The Industrial Internet Of Things

#IIoTReport

McRock Capital
“The Industrial Internet of Things (IIoT) is the next wave of innovation impacting the way the world connects and optimizes machines. The IIoT, through the use of sensors, advanced analytics and intelligent decisioning, will profoundly transform the way field assets connect and communicate with the enterprise.”
Rise Of The Machines

The Industrial Internet of Things is connecting the physical world of sensors, devices and machines with the Internet and, by applying deep analytics through software, is turning massive data into powerful new insight and intelligence. We are entering an era of profound transformation as the digital world is maximizing the efficiency of our most critical physical assets.

Cisco’s CEO has pegged the Internet of Things at a $19 trillion market. The IIoT is a significant sub-segment and includes the digital oilfield, advanced manufacturing, grid automation, and smart cities. We are experiencing incredible innovation around the internet as it accelerates the connection of objects not only with humans but with other objects. Every Industry will change.
McRock: Cisco has been a proponent of the IoT. The Industrial IoT has risen from this concept and is a topic of great interest. What’s your view on this emerging area?

Paul: People might describe the Industrial Internet as emerging because, with a few exceptions, the transformations have been at a fundamental industry function level. Consumers have typically led industry by bringing technology like social networks and then mobile computing devices into the enterprise. The shift to the Industrial Internet will be much more subtle and led by industry experts, who are starting to use cloud based solutions to drive automation and productivity. All of this is supported by massive data sets from their own sensors, and those of others, which is what makes the Internet of Everything (IoE) different than the closed systems of the past.

“IoT as a concept has crossed the chasm from slideware to reality with many industries implementing IoT solutions.”
McRock: Why is the Industrial Internet of Things a big deal?

Paul: What makes this exciting is that only 1% of the world’s devices are connected today. This creates an obvious opportunity for those that want to connect all those devices but it’s also a great opportunity for a number of new businesses to be created that can help industries derive value from all of the new data that will be available.

McRock: What, in your opinion, needs to be done for broader adoption of the Industrial Internet of Things?

The bottleneck isn’t really the technology; the fundamental components or “things” are all there. What the market needs is more industry innovators who can put the technology together in unique ways that will solve specific industry problems. It’s one of the reasons Cisco uses the term Internet of Everything because it includes the people and processes that will change industry, not just the “things”.

In support of this vision of connecting people, processes and things, Cisco announced four global IoE Centres of Excellence at CES in January, including one in Cisco Canada’ new Toronto headquarters opening in 2015. Centre’s, like the one in Toronto, will provide a unique environment for industry experts to gain exposure to the underlying industrial internet technologies allowing them to create new innovative solutions. Of course there are some technology factors like machine learning that are still in the early stages. Machine learning provides the potential to move IoE automation beyond the simple binary “yes/no” decisions computers can make for us today into something that is more context aware.
Digital Oilfield

Leading O&G companies are building an infrastructure where sensors, data management, advanced analytics and automation are being used to unlock production, reduce operating costs and optimize assets.
McRock: For over 15 years Shell has been considered a leader in the Digital Oilfield or as Shell terms it, the Smart Field. Since the term is fairly broad reaching, how does Shell define the Smart Field?

Henrik: The Smart Field is where operators, partners and service companies seek to take advantage of improved data and knowledge management, enhanced analytical tools, real-time systems and more efficient business processes. At Shell, we strive to continuously optimize our assets for life-cycle value through the integration of technologies, people skills and workflows. This helps us enable top-quartile well, reservoir and production management.
McRock: Can you describe some interesting Smart Field applications?

Henrik: Smart Wells, 4D Seismic Acquisition and the Smart Mobile Worker are just some of the areas of interest for Shell. A smart well is an essential part of the Smart Field. It is an instrumented and intelligent well. It has downhole sensors and flow control devices installed that can be monitored and possibly controlled from the surface. 4D Seismic Acquisition is the surveillance of reservoir dynamics using repeat seismic data. It is used to monitor water flow, gas breakout or movement, pressure changes, and compaction following production and injection. 4D Seismic is unique in that it reveals areal patterns in reservoir dynamics.

McRock: How has Shell implemented the Smart Mobile Worker?

Henrik: The aim of our Smart Mobile Worker project is to increase worker efficiency, and at the same time, improve safety standards and minimize exposure to environmental health hazards. Take, for example, a remote Shell production site where a mobile worker has discovered a corroded pipeline. Equipped with a tablet device and his helmet’s camera and voice-integration system, the worker is able to connect instantly with field experts in head office to analyze the situation and decide on a solution.

McRock: Why does Shell care so much about the Smart Field?

Henrik: At Shell, we aim to have no incidents that harm our employees, contractors, neighbors or the environment, or put our facilities at risk. The Smart Field is an example of putting that aim into practice.
Ayata is processing vast amounts of data – video, images, sounds, text and numbers, to reveal what is expected ahead. Now an industrial equipment operator can take the best action to improve the predicted future of its asset.
What To Do If You Knew

Big Data Analytics is evolving from understanding the past to seeing and improving the future. Ayata has developed a prescriptive analytic software that combines vast data of all types with mathematical models and business rules to prescribe the best course of action to optimize the future.

Ayata has targeted the oil & gas industry and is working with large customers like Apache Corp. Apache uses thousands of Electrical Submersible Pumps (ESPs) to pull oil from reservoirs worldwide, onshore and offshore – but many ESPs fail unpredictably, resulting in missed production targets. Prescriptive Analytics predicts ESP failures by taking into account data about pumps, production and subsurface characteristics. The software then prescribes actions to reduce pump failures and mitigate production losses.

“Just a 1% improvement in global Pump performance would provide over a half-million additional barrels of oil per day – that’s $19 billion per year.”
- Apache
Pure Technologies
Pipeline Monitoring and Condition Assessment

Pure is a world leader in the development and application of innovative technologies for inspection, monitoring and management of physical infrastructure including water and hydrocarbon pipelines.
Leak Busters

Pure’s Acoustic Fiber Optic Sensor system detects and alerts operators of deteriorating concrete water pipelines. The in-line technology is always on and is capable of determining both the location and the rate of deterioration. This provides operators with the intelligence to optimize planned maintenance to extend the asset life and to take emergency measures to avoid costly and dangerous pipeline bursts.

In order to help pipeline operators manage all aspects of their complex infrastructure, Pure has created a data-driven asset management software system. PureNET streamlines information from existing utility databases such as hydraulic models, workload programs and maintenance management systems into one platform to improve efficiency. The system can also merge pipeline condition assessment and monitoring data into the platform to provide operators with valuable information on asset condition.

Extending the life of the aging global pipeline infrastructure and avoiding catastrophic failure through sensors and software analytics is Pure Genius.
Grid Automation

The digitization of the grid is coming as electromechanical devices of the analog age are replaced with modern technology. Companies like GE are working to create a self-healing power network to meet the needs of our digital society.
McRock: *GE has put the Industrial Internet on the map starting with Jeff Immelt’s launch of the platform in November 2012. Can you comment on some of these initiatives?*

Yida: A couple of years ago, we opened a new Global Software Center headquartered in San Ramon, California and committed $1 billion over a 3 year period to deliver on our vision for the Industrial Internet. We are developing solutions that help our customers increase productivity and reduce costs, whether they operate power plants, jet engines, or locomotives around the world.

These solutions are powered by our software platform called Predix, which enables asset and operations optimization by providing a standard way to run industrial-scale analytics and connect sensorized machines, data, and people.

“*GE has hired over 700 software engineers, data scientists and product managers to develop solutions that help our customers*”
McRock: Speaking of power plants, at Distributech in January of this year, GE announced GridIQ Insight Solution for the electric power industry. Describe GridIQ Insight and why this is a valuable solution for your customers.

Yida: GridIQ Insight is a flexible, scalable platform that provides utility customers access to critical data such as electrical usage, grid performance and weather history. This enables faster, more accurate decision making and optimization of their electrical distribution systems. It incorporates a number of modules such as Load Forecasting, Meter Health and Revenue Protection, each geared towards a specific set of issues inside a utility.

McRock: Why do you think GE is leading the charge and different from others trying to do the same thing?

Yida: GE is uniquely positioned given our large installed base of critical equipment and deep industry experience. We know how the power industry works and what processes the utilities follow. We have combined that knowledge with data science and application development to create solutions that work for our customers. With the more than 1,000 utilities using GE software solutions, we continue to collaborate with our utility partners to deliver outcomes, increase revenue and lower opex costs.
Awesense
Recovering Revenue and Reducing the Risk of Outages

Awesense uses analytics to provide True Grid Insight on high risk segments of the distribution grid. Situational awareness using secure wireless current sensors identify losses and overloaded lines that impact business performance.
True Grid Insight

Utilities are faced with more than $200B in annual electrical losses and theft; which are steadily increasing by 2.5% per year. Utilities are under pressure to reduce both. There is rarely enough monitoring in place to pinpoint the cause of these losses making it difficult to find overloaded transformers, illegal bypasses and metering errors that compromise grid reliability, public safety, and financial performance.

Utility Fraud is 2\textsuperscript{nd} only to credit card fraud. Every year $85 billion globally and $6 billion in the US is stolen from the grid because it’s easy to do and difficult to detect.

Situational awareness based on actual line measurements can provide insight into the operating condition of the distribution grid. Bringing visibility to an otherwise invisible network improves the ability to predict overloads and avoid outages. Actual line data reduces financial risk by truing up conventional billing and smart meter data to the actual consumption on the lines, pinpointing theft as well as metering/billing errors.
Advanced Manufacturing

“The IIoT will help manufacturers improve resource efficiency, safety and return on assets...creating new opportunities for revenue growth and cost savings.”
– Lopez Research
McRock: Echelon was founded by Mike Markkula in 1988 with a futuristic vision of creating a network for everyday devices. Would you agree Markkula had an early vision of today’s Internet of Things?

Varun: Our founder is a great entrepreneur and the third employee of Apple so the initial concept for Echelon certainly had elements of connecting consumer devices or what Markkula called “everyday objects”. The early vision for the IoT was there but the price point for silicon chips was too high in the late 80’s to make a use case for connecting a toaster. In 1990, the company released LonWorks for control networking and today controls more than 100 million industrial devices.

“Echelon is a leader in the IoT segment - our firm was founded with a vision of creating a network of everyday devices”
McRock: Echelon clearly sees a huge opportunity in the emerging Internet of Things segment but how do you define Industrial IoT?

Varun: The IIoT refers to industrial objects, or "things“, that automatically communicate over a network, without human-to-human or human-to-computer interaction, to share information and take action, often autonomously. Because of the unforgiving environments in which these industrial devices exist, including harsh physical conditions and mission-critical processes, IIoT solutions must meet the challenging requirements of industrial-strength reliability, hardened security, wired and wireless connectivity, and backwards compatibility with large installations of legacy devices.

McRock: You recently launched the IzoT™ platform, can you tell us more about the FT 6050 system on a chip?

Varun: The IzoT™-enabled FT 6050 chip will make it easier and more cost-effective for both existing and new industrial devices to join the burgeoning IIoT, while providing industrial-grade reliability. The FT 6050 is designed to provide a better wired alternative than either RS-485 or Ethernet for industrial applications that can benefit from IP enablement.
RtTech specializes in software that improves industrial facilities’ efficiency and productivity. Real-time solutions turn operational data into information that can be used to make more profitable decisions.
Industrial Size Optimization

RtTech’s software provides real-time visibility on the performance of plant floor assets. In production and process industries, improving output is a major challenge among plant managers and executives. By understanding the factors that are preventing 100% availability of assets, a manufacturer can make smart decisions to boost productivity. Knowing when critical equipment needs servicing before it fails saves time and money.

Along with real-time asset visibility comes a comprehensive understanding and visualization of energy consumption within the plant. RtTech offers a facility wide energy management solution that reduces a plant’s highest variable cost. RtTech automates the process of mapping and managing energy consumption, as it is being consumed, allowing decision-makers to take positive actions to significantly drive down energy costs.

Almost 50% of today’s energy consumption occurs in industrial environments. Industrial energy consumption will grow by 70% by 2030.
Sight Machine merges machine vision and big data to control quality. Software continuously processes data from sensors and cameras and makes assessments in real time to stop problems before they happen.
Better Inspection – Full Stop

Sight Machine uses visual data to inspect raw materials, check parts in process, and share data with customers. The system identifies why parts are failing, alerts operators to trends and variations, and tracks relationships among scores of parameters. All data is accessed and analyzed in real time, and can be stored as long as needed, for re-analysis and retrieval anytime. This enables plants to run correlations over time, track trends and identify root causes, and as new variables of interest arise, go back and analyze previously acquired data.

Sight Machine’s Vision Intelligence is about data, not hardware. Sight Machine’s software takes visual data from the entire spectrum of optical devices: sensors, low-cost cameras, leading machine-vision cameras, and lasers and offers an exponential improvement in automated inspection. Vision tests can be written in hours and updated remotely.
Intelligent Transport is about using data and communication technologies for road, rail, and air transport to optimize traffic flows. It’s about vehicles and infrastructure.
Miovision creates intelligent traffic data collection solutions and video based real-time adaptive traffic control systems to address challenges facing today’s transportation networks.
Getting To Work On Time

It’s time traffic controlled the signals, not the other way around. Miovision’s adaptive signal control system coordinates all traffic signals in a traffic network based on real-time demand. Using the power of cloud computing, video detection, and wireless communication, Miovision quickly connects traffic intersections to optimize traffic flow in real-time.

Miovision Traffic Data Solution provides transportation professionals with an end-to-end data collection and management platform. The platform is a cloud based application that manages requests for traffic data and video evidence, produces traffic data reports, facilitates project management, and stores all data for easy access and sharing. Miovision’s traffic data reports are available with vehicle classifications, directional pedestrian counts and bicycle counts in industry standard traffic data formats.

The next generation of traffic network optimization - wireless connectivity, advanced detection and intelligent algorithms in one integrated system.
McRock is tracking innovative Industrial Internet of Things companies. Here are a few rising stars in North America.

**Bit Stew Systems** – Burnaby, BC

Bit Stew Systems Inc. provides integrated, real-time network operations solutions for the utility industry. Bit Stew is revolutionizing the way the utility industry deploys, operates, secures and optimizes smart grids globally.

**Ayla Networks** – Sunnyvale, CA

Ayla Networks has an end-to-end solutions that allows manufacturers to turn home controls, HVAC, appliances, lighting and other everyday products into intelligent devices that are managed in the cloud.

**Rescale** – San Francisco, CA

Rescale offers a software platform and hardware infrastructure for companies to perform scientific and engineering simulations.
McRock Capital is a venture capital firm that invests exclusively in Industrial Internet companies across Canada and the US. The Industrial Internet is about the intersection of sensors & software and large industrial markets.