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SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Next Generation Networks – Frameworks and functional
architecture models

Distributed service networking relay functions

Recommendation ITU-T Y.2082

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Recommendation ITU-T Y.2082

Distributed service networking relay functions

Summary

Recommendation ITU-T Y.2082 specifies the architecture for relay function (RF), in support of application layer routing optimization for performance improvement and network address translation (NAT)/firewall traversal in the environment of distributed service networking (DSN) as described in Recommendation ITU-T Y.2080.

Application layer routing optimization means the usage of application layer relays to change the route of data packets. Considering the case that the default transport layer route is congested, better performance can be achieved through application layer routing optimization.

The main objectives of this Recommendation are to specify:

- Functional entities of RF
- Information flows related to RF
- Reference points related to RF.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.2082	2013-08-13	13	11.1002/1000/11974-en

Keywords

Distributed service networking, DSN, functional architecture, relay, relay function, RF.

* 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 Y.2082

Distributed service networking relay functions

1 Scope

This Recommendation specifies relay function (RF) support for network address translation (NAT)/firewall traversal and application layer routing optimization for service performance improvement in distributed service networking (DSN). Furthermore, it defines functional entities of RF, information flows related to RF, and detailed reference point descriptions related to RF.

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 Y.2080] Recommendation ITU-T Y.2080 (2012), *Functional architecture of distributed service networking*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 control node [b-ITU-T Y.2000-series Sup.10]: A DSN node which provides service control functionalities.

3.1.2 distributed service networking (DSN) [b-ITU-T Y.2206]: An overlay networking which provides distributed and manageable capabilities to support various multimedia services and applications.

3.1.3 DSN node [b-ITU-T Y.2206]: A node used in DSN providing distributed functionalities, including distributed routing and distributed storage.

3.1.4 network address translation (NAT) [b-ITU-T Y.2111]: The operation by which IP addresses are translated (mapped) from one address domain to another address domain.

3.1.5 point of presence (POP) [b-ITU-T Y.2081]: A point representing one or several DSN nodes, which supports DSN users in accessing services directly without having intermediate DSN nodes.

3.1.6 reference point [b-ITU-T Y.2012]: A conceptual point at the conjunction of two non-overlapping functional entities that can be used to identify the type of information passing between these functional entities.

3.1.7 relay node (RN) [ITU-T Y.2080]: A DSN node which relays data packets in order to improve node reachability and quality of service (QoS) by changing the original route of the packets. The data can be voice data, video data, etc.

3.1.9 user profile [ITU-T Y.2080]: In the context of the DSN functional architecture, a collection of information that specifies the subscribed services and access privileges related to a DSN service user. The data in the user profile is called user profile data.

NOTE – A user profile may include the following attributes: user ID and other data related to authentication and authorization, user preferences, service status, service class, usage and/or contribution information, or subscriber accounting characteristics, etc.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 functional entity: An entity that comprises an indivisible set of specific capabilities. Functional entities are logical concepts, while groupings of functional entities are used to describe practical, physical implementations.

3.2.2 relay: A procedure to forward data packets from one entity to another entity according to a given policy.

NOTE – In the context of this Recommendation, relay is used to achieve NAT/firewall traversal and QoS improvement.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DSN	Distributed Service Networking
EF	End-user Functions
ID	Identifier
MMTel	Multimedia Telephony
NAT	Network Address Translation
POP	Point Of Presence
RF	Relay Functions
RLF	Resource Location Functions
RN	Relay Node
RT-FE	Relay Transport Functional Entity
RTT	Round Trip Time
SCF	Service Control Functions
TOCF	Traffic Optimization Control Functions
TQM-FE	Transport Quality Measurement Functional Entity
UE	User Equipment

5 Conventions

The following conventions apply:

1) The meaning of Functions is as follows:

Functions: In the context of DSN architecture, "Functions" are defined as functional groups composed of functional entities. It is represented by the following symbol:

6 Overview of relay functions

RFs support relaying of particular application traffic for DSN nodes to achieve NAT/firewall traversal and quality of service (QoS) improvement. One or more relay node (RN) entities can be inserted into the data path to improve network performance. RF supports the following functions:

- NAT or firewall traversal
When one or more DSN nodes involved in DSN service are behind the NAT/firewall, RF can be used to support NAT/firewall traversal enabling those DSN nodes to communicate with other DSN nodes.
- Routing optimization
When the default route cannot meet the desired QoS requirements for DSN services, communicating parties can set up an alternative data path through RNs to improve network performances, e.g., packet loss rate, delay, jitter. It is also possible to set up multiple data paths through RNs to provide backups in case the main path is interrupted or congested.

Figure 6-1 shows the position of RF in DSN functional architecture as defined in [ITU-T Y.2080].

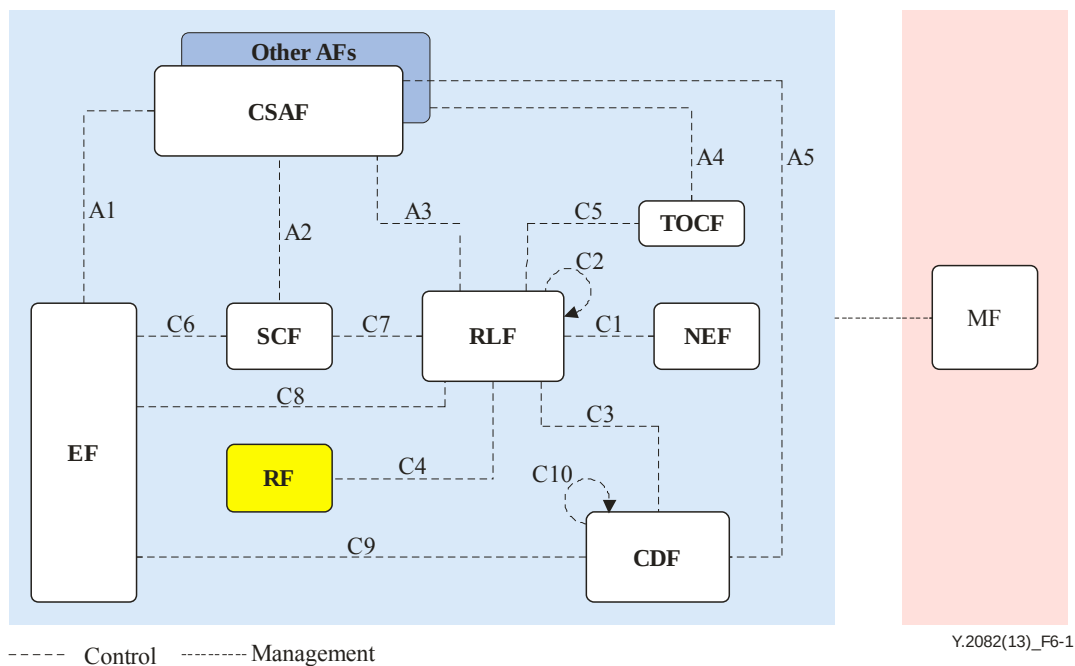


Figure 6-1 – The position of RF in DSN functional architecture

7 RF functional architecture

7.1 Architecture framework

Figure 7-1 describes the RF functional architecture with functional entities and relevant reference points. RF consists of the following FEs:

- RT-FE (relay transport functional entity).
- TQM-FE (transport quality measurement functional entity).

The detailed functions of RT-FE and TQM-FE are described in clause 7.2.

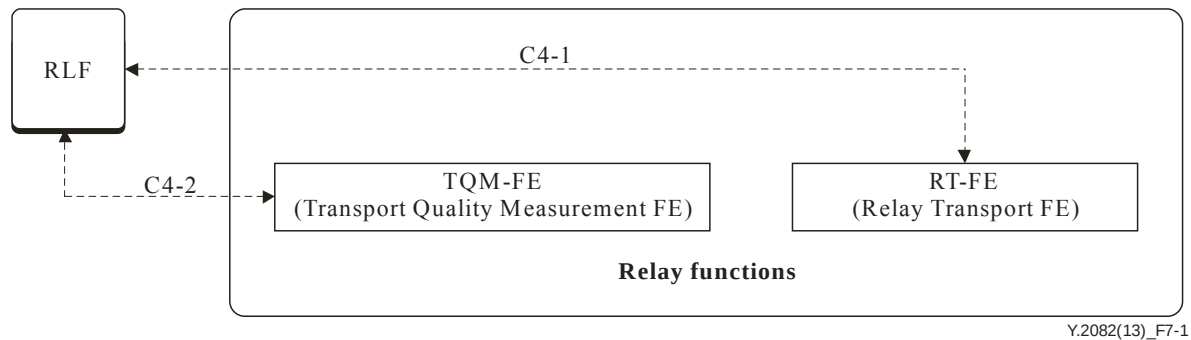


Figure 7-1 – Relay functions functional architecture

7.2 Functional entities

7.2.1 Relay transport functional entity

RT-FE is a functional entity that relays the data packet between DSN nodes. RT-FE also reports flow statistics and RN status to a resource location function (RLF). The functions performed by RT-FE include the following:

- RT-FE registers RN to RLF.
- RT-FE reserves resource for data packet relay.
- RT-FE relays data packets for DSN nodes, including DSN nodes behind NAT/firewall.
- RT-FE validates the legality of a DSN node when the DSN node sends data packet to RT-FE.
- RT-FE buffers relayed data packets.
- RT-FE reports relay task results (e.g., the duration and flow statistic) to RLF.
- RT-FE forwards data packets from one input to several outputs.
- RT-FE monitors RN status and reports status information to RLF. Status information includes CPU usage, memory usage, disk usage, and network interface usage, etc.
- RT-FE monitors events and reports event related information to RLF when it occurs.

NOTE – For example, an event includes the case when an RN load reaches a given threshold.

7.2.2 Transport quality measurement functional entity

TQM-FE is a functional entity that performs QoS measurement for the data path starting from or ending by it. The functions of TQM-FE include the following:

- TQM-FE receives measurement instructions from RLF and reports these measurement results as required by RLF.
- TQM-FE measures the QoS parameters (e.g., delay, delay jitter, packet loss rate) on application flows.

- TQM-FE can initiate a new measurement flow with a certain packet pattern to another TQM-FE to measure the application's QoS parameters, when requested by RLF.

NOTE – TQM-FE uses different connection methods for different types of measurements, e.g., TCP connections for measuring TCP QoS parameters, and UDP connections for measuring UDP QoS parameters.

8 Procedures

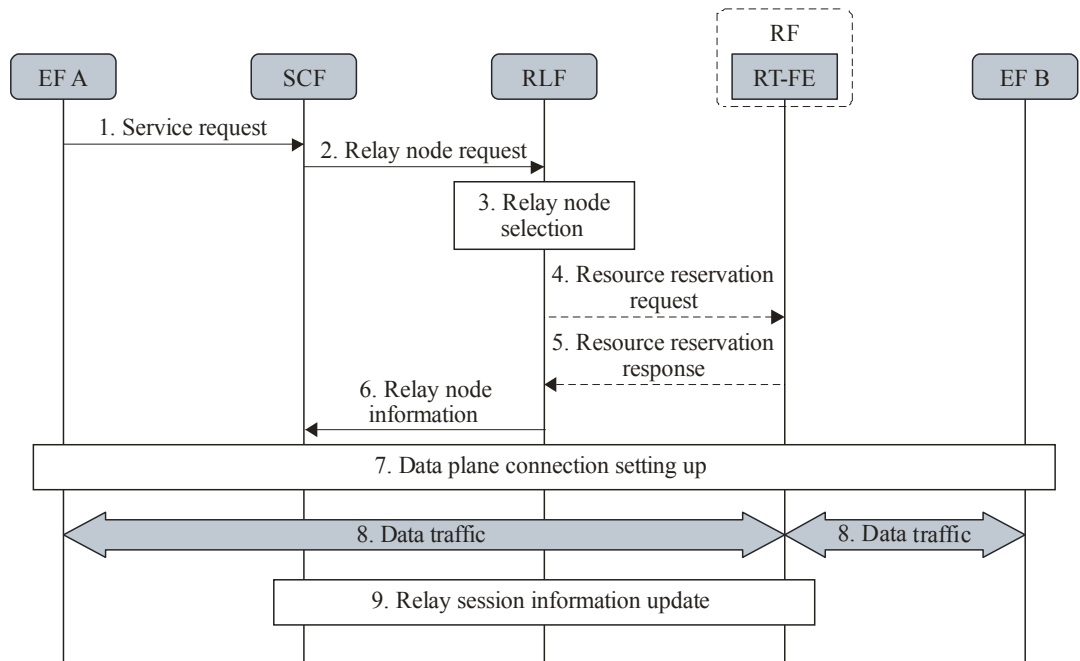
This clause describes how RFs interact with other DSN functions to provide relay services. The procedures in this clause apply for conversational services such as multimedia telephony (MMTel) or video conferencing.

8.1 Relay procedures

8.1.1 General relay procedure

Figure 8-1 shows the general relay procedure. The detailed relay procedures are illustrated in the following clauses in 8.1.

The service control function (SCF) handles the service request and sets up the relay path between EFs. EFs may or may not be aware of the RN inserted into the data path.



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Figure 8-1 – General relay procedure

1. EF A sends service request (e.g., the Invite message in a SIP session) to SCF to request DSN services.
2. SCF sends RN request to RLF (which is in charge of managing RNs).
NOTE 1 – Based on the user profile (e.g., whether the user has subscribed to the relay service), the requested service type, and the current access status of EF A or EF B (e.g., whether there are NAT/firewall devices), the SCF may determine that an RN is needed.
3. Based on the EF addresses and the requested service, RLF locates and selects one or more suitable RNs for this request.