International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.1911

(04/2010)

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

Internet protocol aspects – IPTV over NGN

IPTV services and nomadism: Scenarios and functional architecture for unicast delivery

Recommendation ITU-T Y.1911

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Recommendation ITU-T Y.1911

IPTV services and nomadism: Scenarios and functional architecture for unicast delivery

Summary

Recommendation ITU-T Y.1911 describes scenarios and functional architecture aspects related to the support of IPTV services in conjunction with nomadism.

Recommendation ITU-T Y.1911 addresses IPTV services supported via the use of unicast delivery.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.1911	2010-04-30	13

Keywords

IPTV, nomadism, roaming, unicast delivery.

FOREWORD

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Recommendation ITU-T Y.1911

IPTV services and nomadism: Scenarios and functional architecture for unicast delivery

1 Scope

This Recommendation describes:

– Scenarios for the support of IPTV services to nomadic end users taking into account the requirements identified in [ITU-T Y.1901] and the functional architecture defined in [ITU-T Y.1910]. These scenarios are established based upon assumptions which are provided in this Recommendation;

– Functional architectures, reference points and information flows based on the scenarios identified in this Recommendation.

Scope of this Recommendation is limited to the IPTV services provided through unicast delivery. The IPTV services provided through multicast delivery are out of scope of this Recommendation.

The use of this Recommendation requires contractual agreements among involved parties, e.g., end user, service provider, network provider and content provider, whose description 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 H.235.0] Recommendation ITU-T H.235.0 (2005), *H.323 security: Framework for security in H-series (H.323 and other H.245-based) multimedia systems*.

[ITU-T H.324] Recommendation ITU-T H.324 (2009), *Terminal for low bit-rate multimedia communication*.

[ITU-T H.770] Recommendation ITU-T H.770 (2009), *Mechanisms for service discovery and selection for IPTV services*.

[ITU-T Q.9] Recommendation ITU-T Q.9 (1988), *Vocabulary of switching and signalling terms*.

[ITU-T Q.1706] Recommendation ITU-T Q.1706/Y.2801 (2006), *Mobility management requirements for NGN*.

[ITU-T Q.3401] Recommendation ITU-T Q.3401 (2007), *NGN NNI signalling profile (protocol Set 1)*.

[ITU-T X.1191] Recommendation ITU-T X.1191 (2009), *Functional requirements and architecture for IPTV security aspects*.

[ITU-T Y.1401] Recommendation ITU-T Y.1401 (2008), *Principles of interworking*.

[ITU-T Y.1901] Recommendation ITU-T Y.1901 (2009), *Requirements for the support of IPTV services*.

[ITU-T Y.1910] Recommendation ITU-T Y.1910 (2008), *IPTV functional architecture*.

[ITU-T Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of the next generation networks*.

[ITU-T Y.2014] Recommendation ITU-T Y.2014 (2010), *Network attachment control functions in next generation networks*.

[ITU-T Y.2111] Recommendation ITU-T Y.2111 (2008), *Resource and admission control functions in next generation networks*.

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

[ITU-T Y.2702] Recommendation ITU-T Y.2702 (2008), *Authentication and authorization requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 functional architecture [ITU-T Y.2012]: A set of functional entities and the reference points between them used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define the distribution of functions.

3.1.2 home network [ITU-T Q.1706]: The network to which a mobile user is normally connected, or the service provider with which the mobile user is associated, and where the user's subscription information is managed.

3.1.3 interworking [ITU-T Y.1401]: The term "interworking" is used to express interactions between networks, between end systems, or between parts thereof, with the aim of providing a functional entity capable of supporting an end-to-end communication.

3.1.4 media [ITU-T H.324]: One or more of audio, video or data.

3.1.5 media stream [ITU-T H.235.0]: A media stream can consist of audio, video, or data, or a combination of any of them. Media stream data conveys user or application data (i.e., a payload) but no control data.

3.1.6 nomadism [ITU-T Q.1706]: The ability of the user to change their network access point. When changing the network access point, the user's service session is completely stopped and then started again, i.e., there is no service continuity or hand-over used. It is assumed that normal usage pattern is that users shut down their service session before attaching to a different access point.

3.1.7 personal mobility [ITU-T Q.1706]: This is the mobility for those scenarios where the user changes the terminal used for network access at different locations. The ability of a user to access telecommunication services at any terminal on the basis of a personal identifier, and the capability of the network to provide those services delineated in the user's service profile.

3.1.8 reference point [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.

3.1.9 roaming [ITU-T Q.1706]: This is the ability of users to access services according to their user profile while outside of their subscribed home network, i.e., by using an access point of a visited network.

NOTE – This requires the capability for access to the visited network, the existence of an interface between home network and visited network, as well as a roaming agreement between the respective network operators.

3.1.10 signalling message [ITU-T Q.9]: An assembly of signalling information pertaining to a call, management transaction, etc., comprising also elements for delimitation, sequencing and error control, that is transferred as an entity.

3.1.11 terminal mobility [ITU-T Q.1706]: This is the mobility for those scenarios where the same terminal equipment is moving or is used at different locations. The ability of a terminal to access telecommunication services from different locations and while in motion, and the capability of the network to identify and locate that terminal.

3.1.12 visited network [ITU-T Q.1706]: The network outside a home network that provides service to a mobile user. This term is more business significant than geographically significant.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA Authentication, Authorization and Accounting

IMS IP Multimedia Subsystem

IP Internet Protocol

IPTV IP Television

ITF IPTV Terminal Functions

NACF Network Attachment Control Functions

NGN Next Generation Network

RACF Resource and Admission Control Functions

RTP Real Time Protocol

RTSP Real Time Streaming Protocol

SCF Service Control Functions

SCP Service and Content Protection

SIP Session Initiation Protocol

TV Television

VoD Video on Demand

5 Conventions

The terms "home network" and "visited network" used in this Recommendation are based on the context of mobile (e.g., cellular) networks or networks supporting nomadism. These terms are not to be confused with the use of the term "home network" as used in the context of residential (home) networks.

6 General description

6.1 Introduction

Figure 6-1 depicts interworking between IPTV functional architectures as specified in [ITU-T Y.1910].

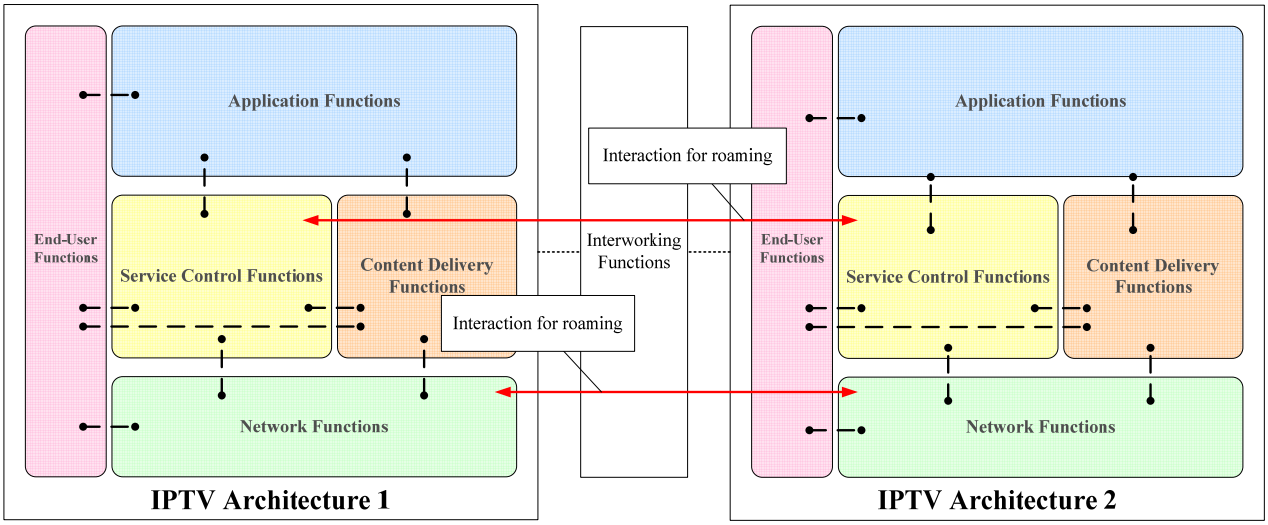

Figure 6-1 – Interworking between IPTV functional architectures

As shown in Figure 6-1, interworking between IPTV functional architectures 1 and 2 is achieved by means of interworking functions. Details of the interworking functions, such as media transcoding, are out of scope of this Recommendation given that interworking functions can be carried out at one or more layers, and depend on the specifics of the provided IPTV services.

6.2 Assumptions

Assumptions made in this Recommendation are as follows:

- IPTV functional architectures shown in Figure 6-1 are NGN-based IPTV architectures as per [ITU-T Y.1910];
- IPTV functional architectures shown in Figure 6-1 are either "NGN IMS-based IPTV functional architectures" or "NGN-based non-IMS IPTV functional architectures";
- Interworking between IPTV functional architectures 1 and 2 is limited to IPTV services (e.g., VoD) using unicast delivery;
- Interworking between IPTV functional architectures 1 and 2 is achieved between their respective network functions. The service control functions (SCF) of IPTV functional architectures 1 and 2 may be used for interworking as well. Interworking between content delivery functions of IPTV functional architectures 1 and 2 is out of scope of this Recommendation;
- IPTV functional architectures 1 and 2 are described as either "home network" or "visited network", when dealing with roaming cases;
- Content is always delivered from the home network.

6.3 Non-roaming scenario

This clause describes the non-roaming scenario where an NGN operator provides its own nomadic end users with IPTV services.

Figure 6-2 shows the non-roaming scenario where the end user is attached to its home network.

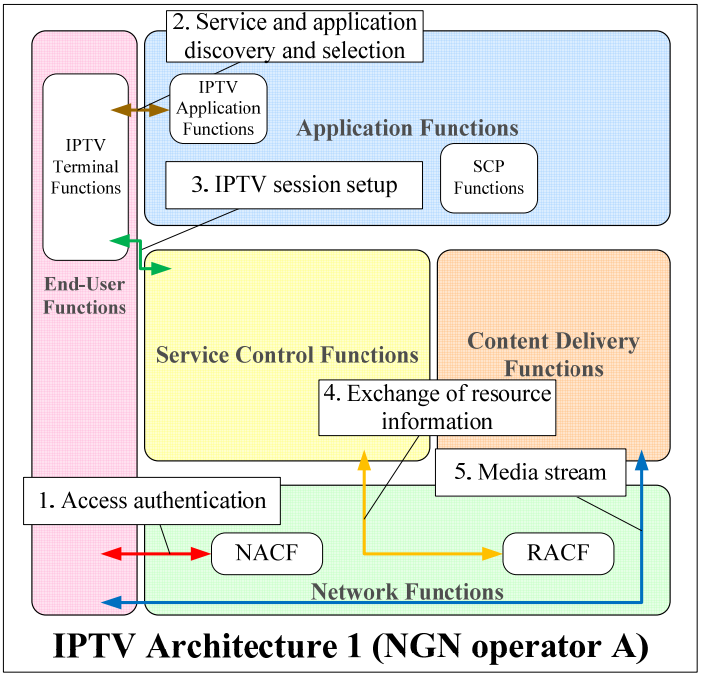

Figure 6-2 – Non-roaming scenario

In the home network, it is assumed that the IPTV terminal functions (ITF) can communicate with the SCF using the standardized mechanism, i.e., IMS-based or non-IMS-based IPTV service control functions defined in [ITU-T Y.1910]. The service and content protection (SCP) functions control the protection of the services and content. The service protection includes authentication and authorization of access to services and, optionally, protection of the services, using methods such as encryption as defined in [ITU-T Y.1910]. Content protection includes the control of access to contents and the protection of content using methods such as encryption. IPTV functional architecture 1 is operated by NGN operator A. The end-user functions subscribe to NGN operator A as its home network.

In this scenario, the following interactions are performed:

1) The end-user functions interact with the network functions of the home network. Access authentication is performed by the NACF of the home network;

2) After access authentication is completed, the end-user functions perform service and application discovery, and selection with the application functions;

3) After service and application discovery, and selection are completed, the end-user functions negotiate with the SCF of the home network in order to set up an IPTV session;

4) The SCF then exchanges the resource information with the network functions through the RACF of the home network;

5) Content delivery functions send content to the end-user functions.

6.4 Roaming scenarios

6.4.1 Roaming with compatible SCFs between NGNs

Figure 6-3 shows the roaming scenario where the end-user functions are capable of communicating with the SCF of the visited network.

In this Recommendation, the SCFs of two different network operators are considered to be compatible when the SCFs of both network operators are capable of communicating with each other (e.g., both are IMS-based SCFs). On the other hand, SCFs of two different network operators are considered to be incompatible when the SCFs of both network operators are not capable of

communicating with each other. For example, if the end-user functions only support an IMS-based IPTV session control function and the SCFs of the visited network support a non-IMS-based, there may be no compatibility between them. Configurations of compatible SCFs and incompatible SCFs between home network and visited network need to be supported.

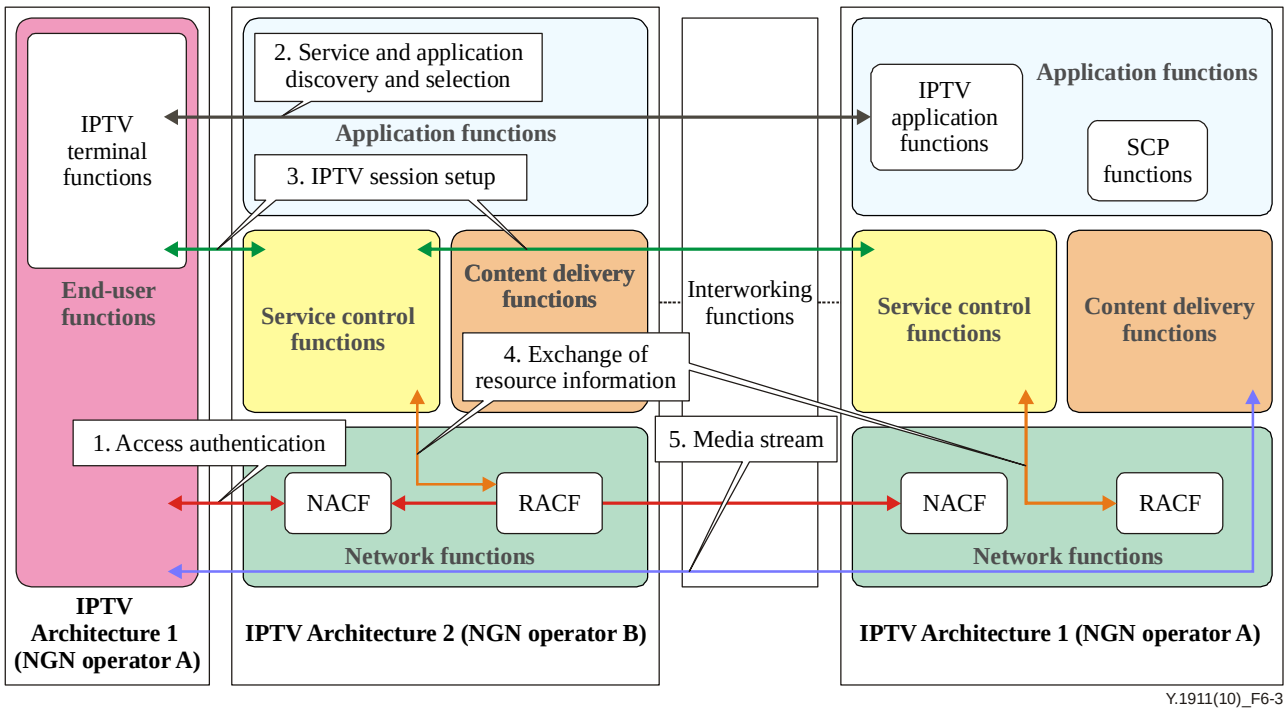

Figure 6-3 – Roaming scenario using the SCF of the visited network

In this case, IMS-based or non-IMS-based service control is used to control the IPTV services. IPTV functional architectures 1 and 2 are managed by NGN operators A and B, respectively. The end-user functions subscribe to NGN operator A, as its home network, through NGN operator B, as the visited network. It is assumed that the SCP functions defined in [ITU-T Y.1910] are applied in the home network (i.e., in IPTV functional architecture 1).

In this scenario, the following interactions are performed:

1) The end-user functions interact with the network functions of the visited network. Access authentication is performed by the NACF of the home network through that of the visited network;

2) After access authentication is completed, the end-user functions perform service and application discovery, and selection with the application functions of the home network;

3) After service and application discovery, and selection are completed, the end-user functions negotiate with the SCF of the home network through that of the visited network, in order to set up an IPTV session;

4) The SCF of the home network and that of the visited network then exchange the resource information with each network functions through each RACF;

5) Content delivery functions of the home network send content to the end-user functions through the network functions of the home network and the visited network.

NOTE – Interaction between the NACF of the visited network and that of the home network is subject to contractual agreements between both network operators. Furthermore, this interaction is not required in case access to subscriber's information is achieved using other mechanisms, such as interactions between the SCF of both network operators.

6.4.2 Roaming with incompatible SCFs between NGNs

Figure 6-4 shows the roaming scenario where the end-user functions are not capable of communicating with the SCF of the visited network due to lack of compatibility.

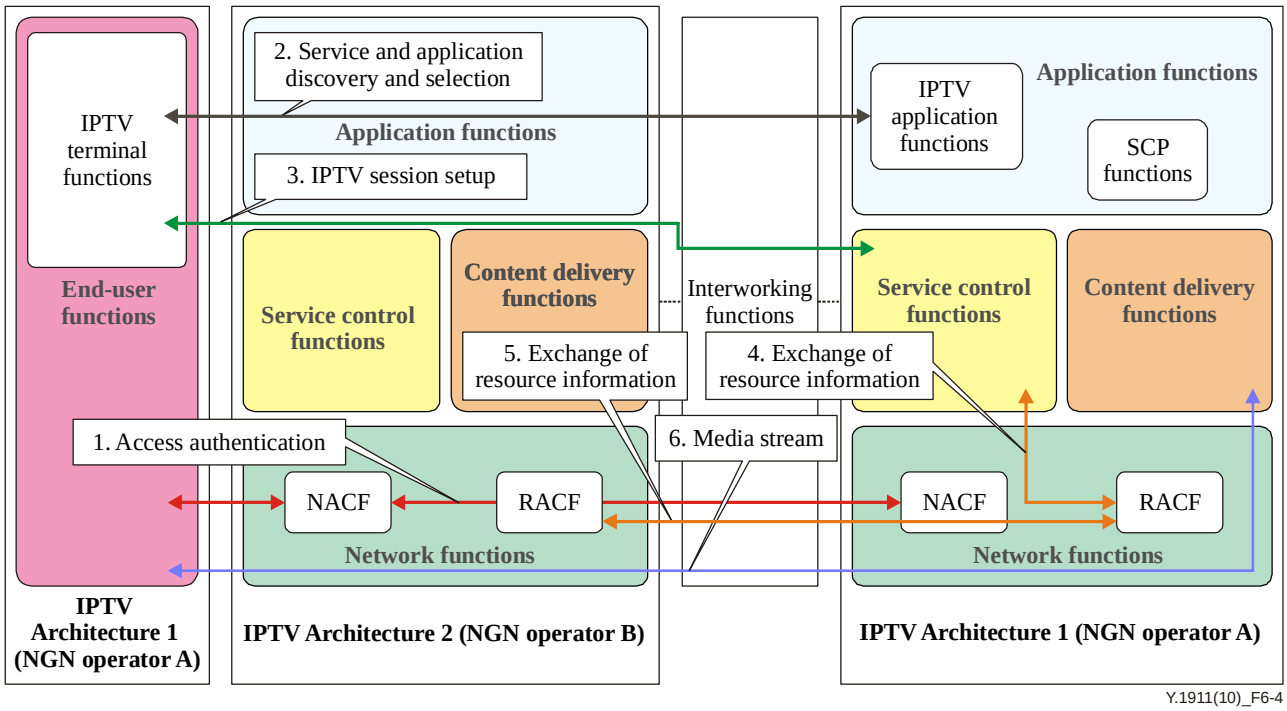

Figure 6-4 – Roaming scenario without using SCF of the visited network

In this case, there is no compatibility between the SCF of the home network and that of the visited network. IPTV functional architectures 1 and 2 are managed by NGN operators A and B, respectively. The end-user functions subscribe to NGN operator A, as its home network, through NGN operator B, as the visited network. It is assumed that the SCP functions defined in [ITU-T Y.1910] are applied in the home network (i.e., in IPTV functional architecture 1).

In this scenario, the following interactions are performed:

1) The end-user functions interact with the network functions of the visited network. Access authentication is performed by the NACF of the home network through that of the visited network;

2) After access authentication is completed, the end-user functions perform service and application discovery, and selection with the application functions of the home network;

3) After service and application discovery, and selection are completed, the end-user functions negotiate with the SCFs of the home network through the network functions of the visited network, in order to set up an IPTV session;

4) The SCFs of the home network then exchange the resource information with the network functions of the home network;

5) The RACF of the home network interacts with that of the visited network, in order to exchange the resource information;

6) Content delivery functions of the home network send content to the end-user functions through the network functions of the home network and the visited network.

NOTE – Interaction between the NACF of the visited network and that of the home network is subject to contractual agreements between both network operators. Furthermore, this interaction is

not required in case access to subscriber's information is achieved using other mechanisms, such as interactions between the SCF of both network operators.

6.4.3 Roaming configurations

In order to support IPTV services in conjunction with nomadism (including personal mobility or terminal mobility), the following roaming configurations should be taken into account:

- NGN operator A (IMS-based IPTV network) – NGN operator B (IMS-based IPTV network): The end user is a subscriber of operator A and the ITF used by the end user supports an IMS-based IPTV server.
- NGN operator A (IMS-based IPTV network) – NGN operator B (non-IMS-based IPTV network): The end user is a subscriber of operator A and the ITF used by the end user supports an IMS-based IPTV server.
- NGN operator A (non-IMS-based IPTV network) – NGN operator B (IMS-based IPTV network): The end user is a subscriber of operator A and the ITF used by the end user supports a non-IMS-based IPTV server.
- NGN operator A (non-IMS-based IPTV network) – NGN operator B (non-IMS-based IPTV network): The end user is subscriber of operator A and the ITF used by the end user supports a non-IMS-based IPTV server.

  NOTE – In case of personal mobility, the ITF used by the end user changes while, for terminal mobility, the ITF remains the same.

Regarding nomadism, this Recommendation focuses on terminal mobility defined in clause 3.1.11. Regarding personal mobility defined in clause 3.1.7, it is assumed that when the user changes terminal, this involves the SCFs as per [ITU-T Y.1910] and, therefore, personal mobility will be possible depending on parameters, such as terminal location, subscription options or other network operator policies.

7 Architectural overview

7.1 Roaming with compatible SCFs between NGNs

IPTV functional architectures and functions are described in [ITU-T Y.1910]. Figure 7-1 depicts the case where end-user functions are connected to a visited network and access the application functions in the home network.

In this scenario, the SCFs of the home network are compatible with those of the visited network. For example, both the end-user functions and the SCFs of the visited network have an IMS-based IPTV capability.

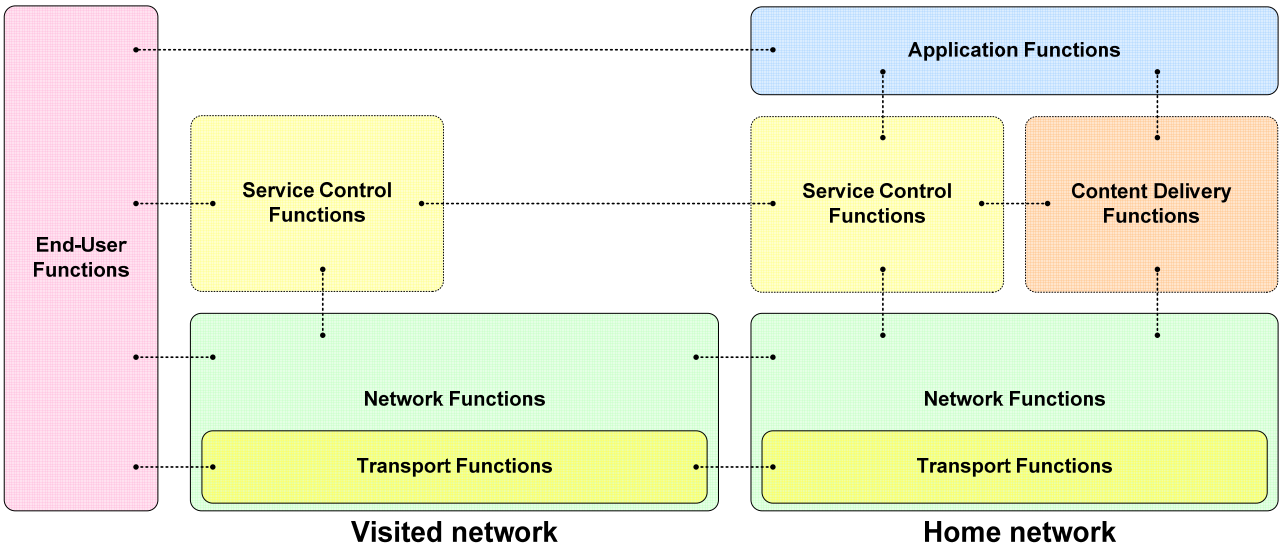

Figure 7-1 – General functional architecture for roaming with compatible SCFs between NGNs

7.2 Roaming with incompatible SCFs between NGNs

Figure 7-2 depicts the case where end-user functions are connected to a visited network and access the application functions in the home network without using the SCFs of the visited network. The end-user functions interact with the SCFs of the home network through the network functions of the visited network and the home network. Details of how this interaction via the network functions is achieved are not further described in this Recommendation.

In this scenario, the SCFs of the home network are incompatible with those of the visited network. For example, end-user functions have only a non-IMS based IPTV capability, although SCFs of visited network have an IMS-based IPTV capability.

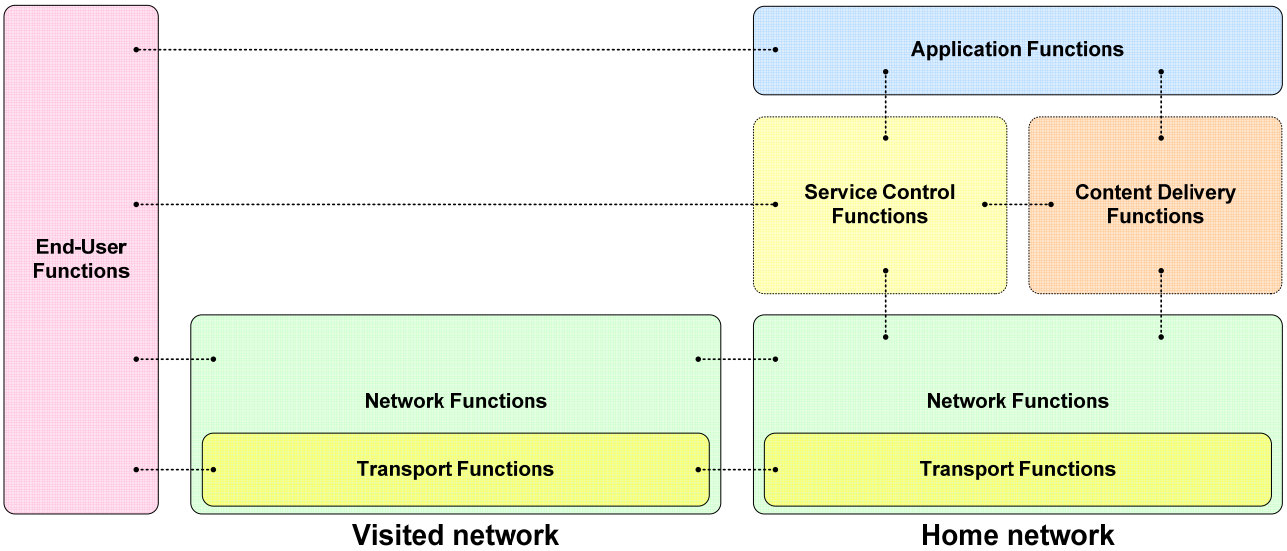

Figure 7-2 – General functional architecture for roaming with incompatible SCFs between NGNs

8 Functional architecture

This clause describes the functional architecture along with reference points required for IPTV interworking for NGN.

8.1 Detailed functional architecture for network functions

8.1.1 Roaming with compatible SCFs between NGNs

Figure 8-1 depicts the detailed functional architecture for Figure 7-1, which is based on the roaming scenario with compatible SCFs between the visited network and the home network. In this figure, either the IPTV service control functional block or the core IMS functions is used, depending on the capabilities of the visited network and the home network, respectively. New reference points, S6 and T2, are introduced. Details for the service and application discovery, and selection are described in [ITU-T Y.1910] and [ITU-T H.770]. Further study is required regarding the use of procedures defined in [ITU-T H.770] in the roaming scenario.

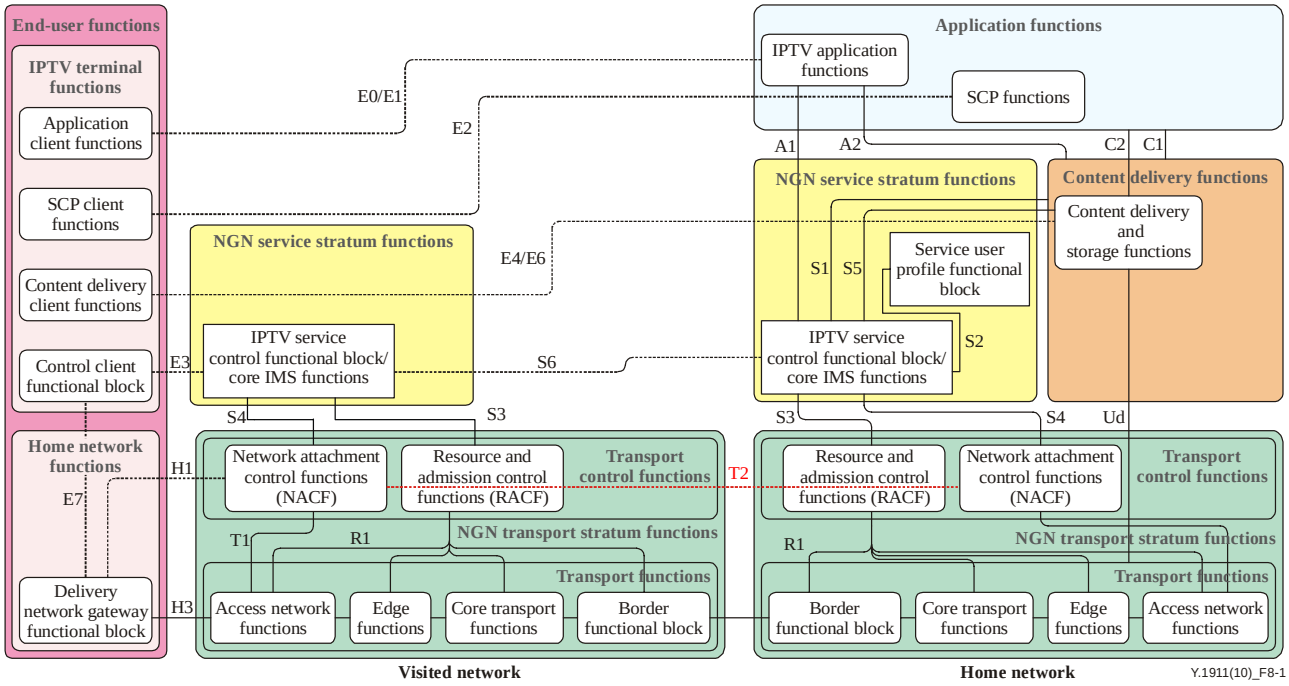

Figure 8-1 – Detailed functional architecture for roaming with compatible SCFs

8.1.2 Roaming with incompatible SCFs between NGNs

Figure 8-2 depicts the detailed functional architecture for Figure 7-2, which is based on the roaming scenario with incompatible SCFs between the visited network and the home network. In this figure, either the IPTV service control functional block or the core IMS functions is used, depending on the capabilities of the home network. New reference points, T2 and R2, are introduced. Details for the service and application discovery, and selection are described in [ITU-T Y.1910] and [ITU-T H.770]. Further study is required regarding the use of procedures defined in [ITU-T H.770] in the roaming scenario.

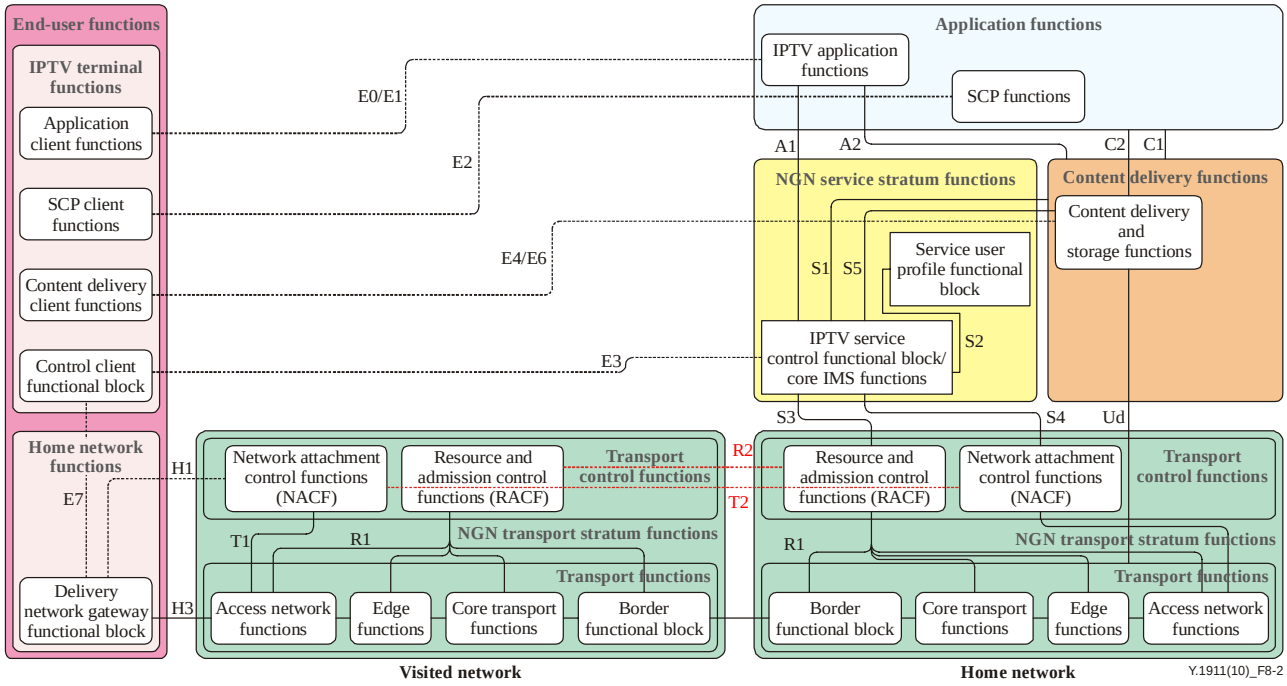

Figure 8-2 – Detailed functional architecture for roaming with incompatible SCFs

8.2 Reference points

All reference points other than those described below are defined in [ITU-T Y.1910].

8.2.1 Reference point S6

The S6 reference point is between the SCFs of the visited network and that of the home network.

This reference point is used when the end-user functions request the media stream to the application functions of the home network via the SCFs of the visited network. This reference point is equivalent to the service control part of the NNI reference point specified in [ITU-T Q.3401].

8.2.2 Reference point T2

The T2 reference point is between the NACF of the visited network and that of the home network.

This reference point is used to perform proxy of authentication and obtain necessary network parameters, such as capability of the end-user functions. These parameters are used for the initial access control at access network functions through the T1 reference point. This reference point is equivalent to Ni reference point specified in [ITU-T Y.2014]. The interworking information of Ni reference point is used to exchange the capability of the end-user functions between the home network and the visited network.

8.2.3 Reference point R2

The R2 reference point is between the RACF of the visited network and that of the home network.

This reference point is used to exchange the resource information and exchange of operator's information between the RACF of the home network and that of the visited network. This reference point is equivalent to the Ri reference point specified in [ITU-T Y.2111].

9 Security considerations

The security requirements within the functional requirements and architecture of NACF, RACF and IPTV architecture are addressed by the security requirements for NGN [ITU-T Y.2701], the security requirements for NGN authorization and authentication [ITU-T Y.2702] and IPTV service requirements [ITU-T Y.1901] and requirements for IPTV security aspects [ITU-T X.1191], including service and content protection.

If security association is required between end-user functions and service control functions of the home network, the IP address space to be assigned to the end-user functions and other related information should be exchanged and agreed in advance between the home operator and the visited operator.

The security of IPTV content involves a contractual agreement between the service provider and the content provider. This contractual agreement applies whether the IPTV subscriber remains in his residential domain or is receiving a unicast service while roaming in another network provider's domain. Further study is required regarding the detailed impacts of such contractual agreement on the end-to-end security architecture (involving the end user, the ITF, the visited network and the home network).

Appendix I

Information flows

(This appendix does not form an integral part of this Recommendation)

This appendix provides high level informational procedures.

I.1 Roaming with compatible SCFs between NGNs

Figure I.1 provides a VoD setup procedure that defines the network attachment process and the service session establishment process, in case both NGNs are capable of IMS-based IPTV according to Figure 8-1.

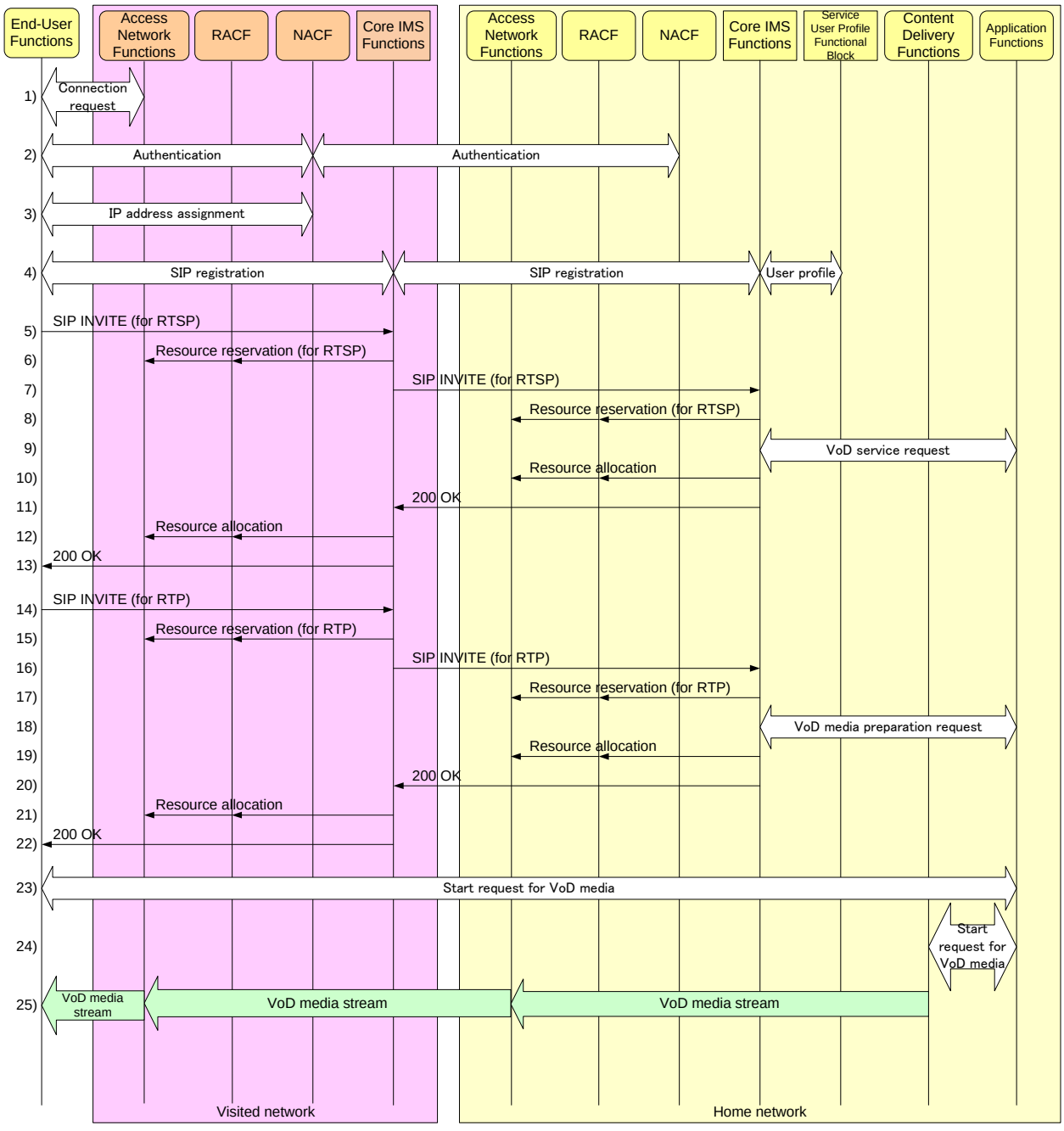

Figure I.1 – Basic setup procedure for IMS-based IPTV in compatible SCFs scenario

1. The end-user functions are connected to the access network functions and establish the lower link.
2. The end-user functions and the NACF of the visited network perform the authentication and authorization of end-user functions. The NACF of the visited network sends the authentication information to the NACF of the home network as a proxy over T2 reference point. The NACF of the home network includes the necessary network parameters, such as the capability of the end-user functions in interworking information field of the reply message.

   NOTE 1 – The proxy mechanism of the authentication information should be agreed between operators in advance.
3. After the completion of the authentication and authorization, the NACF of the visited network assigns the valid IP address to the end-user functions and establishes the connection. The NACF of the visited network and the access network functions perform the initial access control towards signalling messages (e.g., SIP) according to the information obtained during step 2.

   NOTE 2 – The procedures for the service discovery and the selection mechanism are defined in [ITU-T H.770]. Further study is required regarding the use of these procedures in the roaming scenario.
4. The end-user functions perform the SIP registration with the core IMS functions over S6 reference point. The core IMS functions exchange the user profile information with the service user profile functional block.
5. The end-user functions send a SIP INVITE message for an RTSP session to the core IMS functions of the visited network, in order to setup an RTSP session.
6. The core IMS functions of the visited network exchange the media resource information including RTSP information (e.g., IP address, port number and bandwidth) with the RACF of the visited network. The RACF of the visited network communicates with its access network functions, in order to reserve the resource for the RTSP session.
7. On receipt of the resource reservation acknowledgement, the core IMS functions of the visited network forward the SIP INVITE message to the core IMS functions of the home network.
8. The core IMS functions of the home network exchange the media resource information for an RTSP session with the RACF of the home network. The RACF of the home network communicates with its access network functions, in order to reserve the resource for the RTSP session.
9. On receipt of the resource reservation acknowledgement, the core IMS functions of the home network request a VoD service to the application functions.
10. On receipt of the acknowledgement from the application functions, the core IMS functions of the home network exchange the media resource information with the RACF of the home network. The RACF of the home network communicates with its access network functions, in order to allocate the resource.
11. On receipt of the acknowledgement from the RACF of the home network, the core IMS functions of the home network send a 200 OK message to the core IMS functions of the visited network.
12. On receipt of the 200 OK message, the core IMS functions of the visited network exchange the media resource information with the RACF of the visited network. The RACF of the visited network communicates with its access network functions, in order to allocate the resource.
13. On receipt of the acknowledgement from the RACF of the visited network, the core IMS functions of the visited network forward the 200 OK message to the end-user functions.

14. The end-user functions send a SIP INVITE message for an RTP session to the core IMS functions of the visited network, in order to setup an RTP session.
15. The core IMS functions of the visited network exchange the media resource information including VoD information (e.g., IP address, port number, content type and bandwidth) with the RACF of the visited network. The RACF of the visited network communicates with its access network functions, in order to reserve the media resource for the RTP session.
16. On receipt of the resource reservation acknowledgement, the core IMS functions of the visited network forward the SIP INVITE message to the core IMS functions of the home network.
17. The core IMS functions of the home network exchange the media resource information for an RTP session with the RACF of the home network. The RACF of the home network communicates with its access network functions, in order to reserve the media resource for the RTP session.
18. On receipt of the resource reservation acknowledgement, the core IMS functions of the home network request a VoD media preparation to the application functions.
19. On receipt of the acknowledgement from the application functions, the core IMS functions of the home network exchange the media resource information with the RACF of the home network. The RACF of the home network communicates with its access network functions, in order to allocate the resource.
20. On receipt of the acknowledgement from the RACF of the home network, the core IMS functions of the home network send a 200 OK message to the core IMS functions of the visited network.
21. On receipt of the 200 OK message, the core IMS functions of the visited network exchange the media resource information with the RACF of the visited network. The RACF of the visited network communicates with its access network functions, in order to allocate the resource.
22. On receipt of the acknowledgement from the RACF of the visited network, the core IMS functions of the visited network forward the 200 OK message to the end-user functions.
23. The end-user functions request the application functions to start sending the VoD media.
24. The application functions request the content delivery functions to start sending the VoD media.
25. The end-user functions receive the VoD media stream from the content delivery functions through the access network functions of the home network and the access network functions of the visited network.

I.2 Roaming with incompatible SCFs between NGNs

Figure I.2 provides a VoD setup procedure that defines the network attachment process and the service session establishment process, in case of incompatible SCFs between the visited network and the home network. The home network is capable of only non-IMS-based IPTV according to Figure 8-2.

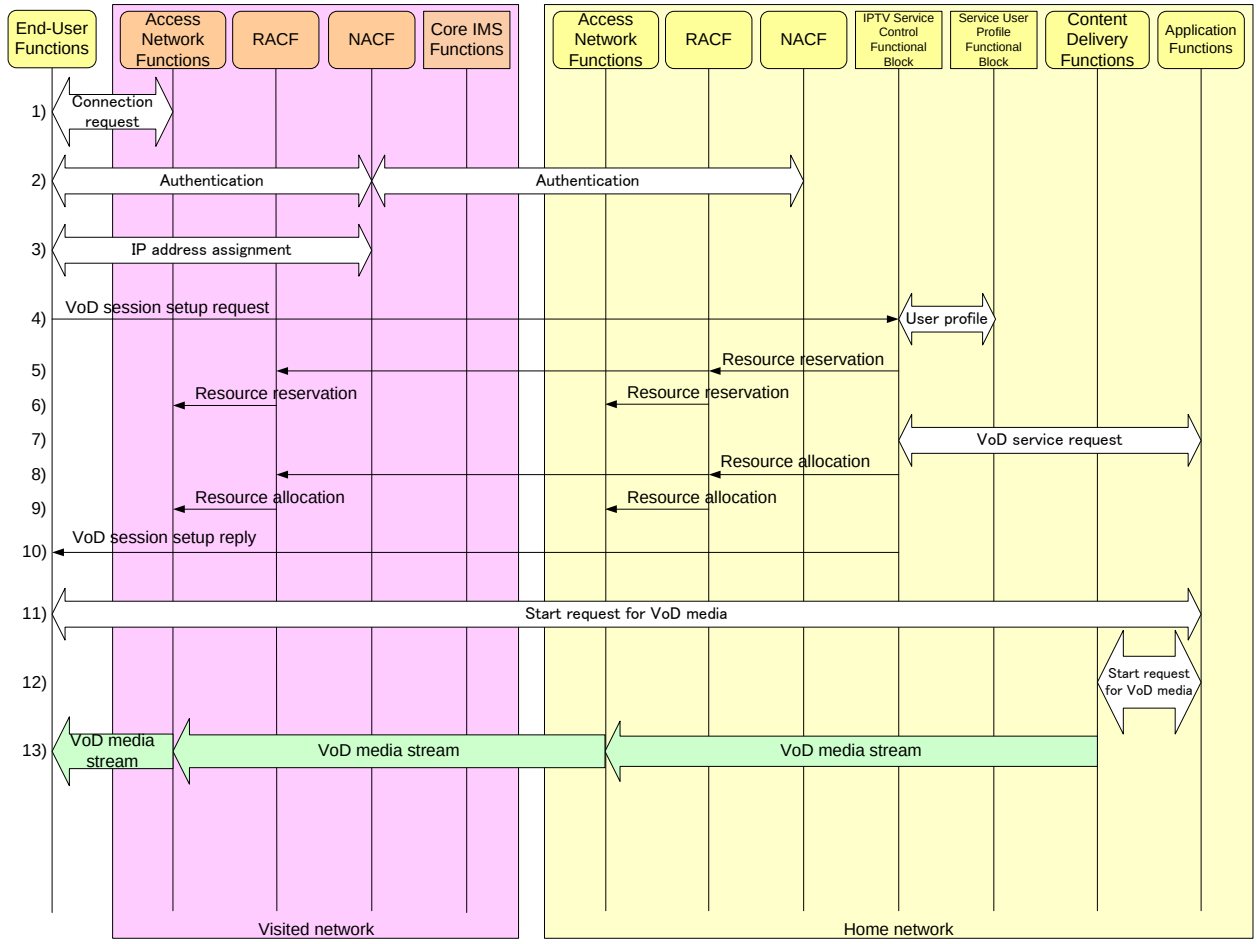

Figure I.2 – Basic setup procedure for non-IMS-based IPTV in incompatible SCFs scenario

1. The end-user functions are connected to the access network functions and establish the lower link.

2. The end-user functions and NACF of the visited network perform the authentication and authorization of the end-user functions. The NACF of the visited network sends the authentication information to the NACF of the home network as a proxy over T2 reference point. The NACF of the home network includes the necessary network parameters, such as the capability of the end-user functions in interworking information field of the reply message.

   NOTE 1 – The proxy mechanism of the authentication information should be agreed between operators in advance.

3. After the completion of the authentication and authorization, the NACF of the visited network assigns the valid IP address to the end-user functions and establishes the connection. The NACF of the visited network and the access network functions perform the initial access control towards media and signalling messages (e.g., RTSP), according to the information obtained during step 2.

   NOTE 2 – The procedures for service discovery and the selection mechanism are defined in [ITU-T H.770]. Further study is required regarding the use of these procedures in the roaming scenario.

4. The end-user functions request a VoD session to the IPTV service control functional block of the home network through access network functions of the visited network and that of the home network. The IPTV service control functional block exchanges the user profile information with the service user profile functional block.

5. The IPTV service control functional block of the home network exchanges the media resource information, including the VoD content information (e.g., IP address, port number, content type and bandwidth), with the RACF of the home network. The RACF of the home network exchanges the media resource information with the RACF of the visited network over R2 reference point.

   NOTE 3 – The RACF of the home network may find the RACF of the visited network by static configuration or by obtaining the RACF information of the visited network from the NACF of the home network.

6. The RACF of the home network and that of the visited network reserve the media resource towards each access network function.

7. On receipt of the resource reservation acknowledgement, the IPTV service control functional block requests a VoD service to the application functions.

8. On receipt of the acknowledgement from the application functions, the IPTV service control functional block of the home network exchanges the media resource information with the RACF of the home network. The RACF of the home network forwards it to that of the visited network.

9. The RACF of the home network and that of the visited network allocate the media resource towards each access network function.

10. On receipt of the acknowledgement from the RACF of the home network, the IPTV service control functional block of the home network sends a VoD session setup reply message to the end-user functions.

11. The end-user functions request the application functions to start sending the VoD media.

12. The application functions request the content delivery functions to start sending the VoD media.

13. The end-user functions receive the VoD media stream from the content delivery functions through the access network functions of the home network and that of the visited network.

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Printed in Switzerland
Geneva, 2010