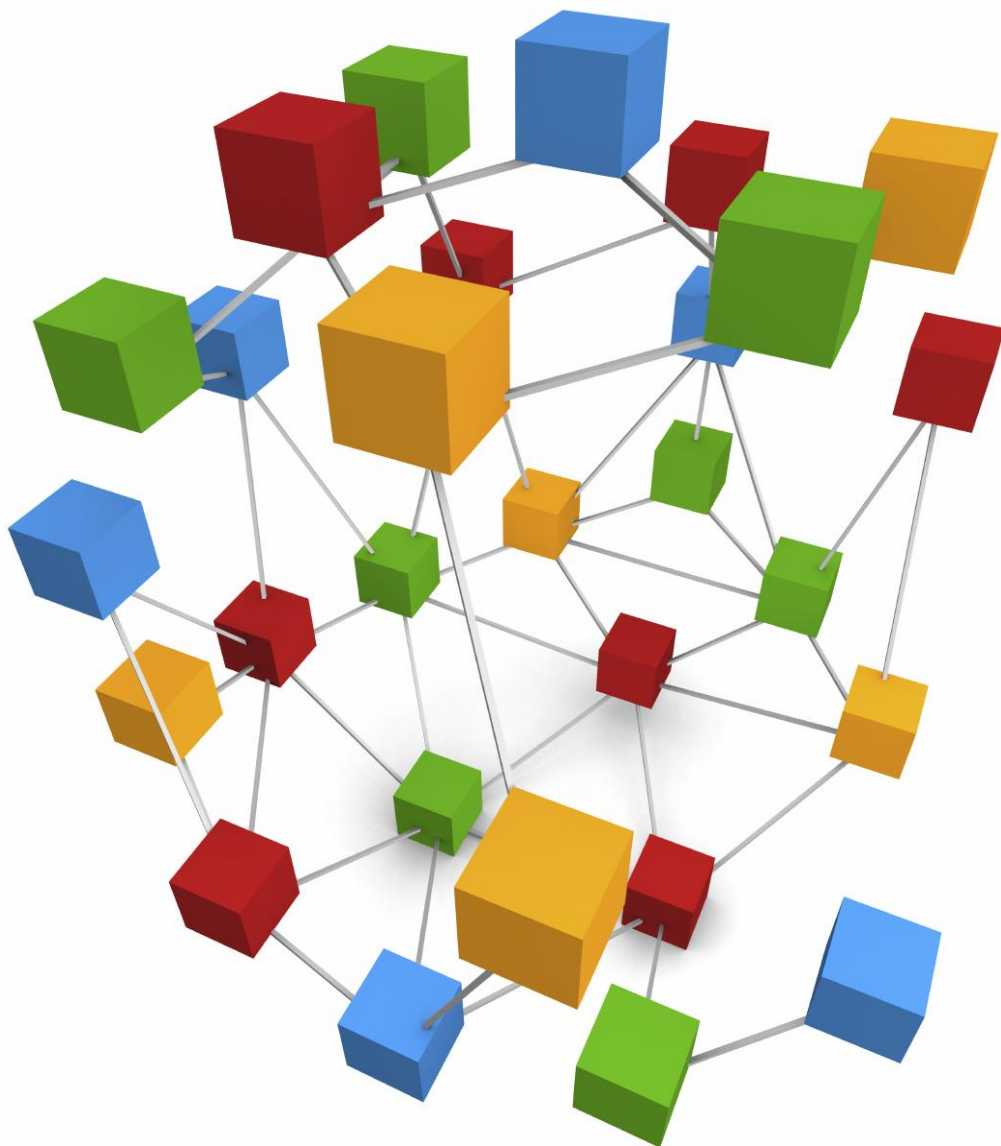# Embedded Mobile

M2M solutions and beyond

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Introduction

In most developed economy markets, the near term focus for MNOs is on boosting subscriber numbers and stimulating usage of data and messaging services. This path has a limited end-game with flat revenues coupled to rising traffic costs. Against this backdrop, new classes of device and service are a highly compelling source of subscription and revenue growth to take advantage of ever improving levels of technology and network capacity.

This brief report summarises the key findings from a study conducted on behalf of members of the GSMA's Board and Strategy Committee to explore the landscape, opportunities and challenges associated with new devices and services.

Based on the study recommendations, this report outlines the direction that the GSMA plans to take in developing a highly promising new segment of the mobile market. The study was conducted over a period of months from June to October 2008 with the participation of several mobile operators, equipment vendors and specialist service providers.

M2M is the fast growing category for alternative devices and services

The starting point for any discussion on alternative devices and services, outside of handset and PC data card categories, generally begins with the M2M (machine-to-machine, man-to-machine etc.) market. M2M is typically associated with enterprise customers and covers applications that include vehicle telematics, asset monitoring, point-of-sale (POS) and ATM uses.

In 2007, the worldwide installed base of cellular M2M devices was about 37m, according to a recent analyst report[1]. The market is projected to surpass 180m subscriptions in 2012, based on unit shipments that will themselves grow at 30% CAGR as indicated in the two sets of analyst projections below.

Exhibit 1 Cellular M2M shipments to reach 90m by 2012
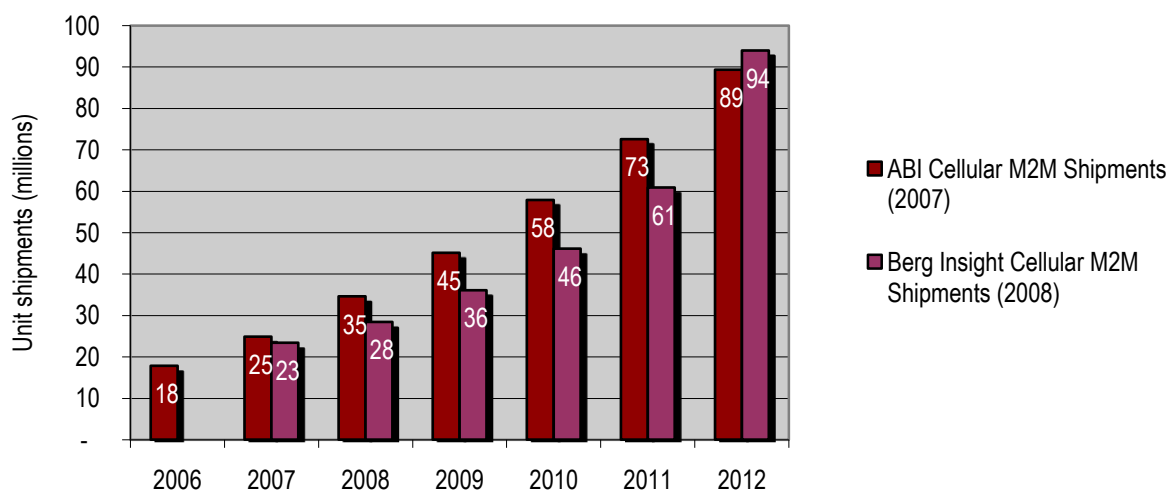
[1] The Global Wireless M2M Market, Berg Insight (2008)

Many other opportunities are emerging in non-traditional M2M segments

The consensus view on growth misses a larger market potential, in two notable respects – the size of the potential market and the range of segments that is capable of being addressed. The consumer electronics segment (e.g. digital cameras, e-book readers, game stations, music and video players) is one area where new, wireless-enabled device opportunities are currently over looked.

In the health sector, almost a billion people suffer from non life-threatening ailments. Many of these conditions lend themselves to telemedicine and telecare applications on sound economic grounds and for improved quality of life reasons. Sizeable and growing levels of expenditure are involved now and in the future; mobile solutions can deliver treatment efficiencies and significant value for money. The mobile industry cannot afford to ignore this segment, especially as it becomes an issue for corporate social responsibility in the future.

The following exhibit casts a different perspective on the market opportunity. It shows the possible number of host 'devices' into which wireless connectivity might be embedded. It should be noted that the healthcare opportunity is illustrated by reference to the general population focusing on different ailment categories. In the case of machines, the exhibit refers to estimated annual worldwide production or shipment of devices. The equipment related statistics focus on the new market opportunities; the automotive sector, to pick one example, constitutes a second source of opportunity through a sizeable installed base for after-market devices and applications.

Exhibit 2 Examples of the addressable market opportunities for M2M devices and services
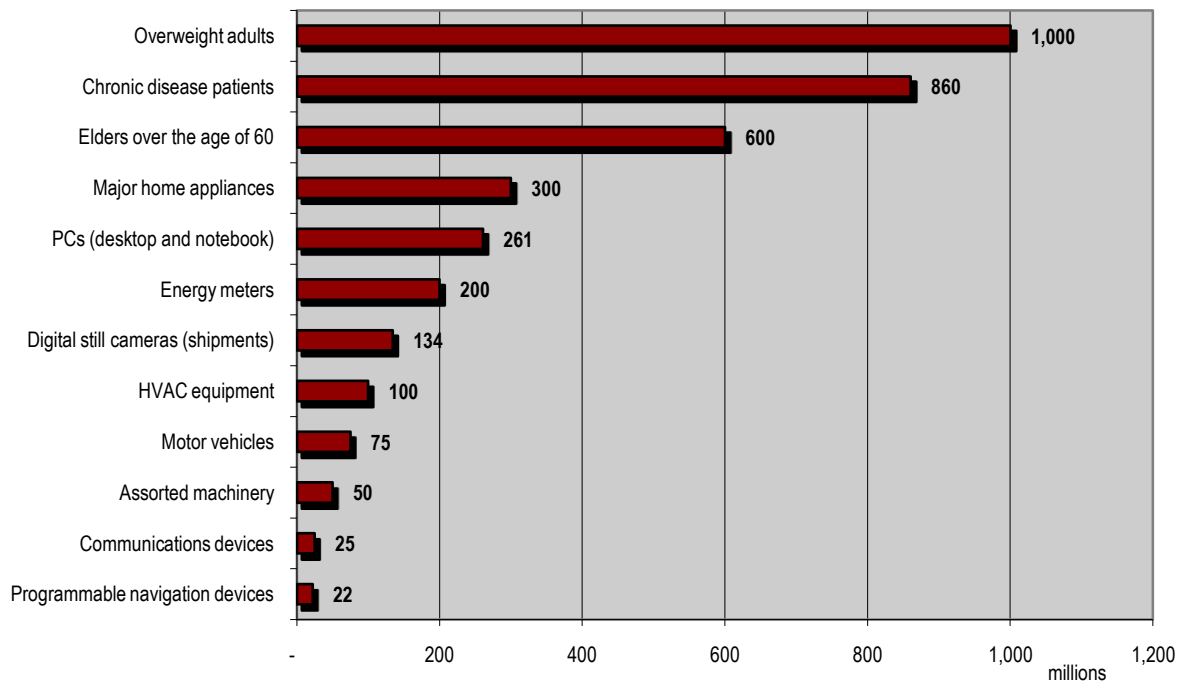
SOURCE: ABI Research, Berg Insight, Continua Health Alliance, IDC, Korea Investment & Securities

Cellular connectivity will not be applicable to each and every one of the individuals and machines referenced above. Nevertheless, even if a fraction of the market is connected via cellular devices or by hybrid cellular-LAN/PAN combinations, the absolute number of subscriptions is sizeable in comparison with the voice handset market. The scope for achievement is well above the target that the mobile industry is currently setting its sight upon.

Changes in policy and personal attitudes are key drivers of demand

Macro-economic pressures and regulatory directives are opening new markets for wide area wireless connectivity. Smart metering (for reasons of energy efficiency) and in-vehicle systems (emergency call and transport efficiency) are two areas that are the target of public policy initiatives.

At the same time, consumers are being presented with more and more lifestyle choices. This is causing a heightened awareness of their impact on the well being of the environment in ways that can be satisfied with embedded mobile solutions. Furthermore, innovative services are springing up as companies realize that ubiquitous cellular access can enable new applications. There is also a growing recognition that a standardized wireless delivery platform helps to overcome the complexity of managing IT policies across mixed WAN/LAN environments.

The range of emerging segments identified during this study and the associated drivers of demand are illustrated in the exhibit below.

**Exhibit 3 Major segment opportunities and key drivers**

Segment	Sub-segment	Drivers
Consumer Electronics	N/A	• Technology innovation emanating from leading Asia Pacific vendors as exemplified by Sony's strategy to wirelessly enable 90% of its device categories. • North American marketing push to establish new device categories e.g. Intel's category of MIDs and Sprint/Clearwire's WiMAX devices. • Content and service providers seeking to stimulate additional sales through new device and service propositions e.g. Amazon's Kindle.
Clean Technology	N/A	• Monitoring, reporting and policing of Greenhouse gas emissions • Public demand for air-quality information in public gathering locations (city centres, holiday beaches etc.) for people suffering from allergies and respiratory ailments
Health	Telemedicine	• New sensor technologies allied to wide-area and ultra low-power wireless connectivity. • Rising costs of medical care, privatisation of care combined with changes in attitude about the ease of use and dependability of telemedicine applications.
	Tele-care	• Consumer demand for information and applications to support personal health care choices. • Availability of monitoring data in sports aids, for example. • Service provider innovation using home-hubs for communication and monitoring
Transport	Automotive	• Tracking of assets for security as well as energy and resource efficiency purposes. • Consumer demand for in-car services including navigation alerts and entertainment etc. • Congestion reduction • Government-mandated emergency call in vehicles
	Transport infrastructure	• Remote sensing and information alerts to improve transport efficiency • Monitoring of critical infrastructure for predictive fault finding to minimise unplanned service outages (e.g. elevators, trams etc.)
Utilities	N/A	• Government policies to improve energy consumption • Consumer education about personal consumption patterns and the associated costs. • Smart meters offer a new channel of communicating with end users (households) and also a way of offering new service plans e.g. time of day pricing.

SOURCE: GSMA project team analysis

M2M needs to evolve to a broader category of "Embedded Mobile" solutions

A change in market perspective is essential if the mobile industry is to succeed in addressing the wider market opportunity. As illustrated below, the focus on M2M, with its mostly industrial segment connotations, has to be broadened to consider several different segments with service solutions and business models that cater to segment-specific customer needs.

Exhibit 4 Embedded Mobile market opportunities
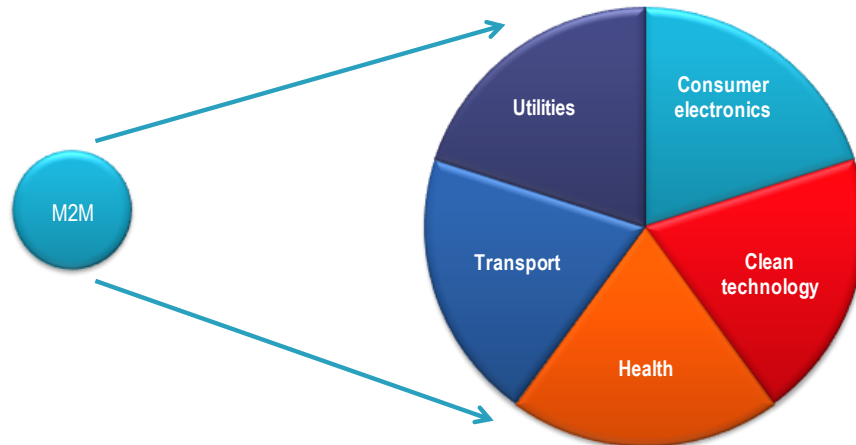
SEGMENTS	CONSUMER ELECTRONICS	CLEAN TECHNOLOGY	HEALTH (tele-care/medicine)	TRANSPORT (automotive & infrastructure)	UTILITIES
SERVICE NEEDS & VALUE PROPOSITION	• Novelty of new services • Convenience • Immediacy of media content	• Availability of audit information • Lower infrastructure costs to gather conformance data	• Cost saving • Resource efficiency • Improved treatment effectiveness • Service novelty • Personal responsibility for self care	• Improved resource utilisation (e.g. congestion control) • Operating cost control • Societal benefits • In-vehicle entertainment	• Operating cost savings • Opens up new lines of service • Consumer responsibility

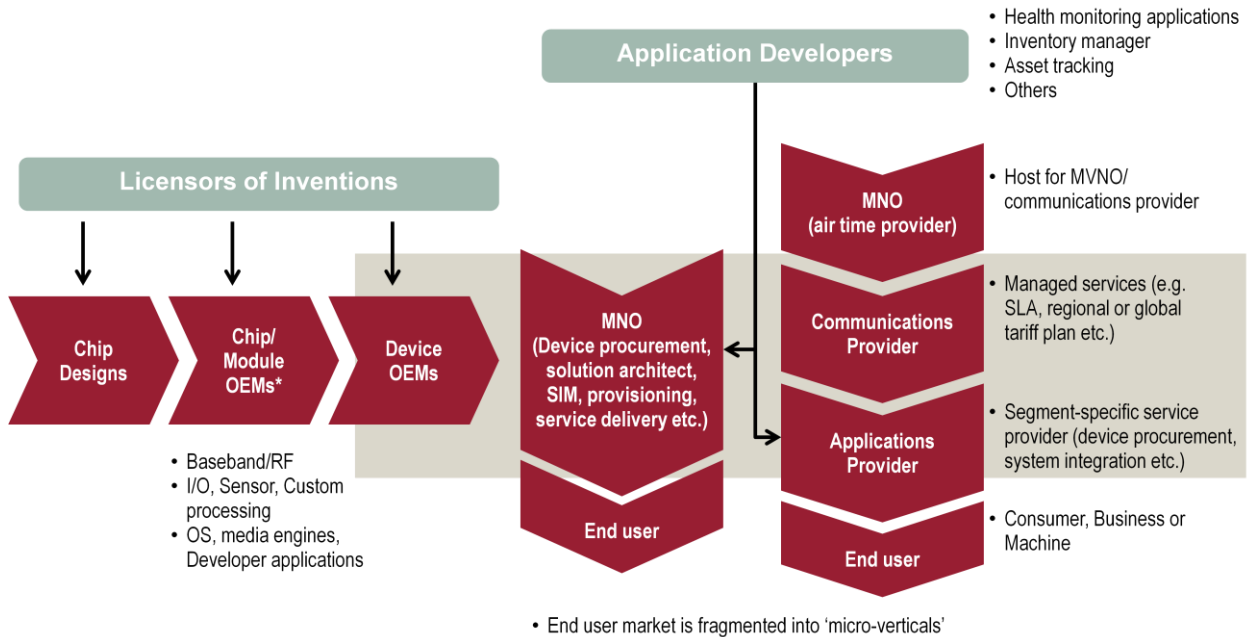*SOURCE: GSMA project team analysis*

While there is much to learn from M2M, the marketing emphasis is now shifting to "Embedded Mobile", a term that companies and consumers can more easily respond to.

There are several lessons to be learned from today's M2M market

The first issue that the mobile eco-system needs to address is the long and fragmented industry value chain that characterizes today's M2M industry. This results in numerous supplier/buyer interfaces, as illustrated below, adding costs and time to the launch of any new product offering. One interviewee commented that the M2M market currently functions like a cottage industry. The fragmented structure of the supplier market suffers from concentrated pools of knowledge and poor awareness of end-user demand, service requirement and commercial issues.

The value chain has been separated into two parts the first relating to devices (depicted horizontally) and the second to application development and service delivery (depicted vertically). The broad intersection between these two parts, as illustrated by the shaded zone in the exhibit below, represents the means by which devices are procured and integrated into M2M solutions and services.

Exhibit 5 Overview of the M2M industry value chain

* NOTE: Some operators such as KTF provide M2M modules as part of their efforts to develop the market
SOURCE: GSMA and MNO project team analysis

Considering the vertical portion of the end to end value chain, one route to market for M2M devices can involve MNOs, with some operators taking a more active role than others. Equally, as shown below, devices can be procured independently of MNOs by communications and applications providers, subject to having their devices certified on a host operator's network.

The many steps involved in producing devices combined with segment-specific service application needs limits economies of scale and adds to both costs and time to market. Economies of scale are difficult to achieve because the target segments for embedded mobile solutions are individually very distinct – transport differs from healthcare which differs from utilities, for example. Matters are compounded by the fact that several sub-segments can exist within a single segment.

During the course of interviews with MNOs and vendors in the M2M eco-system other factors that emerged as challenges to be overcome included the following:

- **Today's industry is overwhelmingly focused on 2/2.5G technology for embedded mobile solutions.** This is partly a function of having to design wide-area applications for the best bit rate available combined with the 2/2.5G experience base of system integrators. However, a certain amount of inertia stems from the higher cost of 3G chip sets and confusion about different form-factor related IPR models. This trend will eventually be reversed because of innovation in 3G markets such as South Korea and Japan. US market dynamics involving AT&T (Emerging Devices unit), Sprint (WiMAX) and Verizon (Open Development Initiative) will also fuel the market for new devices and applications on higher speed networks.

- **The design of M2M solutions can be complicated by external (non-mobile) factors**. The value created by many M2M solutions usually depends on some change in a business process, beyond the realm of wireless connectivity. Due consideration to change management issues has to be an integral part of the M2M solution. A separate source of complexity arises when device or application features are governed by external factors. In the US health sector, for example, devices need to meet federal, Food and Drug Administration (FDA) guidelines. Similarly, if MNOs are directly involved in handling patient record information then appropriate data privacy guidelines[2] must be implemented. Finally, from an operational standpoint, the procurement criteria of end customers may override mobile service design considerations and affect how devices and IT applications are managed. For example, some enterprise clients require multi-operator M2M SIM solutions to be managed from a single application management control suite. Each of these external factors has a bearing on the design and commercial success of an M2M application.

- **Roaming needs to be seamless.** Product manufactures want to design for ease of assembly and seamless international use. Roaming presents certain commercial and technical challenges with scope for simplification through better education and tools to support product vendors in their business case evaluations, for example.

- **The principal operational challenge is that of managing scale**. The key operational challenge that MNOs need to handle is one of scale. For example, a single account may correspond to several tens of thousands of devices. Simultaneous changes in service provisioning or billing at the account level need to be phased to avoid service disruption. Applications based on periodic communications also need to be scheduled over time to mitigate overloads to critical network resources.

- **New standards are needed to manage large numbers of devices.** As many more devices attach to mobile networks, MNOs are concerned about how capacity is managed and revenues derived for customer data (revenue generating traffic) and for network signalling resources (non-revenue generating traffic). This is particularly relevant for high polling frequency, low data applications. Industry standards and vendor implementations are starting to address these issues, primarily in the area of VoIP services. The work on standards and best practice guidelines needs to be extended to embedded mobile applications.

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[2] As an example, the USA Health Insurance Portability and Accountability Act (HIPAA) includes the following: the Privacy Rule, the Transactions and Code Sets Rule, the Security Rule, the Unique Identifiers Rule, and the Enforcement Rule.

MNOs need to apply different business models

Currently, the most common M2M business model for MNOs is based on connectivity and transport revenues – the bit pipe approach. This represents a challenging business case, as acknowledged by several MNOs, and one that can only be improved by changes in the business model.

Some operators recognise that M2M subscriptions are commercially attractive on a contribution margin basis especially when viewed in the light of long life (negligible churn) subscriptions and low acquisition and operational support costs. Others see benefits in a partnering strategy where MNOs capture a share of system design, integration and managed service revenues in exchange for expertise in developing and operating network friendly applications.

As embedded mobile solutions extend into new application areas, MNOs will be exposed to significant new business opportunities. They will also be in a position to capture revenues from operational savings and the more efficient use of resources.

New business models will arise from these opportunities including:

- Revenue contributions from MNO assets (e.g. customer information, location, billing etc.) incorporated into M2M applications.

- Involvement of third-party payers (e.g. government agencies for wireless health solutions that relieve public sector resources).

- Revenue uplift from spillover effects and convergent services - M2M applications that improve 'information efficiency' are likely to result in spillover effects that stimulate voice and messaging usage; these benefits may be amplified through converged communications strategies. An equipment fault, for example, is likely to trigger several voice and data exchanges during the repair process.

- Expansion of the business relationship and scope of services to existing customers generating incremental revenues for a marginal increase in the cost of sale.

Study Recommendations for the GSMA

The main issue that companies in today's mobile eco-system have to address is the poor level of awareness about new device and application opportunities, especially in segments beyond traditional M2M applications.

The GSMA is well placed to draw attention to these opportunities and to address market development challenges. It is in a strong position to act as a facilitator, and to take a more ground breaking approach with vendors and MNOs in promoting new designs as well as service pilots with MNO hosts.

The recommendations from this study are for the GSMA to use its unique industry position to facilitate key market development activities within the mobile eco-system and with representatives from other industries through the following objectives.

- Raise awareness of mobile-enabled devices and applications through a web portal (case studies, directory for companies in the wider eco-system beyond M2M), demonstrator zone and speaker events at MWC-08.

- Initiate a collaborative outreach to promising industry segments outside of the traditional mobile domain in order to accelerate the adoption of embedded mobile connectivity.

- Establish MNO working groups to address common designs (chip sets, modules) and industry conformance on a common set of technologies (e.g. device APIs) and operational (e.g. network resource management) issues, with a goal to cost reduction and simplification of units.

- Obtain sponsorship and participation of interested vendors to pursue longer term Embedded Mobile program goals.

The GSMA is proposing to launch a cross-industry program to develop the embedded mobile market subject to broad-based and active participation of companies in the eco-system. The high level plan begins with a public display and discussion of industry issues at Mobile World Congress (2009). This will culminate in a review of progress through a showcase of new devices, services and solutions at the end of the first year of the program as shown below.

Exhibit 6 Overview of the Embedded Mobile program
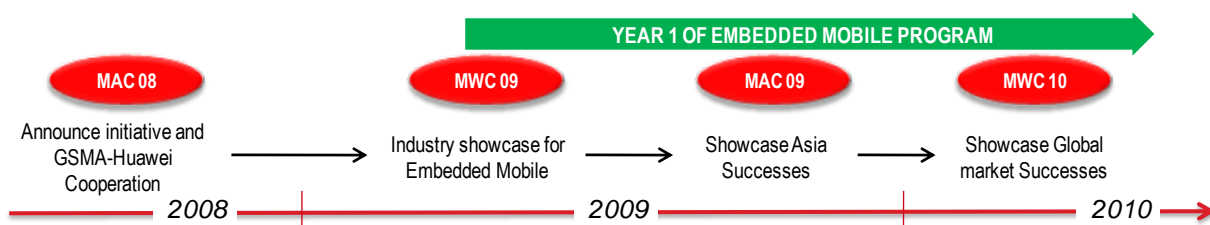
Acknowledgements

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Embedded Mobile initiative - MNO project sponsors

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Telstra	TIM	Vodafone

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This project was approved by the GSMA Board in May 2008. Industry interviews were conducted between June and September and this report was finalised in November 2008.