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ASON routing architecture and requirements for remote route query

ITU-T Recommendation G.7715.2/Y.1706.2



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ITU-T Recommendation G.7715.2/Y.1706.2

ASON routing architecture and requirements for remote route query

Summary

ITU-T Recommendation G.7715.2/Y.1706.2 describes the ASON routing architecture and requirements for remote route query.

Source

ITU-T Recommendation G.7715.2/Y.1706.2 was approved on 6 February 2007 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

Keywords

ASON, connection controller, control plane, hierarchical routing, remote route query, route query requester, route query responder, routing controller.

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ASON routing architecture and requirements for remote route query

1 Scope

This Recommendation specifies the requirements and architecture for the functions performed by routing controllers (RC) during the operation of remote route query. The purpose of the remote route query is to compute one or more routing paths for a switched connection (SC) or a soft permanent connection (SPC) within the framework of the automatically switched optical network (ASON).

During the operation of remote route query, a RC (route query requester) sends a RI_QUERY message to another RC (route query responder) not associated with the same set of layer resources, and if a routing path (or more) is found after computation, the route query responder would send back a RI_UPDATE message to the route query requester. A routing path for a SC or SPC may be computed collaboratively by a group of RCs in this manner.

The route query interface as defined by [ITU-T G.8080] is used by routing controllers when they communicate with each other during the remote route query operation. Note that the route query interface is used in two different cases. First, a connection controller (CC) might request its routing controller for a routing path, and secondly, a routing controller (RC-X) might send a request to another routing controller (RC-Y) for a routing path, either because it (RC-X) needs to respond to a connection controller (CC-X) or a remote routing controller (RC-A), for a route query. The second case, i.e., the RC-to-RC communication for path computation, is the main focus of this Recommendation.

The messages exchanged between routing controllers during the remote route query operation fall into the same category of the routing messages as defined in [ITU-T G.7715], and they are transported over a data communication network (DCN). This Recommendation takes a protocol neutral approach, i.e., it does not specify any protocol solution for the communication between routing controllers during remote route query operation.

The routing algorithm used by a route query responder during the path computation is beyond the scope of this Recommendation.

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 G.7712] ITU-T Recommendation G.7712/Y.1703 (2003), *Architecture and specification of data communication network*.
- [ITU-T G.7713] ITU-T Recommendation G.7713/Y.1704 (2006), *Distributed call and connection management (DCM)*.
- [ITU-T G.7713.1] ITU-T Recommendation G.7713.1/Y.1704.1 (2003), *Distributed call and connection management (DCM) based on PNNI*.
- [ITU-T G.7713.2] ITU-T Recommendation G.7713.2/Y.1704.2 (2003), *Distributed call and connection management: Signalling mechanism using GMPLS RSVP-TE*.



- [ITU-T G.7713.3] ITU-T Recommendation G.7713.3/Y.1704.3 (2003), *Distributed call and connection management: Signalling mechanism using GMPLS CR-LDP*.
- [ITU-T G.7715] ITU-T Recommendation G.7715/Y.1706 (2002), *Architecture and requirements for routing in the automatically switched optical networks plus Amendment 1* (2007).
- [ITU-T G.7715.1] ITU-T Recommendation G.7715.1/Y.1706.1 (2004), *ASON routing architecture and requirements for link state protocols*.
- [ITU-T G.8080] ITU-T Recommendation G.8080/Y.1304 (2006), *Architecture for the automatically switched optical network (ASON)*.
- [ITU-T G.8081] ITU-T Recommendation G.8081/Y.1353 (2004), *Terms and definitions for automatically switched optical networks (ASON)*.

3 Terms and definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

- 3.1.1 **data communication network (DCN):** [ITU-T G.7712]
- 3.1.2 **connection controller (CC):** [ITU-T G.8080]
- 3.1.3 **federation:** [ITU-T G.8080]
- 3.1.4 **protocol controller (PC):** [ITU-T G.8080]
- 3.1.5 **routing area (RA):** [ITU-T G.8080]
- 3.1.6 **routing controller (RC):** [ITU-T G.8080]
- 3.1.7 **routing information database (RDB):** [ITU-T G.8081]
- 3.1.8 **soft permanent connection (SPC):** [ITU-T G.8080]
- 3.1.9 **switched connection (SC):** [ITU-T G.8080]
- 3.1.10 **routing adjacency (RAdj):** [ITU-T G.7715]

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

- 3.2.1 **remote route query:** An operation where a routing controller communicates with another routing controller, which does not have the same set of layer resources, in order to compute a routing path in a collaborative manner.
- 3.2.2 **route query requester:** A connection controller or routing controller that sends a route query message to a routing controller requesting for one or more routing path that satisfies a set of routing constraints.
- 3.2.3 **route query responder:** A routing controller that performs path computation upon reception of a route query message from a routing controller or connection controller, sending a response back at the end of computation.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ASON	Automatically Switched Optical Network
CC	Connection Controller
DCN	Data Communication Network
E-NNI	External Network-Network Interface
NE	Network Element
NNI	Network-to-Network Interface
RC	Routing Controller
SC	Switched Connection
SPC	Switched Permanent Connection

5 Conventions

None

6 General architecture

The remote route query operation is part of ASON routing paradigms as defined in [ITU-T G.8080], where when one routing controller does not have sufficient routing information in a local RDB to compute a routing path for a connection request, it may communicate with another routing controller at a remote site for assistance.

6.1 Route query as used by RC federations

As described in [ITU-T G.8080], a routing controller can be implemented as a distributed set of entities that make up a cooperative federation, i.e., RC federations. There are two aspects of the use of the RC federations, as follows:

- 1) Routing topology information may be exchanged between RC federations and also among RCs within a single federation. This aspect is described in [ITU-T G.7715] and [ITU-T G.7715.1].
- 2) Route query messages may be exchanged between RC federations and also among RCs within a single federation. This aspect is described in this Recommendation.

Note that these two aspects are associated with different functions performed by routing controllers.

There are different styles that are used by RC federations during remote route query operation including the following:

- 1) step-by-step remote path computation;
- 2) hierarchical remote path computation;
- 3) combination of the above two.

The step-by-step case is illustrated in Figure 1, where the dotted lines show the RC federation boundaries. Each RC is responsible to compute a portion of the end-to-end routing path, usually within its own routing area; for the portion of the routing path that is outside of its routing area, the RC would first decide the next RC in the chain that belongs to another routing area. This presumes that the RC has enough knowledge to determine the appropriate next RC or, if not, it has to communicate (simultaneously or successively) to all neighbouring RCs belonging to another routing area to find out the appropriate one. The RC communicates with that RC belonging to