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

Next Generation Networks – Service aspects: Service capabilities and service architecture

Requirements of managed delivery services

Recommendation ITU-T Y.2212

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Recommendation ITU-T Y.2212

Requirements of managed delivery services

Summary

Recommendation ITU-T Y.2212 provides the service and functional requirements of managed delivery services (MDS).

Source

Recommendation ITU-T Y.2212 was approved on 29 February 2008 by ITU-T Study Group 13 (2005-2008) under Recommendation ITU-T A.8 procedure.

Keywords

Always on service (AoS), managed delivery services (MDS), MDS control, MDS functional architecture model, MDS service classification, MDS service partnership, MDS service profile, MDS service scenario, non-subscription based MDS, on-demand service (ODS), subscription-based MDS.

FOREWORD

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CONTENTS

Introduction

One of the advantages of the ITU-T NGN is the openness formed by the whole of the ITU-T NGN architecture (Recommendation ITU-T Y.2001). The NGN's concept, principles and functional architectural model provides a great opportunity to initiate a more detailed development of various interfaces such as UNI, NNI, ANI, etc.

NGN should have efficient and flexible capabilities to enable third-party providers and users to use NGN capabilities through the interfaces.

This Recommendation describes "managed delivery services" as the services that use ANI to enable the provision of managed delivery services between third-party providers and users.

Recommendation ITU-T Y.2212

Requirements of managed delivery services

1 Scope

The objective of this Recommendation is to describe the service and functional requirements of the managed delivery services (MDS) provided by an NGN provider to third-party providers via ANI (application network interface), with features supported by the next generation network (NGN) [ITU-T Y.2001], [ITU-T Y.2011], [ITU-T Y.2012], and [ITU-T Y.2201].

The service and functional requirements described in this Recommendation are built on the NGN general reference model [ITU-T Y.2011] and generalized functional architecture [ITU-T Y.2012]. This Recommendation describes the service concept of MDS, the business model among players relevant to MDS, the service requirements of MDS, profiles for MDS management, the functional architecture model, MDS service scenarios, and security considerations for MDS.

This Recommendation describes several service scenarios to show how MDSs are operated. These service scenarios are described from a service procedural point of view, as well as in terms of the functional entities involved.

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.2001] Recommendation ITU-T Y.2001 (2004), *General overview of NGN*.

[ITU-T Y.2011] Recommendation ITU-T Y.2011 (2004), *General principles and general reference model for next generation networks*.

[ITU-T Y.2012] Recommendation ITU-T Y.2012 (2006), *Functional requirements and architecture of the NGN release 1*.

[ITU-T Y.2111] Recommendation ITU-T Y.2111 (2006), *Resource and admission control functions in next generation networks*.

[ITU-T Y.2201] Recommendation ITU-T Y.2201 (2007), *NGN release 1 requirements*.

[ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application network interface (ANI) [ITU-T Y.2012]: Interface which provides a channel for interactions and exchanges between applications and NGN elements. The ANI offers capabilities and resources needed for the realization of applications.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 managed delivery services (MDS): The services provided by an NGN provider to third-party providers with features supported by the NGN, in which comprehensive control capabilities for service delivery are available between third-party providers and their users.

3.2.2 MDS control profile: The set of information regarding service control, session control, resource control and transport control to support MDS.

3.2.3 MDS service profile: The sets of MDS service information to provide comprehensive control capabilities for service delivery between third-party providers and their users.

3.2.4 user: The user of the services of a third-party provider whose services are provided with managed delivery features facilitated through MDS.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC	Admission Control
AMG-FE	Access Media Gateway Functional Entity
ANI	Application Network Interface
AoS	Always on Service
ASF&SSF	Application Support Functions and Service Support Functions
BE	Best Effort
BiC	Bandwidth Instantiation Control
BoD	Bandwidth-on-Demand
BW	Bandwidth
CoS	Class of Services
CPE	Customer Premises Equipment
CPE-BE	Customer Premises Equipment Border Element
FE	Functional Entity
IBC-FE	Interconnection Border Gateway Control Functional Entity
IBG-FE	Interconnection Border Gateway Functional Entity
I-CSC-FE	Interrogating Call Session Control Functional Entity
MDS	Managed Delivery Services
MGC-FE	Media Gateway Control Functional Entity
MRB-FE	Media Resource Broker Functional Entity
MRC-FE	Media Resource Control Functional Entity
NACF	Network Attachment Control Function
NAPT	Network Address and Port Translation
NGN	Next Generation Network
ODS	On-Demand Service

P-CSC-FE Proxy Call Session Control Functional Entity

PSS Pre-Scheduled Service

RACF Resource and Admission Control Function

SCF Service Control Function

S-CSC-FE Serving Call Session Control Functional Entity

SeC Security Control

TCF Transport Control Function

UNI User Network Interface

VoD Video-on-Demand

5 Conventions

This Recommendation uses the following conventions, the same as those used in [ITU-T Y.2012], to denote functional entities.

A-n: This term is used to indicate the functional entity in application support functions.

S-n: This term is used to indicate the functional entity in service support functions.

T-n: This term is used to indicate the functional entity in transport and transport control functions.

6 MDS overview

This clause describes the business model and service provisioning types of MDS.

6.1 MDS business model

It is recognized that MDS focus on the online business area, particularly on markets and businesses where the broadband real-time interaction is involved, and where an added value is required via customization.

It is required that MDS make use of NGN capabilities to differentiate the service levels experienced by users, such as quality of service, security level, etc.

Figure 6-1 explains the key aspects of the MDS business model. Users invoke services to satisfy their own special requirements by requesting certain managed capabilities, such as bandwidth allocation and routing, depending on their service needs. A third-party provider will be able to provide more service capabilities by partnering with NGN providers, without any further infrastructural investments between a user and a third-party provider, or between users of the third-party providers. Due to these additional capabilities, a third-party provider will provide a better and broader range of services through the selection of appropriate parameters. Users of a third-party provider will use their services in various ways, depending on their needs. NGN providers will be able to extend their business coverage jointly with third-party providers, in order to extend their users directly or indirectly, and to develop a value-added infrastructure.

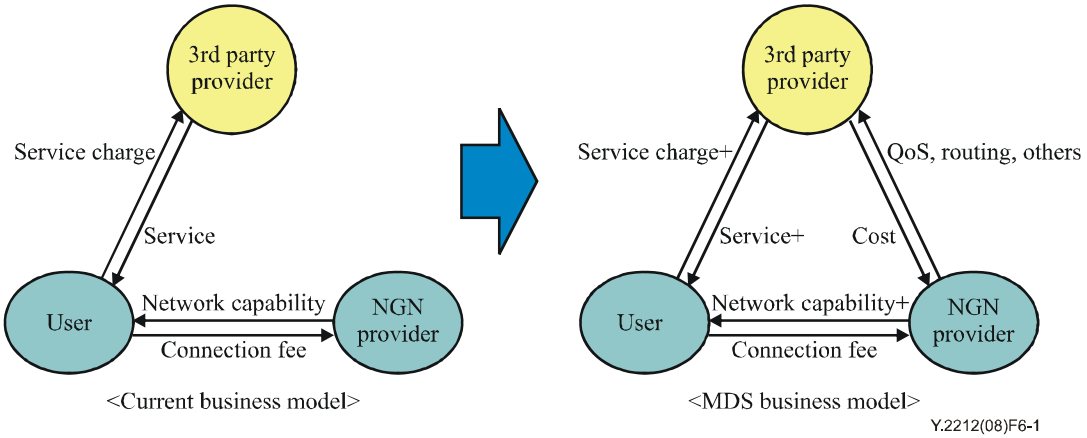

Figure 6-1 – Example of MDS business model

6.2 MDS service provisioning

There are three different general categories of MDS service provisioning: subscription related viewpoint, service request related viewpoint, and participation into MDS control process related viewpoint.

1) Service provisioning from a subscription related viewpoint

Two types of MDS service provisioning can be distinguished, depending on whether or not a prior subscription exists between a third-party provider and a user.

- Subscription-based MDS: This requires a subscription between a third-party provider and a user prior to using MDS. This type is generally useful for services having a regular or specific usage pattern. In general, MDS control policy applies to the network when the user connects to the network. Virtual private leased line services and network-controlled e-learning services would be examples of subscription-based MDS.
- Non-subscription-based MDS: This requires no subscription between a third-party provider and a user prior to using MDS. This type is generally useful for services having an irregular or single usage pattern. MDS control policy applies to the network when the user requests an MDS on demand. VoD services, video phone services and networked storage services with BoD would be examples of non-subscription-based MDS.

2) Service provisioning from a service request related viewpoint

Three types of MDS service provisioning can be distinguished, depending on whether MDS is provided when a user is always connected to the network, or a user requests a service in pre-scheduled or on-demand manner.

- Always on service (AoS): In this service type, MDS is provided when a user connects to the network, without any concern about whether MDS related traffic is generated or not. MDS is cancelled when a user disconnects from the network.
- Pre-scheduled service (PSS): In this service type, MDS is provided when a user connects to the network, in a pre-scheduled manner that is agreed between a third-party provider and a user.
- On-demand service (ODS): In this service type, MDS is provided when a user requests a service using MDS on demand. When a user requests the corresponding service to end, MDS is cancelled.

3) Service provisioning from a control process participation related viewpoint

Two types of MDS service provisioning can be distinguished, depending on whether a third-party provider takes part in the MDS control process or not.

- MDS control process participation: In this type, a third-party provider participates in the MDS control process by agreement with an NGN provider. In the case of ODS service type, MDS control process participation is required, and the third-party provider requests MDS control to the NGN provider. In the case of AoS/PSS service types, the third-party provider is informed by the NGN provider regarding the user's network access, and then can optionally request MDS control to the NGN provider.
- No MDS control process participation: In the case of AoS/PSS service types, when a user connects to the network, an NGN provider provides MDS control on its own, without the participation of the 3rd party provider.

Subscription-based MDS with a regular usage pattern is provisioned as either AoS, PSS or ODS type, according to the user profile given to the 3rd party provider during the subscription process. Non-subscription based MDS with an irregular usage pattern is provisioned as ODS type.

Figure 6-2 shows the relationship between MDS service provisioning types.

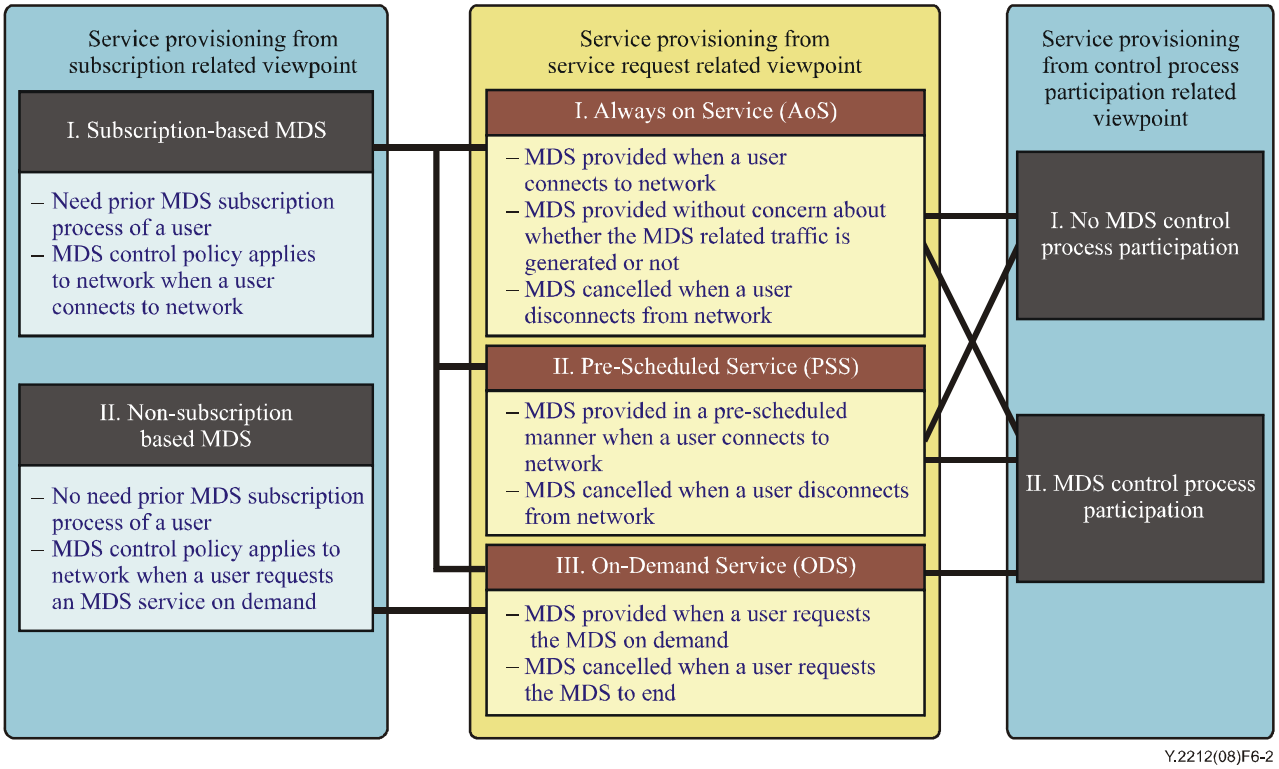

Figure 6-2 – Relationship between MDS service provisioning types

7 Service requirements of MDS

This clause describes the service requirements for the provision of MDS.

7.1 Requirements for MDS service classification

MDS allows the third-party provider to request different levels of relevant resources and network capabilities, which are identified in NGN release 1. The usage of new or extended capabilities identified in NGN R2 is not precluded. The key components comprising MDS are to be identified as follows:

- Traffic handling: It is required to be able to classify traffic in order to enable QoS differentiation of the traffic according to the third-party provider's application requirements.
- Bandwidth instantiation control: It is required to be able to control bandwidth. It is recommended that this control be classified in two way: one for amount of bandwidth and the other for control of bandwidth, such as on-demand, semi-permanent, or permanent
- Admission control (AC): This is required to be classified based on the third-party provider's service policies and business model, such as "always admitted", "premium class admitted", "admission only when available", etc.
- Class of security: It is required to be able to differentiate levels of security, such as level of firewalls, AAA, level of traversal in NAPT, privacy, etc.
- Other capabilities: The usage of new or extended capabilities identified in NGN R2 is not precluded (e.g., multicast).

7.2 Requirements for MDS service partnership

The third-party provider is recommended to have an MDS partnership with the NGN provider, based on the MDS service profile given by the NGN provider, before providing MDS to users.

MDS service provisioning is recommended to be carried out according to the result of the MDS partnership between the NGN provider and the third-party provider.

The NGN provider is recommended to update the status of service partnership with the third-party provider after its service partnership is confirmed.

The management of MDS partnerships is recommended to be performed online through ANI or offline.

7.3 Requirements for the use of profiles for MDS

It is recommended that the MDS service profile be prepared by the NGN provider to enable the third-party provider to select NGN capabilities. It is also recommended that the MDS service profile be classified using several combinations, according to NGN network capabilities.

It is recommended that the MDS service profile allow for choices of different levels of resources relevant to services, network capabilities, and resulting cost.

The MDS service profile is recommended to be selected by the third-party provider, according to its specific service requirements.

It is recommended that the third-party provider maintain the user profile.

It is recommended that the third-party provider transfer its third-party provider profile and the user profile regarding its users to the NGN provider, after forming a partnership with the NGN provider.

It is recommended that user discover the types of MDS that are available from third-party providers, via online or offline methods.

It is recommended that the NGN provider maintain MDS control profile.

In addition, it is recommended that the NGN provider collect and maintain MDS accounting and charging related information.

7.4 MDS control requirements

It is recommended that MDS control, such as session/resource control, be carried out by the NGN provider. In order to achieve this, MDS control profile is used internally in the NGN provider.

7.5 Authentication and authorization requirements

The user is required to be authenticated and authorized by the third-party provider to use MDS provided by the third-party provider.

The user is required to be authenticated and authorized by the NGN provider to access the network in which the MDS is provided.

The third-party provider is required to be authenticated and authorized by the NGN provider to use the MDS.

8 Profiles for MDS management

This clause identifies high-level requirements and profiles for the maintenance and exchange of MDS-related information that is required to be properly shared and maintained between the NGN provider, the third-party provider, and the user.

8.1 General requirements of MDS related profiles

It is recommended that the NGN provider and the third-party provider maintain, exchange, and update appropriately relevant information for the provision of MDS.

The profiles relevant to each player, including the user and the provider, for support of MDS are recommended to be as follows:

a) The NGN provider is required to maintain at least the following profiles:
   - i) MDS service profile;
   - ii) Third-party provider profile (this information is transferred from the third-party provider);
   - iii) User profile (this information is transferred from the third-party provider);
   - iv) MDS control profile (this information is maintained internally in the NGN provider);
   - v) Others: for further study;

b) The third-party provider is required to maintain at least the following profiles:
   - i) Third-party provider profile: Third-party provider identification information, service server's address and status information, and other information as needed (this information is required to be transferred to the NGN provider);
   - ii) User profile (this information is transferred to the NGN provider);
   - iii) Others: for further study;

c) The user is required to have access to at least the following profiles:
   - i) Third-party provider profile (this information is transferred from the third-party provider);
   - ii) Others: for further study.

Figure 8-1 shows the relationship of MDS-related profiles between players.

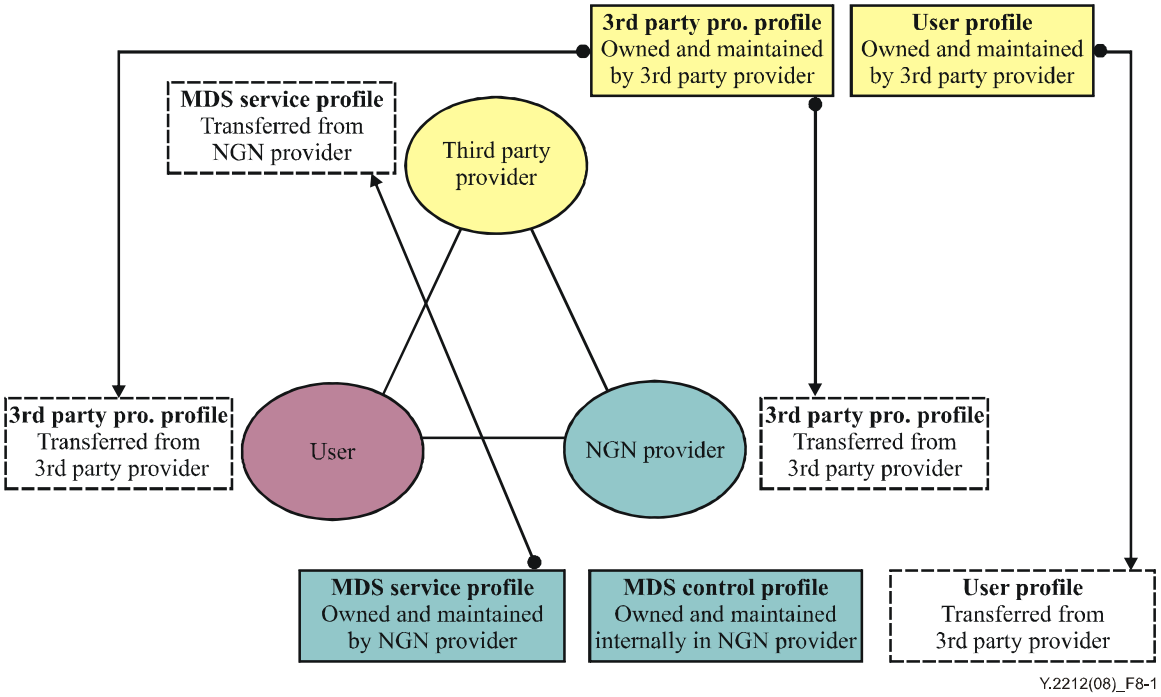

Figure 8-1 – Relationship of MDS-related profiles between players

8.2 MDS service profile

An MDS service profile is recommended to be classified as one of several combinations, with various NGN network capabilities. The set of MDS service information is recommended to be selected by the third-party provider according to their service requirements.

The basic information comprising the MDS service profile is as follows:

- CoS (class of services) information: This information relates to the differentiation of traffic handling (e.g., switching and routing) services, according to the service requirements corresponding to different classes of services, such as best effort, premium, etc.
- AC (admission control) information: This information relates to the admission control of MDS. Examples of priority classification schemes for admission of MDS include 'always admitted', 'premium class admitted', and 'admitted only when available', etc.
- BiC (bandwidth instantiation control) information: This information relates to the bandwidth control according to the service requirements, such as on-demand, permanent, fixed, variable bandwidth, etc.
- SeC (security control) information: This information relates to the control of the security level, such as the level of firewalls, AAA, level of traversal in NAPT, privacy, etc.
- Multicast control information: This information relates to the multicast control of the MDS.
- Others: for further study

Usage examples of MDS service profile are shown in Table 1.

Table 1 – Usage of MDS service profiles

CoS	AC	BiC	SeC	Service examples
BE class	Always admitted via predetermined AC policy	Always on or Pre-scheduled or On-demand based	Not provided	BW pre-assigned network access
			Provided	BW pre-assigned network access w/ security
	Admitted only when available		Not provided	BoD
			Provided	BoD w/ security
Premium class	Always admitted via predetermined AC policy	Always on or Pre-scheduled or On-demand based	Not provided	IP-Media, Video phone service
			Provided	IP-media/video phone Service w/ security
	Admitted only when available		Not provided	Video phone service, BoD
			Provided	VoD/BoD w/ security

8.3 Third-party provider profile

This profile contains the relevant information of the third-party provider who has an MDS partnership with the NGN provider. The NGN provider maintains and may modify this profile as required over the course of the partnership, to accommodate establishment, modification or cancellation of MDS.

This profile is required to include the following information:

- Addresses of the servers of the third-party provider
- Server status information of the third-party provider
- Others: for further study

This profile can optionally include the following information:

- Identifier of the third-party provider

8.4 User profile

This profile contains relevant information regarding the users of the third-party provider. The NGN provider maintains this profile for each third-party provider.

This profile is required to include the following information:

- User's IP address
- User name
- MDS service type (e.g., subscription-based MDS, non-subscription based MDS)
- Subscriber log in ID for network access in case of subscription-based MDS
- Detailed information about MDS service profile selected by the third-party provider (e.g., premium class for CoS, always admitted for AC, fixed bandwidth control for BiC, etc.)
- Others: for further study

This profile can optionally include the following information:

- Subscriber log in ID for network access in case of the non-subscription based MDS

8.5 MDS control profile

This profile contains information regarding service control, session control, resource control and transport control to support MDS.

This profile is required to include the following information:

- Subscriber log session information for network access: Subscriber log related session information that is created or cancelled when the subscriber is logging into or out of the network
- Subscriber default service policy information for network access: Default service policy information given to a network subscriber when the subscriber is logging into the network
- User session information: User session information that is created or cancelled when a subscription-based MDS user is logging into or out of the network, or when an non-subscription based MDS user requests MDS or demands that the MDS be terminated
- Network topology information: Information for MDS routing that provides network topology information about network nodes and links
- Network resources information: Network link-related resources information
- Network node information: Network node related information for dynamic policy control of network nodes
- Others: for further study

8.5.1 Subscriber log session information of network access

This information contains subscriber log related session information, which is created or cancelled when a subscriber is logging into or out of the network.

The following elements are required to be included in this set of information:

- Subscriber IP address of network access
- Subscriber MAC address of network access
- Subscriber log in ID of network access
- IP address of transport resource control node (T17/Figure 9-1) associated with access network
- IP address of access relay node (T-4/Figure 9-1)
- IP address and port number of edge node (T-3/Figure 9-1)
- IP address and port number of access node (T-2/Figure 9-1)
- IP address and port number of access media gateway node (T-1/Figure 9-1)
- Subscriber basic connection service policy of network access
- Subscriber connection bandwidth of network access
- Subscriber service lists of network access
- Subscriber log in time of network access
- Others: for further study

8.5.2 Subscriber default service policy information of network access

This information contains default network access service policy information given to a subscriber when he or she is logging into the network.

The following elements are required to be included in this set of information:

- Subscriber IP address of network access
- Subscriber basic connection service policy of network access

- Others: for further study

8.5.3 User session information

This information contains the user's service session information, which is created and cancelled when the subscription-based MDS user is logging into or out of the network access, and when the non-subscription based MDS user requests MDS or demands that the MDS be terminated.

The following elements are required to be included in this set of information:

- User IP address
- IP address and port number of MDS source
- IP address and port number of MDS destination
- Protocol types (e.g. TCP, UDP, etc.) for MDS
- Detailed information about the MDS service profile selected by the third-party provider (e.g., premium class for CoS, always admitted for AC, fixed bandwidth control for BiC, etc.)
- Network topology information of the MDS routing path
- IP addresses and status information of service control nodes, session control nodes and transport control nodes involved in the MDS routing path
- IP addresses, port numbers and status information of transport nodes involved in the MDS routing path
- Link-related resources information in the MDS routing path
- MDS usage time
- Others: for further study

8.5.4 Network topology information

This contains information for MDS routing, and is comprised of network node and link information.

The following elements are required to be included in this set of information:

- IP addresses, port numbers and status information of transport nodes
- Link configuration and status information between transport nodes
- Others: for further study

8.5.5 Network resources information

This contains network link related resources information.

The following elements are required to be included in this set of information:

- Information of links between transport nodes (e.g., link bandwidth, etc.)
- Others: for further study

8.5.6 Network node information

This contains network node related information for dynamic policy control of network nodes.

The following elements are required to be included in this set of information:

- IP addresses and status information of service control nodes, session control nodes, transport control nodes and transport nodes
- Port numbers of transport nodes
- Others: for further study

9 Functional architecture

9.1 Functional architecture model

9.1.1 Reference architecture model

It is recommended that the MDS functional architecture model be based on the functional architecture model, as in [ITU-T Y.2012], which identifies the NGN functional architecture model. Figure 9-1 and the accompanying Notes (see Notes 1 through 11) are excerpted from the functional architecture model from [ITU-T Y.2012], which is recommended to be a reference model for an MDS functional architecture model.

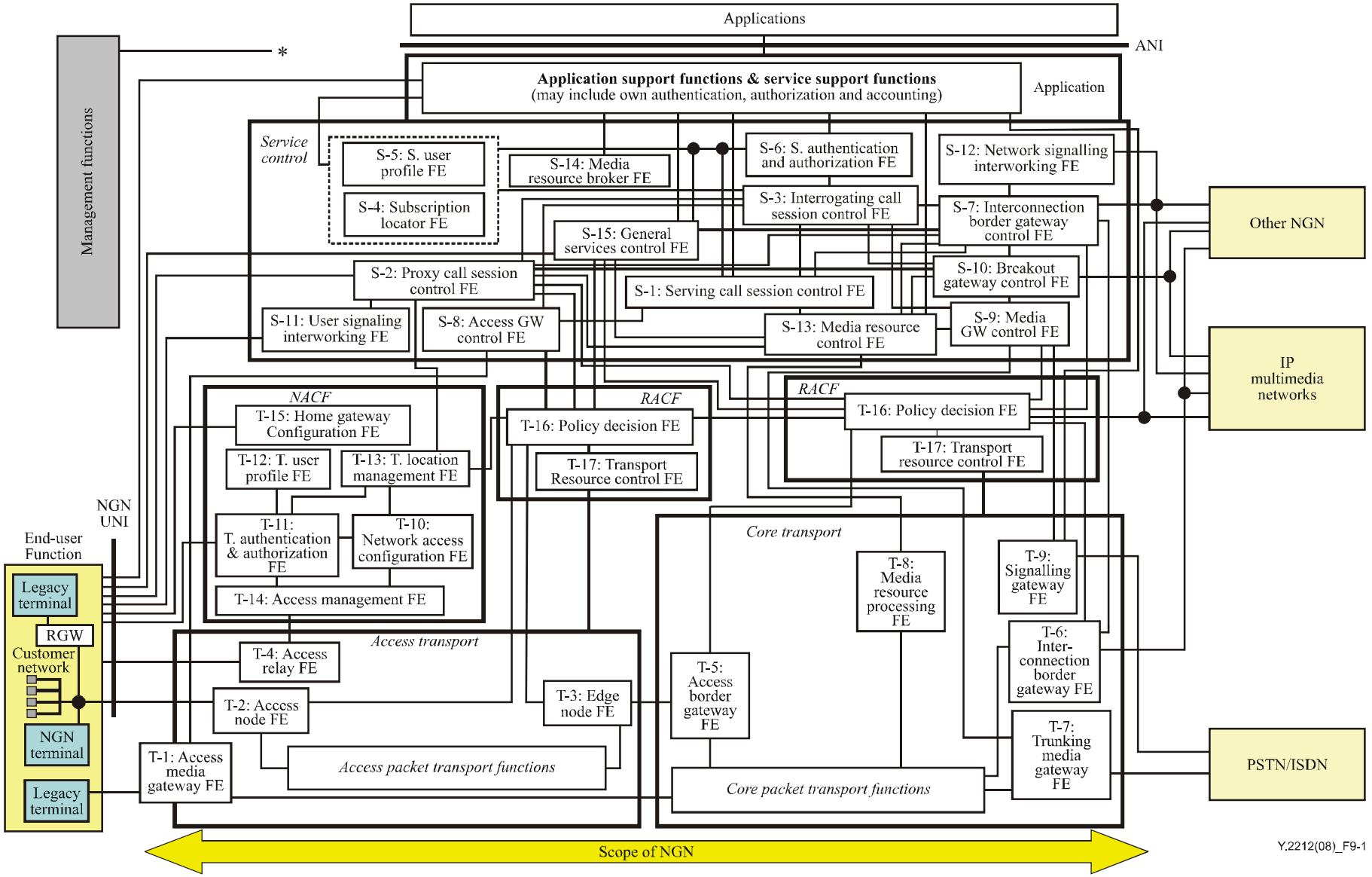

Figure 9-1 – NGN generalized functional architecture (refer to Notes below)

NOTE 1 – The T-10 network access configuration FE can optionally reside in a visited network or a home network. It depends on the administrative domain and the business scenario.

NOTE 2 – Lines terminating on the dotted box around S-4 and S-5 indicate connection to both internal FEs. Inclusion of these two FEs in the dotted box does not imply that they are collocated.

NOTE 3 – Allocation of some functions to the IBG-FE needs further study: IBG-FE can/cannot optionally perform media conversion under the control of IBC-FE. A direct link between IBG-FE and IBC-FE is for further study. (Refer to clause 9.3.1.6 of [ITU-T Y.2012] on T-6 IBG-FE.)

NOTE 4 – The NGN-UNI line shows the functional aspect only, and is recommended to not make any pre-decision about an ownership domain.

NOTE 5 – More precise location and distinction of possible NGN-UNIs are for further study.

NOTE 6 – As an option, P-CSC-FE, I-BGC-FE, BGC-FE, and MGC-FE interact with MRC-FE in support of invoking transcoding.

NOTE 7 – Although it is located in the service control functions, the MRB-FE is recommended to be viewed as a part of application support functions and service support functions.

NOTE 8 – Although the scope of this Recommendation is targeted primarily at an NGN architecture, it is clear that the accommodation of legacy PSTN/ISDN terminals and/or interworking with the PSTN/ISDN is an important consideration with respect to NGN deployment. Thus, to provide a more comprehensive view, AMG-FE required to accommodate PSTN/ISDN terminals is shown even though they are not strictly part of the NGN architecture itself.

NOTE 9 – * indicates multiple links from management functions towards applications, service control, NACF, RACF, access transport, and core transport.

NOTE 10 – This figure does not show any linkage between two same FEs, though it is not precluded.

NOTE 11 – The relationship between S-7 and S-12 needs further study with regard to the interaction with other networks. The relationship of S-7 and S-12 with other NGN needs further study.

9.1.2 MDS functional architecture model

Figure 9-2, as well as the accompanying Notes (see Notes 1 through 3) show the overall MDS functional architecture model based on [ITU-T Y.2012] (NGN functional architecture model).

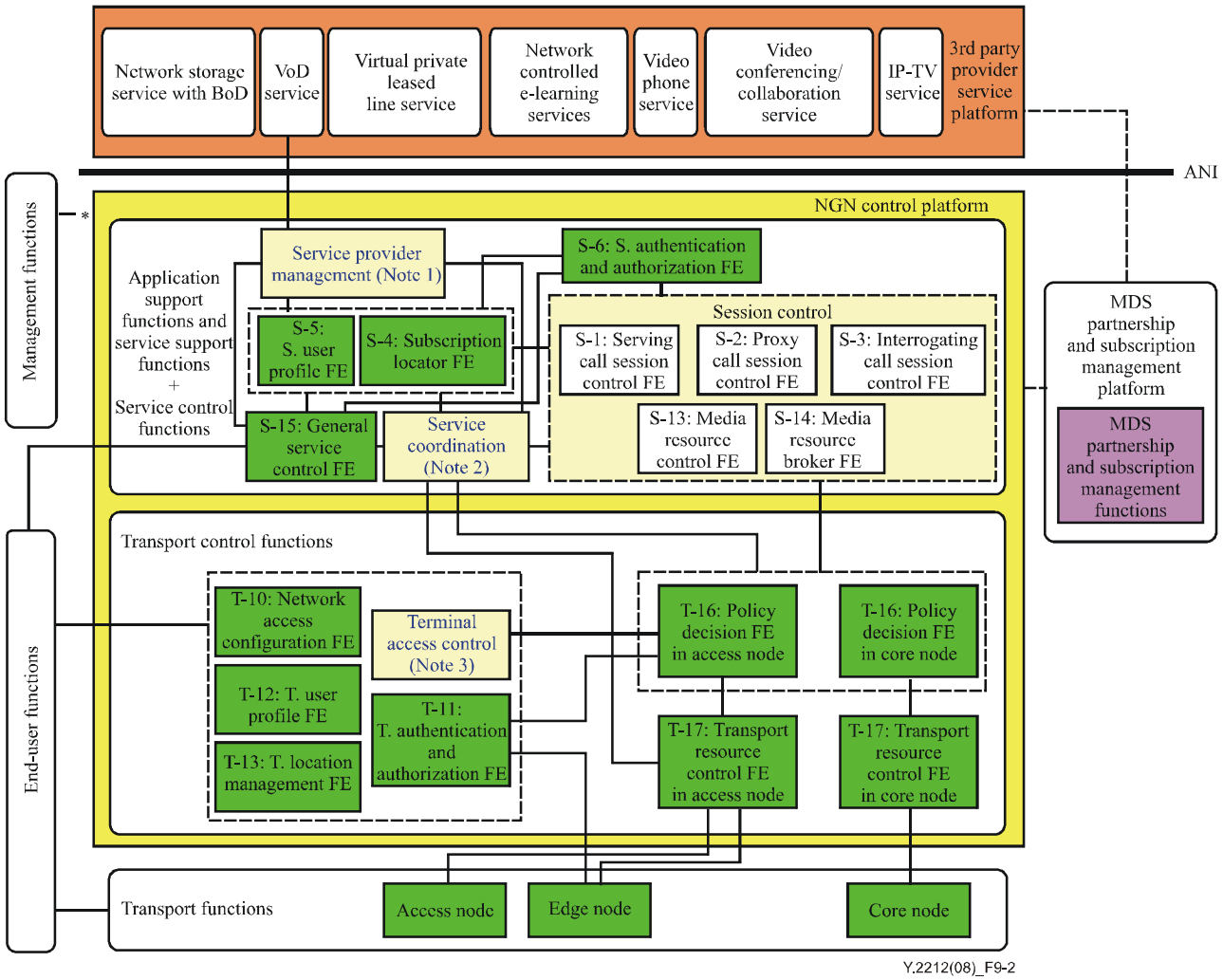

Figure 9-2 – MDS functional architecture model

NOTE 1 – Service provider management function: Its functions, e.g., authentication of service providers and their authorization to use MDS, handling of service requests across an interface, are mainly for the interworking between third-party providers and NGN providers. These are similar to the functions provided by A-2 (application gateway FE). The only difference between this function and A-2 is that this function supports the interworking between the third-party applications and service coordination function, whereas A-2 supports the interworking between applications and S-CSC-FE.

NOTE 2 – Service coordination function: Similar to A-3 (application service coordination manager FE), this function plays a mutually coordinating role between services. The only difference is that A-3 only coordinates between applications, whereas this function coordinates not only between applications but also between application and transport control functions related nodes, such as 'Policy decision FE' and 'T-17: Transport resource control FE in access node'.

NOTE 3 – Terminal access control function: This Function controls terminal access, by identifying terminal profile information and transferring its results to the access part of resource control management FEs, such as T-16 and T-17. This FE is not defined in [ITU-T Y.2012], so further clarification is requested to support this function in line with [ITU-T Y.2012].

Table 2 shows the relationship between MDS functions in terms of NGN functional elements as in [ITU-T Y.2012]. The key differences between MDS functions and [ITU-T Y.2012] FEs are summarized as follows:

Table 2 – Differences between MDS functions and FEs in [ITU-T Y.2012]

<table>
<tr><th colspan="2">MDS Functions</th><th colspan="2">Y.2012 FEs</th></tr>
<tr><td>Service Provider Management</td><td>– Open I/F for 3rd party provider to use the MDS
– SP authentication & authorization
– Processing of service request from SP</td><td rowspan="2">Application Support Functions & Service Support Functions</td><td>A-2 (Note 1)</td></tr>
<tr><td>Service Coordination</td><td>– Processing of service request from SP</td><td>A-3 (Note 2)</td></tr>
<tr><td rowspan="5">Session Control</td><td rowspan="5">– Functions related to session control</td><td rowspan="5">Service Control Functions</td><td>S-1</td></tr>
<tr><td>S-2</td></tr>
<tr><td>S-3</td></tr>
<tr><td>S-13</td></tr>
<tr><td>S-14</td></tr>
<tr><td>Terminal Access Control</td><td>– Terminal access control of the network</td><td>Transport Control Functions</td><td>T-11 (Note 3)</td></tr>
</table>

9.2 MDS functional elements

9.2.1 MDS functional elements in ASF&SSF (application support functions & service support functions)

- Service provider management function (A-2): This function handles the identification and authentication of third-party providers and processing of MDS service requests. As such, open interface (ANI) should be supported for third-party providers.

9.2.2 MDS functional elements in SCF (service control functions)

- General service control FE (S-15): This FE handles non-session control related service requests and third-party service requests. For the handling of services binding with MDS, this FE could be coordinated with the service coordination function performing mutual interactive control between services. For the handling of services without binding MDS, this FE directly requests policy decision FE for resources arrangements or transport resource control FE (T-17) for routing arrangements.
- Session control function (S-1, S-2, S-3, S-13 and S-14): This function handles functionality related to session control. This function is recommended to be implemented in the same manner as P-CSC-FE, S-CSC-FE, and I-CSC-FE depending on the implementation scenarios. For the handling of services binding with MDS, this function is recommended to be coordinated with service coordination function performing mutual interactive control between services. For the handling of services without binding MDS, this function directly requests policy decision FE for resources arrangements.
- Service coordination function (A-3): This function handles mutual coordination roles between services. In case of a service requiring resource control function, this function is recommended to coordinate with policy decision FE; whereas in case of a service not requiring resource control function, this function is recommended to coordinate directly with transport resource control FE (T-17) for path control management (e.g., tunnelling etc.).
- Service authentication and authorization FE (S-6): This FE handles the authentication and authorization of the requested services in coordination with general service control FE (S-15) and session control function.

9.2.3 MDS functional elements in TCF (transport control functions)

- Policy decision FE (core node: T-16): This FE handles resource control functions in the core network and manages information for the core network topology and relevant resources.
- Policy decision FE (access node: T-16): This FE handles resource control functions in the access network and manages information for access network topology and relevant resources.
- Transport resource control FE (core node: T-17): This FE is responsible for transport technology-dependent resource control. This FE collects and maintains network information and resource status information (see clause 7.2.3.3 of [ITU-T Y.2111]).
- Transport resource control FE (access node: T-17): This FE controls edge and access nodes in the access network and performs the functions of authentication for user's network attachment, policy control of access/edge node, and provision of tunnelling functions to servers.
- Terminal access control function (N/A): This function controls terminal access. As such, this function identifies terminal profile information and transfers it to the terminal and edge node control FE.
- Network access configuration FE (T-10): This FE handles the IP assignment to the terminal, e.g., DHCP server. This FE provides terminal upgrade information and carries out its upgrades.
- Transport authentication and authorization FE (T-11): This FE performs authentication and authorization functions in the transport stratum. This FE performs user authentication as well as authorization checking based on the user profiles for network access.
- Transport user profile FE (T-12): This FE is responsible for storing user profiles (e.g., QoS profile, session control function address, and HGWC-FE address) related to the transport stratum.
- Transport location management functional entity (T-13): This FE registers the association between the IP address allocated to the user equipment and related network location information provided by NAC-FE (e.g., access line identifier). This FE also registers the association between the network location information received from NAC-FE and geographical location information.

10 MDS service scenarios

10.1 Subscription-based MDS service scenario

Subscription-based MDS is provisioned on an AoS, PSS or ODS basis.

When provisioned on an AoS/PSS basis, two different types of subscription-based MDS service scenarios are distinguished, depending on whether the third-party provider participates in the MDS control process (Type II) or not (Type I).

In the case of Type I, when a user connects to the network, the NGN provider provides MDS on its own, according to the agreements on partnership and subscription.

In the case of Type II, the third-party provider requests for network control related to MDS after being informed of the user's network access by the NGN provider.

10.1.1 Subscription-based MDS service scenario – Type I

The transport control functions of NGN carry out the relevant network controls according to the result of MDS service subscription in the subscription-based MDS Type I scenario. The subscription-based MDS Type I provisioning mechanism is as follows (see Figure 10-1):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline.

2) A user may request an MDS subscription from the third-party provider online and/or offline.

3) The third-party provider queries the subscription availability of the user to the NGN provider. This will depend on the status of the partnership between the third-party provider and the NGN provider.

4) The NGN provider informs the third-party provider of the result of the user's MDS subscription.

5) The third-party provider informs the user requesting for MDS of the result of the service subscription.

6) The user of the third-party provider connects to the network.

7) The NGN provider recognizes this network connection through the network connection information of the user.

8) The NGN provider carries out MDS related network controls according to the agreements formed during the MDS partnership and subscription.

9) The user then uses the service using MDS between the user and the third-party provider or between the user and another user.

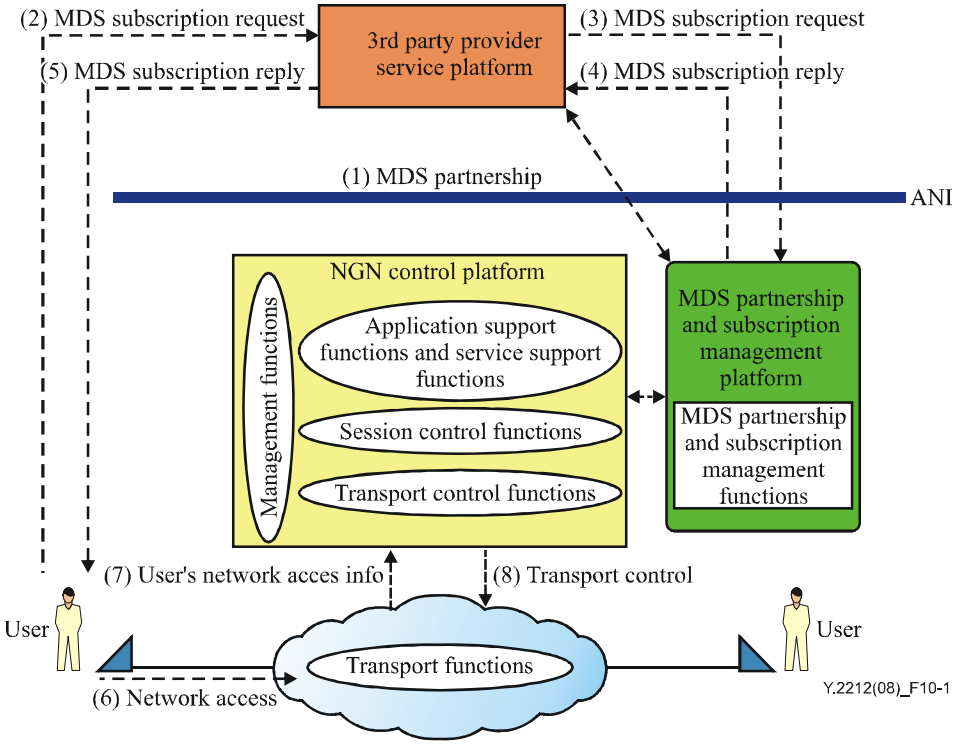

Figure 10-1 – Subscription-based MDS provisioning mechanism – Type I

The subscription-based MDS Type I service scenario is as follows (see Figure 10-2):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline. MDS subscription between the user and the third-party provider via the NGN provider is processed.

2) The network connection information of the user is transferred to transport resource control FE (T-17) via access node.

3) Transport resource control FE (T-17) transfers information related to the session and topology to policy decision FE (T-16) in access node.

4) Policy decision FE (T-16) enforces the resource control policy on transport resource control FE (T-17) and terminal access control function.

5) Transport resource control FE (access node: T-17) applies the policy to access node and terminal access control function applies the policy to end-user functions.

6) The user starts to use MDS as the result of MDS resource control and/or routing control.

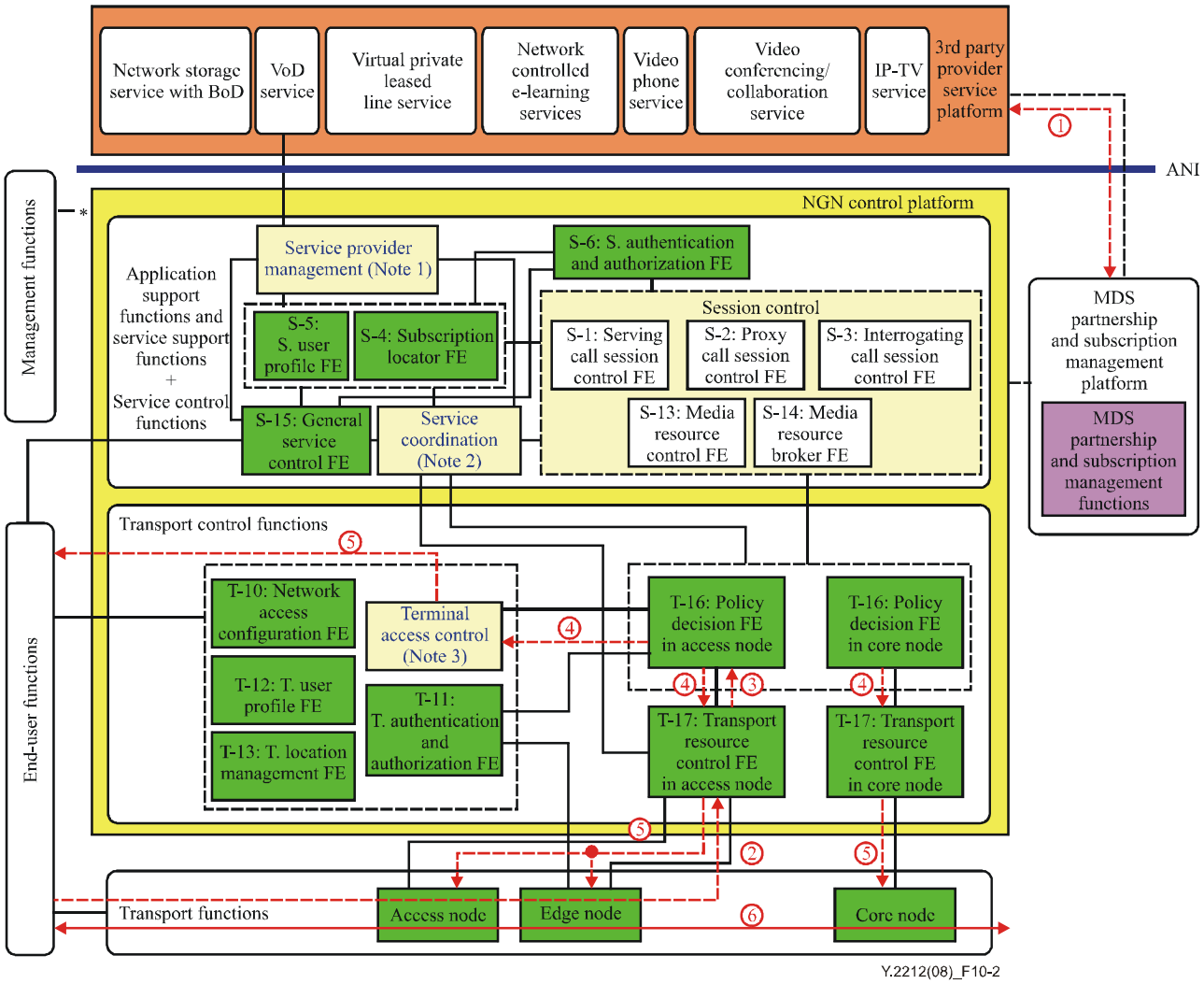

Figure 10-2 – Subscription-based MDS service scenario – Type I

10.1.2 Subscription-based MDS service scenario – Type II

After being informed of the user's network access by the NGN provider, the third-party provider requests for network control related to MDS in the subscription-based MDS Type II service scenario.

The subscription-based MDS Type II provisioning mechanism is as follows (see Figure 10-3):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed by online and/or offline.
2) A user requests for MDS subscription from the third-party provider online and/or offline.
3) The third-party provider queries the NGN provider regarding the availability of the user's desired subscription. This will depend on the status of partnership between the third-party provider and the NGN provider.
4) The NGN provider informs the third-party provider of the query result regarding the user's desired MDS subscription.
5) The third-party provider informs the user requesting for MDS of the result of the service subscription.
6) The user of the third-party provider connects to the network.
7) The NGN provider recognizes this network connection through the network connection information of the user.
8) The NGN provider informs the third-party provider of the user's network access information.
9) The third-party provider requests for MDS related network controls from the NGN provider.
10) The NGN provider carries out MDS related network controls, according to the agreements formed during the MDS partnership and subscription.
11) The user then uses the service using MDS between the user and the third-party provider, or between the user and another user.

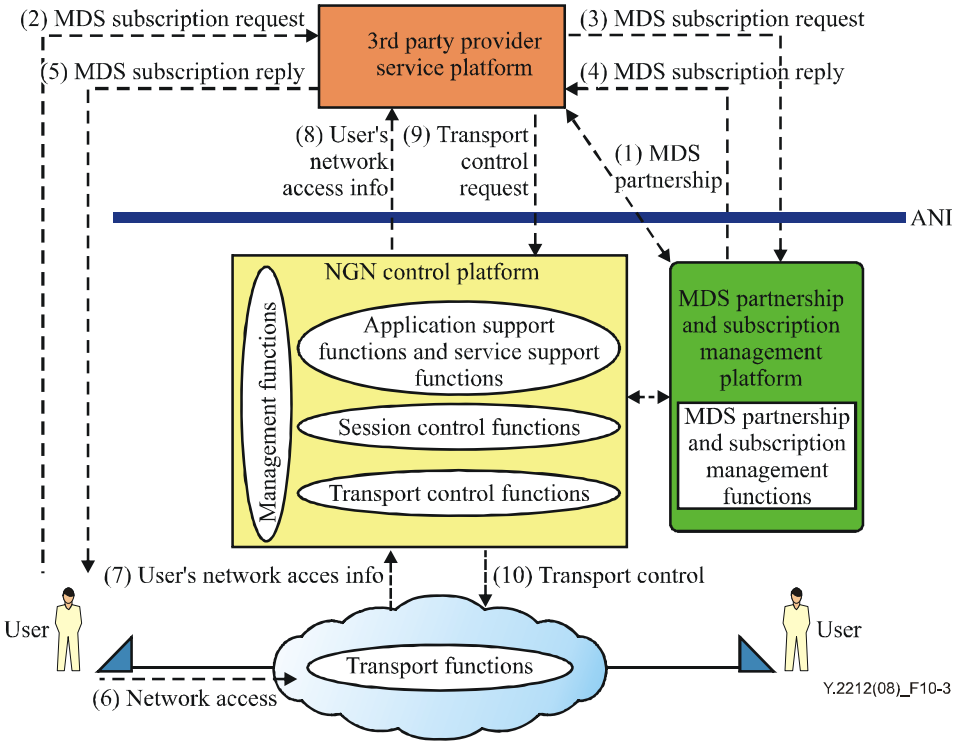

Figure 10-3 – Subscription-based MDS provisioning mechanism – Type II

The subscription-based MDS Type II service scenario is as follows (see Figure 10-4):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline. MDS subscription between the user and the third-party provider via the NGN provider is processed.

2) The network connection information of the MDS user is transferred to transport resource control FE (access node: T-17) via access node.

3) Transport resource control FE (access node: T-17) transfers information related to the dynamic session and topology to policy decision FE (access node: T-16). Transport resource control FE (access node: T-17) also transfers information related to dynamic session and accounting to service provider management function (A-2) via service user profile FE (S-5) and subscription locator FE (S-4).

4) Service provider management function (A-2) relays to the third-party provider information on the status of the user connected to the network, as obtained from service user profile FE (S-5) and subscription locator FE (S-4).

5) The third-party provider requests for MDS from service provider management function (A-2).

6) Service provider management function (A-2) requests for MDS related resources and/or relevant routing control from service coordination function (A-3).

7) Service coordination function (A-3) requests for the relevant resources control from policy decision FE.

8) Policy decision FE (T-16) enforces the resource control policy on transport resource control FE (T-17) and terminal access control function.

9) Transport resource control FE (access node: T-17) applies the policy to access node and terminal access control function applies the policy to end-user functions.

10) The user starts to use MDS as the result of MDS resource control and/or routing control.

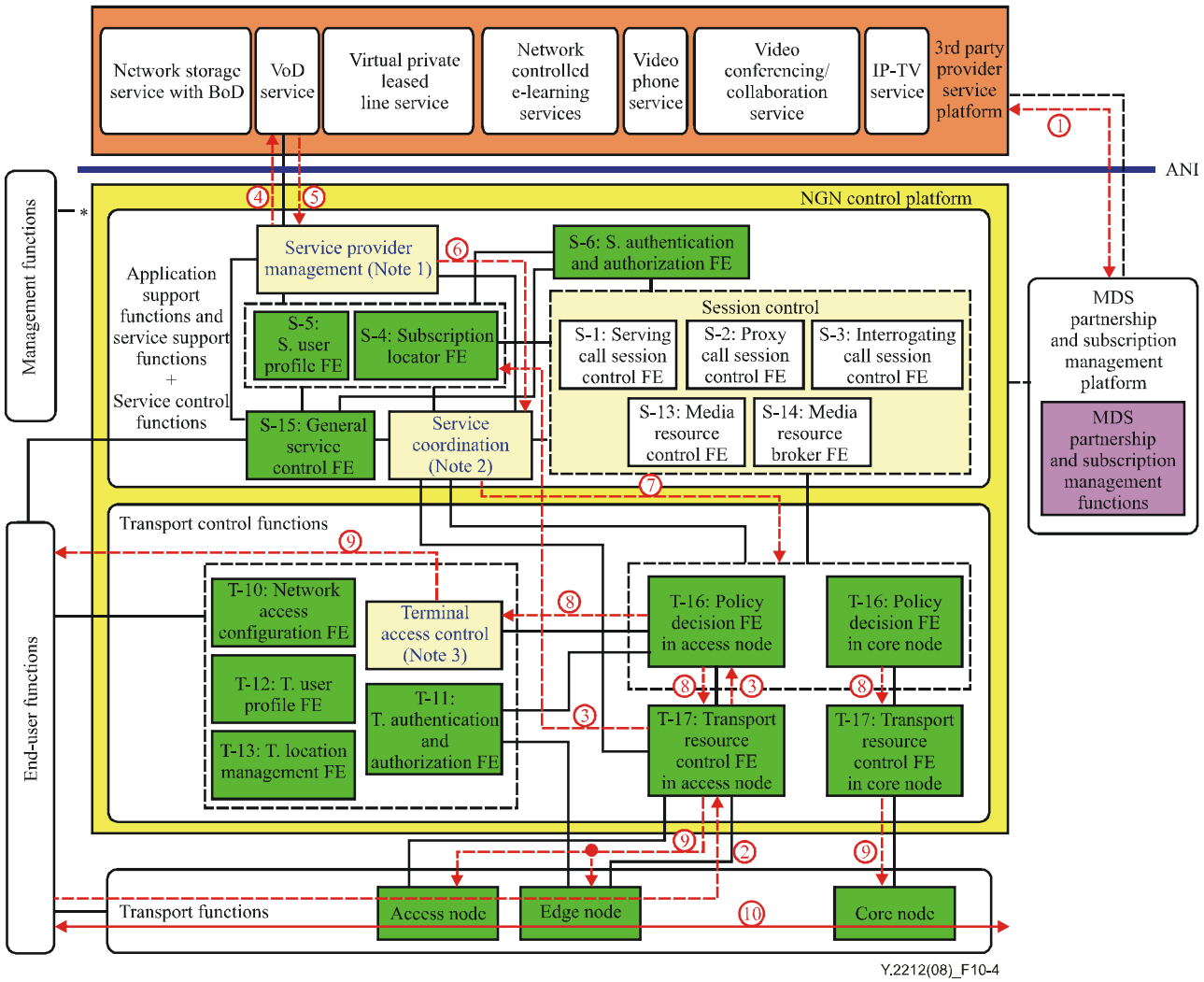

Figure 10-4 – Subscription-based MDS service scenario – Type II

10.1.3 Subscription-based MDS service scenario – Type III

The subscription-based MDS Type III provisioning mechanism is as follows (see Figure 10-5):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline.

2) A user may request for an MDS subscription from the third-party provider online and/or offline.

3) The third-party provider queries the subscription availability of the user with the NGN provider. This will depend on the status of the partnership between the third-party provider and the NGN provider.

4) The NGN provider informs the third-party provider of the result of the user's MDS subscription.

5) The third-party provider informs the user requesting for MDS of the result of the service subscription.

6) A user requests for MDS from the third-party provider online.

7) The third-party provider requests for MDS from the NGN provider.

8) The NGN provider checks the availability of the requested MDS provision and carries out the relevant network resources control, according to the requested MDS.

9) The NGN provider informs the third-party provider of the service availability result, as obtained from the network resources control.

10) The third-party provider informs the user of the result of the service request.

11) The user then uses the service using MDS between the user and the third-party provider, or between the user and another user.

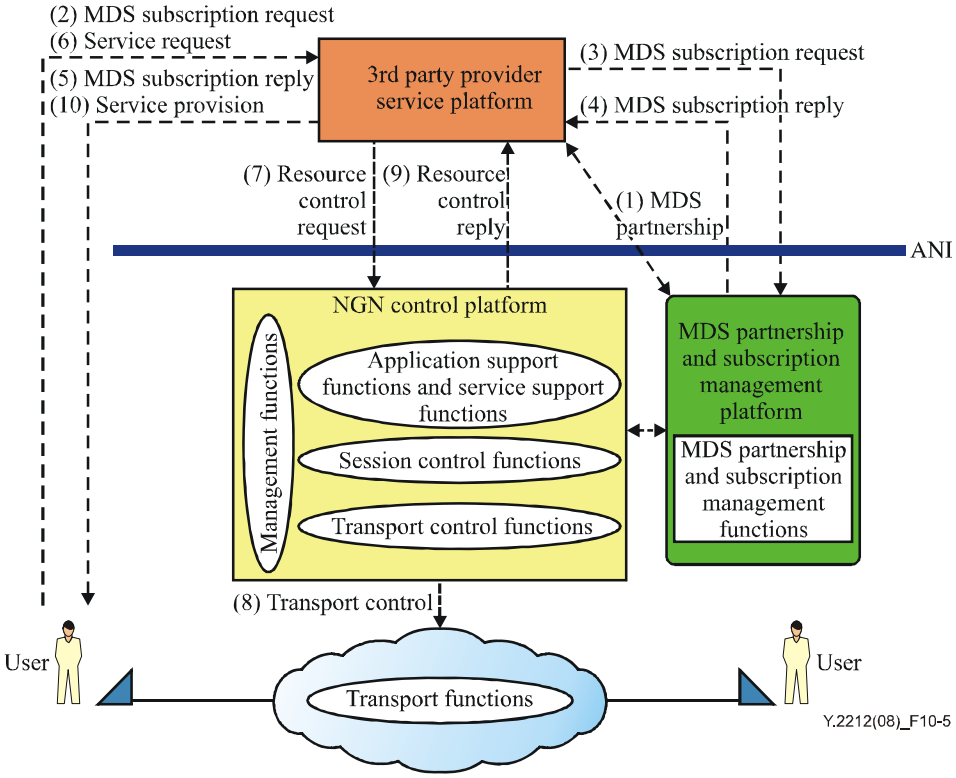

Figure 10-5 – Subscription-based MDS provisioning mechanism – Type III

The subscription-based MDS Type III service scenario is as follows (see Figure 10-6):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline. MDS subscription between the user and the third-party provider via the NGN provider is processed.

2) A user requests for MDS from the third-party provider.

3) The third-party provider requests for the use of MDS from service provider management function (A-2).

4) Service provider management function (A-2) evaluates the MDS request, and then requests for the relevant network resources control and/or route control from service coordination function (A-3).

5) Service coordination function (A-3) requests for the resources control from policy decision FE.

6) Policy decision FE (T-16) enforces the resource control policy on transport resource control FE (T-17) and terminal access control function.

7) Transport resource control FE (access node: T-17) applies the policy to access node, and terminal access control function applies the policy to end-user functions.

8) The NGN provider responds to the MDS request made from the third-party provider through service provider management function (A-2).

9) The user starts to use MDS as the result of MDS resources control.

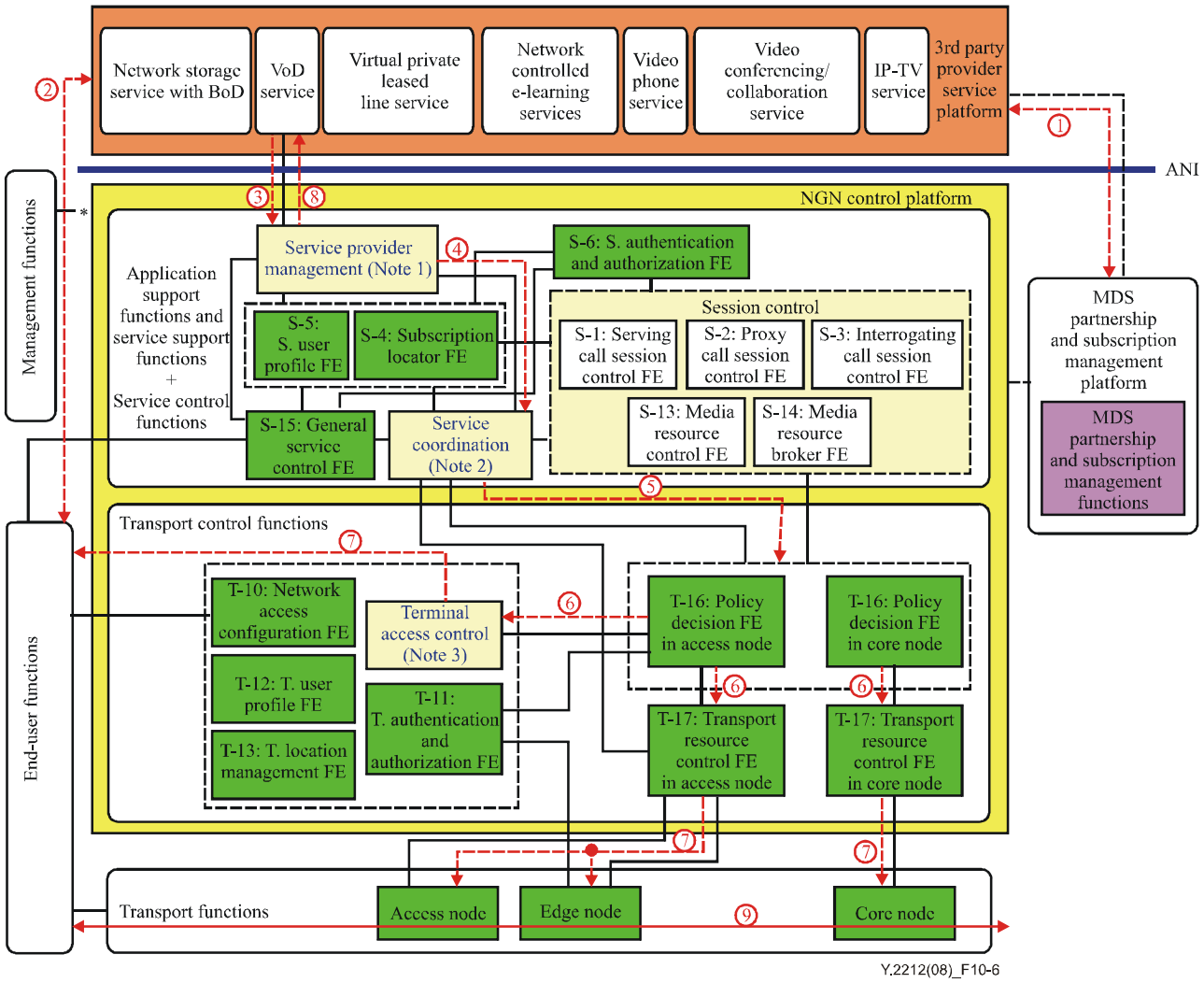

Figure 10-6 – Subscription-based MDS service scenario – Type III

10.2 Non-subscription based MDS service scenario

The non-subscription based MDS provisioning mechanism (Type IV) is as follows (see Figure 10-7):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline.

2) A user requests for MDS from the third-party provider online.

3) The third-party provider requests for MDS from the NGN provider.

4) The NGN provider checks the availability of the requested MDS provision, and carries out the relevant network resources control, according to the requested MDS.

5) The NGN provider informs the third-party provider of the service availability result, as obtained from the network resources control.

6) The third-party provider informs the user of the result of the service request.

7) The user then uses the service using MDS between the user and the third-party provider, or between the user and another user.

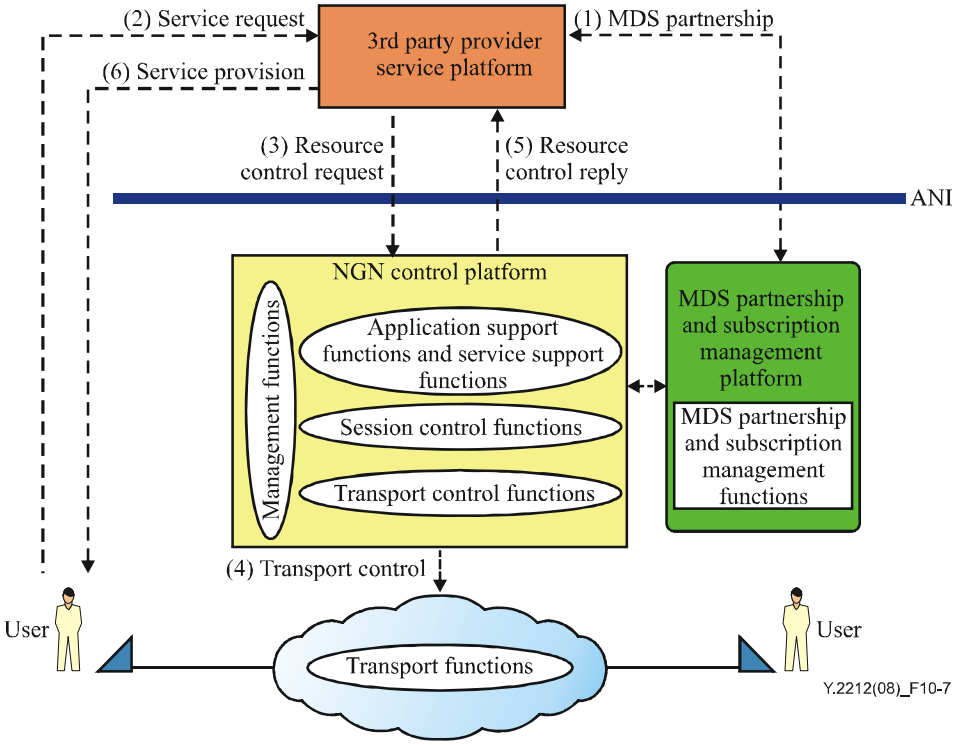

Figure 10-7 – Non-subscription based MDS provisioning mechanism – Type IV

The non-subscription based MDS scenario is as follows (see Figure 10-8):

1) It is recommended that the third-party provider have an MDS partnership with the NGN provider. This partnership may be formed online and/or offline.
2) A user requests for MDS from the third-party provider.
3) The third-party provider requests for the use of MDS from service provider management function (A-2).
4) Service provider management function (A-2) evaluates the MDS request, and then requests for the relevant network resources control and/or route control from service coordination function (A-3).
5) Service coordination function (A-3) requests for the resources control from policy decision FE.
6) Policy decision FE (T-16) enforces the resource control policy on transport resource control FE (T-17) and terminal access control function.
7) Transport resource control FE (access node: T-17) applies the policy to access node, and terminal access control function applies the policy to end-user functions.
8) The NGN provider responds to the MDS request made from the third-party provider through service provider management function (A-2).
9) The user starts to use MDS as the result of MDS resources control.

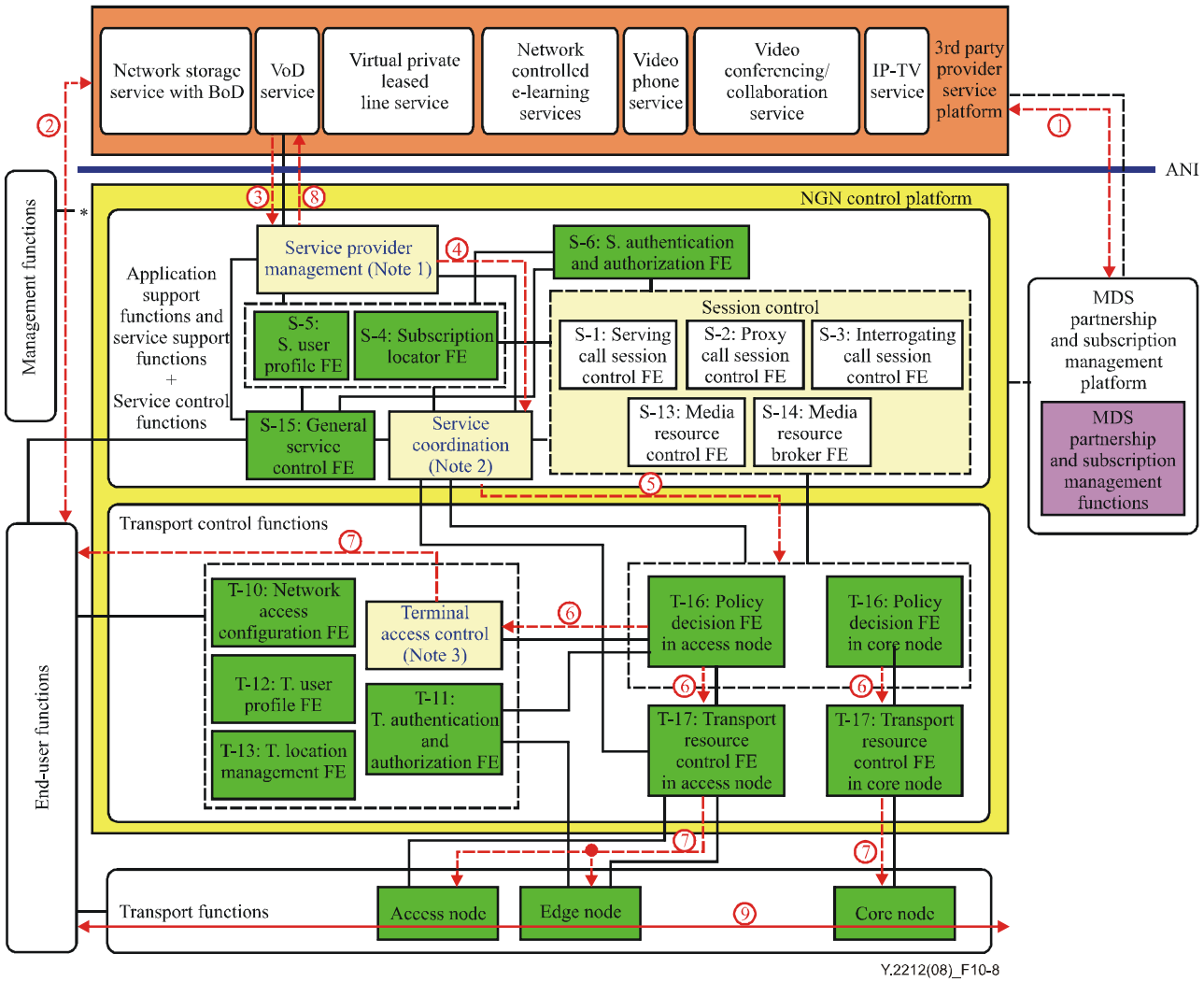

Figure 10-8 – Non-subscription based MDS service scenario – Type IV

11 Security considerations

Three key players are involved in MDS: the user, the NGN provider and the third-party provider. Each provider should equip its systems (or elements) to request for, use, control, and manage MDS, according to their roles and positions. Two interfaces should have a key role in communicating MDS: UNI between the user and the NGN provider, and ANI between the NGN provider and the third-party provider.

The overall security framework of MDS is required to comply with [ITU-T Y.2701], which specifies the NGN security framework.

The security trust relationship of MDS is described in Figure 11-1, based on the trust model identified in [ITU-T Y.2701].

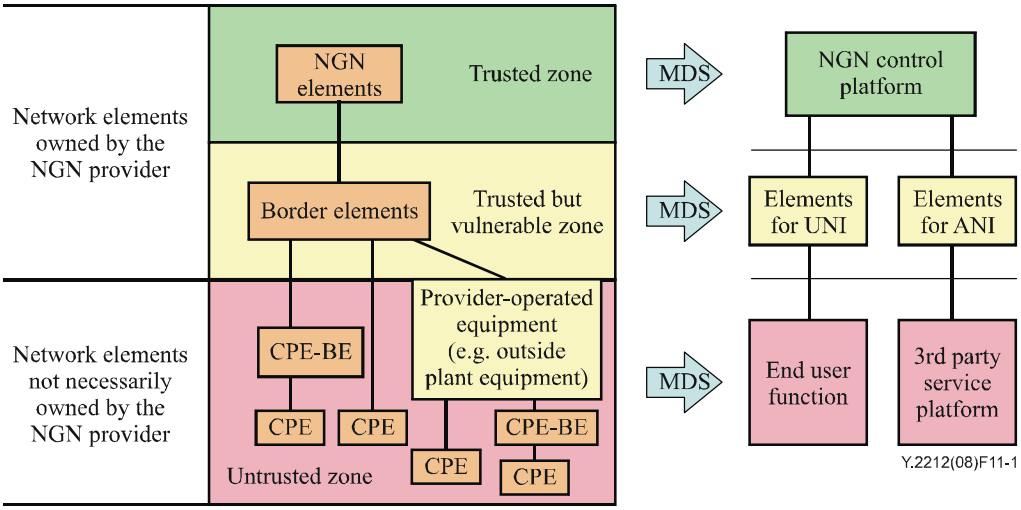

Figure 11-1 – Trust relationship of MDS based on [ITU-T Y.2701]

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