A Content Transformation Framework for Personalization Service

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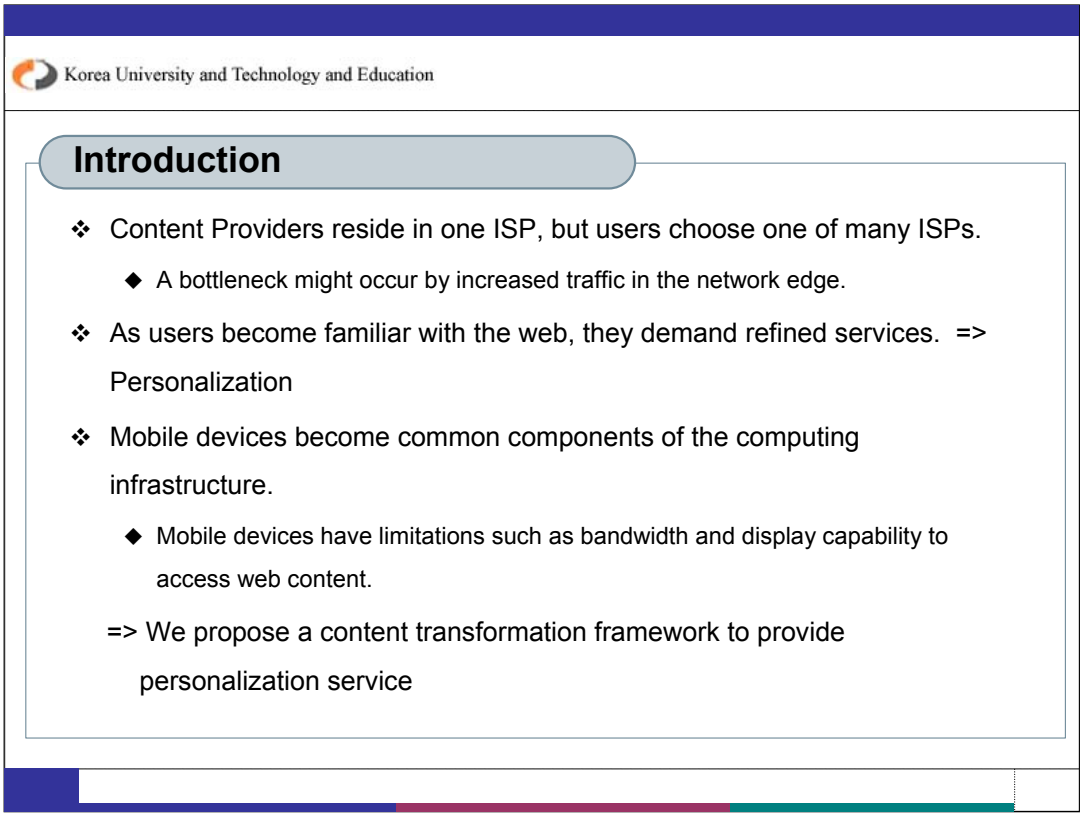
Abstract

Nowadays, users want new services without changing style. Personalization gathers user information during interaction and then delivers appropriate contents and services for the user's need. It can be accomplished by the framework for the transformation of contents and services.

In this paper, we propose a content transformation framework for personalization service. It builds upon the OPES (Open Pluggable Edge Service) model by adding Authentication Server, Policy Manager and Authorization Server. In this framework, the Policy Manager creates the rules based on user and network resource information. The Intermediary invokes the service application which can be determined from rule-set in order to provide the personalized service.

Keywords : content transformation, personalization



1. Introduction

With continuing growth in the size and use of World Wide Web, Content Providers (CPs) provide many multimedia contents. They reside in one ISP (Internet Service Provider), but users choose one of many ISPs. When users access content, a bottleneck might occur by increased traffic in the network edge. To solve the problem, CDNs (Content Delivery Networks) was proposed to distribute contents.

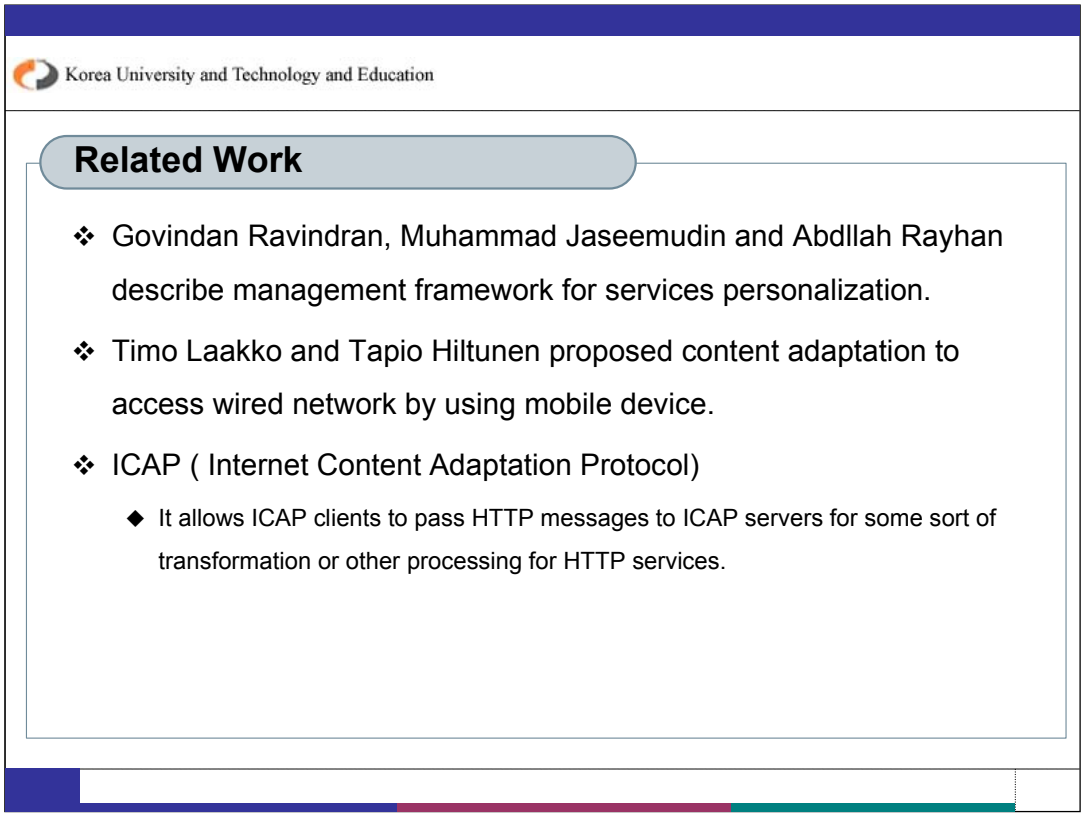
As users become more and more familiar with the web, they demand refined services. The Personalization Consortium defines personalization as "the use of technology and customer information to tailor electronic commerce interactions between a business (i.e., CP) and each individual customer (i.e., user) [1]." That is, personalization gathers user information during the interaction with the user and then delivers appropriate content and services for user's need[1]. The purpose of providing personalization is expressed by the Personalization Consortium [1] in the below.

- Better serve the customer by anticipating needs
- Make the interaction efficient and satisfying for both parties (i.e., user and CP)
- Build a relationship that encourages the customer to return for subsequent purchases

Today's mobile and portable devices such as PDAs (Personal Digital Assistants), mobile phones, and notebooks have common components of the computing infrastructure [2] and their popularity increase. Mobile devices have limitations such as bandwidth and display capability to access web content.

By adapting content, those problems will be solved. Web proxy can provide content adaptation as well as virus scanning, web caching and data filtering. But, lack of standardized mechanisms to trace and to control such intermediaries causes problems with respect to failure detection, data integrity, privacy and security [3]. Thus, we select OPES (Open Pluggable Edge Service) framework [3].

In this paper, we propose a content transformation framework to provide personalization service.



2. Related works

Govindan Ravindran, Muhammad Jaseemudin and Abdllah Rayhan [4] describe a management framework for personalization service. The framework builds on the OPES framework by adding service manager and authorization server components. It enables and automates processes of the personalization service and provides function for subscriber management, fault management, performance management and service accounting. The policy rule is created by combining user preference, content profile information and the service policy of the content provider.

Nowadays research in personalization services are issued. Timo Laakko and Tapio Hiltunen [5] proposed the content adaptation to access wired networks by using mobile devices. The adaptation proxy can adapt XHTML (Extensible Hypertext Markup Language) documents into XHMTL MP (mobile profile) and WML (Wireless Markup Language) and perform media adaptation, using adaptation proxy, mobile devices access to wired content without transformation. Proxy however causes problems with respect to failure detection, data integrity, privacy, security.

ICAP (Internet Content Adaptation Protocol) [6] allows ICAP clients to pass HTTP messages to ICAP servers for some sort of transformation or other processing for HTTP services. The server executes its transformation service on messages and sends back responses to the client, usually with modified messages. The adapted messages may be either HTTP requests or HTTP responses. Currently, we are considering an extension to SMTP service or other service. Thus, we choose OPES model which is similar to ICAP function in order to provide personalization service for wired and wireless device by performing content transformation.

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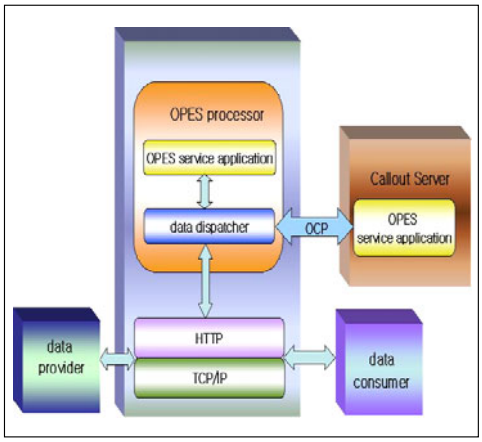
Architecture of OPES

- The architectural components of Open Pluggable Edge Services (OPES)
  - OPES entities
    - OPES service application
    - data dispatcher
  - OPES flows
  - OPES rules.



[Interaction of OPES Entities]

3. OPES Framework

The OPES Working Group of IETF (Internet Engineering Task Force) [3] "has developed an architectural framework to authorize, invoke, and trace such application-level services for HTTP [3]." The framework is a one-party consent model that each service is authorized explicitly by at least one of the application-layer endpoints.

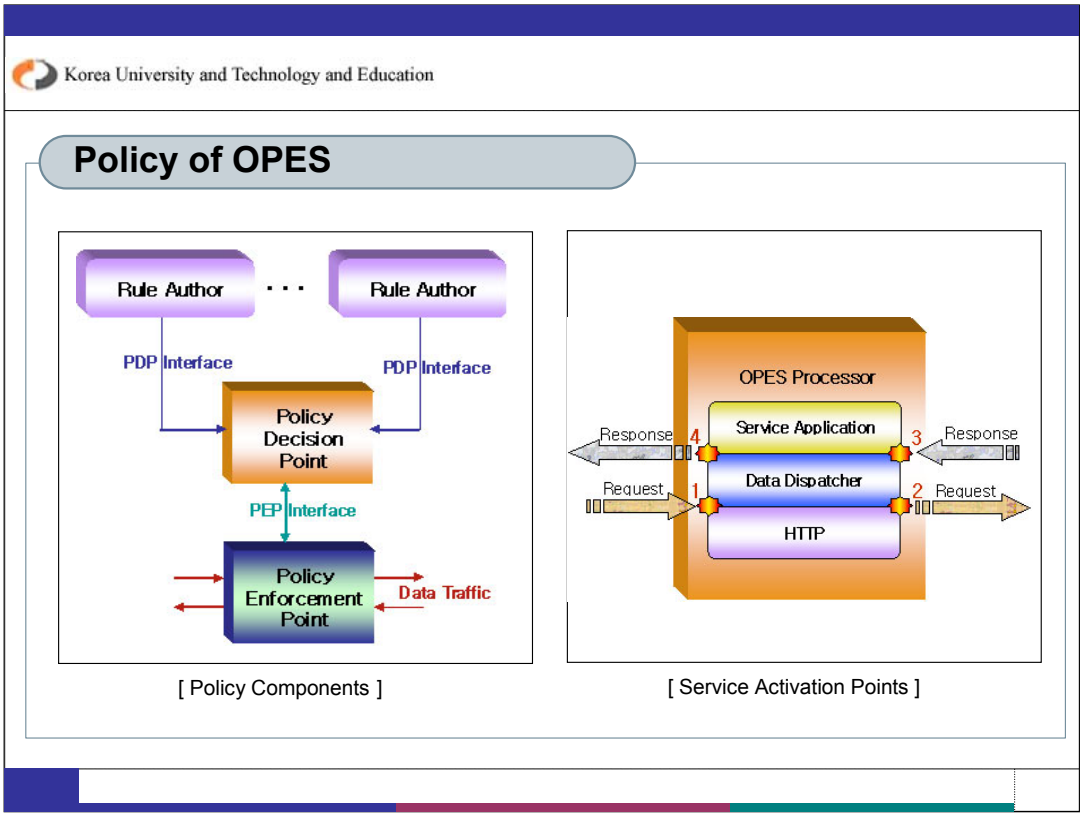
3.1. Architecture [7]

The OPES, existing in the network edge, provides services that modify requests, modify responses and create responses. The architecture of OPES can be described by OPES entities, OPES flows and OPES rules. An OPES entity residing inside OPES processors is an application that operates on a data flow between a data provider application and a data consumer application.

An OPES entity consists of an OPES service application and a data dispatcher. An OPES service application analyzes and transforms messages on a data stream. A data dispatcher invokes an OPES service application according to an OPES rule-set and application-specific knowledge. If there is no needed service application in the local OPES processor, or if it is useful for the OPES processor to distribute the responsibility of service execution, the data dispatcher invokes a remote service application by communicating to one or more callout servers. OCP (OPES Callout Protocol) is used for communication between a data dispatcher and a callout server [7,8].

OPES flows is data flow between a data provider, a data consumer, and one or more OPES processors and data dispatchers must exist in OPES flows. Exchanging data between a data provider and a data consumer application is independent of protocols. We selected HTTP as the example for the underlying protocol in OPES flows.

The rule-set is a superset of all OPES rules. The OPES rules consist of a set of conditions and related actions and specify when and how to execute OPES services on a data stream. The data dispatcher examines the rules, enforces policies, and invokes service applications for offering the service [9]. Since configuring a rule-set into a data dispatcher is processed as a local matter for each implementation, the OPES architecture does not require a mechanism for this.



3.2. Policy for OPES [10]

Policy is a set of rules to the express the purpose of OPES. Policies manage and control access to resources. Policy functions consist of : Rule Author, PDP (Policy Decision Point), PEP (Policy Enforcement Point).

Rule Author provides rules used by OPES entities and rule control invocation of services on behalf of the rule author. PDP interprets rules and then PEP enforces them.

PDP is naturally a complier and provides the authentication and authorization of rule authors. It provides support to the PEPs and the validation and compilation of rules.

PEP resides in the OPES processor and is the data filter for invocation of evaluated data and services according to rules on OPES flows. The execution of an action may modify message property value. For example, OPES service, providing conversion from images to text, modifies the content of the requested web object.

The data dispatcher examines OPES rules, enforces policies, and invokes service applications at the point identified by the numbers 1 through 4 [9]. It may be referred to service activation point or processing points [9,10]. OPES services can be classified as following [9].

- services performed on requests
- services performed on responses
- services for creating responses

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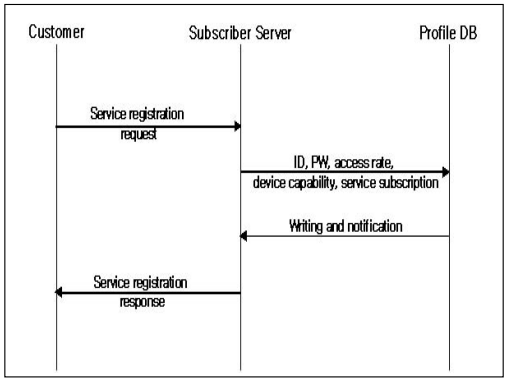
The content transformation framework

❖ A user can register to ISP with information such as ID, password, kinds of service, access rate, device capability and service subscription such as weather service and language transformation.

[Initialization of user]



[Sequence diagram]

4. Content Transformation Framework

In the network edge or middle, the entity that provides the content transformation service is called the CT (Content Transformation) intermediary, which in the OPES case is called the OPES intermediary [11]. The content transformation services contain virus scanning, transformation language etc. The CT intermediary may perform the required transformation by itself or delegate the task to callout servers [11] and deliver the transformed content to the user.

4.1 User Registration

We assume that a user can register to an ISP with information such as ID, password, kinds of service, access rate, device capability and service subscription such as weather service and language transformation.

When the user is in the join time, he informs the Subscriber Server preferences. In turn, the Subscriber Server writes those to Profile DB and notifies the status of registration to the user. Also, the user will update his profiles through the Subscriber Server.

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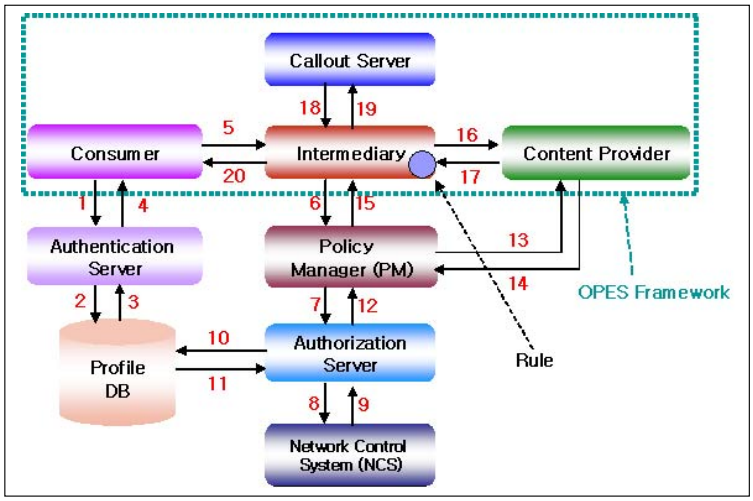
The content transformation framework (Cont.)



[The content transformation framework]

4.2 The Components of Framework

We present the content transformation framework for personalization services. We assume that only the Subscriber Server can change the Profile DB. The content transformation framework does not perform the operations of creating or updating it.

The Intermediary consists of a number of OPES processors. It invokes service applications in local or remote area and executes services. It delivers the response to the user without the transformation of personalized contents.

The Network Control System is the resource management system for providing QoS (Quality of Service). It maintains all network resources and the information on resources allocated/available to users.

The Authentication Server identifies the validation of users for services. Only authenticated user can request service to the Intermediary.

The Authorization Server compares the user information with the information in Profile DB for supporting the authorization service. It connects to Network Control System which decides whether it can use resources for the requested service.

The Policy Manager delivers user information to the Authorization Server and interprets the collected rules by using the XML (eXtensible Markup Language) technology for representing the personalized service of the user.

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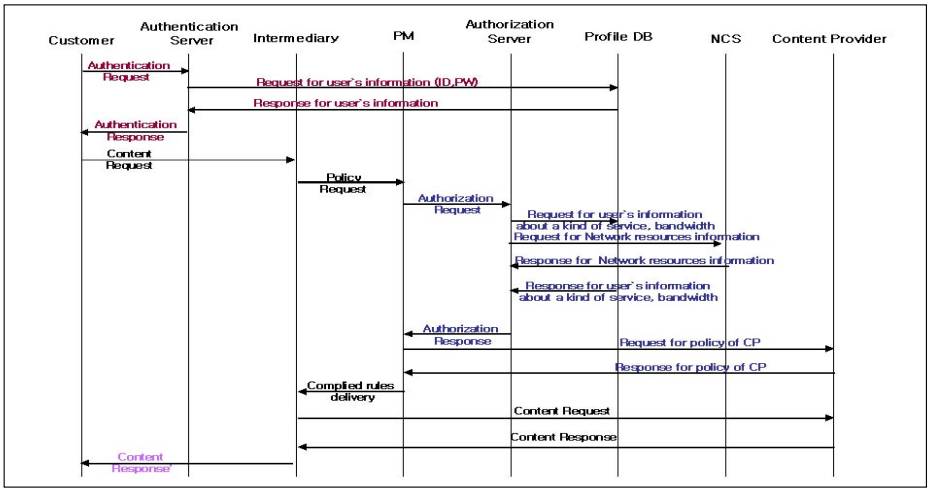
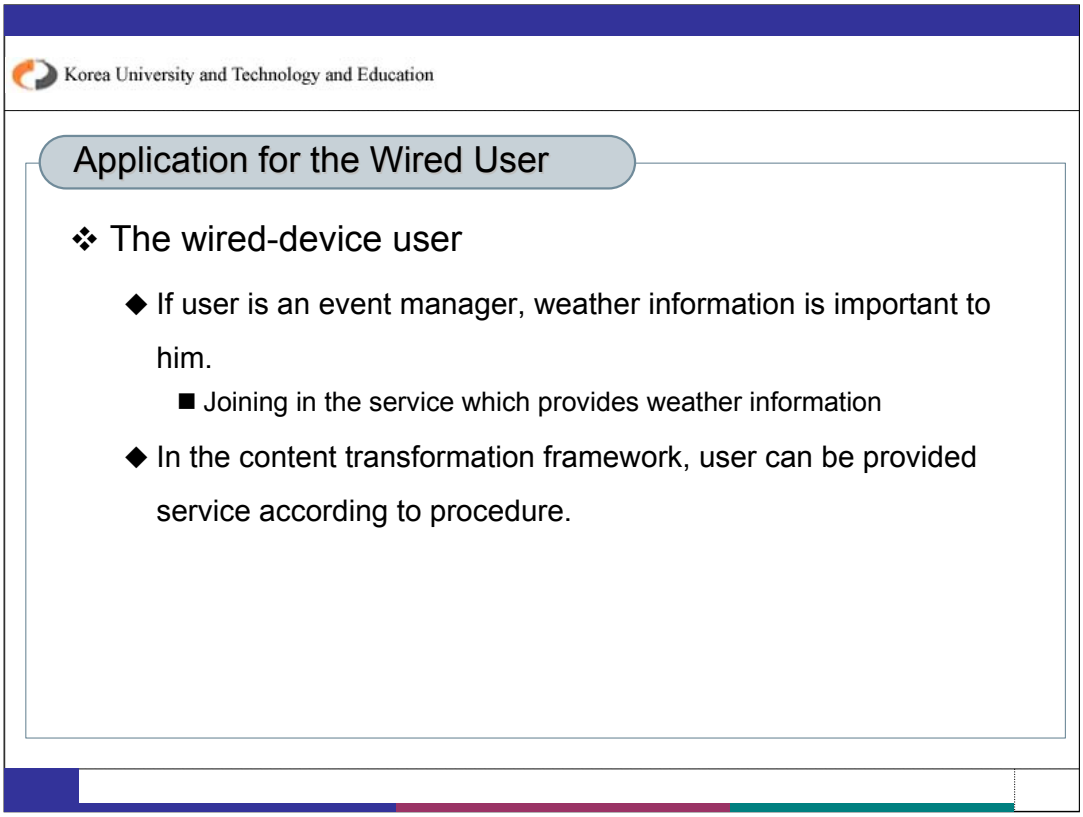
The content transformation framework (Cont.)



[Sequence diagram]

The framework is described from the viewpoint of data flow, as follows.

1. User is authenticated using the Authentication Server (1 ~ 4).
2. The authenticated user requests Intermediary for his required services (5).
3. The Intermediary delivers the user request to the Policy Manager to decide to apply policy for the user (6).
4. The Policy Manager delivers the user request to the Authorization Server to perform user authorization (7).
5. The Authorization Server collects the network resource information by using the Network Control System (8, 9) and verifies the registered services and allocated bandwidth of the user from the Profile DB (10,11) .
6. The Authorization Server informs the availability of services to the Policy Manager by using the information on network resources and registration status (12).
7. If services can not be provided, the Policy Manger delivers the request from the Authorization to the Intermediary (15). The Intermediary notifies the disability of services to the user (20).
8. If services can be provided, the Policy Manger interpreters rules according to the type of user service, allocated bandwidth, usable resources, and the policy of the CP. The Policy Manager delivers the result of the interpretation to the Intermediary (15).
9. The Intermediary requests the contents to the CP (16).
10. The CP responds to the Intermediary for the request (17).
11. The Intermediary enforces services according to complied rules. If service is not existed in the local server, then Intermediary connects to the Callout Server (18, 19).
12. The Intermediary delivers the adapted requests to the user which fit user's stated needs (20).



4.3 Application for the Wired User

The proposed framework is made to customize services for wired and wireless devices.

For the wired-device user, if a user is an event manager, weather information is important to him. Therefore the user joins in the service which provides weather information with the provision of the middle bandwidth. The user can use the service according to the procedure below.

1. The user is verified by inputting ID and password.
2. The user requests Intermediary for the specific web site.
3. The Intermediary delivers the user information to the Policy Manager, then it transfers the user request to the Authorization Server. The Authorization Server verifies the availability on registered services of the user and notifies the result information to the Policy Manager.
4. The Policy Manager interprets policy based on information collected from the Authorization Server and the CP by connecting to the CP server, the it delivers complied rules to the Intermediary.
5. The Intermediary requests the web content to the specific CP.
6. The Intermediary selects the appropriate templates based on rules, inserts corresponding weather forecasts and delivers the content to the user [9].
7. The Policy Manager generates rule-set per user. An example of rule-set is briefly expressed as following.

```
<ruleset>
    <device type = “desktop” />
    <up> 4M </up>
    <down> 4M </down>
    <protocol> HTTP </protocol>
    <rule processing_point =”3”>
        <service = “insert weather information”, priority =”primary”>
            <uri>  http://www.kma.go.kr/kor/weather/weather/weather_01.jsp  </uri>
        </service>
     </rule>
</ruleset>
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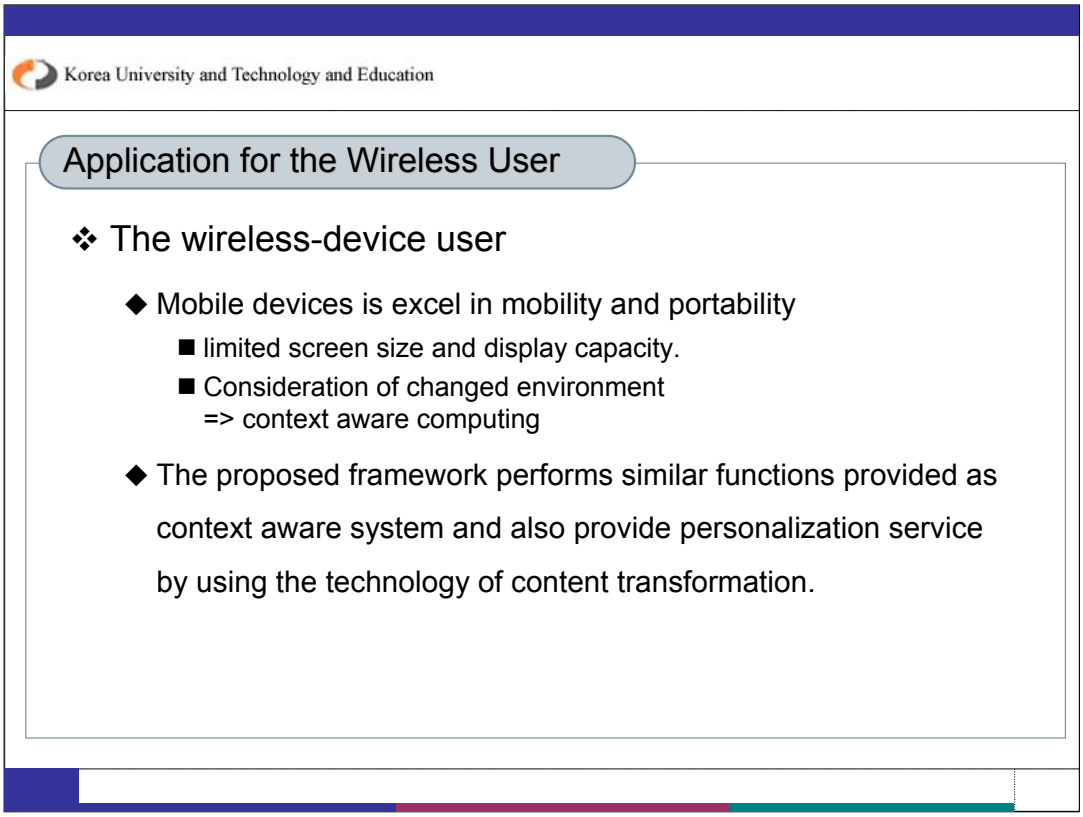

4.4 Application for the Wireless User

Mobile devices is excel in mobility and portability but have limitations in screen size and display capacity. When considering the provision of service to the mobile device, we must reflect the changed environment of the mobile user. That is, we are aware of the context of the user. Important aspects of context are i) where you are, ii) who you are with, iii) what resource are nearby [12].

The context aware system adapts the environment of the user according to the location of use, the collection of nearby people, hosts, and accessible devices, as well as changes to such things over time [12]. The proposed framework performs similar functions provided as context aware system and also provide personalization service by using the technology of content transformation.

For example, when a user accesses a web site, he informs Intermediary to the user context environment and the services necessary. The Policy Manager makes the rules by interpreting policy and delivers them to Intermediary. And then it invokes a variety of services for the user. The content transformation framework performs that it adapts images to link state or many texts to importantly significant few text, and etc.

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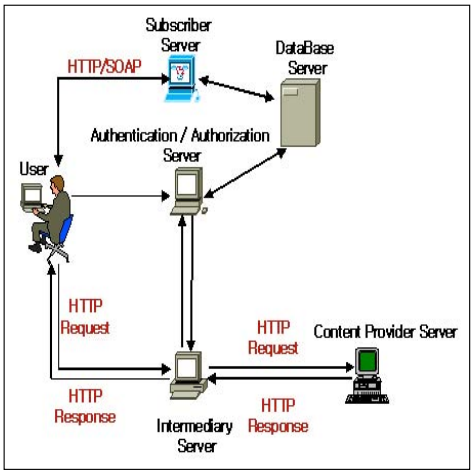
System Configuration & Conclusion



[System Configuration]

- We propose a framework providing content transformation service at the network edge.
  - The OPES(Open Pluggable Edge Service) model by by adding Authentication Server, Policy Manager and Authorization Server
  - Providing personalization service
- The distribution of loads of the intermediary to provide personalization service must be considered.

4.5 System Configuration

The server performs the authentication and authorization procedures by using JAAS (Java Authentication and Authorization Service) technology[13].

When a user is authenticated and authorized by using the Authentication/Authorization Server, the Intermediary Server complies rules based on profile information of the user. Then it delivers user request to the Content Provider Server, receives the response and invokes local service application according to created rules. For the simplicity of the development environment, we assume that the services application of the user are located in local.

5. Conclusion

We propose a framework providing content transformation service at the network edge. It builds on the OPES model by adding Authentication Server, Policy Manager and Authorization Server.

Personalization services are provided by using a proposed content transformation framework for wired and wireless devices. As the content is transformed at the network edge and users want to access a number of contents, the network edge might be overloaded. The distribution of loads of the intermediary to provide personalization service must be considered.

References

[1] Personalization Consortium, “http://www.personalization.org/pesonalization.html.

[2] T. Lemlouma, N. Layaïda, “Adapted Content Delivery for Different Contexts”, SAINT 2003 Conf., Orlando, Florida, USA, January 27-31, 2003. IEEE, pp.190 – pp. 197.

[3] OPES Working Group, http://www.ietf.org/html.charters/opes-charter.html.

[4] G.Ravindarn,M.Jaseemudin,A.Rayhan,"A Management Framework for Service Personalization", Proc.Int`l Conf. On Mgmt. Of Multimedia Networks and Services, Santa Barbara, October 2002.

[5] Timo Laakko and Tapio Hiltunen, “Adapting Web Content to Mobile User Agents”, IEEE internet Computing, vol.9, no 2,2005,pp.46-85.

[6] J. Elson, A.Cerpa, “Internet Content Adaptation Protocol (ICAP) “,RFC3507, April 2003.

[7] A. Barbir, R. Penno, R. Chen, M. Hofmann, H. Orman, " An Architecture for Open Pluggable Edge Services (OPES)", RFC3835, August 2004.

[8] A. Beck, M. Hofmann, Lucent Technologies, H. Orman, R. Penno, A. Terzis, "Requirements for Open Pluggable Edge Services (OPES) Callout Protocols", RFC3836, August 2004.

[9] Barbir, E. Burger, R. Chen, S. McHenry, H. Orman, " Open Pluggable Edge Services (OPES) Use Cases and Deployment Scenarios", RFC3752, April 2004.

[10] A. Barbir, O. Batuner, A. Beck, T. Chan, H. Orman, "Policy, Authorization, and Enforcement Requirements of the Open Pluggable Edge Services (OPES)", RFC3838, August 2004.

[11] B.S.Srinivas, Tat Chan, “Security threats and risks with content transformation intermediaries”, Telecommunications, 2003. ICT 2003. 10th International Conference on , Volume: 1, pp.608-pp.613, 23 Feb.-1 March 2003.

[12] Bill Schilit, Norman Adams, and Roy Want. “Context-aware computing applications.” In IEEE Workshop on Mobile Computing Systems and Applications, Santa Cruz, CA,US, 1994.

[13] Sun Microsystems, Inc, “http://java.sun.com/ products/jaas/”.