White Paper

October 2004

T290i/T290c

Calling made easy

Sony Ericsson

Preface

Purpose of this document

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

The aim of this White Paper is to give the reader an understanding of technology and its main applications, as well as the main functions and features of the T290i/T290c.

Note: This document contains general descriptions for this specific Sony Ericsson mobile T290i/T290c.

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 on www.SonyEricsson.com/developer/, which contains up-to-date information about technologies, products and tools.

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Online Developer Resources

On www.SonyEricsson.com/developer, developers will find all documentation and tools such as phone White Papers, Developers Guidelines, SDK's and API's etc. The developer web site also contains discussion forums monitored by our Sony Ericsson Developer Support team, a searcheable Knowledge Base of support queries and solutions, Tips & Tricks, example code etc. To stay up to date on development issues, register and subscribe to the monthly Sony Ericsson Developer Newsletter.

Sony Ericsson Developer Support

Sony Ericsson offers developers professional technical support services. The service can be purchased from the developer web portal, as part of the Sony Ericsson Core and Core+ membership package or as individual support incidents. There are two levels of support, described below.

The Basic Email Developer Support is an annual support service included in the Core membership that provides developers with all the basics to successfully develop world-class applications for Sony Ericsson products. With this support contract, developers get access to Sony Ericsson developer support engineers via email with same-day response, five technical support incidents as well as the ability to purchase more.

The Priority Email Developer Support is an annual support service included in the Core+ membership that equips professional developers with everything they need to successfully develop world-class applications for Sony Ericsson products. With this support contract, developers get priority access to Sony Ericsson developer support engineers via email with fast response times and up to 50 technical support incidents.

Document conventions

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

Document history

Change history		
2004-10-22	Version R1A1	First edition

Contents

Product overview

The T290i/T290c mobile phone are designed to include an impressive set of features for a very reasonable price. The focus is on messaging, music, gaming, imaging, and connectivity. EMS picture messaging (text messaging with pictures and sounds), email, MMS (Multimedia messaging), and a snap-on camera accessory are all supported.

This dual band GSM phone (900/1800 MHz) offers a fast and satisfying mobile Internet experience. The T290c is intended for the China market. The T290i is intended for the rest of the world with the exception of Americas. Both phones are scheduled to be available during the first quarter of 2005.

Key functions and features

Multimedia Messaging - Digital greetings

Reacting to the enormous popularity of mobile phone messaging, Sony Ericsson has incorporated the latest messaging standards into the T290i/ T290c phone, along with a colour display for an enhanced imaging experience.

Say it in words, say it with pictures, animate it, add sound. Multimedia birthday and holiday greetings are great fun to put together using your phone. On vacation, use your mobile phone and accessories to send a digital postcard with stylized text, digital pictures of where you are, and authentic sound clips to friends and family back home.

With MMS, the subscription applications get more interesting, for example stock information, movie trailers and weather reports.

Speakerphone

Speakerphone is a feature that allows the user to utilize the phone in “Public Mode” where the phone routes audio to the loudspeaker. With speakerphone, the user can place the phone at a greater distance away than normally is possible and still communicate effectively. Multiple individuals in close proximity can also participate in a phone call. The speakerphone functionality works with all accessories except those that inherently modify audio behaviour such asa PHF, a car kit, or a desk speakerphone.

Chinese phonebook sorting

You can look up and call a contact in your phonebook by entering the first letter of the name you want to call. Chinese phonebook sorting makes it possible to look up and call contacts not only by entering Latin letters but also by using Chinese characters.

Polyphonic ring signals

Pleasing to the ear, polyphonic ring signals play several tones simultaneously making a more musical sound. The word “polyphony” means playing with several tones at the same time. Almost all music that we listen to consists of polyphonic melodies. Polyphonic sounds and ring signals are widely used in GSM mobile phones.

The T290i/T290c will contain several polyphonic ring signals. Users can share ring signals, and download them from the Web.

Early Ericsson mobile phones supported a proprietary non-polyphonic format called eMelody. Due to the musical limitations of eMelody, and as it became popular to create, send and download ring melodies, Ericsson and Sony Ericsson, together with other manufacturers created the more advanced non-polyphonic sound format - iMelody.

The development from the iMelody format to the MIDI format means a revolution to the sound quality. The MIDI files are small, and perfect for mobile devices which have limited storage capacity.

MIDI - Musical Instrument Digital Interface - is a specification for a communications protocol principally used to control electronic musical instruments. MIDI is today a well known standard used by musicians, composers, arrangers and so forth.

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

Please visit www.midi.org for more information.

Downloadable games

Gaming is already a very popular feature in Sony Ericsson phones. In addition to pre-installed games, now the mobile Internet portal offers the possibility of downloading games. Network operators may also offer downloadable games to their customers as an added value offer. Users can add new games and skill levels to further enhance the entertainment value of Sony Ericsson phones.

Downloading of games on T290i/T290c is made possible by a true virtual machine. The Sony Ericsson portal for downloading of free games is acces-

sible via the WAP browser. The openness of the downloadable games solution is dedicated to provide an enhanced gaming experience.

The downloadable games can fully take advantage of the phone's interfaces, such as TCP/IP, SMS, vibrator and backlights. The virtual machine executes the downloading of games for the optimal game experience. The user can download an unlimited number of games as long as the file system allows it, i.e. until the phone memory is full.

The downloading concept includes certification of the games, which makes it possible to create a revenue chain and favorable business opportunities for network operators and content providers. The virtual machine uses true sandbox technology for highest level of security. The software development kits are available via www.mophun.com

Imaging

With a digital camera attached to your phone, you can take, view, store and send high-quality pictures over the air to another mobile phone, as MMS messages, or you can send them to an email address or Web photo album. Downloading images from the Web is another alternative. Thousands of online image collections already exist on the Web and many sites are already gearing up to include images for use in mobile phones.

There are various ways to incorporate images and other multimedia into your communication. You can attach pictures to people listed in your phonebook and have pictures or icons of the caller identifying them in your display.

The pictures are stored in the picture browser in the phone. From here, the user can select view, thumbnail or full view, as well as keep track of the number and size of the pictures stored in the phone.

WAP

Your T290i/T290c supports the WAP 1.2.1 browser and protocol stack, as well as the WAP 2.0 browser. With WAP 1.2.1, your phone can read WML pages and use WTLS class 3 security. The added benefit of supporting the WAP 2.0 browser is the capability to navigate to pages written in XHTML Mobile Profile and XHTML Basic markup languages. These two languages, 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, checkboxes, radio buttons, text areas, headings, horizontal rules and lists. In addition to WML, XHTML Mobile Profile, and XHTML Basic, your phone supports the markup language iHTML.

With the WAP 2.0 browser, cascading style sheets (CSS) and cookies are supported. CSS enhances content presentation and style. Cookies are 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 (shopping carts and wish lists), and to save the user from entering the same information more than once.

Full graphic 4K display

The T290i/T290c delivers 4K colours on a large display that enhances viewing, facilitating high-quality multimedia messaging, and personalized imaging. The standby display looks like the desktop in a computer, with the menus presented as icons.

Figure 1. The T290 standby display.

Navigation

There is an easy-to-use 4-directional navigation key. Using finger or thumb, you can easily navigate the menu system. When you arrive at the required function in a menu, instead of pressing Yes, just gently press the small button in the center of the navigation key and the feature is activated.

GPRS

GPRS uses Internet-style packet based technology. It allows users to be permanently connected to the mobile Internet, but only uses the radio link for the duration of time that it transfers data. GPRS offers the user the speed needed for satisfactory mobile Internet usability. Support is provided for GPRS 3+1.

Localization/Customization

Different markets will be served with appropriate pre-stored content. In addition, individual operators can be provided with uniquely customized phones. A complete list of customization options is available in the customization specification.

More in-phone functions

Email

The T290i/T290c is another Sony Ericsson mobile phone with a built-in fully functional email client. With inbox, outbox, save draft and reply options, you have all the functions you need for effective email communication in a small and powerful mobile phone. Constantly connected to a POP3, SMTP or IMAP4 email server anywhere on the Internet, your T290i/T290c stores messages (without attachments) dynamically, depending on available memory, and updates your inbox automatically and over the air. Check your email anywhere. Reply to email on the move. Friends, family and business contacts know that when they send you email, you receive it and can read it and act on it immediately. You can include pictures in outgoing emails, but cannot receive attachments. Hyperlinks in emails are supported.

EMS (Enhanced Messaging Service)

You can send text, pictures and sounds in easy-to-create and fun messages. EMS has been adopted by several leading mobile phone manufacturers, making it possible for users to send enhanced text messages to users of other makes of mobile phones. EMS makes it possible for the user to use text formatting (style, size, alignment and paragraphs) in a text message. At purchase, the phone is loaded with several pre-defined images and animations.

Predictive Text Input Software

Text messaging with your T290i/T290c is made easier than ever with the introduction of predictive text input software. Instead of having to press keys several times for a letter, software in your T290i/T290c chooses from a dictionary of words and phrases and anticipates what word or phrase you are writing, giving your mobile phone keyboard ease of use comparable to that of a full-size keyboard.

Sleep Mode

After a short period of inactivity, the display changes to sleep mode to save power.

Memory management

All applications in the phone share the same memory, allowing for efficient memory usage. When the memory runs low, the user gets information about the current memory situation, where each application's usage is displayed. The user can delete items from any application, in order to set memory free. At purchase, there is approximately 400 KB of memory space available to the user in the file system for objects such as pictures, games, sounds, and themes. In addition to the user space, the file system contains preloaded pictures, games, sounds, MMS messages, message templates, themes, and WAP security information. Details depend on market and customer requirements.

Mobile chat

Mobile chat makes text messaging easier, since a chat-session opens up immediately when a text message is received from a phone. Because the user stays connected during the session, the messages open up automatically. Previous messages from both persons are visible on screen, each writer being distinguished by a nickname.

Picture phonebook

The phonebook lets the user assign a picture and/or a personal ring signal to a certain phone number. When the user gets a call from this person, the picture (instead of the number) is shown in the display.

Events

The Events feature keeps track of important meetings that you need to attend, phone calls that you need to make or tasks that you need to do. Twenty items can be saved. You can also choose to add, reschedule, edit, send or delete events.

iMelody and Melody Composer

The audio iMelody format enhances the sound quality in the T290i/T290c. With this format, the user can play, compose, edit and send melodies within the improved Melody Composer. The composer has an improved graphical user interface to simplify melody handling. All new and edited melodies are stored in the iMelody format.

Explanatory Help

The T290i/T290c can be pre-loaded with an MMS message that contains a demonstration of some of the phone's features. In addition, an icon glossary is included.

Sound browser

From the Sound browser function, the user can handle all sounds (for example MIDI, eMelodies, iMelodies and sound recordings) stored in the phone. The user can play, send and view information on the sounds. Ring signals (MIDI, eMelody, iMelody, vMel) can be downloaded via WAP or exchanged via SMS (iMelodies) and MMS (MIDI, iMelodies). Sound recordings can be exchanged via MMS. The maximum number of sounds is limited only by the amount of free memory.

Please also see information about the MIDI format under “Speakerphone” on page 7.

Camera application

The camera application supports a number of Sony Ericsson cameras. The user can browse, view, send and store pictures in the phone. It is also possible to set different picture sizes.

Themes

With themes, the user can change the appearance of the display, for example, the text, the background colours and the background picture. The phone comes with a number of pre-defined themes. It is possible to download and exchange additional themes. The maximum number of themes is limited only by the amount of free memory.

Technologies in detail

Multimedia in the T290i/T290c

The T290i/T290c is a multimedia phone. The colour display together with the audio functionality gives the user several multimedia possibilities. For example, sounds can be recorded and stored. By using themes, it is easy to change the appearance of the display. Pictures, audio, animations and themes can be transmitted via MMS.

Graphics

Graphics (tables, charts, diagrams and layouts) have a major impact on the way we work. The T290i/T290c supports JPG (max 640x480), GIF (max 160x120), WBMP (max 320x320) and animated GIFs.

You can set a picture to appear as the background when you are in standby mode.

Audio

The user of the T290i/T290c can use the mobile phone as a sound recorder. With the sound recorder function, it is easy to make a voice recording, for example a personal rendition of “Happy Birthday”. The audio function in the T290i/T290c also allows downloading of sounds and melodies.

Pictures

With a digital camera attached to your T290i/T290c, you can take, view and store pictures. It is also possible to download colour pictures to your T290i/T290c. The pictures are stored in the picture browser in the phone. From here, the user can select view, thumbnail or full view, as well as keep track of the number and size of the pictures stored in the phone.

The pictures stored in your T290i/T290c can be used for creating your own digital postcards. This is easily done by adding text to the pictures and sending them via MMS.

Themes

With themes, the user can change the appearance of the display, for example the text, the background colours and the background picture. The phone comes with a number of pre-defined themes, and it is possible to download additional themes. The maximum number of themes is limited only by the amount of memory.

Image formats

For information on Image formats and downloading of images, see “Image format technical data” on page 61 and “Images – downloading to phone” on page 62.

MMS (Multimedia Messaging Service)

One of the key features in the T290i/T290c is the Multimedia Messaging Service (MMS). MMS is expected to become the preferred messaging method of mobile terminal users, since there are virtually no limits to the content of an MMS transmission. An MMS message from the T290i/T290c can contain text, graphics, animations, images, audio clips and ring melodies. For more detailed information, see “Multimedia Messaging Service” on page 51. For third-party developers’ information, please visit www.Ericsson.com/mobility-world/ and look for the MMS Developers’ guidelines.

Defined and specified by 3GPP as a standard for third generation implementation, 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 forty percent.

Using the Wireless Application Protocol (WAP) as bearer technology and powered by the high-speed transmission technologies such as GPRS, Multimedia Messaging allows users to send and receive messages that look like PowerPoint-style presentations. The messages may include any combination of text, graphics, photographic images, speech and music clips. MMS eventually 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.

Figure 2. An MMS message can contain images, music, audio and graphics.

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 limited only by the memory. 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. And whether the messages are full or only notifications is insignificant.
An MMS message can contain one or more of the following:

Text

As with SMS and EMS, an MMS message can consist of normal text. The length of the text is unlimited, and it is possible to format the text. 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 in the future, video sequences.

Templates

The T290i/T290c 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 (iMelody, MIDI and AMR) messages. Not only can users share a favorite song or ring signal with a friend, they can also use the mobile phone to record sound and send it along with a message. Because sound includes speech as well as music, this extra dimension of an MMS message makes for enhanced immediacy of expression and communication. Rather than sending a downloaded birthday jingle in EMS, for example, a user can send a clip of his or her own personal rendition of "Happy Birthday".

The T290i/T290c will contain several polyphonic ring signals. Users can share ring signals, and download them from the Web.

Pictures and themes

By using a snap-on camera accessory, users can take a snapshot 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-sending market. Themes (downloaded or pre-defined) can be exchanged via MMS.

SMIL presentations

SMIL stands for Synchronized Multimedia Integration Language and is pronounced “smile”. SMIL in the T290i/T290c allows the user to create and transmit PowerPoint-style presentations on the mobile device. SMIL is an advanced XML-based protocol, and Sony Ericsson MMS supports a subset of this protocol. Using a simple media editor, users can incorporate audio and animated GIFs along with still images, animations and text to assemble full multimedia presentations.

The idea of SMIL is to allow the user to customize the page timing in PowerPoint-style 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 in the display

PIM communication with MMS

With MMS in the T290i/T290c, it is easy to send and receive business cards and events.

Business card (vCard)

With MMS in the T290i/T290c, the user can send his/her business card.

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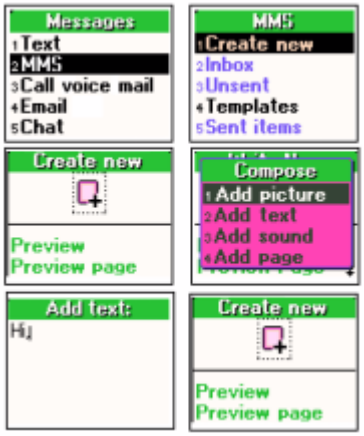

Figure 3. Example of the creation of an MMS message.

Benefits

Essentially enabling the mobile terminal to serve as image processor and conveyor, Multimedia Messaging accommodates the exchange of important visual information as readily as it facilitates fun. Business and leisure usage of MMS will be dynamically merged, resulting in enhanced personal efficiency for users and increased network activity for operators. In short, MMS affords total usage for total communication

Because MMS uses WAP as its bearer technology and is being standardized by 3GPP, it has wide industry support and offers full interoperability, which is a major benefit to service providers and end users. Ease-of-use resulting from both the gradual steps of the messaging evolution and the continuity of user experience gained from interoperability is assured.

The MMS server, through which MMS messages are sent, supports flexible addressing (to both normal phone numbers (MSISDN) and email accounts), which makes the user interface more friendly and allows greater control for operators. The MMS server, moreover, is responsible for the instant delivery of MMS.

MMS technical features

The MMS standard, just like 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. Unlike SMS, the MMS standard uses WAP as its bearer protocol. MMS will take advantage of the high speed data transport technologies such as GPRS and support a variety of image, video and audio formats to facilitate a complete communication experience.

Architecture

The MMS Center (MMS-C) is comprised of the MMS Server, the MMS Proxy-Relay and the MMS Store. The MMS Center 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-email, and supporting flexible addressing. The center's MMS Proxy-Relay interacts with the application being run on the MMS-enabled terminal to provide various messaging services. WAP is used as 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.

Figure 4. 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, e.g. 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.

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.

EMS (Enhanced Messaging Service)

Enhanced Messaging Service (EMS) adds new powerful functionality to the well-known SMS standard. With it, mobile phone users can add life to SMS text messaging in the form of pictures, animations, sound and formatted text. This gives the users new ways to express feelings, moods and personality in SMS messages. In addition to messaging, users will enjoy downloading, collecting, swapping, and editing pictures, ring signals, and other melodies.

EMS uses existing SMS infrastructure and industry standards, keeping investments to a minimum for operators. EMS provides a familiar user interface and compatibility with existing phones and other manufacturers.

EMS – more than just words

Sounds and melodies

EMS gives the user the ability to send and receive sounds. These can be pre-defined sounds or melodies (ring signals in the phone), downloaded from the Internet, received in SMS messages or composed by the user on the phone keypad or a PC. Note that MIDI ring signals cannot be exchanged via EMS.

Several sounds and melodies can be inserted in one message, and they can be combined with pictures.

Pictures, animations and formatted text

Phones supporting EMS include a set of pre-defined pictures for inserting in SMS messages. New pictures and animations are downloaded from the Internet or received in SMS messages. Several pictures can be inserted in one message, and they can be combined with sounds and melodies. The users can format text in messages with different styles and sizes.

Concatenated messages

A part of the EMS standard is the support for concatenated messages, which means that the phone is able to automatically combine several messages both when creating and receiving EMS. This is useful to be able to build, and display, messages with rich content, since the amount of information in each SMS is limited by the SMS standards.

New possibilities with messaging

The EMS standard is now a part of the SMS standard and supported by the major network operators and mobile phone manufacturers. This universal approach enables a fast penetration and development of new services and applications within messaging.

Creativity explosion

Users will be inspired to create and swap their own melodies and pictures. But more importantly, professional content creators and providers are already preparing to offer imaginative and creative contents for use with EMS. Based on subscriptions, fees or ads, network operators will be able to provide wide ranges of ring signals, operator logos and corporate icons, as well as personal and mood-related pictures and melodies. Movie, music and game companies can promote new products and events with designer melodies, animations and pictures.

Huge business potential

Network operators can now enhance their services and attract more customers by offering pictures, animations, ring signals and melodies for download at their portals. Operators can charge more per EMS message since it contains more data. Thereby EMS adds more value to the operators and to the end users.

Increase SMS revenue

EMS uses the same basic network support as ordinary SMS, and with the same familiar user interface. From an operator's point of view, SMS is low tech because minimal investment is needed to provide an effective SMS service to subscribers and little maintenance is required. EMS will create additional revenue for service providers and network operators by increasing SMS traffic.

Compatible with SMS standards

Users will find EMS as easy to use as SMS. Over 15 billion SMS messages, are sent every month worldwide. Roughly 80% of this traffic is user-to-user, i.e. mobile phone users sending short messages to each other using the keypad of the phone to enter text. The remaining 20% is shared by downloads and notifications of different kinds.

The Enhanced Messaging Service (EMS) was first submitted to the standards committees by Ericsson. Ericsson presented the outline structure of EMS to the relevant ETSI/ 3GPP committees. The major mobile phone manufacturers and most operators are actively contributing to the 3GPP standards. Hence the EMS standards have evolved and are now stable and complete as part of the 3rd Generation Partnership Project (3GPP) technical specification.

An EMS message can be sent to a mobile phone that does not support EMS, or only supports part of EMS. All the EMS elements i.e. text formatting, pictures, animations and sounds are located in the message header. The EMS contents will be ignored by a receiving phone that does not support the standard. Only the text message will be displayed to the receiver. This is true consumer-friendly standardization. EMS is compatible to SMS across most of the range of mobile phones from the oldest to the newest.

Some companies in the mobile phone industry have developed their own messaging technologies, which only work with their own phone models. Network operators are in favor of EMS because it is universal – many of the major mobile phone manufacturers are constructively improving and developing the EMS standards even further for implementation in their products.

Examples of EMS contents and applications

A wide range of contents, applications and services may be developed. Below is a list of examples and areas where messaging can be enhanced with EMS.

User-to-user message

Messages usually originating from the keypad of a mobile phone can include pictures, melodies, and formatted text with EMS.

Voice and email notifications

Notifying mobile phone users that they have new voice or fax mail messages waiting - including icons or melodies with EMS.

Notification

The user typically receives a short message notifying them that they have a new message in their messaging box, with icons or formatted text further enhancing the message.

Internet email alerts

An Internet email alert is provided in the form of a short message that typically details the sender of the email, the subject field, and the first few words of the email message. In this case, formatted text is excellent to identify message elements.

Ring signals

Downloading ring signals from the Internet.

News & commercials

Examples include: Illustrated world news, sports scores and news headlines, finance and stock market news with diagrams and tickers, commercial product promotions, weather reports with maps, tunes from TV commercials as ring signals.

Info & entertainment

Examples include: Ring signals, e-greetings, football team logo, joke-of-the-day illustrated by pictures or sound, horoscopes, movie related animation or theme song, TV show promotions, music artist promotions, lottery results, food and drink pictures and recipes, mood-related pictures.

Corporate

Examples include: Flight schedules, preinstalled corporate logos, map snippets and travel info, company branded icons and ring signals, corporate email notifications, affinity programs where companies notify customers of product updates etc., banks notifying customers about new services and interest rates, call centers providing answers to questions about a product, vehicle positioning combining EMS with Global Positioning System (GPS) position information, job dispatch with delivery addresses for sales or courier package delivery, using EMS in a retail environment for credit card authorization, remote monitoring of machines for service and maintenance purposes.

Using Web, WAP and SMS for download

Already today services exist on the Internet where users can create melodies, view icons, pictures, and subscribe to entertainment and informations services. These may develop further in the future to support Internet access by a PC connected to a mobile phone using WAP, or even an SMS request interface.

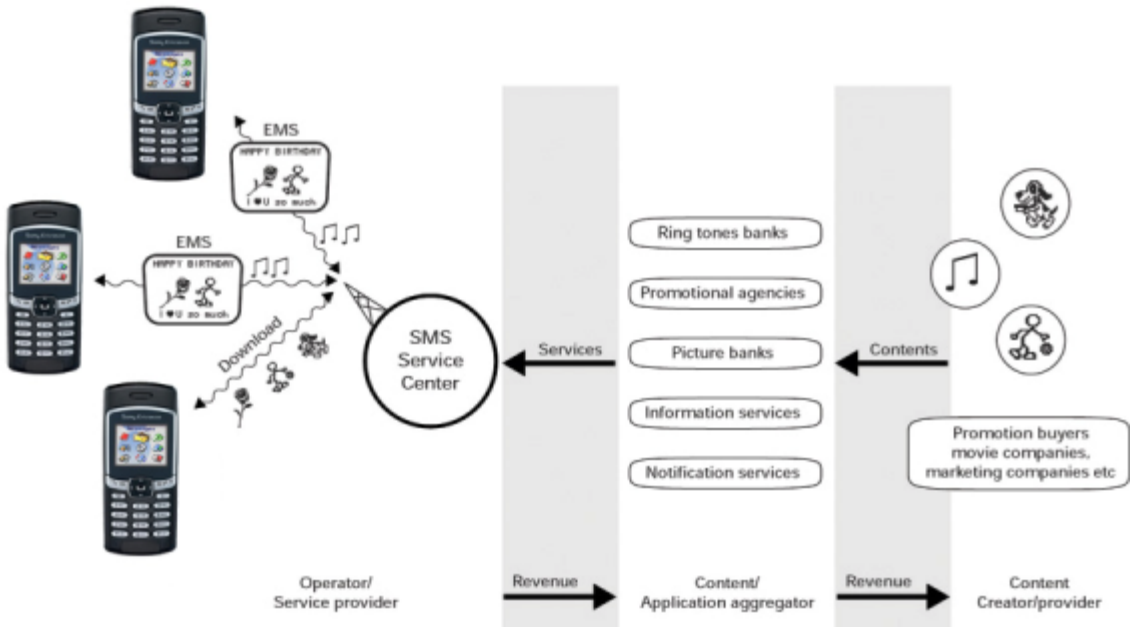

Figure 5. The possibilities of using EMS

The diagram shows the possibilities for using Enhanced Messaging Service:

- When the Operator/Service provider enables EMS in the network, users will enjoy adding life to messages with sounds, melodies, pictures and formatted text.
- New ranges of Content/Application aggregators on the operator network or the Internet can provide EMS contents and services to the users over SMS.
- Content Creators/providers can see a new demand for creative contents. Also, promotional activities from movie companies, record labels etc can provide ring signals, movie snapshots, etc.

The added value in SMS messaging will create new revenue which can be shared between the network operators, the application aggregators, and the content providers.

WAP services

The T290i/T290c supports WAP 1.2.1 browser and protocol stack, as well as WAP 2.0 browser (WML 1.3). WAP 2.0 optimizes usage of higher bandwidths and packet-based connections of wireless networks.

The typical WAP client is a small, portable device connected to a wireless network. This includes mobile phones, pagers, smart phones, PDAs and other small devices. Of course, compared to desktop and laptop computers, these devices are limited by user interface, low memory and low computing power.

The WAP browser in the T290i/T290c is compliant with WAP 2.0 and WAP 1.2.1. It includes WTLS class 3 as well as mechanisms for digital signatures. The T290i/T290c supports WML, XHTML, and iHTML. The WAP browser in the T290i/T290c is also designed to access information such as timetables, share prices, exchange rates, Internet banking and other interactive services. For more details, see “WAP browser technical data” on page 54.

Using WAP in the T290i/T290c

The built-in WAP browser in the T290i/T290c gives the user portable, fast and secure access to a wide variety of services, including personalized services, with new opportunities for business, individuals and service providers:

Push services

Businesses and service providers can “push” content or service indications to work groups and/or customers. Examples of pushed content would be mail alerts, messaging, news, stock quotes, contacts, meeting requests, etc.

Support of XHTML

The WAP browser supports the markup languages of WAP 2.0 – XHTML Mobile Profile 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, checkboxes, radio buttons, text areas, headings, horizontal rules and lists.

Support for cookies

This version of WAP has support for cookies (client based), an application used by Web sites to store site-specific information in the browser between visits to the site. Cookies give the site owner a possibility to see when a person has visited their site. They also save the user from having to enter the same information (e.g. the password or user ID) more than once. Cookies are often used by e-commerce sites (shopping carts and wish lists).

Sending bookmarks

WAP 2.0 enables the sending of bookmarks via SMS.

Cascading Style Sheets (CSS)

WAP 2.0 enables CSS. CSS allows developers to specify the style of WAP page content such as font, spacing, etc. The T290i/T290c supports CSS, and with its colour display, user presentation is further enhanced.

Provide settings

Using SMS messages, configuration settings can be sent over the air, OTA, so that the user does not need to configure the WAP access settings manually. WAP settings may also be customized by the operator. For more information, see “WAP operator technical data” on page 55.

Adapt to phone type

The User Agent Profile function allows WAP content to be automatically optimized for the T290i/T290c capabilities, ensuring the intended user experience.

Several bearer types

The T290i/T290c accesses WAP over a standard GSM Data connection as well as over a GPRS connection (network-dependent services.)

Bandwidth efficiency

Unlike traditional Internet services, WAP services are relayed to wireless devices as binary encoded data, maximizing bandwidth efficiency. A GPRS connection further increases efficiency.

Easy to create WAP pages

Creating a WAP service is no harder than creating an Internet/intranet service, since the markup languages (WML, WMLScript, XHTML Mobile Profile, and XHTML Basic) are based on well-known Internet languages such as HTML, XHTML, and JavaScript.

Using standard tools

Service creators can use standard tools such as ASP (Active Server Page) or CGI (Common Gateway Interface) to generate content dynamically. Services can be created once and then made accessible on a broad range of wireless networks.

Existing services can be adapted to WAP. The necessary binary encoding is handled by a WAP Gateway, allowing HTML-based services to be viewed on the WAP browser of the T290i/T290c. An XHTML page can be viewed in both the WAP browser and in any standard Web browser.

Improve productivity

A business can use a WAP gateway to provide a secure connection to its corporate network, improving internal communication flow by making information available to mobile as well as office users.

The WAP profiles

A WAP profile holds network settings and user identification, allowing the user to switch easily between corporate services and WAP services on the Internet, simply by switching WAP profile.

The T290i/T290c has dynamic WAP profile handling, which means that the user can add, edit and delete WAP profiles. The T290i/T290c has a maximum of 5 WAP profiles.

During WAP browsing, the options button on the T290i/T290c gives the user immediate access to a dynamic option menu for WAP services, similar to a right mouse click in PC programs.

Bearer type characteristics

The T290i/T290c accesses WAP services over IP. IP can be provided either over GSM Data or GPRS, depending on network services.

Typical differences which distinguish the bearer types are listed below.

GPRS access

- The connection is maintained “constantly”, with data transmitted in packets, and transmission capacity being used by the application in use on an as-needed basis.
- Higher transmission speed than with GSM Data or SMS access.
- Pricing of GPRS can be dependent on the actual use of bandwidth, which means the user is charged for the volume of data transmitted, rather than the duration of the connection.
- When transmitting large amounts of data, bandwidth can be increased automatically to allow faster transmission speed.
- Ideal for complex pull services, browsing, data transfer, provisioning, pager services, messaging services, info services, push initiations.

GSM data access

- Circuit connection of data calls, which means that the phone is connected during the entire WAP session.
- Pricing is comparable to that of data calls in the network.

Gateway characteristics

A WAP Gateway provides Internet/intranet as well as WAP services to the mobile browser. A Gateway is identified by an IP number, depending on access type.

End-to-end gateway navigation

The WAP 2.0 supports E2E (End-to-End) Gateway navigation, making it possible for example for a bank to redirect its clients from the Internet gateway to its own gateway.

Security using WAP

For certain WAP services, such as banking services, a secure connection between the phone and WAP gateway is necessary. An icon in the display of the T290i/T290c indicates when a secure connection is in use.

The T290i/T290c is based on the WAP 1.2.1 specification suite, in which security functionality is specified by a technology called Wireless Transport Layer Security (WTLS). The WAP protocols for handling connection, transport and security are structured in layers, with security handled by the WTLS layer, operating above the transport protocol layer. WTLS classes define the levels of security for a WTLS connection:

- WTLS class 1 – encryption with no authentication.
- WTLS class 2 – encryption with server authentication.
- WTLS class 3 – encryption with both server and client authentication.

Server authentication requires a server certificate stored at the server side and a trusted certificate stored at the client side.

Client authentication requires a client certificate stored at the client side and a trusted certificate stored at the server side.

A Wireless Identity Module (WIM) can contain both trusted and client certificates, private keys and algorithms needed for WTLS handshaking, encryption/decryption and signature generation. The WIM module can be placed on a SIM card which is then referred to as a SWIM card.

Certificates

To use secure connections, the user needs to have certificates stored in the phone. There are two types of certificates:

- Trusted certificate
  A certificate that guarantees that a WAP site is genuine. If the phone has a stored certificate of a certain type, it means that the user can trust all WAP gateways that use the certificate. Trusted certificates can be pre-installed in the phone, in the SWIM or they can be downloaded from the trusted supplier's WAP page.
- Client certificate
  A personal certificate that verifies the user's identity. A bank that the user has a contract with may issue this kind of certificate. Client certificates can be pre-installed in the SWIM card.

WIM locks (PIN codes)

There are two types of WAP security locks (PIN codes) for a SWIM, which protect the subscription from unauthorised use. The PIN codes should typically be provided by the supplier of the SWIM.

- Access lock
  An access lock protects the data in the WIM. The user is asked to enter the PIN code the first time the SWIM card is accessed when establishing a connection.
- Signature lock
  A signature lock is used for confirming transactions, much like a digital signature.

In the T290i/T290c, the user can check which transactions have been made with the phone when browsing. Each time the user confirms a transaction with a signature lock code, a contract is stored in the phone. The contract contains details about the transaction.

Configuration of WAP settings

An easy way to perform WAP configuration in the T290i/T290c is to use the step-by-step WAP configurator available on http://www.SonyEricsson.com. The configurator utilizes OTA provisioning.

Manual configuration is done using the menu system in the phone. This is described in the User's Guide.

WAP settings can also be customized in the mobile phone based on the operator's preferences.

Over-the-air provisioning of WAP settings

To simplify the configuration of WAP settings in the T290i/T290c, all settings can be sent to the phone as an SMS message. This makes it easy for an operator, a service provider or a company to distribute settings for Internet/intranet, and WAP, without the user having to configure the phone manually. This also makes it easy to upgrade services, as no manual configuration is required.

- The OTA configuration message is distributed via SMS point-to-point.
- The setup information is a binary encoded XML message (WBXML). To receive information about OTA specifications, please contact your local Sony Ericsson representative for consumer products. A configurator that utilizes OTA provisioning can be tested on www.SonyEricsson.com.
- The user is alerted about new settings when the ongoing browsing session ends. Settings are not changed during an ongoing browsing session.
- User interaction is limited to receiving and accepting/rejecting the configuration message, and selecting which WAP profile to allocate the settings to.
- Security can be handled using a keyword identifier displayed on the screen as a shared secret between the SMS sender and recipient. It is important that the user can verify that the configuration message is authentic.

Push services

Examples of WAP services that can be pushed include:

- Notification of new email, voice mail, etc.
- News, sports results, weather forecasts, financial information (stock quotes etc.).
- Personal Information Manager (PIM) - delivery of contacts, meeting requests etc.
- Smart card e-cash.
- Interactive games.

In the T290i/T290c, the user selects whether to allow push messages or not. There are two different forms of Push services:

Service Indication (SI)

An SI service sends to the browser a text message with a URL of a WAP page. If the user decides to load the URL, normal WAP browsing commences.

When an SI is received by the T290i/T290c, the user can load it immediately, postpone it or delete it. Received SIs are stored in the Push Inbox and can be viewed and loaded at a later time. The Push Inbox displays a list containing the first part of each received message. The list is sorted by action attribute (high/medium/low) or reception time of the message.

Service Loading (SL)

An SL service sends and displays a WAP page if accepted by the user. If the SL is not accepted, it is loaded and stored in the cache for later use. The user can start the browser and load the page from the cache manually.

Mobile Internet

The mobile Internet offers much more than mobile access to the Internet. It opens up a whole new range of situation-based services that give the user access to personalized communications, information and entertainment, anytime, anywhere.

Data connections

In order to browse via WAP or use an Internet connection, the user must have a data communication connection configured in the phone. This connection contains specific settings and parametres to connect to an appropriate server. Several data connections can be saved in the T290i/T290c. To make it easier for the user, data connections can be provided by the operator via customization or OTA provisioning.

Advantages of data connections include:

- Once the data connections are defined and named, the user does not have to enter the settings for the connection again.
- Data connections can be re-used at any time.
- Individual data settings for working with WAP, email or the Internet can be stored and activated as needed.
- Data connections can be used for both GSM Data and GPRS connection settings.
- Bearer type for WAP and corresponding bearer-specific parametres may be selected.
- Data connections contain all the necessary settings for the Internet access point, including modem pool phone number or IP address, user ID and password.

General Packet Radio Services

The introduction of GPRS (General Packet Radio Services) is one of the key steps in the evolution of today's GSM networks for enhancing the capabilities of data communication. Data traffic is increasing enormously (over both wired and wireless networks), with the growth in demand for Internet access and services paralleling that for mobile communications. Users want access to the Internet while they are away from their offices and homes, and surveys have found that the vast majority of business professionals want the ability to send and receive email, browse the Web and transmit text and graphics on a portable device. That is why the main applications driving Mobile Internet development are email clients and Web browsers.

The demand for high-speed Internet access will be the key driver for coming generations of wireless services, and GPRS can deliver the necessary speed. GPRS allows innovative services to be created, enabling new and previously inaccessible market segments to be addressed and increasing customer loyalty.

GPRS applications can be developed as both horizontal and vertical applications. Vertical applications are specific, including those for operations such as reaching police and emergency, taxi, delivery or automated services (vending machines, supervision, vehicle tracking). Horizontal applications are more generic and include those for Internet access, email, messaging, e-commerce and entertainment.

GPRS is able to take advantage of the global coverage of existing GSM networks. Applications developed for GPRS can be deployed on a large scale and can reap the associated benefits. GPRS also provides a secure medium for connections to private networks, banking and financial services.

With GPRS, the T290i/T290c sends data in "packets" at a very high speed. The T290i/T290c remains connected to the network at all times, using transmission capacity only when data are sent or received. For details, see "GPRS technical data" on page 59.

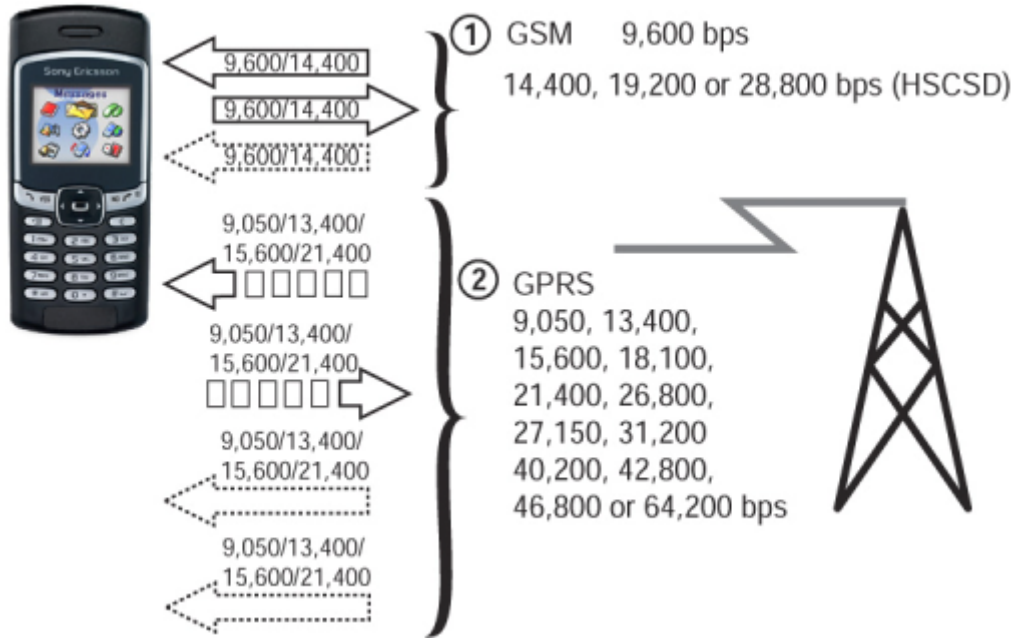

Figure 6. A comparison between GSM and GPRS.

1. A normal GSM call uses only one of eight repeating time slots in the GSM channel, giving a data speed of 9,600 bps. The T290i/T290c supports a more efficient coding scheme, giving data speeds of up to 14,400 bps (with necessary network support). Furthermore, High Speed Circuit Switched Data (HSCSD) adds the possibility of using two time slots for receiving data, increasing the data speed to as much as 28,800 bps (network dependent).

2. In GPRS, data is sent in packets, with up to three time slots being combined to provide the necessary bandwidth. The T290i/T290c is prepared to support 3+1 time slots (three slots for receiving data and one slot for transmitting data), giving speeds of up to 64,200 bps for receiving data, depending on coding scheme.

Using GPRS in the T290i/T290c

Instead of occupying an entire voice channel for the duration of a data session, the T290i/T290c sends/receives data in small packets, as needed, much like IP on the Internet. Because of this, the T290i/T290c maintains a constant online connection. Its data transmission abilities are summoned by the application in use on an as-needed basis.

The GPRS specification includes four coding schemes – CS1, CS2, CS3 and CS4 – that allow data speeds of 9,050 bps, 13,400 bps, 15,600 bps and 21,400 bps respectively using one time slot. The T290i/T290c works with all four coding schemes, but data speed will naturally vary according to network configuration. At the moment, CS3 and CS4 are not supported in any live network, i.e., present speed is limited to 40,200 bps using three time slots.

The GSM system limits the ability to use all eight time slots, so the T290i/T290c uses up to three time slots for receiving data, and one slot for transmitting (3+1). This means that for CS4, the speed for receiving data is up to 64,200 bps and up to 21,400 bps for sending data.

Information about the identity of the phone and the 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 with the T290i/T290c has several advantages, for example:

- All connection settings can be managed by using the data connections feature.
- High speed
  Gain access automatically to increased bandwidth when downloading images, etc.
- Cost efficient
  Use transmission capacity only when needed, thus reducing costs.
- WAP over GPRS
  Access the Internet via WAP at high speed and with a constant connection.
- Email over GPRS
- Data and voice
- Provide settings
  Receive GPRS configuration settings from the provider over the air, OTA, 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.

In-phone functions and features

**Subscription and/or network-dependent*

A	AMR	Yes (AHS and AFS)
	Antenna connector, external for HF kits	No
	Automatic Bearer Selection	Yes
B	Background light	Yes
	Background pictures, pre-defined	Yes
	Background pictures, downloadable	Yes, only limited by memory
	Bluetooth wireless technology support	No
	Bookmarks (URL memory)	Yes, 25
	Built-in antenna	Yes
	Business card exchange	Yes
C	Calendar	No
	Caller Name Presentation (CNAP)	Yes
	Call functions	
	Call counter	Yes, outgoing and total (not incoming)
	Call barring*	Yes
	Call forward*	Yes

	Call hold*	Yes
	Call list (last dialled, answered and missed calls)	Yes, 30 entries
	Call screening*	Yes
	Call time/call cost (a.k.a Advice of Charge, Information/Charging)*	Yes
	Call timer (Total) is non-resettable for warranty program	Yes
	Call transfer*	Yes
	Calling card service	No
	Calling Line Identification (CLI)	Yes. Either as the number of the caller, or as a picture, icon or personal ring signal assigned to the number of the caller.
	Conference calls*	Yes
	Camera application	Yes. The application supports the Communicam MCA-25 and other cameras. The user can browse, view, send and store pictures. It is also possible to set different picture sizes.
	Chat application	Yes, SMS as radio bearer, developed in-house.
	Chinese phonebook sorting	Yes
	Clock	Yes, with Automatic Time Zone*
	Closed User Groups (CUG)*	Yes
	Code Memo	No
	Colour display	Yes, 4K colour
	Connected Line Identity Presentation (COLP)	Yes
	Contacts	Yes
	Copyright protection	Yes, possible with copyright protection via EMS and MMS.
	CSD, Circuit Switched Data*	Yes
	CSS	Yes
D	Date	Yes
	Display light	Yes
	DRM	Yes, OMA Level 1
E	EDGE (Enhanced Data rates for Global Evolution)*	No

	Email address storage	Yes
	Email client	Yes, supporting IMAP4, POP3, SMTP.
	EMS (Enhanced Messaging Service)*	Yes, with 30 pre-defined pictures, 15 pre-defined animations and 4 melodies.
	EONS	Yes
	EOTD	Yes, is supported but may not be enabled
	Events	Yes
	External antenna connector	No
F	File system	Yes. At the purchase of the T290i/T290c phone, there is approximately 400 KB of memory space available to the user in the file system for objects such as pictures, games, sounds, and themes. In addition to the user space, the file system contains preloaded pictures, games, sounds, MMS messages, message templates, themes, and WAP security information. Details depend on market and customer requirements.
	Fixed Dialling Numbers (FDN)*	Yes
G	Games	Yes. Others can be downloaded. Number only limited by available memory.
	GPRS (General Packet Radio Services)*	Yes, up to 40.2 kbps with multislot class 4 using 3+1 timeslots in CS-2. Up to 64.2 kbps with multislot class 4 using 3+1 timeslots in CS-4.
H	High Speed Data (HSCSD)*	Yes, up to 28.8 kbps with multislot class 2.
I	Image browser	Yes. Gives access to pictures stored in the phone.
	Infrared port	No
	Input methods	T9 Text Input and Multitap
K	Keypad lock	Yes
L	Languages	Languages for GSM 900/1800 markets
M	Melody composer	Yes
	Memory check	Yes, dynamic memory allocation: 400KB
	MMS (Multimedia Messaging Service)	Yes
	MMS pictures, pre-defined	Yes
	MMS templates, pre-defined	Yes

	Mobile chat	Yes
	Modem	No
N	Nokia Group Graphics	Yes, receiving
	Nokia Operator Logos	Yes, receiving
	Nokia Picture Messaging	Yes, sending/receiving
	Nokia Ring Tones	Yes, receiving
O	Option key	Yes, gives the most common options for the function currently in use. The option key also provides a help menu for certain functions.
P	Personal management	
	Calculator	Yes
	Events	Yes
	Calendar	No
	Alarm clock with snooze function	Yes
	Stopwatch	Yes
	Timer	Yes
	Code memo	No
	Phonebook	
	Capacity	250 numbers in phone + SIM
	Maximum number of ADN read from the SIM	255
	Maximum number of FDN read from the SIM	55
	Phonebook user groups	Yes, 10
	Phone lock	Yes
	Pictures	
	Total storage capacity	Limited by the memory
	Number of pre-existing pictures	TBD
	Possibility to download	Yes, storage capacity limited by memory
	Editor	No
	Picture messaging	Yes, sending/receiving
	Picture Phonebook	Yes
	Pictures, exchange	Yes, via EMS and MMS
	Polyphonic ring signals	Yes (up to 32 voices)
	Predictive text input	Yes

	Profiles	No
R	Re-dialling, automatic	Yes
	Ring signals	
	Total storage capacity	Limited by the memory
	Number of pre-existing ring signals	Varies according to operator
	Possibility to download	Yes, storage capacity only limited by the memory
	Possibility to compose	Yes, storage capacity only limited by the memory
	Ring signal exchange	Yes, via EMS and MMS.
S	Screen savers	No
	SIM relative features	
	SIM voltage	3V and 5V
	SDN support	Yes, 15. Located in Phonebook menu/ Special numbers/ Service numbers
	SIM Application Toolkit*	Yes
	SIM card copy	Yes
	SIM card lock	Yes (support of GID 1 and GID 2)
	Sleep mode	Yes
	SMS (Short Messaging Service)*	Yes
	SMS, long messages (also known as concatenated SMS)*	Yes, up to 10 messages of 160 characters each (or 70 Chinese characters).
	SMS Cell Broadcast*	Yes
	SMS counter	Yes
	SMS templates	Yes, up to 10 templates of 30 characters each
	Sound browser	Yes. Gives the user access to sounds stored in the phone.
	Sound handling	Yes (iMelody, MIDI, vMel, and AMR)
	Sound recorder	Yes, the total time is only limited by the memory. The sound recordings can be used as ring signals. Calls cannot be recorded.
	Speakerphone	Yes
	Speech coding	Enhanced Full Rate, Full Rate, Half Rate, and AMR
	Speed dialling	Yes

	Start-up/Shut-down show	Yes
	Status menu	Yes
	Swatch Internet Time	No
	Synchronization with PC	No
	SyncML	No
T	Themes, pre-defined	Yes
	Themes, downloadable	Yes, only limited only by memory
	Themes, exchange	Yes, via MMS
	TTY	No
	Two Line Service (a.k.a Alternate Line Service, ALS)	Yes
V	Vibrator	Yes
	Vibrator mode: vibrating only	Yes
	Vibrating mode: vibrating + ringing	Yes
	Voice coding	Yes, EFR, FR, HR, AMR (AFS and AHS)
	Voice command	No
	Voice recognition	No
W	WAP browser	Yes, WAP 1.2.1 and WAP 2.0 browser with support for XHTML Basic, XHTML Mobile Profile, WML, and iHTML.
	WTLS for added WAP security*	Yes, WTLS class 1/2/3 and SignText

Network-dependent features

SMS and EMS messaging

The T290i/T290c is capable of sending and receiving SMS and EMS messages, and linked messages.

- With the Short Messaging Service, a user can send text messages containing up to 160 characters to and from GSM mobile stations
- With the linked SMS, the user can link up to 10 SMS messages together to create a longer message (network-dependent service)

A Service Center (SC) acts as a a storage and forwarding center. SMS consists of two basic services:

- Mobile Originated SMS
- Mobile Terminated SMS

For Mobile Originated SMS, an SMS message is sent from a Mobile Station to the SMS-C where it is forwarded to its destination. This can be another Mobile Station, or a terminal in the fixed network.

A Mobile Terminated SMS is delivered when an SMS message is forwarded from the SMS-C to a Mobile Station. When the Mobile Station receives the message, it returns a delivery report saying the transfer was successful.

Fixed dialling and Restricted calls

For a company or an organization, it can be useful to restrict phone calls. Fixed dialling allows the user to preset a number of digits, for example area codes. This restricts the user to making calls only to numbers which use the preset digits as leading digits. Fixed dialling makes use of the PIN2, and requires fixed dial fields on the SIM card.

The Restrict calls service allows the user to block outgoing or incoming calls in certain situations, for example international calls.

EOTD

EOTD is part of the GSM R99 location services. The T290i/T290c supports EOTD to satisfy the FCC E911 positioning requirements. Although EOTD is supported, it may not be enabled.

EOTD determines position of the mobile phone by measuring the signal propagation delay between the phone and multiple base stations. The mobile phone knows which BTS's to measure against based on assistance data contained in the Measure Position Request received from the network. Some BTS's may even be below the reference sensitivity of the mobile phone (-110 dBm). Since neither the phone nor BTS has knowledge of absolute time, the mobile phone measures time delay by looking at the burst arrival time differences between each BTS and a reference BTS. This time difference is known as the observed time difference value (OTD). The BTS's are not synchronized in a typical network, and suffer from clock drift. A special device in the network, known as an LMU, is used to measure the Real Time Difference (RTD) between each BTS and the reference BTS. The network takes the OTD values from the mobile phone, interpolates the RTD from the LMU at the measurement time (the LMU typically only measures each BTS once per minute), and uses the known location and height of each BTS to calculate the phone position. Because the network calculates the position of the mobile phone, the term "MS-assisted" positioning is used.

The T290i/T290c supports Network Induced Location Request (NI-LR) which means that the T290i/T290c will calculate OTD values when it receives a Measure Position Request from the network during emergency calls.

AMR

The T290i/T290c supports the Adapative Multi-Rate (AMR) speech codec, which is a GSM speech service specified in Release 98/99. AMR is significantly different from the existing GSM speech codecs (FR, HR, and EFR) in that it offers multiple speech and channel codec rates rather than a fixed ratio. Both half and full rate channel types are defined for AMR. Eight codec rates are defined for the full rate channel and 6 for the half rate.

AMR offers capacity advantages over the standard GSM speech codecs in two ways. First, the half rate mode exhibits significantly improved quality as compared with the existing HR speech codec. Use of the AMR half rate mode would double the number of users that can use a given frequency and, correspondingly, increase the network capacity without the need for added infrastructure or bandwidth. A secondary benefit of the half rate mode is that the talk time of the mobile phone would be increased due to the reduced duty cycle of the transmissions.

Second, the rate adaptability indirectly offers a potential increased capacity with regards to the cell repeat pattern of the system. Poor channel quality could be made acceptable by changing the AMR rate to have more channel coding. As a result, lower C/I ratios can be tolerated in the system. By allowing for a lower C/I ratio, a tighter re-use pattern may be used which increases the system capacity.

SIM application toolkit

The SIM Application Toolkit (SIM AT) is a smart card-centric method of deploying programs that apply only to GSM and to SMS and USSD transports. Programs must be distributed on smart cards. WAP is an Internet-centric method of deploying programs that is independent of network technology. Programs and content are kept centrally on web servers and downloaded as required. While there is some overlap, WAP is a particularly good choice when deploying programs that also have an HTML version for desktop use. Work is currently under way on building interfaces between the two technologies.

For an operator, a company or service provider, SIM AT offers a powerful way to deploy programs and services to users, without the need for new or upgraded equipment. All necessary setup and programming is distributed to users over the air, directly to their phones. In the T290i/T290c, a separate menu is available for functions residing on the SIM card. These can include submenus for controlling functions, and also functions which allow the phone to initiate calls, send data, and display information to the user.

SIM AT services supported by the T290i/T290c

Service		Mode	Support in T290i/ T290c
CALL CONTROL			Yes
CELL BROADCAST DOWNLOAD			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 in T290i/ T290c
GET INKEY		General: The GET_INKEY requires that the user press Yes to confirm 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	20
	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
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 in T290i/ T290c
		'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

Service	Mode	Support in T290i/ T290c
	'02' = Call disconnected	Yes
	'03' = Location status	Yes
	'04' = User activity	No
	'05' = Idle screen available	Yes
	'06' = Card reader status	No
	'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 sup-ported
SET UP MENU		Yes
SMS PP DOWNLOAD		Yes

User interaction with SIM AT

DISPLAY TEXT

Text of up to 240 characters (80 UCS coded) is supported.

'Key' responses

- 'Long NO' – Proactive session terminated by user.
- 'NO' – Backward move in proactive session. Any other key clears display if the command is performed successfully.

GET INKEY

Prompt for a one-character input. Pressing 'YES' without entering a character gives warning message "Minimum 1 character".

'Key' responses

- 'C' clears current character.
- 'Long NO' terminates the proactive session.
- 'NO' – Backward move in proactive session.
- 'YES' – Command performed successfully.

GET INPUT

Prompt for character input. Pressing 'YES' without entering a character gives warning message "Minimum 'no.' characters". The phone will refuse to accept further input when maximum response length is exceeded.

MMI Maximum Response lengths

- Digits Only – 160 characters
- SMS default alphabet characters – 160 characters
- Hidden Characters (digits only) – 40 characters

‘Key’ responses‘

- ‘C’ clears current character/characters.
- ‘Long NO’ terminates the proactive session.
- ‘NO’ – Backward move in proactive session.
- ‘YES’ – Command performed successfully.

REFRESH

When a refresh command is executed by the phone, it displays the message “Please wait” and then restarts.

SELECT ITEM

Scroll to highlight item for selection. The maximum number of items supported by the phone within one Select Item command is 30.

‘Key’ responses

- Down arrow – Scroll down list.
- Up arrow – Scroll up list.
- Long ‘NO’ terminates proactive session.
- ‘NO’ – Backward move in proactive session.
- ‘YES’ – Command performed successfully.

SEND SHORT MESSAGE

Default message “Sending message, please wait” can be replaced by the Alpha Identifier text, or suppressed completely if a null text is provided. Responses are “MESSAGE FAILED” or “MESSAGE SENT”.

‘Key’ responses

- Long ‘NO’ or ‘NO’ terminates 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 'Current call will be held'. If the 'YES' key 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 ‘Current call will be disconnected’. If the ‘YES’ 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. From the standby display the right or left arrow buttons can be pressed to select the Menu Items. (Note: The SIM AT menu option is found in the ‘Connect’ menu.)

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 only one item provided, then this item is used as header. 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 using the ‘YES’ key all the items sent in the Set Up Menu command will be available for selection, in the same way as the Select Item command. A limit of 30 menu items has been set within this command.

‘Key’ responses

- Down arrow – Scroll down list.
- Up arrow – Scroll up list.
- Side key: Scrolls the menu.
- ‘YES’ – Envelope (Menu Selection).

Security and M-commerce technical data

Feature	Support in the T290i/T290c for m-commerce
Dual-slot	No
Associated with a STK card, allowing ISO B0' bank card payments	If separate card, no

Feature	Support in the T290i/T290c for m-commerce
Associated with a STK card, allowing EMV bank card payments	If separate card, no
Certified by the "GIE Carte Bancaire"	If separate card, no
WIM support	If separate card, no
Ability to use a WIM application embedded on a SIM/ USIM card	Yes
WIM application embedded on a SIM/USIM card the default WIM application	Yes
Number of smart card readers in the handset	1
Provisioning of the following STK commands: Perform Card APDU, Power Off Card, Power On Card, Get Reader Status	No
DRM solution	ODI for EMS, OMA forward lock for WAP and MMS.
Information to the user while in secured mode (WTLS)	Yes, via icon
Is an incoming class 2 SMS transferred to the SIM even when another application (a browser) is running?	Yes
Access to the WIM	WIM can only be accessed by native applications, e.g. the browser

Facts and figures

Terminology and abbreviations

3GPP
3rd Generation Partnership Project.

AMR
Adaptive Multi Rate. For speech sounds and speech coding.

API
Application Programming Interface.

ASP
Active Server Page. Server technology that generates web pages dynamically.

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

bFTP
binary File Transfer Protocol.

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.

C/I
Carrier to interference ratio of radio signal.

Calling Line Identification (CLI)
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.

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

CGI
Common Gateway Interface. Server technology that generates web pages dynamically.

CS
Circuit Switched.

CSD
Circuit Switched Data.

Deck
A collection of WML cards.

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.

EDGE
Enhanced Data rates for Global Evolution. EDGE uses a new modulation schema to enable data throughput speeds of up to 384kbit/s using existing GSM infrastructure.

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.

EOTD
Enhanced Observed Time Difference. Positioning solution currently used to satisfy FCC E911 mandate.

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 850, 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 850
In some documents, GSM 850 is called GSM 800. These names refer to the same GSM band.

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.

HDML
Handheld Device Markup Language.

HDTP
Handheld Device Transport Protocol.

HR
Half Rate, speech coding.

HSCSD
High Speed Circuit Switched Data.

HTML
HyperText Markup Language.

HTTP
HyperText Transfer Protocol.

Image
WBMP or GIF image contained in a Card.

ISP
Internet Service Provider.

ITTP
Intelligent Terminal Transfer Protocol.

LED
Light Emitting Diode.

LAN
Local Area Network.

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.

MMI
Man-Machine Interface.

MS
Mobile Station.

MT
Mobile Termination.

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.

SMS-C
Service Center (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 T290i/T290c 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 center to a mobile phone.

SS
Supplementary Services.

TCP/IP
Transmission Control Protocol/Internet Protocol.

TTY
Text Telephony

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.

USSD
Unstructured Supplementary Services Data.

VAS
Value Added Service.

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

WAE
Wireless Application Environment.

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.

WBMP
WAP Bitmap.

WBXML
Wireless Binary Extensible Markup Language.

WDP
Wireless Datagram Protocol.

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, JavaScript may be utilized in HTML. It makes it possible to add procedural logic and computational functions to WAP-based services.

WSP
Wireless Session Protocol.

WTLS
Wireless Transport Layer Security.

WWW
World Wide Web.

XML
Extensible Markup Language.

XHTML
Extensible HyperText Markup Language.

Related information

Documents

- The T290i/T290c User's guide
- WAP June 2000 (WAP 2.0) Specification

Links

- http://www.SonyEricsson.com/
- http://www.Ericsson.com/mobilityworld
- http://www.imc.org/
- http://www.3gpp.org/
- http://www.openmobilealliance.org/
- http://www.etsi.fr/
- http://www.wapforum.org
- http://www.imc.org/pdi/
- http://www.w3.org/TR/xhtml-basic/
- http://www.gsmworld.com/

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- T9 is a registered trademark of Tegic Communications.
- XHTML™ is a registered trademark of the W3C.

Technical specifications

The consumer pack includes

- Mobile Phone T290i/T290c
- Standard Battery (700mAh, Lithium Ion)
- Standard Charger
- User's guide, including battery information
- Inbox leaflet
- Service and Support leaflet
- SAR Leaflet

General technical data

Product name	T290i/T290c
System	T290i/T290c: dual band GSM 900/1800 GSM 900 (3GPP TS 51.010-1) GSM 1800 (3GPP TS 51.010-1)
Speech coding	AMR, HR, FR, EFR supported where available, for high speech quality
SIM card	Small plug-in card, 3V or 5V type
Type number	AAA-1001013-BV/AAA-1001013-CN

Exterior description

Dimensions	101 x 43.9 x 19 mm
Weight (including battery)	79.2 g
Graphic display	Full graphic LCD 101 x 80 pixels 4K colours, 34 x 28 mm (30.3 x 24 mm used)
Display	Type: graphical Resolution: 101 pixels wide, 80 pixels high Size, viewing: 34 x 28 millimetres, 101 x 80 pixels Size, used: 30.3 x 24 millimetres, 101 x 80 pixels Technology: CSTN LCD Colours displayed together: 4K colours Size (lines): up to 7 depending on font size (plus a header) Backlight colour: 1
Antenna	Built-in
Text size	A selection of text sizes
Text rows	Varies depending on text size used
Colours	Frosty white Misty black
Battery	Lithium Ion Battery (700 mAh)
Network LED	No
Keypad	 14 keys are painted silicon rubber 2 keys (yes and no) are metallic painted hard plastic on silicon mat 5-way navigation key side keys

Ambient temperatures

Operating	Max: +55°C, Min -10°C
Storage	Max: +70°C, Min -40°C
Charging	Max: +35°C, Min 0°C

Supported Man-Machine Interface (MMI) languages

Languages for GSM 900/1800 markets

Current consumption, talk and standby times

	Value in GSM 1800	**Value in GSM 900**
Transmission current	50.2 mA - 186.2 mA	52.9 mA - 230.8 mA
Standby current	2.2 mA - 4.1 mA	2.2 mA - 4.1 mA
Standard Battery (Lithium Ion) BST-30 (700 mAh)	Talk time up to 12 hours	Talk time up to 12 hours
	Standby time up to 300 hours	Standby time up to 300 hours
	Charging time	up to 4 hours

Embedded games

- All games will stop and be saved in the memory if interrupted by an incoming call. You can resume the games after the call.

Technical platform information	
AVR micro-controller	13 Mhz frequency
Video management memory	Yes, 8 Kb
API (Application Program Interface)	Yes

Downloadable games

Feature	Support in the T290i/T290c
Send/receive via TCP/IP link	Yes
Send/receive via SMS	Yes
Vibrator on/off	Yes
Backlight on/off	Yes
Full colour support	Yes
Certification control of games	Yes
True sandbox technology	Yes
True file support	Yes
Sprite detection collision	Yes
The maximum recommended size of downloadable games is 60kb, but this may vary.	

Speech coding

	Full rate (FR)	Enhanced full rate (EFR)
Type	RPE/LPC with LTP	ACELP
Bit rate	13.0 Kbp/s	12.2 Kbp/s
Frame duration	20 ms	20 ms
Block length	260 bits	244 bits
Class 1 bits	182 bits	
Class 2 bits	78 bits	

AMR	Full rate (AFS)	Half rate (AHS)
	12.2 kbps	7.95 kbps
	10.2 kbps	7.40 kbps
	7.95 kbps	6.70 kbps
	7.40 kbps	5.90 kbps
	6.70 kbps	5.15 kbps

AMR	Full rate (AFS)	Half rate (AHS)
	5.90 kbps	4.75 kbps
	5.15 kbps	
	4.75 kbps	

Cell broadcast service

Feature	Support in the T290i/T290c
User notification of the reception of a CB message	Message displayed on screen
Handling of reception of several unread messages	The last message overwrites the previous one
Support of all CMBI from 0 to 65535	Yes
File support	CBMI and CBMID
Support CB SIM data download	Yes
Support of all applicable Data Coding Scheme values as defined in 3G TS 23.038 V3.3.0	Yes
Ability to display in a understandable way a message with a DCS “language unspecified” whatever language is set in the SIM card	Yes
Ability to extract a phone number or short number of a CB message to re-use it (to send an SMS or call the sender)	Yes
Support of multi-page CB-messages	Yes

Short Messaging Service

Feature	Support in the T290i/T290c
SMS Center Number	It is possible to store the SMS Center Number.
Pictures	It is possible to insert a picture/an icon into the text message. EMS compliant mobile handsets will be able to see the picture correctly.
Input methods	Predictive text input or Multitap
Reply to messages	Yes
Enhanced predictive writing method by:	

Feature	Support in the T290i/T290c
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 predefined 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 in the inbox	Yes
get delivery time and date	Yes
call	Yes
chat	Yes
Save on SIM	Yes
Possibilities of the previously sent message:	
delivery report of the message	Yes
forward the message	Yes
save the message in the Inbox	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

Feature	Support in the T290i/T290c
via phone call (set up a call to the number contained in the message body)	Yes
via WAP call (go to the WAP address contained in the message body)	Yes
via USSD session	No
Possibility to offer the user the ability of sending an SMS to a list of recipients	Yes, using Phonebook groups
Possibility to write an email address as a recipient address	Yes, if SMS type=email
SMS storage	In the SIM and in the handset.

Enhanced Messaging Service

Feature	Support in the T290i/T290c
Level of compliance supported by the handset regarding the specifications described in release 4.	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	10
Outgoing messages	It is possible to... • see how many short messages an EMS message consists of before sending it. • choose whether to send the message or not after writing it.
Incoming messages	• A pre-defined signal is heard once all parts of the message have been received or when a timeout occurs. • It is possible to re-use the content of an EMS message. Sounds, pictures, animations, text formatting, can be inserted in a new message, if the object is not protected using ODI.
Concatenated messages	A receipt is received in the handset when all parts of a concatenated message have been delivered.
Attachments	It is possible to attach pictures, animations and sounds to an EMS message.
Text formatting	• Centered, left and right aligned text. • Small, normal and large font size. • Bold, italic, underlined and strikethrough style.
Sounds	Yes

Feature	Support in the T290i/T290c
I-melody	Yes, version 1.2.
Melodies	It is possible to... • edit and create melodies by using the phone key-pad. • send and receive melodies via EMS. • download melodies and commercial tunes from Web/WAP portals. • create melodies on Web/WAP portals.
WBMP	Yes
Picture sizes	16 x 16 pixels, 32 x 32 pixels, variable size receipts in black and white.
Pictures	It is possible to... • send and receive pictures via EMS. • create pictures on Web/WAP portals. • download pictures from Web/WAP portals. • receive pictures in enhanced messages originated by service providers.
Animations	The handset supports the following animations: I am angry, I am glad, I am skeptical, I am sad, WOW!, I am crying. Plus the other 9 defined in 23.040 v4.3.0. It is possible to... • send and receive animations. • download animations from Web/WAP portals.
TP-PID field value given by the handset before sending an EMS message	0x32

Multimedia Messaging Service

Feature	Support in the T290i/T290c
MMS/CSD parametres and MMS/GPRS parametres placement	MMS is bound to a WAP profile. A WAP profile is bound to a Data Account. A Data Account contains either CSD parametres or GPRS parametres.
Possibility to pre-configure the MMS parametres in factory	• MMS/CSD: Yes • MMS/GPRS: Yes
Possibility to configure the MMS parametres by OTA provisioning	• MMS/CSD: Yes • MMS/GPRS: Yes

Feature	Support in the T290i/T290c
Possibility for all the parametres from the parametres set to be OTA provisioned at the same time	• MMS/CSD: Yes • MMS/GPRS: Yes
Possibility for only one parametre from the parametres set to be OTA provisioned	• MMS/CSD: No • MMS/GPRS: No
OTA provisioning solution	OTA specified by Ericsson and Nokia, WAP Provisioning (WAP-185)
MMS User Agent functional entity will be a separate entity from WAP browser:	Yes
MMS User Agent support	WAP WTA, WAP UAProf and WTA Public.
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 parametres	Proprietary, WAP-185
Functionalities that the user is able to set during message composition:	• message *subject* • MSISDN recipient address • *email* recipient address • message *Cc* recipient(s) address(es) • *delivery report* request • *read-reply* report request • *message* priority
Places from which user can insert multimedia elements into multimedia messages:	• terminal memory • directly from camera
Supplier indication if MMS User Agent will be able to handle a network-based address book	No
Possibility for sent messages to be memorized into a folder in handset memory	Yes
Actions that the user can perform after message notification:	• retrieve the message immediately • defer message retrieval • reject message
Actions that the user can perform after message retrieval:	• reply to the sender of the message • reply to the sender and to Cc people • forward the message • delete the message • save message into terminal
Multimedia codecs/formats supported for audio	AMR
Multimedia codecs/formats supported for video	None

Feature	Support in the T290i/T290c
Multimedia codecs/formats supported for image	Baseline JPG, GIF 89a
MMS User Agent provides:	• text formatting facilities (only textsize) • coloured text/background (Viewer/player supports coloured text and background. Not editable in composer) • predictive writing
Supported formats for message presentation:	• message body + attachments (email presentation) • SMIL version as described in “Nokia/Ericsson MMS Conformance document • (not WML and SMIL 2.0 Boston)
Storage capacity dedicated to multimedia messages (Kb)	~400kb available for user data (images, sounds, MMS,...)
Maximum message size that can be handled by the handset for message	30 kb for sending, 50 kb for receiving
Possibility to configure unconditional message modification (such as media modification in messages)	Yes
MMS User Agent will report problems to user in case of:	• message not sent causes no user subscription to service, if included in ResponseText (please see WAP209) • message not sent causes required functionality not supported by MMS Relay/Server, if included in ResponseText (please see WAP209) • message not sent causes insufficient credit (in case of prepaid charging), if included in ResponseText (please see WAP209)

Performance and technical characteristics

	EGSM 900	GSM 1800
Frequency range	TX: 880-915 RX: 925-960	TX: 1710 – 1785 RX: 1805 – 1880
Channel spacing	200 kHz	200 kHz
Number of channels	174 Carriers *8 (TDMA)	374 Carriers *8 (TDMA)
Modulation	GMSK	GMSK
TX Phase Accuracy	< 5° RMS Phase error (burst)	< 5° RMS Phase error (burst)
Duplex spacing	45 MHz	95 MHz

	EGSM 900	GSM 1800
Frequency stability	+/- 0.1ppm	+/- 0.1ppm
Voltage operation (nominal)	3.6 Volts	3.6 Volts
Transmitter RF power output	33 dBm Class 4 (2W peak)	30 dBm Class 1 (1W peak)
Transmitter Output impedance	50 Ω	50 Ω
Transmitter Spurious emission	< -36 dBm up to 1 GHz < -30 dBm over 1 GHz (according to GSM spec.)	< -36 dBm up to 1 GHz < -30 dBm over 1 GHz (according to GSM spec.)
Receiver RF level	Better than – 102 dBm	– 102 dBm
Receiver RX Bit error rate	< 2.4%	< 2.4%

WAP browser technical data

Feature	Support in the T290i/T290c WAP browser
Back to previous page	Yes
Bearer type GPRS (IP)	Yes
Bearer type GSM Data (IP)	Yes, HSCSD, ISDN and analogue
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
Cache	Yes (size 6 kbyte)
Character sets	UTF8 (Default), USASCII, Latin1, UCS2
Clear cache	Yes
Colour	Colour display
Home page	Yes, up to 5 different, one for each WAP profile
HTML version for WAP browser	xHTML Mobile Profile and Basic, iHTML, WML
Hyperlinks in Text	Yes, highlighted by inverse video
Hyperlinks in Images	Yes, indicated by a frame
Image Animation	No
Image Formats	GIF (interlaced and non-interlaced), WBMP, no transparent layers, JPG
Network Settings	Up to 5 different settings available by selecting WAP profile (Intranet, Internet, Banking, Gateway etc.)
OTA Support	Yes

Feature	Support in the T290i/T290c WAP browser
PPP Authentication	PAP, CHAP supported
Reload page	Yes
Tables	Yes
User Agent Profiles	Yes, list of client characteristics - e.g. display size
WAP	WAP 1.2.1 stack and browser, WAP 2.0 browser
WAP browser	WAP 1.2.1 and WAP 2.0
WAP profiles	Dynamic - up to 5 WAP profiles, each with its own settings
WTLS (security)	Yes, WTLS Class 1 - Encoding WTLS Class 2 - Encoding + Server Authentication. Root Certificates needed in phone WTLS Class 3 - Encoding + Server Authentication + Client Certification. Root Certificates needed in phone + special SIM cards Sign text

WAP operator technical data

Feature	Support in the T290i/T290c for WAP
WAP Browser	
Version	1.2.1 and 2.0
HTML	xHTML Mobile Profile and Basic, iHTML, WML, CSS
WAP Provisioning	
Total Parametre sets	5
Parametre set list	Name Startpage IP settings: CSD phone no., CSD Data rate, CSD dial type GPRS APN, password request, allow calls, authentication, data compression, header compression, quality of services IP address, datamode (conn.less or oriented) UserId and password Security on/off Show images on/off Response timer
Manual selection	Yes, between Analogue (V32) and Digital (V110)
Parametre sets include	WAP/CSD, WAP/GPRS (different sets)
Factory pre-configuration	WAP/CSD (possibility to lock a setting), WAP/GPRS

Feature	Support in the T290i/T290c for WAP
OTA	WAP/CSD, WAP/GPRS configuration possible
Simultaneous OTA	WAP/CSD, WAP/GPRS configuration possible
Single OTA	WAP/CSD, WAP/GPRS is not possible
Bookmarks	Not empty by default
URL format	Underlined
Security mechanism	
OTA provisioning (if empty)	Operator verification through a code, included in the OTA data. This code is shown to the user who can choose installation or not.
Interface (if empty)	An Install question is asked with the code, if available. The user has to choose if a new WAP profile shall be created or an existing profile shall be replaced.
Re-provisioning (Set 1 filled)	As above
Interface (Set 1 filled)	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. No new certificates can be stored and no old ones can be removed by the terminal.
Additional provisioning	
Preferred bearer customization	Yes
Email customization	No
Other applications/features	Yes, MMS
Technologies	
WAP Forum OTA provisioning	Yes
Openwave OTA	No
Other	Yes. The Ericsson-Nokia solution.
Provisioning bearer	SMS
Parametre sets available	5
Parametre sets for OTA modification	5

PUSH	

Feature	Support in the T290i/T290c for WAP
Content types	
Service Indication (SI)	Yes
Service Loading (SL)	Yes
Cache Operation (CO) content type	Yes
Session Initiation Application (SIA)	Yes
Man Machine Interface	
SI/content retrieval postponing	Yes
SI menu structure accessability	WAP services, Push inbox
SL reception warning	The user can make a choice if a dialogue is wanted or not before loading the SL. WAP services/options/common/Push access/prompt
SIA reception warning	Yes
Cache size limitations	If the inbox is full and a new push is received, 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. WAP services/options/common/Push access/Off
Dynamic push menu changes	No. There are no changes in the menus when activating/deactivating push
Security	
Mechanisms for push	None
Trust with PPG	Sending a SIA is the most trustful.
WSP push sessions	1
User agent profile	
UA profile content sent at beginning of WSP session	No
URL sent pointing to the UA profile at the beginning of WSP session	Yes
URL location	On the manufacturer web site.
WTAI	
WTA Make Call	Yes
WTA Send DTMF	Yes
WTA Add Phone Book	Yes

Feature	Support in the T290i/T290c for WAP
Other WTA/WTAI	No
DOWNLOAD	
WAP solutions	
SAR/WSP/HTTP GET solution to download content over WAP	Yes
Download Fun from Openwave	No
Other download content over WAP	Yes. Content limited to 3kB is downloaded without using SAR
Features	
Download application/product memory check	Yes
Downloaded object solution	Yes. The user is asked if the content is to be saved.
UAP indication for downloading	Yes
Other features	Yes. Store, delete, forward, use, manage.
Object formats	
Ringing tones	audio/iMelody, other/eMelody, vMel, MIDI.
Wallpapers	Image/WBMP, GIF, JPG.
Pictures	Image/WBMP, GIF, JPG.
Games	Yes
JAVA applications	No
Audio files	audio/MPEG4 not used,MP3 not used, WAV not used
Skins	No
Video	No
GRAPHICAL USER INTERFACE	
Man Machine Interface	
Soft keys	None
Separate/dedicated back or erase keys	No
Screen backlight on when browsing?	Yes (except during periods of inactivity)

Feature	Support in the T290i/T290c for WAP
Predictive writing for WAP sessions?	Yes
“http://” string displayed automatically when entering URLs	Not displayed but the "http://" is added automatically to the URL.
Elements	
Number of display lines for a WAP connection	4 to 7 plus Title, depending on the selected font size.
Pop-up menus	Yes. Single select list to conserve space.
Radio buttons	Yes. Single select list to conserve space.
Check boxes	Yes. Boolean selection.
Push buttons	No
Horizontal rules	Yes. Separate sections of WML card.

GPRS technical data

	Support in the T290i/T290c
Compatible GPRS and SMG specifications	ETSI R97 SMG 31 bis
Data rates	Multislot class 4 supported (3+1) CS-1, CS-2, CS-3, CS-4 9,050 bps, 13,400 bps, 15,600 bps, 21,400 bps supported (network-dependent)
Indicator of attachment to the GPRS service	Yes, an icon in the bottom left corner, a filled triangle if attached 
Indicator of PDP context activation	Yes, an icon on the right side. Animated globe 
Medium Access Modes	Fixed and dynamic allocation
Support of Packet Control Channels (PBCCH/PCCCH)	Yes.
Network operation mode	NOM I, II, III
Support of GPRS/CS combined procedures	Yes
Network control mode	NC0

	Support in the T290i/T290c
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
Support of compression algorithms	No
Support of the QoS modification procedure	Yes, when initiated by the network (not by the handset)
Downlink data rate	Up to 64,200 bps for packet data communication, using 3 time slots in coding scheme CS-4
Uplink data rate	Up to 21,400 bps for packet data communication, using 1 time slot in coding scheme CS-4
Mode of operation	Class B and Class C modes of operation supported. It is possible for the user to choose if the Circuit Switched services should be favored.
R Reference point	Physical layer: PPP is supported as L2 layer in the R reference point Authentication algorithms PAP, CHAP supported
IP connectivity	PDP type IP is supported IP termination in mobile or TE (laptop, PDA) supported
Application	WAP over GPRS supported (UDP/IP and GPRS-SMS) SMS over GPRS (SMS-MT, SMS-MO) supported
QoS	QoS negotiation supported. Default requested QoS sent by the handset at PDP context activation is reliability Class 3. Peak/Mean/Delay/Precedence Class: subscribed (1,2,3). Precedence class supported (1,2,3) Reliability class 1-5 supported Delay classes supported (1,2,3,4) Mean and peak throughput rate limited by multislot class 4 and CS-4
PDP context	10 PDP context descriptions stored in mobile PDP context description is edited via application in mobile or via OTA Simultaneous PDP contexts not supported Network requested PDP context not supported
SIM	GPRS aware, as well as non GPRS aware SIMs are supported

Email client technical data

Feature	Support in the T290i/T290c email client
Attachment	Yes (outgoing, images only)
Bearer type GPRS (IP)	Yes
Bearer type GSM Data (IP)	Yes, HSCSD, ISDN and analogue
Character sets	US ASCII (All variants) ISO8859-1 WIN1252 UTF7 UTF8
OTA Support	Yes
Supported protocols	POP3, IMAP4, SMTP

USSD technical data

Feature	Support in T290i/T290c
USSD support	GSM Phase 1/ 2 (Cross-phase compatibility). GPRS behaviour according to class B
Mode support -mode	MMI-mode supported. No application mode support (not needed for any application).
MMI-mode details	• USSD messages displayed until removed by user • It is possible to scroll up and down the text in USSD messages

Image format technical data

Format	Visible	Max	Animation	Colours	Visible colours	Transparency support
GIF	101 x 80 pics	160 x 120 pixels	50 frames (1 frame/ 100ms)	4K	4K	Yes

Format	Visible	Max	Animation	Colours	Visible colours	Transparency support
JPEG	101 x 80 pics	640 x 480 pixels	No	16.8 mil.	4K	No
WBMP	101 x 80 pics	320 x 320 pixels	No	Black/ White	2	No

Images – downloading to phone

Feature	File type	Max. size	PC Applications	WAP	MMS
EMS icons	WBMP	WxH<=1024 pixels	Yes	Yes	Yes
MMS	GIF, WBMP, JPG	Limited by the memory	Yes	Yes	Yes
Background	GIF, WBMP; JPG	Limited by the memory	Yes	Yes	Yes
MMS template		Send 30k, Receive 50k	No	No	Yes
Animations	Animated GIF	Limited by the memory	Yes	Yes	Yes
Themes	GIF (propriety, THM)	Limited by the memory	Yes	Yes	Yes

Exceptions:

MMS: GIF, WBMP, JPG, 160 x 120 pics

EMS icons: WBMP max WidthxHeight<=1024 pixels (eg 32 x 32=1024)

Themes: GIF max, 160 x 120 pixels

WAP: Can not show animations in the WAP Browser. The maximum file size when downloading via WAP is 60 kB if the gateway supports LDT. On a WAP page, the maximum size of one object is 3 kB. The animation will be shown in the Image Browser if it is saved in the phone.

GIF: Animations used as background images or user greetings displays first frame only.

M-commerce technical data

Feature	Support in the T290i/T290c for m-commerce
Dual-slot	No

Feature	Support in the T290i/T290c for m-commerce
Associated with a STK card, allowing ISO B0' bank card payments	If separate card, no
Associated with a STK card, allowing EMV bank card payments	If separate card, no
Certified by the "GIE Carte Bancaire"	If separate card, no
WIM support	If separate card, no
Ability to use a WIM application embedded on a SIM/USIM card	Yes
WIM application embedded on a SIM card the default WIM application	Yes
Number of smart card readers in the handset	1
Provisioning of the following SATK commands: Perform Card APDU, Power Off Card, Power On Card, Get Reader Status	No
DRM solution	Possible with copyright protection via EMS and MMS
Information to the user while in secured mode (WTLS)	Yes, via icon
Is an incoming class 2 SMS transferred to the SIM even when another application (a browser) is running?	Yes
Access to the WIM	WIM can only be accessed by native applications, e.g. the browser

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