THE BENEFITS AND CHALLENGES IN

CREATING SOFTWARE-INTENSIVE PRODUCTS IN THE INDUSTRY

WHITEPAPER

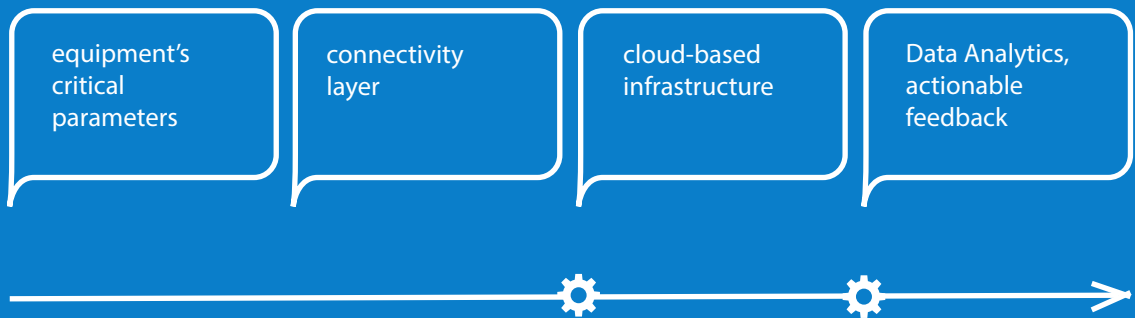| equipment's critical parameters | connectivity layer | cloud-based infrastructure | Data Analytics, actionable feedback |

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ABSTRACT

The use of software in the Industry is becoming the competitive differentiator in new product development. Software has the ability to create new and better services and help people and machines achieve better KPIs. In the field of Industry Equipment Manufacturers, efficiency is king - for them and for their customers. The latest technological advancements can bring even more efficiency through utilizing integrated software platforms and complex data analytics. Using Statistics and Machine Learning algorithms to analyze data is the only way to bring the most value to the OEMs almost out-of-the-box. There are data analytics algorithms that can help at different levels of the software system. HutGrip's solution provides a software infrastructure and data analytics focussed in two key directions - forecasting in order to prevent potential costly failures and anomaly detection.

equipment's critical parameters

connectivity layer

cloud-based infrastructure

Data Analytics, actionable feedback

THE DIGITAL LIFE OF PRODUCTS IN THE INDUSTRY

Many of the physical products we consume daily have digital footprints, the so-called Internet of Things is changing the way we interact with the world. Cars, thermostats, lights, door locks, etc. - they connect to the internet and become much more than physical products. In the industry, providing the right type of services to support the equipment you provide is key to having happy and loyal customers. Building "platforms" around the products you produce helps both you and your customers.

According to a recent McKinsey Global Institute report, the Internet of Things (IoT) has the potential to unleash as much as $6.2 trillion in new global economic value annually by 2025 2. The firm also projects that 80 to 100 percent of all manufacturers will be using IoT applications by then, leading to potential economic impact of as much as $2.3 trillion for the global manufacturing industry alone.

transportation

Huge companies like GE are already taking advantage of the so called "Industrial Internet", providing a whole new set of services around the actual products they sell. Embedding sensors and collecting data remotely is not something new in the Industry. However new ways to use and interact with the gathered data are on the verge of making our life more productive.

Just recently, engine data suggested that a missing Malaysia Flight was airborne long after radar disappearance[1]. The engines' onboard monitoring system is provided by their manufacturer, Rolls-Royce PLC, and it periodically sends bursts of data about engine health, operations and aircraft movements to facilities on the ground. As part of its maintenance agreements, Malaysia Airlines transmits the engine data live to Rolls-Royce for analysis.

construction

Komatsu's Komtrax[2] internal system provides their clients with answers to critical questions about the machines—what they're doing, when they did it, where they're located, how they can be used more efficiently, and when they need to be serviced. The data gathered is then used to help their R&D Department figure out what more do their customers need, what is a reason for abnormal situations, what can be improved and others. It is so valuable for them internally so that they give it for free to their customers for the first 5 years of equipment utilization.

oil & gas

Data and knowledge management, using enhanced analytical tools is a growing opportunity in the Oil and Gas industry. Shell is taking steps to create remote drilling centers. Their internal solution, named Rig-In-A-Box[3], provides centralized monitoring and management of the equipment that provides real-time "health" of the system in the event of a physical and/or network breach and/or failure. This allows for proactive support of the equipment and applications to minimize downtime.

[1] The Wall Street Journal,
Missing Airplane Flew On for Hours
http://on.wsj.com/1nlpAh8

[2] Komatsu's Komtrax System: http://www.komatsu.eu/komtrax-what-is-komtrax.asp

[3] Remote drilling at Shell Rig-In-A-Box http://www.drillingcontractor.org/remote-directional-drilling-enhances-shale-well-quality-efficiency-23290

THE LONG TAIL AND WHAT THAT MEANS IN THE INDUSTRY

These were only a few examples of how big companies are adding services to their products. It is certainly possible to build a complete service yourself, end-to-end, and ten years ago it was necessary. But this "re-inventing the wheel" approach will cost a large amount, take a long time, and in a world where the pace of change is only increasing, it is important to spend your time on the things that only you know, rather than on engineering generic services. These factors make the "buy vs. build" decision a particularly critical one.

As Chris Anderson, CEO of 3D Robotics writes in "The Long Tail: Why the Future of Business Is Selling Less of More" in 2006[1] another critical factor remains the so-called "Long Tail" concept. The theory of the Long Tail is that our culture and economy is increasingly shifting away from a focus on a relatively small number of "hits" (mainstream products and markets) at the head of the demand curve and toward a huge number of niches in the tail. Actually, The long tail is the name for a long-known feature of some statistical distributions such as the pareto distribution(the 80/20 rule[2]).

The truth is that the profile of manufacturers is changing. Once dominated by large-scale plants serving a Global market, now every company has the ability to operate at a Global market. The manufacturing sector is very much built on local demand and on providing highly customized and specialized products.

Small and Medium-size Original Equipment Manufacturers(OEMs) can leverage existing platforms like HutGrip in order to quickly gain competitive advantage and boost existing and new services and revenue streams. It specifically gives them the infrastructure and data analytics platform to be able to achieve more with less.

[1] The Long Tail: Why the Future of Business Is Selling Less of More, Chris Anderson

[2] Pareto Principle http://en.wikipedia.org/wiki/Pareto_principle

CREATING SOFTWARE-INTENSIVE PRODUCTS

Embedding software systems inside products coming out of the factory production floor is entirely changing the way customers interact with them.

Reactive vs. Preventive in the Industry

In the industry, almost all modern equipment comes with a Service Contract that includes web-based remote service. Usually this is paid additionally and comes only for the first 2 years of operations. After that you have to pay each year to renew this type of support.

The included features are usually something similar to:

⚙ Coverage of all needed repairs, including repair parts and travel costs

⚙ All software updates for the duration of the program

⚙ 24/7 online support through an online help system

⚙ Technical support through the OEM's expert team

⚙ Access to phone support

⚙ Includes web-based Remote Services

Once there is a failure, somebody has to call the Equipment Provider team. They would give them remote access to the machine usually through a secure VPN connection. That team would then start downloading and analyzing log files in order to figure out what happened. However in the same time, the customer (manufacturing company) is losing a lot of money any minute they have to wait for somebody to fix the problem. This means loss of business opportunities for the customer.

This is the exact definition of being reactive and doing reactive maintenance. In fact, typical maintenance practices for reactive, preventive, and predictive maintenance have not changed in over 15 years. This is primarily due to a lack of tools powerful enough to fundamentally change maintenance practices.

But what happens after the warranty period?

The truth is that OEMs have limited or no equipment feedback that can otherwise help their R&D department. The lack of information about machine performance lengthens the product development cycle times and makes it hard to introduce valuable changes.

The customer is king. But how do you know what they need?

The best way to answer that question is that using new technologies provided by platforms like HutGrip, you can let the product - the equipment, "speak" to you instead. Then you will know much more about how people use it and you will be able to make better decisions in order to perfectly answer your market needs very fast.

WHAT DO THE NUMBERS SAY

One million bytes of data can easily be generated by a single piece of equipment in a day. The question is how do we use it. As Jeff Immelt, GE chairman and CEO says[1] their "greatest challenge and opportunity is to manage and analyze this data in a highly secure way to deliver better outcomes for customers and society." And with a company as big as they are, they are "transforming itself(GE) into a seller of services rather than just equipment."[2] "Software now contributes $4 billion a year to GE's revenue. And service contracts create a stream of high-margin income that can last for the life of the equipment the company sells—in some cases, three or four decades."
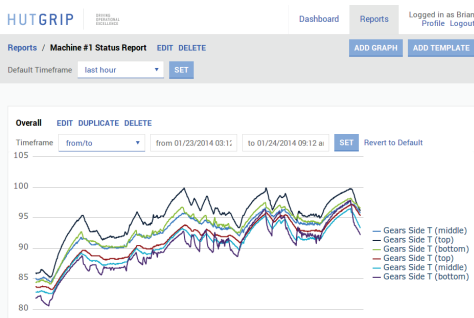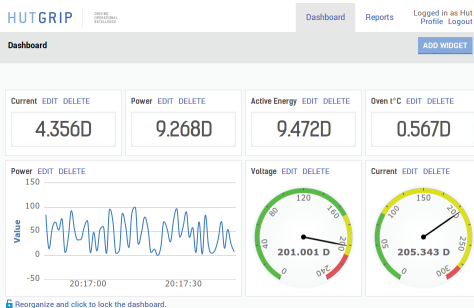
TOWARDS AN ERA OF PRODUCTIVITY GROWTH - WHAT MORE CAN WE DO

To be more productive we need more and better software. Asset-maintenance insights need to be communicated to multiple parties and workflows need to be integrated. Equipment and spare parts will be more readily available, for example, through greater sharing of information in near real time.

We need an infrastructure that is easy to set up and interact with the existing systems and software. Then we need the answer of the question about what should we do with the data that will start coming in. How will we analyze it and what measurable ROI will we generate.

HutGrip's technology provides traceability of equipment's parameters more efficiently by replacing VPNs with the Cloud and real-time data analytics. This helps to:

⚙ Reduce support costs - support engineers are one click away to any automatically gathered and stored in the cloud equipment data. Problem identification is fast and easy and the response time is dramatically reduced.

⚙ Increase equipment uptime using preventive data analytics - custom rules and forecasting algorithms combined with alerts and notifications provides the engineers with way to act proactively.

⚙ The real-time feedback from sold equipment shortens the cycle of product change, reducing time to market, spurring innovation and leveraging huge competitive advantage.

⚙ Boost existing revenue channels by providing new services such as extended warranty, better buy-back plans, bundled repairs and spare parts kits, equipment utilization analyzes, improving overall equipment efficiency, Machine-As-A-Service (pay only for hours of operation).

[1] GE Report for 2013 http://www.gereports.com/post/75376897042/2013-the-year-in-review

[2] WSJ: http://www.gereports.com/post/75376897042/2013-the-year-in-review

MACHINE LEARNING AS THE PATH TO LEAD US THERE

Using Statistics and Machine Learning algorithms to analyze data is the only way to bring the most value to the OEMs almost out-of-the-box. There are data analytics algorithms that can help at different levels of the software system. HutGrip's solution has focused in two key directions:

1. Forecasting

2. Anomaly Detection

Some of the algorithms that OEMs can use to automatically analyze the data include:

⚙ STL decomposition

⚙ Holt-Winters Exponential Smoothing

⚙ Logarithmic Regression with Multiple Variables

USING ALGORITHMS TO SOLVE PROBLEMS

The OEMs can set up alarms and different types of notifications based on the Machine Learning Analytics we execute behind the scene. To do that, they use the Assets Configuration module. For instance, let's say that based on the underlying forecasting we want to prevent a specific gearbox from overheating.

For example, we will choose to use the Holt-Winters Exponential Smoothing algorithm. The algorithm will run near real time (depending on what the OEM needs - every second, every minute, every hour, etc.), it takes in historical temperature data and predicts the next two hours of operations for the specified parameter.

Then, the HutGrip platform will match the predicted values to the critical limits interval. We have widgets on the Dashboard that will change their status accordingly and show the time before potential failure with a specific accuracy. All of these variables are dynamic and changing based on the current condition of the system. In this way we want to give the platform users an easy and very simple way to have reaction time and eliminate failures.

When looking at a single critical parameter like temperature, pressure, etc. Exponential Smoothing algorithms have shown very good results. However, where the relationships are not deterministic we need another approach. Then we are looking at complex systems of parameters. In order to "solve" a specific problem here we can build Autoregressive models and Artificial neural networks to help us study the problem from the inside out and be able to make accurate forecasting predictions and anomaly detection.

At HutGrip we have tried to hide all this complexity and let the platform users set their critical limits, alarms and notifications based on their needs. The system will then learn about the data that gets produced and help people choose which algorithms to run.
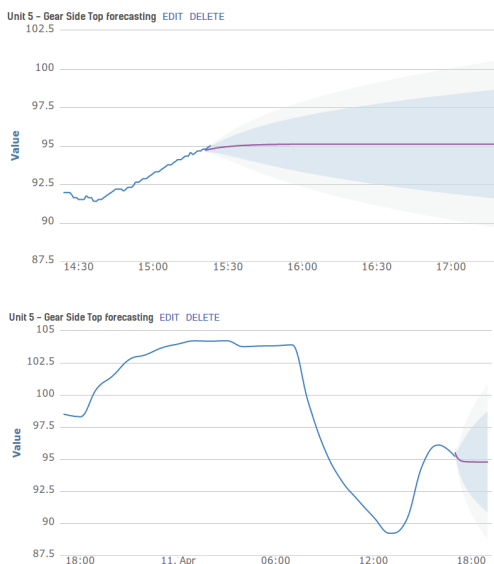
WORK WITH HUTGRIP

⚙ We can work with you to help you Cloud-enable your equipment and open new opportunities with data analytics

⚙ Connect with us at team@hutgrip.com and we will be happy to help

LEARN MORE ABOUT THE TECHNOLOGY AND SEE SHOWCASES

⚙ Printing and Packaging: Avoid Breakdowns showcase with TPC Printing and Packaging, Chattanooga, TN USA - http://hutgrip.com/case-studies/avoid-breakdowns/

⚙ Printing and Packaging: Identify Problems showcase with Diversified Companies, Chattanooga, TN USA - http://hutgrip.com/case-studies/identify/

⚙ Induction Heating Equipment Manufacturer UltraFlex Power Technologies, New York USA - http://hutgrip.com/case-studies/oem/

ABOUT HUTGRIP

HutGrip is a Cloud-based SaaS to help equipment manufacturers and their customers increase performance and efficiency of the equipment. We help the people who make the machines.

The existing problems are related to the high costs for technical support of the equipment, loss of business opportunities because of equipment breakdown and downtimes and 3-rdly, limited equipment feedback and visibility after the warranty period, that can otherwise affect the product development cycles.

Our solutions provides automated remote monitoring and traceability of equipment's parameters more efficiently by replacing VPNs with the Cloud and real-time data analytics. This helps to reduce support costs, increase equipment uptime using preventive data analytics, shorten product development cycles, boost existing revenue channels by providing new services such as bundled repairs, better equipment utilization and implementing Machine-As-A-Service (pay only for hours of operation) model.