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Shaping Digitalization Innovation at Siemens

Dr. Roland Busch, Chief Technology Officer and Member of the Managing Board of Siemens AG – Siemens Innovation Day China 2017
September 13 – 14 | Suzhou

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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

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New technologies and digitalization change everything

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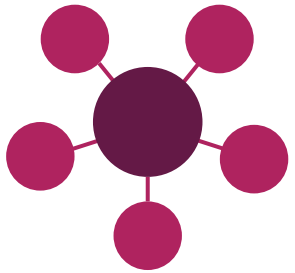
New technologies

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

Supply chain

Tier 2 → Tier 1 → OEM

Ecosystems



Business models

- Interconnected mobility
- "Availability" vs. products
- "Power" vs. turbines
- Car sharing vs. cars
- Decentralized energy systems

Digital technologies

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

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

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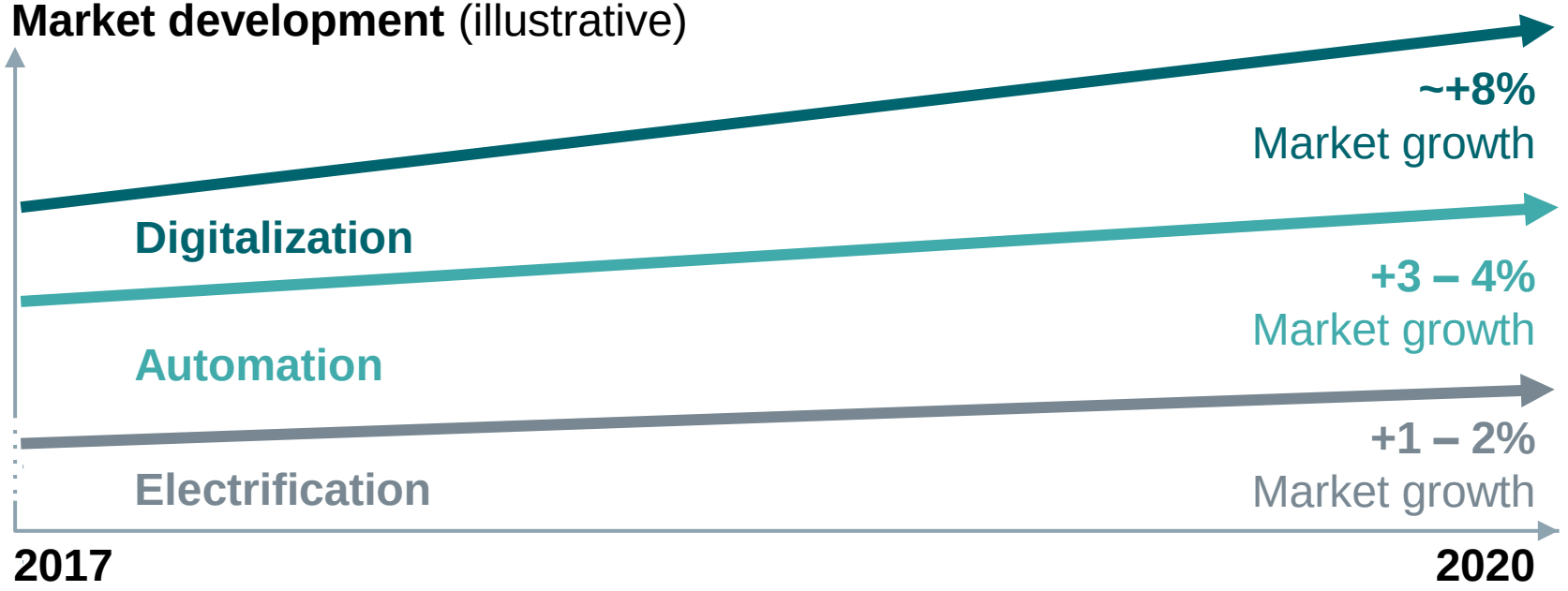
Global trends

- 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

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Global company with a strong regional footprint – Active in more than 200 countries

€86.5bn Orders	**€79.6bn** Revenue	**351,000** Employees
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)

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Digitalization provides growth momentum

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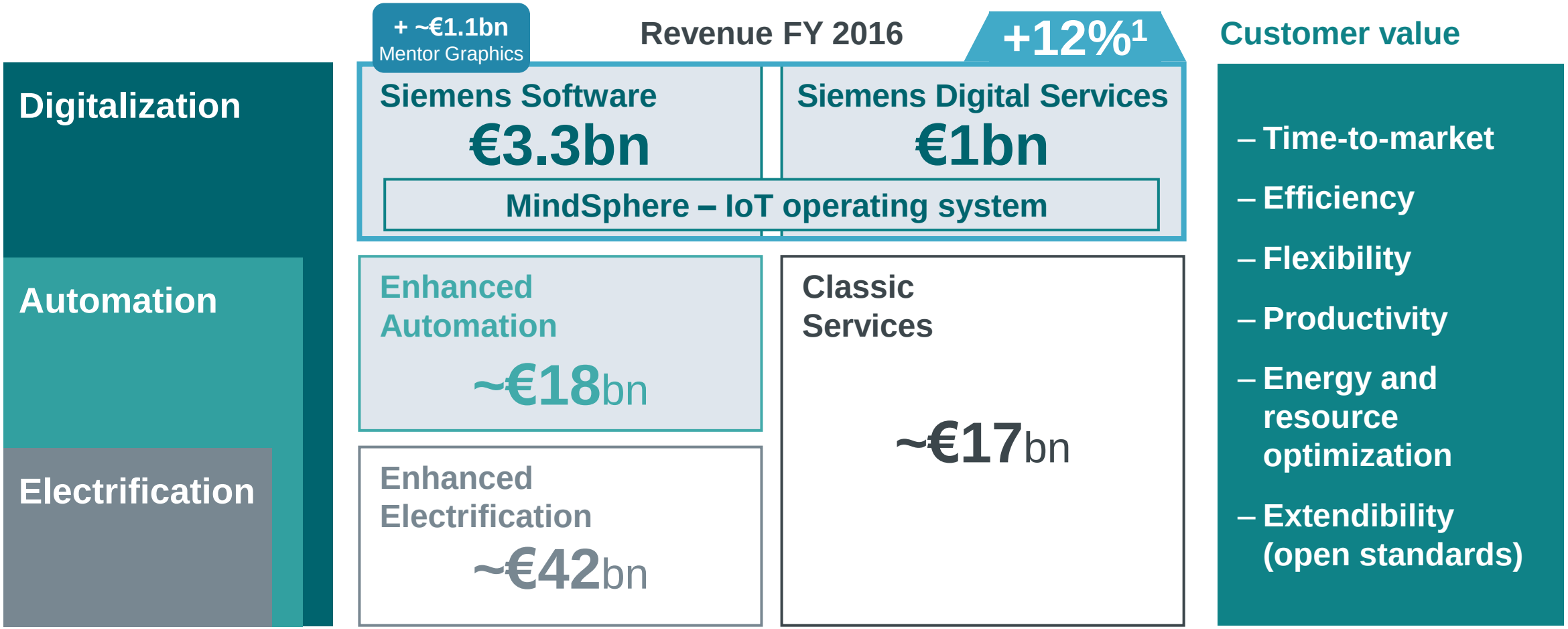

1 Comparable; portfolio adjusted

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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

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Digitalization – Holistic approach to meet the needs of our customers worldwide

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Design & Engineering | Automation & Operation | Maintenance & Utilization

Siemens Software

Siemens Digital Services

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

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

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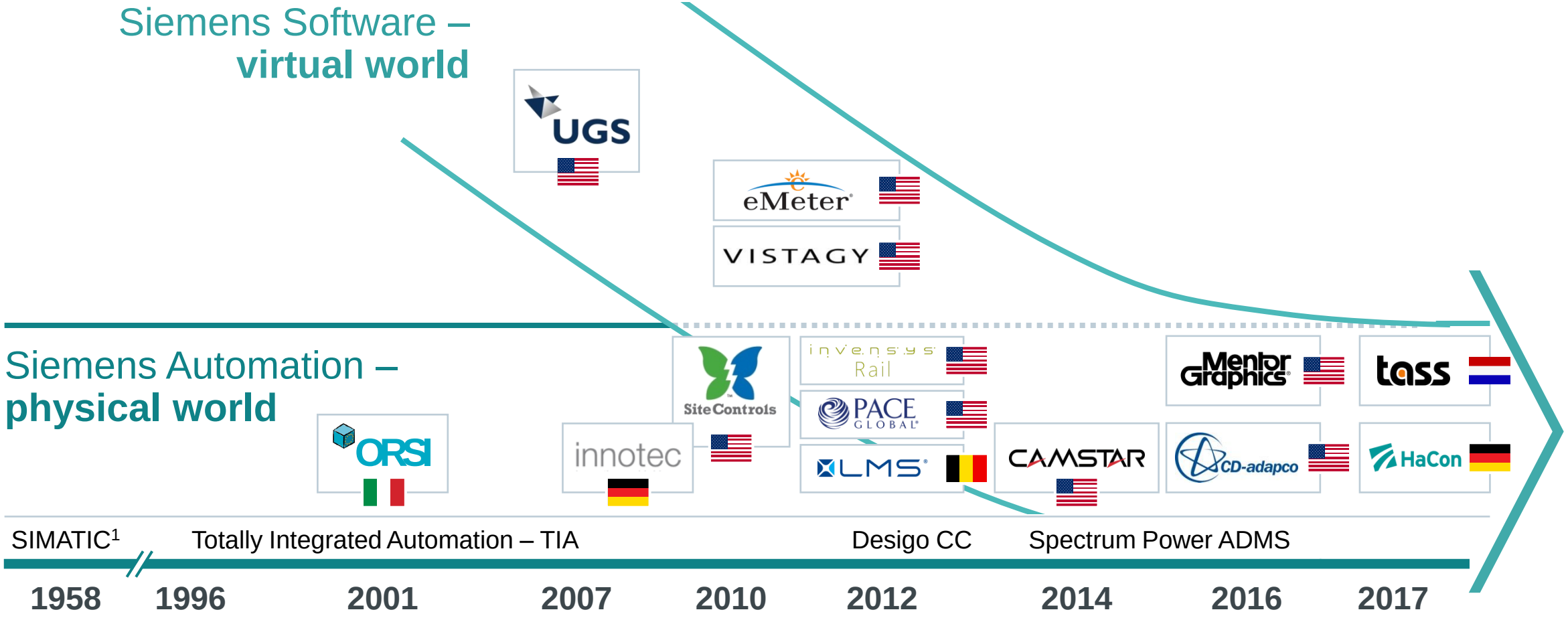

1 In-house developments/digital upgrades

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Open partner ecosystem

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Consulting/strategy partners

McKinsey&Company · pwc · accenture · TATA CONSULTANCY SERVICES

Technology Provider

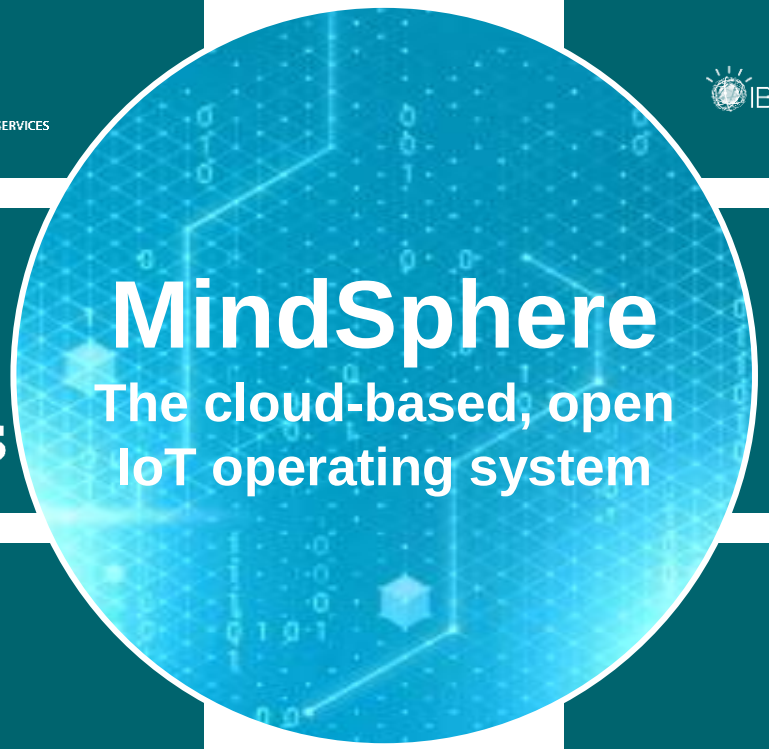
IBM Watson · amazon web services · SAP · Microsoft Azure · accenture

Application Developer

SAP · evosoft · accenture · pwc · senseye · Atos

IaaS Provider

amazon web services · SAP · Microsoft Azure · Atos



System Integrator

accenture · Atos · OMNETRIC Group
A Siemens & Accenture Company

Connectivity Developer

bluvision · TATA CONSULTANCY SERVICES

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Holistic approach to meet customer needs

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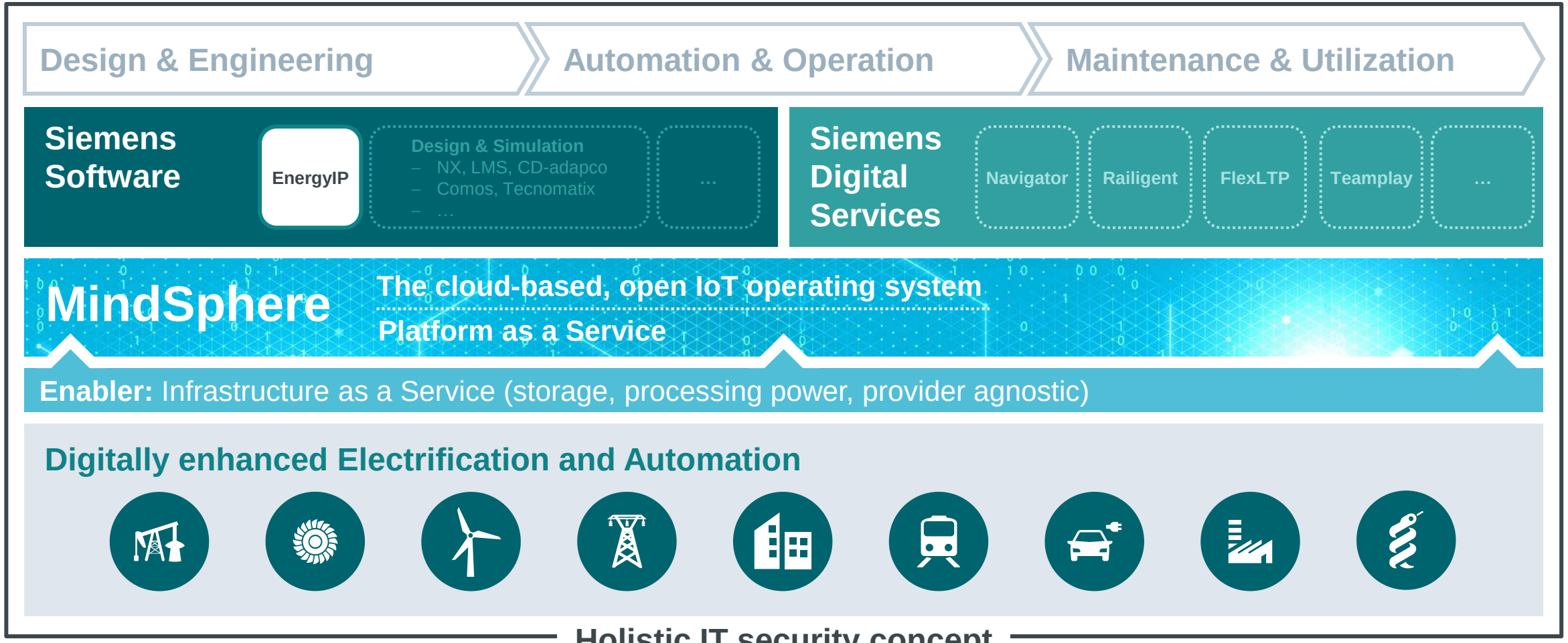

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Jacksonville, USA

Smart power grids

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

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Holistic approach to meet customer needs

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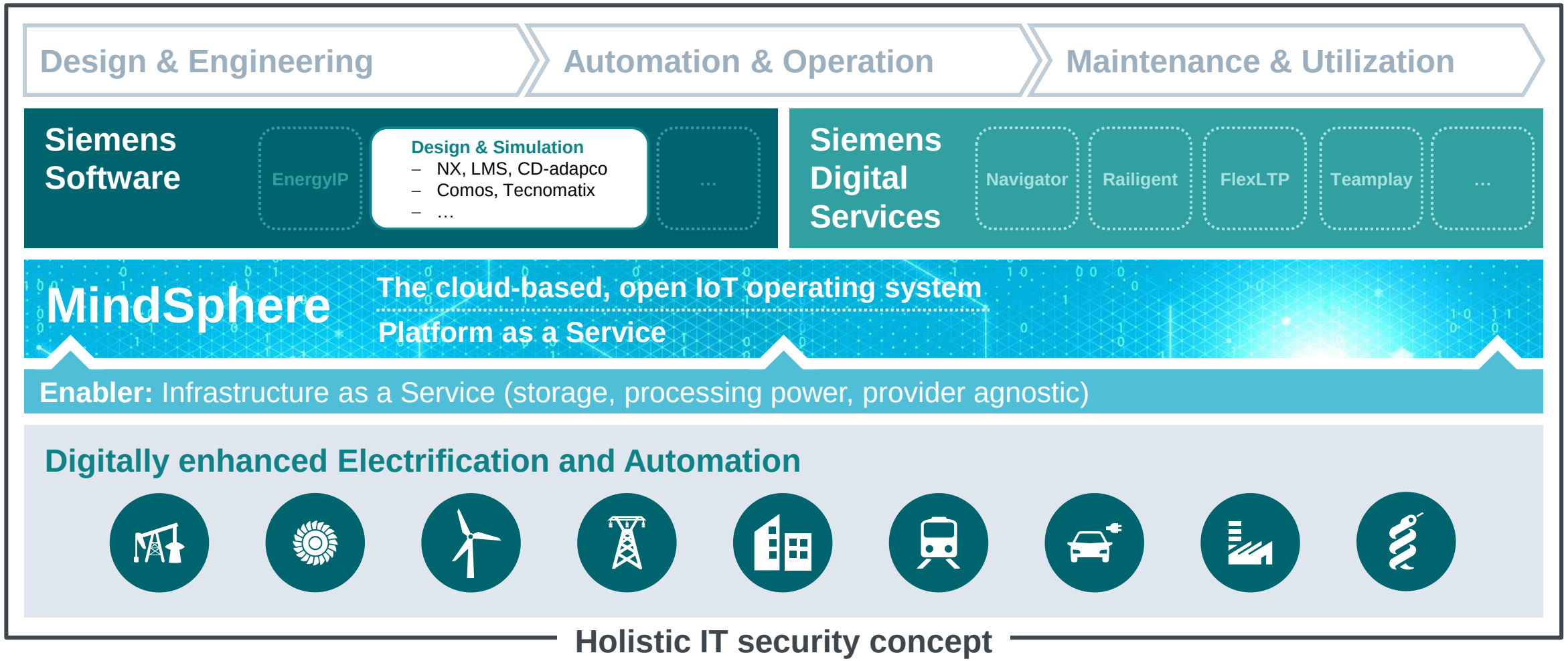

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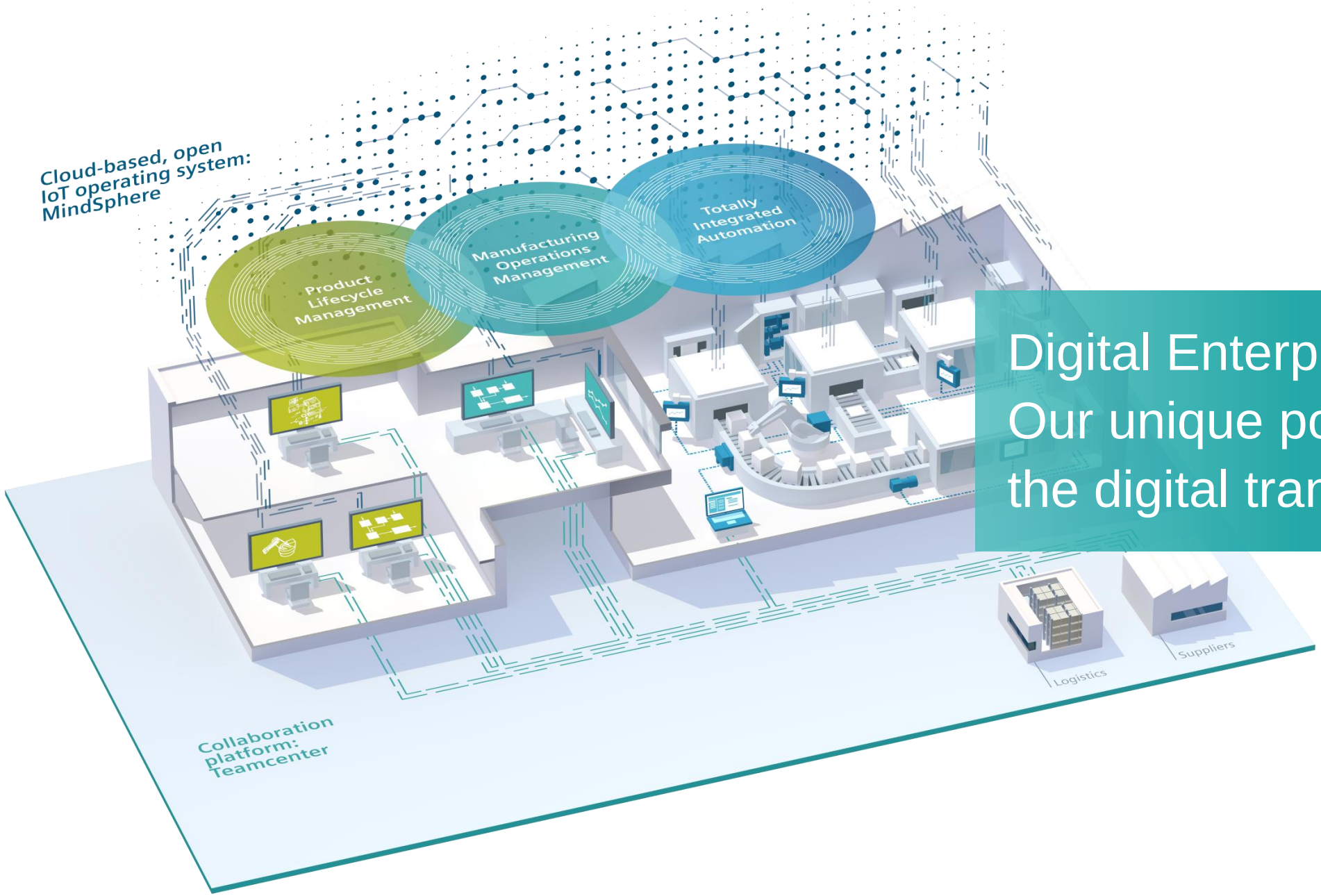
Digital Enterprise Suite – Our unique portfolio for the digital transformation



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Siemens Industrie 4.0 factory Amberg, Germany

Internal value – Improvement of own sites

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

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Holistic approach to meet customer needs

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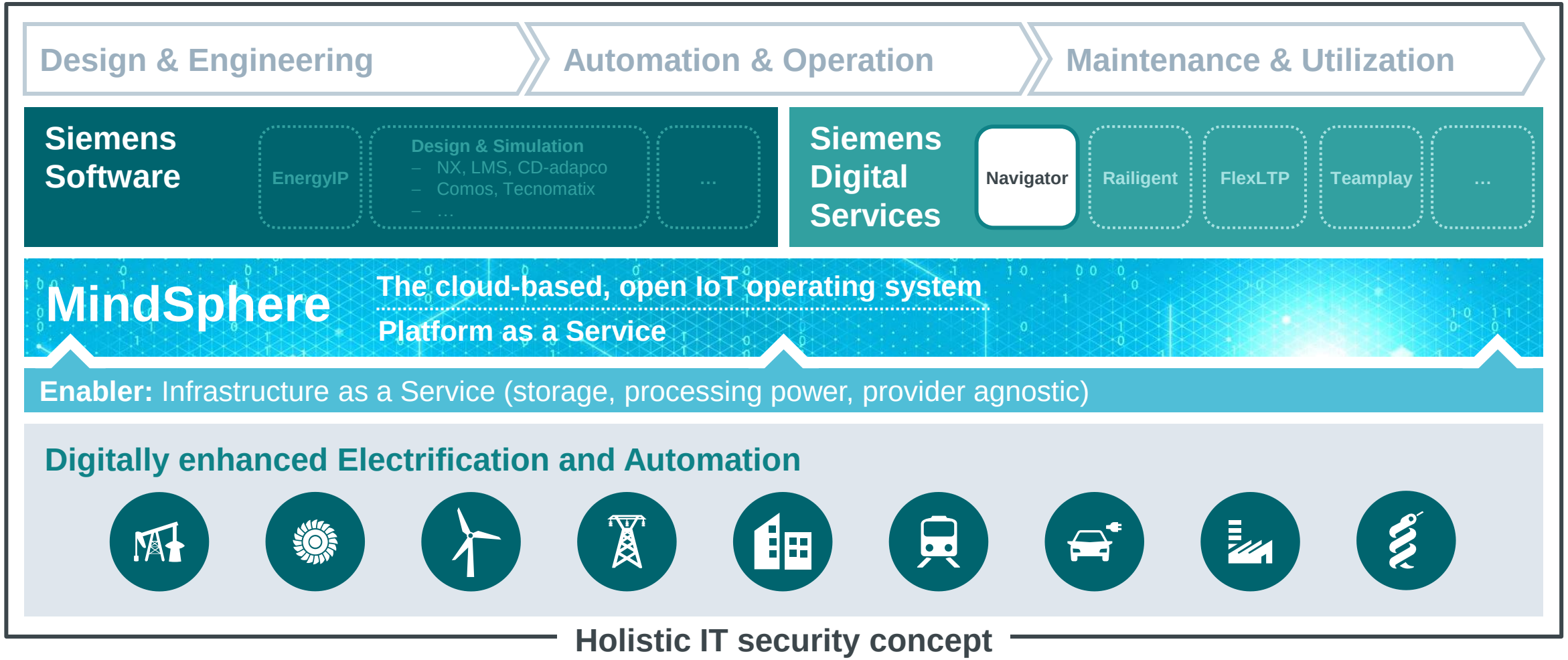

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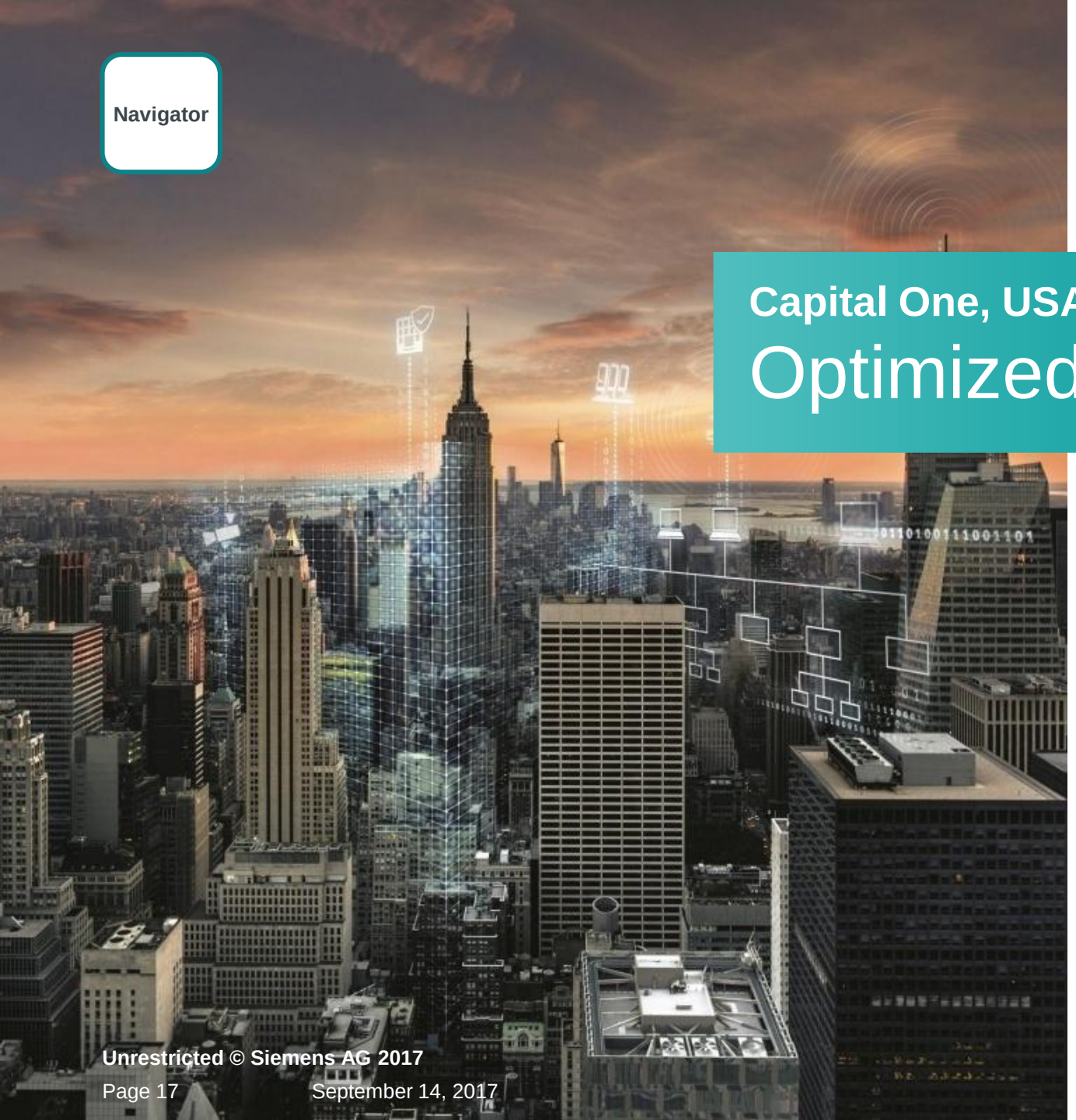

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Capital One, USA

Optimized building performance

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

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Holistic approach to meet customer needs

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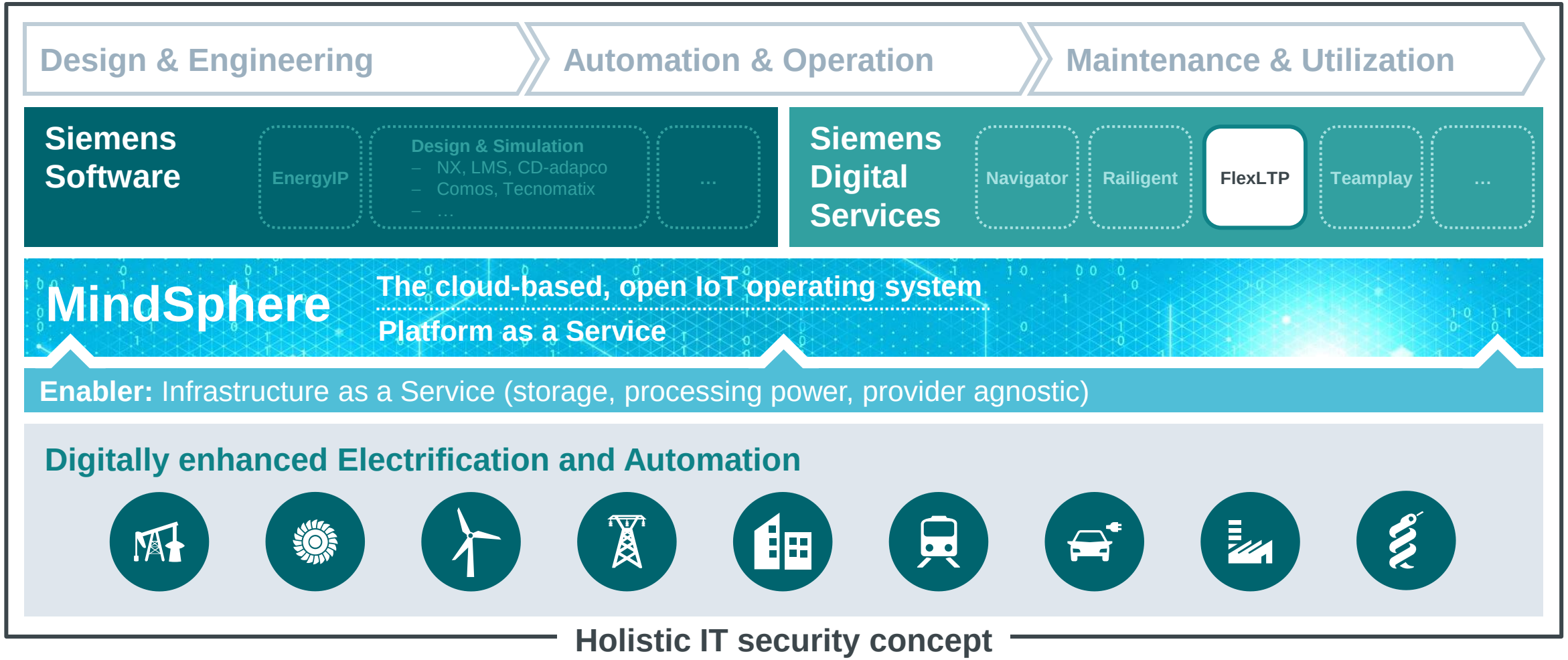

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Machine learning

NO_x emission reduction

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

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A unique digital offering for the infrastructure needs of a city

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Operating system of a city

Siemens Software and Digital Services

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

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

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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 CO_2 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

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Hong Kong 2030

8.3m
Inhabitants
→ +12%

20%
Reduction of energy intensity

-4%
Loss of labor workforce

100%
Increase in cross-border commuter trips

40%
Less CO_2 emissions per capita

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Hong Kong 2030

Sustainable buildings

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

CyPT Air

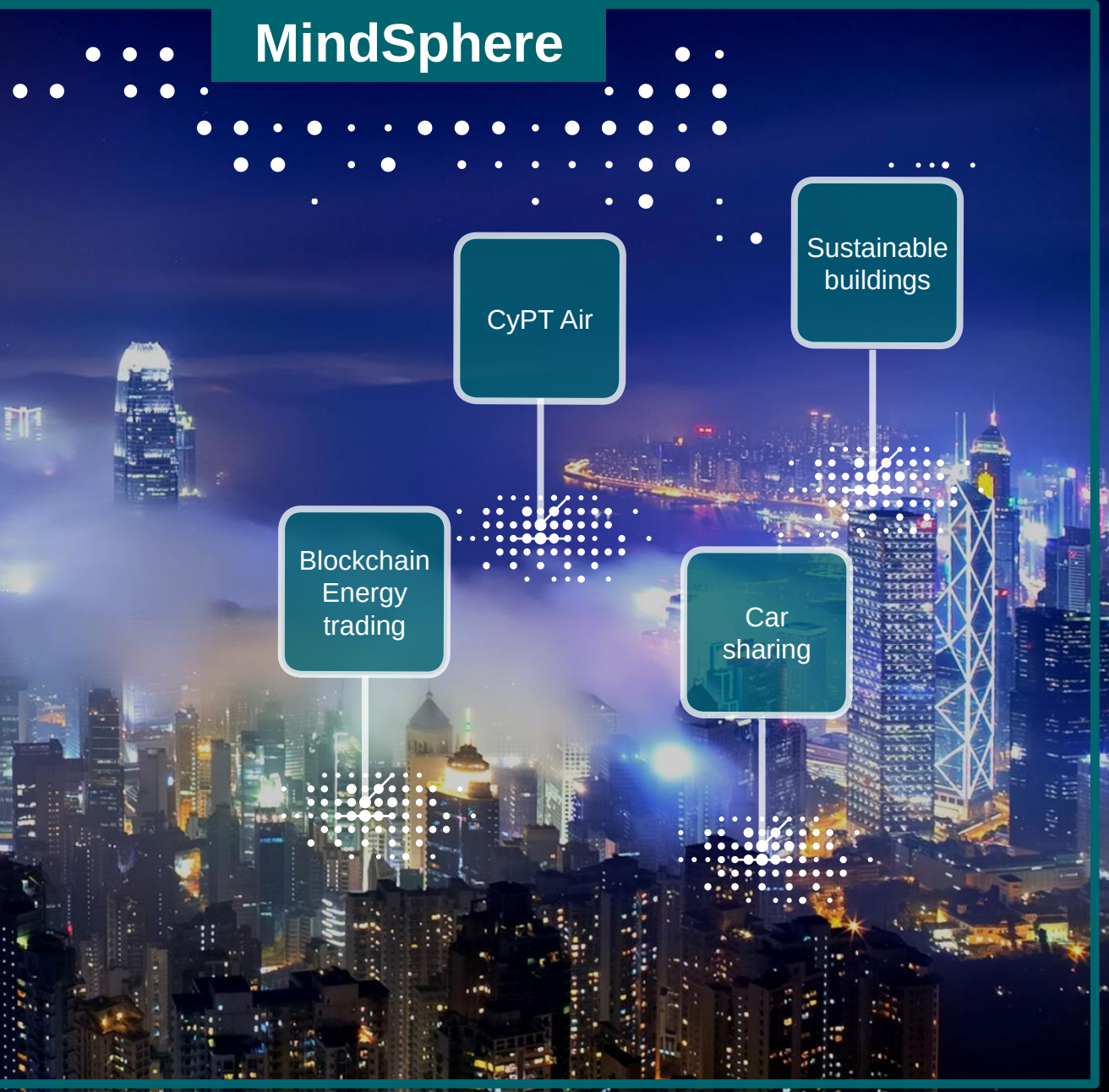
Active management of air quality through technology implementation

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



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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

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Our innovative power –
Research with a clear focus on future critical technologies

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Expenditures for research and development

€4.7 billion
Expenditures for R&D in fiscal 2016

33,000
R&D employees[1]

Inventions and patents – securing our future

7,500
Inventions[1]

3,500
Patent applications[1]

next47

€1 billion
over five years in start-ups

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

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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

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Thank you!

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