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Managed P2P communications: Overlay content management protocol

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Recommendation ITU-T X.609.9

Managed P2P communications: Overlay content management protocol

Summary

This Recommendation specifies an overlay content management protocol (OCMP) that runs on an interface between an index server and a peer to carry meta-information of overlay content over managed peer-to-peer (MP2P) architecture defined in Recommendation ITU-T X.609. The meta-information includes attributes of a content to be distributed and mapping information with an overlay network. This Recommendation provides message formats and protocol operations.

Keywords

managed peer-to-peer, overlay content, management, protocol

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Managed P2P communications: Overlay content management protocol

1 Scope

This Recommendation specifies the overlay content management protocol (OCMP) to be used by peers and index server. The purpose of this protocol is to carry meta-information of an overlay content to be distributed over managed peer-to-peer (MP2P) network.

It describes following details:

- protocol overview;
- protocol operations including information flows;
- protocol messages and its parameters.

2 References

The following ITU-T Recommendations and other references contain provisions, which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- | | |
|------------------|---|
| [ITU-T X.609] | Recommendation ITU-T X.609 (2015), <i>Managed P2P communications: Functional architecture</i> |
| [ITU-T X.609.3] | Recommendation ITU-T X.609.3, <i>Managed P2P communications: Multimedia streaming signalling requirements</i> |
| [ITU-T X.609.6] | Recommendation ITU-T X.609.6, <i>Managed P2P communications: Content distribution signalling requirements</i> |
| [ITU-T X.609.10] | Recommendation ITU-T X.609.10, <i>Managed P2P communications: Signalling requirements for data streaming</i> |
| [IETF RFC 7159] | IETF RFC 7159 (2014), <i>The JavaScript Object Notation (JSON) Data Interchange Format</i> |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 overlay network [b-ITU-T X.1162]: An overlay network is a virtual network that runs on top of another network. Like any other network, the overlay network comprises a set of nodes and links between them. Because the links are logical ones, they may correspond to many physical links of the underlying network.

3.1.2 peer [b-ITU-T X.1161]: Communication node on P2P network that functions simultaneously as both "client" and "server" to the other nodes on the network.

3.1.3 peer-to-peer (P2P) [b-ITU-T Y.2206]: A system is considered to be P2P if the nodes of the system share their resources in order to provide the service the system supports. The nodes in the system both provide services to other nodes and request services from other nodes.

NOTE— Peer is the node in a P2P system.

3.1.4 managed P2P [b-ISO/IEC TR 20002]: P2P with manageability features to manage the P2P-based service and P2P network by the P2P participants such as P2P service provider, ISP, and peer.

3.1.5 buffermap [ITU-T X.609]: A map showing downloading status of fragments comprising a shared content.

3.1.6 fragment [ITU-T X.609]: A piece of the shared content.

3.1.7 fragmentation [ITU-T X.609]: A process that divides the shared content into multiple fragments for sharing the content in a distributed manner.

3.1.8 source peer [ITU-T X.609.3]: A peer that streams the multimedia contents to the overlay network. The peer only provides content data to other peers and does not receive it. This peer generates fragments using the multimedia data received from the contents source.

3.1.9 client peer [ITU-T X.609.3]: A peer that sends fragments received from other peers to other peers, and does not generate its own fragments.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 overlay content: A content to be distributed through an overlay network.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

CBR	Constant Bit Rate
CMIM	Content Meta-Info Management
CVBR	Constrained Variable Bit Rate
FE	Functional Entity
FQDN	Fully Qualified Domain Name
HTTP	Hyper Text Transfer Protocol
ID	Identifier
IDR	Instantaneous Decode Refresh
IXS	Index Server
KiB	Kibibyte
MIC	Meta Information Control
MP2P	Managed Peer-to-Peer
OMS	Overlay Management Server
OCMP	Overlay Content Management Protocol
VBR	Variable Bit Rate

5 Conventions

See clause 8.1 for the grammar used in object representation.

6 Overview

When it comes to specify a content to be distributed over an overlay network that is specified in Rec. ITU-T X.609, the content needs meta-information describing the content. IXS maintains the meta-information related to the overlay content, and also maintains mapping information between the overlay content and an overlay network which is created in OMS. This meta-information is used to specify the size of fragment, overlay network identifier, hash of fragment for assuring integrity, etc.

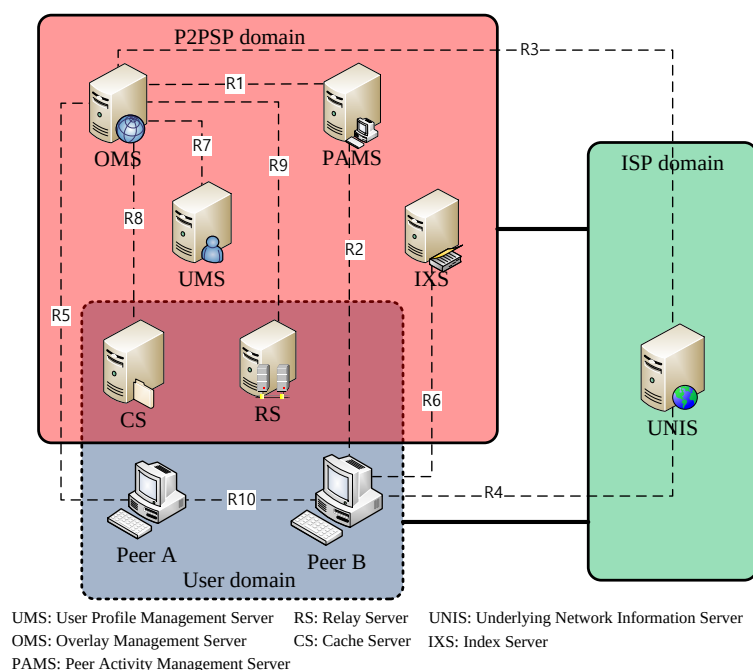


Figure 6-1 – Framework and reference points of MP2P [ITU-T X.609]

Figure 6-1 shows a framework and reference points of managed peer-to-peer (MP2P) that is defined in [ITU-T X.609], and this Recommendations specifies an overlay content management protocol for reference point R6.

7 Protocol operations

This clause describes basic and extended operations with high-level information flows. The basic operations include creation, removal, update and query overlay content information. In the extended operations, this describes the protocol operations for different types of services.

7.1 Basic operations

This clause describes the basic procedural operations on managing an overlay content information management protocol.

7.1.1 Overlay content information registration

This clause provides procedures of registration of an overlay content. It is assumed that the source peer already created an overlay network by interactions with OMS (Overlay Management Server) to map the overlay content to the specific overlay network. Figure 7-1 shows procedures for overlay content registration.

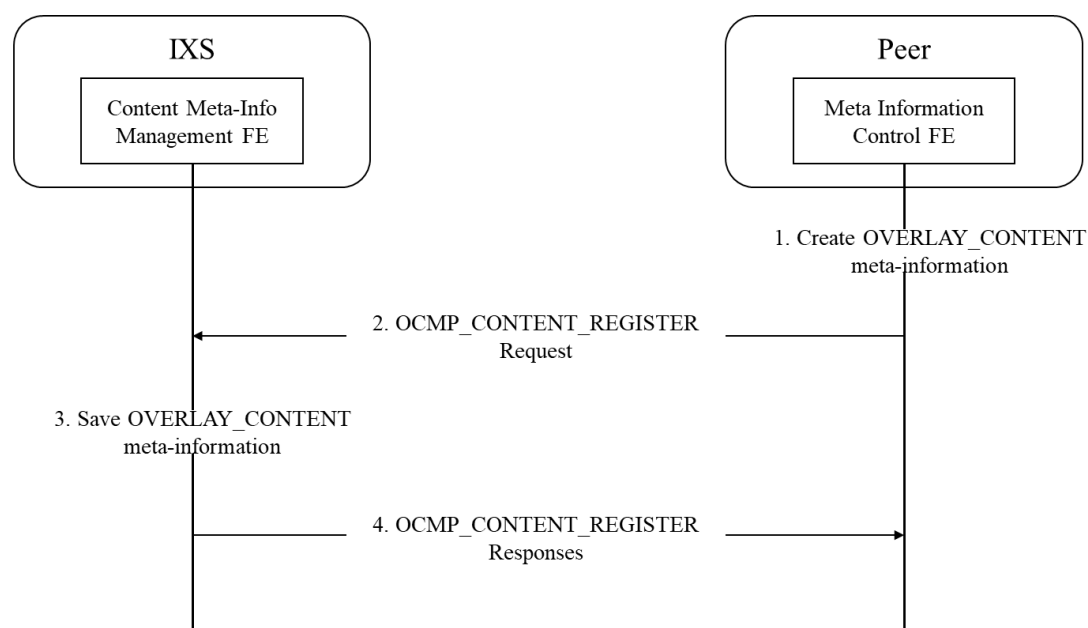


Figure 7-1 – Procedures for overlay content registration

- ① MIC (Meta Information Control) FE of a source peer creates a meta-information, and embeds it into OVERLAY_CONTENT element that is specified in clause 8.1.1.
- ② MIC FE of the source peer sends OCMP_CONTENT_REGISTER request that is specified in clause 8.2.1.1 to IXS.
- ③ CMIM (Content Meta-Info Management) FE of IXS stores the meta-information when validation is successful.
- ④ CMIM FE of IXS sends OCMP_CONTENT_REGISTER response that is specified in clause 8.1.1.2 to the peer

7.1.2 Overlay content information update

When it needs to modify an overlay content, the source peer sends a request with updated meta-information to IXS. On receiving this request, IXS increments the version of the meta-information. Figure 7-2 shows procedures for the overlay content update.

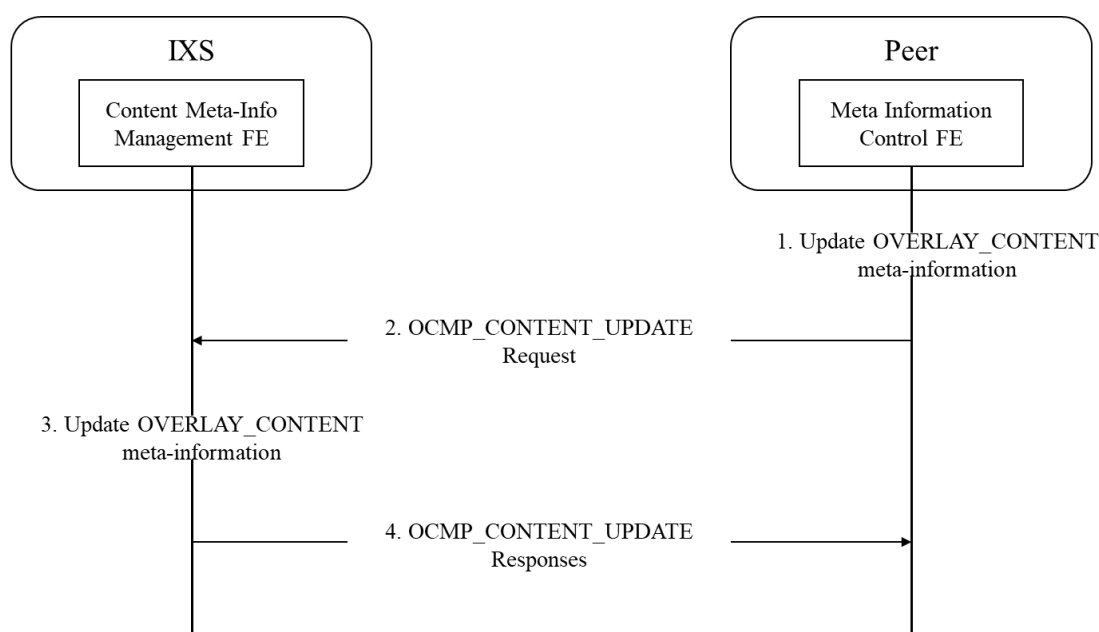


Figure 7-2 – Procedures for overlay content update

- ① MIC (Meta Information Control) FE of a source peer updates the overlay content, and updates the FILES element of OVERLAY_CONTENT element that is specified in clause 8.1.1 and 8.1.2. If a HASHES element exists in the OVERLAY_CONTENT element, it is also to be updated accordingly. Finally, it increments the version of the OVERLAY_CONTENT element.
- ② MIC FE of the source peer sends OCMP_CONTENT_UPDATE request that is specified in clause 8.2.2.1 to IXS.
- ③ CMIM (Content Meta-Info Management) FE of IXS saves the meta-information if validation check is successful.
- ④ CMIM FE of IXS sends OCMP_CONTENT_UPDATE response that is specified in clause 8.2.2.2 to the peer

7.1.3 Overlay content information removal

When a source peer wants to remove a specific overlay content that will be mapped with an overlay network, it sends removal request to IXS. Unlike modification specified in 7.1.2, this removes the overlay content. Figure 7-3 shows procedures for deregistration/removal of an overlay content from IXS.

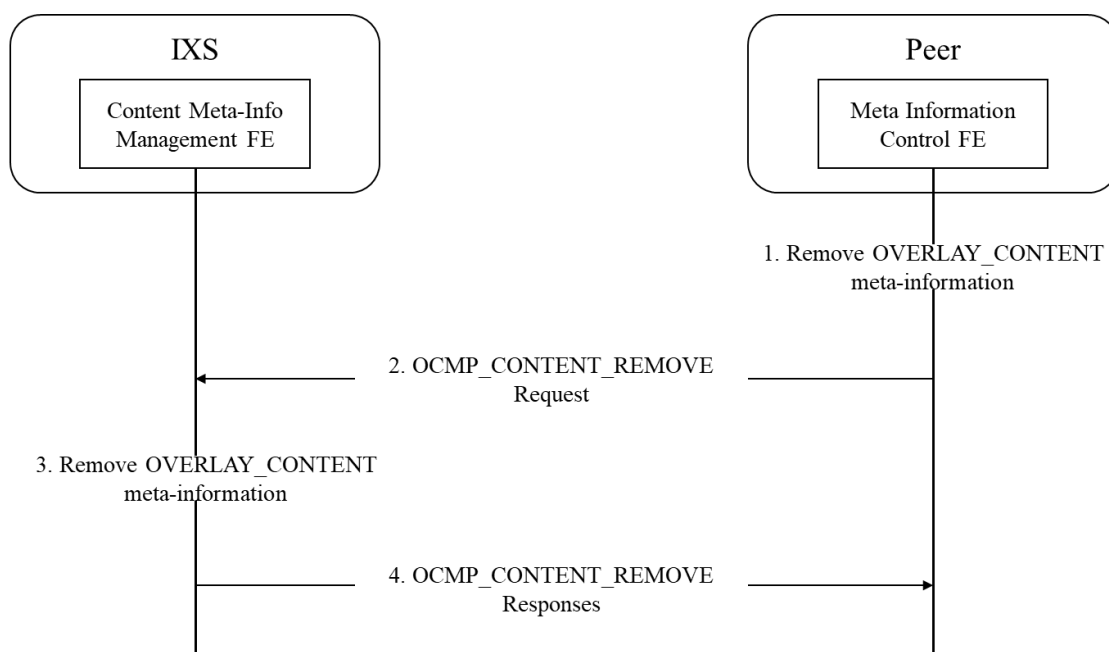


Figure 7-3 – Procedures for overlay content removal

- ① MIC (Meta Information Control) FE of a source peer removes OVERLAY_CONTENT element.
- NOTE – It is also possible to perform this procedure after receiving response for the removal request. This is implementation dependent.
- ② MIC FE of the source peer sends OCMP_CONTENT_REMOVE request that is specified in clause 8.2.3.1 to IXS.
 - ③ CMIM (Content Meta-Info Management) FE of IXS removes the meta-information if validation check is successful.
 - ④ CMIM FE of IXS sends OCMP_CONTENT_REMOVE response that is specified in clause 8.2.3.2 to the peer.

7.1.4 Overlay content information query

This clause describes the procedures for querying overlay content by a client peer.

When a peer wants to receive a specific overlay content, it needs to find a meta-information that indicates the attribute of the content and the overlay network information. IXS provides necessary information to the requesting peer as shown in Figure 7-4.

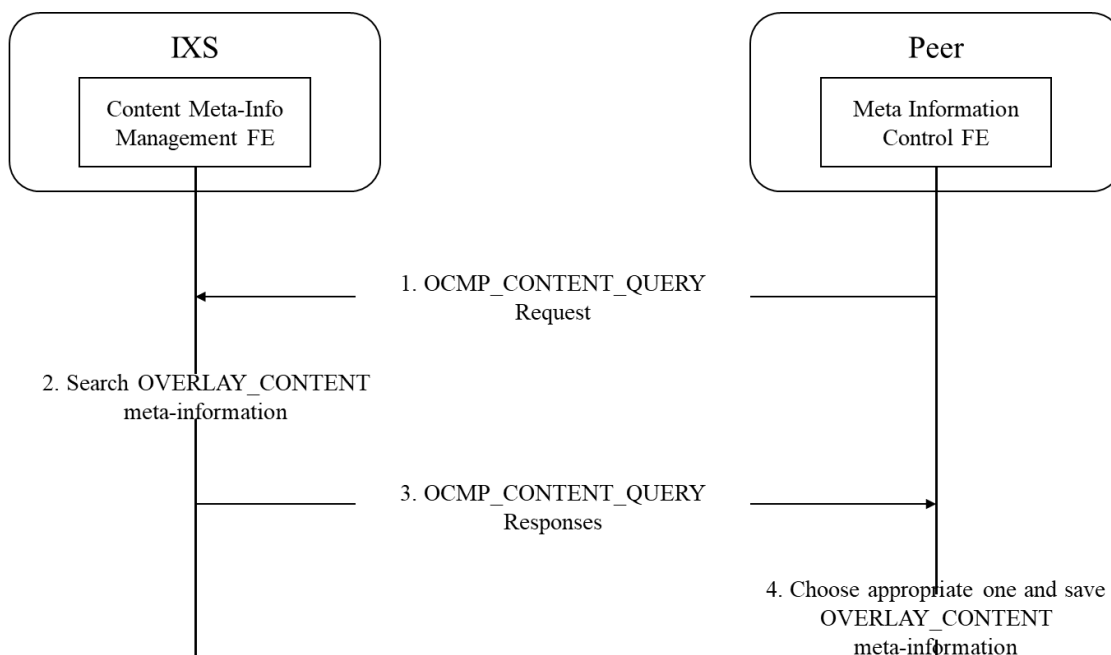


Figure 7-4 – Procedures for overlay content query

- ① MIC (Meta Information Control) FE of a client peer sends OCMP_CONTENT_QUERY request that is specified in clause 8.2.4.1 to IXS to find an overlay content that it wants to receive. When it finds a specific content, it embeds an appropriate keyword for title, owner-id and content-id.
- ② CMIM (Content Meta-Info Management) FE of IXS search overlay contents that is matched on the keyword. If there is no keyword in the request, it returns the list of all overlay networks of the IXS.
- ③ CMIM FE of IXS sends OCMP_CONTENT_QUERY response that is specified in clause 8.2.4.2 to the peer.
- ④ A user selects one overlay content of the list, and MIC FE of the client peer save the relevant OVERLAY_CONTENT meta-information.