The Advantages of Global 3G Coverage for M2M Applications

Carl Fenger and Ezra Stein

U-Blox' LISA-U2 UMTS/HSPA+ Universal Modem Family

In many regions of the world there is a strong migration from 2G to 3G networks, especially in regions such as the USA, Japan, Korea and Australia. Almost daily there is news published about service providers informing GSM customers to switch to 3G services:

• Japan's NTT DoCoMo, which provides mobile communication services to over half of all users in Japan, has announced the termination of 2G services by end of 2012.

• In South Korea, the two largest carries SKTelecom (SKT) and Korea Telecom Freetel (KTF) have also announced plans to discontinue their 2G networks.

• In March of 2012, America's 2nd largest mobile service provider AT&T advised all its customers in the New York and Dallas areas to switch to 3G services to avoid GSM service degradation resulting from the ramp-down of its 2G networks. Simultaneously AT&T is investing heavily on the expansion of its 3G network throughout the US.

• In Australia, Vodafone Hutchinson, the country's 3rd largest mobile carrier, also announced the phasing out of its 2G services in favor of 3G. Telstra, the largest carrier in Australia, is actively encouraging customers to switch from 2G to 3G.

These are just a few examples in recent news indicating the gradual termination of GSM/GPRS services by major telecommunication carriers. The motivation is clear: the ever growing demand for wireless data transmission supporting the latest generation of smartphones and tablet computers that deliver graphic-rich services

and streaming video requires enormous amounts of additional bandwidth. Spectrum occupied by voice centric 2G technology must therefore be released for 3G services. It is a very similar situation to the replacement of dial-up Internet services by ADSL which provides speeds typically 300 times faster than the old phone modem could muster. Indeed, home ADSL and Cable Internet services have become the benchmark for consumer expectations. This expectation extends to mobile Internet users who do not care how the service quality is achieved; they just expect to have it regardless of whether they are logged into their home WiFi connection, or their mobile phone while travelling.

The migration from 2G networks to 3G (also called “W-CDMA” or “UMTS/HSPA”) affects not only mobile phone and Internet users. As the service is replaced, machine-to-machine (M2M) applications will also have to adapt to the new standard, regardless of whether they need the high speed or not.

Some important considerations must be taken into account when selecting a 3G wireless modem for embedded M2M applications. A major issue is that GSM is basically a unified standard operating on only four frequency bands worldwide. For UMTS/HSPA services, different regulatory bodies in different parts of the world have allocated many more frequency bands for 3G services. The result is very clear: a 3G modem which works fine in one region may not work at all in another.

In this age of global transportation and manufacturing supply chains spanning several regions, countries or even continents, this spectrum allocation can have serious limitations for M2M applications, for example:

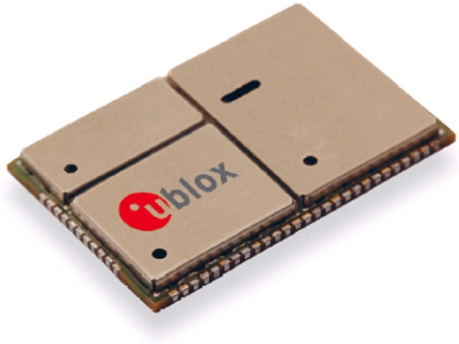
• Tracking systems for cargo and containers can fail to operate in a foreign port or warehouse. Vehicle emergency calls systems would have to be customized depending on where the vehicle is intended for use.

• Monitoring of remote workers, for example emergency services employees or oil pipeline workers, could work in some places, but not another.

• Devices made for the monitoring of the elderly or other institutionalized people would have to be specially designed to operate in different regions of the world.

• Additional design and logistical efforts must be made for security systems that monitor assets or supply chains spread across different regions of the world.

These situations are all the result of the fact that UMTS/HSPA frequency bands are not the same everywhere: there are several main frequency bands utilized by UMTS/HSPA networks across the globe, making both design and logistics complicated for wireless terminals that should operate in more than one region.



In general, the various UMTS bands are deployed throughout the world as follows:

• Band I (W-CDMA 2100) in Europe, India, Africa, Israel, Asia, Australia, New Zealand, Thailand, and Brazil

• Band II (W-CDMA 1900) in North America and South America • Band IV (W-CDMA 1700) in the United States and Canada

• Band V (W-CDMA 850) in Australia, Hong Kong, Thailand, New Zealand, Brazil, Canada, the USA, South America, Israel, parts of Asia and Poland

• Band VI (W-CDMA 800) in Japan

• Band VIII (W-CDMA 900) in Europe, Asia, Australia, New Zealand, Dominican Republic, Venezuela, and Poland

Note that often more than one frequency band is used in the same country depending on service provider and also on the service which is supported.

To address this problem for M2M applications, u-blox has introduced the LISA-U2 module series, universal UMTS surface-mount wireless modems in SMT packages that support all globally deployed UMTS frequency bands, allowing equipment makers to create wireless terminals that work everywhere based on a single modem and hardware/software design.

Module	Technology		Bands		Interface					Audio		Functions											
	HSUPA [Mb/s]	HSDPA [Mb/s]	UMTS/HSPA [MHz]	GPRS/EDGE quad-band	UART	SPI	USB	DDC for u-blox GPS	GPIO	Analog Audio	Digital Audio	Network indication	Antenna Supervisor	Jamming Detection	Embedded TCP/UDP	HTTP, FTP, SSL	GPS via Modem	AssistNow software	FW update via serial	FOTA	In-band modem	Rx diversity	CellLocate
LISA-U200	5.76	7.2	800/850/900/ 1700/1900/2100	•	1	1	1	1	14		2	•	•	•	•	•	•	•	•		•		•
LISA-U230	5.76	21.1	800/850/900/ 1700/1900/2100	•	1	1	1	1	14		2	•	•	•	•	•	•	•	•		•	•	•

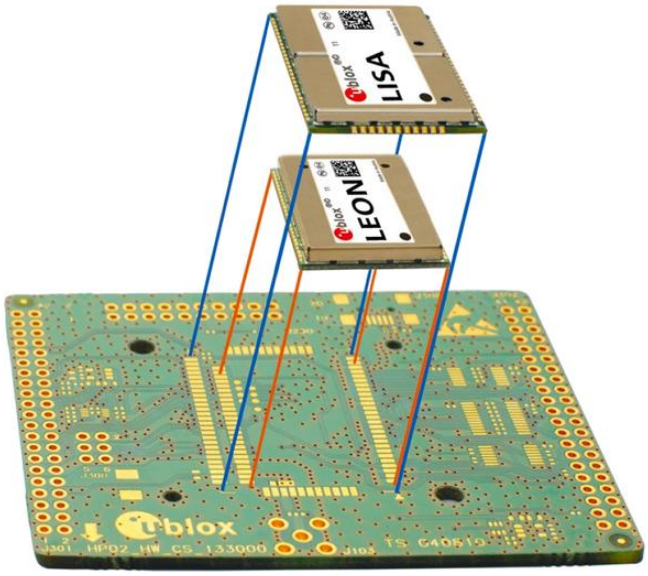
The table above summarizes the features of the LISA-U2 modules, which include

multi-standard support, voice and data capability, in-band modem for emergency call systems such as Europe's eCall and Russia's ERA-GLONASS, support of assisted GPS for accelerated positioning in telematics applications, and download speed up to 21.1 Mb/s for ultra high-speed applications such as video (HSPA+).

Interoperability with multiple GNSS systems

As M2M applications often depend on a global positioning feature to deliver location, route, as well as speed and acceleration information, the LISA-U2 modems provide a simple standard interface to multi-GNSS (Global Navigation Satellite Systems of which GPS is one) technologies. The interface between LISA-U2 modules (as well all u-blox wireless modems) and a u blox GNSS receiver, be it for GPS, GLONASS, Galileo or QZSS, has been reduced to a simple 2-wire I2C bus. This means that end-device variants supporting different satellite positioning standards can be easily created by simply swapping the GNSS receiver without the need for layout or software changes.

Hardware compliance with multiple wireless standards



World mobile communication usage has settled primarily on these 3 network protocols: GSM (which will still exist for several years), UMTS and CDMA. Often a geographic region will support multiple standards provided by different carriers. For equipment manufacturers it is thus advantageous to be able to introduce a single hardware design that can quickly adapt to different protocols simply by interchanging the modem module and upgrading the firmware. This is the case for u blox' LEON 2G and LISA 3G modem series: a single PCB footprint can be designed that adapts to GSM, UMTS and CDMA networks to maintain compatibility across different regional requirements. u-blox maintains a consistent form factor approach to insure that successive generations of SMT components retain layout-compatibility with previous generations, allowing device manufacturers to easily upgrade their designs with minimal hardware and PCB changes. Additionally, firmware compatibility between successive generations assures that designers don't lose man-years of software development time with each successive product

generation.

Operator certification

In today's global marketplace, manufacturers of devices with embedded wireless connectivity also target multiple markets, making certification a complicated and time-consuming process. It is for this reason that a pre-certified wireless module is the most attractive solution. With certifications already granted at the module level, certification of the end-device is vastly simplified: many steps may be skipped. The risk of failing to pass final certification is also minimized as any chance of a potential design flaw in the module has been eliminated. For the LISA-U2 series, an extensive set of national regulatory and operator certificates is available including GCF, PTCRB and AT&T.

Check the u-blox website for the latest operator and standards bodies certifications.

LISA-U2 overview

The LISA-U2 series provides dual-band UMTS/HSPA high-speed data and voice communication. Each modem supports all globally implemented UMTS frequency bands, as well as quad-band GSM/GPRS/EDGE, in the industry's smallest SMT (LCC) form factor. Featuring up to 21.1 Mb/s HSDPA download and 5.76 Mb/s HSUPA upload speeds, a rich set of Internet protocols (TCP/IP,UDP/IP, HTTP, FTP) including SSL functionality, and very low power consumption, LISA-U2 series is ideal for compact applications requiring voice and/or very high data transmission rates such as mobile Internet terminals, hand-held industrial terminals, in-car infotainment, connected navigation systems, eCall, Security and surveillance (video and images), antitheft systems, and Internet Gateways.

LISA also includes embedded CellLocateTM technology enabling approximate positioning in areas where GPS signals are blocked such as indoors, and also supports in-band modem data transmission supporting emergency call standards. For more information, visit www.u-blox.com [1]

Evaluating LISA

Both hardware design, software development and debugging of complex telematics systems can involve significant time and R&D investment. When choosing a 3G modem, it is therefore advisable to take advantage of vendor-provided development environments that can immediately save man-years of engineering costs as well as shave many months off development time.

To make embedded UMTS/HSPA designs run smoothly, u-blox provides LISA-U2 series samples and evaluation kits EVK-U23.The kit provides simple, flexible and ready-to-use environments for evaluating the LISA-U2 module series, as well as for designing and testing of wireless/GPS telematics applications.The kits are very user-friendly, and have both USB and RS232 interfaces for development, testing and tracing.

The kit comes with a built-in u-blox GPS receiver module, giving designers the flexibility to either test GSM/GPRS functionality alone or to integrate it together with u-blox GPS technology. For evaluating Assisted-GPS (A-GPS) a u-blox AssistNow A-GPS client is embedded in the firmware stack, providing users with the option of integrating and testing our license-free A-GPS solutions.

The EVK-U23 evaluation kit includes m-center [2] and u-center [3]: u-blox' interactive evaluation tools for configuration, testing, visualization and data analysis of wireless and GPS receivers. These powerful and easy to use tools provide useful assistance during all phases of a system integration project.

www.u-blox.com [4]

Posted by Sara Cohen, Editorial Intern

June 12, 2012

Links:
[1] http://www.u-blox.com/
[2] http://www.u-blox.com/en/evaluation-tools-a-software/u-center/m-center.html
[3] http://www.u-blox.com/en/evaluation-tools-a-software/u-center/u-center.html
[4] http://www.u-blox.com