

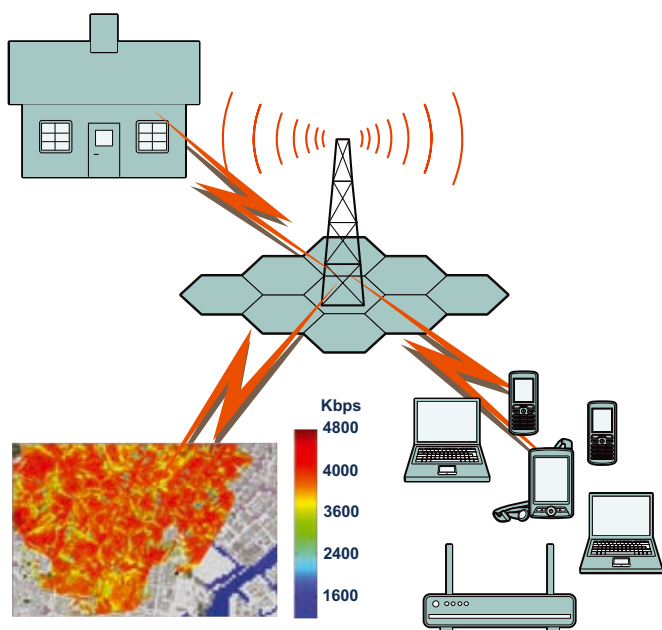
# HSPA EVOLUTION

One network delivers all services



One of the key success factors for the dominance of the GSM/WCDMA family is economy of scale. The volume advantage is beneficial for both handsets and infrastructure equipment and drives the manufacturing costs down. It also facilitates the necessary Research & Development efforts,

required to maintain the competitive advantage for a standard, to be distributed over a large number of manufactured units. The GSM/WCDMA technology has continuously evolved to meet the needs of a changing world of ever more universal wireless communications.



### One network that delivers all services

A WCDMA network is already from the start designed as a multi service network. This means that services for voice, Mobil TV, Mobile & Wireless broadband etc, can be supported by the same infrastructure.

This gives large benefits for the operator, such as: maximum usage of capacity resources, low entry cost level/low risk and fast time to market for new services. Ericsson's scalable and traffic agnostic system capacity makes it cost effective to grow in every direction where new services and revenues take off.

**Voice** – End users demand a high quality voice service with wide-area coverage and full mobility. Only the WCDMA family offers this on a truly global level with an enormous variety of attractive end user devices. With the upcoming introduction of AMR wideband, speech quality and system capacity for voice will reach even higher levels. This facilitates a growth of minutes of use per subscriber and secures a firm foundation for the operator's success.

**Video telephony** – Interest is steadily increasing for this service now that more and more end users have support for this in their devices and discover that family members and colleagues also have it.

High quality, wide-area coverage and a large penetration of capable devices are a must for video telephony growth and WCDMA networks have this.

**Mobile TV** – Inherent support for interactivity and on-demand content distribution are strong cards to play in the Mobile TV game. Today, a wide range of unicast mobile TV services are offered by more than 100 WCDMA operators around the globe. With the growing usage of these services, the demand for capacity will increase. HSPA has very efficient means to increase the capacity of the network. To handle distribution of TV services to large groups of end users simultaneously, a highly efficient TV broadcast functionality called MBMS is introduced in WCDMA networks.

### Mobile Broadband & Wireless Broadband

– An attractive broadband service offers data communication with high speeds in uplink and downlink, high system capacity, low latency and wide-area availability. WCDMA networks deliver all of this today, including full mobility for data users on the move. In networks today, cell ranges of up to 200 km have been proven with measured speeds that exceed 2 Mbps at the cell edge. This enables mobile operators to offer wireless broadband services to large areas that are not economically viable with fixed broadband. HSPA support is available in all types of end user devices like telephones, PDAs, laptops, Fixed Wireless Terminals and embedded modules giving the economies of scale needed to have attractive end user offerings. WCDMA operators have the possibility to offer a wide range of data services reaching from wireless usage in homes and offices to truly mobile usage, all with one network. And there is a strong evolution path for HSPA to reach even higher peak speeds, more capacity and lower latency.



## HSPA Evolution

### HSPA on the downlink

Not long ago, end users had fixed analogue modems with speeds of 28.8 kbps and the first data connections via GSM phones used 9.6 kbps.

Since then, a huge evolution of the downlink has taken place at a rapid pace. A quantum leap has been taken with the introduction of HSPA on the downlink.

Ericsson's commercially released WCDMA RAN system supports data rates of up to 14 Mbps. Today's end user devices support 7.2 Mbps on the downlink. Ericsson is ahead of competition due to its sophisticated radio advantages which makes it possible to provide high bit rates and high throughput per carrier with a low latency. Ericsson has a future proof solution to secure operator investments. All delivered WCDMA base stations (delivered since the early days of WCDMA in 2001) are fully HSPA capable and there is also an easy upgrade path to HSPA for high-capacity Ericsson GSM base stations.

Today, two modulation schemes are supported also known as 16QAM and QPSK. A third modulation scheme will be introduced known as 64QAM which enables data speeds up to 21 Mbps.

Up to 28 Mbps can be achieved with the introduction of 2x2 MIMO (Multiple Input Multiple Output). Instead of transmitting one data stream from one antenna, 2 different data streams are transmitted from 2 antennas. By combining the 2 different data streams at the terminal, it is possible to double the data speed by a factor 2 (2x14 Mbps). 2x2 MIMO introduction is done with a very easy upgrade since virtually every WCDMA base station installed today already has two antennas per sector.

With the upcoming system releases, bit rates will increase even further.

Further evolution steps can be:

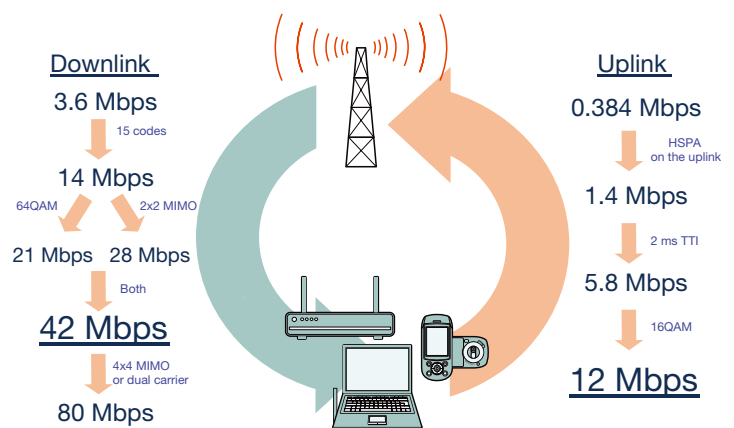
- 2x2 MIMO in combination with 64QAM. This gives double the speed compared to a single stream with 64QAM which means that speeds of up to 42 Mbps are enabled.
- Dual carrier technology or 4x4 MIMO in combination with 64QAM. Here, speeds of around 80 Mbps can be enabled.

### HSPA on the uplink

End user devices are getting more sophisticated. With the introduction of cameras for still images and videos and support for sending e-mails with attachments, the need for faster uplink speeds is growing more and more. The first WCDMA devices supported 64 kbps in the uplink. This was increased in steps to 128 and 384 kbps. And now, uplink speeds have passed the one Mbps limit. Ericsson's HSPA systems and end user devices support already today 1.4 Mbps.

A further evolution will take place by reducing the transmission time interval in the system. This will result in speeds up to 5.8 Mbps.

And by introducing a second modulation scheme in the uplink, called 16QAM, peak speeds of 12 Mbps can be reached.



### Low latency

The time it takes for a message to travel from the end-user device to a server on the internet and back is called the latency or ping time. A low latency (short ping time) has a large positive impact on the time it takes to download e.g. a web page with a lot of different objects. Low latency is also one of the enablers when it comes to gaming, in many games you need to be able to react fast.

HSPA offers the low latency needed to give similar end user experience as fixed connections. And Ericsson's implementation excels when it comes to excellent low latency performance, unmatched by any other vendor.

