CDMA 환경에 기반 한 WAP Gateway 설계 및 구현

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Design and Implementation of the WAP gateway based on CDMA Environment

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Abstract

This paper proposes what MASTER/SLAVE design and implementation of the WAP Gateway in currently implemented Internet and CDMA Infrastructure environment to provide mobile content service to mobile terminals such as PDA, handheld computer, and notebook. We can see the local WAP network by using the CDMA emulator of the Racal Instrument mobile solution provider.

Key words: WAP Gateway , WML, CDMA Base station

1. Introduction

Recent development in the Information Technology (IT) has brought big change in wireless network as well as wired network. In the future, most people may want service through wireless network that are being serviced in Internet such as WWW (World Wide Web). This trend proposes integration of wired and wireless network.

The problems, however, is that wireless network can hardly provide as good service as wired network. Mobile terminals, such as PDA, use narrow bandwidth, have low CPU processing power, low power capacity, high power consumption, high transfer error, low transfer rate, mobility of mobile terminals, etc.

A number of the protocols have been proposed to solve this problem but so many of the proposed mobile protocol were not suitable protocol to the mobile environment. But WAP is the best mobile environment protocol, So we need to develop WAP(Wireless Application Protocol) to provide high quality mobile service. This paper presents the design and implement of the WAP gateway and the rest of the paper is organized as follows. Section 2 reviews of WAP. Section 3 describes of design and implementation

of the WAP Gateway. Section 4 present the result of implementation of the designed WAP Gateway, and finally Section 5 concludes the paper with some discussions.

2. Review of WAP
2.1 Structure of WAP

WAP consists of several protocol layers to effectively provide data service for small mobile terminals and wireless environment. WAP is designed in a layered fashion in order to be extensible, flexible, and scalable. With the Open System Interconnection (OSI) model, the WAP stack basically is divided into five layers. [1][2]
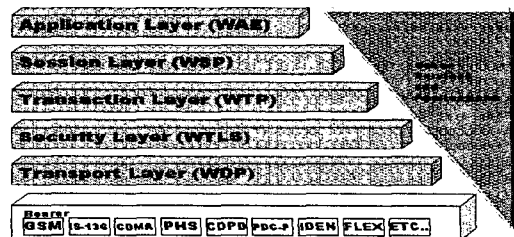

Figure 1. Structure of WAP.

● WAE (Wireless Application Environment)
: This layer is able to defines content composition
   between mobile terminals and server.
● WSP (Wireless Session Protocol)
: Takes care of handling actual requests for pages.
   Sessions are used to optimize bandwidth usage.
● WTP (Wireless Transaction Protocol)
: Implements a single request-response pair between
   phone and gateway. The request may be for a new
   page, or it may be something related to the higher
   level protocols.
● WTLS (Wireless Transport Layer Security)
: Protocol layer for the communication security
   between terminals.
● WDP (Wire Datagram Protocol)
: it is a general datagram service, offering
   a consistent service to the upper layer protocols and
   communicating transparently over one of the avai-
   lable underlying bearer services. This consistency
   is provided by a set of adaptations to specific fe-
   atures of these bearers. This thus provides a com-
   mon interface to the upper layers that are then able
   to function independently of the services of the
   wireless network.

The key features offered by WAP are

● A programming model similar to the Internet's
● Wireless Markup Language (WML)
● WMLScript
● Wireless Telephony Application (WTA)
● Optimised protocol stack

2.2 Model between WWW and WAP Gateway

As shown in Figure 2,we need to identity the relation
between WWW and WAP gateway before we start design.

Figure 2. The relation protocol between WWW and
WAP.

First of all, WAP Gateway must have one of the impor-
tant function in the WAP, it is protocol transformation to
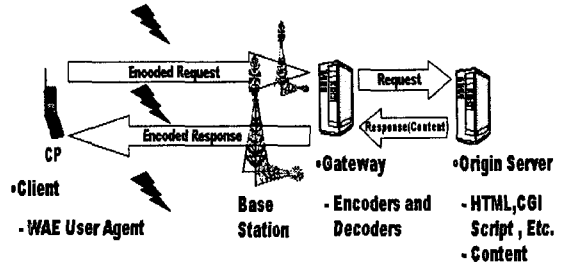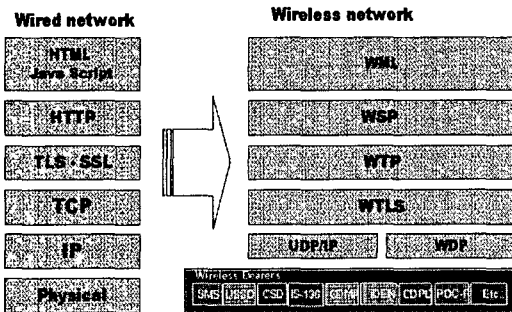different protocol.[5]

Figure 3. Simple request and response between
WWW and WAP.

In wired network A text based type documents can be
used. In wireless network, however, can't use large size
documents such as HTML cannot be used, thus WAP
Gateway need to change the document type from HTML
to WML and file image from TEXT to BIN. Figure 3
shows simple request and response between WAP and
WWW.

3. WAP Gateway Design

3.1 Function of the WAP Basic Service

As show in Figure 4, there are two types of WAP ser-
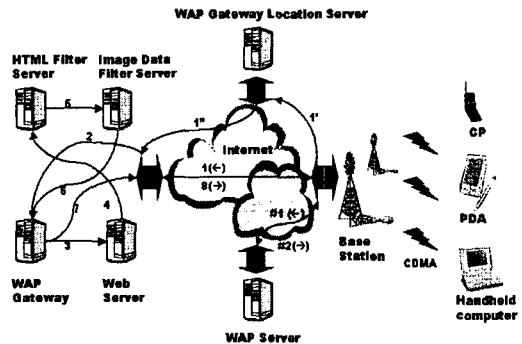vice models.

Figure 4. Function of the WAP basic service.

The first model is that can be applied to the infrastruc-
ture. It is the service that various mobile terminal clients
can directly use existing contents in the web if mobile
terminals require a HTML type content since CDMA base
station linked Internet. However these services need some
proxy server such as HTML Filter Server (Server that
changes HTML file to WML file), Image Data Filter
Server (Server that changes JPG, and GIF to WBMP or
low size image file by using high compression algorithm).
The sequence of the service that from 1 to 8 and from 1"
to 8 through 1' is explained below.

1: The process that connects the mobile terminals that us-
   ing CDMA environment to the Internet.
2: Mobile terminals already know the position of WAP

gateway before transmission by the received mobile terminal request (1→2) or the broadcast WAP service request over Internet. WAP Gateway position server sends mobile terminal WAP Gateway IP address if it can find 수 position of the WAP Gateway it there are server. This is a good model it there are many users (1'→1''→2). By some method, mobile terminals need not to have IP address of known WAP Gateway.

3: WAP Gateway sends request to the web server, and it sends a proxy server the IP address assigned to the HTML Filter Server. The response the HTML Filter Server can get a HTML file.

4: The process that convert the HTML file type to WML file type.

5: The process that conversion from GIF or JPG image file to WBMP image file by using the high compression graphics algorithm.

6: Here the HTML file is WML file and image data is small size image data of WBMP.

7: The process that transmit binary file type.

8: The process that responses about WAP request.

We have been already discussed the first proposal for the WAP Gateway by using the HTML Filter Server and Image Data Filter Server, utilizing the maximum resource. Second proposal is that sequence but it from #1 to #2 has the WAP Server in Internet, but it difficult to implement since newly. We also need content server, wireless contents server and wired content server to provide the existing web content, So having two types of servers of the same content is wasteful, and thus we employ the first model, WAP Gateway.

3.2 Master, Slave WAP Gateway Design and Implementation

We design and implement HTML Filter Server and Image Data Filter Server for WAP Gateway.

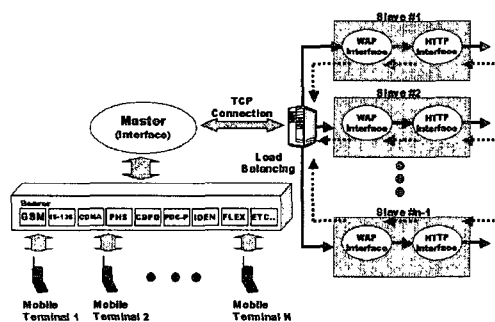It is constructed using model of Master and Slave as show in Figure 5 and Figure 6.

Figure 5. Master, Slave of the WAP gateway.

Master can link to the bearer interface. For example,

GSM, PHS or CDPD in the bearer layer, one of the important functions of the Master, is to get the non-sequential request from mobile terminals.

Slave sequentially processes non-sequential request from Master, and its load is balanced by Master. Slave always sends heartbeat to identity itself. If a slave does not send heartbeat to the Master, Master assumes that it is dead slave.
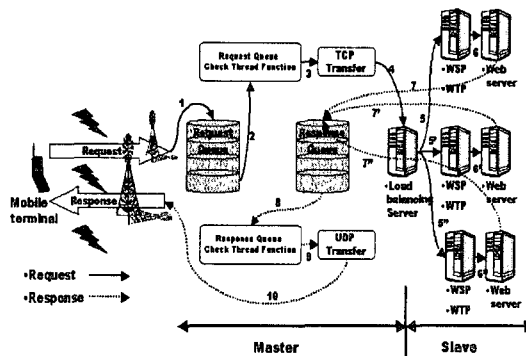

Figure 6. WAP Gateway Operation Based on Master, Slave Architecture.

4. WAP implementation

4.1 Structure

Actual structure of WAP implementation is show in Figure 7, WAP Client tries to detect a CDMA base station.
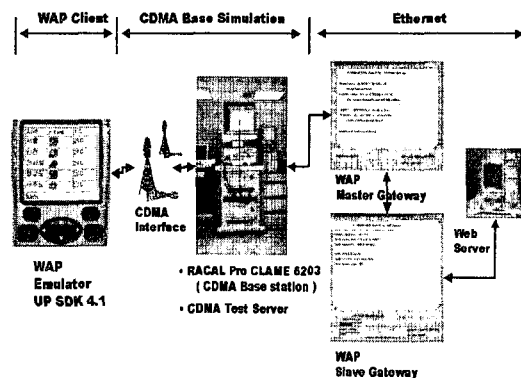

Figure 7. Implemented WAP Network.

Figure 7 is actual implementation of WAP test service, and we need to modify the MIME type to provide WML in httpd.conf of the web server. Then WAP Client can get the WML type content through CDMA environment and internet when WAP Client requests WML content. WAP Brower of the WAP Client will see the WML content.

4.2 Implementation Environment.

The WAP Implementation environment is as follows. Figure 8 and Figure 9 are show the Interface of the WAP

Gateway.
- WAP client :
  - WAP Emulator (phone.com UP.sdk4.1)
- OS : Windows NT Server 4.0
- CDMA Base Station Emulator:
  - Racal Instruments
    PROCLAIME 6203
- CDMA Interface : SKY im-3000 Cellular Phone
- Tool: Microsoft Visual C++ 6.0
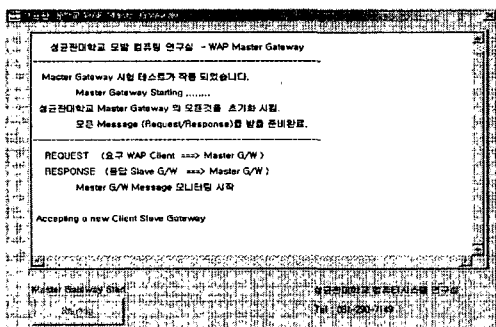- Web server : Apache web server on Linux

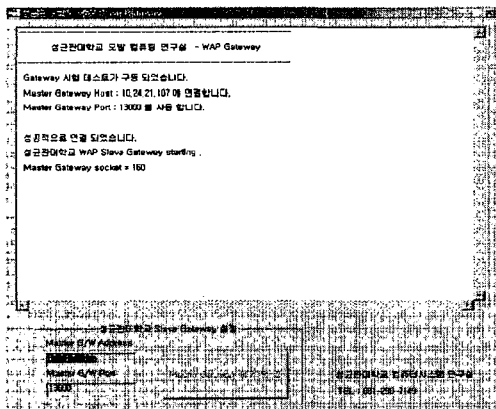Figure 8. Interface of the Master.

Figure 9 Interface of the Slave.

5. Conclusion

In this paper, we have presented an implementation of WAP Gateway providing WAP service, with uploading the WML file on the web server. We need an interlock between HTML Filter Server and Image Filter Server it a better WAP Gateway is needed. The implemented WAP Gateway in this paper is able to service only TEXT and Picture, such as JPG and GIF.

There exist many problems for providing the multimedia service. As show in Figure 10, most of the mobile services will be multimedia service[7] . There for we need Moving Picture Data Filter Server like Image Data Filter Server to provide a high quality multimedia service.
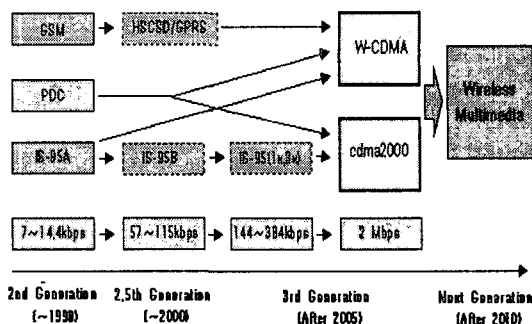

Figure 10. Development of the next generation wireless network

Reference

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