Karlsruher Institut für Technologie

Regulatory Issues of Smart Grids

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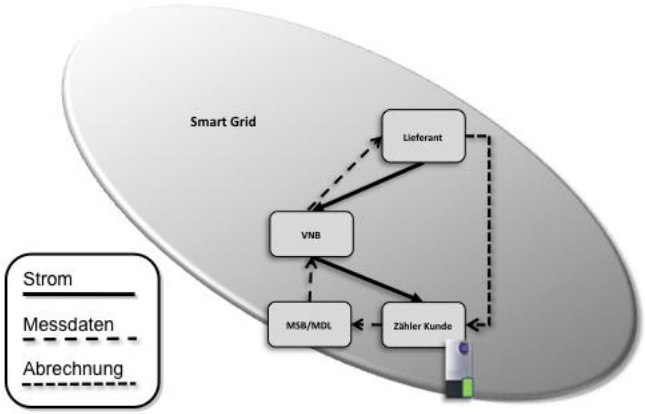
EIT ICT Labs – Smart Energy Systems Summer School 2012

Institut für Informations- und Wirtschaftsrecht (IIWR)
Zentrum für Angewandte Rechtswissenschaft (ZAR)

Agenda

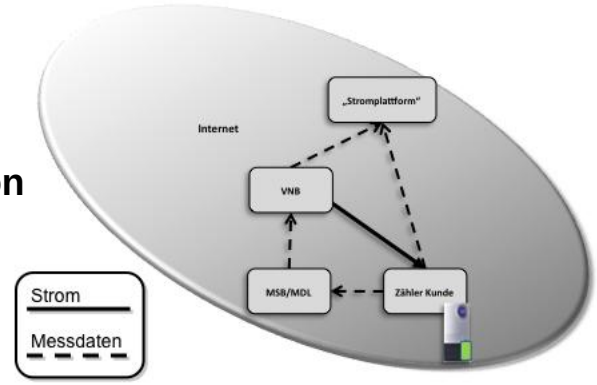
- Scenarios
- Energy and Calibration Law
- Data Protection Law

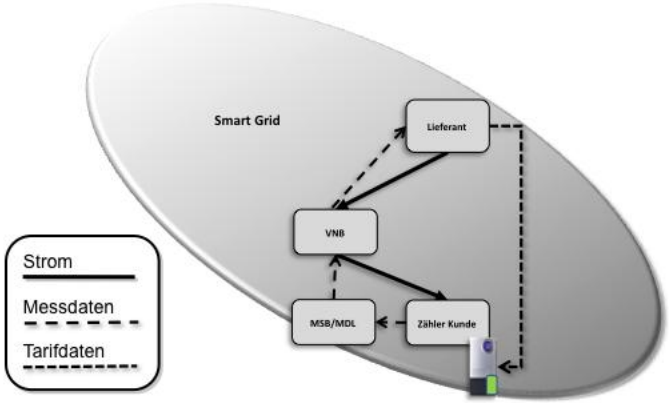
Today: Smart Meter (data flow based on GPKE/WiM)



Billing

Visualization





Incentive Tariffs

Tomorrow: E-mobility (based on GPKE/WiM)

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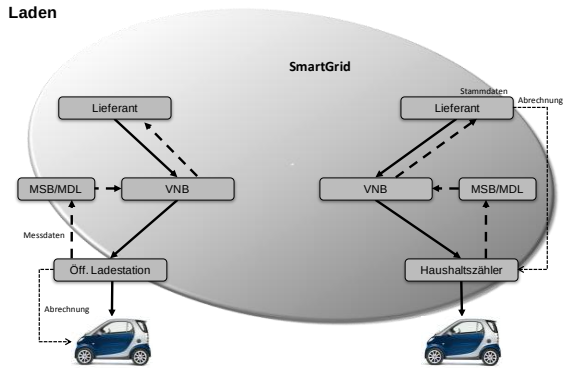
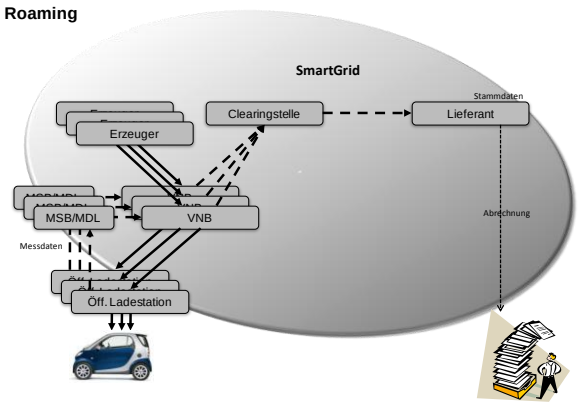
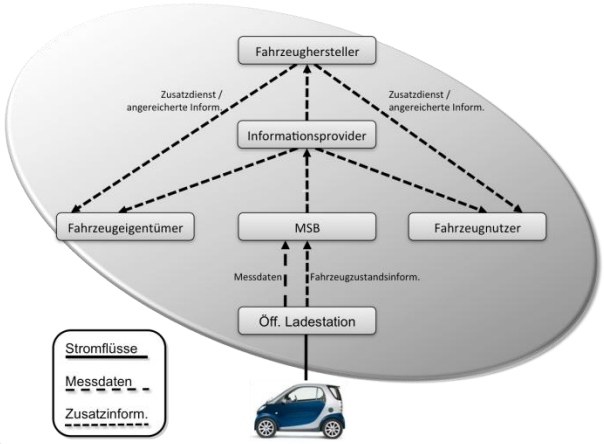
Billing

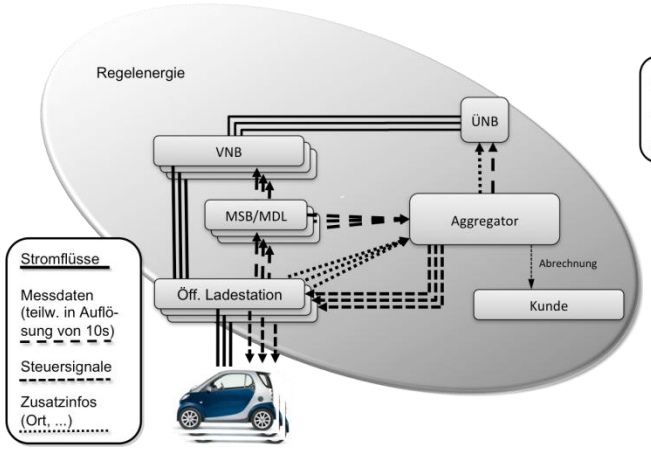


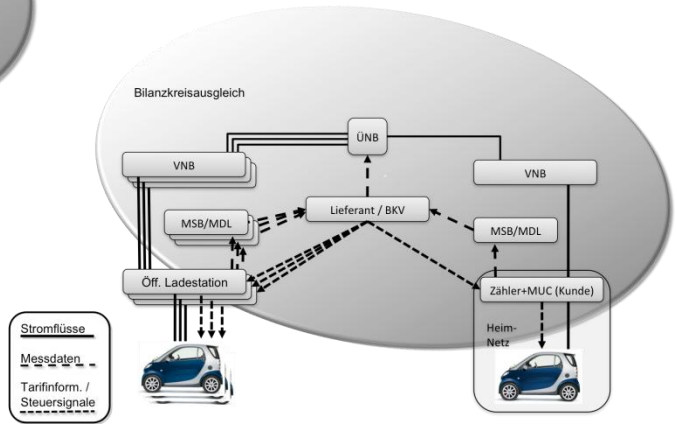


Vehicle Information

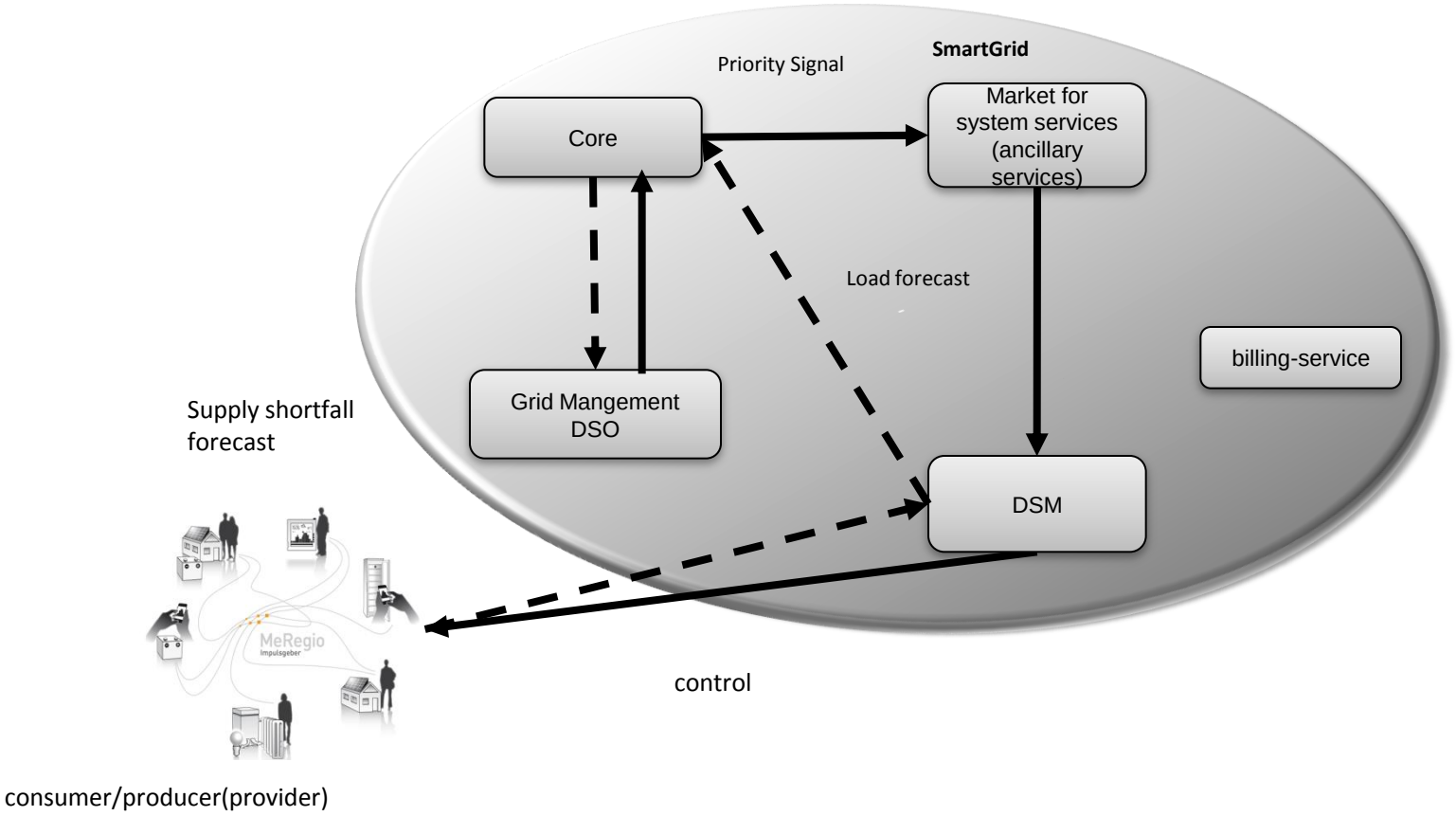


Grid Management





The day after tomorrow: Demand Side Management and Priority Signals



Challenges

Present	Future
› Closed market of the power industry	› Open market with new market participants
› „Offline“ business processes	› „Online“ business processes

→ twofold paradigm change

Present	Future
› Characterised trough energy (management) law	› Integration of requirements from ICT-Law
› „Offline“ business processes	› Transfer of requirements from the offline -world into the online-world

→ Need for adjustments regarding substantive and procedural law

Smart Meters

Legal aspects regarding Smart Meters

- Energy (Management) Legislation
  (*Energy Industry Act*)
- Calibration Law
- Data Protection Law

Energy and Calibration Law

Metering Systems

- Definition in section 21d EnWG (German Energy Industry Act)

A metering system consists of:

- a measuring instrument
- which is connected to a communication network
  (*Actual use of the communication module is not necessary, the mere ability to communicate suffices*)

→ A metering system consists of 2 at least logically separated parts.

Mandatory Installation of Metering Systems, section 21c (1) EnWG

If technically feasible metering systems have to be installed:

- in buildings, which are connected to the power grid for the first time or after a major renovation of an existent building,
- if the annual consumption of electricity by a consumer exceeds 6.000 kWh
- if an installation for producing renewable energy (EEG, KWKG) has a maximum power of more than 7 kW

If technically feasible and economically reasonable metering systems have to be installed:

- In all other buildings

Starting point: Liberalisation of the measurement sector

In Germany:

- **Objective: Enabling new market players to enter the market through** liberalisation of the measurement sector for third party measurement service providers

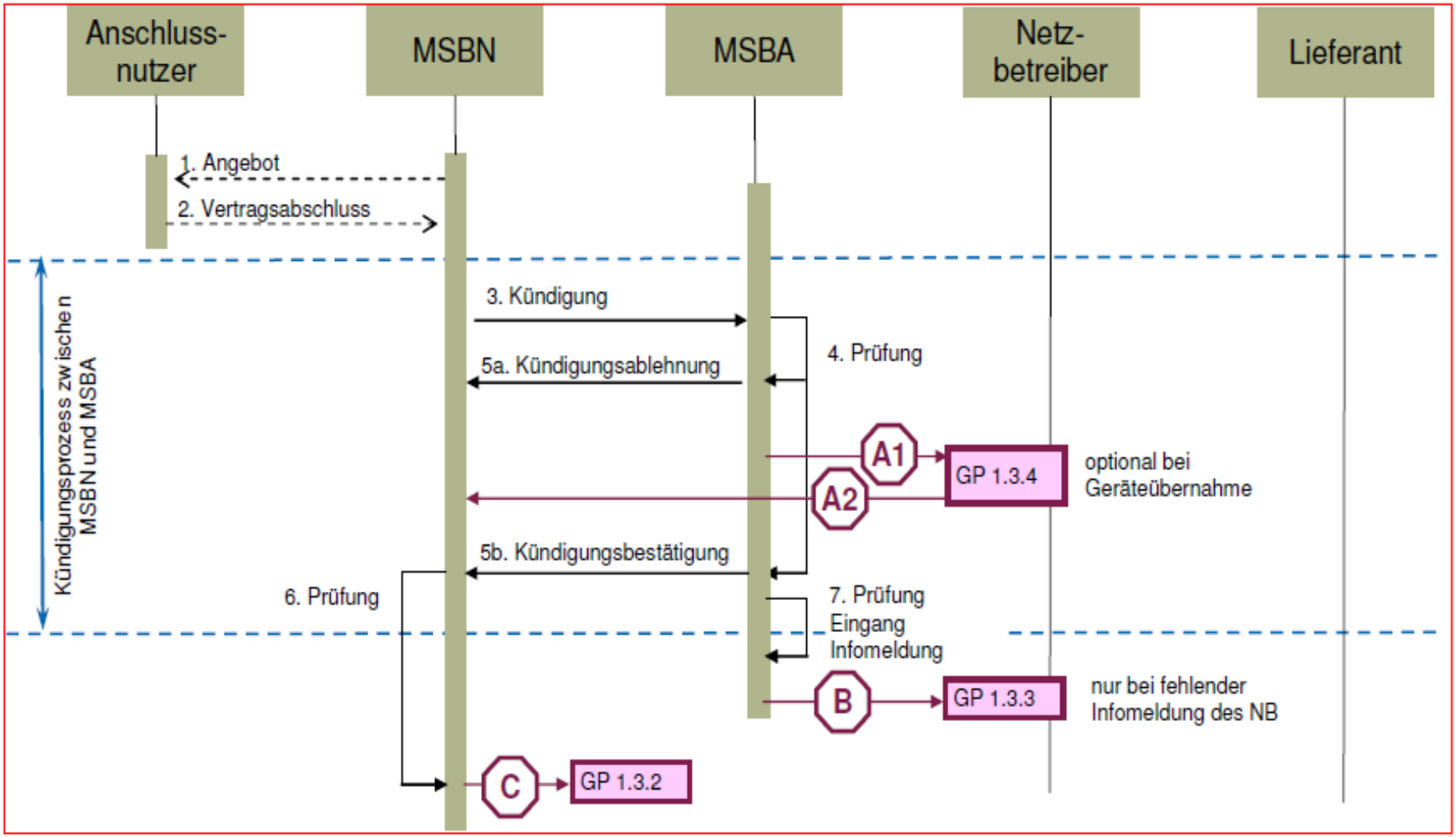
Regulation

- The Federal Network Agency implemented (ex officio) a regulation procedure for the standardization of contracts and business processes in the measurement sector (WiM) concerning:
  - Framework contracts for metering and measurement
  - Processes which must be implemented between the market participants
  - Including a framework for **electronic data exchange.**
- **Result:** binding specifications for data formats and processes to be used in the market communication

Binding effect

- The specifications defined by the Federal Network Agency are classified as a general disposition and are therefore binding for all addressees.
- Specifications can be changed with effect for the future, if certain requirements are given.
- Problem: the principle of reliance and financial investments already carried out
- Risk: De facto standards are established which are difficult to correct or change afterwards.

Regulation: Example – process model „cancellation of the metering (point) operator“



Problematic issues of the specifications concerning business processes

- The specification of the business processes address only the yet known market participants regarding the transfer of the metering data .

- Difficulties to integrate new market participants, e.g. energy service providers (directive 2006/32/EU).

Regulation: specification of the data formats

- Exchange of meter readings and metering data between market participants
- GPKE
  - Data format **EDIFACT**
  - Message type **MSCONS**

for the transfer of meter readings and metering data.

Problematic issues of the specification

- EDIFACT has been developed for the B2B sector
- Lacking flexibility and extensibility for new market roles
- Conversion from EDIFACT could be a „bottleneck“
- EDIFACT has no standardized transformation procedure, and is not self-descriptive

Problematic issues of the specification: Example SmartMeter - section 40 (5) EnWG – dynamic tariffs

- The offering of variable tariffs to influence the current consumption is requested by law
- Issue of calibration law:

Tariffing within metering system

- Possible with the deposit of a so-called counter register

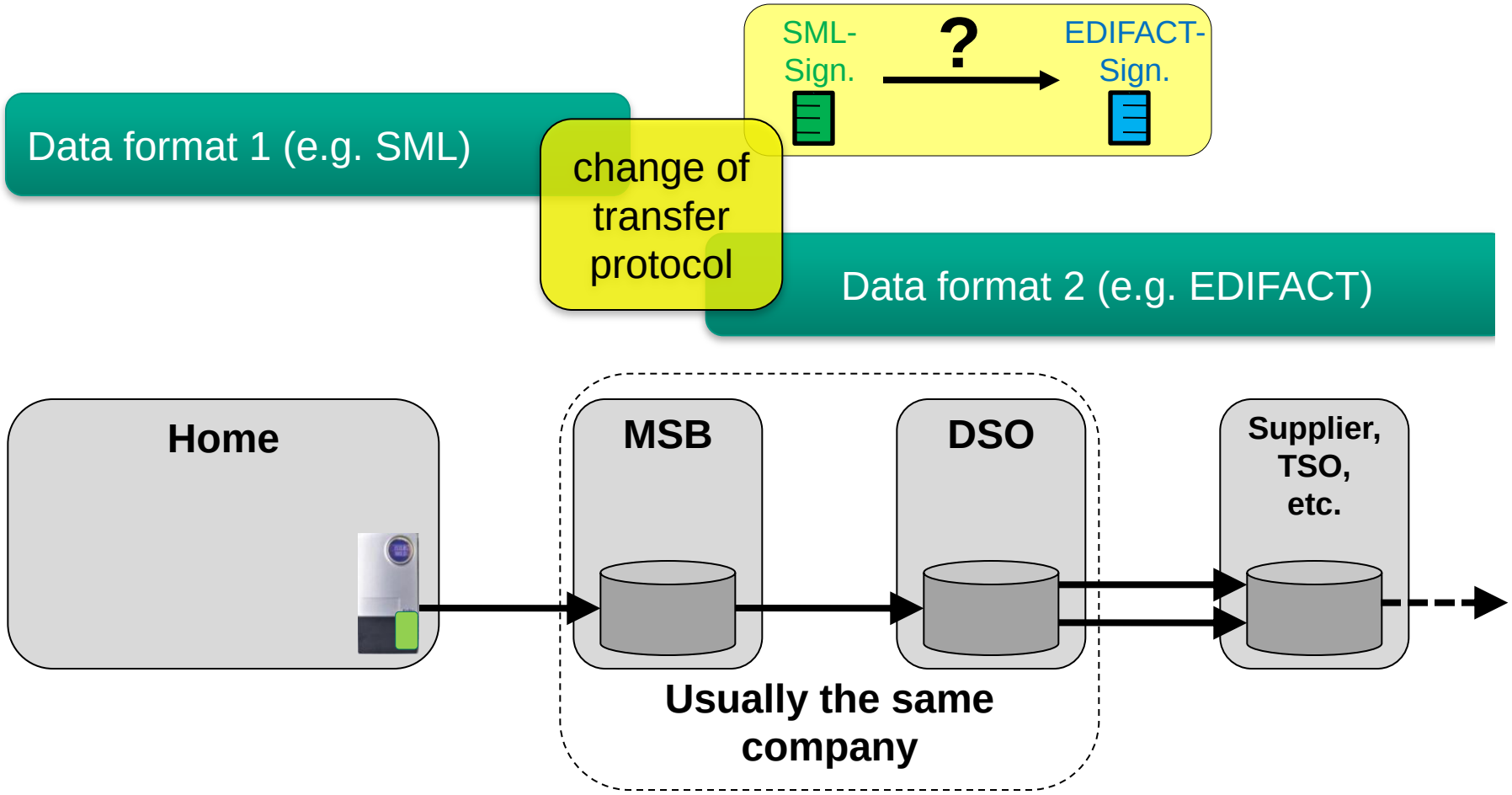
With dynamic tariffs this is hardly practicable

Tariffing within the backend

- the load pattern recorded by the meter is matched to tariff information in the backend

The consumer needs the original signed meter data

SmartMeter: Tariffing in the Backend – Metering data communication

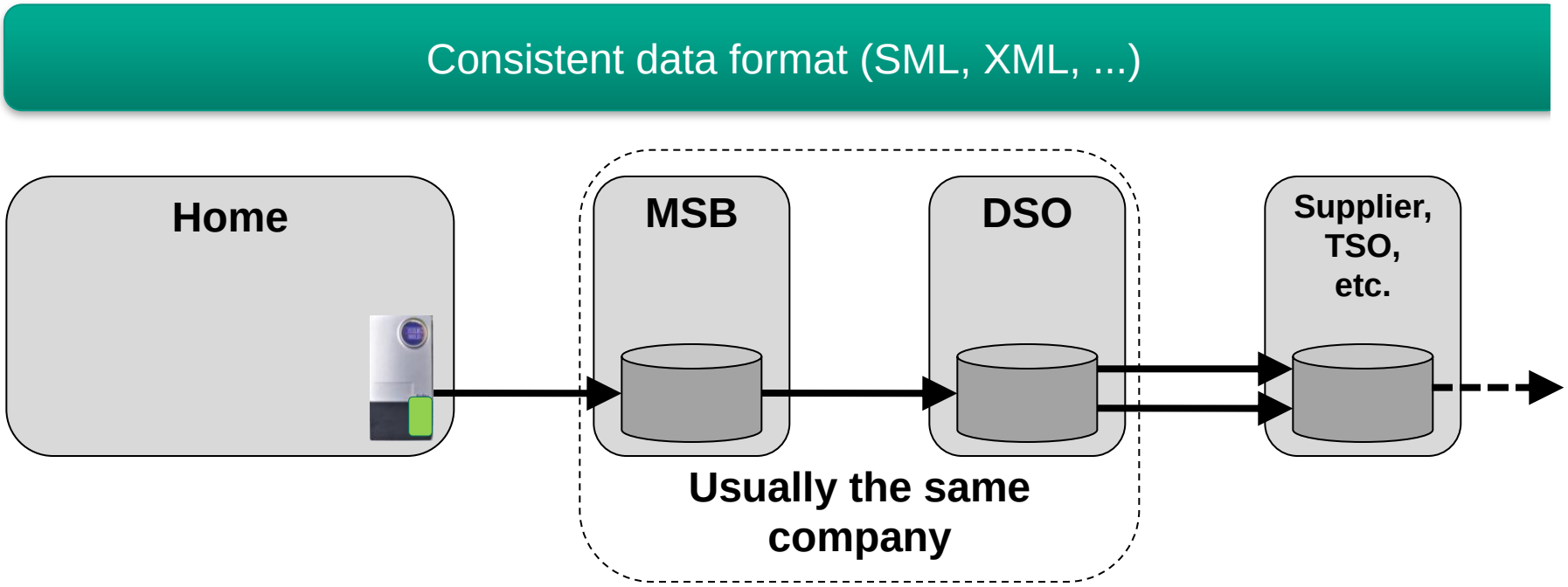


Smart Meter: Conversion from SML- to EDIFACT-signatures

Problem:
the current status of protocol technology does not allow lossless conversion from SML- to EDIFACT signatures

- data integrity cannot be guaranteed
- data integrity can neither be traced nor proven
- primary purpose of the signature is no longer met

Smart Meter: perspective solution for meter data communication



Data Protection Law

Smart Metering: Data Protection

- Formal aspects:
  which laws are relevant?
  (e.g. „Federal Data Protection Act“ - BDSG or
  „Energy Industry Act“ - EnWG)

- Legislatory aspects:
  which laws and ordinances have to be adapted or newly implemented?

- Substantive aspects: which specific issues need regulation?

- Technical aspects: Protection Profiles („Federal Office for Information Security“, BSI)

Excursion: Basic Principles of Data Protection

Basic principle within the data privacy law:

Generally all handling of personal data is illegal, unless it is explicitly permitted.

- Permission by law or freely given consent
- Permission is required whenever personal (not anonymous) data is concerned:

"Personal data shall mean any information concerning the personal or material circumstances of an identified or identifiable natural person (data subject)."

- Informing the concerned person about the purpose of the data usage is obligatory

Substantial aspects of Data Protection regarding Smart Meter

- Lawfulness
- Data minimisation
- Consent (media break)
- Transparency (machine-to-machine communication)
- Pseudonymous use (e.g. calibration law)
- Data protection audit
- Data protection using technical or organisational mechanisms (technology vs. organisation)

Challenge:

Ensuring openness to innovation and guaranteeing legal compliance

Challenges

- Legislative acting with limited forecast horizon
- Main objectives of the climate change policy: promotion of innovation and guaranteeing fundamental rights

Protection concept of the EnWG

- The three pillars of the „protection concept“:

→ The EnWG creates product-related Data Protection (Metering system)

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Permissions for the handling of personal (meter-) data (1st pillar)

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Section 21g EnWG:

- No. 1: conclusion and adaption of contracts;
- No. 2: measuring of energy consumption and feeding-in of electrical energy;
- No. 3: supplying of electrical energy, including related billing processes;
- No. 4: feeding-in of energy into the power grid and related billing processes;
- No. 5: controlling of interruptible consumer equipment;
- No. 6: implementation of variable tariffs such as in section 40 (5) EnWG and visualisation of energy consumption and feeding-in of energy;
- No. 7: Determination of the state of the power grid;
- No. 8: Revelation and prevention of illegal use of services.

All current relevant energy industry processes are covered!

The problem: No consent (1st pillar)

Basic principle within the data privacy law:

- Generally all handling of personal data is illegal, unless it is explicitly permitted.
- Permission by (1) law or (2) freely given consent

The problem: No consent (1st pillar)

Challenge: Ensuring openness to innovation

- The EnWG mentions the possibility of consent in section 21g
  - Section 21g (2): relates to the personal scope
  - Section 21g (6): relates to remote measuring- and remote control
- Problem: data may not be used for other than purposes specified in section 21g!
- Openness to innovation? Future services may not use data for other than the specified purposes (prevents innovation e.g. energy efficiency services)

BSI Protection Profile (3rd pillar)

- Request by the BMWi for protection profile for smart meter to the BSI (Federal Office for Information Security)

Criticism:

- Only devices „within the house“ are taken into account, whereas reliability of external entities handling the data is merely assumed.
- Process specifications of the Federal Network Agency are not taken into account.
- Implementing IT-security measures and „intelligence“ into every metering device (Smart Meter Gateway) causes cost explosion

→ **Need for product- and process-related technical data protection**.

Types of data protected by the EnWG

- **EnWG protects only meter data**
  - data taken from the metering system
  - the measured consumption
  - and all linked informationen (e.g. time stamp, Meter-ID etc.)

Smart Metering System (BSI)

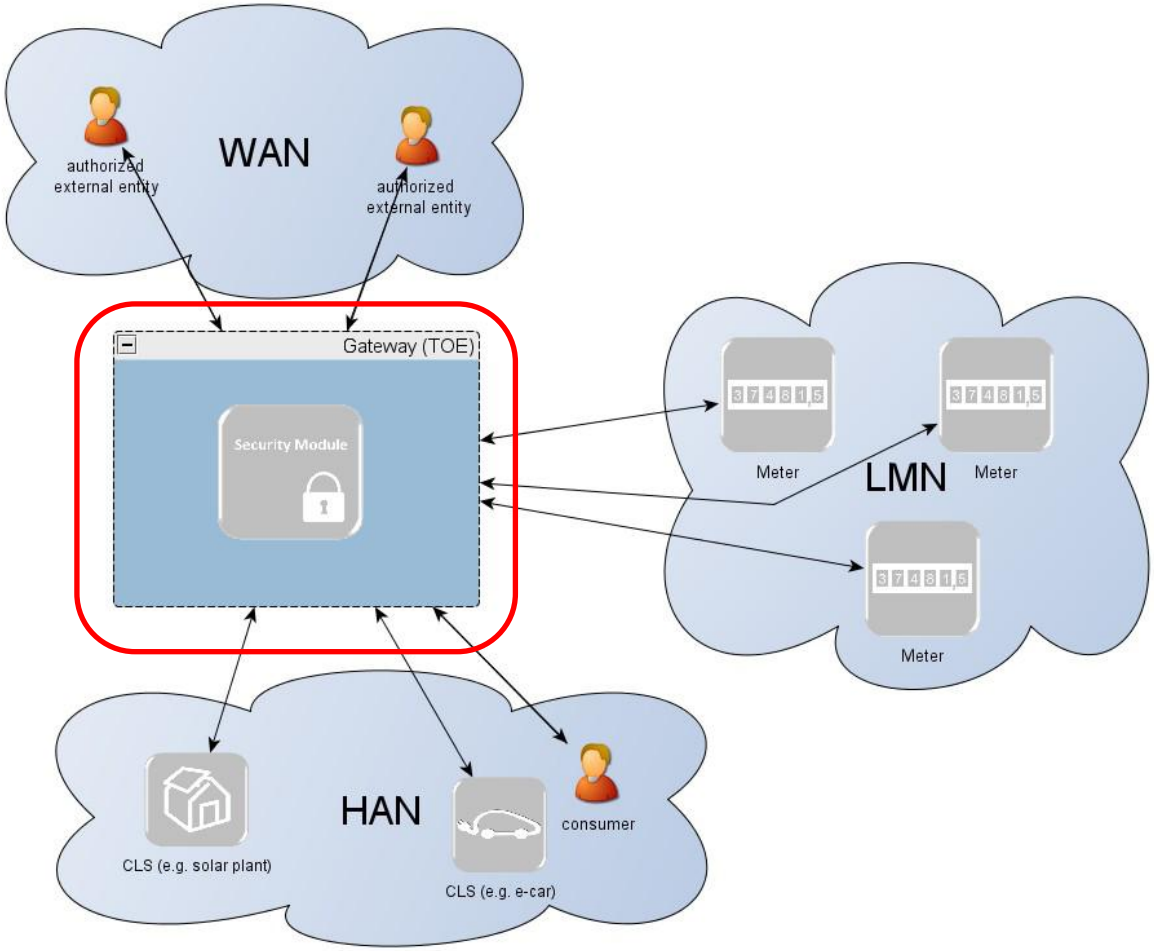
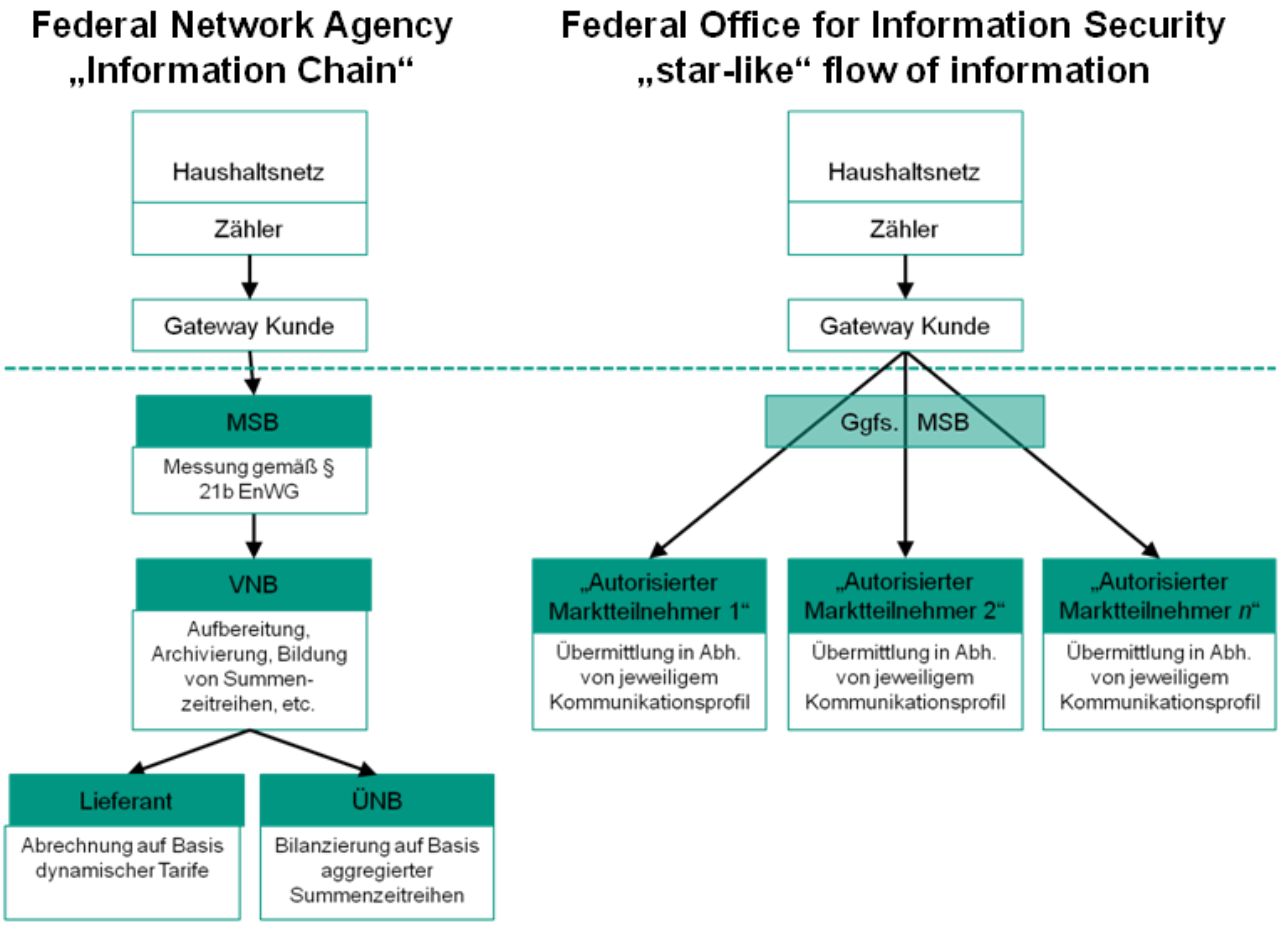


Fig. BSI-Protection Profile Smart Meter Gateway

Problem: Market communication

Federal Network Agency vs. BSI



BSI - Protection Profile (3rd pillar)

- **Key Questions: personal identification and data granularity**
  - **Energy supplier**: billing based on dynamic tariffs requires personalized, highly granular data
  - **Other entities:** lower granularity of data or pseudonymous / anonymous data might be sufficient

BSI - Protection Profile Gateway

Purpose

- Minimum requirements for privacy-friendly operation
- Basis for product testing (Certificates)
- achievement of uniform safety standards and a high level of IT-security

BSI - Protection Profile Gateway

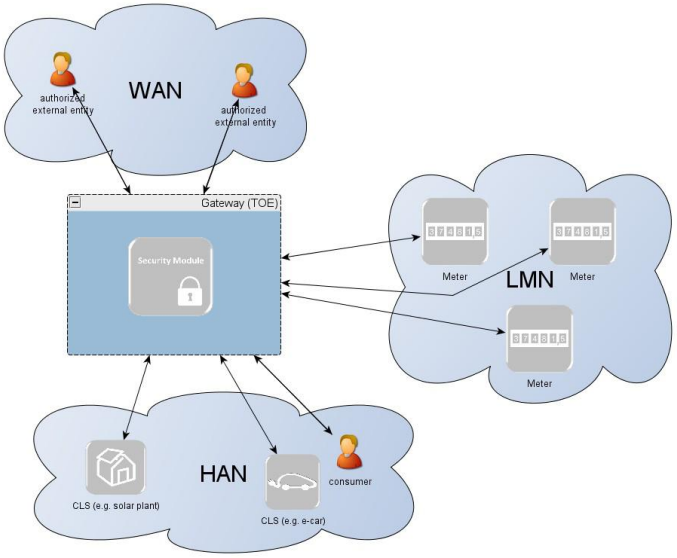
Functionalities of the Smart Meter Gateway

- Central communication unit in the Smart Metering System
- Central component that collects, processes and stores the meter data
- special kind of firewall to fend attacks from the outside of the Gateway
- Responsible for distribution of meter data to authorised external parties
- Communication interfaces, time service (time-stamps)
- Consumer log (contains the information about the information flows)
- “Aliasing”

BSI - Protection Profile Gateway

The Gateway and it`s direct environment

- Connection with the LMN (local metrolocical network)
  - LMN-Meter records the consumption or production of energy in defined intervals and submits them to the Gateway
- Connection with the WAN (wide area network)
  - Only authorised external parties
- Connection with the HAN (home area network)
  - controlling of interruptible consumer equipment , CLS (controllable local system e.g. e-car or solar-panel)
  - visualisation of energy consumption



BSI - Protection Profile Security Module

Target of Evaluation:

- Security module as a „cryptographic service provider”
- Physically embedded into the Gateway and protected

Purpose:

- Integrity and authenticity

Functions:

- Storage for confidential assets/cryptografic keys and further data relevant to the Gateway
- generating and verifying digital signatures

Thank you for your attention!

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