Mobile Streams

www.mobilestreams.com

“YES 2 3G” - White Paper

February 2001

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CONTENTS

The full 3G report, "YES 2 3G" is divided into the following sections:

1. INTRODUCTION

This white paper is a summary version of the report "Yes 2 3G" which contains nearly 300 pages of highly detailed information on all aspects of the Third Generation of mobile telecommunications. Written in an easy to read, non-technical style we hope you find it useful. For the complete picture, there is no replacement for the full version of "Yes 2 3G". To order your copy for just 495 US dollars, visit www.mobile3G.com or contact Mobile Streams.

The telecommunications world is changing as the trends of media convergence, industry consolidation, Internet and Internet Protocol (IP) technologies and mobile communications collide into one. Significant change will be bought about by this rapid evolution in technology, with Third Generation mobile Internet technology a radical departure from that that came before in the first and even the second generations of mobile technology. Some of the changes include:

- People will look at their mobile phone as much as they hold it to their ear. As such, 3G will be less safe than previous generations- because television and other multimedia services tend to attract attention to themselves- instead of hands-free kits, we will need eyes-free kits!

- Data ("non-voice") uses of 3G will be as important as and very different from the traditional voice business

- Mobile communications will be similar in its capability to fixed communications, such that many people will *only* have a mobile phone

- The mobile phone will be used as an integral part of the majority of people's lives- it will not be an added accessory but a core part of how they conduct their daily lives. The mobile phone will become akin to a remote control or magic wand that lets people do what they want when they want

As with all new technology standards, there is uncertainty and the fear of displacement. Third Generation (3G) mobile is topical and contentious for several reasons:

- Because the nature and form of mobile communications is so radically changed, many people do not understand how to make money in the nonvoice world, and do not understand their role in it

- 3G licenses have been awarded around the world, in many cases at huge cost, necessitating that existing mobile communications companies in the 2G world think about and justify their continued existence

- 3G is based on a different technology platform- Code Division Multiple Access (CDMA)- that is unlike the Time Division Multiple Access (TDMA) technology that is widely used in the 2G world. GSM (Global System for Mobile Communications) was based on TDMA technology

- The US, Japanese and European mobile players all have different technology competences and are now unified in this single standard- the separate wireless evolution paths and European wireless leadership are thereby challenged

- Japanese network operators will be the first to implement 3G networks in the year 2001, and Japanese terminal manufacturers, who have not had much market share outside their home market, will be first with 3G terminals

- Many industry analysts and other pundits have questioned the return on an investment in 3G technology- questioning whether network operators will be able to earn an adequate return on the capital deployed in acquiring and rolling out a 3G network.

- Many media and Internet companies have shown a strong interest in using 3G technology as a new channel to distribute their content, opening the opportunity for new entrants and new partnerships and value chains.

2. SUMMARY OF MOBILE STREAMS' VIEW ON 3G

As detailed in its full "Yes 2 3G" report, Mobile Streams believes relating to 3G:

- 3G can be thought of as 2.5G services such as GPRS plus entertainment (games, video, mobile multimedia) plus new terminals. 3G brings with it significantly more bandwidth. Whereas GPRS terminals will have the same range of form factors as today's 2G phones do, many 3G terminals will be video centric.

- There is a clear business case for investing in 3G for existing network operators that are facing congested 2G networks. Voice traffic over 3G networks will be the cash cow that supports and ensures the 3G business case can pay for itself. The main positive (rather than defensive) reason for mobile network operators to secure 3G network licenses is to solve capacity issues in terms of enabling far greater call capacity than today's digital mobile networks allow.

- Nonvoice (data) traffic will also be huge, with new mobile multimedia applications such as mobile postcards, movies and music driving new applications and services along with corporate applications. Applications and services available through the Internet, intranet and extranet will drive the interest in and traffic on 3G networks.

- Providing that network operators adopt an open model to all Internet traffic, the business case for 3G fuelled by both greater data and voice traffic is clear and Mobile Streams is confident that the business case for winning and rolling out a 3G network is compelling. If the network operator insists upon a closed model in which data traffic is funneled primarily through its own in-house portal or limits access to its customers for eCommerce and other Internet services, the business case is endangered.

- Third Generation technology is essential- think about the huge change that will happen in the next five years from today's rudimentary and crude text based if elegant services such as Short Message Service to moving video clips.

- It is often assumed that early adopters will be corporate customers for 3G, but Mobile Streams expects that since consumer electronics devices as their name suggests appeal to consumer markets and will have 3G built in. Mobile multimedia-games, entertainment and the like are much more consumer oriented that the buttoned down sober suited business people. Mobile Streams expects 3G to be a consumer revolution and not a corporate one.

- Many people will not have a fixed phone at home. Preventing this until now has been the slow speed of mobile data in 2G and even so called 2.5G technology that has made Internet access the principle application for home phones.

- There will be a lot of suppliers of mobile terminals as Japanese, mobile handheld computer manufacturers (Palm, Microsoft), information appliance and IT suppliers enter the global mobile terminal market. Mobile enabled devices will proliferate as all portable consumer electronics devices get mobile communications (and short range wireless communications) technology built-in. The successful handset vendors will be those that can deliver new products rapidly and reliably.

  Given the fragmented market for wireless phones, alliances and mergers between Korean, Japanese, European and American mobile phone and consumer electronics manufacturers will continue and accelerate since few if any companies have all the enabling technologies in-house from video to camera to mobile to interfaces. Smaller players in all of these sectors will continue to consolidate, as companies such as Sagem and Benefon (with data skills and location centric smart phones respectively) are acquired to gain better distribution for their technologies.

- 3G terminals will be very significantly more complex than today's GSM phones, because of the need to support video, more storage, multiple modes and new software and interfaces, better battery life and so on. Given that the biggest single inhibitor of take up of new services such as Wireless Application Protocol (WAP) and High Speed Circuit Switched Data (HSCSD) has already proven to be a lack of handsets, and given that every stage in the data evolution path for GSM from today to 3G requires a new handset, once again we see that terminals are mission critical and their timely volume availability will be critical factor in determining when 3G is a success.

- Partnerships will increasingly develop between (US based) Internet, IT and IP companies, traditional mobile communications vendors (from Europe and the USA) and (Japanese) consumer electronics manufacturers. Different regions have different strengths and are likely to leverage them through strategic alliances.

- From a network operator technology point of view, the introduction of packet data services such as GPRS to circuit switched networks is more challenging than the move from GPRS to 3G- this is because GPRS is the first time addition of packet capability to a circuit switched network, whereas 3G is the addition of more packet.

- From an end user point of view, the move from GPRS to 3G is much more revolutionary than the move from Second Generation data services to GPRS. GPRS allows the mobile network to catch up with the data bandwidths available over fixed telecommunications networks, whereas 3G provides unprecedented bandwidth for mobile users, so much bandwidth that new applications will need to be invented to use it.

3. THE STANDARDS FOR 3G

Third Generation (3G) is the mobile phone system that will be begin to be available commercially in the year 2001/2. The idea behind 3G is to unify the disparate standards that today's second generation wireless networks use. Instead of different network types being adopted in The Americas, Europe and Japan, the plan is for a single network standard to be agreed and implemented.

3G STANDARDIZATION PROCESS

In 1998, the International Telecommunications Union (ITU) (see www.itu.int) called for Radio Transmission Technology (RTT) proposals for IMT-2000 (originally called Future Public Land Mobile Telecommunications Systems (FPLMTS)), the formal name for the Third Generation standard. Many different proposals were submitted: the DECT and TDMA/ Universal Wireless Communications organizations submitted plans for the RTT to be TDMA-based, whilst all other proposals for non-satellite based solutions were based on wideband CDMA- the main submissions were called Wideband CDMA (WCDMA) and cdma2000. The ETSI/ GSM players including infrastructure vendors such as Nokia and Ericsson backed WCDMA. The North American CDMA community, led by the CDMA Development Group (CDG) including infrastructure vendors such as Qualcomm and Lucent Technologies, backed cdma2000.

3GPP

In December 1998, the Third Generation Partnership Project (3GPP) was created following an agreement between six standards setting bodies around the world including ETSI, ARIB and TIC of Japan, ANSI of the USA and the TTA of Korea. This unprecedented cooperation into standards setting made 3GPP responsible for preparing, approving and maintaining the Technical Specifications and Reports for a Third Generation mobile system based on evolved GSM core networks and the Frequency Division Duplex (FDD) and Time Division Duplex (TDD) radio access technology. For example, ETSI SMG2 activities on UMTS have been fully transferred to 3GPP. The Chinese and the CDMA Development Group were unfortunately not original members of the 3GPP.

In the first half of 1999, much progress was made in agreeing a global IMT-2000 standard that met the political and commercial requirements of the various technology protagonists- GSM, CDMA and TDMA. In late March 1999, Ericsson purchased Qualcomm's CDMA infrastructure division and Ericsson and Qualcomm licensed each other's key Intellectual Property Rights and agreed to the ITU's "family of networks" compromise to the various standards proposals.

3 AIR INTERFACE MODES

The proposed IMT-2000 standard for Third Generation mobile networks globally is a CDMA-based standard that encompasses THREE OPTIONAL modes of operation, each of which should be able to work over both GSM MAP and IS-41 network architectures. The three modes are:

MODE	TITLE	ORIGIN	SUPPORTERS
1	IMT DS WCDMA Direct Spread FDD (Frequency Division Duplex)	Based on the first operational mode of ETSI's UTRA (3G Terrestrial Radio Access) RTT proposal.	Japan's ARIB (Association of Radio Industries and Businesses, the Japanese standards setting body) and GSM network operators and vendors. To be deployed in Japan and Europe.
2	IMT MC cdma2000 Multi-Carrier FDD (Frequency Division Duplex)	Based on the cdma2000 RTT proposal from the US Telecommunications Industry Association (TIA). Consists of the 1XRTT and 3XRTT components	cdmaOne operators and members of the CDMA Development Group (CDG). Likely to be deployed in the USA.
3	IMT TC UTRA TDD (Time Division Duplex)	The second operational mode of ETSI's UTRA (3G Terrestrial Radio Access) RTT proposal. An unpaired band solution to better facilitate indoor cordless communications.	Harmonized with China's TD-SCDMA RTT proposal. Probably will be deployed in China.

TABLE 2: SOURCE MOBILE STREAMS

Having three different modes, one for Europe and Asia, one for Japan and one for the US is not all that different from the existing 2G situation. The main change is that Japan has joined the European GSM community and based WCDMA.

As can be seen from the table above, there are several different names for each of the air interface modes, and furthermore, new names are regularly introduced! For the sake of this book, we refer to WCDMA, cdma2000 and FDD wherever possible, and refer to UWC 136 and UMTS separately.

In fact, strictly speaking, the final ITU recommendations for IMT-2000 stipulated five terrestrial radio interface standards when DECT (IMT FT) and EDGE (IMT SC or IWC 136) are included. EDGE and DECT will NOT be the topic of this introduction to 3G.

There are three radio interface modes with two (existing) major core network standards- GSM MAP and TIA IS-41 (from Telecommunications Industry Association, a US standards setting body). The core network is the physical network infrastructure to which the radio access network is connected in a mobile network. A radio access network is the portion of a mobile network that handles subscriber access, including radio base stations and other nodes.

3G DATA RATES

The International Telecommunications Union (ITU) has laid down some indicative minimum requirements for the data speeds that the IMT-2000 standards must support. These requirements are defined according to the degree of mobility involved when the 3G call is being made. As such, the data rate that will available over 3G will depend upon the environment the call is being made in:

HIGH MOBILITY
144 kbps for rural outdoor mobile use. This data rate is available for environments in which the 3G user is traveling more than 120 kilometers per hour in outdoor environments. Let us hope that the 3G user is in a train and not driving along and trying to use their 3G terminal at such speeds.

FULL MOBILITY
384 kbps for pedestrian users traveling less than 120 kilometers per hour in urban outdoor environments.

LIMITED MOBILITY
At least 2 Mbps with low mobility (less than 10 kilometers per hour) in stationary indoor and short range outdoor environments These kinds of maximum data rates that are often talked about when illustrating the potential for 3G technology will only therefore be available in stationary indoor environments.

4. 3G NETWORK NODES

3G networks will require new radio and core network elements:

RADIO NETWORK

A new air interface is needed for 3G. This will require new Base Station Systems (BSSs). Specifically, the BSS changes needed are:

The 3G radio access network will comprise a RNC (Radio Network Controller) and Node B.

RADIO NETWORK CONTROLLER

A Radio Network Controller (RNC) will replace the Base Station Controller. The RNC will include support for connection to legacy systems and provide efficient packet connection with the core network packet devices (SSGN or equivalent). The RNC performs radio network control functions that include call establishment and release, handover, radio resource management, power control, diversity combining and soft handover.

NODE B

A Node B is equivalent to a Base Station in the 2G network but also incorporates support for the 3G air interfaces.

CELL PLANNING

New cell planning methods will be needed to support the new frequency allocations for 3G and the radio interface changes- more 3G base stations will be needed compared to the comparable 2G coverage area. This gives an advantage to GSM 1800 and 1900 network operators whose cells already cover a smaller coverage area than those for GSM 900 networks. GSM 900 network operators will need to “fill in” coverage in between existing cell sites.

CORE NETWORK

The 3G core network will be an evolution from GPRS or equivalent 2.5G core network systems. GPRS nodes such as the Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN) are described in detail in “Data on GPRS” from Mobile Streams. Upgrades to the mobile and transit switching systems to deliver packets will also be needed.

A new piece of network infrastructure for 3G is Media Gateways (MGW) that resides at the boundary between different networks to process end user data such as voice coding and decoding, convert protocols and map quality of service. The connectivity layer also provides access to backbone switches and non-mobile networks such as Cable Television. In some vendor solutions, MGWs are controlled remotely by the Mobile

Switching Centre (MSC) and GSN servers by means of the Gateway Control Protocol. The ITU Study Group 16 and the IETF Megaco H.248 are working to ensure the GCP is an open standard protocol.

Existing network operators can then upgrade their Mobile Switching Centre (MSC) and GSNs to implement 3G OR ALTERNATIVELY to implement a new standalone MGW that is controlled from the server part of an upgraded 2G node.

BACKBONE NETWORK

The radio network will be connected to the core network by a backbone network allowing wideband access and interconnection of subscribers. The 3G backbone network can use any transport technology but is certain to be based on packet technologies such as Asynchronous Transfer Mode (ATM) and Internet Protocol (IP). The backbone network is built as a mesh of IP routing or ATM switching nodes interconnected by point to point links. Technologies such as IP over ATM may be used that uses ATM switching to multiplex IP traffic. This IP over ATM architecture supports voice traffic alongside IP. Many vendors prefer a "pure" end to end IP approach whereas others (such as Fujitsu profiled below) prefer an ATM/ IP hybrid to guarantee quality of service.

Alternatively, IP over SONET/ SDH is a different backbone network solution that eliminates the ATM layer by establishing point to point links between IP routers directly over SONET/ SDH rings which run over a Dense Wavelength Division Multiplexing (DWDM) layer that enables Terabits per second (Tbits/s) of aggregate network bandwidth.

SUPPORT SYSTEM CHANGES

Of course, platforms and systems such as the value added service centers, gateways, billing systems, customer service elements, Intelligent Network systems and the like will also need to be upgraded. Once again, this is likely to be an evolution from 2.5G data centric services such as GPRS where packet charging elements and so on where introduced.

There may also need to be a change in personnel as more applications specialists, alliance managers, Internet sector managers and the like are hired to develop content and applications over 3G networks.

5. TIMESCALES FOR 3G

When a new service is introduced, there are a number of stages before it becomes established. 3G service developments will include standardization, infrastructure development, network trials, contracts placed, network roll out, availability of terminals, application development, and so on. These stages for 3G are shown in Table 4 below:

DATE	MILESTONE
Throughout 1999	3G radio interface standardization took place, and initial 3G live demonstrations of infrastructure and concept terminals shown
2000	Continuing standardization with network architectures, terminal requirements and detailed standards
May 2000	The formal approval of the IMT-2000 Recommendations will be made at the ITU Radiocommunication Assembly in early May
2000	3G licenses are awarded by governments around Europe and Asia
2001	3G trials and integration commence
2001	3G launched in Japan by NTT DoCoMo
Summer of 2001	First trial 3G services become available in Europe
Start of 2002	Basic 3G capable terminals begin to be available in commercial quantities
Throughout 2002	-Network operators launch 3G services commercially and roll out 3G. -Vertical market and executive 3G early adopters begin using 3G regularly for nonvoice mobile communications
2002/3	New 3G specific applications, greater network capacity solutions, more capable terminals become available, fuelling 3G usage
2004	3G will have arrived commercially and reached critical mass in both corporate and consumer sectors.

TABLE 4- SOURCE MOBILE STREAMS

6. 3G SPECIFIC APPLICATIONS

There are several applications that will be enabled by the broadband bandwidth that will come with 3G. These applications include:

AUDIO

Audio or video over the Internet is downloaded (transferred, stored and played) or streamed (played as it is being sent but not stored). The later tends to be of lower quality than the former. Content is transferred using various different compression algorithms such as those from Microsoft or Real Networks or the MPEG-1 Audio Layer 3 (better known as MP3) protocol. In fact, MP3 is a codec- a compression/ decompression algorithm. MP3 was invented in 1987 in Germany and approved by the Moving Pictures Experts Group, a part of the International Organization for Standardization, in 1992.

With 3G, MP3 files will be downloadable over the air directly to your phone via a dedicated server. There are numerous business models to allow both the network providers as well as the copyright owners of the MP3 material to benefit financially. Mobile Streams expects that the integration of mobile telephony with everyday consumer products will emerge within the next four years to the extent that we will be able to retrieve data – be it voice, Internet or Music – anytime, anyplace through the next generation of mobile devices.

The era of downloading multimedia content from the Internet over fixed telecommunications and cable links to PCs is only just beginning and is dependent upon bandwidth to a large degree- with quality of image and availability of service inversely proportionate to the amount of available bandwidth.

Due to bandwidth constraints, currently, users go online and downloaded files to their portable device over the fixed network which are then watched and listened to a later date- there is no real time audio and video streaming over mobile networks.

Since even short voice clips occupy large file sizes, high speed mobile data services are needed to enable mobile audio applications. The higher the bandwidth, the better- hence the attractiveness of 3G for mobile multimedia applications such as mobile audio and video.

VOICE OVER INTERNET PROTOCOL

Another audio application for 3G is Voice over IP (VoIP)- the ability to route telephone calls over the Internet to provide voice telephony service at local call rates to anywhere in the world. With 3G and higher rate 2.5G technologies such as EDGE, VoIP will be available for the first time on mobile phones. To make a voice call, Voice Over IP can be used as an alternative to regular service. The irony here being is that voice has now become an application- and a very popular one- in its own right!

VoIP is not however a replacement for standard voice services since VoIP services are bandwidth demanding- there needs to be a high switching rate on the IP backbone to minimize the very high likelihood of delayed and lost packets.

STILL IMAGES

Still images such as photographs, pictures, letters, postcards, greeting cards, presentations and static web pages can be sent and received over mobile networks just as they are across fixed telephone networks.

Two variables affect the usability of such applications- bandwidth and time - and they are inversely related. The faster the bandwidth, the less time is needed to transmit images, and vice versa. This is the reason why transmission of image based rather than textual information has not been a popular nonvoice mobile application until now- it takes too long given the slow data transmission speeds that were available prior to the introduction of mobile packet data.

Once captured, images can then be sent directly to Internet sites, allowing near real-time desktop publishing. The size of the file for a picture depends on the resolution and type of compression. Typically each picture is between 50K and 100K in the JPEG format. This can be transmitted quickly using mobile packet data.

Still image transmission is a much touted application for lower packet data services such as GPRS and beyond. Many people see still images as a killer compelling applications for GPRS.

Whilst a picture paints a thousand words, and this amount of text can easily be handled by GPRS, we expect the single image to be used instead!

MOVING IMAGES

Sending moving images in a mobile environment has several vertical market applications including (monitor sensor triggered) monitoring parking lots or building sites for intruders or thieves, and sending images of patients from an ambulance to a hospital. Videoconferencing applications, in which teams of distributed sales people can have a regular sales meeting without having to go to a particular physical location, is another application for moving images that is similar to the document sharing/ collaborative working applications reviewed below. Skeptics argue that vertical markets don't need video and consumer s don't want it. However, with the Internet becoming a more multimedia environment, 3G will be able displaying those images and accessing web services.

The transmission of moving images is one of the applications that GPRS and 3G terminal and infrastructure vendors routinely and repeatedly tout as a compelling application area that will be enabled by greater data rates. And they are not incorrect to do so. However,

it must be noted that even demonstrations of one megabyte of data over the air using Microsoft NetMeeting to perform a video conference facility do not deliver smooth broadcast quality video images. However, improving compression techniques should allow acceptable quality video images to be transmitted using 64 kbps of bandwidth.

Whilst videophones have failed to alight the public's imagination on fixed networks, this could be a function of the fact that a videophone is only as good as the number of other people who have one too. Corporations with several people with video capable mobile phones could easily hold virtual remote sales meetings between all their regional sales representatives.

As such, whilst we are confident that still images such as pictures and postcards will be a significant application for GPRS, moving images may not be of high enough quality initially to elevate the communication above the medium. Users could spend all their time adjusting the size of the image on their screen and trying to work out what they are seeing.

This is where 3G comes in- once again, the bandwidth uplift it enables allows for high quality image transmission over the mobile network. As such, we see all moving video and image transmission application migrating to the 3G bearer as soon as it becomes available. By the time 3G is here, full length moves could be downloadable from Internet sites.

VIRTUAL HOME ENVIRONMENT

A Universal Mobile Telephone Service (UMTS) service that is often mentioned in the vendor's brochures is so called Virtual Home Environment (VHE), a service that simply lets customers have seamless access with a common look and feel to their services from home, office or on the move and in any city as if they were at home. VHE is therefore aimed at roamers (a small subset of total mobile phone users).

VHE could also allow some other more useful services by placing their Universal Identity Module (UIM) into ANY terminal- and those terminals could be something other than mobile devices if smart cards are more widely supported than they are today.

Virtual Home Environment could hardly be described as a killer application though, especially since email and other services are increasingly available worldwide as the Internet becomes more widespread and services migrate to the Internet and can therefore be accessed from any Internet browser- with or without a smart card!

In general, smart cards are hyped beyond their usefulness. They have very limited storage capability (64 K counts for being the state of the art) but are useful in switching devices (users are likely to have multiple devices in different form factors in the 3G

world) and for non-mobile applications such as identification and security for mobile banking and the like.

ELECTRONIC AGENTS

Electronic agents are a technology that Mobile Streams' believes will pay an important role for mobile working in the future- as agents are dispatched to carry out searches and tasks on the Internet and report back to their owners. This is an efficient way to get things done on the move.

Electronic agents are defined as "mobile programs that go to places in the network to carry out their owners' instructions. They can be thought of as extensions of the people who dispatch them." Agents are "self-contained programs that roam communications networks delivering and receiving messages or looking for information or services."

Certainly, 3G terminals will give their owners much more control over their lives than today's mobile phones. They will be eAssistants, eSecretaries, eAdvisors and eAdministrators. This kind of control is what Home Automation applications anticipate. Indeed Orange in the UK has a vision expects that within ten years, our mobiles will be waking us up, reading out our emails, ordering our groceries, telling us the best route to work, reminding us and translating our conference calls. The key question is the extent to which these processes are human initiated or computer generated and controlled and the extent to which devices can "learn" individual preferences and act accordingly.

DOWNLOADING SOFTWARE

In the twenty-first century, software will increasingly be downloaded electronically from the Internet rather than purchased as boxed product in stores. This is a like file transfer applications that involve downloading the software itself. You might for example need WinZip or Abode Acrobat to read a file- and can download that over the 3G network to your 3G terminal.

Downloading software has several advantages because it is:

- Environmentally friendly: there is no packaging to throw away or store.
- Quick and convenient: downloadable products are delivered direct to your computing device. It arrives in minutes, not days.
- Value for money: you pay no delivery charges.

DOWNLOAD TIMES

Download times vary depending on the speed of your modem and the size of the application. Typical download times vary from 10 minutes to two hours.

Here are download times for a 5 Megabyte (MB) application:

CONNECTION SPEED	DOWNLOAD TIME
Very fast corporate type connection (e.g. T1)	30 seconds
Corporate type connection (e.g. ISDN)	12 minutes
Typical home modem (e.g. 28.8 modem)	104 minutes

Sites such as beyond.com and Mobiledatashop.com from Mobile Streams offers many software products for immediate electronic download. Additionally, the Application Service Provision (ASP) market in which software platforms and server software is being hosted by third parties and accessed by client software mimics this "thin client" world in which the bandwidth is high enough for applications and files to be retrieved from the Internet on the fly whenever they are needed.

Since it relies on the bandwidth that 3G provides, 3G is likely to be the key bearer for downloading software.

7. OPTIMAL BEARER BY APPLICATIONS

By designing applications to minimize the effects of the limitations of existing mobile services- such as the length of a short message or the speed of a Circuit Switched Data call- existing nonvoice mobile services can often be successfully used for mobile working. However, many nonvoice applications are graphics intensive and the new faster data services such as 3G will allow BETTER VERSIONS of today's existing nonvoice applications.

It is often assumed that early adopters will be corporate customers for 3G, but Mobile Streams expects that since consumer electronics devices as their name suggests appeal to consumer markets and will have 3G built in. Mobile multimedia- games, entertainment and the like are much more consumer oriented that the buttoned down sober suited business people. Mobile Streams expects 3G to be a consumer revolution and not a corporate one.

The most ideal bearer for each application- 3G, GPRS or the Short Message Service (SMS).- is an important question we will consider next.

The optimal bearer for each type of application will be:

APPLICATION	**PREFERRED BEARER**
Voice over IP (VoIP)	3G
Moving Images	3G
File Transfer	3G
Downloading Software	3G
Virtual Home Environment	3G
Web Browsing	GPRS/ 3G
Document Sharing/ Collaborative Working	GPRS/ 3G
Audio	GPRS/ HSCSD/ 3G
Home Automation	GPRS/ 3G
Remote LAN Access	GPRS/ 3G
Electronic Agents	GPRS/ 3G
Dynamic Authoring	GPRS/ 3G
Job Dispatch	GPRS
Still Images	GPRS
Information Services- Qualitative	GPRS
Unified Messaging	SMS/ GPRS
Internet Email	SMS/ GPRS
Chat	SMS/ GPRS
Remote Monitoring	SMS/ GPRS
Instant Messaging	SMS/ GPRS

Mobile banking	SMS/ GPRS
Corporate email	SMS/ GPRS
Information Services- Quantitative	SMS
Affinity programs	SMS
Simple Person to Person Messaging	SMS
Voice and fax mail notifications	SMS
Prepayment	SMS
Ringtones	SMS
Electronic commerce	SMS
Customer Service	SMS
Vehicle Positioning	SMS
Over The Air	SMS
People Location	SMS
Remote Point of Sale	Circuit Switched Data

SOURCE: MOBILE STREAMS

Of course, stating optimal and primary bearers does not mean that handset vendors, network operators, application developers and customers will not develop all kinds of applications using all kinds of bearers. However, these bearers are considered to be the optimal means to deliver the customer's requirements in the most efficient and convenient way.

8. 3G MOBILE TERMINALS

As shown and described in detail in Mobile Streams “Yes 2 3G” report, there are common trends in 3G terminals:

- Bigger and better screen technology- screens will be color which unusual today and have be bright and have considerably larger screen areas in many cases than today’s phones.

- Video is central to the technology demonstration- of course, multimedia is the biggest single new understandable thing about 3G. Videoconferencing is an application that many of the concept terminals anticipates.

- Consumer electronics and mobile phones converge, as cameras are built into mobile phones. The majority of these devices include built-in miniature cameras.

- The most popular form factor that has been shown in the 3G concept devices is the video palm- a device form factor that can be held in one hand and supports video applications with varying small, medium or large screen sizes.

- Nearly all of the devices are in form factors that are familiar to us today- we may use the phone for different things and in different ways, but it will probably look similar to today’s mobile phones

The broadband bandwidth on 3G networks enables mobile multimedia as will the devices. When the networks and the devices are in harmony and the customer is king, the Three Dimensions of the Third Generation will enough a level of applications and services never before possible on mobile networks.

9. SUMMARY

The Third Generation of mobile communications will bring with it mobile multimedia with high data bandwidths and sophisticated mobile terminals and new services and applications.

This white paper is a summary version of the report “Yes 2 3G” which contains nearly 250 pages of highly detailed information on all aspects of the Third Generation of mobile telecommunications. Written in an easy to read, non-technical style we hope you find it useful. For the complete picture, there is no replacement for the full version of “Yes 2 3G”. Order your copy priced at just 495 US dollars, visit www.mobile3G.com or contact Mobile Streams.

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SUCCESS 4 SMS – SIMON BUCKINGHAM

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"Success 4 SMS" is the third edition of Mobile Streams' renowned SMS report series, to be published. The intention of this report is to show how to maximize the use of, and therefore the revenue from, the Short Message Service. "Success 4 SMS" explains and interprets both the existing and future aspects of SMS by providing both an explanation of these developments and analysis to help interpret them. The idea is to identify the critical success factors for Service – now and in the future.

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Yes 2 GPRS – Simon Buckingham

Published: August 2000 (218 A4 pages)

This report shows how to make mobile data a success by maximizing the use of, and therefore the revenue from, the General Packet Radio Service (GPRS). Education is the principle means of achieving this objective- by providing the first and only single source for accurate and comprehensive information about the development and deployment of GPRS around the world. "YES 2 GPRS" explains and interprets both the existing and future aspects of GPRS. It provides both an explanation of these developments, and analysis to help interpret them. The idea is to identify the critical success factors for the General Packet Radio Service- now and in the future

For more information visit: http://www.mobileGPRS.com
Price: 495$US
ISBN: 1929105258

Data on Prepaid – Gerald T. Christensen

Published: August 2000 (370 A4 pages)

Written by Mobile Streams' Prepaid expert, Gerry Christensen, this 131 page report has been designed to help product and service providers and those investing in systems/solutions to make more informed business decisions.

For more information visit: http://www.mobilePREPAY.com
Price: 250$US
ISBN: 1929105231

Success 4 WAP – Simon Buckingham
Published: January 2001 (190 A4 pages)

The Wireless Application Protocol (WAP) is a hot topic that has been widely hyped in the mobile industry and outside of it. Mobile Streams originally produced its first WAP book, “Data on WAP”, in July 1999. Due to rapid changes and developments this book was reissued in December 1999 before being reissued as "Yes 2 WAP" in May 2000.

For more information visit: http://www.yes2WAP.com
Price: 495$US
ISBN: 1929105215

Yes 2 3G – Simon Buckingham
Published: February 2001 (245 A4 pages)

"Data on 3G" presents an optimistic look at tremendously exciting possibilities that Third Generation/ UMTS technologies and applications enable. Timescales, profiles of all the major infrastructure vendors including the Japanese vendors, every mobile multimedia application, "At home with your futurephone"- mobile communications in the next few years, 3G Talking Points, all the 3G contracts awarded, the standards, handset alliances and partnership opportunities and much, much more are included in this report.

For more information visit: http://www.mobile3G.com
Price: 495$US
ISBN: 1929105150

Mobile Positioning – Stephen M Dye and Dr Frank Baylin
Published: November 1999 (273 A4 pages)

"Mobile Positioning" is a book about mobile positioning systems- in particular, the Global Positioning System (GPS), non-GPS location techniques and Cell Broadcast. Although the book focuses primarily on the Global Positioning System (GPS), appendixes cover other non-GPS location schemes and Cell Broadcast in considerable detail.

For more information visit: http://www.MobilePositioning.com
Price: 250$US
ISBN: 1929105134

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