

Digitalization and Digital Twin in the electricity system

Lunch Lecture TU Delft PowerWeb,
October 11th 2018

Power Technologies International optimizes technical system performance and maximizes business value

SIEMENS
Ingenuity for life



Energy Business Advisory

Opening doors to future value creation

- Infrastructure development
- Business transformation
- Market advisory
- Transaction advisory
- Solution engineering



Power System Consulting

Complete set of analysis, design & optimization studies

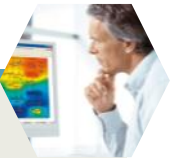
- Steady-state system studies
- Dynamic system studies
- Transient system studies
- Protection & control system studies
- Power quality & earthing studies



Software Solutions

State-of-the-art system planning and data management

- Planning and simulation of power systems
- Planning and simulation of pipe networks
- Model and data management
- Dynamic and protection security assessments in operation



Energy Business Advisory: Unlocking Tomorrow – Opening doors to future value creation



Infrastructure development



Technology advancements enable modern infrastructures, driving economic, social and environmental value for a sustainable future.

- Infrastructure strategies
- Community energy plans
- IoT strategies (internet of things)

Business transformation



Value-driven optimization of capabilities and technology infrastructure of a utility to create the industry leaders of tomorrow.

- Utility of the future strategies
- Business model transformation
- Managed transition programs
- Grid asset management concepts

Market advisory



Adequate models, plans and strategies to enable clients to not only survive but thrive in challenging markets.

- Integrated resource plans
- Market entry and regulatory strategies
- Market forecasting and analytics
- Risk Management

Transaction advisory



Holistic advisory driven by a deep understanding of the industry enables low risk, high value transactions for our clients.

- Target / investor identification
- Due diligence
- Contract structuring and negotiations
- Valuation services

Solution engineering



Integrated solution blueprints on a conceptual level for an effective, efficient and secure Infrastructure.

- Capability Architecture Management
- Data and event reference models
- Cyber security consulting

Digitalization is changing our world – even in everyday life

Today

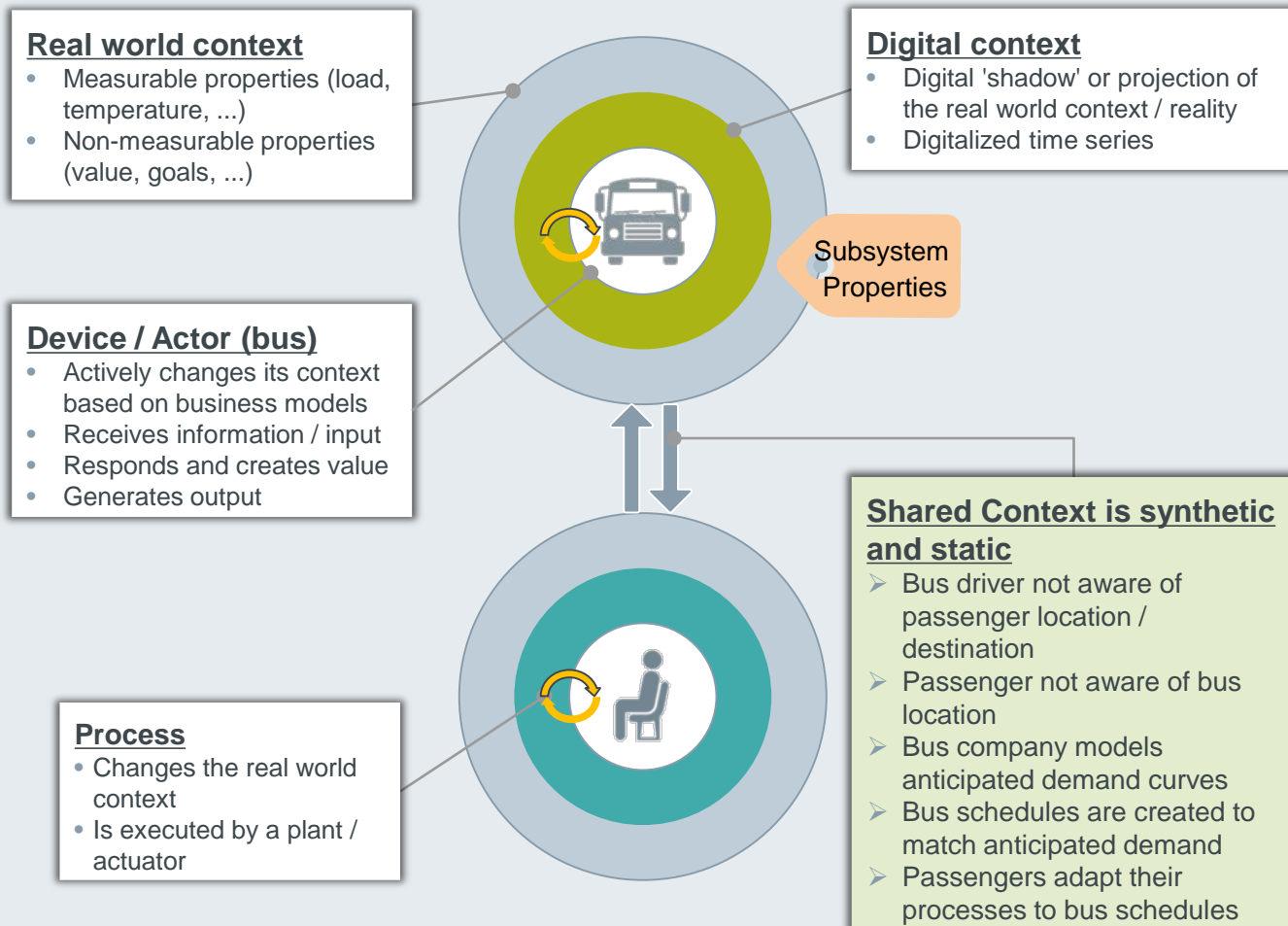
Tomorrow

Today we only know when the bus is coming ...

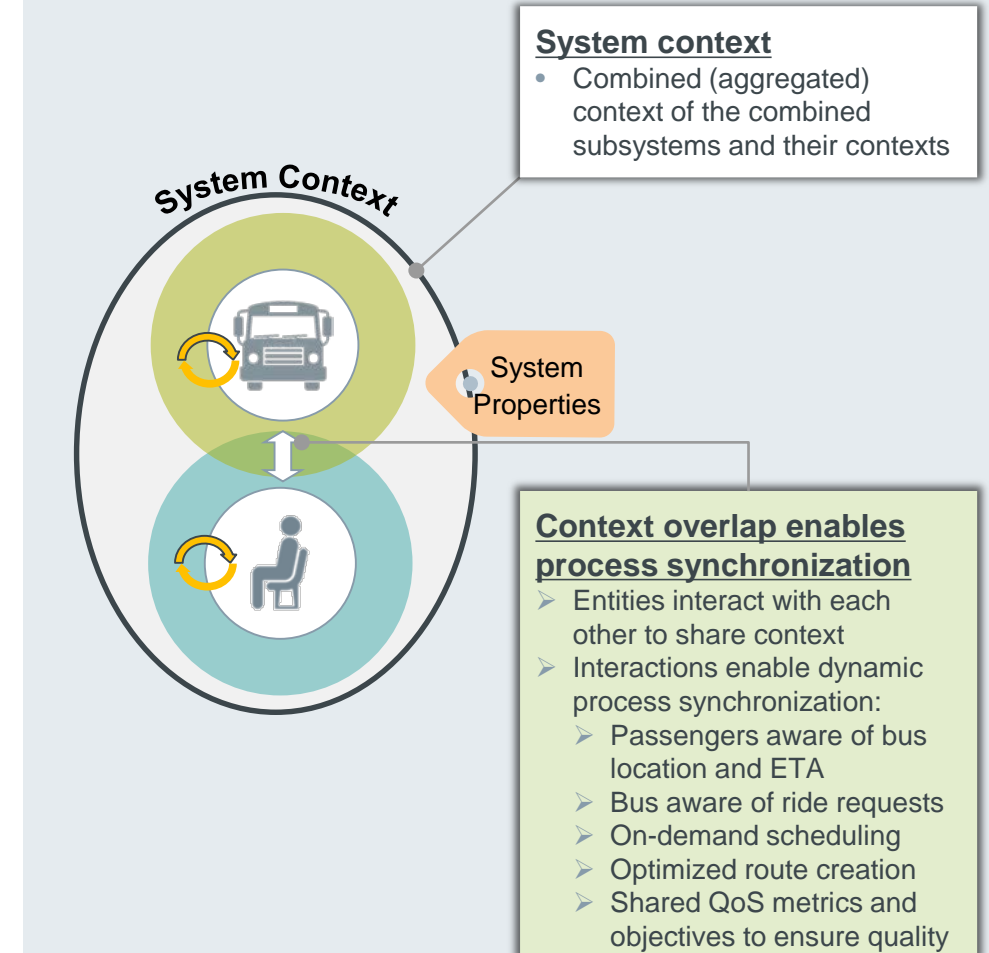
... tomorrow the bus will know where we are and where we want to go

Digitalization in a networked world enables dynamic synchronization regardless of space and time

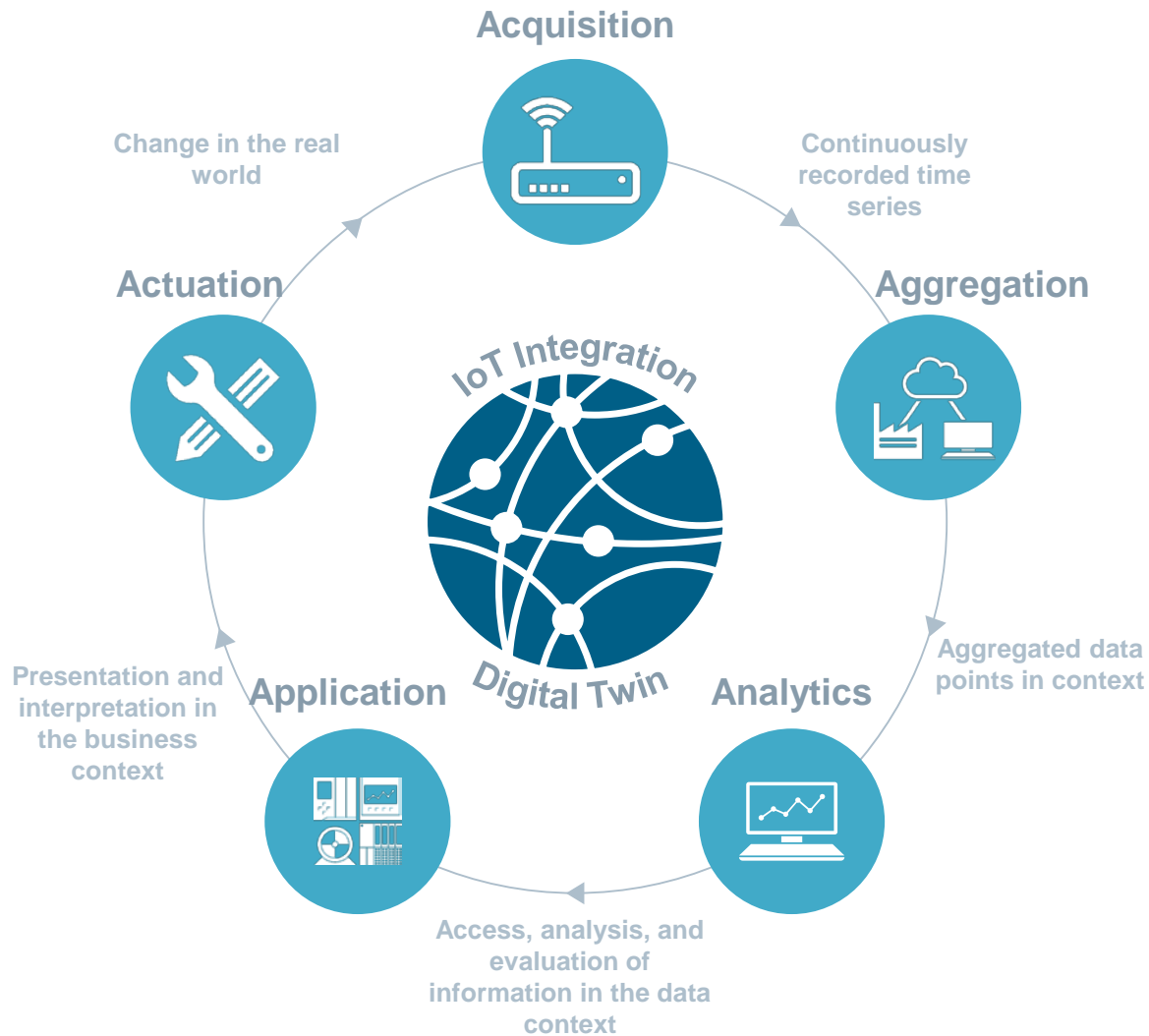
Today: Transport System is based on synthetic, static context



Future: IoT will enable on-demand mobility



Digitalization involves handling five steps of increasing complexity



Steps

Acquisition

Digitalizing system properties makes them independent of space and time

Aggregation

The aggregation of properties and time reflects the state of the system in the digital world and its behavior over time.

Analytics

Analyzing the past now makes it possible to predict the future state of the system.

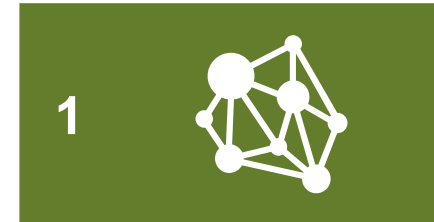
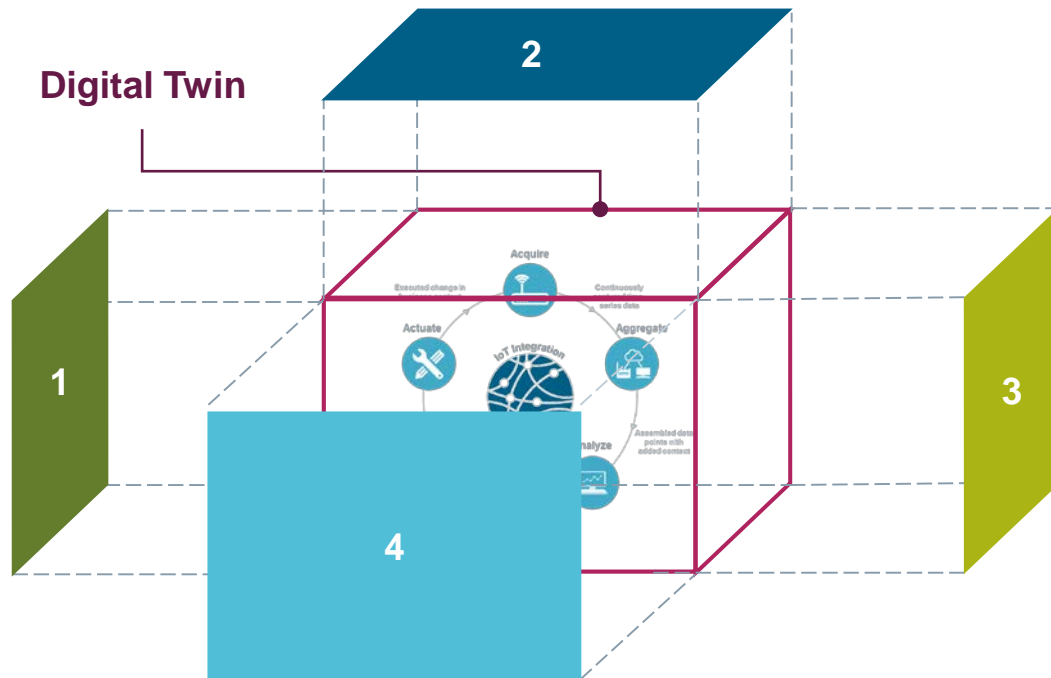
Application

Interpreting the data in the business context allows identifying activities and setpoints for the target system state.

Actuation

Automation of activities and setpoints closes the loop.

Simplified perspectives are required for handling high levels of complexity



Business Environment

Ecosystem, partner network, and interactions with other market participants



Capabilities

Technical and organizational processes



Technology Architecture

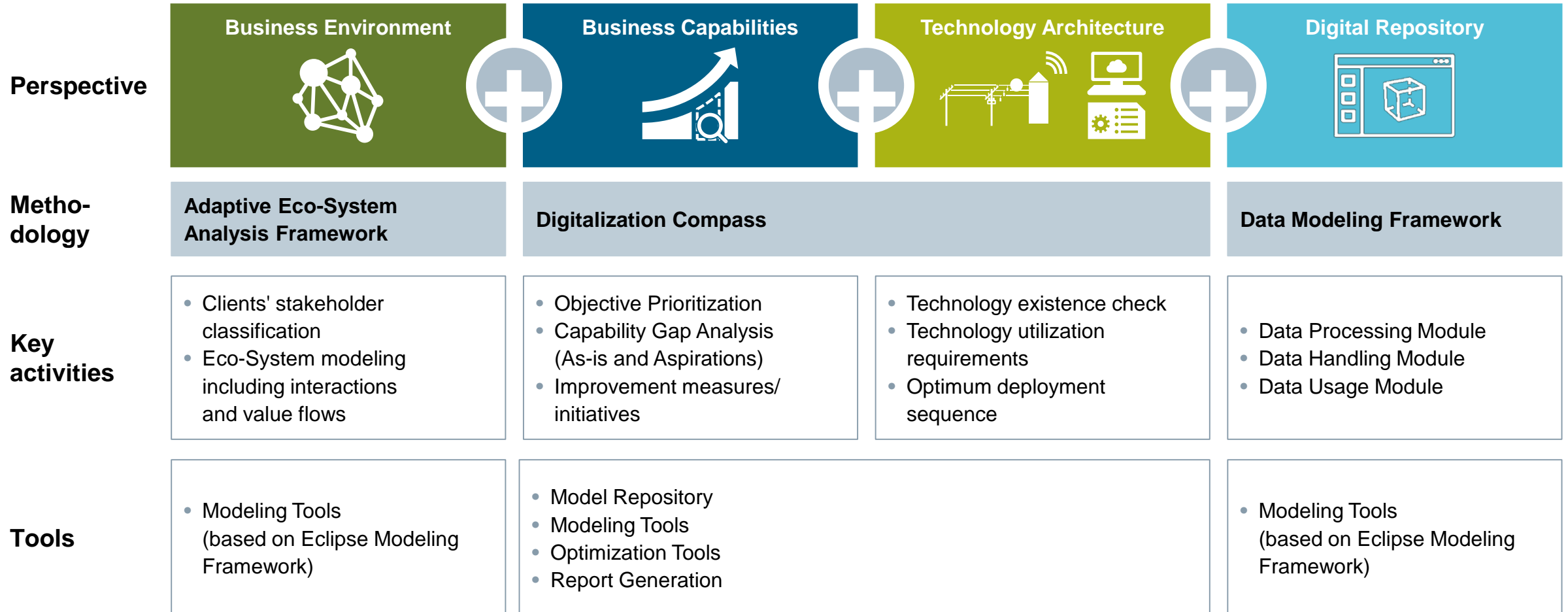
Field devices and applications for data analysis and business support



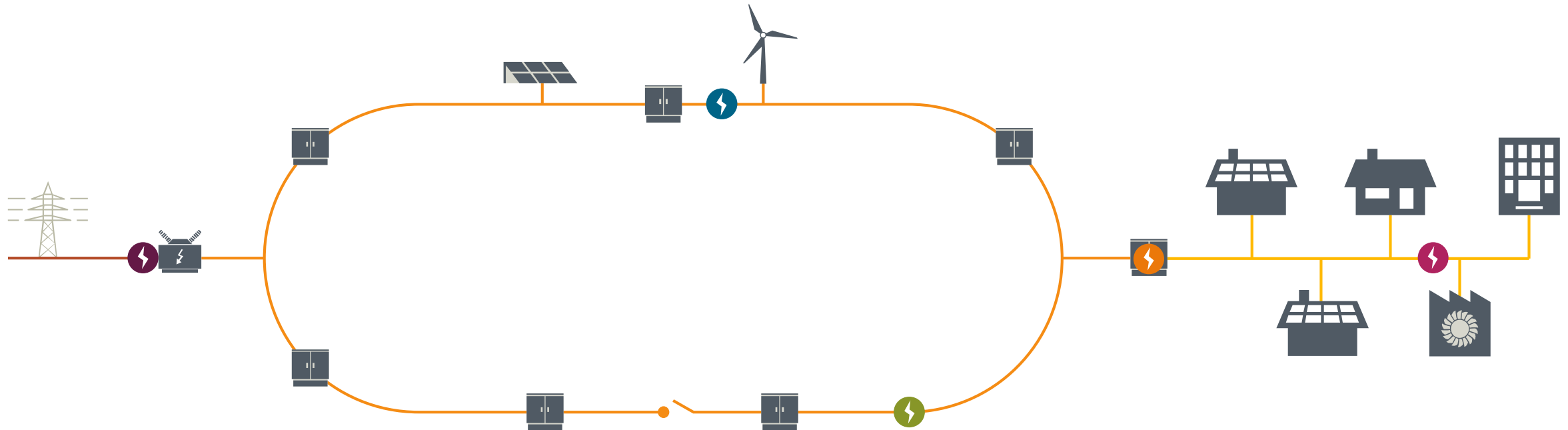
Digital Repository

Data management, processing, and storage aspects of the networked system

The core IoT methodology of PTI is an extension of the known Digitalization Compass by two adjacent frameworks



Digital Twin concepts can provide significant value to the electricity grid



Self Healing

- Automated fault detection, isolation and service restoration
- Reduction of outage duration
- OPEX optimization

Load Management

- Dynamic usage of flexible load generation
- Optimized usage of grid capacity
- Avoided or delayed grid extensions

Overload Reduction

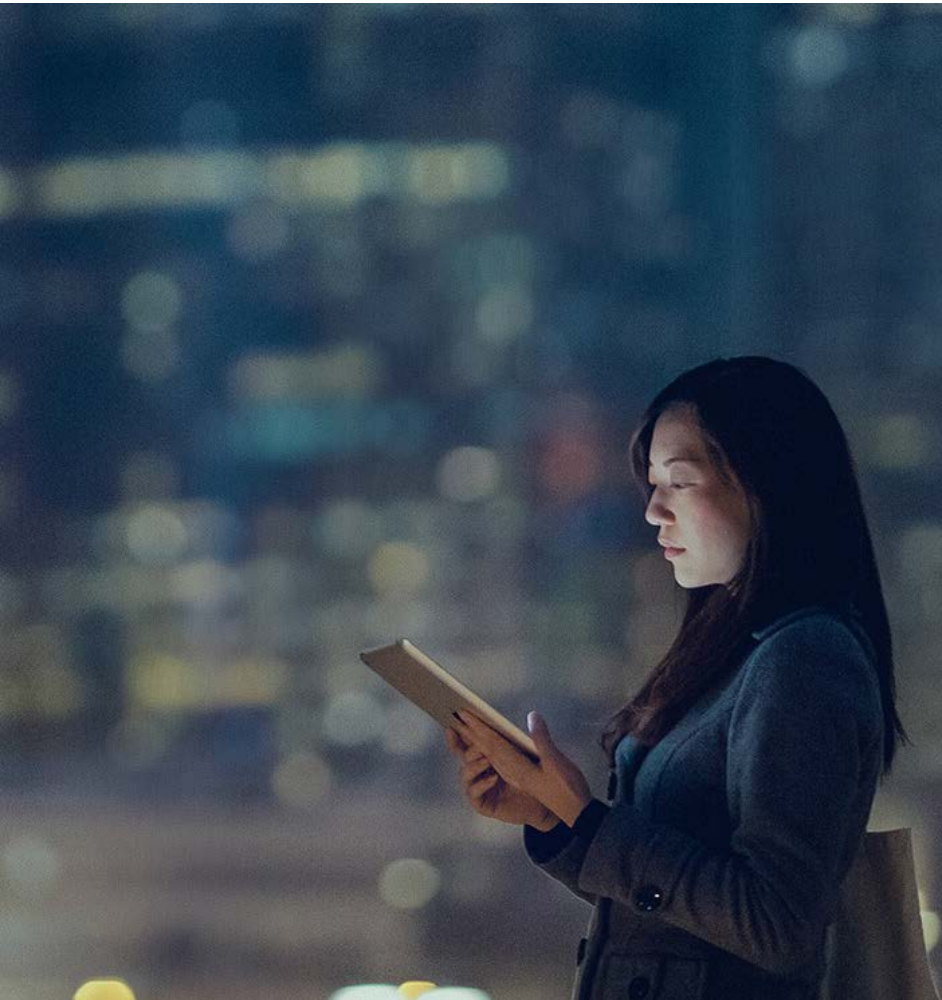
- Dynamic feeder reconfiguration
- Avoid overload situations
- Limit disturbance instances and duration

Service Restoration

- Dynamic feeder reconfiguration in case of loss of source
- Limit disturbance instances and duration

Voltage Quality

- Active voltage regulation
- Avoiding voltage deviations
- Avoided grid extensions



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