

Internet Information Service using Telephony and Fax, ITC-CSCC'2000

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Abstract: This paper is addressed to Internet telephony based service implementation. It describes an implementation method which uses ARS as a gateway which combines Internet and traditional public switched telephone network for Internet information service using telephony and fax, is different to traditional Internet telephony which provide enhanced speech quality and low cost functionality. This method allows telephony and/or fax user to get Internet information without additional Internet bill, Internet infrastructure and low connection quality from low signal bandwidth connected him. Implemented system is useful to a special kind information service such as climate information of Korea etc and simpler than WAP based service as for wireless mobile telephony user.

We implement job opportunity information and advertisement service supported by Home page of Choong Book Small & Medium Business Administration and e-mail service supported by Korean Society for Rehabilitation of persons with Disabilities to demonstrate the system ability. As a result of test implementation, this service system works good for blind persons and graduated persons without job, is expected to apply for special Internet information provider via Voice and Fax.

1. Introduction

Every ten years or so, the most basic of telecommunications services, the telephone, has undergone a dramatic change. In 1950s, the introduction of transatlantic coax cables allowed direct-dial international calls; in 1960s, digital transmission and switching dramatically improved the audio quality, in 1970s, programmable switches enabled touch tone dialing and local services such as call waiting; and in the 1980s, the wide-spread implementation of out-of-band common channel signaling systems like Signaling System 7(SS7) made services such as 800 numbers possible. These changes define a trajectory from analog transmission and signaling to digital, circuit switched transmission and packet based signaling.

In the 1990s, Internet telephone marks the latest step along this slow path to an all packet infrastructure. The first papers on how to transmit voice were published in the early 1970s, and the first Internet packet audio experiments took place in August 1974, when real time packet voice was demonstrated between the University of Southern California's Information Sciences Institute and the MIT's Lincoln Laboratory. The first Request for Comments for packet voice, RFC 741, was published in 1977.

Internet telephony developed relatively slow until 1991

and 1992, when packet-audio experiments were performed on DARI net, and the first IETF meetings were multicast across the Mbone. In 1995, Vocaltec introduced one of the first PC-based Internet telephony applications. Gateways to the public switched telephone system(PSTN) following shortly thereafter, although most were initially limited to a few analog ports. There was also a shift away from using end systems like PCs, which connect directly to the Internet, and toward using regular telephones on both ends instead.

But because infrastructure and facilities are concentrated to special group such as research center, university and big enterprise, data transfer rate is low, internet billing is expensive and internet retrieval demand professional education, it needed for much more investment and time that usage of internet is popular to everyone in Korea. Therefore, in meantime, there is keen interest in methods that allow the existing phone system to connect to Internet, while maintaining the functionality of the existing network^[5-7,10]. Thus we will look at integrating Internet with traditional communication tool such as telephone and Fax during the transition to a packet-based environment

The integrating Internet with existing public switched telephone network (PSTN) services affords an opportunity to revisit many of the fundamental design choices that have governed the architecture of telephony. Most of researches and developments for it are divided in three categories, the first of them is concerned with Internet telephony, the second is wireless phone protocol solution for Internet such as WAP, the third is voice extensible markup language solution.^[13] The explosive growth of the Internet and World Wide Web technologies has shifted the landscape for providers of traditional phone services to a new set of customers accessing information and services through the Web. While in most cases customers' still access-automated services through the phone, providers are finding it easier to build new services that exploit the power of Web technology. The motivations for integrating Internet with telephony are prospect of integrating other Internet services and creating new services with relative ease. It will be possible to separate bit transport from service provision in a manner similar to the way specialized companies today provide "portal" service, like Web-based e-mail or Web hosting, without necessarily owning the internet network infrastructure^[1-4]. Integrating POTS with web services may be as simple as connecting a caller to a web page listing different destinations, rather than connecting to an interminable voice menu. In general, integration will allow a back-and-forth interface between the asynchronous "canned" interaction of a web page and live human interaction.

CTI (Computer telephony integration technology) refers to systems that enable a computer to act as a call center, accepting incoming calls and routing them to the appropriate device or person. Today's CTI [10] systems are quite sophisticated and can handle all sorts of incoming and outgoing communications, including phone calls, faxes, and Internet messages.

The main CTI functions are integrating messaging with databases, word processors etc.; controlling voice, fax, and e-mail messaging systems from a single application program; graphical call control - using a graphical user interface to perform functions such as making and receiving calls, forwarding and conferencing; call and data association - provision of information about the caller from databases or other applications automatically before the call is answered or transferred; speech synthesis and speech recognition; automatic logging of call related information for invoicing purposes or callback.

This paper is addressed to a simple method of integrating Internet and PSTN, is concerned on an implementation model, which can get special Internet information by using general telephone and Fax. We select ARS system for phone as Internet gateway and can select scope or categories of Internet information by selecting telephone number like as web URL selection, which has assumption that telephone users get knowledge about scope of information in advance the telephone number, has. This system gathers information from preselected web pages using web browser and specially designed web agent per selected time interval, register and store the information in system database independently to consumer process. Phone users are supported by guide voice, select desired information by telephone button, then the information is transferred to them via voice or Fax. This method is identical to general ARS, but is different to it by the sense that supported information is web information. Therefore the system can supply more general information than traditional ARS.

2. System Configuration

The internet Information system is composed of ARS server for telephone or Fax interface, web server, TTS server, DB server and application program. The interface to the public telephone network is a set of standard telephony boards inside an dual Intel Pentium II personal computer running the Windows NT operating system. We use Dialogic 4 channel VFX40Esc as ARS board which can perform with real time, because the board include exclusive function, Intel CPU, Motorola DSP chip for telephone and FAX service.

This system needs DNA3 driver for execution which is supplied by Dialogic. Application programs are coded by using visual basic, visual C++ and special Ring Impact tool. We develop simple web agent for gathering web information, gathered information is saved in database. We use Oracle and SQL Server as DB server and select LG TTS server for converting text information to sound file. This system configuration is shown in Fig 1.

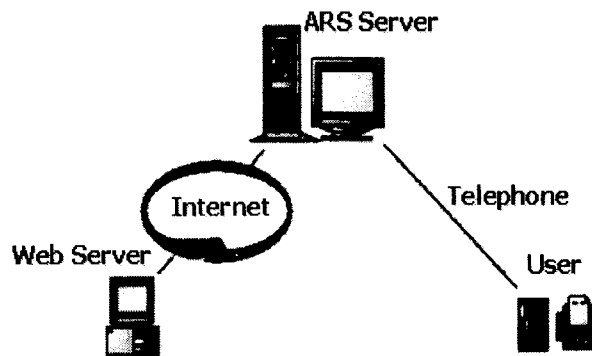


Fig 1. The Basic Configuration of Total System

The configuration of this system S/W is shown in Fig 2.

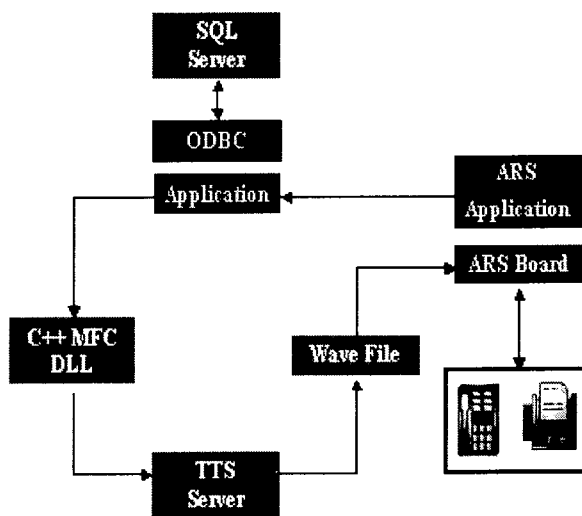


Fig 2. The Architecture of System S/W

3. Voice Synthesis and Web Agent

Text to speech [5-7] has function which transforms text to speech. Developed system saves information getting HTML documents which converted to characters in database therefore this system needs voice synthesis for transmission the voice which is converted from the text in the database by telephone. TTS systems are entering mainstream of advanced telecommunication applications. For this, they have to deliver highly intelligible output for general text, while also sounding natural. In a Nov. 1998 TTS comparison test conducted by ESCA /COCOSDA, a total of 17 systems competed in English Language(13 US and 4 UK English systems). Test items are overall voice quality, intelligibility and overall impression [14]. Although test procedures were not totally satisfactory for many reasons, evaluations like the ESCA/COCOSDA tests will continue to be necessary in order to measure further improvements.

On this study, we test two-products of TTS server which are developed for Korean language. Test items are same as ESCA/COCOSDA case, we select one product by five-members' opinion.

Soft agent [8,9,11] as new paradigm in software engineering is computer program that executes special

work automatically by user's presetting. Main themes of study about it are autonomy, intelligence, and interactive cooperation function. But there is not perfect agent which has all 3 functions until now. Generally, user offer information service needs web agent [11] program which can move the other site alone. But In this paper, we implement service about special homepage. therefore this system use implement agent which is simple. we implement agent which get special information in the web homepage by web browser. In the method case, it get the location and text in the HTML document. but it is not easy to generalize. If the HTML is changed, error occurs and user would be heard information faulted. Therefore web agent should check what is changed as form or location of special information.

4. Implemented Service

We implement service whose information is restricted to web information by using Windows NT platform. Some text information is transformed to speech, supplied to user via voice by telephone and some text, graphic or image information is transformed to Fax format, supplied by Fax. We prefer home page of Choong Book Small & Medium Business Administration and e-mail service supported by Korean Society for Rehabilitation of persons with Disabilities as system test bench and implement service system for them. An application scenario of ARS program for Choong Book Small & Medium Business Administration is shown in Fig. 3, is most clearly explained in terms of an incoming call. A separate process on the telephony PC monitors each incoming line. This controlling process detects ring and answers the call by playing the introductory welcome and instructions. Then the dialogue is started as programmed by a script for this controlling process. The system configuration for it is shown in Fig. 4, and the system configuration of voice E-mail reading service for KSRD is shown in Fig. 5.

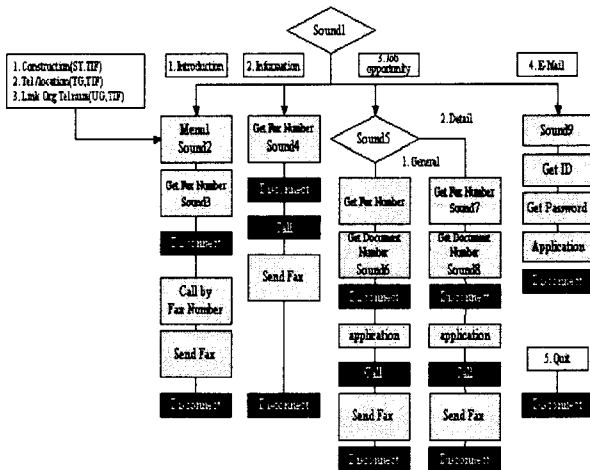


Fig 3. ARS Service

The service diagram of Choong-book small & medium business administration is showed in Fig 4.

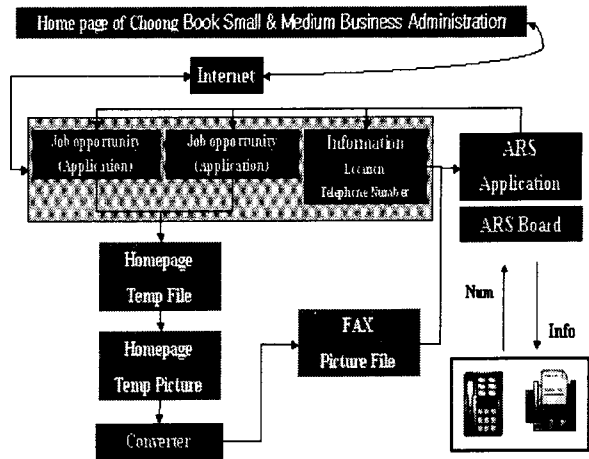


Fig 4. Service of Choong Book Small & Medium Business Administration

As a result of test, it operates successfully, takes one-minute to get information of one full text page in the web homepage and to make fax file. It take one-minute to send fax as two pages by using 14,400 b/s Fax modem therefore it takes three minutes per one user. It supports twenty members per one hour. If it is operated by off-line it supports double the connection performance. Delay problem occurs when telephone user inputs incorrect Fax number because this system tries connection by incorrect number. We can't know user's telephone number due to law in Korea. So we can't inform to user that requested Fax is not delivered. We can solve the problem by the membership system.

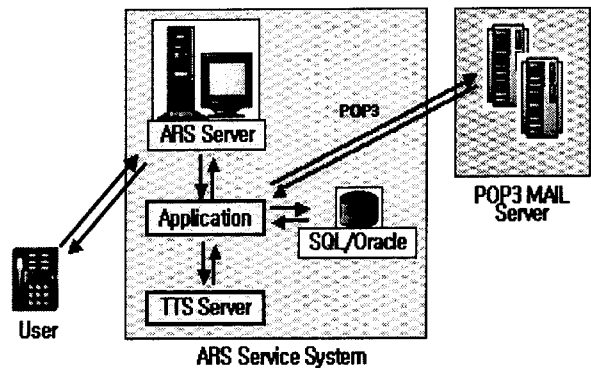


Fig 5. Service of e-mail

E-mail is useful as a TCP/IP application. We can transfer sentence, file, sound, image or other information to other people by E-mail. E-mail is more important than before because we can transfer what we want whether the receiver is ready to receive it or not. The need for E-mail-to-speech converters is growing as more people demand access to their E-mail over the telephone.

In addition E-mail texts may contain various types of embedded messages -- forwarded material, quotations -- that should be detected and set off auditorily in order to aid the listener in navigating the document. And E-mail text is rife with non-standard words.

E-mail contents are encoded by MIME. This is for transmitting many kinds of information. They are 7/8bit,

Base64, Quoted-Printable, and this system supports that so that users can use various E-mail servers.

- 7/8 bit
- ISO-2022-KR, ks_c_5601.1987(Microsoft),
- Base64
- Quoted-Printable

ARS system searches information of user in database. ARS system get user ID and password by telephone button and then mail agent application searches user information in the database as mail server address, mail server user ID and password.

This mail agent application connects mail server by user information and get the e-mail. After the e-mail content is a converted voice file. The user can hear the voice by ARS system. For saving the user information, database consist of name, user ID, mail server address, password, and telephone number.

User can know mail subject, content, how many pieces of mail are in the user's mailbox. And user can hear the mail again, delete the mail selected. This mail system is support 7/8bit, base64, Quoted-printable decoding. When the user uses this system, the user has to wait for about 3-5 second to hear own his mail.

5. Conclusions and Discussion

We suggest an Internet Information service Model using telephone and Fax, implement services for job opportunity information and advertisement service supported by Home page of Choong Book Small & Medium Business Administration and e-mail service supported by Korean Society for Rehabilitation of Persons with Disabilities to demonstrate the system ability using telephone and Fax. These services are probably one of the first services for Internet information using general telephone and Fax in Korea, commercialized in USA, awarded for Best 10 Internet New Technology in 1997.

As results of this implementation, we understand high speed service requirement for real time service, for which both of information provider and information supplier needs high speed exclusive network and real time processing capability of web server is very important for many user service. This implemented service is suitable to the daily or hourly updated information service. Actually, it is often occurred that telephone user is tedious due to network heavy traffic at daytime. To overcome this problem, we use web agent, which connect information provider via Internet, acquire necessary information and update service database at regular time interval.

To generalize information retrieval, an intelligent reasoning technique and voice recognition capability is needed for telephone guide and to generalize information extraction, it is needed that develop editor which identify corresponding web contents of information provider.

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6. Acknowledgement

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