**3GPP TSG-S4 Meeting #123-e *S4-230474***

**Online, , 17th–21st April 2023** revision of S4aI230084

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| *CR-Form-v12.1* |
| **DRAFT CHANGE REQUEST** |
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|  | **26.502** | **CR** | **0021** | **rev** | **2** | **Current version:** | **17.4.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  |  |
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| ***Source to WG:*** | BBC, Nokia Corporation |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | 5MBUSA |  | ***Date:*** | 2023-04-05 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),****C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Use of Object Distribution Method is currently underspecified, especially for object collection and object carousel operating modes. |
|  |  |
| ***Summary of change:*** | * Update to user services network architecture introducing a new reference point (MBS‑11) for acquisition of compiled User Service Announcement objects from the MBS AF.
* Updates to Object Distribution Method parameters.
* Definition of baseline parameters for object carousel manifest.
* Definition of procedures for internal provisioning of User Service Announcement Channel.
* Clarification on procedures for advertising User Services via the User Service Announcement Channel.
* Clarification of constraints on MBS Distribution Session parameters for operating modes of Object Distribution Method.
 |
|  |  |
| ***Consequences if not approved:*** | Use Cases for carousel opeating mode, especially MBS User Service Announcement Channel are not fully supported. |
|  |  |
| ***Clauses affected:*** | 4.2.1, 4.2.2, 4.2.4, 4.3.1, 4.3.3A, 4.4, 4.5.6, 4.5.10 (new) 5.3A (new), 5.4, 6.1, B.2.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | S4aI230078 -> S4aI230084 -> S4-230474 |

FIRST CHANGE

### 4.2.1 Network architecture

Figure 4.2.1-1 depicts the MBS network architecture defined in clause 5.1 of TS 23.247 [5] using the reference point representation.



Figure 4.2.1-1: Network architecture for MBS User Services delivery and control

The functions and reference points involved in providing MBS User Services within the MBS System are highlighted in green. In particular:

- Reference point Nmb10 is used by the AF/AS to provision MBS User Services in the MBSF by invoking the Nmbsf service defined in clause 7.2.

- Reference point Nmb2 is used by the MBSF to configure and control MBS User Services distribution methods in the MBSTF by invoking the Nmbstf service defined in clause 7.3. Additionally, Nmb2 may be used by the MBSF to push object manifests to the MBSTF describing a set of User Service Announcement objects for subsequent delivery to the MBS Client via a suitable MBS Distribution Session (see clause 4.2.4).

- Reference point Nmb8 is used by the MBSTF to ingest content from the AF/AS.

NEXT CHANGE

### 4.2.2 User Services network architecture

MBS User Services enable high-level applications to make use of the low-level features of the MBS System. An MBS User Service is provided by the MBSF and MBSTF working in combination to support configuration option 2 and configuration option 3 defined in annex A of TS 23.247 [5]. In addition to the Network Functions defined in [5]:

- The MBS AF provides unicast User Service Announcements to the MBSF Client in the user plane and to the MBSTF.

- The MBS AS provides unicast services such as Object Repair to the MBSTF Client.

- The MBSSF supports the User Plane security procedure according to clause W.4.1.3 of TS 33.501 [18] and provides a user plane authentication service to the MBSF Client.

Together, these functions enable a complete service offering to an end-user, via a set of APIs that allows the MBS Client to activate or deactivate reception of MBS User Services.

The MBS User Services architecture depicted in figure 4.2.2-1 shows the MBS-related entities involved in providing MBS User Services delivery and control. These are described in the following clauses. The MBS Application Provider plays the role of the AF/AS.



Figure 4.2.2-1: MBS User Services network architecture

NEXT CHANGE

### 4.2.4 User Service Announcement

The User Service Announcement provides service access information needed by the MBS Client to discover and activate the reception of one or more MBS User Services. User Service Announcements may be delivered:

1. V

2. Via a dedicated MBS Distribution Session provisioned and managed by the MBSF called the *MBS User Service Announcement Channel* at reference point MBS‑4‑MC. User Service Announcements are delivered using the Object Distribution Method.

NOTE: The MBS User Service Announcement Channel is provisioned using the procedures defined in clause 5.3A.

3. Via application-private means at reference point MBS‑8.

The baseline information conveyed in User Service Announcements is defined in clause 4.5.7. The procedures for User Service advertisement are defined in clause 5.4.

NEXT CHANGE

### 4.3.1 General

The MBSF and MBSTF offer service layer functionality for sending data via MBS Sessions. The MBSF (clause 4.3.2) offers control plane functionality while the MBSTF (clause 4.3.3) offers user plane functionality. The MBSTF acts as a User Plane anchor when it sources IP multicast traffic. Reference point Nmb2 provides the means for the MBSF to configure the delivery methods in the MBSTF, and supports push-based ingest of object manifests. Reference point MBS‑11 supports pull-based ingest by the MBSTF of object manifests and in addition User Service Announcement objects for delivery to the MBS Client via reference point MBS‑4‑MC (as described in clause 4.2.4).

Figure 4.3.1-1 shows the complete set of functional entities involved in supporting MBS User Services when the MBS Application Provider is deployed in the Trusted DN, including client functions in the UE.

 

NOTE: When the MBS Application Provider is deployed outside the Trusted DN, it interacts with the MBSF via the NEF at reference point N33, as shown in figure 4.2.2‑1, instead of via Nmb10.

Figure 4.3.1-1 MBS User Service reference architecture

In the above architecture, MBS-specific functions such as the MBS AS and MBSF are shown as independent and standalone. In deployments, they may be co-located on physical devices with other functions. As an example, the MBS AS may be hosted in the MBS Application Provider domain, or it may be hosted in a 5GMS AS.

NEXT CHANGE

#### 4.3.3.2 MBSTF subfunctions to support Object Distribution Method

The MBSTF subfunctions supporting the Object Distribution Method are depicted in figure 4.3.3.2-1 below.



Figure 4.3.3.2-1: MBSTF architecture overview for Object Distribution Method

The *Object ingest* subfunction supports:

- Pull-based ingest at reference point MBS‑11: The Object ingest subfunction in this case fetches one or more objects from the MBS AF using HTTPS for inclusion in the MBS User Service Announcement Channel. (The set of objects to be included is listed in an object manifest previously fetched from the MBS AF at the same reference point.)

- Push-based ingest at reference point Nmb2: The Object ingest subfunction receives an object manifest from the MBSF using HTTPS that describes a set of objects for inclusion in the MBS User Service Announcement Channel. The MBSTF fetches these objects from the MBS AF using HTTPS.- Pull-based ingest at reference point Nmb8: The Object ingest subfunction in this case fetches one or more objects from the MBS Application Provider (AF/AS) using HTTPS.

- Push-based ingest at reference point Nmb8: The Object ingest subfunction receives one or more objects from the MBS Application Provider (AF/AS) using HTTPS.

Object ingest procedures at reference point MBS‑11 shall be a subset of those at reference point Nmb8.

The *Object segmentation subfunction* supports the partitioning of an object into payload units suitable for MBS transmission.

The optional *Application Layer FEC* subfunction supports object recovery when some packets are not received by the MBMS Client.

The *Packetisation* subfunction places the payload units (and, optionally, the FEC data) into Nmb9 transmission packets according to clause 6.1.

The *Packet scheduling* subfunction schedules the outgoing packet stream according to target bit rate configuration.

The *Control subfunction* offers support for MBSTF service configuration, status query and notifications at reference point Nmb2.

NEXT CHANGE

### 4.3.3A MBS AF

The MBS AF is an optional entity that performs the following functions to support MBS User Services:

- Serving unicast User Service Announcements to the MBSF Client via reference point MBS‑5.

- Serving User Service Announcements to the MBSTF via reference point MBS‑11.

The MBS AF is configured by the MBSF at reference point MBS‑3. This interaction is not further defined by the present document.

The MBS AF may be deployed as a standalone entity, or its functions may be co-located with other Network Functions such as the MBSF (see clause 4.3.2), or the 5GMS AF defined in TS 26.501 [7].

NEXT CHANGE

## 4.4 Reference points and interfaces

### 4.4.1 Overview

The following reference points defined in clause 5.1 of TS 23.247 [5] are relevant to MBS User Services architecture: Nmb1, Nmb2, Nmb5, Nmb8, Nmb9, Nmb10 and Nmb12.

The following additional reference points are defined by the present document:

**- MBS-3:** Used by the MBSF to configure the MBS AF and to publish User Service Announcements to it. This reference point is not described further in the present document.

**- MBS-4-MC:** Unidirectional multicast distribution of content from the MBSTF to the MBS Client.

**- MBS-4-UC:** User Plane interactions between the MBSTF Client and the MBS AS for the purpose of file-based unicast repair.

**- MBS-5:** User Plane interactions between the MBSF Client and the MBS AF for the purpose of MBS control plane and service handling.

**- MBS-6:** API exposed by the MBSF Client and used by the MBS-Aware Application to manage and control MBS User Services.

**- MBS-7:** API exposed by the MBSTF Client and used by the MBS-Aware Application to receive user data information distributed using MBS User Services.

**- MBS-8:** Announcement of MBS User Services to the MBS-Aware Application by the MBS Application Provider. The procedures at this reference point are beyond the scope of 3GPP specification.

**- MBS-9:** Used by the MBSF to configure the MBS AS. This reference point is not described further in the present document.

**- MBS-10:** User Plane interactions between the MBSF Client and the MBSSF for the purpose of authorising access to security-protected MBS data by means of the User Plane security procedure specified in clause W.4.1.3 of TS 33.501 [18].

**- MBS-11:** Used by the MBSTF to retrieve object manifests and User Service Announcements listed in object manifests from the MBS AF.

In addition, the following reference points are defined inside the MBS Client function:

- **MBS‑6′:** API exposed by the MBSTF Client and used by the MBSF Client to (de)activate reception of an MBS Session by the MBSTF. The reception parameters are supplied by the MBSF Client.

 This reference point is outside the scope of MBS User Services and is not described further in the present document.

- **MBS‑7′:** API exposed by the MSTF Client and used by the MBSTF to supply MBS Session configuration information that has been received from reference point MBS‑4‑MC.

 This reference point is outside the scope of MBS User Services and is not described further in the present document.

NEXT CHANGE

### 4.5.6 MBS Distribution Session parameters

This entity models an MBS Distribution Session, as provisioned by the MBS Application Provider and as managed by the MBSF. This MBSF subsequently uses this information to provision a corresponding MBS Distribution Session in the MBSTF.

(SNIP)

The following MBS Distribution Session parameters are additionally relevant when the distribution method is the Object Distribution Method:

Table 4.5.6‑2: Additional MBS Distribution Session parameters for Object Distribution Method

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Cardinality | Assigner | Description |
| Object acquisition method | 1..1 | MBS Application Provider | Indicates whether the objects(s) to be distributed are to be pushed into the MBSTF by the MBS Application Provider or whether they are to be pulled from the MBS Application Provider by the MBSTF as part of the corresponding MBS User Data Ingest Session.In the latter case, the *Object acquisition method* indicates whether the object(s) are to be retrieved once from the MBS Application Provider at the start of each active period of the corresponding MBS User Data Ingest Session, or whether the MBSTF is required to check their validity periodically, for example once per rotation of an object carousel.When a reference to an object manifest is provided as one of the *Object acquisition identifiers*, it is the responsibility of the MBSTF to check for updates to the object manifest itself in an efficient manner. |
| Object acquisition identifiers | 0..\* |  | Directly or indirectly identifies the object(s) to be ingested and distributed by the MBSTF during this MBS Distribution Session.This could be the ingest URL of the object, the ingest URL of a manifest describing a set of objects or the ingest URL of an application service entry point document.Constraints on this parameter are specified in table 6.1-1. |
| Object ingest base URL | 0..1 | MBS Application Provider or MBSF | A URL prefix substituted by the MBSTF with the *Object distribution base URL* prior to distribution of ingested objects.Assigned by the MBS Application Provider for the pull-based *Object acquisition method*. Assigned by the MBSF for push-based object acquisition.If omitted, nothing is removed from the content ingest URL when forming the object distribution URL |
| Object distribution base URL | 0..1 | MBS Application Provider | A URL prefix substituted by the MBSTF in place of the *Object ingest base URL* prior to distribution of ingested objects.If present, the optional *Object ingest base URL* shall also be present.If omitted, the object distribution URL is the same as the object ingest URL. |
| Object repair base URL | 0..1 | MBSF | A URL prefix substituted by the MBSTF Client in place of the *Object distribution base URL* when repairing objects not received completely intact from this MBS Distribution Session (see NOTE). The value shall point to the MBS AS.Present only when object repair is provisioned for this MBS Distribution Session. |
| NOTE: Parameter not relevant to the MBSTF. |

(SNIP)

NEXT CHANGE

### 4.5.10 Object manifest parameters

An object manifest describes a set of objects to be distributed in an MBS Distribution Session that is provisioned in OBJECT\_COLLECTION or OBJECT\_CAROUSEL operating mode. For each such object, the baseline properties listed in table 4.5.10‑1 below are defined.

Table 4.5.10‑1: Baseline parameters of object manifest

|  |  |  |
| --- | --- | --- |
| Parameter name | Cardinality | Description |
| Location | 1..1 | The URL from which the object is to be ingested by the MBSTF. |
| Repetition period | 0..1 | The periodicity of the object in the MBS Distribution Session, expressed in appropriate time units (see NOTE).If omitted, the MBSTF shall determine the periodicity of the object. |
| Update period | 0..1 | The maximum period of time that the MBSTF waits after acquiring the object and before checking for changes to the object at its origin *Location* (see NOTE).In case of conflicting information, cache control metadata provided by the object origin should take precedence over this parameter.If omitted, the MBSTF shall not attempt to check for updates to the object.Any changes to the object that are detected by the MBSTF shall be reflected in the MBS Distribution Session at the earliest opportunity and the replacement of an object with a more up-to-date version shall be signalled to the MBSTF Client. |
| Earliest fetch time | 0..1 | The MBSTF shall fetch the object no sooner than this time.If omitted, the object shall be present at the origin indicated by *Location* and the MBSTF may fetch it at a time of its choosing. |
| Latest fetch time | 0..1 | The MBSTF shall fetch the object no later than this time.If omitted, the object shall be present at the origin indicated by *Location* and the MBSTF may fetch it at a time of its choosing. |
| NOTE: Not applicable to OBJECT\_COLLECTION operating mode. |

The syntax of the object manifest is specified in TS 26.517 [13].

NEXT CHANGE
(NEW CLAUSE)

## 5.3A Procedures for User Service Announcement Channel provisioning

The procedures depicted in figure 5.3A‑1 are optionally followed in deployments where an MBS User Service Announcement Channel is provided at reference point MBS‑4‑MC as part of the MBS System. Where deployed, the MBS User Service Announcement Channel shall be provisioned as an MBS Distribution Session using the OBJECT\_CAROUSEL operating mode of the Object Distribution Method.

NOTE: This is a special case of the procedures for provisioning an MBS Distribution Session defined in steps 6 to 14 of clause 5.3.



Figure 5.3A‑1: Procedures for User Service Announcement provisioning

The steps are as follows:

1. The MBSF allocates a TMGI for the MBS User Service Announcement Channel by invoking the Nmbsmf\_TMGI\_Allocate service operation on the MB SMF at reference point Nmb1, as specified in clause 9.1.2.2 of TS 23.247 [5].

2. The MBSF creates an MBS Session to reserve resources in the MBS System for the MBS User Service Announcement Channel by invoking the Nmbsmf\_MBSSession\_Create service operation on the MB‑SMF at reference point Nmb1, as specified in clause 9.1.3.6 of TS 23.247 [5]). The MBS Session ID reserved in the previous step is provided as an input parameter. The MBSF determines the other input parameters as specified in clause 4.5.9.

3. The MBSF creates the MBS Distribution Session in the MBSTF by invoking the Nmbstf\_‌MBS‌Distribution‌Session\_‌Create service operation at reference point Nmb2. This is a mirror of the entity in the MBSF (see clause 4.5.6). The Object Distribution Method and carousel operating mode are indicated. The object acquisition identifier points to a carousel manifest resource on the MBS AF. Either push- or pull-based ingest may be provisioned.

4. The MBSF subscribes to status events from the MBSTF relating to the MBS Distribution Session just created by invoking the Nmbstf\_MBSDistributionSessionStatusSubscribe service operation at reference point Nmb2.

5. If pull-based ingest was provisioned in step 3, the MBSTF attempts to establish content ingest from the MBS AF at reference point MBS‑11 according to the ingest parameters and distribution method provisioned in the previous step (see tables 4.5.6‑1 and 4.5.6‑2).

6. The MBSTF invokes the Nmbstf\_MBSDistributionSession\_StatusNotify callback service operation at reference point Nmb2 using the *Distribution Session established* event to inform the MBSF of the (un)successful establishment of content ingest with the MBS AF.

As a consequence of this provisioning, the MBSTF now begins polling for updates to the carousel manifest (see step 2B in clause 5.4) if pull-based ingest was provisioned in step 3. If push-based ingest was specified, the MBSTF instead waits for a carousel manifest to be published to it.

NEXT CHANGE

## 5.4 Procedures for User Service advertisement/discovery

At this point, the MBS User Service Session is advertised to the MBSF Client, as shown in figure 5.4‑1 below, using one or more of the delivery options defined in clause 4.2.4 for the User Service Announcement.



Figure 5.4‑1: Call flow for MBS User Service advertisement/discovery

The steps are as follows:

1. The MBSF compiles a composite MBS User Service Announcement from the set of individual MBS Distribution Session Announcements compiled in step 14 of clause 5.3. The compiled MBS User Service Announcement describes the current set of MBS Distribution Sessions that comprise the active MBS User Data Ingest Session. The advertised start date–time is the next start time indicated in the MBS User Data Ingest Session schedule of active periods, or the current date–time if no schedule is provisioned.

1a. The MBSF publishes the compiled MBS User Service Announcement to the MBS AF via reference point MBS‑3 (not specified).

2. The MBS User Service Announcement is distributed using one or more of the following mechanisms:

A. The MBS User Service Announcement is made available by the MBS AF for unicast retrieval by the MBSF Client at reference point MBS‑5.

B. A carousel manifest for the MBS User Service Announcement Channel is compiled by the MBSF. This lists all of the MBS User Service Announcements to be made available in the corresponding MBS Distribution Session and indicates that the objects listed should be polled for updates.

If the MBS User Service Announcement Channel is provisioned for pull-based acquisition, the carousel manifest for the MBS User Service Announcement Channel is published by the MBSF to the MBS AF via reference point MBS‑3 (not specified) and made available as a resource for unicast retrieval by the MBSTF via reference point MBS‑11 at the location indicated by the object acquisition identifier provisioned for the corresponding MBS Distribution Session (see step 3 in clause 5.3A). The carousel manifest is pulled by the MBSTF from the MBS AF at this reference point, as defined in clause 4.3.3.2. The MBSTF continues to monitor the MBS AF for changes to the carousel manifest and retrieves a new copy as needed.

If the MBS User Service Announcement Channel is provisioned for push-based acquisition, the carousel manifest for the MBS User Service Announcement Channel is published by the MBSF to the MBSTF via reference point Nmb2, as defined in clause 4.3.3.2.

For both pull- and push-based acquisition, the MBS User Service Announcement itself is made available as a resource by the MBS AF for unicast retrieval by the MBSTF via reference point MBS‑11 at a location listed in the aforementioned carousel manifest. The MBS User Service Announcement is pulled by the MBSTF from the MBS AF at this reference point, as defined in clause 4.3.3.2, for inclusion in the MBS User Service Announcement Channel carousel. In addition, carousel manifest may direct the MBSTF to fetch ancillary objects (e.g. application service entry point documents) referenced by the MBS User Service Announcement for inclusion in the MBS User Service Announcement Channel carousel. Because it is directed to do so by the carousel manifest, the MBSTF efficiently polls the MBS AF or MBS Application Provider as appropriate for changes to these objects and retrieves a new copy as needed to replace the previous version in the MBS User Service Announcement Channel carousel.

As a result, the most up-to-date MBS User Service Announcement and any ancillary objects it references are delivered repeatedly by the MBSTF to the MBSTF Client via the MBS User Service Announcement Channel at reference point MBS‑4‑MC using the Object Distribution Method.

C. The MBS User Service Announcement is passed back to the MBS Application Provider by invoking the Nmbsf\_MBSUserDataIngestSession\_StatusNotify callback service operation at reference point Nmb10 (or Nmb5+N33, if invoked via the NEF).

 As a result, the MBS Application Provider advertises the MBS User Service Announcement to the MBS-Aware Application by private means at reference point MBS‑8.

The MBSF may rescind an MBS User Service Announcement at any time for operational reasons.

NEXT CHANGE

## 6.1 Object Distribution Method

The Object Distribution Method is used to deliver binary objects to the MBS Client over an MBS Session that have been received from the MBS Application Provider over reference point Nmb8.

The following Use Cases are supported:

- Single-shot file delivery.

- Delivering a root object and its dependent objects as a collection, e.g. a web page and all the assets needed to render it.

- Object carouselling for file delivery, including updates of files.

- Real-time object streaming, for example for regular-latency or low-latency streaming delivery. In the latter case, the objects distributed may be CMAF segments as defined by the 5G Media Streaming DASH Interoperability Point specified in clause 7.3.11 of TS 26.247 [10].

The operating modes for the Object Distribution Method are defined in table 6.1‑1 below.

Table 6.1‑1: Summary of operating modes for Object Distribution Method

|  |  |  |
| --- | --- | --- |
| Distribution method | Operating mode | Description |
| OBJECT | OBJECT\_SINGLE | Each object ingested by the MBSTF is distributed once.Either pull-based and push-based object acquisition methods may be provisioned in combination with this operating mode.When the pull-based object acquisition method is provisioned, the MBS Distribution Session parameters (see table 4.5.6‑2) shall cite a set of one or more object URLs as *Object acquisition identifiers*.When the push-based object acquisition method is provisioned, the set of *Object acquisition identifiers* shall be empty. |
|  | OBJECT\_COLLECTION | A set of objects described by a manifest (see NOTE 1) is ingested by the MBSTF and distributed once. When the push-based object acquisition method is provisioned, the object manifest (only) shall be pushed to the MBSTF; the objects referenced by the object manifest shall be pulled.The MBS Distribution Session parameters (see table 4.5.6‑2) shall cite a single object manifest URL in *Object acquisition identifiers*. |
|  | OBJECT\_CAROUSEL | A set of one or more objects described by a manifest (see NOTE 1) is ingested by the MBSTF and distributed according to a repetition pattern specified in the manifest.Any change to an object during the course of the MBS Distribution Session is reflected in the distribution at the next available opportunity.When the push-based object acquisition method is provisioned, the object manifest (only) shall be pushed to the MBSTF; the objects referenced by the object manifest shall be pulled.The MBS Distribution Session parameters (see table 4.5.6‑2) shall cite a single object manifest URL in *Object acquisition identifiers*. |
|  | OBJECT\_STREAMING | A sequence of objects is ingested by the MBSTF and streamed in real time, for example according to a schedule described in an application service entry point document (e.g. DASH MPD).Either pull-based and push-based object acquisition methods may be provisioned in combination with this operating mode.In all operating modes, the MBS Distribution Session parameters (see table 4.5.6‑2) shall cite a single application service entry point URL of each type in *Object acquisition identifiers* (see NOTE 2). As a consequence, the referenced application service entry point documents shall be included in the MBS User Service Announcement Channel as ancillary objects.All application service entry points referenced by an MBS Distribution Session shall be for equivalent presentations, i.e., comprising common object streams according to compatible presentation timelines. |
| NOTE 1: OBJECT\_COLLECTION operating mode is a special case of OBJECT\_CAROUSEL operating mode in which the objects described by the manifest are distributed only once. The baseline parameters of the object manifest are defined in clause 4.5.10. |

Based on the configuration received from the MBSF via reference point Nmb2, the objects are ingested by the MBSTF from the MBS Application Provider via the pull-based or push-based object ingest method. As defined in clause 4, the MBSTF segments the objects into appropriate payloads, adds the FEC redundancy and schedules packet transmission to the MBS Client.

NOTE: Pull-based object ingest may occur once at the start of each active period of the associated MBS User Data Ingest Session, or the pulled objects may be revalidated (and possibly re-ingested) periodically, for example once per rotation of an object carousel.

Object repair functionality may be utilized to repair object fragments that are transmitted by the MBSTF using the Object Distribution Method, but lost or corrupted in transit. In such cases, the MBS Client may request the missing object fragments from the MBS AS using the procedure defined in clause 5.6. This procedure may be invoked during an ongoing MBS User Services Session or after an MBS User Services Session has finished.

NEXT CHANGE

## B.2.1 Object Distribution Method with pull-based ingest

Figure B.2.1-1 illustrates a setup in which the MBS Application Provider (AF/AS) provides an object manifest to the MBSF listing the URLs of objects to be ingested and distributed. This is passed to the MBSTF at reference point Nmb2, and the MBSTF then fetches these objects using HTTP. The MBSTF handles all MBS-related complexity, e.g. converting the HTTP message payload into an IP multicast suitable protocol, adding AL-FEC, etc. The AF/AS delegates to the MBSF the delivery of MBS Service Announcement metadata to the MBS Client (i.e. IP multicast protocol details, etc).



Figure B.2.1-1: Object Distribution Method using Pull ingest mode (HTTP GET)

The following Parameters are used by the MBS Application Provider (AF/AS) at reference point Nmb10 to provision this setup:

*- Distribution method* is set to *Object*.

*- Object acquisition method* (property specific to the distribution method) is set to *Pull*.

*- Operating mode* is set to OBJECT\_SINGLE or OBJECT\_COLLECTION or OBJECT\_CAROUSEL or OBJECT\_STREAMING, as appropriate.

- OBJECT\_SINGLE: *Object acquisition identifiers* refers to a non-empty set of objects each of which is to be distributed once.

- OBJECT\_COLLECTION: *Object acquisition identifiers* refers to a manifest describing the set of objects to be distributed once.

- OBJECT\_CAROUSEL: *Object acquisition identifiers* refers to a manifest describing the set of objects and their repetition and update pattern.

- OBJECT\_STREAMING: *Object acquisition identifiers* refers to a presentation manifest such as a DASH MPD. The MBSTF pulls the objects according to the presentation manifest.

END OF CHANGES