International Telecommunication Union

ITU-T G.7712/Y.1703

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Amendment 2

(02/2016)

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Architecture and specification of data communication network

Amendment 2

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Recommendation ITU-T G.7712/Y.1703

Architecture and specification of data communication network

Amendment 2

Summary

Amendment 2 to Recommendation ITU-T G.7712/Y.1703 contains the updates to Recommendation ITU-T G.7712/Y.1703 (2010) to provide the specification of the out-of-band (OOB) OCh overhead (OCh-O) status report protocol (SRP).

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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4.1	ITU-T G.7712/Y.1703 (2010) Amd. 1	2013-10-07	15	11.1002/1000/12000
4.2	ITU-T G.7712/Y.1703 (2010) Amd. 2	2016-02-26	15	11.1002/1000/12553

* 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.

FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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1) Scope

This amendment contains the updates to Recommendation ITU-T G.7712/Y.1703 (2010) to provide the specification of the out-of-band (OOB) OCh overhead (OCh-O) status report protocol (SRP).

2) Updates to Recommendation ITU-T G.7712/Y.1703

2.1) Clause 2, References

Add the following reference to clause 2:

[IETF RFC 4204] IETF RFC 4204 (2005), *Link Management Protocol (LMP).*

2.2) Clause 4, Abbreviations

Add the following abbreviations, inserted alphabetically, to clause 4:

LMP Link Management Protocol

OOB Out-Of-Band

OPS Optical Physical Section

UDP User Datagram Protocol

2.3) Clause 6.3.1

Update to clause 6.3.1, "OCh overhead communication application"

Replace the note:

NOTE – The specification for how the primitive and information elements described in Amendment 2 of [ITU-T G.709] are carried across an OCN is for further study.

with the following text:

The protocol used for OCh overhead communication is defined in Annex D.

2.4) Add a new Annex D

Insert the following text as a new Annex D:

Annex D

OOB OCh-O protocol specification

(This annex forms an integral part of this Recommendation.)

D.1 Overview

The OOB OCh-O protocol supports an OCC carrying the status of OCh connections and signals over an OCN to systems that do not have direct access to the OSC. For deployment flexibility, the OCh-O

protocol is defined independent of the specific DCN protocol in use (e.g., IPv4, IPv6). The details of how to adapt the characteristic information (CI) of this protocol to an IPv4-based DCN are provided at the end of the protocol definition.

The OOB OCh-O protocol requires configuration of a protocol adjacency between two OCh-O connection points (OCh-O CP) located on the associated network equipment being connected by one or more optical physical section (OPS). Prior to both ends being configured, the status reporting behaviours driven by the protocol will not be operational. The adjacency is identified by using OPS as well as OCh identifiers and is carried by the DCN network.

The status messages carried by the OOB OCh-O protocol provide unidirectional state information for one or more OCh connections and signals. The messages include identifiers of the OPS trail and one or more OCh-P link connections carried by that trail that identify the OCh-P link connections for which status is being reported. The receiving NE correlates the received status message with a local OCh-P CP utilizing the configured OPS adjacency.

D.2 PDU format

The OOB OCh-O protocol is derived from the IETF's link management protocol (LMP) [IETF RFC 4204]. LMP uses a common format for the PDUs of all protocol messages as shown in Figure D.1.

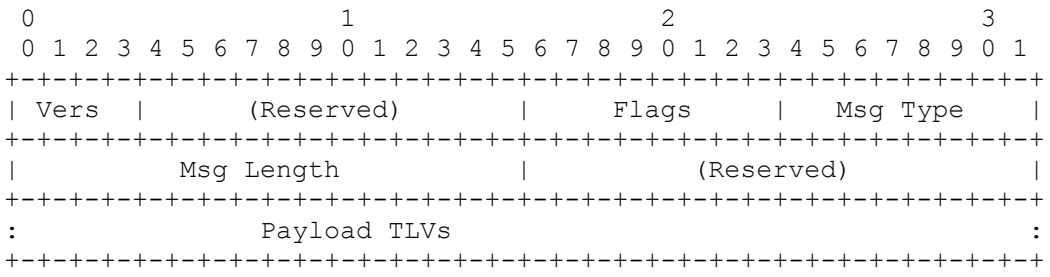

Figure D.1 – OOB OCh-O protocol message PDU format

Sub-protocols are used in the design of the OOB OCh-O protocol. The value in the Msg Type field indicates which of the sub-protocols a PDU belongs to. TLV structure is used for the base PDU and payload TLV structures; in all cases the units of length are octets. The Msg Length provides the overall length of the PDU.

Payload TLVs follow the format shown in Figure D.2.

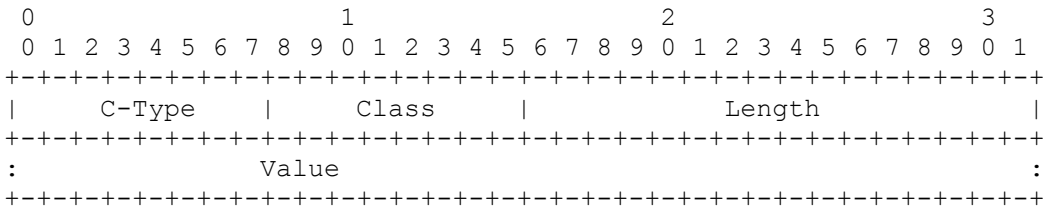

Figure D.2 – OOB OCh-O protocol payload TLV format

The C-Type and Class fields are defined by each sub-protocol. The Length field provides the overall length of the TLV inclusive of the C-Type, Class and Length fields.

The OOB OCh-O protocol shall exchange Hello PDUs and Status Reporting PDUs.

D.2.1 Hello sub-protocol

The Hello sub-protocol uses a message type of 4. Inside the message are Hello sequence and validity TLVs. The format of these TLVs is as follows:

D.2.1.1 Hello sequence TLV

The C-type is 7, Class is 1 and Length is 12. The Value field is formatted as shown in Figure D.3.

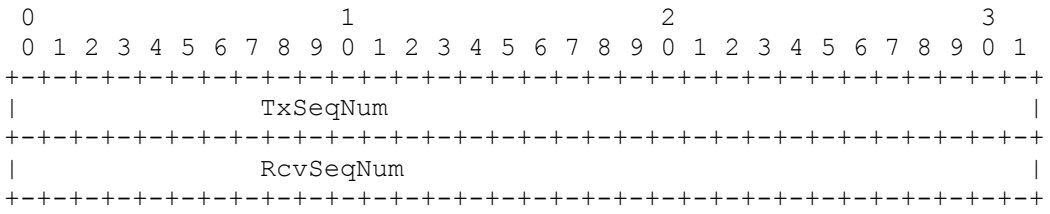

Figure D.3 – OOB OCh-O protocol Hello sequence format

The TxSeqNum is the sequence number of the Status Reporting message last transmitted by this adjacency endpoint. The RcvSeqNum is the sequence number of the Status Reporting message last received by this adjacency endpoint.

Initially the RcvSeqNum=0 and the TxSeqNum=1. The RcvSeqNum will be replaced with the TxSeqNum received from the peer when the first Hello message is received.

If a Hello message is received with a Hello sequence TLV containing a RcvSeqNum equal to 0, it is an indication that the peer endpoint has restarted and requires state information be sent for all OCh associated with this adjacency. The TxSeqNum may eventually exceed 2^32. When this occurs, the TxSeqNum will wrap to the value of 1.

D.2.1.2 Hello validity TLV

The C-type is 240, Class is 1 and Length is 8. The value is formatted as shown in Figure D.4.

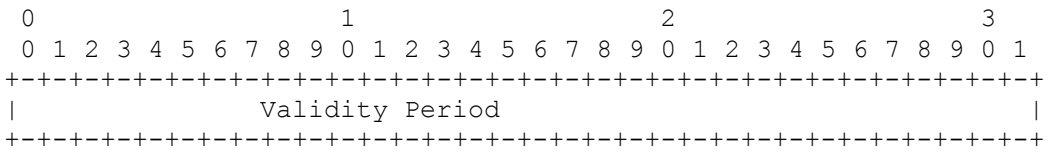

Figure D.4 – OOB OCh-O protocol Hello validity format

The Validity Period field describes the amount of time (in ms) before another Hello must be received for the adjacency to be considered up. A transmitter should send subsequent Hello messages prior to the expiration of the validity period. The receiver of the Hello must update the expiration of the adjacency health timer upon receipt of a Hello PDU. If the validity period expires, the adjacency shall raise an alarm to the EMF. This alarm clears when the Hello protocol receives a Hello message from the peer starting a new validity period.

D.2.2 Status Reporting sub-protocol

Status Reporting PDUs are issued for one or more OCh connections and signals as state changes occur or initial state requests are received. These PDUs use message type 17. The PDUs each contain a Message ID TLV, an OPS Trail Identification TLV, along with one or more identifiers for one or more OCh-P Link Connections and one OCh Status TLVs.

It is possible for multiple OCh-P link connections that change state at the same time to be reported in a single Status Reporting PDU. In this case, all OCh-Ps identified in the PDU will have the same status.

The format of these TLVs is as follows:

D.2.2.1 Message ID TLV

The Message ID TLV contains the TxSeqNum for this specific Status Reporting PDU. The Class number is 5 and the C-Type 1. The TLV Length is 8. The format is shown in Figure D.5.

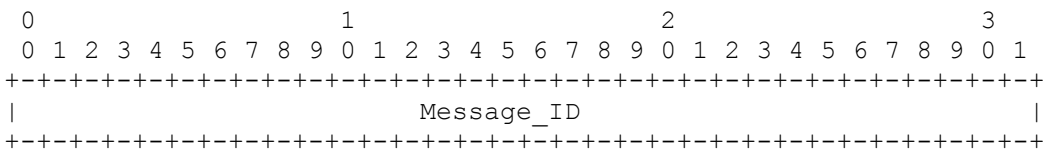

Figure D.5 – OOB OCh status reporting Message ID format

D.2.2.2 OPS Trail Identification TLV

The namespace used for OPS Trail Identification is the TCP_ID namespace used by ITU-T G.7714 neighbour discovery. Control plane names are not used as it is not guaranteed that a control plane is active on this link.

An OPS Trail Identification TLV has a C-type of 241 and Length of 16. The class uses the Format ID defined for each TCP-ID format in [ITU-T G.7714.1]. The Value field is formatted as shown in Figure D.6, Figure D.7 and Figure D.8 for TCP-ID Name, DCN Address format and DCN Name formats respectively.

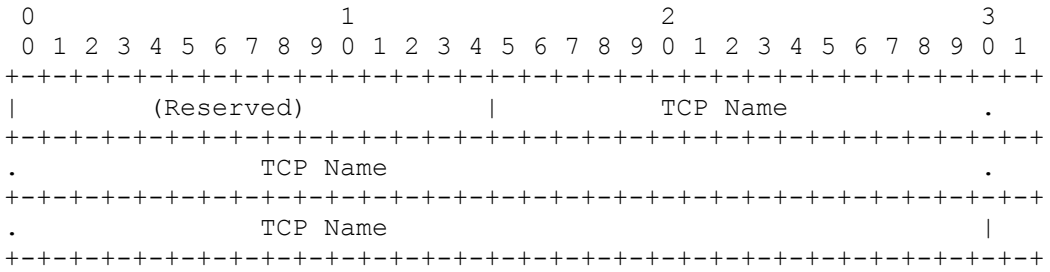

Figure D.6 – OOB OPS Trail and OCh-P Link Connection ID – TCP-ID Name format (Class=1)

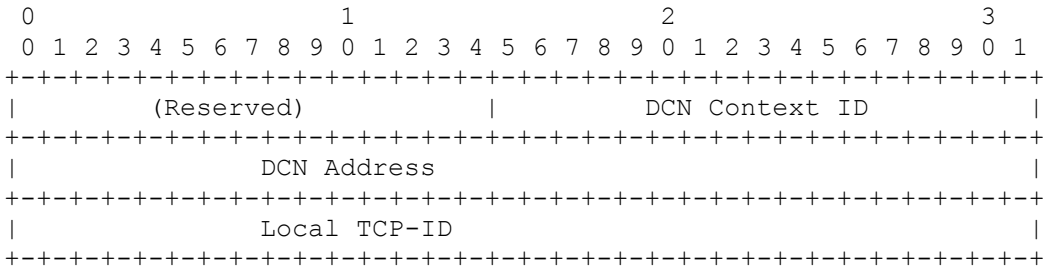

Figure D.7 – OOB OPS Trail and OCh-P Link Connection ID – DCN Address format (Class=2)

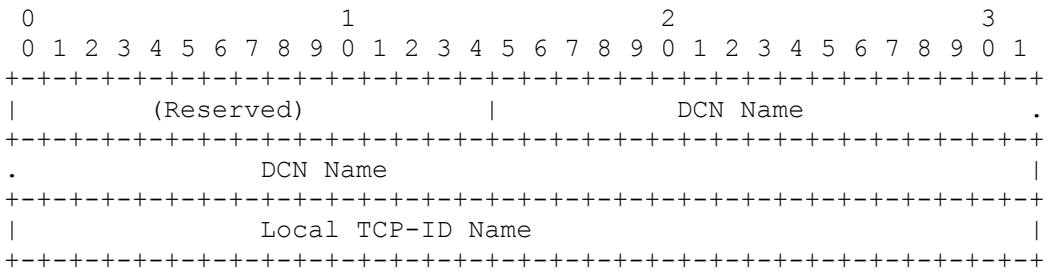

Figure D.8 – OOB OPS Trail and OCh-P Link Connection ID – DCN Name format (Class=3)

D.2.2.3 OCh-P Link Connection ID TLV

The OCh-P Link Connection ID TLV identifies an OCh-P instance carried by the OPS trail.

The namespace used for the OCh-P Link Connection ID is the TCP-ID namespace used by ITU-T G.7714.1 neighbour discovery. Control plane names are not used as it is not guaranteed that a control plane is active on this link.

The format for the OCh-P Link Connection ID TLV is the same as the format for the OPS Trail Identification TLV.

An OCh-P Link Connection ID TLV has a C-type of 244 and Length of 16. The class uses the Format ID defined for each TCP-ID format in [ITU-T G.7714.1]. The Value field for the OCh-P Link Connection ID TLV is formatted as shown in Figure D.6, Figure D.7 and Figure D.8 for TCP-ID Name, DCN Address and DCN Name format respectively.

Multiple Link Connection ID TLVs may be carried in the same status update message. In this case, all OCh-P link connections in the message will have the same status.

D.2.2.4 OCh Status TLV

The OCh Status TLV is a bit vector providing status indication for one or more OCh-P link connections identified in the Status Reporting PDU. The Class number is 242 and the C-Type is 1. The TLV Length is 8. The format is shown in Figure D.9.

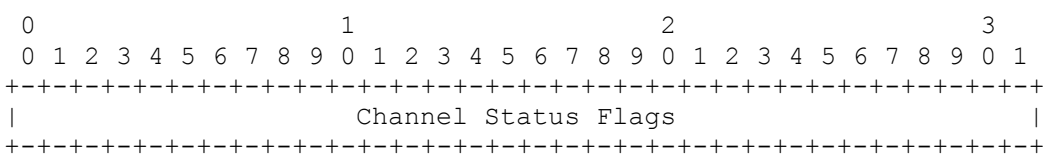

Figure D-9 – OCh Status TLV format

The flags in the Channel Status Flags field are defined as follows:

0x0000.0001: FDI-P

0x0000.0002: FDI-O

0x0000.0004: OCI

All remaining flags are reserved. Reserved flags are transmitted as zero (0) and ignored on reception.

D.2.3 Protocol adaptation to IPv4 DCN

The OOB OCh-O protocol is carried over IPv4 networks using unicast user datagram protocol (UDP) messages.

The OOB OCh-O PDUs are carried as payload within adaptation frames with one PDU in each frame. The adaptation uses the format in Figure D.10.

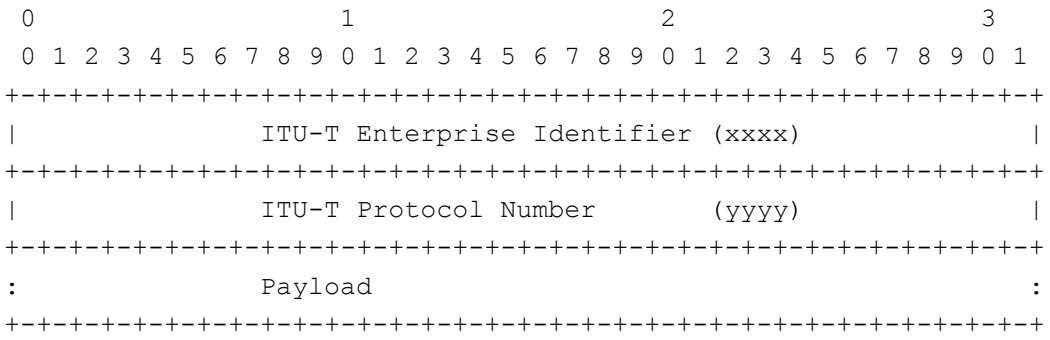

Figure D.10 – OOB OCh-O protocol UDP/IPv4 frame format

While the OOB OCh-O protocol does not have a byte-count limit on a PDU, they are to be carried within a single IPv4 PDU to the destination to avoid problems with complete message loss due to message fragmentation and loss of fragments. For this reason, the IPv4 DoNotFragment bit should be set and PDUs should be less than 1500 bytes (inclusive of IPv4, UDP and frame header overheads).

D.3 OCh_O communication channel adaptation function (OCC/OCh-O_A)

The OCC/OCh-O_A function aggregates/de-aggregates OCh_CI_OH.

The specification of this function is for further study.

D.4 OCh_O communication channel termination function (OCC_TT)

The OCC_TT function is responsible for the end-to-end supervision of the OCC trail.

The specification of this function is for further study.

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