# When will video be delivered to my phone?

Analysis of Mobile Video Services

## Introduction

Current technology development and enhancements both on the mobile terminals and the wireless network side will soon enable new ways for personal communications. Among the new services and applications that are feasible with the introduction of next generation networks and terminals, mobile video services will mean a substantial change to the way mobile users share their experiences and emotions, access to information and entertainment, and communicate with other people.

This white paper aims to analyse the current and future position of the mobile video services market. It includes all key aspects of offering wireless video services, from handset and network video related technologies and standards to the mobile operators' plans for introducing mobile video services.

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### *Are all mobile video services the same?*

Currently there are at least three different types of mobile video services: mobile video messaging, mobile video distribution services (including both streaming and download) and mobile video telephony/conferencing.

- Mobile video messaging is a person-to-person communication service that consists of sending video content together with other media on a non-real time basis from mobile to mobile, mobile to PC or PC to mobile. It can be considered as a case of Multimedia Messaging Service (MMS) in which the multimedia message contains a video component.
- Mobile video distribution services allow mobile users to either stream or download video content to their mobile devices. The main difference between download and streaming is that the latter allows transferred data to be processed as a steady and continuous stream by a streaming multimedia application and displayed before the entire file has been transmitted.
- Video telephony is a person-to-person communication service that uses visual as well as voice data. It enables a real-time two-way stream of video and audio signals between two mobile devices or a mobile device and a fixed videophone.

It is important to understand the characteristics of each one of these mobile video services, as they impose different technical requirements both on the terminals and mobile networks. Although some of these mobile video services will be technically feasible after the introduction of GPRS, the more demanding mobile video services (such as mobile video telephony) will only be a reality in the long term.

### *What is happening today?*

There is a growing interest for mobile video services especially among 3G license holders. Most of them are seeking to introduce mobile video services as part of their service product portfolio.

NTT DoCoMo is considered by many as the most advanced wireless operator both in terms of mobile video services and video content available to its customers. Video distribution services have been available in the Japanese operator's network, with the launch of its M-Stage Visual service, since November 2000. In addition to this, NTT DoCoMo is currently conducting trial video telephony and video distribution services as part of its introductory FOMA (Freedom Of Mobile Access) 3G service, which was launched in May 2001.

Mobile equipment vendors are today further developing their SMS and WAP Platform solutions for the delivery of rich content to mobile devices. The migration path comprises firstly enhancements to their SMS systems to combine the conventional short messages with simple pixel pictures, and finally MMS, which will enable mobile video messaging applications. Furthermore, some European operators have announced MMS trials with equipment providers.

Internet video content and streaming applications have experienced significant growth over the last few years (in November 2000 nearly 49 million of Internet users streamed video over the web). This increase in streaming usage is closely linked to huge media events such as the Olympics and the Elections in the USA. Hutchison 3G and Orange have identified these potential business opportunities and have secured the digital rights to football content in the UK, Italy, and France. Through these agreements both operators will aim to provide football match highlights such as video clips of selected goals.

It is important to recognise, on the other hand, that the first video-enabled mobile terminals are already available and numerous media companies and vendors developing products and services are now focusing on the delivery of rich media to wireless terminals.

### *What will future video-enabled mobile terminals look like?*

Despite some early product examples, handsets are still one of the biggest limitations for the mobile video market and will require a significant transformation from today's design and functionality. Some of the new features that will have to be integrated into future mobile devices in order to view video content include: high-resolution colour flat panel displays; client video players (either software or hardware) to be able to playback video content; additional memory for buffering streamed video and storing downloaded small video clips or multimedia messages. In addition to them, mobile devices capable of generating video content require integrated CMOS video cameras and video codecs.

- Regarding colour flat panel displays, Thin-Film Transistor Liquid Crystal Display (TFT-LCDs) will be the most common display technology in the short-term. There are, however, other emerging technologies that will rival TFT-LCDs in the mobile display segment. Among them, the Organic Led Emitting Display (OLED) technology will most likely become the technology of choice in future terminals, due to its superior performance.

- Despite some early mobile phone prototypes used charge-couple device (CCD) sensor technology, Complimentary Metal Oxide Semiconductor (CMOS) based sensors will become the dominant technology for video cameras in mobile devices, due to their lower power usage and system cost.

- Software video decoders represent a cheap and viable option for applications where the mobile device is used for playback only (i.e., mobile video messaging and mobile video distribution services). General-purpose Digital Signal Processors (DSPs) with enough computational power for decoding video signals are presently available on the market that integrate software decoders. Moreover, several other companies currently offer free downloadable software video players for PDAs and other handheld devices.

- Hardware-based codecs will be preferred in mobile phones as they consume less power and are faster than software routines. Some hardware codecs are presently available in the market, but current products need to evolve in order to reduce cost and power consumption. However, significant increase in computational capacity is needed for software-based encoders. Therefore, they will most likely be used to record and play video (and audio) on PCs, using the computer's CPU for processing.

- Video applications will also require mobile terminals with better user interfaces to control the video stream (intuitive "VCR-like" commands), navigate through video repositories, etc.

While most Asian phone makers have already included some advanced features (such as colour LCDs) in their products, European and American vendors have so far opted for a more conservative approach, where the introduction of colour displays and other video capabilities will be done at a later stage.

However, most of the handset manufacturers will most likely launch video-enabled mobile phones as part of their initial 3G product ranges, which will most

likely be available in mass quantities in 2003-2004. In general, these new terminals will include colour LCDs, video download and video streaming capabilities (i.e., streaming video players, multimedia cards for external storage) and CMOS video or still image cameras. Before that, GPRS MMS phones for GPRS supporting services based on photographic images only (i.e., no video capability) will start to appear in 2002.

3GPP standard compliant (and MPEG-4 based) video telephones will constitute a next generation of video-enabled phones. It is still unclear when these terminals will become widely available in Europe (note that these videophones are today a reality in Japan). Northstream believes that this second generation of 3G video terminals will start to be available in commercial volumes in the 2005-2006 timeframe.

Finally, although the range of mobile terminals will become much wider than it is today not all future mobile terminals will be video enabled. The terminal replacement rate, as well as the penetration of data related devices are key factors for understanding the mobile video services uptake. A slower acceptance of video-enabled devices would have a significant impact on the success and uptake of all mobile video services.

### *When will mobile networks be ready to support video services?*

Upcoming 2.5G and 3G mobile networks will enable mobile applications demanding higher data rates and more stringent quality of service requirements.

- With the widespread introduction of GPRS technology, mobile video messaging services and downloading small video files into the mobile device will be possible due to the increased data rates provided and the non-real-time characteristics of these services.

- Streaming video distribution services are best supported with 3G. However, these services can also be designed for GPRS networks offering small low-resolution video files that require low data throughput, and using proprietary application-associated mechanisms to compensate the bandwidth fluctuations over the air due to adverse radio conditions. Streaming full-length movies to a phone or handheld will be, at best, a niche application for a long time.

- Some mobile network technologies are not appropriate for real-time video telephony/conferencing. For instance, GPRS latency (approx >300ms) and packet loss (>1%) characteristics are inadequate to make it a suitable technology for video telephony. 3G is the first technology that can be widely used for video telephony services, as it offers circuit switched data rates of 64 Kbps both to and from the terminal.

In addition to 2.5G and 3G mobile networks, there are other wireless broadband technologies capable of high data rates that will also enable mobile video services within selective areas. These include both Wireless Local Area Network (WLAN) and Wireless Personal Area Network (WPAN) technologies.

### *Are the standards complete?*

There are many associations and standard groups that are involved in the standardisation of video distribution services for both wireless and wired networks.

Within the wireless world, the main standard-setting association is the Third Generation Partnership Project (3GPP), which is currently working on the

standardisation of wireless video services over 3G networks (n particular, a non-real-time multimedia messaging service, a packet-switched streaming service (PSS) and a circuit switched multimedia telephony service). However, there are several technical and implementation aspects that have been left for future standardisation work. These include other implementation options for MMS, security mechanisms and digital right management for PSS, to name a few.

Over the last two years, several industry forums have been created with the purpose of ensuring and promoting end-to-end interoperability and helping the development of different aspects of the mobile video market. Some of the most relevant ones include the Wireless Multimedia Forum (WMF), the MPEG-4 Industry Forum (M4IF) and the Internet Streaming Media Alliance (ISMA). However, both the WMF and the ISMA are seen by part of the video industry as trade organisations, and therefore, it is doubtful that the recommendations produced by these bodies gain wide acceptance within the wireless industry.

### *Which video coding format will dominate the market?*

One of the key issues is the use of a commonly accepted video coding standard to enable universal compatibility between terminals and services.

Over the last few years the Internet has experienced a fierce “video format war” with multiple proprietary video compression standards fighting for the highest market share. This phenomenon will continue in the wireless world, with most mobile terminals supporting one or several of the RealVideo, Windows Media and MPEG-4 formats.

The MPEG-4 Visual standard will most likely become the dominant format, as it facilitates compatibility among products from different vendors and has been optimised for wireless communications. However, licensing and patent fees issues may become a potential impediment to the success of MPEG-4, since several companies have patents that apply to different aspects of MPEG-4. Combining these patents into one single license fee will be quite challenging.

PDAs and other mobile devices with increased computational capacity may either integrate or allow downloading other proprietary Internet video players like Windows Media Player, Real Network or QuickTime.

There are numerous companies developing MPEG-4 products (from software based players to chips and servers). Most of these MPEG-4 products will include proprietary features and enhancements to the standard, as these companies will aim to differentiate from competition. Therefore, it is also crucial to agree on the minimum subset of MEPG-4 functionality to allow effective implementation of the standard within mobile devices.

### *Are users ready to see and be seen?*

It is envisaged that the introduction of video will create a change in users’ communicational behaviour. Visual applications will not necessarily replace other existing ways of communications. The mobile user will communicate using the most convenient communication vehicle at each time: the one that best suits his or her current situation and needs, is available/feasible and is charged at a price that the user is ready to pay. From the users’ perspective, price sensitivity will be one of the key issues for all these new mobile video services. Nevertheless, it is clear that mobile users will react differently to each of the mobile video services:

- According to several market studies, there seems to be a strong demand for multimedia messaging services (including video). MMS will eventually be adopted by most mobile users due to its usage possibilities, offering not only fun and emotion sharing but also utility.

- Regarding mobile video distribution services, mobile networks constitute a new market for existing Internet streaming distribution companies, providing mobility, localisation and personalisation, and offering the possibility to bill end users for accessing video content. It is still unclear whether users will accept paying per viewing schemes, as video files can in most cases be freely streamed/downloaded today from the Internet.

- Northstream predicts that user acceptance of mobile video telephony services will increase very quickly, as it significantly enhances personal communications. Once customers experience rich telephony, they will quickly become accustomed to them and their expectations will rise accordingly.

It is also important to understand what device types mobile subscribers are using today, and which mobile devices they are likely to use in the next few years. It should be noted that many users would ideally want to have video and other features integrated into one single mobile device, although in reality they will most likely opt for separate devices because of habits, device price and usability.

In one respect, adding a camera to mobile terminals will have a significantly bigger impact than adding WAP, GPRS, Mobile Java, etc. This difference is evident simply because when looking at a mobile phone with an integrated camera lens, mobile users will understand that, somehow, they should be able to take and even send pictures (and/or videos) to other people. Northstream believes that this concept will be extremely appealing to a great deal of people.

### *What are the challenges for the mobile operators?*

One of the key issues for the operator consists of the definition of an “ideal” service roadmap. Northstream finds that mobile video services are a category of services that cannot be overlooked at this moment. The mobile operator must take advantage of the opportunity offered by mobile video services as a means to generate increasing airtime traffic, revenue, service-differentiation and customer loyalty. It should be noted that services with video content will initially be low volume compared to other text and voice based services. The mobile operator must then define a service roadmap including realistic video applications but prioritising those services that are expected to generate more revenues in the short term. Additionally, the operator should take into account that mobile subscribers need to be educated and become familiar with these new services.

Finding viable pricing models for mobile video services is yet another key challenge, as high charges might hinder the general usage of mobile video applications.

Other implementation and technical issues that mobile operators must also take into consideration when delivering video are content management (including also content creation/acquisition and content hosting); terminal adaptation and/or capability exchange; mechanisms to dynamically and automatically adjust the data stream bit rate; digital rights management and traffic dimensioning in order to support applications with higher bandwidth requirements.

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