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SERIES X: DATA NETWORKS, OPEN SYSTEM
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OSI networking and system aspects – Networking

Managed P2P communications: Multimedia streaming overlay management protocol

Recommendation ITU-T X.609.5

ITU-T

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Recommendation ITU-T X.609.5

Managed P2P communications: Multimedia streaming overlay management protocol

Summary

Recommendation ITU-T X.609.5 specifies a multimedia streaming overlay management protocol (MSOMP) that runs on the interface among entities of managed P2P communications. The management functionalities covered in this Recommendation include overlay network management and peer management. This Recommendation provides protocol operations and message formats.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T X.609.5	2018-01-13	11	11.1002/1000/13494

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Managed P2P, multimedia streaming, overlay network management.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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Recommendation ITU-T X.609.5

Managed P2P communications: Multimedia streaming overlay management protocol

1 Scope

This Recommendation specifies overlay management protocol for providing multimedia streaming services over managed peer-to-peer infrastructure. This Recommendation describes following details:

- overview of multimedia streaming overlay protocol;
- protocol elements;
- protocol messages and its parameters;
- protocol behaviours including information flows.

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), *Managed P2P communications: Functional architecture*.
- [ITU-T X.609.1] Recommendation ITU-T X.609.1 (2016), *Managed P2P communications: Peer activity management protocol (PAMP)*.
- [ITU-T X.609.2] Recommendation ITU-T X.609.2 (2016), *Managed P2P communications: Overlay resource control protocol (ORCP)*.
- [ITU-T X.609.3] Recommendation ITU-T X.609.3 (2017), *Managed P2P communications: Multimedia streaming signalling requirements*.
- [ITU-T X.609.4] Recommendation ITU-T X.609.4 (2017), *Managed P2P communications: Multimedia streaming peer protocol*.
- [IETF RFC 7159] IETF RFC 7159 (2014), *The JavaScript Object Notation (JSON) Data Interchange Format*.
- [IETF RFC 7231] IETF RFC 7231 (2014), *Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content*.

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

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 peer list: A list of peer IDs which identifies the peers participating in an overlay network.

3.2.2 peer ID: An identifier of a peer. Each peer can be identified by own peer ID.

3.2.3 overlay ID: An identifier of an overlay network. Each overlay network can be identified by own overlay ID.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CS	Cache Server
JSON	Javascript Object Notation
MP2P	Managed Peer-to-Peer
MSOMP	Multimedia Streaming Overlay Management Protocol
OMS	Overlay Management Server
PAMS	Peer Activity Management Server
REST	Representational State Transfer
P2P	Peer-to-Peer
RS	Relay Server
UMS	User Management Server
UNIS	Underlying Network Information Server

5 Conventions

See clause 8.1 for the grammar used in object representation.

6 Overview

The framework of managed peer-to-peer (P2P) communication is defined in [b-ISO/IEC TR 20002], and the details of the entities and the reference points among the entities are defined in [ITU-T X.609].

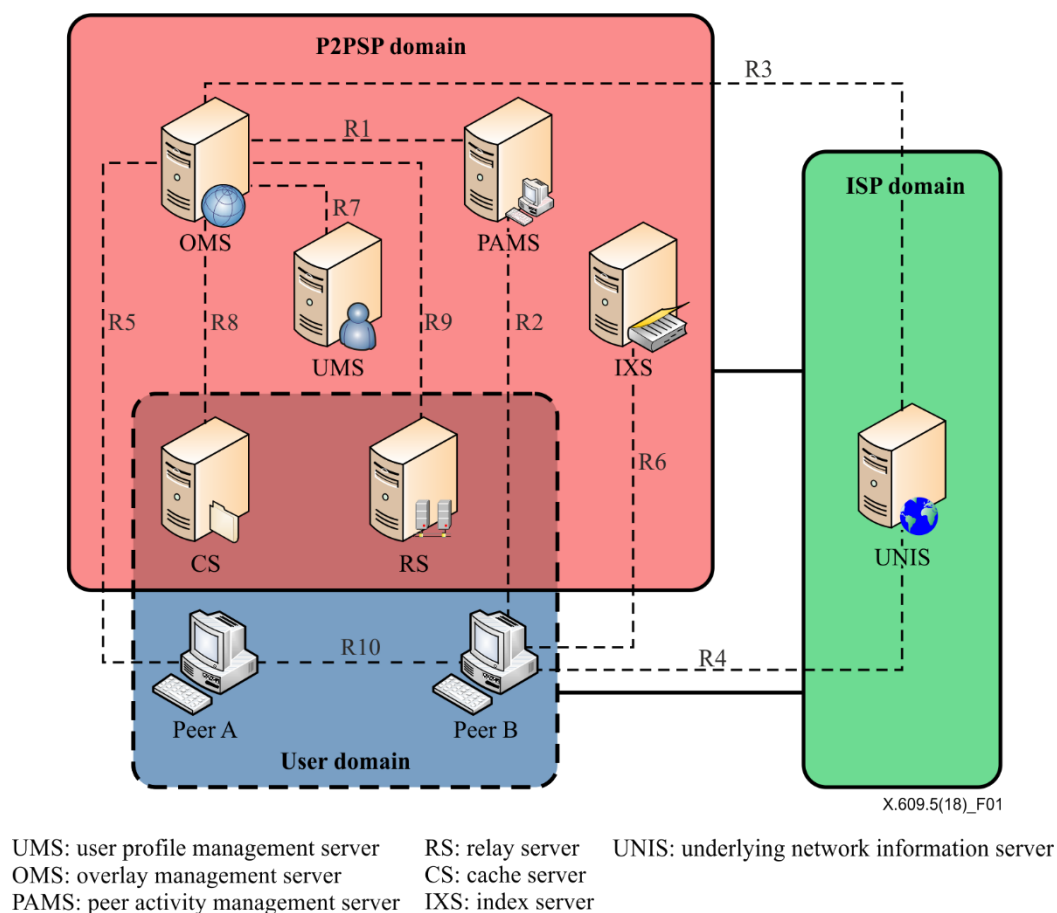


Figure 1 – Framework and reference points of MP2P [ITU-T X.609]

Figure 1 shows the framework and reference points of managed P2P (MP2P) communication. From the management point of view, the overlay management server (OMS) manages the information of established overlay networks and controls resources such as cache server (CS) and relay server (RS). A peer interacts with OMS to join a specific overlay network. The peer can also interact with OMS when it leaves the joined overlay network. This Recommendation defines a multimedia streaming overlay management protocol (MSOMP) running over reference point R5, which is used for management related to overlay network. OMS can interact with other entities such as peer activity management server (PAMS), underlying network information server (UNIS), and user management server (UMS) to form a well-organized overlay network, but those interactions are not part of this Recommendation.

The basic service flow for overlay network management in MP2P communication is shown in Figure 2.

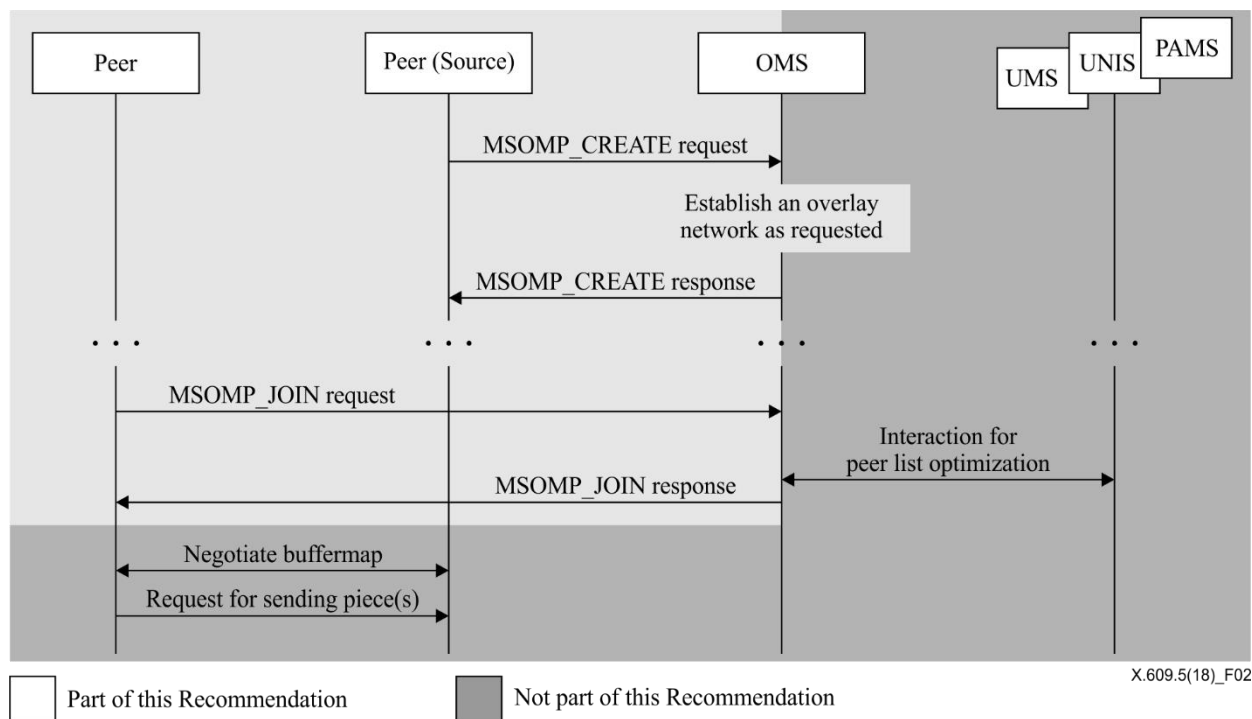


Figure 2 – Basic service flow of overlay network management

A peer can request OMS to create a new overlay network. If the request is valid, OMS establishes a new overlay network as requested. After an overlay network is created, peers can join the overlay network by interacting with OMS. A peer can request OMS to join a specific overlay network; each overlay network corresponds to a distinct multimedia content. As a response, OMS provides a peer list that contains contact information of peers participating in the overlay network. The peer list can be generated by OMS itself, or OMS can interact with other servers such as UMS, UNIS and PAMS to generate the optimized peer list. Upon receiving response including peer list, the peer contacts other peers in the overlay network and conducts REST processes to receive multimedia streams.

As depicted in Figure 2, this Recommendation covers the interaction between peer and OMS, which runs over reference point R5 shown in Figure 1. The interaction can be classified into two categories. One category is overlay network management. Overlay network management is about creation, modification and termination of an overlay network. The second category is peer management. Peer management is about joining and leaving a specific overlay network. Both categories additionally have an information query function. For instance, a peer can query the information of a specific overlay network or the peer list of a specific overlay network.

7 Protocol operation

This clause describes the protocol operations of MSOMP. The operations are classified into two types: overlay network management and peer management. The messages for each operation are defined in clause 8.

7.1 Overlay network management

7.1.1 Creation of overlay network

A peer can request OMS to create a new overlay network. The request may specify options such as peer ID of the peer that sent the request or a list of peer IDs for closed group communication. Upon receiving the request, OMS checks whether the request is valid. If the request is valid, OMS creates an overlay network as requested. When OMS creates the overlay network, it should also generate a unique overlay ID for the overlay network since each overlay network is distinguished by own overlay