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The BSI Smart Metering Gateway Protection Profile – an evaluation

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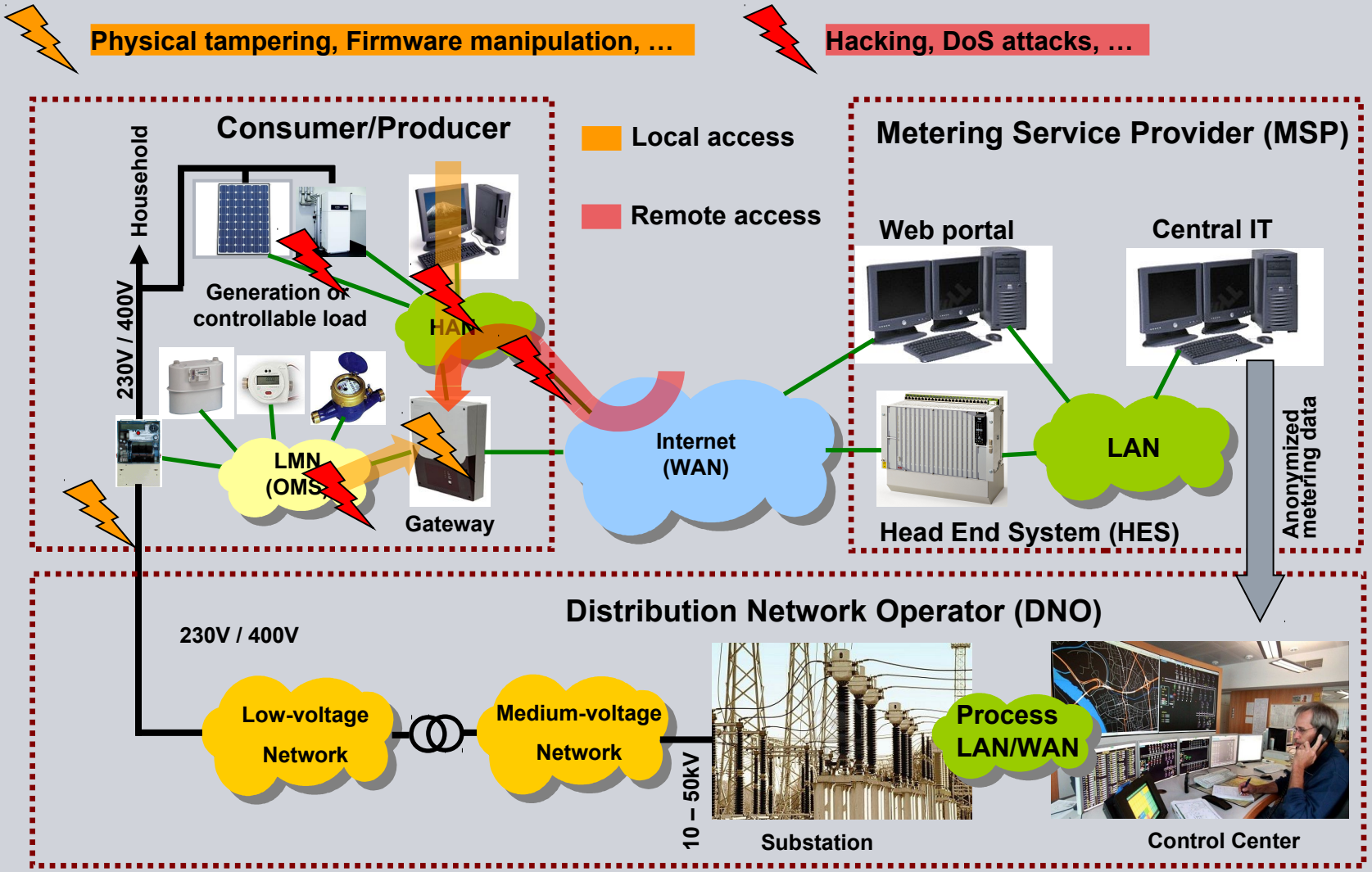
Outline

- Application context: Smart Metering (SM) and its regulation
- Certification background: Common Criteria, Protection Profiles
- Technical content of BSI's Protection Profile for SM gateways
- Some comments on the BSI's Protection Profile

Context of the Smart Metering Gateway (GW) with attack points



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History of Germany Smart Metering GW security regulations

- In September 2010, the BMWi (Bundesministerium für Wirtschaft und Technologie) commissioned the BSI (Bundesamt für Sicherheit in der Informationstechnik) to provide a Protection Profile for SM Gateways.
- According to the Common Criteria (CC) approach, the SM Gateway Protection Profile (PP) shall define the minimum security requirements for Smart Metering gateways in an implementation-independent way.
- Since mid-2011, partly to ensure interoperability of Smart Metering devices, several more detailed supplementary guidance documents (TR: Technische Richtlinie) are under development.
- Several commenting rounds with industry have been executed; high amount of feedback has been partly considered in revisions.
- Deadline according to EnWG (§21e.(4) Energiewirtschaftsgesetz) for mandatory use of certified SM gateways was end-2012, but postponed by at least two years due to significant delays in the definition process.

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Common Criteria (CC) for IT security evaluation

Common Criteria

product-oriented methodology

for IT security assessment

ISO/IEC **standard** 15408

Current version: 3.1R3 of July 2009

Aim: gain confidence in the security of a system, via impartial review

- What are the objectives the system should achieve?
- Are the measures employed appropriate to achieve them?
- Are the measures implemented and deployed correctly?

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CC: Security Targets and Protection Profiles

Security Target (ST): defines extent and depth of the evaluation

for a specific product called *Target of Evaluation (TOE)*

Protection Profile (PP): defines extent and depth of the evaluation

for a whole class of products, i.e. firewalls

STs and PPs may inherit ('*claim*') other PPs.

ST and PP specifications use **generic** "construction kit":

- Building blocks for defining *Security Functional Requirements (SFRs)*
- Scalable in depth and rigor: *Security Assurance Requirements (SARs)*

typically layered as *Evaluation Assurance Levels (EALs)*

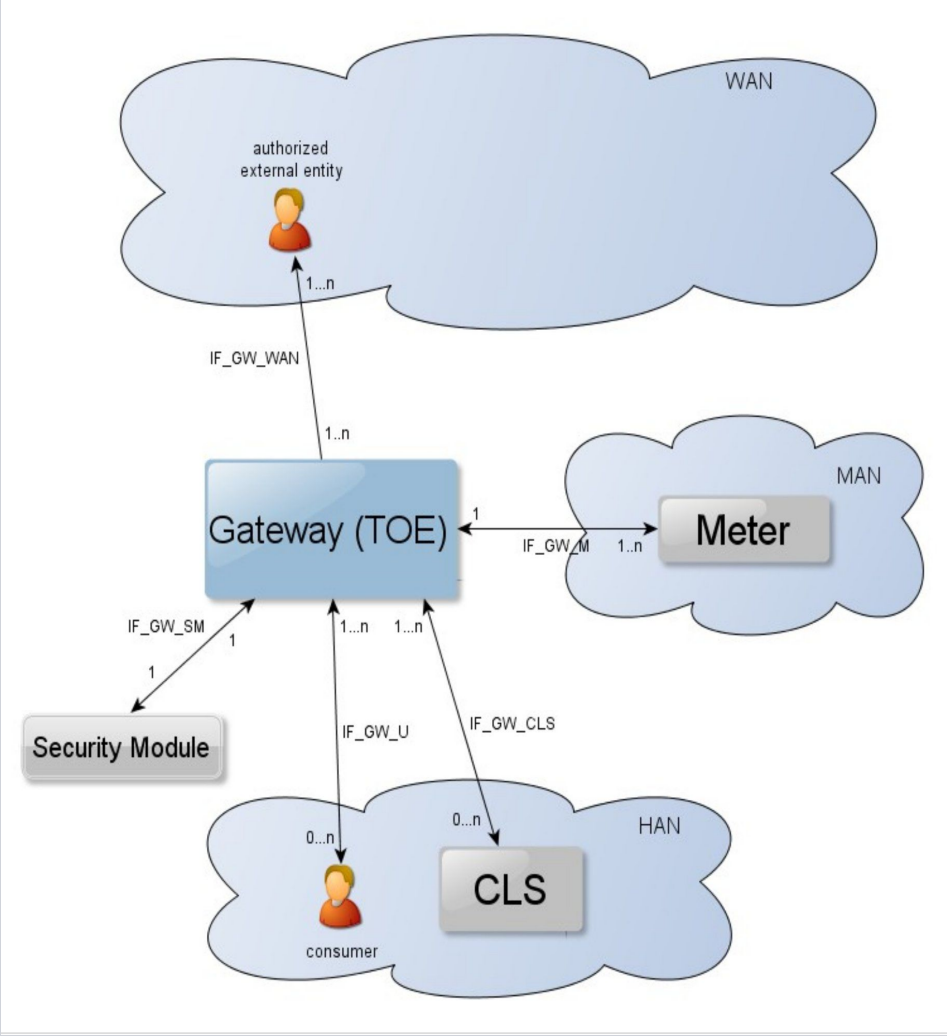
BSI PP for the Gateway of a Smart Metering System: TOE definition (1)

TOE: the local gateway between

Metrological Area Network (MAN)
with meters for commodities

Home Area Network (HAN)
with consumer display and CLS

Wide Area Network (WAN)
with authorized Service Providers



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BSI PP for the Gateway of a Smart Metering System: TOE definition (2)

- **The TOE of the SM PP is a gateway** serving as the communication unit between devices of private and commercial consumers and *Service Providers* of a commodity industry (i.e., electricity, gas, water).
- *Service Providers*: the Gateway Operator, Meter Operator, Metering Service Provider, Grid Operator, Commodity Supplier and others.
- Typically, the Gateway will be placed in the household or premises of the consumer and enables access to local meters and *Controllable Local Systems (CLS).*
- The gateway collects, processes and stores meter data and is responsible for the secure distribution of this data to external parties.
- It protects all critical information using digital signatures and encryption.
- It also serves as a firewall and should have a fail-safe design.
- It contains a mandatory user interface with access control.

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BSI PP for SM GW: List of major requirements (1)

1. Communication security

- Transport-level protection on all channels, with **mandatory use of TLS v1.1**
- Application-level confidentiality, integrity, and authenticity protection
- Firewall functionality: GW is connection initiator with optional wake-up mechanism

2. Cryptography support, mandatory use of Hardware Security Module (HSM)

- Elliptic Curve Cryptography (ECC-256)
- Advanced Encryption Standard (AES-128)
- Secure Hash Algorithm (SHA-256)
- Random number generation (according to BSI AIS 20 / AIS 31)

3. Local key/certificate management with mandatory use of full-blown PKI

- Generate public/private key pairs and secret keys internally
- Store private/secret keys confidentially
- Send public keys in CSR to a sub-CA of the PKI
- Receive certificates from sub-CA
- Store certificates in a tamper-proof way
- Full certificate chain checking including CRLs
- Update of outdated or compromised key material

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BSI PP for SM GW: List of major requirements (2)

4. Meter data handing

- Secure time-stamping of meter data
- Secure logging of application-level events
- Pseudonymization of personal data to support data protection requirements

5. Device management

- Tamper protection and detection
- Secure incident logging
- Secure GW software update
- Key management for connected meters and CLS

6. Local user management

- Authentication of users
- Access control (for consumers and administrator)

Assurance Requirements

EAL4 (methodically designed, tested and reviewed), augmented by

- *AVA_VAN.5 (Advanced vulnerability analysis; resistance to high attack potential)*
- *ALC_FLR.2 (Life-cycle support; flaw reporting procedures)*

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Comments on the BSI's SM GW PP

- Clear security requirements for the gateway
- High assurance level of critical system component
- Strong national standard ensuring interoperability
- Real-time communication support and DoS protection not addressed
- Technical detail: Multiple layers of protection, comprehensive PKI, mandatory use of HW crypto module and point-to-point connections
- Potentially high costs per GW device, installation, and system operation


Questions?
Comments?