



Request for proposals for the development and validation of open-source tools for DVB-MABR

The DVB Project invites proposals (the "**Proposals**") from potential suppliers ("**Suppliers**") for the development and validation of an open-source tool for use with the DVB-MABR specification as specified in the attached Request for Proposals (the "**RfP**").

The content and structure of the Proposal shall follow the guidance given in the RfP. Details of how to submit your Proposal and the deadline for submission are given in the RfP.

Suppliers should note the requirement to submit Proposals in the format set out in Annex 1 of the RfP.

The DVB Project reserves the right to appoint any number of Suppliers or may decide to appoint no Suppliers at all in respect of this RfP. Where necessary, DVB may enter into several agreements with the same Supplier in respect of different features or options or phases.

Dated this 22 November 2023

Signed by

Peter MacAvock

(no signature – electronic delivery)

For and on behalf of the DVB Project

Attachment: RfP for DVB -MABR open-source tool



**Request for proposals for the development and
validation of an open-source tool for DVB-MABR**

Phases 0, 1 and 2



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1. Scope of the RfP

Proposals are invited for the supply of an open-source tool for DVB-MABR [1] implementing a subset of functions of the multicast server and the multicast gateway and further specified in Annex 2 to this RfP.

Proposals shall include:

- the creation of a publicly available multicast server and multicast gateway implementation, including a high-level outline and justification of the technical approach to be taken, including initial and ongoing operational requirements and costs.
- the reporting of issues where the DVB-MABR specification is felt to be incomplete or insufficiently detailed or contradictory and participating in the resolution of those issues within the DVB process,
- the maintenance and support of the delivered solution during acceptance, during the warranty period and subsequently.

The deliverables shall be completed in phases. This RfP outlines the preferred phases for the DVB Project, however suppliers are free to suggest alternative phased variations on the basis of improved efficiency and effectiveness. In the latter case, Suppliers still need to include a response based on the phases defined in this RfP.

The target delivery dates are:

Phase 0 – **1st of April 2024**

Phase 1 – **1st of May 2024**

Phase 2 – **1st of July 2024**

The development must be licensed under an open-source license such as the MIT license.

1.1 Deliverables

The package of deliverables shall comprise the following.

- Phase 0 targets a set of features to be iso functional with the current V&V process for DVB-NIP: delivery of linear services with the FLUTE multicast protocol.
- Phase 1 is predominantly focused on delivering the core functionalities to enable the delivery of linear services with low latency.
- Phase 2 is focused on robustness by the addition of file repair, for low latency and non-low latency delivery.

More detailed information is provided in the Annex 2, listing the technical requirements for each phase.

Phase 0

The supplier shall provide a basic functional set of open-source tools allowing the delivery of a set of DVB-DASH live streams over multicast. These tools implement (see Figure 1):

- The multicast server function at reference points O_{in} and M
- The multicast gateway function at reference points M and L
- The support of the FLUTE protocol for the delivery over M

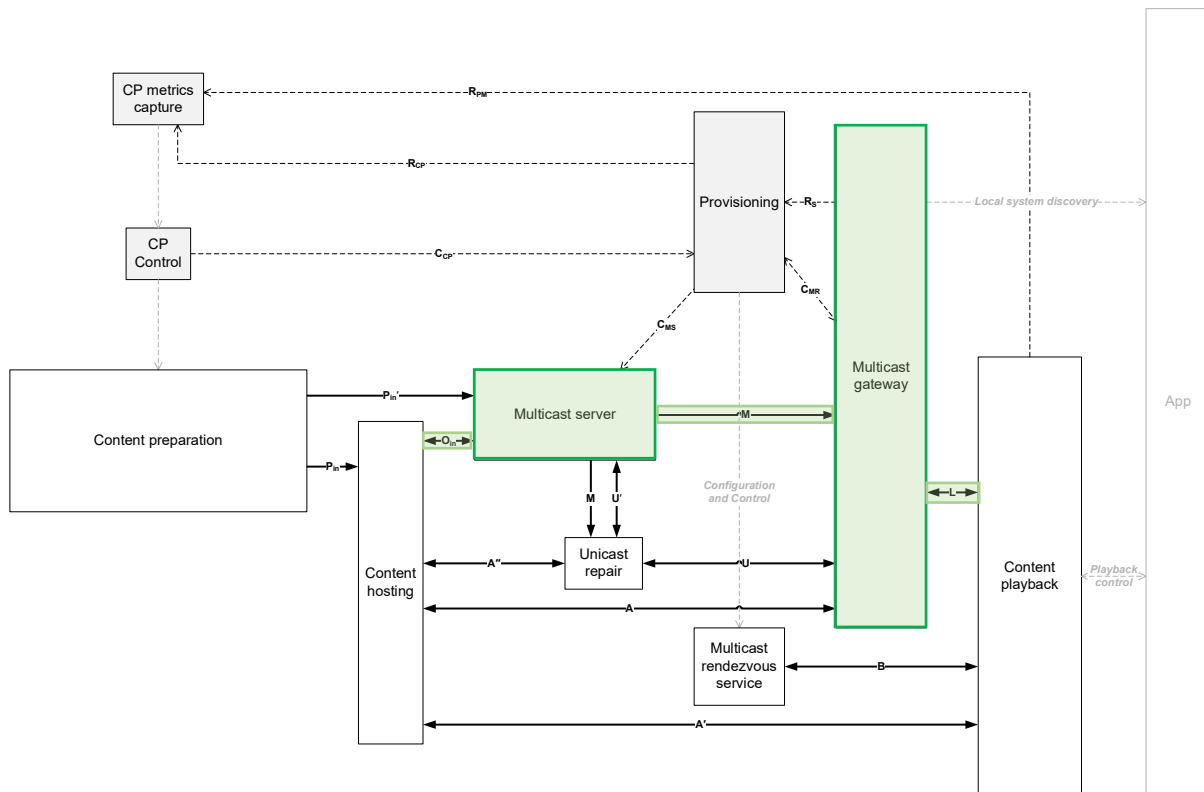


Figure 1: Scope (in green) of the open-source tools in phases 0 and 1

Phase 1

Phase 1 aims to provide the tools to achieve the delivery of a low latency linear service.

The supplier shall add the support of low latency delivery to the tools from phase 0, provided that the DVB-DASH source streams are themselves supporting low latency (presence of the @availabilityTimeOffset attribute in the manifest).

Online low latency reference streams will be used for validating the development.

Phase 2

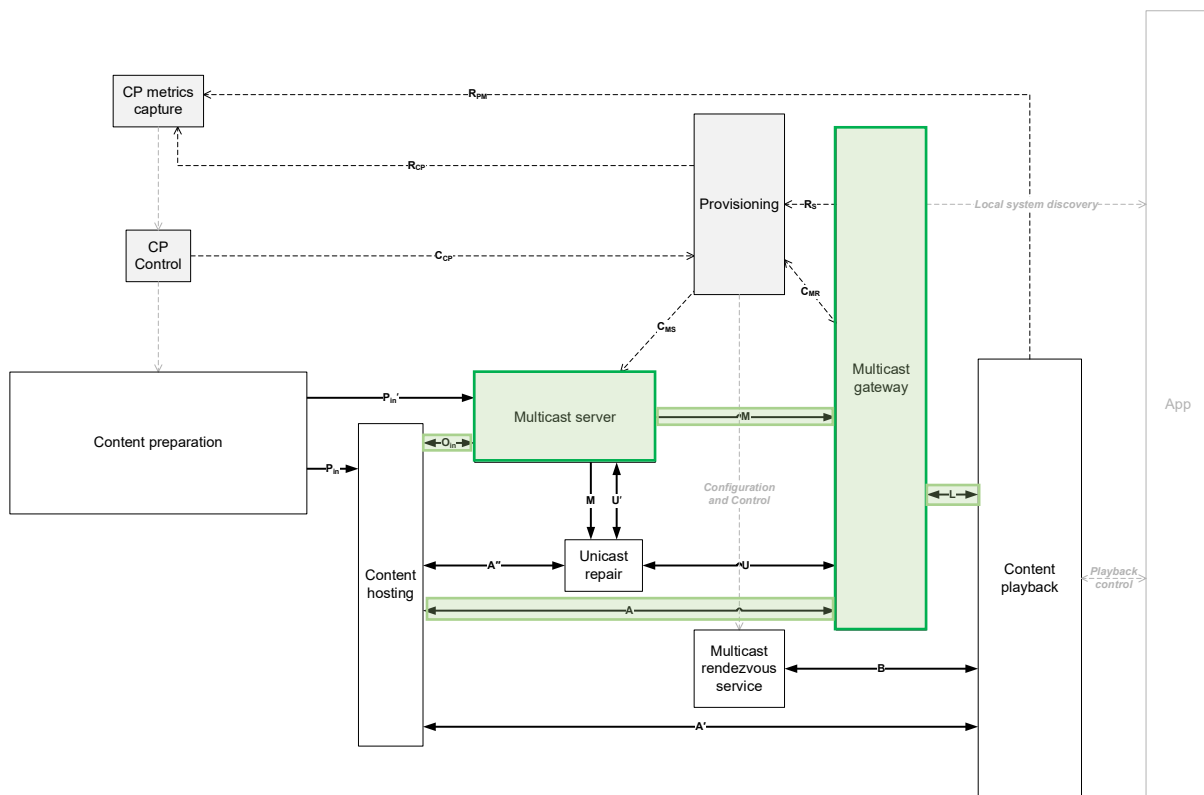


Figure 2: Scope (in green) of the open-source tools in phase 2

Phase 2 complements the phases 0 and 1 with the support of unicast repair over the reference point A. Unicast repair may be used in conjunction with low latency delivery.

Technical requirements are listed in Annex 2.

1.2 Common deliverables for both phases

The supplier shall report any issue related to the DVB-MABR specifications (incompleteness, insufficient details or contradiction) and shall participate in the resolution of those reports within the DVB process.

The supplier must agree to make small / reasonable changes to the development environment to reflect any such small amendments to the DVB-MABR specifications without additional charges to the DVB Project. If the supplier deems any changes to be significant, warranting significant additional work and additional charges then these must be separately identified, justified and submitted in writing to the DVB Project for consideration as additional costs for approval. The DVB Project makes no guarantees that such additional costs would be accepted or approved.

2. Guidance for submission

2.1 Period of validity

The Proposal shall be valid for a period of three months from the date of the Proposal.

2.2 Delivery of Proposal

The deadline for submitting a Proposal shall be 9am CET on **8th January 2024**.

A signed copy of the Proposal should be submitted by the deadline by email to the <dvb@dvb.org> email address. The Proposal should be addressed to:

DVB Project
L'Ancienne-Route 17A
CH-1218 Grand-Saconnex
Suisse

2.3 Further information

Contract, administrative and technical queries should be sent to the <dvb@dvb.org> email address.

Queries should be clearly marked as confidential if the Supplier wishes them to be treated as such. Suppliers are allowed to send in questions related to RfP subjects until 9am CET on **8th December 2023**. Anonymized responses to these questions will be provided by DVB to all Suppliers by **15th December 2023**.

3. Requirements

The Suppliers and the Proposals must fulfil the following requirements:

3.1 Proposal structure and contents

Proposals shall follow the proposal structure and provide the contents specified in Annex 1.

3.2 Pricing

The preferred model for the creation of the open-source DVB-MABR tools and documentation is a fixed payment to the Supplier alone, although DVB Project is open to other payment models as well.

Supplier shall provide prices for the following;

- For phases 0 and 1 only,
- For all phases (0, 1 and 2)

Phases 0 and 1 gather the minimum requirements, but if the supplier views that adding feature of Phase 2 would not affect the time and price, then it should additionally be specifically suggested to bring those forward in the response.

Pricing must include ALL third-party services such that DVB has no other costs, except those in the response in order to complete this project.

Prices quoted shall include coverage for warranty as well as appropriate (remote) technical support for a proper handling of the delivered tools.

Suppliers shall provide separate pricing and terms for extended support and maintenance (see "Maintenance").

All pricing must be in Euros including all applicable fees and taxes.

3.3 Schedule

The following major milestones are defined;

Milestones	Commentary	Acceptance Period	Payment after initial acceptance
1. Delivery of phase 0 DVB-MABR open-source tools	A delivery suitable for interested DVB members to review including testing from their own facilities.	Delivery Date + 4 weeks	20%
2. Delivery of phase 1 DVB-MABR open-source tools	A delivery suitable for interested DVB members to review including testing from their own facilities.	Delivery Date + 4 weeks	40%
3. Delivery of phase 2 DVB-MABR open-source tools	A delivery suitable for interested DVB members to review including testing from their own facilities.	Delivery Date + 4 weeks	40%

Suppliers should provide a schedule including at least 3 milestones together with an approximate schedule for any potential intermediate deliveries.

For each of the milestones identified above, DVB Project will carry out acceptance testing within the acceptance period (as indicated in the table above) starting from the actual date of each delivery. If DVB Project rejects the delivery, it shall notify Suppliers

of such rejection and Suppliers must fix any errors notified to it and re-submit what was rejected. Upon re-submission DVB Project will recommence acceptance testing which it will carry out within the acceptance period (as indicated in the table above) starting from the actual date of re-submission. Acceptance of any delivery shall be notified to Suppliers by DVB Project once DVB Project has completed acceptance testing. In the event that no notice of rejection is made to Suppliers within the acceptance period (as indicated in the table above) following the delivery or re-submission of the delivery, then acceptance of the delivery shall be deemed to have taken place.

3.4 General expertise

Developing this reference demonstration implementation and documentation will require specialised expertise in media streaming formats and multicast protocol stacks. Proposals shall identify what, if any, expertise Suppliers have related to these subjects. If Suppliers does not yet have the needed expertise, then their Proposal shall identify how Suppliers would address this (e.g. hire, sub-contract, partner) including the lead time expected to put those arrangements in place.

DVB Project requires that the primary point of contact for project management and technical issues shall be located in Europe. Proposals shall identify the location from which these activities will be carried out and the names of those staff involved. There shall be no requirement for DVB Project (or company members representing DVB Project) to travel outside Europe for the purposes of this contract. Indeed, it is expected all activities can be managed remotely / virtually.

It is important that the Proposals indicate how they will manage continuity of staff and expertise over the period of time covering application creation, testing, warranty and maintenance.

3.5 Warranty

DVB Project requires a 12 months warranty period starting from the submission date of the invoice relating to the final delivery. Suppliers shall provide without delay any updates to the application and/or content and/or documentation if errors are found.

Suppliers shall indicate in their Proposal what is covered by the warranty.

3.6 Way of working

The tools should be developed and maintained in a (private) GitHub repository (or similar). The DVB Project, any DVB member and any other interested organisation shall be able to fork the GitHub repository given reasonable / suitable approval from DVB Project.

3.7 Change control

While DVB intends, expects and needs the DVB-MABR specification to be stable, Suppliers must recognise that bugs in the specification will be found and fixed (see also under clause 3.8). Ideally the impact of these on the implementation will be trivial or at least small but the possibility of a bug being found whose solution has a non-trivial impact cannot be excluded. Suppliers will track proposed bug fixes to the DVB-MABR specification and promptly report to DVB any proposed fixes that will have a significant impact. The implementation shall be tolerant to such fixes to the DVB-MABR specification except for those reported to DVB as described.

3.8 Additional duties of Suppliers

Any technology or information that needs to be licensed from third parties in order to develop the DVB-MABR open-source tools is the responsibility of Suppliers. It is not practical for DVB Project to be a party to confidentiality agreements with third parties. Any arrangement with a third party shall provide for the use by users of the deliverables without further licence from or payment to the third party.

3.9 Maintenance

DVB project may require additional features or adjustments after the delivery and acceptance of phases 0, 1 or 2. Suppliers shall include in their proposal an hourly/daily rate as a basis for any extra developments.

4. Appointment Process

The process of making any appointments of a Supplier or Suppliers is the following:

4.1 Evaluation and Appointment

Proposals will be opened and reviewed internally at the convenience of DVB Project. By **15th January 2024**, DVB Project will have completed a comparative assessment of received Proposals in order to decide as to which Proposals, if any, should be selected for further analysis and negotiation.

Those proposals will be subject to a technical review and a commercial/business review, including:

- The significant factors for the technical review shall be
 - the quality of the Proposal,
 - the technical understanding of the subject area demonstrated by the Proposal,
 - Suppliers' experience relating to media streaming distribution.
- The significant factors for the commercial/business review are
 - the perceived ability and track record of Suppliers,

- Suppliers' approach to ensuring the schedule for the phase 1 deliverable is met,
- other aspects of the proposed delivery schedule,
- Suppliers' ability to manage continuity of staff and expertise over the period of the contract and subsequent maintenance.

None of these factors is dominant and Proposals which score highly on one factor may be rejected due to scoring badly on another.

If all other factors are equal, DVB has a slight preference for Suppliers who are members of the DVB Project.

By **29th January 2024** DVB Project will aim to make a provisional appointment (the "**Appointment**"), at its entire discretion, of the Supplier or Suppliers who demonstrate the best ability to meet the requirements set out in this RfP to deliver and validate the DVB-MABR open-source tools implementation.

4.2 Clarification of Proposals / Changes to process

Notwithstanding any other provision of this RfP, DVB Project reserves, at its entire discretion, the right to:

- a) Conduct discussions with any or all potential Suppliers for the purpose of clarification of Proposals;
- b) Waive, or decline to waive, any defect in any Proposal;
- c) Accept, reject, or negotiate any or all Proposals or the terms of any Proposal for the purpose of obtaining the best and final offer;
- d) Cancel or amend this RfP or issue other requests for proposals (and in doing so will endeavor to communicate transparently and in a timely manner with all Suppliers);
- e) Request Suppliers submitting Proposals to resubmit Proposals with a modified scope;
- f) Provisionally appoint any number of Suppliers and complete more than one agreement with any one Supplier relating to different phases and to complete agreements at different times; and
- g) Select no Proposals at all.

4.3 Negotiation and execution of agreements

In the event that there is negotiation and the appointed Supplier and DVB Project are not able to reach agreement and execute such agreements within 30 days of the Appointment, DVB Project may declare the Appointment void and may provisionally appoint another Supplier or Suppliers or issue a new RfP.

4.4 Rejected Proposals

DVB Project has no duty to provide Suppliers with any explanation or justification of its decisions not to accept a Proposal or to accept a Proposal only in part.

5. Intellectual Property

The DVB-MABR multicast gateway and multicast server implementation and documentation must be licensed under an open-source license such as the MIT license - <https://opensource.org/licenses/MIT>.

If any part of the implementation is making use of any third-party open-source software, it must be clearly identified and should be coherent with the open-source license governing the supplier's contribution.

If the implementation or related tools contain open-source components, this must be disclosed in the Proposal.

6. Exclusion of liability / costs

The DVB Project has prepared this RfP in good faith with a particular interest for swift and cooperative progress in the development of the DVB-MABR tools. To the extent permitted by law, the DVB Project excludes any liability (whether in contract, tort, negligence or otherwise) for any incorrect or misleading information contained in this RfP.

Any costs or expenses incurred by any Supplier or other person under the present submission process will not be reimbursed by the DVB Project and neither the DVB Project nor any of its representatives will be liable in any way to any Supplier or other person for any costs, expenses or losses incurred by any Supplier or other person in connection with this RfP.

7. Confidentiality

Sections 1 to 9 of the Proposals (whose required structure is described in Annex 1) may be shared with any member of the DVB Project, while sections 10 to 11 will only be shared with members who have been specifically tasked with considering the Proposals and will not be shared more widely. Please ensure that the latter sections can be separated in order to achieve this.

8. Applicable Law and Dispute Settlement

This present RfP, as well as subsequent negotiations shall in all respects be governed by and construed in accordance with Swiss law.

The present RfP must be regarded as a modality of a negotiation subject to the general rules of the Swiss Code of Obligations. Swiss law does not subject requests for proposals in the present context to any specific rules, such as e.g. public procurement rules, and DVB Project is entirely free to enter into contract with whatever Supplier it considers best suited for the awarded work. As a consequence, no claims can be

brought against the DVB Project out of the present procedure. For all practical purposes, the following dispute settlement rules shall nevertheless apply:

All disputes arising out of or in connection with the present RfP shall be submitted, in the first instance, to the Dispute Adjudication Board ("**DAB**") in accordance with the Dispute Adjudication Board Rules of the International Chamber of Commerce (the "**DAB Rules**"), which are incorporated herein by reference.

The DAB shall consist of three (3) members to be appointed as follows: when a dispute arises that could not be amicably settled, each of the potential Supplier and DVB Project (each a "**Party**", collectively the "**Parties**") may send a written notice to the other Party requesting the establishment of the DAB. Each Party shall then within 10 business days appoint one independent DAB member who must have the following credentials: (i) be demonstrably experienced in the subject matter of the dispute, and (ii) be an employee or representative of a company that is a member of the DVB Project. The two appointed DAB members shall appoint, within 10 business days, the third independent DAB member, who shall act as chairman of the DAB.

The DAB procedure shall be purely private, and the parties shall not revert to the ICC Dispute Board Center. Problems arising from not having the support of the ICC Dispute Board Center shall be resolved ad hoc by the DAB.

For any given dispute, the DAB shall issue a decision in accordance with the DAB Rules and within a time period of 2 months. The deadlines for the various steps of the procedure shall be set (and if longer deadlines are mentioned in the DAB Rules be systematically reduced) to allow for a swift rendering of the decision of the DAB within the time limit of 2 months.

If (i) any Party fails to comply with a decision when required to do so pursuant to the DAB Rules, (ii) any Party sends a written notice to the other Party and to the DAB expressing its dissatisfaction with a decision, as provided in the DAB Rules, (iii) the DAB does not issue the decision within the time limit of 2 months, or (iv) if the DAB is disbanded pursuant to the DAB Rules, the dispute shall be finally resolved by arbitration in accordance with the Swiss Rules of International Arbitration of the Swiss Chambers of Commerce (the "**Swiss Rules**") in force on the date when the notice of arbitration is submitted in accordance with these Swiss Rules. The number of arbitrators shall be one (1). The applicable procedure shall be the expedite procedure under Article 42 para 1 of the Swiss Rules (in particular: award to be made within six months). The seat of the arbitration shall be Geneva and the arbitral proceedings shall be conducted in English.

Each Party hereby: (i) irrevocably consents to the exclusive jurisdiction of such arbitral tribunal for the resolution of such disputes; (ii) irrevocably waives any objection that it may now or hereafter have to the venue of any such action or proceeding in such arbitral tribunal or to the convenience of conducting or pursuing any action or proceeding in such arbitral tribunal; and (iii) irrevocably waives any right to a trial by jury regarding the resolution of any dispute between the Parties hereto.

Neither the DAB procedure, nor the arbitration under the Swiss Rules oblige the DVB Project to suspend or abort its work relating to DVB-MABR.

9. **References**

[1] [Adaptive media streaming over IP multicast](#); DVB Document 176 Rev.4; July 202”

Annex 1: Proposal Structure

1. Table of Contents
2. Executive Summary
3. DVB-MABR multicast server and gateway implementation to be supplied
 - 3.1. Features included within the implementation
 - 3.2. Expected source of the Implementation (e.g. open source, 3rd party, created by Suppliers for the purpose of this RfP, re-use of existing implementations) with details.
 - 3.3. License(s) to be used for reference application
4. Hardware and software platforms to be used
 - 4.1. Proposed Programming Language / Systems to be used
 - 4.2. Other Hardware/Software components
5. Validation
 - 5.1. Description of how Suppliers propose to validate that the implementation application works on the proposed hardware and software platforms to be used
6. Deviations from the RfP
 - 6.1. Specific deviations
7. Suppliers' Project Personnel
 - 7.1. List of Project Members and contact information
 - 7.2. Background, Experience and Skill Sets of Project Members
 - 7.3. Source of specialised or scarce expertise
8. Schedule for deliverables
9. Suppliers Information
 - 9.1. Corporate Information
 - 9.2. References
 - 9.3. Other relevant involvement, experience
 - 9.4. QA processes
 - 9.5. Contact Information
10. Payments and terms & conditions
 - 10.1. Prices and terms & conditions relating to Pricing, Pricing models, warranty
 - 10.2. Support and maintenance prices and terms
 - 10.3. Any other costs
11. Supporting confidential information
 - 11.1. Any other information Suppliers wish to remain confidential.

Each section should start on a new page.



Section 11 should only be used for material that is clearly confidential. Use of section 11 for material that needs to be assessed by the DVB membership outside the small group of volunteers evaluating the responses may damage the chances of the Proposal being accepted.

Responses that do not follow the above structure will be de-prioritised behind those that do and as such may not be considered.

Annex 2: Technical requirements

Phase 0 requirements:

1. Suppliers shall provide a basic functional set of open-source tools allowing the delivery of a set of DVB-DASH live streams over multicast. These tools implement (see Figure 1):
 - a. The multicast server function at reference points Oin and M
 - b. The multicast gateway function at reference points M and L
 - c. The support of the FLUTE protocol (Annex F of [1]) for the delivery over M
2. Provisioning/Configuration of the multicast server may be achieved by implementing the procedures over the C_{ms} reference point specified in clause 10.4.2 of [1]. Suppliers can chose to implement another configuration mechanism (e.g. with a simple configuration file or using command line arguments). The list of services is configured when starting the multicast server. Ability to dynamically change the list of services delivered by the multicast server is not mandated.
3. By default, the multicast server shall deliver all the representations described in the manifest. Each representation is delivered in its own FLUTE session (see G.2.2 or G.2.3 in [1]). Suppliers may provide an additional configuration option to select which representation(s) to deliver.
4. The multicast server shall send one File Description Table (FDT) instance per object to be delivered. The FDT is sent once just before delivering the object.
5. The multicast server shall generate the multicast gateway configuration document, based on the provisioning/configuration mechanism used to address requirement 2. The multicast server shall be able to deliver this multicast gateway configuration document over the dedicated transport session.
6. The multicast gateway shall be able to be provisioned with the multicast gateway configuration transport session. Transport parameters of the multicast gateway transport session (corresponding to the bootstrap instance document, clause C.2. of 1) can be hardcoded, or configured manually (command line arguments, or configuration file).
7. The multicast server shall offer options to select how the manifests and init segments are delivered:
 - a. in the multicast gateway configuration transport session
 - b. in the multicast transport sessions delivering the content
8. The multicast gateway shall trigger the reception of the media transport sessions when receiving a request over L for the manifest.
9. The multicast server shall offer a global configuration option to select how the URI of objects delivered over M should be constructed:
 - a. by using the absolute URL of the source object on the content hosting function; or
 - b. by using the relative URL of the source object, i.e. its relative path under the root domain.

For clarification purposes, the following requirements are NOT mandated by this RfP:

- Support of HTTPS over L.
- Usage of Forward Error Correction
- Traffic regulation: the multicast server can send the FLUTE packets without traffic policing. In particular implementation of a leaky bucket algorithm is not required.

Phase 1 Requirements

- Suppliers shall provide an option to deliver the streams in a low latency manner, provided that the DVB-DASH source streams are themselves supporting low latency (presence of the @availabilityTimeOffset attribute in the manifest). Low latency streams over M shall be delivered according to the Chunked transmission mode specified in clause F.2.2 of [1].
- The multicast server shall support of HTTP/1.1 chunked transfer coding over O_{in} . Additionally, the multicast server may provide the support of ingestion of objects spanned over multiple DATA frames in HTTP/2 or HTTP/3.
- The multicast gateway shall support of HTTP/1.1 chunked transfer coding over L.
- The multicast server shall deliver over multicast any HTTP chunk received over O_{in} . Parsing and re-segmenting the HTTP chunks to deliver CMAF chunks over the multicast transport session, and signalling random access point (*hasRandomAccessPoint* in F.2.2 [1]) is NOT mandated. The multicast server shall make use of the *isLast* component to signal delivery completion of an object.
- When the playback function requests a segment of a service delivered in a low latency manner, the multicast gateway progressively responds with all the received chunks (Figure 3).

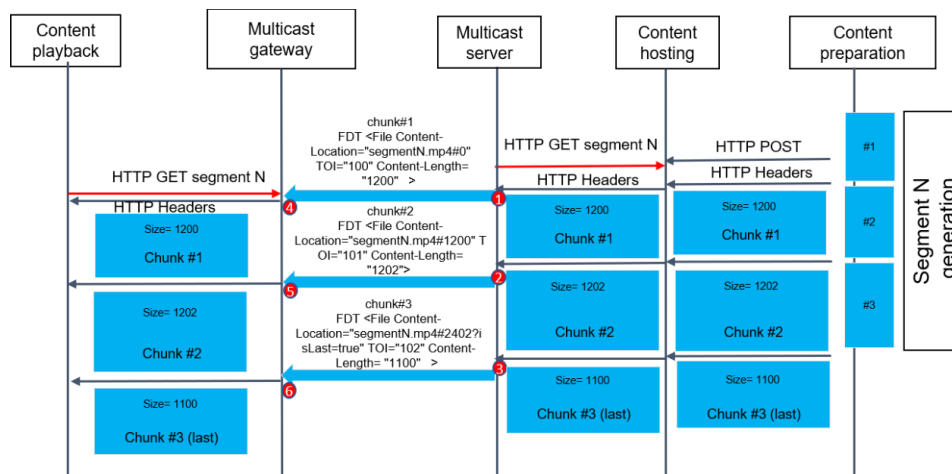


Figure 3: Chunked transmission mode with pull ingest (from G.1.2-1[1])

Phase 2 Requirements

- As an option, the multicast server shall be able to signal that the delivered content is protected by unicast repair, i.e. that it can be repaired over A. The multicast server shall include the @transportObjectReceptionTimeout parameter (10.2.3.12 in [1]) in the multicast gateway configuration

- document with a configured value. *@fixedBackOffPeriod* and *@randomBackOffPeriod* timing parameters may be omitted.
16. When the content is protected by unicast repair and the playback function request a segment which is not already cached by the multicast gateway nor being currently received:
 - a. the multicast gateway waits for a configured period (NOTE 1), and;
 - b. if the segment delivery has started, it responds with the received segment;
 - c. else, the multicast gateway requests the segment over A and forward the response to the playback function.
 17. When the reception of a media object (segment or chunk) is incomplete, the multicast gateway shall trigger a byte-range HTTP request over A to get the missing parts (NOTE 2). The request is triggered:
 - a. when a packet with the A flag or B flag (ALC/LCT header) has been received, or
 - b. when the packets for another media object starts to be received
 - c. when no packet has been received in the FLUTE session, during a period configured by the *@transportObjectReceptionTimeout* parameter (NOTE 1)
 18. The multicast server shall include an option to simulate losses in the multicast sessions by not sending some packets. The losses are parameterized as a 2 states Markov chain (“sending”/“not sending”). When activated, the multicast server shall log for each not-sent packet:
 - a. the TOI (Transmission Object Identifier, see RFC 5775)
 - b. the multicast transport object URI
 - c. the ESI (Encoding Symbol ID, see RFC 3695)
 19. The multicast gateway shall log all byte-range HTTP requests over A.

NOTE 1: Unicast repair is triggered by two distinct timers. The first, in requirement 16, is not defined in the multicast gateway configuration instance document. Suppliers shall provide a way to configure it as a global parameter. The second (*@transportObjectReceptionTimeout*, in requirement 17) is specified in [1]. Both shall be expressed in milliseconds.

NOTE 2: Offset and size of the missing parts shall be deducted from:

- the ESI of the received symbols;
- the object size, as signaled in the FDT;
- offset of the chunk, given in the suffix (clause F.2.2 of [1]), when using the chunked transmission.

The multicast gateway shall support the case when a full chunk has been missed.

The DVB TM-MCAST group acknowledges that conciliating unicast repair with low latency delivery can be challenging, depending on external parameters (content player buffer management, round time trip between the multicast gateway and the content hosting function...). The tools will allow to explore how those two features can be efficiently used.