The M2M industry is meeting this challenge head on with new embedded machine identification modules (MIMs) and complementary provisioning services. These new offerings increase durability, expand the lifespan of telematics systems and enable new opportunities for device manufacturers.

The next evolution for telematics systems

Today, automotive telematics systems and onboard devices with embedded cellular communication modules are indispensable for commercial vehicles and construction equipment. Examples range from single purpose onboard units for electronic road tolling to multipurpose fleet management and asset tracking solutions for trucks, trailers, shipping containers and even sophisticated smart vehicle telematics solutions that are designed and equipped by vehicle manufacturers on the assembly line. Though the variety of embedded cellular telematics is diverse, the basic requirements for quality and durability are largely the same due to the industry standards and rigorous operating environments. Extended temperature ranges for all components are a mission-critical prerequisite to ensure reliable communications even in extremely cold winters and scorching desert heat conditions. Commercial vehicles travel hundreds of thousands of kilometres, operating almost every day without rest. Excessive vibration and shock caused by rough road conditions plus high humidity can stress a device, which must be extremely rugged to survive these harsh conditions. Vehicle telematics systems are designed to meet specific automotive standards to withstand extremely harsh conditions for all possible scenarios. Many vendors even insist that telematics aftermarket devices meet the same quality requirements to ensure competitive advantage and customer confidence. All components for automotive telematics solutions must be specially selected to guarantee a device lifetime that matches the vehicle itself.

Until recently, automotive grade telematics systems were all equipped with the same plastic SIM cards used for the mobile phones in our pockets. To overcome the durability limitations of consumer SIM cards, the M2M industry developed dedicated MIMs. MIMs have the same base functionality as traditional SIMs for phones – they support the personalisation with subscriber information, can be remotely updated over the air, ensure the security and serve for the authentication at the mobile network and offer an execution environment for applications. However, MIMs offer several M2M specific features, which ensure an extended lifetime even under severe environmental conditions. MIMs are not only available as plug-in form factor with increased stability and reliability but also as fixed solderable components embedded in the telematics systems. Since soldered MIMs cannot be removed and replaced, new provisioning services, such as late stage personalisation (LSP), are now available to device manufacturers. LSP occurs when mobile network operator (MNO) subscription information is securely transferred to the MIM within the device at a late stage of the manufacturing process. LSP gives a customer full flexibility in choosing a carrier because the device is not MNO-specific, even if the MIM is already integrated in the device. Telematics systems manufacturers can individually control the customising of the devices for each project or for each customer order by MIM provisioning services.

Machine identification modules for more endurance

Due to the wide variety of telematics systems with varying vertical market requirements and value chain specifics a "one MIM fits all" offering is not possible. Instead, individual MIM features and advantages are packaged for the different categories of use to increase customisation and flexibility while best meeting customer needs and requirements. MIMs are available in two families of form-factors – as plug-in and as solderable quad flat packaging. Both families of form-factors are standardised and compliant to the ETSI 2FF or the ETSI MFF specifications. M2MPlug MIMs have the same dimensions of traditional mobile phone SIMs but offer additional M2M-specific features. The M2M
Plug version is based on a specifically designed and highly durable M2M security controller chip, which is resistant to extreme conditions of temperature, high humidity and shock. The M2M chip offers a long lifespan with an extended number of write cycles and improved endurance of the non-volatile memory. In addition to the M2M chip, a dedicated Java Card operating system which handles and controls all the MIM tasks provides highly sophisticated software features, extending the life of the MIM and the long time availability of stored data, like for instance authentication keys. By selecting M2MPlug the M2M advantages of MIMs can easily be used without changing the overall design of the telematics systems. Just the M2MPlug MIM is put in the telematics device instead of a normal SIM. It was developed specifically for devices used in extreme temperature conditions, like construction equipment and trucks in Mid-East Africa where very high temperatures and humidity are the norm; or for vehicles used in the northern reaches of Canada and Russia where temperatures are far below zero Celsius any time of day or night. In cases where vehicle telematics systems are exposed over many years to severe shock and vibration but not extreme temperatures, a variant of M2MPlug with a smaller temperature range is applicable.

Another consideration for telematics device OEMs is the use of M2M-grade solderable MIMs. Like the M2MPlug family, the FullM2M quad MIM has the same ruggedised M2M chip, the XL OS and the extended temperature range of -40°C up to +105°C to guarantee highest reliability.

With the solderable MIM, the telematics device printed circuit board (PCB) can be smaller and the plug-in SIM cardholder can be eliminated, which reduces hardware costs. In addition, the PCB design is optimised because quad flat packaging of the MFF2 enables automated assembly by machines and eliminates the human accessibility of the SIM cardholder. Telematics devices no longer need to be opened by field people to plug-in the SIM card. Telematics devices can be sealed at the factory and shipped as a complete unit. This is a huge benefit to device longevity and warranty validations, which are no longer impacted by opening and closing the device to plug-in the SIM. Another advantage gained with soldered MIMs in sealed cases is eliminating a potential inroad for humidity inside the device, which can quickly wreak havoc with sensitive electronics. The device handling is further simplified with FullM2M quad MIMs because the PIN codes necessary to protect plug-in cards from unauthorised use can be eliminated when the solderable MIM stays with the same telematics device through its lifespan. Avoiding the need to distribute and manually enter PINs during device deployment increases ease of use for both OEMs and system integrators alike. With the variety of new MIM technology options, OEMs and vendors are now able to select the feature set best suited to individual solutions, value chains, industries and customer requirements.

Provisioning services by late stage personalisation
Manufacturing flexibility and individual customisation are crucial issues when integrating solderable MIMs for specific telematics systems. Traditional SIM cards are individually personalised for each customer by SIM card manufacturers on behalf of a mobile network operator. Specific information of a SIM card – the MSISDN and IMSI numbers for instance – are mapped by the MNO to individual customers and used for identification and monthly billing. Solderable MIMs operate in the same way, however, a challenge arises because the telematics device becomes MNO-specific and/or project-specific as soon as the personalised MIM is embedded in the device.

For projects where the MNO is selected by the customer in advance and telematics devices are manufactured in high volumes, there is a strong business case for pre-personalised solderable MIMs – they are cost-effective, reliable, rugged, and can be managed with reasonable effort. But in cases where a customer uses multiple MNOs or for small production runs, pre-personalised solderable MIMs lead to high handling efforts and/or larger-than-necessary inventory stock.

To overcome this hurdle and limit the number of telematics device variants, Gemalto, a
leading SIM and MIM vendor, has developed new provisioning services such as late stage personalisation (LSP) of MIMs.

LSP is a process that takes place during telematics systems manufacturing via a secure virtual private network (VPN) connection established between the personalisation centre of the MIM vendor and the telematics systems manufacturing line. Encrypted channel communication between the backend system of the MIM vendor and the security controller within the MIM establishes MNO-specific subscription information for each individual MIM. LSP processing can be integrated in the assembly line manufacturing process or existing inventory can be personalised for a specific customer or project just before shipping in a three-way collaborative approach between telematics systems OEMs, MNOs and Gemalto M2M. The flexibility of new provisioning services provides telematics systems OEMs with new product offerings and services in combination with the telematics devices. And LSP is just the beginning of a whole new category of complementary provisioning services to optimise and simplify specialty wireless device design and development.

The GSMA, the global trade association representing mobile operators and more than 200 companies in the broader mobile ecosystem worldwide, and standardisation organisations like ETSI (European Telecommunications Standards Institute) are currently defining new services that allow remote over the air (OTA) and over the internet (OTI) provisioning of MIMs. In the near future, a more simplified and optimised supply-chain based on OTA and OTI provisioning will eliminate the constraints of manual SIM card handling for large scale deployments of telematics devices. Telematics systems OEMs and early adopters of solderable MIMs are looking forward to the cost- and time-saving benefits as well as gaining competitive advantage over others in the marketplace by adopting these new MIM related provisioning services.

Partnership for expertise

Careful OEM evaluation of solderable MIMs and new related provisioning services is crucial to take this promising technology to the next level. Trustworthy partners with established expertise and market-proven knowledge are essential for judging the pros and cons of any new technology or process and developing a roadmap for success. Brought together by Gemalto’s acquisition of Gemalto M2M, these two brands are leading the charge for MIM and provisioning innovation, making them the business partners of choice for cutting-edge OEMs in vehicle telematics. Gemalto M2M, a global leader in wireless M2M communication modules, has been a pioneering force in cellular M2M since 1995; and Gemalto, the leader in digital security and the largest vendor of SIM cards, MIMs and complementary provisioning services are leveraging their combined expertise to optimise M2M solution development and motivate continued growth of the explosive M2M market. Together, the companies offer market leading expertise in M2M and automotive-grade modules plus the latest knowledge and technology in identification modules for MNOs, digital security and state of the art services for subscription management.

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