Development and Customisation Agreement

Agreement governing the delivery of software that is developed or customised for the Customer

The Norwegian Government's Standard Terms and Conditions for IT Procurement
SSA-T
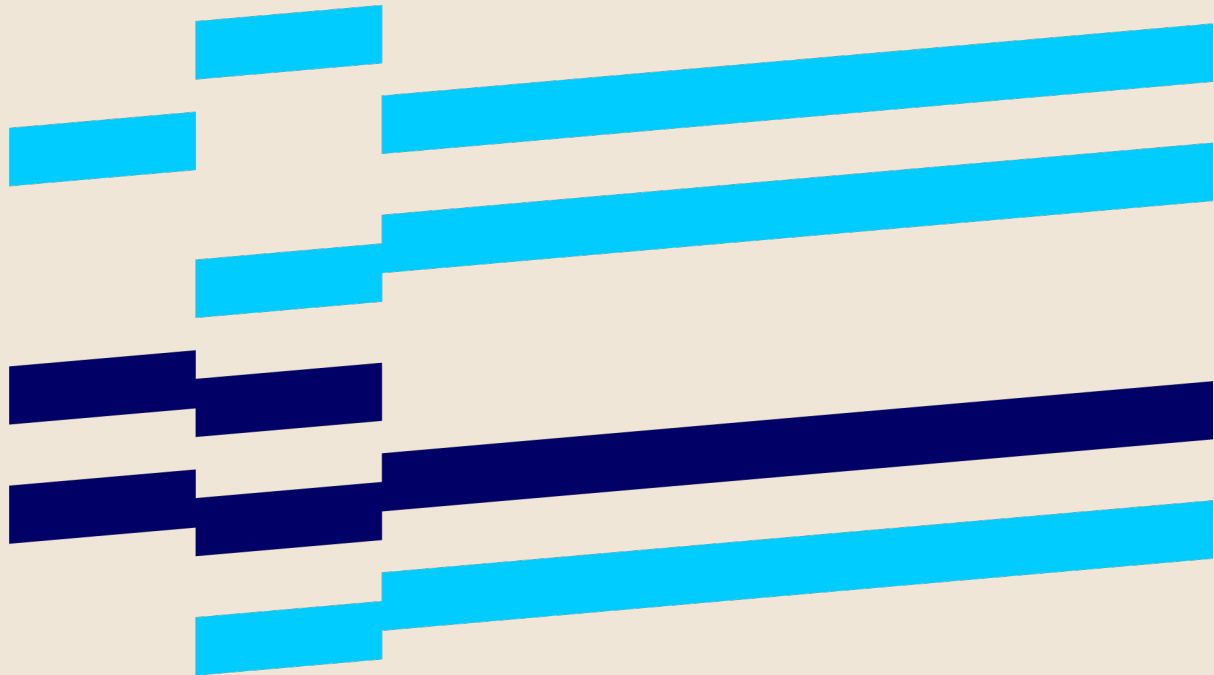
Agreement governing the delivery of software that is developed or customised for the Customer

An agreement concerning
[designation of the procurement]

has been concluded between:

[Write here]

_____

(hereinafter referred to as the Contractor)

and

[Write here]

_____

(hereinafter referred to as the Customer)

Place and date:

[Write place and date here]

_____

(NB: Concerning the duration of the Agreement, see clause 5.1.)

[The Customer's name here]   [The Contractor's name here]

_____   _____
Signature of the Customer   Signature of the Contractor

The Agreement is signed in two copies; one for each party.

Communications
Unless otherwise specified in Appendix 5, all communication concerning this Agreement shall be directed to:

On behalf of the Customer:	**On behalf of the Contractor:**
Name:	Name:
Position:	Position:
Telephone:	Telephone:
Email:	Email:

The Norwegian Government's Standard Terms and Conditions for the Delivery of Standard Systems and Customizations - Development and Customization Agreement, The Agency for Public Management and eGovernment (Difi), 2018

Contents

1.   GENERAL PROVISIONS

1.1   SCOPE OF THE AGREEMENT

The Agreement governs the delivery of software that is developed or customised for the Customer, as well as configuration, the setting of parameters, integration work, and other services associated with the customisation of software for the Customer as described in Appendices 1 and 2 ("the deliverables").

The Agreement shall also apply to any delivery of equipment, training, etc.

The Customer has, based on its purposes and needs, specified its requirements in Appendix 1 (Customer requirements specification) and has described the software and the systems with which the software shall be compatible in Appendix 3. The Contractor has described its solution, based on the Customer requirements specification and the Contractor's assumptions in respect of the deliverables, in Appendix 2 (Contractor solution specification), including any requirements relating to the Customer's operating environment that must be satisfied in order to enable the Customer to utilize the deliverables. If the Contractor is of the view that there are obvious errors or ambiguities in the Customer requirements specification, the Contractor shall point this out in Appendix 2.

If Appendix 1 stipulates that the deliverables shall function together with the Customer's current technical platform, the Customer shall describe this in Appendix 3. If the Customer's technical platform needs to be upgraded in order to enable the Customer to utilize the deliverables, the Contractor shall point this out in Appendix 2.

The Contractor shall, in Appendix 2, inform the Customer of the likely consequences of the relevant customisations in terms of the complexity and price of any future maintenance of the standard system and customization.

If Customer participation is a requirement for the Contractor to be able to deliver according to the agreement, the Contractor must, in appendix 2, describe the Customer's participation in sufficient detail as to enable the Customer to prepare and provide specified expertise at the specified time according to the agreement.

The scope and delivery of the deliverables are described in more detail in the Appendices included as part of the Agreement.

The "Agreement" means this general contractual wording, including Appendices.

The Norwegian Government's Standard Terms and Conditions for the Delivery of Standard Systems and Customizations - Development and Customization Agreement, The Agency for Public Management and eGovernment (Difi), 2018

1.2 APPENDICES TO THE AGREEMENT

All rows shall be ticked (Yes or No)	Yes	No
Appendix 1: Customer requirements specification		
Appendix 2: Contractor solution specification		
Appendix 3: Customer technical platform		
Appendix 4: Project and progress plan		
Appendix 5: Testing and approval		
Appendix 6: Administrative provisions		
Appendix 7: Total price and pricing provisions		
Appendix 8: Changes to the general contractual wording		
Appendix 9: Changes subsequent to the conclusion of the Agreement		
Appendix 10: Licence terms and conditions for standard software and free software		
Other Appendices:		

1.3 INTERPRETATION – RANKING

Changes to the general contractual wording shall be set out in Appendix 8, unless the general contractual wording refers such changes to a different Appendix.

The following principles of interpretation shall apply in the case of conflict:

1. The general contractual wording shall prevail over the Appendices.

2. Appendix 1 shall prevail over the other Appendices.

3. To the extent that the clause or clauses that have been changed, replaced or supplemented, are clearly and unequivocally specified, the following principles of precedence shall apply:

   a) Appendix 2 shall prevail over Appendix 1.
   b) Appendix 8 shall prevail over the general contractual wording.
   c) If the general contractual wording refers to changes to any other Appendix than Appendix 8, such changes shall prevail over the general contractual wording.
   d) Appendix 9 shall prevail over the other Appendices.

4. The standard licence terms and conditions (Appendix 10) shall apply between the producer of any standard software (licensor) and the Customer, but these shall not change the Contractor's obligations under this Agreement to an extent greater than that which is stipulated in clause 5.1 (The Contractor's responsibility for the deliverables) and chapter 10.7 (Free software). "Standard software" means software that is produced for delivery to multiple users, where a licence (right of disposal) may be acquired independent of services from the software producer.

1.4 THE REPRESENTATIVES OF THE PARTIES

Upon the conclusion of the Agreement, each of the parties shall appoint a representative who is authorized to act on behalf of such party in matters relating to the Agreement. The authorized representatives of the parties, as well as procedures and notice periods for any replacement thereof, shall be specified in more detail in Appendix 6.

1.5 THE PHASES AND MILESTONES OF THE AGREEMENT

The Agreement is split into five phases: the preparatory phase (chapter 2.1), the specification phase (chapter 2.2), the development phase (chapter 2.3), the acceptance test phase (chapter 2.4), and the approval period (chapter 2.5). The specification phase, development phase, acceptance test, and approval period may be repeated as often as is necessary to realize the deliverables, see clause 2.1.4 (Partial deliveries).

The main milestones in the Agreement are:

- Approval of the detailed specification (2.2.2)
- Solution ready for acceptance test (2.4.2)
- Acceptance test approved (2.4.6)
- Delivery date (2.5.3)

2. PERFORMANCE OF THE DELIVERABLES

2.1 PREPARATIONS AND ORGANIZATION

2.1.1 Project and progress plan

An overall project and progress plan for the delivery of the deliverables shall be included in Appendix 4.

During the planning phase, the Contractor shall, in cooperation with the Customer, prepare a detailed project and progress plan within the framework defined by the overall plan in Appendix 4. The detailed project and progress plan shall define activities under the milestones defined by the general plan and describe the scope of the Customer's contribution to the project, including resource and time estimates. Those parts of the plan that concern the Customer's participation shall be approved by the Customer. This shall not affect the responsibility of the Contractor for the delivery of the deliverables. If partial deliveries as described in clause 2.1.4 are used, this shall be stipulated in the plan.

The Contractor shall be responsible for keeping the plan updated in the case of changes. An updated version of the plan shall be available to both the Customer and the Contractor at any given time.

2.1.2   Project organisation

The project organisation, definition of roles, responsibilities and authorisations, management documents, reporting, meetings and frequency of meetings are described in Appendix 6.

2.1.3   Project documentation

The Contractor shall prepare and update, on an ongoing basis, the project documentation specified in Appendix 6.

The Contractor shall provide the Customer with status reports for the project in conformity with the procedures agreed in Appendix 6.

2.1.4   Partial deliveries

The deliverables may be split into partial deliveries that are introduced over time. An overall plan for this shall be set out in Appendix 4. The procedures in this Agreement's chapters 2.2-2.4 shall be repeated in connection with each partial delivery. If the partial deliveries shall be put into production on an ongoing basis as they are fully developed and tested, an approval period shall be conducted for each partial delivery, cf. chapter 2.5. Unless otherwise is stipulated in Appendix 4, an overall specification for all of the deliverables, which shows how the combination of the partial deliveries satisfies the overall scope of delivery pursuant to the Agreement, shall be prepared as part of the specification phase for the first partial delivery.

During the acceptance test and the approval period for each new partial delivery, a regression test shall be conducted to check that partial deliveries that have previously been made available or put into use continue to function as they did when they were approved earlier and that they fulfil the Agreement's requirements concerning the interaction between the various partial deliveries, performance, stability and scalability. Detailed provisions concerning the type and scope of the

acceptance test for each partial delivery and the overall acceptance test and approval period shall be stipulated in Appendix 5.

Unless otherwise is stipulated in Appendix 4, the approval period shall be one (1) month for each partial delivery and three (3) months in connection with the final partial delivery, cf. clause 2.5.1. If one or more partial deliveries shall be exempt from the combined testing, this shall be stipulated in Appendix 4.

2.2   DETAILED SPECIFICATION (THE SPECIFICATION PHASE)

2.2.1   Preparation of a detailed specification

During the specification phase, the Contractor shall prepare a detailed specification for the deliverables. Unless otherwise is stipulated in Appendix 4, the detailed specification shall contain an overall description of the deliverables (overall specification), a detailed description of the functionality of the solution (functional specification) and a specification of the interface, and any guidelines for the technical architecture, for those components of the deliverables that shall be developed, and for those components of the deliverables that the parties otherwise find it necessary to specify in more detail.

The specification work shall be carried out in close cooperation with the Customer, and in accordance with procedures and guidelines agreed in Appendix 4. Unless otherwise is stipulated in Appendix 4, the Customer shall be represented at meetings by people with the expertise necessary to discuss questions of significance concerning alternatives for the solution. The Contractor shall document clarifications concerning the solution and the proposed choices made for the solution and send them to the Customer for approval. The Contractor shall, after each working meeting, send out written minutes that describe the choices that were proposed, including the consequences the choices have for the detailed specification and, if relevant, for Appendices 1 and 2. Unless the Customer presents written objections to the proposed choices made for the solution within ten (10) working days, they shall be deemed to have been approved by the Customer. "Working days" means all days that are neither Saturdays, Sundays or public holidays, nor Christmas Eve or New Year's Eve. The Customer shall be responsible for any delays in respect of the deliverables if the Customer does not approve or present written objections to the proposed choices made for the solution by the agreed deadline.

The detailed specification shall set out the choices made for the solution in respect of the deliverables, including details and clarifications of the requirements, within the framework of Appendices 1 and 2. To the extent that changes are made to the Customer's requirements in Appendix 1 and the Contractor's proposed solution in Appendix 2, and these have consequences for the contract price, progress plan, Customer's participation, other requirements in Appendix 1, or other factors, a change order shall be issued. A joint change order shall be prepared for changes

that follow from the specification work, although it shall be clearly stated which requirements have been changed. The Customer may not waive requirements in any other manner than by issuing a change order.

The detailed specification shall form the basis for the development and delivery of the solution.

A plan for the conversion work shall also be prepared in the specification phase, cf. clause 2.3.8.

2.2.2 Delivery and approval of the detailed specification

A final detailed specification, cf. clause 2.2.1, and a complete project and progress plan for the deliverables, cf. clause 2.1.1, shall be handed over to the Customer, for final review and approval by the deadlines set out in Appendix 4.

Unless different deadlines are agreed between the parties, or are agreed in Appendix 4, the Customer shall, within ten (10) working days after they are handed over pursuant to the previous paragraph, consider the documents and provide the Contractor with a written response stating whether or not the documents are approved. If the Customer has not provided a response by the agreed deadlines, the specification shall be regarded as approved. If, in the opinion of the Customer, the documents do not conform with the requirements agreed in Appendices 1 and 2 as these are set out in detail and clarified pursuant to clause 2.2.1 or as changed through a change order, the Customer shall specify which factors it wants changed and notify the Contractor of these in writing. The Contractor shall rectify the documents in accordance with the Agreement and shall submit such documents to the Customer anew. The Customer shall then make a decision concerning the documents within ten (10) working days or the deadline stipulated in Appendix 4. Detailed terms and conditions for the approval of detailed specifications may be agreed in Appendix 5. If only minor components of the detailed specification are not approved by the Customer, the Contractor may start working on the deliverables for the approved components.

If the Customer rejects or requires changes to the detailed specification for any reason other than that it does not conform with what has been agreed (for example, because the Customer disagrees with some choices made for the solution and wants them changed, despite the fact that the choices would represent fulfilment of the requirements in Appendices 1 and 2, and are described in detail and clarified pursuant to clause 2.2.1) the Contractor shall be entitled to a change order.

2.3 PERFORMANCE OF THE DELIVERABLES

2.3.1 Development

The Contractor shall develop that which is described in the detailed specification, cf. clause 2.2, such that the software satisfies the requirements of the Agreement. The Contractor is in this regard responsible for carrying out design and development, as well as its own testing, of the software in accordance with the detailed project plan, cf. Appendix 4.

2.3.2 Interaction with equipment and other software

The Contractor shall execute the implementation work at the Customer, such that the software satisfies the requirements of the Agreement.

The Contractor shall be responsible for ensuring that the deliverables work together with those components of the Customer's current solution that the Customer has, in Appendix 3, informed the Contractor of and that the appendix states they shall work with, unless the Contractor has, in Appendix 2, stipulated that upgrading is required, cf. clause 1.1.

The Contractor shall be responsible for integrating the software with other software that the Customer has described in Appendix 3 pursuant to the requirements set out in Appendix 1, as well as the Contractor's proposed solution and assumptions in respect of the integration work in Appendix 2. Appendices 1 and 2 shall set out which integrations the Contractor shall bear responsibility for in respect of their results and progress, and which shall be delivered as additional services (contribution obligation). Integrations that are delivered as additional services, shall, unless otherwise is agreed, be paid for by the Customer on the basis of time spent charged at the Contractor's hourly rates in Appendix 7. Integrations that are delivered as additional services, shall, insofar as it is possible, be delivered pursuant to the progress plan in Appendix 4, but shall not provide a basis for rejecting the deliverables during the acceptance test or the approval period.

2.3.3 Implementation method

Appendix 2 shall describe the methods and tools that shall be used to implement the deliverables, as well as the environment in which they shall be implemented. Any special requirements on the part of the Customer as far as the methods, tools or environment are concerned are set out in Appendix 1.

2.3.4 Quality assurance

The Contractor shall have and maintain a quality plan based on documented work and quality assurance methods. The Contractor shall quality assure and test in a proper manner anything developed in accordance with the quality plan.

2.3.5   Audits

The Customer, or whomever it may authorise, shall, for its own account, be entitled to carry out quality and security audits and reviews of the development effort. The Customer shall also be entitled to conduct other audits to verify that the Contractor is complying with its other obligations under this Agreement. More detailed procedures and notification rules may be set out in Appendix 6. The Customer shall have the right to engage a third part to conduct the audit. The Contractor shall be notified of any third party selected by the Customer and may reject the assignment if the Contractor is able to demonstrate that this will entail a material commercial disadvantage to the Contractor.

2.3.6   Documentation

Documentation requirements shall be set out in Appendices 1 and 2. Unless otherwise is agreed, the Customer shall be granted access to the Contractor's standard documentation for the solution, as well as the documentation of the components of the solution that have been developed or customised especially for the Customer.

The documentation shall be delivered within the deadline or deadlines specified in Appendix 4. Unless otherwise specified therein, the documentation shall be delivered no later than the day before the Customer acceptance test shall commence, in order to enable testing of the documentation simultaneously with testing the other parts of the deliverables.

2.3.7   Training

If the Contractor shall assist with training, this shall be stipulated in Appendices 1 and 6, and priced separately in Appendix 7. The date for training shall be stipulated in Appendix 4.

2.3.8   Conversion

If the Contractor shall carry out the conversion of the Customer's data, this is described in more detail in Appendix 1 and/or Appendix 2. Unless otherwise is agreed in Appendix 7, conversion shall be executed based on time spent charged at the Contractor's hourly rates in Appendix 7.

A detailed plan for the conversion work and a specification of the necessary conversion software shall be prepared and approved in the detailed specification phase, cf. clause 2.2. The plan shall also describe how personal data shall be processed in connection with conversion.

It is a prerequisite that the Customer has undertaken the necessary synchronisation and structuring of its own databases to ensure that the data quality of the Customer's existing systems is sufficient for purposes of conversion to the software.

The Contractor shall, for example, by obtaining confirmation from the Customer, ensure that backup copies are made of the Customer's data before conversion takes place. The backup shall be stored until the Customer has confirmed that the conversion has been correctly executed.

Approval shall take place by the parties conducting one or more test conversions of data, as specified in detail in Appendix 5, whereupon the Customer shall verify that the test conversion has been correctly executed, including that the data have been transferred and are in the correct format.

Approval of the conversion shall otherwise take place pursuant to the provisions of Appendix 5, and within the deadlines specified in Appendix 4.

2.4 THE CUSTOMER ACCEPTANCE TEST

2.4.1 Preparations for acceptance tests

The duties of the Customer and the Contractor in connection with preparations for acceptance tests shall be stipulated in Appendix 5.

2.4.2 Solution ready for acceptance test

The Contractor shall inform the Customer in writing once the development and customisation of the software has been completed and it has been tested by the Contractor. The Contractor's test report, which shall include a list of known errors, shall be appended to the notice. The Customer may, in Appendix 5, stipulate requirements that limit the number of errors in various categories that the software may contain at the start of the acceptance test.

If, during the first ten (10) working days after the Customer has received notification from the Contractor, it becomes clear that the solution is so defective that it would entitle the Customer to halt the acceptance test pursuant to clause 2.4.5, paragraph five, the Customer may contest the notice and the milestone "Solution ready for acceptance test" shall be deemed not to have been achieved. Such complaints from the Customer shall be sent within ten (10) working days after the Customer received the notice from the Contractor. A corresponding procedure shall apply to any new notices.

2.4.3 Plan for the Customer acceptance test and the approval period

The Customer shall prepare and be responsible for a plan for the Customer's acceptance test; the Contractor shall contribute as set out in Appendix 5.

The Contractor shall make available to the Customer the material the Contractor will utilise as a basis for its testing of the solution, such that the Customer may use this as a basis for the Customer's work on the test plan.

The acceptance test plan shall describe how the Customer's acceptance test shall be conducted.

The Customer shall submit the test plan to the Contractor for its comments. This shall be set out in Appendix 5. The Contractor shall, as soon as possible, consider the test plan and provide a written response concerning whether or not it is deemed adequate to achieve the satisfactory testing of the solution by the deadline set out in Appendix 5.

2.4.4   Scope of the acceptance test

The Customer acceptance test shall comprise the software and the equipment that form part of the deliverables. The scope of the acceptance test is described in more detail in Appendix 5 and the test plan.

2.4.5   Performance of the Customer acceptance test

The acceptance test shall be commenced and completed in accordance with the deadlines set out in Appendix 4.

The Customer acceptance test shall be performed as described in Appendix 5, and in accordance with the acceptance test plan, cf. clause 2.4.3. The Customer is obliged to observe the progress plan for the test.

All errors reported during the Customer acceptance test shall be documented, in order that they may be reproduced. All reported errors shall be categorised as A, B or C errors by the Customer.

Unless Appendix 5 specifies otherwise, the following error definitions shall apply:

Level	Category	Description
A	Critical error	- Error that results in the stoppage of the software or equipment, a loss of data, or in other functions that, based on an objective assessment, are of critical importance to the Customer not being delivered or not working as agreed. - The documentation being so incomplete or misleading that the Customer is unable to use the software or the equipment, or material parts thereof.
B	Serious error	- Error that results in functions that, based on an objective assessment, are of importance to the Customer not working as described in the agreement, and which it is time-consuming and costly to work around. - The documentation being incomplete or misleading, and this resulting in the Customer being unable to use functions that, based on an objective assessment, are of importance to the Customer.
C	Less serious error	- Error that results in individual functions not working as intended, but which can be worked around with relative ease by the Customer.

| | | - The documentation being incomplete or imprecise. |

The Customer shall report errors to the Contractor on an ongoing basis, and the Contractor shall repair the errors without undue delay. Rectified errors shall be delivered for retesting as set out in Appendix 5.

If the Customer is prevented from executing the test because of inadequate error rectification, or if errors are discovered that prevent the effective execution of the entire test, or parts thereof, the affected component of the test shall be halted until the Contractor has performed the necessary rectifications. A period of time equal to the length of time for which the test was stopped plus the length of time the Customer needs to redo the test shall be added to the period for the Customer's acceptance test.

If previously rectified errors are reintroduced into the solution because the Contractor makes a version management mistake and inserts outdated code, the Customer's acceptance test shall be halted until the Contractor has performed the necessary rectifications. A period of time equal to the length of time for which the test was stopped plus the length of time the Customer needs to redo the test shall be added to the test period.

If the type or scope of the errors prevent all of the planned tests being conducted within the period of time set aside for the acceptance test, the Customer shall be entitled to extend the acceptance test by the period of time necessary.

2.4.6   Approval of the Customer acceptance test

If the Customer approves the acceptance test, the Customer shall give the Contractor written notice to such effect without undue delay. The acceptance test is under any circumstance deemed to be approved unless the Customer has notified the Contractor in writing, within ten (10) working days after the expiry of the acceptance test period, including any extensions because of matters as described in clause 2.4.5, stating that it is not approved. The acceptance test is also deemed to have been approved if the Customer opts to put the software into operation.

The Customer may not refuse to approve the test on the basis of matters that are immaterial for purposes of the Customer's use of the deliverables. A and B errors are deemed to be individually material, with the exception of B errors that are not of material importance to the ability of the Customer to put the software into operation and commence the approval period. C errors are deemed to be immaterial, unless several C errors imply, in aggregate, that approval would be clearly unreasonable. Other, or more detailed, acceptance criteria may be described in Appendix 5.
Errors that have only occurred once, and which it has not been possible to reproduce during the acceptance test period, are not deemed to be errors for the purpose of approving the test. If the Customer refuses approval, the reasons for this

shall be explained in writing with a statement of which errors are preventing approval. If the Contractor wishes to argue that the refusal is unjustified, including that the Contractor disagrees with the categorisation of errors, written notice shall be given to such effect, which notice shall be given within five (5) working days. If the Customer still refuses to approve the test, the dispute shall be resolved pursuant to chapter 16. The Contractor shall in all circumstances rectify the asserted errors as quickly as possible.

If the Contractor does not dispute the Customer's refusal, the Contractor shall within five (5) working days send the Customer a timetable for repairing the errors. The Contractor shall give written notice to the Customer when the repairs have been carried out. Repairs are not deemed to be performed until they have been properly tested by the Contractor and the acceptance test of the Customer. The Contractor's tests shall cover all parts of the deliverables that may be affected by the errors.

The Customer shall, as soon as the Contractor has given notice stating that the errors have been repaired and tested, resume its acceptance test. The Customer shall be entitled to a reasonable amount of additional time for purposes of carrying out such testing.

If, at the end of the acceptance test, the deliverables have errors and deviations that would entitle the Customer to reject the deliverables, the Customer may nevertheless choose to accept them with reservations. If the Customer chooses to accept with reservations and references to the agreed rectification plan, and the rectification plan is not complied with, the remedies shall apply as if the acceptance test was rejected (delay) from this point in time.

If the Customer, during the last five (5) working days of the acceptance test, reports an error to the Contractor for the first time that in principle prevents approval, the error shall be deemed to be covered by the agreed rectification plan. Such errors shall be rectified within ten (10) working days after the end of the acceptance test. The Customer shall then have five (5) working days to test the rectified errors. If the errors have not been rectified within the ten-day deadline, the remedies shall apply as if the acceptance test was extended (delay).

The approval period may only commence when the acceptance test has been approved.

The Customer's approval of the acceptance test shall not prevent the Customer from demanding, during the approval period, the rectification of errors or defects that the Customer did not discover during the acceptance test, or errors that have not been rectified by the Contractor during the acceptance test period.

2.4.7 Commissioning

The software may be put into ordinary operation after the Customer's acceptance test has been successfully conducted and approved. The schedule for preparing for commissioning is set out in Appendix 4.

The duties of the parties in connection with commissioning are specified in Appendix 5.

2.5 APPROVAL PERIOD AND DELIVERY DATE

2.5.1 Duration

A three (3) month approval period commences on the date on which the deliverables are put into regular operation, unless a different duration has been agreed in Appendix 5.

If start-up of regular operations is delayed as the result of circumstances related to the Customer, the approval period shall nevertheless commence on the agreed date, unless the Customer requests a change to the progress plan pursuant to chapter 3.

2.5.2 Implementation of the approval period

The Customer shall carry out, during the approval period, checks as to whether the deliverables are in conformity with what has been agreed.

The checks carried out by the Customer during the approval period shall be performed on the basis of the ordinary, daily operational and other duties. A detailed specification of the content of the approval period, with a specific description of the checks to be carried out by the Customer, may be set out in Appendix 5 or in a separate plan for the approval period.

The Customer shall during the approval period give the Contractor written notice of any errors on an ongoing basis, including a description of the errors, in accordance with the same procedures for the acceptance test, unless otherwise is agreed in a separate plan for the approval period or in Appendix 5. The Contractor shall, as quickly as possible, rectify the errors and test the error rectifications before they are handed over to the Customer for retesting.

Unless otherwise agreed in Appendix 5, any errors shall be repaired, at the latest, by the end of the approval period, with the exception of:
> 1) errors that, pursuant to the agreed rectification plan, shall be rectified later, as well as
> 2) errors that are of only minor significance in respect of the Customer's use of the solution, and which will be rectified in a planned update of the

software within a reasonable period of time and at the latest by the end of the warranty period, and which it would therefore be disproportionately resource-demanding for the Contractor to rectify during the approval period. Under any circumstances, the errors shall be rectified by no later than the end of the warranty period.

The basis for further examination during the approval period shall be regarded as having been rendered impossible if the Customer finds, and invokes in writing, A or B errors that on their own or combined would made further examination impossible, or very difficult, or that mean that the value of such an examination would be significantly reduced. The Customer may demand that the approval period be extended by a period of time equal to the time is takes to rectify the errors, as well as a reasonable period of time for retesting.

2.5.3 Final approval – delivery date

The Customer shall, prior to the end of the approval period, give the Contractor written notice of the extent to which of the deliverables are deemed to be in conformity with the agreed deliverables and, consequently, whether or not they can be approved. If such notice has not been sent by the end of the approval period, the deliverables shall nevertheless be deemed to be approved (through laches).

The Customer may not refuse to approve the deliverables on the basis of matters that are immaterial for the Customer's use of the deliverables. Unless otherwise is agreed in Appendix 5, the following shall apply: A errors and three (3) B errors are deemed to be individually material. C errors are deemed to be immaterial, unless several C errors imply, in aggregate, that approval would be clearly unreasonable.

If the Customer refuses to approve the deliverables, such refusal shall be explained in writing. If the Contractor wishes to argue that the refusal is unjustified, including that the Contractor disagrees with the categorisation of errors, written notice shall be given to such effect no later than five (5) working days after the receipt of the Customer's notice of refusal. If the Customer still refuses to approve the deliverables, the dispute shall be resolved pursuant to chapter 16. The Contractor shall in all circumstances rectify the asserted errors as quickly as possible.

If the Contractor does not dispute the Customer's refusal, the Contractor shall within five (5) working days send the Customer a timetable for repairing the errors associated with the deliverables. The Contractor shall give written notice to the Customer when the repairs have been carried out. Repairs are not deemed to be performed until they have been properly tested by the Contractor and retested by the Customer. The Contractor's tests shall cover all parts of the deliverables that may be affected by the errors. The Customer shall retest the rectification(s) within five (5) working days.

If the deliverables are not approved, the approval period shall be extended until the prerequisites for approval have been met.

If, at the end of the approval period, the deliverables have errors and deviations that would entitle the Customer to reject the deliverables, the Customer may nevertheless choose to approve them with the proviso that the errors be rectified in accordance with an agreed rectification plan. If the rectification plan is not complied with, the remedies shall apply as if the approval period was rejected (delay from the end of the original approval period).

If the Customer, during the last five (5) working days of the approval period, reports an error to the Contractor for the first time that in principle prevents approval, the error shall be deemed to be covered by the agreed rectification plan. Such errors shall be rectified within ten (10) working days after the end of the approval period. The Customer shall then have five (5) working days to test the rectified errors. If the errors have not been rectified within the ten-day deadline, the remedies shall apply as if the approval period was extended (delay).

The first working day after the deliverables are, or are deemed to be, approved, is referred to as the delivery date.

The Customer shall enjoy, as of the delivery date, the warranty described in chapter 4.

The Customer's approval shall not prevent the Customer from demanding, during the warranty period, the rectification of errors and defects that the Customer did not discover and could not be expected to discover during the approval period, or errors that have not been rectified by the Contractor during the approval period.

2.6   CANCELLATION – TEMPORARY SUSPENSION

2.6.1   Cancellation in connection with the specification phase

Prior to the end of the specification phase as stipulated in clause 2.2, the Customer may cancel, in full or in part, the items contracted under this Agreement. Such cancellation shall be made in writing, and shall be received by the Contractor no more than ten (10) working days after the end of the specification phase.

In the event of such cancellation, the Customer shall pay the amount stipulated in Appendix 7 for cancellation during this phase, or if no such amount has been stipulated:
   a)   Any amount due to the Contractor in respect of such part of the project as has already been completed.
   b)   The Contractor's necessary and documented direct costs in relation to the reassignment of personnel.
   c)   Other documented direct costs incurred by the Contractor as the result of

the cancellation, including disbursements and costs that have been incurred by the Contractor prior to its receipt of the notice of cancellation, and which the Contractor is unable to make use of for other purposes.

The total cancellation fee for the specification phase may never exceed the consideration for the specification phase agreed in Appendix 7.

The consequences that partial cancellation has in respect of the remaining parts of the deliverables, including the effect on the contact price, shall be handled in accordance with the provisions in chapter 3.

2.6.2 Cancellation after the specification phase

After the specification phase as stipulated in clause 2.2, the Customer may cancel, in whole or in part, the items contracted under this Agreement on one (1) month's written notice.

In the event of such cancellation, the Customer shall pay:
   a) Any amount due to the Contractor in respect of such part of the project as has already been completed.
   b) The Contractor's necessary and documented direct costs in relation to the reassignment of personnel.
   c) Other documented direct costs incurred by the Contractor as the result of the cancellation, including disbursements and costs that have been incurred by the Contractor prior to its receipt of the notice of cancellation, and which the Contractor is unable to make use of for other purposes.

In addition, the Customer shall pay a cancellation fee equal to the lower of:
   − four (4) per cent of the contract price, or
   − six (6) per cent of such part of the contract price as remains unpaid as per the cancellation date, and which has not been paid pursuant to letter a) above either.

A different cancellation fee may be agreed between the parties in Appendix 7.

In the case of partial cancellation, the cancellation fee shall be calculated on the basis of the share of the contract price accounted for by the cancelled items. The consequences that partial cancellation has in respect of the remaining parts of the deliverables, including the effect on the contact price, shall be handled in accordance with the provisions in chapter 3.

2.6.3 Temporary suspension of the deliverables

The Customer may request upon minimum 5 (five) working days' written notice to the Contractor, the temporary suspension of the delivery of the deliverables.

The Customer shall specify, in such notice, as from what date (milestone) the delivery of the deliverables shall be suspended, as well as from which date it is intended for the delivery of the deliverables to recommence.

The Contractor shall immediately, and no later than five (5) working days after notice has been received, send the Customer an overview of the functions and activities that need to be sustained during the suspension period.

The delivery of the deliverables shall recommence, without undue delay, upon written notice from the Customer.

The Customer shall reimburse the Contractor for its documented costs relating to the reassignment of personnel on the part of the Contractor and its subcontractors, as well as other direct costs incurred by the Contractor as the result of the suspension. If the Customer requests that personnel who participated in the delivery of the deliverables prior to the suspension shall recommence the work and complete the delivery of the deliverables, the Customer shall reimburse the costs of the Contractor in respect of such personnel, calculated on the basis of the lowest of the hourly rates for consultants set out in Appendix 7, but only to the extent that it has not been possible for the Contractor to use the resources for other income-generating work during the period of suspension of the delivery of the deliverables. Such a claim from the Customer shall be submitted no later than the notice referred to in paragraph two above.

If the suspension has consequences in terms of progress in the delivery of the deliverables or the contract price, cf. Appendices 4 and 7, such consequences shall be dealt with pursuant to the provisions in chapter 3 on changes.

If the delivery of the deliverables has been continuously suspended for more than one hundred and twenty (120) calendar days, the Contractor may terminate the Agreement without cause by written notice to the Customer. Unless the Customer renders written notice, within fourteen (14) calendar days of having received the notice, stating that the delivery of the deliverables shall recommence, the cancellation provisions of clauses 2.6.1 and 2.6.2 shall apply correspondingly.

2.6.4   Handover of specifications, etc.

Upon cancellation pursuant to clause 2.6.1 or 2.6.2, the Contractor shall hand over to the Customer all specifications and other materials prepared for the Customer up and until the cancellation date. This shall apply to both written and electronic materials.

3. CHANGES SUBSEQUENT TO THE CONCLUSION OF THE AGREEMENT

3.1 RIGHT TO CHANGE THE CONTENTS OF THE AGREEMENT (CHANGE TO THE DELIVERABLES)

The Customer has the right to order changes, in the form of increases or reductions in the scope, nature, type, quality or delivery of the deliverables, as well as changes to the progress plan, provided that such changes fall within the scope of what the parties could have reasonably expected upon the conclusion of the Agreement.

However, the Contractor shall not be obliged to carry out additional work that represents, in aggregate, a net addition of more than fifteen (15) per cent to the original contract price, other than in the case of a disputed change order pursuant to clause 3.8.

If the overall consideration of the Contractor, net of all reductions and additions, is reduced by more than fifteen (15) per cent of the original contract price, such reduction shall be dealt with as a partial cancellation, cf. clause 2.6.

3.2 CHANGE ESTIMATE

Unless otherwise is specified in Appendix 6 or the change order itself, the Contractor shall, within a maximum of ten (10) working days from receipt of a written request for a change, submit a study of potential risk and change consequences, as well as a price estimate. In the event of a request for major changes, the parties shall agree an extension of the deadline with such number of days as is deemed to be reasonable. In such circumstances, the Contractor may require an extension of the time-limit of up to ten (10) working days. The request for an extension of the deadline must be submitted before the end of the ten-day deadline in the first sentence.

At a minimum, the study shall include the following:

a) description of the change
b) description of the scope of work that needs to be carried out as a result of the change, and the time required for such work
c) implications for the requirement specification/solution specification and/or detailed specification
d) implications for the requirements applicable to the Customer's technical platform
e) implications for the contract price, with a detailed specification of the calculation basis, cf. clause 3.5
f) implications for the progress plan, cf. clause 3.5
g) changes to the Customer participation requirements
h) changes to test plans and test criteria

     i)   implications for the future maintenance of the standard system and the developed software, and the relation between these

Documented costs in connection with the preparation of change estimates are carried by the Customer in accordance with the prices and terms applicable to supplementary work, cf. Appendix 7. If standard prices for the preparation of change estimates are set out in Appendix 7, the Contractor shall not be entitled to the reimbursement of any costs in excess thereof, unless the Customer has given its prior written approval of a larger estimate.

If the preparation of a change estimate does in itself necessitate changes to the progress plan, the Contractor may request that the plan be adjusted.

3.3   CHANGE ORDERS

If the Customer accepts the study and the price submitted by the Contractor, the Customer shall inform the Contractor, by issuing a change order, that the Customer wishes the change to be implemented. The change order shall be signed by the Customer.

Thereafter, the Contractor shall, within ten (10) working days of the Contractor receiving the signed change order, ensure that the change order is incorporated into the Agreement, with changes to specifications, the progress plan, the technical platform, tests, required contributions from the Customer, as well as changes to the contract price, being set out in the Agreement.

The changes shall be presented to the Customer for its approval.

The terms and conditions of the Agreement shall apply to the change order as well, unless otherwise explicitly stated in the change order.

3.4   DOCUMENTATION OF THE CHANGE

Changes to the deliverables as referred to in chapter 3 shall be made in writing, and shall be signed by an authorised representative of the parties. The Contractor shall maintain a directory of the changes on an ongoing basis, which directory shall form Appendix 9, and shall without undue delay provide the Customer with an updated copy thereof.

3.5   CONSEQUENCES OF CHANGE ORDERS

If the Customer requires a change, the Contractor shall have the right to require adjustments to the contract price and progress plan or other matters, cf. clause 3.2, caused by the change requirement of the Customer.

Adjustments to the contract price shall be calculated on the basis of the hourly charges or other unit prices set out in Appendix 7, provided that the work occasioned by the change is, in the main, similar to work for which hourly charges or unit prices have been specified.

If it is not possible to calculate the change based on the hourly rates or unit prices in Appendix 7, the Contractor shall present a quote in respect of the addition or deduction for the changes. The offer shall reflect the general price level of this Agreement.

If any changes and/or additions requested would, as a general rule, have resulted in an adjustment to the agreed date on which the solution will be ready for the acceptance test or delivery date, the Contractor shall, to the extent practicable, seek to accelerate implementation in order that the agreed deadlines may nevertheless be observed. In such case, acceleration shall be deemed to constitute a change to be dealt with pursuant to the rules set out in chapter 3.

The change order shall be implemented without undue delay when received by the Contractor. This shall apply irrespective of whether the effect of the change order in terms of the contract price, the progress plan or other terms and conditions of the Agreement have been finally resolved, cf. clause 3.6.

3.6   DISPUTE CONCERNING THE CONSEQUENCES OF A CHANGE

If the parties agree that there is a change, but disagree on the effect of such change as far as the contract price is concerned, the Customer shall pay a preliminary consideration calculated pursuant to the rules set out in clause 3.5. If no ruling from an independent expert or mediator has been requested and no legal proceedings have been instituted in respect of the work occasioned by the change within six (6) months after the delivery date or the date on which notice of termination for breach or cancellation was received by the Contractor, the consideration paid shall be deemed to be final. The Contractor shall pledge security for the disputed part of the consideration, or alternatively choose to be paid half of the disputed part of the consideration, up to the date when the consideration is deemed to have been set with final effect.

3.7   DISAGREEMENT AS TO WHETHER THERE IS A CHANGE

If the Customer requests, in the form of written orders, specifications or otherwise from an authorised person, the performance of certain specific work that the Contractor believes to fall outside the scope of its obligations pursuant to the Agreement, the Contractor shall, in writing, request the Customer issue a change order.

Together with the change order request, the Contractor shall provide the Customer with a study of relevant risk and change consequences, as well as a price estimate (change estimate) pursuant to clause 3.2. The costs associated with the preparation of change estimates shall be paid by the Customer if the Contractor's request for a change order is accepted.

If the Contractor fails to make such request within a reasonable period of time, the work shall be deemed to form part of the Contractor's obligations pursuant to the Agreement, and the Contractor waives its right to invoke such work as grounds for extending deadlines, additional consideration or damages.

3.8   DISPUTED CHANGE ORDER

If the Contractor has requested the Customer to issue a change order pursuant to clause 3.7, the Customer shall, within a reasonable period of time, issue a change order pursuant to clause 3.3, or issue a written waiver of the request.

If the Customer deems the work to form part of the deliverables, it shall be explicitly stated that the change order is disputed (disputed change order). The change order shall include an explanation as to why the Customer deems the change order to be disputed.

Even if the change order is disputed, the Contractor shall perform what has been ordered in return for the Customer paying a provisional consideration corresponding to half of the amount to which the Contractor believes it is entitled. If the Contractor does not demand a decision concerning the disputed change pursuant to clause 3.9 of the Agreement within three (3) months after the consideration has been paid, or if the work is deemed to fall within the scope of the Agreement, the provisional consideration shall be set off against the consideration due upon the next payment milestone. If the work is deemed to be a change, the fixed consideration for the change, adjusted for the provisional consideration, shall be incorporated into the ordinary payment plan.

The Contractor may contest the duty to perform the work by requesting a ruling from an independent expert or mediator or institute legal proceedings or submit the dispute for arbitration in order to have its claim resolved with final effect, cf. chapter 16. Such a request must be submitted without undue delay after the Customer has provided notice that the change is disputed. The Contractor shall bear the risk associated with any delays that may occur due to the postponement of the work, if it is determined that the work falls within the scope of the Agreement.

3.9   DISPUTE RESOLUTION – DISPUTED CHANGE ORDER

If the Contractor has received a disputed change order, the Contractor shall, within six (6) months of having received the disputed change order, either request a ruling

from an independent expert or mediator or institute legal proceedings or submit the dispute for arbitration in order to have its claim resolved with final effect, cf. chapter 16. If the Contractor fails to do so, the work shall be deemed to fall within the scope of the Contractor's duties under the Agreement.

4. WARRANTY PERIOD

4.1 SCOPE OF THE WARRANTY

Unless otherwise agreed in Appendix 7, the warranty period shall be one (1) year for software and two (2) years for equipment after the delivery date, cf. clause 2.5.3.

Contingent upon normal, diligent use on the part of the Customer, the Contractor shall, at no additional cost, rectify errors and defects, replace defect parts of equipment and rectify errors in software governed by this Agreement and which the Customer has complained about before the expiry of the warranty period. No damages or other remedies for breach of contract may be claimed for defects that are rectified pursuant to the warranty.

Appendix 2 may specify detailed requirements for the maintenance of equipment that must be performed for the warranty to remain valid.

4.2 PERFORMANCE LEVEL

Any maintenance services beyond the warranted performance shall be specified and priced in a designated agreement.

If the parties have concluded a maintenance and service agreement, the performance level of such agreement shall also form the basis for the warranted performance.

If no maintenance agreement has been concluded, the performance level during the warranty period shall be specified in Appendices 1 and/or 2.

Moreover, all work involved in curing errors and defects shall be commenced and completed without undue delay after the Contractor has received notice of such errors or defects. The second to last paragraph of clause 5.1 shall apply correspondingly.

If the Contractor chooses to rectify errors during the warranty period by delivering a new version of the software, the Contractor shall not be entitled to any consideration in respect of the new version, even if it contains improvements. The Contractor may only rectify errors and defects by way of the delivery of a new

version if the Customer is able to utilise such new version on the Customer's existing technical platform.

4.3 ADDITIONAL CONSIDERATION

In the event of errors and defects that fall outside the scope of the warranty, the Contractor will perform the same service as agreed for the warranty period, but in the form of a chargeable service. The Contractor's list prices for such services shall apply, unless otherwise agreed.

5. THE DUTIES OF THE CONTRACTOR

5.1 THE RESPONSIBILITY OF THE CONTRACTOR FOR ITS PERFORMANCE

The Contractor is responsible for ensuring that the deliverables as a whole (the overall solution) provide the functions and satisfy the requirements specified in the Agreement.

The Contractor is responsible for ensuring that the deliverables are tailored to the technical platform specified in Appendices 2 and 3, cf. clause 1.1, and that the deliverables are compatible with other software specified in Appendices 1 and 2.

To the extent that standard software included in the deliverables must be delivered under standard licence terms and conditions and agreement terms and conditions (licence terms and conditions), this shall be explicitly stated in a separate chapter in Appendix 2, and copies of the licence terms and conditions shall be appended as Appendix 10.

The provisions of the licence terms and conditions governing right of disposal shall prevail over the provisions governing right of disposal in this Agreement, unless otherwise is explicitly stated in Appendix 8. The Contractor shall, however, ensure that standard software is offered under licence terms and conditions with a right of disposal that satisfy the requirements in respect of the deliverables and their area of use stipulated by the Customer in Appendix 1, and this Agreement's provisions governing right of disposal. To the extent that the provisions of licence terms and conditions governing right of disposal differ from this Agreement's provisions governing right of disposal, the Contractor shall describe this clearly in Appendix 7. In the event of defects in title, the Contractor shall not be liable for damages for defects in title associated with standard software beyond that which follows from licence terms and conditions included in Appendix 10 and the coverage of any liability for damages imposed on it in relation to a third party (the rightsholder(s)) pursuant to clause 13.4.

The deliverables shall be tested and approved pursuant to this Agreement's provisions governing testing and approval, independent of what may follow from the software's licence terms and conditions.

The Contractor shall be responsible for the deliverables (the overall solution) meeting the requirements under this Agreement, irrespective of the provisions of the particular licence terms and conditions.
If the deliverables deviate from what was agreed under this Agreement, it shall be the responsibility of the Contractor to rectify the deviation in such a way as to make the deliverables conform to what was agreed, even if such deviation is caused by factors in standard software that are subject to licence terms and conditions that include different provisions on the rectification of errors. The rectification of errors in, or errors caused by, standard software may be effected in any manner that makes the deliverables conform to the requirements under the Agreement.

If the Contractor documents that deviations in the deliverables are due to the behaviour of the standard software not matching the software producer's specifications, and that access to the standard software's source code is required in order rectify the errors, the Contractor's obligation to rectify the errors is limited to reporting the error to the software producer, seeking to the best of its ability to make rectification of the error a priority, keeping the Customer informed about the status of the error rectification, and making the rectified version available to the Customer once the error in the standard software has been rectified by the software producer. The Contractor shall assist with installation at the request of the Customer, without additional consideration. The Contractor shall make a reasonable effort to find a temporary solution while the software producer rectifies the error. A maximum financial limit for the Contractor's obligation to work out temporary solutions that work around errors in standard software can be agreed in Appendix 7.

Errors in standard software such as those mentioned in the second to last paragraph shall not be included in the assessment of whether or not the acceptance criteria or approval criteria have been fulfilled, unless the Contractor has failed to perform its duties in respect of following up the error rectification and installing the rectified version. As soon as the errors in the standard software have been rectified, the rectified version has been installed, and the Contractor has otherwise performed the tasks necessary for the deliverables to match that which has been agreed, the Customer shall be entitled to a reasonable period of time to retest the deliverables. If such errors as those mentioned in this paragraph result in the Customer deciding to postpone the start of the approval period, the Contractor may not demand consideration for this postponement, even if a change order is issued pursuant to clause 2.5.1, paragraph two. If the errors in the standard software are not rectified by the expiry of the warranty period, the Customer may demand a price reduction and possible damages pursuant to the Agreement's chapter 11.

5.2   REQUIREMENTS AS TO THE RESOURCES AND EXPERTISE OF THE CONTRACTOR

The Contractor warrants that the deliverables will be performed with sufficient qualitative and quantitative resources and expertise, given the requirements stipulated in the Agreement. The Contractor's project manager and other key personnel are specified in Appendix 6.

Persons designated as key personnel in Appendix 6 shall not, within the scope of the Contractor's managerial prerogative as employer, be replaced without the prior approval of the Customer. Such approval shall not be unreasonably withheld. The actual participation of the key personnel in the provision of the deliverables shall not be scaled back without the prior approval of the Customer.

Personnel that the Customer, for justifiable reasons, does not wish to use, or wishes to have replaced, shall as soon as possible be replaced by alternative personnel with at least corresponding expertise.

Personnel replacements shall not affect the progress of the project or impose additional costs on the Customer.

5.3   USE OF SUBCONTRACTORS

The Contractor's use and replacement of subcontractors that directly participate in the performance of the deliverables must be approved in writing by the Customer. Approval shall not be unreasonably withheld.

Subcontractors that are approved shall be specified in Appendix 6.

5.4   COOPERATION WITH THIRD PARTIES

The Contractor undertakes to cooperate with third parties to the extent that the Customer deems this necessary for the purposes of performing the duties stipulated in this Agreement. The scope of such assistance shall be specified in Appendix 6. Any consideration for such assistance shall be specified in Appendix 7. The Contractor shall in such cases adopt an independent position, and act in consultation with the Customer.

However, the Contractor shall be released from the duties mentioned in this clause if the Contractor substantiates that such cooperation will be of material disadvantage for the Contractor's relationship to its existing subcontractors or other business contacts.

5.5 **WAGES AND WORKING CONDITIONS**

The following shall apply to agreements governed by the Regulations No. 112 of 8 February 2008 relating to Wages and Working Conditions under Government Contracts:

In respect of areas covered by the Regulations relating to Generalised Collective Wage Agreements, the Contractor shall ensure that its and any subcontractors' employees who contribute directly to the performance of the Contractor's obligations under the Agreement do not receive wages or have working conditions that are inferior to those stipulated in the Regulations relating to Generalised Collective Wage Agreements. In areas not covered by generalised collective wage agreements, the Contractor shall ensure that the same employees do not receive wages or have working conditions that are inferior to those stipulated in any applicable nationwide collective wage agreements relating to the relevant trade. This applies to work performed in Norway.

All agreements that are entered into by the Contractor and that involve the performance of work that contributes directly to the performance of the Contractor's obligations under the Agreement shall include corresponding terms and conditions.

If the Contractor fails to meet this obligation, the Customer shall be entitled to retain part of the contract price, corresponding to approximately two (2) times the savings of the Contractor, until it has been documented that compliance has been achieved.

The Contractor's obligations as mentioned above shall be documented in Appendix 6 by means of either a self-declaration or a third-party declaration showing conformity between the relevant collective wage agreement and the actual wages and working conditions relating to compliance with the Contractor's and any subcontractors' obligations.

The Contractor shall, at the request of the Customer, disclose documentation relating to the wages and working conditions which are used. Each of the Customer and the Contractor may request that the information be submitted to an independent third party appointed by the Customer to examine whether the requirements of this provision have been complied with. The Contractor may require the third party to sign a declaration that the information will not be used for any purpose other than to ensure fulfilment of the Contractor's obligations pursuant to this provision. The disclosure obligation shall also apply to subcontractors.

Further clarification concerning the implementation of this clause 5.5 may be agreed in Appendix 6.

6. THE DUTIES OF THE CUSTOMER

6.1 RESPONSIBILITIES OF AND CONTRIBUTIONS BY THE CUSTOMER

The Customer is responsible for having described the purpose of the procurement and its requirements and needs, in Appendix 1, in a clear manner, as a basis for the performance of the Contractor. If it is stated in Appendix 2 that the technical platform of the Customer needs to be upgraded, cf. clause 1.1, the Customer shall itself ensure such upgrading, unless otherwise stipulated in Appendices 1 and/or 2.

The Customer shall contribute to facilitating the Contractor's performance of its duties under this Agreement.

The Customer shall contribute to the delivery of the deliverables in the manner specified in Appendix 2, in accordance with the deadlines stipulated in Appendix 4.

6.2 USE OF A THIRD PARTY BY THE CUSTOMER

The Customer may freely appoint a third party to assist it in connection with its duties under the Agreement. Such third parties shall be specified in Appendix 6. The Contractor shall be notified of any third party selected by the Customer, and may reject the assignment if the Contractor is able to demonstrate that this will entail a material commercial disadvantage to the Contractor.

7. DUTIES OF THE CUSTOMER AND THE CONTRACTOR

7.1 MEETINGS

A party may, if deemed necessary by it, convene, with no less than three (3) working days' notice, a meeting with the other party to discuss the contractual relationship and how the contractual relationship is being handled.

Other deadlines and procedures for the meetings may be agreed in Appendix 6.

7.2 RESPONSIBILITY FOR SUBCONTRACTORS AND THIRD PARTIES

If the Contractor appoints a subcontractor or the Customer appoints a third party to perform work occasioned by this Agreement, the relevant party shall remain fully responsible for the performance of such work in the same manner as if said party was performing the work itself.

7.3 CONFIDENTIALITY OBLIGATION

Information that comes into the possession of the parties in connection with the Agreement and the implementation of the Agreement shall be kept confidential, and shall not be disclosed to any third party without the consent of the other party.

If the Customer is a public body, the scope of the confidentiality obligation under this provision shall not go beyond that laid down by the Act of 10 February 1967 relating to Procedure in Cases concerning the Public Administration (Public Administration Act) or corresponding sector-specific regulations.

The confidentiality obligation pursuant to this provision shall not prevent the disclosure of information if such disclosure is demanded pursuant to laws or regulations, including any disclosure or right of access pursuant to the Act of 19 May 2006 relating to the Right of Access to Documents in the Public Administration (Freedom of Information Act). The other party shall, if possible, be notified prior to the disclosure of such information.

The confidentiality obligation shall not prevent the information from being used when there is no legitimate interest in keeping it confidential, for example when it is in the public domain or is accessible to the public elsewhere.

The parties shall take all necessary precautions to prevent unauthorised persons from gaining access to, or knowledge of, confidential information.

The confidentiality obligation shall apply to the parties' employees, subcontractors and other third parties who act on behalf of the parties in connection with the implementation of the Agreement. The parties may only transmit confidential information to such subcontractors and third parties to the extent necessary for the implementation of the Agreement, and provided that they are subjected to a confidentiality obligation corresponding to that stipulated in this clause 7.3.

The confidentiality obligation shall not prevent the parties from utilising experience and expertise developed in connection with the implementation of the Agreement.

The confidentiality obligation shall continue to apply after the expiry of the Agreement. Employees or others who resign from their positions with one of the parties shall be subjected to a confidentiality obligation following their resignation as well, as far as factors mentioned above are concerned. The confidentiality obligation shall lapse five (5) years after the delivery date, unless otherwise stipulated by law or regulation.

7.4 FORM OF COMMUNICATION - IN WRITING

All notices, demands or other communications relating to the Agreement shall be submitted in writing to the postal address or electronic address stated on the first

page of the Agreement, unless the parties have agreed a different procedure in Appendix 6 for this type of enquiry.

8. CONSIDERATION AND PAYMENT TERMS

8.1 CONSIDERATION

All prices and the detailed terms governing the consideration to be paid by the Customer for the deliverables provided by the Contractor are set out in Appendix 7.

Disbursements, including travel and subsistence costs, shall only be reimbursed to the extent agreed. Travel and subsistence costs shall be specified separately, and shall be paid pursuant to the Government Travel Allowance Scale applicable at any given time, unless otherwise agreed. Travel time shall only be invoiced if this is agreed in Appendix 7.

Unless otherwise specified in Appendix 7, all prices are quoted exclusive of Value Added Tax, but include customs duties and any other indirect taxes.

All prices are quoted in Norwegian kroner unless the Customer has, in Appendix 7, agreed that prices for components that are delivered from abroad may be stated in a foreign currency.

8.2 INVOICING

Payment shall be made within thirty (30) calendar days of the invoice date. The invoices of the Contractor shall be specified and documented so that the Customer can easily check whether the invoice conforms to the agreed consideration. All invoices relating to hours recorded on an ongoing basis shall be accompanied by a detailed specification of the hours accrued. Disbursements shall be specified separately.

When the Customer has made arrangements for such, the Contractor shall submit invoices, credit notes and reminders in accordance with the Electronic Trading Format (EHF) that has been determined.

The payment schedule and other payment terms, and any terms and conditions relating to the use of EHF, are set out in Appendix 7.

The Contractor shall be responsible for paying any costs that it incurs in respect of submitting electronic invoices.

8.3 LATE PAYMENT INTEREST

If the Customer fails to make payment by the agreed time, the Contractor shall be entitled to claim interest on any overdue amount, pursuant to the Act No. 100 of 17 December 1976 relating to Interest on Overdue Payments, etc. (Late Payment Interest Act).

8.4 PAYMENT DEFAULT

If overdue consideration, with the addition of late payment interest, has not been paid within thirty (30) calendar days of the due date, the Contractor may send a written notice to the Customer, stating that the Agreement will be terminated for breach, unless settlement has taken place within sixty (60) calendar days of receipt of such notice.

Termination for breach may not take place if the Customer settles the overdue consideration, with the addition of late payment interest, by the expiry of the deadline.

8.5 PRICE ADJUSTMENTS

Hourly rates charges for services may be adjusted at the beginning of every calendar year by an amount equivalent to the increase in the retail price index (the main index) of Statistics Norway, with the initial reference index value being the index value for the month in which the Agreement was formed, unless a different index value is agreed in Appendix 7.

The prices may be adjusted to the extent that rules or administrative decisions pertaining to indirect taxes are amended in a way that affects the consideration or costs of the Contractor.

Any other provisions pertaining to price adjustments are set out in Appendix 7.

9. EXTERNAL LEGAL REQUIREMENTS, DATA PROTECTION AND SECURITY

9.1 GENERAL EXTERNAL LEGAL REQUIREMENTS AND MEASURES

The Customer shall identify, in Appendix 1, which legal requirements, or requirements that are specific to the party in question, are of relevance to the conclusion and implementation of this Agreement. The Customer shall be responsible for specifying, in Appendix 1, any relevant functional and security requirements that are applicable to the deliverables.

The Contractor shall in Appendix 2 describe how the Contractor takes account of these requirements through its solution.

Each party is responsible for the follow-up of its own duties pursuant to such legal requirements.

Each party shall, as a general rule, pay the costs of complying with legal requirements applicable to the party and its activities. In the event of amendments to legal requirements or official requirements that affect the activities of the Customer that occasion a need for changes to the deliverables subsequent to the conclusion of the Agreement, the Customer shall cover the costs associated with such changes and any additional work, cf. chapter 3.

9.2 INFORMATION SECURITY

The Contractor will take appropriate measures to address the information security requirements associated with the performance of the Service.

This entails that the Contractor will take appropriate measures to ensure the confidentiality of the Customer's data, as well as measures to ensure that data does not fall into the hands of unauthorised persons. Furthermore, the Contractor will take appropriate measures to protect against the unintended modification and deletion of data, and against virus and other malware attacks.

If the Customer has specific requirements for how information security is to be safeguarded by the Contractor, the Customer must state this in Appendix 1.

If the Contractor handles the Customer's data, the Contractor will be obliged to keep the Customer's data separate from the data of any third parties, in order to reduce the risk of impairment of data and/or access to data. By separate is meant that necessary technical measures to secure data against unintended change or access are implemented and maintained. Unintended changes or access also include access by the employees of the Contractor or others who do not need the information in their work for the Customer.

If the Customer has specific requirements for how the Contractor is to fulfil the requirement of separation of data, the Customer must specify this in Appendix 1.

The Contractor must ensure that Contractors of third-party deliverables undertake sufficient and necessary assurance of the Customer's data.

If the Customer has specific requirements for how the Contractor is to ensure that the Contractor(s) of third-party deliverables undertake adequate and necessary safeguarding of the Customer's data, the Customer must state this in Appendix 1.

9.3 PERSONAL DATA

If the Contractor is to process personal data during the performance of the service, the Contractor must describe in Appendix 2 how satisfactory processing in line with the personal data protection regulations will be achieved and performed. This includes privacy shield requirements. This applies irrespective of whether the Customer has set this requirement in Appendix 1.

If the Customer has any further requirements relating to the Contractor's information security measures, the Customer must state this in Appendix 1.

The Contractor must document that the information system and security measures are satisfactory. Such documentation shall be made available, upon request, to the Customer and its auditors, as well as the Norwegian Data Protection Authority and the Privacy Appeals Board. If the Customer has any further documentation requirements relating to the information system and security measures, the Customer must state this in Appendix 1. If the Customer requests information to perform Data Protection Impact Assessments, the Contractor must assist in providing such information.

The Contractor may not entrust personal data to other parties for storage, reworking or deletion without prior special or general written permission for this from the Customer. The Contractor must ensure that any subcontractors used by the Contractor, and which process personal data, assume the same obligations as those set out in clause 9.3 of the Agreement. If special or general written permission has been obtained, the Contractor must notify the Customer of any plans to use other data processors or to replace data processors, and thereby give the Customer the opportunity to oppose such changes. Subcontractors that are approved by the Customer must be stated in Appendix 6.

Personal data may not be transferred to countries outside the EEA without any transfer basis and documentation demonstrating that the terms for use of the transfer basis are fulfilled. In such case, the Contractor will document this in Appendix 2.

If the assignment concerns the processing of personal data on behalf of the Customer, the Customer and the Contractor will be obliged to enter into a data processor agreement in accordance with the personal data protection legislation. If the Customer has not prepared a draft data processor agreement, the Contractor will attach a draft as an attachment to Appendix 2. The data processor agreement must be entered into before the processing of personal data begins.

If the parties have entered into a data processor agreement, this data processor agreement will take precedence in the event of any conflict with the Agreement's provisions relating to the processing of personal data.

The parties' liability for damage suffered by a data subject or other natural persons which is due to a violation of the General Data Protection Act (Regulation 2016/679), the General Data Act with regulations or other regulations that implement the General Data Protection Act, will follow the provisions of article 82 of the General Data Protection Act.

The limitation of liability in section 11.5.6 does not apply to liability arising from article 82 of the General Data Protection Act.

The parties are individually liable for administrative fees imposed pursuant to article 83 of the General Data Protection Act.

10. RIGHT OF OWNERSHIP AND RIGHT OF DISPOSAL

10.1 RIGHT OF OWNERSHIP OF EQUIPMENT, ETC.

Equipment that is delivered pursuant to the Agreement becomes the property of the Customer upon such delivery. The transfer of title implies that the Customer is granted complete physical and legal right of use of the equipment, subject to the limitations set out in this Agreement with appendices, or in a maintenance and software service agreement.

Any purchase-money security interest may be agreed in Appendix 7.

10.2 RIGHT OF DISPOSAL OF STANDARD SOFTWARE

10.2.1 Limited right of disposal

The Customer is granted a limited right of disposal of the standard software that forms part of the deliverables. The right of disposal comprises the rights that are necessary for the Customer to be able to utilise the deliverables as agreed, including a right to make such number of copies of the software as follows from ordinary operational and safety procedures.

The Contractor shall be responsible for the Customer being granted the agreed right of disposal in respect of the software, and for the Customer being able to utilise it without being restricted by the copyright or other rights of third parties.

Consideration for the right of disposal in respect of the software, including any prerequisites and limitations, for example, in relation to the number of users or the

place where the right of disposal is exercised/the equipment used to do so, is described in Appendix 7.

10.2.2 Security for access to source code, etc.

The Customer may, in Appendix 1, stipulate a requirement that the Contractor shall offer the Customer an agreement concerning access to source code or some other solution (for example, a performance bond from its parent company or an associated company) that satisfactorily secures the Customer's interests should the Contractor go bankrupt or for some other reason be unable, or cease, to deliver its services pursuant to this Agreement or an associated maintenance agreement. In those circumstances where the Customer is entitled to access to the source code pursuant to this provision or have arrangements put in place to fulfil this provision, the Customer shall have an expanded right of disposal that covers the right to use, copy, modify and develop the deliverables itself, or with the aid of a third party, to the extent necessary to achieve the purpose of the procurement.

10.2.3 Maintainability

If the Contractor chooses to deliver customer customisations in the form of developing the source code of software that provides the basis for the deliverables, the Contractor shall ensure that the customer customisations are also addressed in subsequent versions of the software.

10.3 RIGHTS TO DEVELOPMENT AND CUSTOMISATIONS

10.3.1 The rights of the Contractor

The Contractor shall retain the copyright to software that are developed specifically for the Customer unless otherwise agreed in the particular case.

10.3.2 The rights of the Customer

The Customer is granted, free of charge, an indefinite and non-exclusive right to utilise the various parts of the software developed or customised specifically for the Customer (expanded right of disposal). The expanded right of disposal includes the right to use, copy, modify and develop the customisations, either on its own or with the assistance of a third party. The Customer is entitled to confer a corresponding expanded right of disposal on any other public body.

Source code and associated specifications and documentation of the development and customisations shall be handed over to the Customer within ten (10) working days after the delivery date, unless otherwise agreed in the particular case.

10.4   RIGHT OF DISPOSAL OF DOCUMENTATION

10.4.1   Making of copies (copying)

The Contractor shall make available such number of copies of the documentation as is desired by the Customer, at the prices listed in Appendix 7.

If the Contractor is unable to make available the necessary number of copies, the Customer may make such copies itself for its own use. No consideration shall be payable in respect of such copies.

10.4.2   Changes to the documentation

The Customer may, at its own risk, make such changes, additions, etc., to the documentation for its own use as are deemed appropriate by the Customer.

10.4.3   Documentation of development and customisations

The Customer is granted a corresponding right of disposal of documentation prepared in connection with development and customisations, cf. clause 10.2, as the Customer is granted in relation to the development and customisations. This shall also cover training materials.

10.4.4   Utilisation of the detailed specification

Each of the parties may utilise the detailed specification without hindrance in respect of the other party's possible copyright. The right of utilisation includes the right to reuse the detailed specification in other assignments and to make it available to others, including for their reuse. This provision does not provide a right to distribute information that is covered by a confidentiality obligation pursuant to clause 7.3.

10.5   JOINT PROVISIONS APPLICABLE TO SOFTWARE AND DOCUMENTATION

10.5.1   Marking of software and documentation

If the original copy of the software or documentation made available by the Contractor for the Customer is marked with a "copyright notice", the Customer shall add corresponding marking to all the copies made by the Customer pursuant to the Agreement.

10.5.2   Duration of the right of disposal

The right of disposal shall apply as from signing of the Agreement, without any deadline or right of termination, unless otherwise agreed in Appendix 7.
If a right of disposal has been agreed in return for the payment of ongoing consideration, the right of disposal may be terminated by the Customer by giving three (3) months' notice, unless otherwise is agreed in Appendix 7. The right of

disposal shall lapse as per the end of the relevant calendar month. Upon termination, a proportional consideration shall be paid for the right of disposal up to the expiry of the period of notice. Further provisions may be stipulated concerning this in Appendix 7.

10.5.3 Return or destruction upon termination of the right of disposal

The Customer undertakes to return or delete, upon the termination of an agreed right of disposal of software, all copies of the software that fall within the scope of the agreement and are located on the premises of the Customer. The same shall apply to copies of documentation.

10.6 THE TOOLS AND METHODOLOGICAL BASIS OF THE CONTRACTOR

Unless otherwise specified in Appendix 1 and/or Appendix 2, the Contractor, the subcontractors, and any third party from whom the Contractor or the subcontractors derive their rights, shall retain the right to their own tools and to the methodological basis used by the Contractor in respect of the deliverables. This includes any customisations that the Contractor has developed independently of the Customer, and has reused for purposes of these deliverables.

10.7 FREE SOFTWARE

10.7.1 General provisions pertaining to free software

Free software means software that is offered under what are generally recognised to be free software licences.

A free software licence permits, for example, the Customer to use the software for any purpose and on any scale, and grants access to the source code of and documentation on the software, the right to examine and change the software, to make copies of the software and to make changes and improvements to the software available to the general public.

If free software is to be used in connection with the deliverables, the Contractor shall prepare an overview of the relevant free software. The overview shall be included as a separate chapter in Appendix 2. Copies of the applicable licence terms and conditions for the relevant free software shall be appended in Appendix 10.

The Contractor shall ensure that no free software is being used under licence terms that are incompatible with the requirements applicable to the deliverables, or incompatible with the licence terms governing other software that forms part of the deliverables.

The general terms and conditions of the Agreement shall also govern those parts of the deliverables that consist of free software, subject to the clarifications and exceptions set out below.

10.7.2 The Contractor's responsibility for the overall functionality of the deliverables when using free software

The Contractor shall be responsible for the deliverables (the overall solution) meeting the requirements under the Agreement, cf. clause 5.1, irrespective of the provisions of any particular free software licence.

If errors in free software result in the deliverables deviating from what was agreed under this Agreement, it shall be the responsibility of the Contractor to rectify the error in such a way as to make the deliverables conform to what was agreed, even if such free software might be subject to separate licence terms and conditions that include different provisions on the rectification of errors. The rectification of errors in free software may be effected in any manner that makes the deliverables conform to the requirements under the Agreement.

10.7.3 The Customer's rights in relation to the parts of the deliverables that are based on free software

As regards the parts of the deliverables that are based on free software, including customisations and further developments of the free software, the Customer shall be granted the rights that are necessary for compliance with the terms of the relevant free software licence.

The rights include access to source code, with associated specifications and documentation.

10.7.4 Effects of distributing free software to others

If the deliverables are to be distributed to others, the terms of the relevant free software licence shall apply. If distribution to others, or other ways of making the deliverables available, implies that also other parts of the deliverables than those that originally were free software will be governed by the terms of a free software licence, this shall be specified by the Contractor in Appendix 2.

10.7.5 The Contractor's responsibility for defects in title to free software

The Contractor shall only use free software that is offered under generally recognised free software licences, and that does not, based on a sound assessment on the part of the Contractor, infringe third-party rights. The assessment shall take into consideration, inter alia, how well-established the relevant free software is in the market, the Contractor's knowledge, if any, of the history and origins of the software, and whether it is known in the relevant market that someone is arguing

that the software infringes their rights. The Contractor shall describe its assessment in Appendix 2.

If free software used by the Contractor in connection with the delivery infringes third-party rights, the Contractor shall, within the limitations laid down by clause 10.7.6, remedy the defects in title as specified in clause 13.2.

The Contractor shall indemnify the Customer in respect of any liability for damages imposed as a result of defects in title in respect of free software that the Contractor has offered or independently chosen to use in connection with the deliverables, cf. clause 13.4.

10.7.6 Liability of the Customer if it requires the use of free software

If the Customer requires the use of specific free software as part of the deliverables, the Customer shall itself pay any costs resulting from inadequate functionality caused by errors or defects in the free software.

The Customer shall itself carry the risk of defects in title relating to free software that the Customer has requested be used as part of the deliverables. The Customer shall indemnify the Contractor in respect of any liability for damages imposed as a result of defects in title in respect of free software that the Customer has chosen, cf. clause 13.4 of the Agreement.

To the extent that the Contractor is aware that free software that the Customer has requested be used as part of the deliverables, is unsuited to satisfying the Customer's requirements or, infringes, or is alleged by anyone to infringe, third party copyrights, the Contractor shall point this out in Appendix 2, cf. clause 1.1 of the Agreement.

The Contractor shall, as a supplementary and chargeable service, assist the Customer with the remediation of any defects or defects in title in free software that is chosen by the Customer as mentioned above. The Contractor's standard hourly rate for consultancy services under this Agreement shall apply, unless otherwise agreed in Appendix 7. The Contractor may request a change to the Agreement pursuant to chapter 3 if the effort to remedy such defects has implications for the other obligations of the Contractor under the Agreement.

11. BREACH OF CONTRACT ON THE PART OF THE CONTRACTOR

11.1 WHAT IS DEEMED TO CONSTITUTE BREACH OF CONTRACT

There is a breach of contract on the part of the Contractor if the deliverables do not conform to the agreed functions, requirements or deadlines. There is also a breach of contract if the Contractor fails to perform other duties under the Agreement.

Nevertheless, there is no breach of contract if the situation is caused by circumstances related to the Customer or by force majeure.

The Customer shall submit a written complaint without undue delay after the breach of contract has been discovered or ought to have been discovered.

11.2 NOTIFICATION OBLIGATION

If the Contractor's deliverables cannot be delivered as agreed, the Contractor shall give the Customer written notice thereof as soon as possible. The notice shall specify the reason for the problem and, insofar as it is possible, when performance can take place. A corresponding obligation shall apply if additional delays are to be expected after the first notice has been given.

No damages or other remedies for breach of contract may be claimed for circumstances that have not been notified at the latest prior to the expiry of the warranty period. Nevertheless, this shall not apply to any liability for damages imposed in relation to a third party in respect of defects in title pursuant to clause 13.4.

11.3 EXTENSIONS OF DEADLINES

The Contractor may request an extension of the deadline, which extension must have the written approval of the Customer in order to apply.

The Customer shall not be entitled to claim liquidated damages, ordinary damages or other remedies for breach of contract in respect of the period comprised by an extension of the deadline.

An extension of the deadline shall have no impact on the entitlement of the Customer to any liquidated damages or ordinary damages that accrue prior to the extension of the deadline.

11.4 CURE

The Contractor shall commence and complete the effort of curing the breach of contract without undue delay.

The aim of the cure shall be for the deliverables to satisfy the agreed requirements and specifications, and for the deliverables to work as agreed. Cure may, for example, take the form of repair, redelivery or supplementary delivery.

To the extent that no cure is provided, the Customer may request a proportional price reduction or terminate the Agreement for breach if the conditions for this in clause 11.5.3 or clause 11.5.4 are met.

If the Contractor has failed to cure the breach of contract within the stipulated or agreed deadline, or if the conditions for termination for breach are met, the Contractor shall pay all expenses incurred by the Customer in obtaining a cure from a third party. Nevertheless, the Customer may not allow a third party to cure the defect until any extended deadline has expired.

The Customer shall give written notice to the Contractor prior to appointing a third party.

11.5 REMEDIES FOR BREACH OF CONTRACT

11.5.1 Withheld payment

In the event of breach of contract, the Customer may withhold payment, although the amount withheld shall not be obviously higher than what is necessary to secure the Customer's claim resulting from the breach of contract.

11.5.2 Liquidated damages in the case of delay

If the agreed detailed specification approval date, solution ready for acceptance test date, acceptance test approval date, delivery date, or some other deadline in respect of which the parties have stipulated liquidated damages in Appendix 4 is not complied with, and this is not caused by force majeure or circumstances related to the Customer, there is a delay on the part of the Contractor that triggers liquidated damages.

If the Contractor is delayed with regard to the detailed specification approval milestone or later milestones for which the parties have stipulated liquidated damages, later deadlines shall be extended corresponding to the number of calendar days of the liquidated damages. If the Contractor, through acceleration, manages to meet the milestone *solution ready for acceptance testing* at the originally agreed time, the previously accrued liquidated damages shall be cancelled.

The liquidated damages shall accumulate automatically. The liquidated damages amount to 0.15 per cent of the total consideration payable for the deliverables (the contract price), excluding Value Added Tax, for each calendar day of delay, but albeit limited to a maximum of one hundred (100) calendar days. If the delay pertains to a partial delivery, the liquidated damages shall amount to 0.15 per cent of the total consideration (exclusive of Value Added Tax) for the partial delivery in question for each calendar day the delay lasts, but limited to a maximum of one hundred (100) calendar days. If no price has been quoted for the partial delivery in

Appendix 7, the liquidated damages shall be calculated based on the partial delivery's relative share of the consideration for the total delivery. In the case of the final, comprehensive acceptance test, liquidated damages shall be calculated based on the total consideration for the deliverables. The sum of previously accumulated liquidated damages for the partial deliveries and the comprehensive acceptance test may not exceed 15 per cent of the total consideration for the deliverables.

Other rates for liquidated damages, a different calculation basis and other periods for liquidated damages may be agreed in Appendix 4. Unless otherwise is explicitly stated in Appendix 4, total liquidated damages shall not exceed 15 per cent of the total consideration for the deliverables.

The Customer shall not have the right to terminate the Agreement for breach for as long as the liquidated damages continue to accumulate. However, this time restriction shall not apply in the case of wilful misconduct or gross negligence on the part of the Contractor or anyone for whom it is responsible.

If only parts of the agreed deliverables are delayed, the Contractor may request a reduction in the liquidated damages proportional to the ability of the Customer to utilise the part of the deliverables that has been delivered.

11.5.3 Price reduction

If the Contractor has not succeeded, despite repeated attempts, in curing a defect, the Customer may claim a proportional reduction in the contract price. The price reduction shall compensate for the reduced value of what has been delivered, and shall be independent of any damages.

11.5.4 Termination for breach

If there is a material breach of contract, the Customer may, after having given the Contractor a written notice and granted it a reasonable deadline for remedying the situation, terminate all or part of the Agreement for breach with immediate effect.

The Customer may terminate all or part of the Agreement for breach with immediate effect if the deliverables are materially delayed. There is a material delay if delivery has not taken place by the time liquidated damages reach their maximum limit, or by the expiry of an extended deadline, if this expires later.

The Customer may terminate the Agreement for breach for a partial delivery when the period for the liquidated damages for the specific partial delivery has expired. If the delay is of such a type that the delivery as a whole must be deemed to be substantially delayed, for example, because that which is already delivered or which shall be delivered later cannot be used without that which is covered by the right to terminate for breach, the Customer may terminate the total delivery for breach.

11.5.5 Damages

The Customer may claim damages in respect of any direct loss, including additional costs the Customer incurs due to substitute purchases, any loss caused by additional work and other direct costs in connection with delays, deficiencies or other breaches of contract pursuant to clause 11.1, unless the Contractor demonstrates that the Contractor did not cause the breach of contract or the reason for the breach of contract.

Liquidated damages shall be deducted from any other damages in respect of the same delay.

11.5.6 Limitation of damages

No damages may be claimed in respect of indirect loss. Indirect loss includes, but is not limited to, lost earnings of any kind, lost savings, loss of data, and claims from third parties, with the exception of liability for damages pursuant to clause 13.4.

Overall damages over the term of the Agreement are limited to an amount corresponding to the contract price exclusive of Value Added Tax. Overall damages in the specification phase are limited to an amount corresponding to the consideration for the specification phase.

The said limitations of damages shall not apply in the case of gross negligence or wilful misconduct on the part of the Contractor or anyone for whom the Contractor is responsible.

12. BREACH OF CONTRACT ON THE PART OF THE CUSTOMER

12.1 WHAT IS DEEMED TO CONSTITUTE BREACH OF CONTRACT

There is breach of contract on the part of the Customer if the Customer fails to perform its duties under the Agreement.

Nevertheless, there is no breach of contract if the situation is caused by circumstances related to the Contractor, or by circumstances deemed to constitute force majeure.

The Contractor shall submit a complaint without undue delay after the breach of contract has been discovered or ought to have been discovered.

12.2 NOTIFICATION OBLIGATION

If the Customer is unable to perform its duties under the Agreement, including observing any deadlines, the Customer shall notify the Contractor in writing

accordingly as soon as possible. The notice shall specify the reason for the problem and, to the extent possible, when the Customer will again be able to perform the agreed duty.

12.3   CURTAILMENT OF THE RIGHT OF RETENTION ON THE PART OF THE CONTRACTOR

The Contractor shall not suspend any performance as the result of breach of contract on the part of the Customer, unless the breach is material, cf. clause 12.4.

12.4   TERMINATION FOR BREACH

In the event of payment default, the Contractor may terminate the Agreement for breach if the Customer has failed to settle overdue payments within sixty (60) calendar days of the Customer having received the Contractor's written notice pursuant to clause 8.4.

In the event of other material breach of contract, the Contractor may send the Customer a written notice stating that the Agreement will be terminated for breach unless the Customer has discontinued or cured the breach of contract within sixty (60) calendar days after the Customer received the notice. Termination for breach shall not take place if the Customer has discontinued the breach of contract situation before the expiry of the deadline.

12.5   DAMAGES

The Contractor may claim damages in respect of any direct loss that arises from breach of contract pursuant to clause 12.1, unless the Customer demonstrates that the breach of contract or the cause of the breach of contract is not attributable to the Customer. If the Customer's performance of its duties under the Agreement is delayed, and this results in the Contractor spending more time implementing its part of the deliverables, the Contractor shall have the right to adjust the agreed consideration by an amount corresponding to the number of hours of additional work the Contractor has been caused due to the breach on the part of the Customer.

The limitation of damages provision of the Agreement, cf. clause 11.5.6, shall apply correspondingly.

13. INFRINGEMENT OF THE INTELLECTUAL PROPERTY RIGHTS OF THIRD PARTIES (DEFECT IN TITLE)

13.1 THE RISKS AND RESPONSIBILITIES OF THE PARTIES IN RELATION TO DEFECTS IN TITLE

Each party shall be responsible for ensuring that its deliverables do not infringe the copyrights or other intellectual property rights of third parties, and shall carry all risks in this respect. There is a defect in title if the deliverable entails such infringement.

13.2 THIRD-PARTY CLAIMS

If a third party asserts to one of the parties that the deliverables entail a defect in title, the other party shall be informed thereof in writing as soon as possible.

The responsible party shall deal with the claim at its own expense. The other party shall assist the relevant party with this task to a reasonable extent.

The relevant party shall commence and complete the effort of curing defects in title without undue delay, by
   a) ensuring that the other party is able to use the deliverable as before, without infringing any third-party rights, or
   b) providing a corresponding deliverable that does not infringe any third-party rights

If the defect in title cannot be resolved as stipulated in paragraph three, the Customer shall stop any further use of the solution and delete the relevant software component.

13.3 TERMINATION FOR BREACH

A defect in title that is not cured, and that is of such a nature as to be of material importance to the other party, shall give the other party the right to terminate the Agreement for breach.

13.4 INDEMNIFICATION OF LOSS RESULTING FROM A DEFECT IN TITLE

A party shall be fully indemnified in respect of any liability for damages imposed on it in relation to a third party and any legal costs incurred, including the party's own costs connected to dealing with the case, in connection with a defect in title. The party may also claim damages in respect of other loss pursuant to the provisions of clauses 11.5.5, 11.5.6 and 12.5.

14.   SETTLEMENT UPON TERMINATION FOR BREACH

Upon termination for breach, the Customer shall have the rights stipulated in chapter 10 to what has been produced and made available to the Customer, and the Customer shall pay the agreed consideration for the deliverables that were performed prior to the date of the termination for breach with the deduction of a price reduction in accordance with clause 11.5.3. Clause 2.6.4 concerning the handover of material shall apply correspondingly.

If the deliverables rendered prior to the termination date are of such a nature that the Customer has gained little or no benefit from the deliverables rendered on the termination date and cannot reasonably expect to complete the deliverables with the assistance of another contractor, the Customer may, in connection with termination for breach, choose to demand the repayment of consideration received by the Contractor under the Agreement, with the addition of interest, at the rate of NIBOR plus one (1) per cent, as from the date on which payment was made. In this circumstance, chapter 10 shall not apply.

When the rights of the Customer in relation to what has been made available to the Customer lapse, and if requested by the Contractor, equipment and software and all other materials, whether in an electronic or other format, and irrespective of the medium, shall be handed back or deleted or destroyed in a proper manner. The Contractor may request confirmation from an impartial auditor stating that this has been done. In the event of termination for breach by the Customer, the fee of the auditor shall be paid by the Customer, otherwise it shall be paid by the Contractor.

15.   OTHER PROVISIONS

15.1   RISK

The risk of damage to equipment and delivered software copies, etc., due to an accidental occurrence, shall pass to the Customer on the date they are physically handed over to, or downloaded at, the Customer. The Contractor is responsible for maintaining insurance cover for the period up to this date.

If delivered software copies are destroyed after the risk has passed to the Customer, the Customer shall nevertheless be entitled to new software copies in return for payment of the direct costs incurred by the Contractor in making these available.

15.2   INSURANCE POLICIES

If the Customer is a public body, the Customer shall be self-insured. If the Customer is not self-insured, the Customer will be under an obligation to have insurance policies that are sufficient to cover any claims the Contractor may bring on the basis

of the risks or responsibilities assumed by the Customer pursuant to this Agreement, within the limits defined by ordinary insurance terms and conditions.

The Contractor shall hold insurance policies that are sufficient, within the limits defined by ordinary insurance terms and conditions, to meet such claims from the Customer as may arise on the basis of the risks and responsibilities assumed by the Contractor pursuant to this Agreement. This obligation shall be deemed to be met if the Contractor takes out third-party and business insurance on terms and conditions that are deemed to be ordinary within the Norwegian insurance industry.

The Contractor shall, at the request of the Customer, explain and document those of the insurance policies of the Contractor that are of relevance to compliance with this provision.

15.3   ASSIGNMENT OF RIGHTS AND OBLIGATIONS

To the extent that the Customer is a public body, the Customer may assign its rights and obligations under this Agreement to another public body. The entity to which the rights and obligations are assigned shall be entitled to corresponding terms and conditions, provided that the rights and obligations under the Agreement are assigned jointly.

The Contractor may only assign its rights and obligations under the Agreement with the written consent of the Customer. The same shall apply if the Contractor is de-merged into several companies or in the case of assignment to a subsidiary or another company within the same group, but not if the Contractor is merged with another company. Consent shall not be unreasonably withheld.

The right to assignment in the paragraph above shall only apply if the new contractor meets the original qualification requirements, no other material changes are made to the contract, and the assignment is not made to circumvent the regulations concerning public procurement.

The right to consideration under this Agreement may be assigned freely. Such assignment shall not release the relevant party from its obligations and responsibilities.

15.4   BANKRUPTCY, COMPOSITION WITH CREDITORS, ETC.

In the case of debt rescheduling proceedings, composition with creditors, bankruptcy, or any other form of creditor intervention, in respect of the business of the Contractor, the Customer shall be entitled to terminate the Agreement for breach with immediate effect, unless otherwise is stipulated by mandatory law.

15.5 DUTY OF CARE IN RELATION TO EXPORTS

If any products, including spare parts, software and technology, delivered by the Contractor are subject to requirements for authorisation from the authorities in the country of origin and/or other countries, the Customer is responsible for obtaining such authorisations in the case of export or re-export of such products.

15.6 FORCE MAJEURE

If an extraordinary situation should arise which is outside the control of the parties which makes performance of the duties under this Agreement impossible, and which under Norwegian law must be classified as force majeure, the other party shall be notified of this as soon as possible. The obligations of the affected party shall be suspended for as long as the extraordinary situation prevails. The corresponding obligations of the other party shall be suspended for the same period.

In force majeure situations, the other party may only end the Agreement with the consent of the affected party, or if the situation prevails or is expected to prevail for more than ninety (90) calendar days as of the date on which the situation arose, and in such case only with fifteen (15) calendar days' notice. Each of the parties shall cover their own costs associated with the ending of the contractual relationship. The Customer shall pay the agreed price for the part of the deliverables that was performed prior to the Agreement coming to an end. The parties may not present other claims against each other due to the Agreement coming to an end pursuant to this provision.

The parties shall, in connection with force majeure situations, have a mutual disclosure obligation towards each other concerning all matters that must be deemed relevant to the other party. Such information shall be disclosed as soon as possible.

16. DISPUTES

16.1 GOVERNING LAW

The rights and obligations of the parties under this Agreement shall in their entirety be governed by Norwegian law.

16.2 NEGOTIATIONS

Should a dispute arise between the parties as to the interpretation or the legal effects of the Agreement, the parties shall seek to resolve such dispute through negotiations.

If such negotiations do not succeed within ten (10) working days, or a different period agreed by the parties, each of the parties may request that the dispute be brought before an independent expert or submitted for mediation.

16.3 INDEPENDENT EXPERT

The parties shall in connection with the conclusion of the Agreement appoint an independent expert, whose name shall be specified in Appendix 6, and who shall hold such qualifications as the parties believe to be the most appropriate in the light of the Agreement. If this has not been done, the parties may agree on the appointment of an independent expert at the time of a dispute.

The parties shall in advance choose either to
a) comply with the solution proposed by the expert (binding), or
b) use the solution proposed by the expert as a basis for reaching a solution themselves (advisory).

The detailed approach to these efforts shall be determined by the independent expert, in consultation with the parties.

16.4 MEDIATION

If a dispute related to this Agreement has not been resolved after negotiations or by using an independent expert, the parties may attempt to resolve the dispute through mediation.

Mediation may also be used without the prior use of an independent expert.

The parties may elect to adopt the rules of the Norwegian Bar Association for mediation by advocate, modified, if applicable, to suit the preferences of the parties. The parties should agree on a mediator and who shall hold such qualifications as the parties believe to be the most appropriate in relation to the nature of the dispute.

The detailed approach to the mediation shall be determined by the mediator, in consultation with the parties.

16.5 JOINT RULES FOR INDEPENDENT EXPERT AND MEDIATION

The independent expert and/or mediator shall act impartially and independently in the performance of his or her duties. Prior to accepting an assignment, the expert/mediator shall notify the parties of any potential circumstances that are likely to give rise to a suspicion of insufficient impartially or independence on his or her part. The expert/mediator shall also give the parties such notice during the

assignment if the parties have not previously received such information, or if the relevant circumstances arise during the assignment.

At the start of mediation, the expert/mediator shall inform the parties of the basis on which his or her remuneration will be calculated. Unless otherwise agreed, each party shall pay its own costs and half of the costs of the expert/mediator. The expert/mediator has the right to request the parties to pay a sufficient advance to cover the costs and remuneration of the mediator/expert, or to request the parties to provide sufficient security.

The assignment of the independent expert or mediator shall be concluded in one of the following ways:

a) through a proposed solution from the expert in accordance with clause 16.3, second paragraph,

b) through a written settlement or agreement between the parties, based on the solution proposed by the expert/mediator,

c) through the expert/mediator informing the parties that he or she does not deem it appropriate to continue the assignment, or

d) through a party informing the expert or the mediator that such party wishes to conclude the assignment

16.6   LITIGATION OR ARBITRATION

If a dispute is not resolved through negotiations, through mediation or by an independent expert, each party may require such dispute to be resolved with final effect before the Norwegian courts of law.

The venue shall be the court of domicile of the Customer.

The parties may alternatively agree that the dispute shall be resolved with final effect through arbitration.

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Maintenance Agreement

Agreement governing the maintenance and servicing of software and equipment

The Norwegian Government's Standard Terms and Conditions for IT Procurement
SSA-V
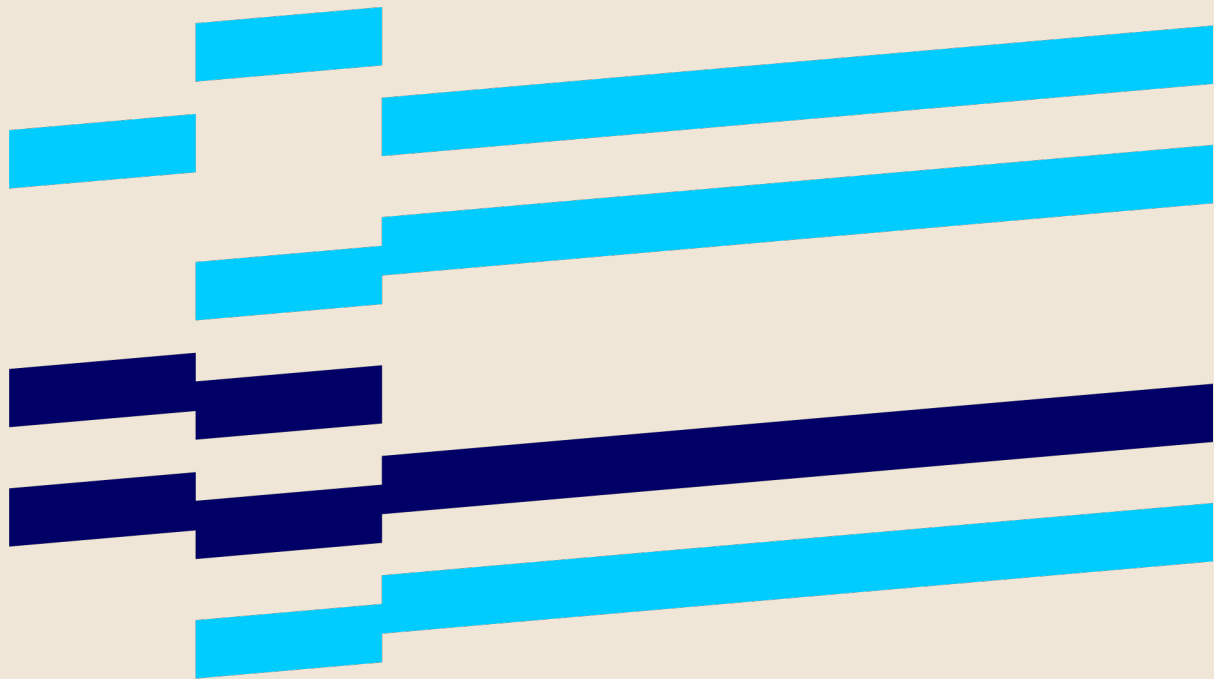
Agreement governing the maintenance and servicing of software and equipment

An agreement governing
[designation of the procurement]

has been concluded between:

[Write here]

_____
 (hereafter referred to as the Contractor)

and

[Write here]

_____
 (hereafter referred to as the Customer)

Place and date:

[Write place and date here]

_____

[The Customer's name here]   [The Contractor's name here]

_____   _____
 Signature of the Customer   Signature of the Contractor

The Agreement is signed in two copies; one for each party.

Unless otherwise is specified in Appendix 4, the **commencement date** shall be:
Upon commissioning of iteration 1 cf. SSA-T Appendix 4

Communications
Unless otherwise specified in Appendix 6, all communications concerning the Agreement shall be directed to:

On behalf of the Customer: **On behalf of the Contractor:**

Name: Name:

Position: Position:

Telephone: Telephone:

Email: Email:

The Norwegian Government's Standard Terms and Conditions for the Maintenance and Servicing of Software and Equipment - Maintenance Agreement, The Agency for Public Management and eGovernment (Difi), January 2019

Contents

1.   GENERAL PROVISIONS

1.1   SCOPE OF THE AGREEMENT

The Agreement governs the provision of maintenance services for software and any equipment as specified in more detail in the Appendices.

1.2   APPENDICES TO THE AGREEMENT

All rows shall be ticked (Yes or No):	YES	NO
Appendix 1: Customer requirements specification (requirements for the maintenance services)		
Appendix 2: Contractor solution specification (description of the maintenance services)		
Appendix 3: Software and/or equipment to be maintained		
Appendix 4: Project and progress plan for the establishment phase		
Appendix 5: Service level with standardised price reductions		
Appendix 6: Administrative provisions		
Appendix 7: Total price and pricing provisions		
Appendix 8: Changes to the general contractual wording		
Appendix 9: Changes subsequent to the conclusion of the Agreement		
Appendix 10: Third party's terms and conditions for the maintenance of third party's software		
Other Appendices:		

1.3   INTERPRETATION – RANKING

Changes to the general contractual wording shall be set out in Appendix 8, unless the general contractual wording refers such changes to a different Appendix.

The following principles of interpretation shall apply in the case of conflict:

1.   The general contractual wording shall prevail over the Appendices.

2.   Appendix 1 shall prevail over the other Appendices.

3. To the extent that the clause or clauses that have been changed, replaced or supplemented, are clearly and unequivocally specified, the following principles of precedence shall apply:

    a) Appendix 2 shall prevail over Appendix 1.

    b) Appendix 8 shall prevail over the general contractual wording.

    c) If the general contractual wording refers to changes to any other Appendix than Appendix 8, such changes shall prevail over the general contractual wording.

    d) Appendix 9 shall prevail over the other Appendices.

A third party's terms and conditions governing the maintenance of third-party software shall not release the Contractor's from any obligations under the Agreement to any extent greater than that set out in clause 2.2.5.

1.4 CHANGES SUBSEQUENT TO THE CONCLUSION OF THE AGREEMENT

Changes to the deliverables subsequent to the conclusion of the Agreement shall be made in accordance with the provisions in chapter 3.

1.5 THE REPRESENTATIVES OF THE PARTIES

Upon the conclusion of the Agreement, each of the parties shall appoint a representative who is authorised to act on behalf of such party in matters relating to the Agreement. The authorised representatives of the parties, as well as procedures and notice periods for any replacement thereof, shall be specified in more detail in Appendix 6.

1.6 PHASES OF THE AGREEMENT

The Agreement consists of three phases: the establishment phase (clause 2.1), ordinary maintenance (clause 2.2) and the discharge phase (clauses 4.2 and 4.3).

2. PERFORMANCE OF THE DELIVERABLES

2.1 ESTABLISHMENT OF THE MAINTENANCE SERVICES

2.1.1 Plan for the establishment phase

The Contractor shall prepare, in collaboration with the Customer, a plan with a description of purpose, organisation, activities, detailed plans concerning progress, etc., for establishing the maintenance services. The plan shall include a description of roles and responsibilities, as well as a progress plan, including the need for information and deliveries from any previous maintenance contractors. The plan shall conform to the limits set out in Appendix 2.

2.1.2 Cooperation plan

The Contractor shall prepare, or make available, a cooperation plan.
The cooperation plan shall be finalised in consultation with the Customer. The cooperation plan shall contain the routines and procedures necessary for the interaction between the Customer and the Contractor, including:
- procedures for error handling (also see clause 2.2.5),
- procedures for change handling, for the software being maintained and for changes to the platform, respectively,
- any routines and plans for meetings, and
- cooperation with the Customer's other providers (such as the provider of operational services).

The cooperation plan shall be based on the cooperation requirements the Customer has specified in Appendix 6 and the requirements for the maintenance services in Appendix 1.

2.2 PERFORMANCE OF ORDINARY MAINTENANCE

2.2.1 Scope of the maintenance services

The Contract shall provide the maintenance services for software and equipment as specified in more detail in Appendices 1 and 2.

Unless otherwise is specified in Appendix 1 or Appendix 2, the maintenance services shall, as a minimum, include error handling and the services required to maintain the software's interaction with other software covered by the maintenance services (see Appendix 3).

The deliveries from the Contractor shall, in an integrated manner, serve the functions and meet the requirements specified in the Agreement.

Appendices 1 and 2 may describe how old versions of the relevant software and equipment should be maintained.

2.2.2 Reporting performed maintenance

The Contractor shall, on a regular basis, provide the Customer with a readily understandable report that describes what maintenance and what servicing has been performed. Unless otherwise is agreed in Appendix 6, the Contractor's standard format and level shall be used for such reporting.
The reporting obligation may be described in more detail in the cooperation plan.

2.2.3 Updating of documentation

To the extent that performed maintenance is of importance in relation to the associated documentation, documentation updates shall be made available to the Customer without undue delay. The scope of the updating obligation may be specified in more detail in Appendices 1 and 2.

2.2.4 User support

If the Agreement includes user support, such services shall be described in Appendix 6. The users or user groups at the Customer who may seek assistance may also be agreed in Appendix 6. A maximum annual volume of enquiries that shall be covered by the fixed price may also be agreed. If the Contractor guarantees a response within certain deadlines, this shall be set out in the service level agreement in Appendix 5.

2.2.5 Error handling

The Customer shall report any errors without undue delay. The Contractor shall assist with identifying and rectifying errors within the framework defined in Appendix 2, and based on the framework set out in the service level agreement in Appendix 5. If the agreed deadlines are not complied with, the Customer may demand standardised compensation as stipulated in the service level agreement in Appendix 5.

Unless otherwise is agreed in Appendix 5, the following error definitions shall apply:

Level	Category	Description
A	Critical error	- Error that results in the stoppage of the software or equipment, a loss of data, or in other functions that, based on an objective assessment, are of critical importance to the Customer not working as agreed. - The documentation being so incomplete or misleading that the Customer is unable to use the software or the equipment, or material parts thereof.
B	Serious error	- Error that results in functions that, based on an objective assessment, are of importance to the Customer not working as described in the agreement, and which it is time-consuming and costly to work around. - The documentation being incomplete or misleading, and this resulting in the Customer being unable to use functions that, based on an objective assessment, are of importance to the Customer.
C	Less serious error	- Error that results in individual functions not working as intended, but which can be worked around with relative ease by the Customer. - The documentation being incomplete or imprecise.

To the extent that the services include the maintenance of standard software that the Contractor has not developed itself or does not maintain itself, or where elements of the services are in some other manner delivered by a third party and the Customer has not itself concluded a maintenance agreement with the software producer, the Contractor shall conclude the necessary agreement with the software producer. The terms and conditions for the maintenance that are agreed between the Contractor and the software producer shall be explicitly specified in a separate chapter in Appendix 2, and copies of the terms and conditions for the maintenance shall be appended as Appendix 10. If the Customer has itself concluded a maintenance agreement with the aforementioned software producer, these shall be appended to the Agreement as Appendix 10. The Contractor may request that the Customer assert or, with the agreement with the Customer, itself assert the Customer's rights in relation to the software producer under the standard maintenance agreement for the third party software.

If deviations in the deliverables are caused by errors in standard software and access to the standard software's source code is required in order to rectify these, and the Contractor does not itself have access to the source code, the Contractor's obligation to rectify the errors is limited to reporting the error to the software producer, seeking to the best of its ability to make rectification of the error a priority, keeping the Customer informed about the status of the error rectification, and ensuring correct installation after the error in the standard software has been rectified by the software producer, or alternatively making the update that rectifies the error available to the Customer if the Contractor is not responsible for installation pursuant to clause 2.2.6.

The Contractor shall make a reasonable effort to find a temporary solution while the software producer rectifies the error. A maximum financial limit for the Contractor's obligation to work out temporary solutions that work around errors in standard software can be agreed in Appendix 7.

If errors that are covered by paragraph four of this provision (errors in standard software that require access to the source code in order to rectify them) result in delays or deviations in respect of the agreed service criteria in Appendix 5, the Contractor shall not be liable for that part of the deviation that can be attributed to the error in the standard software, including deficient error rectification by a third party. However, the Contractor shall be liable for delays and deviations in respect of the agreed service level that are caused by the Contractor failing to perform its obligation to follow up the error rectification and install, or make available, updates that rectify the error as stipulated in paragraph four.

2.2.6 Installation of patches, etc.

The Contractor is responsible for installing patches unless Appendix 1 specifies that this shall be performed by the Customer itself or the Customer's provider of operational services. The provisions governing the installation of new versions in clause 2.2.7, paragraph two, shall also apply to the installation of patches. The installation of patches shall be covered by the fixed consideration for maintenance, unless this has been priced separately in Appendix 7.

If it has been agreed in Appendix 5 that the Contractor may rectify an error by sending or making available a patch to the Customer, it shall do so in accordance with agreed procedures set out in Appendix 5 or Appendix 6. The Contractor shall in such a case furnish the Customer with instructions as to how the patch, etc., shall be installed. The Customer shall install the patch, etc., as soon as possible, or as per the instructions of the Contractor. Any deadlines shall be set out in Appendix 5.

If the rectification of an error consists of a new version of the software, the new version shall also be covered by the fixed consideration for maintenance. The Contractor may only rectify errors by delivering a new version if the Customer can utilise it on the Customer's existing technical platform. If the new version can only be utilised if an upgrade of the Customer's technical platform is performed or if changes are made to the Customer's other systems, the Customer shall have the right to demand that the error be rectified in some other manner, unless otherwise is specified in Appendix 1.

2.2.7 New versions

New versions of the software specified in Appendix 3 shall be covered by the Agreement, unless otherwise is stipulated in Appendix 1 or Appendix 2. New versions shall be covered by the fixed consideration for maintenance, unless this is priced separately in Appendix 7 (for example, in the case of larger upgrades).

When a new version of software can be made available to the Customer, the Contractor shall notify the Customer of this. The Customer shall have the right to ask the Contractor for assistance with installing the new version. The Contractor shall charge the hourly rates for performing the installation work that are set out for such work in Appendix 7, unless otherwise is specified in Appendix 7.

Any modifications that were made for the Customer in the version being replaced shall be implemented by the Contractor in the new version before it is made available to the Customer. The Contractor shall charge the hourly rates for performing the modification and implementation work that are set out for such work in Appendix 7, unless otherwise is specified in Appendix 7.

The Contractor shall have an obligation, for a minimum of four (4) years after the agreement has come into force, to make new versions of software, etc. covered by the Agreement, cf. Appendix 3, available regularly such that the Customer can comply with the recommended upgrade schedule for new versions of commonly used software that is utilised as part of the Customer's technical platform. Specific deadlines may be agreed in Appendix 5 and software that is exempt from this provision may be specified in Appendix 5.

2.2.8 Further development

The Customer may order the further development of software that is covered by the maintenance agreement within the framework described in Appendices 1 and 2. This includes the development of additional functionality that is moderate in scope. The consideration for such further development shall be the Contractor's ordinary hourly rate set out in Appendix 7, unless another model for consideration is set out in Appendix 7. The parties shall agree a progress plan for such development and acceptance criteria. The parties may choose to utilise SSA-O or SSA-B for the performance of such development.

Software that is developed pursuant to this clause shall become part of the software that shall be maintained under the Agreement. If the consideration for maintenance shall be adjusted, this shall be clearly set out in the agreement governing the development assignment.

2.2.9 Supplementary purchases

The Customer may, throughout the entire term of the Agreement, carry out supplementary purchases and extend or expand its licensing within the limits of, and to the extent that is required to maintain or achieve, the overall goal of the deliverables as described in Appendix 1.

"Supplementary purchases" means replacements or additions of equipment that forms part of the solution that shall be maintained when such replacements or

additions are required to maintain the reliability of the solution or keep it up-to-date, and in connection with expansions to new premises and similar. This shall also apply in the case of replacements that are required to fulfil new statutory or regulatory requirements to which the solution that shall be maintained is subject.

"Extend or expand its licensing" means securing the rights in respect of previously procured software (including new versions) that are required for more users and entities to use it, for it to be used in more locations, or to expand the scope of its use beyond what was originally agreed, as well as the purchase of new licences when such licences are otherwise necessary to ensure continued interaction with the solution, to fulfil new statutory or regulatory requirements to which the solution that shall be maintained is subject, or to supplement the solution within the framework of the overall goal as set out in Appendix 1.

In the case of supplementary purchases and licensing extensions and expansions, the Customer shall pay the Contractor's list price on the date of the purchase after the deduction of the discount set out in Appendix 7. In the case of extensions to existing licences, the Customer's existing agreement governing the right of disposal in respect of the licence concerned shall apply, unless otherwise is agreed in each instance. In the case of the purchase of new licences pursuant to paragraph three, the licensor's standard terms and conditions for such purchases shall apply, unless otherwise follows from another agreement or is agreed in each instance.

Software and equipment that is procured pursuant to this clause shall become part of what shall be maintained under the Agreement. If the maintenance consideration shall be adjusted, this shall be clearly set out in the agreement governing supplementary purchases or licensing extensions and expansions.

2.2.10   Additional services

The Customer may order those additional services naturally associated with the maintenance; for example, periods of expanded standby services, monitoring, assistance with testing changes and new versions, etc. The services and the consideration relating thereto shall be described in the Contractor's service directory, which forms part of Appendix 7.

Additional services shall be registered in Appendix 9.

2.3   REPORTING

If the service level applicable to the maintenance deliverables is agreed in Appendix 5, the Customer shall on a regular basis receive reports documenting that the deliverables are in conformity with the agreed level and specifying any deviations. Unless otherwise stipulated, the reporting shall take place on a monthly basis. The reporting shall address all material aspects of the regulation of the service level. The

report shall specify how the measurement of the service level has been carried out. In addition, it shall contain the following:

- The number of reported errors, including a description thereof and specification of the response time and the amount of time elapsed before such errors had been rectified.
- Description of any upgrades and other changes made during the reporting period.
- If user support falls within the scope of the Agreement, the number of user support requests, including a description thereof and specification of the response times and outcomes.

3. CHANGES SUBSEQUENT TO THE CONCLUSION OF THE AGREEMENT

If the Customer needs, subsequent to the conclusion of the Agreement, to change the requirements applicable to the deliverables, or other stipulations underpinning the Agreement, in such a manner that the nature or scope of the deliverables will differ from that which is agreed, the Customer may request a change agreement.

The Contractor may request adjustments to the consideration or progress plans due to such a change. Any request for adjusted consideration or progress plans must be submitted, at the latest, simultaneously with the Contractor's response to the Customer's request for an amendment agreement.

Changes to the deliverables shall be made in writing, and shall be signed by an authorised representative of the parties. The Contractor shall maintain a directory of the changes on an ongoing basis, which directory shall form Appendix 9, and shall without undue delay provide the Customer with an updated copy thereof.

4. DURATION, TERMINATION WITHOUT CAUSE, DISCHARGE AND ASSIGNMENT OF THE AGREEMENT

4.1 DURATION AND TERMINATION WITHOUT CAUSE

Unless another term of duration or a different commencement date is agreed in Appendix 4, the Agreement shall be for a term of three (3) years starting from the date set out on page two of the Agreement (commencement date). The Agreement shall thereafter be automatically renewed for a term of one (1) year at a time, unless the Customer terminates the Agreement without cause by giving three (3) months' notice prior to the renewal date. The Contractor may terminate the Agreement without cause by giving twelve (12) months' notice prior to the renewal date. If in practice the Contractor is the sole provider of maintenance services for material elements of the software covered by the Agreement, it may terminate the

Agreement without cause by giving twenty-four (24) months' notice, but not during the initial four (4) years, such that the total term of the Agreement shall be a minimum of six (6) years.

4.2 CANCELLATION

The Customer may cancel, in whole or in part, the deliverables contracted under this Agreement giving three (3) month's written notice.

In the event of such cancellation, the Customer shall pay:

a) Any amount due to the Contractor in respect of the part of the maintenance deliverables that has already been performed.
b) The Contractor's necessary and documented direct costs in relation to the reassignment of personnel.
c) Other documented direct costs incurred by the Contractor as the result of the cancellation, hereunder disbursements and costs that have been incurred by the Contractor prior to its receipt of the notice of cancellation, and which the Contractor is unable to make use of for other purposes.

In addition, the Customer shall pay a cancellation fee of four (4) per cent of the annual consideration.

A different cancellation fee may be agreed between the parties in Appendix 7.

In the case of partial cancellation, the cancellation fee shall be calculated on the basis of the share of the contract price accounted for by the cancelled items. The consequences that partial cancellation has in respect of the remaining parts of the deliverables, including the effect on the contact price, shall be handled as a change pursuant to chapter 3.

The total cancellation consideration may never exceed the remainder of the amount the Contractor would be entitled to prior to the next ordinary renewal of the Agreement.

4.3 DISCHARGE PERIOD

The discharge period runs from the date of the notification of termination without cause, cancellation or termination for breach until the Agreement comes to an end (including any extension pursuant to clause 4.4). In addition, the Customer shall have a right to follow-up assistance for up to sixty (60) calendar days after the maintenance services have been established at a new contractor or the Customer itself, even where this is after when the Agreement otherwise comes to an end.

The maintenance services shall remain fully adequate during the discharge period, irrespective of the reason why the Agreement has come to an end.

Upon discharge of the Agreement, irrespective of the reason therefore, the Contractor shall, as part of the deliverables, make available the necessary services during the discharge period and cooperate with any new contractor, in order that necessary actions may be carried out with the minimum possible interruption to the Customer's activities. The Contractor is also obliged to contribute to the necessary transfer of expertise to the new maintenance contractor, taking the nature of the services into account. The Contractor shall not have an obligation to assist with the transfer of basic skills or with the transfer of expertise linked to the Contractor's business secrets.

The Customer shall prepare a progress plan for the discharge period called the "discharge plan". The Customer may allow a new contractor to produce such a plan on behalf of the Customer. The Contractor shall, without undue delay, contribute the information and expertise necessary to ensure the Customer is able to prepare the plan, including proposing specific activities that are necessary on the part of the Contractor, the time frame for these, and otherwise describing the cooperation required between the Contractor and the Customer upon discharge of the Agreement. Furthermore, the Contractor shall make sure that the Customer is given access, without undue delay, to any information the Customer requires from any of the Contractor's subcontractors.

The Contractor shall assist the Customer in connection with the preparations for the conclusion of a new agreement, and shall provide such information as is necessary in connection with such preparations.

The Contractor shall, without undue delay, supplement and update the maintenance documentation and, without undue delay, transfer to the Customer all the data and materials that the Contractor has in its possession and that belong to the Customer.

The Customer shall pay a consideration for the deliverables mentioned under this clause pursuant to the Contractor's hourly rates as stipulated in Appendix 7 or, alternatively, pursuant to special prices applicable to such services as specified in Appendix 7. Nevertheless, the Customer shall not pay such a consideration if the Agreement is terminated due to a material breach of contract on the part of the Contractor.

For the purposes of facilitating the potential sanctioning of inadequate deliveries in connection with the discharge of the Agreement, the Customer shall be entitled to withhold an amount corresponding to one (1) month's consideration for up to two (2) months after the Agreement comes to an end.

4.4 TEMPORARY EXTENSION OF THE AGREEMENT

The Contractor is obliged to extend the Agreement on otherwise equal terms by up to six (6) months as of the date of discharge of the Agreement, if thus requested by the Customer. The Customer shall give notice to such effect no less than sixty (60) days prior to the discharge of the Agreement.

If the Customer terminates the Agreement for breach by the Contractor, notice as mentioned in the above paragraph may be given simultaneously with the notice of termination for breach. If the discharge of the Agreement results from the Contractor terminating for breach by the Customer, such notice may be given within one (1) week of the Customer having received the notice of termination for breach. The right of the Customer to an extension shall in these cases be conditional upon the Customer prepaying consideration for the extended term as stipulated in the above paragraph.

5. THE DUTIES OF THE CONTRACTOR

5.1 THE RESPONSIBILITY OF THE CONTRACTOR FOR ITS PERFORMANCE

The deliveries from the Contractor shall, in an integrated manner, serve the functions and meet the requirements specified in the Agreement.

The Contractor is responsible for ensuring that the personnel who perform the maintenance and services possess the necessary expertise.

5.2 KEY PERSONNEL

Persons designated as key personnel in Appendix 6 shall not, within the scope of the Contractor's managerial prerogative as employer, be replaced without the prior approval of the Customer. Such approval shall not be unreasonably withheld. The actual participation of the key personnel in the provision of the services shall not be scaled back without the prior approval of the Customer.

5.3 SUBCONTRACTORS AND THIRD PARTIES

If the Contractor appoints a subcontractor or the Customer appoints a third party to perform work occasioned by this Agreement, the relevant party shall remain fully responsible for the performance of such work in the same manner as if said party was performing the work itself. The Contractor shall be notified of any third party selected by the Customer, and may reject the assignment if the Contractor is able to demonstrate that this will entail a material commercial disadvantage to the Contractor.

The Contractor's use and replacement of subcontractors that directly participate in the performance of the deliverables must be approved in writing by the Customer. Approval shall not be unreasonably withheld.

The Contractor shall cooperate with the Customer's other contractors and third parties, including any provider of operational services and providers of third-party software that is covered by the maintenance agreement. The cooperation shall be described in more detail in the cooperation plan, cf. clause 2.1.2.

5.4 WAGES AND WORKING CONDITIONS

The following shall apply to agreements governed by the Regulations No. 112 of 8 February 2008 relating to Wages and Working Conditions under Government Contracts:

In respect of areas covered by the Regulations relating to Generalised Collective Wage Agreements, the Contractor shall ensure that its and any subcontractors' employees who contribute directly to the performance of the Contractor's obligations under the Agreement do not receive wages or have working conditions that are inferior to those stipulated in the Regulations relating to Generalised Collective Wage Agreements. In areas not covered by generalised collective wage agreements, the Contractor shall ensure that the same employees do not receive wages or have working conditions that are inferior to those stipulated in any applicable nationwide collective wage agreements relating to the relevant trade. This applies to work performed in Norway.

All agreements that are entered into by the Contractor and that involve the performance of work that contributes directly to the performance of the Contractor's obligations under the Agreement shall include corresponding terms and conditions.

If the Contractor fails to meet this obligation, the Customer shall be entitled to retain part of the contract price, corresponding to approximately two (2) times the savings of the Contractor, until it has been documented that compliance has been achieved.

The Contractor's obligations as mentioned above shall be documented in Appendix 6 by means of either a self-declaration or a third-party declaration showing conformity between the relevant collective wage agreement and the actual wages and working conditions relating to compliance with the Contractor's and any subcontractors' obligations.

The Contractor shall, at the request of the Customer, disclose documentation relating to the wages and working conditions which are used. Each of the Customer and the Contractor may request that the information be submitted to an

independent third party appointed by the Customer to examine whether the requirements of this provision have been complied with. The Contractor may require the third party to sign a declaration that the information will not be used for any purpose other than to ensure fulfilment of the Contractor's obligations pursuant to this provision. The disclosure obligation shall also apply to subcontractors.

Further clarification concerning the implementation of this clause 5.4 may be agreed in Appendix 6.

6. THE DUTIES OF THE CUSTOMER

6.1 RESPONSIBILITIES OF AND CONTRIBUTIONS BY THE CUSTOMER

The Customer shall perform daily follow-up actions. This includes making back-up copies of software and data, as well as ensuring that equipment and software are utilised and stored as prescribed by the equipment or software provider.

The Customer shall facilitate the Contractor's performance of its duties by, inter alia, granting the Contractor the necessary access to its premises and giving written notice of any relocation of equipment that is of importance to the deliverables. More detailed requirements in respect of the Customer's participation may be specified in Appendix 2.

7. DUTIES OF THE CUSTOMER AND THE CONTRACTOR

7.1 CONFIDENTIALITY OBLIGATION

Information that comes into the possession of the parties in connection with the Agreement and the implementation of the Agreement shall be kept confidential, and shall not be disclosed to any third party without the consent of the other party.

If the Customer is a public body, the scope of the confidentiality obligation under this provision shall not go beyond that laid down by the Act of 10 February 1967 relating to Procedure in Cases concerning the Public Administration (Public Administration Act) or corresponding sector-specific regulations.

The confidentiality obligation pursuant to this provision shall not prevent the disclosure of information if such disclosure is demanded pursuant to laws or regulations, including any disclosure or right of access pursuant to the Act of 19 May 2006 relating to the Right of Access to Documents in the Public Administration (Freedom of Information Act). The other party shall, if possible, be notified prior to the disclosure of such information.

The confidentiality obligation shall not prevent the information from being used when there is no legitimate interest in keeping it confidential, for example when it is in the public domain or is accessible to the public elsewhere.

The parties shall take all necessary precautions to prevent unauthorised persons from gaining access to, or knowledge of, confidential information.

The confidentiality obligation shall apply to the parties' employees, subcontractors and other third parties who act on behalf of the parties in connection with the implementation of the Agreement. The parties may only transmit confidential information to such subcontractors and third parties to the extent necessary for the implementation of the Agreement, and provided that they are subjected to a confidentiality obligation corresponding to that stipulated in this clause 7.1.

The confidentiality obligation shall not prevent the parties from utilising experience and expertise developed in connection with the implementation of the Agreement.

The confidentiality obligation shall continue to apply after the expiry of the Agreement. Employees or others who resign from their positions with one of the parties shall be subjected to a confidentiality obligation following their resignation as well, as far as factors mentioned above are concerned. The confidentiality obligation shall lapse five (5) years after the Agreement comes to an end, unless otherwise is stipulated by law or regulations.

7.2 FORM OF COMMUNICATION - IN WRITING

All notices, demands or other communications relating to the Agreement shall be submitted in writing to the postal address or electronic address stated on the first page of the Agreement, unless the parties have agreed a different procedure in Appendix 6 for this type of enquiry.

8. CONSIDERATION AND PAYMENT TERMS

8.1 CONSIDERATION

All prices and the detailed terms governing the consideration to be paid by the Customer for the deliverables provided by the Contractor are set out in Appendix 7. Unless otherwise specified in Appendix 7, all prices are quoted exclusive of Value Added Tax, but inclusive or customs duties and any other indirect taxes. All prices are quoted in Norwegian kroner.

Disbursements, including travel and subsistence costs, shall only be reimbursed to the extent agreed. Travel and subsistence costs shall be specified separately, and shall be paid pursuant to the Government Travel Allowance Scale applicable at any

given time, unless otherwise agreed. Travel time shall only be invoiced if this is agreed in Appendix 7.

If the Contractor is of the view that maintenance and servicing falling outside the scope of the Agreement should be carried out, the prior consent of the Customer shall be obtained in respect thereof if such maintenance shall be invoiced over and above the consideration specified in the Agreement.

8.2   PAYMENT TERMS

Periodic consideration shall fall due for payment within thirty (30) calendar days of the invoice date, with the initial payment due date being no earlier than thirty (30) calendar days after the maintenance agreement comes into effect.

If special pricing and/or payment terms and conditions shall apply for the Agreement, these shall be specified in Appendix 7.

When the Customer has made arrangements for such, the Contractor shall submit invoices, credit notes and reminders in accordance with the Electronic Trading Format (EHF) that has been determined.

Other payment terms, and any terms and conditions relating to the use of EHF, shall be set out in Appendix 7.

The Contractor shall be responsible for paying any costs it incurs in respect of submitting electronic invoices.

8.3   LATE PAYMENT INTEREST

If the Customer fails to make payment by the agreed time, the Contractor shall be entitled to claim interest on any overdue amount, pursuant to the Act No. 100 of 17 December 1976 relating to Interest on Overdue Payments, etc. (Late Payment Interest Act).

8.4   PAYMENT DEFAULT

If overdue consideration, with the addition of late payment interest, has not been paid within thirty (30) calendar days of the due date, the Contractor may send a written notice to the Customer, stating that the Agreement will be terminated for breach, unless settlement has taken place within sixty (60) calendar days of receipt of such notice.

Termination for breach may not take place if the Customer settles the overdue consideration, with the addition of late payment interest, by the expiry of the deadline.

8.5 PRICE ADJUSTMENTS

The maintenance consideration and hourly rates may be adjusted at the beginning of every calendar year by an amount equivalent to the increase in the retail price index (the main index) of Statistics Norway, with the initial reference index value being the index value for the month in which the Agreement was formed, unless a different index value is agreed in Appendix 7.

The prices may be adjusted to the extent that rules or administrative decisions pertaining to indirect taxes are amended in a way that affects the consideration or costs of the Contractor.

Any other provisions pertaining to price adjustments are set out in Appendix 7.

9. EXTERNAL LEGAL REQUIREMENTS, SECURITY AND DATA PROTECTION

9.1 GENERAL EXTERNAL LEGAL REQUIREMENTS AND MEASURES

Each party is responsible for fulfilling its respective duties pursuant to external legal requirements (acts, regulations, other regulatory requirements). The Customer shall identify, in Appendix 1, which legal requirements, or requirements that are specific to the party in question, are of relevance to the conclusion and implementation of this Agreement. The Customer shall be responsible for specifying the relevant requirements for the maintenance services in Appendix 1.

Each party shall, as a general rule, pay the costs of complying with legal requirements applicable to the party and its activities. In the event of changes to legal requirements or official requirements that affect the activities of the Customer and that occasion a need for changes to the deliverables subsequent to the conclusion of the Agreement, the Customer shall cover the costs associated with such changes and any additional work.

9.2 INFORMATION SECURITY

The Contractor will take appropriate measures to address the information security requirements associated with the performance of the Service.

This entails that the Contractor will take appropriate measures to ensure the confidentiality of the Customer's data, as well as measures to ensure that data does not fall into the hands of unauthorised persons. Furthermore, the Contractor will take appropriate measures to protect against the unintended modification and deletion of data, and against virus and other malware attacks.

If the Customer has specific requirements for how information security is to be safeguarded by the Contractor, the Customer must state this in Appendix 1.

If the Contractor handles the Customer's data, the Contractor will be obliged to keep the Customer's data separate from the data of any third parties, in order to reduce the risk of impairment of data and/or access to data. By separate is meant that necessary technical measures to secure data against unintended change or access are implemented and maintained. Unintended changes or access also include access by the employees of the Contractor or others who do not need the information in their work for the Customer.

If the Customer has specific requirements for how the Contractor is to fulfil the requirement of separation of data, the Customer must specify this in Appendix 1.

The Contractor must ensure that Contractors of third-party deliverables undertake sufficient and necessary assurance of the Customer's data.

If the Customer has specific requirements for how the Contractor is to ensure that the Contractor(s) of third-party deliverables undertake adequate and necessary safeguarding of the Customer's data, the Customer must state this in Appendix 1.

9.3 PERSONAL DATA

If the Supplier is to process personal data during the performance of the service, the Supplier must describe in Appendix 2 how satisfactory processing in line with the personal data protection regulations will be achieved and performed. This includes privacy shield requirements. This applies irrespective of whether the Customer has set this requirement in Appendix 1.

If the Customer has any further requirements relating to the Supplier's information security measures, the Customer must state this in Appendix 1.

The Supplier must document that the information system and security measures are satisfactory. Such documentation shall be made available, upon request, to the Customer and its auditors, as well as the Norwegian Data Protection Authority and the Privacy Appeals Board. If the Customer has any further documentation requirements relating to the information system and security measures, the Customer must state this in Appendix 1. If the Customer requests information to perform Data Protection Impact Assessments, the Supplier must assist in providing such information.

The Supplier may not entrust personal data to other parties for storage, reworking or deletion without prior special or general written permission for this from the Customer. The Supplier must ensure that any subcontractors used by the Supplier, and which process personal data, assume the same obligations as those set out in

clause 9.3 of the Agreement. If special or general written permission has been obtained, the Supplier must notify the Customer of any plans to use other data processors or to replace data processors, and thereby give the Customer the opportunity to oppose such changes. Subcontractors that are approved by the Customer must be stated in Appendix 6.

Personal data may not be transferred to countries outside the EEA without any transfer basis and documentation demonstrating that the terms for use of the transfer basis are fulfilled. In such case, the Supplier will document this in Appendix 2.

If the assignment concerns the processing of personal data on behalf of the Customer, the Customer and the Supplier will be obliged to enter into a data processor agreement in accordance with the personal data protection legislation. If the Customer has not prepared a draft data processor agreement, the Supplier will attach a draft as an attachment to Appendix 2. The data processor agreement must be entered into before the processing of personal data begins.

If the parties have entered into a data processor agreement, this data processor agreement will take precedence in the event of any conflict with the Agreement's provisions relating to the processing of personal data.

The parties' liability for damage suffered by a data subject or other natural persons which is due to a violation of the General Data Protection Act (Regulation 2016/679), the General Data Act with regulations or other regulations that implement the General Data Protection Act, will follow the provisions of article 82 of the General Data Protection Act.

The limitation of liability in section 11.4.6 does not apply to liability arising from article 82 of the General Data Protection Act.

The parties are individually liable for administrative fees imposed pursuant to article 83 of the General Data Protection Act.

10. RIGHT OF OWNERSHIP AND RIGHT OF DISPOSAL

10.1 RIGHT OF OWNERSHIP OF EQUIPMENT

The Customer is granted the same rights in respect of new equipment supplied under this Agreement as it was granted in respect of the original equipment, unless otherwise is agreed in Appendix 7.

10.2 RIGHT OF DISPOSAL OF SOFTWARE, DOCUMENTATION, ETC.

The Customer is granted a right of disposal in respect of software in accordance with the concluded agreement governing rights of disposal. If maintenance is performed by software being replaced, the Customer is granted the same rights in respect of the new software as it had in respect of the software being replaced.

The Customer is granted a right of disposal in respect of any documentation and reports that the Customer receives pursuant to the concluded agreement governing rights of disposal. If no such agreement exists, the Customer is granted the right of disposal necessary to utilise the documentation for its activities and for the cooperation necessary with the Customer's contractual partners. When documentation and reports are updated, the Customer is granted the same rights in respect of the updated documentation or reports as it had in respect of the originals.

10.3 EXPANDED RIGHT OF DISPOSAL OF CHANGES AND SOFTWARE EXPANSIONS THAT ARE DEVELOPED FOR THE CUSTOMER

The Customer is granted, free of charge, a perpetual and non-exclusive right to utilise changes and software expansions that are developed or customised specifically for the Customer (expanded right of disposal) pursuant to the Agreement. The expanded right of disposal includes the right to use, copy, modify and develop the customisations, either on its own or with the assistance of a third party. The Customer is entitled to confer a corresponding expanded right of disposal on any other public body.

Source code and associated specifications and documentation of the development and customisations shall be handed over to the Customer within ten (10) working days after the change or software expansion has been approved by the Customer, unless otherwise is agreed in each instance.

11. BREACH OF CONTRACT ON THE PART OF THE CONTRACTOR

11.1 WHAT IS DEEMED TO CONSTITUTE BREACH OF CONTRACT

There is a breach of contract on the part of the Contractor if the Contractor fails to perform its duties under the Agreement and this is not caused by circumstances related to the Customer or by force majeure.

The Customer shall submit a written complaint without undue delay after the breach of contract has been discovered or ought to have been discovered.

11.2 NOTIFICATION OBLIGATION

If the Contractor is unable to perform its duties as agreed, the Contractor shall give the Customer written notice of this as soon as possible. The notice shall specify the reason for the problem and, insofar as it is possible, when the deliverables can be performed. A corresponding obligation shall apply if additional delays are to be expected after the first notice has been given.

11.3 CURE

The Contractor shall commence and complete the effort of curing the breach of contract as quickly as possible after the Contractor has been notified of the breach.

11.4 REMEDIES FOR BREACH OF CONTRACT

11.4.1 Withheld payment

In the event of a breach of contract on the part of the Contractor, the Customer may withhold payment, although the amount withheld shall not be obviously higher than what is necessary to secure the Customer's claim resulting from the breach of contract.

11.4.2 Price reduction

If the Contractor has not succeeded, despite repeated attempts, in curing the breach of contract, the Customer may claim a proportional price reduction.

11.4.3 Standardised damages and hourly liquidated damages

In the case of overrun deadlines or another failure to perform on the part of the Contractor, the Customer shall have the right to standardised compensation as stipulated in Appendix 5.

If standardised damages have *not* been agreed in Appendix 5, the Customer may demand hourly liquidated damages in accordance with the provisions below:

If any agreed deadline for rectifying A or B level errors is not complied with, and this is not caused by force majeure or circumstances related to the Customer, there is a delay on the part of the Contractor that triggers hourly liquidated damages.

The hourly liquidated damages shall accumulate automatically and amount to 0.2 per cent of the overall annual consideration, excluding Value Added Tax, for each hour, or part thereof, of delay. The hourly liquidated damages shall only accumulate during ordinary working hours on working days. The liability for accumulated hourly liquidated damages may not exceed 5 per cent of the annual consideration per instance of breach of contract and 15 per cent of the annual consideration per year.

Other rates and other periods for hourly liquidated damages, as well as the deliverables to which these shall apply, may be agreed in Appendix 1.

If only parts of the maintenance deliverables are delayed, the Contractor may request a reduction in the hourly liquidated damages proportional to the ability of the Customer to utilise the software and equipment.

The Customer shall not have the right to terminate the Agreement for breach for as long as the hourly liquidated damages continue to accumulate. However, such restriction as to the timing of termination for breach shall not apply in the case of wilful misconduct or gross negligence on the part of the Contractor or anyone for whom it is responsible.

11.4.4   Termination for breach

If there is a material breach of contract, the Customer may, after giving the Contractor written notice and a reasonable deadline for remedying the situation, terminate the Agreement for breach with immediate effect.

The Customer may terminate all or part of the Agreement for breach with immediate effect if the accumulated hourly liquidated damages reach the maximum ceiling of 15 per cent within a one (1) year period.

11.4.5   Damages

The Customer may claim damages in respect of any direct loss, including additional costs the Customer incurs due to substitute purchases, any loss caused by additional work and other direct costs in connection with delays, deficiencies or other breaches of contract pursuant to clause 11.1, unless the Contractor demonstrates that the Contractor did not cause the breach of contract or the reason for the breach of contract.

Any accumulated hourly liquidated damages and standardised damages shall be deducted from any other damages in respect of the same delay/breach.

11.4.6   Limitation of damages

No damages may be claimed in respect of indirect loss. Indirect loss includes, but is not limited to, lost earnings of any kind, lost savings, loss of data, and claims from third parties, with the exception of liability for damages imposed as a result of defects in title.

Overall damages per calendar year are limited to an amount corresponding to the overall annual consideration under the Agreement, excluding Value Added Tax.

The said limitations of damages shall not apply in the case of gross negligence or wilful misconduct on the part of the Contractor or anyone for whom the Contractor is responsible.

12. BREACH OF CONTRACT ON THE PART OF THE CUSTOMER

12.1 WHAT IS DEEMED TO CONSTITUTE BREACH OF CONTRACT

There is breach of contract on the part of the Customer if the Customer fails to perform its duties under the Agreement, and this is not caused by circumstances related to the Contractor or by force majeure.

The Contractor shall give written notice without undue delay after the breach of contract has been discovered or ought to have been discovered.

12.2 NOTIFICATION OBLIGATION

If the Customer is unable to perform its duties as agreed, the Customer shall notify the Contractor in writing accordingly as soon as possible. The notice shall specify the reason for the problem and, to the extent possible, when the Customer will again be able to perform the agreed duty.

12.3 CURTAILMENT OF THE RIGHT OF RETENTION ON THE PART OF THE CONTRACTOR

The Contractor shall not suspend any deliverables as the result of breach of contract on the part of the Customer, unless the breach is material.

12.4 TERMINATION FOR BREACH

If there is a material breach of contract, the Contractor may, after having given the Customer written notice and granted it a reasonable deadline for remedying the situation, terminate all or parts of the Agreement for breach with immediate effect.

12.5 DAMAGES

The Contractor may claim damages in respect of any direct loss that results from a breach of contract pursuant to clause 12.1, including any loss caused by additional work and other direct costs, unless the Customer is able to demonstrate that the breach of contract or the cause of the breach of contract is not attributable to the Customer.

The limitation of damages provision of the Agreement, as set out in clause 11.4.6, shall apply correspondingly.

13. OTHER PROVISIONS

13.1 RISK IN RESPECT OF SOFTWARE AND EQUIPMENT

The Customer assumes the risk relating to equipment and software that fall within the scope of the Agreement, cf. Appendix 3. The Contractor assumes the risk relating to any other equipment or software, for example, spare equipment, which it has placed on the premises of the Customer, unless otherwise agreed.

13.2 ASSIGNMENT OF RIGHTS AND OBLIGATIONS

To the extent that the Customer is a public body, the Customer may assign, in full or in part, its rights and obligations under this Agreement to another public body, which shall then be entitled to corresponding terms and conditions.

The Contractor may only assign its rights and obligations under the Agreement with the written consent of the Customer. The same shall apply if the Contractor is de-merged into several companies or in the case of assignment to a subsidiary or another company within the same group, but not if the Contractor is merged with another company. Consent shall not be unreasonably withheld.

The right to assignment in the paragraph above shall only apply if the new contractor meets the original qualification requirements, no other material changes are made to the contract, and the assignment is not made to circumvent the regulations concerning public procurement.

The right to consideration under this Agreement may be assigned freely, but shall not release the Contractor from its obligations and responsibilities.

13.3 BANKRUPTCY, COMPOSITION WITH CREDITORS, ETC.

In the case of debt rescheduling proceedings, composition with creditors, bankruptcy, or any other form of creditor intervention, in respect of the business of the Contractor, the Customer shall be entitled to terminate the Agreement for breach with immediate effect, unless otherwise is stipulated by mandatory law.

13.4 FORCE MAJEURE

Should an extraordinary situation outside the control of the parties arise that makes it impossible to perform duties under this Agreement, and which under Norwegian law shall be classified as force majeure, the other party shall be notified of this as soon as possible. The obligations of the affected party shall be suspended for as long as the extraordinary situation prevails. The corresponding obligations of the other party shall be suspended for the same period.

In force majeure situations, the other party may only terminate the Agreement for breach with the consent of the affected party, or if the situation prevails or is expected to prevail for more than ninety (90) calendar days as from the date on which such situation arose, and in such case only with fifteen (15) calendar days' notice. Each of the parties shall cover their own costs associated with the ending of the contractual relationship. The Customer shall pay the agreed price for the part of the deliverables that was performed prior to the Agreement coming to an end. The parties may not present other claims against each other due to the Agreement coming to an end pursuant to this provision.

The parties shall, in connection with force majeure situations, have a mutual disclosure obligation towards each other concerning all matters that must be deemed relevant to the other party. Such information shall be disclosed as soon as possible.

14. DISPUTES

14.1 GOVERNING LAW

The rights and obligations of the parties under this Agreement shall in their entirety be governed by Norwegian law.

14.2 NEGOTIATIONS AND MEDIATION

Should a dispute arise between the parties as to the interpretation or the legal effects of the Agreement, the parties shall first seek to resolve such dispute through negotiations and/or mediation.

14.3 LITIGATION OR ARBITRATION

If a dispute is not resolved through negotiations or mediation, each party may require the dispute to be resolved with final effect before the Norwegian courts of law.

The venue shall be the court of domicile of the Customer.

The parties may alternatively agree that the dispute shall be resolved with final effect through arbitration.

NRK

SSA-T Appendix 1

Customer requirements specification

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Attachments

Attachment 1-1: MPP AVoIP Live Media Standards

Attachment 1-2: NRK Device ST2110 ST2059 NMOS Conformance - v3.2

Attachment 1-3: NRK Supplier Security Requirements v0.9

1   INTRODUCTION

1.1   About this Appendix

This Appendix describes background for and scope of the procurement and the Customer's objectives, needs and requirements for a new automation/playout solution (hereinafter referred to as "the Solution") The needs and requirements must be answered in subsequent appendices as indicated, where an overall description of the Solution must be provided as well as a detailed description of how the Contractor's objectives, needs and requirements will be fulfilled.

The list below provides an overview of this document:

a) Chapter 2 summarizes the background and main objectives of the project.

b) Chapter 3 describes the scope of the Solution, including options.

c) Chapter 4 contains instructions for the documentation of the Contractor's high-level solution proposal.

d) Chapter 5 describes the Customer's needs and user requirements.

e) Chapter 6 describes the Customer's needs and requirements related to the solution architecture.

f) Chapter 7 and 8 describes the Customer's technical needs and requirements, also related to integrations and API.

g) Chapters 9-10 describe needs and requirements related to other deliveries and performances; including processing and storage of personal data, implementation methods, documentation; training and administrative and legal requirements.

• Attachments according to the table of contents, whereof Attachment 1-3 shall be responded to by the Contractor.

This Appendix contains a combination of textual descriptions of objectives, needs, cases, user stories and requirements as well as tabulatory listings of requirements of a more technical character.

The specified needs and requirements must be understood on the basis of descriptions of the background, as well as the customer's purpose and needs in chapters 2 and 3. By answering all requirements and describing how the requirements are met in the offered solution, the Contractor is expected to present its best proposed solution based on the described needs that fulfils the objectives in a best possible manner.

For practical purposes "the Customer" may also be referred to as "NRK".

Any reference to "clause" refers to a section in the General Contract Terms (SSA-T).

1.2   Explanation to the requirements specification

The requirement specification table as used in chapters 7 and 8 consists of the columns shown in Figure 1 below. Light gray shaded columns in Appendix 2 only and to be filled out by the Contractor.

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	

Figure 1: Columns in Appendix 2 Attachment 2.1 Contractor's solution description

#: Requirement ID - Consecutive numbering of needs/requirements within each section.

Requirement: Textual description of the need/requirement.

"Requirement fulfilment:

- **STD**: the requirement is fulfilled through default standard functionality "preconfigured out of the box".

- **CON**: the requirement is fulfilled through configuration, e.g. screen/GUI config, reports, etc.

- **DEV**: the requirement is fulfilled through custom development (changes to the source code of the standard solution or custom extensions/add-ons to the standard solution).

- **3RD INT**: the requirement is fulfilled through third-party software with built-in integrations as part of the standard solution.

- **3RD**: the requirement is fulfilled through third-party software.

- **FUT**: the requirement is fulfilled through future software release. Future software release refers to versions that are released after the Solution is put into operation for the Customer. The Contractor must comment on which future version will fulfil the requirement and the estimated time for when this version will be available to the Customer.

- **WA**: the requirement is **not** fulfilled as intended by the Customer's requirement description, but the Contractor has a workaround solution (describe workaround solution).

- **NO**: the requirement is **not** fulfilled.

The Contractor's Solution Description: The Contractor's detailed description of _how_ the need/requirement is fulfilled as well as which parts of the requirement are possibly not fulfilled according to the applied fulfilment code. Please also refer to section 1.3 below.

1.3   Instructions for completing Appendix 2

The Contractor is required to document degree of fulfilment of and compliance with the specified objectives, needs and requirements in Appendix 1 by completing the corresponding Appendix 2 Contractor's solution description.

In Appendix 2 the Contractor shall:

- provide a high level solution overview, cf. chapter 4

- document fulfilment of cases and user stories, cf. sections 5.5 through 5.7.

- document fulfilment of requirements as specified in chapters 6 through 10.

The Contractor must in Appendix 2, provide for each case, user story and requirement, an exhaustive elaboration of how the Solution addresses the Customer's needs and requirements. The Contractor is encouraged to add illustrations and screenshots whenever this may help the Customer to a better understanding of how the Solution addresses the requirement. References to general materials such as sales and/or product brochures, product magazines and web content is not sufficient. Any relevant supplementary information may be provided as attachment(s) to Appendix 2 with clear and unambiguous reference.

Where requirement tables are used the Contractor must answer each requirement with a confirmation by marking an "X" in the relevant column(s) under the heading "Requirement fulfilment":

a) If the Contractor marks either one of columns "STD", "CON", "DEV", "3RD INT", "3RD" or "FUT", the requirement is accepted as fulfilled.

b) If the Contractor has any reservations to the requirement, this must be explained in the "Solution Description"-column. If the Contractor will fulfil part of the requirement with one of the categories and another part with another category, then the Contractor may mark more than one category. In that case, the Contractor must be very explicit in his description in Appendix 2 about how each part of the requirement is fulfilled. The Contractor shall, inform the Customer of the likely consequences of any customizations in terms of the complexity and price of any future maintenance of the standard system and customization.

c) If the Contractor does **not** fulfil the requirement as intended by the Customer's requirement description, but the Contractor has a workaround solution, the Contractor must put a mark in the "WA"-column and describe the workaround solution in the "Workaround solution"-column.

d) If the Contractor does **not** fulfil the requirement, the Contractor must mark the "No"-column.

The Contractor's Solution Description must be sufficiently exhaustive for the Customer to assess whether the solution meets the requirement and otherwise may be considered suitable, possibly adding value, and thus form a sufficient framework for any detail specification. If the column "The Contractor's Solution Description" in the opinion of the Contractor does not contain sufficient space for text and possible illustrations for certain requirements the description may be included under each requirements table with clear and unambiguous reference to the applicable requirement number.

Although alternative proposals are not allowed as such, this does not prevent the Customer from accepting a fulfilment of individual requirements that are not necessarily "according to the letter of the requirement" if the Customer has justified this in terms of increased performance, value, efficiency, safety, gain etc., or reduced risk and cost. Similarly, if the Contractor considers certain requirements to be particularly complex or cost-driving the Contractor may justify this and propose and describe an alternative fulfilment.

It is the responsibility of the Contractor to ensure that all requirements are sufficiently addressed. If requirements are left unanswered or uncommented – they are to be considered as fulfilled unless otherwise explicitly stated by the Contractor.

Any limitations, demarcations, assumptions, or deviations must be clearly described in connection with the individual goal/need/requirement in Appendix 2 order to be invoked.

1.4   Instructions for completing other Appendices

ID	Instructions
1	The Contractor shall in Appendix 4, in accordance with the structure and instructions provided in the Appendix, describe their overall project and progress plan for the delivery of the Solution, based on the Contractor's applied project methodology as described in Appendix 2.
2	The Contractor shall in Appendix 5, in accordance with the structure and instructions provided in the Appendix, describe how testing and approval shall be conducted.
3	In Appendix 6, the Contractor shall, in accordance with the structure and instructions provided in the Appendix, describe its organisation, staff and interaction with the Customer as instructed. .
4	The Contractor shall specify prices and the principles for pricing in Appendix 7.
5	If the Contractor has any reservations to the general terms in the agreement these shall be set forth in Appendix 8, except for cases where the General Contract Terms refer to other documents.
6	Any licence terms and conditions for standard software and free software shall be included in Appendix 10.

2   BACKGROUND AND PURPOSE

2.1   Background

NRK's current automation/playout has reached end-of-life and needs to be replaced and modernized. It has been a stable and reliable installation, but due to its age we are running with a higher risk than desirable. We have major shortages both on support and spare parts. It is based on legacy integration with stand-alone video servers, routers, graphic generators, vision mixers and is not set to meet the strategic editorial and technical development needed.

Current workflows are based in the linear world, but we need an operation which can serve a wider publishing strategy. NRK's focus is on online publishing both live and on-demand, beside our linear channels.

It is an expectation that implementation of a new continuity automation and playout solution contributes to to NRK's efforts to reach its strategic objectives. In the long-term strategy for 2021-2024, NRK states three strategic objectives shown in Figure 2 below.
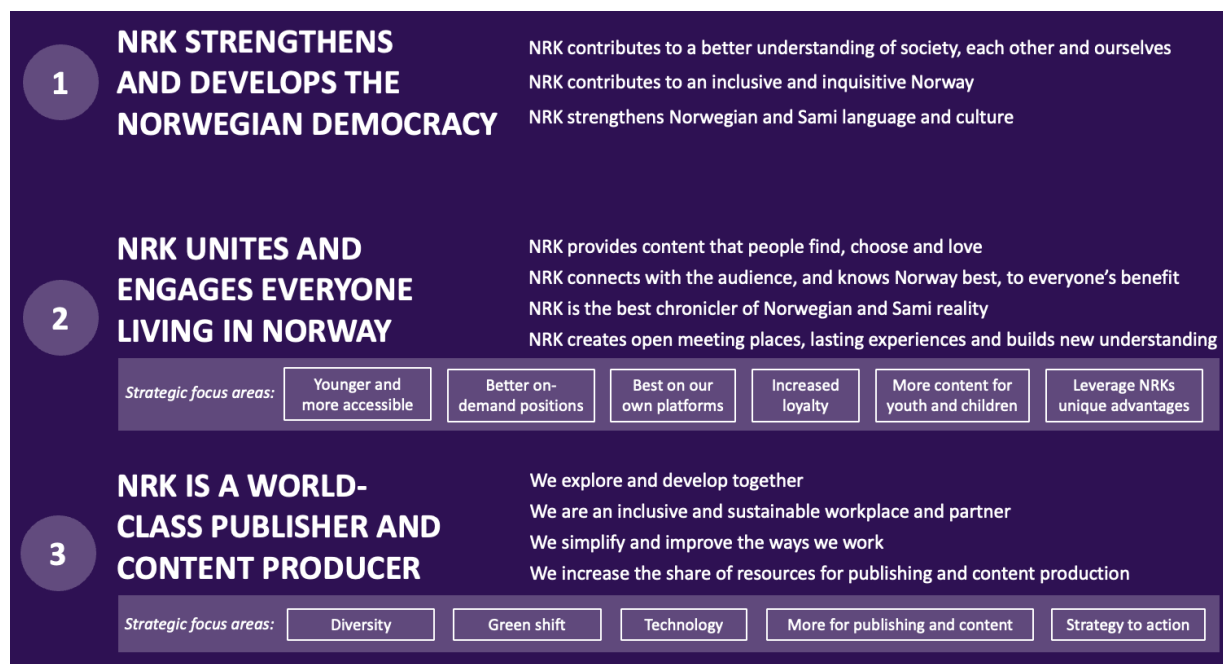
Figure 2: NRK's three strategic objectives in the long-term strategy for 2021-2024

NRK's long-term strategy is based on NRK's role in the Norwegian society, as formulated both through the statutes approved by the Ministry of Culture and through the NRK placard set by the Parliament. Some of the highlights include:

a) NRK shall ensure that content and services can be used by everyone regardless of sight, hearing and other cognitive or physical skills.

b) NRK has a special emergency response responsibility and will thus facilitate that the government reaches the entire population with information in the event of national crises and disasters.

c) NRK shall strengthen the Norwegian and Sami languages, culture and identity

2.2   Main objectives

There is an ongoing, long-running project at NRK where the main focus is to **renew** the **presentation suite/main continuity centre** to meet the editorial and technological requirements for NRKs publishing strategy as addressed in the previous section. A new automation/playout solution (this procurement) is central in achieving this. The main objectives that are sought realised through the solution are described below.

2.2.1 Support editorial innovation and development

Less technical problem solving for the operators

Their focus should be on their editorial tasks. The quality of the user experience will be highly valued and prioritized.

Flexible control of program length and scheduling

Handling live programming and breaking news situations (last second changes)

Location independence

The Presentation suite/Main continuity centre should be located where it is appropriate from an organizational point of view, and not be bound by technical limitations

2.2.2 Technological renewal and modernization

Software-based solution

We focus on software-based playout chain and automation, which is in line with NRKs strategy.

Virtualization

Virtualized systems and infrastructure (data center or cloud) is an important part of NRKs technological strategy.

Modern software development and operations methodologies

Infrastructure as code, version-controlled configuration, continuous integration/delivery and automatic deployment of both servers and software

API driven

Integration and "development-friendly". Use modern API-interfaces and other modern techniques to integrate applications, whenever possible

Prepares for IP transformation

Although the first iteration of the delivery operates on SDI infrastructure, the ability to gradually introduce AVoIP capabilities into the installation is of high importance.

Location independent architecture

NRKs HQ will be relocated in the next years, and the system needs a technological architecture that simplifies the relocation.

2.2.3 Secure service availability

High availability design

High availability design with multiple parallel streams from more than one location will be important to secure NRKs responsibilities as a public broadcaster.

Redundancy and resilience

Across multiple locations, servers and rendering engines, we strive for location independent publishing.

Quality

Increased technological quality. Higher degree of flexibility to meet current and future technical standards and formats.

3 SCOPE OF PROCUREMENT

The customer shall procure a new automation/playout solution (hardware and software) using an iterative approach during design (customization) and implementation.

The project aims to deliver a high degree of continuous value to the organization by actively planning for an incremental introduction of the new systems and features.

Combined with a clear Separation of Concern (SoC) and co-developed integrations (cf. 3.1 and 8) this should enable the responsible teams at NRK a higher change-rate and ability to implement new workflows faster and more reliably.

The 1st main delivery shall be based on serial digital interface (SDI) as the source and output transport and is proposed divided in 3 iterations. The level of functionality adapted to each iteration is described in chapter *5 User requirements specific to Automation/Playout.*

a) 1st Iteration: **NRK 4 - 8** (NRKs streaming/off-loading channels)

b) 2nd Iteration: **NRK2 and NRK3/NRK Super** (Primarily pre-programmed playlists)

c) 3rd Iteration: **NRK1** (High degree of live programming and last second changes. Requires more complex functionality and integrations)

See section 5.4 for a more detailed description of the channel structure and section 5.5 for "every-day" case examples explaining the level of functionality. The matrix in section 5.7 shows which iteration the different uses stories belong to.
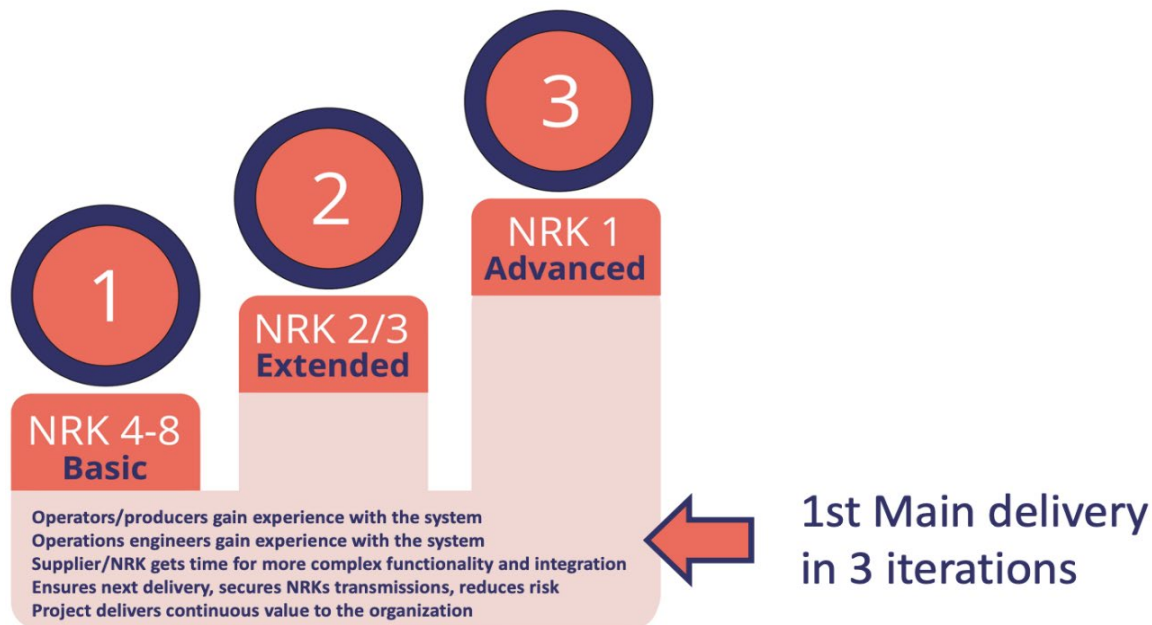
Figure 3: Iterations in 1st delivery

These iterations are based on the level of functionality of the different channels and a strive for continuous progress. It will deliver knowledge and value to the organization during the implementation.

Starting with the less critical channels that are not on-air 24/7/365 has several positive effects:

- Continuity producers gain experience with the system

- Operations engineers gain experience with the system

- Easy to make test scenarios in production

- More time for complex functionality and integration that is needed for main channels

- These processes can be time consuming, and must be run in parallel when implementing the first iteration

- Reduces risk and secures NRKs delivery to the public

The solution in this delivery shall be designed for very high availability, be integrated in today's HQ and include a feature complete development/staging environment that is comparable to the production environment. Operations engineers and developers will use this environment for test, development, and configuration (see section 7.12.3).

As part of this main delivery, one is also the implementation and establishment of the Contractor preferred resilience solution, cf. section 6.2 for more information.

The Contractor shall as part of its high-level solution overview describe, supported by graphic illustrations, how the solution will support the need of functionality, and specify the need for hardware

and software necessary for development, staging, testing and operating platforms in accordance with the requirements listed in this Appendix and Appendix 7.

The 2nd main delivery is a transition to a multi-site AVoIP based playout, where NRK will provide the underlying AVoIP networking infrastructure and broadcast/network control software.

The strategy for the design and build of AVoIP infrastructure is an ongoing process in NRK, and there are still some uncertainties regarding the timeframe and standards. Playout on SDI infrastructure needs to be in place first, but transition from SDI to AVoIP must be defined from the automation/playout solution perspective.

Therefore, the new automation/playout is expected to eventually be able to playout simultaneously on ST2110 and SDI in sync.

How this migration is solved and what implications this has for new/duplicate hardware, licensing is essential information and is requested in section 7.5 below.

Also to be included in the high-level solution overview, this second main delivery shall be described, including a migration plan and description of work packages, prerequisites, and necessary hardware/software to enable two IP-based playout-chains at two (presumably external) locations that work seamlessly and as an integral part of the first SDI-based delivery and automation, enabling a low-risk transition to IP-based playout.
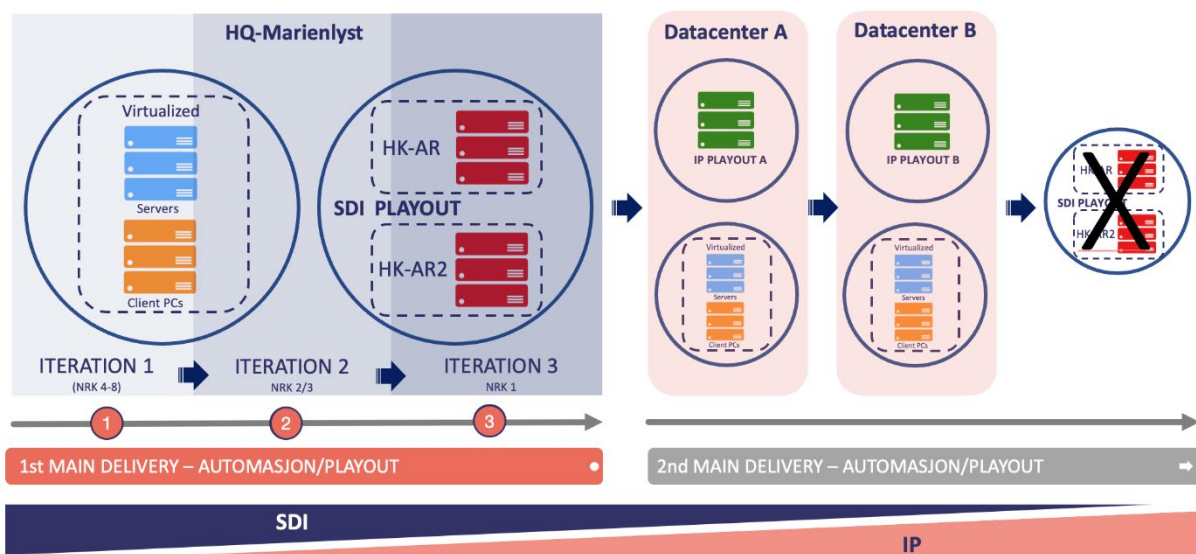
Figure 4: Prepare for IP transformation

Business processes not in scope

In a best effort to clarify the process scope, the following list attempts to summarize some business processes that are not in scope:

•   Distribution

•   Contribution

•   Media Management (beyond what is needed for the solution to work internally)

3.1 Technical Scope

The following figure shows a high-level overview of the technical scope – which systems/services are considered in scope in this procurement. It includes the automation, as much as possible of the playout chain, with some notable exceptions like the main graphics system and subtitle rendering.

The reasoning behind the individual exceptions is covered later in this document, both in the user stories, the technical requirements and in the integration-chapter, but it follows a common pattern of loose coupling, low cohesion.

Although the goal is highly integrated playout-chain and to move away from the current design with a lot of discrete boxes, where all and every small processing of audio/video is looped through the routers to create switchover points, breaking out to external equipment or solutions for some features is not disqualifying if technically or functionally justified.

Especially in areas where NRK has very bespoke needs or expects changing business or user requirements, a separate system or integration, is preferred to be an "all-in-one" solution. Likewise, the integration between new and existing system where the business logic or domain is important and may change due to changing business flows or requirements, NRK wants to own or be a part of the system-integration (cf. chapter 8). This is based on prior experience where the most complicated and difficult part of many integrations are not the technical implementation or development, but the business and data model impedance and the need to be able du adjust and adapt the mapping and logic over time.

This is also why the integration between some of these systems are marked as "in scope through co-development"; The indicate areas where we would prefer that the new integration is done through use of public APIs, extension points, modules and/or external integration-services (that may be hosted on NRKs servers or Kubernetes clusters) and where the source-code and ability to evolve, build and deploy the integrations are retained by NRK. Please see Integrations and API for more details.

This is the main principle, but NRK may consider counterarguments and suggestions to why and where this may not apply or be solved differently.
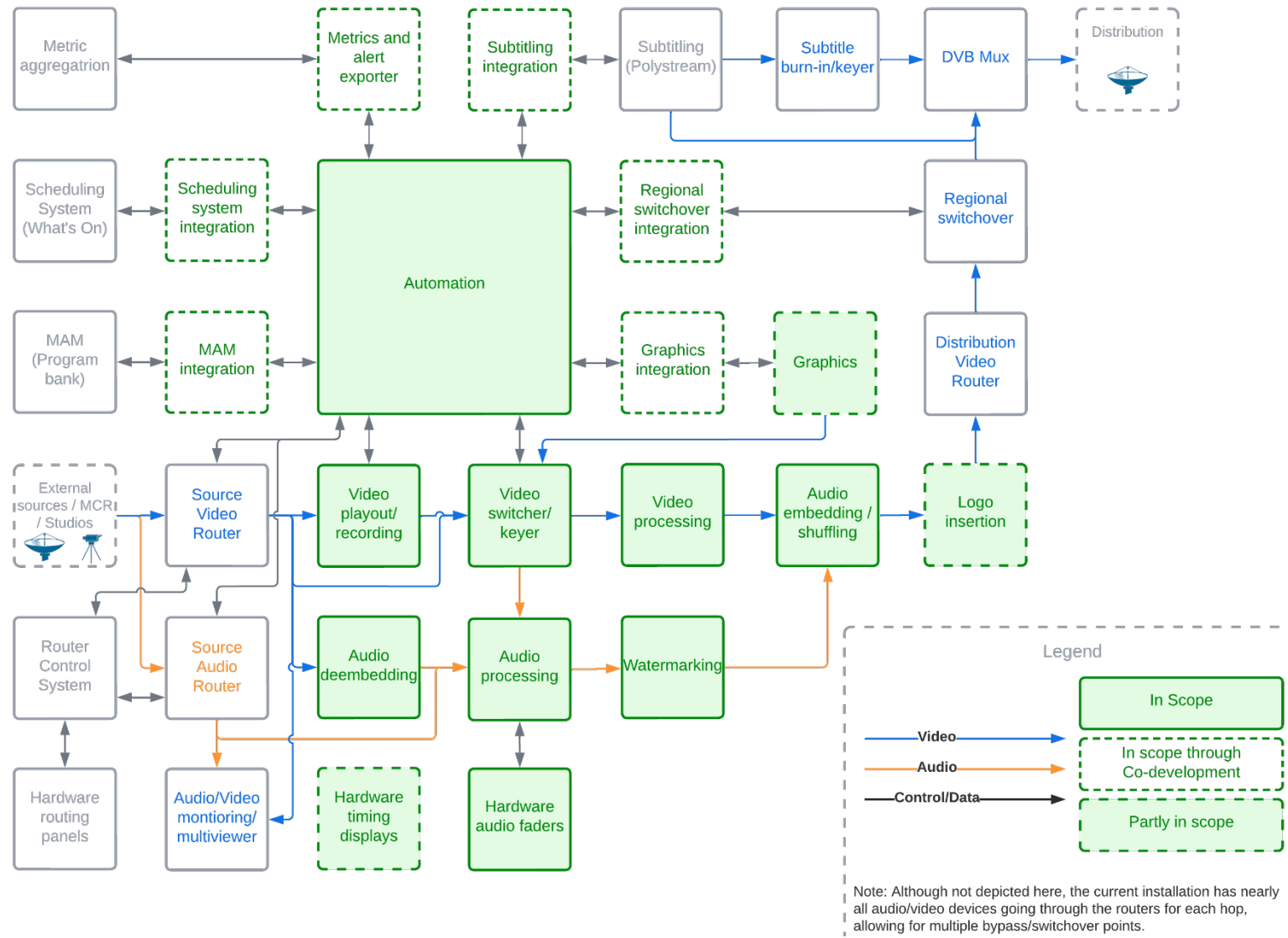
Figure 5 High level scope overview

3.2   Volumes

The solution must at least handle the following volumes of concurrent channels, in addition to any number of extra channels/nodes required to handle the proposed resilience model (See section 6.2 High availability and resilience).

- ***Automation/Playout for 3 x "Tier-1" Channels***

    As described in section 5.4 Linear channel structure

- ***Automation/Playout for 5 x "Tier-2" Channels***

    As described in section 5.4 Linear channel structure

- ***Automation/Playout for a feature complete development/staging environment***

- ***Scalability***

    In the current situation we have a setup of 3 + 5 channels, but the volumes and number of channels is dynamic. At times, we will have to scale up the number of streaming (Tier-2) channels. Please see section 3.3 below.

3.3   Options

In addition to the volumes described above, the following options shall be briefly described in Appendix 2 and priced in Appendix 7.

a) On Premises channels

Details for establishing new on premises instances in "Tier-1" Channels category.

(As described in section 5.4 Linear channel structure)

b) Pop-Up channels

Event based channels with "short life", "Tier-2" Channels category.

(As described in section 5.4 Linear channel structure)

c) Disaster Recovery as cloud-only instance

As discussed in section 6.2 Resilience

d) Streaming/Off-loading channels as cloud-only instances

As discussed in section 6.6 Cloud/hybrid/on-premises solutions. To place the main playout and automation for a public broadcaster in the cloud is a "hard sell". But a hybrid model with NRK 4-8 as cloud-native is interesting to investigate as an option.

e) On Site spares of critical components

Please advise the Customer on which components that are assessed as critical and should be part of an on-site spare stock.

4   HIGH-LEVEL SOLUTION OVERVIEW

The Contractor shall provide a comprehensive high-level overview of their Solution based on the objectives and needs described in chapter 2 and 3 and the accompanying cases, user stories and requirements in the following chapters. A high-level technical description/illustration of the Solution should be included.

The Contractor must provide clear and unambiguous statements about which of the Customer needs and requirements they do not support or cannot deliver.

The documentation should emphasise:

d) **Performance**: How the offered Solution contributes to achieve the main objectives of this procurement (cf. chapter 2.2). Please make unambiguous references to the relevant sections in Appendix 2 that contribute to the achievement of the Customer's objectives.

e) **Risk**: How the Contractor will help the Customer to reduce principal risk related to this Solution. Both in establishing the service and running it. Please make unambiguous references to the relevant sections in Appendix 2 where the offered measures provide effect.

f) **Additional Value**: How the Contractor can offer additional value to the Customer in addition to the listed requirements and relative to the competing Contractors. Please make unambiguous references to the relevant sections in Appendix 2 that shows how the offered Solution provides added value and better goal achievement for the Customer.

5 USER REQUIREMENTS SPECIFIC TO AUTOMATION/PLAYOUT

This chapter describes roles, actors, a selection of "every-day" case examples, and user stories to exemplify functional requirements and deliveries from NRKs current Presentation suite/Main continuity centre.

The phrased and simplified user stories begin with a role, e.g. "As a Continuity producer …". The roles referred to in these user stories are the most prevalent roles within the current Presentation suite/Main continuity centre. The wording of a user story cannot be considered literally exhaustive, they are only meant to exemplify functional requirements in a richer context.

5.1 Roles

5.1.1 Continuity producer

The continuity producer mans the Presentation suite/Main continuity centre. They have a significant editorial responsibility as the final publisher and are responsible for how the end product appears to the public.

The tasks include the following

- The continuity producer acts as producer and editor for the entire TV offer

- Composes the front page of NRK TV on behalf of the on-demand team outside office hours

- Produces and edits parts of the promotion and program presentation

- Maintains daily publication plans and marketing plan

- Responsible for informing the public of changes from the set plan

- Production support for channel hosts, subtitlers and sign language interpreters

- They operate all the technical equipment; handling everything from the automation system, vision mixers, router control software, editing software and graphical systems in the Presentation suite, to create the desired product.

- Continuity producers are working in shifts and are present at the Presentation suite/Main continuity centre between 06:00 – 01:00. The playout is unattended at night

5.1.2 Announcer/host

NRK has an on-camera live channel host service. The most important task of the channel hosts is to announce the next program and sell the current and future programs on all platforms.

They compose the NRK 1-experience together with the continuity producer and has a unifying role when major events happen. They are the face of the channel to the public.

The channel hosts plans, schedules and operates playout of branding graphics between shows on NRK1 and do off-tube voiceovers on program-flow elements, like end-credits.

They often use NRK1 to cross-promote NRK content on other channels and platforms (podcasts, radio shows, web articles).

5.1.3 Planner

There are people with the full-time role of handling schedule planning, but the responsibility is divided between several different other roles – depending on time scale.

Mainly 3 levels of planning are defined in NRK.

- Long term: Relates to the ordering of programs to the channel. See the big picture. Last up to 6 weeks before publishing. Changes done by the management.

- Mid-term: 3 - 6 weeks before publication date. Changes done by the planner.

- Short term: 3 weeks before and up to and including time of playout. Changes done by the Continuity producer or the planners manager.

5.1.4 Operations engineer

Operations engineers ensures the stable operation and development of the technical infrastructure underpinning the Presentation suite/Main continuity center. Monitoring, maintenance, bug hunting and fixing, updates and upgrades are handled by the team. They are responsible for planning and design of the technical architecture in the TCR/ Presentation suite-sphere together with Contractors and adjacent departments in NRK.

They are the main support for all playout related equipment and systems in the Presentation suite and are 1st line support contact for the continuity producers.

5.1.5 Developer

NRK has a high degree of developer competence in-house. This has been a proven commitment over several years. It provides continuous added value for the organization to be able to create tailored user experiences and rapid rollout of new workflows. The type of in-house projects spans from user interfaces on top of commercial off-the-shelf software to complete systems like NORA (Graphics system) and SOFIE (news playout system).

In the context of continuity playout, having in-house control of most of the integration points between systems, version-controlled configuration and automated deployment are some of the areas where our developers will contribute. As an example, the integration between the automation system and the MAM will most probably be facilitated by NRKs own development-teams.

5.1.6 Subtitler

As a national broadcasting company, NRK has a clear social responsibility defined by law with clear requirements for the availability of accessibility services.

Subtitles are an important tool to achieve the goals set in the statutes mentioned in section 2.1.

NRK provides subtitles to *live* and *planned productions*.

The former type will be provided by a *live subtitler*. The live subtitler writes fast via a program developed by NRK for providing text to live shows.

Planned productions will be subtitled by a person with a translator background. Where the former has a great need for speed the other has time to add the best quality of text.

The manually written subtitles, both open (for translation of foreign languages) and closed (for hard of hearing) are, together with pre-produced audio description and automated text-to-speech audio tracks, an important part of the accessibility services NRK are required to provide by law.

5.2 Actor overview

A map to visualize different actors involved in the work of the continuity producer. The map is divided into four areas of expertise, and the closer to the centre the higher degree of contact with the continuity producer.

5.3 Glossary

Kaleido: Image publishing and origin system handling all image sourcing at nrk.no and other online nrk-services.

Marienlyst: HQ, main office located in Oslo

NORA: NRKs own graphics system NORA. Please see 5.6.11 Graphics for an introduction.

NRK TV: Common name for the TV streaming service of NRK which includes both live, linear channels, recordings and on demand content. The service is available on multiple user devices such as smart TVs, set-top-boxes, mobile devices, and desktop. The NRK TV service is not to be confused with the broadcast linear channels, although they are available in the NRK TV service.

nrk.no : The main web-page for the article-based offerings of NRK

Presentation suite/Main continuity centre: Also known as Playout, Transmission Control, Presentation/Playout Centre. Main control rooms for the continuity playout operations.

SOFIE: News playout systems used in both the regions and Marienlyst
https://www.sofieautomation.com/

Whats´On: Scheduling software from Mediagenix. See 8.1.3.

5.4 Linear channel structure

NRK broadcasts its programs on the linear channels NRK1, NRK2, and NRK3/Super. In addition, we have five streaming/off-loading channels.

NRK 1 is the most popular TV channel in Norway. The market share is about 30 %. The content offered by NRK1 is varied and broad and is intended to give Norwegian people shared understanding and great experiences across news, sport, drama, entertainment, and documentaries. Flexible control of program length and scheduling for handling live programming and breaking news situations (last-second changes) is of high importance for NRK1, which is an important news source for people in Norway on major events.

During weekdays the regional offices have their own live news broadcasts. Currently, there are 10 regional offices transmitting at 19:45-20:00 and 22:55-23:00. *See 5.6.2 Regional switchover and time-sharing of channels* for details.

NRK 2 offers news, debate programs, documentaries, analyses, and cultural programs. Primarily pre-programmed playlists, however, when major news events occur, it often takes the role as an offloading-channel for NRK1, and this requires a high degree of flexibility.

NRK 3/NRK Super offers movies, comedy, lifestyle, and music for a younger audience. NRK3 also hosts the children's channel NRK Super. Primarily pre-programmed playlists. NRK3 and NRK Super is co-distributed on the same distribution channel according to a time-sharing schedule:

- NRK 3:   19:30 – 04:00
- NRK Super: 04:00 – 19:30

NRK 4-8 is the internal names for NRKs streaming/off-loading channels. They are available only in the NRK TV apps, and are shown only as event-based transmissions, not discrete channels. Primarily used for live sport and news events.
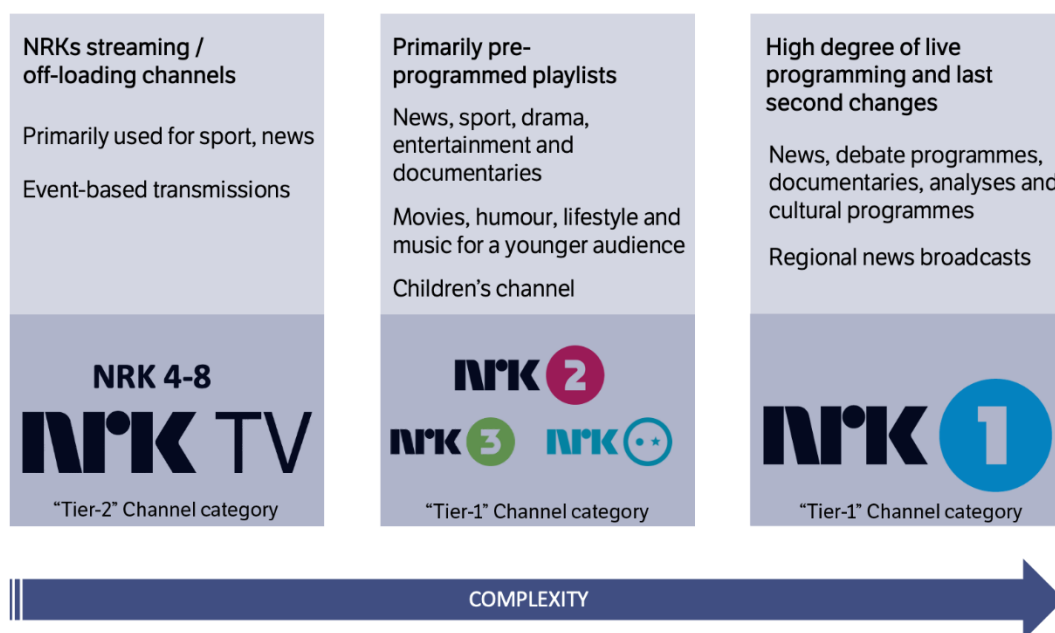
Figure 6: Linear Channel Structure

The difference in complexity and functionality requirements of the linear channels can be read from the table in 5.7 Matrix - Case examples vs User stories.

The most significant differences lie in live operation, accessibility services and the initial set of integrations.

5.5 Case examples

This chapter contains a selection of "every-day" case examples from the current Presentation suite/Main continuity centre. They describe the level of functionality in the different iterations planned for new automation/playout. These are typical scenarios and help to concretize and explain the overall workflow.

They do, however, **not** tell **how** the tasks are to be solved with a new system but perform as a description of the functions needed.

The Contractor will under section 5.6 below be asked to describe how the offered solution would solve the scenarios below.

5.5.1 Streaming channels: Flipp Klipp/Nyhetsstrømmen/Sport

NRK has different programs sent purely via its streaming channels (for details, see section 5.4.1). This may be both to off-load the main channels and for providing an extended or uninterrupted viewing experience where programs may not fit in the linear schedule.

In addition to one-off events, examples of regularly scheduled programs are *"FlippKlipp"* and *"Nyhetsstrømmen"*. FlippKlipp is NRK Super's investment in the video website YouTube. As of February 2022, the channel has over 200 000 subscribers. In addition to being broadcast on YouTube, it is also broadcast on a streaming channel so that the content is available via NRK TV. The live content is immediately available as on-demand.

Nyhetsstrømmen is a stream of looped news atoms/stories siphoning off the content created for the regular news shows. Updated throughout the day it gives the users an uninterrupted, continuous update on current news.

The continuity producer will prepare the playout by importing the schedule from 'Whats´On' into the automation. After importing, the timing of the program is adjusted, and the sources are set. In addition, the continuity producer will publish a poster in advance of the broadcast informing the public about the upcoming program.

At the scheduled time, the continuity producer will remove the poster and start the broadcast followed by adding the NRK-logo and age marking. When the program nears ending, the continuity producer will be ready to stop the broadcast and then publish a poster informing the public that the broadcast has finished.

FlippKlipp

Nyhetsstrømmen

Figure 7: Flippklipp and Nyhetstrømmen

5.5.2 NRK2: Ski jump interrupted by fog

NRK has the rights for a ski-jump event from the venue Holmenkollen in Oslo. The event is planned on NRK1 from 10:50 to 13:00 (see Figure - Ski jump interrupted by fog), and this is the slot the programme is given in the transmission schedule in Whats´On.

As an extra service to viewers of the streaming platforms, the event is also planned on one of the streaming/off-loading channels.
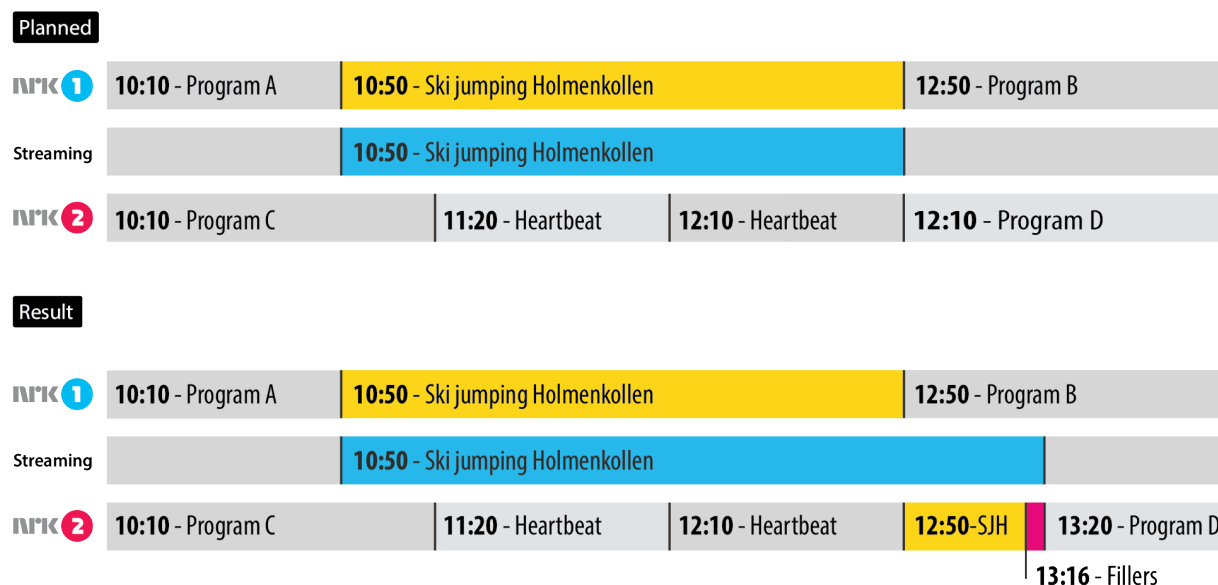
Figure 8: Ski jump interrupted by fog

Based on prior experience, the continuity producer knows that this is a typical open-end event, where there are several circumstances (like the weather) that may affect the competition and thus the actual end-time. Today the forecast warns of fog, not uncommon at the venue, and this will typically result in delays for events like ski jump.

During the competition, and if possible, well in advance of the next program, the continuity producer will look for a way of extending the transmission either on the same channel or any of the other main channels. The program following the ski jump competition on NRK1 should preferably not be moved, so the operator makes space on NRK2 for the continuity of the original programme and moves the rest of the schedule on NRK2 accordingly. The changes must be made in Whats´On as well in the automation system, since Whats´On is the source of truth for the EPG-information that flows to the distributors.

Since the actual end time of the ski jump is not known in advance, the operator prepares some teasers and other short programmes in the schedule of NRK2 to work as flexible.

As the end-time of the program slips, the continuity producer tries to estimate the number of fillers needed to get the next scheduled program on-air at a predictable time, adding or removing them from the playlist based on information and estimates from the sports production unit.

Before, during and for a time after the channel jumping (move from NRK1 to NRK2) the viewers are informed of the changes in the schedule by information crawls on both NRK1 and NRK2, explaining the reason behind the changes and where to find the rest of the ski jump competition.

5.5.3   NRK1/2: News event on NRK2 with prime time shows on NRK1

"Mesternes mester" is a popular entertainment program broadcast on NRK1. The final had 1.2 million viewers in 2022.

In an imaginary situation where an incident with important news value occurs when Mesternes mester is broadcast, the continuity producer can generally choose between the following solutions:

1) Break into the broadcast of "Mesternes mester" on NRK1.

2) Air the news on NRK2 and inform about the news via graphics on NRK1.

3) Air it purely as a stream-only event and inform the public via graphics on both NRK1 and NRK2

On a Friday evening the news value must be of high value for a continuity producer to choose alternative 1.

In the illustrated case below, the continuity producer has chosen alternative 2, and thus will cut the program "An Octopus in my House" on NRK2, not disrupting the schedule on NRK1. The broadcaster will have regular contact with the news department during such an event and will clarify in advance how much time they need. This is admittedly an estimate and may vary. The value of the news could also increase, and thus mean that the continuity producer may go for a version of alternative 1.

Planned

| NRK1 | 19:50 - Entertainment | 20:15 - Mesternes mester - Finale | 21:20 - Entertainment |
| NRK2 | 20:05 - Entertainment | 20:15 - An Octopus in My House | 21:10 - Entertainment |

Result

| NRK2 | 20:05 - Entertainment | 20:15 - An Octopus in My House | 20:50 -Breaking news | 21:10 -Entertainment |

Fillers
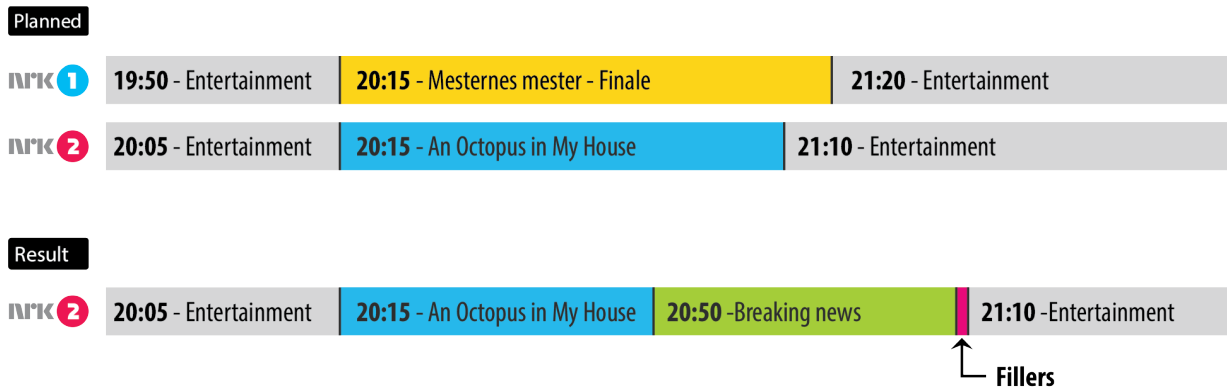
Figure 9: Friday evening with breaking news

Any significant change of the schedule should also be announced through graphics on all channels. If the news broadcast lasts longer, then there is a need to inform the public about changes in the broadcast schedule and cancelled programs while also informing about airing of the news event. Any major change should ideally also be mirrored to Whats´On, as this will update the EPG data for the distribution chain. On the other hand, the news broadcast can be very short, and then it may be relevant to return to the program that was cut.

This uncertainty thus requires a tool that makes it possible to quickly select different solutions to best manage the broadcast schedule. Like in the open-ended ski-jump example above there is need for the ability to quickly select fillers and promos from a curated list that can fit to make a smooth transition to the next scheduled program.

5.5.4 NRK1: Normal but busy Saturday night with live shows

Weekends are important for NRK. In the illustrated case the evening consists mainly of sports, news and lastly entertainment.

Normal but busy Saturday night with live shows
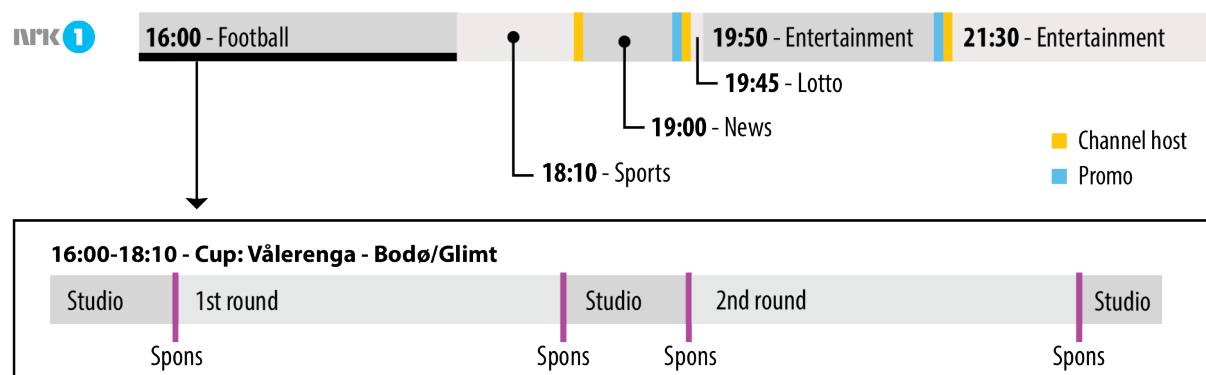
Figure 10: NRK1: Normal, but busy Saturday night with live shows

The first part of the afternoon / evening is scheduled with sports. For the football match the continuity producer needs to run sponsor ads ("spons") at specific times. There are a set of rules dictated by law, e.g., no motion, only logos, maximum time of exposure. In the illustrated case the continuity producer will run the ads before and after each round, a total of 4 runs. It is important that the advertisement will appear as close as possible to the actual sport.

When the football match and athletics are done, the channel host will be given air-time and advertise what is scheduled this evening on NRK and then introduce the next program which is the Saturday

news, *Lørdagsrevyen.* When the news ends, the continuity producer will run promos for coming content on the channel. After the promos the channel host will announce that next up is Lotto followed by the first entertainment program for the evening at 19:50, *Alle mot 1*.

When the first entertainment program is done, the continuity producer will run promos selling content followed by the channel host talking about the next entertainment program at 21:30, *Kåss til kvelds.*

A normal, but busy Saturday night at NRK1 is filled with transitions between programs, promos, channel hosts and sponsorships.

5.6 User stories

These user stories below are meant to exemplify functional requirements. The Contractor is asked to describe, in written form and with illustrations, how the solution will support the functionality requested and the cases described in section 5.5 above.

5.6.1 Schedule and playlist import, export and manipulation

5.6.1.1 Quality control of coming schedules

a) *As a continuity producer, I need to be able to verify playout of the programs planned in Whats´On, so that I can do quality control, check timecodes, preview transitions, adjust secondary events and in/out-points in the schedule days before the schedule is to go on air.*

Today this is done by exporting the schedule from Whats´On, importing it on a spare automation channel and going through the playlist in the automation system with manual update of in/out-timecodes in Whats´On. It requires a lot of manual steps, and a lot of context switching back and forth between Whats´On and the automation system.

5.6.1.2 Daily, continuous transfer of schedules

a) *As a continuity producer, I want to get the schedule from What's On for a given channel and day/time-period imported into the currently active playlist for the channel without disrupting the ongoing schedule, so that I may get the planned content on air.*

Today this is done through trigging export of a channel/time-span combination in Whats´On followed by an import into the currently active playlist in the automation system. Any overlap or duplications must be deleted manually. Please describe any automation or functionality that could make the flow of changes from the scheduling system to the automation system easier, less error prone but at the same time safe (i.e., prevent accidental replacement of manually adjusted events in the automation).

5.6.1.3 Playlist manipulation and functionality for a live program schedule

b) *As a continuity producer, I want newly added events to be cued and ready for playout with minimal delay and latency so that I may handle live show transitions with high accuracy.*

The main channels are heavily curated with several live events during the day. Please describe the latency from manually adding a (already cached) file or live element to the actual element is available for take in different file/live combinations.

c) *As a continuity producer, I want manual take of file and live events to happen with minimal delay and latency so that I may handle live show transitions with high accuracy.*

The main channels are heavily curated with several live events during the day. Please describe the latency from doing a "take" to the actual element is on air in different file/live combinations.

d) As a continuity producer, I want to be able to interrupt planned, already started programs with other elements/programs/events, and then afterwards be able to go back to resume the originally planned program, so that I may handle breaking news and unplanned intermissions without manually re-adding the rest of the interrupted event and corresponding secondary events.

Today they must re-add the original event using a new program-id and adjust the in-point in order to playout the rest of the interrupted program.

e) As a continuity producer, I want to be able to switch the live source of a program/event currently on air in the automation, so that I may handle unplanned problems with the incoming signal without having to duplicate or change the scheduled program or routing incoming signals manually.

Today this is done by using manually routed source lines from MCR (the main distribution and contribution control and monitoring centre, currently located adjacent to the main presentation suites), so that the operators may change the source-routing without using the automation. But this requires an extra step of pre-planning.

f) As a continuity producer, I want to be able to preview and possibly change the source of a playlist element before it goes on air, so that I may quickly correct a live or file source.

g) As a continuity producer, I want to have one or more readily available multiple, sortable, searchable shortlists, shotboxes or playlists with multi-purpose teasers, promos and other content, so that I may quickly fill gaps or re-schedule slots in the playlist with appropriate content.

The main channels are sometimes heavily curated before and after live-events to hit pre-announced time-slots – especially when breaking or other live events disrupts the planned schedule. When this happens, the continuity producers must be able to find relevant available content – often matching certain constraints on content type or media duration. Please describe how secondary events may follow or automatically be added when this type of content is added to a playlist, and what metadata fields imported from Whats´On may be displayed in the lists.

h) As a continuity producer, I need to be able to program event-timings such as manual take, on-time, hold etc so that I can handle complex schedules with mixed live and pre-programmed content.

Please describe the timing types available and their typical use for different live/file-combinations.

i) As a continuity producer, I need to be able to search and find media in the MAM and/or scheduling system (Whats´On) and quickly add it to playlist or shortlists.

Please see the notes on integration and involvement of NRKs developers on this type of MAM/Whats´On integration in section 7.11.

j) As a continuity producer, I need to be able to quickly search and find media assets in the scheduling system (Whats´On) without media, so that I may assign this product/media-id to a new live event.

In breaking-news scenarios it is important to quickly go to live while simultaneously have the event recorded and attached to a new, valid asset ID in the scheduling system.

Please see the notes on integration and involvement of NRKs developers on this type of MAM/Whats´On integration in section 7.11.

> **k) As a continuity producer, I want to be able to make manual notes on the individual events in the playlist, so that I remember important details about upcoming elements.**

5.6.1.4 Secondary events and signalling

Generally, we want as much of the pre-planning as possible to be done in the scheduling system, but with the ability to create and modify secondary events locally in the automation system. Please make sure to describe the support of secondary events, what they may control and how they may be extended to support future and custom workflows.

Keep in mind our focus on the availability of public APIs, extension-points, events and hooks.

> **l) As a continuity producer, I want pre-planned secondary events to follow from the scheduling system into the automation playlist on import, so that I don't have to manually add them after import.**

> **m) As a continuity producer, I want to be able to manually add, edit and remove secondary events in the automation playlist – both the locally created and any imported from the scheduling system.**

> **n) As a systems developer I want to be able to control external systems through custom secondary events, so that I may solve future workflows in a way that is visible and controllable by the continuity producers.**

Please describe what possibilities exists for doing HTTP-calls or other API operations through secondary events, and what type of information, metadata and user interface elements these events may show to the user.

> **o) As a continuity producer I want certain elements to automatically get some pre-defined secondary events, like "live"-graphics, logo/bug-graphics or other general control-events.**

Describe how this may be solved by a rule-based approach (if available), through rules in the scheduling system, by external integrations (listening on playlist-change events and adding the secondary events through APIs) or by other means.

5.6.2 Regional switchover and time-sharing of channels

As described in the channel structure in section 5.4.1, NRK currently has two types of break-away:

One is the reginal offices live news broadcasts during the evening, where it usually is no main transmission and all regions replace/break in with their own live signal. The regional offices don't have their own continuity playout, but run the news shows from local news playout systems (Sofie - https://www.sofieautomation.com/).

This is currently signalled from the central automation by inserting a specially named event, and an NRK-developed service monitor the datafeed of playout flow events (Cue, Take ++) for this pattern and handle the switchover on SDI-level.

The other is the daily time-sharing of NRK3/NRK Super (children's channel) where there is a regular switch-over at 04:00 and 19:30. This is mainly handled by hard coded (time-based) convention in the NRK TV app (and change of logo in the shared playlist/channel in the automation system). There is currently only one signal offered to the traditional DVB-distributors, played out by the same channel in the automation.

> **a) As a continuity producer, I would like to have a strongly defined concept of break-away for regional transmissions visible in the automation system, so that I may easily control the start/stop of the break-away and handle schedule changes and exceptions to the rules more easily.**

Please describe a possible solution, even if it differs from how this is currently solved, including any technologies that may be used for this type of signalling (like SCTE-35/224).

b) **As a continuity producer, I would like to have a strongly defined concept of break-away/time sharing for the NRK3/NRK Super channels, so that I may more easily adjust the timing of the switchover.**

Please describe a possible solution, even if it differs from how this is currently solved, including any technologies that may be used for this type of signalling (like SCTE-35/224).

5.6.3 Media and MAM-integration

NRK has Tedial Evolution as its main MAM, but with an internally developed platform-layer on top for metadata, job control and integration. The integration between the automation system and the MAM will be facilitated by NRKs own development-teams.

a) **As a continuity producer, I want to be able to adjust the in- and out-points of file-based content, so that I may trim the transitions in and out of the program.**

The in- and out-points should follow through from the scheduling system, but the operators may need to adjust them after import to make better transitions. Please describe how this may be done with or without preview playout of the media in question, and how this information may flow back to the scheduling system if need be.

b) **As a continuity producer, I want the automation system to automatically fetch media from the main MAM-system whenever a program/teaser/promo/file is needed in a playlist – whether it is inserted manually or through playlist import, so that I don't have to manually trig transfer of media.**

As afore mentioned, this integration will probably be to an intermediate service developed by NRK, so the exact interface may be designed in cooperation with NRK, but please describe when and how the automation system may send these requests.

Describe the user experience include transfer status and progress on these retrievals.

c) **As an operations engineer I want the system to do automatic housekeeping of internal media caches (if present), so that I don't have to manually herd the media storage.**

Please describe any automatic housekeeping capabilities, including how emergency shortlist/shotbox-media may be kept online even when not currently scheduled for playout.

d) **As a continuity producer I want to be able to put late-arriving file-based media on air quickly, without having to wait for file transfer.**

Please describe any capabilities the system has for playing growing files while in transfer, or to play files directly from network attached storage (typically the SMB/NFS-based storage of NRKs main MAM-system) if provided the file paths.

e) **As a continuity producer, I want to be able to play all video formats currently in NRKs archive in the same playlist.**

Please see 7.6.1 File-formats currently in use at NRK.

f) **As a continuity producer, I want to be able to override the aspect ratio of file based elements.**

Please describe any capabilities the system has for adjusting the aspect ratio of playlist elements. If the file contains wrong meta data within the essence header this needs to be corrected on playout

The archive includes both SD 4:3, SD 16:9 anamorphic and HD (and beyond) 16:9 media.

5.6.4 Recording

a) *As a continuity producer, I want programs to be flagged for recording based on playlist metadata, so that I don't have to manually mark live-programs for recording.*

Today all non-file-events with duration over 1 minute (to avoid channel host entries) are recorded. Please describe possible solutions for a rule-based approach based on metadata in the playlist from the scheduling system, like live/not-live attributes etc.

b) *As an operations engineer I need to be able to configure where in the chain the recordings are done, typically clean-feed (before any graphics layers) and with programme graphics (see 5.6.12.1 Overview of graphic elements), so that I may store material for both re-runs and as source material.*
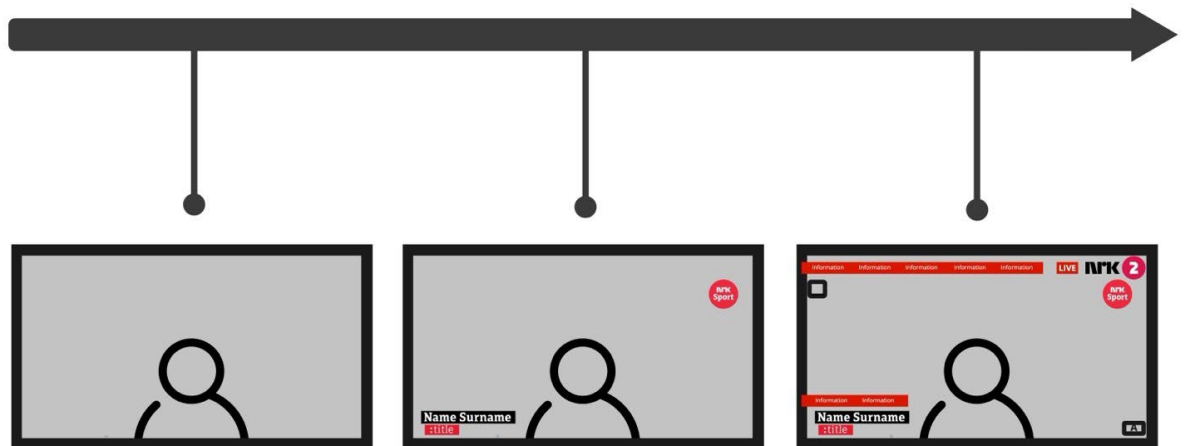
Figure 11 - Recording products

c) *As a continuity producer, I want to be able to easily see what programs are scheduled for recording, what name/id the program will receive upon recording and easily toggle recording for a particular program on and off, so that I may control what live-programs are recorded.*

d) *As a continuity producer, I want recorded content to be automatically transferred to the MAM-system for ingest as default, preferably through API-integration and not watchfolders, so that I may get all recorded programs ingested into the MAM and be confident that the files are actually picked up and processed.*

Ideally recorded content should start transfer to the MAM during the recording, so that the media may be available as growing files.

e) *As a continuity producer, I sometimes want to cancel a recording – even after it has started.*

f) *As a continuity producer, I sometimes want to adjust in- and out-points of recordings – after they have ended.*

Ideally recorded content should start transfer to the MAM during the recording, so that the media may be available as growing files.

In- and out-points in the automation system will most of the time be in context of automation playout, and a sync back to the MAM/scheduling system is not desired. However, for content that origins in the automation system (recordings), a way of pushing/syncing metadata (like updated in-/out-points) to the MAM and/or scheduling system would be helpful.

Please see the notes on integration and involvement of NRKs developers on this type of MAM/Whats On integration in section 7.11.

g) *As a continuity producer, I want to be able to change the name and/or id of a recording either before event-start or during the event, so that manually inserted live-events may*

get connected to a valid programme/media asset in the MAM and scheduling system upon transfer of the media and later reconciliation of the playlist.

h) *As a continuity producer I want to be able to playout files while they are recorded, so that I may put on air time-shifted programs on another channel/port.*

5.6.5 Audio

a) *As a continuity producer, I want to be able to adjust the audio levels and balance between announcer/host and program sound (live or preproduced)*

b) *As a continuity producer, I want to be able to adjust the audio levels and balance with physical faders and/or touch-screen faders.*

Today this is done with physical faders directly adjusting audio levels in the vision mixer. Please describe what type of hardware integration that may provide this.

5.6.6 Signal-monitoring, preview and quality control

a) *As a continuity producer, I want to preview and pre-listen to live-sources, video and audio files planned in the schedule, so that I may be confident in what will be broadcast when the event goes on air.*

Please describe the level of preview available –for files and live sources – both in the client or on full playout ports, and what type of secondary events, transitions etc are previewed.

b) *As a continuity producer or operations engineer, I want to monitor the signal in the playout chain at arbitrary point, enabling me to identify any signal or quality problems related to individual processing steps in the chain.*

Please also describe what type of signal level and monitoring analysers (like spectrum-, phase-, audio level etc) are available built-in.

c) *As a continuity producer I want to have the most important countdown clocks for the main readily available in the user interface, so that I may follow countdown to next program, countdown to next element with any errors (missing media, subtitles).*

Today it is also possible to show countdown to an arbitrary selected element in the playlist, making it easy to follow the time left to secondary elements or programs further down in the playlist than just the next element.

d) *As a continuity producer I want to have the most important countdown clocks for the main channels available on separate, physical displays, so that I may follow countdown to next program even when not in front of the main client.*

Today the countdown to the next event on the main channels are available on physical displays driven by LTC in several locations and rooms in the Presentation suite area. Please describe possible solutions to providing this type of physical display of internal clocks and countdowns, either on dedicated hardware or monitors.

5.6.7 System-monitoring, events and alarms

a) *As a continuity producer, I want an easily readable overview of any media or content related anomalies or errors in the system, such as missing or invalid media, missing subtitle files or loss of incoming video/audio, so that I may focus on issues that require my attention instead of wasting time on everything that is working and playing out as intended.*

b) *As an operations engineer, I want to get early warnings and alarms for anomalies and system errors – preferably through established services for systems monitoring and maintenance, so that I may tend to the system and maintain system stability without having to manually check dashboards.*

NRK currently uses several monitoring protocols, technologies, and systems, including SNMP, Prometheus, Grafana, Icinga, CheckMK and Splunk On-Call for metric aggregation, alerting and notification-handling. Please describe both internal alert functionality and how these alerts may be passed on to external systems.

c) *As an operations engineer, I want logs to be externally available for aggregation or automatically sent to log analysis services like Kibana or Grafana Loki, so that I may consolidate, search, and compare logs across the whole system.*

5.6.8 Multi-channel user experience

a) *As a continuity producer I want an easily accessible overview/timeline of at least all the main channels in the system, so that I may at a glance verify the schedule and state of what is currently playing out.*

b) *As a continuity producer I want to be able to copy or move programs between channels, so that I may easily offload programs (including any secondary event and subtitle information) on other channels in case of breaking news or live show running late*

c) *As a continuity producer I want to be able to easily switch between controlling different channels – either directly in the client or by switching user interface – so that I may control several channels form same physical location.*

d) *As a continuity producer or operational engineer, I want the number of automation and playout channels to be flexible – either as a built-in feature or through automated instantiation and provisioning, so that I may add short lived channels when the need arises without having to run a purchase process.*

Please describe how the system handles scaling, including when additional hardware is needed – both for tier-1 channels and for streaming-type AVoIP-output only channels.

5.6.9 Master control surfaces

a) *As a newsroom producer, I want to be able to get the news studio on-air during nighttime in case of breaking news situations. The Presentation suite/Main continuity centre is unattended in the period between 01:00-06:00.*

Please describe possibilities for simplified user interfaces adapted to special tasks or alternative ways of solving this.

b) *If the system includes any master control surface capabilities, please describe the functionality – including any dynamic user interface controls (information feedback from integrated system), macros, automation, salvos or scripting if available.*

5.6.10 Accessibility services

a) *As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.*

b) *As a continuity producer, I want to be able to preview video with subtitling planned in the schedule, so that I may be confident in that the correct subtitles goes on air in sync with the video.*

Today this is done by manually loading the subtitle file (CHK) in Poliscript, routing a free playout port on the Harmonics servers to the monitors in a suite with Poliscript installed (so that the VITC of the video may be decoded and forwarded to the right machine), and starting playback of the relevant program on the playout port.
Although a very manual process, it makes it easy for the continuity producers to do adjustments to the CHK-file and do QA on the playback of the file and video on the same type of system that is going to play out the final result.

We want to keep most of this workflow, and since the routing may be done manually by our routing control software, the only requirement to be able to solve this will be the ability to manually playout a program of interest to a free playout port with VITC intact.

c) *As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.*

d) *As a continuity producer, I want to easily add, edit, and remove subtitle file association, so that I may fix file name errors, switch file associated with a program or remove the subtitle from playout.*

e) *As a continuity producer, I want the changes I make to a subtitle entry to be effectuated by the system and sent to the subtitling system, even if the program has already started, so that I may fix or adjust subtitle associations even while the event is playing out.*

f) *As a continuity producer, I want the system to show whether subtitle files are missing or present and detect if they appear – even after a program has started playing out, so that a late-arriving subtitle file may be played out as soon as it arrives.*

5.6.11 Graphics

At NRK, all live on-screen graphics aired in news/sports shows, a lot of specialized election and show graphics and all manual graphics (lower thirds, info crawls ++) handled by the continuity producers are currently created, controlled and rendered by NRKs own graphics system NORA.
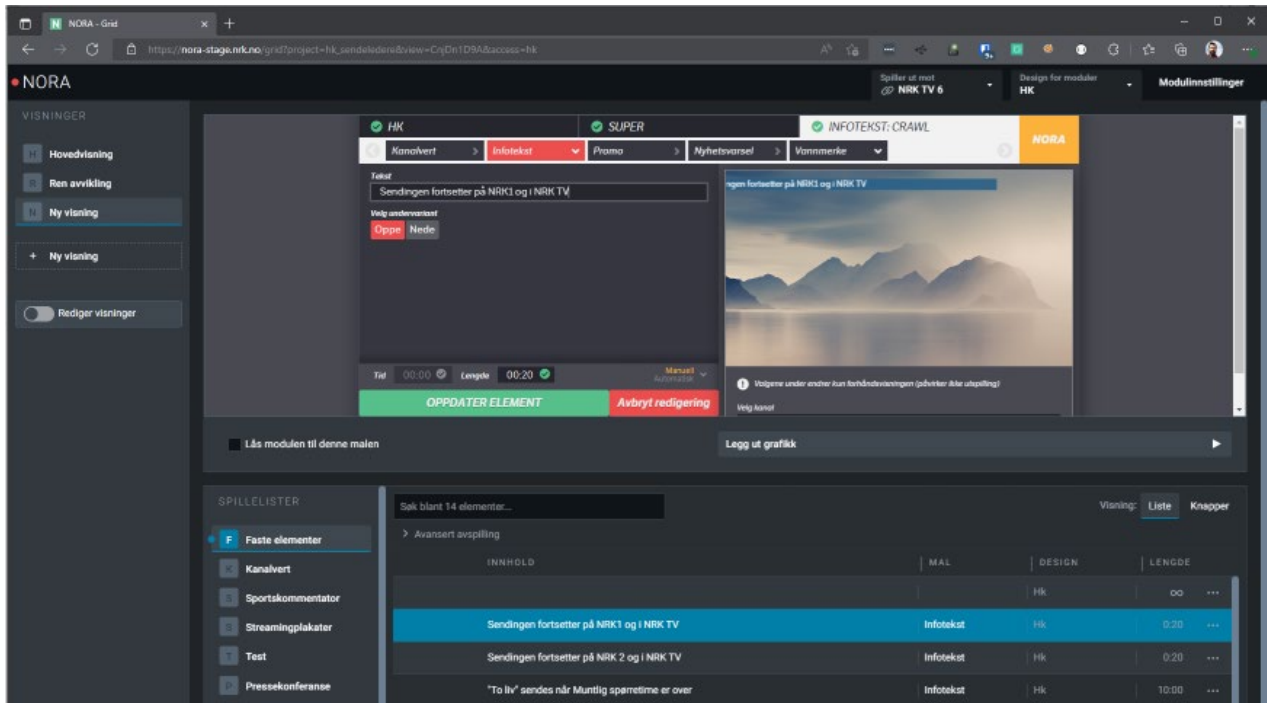
It is a HTML5/javascript based render-engine running in on-prem Kubernetes, with a browser-based control surface and integrations against SOFIE, ENPS, Viz and internal sources of truth, like the person-lookup services in the Authority Registry and the internal image bank Kaleido.
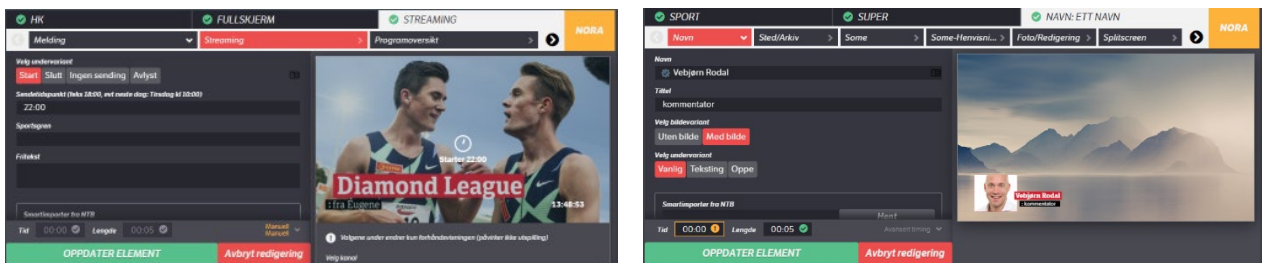
This winter it was put into production in the Playout suites for manual graphics, replacing an aging Chyron installation. In the playout chain we are using Linux-based CasparCG-installations outputting key/fill over SDI that is put on air using DSKs by the vision mixers currently in use by the automation/playout system.

Although NRK is open for suggestions and examples of other graphical solutions, it is believed that the added value of using the same system generating close to all other graphics output at NRK, with an extensive HTTP-based rest-like API for automation both of templates, content, integration and playout control, is so huge that our current intent is to use NORA for graphics in a future installation as well. Some exception could be the (for NRK) highly static elements like logos and age rating graphics, where use of Nora-integration would give little extra value over internal logo/graphics generators.

This chapter will therefore briefly describe the type of graphics templates currently in use and the Contractors are asked to mainly focus on how this may fit with the type of secondary events or plugin capabilities available. As with other specialized integrations, we expect our in-house developers to be involved in making the new system and NORA interact – but we are of course depending heavily on the availability of proper APIs and extension points in the automation system to do so.

Depending on the possibilities in the new system, compositing may be done through software rendering of the HTML5-pages by a compatible chromium instance in the directly in playout chain or through NDI, SDI or other video key/fill pairs. Regardless it will require keying through an equivalent of a downstream keyer in the playout chain – controllable both automatically by secondary events and by manual interface interactions by the continuity producers.

5.6.11.1 Some graphics layers and templates in use

As we hope to be able to key all graphics as part of the software playout chain, the different layers/order of keyers are important for the recording of clean-feed and finished composition.
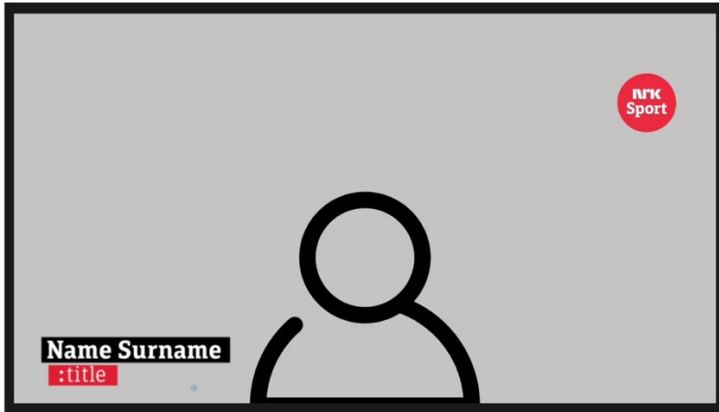
Figure 12 Program branding

Program branding

Contextual information/Lower thirds.

Often part of the incoming signal, but sometimes done in continuity playout to offload sport/news studios.
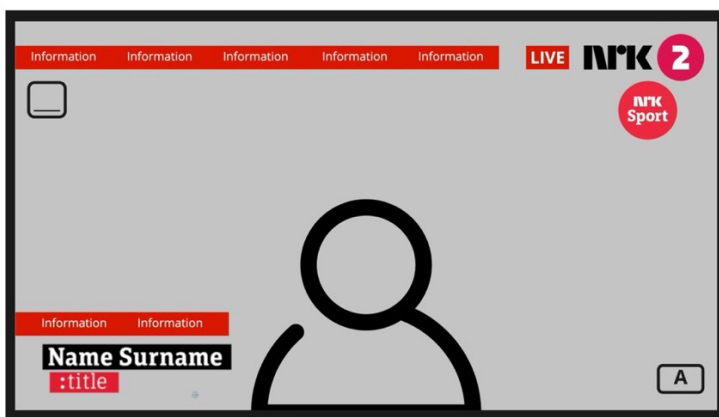
Figure 13 Channel Graphics (Includes channel branding and Info Graphics)

Channel graphics

Channel branding/logo
Info graphics
Age marking
Accessibility services information

Part of the channel identity and not supposed to be part of the live-recording of the current program.

Figure 14 Full screen info-posters

Full screen info-posters

Different types of full-screen posters typically used before and after programs on streaming-channels. Uses graphics from the Kaleido image origin system.

Figure 15 Full screen program rundown

Full screen program rundown

Typically running during night-time or off-hours.

This is currently not generated by NORA but will probably be moved there eventually.

Figure 16 On-screen channel host

On-screen channel host

This is currently not generated by NORA but will probably be moved there eventually. The channel host has a specialized user interface for fetching and preparing the rundown, and highlights using a small remote.

Live video with graphics overlay currently composited by the vision mixer in the chain based on external graphics sources.

End-credit squeezeback

This is currently not generated by NORA but will probably be moved there eventually.

The currently played out source is squeezed by DVE, overlayed full screen graphical background – potentially with third graphical layer on top. Currently composited by the vision mixer in the chain based on external graphics sources.

Please describe how this may be composited in the playout chain with an external graphics system (HTML5, NDI, SDI) in combination with any internal DVEs.

5.6.11.2 Control of graphic elements

The NORA graphics-system has a rich API, and since it can render the graphics in a web-browser (or chromium instance), we are interested in exploring how NORA may be integrated with the user interface of the new automation system.

As a minimum we expect to be able to integrate in such a way that the automation system may key in the graphics system and trig pre-created templates (like age-information, accessibility services logos or live-bugs), and have these events represented as secondary events.

a) *As a continuity producer, I need a good view of the planned, automatic graphics in the timeline and the state of the downstream keyers at any time.*

This typically refers to the automatically cued graphics, like age-markings, live-bug.

b) *As a continuity producer, I need to be able to manually put graphics sources on and off air, and a clear view of the state of the keyers*

Some of the graphics will be handled completely manually, without any scheduling og pre-planning. In these situations, the continuity producer will prepare the graphics in NORA, put the keyers on air, and press "take" in NORA, running the animations and graphics.

c) *As a continuity producer, I want secondary events from the scheduling system to control graphical elements like live-bugs and age rating logos.*

These should be created based on metadata in the imported schedule or by rules in the automation system (again based on data from the schedule) and should control playout of pre-defined templates in NORA.

d) *As a continuity producer, I would like to be able to create NORA-rendered graphics event on the timeline and fill in metadata based on templates.*

Please describe any support for tight integration of external graphical systems, including the possibility for third party modules/panels/extensions to the automation-client user interface.

5.7   Matrix - User stories vs iterations

	Iteration 1 Streaming Channels	Iteration 2 NRK2/3	Iteration 3 NRK1
5.6.1 Schedule and playlist import, export and manipulation			
5.6.1.1 Quality control of coming schedules			
a) As a continuity producer, I need to be able to verify playout of the programs planned in Whats´On, so that I can do quality control, check timecodes, preview transitions, adjust secondary events and in/out-points in the schedule days before the schedule is to go on air.		X	X
5.6.1.2 Daily, continuous transfer of schedules			
a) As a continuity producer, I want to get the schedule from What's On for a given channel and day/time-period imported into the currently active playlist for the channel without disrupting the ongoing schedule, so that I may get the planned content on air.	X	X	X
5.6.1.3 Playlist manipulation and functionality for a live program schedule			
a) As a continuity producer, I want newly added events to be cued and ready for playout with minimal delay and latency so that I may handle live show transitions with high accuracy.	X	X	X
b) As a continuity producer, I want manual take of file and live events to happen with minimal delay and latency so that I may handle live show transitions with high accuracy.	X	X	X
c) As a continuity producer, I want to be able to interrupt planned, already started programs with other elements/programs/events, and then afterwards be able to go back to resume the originally planned program, so that I may handle breaking news and unplanned intermissions without manually re-adding the rest of the interrupted event and corresponding secondary events.		X	X
d) As a continuity producer, I want to be able to switch the live source of a program/event currently on air in the automation, so that I may handle unplanned problems with the incoming signal without having to duplicate or change the scheduled program or routing incoming signals manually.	X	X	X
e) As a continuity producer, I want to be able to preview and possibly change the source of a playlist element before it goes on air, so that I may quickly correct a live or file source.	X	X	X
f) As a continuity producer, I want to have one or more readily available multiple, sortable, searchable shortlists, shotboxes or playlists with multi-purpose teasers, promos and other content, so that I may quickly fill gaps or re-schedule slots in the playlist with appropriate content.		X	X
g) As a continuity producer, I need to be able to program event-timings such as manual take, on-time, hold etc so that I can handle complex schedules with mixed live and pre-programmed content.	X	X	X
h) As a continuity producer, I need to be able to search and find media in the MAM and/or scheduling system (On) and quickly add it to playlist or shortlists.		X	X
i) As a continuity producer, I need to be able to quickly search and find media assets in the scheduling system (Whats´On) without media, so that I may assign this product/media-id to a new live event.		X	X
j) As a continuity producer, I want to be able to make manual notes on the individual events in the playlist, so that I remember important details about upcoming elements.		X	X
5.6.1.4 Secondary events and signaling			

	Iteration 1 Streaming Channels	Iteration 2 NRK2/3	Iteration 3 NRK1
3			
a) As a continuity producer, I want pre-planned secondary events to follow from the scheduling system into the automation playlist on import, so that I don't have to manually add them after import.		X	X
b) As a continuity producer, I want to be able to manually add, edit and remove secondary events in the automation playlist – both the locally created and any imported from the scheduling system.	X	X	X
c) As a systems developer I want to be able to control external systems through custom secondary events, so that I may solve future workflows in a way that is visible and controllable by the continuity producers.	X	X	X
d) As a continuity producer I want certain elements to automatically get some pre-defined secondary events, like "live"-graphics, logo/bug-graphics or other general control-events.	X	X	X
5.6.2 Regional switchover and time-sharing of channels			
a) As a continuity producer, I would like to have a strongly defined concept of break-away for regional transmissions visible in the automation system, so that I may easily control the start/stop of the break-away and handle schedule changes and exceptions to the rules more easily.			X
b) As a continuity producer, I would like to have a strongly defined concept of break-away/time sharing for the NRK3/NRK Super channels, so that I may more easily adjust the timing of the switchover.		X	
5.6.3 Media and MAM-integration			
a) As a continuity producer, I want to be able to adjust the in- and out-points of file-based content, so that I may trim the transitions in and out of the program.		X	X
b) As a continuity producer, I want the automation system to automatically fetch media from the main MAM-system whenever a program/teaser/promo/file is needed in a playlist – whether it is inserted manually or through playlist import, so that I don't have to manually trig transfer of media.	X	X	X
c) As an operations engineer I want the system to do automatic housekeeping of internal media caches (if present), so that I don't have to manually herd the media storage.		X	X
d) As a continuity producer I want to be able to put late-arriving file-based media on air quickly, without having to wait for file transfer.		X	X
e) As a continuity producer, I want to be able to play all video formats currently in NRKs archive in the same playlist.		X	X
f) As a continuity producer, I want to be able to override the aspect ratio of file based elements.		X	X
5.6.4 Recording			
a) As a continuity producer, I want programs to be flagged for recording based on playlist metadata, so that I don't have to manually mark live-programs for recording.	X	X	X
b) As an operations engineer I need to be able to configure where in the chain the recordings are done, typically clean-feed (before any graphics layers) and with programme graphics (see 5.6.12.1 Overview of graphic elements), so that I may store material for both re-runs and as source material.	X	X	X
c) As a continuity producer, I want to be able to easily see what programs are scheduled for recording, what name/id the program will receive upon recording and easily toggle recording for a particular program on and off, so that I may control what live-programs are recorded.	X	X	X
d) As a continuity producer, I want recorded content to be automatically transferred to the MAM-system for ingest as default, preferably through API-integration and not watchfolders, so that I may get all recorded programs ingested into the MAM and be confident that the files are actually picked up and processed.	X	X	X

3	Iteration 1 Streaming Channels	Iteration 2 NRK2/3	Iteration 3 NRK1
e) As a continuity producer, I sometimes want to cancel a recording – even after it has started.	X	X	X
f) As a continuity producer, I sometimes want to adjust in- and out-points of recordings – after they have ended.	X	X	X
g) As a continuity producer, I want to be able to change the name and/or id of a recording either before event-start or during the event, so that manually inserted live-events may get connected to a valid programme/media asset in the MAM and scheduling system upon transfer of the media and later reconciliation of the playlist.	X	X	X
h) As a continuity producer I want to be able to playout files while they are recorded, so that I may put on air time-shifted programs on another channel/port.	X	X	X
5.6.5 Audio			
a) As a continuity producer, I want to be able to adjust the audio levels and balance between announcer/host and program sound (live or preproduced)	X	X	X
b) As a continuity producer, I want to be able to adjust the audio levels and balance with physical faders and/or touch-screen faders.	X	X	X
5.6.6 Signal-monitoring, preview and quality control			
a) As a continuity producer, I want to preview and pre-listen to live-sources, video and audio files planned in the schedule, so that I may be confident in what will be broadcast when the event goes on air.	X	X	X
b) As a continuity producer or operations engineer, I want to monitor the signal in the playout chain at arbitrary point, enabling me to identify any signal or quality problems related to individual processing steps in the chain.	X	X	X
c) As a continuity producer I want to have the most important countdown clocks for the main readily available in the user interface, so that I may follow countdown to next program, countdown to next element with any errors (missing media, subtitles).	X	X	X
d) As a continuity producer I want to have the most important countdown clocks for the main channels available on separate, physical displays, so that I may follow countdown to next program even when not in front of the main client.		X	X
5.6.7 System-monitoring, events and alarms			
a) As a continuity producer, I want an easily readable overview of any media or content related anomalies or errors in the system, such as missing or invalid media, missing subtitle files or loss of incoming video/audio, so that I may focus on issues that require my attention instead of wasting time on everything that is working and playing out as intended.	X	X	X
b) As an operations engineer, I want to get early warnings and alarms for anomalies and system errors – preferably through established services for systems monitoring and maintenance, so that I may tend to the system and maintain system stability without having to manually check dashboards.	X	X	X
c) As an operations engineer, I want logs to be externally available for aggregation or automatically sent to log analysis services like Kibana or Grafana Loki, so that I may consolidate, search and compare logs across the whole system.	X	X	X
5.6.8 Multi-channel user experience			
a) As a continuity producer I want an easily accessible overview/timeline of at least all the main channels in the system, so that I may at a glance verify the schedule and state of what is currently playing out.		X	X
b) As a continuity producer I want to be able to copy or move programs between channels, so that I may easily offload programs (including any secondary event and subtitle information) on other channels in case of breaking news or live show running late		X	X

3	Iteration 1 Streaming Channels	Iteration 2 NRK2/3	Iteration 3 NRK1
c) As a continuity producer I want to be able to easily switch between controlling different channels – either directly in the client or by switching user interface – so that I may control several channels form same physical location.	X	X	X
d) As a continuity producer or operational engineer I want the number of automation and playout channels to be flexible – either as a built in feature or through automated instantiation and provisioning, so that I may add short lived channels when the need arises without having to run a purchase process.	X		
5.6.9 Master control surfaces			
a) As a news room producer, I want to be able to get the news studio on-air during night time in case of breaking news situations. The Presentation suite/Main continuity centre is unattended in the period between 01:00-06:00.			X
b) If the system includes any master control surface capabilities, please describe the functionality – including any dynamic user interface controls (information feedback from integrated system), macros, automation, salvos or scripting if available.	X	X	X
5.6.10 Accessibility services			
a) As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.		X	X
b) As a continuity producer, I want to be able to preview video with subtitling planned in the schedule, so that I may be confident in that the correct subtitles goes on air in sync with the video.		X	X
c) As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.		X	X
d) As a continuity producer, I want to easily add, edit and remove subtitle file association, so that I may fix file name errors, switch file associated with a program or remove the subtitle from playout.		X	X
e) As a continuity producer, I want the changes I make to a subtitle entry to be effectuated by the system and sent to the subtitling system, even if the program has already started, so that I may fix or adjust subtitle associations even while the event is playing out.		X	X
f) As a continuity producer, I want the system to show whether subtitle files are missing or present and detect if they appear – even after a program has started playing out, so that a late-arriving subtitle file may be played out as soon as it arrives.		X	X
5.6.11 Graphics			
5.6.11.2 of graphic elements			
a) As a continuity producer, I need a good view of the planned, automatic graphics in the timeline and the state of the down stream keyers at any time.	X	X	X
b) As a continuity producer, I need to be able to manually put graphics sources on and off air, and a clear view of the state of the keyers	X	X	X
c) As a continuity producer, I want secondary events from the scheduling system to control graphical elements like live-bugs and age rating logos.	X	X	X
d) As a continuity producer, I would like to be able to create NORA-rendered graphics event on the timeline, and fill in metadata based on templates.	X	X	X

5.8 Non-discriminatory Solution

NRK is committed to "*prevent exclusion and dropout from work*". Complex and poorly designed computer applications may cause employees to be excluded from work. NRK is required by law, the Norwegian Public Procurement act, to consider life cycle costs, universal design and environmental consequences of the procurement.

Universal design means "*design or adaptation of the main solution in physical conditions*", including information and communication technology (ICT), so that the general function of the enterprise can be used by "*as many as possible*" according to the Discrimination and Accessibility Act.

The Contractor should elaborate on how basic technical and perceptual universal design of relevant parts of the Solution is incorporated and enabled.

6 SOLUTION ARCHITECTURE REQUIREMENTS

The Contractor shall provide a description on how their Solution would comply with the different aspects of the architecture requirements listed under this chapter.

The purpose of the architecture requirements is to ensure that the new Solution will operate smoothly within the Customer's complex landscape of:

- Information objects
- Business processes
- Organizational structures and roles

6.1 Separation of user interface and computing

It is an essential premise for the planned moving of headquarters that all user interfaces – including client instances, monitoring, physical interaction surfaces and panels – may be separated from the compute, automation, media processing/playout and infrastructure part of the installation.

Even if the first installations will be on-premises, we envision a gradual move of infrastructure out to external datacentres and/or cloud services, all while keeping the very high service availability and quality required by a public broadcaster.

Please keep this in mind while designing the solution, and describe how this may be solved, either by inherent capabilities of the system or by leveraging infrastructure like virtual desktops, zero-clients, and general virtualized infrastructure, or other techniques for creating a location-agnostic multi-site installation.

6.2 High availability (HA) and resilience

Very high service availability is imperative, however in a more software based and defined installation this may sometimes be achieved in different ways than the traditional main/backup setup.

Although there are different SLA and availability requirements for the primary channels and the streaming channels, please suggest and discuss the systems' resilience strategies, what type of outage, failure and emergency situations are mitigated with the different possible configurations (1:1, 1:N etc), and if there are any added value or benefits in running all channels with same resilience/redundancy strategy.

Please also discuss any disaster recovery strategies available – including ones with reduced service level and features (like compressed cloud-only instances) – and in what type of outage, failure, and emergency situations (network, power, hardware breakdown, security breaches etc), they may and may not help.

The offered Disaster Recovery-solution shall be priced according to instructions in Appendix 7.

6.3   Installation and deployment strategies

Through its many internal development teams and in-house developed services, NRK has learned the huge benefits of automated deployments – both for reducing risk, documenting installation procedures, ensure repeatability, increase development and deployment speed - and ultimately making higher-quality services available for both users and viewers.

It is therefore expected that all virtual server instances may be automatically provisioned based on pre-created images, or preferably be created completely from scratch on-demand by leveraging technologies like HashiCorps Packer or similar.

In the same vein, it is expected to be able to automatically configure and set up both infrastructure, servers, and software through the use of terraform, ansible, salt, puppet, or other provisioning and configuration technology enabling a version-controlled environment.

NRK has local experience and resources for working in collaboration with the Contractors to set up such deployment strategies. Still, it requires that the software, hardware, and infrastructure is capable of being configured and installed this way.

Please describe what deployment technologies and strategies the system may support, including both initial installation and subsequent updates and upgrades.

6.4   Stateful and stateless components, backup

With the wish for automated deployment and provisioning in mind, please make sure that it is clearly stated what parts of the system hold local (and authoritative) state – i.e., what part of the system holds data that has to survive a re-installation/re-deployment, and thus needs traditional backup.

Please describe suggested backup strategies (database backups, snapshots etc) for the stateful instances, and any if any operational considerations must be taken (downtime, failover etc) for backing up or restoring the system to a previous state.

Please state if there are parts of the system that has quorum requirements – i.e., if there are a minimum number of nodes that need to be healthy for a cluster to be available, and how this may affect deployment strategies and requirements.

6.5   Information architecture – Data model

The current integration between Whats'On (scheduling), the current automation (Abit Present-It) and the current MAM (Tedial) is relying on some common conventions and data-fields.

See section 8.1 for more information about the integration between the different systems at NRK.

Both the scheduling system and the program bank has complex data models, but some of the most important common domain concepts in use today are:

Domain concept	Description
Programme ID / Product ID	Unique human readable ID identifying a product (in Whats´On) / program. A program may have several technical versions (with/without graphics, recording in OB-van vs recording in playout etc). Generated by Whats´On. Examples: NNFA21062222
Media ID / MAM ID	Unique GUID generated by the MAM for each technical version of a program. This is what should identify media instances in playlists from the schedule system and is used to request/query media from the Program Bank. Example: 6e6852274a284a86a3ffe1ae0c441496
Clip name	Human readable ID identifying a video (or audio) clip/media in the Program Bank. Unique throughout the Program Bank services (uniqueness automatically enforced by the central services upon name collision). Conventions dictate that programs have a stricter structure than raw material and news items. Example program: NNFA21062222AH Example raw material: helsedirektøren-til-dagsrevyen-270221
Clip descriptive title	Human readable string suitable for free-text search in archive and (for some material) for publishing to viewers. Not unique. Examples: Leka kåret til geologisk nasjonalmonument Dagsnytt Ođđasat - nyheter på samisk
Media file name / file path	Source filenames may or may not be similar or equal to the Clip Name. Source file paths may point to several different storage locations.
Reconcile key	Unique GUID created by Whats´On to uniquely identify a specific instance of a program withing a schedule/transmission. Used when reconciling as-run-logs back to the scheduling system.

6.6 Cloud/hybrid/on-premises solutions

Cloud services are a vital part of and underpin a lot of NRKs services to internal users and public viewers. However, as stated in section 2.1- Background, NRK has some very clear responsibilities as a public broadcaster concerning being able to handle critical broadcasts in case of national emergencies.

Combined with a 12-15 petabyte archive of historical programmes and broadcasts actively in use, there are several political, technical, practical and security related hurdles that must be cleared to put the main playout and automation of a public broadcaster in the cloud, or even have vital parts of it depending on the availability of foreign services.

Even though we don't believe it is viable to select a solution with a strict and absolute dependency on cloud services at this point in time, we do not plan to automatically exclude solutions that include such elements. However, a very clear discussion of how this will affect the total availability/uptime budget, including failure modes on cloud-service downtime/relocation/failover will be needed for such a solution to be considered.

As asked in section 3.3, please price a hybrid model with NRK 4-8 as cloud-native as an option.

In the case where the solution includes any cloud-hosted or -dependent components, NRK has as a principle that they are hosted in NRK owned and purchased accounts. Any deviations must be agreed upon.

7 TECHNICAL REQUIREMENTS

How well the Solution fits into the Customer's current technical platform has implications for how well or smoothly it supports business processes across applications, how it is perceived by users and how many IT-manhours are required to operate and maintain the Solution and the overall technical platform. This chapter is intended to ensure a good fit. See also Appendix 3.

If the Customer's technical platform needs to be upgraded in order to enable the Customer to utilize the deliverables, the Contractor shall point this out in Appendix 2 and price this in Appendix 7, see section 7.12.

7.1 Physical interfaces

#	Requirement description
1	The equipment should be mountable in 19in racks.
2	The Contractor should specify the dimensions of the equipment (WxDxH).
3	The Contractor must specify the total physical space in terms of rack units (excluding client pc's).
4	The Contractor must specify the total maximum and average power consumptions of the system (excluding client pc's).
5	The Contractor must specify the required cooling capacity to cool the entire system (excluding workstations).
6	All devices (including auxillary devices) part of the delivery should be listed in Appendix 7.
7	Specify any operational environmental requirements (temperature/humidity) for the equipment
8	Specify airflow and any special needs regarding mounting and cooling.
9	All equipment must bear the CE marking for declaration of conformity and meet the current applicable EU directives.
10	All equipment must meet the current RoHS directive.
11	Please describe the different possible physical SDI input/output configurations (max/min number of in/out-ports).
12	Please describe supported SDI interfaces and connectors (optical and/or electrical).
13	Physical connectors should not be on breakout cables.
14	All media interfaces should be according to relevant SMPTE and AES/EBU standards.
15	The system should support a minimum of input and output of 4 audio stereo pairs using AES3, AES67/SMPTE 2110-30, or MADI. Please describe alternatives and recommendations.
16	All hardware delivered with the system should have hot-swappable dual power supplies (where applicable).
17	All equipment must be operating at nominal 230 VAC, 50Hz.
18	All hardware with network connectivity should have dual network ports for redundancy.

7.2 Timing, latency, and tolerances

#	Requirement description
1	Please describe the minimum duration file-based elements can have in the timeline/playlist

#	Requirement description
2	The cue time for a newly added element (i.e., how long after a locally available media file is added to the playlist before it is available for playout) should not exceed 3 seconds
3	The take time for a cued/next-element (i.e. the time it takes from a manual "take" by keyboard, user interface, external signal) to the element it taken on air should be consistent and not exceed 1 second
4	Please describe the timing characteristics of the system; does adding/removing processing elements in the playout chain change timing or delay through the system
5	Please describe limitations on last-minutes changes in playlist. How close to "on air-time" can modifications be done?

7.3 Video

As described in section 3 Scope, the infrastructure before and after in the signal chain is currently SDI, and therefore the initial installation will be predominantly SDI based. However the migration to more and more IP based transportation is expected to happen in the not too distant future, so the optional support for NDI, ST2110 both as sources and main/monitoring output will be important (see section 7.5 AVoIP for specifications).

If the solution includes pure software-based playout (cloud/virtualized), please show how conversion and transport to/from on-prem SDI signals may be done reliably and with consistent delay/latency.

The main playout format will be 1080p/50, with a mix of mainly 1080i/25 and 1080p/50 sources. A future move to other framerates, higher resolution and/or HDR will start on streaming/popup-channels.

7.3.1 General video requirements

#	Requirement description
1	The system should be able to seamlessly play out any combination of 1080i/25, 1080p/50 live sources and 1080i/25, 1080p/50, 1080Psf/25 (25i codec in 25p wrapper), 576i/25, 576p/25 files as 1080p/50 with proper upsampling and framerate conversion
2	The system should be able to do playout of files which are still being ingested into the system ("growing files")
3	The system should be able to perform time shifted playout of a file being recorded by the system immediately after recording starts
4	The system should be able to do up/down conversion on playout to match a defined output format
5	The visual quality must be approved by NRK based on a subjective judgement
6	The system should be able to playout multiple media elements in sync - for instance video content with additional audio description tracks in separate audio files
7	The system should support rule-based aspect ratio conversion based on schedule metadata or media headers
8	The system should support manual override of the aspect ratio conversion on a per-program basis, and this change should be possible to do after the program in question has started. Example 16:9-anamorphic SD content erroneously marked as 4:3.
9	The system should accept an external TC/time source as master clock
10	It should be possible to configure recordings to include time-of-day-TC
11	Please explain how flexible the solution is in relation to format agnostic playout. What is possible -and not, in a mixed timeline. Clarify strengths and limitations

#	Requirement description
12	Please describe possible video sync source signals supported (black burst, tri-level, PTP etc)
13	The system should support down stream keyers with external sources (fill/key)
14	The system should be able to insert VITC on the output signal. "Time-of-day TC" on live and source file TC on file playout.
15	For cloud/virtualized systems, describe how the main transport/input delay is compensated for, so that time-of-day-scheduled elements are put on air correctly relative to the live source content
16	Please describe additional hardware requirements/upgrade path in order to support higher resolutions/framerates (2160p) and/or HDR/wide color gamut.
17	It should be possible to reconfigure individual channels for 1080i/29.97, 1080p/29.97 and 1080p/59.94, and to play out corresponding live sources. This is for event-channels where the source will be non-European framerates and where the output will be streamed with the same framerate as the sources.

7.3.2 Video processing

#	Requirement description
1	Normal AB-mixing with transitions (cut, X-fade, V-fade, asymmetric V-fade, wipe) for all source types (file-file, file-live, live-live)
2	Two (or more) channel, fully controllable 2D DVE. Should be controllable by secondary events and external API for mixed-source graphical compositions
3	The DVEs should be able to process any source in the system (file, live) – including external key/fill pairs
4	Simultaneous playback of graphic clips/templates over the background video during AB-mixing (all with audio), DVE, subtitles, prerecorded and live voiceovers
5	Frame accurate transition between all combinations of live and file playout, even when routed through DVE
6	The coexistence of multiple flavors of HDR and new color space brings complexity into the playout chain. Please describe the HDR color space/signaling support in the solution if available, including HDR-to-SDR and SDR-to-HDR remapping.
7	Please describe any 3D DVE capabilities, if available.

7.4 Audio

7.4.1 Sources

The main sources of audio during normal operation are:

- Specific channel groups in incoming SDI (stereo + 5.1)
- Specific channel groups in file-based video media (stereo + 5.1)
- Stereo audio from WAV/BWF-based media
- Stereo audio from off-tube suites
- Stereo audio from on- and off-screen channel hosts
- Stereo audio from radio broadcasts

As described in the use cases the continuity producers should be able to manually adjust program (source) and added audio tracks (typically live voiceovers) but based on automatic preparation of the source routing.

The schematics in Figure 14 Audio processing logical overview show the current requirements for discrete processing of the different sources and encoding of the different outputs. The current plan is to output all audio one SDI stream with the different audio outputs stacked in the audio channels.

If the system has explicit functionality for voiceover handling, please describe how this differs from plain audio mixdown/level adjustment and how it may be used to handle off-tube and channel hosts.

7.4.2 Outputs

Two types of audio output are needed: monitoring and main output. Example of monitoring output need is a minus one programme audio for the channel hosts, allowing them to listen to whatever is played out (live/file), without their own audio mixed in. Desired audio monitoring points in the chain are indicated by a red dot in the Figure 17 Audio processing logical overview.

Separate processing should be done for the main output audio channels destined for DVB and OTT. Due to limitations in the DVB receivers in use in Norway, it is important that Dolby 2.0 is used when the source is stereo, and not just stereo encoded as 5.1. The following matrix shows the expected output encoding based on the source type. Currently the only source for 5.1 is file-based, and information about the source type may come from the scheduling playlist and exist in the automation playlist. This may be used for the switching logic.

In (file or live)	Out DVB	Out OTT
Stereo	PCM Stereo PCM 5.1 (upmix) Dolby 2.0	PCM Stereo Dolby 2.0
Stereo 5.1	PCM Stereo PCM 5.1 Dolby 5.1	PCM Stereo Dolby 5.1

All outputs packages should be able to have separate processing/level settings and watermarking.
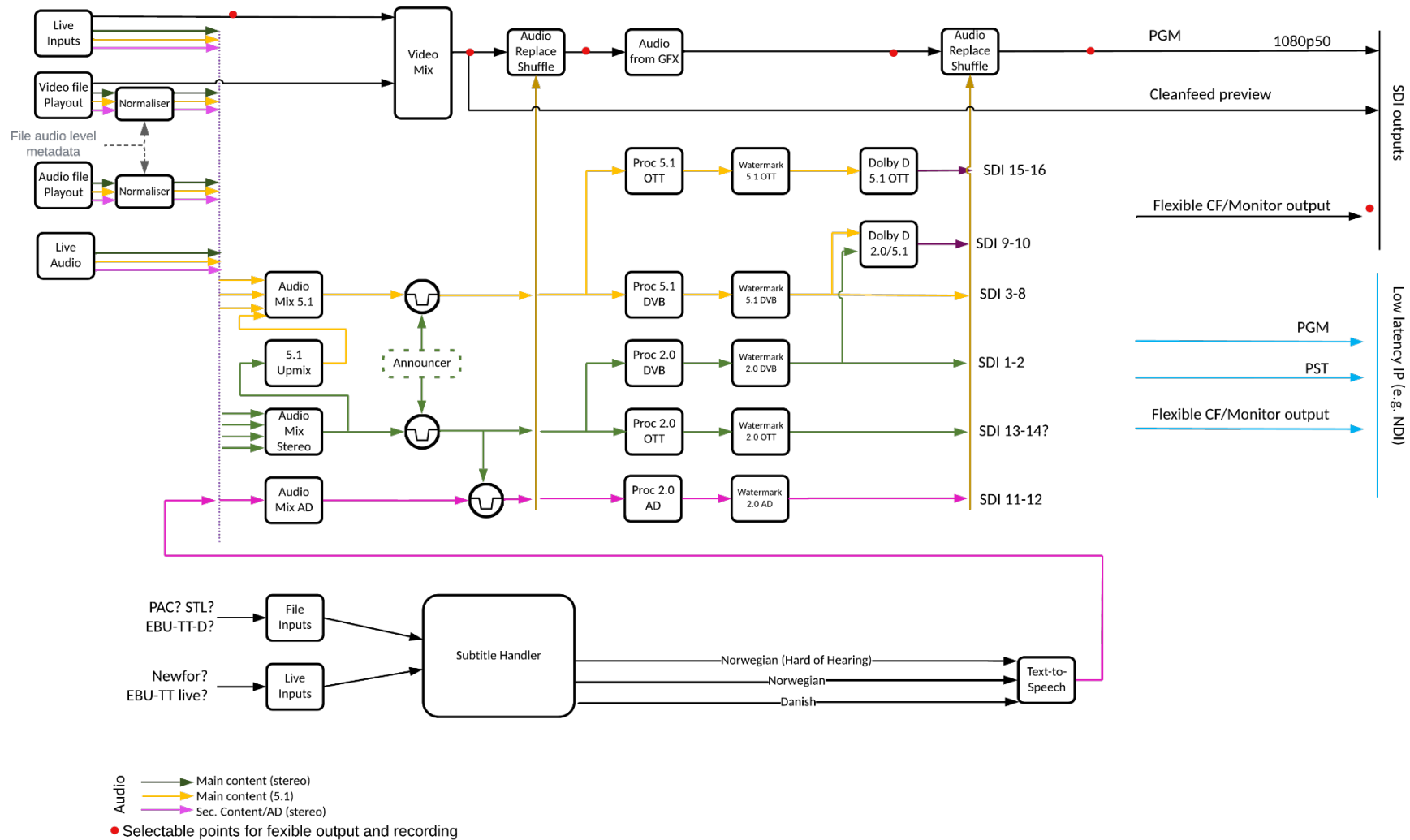
Figure 17 Audio processing logical overview

7.4.3 Loudness analysis

Today files sent to the automation system is pre-analysed by separate services, and peek level information is stored and transferred in the scheduler playlists. This is then used by external services to automatically control the audio processers.

Please describe what type of loudness analysis capabilities exists in the system, if it may be used for automatic normalising and how existing metadata may be used for adjusting the processors.

7.4.4 General audio requirements

#	Requirement description
1	De-embedding of all audio tracks in SDI-inputs.
2	Re-embedding of all audio tracks in SDI-outputs.
3	The system should maintain Audio Sync ("lip sync") between audio and video in all modules/nodes in the chain where audio and video are processed together
4	The system should maintain timing of audio channels within a channel group, keeping them in sync
5	Playout of audio from video clips (see format specifications at 7.6)
6	Internal playout of stereo and multi-channel WAV files (see format specifications at 7.6)
7	Internal playout of stereo and multi-channel BWF files (see format specifications at 7.6)
	Internal Audio Processor
8	If needed to maintain audio/video sync through the chain, please describe the availability of individual, programmable Audio Delay
9	Independent level adjustments for all channels at different points in the chain
10	Independent mixes/routing for different physical outputs. For example, no voiceovers on a "clean feed" SDI output, but voiceovers included on a "program" SDI output.
11	AB-mixing (cut/crossfade) of audio between successive program events with the transition type following the playlist. Audio for an event may come either from a live SDI source, or a video clip.
12	Cut between two external sources must be without any glitch in the audio
13	Automation controlled multi-channel shuffling should be possible
14	Multi-channel shuffling via manual override should be possible
15	Gain control of individual channels (both from file and live sources), planned in the automation play list should be possible
16	Gain control of individual channels (both from file and live sources) via manual override should be possible
17	The Contractor should state whether manual gain control at different points in the chain can be achieved via software fader panel
18	The Contractor should state whether manual gain control at different points in the chain can be achieved via a hardware fader panel
19	Audio meter true peak level monitoring for all output tracks
20	R128 audio meter level monitoring for output stereo and 5.1 groups
21	The system should support upmixing of stereo to 5.1 for use when native 5.1 is not available in live or file source
22	The 5.1 upmixing should have an up-mix algorithm with control- and routing parameters available to the user

#	Requirement description
23	The system should be able to select native 5.1 or up-mixed audio based o metadata from traffic system
24	The system should be able to allow manual override of selection of native 5.1 or upmixed version
25	Switching between native 5.1 and upmix should be seamless and without interruption, shift or artifacts in the audio
26	It should be possible to manually override from 5.1 to stereo or from stereo to 5.1 in case of incorrect metadata from traffic system.
27	The system should support audio processing for both stereo and 5.1 channel structures
28	The audio processing should include Equalizer with several bands
29	The audio processing should include Multiband Compressor/Expander (or similar) with parameters such as Adjustable Attack, Release, Ratio and threshold
30	The audio processing should include Output limiter
31	The audio processing should include Voice optimizing algorithms
32	The audio processing should include normalizer compatible with EBU R128
33	The audio processing should support user specified target level (e.g. -23LUFS and/or -16LUFS) in each chain
34	The audio processing should support saving parameters to presets
35	The audio processing should support dynamically loading presets without interruption or artifacts in the audio
36	The system should be able to control the audio processing presets based on playlist metadata and external APIs
37	The system should support manually loading presets and/or adjusting individual parameters
38	The system should support minimum 3x stereo and 2x 5.1 concurrent and separate processing chains – with individual level adjustment, watermarking, compressors/expanders on all channel pairs/groups
39	If externally sourced/OEM solution of audio processing is used, please describe which manufacturer and product/version is used
40	Please include screenshot of the user interface used to adjust audio processing parameters
	Watermarking
41	The system should support Kantar audio watermarking
42	The system should support multiple concurrent audio watermarking encoders in the chain, but only one per stereo/5.1 audio pair/group (refer to Figure 16 Audio processing logical overview).
43	The audio watermarking should support separate id codes for each encoder
44	Please describe which other formats and manufacturers of audio watermarking are supported.
	Dolby processing
45	The system should support internal encoding of Dolby Digital ("AC3")
46	The system should support minimum 2 concurrent Dolby Digital encoders with individual inputs and outputs
47	The system should allow access to adjust all Dolby Metadata fields
48	The Dolby Digital encoders should support dynamic switching between 2.0 and 5.1 mode (with switching of input signals) based on metadata from the traffic system
49	The system should be able to manually override the parameters and operation mode of the Dolby Digital encoders.

#	Requirement description
50	The switching between 2.0 and 5.1 should be seamless without interruption, delay or artifacts in the audio

7.5 AVoIP

As described in 3 Scope, the infrastructure before and after in the signal chain is currently SDI, and therefore the initial installation will be predominantly SDI based. However, the migration to more and more IP based transportation is expected to happen in the not-too-distant future, so the optional support for AVoIP streams both as sources and main/monitoring output will be important.

Except for some less critical applications like in-application monitoring and graphics sources, where technologies like NDI may be put to use relatively early, it is expected that the initial AVoIP installation will be the test environment, followed by parallel IP-based chains for the other channels in production. Full adaptation in the production environments will follow later when the AVoIP infrastructure at NRK has stabilized and is mature enough for handling playout.

As the distribution area at NRK are moving towards a mezzanine-format-based infrastructure, it may also be interesting if the playout could output an encoded stream directly, but as this format and transport is not yet defined and the receiving parties are not currently ready for this, the handover to distribution is SDI-based for now.

If the proposed solution is based on an internal/contained AVoIP infrastructure, with SDI-gateways before and after, this is not necessarily disqualifying. It must however be described and documented why this is justified and how it may positively contribute to the main goals of the solution without negatively affecting stability, availability, or implementation speed.

For the anticipated AVoIP-spec please see attachment 1-1 ("MPP AVoIP Live Media Standards") and attachment 1-2 ("NRK Device ST2110 ST2059 NMOS Conformance"). Please note that this spec is work-in progress but indicates the direction NRK are heading with the underlaying infrastructure.

#	Requirement description
1	The system must support the transition to ST2110-based sources and playout according to the attachment 1-1 MPP AVoIP Live Media Standards-document.
2	When AVoIP support is installed/deployed, the automation system must be able to playout the same channel on both SDI and IP-based chains simultaneously (not necessarily on the same hardware) in sync.
3	Please describe how a gradual migration from SDI to AVoIP may be taken (in context of the automation and playout servers and services), including necessary hardware- and software-upgrades, and if it affects any functionality or capabilities of the initial SDI based system.
4	If the system can use NDI as source or output even in an SDI-configuration, for instance as source for key/fill for graphics or for monitoring, please describe extra requirements (network, hardware) if applicable

7.6 File-formats

7.6.1 File-formats currently in use at NRK

#	Requirement description
1	The system must be able to play back MPEG IMX intra-frame 50 Mb/s, MPEG-2 4:2:2P@ML, 576i/25 video with 8x 16 or 24 bits (in 32 bits samples) audio channels in AES3, all in an MXF OP1a, eVTR wrapper

#	Requirement description
2	The system must be able to play back XDCAM HD422 MPEG2 long-GOP 50 Mb/s, MPEG-2 4:2:2P@HL, 1080i/25 video with 8x 16- or 24-bits audio channels, all in an MXF OP1a, RDD9 wrapper
3	The system must be able to play back and record XAVC Intra Class100 100/200 Mb/s, 1080i/25, 1080i/29.97, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper

7.6.2 File-formats that should be supported

#	Requirement description
1	The system should be able to play back and record XAVC Intra Class200, 1080i/25, 1080i/29.97, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper
2	The system should be able to play back and record XAVC Intra Class300, 2160p/25, 2160p29.97, 2160p59.94 and 2160p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper
3	The system should be able to play back and record XAVC Intra Class480, 2160p/25, 2160p29.97, 2160p59.94 and 2160p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper
4	The system should be able to play back and record XAVC Long GOP 35, 1080i/25, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper
5	The system should be able to play back and record XAVC Long GOP 50, 1080i/25, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper
6	Please state the support for XAVC Long GOP/UHD formats: - XAVC Long GOP 188, 2160p/25 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper - XAVC Long GOP 300, 2160p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper
7	Please state the support for HDR formats and flavours
8	Audio; Stereo and multi-channel WAV files
9	Audio; Stereo and multi-channel BWF files
10	The playout should handle the above-mentioned video formats natively, that is without transcoding during ingest
11	Please attach a total overview which media file formats are supported for both recording and playout. (UHD/HDR included)

7.6.3 Future file formats and codecs

#	Requirement description
1	Please state the Contractor's strategics for implementation of future file formats and codecs in software

7.7 Accessibility services

As a national broadcasting company, NRK has a clear social responsibility defined by law with clear requirements for the availability of accessibility services, including subtitles, text-to-speech and sign-language interpretation for hearing-impaired viewers.

7.7.1 Subtitles

Subtitles are an important tool to achieve the goals set in the statutes mentioned in section 2.1.

NRK provides subtitles to *live* and *planned productions* – and both are rendered and muxed down-stream with the DVB-signals using a combination of in-house software and Polistream from Broadstream (former Screen). NRK uses a combination of open and closed subtitles, with multi language support.

The source subtitle files are Screen/Polistream PAC-files that are merged to multi-language CHK-files before rendering by Broadstream software. Combined with a tailored live-subtitling and replay workflow, this is not something that NRK see beneficial to replace as a part of this initial installation. This may change when this workflow is to be revisited in the future.

The DVB-streams are synced in Polistream by back-sourcing PCR-timing from the muxer. This allows for time-shifted live-subtitles leveraging the time-delay in the encoder/distribution chain to compensate for the delay in live-subtitles.

Due to this complexity and since the Polistream system is already handling the workflow with all the rendering and DVB insertion, there is currently no plans to use an internal subtitle functionality directly in the new playout chain right now. Since it is the Polistream system that is to do the final rendering, any internal preview of the .PAC-files (if available) will only be an indication of the end result, and full QA of subtitle files will at least in the first iterations be done through the use of Polistream.

However, we want the automation system to control the playout of the subtitles, so an integration with Polistream is needed – this is covered in section 8.1.5 Subtitling.

Therefore Broadstream-integration is seen as a requirement. Note that as with the other major integrations, NRK are open to do or assist in this development, if the flexibility of the secondary-events, available APIs and program-flow-information allows for it.

However, the integration is done, the concept of subtitles is expected to be present in the system, even though any internal rendering or insertion may not be used.

#	Requirement description
1	The notion of subtitles must be present in the system's play list, and be based on information from Whats´On (NRK's planning/scheduling system)
2	File-based subtitle events inside the system's play list must reference the appropriate subtitle filename
3	Preparation, start and stop of file-based subtitle playout events should be controlled automatically by the automation playlist
4	The system should show a clear indication in case of missing subtitle files
5	The system should deliver TC on video output as VITC
6	For QC purposes manual playout of video with VITC routed to the Poliscript-system will be used. If the system also is able preview video clips with burned in selectable PAC-subtitle-file(s) internally, please describe the functionality.
7	The system GUI should allow for subtitle events to be manually created and edited, both for file-based subtitle events
8	The System GUI should allow for subtitle events (file-based or live) to be manually re-submitted without interfering with video, audio or graphics from the on-air event.
9	On every change of a subtitle event, even after the program has started, it should be re-submitted to the subtitling system for playout. One example would be that the program goes on air before the subtitle file is present - as soon as the file arrives, a load-command should be sent to the subtitling system
10	The system GUI should display the filenames of all the subtitle files contained in the active play list

#	Requirement description
11	The system GUI must be able to display the current timecode of the on-air video clip.

7.7.2 Text to speech

NRK has an automatic text-to-speech service that creates audio based on subtitle files. For the automation system this comes in the form of external audio sources that should be mixed, processed, and inserted in the final output according to Figure 14 Audio processing logical overview.

7.8 Virtualization

An important stepping-stone in the process of separating compute and processing from the user surfaces and prepare for the move of headquarters is having as much server and workstation instances virtualised as possible – if it doesn't reduce uptime or general availability of the services.

NRKs will prefer to virtualize as much as possible (both servers and workstations) of the automation system on this system and will strive to automate the provisioning of both servers and virtualized infrastructure.

Media processing or playout servers or servers that require specialized hardware (typically the playout servers using SDI/audio-cards and hardware offloading network) may be exempt from this, unless the system provider has experience with, and recommends, virtualizing even these using hardware forwarding.

#	Requirement description
1	When designing and describing the system, please state what parts may (and may not) be virtualized
2	When designing and describing the system, please state any special requirements to the virtualization platform for each load, including vCPU/RAM/storage
3	When designing and describing the system, please elaborate: Is the server load/service stateful or stateless – in other words; may the instance be provisioned from ground up or from images / snapshots, or does it need backup due to on-server stored state. If servers need local state, please describe why this may not live in a central data-/file-store.

7.9 Network

The networking platform is based on Ethernet with the following physical layers supported:

- 100 Base-T/TX
- 1000 Base-T
- 1G Base-T
- 10G Base-T/LR/SR
- 40G Base-LR/SR (QSFP)

The network will also provide segmentation on layer 2 with layer 4 firewalling. Examples of segmentation could be separate VLANs for administration network, file transfer network, live video monitoring network (like for NDI) – these may be available for both virtual (in VMware) and physical loads and appliances.

#	Requirement description
1	Please describe how the solution can take use of network segmentation and layer 4 firewalling for security.
2	Please describe the network topology including protocols and ports that are in use by the solution.
3	NRK might distribute hosting of the solution over multiple data centres. Please describe any requirements for bandwidth and latency between components. Please also describe how confidentiality and integrity in communication between components is ensured.
4	If the solution is not compliant with NRKs network infrastructure, please provide information on which parts that do not comply with, and why.

7.10 System Performance Monitoring

NRK currently uses several protocols, technologies, and systems, including SNMP, Prometheus, InfluxDB, Grafana, Loki, Icinga, CheckMK and Splunk On-Call for metric aggregation, alerting and notification-handling.

#	Requirement description
1	Please describe how, and to what extent the system exposes metrics and logs that are available for ingest/forwarding into NRKs monitoring platform, and if they are available through any common formats or protocols like Open Metrics and Open Telemetry.
2	If for any reason some logs or metrics from the platform cannot be exported automatically – please describe these.
3	Please describe any integrated system monitoring, graphing, alerting and log aggregation, if available.

7.11 Security

7.11.1 General requirements

The Contractor shall demonstrate that processes are in place to minimize the risk of product/service-vulnerabilities and minimize the risk that professional or support services are exposing NRK to threats.

The Contractor shall review and complete Attachment 1-3 NRK Supplier Security Requirements.

7.11.2 Servers and devices

#	Requirement description
1	All installed software should be able to run on actively maintained and supported current generation server operating systems. If long-term servicing (LTS) versions are required, it should be explicitly noted.
2	All servers should be able to follow the normal security patching channel of its operating system, even if the actual installation of the patches is manually triggered.
3	All container hosts or orchestration platforms (like Kubernetes) should follow the normal security patching channel of both underlaying operating systems and hosting platform.
4	All container images should be regularly updated with security patches for the underlaying base image.
5	All hardware devices should be able to receive all security patches or firmware updates issued by the manufacturer.

#	Requirement description
6	All Windows and Linux-servers being a direct part of the system - either provided by the contractor or customer - should be able to run current and updated Microsoft Defender for Endpoints unless explicitly noted.

7.12 Other technical requirements

7.12.1 Changes to the technical platform

The Contractor shall describe how the offered Solution will cooperate with the Customer's technical platform described in appendix 3. Any assumptions/prerequisites or required changes in the customer's technical platform must be explicitly described in Appendix 2 in order to apply.

The Customer will itself ensure such upgrading and reserves the right to purchase the necessary equipment and software required by its own agreements.

7.12.2 Scalability and flexibility

The Solution has a logical and technical architecture that supports scalability and flexibility regarding new requirements and efficient maintenance.

The contractor is asked to describe how the Solution is scaled up or down and important limitations or dependencies.

7.12.3 Environments

The Solution must be delivered with a staging-environment for testing changes, installation, patching and features before they are put into production.

The staging-environment must consist of at least two complete chains with feature-parity to the production environment, running at least two concurrent channels. The staging-environment should support the same type of failover/HA-strategies that the main production environment features.

Additional developer-software-licenses for running the software on developer machines and/or in build/test-chains (if applicable) should also be provided.

8   INTEGRATIONS AND API´S

This chapter covers the integrations needed between the automation / playout system and adjacent systems at NRK, followed by general API requirements and especially requirements for program flow events.

Please also revisit the relevant paragraphs in section 3.1 to fully understand NRKs need regarding integrations.

8.1   Integrations

Where there are well known and/or well-defined protocols and transports with little technical, business- or data-modelling ambiguity (like router-control), NRK prefers and expects the offered automation system to include proper integrations to the external system in question (integration type A below).

However, NRK has a strong developer community, and especially in areas where NRK has very bespoke needs or expects frequent changing business or user requirements, there is a policy of

(co)developing and owning these integration-services or -modules in-house rather than asking the involved vendors to deliver a bespoke integration on their own. This is based on prior experience where the most complicated and difficult part of many integrations are not the technical implementation or development, but the business and data model impedance and the need to be able to adjust and adapt the mapping and logic over time (integration type B/C below).

If an integration is missing or inadequate, NRK would prefer that work and effort is put into providing proper, public APIs and/or SDKs or stand-alone modules over writing a black-box integration as an internal part of the provided system/software.

In Appendix 7, the Contractor shall price the integration or facilitation of integration with the listed systems/applications in this chapter by means of at least one of

A. An existing, already working and documented integration that covers the required integration.
If only minor adaptions or adjustments are needed this may still be a viable option.

B. Existing APIs/SDKs.
Well documented interfaces, module SDKs, extension-points and/or event-based integrations that enable NRK to do the integration described.

C. New APIs/SDKs developed to facilitate the requirements.
In the case that an integration is not currently supported, or the supported integration deviates in vital areas from what is requested, please provide price estimates for enabling the integration in question through creation of public APIs as described in section 8.2. NRK emphasises that the estimate must be a starting point for further detailing together with the Customer in the specification stage of the project. Please see the requirements below for expected details in the descriptions.

The following sections describe the adjacent systems / applications at NRK with which the new automation / playout system must interact.

8.1.1 MAM

The involvement of the in-house development teams will especially be important for the MAM-integration. The MAM-installation is a part of a larger file-based production platform developed by NRK ("The Program Bank"), with a host of integrations with both third-party software and services, and NRK-developed systems and applications.

A simplified logical stack is shown in Figure 10 Program Bank production platform. Except for some operations-related tasks, users access the Program Bank (and underlaying MAM) through concise and streamlined user-interfaces – both in the browser and embedded in some productions systems (most notably Premiere Pro, ENPS, Quantel QEdit, Digas).

A simplified logical diagram of the current integrations between the automation system, What's On and the MAM/Program Bank is shown in Figure 11 Current MAM integration.

The underlying MAM powering parts of the production platform is Tedial (with products like Evolution, Fikus, MPM and AST). It supplies an online/offline storage system (AST) with archiving/offlining
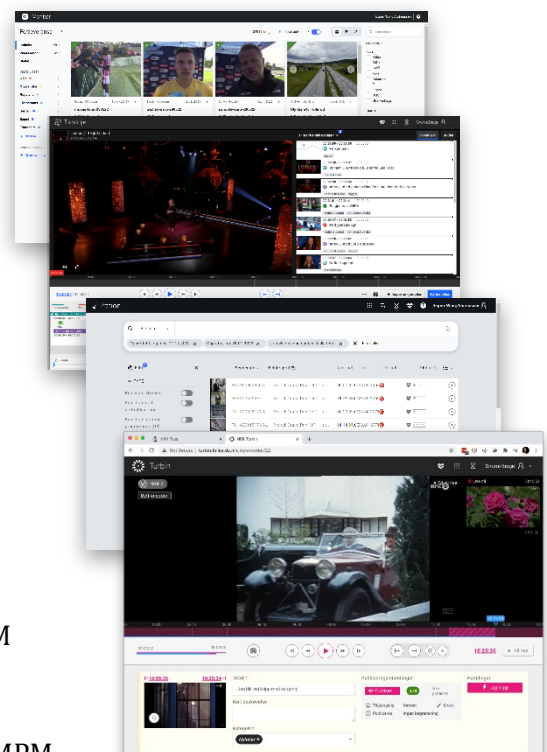
implemented through on-site and remote tape-robots handled by Telestream DIVA, transfer to/from regional offices and housekeeping of local production storage.

The Program Bank APIs may provide endpoints and events for:

- Querying technical metadata (formats, codecs, preview urls ++)

- Querying availability of media

- Requesting transfer of files to the playout system and filepaths to media online on the central storage

- Media conversion/transcoding

- By further agreement, other requests the automations system needs to fulfill its media flows

Finalizing the specs for the needed operations and APIs will be done in collaboration with NRK-developers, including a possible small integration-service owning the interfacing between the Program Bank and the automation/playout system.

#	Requirement description
1	Please describe the possible media flow strategies in and out of the playout system, including internal media management and housekeeping capabilities/workflows (if any), and what type of integrations/interfaces (APIs, callbacks and events) are available for the NRK development teams to receive requests for media.
2	Please describe what type of hooks, callbacks, events and APIs are available to handle automatic query, fetch and push of media files and technical metadata to and from the automation system.

Apps	Potion	Foss	Turbin	Lists	Timelines	Ingest	Monitor	Field

Metadata, workflow, APIs

Bridge API	Programbank API
Bridge services	
Metadata-bank	

Integrations

Mediakvern	Tedial	What's On	MASV	Baton
			Signiant	Vantage

Infrastructure

RabbitMQ	Databases	Elasticsearch	Azure Servicebus
VMWare	Kubernetes	Docker	Hardware

In-house Apps	In-house services

Figure 18: Program Bank production platform
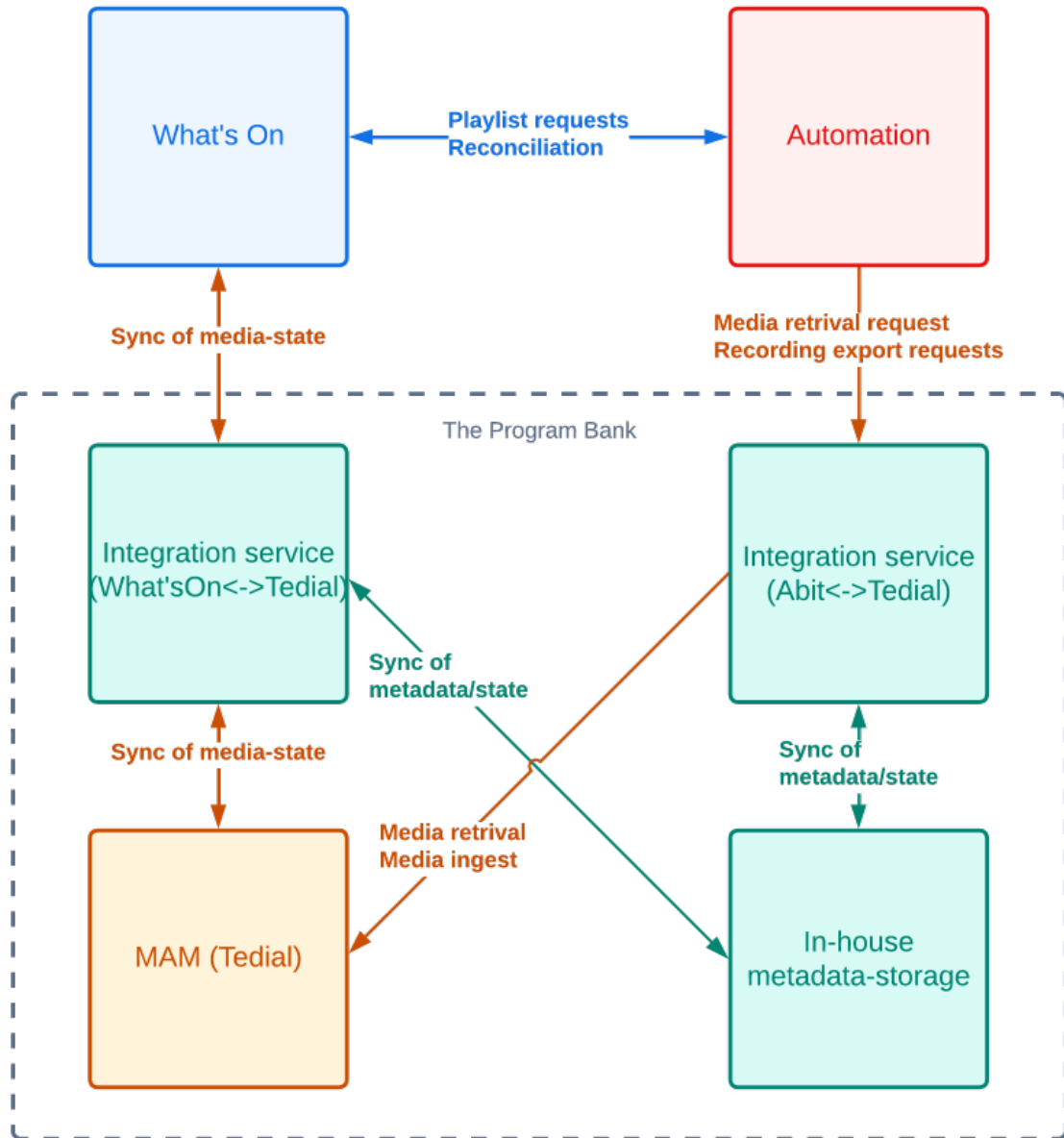
Figure 19: Current MAM integration

8.1.2 Routing

The automation system will be installed in a somewhat aging SDI-infrastructure, and at least for the first iterations the only routing expected is source-routing, with optional automatic failover routing to follow.

The current SDI routers installed in the Playout centre will be replaced – either partly or completely, but the choice of brand and type is to be decided. It may be a set of smaller pure SDI-routers handling source-routing for the automation (reducing complexity), or some somewhat larger modular routers with possible IP-video capabilities for a slightly more future-proof system. Whatever we chose, it will be from some of the known broadcast router manufacturers, as one of the goals of the intermediate SDI-step is to reduce risk. It may therefore be expected that the routers available for controlling by the automation will be modern and up to date.

#	Requirement description
1	Please list the existing router / router-control-system protocols and integrations available in the system together with licensing strategy.

8.1.3 Scheduling

NRKs scheduling system is What's On from Mediagenix, currently at version 2019r3 – expected to be upgraded to 2022r4/5 during the fall.

All linear channels (and rights for all long-format on-demand content) are planned using What's On, so this will be an important integration point for the system and the master source for both playlist and some metadata.

The current automation (Abit Present-It) does a lot of bespoke SQL-queries towards the What's On database. This is powerful, but fragile. We want the new system to integrate using the new Business API (https://www.mediagenix.tv/api-j7d2XD7sFqcdWGeS/docs/) and/or through the BXF (https://ieeexplore.ieee.org/document/8023927) Automation Integration Module in What's On.

#	Requirement description
1	If the system has an existing and flexible integration with What's On, and the Contractor has former integration with the products of Mediagenix, please describe the capabilities of this integration and how it will solve the user cases described in 5.6.1.
2	Regardless of whether this integration already exists, please describe, and provide documentation of IPIs, events, hooks, callbacks for playlist manipulation/integration.

In the same manner as with the MAM-integration, it may be that NRK wants to own the integration-layer between the automation and the scheduling system, removing any need for cross-vendor integration and coordination and providing future flexibility and control.

8.1.4 Graphics

Please see section 5.6.11 for an introduction to NRKs internal graphics system NORA and user stories connected to graphics playout.

As described there, although NRK is open for suggestions and examples of other graphical solutions, it is believed that the added value of using the same system generating close to all other graphics output at NRK, with an extensive HTTP-based rest-like API for automation both of templates, content, integration and playout control, is so huge that our current intent is to use NORA for graphics in a future installation as well.

Some exception could be the (for NRK) highly static elements like logos and age rating graphics, where use of Nora-integration would give little extra value over internal logo/graphics generators.

As with other specialized integrations, we expect our in-house developers to be involved in making the new system and NORA interact – but we are of course depending heavily on the availability of proper APIs and extension points in the automation system to do so.

Depending on the possibilities in the new system, compositing may be done through software rendering of the HTML5-pages by a compatible chromium instance directly in the playout chain or through NDI, SDI or other video key/fill pairs. Regardless of transport/signal type, it will require keying through an equivalent of a down stream keyer in the playout chain – controllable both automatically by secondary events and by manual interface interactions by the continuity producers.

As an example of a HTML5-renderer, please see https://nora-public.nrk.no/render/nyheter. It is a stand-alone demo of a rendered page using the NORA engine playing out a continuous loop of simple, standard graphics elements.

8.1.5 Subtitling

NRK is using Broadstream (former Screen) Polistream for subtitling. As described in the user stories and the technical requirements the workflow is quite complicated due to dual language requirements, a combination of open/closed subtitles and frequent use of live-subtitling done with in-house developed live-subtitling tools.

A complete subtitle-solution is therefore not a part of this request, and we plan to let the output of the playout chain to be muxed with the DVB-subtitles from the Polistream system in our current muxer down stream.

However, we want the automation system to control the playout of the subtitles, so an integration with Polistream is needed.

The subtitle files will be available on network storage, and information about assigned subtitle files are available from metadata in the schedules from What's On.

As a minimum, the ability to ask Polistream to load subtitle files (including reporting the return state of this command) and clear/unload subtitle files is required, either through an direct integration or through the availability of APIs in the automation system.

#	Requirement description
1	Please describe what existing integration is available for controlling subtitle systems like Polistream, and please describe and provide documentation of APIs, events, hooks for subtitle information manipulation/integration.

8.1.6 List of out-of-the-box supported integrations

NRK's presentation suites will change over time, with new user and business requirements, and we expect the transition to AVoIP to happen in the lifetime of the new system.

#	Requirement description
1	To better understand how changing needs may be accommodated by the system, please provide a list of existing and out-of-the-box supported integrations and protocols, indicating licensing model, if it is configurable by the operational staff or if it requires extra hardware/software installations.

8.2 API

NRK has a strong developer community, and being able to create new workflows, automate operations and adjust integrations between in-house built software and third party systems is an important principle for NRK.

We have therefore seen a shift in the last years from commissioning bespoke integrations between third-party systems to making the glue-services in-house, and this has enabled us to deliver new and powerful integrations and workflows to our users and viewers.

We therefore value well-defined, documented APIs with a hight degree of functionality coverage, and has come to expect this as an essential part of any new system or software delivery.

8.2.1 General API requirements

#	Requirement description
1	The system must provide access to all vital functionality in the business layer like playlist manipulation and media handling through a public APIs.

#	Requirement description
2	The APIs must be thoroughly documented.
3	The data model in use by the API should be documented and include formal schema definitions.
4	Usage of the API must be covered by the support level agreements.
5	The API and documentation must be kept up to date when new features are added to the system so that requirements #1 and #2 are always fulfilled.
6	If the API is exposed through one or more HTTP REST-like endpoints, they should use proper HTTP methods and response codes (i.e. errors should be in the 400-500 range etc).
7	The API should be consistent on media format and return types – using correct Content-Type headers including character sets.
8	Access to the API should at a minimum be controlled by the same authorization and authentication mechanisms (built-in/LDAP/Azure AD etc) as present in the user interface.
9	The API authentication should offer single sign on through Azure AD supported authentication protocols.
10	The concurrency control mechanism (locking, etags, row version or similar) in use by the system should also be available and in use by the API, enabling prevention or detection of the Lost Update Problem.
11	The API should allow external systems to subscribe to events affecting assets in the system (like creation, modification, etc) through callbacks, message queues or other event systems.
12	The system-provided user interfaces should rely on publicly exposed and documented APIs
13	Responsiveness of the API should not be linked to the responsiveness or availability of the automation/playout-capabilities; it should not be possible to affect the stability of the playout due to excessive use of the API by an ill-behaving client.

8.2.2 Program flow events

NRK wants to emphasise the importance of this type of API/interface in the new system. Several existing integrations are based on the presence of instant, reliable program flow events; Events notifying integrations about:

h) Scheduling of program (the insertion of a program in the playlist)

i) Modification of program (any type of change on a program in the playlist – including secondary events or metadata)

j) Cuing of program (including predicted/estimated start-time)

k) Start of playout of program (including exact start-time of playout)

l) Stop of playout of program (including exact stop-time of playout)

m) Start of recordings

n) Stop of recordings

#	Requirement description
1	All events should include at least the following information: o) An ID of the event – this should be unique for this instance and not be reused by any other messages/events p) Timestamp of the event q) Channel ID r) Type of event (live, file, other ++)

#	Requirement description
	s) Automation ID of the program (unique ID of the program as known by the automation system)
	t) MAM ID of the program
	u) At least minimal metadata – like title
	v) Estimated or exact start/stop/duration – any combination that makes sense for the given event type
	w) Auxiliary information relevant for the event type (like source type, source id (router/file), secondary event information, subtitle file)
2	If the events do not include all program information in the event-body itself, a fast, responsive API for querying this information should be available, so that integrating services are able to quickly fetch any relevant information. Please describe the recommended solution.
3	There may be several viable transports for these type of messages – please state what type of technology/service makes these events available (message queues, callbacks, tcp-sockets etc) and the media format and data model of the events.
4	Please state how client may keep a reliable connection or message flow during failover-situations. At-least-once delivery of messages is expected – ideally pr client (proper queues) but at least for established connections is expected.

9   INFORMATION SECURITY AND PERSONAL DATA PROTECTION (CF. CLAUSES 9.2 AND 9.3)

Any personal data shall be processed according to the current legislation in the Norwegian Personal Data Act, as outlined in the "Data processing agreement" which is collectively signed by the Parties and apply for deliverables and activities under this Agreement and the associated Support and Maintenance Agreement. EU Standard Contractual Clauses (SCC) will also be accepted. The Norwegian Personal Data Act is aligned with the EU's "General Data Protection Regulation" (GDPR).

The level of protection in the Personal Data Act must not be undermined if personal data is transferred to another state. All the countries within the EU / EEA area have implemented the Privacy Policy and thus ensured that personal data are handled properly. Therefore, one can freely transfer personal data to these states provided the other conditions of the Personal Data Act are fulfilled.

Under certain conditions, personal data may be transferred to states outside the EU / EEA area - so-called "third countries":

1) The European Commission has recognised that some third countries have a sufficient level of personal data protection. Transfers to such a country are recognized as adequate and are comparable to transfers to countries within the EU / EEA. It is currently 12 countries that have a decision on a sufficient level of protection. These are Switzerland, Andorra, the Faroe Islands, Guernsey, Jersey, the Isle of Man, Argentina, Canada, Israel, New Zealand, and Uruguay.

2) USA – Privacy Shield: For the transfer of personal data to the United States, the Commission Decision on Privacy Shield applies. This decision includes companies established in the United States which have been certified under the Privacy Shield Agreement. If personal information is to be transferred to the United States under the Privacy Shield, the recipient of the personal data must be listed on the Privacy Shield Certified Entities. In addition, NRK will have to make the following assessments:

   a. Assess whether the transfer is in accordance with the basic requirements of GDPR Article 5.

b. Carry out a risk assessment, in accordance with the requirements of the GDPR Article 32.

c. Assess the risk and the financial consequences of a situation where the recipient of personal data loses its privacy Shield certification.

#	Requirement description
1	The Contractor shall explain how their obligations under Clause 9.2 on ensuring the confidentiality and integrity of the Customer's data, are handled.
2	The Contractor shall describe in which country (personal) data will be stored.
3	The Contractor shall describe how satisfactory processing, including information system and security measures in line with the personal data protection regulations will be achieved and performed.
4	In the event personal data may be transferred to the United States the Contractor shall identify the recipient of such data and whether the recipient is included in the list of Privacy Shield Certified Entities. If not relevant for the Contractor's situation, this requirement can be answered with a "Not Applicable"

10 OTHER REQUIREMENTS

10.1 Project Implementation Methodology (cf. clause 2.3.3)

The Customer prefers an iterative approach aiming to deliver a high degree of continuous value to by actively planning for an incremental introduction of the new Solution and its features.

The Contractor shall describe the proposed method and approach for the project including how the method facilitates user involvement

10.2 Documentation (cf. clause 2.3.6)

The Solution including customisations and configurations must be documented so that the Customer has the necessary and correct documentation available in all areas of the Solution. The documentation shall facilitate effective use, training, further development, and service of the Solution. The Solution shall be provided at least with the following documentation:

10.2.1 Detailed specification - design documentation

The solution is provided with a detailed specification document that is developed during the specification phase. This design document is a description of how the processes and requirements are to be fulfilled in the new solution. The document describes how to solve the desired functionality and the guide to those who will configure and complete the solution for NRK's use.

10.2.2 Training material

The Contractor will provide training material. The training material must be adapted to the individual user group and must be written in Norwegian or English.

10.2.3 User documentation

The Solution is provided with NRK-specific user documentation that is:

x) Provided in a common electronic format.

y) Adapted to different user groups, including advanced users, such as project managers, superuser, system managers, and end-users who will use the Solution in a limited way

10.2.4 Documentation of integrations

The Solution is provided with technical documentation in English describing public API, integrations and APIs specific to NRK (interfaces, methods, etc.).

10.2.5 Functional system documentation

The Solution is provided with functional documentation in English describing configurations and setup, including functional design for any customizations.

10.2.6 Technical system documentation

The Solution comes with a technical system documentation in English, describing logical service and information architecture, security and access architecture (ADFS, etc.), provisioning and orchestration functionality and procedures.

10.2.7 Installation and maintenance documentation

The Solution comes with installation and maintenance documentation in English. This requirement applies only to On-premises-solutions.

10.3 Training (cf. clause 2.3.7)

10.3.1 Training method

The Contractor shall plan and develop a training program, including training material, and train NRK in the use of the Solution. The training shall ensure that NRK can perform qualified testing of the Solution and start using the Solution properly and efficiently.

All user groups shall receive training. The training shall be designed appropriately for each specific user group. Training methods shall be described.

10.3.2 User groups

10.3.2.1 Continuity producers

The continuity producer mans the Presentation suite/Main continuity centre. They operate the Automation/Playout solution. See 5.1.1 for role description. The number of producers that needs training are 15-20.

10.3.2.2 Operations

Operations engineers ensures the stable operation and development of the technical infrastructure underpinning the Presentation suite/Main continuity center. See 5.2.4 for role description

The group is 6-10 people and consists of:

* Systems Planner – Video

* Systems Planner – Audio

- Systems Specialist – Automation

- Systems Specialist – Video

- Systems Developer

- Architect

- Systems owner

10.3.3 Description of training courses

Training material shall as a minimum be in English or Norwegian and have use cases that are relevant for the different user groups.

The Contractor shall describe how the training will be for the different target groups. The description shall at minimum include the following:

- Objective of the training

- Training content

- Expected benefits from completing the training

- Training style

- Duration

10.4 Administrative and legal requirements

10.4.1 Right of ownership and right of disposal

The new system is business-critical for the Customer. Thus, the Contractor is required to suggest and describe appropriate measures according to which the Customer shall be notified and provided access to the source code if the Contractor during the term of the Agreement or the Maintenance Agreement should have or should have any reason to foresee that events described in the General Contract Terms clause 10.2.2 may occur. Any related third-party terms should be described, and prices be included in Appendix 7.

10.4.2 Supplementary license terms for standard software and open-source software

The Contractor shall in Appendix 2 provide an _overview_ of any standard software and/or open source software included in the provided solution, including which license terms that apply for such components.

The actual terms shall be presented in Appendix 10.

MPP AVoIP Live Media Standards [20xx-20xx]

601 Platform Standards

1.   <u>Contents</u>

2.   <u>Version Control</u>

Rev.	Date	Detail	Author(s)
0.1	09/06/22	First draft release of document for review This version of the document is concerned with flow exchange within and between NRK data centres and office locations. It does not currently describe flow exchange standards between NRK cloud and public cloud resources or third party contribution standards.	GH
0.2	13/06/22	Second draft following internal reviews and discussions around multi-channel audio production workflows.	GH / TH
0.3	14/06/22	Further ammendments following further internal review and discussions. First release to NRK.	GH / TH
0.4	22/06/22	Added support for mono flows which may (subject to future design work) be beneficial to Radio	GH

3.   Introduction

Fading industry standards such as SDI brought great benefits, not least they were reliable and simple to build with, which brought a high degree of creative freedom. However, the trade-off is that they are also rigid, which, in a rapidly evolving landscape constrains agility within media organisations.

With the transition to AVoIP media organisations have greater freedom to choose the standards and pseudo standards (such as NDI) they wish to support and to embrace new standards as the emerge. However, with this freedom, some of the responsibility for standards documentation, enforcement, and interoperability testing passes from standards bodies and suppliers to media organisations.

This document details NRK's audio, video, and ancillary data standards for live media exchange within the platform. It does not describe Contribution or Distribution standards. It also does not describe NRK file-based media standards.

The aim of this document is to ensure that NRK experiences all the benefits of SDI without its constraints, and with all the benefits AVoIP brings. Benefits include:

1. **Device Interoperability -** High-level standards support does not guarantee interoperability. For example, whilst a device may support ST 2110, ST 2110 offers many options for audio and video transport and support for specific features varies greatly between products.
2. **Improved business agility -** Improved interoperability makes it quicker and easier to create new workflows without the need for heavy research and development processes.
3. **More effective project delivery -** Product failure to comply with these standards can be exposed early. Products can either be rejected or agreed enhancements placed on a roadmap and managed.
4. Reduces system complexity
5. **Less physical equipment** required for signal exchange
6. Significantly reduces control system complexity
7. Minimise format conversions – benefits include:
8. **Cost savings** – from needing less equipment
9. **Maximise quality** – by minimising the need for conversions
10. **Minimise latency** – by minimising the need for conversions
11. Increases system reliability
12. Maximise operational efficiency
13. **Minimise manual interventions** to convert audio and video signals.
14. **Simplifies multi-format working** - when working with multiple video resolutions, framerates, colour formats, and audio formats.
15. Reduces effort spent reinventing basic system constructs

Whilst conformance to these standards is mandatory, this is an active document. Suggestions for updates is encouraged where it brings value to NRK and increases NRK's creative freedom.

4. <u>Normative References</u>

This document makes reference to the standards and quasi-standards detailed below.

Please note the control standards such as the AMWA NMOS suite are specifically exlcuded from this document.

4.1. <u>Standards</u>

- AES67: High-performance streaming audio-over-IP interoperability
- AES-r16-2016: PTP parameters for AES67 and SMPTE ST 2059-2 interoperability
- ITU BT.709: Parameter values for the HDTV standards for production and international programme exchange
- ITU BT.2020: Parameter values for ultra-high definition television systems for production and international programme exchange
- ITU BT.2100: Image parameter values for high dynamic range television for use in production and international programme exchange
- SMPTE ST 2110-10: System Timing and Definitions
- SMPTE ST 2110-20: Uncompressed Active Video
- SMPTE ST 2110-21: Traffic Shaping Uncompressed Video
- SMPTE ST 2110-22: Constant Bit-Rate Compressed Video
- SMPTE ST 2110-30: PCM Digital Audio
- SMPTE ST 2110-31: AES3 Transparent Transport
- SMPTE ST 2110-40: SMPTE ST 291-1 Ancillary Data
- SMPTE ST 2110-41: Fast Metadata [once standard is ratified]
- SMPTE ST 2022-1: Forward Error Correction for Real-Time Video/Audio Transport Over IP Networks
- SMPTE ST 2022-2: Unidirectional Transport of Constant Bit Rate MPEG-2 Transport Streams on IP Networks
- SMPTE ST 2022-7: Seamless Protection Switching of SMPTE ST 2022 IP Datagrams
- VSF TR-08: Transport of JPEG XS Video in ST 2110-22

4.2. <u>Quasi Standards</u>

- Audinate: Dante
- Viz RT: NDI

5. Video

5.1. Formats

Table 1 summarises supported video formats within the platform.

The two main house production formats are highlighted in gold text. Transitioning to and standardising on 1080p50 and 2160p50 WCG HDR HLG will simplify platform design and operations, as well as increase picture quality, by avoiding unnecessary colour space, framerate, and scan conversions. It will also reduce the number of format variations that operations need to manage.

720p50 is included because Playout hands off to some distributors in this format but is not used. It's possible that support for this format may not be required in future.

1080p25 HDR is inlcuded for multiviewer heads. Running these at 1080p50 will consume twice as much WAN bandwidth for minimal or zero production quality gain.

#	Wide	High	Scan	FR	Ratio	Gamut	Range	Notes
1	1280	720	p	50	16:9	Rec 709	SDR	Playout distribution handoff
2	1920	1080	i	25	16:9	Rec 709	SDR	
3	1920	1080	p	50	16:9	Rec 709	SDR	
4	1920	1080	p	25	16:9	Rec 2100	HDR_HLG	Used for multiviewer heads
5	1920	1080	p	50	16:9	Rec 2100	HDR_HLG	House production format
6	3840	2160	p	50	16:9	Rec 2100	HDR_HLG	House production format

Table 1 - Video Formats

5.2. Transports

The following transports are supported within the platform:

1. SMPTE ST 2110-20 (uncompressed)
2. SMPTE ST 2110-22 (JPEG XS compressed)
3. NDI (SHQ)
4. SMPTE 2022-2 Transport Streams

5.2.1.   SMPTE ST 2110-20 & -22

All flows shall be compressed using the JPEG-XS codec with the codestream encapsulated with an ST 2110-22 transport.
Two quality levels shall be supported:

1. **Full** – 6:1 compression - Used for content production and quality monitoring
2. **High** – 8:1 compression - Used for monitoring, where pristine picture quality isn't required, e.g. the majority of multiviewers.

JPEG-XS profiles for different resolution and frames rate combinations shall adhere to the interoperability points defined within VSF TR-08:2022:

https://vsf.tv/download/technical_recommendations/VSF_TR-08_2022-04-20.pdf

*Note 8/6/2022 - Platform adoption of intoPIX's "Flawless Imaging Profile" for JPEG-XS is currently under investigation.

The rationale behind adopting compressed can be summarised as follows:

Whilst WAN costs have continued to fall, the bandwidth requirements necessary to transport uncompressed live media flows media flows for datacentres to offices is so great that compression is necessary. JPEG-XS is the ideal codec for this. It's fast (just a few lines of latency), high-quality, low power, and simple to implement. Lower bandwidth flows can also be routed across un-orchestrated networks, allowing data only carriers to bid on connectivity and reducing connectivity costs. It does mean however that a pair of codecs is required for every multiviewer and quality monitor in a facility.

Furthermore, supporting uncompressed 2160p50 production and playout requires provisioning a lot of 100Gb network ports, at great cost. Using JPEG-XS compression is a practical way to reduce the network bandwidth requirements, allowing 10Gb and 25Gb ports to be used for 2160p50 production.

Once the decision to compress 2160p50 flows is made along with the necessary production selections and licence investments, it's reasonable to apply compression to all flows. This allows 1Gb and 10Gb network ports to be used for transport of these flows, which reduces networking costs.

In addition to network cost savings within datacentres, once all flows are JPEG-XS encoded, various benefits can be realised:

1. The need for JPEG-XS codecs between the DCs and offices goes away, reducing platform cost and complexity, and increasing platform reliability.

2. Confidence – What operators see is the same codestream that is in the datacentres, not a compressed representation of datacentre side uncompressed flows.
3. Hybrid cloud – Having a single codestream for private and public cloud becomes a reality and the need for transcode at datacentre boundaries disappears. Reducing platform complexity, latency and cost, and increasing picture quality.
4. Remote production – Opens the possibility of not having to recode flows from remote events. Reducing platform complexity, latency and cost, and increasing picture quality.

5.2.2.   NDI

A dedicated NDI VRF is configured on NRK AVoIP networks for NDI traffic.

To minimise coding latency and maximise picture quality, full bandwidth NDI (~100Mbps) shall be used for on premises production and, where adequate network bandwidth exists, remote production scenarios.

NDI uses a proprietary codec call Speed HQ (SHQ), which offers various profiles:

- SHQ0/SHQ1 are 4:2:0 with/without alpha
- SHQ2/SHQ3 are 4:2:2 with/without alpha
- SHQ4/SHQ5 are 4:4:4 with/without alpha
- SHQ7 is 422 with alpha coded the same way as luma
- SHQ9 is 444 with alpha coded the same way as luma

A combination of SHQ 2 and SHQ 7 profiles will be used such that alpha is encoded in the same way as luma. This configuration has become the industry norm for production workflows.

For bandwidth constrained workflows, NDI HX2 shall be used. HX2 offers more coding options than HX as well as equivalent functionality to full bandwidth NDI.

- 1080p50 workflows shall use the h.264 codec configured as follows: details TBD [profile, bitrate, CBR/ABR, GOP size]
- 2160p50 workflows shall use the h.265 codec configured as follows: details TBD [profile, bitrate, CBR/ABR, GOP size]

5.2.3.   SMPTE ST 2022-2 Transport Streams

Two dedicated ST 2022-2 VRFs are configured on NRK AVoIP networks to accommodate 2022-2 Transport Stream traffic which is 2022-7 protected.

The VRF is not orchestrated. Uplink bandwidth is assigned on a case-by-case basis. For example, leaves hosting playout and distribution devices will have a 2022-2 reservation, whereas leaves hosting vision mixers will not.

All ST 2022-2 transport streams must pass EBU/ETSI ETR-290 health checks.

https://www.etsi.org/deliver/etsi_etr/200_299/290/01_60/etr_290e01p.pdf

Multiple TS payload profiles are allowable within the platform. Any new profiles must be captured within this document.
Currently only one profile has been defined.

5.2.3.1. Playout and Distribution TS Format

22/6 Note: This is a template definition which is subject to review confirmation by Playout and Distribution projects

Type	Attribute	Value
Video	Resolution	1920x1080
	Encoding	h.264
	Profile/Level	High@4.0
	Bitrate	35Mbps
	Type	CBR
	Frame Rate	50
	Scan Type	Progressive
	Mode	TFF
	GOP	50
	Colour	4:2:2
	Pixel	1:1
Audio	Encoding	AAC-LC
	Bitrate	256Kbps
	Mode	CBR
	Sample	48KHz
Data	Type 1	SCTE-35 splice_insert & time_signal
		Examples
		1. COM - commercials - splice in/out
		2. LIVE - Live - start/stop
		3. PROGRAM - Program - start/ID/stop.
	Type 2	CEA 708 Captions
	Type 3	etc.
Transport	Type	ST 2022-2 MPEG-2 TS
	Protection	ST 2022-7
	FEC	If required

Table 2 - Playout & Distribution TS Format

6.   Audio

6.1.   Formats and Quantities of Channels per Flow

Audio shall be captured exchanged with a sample frequency of 48kHz and sample accuracy of 24bits.
All production audio within the platform shall be exchanged as uncompressed PCM.
Compressed audio shall be decompressed on ingress to the facility.

Audio shall be exchanged within the platform as 2, 8 or 16 channels flows.

Audio channel assignments shall adhere to the mappings defined in Table 3.

13/6 Note: Surround configurations are proposed and based on notional audio workflows which have not yet been designed. Left and right stereo channels are placed in the same flow as the surround channels to ensure phase coherence, which is unlikely to be possible to achieve using discreete flows. For example, if there's a problem with the decoded Dolby audio of an incoming feed, a sound desk operator can switch cleanly to the stereo mix. Contributions arriving with multichannel audio may need to pass through processing to generate a 16 channel composite flow and two 2 channel stereo to service non-surround/Atmos operations.

Channels per flow	Description	Order of channels in group	Notes
1	Mono	Mono	To support radio workflows
2	mono	Mono, Silent	
2	dual mono	M1, M2	
2	stereo	Left, Right	
8	5.1 surround	LSt, RSt, Lf, Rf, C, LFE, Ls, Rs	Proposed
16	Mixed & Effects	Mix: LSt, RSt, Effects: LSt, RSt, Mix: Lf, Rf, C, LFE, Ls, Rs Effects: Lf, Rf, C, LFE, Ls, Rs	Proposed
16	Atmos e.g. 7.1.4	L, R, C, LFE, Lss, Rss, Lrs, Rrs Ltf, Rtf, Ltr, Rtr, silent, silent, silent, silent	Proposed. Silent channels can be used for commentary objects.

Table 3 - Audio flow channel assignments

6.2.   Transports

The following transports are supported within the platform:

1. SMPTE ST 2110-30
2. SMPTE ST 2110-31

3. Dante
4. NDI

6.2.1. SMPTE ST 2110-30 & 31 Conformance Levels

Table 3 summarises supported ST 2110-30 and -31 profiles used to carry audio data.

Whilst Conformance Level A, 1ms packet timing offers the widest compatibility with AES67 devices, use of 125uS packet timing has been mandated across all channel counts to avoid integration issues. Specifically, not all Receivers are able to concurrently receive multiple audio flows with different packet timings.

#	Level	channels	Timing	Freq	Bits	Notes
ST2110-30 Conformance Levels						
1	C	2	125us	48kHz	24	
2	C	8	125us	48kHz	24	To support 5.1 surround
3	C	16	125us	48kHz	24	To support 16ch hand-off & future Atmos workflows
ST2110-31 Conformance Levels						
4	C	2xAES	125us	48kHz	24	To support coded audio (Dolby ED2 & Dolby Atmos)

Table 4 - Permitted ST 2110-30 & -31 audio formats

6.2.2. NDI

To minimise coding latency and maximise audio quality, full bandwidth NDI (~100Mbps) shall be used for on premises production and, where adequate network bandwidth exists, remote production scenarios. Audio shall be uncompressed.

For bandwidth constrained workflows, NDI HX2 shall be used. NDI HX2 encoders shall be configured to encode audio using the AAC codec, configured at = 128Kbps for stereo pair

7.   Ancillary Data

7.1.   Contribution

Currently no requirements have been identified for the carriage of ancillary data.

7.2.   Playout

Currently no requirements have been identified for the carriage of ancillary data. Within playout, no data is carried in SDI, it's all inserted at the distribution compression stage.

14/6 – Note: Live multi-channel audio workflows may yet require SMPTE ST 2020 metadata, for example to signal the presence/absence of ST 2020 to indicate that a production is in stereo/ 5.1 /Atmos.

NRK Device ST 2110, ST 2059 and NMOS Conformance [20xx-20xx]

601 Platform Standards

1. <u>Contents</u>

2.   <u>Version Control</u>

Rev.	Date	Detail	Author(s)
3.0	17/06/22	First draft release of document for review Alignment with architectural model and AVoIP live media production formats.	GH
3.1	27/06/22	Updates from NRK review: Stig Krokstad, Henning Bernsten, Thomas Berglund, Odd Erling Høgberg, Erik Vold, Dag Gulbrandsen. 1. Added NMOS IS-07 and 09 to optional standards support table. 2. Added mandatory RTP Offset = 0 parameter to ensure AES67 / ST 2110 compatibity. 3. Added requirement for 64 channel flow for certain categories of audio devices.	GH
3.2	17/08/2022	NMOS IS-07, 08 and 10 made mandatory in Section 5 standards tables. Updated link to TR-1001-1. Section 7. Update to IS-04 heartbeat support parameter support. Added section 11. Security, requiring demonstration of robust cyber security practices per EBU r143. Updated diagram in Section 4.	GH
3.3	02/09/2022	Section 9. Point 13 - Added requirement. «It must be possible for a Receiver to subscribe to a multicast group that originates on the same interface (i.e. loopback).» Section 9. Point 8 - Minor adjustment to expected device behaviour.	GH

3.   Introduction

To support the transition to AVoIP production, our industry has created many new standards and built on many existing ones.

To build supportable, interoperable IP production platforms, it is critical that vendors implement these standards in a consistent way. Furthermore, it is necessary that vendors support the specific configuration options within those standards necessary for successful deployment within NRK's AVoIP infrastructure.

This document details the NRK's conformance requirements for AVoIP devices supporting ST 2110, ST 2059 and AMWA NMOS standards.

Broadly speaking, endpoints must adhere to the requirements detailed in EBU Tech 3371 (https://tech.ebu.ch/docs/tech/tech3371.pdf), AMWA NMOS JT-NM_TR-1001 (https://www.jt-nm.org/tr-1001-1) and AMWA NMOS BCP-003 (https://amwa-tv.github.io/nmos/). Additionally, endpoints must adhere to the requirements detailed in this document.

When reviewing the documentation, vendors are requested to state their product compliance by marking the feature "comply" and where more detail is required, describe the current product capability. Where a feature is not currently available within a product, vendors must state their current capability and when the required feature will become available. Where a feature is not relevant to a product, vendors should simply mark it "not applicable". Where a feature will be implemented vendors should mark it "roadmap [delivery date]". Where a vendor has no plans to implement a requested feature, it should be marked "does not comply".

4.   Platform Configuration Overview

NRK's production platform shall be built around two datacentres.

Within each datacentre is all the backend processing equipment required to support operational workspaces (e.g. edit suites, PCRs, MCRs, Tx suites etc) located in different regional offices in Norway.

Regions and datacentres are all connected via a nationwide, high-bandwidth WAN. Additionally, datacentres are directly connected via resilient and diverse high-bandwidth network connections.

Within a datacentre, two independent leaf/spine networks (Fabric A and Fabric B) provide the audio/video switching fabric. A third leaf/spine network provides control and monitoring connectivity. Devices supporting ST 2110 are connected to both A and B networks. Resilient, GPS locked PTP GMs provide ST 2059 profile PTP to network fabrics. Each leaf will be configured as a Boundary Clock (BC). BC's shall select the best clock to lock to. Endpoints shall lock to the local BC.
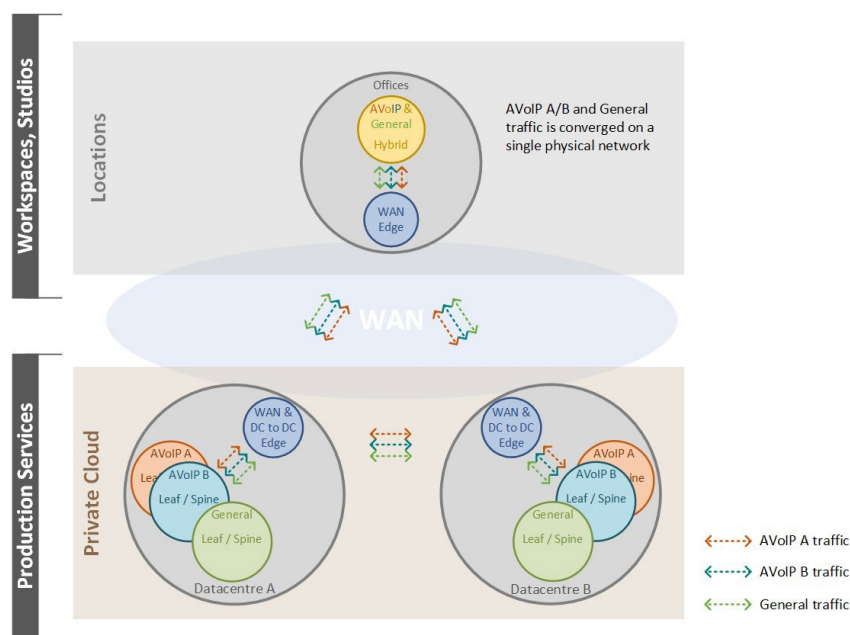
Within a region, control and AVoIP traffic is converged on a single network. The network is virtualised and dedicated AVoIP uplinks between switches create A and B networks and carry ST 2110 traffic. Resilient, GPS locked PTP GMs provide ST 2059 profile PTP to network fabrics. Each leaf will be configured as a Boundary Clock (BC). BC's shall select the best clock to lock to. Endpoints shall lock to the local BC.

Devices deployed across the platform are required to be interoperable across the WAN and between datacentres. The instantaneous path differential (PD) timing for resilient ST 2022-7

flows between the datacentres shall be less than 10ms. Between a datacentre and region, instantaneous path differential timing for resilient ST 2022-7 flows shall be less than 50ms. Receivers must be 2022-7 Class B compliant and be able to tolerate an instantaneous PD of up to 50ms.

Network flows within the DCs and Offices are orchestrated by SDN controllers. No other SDN controllers are permitted within the platform.

All endpoints must support IS-04 for registration/discovery and IS-05 for direct device control. Each datacentre and office shall have a separate IS-04 registry.

5.   Standards

Devices must support the following standards, where applicable:

#	Standard	Title
1	SMPTE ST 2059	SMPTE Profile IEEE-1588 PTP
2	SMPTE ST 2110-10	System Timing and Definitions
3	SMPTE ST 2110-20	Uncompressed Active Video
4	SMPTE ST 2110-21	Traffic Shaping Uncompressed Video
5	SMPTE ST 2110-22	Constant Bit-Rate Compressed Video
6	SMPTE ST 2110-30	PCM Digital Audio
7	SMPTE ST 2110-31	AES3 Transparent Transport
8	SMPTE ST 2110-40	SMPTE ST 291-1 Ancillary Data
9	SMPTE ST 2022-7	Seamless Protection Switching
10	AMWA NMOS IS-04 v1.3.x	Discovery and Registration
11	AMWA NMOS IS-05 v1.1.x	Device Connection Management
12	AMWA NMOS IS-07 v1.0.x	Event & Tally
13	AMWA NMOS IS-08 v1.0.x	Audio Channel Mapping
14	AMWA NMOS IS-10 v1.0.x	Authorization
15	AMWA NMOS BCP-003	Security recommendations for NMOS APIs
16	IEEE 1588v2	Precision Clock Synchronization Protocol for Networked Measurement and Control Systems
17	IEEE 802.1AB	Specifically, the Link Layer Discovery Protocol (LLDP)
18	AES67	High-performance streaming audio-over-IP interoperability
19	IETF RFC 3376	IGMPv3/SSM
20	ISO/IEC 21122	JPEG XS low-latency lightweight image coding system
21	AES-r16-2016	PTP parameters for AES67 and SMPTE ST 2059-2 interoperability
22	VSF TR-08	Transport of JPEG XS Video in ST 2110-22

Table 1. Mandatory standards support

Devices should support the following standards:

#	Standard	Title
1	AMWA NMOS IS-09 v1.0.x	System Parameters
2	SMPTE ST 2110-41	Fast Metadata [when it is released]

Table 2. Optional standards support

6. Exceptions to EBU Tech 3371: Minimum User Requirements to Build and Manage an IP-Based Media Facility Using Open Standards and Specifications

Devices must adhere with the requirements detailed in the latest version of EBU Tech 3371, with the following exceptions:

- I.1.1 Single link video: SMPTE ST 2110-20

  "For simplicity of operation, troubleshooting and optimally dense use of the network, video Media Nodes ~~should~~ **shall** *use single link streams (i.e. Media Nodes should not use SMPTE ST 2110-23). For instance, a single 59.94 Hz UHD stream requires a 25 Gigabit Ethernet (GbE) port and a high-density device (such as a multiviewer or a vision mixer)* ~~should~~ **shall** *take benefit of bi-directional 100 GbE."*

  Please note alterations to text above.

- I.3.1 Universal, multichannel, low latency audio: SMPTE ST 2110-30 Level B

  "In addition to SMPTE ST 2110-30 Level A, which is compatible with all AES67 and 2110-30 devices, audio Senders and Receivers shall support Level ~~B~~ **C** *to support low latency applications* **and future multi-channel audio applications***;"*

  Please note alterations to text above.

- I.4.2 Stream protection with SMPTE ST 2022-7:2018

  "Receivers shall support SMPTE ST 2022-7:2018 Class D with Ultra Low-Skew 150 µs that is adapted to engineered LAN with adding minimal latency"

  Requirement does not apply.

- II.2.1 & II.2.2 PTPv2 configurable within SMPTE and AES profiles

  "PTP parameters of Media Nodes shall be configurable within the union of the ranges covered by the both SMPTE ST 2059-2 profile, the AES67 media profile and the IEEE-1588 default profile so that we can use the Media Nodes for the full range of possible operational scenarios;"
  "However, it is recommended to the users to select an operational point within the range of AES-r16-2016 so that it is compatible with equipment previously delivered on the market that might be limited to one of the two profiles;"

Please ignore. PTP GMs shall be configured with SMPTE ST 2059-2:2021 default parameters. Importantly, in this release of the standard, portDS.logAnnounceInterval has been change from -2 to 0, reducing the frequency of Announce message which enables a common PTP domain for AES67 and ST 2110 devices.

7.   Exceptions to JTNM TR-1001-1:2020 System Environment and Device Behaviours for SMPTE ST 2110 Media Nodes in Engineered Networks

Devices must adhere with the requirements detailed in the latest version of JTNM TR-1001-1:2020, with the following exceptions:

- 10.2.6 NMOS System Parameters (IS-09)

  " Media Nodes ~~shall~~ should use the registry heartbeat_interval value specified in the System API defined in AMWA IS-09 when maintaining their registration."

  Please note alterations to text above.

- 10.3 Multicast Media Streams

  "Media Nodes ~~should~~ shall provide a user mechanism for selecting the DSCP markings of the generated streams."

  Please note alterations to text above.

- 11.2 Media Node Startup and Multicast Addresses

  "The System API defined in IS-09 includes a System ID, which shall be assigned uniquely (e.g. randomly) in each facility. Media Nodes shall store the System ID and their DHCP-assigned address as part of their current operating settings, and shall check at re-start, before generating any multicast outputs, that the current Network Environment's System ID and DHCP-assigned address match the previously stored values. If the current system ID and address are the same as before, then recalling the previous operating settings might be appropriate and safe, subject to the clause below."

  Products should support IS-09.

8. Interoperability

8.1. RTP Payload Values

1. Devices must support SDP configuration.
2. Receiver endpoints must autodetect and select RTP payload values from the Sender SDP file.
3. Devices must support SDP Payload Type values 96 to 127. See Section 6, Table 4 of https://datatracker.ietf.org/doc/html/rfc3551 and Section 6.2 of ST 2110-10.

8.2. Synchronisation, Timing and Latency

1. As defined within ST 2059, all devices shall support IEEE1588-2008. IEEE1588v1 is not supported.
2. Default values within ST 2059-2:2021 shall be used.
3. Devices shall support a hybrid PTP communications model. Sync and Follow_Up (multicast), Delay_Request and Delay Response (Unicast).
4. Devices must be capable of handling asynchronous baseband video and audio inputs. If alignment cannot be achieved, Audio is to be passed through out of sync and an alarm raised.
5. Devices must have an optional "minimum latency" mode, whereby baseband outputs are presented without further frame synchronisation.
6. SMPTE ST 2110-10 mandates that the media clock and the network timebase shall share the SMPTE ST 2059-1 epoch, with an offset of zero between the Media Clock and the RTP Clock, as specified in SMPTE ST 2110-10. All audio devices (specifically AES67) shall adhere to this.

8.3. Traffic Shaping

1. Senders shall adhere to ST 2110-21 'Narrow' or 'Narrow Linear' definitions.
2. If a Sender complies with the 'Wide' definition, vendors must state how 'Wide' the Sender is.
   The SMPTE ST 2110-21 'Wide' definition permits a range of performance levels. For example, whilst one Sender implementation may come very close to meeting 'Narrow' performance, another may meet the widest definition of 'Wide'. Senders marginally outside of the Narrow definition may (subject to testing) be acceptable.
3. Receivers must be ST 2110-21 'Type A' compliant i.e. capable of receiving signals from a type N, NL, or W sender, regardless of the value of the sender's `ts-refclk clksrc` or the sender's `TROFF` parameter value. Vendors must state any device performance implications resulting from supporting 'Wide' flows.

8.4.   Receiver WAN Interoperability

1. Some endpoints will be required to receive 2022-7 protected flows which have originated from a Sender located at another site on NRK's WAN. The instantaneous path differential timing between diverse network paths across the WAN will be greater than 10ms. Devices must meet the 2022-7 "Class B" definition and be capable of handling an instantaneous path differential of up to 50ms.

8.5.   Audio Devices and Endpoints

1. The NRK audio architecture is based around the exchange of 1-channel, 2-channel, 8-channel and 16-channel, 125us ST 2110-30 flows (Conformance Level: C). Audio Senders and Receivers responsible for processing uncompressed PCM audio must be capable of processing flows in these formats.
2. Audio devices required to send or receive flows via trunk links shall support up to 64 channels of audio per flow.
3. The NRK audio architecture also supports the exchange of 2-channel 125us ST 2110-31 flows (Conformance Level : C). Audio Senders and Receivers responsible for processing AES3 signal must be capable of processing flows in this format.
4. An audio Sender which is capable of handling more than 2 channels of audio must be capable of generating multiple 2 channels flows up to the maximum number of channels the device can handle.
5. An audio Receiver which is capable of handling more than 2 channels of audio must be capable of receiving multiple 2110-30 or 31 flows.
6. Receivers capable of receiving multiple 2110-30 multicast groups must be able to receive groups with different channel counts.
7. Receivers capable of receiving multiple 2110-30 multicast groups must be able to shuffle audio as required. Associated with this, support for AMWA IS-08 (future) should be planned as a roadmap feature.
8. All AES67 / ST2110 audio devices shall support 2022-7 on two physical network interfaces.
9. The device must guarantee phase coherence to within two samples between channels in a flow.

9. Device Behaviours

1. Devices must be capable of locking to PTP on both Fabric A and Fabric B network interfaces.
2. Devices must compare PTP sources using the Best Master Clock Algorithm (BMCA) defined in IEEE 1588-2008 to compare BC's on Fabric A and Fabric B and lock to the best BC.
3. In normal operation, the BC that an endpoint locks to on each of its network interfaces will be equal. In the event of a tie, the device shall use the BMCA algorithm defined in IEEE 1588-2008 to determine which interface to take time from.
4. Should a device lose lock to the BC it is currently syncing to, it must transparently failover to the PTP source on its other network interface and be capable of failing back when service is restored. This process must have zero impact on the performance of the endpoint from a user perspective.
5. A device which has lost connectivity to one fabric for a prolonged period (e.g. due to a leaf failure) will receive many routing requests during the outage, which it won't be able to fulfill on the failed link. On recovery of a failed network interface, a device shall re-acquire the current set of multicast groups to which it is subscribed. Historic subscription requests which were requested during the outage, and which have been superseded by newer requests shall be discarded. Historic route requests which have not been superseded shall be automatically acquired.
6. The possibility exists that a fault may arise which causes an endpoint to lose one flow from a logical group of flows (e.g. the audio, video or ancillary) on one or both network connections.
   a. If the route is still current, an endpoint must re-acquire the multicasts transparently when the flow(s) are reestablished.
   b. The loss and recovery process must not affect the stability of the endpoint. E.g. loss of the video flow shall mean that the endpoint shall display optionally black, freeze frame or another still image with the audio and any ancillary data continuing.
   c. Loss of an audio stream shall mute relevant channels, until such time as the flow is restored. Whilst audio must be restored as quickly as possible, this must not result in loud clicks or pops as the audio is reacquired.
7. The possibility exists that an endpoint may become flooded with multicast traffic. Once the flood is resolved, the endpoint must remain stable and recover all current multicast groups it should be subscribed to without user intervention.
8. Devices are not permitted to create a 1:1 relationship between a multicast receiver and a device input. NRK may wish to present the audio within a multicast to multiple device inputs simultaneously. It is not possible for a network interface to subscribe to the same multicast more than once. An endpoint which is capable of receiving multiple flows and presenting them to an application must also be capable of internally routing the same IP input stream to all application inputs. In

such a situation, all receivers must report the 'actual' sender, rather than an any internally replicated source which may be used to work around the limitations of multicast.

9. Endpoints must reliably exchange SMPTE ST 2110 compliant flows with endpoints from other manufacturers.

10. Devices must not place any restrictions on the multicast group address assignment. e.g. restricting to 239.x.x.x.

11. Devices must allow the TTL parameter to be user configurable.

12. Devices must support SSM.

13. It must be possible for a Receiver to subscribe to a multicast group that originates on the same interface (i.e. loopback).

14. Signal handling or processing performance should not be directly connected to the load on the API endpoints. I.e. excessive requests rates, malformed packages or other unexpected connections to the APIs should not interfere with the continuous operation of the device.

10. Control

1. Devices must be directly controllable via an NMOS API, rather than via separate API gateway server.
2. Devices shall support NMOS IS-04 v1.3 and IS-05 v1.1.
3. Devices shall support NMOS IS-07 v1.0.x.
4. Devices shall implement the BCP-002 `GroupHint` tag.
5. Devices shall support BCP-003 to provide secure communications.
6. Where in-band control is supported, devices shall allow NMOS control on both A and B NICs simultaneously. It is unacceptable for a device to bind NMOS control to one NIC or the other.
7. NMOS UIDs must not be derived from replaceable device components. For example, replacing a NIC should not result in the generation of new UIDs.

10.1. Device Performance

A logical source may consist of multiple Senders associated with multiple Devices / Nodes (typically a video, multiple audio and multiple data flows) and a logical destination may optionally select from flows from multiple Senders associated with multiple Devices / Nodes. In a ST 2110 based platform, a lot of messaging between systems must take place between systems to establish connectivity between a logical source and logical destination. To avoid unacceptably slow connection request response times, it is therefore important that control systems and devices process commands as quickly as possible and communicate with other systems efficiently.

Though other protocols are supported (RTP and MQTT), in practice the majority of NMOS implementations use the WebSockets protocol for message exchange. WebSocket connections are slow. Establishing a connection can take ~200ms and requests ~80ms to complete. It is therefore easy to see how (without careful optimisation) subscribing a device to multiple audio, video and data flows could take seconds to complete and a salvo to a multiviewer, vision mixer or audio mixer might take significantly longer.

1. Devices shall provide support for IS-05 "bulk" connection requests.
2. Devices shall process individual connection requests within a bulk connection request in parallel.
3. The Supplier shall state how long it takes a Receiver to process a bulk request containing ten connections.

10.2. Decvice Configuration

A large broadcaster can expect to deploy hundreds of thousands of Sender and Receiver endpoints on a ST 2110 based platform. To be able to effectively manage the configuration of a platform, it is a fundamental requirement for control systems to be able to accurately identify

equipment which is added to the system. Presently there is currently no simple and standardised way within NMOS to identify which endpoints belong to which physical device. For example, if ten ingest servers are added to a rack and announce themselves to a registry, there is no simple way to identify which NMOS IDs belong to which server and to link device and endpoint IDs back into a wider platform configuration model.

Whilst some products populate Resource `Label` or Description properties with descriptive information there is no consistency between products (in some cases even when the products are from the same Supplier). Furthermore, information inserted in these properties is often unsuitable for linking NMOS IDs into a platform configuration model (Figure 1).

Figure 1 - Meaningless endpoint identification

Fortunately, there is a simple way to resolve this, by adding a structured foreign key into the `Label` property of a Resource.

1. Devices shall support the insertion of a configurable foreign key into the Label property of a Resource (Figure 2). This might be via a Suppliers online configuration tool, or configuration file.

Figure 2 - Meaningful device identification, with configurable label field

The idea is that every Resource is labelled using a human-recognisable string, with all data in a single field. For example:

NMOS `Label` Format:

Node (Design ID)_NaturalGrouping (Endpoint Direction & Count)_MediaCounter (Media Type & Count)

Which translates to:

17101/POENG/235#01_r01_v01

It should be noted that the format of the string placed with the `Label` property may change between installations.

2. The device shall place no constraints of the structure of the `Label` property.
3. The device shall place no constraints on characters within the `Label` property
4. The `Label` property shall support string at least 32 characters wide.
5. The `Label` property shall persist between device reboots. Note that this applies to both virtual and physical devices.

10.3. Multiformat

One of the key benefits to broadcasters of the transition to IP is that the data transmission technology (the professional media network) is format agnostic, allowing rapid adoption of new media formats and multiple media formats to coexist on the same network fabric. Such flexibility requires care be taken when defining platform control system design and philosophy.

Increasingly, devices are becoming reconfigurable to be able to create and consume a broad range of compressed and uncompressed media formats, each with very different bandwidth requirements. Such flexibility presents challenges to platform management.

To ensure the correct operation of a large professional media network, it is critical that the opportunity for unsolicited flows to get onto the network is minimised. Furthermore, it is important to be able to detect and set correct Sender and Receiver format configuration.

1. The device shall provide an API call to report and set Sender and Receiver format configuration.
2. The Supplier shall explain how the device presents Senders and Receivers via NMOS when Sender / Receiver format/bandwidth is changed and how this relates to the internal processing capabilities of the device. For example, when switching between 1080i25/1080p50 and 2160p50 modes, several different behaviours have been observed, including:
   a. The device presents different sets of NMOS UIDs for UHD and 3G modes.
   b. Existing NMOS UIDs are retained but three out of four UIDs are invalidated.

11.   Security

Suppliers must demonstrate that processes are in place to:
    a.   Minimise the risk of product / service vulnerabilities and;
    b.   Minimise the risk that of professional or support services exposing NRK to threats

Suppliers are expected to review EBU r143 and complete columns A and B of the R 143 Security Controls Assertation.

SUPPLIER SECURITY REQUIREMENTS

Version	0.9
Issued	14.09.2022
Classification	NRK Public

Contents

1   INTRODUCTION

This document establishes minimum security standard required for suppliers to meet appropriate organisational and technical measures, to help ensure the confidentiality, integrity, and accessibility of NRK's data and information technology environment.

All requirements are based on ISO/IEC 27001:2018 *Information Security Management Systems*, and *Cybersecurity for Media Vendor Systems, Software & Services*, which is a standard (R 143, 2020) developed by the European Broadcasting Union (EBU).

2   SCOPE

The scope of this document includes any suppliers that process or have access to NRK's data. This includes, but not limited to:

- Suppliers that process, access, hold or transmit data for NRK.
- Suppliers that have access to NRK's physical sites or IT systems.

Suppliers must demonstrate compliance with each of the requirements below in Section 3 *Organisational measures*.

Suppliers providing software, middleware, hardware, platforms, or other systems and/or components integrated with, or connected to, NRK's information technology environment, must also comply with Sections 4 *Technical Measures* of this document.

3   ORGANISATIONAL MEASURES

#	Description	Fully meets	Partially meets	Don´t support	Comment
1	**Security Governance** The supplier must have a security policy that is regularly evaluated and updated.				
2	**Risk Management** The supplier must identify risks that are caused by its services and provide mitigating measures.				
3	**Personnel Security** The supplier must ensure that all personnel who will have access to any of NRK's sites or data, are screened prior to engagement.				
4	**Supply Chain** The supplier must ensure that their subcontractors is compliant with the measures in this document.				

4   TECHNICAL MEASURES

#	Description	Fully meets	Partially meets	Don´t support	Comment
5	**Vulnerability Management** The supplier must ensure that a vulnerability management process is in place to keep track of identified vulnerabilities and patches that may fix them.				
6	**Security Testing** The supplier must perform regular technical security analysis such as penetration or vulnerability testing of the service.				
7	**Incident Management** The supplier must have an incident response procedure implemented. To collect security events, technical controls must be established.				
8	**Incident Reporting** The supplier must have a documented process in place to notify NRK when a security incident occurs.				
9	**Disaster Recovery** The supplier must have appropriate backup procedures implemented, and recovery plans that are tested.				
10	**Access Control** The supplier must ensure that their services support role based access control and NRK's Single Sign On (SSO).				
11	**Data Encryption** The suppliers must have an established method of encrypting sensitive data in storage and in transit following industry best practice.				
12	**Change Management** The supplier must ensure that changes of the services are controlled and authorised through a formal, documented process.				
13	**Separation of Environments** The supplier must ensure that production, test, and development environments are kept separate.				
14	**Segregation of Customer Data** The supplier must have in place appropriate segregation of customer data where it is being				

	stored or processed in a multi-tenanted environment.			
15	**Physical Security** The supplier must have established access control and necessary physical security of its premises.			
16	**Personal Data** The supplier must disclose if personal data is being processed outside of the EEA.			

SSA-T Appendix 2

Contractor solution specification
Multi-channel Continuity automation and playout
NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Attachments

Attachment 1-3: NRK Supplier Security Requirements

1   INTRODUCTION

This Appendix contains the Contractor's specification of the solution in accordance with the objectives, needs, requirements and instructions as described and specified by the Customer in Appendix 1.

2   BACKGROUND AND PURPOSE

Please refer to the corresponding chapter in Appendix 1.

3   SCOPE OF PROCUREMENT

Please refer to the corresponding chapter in Appendix 1.

4   HIGH-LEVEL SOLUTION OVERVIEW

[The Contractor's response in accordance with the instructions in Appendix 1 chapter 4 to be inserted here.]

5   USER REQUIREMENTS SPECIFIC TO AUTOMATION/PLAYOUT

5.1   Roles

Please refer to the corresponding section in Appendix 1.

5.2   Actor overview

Please refer to the corresponding section in Appendix 1.

5.3   Glossary

Please refer to the corresponding section in Appendix 1.

5.4   Linear channel structure

Please refer to the corresponding section in Appendix 1.

5.5   Case examples

Please refer to the corresponding section in Appendix 1.

5.6   User stories

5.6.1   Schedule and playlist import, export and manipulation

5.6.1.1   Quality control of coming schedules

a)   *As a continuity producer, I need to be able to verify playout of the programs planned in Whats´On, so that I can do quality control, check timecodes, preview transitions,*

adjust secondary events and in/out-points in the schedule days before the schedule is to go on air.

[The Contractor's response to be inserted here.]

5.6.1.2   Daily, continuous transfer of schedules

a) *As a continuity producer, I want to get the schedule from What's On for a given channel and day/time-period imported into the currently active playlist for the channel without disrupting the ongoing schedule, so that I may get the planned content on air.*

[The Contractor's response to be inserted here.]

5.6.1.3   Playlist manipulation and functionality for a live program schedule

a) *As a continuity producer, I want newly added events to be cued and ready for playout with minimal delay and latency so that I may handle live show transitions with high accuracy.*

[The Contractor's response to be inserted here.]

b) *As a continuity producer, I want manual take of file and live events to happen with minimal delay and latency so that I may handle live show transitions with high accuracy.*

[The Contractor's response to be inserted here.]

c) *As a continuity producer, I want to be able to interrupt planned, already started programs with other elements/programs/events, and then afterwards be able to go back to resume the originally planned program, so that I may handle breaking news and unplanned intermissions without manually re-adding the rest of the interrupted event and corresponding secondary events.*

[The Contractor's response to be inserted here.]

d) *As a continuity producer, I want to be able to switch the live source of a program/event currently on air in the automation, so that I may handle unplanned problems with the incoming signal without having to duplicate or change the scheduled program or routing incoming signals manually.*

[The Contractor's response to be inserted here.]

e) *As a continuity producer, I want to be able to preview and possibly change the source of a playlist element before it goes on air, so that I may quickly correct a live or file source.*

[The Contractor's response to be inserted here.]

f) *As a continuity producer, I want to have one or more readily available multiple, sortable, searchable shortlists, shotboxes or playlists with multi-purpose teasers, promos and other content, so that I may quickly fill gaps or re-schedule slots in the playlist with appropriate content.*

[The Contractor's response to be inserted here.]

g) *As a continuity producer, I need to be able to program event-timings such as manual take, on-time, hold etc so that I can handle complex schedules with mixed live and pre-programmed content.*

[The Contractor's response to be inserted here.]

h) *As a continuity producer, I need to be able to search and find media in the MAM and/or scheduling system (Whats´On) and quickly add it to playlist or shortlists.*

[The Contractor's response to be inserted here.]

i) As a continuity producer, I need to be able to quickly search and find media assets in the scheduling system (Whats´On) without media, so that I may assign this product/media-id to a new live event.

[The Contractor's response to be inserted here.]

j) As a continuity producer, I want to be able to make manual notes on the individual events in the playlist, so that I remember important details about upcoming elements.

[The Contractor's response to be inserted here.]

5.6.1.4 Secondary events and signalling

As a continuity producer, I want pre-planned secondary events to follow from the scheduling system into the automation playlist on import, so that I don't have to manually add them after import.

a) As a continuity producer, I want to be able to manually add, edit and remove secondary events in the automation playlist – both the locally created and any imported from the scheduling system.

[The Contractor's response to be inserted here.]

b) As a systems developer I want to be able to control external systems through custom secondary events, so that I may solve future workflows in a way that is visible and controllable by the continuity producers.

[The Contractor's response to be inserted here.]

c) As a continuity producer I want certain elements to automatically get some pre-defined secondary events, like "live"-graphics, logo/bug-graphics or other general control-events.

[The Contractor's response to be inserted here.]

5.6.2 Regional switchover and time-sharing of channels

a) As a continuity producer, I would like to have a strongly defined concept of break-away for regional transmissions visible in the automation system, so that I may easily control the start/stop of the break-away and handle schedule changes and exceptions to the rules more easily.

[The Contractor's response to be inserted here.]

b) As a continuity producer, I would like to have a strongly defined concept of break-away/time sharing for the NRK3/NRK Super channels, so that I may more easily adjust the timing of the switchover.

[The Contractor's response to be inserted here.]

5.6.3 Media and MAM-integration

a) As a continuity producer, I want to be able to adjust the in- and out-points of file-based content, so that I may trim the transitions in and out of the program.

[The Contractor's response to be inserted here.]

b) As a continuity producer, I want the automation system to automatically fetch media from the main MAM-system whenever a program/teaser/promo/file is needed in a playlist – whether it is inserted manually or through playlist import, so that I don't have to manually trig transfer of media.

[The Contractor's response to be inserted here.]

c) *As an operations engineer I want the system to do automatic housekeeping of internal media caches (if present), so that I don't have to manually herd the media storage.*

[The Contractor's response to be inserted here.].

d) *As a continuity producer I want to be able to put late-arriving file-based media on air quickly, without having to wait for file transfer.*

[The Contractor's response to be inserted here.]

e) *As a continuity producer, I want to be able to play all video formats currently in NRKs archive in the same playlist.*

[The Contractor's response to be inserted here.]

f) *As a continuity producer, I want to be able to override the aspect ratio of file based elements.*

[The Contractor's response to be inserted here.]

5.6.4 Recording

a) *As a continuity producer, I want programs to be flagged for recording based on playlist metadata, so that I don't have to manually mark live-programs for recording.*

[The Contractor's response to be inserted here.]

b) *As an operations engineer I need to be able to configure where in the chain the recordings are done, typically clean-feed (before any graphics layers) and with programme graphics (see 5.6.12.1 Overview of graphic elements), so that I may store material for both re-runs and as source material.*
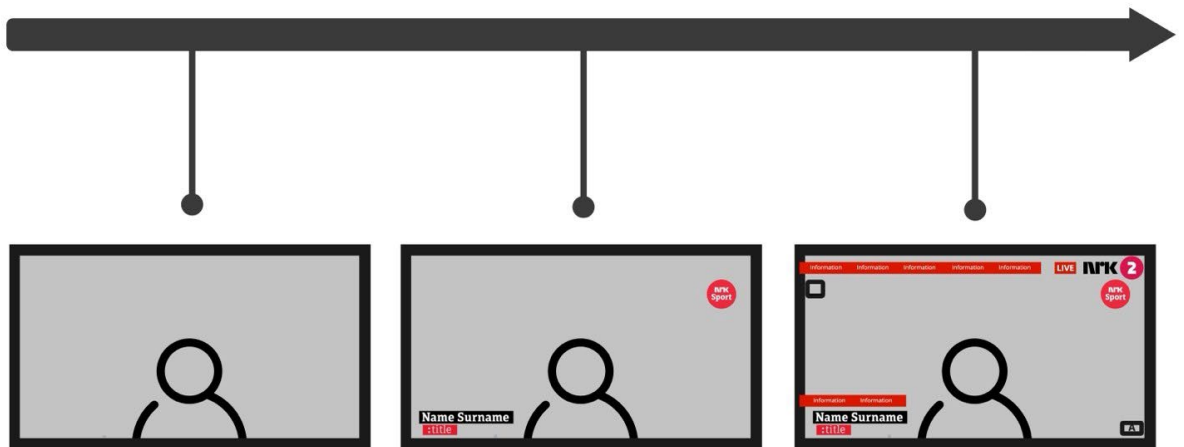
Figure 1 - Recording products

[The Contractor's response to be inserted here.]

c) *As a continuity producer, I want to be able to easily see what programs are scheduled for recording, what name/id the program will receive upon recording and easily toggle recording for a particular program on and off, so that I may control what live-programs are recorded.*

[The Contractor's response to be inserted here.]

d) *As a continuity producer, I want recorded content to be automatically transferred to the MAM-system for ingest as default, preferably through API-integration and not watchfolders, so that I may get all recorded programs ingested into the MAM and be confident that the files are actually picked up and processed.*

[The Contractor's response to be inserted here.]

e) *As a continuity producer, I sometimes want to cancel a recording – even after it has started.*

[The Contractor's response to be inserted here.]

f) *As a continuity producer, I sometimes want to adjust in- and out-points of recordings – after they have ended.*

[The Contractor's response to be inserted here.]

g) *As a continuity producer, I want to be able to change the name and/or id of a recording either before event-start or during the event, so that manually inserted live-events may get connected to a valid programme/media asset in the MAM and scheduling system upon transfer of the media and later reconciliation of the playlist.*

[The Contractor's response to be inserted here.]

h) *As a continuity producer I want to be able to playout files while they are recorded, so that I may put on air time-shifted programs on another channel/port.*

[The Contractor's response to be inserted here.]

5.6.5 Audio

a) *As a continuity producer, I want to be able to adjust the audio levels and balance between announcer/host and program sound (live or preproduced)*

[The Contractor's response to be inserted here.]

b) *As a continuity producer, I want to be able to adjust the audio levels and balance with physical faders and/or touch-screen faders.*

[The Contractor's response to be inserted here.]

5.6.6 Signal-monitoring, preview and quality control

a) *As a continuity producer, I want to preview and pre-listen to live-sources, video and audio files planned in the schedule, so that I may be confident in what will be broadcast when the event goes on air.*

[The Contractor's response to be inserted here.]

b) *As a continuity producer or operations engineer, I want to monitor the signal in the playout chain at arbitrary point, enabling me to identify any signal or quality problems related to individual processing steps in the chain.*

[The Contractor's response to be inserted here.]

c) *As a continuity producer I want to have the most important countdown clocks for the main readily available in the user interface, so that I may follow countdown to next program, countdown to next element with any errors (missing media, subtitles).*

[The Contractor's response to be inserted here.]

d) *As a continuity producer I want to have the most important countdown clocks for the main channels available on separate, physical displays, so that I may follow countdown to next program even when not in front of the main client.*

[The Contractor's response to be inserted here.]

5.6.7 System-monitoring, events and alarms

a) *As a continuity producer, I want an easily readable overview of any media or content related anomalies or errors in the system, such as missing or invalid media, missing subtitle files or loss of incoming video/audio, so that I may focus on issues that require*

my attention instead of wasting time on everything that is working and playing out as intended.

[The Contractor's response to be inserted here.]

b) *As an operations engineer, I want to get early warnings and alarms for anomalies and system errors – preferably through established services for systems monitoring and maintenance, so that I may tend to the system and maintain system stability without having to manually check dashboards.*

[The Contractor's response to be inserted here.]

c) *As an operations engineer, I want logs to be externally available for aggregation or automatically sent to log analysis services like Kibana or Grafana Loki, so that I may consolidate, search, and compare logs across the whole system.*

[The Contractor's response to be inserted here.]

5.6.8 Multi-channel user experience

a) *As a continuity producer I want an easily accessible overview/timeline of at least all the main channels in the system, so that I may at a glance verify the schedule and state of what is currently playing out.*

[The Contractor's response to be inserted here.]

b) *As a continuity producer I want to be able to copy or move programs between channels, so that I may easily offload programs (including any secondary event and subtitle information) on other channels in case of breaking news or live show running late*

[The Contractor's response to be inserted here.]

c) *As a continuity producer I want to be able to easily switch between controlling different channels – either directly in the client or by switching user interface – so that I may control several channels form same physical location.*

[The Contractor's response to be inserted here.]

d) *As a continuity producer or operational engineer, I want the number of automation and playout channels to be flexible – either as a built-in feature or through automated instantiation and provisioning, so that I may add short lived channels when the need arises without having to run a purchase process.*

[The Contractor's response to be inserted here.]

5.6.9 Master control surfaces

a) *As a newsroom producer, I want to be able to get the news studio on-air during nighttime in case of breaking news situations. The Presentation suite/Main continuity centre is unattended in the period between 01:00-06:00.*

[The Contractor's response to be inserted here.]

b) *If the system includes any master control surface capabilities, please describe the functionality – including any dynamic user interface controls (information feedback from integrated system), macros, automation, salvos or scripting if available.*

[The Contractor's response to be inserted here.]

5.6.10 Accessibility services

a) *As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.*

[The Contractor's response to be inserted here.]

b) *As a continuity producer, I want to be able to preview video with subtitling planned in the schedule, so that I may be confident in that the correct subtitles goes on air in sync with the video.*

[The Contractor's response to be inserted here.]

c) *As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.*

[The Contractor's response to be inserted here.]

d) *As a continuity producer, I want to easily add, edit, and remove subtitle file association, so that I may fix file name errors, switch file associated with a program or remove the subtitle from playout.*

[The Contractor's response to be inserted here.]

e) *As a continuity producer, I want the changes I make to a subtitle entry to be effectuated by the system and sent to the subtitling system, even if the program has already started, so that I may fix or adjust subtitle associations even while the event is playing out.*

[The Contractor's response to be inserted here.]

f) *As a continuity producer, I want the system to show whether subtitle files are missing or present and detect if they appear – even after a program has started playing out, so that a late-arriving subtitle file may be played out as soon as it arrives.*

[The Contractor's response to be inserted here.]

5.6.11 Graphics

5.6.11.1 Some graphics layers and templates in use

Please refer to the corresponding section in Appendix 1.

5.6.11.2 Control of graphic elements

a) *As a continuity producer, I need a good view of the planned, automatic graphics in the timeline and the state of the downstream keyers at any time.*

[The Contractor's response to be inserted here.]

b) *As a continuity producer, I need to be able to manually put graphics sources on and off air, and a clear view of the state of the keyers*

[The Contractor's response to be inserted here.]

c) *As a continuity producer, I want secondary events from the scheduling system to control graphical elements like live-bugs and age rating logos.*

[The Contractor's response to be inserted here.]

d) *As a continuity producer, I would like to be able to create NORA-rendered graphics event on the timeline and fill in metadata based on templates.*

[The Contractor's response to be inserted here.]

5.7 Matrix - User stories vs iterations

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
5.6.1 Schedule and playlist import, export and manipulation												
5.6.1.1 Quality control of coming schedules												
a) As a continuity producer, I need to be able to verify playout of the programs planned in Whats´On, so that I can do quality control, check timecodes, preview transitions, adjust secondary events and in/out-points in the schedule days before the schedule is to go on air.		X	X									
5.6.1.2 Daily, continuous transfer of schedules												
a) As a continuity producer, I want to get the schedule from What's On for a given channel and day/time-period imported into the currently active playlist for the channel without disrupting the ongoing schedule, so that I may get the planned content on air.	X	X	X									
5.6.1.3 Playlist manipulation and functionality for a live program schedule												
a) As a continuity producer, I want newly added events to be cued and ready for playout with minimal delay and latency so that I may handle live show transitions with high accuracy.	X	X	X									
b) As a continuity producer, I want manual take of file and live events to happen with minimal delay and latency so that I may handle live show transitions with high accuracy.	X	X	X									
c) As a continuity producer, I want to be able to interrupt planned, already started programs with other elements/programs/events, and then afterwards be able to go back to resume the originally planned program, so that I may handle breaking news and unplanned intermissions without manually re-adding the rest of the interrupted event and corresponding secondary events.		X	X									
d) As a continuity producer, I want to be able to switch the live source of a program/event currently on air in the automation, so that I may handle	X	X	X									

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
unplanned problems with the incoming signal without having to duplicate or change the scheduled program or routing incoming signals manually.												
e) As a continuity producer, I want to be able to preview and possibly change the source of a playlist element before it goes on air, so that I may quickly correct a live or file source.	X	X	X									
f) As a continuity producer, I want to have one or more readily available multiple, sortable, searchable shortlists, shotboxes or playlists with multi-purpose teasers, promos and other content, so that I may quickly fill gaps or re-schedule slots in the playlist with appropriate content.		X	X									
g) As a continuity producer, I need to be able to program event-timings such as manual take, on-time, hold etc so that I can handle complex schedules with mixed live and pre-programmed content.	X	X	X									
h) As a continuity producer, I need to be able to search and find media in the MAM and/or scheduling system (On) and quickly add it to playlist or shortlists.		X	X									
i) As a continuity producer, I need to be able to quickly search and find media assets in the scheduling system (Whats´On) without media, so that I may assign this product/media-id to a new live event.		X	X									
j) As a continuity producer, I want to be able to make manual notes on the individual events in the playlist, so that I remember important details about upcoming elements.		X	X									
5.6.1.4 Secondary events and signaling												
a) As a continuity producer, I want pre-planned secondary events to follow from the scheduling system into the automation playlist on import, so that I don't have to manually add them after import.		X	X									
b) As a continuity producer, I want to be able to manually add, edit and remove secondary events in	X	X	X									

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
the automation playlist – both the locally created and any imported from the scheduling system.												
c) As a systems developer I want to be able to control external systems through custom secondary events, so that I may solve future workflows in a way that is visible and controllable by the continuity producers.	X	X	X									
d) As a continuity producer I want certain elements to automatically get some pre-defined secondary events, like "live"-graphics, logo/bug-graphics or other general control-events.	X	X	X									
5.6.2 Regional switchover and time-sharing of channels												
a) As a continuity producer, I would like to have a strongly defined concept of break-away for regional transmissions visible in the automation system, so that I may easily control the start/stop of the break-away and handle schedule changes and exceptions to the rules more easily.			X									
b) As a continuity producer, I would like to have a strongly defined concept of break-away/time sharing for the NRK3/NRK Super channels, so that I may more easily adjust the timing of the switchover.		X										
5.6.3 Media and MAM-integration												
a) As a continuity producer, I want to be able to adjust the in- and out-points of file-based content, so that I may trim the transitions in and out of the program.		X	X									
b) As a continuity producer, I want the automation system to automatically fetch media from the main MAM-system whenever a program/teaser/promo/file is needed in a playlist – whether it is inserted manually or through playlist import, so that I don't have to manually trig transfer of media.	X	X	X									
c) As an operations engineer I want the system to do automatic housekeeping of internal media caches (if present), so that I don't have to manually herd the media storage.		X	X									

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
d) As a continuity producer I want to be able to put late-arriving file-based media on air quickly, without having to wait for file transfer.		X	X									
e) As a continuity producer, I want to be able to play all video formats currently in NRKs archive in the same playlist.		X	X									
f) As a continuity producer, I want to be able to override the aspect ratio of file based elements.		X	X									
5.6.4 Recording												
a) As a continuity producer, I want programs to be flagged for recording based on playlist metadata, so that I don't have to manually mark live-programs for recording.	X	X	X									
b) As an operations engineer I need to be able to configure where in the chain the recordings are done, typically clean-feed (before any graphics layers) and with programme graphics (see 5.6.12.1 Overview of graphic elements), so that I may store material for both re-runs and as source material.	X	X	X									
c) As a continuity producer, I want to be able to easily see what programs are scheduled for recording, what name/id the program will receive upon recording and easily toggle recording for a particular program on and off, so that I may control what live-programs are recorded.	X	X	X									
d) As a continuity producer, I want recorded content to be automatically transferred to the MAM-system for ingest as default, preferably through API-integration and not watchfolders, so that I may get all recorded programs ingested into the MAM and be confident that the files are actually picked up and processed.	X	X	X									
e) As a continuity producer, I sometimes want to cancel a recording – even after it has started.	X	X	X									
f) As a continuity producer, I sometimes want to adjust in- and out-points of recordings – after they have ended.	X	X	X									
g) As a continuity producer, I want to be able to change the name and/or id of a recording either	X	X	X									

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
before event-start or during the event, so that manually inserted live-events may get connected to a valid programme/media asset in the MAM and scheduling system upon transfer of the media and later reconciliation of the playlist.												
h) As a continuity producer I want to be able to playout files while they are recorded, so that I may put on air time-shifted programs on another channel/port.	X	X	X									
5.6.5 Audio												
a) As a continuity producer, I want to be able to adjust the audio levels and balance between announcer/host and program sound (live or preproduced)	X	X	X									
b) As a continuity producer, I want to be able to adjust the audio levels and balance with physical faders and/or touch-screen faders.	X	X	X									
5.6.6 Signal-monitoring, preview and quality control												
a)As a continuity producer, I want to preview and pre-listen to live-sources, video and audio files planned in the schedule, so that I may be confident in what will be broadcast when the event goes on air.	X	X	X									
b) As a continuity producer or operations engineer, I want to monitor the signal in the playout chain at arbitrary point, enabling me to identify any signal or quality problems related to individual processing steps in the chain.	X	X	X									
c) As a continuity producer I want to have the most important countdown clocks for the main readily available in the user interface, so that I may follow countdown to next program, countdown to next element with any errors (missing media, subtitles).	X	X	X									
d) As a continuity producer I want to have the most important countdown clocks for the main channels available on separate, physical displays, so that I may follow countdown to next program even when not in front of the main client.		X	X									

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
5.6.7 System-monitoring, events and alarms												
a) As a continuity producer, I want an easily readable overview of any media or content related anomalies or errors in the system, such as missing or invalid media, missing subtitle files or loss of incoming video/audio, so that I may focus on issues that require my attention instead of wasting time on everything that is working and playing out as intended.	X	X	X									
b) As an operations engineer, I want to get early warnings and alarms for anomalies and system errors – preferably through established services for systems monitoring and maintenance, so that I may tend to the system and maintain system stability without having to manually check dashboards.	X	X	X									
c) As an operations engineer, I want logs to be externally available for aggregation or automatically sent to log analysis services like Kibana or Grafana Loki, so that I may consolidate, search and compare logs across the whole system.	X	X	X									
5.6.8 Multi-channel user experience												
a) As a continuity producer I want an easily accessible overview/timeline of at least all the main channels in the system, so that I may at a glance verify the schedule and state of what is currently playing out.		X	X									
b) As a continuity producer I want to be able to copy or move programs between channels, so that I may easily offload programs (including any secondary event and subtitle information) on other channels in case of breaking news or live show running late		X	X									
c) As a continuity producer I want to be able to easily switch between controlling different channels – either directly in the client or by switching user interface – so that I may control several channels form same physical location.	X	X	X									
d) As a continuity producer or operational engineer I want the number of automation and playout channels to be flexible – either as a built in feature or through automated instantiation and	X											

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
provisioning, so that I may add short lived channels when the need arises without having to run a purchase process.												
5.6.9 Master control surfaces												
a) As a news room producer, I want to be able to get the news studio on-air during night time in case of breaking news situations. The Presentation suite/Main continuity centre is unattended in the period between 01:00-06:00.			X									
b) If the system includes any master control surface capabilities, please describe the functionality – including any dynamic user interface controls (information feedback from integrated system), macros, automation, salvos or scripting if available.	X	X	X									
5.6.10 Accessibility services												
a) As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.		X	X									
b) As a continuity producer, I want to be able to preview video with subtitling planned in the schedule, so that I may be confident in that the correct subtitles goes on air in sync with the video.		X	X									
c) As a continuity producer, I want the subtitle file information from the scheduling system to follow through to playout events, so that subtitles are automatically played back by the Polistream system.		X	X									
d) As a continuity producer, I want to easily add, edit and remove subtitle file association, so that I may fix file name errors, switch file associated with a program or remove the subtitle from playout.		X	X									
e) As a continuity producer, I want the changes I make to a subtitle entry to be effectuated by the system and sent to the subtitling system, even if the program has already started, so that I may fix or adjust subtitle associations even while the event is playing out.		X	X									
f) As a continuity producer, I want the system to show whether subtitle files are missing or present		X	X									

User story	Iteration 1	Iteration 2	Iteration 3	Requirement fulfilment								The Contractor's Solution Description
	Streaming Channels	NRK2/3	NRK1	STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
and detect if they appear – even after a program has started playing out, so that a late-arriving subtitle file may be played out as soon as it arrives.												
5.6.11 Graphics												
5.6.11.2 of graphic elements												
a) As a continuity producer, I need a good view of the planned, automatic graphics in the timeline and the state of the down stream keyers at any time.	X	X	X									
b) As a continuity producer, I need to be able to manually put graphics sources on and off air, and a clear view of the state of the keyers	X	X	X									
c) As a continuity producer, I want secondary events from the scheduling system to control graphical elements like live-bugs and age rating logos.	X	X	X									
d) As a continuity producer, I would like to be able to create NORA-rendered graphics event on the timeline, and fill in metadata based on templates.	X	X	X									

5.8   Non-discriminatory Solution

[The Contractor's response to be inserted here.]

6   SOLUTION ARCHITECTURE REQUIREMENTS

6.1   Separation of user interface and computing

[The Contractor's response to be inserted here.]

6.2   High availability (HA) and resilience

[The Contractor's response to be inserted here.]

6.3   Installation and deployment strategies

[The Contractor's response to be inserted here.]

6.4   Stateful and stateless components, backup

[The Contractor's response to be inserted here.]

6.5   Information architecture – Data model

[The Contractor's response to be inserted here.]

6.6   Cloud/hybrid/on-premises solutions

[The Contractor's response to be inserted here.]

7 TECHNICAL REQUIREMENTS

7.1 Physical interfaces

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The equipment should be mountable in 19in racks.									
2	The Contractor should specify the dimensions of the equipment (WxDxH).									
3	The Contractor must specify the total physical space in terms of rack units (excluding client pc's).									
4	The Contractor must specify the total maximum and average power consumptions of the system (excluding client pc's).									
5	The Contractor must specify the required cooling capacity to cool the entire system (excluding workstations).									
6	All devices (including auxillary devices) part of the delivery should be listed in Appendix 7.									
7	Specify any operational environmental requirements (temperature/humidity) for the equipment									
8	Specify airflow and any special needs regarding mounting and cooling.									
9	All equipment must bear the CE marking for declaration of conformity and meet the current applicable EU directives.									
10	All equipment must meet the current RoHS directive.									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
11	Please describe the different possible physical SDI input/output configurations (max/min number of in/out-ports).									
12	Please describe supported SDI interfaces and connectors (optical and/or electrical).									
13	Physical connectors should not be on breakout cables.									
14	All media interfaces should be according to relevant SMPTE and AES/EBU standards.									
15	The system should support a minimum of input and output of 4 audio stereo pairs using AES3, AES67/SMPTE 2110-30, or MADI. Please describe alternatives and recommendations.									
16	All hardware delivered with the system should have hot-swappable dual power supplies (where applicable).									
17	All equipment must be operating at nominal 230 VAC, 50Hz.									
18	All hardware with network connectivity should have dual network ports for redundancy.									

7.2 Timing, latency, and tolerances

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The system should be able to seamlessly play out any combination of 1080i/25, 1080p/50									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	live sources and 1080i/25, 1080p/50, 1080Psf/25 (25i codec in 25p wrapper), 576i/25, 576p/25 files as 1080p/50 with proper upsampling and framerate conversion									
2	The system should be able to do playout of files which are still being ingested into the system ("growing files")									
3	The system should be able to perform time shifted playout of a file being recorded by the system immediately after recording starts									
4	The system should be able to do up/down conversion on playout to match a defined output format									
5	The visual quality must be approved by NRK based on a subjective judgement									

7.3   Video

7.3.1   General video requirements

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The system should be able to seamlessly play out any combination of 1080i/25, 1080p/50 live sources and 1080i/25, 1080p/50, 1080Psf/25 (25i codec in 25p wrapper), 576i/25, 576p/25 files as 1080p/50 with proper upsampling and framerate conversion									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
2	The system should be able to do playout of files which are still being ingested into the system ("growing files")									
3	The system should be able to perform time shifted playout of a file being recorded by the system immediately after recording starts									
4	The system should be able to do up/down conversion on playout to match a defined output format									
5	The visual quality must be approved by NRK based on a subjective judgement									
6	The system should be able to playout multiple media elements in sync - for instance video content with additional audio description tracks in separate audio files									
7	The system should support rule-based aspect ratio conversion based on schedule metadata or media headers									
8	The system should support manual override of the aspect ratio conversion on a per-program basis, and this change should be possible to do after the program in question has started. Example 16:9-anamorphic SD content erroneously marked as 4:3.									
9	The system should accept an external TC/time source as master clock									
10	It should be possible to configure recordings to include time-of-day-TC									
11	Please explain how flexible the solution is in relation to format agnostic playout. What is possible -and not, in a mixed timeline. Clarify strengths and limitations									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description	#
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO		
12	Please describe possible video sync source signals supported (black burst, tri-level, PTP etc)										
13	The system should support down stream keyers with external sources (fill/key)										
14	The system should be able to insert VITC on the output signal. "Time-of-day TC" on live and source file TC on file playout.										
15	For cloud/virtualized systems, describe how the main transport/input delay is compensated for, so that time-of-day-scheduled elements are put on air correctly relative to the live source content										
16	Please describe additional hardware requirements/upgrade path in order to support higher resolutions/framerates (2160p) and/or HDR/wide color gamut.										
17	It should be possible to reconfigure individual channels for 1080i/29.97, 1080p/29.97 and 1080p/59.94, and to play out corresponding live sources. This is for event-channels where the source will be non-European framerates and where the output will be streamed with the same framerate as the sources.										

7.3.2 Video processing

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	Normal AB-mixing with transitions (cut, X-fade, V-fade, asymmetric V-fade, wipe) for all source types (file-file, file-live, live-live)									
2	Two (or more) channel, fully controllable 2D DVE. Should be controllable by secondary events and external API for mixed-source graphical compositions									
3	The DVEs should be able to process any source in the system (file, live) – including external key/fill pairs									
4	Simultaneous playback of graphic clips/templates over the background video during AB-mixing (all with audio), DVE, subtitles, prerecorded and live voiceovers									
5	Frame accurate transition between all combinations of live and file playout, even when routed through DVE									
6	The coexistence of multiple flavors of HDR and new color space brings complexity into the playout chain. Please describe the HDR color space/signaling support in the solution if available, including HDR-to-SDR and SDR-to-HDR remapping.									
7	Please describe any 3D DVE capabilities, if available.									

7.4 Audio

7.4.1 Sources

Please refer to the corresponding section in Appendix 1.

7.4.2 Outputs

Please refer to the corresponding section in Appendix 1.

7.4.3 Loudness analysis

Please refer to the corresponding section in Appendix 1.

7.4.4 General audio requirements

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	De-embedding of all audio tracks in SDI-inputs.									
2	Re-embedding of all audio tracks in SDI-outputs.									
3	The system should maintain Audio Sync ("lip sync") between audio and video in all modules/nodes in the chain where audio and video are processed together									
4	The system should maintain timing of audio channels within a channel group, keeping them in sync									
5	Playout of audio from video clips (see format specifications at 7.6)									
6	Internal playout of stereo and multi-channel WAV files (see format specifications at 7.6)									
7	Internal playout of stereo and multi-channel BWF files (see format specifications at 7.6)									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	Internal Audio Processor									
8	If needed to maintain audio/video sync through the chain, please describe the availability of individual, programmable Audio Delay									
9	Independent level adjustments for all channels at different points in the chain									
10	Independent mixes/routing for different physical outputs. For example, no voiceovers on a "clean feed" SDI output, but voiceovers included on a "program" SDI output.									
11	AB-mixing (cut/crossfade) of audio between successive program events with the transition type following the playlist. Audio for an event may come either from a live SDI source, or a video clip.									
12	Cut between two external sources must be without any glitch in the audio									
13	Automation controlled multi-channel shuffling should be possible									
14	Multi-channel shuffling via manual override should be possible									
15	Gain control of individual channels (both from file and live sources), planned in the automation play list should be possible									
16	Gain control of individual channels (both from file and live sources) via manual override should be possible									
17	The Contractor should state whether manual gain control at different points in the chain can be achieved via software fader panel									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
18	The Contractor should state whether manual gain control at different points in the chain can be achieved via a hardware fader panel									
19	Audio meter true peak level monitoring for all output tracks									
20	R128 audio meter level monitoring for output stereo and 5.1 groups									
21	The system should support upmixing of stereo to 5.1 for use when native 5.1 is not available in live or file source									
22	The 5.1 upmixing should have an up-mix algorithm with control- and routing parameters available to the user									
23	The system should be able to select native 5.1 or up-mixed audio based o metadata from traffic system									
24	The system should be able to allow manual override of selection of native 5.1 or upmixed version									
25	Switching between native 5.1 and upmix should be seamless and without interruption, shift or artifacts in the audio									
26	It should be possible to manually override from 5.1 to stereo or from stereo to 5.1 in case of incorrect metadata from traffic system.									
27	The system should support audio processing for both stereo and 5.1 channel structures									
28	The audio processing should include Equalizer with several bands									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
29	The audio processing should include Multiband Compressor/Expander (or similar) with parameters such as Adjustable Attack, Release, Ratio and threshold									
30	The audio processing should include Output limiter									
31	The audio processing should include Voice optimizing algorithms									
32	The audio processing should include normalizer compatible with EBU R128									
33	The audio processing should support user specified target level (e.g. -23LUFS and/or -16LUFS) in each chain									
34	The audio processing should support saving parameters to presets									
35	The audio processing should support dynamically loading presets without interruption or artifacts in the audio									
36	The system should be able to control the audio processing presets based on playlist metadata and external APIs									
37	The system should support manually loading presets and/or adjusting individual parameters									
38	The system should support minimum 3x stereo and 2x 5.1 concurrent and separate processing chains – with individual level adjustment, watermarking, compressors/expanders on all channel pairs/groups									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
39	If externally sourced/OEM solution of audio processing is used, please describe which manufacturer and product/version is used									
40	Please include screenshot of the user interface used to adjust audio processing parameters									
	Watermarking									
41	The system should support Kantar audio watermarking									
42	The system should support multiple concurrent audio watermarking encoders in the chain, but only one per stereo/5.1 audio pair/group (refer to Figure 16 Audio processing logical overview).									
43	The audio watermarking should support separate id codes for each encoder									
44	Please describe which other formats and manufacturers of audio watermarking are supported.									
	Dolby processing									
45	The system should support internal encoding of Dolby Digital ("AC3")									
46	The system should support minimum 2 concurrent Dolby Digital encoders with individual inputs and outputs									
47	The system should allow access to adjust all Dolby Metadata fields									
48	The Dolby Digital encoders should support dynamic switching between 2.0 and 5.1 mode (with switching of input signals) based on metadata from the traffic system									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
49	The system should be able to manually override the parameters and operation mode of the Dolby Digital encoders.									
50	The switching between 2.0 and 5.1 should be seamless without interruption, delay or artifacts in the audio									

7.5 AVoIP

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The system must support the transition to ST2110-based sources and playout according to the attachment 1-1 MPP AVoIP Live Media Standards-document.									
2	When AVoIP support is installed/deployed, the automation system must be able to playout the same channel on both SDI and IP-based chains simultaneously (not necessarily on the same hardware) in sync.									
3	Please describe how a gradual migration from SDI to AVoIP may be taken (in context of the automation and playout servers and services), including necessary hardware- and software-upgrades, and if it affects any functionality or capabilities of the initial SDI based system.									
4	If the system can use NDI as source or output even in an SDI-configuration, for instance as source for key/fill for graphics or for monitoring, please									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	describe extra requirements (network, hardware) if applicable									

7.6 File-formats

7.6.1 File-formats currently in use at NRK

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The system must be able to play back MPEG IMX intra-frame 50 Mb/s, MPEG-2 4:2:2P@ML, 576i/25 video with 8x 16 or 24 bits (in 32 bits samples) audio channels in AES3, all in an MXF OP1a, eVTR wrapper									
2	The system must be able to play back XDCAM HD422 MPEG2 long-GOP 50 Mb/s, MPEG-2 4:2:2P@HL, 1080i/25 video with 8x 16- or 24-bits audio channels, all in an MXF OP1a, RDD9 wrapper									
3	The system must be able to play back and record XAVC Intra Class100 100/200 Mb/s, 1080i/25, 1080i/29.97, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									

7.6.2 File-formats that should be supported

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The system should be able to play back and record XAVC Intra Class200, 1080i/25, 1080i/29.97, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									
2	The system should be able to play back and record XAVC Intra Class300, 2160p/25, 2160p29.97, 2160p59.94 and 2160p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									
3	The system should be able to play back and record XAVC Intra Class480, 2160p/25, 2160p29.97, 2160p59.94 and 2160p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									
4	The system should be able to play back and record XAVC Long GOP 35, 1080i/25, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									
5	The system should be able to play back and record XAVC Long GOP 50, 1080i/25, 1080p29.97, 1080p59.94, 1080Psf/25 and 1080p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									
6	Please state the support for XAVC Long GOP/UHD formats: - XAVC Long GOP 188, 2160p/25 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	- XAVC Long GOP 300, 2160p/50 video with 8x 16 or 24bits audio channels, all in an MXF OP1a wrapper									
7	Please state the support for HDR formats and flavours									
8	Audio; Stereo and multi-channel WAV files									
9	Audio; Stereo and multi-channel BWF files									
10	The playout should handle the above-mentioned video formats natively, that is without transcoding during ingest									
11	Please attach a total overview which media file formats are supported for both recording and playout. (UHD/HDR included)									

7.6.3 Future file formats and codecs

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	Please state the Contractor's strategics for implementation of future file formats and codecs in software									

7.7 Accessibility services

7.7.1 Subtitles

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The notion of subtitles must be present in the system's play list, and be based on information from Whats´On (NRK's planning/scheduling system)									
2	File-based subtitle events inside the system's play list must reference the appropriate subtitle filename									
3	Preparation, start and stop of file-based subtitle playout events should be controlled automatically by the automation playlist									
4	The system should show a clear indication in case of missing subtitle files									
5	The system should deliver TC on video output as VITC									
6	For QC purposes manual playout of video with VITC routed to the Poliscript-system will be used. If the system also is able preview video clips with burned in selectable PAC-subtitle-file(s) internally, please describe the functionality.									
7	The system GUI should allow for subtitle events to be manually created and edited, both for file-based subtitle events									
8	The System GUI should allow for subtitle events (file-based or live) to be manually re-submitted without interfering with video, audio or graphics from the on-air event.									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
9	On every change of a subtitle event, even after the program has started, it should be re-submitted to the subtitling system for playout. One example would be that the program goes on air before the subtitle file is present - as soon as the file arrives, a load-command should be sent to the subtitling system									
10	The system GUI should display the filenames of all the subtitle files contained in the active play list									
11	The system GUI must be able to display the current timecode of the on-air video clip.									

7.7.2 Text to speech

[The Contractor's response to be inserted here.]

7.8 Virtualization

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	When designing and describing the system, please state what parts may (and may not) be virtualized									
2	When designing and describing the system, please state any special requirements to the virtualization platform for each load, including vCPU/RAM/storage									
3	When designing and describing the system, please elaborate: Is the server load/service stateful or stateless – in									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	other words; may the instance be provisioned from ground up or from images / snapshots, or does it need backup due to on-server stored state. If servers need local state, please describe why this may not live in a central data-/file-store.									

7.9 Network

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	Please describe how the solution can take use of network segmentation and layer 4 firewalling for security.									
2	Please describe the network topology including protocols and ports that are in use by the solution.									
3	NRK might distribute hosting of the solution over multiple data centres. Please describe any requirements for bandwidth and latency between components. Please also describe how confidentiality and integrity in communication between components is ensured.									
4	If the solution is not compliant with NRKs network infrastructure, please provide information on which parts that do not comply with, and why.									

7.10 System Performance Monitoring

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	Please describe how, and to what extent the system exposes metrics and logs that are available for ingest/forwarding into NRKs monitoring platform, and if they are available through any common formats or protocols like Open Metrics and Open Telemetry.									
2	If for any reason some logs or metrics from the platform cannot be exported automatically – please describe these.									
3	Please describe any integrated system monitoring, graphing, alerting and log aggregation, if available.									

7.11 Security

7.11.1 General requirements

The Contractor has reviewed and completed Attachment 1-3 NRK Supplier Security Requirements.

7.11.2 Servers and devices

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	All installed software should be able to run on actively maintained and supported current generation server operating systems. If long-term servicing (LTS) versions are required, it should be explicitly noted.									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
2	All servers should be able to follow the normal security patching channel of its operating system, even if the actual installation of the patches is manually triggered.									
3	All container hosts or orchestration platforms (like Kubernetes) should follow the normal security patching channel of both underlaying operating systems and hosting platform.									
4	All container images should be regularly updated with security patches for the underlaying base image.									
5	All hardware devices should be able to receive all security patches or firmware updates issued by the manufacturer.									
6	All Windows and Linux-servers being a direct part of the system - either provided by the contractor or customer - should be able to run current and updated Microsoft Defender for Endpoints unless explicitly noted.									

7.12 Other technical requirements

7.12.1 Changes to the technical platform

[The Contractor's response to be inserted here.]

7.12.2 Scalability and flexibility

[The Contractor's response to be inserted here.]

7.12.3 Environments

[The Contractor's response to be inserted here.]

8   INTEGRATIONS AND API´S

8.1   Integrations

8.1.1   MAM

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3ᴿᴰ INT	3RD	FUT	WA	NO	
1	Please describe the possible media flow strategies in and out of the playout system, including internal media management and housekeeping capabilities/workflows (if any), and what type of integrations/interfaces (APIs, callbacks and events) are available for the NRK development teams to receive requests for media.									
2	Please describe what type of hooks, callbacks, events and APIs are available to handle automatic query, fetch and push of media files and technical metadata to and from the automation system.									

8.1.2 Routing

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	Please list the existing router / router-control-system protocols and integrations available in the system together with licensing strategy									

8.1.3 Scheduling

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	If the system has an existing and flexible integration with What's On, and the Contractor has former integration with the products of Mediagenix, please describe the capabilities of this integration and how it will solve the user cases described in 5.6.1.									
2	Regardless of whether this integration already exists, please describe, and provide documentation of IPIs, events, hooks, callbacks for playlist manipulation/integration.									

[The Contractor's supplementary response to be inserted here.]

8.1.4 Graphics

[The Contractor's response to be inserted here.]

8.1.5 Subtitling

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	Please describe what existing integration is available for controlling subtitle systems like Polistream, and please describe and provide documentation of APIs, events, hooks for subtitle information manipulation/integration.									

8.1.6 List of out-of-the-box supported integrations

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	To better understand how changing needs may be accommodated by the system, please provide a list of existing and out-of-the-box supported integrations and protocols, indicating licensing model, if it is configurable by the operational staff or if it requires extra hardware/software installations.									

8.2 API

8.2.1 General API requirements

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	The system must provide access to all vital functionality in the business layer like playlist manipulation and media handling through a public APIs.									
2	The APIs must be thoroughly documented.									
3	The data model in use by the API should be documented and include formal schema definitions.									
4	Usage of the API must be covered by the support level agreements.									
5	The API and documentation must be kept up to date when new features are added to the system so that requirements #1 and #2 are always fulfilled.									
6	If the API is exposed through one or more HTTP REST-like endpoints, they should use proper HTTP methods and response codes (i.e. errors should be in the 400-500 range etc).									
7	The API should be consistent on media format and return types – using correct Content-Type headers including character sets.									
8	Access to the API should at a minimum be controlled by the same authorization and authentication mechanisms (built-in/LDAP/Azure AD etc) as present in the user interface.									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
9	The API authentication should offer single sign on through Azure AD supported authentication protocols.									
10	The concurrency control mechanism (locking, etags, row version or similar) in use by the system should also be available and in use by the API, enabling prevention or detection of the Lost Update Problem.									
11	The API should allow external systems to subscribe to events affecting assets in the system (like creation, modification, etc) through callbacks, message queues or other event systems.									
12	The system-provided user interfaces should rely on publicly exposed and documented APIs									
13	Responsiveness of the API should not be linked to the responsiveness or availability of the automation/playout-capabilities; it should not be possible to affect the stability of the playout due to excessive use of the API by an ill-behaving client.									

8.2.2 Program flow events

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
1	All events should include at least the following information:									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	a) An ID of the event – this should be unique for this instance and not be reused by any other messages/events b) Timestamp of the event c) Channel ID d) Type of event (live, file, other ++) e) Automation ID of the program (unique ID of the program as known by the automation system) f) MAM ID of the program g) At least minimal metadata – like title h) Estimated or exact start/stop/duration – any combination that makes sense for the given event type Auxiliary information relevant for the event type (like source type, source id (router/file), secondary event information, subtitle file)									
2	If the events do not include all program information in the event-body itself, a fast, responsive API for querying this information should be available, so that integrating services are able to quickly fetch any relevant information. Please describe the recommended solution.									
3	There may be several viable transports for these type of messages – please state what type of technology/service makes these events available (message queues, callbacks, tcp-sockets etc) and the media format and data model of the events.									
4	Please state how client may keep a reliable connection or message flow during failover-situations. At-least-once delivery of messages is									

#	Requirement	Requirement fulfilment								The Contractor's Solution Description
		STD	CON	DEV	3RD INT	3RD	FUT	WA	NO	
	expected – ideally pr client (proper queues) but at least for established connections is expected.									

9   INFORMATION SECURITY AND PERSONAL DATA PROTECTION (CF. CLAUSES 9.2 AND 9.3)

#	Requirement	The Contractor's Solution Description
1	The Contractor shall explain how their obligations under Clause 9.2 on ensuring the confidentiality and integrity of the Customer's data, are handled.	
2	The Contractor shall describe in which country (personal) data will be stored.	
3	The Contractor shall describe how satisfactory processing, including information system and security measures in line with the personal data protection regulations will be achieved and performed.	
4	In the event personal data may be transferred to the United States the Contractor shall identify the recipient of such data and whether the recipient is included in the list of Privacy Shield Certified Entities. If not relevant for the Contractor's situation, this requirement can be answered with a "Not Applicable"	

10   OTHER REQUIREMENTS

10.1 Project Implementation Methodology (cf. clause 2.3.3)

[The Contractor's response to be inserted here.]

10.2 Documentation (cf. clause 2.3.6)

10.2.1 Detailed specification - design documentation

[The Contractor's response to be inserted here.]

10.2.2 Training material

[The Contractor's response to be inserted here.]

10.2.3 User documentation

[The Contractor's response to be inserted here.]

10.2.4 Documentation of integrations

[The Contractor's response to be inserted here.]

10.2.5 Functional system documentation

[The Contractor's response to be inserted here.]

10.2.6 Technical system documentation

[The Contractor's response to be inserted here.]

10.2.7 Installation and maintenance documentation

[The Contractor's response to be inserted here.]

10.3 Training (cf. clause 2.3.7)

10.3.1 Training method

[The Contractor's response to be inserted here.]

10.3.2 User groups

10.3.2.1 Continuity producers

[The Contractor's response to be inserted here.]

10.3.2.2 Operations

[The Contractor's response to be inserted here.]

10.3.3 Description of training courses

[The Contractor's response to be inserted here.]

10.4 Administrative and legal requirements

10.4.1 Right of ownership and right of disposal

[The Contractor's response to be inserted here.]

10.4.2 Supplementary license terms for standard software and open-source software

[The Contractor's response to be inserted here.]

SSA-T Appendix 3

Customer technical platform

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

This Request for Proposal is formally issued by:

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1   INTRODUCTION

This Appendix contains a description of the Customer´s technical platform the proposed solution must interact with.

Any changes to the Customer´s technical platform must be specified in Appendix 2 to be valid and priced in Appendix 7.

The Customer assumes that the Contractor will make the necessary enquiries regarding the Customer existing infrastructure in order to commit to this contract and provide the necessary equipment and software.

2   CURRENT APPLICATION LANDSCAPE

This illustration gives an overview of the landscape the new system is intended to fit into and their main connections.
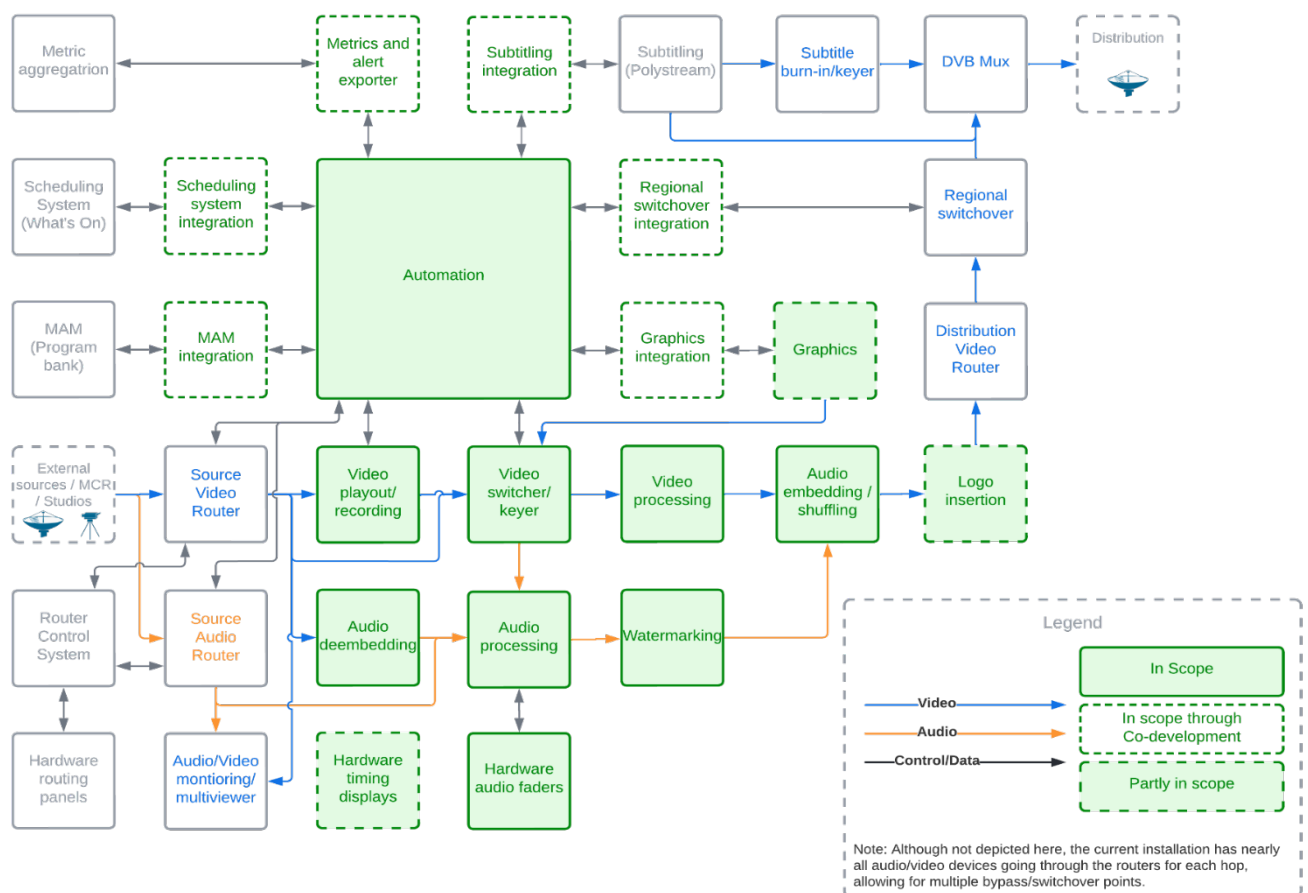
3   INTEGRATIONS

3.1   MAM

The underlying MAM powering parts of the production platform is Tedial (with products like Evolution, Fikus, MPM, and AST). It supplies an online/offline storage system (AST) with archiving/offlining implemented through on-site and remote tape-robots handled by Telestream DIVA, transfer to/from regional offices, and housekeeping of local production storage.

See «NRK-MA3542-22E SSA-T App 01, chapter 8.1.1 for details and requirements».

3.2 Routing

The current SDI routers installed in the Playout center will be partly or completely replaced. It will be from some of the known broadcast router manufacturers, and thus standardized protocol will be used. See «NRK-MA3542-22E SSA-T App 01, chapter 8.1.2.»

3.3 Scheduling

NRKs scheduling system is Whats´On from Mediagenix, currently at version 2019r3 – expected to be upgraded to 2022r4/5 during the fall. See «NRK-MA3542-22E SSA-T App 01, chapter 8.1.3 for details and requirements».

3.4 Graphics

Please see "NRK-MA3542-22E SSA-T App 01, chapter 5.6.11 and 8.1.4" for detailed descriptions.

3.5 Subtitling

NRK is using Broadstream (former Screen) Polistream for subtitling. Details and requirements of control and integration are described in NRK-MA3542-22E SSA-T App 01, chapters 7.7.1 and 8.1.5.

4 TECHNICAL ENVIRONMENT

4.1 File-formats

Please see "NRK-MA3542-22E SSA-T App 01, chapter 7.6" for detailed descriptions and expected format support.

4.2 Network

Network basics and requirements are described in "NRK-MA3542-22E SSA-T App 01, chapter 7.9".

4.3 System Performance Monitoring

Protocols, technologies, monitoring systems, and requirements are described in "NRK-MA3542-22E SSA-T App 01, chapter 7.10".

4.4 Virtualization

NRK runs and maintains on- and off-prem VMware instances, including a cluster in the current equipment rooms of TCR/MCR/Playout. Strategies and requirements are described in "NRK-MA3542-22E SSA-T App 01, chapter 7.8".

4.5 Clients

Any client software must be able to run on the following workstations, provided by NRK:

Operating system:

- Microsoft Windows 10 or 11 - 64-bit (regularly updated based on the General Availability Channel)

- All workstation are members of an Active Directory domain, which is mandatory.

- All workstations run the latest version of Microsoft Defender for Endpoints (or descendants, siblings) and are patched up to date, and all systems accept new patches regularly.

All installed client programs are programmed in accordance with modern Windows application development principles:

- Users do not need administrative privileges to run the application

- Applications are programmed to run under any language version of Windows

Browser based software should be able to run in the at all time current version of Edge (Extended Stable Channel) or Chrome (Stable channel).

All client software should be able to run on virtualized workstations. Any exceptions or special requirements (like hardware graphics cards) should be noted.

4.6   Data Center

The 1st Main delivery is to be installed in a local DC in the same area as the Main Continuity Center.

5   SECURITY

Please see "NRK-MA3542-22E SSA-T App 01, chapter 7.11" for detailed descriptions.

6   COLLABORATION TOOLS

#Slack is currently NRK's preferred tool for interaction in support and technology.

SSA-T Appendix 4

Project and progress plan

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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1   INTRODUCTION

This Appendix contain the Contractor's project and progress plan for the deliverables as specified by the Customer in Appendix 1 and described by the Contractor in Appendix 2.

The description must be sufficiently detailed so that the Customer can prepare and provide the specified competence and capacity at the specified time.

The plan should appreciate the Customer's preference to maintain a certain momentum in the project through a progressive plan to facilitate quick and safe commissioning of Iterations 1, 2 and 3 for Main Delivery 1 without unnecessary delay.

Main Delivery 1 and 2 are considered as separate deliveries which each may contain partial deliveries (i.e. iterations 1 – 3 under Main delivery 1).

2   PROJECT AND PROGRESS PLAN

2.1   Overall project and progress plan (cf. clause 2.1.1)

An overall project and progress plan for the delivery of the Contractor shall be included in the table below.

	#	Milestones	Contractor Suggested Date
Preparations	MS01	Preparation completed; project start up	Date
1st Main delivery	MS02	Overall specification (Design) completed including • Progress plan for implementation phase • Progress plan for test and training • Design handed over	Date
1st Main delivery	MS03	Overall specification approved	Date
1st Main delivery/ 1st Iteration (NRK 4-8)	MS04	Detailed specification approved	Date
	MS05	Customer Approval Test approved	Date
	MS06	Commissioning	Date
	MS07	Delivery Date (MS06 + 1 month)	Date
1st Main delivery/ 2nd Iteration (NRK 2+3)	MS08	Detailed specification approved	Date
	MS09	Customer Approval Test approved	Date
	MS10	Commissioning	Date
	MS11	Delivery Date (MS06 + 1 month)	Date
1st Main delivery/ 3rd Iteration (NRK 1)	MS12	Detailed specification approved	Date
	MS13	Customer Approval Test approved	Date
	MS14	Commissioning	Date
	MS15	Delivery Date (MS06 + 3 months)	Date
2nd Main delivery	MS16	Overall specification (Design) completed Design handed over	Date

	#	Milestones	Contractor Suggested Date
2nd Main delivery	MS17	Overall specification approved	Date
2nd Main delivery	MS18	Solution ready for Customer Acceptance test	Date
2nd Main delivery	MS19	Customer Acceptance Test approved (clause 2.4.6)	Date
2nd Main delivery	MS20	Commissioning (Go Live)	Date
2nd Main delivery	MS21	Delivery Date (MS20 + 3 months)	Date

The Contractor must notify NRK of any unforeseen events or information the Contractor is or should become aware of, where the Contractor understands or should have understood that the information is relevant for concluding the project. Examples of such events or information is delays, errors, changes in functionality, lack of integrations or missing regulatory requirements.

If the Contractor has concerns related to commitments, responsibilities, functionality or scope of the delivery, the Contractor must notify NRK and present and discuss the concerns with NRK representatives. Examples of such concerns include, but are not limited to functionality prioritizations, delivery milestones or other challenges relevant for the delivery.

The Contractor acknowledges that NRK is not a professional IT Customer, and that NRK does not have the resources or competence to assist the Contractor beyond what has been described in the agreement. The Contractor acknowledges the responsibility for the progress in the project, and for delivering the project within the agreed cost and time restraints.

[Contractor's response to be inserted here]

2.2   Activities and deliverables

Activities and deliverables that lead to milestones identified in the overall plan above shall be described. Reference is made to the General Contract terms chapter. 2.

The Customer's role(s), resources and estimates should be specified for each activity.

The Contractor shall similarly describe expected participation from NRK (including estimated number of hours) throughout the project, linked to the specified phases/activities/tasks/deliverables.

[Contractor's response to be inserted here]

2.3   Procedures and guidelines for the specification phase

The Contractor's suggested procedures and guidelines for the development of the detailed specification is set out below.

[Contractor's response to be inserted here]

3   LIQUIDATED DAMAGES (CF. CLAUSE 11.5.2)

Liquidated damages as described in clause 11.5.2 apply for the following milestones:

- MS07 - Delivery Date 1st Main delivery/1st Iteration
- MS15 - Delivery Date 3rd Main delivery/1st Iteration (as described in clause 2.5.3)
- MS21 - Delivery Date 2nd Main delivery

SSA-T Appendix 5

Testing and approval

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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1   INTRODUCTION

Requirements for the testing and approval procedures, including the test criteria, routines and so on are outlined in this Appendix.

The Contractor shall respond to the requirements in the tables at the bottom of each section. If some of the requirements are not met, please explain why and how this can be solved in another way.

Text inserted by the Contractor should be marked in blue font.

2   PARTIAL DELIVERIES (CF 2.1.4)

The implementation of the project will be done as iterations/work packages with different functionality implemented in NRK. These functions implemented will be tested and approved as the rollout commences and each package will follow the guidelines in the Agreement.

Each work package will have an individual test plan and approval period.

Contractor's response:

3   TEST METHODOLOGY

Describe the testing methodology to be used in this project, both automatic and manual. If the Contractor will utilize a test management tool, please include which tool and how it will be used.

Describe the different tests and test-types for the project, implementation, go-live and operations phases including prerequisites and procedures.

The Contractor is responsible for executing volume, capacity and response time tests. The Contractor shall execute these tests as a part of the system test before handing over to NRK acceptance tests. Test results from the tests shall be presented to and approved by NRK.

For manual testing, NRK shall have the option to participate in all tests, including development of test scenarios and test scripts. For automatic on-site integration tests, NRK shall have access to the test-portal/-reports.

Tests completing the different phases must be documented with a sign-off from the responsible tester from the Contractor or Customer depending on test phase. Please describe in detail the sign-off regime to be used in this project. The test documentation must include input/test data used in the test, and the result based on this input/test data. Describe typical documentation formats.

All functional requirements must be associated with and verified by specific test scenarios and test scripts. Describe how this is accomplished.

Contractor's response:

4   PREPARATIONS FOR ACCEPTANCE TESTS (CF 2.4.1)

The Contractor shall clearly describe their own and NRK's obligations and tasks related to the preparations of acceptance tests.

Contractor's response:

5 PLAN FOR THE CUSTOMER ACCEPTANCE TEST AND APPROVAL PERIOD (CF 2.4.3)

The Customer shall create a test plan and test scenarios for the acceptance tests in cooperation with the Contractor as defined in chapter 4. The acceptance test plan may contain more detail acceptance criteria regarding approval of the Customer acceptance test (cf. 2.4.6).

The Contractor is required to create the tests based on these test scenarios. All test scenarios and test scripts shall be linked to the requirements as outlined in appendix 1, 2 and 3 with a coverage of 100%.

The test plan will be created as part of the specification phase.

Contractor's response:

6 SCOPE OF THE ACCEPTANCE TEST (CF 2.4.4)

The Customers acceptance test shall comprise the software and the equipment that form part of the deliverables. The scope of acceptance tests must verify the requirements as outlined in appendix 1, 2 and 3 for each iteration/delivery.

The Contractor shall describe the software, equipment and tools that are a part of the deliverables and must be tested.

Contractor's response:

7 PERFORMANCE OF THE CUSTOMER ACCEPTANCE TEST (CF 2.4.5)

All delivered functionality will be thoroughly tested according to the acceptance test plan.

The Contractor is asked to describe how rectified errors will be delivered for retesting during the Acceptance test.

Contractor's response:

8 COMMISSIONING (CF 2.4.7)

The details of responsibilities for assisting NRK with the commissioning will be discussed during the specification phase. However, NRK expects that the Contractor will be present on-site at least during the very first commissioning to assist in any unforeseen events that may occur. Furthermore, we see it as an important success criterion that relevant personnel from the Contractor is available for remote assistance at every commissioning event during the solution roll-out.

Contractor's response:

9   PERFORMING THE APPROVAL PERIOD (CF 2.5.2)

NRK will test the functionality as it is delivered. However, for some of the work packages, it might be relevant to perform load tests, meaning we might expose the work package to a number of users in production or simulated testing.

During the approval of each iteration, NRK will perform realistic testing of redundancy and functionality level adapted to each iteration. Details will be discussed and agreed upon during the specification/design phase.

During final approval, NRK will perform realistic testing of both redundancy and disaster recovery. Details will be discussed and agreed upon during the specification/design phase.

In addition to the provisions that follow from section 2.5.2 of the general agreement text, the following applies for the final approval:

Errors reported during the approval period must be rectified continuously and by the end of the approval period, however, so that a month's continuous operation without A or B errors is achieved. If such errors occur during the last month of the approval period, the approval period must be extended accordingly.

Contractor's response:

NRK

SSA-T Appendix 6

Administrative provisions

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Table of Contents

1   INTRODUCTION

Requirements for administrative provisions are outlined in this appendix. The Contractor should respond to the requirements at the bottom of each section. If some of the requirements cannot be met, explain why and how this can be solved in another way.

Text inserted by the Contractor should be marked in blue font.

2   THE REPRESENTATIVES OF THE PARTIES (CLAUSE 1.4)

Authorised representatives of the parties:

THE CUSTOMER

Name	Position	Role
		Project Owner; The representative who is authorised to act on behalf of the party in matters relating to the Agreement.
		Contact person technical matters
		Contact person contractual matters
		[Other, if relevant]

[Customer information to be filled in upon the conclusion of the Agreement]

THE CONTRACTOR

Name	Position	Role
[Name]	[Position]	The representative who is authorised to act on behalf of the party in matters relating to the Agreement.
[Name]	[Position]	Contact person technical matters
[Name]	[Position]	Contact person contractual matters
[Name]	[Position]	[other, if relevant]

Changes of authorised representatives of the Contractor shall be notified one month in advance in writing. The Contractor should ensure transfer of competence.

3   PROJECT ORGANISATION (CLAUSE 2.1.2)

The Contractor shall outline a proposal for project organisation structure, governance model and plan for quality assurance for the implementation project. Identify all projects, sub projects and relevant teams, in addition to roles, responsibilities and authority for the Contractor resources.

The description shall be outlined according to defined project phases and comprise number of project resources (full time equivalents) from the Contractor, including any sub-contractors, and assumed NRK resources (cf. Appendix 4, section 2.2).

The Contractor shall propose the needed competency profiles needed at NRK for the implementation project.

The governance model shall outline the Contractor's recommended governance forums (for example reference group(s), steering group, etc.), what roles/functions to be included in the

forums and recommended reporting and meeting structure. The Contractor shall also outline the recommended governance model for documents and change control.

The Contractor shall assume that the NRK headquarter in Oslo is project headquarter and outline the need for on-site or off-site collaboration. Please see Appendix 7, section 6 regarding travel expenses.

The Contractor's proposal on governance model and work plan must be adapted to secure involvement of key personnel and minimize time and cost for travel. Effective collaboration tools (e.g. video conferencing, Sharepoint, etc.) should be leveraged and be part of the Contractor's response to project organization and governance.

All personnel intended to perform work under this contract shall sign a NDA.

Contractor's response:

4   PROJECT DOCUMENTATION (CLAUSE 2.1.3)

The Contractor shall specify relevant project documentation, routines for status reporting, and routines for the registration and follow-up of non-conformance, additions and agreed amendments, etc.

Status report shall describe as a minimum:

- Overall status
- Progress according to plan (Progress on deliverables)
- Risk assessment and actions to mitigate
- Issues for clarification and decision
- Staffing/resources

Contractor's response:

5   REQUIREMENTS AS TO THE RESOURCES AND EXPERTICE OF THE CONTRACTOR (CLAUSE 5.2)

A resume of the key qualifications for the Contractor's project manager and other key personnel for the performances under SSA-T including those who will be responsible for training, shall be listed below.

Name	Position/role	Competance/Experience	CV #

The Contractor shall present a CV for all personnel, adapted specifically for their prospected role in this project, where relevant competency (education, certifications, etc.) and experience is documented.

6 USE OF SUBCONTRACTORS (CLAUSE 5.3)

If applicable, the Contractor's approved subcontractors shall be listed here.

Name	Organisation number	Delivery area
[company name]		

In addition, the Contractor asks that a description of personnel from subcontractors shall be listed her.

Name	Position/role	Competance/Experience	CV #

The Contractor shall present a CV for all personnel, adapted specifically for their prospected role in this project, where relevant competency (education, certifications, etc.) and experience is documented.

7 COOPERATION WITH THIRD PARTIES (CLAUSE 5.4)

If the Customer finds it necessary to have the Contractor to cooperate with the Customer's third party to fulfil the contract, this will be handled case by case and be remunerated according to hourly rates in Appendix 7.

Based on the Contractor solution and as part of the negotiations, the Customer may add third parties in the table below before the conclusion of the Agreement.

Name	Organisation number	Delivery area
[company name]		

8 AUDIT (CLAUSE 2.3.5)

NRK reserves the right to perform audits according to General Contract Terms with a prior notice of two (2) days.

9 WAGES AND WORKING CONDITIONS (CLAUSE 5.5)

The Contractor shall confirm compliance with the Contractor's obligations as stipulated in clause 5.5 of the Agreement (Wages and working conditions).

10 INDEPENDENT EXPERT (CLAUSE 16.3)

Should there be a need for an independent expert, the nature of this expert will be determined based upon the issues that need resolving.

SSA-T Appendix 7

Total price and pricing provisions

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]
[Contractor logo]

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Table of Contents

1   INTRODUCTION

This Appendix contains all prices and detailed conditions for the consideration the Customer must pay for the Contractor's deliverables under the Agreement.

All functionality described in appendix 2 and other deliverables as described in Appendices 4-6 will automatically be considered included in the prices unless otherwise explicitly stated in this Appendix.

Any special payment schemes, discounts, advances, payments on account or deviant payment dates shall also be stated as part of the basis for the total price.

Any other listing of prices shall be specified separately. It must be listed whether the price is per unit or per month, year, agreement period, etc.

If the parties agree on anything that is not stipulated in the Agreement concerning consideration, then this shall be specified in this Appendix.

All references marked CF <number> or clause <number> refers to the Development and Customization Agreement (SSA-T).

The Customer requires that the Contractor answers every section in this document consecutively. Text inserted by the Contractor should be marked in blue font.

1.1   Submission of a calculation basis (excel)

The Contractor is asked to prepare the prices in an excel form (combined for SSA-T and SSA-V) based on the format of the tables in the appendices, and in addition insert other tabs with details to serve as calculations for the prices. The calculation basis (in excel) will be used in the negotiations to ensure that the Customer understands the content of the prices.

Provided that the tables in the excel form are identical (columns) to the tables in this Appendix, the Contractor may replace the tables with their own tables or picture of the tables.

1.2   Currency

The prices may be quoted in a preferred currency; Norwegian kroner (NOK), US Dollar (USD), British Pounds (GBP) or EURO (EUR) (etc), exclusive of value-added tax but inclusive of customs duties and other indirect taxes.

NRK will pay in the same currency as quoted, thus reservations regarding currency fluctuations are not permitted.

The Contractor shall specify which currency the proposal or parts thereof is quoted in.

Contractor's response:

1.3   Incoterms

The hardware shall be delivered according to DDP INCOTERMS 2020.

1.4   Payment models for the delivery

1.4.1   CAPEX / OPEX

The Customer's preferences for payment model under this agreement is;

CAPEX

- Hardware cost and implementation cost (project cost).

OPEX

- SW License as a recurring price (annual subscription).

However, the Contractor may also price HW and implementation as OPEX. If so, this must be stated specifically in relation to each pricing table below. The final model will be decided upon during the negotiations.

1.4.2 Target prices for implementation work

The Customer sees the benefit of using a target price model for project implementation based upon estimates in the project plan (Appendix 4) and specified in section 2.4 and section 4.2 in tables below. The terms of the target price model is as follows:

Deviation	Invoiced if exceeded (x%)	Invoiced at savings (y %)
< 9 %	100 %	0 %
10 % < 19 %	80 %	20 %
20 % < 29 %	70 %	30 %
> 30 %	60 %	40 %

Explanation:

- If the solution is established with hourly consumption above the estimates that form the basis of the target price (adjusted for any agreed change orders), and excesses are the Contractor's responsibility, the Contractor can invoice a maximum of x percent of the Contractor's hourly price for the number of hours that constitute the excess.
- If the solution is established with hourly consumption below the estimates that form the basis of the target price (adjusted for any agreed change orders), the Contractor can invoice a maximum of y percent of the Contractor's hourly price for the number of hours that make up the savings.

2 CONSIDERATION (CF. 8.1) FOR MAIN DELIVERY 1

The Contractor shall specify all prices that are necessary to realize the solution required in Appendix 1 and offered in the Appendices 2, 4-6.

2.1 Total Prices

This total price table shall compile the prices from the underlying chapters for prices for main delivery 1.

Contractor is asked to insert values and state the currency used with blue text.

Contractor's response:

Delivery	SW yearly cost (cf. section 2.1.1)	HW one time cost*) (cf. section 2.1.2)	Implementation one time cost*) (cf. section 2.1.3)	Total price
Planning main delivery 1				
Iteration 1 NRK 4-8 (5 x tier 2)				
Iteration 2 NRK 2-3 (2 x tier 1)				
Iteration 3 NRK 1 (1 x tier 1)				
Staging environments (As described in Appendix 1 sec. 7.12.3)				

Delivery	SW yearly cost (cf. section 2.1.1)	HW one time cost*) (cf. section 2.1.2)	Implementation one time cost*) (cf. section 2.1.3)	Total price
	SW	HW	Implementation	Total
Disaster Recovery solution (cf. section 2.2)				
Upgrades to Customer technical platform (if applicable) (cf. section 2.3)				
TOTAL PRICE				

*) Please change the label if the Contractor is using OPEX for HW and implementation cost.

2.1.1 Price Software / Licenses

For software licenses, including third-party licenses, prices are stated in the table below. Please specify which variables (license type) the prices are based on (site license, number of environments/users, etc.

The Contractor may expand the table below with extra rows and to insert values with blue text.

It is expected that further details regarding sw/licenses per iteration and environment shall be detailed in the submitted excel form.

Contractor's response:

Software license (name/version)	3.party? (Y/N)	License type (site, users, etc)	Unit price	Quantity	Total price yearly cost
Iteration 1					
Iteration 2					
Iteration 3					
TOTAL LICENSES PRICE YEARLY COST					

Any prerequisites for and limitations in the Customer's right of disposal, cf. section 10.2.1 of the general agreement text, must be stated.

Contractor's response:

Any time limitations in the Customer's right of disposal to standard software, cf. section 10.5.2 of the general agreement text, must be stated. Such limitation is only applicable if the Contractor deliver the licenses as a one-time-cost and not as a recurring cost.

Contractor's response:

The Contractor must clearly describe any deviations between the provisions in the Contractor's or third party's license conditions regarding right of disposition and the general agreement text's provisions regarding right of disposition.

Contractor's response:

2.1.2 Price Hardware

Contractor may expand the table below with extra rows and to insert values with blue text.

It is expected that further details regarding HW per iteration and environment is detailed in the submitted excel form, thus the Contractor may make HW bundles within each iteration to simplify the input in this table.

If the proposed HW is regarded as commercial off the shelf (COTS), the Customer is free to use their existing agreements to acquire the products.

Contractor's response:

Hardware (Product name)	Type of HW	Unit price	Quantity	Total price
Iteration 1				
Iteration 2				
Iteration 3				
TOTAL HARDWARE				

2.1.3 Implementation cost

Contractor is asked to insert values with blue text.

Contractor's response:

Stage/activity	Quantity (hours)	Sum
Detail planning main delivery 1		
Iteration 1		
Detail specification stage Iteration 1		
Development, Customization, Configuration, Testing		
Integrations		
Documentations		
Training		
Project management and quality assurance		

Stage/activity	Quantity (hours)	Sum
Iteration 2		
Detail specification stage Iteration 2		
Development, Customization, Configuration, Testing		
Integrations		
Documentations		
Training		
Project management and quality assurance		
Iteration 3		
Detail specification stage Iteration 3		
Development, Customization, Configuration, Testing		
Integrations		
Documentations		
Training		
Project management and quality assurance		
Total implementation cost main delivery 1	**[tot.hours]**	**[tot.cost]**
Average hourly price used as basis for target price cf, section 1.4.2	**[tot cost / tot hours]**	

Integration cost

The record shall contain the total of integration work. See SSA-T Appendix 1, section 8.1 for de 3 different cases of integrations. The Contractor must in Appendix 2 describe which type of integration (A, B or C) the integration is based up on. Further the Customer asks the Contractor to detailing cost calculations for the integrations in the submitted excel form and explicitly state whether the integration work is performed by the Contractor as a bear responsibility in respect of results and progress, and which shall be delivered as additional services (contribution obligation). This information will be a starting point to be detailed further in the negotiations.

Training cost

This record must contain what the Contractor believes is the required training for the Customer to test and use the system as intended. The training will take place in stages (cf. the iterations) and should be further detailed in the submitted excel form. For additional trainings courses, please price this in section 5.

Documentation

Included in the price is an unlimited number of copies of the documentation for use in his own business, related to the solution delivered by the Contractor (cf. 10.4.1).

2.2 Price Disaster Recovery solution

The suggested disaster recovery solution shall be priced as a complete installation including its need for SW/licenses and hardware.

It is expected that further details regarding SW/HW is detailed in the submitted excel form.

Contractor's response:

Delivery	SW yearly cost	HW one time cost*)	Implementation one time cost*)	Total price
Offered Disaster Recovery solution				
TOTAL PRICE				

*) Please change the label if the Contractor is using OPEX for HW and implementation cost.

2.3 Upgrades to Customer platform

If the Customer's technical platform needs to be upgraded to enable the Customer to utilize the deliverables, the Contractor shall point this out in Appendix 2 and price the needed upgrades.

The Customer reserves the right to use their existing agreements for the purchase of equipment and software to upgrade the technical platform.

Contractor's response:

Hardware / Software (Product name)	Type of HW/SW	Unit price	Quantity	Total price

3 CONSIDERATION (CF. 8.1) FOR MAIN DELIVERY 2

This second main delivery shall be described, including a migration plan and description of work packages, prerequisites, and necessary hardware/software to enable two IP-based playout-chains at two (presumably external) locations that work seamlessly and as an integral part of the first SDI-based delivery and automation, enabling a low-risk transition to IP-based playout.

This delivery shall be priced as a self-contained solution, regardless of any parts of the delivery 1 that may be re-used for this playout chain. When the Customer decides to switch to the IP-based playout chain, the SDI chain will no longer be in use and consequently the subscription to software that is no longer in use will be terminated.

3.1 Total Prices

This total price table shall compile the prices from the underlying chapters for main delivery 2.

Contractor may adapt the table below with extra rows and relevant activities that is relevant for this implementation and to insert values with blue text.

It is expected that further details regarding the scope of work will be detailed in the submitted excel form.

Contractor's response:

Delivery IP-based playout chain for datacenter A and B	SW yearly cost (cf. section 3.1.1)	HW one time cost*) (cf. section 3.1.2)	Implementation one time cost*) (cf. section 3.1.3)	Total price
Planning main delivery 2 and Migration plan				

Delivery IP-based playout chain for datacenter A and B	SW yearly cost (cf. section 3.1.1)	HW one time cost*) (cf. section 3.1.2)	Implementation one time cost*) (cf. section 3.1.3)	Total price
Iteration 1 NRK 4-8 (5 x tier 2)				
Iteration 2 NRK 2-3 (2 x tier 1)				
Iteration 3 NRK 1 (1 x tier 1)				
Staging environments (As described in Appendix 1 sec. 7.12.3)				
TOTAL PRICE				

3.1.1 Price Software / Licenses

For software licenses, including third-party licenses, prices are given in the table below. Please specify which variables (license type) the prices are based on (site license, number of environments/users, etc.).

Contractor may expand the table below with extra rows and to insert values with blue text.

It is expected that further details regarding sw/licenses per iteration and environment shall be detailed in the submitted excel form.

Contractor's response:

Software license (name/version)	3.party? (Y/N)	License type (site, users, etc)	Unit price	Quantity	Total price yearly cost
Iteration 1					
Iteration 2					
Iteration 3					
TOTAL LICENSES PRICE YEARLY COST					

Any prerequisites for and limitations in the Customer's right of disposal, cf. section 10.2.1 of the general agreement text, must be stated.

Contractor's response:

Any time limitations in the Customer's right of disposal to standard software, cf. section 10.5.2 of the general agreement text, must be stated. Such limitation is only applicable if the Contractor deliver the licenses as a one-time-cost and not as a recurring cost.

Contractor's response:

The Contractor must clearly describe any deviations between the provisions in the Contractor's or third party's license conditions regarding right of disposition and the general agreement text's provisions regarding right of disposition.

Contractor's response:

3.1.2 Price Hardware

Contractor may expand the table below with extra rows and to insert values with blue text.

It is expected that further details regarding HW per iteration and environment is detailed in the submitted excel form, thus the Contractor may make HW bundles within each iteration to simplify the input in this table.

If the proposed HW is regarded as commodity off the shelf (COTS), the Customer is free to use their existing agreements to acquire the products.

Contractor's response:

Hardware (Product name)	Type of HW	Unit price	Quantity	Total price
Iteration 1				
Iteration 2				
Iteration 3				
TOTAL HARDWARE				

3.1.3 Implementation cost

Contractor may adapt the table below with extra rows and relevant activities that is relevant for this implementation and to insert values with blue text.

It is expected that further details regarding the scope of work will be detailed in the submitted excel form.

Contractor's response:

Stage/activity	Quantity (hours)	Sum
Detail planning main delivery 2		
Migration plan		
Iteration 1		
Detail specification stage Iteration 1		
Development, Customization, Configuration, Testing		
Integrations		
Documentations		
Training		
Project management and quality assurance		

Stage/activity	Quantity (hours)	Sum
Iteration 2		
Detail specification stage Iteration 2		
Development, Customization, Configuration, Testing		
Integrations		
Documentations		
Training		
Project management and quality assurance		
Iteration 3		
Detail specification stage Iteration 3		
Development, Customization, Configuration, Testing		
Integrations		
Documentations		
Training		
Project management and quality assurance		
Total implementation cost main delivery 1	**[tot.hours]**	**[tot.cost]**
Average hourly price used as basis for target price cf, section 1.4.2	**[tot cost / tot hours]**	

3.2 Upgrades to Customer platform

If the Customer's technical platform needs to be upgraded to enable the Customer to utilize the deliverables, the Contractor shall point this out in Appendix 2 and price the needed upgrades.

The Customer is free to use their existing agreements for the purchase of equipment and software to upgrade the technical platform.

Contractor's response:

Hardware / Software (Product name)	Type of HW/SW	Unit price	Quantity	Total price

4 CONSIDERATION - OPTIONS

4.1 Options asked by the Customer

If the options will differ in price if it is realized on SDI-based playout chain or IP-based playout chain, the Contractor is asked to address this in the table below. Contractor may expand the table below with extra rows and to insert values with blue text.

It is expected that further details regarding options shall be detailed in the submitted excel form.

Contractor's response:

	Delivery (cf. Appendix 1 section 3.3)	SW cost per month	HW one time cost (if appliable)	Implementation one time cost (if applicable)
A	One extra on-premises channel (Tier 1 category)			
B	One extra pop-up channel (Tier 2 category)			
	Delivery (cf. Appendix 1 section 3.3)	SW cost per year	HW one time cost (if appliable)	Implementation one time cost (if appliable)
C	Disaster recovery as a cloud-only-instance			
D	Streaming/Off-loading channels (NRK 4-8) as cloud-only-instance			
E	Total price for suggested on-site spares for critical components			
	TOTAL			

4.1.1 On site spares

Please list critical components, cf. Appendix 1 section 3.3, with associated prices.

Contractor's response:

Hardware	Type of HW	Unit price	Quantity	Total price

4.2 Additional options

Please list any additional option, such as extra training. The options shall be described in Appendix 2.

Contractor's response:

Additional options	Unit price	Quantity	Total price

5 HOURLY RATES

For any additional work, changes, and further development beyond what is included in the project delivery, hourly rates for the personnel offered must be stated by filling in the table below.

The following categories must be used:

- Junior (0-4 years of relevant experience in the field)

- Senior (5-10 years of relevant experience in the field)
- Expert (10+ years of relevant experience in the field)

Contractor's response:

Role / Category	Junior	Senior	Expert
Project manager	███████		
Solution manager	███████		
Architect	███████		
Developer/customization/test			
Test manager	███████		

6 TRAVEL EXPENSES

Travel and accommodation costs in relation to necessary trips to the Customer's premises in Oslo are covered according to the Government Travel Allowance Scale (cf. clause 8.1).

Contractor's response:

Estimated cost per travel:

- Day trip (all inclusive):   [insert price]
- Monday to Friday with accommodations: [insert price]

Based on the project and progress plan as described in Appendix 4, the total number of trips / weekly stays during the project period is calculated as follows:

- Day trip (all inclusive):   [total number of day trips]
- Monday to Friday with accommodations: [total number of day units]

Travel-time is not subject to remuneration.

7 PRICING MODEL SUPPLEMENTARY PURCHASES

The Contractor is asked to suggest a predictable and transparent pricing model for purchasing software/hardware, which may provide a basis for supplementary purchases. For example:

[Global price list – % discount + % profit margin = Customer price]

Contractor's response:

8 PAYMENT TERMS (CF. 8.2)

8.1 Payment plan

The Customer prefers the following payment plan but is open for suggestions as part of the negotiations.

Monthly software licenses are invoiced at the start of the Delivery Date.

Hardware costs are invoiced on account at the following milestones:

- Installation: 50%
- Go-live: 50%

Project costs are invoiced on account at the following milestones:

- Detailed specification approved: 20%
- Start of acceptance test: 30%
- Start of the Approval Period: 20%
- On delivery day: 30% / Final settlement according to target price.

Accrued travel costs are specified and invoiced at each milestone.

Contractor's response or counter proposal:

8.2 Invoicing

All deliveries are to be invoiced according to price terms as given from this Agreement.

The Contractor cannot add additional fees to the invoices, such as ordering fees, invoice fees or any similar fee.

Payment terms are 30 days credit. Paying the invoice, does not involve approval of the delivery.

All invoices must come directly from the Contractor. Invoices from subcontractors will not be accepted unless specifically agreed in each case.

Invoices that are not issued correctly will be returned and claimed credited.

The price also includes necessary meeting activities under this Contract, insurances, and courier mail.

Any pre-payments require a Bank Guarantee.

Invoices shall (unless otherwise agreed) be sent electronically in standard format EHF (electronic trading format).

Electronic invoices shall be addressed to the respective organization and the following VAT number: **[TO BE INSERTED UPON CONTRACT SIGNATURE]**

All invoices must be marked with contract number **[TO BE INSERTED UPON CONTRACT SIGNATURE]**

In addition to the mandatory requirements of the EHF format, NRK AS requirements for the content of the following data elements:

- Your reference "AccountingCustomerParty / Party / Contact / ID"
  Data element must contain the name of the person who ordered the goods / services.
- Order number "OrderReference / ID"
  Data element must contain NRK purchase order number if specified, and contract number.
- Appendix "AdditionalDocumentReference / Attachment / EmbeddedDocumentBinaryObject"
  Attachments shall be of the format PDF or TIF and should be embedded in the XML document.
  If possible, we also want the invoice attached as an appendix. This ensures a better view of the invoice in our invoice processing system.

The invoice must also meet the following requirements:

1) The invoice must be numbered and dated
2) The invoice must contain information on:
    a) Seller's name, address and organization (including VAT when the Contractor is VAT registered)
    b) Buyer's name and address

      c) Clear description of what is delivered

      d) Quantity or scope of the supplied

      e) Price (specified tax base and tax amount)

      f) Delivery Time and place of delivery

2) Invoices should be addressed to

[TO BE INSERTED UPON CONTRACT SIGNATURE]

Contractor's response:

SSA-T Appendix 8

Changes to the general contractual wording

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

This Request for Proposal is formally issued by:

Norwegian Broadcasting Corporation Ltd. (NRK)

Bjørnstjerne Bjørnsonsplass 1

N-0340 OSLO, Norway

Switchboard: +47 23 04 70 00

Website: www.nrk.no

Norwegian Business Registration NO976 390 512

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1   CHANGES TO THE GENERAL CONTRACTUAL WORDING

Changes to the general contractual wording shall be set out here, unless the general contractual wording refers such changes to a different Appendix.

Changes can be made to all the clauses in the Agreement, even where there is no clear reference to the fact that changes can be agreed. Changes to the contractual wording shall be specified here so that the wording of the general contractual wording remains unchanged. It must be stated clearly and unequivocally which clause or clauses in the Agreement have been changed and the result of the changes.

The Contractor should, however, be aware of the fact that deviations, reservations or changes to the Agreement in connection with the submission of a tender may result in rejection of the tender by the Customer.

2   AGREED CHANGES INITIALISED BY THE CUSTOMER

Amended text; deleted text marked with ~~strike-through~~, new text in red

Clause	Original text	Comments / Shall be replaced by
2.5.3, last paragraph	The Customer's approval shall not prevent the Customer from demanding during the warranty period, the rectification of errors and defects that the Customer did not discover during the approval period, or errors that have not been rectified by the Contractor during the approval period.	*[Amended text]* The Customer's approval ~~shall~~ does not prevent the Customer from demanding the Contractor to rectify errors and defects during the warranty period that~~,~~ ~~the rectification of errors and defects that~~ the Customer did not discover ~~and could not be expected to discover~~ during the approval period, or to rectify errors or defects ~~that have~~ not ~~been~~ rectified by the Contractor during the approval period.
3.2, 2nd paragraph	However, the Contractor shall not be obliged to carry out additional work that represents, in aggregate, a net addition of more than fifteen (15) per cent to the original contract price, other than in the case of a disputed change order pursuant to clause 3.8.	*[The paragraph is deleted in its entirety]*
3.2, new last paragraph		*[New last paragraph]* Changes and additions to the Agreement can be made during all contract stages. The right to agree upon changes that are not a consequence of changes in legal requirements, do not go beyond what can be agreed upon within the legal framework of the procurement rules.

Clause	Original text	Comments / Shall be replaced by
3.6, first paragraph, first sentence	If the parties agree that there is a change, but disagree on the effect of such change as far as the contract price is concerned, the Customer shall pay a preliminary consideration, calculated pursuant to the rules set out in clause 3.5.	*[Amended text]* If the parties agree that there is a change, but disagree on the effect of such change as far as the contract price is concerned, the Customer shall pay a preliminary consideration, corresponding to the undisputed part of the consideration calculated pursuant to the rules set out in clause 3.5.
3.8, 3rd and 4th paragraph	Even if the change order is disputed, the Contractor shall perform what has been ordered in return for the Customer paying a provisional consideration corresponding to half of the amount to which the Contractor believes it is entitled. If the Contractor does not demand a decision concerning the disputed change pursuant to clause 3.9 of the Agreement within three (3) months after the consideration has been paid, or if the work is deemed to fall within the scope of the Agreement, the provisional consideration shall be set off against the consideration due upon the next payment milestone. If the work is deemed to be a change, the fixed consideration for the change, adjusted for the provisional consideration, shall be incorporated into the ordinary payment plan. The Contractor may contest the duty to perform the work by requesting a ruling from an independent expert or mediator or institute legal proceedings or submit the dispute for arbitration in order to have its claim resolved with final effect, cf. chapter 16. Such a request must be submitted without undue delay after the Customer has provided notice that the change is disputed. The Contractor shall bear the risk associated with any delays that may occur due to the postponement of the work, if it is determined that the work falls within the scope of the Agreement.	*[Both paragraphs are deleted in its entirety]*

Clause	Original text	Comments / Shall be replaced by
3.8, new 3rd paragraph		*[New paragraph]* Although the change order is disputed, the Contractor has a duty to perform the work provided the Customer provides a guarantee. The guarantee requirement does not apply if the Customer is a Norwegian public enterprise.
8.4, 1st paragraph	If overdue consideration, with the addition of late payment interest, has not been paid within thirty (30) calendar days of the due date, the Contractor may send a written notice to the Customer, stating that the Agreement will be terminated for breach, unless settlement has taken place within sixty (60) calendar days of receipt of such notice.	*[Amended text]* If a non-disputed overdue consideration, with the addition of late payment interest, which in total is considered to be material, has not been paid within thirty (30) calendar days of the due date, the Contractor may send a written notice to the Customer, stating that the Agreement will be terminated for breach, unless settlement has taken place within sixty (60) calendar days of receipt of such notice.
11.1, last paragraph	The Customer shall submit a written complaint without undue delay after the breach of contract has been discovered or ought to have been discovered.	*[Amended text]* The Customer shall submit a written complaint within reasonable time ~~without~~ undue delay after the breach of contract has been discovered ~~or ought to have been discovered~~.
11.2, last paragraph	No damages or other remedies for breach of contract may be claimed for circumstances that have not been notified at the latest prior to the expiry of the warranty period. Nevertheless, this shall not apply to any liability for damages imposed in relation to a third party in respect of defects in title pursuant to clause 13.4.	*[Amended text]* No damages or other remedies for breach of contract may be claimed for circumstances that have not been notified at the latest prior to the expiry of the warranty period. Nevertheless, this shall not apply to any liability for damages imposed in relation to a third party in respect of defects in title pursuant to clause 13.4, nor shall it apply in the case of gross negligence or wilful misconduct on the part of the Contractor.
13.2, last paragraph	If the defect in title cannot be resolved as stipulated in paragraph three, the Customer shall stop any further use of the solution and delete the relevant software component.	*[The paragraph is deleted in its entirety]*

3   AGREED CHANGES INITIALISED BY THE CONTRACTOR

Amended text; deleted text marked with, new text in blue

Clause	Original text	Comments / Shall be replaced by

SSA-T Appendix 9

Changes subsequent to the conclusion of the Agreement

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Norwegian Business Registration NO976 390 512

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1   INTRODUCTION

This Appendix documents changes in the delivery subsequent to the conclusion of the Agreement.

The Contractor shall maintain a directory of the changes on an ongoing basis, which directory shall form Appendix 9, and shall without undue delay provide the Customer with an updated copy thereof.

2   DOCUMENTATION OF THE CHANGE (CLAUSE 3.4)

Change no.	Description	Effective date	Archive reference

SSA-T Appendix 10

Licence terms and conditions for standard software and free software

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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1   INTRODUCTION

Copies of the licence terms and conditions for standard software and free software shall be inserted here in Appendix 10.

The Contractor shall fill in relevant information. Text inserted by the Contractor should be marked in blue font.

2   LICENCE TERMS AND CONDITIONS FOR STANDARD SW (CLAUSE 5.1)

To the extent that standard software included in the deliverables must be delivered under standard licence terms and conditions, this shall be explicitly stated in a separate chapter in Appendix 2, and copies of the licence terms and conditions shall be appended here.

Attachment no.	Software/license	Comments

3   GENERAL PROVISIONS PERTAINING TO FREE SW (CLAUSE 10.7.1)

If free software is to be used in connection with the deliverables, the Contractor shall prepare an overview of the relevant free software. The overview shall be included as a separate chapter in Appendix 2. Copies of the applicable licence terms and conditions for the relevant free software shall be appended in Appendix 10.

Attachment no.	Software/license	Comments

NRK

SSA-V Appendix 1

Customer requirements specification

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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1   INTRODUCTION

This agreement is related to maintenance of the solution for Multi-channel Continuity automation and playout in NRK.

Appendix 1 describes the needs as deemed suitable by the Customer to maintain the Solution (software, Contractor delivered integrations, hardware) delivered by the Contractor under SSA-T.

The Contractor shall give their response in Appendix 2 where this is marked in blue (Contractor's response) and follow the instructions how to the Contractor should use illustrations and text, to make sure it is clear how the service meets the requirements.

2   GENERAL NEEDS TO BE FULFILLED

The Customer's multi-channel Continuity automation and playout is a vital part of the Customer's publishing chain. It is expected that the solution will provide 100% broadcast ability. The solution provides a mission critical service for the customer and unscheduled downtime affecting the Customer ability to broadcast cannot be accepted. Furthermore, cost-efficient and optimized support and maintenance as described in this agreement will for the lifecycle of the solution be of high importance to ensure the Customer has an up-to-date and well-functioning toolset.

During the duration of support agreement, the solution will have to be adapted to the Customer's needs as a technologically advanced and demanding business.

The Contractor must provide an overall description of his understanding of the assignment and the maintenance service offered, including any prerequisites.

The Contractor shall describe how a combination of proactive and reactive maintenance services can enable him to guarantee uptime and transmission capability set forth in Appendix 5. Please also see sections 4.3 and 4.4.

The Contractor should offer his standard service agreement that, to the best extent, fits or exceeds the requirements in Appendices 1 and 5. The description of the service shall address which level of standard service agreement that best fits the Customer's need.

#	Deliverable
1	The Contractor must describe how the system is kept updated at any time in cooperation and per agreement with the Customer.
2	The Contractor must describe how they take care of their responsibility for life cycle management of the software that is necessary to maintain the agreed function and service level.
3	The Contractor must describe how they will carry out maintenance of the software so that the solution can be kept up-to-date in terms of security and quality throughout the entire agreement period.
4	If any standard software or third-party software is included in the solution, of which the Contractor has not developed itself or does not maintain itself, please describe how this will be handled by the Contractor support organization.
5	The Contractor is responsible for quality and performance also for any standard software or third-party deliveries, and any maintenance conditions agreed between the Contractor and the third-party supplier must be attached in Appendix 10 and the terms and conditions for the maintenance service shall be explicitly specified in a separate chapter in Appendix 2. Please read clause 2.2.5 in the general contracting wording.
6	Present roadmap: The Contractor should at least once a year present in writing form any new functionality that will be available the next 12-24 months.

#	Deliverable
7	The Contractor should proactively contribute to keep down cost levels associated with the operation and maintenance of the solution, cf. section 4.2, requirement 6.
8	The Customer shall be notified and provided access to the source code as described in SSA-T Appendix 1, section 10.4.1 Right of ownership and right of disposal, if the Contractor during the term of the Maintenance Agreement should have or should have any reason to foresee that events described in the General Contract Terms clause 10.2.2 may occur.

3   HANDLING OF INQUIRES

#	Deliverable
1	The Contractor must have a dedicated help line/user support making it possible for the Customer to report critical problems. The Contractor is asked to describe in Appendix 6 the support organisation and communication channels, i.e. phone/web/e-mail. It is preferred that the customer is given access to the Contractor's service management system for self-service in registering and monitoring the progress on the issues solving.
2	The Customer will provide the Contractor with remote access to the relevant parts of the infrastructure, to facilitate on-line investigation on the solution. The Contractor must be able to use remote access for user support and troubleshooting /correction. Routines and toolset for remote access is to be discussed and agreed upon during the establishment phase.
3	Where the Contractor does not itself supply the products (including hardware and software), the Contractor shall accept that the Customer can take direct contact with the manufacturer whenever the Customer think it is appropriate.

4   THE MAINTENANCE SERVICE (CF 2.2.1)

The following services are part of the maintenance price.

4.1   User support (cf 2.2.4)

#	Deliverable
1	The Contractor must provide second- and third-line support. First line support will be handled by the Customer.
2	The Contractor must have available qualified personnel for providing third line support and take technical support calls and on-line communication via telephone, email, and the fault reporting system. The user support is to be described in Appendix 6.
3	The Contractor must have an option for reporting critical issues (Level A) 24/7-365, and support staff ensuring that the critical issues will be handled in accordance with Appendix 5, section

4.2   Preventive maintenance

#.	Deliverable
1	The Contractor must keep updated on current OS support to ensure the Customer is not left on an EOL-branch of OS.

#.	Deliverable
2	The Contractor must continuously make security updates and patching of known vulnerabilities available to the Customer. The Customer carries out all upgrades and patching themselves.
3	The Contractor must actively notify the Customer of events that may affect the Customer's use of the system, such as known errors and the need for upgrades and security updates. The information is to be readily available for the Customer. The Contractor must inform on when and how the error is planned to be solved and inform on whether any temporary solutions are available.
4	The Contractor should at regular intervals (e.g. annually) perform a solution health check in cooperation with the Customer. Based on this, the Contractor shall provide a plan of action to resolve any issues within a reasonable time plan.
5	When applying changes, upgrades and maintenance to the system, it has to be done in a manner that doesn't affect the uptime and delivery of the service provided by the system.
6	The Contractor is asked to describe other preventive services that they believe are necessary for them to be able to guarantee the level of service expressed in Appendix 5. Please inform whether these services are part of their standard service agreements and already included in the price. If the services are priced separately the price must be inserted in Appendix 7.

4.3 Corrective maintenance

#	Deliverable
1	Errors reported by the Customer must contain the Customer's proposal for categorizing the error (A, B or C error), as described in SSA-V clause 2.2.5. If the work with an error situation shows that the categorization is incorrect or is no longer valid, the Contractor must propose a changed categorization. Changed categorization is only valid if the Customer approves the change.
2	The Contractor must, by agreement, deliver error reports where the Customer is affected, which describes the consequences for the customer, deviation reports and any change requests.
3	The Contractor will make bug fix releases available to the Customer when required to fix any urgent issues.
4	The Contractor shall provide new releases including fixes to previously reported problems and improved or new functionality to the software.
5	The Contractor must carry out thorough tests of the software before the correction is made available for installation in the Customer's test environment. The testing must also ensure that no errors have occurred as a result of the error correction.
6	The Contractor must maintain control of all third-party libraries and components in the solution in order to uncover security vulnerabilities and updates that are significant for the solution and ensure that errors in third-party libraries that imply the need for error correction of the solution are delivered under the same conditions as error corrections in self-developed components.
7	The Contractor is obliged, without additional remuneration, to assist with the implementation of program corrections in connection with category A and B errors.

4.4 Error handling (cf 2.2.5)

#	Deliverable
1	The Contractor shall provide fixes to problems and improvements to vulnerabilities for the version of the software or hardware used by customer.
2	The Customer wants error handling work to be initiated as soon as the error is reported and solved as soon as possible; Please see Appendix 5.

#	Deliverable
3	If the Customer is in doubt as to whether the error is caused by software, equipment or the network, the Customer can demand that the Contractor implements the necessary measures for troubleshooting. The Contractor shall assist the Customer in fault finding and rectification, even if it is unclear whether the fault is the Contractor's responsibility, if the Customer requests this.
4	The Customer will upon the Contractor's advice purchase and store critical components (hardware spare-parts) on-site to minimize the restore time on error caused by hardware. The Customer may be of help to fix hardware error upon guidance of the Contractor.
5	The Contractor shall describe relevant support packages for equipment which does not have spare parts stored at the customers facility.

4.5   New versions (cf 2.2.7)

#	Deliverable
1	The Contractor must offer new versions of the software to the Customer as soon as reasonably possible after new versions become available. The parties will agree to a timetable for testing and the migration from the current version with the aim of minimizing interruption to the Customer's operations.
2	The Contractor must inform the Customer in writing in reasonable time before launching a new version. The information must include changes that may significantly impact the Customer's use of the Solution.
3	The Contractor must support previous version of the software up to 12 months after a release of new main versions.
4	All new versions should be backward compatible so that functionality that the Costumer is using, or is planning to use, is not lost in the new version.
5	Upon the release of new versions, the Contractor shall ensure that the version/fix has been subject to testing, equivalently to the requirements as set forth in the Customization Agreement, in an environment comparable to the Customer's production platform. Documentation on such testing, including test results, should follow the release.
6	As a general rule, the Customer is himself responsible for the installation of program corrections and new software versions, but the Contractor shall, upon specific request from the Customer, be able to assist, or possibly take responsibility for this, in accordance with the hourly prices that appear in appendix 7.
7	The Contractor shall describe their methods for delivering new versions, e.g. how often major or minor releases are given to the Customers.
8	When the Contractor makes new versions, patches or other changes to the system available for the Customer, it shall be possible to deploy using the described deployment procedure cf. in SSA-T Appendix 1, section 6.3. This applies for all changes to be deployed to the system.

5   UPDATING DOCUMENTATION (CF 2.2.3)

#	Deliverable
1	The Contractor must deliver updated documentation as specified in SSA-T Appendix 1 section 9 for new versions and significant changes to the solution. This update shall be part of the service price.
2	A new version must contain a version note. The note must describe what has been changed, which upgrades, optimization, configuration changes, technical/logical sketch and error corrections

#	Deliverable
	have been carried out as well as a test report. Correspondingly, error correction in the form of a fix/patch must be documented.
3	Customer-specific documentation and general product documentation must be made available in English.
4	For each main delivery, the Contractor must deliver safety documentation that includes: • Updated solution description for security • Requirements for configuration in the Customer's environment to safeguard security • A guarantee that the Delivery does not contain code that could weaken the security of the solution, including viruses, back doors, unspecified/undocumented functions or other forms of malware.

6   ADDITIONAL SERVICES

6.1   Future development (cf 2.2.8)

The Customer may request changes or enhancements to the software at any time. The Contractor must provide an estimate of cost and timetable for delivery, according to Appendix 5 2.3

The Customer anticipates the need for improvements and development of new features during the lifecycle of the solution, including e.g. new modules.

The Customer reserves the right to demand that major project deliveries under SSA-V are carried out in line with the principles and provisions that follow from SSA-T Appendices 1/2, 4-6 and 7.

The Contractor shall account for how the Contractor handles future development requests with reference to the maintenance agreement 2.2.8 – «Future development».

6.1   Training

#	Deliverable
1	The Contractor must provide, upon request, functional and/or technical training of the Customer's internal experts/super users on the software and on the problem reporting procedures and problem analysis tools. All requests to the Contractor by the Customer for the service shall be made by the internal expert/second line support.

7   EXTERNAL LEGAL REQUIREMENTS (CF 9.1)

#	Deliverable
1	The Contractor shall handle personal data in accordance with applicable Norwegian laws and regulations. The Contractor and the customer will have to sign a data processor agreement pursuant to the Personal Data Act at the time of contract signing.

8   TERMINATING MAINTENANCE OPERATIONS (CF 4)

The Contractor shall in SSA-V Appendix 2 answer the following:

#	Deliverable
1	**Migrating:** When the delivery is terminated, assistance to migrate Customer Data is to be provided.
2	**Interface**: When the delivery is terminated, structured interfaces for delivering data to new Solution is to be provided.

#	Deliverable
1	**Migrating:** When the delivery is terminated, assistance to migrate Customer Data is to be provided.
2	**Interface**: When the delivery is terminated, structured interfaces for delivering data to new Solution is to be provided.

SSA-V Appendix 2
Contractor solution specification

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

This Request for Proposal is formally issued by:

Norwegian Broadcasting Corporation Ltd. (NRK)

Bjørnstjerne Bjørnsonsplass 1

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Switchboard: +47 23 04 70 00

Website: www.nrk.no

Norwegian Business Registration NO976 390 512

Table of Contents

1   INTRODUCTION

This Appendix contains the Contractor's specification of the support and maintenance solution in accordance with the requirements as set out by the Customer in Appendix 1.

Compliance is indicated by applying the following codes supplemented by solution descriptions for each requirement:

-    Y – Yes; fully comply
-    P – Partly comply
-    N – No; Does not comply

2   GENERAL NEEDS TO BE FULFILLED

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must describe how the system is kept updated at any time in cooperation and per agreement with the Customer.		
2	The Contractor must describe how they take care of their responsibility for life cycle management of the software that is necessary to maintain the agreed function and service level.		
3	The Contractor must describe how they will carry out maintenance of the software so that the solution can be kept up-to-date in terms of security and quality throughout the entire agreement period.		
4	If any standard software or third-party software is included in the solution, of which the Contractor has not developed itself or does not maintain itself, please describe how this will be handled by the Contractor support organization.		
5	The Contractor is responsible for quality and performance also for any standard software or third-party deliveries, and any maintenance conditions agreed between the Contractor and the third-party supplier must be attached in Appendix 10 and the terms and conditions for the maintenance service shall be		

#	Deliverable	Compliance	The Contractor's Solution Description
	explicitly specified in a separate chapter in Appendix 2. Please read clause 2.2.5 in the general contracting wording.		
6	Present roadmap: The Contractor should at least once a year present in writing form any new functionality that will be available the next 12-24 months.		
7	The Contractor should proactively contribute to keep down cost levels associated with the operation and maintenance of the solution, cf. section 4.2, requirement 6.		
8	The Customer shall be notified and provided access to the source code as described in SSA-T Appendix 1, section 10.4.1 Right of ownership and right of disposal, if the Contractor during the term of the Maintenance Agreement should have or should have any reason to foresee that events described in the General Contract Terms clause 10.2.2 may occur.		

3 HANDLING OF INQUIRES

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must have a dedicated help line/user support making it possible for the Customer to report critical problems. The Contractor is asked to describe in Appendix 6 the support organisation and communication channels, i.e. phone/web/e-mail. It is preferred that the customer is given access to the Contractor's service management system for self-service in registering and monitoring the progress on the issues solving.		
2	The Customer will provide the Contractor with remote access to		

#	Deliverable	Compliance	The Contractor's Solution Description
	the relevant parts of the infrastructure, to facilitate on-line investigation on the solution. The Contractor must be able to use remote access for user support and troubleshooting /correction. Routines and toolset for remote access is to be discussed and agreed upon during the establishment phase.		
3	Where the Contractor does not itself supply the products (including hardware and software), the Contractor shall accept that the Customer can take direct contact with the manufacturer whenever the Customer think it is appropriate.		

4   THE MAINTENANCE SERVICE (CF 2.2.1)

4.1   User support (cf 2.2.4)

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must provide second- and third-line support. First line support will be handled by the Customer.		
2	The Contractor must have available qualified personnel for providing third line support and take technical support calls and on-line communication via telephone, email, and the fault reporting system. The user support is to be described in Appendix 6.		
3	The Contractor must have an option for reporting critical issues (Level A) 24/7-365, and support staff ensuring that the critical issues will be handled in accordance with Appendix 5, section		

4.2   Preventive maintenance

#.	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must keep updated on current OS support		

#.	Deliverable	Compliance	The Contractor's Solution Description
	to ensure the Customer is not left on an EOL-branch of OS.		
2	The Contractor must continuously make security updates and patching of known vulnerabilities available to the Customer. The Customer carries out all upgrades and patching themselves.		
3	The Contractor must actively notify the Customer of events that may affect the Customer's use of the system, such as known errors and the need for upgrades and security updates. The information is to be readily available for the Customer. The Contractor must inform on when and how the error is planned to be solved and inform on whether any temporary solutions are available.		
4	The Contractor should at regular intervals (e.g. annually) perform a solution health check in cooperation with the Customer. Based on this, the Contractor shall provide a plan of action to resolve any issues within a reasonable time plan.		
5	When applying changes, upgrades and maintenance to the system, it has to be done in a manner that doesn't affect the uptime and delivery of the service provided by the system.		
6	The Contractor is asked to describe other preventive services that they believe are necessary for them to be able to guarantee the level of service expressed in Appendix 5. Please inform whether these services are part of their standard service agreements and already included in the price. If the services are priced separately the price must be inserted in Appendix 7.		

4.3 Corrective maintenance

#	Deliverable	Compliance	The Contractor's Solution Description
1	Errors reported by the Customer must contain the Customer's proposal for categorizing the error (A, B or C error), as described in SSA-V clause 2.2.5. If the work with an error situation shows that the categorization is incorrect or is no longer valid, the Contractor must propose a changed categorization. Changed categorization is only valid if the Customer approves the change.		
2	The Contractor must, by agreement, deliver error reports where the Customer is affected, which describes the consequences for the customer, deviation reports and any change requests.		
3	The Contractor will make bug fix releases available to the Customer when required to fix any urgent issues.		
4	The Contractor shall provide new releases including fixes to previously reported problems and improved or new functionality to the software.		
5	The Contractor must carry out thorough tests of the software before the correction is made available for installation in the Customer's test environment. The testing must also ensure that no errors have occurred as a result of the error correction.		
6	The Contractor must maintain control of all third-party libraries and components in the solution in order to uncover security vulnerabilities and updates that are significant for the solution and ensure that errors in third-party libraries that imply the need for error correction of the solution are delivered under the same conditions as error corrections in self-developed components.		
7	The Contractor is obliged, without additional remuneration, to assist with the		

#	Deliverable	Compliance	The Contractor's Solution Description
	implementation of program corrections in connection with category A and B errors.		

4.4 Error handling (cf 2.2.5)

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor shall provide fixes to problems and improvements to vulnerabilities for the version of the software or hardware used by customer.		
2	The Customer wants error handling work to be initiated as soon as the error is reported and solved as soon as possible; Please see Appendix 5.		
3	If the Customer is in doubt as to whether the error is caused by software, equipment or the network, the Customer can demand that the Contractor implements the necessary measures for troubleshooting. The Contractor shall assist the Customer in fault finding and rectification, even if it is unclear whether the fault is the Contractor's responsibility, if the Customer requests this.		
4	The Customer will upon the Contractor's advice purchase and store critical components (hardware spare-parts) on-site to minimize the restore time on error caused by hardware. The Customer may be of help to fix hardware error upon guidance of the Contractor.		
5	The Contractor shall describe relevant support packages for equipment which does not have spare parts stored at the customers facility.		

4.5 New versions (cf 2.2.7)

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must offer new versions of the software to the Customer as soon as reasonably possible after new versions become available. The parties will agree to a timetable for testing and the migration from the current version with the aim of minimizing interruption to the Customer's operations.		
2	The Contractor must inform the Customer in writing in reasonable time before launching a new version. The information must include changes that may significantly impact the Customer's use of the Solution.		
3	The Contractor must support previous version of the software up to 12 months after a release of new main versions.		
4	All new versions should be backward compatible so that functionality that the Costumer is using, or is planning to use, is not lost in the new version.		
5	Upon the release of new versions, the Contractor shall ensure that the version/fix has been subject to testing, equivalently to the requirements as set forth in the Customization Agreement, in an environment comparable to the Customer's production platform. Documentation on such testing, including test results, should follow the release.		
6	As a general rule, the Customer is himself responsible for the installation of program corrections and new software versions, but the Contractor shall, upon specific request from the Customer, be able to assist, or possibly take responsibility for this, in accordance with the		

#	Deliverable	Compliance	The Contractor's Solution Description
	hourly prices that appear in appendix 7.		
7	The Contractor shall describe their methods for delivering new versions, e.g. how often major or minor releases are given to the Customers.		
8	When the Contractor makes new versions, patches or other changes to the system available for the Customer, it shall be possible to deploy using the described deployment procedure cf. in SSA-T Appendix 1, section 6.3. This applies for all changes to be deployed to the system.		

5   UPDATING DOCUMENTATION (CF 2.2.3)

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must deliver updated documentation as specified in SSA-T Appendix 1 section 9 for new versions and significant changes to the solution. This update shall be part of the service price.		
2	A new version must contain a version note. The note must describe what has been changed, which upgrades, optimization, configuration changes, technical/logical sketch and error corrections have been carried out as well as a test report. Correspondingly, error correction in the form of a fix/patch must be documented.		
3	Customer-specific documentation and general product documentation must be made available in English.		
4	For each main delivery, the Contractor must deliver safety documentation that includes: • Updated solution description for security		

#	Deliverable	Compliance	The Contractor's Solution Description
	• Requirements for configuration in the Customer's environment to safeguard security • A guarantee that the Delivery does not contain code that could weaken the security of the solution, including viruses, back doors, unspecified/undocumented functions or other forms of malware.		

6 ADDITIONAL SERVICES

6.1 Future development (cf 2.2.8)

[The Contractor's response to be inserted here.]

6.1 Training

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor must provide, upon request, functional and/or technical training of the Customer's internal experts/super users on the software and on the problem reporting procedures and problem analysis tools. All requests to the Contractor by the Customer for the service shall be made by the internal expert/second line support.		

7 EXTERNAL LEGAL REQUIREMENTS (CF 9.1)

#	Deliverable	Compliance	The Contractor's Solution Description
1	The Contractor shall handle personal data in accordance with applicable Norwegian laws and regulations. The Contractor and the customer will have to sign a data processor agreement pursuant to the Personal Data Act at the time of contract signing.		

8 TERMINATING MAINTENANCE OPERATIONS (CF 4)

#	Deliverable	Compliance	The Contractor's Solution Description
1	**Migrating:** When the delivery is terminated, assistance to migrate Customer Data is to be provided.		
2	**Interface**: When the delivery is terminated, structured interfaces for delivering data to new Solution is to be provided.		

NRK

SSA-V Appendix 3

Software and/or equipment
to be maintained

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

This Request for Proposal is formally issued by:

Norwegian Broadcasting Corporation Ltd. (NRK)

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Norwegian Business Registration NO976 390 512

Table of Contents

1   INTRODUCTION

Please list all software and hardware to be maintained as part of this agreement.

The maintenance agreement must cover all deliveries that are part of the solution in SSA-T Appendix 2; this includes any added deliveries during the lifecycle of the provided solution.

This Appendix must be updated after the approval of the detailed specifications of the Development and Customization Agreement and shall be updated during the lifetime of the contract.

2   MAINTENANCE

2.1   The scope of the maintenance service (Clause. 2.2.1)

The Contractor is to specify hardware, software and APIs that is subject to support and maintenance under this agreement.

2.2   Hardware

Name	Item number	Purpose	Number of units

2.3   Software

Name	Version number	Purpose	Number of units

2.4   API

API (software's interaction with other software)	Version

3   OTHER RELEVANT INFORMATION

Contractor's response:

SSA-V Appendix 4

Project and Progress plan

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Table of Contents

1. INTRODUCTION

Plans for the establishment of the system <u>before</u> the system is fully operative and accepted by the Customer, must be placed in Appendix 4 of the Customization agreement.

Any reference to "clause" refers to a section in the main text of the SSA-V Agreement.

2. PROJECT AND PROGRESS PLAN

The Contractor shall provide a plan for establishing the support and maintenance service. Please include this description in Appendix 4 of the Customization agreement (SSA-T), including any prerequisites or demands to the Customer's organization.

3. DURATION OF THE SUPPORT AND MAINTENANCE AGREEMENT

The Agreement shall be for a term of minimum five (5) years starting from the date set out on page two of the Agreement.

SSA-V Appendix 5

Service level with standardised price reduction

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Table of Contents

1   INTRODUCTION

The service level described in this Appendix is required for support and maintenance.

The Contractor shall provide relevant information, as far as possible, where requested.

All references labeled cf. <number> refer to the General Contract Terms (SSA-V)

The Contractor is to fill out relevant information and provide their response where this is marked in blue (Contractor's response).

The table below contains definitions of terms applied in this Appendix.

Term	Definition
Scheduled Maintenance	Pre-notified work performed by either the Contractor or Customer within the maintenance window. Scheduled Maintenance also includes customer-specific maintenance outside the Maintenance Window, if the Customer has requested this. Should not make impact on Uptime.
Response Time	The elapsed time` between an inquiry or incident and the beginning of the Contractors` support staff has started troubleshooting or analyzing the incident.
Resolution time	The elapsed time between an inquiry or incident was reported until the event has been resolved or a "Workaround" has been implemented. For A- and B errors resolution time applies 24/4, for C errors resolution time working days apply.
Measurement period	The measurement period for all the services in this document is monthly (per calendar month), measured 24/7.

2   RESPONSE TIME

2.1   User support (cf. 2.2.4)

The table below indicates response times for daily requests.

Request type	Response time	Resolution time (if relevant)	Reporting requirements
Service request and support	5 working days	Next maintenance release or upon agreement	Regular status meeting or after Agreement

The Contractor shall reply on his ability to fulfill the response time set above.

 Contractor's response:

2.2   Error handling (cf. 2.2.5)

The solution is mission critical for the Customer and it is of high importance to keep the number of incidents low and short response times for support requests is expected. The table below describes NRKs' preferred response and resolution times.

The Contractor shall describe and classify any deviations in their offered service level.

Error type	Response time	Resolution time	Reporting requirements
Critical error (A)	30 minutes or better* (c.f. table "type of communication")	1 hour	Every 30 minutes, and when new information is available

Error type	Response time	Resolution time	Reporting requirements
Serious error (B)	1 hour	8 hours	Every 4 hours
Less serious error (C)	Next working day	Five (5) working days unless otherwise agreed	Regular status meeting

If an incident categorized as a level A error is solved with a workaround, it will transition to a level B error until a permanent fix is implemented.

Support must be available with competent resources 24/7-365. A hotline telephone number for reporting critical (level A) issues is preferred. Contact information according to Appendix 6.

*Type of communication	Maximum response time
Phone/Chat/video	30 minutes
Support portal/e-mail within office hours	1 hour
Support portal/e-mail outside office hours (next working day)	2 hours

When serious and critical system errors occur (or re-occur), it may require joint troubleshooting between the Contractor and the Customer. In such scenarios it is preferred to establish a common communication platform, using established routines for chat, video conference etc. This allows for rapid onboarding of relevant resources in both ends and secures a close communication. The Contractor has described their routines in Appendix 6.

The Contractor shall reply on his ability to fulfill the response time set above.

Contractor's response:

2.3   Change Management response time

If the Customer requests changes, future development etc., the following response time should be guaranteed.

The Contractor may change (highlighted yellow) in the table below.

Change Management	Response Time
The Contractor guarantees a response time on normal change request, after the request has been received.	5 working days

Violation of guaranteed Change Management response time provides a basis for compensation (see section 3.2.3 below).

Contractor's response:

3   SERVICE LEVEL AND COMPENSATION

In the following sections, service level objectives are required in connection with the operation of the system.

Service Level Measurement

Service Level Measurements must be able to document actual reduction of service or actual downtime on the system / application. Measurement of ping and monitoring of hardware is not sufficient to give a real result.

The Contractor is responsible for providing metrics and data, enabling measurement of the actual service provided by the system.

The Contractor will describe proposed measurement methodology, what to measure and how. That is, the description of tools used and how this is used.

The Costumer expects description of method within this area (given as an example):

> The calculation period for availability is made according to the following formula:
>
> A = (1 - ((D–P)/O)) x 100
>
> A = Availability
>
> P = Planned downtime in connection with work in agreed service window
>
> O = Operating time in minutes
>
> D = Downtime - The time the Solution has been unavailable
>
> Downtime (D) is the time in minutes that the solution is not available. Downtime (D) is not the time in minutes the solution is not available, if there is force majeure, or other conditions beyond the Contractor's control.
>
> Up- and down-times are given in whole minutes.

NRK shall approve measurement methodology during the installation phase.

Requirements for precise calculation of presented target number:

- Formula calculation method must be accurate and correct.
- Suitable and consistent with measurement / definition
- Consider all contractual forms of downtime.

Contractor's response:

3.1 Guaranteed Uptime / Availability

It is expected that the solution will provide 100% broadcast ability.

The solution provides a mission critical service for the Customer and unscheduled downtime affecting the Customer's ability to broadcast cannot be accepted. We acknowledge that computers and servers may have errors or stop working, thus it is vital that the Contractor always prioritizes the customers' ability to broadcast when performing maintenance, does architectural changes or when providing support.

Contractor's response:

Please describe the anticipated need for scheduled maintenance that will affect the service provided by the system. If any, please also describe any reduction of service as a consequence of the maintenance.

Contractor's response:

3.2 Compensation for service level breach (cf. 11.4)

The Contractor shall describe the sanction regime and the level of compensation for service level breaches. The Contractor may suggest other ways to reimburse the Customer as part of the negotiations.

The Contractor may change (highlighted yellow) in the tables below.

Compensation shall be in % of monthly remuneration.

3.2.1 Breach of guaranteed uptime

Cf. section 3.1.

Specification	Minimum uptime %	Sanction
Unplanned reduction of service	99,9995	5%
	99,9990	10%
	99,998	20%
	Below 99,997	30%
Scheduled work resulting in reduction of service	99,995	5%
	99,993	10%
	99,991	20%
	Below 99,990	25%

The shaded area in the table above is considered material breach of contract and gives the Customer the right to terminate the Agreement and claim damages if the deviation occurs for 2 consecutive months or 3 months per year.

3.2.2 Violation of guaranteed error correction time

Cf. section 2.2.

Specification	Sanction
A – Critical errors – Solution time	1,0%
B – Major errors – Solution time	0,5%
C – Minor Errors - Solution time	0,2%

The hourly compensation shall accumulate automatically and amount to the percentage in the table above of the overall monthly consideration, excluding Value Added Tax, for each hour, or part thereof, of delay.

The hourly compensation shall accumulate 24/7-365 for A and B errors. Hourly compensation shall only accumulate during ordinary working hours for C-errors.

The liability for accumulated hourly compensation may not exceed 60 per cent of the monthly consideration per instance of breach of contract and 15 per cent accumulated of the annual consideration.

3.2.3 Violation of response time

Cf. sections 2.1 and 2.3.

Service Level	Specification	Sanction
Violation of guaranteed average response time support (2.1)	Contact support-by phone, chat or email	0,2%
Violation of guaranteed Change Management response time (2.3)	Response time	0,2%

The liability for accumulated hourly compensation may not exceed 60 per cent of the monthly consideration per instance of breach of contract and 15 per cent of the annual consideration.

3.2.4 Material breach of contract

If the total compensation exceeds 70% of the monthly consideration, it is considered material breach of contract and gives the Customer the right to terminate the Agreement and claim damages if the deviation occurs for 2 consecutive months or 3 months per year.

Contractor's response:

4   OTHER RELEVANT INFORMATION

Contractor's response:

SSA-V Appendix 6

Administrative provisions

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Table of Contents

1. INTRODUCTION

Requirements for administrative provisions are outlined in this appendix. The Contractor should respond to the requirements at the bottom of each section. If some of the requirements cannot be met, explain why and how this can be solved in another way.

Text inserted by the Contractor should be marked in blue font.

2. REPRESENTATIVES OF THE PARTIES

2.1. Customer's representatives (Clause 1.5)

Customer key personnel for maintenance procurement and operating the service during the agreement:

Name	Position	Role
		Project Owner; The representative who is authorised to act on behalf of the party in matters relating to the Agreement.
		Contact person technical matters
		Contact person contractual matters
		[Other, if relevant]

[Customer information to be filled in upon the conclusion of the Agreement]

2.2. Contractor's representatives (Clause 1.5)

Name	Position	Role
[Name]	[Position]	The representative who is authorised to act on behalf of the party in matters relating to the Agreement.
[Name]	[Position]	Contact person technical matters
[Name]	[Position]	Contact person contractual matters
[Name]	[Position]	[other, if relevant]

2.3. Contact persons for the Agreement's service levels

Party	Name	Position	Phone
Customer	[TBC]	[TBC]	[TBC]
Contractor	[Name]	[Position]	[No]

[Customer information to be filled in upon the conclusion of the Agreement]

3. JOINT COLLABORATION

The Contractor must describe a plan for interaction as well as which routines for interaction between the Customer and the Contractor are to be used as a basis for an efficient performance of the maintenance service.

The Contractor must provide resources to enable the Customer and Contractor to establish joint processes and routines related to the handover areas between the Customer and the Contractor.

The Contractor must describe the use of any subcontractors and their efforts in carrying out the maintenance service.

In addition to the points specified in clause 2.1.2 of the SSA-V Agreement, the Contractor must describe routines and procedures for:

- Contact with the Contractor's user support/technical support during and outside normal working hours

- Error reporting and correction during and outside normal working hours, including routines for sending program corrections that can be installed by the Customer themselves

- Escalation with the Customer and the Contractor; escalation points and routines/criteria for escalation

- Following up the delivery:
  - The Customer's person responsible for the agreement will follow up this agreement.
  - The Contractor is to provide a dedicated resource to answer to the Customer's responsible for the agreement.
  - Regular meetings are to be held every 4 weeks, where the delivery is followed up, and any improvement areas are discussed. This is to take place in the Customer's premises unless otherwise agreed. The Contractor is responsible for meeting minutes. All reports related to following up on the delivery, is to be made available for the Customer one week in advance of the meeting.

- Supplementary purchases and license extensions

- Any further development.

- Interaction with any third parties

- Routines for ordering additional work, including approved requisitioner from the Customer

- Routines for major upgrades

- Other relevant assistance

Contractor's response

4. USER SUPPORT

According to Appendix 1, the Contractor requests user support as part of the service. User support shall under this Agreement be understood as "technical support/ 2nd line user support", where the Customer's 2nd line shall be able to direct inquiries and report incidents to the Contractor's technical support organization, providing third line support.

The Contractor is asked to describe their user support service. The following topics shall be described:

- Organization of the user support, hereunder available qualified personnel

- Available communication channels and their respective opening hours

- The functionality of the Contractor's error reporting tool (accessible for the Customer)

- The possibility for increased and extended access to user support beyond normal opening hours, cf Appendix 1, section 4.1 – requirement no 3; reporting critical issues 24/7/365

5. SAFEGUARDING COMPETENCE AND EXPERIENCE

The Contractor shall ensure and describe:

- continuity of general competence and experience when delivering according to the Agreement.

- continuity in competence and experience with the Customer specific Solution and any customizations when delivering according to the Agreement.

Contractor's response

6. CONTRACTOR'S KEY PERSONNEL (CLAUSE 5.2)

Key personnel means the Contractor's named personnel who have defined roles and areas of responsibility related to the execution of the Agreement, both technical and mercantile.

The Customer asks the Contractor to assess the need of available key personnel to safeguard the solution's ability to broadcast cf. SLA in Appendix 5

- 2-3 named consultants will be made available for technical support, maintenance, and further development. A resumé and CV where competence, experience and certifications appear must be attached.

- 1-2 named consultants must be offered who will provide advice related to the solution, these can be the same consultants as in row 1. A resumé and CV showing competence, experience and certifications must be attached.

All personnel intended to perform work under this contract shall sign a NDA.

The Contractor's key personnel for delivering the service are to be provided in the table.

Name	Position/role	Competence/Experience	CV#

7. SUB-CONTRACTOR(S)

The Subcontractors approved by the Customer for carrying out work and/or deliveries under the Agreement are listed below. In this context, subcontractor shall also be understood as "Producer" if the manufacturer's resources are performing service. It must be stated which deliveries are carried out by the individual subcontractor.

All personnel intended to perform work under this contract shall sign a NDA.

The Contractor's subcontractor for delivering the service is to be provided in the table

Name	Role / position	Area of competence

8. WAGES AND WORKING CONDITIONS (CLAUSE. 5.4)

Documentation showing the Contractor's compliance with the obligations stipulated in clause 5.4 of the Agreement (Wages and working conditions) shall be provided here.

Contractor's response:

SSA-V Appendix 7

Total price and pricing provisions

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

This Request for Proposal is formally issued by:

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N-0340 OSLO, Norway

Switchboard: +47 23 04 70 00

Website: www.nrk.no

Norwegian Business Registration NO976 390 512

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1   INTRODUCTION

This Appendix contains all prices and detailed conditions for the consideration the Customer must pay for the Contractor's deliverables under the Agreement.

All services described in Appendix 2 and other deliverables as described in Appendices 4-6 will automatically be considered included in the prices unless otherwise explicitly stated in this Appendix.

Any special payment schemes, discounts, advances, payments on account or deviant payment dates shall also be stated as part of the basis for the total price.

Any other listing of prices shall be specified separately. It must be listed whether the price is per unit or per month, year, agreement period, etc.

If the parties agree on anything that is not stipulated in the Agreement concerning consideration, this shall be specified in this Appendix.

All references marked CF <number> or clause <number> refers to the Maintenance Agreement (SSA-V).

The Customer requires that the Contractor answers every section in this document consecutively. Text inserted by the Contractor should be marked in blue font.

1.1   Submission of a calculation basis (excel)

The Contractor is asked to present the prices in an excel form (combined for SSA-T and SSA-V) based on the format of the tables in the appendices, and in addition insert other tabs with details to serve as calculations for the prices. The calculation basis (in excel) will be used in the negotiations to ensure that the Customer understands the content of the prices.

Provided that the tables in the excel form are identical to the tables in this Appendix, the Contractor may replace the tables with their own tables or picture of the tables.

1.2   Currency

The prices may be quoted in a preferred currency; Norwegian kroner (NOK), US Dollar (USD), British Pounds (GBP) or EURO (EUR) (etc), exclusive of value-added tax but inclusive of customs duties and other indirect taxes.

NRK will pay in the same currency as quoted, thus reservations regarding currency fluctuations are not permitted.

The Contractor shall specify which currency the proposal or parts thereof is quoted in.

Contractor's response:

1.3   Incoterms

If supplementary hardware is ordered, this shall be delivered according to DDP INCOTERMS 2020.

1.4   Payment models

1.4.1   CAPEX / OPEX

The Customers preferences for payment model under this agreement are;

OPEX

- SW and HW support for the solutions as a recurring price at regular intervals per year.
- For pop-up channels the support duration is in accordance with agreed purchase order cf. SSA-T.
- Supplementary SW License as a recurring price (annual subscription), according to terms agreed in SSA-T.

CAPEX

- Supplementary hardware cost and implementation cost (project cost) paid according to a payment plan or full upon delivery.

1.4.2 Target prices for implementation work

Please see a price model for implementation work, described in SSA-T Appendix 7. This model may also be used for additional implementation work under this Agreement.

2   CONSIDERATION (CF. 8.1)

The Customer prefers an annual fixed price for the total set of requirements in Appendices 1 and 5, except training, future bespoke development, and on-site assistance in implementing new software versions.

The price shall include maintenance and support service according to the Contractor offers in Appendix 2 and SLA in Appendix 5, including new versions (updates and upgrades).

During the contract period, the Customer will move from SDI to IP technology. How the transition to new technology is done depends on the plan for main delivery 2. In a transition phase, the Customer will probably use both SDI and IP based solutions.

The Customer pays for support based on which technology is used to broadcast, e.g. if NRK 4-8 broadcast from the IP-based delivery, the Customer no longer has to pay for SDI-based support, but only for IP-based support. Hence the yearly price must include both SW and HW support within each tier.

Consideration for the support deliverables for the scope in SSA-T Appendix 7, section 2 and 3:

Contractor's response:

Support and maintenance for the deliverable:	SDI based playout chain (Delivery 1)		IP-based playout chain Delivery 2)	
	Price/year 1*	Price / year 2 and onward	Price/year 1*	Price / year 2 and onward
Iteration 1 NRK 4-8 (5 x tier 2)				
Iteration 2 NRK 2-3 (2 x tier 1)				
Iteration 3 NRK 1 (1 x tier 1)				
Total				

Support and maintenance for the deliverable:	Price year 1*	Price year 2	Price year 3
Staging environments			
Offered Disaster Recovery solution			

*The Customer expects the price for year 1 to be lower, as the consideration under SSA-T includes guarantee/warranty.

3 CONSIDERATION (CF. 8.1) FOR OPTIONS

	Delivery (cf. Appendix 1 section 3.3)	Support cost per month SDI tech.	Support cost per month IP-tech.
A	One extra on-premises channel (Tier 1 category)		
B	One extra pop-up channel (Tier 2 category)		
	Delivery (cf. SSA-T Appendix 1 section 3.3)	Support cost per year	
C	Disaster recovery as a cloud-only-instance		
D	Streaming/Off-loading channels (NRK 4-8) as cloud-only-instance		

The Contractor shall specify any additional products or services that the Customer may buy as an option:

Option	Description	Price per year

4 PRICING MODEL SUPPLEMENTARY PURCHASES (CF. 2.2.9)

The Contractor is asked to suggest a predictable and transparent pricing model for purchasing software and hardware, which may provide a basis for supplementary purchases. For example:

[Global price list – % discount + % profit margin = Customer price]

Contractor's response:

5 HOURLY RATES

For any additional work, changes, and further development beyond what is included in the delivery, hourly rates for the personnel offered must be stated by filling in the table below.

The following categories must be used:

- Junior (0-4 years of relevant experience in the field)
- Senior (5-10 years of relevant experience in the field)
- Expert (10+ years of relevant experience in the field)

The Contractor may adapt the table below with extra rows and relevant activities with blue text.

Contractor's response:

Role / Category	Junior	Senior	Expert
Project manager	███		
Solution manager	███		
Architect	███		
Developer/customization/test			
Test manager	███		
Test assistance			
Training			
On-site assistance implementing new standard versions.			
Monitoring			
Expanded standby services			

6 ADDITIONAL SERVICES / CONTRACTOR'S SERVICE DIRECTORY (CF. 2.2.10)

Please list any additional services from the Contractor's service directory which are naturally associated to the maintenance service with associated prices. The services shall be described in Appendix 2

Contractor's response:

Additional options - description	Unit price	Number	Total price

7 TRAVEL EXPENSES

Travel and accommodation costs in relation to necessary trips to the Customer's premises in Oslo are covered according to the Government Travel Allowance Scale (cf. clause 8.1).

Contractor's response:

Estimated cost per travel:

- Day trip (all inclusive):   [insert price]
- Monday to Friday with accommodations: [insert price]

Travel-time is not subject to remuneration.

8   STANDARDIZED COMPENSATIONS

The compensations shall be specified in the next invoice, without the Customer having to ask for it.

Contractor's response:

9   PAYMENT TERMS (CF. 8.1)

9.1   Payment plan

The Customer prefers the following payment plan but is open for suggestions as part of the negotiations.

- Payment schedule for support fees should match main subscription fees frequency.

- Maintenance services and SLA will be invoiced in advance and on a quarterly basis.

- Additional professional services requested will be invoiced 100% at services delivery and final NRK acceptance unless otherwise agreed.

Contractor's response or counter proposal:

9.2   Invoicing

All deliveries are to be invoiced according to price terms as given from this agreement.

The Contractor cannot add additional fees to the invoices, such as ordering fees, invoice fees or any similar fee.

Payment terms are 30 days credit. Paying the invoice, does not involve approval of the delivery.

All invoices must come directly from the Contractor. Invoices from subcontractors will not be accepted unless specifically agreed in each case.

Invoices that are not issued correctly will be returned and claimed credited.

All services provided under this Contract must be linked to the projects milestones as described in Appendix 4 according to the deliverance agreed.

The price also includes necessary meeting activities under this Contract, insurances, and courier mail.

Any prepayments require a Bank Guarantee.

Invoices shall (unless otherwise agreed) be sent electronically in standard format EHF (electronic trading format).

Electronic invoices shall be addressed to the respective organization and the following VAT number: **[TO BE INSERTED UPON CONTRACT SIGNATURE]**

All invoices must be marked with contract number **[TO BE INSERTED UPON CONTRACT SIGNATURE]**

In addition to the mandatory requirements of the EHF format, NRK AS requirements for the content of the following data elements:

- Your reference "AccountingCustomerParty / Party / Contact / ID"
  Data element must contain the name of the person who ordered the goods / services.
- Order number "OrderReference / ID"
  Data element must contain NRK purchase order number if specified, and contract number.
- Appendix "AdditionalDocumentReference / Attachment / EmbeddedDocumentBinaryObject"
  Attachments shall be of the format PDF or TIF and should be embedded in the XML document.
  If possible, we also want the invoice attached as an appendix. This ensures a better view of the invoice in our invoice processing system.

The invoice must also meet the following requirements:

1) The invoice must be numbered and dated
2) The invoice must contain information on:

   a) Seller's name, address and organization (including VAT when the Contractor is VAT registered)

   b) Buyer's name and address

   c) Clear description of what is delivered

   d) Quantity or scope of the supplied

   e) Price (specified tax base and tax amount)

   f) Delivery Time and place of delivery

2) Invoices should be addressed to

   [TO BE INSERTED UPON CONTRACT SIGNATURE]

Contractor's response:

SSA-V Appendix 8

Changes to the general contractual wording

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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1   CHANGES TO THE GENERAL CONTRACTUAL WORDING

Changes to the general contractual wording shall be set out here unless the general contractual wording refers such changes to a different Appendix.

Changes can be made to all the clauses in the Agreement, even where there is no clear reference to the fact that changes can be agreed. Changes to the contractual wording shall be specified here so that the wording of the general contractual wording remains unchanged. It must be stated clearly and unequivocally which clause or clauses in the Agreement have been changed and the result of the changes.

The Contractor should, however, be aware of the fact that deviations, reservations or changes to the Agreement in connection with the submission of a tender may result in rejection of the tender by the Customer.

2   AGREED CHANGES INITIALISED BY THE CUSTOMER

Amended text; deleted text marked with ~~strike-through~~, new text in red

Clause	Original text	Comments / Shall be replaced by
2.2.8, (Parts of) 1st paragraph	**Further development** The Customer may order the further development of software that is covered by the maintenance agreement within the framework described in Appendices 1 and 2. This includes the development of additional functionality that is moderate in scope.	*[Amended text]* The Customer may order the further development of software that is covered by the maintenance agreement within the framework described in Appendices 1 and 2. This includes the development of additional functionality that is within the limits of, and to the extent that is required to maintain or achieve, the overall goal of the deliverables as described in SSA-T Appendix 1 ~~moderate in scope~~.
2.2.9, 1st paragraph	**Supplementary purchases** The Customer may, throughout the entire term of the Agreement, carry out supplementary purchases and extend or expand its licensing within the limits of, and to the extent that is required to maintain or achieve, the overall goal of the deliverables as described in Appendix 1.	*[Amended text]* The Customer may, throughout the entire term of the Agreement, carry out supplementary purchases and extend or expand its licensing within the limits of, and to the extent that is required to maintain or achieve, the overall goal of the deliverables as described in SSA-T Appendix 1.
11.1, last paragraph	The Customer shall submit a written complaint without undue delay after the breach of contract has been discovered or ought to have been discovered.	*[Amended text]* The Customer shall submit a written complaint within reasonable time ~~without undue delay~~ after the breach of contract has been discovered ~~or ought to have been discovered~~.

Clause	Original text	Comments / Shall be replaced by
11.4.3, 5th paragraph	Other rates and other periods for hourly liquidated damages, as well as the deliverables to which these shall apply, may be agreed in Appendix 1.	*[Amended text]* Other rates and other periods for hourly liquidated damages, as well as the deliverables to which these shall apply, may be agreed in Appendix ~~1~~ 5.

3   AGREED CHANGES INITIALISED BY THE CONTRACTOR

Amended text; deleted text marked with, new text in blue

Clause	Original text	Comments / Shall be replaced by

SSA-V Appendix 9

Changes subsequent to the conclusion of the Agreement

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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Norwegian Business Registration NO976 390 512

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1   INTRODUCTION

This Appendix documents changes in the delivery subsequent to the conclusion of the Agreement.

The Contractor shall maintain a directory of the changes on an ongoing basis, which directory shall form Appendix 9, and shall without undue delay provide the Customer with an updated copy thereof.

2   DOCUMENTATION OF THE CHANGE (CLAUSE 3)

Change no.	Description	Effective date	Archive reference

1   INTRODUCTION

SSA-V Appendix 10

Third party's terms and conditions for the maintenance of the third party's software

Multi-channel Continuity automation and playout

NRK-MA3542-22E

[Contractor name]

[Contractor logo]

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1   INTRODUCTION

In this attachment, all copies of license terms for standard and free software is to be described or attached. If applicable, the Contractor is instructed to explain any consequences for the Customer of any special terms and conditions as well as any deviation from the General Contract Terms.

The Contractor shall give their response where this is marked in blue (Contractor's response).

2   THIRD PARTY TERMS AND CONDITIONS (CLAUSE 2.2.5)

Attachment no.	Software/license	Comment

DATA PROCESSING AGREEMENT

BETWEEN

<mark>(NRK) org. no. 976 390 512</mark>
«Controller»

and

<mark>Supplier, org. no. xxx xxx xxx</mark>
«Processor»

INDEX

1

1.   BACKGROUND, PURPOSE AND DEFINITIONS

The Parties to this Data Processing Agreement has entered into an agreement of (date) "the **Agreement**") on account of (background/scope of the main agreement). This Data Processing Agreement governs each Party's rights and obligations, in order to ensure that all processing of personal data is conducted in compliance with applicable data protection legislation, including EU Regulation 2016/679 ("**GDPR**") and its applicable national data protection legislation implementing the GDPR.

Processor will process personal data in order to fulfil the Agreement, as specified in Appendix 1. Appendix 1 specifies:

- The subject-matter, nature and purpose of the processing,
- the types of personal data and the categories of data subjects involved.

The Controller determines the purposes and means of Processing in accordance with applicable law. The Processor shall only process personal data on behalf of the Controller and not for Processor's own purposes.

The terms "personal data", "sensitive personal data", "processing", "controller", "processor", "data subject" etc. used herein shall have the meaning assigned to them in the GDPR and applicable national laws.

2.   OBLIGATIONS OF THE CONTROLLER

The Controller confirms that it:

- has sufficient legal basis for processing of the personal data;
- has the right to use the Processor for processing of the personal data;
- has the responsibility for the correctness, integrity, content, reliability and legality of the personal data;
- shall implement sufficient technical and organizational measures to ensure and demonstrate compliance with applicable data protection legislation;
- informs the data subjects in accordance with applicable law

The Controller shall:

- notify applicable regulatory authorities and/or data subjects in case of personal data breach, pursuant to applicable data protection regulation;
- reply to requests from the data subjects regarding processing in relation to this Data Processing Agreement
- Assess the necessity of specific safeguards as set down in this Data Processing Agreement section 3.3.2, 3.3.4, and order such measures from the Processor.

3.   THE PROCESSOR'S OBLIGATIONS

3.1.   Compliance

The Processor shall comply with all provisions for protection of personal data set out in this Data Processing Agreement and in applicable data protection legislation.

The Processor shall comply with the instructions and routines issued by the Controller in relation to the Processing of Personal Data. The Processor shall immediately notify the Controller if the Processor is of the opinion that an instruction from the Controller is in violation of any applicable data protection regulation.

The Processor shall assist the Controller in ensuring and documenting compliance with the Controller's obligations under applicable data protection legislation.

3.2.   Restrictions on use

The Processor shall only process personal data in accordance with documented instructions from the Controller, unless the Processor is:

i)   required to do so by statutory law to which the Processor is subject. In such a case, the Processor shall inform the Controller of that legal requirement before processing, unless that statutory law prohibits such information on important grounds of public interest.

ii)   required to do so in order to fulfil its obligations towards the Controller subsequent to termination of the Agreement. In such a case, the provisions of this Data Processing Agreement shall continue to apply until the processing has seized.

3.3.   Information security

3.3.1.   Duty to ensure information security

The Processor shall by means of planned, systematic, organisational and technical measures ensure appropriate information security with regard to confidentiality, integrity and accessibility in connection with the Processing of Personal Data in accordance with the information security provisions in applicable data protection legislation.

A detailed description of the Processor's information security measures shall be set out in Appendix 2.

3.3.2.   Assessment of measures

In deciding which technical and organisational measures should be implemented, the Processor shall, in consultation with the Controller, take into account:

- The state of the art
- The costs of implementation
- The nature and scope of the processing
- The context and purpose of the processing,
- The severity of risks the Processing of Personal Data has for the rights and freedoms of the data subject

The Processor shall, in consultation with the Controller, consider:

- Implementing pseudonymisation and encryption of Personal Data
- the ability to ensure the confidentiality, integrity, availability and resilience of processing systems and services on an ongoing basis
- the ability to restore the availability and access to personal data in a timely manner in the event of a physical or technical incident
- a process for, on an ongoing basis, testing, assessing and evaluating regularly the effectiveness of technical and organisational measures for ensuring the security of the Processing

3.3.3.   Requests from the data subjects

Taking into account the nature of the processing, the Processor shall implement appropriate technical and organisational measures in order to support the Controller's obligation to facilitate exercise of the rights of the data subjects pursuant to GDPR chapter 3.

3.3.4.   Assistance to the Controller

The Processor shall assist the Controller in ensuring compliance with applicable law, including assisting the Controller with:

• Implementing technical and organisational measures as stated above;
• Complying with duty of notification to supervisory authorities and data subjects in case of a personal data breach;
• Conduct data privacy impact assessments;
• Conduct prior consultations with supervisory authorities when a privacy impact assessment makes it necessary;
• Notice to the Controller if the Processor is of the opinion that an instruction from the Controller is non-compliant with applicable data protection regulations.

Assistance as set out above, shall be carried out to the extent necessary, taking into account the Controller's need, the nature of the processing and the information available to the Processor.

3.4.   Personal Data Breach (discrepancy)

Any use of the information systems and Personal Data in violation of established routines, instructions from the Controller or applicable privacy legislation shall be treated as a Personal Data Breach.

The Processor shall have in place technical and organisational measures to follow up discrepancies, which shall include re-establishing of the normal state of affairs, eliminating the cause of the discrepancy and preventing its recurrence.

The Processor shall immediately and without undue delay notify the Controller of:

i)   any breach of this Data Processing Agreement including
    a.   accidental, unlawful or unauthorized access to, use or disclosure of personal data;
    b.   that personal data may have been compromised; or
    c.   a breach of the integrity of the Personal Data.
ii)   any other discrepancies from this Agreement

The Processor shall send notifications to personvern@nrk.no and to the Controller's contact person for the Agreement.

The Processor shall provide the Controller with all information necessary, and assistance to enable the Controller to comply with applicable data protection legislation and enabling the Controller to answer any inquiries from the applicable data protection authorities and/or the data subjects. The Controller is the party responsible to notify the applicable data protection authority of discrepancies in accordance with applicable law.

3.5.   Confidentiality

The Processor shall keep confidential all personal data and other confidential information provided to it under the Agreement or this Data Processing Agreement. The Processor shall ensure that each member of its staff, whether employed or hired employee, having access to or being involved with the processing of personal data under the Agreement undertakes a duty of confidentiality and is informed of and complies with the obligations of this Data Processing Agreement. The duty of confidentiality shall also apply after termination of the Agreement or this Data Processing Agreement.

3.6.   Security audits

The Processor shall, by itself or through a third party auditor, regularly conduct security audits on its organisational and technical measures, including its systems and similar relevant to the

processing of personal data covered by this Data Processing Agreement. The results of the audit shall be documented and made available to the Controller upon request.

The Controller has the right to demand security audits performed by an independent third party. The third party will provide a report to be delivered to the Controller upon request. The Controller accepts that the Processor may claim compensation for the performance of the audit.

The Controller is entitled to submit audit reports to the applicable data protection authority and other third parties who are entitled to view the report.

3.7. Use of subcontractors

Any sub-contractors shall be approved in writing by the Controller before the sub-contractor may Process Personal Data. The Processor is entitled to use sub-contractors and the Controller accepts the use of sub-contractors identified in Appendix 1. The Processor shall, by written agreement with any sub-contractor ensure that any Processing of Personal Data carried out by sub-contractors shall be subject to the same obligations and limitations as those imposed on the Processor according to this Data Processing Agreement.

If the Processor plans to change sub-contractors or plans to use a new sub-contractor, Processor shall notify the Controller in writing 4 months prior to any Processing by the new sub-contractor, and the Controller is entitled to object to the change of sub-contractors within 1 month. Should the Controller object to the change, Controller may terminate the Agreement upon 3 months notice. To the extent Controller does not terminate the Agreement, the change of sub-processor is rendered as accepted.

3.8. Transfer of personal data to third countries

The Processor shall not transfer Personal Data outside the EU/EEA, or give anyone outside the EU/EEA (including subcontractors) access to Personal Data processed on behalf of the Controller, without prior written consent of the Controller. To avoid any doubt, the same applies if the information is stored in the EU/EEA, but can be accessed by personnel located outside the EU/EEA.

If the Controller has given its written consent to the transfer of Personal Data to a country outside the EU/EEA that is not considered to ensure an adequate level of protection under the GDPR ("Third Country"), the Processor shall cooperate with the Controller to ensure the legality of the transfers. The Processor herby undertakes, at the request of the Controller, to enter into the EU Standard agreement for the transfer of personal data to data processors in third countries (2010/87/EC) or other provisions that replace these terms, in the Controllers name and om behalf of the Controller. The Processor undertakes to send a copy of the signed EU standard agreement to the Controller. The Processor shall further assist in ensuring that, when necessary, additional measures are established to ensure a sound level of protection of the Personal Data in the Third Country.

4. LIABILITY, BREACH

4.1. Procedure

In the event of breach of this Data Processing Agreement, or a breach of obligations according to applicable law on processing of personal data, the relevant provisions regarding procedure for breach management in the Agreement shall apply.

The Processor shall notify the Controller without undue delay if it will or has reason to believe it will be unable to comply with any of its obligations under this Data Processing Agreement.

4.2. Liability and limitation of liability

The Processor is liable for direct economic loss, including fines or similar administrative sanctions, and claims directed to the Controller, which relates to the Processor's violation of any responsibilities under this Data Processing Agreement. The Processor is also liable for any sub processor's breach of this Data Processing Agreement.

Should one or both Parties become liable for administrative fees pursuant to GDPR article 83, shall the Party in question pay the administrative fees. If the Controller is liable for administrative fees due to the Processor's breach of the Contract, the Controller has the right to compensation equivalent to the administrative fees. If the administrative fees also refer to circumstances to which the Controller is also responsible, the Processor's liability is reduced accordingly. Any limitation of damages set forth in the Agreement does not apply in such cases.

If the Processor, the Processor's employees, contractor's or subprocessor's has acted with gross negligence or intent, the limitations of liability stated above does not apply.

5. TERM AND TERMINATION OF THE DATA PROCESSING AGREEMENT, CHANGES

This Data Processing Agreement shall be effective from the date it is signed by both Parties and until the Agreement expires or until the Processor's obligations in relation to the delivery of services in accordance with the Agreement is otherwise terminated, except for those provisions in the Agreement and Data Processing Agreement that shall continue to apply after termination.

Upon termination of this Data Processing Agreement, the personal data and all other data belonging to the Controller shall be returned in a standardised format and medium along with necessary instructions to facilitate the Controller's further use of the personal data and other data. The Processor shall first return and subsequently delete all remaining personal data and other data. The Processor (and its subcontractors) shall immediately stop the processing of personal data from the date stipulated by the Controller

As an alternative to returning the personal data (or other data), the Controller may at its sole discretion instruct the Processor in writing, that all or parts of the personal data (or other data) shall be deleted by the Processor, unless the Processor is prevented by statutory law from deleting the Personal Data.

The Processor is not entitled to retain any copies of any personal data and/or other data provided by the Controller in relation to the Agreement or this Data Processing Agreement in any format. All physical and logical access to such Personal Data or other data shall be deleted or removed.

The Processor shall at its own initiative provide the Controller with a written declaration whereby the Processor warrants that all personal data or other data mentioned above has been returned or deleted according to the Controller's instructions and that the Processor has not kept any copy or prints, or kept the data on any medium.

The obligations pursuant to sections 3.5 and 4 shall continue to apply after termination. Further, the provisions of the Data Processing Agreement shall apply in full to any Personal Data retained by the Processor in violation of the Data Processing Agreement and/or the Agreement.

6. DISPUTE AND JURISDICTION

This Data Processing Agreement shall be governed by and construed in accordance with the laws of Norway. The legal venue shall be Oslo District Court.

7.   SIGNATURES

This Data Processing Agreement is signed in two copies, one for each Party.

Date: Date:

For the Processor   For the Controller

_____   _____
Name: Name:
Title   Title:

APPENDIX 1 TO THE DATA PROCESSING AGREEMENT

This appendix constitutes the Controllers further instructions to the Processor in connection with the Processors processing of personal data on behalf of the Controller and is an integral part of this Agreement.

1.   PURPOSE OF THE PROCESSING ACTIVITIES

[For example. The Processor shall send out a survey to our audience with the purpose to find out how our services meet our strategies, or send out a survey to our employees (employee survey) with the purpose to find out if we have a safe working environment, or provide assistance to the Controller in connection with recruitment processes etc. In this connection the Processor will be given or obtain information about the audience/ employees].

2.   CATEGORIES OF DATA SUBJECT

The Processor shall process the following categories of personal data on behalf of the Controller:

a)   [Audience].
b)   [The Controllers Employees]
c)   [Consultants]
d)   [contractors]
e)   [etc.]

3.   CATEGORIES OF PERSONAL DATA

Insert a description of the categories of personal data for each category of data subjects as listed in section 2 above.

Re a):

Re b):

Re c):

4.   SPECIAL CATEGORIES OF PERSONAL DATA

[Insert a description of the special categories of personal data that will be processed for each category of data subject. Special categories of personal data include data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation. And personal data relating to criminal convictions and offences]

Re a):

Re b):

Re c):

5.   LOCATION(S) (HEREUNDER COUNTRY(IES) THAT ARE PROCESSING PERSONAL DATA)

Name of Processor /the subcontractor	Org.nr.	Processing Activity	Location (Country)

APPENDIX 2 – PROCESSOR'S INFORMATION SECURITY MEASURES

The level of security shall take into account the nature, scope, context and purposes of the processing activity as well as the risk for the rights and freedoms of natural persons.

The Processor shall have:

- Routines for monitoring and logging, as well as staff to perform such tasks
- Routines for periodic security tests, and documentation of performed security tests within the last 6 months
- Routines for hardening of systems and applications
- Routines for patching of systems and applications
- Routines for periodical review of accesses to systems and applications
- Requirements for protection of data in transmit and storage
- Routines for incident management, including disaster recovery

APPENDIX 3 – APPLICABLE LEGAL BASIS FOR TRANSFER OF PERSONAL DATA TO THIRD COUNTIES

[EU Standard Contractual Clauses to be inserted if applicable]
https://www.datatilsynet.no/rettigheter-og-plikter/virksomhetenes-plikter/overfore/