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

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**ITU-T Y.2000-series – Profile-based application  
adaptation service using next generation  
networks**

ITU-T Y-series Recommendations – Supplement 15



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## Supplement 15 to ITU-T Y-series Recommendations

### ITU-T Y.2000-series – Profile-based application adaptation service using next generation networks

#### Summary

The dynamic adaptation between various service environments using the application profiles for continuous service is a key issue of the profile-based application adaptation service (PAAS) using next generation networks (NGNs). PAAS offers an optimized service framework for providing continuous services for users, such as multimedia, educational broadcasting and games, etc., using the various devices that are not restricted by the service environment of the user. This Supplement specifies the functional model and service scenario of PAAS.

#### History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y Suppl. 15	2011-10-21	13

#### Keywords

NGN, profile, profile-based application adaptation service.

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## Supplement 15 to ITU-T Y-series Recommendations

### ITU-T Y.2000-series – Profile-based application adaptation service using next generation networks

#### 1 Scope

The purpose of this Supplement is to provide continuous service for users who have service profiles with different attributes (user device, application software, frame format, etc.) for the applications using NGN. Therefore, the profile-based application adaptation service (PAAS) offers an optimized service framework for providing continuous services for users. This Supplement specifies the functional model of PAAS and service scenario.

It includes the following information:

- general description of PAAS;
- functional model for PAAS;
- functional capabilities and functional procedures of PAAS;
- a service scenario for PAAS.

#### 2 References

- [ITU-T G.8012] Recommendation ITU-T G.8012/Y.1308 (2004), *Ethernet UNI and Ethernet NNI*.
- [ITU-T T.86] Recommendation ITU-T T.86 (1998) | ISO/IEC 10918-4:1999, *Information technology – Digital compression and coding of continuous-tone still images: Registration of JPEG Profiles, SPIFF Profiles, SPIFF Tags, SPIFF colour Spaces, APPn Markers, SPIFF Compression types and Registration authorities (REGAUT)*.
- [ITU-T Y.1910] Recommendation ITU-T Y.1910 (2008), *IPTV functional architecture*.
- [ITU-T Y.2001] Recommendation ITU-T Y.2001 (2004), *General overview of NGN*.
- [ITU-T Y.2011] Recommendation ITU-T Y.2011 (2004), *General principles and general reference model for Next Generation Networks*.
- [ITU-T Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of next generation networks*.
- [ITU-T Y.2014] Recommendation ITU-T Y.2014 (2010), *Network attachment control functions in next generation networks*.
- [ITU-T Y.2018] Recommendation ITU-T Y.2018 (2009), *Mobility management and control framework and architecture within the NGN transport stratum*.
- [ITU-T Y.2111] Recommendation ITU-T Y.2111 (2008), *Resource and admission control functions in next generation networks*.
- [ITU-T Y.2261] Recommendation ITU-T Y.2261 (2006), *PSTN/ISDN evolution to NGN*.

## 3 Definitions

### 3.1 Terms defined elsewhere

This Supplement uses the following terms defined elsewhere:

**3.1.1 application** [ITU-T Y.2261]: A structured set of capabilities providing value-added functionality supported by one or more services that may be supported by an API interface.

**3.1.2 content provider** [ITU-T Y.1910]: The entity that owns or is licensed to sell content or content assets.

**3.1.3 network network interface (NNI)** [ITU-T G.8012]: An interface that is used for the interconnection of networks elements within a transport network.

**3.1.4 next generation network (NGN)** [ITU-T Y.2001]: A packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

**3.1.5 profile** [ITU-T T.86]: A specific set of capabilities, parameter values or ranges, and optionally file format. A specific implementation of the encoding processes in Rec. ITU-T T.81 | ISO/IEC 10918-1 and Rec. ITU-T T.84 | ISO/IEC 10918-3.

**3.1.6 user network interface (UNI)** [ITU-T G.8012]: An interface used for the interconnection of customer equipment with a network element of the transport network.

### 3.2 Terms defined in this Supplement

None.

## 4 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

ANI	Application Network Interface
GUI	Graphic User Interface
MMCF	Mobility Management and Control Functions
NACF	Network Attachment Control Functions
NGN	Next Generation Network
NNI	Network to Network Interface
PAAS	Profile-based Application Adaptation Service
PC	Personal Computer
PDA	Personal Digital Assistant
RACF	Resource and Admission Control Functions
SCF	Service Control Functions
SNI	Service to Network Interface
UNI	User Network Interface

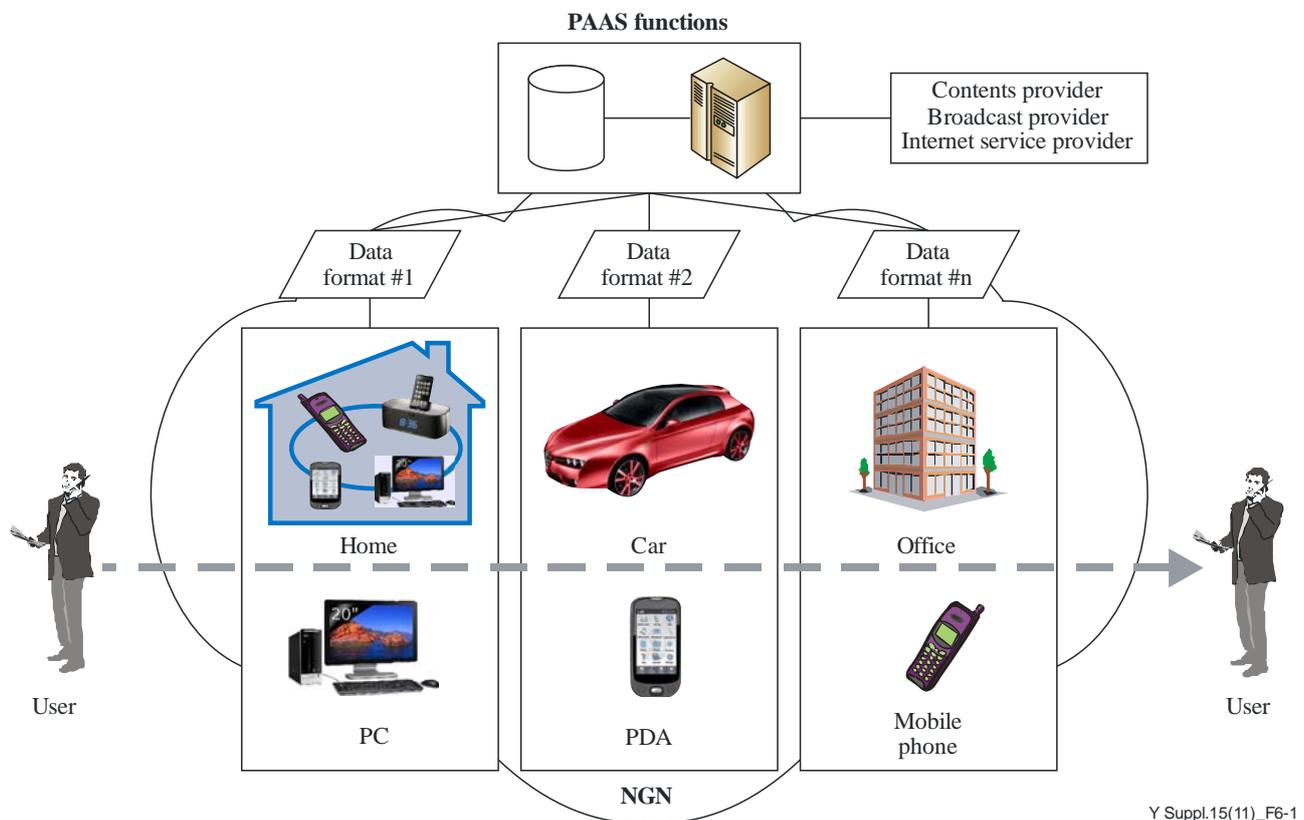
## 5 Conventions

The term "continuous service" is not used in this document to indicate service continuity when a user moves across different service environments, but rather to indicate the capability using PAAS functions to provide comparable service in different service environments.

## 6 General description of PAAS

Application profiles are registered with the service provider according to each application. They have different attributes. A user wishing to change his service environment should be provided with continuous service to adapt to the service profiles having different attributes. It is required that advanced applications using NGN overcome some of the service restrictions of the different service environments. Therefore, PAAS provides continuous service using the application profiles, which are adapted to the changed service environment such as user devices.

Figure 6-1 presents the conceptual model of PAAS. PAAS provides continuous service when a user moves from PC to PDA and/or mobile phone. The pre-encoded data formats of contents according to the different devices for the user service, are provided by the contents/broadcast/Internet service provider.



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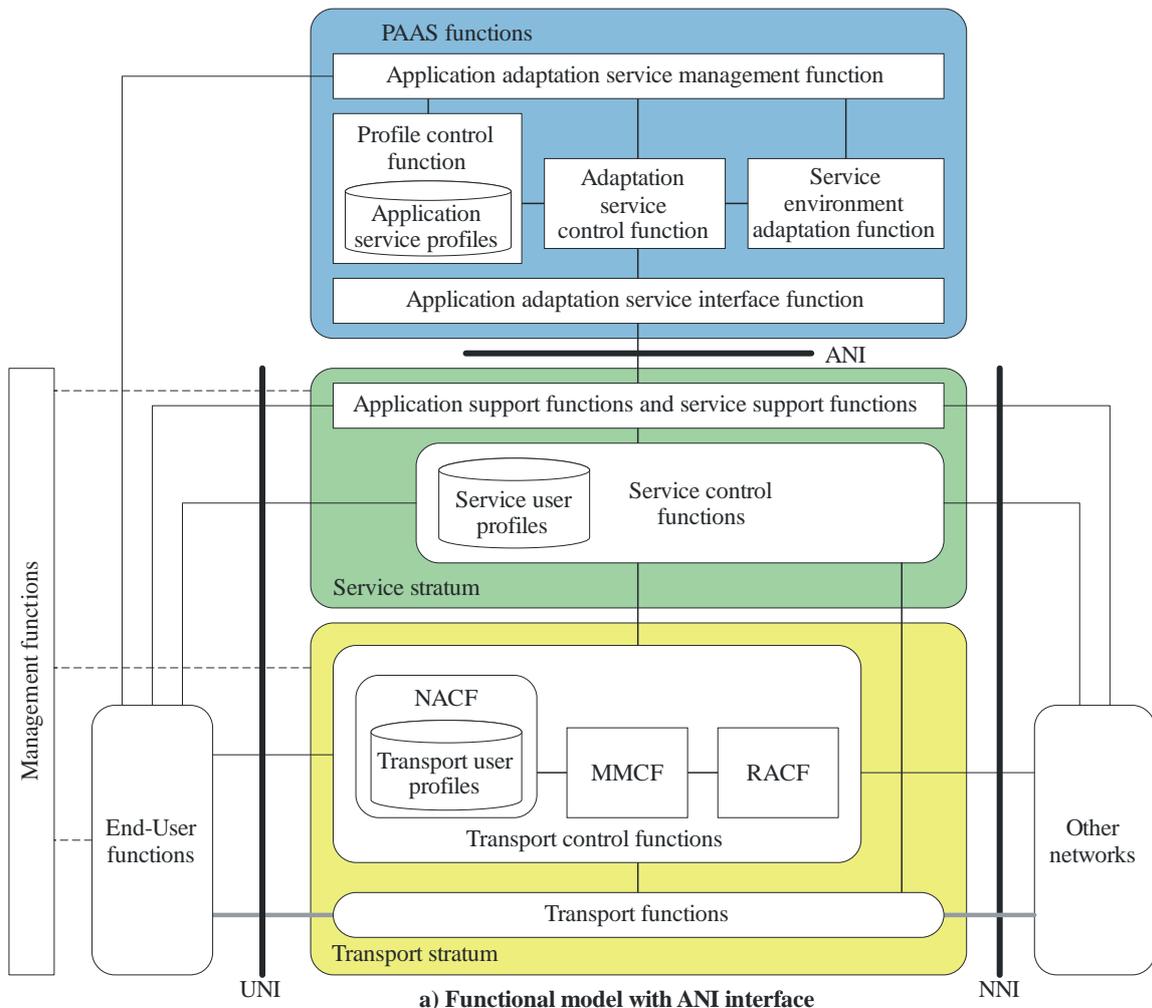
**Figure 6-1 – Conceptual model of PAAS**

In support of PAAS, the following functions are provided:

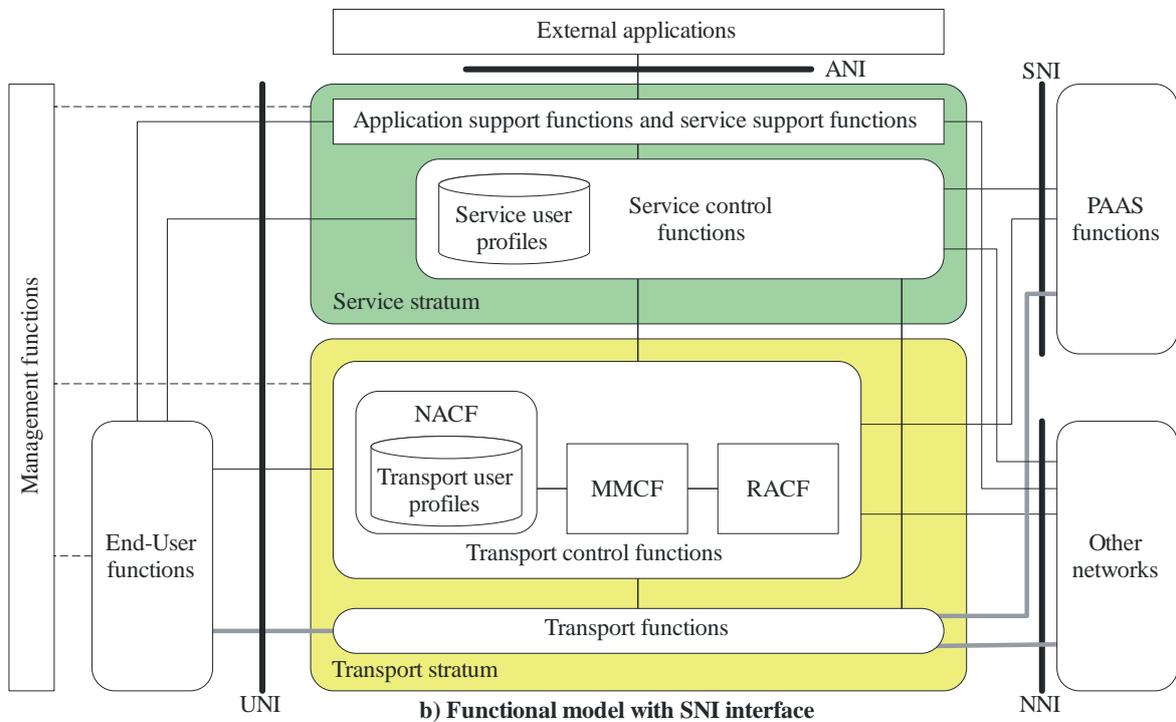
- user and service registration and management;
- facilitation for continuous services by adapting application profiles according to the changed user environment;
- efficient media conversion according to the application profiles;
- management of various application profiles (user information, device information, service information and session information).

## **7 Functional model for PAAS**

This clause describes the functional model for PAAS. Based on the NGN framework architecture [ITU-T Y.2012], this functional model uses the functions and functional entities of RACF [ITU-T Y.2111], NACF [ITU-T Y.2014], MMCF [ITU-T Y.2018], and SCF [ITU-T Y.2012]. The PAAS functions are added in the application part of the NGN framework architecture [ITU-T Y.2012], and they communicate with NGN via the ANI interface as shown in Figure 7-1(a) or via the SNI shown in Figure 7-1(b). This figure also presents an overview of the functional model.



a) Functional model with ANI interface



b) Functional model with SNI interface

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Figure 7-1 – Functional model for PAAS using NGN

The PAAS functions consist of the application adaptation service management function, profile control function and application profiles, adaptation service control function, service environment adaptation function and the application adaptation service interface function using NGN.

### **7.1 Application adaptation service management function**

The application adaptation service management function is used to process user authentication and authorization. Using user information, the application adaptation service management function sends a new request for continuous service to the adaptation service control function. This function also provides the required service information to the user for continuous service and performs the following functions:

- service registration, service deletion and service information update;
- user registration, user deletion and user information update;
- service session management;
- interface with a user device.

### **7.2 Adaptation service control function**

The adaptation service control function aims to recommend the proper services to the user to adapt to the current user service environments. To do this, it manages the service history using the application profiles. The adaptation service control function also provides the device information to the service environment adaptation function for the handling of media conversion with profile adaptation.

### **7.3 Service environment adaptation function**

The service environment adaptation function is used to adapt the user's service to the new service environment using the appropriate attributes pre-registered in the application profile. It handles the adaptation of the profile information and provides a proper execution environment according to the control of the adaptation service control function.

### **7.4 Profile control function and application profiles**

The profile control function is used to manage the attributes related to the service, user, devices and session. It also provides the interface between the application profiles and other functions. The application profiles store the user information, session information, device information and service information used for providing continuous services. The following profiles are provided:

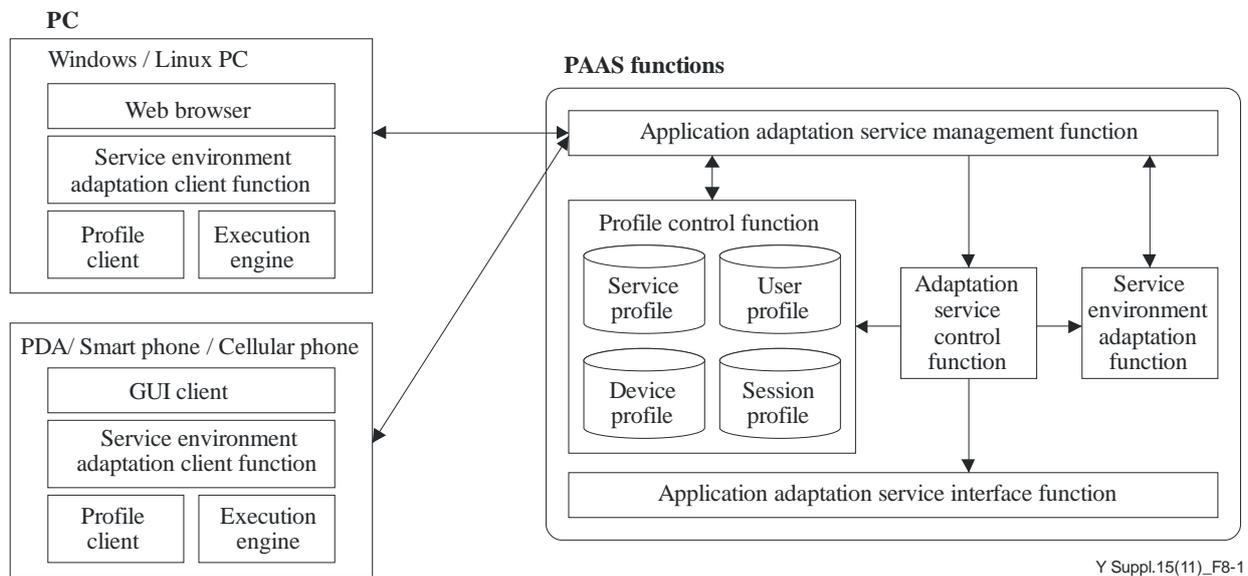
- User profile:  
This profile stores personal data including ID, name, address, password, affiliation, and preferences and/or interests of users as well as the history of the user's selection of service.
- Session profile:  
This profile stores the description of sessions from user log-in and services provided, and the log-in status of the user, connection status and period, and devices used.
- Device profile:  
This profile stores the description of the device such as type, vendor, model, hardware and software specifications.
- Service profile:  
This profile stores the description of services including the name, provider, language used, hierarchy of service categories and position of each service, search tags of services and the requirements of services for the proper delivery of service to devices.

## 7.5 Application adaptation service interface function

The application adaptation service interface function provides interaction between the PAAS functions and the application support function of the service stratum via ANI. It can also support the interaction between the PAAS functions and service control functions, transport control functions, and transport functions via SNI. It offers an exchange protocol for a well determined dialogue and the requested format used in the exchange of a control message and the communication of the user context to the other entities.

## 8 Details on functions of the PAAS

User devices use a PC with a web browser or a PDA, a cellular phone, and a smartphone with the GUI client for the service interface. User devices also have the service environment adaptation client function for service execution engine downloading from the service environment adaptation function. Figure 8-1 presents a detailed functional model of user device and PAAS functions.



**Figure 8-1 – Detailed functional model of user device and PAAS functions**

### 8.1 Service and user registration/management

#### 8.1.1 Service registration, deletion and update

The service registration of the PAAS functions is performed by the application adaptation service management function through the service registration. The service provider also registers the service execution engine for the registered service. The registered service execution engine information is provided to the service environment adaptation function for service execution engine downloading. The registered service information is stored in the service profile, which optionally includes:

- service description,
- service category,
- service keyword,
- service execution engine.

The service deletion of the PAAS functions is performed by the application adaptation service management function through the service list page. The application adaptation service management function deletes the requested service in the service profile. It also supports the service update function. This function lists the registered services and service execution engines.

### **8.1.2 User registration, deletion and update**

The user registration of the PAAS functions is performed by the application adaptation service management function through the user registration page of the user device. The user inputs the name, user ID, password, area of interest, etc., for the user information. The registered user information is stored in the user profile.

The user deletion of the PAAS functions is performed by the application adaptation service management function through the user deletion page of the user device. The application adaptation service management function deletes the requested user in the user profile. It also supports the user update function. This function lists the registered users and shows user information using the user ID.

## **8.2 User preference service**

The user preference service is performed by the application adaptation service management function, which provides the following services to the user device using the user profile and service profile:

- recently used service,
- frequently used services by the user,
- user preference recommended services.

For the user preference recommended service, the adaptation service control function provides a preference service using the service usage pattern and service category of the user. The information on user preference recommended services is transferred to the application adaptation service management function for listing on the user device.

## **8.3 Service execution engine download**

Service execution engine download is performed by the service environment adaptation function for the configuration of a specific service execution environment in the user device.

When requested by a user for a specific service, the application adaptation service management function, checks the execution environment of the requested user device using the user profile and service profile. If a user device needs the execution environment of the requested service, the application adaptation service management function informs the adaptation service control function, which then extracts the proper execution engine using the device profile and the session profile and informs the service environment adaptation function of this execution engine information. The service environment adaptation function downloads the service execution engine to the user device.

## **8.4 Session management**

### **8.4.1 Login session management**

When a user logs in, user authorization is performed by the application adaptation service management function, and information of the login user is added to the session profile. This login session information provides the current user lists to the application adaptation service management function.

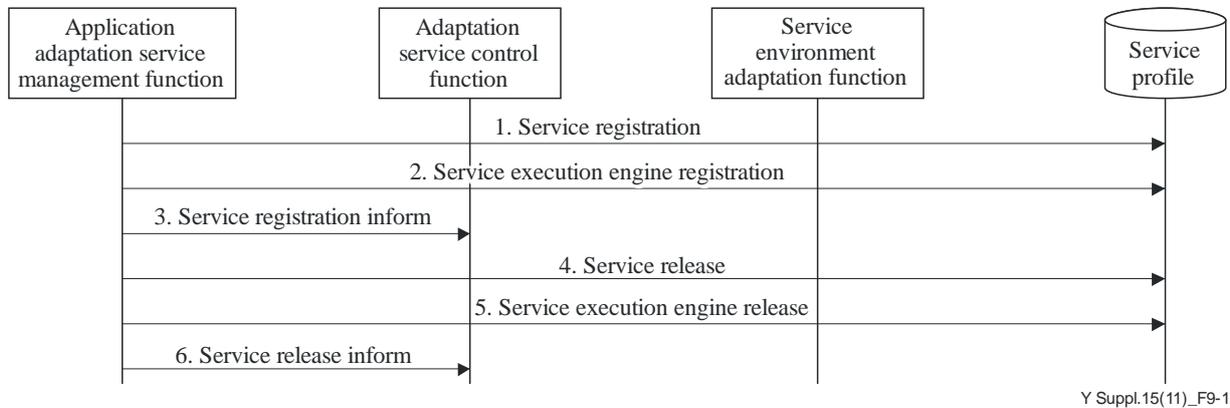
### **8.4.2 Service execution engine session management**

When a user selects a specific service, and after the service execution engine is downloaded, the adaptation service control function creates a service execution engine session in the session profile, which provides the list of services and service execution engines to the application adaptation service management function.

## 9 Functional procedures for PAAS

### 9.1 Service registration and release

Figure 9-1 shows the functional procedure when a service is registered and released. In this procedure, the application adaptation service management function registers/releases a service and a service execution engine to the service profile.

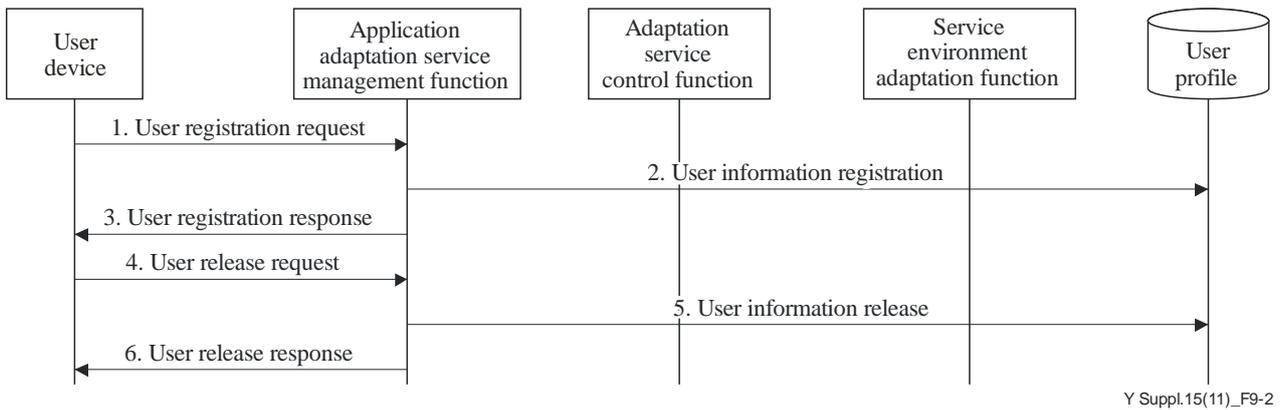


**Figure 9-1 – Functional procedures for service registration and release**

- 1) The application adaptation service management function creates the service information with the service description, service category, service keyword, etc. and requests the addition of service information to the service profile through service registration.
- 2) The application adaptation service management function also registers the related service execution engine to the service profile through service execution engine registration.
- 3) After service and service execution engine registration, the application adaptation service management function informs the adaptation service control function of this service profile.
- 4) The application adaptation service management function deletes the requested service information from the service profile using service release.
- 5) The application adaptation service management function also releases the related service execution engine from the service profile through service execution engine release.
- 6) After the service and service execution engine are released, the application adaptation service management function informs the adaptation service control function of this released service information.

### 9.2 User registration and release

Figure 9-2 illustrates the functional procedure when a user is registered and released. In this procedure, the user registers/releases the user information to the user profile.

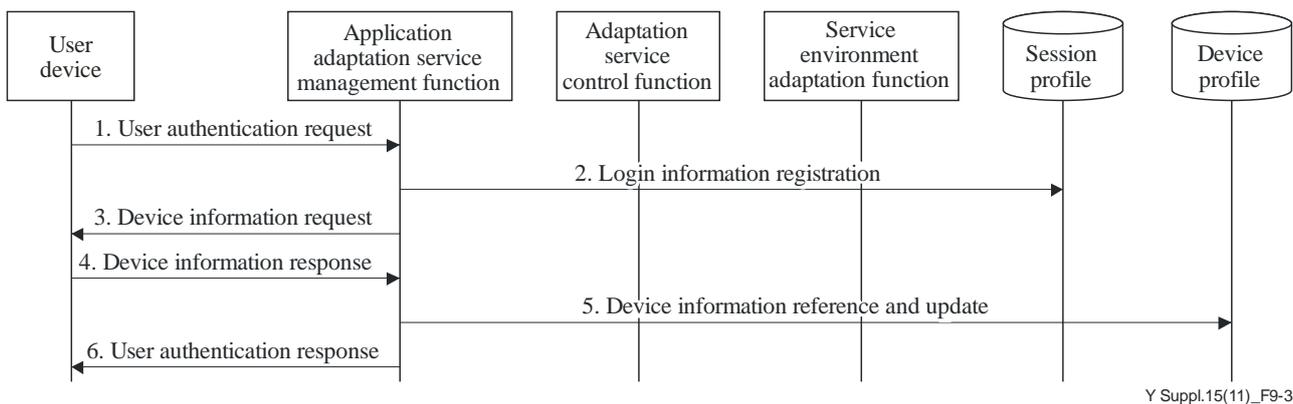


**Figure 9-2 – Functional procedures for user registration and release**

- 1) When a user requests a user registration through the user device, the user registration request message with user information (user ID, name, password, address, etc.) is sent to the application adaptation service management function.
- 2) The application adaptation service management function requests the addition of user information to the user profile using the user information registration.
- 3) The application adaptation service management function sends the user registration response message to the user device.
- 4) When a user requests release in the user device, the user registration release message with user ID is sent to the application adaptation service management function.
- 5) The application adaptation service management function requests the deletion of user information to the user profile through user information release.
- 6) The application adaptation service management function sends the user release response message to the user device.

### 9.3 User login

Figure 9-3 presents the functional procedure when a user logs in. In this procedure, the application adaptation service management function performs authorization and registers user login session information to the session profile.



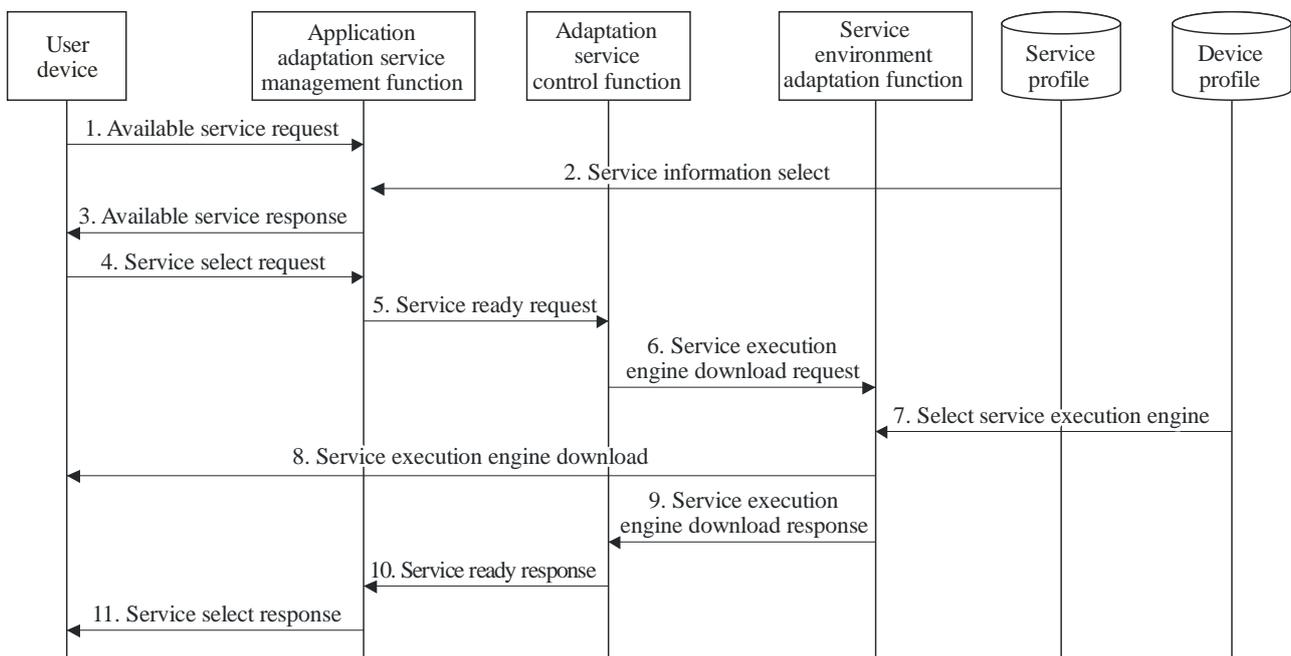
**Figure 9-3 – Functional procedure for user login**

- 1) When a user logs in, the user device sends the user authorization request message to the application adaptation service management function.
- 2) After the processing of authorization, the application adaptation service management function requests the addition of user login information (user ID, IP address, etc.), to the session profile using login information registration.

- 3) The application adaptation service management function requests the device information of the login user device.
- 4) The user device sends the device information response message to the application adaptation service management function.
- 5) Using this device information, the application adaptation service management function references and updates the device profile about the login user.
- 6) The application adaptation service management function sends the user authorization response message to the user device.

#### 9.4 Service execution engine download

Figure 9-4 shows the functional procedure when a service execution engine is downloaded. In this procedure, a user selects an available service and the necessary service execution engine is downloaded to the user device from the device profile for the execution of the selected service.



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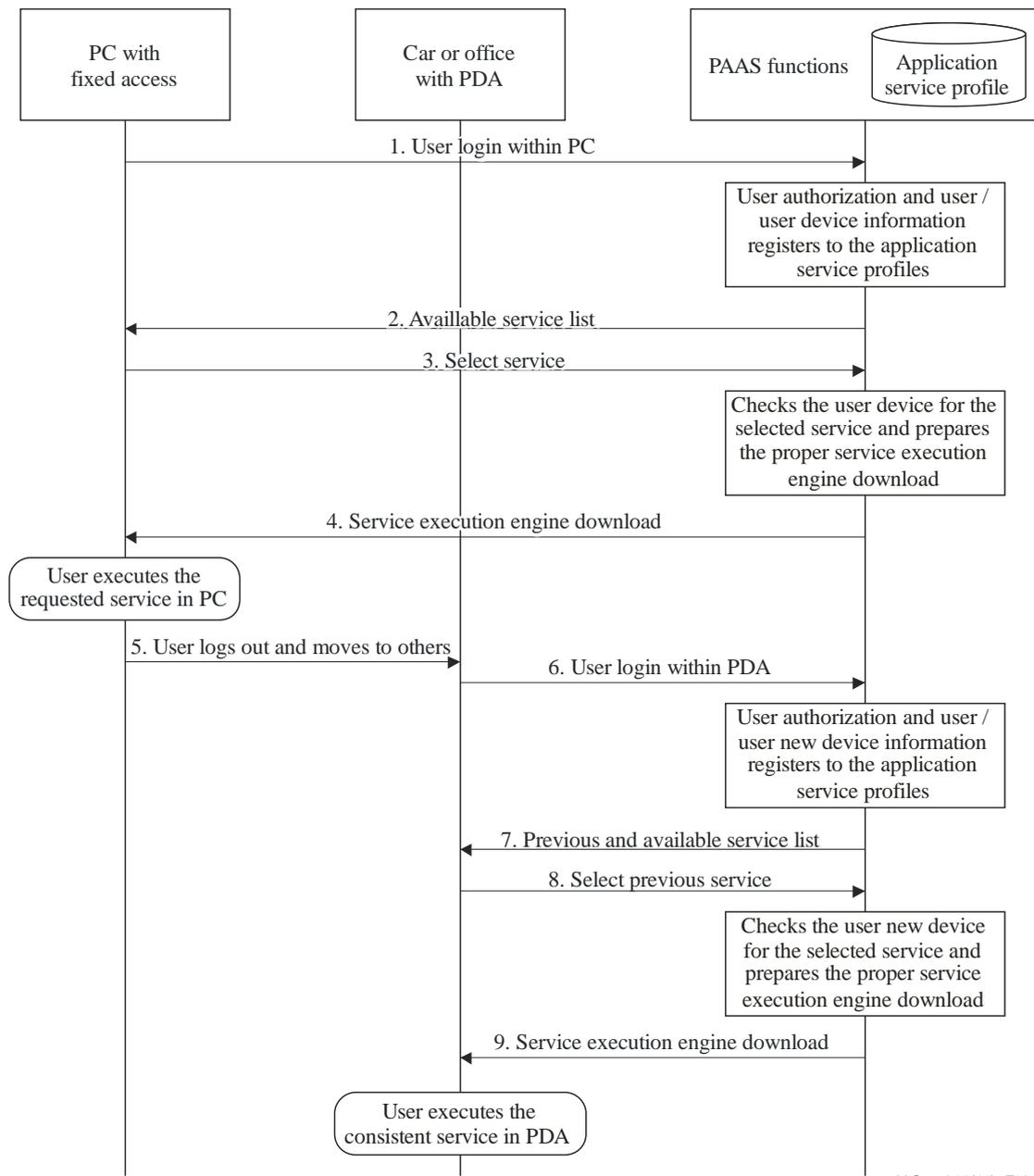
**Figure 9-4 – Functional procedure for service execution engine download**

- 1) A user requests the available services with the available service request message.
- 2) The application adaptation service management function selects the available services from the service profile.
- 3) The application adaptation service management function provides the selected available services using the available service response message.
- 4) When selecting a service from the available services, a user sends the service select request message to the application adaptation service management function.
- 5) The application adaptation service management function forwards this request to the adaptation service control function using the service ready request message for referencing of the appropriate service execution engine.
- 6) The adaptation service control function forwards this request to the service environment adaptation function for the selection of the appropriate service execution engine.
- 7) The service environment adaptation function selects the requested service execution engine from the device profile.

- 8) The service environment adaptation function downloads the requested service execution engine to the user device.
- 9) After downloading, the service environment adaptation function sends the service execution engine download response message to the adaptation service control function.
- 10) The adaptation service control function forwards this response to the application adaptation service management function using the service ready response message.
- 11) The application adaptation service management function sends the service select response message to the user device.

## 10 Service scenario of PAAS

PAAS provides continuous service with application profiles when a user moves from the home environment to the car and/or office. It is assumed that the service registration and user registration have been done previously.



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**Figure 10-1 – Service scenario**

Figure 10-1 describes the service scenario of continuous service when a user moves from a PC with fixed access to the car or office with a PDA. The flow of the scenario is as follows:

- 1) When a user requests login from the PC, the PAAS functions process the user authorization. The user information and the user device information are registered to the session profile and the device profile in the application profiles.
- 2) The PAAS functions send the available service list to the user device.
- 3) The user selects a service among available services from the list. The PAAS functions check if the user device has a candidate execution engine for the selected service using the service profile and the device profile. If not, a candidate service execution engine is selected for downloading.
- 4) The PAAS functions download the service execution engine to the user device. The user executes the requested service in the PC.
- 5) The user logs out and moves to use the different device (PDA).
- 6) When a user requests login from PDA, the PAAS functions process the user authorization for the new device. The user information and the new user device information are registered to the session profile and the device profile in the application profiles.
- 7) The PAAS functions send the previous and newly available service list to the new user device.
- 8) The user selects the previous service. The PAAS functions check if the new user device has a candidate execution engine for the selected previous service using the service profile and the device profile. If not, a candidate service execution engine is selected for the download.
- 9) The PAAS functions download the service execution engine to the new user device. The user executes the previous service continuously in the PDA.

## **11 Security considerations**

No specific security considerations have been identified.





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