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The benefits of implementing Industry 4.0 – the Industrial IoT

Mark Patrick, Mouser Electronics

While most of us are waiting for the Internet of Things (IoT) to transform our everyday lives, the Industrial Internet of Things - which is the IoT applied to manufacturing, logistics and other industries - is already here, making our plants more efficient, our fields more productive and our factories safer.

Also known as Industry 4.0 in Europe, the Industrial Internet of Things (IIoT) is powering a new industrial revolution that goes beyond machinery and automation. Using sensors and wireless technology to connect our physical world with the cloud, there are improved efficiencies through knowledge sharing across data silos, better decision-making through big data analytics, and better collaboration between departments and organizations.

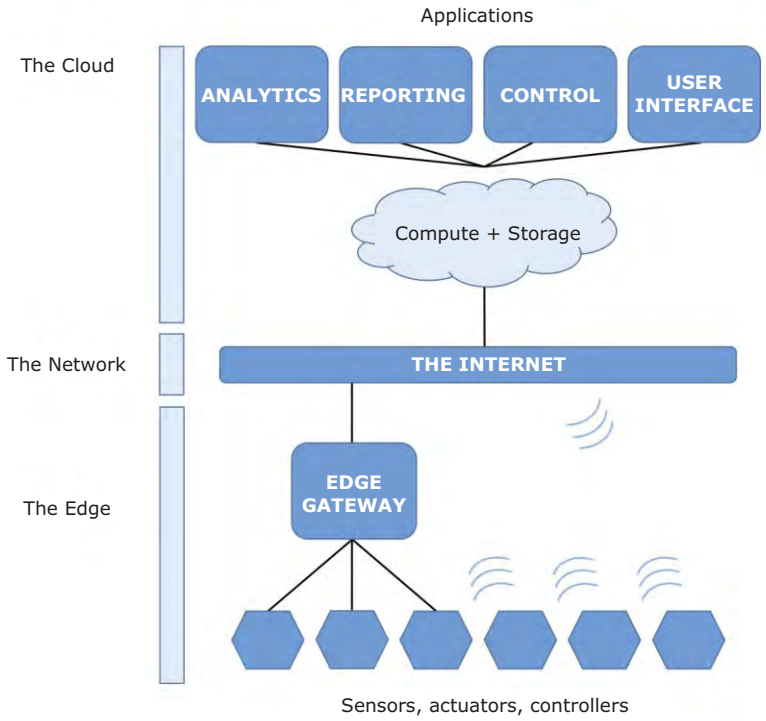

Figure 1: Typical Industrial Internet of Things Architecture

WiFi + RFID Technology Reduces Plant Defect Rates

Manufacturing companies have been some of the first pioneers of the IIoT and have already seen the benefits from connecting assembly lines, workers and materials to the cloud.

Stanley Black and Decker is a leading global provider of power tools. One of its largest manufacturing centres is based in Reynosa, Mexico. Having opened in 2005, the plant employs thousands of employees to produce dozens of products across 40 multi-product assembly lines to serve the North American market. Each year, the plant manufactures millions of power tools.

With so many products to assemble and materials to manage, production complexity was constantly growing. Keeping operations efficient was a challenge, so Stanley turned to business experts, operations gurus and IT consultants to come up with a solution. The team examined the challenges faced by the plant and decided it needed to improve production visibility using IoT technology. To test this suggestion, the team decided to implement an IoT solution on the router tool production line.

The router tool assembly line makes nearly 3 dozen models of router power tools. Quick changeovers are essential. To support better production efficiency, management wanted to have visibility into key metrics such as production scheduling, quality, and the effect of shift changes.

Using Real Time Location System (RTLS) technology, Stanley deployed active RFID tags on its assembly materials, allowing their location and status to be transmitted and tracked in real-time over the plant's wireless network. An Active RFID tag, integrated in the PLC of the quality scale at the end of the line, transmitted positive or negative production results when the end product was weighed.

Along with the tags, plant dashboard desktop and mobile apps were also deployed, allowing plant managers to track production from the back office to the shop floor. The new tags allowed floor managers to be constantly aware of each production line's output and how quickly workers were completing each stage of assembly.

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After implementation, immediate benefits became apparent. Increased visibility into actual labor requirements resulted in immediate cost savings. Production output was more consistent and overall equipment effectiveness increased by 24%. With better work in progress data, inventory and associated warehousing costs were able to be reduced. Labor efficiency increased by 10%, and Defects Per Million Opportunities(DPMO) decreased by 16%. The team was extremely happy with the results, as they were even better than expected, and decided to rollout their IoT solution to the rest of the plant.

Sensors and Wireless Communication Improve Crop Yields

Factories aren't the only places where the IIoT is transforming industry. In Italy, Famosa is using precision agriculture techniques to improve strawberry crop yields.

Despite strawberries being a major crop for Italy, with 130,000 tons produced annually, Italian farmers have relatively limited land to grow their crops and therefore seek to maximize their yields. Specifically, farmers' goals are to shorten the time between picking the berries and selling them, and to improve the average quality of their fruit. Famosa found that strawberry quality and yield is sensitive to air temperature and water irrigation amount. Both of these factors need to be closely monitored or up to 80% of the fruit may have to be discarded for being too small or misshapen.

To address this challenge, Famosa created an integrated agricultural management system for farmers. Air temperature and water sensors in the field were connected wirelessly to the cloud and a custom portal, esiFARM, was then built to let farmers log in and instantly check the current status of their crops from their phone.

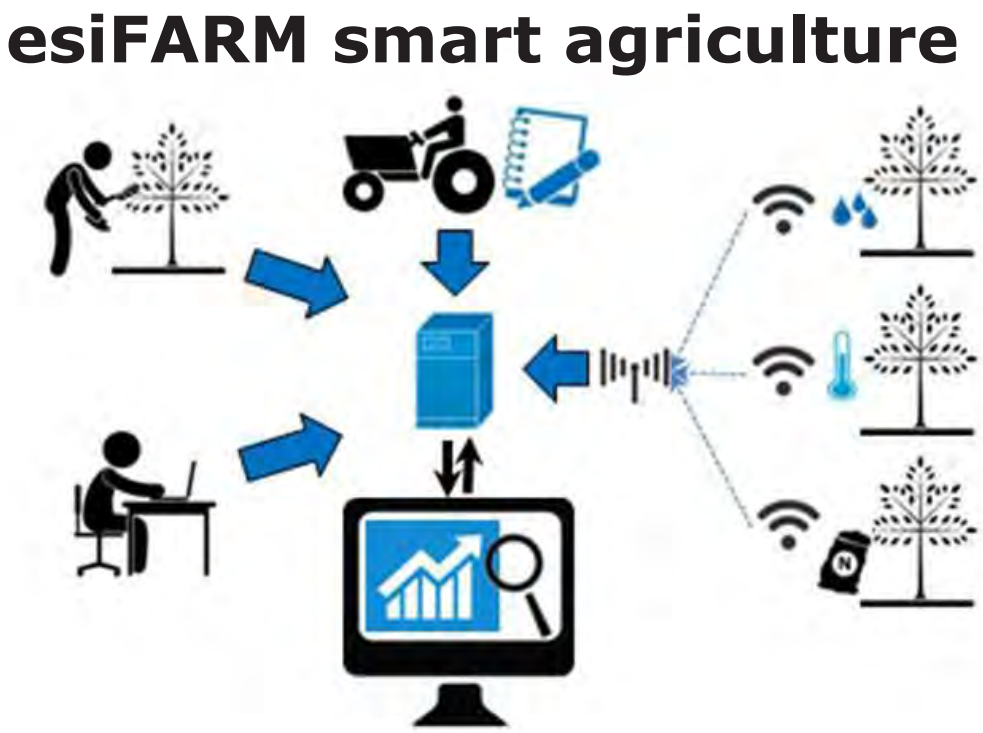

Figure 2: Integrated agricultural management system (Image courtesy of Famosa)

If temperatures or water conditions exceed safe parameters, farmers are instantly notified. With up to date information on growing conditions, farmers can reduce water use, save time, decrease crop losses, and improve the average quality of their crop yields, letting them liquidate stock faster and with higher profits.

Honeywell's IoT Wearable Improves First Responder Safety

Honeywell and Intel recently developed an IoT-based wearable system for industrial workers and emergency responders, designed to improve safety and productivity for at-risk personnel.

The Honeywell Connected Worker solution is a wearable product that collects data from a variety of health and activity sensors to transmit vital statistics and location data remotely, to give an accurate picture of what a worker is experiencing. Data is gathered from a range of sensors on the worker to monitor toxic gas exposure, breathing, heart rate, posture, motion, location, and even physical gestures.

The data gathered can be viewed remotely on a cloud-based dashboard to understand a worker's safety status. This provides plant managers and incident commanders with real time information to keep their workers safe, anticipate and prevent unsafe conditions, and react quickly to man-down scenarios.

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Identifying the Value in the IIoT

For companies looking at leveraging the IIoT to make their existing operations more efficient or their product offerings more competitive, successful implementations will require cross-team collaboration to a degree rarely seen today.

Today's sensors and wireless communications technology make it possible to capture myriad types of data in locations and situations unfathomable even just a few years ago, opening up a whole new world of optimizations and insight. But while it's possible to capture an almost infinite variety and amount of data, the costs of doing so would outweigh any possible benefits.

Successful IIoT deployments depend on identifying the key kinds of data that will truly be effective at making operations more efficient and products more competitive. The value of this kind of data, such as production line visibility for a manufacturer, or plant pest counts for a farmer, is often obvious at the organizational level, but hard to spot by individual staff and departments.

Just as Stanley Black and Decker brought together plant managers, line of business personnel, operations experts and IT consultants to identify what data should and could be captured in their plants to improve production, companies looking to implement IIoT effectively will need to have cross-disciplinary collaboration between stakeholders to identify new kinds of data that will bring the most value to their organization.

Capturing and Delivering Data in Industrial Environments

Advancements in sensing and wireless communication technologies have given us new ways to capture useful data that was inaccessible to us before. Cost effective, power sipping, industrial-grade sensors now exist for position, speed, pressure, torque, temperature, humidity, airflow, and many more types of data. Compact wireless transmitters allow us to place sensors in locations where it's difficult or impossible to run wiring. With energy efficient wireless transmitters using ZigBee or Bluetooth LE, sensors can be installed and used for months or even years without battery replacement.

Compared to consumer IoT applications, IIoT sensor systems often need to operate in harsher environments, and with less access to power. Designers should consider the application environment and choose components with appropriate ruggedness and energy efficiency as needed.

RFID, in both passive and active forms, also presents a cost-effective way to capture information on materials, production processes and even employees. Passive RFID labels on material bins can be used to automate customized production steps and track the production process. Active RFID tags increase reading range, extending the benefits of RFID through applications such as RTLS systems to track material or employee locations in real time.

Security, always a concern in IoT applications, becomes even more crucial in the industrial environment, where heavy machinery or vital infrastructure is being monitored and may even be controlled through wireless signals. Thankfully, the three major wireless protocols of the IIoT– WiFi, Bluetooth, and ZigBee, all have military grade AES-CCM encryption modes available. AES is a fairly efficient algorithm, and radio modules like the Microchip RN4020 BLE transceiver can handle 128bit AES with minimal resource usage. If even stronger encryption is needed, for instance in an embedded system on a WiFi WPA2 network using 256-bit AES, MCUs are available such as the MSP430 from TI with AES accelerators.

Beyond Automation - Industry 4.0

While the consumer IoT dawdles, the Industry 4.0, otherwise known as the Industrial Internet of Things, has sprinted ahead, making waves in industries ranging from manufacturing, to agriculture, to emergency response.

The technology to implement the IIoT is already here in the form of industrial grade sensors and low power wireless modules.

For designers, engineers, and organizations able to identify high value data opportunities, potential benefits range from increased operational efficiencies, to better profit margins, or even entirely new lines of business.

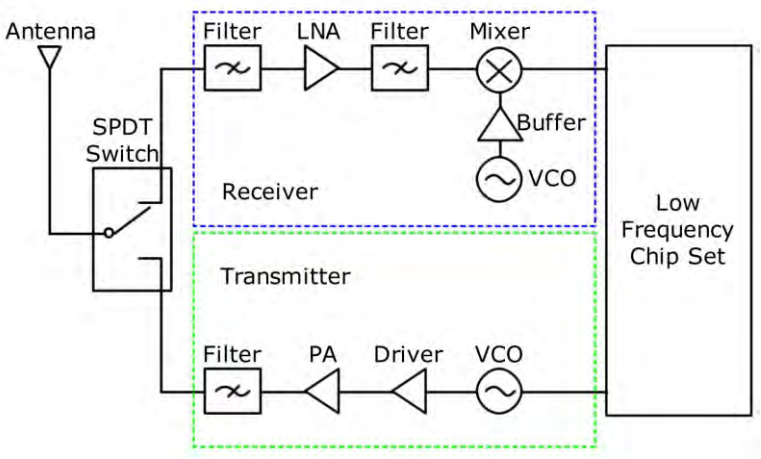

Figure 3: RF communication

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Hewlett Packard Enterprise « HPE » Delivers Industry First Converged System for IoT; partnering with GE Digital, NI & PTC

New IoT solutions, services and ecosystem provide device security and enables decision making at the edge

LAS VEGAS – Today, Hewlett Packard Enterprise (HPE) unveiled the Edgeline EL1000 and Edgeline EL4000, the industry's first converged systems for the Internet of Things (IoT). These systems integrate data capture, control, compute and storage to deliver heavy-duty analytics and insights at the edge to enable real-time decision making. In addition, HPE announced enhanced IoT security capabilities, new services and an industry leading partner ecosystem to advance the adoption and impact of the Internet of Things.

With the proliferation of IoT devices, or "things" generating petabytes of data every day, organizations have an opportunity to quickly capture, process and analyze that data to enable real-time control and decision making. Oil and gas, manufacturing and telecommunications industries face specific IoT challenges – they need to harness data in remote environments, from windmills in the desert to smart energy grids and manufacturing plants, to drive timely business decisions. Until now, the remote data would have to be transported to a data center or cloud for analysis, which can be a slow, risky and inefficient process. HPE today introduced new IoT solutions that enable organizations to harness the power of their data by delivering real-time analytics and machine learning at the edge, where the "things" are.

"Organizations that take advantage of the vast amount of data and run deep analytics at the edge can become digital disrupters within their industries," said Dr. Tom Bradicich, vice president and general manager, Servers and IoT Systems, Hewlett Packard Enterprise. "HPE has built machine learning and real time analytics into its IoT platforms, and provides services that help customers understand how data can best be leveraged, enabling them to optimize maintenance management, improve operations efficiency and ultimately, drive significant cost savings."

HPE Edgeline IoT Systems: Deep Data Capture and Analytics at the Edge
HPE is unveiling the Edgeline EL1000 and Edgeline EL4000, the industry's first converged systems for the IoT, integrating compute, storage, data capture, control and enterprise-class systems and device management built to thrive in hardened environments and handle shock, vibration and extreme temperatures. The EL1000 and EL4000 are optimized to deliver heavy-duty data analytics and insights, graphically intense data visualization, and real time response at the edge.
In addition, HPE announced today that the HPE Vertica Analytics Platform runs on the Edgeline EL4000, delivering historical and predictive analytic insights from in-database machine learning algorithms across a broad range of IoT analytic use cases. Vertica on Edgeline brings applied machine learning to the edge to deliver closed-loop analytics that enable organizations to derive immediate insights from their IoT initiatives. In addition, to easily secure traffic back to the data center, the EL1000 and EL4000 support **Aruba**'s Virtual Intranet AccessTM (VIA) VPN client. Aruba's VIATM provides organizations an automated, zero-touch, secure VPN, and is available for both commercial and high-security government IoT applications.

Dynamic IoT Security
Securing enterprise networks for the onslaught of IoT devices is also a primary concern for IT professionals today. Networks need to automatically add, detect, profile and secure new and unknown IoT devices without manual intervention. With enhancements to Aruba ClearPass, IT can profile new IoT devices, enforce security policies, and exchange policy status with other security systems including mobile device management systems. ClearPass integrates with existing network infrastructures from any vendor enabling IT teams to easily automate and scale rather than become an inhibitor for new digital transformation initiatives.

IoT Expertise - Helping Customers Transform, Design and Run IoT
HPE also introduced the HPE IoT Transformation workshop (TW), an interactive HPE facilitated workshop that helps customers to define their IoT vision and strategy and gain business technology alignment. This structured discussion takes a fact-based, analytical approach to help customers achieve alignment on their vision, identify current and future states, and determine a set of specific transformational IoT projects. The IoT TW is the first step in a full suite of services designed to help customers successfully implement IoT solutions based on business needs and industry parameters. In addition, HPE's Analytic Consulting and Predictive Maintenance Services deliver advanced analytics to business processes to achieve objectives, reduce costs and improve efficiencies.

Partnerships
HPE is partnering with industrial IoT leaders like **GE Digital**, **National Instruments** and **PTC** as part of its go to market plan to deliver joint solutions to customers. These solutions address industrial use cases to combine the very best of **Operational Technology (OT) and IT to support the aerospace, oil and gas, manufacturing, automotive and energy industries.**

HPE also announced **four IoT Innovation Labs and expertise across the globe**. HPE and Intel® operate these labs to help customers envision how IoT can be applied in their industry, build and test IoT applications, and access technical expertise. In addition, partners and customers are able to engage, interact, assess and collaborate on solutions development and their applications. The labs are now open and located at HPE facilities in Houston, Texas, Grenoble, France, Bangalore, India and Singapore. **MORE:** Click Here

ADLINK IoT Gateway Line Expands Support for Intel® IoT Gateway Technology

Intel® Quark™ , Intel® Atom™ and Intel® Core™ processor-based models deliver scalable computing solutions for a variety of Industrial IoT applications

San Jose, CA, June 21, 2016 – ADLINK Technology, a leading global provider of embedded building blocks, intelligent gateways and cloud/fog computing solutions that enable the Industrial Internet of Things (IIoT), announces the release of three ADLINK IoT gateway models supporting Intel® IoT Gateway Technology. The MXE-110i, MXE-202i, and MXE-5400i, based on the Intel® Quark™, Intel® AtomTM, and Intel® Core™ processors, respectively, further expand the scope of ADLINK's IoT gateway-based scalable computing platforms. From energy-saving applications to intelligent analytics, ADLINK's IoT gateways supporting Intel® IoT Gateway Technology provide the ideal IoT-ready industrial platforms for a wide variety of applications.

Intel® IoT Gateway Technology enables development of intelligent gateways, which are critical to connecting systems with next-generation intelligent infrastructures and increasing business value for a world of applications. The ADLINK IoT Gateway product line, fully supported by Intel® IoT Gateway Technology, with integrated Wind River® Intelligent Device Platform XT, and McAfee Embedded Control, is available for Intel® IoT Gateway Software Suite, Intel® IoT Gateway Pro Software Suite, and Intel® IoT Gateway Pro Pilot Software Suite.

"We understand customers require an application-ready solution to tackle the complexity of IIoT infrastructure. We're happy to leverage Intel Gateway Technology to provide seamless connectivity between devices and the cloud, ensuring the interoperability of edge devices through an open architecture enabling rapid application and service, all to successfully equip new connected applications with minimum effort," said Roy Wan, general manager of ADLINK's Measurement and Automation Product Segment.

"A key motivator in the adoption of IIoT functionality is the potential to unlock knowledge from their data," said Rose Schooler, vice president IoT Strategy and Technology at Intel. "Because ADLINK's full spectrum of IoT gateway platforms utilize the latest version of Intel IoT Gateway Technology, developers will be able to utilize new enhancements designed to help prototype and develop IoT applications more quickly than ever."

The latest version of Intel® IoT Gateway Technology enables enhanced user interface, security, scalability, interoperability, and manageability, as well as support for a wider variety of fieldbus communication protocol, including Modbus (RTU/Ethernet), BACNet, CAN for industrial applications, Exegin, Zigbee, Open Z-Wave, and 6lowpan empowering smart buildings. Other features include support for MQTT, Bluetooth/BLE, CoAP, XMPP device-to-cloud protocol, as well as AllJoyn and IoTivity (open source software framework) to enable seamless device-to-device connectivity.

New additions to ADLINK's IoT gateway product line include the MXE-110i, MXE-202i, and MXE-5400i. The MXE-5400i, based on Intel® Core™ i3, Intel® Core™ i5, and Intel® Core™ i7 processors. These processors deliver exceptional performance and manageability, optimized connectivity, and rugged construction for mission-critical applications. The gateway performs dependably under an extended operating temperature range (from –20°C to 70°C with industrial SD card), making it the optimal solution for outdoor intelligent transportation, digital surveillance systems, and industrial automation applications. The MXE-202i gateway, powered by the Intel® Atom™ processor E3826, features two processing cores with an SoC design, delivering the computing performance needed to handle the flow of data from sensors, while power-efficient enough to perform reliably in a fanless enclosure. Finally, the MXE-110i gateway, based on the Intel® Quark™, is suitable for applications requiring enhanced energy efficiency, such as smart agriculture, smart factory, and automated building environments.

For more information on our IoT gateways, please visit:
http://www.adlinktech.com/Industrial-PCs-Fanless-Embedded-PCs/IoT-Gateway.php
For more information on ADLINK, please visit: www.adlinktech.com

About ADLINK

ADLINK Technology is enabling the Internet ofThings (IoT) with innovative embedded computing solutions for edge devices,intelligent gateways and cloud services. ADLINK's products are application-ready for industrial automation, communications, medical, defense, transportation, and infotainment industries. Our product range includes motherboards, blades, chassis, modules, and systems based on industry standard form factors, as well as an extensive line of test & measurement products, smart touch computers, displays and handhelds that support the global transition to always connected systems. Many products are Extreme Rugged™, supporting extended operating temperature ranges, and MIL-STD levels of shock and vibration.

The Aircraft's Place in the IoT Revolution

Aviation interests are warming to the Internet of Things and how the coming connectivity revolution will enhance the industry on multiple levels

By Robert W. Moorman - Already published in Aviation Today 01-Jun-2016

In aviation circles, professionals prefer the conceptual term "connected network" to the consumer-products-sounding Internet of Things (IoT). While IoT may not adequately describe the technical and commercial potential of satellite-based data communications in all things aviation, the growth of connectivity in the industry needs no debate.

"15 years ago, less than 10 percent of the world's aircraft had connectivity of any sort," says TrueNorth Avionics Founder and CEO Mark van Berkel. "By 2030, 90 percent of all aircraft will have some sort of connectivity." TrueNorth specializes in providing airborne connectivity to long-range business jets.

The origin of IoT dates back to 1982, when a modified soft drinks machine at Carnegie Mellon University in Pittsburgh, Penn. became the first Internet-connected appliance.

IoT — the concept of gathering, analyzing and transmitting data via satellite for analysis in real time — in aviation has extended to avionics, aircraft engines, airframes and other aspects of flight operations, including weather forecasting, over the last several years. Better aircraft data networks, connection points and increased bandwidth have significantly improved aircraft connectivity. Global high-speed satellite-based networks, such as Inmarsat's GX Aviation, are making bandwidth, data storage and processing more accessible to the aviation industry. And with that improvement comes a desire expressed by various segments of the industry to be connected 24/7.

IFE to IFEC

Consider the growing popularity of In-Flight Entertainment and Connectivity (IFEC) systems, which ushered in the IoT concept for many airlines. In a decade, IFEC has gone from being an onboard novelty to a must-have system for airlines to attract and maintain market share. Panasonic Avionics, a leader in this sector, expects growth in its IFEC and communications units to continue.

"The key enabler for the next generation of air travel is made possible by very cheap, high broadband communications to the aircraft," David Bruner, vice president of global communications services at Panasonic says. "The long term application is to have everything on the aircraft connected."

The air transportation business is moving into the "second generation" of connected capability, Bruner said. This chapter in the IoT story will cover advanced management of aircraft and all of its systems.

Known mainly as an IFEC systems provider, Panasonic's communications systems are gaining traction. In Europe, where many aircraft operate in confined airspace, the VHF radios used for communications with Air Traffic Control (ATC) are saturated with non-essential voice communications. Panasonic is collaborating with SES, a leading satellite operator, on offloading operational traffic communications to make room for essential ATC voice communications.

Panasonic has outfitted 1,100 aircraft with in-flight communications systems, and currently has a backlog of orders for another 2,000. The company expects to install these systems on 600 Boeing and 1,000 Airbus aircraft at the two air framers' facilities in 2016 and 2017, respectively. The goal: to outfit between 10,000 and 12,000 commercial airliners with Panasonic communications devices over the next decade.

Panasonic's strength in the IFEC arena continues, however. From April 2015 to March 2016, Panasonic delivered 1,200 IFEC systems to airlines worldwide.

To keep up with growing demand for connectivity, Panasonic announced several satellite capacity deals in the last year. By the end of 2016, Panasonic will be funneling its systems through second-generation High Throughput Satellite (HTS) systems, which provide six to 10 times the capacity of the current network. In February 2016, SES and Panasonic signed two, multi-year satellite capacity agreements serving aeronautical, maritime and oil and gas markets across the Americas.

Panasonic also provides four-dimensional weather forecasting to commercial airliners through connectivity as well as an aircraft tracking service, a byproduct of having its GPS-linked IFEC systems onboard.

Panasonic isn't alone, Honeywell Aerospace is also connected in a big way, gathering, sending and analyzing data on engines, Auxiliary Power Units (APUs), brakes and avionics, all of which it produces. "This is new technology that we're flying on our [Boeing] 757 test aircraft," Carl Esposito, vice president of marketing and product management at Honeywell Aerospace, tells Avionics Magazine.Esposito said tests on connectivity software would continue through 2016, with FAA certification expected by year's end and available for sale sometime in 2017.

The multi-part company is also developing connected radar by updating its IntuVue RDR4000 3D weather radar. In 2015, Honeywell launched the Weather Information Service (WIS) mobile app, which it claims can save airlines as much as $65,000 per aircraft per year. Turbulence costs airlines around $100 million per year. **... to next page**

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Aviaso, now a Honeywell company, offers IoT software that gathers aircraft usage data and identifies ways airlines can save fuel through an intuitive software interface. Aviaso services can reduce fuel costs from 3 to 5 percent per flight, saving airlines tens of millions of dollars annually, Esposito said.

Honeywell's Flight Management System (FMS) datalink service provides pilots with updated wind and temperature information to improve fuel performance, which, Honeywell projects, will save airlines $75,000 to $100,000 per year per aircraft, depending upon average flight length and the version of its FMS installed. Virgin Atlantic will be the first airline to install Honeywell's FMS datalink service.

Honeywell is partnering with Bombardier on connectivity technologies, and in late March, Transport Canada awarded Bombardier Business Aircraft's Wireless Access Virtually Everywhere (WAVE) high-speed in-flight connectivity solution a Supplemental Type Certificate (STC).

Using Honeywell's JetWave hardware, WAVE allows business aviation passengers to browse the Internet and conduct videoconferencing in-flight anywhere worldwide. JetWave satellite communications hardware stays connected to Inmarsat's Jet ConneX satellite solution at various altitudes, angles and speeds, in any kind of weather. The system is offered as an option to customers of new Global 5000 and Global 6000 aircraft; it is also offered as an upgrade for existing Global aircraft currently in service.

Separately, Bombardier's Smart Link service, which rolled out in late 2015, provides performance and operations monitoring as well as reporting services for Learjet, Challenger and Global aircraft. Through a direct link to Bombardier's Customer Response data center, SmartLink enables support teams to monitor operator and fleet performance, alert maintenance personnel of failures and transform notifications into real-time service plans, which is the long-term goal of all aircraft and engine OEMs and their customers.

Mike Blackman, manager of Aircraft Health Management Systems (AHMS) for Bombardier Business Aircraft says the goal with Smart Link is to go from a "reactive to proactive environment. It isn't just about maintenance. It is about the operation of the various departments" and linking all the systems together.

Powerplant Prominence

Engine manufacturers have led the way in IoT related advances on aircraft hardware. Predictive maintenance solutions for engines have been around for some time, but the latest engine monitoring systems are superior, in part, because of better aircraft connectivity. In the past, engineers analyzed the basics, such as exhaust gas, temperature and core vibration. Now, there is continuous operational performance data coming from the engine during all phases of flight as well as configuration data, which examines the number of cycles of the engine.

To help advance the science of predictive analytics, GE Aviation launched a digital division in March, which combines the company's digital expertise into one unit. In addition, GE is modifying its Predix cloud platform for the industrial Internet to apply to predictive analytics for aircraft engines.

"In a nutshell, it is about three things: gathering more data with better triangulation through a better platform, which is our Predix, and being able to predict things through a combination of physics and data science," Vijayant Singh, executive director of fleet support at GE Aviation says. "We have never had this before."

The big evolution, with the help of connectivity, is the change from obtaining a snapshot of data to providing a continuous data stream. "Our involvement now is to analyze a much higher volume and velocity of data, whereas before engine analysts only had insights into a few snapshots per flight," says Andy Rector, flight analytics platform leader for GE Aviation Digital.

The fidelity of the data continues to improve, at rates of 128 snapshots a second versus one. "We are tied into 60 member systems across the aircraft with very detailed information about how things are operating and how one system sees another system," Mark Thomson, product manger for GE Aviation's Onboard Maintenance System (OMS) and AHMS says.

GE predictive analytics extends beyond analyzing engine data. This predictive analytics capability is also involved with advanced operational management of the aircraft, as a complex system within the connected network. GE is supplying the data concentration and network, the advanced power management and health management systems for the Gulfstream G500/G600 business jets, which are powered by Pratt & Whitney PurePower PW814GA and PW9815GA engines. GE also provides maintenance and health management data on the G650 powered by Rolls-Royce BR725 engines.

Pratt & Whitney and Rolls-Royce are both developing innovative connected technologies to track the performance of their respective engines in real time, but declined to be interviewed for this article.

Pratt did provide this statement to Avionics: "With more than 450 commercial engines customers flying 10,500 engines, we have been collecting and analyzing vast amounts of data from our engines for decades," says Lynn Fraga, analytics manager of Pratt & Whitney Engine Services. "This data allows us to optimize engine performance by identifying trends to reduce unplanned engine removals and improving visibility into the overall health of the fleet."

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"Predictive analytics is a significant driver of innovation in the future. We are investing in data analytics to accurately and proactively monitor the health of the engines to predict future maintenance visits, customize maintenance work scopes, and improve visibility in the overall health of an operator's fleet," Fraga adds.

Savings & Efficiency

Technology for technology's sake is not a mantra of airline management. The airline must make the business case in order to embrace IoT-related technologies, meaning that being connected must yield efficiency and cost savings, particularly in the lowering of Direct Operating Costs (DOCs). Enhancing aircraft and operational safety also is an important byproduct of being connected.

"In the airline industry, everything, including achieving operational efficiency has to have a business case," Joel Otto, Rockwell Collins vice president of strategy development and technology for Information Management Services (IMS), formerly ARINC, says. He notes that being part of a connected network could provide immediate benefits. Airlines globally lose an average of $40 billion annually due to disruption of flight schedules, according to Otto.

Operationally, there is a growing list of disciplines connected to aviation that will need satellite-fed data. Among them are: governments, ATC, OEMs, airline back offices, dispatch and maintenance departments.

"Interactions between the ground systems and aircraft systems will become more rich and robust in the exchange of information," Otto said. "As this happens, it will require a whole level of safety, security, resilience and integrity to make sure it works the way you want it to."

Next generation Aircraft Data Networks (AFDX) should also be able to support the needs of aviation-connected entities. "However, new networking services might have to be incorporated into AFDX aircraft to make end-to-end connected systems," Otto says.

Rockwell Collins' ARINC MultiLink flight tracking service gathers data previously unavailable for flight tracking into one streaming data feed for airlines. ARINC MultiLink merges the Future Air Navigation System (FANS), Automatic Dependent Surveillance - Broadcast (B), Automatic Dependent Surveillance-Contract (ADS-C), Aircraft Communications Addressing and Reporting System (ACARS), Aircraft Situation Display to Industry (ASDI), Satellite Communications (Satcom) and High Frequency Data Link (HFDL).

Rockwell Collins' Programmable Audio Video Entertainment System (PAVES), which launched in the late 1990s, is in the process of becoming a full-fledged connected system, Otto says.

With the ability to gather and transmit multiple sources of data in real-time, savings to airlines and other segments of air transportation are noticeable. "One could save a lot of money, between 1 percent and possibly 4 percent in direct operating costs per flight," Chip Downing, senior director of aerospace and defense for Wind River, part of Intel's Internet-of-Things Group (IOTG), tells Avionics Magazine.

Wind River provides embedded software for intelligent connected systems. The company's Helix portfolio of software and technology helps connect data and devices through gateways, across the network, and up into the cloud.

The conundrum, said Downing, is that there isn't a single owner that controls the system of systems. Airlines own the aircraft and related MRO facilities. Communications go through radios, ACARS data link or commercial broadband services controlled by another entity. And flight operations are managed by government agencies, such as the FAA and Eurocontrol.

"This multi-owner, multi-tenant environment makes it particularly challenging to implement system-of-system efficiencies and to exploit data in the emerging concept of IoT," Downing said.

The next stage in connectivity also will include finding ways to make the process of capturing, securely transporting and analyzing data easier, he adds.

Being connected provides significant safety and maintenance related benefits to aircraft manufacturers. Airbus is installing around 6,000 sensors on the wings of the A350. The sensors, which transmit data via satellite in real time, are a good way to monitor stress and other anomalies on the aircraft's composite-filled wings. With composites, an added challenge is detecting damage one can't see.

Airbus' next-generation A380neo, which will have new engines and better wings, could have 10,000 sensors on the wings.

The ultimate goal of the IoT concept could be the advanced management of unmanned passenger aircraft, writes James Hardie, who is responsible for ARINCDirect services in Europe, Middle East and Africa. But that idea will likely run into a wall of professional pilots opposed to being removed from the cockpit. Nevertheless, the desire and need for greater connectivity in the air and on the ground will continue to grow.

END

The Industrial Internet Consortium Announces Steering Committee Election Results

Representatives from ABB, Fujitsu, MITRE, and RTI elected by the membership

August 30, 2016 09:00 AM Eastern Daylight Time

NEEDHAM, Mass.--(BUSINESS WIRE)--The Industrial Internet Consortium® (IIC), the global, public-private organization formed to accelerate adoption and enablement of the Industrial Internet of Things (IIoT), announced four new Steering Committee members for a total of 13 members. The new Steering Committee members, voted in as the result an annual membership election, include:

- ABB, Eric Harper, Senior Principal Scientist, elected to serve a one-year term in one of the large industry seats.
- Fujitsu, Jacques Durand, Director of Standards and Engineering, re-elected to serve a two-year term in one of the large industry seats.
- MITRE Corporation, Robert A. Martin, Senior Principal Engineer, re-elected to serve a one-year term in the academic non-profit seat.
- Real-Time Innovations, Inc., Stan Schneider, CEO, re-elected to serve a two-year term in the small industry seat.

"I'd like to congratulate the new and re-elected Steering Committee members on their election and welcome them to the team," said **John Tuccillo, IIC Steering Committee Chair, and Senior Vice President of Global Industry and Government Affairs, Schneider Electric**. "We have a dynamic group and I look forward to working together to guide the IIC and collaborate on strategic initiatives in the coming years."

Eric Harper, Senior Principal Scientist, ABB, who brings additional perspective of the large industry to the IIC from a leading automation supplier in utilities, industry, and transport, said, "As a Steering Committee member, I will foster collaboration between group leaders and encourage knowledge sharing and best practices among members to advance the goals of the IIC." Eric currently serves as Co-chair for both the Technology Working Group and the Industrial Analytics Task Group. He contributes to both the Testbed and Business Strategy and Solution Lifecycle (BSSL) Working Groups.

Jacques Durand, Director of Standards and Engineering, Fujitsu, said, "As a Steering Committee member, I'll continue to use my large-industry expertise with standards development organizations and testing, conformance, and interoperability labs to further the mission of the Industrial Internet Consortium. I'll also bring additional representation on the SC for the IIC members of East Asia and in particular for the Japanese IIC community." Mr. Durand is Co-chair of the BSSL Group. He is an active participant in the Liaisons, Technology, and Testbed groups.

Robert A. Martin, Senior Principal Engineer, MITRE Corporation, brings his knowledge and skills about risk management, cyber security, and quality assurance to the IIC. "During the past year, I have been actively engaged in crafting the Industrial Internet Security Framework," said Mr. Martin. "As a Steering Committee member, I will ensure that we are diligent in how we shape new solutions and approaches to security." Previously Mr. Martin co-chaired the Vertical Taxonomy Task Group and delivered the first version of the Verticals Taxonomy. He also serves on the Testbed Subcommittee and participates in the Industrie 4.0/IIC Joint Working Group on Security.

Stan Schneider is the CEO, Real-Time Innovations, Inc. (RTI), a small company with more than 1,000 IIoT projects spanning many industries. "The IIC has the scale and momentum to lead the amazing future of the Industrial IoT. Small companies bring great ingenuity and agility to the IIC but they need the IIC to move quickly," said Dr. Schneider. "On the Steering Committee, I will work to speed execution and communication." Dr. Schneider is the Chair of the Steering Committee Testbed Subcommittee, chartered to clarify testbed strategy and ensure execution and maximum industry impact. Recently, Dr. Schneider created the Ecosystem Task Group to help member companies leverage the IIC's members and resources to maximize return.

The newly-elected steering committee members will officially join their peers at the IIC's quarterly member meeting in St. Leon-Rot, Germany on September 19th.

About Industrial Internet Consortium

The Industrial Internet Consortium is an open membership organization with about **250 members from 30 countries,** formed to accelerate the development, adoption and wide-spread use of interconnected machines and devices, intelligent analytics and people at work. **Founded by AT&T, Cisco, General Electric, IBM, and Intel in March 2014,** the Industrial Internet Consortium catalyzes and coordinates the priorities and enabling technologies of the Industrial Internet. The Industrial Internet Consortium is managed by the Object Management Group® (OMG®).

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Top 20 IoT Enterprise Market Leaders In 2016

IoT Hits $6.7B For Q4 2015

The Internet of Things market landscape is finally taking shape, as revenue hit a record high of $6.7 billion for the top 20 benchmarked IoT companies in the fourth quarter of 2015, according to a recent report from market research firm TBR.

Amazon Web Services

Accenture

AT&T

Cisco

Dell

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General Electric

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Internet of Things Thought Leaders to Keynote Penton's IoT Emerge Event

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The IoT Emerge conference program will focus on four key areas:
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- IoT Engineering
- Smart Buildings
- IoT Security

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