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

Next Generation Networks – Frameworks and functional architecture models

Functional requirements and architecture of the web service component in next generation networks

Recommendation ITU-T Y.2024

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Recommendation ITU-T Y.2024

Functional requirements and architecture of the web service component in next generation networks

Summary

Recommendation ITU-T Y.2024 provides the functional requirements and architecture of the web service component using web technologies in next generation networks (NGNs). The web service component in NGN basically supports legacy web services and converged NGN services through the interworking with the internet protocol (IP) multimedia service component and/or the internet protocol television (IPTV) services component.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.2024	2012-07-29	13

Keywords

NGN, web.

FOREWORD

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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1 Scope

The objective of this Recommendation is to describe the functional requirements and architecture of the web service component in NGN using web technologies (e.g., HTML, HTTP, XML, SOAP, REST). The web service component in NGN basically supports legacy web services (e.g., web-browsing, e-mail, blogging, web-office services) and converged NGN services such as web-based conversational services through the interworking with the IP multimedia service component and/or web-based multimedia streaming service through the interworking with the IPTV services component.

The scope of this Recommendation includes:

- overview of the web service component in the support of legacy web services and converged NGN services;
- requirements for the web service component in NGN;
- functional architecture for the web service component in NGN;
- interworking between web service component and other service components.

This Recommendation mainly focuses on service control and content delivery functions in the service stratum of NGN. Details of web technologies are out of the scope.

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.101] Recommendation ITU-T Y.101 (2000), *Global Information Infrastructure terminology: Terms and definitions*.

[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.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 (2010), *Functional requirements and architecture of next generation networks.*

[ITU-T Y.2021] Recommendation ITU-T Y.2021 (2006), *IMS for Next Generation Networks*.

[ITU-T Y.2031] Recommendation ITU-T Y.2031 (2006), *PSTN/ISDN emulation architecture*.

[ITU-T Y.2091] Recommendation ITU-T Y.2091 (2008), *Terms and definitions for Next Generation Networks.*

[ITU-T Y.2201] Recommendation ITU-T Y.2201 (2009), *Requirements and capabilities for ITU-T NGN*.

[ITU-T Y.2232] Recommendation ITU-T Y.2232 (2008), *NGN convergence service model and scenario using web services*.

[ITU-T Y.2235] Recommendation ITU-T Y.2235 (2008), *Converged web-browsing service scenarios in NGN*.

[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 application [ITU-T Y.101]: A structured set of capabilities, which provide value-added functionality supported by one or more services.

3.1.2 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.

NOTE – The functional entities can be used to describe a set of reference configurations. These reference configurations identify which reference points are visible at the boundaries of equipment implementations and between administrative domains.

3.1.3 functional entity [ITU-T Y.2012]: An entity that comprises an indivisible set of specific functions. Functional entities are logical concepts, while groupings of functional entities are used to describe practical, physical implementations.

3.1.4 internet protocol television (IPTV) [ITU-T Y.1901]: Multimedia services such as television/video/ audio/text/graphics/data delivered over IP-based networks managed to support the required level of QoS/QoE, security, interactivity and reliability.

3.1.5 NGN service stratum [ITU-T Y.2011]: That part of the NGN which provides the user functions that transfer service-related data and the functions that control and manage service resources and network services to enable user services and applications (see also clause 7.1 of [ITU-T Y.2011]).

3.1.6 NGN transport stratum [ITU-T Y.2011]: That part of the NGN which provides the user functions that transfer data and the functions that control and manage transport resources to carry such data between terminating entities (see also clause 7.1 of [ITU-T Y.2011]).

3.1.7 service [ITU-T Y.2091]: A set of functions and facilities offered to a user by a provider.

3.1.8 web service [ITU-T Y.2232]: A service provided using web services systems.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Programming Interface
APL-GW-FE	Application Gateway Functional Entity
APL-SCM-FE	Application Service Coordination Manager Functional Entity
AS-FE	Application Support Functional Entity
CSCF	Call Session Control Function
FE	Functional Entity
FTP	File Transfer Protocol
HTML	Hyper Text Mark-up Language
HTTP	Hyper Text Transfer Protocol
IETF	Internet Engineering Task Force
IMS	IP Multimedia Subsystem
ISDN	Integrated Services Digital Network
MMoIP	Multimedia over IP
MRB-FE	Media Resource Broker Functional Entity
MRC-FE	Media Resource Control Functional Entity
NACF	Network Attachment Control Function
NGN	Next Generation Network
NSIW-FE	Network Signalling Interworking Functional Entity
PC	Personal Computer
PCC-FE	Policy and Charging Control – Functional Entity
PDF	Policy Decision Function
PSTN	Public Switched Telephone Network
PWC-FE	Proxy Web Control – Functional Entity
QoS	Quality of Service
RACF	Resource Admission Control Function
REST	Representational State Transfer
RTCWEB	Real-Time Communication in WEB-browsers
RTSP	Real Time Streaming Protocol
SAA-FE	Service Authentication and Authorization Functional Entity
SCIM	Service Capability Interaction Manager
SIP	Session Initiation Protocol
SL-FE	Subscription Locator Functional Entity
SOAP	Simple Object Access Protocol
SUP-FE	Service User Profile Functional Entity
USIW-FE	User Signalling Interworking Functional Entity

WMF	Web Media Function
WMGC-FE	Web Media Gateway Control – Functional Entity
WMRC-FE	Web Media Resources Control – Functional Entity
WMT-FE	Web Media Transform – Functional Entity
WSCF	Web Service Control Function
WSDL	Web Service Definition Language
WSGC-FE	Web Signalling Gateway Control – Functional Entity
XML	Extensible Mark-up Language

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

The keywords "is prohibited from" indicate a requirement which must be strictly followed and from which no deviation is permitted, if conformance to this Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "is not recommended" indicate a requirement which is not recommended but which is not specifically prohibited. Thus, conformance with this Recommendation can still be claimed even if this requirement is present.

The keywords "can optionally" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option, and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

6 Overview of the web service component in NGN

6.1 Web service component

The NGN architecture [ITU-T Y.2012] has three service components for the service control function: IPTV service component [ITU-T Y.1910], PSTN/ISDN emulation service component [ITU-T Y.2031] and IP multimedia service component [ITU-T Y.2021].

- IP multimedia service component

  The IP multimedia service component supports mediated multimedia services. These services may include multimedia session services such as voice or video telephony or PSTN/ISDN simulation, and some non-session services such as subscribe/notify for presence information and the message method for message exchange.

- PSTN/ISDN emulation service component

  The PSTN/ISDN emulation service component enables the support of legacy terminals connected through a gateway to an IP network. All PSTN/ISDN services remain available and identical (i.e., with the same operating characteristics) such that end users are unaware that they are not connected to a TDM-based PSTN/ISDN. Not all service capabilities and interfaces have to be present to provide PSTN/ISDN emulation.

- IPTV service component

  Service control functions and content delivery functions can optionally be included in the IPTV service component of NGN. Thus, application functions, service control functions, and content delivery functions are included in the service stratum of the NGN architecture. IPTV service control functional block corresponds to NGN service control functions. However, NGN service control functions can optionally include other functionalities.

Additionally, the web service component is newly added into the service stratum of the NGN architecture to support web-related capabilities as shown in Figure 6-1.

- Web service component

  The web service component enables NGN services to support legacy web services and converged NGN services considering the web standard interfaces and protocols (e.g., HTML, XML, HTTP, SOAP, REST, WSDL).

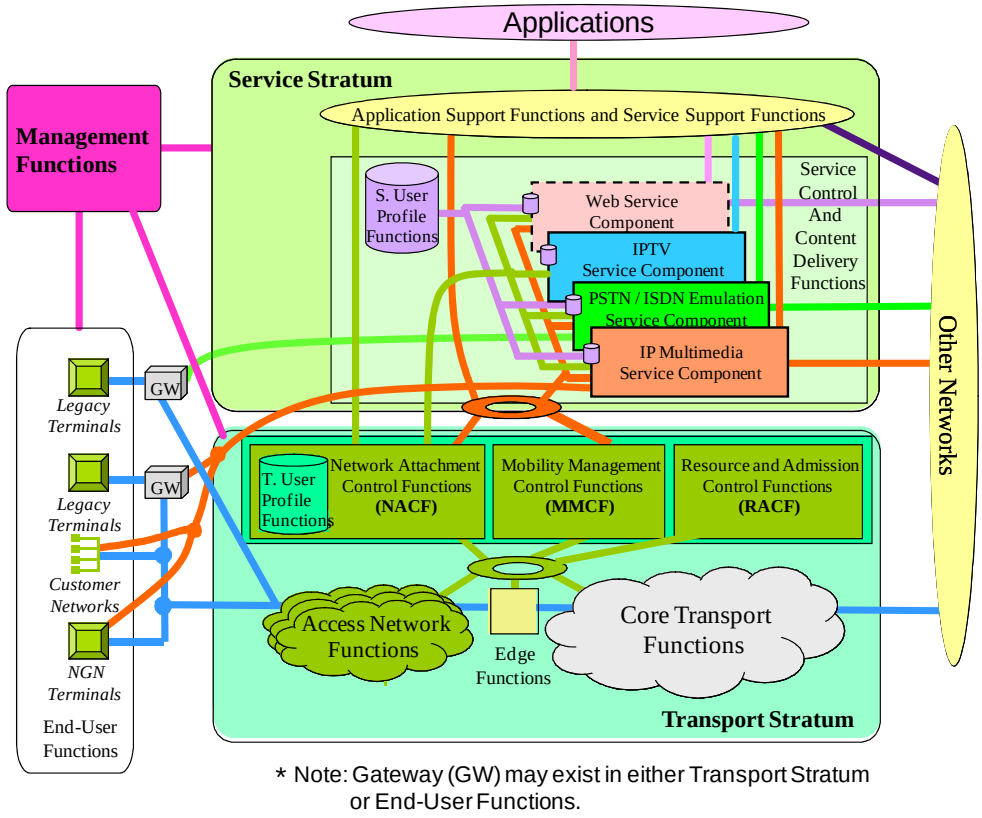

Figure 6-1 – Web service component in NGN service specific components

6.2 Service classification using the web service component

NGN needs to support multi-service capabilities which support various composition services simultaneously. The network requires networking environment with NGN/web convergence.

Depending on the type of service control, web services in the NGN can be classified as follows.

- Legacy web services: Well-known web services using web in an NGN environment (e.g., web-browsing, e-mail, blogging and web-office services).
- Converged NGN services: Interworking services with web and NGN
  - Web-based IMS services (e.g., MMoIP using web) using interworking with IP multimedia service component
  - Web-based streaming services (e.g., IPTV using web) using interworking with IPTV service component

– Web-based composition services (e.g., MMoIP and IPTV using web) using interworking with the web service component and other service components.

7 Requirements for the web service component in NGN

The web service component in NGN has the following general requirements to support web-related applications/services.

- It is required to support web-based application for satisfying interoperability across wired and wireless network environments.

  NOTE 1 – The web-based application support enablers allow enhanced utilization of device capabilities and network characteristics for web-based applications [ITU-T Y.2201].

  NOTE 2 – Web-based application support capabilities provide users with a consistent web environment which spans multiple network environments and multiple devices (PC, laptop and smart phone) [ITU-T Y.2201].
- It is required to support web-based information and media types (e.g., text, audio, image, video) and related metadata formats.
- It is required to provide the service control functions (e.g., service directory, classification, session management, protocol mapping, billing and charging on the web).
- It is required to provide the media transformation functions (e.g., transcoding, filtering, QoS control and media gateway on the web).
- It is required to support the interaction with existing NGN services and transport control functions (e.g., user profile function in service stratum and RACF, NACF in transport stratum).

The web service component in NGN has the following requirements to support various types of services using web.

- It can optionally support legacy web services in NGN environments.

  A number of well-known web services can optionally be supported by the web service component in NGN.

  NOTE 3 – The NGN basically supports legacy web services with no special requirements for the web service component.
- It is required to support interworking with conversation services using web.

  NOTE 4 – The service capability interaction manager (SCIM) and Parlay gateway could be used for conversation services.

  NOTE 5 – Protocol interworking between HTTP and SIP is necessary to support the web-based IMS service.
- It is required to support interworking with streaming services using web.

  NOTE 6 – The IPTV media delivery could be used for streaming services.

8 Functional architecture of the web service component

8.1 High-level NGN architecture with the web service component

Figure 8-1 shows the NGN-web convergence architectural model for interconnecting NGN and web. The architecture mainly comprises the web service control function (WSCF) and the web media function (WMF). The WSCF performs adaptation function between the NGN service stratum and the web. The WMF performs interworking between the NGN transport stratum and the web.

In Figure 8-1, the service components are related to each other and may contain a common or shared functionality.

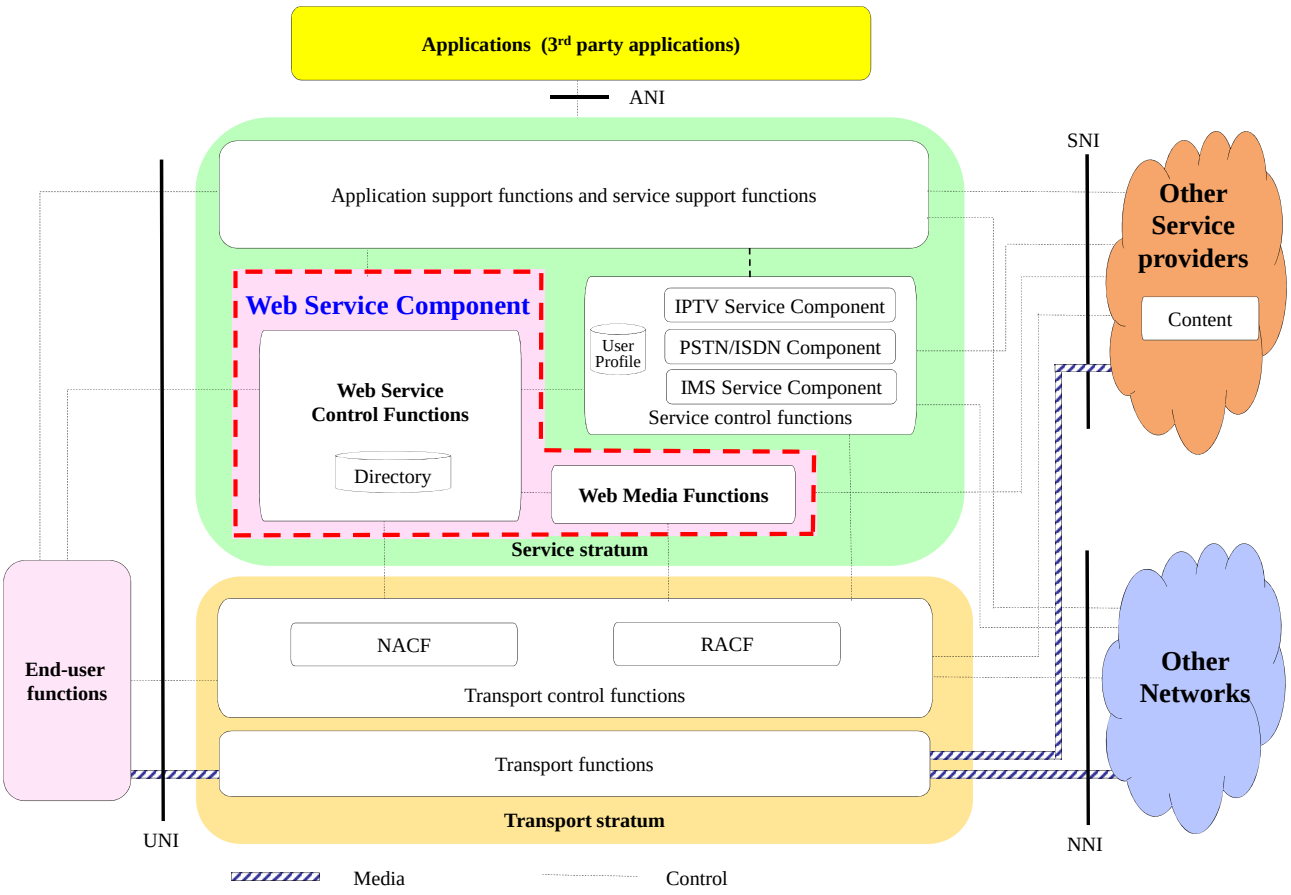

Figure 8-1 – NGN architecture with web service component

Figure 8-2 depicts related service components for various web services in NGN. The web service component interacts with the IPTV service component as well as the IP multimedia service component for converged NGN services. Common functionalities are a group of functional entities which are specified in another service component. There are four cases of the different service components in the figure as follows:

- Case 1: Web service component;
- Case 2: Web service component and IPTV service component;
- Case 3: Web service component, IP multimedia service component and IPTV service component;
- Case 4: Web service component and IP multimedia service component.

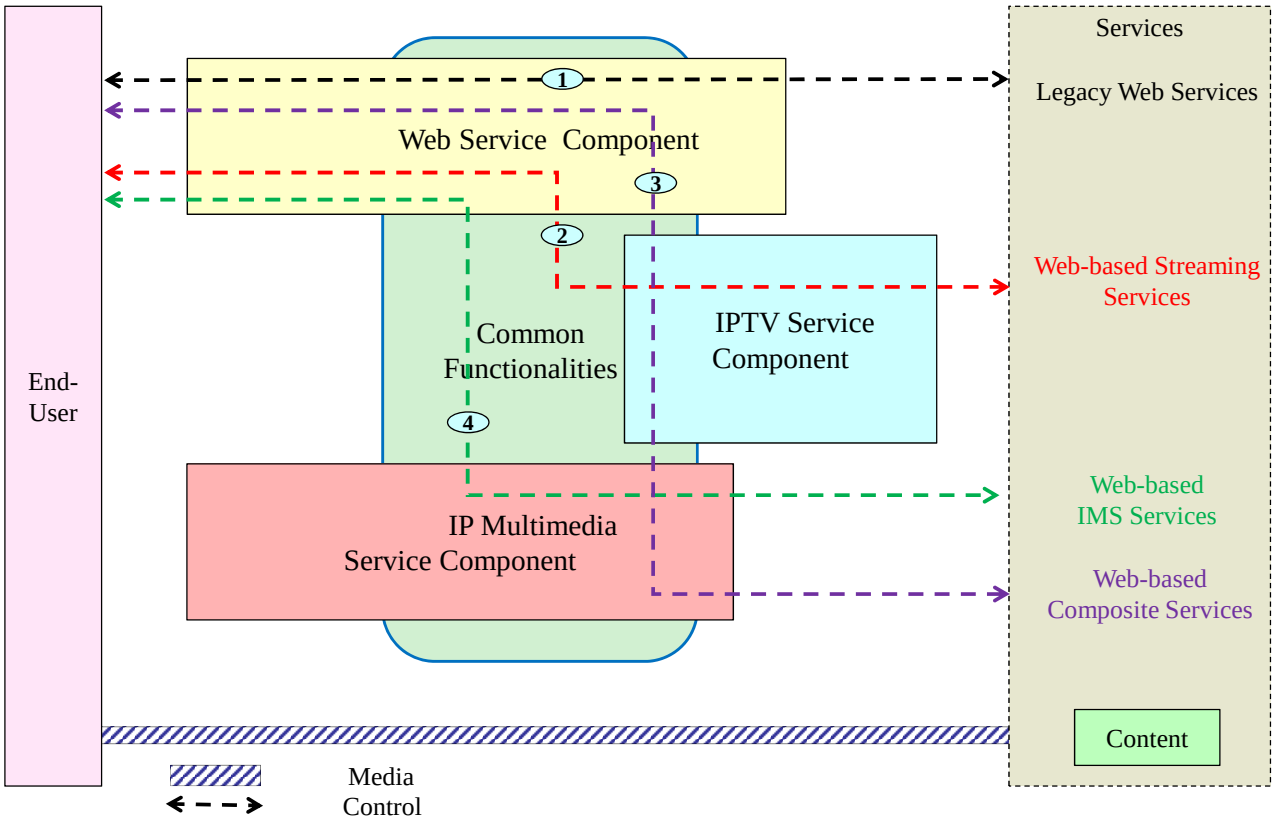

Figure 8-2 – Service classification according to different service control

Appendix II describes related functions for the web service in NGN as common functionalities.

8.2 Functional entities for the web service component

The web service component comprises the following functional entities (FEs):

The web service control functions include:

- PWC-FE (proxy web control functional entity): PWC-FE performs functionalities as a proxy between the web server and the HTTP client through interaction with the directory, including profile information;
- WSGC-FE (web signalling gateway control functional entity): WSGC-FE performs the functionalities of signalling gateway and session manager;
- PCC-FE (policy and charging control functional entity): PCC-FE instructs PEC-FE and gets information of session flow or service usage from PEC-FE at the transport control functions;
- WMRC-FE (web media resources control functional entity): WMRC-FE is in charge of controlling resources to the users.

Web media functions include:

- WMGC-FE (web media gateway control functional entity): WMGC-FE is controlled by the WSGC-FE in order to allow authorized media flow;
- WMT-FE (web media transform functional entity): WMT-FE performs media adaptation according to different user devices and transport environments.

Figure 8-3 depicts the functional entities of the web service component in NGN.

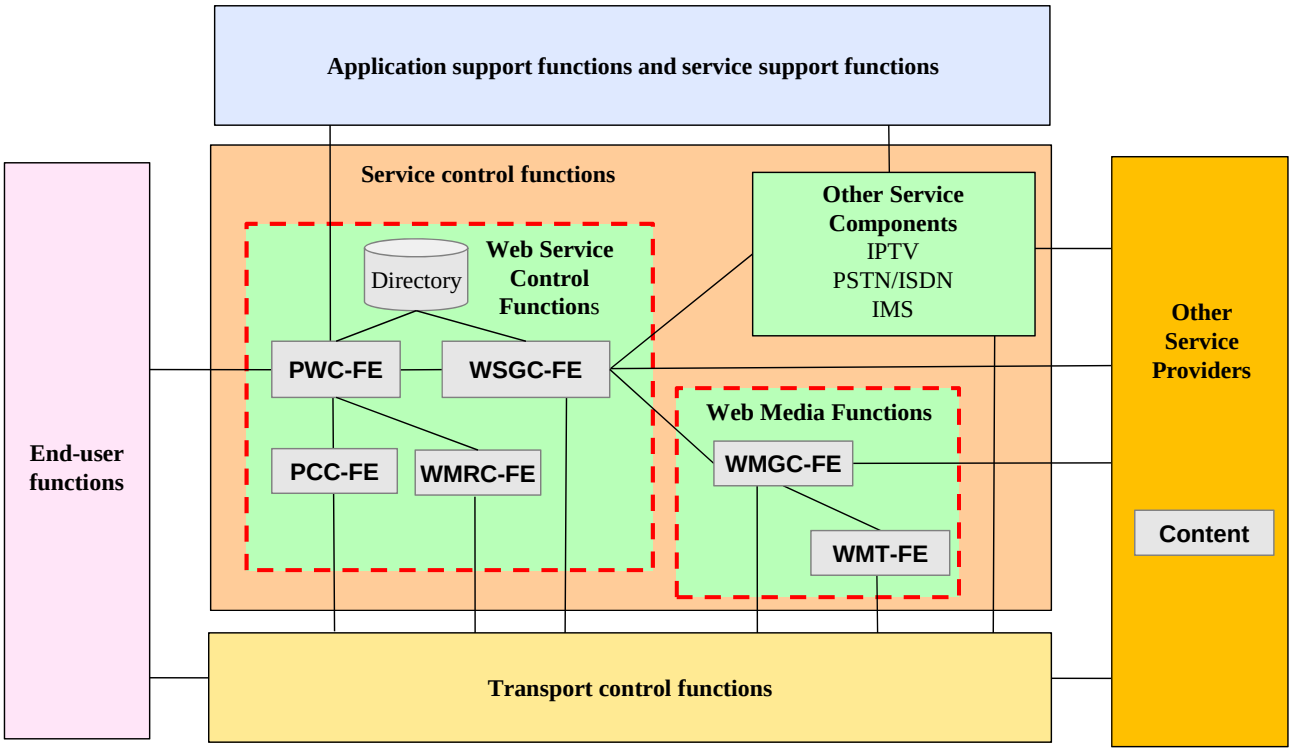

Figure 8-3 – Functional entities of the web service component in NGN

NOTE – The transport stratum of NGN is out of scope.

8.2.1 Web service control function (WSCF)

Key capabilities for WSCF include:

- Service directory: It holds a list of peer web server;
- Service classification: It identities service types for appropriate service control;
- Signalling mapping and translation (adaptation function): It performs protocol conversion (e.g., between HTTP and SIP);
- Session manager: It performs session management with session control functions;
- Billing and charging: It performs traffic measurement/monitoring;
- Use of web interfaces: It is used for search and discovery through queries to the directory/repository.

Interactions between WSCF and other components [ITU-T Y.2021], [ITU-T Y.2031], [ITU-T Y.1910] are performed as follows:

- NGN service control functions: CSCF, profile management;
- Web media function: media delivery and conversion (gateway functions);
- Web components: interface with web server and web service description languages as well as support of personalization and social networking using mesh-up, semantic and ontology;
- Application support functions and service support functions: service creation, service composition.

8.2.2 Web media function (WMF)

Key capabilities for WMF include:

- Transcoding: conversion between different codecs;
- Packet filtering: depending on IP addresses and port numbers;
- QoS control: resource allocation and management, policing based on media flow parameters (e.g., packet size and bandwidth limits);
- Media gateway: media delivery and conversion as well as transport interworking between NGN and web.

Interactions with other components for WMF are performed as follows:

- NGN transport control functions: interaction with RACF and NACF;
- Web server: interface with the media transport protocol (e.g., RTSP).

9 Interworking between the web service component and other service components

This clause introduces interworking between the web service component and other service components to support the interactions among relevant functions to provide web services as well as web-based services.

9.1 Interactions for the support of legacy web services

The end user requests a web service to the web service control functions utilizing the HTTP protocol to communicate with the web server. Next, the web service control functions determine an appropriate web server to provide the request service with directory by referring service user profile functions. The web server creates a web service by transferring a service response message to the end user. At this time, if the web server cannot support the requested format from the end user, the web media functions can transcode the media data into a format appropriate for the end user's device.

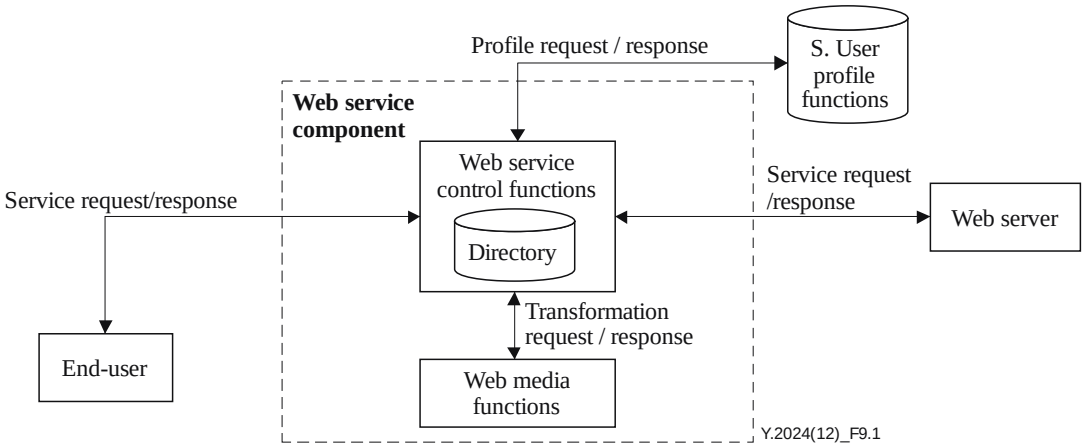

Figure 9-1 – Legacy web services using the web service component

9.2 Interactions for the support of web-based conversation services

The end user requests a conversation service to the web service control functions utilizing the HTTP protocol to communicate with the IP multimedia service component. The IP multimedia service component creates a conversation service by a method of calling relevant APIs to interact with the IMS call server and then responds to the service request from the end user. At this time, if the IMS call server cannot support the requested codec from the end user, the web media functions can transcode the media data into a format appropriate for the end user.

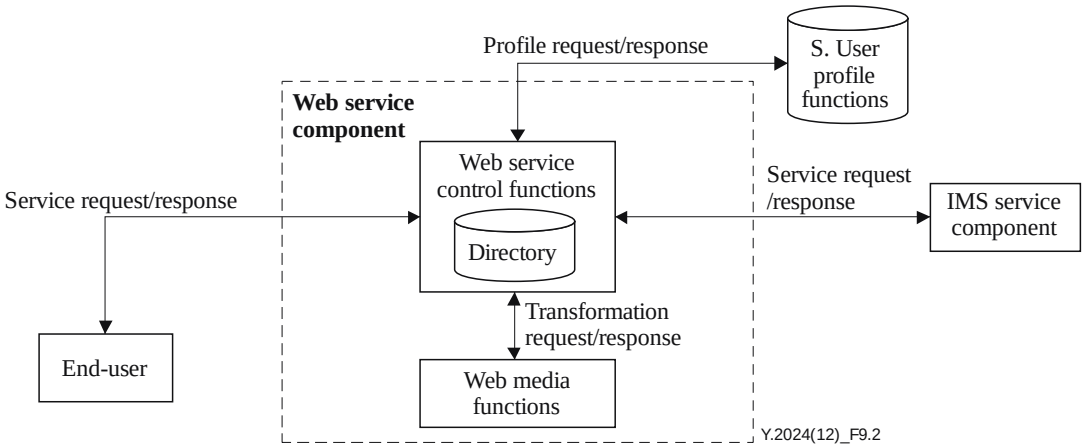

Figure 9-2 – Web-based conversation services using the web service component

9.3 Interactions for the support of web-based streaming services

The end user requests a streaming service to the web service control functions utilizing the HTTP protocol to communicate with the IPTV service component. The IPTV service component creates a streaming service by delivering video streaming to the end user. At this time, if the IPTV service component cannot support the requested video streaming format from the end user, the web media functions can transcode the media data into a format appropriate for the end user.

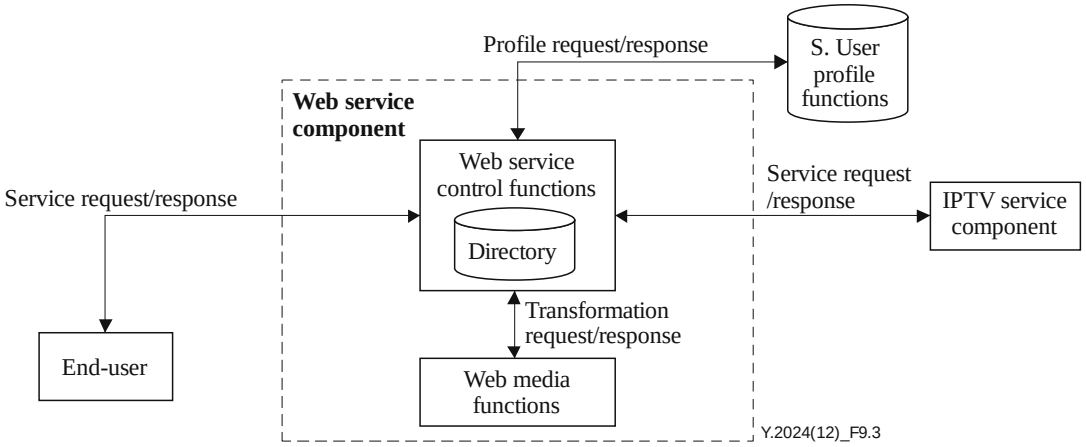

Figure 9-3 – Web-based streaming services using the web service component

10 Security considerations

The security requirements within the functional requirements and architecture of the web service component in NGN are addressed by the security requirements for NGN in [ITU-T Y.2701] and [ITU-T Y.2702].

Appendix I

Relationship among NGN service specific components with the web service component in the NGN architecture

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

This appendix describes the relationship among NGN service specific components with the web service component in NGN.

Figure I.1 describes the relationship with each service component of NGN.

- The IP multimedia service (IMS-based) component is specified further in [ITU-T Y.2021].
- The PSTN/ISDN emulation service (IMS-based and call server) component is specified further in [ITU-T Y.2031].
- The IPTV service (IMS-based, non-IMS, and non-NGN) component is specified further in [ITU-T Y.1910].
- The web service component will be specified in this Recommendation. In case of web-based, interworking with other service components will be necessary.

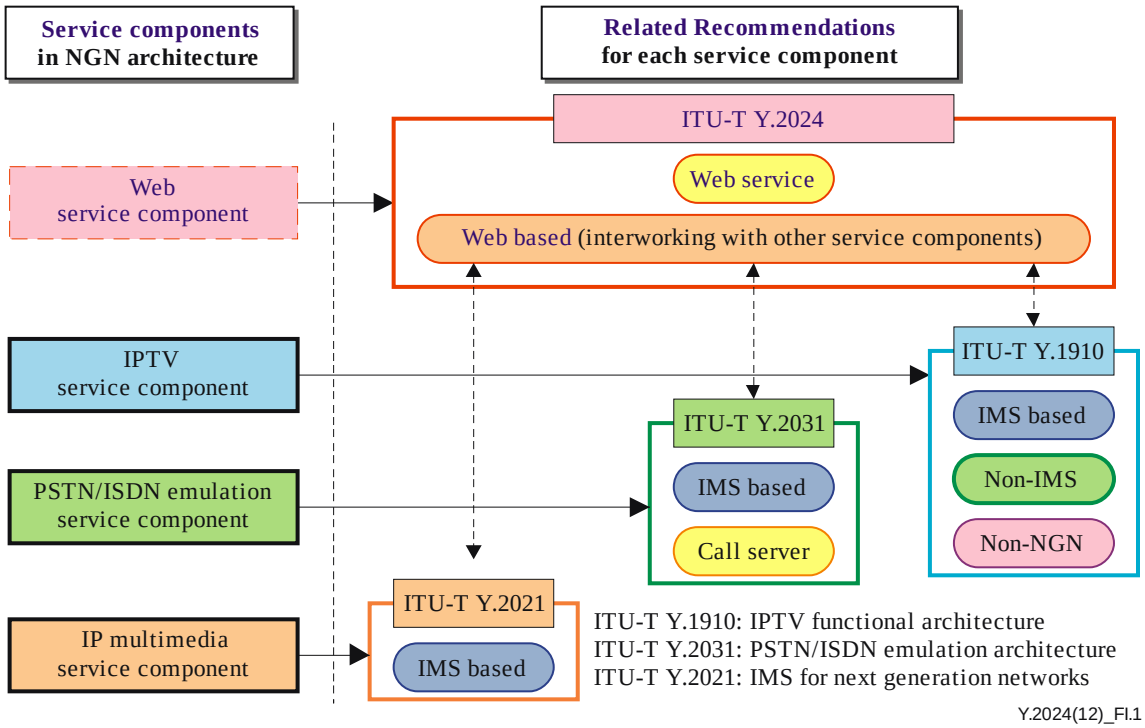

Figure I.1 – Service components and relationships in NGN architecture

Appendix II

Relationship of web service component functions with other NGN functions

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

This appendix identifies the mapping relationship with [ITU-T Y.2235] and common functionalities which include several FEs for authenticating/authorizing, protocol interworking, media adaptation and service/application support defined in [ITU-T Y.2012].

II.1 Relationship between ITU-T Y.2235 and ITU-T Y.2024

Table II.1 shows the mapping relationship with the functions defined in [ITU-T Y.2235] and this Recommendation. It indicates that the FEs below perform almost the same role, respectively.

Table II.1 – Mapping between ITU-T Y.2235 and ITU-T Y.2024

Recommendation ITU-T Y.2235	Recommendation ITU-T Y.2024
Functional entities	**Corresponding functional entities**
Web proxy function	PWC-FE
Profile serving function	Directory
Content transformation function	WMT-FE

II.2 Related functions for the web service in NGN

Some of the functions defined in [ITU-T Y.2012] are used for supporting the web service component as common functionalities. These functionalities include several FEs for authenticating/authorizing, protocol interworking, media adaptation and service/application support.

II.2.1 Authentication-related FEs

The following FEs could be used for authenticating and authorizing service access of IMS, IPTV, and web, as well.

– Service authentication and authorization functional entity (SAA-FE): It provides authentication and authorization in the service stratum.

– Subscription locator functional entity (SL-FE): It is used to find the address of the physical entity that holds the subscriber data for a given user identifier when multiple, separately addressable SUP-FEs have been deployed by the NGN operator.

– Service user profile functional entity (SUP-FE): It is responsible for storing user profiles, device profiles, subscriber-related location data, and presence status data in the service stratum. A user profile is a set of stored information related to authentication, authorization, mobility, location and charging. A device profile is a set of stored information related to the terminal (e.g., screen size and supported media).

II.2.2 Interworking related FEs

The following FEs could be used for protocol interworking between HTTP and RTSP, SIP and HTTP.

– User signalling interworking functional entity (USIW-FE): It has the responsibility for the interworking and information screening functions for different types of application signalling at the subscriber side. It is assumed that protocol interworking happens, for example between HTTP and SIP, in this functional entity.

– Network signalling interworking functional entity (NSIW-FE): It has the responsibility for the interworking for different types and profiles of application signalling at the trunking side. It is assumed that protocol interworking happens, for example between HTTP and SIP, in this functional entity.

II.2.3 Media control-related FEs

The following FEs could be used for controlling media adaptation of audio, video and web page.

– Media resource control functional entity (MRC-FE): It controls the media resource processing functional entity (MRP-FE) by operating as a media resource control function. It should be used for enabling MRP-FE to transform the web content into an appropriate form according to the profile information

– Media resource broker functional entity (MRB-FE): It assigns specific media server resources (i.e., MRC-FE and MRP-FE) to incoming calls at the request of service applications.

II.2.4 Application related FEs

The following FEs could be used for blending service features and making new converged services by interworking among IMS, IPTV and the web service component.

– Application support functional entity (AS-FE): It supports generic application server functions including hosting and executing services.

– Application gateway functional entity (APL-GW-FE): It serves as an interworking entity between the applications and the S-CSC-FE of the service stratum.

– Application service coordination manager functional entity (APL-SCM-FE): It manages interactions between multiple applications and services. It should be used for providing the web-based composite services.

Appendix III

Information flows for services using the web service component in NGN

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

III.1 Procedure for the support of legacy web services

The information flow for legacy web service using the web service component with directory including profile information is shown in Figure III.1.

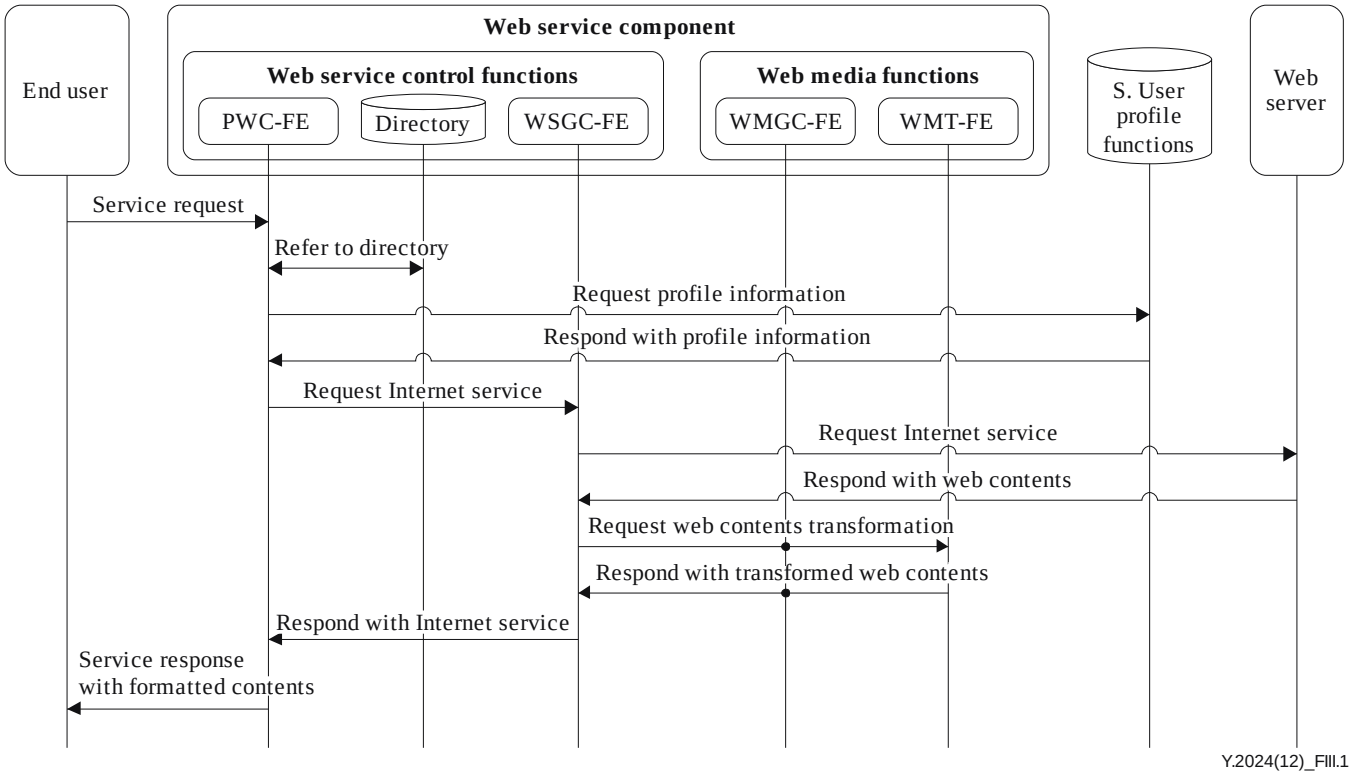

Figure III.1 – Message flow for legacy web service using the web service component

The information flow is:

a) The end user requests the web service to get web contents utilizing HTTP protocol;

b) The web service component, especially PWC-FE, refers to directory to get a list of peer web servers;

c) PWC-FE requests profile to refer information of the end user;

d) Service user profile function responds with the profile of the end user;

e) PWC-FE determines a web server and requests web service to WSGC-FE with user profile;

f) WSGC-FE requests web service to the web server;

g) Web server responds with the requested web contents to WSGC-FE;

h) If the web server cannot support the requested format according to the user profile, WSGC-FE requests web contents transformation to WMT-FE through WMGC-FE;

i) WMT-FE transcodes web contents into a format appropriate for the end user's device and sends them to the WSGC-FE;

j) WSGC-FE responds with the formatted web contents to PWC-FE;

k) PWC-FE responds to the end user.

III.2 Procedure for the support of web-based conversation services

The information flow for the conversation service using the web service component with directory including profile information is shown in Figure III.2.

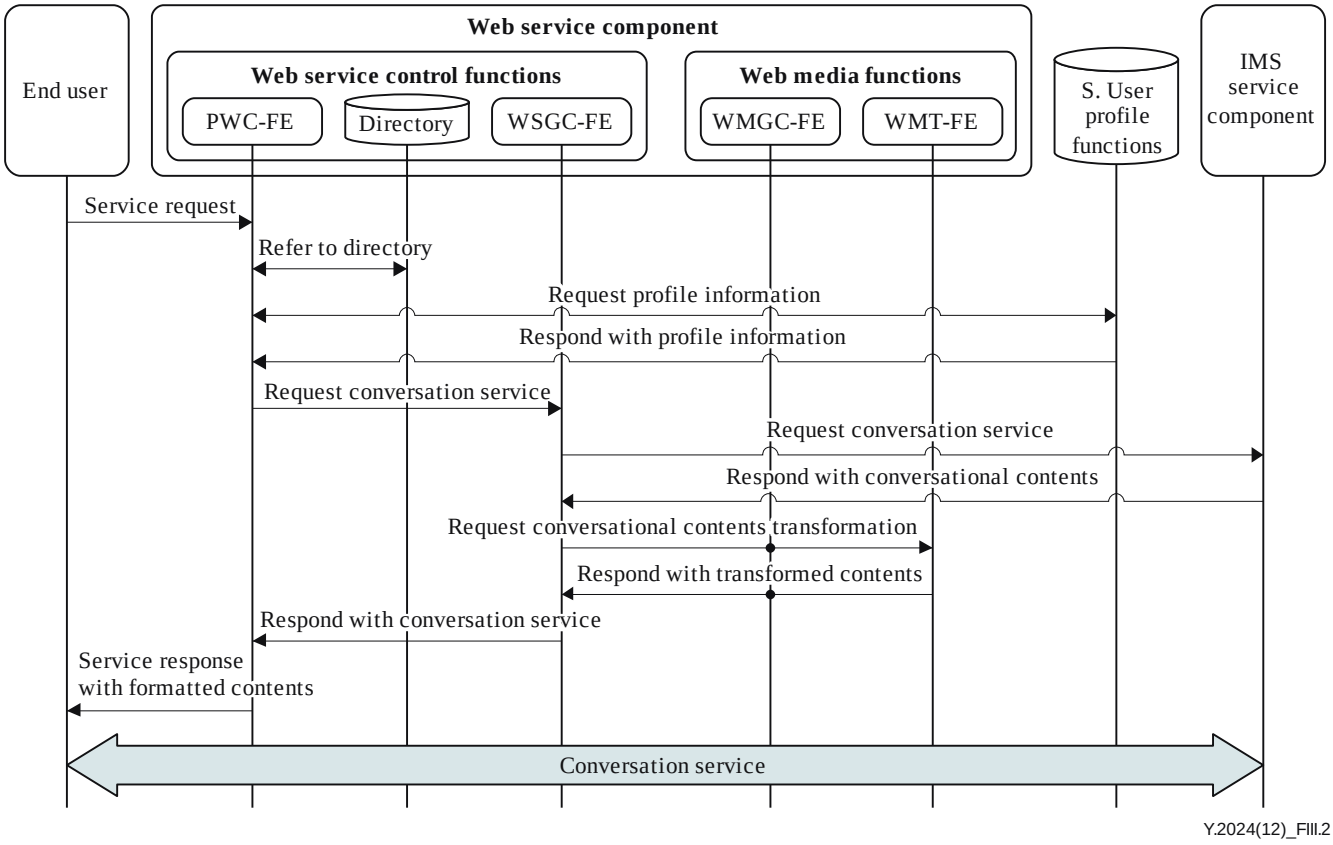

Figure III.2 – The message flows for web-based conversation services using web service component

The information flow is:

a) The end user requests the conversation service to the web service component utilizing the HTTP protocol in order to communicate with the IP multimedia service component that interacts with the IMS call server;

b) The web service component, especially the PWC-FE, refers to directory to get a list of peer IMS call servers;

c) PWC-FE requests profile to get information of the end user;

d) The service user profile function responds with the profile of the end user;

e) PWC-FE selects an IMS call server and requests the conversation service to WSGC-FE with the user profile;

f) WSGC-FE converts protocol HTTP into SIP and requests conversation service to the IMS service component;

g) The IP multimedia service component creates a conversation service by calling the relevant APIs with IMS call server and responds to WSGC-FE. Also WSGC-FE converts protocol SIP into HTTP;

h) If the IMS call server cannot support the requested codec according to user profile, WSGC-FE requests transformation of conversational contents to WMT-FE through WMGC-FE;

i) WMT-FE transcodes contents into a format appropriate for the end user's device and sends them to the WSGC-FE;

j) WSGC-FE responds with formatted conversational contents to PWC-FE;

k) PWC-FE responds to the end user.

III.3 Procedure for the support of web-based streaming services

The information flow for the web-based streaming service using the web service component with directory including profile information is shown in Figure III.3.

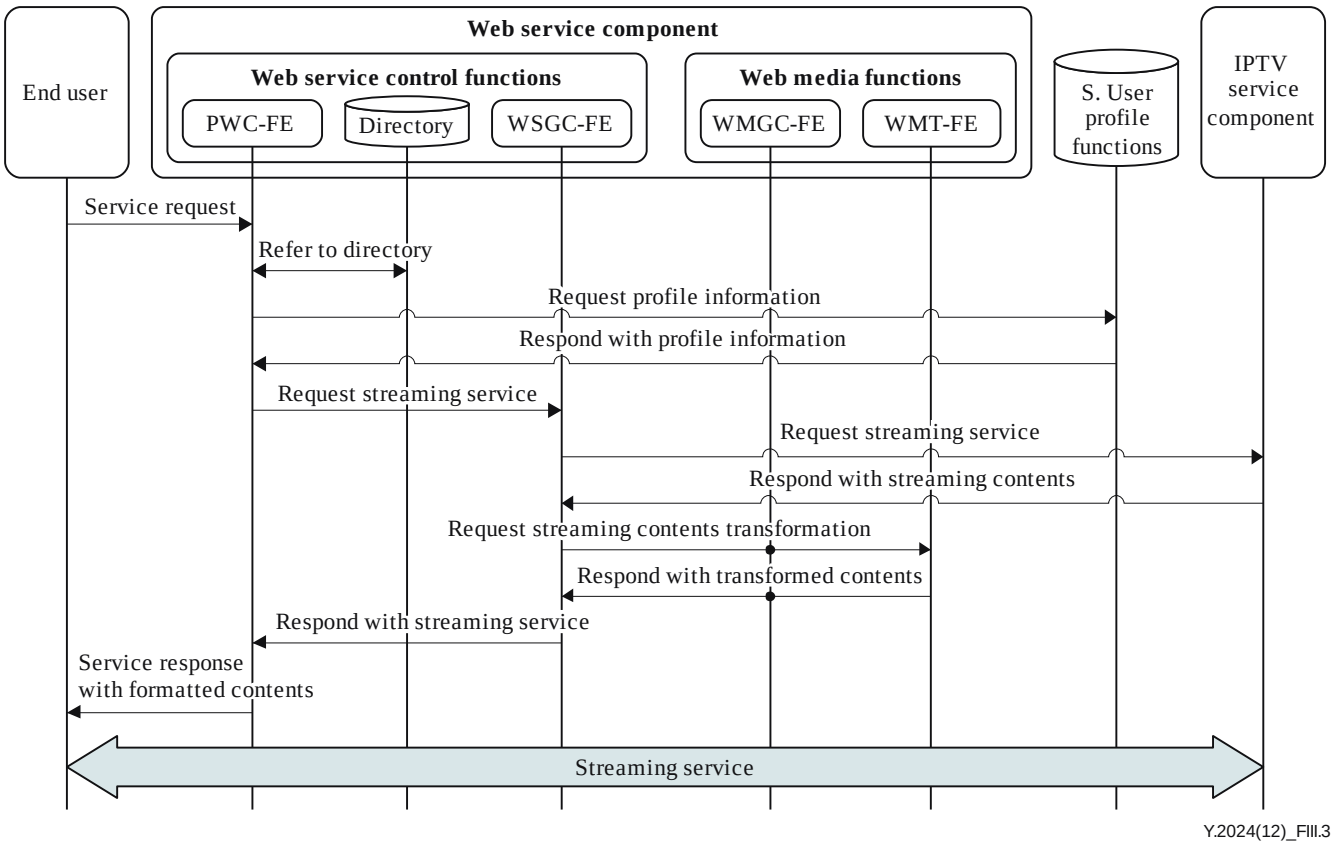

Figure III.3 – The message flows for web-based streaming services using web service component

The information flow is:

a) The end user requests the streaming service to the web service component utilizing the HTTP protocol in order to receive video streaming contents;

b) The web service component, especially the PWC-FE, refers to the directory to get a list of peer streaming servers;

c) PWC-FE requests profile to get information of the end user;

d) The service user profile function responds with the profile of the end user;

e) PWC-FE determines a streaming server and requests streaming service to WSGC-FE with user profile;

f) If the streaming server cannot support the HTTP protocol, WSGC-FE converts protocol HTTP into an appropriate protocol and requests streaming service to the IPTV service component;

g) The IPTV service component creates a streaming service with the streaming server and responds to WSGC-FE. Also WSGE-FE converts the protocol into HTTP;

h) If the streaming server cannot support the requested codec according to the user profile, WSGC-FE requests transformation of streaming contents to WMT-FE through WMGC-FE;

i) WMT-FE transcodes contents into an appropriate format to end user's device and sends them to the WSGC-FE;

j) WSGC-FE responds with formatted streaming contents to PWC-FE;

k) PWC-FE responds to the end user.

Appendix IV

IETF activities related to the web service component in NGN

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

IV.1 IETF real-time communication in web-browsers (RTCWeb)

There are a number of proprietary implementations that provide direct interactive rich communication using audio, video, collaboration and games between two peers' web-browsers, while these are not interoperable. Real-time communication in web-browsers (RTCWeb) working group in IETF attempts to standardize the basis for such communication so that interoperable communication can be established between any compatible browsers. The goal is to enable innovation on top of a set of basic components. One core component is to enable real-time media (e.g., audio and video), a second is to enable data transfer directly between clients.

[b-IETF Real] describes web-based real-time communication use cases. Based on the use cases, [b-IETF Real] also derives requirements related to the browser and the API used by web applications to request and control media stream services provided by the browser.

This appendix introduces two basic use cases even though a number of use cases are described in the above document.

- Simple video communication service

  Two or more users have loaded a video communication web application into their browsers, provided by the same service provider, and logged into the service it provides. The web service publishes information about user login status by pushing updates to the web application in the browsers. When one online user selects a peer online user, a 1-1 video communication session between the browsers of the two peers is initiated. The invited user might accept or reject the session.

  During session establishment a self-view is displayed, and once the session has been established the video sent from the remote peer is displayed in addition to the self-view. During the session, each user can select to remove and re-insert the self-view as often as desired. Each user can also change the sizes of his/her two video displays during the session. Each user can also pause sending of media (audio, video, or both) and mute incoming media.

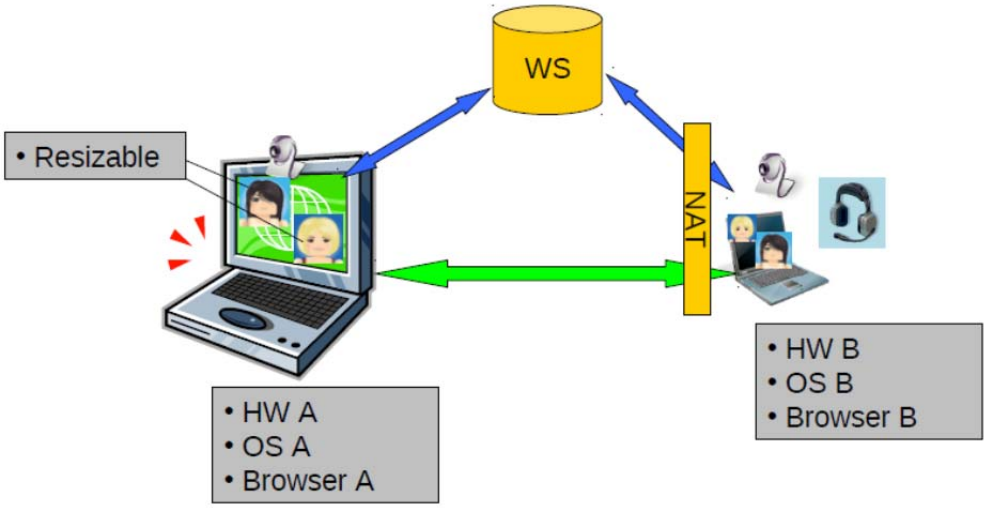

Figure IV.1 – Use case of simple video communication service

- Simple video communication service with inter-operator calling

Two users have logged into two different web applications provided by different service providers. The service providers are interconnected by some means, but exchange no more information about the users than what can be carried using SIP.

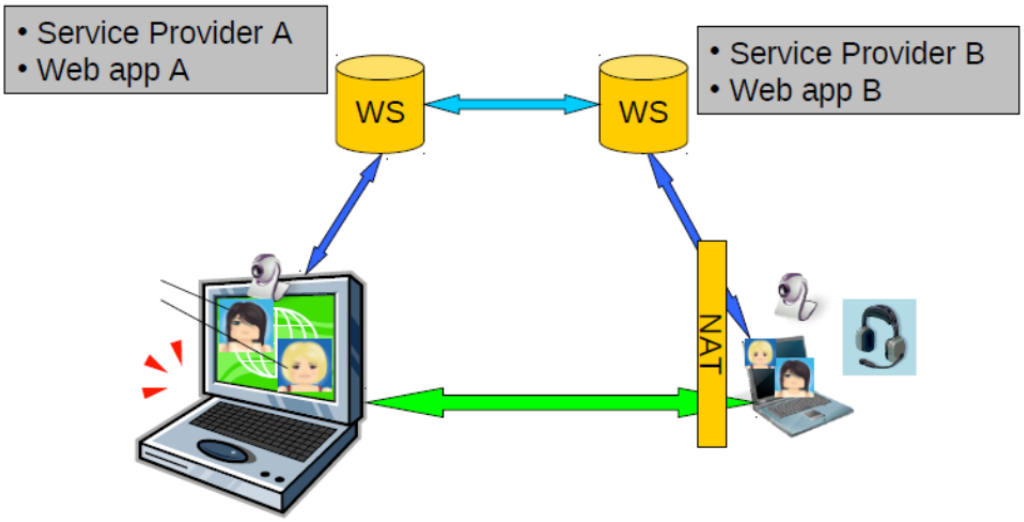

Figure IV.2 – Use case of simple video communication service with inter-operator calling

From the above introduction, the IETF RTCWeb attempts to identify and standardize web-browser's functionality running on the user side.

Bibliography

[b-IETF Real] IETF (2012), *Web Real-Time Communication use-cases and Requirements*. <http://tools.ietf.org/id/draft-ietf-rtcweb-use-cases-and-requirements-10.html>

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