Seminar Report

On

i-Mode Technology

submitted by

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CERTIFICATE

Certified that this is a bonafide record of the seminar titled

i-Mode Technology

Done by

Awanish Vatsa

of VII semester Computer Science & Engineering in the year 2010 in partial fulfillment of the requirements for the award of Degree of Bachelor of Technology in Computer Science & Engineering of Cochin University of Science & Technology

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AWANISH VATSA

ABSTRACT

The imode is the NTT DoCoMo's new Internet access system. It is an advanced intelligent messaging service for digital mobile phones and other mobile terminals that will allow us to see Internet content in special text format on special imode-enabled mobile phones. Enabling information access from handheld devices requires a deep understanding of both technical and market issues that are unique to the wireless environment. The imode specification was developed by the industry's best minds to address these issues. Wireless devices represent the ultimate constrained computing device with limited CPU, memory and battery life and a simple user interface Wireless networks are constrained by low bandwidth, high latency and unpredictable availability and stability. The imode specification addresses these issues by using the best of existing standards and developing new extensions when needed. The imode solution leverages the tremendous investment in web servers, web development tools, web programmers and web applications while solving the unique problems associated with the wireless domain. The specification ensures that this solution is fast, reliable and secure. The imode specification is developed and supported by the wireless telecommunication community so that the entire industry and its subscribers can benefit from a single, open specification.

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CHAPTER 01

INTRODUCTION

The imode is the NTT DoCoMo's new Internet access system. It is an advanced intelligent messaging service for digital mobile phones and other mobile terminals that will allow you to see Internet content in special text format on special imode-enabled mobile phones. Enabling information access from handheld devices requires a deep understanding of both technical and market issues that are unique to the wireless environment. The imode specification was developed by the industry's best minds to address these issues. Wireless devices represent the ultimate constrained computing device with limited CPU, memory and battery life and a simple user interface.

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1.1 NTT DoCoMo: The Creators of imode

NTT DoCoMo is a subsidiary of Japan's incumbent telephone operator NTT. The majority of NTT-DoCoMo's shares is owned by NTT, and the majority of NTT's shares is owned by the Japanese government. NTT-DoCoMo's shares are separately listed on the Tokyo Stock Exchange and on the Osaka Stock Exchange, and NTT-DoCoMo's market value (capitalization) makes it one of the world's most valued companies.

1.2 Goals of the imode

The goals of the imode forum are listed as follows.

- To bring Internet content and advanced data services to wireless phones and other wireless terminals.
- To develop a global wireless protocol specification that works across all wireless network technologies.
- To enable the creation of content and applications that scale across a wide range of wireless bearer networks and device types, i.e. to maintain device and bearer independence
- To embrace and extend existing standards and technology whenever possible and appropriate.

1.3 Why imode is necessary?

Ensure interoperability

Service providers must feel secure that their investments will yield benefits in the future. They will not be able to do so until equipment and software offered by different suppliers can be made to work together. The imode specification has been designed to encourage easy, open interoperability between its key components. Any solution component built to be compliant with the imode specification can interoperate with any other imode-compliant component. Service providers can choose equipment and software from multiple imode-compliant vendors, selecting each piece of the solution that is appropriate for the service provider's particular needs. Bearer and device independence both help foster interoperability. But interoperability goes beyond these two principles to require that each imode-compatible component will communicate with all other components in the solution network by using the standard methods and protocols defined in the specification.

Encourage and Foster Market Development

The imode specification is designed to bring Internet access to the wireless mass market. By building open specifications, and encouraging communication and technical exchanges among the industry players, the **NTT DoCoMo** has already begun to open the wireless data market in new ways. Just over a year ago, the idea of a single wireless data standard was unheard of, yet today the imode specification is available to the public, and dozens of companies are promoting this vision of the future. The revolution is under way to bring information access to any handset, at a reasonable price and in an easy to use form factor.

The Market Is Different

Bringing computing power to a wireless handset opens an extensive new market for information access. This market is very different from the traditional desktop or even the laptop market because the subscriber has a different set of needs and expectations. Some of these differences include:

- . Ease of use
- . Market size
- . Price sensitivity
- . Usage patterns
- . Essential tasks

The Network Is Different

Wireless data networks present a more constrained communication environment compared to wired networks. Because of fundamental limitations of power, available spectrum and mobility, wireless data networks tend to have:

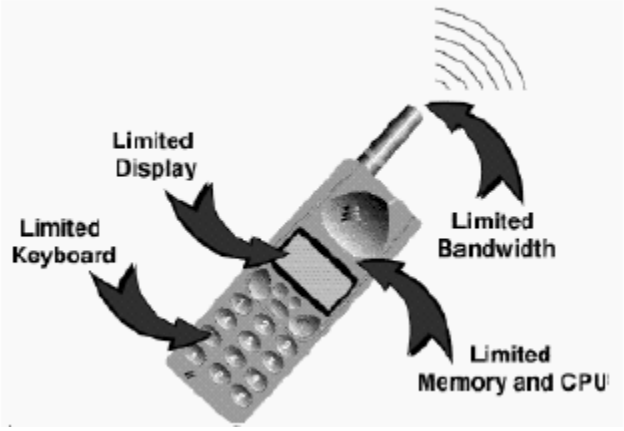
- Less bandwidth:
  imode addresses this issue by minimizing the traffic over the airinterface. cHTML(compact HTML) is binary encoded into a compact form when sent over the air in order to minimise the number of bits and bytes.

- High latency
  Wireless networks have high latency compared to wired networks. This is addressed in imode by minimizing the roundtrips between the wireless device and the wireless network.

- Less predictable availability
  Wired network access provides a more or less reliable connection to the network. That is not the case in wireless networks where bearers might be inaccessible for shorter or longer periods of time due to fading, lost radio coverage or deficient capacity. The problem mentioned above is addressed by allowing lost sessions to be resumed. Selective retransmission is also employed to retrieve small segment of a message that are lost. Furthermore, as bandwidth increases, the handset's power consumption also increases which further taxes the already limited battery life of a mobile device. A wireless data solution must be able to overcome these network limitations and still deliver a satisfactory user experience.

The Device Is Different

Handheld wireless devices present a more constrained computing environment compared to desktop computers. Because of fundamental limitations of battery life and form factor, mass-market handheld devices tend to have:



- Less powerful CPUs
- Less memory (ROM and RAM)
- Restricted power consumption
- Smaller displays
- Different input devices (e.g., a phone keypad, voice input, etc.)

Because of these limitations, the user interface of a wireless handset is fundamentally different than that of a desktop computer. The limited screen size and lack of a mouse requires a different user interface metaphor than the traditional desktop GUI.

CHAPTER 02

The Technology

imode consists of three technologies:

- A smart handset
- A new transmission protocol
- A new markup language.

The above mentioned three technologies together make the brand name, imode. Each of the above is dealt with in the succeeding sections.

2.1 Smart phone

A current high-end cell phone is now equivalent to a low-end PC. It has a 100 Hz processor, many megabytes of flash memory, and a color display with a graphical user interface. These 'smart' phones enable users to brows the Net with a touch of button. But users cannot talk while browsing the web. They switch to the web by hitting URL with a button on the phone. There is no defacto standard in operation system and browsing software, such as Windows 2000 or Internet Explore. Since information imode deals with is still simple, each cell phone maker adopt its own system. A typical screen of the smart phone looks the one below. Since most of the sites supported by imode presently are Japanese, the menu is seen to be in Japanese language. However the menu can be made to appear in English by selecting English as shown by the figure below.

imode displays are somewhat larger than regular cell phones. Some models are monochrome while others display gray scale or 256 colors. Most models can show small animations (animated GIFs). The size ranges from the smallest screen with 96 x 108 pixels (D501i) to the largest one with 120 x 130 pixels (N502i). This corresponds to anywhere from six to ten lines of text, at 16 to 20 characters per line.

a typical imode display.

The latest imode phones or the 'smart phones support rich, graphics. They also have color displays. When the 3G phones would be introduced. The imode smart phones would be able to display even moving pictures, which can be downloaded from the internet. Lot of new range of phones are available in the market with great design and engineering features.

2.2 The Transmission System.

CDMA

The transmission protocol of imode is Code Division Multiple Access (CDMA),which enables several subscribers to use the same line at once. imode's transmission speed is 9.6 K bps(bit per second), which is slower than a typical modem for personal use, 28.8K bps. Thus, email is limited to about 250 characters per message. Although 9.6Kbps is insufficient to download video, it is appropriate for short email and simple graphics.

One of the most important concepts to any cellular telephone system is that of "multiple access", meaning that multiple, simultaneous users can be supported. In other words, a large number of users share a common pool of radio channels and any user can gain access to any channel (each user is not always assigned to the same channel). A channel can be thought of as merely a portion of the limited radio resource that is temporary allocated for a specific purpose, such as someone's phone call. A multiple access method is a definition of how the radio spectrum is divided into channels and how channels are allocated to the many users of the system.

Multiple Access Comparison

It is easier to understand CDMA if it is compared with other multiple access technologies. The following sections describe the fundamental differences between a Frequency Division Multiple Access Analog technology (FDMA), a Time Division Multiple Access Digital technology (TDMA) and a Code Division Multiple Access Digital technology (CDMA). The multiple access technologies can be listed as:

- FDMA (frequency division multiple access)
- TDMA (time division multiple access)
- CDMA (code division multiple access)

2.2.1.FDMA - Frequency Division Multiple Access

FDMA is used for standard analog cellular. Each user is assigned a discrete slice of the RF spectrum. FDMA permits only one user per channel since it allows the user to use the channel 100% of the time. Therefore, only the frequency "dimension" is used to define channels.

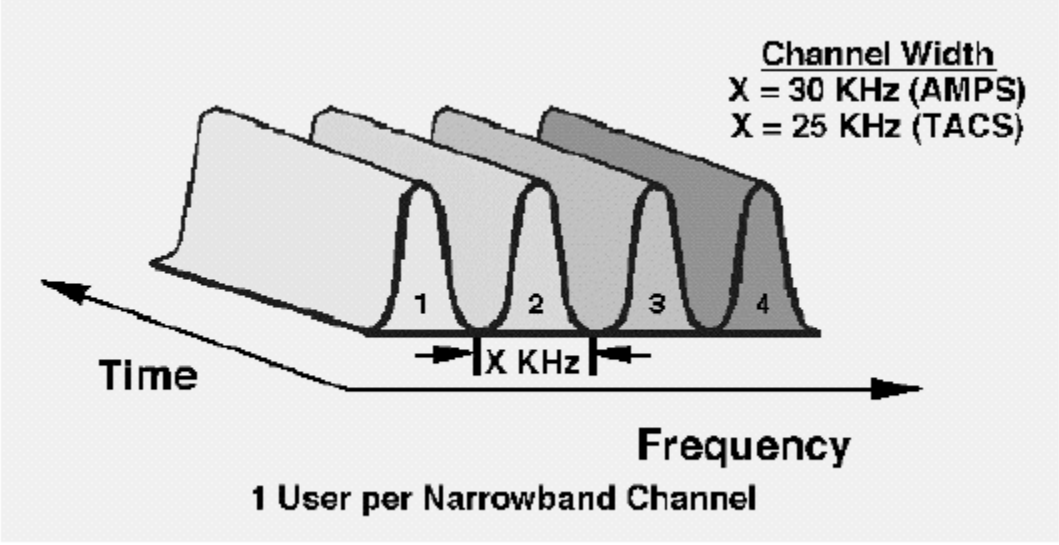


Figure : FDMA

2.2.2. TDMA - Time Division Multiple Access

The key point to make about TDMA is that users are still assigned a discrete slice of RF spectrum, but multiple users now share that RF carrier on a time slot basis. Each of the users alternates their use of the RF channel. Frequency division is still employed, but these carriers are now further sub-divided into some number of time slots per carrier. A user is assigned a particular time slot in a carrier and can only send or receive information at those times. This is true whether or not the other time slots are being used. Information flow is not continuous for any user, but rather is sent and received in "bursts." The bursts are re-assembled at the receiving end, and appear to provide continuous sound because the process is very fast.

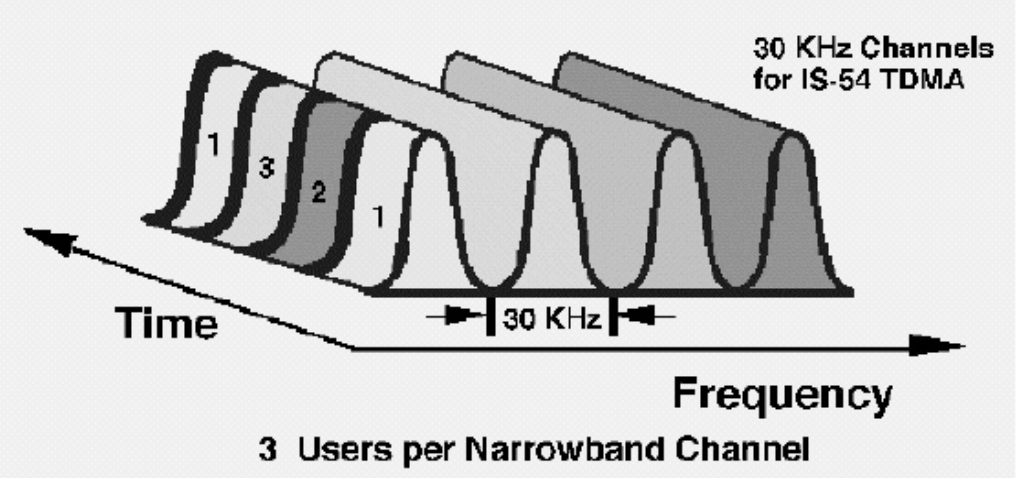


Figure : TDMA

2.2.3 CDMA - Code Division Multiple Access

IS-95 uses a multiple access spectrum spreading technique called Direct Sequence (DS) CDMA. Each user is assigned a binary, Direct Sequence code during a call. The DS code is a signal generated by linear modulation with wideband Pseudorandom Noise (PN) sequences. As a result, DS CDMA uses much wider signals than those used in other technologies. Wideband signals reduce interference and allow one-cell frequency reuse. There is no time division, and all users use the entire carrier, all of the time.

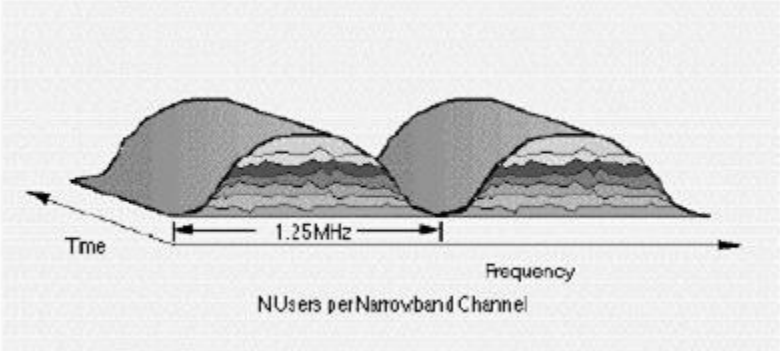


Figure: DS-CDMA

CDMA Implementation

CDMA Channels

Just when one grasps an understanding of the CDMA carrier which is 1.25 MHz wide, someone talks about "traffic channels" and confuses the issue. The fact is that with CDMA, the path by which voice or data passes is the entire carrier, as described previously. CDMA traffic channels are different: they are dependent on the equipment platform, such as Motorola's SC™

products, on which the CDMA is implemented. Motorola designates channels in three ways: effective traffic channels, actual traffic channels and physical traffic channels.

- The number of "Effective" traffic channels includes the traffic carrying channels less the soft handoff channels. The capacity of an effective traffic channel is equivalent to the traffic carrying capacity of an analog traffic channel.
- The number of "Actual" traffic channels includes the effective traffic channels, plus channels allocated for soft handoff.
- The number of "Physical" traffic channels includes the Pilot channels, the Sync channels, the Paging channels, the Soft Handoff Overhead channels and the Effective (voice and data) traffic channels.

CDMA uses the terms "forward" and "reverse" channels just like they are used in analog systems. Base transmit equates to the forward direction, and base receive is the reverse direction. ("Forward" is what the subscriber hears and "reverse" is what the subscriber speaks.)

CDMA Forward Channels

Pilot Channel

The mobile unit to obtain initial system synchronization and to provide time, frequency, and phase tracking of signals from the cell site uses the pilot channel.

Sync Channel

This channel provides cell site identification, pilot transmit power, and the cell site pilot pseudo-random (PN) phase offset information. With this information the mobile units can establish the System Time as well as the proper transmit power level to use to initiate a call.

Paging Channel

The mobile unit will begin monitoring the paging channel after it has set its timing to the System Time provided by the sync channel. Once a mobile unit has been paged and acknowledges that page, call setup and traffic channel assignment information is then passed on this channel to the mobile unit.

Forward Traffic Channel

This channel carries the actual phone call and carries the voice and mobile power control information from the base station to the mobile unit.

CDMA Reverse Channels

Access Channel

When the mobile unit is not active on a traffic channel, it will communicate to the base station over the access channel. This communication includes registration requests, responses to pages, and call originations. The access channels are paired with a corresponding paging channel.

Reverse Traffic Channel

This channel carries the other half of the actual phone call and carries the voice and mobile power control information from the mobile unit to the base station.

CDMA Modulation

Both the Forward and Reverse Traffic Channels use a similar control structure consisting of 20 millisecond frames. For the system, frames can be sent at either 14400, 9600, 7200, 4800,

3600, 2400, 1800, or 1200 bps. For example, with a Traffic Channel operating at 9600 bps, the rate can vary from frame to frame, and can be 9600, 4800, 2400, or 1200 bps. The receiver detects the rate of the frame and processes it at the correct rate. This technique allows the channel rate to dynamically adapt to the speech or data activity. For speech, when a talker pauses, the transmission rate is reduced to a low rate. When the talker speaks, the system instantaneously shifts to using a higher transmission rate. This technique decreases the interference to other CDMA signals and thus allows an increase in system capacity. CDMA starts with a basic data rate of 9600 bits per second. This is then spread to a transmitted bit rate, or chip rate (the transmitted bits are called chips), of 1.2288 MHz. The spreading process applies digital codes to the data bits, which increases the data rate while adding redundancy to the system. The chips are transmitted using a form of QPSK (quadrature phase shift keying) modulation which has been filtered to limit the bandwidth of the signal. This is added to the signal of all the other users in that cell. When the signal is received, the coding is removed from the desired signal, returning it to a rate of 9600 bps. When the decoding is applied to the other users' codes, there is no dispreading; the signals maintain the 1.2288 MHz bandwidth. The ratio of transmitted bits or chips to data bits is the coding gain. The coding gain for the IS-95 CDMA system is 128, or 21 dB.

CDMA Benefits

When implemented in a cellular telephone system, CDMA technology offers numerous benefits to the cellular operators and their subscribers. The following is an overview of the benefits of CDMA. Each benefit will be described in detail in the following subsections.

- Capacity increases of 8 to 10 times that of an AMPS analog system and 4 to 5 times that of a GSM system
- Improved call quality, with better and more consistent sound as compared to AMPS systems
- Simplified system planning through the use of the same frequency in every sector of every cell
- Enhanced privacy

- Improved coverage characteristics, allowing for the possibility of fewer cell sites
- Increased talk time for portables
- Bandwidth on demand

2.3 Compact Hypertext Markup Language (cHTML)

The Compact HTML is a well-defined subset of HTML 2.0[1], HTML 3.2[2] and HTML 4.0[3] recommendations, which is designed for small information appliances. HTML defines flexible, portable, and practical document format for the documents on the Internet. One direction of HTML is to grow toward richer multimedia document format. A new recommendation HTML 4.0[3] includes new additional features. For example, CSS(Cascading Style Sheets) give a wider range of document styles. On the other hand, there must be another direction for small information appliances. Small information appliances have several hardware restrictions such as small memory, low power CPU, small or no secondary storage, small display, monocolor, single character font, and restricted input method (no keyboard and mouse). The browser for Compact HTML proposed in this document can be implemented in such a restricted environment. Once such a subset of HTML is defined, contents providers and information appliance manufacturers can rely on this common standard. We believe that Compact HTML definitely contributes to the rapid growth of small information appliance market.

Definition of Compact HTML

2.3.1. Design Principles

The Compact HTML is designed to meet the requirements of small information appliances described above. It is designed based on the following four principles.

1. Completely based on the current HTML W3C recommendations.

Compact HTML is defined as a subset of HTML 2.0, HTML 3.2 and HTML 4.0 specifications.This means that Compact HTML inherits the flexibility and portability from the standard HTML.

2. Lite Specifications

Compact HTML has to be implemented with small memory and low power CPU. Frames and tables which require large memory are excluded from Compact HTML.

3. Can be viewed on a small mono-colored display

Compact HTML assumes a small display space of black and white color. However, it does not assume a fixed display space, but it is flexible for the display screen size. Compact HTML also assumes single character font.

4. Can be easily operated by the users

Compact HTML is defined so that all the basic operations can be done by a combination of four buttons; *Cursor forward, Cursor backward*, *Select*, and *Back/Stop*(Return to the previous page). The functions which require two-dimensional focus pointing like "image map" and "table" are excluded from Compact HTML.

The definition of Compact HTML is derived straightforwardly from the above principles.

2.3.2. Features of Compact HTML

The Compact HTML is a subset of HTML 2.0, HTML 3.2 and HTML 4.0. We describe the major features which are excluded from Compact HTML, as follows.

- JPEG image
- Table
- Image map
- Multiple character fonts and styles
- Background color and image
- Frame
- Style sheet

We define that Compact HTML includes GIF image support. It should be noted that this subset does not require two-dimensional cursor moving, that is, it can be operated by using only four buttons. We can also expect that well-designed pages for small display fit the screen space and the scrolling is not necessary. Actually the Compact HTML browser can display the pages like "deck of cards" by HDML[4]. Since the memory capacity is the most important issue in implementing the Compact HTML browser, we recommend the buffer limit for some functions.

- INPUT
  The maximum buffer size is 512 bytes.
- SELECT
  The maximum buffer size is 4096 bytes.

Though such a limitation belongs to the implementation issues, the common criteria is useful while developing devices. One recommended implementation for the browser is to support the direct selection of anchors by using number buttons. For example, when five anchors are contained in an HTML page, the third anchor can be selected just by pressing the "3" button. (The HTML 4.0 specification includes a new attribute "access key" for the similar purpose of direct key assignment.)

2.3.3.Detail Definition

The complete list of tags supported by Compact HTML is described in Appendix A. The comparison with HTML 2.0, HTML 3.2 and HTML 4.0 is marked in the table. The document type definition (DTD) for Compact HTML is also described in Appendix B. This gives the intended interpretation of Compact HTML elements. The document type is defined as follows;

<!DOCTYPE HTML PUBLIC "-//W3C//DTD Compact HTML 1.0 Draft//EN">

Examples and Benefits of Compact HTML

Examples

Here we describe the examples of applications by using Compact HTML. The following examples show the compact browser for cellular phones. The screen is the space of 7 text lines and 16 characters wide. The top line is used for displaying the status information.

1. compact HTML example: Simple menu

   In this example, the cursor focus point is expressed as the reverse text.

2. Compact HTML example: Mail Send Form

This example shows the mail sending form using INPUT tags. The focused form is expressed as solid surrounding lines, and non-focused forms are expressed as dotted surrounding line. The cursor point for input characters is expressed as a reverse box.

3. Compact HTML example: Image Contents

This example shows weather and rain information of the day. It uses monocolor GIF image.

Practical implementations and experiments show that Compact HTML is enough useful for small screen of 5-10 text lines and 10-20 characters wide.

2.3.4. Benefits of Compact HTML

The Compact HTML, an HTML-based approach, guarantees that small information appliances can connect to the open WWW world. Compact HTML keeps the advantage of HTML features and solves the problems arising from the restrictions of small information appliances. The tools like HTML authoring systems can refer to the Compact HTML specification. In addition, the client-specific web services for such small devices can be realized by using user agent attributes [5]. That is, the server can do the content filter for Compact HTML.

CHAPTER 03

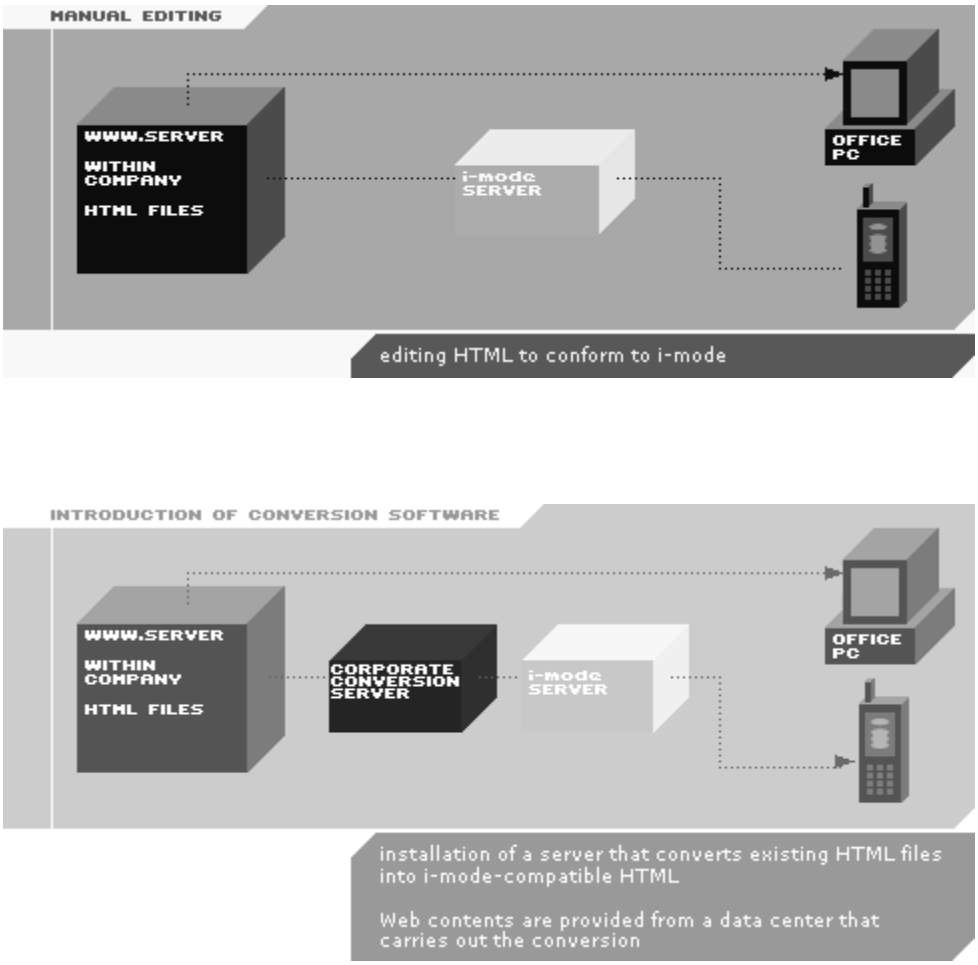
Working of imode

imode uses the proprietary PDC-P packet-switching protocol for data transmission over the existing circuit-switched PDC voice network. This provides an "always on" service for both push and pulls transmissions. The use of packet switching is appropriate for data transmission because a communication path is not dedicated to a data call, thus enabling resources to be shared between many users.

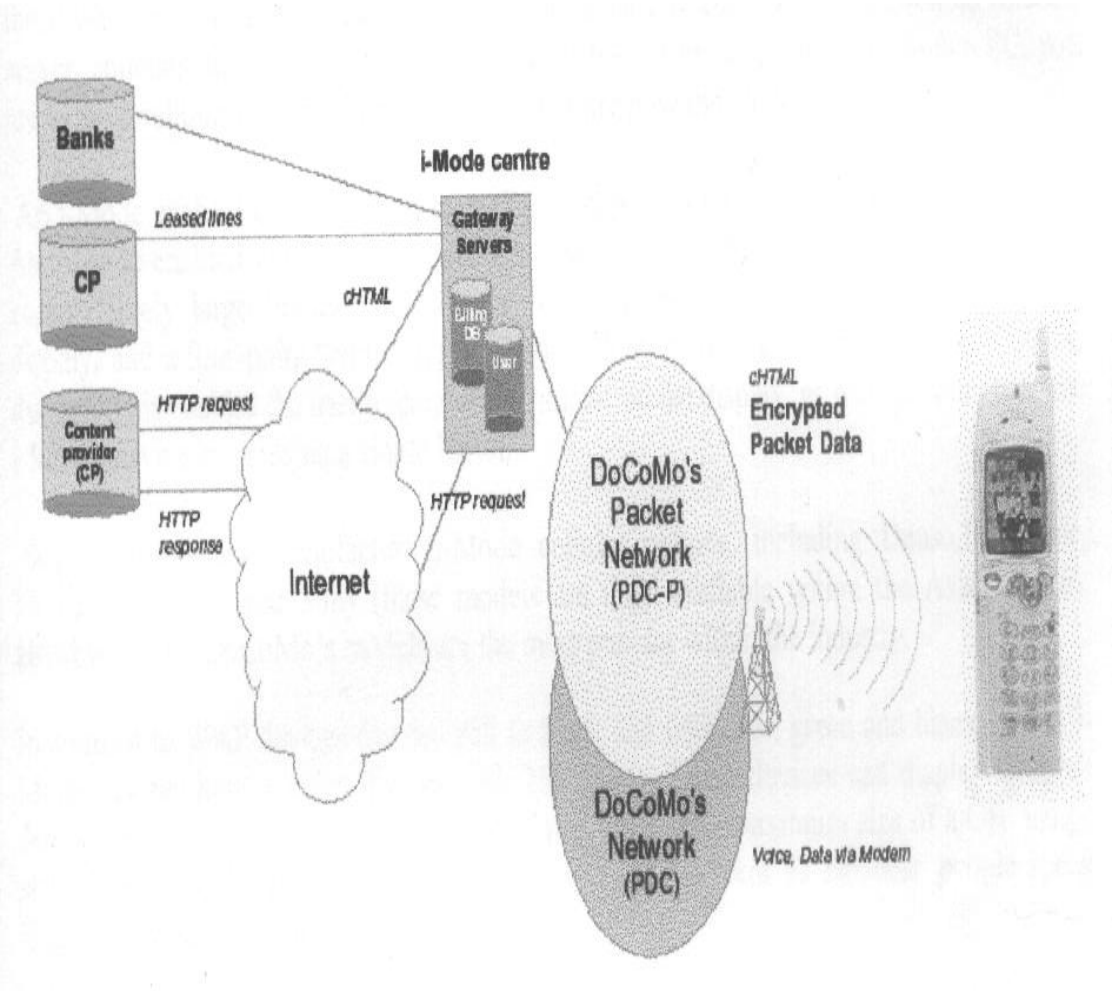
imode works basically the same as the any typical software HTML browser allowing users to access thousands of imode enabled web sites via WWW address, simply by pushing the cell phone's "I-Mode"button.When you select an imode item in the handset menu, the data is usually immediately downloaded. There is no delay for dialing up the connection after a click on a link or a type in a URL and press the remote or enter button.

This initiates a connection between the client (phone) and the imode gateway .The PDC-P network is connected to an imode Gateway Server, which has internal connections to user and billing databases. The Gateway Server, also known as "I-Mode Centre", manages request and responses made by the packet network to and from imode handsets. The Gateway Server connects, via HTTP, to content provider sites available the internet. The Web Servers at the content providers return cHTML back to the "I-Mode Centre". The I-Mode Centre forwards the cHTML without transformation to the imode handset via the PDC-P network. The "I-Mode Centre" also performs functions such as authentication, content provider authentication and subscriber look-up. It handles 'Push' content from content providers who send alert-based content to their subscribers. The "I-Mode Centre" transmits banking and other security-sensitive transactions over a leased line between the Gateway Servers and the financial institutions or secure content provider to avoid data flow via the internet. Currently, the only encryption that exists is between the imode handset and the Base Station unit that forms part of the PDC-P network.

The FIGURE-1 shows an overview of imode.



Content providers create Web sites for i-mode by using **cHTML**, **a subset of HTML**. This makes it easy to convert any existing Web site written in HTML into imode content, since cHTML requires only minor changes to the HTML. Because conversion is so simple, more and more sites are joining the imode roster.


Banks
i-Mode centre
Leased lines
Gateway Servers
CP
cHTML
HTTP request
Content provider (CP)
HTTP response
Internet
HTTP request
DoCoMo's Packet Network (PDC-P)
cHTML
Encrypted Packet Data
DoCoMo's Network (PDC)
Voice, Data via Modem

CHAPTER 04

WAP and imode

Comparing imode and WAP is not straight forward. In some sense,imode and WAP based services are in competition in Japan, and possibly world wide in the future. Both imode and WAP are complex systems, and it is really only possible to compare present implementations of imode and WAP, as well as their business models, the pricing, marketing etc. There are several important differences in the way imode and WAP based services are presently implemented, marketed and priced. As an example, imode uses cHTML which is a subset of HTML and is relatively easier to learn for website developers than WAP's markup language "wml".

Another difference is, that at present in Japan imode is implemented with a packet switched system, which is in principle "always on" while WAP systems in Europe are at present circuit-switched, i.e. dial-up. Another difference is, that at present an imode user is charged for the amount of information downloaded plus various premium service charges (if used), while WAP services are at present charge by the connection time. Packet switching or circuit switching is a technical difference of the telecommunication system on which the services are based, it has nothing to do in principle with the imode and WAP standards itself. In principle, imode and WAP encoded WebPages can be delivered over packet and circuit switched systems. The advantages of imode over WAP can be listed as:

- imode uses a modified subset of html(compact html,cHtml). Therefore it is very easy and straightforward to build websites for imode. Wap uses its own language therefore the barriers to building wap sites are higher
- imode is packet switched in Japan now i.e. imode is ‘always on’. Users don’t need to dial up and the charges are not connection time based. Wap at the moment in Europe

uses circuit-switching (dial up) i.e. users must wait during dial up and users are charged by the minute of connection time.

- At the moment wap services are very limited : a few lines of text with a few words, no images. Imode already now allows color animated gifs and other sophisticated downloads. In autumn 2000 java handsets will be introduced on imode
- Can imode kill WAP? Yes, in principle. But the consumers decide and in principle imode can also run on WAP, but not need to run on WAP. Who wins: WAP or imode?? At the moment: imode. Customers have already decided this competition in Japan. Also the next WAP standard can be more like imode so that WAP and imode could merge

CHAPTER 05

imode and JAVA

Some docomo handsets already include a java virtual machine. From autumn 2000 some ntt-docomo handsets(503i) will include a mini jvm and downloading of applets will be enabled. Java applets(e.g. comp.games,info. Applications ,security applications)can be downloaded and played offline. Since java is one technology which no brand or technology which can overlook java will slowly become an integral part of the imode handset and slowly all applications of java can be used by an imode set. Two kinds of java applets can be downloaded:

1. downloaded applets: games, multimedia content etc

2. agent-type applets: which can obtain information from the internet (e.g. stockprices ,weather info. Etc)

CHAPTER 06

Applications

There are various business applications for mobile computing. This includes both horizontal applications that are used by workers and professionals across all the industries as well as those specific to business processes in a vertical industry.

6.1. Horizontal applications

Electronic mail

Wireless-network-based e-mail is becoming a popular application available now. In order to provide a high level of customer service, mobile workers and sales professionals must stay in touch with home offices and customers. This is possible only through wireless network support.

Wireless workgroup applications

These applications allow members of a workgroup to access information on workgroup calendaring (scheduling meetings), status of collaborative projects, research and development, time and expense reporting, customer service and other activities where multiple members of a workgroup participate in approval process. Because many of these people are mobile, they need to access this information wirelessly from the field or from their vehicles while they are moving from customer to customer.

Mobile data collection

These solutions are based on some sort of handheld device scanning information on an item and either storing it locally or transmitting it to a central processor. The device might range from simple portable bar code readers to more sophisticated PDTs (Portable Data Terminals) with RF capability that will read information from various devices and send this information automatically through wireless local area networks or wide area networks.

6.2 Vertical Applications

Banking

Many banking industry customers are developing wireless applications to improve bottom-line costs. Even the big banks are realizing that their sales people must leave their offices to sell directly to customers. The features provided include:

- Wireless banking transactions - account balance, funds transfer, bill payment
- Sales Professional Automation in financial industry
- Credit card authorization via POS terminals equipped with wireless adapters

Stock Trading

The New York stock exchange has made a significant change to the classical methods used by traders in the past. This include:

- Hand-held PDAs connected to wireless networks, accessing information from stock exchange servers.
- Wireless mobile computing trading from Palm and Pocket PC by large active investors.

Airline and Railway industries

The application in airline and railway industries include:

- Data access for staff via cellular circuit switched network including: ticketing and schedule information, maintenance - fueling and de-icing information and baggage handling information.
- Mobile scanners to scan bar-coded information from baggage tickets directly into a database.
- Pen based work order application using mobile data network.
- Airport security and monitoring.
- Airline Baggage and Cargo Control.

CHAPTER 07

Future Scope

It is very difficult to predict the future. Future development depends on user/consumer choices, operators' choices and commercial decisions, technical limitations, and there are even health issues, which keep being raised.

Therefore unexpected developments are not to be excluded. In the future it is likely (but not guaranteed) that ***XML*** encoding will become dominant on the internet. Therefore future standards both for ***WAP*** and ***imode*** could become ***XML*** based. In this (likely) case it is difficult to assign winners and losers! Although it is not very clear at this stage whether ***WAP*** would be more successful or ***imode*** would steal the show, but is certain that the mobile communication is going to make great strides in the very near future.

There are many services that are and will soon be available for iMode phones. A few of these are interesting.

First, there is some demand by businesses for the representation of vector graphics on the phone. These can be used to display diagrams in “industrial service manuals” for auto mechanics to “take online documentation under the hood” and civil engineers to “consult underground maps on site”

A current popular service is “Animated Mail”. A patented text-to-animation engine parses email received and generates an animation based on the email’s contents. For example, if the email has the word “hawaii” in it the phone could show an animation of a sunny beach.

- Cartoons and graphics-based games generate millions of dollars a year in revenue. The founder of the Animated Mail service explains this success: “The Japanese have a strongly developed visual sensibility; they have a long tradition of communicating iconographically. As youngsters they form emotional attachment with Japanese Kanji characters” and hence they are very good at communicating with pictures.

CHAPTER 08

Conclusion

imode, with all its features is best suited as the technology, which would help us harness the infinite amount of knowledge which is available to us by internet. imode is best suited for this. Although, as stated earlier the future is very unpredictable, one thing can be stated with conviction. imode would be the ideal technology which would be employed into the next generation of mobile phones, i.e. 3G and also 4G. imode would make mobile phones an indispensable gizmo. People would send mails, play games, check their stock, shop online, in other words imode would help people to carry along with them the power of internet always, wherever they are. imode would change the very way every human being exists; all of us would evolve into cyborgs (cyber-organisms) for good.

CHAPTER 09

Reference

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