Wireless technologies in mobile learning

Aleksander Dye

NKI Distance Education

June 2006

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This paper is about the wireless technologies used in mobile learning and is meant to show what is readily available and how the development might be. The technologies are described with bandwidth, cost of use and coverage in mind.

3g

"3G (or 3-G) is short for third-generation technology. It is usually used in the context of cell phones. The services associated with 3G provide the ability to transfer both voice data (a telephone call) and non-voice data (such as downloading information, exchanging email, and instant messaging)." -Wikipedia.
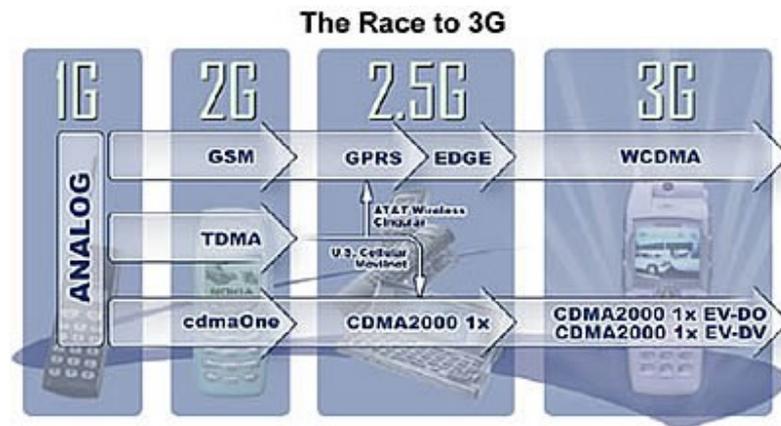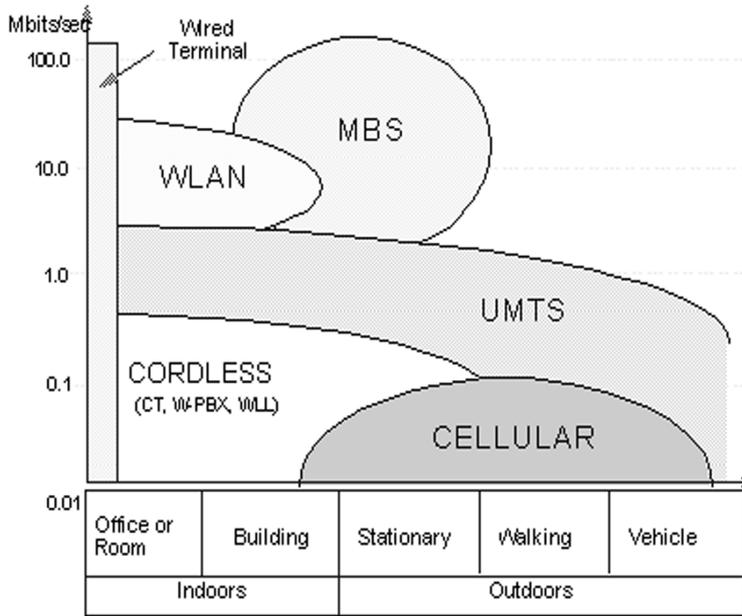

Illustration 1: From analog to 3G

As shown in the illustration we are going towards new technologies all the time, and we are already looking at 4G and 5G at the moment. What will be possible in the future – no one can predict.

Universal Mobile Telecommunications System (UMTS)

UMTS supports up to 1920 kbit/s data transfer rates, although at the moment users in the real networks can expect performance up to 384 kbit/s. There are upgrades for 3 Mbit/s in Japan in preparation. The practical transfer rate with UMTS is still much grater than the 14.4 kbit/s of GSM with 14.4 kbit/s.

The illustration shows the speed of the different networks as well as the range and usage of them. The range is usually low when the mobility and range is high, but if you accept a stationary work place you can get high bandwidth and some mobility. The cost of mobility is the speed of the network.

Coverage in Norway

The coverage in Norway is numbers from Telenor and the maps shows EDGE and UMTS coverage in March 2006. The green areas of the map shows coverage. As sees the UMTS network is not ready in most areas.

Time	Numbers of communities	Covers communities with inhabitants above	Numbers of people covered where they live	Area covered
March 2005	132	2800	2,8 million	15000 km2
March 2006	Not defined	Not defined	3,25 million	35000 km2
March 2007	850	200	3,75 million	75000 km2

GPRS

GPRS supports a much better data rate than what was previously available through the GSM networks (up to a theoretical maximum of 140.8kbit/s, though typical rates are closer to 56kbit/s) and is packet switched rather than connection oriented (circuit switched). It is deployed in many places where GSM is used. E-GPRS, or EDGE, is a further evolution of GPRS and is based on new "coding schemes". With EDGE the actual packet data rates can reach around 180 kbit/s (effective). EDGE systems are often referred as "2.75G Systems". Typical rates vary wildly, ranging from EUR €1 per megabyte to over €20 per megabyte.

Pricing

The prices in Norway are quite similar for the large teleoperators and for customers of Telenor 549 NOK pr month for unrestricted use of Internet. This includes the use of WAP as well as other mobile services when the cellphone is used for Internet access. If the Internet useage is low it is possible to have a maximum price of 50 NOK a day where you pay 20 NOK for one MB of traffic. Video conversations are priced at 2,24 NOK a minute.

WAP – Wireless Application Protocol

WAP is an open international standard for applications that use wireless communication (for example, Internet access from a cell phone). WAP was designed to provide services equivalent to a web browser with some mobile-specific additions, being specifically designed to address the limitations of very small portable devices. It is now the protocol used for the majority of the world's mobile Internet sites, otherwise known as wap-sites. The Japanese i-mode system is the other major competing wireless data protocol.

The new version of WAP (WAP 2.0), is a re-engineering of WAP using a cut-down version of XHTML with end-to-end HTTP (i.e., dropping the gateway and custom protocol suite used to communicate with it).

Several different standards exists: HDML, WML, cHTML, and xHTML. Older phones support HDML and WML. Most new phones support WML and xHTML. Some phones also work with cHTML, the standard behind NTT DoCoMo's i-Mode service, which is found in Japan and parts of Europe. xHTML, which is related to WAP 2.0, is the standard that the industry is converging on.

(x)html reader on the cell

Opera Mini™ is a web browser, that allows gives access the full Internet on a cellphone. It uses a remote server to pre-process Web pages before sending them to the phone, this way the information downloaded to the phone is less than downloading the full web page. The content is optimized for the mobile device, ensuring fast browsing and a better user experience.

Opera Mini™ offers the same speed and usability as the Opera mobile browser, and uses Opera™ Small Screen Rendering™ technology to provide access to the Web. It has the features expected of a browser, as well as, content download, skinning, bookmarks, browsing history.

Opera has developed a way to tailor the content to a device and have two versions of the Opera Mini™. The Advanced (MIDP 2) version uses more advanced text and image compression algorithms, which reduces waiting time and the amount of data transferred. It also offers more features such as: page icons, more font options, better-looking menus, smooth scrolling and a built-in clock. Advanced (MIDP 2) phones can often fit large web-pages in the phone's memory.

In Basic (MIDP 1) phones, large pages are automatically divided into several partial pages.

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