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

ITU-T Y.2000 series – Supplement on service scenarios for convergence services in a multiple network and application service provider environment

ITU-T Y-series Recommendations – Supplement 3

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Supplement 3 to ITU-T Y-series Recommendations

ITU-T Y.2000 series – Supplement on service scenarios for convergence services in a multiple network and application service provider environment

Summary

This Supplement defines service scenarios for convergence services in a multiple network and application service provider environment, and it defines convergence terminal capabilities for describing convergence service scenarios. In addition, the deployment architecture for a multiple network and application service provider environment is described. Finally, typical scenarios of convergence services on the contents level and functional level, such as personal broadcasting services and event driven services, are introduced.

Source

Supplement 3 to ITU-T Y-series Recommendations was agreed on 25 January 2008 by ITU-T Study Group 13 (2005-2008).

Keywords

Convergence service, convergence terminal equipment (CTE), event driven service (EDS), personal broadcasting service (PBS).

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ITU-T Y.2000 series – Supplement on service scenarios for convergence services in a multiple network and application service provider environment

1 Scope

Convergence services could be provided to users, on user-requests, taking advantages of combinations of contents or functions administered by the multiple network or application service providers for the purpose of providing more benefits to users and more profits to providers.

Key features in this Supplement are:

a) service coordination, including interactions between multiple application service providers above the application network interface (ANI);

b) content convergence and functional convergence from multiple application service providers;

c) terminal capabilities that support services covering content and functional convergence.

This Supplement covers:

- definition of, and requirements for, convergence services in an environment with multiple application service providers and network providers;
- terminal capabilities for convergence services;
- deployment architecture for a multiple network and application service provider environment;
- convergence service scenarios such as:
  - personal broadcasting service (PBS)
  - event-driven service (EDS).

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3 Definitions

This Supplement defines the following terms. These terms are specific to this Supplement and are used to facilitate new functionalities.

3.1 application service provider (ASP): The role that provides application services to users through the ANI to deliver a wide variety of services including voice, video, audio and visual data, via session- and interactive-based services in unicast, multicast and broadcast.

3.2 content convergence: One aspect of the service convergence related to the combination or coordination of contents that are managed by different application service providers.

3.3 convergence gateway (CG): The gateway between terminals and NGN, which provides convergence services to the legacy TE.

3.4 convergence service: A service resulting from service convergence. In this Supplement, service convergence is realized using content and functional convergence.

3.5 convergence terminal equipment (CTE): The end user's terminal equipment for accessing the convergence services.

3.6 functional convergence: One aspect of the service convergence related to the combination or coordination of functions used within services that are controlled by different application service providers.

3.7 network provider (NP): The role that has overall responsibility for the provision of network facilities covering NGN transport stratum and service stratum.

4 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

AAA Authentication, Authorization and Accounting

AN Access Network

AN-FE Access Node Functional Entity

ANI Application Network Interface

AS Application Service

ASP	Application Service Provider
CG	Convergence Gateway
CP	Customer Premises
CSF	Converged Services Framework
CTE	Convergence Terminal Equipment
DRM	Digital Rights Management
DSL	Digital Subscriber Line
DSS	DiScovery Service
EDS	Event Driven Service
FCTE	Fixed Convergence Terminal Equipment
IP	Internet Protocol
IPTV	Internet Protocol Television
LBS	Location-Based Service
MCTE	Mobile Convergence Terminal Equipment
NAT	Network Address Translation
NGN	Next Generation Network
NNI	Network-to-Network Interface
NP	Network Provider
OAM	Operation, Administration and Maintenance
PBS	Personal Broadcasting Service
PC	Personal Computer
PLC	Packet Loss Concealment
QoS	Quality of Service
RAN	Radio Access Network
SDH	Synchronous Digital Hierarchy
SIP	Session Initiation Protocol
SOA	Service-Oriented Architecture
TTS	Text-To-Speech
UCC	User-Created Content
UNI	User Network Interface
USB	Universal Serial Bus
VoIP	Voice over IP
WIFI	Wireless Fidelity
WLAN	Wireless Local Area Network

5 Conventions

None.

6 Service requirements and capabilities for convergence services

Convergence services should operate seamlessly across NGN infrastructures provided by multiple network providers. Seamless interoperability of services offered by different application service providers is required.

Service convergence allows for an evolution towards a multi-service and multi-network provider environment for open services as follows:

- convergence services should be available across multiple networks;
- IP-based access networks should support convergence services using both fixed and mobile terminals.

IP technology is used by application service providers and network providers in different network types as follows:

- wireline networks (e.g., operated by companies offering telephony services and other advanced services);
- cable networks (e.g., operated by television service providers);
- wireless networks (e.g., operated by cellular/mobile companies along with new nomadic capabilities).

The NGN architecture supports the delivery of services including multimedia services as the forms of conversational services (e.g., relying on SIP for session control) and content-delivery services (e.g., video streaming and broadcasting). NGN could provide capabilities and resources to support applications for value-added services. The NGN functions are divided into service stratum functions and transport stratum functions according to [ITU-T Y.2011].

To provide a convergence service in an environment of multiple application service providers or network providers, it is necessary to define the requirements which enable the delivery of various value-added services as follows:

- Open standards-based interfaces allowing "plug-and-play" integration of a large number of applications.
- A standardized session-based control could perform functions through which application can signal. This allows full convergence of services over a number of access modes, for example, blending contents with unified communications and VoIP. A logical subscriber database that holds all customer information makes service rollout and ongoing administration manageable and scalable.
- A set of access-independent application and service creation capabilities, so that these convergence applications and services can be adapted to any devices chosen by the end-users and delivered with consistency.
- End-users shall access their services regardless of their current location, active device, or the access network in which they are registered.
- NGN services should be operated seamlessly and transparently across public mobile/fixed and customer premises networks in an NGN infrastructure.
- A user in a public network can communicate (e.g., via VoIP, push-to-talk, short message, etc.) with another user in a customer premises network possibly using a different type of device (e.g., a multimedia PC versus a 3G handset), and vice versa.
- A user in a public wireless network can maintain existing communication without the associated session or connection being dropped while travelling from the public wireless network to his or her customer premises (CP) network (CP terminal and session mobility), and vice versa.

In addition, it is needed to clarify provider aspects that play the important roles in providing convergence services. A provider is an organization, or individual, which undertakes one or more roles. The provider can be a commercial company, a government agency, a non-profit organization, a charity or an individual. The NP is an organization that maintains and operates the network components to support services. The NP may also take more than one role, e.g., also acting as ASP. The ASP is a general reference to an operator that provides NGN telecommunication services to customers and other users either on a tariff or contract basis. An ASP may or may not operate a network and the ASP may or may not be a customer of another service.

A service architecture representing deployment aspect for multiple provider environments is presented in Figure 1. The application service (AS) may provide convergence services by coordinating between multiple ASPs or NPs and referencing a service profile that includes service attributes registered from user equipments such as CTE. Detailed scenarios for convergence services can be derived from the architecture in Figure 1.

As users move across different environments, their services are managed and delivered to them seamlessly and with ease. The converged services framework (CSF), as described in [ITU-T Y.2013], is used to provide a common point of coordination for services, mobility, preferences, resources and state of users on a per-user basis.

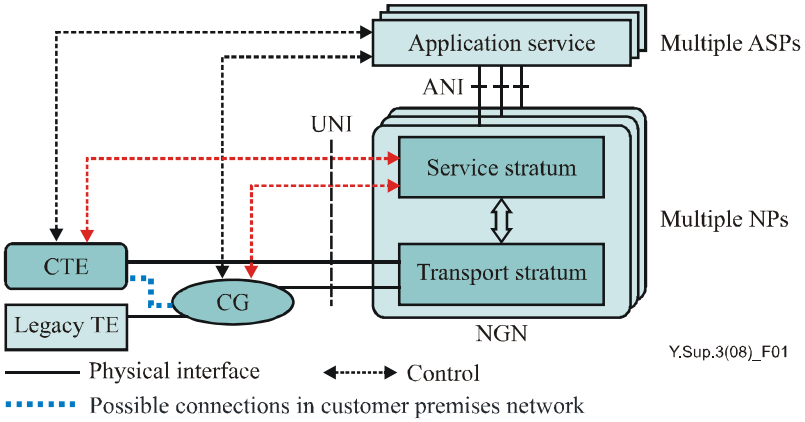


Figure 1 – Service architecture representing deployment aspects for a multiple network and application service provider environment

The architecture includes AS, service stratum, transport stratum, convergence gateway (CG), and convergence terminal equipment (CTE). An AS dedicated to any ASP may interact with the service stratum via the ANI for the manageable user services. The AS also coordinates the interactions required for the convergence services covering multiple ASPs while it covers required interactions between end-user functions (including CTE) where the AS plays an important role for coordination between multiple providers. Depending on particular deployments, service coordination can be placed in the application service with the core and access networks, or can be distributed with components residing in the CTE.

7 Capabilities of NGN convergence service terminals

Capabilities of NGN convergence service terminals could be classified into two groups. Those are CTE and CG. CTE supports convergence services.

7.1 Capabilities of NGN convergence terminal equipment (CTE)

The capabilities of CTE could be described with general capabilities and terminal system functions. The general capabilities consist of basic system capabilities, interface-supporting capabilities, and application-supporting capabilities.

7.1.1 General aspects

CTE may provide a convergence service based on the mobile service function and fixed service function provided by the transport network according to the scenario based on terminal capability. It handles the video, audio, textual and graphical information as well as connecting to a wireline/wireless network.

CTE, whether a fixed or mobile terminal, may include local connectivity, which can be IP-based or non-IP-based, e.g., Bluetooth. It is assumed that commercially available consumer electronic devices will evolve to enable a portable CTE to potentially support basic system capabilities (e.g., adequate data storage, display, transcoding, digital rights management (DRM) and user configurability, etc.), interface supporting capabilities (e.g., multimode, wireless/WiFi/WiMax/WiBro/DSL/Ethernet supporting capabilities, local accessory interface supports, etc.), and application supporting capabilities (e.g., video encoding/decoding, image acquisition, MP3 audio, mobile broadcasting, biometrics, voice recognition, etc.).

In order to tailor services and applications to user and device needs, the NGN shall provide for a means for a user terminal or device to register with a network and to notify the network of its client capabilities, such as video encoding/decoding, support for VoIP or presence, etc. Based on the client capabilities and any user preferences, the network then offers to the user a list of available services from which the user can choose. Network services and applications then may be downloaded and used only when the services and applications are needed or desired by users, thereby using available device and network resources efficiently. Additionally, the NGN shall provide for a means for a user terminal or device to notify the network of its state of activity, e.g., whether a display is in use and for what application, or the set of other services to which it responds (independent of a particular administrative domain).

The CTE may be capable of functioning as either a MCTE (mobile convergence terminal equipment) outdoors or a FCTE (fixed convergence terminal equipment) indoors for seamless convergence services. The FCTE could have a server or a personal computer-based phone function with high quality audio/camera/display functions.

The CTE functional architecture consists of several function blocks as shown in Figure 2.

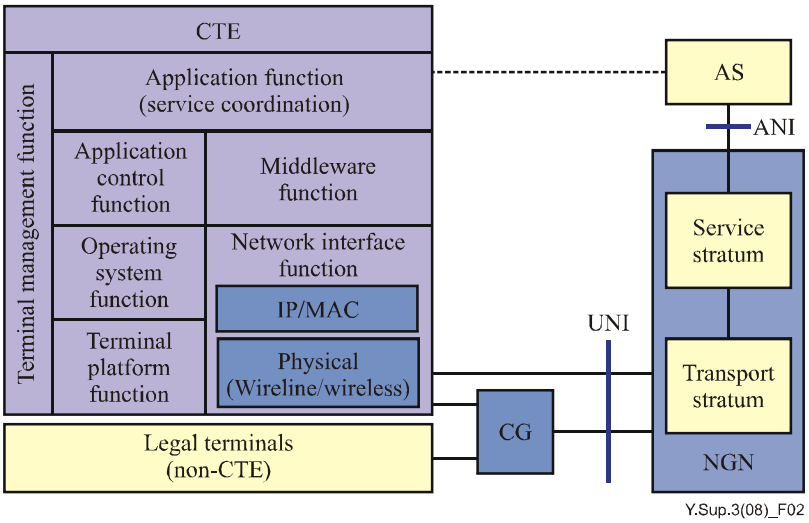


Figure 2 – CTE functional architecture for convergence service scenarios

7.1.2 CTE functions

The convergence terminal equipment (CTE) functions support the capabilities for a convergence service scenario from a user's perspective. It could function as a convergence terminal in multiple application service provider environments.

The overall CTE system function is subdivided into the following functional elements: application function, application control function, operating system function, terminal platform function, middleware function, network interface function, and CTE management function. The CTE management function is additionally described in the next clause. The middleware function plays main roles for supporting convergence services to users. Figure 2 shows the CTE functional architecture for a scenario of convergence service to be interfaced with NGN. The functional descriptions that need to be discussed are identified as follows:

- Application function: This function provides services to users in multi-provider environments. The application function works in conjunction with the application control function to provide end-users and third-party application providers with the value-added services they request.
- Application control function: This function includes control of both session and non-session control, registration, and authentication and authorization functions at the application level. In cases where multiple services are invoked, a means of establishing priority shall be provided. In particular, profile, identity and state are required to be coordinated for users and devices, as well as session state, resource availability and location information across different networks.
- Operating system function: This function controls the execution of programs and provides services such as CTE terminal resource allocation, scheduling, input/output control, and data management. Those are the process management function, I/O management function, memory management function, and file management function, etc.
- Terminal platform function: This function is fundamental to the structure of the terminal hardware platform. This includes media device driver, input/output device drivers for encoding/decoding of text, image (still, moving), audio, graphics, recognition algorithms (video and image recognition), TTS (text-to-speech), and storage devices.
- Middleware function: This function interconnects with terminals which run on different operating systems and application programs. This could be activated as a glue function when CTEs including different operating systems and applications try to communicate with each other on the network. Then it could include security, transactions, load-balancing, and protocol conversion functions, etc.
- Network interface function: This function provides interfaces with the UNI and external communication networks, which consist of wireline and wireless access interfaces. This function provides interfaces with the UNI and external communication networks, which consist of wireline interfaces (e.g., xDSL, SDH dedicated bandwidth access, optical access, IEEE 802.3x Ethernet, PLC, etc.), wireless interfaces (e.g., [IEEE 802.11], [IEEE 802.16] and [IEEE 802.20] wireless, 3G RAN), and local accessory interfaces (e.g., Bluetooth, 20Zigbee, wireless USB).

7.1.3 CTE management function

Terminal management is fundamental to the operation of CTE. These functions provide the ability to manage the CTE in order to provide services with the expected quality, security and reliability.

These functions cover configuration management, accounting management, performance management, device management, fault management, and security management, etc.

7.1.3.1 Configuration management

Configuration could be provided for the CTE and user identity. Configuration management allows functions to:

- manage software through its deployment life-cycle from initial provisioning, update and repair to removal;
- provide remote terminal maintenance, which avoids end-user involvement in software management;
- support multi-platform computing environments;
- scale to meet enterprise business needs while reducing impact on CTE by automating software updates and configuration management tasks.

The CTE configuration management ensures that the entire software infrastructure is always in its desired state – up-to-date, reliable and secure.

7.1.3.2 Accounting management

A good management system will collect usage statistics for various resources and monitor performance parameters such as response time. The accounting function is to track actions or events. Events are groups of operational activities that may occur on a cyclic basis, on a daily or weekly basis, or may occur sporadically. General accounting functions capture, store, review and report as follows:

- the capture mechanism may need to provide the ability to include selectively different information threads, depending on the security status of CTE;
- the storage mechanism may provide flexible capabilities by the review and report mechanisms;
- the review mechanism may provide capabilities supporting non-real-time or real-time services for reviewing;
- the report mechanism may require the ability to report or send alerts immediately and should be flexible enough to create their personalized reports dynamically.

7.1.3.3 Performance management

Performance management is the process of assessing progress toward achieving predetermined goals. It can be thought of as a comparison between actual and desired results. This refers to the rules within the CTE management that focus on monitoring and managing the performance and availability of software applications. This can be defined as workflow and related tools deployed to detect, diagnose, remedy and report on application performance issues to ensure that application performance meets or exceeds end-users' expectations.

7.1.3.4 Fault management

Fault management is the set of functions that detect, isolate and correct malfunctions in the CTE for environmental changes, and include maintaining and examining error logs, accepting and acting on error detection notifications, tracing and identifying faults, carrying out sequences of diagnostic tests, correcting faults, reporting error conditions, and localizing and tracing faults by examining and manipulating database information. It allows a terminal operator to monitor user events and perform actions based on this information. Ideally, fault management should be able to correctly identify events and automatically take action, either launching a program or script to take corrective actions, or activating notification software that allows a user to intervene.

7.1.3.5 Security management

Security management actively monitors, correlates and quickly responds to CTE security. Security functions include subscriber identification, privacy encryption, and contents encryption. It is the

trusted component in security management for the CTE that achieve terminal efficiencies and ensure continuous operations.

7.2 Capabilities of convergence gateway

The convergence gateway could include an integrated function that is a multi-access gateway to the CTE. This may be a node on the network that serves as the multiple access point to other wireline and wireless networks.

The convergence gateway can serve as a link between wireless networks including WLAN, Bluetooth, WiMAX and cellular networks. So long as the service is IP-based, such as VoIP, web browsing or video streaming, the convergence gateway will provide seamless data services between CTEs and access networks assuming the CTE can access both of them. It provides interfaces to be connected with legacy terminals.

The CG supports the following functions:

- convergence service provision: provided to legacy terminals;
- various physical interfaces: this function provides interfaces with the UNI and external communication networks, which consist of wireline interface (e.g., xDSL, SDH dedicated bandwidth access, optical access, IEEE 802.3x Ethernet, PLC, etc.), wireless interfaces (e.g., [IEEE 802.11], [IEEE 802.16] and [IEEE 802.20] wireless, 3G RAN), and local accessory interfaces (e.g., Bluetooth, Zigbee, wireless USB);
- basic functions: protocol translation, impedance matching, repetition and amplification, and rate conversion;
- packet processing: classification, queuing/scheduling, routing/NAT, bridging, and filtering/encryption;
- OAM functions: device discovery and configuration, software management and upgrade, physical security, status and performance monitoring, and diagnostics.

8 Deployment architecture for multiple network and application service provider environment

Considerations for a multi-provider environment demand clarification on the providers (i.e., NP, ASP) having complex aspects such as service roles and functional components, etc. Therefore, deployment architecture based on service roles is needed to be described. The access administration for the session establishment is also covered in this clause, since it is essential for convergence service deployment in NGN. Interactions for convergence service deployment are lastly covered to clearly show the relationship between components in NGN.

8.1 Deployment architecture based on service roles

Users, NPs and ASPs will play the main roles in the deployment of NGN. Figure 3 illustrates a deployment architecture composed of these elements as the service roles. The network elements in the figure could be defined by different interfaces and generally interconnected with the access network(s) and core transport network(s) and transport control network.

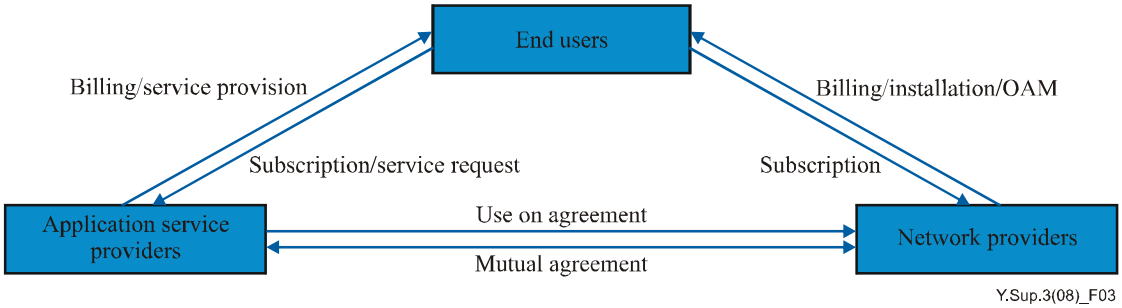


Figure 3 – Deployment Architecture based on service role

The relationship between end users and ASPs could include subscription, billing and service request/provision. The relationship between end users and NPs could include subscription, billing, installation and OAM. The relationship between ASPs and NPs could include mutual agreement and use on the agreement on a coordination basis.

8.2 Access control for convergence service provision

This clause provides the functions to confirm registration and to establish the session for accessing networks or application service providers. The NP or ASP should protect against theft-of-service attacks by unauthorized individuals with excess free time; it should verify user's levels of access authorization for accounting and resource planning purposes. It is necessary to have the time of connection in order to validate the user identity. Furthermore, to provide maximum coverage to increasing roaming and mobility, users may choose their providers while retaining control over user access, usage and billing information. All these features require coordination between the various administration systems. This clause includes access administration control for convergence service provision in NGN using the functions of AAA.

8.2.1 Registration

The procedure of registration is to register user information needed to be protected from cyber attacks. This procedure consists of terminal and user registration. The terminal registration is done to declare the ownership and user registration is performed to store user information.

8.2.1.1 Terminal registration

The terminal registration could be done between the user and the terminal using some medium (e.g., security card) inside the terminal or other means. It proves the ownership of the user while protecting user privacy and protecting the terminal from viruses or cyber attacks.

8.2.1.2 User registration

User registration is the procedure to register the notion that the end-user possesses a unique piece of information – a user name/password, a secret key, biometric data, etc., that serves as unambiguous identification credentials. During the registration process, users' private data may be stored in AAA functions of ASPs. User registration offers the user the ability to log into networks and services. In other words, a user registration scheme allows the user to log into all relevant networks and services, using only one set of authentication credentials (e.g., only one username/password pair). This function could be completed through identity coordination to support the various identifier verification mechanisms (e.g., biometrics, text, etc.).

8.2.2 Authentication

Authentication involves validating the identity of the terminal and user prior to permitting logical connections between CTEs and ASPs. During this process, the AAA function compares the user-supplied authentication data with the user-associated data stored in its database. In case of

credential match, the user is granted access to the connections between CTEs and ASPs. A non-match results in an authentication failure and a denial of the CTE-ASP connection. This clause deals with authentication required between CTEs and ASPs in a multiple network and application provider environment.

8.2.2.1 Terminal authentication

This procedure is performed to confirm the ownership and the use rights of the terminal. First, to declare the ownership of the terminal, identification between the user and the terminal is done using a security card inside the terminal. This procedure is performed before using features of the terminal. Secondly, to confirm the use rights of the terminal, identification is performed between the user and the equipment. It proves the identity of the terminal and the user while protecting user privacy.

8.2.2.2 User authentication

This procedure is performed to validate the identity of the user. To access application service providers, authentication between an ASP, which first responds to the user's service request, and a user also could be performed via some medium (e.g., security card) or other means while establishing the connection between the user and the ASP. Also, this procedure is required to use an AAA service for validating the identity of the user. As the part of the above procedure, authentication is required before resources of services are made available in response to requests from users.

8.2.3 Authorization

This procedure is performed to decide what rights the end user has if the user is allowed to access application service providers. In the case of the access to an ASP, the user may have different rights to access the service according to the user's registration information. Authentication and authorization are usually performed together during session establishment.

8.2.4 Accounting

This procedure is performed to provide the methodology for collecting information about the end user's resource consumption, which can then be processed for billing, auditing and capacity-planning purposes. As soon as the connection between the user and ASP, which first responds to the user's service request, is established, it is necessary to invoke the accounting functions (e.g., an accounting-start message, including input and output packets, session duration, and termination cause, such as user request or idle time-out). When the session is terminated, it is necessary to indicate that the session is over (e.g., an accounting-stop message).

8.3 Interactions at UNI and ANI

Interaction occurs when terminals take turns transmitting data between one another on the networks. This should be distinguished from transaction of communications, in which terminals transmit data simultaneously. Included interaction in this category could be classified into three types, as follows:

– interactions between CTE and networks of NP (UNI);

– interactions between CG and networks of NP (UNI);

– interactions between AS and networks of NP (ANI).

8.3.1 Interactions between CTE and networks of NP

Interaction activities between the CTE and networks of NP are performed through the AN-FE in the network functions. The AN-FE directly connects to the end user terminals (e.g., CTE) and terminates the first/last mile link signals at the network side.

The access network function of the NP takes care of the end-users' access to the network as well as collecting and aggregating the traffic coming from these accesses towards the core transport

function and the CTE. These functions also perform QoS control mechanisms dealing directly with user traffic, including buffer management, queuing and scheduling, packet filtering, traffic classification, marking, policing and shaping.

8.3.2 Interactions between CG and networks of NP

Interactions between the CG and networks of NP should be considered if the CG tries to connect to the networks of NP. Interaction activities between the CG and the networks are performed through the UNI. The UNI directly connects to the CG and terminates the link signals at the network side.

8.3.3 Interactions between AS and networks of NP

There would be various interactions between providers if the terminal or the user requests services. These are classified into four types, as follows:

- Interaction between networks of NP and AS: A case where one AS is connected to one network of NP. The network of NP would try to connect to one AS.
- Interaction between networks of NP and multi-AS: A case where one network of NP could be connected to many ASs. The network is required to connect many ASs for offering a variety of contents.
- Interaction between AS and networks of multi-NPs: A case where one AS is connected to networks of multiple NPs. Different paths are required in case of multiple networks for multi-NPs. A different path means a different network connection to be provided by each different network of multiple NPs.
- Interaction between networks of multi-NPs and multi-ASs: A case where networks of multi-NPs could be connected to many ASs. This could occur when a variety of service contents located in different ASs are required to connect different channels.

9 Convergence service scenarios for a multiple network and application service provider environment

9.1 Overview

Users benefit from new convergence services which are offered through convergence terminals in a multiple network and service provider environment. Convergence services are introduced through convergence between networks of multiple NPs or ASs, more specifically, services are coordinated across networks of different network providers and ASs of application service providers.

Convergence services are coordinated such that, from the user perspective, the service and content components are presented in a seamless way, giving the impression of a unified overall service environment.

The convergence services cover:

- convergence between different functions or contents in multiple ASs;
- convergence between networks of multiple NPs.

Convergence services can be provided with the convergence between multiple NPs or ASPs. Interactions between NP, ASP and CTE occur at UNI/ANI and are listed in clause 8.3. One case, NP oriented convergence services, is described first, and another case, ASP oriented convergence services, is also listed. Scenarios of convergence services such as PBS and EDS are introduced last.

9.2 NP-oriented convergence services

An NP could be one of the wireline, wireless or mobile NPs. The future NGN service will emerge through the convergence between these various NPs. These services could be categorized in the convergence service aspect as shown in the next clauses.

9.2.1 Convergence services through multiple network providers with roaming users

It is assumed that users 1, 2 and 3 are subscribed to NP1.

In Figure 4, user 1 is provided with services from the home NP, i.e., NP1, while users 2 and 3 are roaming and are provided with services from another visited NP, i.e., NP2. NP1 and NP2 may have a roaming agreement and can cooperatively provide authentication, authorization and accounting (AAA) and hence NP1 can provide a single bill to the users. In the following diagram, arrows are used to indicate content provision or data delivery.

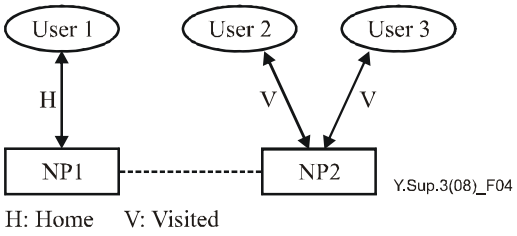


Figure 4 – Convergence services with roaming

9.3 ASP-oriented convergence services

9.3.1 Convergence services provided from a single ASP

In Figure 5, users 1, 2 and 3 are provided convergence services from ASP1. In this case, they may have already subscribed to ASP1 for the service. The convergence services may include the combination of services or contents that originate from different users.

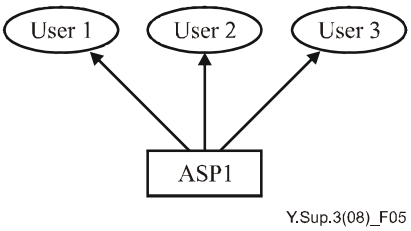


Figure 5 – Convergence services provided from a single ASP

9.3.2 Convergence services provided from multiple ASPs

In Figure 6, users 1, 2 and 3 request and receive convergence services from multiple ASPs (ASP1 and ASP2). In this case, the users do not need to hold subscriptions with a specific ASP.

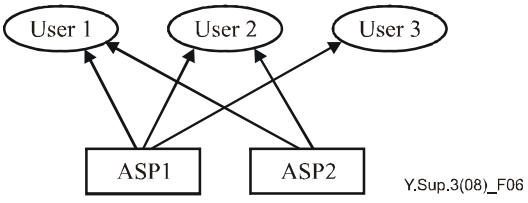


Figure 6 – Convergence services provided from multiple ASPs

9.3.3 Convergence services with content forwarding

In Figure 7, user 1 is provided services from ASP1, while users 2 and 3 are provided services forwarded from ASP1 via another service provider, ASP2. ASP1 and ASP2 may have a service

provision agreement and can cooperatively provide authentication, authorization and accounting (AAA) and hence ASP1 can provide a single bill to the users.

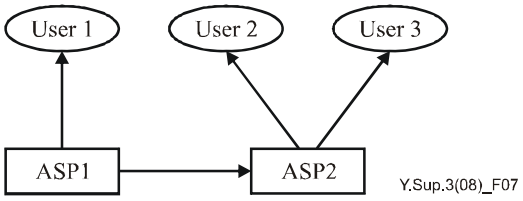


Figure 7 – Convergence services with content forwarding

9.3.4 Convergence services with user-produced content forwarding

In Figure 8, user 1 generates streamed content using a personal device and broadcasts it to Users 2 and 3 who are associated with ASP2. All users have a subscription with ASP1.

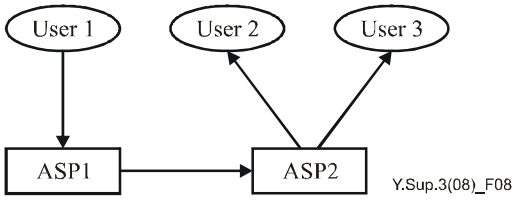


Figure 8 – Convergence services with user-produced content and receiving users

9.4 Convergence service scenarios

Convergence might occur at the content-level that is provided by multiple providers or in the function-level that is incorporated by multiple providers. The former case might be considered in services including streaming capabilities such as IPTV or various types of broadcasting services including personal broadcasting service (PBS). The latter case might be considered in services including functions from different application service providers (e.g., location-based service (LBS), discovery service (DSS), or others for event driven service (EDS)). To explore the possibility of deployment of the convergence services in the multi-provider environment, the approach using the more detailed service scenario in this context is necessary. Moreover, the convergence services can be provided from the same type of providers (i.e., homogeneous providers) or different types of providers (i.e., heterogeneous providers). The former case could be outlined in the PBS scenario. The latter case could be described in the EDS scenario.

9.4.1 Personal broadcasting service (PBS)

Personal broadcasting service (PBS) is regarded as a typical convergence service that can be provided in multiple application service provider environments, where convergence services can use contents distributed across different ASPs, when contents from different sources are combined together. Specifically, PBS is a sort of ASP-oriented convergence service covering cases from clauses 9.3.2, 9.3.3 and 9.3.4. On-demand PBS could be deployed applying the case from clause 9.3.2, while subscription-based PBS could be deployed applying the cases from clauses 9.3.3 and 9.3.4. In particular, user-created content (UCC) could be serviced in PBS applying the case from clause 9.3.4.

In order to provide this service, the NGN should support the capability for selecting appropriate providers in accordance with the users' designation. It also must have the capability to deliver the content to multiple users at the same time. In addition, point-to-point unicast, point-to-multipoint multicast, and broadcast mechanisms should be supported for efficient network resource usage and

scalable content delivery. The user profile (subscriptions, billing, preferences, etc.) is required to provide a key function to enable seamless broadcasting services under multiple ASP environments.

The requesting user can initiate PBS to the designated users while maintaining the session. PBS could be provided in two ways: PBS on demand and subscription-based PBS. Contents could be composed of user-created content or the combination of existing content from multiple ASPs.

The cases described in clauses 9.3.3 and 9.3.4 are consistent with PBS.

9.4.1.1 Description

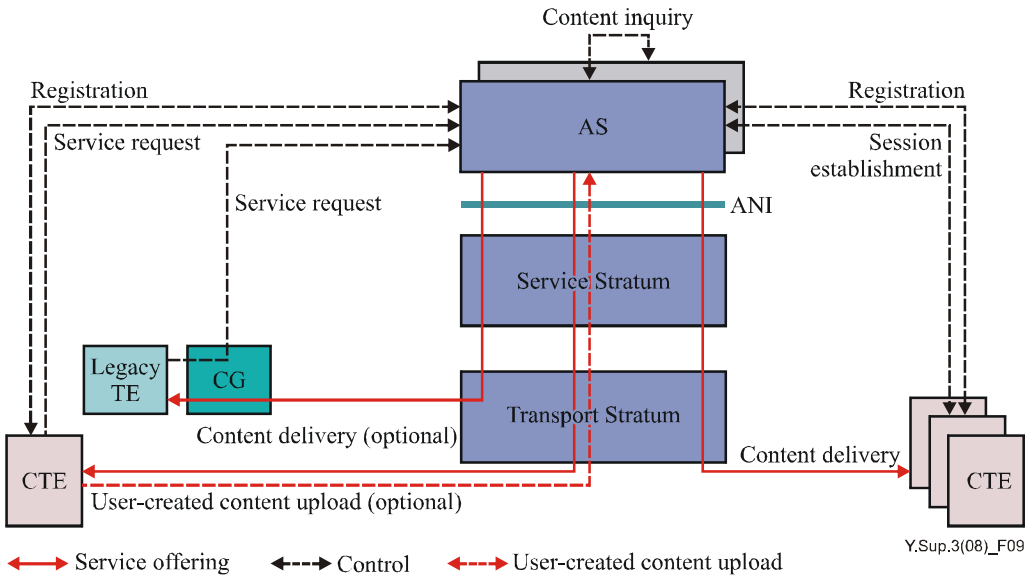


Figure 9 – Personal broadcasting service

The CTEs and the CGs (optional) register their identifications with the AS. The CTE requests services to the AS (as an option, the CTE may make a request via the CG). The AS then carries out the AAA procedures for the requesting users and the CTEs. If the AAA result is valid then the AS establishes sessions with the designated CTEs. The AS prepares service contents, including a content inquiry to the AS of the other ASP if needed, according to the requests. The AS broadcasts the prepared contents to the designated CTEs. The requesting CTE may be provided with the contents for monitoring purposes.

9.4.1.2 Information flow

A typical example of information flow for PBS is shown as follows:

Assumptions:

1) When the user is not subscribed to the ASP then he/she will be charged on a usage basis by each ASP.
2) The details of the AS are hidden for simplicity.
3) DRM processing for license transaction in the AS is also hidden.
4) The flows shown here are at a high level and are not meant to show the actual detailed protocol procedures.

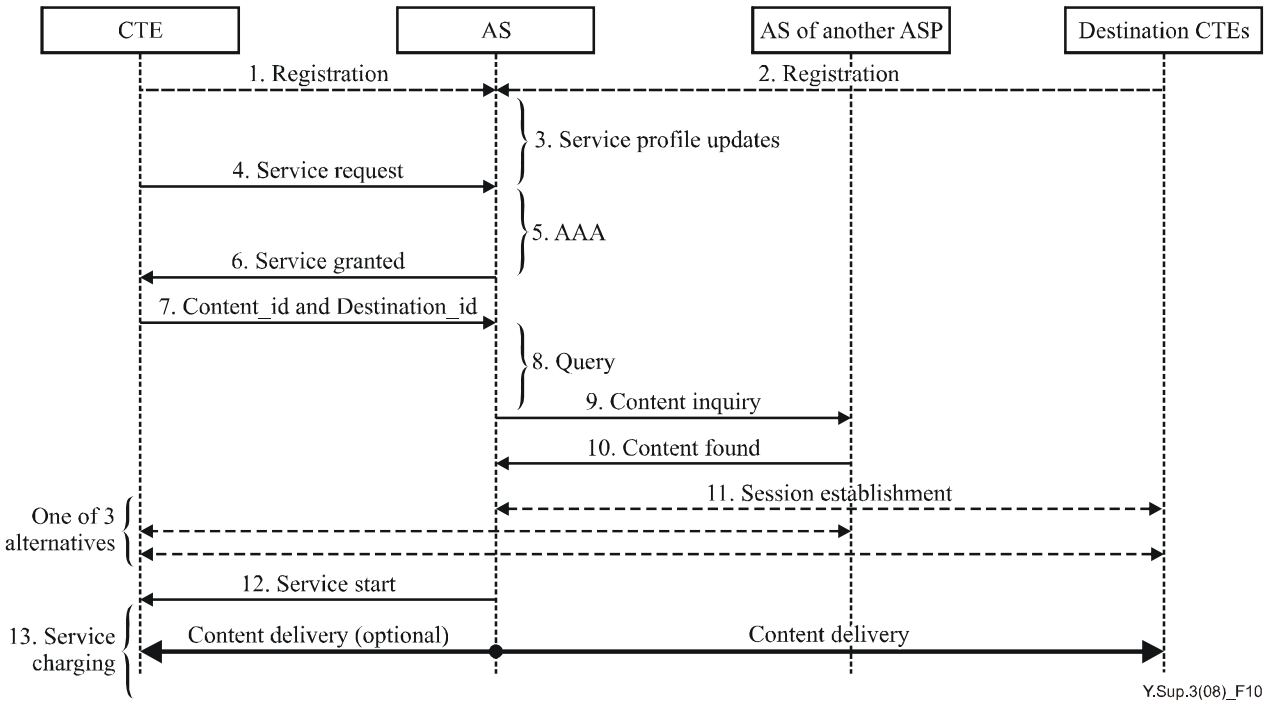


Figure 10 – Flow for the personal broadcasting service

Flow descriptions:

1) The CTE registers its identification and/or its content or content list with the AS (this may occur after step 2).

2) The destination CTEs also register its identification with the AS (this may occur before step 1).

3) The AS then updates the user service profile using the received information.

4) The CTE requests PBS with the AS.

5) The AS then carries out the AAA procedure for the requesting user and CTE.

6) If the AAA result is valid then the AS grants PBS to the requesting CTE. Otherwise, it notifies the denial of PBS to the CTE.

7) The CTE designates the destination CTEs and the contents the user wants to broadcast.

8) The AS queries the appropriate content for the request using the user service profile.

9) If the query is unsuccessful, the AS inquires the AS of the other ASP for the requested content.

10) If the requested content is found, the AS of the other ASP passes the content or its list to the originating AS.

11) Sessions between the AS and the designated CTEs, or between the requesting CTE and the designated CTEs, or the AS of the other ASP are established.

12) The AS starts PBS with the delivery of the requested contents.

13) The AS carries out the charging process for the PBS provision.

9.4.2 Event driven service (EDS)

EDS is a typical convergence service performing convergence between functions owned by multiple ASPs. EDS provides users with the relevant information and communication by the various personal conditional environments. An alternative terminology for events for

network-related applications is 'triggers' – these are assumed to be included in the present description. Events could be defined as any activities which occur within a service area caused by user actions, connectivity signals, signals related to service selection and service availability, signals classifying provider and associated control signals, and billing signals. Events can be managed, for example, as part of a context-aware application. EDS could carry out a procedure for processing a user's requested information about mobile network-based entities, such as the combination of functions with various types of information, such as LBS (location-based service) information and area information, etc. In multiple ASP environments, the user has his customized EDS in the network. The EDS automatically connects the appropriate CTE consistent with a user profile. EDS can also send the collected information to other requesting users.

The user can record/retrieve the user-related information to/from the information base through EDS. The information base may initially reside in the server of the ASP side. The cache of the CTE may partly store the information and can be autonomously updated.

9.4.2.1 Description

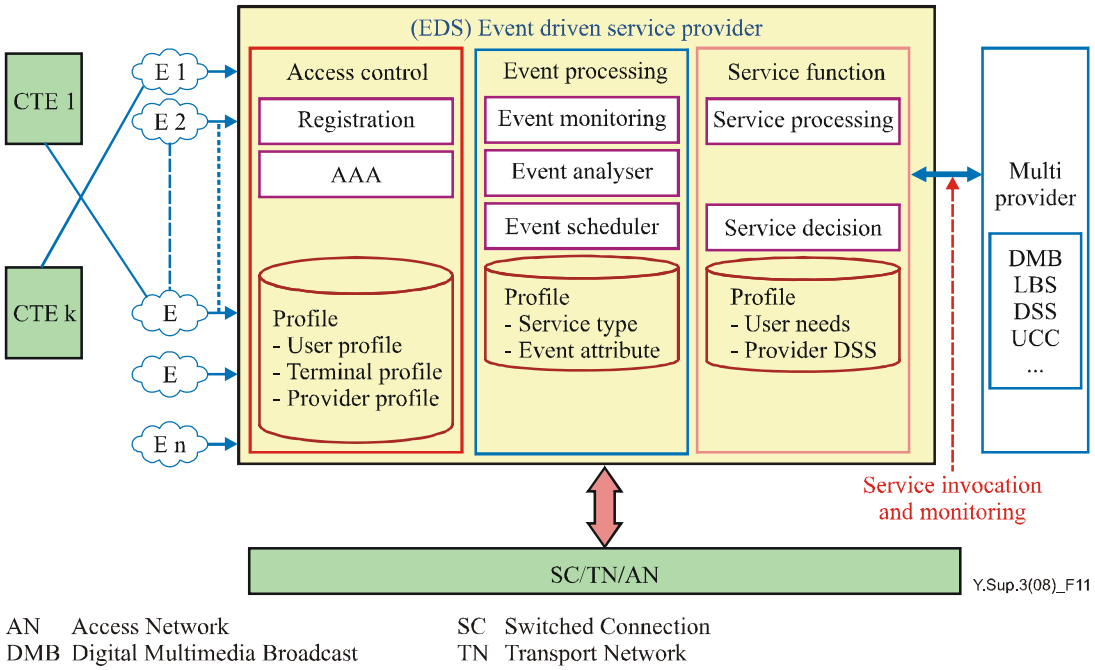


Figure 11 – Configuration of EDS system function

EDS consists of service functions of multiple ASPs. The EDS provider has an access control function, event processing function, and service function. The EDS services may include LBS (location-based service) function, DSS (discovery service) function, and push service function, etc., in the multi-provider environment. E_1, E_2, ..., E_n refer to events or triggers.

The occurrence of an event from users can trigger the invocation of one or many service functions. EDS could be provided using service functions, event generation functions, and event processing functions, etc.

The functions within the architecture are as follows:

- Access control has a registration function of user profiles, terminal profiles, and provider profiles for providing the proper application services when applying AAA to users. AAA performs authentication for verifying user ID and authorization for providing specific access service and accounting services of it. The requested services could be offered

performing the AAA function on the basis of preregistered profile data such as user ID, terminal ID, etc. The requesting user is informed of the billing transaction at the release process, and the AS processes a distribution of charge between ASPs.

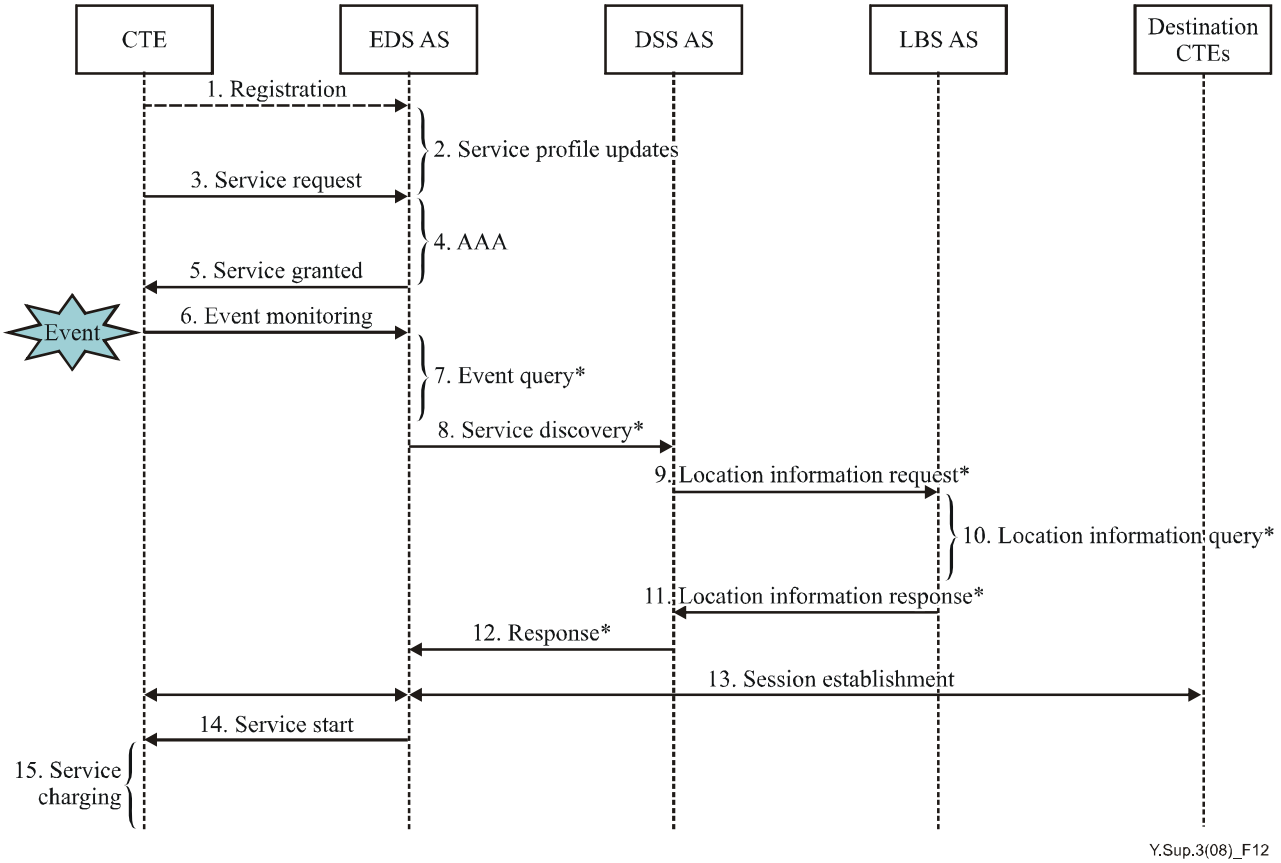
- The event processing function makes the choice of the best suited access option, by taking into consideration the application requirements and user preferences by analysing event attributes. Corresponding information is maintained and structured in profiles, which are located in the access profile of the access control function. These profiles could be accessed by the service functions in order to combine link-specific parameters with user preferences and application requirements.

9.4.2.2 Information flow

A typical example of information flow for EDS is shown as follows:

Assumptions:

1) When the user is not subscribed to an ASP then he/she will be charged on a usage basis by each ASP.
2) The details of the AS are hidden for simplicity.
3) DRM processing for license transaction in the AS is also hidden.
4) The flows shown here are at a high level and are not meant to show the actual detailed protocol procedures.
5) Events can be generated by a user's request or according to movement of the CTE.



NOTE – Steps with * are executed only if needed.

Figure 12 – Flow for the event driven service

Flow descriptions:

1) The CTE registers user information and subscriber service identification.
2) The EDS AS then updates the user service profile using the received information.
3) The CTE requests the EDS from the AS.
4) The EDS AS then carries out the AAA procedure for the requesting user and CTE.
5) If the AAA result is valid then the EDS AS grants the EDS to the requesting CTE. Otherwise, it notifies the denial of EDS to the CTE.
6) The EDS AS monitors whether the requested events occur.
7) If the requested events are detected, the EDS AS queries event parameters for the events. If the parameters are found locally, go to the step 13.
8) The DSS AS searches the appropriate service types.
9) The DSS AS demands the related parameters for the requested service to the corresponding LBS AS.
10) The LBS AS queries the related location information.
11) The LBS AS delivers the collected information to DSS AS.
12) The DSS AS responds with the collected information.
13) The sessions between the AS and the destination CTEs, or between the originating CTE and the destination CTEs are established.
14) The EDS AS starts the requested service with the collected information.
15) The EDS AS carries out the charging process for the provision of the requested service.

10 Security considerations

As convergence services are provided in NGN, new concerns and threats, unknown in the legacy networks, may be encountered. Therefore, additional measures may be required to guarantee at least the current level of security.

Further details of security matters are found in clauses 7.1.3.5, 8.2.2 and 8.2.3.

The security requirements within service elements and network elements to support convergence services in a multiple network and application service provider environment of NGN are addressed by [ITU-T Y.2701] and [ITU-T X.805].

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