Topics of the presentation

1. Siemens as a leading software provider
2. Siemens perspective on Big Data
3. Examples from offerings and research
4. What can we expect from big Data in industrial applications?
Siemens is a global company active in Industry, Energy, Infrastructure and cities and Healthcare

Revenue by Sector

- Healthcare: 17%
- Energy: 35%
- Infrastructure: 22%
- Industry: 26%

Revenue by Region

- Germany: 14%
- Europe, CIS, Africa, Middle East (excl. Germany): 37%
- Asia, Australia: 20%
- Americas: 29%

Revenue and employees

- FY 2011:
  - Revenue: 73,275
  - Income: 7,376
  - Free cash flow: 5,918
  - Employees: 359,000

- FY 2012:
  - Revenue: 78,296
  - Income: 5,184
  - Free cash flow: 4,790
  - Employees: 370,000

As reported in annual reports
Siemens aims to being a pioneer in technology driven markets

Future of energy
High-performance technologies for the generation, transmission, distribution and use of energy
- Highly efficient power generation from fossil fuels as well as renewable sources
- Smart grids that integrate decentralized power generation and energy storage units
- Comprehensive electromobility solutions – from charging infrastructures to drives

Vertical IT
Integrated industry-specific hardware and software solutions
- Industrial automation
- Transport logistics
- Building automation
- Healthcare IT

SMART products for local markets
Innovative, robust products for entry-level market segments – developed in local markets for local markets and for customers around the globe
Siemens aims to being a pioneer in technology driven markets

**Future of energy**

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**Vertical IT**

Integrated industry-specific hardware and software solutions

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- Healthcare IT

**SMART products for local markets**

Innovative, robust products for entry-level market segments – developed in local markets for local markets and for customers around the globe
Vertical IT is a new and fast growing market

Horizontal IT

Equipment
Vertical IT is a new and fast growing market
Siemens aims for leadership in vertical IT by combining domain know how and technology

**Industry**
- PLM
- Production SW
- Computer aided design

**Infrastructure & Cities**
- Smart Grid
- Smart buildings
- Intelligent traffic

**Energy**
- Plant mgmt
- Plant automation
- Renewables

**Healthcare**
- IT workflows
- Patient record management
- E-health

**Key strengths to leverage:**
- Deep domain know-how and customer intimacy
- Outstanding technology
- Global presence

**Vertical IT & Software**

**Horizontal IT**
(Infrastructure, tools, platforms and services)

PLM: Product lifecycle management
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The future of big data will be in industrial data
The future of big data will be in industrial data

Social media today mostly in focus

Social Media

Mobile devices

FACEBOOK GROWS 250MILLION PHOTOS / DAY
The future of big data will be in industrial data

Social media today mostly in focus

Social Media

FACEBOOK GROWS
250MILLION
PHOTOS / DAY

Mobile devices

The future will focus more on sensor data

Geophysical Exploration

ONE OIL RIG OFFERS
25 THOUSAND
DATA POINTS/SEC

Medical Imaging

READING METERS
EVERY 15 MINS. IS
3,000X MORE
DATA INTENSIVE

Smart Grids
The future of big data will be in industrial data

Social media today mostly in focus

Social Media

Mobile devices

In 2000 years, the world generated approximately two Exabytes of new information:

2,000,000,000,000,000,000

The future will focus more on sensor data

Geophysical Exploration

Medical Imaging

Smart Grids

One oil rig offers 25 thousand data points/sec

Reading meters every 15 mins. is 3,000x more data intensive
The future of big data will be in industrial data

Social media today mostly in focus

Social Media

Mobile devices

Geophysical Exploration

Medical Imaging

Smart Grids

The future will focus more on sensor data

In 2000 years, the world generated approximately two Exabytes of new information:

2,000,000,000,000,000,000

It now generates that much data in 1 day
However, data alone is not sufficient to drive meaningful actions

<table>
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However, data alone is not sufficient to drive meaningful actions.

**Sensor data**

- **One oil rig offers 25 thousand data points/sec**
- **Reading meters every 15 mins. is 3,000x more data intensive**

**Actions**
However, data alone is not sufficient to drive meaningful actions

Sensor data

Vertical knowledge

Actions
Big Data will transform industrial systems

Dimensions of big data
Big Data will transform industrial systems

Dimensions of big data

Volume
Big Data will transform industrial systems

Dimensions of big data

Volume

Analyze data for complex systems, not only components
Big Data will transform industrial systems

Dimensions of big data

- **Volume**: Analyze data for complex systems, not only components
- **Velocity**
Big Data will transform industrial systems

Dimensions of big data

- **Volume**: Analyze data for complex systems, not only components
- **Velocity**: Generate analytics answers while they still matter
Big Data will transform industrial systems

Dimensions of big data

Volume

Analyze data for complex systems, not only components

Velocity

Generate analytics answers while they still matter

Variety
Big Data will transform industrial systems

Dimensions of big data

- **Volume**: Analyze data for complex systems, not only components
- **Velocity**: Generate analytics answers while they still matter
- **Variety**: Provide additional context to the data
Big Data will transform industrial systems

Dimensions of big data

- Optimization of complex system behavior
- Real time decisions in operational processes
- Improvement of sustainability of industrial processes
## Topics of the presentation

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Embracing big data requires both data sharing policies to preserve privacy & confidentiality and scalable data analytics

- Intelligent on demand reconfiguration of transmission and distribution networks to accommodate both large renewable energy parks as well as small distributed generation
- Implementing flexible tariffs for industrial and private demand side management, distributed feed-in, and e-car roaming

TSO – Transmission System Operator
DSO – Distribution System Operator
Data Management and Real Time Monitoring for Gas Turbines

Benefits

- Improved turbine ramp-up with less vibrations (lower maintenance needs)
- Reduced NOx Emissions
- Increase of turbine efficiency
- Guiding turbine development process

Online-Data: ca. 5,000 variables / s

Real-time Data Analysis (1,000 Neural Models)

Database: Input data and model results

Complete Data and Dependency Analysis plus Learning Optimization
Benefits

Accurate forecasts of the wind energy supply of an entire wind field enable e.g.

- The usage of wind power as an **instantaneously** available energy source,
- The disposition of wind power quantities on the spot market
- An optimal scheduling of wind turbine maintenance jobs
- Efficient power grid management
Concept for Short Term Solar Power Forecast

Benefits

- Forecast the solar energy supply of a selected control area up to 15 min
- Improve power grid management and balancing of energy mix energy components
With Power/Plant Monitoring we can detect failures and fatigue in advance

Condition monitoring platform that predicts failures by
• learning from historical data and trends
• incorporating it with user defined rules and knowledge

Benefits
• Detect failures and fatigue in advance
• Alert service operators upfront before damage occurs
• Mitigate the risk of long term service contracts
• Increase the efficiency of remote monitoring operations
When marking text in reports, associated diagnosis are highlighted in lists and images
## Topics of the presentation

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Analytics based on Big Data can have strong impacts on industry

<table>
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<th>Big Data implications</th>
<th>Possible impacts in industry</th>
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<td>• Optimization of complex system behavior</td>
<td>• Optimization of industrial processes across the value chain, including semi-autonomous,</td>
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<td>self organized continuous change</td>
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<td>• Real time decisions in operational processes</td>
<td>• Reduction in operational risks for customers</td>
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<td>• Automation of decision making on the level of complex systems</td>
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Individual reference cases already implemented – broader scale implementation started
What is required to make this all happen?
What is required to make this all happen?

Continue research on vertical algorithms
What is required to make this all happen?

Continue research on vertical algorithms

Implementation of further big data reference cases
What is required to make this all happen?

Continue research on vertical algorithms

Implementation of further big data reference cases

Continued research programs on big data in Europe (basic technologies, standard algorithms, data security and privacy, etc.)
What is required to make this all happen?

- Continue research on vertical algorithms
- Implementation of further big data reference cases
- Improvement of analytics skill base in Europe
- Continued research programs on big data in Europe (basic technologies, standard algorithms, data security and privacy, etc.)
What is required to make this all happen?

- Continue research on vertical algorithms
- Implementation of further big data reference cases
- Understanding of big data implications (privacy concerns, risks, etc.)
- Improvement of analytics skill base in Europe
- Continued research programs on big data in Europe (basic technologies, standard algorithms, data security and privacy, etc.)
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- Continue research on vertical algorithms
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