Driving the Digital Enterprise
Totally Integrated Automation for Manufacturing
Question

What is the difference between simulation plans and construction plans?
What is the difference between simulation plans and construction plans?

“Simulation mean I know it will work and construction plans mean I think it will work. There is a huge difference”.

—Rainer Feuchter CEO OPTIMA consumer GmbH
New business models in the Internet age

From **bookstore** to **e-book**

From **Yellow Pages** to **marketplace**

From **record store** to **streaming**

From **taxi** to **ride-sharing**
Studies emphasize manufacturing transformation

» Trend to individualized mass production requires extended communication technologies along the value chain «

» The shift towards networked production is just beginning «

» Digital manufacturing is expected to change the face of today’s industry structures and value chains «
The Internet is revolutionizing the business world and creates major opportunities for manufacturing companies.
The next level of manufacturing

Characteristics

- Humans, devices and systems are connected along the entire value chain
- All relevant information are available in real-time – across suppliers, manufacturers and customers
- Parts of the value chain can constantly be optimized with respect to different criteria, e.g. cost, resource utilization, customer needs

Sources: BITKOM, BCG
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Industrie 4.0
Defining the way forward in industry in the internet age

Cornerstones of the initiative Industrie 4.0

- Horizontal integration of the value-add networks
- Seamless integration of the engineering of the entire value-add chain
- Vertical integration and networked production systems

Source: acatech, April 2013 “Umsetzungsempfehlung für das Zukunftsprojekt Industrie 4.0”
Initiatives around the world focusing on “the Future of Manufacturing”
Digitalization addresses all aspects of the industrial value chain

Siemens portfolio addresses specific aspects of digitalization in industry

Domains covered by Siemens DF and PD portfolios
Key areas where “Digital Enterprise“ solution will need to provide significant progress

- Shorter innovation cycles
- More complex products
- Larger data volumes

- Individualized mass production
- Volatile markets
- High productivity

- Energy and resource efficiency as key competitive factors
Only a holistic automation approach including the whole value add chain will yield sustainable competitiveness
“Digital Enterprise” Software Suite –
The Siemens answer to Digitalization requirements
The meaning of digitalization for machine building
Implications for machine builders resulting from market trends

**Higher number of product variants...**

- Requires vertical integration to ERP and MES level of end-customer

**Faster reaction to market trends...**

- Requires digitalization and simulation

**Production Flexibility**

- Requires modularity of machines

**Productivity improvements...**

- Require highly available machines
Digitalization in machine building
An example for seamless engineering along the entire value chain

Individualization

From virtual to real

Simulation of entire production
with **Plant Simulation**

Simulation of machine behavior
with **Mechatronic Concept Designer**

Generation of Project
with **SIMOTION easyProject**

Automation Engineering
with **TIA Portal** and **Scout TIA**

Print your own name on your individual perfume flacon

Cloud Services

Horizontal integration of production planning and production engineering
The meaning of digitalization for the entire production
1,000 - different products manufactured

1 - product per second

1 million - monthly production of SIMATIC products

50 million - process items entered in SIMATIC IT each day

75% - automation level

12 dpm - 99.9988% quality rate

1,000 - Teamcenter managed product variants

60,000 - customers worldwide each year
The products of EWA – SIMATIC

Programmable Logic Controller **SIMATIC S7**

Decentral IO system **SIMATIC ET 200**

Human Machine Interface **SIMATIC HMI**
EWA development Industrie 1.0 to 4.0

Industrie 1.0/2.0
- Mechanical production lines
- Mass production
- Manual drawings

Industrie 3.0
- Automated production
- Lean production
- Intranet and Internet

On the way to Industrie 4.0
- Digital Product Lifecycle
- Horizontal and vertical integration
- Identification and history for all elements
Implementation of a Digital Enterprise with Totally Integrated Automation

- Product Lifecycle Management and Enterprise Resource Planning
  - Product design
  - Product data management
  - Production planning
  - ERP

- Management
  - Manufacturing Execution System

- Operations
  - Totally Integrated Automation Portal
    - SCADA System
    - Engineering Framework
    - Energy Management

- Control
  - Controller
  - HMI
  - IPC
  - Communication
  - Motion Control
  - CNC

- Field
  - Power Supply
  - Industrial Identification
  - Distributed I/O
  - Drive Systems
  - Industrial Controls

Added value in all automation tasks

- Integrated Engineering
- Industrial Data Management
- Industrial Communication
- Industrial Security
- Safety Integrated
The way to increase productivity – continuously optimize and extend the production

A consistent connection between IT level and machine level is the key to continuously increasing productivity
Horizontal integration from product development to production

Virtual component

Virtual product

Real product

SIMATIC S7-1500 IO module

Design in NX

Simulation in NX

Production with SIMATIC

Teamcenter as central data backbone
Interaction with suppliers via the central data backbone Teamcenter

95% of all data are already today downloaded from Teamcenter by the suppliers

**Siemens**

**Construction of product in NX**

Storage of all data, incl. versioning

Teamcenter

Access to virtual component data

Quality control

Storage of all data after quality check

Production planning

Access to always up-to-date information

Only manual step: forwarding component information

Component supplier
A maximum of transparency for logistics and quality

Record big data and push smart data

Identification of all objects and process
- All products, parts,…
- All machines, bins, adapters
- All programs, data, …

Record of all process values
- Soldering temperature
- Pass or fail
- Torque …

Autonomous process analysis
- Real-time
- All employees
- All processes
Always up-to-date

How
- Current technology: Smartphone-App
- Access to MES
- Platform independent

What
- Quality
- Performance, for example yield
- Company’s performance
Totally Integrated Automation – the basis for future industrial concepts

Customer requirements

- Consistent data management
- Global standards
- Uniform interfaces for hardware and software

Totally Integrated Automation

IT Level

- PLM
  - Teamcenter / NX
- MES
  - SIMATIC IT
- Services
  - Plant Cloud Services

Integrated Engineering

Industrial Data Management

Industrial Communication

Industrial Security

Safety Integrated
Benefits of a common architecture based on Totally Integrated Automation

Easy engineering and integration

**Single engineering tool**
Thanks to TIA Portal usage of same program parts in all machines possible

**Scalable portfolio**
Scalable and seamless TIA portfolio fits for each application

**Production lifecycle**
Connect old and new machines thanks to compatible components

**Vertical integration**
Uniform Ethernet communication from field to management level
## Benefits of a common architecture based on Totally Integrated Automation

### High availability

<table>
<thead>
<tr>
<th>TIA Portal</th>
<th>System diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="TIA Portal" /></td>
<td><img src="image2" alt="System diagnosis" /></td>
</tr>
<tr>
<td>In case of maintenance, only one tool for controller, HMI, drives, etc.</td>
<td>Uniform, integrated and self-explaining diagnosis for all devices</td>
</tr>
</tbody>
</table>

### Device replacement

- Device replacement due to maintenance without tools or engineering

### Vertical integration

- Direct connection to MES and cloud systems for predictive maintenance
Integrated Engineering with TIA Portal saves significantly engineering time

- One common framework
- Unique and consistent user interface concept
- Common and centralized services

Totally Integrated Automation Portal

Common Data Management

- WinCC
- Step7
- Scout
- Startdrive

HMI  Controller  Distributed I/O  Motion Control  Drives

Security Integrated

Safety Integrated

Diagnostics
Integrated Engineering
Scalable SIMATIC Controller portfolio – seamlessly engineered with TIA Portal

Engineering with TIA Portal

System performance

Basic Controller
SIMATIC S7-1200

Distributed Controller
SIMATIC ET 200SP

Advanced Controller
SIMATIC S7-1500

Software Controller
SIMATIC S7-1500

Application complexity

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Safety Integrated
SIMATIC Safety – the highest possible integration of Safety in automation

Seamless integration of Safety in HW & SW

Standard and fail-safe automation with...

- ...one engineering
- ...one controller
- ...one network

No additional HW & SW is required

Safety Integrated in TIA Portal

- Controller S7-1200/1500
- Remote I/O ET 200
- Operation and monitoring SIMATIC HMI
- Drives SINAMICS
Horizontal and vertical integration in the value chain

From machine building to digital enterprise operation

Engineering
- Mechanical
  - NX
- Electrical
  - EPLAN
- Automation
  - TIA Portal

Simulation
- NX & PLCSIM advanced

Commissioning
- TIA Portal

Execution
- TIA Portfolio

Maintenance
- Data Driven Services

Cloud
- Mindsphere
- SIMATIC IT
- SIMATIC WinCC
- MES
- SCADA
- Energy Management

Teamcenter
Digitalization @ Hanover Fair 2016
25 - 29 April

Ingenious for life – Driving the Digital Enterprise

Four Highlight Cubes
- Energy for Industry
- Automotive
- Additive Manufacturing
- Fiber Industry demo

Exhibition Area: ca. 3,600 m²

Hanover Fair - Highlights DF FA
- **TIA Portal V14**
  - TIA Portal goes digital
  - Higher performance and quantity structures
- **SIMATIC S7-1500 T**
  - Scalable motion control functions within S7-1500 CPU Portfolio
  - SIMATIC S7-1500T and SINAMICS
Realize innovation in the digital factory with Siemens

Digital Enterprise Software Suite

Totally Integrated Automation portfolio

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Thank you for your attention!

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