Industry 4.0 – Vision to Reality
Industry 4.0….moving into a fourth Industrial Revolution

First Industrial Revolution
based on the introduction of mechanical production equipment driven by water and steam power

Second Industrial Revolution
based on mass production achieved by division of labor concept and the use of electrical energy

Third Industrial Revolution
based on the use of electronics and IT to further automate production

Fourth Industrial Revolution
based on the use of cyber-physical systems
The Internet is revolutionising the world of business
New business models in the Internet age

From bookstore to e-book

From record store to streaming

From Yellow Pages to marketplace

From taxi to ride-sharing
Industrial challenges and drivers

Shorten time to market
- Shorter innovation cycles
- More complex products
- Greater data volumes

Increase flexibility
- Individualised mass production
- Volatile markets
- High productivity

Boost efficiency
- Energy efficiency and resource efficiency are critical competition factors
Industry 4.0 …

- Organisation and control across entire value chain & product life cycle
- Individualised to customer wishes
- Encompassing all phases:
  - From idea to order
  - Development and production
  - Delivery to the customer
  - Even recycling and related services

Key research areas

- Horizontal integration via value-added networks
- End-to-end engineering across the entire value chain
- Vertical integration and networked production systems

Source: acatech, April 2013 “Recommendations for implementing the strategic initiative Industrie 4.0”
Influence of Digitalisation on Siemens Innovation

Enablers
- Sensors
- Computing power
- Storage capacities
- Data analytics
- Networking
Industry 4.0 touches all elements of the value chain
Discrete industry –
The entire value chain is digitalised and integrated
Cyber-physical systems - Complete digital model

Cyber-physical system (CPS) + Digital model

Contains all information …
- Software / Informatics
- Mechanics
- Electrics, Electronics
- Automation, HMI
- Safety, security
- Maintenance
- Location, identity…
- Status
- SW version
- Interfaces
- …

The digital model always up-to-date and is extended over the entire lifecycle

Product design → Production planning → Production engineering → Production execution → Services
Cornerstones of the Digital Enterprise – The Innovation Challenge

Use of intelligent models

Integrated value chain with seamless engineering

Modular, networked, secure automation

Transparent factories, internally and externally networked
Step by step into the digital world

Four steps to the Digital Enterprise for small and medium-sized enterprises

1. Digital Enterprise Software Suite
2. Industrial communication networks
3. Security in automation
4. Business-specific industrial services
Secure end-to-end communication infrastructure

End-to-end communication across companies, production facilities and field sensors with PROFINET

Communications Solutions for Industry
- Profinet – Profisafe, ProfiEnergy
- Wireless Industrial Communication
- Managed Switches
- Network Management & Diagnostics
- Secure Remote Access
Comprehensive security

Security - “Defense in Depth”

- Copy and manipulation protection
- Authentication and user management
- Firewall & VPN (Virtual Private Network)
- System “hardening”

Products and systems with integrated security

- SCALANCE S
- SCALANCE M
- CP 343-1 Adv
- CP 443-1 Adv
- SIEMENS CPU 15<br>SIEMENS CPU 15
- CP 124-1
- CP 144-1
- CP 164-8
- SIEMENS Security Client

Industrial Security Services

1. Risk Analysis
2. Guidelines, organizational measures
3. Technical measures
4. Evaluation & improvement

* Based on IEC 62443

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Big Data > Smart Data > Business Data

Siemens Plant Data Services Portfolio

Siemens Plant Cloud Services

- Open industrial cloud platform, including standardised device connectivity
- Eco-systems for customers and analytics partners
- Siemens as “data custodian”

Siemens Plant Analytics Services

- Plant and asset optimisation through
  - Asset Analytics
  - Energy Analytics
  - Process Data Analytics

Siemens Plant Security Services

- Holistic security offering for industrial plants
- Ensuring data confidentiality and integrity as well as plant and asset availability
  - Plant assessment
  - Plant optimization
  - Managed Security Service

1) Currently only pilot customers

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Optimisation of plants and machines as well as energy and resources

- **Open standard (OPC)** for connectivity of Siemens and third-party products
- **Plug and play connection** of Siemens products (engineering in the TIA Portal)
- **Cloud for industry** with open application interface for individual customer applications
- Optional **cloud infrastructure** – public cloud, private cloud or on-premise solution
- Transparent **pay-per-use pricing model**
- Opportunities for completely **new business models** (e.g. selling machine hours)
The future of Industry
Many teams are posed on the starting line

Don't wait for Industry 4.0, join the challenge now and help to shape it!
Today’s investments in Industry 4.0 – to beat global competition

Summary

- **Infrastructure** Industrial Ethernet, wireless, IoT, sm@rt data, mass customisation
- **Virtualisation** 3D CAD modeling, simulation, supply chain data collaboration, zero prototyping
- Hybrid **Skills** for self optimising cyber-physical manufacturing

Results

- **Mass Customisation** - batch sizes of 1
- Shorter **Time to Market** – zero prototyping
- **Highly Flexible Manufacturing**
  - 30% increased productivity

Smart Products, Smart Factories, Smart Supply Chains
Factory of the Future R&D environments
Thank you