Creation and Management of User Centric Service Session in Future Network

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Abstract. In recent years, with the rapid evolution of the next generation network (NGN), next generation service (NGS) has been proposed almost at the same time. In the coming NGN era, end users have more and more requirements for NGS. They desire not only the service can be accessed anywhere and anytime, but also the service is personalized to adapt to their different devices, heterogeneous networks and their contexts about activities and locations. This paper proposes a creation approach of user centric service session basing on the Virtual Private Service Network (VPSN) model to ensure the service personalization. It also tries to guarantee the quality of the service according to the different environment by context-aware management. In the end, the paper introduces a new idea to define the service performance and finish the paper with a conclusion and perspective.

Keywords: user centric service, personalized service, service composition, context-aware, QoE, etc.

1. Introduction

Nowadays, with the rapid development of network technology, the concept of network has deeply rooted in people's heart. The more people rely on the internet, the more requirements they have with the internet. Since the NGS has been proposed in the future internet, we think that NGS is personalized, user-centric and adapt to end user's terminal and location etc. So how to provide a service effectively which can meet with people's requirements has become a huge challenge to providers.

Our work starts with the analysis of "user centric service" requirements. This kind of service is proposed to satisfy end users' requirements. So what they really need is much important. Investigations discovery that requirements are summarized as follows:

1) Accessibility of the service means an adaption between the demanded service and the used device. The adaption is related to the user's preference and it's irrelevant to the time and location.
2) Mobility refers to the continuous service when the user moves. In future network, network and service providers should guarantee the service can roam to the visited networks without interrupted.
3) Personalization indicates a dynamic composition of a group of sufficient basic service components. The desired services should be provided in sequence according to the user's particular preference and special context respecting the locations and activities.
4) QoE is not completely the same as QoS. QoE means the quality of the experience, and then QoS means the quality of the service. In future network, what's more important is the experience of end users rather than some lifeless parameters like time-delay etc.

The goal of our project is to propose an innovative user centric service session. The user centric is considered as a logic service composition of some suitable basic services. And the service is context-aware.

End users and service providers or network providers have different understandings and experience. The quality indicators of the service or network can't reflect the user's inherent expectations. QoE can directly affect the service or network performance and user's satisfaction.

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Services that provided to the end users will in future consider the situation the service invoker is in, including user's, network's, service's as well as business' context. Of course they can select services according to these situations. But there are also some unpredictable events and changes during the service process. Thus context-aware service management will ensure that users get what they want and when it is needed in form and shape applicable to the situational circumstances at hand.

The remainder of this paper organized as the following. Section 2 provides some related work on the topic of this paper. Section 3 details the mechanisms used to set up the user centric service session. Section 4, the paper provide the context-aware management of the service session. Conclusion and perspective are presented in section 5.

2. Related Work

In this section, we analyze some important technologies in the service-provisioning domain in current time. We then introduce what is the context-aware service management and describe the details about QoE.

Web 2.0 [1] is an important way of the internet to promote information exchange and collaboration between people on the network through web applications. It aims to be more user centric. Supporters believes that the use of the Web is becoming social networking interactivity and it permits users to become data contributors not just traditionally data consumers. However, web 2.0 is established in the existing web server architecture, but it emphasis on the background software. This server-client architecture could not satisfy the user centric requirements in future network.

Service Oriented Architecture (SOA) [2] is another important trend in service provisioning domain. In software engineering, a Service Oriented Architecture (SOA) is a set of principles and methodologies for designing and developing software in the form of interoperable services. These services are well-defined business functionalities that are built as software components (discrete pieces of code and/or data structures) that can be reused for different purposes. Briefly, Service Oriented Architecture (SOA) provides the architecture of service composition on the service layer. Unfortunately, it still follows the service centric mode and service provider accounts more than end users. So SOA can't satisfy users' precise requirements duly as well.

Virtual Private Service Network (VPSN) [3] realizes service composition in a novel way. It refers to some successful experience of the network principle such as routing. In the VPSN model, service elements, which implement some certain functions, are regarded as nodes. The service logics are considered as links. All the nodes and links comprise the network. In the VPSN, nodes are distributed everywhere, but links are lined up according to the needs of the user. Actually, inspired by the VPSN, we propose the user centric service.

Mobility management of network is getting more and more attention along with the terminal advancing and user's need to access seamless. However, until now, there is not even an effective approach to guarantee the service quality to make users satisfy while the circumstance is changing. Context-aware network and service control focus on the environment and network enables support of context-aware users and services, seamless reacting to the context changes with minimal impacts to the services and multicast control [4].

Context-awareness refers to capability of mobile systems to sense their physical environment, i.e., their context of use, and adapt their behavior accordingly. Context encompasses more than just the user's location. Context includes lighting, noise level, network connectivity, communication costs, communication bandwidth, and even the social situation; e.g., whether you are with manager or with a co-worker [5].

The International Telecommunication Union -Telecommunication Standardization Sector (ITU-T) defined an NGN [6] as "A packet-based network able to provide telecommunication services and able to make use of multiple broadband, Quality of Service (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". We focus on the "services of their choice" and try to guarantee the "Quality of Service" from a different angle.

3. Service Creation

3.1. Concept of user centric service session

User centric means that user's requirement is the center rather than the service itself. Service elements are important components of a session. But what decide which services are needed is user's requirement.

3.2. Creation of the service session

The process of the creation of the user centric service session is the process of the chaining the needed service components. A user request corresponds to a service session, and this one service session will complete all the service elements the user request. To describe this process clearly, we first generate the process in text and graphs, and then we will explain all the important described files and data structures.
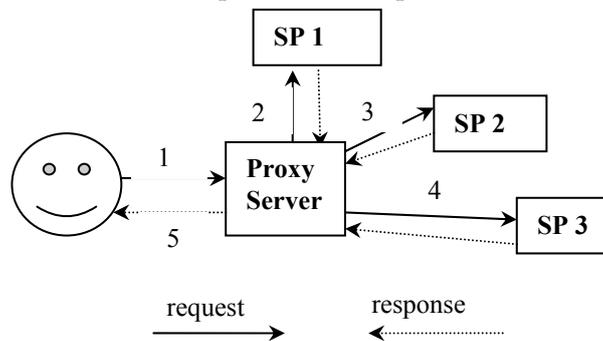
Fig. 1: User centric service session workflow.

Figure1 shows a typical example of this user centric service session. In this service session, there are three service elements involved. SP means service provider. The details will be explained as follows:

Step1: session initiation process

A user starts a request with a session description file. The request information goes directly to the proxy server and the proxy server will generate the service list. A user centric service session starts since now.

Step2: session execution process

Two things happen in this process: service routing and service execution. Proxy server will rout to the first service provider according to the service list generated and its routing table. After that, the first service element will be fulfilled according to the desired service parameters and the service executive response will return to the proxy server.

Step3 and step4 is the same process as the step2.

Step5: session termination process

Apparently, this process ends up the total session by proxy server after all the service components are executed and the proxy server will return back all the service executive results of the executed services.

3.3. Important files and data structures

Session description file

This file is generated by the client. It aims to describe a user's personalized tastes and his context. This profile includes user's preference, his performing activity, his location, his device, surrounding network information, his QoS requirements etc. It is so important that the service list is generated according to it.

When a user opens his service session, he selects services he wants through the session description file. It includes all his functional and non-functional requirements. Indeed, during the service list generating process, we take into consideration the user's geo-location information that obtained by the user's terminal to promote the added value. One kind of service there are several provider choices, the basing line we make the choice is the session description file.

Service list

The service list includes all the exact service components in this user centric service session. It is generated by proxy server according to the session description file. Actually, the service list only describes

the service type in the whole session. Then there may be several service providers about one kind of service type, so which service will be executed finally depends on whether it better match with the current context.

Routing table

The routing table is stored in proxy server. Just like the routing table in the network layer of the traditional network, the difference is service elements in place of the hosts [7].

In this routing table, priority level is related to the QoE indicator. If a service is more priority than the other service in a service type, it is more easily selected by the proxy server. And the priority is changing with the QoE indicator.

Service type	Service name	Service provider	Access link	Priority level
Mail service	1st service	Google	Link1	Level1
	2nd service	Sina	Link2	Level2
	3rd service	yahoo	Link3	Level3
Video service	1st service	youku	Link1	Level1
	2nd service	sohu	Link2	Level2
Chat service	1st service	Tencent	Link1	Level1
	2nd service	Microsoft	Link2	Level2
	3rd service	China mobile	Link3	Level3

Fig. 2: Service routing table.

As we can see from Figure2, there could be several service providers provide one kind of service. It is convenient for end user to choose a suitable service according to his real context environment. And this part is also involved in the latter chapter "Management of service logic".

Service description file

This file includes two different parts: service parameters and service result. When one service is described in a formal format, it can be better understood by other services. And this formal format file is called service description file.

--service parameters: the parameters indicate the useful information about the user centric service session. When the service parameters match with the context information in the session description file, the service will be selected by the session.

--service executive result: the general executed result for the selected service.

These four fields are important for the user centric service session. They present the data structures that are tightly associated and can be shared during the whole session. Maybe there are some specific indicators to each service, these can be popped out for the users to fulfil them when needed.

4. Management of the service session

In many situations, especially during the mobility, a basic service component that is used in a user centric service session may not continue to function normally or to fulfill the user's QoS requirements due to some unexpected cases. In order to guarantee the quality of the total service session, we propose the context-aware management approach. In our approach, both the internal QoE management of the service elements and the logic chain between the service elements during the service session approaching can be controlled. Finally, we want to guarantee the quality of experience (QoE) in the whole process and make the user satisfied.

4.1. internal QoE management of service elements

Since we define the service session as user centric, better reflect the user centric principle is the quality of experience (QoE).

There are many reasons for which service providers should pay attention to the QoE: (I)Inconformity always exists between service performance and user experience. It is not enough to just focus on the performance indicators but ignore the user experience. It's not ruling out that some service has very good

performance indicators but user experience is not satisfied. (II)Users and providers have different understanding of the services. Providers always commit themselves to improve the service quality indicators, however, users mostly can stand with some quality indicators are not good enough as long as the service experience is good as a whole. (III)QoE directly decide the loyalty on the service. That is what decides the service providers profit or loss. So it is worthy for service providers to devote themselves to perfect the QoE in the service management process.

But the question how to define the QoE indicator of a service is challenging [8]. We may have to figure out the relationship among QoE, QoS and service performance indicators. We may have to calculate the weight of different indicators to establish the new QoE indicator. Meanwhile, we can also make use of the users' feedback to adjust the weight to manage the service in a more effective way.

4.2. Management of the service logic

The personalized service session can be influenced by several types of context, thus, allowing users access sessions based on their location, preferences, terminal and network performance [9]. For instance, if a user steps into a classroom from outside, his mobile phone should switch automatically from ringing mode to silence or vibration mode. If the battery of a user's mobile is gradually reducing along with watching an video information, the information should be provided in audio or text mode automatically. These cases, mobile users can receive asynchronous message when their context satisfy pre-determined conditions. That's what the defined context-aware management means.

With the aim to efficiently provide the context-aware management above, the following steps are necessary to obtain the accurate context [10]: (I) obtain the basic context information from sensors or networks; (II) broadcast the information in an asynchronous way; (III) deliver the selected service basing on the context information. After that, the selected service elements must adaptively use available resources to best meet users' need.

Basing on the described context-aware management we can select the proper services to meet with user's need. And with regard to selected service elements, we use QoE management dynamically satisfy users' experience. After that, better service chain will be provided to our user centric service session.

5. Conclusion and outlook

While the blueprint of future network has attracted more and more attentions in both academia and industry areas, we present some tiny imagine and proposal about future service deliver mode. In this paper, we have described the importance of putting users' requirements in the first place. Among the satisfying the users' need, we present the user centric service session and elaborate the creation method and some important data files during the process. To better satisfy users, we also introduce the QoE indicator to measure a service performance and we admire the context-aware management pattern to better meet with the users' personalized need. This paper put more emphasis on the image of the whole conceptual structure of the user centric service session. There are so much detailed questions to consummate in our future research work. All these challenges will push on orderly. And we believe the issues can be figured out in our future work.

6. Acknowledgements

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