

# Machine-to-Machine

## Let your machines talk



# Contents

<b>1. EXECUTIVE SUMMARY</b>	<b>1</b>
<b>2. INTRODUCING THE M2M CONCEPT</b>	<b>2</b>
2.1 Connecting people, devices and systems	2
2.2 The vast field of M2M communication	2
<b>3. SUCCESSFUL M2M SOLUTIONS</b>	<b>3</b>
<b>4. GSM – THE TECHNOLOGY FOR M2M SOLUTIONS</b>	<b>3</b>
<b>5. OPPORTUNITIES IN M2M BUSINESS</b>	<b>4</b>
5.1 Opportunities for M2M solution users	4
5.2 Opportunities for system integrators and solution providers	4
5.3 Opportunities for M2M service providers	4
5.4 Opportunities for segment specialists and application developers	5
5.5 Opportunities for mobile operators	5
<b>6. NOKIA M2M OFFERING</b>	<b>6</b>
<b>7. CONCLUSION</b>	<b>7</b>

# 1. Executive summary

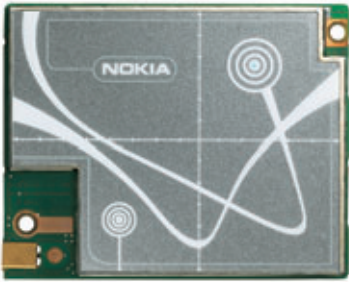
The normal perception of communication is broadening. It is not only people who use telecommunication and Internet technologies to communicate, but the machines around us as well. This is called machine-to-machine (M2M) communication. With tens of billions of machines in the world, from home appliances to industrial machines, the potential is vast.

In addition to mobile devices targeted at personal communication, Nokia also offers

products for creating and operating M2M solutions, thereby enabling a wider exploitation of the opportunities offered by wireless data. Supporting open technologies, Nokia provides the M2M market with its global expertise in telecommunications.

From mobile operators to GSM equipment suppliers, system integrators to application developers, M2M business offers opportunities for several kinds of companies. Successful M2M solutions are

created by these players, working together and forming value networks to offer comprehensive M2M solutions and services for the customers. Collaboration is one of the key elements on which the success of M2M market is, and will be, based.



Nokia 12 GSM module, size 1:1.



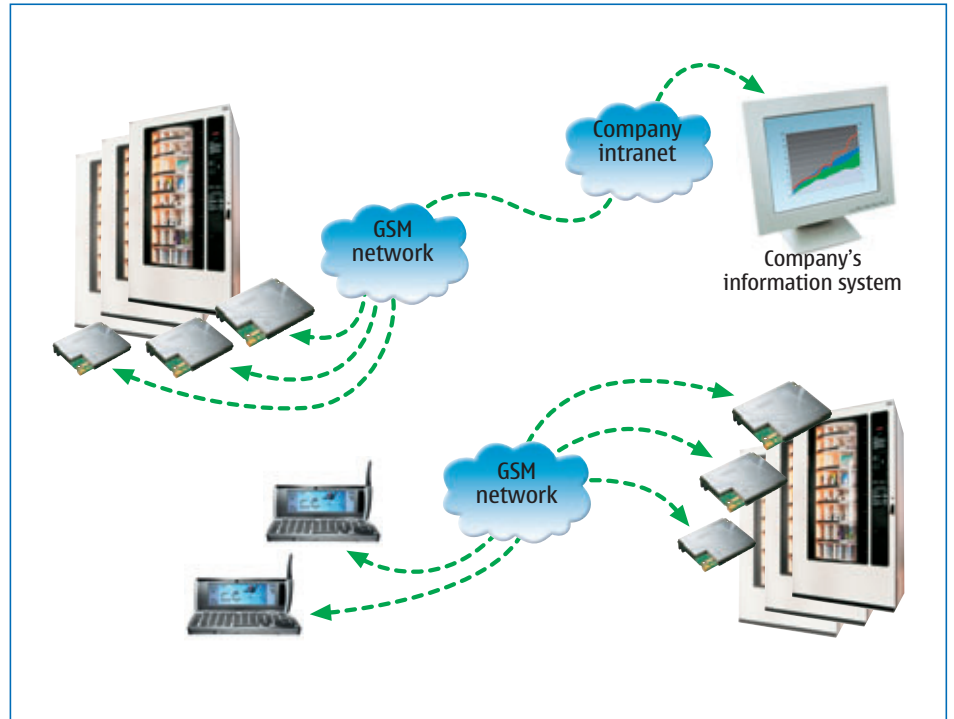
## 2. Introducing the M2M concept

### 2.1 Connecting people, devices and systems

There are billions of machines waiting to be able to communicate. An ice-cream vending machine wants to tell the supplier that it's running out of chocolate cones, enabling the vending operator to better schedule his on-site visits. An electricity meter wants to send consumption figures to the energy provider's billing system, thus providing more frequent meter reading. Or the other way around – using your mobile handset, you may want to activate the alarm system at your cottage remotely, check if the doors at your home are locked or tell your greenhouse to water your plants.

M2M is potentially all that, and even more. The term M2M refers to systems that enable machines to communicate with companies' information systems and other machines (machine-to-machine) – or with people's mobile handsets (mobile-to-machine, machine-to-mobile) – and provide real-time data. A wireless data link is used for monitoring and control, with data transfer occurring either by request or at predetermined intervals.

Ultimately, M2M solutions are created for increasing the profits and competitiveness of a company through more efficient processes, better customer service or new ways of doing things. M2M is about connecting people, devices and systems. M2M is about letting your machines talk.



M2M communication

### 2.2 The vast field of M2M communication

M2M solutions are typically developed for sending indications of unusual situations, collecting information or setting parameters according to business needs. New M2M applications are continuously emerging to serve rather comprehensively all business

areas – monitoring elevators in shopping centres, downloading new games into amusement machines, checking the temperature of swimming pools, locating trucks on the highways and tracking the use of office photocopiers, to name just a few.

	Service & maintenance	Home automation	Building automation	Infotainment	Pay as you use	Transportation & Logistics
Utility meters	•	•	•		•	
Household appliances	•	•		•		
Vending machines	•			•		
Security systems		•	•			•
Elevators	•		•			
HVAC* systems	•	•	•			
Billboards	•			•		
Amusement machines	•			•		
Industrial machines	•					•
Photocopiers	•				•	
Traffic signs				•		•
Trucks	•				•	•

\*) heating, ventilation, air conditioning

M2M segment examples

### 3. Successful M2M solutions

Winning M2M solutions are created by combining the competencies of highly skilled market players and then offering customers comprehensive solutions, not separate elements. Solutions are developed with expertise in different fields, such as communication technologies, software development, hardware integration, customer care and billing. And because such solutions are often tailored to meet the specific demands of each situation and customer, specialized knowledge of the business environment is also needed.

Like in any investment, a careful assessment of the solution profitability is needed also when planning an M2M solution. Benefits, whether they are cost savings, increased sales, revenues from new services or something else, together with occurring costs form the basis for profitability evaluation.

The factors affecting a solution's cost-effectiveness are the costs of application creation, system components, operation and

upgrades, which all need to be considered. One can minimize the application creation and upgrade costs by selecting reliable products with efficient development tools and standard, open interfaces. Operational costs may be minimized by, for example, making best use of different data bearers.

M2M solutions will typically link a company's remote assets, such as vehicles and escalators, to its existing information system. The reliability of a solution can be guaranteed only by taking an end-to-end approach to the development work. Efficient information security measures, such as data encryption and authentication, are needed in some applications to provide adequate security.

M2M solutions are often long-term investments, further stressing the importance of future-proof solutions. Solution continuity means that the customer must be able to take advantage of new technologies, whether in terms of lower equipment costs, higher data transmission

rates or more affordable operating costs. However, solution upgrades must not lead to expensive re-development cycles. Therefore easier upgradeability of both software and hardware components is one of the key elements of a successful M2M solution.

In addition to the technological aspects, the solution implementation process and the actual use of the solution should also be taken into account. Exploring M2M often means adopting new ways of operating. Altering the behaviour of the employees concerned is sometimes the biggest challenge – effective change management is needed.

#### Successful M2M solutions

- Benefits and costs – positive return on investment
- Reliability
- Continuity
- Scalability
- Change management

### 4. GSM – The technology for M2M solutions

Global System for Mobile Communications (GSM) is a global, proven system with considerable benefits compared to other technologies. The history of openness and standardization of GSM enables the creation of international M2M solutions. With the introduction of 850 MHz bandwidth as well as the 1900 MHz bandwidth, widespread M2M solutions are also a reality in the USA. Therefore, it is not an exaggeration to state that GSM technology enables the creation of truly international M2M solutions.

#### Why GSM?

- Truly international, proven standard
- Open and standardised
- Fulfilment of various customer needs
- Advanced data services with security features already available
- Continuity and future-proofing of networks and products
- Convenient installation
- Flexibility in mobility / relocating assets
- Roaming between mobile operators
- M2M business entry now

GSM technology roadmaps are created jointly with all the major players in the GSM industry, to enable the same level of stability and international compatibility in the future. In addition, the large number of GSM product and communication providers enables the fulfilment of various customer needs. The fact that there are multiple providers also makes possible the continuity of GSM technology – no single player can bring down the GSM market.

A great benefit of GSM technology is the advanced data services, including security features, that are already available with GSM networks and products. GSM networks usually offer several bearer options, including General Packet Radio Service (GPRS), High Speed Circuit Switched Data (HSCSD) and Short Message Service (SMS). Data services are continuously being enhanced, aiding the continuity of M2M solutions built on GSM technology. A future development path is essential, as M2M solutions are often long-term investments.

A GSM solution is convenient and reasonably inexpensive to install. In fact, GSM connectivity

can be built into machines by the manufacturer instead of being installed later at higher cost. No cabling is needed; equipment with GSM connectivity can conveniently be moved from one location to another, and also placed in third-party premises.

Roaming between different operators' networks is more and more readily available, further enhancing the mobility of M2M solutions built on GSM technology. Subscription fees in wireless networks are competitive. Compared to fixed-line data transfer options, in fact, choosing the appropriate GSM data bearer can optimise costs for application communications.

An important aspect of GSM technology is that it enables M2M business entry now. With existing GSM systems in more than two hundred countries,<sup>1</sup> the technology is also rapidly becoming the world's most popular third-generation evolutionary route. Advanced M2M solutions based on existing technology can be created today, and these solutions and services may form a convenient evolution path to third-generation business.

<sup>1</sup> GSM Association, March 2004.

## 5. Opportunities in M2M business

As previously stated, creating and maintaining an M2M solution is rarely done by a single company. Instead, M2M solutions are developed in collaboration by combining the competencies of several players. In this way M2M business has potential that may be explored by several different parties. Seamless collaboration between companies and, from the customer's point of view, a single contact point with the M2M solution creators, are essential for realizing this M2M potential.

### 5.1 Opportunities for M2M solution users

Companies are constantly looking for new ways to increase efficiency, cut costs and improve customer service to win competitive edge in their core businesses. The possibilities offered by M2M solutions are already recognized in several industries.

An M2M solution integrates the assets of a company, including those in the field and around the world, in one complete system. Operational costs can be reduced when needless site visits for service, maintenance and machine updates can be avoided, thanks to online connections with all machines. Manpower can thus be used more productively and machine downtime reduced.

M2M solutions may provide relevant information for decision-making and analysis of current business and processes. Furthermore, when competition in the traditional business area is getting more intense and eating into profits, expanding the business - for example, in terms of

service provision - with the help of an M2M solution may be a way to maintain profitability.

In addition to enhancing business processes, an M2M solution may benefit a company by enabling it to offer new services to its customers. Sometimes M2M solutions can also help meet requirements set by legislation. For instance, energy meters in some areas must be read at certain times during the year; an M2M solution can ease this task.

### 5.2 Opportunities for system integrators and solution providers

In the creation of M2M solutions, value networks consisting of several companies are required and the customer is "owned" by the whole network. But it is clear that the customer typically wants to deal with one specific company instead of the whole network when acquiring an M2M solution. These specific companies – system integrators or solution providers that actually offer total M2M solutions – play the central role in interacting with customers, for whom they add value by handling project management and subcontracting parts of the development project as necessary.

Because many corporate customers are finding that M2M provides the way to make their operations more profitable than before, there are plenty of untapped business opportunities for companies that understand these needs. M2M business enables system integrators and solution

providers to deliver complete turn-key solutions and create long-lasting relationships with their customers – from designing system architecture to providing support and maintenance services. Additional business opportunities include application development, consultation and product sales.

### 5.3 Opportunities for M2M service providers

A number of companies are looking into M2M right now – the question is, which approach will enable them to make the most of it? Many of these companies want to minimize their investments and concentrate on their core business, which they can do by outsourcing part of the solution operation to an M2M service provider. Service providers sell airtime and services, but instead of owning the network they rent network capacity from mobile operators, offering their customers a compelling M2M proposition: instead of multiple subscriptions, customers get just one bill for all their M2M services.

The business scope of M2M service providers may vary considerably. Probably the best known business model is that of an application service provider (ASP) which manages and hosts software, renting or leasing it to companies wishing to minimize the cost of their IT resources and equipment.

M2M service providers play a critical role in developing and expanding the M2M marketplace, and their significance is about

## An M2M Solution for vending businesses

M2M solutions should be designed to grow along with the company and its needs. Technology development or changes in the business environment may require the introduction of new applications or services. This vending example illustrates an M2M solution that develops over time and ultimately combines both company internal applications and consumer services. It even generates new business.

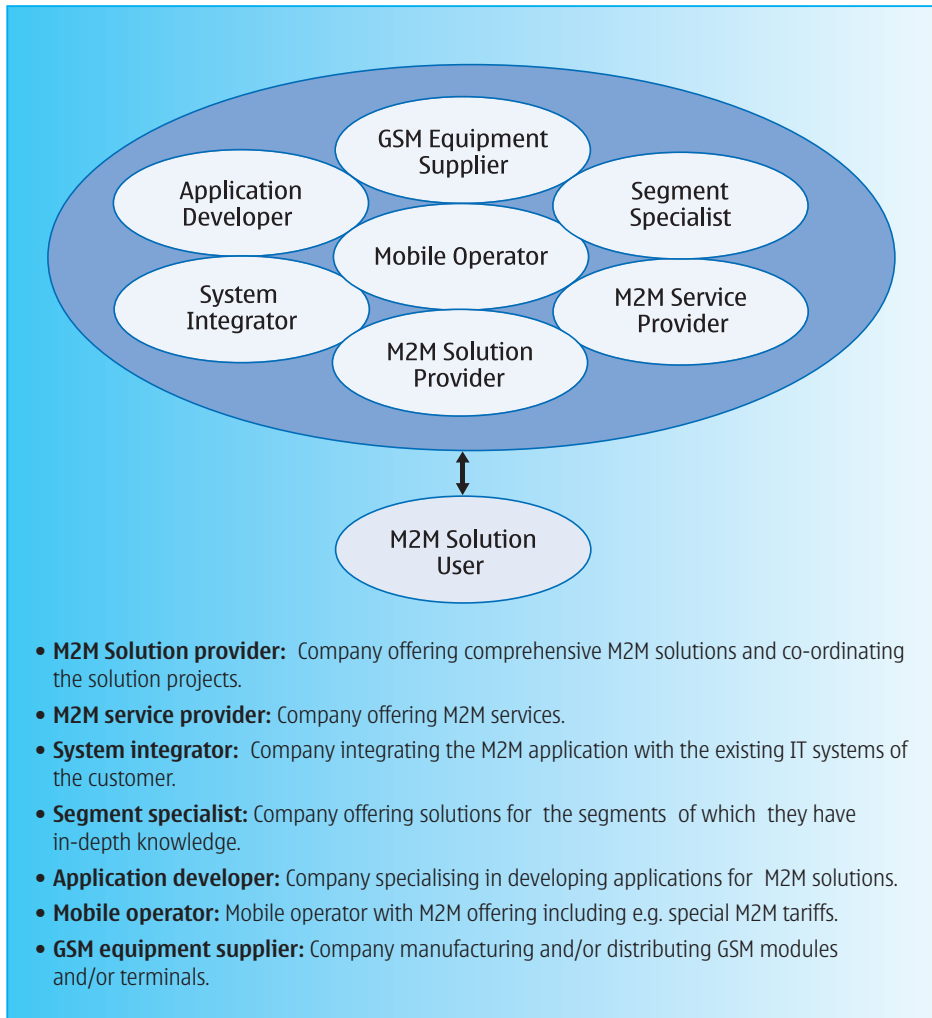
The first target of the solution is to **reduce the costs of vending machine operation** by using remote monitoring, data collection and configuration of the machines. Maintaining

optimum stock in each machine, undertaking proactive maintenance, immediately fixing malfunctions and changing prices remotely are just a few of the options for improving efficiency that this M2M application provides.

The M2M solution in the vending business may be expanded by providing consumers with the possibility of **mobile payment**. In addition to eliminating the trouble and cost of handling coins, mobile payment increases sales. A mobile payment solution can be implemented today in cooperation with an operator, and the evolution of mobile devices may enable new concepts to be applied in the future. Creating a direct link to

the consumer through his/her mobile device may for the first time make it possible to build **customer profiles and provide personalized services** and offerings to customers based on their individual needs.

The next step for the M2M solution in the vending business could be to **expand the business scope of the vending operator**. M2M-enabled machines could be used to provide information or content – e.g., news or games - financed by a third-party content provider. The same content may also draw people to the machine and encourage them to spend extra time for a snack or a beverage while there.



M2M value system

to expand along with growing demand for M2M solutions. As that demand increases, so does the need for a broader spectrum of service providers. M2M service provision is an outstanding business opportunity for existing ASPs to use M2M services in expanding their portfolio for existing customers and/or to penetrate new business areas. Also, companies currently acting in different fields may find M2M service provision gives them a way to expand their business scope and fully capitalize their business understanding.

#### 5.4 Opportunities for segment specialists and application developers

Whether a company is a specialist in home appliances, vending machines, utility meters or point-of-sales terminals, M2M offers many opportunities. As a segment specialist, a company has the possibility to integrate

wireless connectivity into its devices during the manufacturing process, avoiding retrofit installations in the field and thereby making M2M implementation easier.

M2M solutions can help these companies to achieve cost-effectiveness in maintenance and after-sales service operations, as its devices can report their status. But they can offer even more. Using M2M solutions, a segment specialist can gain better understanding of both its product performance and its customers. The company may even increase its customer base by offering new, specialized products and services that help customers make their businesses more efficient and profitable.

Application developers are companies specialising in creation of application specific software or sometimes also

hardware. Application developers are typically acting as subcontractors for M2M solution providers. They bring in their expertise in software development and testing. As the application developers' added value is based on their skills in specific software languages and operating systems, they can easily participate in M2M solution creation in very different segments, without having to worry about the project coordination and segment specific business requirements.

#### 5.5 Opportunities for mobile operators

With the voice market becoming saturated and competition increasing, mobile operators may enjoy new revenue streams from machines communicating over their networks. The present-day M2M market consists of several profitable, fast-growing segments and offers significant growth potential for operators to explore. Current demand for specific M2M tariff plans and services is likely to continue to increase.

M2M solutions provide an appealing opportunity to strengthen the operator's position in the profitable corporate sector. With M2M solutions, the operator is comprehensively equipped to extend its customer base into new market segments, to win more mobile telephony traffic and to reduce churn as M2M solutions typically mean long-term contracts.

With M2M, subscribers' traffic can often be concentrated in off-peak hours to balance capacity utilization, and much of the traffic flow is predictable so network resources may be used more efficiently. M2M solutions make it possible to generate significant additional revenues for a low initial investment.

M2M applications can also provide a good opportunity for content creation, which is especially desirable in the third-generation world. M2M offers people new ways to use their mobile devices and benefit from their subscriptions.

## 6. Nokia M2M offering

As a GSM equipment supplier, Nokia offers the M2M market with Nokia GSM modules and Nokia GSM Connectivity Terminals as well as related enhancements.

Further facilitating M2M solution creation, application development support is a part of Nokia's M2M offering.

### Nokia 12 GSM module

Nokia 12, an intelligent GSM module for wireless applications, provides M2M players with a set of technological advances, giving them more dimensions for developing applications and operating M2M solutions. EDGE, automated GSM connection establishment and in-built authentication mechanisms are examples of how Nokia 12 offers advanced GSM connectivity.

Java™ as a standard and well-known programming environment eases and speeds up the application development and allows the application being executed in the Nokia 12, minimising the need for extra hardware in the remote machine.

With enhanced Java™ reliability, versatile signal connectors, in-built Internet protocols and SIM card security feature Nokia 12 further enables reliability for applications. Other advanced supported features, such as easy integration for standard NMEA GPS modules, augment the Nokia 12 feature set, strengthening the intelligence that Nokia 12 possesses.

- Dual Band: EGSM 900/GSM1800 MHz, GSM 850/1900 MHz
- Supported bearers: EDGE, GPRS, HSCSD (not in 850/1900 MHz), CSD and SMS
- Size: 36 mm x 45 mm x 9 mm
- Weight: 15 g



Nokia 12 GSM module

### Nokia 30 and 31 GSM Connectivity Terminals

The Nokia 30 and 31 GSM Connectivity Terminals are compact GSM terminals optimised for M2M communications. In-built SIM card reader, internal antenna and interfaces for connecting to a remote device make them ideal as the communication links for a wide range of M2M applications. The Nokia GSM Connectivity Terminals can also be used as normal wireless modems for connecting to the Internet.

- Dual Band: EGSM 900/GSM1800 MHz (Nokia 30) GSM 850/1900 MHz (Nokia 31)
- Supported bearers: GPRS, HSCSD (not in 850/1900 MHz), CSD, SMS and USSD
- Size: 84 mm x 53 mm x 26 mm
- Weight: 65 g



Nokia 30 or 31 GSM Connectivity Terminal

### Application development support

As application development plays an important role in the creation of M2M solutions, Nokia sees it as essential to ease this development work. Forum Nokia website ([www.forum.nokia.com/m2m](http://www.forum.nokia.com/m2m)) is an information source for people interested in learning more about the possibilities with the Nokia M2M products.

Nokia 12 test board is a product designed for easing the early phase application development work. It can be used for familiarizing with the Nokia 12 functionality and setting the configuration of the Nokia 12 GSM module.

#### M2M at the Forum Nokia website

- **Read the documents** such as product specifications, user guides and programming guides
- **Download free software tools** such as Software Development Kits, modem drivers and Nokia 12 IMP1.0 Concept Simulator
- **Share your M2M experiences** with other developers
- **Ask from the Nokia M2M team** directly by e-mail

## 7. Conclusion

Nokia sees M2M solutions as a significant sector in the wireless data business, because they enable widespread mobile connectivity and Internet access. M2M solutions should not be seen merely as narrow vertical applications, isolated from the external world, but rather as tools to integrate devices, applications, people and companies so they become interactive parts of the Mobile World.

The technology for most M2M solutions exists today – not only in highly industrialized environments but also on a larger scale, for example home and office appliances. Little wonder that more and more companies are waking up to the potential of M2M communications.

Let your machines talk.

For more information, please visit:

[www.nokia.com/m2m](http://www.nokia.com/m2m)

[www.forum.nokia.com/m2m](http://www.forum.nokia.com/m2m)

[www.nokiausa.com/solutions/m2m](http://www.nokiausa.com/solutions/m2m)



---

**The contents of this document are copyright**

© 2004 Nokia. All rights reserved. A license is hereby granted to download and print a copy of this document for personal use only. No other license to any other intellectual property rights is granted herein. Unless expressly permitted herein, reproduction, transfer, distribution or storage of part or all of the contents in any form without the prior written permission of Nokia is prohibited.

The content of this document is provided "as is", without warranties of any kind with regards its accuracy or reliability, and specifically excluding all implied warranties, for example of merchantability, fitness for purpose, title and non-infringement. In no event shall Nokia be liable for any special, indirect or consequential damages, or any damages whatsoever resulting from loss of use, data or profits, arising out of or in connection with the use of the document. Nokia reserves the right to revise the document or withdraw it at any time without prior notice.

Copyright © 2004 Nokia. All rights reserved. Nokia and Nokia Connecting People are trademarks or registered trademarks of Nokia Corporation. Other product and company names mentioned herein may be trademarks or tradenames of their respective owners. Java™ and all Java based marks are trademarks or registered trademarks of Sun Microsystems, Inc. Nokia operates a policy of continuous development. Nokia reserves the right to make changes and improvements to any of the products described in this document without prior notice.

**Nokia Corporation**

Nokia Multimedia

P.O.Box 100

FIN-00045 Nokia Group, Finland

Tel. +358 7180 08000

Fax: +358 7180 34016

[www.nokia.com](http://www.nokia.com)

**NOKIA**  
CONNECTING PEOPLE