

Internet of Things: Enabling
Device Manufactures cash on
Intelligence through Subscription
Model/SaaS – White Paper

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Abstract

Device Manufacturers have been selling their hardware's with embedded software's to their customers. Majority of their revenues come from device sales and AMC associated with the devices. However, these devices capture huge set of health data and it has lot of value. Both the manufacturer and the customers are largely dependent on these silos of data to learn about the health of the system, performance and durability, etc. In this whitepaper, we discuss about the volumes of data generated, ways to generate meaningful insights from these data securely at the customer level. Monetizing the insights will essentially lead the device manufacturers towards subscription based business model. Let's look at how this can be accomplished easily using a SaaS framework.

Introduction

M2M space is going through significant transformation. Device manufacturers are investing a lot on making the devices such as HMI, PLCs, and Robots smarter. With the proliferation of mobiles and cloud, customers are demanding to visualize the data from their machines on their mobile and desktop. Significant effort is going on using the data coming out of these devices and getting intelligence out of the data.

And, we know that access to data alone is not sufficient. You need to derive intelligence and insights from these large chunks of data that is collected from varieties of machines and devices. With the ability to manage big data at the cloud and apply various machine learning algorithms, it is lot more easier to extract great insights from the data generated out of these devices.

The intelligence is used for making proactive business decisions, delight customers, etc. Preventive maintenance could be one example on how the intelligence is used.

Most of the devices already provide the ability to extract data out of their devices into a computer (there is nothing new on this). Missing elements are: a) ability to take the data to the cloud and helping the customers

get intelligence out of the data & b) monetization mechanism around this.

Pushing the data to the cloud actually forces the device manufacturer take responsibility on the network security, data security, etc. They will need a good cloud infrastructure and data analysis capabilities for the end users to access the data and get intelligence out.

We need to spell out the benefits here to make our business case stronger...importance of data analysis capabilities and generating insights. Then, sell the insights on subscription model.

Here the revenue generation model is "subscription" – how many devices are on the cloud, what is the volume of data coming out of these devices to the cloud, how is the intelligence delivered and consumed, value of these intelligence, etc. Good thing about this is the end users will be willing to pay for the intelligence. If you can get the data out of a machine to the cloud and provide intelligence, machine tool manufacturer/user will be ready to spend some dollars on monthly basis.

Examples of various organizations who have capitalized on this

Following are some of the list of companies who have leveraged internet of things effectively and made significant impact on how they do their business.

	Examples of manufacturers who have leveraged IoT	Reference
Lifts & Elevators	ThyssenKrupp, OTIS, Kone	ThyssenKrupp : http://www.cruxialcio.com/iot-lifts-maintenance-ops-thyssenkrupp-9411
Windmills	Gamesa, Suzlon, Vestas	https://www.youtube.com/watch?v=92tZ30ZporE http://ibmdatamag.com/2013/05/video-ibm-big-data-technologies-helps-vestas-turn-climate-big-data-into-capital/
Storage devices	Network Appliances, Hitachi, LG Electronics, Fujitsu	http://www.hitachiconsulting.com/technology-solutions/internet-of-things
Automobiles	GM, Continental AG, TOYOTA Motor Corp	http://www.youtube.com/watch?v=Eegb0PDzTTI
Consumer Electronics	Samsung, LG	http://www.cnet.com/news/samsung-snaps-up-smarthings-embracing-internet-of-things/
Industry Machines	Bain, Manta	http://www.bain.com/publications/articles/is-your-company-ready-for-the-internet-of-things.aspx

ThyssenKrupp Elevators

Big cities can't exist without skyscrapers, and in turn, skyscrapers can't exist without elevators. ThyssenKrupp Elevator is one of the world's largest manufacturers and operators of passenger transportation systems, with customers in more than 150 countries. It maintains more than 1.1 million elevators worldwide, including those at some of the world's most iconic buildings.

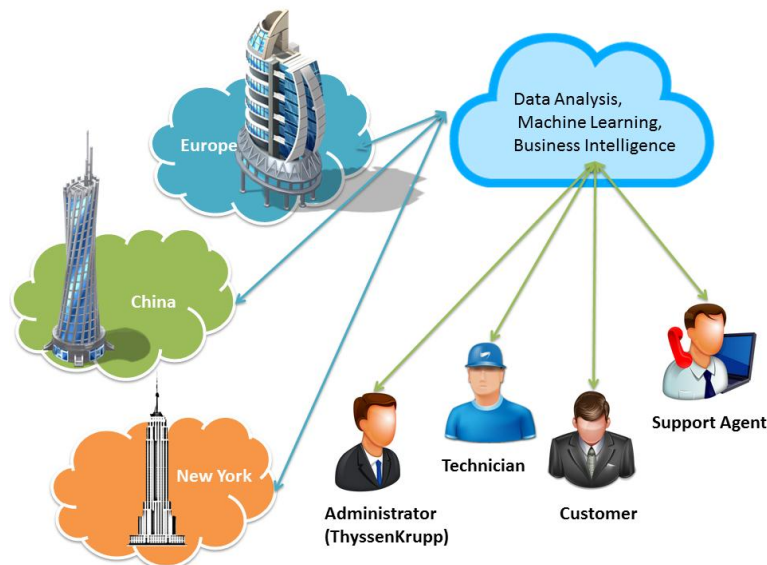


As one of the world's leading elevator companies, it offers innovative and energy-efficient products such as passenger and freight elevators, escalators and moving walks, passenger boarding bridges, stair and platform lifts as well as tailored service solutions.

ThyssenKrupp gained a competitive edge by focusing on what matters most to its customers in buildings the world over: reliability. Drawing on the potential of the Internet of Things (IoT) by connecting its elevators to the cloud, gathering data from its sensors and systems and transforming that data into valuable business intelligence, ThyssenKrupp is vastly improving operations — and offering something its competitors do not: “We wanted to go beyond the industry standard of preventative maintenance, to offer predictive and even *preemptive* maintenance,” says Andreas Schierenbeck, ThyssenKrupp Elevator CEO, “so we can guarantee a higher uptime percentage on our elevators.”

Reference 1: <http://blogs.microsoft.com/firehose/2014/07/16/the-internet-of-things-gives-the-worlds-cities-a-major-lift/>

Reference2: <http://www.youtube.com/watch?v=ZBGKgiKQfeY>



Gamesa Windmills

Gamesa WindNet® is the new generation of tools for wind farm remote control management. An innovative product internally designed by Gamesa to meet the needs of the most demanding operators, with easy and intuitive access through a Web Browser.



- On-line supervision of data concerning wind turbines, meteorological masts and substation.
- Remote control of wind turbines and substation.
- Production and availability reports (Report Generator).
- Management of alarms which send warnings to mobile phones.
- Personalized reports (Information Manager) and administration for users.
- Display of the trends of the main variables (Trend Viewer) and integration with Gamesa SMP.
- Power regulation tools and environmental options.

- Communications via earth-satellite network 24x7.

<http://www.gamesacorp.com/recursos/doc/productos-servicios/operacion-y-mantenimiento/gpa-brochure.pdf>

They collect information about availability, mean time to repair, small & large correctness, self-testing to measure the pitch, etc.

Benefits of having machines on the internet

Following are some of the benefits that are gained through leveraging M2M to Internet to solve business challenges:

- Cost-effective preventive maintenance and Quality of Service
- Fast response through outsourcing troubleshooting
- Centralized service support and data management
- On-going revenues throughout product lifecycle
- Increased revenues from minimized downtime
- Remote diagnostics and Real-time statistic.

What makes up a subscription management solution?

Usually an M2M solution is made up of several components:

- An application and database to process the data and get intelligence out.
- An application to ensure security of the data transmitted and to monitor and manage the connectivity to the device or sensor network.
- Connectivity (either fixed line or wireless) to connect the device or sensor to a central server.
- A modem to allow data exchange between the device(s) or sensor(s) and the central server.

Factors to be considered while looking at IoT

These small scales to large electronic devices are generally built to provide the information about the system, but the volume of data that it generates would be huge and thus requires a reliable, secured, durable and economical infrastructure to store and process the information to derive worthy information out of it. While there are platforms and storage

systems available to store and process the data, but the real challenge is “How to make the customers consume this information using their devices such as Laptop, Tablets & Smart Phones.”

It is necessary to build a Secured web based systems and APIs to make this data consumable and hence we need a Multi-Tenant System.

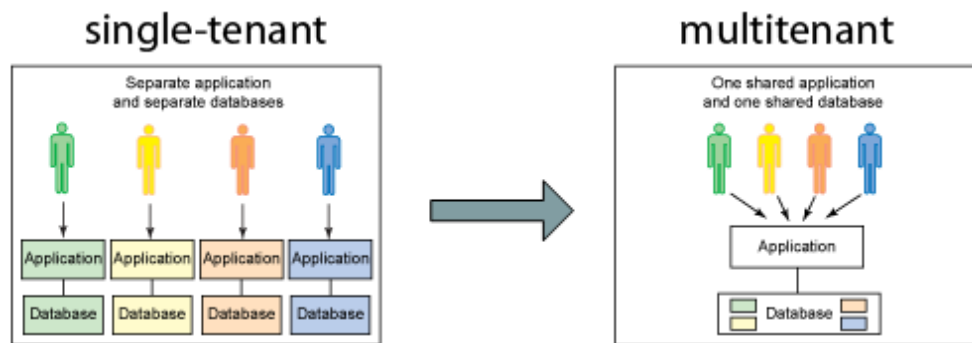
Why Multi-Tenancy

Multi Tenancy is an Architectural pattern for building highly scalable, secured, economical and efficient web based solutions. Multi-Tenant system provides the economies of scale and efficiency by taking advantage of sharing the hardware

and software resources by all the customers as well as advanced configuration and self-service features to reduce the software management cost.

Data belongs to the devices and owner of these devices. For example, if Ford Motor Company has 100 machines and data from these machines get collected in a cloud, you should be able to identify each piece of data, its source (machine) and also identify that it belongs to Ford. When you collect data from several machines from several companies, it is important to identify the tenant (company) properly while processing the data.

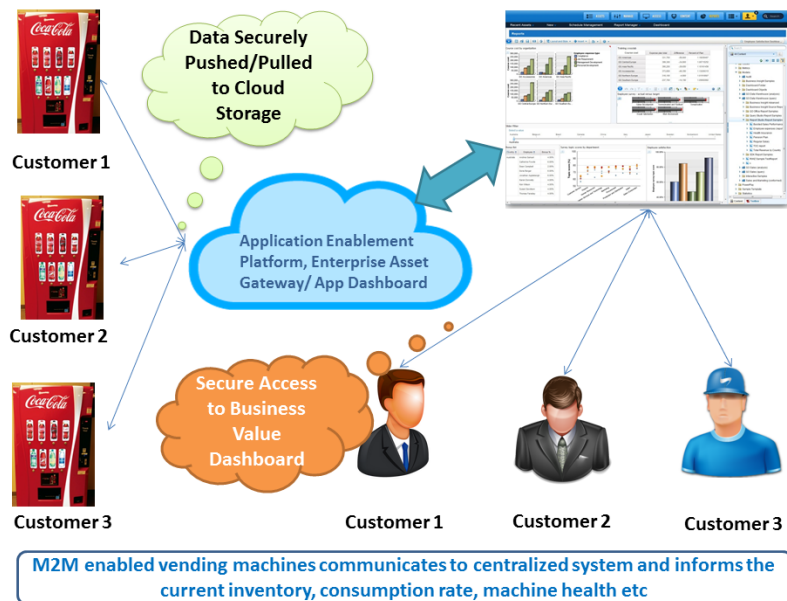
Multi-Tenant softwares enable customers to concentrate more on their business without worrying about software set-up, maintain, upgrade or patch. Single tenant model is highly inefficient and expensive way of maintaining and managing the system.



How Multi Tenancy Comes into Picture in M2M

Machine Manufacturers sell their electronic machineries or parts to large scale to medium sized business along with software to monitor and maintain the data collected from these machineries. These data generally resides within the customer's premise and a self-hosted system is generally used to maintain to monitor the resources. The biggest challenge with this setup is, customers have to manage and maintain the entire software system by themselves by having specialists to overview the hardware and software setup. Scalability is another challenge, because when the data grows the customer has to take care storage, security, replication, backup and purge etc.

Adopting Multi-tenant systems by the M2M provider is a better way to handle such systems easily without putting the burden on the customers. With multi-tenant systems, the customers need not worry about hardware, software and the data storage mechanism. Multi-Tenant Systems is a web based scalable system (Business Value Dashboard) which provides secured access to the customers data.



Multi-Tenant Business Value Dashboard Architecture

Data Security

Multi Tenancy at its core is all about sharing the Hardware and Software infrastructure without compromising the Data Security which is the Key. Data must be securely handled while in transit, rest and handling. There are several standards, best practices, tools and techniques generally used to maintain higher security standard.

Multi-Tenant systems must employ isolated and semi isolated storage model to store and retrieve the data from different customer to provide higher data isolation for each of their customers. Similarly, within the application, it is advisable to utilize Identity and access mechanism and Role based access methodologies to provide granular role based access mechanism to individual users.

Data Volume

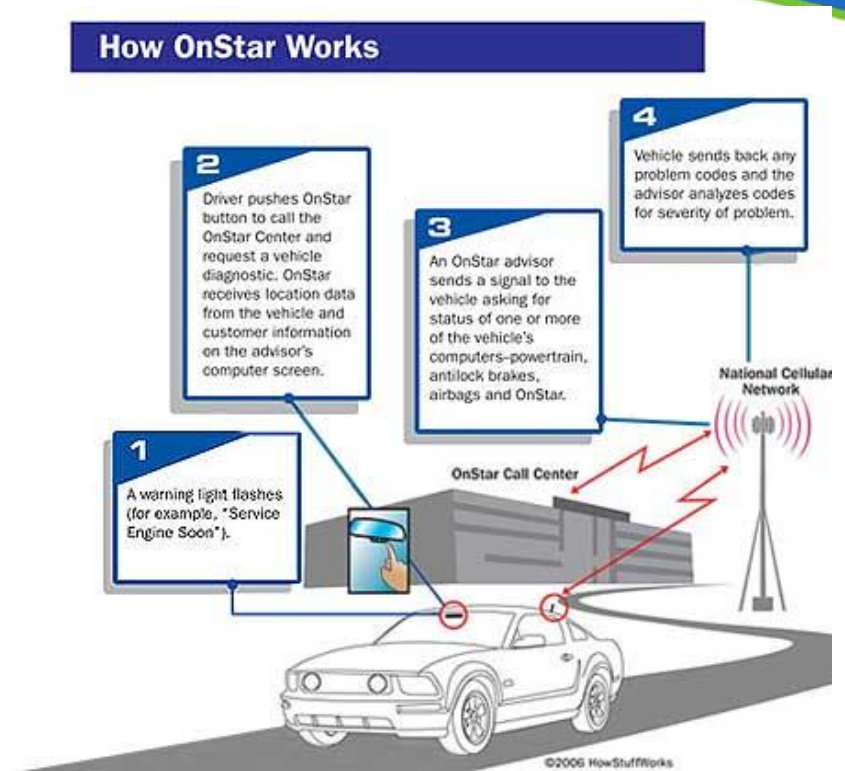
One of the key considerations while architecting the product is the data volume. In a typical IoT scenario, you will tend to collect and process huge volumes of data from the device. This actually influences the way you will collect data from the device; there are three ways to collect data from the devices:

- Devices will push the data out to the cloud
- Cloud will have to pull the data from the device
- Or, you may have intermediate server at the plant level for collecting data from the devices and then push the data to the cloud.

But, once the data reaches the cloud, you will have to employ right data management strategies for managing and making sense out of this data.

As on Jan 2014, General Motors OnStar a subscription-based communications, in-vehicle security, hands free calling, turn-by-turn navigation, and remote diagnostics systems has 6.5 million customer throughout the United States, Canada and China.

Refer: <http://en.wikipedia.org/wiki/OnStar>



Network security & access to the device

Although this is outside the scope of this white paper, make sure that the data reaches the cloud from the device. Generally, Organizations were hesitant to expose the devices generated data because of the security threat, but now with the advanced security measures and acceptance and adoption of the cloud technologies have given enough confidence for the enterprises to open the data for the manufactures.

Insights & Analytics

Finding the right insights at the right time is the key consideration for cloud enabling M2M device analytics. At the same time, who should take the corrective measures against the information at the right time, is also equally important for handling situations. In an organization, if there is a need to get more than one approval to avail the right preventive measures, it would involve getting approval from multiple personals and the process might vary from one customer to another customer. Hence involving a flexible Workflow engine and Business Rules management will also play a crucial Role.

Workflow & Business Rules engines are external systems which could help the system to achieve high level of configurability and customizability.

How Techcello can help device manufacturer in this journey?

Let us explain this with a real-world example; a machine tool builder who manufactures and sells a punch-press. And, each customer buys multiple punch-presses. In this case, punch press manufacturer should get know-how of the health

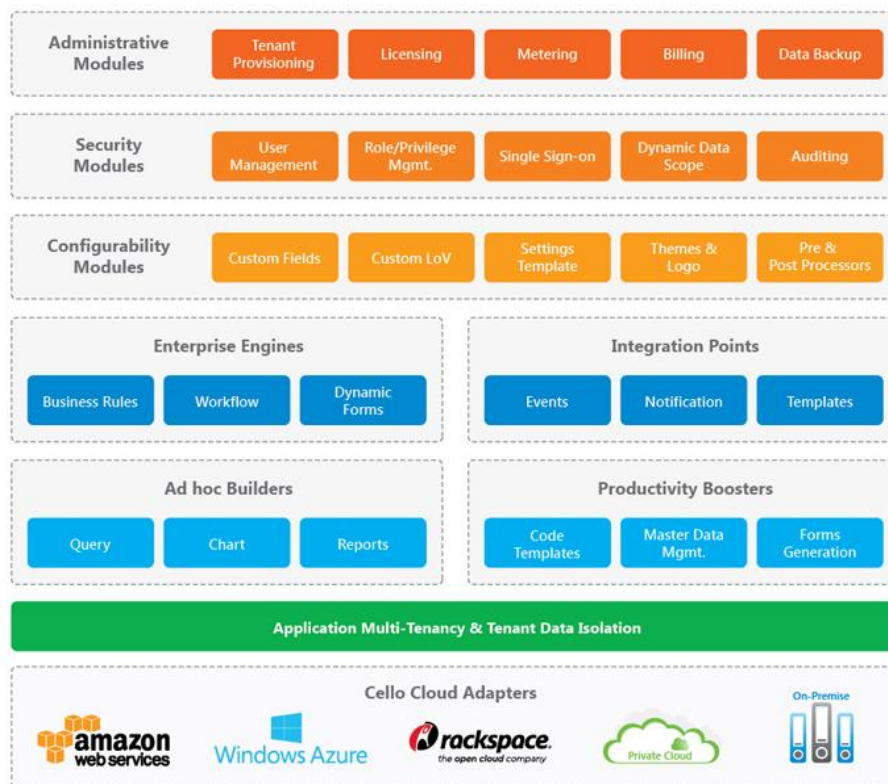
of the machine. And, customer's shop-floor manager will also need to know the health and other productivity data coming out of the machine.

Introduction to Techcello

Techcello is a SaaS application development framework providing engineering, business management and product support functionalities required for building a highly scalable & efficient multi-tenant SaaS application for any cloud. Device manufacturer can quickly move to the subscription based Insights & Analytics business model with the help of Techcello without investing their time and money in the non-functional components mentioned above. Techcello can help you in building the application quickly and help manage the business easily.

Techcello architecture

Techcello provides a multi-tenant architecture for building robust & scalable web applications for cloud. It provides all the engineering components, business components, monetization utilities so that Application developers focus on solving the business problem than reinventing the SaaS wheel.



Administrative Modules

SaaS Administrative modules help device manufacturers with all the necessary components to overcome the SaaS administration challenges such as

- Customer provisioning & device provisioning for data collection
- SaaS Licensing
- Consumption Metering
- Recurring Billing & Invoicing
- Data Backup

Security Modules

Security modules help device manufacturers to configure and setup Role based Access control for each tenant of the application.

- Membership Management (User/Roles Mgmt.)
- Single Sign on Capability – if required, these can be integrated with the enterprise LDAP
- Dynamic Data scope
- Data Auditing

Customization & Configuration

Customizability & Configurability are some of the challenging capabilities to be built inside the application. This requires high skills, expertise, time and effort to be invested to research and make the product highly resilient to change depends upon the need. By its very nature, Techcello's architecture provides these capabilities as an out of the box facilities which helps you to make your product more configurable and customizable.

- Custom Fields
- Custom list of Values
- Settings Template
- Themes & Logo
- Pre & Post Processors

Enterprise Engine

Business Applications are a bunch of process, policies and complex logics. In multi-tenant software, the application can never assume anything and rely on any specific process and hence it's highly recommended to employ techniques like Workflow, Business Rules and Dynamic Forms. For example, when the production quantity reaches certain threshold value or does not reach a threshold value, trigger some business rules. Or, if a particular machine part sends multiple alarms within a short span of time, send an alert to a specific person. When WF & BR are employed in such scenarios it

can high provide high level of configurability and customizability to the system and it allows non-technical business users to customize the system without any assistance from the developers.

- Business Rules
- Workflow
- Dynamic Forms

Integration Points

Business Software's must integrate and collaborate with internal and external systems in general which requires proper endpoint/hooks strategy to integrate with other systems. Integration points help you in simplifying the cloud application integration.

- Business Events
- Notification
- Templates

M2M Analytics systems must be built to easily integrate with other on premise and cloud based ERP/CRM which is already used by customers. Business Events, Schedulers & Web hooks could help you in simplifying the integration process.

Ad-hoc report Builders

Techcello provides a simple and effective ad-hoc query/chart/report builder to query against the multi-tenant shared database. Other features query builder includes querying against custom fields added by the tenants, application of dynamic Data Scope, field/record level Data Scope configured at each tenant level.

- Query Builder
- Chart Builder
- Reports Builder

Mobile Enablement

As per research, more than 50% of the current field work resources are now accessing applications using mobiles and tablets. Newer web technologies like HTML5, CSS3 and JavaScript helps to build a true responsive and elegant web interfaces which can automatically adopt the resolution of the client devices. Depending on the application, you can decide to go building native apps / mobile web apps. But, once you have the data on the cloud, it is easier to have a view from the mobile devices.



Benefits of using Techcello

You can build your product's business functionalities from DAY 1 without worrying about SaaS nitty-gritties.

- 50% savings in your engineering budget
- 10X times reduction in operating expenses
- 40% increase in trial conversions
- 50% reduction in implementation time & cost
- Increase in customer life time value
- 60-80% reduction in support workload
- Reduce customer churn
- On time Payment collection
- Accurate and Transparent Billing
- Increased product value

Summary

Most of the device manufacturers are used to selling the devices and charging AMC (Annual maintenance cost). This subscription line of revenue is an additional revenue channel. But, has the potential for business innovation and customer delight. It is altogether a different business model where they will have significant unlearning and learnings to do.

Techcello can help the device manufacturer move onto this SaaS journey easily. They can focus on building their business application without having to worry on the underlying SaaS nuances.

If you would like to know more about how Techcello, please write to info@techcello.com

About Techcello

Techcello is a cloud-ready, multi-tenant application development framework built on Microsoft .NET. ISVs, Enterprises and BPO/KPOs use Techcello to build software products and applications within .NET - better and faster. Applications built on Techcello can be hosted anywhere from public cloud (such as Amazon, Windows Azure) or private cloud to on-premise serves.

Techcello provides a complete SaaS lifecycle management solution, which allows ISVs to build, manage and operate their product in a SaaS business model.

Techcello provides complete freedom, flexibility and control of custom development, without vendor or platform lock-in and still saves you from all the complexities and cost overheads of building and maintaining your own engineering framework. Techcello framework consists of all the basic engineering components & administration components in a ready to use form (API, WCF services and inheritable classes) so that application developers can focus on building their domain specific business features rather than engineering / multi-tenant features.

Further Reference

- [SaaS : Take a Tour](#)
- [Enterprise Application: Take a Tour](#)
- [Techcello Architecture](#)
- [Techcello Features](#)
- [SaaS application Benefits / Enterprise Application Benefits](#)
- [White Papers / Case Studies](#)
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