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Wireless M2M

Key Factors for a Successful Deployment Strategy

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INTRODUCTION

Wireless Machine-to-Machine (M2M) communications is emerging as a cost-effective and reliable enabler for a variety of industrial applications and services beyond voice-centric handsets that connect an enterprise's machine assets with its IT infrastructure and workforce through wireless data communication.

Cost/benefit analysis is key to winning adoption among enterprise customers. Unfortunately, there isn't a simple, straightforward guide showing how to connect M2M assets to networks and integrate the resulting machine data into business applications. M2M application deployments can be complex, cost sensitive and open ended. Meticulous planning and execution is therefore key to successful deployments.

It would be useful to establish a framework for a Wireless M2M deployment strategy to take some of the complexity out of M2M and make it easier to get applications off the ground.

CELLULAR M2M DEPLOYMENT FACTORS

1. Business Strategy

1.1. Target Market and Business Objective

M2M can be disruptive to existing business models & processes. Every M2M deployment must therefore begin with clear business objectives so that both senior management and the entire enterprise are on board for a seamless deployment with the fastest ROI. This includes:

- The problem statement and target application
- The amount of data to be communicated and processed
- The type of devices to be deployed: fixed or mobile?
- The environment of deployment for the device
- Deployment reach: global, national, or regional?
- The value proposition, in terms of cost savings, time savings, new revenue opportunities, etc.
- The identification of the existing business processes that will be impacted and the appropriate required changes.

1.2. Building on Core Competency

Since M2M can be disruptive, it is best if the application is built on an established business model and core-competency. An example would be 'Smart Metering' where an electric utility company applies Wireless M2M to traditional electric utility metering for real-time monitoring and energy conservation.



1.3. Budget/Resource Constraints

M2M application deployments can be complex, cost sensitive and open ended. Budget and resource constraints can be a significant hurdle to successful deployments. The key question then is – What is the expected time frame to see a return on investment and how much is one willing to spend?

1.4. Impact on Current Business Model

If M2M is disruptive to existing business model, it can be a painful adjustment process. From a risk mitigation perspective therefore, it is important to have a good understanding of the potential ramifications on the business model and plan appropriately so that current business and revenue streams are not detrimentally impacted.

2. Return-On-Investment (ROI)

2.1. Deployment Costs

2.1.1. M2M Equipment Costs

Physical size, display size & resolution, battery life, sensor features, wireless network technology, embedded software, etc. are all key factors in determining the costs for the ideal device for deployment.

2.1.2. IT Infrastructure Costs

Integrating M2M devices and data into a company's integrated IT infrastructure and back office systems including database, ERP, CRM, automated billing, automatic report generation, workflow management, etc., usually managed as IT projects, can be a significant cost factor.

2.1.3. Solution Development & Integration Costs

M2M Solution Architects/Consultants are central to the success of the project. They are responsible for architecting the entire M2M solution and platform including business case, requirements definition, systems design, selection of partners, and planning and managing the implementation.

2.1.4. Data Communication Costs

Network services and data communication costs in the form of bandwidth can be the most significant recurring cost item for an M2M application. It is important to ensure the application uses the minimum bandwidth it needs. Optimizing communication costs is key to achieving the desired ROI and the long-term economic viability of the application.

2.1.5. Maintenance Costs

Maintenance costs can be high depending on the level of complexity of the implementation, especially on the IT infrastructure side.



2.2. Revenues

2.2.1. Cost Savings (Lower Total COO)

M2M, when correctly applied, can lead to significant cost savings. For a proper assessment of ROI, one must quantify these savings and account for any potential hidden costs.

2.2.2. New Revenue Opportunities

M2M applications can sometimes represent new revenue streams for corporate adopters. Manufacturers can use their connected M2M assets to develop customer relationships that can generate new revenue streams in an information economy.

2.2.3. Increase in Productivity/Efficiency

With Wireless M2M, optimized equipment uptime and minimized equipment downtime can translate to significant productivity & efficiency gains that have a direct impact on revenues and profitability.

2.3. Competitive / Strategic Advantage

2.3.1. Improved QoS → Enhanced Customer Loyalty

M2M can significantly enhance quality-of-service and consequently customer loyalty. By enabling remote data collection, the vending industry, for example can increase customer loyalty and maximize utilization of resources by addressing critical factors such as inventory management, machine performance, prompt maintenance & service, and optimum product mix and stock levels.

2.3.2. New Business Models

Much like the Internet, M2M has the potential of creating new business models and opportunities. Adopting an added-value service model can be a key differentiator for manufacturers in many industry sectors deemed to have reached maturation or saturation. Old reactive business models for service and support of assets will make way for proactive real-time response and 'smart' service.

2.3.3. Differentiation - Increased Entry Barrier

While many businesses and industries have reached a point of maturation where their products may not be perceived as unique, M2M-enabled services provide rich opportunities for value creation, new business models, and new relationships between business and customers — each of which has a dollar value and return on investment. The differentiation between two M2M adopters will, of course, lie in the art of their solution.



2.3.4. *Scalability with new features (E.g. Security)*

For increased ROI, an M2M solution must have sufficient scalability and flexibility that we can continuously add more and more sensors and networked devices to it.

2.3.5. *Scalability into New Verticals/Market Opportunities*

In today's challenging climate, the need to remain competitive continues to increase especially in the face of changing regulatory and economic conditions. Since the investment for M2M deployment can be significant, it would be valuable to assess opportunities to leverage this investment to expand business and operations into new geographic and vertical segments. Companies expanding into new markets can ease their journey and accelerate their presence by partnering with consultants like [Emblaze Consulting](#) who have the experience and relationships required to successfully execute towards market expansions.

2.3.6. *Enhanced Image/Branding*

M2M businesses will recognize that their M2M assets will have a unique personality (as in a 'smart service') based on their business model, their business needs, and their customers' demand for reliability, service, and support — each of which has a dollar value and return on investment. This opportunity for differentiation can be exploited in enhancing the brand image of the company as a leader in the industry.

3. Implementation

3.1. Customization Requirements

Since M2M implementation is still not mainstream, many M2M applications are usually customized for a particular application and industry. As the M2M industry matures, technology providers are endeavoring to create off-the-shelf components to streamline portions of the deployment. Customization however will very likely be required in a large-scale project. M2M Solution Integrators and Consultants can help scope out capability gaps and identify appropriate solutions to enable on-schedule deployment.

3.2. Network Communication

3.2.1. Bandwidth requirements and Communication model

For M2M, there are too many choices for network communication. This includes wired communication versus wireless, with the latter including cellular (GSM/GPRS/EDGE/3G/4G), Bluetooth, WiFi, Zigbee, etc. or a combination thereof. The choice is usually straightforward for most deployments depending on the specific bandwidth and service requirements.



3.2.2. *Network Coverage and Site Survey*

Availability of network coverage for the machines that need to communicate is a critical factor. A Site Survey ensures ample coverage is available for networked M2M assets throughout the lifetime of deployment.

3.2.3. *QoS including reliability of data delivery*

Other requirements may include real-time delivery of data, consistent performance, reliability of data delivery, and acknowledgement of data delivery.

3.3. **M2M Device/Hardware Selection**

For end users, the greatest challenge may be figuring out which hardware options meet the requirements of the application. There are too many choices especially in the wireless communication path (GSM/GPRS/EDGE/3G/4G...) and the development process for this group can be intense with a steep and costly learning curve. Application and hardware providers are usually saddled with the burden of making the hardware ready for deployment.

3.3.1. *Bill-of-Materials (BoM)*

To a first order, the bill-of-materials (BoM) is a key element in determining the cost of the equipment. This can have several components all of which contribute to the total BoM of the equipment such as:

- eBoM (Electronic BoM) - which is comprised of BoM associated with key electronic components including integrated circuits, modules, actives, passives, connectors etc.
- mBoM (Mechanical BoM) - which is comprised of the non-electronic mechanical components including housing, plastics, substrates/pc board, keyboard and buttons, screws, antenna cover, etc.
- sBoM (Software BoM) - which is comprised of costs associated with embedded software including operating system, firmware and device drivers, user interface etc.

3.3.2. *Sensor Features*

There are countless varieties of sensors available on the market. Transducers including miniaturized MEMS sensing solutions (e.g. pressure sensing, microphones, accelerometers, gyroscopes, etc.) solve advanced monitoring and control challenges, together with turnkey wireless communication modules. The choice of the sensor depends on the target application. Smart sensors provide high flexibility and freedom in application design and configuration for M2M solutions.

Many sensors often work well by themselves; however, they cannot pool resources since they cannot co-exist within the same network. It is



therefore important to choose sensors that speak the same 'tongue' or protocol as large scale Machine-to-Machine (M2M) and sensor networks become more popular.

3.3.3. *Network Technology*

The choice (GSM / GPRS / EDGE / 3G / 4G, Bluetooth, WiFi, Zigbee) is usually straightforward for most deployments depending on the specific bandwidth and service requirements. This has implications on the cost of the communication chipset that constitutes the communication module.

3.3.4. *Device Size and Weight*

While device size/weight may not be a constraint for industrial M2M applications, it will most certainly be for consumer applications (e.g. wireless medical devices). The device size & weight will depend upon the target application.

3.3.5. *Modularity and Certification*

Modularity, especially with regards to the communication module, is important to decrease deployment costs. Certification refers to the process of getting wireless M2M products approved for operation on a cellular network. M2M manufacturers, however, often associate the device certification process with high costs and longer time to market, and it can be a significant cause for concern for OEMs (original-equipment manufacturers) navigating the process for the very first time. With a certified communication module, device re-certification may be expedited when the original module is replaced with another certified module.

At a minimum, devices must meet standards set by regulatory bodies (for instance, the Federal Communications Commission, www.fcc.gov, Washington, D.C.) and by the standards bodies for GSM or CDMA. Many M2M device manufactures are novices when it comes to the certification process.

Each carrier may specify its own set of requirements before allowing a piece of equipment to activate on the network. M2M manufacturers must reach out to carriers earlier in order to ensure they're designing their products to their carrier's specifications. Integrated devices must complete PTCRB testing by an approved test house that provides testing & certification services (e.g. [7 Layers](#), [Cetecom](#)). Typical testing can include audio interface testing, power interface testing, SIM interface testing, RF interface testing, MMI interface testing, and other testing.

3.3.6. *Reliability*

The device is perhaps the only tangible element of the M2M solution. The Customer therefore associates the M2M Company with the device. The



reliability of the M2M device is a key factor in the selection of the M2M equipment. In smart metering, for example, the utility companies would not like to replace the meter for the life-time of the house where it is deployed.

Key considerations in the choice of a reliable device are:

- Electrical defects
- Physical (Wear and Weather) reliability
- Battery Life
- Ease of Battery Replacement
- Certification

3.3.7. *Application Enhancement*

Many adopters would multiple improvements from a single M2M investment. It is desirable to design the system such that the same application/network infrastructure for one application can also be used for several others, regardless of the specific nature of the application.

Application enhancement is a periodic enhancement or adaptation of the system performance with changes in business requirements, technology, and new opportunities.

3.4. *Level of Complexity*

3.4.1. *Level 1:* Simple remote data collection and monitoring such as by SMS and 1-way GPRS

3.4.2. *Level 2:* Automated Device Management with, for example, 2-way GPRS data traffic

3.4.3. *Level 3:* Enterprise wide deployment with end-to-end automation & management and extensive integration with IT infrastructure (ERP, CRM, automated billing, etc.)

3.5. *IT Infrastructure Integration*

This can have the following key components:

- M2M Middleware - an intermediate component hosted on the Internet that manages connections with M2M modules in the field and the transfer of data to and from a back-office server.
- Back Office Integration – consisting of data storage and business specific processing

3.6. *Service Activation / Provisioning*

Activation and provisioning should be a seamless user experience for M2M adopters. Unless close attention is paid, the activation and provisioning process, usually a simple step in an M2M deployment process, can easily become a painful experience for the customer. Having activation software embedded in the M2M device (i.e. no software to download) is the ideal solution for



activation/provisioning ease. With such automatic provisioning, many manual steps and activation delays can be eliminated.

3.7. Integration and Testing Complexity

Testing and integration are important steps in M2M application deployment. Besides hardware (device) testing discussed above, systems integration, field testing & validation, security compliance testing, and usage scenario testing conducted by M2M experts is key to fine tune M2M applications to operate more efficiently and cost effectively.

3.8. Maintenance & Service

The M2M deployment process must be managed and maintained throughout the lifecycle of the project (which can be as long as over 10-20 years in some instances). Continuous monitoring, long-term reliability, software and feature upgrade infrastructure (over-the-air), and ongoing maintenance including security and back-end management must be considered at the outset.

3.9. Training – Business & Customer

Since M2M can be a disruptive technology, it requires considerable investment and can pose a significant transformation from a business culture perspective. Adequate training is necessary to ensure the customer receives optimal benefit from their investment. Proper training of field service employees is vital to ensure they fully understand new processes and procedures.

SUMMARY

M2M application deployments can be complex, cost sensitive and open ended. Meticulous planning and execution is therefore key to successful deployments

Unfortunately, there isn't a simple, straightforward guide showing how to connect M2M assets to networks and integrate the resulting machine data into business applications.

Best practices will continue to evolve and refine as more companies find ways to profit from M2M technology. This builds momentum, accelerates adoption, and helps companies bring M2M solutions to market.

ABOUT THE AUTHOR

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