



The vision is clear. Soon, network-connected machines **will improve our lives in numerous ways**: from speeding up traffic, reducing fuel consumption, saving lives, improving access to healthcare, down to making everyday life more convenient.

So what is the problem? Put simply, most network operators are not geared to handle this radically different line of business. Let's take a look at what must be done.

Rise of the machines

ILLUSTRATIONS Rikke Jørgensen

The potential benefits of connecting machines are well proven and **the market is heating up**. Operators can be bystanders in this game, pure bit-pipe providers or become enablers that provide both the technology and the relationships that will drive the next generation of convenience to their consumers. **Some have already started to move** in that direction.

TODAY, WE CAN SEE a clear trend of operators increasingly moving into vertical markets. The number of machine-to-machine (M2M) connections is accelerating, and cars, smart meters, medical appliances, traffic lights – even shoes – are getting connected. However, the average revenue per user (ARPU) of a typical M2M user today is only about 10 percent of that of a mobile subscriber.

To be profitable, operators need to rethink their businesses. This will have a significant impact on business models, business processes and the underlying infrastructure. To succeed, therefore, business innovations are needed. And we are not only talking about applications; whole operations must be reorganized in order to fulfill efficiency requirements and enable sustainable growth. ▶

Theme in short

▶ Defining the market of connected machines and identifying the key players. ▶ Market growth and expectations. ▶ What traditional telecom operators need to consider if they want to play a leading role in this new market. **Conclusion** ▶ The M2M market seems to be taking off, and strategic decisions should be taken now. ▶ As today's solutions are often large scale, complex and expensive, simplification is a key word for the future.

For network operators M2M is an attractive segment due to the *low churn level* and *reasonable* network traffic load. Comparing revenue per megabyte to other mobile services, it is also potentially a high-margin business.

► M2M has been on operators' agenda for years but has only now become one of the hottest topics in the industry, with a new wave of connected devices – for which M2M has been a key market driver – hitting the market.

GAINING MOMENTUM

Having reached a critical mass, M2M services have started to generate significant revenues, and awareness of wireless solutions is increasing among enterprises, which have started to explore new opportunities for leveraging the technologies.

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Several major operators have established specific business units to take advantage of the M2M opportunity. Over the past year, this trend was reinforced by the establishment of Telefónica's international M2M unit, Verizon's center for non-traditional LTE devices, Sprint-Nextel's new M2M

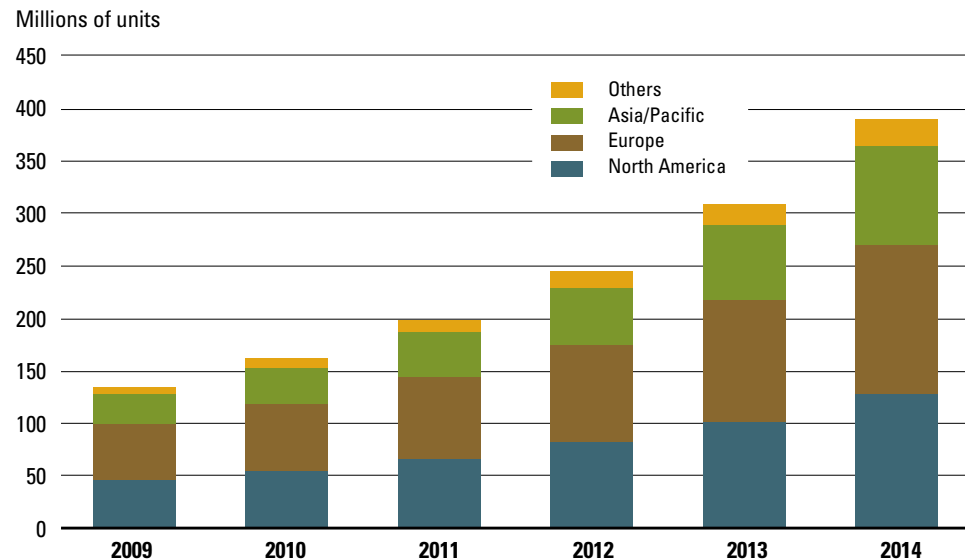
center, the Verizon-Vodafone global M2M alliance, and, finally, the international M2M center launched by Deutsche Telekom.

In addition, new regulations are expected to fuel the growth of the M2M market. For example, the security and safety aspects of the European Commission's eCall, a system designed to help motorists involved in collisions, rely heavily on telematics. And the Dutch government is developing a nationwide electronic road charging system using these technologies. In 2012, road-usage charging starts for trucks and extends to passenger cars in 2013. A nationwide system is expected to be running by 2016.

The EU and USA are currently the largest M2M markets, accounting for around 50 percent of the total. In 2009, the number of wireless M2M connections was estimated at 20.7 million in Europe, 18.6 million in the Americas, 16 million in Asia-Pacific and 5.4 million in the Middle East and Africa combined.

European operators have years of experience in providing wireless M2M solutions and rolling out M2M projects. The earliest wireless M2M solutions were deployed for paging services, followed in the mid-1990s by those for SMS. The

Connections still in the millions, not billions



(The figure above depicts M2M connections for all WWAN technologies, including proprietary cellular networks.)
Source: Harbor Research Inc.

first verticals were introduced in Finland in the 1970s with mobile voice based on the Auto Radio Protocol (ARP) technology.

NORTHERN EUROPE IN THE LEAD

In Europe, the UK has a large wireless M2M market with more than 2 million connections followed by Italy with 1.9 million. M2M penetration is highest in northern Europe, making up more than 5 percent of all mobile connections in Sweden, Norway and Finland. The average penetration range in the rest of Europe is roughly half of that, with the US trailing Europe as a whole. Other large and fast growing markets are China with 5 million M2M connections and Brazil with 3 million M2M connections.

Vertical needs, demands and “pain points” vary depending on the industry and the target market – for example, whether the M2M solution is targeted at businesses or consumers. The automotive sector has to date been the largest consumer of M2M applications, with more than 24 million connections. The market has been driven by professional solutions such as positioning and tracking, fleet management and logistics, and automotive telematics addressing productivity and cost-efficiency needs.

As population and vehicle densities increase, traffic managers will face new challenges. As a result, we can expect increasing numbers of intelligent transport solutions targeted at all road users, including both intelligent traffic lights and traffic re-routing to minimize congestion and optimize fuel consumption, among a range of other safety applications.

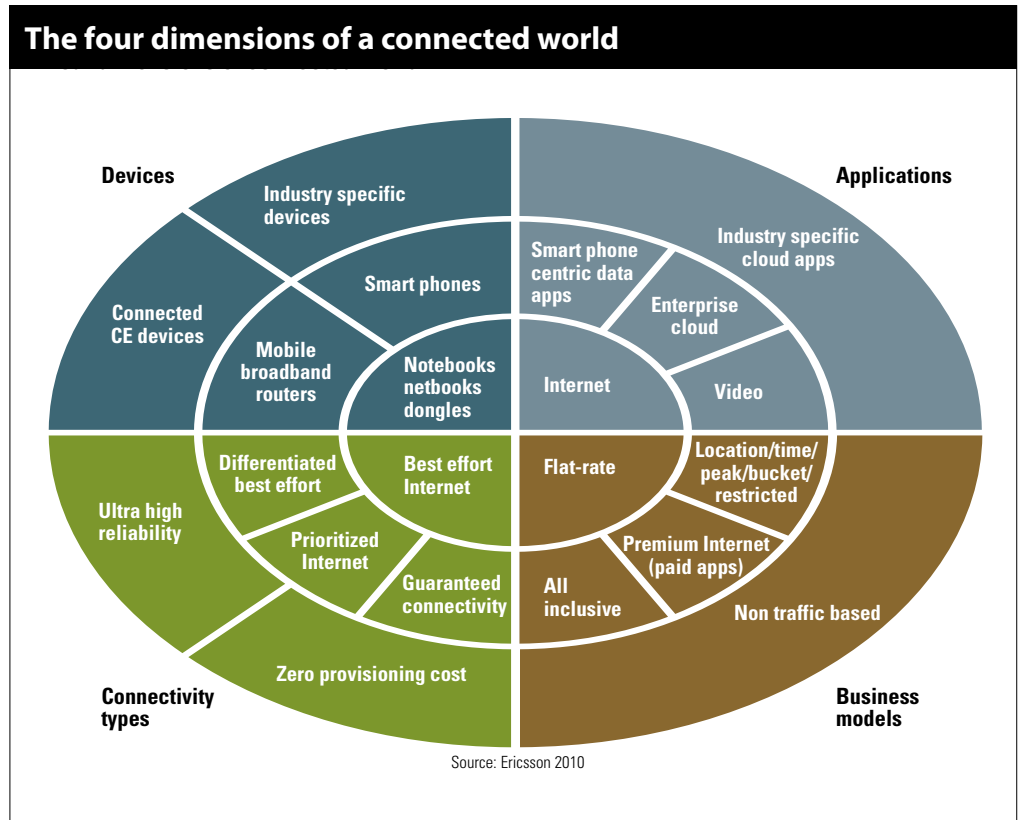
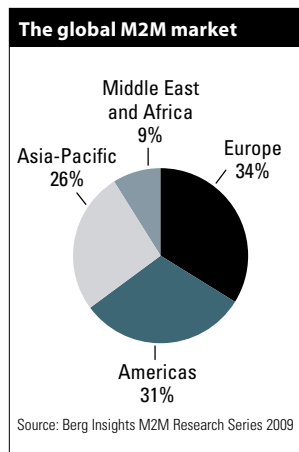
The second-largest M2M market is the electricity sector, which had 14 million connections in 2009 for metering and grids, with the wireless network providing intelligence through two-way communication. In addition, we can see interesting opportunities arising in the e-health market, which is still in its early stages.

In developed markets, such as in large Western European countries, healthcare expenditure accounts for 9 to 10 percent of GDP. These costs are expected to increase as a result of the aging population and the increasing number of chronic diseases. According to research by McKinsey, the healthcare industry could save USD 175-200 billion annually by managing chronic diseases through remote monitoring.

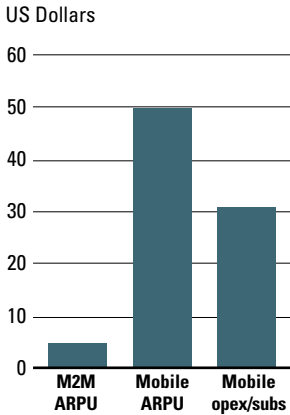
EMISSION SAVINGS

The benefits of e-Health have already been proven. In Germany, projects such as HealthService24 save up to eur 1.5 billion per year in costs for hospitals through mobile monitoring services.

Examples of wireless devices in the healthcare sector include wireless blood glucose monitoring and Bluetooth-enabled products that simplify the use of home monitoring devices attached to a patient’s clothes or body, such as the fingertip pulse oximeter, which measures oxygen in the blood. M2M has also become a way of addressing sustainability concerns. A 2009 Vodafone report, Carbon Connections: Quantifying mobile’s role in tackling climate change, estimates that mobile services will contribute to CO2 emission savings of 113 million tonnes across 25 EU countries in 2020. In financial terms, this would mean EUR



An unfair comparison



Source: Ericsson consulting estimate based on ARPU figures from ABI Research

Let's say that an operator's M2M ARPU is USD 5 per month and its mobile ARPU USD 50 per month. With an EBITDA margin of 39 percent, operating expenditure (opex) accounts for USD 31 per subscription per month. Roughly speaking, opex per subscriber in current mobile operations is six times M2M ARPU in this case.

Even though a direct comparison between mobile services and M2M-services is not fair, we believe that today's operations are not fully optimized for serving M2M businesses. For example, when providing M2M services for the consumer market, costs such as customer care per connection have to be scaled down.

▶ 43 billion savings in energy costs alone, and would require one billion mobile connections, 87 percent of which would be M2M.

M2M solutions will be also used for improving the quality of life of the poorest of the poor, a point emphasized in a 2005 International Telecommunication Union (ITU) report called The Internet of Things. One example of this would be enabling remote diagnostics of HIV or AIDS.

WHAT OPERATORS NEED TO CONSIDER

The market potential for M2M seems almost endless, but to secure profitable growth operators need to rethink their businesses. Vertical solutions are often diverse and consist of a wide variety of technologies and applications. To secure quick time to market and reduce the need for managing complex integration projects, operators deploying M2M have most commonly used a wholesale business model.

Running a wholesale business is a volume game and has tough cost efficiency requirements. Typical M2M ARPU is USD 5-15 per month and can be just a few USD per year or lower. On average, M2M accounts for 10 percent of mobile ARPU, while mobile operators have developed their networks for serving customers with monthly ARPUS of USD 50-60. Therefore, increasing scale yet maintaining profitability is the key challenge operators are facing today.

BUSINESS MODELS IN NEED OF SIMPLIFICATION

To maintain profitable growth, operators' business models, processes and underlying infrastructure have to be streamlined. This requires rethinking all operations, from strategies and business requirements to technical implementation. All levels of the infrastructure will be affected, including the mobile network, business support systems, devices and applications and the integration of company-specific solutions.

The technical capabilities are there, but there are a number of business issues that need to be solved. The connected device ecosystem is often complex and fragmented. Service providers and enterprise customers are expected to interact with multiple parties to get the "things" connected.

For many enterprises, this interaction requires special competence, resources and telecom understanding, something they may not have. End-to-end integration time and complexity is easy to underestimate. Typically, it takes six to 24 months to implement a wireless M2M solution for enterprises. For example, implementing a hospital-wide, fully integrated solution takes typically 18 to 24 months, but could take up to 48 months.

But complexity can be countered by bringing in people with the right expertise. Operators can help streamline "communications near" parts in cases where applications cannot be built in identical ways for mobile and fixed networks. Operators can also help in testing and integration, which is paramount, as most devices are not standardized.

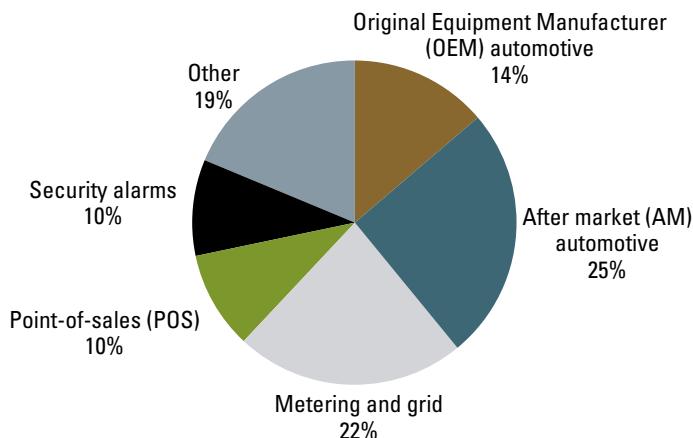
A DIFFERENT SUPPORT STRUCTURE

M2M business challenges are very different from traditional mobile offerings, as the following examples show:

Customer Management: M2M solutions are customized and include products and services from third parties. Extra effort is required to clarify the roles and responsibilities of the different parties, for example when errors occur. New business requirements such as company self-care and bulk provisioning/activation of thousands of devices will increase the complexity of operations. All these factors together create new challenges when automating processes and reducing customer care costs.

Support: Security and reliability requirements are high as most of the vertical applications are

Automotive and metering dominates



Distribution of wireless M2M connections per application area (Source: Berg Insights M2M Research Series 2009)

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business critical. Service Level Agreements (SLAs) and Operator Level Agreements (OLAs) have to be managed end-to-end including those with partners and suppliers as well as roaming agreements with other operators. These agreements must also be enforced in the network.

Revenue Management: Billing is a classical bottleneck, even for verticals. Customized solutions often require customized tariff plans, for example in relation to roaming. The diversity of solutions is increasing, which means new requirements for billing systems.

Network Management: Enhanced network capabilities are required to be able to differentiate business critical M2M traffic from other traffic. This includes prioritization of business critical solutions, solution-specific quality of service (QoS) requirements and differentiation in charging. Massive deployment of M2M may lead to a shortage in the MSISDN and IMSI series (numbers uniquely identifying a subscription in a GSM or a UMTS mobile network); even public IPV4 internet addresses may be an issue in the short term. Operators and system vendors face a common challenge in overcoming potential address problems as the number of devices grow.

Device Management: There will be new requirements for end-user devices and SIM cards to withstand environmental pressures such as vibration, humidity and high temperatures. An

alternative is to provide embedded connectivity with devices.

Simplicity equals cost efficiency – the less functionality you have, the cheaper it gets. However, making it simple is not that simple. When entering new business areas, operators need both process and system flexibility. They may not be aware of all the business requirements and verticals that differ from traditional telecom models. But the more flexibility you have, the more complex and expensive operations get.

BALANCING FLEXIBILITY AND COST

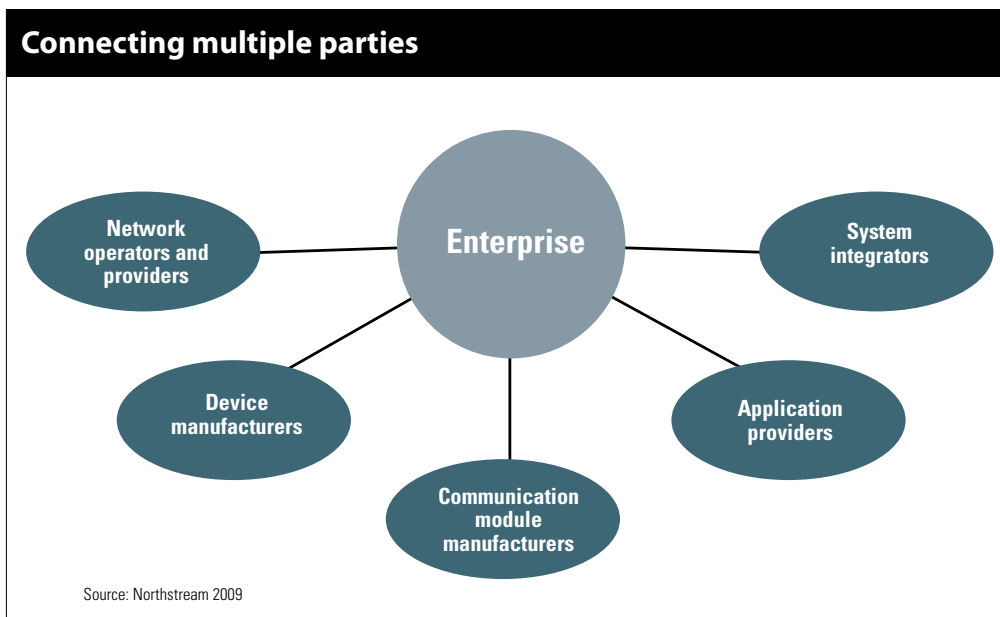
Challenges in finding the right balance between flexibility and cost efficiency can be illustrated with the following customer case. A Western European operator together with a supplier had designed a billing system that was world-class in terms of flexibility. It enabled around 20,000 different tariff plan combinations and offered the required flexibility in the market entry phase. However, later on, the new development proved to be a real headache. To build new functionalities on top of the complex design was time consuming and expensive. Developers had a hard time understanding what was going on, new code did not fit, and the number of test cases increased, along with the number of errors in production. A new project had to be carried out to remove what turned out to be unnecessary flexibility. ▶

▶ In Europe alone there are several billion devices that could potentially be networked by wireless technologies such as GSM/UMTS.

–Telenor Connexion 2010

▶ Demand for wireless consumer electronics devices is escalating. With the advent of the fourth-generation (4G) Long Term Evolution (LTE) network in 2010, the field will expand farther still.

–Verizon Wireless 2010



Why not connect every “thing”?

► The wireless M2M industry has been leading the development of the Internet of Things, but it's not only machines we are talking about. Theoretically every single thing could be connected via a wireless network. According to Wikipedia, every human being is surrounded by 1000 to 5000 things. This means a potential connection of trillions of things.

SEVERAL VISIONARY applications have already been introduced on the market:



GTX GPS Xplorer Smart Shoes:

Worried parents can monitor where their children are. When the GPS signal goes outside the safe area, an SMS notification is sent. One charge is enough for several days wear. (source: gizmono.com)



Pix-Star picture frames:

Stay connected with friends and family with instant picture sharing. View, receive and share pictures without a PC with a wireless connection via GSM, WiFi and Bluetooth. (source: www.pix-star.com)



The MIT Media Lab Musical Jacket:

The electronics and computer industries have been working for some time on developing wearable devices. The next phase will be to integrate computers and other devices into our clothing. (source: gizmono.com)

To reduce opex per connection on a required scale requires *radical action*. All traditional business processes, ways of working and supporting infrastructure must be questioned.

► Operators entering new verticals may need to go through similar processes, adding and removing flexibility. There are alternative ways to do this:

- 1 **Improvements in existing infrastructure:** Adding new features, products and services to the existing infrastructure enables quick time to market and reduces the investment risk. However, incremental improvements in infrastructure may not lead to the desired result in the long term. There are also organizational challenges in terms of the prioritization of different businesses. Whose requirements should be prioritized for the next release? Usually, big business wins and small business has to wait. The new internet reality may offer solutions to this; “software-as-a-service” has already proven a viable model in putting M2M into operation and maintaining good service. The challenge is to have a software package that includes all the functionality necessary to provide the services that customers ask for. Quality-of-service enforcement, for example, requires traffic functionality. It's not only a matter of device provisioning.
- 2 **Redevelopment of the infrastructure:** Business processes and underlying infrastructure can be redeveloped to meet cost-efficiency and M2M specific business requirements. However, running such an ambitious development project requires detailed vertical understanding and technical and financial resources, all of which today's typical M2M organizations (employing 50–60 people) may lack. The investment risks and costs can be reduced by establishing joint-development projects with operators and suppliers from different markets or verticals.
- 3 **Outsourcing the infrastructure:** Operators can benefit from business partnerships with telecom vendors, in which the vendor builds and operates the infrastructure based on the vertical-specific business requirements. Different verticals can be served through different infrastructure. Cost efficiency is achieved through scale, with several operators using similar infrastructure as a service.

MAKING IT HAPPEN

Meeting vertical-specific requirements and providing customized solutions while still maintaining profitability is a challenge. To reduce opex per connection on a required scale requires radical

action. All traditional business processes, ways of working and supporting infrastructure must be questioned.

Successful M2M businesses can be built in many ways depending on the operator's vertical strategy and local market conditions. To make that happen requires new partnerships and different ways of working with suppliers. This includes managing business and technology integration end-to-end, and both providing professional services and developing new outsourcing models in which the infrastructure is provided as a service. ●

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