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Digitalisierung der Verteilernetze

Wien, 2. 10. 2017

Das grundsätzliche Verhalten der Energiekonsumenten blieb überviele Jahrzehnte unverändert

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Konsumelektronik

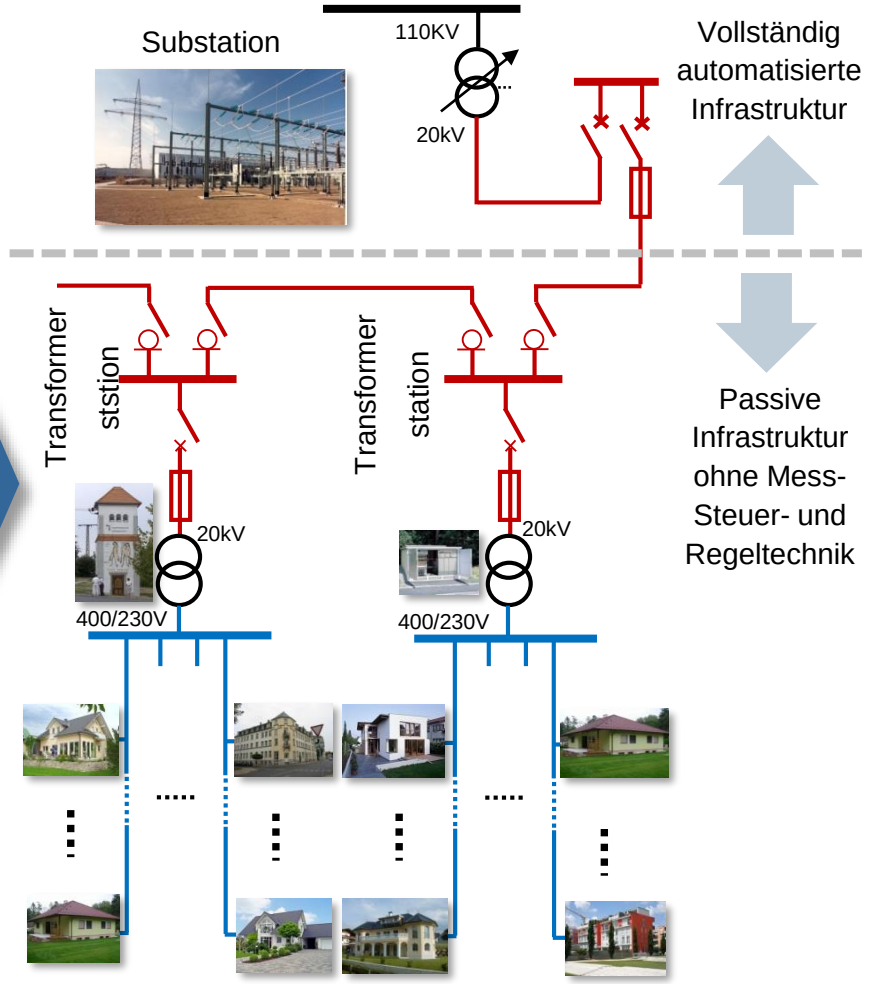
Haushaltsgeräte

Energiekonsument

Beleuchtung

Anforderungen an die Verteilernetz-Infrastruktur

Statische Planungsparameter
- Standardlastprofile
- Gleichzeitigkeitsfaktoren
- Jährlicher Zuwachs des Energieverbrauchs 1 bis 2%
- Unidirektionaler Lastfluss
- Reservekapazität auf Basis einer „wost case“ Abschätzung
- Nutzungsdauer 30 bis 40 Jahre



Der gesamte Energiemarkt unterliegt einem grundsätzlichen Wandel

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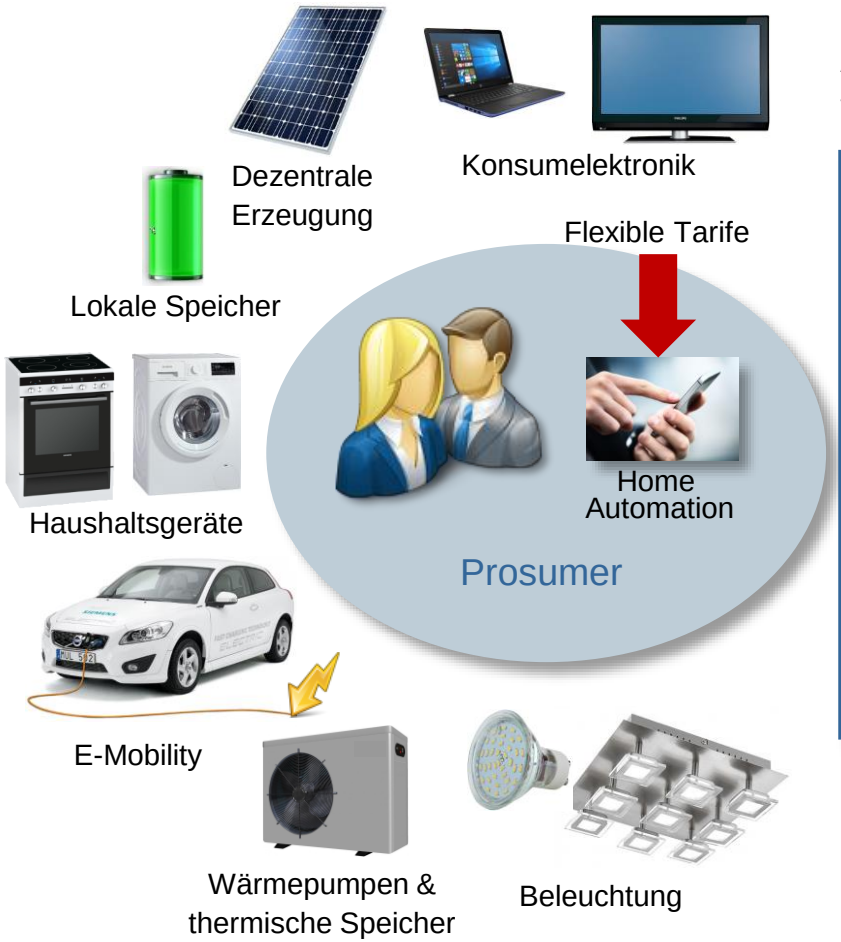

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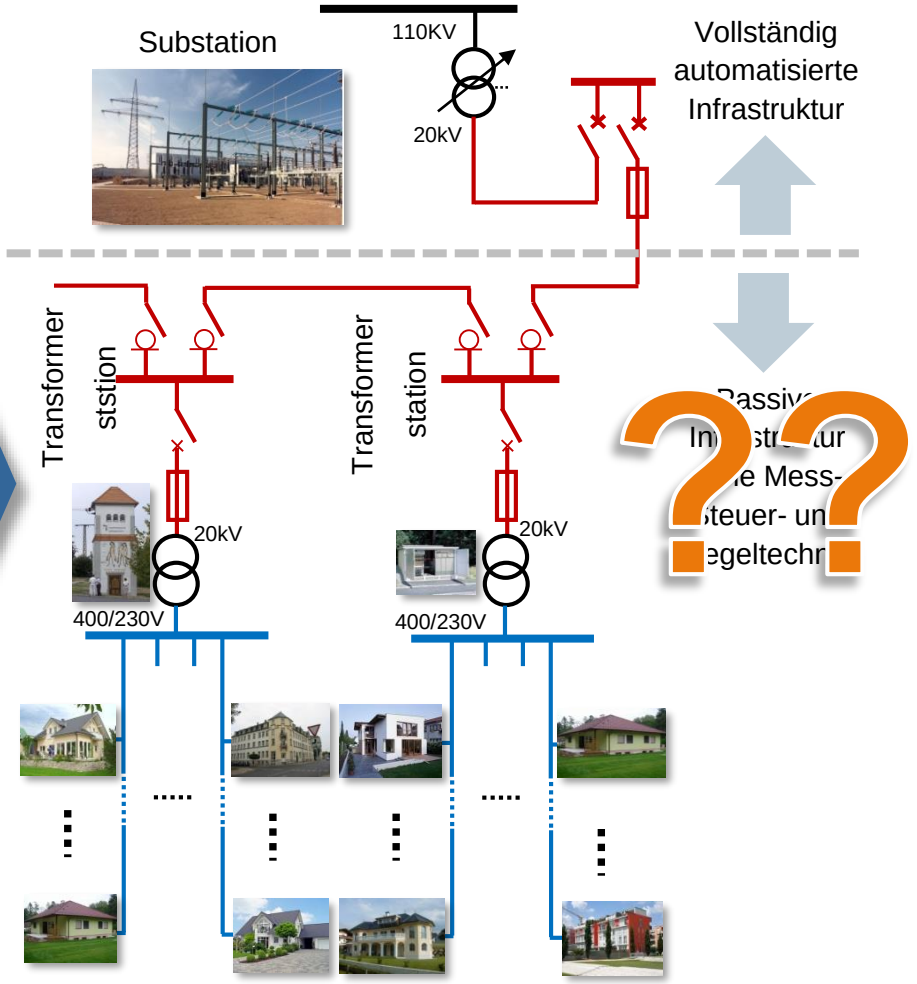

Energy Customers change their consumption/generation behavior

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Drivers for changes

- Decentralized PV generation
- Heat pump penetration
- Flexible tariffs & intelligent buildings
- Storage devices
- E-mobility (charging)
- Regulatory framework

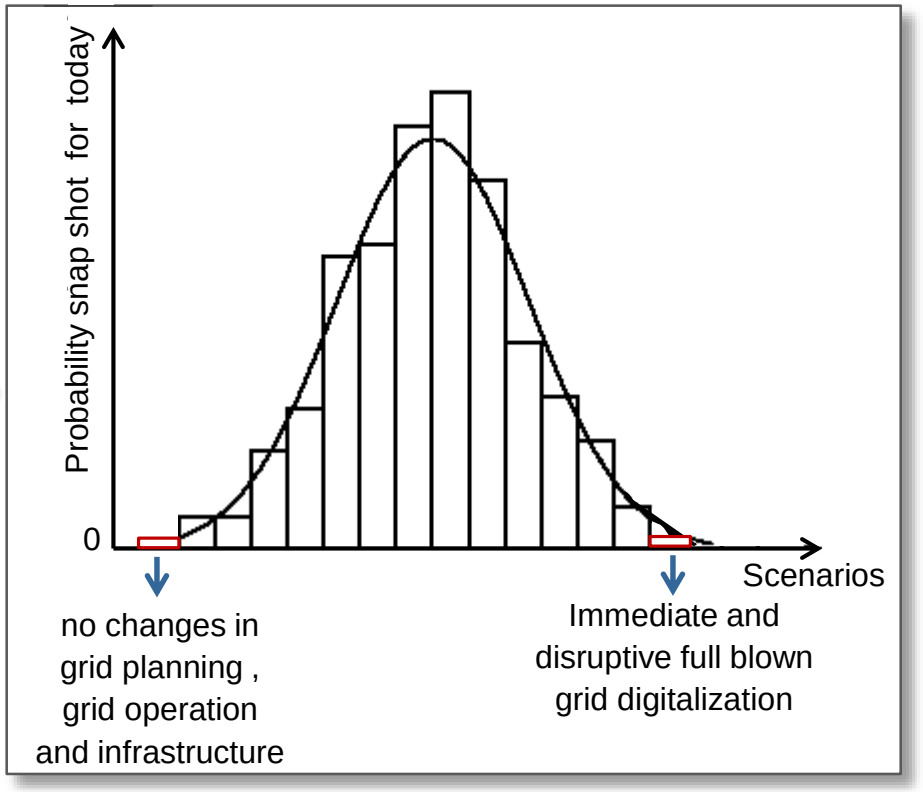
Effects caused by drivers

- Fast changing and locally different
- Mostly weather depended
- Market depended
- Depended on progress in technology development

The Challenge

How will this drivers develop over time? How do they superimpose each other?
→ What are the real consequences for the distribution grid?

Which solution scenario has the highest probability to be the most efficient?



Uncertainties in technology and market developments require a fast detection of changes and a reaction in terms of an introduction of scalable solutions just in time. This has to be complemented with agile operation processes

Monitoring of changes in customer behavior, monitoring of distribution grid asset utilization

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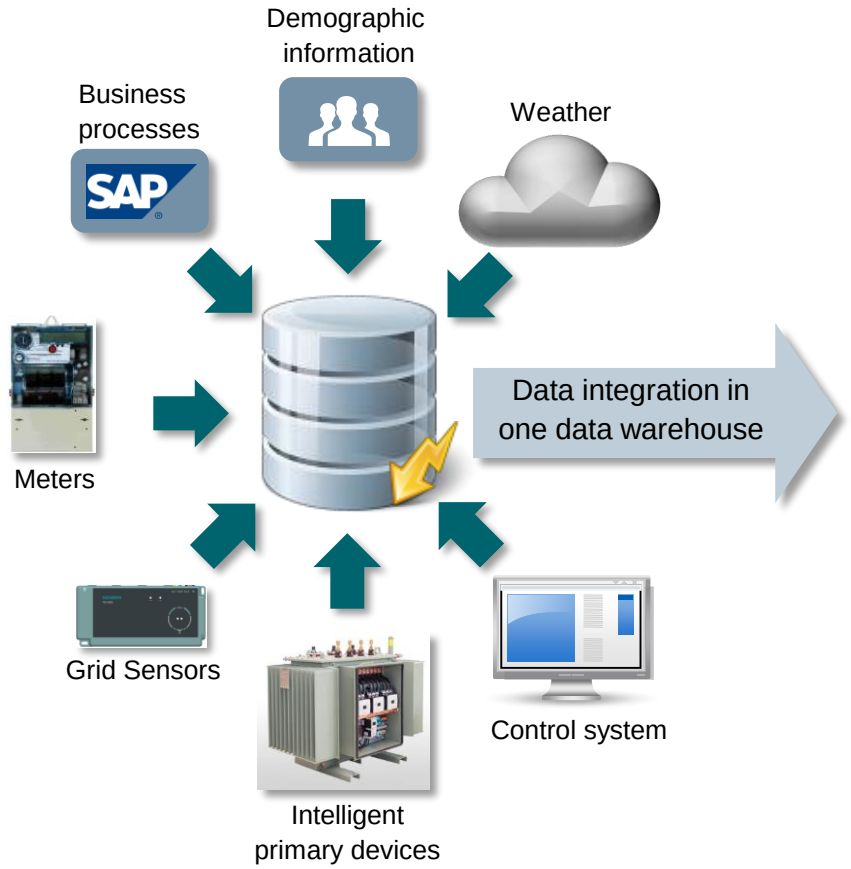


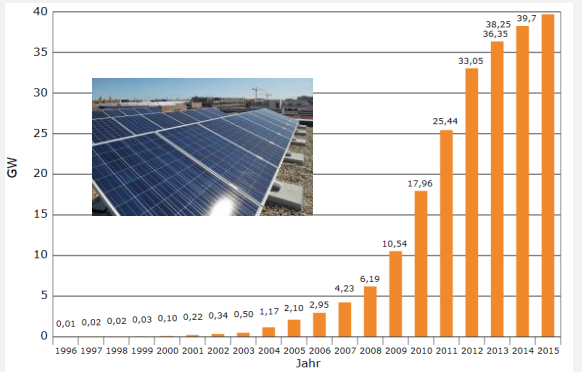
The availability of all data in one warehouse is a necessity for data analytics and simple, fast and cost effective development of applications

Examples for the calculation of trends and forecasts:

- Prosumer specific load profiles
- Discovery of reasons for changes
- Utilization of charging stations
- Grid load forecasts
- Grid bottleneck forecasts
- Asset failure analysis and forecasts

Examples for applications:

- Meter data management
- Toolsets for grid planning and handling of customer connection requests
- Flexibility management
- Reports / data provisioning for the improvement of operation processes
- Reports / data provisioning for market partners and authorities
- Data provisioning for customer services



Example: Growth of PV generation in Germany

Grid planning

Field services

Monitoring of changes in customer behavior, monitoring of distribution grid asset utilization

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This kind of monitoring is a prerequisite for all variants of solutions

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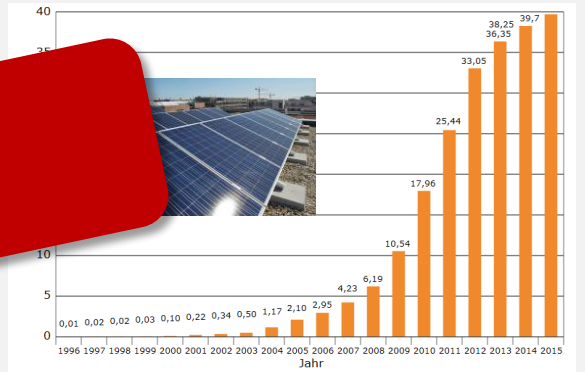

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Step 2 of the SG Migration Path
Data Analytic

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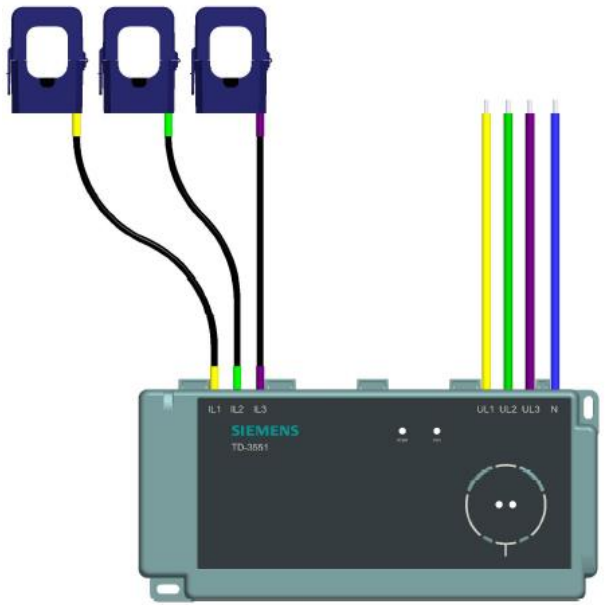
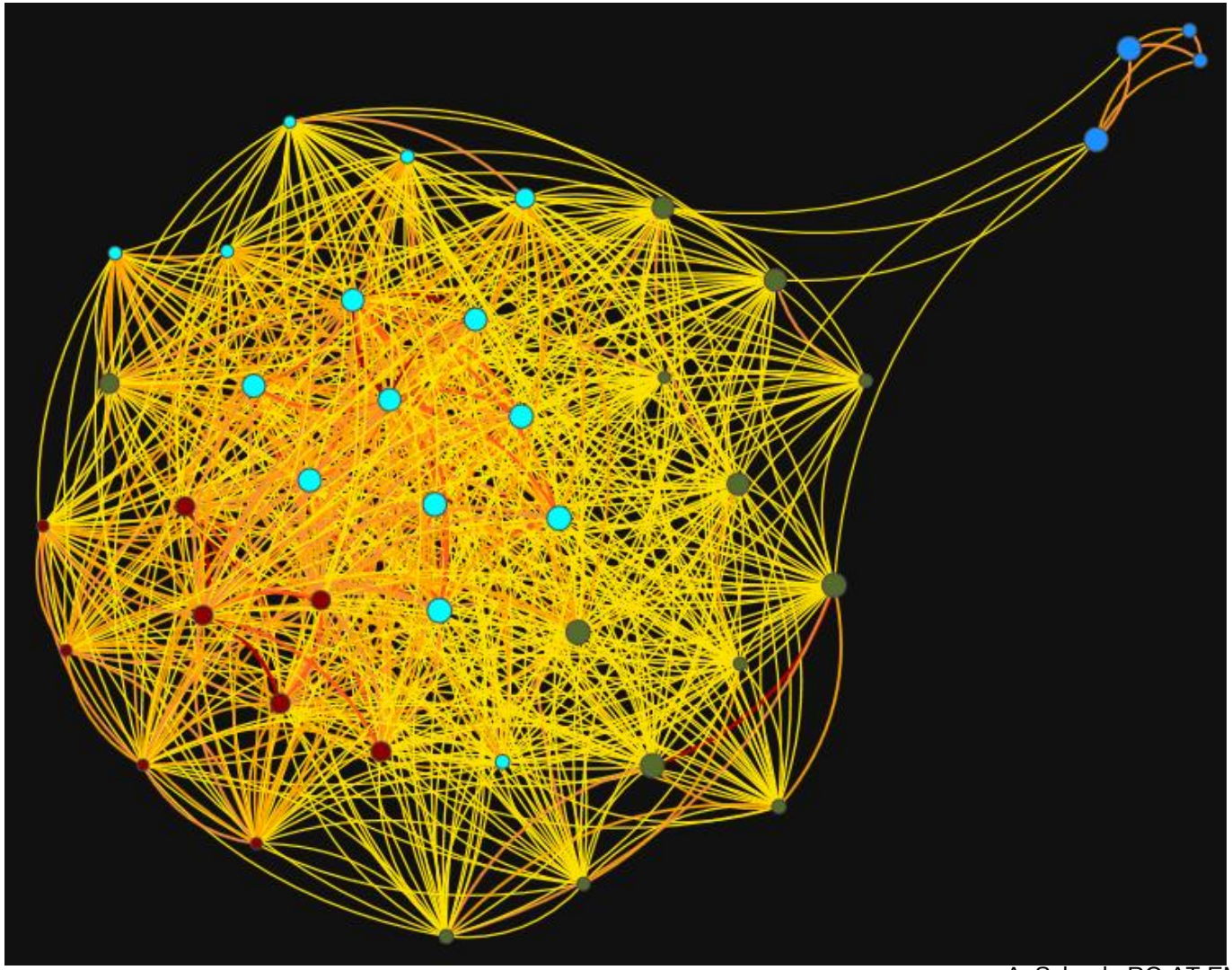
Correlation of measurement values of one GMD with the measurement values of neighboring GMD‘s





Distribution grids interacting with market partners in order to protect grid assets (active grid management)

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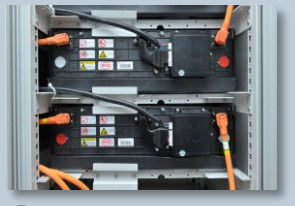
Smart Buildings

Distributed generation

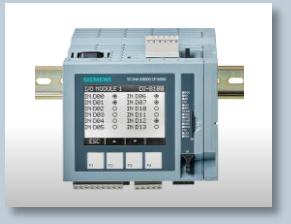
E-car charging

LV transformer station



Battery

Transformer



LV Grid controller

Existing LV grid controller functionalities

The local LV grid controller acts as data hub and automation device

- Data aggregation and pre-processing
- Grid watchdog function
- Voltage controller for tap changer transformers
- Medium voltage switching

Example for a future LV grid controller functionality

The local LV grid controller determines the actual grid load and the available grid resources in the near future and manages load and local production.

- Congestion avoidance
  - Reduction of maximum power for e-car chargers
  - Utilization of building flexibility if necessary
  - Executes limitations given by substations (control systems)
- Provisioning of battery capacity to market partners

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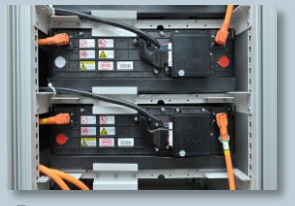

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The future active grid management functionality depends very much on the development of markets, technology and legal framework.

grid controller functionality

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Step 3 of the SG Migration Path
A future proof IIoT based field device concept

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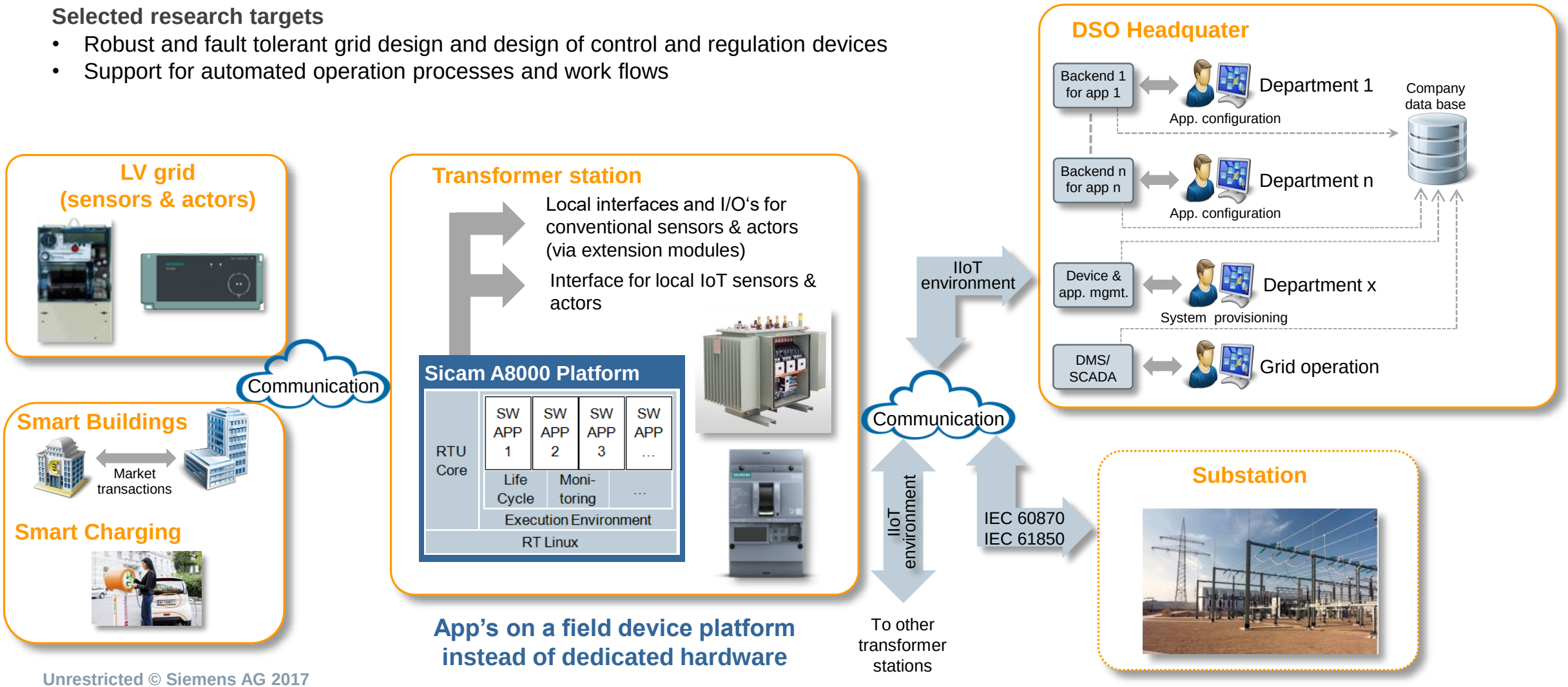
Selected research targets

- Robust and fault tolerant grid design and design of control and regulation devices
- Support for automated operation processes and work flows



Industrial IoT (IIoT) compared to consumer IoT

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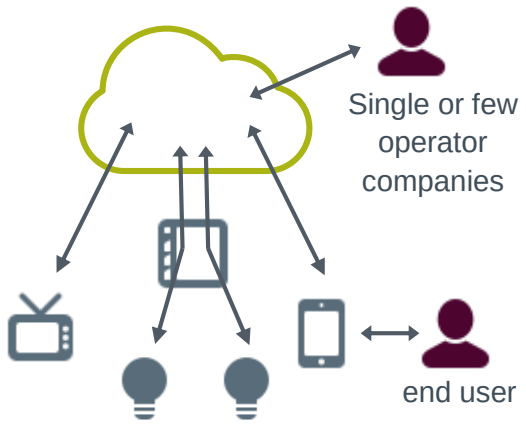
Consumer IoT

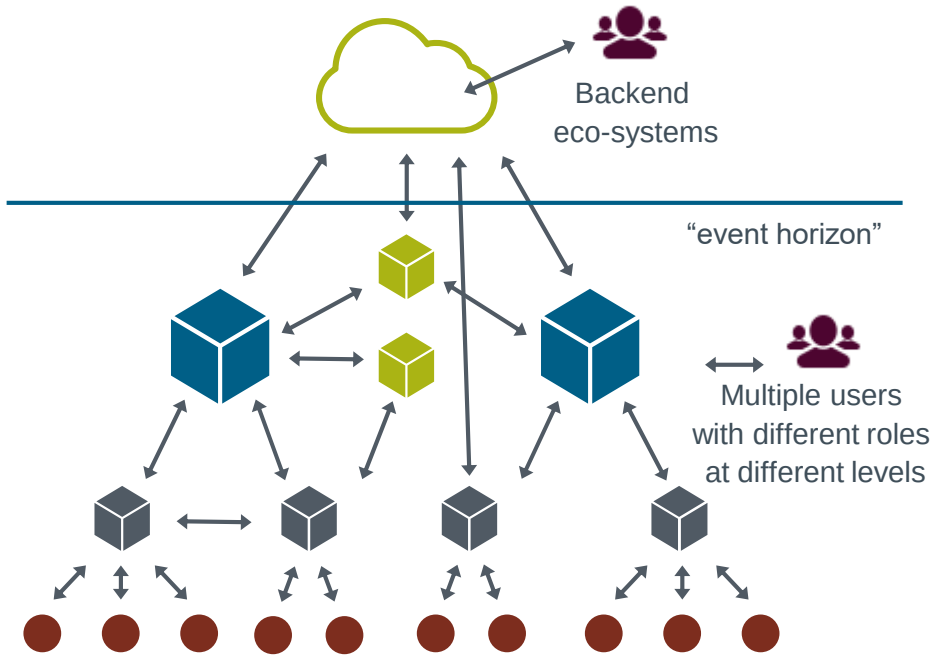


Permanent cloud connection required.

Quality and availability: Best effort

Low-cost / high volume

Industrial IoT



Complex systems combining local intelligence and centralized intelligence

24/7 operation even with no connection to backend.

Guaranteed latency, throughput, and responsiveness.

- High technical and business **complexity** (1:n:m:…, distributed applications)
- **Local-x**, e.g., device management, analytics control
- Increasing demand for local **computing power**
- **Physical-world interfaces**: real-time control, M2M
- **QoS guaranties**
- Strong IT and data **security**
- **Safety** / mixed criticality
- **Industrial-grade systems**: durability, lifetime, compatibility, standards, certification, 24/7 op.
- **Multi-version management** in distributed systems over decades, legacy migration
- Huge variety of **business models** / stake holders

IoT: Internet of Things
QoS: Quality of Service, performance of network, such as error rates, bit rate, throughput, transmission delay, availability, jitter, etc.

Scalability as well as CAPEX and OPEX optimization is the key success factor

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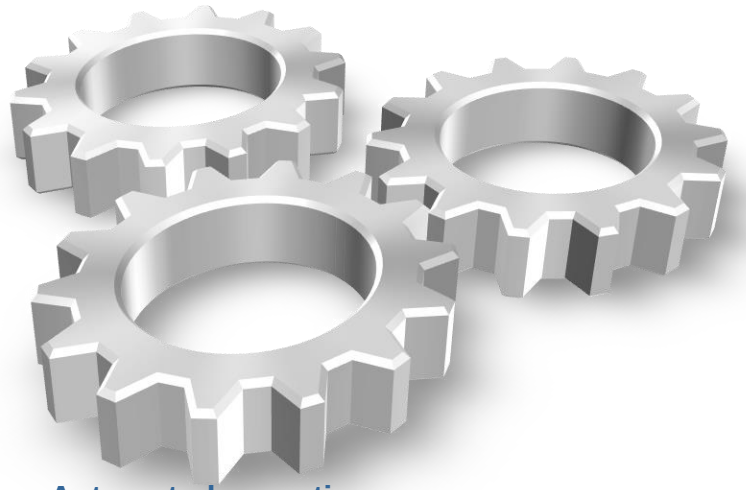
Seamles and scalable solution concepts

- Platform concepts for centralized IT solutions field devices, modular extendable
- Communication protocols supporting plug and play
- Communication concepts integrating narrow band IoT services and broad band services
- Cloud services to complement own infrastructure



Agile company organiszation

- Implementation of a change manage process
- Clear role definition introducing a migration path (responsibilities today ↔ future responsibilities)
- Quality-/efficiency monitoring system to improve processes and workflows

Automated operation processes

- Intelligent tool chains and backend app's supporting the involved operation personnel (keeping away the complexity of the involved technology, focus on the energy related core processes, recommendation of decisions….)
- Comprehensive device management solution linked with IT/OT systems supporting
  - automated parameterization of devices and App procurement / APP distribution
  - automated and coordinated update procedures
  - Monitoring of device performance
  - Fault diagnosis and fault handling

Contact us

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