

**All you need to know about the
Mobile Games
DAPPs* Database**

***Developers, Aggregators-Distributors, Publishers and Portals**

*The Multimedia Research Consultancy
22.1.2008*

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Thank you for expressing interest in *the Multimedia Research Consultancy's* Mobile Games DAPPs Database. These notes explain precisely what's on offer.

The Mobile Games DAPPs Database: The Rationale for its Creation

It became evident in a research study carried out in late 2004 that there was little industry awareness as to the number of Mobile Games enterprises worldwide and, more importantly, who these players might be. Industry observers could only offer up crude guesstimates, ranging at the time from 700 – 1,200. In addition no one could cite any more than the highest profile 200-300 players. **However, it was generally agreed that a Global Database of the Mobile Games industry would be a very useful and valuable source of information** As a consequence we set out to produce the world's most comprehensive, definitive and global database of *Mobile Games DAPPs (Developers, Aggregator-Distributors, Publishers, Portals)*.

Why we believe this database is superior to all others

Our research has revealed that rival lists of Mobile Games enterprises suffer from several problems, which make them far from adequate. Most web based lists have been developed on a reactive basis - they invite visitors to those websites to register company and product details. This means that they have limited coverage and fail to regularly update details in what is a fast moving industry – leading to high levels of defunct enterprises. Moreover, many rival databases also fail to register mergers and acquisitions or changes in trading status.

Our approach, by contrast, has been proactive as we have interrogated of a vast array of online and offline sources in order to identify as many Mobile Games enterprises as possible. We then visited their websites to check if they were suitable candidates for our global database by:

- Assessing their core businesses
- Determining whether they were still trading

This approach makes it much more-up-to date than rival lists, absolutely essential in this fast moving market

Since the launch of the first edition in March 2007 we have widened our remit in response to customer requests. As a consequence the second edition completed December 2007 now contains more enterprises (1,968 in 93 countries) which have not only been rechecked, but have been profiled in more detail. For instance we have added information on:

- their mobile games platform and operating systems specialisms
- whether they are privately owned or publicly quoted
- how long they have been active in mobile games
- whether they are independent commercial entities or part of larger commercial concerns

(For an insight into the full coverage offered by this latest version of the database please go to pages 6 - 7).

Caveat

We acknowledge that any large database cannot be 100% accurate, particularly in fast moving markets where there are new start-ups, mergers, acquisitions and failures on a weekly basis. Whilst our basic assumption is that enterprise websites offer a fair and accurate reflection of their trading status, it is not always the case, with Webmasters sometimes failing to record key events or changes in a company's status until some time after the event.

To counter this we constantly monitor industry developments across a wide range of industry sources to validate or correct wherever possible, an enterprise's trading status. **Based on this approach we believe it is reasonable to claim that the coverage and accuracy offered by this database is, almost certainly, unequalled by any other single source in the world.**

What constitutes a Mobile Games Device?

In our definition Mobile Games Devices must be capable of voice communications (via Mobile Phone Networks) as part of their core capabilities. It follows, therefore, that we do not include handheld games devices such as Nintendo's Game Boy/DS or Sony's PSP. However, at the time of writing it is believed that Sony will soon be introducing a mobile phone variant of the PSP. Should this be the case then PSP games and their associated DAPPs will naturally form part of our future remit.

As a consequence any Mobile Games DAPP (Developer, Aggregator-Distributor, Publisher and Portal) producing or supplying games for the following devices has been considered as eligible for inclusion in our database.

- *J2ME enabled Cell Phones*
- *Other JAVA variants e.g. KJAVA, Unija etc*
- *BREW enabled Cell Phones*
- *Doja / iMode compatible Cell Phones*
- *Smartphones [Windows Mobile]*
- *Palm OS Smartphones*
- *Pocket PC Smartphones*
- *Symbian / Series 60 Cell Phones*
- *Mophun-enabled Cell Phones*
- *ExEn / EGE enabled Cell Phones*
- *Nokia N-Gage / QD / N-Series Cell Phones*
- *Blackberry Cell Phones*
- *Apple iPhones*
- *Linux Cell Phones*

What constitutes a Mobile Games Enterprise?

To be eligible for inclusion in our database enterprises have been defined as actively trading commercial entities ranging from multinational, publicly quoted companies at one extreme, through to 1-2 man operators at the other. It should be noted that where enterprises have subsidiaries operating in more than one country we have counted them separately (although they obviously all share the same parent). We have done so as they often have unique website addresses (URLs), commercial activities exclusive to the countries in question, as well as local management teams offering a unique commercial interface to those customers in the country in which they are physically based. The Enterprise Codes used in our database - Head Office (HO), Subsidiary Head Office (SHO), Independent Subsidiary (IS), Business Division (BD), Regional Branch (RB), and Independent (I) - enable these listings to be distinguished from each other.

What form does the Mobile Games DAPPs Database come in?

The database is being made available in Excel, as well as in the widely accepted **CSV (Comma Separated Values)** format, enabling it to be ported into Excel, Access and a host of other industry standard databases. The comma-separated values (or CSV) file format is a file type that stores tabular data (like in an Excel sheet). The format is long established and as a consequence CSV files are common on all computer platforms. The CSV file uses double quotes (") as a text qualifier to allow commas to be used in long addresses.

DATABASE SECURITY and use of the Mobile Games DAPPs Database

In purchasing either **The Essential Contacts** or **The Full Profiles** global Mobile Games Database (or a subset thereof) a buyer has implicitly agreed to our Terms & Conditions (www.multimedia-research.com/Terms%20and%20Conditions%20). You are advised to read our Terms and Conditions, as they have a distinct bearing on how you and/or your organisation may use the data.

The database has been seeded with up to a maximum of 25 companies which are fictitious in nature and whose identity is known only to TMRC.

These fictitious enterprises are UNIQUE to each individual buyer of the database. If the database in its entirety (or a subset of the database) were to be released illegally into the public domain TMRC will be able to identify which buyer/purchasing organisation had released the data without express permission. We will naturally seek a legal resolution of any violation of our Terms and Conditions.

How can the DAPPS Database be used?

The database can be used in many ways, for example:

- Checking out Developers in Western Europe
- Targeting Aggregators or Publishers in Japan
- Identifying D2C (Direct to Consumer) Mobile Games Portals
- Establishing whether games enterprises are independent or owned by larger groups
- For Direct Marketing - with email addresses, postal addresses or telephone numbers, plus named senior executives/owners for the vast majority of enterprises this is made easy (See Pages 7-9 for coverage statistics)

What exactly are DAPPs?

The database focuses on the following enterprise types (collectively defined as DAPPs – Developers, Aggregators-Distributors, Publishers, Portals):

(a) Mobile Games Developers (Database Code: D)

These are creators of games for mobile handsets. To begin with most Mobile Games Developers were independent start-ups. However, they now include a number of mainstream console/handheld device/PC games developers, who have since established or acquired mobile games development arms to exploit the market's burgeoning commercial opportunities. Mobile Games Developers often specialise in terms of the platforms that they support, with the majority creating mobile games using the J2ME and BREW platforms.

There are a number of enterprises which have also developed utility/applications software for mobile phones, but unless they have developed at least one game they have been excluded from the database. We have set no limit on enterprise size, so developing one game is sufficient qualification for inclusion.

(b) Mobile Games Content Aggregator-Distributors (Database Code: A)

As their name suggests Mobile Games Aggregator-Distributors assemble/gather mobile content (games, as well as ringtones, wallpapers, graphics, music tracks etc) from a variety of developmental sources. Much of the content is sourced from those enterprises that do not have the necessary scale to promote their content independently and effectively. Aggregator-Distributors provide ready and relatively easy access to consumers, Mobile Network Operators (MNOs) and even handset manufacturers. They also assist in promoting games from their consumer facing portals. The role of the Aggregator-Distributor is increasingly overlapping with that of the Mobile Games Publisher (see next). A prime example is *Handango*.

(c) Mobile Games Publishers (Database Code: Pu)

Mobile Games Publishers invariably distribute, promote and publish mobile games on behalf of the smaller players in the development community, helping them to gain access to channels (Mobile Network Operators, Content Aggregators and even handset manufacturers for embedded solutions) otherwise denied to them. By using publishers small developers can readily achieve a sense of scale, helping them to gain exposure and generate sales in the Mobile Games market. Where developers claim to publish their own games, and we can see evidence of this, we have taken this as correct.

(d) Mobile Games Portals (Database Codes: MNO, MVNO, D2C, Others)

Our research has identified four classes of Portal in the mobile games space. They include:

- MNO Portals

Most of the major Mobile Network Operators such as Vodafone, T-Mobile, Verizon Wireless, NTT DoCoMo and Orange have created web portals (Vodafone live!, t-zones, Get It Now!, i-Mode, Orange World), which provide access to a wide repertoire of mobile content. Such sites often list hundreds of mobile games, available for download.

- MVNO Portals

A number of MVNOs (Mobile Virtual Network Operators) also offer games for download from their portals. Virgin Mobile's MVNO portal (BITES) is a prime example.

- **D2C Portals**
The last two years have seen a proliferation in the number of independent, third party D2C portals (also known as 'Off-Deck' portals) which offer access to an even wider repertoire of software than their MNO and MVNO counterparts. D2C portals have flourished partly because MNOs do not have the necessary resources to vet all software from all developers.
- **Other Portals**
This residual group of Mobile Games Portal invariably provides reviews and ratings of individual mobile games, industry news and bulletin boards. However, these sites do not offer transactional capabilities, unlike the three other classes of mobile games portals.

NB – It should be noted that the ways in which some enterprises have classified their core activities in the mobile games space are notoriously inconsistent. Throughout we have made our own classifications, according to the above principles, and have not always taken self-assessments at face value.

What can be found on the database?

There are two versions of the database:

- (i) **The Essential Contacts DAPPs Database**
- (ii) **The Full Profiles DAPPs Database**

The fields covered by each respective version of the database are highlighted in the columns marked **EC (Essential Contacts)** and **FP (Full Profile)**.

The fields (running from LEFT to RIGHT) are labelled in the first row of the database and the Field Labels are shown below: -

FIELD LABEL	DESCRIPTION	EC	FP
Enterprise Name	Enterprise Name	✓	✓
<u>Enterprise Classification</u> Developer	Code D indicates an enterprise is a Developer. X indicates it is not	✓	✓
Aggregator-Distributor	Code A indicates an enterprise is an Aggregator-Distributor. X indicates it is not	✓	✓
Publisher	Code Pu indicates an enterprise is a Publisher. X indicates it is not	✓	✓
Portal Codes	Code MNO indicates an enterprise is a Mobile Network Operator Portal (with games), offering downloads for sale. X indicates it is not	✓	✓
	Code MVNO indicates an enterprise is a Mobile Virtual Network Operator Portal (with games), offering downloads for sale. X indicates it is not	✓	✓
	Code D2C indicates an enterprise is a Direct to Consumer Portal (with mobile games), offering downloads for sale. X indicates it is not	✓	✓
	Code Other indicates an enterprise is a Mobile Games Portal, but does <u>not</u> offer downloads for sale. X indicates it is not	✓	✓
<u>Enterprise Contact:</u> Topline Website Country Regional Code	Website Country in which the enterprise is based This enables global areas to be identified easily as follows: AM	✓ ✓	✓ ✓

	(Americas); GE (Greater Europe); JK (Japan and South Korea); RW (Rest of the World)	✓	✓
<u>Personnel Contact No. 1</u> Contact Name 1 Contact Job Title 1 Email Address 1	Contact Name (usually of the most Senior Executive) Contact Job Title (usually of the most Senior Executive) Email Address (invariably a mix of both generic [info@, contact@, bizdev@] and named email addresses)	✓ ✓ ✓	✓ ✓ ✓
<u>Personnel Contact No. 2</u> Contact Name 2 Contact Job Title 2 Email Address 2	(Only where feasible) Contact Name (usually of another Senior Executive) Contact Job Title (usually of another Senior Executive) Email Address (invariably a mix of both generic [info@, contact@, bizdev@] and named email addresses)	✓ ✓ ✓	✓ ✓ ✓
<u>Telephone Contact</u> Telephone Number Fax Number	Telephone Number Fax Number	✓ ✓	✓ ✓
<u>Postal Contact Details:</u> Address 1 Address 2 Address 3 Town / City State Province Post Code	Office / Building Number Street Name Street Name Town / City State / Province / County Post Code / Zip Code	✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓ ✓
<u>Corporate Details</u> Date Enterprise / Division Created	The Year in which the Enterprise or Division was created	x	✓
Date Mobile Games Activity Started	The Year in which its Mobile Games activity began (Many enterprises had previously developed games for PCs, Consoles and Handheld devices, before moving into mobile games)	x	✓
Parent Name	Parent Company (where applicable)	✓	✓
Parent Website	Parent Company's Website (where applicable)	✓	✓
Country of Parent HO	Country in which Parent is headquartered (where applicable)	✓	✓
<u>Stock Market Details</u>	Specifies the acronyms of the leading Stock Exchange/Exchanges, as well as the Stock Tickers for publicly quoted enterprises or their parents. An NA in this cell denotes 'Not Applicable' (i.e. the enterprise in question is not publicly quoted).	x	✓
<u>Enterprise Types</u>	HO: Head Office SHO: Subsidiary Head Office IS: Independent Subsidiary (part of a larger group, but retaining its own trading identity) RB: Regional Branch BD: Business Division I: Independent	x x x x x x	✓ ✓ ✓ ✓ ✓ ✓
<u>Platform Types & Operating Systems</u>	Descriptors in any cell indicate which Mobile Games Platforms and Operating Systems enterprises currently specialise in. An 'NS' in any cell indicates "Not Specified". Java/J2ME Other Java Variants (KJava, MIDP, EV-Java etc) BREW Variants Symbian Variants (S60, UIQ, N-Gage/N-Series etc) Windows CE Variants (Pocket PC, Smartphone/Windows Mobile etc) Blackberry (RIM) i-Mode / DoJa Palm Variants Flash Lite SMS / MMS Open Source (Linux, Open GL ES etc) Others (Other platform types/ operating systems) [For full definitions of all variants see the Glossary on Pages 12 – 26]	x x x x x x x x x x x x	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
<u>Advanced Games Specialisms</u>	Mobile 3D Games Mobile Location Based Gaming Mobile Online / Connected Gaming Mobile Motion Sensing Gaming	x x x x	✓ ✓ ✓ ✓

	Mobile Community based Games	x	✓
	Advergaming / Ad-funded / Ad-supported Mobile Games	x	✓
	Mobile Multiplayer Games	x	✓
	Mobile Gambling (only Developers)	x	✓
	Other (eg Bluetooth Games etc)	x	✓

Database Coverage

The coverage of this database is truly global and as at December 2007 comprised 93 countries. Non-English sites have also been included and we have employed native translators to ensure the accurate assessment of, for example, Japanese, Chinese, Taiwanese and Korean companies.

As at December 2007 the coverage in the database was as follows:

Data Field	Degree to which Fields are Populated with Data
Assigned Codes indicating whether Mobile Games enterprises are Developers (D), Aggregator-Distributors (A), Publishers (Pu) or Portals (MNOs, MVNOs, D2C, Other Portals)	100%
The Enterprise Name	100%
The Enterprise Website	100%
The Country in which the Enterprise is based	100%
The Name of a Senior Executive	96%
The Job Title of the Senior Executive	97%
Number of Enterprises	1,970
Number of Senior Executives (we have two for some enterprises)	2,700
HO Email Address	85%
Total email addresses (we have two for some enterprises)	2,400
HO Telephone Number	92%
HO Fax Number*	60%*
Full Postal Address	96%

* Not all enterprises have Fax Numbers, relying instead on emails

Enterprises - Trading Status

We have assumed throughout that individual enterprise websites offer a fair and accurate reflection of their current trading status. Occasionally, however, this may not be the case, with Webmasters sometimes failing to record key events or changes in a company's status until some time after the event. As a consequence some enterprises which have ceased trading will still have active websites. To counter this we constantly monitor industry developments across a wide range of industry sources to validate, wherever possible, an enterprise's trading status.

Company Email Addresses

These often represent the first point of online contact into individual Mobile Games enterprises. Sites vary in how they control communications from the outside. Some offer up the names of nominated individuals and provide direct email access. Many, however, use a raft of generic contact email addresses. At the same time an increasing number of sites substitute pre-set forms to be filled in and submitted online to the company. Such an approach prevents spammers from harvesting conventional contact addresses.

Wherever possible we have collected not only generic email addresses, but also the names, job titles and specific email addresses of the two most senior executives in the enterprise - e.g. CEO, MD, Chairman, CTO, COO, Founder, Owner, Head of Studio etc. These have been obtained not only from Websites, but also from a wide range of other sources.

Company Telephone and Fax Numbers

Telephone and Fax numbers have all been provided in full international format (as recommended by the ITU) e.g. +44 20 8292 6367. To use for calls inside a country the initial code, in this example (+44) needs to be removed and (0) added. In some cases these numbers will not agree with the country code where the enterprise is based, as they require contact to be made through the company's Head Office. Users should inspect the details to establish the facts.

Parent Company

Whilst the majority of Mobile Games enterprises in our database are independent and privately owned, an increasing number are now owned or operated by larger commercial concerns. Here we have made every effort to accurately record the name of the parent company, although, once again, the reader is reminded that changes in a company's trading status can happen overnight.

Multiple Roles

Some Mobile Games enterprises operate on a number of levels. For instance, many Developers are also Publishers in their own right. Some also sell games directly from their sites, effectively making them Etailers. Others have gone so far as to create Mobile Games Portals, Forums, Community sites and Weblogs.

How often will the database be updated?

It is our intention to update the database on a regular basis incorporating, wherever possible, the latest industry announcements, mergers, acquisitions and changes in personnel.

Stock Exchange Acronyms

Where companies (or their parents) appear on the database with a Stock Exchange Symbol, followed by a Stock Ticker, they are publicly quoted enterprises (ie their shares are traded openly in the market place).

References to publicly quoted companies typically take the following format – in the case of Electronic Arts (EA) the entry reads as follows: NASDAQ: ERTS + Others. The first half of the entry relates to the Stock Exchange (i.e. in this case the NASDAQ – The National Association of Securities Dealers Automated Quotation System – in America) on which EA's shares are traded.

The second half of the entry relates to the specific NASDAQ Stock Ticker Symbol for the company in question (i.e. Electronic Arts' NASDAQ Stock Ticker is ERTS). '+ Others' relates to the fact that EA's shares are traded on a number of other stock exchanges around the world. This is typically the case with the larger multinationals, with some having their stock traded on as many as 20 or more exchanges.

Listed below are the symbols for the full range of Stock Exchanges as they appear on the Mobile Games Enterprises database.

Stock Exchange Acronym	Full Name of Stock Exchange	Country
AIM:	Alternative Investment Market	(UK)
AMEX:	American Stock and Options Exchange	(USA)
ASX:	Australian Securities Exchange	(Australia)
BAK:	Thailand Stock Exchange	(Thailand)
BSE:	Bombay Stock Exchange	(India)
CAC MID:	Paris Stock Exchange Mid Cap (Cocation Assiste en Continue)	(France)
EURONEXT BRUXELLES:	Euronext Equities Brussels	(Belgium)
EURONEXT PARIS:	Euronext Equities Paris	(France)
FRANKFURT:	Frankfurt Stock Exchange	(Germany)
FTSE:	FTSE Index Values	(UK)
HK:	Hong Kong Stock Exchange	(Hong Kong)
HKG:	Hong Kong Stock Exchange	(Hong Kong)
HSE:	Hyderabad Stock Exchange	(India)
ISE:	Irish Stock Exchange	(Eire)
JAK:	Jakarta Stock Exchange	(Philippines)
JASDAQ:	Japanese Association of Securities Dealers Automated Quotation System	(Japan)
KLSE:	Kuala Lumpur Stock Exchange	(Malaysia)
KOREA:	Korean Stock Exchange	(South Korea)
KOSDAQ:	Korean Association of Securities Dealers Automated Quotation System	(South Korea)
KSE:	Karachi Stock Exchange	(Pakistan)
KSE:	Kuwait Stock Exchange	(Kuwait)
KUWAIT STOCK EXCHANGE:		(Kuwait)
LSE:	London Stock Exchange	(UK)
MI:	Milan Stock Exchange	(Italy)
MIL:	Milan Stock Exchange	(Italy)
MTAX STAR:	Mercato Telematico Azionario: Segment for High Requirement Shares	(Italy)
NASDAQ:	National Association of Securities Dealers Automated Quotation System	(USA)
NGM:	Nordic Growth Market	(Sweden)
NYSE:	New York Stock Exchange	(USA)
NZAC:	New Zealand Stock Exchange	(New Zealand)
OSA TYO:	Osaka Stock Exchange / Tokyo Stock Exchange	(Japan)
OSE LEVEL 1:	Osaka Securities Exchange Level 1	(Japan)
OSE:	Osaka Securities Exchange	(Japan)
OSLO STOCK EXCHANGE:		(Norway)
OTC:	Over the Counter	(China)
OTCBB:	Over the Counter Bulletin Board (a NASDAQ trading service)	(USA)
PINK SHEETS:	Electronic Quotation System for OTC securities	(USA)
PSE:	Philippines Stock Exchange	(Philippines)
SEHK:	Stock Exchange of Hong Kong	(Hong Kong)
SGX:	Singapore Exchange	(Singapore)
ST:	Stockholm Stock Exchange	(Sweden)
STO:	Stockholm Stock Exchange	(Sweden)
STOCKHOLM:	Stockholm Stock Exchange	(Sweden)

STRAITS TIMES INDEX:	Index compiled by a newspaper of the same name – Singapore's leading equity index	(Singapore)
SYD:	Sydney Stock Exchange (part of the Australian Stock Exchange)	(Australia)
TAIWAN		
STOCK EXCHANGE:		(Taiwan)
TEL AVIV		
STOCK EXCHANGE:		(Israel)
TORONTO		
STOCK EXCHANGE:		(Canada)
TSE:	Tokyo Stock Exchange	(Japan)
TSX-V:	Toronto Stock Exchange	(Canada)
TYO:	Tokyo Stock Exchange	(Japan)
VI:	Vienna Stock Exchange	(Austria)
VIE OTH:	Wiener Borse Vienna	(Austria)
WAR:	Warsaw Stock Exchange	(Poland)

A Glossary of Mobile Application Platforms, Operating Systems, Technical Terms and Mobile Games Specialisms

2G Wireless Cellphone Technology

This is short for “second-generation” wireless telephone technology and is usually identified as the Global System for Mobile (GSM) service. 2G’s main differentiator to previous mobile telephone systems (retrospectively dubbed 1G) is that the radio signals that 1G networks use are analogue, while 2G networks are digital in nature. Moreover, 2G mobile handsets are capable of downloading and playing games.

The main 2G standards available worldwide include:

- **GSM** (TDMA*-based), originally from Europe, but used worldwide *Definition Page 16
- **iDEN** (TDMA-based), proprietary network used by Nextel in the US and Telus Mobility in Canada
- **IS-136 aka D-AMPS**, (TDMA-based, commonly referred to as simply TDMA in the US), used in the Americas
- **IS-95 aka cdmaOne**, (CDMA**-based, commonly referred to as simply CDMA in the US), used in the Americas and parts of Asia
- **PDC** (TDMA-based), used exclusively in Japan

2G is frequently referred to as Personal Communications Service or **PCS** in the US.

- * Time Division Multiple Access
- ** Code Division Multiple Access

2.5G Wireless Cellphone Technology

2.5G wireless technology is usually associated with General Packet Radio Services (GPRS) i.e. between the second and third generations of wireless technology. By comparison 2G is usually associated with the Global System for Mobile (GSM) service, whilst 3G is usually associated with the Universal Mobile Telecommunication Service (UMTS).

3G Wireless Cellphone Technology

3G (Third Generation) wireless technology offers the ability to transfer both voice (telephone calls) and data (ie the downloading of information, exchanging emails, instant messaging). Video telephony has often been cited as the killer application for 3G, although, to date, music downloads have proved to be more popular.

The first country to introduce 3G on a large commercial scale was Japan. By 2005 approximately 40% of subscribers were using 3G networks in Japan, with 2G rapidly decreasing in importance. During 2006 the transition from 2G to 3G was largely completed, with upgrades to 3.5G already underway.

3.5G Wireless Cellphone Technology

3.5G effectively offers seven times the bandwidth of 3G, as well as offering a more impressive range of services. This will result in marked improvements in mobile voice telephony, video telephony, mobile TV and mobile broadband. 3.5G relies on the new High-Speed Downlink Packet Access (**HSDPA**) protocol.

4G Wireless Cellphone Technology

4G is the successor wireless access technology to 3G. NTT DoCoMo in Japan is already trialing 4G communications at 100 Mbit/s whilst on the move, and 1 Gbit/s whilst stationary. NTT DoCoMo plans to roll out the first commercial 4G network in 2010. It will provide users with on demand high quality video and audio.

Advergaming / Ad-funded / Ad-supported Mobile Games

The past 18 months have increasingly seen the availability of ‘free’ or discounted mobile games ready for download, effectively subsidised by advertising. End users can access mobile games at little or no cost, as long as they are prepared to be exposed to accompanying advertisements. Many encouraging high profile projects in this nascent field have already been initiated.

- (i) In January 2007 Amobee launched a commercial advertising trial with mobile network operator Orange in France. In it Orange customers were able to download games for reduced prices, or free, from the publisher Filao by accepting advertising. Brands such as Coca-Cola, Saab and Societe Generale signed up for the ad-funded content trial, which ran for two months.

- (ii) Meanwhile, German game developer HandyGames is currently offering 28 titles as free downloads and instead of charging for the games through a carrier's portal or an off-deck publisher, HandyGames is generating revenue from in-game advertising using technology from US group, Greystripe.
- (iii) At the same time Vivendi Games Mobile has launched free ad-supported games on mobile phones, also in partnership with Greystripe. As at October 2007 Greystripe claimed to have distributed 21m ad-based, free mobile games worldwide since its launch in 2006, using a scheme called AdWrap, which bundles ads into the games.
- (iv) Advergaming pioneer, Massive, recently acquired by Microsoft, has already put together Web-based casual games for clients, and it is understood that it will be only a matter of time before they make the jump to mobile.

As the ad-supported mobile game market becomes more competitive, companies have begun to carve out niches. For instance Hovr has revealed that *MobileSpace*, its mobile and online social community that is integrated within many of its games, enables users from around the world to invite friends to play games for free, connect with one another, compete for high scores and interact with one another in this social community.

Hovr can target its advertising more precisely, with users submitting information about themselves when they sign up for the community. As result each user receives the most relevant mobile advertisement according to their profile.

BlackBerry (RIM - Research in Motion)

The BlackBerry (from Canada based Research in Motion (RIM)) is a wireless handheld device introduced in 1999. Also known as Personal Communicator it supports push e-mail, mobile telephone, text messaging, internet faxing, web browsing and other wireless information services. The handset also allows for the download of Blackberry compliant mobile games.

Bluetooth – Multiplayer Games

Bluetooth is a specification for wireless Personal Area Networks (PANs), which effectively provides a way to connect and exchange information (including games) between devices like PDAs, mobile phones, laptops, PCs, printers, digital cameras and video games consoles (such as Nintendo's Wii), via a secure short range radio frequency. Bluetooth enabled mobile handsets can communicate with one another up to 10 metres, facilitating the playing of multiplayer games.

BREW (Binary Runtime Environment for Wireless)

BREW is an online applications development platform for wireless CDMA devices developed by Qualcomm. It is particularly strong in the USA, although the platform's impact in Europe has so far been weak.

BREW is widely regarded as a far more advanced platform than J2ME, enabling developers to make much more complex 3D games (provided destination handsets have the necessary processing power).

Aside from BREW's more powerful gaming credentials there are other advantages for developers. Firstly, the platform is less fragmented than J2ME. There are, for example, far fewer differences in BREW running on a Samsung handset to BREW running on a Nokia model.

Secondly, the way in which BREW games are written is even easier to master than Java, as it uses the popular C and C++ languages, both of which are commonly used in the PC arena.

On the downside BREW is a much more 'closed off' standard and involves higher development costs.

Moreover, the way in which BREW games are distributed also increases the cost of titles, due to the different price plans on offer. When one buys J2ME games, they are owned outright and are saved onto handsets until users opt to remove them. While BREW games can be sold in the same manner, they can also be tailored so that they will only work if a monthly subscription fee is paid. Fail to pay one month and the game will simply not work.

Community Gaming

In March 2004 US based Mobile Network Operator, Sprint, unveiled the world's first carrier based virtual mobile games community for gamers to meet, recommend games and challenge each other within its "Game Lobby" service. The service was launched in conjunction with M7 Networks Application Community Platform. Game Lobby is accessible from the fixed Internet, the mobile web and within the game and currently boasts:

- More than 1.5m members
- The latest blockbuster games, as well as mobile classics
- More than 40m game scores posted by members to leaderboards
- More than 200,000 game ratings uploaded by members, which help other customers buy the best games
- A Status Points Program where customers earn points for their activities to enhance the fun and competitive nature of the virtual games community
- An option to receive new game alerts
- Interoperability with other carriers' mobile games communities to enable cross-carrier buddy communication, game ratings and leaderboards

The Sprint service has since been followed by the likes of Playyoo (www.playyoo.com), Cellufun (www.cellufun.com), MGF 2008 (www.mobilegamesforum.co.uk) to name but a few.

Doja

See i-Mode / Doja

EGE (Entertainment and Gaming Extensions)

EGE is an embedded offline game catalogue, created by In-Fusio (now owned by French group, Zenops), a mobile solutions provider, and is compatible with all MIDP2.0 (Mobile Information Device Profile) handsets. End users can view a catalogue of easy to access games, which can be browsed without any network connection. With its user-friendly interface, EGE eases communications between players (through a buddy list), enables users to try games before purchasing and encourages viral marketing (through the recommendation of games to friends).

Embedded Games

In this instance games are simply embedded onto handheld devices by OEM (Original Equipment Manufacturers) or by mobile network operators. The games in question are invariably simple, unconnected, single player, casual games – such as *Tetris*, *Solitaire* or *Bubble Breaker* – which require little in the way of memory, making them suitable for installation in mobile handsets.

ExEn (Execution Engine)

Launched in July 2001 by games publisher In-Fusio, ExEn was the first software solution dedicated to the download of games onto mobile phones. It was developed to provide better performance and visuals for games.

ExEn has not been widely adopted and is not available on Nokia, Sony Ericsson, Samsung or Motorola handsets. Moreover, in the UK it is supported only by Orange amongst the network operators. Nevertheless ExEn 2 is rumoured to be in development and, if realised, will link up with J2ME's MIDP 2.0 platform to offer further enhancements to games.

Flash Lite Games

Adobe Flash Lite is a lightweight version of Adobe Flash Player optimized for mobile phones and other devices. Its advantage is the ability to add audio and interactive elements without the use of other technologies such as JavaScript. It is widely regarded as being simpler to use and requires less memory. However, Flash Lite applications are not capable of communicating with Bluetooth, infrared or on phone cameras.

Flash Lite for mobile phones was originally developed by Macromedia (now Adobe), with DoCoMo (Japan) and AU KDDI being amongst the first carriers to adopt the technology in June 2005. In 2006, Verizon Wireless announced broad support for Flash Lite in the US, and in 2007, Adobe announced Flash Lite would support video.

GVM (General Virtual Machine) / GNEX

GVM is SinjiSoft's Mobile Download Solution allowing subscribers to download GVM applications that are primarily composed of games, business applications, multimedia and so forth. With GVM enabled mobile phones, subscribers play downloaded content without having to reconnect.

In essence GVM is a Mobile Application Download Platform adapted to both CDMA and GSM that has been optimized for the low-end mobile phone environment. The platform is especially designed for limited devices that use low computing power consumption (ARM7 20MHz or above) and carry the smallest memory footprint (100Kb Flash, 100Kb Ram, and 200~300Kb file system).

MNOs that have adopted the platform have included SK Telecom (CDMA handsets made by Nokia, Motorola, Samsung, etc) and Orange (GSM handsets made by Samsung, LG etc).

GNEX, meanwhile, is the next generation of Sinjisoft's GVM. It allows multimedia content to be downloaded via the wireless interface. With numerous extensions, GNEX delivers colour 3D graphics and sound to wireless games. SK Telecom (CDMA) in South Korea and Partner Communication (GSM/GPRS) in Israel have already committed to its use.

GPRS (General Packet Radio Service)

This is a mobile data service available to users of GSM (Global System for Mobile Communications) mobile phones. It is often described as "2.5G", a technology that sits between the second (2G) and third (3G) generations of mobile telephony. It provides moderate speed data transfer, by using unused TDMA (Time Division Multiple Access) channels in the GSM network. GPRS has been integrated into GSM standards releases since Release 97.

GSM (Global System for Mobile Communications)

GSM is the most popular standard for mobile phones in the world, used by over 2Bn people in more than 210 countries and territories. It differs significantly from its predecessors in that both signaling and speech channels are of digital call quality.

i-appli

Sometimes called "Java for i-mode", i-appli is a Java environment based on CLDC (Connected Limited Device Configuration). It is used on handsets in NTT DoCoMo's i-mode service.

i-Mode / DoJa

i-mode is a type of wireless internet for mobile phones created by the Japanese telco NTT DoCoMo, much along the lines of WAP, which enables customers to subscribe to 'games channels', sampling as much content as they want from the channel for a fixed fee. Often mistakenly described as a platform the games that are played on i-mode still run using platforms such as J2ME, BREW, Symbian etc.

DoJa, meanwhile, is a Java environment specification for NTT DoCoMo's i-mode mobile phone. It allows i-mode to offer more dynamic and interactive content than conventional HTML-based i-mode content. The DoJa profile was originally created for the Japanese market.

iPhone

The iPhone (designed and marketed by Apple Inc) is a multimedia and Internet-enabled quad-band GSM EDGE-supported mobile phone with a wide range of features. User input is accomplished via a multi-touch screen with virtual keyboard and buttons. Whilst Apple itself has yet to publish games for the i-phone platform (it is in the process of setting up an in-house development capability) a number of third party developers have already done so.

J2ME (Java 2 Platform, Micro Edition)

Java is a high level programming language developed by Sun Microsystems, simplified to eliminate common programming errors. Java has taken a lead in the mobile content space with its J2ME Software Development Platform and is particularly strong in the UK and Europe.

Originally envisaged to be a standard platform that would be identical on any handset from any manufacturer and, consequently, able to run any piece of compatible software, the wide-ranging

hardware differences between ever-evolving phone models has undermined Sun's strategic vision for the platform.

As a result, although J2ME exists as a single product name and shares a fundamental core, there are subtle differences in its implementation on various handsets – one reason why a particular game can sometimes run on one handset, but not another.

Java continues to evolve and the market has witnessed the transition from older versions of J2ME components to more modern iterations. Called Mobile Information Device Profiles (MIDPs), they are part of the platform that specifies just what can be achieved by applications made to run on J2ME.

Initially handsets featured MIDP 1.0, which was not well-suited to gaming. Its restricted graphical performance was the main drawback, whilst its successor, MIDP 2.0, is much more powerful.

Meanwhile, J2ME is a relatively easy programming language to master, being similar to C++. However, with so many different versions of J2ME, each one for a different family of mobile phone handsets, even if developers only aim to cover the popular handsets the cost of testing can outstrip that of the game's creation.

KJava

KJAVA is a Java derivation. It is an outdated version of J2ME and was derived from an early package of Java software for PalmOS, released in 2000. It defines a subset of limited Java-commands used in low-memory environments such as i-appli-capable mobile phones and smartphones.

KVM (“Kilobyte” Virtual Machine)

The KVM is a compact Java Virtual Machine (JVM) that is designed for small devices. It supports a subset of the features of the JVM. For example, the KVM does not support floating-point operations and object finalization. The CLDC (Connected Limited Device Configuration) specifies the use of the KVM. According to folklore, the 'K' in KVM stands for kilobyte, signifying that the KVM runs in kilobytes of memory, as opposed to megabytes.

Linux

Linux (launched in 1991) is a Unix-like computer operating system. It is one of the most prominent examples of free software and open source development; its underlying source code can be freely modified, used, and redistributed by anyone.

Linux is supported by corporations such as Dell, HP, IBM, Novell, Oracle, Red Hat and Sun Microsystems and is used in a wide variety of computer hardware, including desktop computers, supercomputers, video game consoles, mobile phones and routers.

Location-based Games (LBGs)

Location-based (or location-enabled) games are ones in which the game play progresses via a player's location. As a consequence LBGs almost always support some kind of localization technology, such as GPS (Global Positioning System), Bluetooth or UWB (Ultra-Wide Band).

BotFighters, developed by It's Alive! and released in 2000, was one of the first LBGs on mobile phones. However, one of the most significant examples of an LBG with a large community is the single-player game *Geocaching*. This is a kind of treasure hunt which is usually played using hand-held GPS receivers or mobile handsets with built-in GPS functionality.

There is a widely held belief within the gaming community that LBGs and Motion Sensing Games (see later) will be strong growth areas in the mobile games space in the near to medium term.

MIDP (Mobile Information Device Profile)

See J2ME

MMS (Multimedia Messaging Service)

This is a standard for telephony messaging systems that allows sending messages that include multimedia objects (images, audio, video, rich text) and not just text as in Short Message Service

(SMS). Having evolved from SMS it is mainly deployed in cellular networks along with other messaging systems like SMS, Mobile Instant Messaging and Mobile E-mail. MMS mobile games often take on the guise of simple single and multiplayer Q&A games, involving the use of both text and images.

Mophun

Mophun, a Synergenix Interactive creation, is a gaming accelerator designed to bridge the gap between traditional console based and mobile games. Mophun has been described as "a software based gaming console for mobile terminals." It has some conceptual similarities to Java, such as running programs in a virtual machine, rather than directly on the device. As a result they can become platform-independent. However, unlike the Java version for mobile devices, Mophun was designed specifically for game development.

Motion-Enabled / Motion Sensing Gaming

Developers have recently released new games that replicate Nintendo Wii's motion controller on mobile camera phones. By making use of phones' internal cameras players can swing phones to simulate movement, such as throwing darts or spears at virtual targets.

Meanwhile, in April 2007 GestureTek announced that NTT DoCoMo in Japan would start embedding its EyeMobile gesture-recognition technology into two new handsets for games applications.

GestureTek's software supports three main types of motion: shake, rock and roll, but is less sensitive than using accelerometers (prevalent in Nintendo's Wii) and gyroscopes. Those devices track movements three-dimensionally, while GestureTek's EyeMobile software only tracks movements in two dimensions.

Multiplayer Games

(i) "Pass and Play" Multiplayer Games

At their most basic level multiplayer games involve no connectivity. They are simply games on a mobile handset which allow one player to play and register a score, and then, in turn, pass the handset onto second player who then has to try and improve upon the first player's performance.

(ii) WAP / GPRS Multiplayer Games

By using GPRS developers can connect a number of mobile gamers with a single server and share data among the players. Some developers have succeeded in developing "cross platform games", allowing mobile game players to play against PCs. WAP and GPRS are ideal for supporting "turn based games" and "small RPG games".

In these types of games, the game communicates with a global server which acts like a router between the mobile phones. Such gaming set-ups consume very little bandwidth.

(iii) UMTS, HSDPA and 3G Multiplayer Games

Faster connections like UMTS, HSDPA (High Speed Downlink Packet Access) and 3G allow real time multiplayer gaming though speeds will still give some level of latency, namely the time between sending a request and receiving a response. This latency lag means that mobile based multiplayer games are slower to respond than PCs using a LAN or the internet.

Nothing affects the user's enjoyment of a real-time game more than the degree of perceived latency. As a result the development of a real-time multiplayer mobile game must allow for latency in both the game design and the software architecture. At the same time the intermittent connectivity of wireless networks and the highly interruptible nature of mobile gaming sessions - receiving a phone call in the middle of the game is a common occurrence - require consideration in a game's design.

(iv) See also Bluetooth Multiplayer – Games

N-Gage / N-Series

The N-Gage is a mobile telephone and handheld game system based on Nokia's Series 60 platform. It was launched in October 2003 and attempted to lure gamers away from Nintendo's Game Boy Advance

by including cellphone functionality. This was unsuccessful, partly because the buttons, designed for a phone, were not well-suited for gaming.

By the end of 2006 Nokia had effectively abandoned the dedicated handheld gaming device, whilst in December 2007 the company began transferring its N-Gage games platform onto its N81 and N81 8GB smartphones, with games ready for download from Nokia's official web site.

The N81 and N81 8GB are members of Nokia's N-series family of convergence mobile devices, which support digital multimedia services such as music playback, video capture, photography, mobile gaming and Internet services. All devices support high-speed wireless technologies such as 3G, HSDPA, or Wireless LAN.

OpenGL ES (Open GL for Embedded Systems)

OpenGL ES is a cross-platform Application Programming Interface (API) for *advanced embedded graphics* (2D and 3D) on consoles, phones, appliances and vehicles. It consists of subsets of the desktop version of OpenGL, and helps to create a flexible interface between software and graphics acceleration.

The API makes it easy and affordable to offer a variety of advanced 3D graphics and games across all major mobile and embedded platforms. Since OpenGL ES is based on OpenGL, no new technologies are required. This ensures synergy with, and a migration path to and from desktop OpenGL – the most widely adopted cross-platform graphics API.

Palm

A Palm device is personal digital assistant (PDA) from Palm, Inc, the first models having been the PalmPilot 1000 and 5000 introduced in early 1996.

In 2003 Palm Inc divided itself into independent hardware and software businesses, named palmOne and PalmSource. The hardware company, palmOne, which later reverted back to the name Palm, produces the company's handheld PDAs and smartphones, including the Treo brand, acquired from Handspring Inc. in 2003.

The Software Platform

PalmSource was set up to license the Palm OS platform, which includes the operating system and HotSync technology that synchronizes data between handhelds and desktop machines. Running on a variety of CPUs from Motorola, Intel, TI and ARM, the Palm OS has been used in more than 40m handhelds and smartphones worldwide. In 2005 PalmSource became a wholly owned subsidiary of Japan-based ACCESS Co Ltd and at the end 2006 was renamed ACCESS Systems Americas.

In addition to a wide range of utility software Palm devices have had several hundreds of games created for the platform over the past decade, many of which can now be played on the Smartphone variants of the Palm range.

PDAs (Personal Digital Assistants)

These are handheld devices that were originally designed as personal organisers, but have become much more versatile over the years. The many uses and tasks of a basic PDA include: calculating, clock and calendar functions, playing computer games, accessing the Internet, sending and receiving E-mails, using as a radio or stereo, video recording, recording notes, using as an address book, and using as a spreadsheet. Current PDAs have colour screens and audio capabilities, enabling them to be used as mobile phones (PDA Phone) web browsers or media players. Many PDAs can access the Internet, Intranets or Extranets via Wi-Fi, or Wireless Wide-Area Networks (WWANs).

Personal Handy-phone System (PHS) / Personal Access System (PAS)

The Personal Handy-phone System (PHS), also marketed as the Personal Access System (PAS) and known as *Xiaolingtong* in China, is a mobile network system operating in the 1880-1930 MHz frequency band, used mainly in Japan, China and Taiwan.

PHS is essentially a cordless telephone like DECT (Digitally Enhanced Cordless Telephone), with the capability to hand over from one cell to another. PHS cells are small, with transmission power of base stations a maximum of 500 mW offering ranges measured in tens or, at most, hundreds of meters (some

can range up to about 2 kilometres in line-of-sight), as opposed to the multi-kilometre ranges of GSM. This makes PHS suitable for dense urban areas, but impractical for rural areas. At the same time the small cell sizes also make it difficult, if not impossible, to make calls from rapidly moving vehicles.

Modern PHS phones also support value-added services such as high speed wireless data / Internet connection (64 kbit/s and higher), WWW access, e-mailing, text messaging and even colour image transfer as well as the ability to play games.

Pocket PC

See Windows CE

S60 Platform, The

Formerly known as the Series 60 User Interface it is a software platform for mobile phones that uses the Symbian OS (Operating System). S60, developed primarily by Nokia, is currently considered to be one of the leading smartphone platforms in the world.

Inputs into the development of the platform come from mobile phone manufacturers, as well as software developers and Mobile Network Operators (such as Vodafone and Orange) who develop and provide S60 based mobile applications and services.

S60 supports application development in Java MIDP, C++ and Python.

Smartphones

A smartphone is any electronic handheld device that integrates the functionality of a mobile phone, personal digital assistant (PDA) or other information appliance. This is often achieved by adding telephone functions to an existing PDA (PDA Phone) or inserting "smart" capabilities, such as PDA functions, into a mobile phone. A key feature of a smartphone is that additional in-house or third-party applications can be installed on the device.

It has become increasingly difficult to define precisely what qualifies as a "smartphone". Nearly all new mobile phones have some rudimentary PDA functionality such as phonebooks, calendars, and task lists. Furthermore, BREW and Java ME devices allow for the installation of additional applications, but are still not classified as smartphones.

There are many BREW devices that boast PDA functionality and the ability to run third-party applications in native code, as well as sporting displays as large as 240x320 pixels. And yet they too are not considered to be "smartphones".

Fundamentally, Smartphones possess the following common traits: They are, in essence, voice-centric devices (voice is the primary function, data is secondary) that offer PDA-like capabilities, whereas PDAs or Personal Communicators (such as most BlackBerries) may offer voice capabilities, but they are data-centric. Smartphones are generally capable of one-handed operation, while PDAs generally require the use of both hands.

Smartphones tend to offer Internet access, e-mail access, scheduling software, built-in cameras, contact management, GPS navigation software and occasionally the ability to read business documents in a variety of formats such as PDF and Microsoft Office.

The most common operating systems used by Smartphones are Symbian, Palm OS (developed by PalmSource), Windows Mobile (formerly known as Windows CE, and developed by Microsoft), BREW (technically a platform developed by Qualcomm) and Linux.

SMS (Short Message Service)

The Short Message Service (SMS), often called text messaging, is a means of sending short messages to and from mobile phones. SMS was originally defined as part of the GSM series of standards in 1985 as a means of sending messages of up to 160 characters, to and from GSM mobile handsets. Most SMS messages are mobile-to-mobile text messages, though the standard supports other types of broadcast messaging as well. SMS games take the form of simple quizzes in which participants are invited to text back the correct answer/answers.

Symbian

This is an open standard operating system for data-enabled mobile phones (smartphones) from UK based Symbian Ltd. Symbian supports Java, PC synchronization, Bluetooth local wireless access and GPRS packet-switched data. The first phone to use the Symbian OS was Nokia's 9210 Communicator in 2001.

Having evolved from Psion's EPOC operating system, Symbian Ltd was created in 1998 by Ericsson, Nokia, Motorola and Psion. The company was created to support the EPOC OS as an independent entity. In 2004 Psion relinquished its interest in the company, leaving it in the hands of Ericsson, Panasonic, Siemens AG, Nokia and Sony Ericsson.

There are a number of Smartphone user interface platforms based on Symbian OS, including 'open platforms' UIQ, Nokia's Series 60, Series 80 and Series 90 and 'closed platforms' such as that developed for NTT DoCoMo's FOMA handsets. This adaptability allows Symbian OS to be used on smartphones with a variety of form factors (e.g. clam-shell or "monoblock"/"candybar", keypad- or pen-driven).

The Symbian OS competes with other mobile operating systems, such as Windows Mobile, Palm OS and Linux. It also competes with the embedded operating systems used on lower-end phones, such as NOS (Nokia OS) and OSE (Open Services Environment).

Symbian is also a solid games platform in its own right. However, some Symbian games cost as much as £8, as they can be five times the size of a J2ME game. Nevertheless, as Symbian is the same on every Symbian handset (making it a less fractured market) it can save developers time and money.

TDMA (Time Division Multiple Access)

The acronym "TDMA" is also commonly used in the USA to refer to a specific second generation (2G) mobile phone standard, more properly referred to as IS-136 or D-AMPS, which uses the TDMA technique to timeshare the bandwidth of the carrier wave.

UIQ (Formerly known as User Interface Quartz)

UIQ (from UIQ Technology) is a software platform based upon the Symbian OS. Essentially this is a graphical user interface layer that provides additional components to the core operating system, enabling the development of feature-rich mobile phones that are open to expanded capabilities through third-party applications. All UIQ-based phones also support Java applications.

UIQ is pre-integrated and tested with Symbian OS. By using the UIQ software platform it is possible to create an entire portfolio of highly diversified phones for different user segments.

In October 2007 Motorola bought 50% of UIQ Technology from Sony Ericsson (who, in turn, had bought it from Symbian Ltd for an undisclosed sum).

UMTS (Universal Mobile Telecommunications System)

This is one of the 3G mobile phone technologies, using W-CDMA as the underlying standard. To differentiate UMTS from competing network technologies, it is sometimes marketed as 3GSM, emphasizing the combination of the 3G nature of the technology and the GSM standard which it was designed to succeed. UMTS supports up to 1920 kbit/s data transfer rates. Meanwhile, in Japan upgrades to 3 Mbit/s are in preparation.

UniJa

In 2004 Sun Microsystems, China Unicom and ZRRT (Beijing ZRRT Communication Technology Co. Ltd.) signed an agreement to deliver advanced mobile data, information and entertainment services to China Unicom wireless subscribers.

This development helped to speed the deployment of mobile services such as Java games. The relationship built on an existing Sun/China Unicom/ZRRT alliance announced in September 2003 to develop and deliver Java technology-based mobile applications and services under the brand name – UniJa.

China Unicom selected Sun's Java Technology for the Wireless Industry (JTWI) platform to develop its own solutions and create a complete end-to-end UniJa environment. The UniJa platform has enabled

delivery of online and offline games, enterprise services, communications services, entertainment services, e-trade and e-commerce capabilities.

WAP (Wireless Application Protocol)

This is a standard that enables mobile phones to access Internet type text based services such as email, news, travel, entertainment, finance, sport etc. It is also used as the bearer technology for features such as MMS, making it ideal for simple Q&A quiz games.

W-CDMA (Wideband Code Multiple Access)

W-CDMA was originally developed by NTT DoCoMo as the air interface for their 3G network - FOMA. Later W-CDMA was selected as the air interface for UMTS, the 3G data part of GSM. Attempts were made to unify W-CDMA (3GPP) and CDMA-1X (3GPP2) standards in order to provide a single worldwide standard. However, divergent requirements resulted in the two incompatible standards being retained.

Willcom

Willcom is a Japanese PHS (Personal Handyphone Service) operator, offering flat-rate wireless network data transmission and flat-rate voice calls for its subscribers and offering coverage of practically all of Japan.

The company was formerly known as **DDI Pocket** and was a subsidiary of KDDI Corporation. In 2004 the Carlyle Group (a Venture Capital specialist) acquired a majority stake from KDDI and changed the name of the company to Willcom in February 2005.

With other PHS operators in Japan withdrawing their services, Willcom has emerged as the only remaining PHS operator of any note. PHS was initially popular because of its lower costs, but Mobile Network Operators (MNOs) have subsequently reduced their charges. At the same time the geographical coverage of Japan's MNOs has expanded to match that of PHS. The competitive advantage of PHS was accordingly diminished until its launch of a flat-rate service and the buyout by Carlyle.

Windows CE / Windows Mobile / Windows Mobile for Pocket PC

Windows CE (also known as Windows Embedded CE or WinCE) is a variation of Microsoft's Windows operating system for minimalistic computers and embedded systems. Windows CE is a distinctly different kernel, rather than a trimmed-down version of desktop Windows, and has been optimized for devices that have minimal storage.

Many platforms have been based on the core Windows CE operating system, including Microsoft's Pocket PC 2000, Pocket PC 2002, Mobile 2003, Mobile 2003 SE, Mobile 5.0, Mobile 6.0 Smartphone 2002 and Smartphone 2003.

Windows Mobile is best described as a subset of platforms based on a Windows CE underpinning. Currently, Pocket PC (now called Windows Mobile for Pocket PC), SmartPhone, and PocketPC Phone Edition are the three main platforms under the Windows Mobile umbrella.

Pocket PC and Windows Mobile is a Microsoft-defined custom platform for general PDA use, and consists of a Microsoft-defined set of minimum profiles (Professional Edition, Premium Edition) of software and hardware.

The SmartPhone platform is a feature rich OS and interface for cellular phone handsets. SmartPhone devices generally resemble other cellular handset form factors, whereas most Phone Edition devices use a PDA form factor with a larger display.

Competitors to consumer CE based PDA platforms like Pocket PC – the main application of Windows CE – are Java, Symbian OS, Palm OS and Linux based packages.

WIPI (Wireless Internet Platform for Interoperability)

Introduced in 2005 WIPI is the standard specification for the mobile platform developed by the Mobile Platform Special Subcommittee of the Korea Wireless Internet Standardization Forum (KWISF). It is a

middleware platform that allows mobile phones, regardless of manufacturer or carrier, to run internet applications.

The South Korean government requires that all cellular phones sold in that country include the WIPI platform, effectively preventing most foreign manufacturers from selling their phones in Korea. However, it recently revised its rules allowing low-cost phones using 3G (third generation) mobile phone technology to be sold without the WIPI platform, as long as they do not have internet functionality. Phones that can access the internet are still required to include the WIPI platform.

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