Unlocking the potential with digitalization
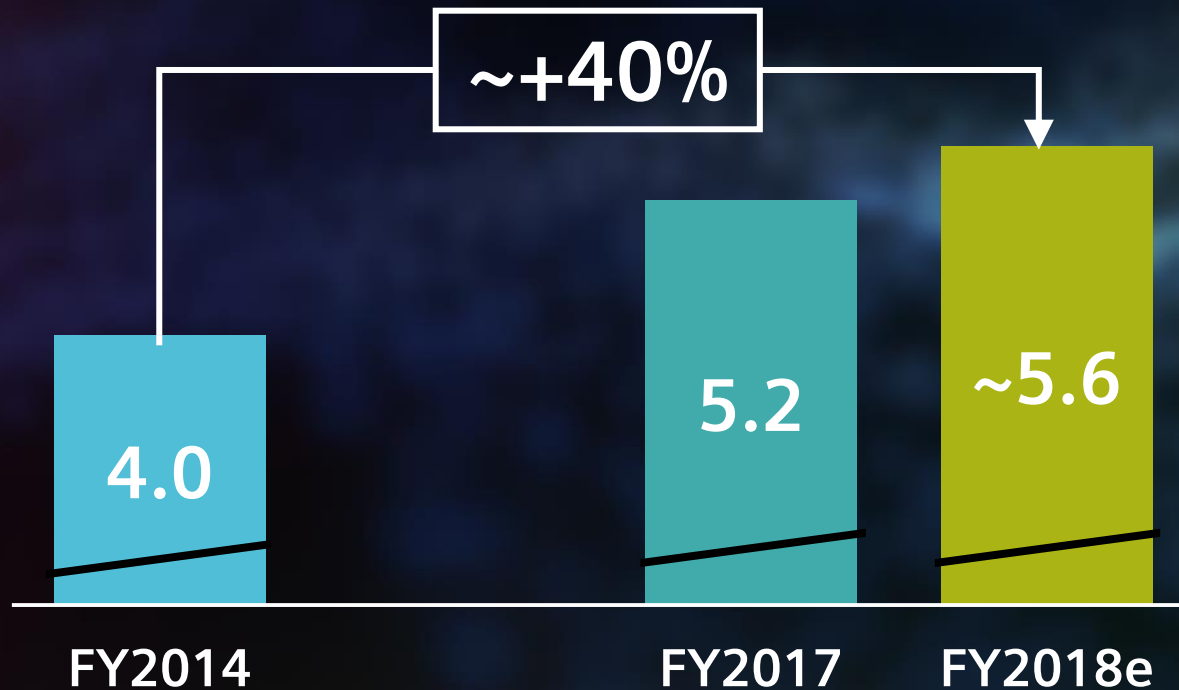
Dr. Roland Busch, CTO and Member of the Managing Board of Siemens AG

Twitter: @BuschRo

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Digitalization opens up enormous potential for India...

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Investing in our digital future – R&D spending

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~+40%

4.0
FY2014

5.2
FY2017

~5.6
FY2018e

*in billions of euros

€1.2 bn R&D in digital business in FY 2017

20% R&D intensity for digital business

Currently 24,500 software engineers

Atellica: ultrafast and flexible diagnostics platform

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Mireo: innovative platform for premium-class mass transit

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1,100 kV: record-breaking HVDC

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3-D printing of gas turbine blades

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NX for additive manufacturing

Innovation with a clear focus
Siemens Company Core Technologies

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Additive Manufacturing	Autonomous Robotics	Blockchain Applications	Connected (e)Mobility	Connectivity and 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	

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Improving innovation speed and capital allocation with Siemens Company Core Technologies

Full innovation cycle:
university collaboration – applied research – advanced applications and prototyping

Covering technological as well as **business model innovations**

Output-driven and market-oriented

Tapping **outside innovations** with partners/ecosystem and **next47**

~€500 million **focused investments**

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The key to success in the digital age

Speed and scale

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Digitalization is a key driver of innovation and growth

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	Revenue FY 2017				Market growth CAGR FY18-22
Digitalization	Siemens software	~€4.0 bn	Digital services	~€1.2 bn	~+8%
	MindSphere				
Automation	Enhanced automation	~€19 bn	Classic services	~€17 bn	~+3%
Electrification	Enhanced electrification	~€43 bn			+1-3%

+20% nominal[1] / +11% excl. Mentor

Revenue digital businesses: €5.2 bn

1) Total growth: +20% (+20% in software, +20% in digital services)
Growth excluding Mentor Graphics acquisition: +11% (+9% in software, +20% in digital services)

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How we drive the digital transformation and create value for our customers

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- Deep domain know-how in a broad range of markets and industries

- Strong installed base/connected fleet

- Powerful ecosystem

- Unmatched digital portfolio: MindSphere, Software, Services, Security

- Strong partnership and co-creation with customers

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Recent acquisitions and partnerships

Mentor
A Siemens Business

MRX TECHNOLOGIES

HaCon
Traffic • Software • Service

infolytica
corporation

tass international

Bentley® *

*minority equity investment

Siemens is among the top 10 of the biggest software companies worldwide

We've invested more than US$10 billion in software acquisitions since 2007

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Siemens ecosystem

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Customers

Application developers

Bentley® Infosys chemtech senseye
Atos accenture evosoft TATA pwc

Integrators

Atos accenture Infosys OMNETRIC A Siemens & Accenture Company TATA Deloitte. Capgemini HCL FPT

Technology & Infrastructure partners

Atos amazon web services bluvision part of HID Global SAP® orange™ Business Services evosoft Microsoft Azure
IBM Watson pwc OMNETRIC Group A Siemens & Accenture Company senseye intel FUJITSU
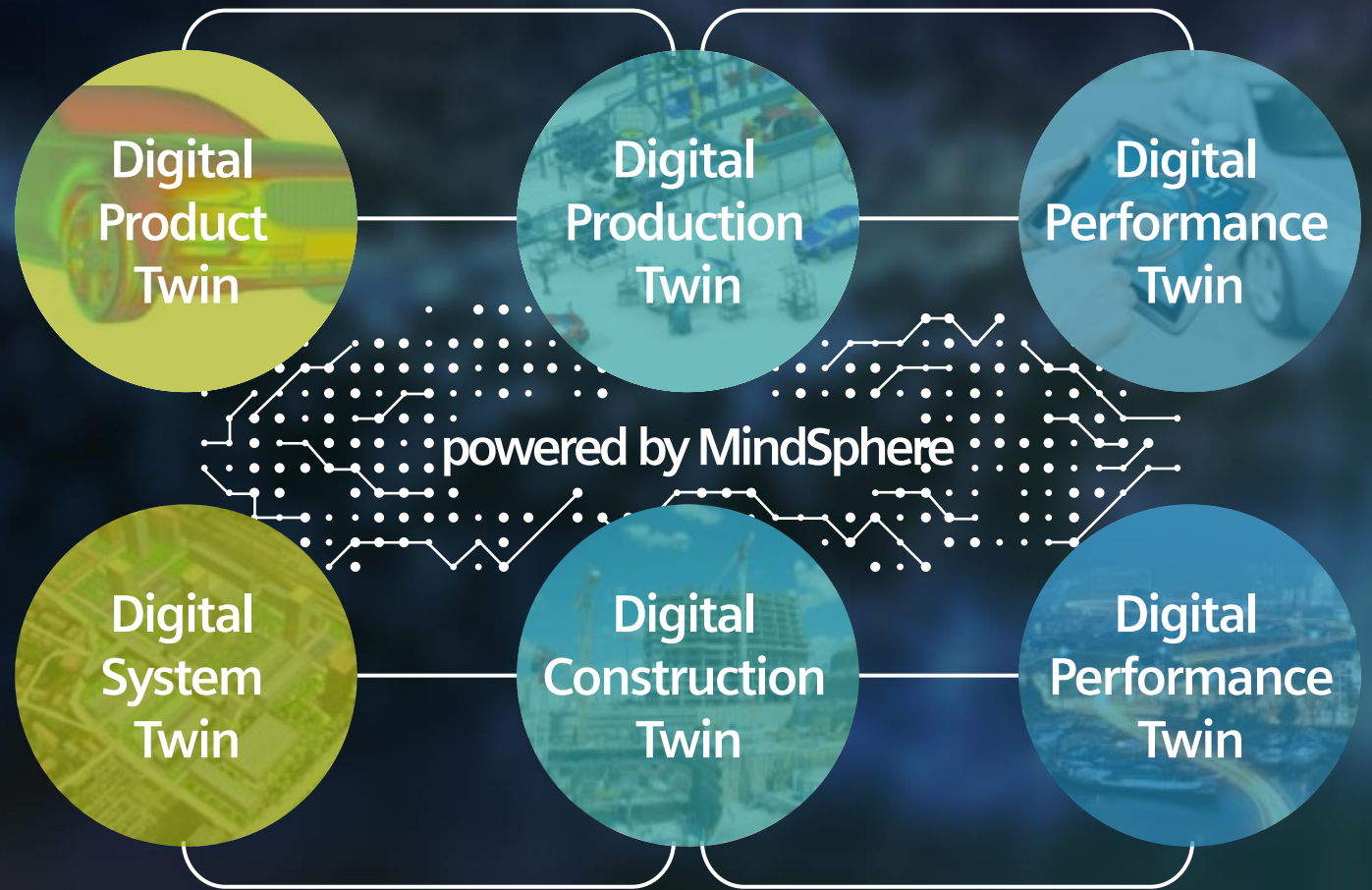
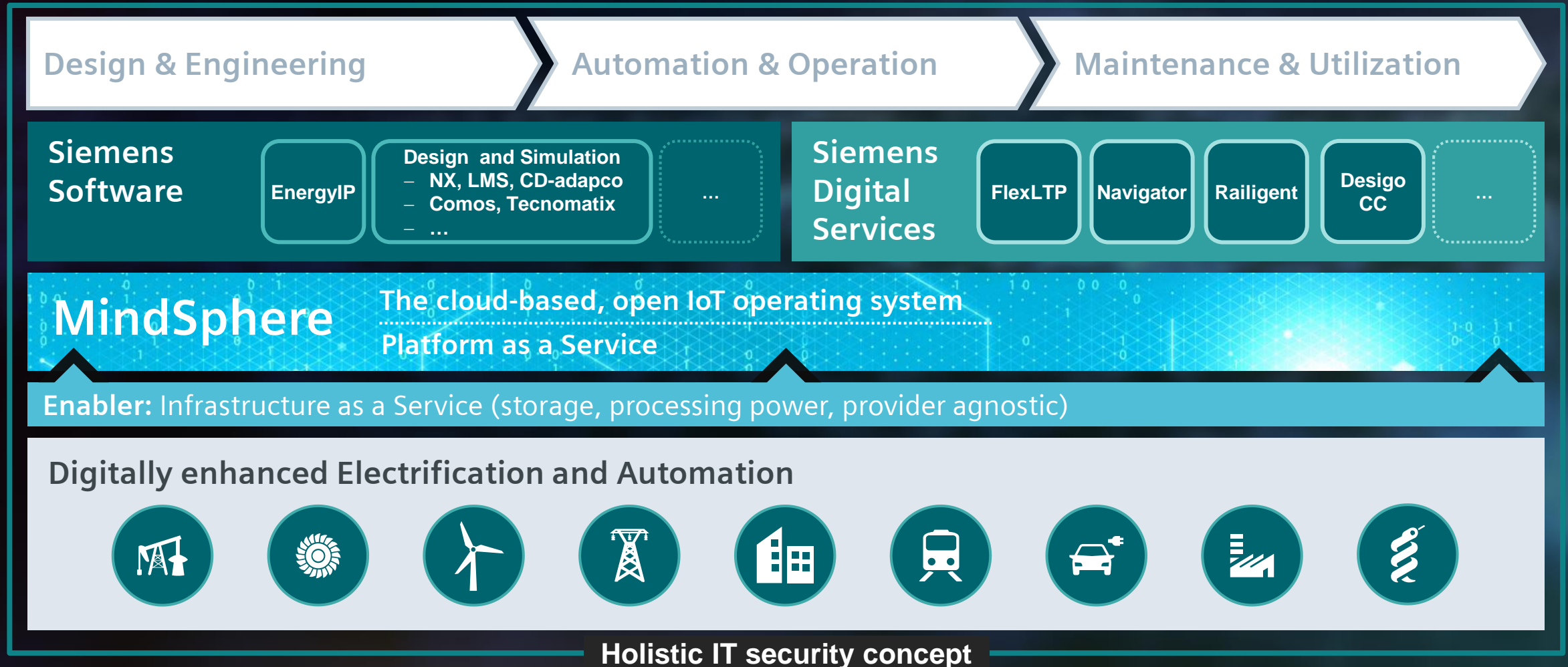# Closed loop innovation – the digital twin improves development, production and operation

MindSphere connects the virtual with the real world – from factories to infrastructure

Manufacturing/factories

Infrastructure/buildings

Digital Product Twin

Digital Production Twin

Digital Performance Twin

powered by MindSphere

Digital System Twin

Digital Construction Twin

Digital Performance Twin

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Holistic approach
to meet the needs of our customers

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| Design & Engineering | Automation & Operation | Maintenance & Utilization |

Siemens Software

EnergyIP

Design and Simulation
- NX, LMS, CD-adapco
- Comos, Tecnomatix
- ...

...

Siemens Digital Services

FlexLTP | Navigator | Railigent | Desigo CC | ...

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

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Developments of our digital offerings over a year

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+25%
connected assets:
1 million devices
and systems

doubled
number of
customers:
plus 2,900

4x
increase of digital
offerings:
more than 250

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Jacksonville, USA
Smart power grids

Infrastructure upgrade with **Advanced Metering** (**65,000 meters** deployed[1])

EnergyIP: collects and validates data and outage events; automated workflow

Customer value:

– Improved timeliness and reliability of electricity usage data

– New prepaid offerings for customers

– Less maintenance thanks to remote connect-disconnect functionality: **130,000 truck rolls** avoided → **US$1.6 million** saved in 1 ½ years

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FlexLTP

Machine learning
Longer service intervals

Use of **artificial intelligence** for maintenance of gas turbines

Algorithms analyze operation data, environmental conditions and component attributes **better than human experts**

Customer value:

– **30%** longer maintenance intervals

– **16%** lower costs

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Navigator

Capital One, USA
Improved energy efficiency

Residential and commercial buildings **account for 40%** of total U.S. energy consumption

Navigator: Bank company Capital One monitors >20 office buildings to improve energy efficiency

Customer value:

- 10% energy savings

- based on 14 million data records per week

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Amtrak, USA
Availability of locomotives

Maximum availability of 70 Vectron locomotives for the North-East Corridor high-speed passenger service.

Optimized maintenance, smart monitoring and obsolescence management

Customer value:

– **33%** fewer delays thanks to predictive maintenance

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Railigent

Museum Victoria, Melbourne
Optimized building performance

Management platform **Desigo CC**

Demand-oriented cooling regulation

Digital services for continuous optimization of building performance with **Navigator**

Customer value:

– Reduction of operating costs by **32%**

– CO_2 emissions lowered by **35%**

– Return of investment after **7 years** with **Energy Performance Contract**

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The digitalization of industries requires a different approach

How to turn data into value?

How to create digital offerings?

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How to turn data into value?
MindSphere Application Centers for Siemens digital offerings

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Domain know-how/vertical expertise

MindSphere and software portfolio

Data analytics capabilities

IoT integration competence

Co-location

Customer

Co-creation

Digital offerings | **Industrial apps** | **Digitally enhanced services** | **Integrated digital solutions**

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MindSphere Application Centers for Siemens digital offerings
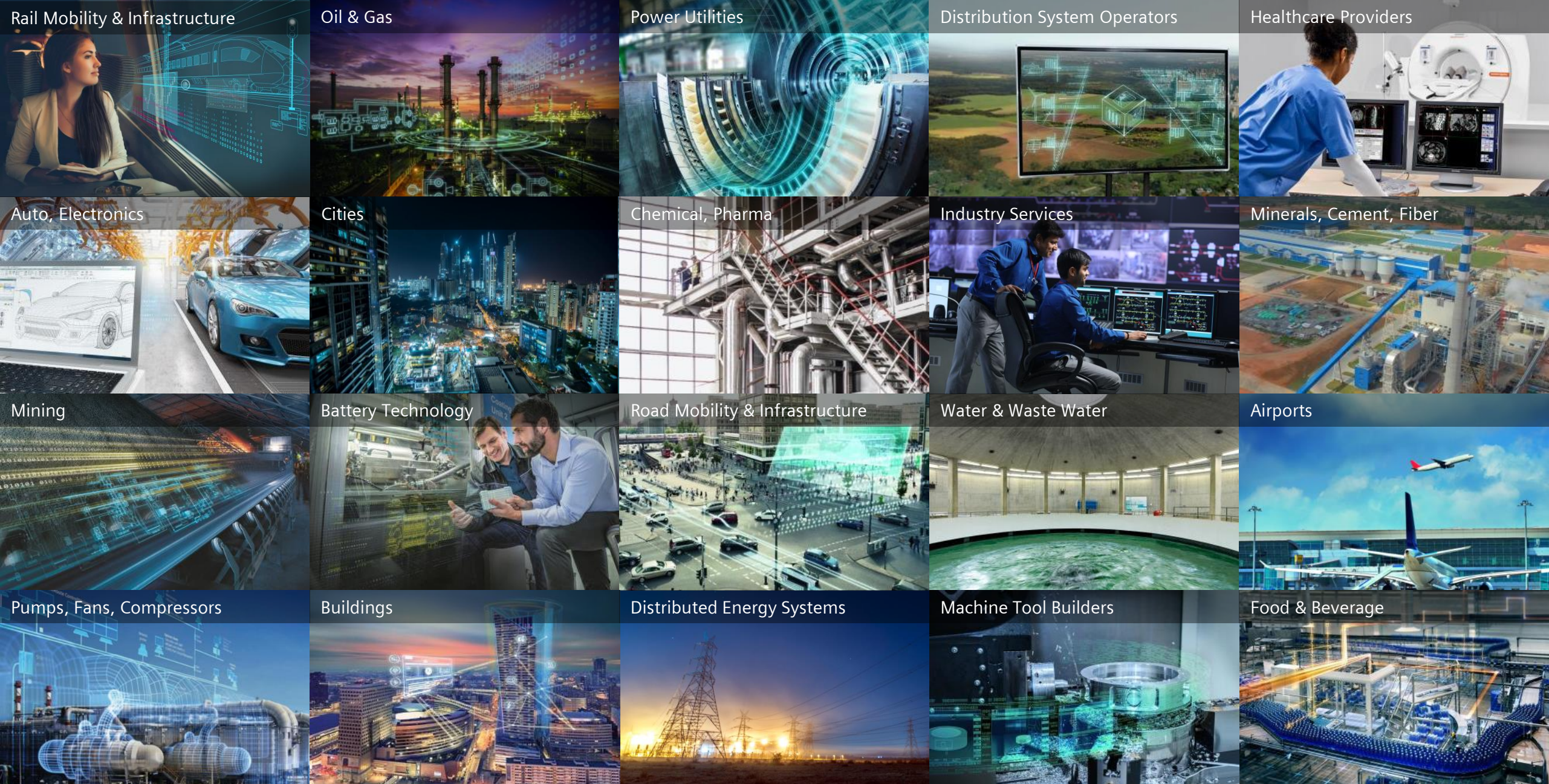
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20
MindSphere
Application Centers

50
Locations in 17 countries
across the globe

~900
software developers, data
specialists and engineers

Speed and scale

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Rail Mobility & Infrastructure

Oil & Gas

Power Utilities

Distribution System Operators

Healthcare Providers

Auto, Electronics

Cities

Chemical, Pharma

Industry Services

Minerals, Cement, Fiber

Mining

Battery Technology

Road Mobility & Infrastructure

Water & Waste Water

Airports

Pumps, Fans, Compressors

Buildings

Distributed Energy Systems

Machine Tool Builders

Food & Beverage

MindSphere Application Centers – Locations around the globe

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Oslo
Berlin
Frankfurt
Bad Neustadt
Renningen
Erlangen
Karlsruhe
Nuremberg
Pittsburgh
Newcastle upon Tyne
Munich
Alpharetta
Dublin
Vienna
Berkeley
Nottingham
Budapest
Moscow
Hong Kong
Foster City
London
Shanghai
Atlanta
Istanbul
Dubai
Singapore
Austin
Orlando
Seville
Abu Dhabi
Gurgaon
Perth
Noida
Sao Paulo
Riyadh
Pune

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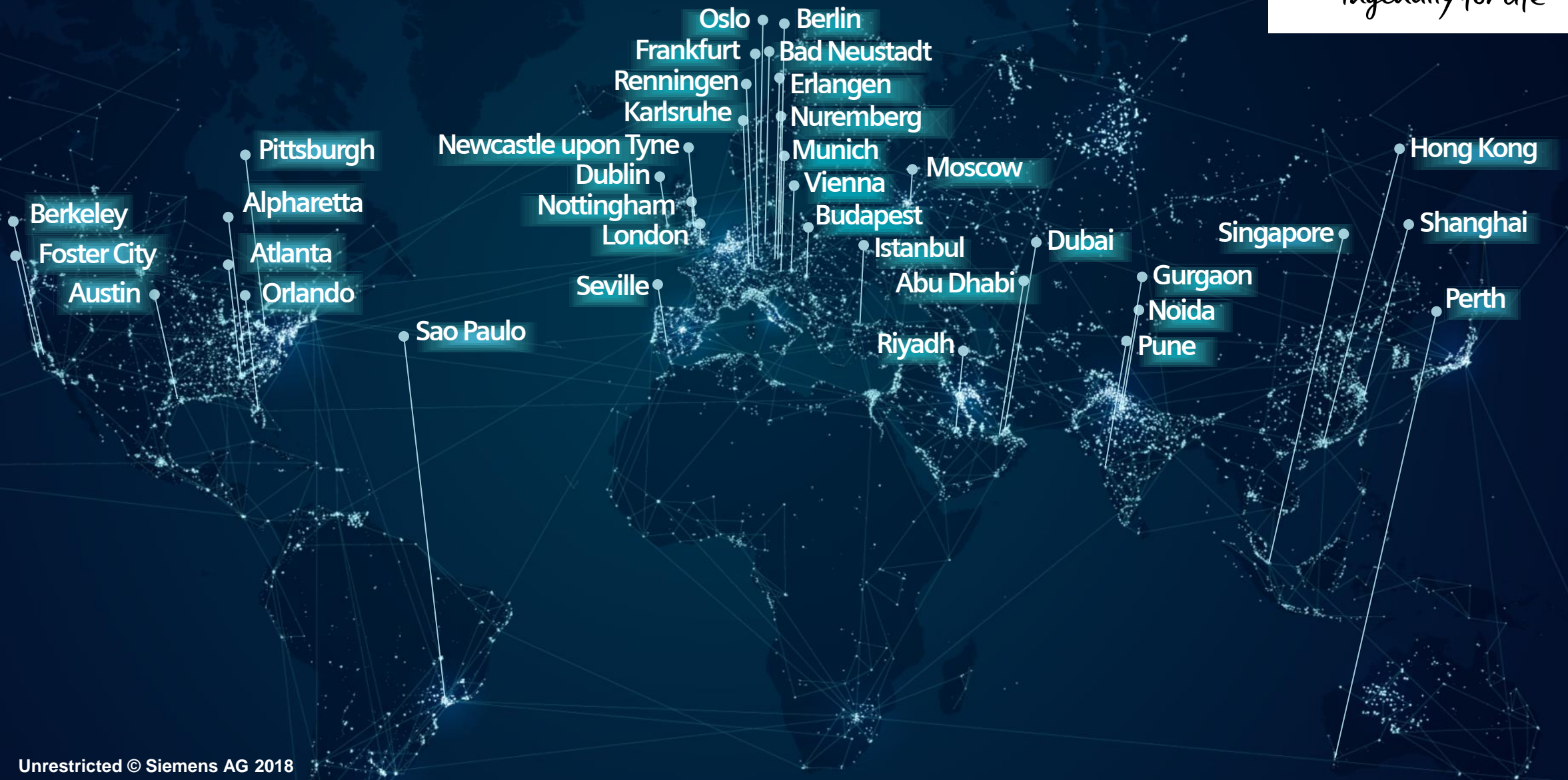
MindSphere Application Centers in India

- **Gurgaon:** one center focusing on steam turbines and one on process industries

- **Noida**: focus on digital grid, municipalities and distribution system operators (DSOs)

- **Pune**: focus on power generation services

Gurgaon

Noida

Pune

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MindSphere – Operating system of a city
Sector management and coupling

Sector

Power Utilities	Rail System Operators	Gov./ Public Buildings

Vertical use cases and horizontal enabling

• Digital services, e.g. dynamic outage planning	• Meter data mgmt. • Digital enhanced fault detection	• Micro grid • CHP solutions • Storage integration	• Digital services, e.g. predictive maintenance	• Interlocking Management	• Energy Efficiency	• End-to-end trip planning • Be-in-be-out ticketing	• Energy efficiency	• Building performance optimization • Energy efficiency	• Meter data mgmt. • Digital enhanced fault detection	**3rd Party Apps**

Platforms

FlexLTP	EnergyIP	DES	Railigent	Navigator	Hacon (SW)	Navigator	EnergyIP

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

Assets

Power generation	Grid	Pro-sumer	Rolling Stock	Signaling/ Rail Infra-structure	Stations	End customers	Airports	Council buildings	Campus	Logistics

Siemens supports India
in unlocking the potential with digitalization

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Clear and focused
R&D capital allocation
to drive differentiation

Leverage domain know-
how, digital portfolio
and customer
relationship

Focus on co-creation
with four MindSphere
Application Centers in
India

Speed and scale

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