Implementation of Real-Time Wireless Web Server Load Monitoring System

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Contents

Abstract

Due to rapid increases in Internet users, it becomes essential to provide well-established web services and monitor web server's load for the sake of reliable web server management. The existing web server load monitoring has been based on such cable methods as RPC, RMI, CORBA and etc. But it has the limitation in bringing information both anywhere and anytime over the Internet. This thesis is aimed to realize real-time wireless web server monitoring system based on Wireless Application Protocol (WAP). As any user can log on wirelessly to the Internet at any time through wireless terminals like PDA, the realization will make possible instant and real-time web server monitoring..

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Ⅰ. Introduction

A recent rapid increase in the number of Internet users causes the significance of reliable web server to grow. In particular, widely recognized websites have seen often errors or service suspensions as their web servers have been heavily loaded in several seconds by a herd of users. Although system operators use mirroring web servers to diversify such tremendous loads, the concentration of loads is unavoidable because they select web servers without considering network status, rate of using CPU, and loads of memory and disk[1][2][3].

Thus the technology of effectively monitoring loads of web servers on a real time base is needed to provide well-established web services and manage performances of web servers. The realtime web server load monitoring enables to conduct optimum operations and prevent errors from occurring by detecting sudden increases of web server's loads. It can also analyze system performances, predict rates of using networks and maximum traffic times, and back further system expansions.

The existing web server load monitoring had been carried out through such cable Internet centered client-server methods such as RPC (Remote Procedure Call), CORBA (Common Object Request Broker Architecture), Java RMI (Remote Method Invocation)[3,4]. But it has the limitation in bringing information both anywhere and anytime over the Internet. Therefore it is necessary to establish the realtime monitoring system through wireless Internet.

The wireless Internet means environment and technology which enable users to make an access to Internet services and download information through wireless networks by using wireless terminals while moving. The thesis has an aim to realize the web server load monitoring system through wireless Internet. Realized systems can monitor web server information more freely than wire Internet in terms of space and time. In particular, operators using the new system can monitor immediately web server overload or log-in by unauthorized users anywhere and anytime.

Chapter 2 describes the necessity for the web server load monitoring, Chapter 3 explains the necessary wireless Internet, Chapter 4 addresses the realization of the wireless web server monitoring system, and Chapter 5 induces the conclusion of the thesis

Ⅱ. Necessity for Web Server Load Monitoring

More than one mirroring web servers have recently been used to improve bandwidth of web server and reduce delay times.

However, as it is difficult to manage performances of web servers due to geographical diversification over the Internet, system operators recognize the technology of web server remote-monitoring as a core part of the management of performances of more than one nodes mirroring web servers.

If web servers see increase in their loads due to sudden increase of users, transmission ratings, number of processes, and memory uses or problems take place on systems themselves, operators cannot provide well web services and will lavish web server development costs[3]. In addition, as web server administrators have difficulties in checking persistently errors occurring in several servers and managing them at the same time, the technology of informing occurrence of problems by automatically measuring loads of web servers is needed [4].

The monitoring function necessary to operate web servers must check persistently whether all components of websites work properly and must be able to detect any error in a short period of time. Against rapid increases in web server users it can prevent errors out of excessive use of resources by conducting optimum operations enabling to detect the number of users and transmission ratings. Using log (historical) data stored in DB after periodic measurements of loads, the web server load monitoring can analyze system performances, predict rates of using networks and maximum traffic times, and back further system expansions. [5].

Important factors representing web server's load are network connection, data transmission rating, CPU, memory, and disk use rates. Importances of these factors are described in 〈Table 1〉.

Table 1. Load Factors of the web server

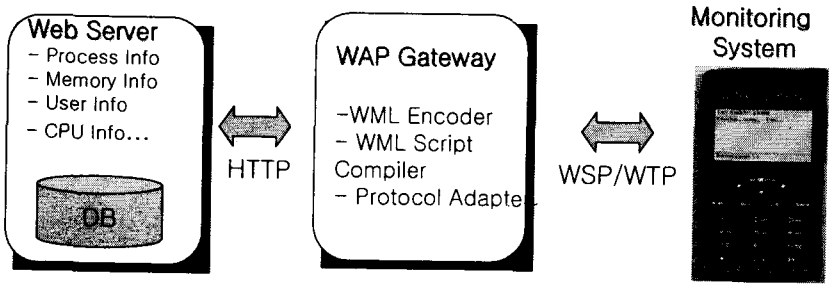
Load Factor	Importance
Network Connection	Server must be always connected to network for user's access to it.
Data Transmission Rating	As data sent to users increase, transmission speed becomes slow due to increases of network loads.
Memory Use Rate	Server's processing speed depends on the amount of memory used.
Available Disk Capacity	Disk full errors are expected if the amount of available disk deceases to less than a certain level.
Disk Use Rate	The higher disk use rate is, the slower disk access speed is.

Ⅲ. Wireless Internet

The wireless Internet provides not only Internet access using wireless communication but also Internet services via wireless equipment such as mobile phone and personal digital assistant (PDA) or wireless systems like LAN and Bluetooth. It gives users an opportunity to use Internet services regardless of space and time. To be given Internet services, they use Internet browsers built in mobile phones and laptop computers or PDA using wireless modems. Wireless LAN enables to receive Internet services through wireless LAN cards, while Bluetooth is used with being mounted on wireless Internet equipments for simple control and communication between them. Linkage to wireless networks is required to applying mobility to the Internet. And the methods of WAP(Wireless Application Protocol) and ME(Mobile Explorer) are suggested as standard to make an effective use of limited resources of wireless terminals.

The thesis uses WAP method rather than ME method initiated by MicroSoft Inc. The WAP as wireless Internet standard protocol is defined and specified in WAP Forum[6][7]. Though the WAP method is used by most of global users, it has the problem of being incompatible with the existing cable Internet protocols which do not support HTTP. For this reason, the WAP method requires WAP Gateway and additional expenses.

Fig. 1. The Overall configuration of the realtime wireless web server monitoring system



Ⅳ. Implementation of Wireless Web Server Load Monitoring System

The configuration of the realtime wireless web server monitoring system via wireless Internet is shown in Fig. 1.

Web server means a system provided via the Internet for general users. Process

information, memory and user information now in use must be monitored to check whether web server functions well. And the WAP gateway plays a role as intermediary converting data between WAP protocols (WSP, WTP, WTLS, WDP) and IP-based packet networks[5][6]. That is, the WAP gateway is a server containing software connecting TCP/IP Internet networks to wireless networks. The monitoring system monitors loads of web server through the WAP gateway. And web masters can monitor wanted information on web server load after logging on to web server via mobile equipment.

The information monitored are shown in Fig. 2 and Fig. 3. The screen in Fig. 3 is the main screen of web server load monitoring system and consists of process, memory, user, and CPU/OS information. When web masters select wanted information, detailed information is called.

Fig. 2. Monitoring information

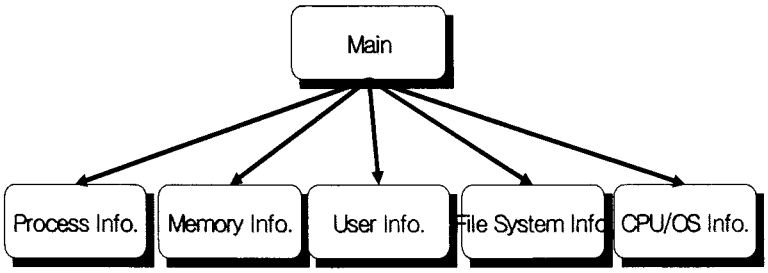
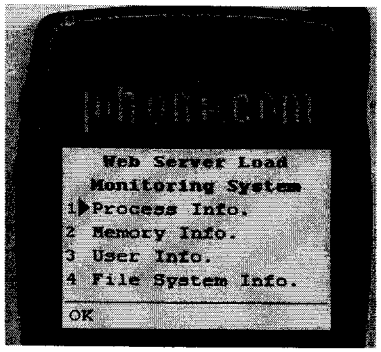


Fig. 3. The main screen of the wireless web server monitoring system



4.1 Process Information

They include process information and demonstration process information now being carried out. The process information now being conducted are shown in Fig. 4 and the number of processes now conducted in the system is 76. PId means process number. And Time means cumulative times of CPU that has been used until now to implement process command, while Command means process name. Fig. 5 shows demo process information now carried out. Now the number of daemon processes is 40 and the remaining information are shown in Fig. 4.

Fig. 3. Current process info.

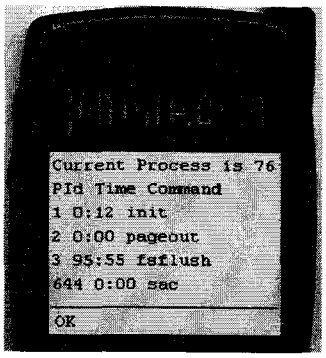
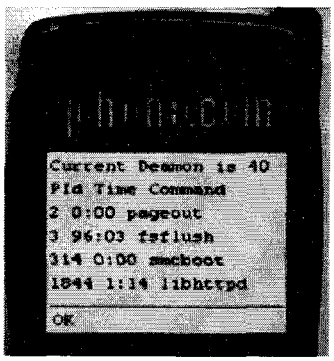


Fig. 4. Current daemon process info.



4.2 Memory Information

They include memory information and swap memory information now in use. The memory information can prevent in advance the disk full phenomenon by measuring the amount of disk used in the system and amount of available disk on a real time base. The phenomenon causes fatal errors in system operations and makes impossible web service provision. As works and processes in the system increase, the amounts of swap memory information now available decrease. The less the amount of swap memory is, the slower web service speed is. The current free memory will be shrunk as works and processes in the system increase. Fig. 6 shows memory information now in use. FS indicates where present file system is installed. In addition, Ail represents the whole disk capacity, Ud expresses used capacity with K, Fr available capacity also with K, and the last To means percentage of available capacity. Fig. 7 shows swap memory information in the present system and Path represents equipment of file system. And others are shown in Fig. 6.

Fig. 6. Current File System info.

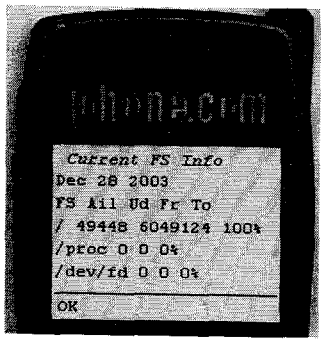
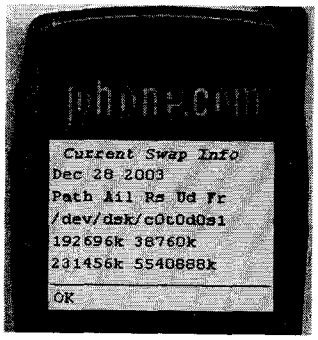


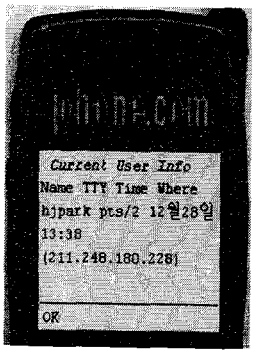
Fig. 7. Current swap info.

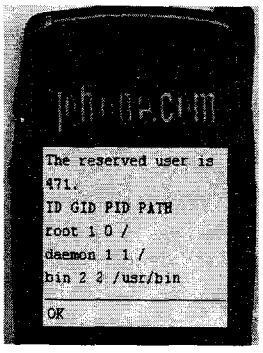


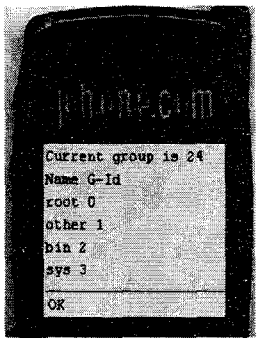
4.3 User Information

They include information on log-in users, users registered with web server, and groups registered with web server. Fig. 8 shows the information on present log-in users. Name represents names of log-in users. TTY means names of terminals to which users make accesses, Time signifies log-in times, and Where means sites of log-in. Fig. 9 shows user information now registered with web server. In the figure, the number of users now registered is a total of 471 and ID, GID, PATH mean user name & group number, process number, and path, respectively. Fig. 10 shows information on groups now registered with web server. As shown in Fig. 10, the total number of registered groups is 24.

Fig. 8. Current user info. Fig. 9. Current reserved user info. Fig. 10. Current Group info.







4.4 File System Information

They contain information on file system's structure and those of file system. Fig. 11 shows information on file system's structure, while Fig. 12 information on file system. FS indicates where file system is installed and the other information are shown in Fig. 6.

4.5 CPU/OS Information

They contain the number of users logging on to the present system, the average number of works conducted in CPU for the latest 1, 5, and 15 minute(s), kind and version of OS, CPU name, and system name. The average number of works conducted represent the whole load status. The higher the average number of works, the more processes recently conducted in the system. Accordingly, the memory and CPU use rates increase. As the average number of works increases, web server's load becomes heavier and web service speed slower. Fig. 13 represents CPU load information. Now 2 users make accesses to the system and use it, and AL(1), AL(5), AL(15) mean the average number of recently conducted works. Fig. 14 shows information on OS. The present system uses SUNOS 5.8,

Fig. 11. Current File System's Structure info.

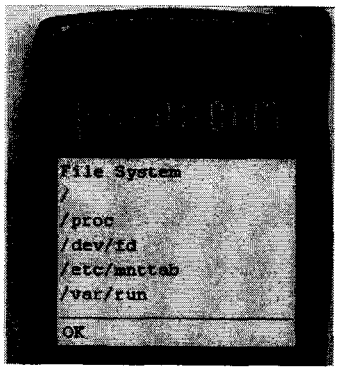


Fig. 12. Current File system info.

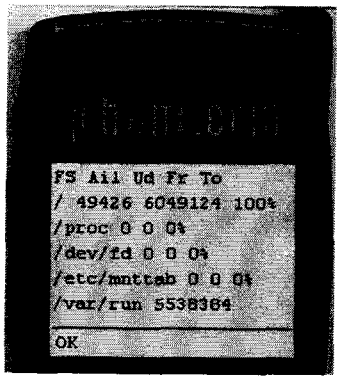


Fig. 13. Current CPU info.

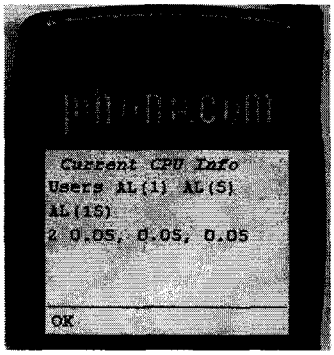
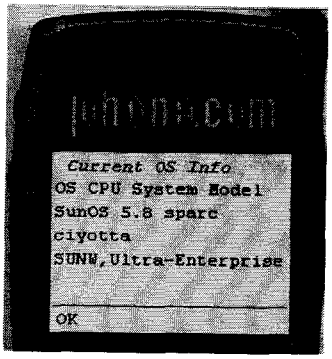


Fig. 14. Current OS info.



whenever they are via PDA using the WAP protocol. The information on the system developed in the thesis are divided into 6 including process, memory, CPU and the like.

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