

White Paper

November 2004

K700i

The next step in Imaging



Sony Ericsson

Preface

Purpose of this document

This White Paper will be published in several revisions as the phone is developed. Therefore, some of the headings and tables below contain limited information. Additional information and facts will be forthcoming in later revisions.

The aim of this White Paper is to give the reader an understanding of technology and its main applications, as well as the main functions and features of the phone.

Note: This document contains general descriptions for this specific Sony Ericsson mobile phone.

People who can benefit from this document include:

- Operators
- Service providers
- Software developers
- Support engineers
- Application developers

More information, useful for product, service and application developers, is published at www.SonyEricsson.com/developer/, which contains up-to-date information about technologies, products and tools.

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Document conventions

The phone has a full graphic screen which supports 65,536 colours, referred to as *65k*.

The screen images in this document are in JPG format and are thus of a lower resolution than the images actually shown on the screen.

The Picture Messaging feature is referred to as *MMS* (Multimedia Messaging Service) throughout this document.

Document history

Date	Version	Comment
2004-02-27	R1A	First edition.
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Product overview

This phone features the latest in imaging, advanced messaging and connectivity technology, with a rich offering of multimedia and entertainment functions. This includes, for example, playing video clips with the media player, taking pictures with the built-in camera and listening to the radio.

Easy-to-use imaging communication provides a dedicated camera button to minimize the number of steps for taking and sending a picture or video clip.

Form follows function in this attractively designed phone with a compact body which cleverly includes dual fronts, one for the phone and one for a real camera look and feel.

There is optimized memory for video communication with up to 41 MB of built-in memory for storage of content such as pictures, music, ringtones, themes, games and video clips.

Easy access to music, images, video and games.

A powerful gaming solution for Java™ 3D with cutting-edge graphics, multi-player games and a large 1.8 inch 65k TFT colour screen.

This phone supports GSM (Global System for Mobile Communications) and GPRS (General Packet Radio Service), triple band 900/1800/1900, GPRS 4+2. It also supports voice, circuit switched (CS) data and packet switched (PS) data.

Note: To be able to give updated information about the implemented technology and functionality of this product as soon as possible, this White Paper will be released in updated revisions.

Key functions and features

This phone is the next step in imaging for Sony Ericsson products. The evolution of mobile communications towards imaging will greatly increase the scope for new applications and services. In the area of multimedia in mobile phones, Sony Ericsson can show its vast experience in consumer electronics and entertainment – music, pictures and games – as well as its mobile technology leadership.

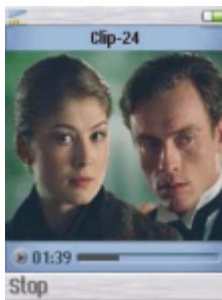
An eye-catching feature of this phone is the large colour screen. It measures 176 pixels wide and 220 pixels high (176 x 220) in portrait mode and has 65,536 colours, allowing high-quality colour imaging and video.

You can listen to sound in the phone via the speaker (earpiece), the loudspeaker, the high-quality stereo headset or other accessory.

System

This phone supports GSM-GPRS and is a triple band mobile phone.

Multimedia (streaming and download)



By streaming media such as audio and video clips, multimedia is available in realtime with minimal downloading or waiting time. Media can also be downloaded and saved in the phone memory and then used with the Media player. Media such as audio files, video clips or slide shows can be played back at any time.

Media player



The Media player converts the phone into a portable MP3, MPEG4, H263 player. Play music, watch pictures and slide shows, as well as streamed or downloaded video clips.

Radio

The radio is built-in and offers instant and easy access to FM radio channels.

The radio can be listened to with the portable handsfree accessory or via the internal speaker. With the radio, up to 20 favourite channels can be stored with the preset function.

VGA camera



With the VGA camera, a camera is always handy.



Video clips

Taking a picture or recording a video clip and sending it away as part of a picture message or as an e-mail attachment is just a few clicks away. The picture can also be sent via bluetooth, infrared or cable.



Digital zoom

The camera also has 4X Digital zoom.



Photo light

The camera has a light to improve taking pictures in darker environments.

QuickShare™

Sony Ericsson's constant ambition of making products easier to use, has had a great outcome: QuickShare™.

QuickShare is the fastest, easiest and smartest ever way to share images. With minimal hassle and just a few clicks, moments can be captured with the integrated camera and shared with friends!

But there is more to QuickShare than sending images with a picture or e-mail message. QuickShare is about ease of use of all the imaging features of the product. Images can be shared phone to phone, with Bluetooth, across the room or between a phone and other paired devices such as PDAs, PCs or printers. For example, it would be possible to print a picture directly from the phone using a Bluetooth enabled printer.

Full graphic 65k colour screen



The large 1.8 inch colour screen, 176 x 220 pixels, enhances viewing, facilitating high-quality multimedia and entertainment.



From standby, the phone features a user interface built on the "desktop" concept, which is widely used in many computer operating systems. From here, navigation between different main functions in the phone is done by selecting one of the 3D icons representing these functions.

MMS



Reacting to the enormous popularity of mobile phone messaging, Sony Ericsson has incorporated the latest messaging standard, along with a colour display for an enhanced imaging experience.

Say it in words, say it with pictures, animate it, add sound. Have fun putting together multimedia birthday and holiday greetings. On vacation, use the mobile phone to send a digital postcard with stylized text, digital pictures of the location, and authentic sound clips, to friends and family back home. When shopping, send a picture of a bargain that a friend has been looking for.

With MMS, there are many interesting applications to subscribe to, for example, stock information, movie trailers and weather reports.

PlayNow™



Content such as music, video and images may be previewed before purchase.

User experience

A unique direct-link to download music, video, games, themes and images, which is easy to use and promises you best-selling content for mobile download.

By selecting PlayNow™, you can, for example, go straight to a live list of Top Music Hits. Choose a song, listen to it, and if you like what you hear, you can buy it and add it to the Sounds folder. You can then listen to it or use it as often as you want.

Content formats that are supported

All formats that are supported in the phone will be possible to download. Music, video and images may be previewed before purchase. The music format is MIDI; MP3 or WAV (Polyphonic 24 voices or more).

How the service works

This service is owned by Sony Ericsson or hosted by Sony Ericsson for a network operator. The PlayNow™ or other premium content is maintained and managed, for example by Sony Music or Sony Pictures. The content on offer can easily be suited to a specific region or operator.

Implementation costs for network operators are minimal and server communication is based on existing, well-established standards. Sony Ericsson offers first or second line support according to the agreement on hosting a white label service or not. High level co-operation is available for the design, look and feel, of content management.

Operator benefits

This service is aimed at providing quality and quantity revenue for network operators. This is truly an ARPU driver with low costs for operators. The process involves:

- Downloading a list
- Previewing content
- Choosing content
- Buying content

Note: The availability of this unique application is limited to specific markets, where relevant infrastructure and agreements have been set up.

Other technical details

Security - Server communication is protected by TLS.

Forward lock - Content cannot be exchanged with other devices by the user, it is limited to use or delete.

Java™ 2 Micro Edition

Download extra content with Java, for example, new information- and entertainment-based applications. This gives users a chance to personalize the functions and features in their phones, and developers the opportunity to create new applications.

Gaming



Gaming is already a very popular feature in mobile phones, and with Java, users can add new games and skill levels to further enhance the entertainment value of Sony Ericsson phones.

3D Games



Java 3D gaming software introduces and supports cutting-edge 3D graphics. Audio developments such as 40 tones polyphonic sound and force feedback provide a much richer experience. With operator support, there is the possibility for multi player games to play against friends. The large 1.8 inch TFT screen adds to a lasting gaming experience. Downloading graphic intensive games, matching up to the size of the built-in memory, is also possible.

Bluetooth™ wireless technology



Using built-in Bluetooth wireless technology, communication with other Bluetooth devices is supported via a radio link. Unlike infrared, Bluetooth wireless technology is not dependent on line-of-sight communication.

A device can be connected to the phone using Bluetooth wireless technology up to 10 metres away. For example, the phone can be answered at a distance with a Bluetooth headset, when it rings. The phone could be in a briefcase, a coat pocket or even in another room. Two mobile phones, or a phone and a computer, with Bluetooth wireless technology can exchange data such as images, video clips, business e-cards, music files and calendar data.

Copyright protection – DRM

DRM (Digital Rights Management) features the rights and copy protection of downloaded content (audio, pictures, Music tones, video, entertainment features such as games etc.).

Content-based services have great market potential, and to encourage this, Sony Ericsson plans to support DRM in all future multimedia products. Sony Ericsson regards DRM as a key enabler for content-based services, and is active in supporting the ongoing standardization work of the OMA (Open Mobile Alliance). Furthermore, any additional market requirements for DRM will be monitored.

Design features



Display and keypad areas

The 1.8 inch display area accommodates relatively large keys on the keypad area.

The keys are aligned in a vertically grouped form.

The display and key areas are designed with a sophisticated metal look.

Sides

It is possible to customize the Internet button area.

Connector cover

The connector cover is designed with three major improvement areas:

- 1. User friendliness** - gives the user a comfortable grip, both when using the phone (in portrait mode) and the camera (in landscape mode), by continuing the smooth, curved frame.
- 2. Product quality** - offers added protection against dust, moisture and impact force.
- 3. Product appearance** - improves the overall appearance by hiding the connector when not in use and continuing the smooth, curved frame.



The circular background form around the navigation key is designed to complement the circular form of the camera on the camera front.

Battery cover

The battery cover is designed to horizontally slide into place whilst locking the battery in the battery housing.

More in-phone functions

Navigation key



The 4-directional + select key is designed to easily navigate the menu system. In a menu, it can be gently pressed to select a feature.

It can also be used as a **joystick** with games.

Improved User Interface (UI)

Selection keys and the key assignment give a very efficient interaction design with full flexibility to handle all the new features and applications. Sony Ericsson has focused on user-centred design and extensive usability testing to solidify the new UI paradigm. This ensures visibility in actions and system status and consistency between applications and similar actions. The large, high-resolution colour screen is easily managed with the navigational key.

Setup wizard

The setup wizard makes it possible for the user to quickly and easily prepare the phone for use.

At the first start-up, the setup wizard starts and helps the user with some core settings whilst giving hints about the functionality of some important keys: back and clear.

The setup wizard includes:

- setting the language
- setting time and time format
- setting date and date format
- the possibility to import contacts from a SIM card
- hints about the **Back** and **C** keys.

Polyphonic sounds - 40 voices



Polyphonic sounds and the MIDI format has revolutionized the sound quality of ringtones in mobile phones. With this format,

the user can play, compose, edit and send melodies by using the Music DJ. The built-in sound synthesizer uses wave tables, real instrument sounds, with 40 voices polyphony. The new

composer has an improved graphical user interface to simplify melody handling. All new and edited melodies are stored in MIDI format.

File management

There is a file manager, similar to that, found on many computers. In the file manager, the user has an overview of the contents of the phone as well as how much memory is allocated to each function and feature. Folders can be created, renamed, deleted and files can be moved between them.

GPRS (General Packet Radio Service)

GPRS uses Internet-style packet-based technology. GPRS gives the benefits of a permanently available connection to the mobile Internet, but only uses the radio link for the length of time it takes to transfer data. GPRS offers the user the speed needed for satisfactory mobile Internet usability. The phone supports GPRS 4+2.

WAP 2.0 supporting XHTML™

The WAP browser supports the markup languages of WAP 2.0 – XHTML Mobile and XHTML Basic. These two subsets of the Web standard XHTML are supported by all major Web browsers. An XHTML page can be viewed in both the WAP browser and in any standard Web browser. All of the basic XHTML features are supported, including text, images, links, check boxes, radio buttons, text areas, headings, horizontal rules and lists.

In addition to XHTML, the WAP browser supports WML. The user can navigate between WML and XHTML pages. WAP 2.0 also supports cookies, often used by Web sites to store site-specific information in the browser between visits to the site. Cookies are often used by e-commerce sites (in shopping carts and wish lists for example), and to save the user from entering the same information more than once.

Cascading style sheets (CSS)

Before style sheets were introduced on the Web, developers had little control over the presentation of their Web pages. An XHTML document specifies

the structure of the content, which part is a paragraph, which part is a heading, and so on. It does not specify how it shall be presented. Browsers use a default presentation for documents without style sheets. By adding a style sheet to the document the developer can control the presentation of the document, the colours, fonts, and layout.

On the Web, the de facto standard style sheet language is Cascading Style Sheets (CSS), specified by the W3C and implemented in IE, Netscape, and Opera. For mobile phones, the OMA has identified a subset of CSS and extended it with OMA specific style rules. The CSS subset and the OMA extensions are called Wireless CSS (WCSS).

The WAP browser supports WCSS 1.1.

My friends (Wireless Village)

To ensure inter operability of mobile instant messaging and presence services, Sony Ericsson, Ericsson, Motorola and Nokia have created the Wireless Village Solution, an open standard. The protocol is bearer-independent and can be implemented in different networks. The Wireless Village Instant Messaging and Presence Service (IMPS) includes three primary features:

Presence

Presence information of other Wireless Village users is received and displayed to indicate their willingness to communicate. The user's own presence information is also sent for others to view. If the user is interested in another person's presence status, he or she can search for this person. If the person is found, the user may subscribe to his/her presence information. The presence information is displayed in a contact list.

Instant messaging

Instant messaging means "point-to-point messaging" between Wireless Village users. Messages can be sent to an entire contact list or to a single user. Short message histories of the communication are logged in a file, which can be read off line. This is a sub-set file of the whole communication and is limited by memory.

Groups

The user may join a chatroom and chat with the other participants/members.

E-mail



With inbox, outbox, save draft and reply options, there are all the functions needed for effective e-mail communication in a powerful mobile phone. Constantly connected to a POP3, SMTP or IMAP4 e-mail server anywhere on the Internet, the phone stores messages dynamically, depending on available memory, and updates the inbox automatically and over the air. Check e-mail anywhere. Reply to e-mail on the move. Friends, family and business contacts know that when they send e-mail, it can be received, read and acted on immediately. Pictures can be included in outgoing e-mails and attachments that are received. Hyperlinks in e-mails are supported.

Personalization

With themes, the user can change many settings in the phone, for example colours, images and ringtones, making it more personal. The phone comes with a number of preloaded themes and pictures, and more can be downloaded and exchanged – sports, movie, seasonal and other themes will be available on Sony Ericsson or operator sites. Other personalizable features are the start-up screen and the screen saver. Specific pictures and ringtones can also be set for each separate name in the phonebook.

Power save

Power save is the default setting for the display light and is designed to optimize standby time. Your screen is turned off completely a few seconds after you last press a key. Press any key and the screen turns on again. Other display light options are on, off and automatic.

Technologies in detail

Entertainment

Media player

The media player supports different audio and video formats, streaming as well as download and playback.

Music

The media player is a multi-format digital audio player which enables the user to carry and play a selection of favourite songs. A range of audio formats are supported:

- **AAC**
Advanced Audio Coding. AAC is the latest audio coding standard, defined in the MPEG-2 standard and is used for high-quality audio compression. AAC provides higher quality than MP3 at the same bit rate, or for the same audio quality it uses a 30 percent lower bit rate. It supports the coding of multichannel audio, with up to 48 main channels and 16 low-frequency

channels. AAC has a profile for Low Complexity (LC) to facilitate trade off between quality, memory and processing power requirements.

- **AMR**
Adaptive Multi Rate. A medium quality compressed sound format.
- **MIDI**
Musical Instrument Digital Interface. Unlike the other formats, MIDI is not a recording of music, but a description which enables a local synthesizer to play the music from the instructions included in the MIDI file. Since a MIDI file only represents player information, it is far more concise than formats that store the sound directly. An advantage is very small file sizes. A disadvantage is the lack of specific sound control. MIDI is ideal for polyphonic ring-tones.

- **MP3**
MP3 is the file extension for MPEG audio layer 3. Layer 3 is one of three coding schemes (layer 1, layer 2 and layer 3) for the compression of audio signals. Layer 3 uses a very efficient compression method, removing all irrelevant parts of a sound signal that the human ear cannot perceive. The result is, for example, CD digital audio (CDDA) converted to MP3 with almost untouched quality, compressed by a factor of around 12. The high compression of audio in MP3 files makes them relatively small, though MP3 files can be created with different size and quality compromises. The small file size, together with the excellent sound quality, are the main reasons for the MP3-format's massive popularity when sharing music over the Internet.
- **WAV**
Windows media audio video. A wave file is an audio file format created by Microsoft, that has become a standard PC audio file format for everything from system and game sounds to CD-quality audio. A wave file is identified by a file name extension of WAV (.wav). Used primarily in PCs, the wave file format has been accepted as a viable interchange medium for other computer platforms, such as Macintosh. This allows content developers to freely move audio files between platforms for processing, for example.
In addition to the uncompressed raw audio data, the wave file format stores information about the file's number of tracks (mono or stereo), sample rate, and bit depth.

Songs may be stored in the File manager. The folder system enables the user to organize songs into groups and create simple playlists of MP3 songs.

Songs may be collected in numerous ways, including Internet download and file transfer from a PC.

The media player is intelligently aware of other applications in the phone:

- Playback is paused when a telephone call is made or received.
- Playback is paused if the user starts another application which requires the audio channels to be dedicated to it.
- Playback of MP3 files continues if the user switches to another application, providing music whilst using other applications such as the phonebook or calendar, or playing games.

Polyphonic

Background

The word "polyphony" means producing several tones at the same time. Almost all music that we listen to consists of polyphonic melodies.

Early Ericsson mobile phones supported a proprietary non-polyphonic format called eMelody. Due to the musical limitations of eMelody, and the popularity of creating, sending and downloading ring melodies, Ericsson and Sony Ericsson, together with other manufacturers, created the more advanced but non-polyphonic sound format – iMelody.

The introduction of the MIDI format revolutionized sound quality. MIDI files are small, and perfect for mobile devices, which have limited storage capacity.

MIDI is a specification for a communications protocol principally used to control electronic musical instruments. MIDI is today a well known standard used by many musicians, composers and arrangers.

A MIDI signal or file does not contain any music. It contains binary data (information) of how a melody is played and when this data reaches a synthesizer, the synthesizer will translate the binary data to music, when connected to an amplifier with speakers so that the sound becomes audible.

Please visit www.midi.org for more information.

SP-MIDI

SP-MIDI stands for Scalable Polyphony MIDI. SP-MIDI is based on the MIDI format and adapted for mobile phones and other portable products. The objective is to secure inter operability between products with different sound capabilities.

Sound Recorder

The sound recorder can record both voice memos and call conversations. Sound recorder saves recordings directly to memory. The size and length of recordings are limited by available storage space.

Sounds are recorded in AMR format and saved in Sounds. Recorded sounds can also be set as ringtones.

Video clips

Moments can easily be shared with friends and family in other geographical sites by capturing the moment with the video recorder and then sending the video clip in a picture message. The video recorder supports QCIF.

The media player supports download and playback of MPEG-4 and H.263 formats for viewing video clips in the phone.

Video clips may be downloaded from the Internet or copied from a connected PC.

Files must be of types MP4 or 3GP, having video encoded in MPEG-4 Simple Visual Profile and audio in AAC or AMR format. Video can be encoded in H.263. The phone encodes video in H.263 Profile 0 Level 10 format.

Streaming Support

The media player can be launched from hyperlinks in the WAP browser, SDP files in the file manager or in messages through hyperlinks. Content is streamed using RTSP (Real Time Streaming Protocol) session control.

Streaming

Streaming media is a method of making audio, video clips and other multimedia available in real-time.

The term streaming refers to the technique it is based on. Previously an entire file had to be downloaded before it could be played, whereas the use of streaming means the end user can almost immediately begin to watch or listen to the content of a requested file. The data in the file is broken down into small packets that are sent in a continuous flow, a stream, to the end user. It is then possible to begin viewing the file while the rest of the packets are transferred.

Applications

The applications which can be built on top of the streaming services can be classified into on demand, and live information delivery applications. Examples of the first category are music and video clips, news on demand as well as on demand instruction material. Live delivery of radio and television are examples of live information delivery. The following video and music codec is supported:

- MPEG-4 Simple Visual Profile Level 0
- H.263 Profile 0 Level 10
- AAC

- AMR
- MP4
- 3GP

Examples of usage

Streaming of music (on demand)

Browse to a Web page to check out the latest top ten list of pop music, to see if there are any new cool songs. Select a few songs, stream the music to the phone and listen to the songs through the stereo headset or via the built-in loudspeaker.

Streaming of news (on demand)

Browse to a morning paper's Web page and decide to check the news. Select the five-minute version of the latest financial news, stream the news to the phone, and watch it on the bus on the way to work.

Streaming/download of music video (on demand)

Browses to a Web page and decide to check out the latest rock videos. Select a video to watch, click the link and then stream a one-minute version of the video. Download and pay for the complete video. A memory check is automatically performed to make sure that the phone has enough free memory.

Streaming of live radio (broadcast)

Check out and listen to a favourite radio station. Browses to the home page and starts to stream the content. The content is audio or audio with pictures of the artist.

Streaming of live traffic information (broadcast)

Find out if there is a traffic jam on the highway before heading home. Browse a page for local traffic information. There is a traffic jam, take an alternative route home.

User-created content (Web album)

Show friends how fantastic the beach is whilst on vacation. Record a video clip and upload it to a Web album. Friends can then stream or download the clip to their PC or phone.

Market and revenue possibilities

As streaming means “seeing the product without having it”, it can be extensively used in the music and film industry. There are also great revenue possibilities for subscription-based content; for example, the user can subscribe to several on demand services such as news and traffic information.

Gaming

Gaming is now seen as a standard feature in mobile phones, where Sony Ericsson promises to be a step ahead in this regard. This is not only due to faster download capability on the network. There are some other reasons why the actual gaming experience is better – the way Java has been implemented, the fact that more processing power has been dedicated to the games, the large 65k colour screen and more sophisticated graphics with Java 3D and the Mascot API. The result is

games with improved graphics that react faster to user commands when using the navigational key as a joystick or game controller. The phone takes mobile gaming to new heights.

Supporting J2ME (Java 2 Micro Edition), the phone lets users download and run new games and applications. This is a great way to upgrade the game gallery, install work-supportive programs and personalize the phone.

SMIL

SMIL stands for Synchronized Multimedia Integration Language and is pronounced “smile”. SMIL is an advanced XML-based protocol, and Sony Ericsson’s MMS implementation supports a subset of the SMIL 2.0 protocol according to OMA MMS IOP document version 1.2.

The use of SMIL in a product allows the user to create and transmit PowerPoint-style presentations on the mobile device. Using a media editor, users can incorporate text, audio, images, video clips and animations to assemble full multimedia presentations. The user can decide in which order the image and text will be displayed, as well as for how long the images and text lines are to be shown on the display.

Media types

There are certain media formats that support continuous media (speech, audio and video). The following media types are supported for SMIL:

- AMR narrow band speech codec MIME media type
- MPEG-4 AAC audio codec MIME media type
- MPEG-4 video codec MIME media type
- H.263 video codec MIME media type

The media types for JPEG and GIF can be used both in the 'content-type' field in http and in the “type” attribute in SMIL 2.0. The following media types are to be used:

- JPEG MIME media type
- GIF MIME media type

All these media are pointed out by MIME (Multipurpose Internet Mail Extensions) types.

Imaging

VGA camera

VGA camera

With the integrated VGA camera, the user can take pictures and video clips and store them in the phone memory. The user can send them as an attachment in an e-mail or a picture message. The picture can also be sent via bluetooth, infrared or cable.

Using the camera or video

When the dedicated camera button is pressed, camera or video is started, depending on what was last used.

A large viewfinder is presented in the display and QuickShare offers a minimal number of steps that take you to the send options as follows:

- 3 steps for camera: start, capture and send.
 - 3 steps for video: start, capture and send.
- The camera or video can also be started in the menu.

Panorama pictures

The camera can create panorama pictures by stitching together several different pictures into one large picture. This is done with the help of a unique image processing technique.

Using this feature is very user friendly. The user simply takes a picture and then moves the camera slightly sideways and then takes a new picture. This can be repeated several times until the user selects to save the panorama where all the different pictures are stitched together.

Image formats

The camera is able to send pictures in the following resolutions:

- Small - QQVGA (160 x 120 pixels)
- Medium - QVGA (320 x 240 pixels)
- Large - VGA (640 x 480 pixels)
- Extended - Megapixel (1280 x 960 pixels)

Megapixel

The Extended camera option means that pictures are enlarged to 1280x960 pixels. The megapixel format is ideal for printing pictures.

VGA pictures

VGA pictures can be used when a larger viewing area is required, for example, when uploading a picture to a PC.

Video format

Video clips can be recorded, played and sent using the following codec:

- H.263

More VGA camera features

The camera has full **automatic exposure control** that selects the optimal exposure time needed to get an excellent picture. When operating the viewfinder, the camera adjusts the exposure time.

The lighting conditions found indoors and outdoors may differ significantly. This may give rise to false colours in photographs. To compensate for this, the VGA camera is equipped with **automatic white balance**. This feature automatically adjusts for different lighting environments in order to produce images with correct colours under most conditions.

The camera also has a **photo light** to improve taking pictures in darker environments.

Messaging

My friends

Sony Ericsson's application - My friends - is an enhanced messaging facility that offers a user friendly and versatile way to quickly get in touch with contacts.

The My friends application merges the Phonebook and messaging functionalities that we commonly find in phones. At a click you can access your list of contacts, and with another click you can choose how you want to communicate with them - via SMS, MMS, e-mail or chat.

The application also enables you to view the 'presence', or availability of the contacts in My friends. You can easily and quickly find out whether they are in a meeting or free to speak to you. You can then choose how you wish to contact them.

My friends contains all the information you need about your contacts.

You can have:

- a select list of up to 20 people
- their contact information such as phone number, e-mail, chat and mail addresses
- call information - calls to and from them
- presence information - their availability, online status (on or off), text or image they choose to show you.

You can present similar information about your own availability and status.

You have access to chatrooms, and can form wireless communities of business associates or contacts.

The main view

You can access the My friends sub-menu by clicking the Messaging desktop icon.

The icon in the status bar indicates the online status of the chosen friend in the list, and indicates new, unread messages if any.



The most likely action (which is context dependent) is available on the left softkey.

Additional actions become available to you when you press the More key.

Adding contacts to My friends

You can add a contact from the Phonebook to the My friends list, and you can change the position of the friend in the list. This enables you to have your list of immediate business or social contacts at hand, so you can establish easy communication with them almost instantly.

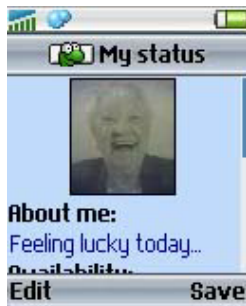
Note: To realise this application's complete potential, access to a Wireless Village server is required.

Managing My friends

Your list of immediate contacts may change to suit business demands. You may need to interact with new sets of people depending on your current project or work at hand. Or you may simply want to alter your list of personal friends whom you want to keep in constant touch with.

You can manage the My friends list to quickly alter the list of contacts that you want displayed. You can sort the names, edit nicknames, block or delete friend, or link a friend to Phonebook.

Viewing the status of contacts in My friends



You can view your contact's status and decide how you want to communicate with him or her. You may want to call or send an SMS, MMS, or e-mail, or join your friend in a chatroom.

Access to the chatroom

The My friends application supports creating chatrooms and inviting your friends (on your My friends list) to the chatroom. You can bookmark associates you would like to chat with. The application can establish connectivity between different service offerings that enable chat between terminals.



MMS

There are virtually no limits to the content of a Multimedia Messaging Service (MMS) transmission. An MMS message can contain text, graphics, animations, images, audio clips and ring melodies. For third party developers' information, please visit www.SonyEricsson.com/developer/ and look for the MMS developers guidelines.

MMS completes the potential of messaging. Sending digital postcards and PowerPoint-style presentations is expected to be among the most popular user applications of MMS. Eagerly awaited by young users in particular, MMS is projected to fuel the growth of related market segments by as much as 40%.

Multimedia Messaging uses WAP (Wireless Application Protocol) or http as bearer technology which also can be powered by the transmission technology GPRS. This allows users to send and receive messages that look like PowerPoint presentations. The messages may include any

combination of text, graphics, photographic images, speech, music clips and video. MMS will serve as the default mode of messaging on all terminals, making total content exchange second nature. From utility to sheer fun, it offers benefits at every level and to every kind of user.

Over the air (OTA) configuration

Users can easily get MMS into their phone. MMS supports OTA, meaning that the user does not have to configure the settings manually. The configuration is done by the operator via OTA.

Note: The specification is in accordance with Ericsson Nokia OTA configuration v7.1.

MMS objects

Although MMS is a direct descendant of SMS, the difference in content is dramatic. The size of an average SMS message is about 140 bytes, while the maximum size of an MMS message is 100 kb.

That is why the key word to describe MMS content is rich. Complete with words, sounds and images, MMS content is endowed with the user's ideas, feelings and personality. An MMS message can contain one or more of the following:

Text

As with SMS and EMS (Enhanced Messaging Service), an MMS message can consist of normal text. The length of the text is unlimited. The main difference between an EMS and MMS message is that in an MMS message, text can be accompanied not only by simple pixel images or melodies but by photographic images, graphics, audio clips and video clips.

Templates

The phone comes with a number of MMS pre-defined templates, for example templates for birthday cards, meeting requests etc.

Audio

MMS provides the ability to send and receive full sound (MIDI, MP3, iMelody, AMR) messages. Not only can users share a favourite song or Music tone with a friend, they can also use the mobile phone to record a sound and send it along with a message. As sound includes speech as well as music, this extra dimension to an MMS message allows for a spontaneous and immediate personal expression in communication messaging. Rather than sending a downloaded birthday jingle in EMS, a user can, for example, send a clip of his or her own personal rendition of "Happy Birthday". The phone supports the MIDI format.

Pictures and themes

By using the integrated camera, users can take a picture or video clip and immediately send it to a recipient. The ability to send pictures is one of the most exciting attributes of MMS, as it allows users to share meaningful moments with friends, family and colleagues.

Mobile picture transmission also offers inestimable utility in business applications, from sending on-site pictures of a construction project to capturing and storing an interesting design concept for later review. Editing a picture by adding text allows users to create their own electronic postcards, an application that is expected to substantially cut into the traditional postcard market.

Themes (downloaded or pre-defined) can be exchanged via MMS.

PIM communication with MMS

By using MMS, it is easy to handle PIM (Personal Information Manager) information. The user can send and receive business cards (vCard), calendar entries such as appointments (vCal) and notes (text/plain).

Streaming content in MMS

Streaming makes it possible to view files while they are being downloaded to the phone. The MPEG-4 file format can be used for continuous media along the entire delivery chain envisaged by the MMS, independent of whether the final delivery is done by streaming or download, thus enhancing interoperability.

In particular, the following stages are considered:

- Upload from the originating terminal to the MMS proxy.
- File exchange between MMS servers.
- Transfer of the media content to the receiving terminal, either by file download or by streaming. In the first case, the self-contained file is transferred, whereas in the second case the content is extracted from the file and streamed according to open payload formats. In this case, no trace of the file format remains in the content that is transmitted over the wire or over the air.

Additionally, the MPEG-4 file format can be used for storage in servers and the "hint track" mechanism can be used to prepare for streaming.

MMS technical features

The MMS standard, just like that of SMS, offers store-and-forward transmission (instant delivery) of messages, rather than a mailbox-type model. MMS is a person-to-person communications solution, meaning that the user gets the message directly into the mobile phone. He or she does not have to call the server to get the message downloaded to the mobile. Unlike SMS, the MMS standard uses WAP as its bearer protocol. MMS will take advantage of the high speed data transport technology GPRS and support a variety of image, video and audio formats to facilitate a complete communications experience.

Architecture

The MMS Centre (MMS-C) is comprised of the MMS Server, the MMS Proxy-Relay and the MMS Store. The MMS Centre is the central element of the MMS network architecture, providing storage and operational support, enabling instant delivery of multimedia messages from terminal-to-terminal and terminal-to-e-mail, and supporting flexible addressing. The centre's MMS Proxy-Relay

interacts with the application being run on the MMS-enabled terminal to provide various messaging services. WAP or http is used as the bearer of an MMS message between the MMS-C and the MMS client (application). The WAP Gateway is used for delivery and retrieval of messages. Information is read in the WAP browser.

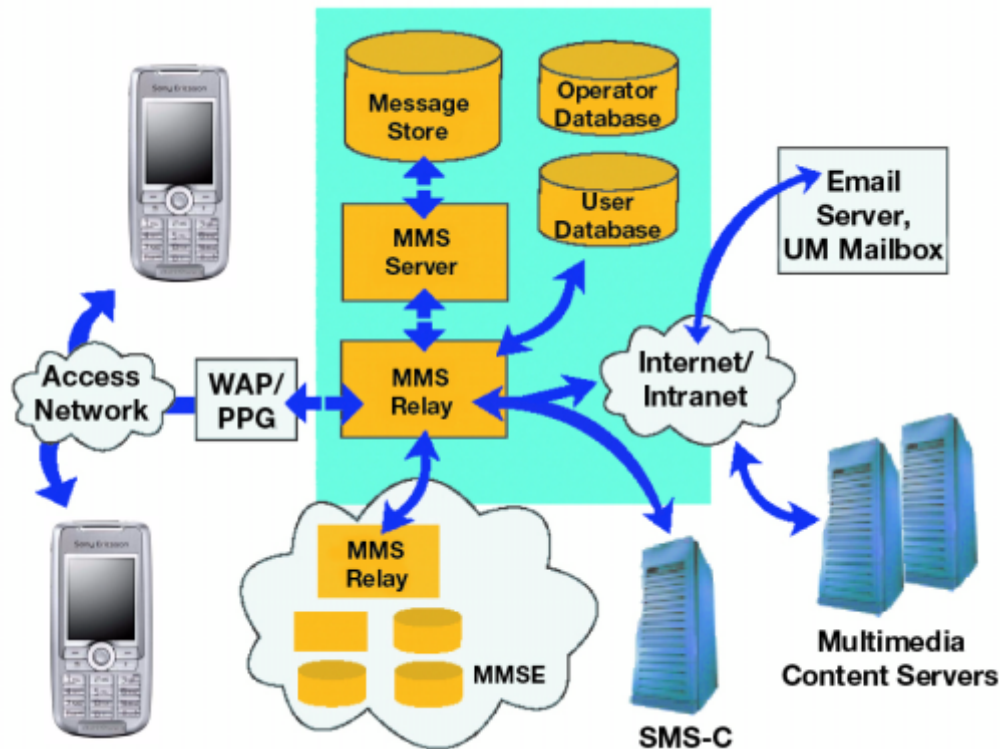


Figure 1. The architecture of MMS

Message conversion

The MMS-C is able to perform limited message conversion - for example, from MMS to SMS - so that processing and air time is not wasted in sending messages to mobile terminals that do not have adequate capability to receive them. It also handles service aspects such as store and forward, guaranteed delivery, subscriber preferences, operator constraints, and billing information. The MMS-C also vouches for high quality messaging, for example by format conversion. This means that the MMS-C recognizes which formats are supported in the mobile phone, and adapts the MMS messages to these formats.

Connectivity

Positioning

The basic cost-efficient positioning method available in 2G networks relies on measuring round-trip time. In 2G it is called Cell-ID + TA (Timing in Advance).

Time difference measurement, involving several base stations, can be used to obtain a more accurate position.

Positioning methods are already used to support location-based information services such as ©YellowPages, restaurant guides, traffic information, directions and friend finder applications. Typically WAP, SMS or voice has been used as delivery mechanisms. Java and MMS will add new possibilities to deliver attractive location-based applications.

GPRS

The introduction of GPRS was a big step in the evolution of the GSM networks for enhancing the capabilities of data communication. Data traffic has increased (over both wired and wireless networks), with the growth in demand for Internet access and services paralleling that of mobile communications.

We can now see that the demand for fast Internet access is the key driver for coming generations of wireless multimedia and entertainment services.

GPRS is able to take advantage of the global coverage of existing GSM networks. Applications developed for GPRS have been deployed on a large scale and have thus reaped the associated benefits.

With a GPRS subscription, transmission capacity is only used when data “packets” are sent or received via a connection.

Instead of occupying an entire voice channel for the duration of a data session, the K700i sends and receives data in small packets, as needed, much like IP on the Internet. Thanks to this, the phone appears to be always online, using transmission capacity only when data is sent or received. The phone is compatible with GPRS R97.

The phone uses up to four time slots for receiving data, and two slots for transmitting.

Phone identity information and characteristics of the connection are described in the PDP (Packet Data Protocol) context. This information is stored both in the phone and in the mobile network, so that each phone is identified and “visible” to the system.

Using GPRS has many advantages, for example:

- Cost efficient
Use transmission capacity only when needed, thus reducing costs.
- WAP over GPRS
- Access the Internet via WAP at high speed.
- E-mail over GPRS
Remain connected to an e-mail system while reading and preparing messages, (which are then sent at high speed).
- Data communication
Transfer data and access the Internet or an intranet with a PC, PDA or handheld device connected via Bluetooth wireless technology, infrared or cable.
- Provide settings
Receive GPRS configuration settings from the provider OTA (over the air), making manual configuration unnecessary.
- User-controlled settings
Take advantage of full user control in the data connections menu, establishing multiple descriptions and accessing advanced settings for GPRS.

Bluetooth™ wireless technology

Bluetooth wireless technology is built-in. It has Bluetooth power class 2, using maximum 2 dBm radio link, which operates in the globally available 2.4 GHz radio frequency band, ensuring fast and secure communications up to a range of 10 metres. Note: In the few countries where the use of Bluetooth wireless technology is not allowed, the Bluetooth function will be disabled. In countries only allowing 0 dBm is allowed, the output power will be limited accordingly.

Bluetooth wireless technology is designed to be fully functional, providing high transmission speeds, even in noisy radio frequency environments. All data transfer is protected by advanced error-correction methods, ensuring a high level of data security.

Bluetooth wireless technology facilitates instant connections, which are maintained even when the devices are not in the line of sight. Enhanced audio quality voice transmission is provided under adverse conditions, making it possible to use a headset connection to the phone at all times.

Ericsson, one of the parent companies of Sony Ericsson, is a founding partner of the Bluetooth Special Interest Group (SIG). Bluetooth wireless technology devices include:

- Headsets for wireless voice transmission and remote call control
- Wireless car handsfree kits
- PCs, laptops, PDAs, palmpads for data transfer, synchronization etc.
- PC cards for Bluetooth wireless technology in laptops and PDAs
- Other phones for exchanging business cards, ringtones, playing games etc.
- Digital still cameras
- Printers, hard disks and other storage devices
- Handheld scanners for text, barcodes and images
- Household appliances with built-in logic, as well as games and entertainment devices

Using Bluetooth wireless technology in K700i

True wireless connection

Connect without cables to headsets, car handsfree equipment, computers/PDAs, digital still cameras and other devices.

Up to 16 added devices

The phone identifies and maintains up to 16 devices which are displayed in a list.

Radio link

No line of sight required; the phone can remain in a briefcase or in a pocket (whereas infrared requires line of sight).

Secure and user-friendly

Data connection with a Bluetooth PC/laptop or PDA turns the phone into a modem for connecting to the Internet and for data transfer.

Synchronization

Fast synchronization, even without line of sight, of calendar, notes and phone book with PC/laptop.

Range

The range is up to 10 meters. There are user options for searching and connecting that make it possible to use a different range in different situations.

Business cards

Quick exchange of business cards, notes and calendar events with other phones and devices.

Imaging and music

Exchange still images and video clips with another mobile phone, a PC/laptop, and with a digital still camera.

Exchange music files with another mobile phone, PC or laptop.

Play MP3, MIDI sent by the phone.

Enable images to be shown on a TV or other display via an accessory, such as the Bluetooth™ Media Viewer MMW-100.

Audio Quality

The phone uses an algorithm that repairs lost audio packets. When needed, a new packet is inserted with content based on previous packets. This, in conjunction with the high sensitivity and high output power radio will enhance the audio quality compared to a standard Bluetooth device.

File sharing

By using the Server role of the File Transfer Profile, the phone enables the user to use a computer to manage content files that reside in the phone's file system. Most computer Bluetooth applications provide an explorer like user interface for the file transfer service. When connecting to the phone, the computer application will show the same folders that the user can find under the File Manager icon on the phone's standby screen, i.e. Pictures, Sounds, Videos, Themes and Others. The content in the Games and more folder is not exposed in the file transfer server. Opening one of these folders will show a list of files related to that folder, e.g. images in the Pictures folder. Using the computer application the user can now: retrieve files from phone to computer, delete files from the phone and transfer files from the computer to the phone using the normal drag and drop mechanisms provided by the computer.

File browsing

By using the Client role of the File Transfer Profile, the phone enables the user to access file systems of other devices, that support the Server role of the same profile. After pairing the phone with the other device, the user can connect to the other device by selecting it in the list of My devices under the Bluetooth menu and selecting the Browse option that should be available on the left selection key. If the browse option does not appear, for example if pairing was initiated from the other device, the user can select the Service option to update the phone's knowledge that file browsing is possible with this device. When the phone is connected to the file server, the user can browse the shared folders and retrieve files listed in the folders. The user can transfer files to the file server device using the normal Send/via Bluetooth option.

Media viewing

The phone can send images and sounds to a media viewer device, for example the MMW-100 TV adaptor accessory. The user can also conveniently run a slide show on the TV showing a set of nice phone camera pictures for family and friends. After selecting an image in the Pictures

folder under the File manager icon, the user can select the Remote screen option under More. The phone will then connect to a Bluetooth device that can receive images and when the user then selects View, the image is transferred to the remote screen and displayed. When the user then selects another image, that image is transferred to the remote screen and displayed.

Profiles

The following Bluetooth profiles are supported in K700i:

- Dial-up Networking Profile
- Generic Access Profile
- Generic Object Exchange Profile
- Object Push Profile
- Serial Port Profile
- Handsfree Profile
- Headset Profile
- Synchronization Profile
- Basic Imaging Profile
- File Transfer Profile
- Human Interface Device (HID) Profile

Remote control

By using the Bluetooth HID (Human Interface Device) Profile v1.0, the phone is able to act as a HID device. This means that when connected to a computer, the phone works like a combined keyboard and mouse. By assigning specific combinations of computer keyboard key presses to each key on the phone keypad, the user can use the phone as a remote control device for computer applications.

The phone keypad is configured for control of a certain computer application through a special type of HID configuration file consisting of an XML file for the keypad and an image for the display. HID configuration files can be downloaded into the phone using the normal file transfer mechanisms. Users can even modify the files themselves on their computers. A few configuration files pre-loaded in the phone enable the user to navigate on a computer desktop and control presentations and media players.

System Functions

User Settings

The following keys can be configured through the HID configurations files: 0-9, #, * and volume up and volume down. For each of these keys, a UsageID from the HID usage tables can be assigned.

The navigational key and the two action keys are not configurable, they always provide functions for moving the mouse and performing right and left mouse clicks.

Characteristics

The HID configuration files, and the set of preloaded HID configuration files, are customizable. The configuration files can be modified by the user if transferred to, and opened on, a computer.

Used Enablers and bearers

The HID based remote control function works over Bluetooth. It is possible to download the HID configuration files via Bluetooth, IR or a cable as well as via WAP. It is also possible to transfer the files to another device using Bluetooth or infrared.

Power save mode

The phone uses sniff mode on headset, handsfree and HID connections which means reduced power consumption and shorter connection set-up times.

IrDA

IrDA (Infrared Data Association) is a point-to-point communication link between two infrared ports. The infrared beam has to be directed towards the target infrared port and as long as the two infrared ports are within sight and range, the devices can exchange data. For optimal performance, place the phone within 30 centimetres and at an angle of 30 degrees to the infrared port on the PC/PDA, or other phone. An advantage of the necessary proximity of devices is reduced risk of transmitting data to other nearby devices.

An infrared link is a serial connection, which means that data bits are sent one after another in a long stream. The IrDA-SIR Data Link Standard is a protocol that makes transmission of data faultless. The standard provides a high level of noise immunity, which means that the connection is not affected by fluorescent light, sunlight and electromagnetic fields – making it suitable for the modern office environment.

Object Exchange via infrared (IrObex) supports transferring objects between compatible phones. These objects are not only limited to ring signals, but even pictures, bookmarks and other files in the file system.

Key benefits of using the phone with its built-in infrared transceiver:

- True wireless communication
- Low power consumption
- Secure data transmission with the IrDA DATA standard
- Ability to send and receive e-mail and data on the connected PC/PDA
- Ability to connect to the Internet from the connected PC/PDA
- Ability to synchronize the phone book from a PC
- Exchange of business cards and calendar events with vCard/vCalendar compatible devices
- Exchange of ringtones and other files between compatible phones
- Ability to attach a photo from a digital camera in outgoing e-mail
- Ability to send and exchange notes with vNote compability devices

Connection via cable

The infrared connection is not always the best solution when connecting to a PC/PDA. Indeed, it is not always even possible. The DRS-11 cable provides connectivity between the phone and a PC with serial port (RS-232) and is included in the phone kit.

The DRS-11 cable supports a subset of the signals in the RS-232 standard.

Synchronization and data transfer

In everyday life, access to an updated calendar, notes and details of friends and business colleagues is greatly appreciated. To be truly mobile, users must be able to carry their important information with them. Equipping mobile phones with Personal Information Manager (PIM) programs such as calendars, task lists and address books gives users access to their most important data anywhere and anytime. The information is kept updated by synchronizing with the information at

the office or at home. The growing use of groupware such as Microsoft® Outlook® means that more and more meetings are booked electronically in daily business life.

The phone uses the SyncML 1.1 protocol for synchronization. This means that it has compatibility to synchronize with a wide variety of devices over a number of different communications media.

SyncML – an open standard for synchronization

SyncML Background

Leading the way in providing remote synchronization capability, Sony Ericsson realizes that interoperability of remote synchronization is of utmost importance if mobile data usage is to become as widespread as generally predicted. That is why Ericsson, along with IBM, Lotus, Motorola, Matsushita, Nokia, Palm Inc., Psion and Starfish Software, founded the SyncML initiative in February 2000. Supported by more than 600 software and hardware developers, the SyncML initiative seeks to develop and promote a globally open standard for remote synchronization, called SyncML. Unlike many other synchronization platforms, SyncML is an open industry specification that offers universal interoperability. Because it uses a common language, called XML, for specifying the messages that synchronize devices and applications, SyncML has been called the only truly future-proof platform for enabling reliable and immediate update of data. The benefit for the end user is that SyncML can be used almost anywhere and in a wide variety of devices, regardless of application or operating system.

accessible and up to date, no matter where the information is stored. For example, a calendar entry made to a mobile device on a business trip is equally available to a secretary in a network calendar. SyncML is the ultimate choice for remote synchronization.

The phone uses SyncML for both local synchronization (for example, with a PC using Bluetooth or a cable connection) and remote synchronization over WAP and http.

Designed for the wireless world

SyncML is designed specifically with the wireless world's tight requirements in mind. SyncML minimizes the use of bandwidth and can deal with the special challenges of wireless synchronization, such as relatively low connection reliability and high network latency. SyncML supports synchronization over WAP, http or OBEX. As an open, future-proof standard, SyncML is the synchronization choice for any device or application of the mobile information society.

What is SyncML?

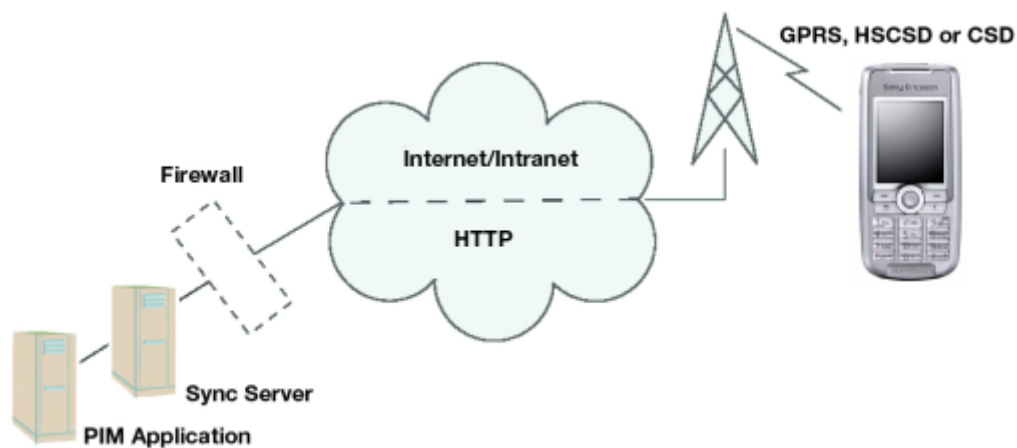
SyncML is the common language for synchronizing all devices and applications over any network. SyncML leverages Extensible Markup Language (XML), making SyncML a truly future-proof platform. With SyncML any personal information, such as calendars, task lists, contact information and other relevant data, will be consistent,

What information can be synchronized in the phone?

Application	Remote sync	Local sync
Contacts	Yes	Yes
Calendar	Yes	Yes
Tasks	Yes	Yes
Notes	Yes	Yes

Remote synchronization

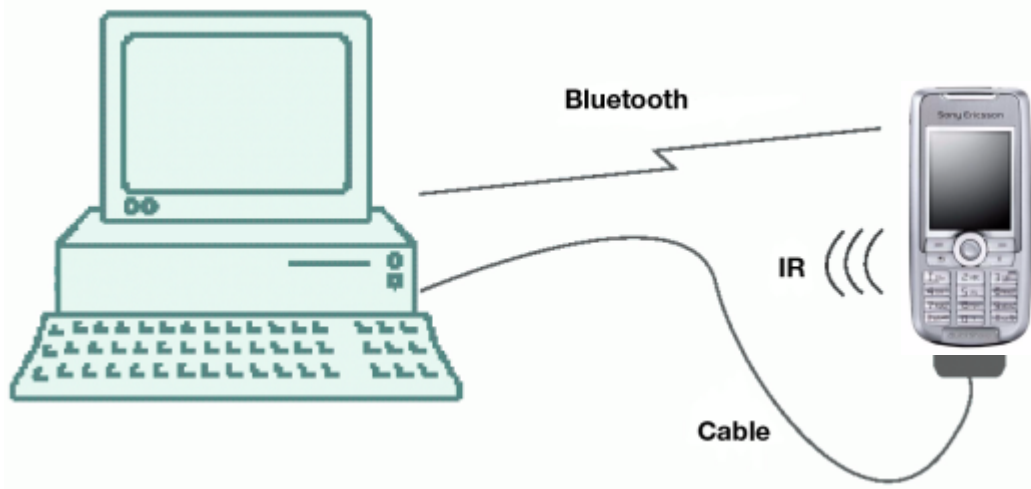
Remote synchronization takes place over the air using and is the ideal way to keep the phone up to date. Using GPRS, the phone can be continuously connected to the remote synchronization server.



Third-party service providers offering synchronization services to corporate personal information management (PIM) applications, such as Microsoft® Exchange, can also supplement added capability with SyncML.

Local synchronization

The phone is supplied with PC software for local synchronization. It may be loaded from the CD-ROM.



Bluetooth, infrared or cable

The phone synchronizes using SyncML, regardless of connection type. It connects via Bluetooth wireless technology, infrared or cable. The cable is connected directly to the phone or alternatively via a desktop charger connector.

Intelligent process

A synchronization engine performs the task of synchronizing. For local synchronization, the synchronization engine is an application that runs on the desktop computer. The synchronization engine compares, updates and resolves conflicts to ensure that the information in the phone is the same as that in the computer.

Compatibility

PC software supplied with the phone enables synchronization with the following:

- Microsoft® Outlook® 98, 2000, 2002, 2003

PC requirements are as follows:

- Microsoft® Windows® 2000, Me, XP
- Minimum recommended hardware configuration for the version of Windows in use.
- 30 MB free space on hard disk

File Transfer Utility

A utility is provided which enables files to be transferred to and from the phone connected to a PC. Typical uses for this include:

- Archiving pictures taken on the phone to PC storage
- Moving images to the phone to use in personalization, MMS messages etc.
- Moving sound clips to/from the phone for personalization.

DRM

Digital Rights Management, DRM, is a technology that enables secure distribution, promotion, and sale of digital media. Examples of such content include images, wallpapers and screen savers with themes from films, Music tones from musical artists, and branded games. In other words, content providers can control how users may use

different types of content in devices, such as mobile phones, smartphones or PDAs. Content providers can also control the use of content in related services, such as MMS.

Sony Ericsson is actively focusing on technology standardization for the DRM concept, and supports the ongoing standardization work and activities of the OMA (Open Mobile Alliance). Sony Ericsson is fully committed to open standard solutions in the mobile environment and is a principal driver of many open standard initiatives. This will ensure the interoperability of mobile terminals in the DRM area and also result in a strong, competitive DRM standard.

How DRM works

The control of the content in digital media is executed by defining usage rights for the content. The usage rights give the content providers flexibility in the way they can publish and sell content. Rights can be defined so that a picture can be used by subscribers only, and rights can be defined so that a Music tone can be played only a limited number of times or for a limited period of time. Rights can also be defined so that the user is not able to forward content to other devices.

Note: All supported image, audio and video formats can be protected by DRM.

Packaging of rights and content

Rights and content can be packaged together and delivered to the device as one DRM package. As an alternative, content can be delivered to the device first, followed by the rights later being pushed to the device, for example via SMS. The kind of service and business model adopted by the content provider determines how the content and rights should be packaged and delivered to the device.

DRM packager

A DRM packager is typically included in the software used by the content provider. It is used to create the DRM package that is delivered to the device, including content and associated rights. In the device, the content of the DRM package is made available to the user according to the rights. For example, if the rights permit the user to play a Music tone ten times, the device will keep track of the number of times the Music tone is played, and notify the user when the Music tone has been used for the tenth time.

A **Sony Ericsson DRM Packager** is available from the Sony Ericsson Developer World at <http://www.sonyericsson.com/developer>.

Protection properties

Content protection according to the OMA DRM standard gets special properties. Content with forward lock protection has the “Send to” option disabled, which prevents it from further distribution.

Unless the content is encrypted, the user cannot copy DRM content to other devices since the **Send to** option is disabled for pictures, Music tones, etc. that are OMA DRM protected. Content providers may choose to protect some content, but leave some content unprotected.

Package and delivery

The OMA DRM standard defines two ways to package and deliver rights and content to a device: combined or separated.

Combined delivery

Rights and content are packaged together into one DRM Package and delivered to the device. In the simplest case, no special rights are defined. The content is just put into a DRM package, thus protected from being copied out from the device by the user. This special case is called **forward-lock**. It is useful for all types of content that the provider wants to charge for.

Separate delivery

Rights are defined and sent in a push message. The content is encrypted and made available for users to download to their devices. The decryption key is put into the rights file. Since the content is encrypted, users cannot access it before the rights have also arrived in the device. In this case, the content can be freely distributed on the network, only users with the rights file can access the content. Content providers can deliver the rights to the user using push technology.

Downloading servers and publishing servers

When using a mobile phone, the users do not have to be aware of the network architecture. During a content downloading session, typically many

physical servers are involved. Sometimes transactions may take place between different companies' servers.

The actual content may be put on one server, the downloading server. The content can be reached, for example, through references from one or many other servers, the publishing servers. The content creator puts his or her content on the downloading server through an interface to the content provider.

The user navigates to the publishing server and selects the content, or rather a link to or description of the content. The content is then downloaded from the actual downloading server.

When content is downloaded to the device, operators generate revenues from the user via, for example, their billing system. Operators might in their turn be billed for rights by the content aggregator, content provider or directly by the content creator.

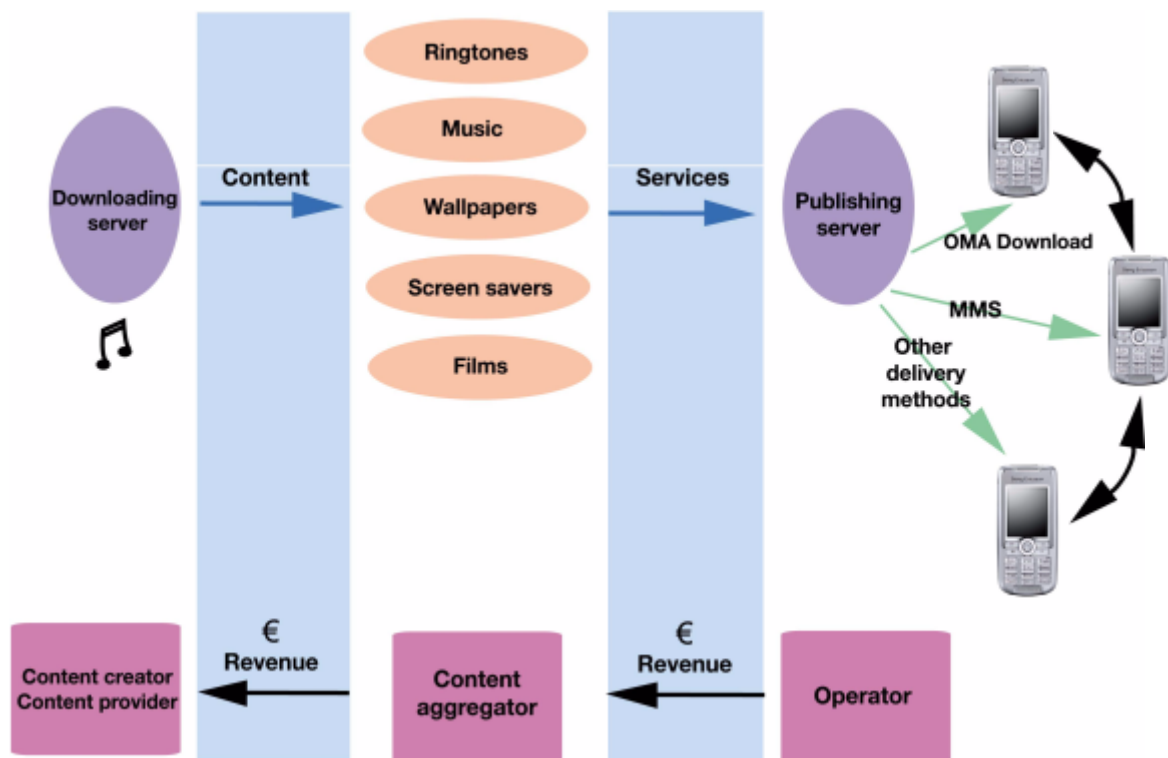


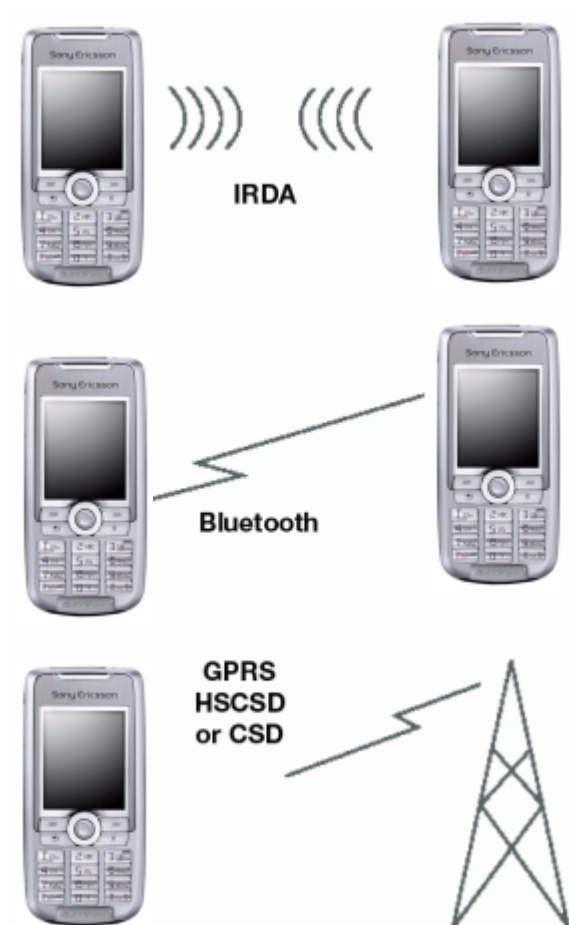
Figure 2. The flow of revenues and content. The content is viewed and selected from a publishing server and downloaded to the mobile phone from a downloading server. The revenue is in this case collected from the user by the operator and transferred to the content creator via the content aggregator.

Object exchange – ‘Send as’

The phone makes it possible to transfer objects via Bluetooth, infrared and messaging. This is presented to the user via ‘Send as’ commands in applications. Simply select an item such as a contact, select ‘Send as’ and select the method to be used for sending. Typical applications are to beam an appointment to other people, or to receive a new wallpaper.

Application	Bearer	IR/Cable	Bluetooth	SMS/EMS	MMS	E-mail
Contact		Yes	Yes	Yes	Yes	No
Appointment		Yes	Yes	No	Yes	No
Tasks		Yes	Yes	No	Yes	No
Notes		Yes	Yes	No	Yes	No
Image		Yes	Yes	No	Yes	Yes
Sound		Yes	Yes	Yes	Yes	Yes
Bookmark		Yes	Yes	Yes	No	Yes
Voice memo		Yes	Yes	No	Yes	Yes

* Only an iMelody can be sent in an EMS.



To perform a ‘Send as’ beam operation using infrared, the two devices are lined up and the sender initiates the transfer.

To beam over Bluetooth, a scan finds the other activated (discoverable) devices within range. The user can then select the required device and send the information across.

When sending via SMS, MMS or E-Mail, the required message type is created with the selected object attached. It is then sent over the air.

Java

Java 2 Micro Edition

Originally developed by Sun in 1991, Java is a programming language used to develop applications - utility programs, games, plug-ins etc. - for different hardware and software platforms. Users of Java-enabled devices can install new applications and games to make their devices more personal and adapt them to specific needs.

J2ME CLDC/MIDP

In 1999, Sun regrouped its Java technologies into three platforms or editions. J2ME (Java 2 Micro Edition) became the platform targeting “micro” devices with small processors and memory capacities, such as mobile phones, communicators and PDAs. (The other two Java platforms are Java 2 Standard Edition, J2SE, and Java 2 Enterprise Edition, J2EE).

J2ME addresses a variety of devices. To handle the diversity, two concepts have been introduced – configurations and profiles. A configuration defines a minimum platform for a family of devices with similar processing and memory capacities. A profile targets a specific device category within that family, for instance mobile phones.

Two J2ME **configurations** are available:

- **CDC**, Connected Device Configuration. This configuration is aimed at devices such as PDAs.

- **CLDC**, Connected Limited Device Configuration. This configuration is aimed at devices such as mobile phones and pagers.

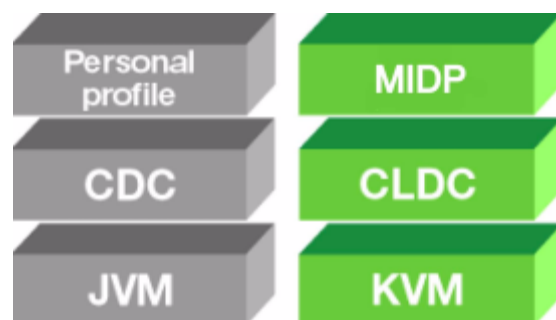


Figure 3. J2ME in detail

Current situation

So far, two **profiles** have been established for J2ME:

- **MIDP**, Mobile Information Device Profile, and
- **Personal Profile**.

MIDP is connected to the CLDC configuration and provides developers with essential information and guidance when writing programs for mobile phones and two-way pagers.

Personal Profile is linked to the CDC configuration. Targeted at PDAs, this combination replaces PersonalJava in J2ME.

CLDC/MIDP v. PersonalJava

Besides targeting different types of devices, the main difference between J2ME CLDC and PersonalJava from a user's point of view is that applications written in J2ME CLDC can be downloaded from the Internet. PersonalJava applications are typically transferred to devices from a PC via cable.

Hand-held computers and mobile phones that support Java also need a Java interpreter to run the applications. Since the Java Virtual Machine (JVM) was not the optimal interpreter for devices with small memory capacity and slower processors, Sun developed K Virtual Machine (KVM). A KVM requires only 40-80 KB of memory and can run on processors with low clock frequency. KVM is only used for J2ME CLDC. PersonalJava relies on the Java Virtual Machine (JVM).

PersonalJava has a richer application environment and can interact more extensively with the phone software.

Support

The phone supports Java 2 Micro Edition. The functionality consists of:

- JSR 139 CLDC 1.1
- JSR 118 MIDP 2.0
- JSR 120 Wireless Msg API (the SMS part, not cell broadcast).
- The following functions of the JSR 135 Mobile Media API:
 - Audio playback
 - Video playback
 - Camera snapshot.

Java 3D

Overview

Rapid advancement in LD hardware has made more sophisticated graphics APIs possible. Among these are the java community standard JSR-184 and the well proven Mascot Capsule API.

JSR-184

A scenegraph based system, generic and easy to use for everyone. This is the next generation standard for games and other 3D-content.

MASCOT CAPSULE V3

Successful in Japan, this API has been very useful for games programming. Command lists and other optimizing features are in focus.

Facts and figures

Technical specifications

General technical data

System	Tri-band GSM phase 2 recommendations. GSM 900 (CTR 19 and CTR 20), GSM 1800 (CTR 31 and CTR 32), GSM 1900 and e-GSM mode supported
Speech coding	Support of HR, FR, EFR, AMR according to 3GPP release 4.
GSM SIM/ USIM card	GSM SIM - GSM 11.11. Small plug-in card, 1,8 V and 3 V
Memory (user free)	Up to 41 MB (depending on software configuration/file content)

Exterior description

Length	99 mm
Width	46.5 mm
Thickness (thinnest point/keypad area)	17.9 mm
Thickness (thickest point/ display area)	19.5 mm
Weight	93 g
Graphic display	Type: Full graphical Resolution: 176 x 220 pixels Technology: TFT Colours displayed together: 65,536 (16 bit) Backlight colour: White
Antenna	Built-in
Colours	2, optic silver and blue tinted silver
Battery	3.6V, 700 mAh, Lithium Polymer or Lithium Ion can be packed in the factory.
Network LED	No
Keypad	Yes, including a navigational key (4-directional + one select)
Co-branding area	7 x 22 mm
Exchangable covers	no

Performance and technical characteristics

Dimension	GSM 900/E-GSM 900	GSM 1800	GSM 1900
Frequency range	TX: 880 – 915 MHz RX: 925 – 960 MHz	TX: 1710 – 1785 RX: 1805 – 1880	TX:1850 –1910 MHz RX:1930 – 1990 MHz
Channel spacing	200 kHz	200 kHz	200 MHz
Number of channels	174 Carriers *8 (TDMA)	374 Carriers *8 (TDMA)	299 Carriers *8 (TDMA)
Modulation	GMSK	GMSK	GMSK
TX Phase Accuracy	< 5° RMS Phase error (burst)	< 5° RMS Phase error (burst)	< 5° RMS Phase error (burst)
Duplex spacing	45 MHz	95 MHz	80 MHz
Frequency stability	+/- 0.1	+/- 0.1	+/- 0.1
Voltage operation (nominal)	3.6 V	3.6 V	3.6 V
Transmitter RF power output	33 dBm Class 4 (2 W peak)	30 dBm Class 1 (1 W peak)	30 dBm Class 1 (1 W peak)
Transmitter Output impedance	50 ohm	50 ohm	50 ohm
Transmitter Spurious emission	< -36 dBm up to 1 GHz < -30 dBm over 1 GHz (according to spec.)	< - 30 dBm (according to GSM spec.)	< - 30 dBm (according to GSM spec.)
Receiver RF level	Better than – 102 dBm	– 102 dBm	– 102 dBm
Receiver RX Bit error rate	< 2.4%	< 2.4%	< 2.4%

Battery information

Dimension	Value in GSM/GPRS
Standard battery (LiPolymer) 3.6V, 700 mAh	Charging time: At least 90% charged within 1 hour
Power save	Yes, default setting for the display light.

VGA Camera

Facts and figures	
Picture sizes (resolution) VGA camera	QQVGA (160 x 120 pixels) QVGA (320 x 240 pixels) VGA (640 x 480 pixels) Extended - Megapixel (1280 x 960 pixels)
Colour depth	24 bit (8 bit per RGB channel), 16.78 million colours
Camera memory	Using phone memory, no memory dedicated to the camera only
Digital zoom	2x, 4x
Photo light	Yes

Media player

File types	Formats	Extensions
Audio	MP3 (192 kbit/s for local playback) AMR WAV G-MIDI (level 1 with 40 voices polyphony)	.mp3 .amr .wav .mid
Video (including audio part)	MP4 (video: MPEG4, audio: AAC or AMR) 3GP (video: MPEG4 or H.263, audio: AAC or AMR)	.mp4 .3gp
Streaming transport	RTSP according to 3GPP	
Video coding	MPEG-4 Simple Visual Profile Level 0 H.263 Profile 0 Level 10	
Audio coding	AAC, AMR, MPEG layer 3	
Features	Automatic loop of songs in folder Automatic pause on telephone call.	

Radio

System	VHF/FM
Output	Portable handsfree Internal speaker

System	VHF/FM
Save channels	Yes, 20 presets
Antenna	Portable handsfree (when connected)

Pictures

Formats	JPEG, BMP, GIF (including animated), PNG, WBMP
Sharing via	IR, Bluetooth, MMS, E-mail, PC file transfer or cable

Image decoders

Decoder	Details	Size	Colour depth	File format
GIF	87a/89a			
JPEG	ISO/IEC JPEG Baseline DCT Progressive DCT Non-differential Huffman coding Symbol 'SOF2'	VGA		JFIF v1.02 EXIF
BMP	The bitmap image format used by Windows®.	XRAM dependent, default is VGA	24 bit	
WBMP				
PNG				

Image encoders

Decoder	Details	Size	Colour depth	File format
GIF	89a			
JPEG	ISO/IEC JPEG Baseline DCT Non-differential Huffman coding Symbol 'SOF0'	VGA		JFIF v1.02
BMP	The bitmap image format used by Windows®.	XRAM dependent, default is VGA	24 bit	

WBMP

Short message service

Feature	Support
SMS Centre Number	It is possible to pre-load the SMS Centre Number.
Pictures	It is possible to insert a picture or an icon into the text message. EMS compliant mobile handsets will be able to see the picture correctly.
Input methods	Predictive text input and multitap.
Reply to messages	It is possible to reply to received messages by SMS, phonecall or E-mail.
Message creation methods support	Predictive writing and multitap.
Copy, cut and paste words	No
Teaching of predictive words that are not in the predictive dictionary	Yes
Possibilities when creating a message:	
save a sent message in a "sent items" folder	Yes
insert a line in the message	Yes
assign a validity period to the message	Yes
use pre-defined messages	Yes
Possibilities when receiving a message:	
reply to the sender	Yes (only to the sender, not to all or part of the message recipients)
forward the message	Yes
save the message on SIM	Yes
get delivery time and date	Yes
Possibilities of the previously sent message:	
delivery report of the message	Yes
forward the message	Yes
save the message on SIM	Yes
know the remaining capacity storage	Yes
Possibilities of the previously received message:	

Feature	Support
reply to the sender	Yes (only to the sender, not to all or part of the message recipients)
save the message in the Inbox	Yes
forward the message	Yes
know the remaining capacity storage	Yes
Supported ways for replying to a received SMS:	
via SMS	Yes
via phone call (set up a call to the number contained in the message body)	Yes
via WAP call (go to the WAP address contained in the message body)	Yes
via USSD session	No
Print via IrDA	No
Possibility to offer the user the ability of sending an SMS to a list of recipients	Yes, using phonebook groups
Possibility to write an e-mail address as a recipient address	Yes, if SMS type=e-mail
SMS storage	In the SIM and in the handset.
Nokia Picture Messaging	Yes

Enhanced message service

Feature	Support
Level of compliance supported by the handset regarding the specifications described in release 99.	Enhanced Messaging Service (EMS) according to the standard 3GPP TS 23.040 v4.3.0, with the addition of the ODI feature from 3GPP TS 23.040 v5.0.0.
Number of messages that the handset is able to handle to generate a concatenated message	20
Capacity storage	100 and the space left on the SIM card.
Outgoing messages	It is possible to... <ul style="list-style-type: none"> see how many short messages an EMS message consists of before sending it. choose whether to send the message or not after writing it.

Feature	Support
Incoming messages	<ul style="list-style-type: none"> • A signal is heard once all parts of the message have been received or when a timeout occurs. • It is possible to re-use the content of an EMS message. Sounds, pictures, and animations can be inserted in a new message, if the object is not protected using ODI.
Concatenated messages	A receipt is received in the handset when all parts of a concatenated message have been delivered.
Insert objects	It is possible to add pictures, animations and sounds to an EMS message.
Text formatting	<ul style="list-style-type: none"> • Centred, left and right aligned text. • Small, normal and large font size. • Bold, italic, underlined and strikethrough style.
Sounds	Chimes high, chimes low, ding, tada, notify, drum, claps, fanfare, chords high, chords low.
I-melody	Yes, version 1.2.
Melodies	<p>It is possible to...</p> <ul style="list-style-type: none"> • send and receive melodies via EMS, if the melodies are not protected by copyright. • download melodies and commercial tunes from WAP/WAP portals. • create melodies on WAP/WAP portals.
WBMP	Yes
Picture sizes	16 x 16 mm, 32 x 32 mm, variable size in black and white.
Pictures	<p>It is possible to...</p> <ul style="list-style-type: none"> • edit pictures by using the phone keypad. • send and receive pictures via EMS, if the pictures are not protected by copyright. • create pictures on WAP/WAP portals. • download pictures from WAP/WAP portals. • receive pictures in enhanced messages originated by service providers.
Animations	<p>The handset supports the following animations: I am ironic, I am glad, I am sceptic, I am sad, WOW!, I am crying. Plus the other nine animations defined in 3GPP TS 23.040 v4.3.0.</p> <p>It is possible to...</p> <ul style="list-style-type: none"> • send and receive animations.
TP-PID field value given by the handset before sending an EMS message	0x00

Multimedia message service

Feature	Support
MMS/CSD parameters and MMS/GPRS parameters placement	MMS is bound to a WAP profile. A WAP profile is bound to a Data Account. A Data Account contains either CSD parameters or GPRS parameters.
Possibility to pre-configure the MMS parameters in factory	<ul style="list-style-type: none"> • MMS/CSD: Yes • MMS/GPRS: Yes
Possibility to configure the MMS parameters by OTA provisioning	<ul style="list-style-type: none"> • MMS/CSD: Yes • MMS/GPRS: Yes
Possibility for all the parameters from the parameters set to be OTA provisioned at the same time	<ul style="list-style-type: none"> • MMS/CSD: Yes • MMS/GPRS: Yes
Possibility for only one parameter from the parameters set to be OTA provisioned	<ul style="list-style-type: none"> • MMS/CSD: No • MMS/GPRS: No
OTA provisioning solution	OTA Settings Specification v7.1 © Ericsson and Nokia
Supplier indication of realized interoperability tests between its MMS User Agent and MMS Relay/Server from other suppliers	Yes
Support of a standard or a proprietary procedure for OTA provisioning of MMS parameters	Proprietary
Functionalities that the user is able to set during message composition:	<ul style="list-style-type: none"> • message subject • message priority • e-mail recipient address • message Cc recipient(s) address(es) • delivery report request • read report request • MSISDN recipient address
From where can the user insert multimedia elements into multimedia messages:	<ul style="list-style-type: none"> • File Manager • directly from camera • Contacts • Calendar
Possibility for sent messages to be memorized into a folder in handset memory	Yes
Actions that the user can perform after message notification:	<ul style="list-style-type: none"> • Auto Download • Always Ask

Feature	Support
Actions that the user can perform after message retrieval:	<ul style="list-style-type: none"> • reply to the sender of the message SMS/MMS • reply to the sender and to Cc people SMS/MMS • forward the message MMS • delete the message • save message into terminal • call the sender of a message
Multimedia codecs/formats supported for audio	AMR
Multimedia codecs/formats supported for video	MPG4, 3GPP, SDP
Multimedia codecs/formats supported for image	JPEG, GIF87, GIF89A, PNG, SVG, WBMP, BMP
Supported formats for message presentation:	<ul style="list-style-type: none"> • message body + attachments (e-mail presentation) • SMIL version as described in OMA MMS IOP document version 1.2
Maximum message size that can be handled by the handset for message	Content Class and Creation mode are applied. Also maximum size is possible to customize.
MMS User Agent will report problems to user in case of:	<ul style="list-style-type: none"> • message not sent causes no user subscription to service, if included in ResponseText (please see WAP209) • message not sent causes required functionality not supported by MMS Relay/Server, if included in ResponseText (please see WAP209) • message not sent causes insufficient credit (in case of prepaid charging), if included in ResponseText (please see WAP209)

Bluetooth technical data

Dimension	Support
Bluetooth capability statement	This phone is manufactured to meet Bluetooth Specification 1.1

Bluetooth functions	Dial-up Networking Profile Generic Access Profile Generic Object Exchange Profile Headset Profile Object Push Profile Serial Port Profile Synchronization Profile Basic Imaging Profile Handsfree Profile File Transfer Profile Human Interface Device (HID) Profile
Connectable devices	All products supporting Bluetooth spec. 1.1 and at least one of the profiles above.
Coverage area	Varies due to radio performance on remote device and the occurrence of obstacles. Up to 10 metres (33 feet)
Transmission power	1.6 mW (2 dBm)
Frequency band	2.4 GHz - the unlicensed ISM band
Power consumption	GSM host processor excluded: <ul style="list-style-type: none"> • Standby, Bluetooth On mode: <0.6mA • Voice mode: 24 mA • Data mode average: 25mA
Data transmission rate	Up to 600 kbps asynchronous and up to 350 kbps synchronous from an application level.
Specific commands working with the SIM card	No

SIM AT services supported

Service	Mode	Support
CALL CONTROL BY SIM		Yes
DATA DOWNLOAD TO SIM	Cell Broadcast SMS	Yes Yes
DISPLAY TEXT	Text of up to 240 characters (120 UCS2 coded).	Yes
	bit 1: 0 = normal priority	Yes
	1 = high priority	Yes
	bit 8: 0 = clear message after a delay	Yes
	1 = wait for user to clear message	Yes

Service	Mode	Support
GET INKEY	General: The GET_INKEY requires that the user confirms his/her choice	Yes
	bit 1: 0 = digits (0-9, *, # and +) only	Yes
	1 = alphabet set	Yes
	bit 2: 0 = SMS default alphabet	Yes
	1 = UCS2 alphabet	Yes
	bit 3: 0 = character sets defined by bit 1 and bit 2 are enabled	Yes
	1 = character sets defined by bit 1 and bit 2 are disabled and the Yes/No response is requested	Yes
GET INPUT	General: No. of hidden input characters	252
	bit 1: 0 = digits (0-9, *, # and +) only	Yes
	1 = alphabet set	Yes
	bit 2: 0 = SMS default alphabet	Yes
	1 = UCS2 alphabet	Yes
	bit 3: 0 = ME may echo user input on the display	Yes
	1 = user input not to be revealed in any way (see note)	Yes
	bit 4: 0 = user input to be in unpacked format	Yes
	1 = user input to be in SMS packed format	Yes
	bit 8: 0 = no help information available	Yes
	1 = help information available	No
LAUNCH BROWSER		Yes
MORE TIME		Yes
PLAY TONE		Yes
POLLING OFF		Yes
POLL INTERVAL		Yes
PROVIDE LOCAL INFORMATION	'00' = Location Information (MCC, MNC, LAC and Cell Identity)	Yes
	'01' = IMEI of the ME	Yes
	'02' = Network Measurement results	Yes
	'03' = Date, time and time zone (DTTinPLI)	Yes

Service		Mode	Support
		'04' - Language setting	Yes
		'05' - Timing setting	Yes
REFRESH		General: The reset option requests the user to wait while the phone restarts	Yes
		'00' =SIM Initialization and Full File Change Notification	Yes
		'01' = File Change Notification	Yes
		'02' = SIM Initialization and File Change Notification	Yes
		'03' = SIM Initialization	Yes
		'04' = SIM Reset	Yes
SELECT ITEM			Yes
SEND DTMF			Yes
SEND SHORT MESSAGE	bit 1:	0 = packing not required	Yes
		1 = SMS packing by the ME required	Yes
SEND SS			Yes
SEND USSD			Yes
SET UP CALL		General: Capability configuration	Yes
		Set-up speech call CallParty	No
		Subaddress DTMF support	Yes
		'00' = set up call, but only if not currently busy on another call	Yes
		'01' = set up call, but only if not currently busy on another call, with re-dial	Yes
		'02' = set up call, putting all other calls (if any) on hold	Yes
		'03' = set up call, putting all other calls (if any) on hold, with re-dial	Yes
		'04' = set up call, disconnecting all other calls (if any)	Yes
		'05' = set up call, disconnecting all other calls (if any), with re-dial	Yes
SET UP EVENT LIST		'00' = MT call	Yes
		'01' = Call connected	Yes
		'02' = Call disconnected	Yes
		'03' = Location status	Yes

Service	Mode	Support
	'04' = User activity	Yes
	'05' = Idle screen available	Yes
	'06' = Card reader status	Not Applicable
	'07' = Language selection	Yes
	'08' = Browser termination	Yes
	'09' = Data available	No
	'OA' = Channel status	No
SET UP IDLE MODE TEXT		Yes, 1 row of text is supported
SET UP MENU		Yes
TIMER MANAGEMENT		Yes
OPEN CHANNEL		No
CLOSE CHANNEL		No
RECEIVE DATA		No
SEND DATA		No
GET CHANNEL STATUS		No

User Interaction with SIM AT

Display text

Text of up to 240 characters (120 UCS coded) is supported.

Text clearing times are 5-20 seconds and a 60-second time-out limit for the user to clear the text. 'Key' responses:

- 'Long Back' – Proactive session terminated by user.
- 'Back' – Backward move in proactive session.

Any other key clears the display if the command is performed successfully.

Get inkey

Prompt for a one-character input. Pressing 'Ok' without entering a character gives warning message "Minimum 1 character". 'Key' responses:

- 'C' clears current character.

- 'Long Back' terminates the proactive session.
- 'Back' – Backward move in proactive session.
- 'OK' – Command performed successfully.

Get input

Prompt for character input. The phone will refuse to accept further input when maximum response length is exceeded. UI Maximum Response lengths:

- Digits Only – 160 characters
- SMS default alphabet characters – 160 characters
- Hidden Characters (digits only) – 20 characters

'Key' responses:

- 'C' clears current character.
- 'Long Back' terminates the proactive session.
- 'Back' – Backward move in proactive session.
- 'OK' – Command performed successfully.

Refresh

A notification will be made if it is demanded that the SIM card initializes again.

Select item

Scroll to highlight item for selection. 'Key' responses:

- Navigational key press down – Scroll down list.
- Navigational key press up – Scroll up list.
- Long 'Back' terminates proactive session.
- 'Back' – Backward move in proactive session.
- 'OK' – Command performed successfully.

Send short message

Default message "Sending message, please wait" can be replaced for the Alpha Identifier text, or suppressed completely if a null text is provided. Default responses are "MESSAGE FAILED" or "MESSAGE SENT". 'Key' responses:

- Long 'Back' or 'Back' ends the proactive session.

Set up call

If the ME is on a call when the command 'Set up Call', 'putting all other calls on hold' is sent, the user will see the text 'Setting up a call current call will be held'. If 'OK' is pressed the current call will be put on hold and the new call set up. If the ME is on a call when the command 'Set Up Call, disconnecting all other calls' is sent, the user will see the text 'Setting up a call current call will be disconnected'. If the 'OK' key is pressed the current call will be disconnected and the new call set up.

Set up menu

Incorporates a SIM Application Toolkit Menu Item into the ME's main menu structure.

If an Alpha Identifier is supplied in the Set Up Menu command, this is used as the SIM AT entry in the ME's main menu. If no alpha identifier is supplied and several items are found in the menu, a default title is used. If the SIM AT Menu Item is selected by pressing 'Select', all the items sent in the Set Up Menu command will be available for selection, in the same way as the Select Item command.

WAP browser technical data

Feature	Support in the browser
Back to previous page	Yes
Bearer type GPRS (IP)	Yes
Bearer type GSM Data (IP)	Yes, HSCSD, ISDN and analog
Bookmarks	Yes, up to 25 named bookmarks for easy access to frequently visited pages
Bookmark Export/Import	Yes, can be sent and received as link using SMS and vBookmark format via IR and BT
Cache	Yes (size 300 KB)
Character sets *	UTF-8 (Default), UTF-16, USASCII, Latin1, UCS2
Clear cache	Yes
Colour	Colour display
Home page	Yes, up to 10 different, one for each WAP profile
HTML version for WAP browser	xHTML, mobile profile
Hyperlinks in Text	Yes, highlighted by inverse video

Feature	Support in the browser
Hyperlinks in Images	Yes, indicated by a frame
Image Animation	Yes
Image Formats	GIF (interlaced and non-interlaced) WBMP, no transparent layers, JPEG, PNG
Network Settings	Up to 10 different settings available by selecting WAP profile (Internet, Banking, Gateway etc.)
OTA Support	Yes
PPP Authentication	PAP, CHAP supported
Reload page	Yes
Security	WTLS class 1-3 TLS 1.0, client authentication WIM on SIM ICC X.509 certificate support, WAP Profile WMLScript signText WPKI OTA download of trusted and client certificates
Tables	Yes
User Agent Profiles	Yes, list of client characteristics - for example display size
WAP/WML WAP	WAP 2.0/WML 1.3
	*) When creating WML applications, it is recommended that to always save the page contents as UTF-8, and that this is clearly indicated in the pages before publishing. This ensures that the contents of the application can be viewed, regardless of character sets used in gateways and the phone. All characters are not supported in all phones. The software version depends on which market the phone is associated to. Also, please note that the phone may not support input on a WAP Service which uses certain characters (languages), even if those characters are supported for browsing in the phone.
WAP browser	WAP 2.0
WAP profiles	Dynamic - up to 10 WAP profiles, each with its own settings

WAP operator technical data

Feature	Support for WAP
WAP Browser	
Version	2.0 baseline
HTML	XHTML, mobile profile

Feature	Support for WAP	
WAP Provisioning types	The Ericsson-Nokia OTA solution Over the Air Settings Specification, v7.1 © Ericsson and Nokia	WAP Forum Client provisioning (v1.0)
Total Parameter sets	10 (shared between the WAP provisioning types). < or = 10 (total number of WAP profiles).	
Parameter set list	name, homepage and homepage title (1st bookmark element), proxy/GW address, bookmarks (remaining bookmark elements), CSD phone number, CSD data rate, CSD dial type, GPRS APN, protocol authentication, GW authentication, secure connection on/off	name, homepage, proxy/GW address, CSD phone number, CSD data rate, CSD dial type, CSD response timer, GPRS APN, protocol authentication, GW authentication, GPRS QoS
Parameter sets include	WAP/CSD, WAP/GPRS (different sets)	
Factory pre-configuration	WAP/CSD (possibility to lock a setting), WAP/GPRS	
OTA	WAP/CSD, WAP/GPRS configuration possible	
Security mechanism		
Bearer	The Ericsson-Nokia solution	WAP Forum OTA provisioning
OTA via SMS	Operator verification through a code that can be included in the OTA configuration data. This code is shown to the user who can choose to install or not.	Uses security mechanism (SEC) methods according to WAP-183-ProvCont-20010724-a (see www.openmobilealliance.org).
OTA via Cell Broadcast	-	According to ch.7.1.2, WAP-184-ProvBoot-20010314-a (see www.openmobilealliance.org).
Interface		
Bearer	The Ericsson-Nokia solution	WAP Forum OTA provisioning

Feature	Support for WAP	
OTA via SMS	A question whether to install, with the code if available is asked. The user may have to choose whether to create a new WAP profile or to replace an existing WAP profile.	For NETWPIN the user is asked to accept to install received settings. For USERPIN, USERNETWPIN and USERPINMAC the user is subsequently asked to enter a PIN code that is a shared secret between the service provider and the user.
OTA via Cell Broadcast	-	The user is asked whether to accept the received settings or not.
Re-provisioning Interface	The Ericsson-Nokia solution	WAP Forum OTA provisioning
OTA via SMS	Same interface as above.	If the settings previously installed were privileged or have higher priority, the settings might not be possible to install again unless the terminal is reset, otherwise as above.
OTA via Cell Broadcast	-	If the settings previously installed were privileged or have higher priority, the settings might not be possible to install again unless the terminal is reset, otherwise as above.
Carrier reset/provisioning	Yes, but not if the set is pre-configured in the factory and locked.	
SWIM	Not used for provisioning. The SWIM is only used for WAP security, both WTLS connections and digital signatures.	
SWIM certificate	Both client and trusted certificates can be used for WTLS connections and digital signatures.	
Applicative provisioning		
Preferred bearer customization	Yes	
E-mail customization	Yes, but not through WAP provisioning.	
Other applications/features	Yes. MMS, SyncML	
Technologies		
WAP Forum Client provisioning	Yes, WAP provisioning document v1.0.	
Openwave OTA	No	
Other	Yes. The Ericsson-Nokia solution. OTA Settings Specification v7.1.	

Feature	Support for WAP
Provisioning bearer	SMS, Cell Broadcast
Parameter sets available	< or = 10 (total number of WAP profiles)
Parameter sets for OTA modification	< or = 10 (total number of WAP profiles)
PUSH	
Content types	
Service Indication (SI)	Yes
Service Loading (SL)	Yes
Cache Operation (CO) content type	Yes
Session Initiation Application (SIA)	Yes
Man Machine Interface	
SI/content retrieval postponing	Yes
SI menu structure accessibility	Messaging, Inbox
SL reception warning	The user can make a choice if a dialogue is wanted or not before loading the SL. Messaging/Settings/Push messages/Allow push msg/Always ask
SIA reception warning	Yes
Cache size limitations	The oldest push in the inbox will be discarded.
Number of push messages	Depending on the size of the push messages. Around 20 push messages with a size of 500 bytes can be stored.
Push de-activate	Yes. Messaging/Settings/Push
Dynamic push menu changes	No. There are no changes in the menus when activating/deactivating push
Security	
Mechanisms for push	None
Trust with PPG	Sending a SIA is the most trustful.
WSP push sessions	The White List is supported.
Denial of service/spoofing	
User agent profile	
UA profile content sent at beginning of WSP session	No
OA profile content size	

Feature	Support for WAP
URL sent pointing to the UA profile at the beginning of WSP session	Yes
URL location	On the manufacturer WAP site.
WTAI	
WTA Make Call	Yes
WTA Send DTMF	Yes
WTA Add Phone Book	Yes
Other WTA/WTAI	No
DOWNLOAD	
WAP solutions	
SAR/WSP/http GET solution to download content over WAP	Yes
Download Fun from Openwave	No
Other download content over WAP	Yes. Content download limited to 200 KB when using WTP protocol. No download limit when using http protocol.
Features	
Download application/product memory check	Yes
Downloaded object solution	Yes. The user is asked if the content is to be saved.
UAP indication for downloading	Yes
Other features	Yes. Store, delete, forward, use, manage.
Object formats	
Ringtones	audio/iMelody, other/eMelody, vMel.
Wallpapers	Image/WBMP, GIF, JPEG.
Pictures	Image/WBMP, GIF, JPEG, PNG.
Games	Yes
JAVA applications	Yes
Screen savers	Image/GIF, JPEG
Audio files	WAV MP3 Uncompressed 8, 16 bit PCM sampled at 8, 11.025, 12 and 16 kHz (stereo and mono). No compressed formats are supported.
Skins	Application/skin

Feature	Support for WAP
Video	
GRAPHICAL USER INTERFACE	
Man Machine Interface	
Selection keys	Yes
Separate/dedicated back or erase keys	Yes
Display backlight on when browsing	Yes
Predictive writing	Yes
“http://” string displayed automatically when entering URLs	Not displayed but the “http://” is added automatically to the URL.
Elements	
Number of display lines for a WAP connection	Up to 8 rows (or 7 rows plus 1 title row), depending on the selected font size. Each row is 21 pixels in height (a title row is 28 pixels).
Pop-up menus	Yes, in XHTML
Radio buttons	Yes, in XHTML.
Check boxes	Yes, in XHTML.
Buttons	Available as XHTML form controls.

USSD technical data

Feature	Support
USSD support	GSM Phase 1/2 (Cross-phase compatibility). GPRS behaviour according to class B.
Mode support -mode	UI-mode supported. SAT initiated USSD supported.
UI-mode details	<ul style="list-style-type: none"> It is possible to scroll the text up and down in USSD messages. It is possible to highlight embedded numbers and take actions accordingly.

GPRS technical data

Dimension	Support
Compatible GPRS and SMG specifications	Release 97 according to ETSI specification.
Data rates	Multislot class 10 supported (4+2) CS-1, CS-2, CS-3, CS-4 9,050 bps, 13,400 bps, 15,600 bps, 21,400 bps supported (network-dependent)
Medium Access Modes	Dynamic allocation
Support of Packet Control Channels (PBCCH/PCCCH)	Yes. Available at launch.
Network operation mode	NOM I, II, III
Support of GPRS/CS combined procedures	Yes
Network control mode	NC0 and 2
Support of access in 2 phases	Yes
Support of PRACH on 11 bits	Yes
Support of GPRS re-selection C31/C32	Yes
Support of static and dynamic addressing	Yes
Support of power control Uplink and Downlink	Uplink = yes, Downlink is a network feature
Support of ciphering algorithms	GEA1, GEA2
Support of compression algorithms	Yes, V42bis and IP header compression
Mode of operation	Class B and Class C modes of operation supported.
R Reference point	Physical layer: Support of RS232 PPP is supported as L2 layer in the R reference point Authentication algorithms PAP, CHAP supported
IP connectivity	PDP type IP is supported IP termination in mobile or TE (laptop, PDA) supported
PDP context	10 PDP context descriptions stored in mobile PDP context description is edited via application in mobile, AT-command or via OTA Simultaneous PDP contexts are supported, maximum 2.
SIM	GPRS aware, as well as non-GPRS aware; SIM cards are supported.

Dimension	Support
AT commands supported	AT+CGDCONT - DEFINE PDP CONTEXT AT+CGQREQ - Quality of Service Profile (REQUESTED) AT+CGQMIN - Quality of Service Profile (Minimum Acceptable) AT+CGATT - PACKET DOMAIN SERVICE ATTACH OR DETACH AT+CGACT - PDP CONTEXT ACTIVATE OR DEACTIVATE AT+CGDATA - ENT

SyncML technical data

Feature	Support for Sync ML
SyncML compliance	The handset is fully SyncML 1.1 compliant (it passed SyncML Conformance testing).
Basic data formats	Contacts: vCard 2.1, Calendar: vCalendar 1.0, vTasks v1.0, vTodo v1.0, Notes: text/plain, v Notes: not supported.
Possibility for operators to extend SyncML functionality	No
Possibility to synchronize other handsets using SyncML	No
Transport method for SyncML messages	WSP (i.e. using a WAP connection), OBEX (RS232, IR, USB, Bluetooth).
Synchronization application placement	Inside the handset
Possibility for the user to configure login parameters (e.g. username and password) to access the remote database	Yes
Configuration parameters that can be entered/modified by the user	Server URL, Server UserID, Server PWD, Paths to databases (Calendar, Contacts, Tasks) UserID and PWD for Databases, Databases to be synchronized (on/off), WAP Account. Ericsson Nokia OTA Settings Specification v7.1.
Mechanisms used by the handset to capture changes made by the end user (i.e. how does the SyncML client in the handset know which changes were made to the address book)	It uses a change log where it marks the contact as updated
Ability to deal with multiple servers	Yes
Ability to perform conflict resolution actions	No

Terminology and abbreviations

3GPP

3rd Generation Partnership Project.

AAC

Advanced Audio Coding.

ACELP

Algebraic Code Excited Linear Prediction.

AMR

Adaptive Multi Rate. Audio format for speech sounds.

API

Application Programming Interface.

ARPU

Average Revenue Per User

Bearer

The method for accessing WAP from the phone, for example GSM Data (CSD) and SMS.

Bookmark

A URL and header/title stored in the phone.

Browsing session

The period from the first access of content until the termination of the connection.

CLI

Calling Line Identification shows the number of the caller, or a picture assigned to the number of the caller in the mobile phone display. Not all numbers can be displayed. Network-dependent service.

Card

A single WML unit of navigation and user interface. May contain information to present to the user, instructions for gathering user input, etc.

CDDA

Compact disc digital audio.

CDMA

Code Division Multiple Access. A generic term that describes a wireless air interface based on code division multiple access technology.

Cell-ID

Cell identification.

CS

Circuit Switched.

CSD

Circuit Switched Data.

CSS

Cascading Style Sheet.

Deck

A collection of WML cards.

DRM

Digital Rights Management; controlling copying and distribution of contents, with respect to intellectual property rights.

DTMF or Touch Tone

Dual Tone Multi-Frequency signal – codes sent as tone signals. Used for telephone banking, accessing an answering machine, etc.

Dual band

GSM 900/1800.

e-GSM

Extended GSM. New frequencies specified by the European Radio Communications Committee (ERC) for GSM use when additional spectrum is needed (Network-dependent). It allows operators to transmit and receive just outside GSM's core 900 frequency band. This extension gives increased network capability.

EFR

Enhanced Full Rate, speech coding.

EMS

Enhanced Messaging Service. Allows the user to add simple pixel pictures and animations, sounds and melodies to a text message. The EMS 3GPP standard also includes text formatting.

ETSI

European Telecommunications Standards Institute.

FM

Frequency Modulation of the (radio) carrier wave.

FR

Full Rate, speech coding.

Gateway

A WAP Gateway typically includes the following functions:

- A Protocol Gateway – the protocol gateway translates requests from the WAP protocol stack to the WWW protocol stack (http and TCP/IP).
- Content Encoders and Decoders – the content encoders translate Web content into compact encoded formats to reduce the size and number of packets travelling over the wireless data network.

GIF

Graphics Interchange Format.

GPRS

General Packet Radio Services.

GSM

Global System for Mobile Communications. GSM is the world's most widely-used digital mobile phone system, now operating in over 100 countries around the world, particularly in Europe and Asia-Pacific.

GSM system

The GSM system family includes GSM 900, GSM 1800 and GSM 1900. There are different phases of roll-out for the GSM system and GSM phones are either phase 1 or phase 2 compliant.

GSM 1800

Also known as DCS 1800 or PCN, this is a digital network working on a frequency of 1800 MHz. It is used in Europe and Asia-Pacific.

HR

Half Rate, speech coding.

HSCSD

High Speed Circuit Switched Data.

HTML

HyperText Markup Language.

http

HyperText Transfer Protocol.

IrMC

Infrared Mobile Communications standard.

IrDA

Infrared Data Association.

ISP

Internet Service Provider.

ITTP

Intelligent Terminal Transfer Protocol.

LED

Light Emitting Diode.

LAN

Local Area Network.

LPC

Linear Predictive Coding.

LTP

Long Term Predictor.

MIDI

Musical Instrument Digital Interface.

ME

Mobile Equipment.

Micro browser

Accesses and displays Internet content in a mobile phone, using small file sizes and the bandwidth of the wireless-handheld network.

MIME

Multipurpose Internet Mail Extensions.

MMI

Man-Machine Interface. See UI.

MP3

Short for "MPEG layer 3", an effective audio coding scheme.

MPEG4/MPG4

MPEG-4 extends the earlier MPEG-1 and MPEG-2 algorithms with synthesis of speech and video, fractal compression, computer visualisation and artificial intelligence-based image processing techniques.

MS

Mobile Station.

MT

Mobile Termination.

Music tones

Ringtones or mastertones, a name for shortened and DRM-protected MP3 ringtones.

ODI

Object Distribution Indicator.

OMA

Open Mobile Alliance.

OTA

Over-the Air Configuration. To provide settings for the phone by way of sending an SMS message over the network to the phone. This reduces the need for the user to configure the phone manually.

PDA

Personal Digital Assistant.

PDP

Packet Data Protocol.

Phonebook

A memory in the mobile phone or SIM card where phone numbers can be stored and accessed by name or position.

PIM

Personal Information Management.

QCIF

Quarter Common Intermediate Format.

QVGA

Quarter Video Graphics Array.

RPE

Regular Pulse Excited codec.

RTSP

Real Time Streaming Protocol session control.

SMS-C

Service Centre (for SMS).

Service provider

A company that provides services and subscriptions to mobile phone users.

SI

Service Indication.

SL

Service Loading.

SIM card

Subscriber Identity Module card – a card that must be inserted in any GSM-based mobile phone. It contains subscriber details, security information and memory for a personal directory of numbers. The card can be a small plug-in type or credit card-sized, but both types have the same functions. The K700i uses the small plug-in card.

SMS

Short Messaging Service. Allows messages of up to 160 characters to be sent and received via the network operator's message centre to a mobile phone.

SP-MIDI

SP-MIDI stands for Scalable Polyphony MIDI.

SS

Supplementary Services.

TA

Timing in advance.

TCP/IP

Transmission Control Protocol/Internet Protocol.

Triple band

GSM 900/1800/1900.

UI

User interface.

UMTS

Universal Mobile Telecommunications System. The telecommunications system, incorporating mobile cellular and other functionality, that is the subject of standards produced by 3GPP.

URL

Uniform Resource Locator.

The global address of documents and other resources on the World Wide Web.

USSD

Unstructured Supplementary Services Data.

vCard

vCard automates the exchange of personal information typically found on a traditional business card, for use in applications such as Internet mail, voice mail, Web browsers, telephony applications,

call centres, conferences, PIMs /PDAs, pagers, fax, office equipment, and smart cards. vCard is specified by IETF.

VGA

Video Graphics Array.

VHF

Very high frequency. A band of radio frequencies falling between 30 and 300 megahertz.

WAP

Wireless Application Protocol. Handheld devices, low bandwidth, binary coded, a deck/card metaphor to specify a service. A card is typically a unit of interaction with the user, that is, either presentation of information or request for information from the user. A collection of cards is called a deck, which usually constitutes a service.

WAP Application

A collection of WML cards, with the new context attribute set in the entry card.

WAP service

A WML application residing on a web site.

WAV

Windows media audio video.

WBMP

Wireless BitMap.

A graphic format optimized for mobile computing devices.

WML

Wireless Markup Language. A markup language used for authoring services, fulfilling the same purpose as HyperText Markup Language (HTML) does on the World Wide Web (WWW). In contrast to HTML, WML is designed to fit small handheld devices.

WMLScript

WMLScript can be used to enhance the functionality of a service, just as, for example, Java Script may be utilized in HTML. It makes it possible to add procedural logic and computational functions to WAP-based services.

WSP

Wireless Session Protocol.

WTLS

Wireless Transport Layer Security.

WWW

World Wide Web.

XML

Extensible Markup Language.

XHTML

Extensible HyperText Markup Language.

Related information

Documents

- The K700i User Guide
- Sony Ericsson K700i FAQ
- AT Command Reference Manual
- WAP 2.0 Specifications

Links

- www.SonyEricsson.com
- www.SonyEricsson.com/fun/
- www.SonyEricsson.com/developer/
- www.ericsson.com/mobilityworld/
- www.midi.org
- www.extendedsystems.com
- http://www.gsmworld.com/
- www.bluetooth.com
- www.imc.org
- www.3gpp.org
- www.irda.org
- www.etsi.fr
- www.wapforum.org
- www.imc.org/pdi/
- www.syncml.org
- www.w3.org/TR/xhtml-basic/
- www.java.sun.com

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