

# White Paper

November 2004

## K500i

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*Total Entertainment in a visually stunning package*



Sony Ericsson

# Preface

## Purpose of this document

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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/](http://www.SonyEricsson.com/developer/), which contains up-to-date information about technologies, products and tools.

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Revised edition (November 2004)  
Publication number EN/LZT 108 7025 R4A

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# Document conventions

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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

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| Date       | Version | Comment         |
|------------|---------|-----------------|
| 2004-05-13 | R1A     | First edition.  |
| 2004-06-14 | R2A     | Second edition. |
| 2004-08-13 | R3A     | Third edition.  |
| 2004-11-29 | R4A     | Fourth edition. |

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# Product overview

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K500i is targeted towards fun-loving youth with total entertainment in a visually stunning package.

Total entertainment is achieved by offering advanced imaging, gaming, messaging and musical functionality.

Imaging includes taking snapshots and sending them with Quickshare™ and Fun Filters.

Gaming includes Java™ 3D games, with multi-player and Gameboard™ options.

Messaging includes My friends and chatting functionality.

Music includes Music DJ™, Quickplay™, MP3 and 40 polyphonic voices.

The visually stunning package is based on cool and fun sleek looks with an amazing large screen, where all the fun is visible and audible.

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

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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.

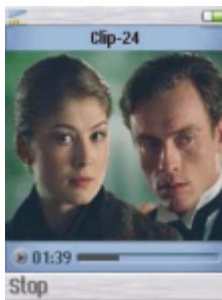
An eye-catching feature of this phone is the large colour screen. It measures 128 pixels wide and 160 pixels high (128 x 160) in portrait mode and has 65,536 colours, allowing high-quality colour imaging and video.

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.

## VGA camera



With the VGA camera, a camera is always handy. 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 infrared or cable.

The camera also has a 4X Digital zoom.

## 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 also be shared via infrared or cable.

## Full graphic 65k colour screen



The large 1.9 inch colour screen, 128 x 160 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 Sounds. 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 1.9 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.

### 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 compact keypad area accommodates the 1.9 inch display area.

The keys are designed in a horizontally grouped form.

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

The keypad thickness has been reduced by removing unused space internally. This improves the ergonomics when handling the phone and emphasizes the wavy curvatures when looking at the phone.

#### Camera and battery cover

The cover is designed to be placed vertically over the battery housing and camera areas. The battery housing has its own battery locking mechanism to hold the battery in place.

There is a built-in camera shutter to protect the camera lens from dust and dirt and also to physically impede the possibility of taking a picture when the lens is covered or closed.

The sound outlet area on the cover has been designed with an obvious speaker look.

The placement of the camera area has been designed to compensate for the shutter mechanism and the speaker look.

#### Sides

The phone and camera fronts are harmonized with a connecting wave-like belt that flows around the sides.





# More in-phone functions

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## 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

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## Entertainment

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### Media player

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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 ringtones

### 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](http://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

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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

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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

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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

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## VGA camera

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### 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 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:

- QQVGA (160 x 120 pixels)

- QVGA (320 x 240 pixels)
- 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.

### Camera shutter

A mechanical switch is designed to protect the lens from dust and dirt when the camera is not in use and also to physically impede the possibility of taking a picture when the lens is covered or closed.



# Messaging

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## My friends

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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.

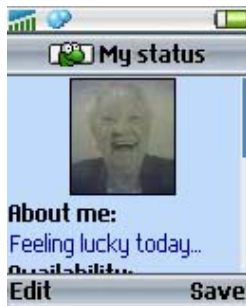
### Managing My friends

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/](http://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 ringtone 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.

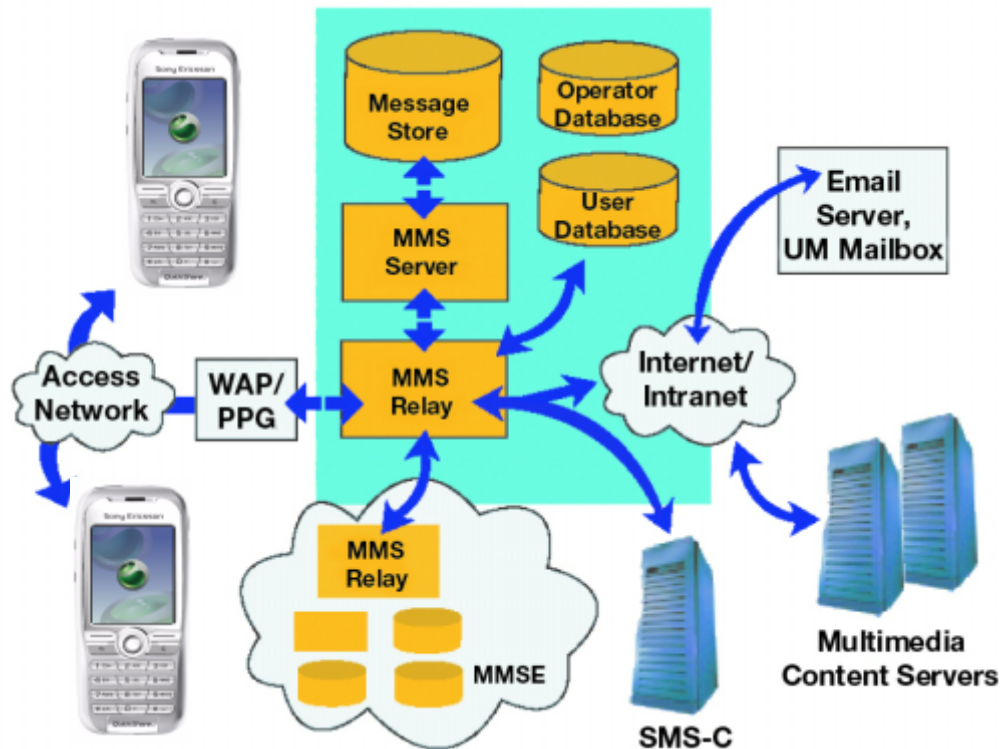


Figure 1. The architecture of MMS

### 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

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## Positioning

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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

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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 K500i 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 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.

## IrDA

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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

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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

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## 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.

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, 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 a cable connection) and remote synchronization over WAP and http.

## Designed for the wireless world

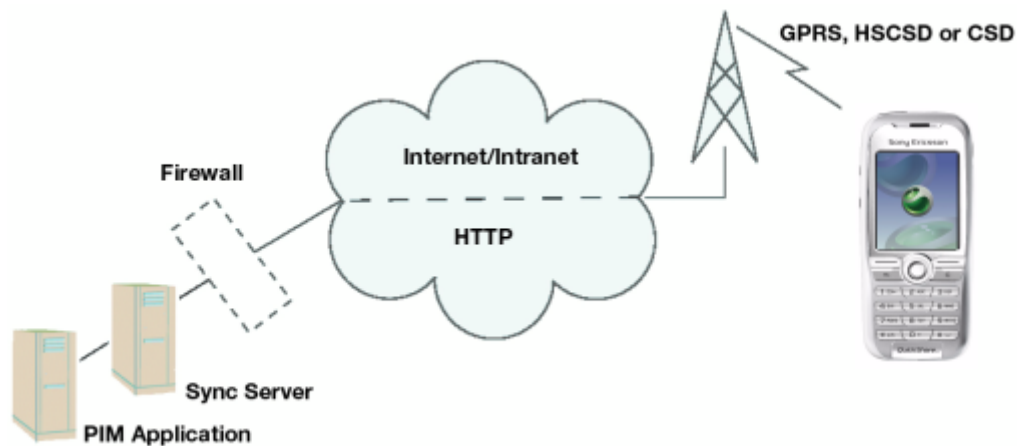
SyncML is designed specifically with the wireless world's tight requirements in mind. SyncML minimizes the use of bandwidth and can deal with the special challenges of wireless synchronization,

### 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.



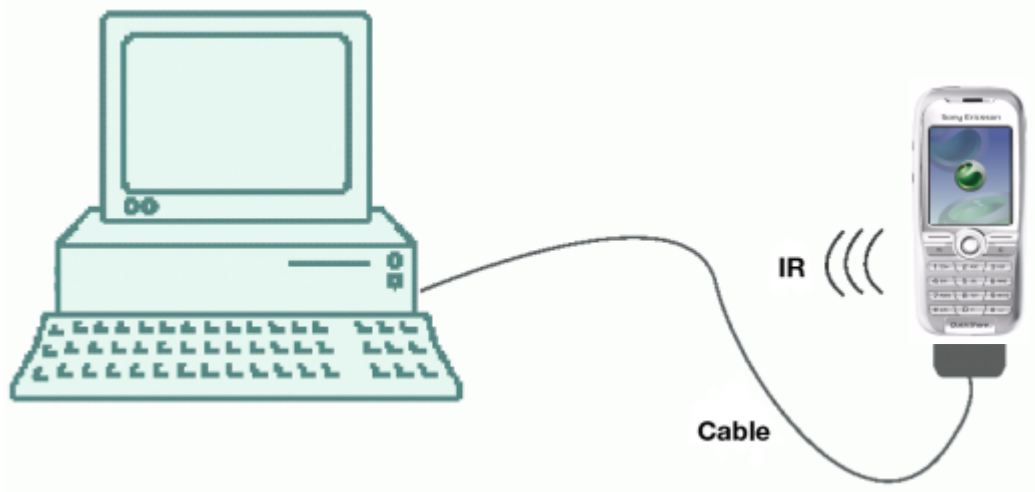
Third-party service providers offering synchronization services to corporate personal information management (PIM) applications, such as Microsoft® Exchange, can also supplement added capability with SyncML.



## Local synchronization

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



### Infrared or cable

The phone synchronizes using SyncML, regardless of connection type. It connects via 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

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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 ringtone 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 ringtone ten times, the device will keep track of the number of times the ringtone is played, and notify the user when the ringtone 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.

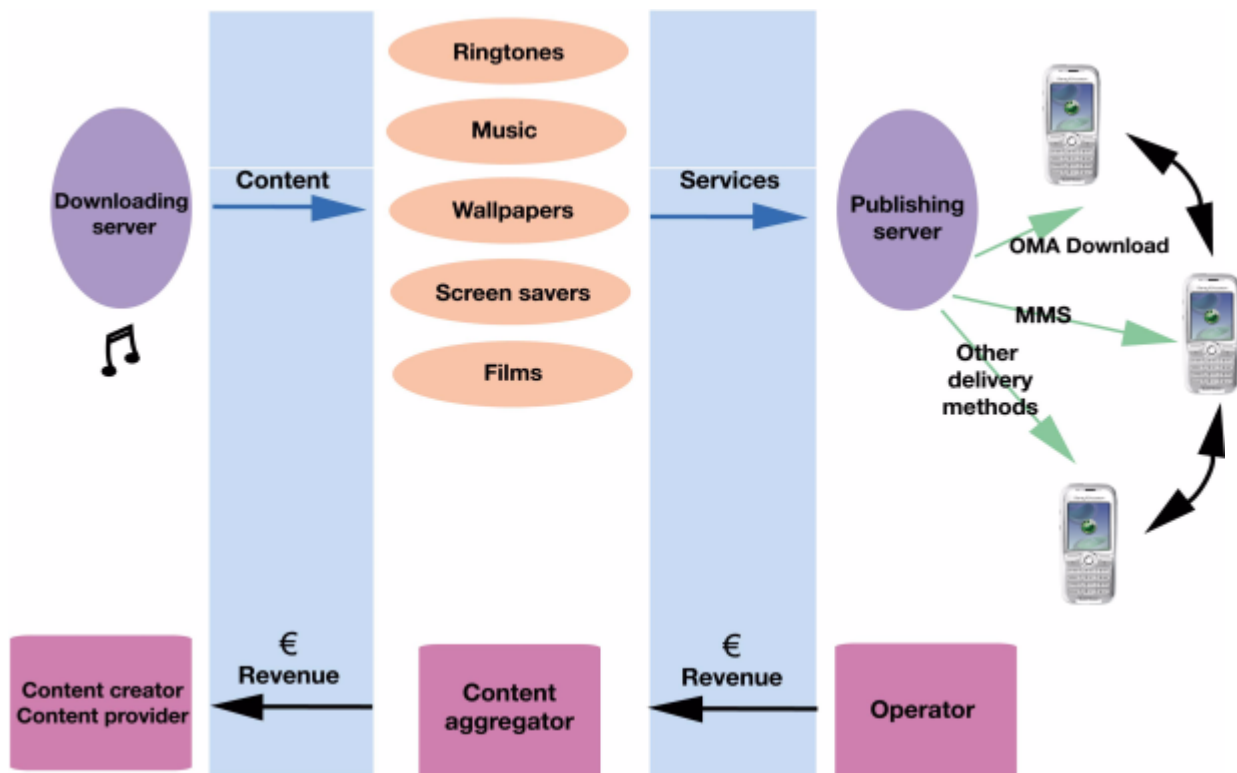


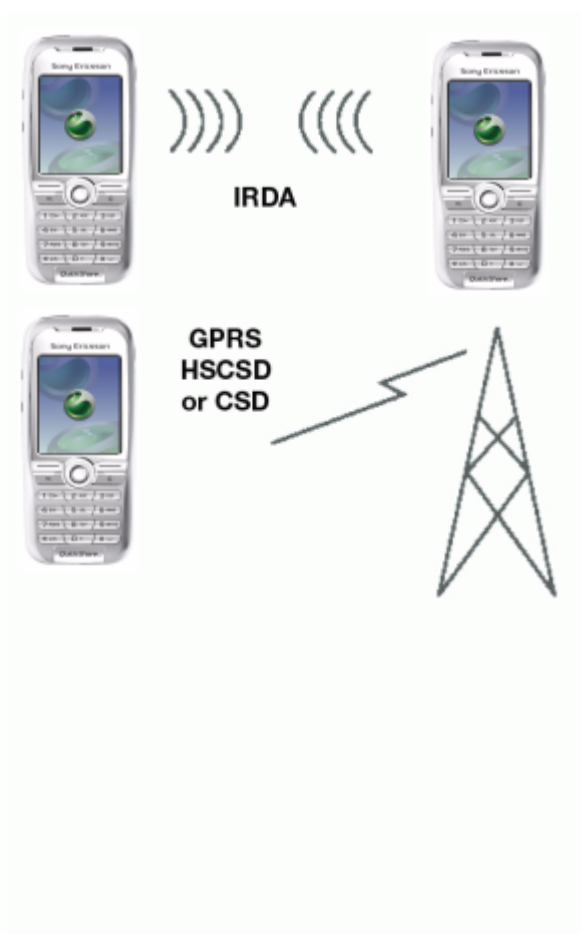
Figure 2. The flow of revenues and content. The content is viewed and selected from a publishing server and downloaded to the mobile phone from a downloading server. The revenue is in this case collected from the user by the operator and transferred to the content creator via the content aggregator.

## Object exchange – ‘Send as’

The phone makes it possible to transfer objects via 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.

| <b>Application</b> | <b>Bearer &gt;</b> | <b>IR/Cable</b> | <b>SMS/EMS</b> | <b>MMS</b> | <b>E-mail</b> |
|--------------------|--------------------|-----------------|----------------|------------|---------------|
| Contact            |                    | Yes             | Yes            | Yes        | No            |
| Appointment        |                    | Yes             | No             | Yes        | No            |
| Tasks              |                    | Yes             | No             | Yes        | No            |
| Notes              |                    | Yes             | No             | Yes        | No            |
| Image              |                    | Yes             | No             | Yes        | Yes           |
| Sound              |                    | Yes             | Yes            | Yes        | Yes           |
| Bookmark           |                    | Yes             | Yes            | No         | Yes           |
| Voice memo         |                    | 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.

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.

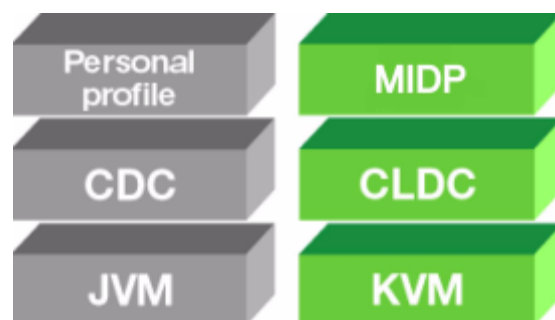


Figure 3. J2ME in detail

### 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

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### 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

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# Technical specifications

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## 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.<br>Small plug-in card, 1,8 V and 3 V  |
| Memory (user free) | Up to 12 MB (depending on software configuration/file content)   |

## Exterior description

|   |   |
|---|---|
| Length                                      | 103 mm  |
| Width                                       | 45,5 mm   |
| Thickness<br>(thinnest point/ keypad area)  | 15 mm   |
| Thickness<br>(thickest point/ display area) | 19,5 mm   |
| Weight                                      | 88 g  |
| Graphic display                             | Type: Full graphical<br>Resolution: 128 x 160 pixels<br>Technology: TFT<br>Colours displayed together: 65,536 (16 bit)<br>Backlight colour: White |
| Antenna                                     | Built-in  |
| Colours                                     | 2, virtual silver and cosmetic blue   |
| Battery                                     | 3.6V, 700 mAh, Lithium Polymer or Lithium Ion can be packed in the factory  |
| Power save                                  | Yes   |
| Network LED                                 | No  |
| Keypad                                      | Yes, including a navigational key (4-directional + one select)  |
| Co-branding area                            | 7 x 20 mm   |
| Exchangable covers                          | Yes, the battery & camera cover.  |

## Performance and technical characteristics

| Dimension                        | GSM 900/E-GSM 900  | GSM 1800                                  | GSM 1900                                  |
|----------------------------------|--|---|---|
| Frequency range                  | TX: 880 – 915 MHz<br>RX: 925 – 960 MHz                                   | TX: 1710 – 1785<br>RX: 1805 – 1880        | TX:1850 –1910 MHz<br>RX:1930 – 1990 MHz   |
| Channel spacing                  | 200 kHz  | 200 kHz                                   | 200 MHz                                   |
| Number of channels               | 174 Carriers *8<br>(TDMA)  | 374 Carriers *8<br>(TDMA)                 | 299 Carriers *8<br>(TDMA)                 |
| Modulation                       | GMSK   | GMSK                                      | GMSK                                      |
| TX Phase Accuracy                | < 5° RMS Phase error<br>(burst)  | < 5° RMS Phase error<br>(burst)           | < 5° RMS Phase error<br>(burst)           |
| Duplex spacing                   | 45 MHz   | 95 MHz                                    | 80 MHz                                    |
| Frequency stability              | +/- 0.1  | +/- 0.1                                   | +/- 0.1                                   |
| Voltage operation<br>(nominal)   | 3.6 V  | 3.6 V                                     | 3.6 V                                     |
| Transmitter RF power<br>output   | 33 dBm Class 4<br>(2 W peak)   | 30 dBm Class 1<br>(1 W peak)              | 30 dBm Class 1<br>(1 W peak)              |
| Transmitter Output<br>impedance  | 50 ohm   | 50 ohm                                    | 50 ohm                                    |
| Transmitter Spurious<br>emission | < -36 dBm up to 1<br>GHz<br>< -30 dBm over 1 GHz<br>(according to spec.) | < - 30 dBm<br>(according to GSM<br>spec.) | < - 30 dBm<br>(according to GSM<br>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)<br>3.6V, 700 mAh | Charging time: At least 90%<br>charged within 1 hour |



## VGA Camera

| Facts and figures                        |   |
|--|---|
| Picture sizes (resolution)<br>VGA camera | QQVGA (160 x 120 pixels)<br>QVGA (320 x 240 pixels)<br>VGA (640 x 480 pixels)<br>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  |
| Camera shutter                           | Yes   |

## Media player

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

## Pictures

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

## Image decoders

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

## Image encoders

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

| Feature  | Support   |
|--|---|
| 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:                          |   |
| 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   |

| Feature   | Support                        |
|---|--------------------------------|
| 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"> <li>• see how many short messages an EMS message consists of before sending it.</li> <li>• choose whether to send the message or not after writing it.</li> </ul>  |
| Incoming messages  | <ul style="list-style-type: none"> <li>• A signal is heard once all parts of the message have been received or when a timeout occurs.</li> <li>• 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.</li> </ul> |
| 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"> <li>• Centred, left and right aligned text.</li> <li>• Small, normal and large font size.</li> <li>• Bold, italic, underlined and strikethrough style.</li> </ul>   |

| Feature   | Support   |
|---|---|
| Sounds  | Chimes high, chimes low, ding, tada, notify, drum, claps, fanfare, chords high, chords low.   |
| I-melody  | Yes, version 1.2.   |
| Melodies  | It is possible to... <ul style="list-style-type: none"> <li>• send and receive melodies via EMS, if the melodies are not protected by copyright.</li> <li>• download melodies and commercial tunes from WAP/WAP portals.</li> <li>• create melodies on WAP/WAP portals.</li> </ul>  |
| WBMP  | Yes   |
| Picture sizes   | 16 x 16 mm, 32 x 32 mm, variable size in black and white.   |
| Pictures  | It is possible to... <ul style="list-style-type: none"> <li>• edit pictures by using the phone keypad.</li> <li>• send and receive pictures via EMS, if the pictures are not protected by copyright.</li> <li>• create pictures on WAP/WAP portals.</li> <li>• download pictures from WAP/WAP portals.</li> <li>• receive pictures in enhanced messages originated by service providers.</li> </ul> |
| Animations  | 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.<br><br>It is possible to... <ul style="list-style-type: none"> <li>• send and receive animations.</li> </ul>   |
| 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. |

| Feature   | Support   |
|---|---|
| Possibility to pre-configure the MMS parameters in factory  | <ul style="list-style-type: none"> <li>• MMS/CSD: Yes</li> <li>• MMS/GPRS: Yes</li> </ul>   |
| Possibility to configure the MMS parameters by OTA provisioning   | <ul style="list-style-type: none"> <li>• MMS/CSD: Yes</li> <li>• MMS/GPRS: Yes</li> </ul>   |
| Possibility for all the parameters from the parameters set to be OTA provisioned at the same time                           | <ul style="list-style-type: none"> <li>• MMS/CSD: Yes</li> <li>• MMS/GPRS: Yes</li> </ul>   |
| Possibility for only one parameter from the parameters set to be OTA provisioned  | <ul style="list-style-type: none"> <li>• MMS/CSD: No</li> <li>• MMS/GPRS: No</li> </ul>   |
| 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"> <li>• message subject</li> <li>• message priority</li> <li>• e-mail recipient address</li> <li>• message Cc recipient(s) address(es)</li> <li>• delivery report request</li> <li>• read report request</li> <li>• MSISDN recipient address</li> </ul>              |
| From where can the user insert multimedia elements into multimedia messages:  | <ul style="list-style-type: none"> <li>• File Manager</li> <li>• directly from camera</li> <li>• Contacts</li> <li>• Calendar</li> </ul>  |
| 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"> <li>• Auto Download</li> <li>• Always Ask</li> </ul>   |
| Actions that the user can perform after message retrieval:  | <ul style="list-style-type: none"> <li>• reply to the sender of the message SMS/MMS</li> <li>• reply to the sender and to Cc people SMS/MMS</li> <li>• forward the message MMS</li> <li>• delete the message</li> <li>• save message into terminal</li> <li>• call the sender of a message</li> </ul> |
| 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-t, WBMP, BMP  |

| Feature   | Support   |
|---|---|
| Supported formats for message presentation:                         | <ul style="list-style-type: none"> <li>message body + attachments (e-mail presentation)</li> <li>SMIL version as described in OMA MMS IOP document version 1.2</li> </ul>   |
| 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"> <li>message not sent causes no user subscription to service, if included in ResponseText (please see WAP209)</li> <li>message not sent causes required functionality not supported by MMS Relay/Server, if included in ResponseText (please see WAP209)</li> <li>message not sent causes insufficient credit (in case of prepaid charging), if included in ResponseText (please see WAP209)</li> </ul> |

## SIM AT services supported

| Service              | Mode   | Support    |
|----------------------|--|------------|
| CALL CONTROL BY SIM  |  | Yes        |
| DATA DOWNLOAD TO SIM | Cell Broadcast<br>SMS                          | Yes<br>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<br>TLS 1.0, client authentication<br>WIM on SIM ICC<br>X.509 certificate support, WAP Profile<br>WMLScript signText<br>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       |
|--------------------|-----------------------|
| <b>WAP Browser</b> |                       |
| Version            | 2.0 baseline          |
| HTML               | XHTML, mobile profile |

| Feature                   | Support for WAP  |  |
|---------------------------|--|--|
| WAP Provisioning types    | <b>The Ericsson-Nokia OTA solution</b><br>Over the Air Settings Specification, v7.1<br>© Ericsson and Nokia  | <b>WAP Forum Client provisioning (v1.0)</b>  |
| Total Parameter sets      | 10 (shared between the WAP provisioning types).<br>< or = 10 (total number of WAP profiles).   |  |
| Parameter set list        | name,<br>homepage and<br>homepage title (1st<br>bookmark element),<br>proxy/GW address,<br>bookmarks (remaining<br>bookmark elements),<br>CSD phone number,<br>CSD data rate,<br>CSD dial type,<br>GPRS APN,<br>protocol authentication,<br>GW authentication,<br>secure connection on/off | name,<br>homepage,<br>proxy/GW address,<br>CSD phone number,<br>CSD data rate,<br>CSD dial type,<br>CSD response timer,<br>GPRS APN,<br>protocol authentication,<br>GW authentication,<br>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                    | <b>The Ericsson-Nokia solution</b>   | <b>WAP Forum OTA provisioning</b>  |
| OTA via SMS               | Operator verification through a code that can be included in the OTA configuration data.<br>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 <a href="http://www.openmobilealliance.org">www.openmobilealliance.org</a> ).                                  |
| OTA via Cell Broadcast    | -  | According to ch.7.1.2, WAP-184-ProvBoot-20010314-a (see <a href="http://www.openmobilealliance.org">www.openmobilealliance.org</a> ).  |
| Interface                 |  |  |
| Bearer                    | <b>The Ericsson-Nokia solution</b>   | <b>WAP Forum OTA provisioning</b>  |

| 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.   |   |

| <b>Feature</b>                                      | <b>Support for WAP</b>   |
|---|--|
| 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)   |
| <b>PUSH</b>   |  |
| <b>Content types</b>                                |  |
| Service Indication (SI)                             | Yes  |
| Service Loading (SL)                                | Yes  |
| Cache Operation (CO) content type                   | Yes  |
| Session Initiation Application (SIA)                | Yes  |
| <b>Man Machine Interface</b>                        |  |
| 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.<br>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  |
| <b>Security</b>                                     |  |
| 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                          |  |
| <b>User agent profile</b>                           |  |
| 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.   |
| <b>WTAI</b>   |   |
| WTA Make Call   | Yes   |
| WTA Send DTMF   | Yes   |
| WTA Add Phone Book  | Yes   |
| Other WTA/WTAI  | No  |
| <b>DOWNLOAD</b>   |   |
| <b>WAP solutions</b>  |   |
| 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.                            |
| <b>Features</b>   |   |
| 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.   |
| <b>Object formats</b>   |   |
| 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<br>MP3<br>Uncompressed 8, 16 bit PCM sampled at 8, 11.025, 12 and 16 kHz (stereo and mono).<br>No compressed formats are supported. |
| Skins   | Application/skin  |



| Feature   | Support for WAP  |
|---|--|
| Video   |  |
| <b>GRAPHICAL USER INTERFACE</b>                             |  |
| <b>Man Machine Interface</b>                                |  |
| 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.   |
| <b>Elements</b>   |  |
| 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.<br>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).<br>GPRS behaviour according to class B.  |
| Mode support -mode | UI-mode supported.<br>SAT initiated USSD supported.   |
| UI-mode details    | <ul style="list-style-type: none"> <li>It is possible to scroll the text up and down in USSD messages.</li> <li>It is possible to highlight embedded numbers and take actions accordingly.</li> </ul> |

## GPRS technical data

| Dimension  | Support   |
|--|---|
| Compatible GPRS and SMG specifications           | Release 97 according to ETSI specification.   |
| Data rates                                       | Multislot class 10 supported (4+2)<br>CS-1, CS-2, CS-3, CS-4<br>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<br>PPP is supported as L2 layer in the R reference point<br>Authentication algorithms PAP, CHAP supported  |
| IP connectivity                                  | PDP type IP is supported<br>IP termination in mobile or TE (laptop, PDA) supported  |
| PDP context                                      | 10 PDP context descriptions stored in mobile<br>PDP context description is edited via application in mobile, AT-command or via OTA<br>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<br>AT+CGQREQ - Quality of Service Profile (REQUESTED)<br>AT+CGQMIN - Quality of Service Profile (Minimum Acceptable)<br>AT+CGATT - PACKET DOMAIN SERVICE ATTACH OR DETACH<br>AT+CGACT - PDP CONTEXT ACTIVATE OR DEACTIVATE<br>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).  |
| 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.

**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 K500i 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.

**SVG-t**

Scalable vector graphics tiny for mobile phones.

**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.

#### **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

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## Documents

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- The K500i User Guide
- Sony Ericsson K500i FAQ
- AT Command Reference Manual
- WAP 2.0 Specifications

## Links

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- [www.SonyEricsson.com](http://www.SonyEricsson.com)
- [www.SonyEricsson.com/fun/](http://www.SonyEricsson.com/fun/)
- [www.SonyEricsson.com/developer/](http://www.SonyEricsson.com/developer/)
- [www.ericsson.com/mobilityworld/](http://www.ericsson.com/mobilityworld/)
- [www.midi.org](http://www.midi.org)
- [www.extendedsystems.com](http://www.extendedsystems.com)
- <http://www.gsmworld.com/>
- [www.imc.org](http://www.imc.org)

- [www.3gpp.org](http://www.3gpp.org)
- [www.irda.org](http://www.irda.org)
- [www.etsi.fr](http://www.etsi.fr)
- [www.wapforum.org](http://www.wapforum.org)
- [www.imc.org/pdi/](http://www.imc.org/pdi/)
- [www.syncml.org](http://www.syncml.org)
- [www.w3.org/TR/xhtml-basic/](http://www.w3.org/TR/xhtml-basic/)
- [www.java.sun.com](http://www.java.sun.com)

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