Autonomous Robotics

Driving innovations from China to the world

Siemens China to lead the company’s global R&D in autonomous robotics

Building a robotics center with Tsinghua University in Beijing
New technologies and digitalization change everything

**New technologies**
- Storage
- GaN inverter
- 3D printing
- LIDAR
- Low-cost edge devices
- Electric propulsion systems
- Digital twin

**Business models**
- Interconnected mobility
- “Availability” vs. products
- “Power” vs. turbines
- Car sharing vs. cars
- Decentralized energy systems

**Supply chain**
- Tier 2
- Tier 1
- OEM

**Ecosystems**

**Digital technologies**
- Data center
- Cloud technology
- AI/ML algorithms
- Cost connectivity
- 5G
- Open source SW (TensorFlow, Cloud Foundry, Cassandra …)
- “Containerization”
- Autonomous cars, robots

**Exponential development**
Elimination of the weakest elements in the value chain

**Tier**
- Tier 2
- Tier 1
- OEM

**OEM**
Vision 2020 is our strategy – And our answer to changing environments

Global trends
- Digitalization
- Globalization
- Urbanization
- Demographic Change
- Climate Change

Market development (illustrative)
- Power generation
- Power transmission, power distribution and smart grids
- Efficient use of energy
- Efficient healthcare delivery

- Digitalization: ~+8% Market growth
- Automation: +3 – 4% Market growth
- Electrification: +1 – 2% Market growth

2017

2020

Unrestricted © Siemens AG 2017
Global company with a strong regional footprint – Active in more than 200 countries

<table>
<thead>
<tr>
<th>Orders</th>
<th>Revenue</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>€86.5bn</td>
<td>€79.6bn</td>
<td>351,000</td>
</tr>
</tbody>
</table>

One of the world’s largest producers of energy-efficient, resource-saving technologies
Among the top 10 largest software companies worldwide
World leader in the field of automation

All figures refer to continuing operations (as of September 30, 2016)
Digitalization provides growth momentum

Siemens Software
€3.3bn

Siemens Digital Services
€1bn

MindSphere – IoT operating system

Revenue FY 2016 +12%¹

Enhanced Automation
~€18bn

Enhanced Electrification
~€42bn

Classic Services
~€17bn

Customer value

– Time-to-market
– Efficiency
– Flexibility
– Productivity
– Energy and resource optimization
– Extendibility (open standards)

¹ Comparable; portfolio adjusted

1 Comparable; portfolio adjusted
Our products and solutions clearly differentiate us from the competition

- Deep domain know-how in broad range of markets and industries
- Strong installed base/connected fleet
- Powerful ecosystem
- Unmatched digital portfolio: MindSphere, Software, Services, Security
- Numerous Siemens internal use cases as proof points
Digitalization – Holistic approach to meet the needs of our customers worldwide

Enabler: Infrastructure as a Service (storage, processing power, provider agnostic)

MindSphere
The cloud-based, open IoT operating system
Platform as a Service

Siemens Software

Siemens Digital Services

– Connectivity
– Open interfaces
– Data analytics
– Artificial intelligence
– Customer-specific apps by Siemens or third-party suppliers
– Cost transparency

Digitally enhanced Electrification and Automation

Holistic IT security concept
Long-standing #1 position in automation – Now combined with the power of Siemens Software

Siemens Software – virtual world

Siemens Automation – physical world

<table>
<thead>
<tr>
<th>SIMATIC¹</th>
<th>Totally Integrated Automation – TIA</th>
<th>Desigo CC</th>
<th>Spectrum Power ADMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2007</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2012</td>
<td>2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2016</td>
<td>2017</td>
</tr>
</tbody>
</table>

¹ In-house developments/digital upgrades

Unrestricted © Siemens AG 2017

Page 9  September 14, 2017

Dr. Roland Busch
Open partner ecosystem

- Consulting/strategy partners
  - McKinsey & Company
  - PwC
  - Accenture
  - Tata

- Application Developer
  - SAP
  - evosoft
  - Accenture
  - PwC
  - Senseye
  - Atos

- System Integrator
  - Accenture
  - Atos
  - OMNETRIC

- Technology Provider
  - IBM
  - Watson

- IaaS Provider
  - Amazon Web Services

- Connectivity Developer
  - BluVision

MindSphere
The cloud-based, open IoT operating system
Holistic approach to meet customer needs

**Enabler:** Infrastructure as a Service (storage, processing power, provider agnostic)

**MindSphere**

- The cloud-based, open IoT operating system
- Platform as a Service

**Digitally enhanced Electrification and Automation**

**Holistic IT security concept**
Trend in utilities sector: Upgrading infrastructure with **advanced metering**

**EnergyIP**: Collects, consolidates, validates meter data and outage events, automated workflow

**Improved reliability**, new pre-paid offerings for customers, less maintenance: Jacksonville-based U.S. utility saves about US$1 million per year
Holistic approach to meet customer needs

Enabler: Infrastructure as a Service
- Storage, processing power, provider agnostic

MindSphere
The cloud-based, open IoT operating system
Platform as a Service

Digitally enhanced Electrification and Automation

Holistic IT security concept
Digital Enterprise Suite – Our unique portfolio for the digital transformation
Production of more than 120 variants per day
Based on 75% automation
Less than 11 defects per million (dpm) equal a quality rate of 99,9988%
Digital twin of Amberg factory in Chengdu
Holistic approach to meet customer needs

Enabler: Infrastructure as a Service (storage, processing power, provider agnostic)

MindSphere - The cloud-based, open IoT operating system
Platform as a Service

Digitally enhanced Electrification and Automation

Holistic IT security concept
Navigator monitors >20 office buildings for U.S. top-ten bank holding Capital One

Analytics based on 14 million data records per week

Energy savings of 10%. Strong potential for more reductions
Holistic approach to meet customer needs

MindSphere
The cloud-based, open IoT operating system
Platform as a Service

Enabler: Infrastructure as a Service (storage, processing power, provider agnostic)

Digitally enhanced Electrification and Automation

Holistic IT security concept
Reducing NOx emissions of gas turbines with artificial intelligence

Machine learning algorithm automatically optimizes the control parameters better than human experts

Benefit: 15 – 20% more NOx reduction
A unique digital offering for the infrastructure needs of a city

Operating system of a city

Siemens Software and Digital Services

- FlexLTP
- Storage
- Demand Management
- Energy Trading/Blockchain
- Fault Detection
- EnergyIP
- CyPT Air
- Navigator
- eCar Charging
- Intermodal Traffic Management
- Car Sharing
- Railigent
- Fleet Management

MindSphere

The cloud-based, open IoT operating system
Platform as a Service

Enabler: Infrastructure as a Service (storage, processing power, provider agnostic)

Electrical field devices of a city

Holistic IT security concept
Hong Kong 2016

7.4m
Inhabitants

€290bn
GDP (€39,500 per capita)

5th highest population density in the world

Excelsior Hotel
7-year performance contract achieving 33% energy savings and 12,000 tons CO₂ reduction

Black Point Power Station
550 MW CCPP with >60% efficiency, achieving +20% O&M efficiency

East Rail Line
Modernising MTR line between Chinese border and Hong Kong central business district, 33% higher train capacity
Hong Kong 2030

- **8.3m Inhabitants**
  - +12%

- **-4% Loss of labor workforce**

- **40% Less CO₂ emissions per capita**

- **20% Reduction of energy intensity**

- **100% Increase in cross-border commuter trips**
Hong Kong 2030

**Sustainable buildings**
Saving up to 90% of energy and 75% of water in office buildings

**CyPT Air**
Active management of air quality through technology implementation

**Blockchain Energy trading**
PV on all roofs supply 25% of the city’s energy demand

**Car sharing**
Only 3% of today’s car pool necessary, if 24/7 available and managed
Siemens and Hong Kong Partner

First smart city digital hub in Hong Kong

**Powered by MindSphere**, the hub will tackle the city’s challenges in an open, interactive and holistic manner.

Focus on connected city solutions, data analytics, cybersecurity and connectivity and edge devices.
Our innovative power –
Research with a clear focus on future critical technologies

Expenditures for research and development

€4.7 billion
Expenditures for R&D in fiscal 2016

33,000
R&D employees

Inventions and patents –
securing our future

7,500
Inventions

3,500
Patent applications

next47

€1 billion
Expenditure for R&D in next47

Our Company Core Technologies

– Additive Manufacturing
– Autonomous Robotics
– Blockchain Applications
– Connected (e)Mobility
– Connectivity & Edge Devices
– Cybersecurity
– Data Analytics/Artificial Intelligence
– Distributed Energy Systems
– Energy Storage
– Future of Automation
– Materials
– Power Electronics
– Simulation and Digital Twin
– Software Systems and Processes

1 In fiscal 2016; 2 Centers of Knowledge Interchange
Siemens China Cyber Defense Center

Safeguarding the digitalization journey

Siemens received the official National Grade Protection Level 3 certification from the Ministry of Public Security of P.R.C.

The first industrial multinational company to be compliant with both local and international security standards
Thank you!

Siemens Innovation Day China 2017
September 13 – 14 | Suzhou