

Market on the move - M2M communication technology

by Oozi Cats, CEO, Telit Wireless Solutions

Although companies are beginning to recognize M2M's value, few understand its technological framework and value chain. M2M enables real-time data communication - mostly using mobile networks - between remote machines and central management applications to enhance the value of the remote device to its user. Historically, M2M has focused on applications, like fleet management, remote monitoring, and utility meter reading. Today, applications such as pay-as-you-drive auto insurance, smart grid automation, e-readers, and personal navigation devices (*PNDs*) are driving M2M innovation and growth.



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For several years machine-to-machine (*M2M*) communication technology has been rapidly gaining public awareness. Businesses as well as public authorities and organizations are beginning to recognize that M2M delivers outstanding value propositions in terms of cost reduction, efficiency improvement and business model development. At the same time there is still a lack of common understanding of the technological framework and the value chain of M2M. To unlock the full power of M2M it's therefore necessary to provide potential users with a clear picture.

M2M - basic principles

The basic idea of M2M is to enable real-time data communication between remote machines and central management applications to

enhance the value of the remote device to its user. Within the basic structure of an M2M application, there are many wired and wireless communications options, but the tendency is to use embedded cellular M2M, which enables rapid and secure data transfer via GSM, UMTS, or CDMA networks.

M2M creates endless possibilities to employ innovative devices and develop applications that leverage its core technology. Historically, M2M has focused on vertical market applications, like fleet management, remote monitoring, and utility meter reading. However, emerging applications such as pay-as-you-drive auto insurance, Smart Grid automation, e-readers, and connected personal navigation devices (*PNDs*) are driving innovation and growth within M2M.

The many benefits M2M technology brings are among the reasons why independent analyst firms such as Berg Insight estimate that the number of cellular M2M connections will triple by 2015 to about 300 million. Contributing to the expected growth of M2M is the recent embrace of the industry by major cellular carriers around the world who have recognized the vast market potential of M2M.

M2M in action

Let's take one example to illustrate the fascinating potential of M2M.

Evron, a Finish manufacturer of mobile devices for the telecare and telesecurity industry, developed a GPS bracelet for those suffering with Alzheimer or other cognitive

disorders. The small device, worn on the wrist, is a bracelet one and a half times the size of a standard watch. When the wearer is in the safety of his own home the device communicates locally via RF to a home base. This allows both indoor positioning and optimised power management. When the wearer leaves the home the device automatically turns on GPS and GPRS and starts tracking. The family or caregiver of the wearer set up a predetermined 'secure zone' personalized to the wearer and may include an outdoor area in which the wearer can roam freely without triggering an automated alert.

Should a wearer move beyond the predefined secure zone, an automatic alert including a GPS position is sent to a monitoring centre, which, in turn, alerts the caregiver. With the integrated two-way voice module, the call centre or the caregiver can communicate with the wearer and/or people around him to validate the alarm and the necessity to intervene.

This shows that we have reached a point where M2M technology can cost-effectively deliver the speed and quality of service that end users require in an M2M application. That is why numerous industries, from healthcare to construction, are realizing the value of cellular and how it positively affects business models.

Building M2M infrastructures

The integration of cellular technology is fundamentally different from the integration of other technologies because of a number of factors

Because of the extensive certification and testing required for chipset-based designs, for the vast majority of developers the best approach is to begin with a pre-certified embedded cellular module. Although the developer's end device still needs to be certified according to the legal requirements in the respective target markets, the level of certification testing significantly pales in comparison to what is required by chipset-based designs. Embedded module suppliers perform extensive software development, lab testing, and field-testing to ensure that no matter which global network provider they select, the module will work reliably.

A reputable module vendor can help guide designers through the many certifications procedures necessary for launching an M2M application, simplifying the design process and speeding time-to-market. Customers with no previous cellular design experience who are entering the market for the first time

need proven and future-proofed technology to build around, as well as critical customer support that is both commercially and technically responsive.

It is an important value to customers, that m2m module vendors encapsulate the frequently changing chipset technology derived from the consumer market, in a way that the system integrator of a device always receives a consistent, compatible, tested and approved product, despite the changes of internal components and improvement to the module software.

In addition to certification requirements, designers of embedded devices must navigate through many technology decisions prior to development, including the selection of cellular technology (GSM versus CDMA), frequency bands, throughput requirements (2G versus 3G), network coverage, and deciding between 'connectorised' or ball-grid array (BGA) packaging. Developers must account for the geographic markets where they plan to launch, what time of year they plan to launch, carrier and industry certifications for different levels of the device, and much more.

Network access decisions play a major role in the design of any cellular-enabled M2M application and can dramatically affect the size, range, performance, and, most importantly, cost of a device. In breaking down which technology is best, it's important to understand the fundamental differences of each.

Second-generation (2G) networks are the most widely deployed in the world, allowing for broader coverage across regions and improving the mobility and reliability of applications. Under the 2G umbrella, OEMs have the option of designing for GSM or CDMA technologies. GSM is the global standard for cellular networks, and it has been widely adopted throughout the world. Although CDMA is not deployed in Europe, it can be a good option in North America and Asia.

Though not as widely available as 2G, newer 3G networks and devices support faster, bandwidth-heavy data traffic, making them ideal for certain M2M verticals that rely on the distribution of large amounts of data or video, as is the case with security applications. On the equipment side, components are generally larger and more expensive, increasing the size and overall cost of an application. Higher-bandwidth data plans also result in additional service costs. As Long-Term Evolution (LTE) 4G technology is rolled out, the same type of

decisions will need to be made based on the requirements of the application.

Once these technology decisions have been made, designers can begin to develop the hardware and software interfaces for the embedded module. A central microprocessor controls the embedded cellular module through AT commands (the standard language for modem control). Each embedded module supplier publishes its own AT command instruction set, which includes not only common AT commands that are supported by all manufacturers, but also AT commands, specific to the cellular module provider, that control unique feature sets.

Once hardware designs are complete, vendors often offer design review services to their customers to help maximize the chances of the design completing industry and carrier certification testing quickly and successfully. We recommend taking advantage of pre-certified testing offered by independent labs that perform industry (such as the PTCRB) and carrier certifications.

Overall, the key to any embedded cellular design is to contact the chosen M2M module supplier very early on in the process and closely follow the recommended design best practices. Good communication throughout the process will help reduce time-to-market and technical risk. Although some steps unique to the embedded cellular design process make it a bit more complicated than a standard embedded design, there has never been a more exciting time to be involved in M2M.

"The future is already here - it's just not very evenly distributed"

The prophetic words of the cult Sci-fi author William Gibson describe the M2M market exactly. M2M has the power to transform many aspects of our business and private life; we have resolved most of the technical problems and the leading market players have established complete, proven and scalable hardware, software and advanced service solutions. M2M can help with many of today's challenges like ecology, demographic change, maintenance of secure individual mobility and business process efficiency. M2M is a future technology that is available today! Nevertheless, the M2M market is still very much in its infancy. As soon as companies and public organizations begin to understand how M2M can help them, the market will explode. So it is the time for potential M2M users to stake their claims in the technological goldfields of the future! ●