The Internet of Things in the Context of Manufacturing

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SAP is a key player in Manufacturing Execution!

- SAP Manufacturing Execution (by Visiprise)
- SAP Manufacturing Integration & Intelligence
- SAP Plant Connectivity
Better Processes and Better Decision Making

- Strategy
- Insight
- Decisions
- Process Change
- Events

Alerting 
Execution

Monitoring & Awareness 
Execution & Control
Internet of Things for Enterprises: Major Research Topics

- E-Energy
- Indep. Living
- Logistics
- Public Security
- Manuf.
- Insurance
- Compliance
- Retail

- Lifecycle Management of Embedded Software
- Distributed Complex Event Processing
- Business Models
- Management of Complex Infrastructures
- Service Architectures & Cloud Computing
- IoT Business Process Modeling
- Semantic Interoperability of Smart Items

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### The Future of Manufacturing Execution

**Internet-of-Things-enabled Innovations**

#### Innovations
- Ubiquitous sensing
- Ubiquitous safety
- Context awareness
- Prediction technologies
- Wireless-X
- Remote-X
- Mobile-X
- Self-X
- Dynamic resources
- Distributed intelligence
- Open-loop RFID/"RFIT"
- Semantic integration
- “Invisible IT”

#### Challenges
- Complexity management
- Semantic interoperability
- Quality of service
- Managing data volumes
- Integration of automation and IT world
- Dynamic re-distribution of computation
- Complex event processing
- Interfacing with the user

#### Benefits
- Visibility & Intelligence
- Flexibility & Control
- Efficiency
- Safety

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SAP Research Future Factory Initiative: Three Pillars

Future Factory Initiative

**Future Factory Lab**
- R&D test and validation platform
- Showroom for customers, partners, colleagues
- Short to mid-term innovations

**Distributed Testbed**
- Distributed manufacturing scenario
- B2B collaboration scenarios
- Mid to long-term innovations

**Center of Excellence**
- Idea exchange between experts
- Workshops / information days
- Joint projects
Future Factory Lab @ SAP Research Dresden: Topics & Projects

- **End-to-end process integration and monitoring**
  - SAP ERP, SAP Business ByDesign, SAP MII, SAP PCo, AII, EWM, SAP ME (by Visiprise)...
  - Time recording via Kaba technology
  - SOA management via HP BTO technology

- **Plant data collection and shop floor execution**
  - Device connectivity via standards like OPC UA
  - Robust and occasionally connected operation
  - Highly customizable processes

- **Real-time manufacturing user interfaces**
  - Highly usable touch screen UIs for workers
  - Mobile UIs for tracking, monitoring and control
  - Large screen UIs for status monitoring and control, 3D visualization

- **Process efficiency and new technologies**
  - Wireless online quality inspection tools
  - Direct digital manufacturing, 3D printing
  - Condition-based predictive maintenance
  - Pick-by-light and pick-by-voice for assembly and commissioning
  - RFID for goods receipt, smart storage, location awareness, container tracking, e-Kanban
Some Technical Issues...

Addressing
- Discovery Services
- ONS
- EPC
- IPv6
- Physical vs. Logical Addressing
- ucode

Heterogeneity
- RFID
- Actuators
- Devices
- Protocols
- Embedded Systems
- Wireless Sensor Networks

Services
- Service Composition
- Service Interfaces
- Semantics
- Quality of Service
- Quality of Actuation
- Context Awareness
- Quality of Information

Scalability
- Sensor Data
- Edge Processing
- Distributed Business Logic
- Event-Driven Architectures
- Streaming Data
- Aggregation
- Filtering
Increasing Networking Capabilities

- Increasing interaction between physical items
- Increasing interaction with physical environment
- Increasing interaction with information systems

Increasing Sensing, Actuation and Computing Capabilities

- Convergence of computing and digital systems for measurement & control
- Real world awareness: identity, location and sensory information
- Enhanced business logic on the item

Discrete *everyday objects* in the real world become *smart items*
SAP Industry Solutions
11 out of 24 are in Manufacturing!

Manufacturing

- Automotive
- Engineering, Construction & Operations
- Industrial Machinery & Components
- Aerospace & Defense
- Chemicals
- Consumer Products
- High Tech
- Life Sciences
- Mill Products
- Mining
- Oil & Gas

Manufacturing is one of SAP’s core businesses!

Service
- Media
- Professional Services
- Retail
- Telecommunications
- Travel & Logistics Services
- Utilities
- Wholesale Distribution

Financial and Public Services
- Banking
- Defense & Security
- Healthcare
- Higher Education & Research
- Insurance
- Public Sector
Future Factory Initiative – Partners

Core Partners

Fraunhofer Institut Arbeitswirtschaft und Organisation

HP

Intel Leap ahead

KABA

myOpenFactory

smartFactory

Associated Partners

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