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Basics of Industrial IoT: Industrial Processes – Part 2

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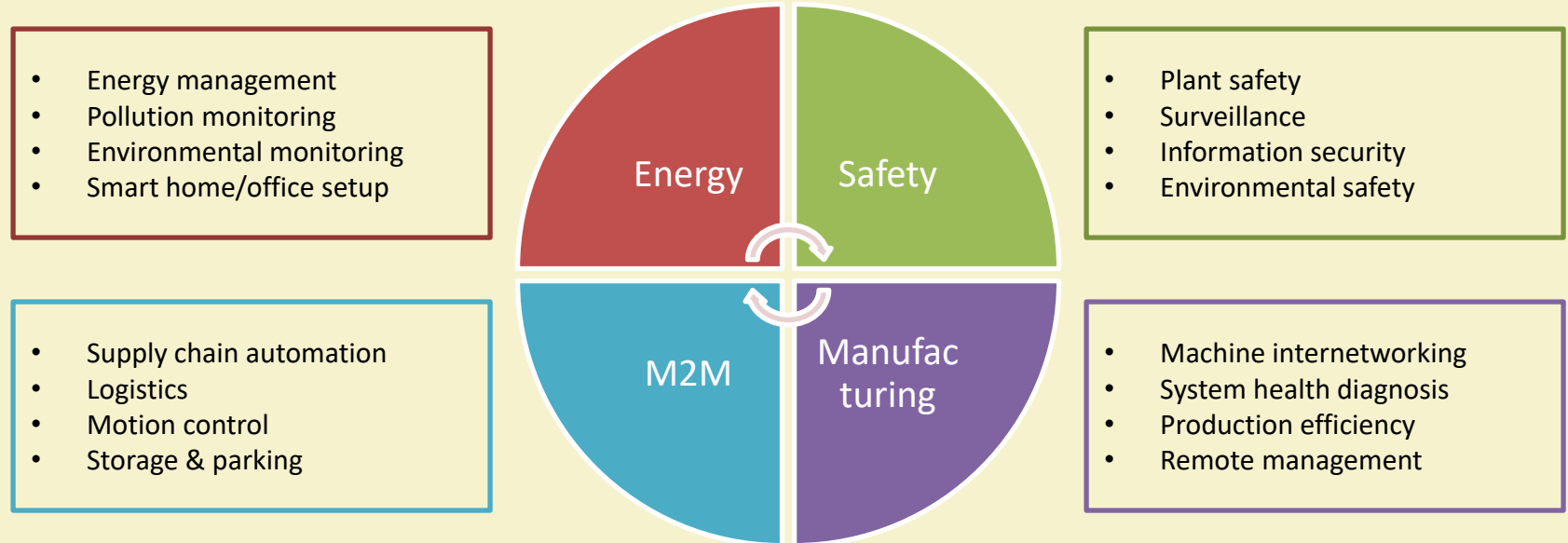
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Industry 4.0 – Different Sectors

- Smart robotics
- Factory of future
- Intelligent manufacturing
- Smart warehousing
- Air-as-a-Service
- Improved mining
- Smart logistics
- Track & Trace Innovation

Industry 4.0 @ ICP DAS

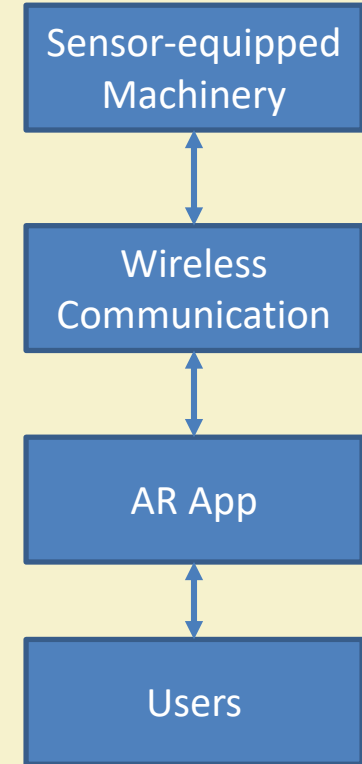


Source: Industry 4.0 at ICP DAS Co. Ltd.

Caterpillar: IoT + AR

- Smart view using IoT and Augmented Reality (AR)
- Real-time machine status and condition monitoring
- Ease of interaction with machines
 - App-based instructions for novices
 - Custom alerts for parts replacement
- Long term data analytics to predict future failures & budget

Source: Caterpillar Inc.



Amazon: Smart Warehousing

- Logistics & supply chain management
 - Smart control of supply fleet
 - Logistic status update with future market demand
- Tech-drivers:
 - Warehouse Automation
 - Human-Machine Interaction
- Robot-equipped goods storage & pickup facility in warehouse
- Lower operational cost
- Faster operating time

Source: Industry 4.0 at ICP DAS Co. Ltd.

Boeing: Efficient Manufacturing

- Smart & digital manufacturing facility
 - Helps in assembling of millions of aircraft parts
 - Automation of assembly steps
- Lower assembly delay & response time
- Reduced errors in manufacture & assembly
- Enhanced production capability
- Tech-drivers
 - Smart glasses for fault detection
 - Sensor-equipped assembler tools

Source: The Boeing Company, “System And Method For Using An Internet Of Things Network For Managing Factory Production”, US Patent 20160202692, 2016.

Cisco & Fanuc: Smart Factory

- The objective is to minimize downtime in industrial facility
- Tech-driver
 - Sensor-equipped robotic manufacturing facility
 - Cloud-based analytics
- Predictive maintenance & failure forecasting
- The system can place orders for replacing failed parts
- Zero Downtime (ZDT) system by Fanuc increases efficiency
- Connection between different production phases & accordingly refill of warehouse stocks

Source: NIKKEI Asian Review, “Boy, do Fanuc and Cisco have a deal for your factory”, Online article, 22 Jan 2016.

Hitachi: Integrated IIoT

- *Lumada* IoT platform
- AI-powered advanced analytics
- *Solution Core*: Replicable components for custom services
- *Co-creation Services*: Co-design facility for customers
- Production acceleration for application needs

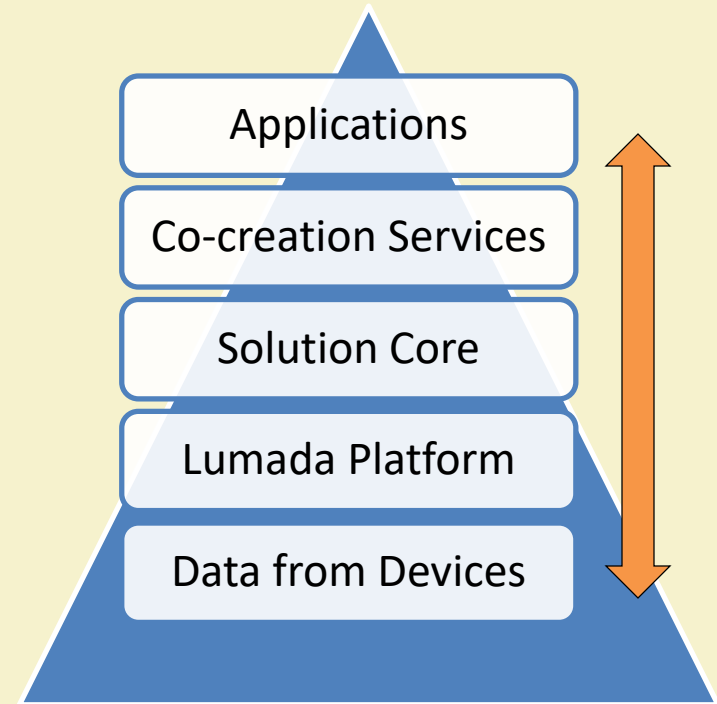


Figure: Hitachi IIoT platform hierarchy

Source: Lumada IoT Platform, Hitachi

John Deere: Precision Agriculture

- On-board GPS for real-time tracking of agricultural equipment
- Telematics technology for forecasting & maintenance
- Bale mobile app for geo-tagged yield mapping & bale monitoring
- Implementing remote control of tractor navigation
- The future goal is to enable autonomous agricultural operations without human intervention by self-driving tractors

Source: Agriculture Technology, Precision Agriculture, John Deere

Kaeser Kompressoren: Air-as-a-Service

- Sensor-equipped air compressors
- Ease of predicting the future failures and maintenance cost
- *Air-as-a-Service*: Users pay per cubic meter of air from company's owned compressors
- Service models: *Selling, Renting, and Air-as-a-Service*
- Operation cost reduction as lesser customer services requests are generated

Source: Kaeser Kompressoren – Service

Real-Time Innovations: Smart Grid

- Smart energy management system with *Connex DDS*
- Integrated apps and devices – scalable, secure & reliable
- Modular design, faster connectivity, high throughput
- Facility for deploying analytics in edge or cloud
- Product suite
 - Professional version: End-to-end solution, scalable & reliable
 - Secure version: Enhanced & secure version
 - Micro version: Specifically for resource constrained systems
 - Cert version: Safety-centric IIoT systems

Source: Real-Time Innovation Products

Komatsu: Improved Mining

- Technology sectors
 - *Mining Intelligence*: Higher profit by predictive machine performance analysis
 - *Proximity Detection*: Enables workers to stay safe from hazards & large machines
 - *Environmental*: Reduced dust, ignition – increased visibility, optimal use of water
- Tech-driver:
 - Internet connected robots
 - Self-driving trucks
 - Wireless sensors
- Systems
 - PreVail remote health monitoring system
 - JoyConnect
 - Longwall 3D Visualization

Source: Komatsu

Rio Tinto: Futuristic Mining

- Central control facility with visualization & collaboration tools
- Real-time monitoring and optimization of supply chain
- Autonomous haulage systems (AHS): a fleet of autonomous trucks
- Safe & efficient navigation resulting in increased productivity
- Automated drilling system (ADS): Enables remote operator to control drilling
- AutoHaul® is the system for autonomous trains to carry iron ore

Source: Rio Tinto – Mine of Future

Stanley Black & Decker: Smart Construction & Engineering

- Innovation Sectors:
 - Engineering: Solutions for product assembly – automotive, computer, home appliances, telecommunications, solar panels.
 - Pipeline: High quality reliable pipeline for oil & gas industry
 - Infrastructure: Solutions for equipment required in construction & maintenance
- Lightweight vehicles: ECOSMART™ innovative solution which reduces energy requirement and carbon footprint

Source: Stanley Black & Decker

Shell: Smart Oil & Gas

- Digital oil field: Sensor-equipped oil & gas machinery, valves and pumps
- Enabling precise operation for shale gas recovery
- Real-time monitoring and optimization facility
- Faster production decisions to reduce slower production rate
- Improved production, reduced downtime & risk, lower costs

Source: Shell – Energy & Gas

North Star BlueScope: Industrial Safety

- Worker death rate due to work-related disease/accident:
~1/15 seconds [Source: International Labor Organization]
- Wearable safety gadgets for industrial workers
- Analytics & IIoT: hazardous condition monitoring, work environment safety
 - Enforcing proper safety conditions
 - Interconnected workers

Source: International Labor Organization; North Star BlueScope

Maersk: Smart Logistics

- IoT and analytics to optimize the route & fuel consumption for containers
- Remote control & maintenance of containers according to its content – dry cargo, refrigerated cargo, or special cargo
- Facility for users to remotely monitor the condition inside cargo
- End-to-end shipment: Source to destination shipping covering intermodal transport
- Trade finance: Solution to control the flow of goods & optimize pricing
- Other solutions: *Supply Chain Optimization & Freight Forwarding*

Source: Maersk Solution

Magna Steyr: Smart Factory

- Digital mapping of entire production timeline
 - Vehicle engineering
 - Production line implementation
- Intelligent production system: Accurate, scalable, reliable & dynamic to changed needs
- Full autonomy of factory: network of humans, machines & resources
- Solutions: *Driver assistance system, Alternative energy storage system, Lightweight design & joining system*

Source: Magna Steyr – Capabilities

Gehring: Connected Manufacturing

- Internet-connected sensor-equipped machinery enables real-time data streaming
- Smart projection of machine functionalities to customers in real-time: precision & efficiency check
- Cloud-based analytics to reduce production downtime & increase productivity
- Provision for real-time tracking & monitoring of machinery
- Facility for data visualization & additional analytics

Source: Gehring Technologies

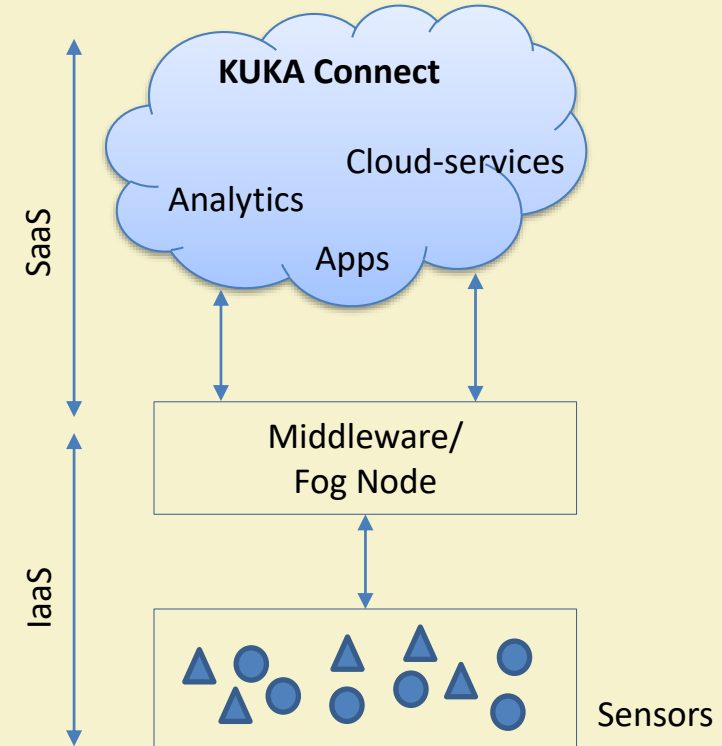
Bosch: Track & Trace Innovation

- Solution to ease the searching of the different tools/parts in a factory
- Sensor-equipped tools/parts can be tracked and traced
- Reduction in searching time and risk for using wrong tools
 - Asset/work management
 - Integrated manufacturing
- Future impact: Can help in automated sequencing of assembly operation
- Tools-as-a-Service: New business model for efficient productivity, enhanced safety & product quality
- The same technology can be applied to many other sectors of the industry – food, logistics, supply chain, pharmacy, etc.

Source: Bosch Track & Trace Innovator

KUKA: Connected Robotics

- Connected robotics system for super-fast manufacturing
- Internetwork between the robotic assemblers and components
- Smart factory with robots connected to private cloud as solution for the clients
- Analytics on collected data to generate better future strategies



Source: KUKA Connect

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Thank You!!

