Development of Real-Time Enterprise Communication Service for Ubiquitous Age

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Smart terminals such as cellular phones and PCs and sophisticated network technologies such as cellular communications and Internet Protocol (IP) can be used to build network service platforms that can change the style of everyday work and create new value for customers. One of the new services to come from such a platform is a high-mobility service that enables people to continue working over a network while traveling. Another is a collaboration service that exchanges voice, video, and other information between different locations. In addition, a ubiquitous service that enhances connections over a network will be provided in the near future. This paper introduces three new network services that enable business to be done more efficiently: a service that connects cellular phones to an enterprise network, a Web-based multimedia videoconference system, and an experimental ubiquitous service that associates Quick Response (QR) codes with cellular phones.

1. Introduction

Recently, there have been remarkable changes in the way work is conducted in enterprises. Conventionally, work is done, for example, by telephone and E-mail communication, document creation at a desk at a local site, and direct communication after business trips. In addition to these conventional styles, new high-mobility and collaboration services have been realized. In a high-mobility service, business can be conducted via a network even during traveling. In a collaboration service, business can be conducted using voice, video, and other means between different locations. In addition, the development of Internet Protocol (IP) technology and the spread of IP applications have encouraged the introduction of IP communication in enterprise networks and the use of IP applications. Also, as extension telephones are replaced with IP phones, new real-time communication services are being realized through cooperations between services such as telephone, E-mail, and Web services. In the future, a ubiquitous service in which even everyday personal items can be connected to the network will arise, and the style of work will change even more.

At present, the authors are studying new ways of using networks in business and daily life that have become possible because of these changes. This paper introduces some typical examples of the new network services that are currently available or will become available in the near future. The first example is a high-mobility service that connects cellular phones to an enterprise network so business activities can be continued even while traveling. The second example is a Web-based multimedia (videoconference) collaboration service that enables people in different locations to attend a videoconference using their PCs. We describe the system configuration and characteristics of these services. We also describe a test for a ubiquitous service in which Quick

Response (QR) codes are used with cellular phones.

2. High-mobility service

The recent improvements of cellular-phone functions and the introduction of packet flat-rate plans have made the use of cellular phones more attractive for business purposes. For example, salespersons traveling abroad on business trips can now read E-mail saved at their company and can read or update a groupware schedule in real time while traveling on a train.

Since August 2005, Fujitsu's FENICS (Fujitsu Enhanced Information and Communication Service) corporate network service has included a solution called the FENICS-AS cellular-phone connection service (**Figure 1**). This service is a network infrastructure service that provides secure connections from cellular phones to in-company networks. The following describes this service and the function extensions that will be made in the future.

2.1 Outline of service

In-company Web content for cellular phones, groupware, and in-company E-mail can be read and used from cellular phones by accessing a portal site dedicated for this service using an i-mode browser, EZWeb browser, or Vodafone Live! browser. Information about the servers shown in Figure 1 can be browsed from a cellular phone, but the cellular phone does not save the information. Therefore, if the cellular phone is lost, the information cannot be obtained from it. This network service also features superior data protection compared to most other services of this type. **Figure 2** shows a use image of this service.

2.2 Characteristics

1) Multi-carrier support

This service supports all the major mobile carriers, for example, NTT DoCoMo, au, and Vodafone, and is available on most cellular phones.

2) High security

The FENICS network is connected to each

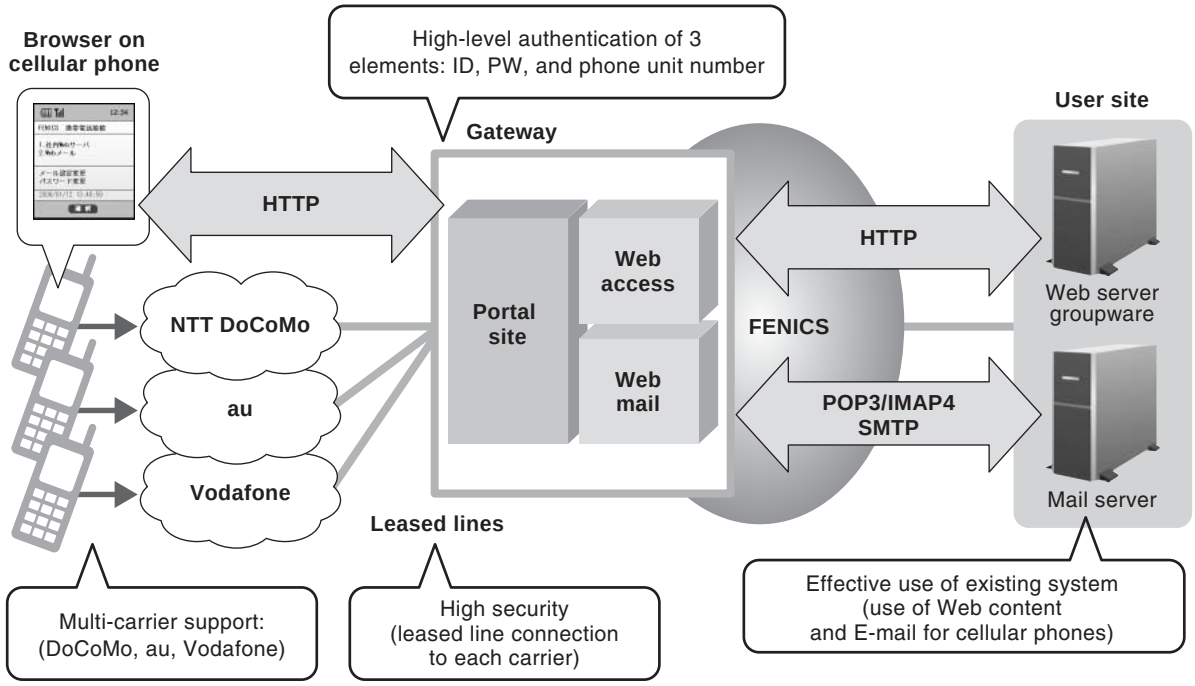

Figure 1
Configuration of FENICS-AS cellular-phone connection service.

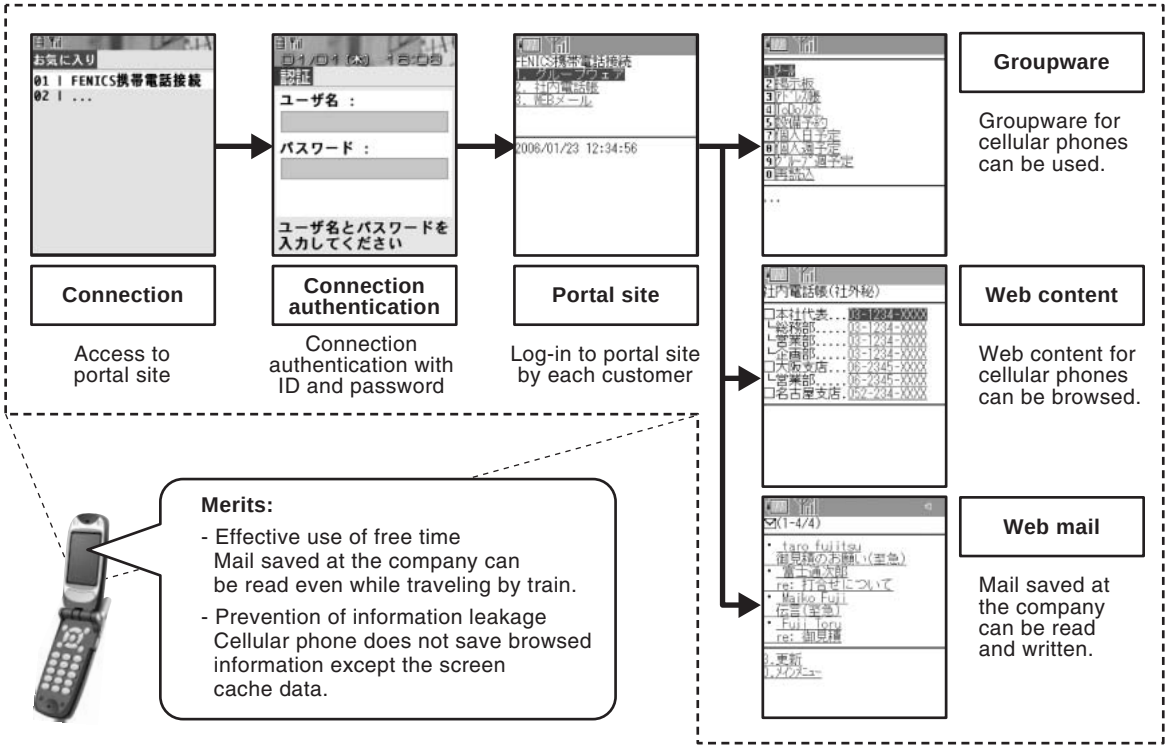

Figure 2
Use image of FENICS-AS cellular-phone connection service.

mobile carrier network as a closed user group. Because this system does not include an open environment such as the Internet, secure communications can be performed without risk of eavesdropping or tampering.

The portal-site connection authentication system supports authentication using an ID, password, and phone unit number, which is a unique number assigned to each cellular phone. Therefore, if the phone unit number of a cellular phone that is permitted to access the portal site is previously registered in the related ID, access from other cellular phones can be rejected.

3) Low cost

Only one line between the customer and the server to be accessed is required, and dedicated lines to each carrier are unnecessary. In addition, new capital investment is not required because conventional mail servers and Web content for cellular phones can be basically used for this service without modification.

Packet flat-rate plans (Pake-Hodai, Double Flat Rate, and Dual Packet Flat Rate) are supported, so this service can be used without incurring a high packet rate after the user has subscribed to a packet flat-rate plan.

2.3 Future extended functions

A pattern authentication system using a one-time password will be introduced to check connections to a portal site. The various convenient functions of cellular phones make them more susceptible to risks such as information leaks. Moreover, many users set simple passwords because it is difficult to input characters to a cellular phone. However, the pattern authentication only requires a simple password to be input and provides high security. With this system, the user memorizes a sequence of simple shapes, for example, circles, squares, and animal outlines,

and then selects the sequence by entering the corresponding number displayed in a random number table on the Web browser. Each time the cellular phone is connected to the portal site, the pattern authentication system supplies a new one-time password. This combination of pattern authentication with phone unit number authentication provides very secure connection authentication that can almost eliminate the possibility of illegal access to a portal site.

3. Collaboration service

In recent years, many conventional videoconference systems have been replaced with Web/PC-based multimedia videoconference systems. In these new systems, videoconferences with video, text, and voice can be held between local sites using ordinary PCs, USB cameras, and handsets. These systems are convenient and very easy to use. Web-based multimedia videoconference systems are becoming increasingly popular as 1) more and more enterprises (especially manufacturers) launch into foreign markets such as China and other Asian countries, 2) broadband use expands, and 3) PC functions improve and system prices fall. Such systems are also becoming popular in Japan, where conventional videoconference systems are not widely used. It is predicted that the market size of Web-based multimedia videoconference systems will exceed that of conventional videoconference systems in 2007. It is also predicted that the total market size of conventional and Web-based multimedia videoconference systems will be 103 billion yen in 2010 and Web-based multimedia videoconference systems will account for about 70% of the market.[1),2)] Web-based multimedia videoconference systems are also becoming important components of infrastructures such as disaster control systems, teleworking systems, customer support systems at contact centers, and teleteaching systems at educational institutions.[3)]

3.1 Fujitsu's Web-based multimedia videoconference system: JoinMeeting

Fujitsu's JoinMeeting Web-based multimedia videoconference system can be used for videoconferencing using PCs connected to a network. JoinMeeting enables realtime transfer of video and voice using USB cameras and headsets, document sharing and creation, and application sharing.

JoinMeeting also has a presence function. This function shows whether a participant in a remote office is present, so wasted calls to a person who is not present at the receiving end can be avoided.

Figure 3 shows a screenshot of JoinMeeting. JoinMeeting has the following functions:

1) Videoconferencing

Videoconferences with up to 18 participants can be held.

2) Text chat

Character data can be sent to all or specified participants in real time.

3) Interactive board

Participants can share, browse, and write any document that can be printed.

4) Web browser sharing

Participants can navigate the same Web site together.

5) Desktop sharing

Operations on the chairperson's desktop screen (application) can be displayed on the other participants' PCs in real time.

6) Remote control

The chairperson and an interrogator can operate the same application at the same time, and other participants can see these application operations.

7) Recording/reproducing functions

Video, voice, text chat data, and documents shared during a conference can be recorded. The recorded data is saved in a recording file and can be reproduced later by executing the recording file.

8) Conference reservation function

A conference can be reserved, and invitations

Figure 3
User interface of JoinMeeting Web-based multimedia videoconference system.

can be sent to the participants by E-mail. The participants can attend the conference by clicking the URL written on the invitation.

9) Conference continuation function

A conference can be continued in another session, and the documents that were shared in a previous session can be reused in the next session without change.

10) Presence function

The attendance status of registered members can be displayed. After checking the attendance status, a conference opening message, invitation, and other short messages can be sent to the members.

11) Hot-standby function

The system has a redundant backup structure, so even if a serious error occurs, a videoconference can be continued without the attendees being aware of the error.

3.2 Future expansion of Web-based multimedia videoconference system

The Web-based multimedia videoconference system will be linked with various systems. When such a linkage with groupware and the presence function is made, the name of the person in charge can be obtained, the presence status of the person can be checked, and the person can be called to participate in the Web conference. Also, linkage with mail, IP phones, and cellular phones has recently advanced.

In the future, Web-based multimedia videoconference systems will be used not just for intra-enterprise collaboration but also for collaboration between enterprises and between enterprises and individuals. In addition, improvements in image quality will make Web-based multimedia videoconference systems suitable for telemedicine.

4. Future expansion: ubiquitous services for connections to everyday personal items

It is predicted that real-time intra-enterprise communication will be enhanced and the range of network-connectable devices will be widened and thus many new services will be provided that establish high reliability on the network.

In the near future, information from everyday personal items will be directly transmittable to the Internet in IP packets. For example, articles can be given labels on which Quick Response (QR) codes are printed and the QR codes can be read with a reader that can send the information to the Internet in an IP packet.

Information can also be encoded, for example, as a three-dimensional pattern on the surface of a metal key, in a radio frequency identification (RFID) tag, or a memory chip.

Although there are currently no services for this type of direct connection to the Internet, we have investigated the possibilities by developing a lost-child support service for theme parks and other venues that is based on the QR code system. **Figure 4** shows the configuration of this system.

With this system, at admission, each child is given a badge displaying QR-encoded information that identifies the child. Then, when a lost child is found, the system is used to identify the child from the badge's information and then contact the parents by E-mail.

We tested this system from August 15 to 21 of 2005 at the Parque Espana amusement park in Shima-city, Japan.

We distributed 1225 badges over these three days. During this test, there were three lost children and they were quickly returned to their parents after their QR codes were read. The shortest time required for their return was three minutes and the longest time was 10 minutes. Usually, in theme parks, including Parque Espana, the details of lost children are not publicly broadcast, so it often takes a long time to

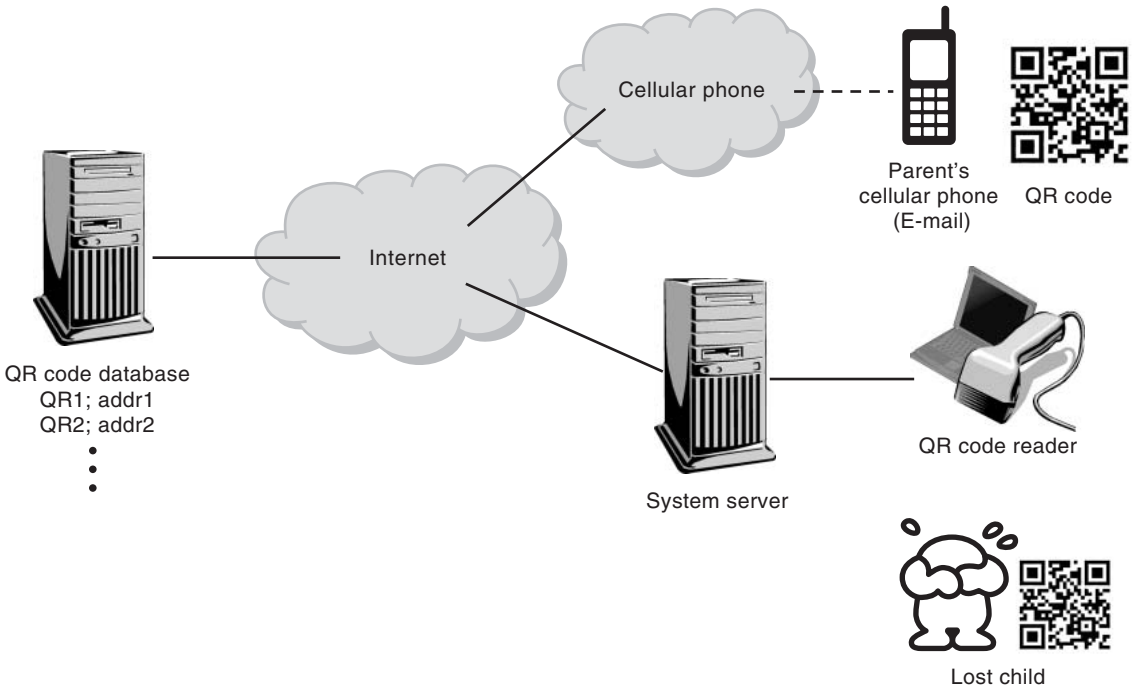

Figure 4
Configuration of lost-child support system.

return the children to their parents. Therefore, this maximum return time of just 10 minutes proves the effectiveness of this service. Also, 99% of the users of this service in the test said the service was effective.

5. Conclusion

The major trends of intra-enterprise real-time communication services are to provide a high-mobility service, mainly for cellular phones and mobile communication networks, and a real-time collaboration service based on IP technology. This paper introduced two new network services: the FENICS-AS cellular-phone connection service and the JoinMeeting Web-based multimedia videoconference system.

Fusing these services with ubiquitous services strengthens the information linkage between humans and everyday personal items. It is important to be able to quickly and appropriately make such linkages, and there will be strong demands for the network infrastructure and services required to make them. To meet these demands, the broadband network must be given a higher communication speed, higher reliability, higher mobility (through radio technology), wider bandwidth assurance, and higher security. While constructing a network infrastructure that satisfies these conditions, we will examine the new ways in which it is used and supply, as new services for business and daily life, the new values that are produced by appropriately linking together people, everyday personal items, and information.

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