MACHINE TO MACHINE

The Technology of the Future

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Abstract:

M2M or Machine-To-Machine is actually a misnomer—it actually connects Machine to Mobile- Mobile to Mobile—and finally Mobile to Machines. Thus, mobile integrators play a vital role in this interaction. M2M is an important connectivity tool relevant for a multitude of industries—e.g. Manufacturing, Logistics & transportation, Healthcare, Retail and consumers. The development of M2M as a technology is facilitated by the improved telecom R&D that enables emergence of technology platforms like 3G/4G (LTE) or FTTx etc.

Worldwide, the M2M ecosystem is growing that includes Telecom Service Providers, Telecom Equipment Providers, Application Service providers, etc. The M2M market is also maturing as the Service Providers think of innovative revenue models. The future potential of M2M Services looks quite bright with most forecasts indicating a huge jump in revenues and connected devices in the years to come.
Machine to Machine (M2M) – The Technology of the Future

M2M or the abbreviated form of Machine-To-Machine Applications is a key technology that has the potential of revolutionizing the communications industry in the near future. M2M is the next Wave of technology revolution that connects people, systems, and Smart devices in new and transforming ways, providing substantial value addition in terms of utility.

High broadband usage, increasing mobility applications, greater usage of Smart devices and emergence of new telecommunications platforms are some of the key factors that have led to the development of M2M.

M2M is part of the larger spectrum of “The Internet of Things”; as is referred to in common parlance and it is expected to connect a staggering 15 billion devices by 2015. These technologies encompass not only mobile M2M, but M2M applications based on wireless sensor networking (WSN) technologies, RFID, and other wired and wireless technologies.

RFID enables tagging and location only, while M2M has a wide encompassing area of operation that includes accessing, tracking, computation, etc.

The need for M2M . . . where can it be used in daily life?

Nowadays remote connectivity without need of human intervention is the need of the hour for all sectors; whether it is the retail consumers or enterprises. Here, M2M is a welcome relief. For any sector, the capability for any device to communicate wirelessly enhances its worth beyond imagination.

An example of consumer usage of M2M enabling services is when one enters the garage, the doors open and closes automatically and the lights switch on and off. Lights and other applications can be turned on and off according to certain system-based rules set previously for managing them.

This is just one of the examples where M2M can reduce power consumption drastically, not to mention enhance the convenience.

Another common example is keyless entry. A M2M application on a Smartphone device allows a person to wave their phone in front of a door, creating a keyless entry - a concept that can make large key chains redundant! The same can be accomplished for car entry using Smartphones instead of car keys.

However, just as an example, M2M has certain inherent advantages over technologies like RFID.
Another popular example of M2M in retail is the usage of Mobile wallets that makes Credit/ Debit Cards redundant by having embedded SIMs. Here, M2M, in conjunction with NFC (Near Field Communications) uses the mobile as a medium for monetary transactions thereby reducing the need for Credit/ Debit Cards. We have entered an age when everyday objects will communicate with, and control other objects over networks- 24/7/365, without human attention or intervention.

In the past, the high cost of deploying M2M technology made it the exclusive domain of large enterprises that could afford to construct and maintain their own dedicated data networks. Today, the extensive adoption of cellular technology has made wireless M2M technology accessible across the world.

The Next Big Thing with M2M: Why the Industry buzz?

There is an enormous market opportunity for M2M as there are many times more devices than people (research indicates a 10:1 ratio). Hence there is an enormous M2M market where numerous opportunities open up for vendors, solution providers, systems integrators and MNOs (Mobile Network Operators).

Some key Market Drivers of M2M technologies are highlighted below:

- **Explosion of connected devices**: Forecasts indicate that by 2012, mobile phone density will rise to 51%; and there will be as many as 612 million mobile users. Moreover – the number of machines is much higher than mobile phones. As per GSM Association (GSMA) - the number of global M2M connections will be 180 million by 2012; research firm Analysts Mason feels there will be 2.1 billion connected devices by 2020.

- **Increased demand for digital content**: Within different vertical industries, the amount of digital data being generated is rising at a near-exponential rate. M2M plays a key role in managing and utilizing this digital content, say in applications like digital signage, etc.

- **Exploit potential of Cloud and SDP platform**: Cloud computing reduces complexity and increases the power and versatility of M2M significantly; thus enhancing customer interest. In fact – it can transform the M2M industry as a whole. The more versatile the platform, the more interest is anticipated from the customer. Moreover, Cloud Computing enables reduction of upfront capital expenditure and thus also lowers entry barriers.

- **Network Optimization and utilization**: Most mobile network operators (MNOs) are becoming involved with M2M application providers; thus they deploy key network elements like mobile packet gateways; e.g. - Gateway GPRS Support Node or GGSN, Packet Data Serving Node (PDSN); etc for their M2M operations. This helps simplify internal business operations and also helps in better optimization of network utilization for unique M2M needs. E.g. mobile packet
gateways optimized for M2M traffic are able to handle many packet data session activations. Worldwide expansion of mobile network coverage provides a wider infrastructural backbone for M2M growth. Further, the emergence of FTTx or Optical Fiber provides improved broadband and means of digitization of broadband in the form of M2M services. An improved network optimization is the key to improved and more successful M2M device synchronization and deployment.

- **Increased versatility of applications and Enabling Services in both B2B and B2C domains**: M2M provides myriad enabling services as applications for different verticals; both in the B2B and B2C domain. There are B2C applications for retail and consumers like Keyless entry, NFC, etc. There are also a number of B2B applications for specific industries – e.g. Logistics, Banking, Healthcare, Utilities, etc.

  *M2M provides manifold advantages – e.g. incremental network traffic and revenues for the carrier, new applications for developers and systems integration opportunities for IT players, huge asset efficiency and productivity gains for the end-user.*

- **Improved quality of connectivity** - Quality of connectivity is also improving due to development of higher efficiency air interface standards, e.g. WCDMA and CDMA EV-DO. The improved connectivity backbone enables new M2M market opportunities - remote video surveillance, remote information display, multimedia content delivery, etc.

- **Role of Governments as a growth-enhancer** - Various governments and regulatory bodies in many countries enact regulations needing functionalities related to M2M; e.g. those related to close monitoring. Thus M2M enables usage of AMI (Advanced Metering Infrastructure), telematics, and POS directives.

  *Provides greater opportunities to Telcos* – In a flagging market where there is continuous pressure of competitive price drops and lowering revenues, growth of packet data surpassing the voice significantly, Telecom Service Providers get abundant opportunities to increase revenues through offering innovative Value-Added M2M services.
M2M Delivery Platforms – Innovative technologies being developed by number of players Worldwide

M2M solution platforms are the backbone for successful technology implementation. Some of the essential features being incorporated into the fabric of these platforms are – embedded support automation and tools for third party application development.

At present, M2M does not have a standard platform and many M2M systems are prepared as per specific task requirements. However – it is likely that with an increase in its frequency of deployment, M2M vendors will decide upon a gradual standardization.

Advent of Cloud Platforms: A key trend in platform development has been the emergence of Cloud platforms; Cloud application providers have developed some key Cloud-based platforms; yet this segment has remained a much smaller niche market within the overall global M2M opportunity.

Some key aspects that a Platform developer needs to keep in mind are – remove complexities of dissimilar systems and applications, simplify application development and provide interfaces compliant with different standards. The latter is important but not compulsory right now. Some of the recent developments in technology platform development for M2M are outlined below;

- Ericsson has entered an agreement to acquire Telenor Connexion’s M2M (machine-to-machine) technology platform
- AT&T works with Sierra Wireless - developer of the AirVantage cloud-based SDP
- In 2007, China Mobile developed an M2M support center in Chongqing for M2M product Research and platform construction
- Vodafone has launched a global M2M service platform to enable deployment and management of large, wireless M2M projects
- nPhase, a 50/50 joint venture between Qualcomm and Verizon, provides advanced Machine to Machine (M2M) cloud platform services

M2M Enabling Services – integral technology for a wide and varying set of verticals

M2M has a huge importance; its significance and its value addition & growing consequence as a domain can be better understood when we glance at the various fields in which we can use these applications. There are a number of M2M enabling services. Starting out with Telematics and Fleet management, M2M has now moved on to the consumer domain, healthcare, and is increasingly finding favor among energy and utility companies. In the current global scenario, security is of paramount importance and M2M has expanded its reach by getting into industrial and building control.
An overview of key Verticals & M2M enabling Services is summarized in the chart below.

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<th>Security</th>
<th>Utility</th>
<th>Wholesale/ Retail</th>
<th>Transportation / Logistics</th>
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Some usage scenarios/opportunities of the above applications are as follows:

- **In Manufacturing** – RFID and M2M can come together and a huge opportunity can open up in sub-sectors ranging from aerospace to oil and gas to electronics across applications such as inventory management, shipping and delivery, tracking parts, work in progress and employee data.

- **In Healthcare** – M2M can be used in body sensors, remote monitoring, remote diagnostic services, etc. The global market for M2M healthcare applications is estimated to be substantially high. Machina Research values it as €69 billion in 2020.

- **In Utility sector**: Huge opportunity exists for metering devices and measurement in case of power sector, oil & gas firms, etc. This will lead the demand for M2M applications in the utility sector.

- **In Transportation & Logistics** – The key application areas are tracking of high-value assets and vehicles, monitoring of entire supply chains, vehicle navigational systems (which has potential both for commercial vehicles as well as consumer cars), etc.

A key trend in M2M is **Vertical and Horizontal Convergence**. Along with increased vertical M2M applications, greater versatility is observed in horizontal applications too – thus enabling the development of applications that can be used in multiple verticals. Say, an application like AR (Augmented Reality) in retail store or an assembly floor.

**M2M revenues - how much do users have to shell out?**

M2M has the potential of generating a massive amount of additional data traffic - it thus creates significant new revenue streams for the Telcos. However, there is a challenge involved.

The **ARPD** (Average-Revenue-Per-Device) is substantially lower than the usual **ARPU** (Average-Revenue-per-User) from cellular operations. However, this is likely to be compensated by increased M2M applications and a huge number of connected devices that enhance the volume. On the other hand the low
ARPU necessitates that MNOs ensure a reduction in OPEX to generate profits.

There can be a number of innovative revenue models for instance a transaction-based model depending on extent of usage or a package-based model (a fixed payment at regular intervals; say monthly, quarterly or annually) or a model where the M2M earnings can be shared between the user and the provider.

Whatever the model, there is always a continuous drive by M2M operators to ensure a low-cost model to negotiate the problems presented by a low-ARPU model such as M2M. For instance having a completely automated IT infrastructure utilizes least manpower as support staff thus reducing overall manpower costs. Moreover M2M operators need to select a platform combining low ongoing TCO (Total-Cost-of Ownership) and also provide flexibility and scalability.

The present model followed by most mobile operators emphasize mostly on data utilization and not on the type or criticality of services utilized in digitization world. However, innovative plans are underway. Vodafone UK M2M for example, is launching a new bundled service with its partners which aim to become a one-stop shop for M2M terminals and managed connectivity on a single contract.

A key plan for Vodafone UK customers is to use their M2M global SIM card as part of their Global Data Service Platform; hence the roaming aspect is not a part of the connectivity via M2M. This is possible since they are in over 50 countries with Vodafone and associate networks, e.g. in Belgium, Austria, France and Russia. Thus, they can offer a single price for M2M service access across Europe, regardless of the network.

Another likely future change can be the development of region-specific business models that are customized due to varied user perceptions and regulatory differences.

The M2M ecosystem – are the players doing enough?

The M2M ecosystem has a wide variety of players – e.g. Cellular Operators or MNOs (Mobile Network Operators) who make available the myriad M2M services to Enterprises and Consumers as well as the Network Operators/ Telecom Equipment Producers.

Innovative business/ Revenue models being developed by Global Telcos

Worldwide major cellular providers such as Vodafone and AT&T have been playing a major role in popularizing and developing M2M services in matured markets North America and Europe in particular. There, they have announced multiple products/services related to M2M and launched data plans accordingly.
AT&T Mobility has dedicated M2M teams focusing on specific applications like developing Smart Grid & mHealth solutions. AT&T has also recently announced its latest new M2M partners – Axeda, ILS Technology, SensorLogic and Sierra Wireless.

Sprint has targeted four high-growth segments within M2M as the umbrella focus of its M2M development activities and offerings: Connected Transportation; Connected Meters, Sensors & Alarms; Connected Machines, Screens & Things; and Connected Personal Devices. Some of its major partners in this domain are Applus Technologies, Trimble, DriveCam, u-blox and Audiovox Electronics.

Network equipment providers too, have a vital role to play since they need to provide the M2M infrastructure and equipment (such as M2M readers). As an example, Cisco has developed the smallest router that works across all vertical markets and plays a major role in enabling machine-to-machine (M2M) applications through a gateway. Recently, in Germany, Deutsche Telekom AG, T-Mobile Deutschland GmbH and Huawei Technologies have announced they will work together in future to develop and market. This is a welcome and interesting trend where equipment providers and telecom service providers have joined hands since this cooperation will enhance the growth of M2M.

How has M2M progressed and developed within different countries?

There has been a significant growth and development of M2M within North America and Europe. However, the development of M2M in the developing & emerging countries has not yet shown the required level of maturity and growth as expected. The primary reason has been lack of technology awareness among potential customer-segments and less maturity within the telecom platforms that serve as a backbone of M2M.

As an example – the growth and development of 3G is quite moderate within South-East Asia and Africa; consequently development of M2M has been restricted within these regions since 3G facilitates the M2M connectivity.
A focus on India, ME and Africa: Leading cellular players like Vodafone continue to offer M2M services in India as an extension of their global capabilities though the initial uptake has been slow. However, many other prominent players such as Idea, BSNL, etc. have yet to do a lot to enable M2M functionalities within their networks.

Dwelling on M2M applications within India, one should also mention the plans of Reliance Communications. As part of their Green VAS & M2M (Machine to Machine) Rural Internet Plan they are considering rural-centric deployment of M2M technologies that includes automation of agro & Irrigation services, water level monitoring, and data gathering for milk & agri-cooperatives, fisheries, poultry, and soil analysis.

For the urban market, opportunity lies in mobile ticketing, purchasing in kiosks, vending machines, and remote monitoring of office automation products. Players like Reliance and Airtel have been trying to garner their share in this space through metering applications.

Within Healthcare - Cisco has a HealthPresence technology that serves remotely located patients. This creates new, streamlined clinical encounters by integrating two technology innovations: Cisco TelePresence and Cisco Unified Communications. Patients in HealthPresence encounters can see images and listen to sounds from a variety of diagnostic devices like digital stethoscopes; thus actively participating with what clinicians see and hear.

The future is now with Smart Energy Technology that will turn everything ‘Smart’ – ‘Smart Homes’, ‘Smart Grids’, and even ‘Smart Cars’
Growing applications in Middle-East and Africa: M2M is still in its infancy in these areas with operators still at an evaluating stage – however these applications have considerable potential in areas including video surveillance, home security, automated meter reading, fleet management, remote patient monitoring, etc. In Tanzania (Africa), electricity is based on a pre-paid system; the power meter will run until the amount is exhausted.

Hence, using a mobile, the consumer can easily make further payment through m-Payment and enhance the power meter. There is scope for the healthcare segment too - market for telemedicine devices and services are anticipated to generate almost US$ 150M for the Middle East and Africa region.

**M2M: Some challenges ahead...**

There are a few significant challenges that act as hurdles for future growth of M2M – some of them are summarized below:

- Limited knowledge and experience of M2M among customers
- Prohibitive cost aspects for deployment
- Dependence on 3G/4G
- Mobile network is prone to congestion to manage huge number of devices

**Risk of failure** - One of the biggest challenges of M2M is the possibility of risk involved in case of failure. The risk and the implications involved in case of cost, time and customer dissatisfaction is considerably large in case of business transactions like those involving banks, tracking in logistics, etc.

Here there is high impact of financial loss. However, the risk and consequences are less serious in case the applications are related to consumer-needs as in the case of keyless entry.

**M2M – Conclusion and Future Trends...**

M2M market will be significantly driven in the next 10 years by enterprises’ need to reduce costs and consumer demand for new services.

As per the forecast by ABI Research, the total number of M2M connections worldwide is predicted to increase to as high as 297 million connections by 2014.

Future trends indicate that the mix is likely to remain similar over the next 5-6 years. According to Strategy Analytics, the worldwide M2M communications market is estimated to reach close to $30 Billion USD by 2014.

Another change is likely to be in the sectoral distribution of M2M applications. Earlier, most deployments in developed markets have focused on the commercial segment, especially the automotive and transport sectors where the first solutions emerged. The balance is likely to shift considerably during the next 10 years: from developed to emerging markets; from commercial to consumer applications; and a focus on one sector to a much wider spread of applications. There is a likelihood of integrating sophisticated technologies like Unified Communications M2M communications in future - this will provide superior services both for enterprises as well as consumers.
Finally – we can conclude that the future is now with Smart Energy Technology that will turn everything ‘Smart’ – then we can have ‘Smart Homes’, ‘Smart Grids’, and even ‘Smart Cars’. The Smart Grid controls the power distribution between utility companies and consumers so that optimal usage of power is ensured by the users – whether consumers or enterprises. This significantly saves energy and avoids blackouts. All these aspects will be ultimately controlled by M2M technology as Digitization solutions.
About the Author

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