

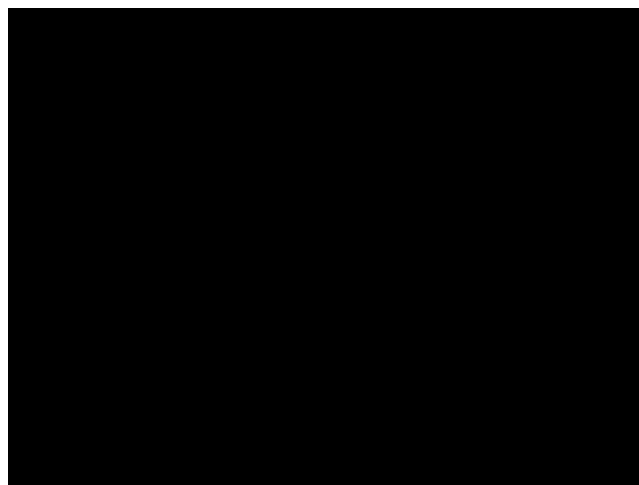
**SIEMENS**



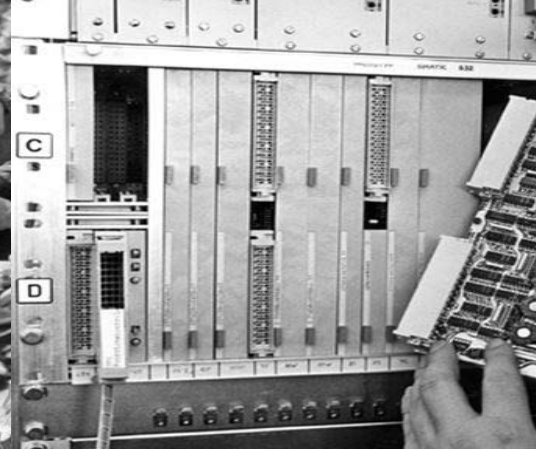
Alan Norbury | Siemens UK Industrial CTO

# Industry 4.0 – Vision to Reality

## Future of Manufacturing - Video



<http://www.siemens.co.uk/future-of-manufacturing>



### First Industrial Revolution

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



First mechanical loom, 1784

### Second Industrial Revolution

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



First conveyor belt, Cincinnati slaughterhouse, 1870

### Third Industrial Revolution

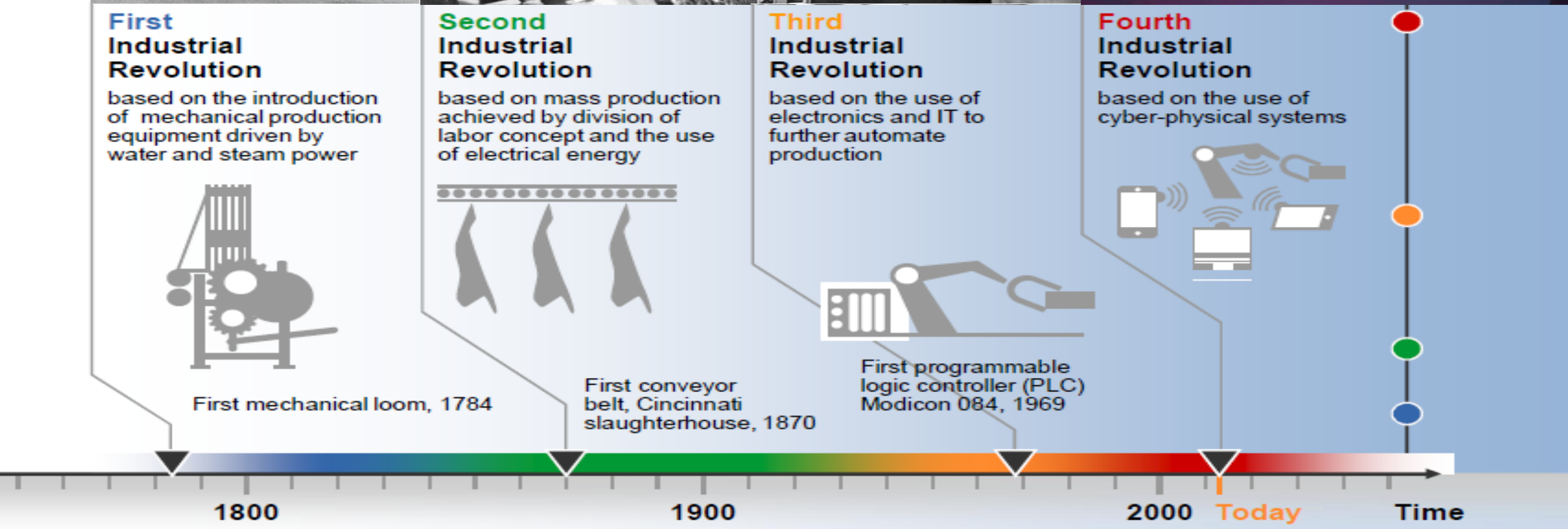
based on the use of electronics and IT to further automate production



First programmable logic controller (PLC) Modicon 084, 1969

### Fourth Industrial Revolution

based on the use of cyber-physical systems



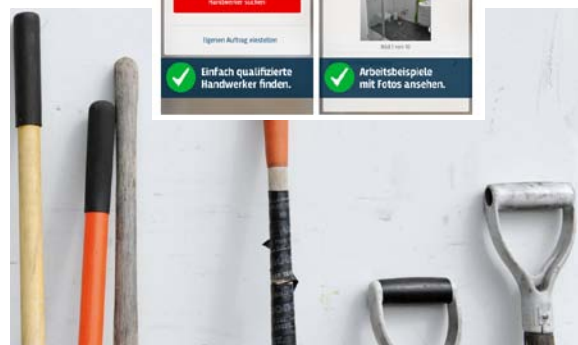
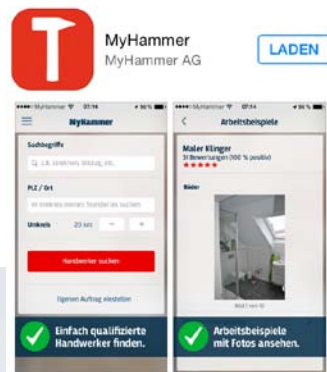
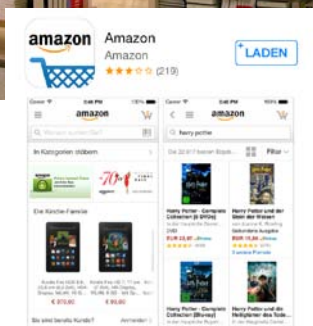


# The Internet is revolutionising the world of business

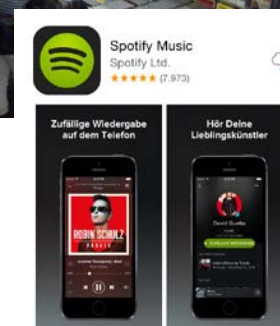
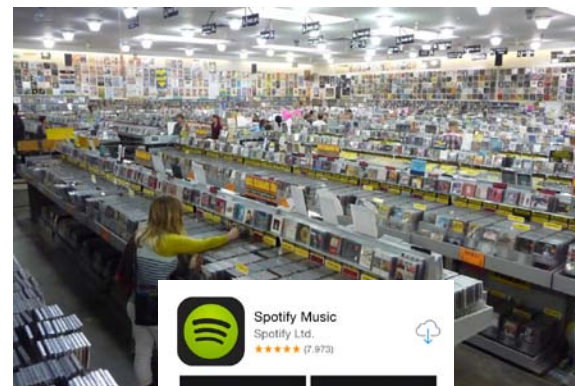


# New business models in the Internet age

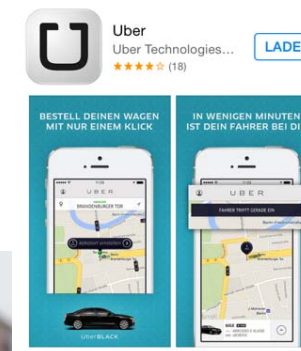
From bookstore to e-book



From Yellow Pages to marketplace



From record store to streaming



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

# Manufacturing beyond 2025



## 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



# The future of Industry

Many teams are posed on the starting line

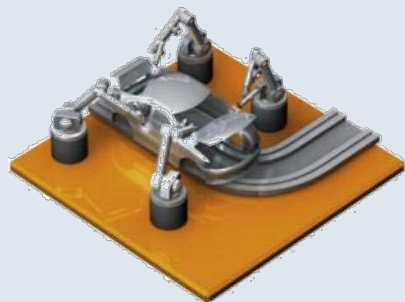
**Don't wait for Industry 4.0, join the challenge now and help to shape it!**





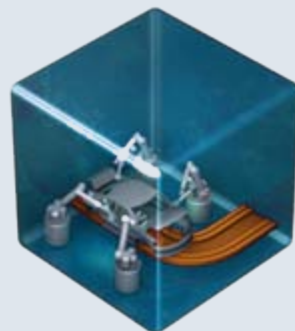
## Cyber-physical systems - Complete digital model

### Cyber-physical system (CPS)



Physical production unit

+



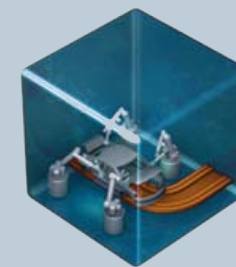
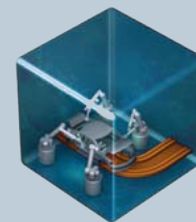
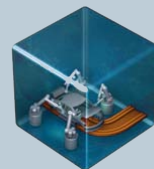
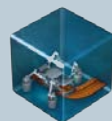
Digital model



### 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

# Influence of Digitalisation on Siemens Innovation

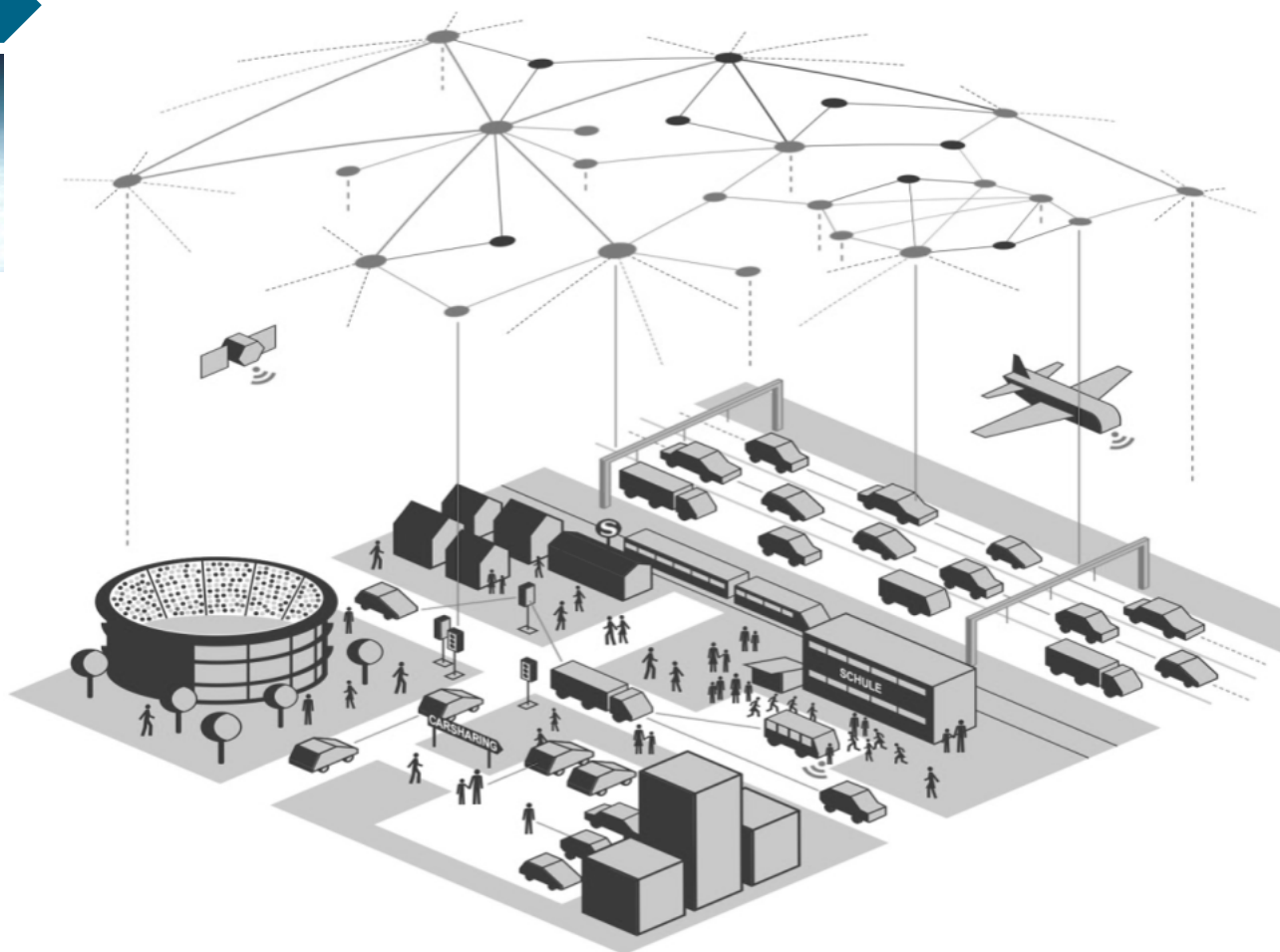
## Digitalisation



## Automation



## Electrification

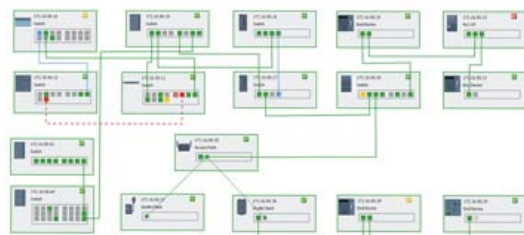


## Enablers

- Sensors
- Computing power
- Storage capacities
- Data analytics
- Networking

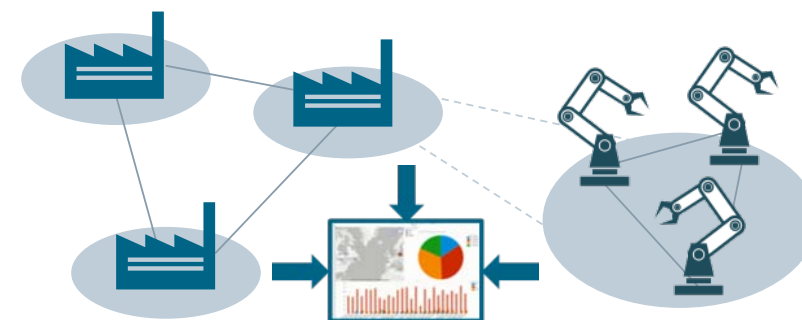
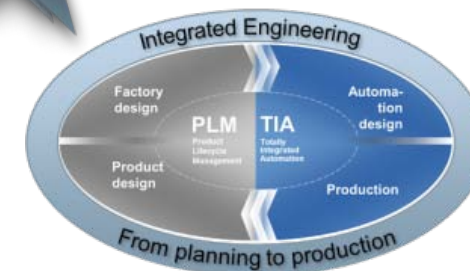
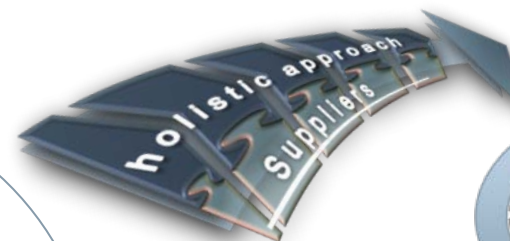
# Cornerstones of the Digital Enterprise – The Innovation Challenge

## Use of intelligent models



## Modular, networked, secure automation

## Integrated value chain with seamless engineering



## Transparent factories, internally and externally networked

## Big Data > Smart Data > Business Data

### Siemens Plant Data Services Portfolio

#### Siemens Plant Cloud Services<sup>1)</sup>



- 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

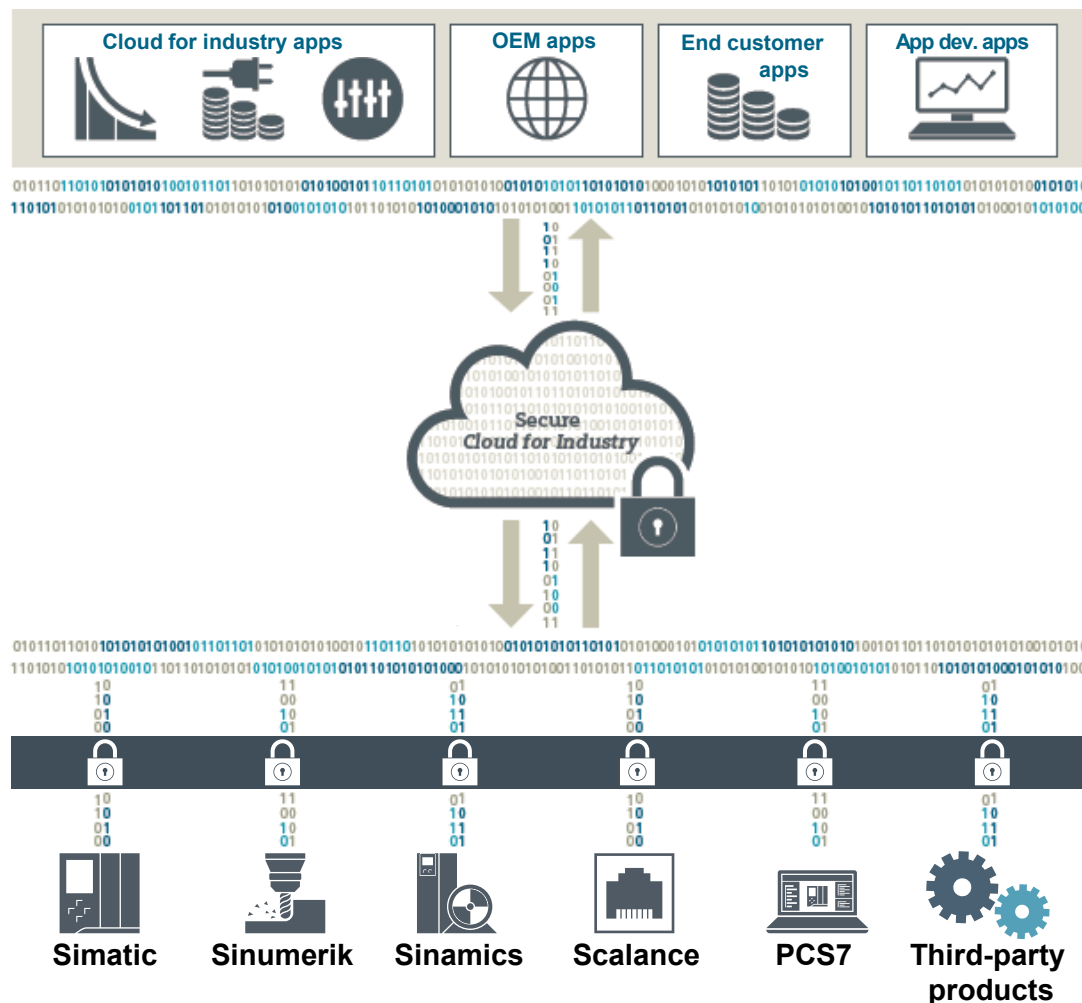


- Holistic security offering for industrial plants
- Ensuring data confidentiality and integrity as well as plant and asset availability
  - Plant assessment
  - Plant optimization
  - Managed Security Service

1) Currently only pilot customers



# Siemens industrial open cloud platform based on SAP HANA technology



## 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)

## Factory of the Future R&D environments

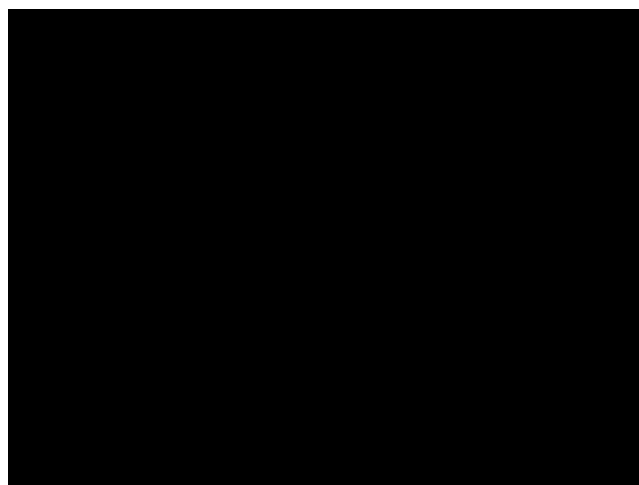


*Smart* Automation Centre Nuremberg  
Focus on Manufacturing and Logistics

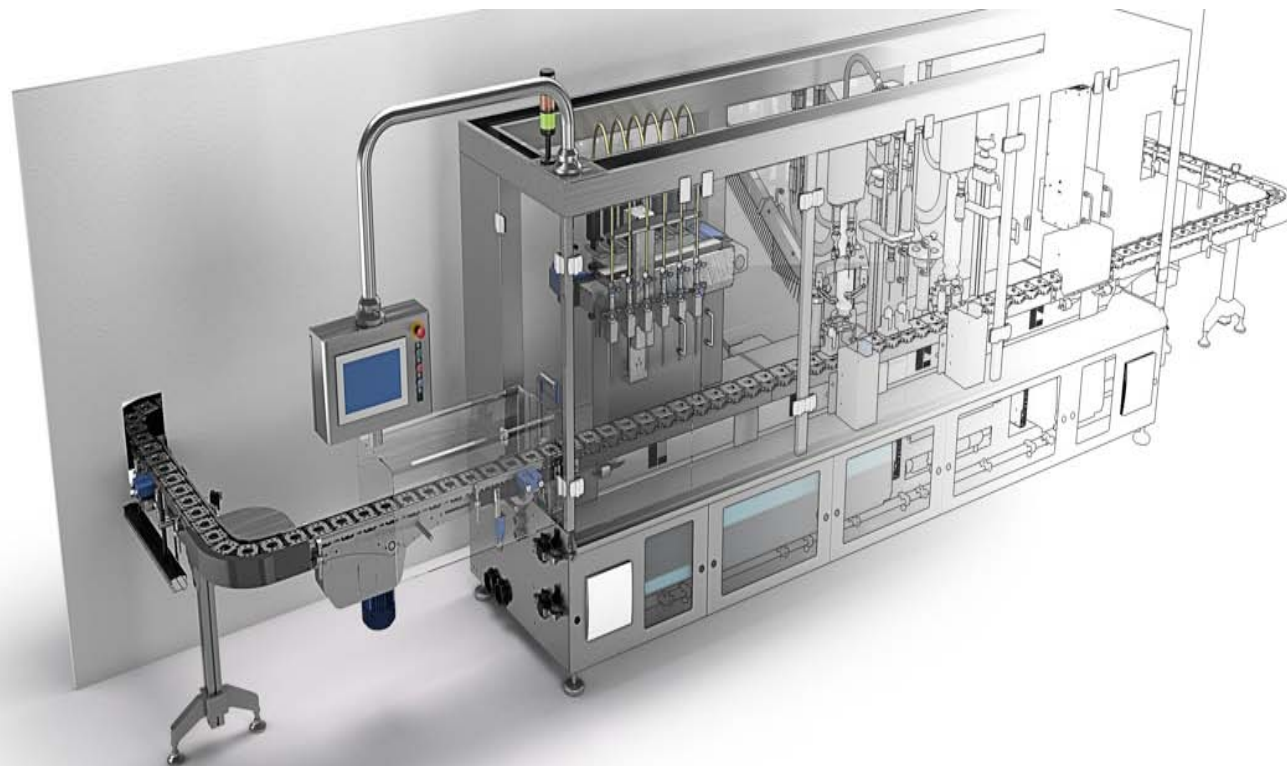


*Smart* Automation Centre Karlsruhe  
Focus on Process Automation

## Factory of the Future R&D environments



## 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 modelling, 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



SIEMENS



Industry 4.0 - Vision to Reality

Thank you