Applying CC/PP to User's Environmental Information for Web Service Customization

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ABSTRACT

We explain our framework and experimentation to exchange user's environmental information described in the form of CC/PP and RDF via HTTP Extension Framework. In the next decade, most appliances will have micro Web browser and server. These appliances collect and exchange the various kind of information (e.g., location, temperature) existing among them. We investigated a new way for describing such kind of information using the framework of CC/PP. We have applied HTTP Extension Framework to exchange their information. This combination will allow us to make web appliances useful without special extension of Web. We have developed two browsers, extended one existing server to ensure the interoperability, and demonstrated effectiveness of our framework. Finally, we present evaluation of our empirical study.

Keywords

CCPP, HTTP Extension Framework

1. INTRODUCTION

Use of user's environmental information in Web environment has been raised as important issue, for Web servers can customize their services by using them. We can use flyweight computers, move with them anytime and anywhere. These computers can always collect this information. We can get most desirable service by transfer this information.

There are no cases that user's client transfers this environmental information by using CC/PP [1][2][3][4]. Therefore, we tried this. CC/PP and CC/PP Exchange Protocol [5][6] are proposed by W3C and IETF. They are specifications of content negotiation framework to customize Web contents by variety of device capabilities and user preferences. CC/PP describes a device capabilities profile using RDF [7], hence we can adapt CC/PP to service negotiation using user's environmental information with extending RDF. More over we found two considerable problems on the way to do this.

One is the consistency of the information. To customize services, Web servers need to handle the information. However information related to real world is very various and ambiguous, hence we must make definition of them.

The other is interoperability between our framework and existing Web environment. Many applications exist on Web such as documents or images. Web is very useful, so that we must use Web as information database, publishing document tools or shared information tools in wearable computing environment. Hence, we paid attention to interoperability between our framework and Web environment.

2. Architecture

We applied two existing frameworks to our framework. More over we have incorporated one new idea to our framework.

2.1 HTTP Extension Framework and CC/PP

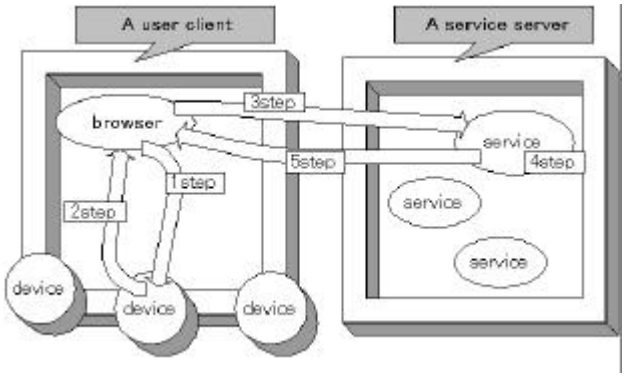
When user's client transfers HTTP request, user's client need also transfer additional data. There are two ways to do this. One is to add them to HTTP request contents, and the other is to add them to HTTP header. Because HTTP request content is used as parameter of Web services, the former may bring about a wrong operation. Therefore, we tried to extend HTTP request header.

HTTP servers or clients ignored a header of HTTP request or response on HTTP protocol if the header is not recognized. Therefore, there is no problem if we input additional data in the header unless the header field name is duplicated. HTTP Extension Framework provides us the way to avoid the duplication by using name space.

CC/PP allows us to describe profiles of user client's capability and user's preference clearly by RDF. RDF is a framework for metadata and user's environmental information is metadata. Therefore, we tried to apply CC/PP to whole user's environmental information by defining the vocabularies that represent user's environmental information with RDF.

2.2 Device information

Many devices are attached to user's client. They sense his environmental information. The information is very various. Therefore, recognizing these devices and interpreting this information are very hard for mobile computers. We introduced software attached to a device. This software gets user's environmental information and creates CC/PP profiles. A user's client can get CC/PP profiles from the software and put them into HTTP request. Therefore, user's client does not need touch any devices directly and recognize the information



Concrete use case is as follows,

1 The browser asks the software attached to each device for user's environmental information.

2 The software returns CC/PP profiles created with device information.

3 The browser create HTTP request with CC/PP profiles

4 The server customizes his service with the information.

5 The server returns customized service.

3. Implementation

In this section, we explain our two clients, a server, device proxy, and service.

We implemented a successor of "PANDA" [10] written with C and GTK, and "SKUNK" [11] written with Java. They are prototype system, and are implemented a part of CC/PP. They use existing libraries for creating HTTP request, PANDA uses Libwww [9] and SKUNK uses JDK core package. They are implemented the ability to collect user's environmental information, and exchange them with servers.

We have extended Apache server by our module. It is implemented a part of CC/PP. According to configuration files such as ".htaccess", this module send the specified user's environmental information to specified CGI. The CGI handle the information and customize the service.

4. Experiment

In this paper, to ensure the appropriateness of our framework, we implemented MAP service CGI. This service gets user's location information, and returns a customized map around the location. More over, we use GPS and IEEE802.11b to get location information.

Our clients were able to collect user's location information and transfer it with HTTP request. As a result, our extended server customized the service and our client got customized map according to the location.

5. Summary

In this paper, we can say that adapting CC/PP to user's environmental information is naturally fitted to Web environment. More over, our framework worked very effectively.

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