NORM – Next generation Open real-time Smart Meter

Background:

Unbundled Smart Meter (USM) architecture,

Support for Smart Grid
Real-time data

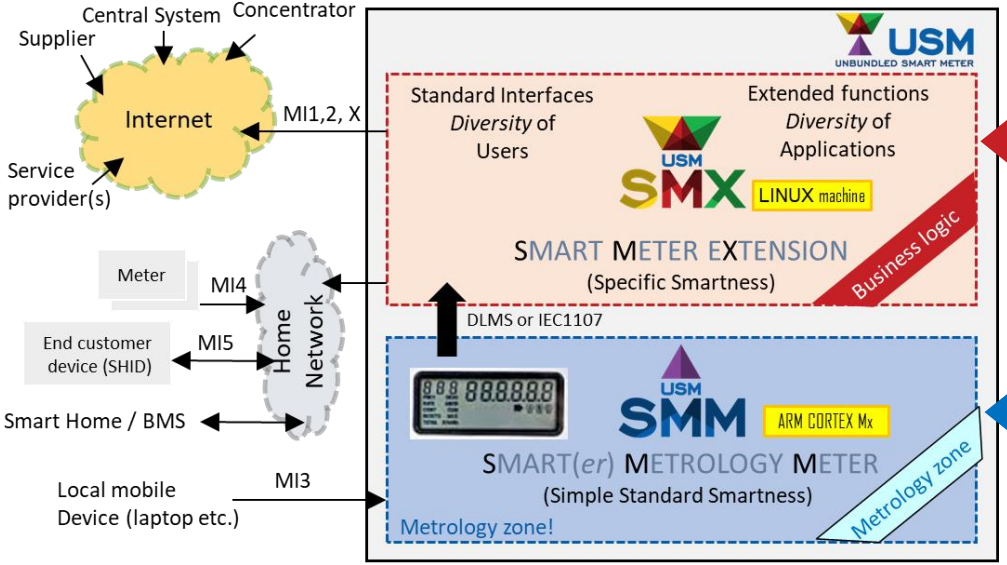
Support for Power Quality
Including harmonics

Support for Energy services

Support for dynamic energy markets

Support for production and storage control

Support for security and privacy



- Competition of Ideas on Smart Grid Functionalities
- Frequent changes, based on Smart Grid evolution
- New business cases easily deployed

- Competition on Standard equipment
- Minimal risk of being technically obsolete during its lifecycle (e.g.15 years)
- Securing investment

Support for
Unknown yet !

(services of the future)

Developed in
NOBELGRID
project

Nobel Grid
Smart energy for people

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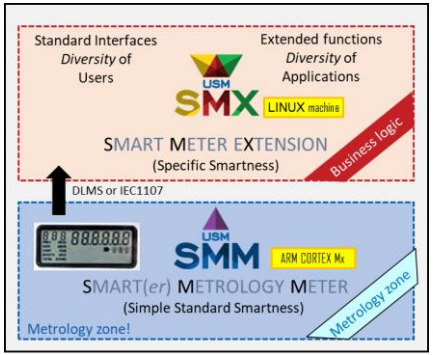
SUCCESS → Next generation Open real-time Smart Meter

Targeting new functionalities:

- Serving **Active distribution networks**, microgrids, high RES
- Implementing SUCCESS **Security Solutions**, facing cyber attacks

Open source part



Synchro

NORM

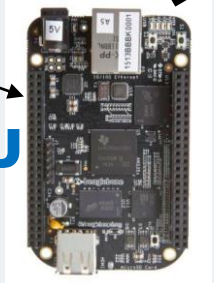
SMM

SMX

SMG

Smart meter Gateway

PMU



High data security

PUF technology

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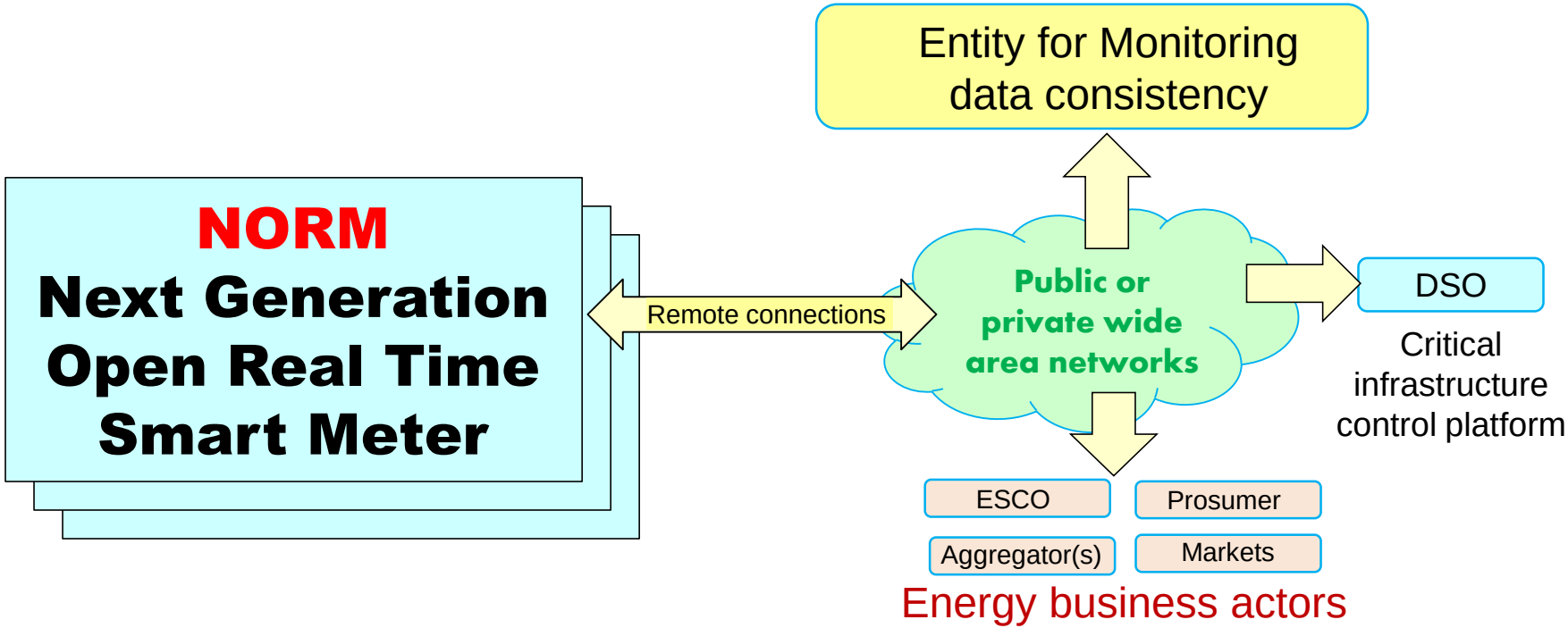
Benefits: Increase Smart Grid cyber-security ← killing factors ↘
Multi-actor, ease renewables penetration, keep privacy



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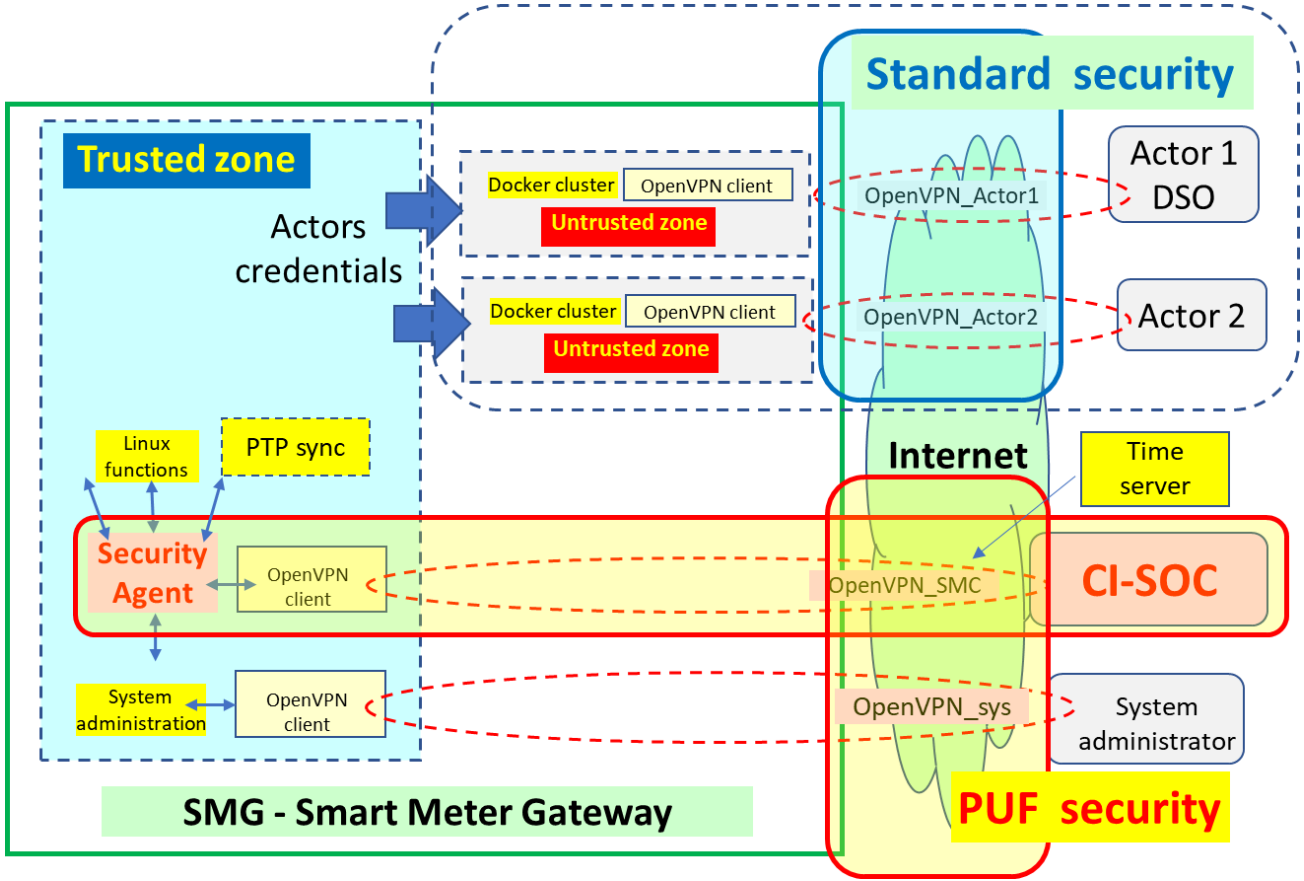

NORM

Design related to cyber-security

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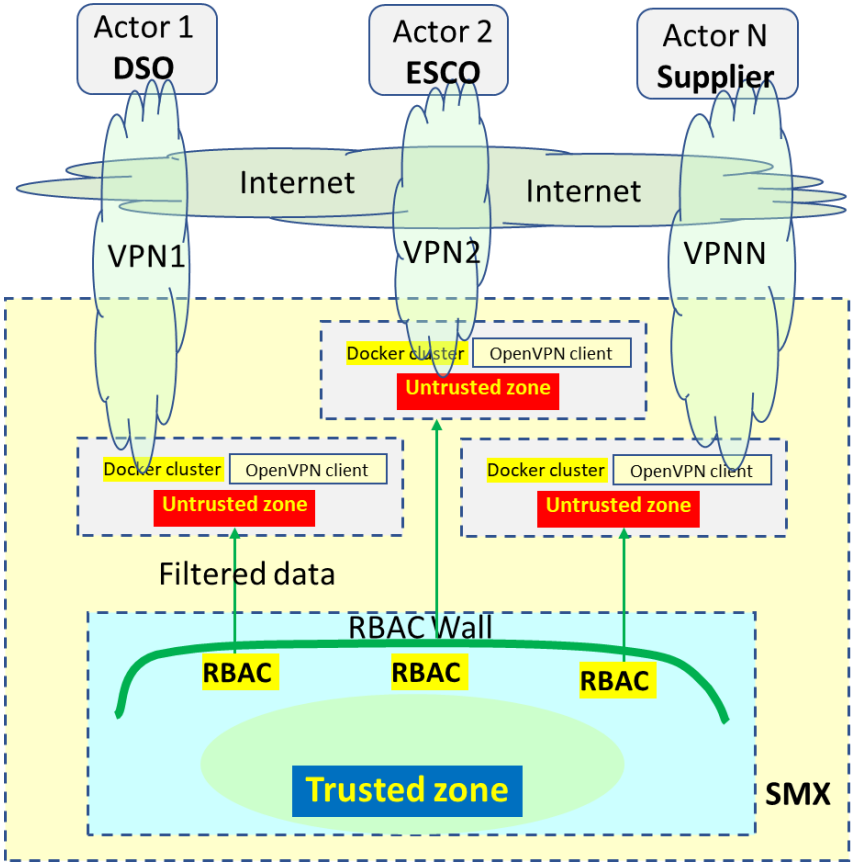

Role-Based Access Control (RBAC)

NORM

RBAC

Design related to cyber-security and Privacy

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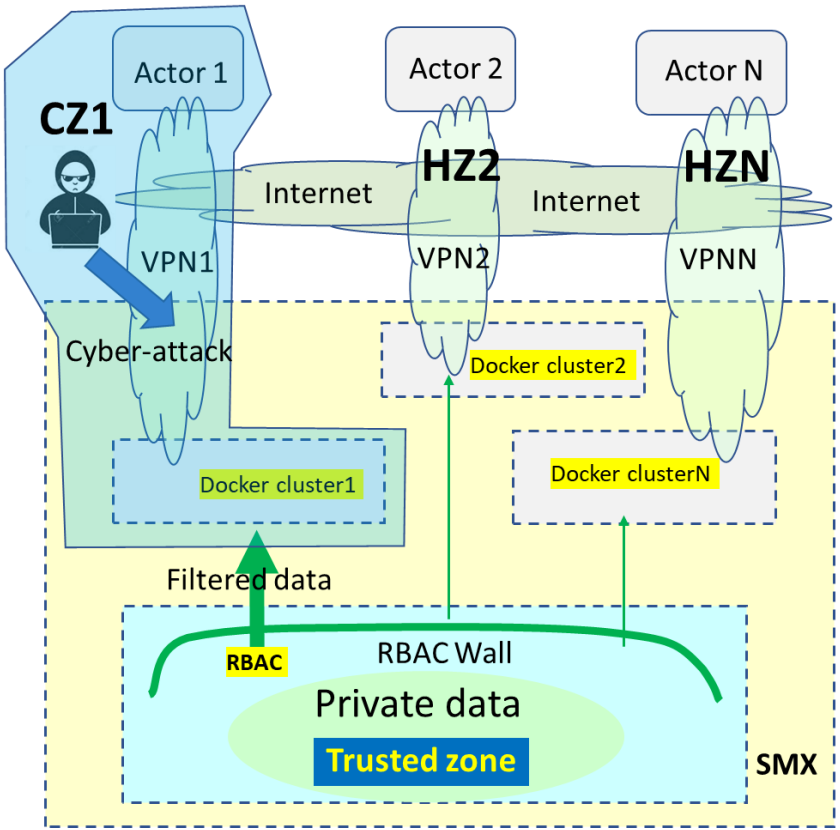

Compromised zone is limited to actor 1
No access to core (trusted) zone

Privacy is compromised only related to Actor 1 data exchange

Limited damage

Role-Based Access Control (RBAC)

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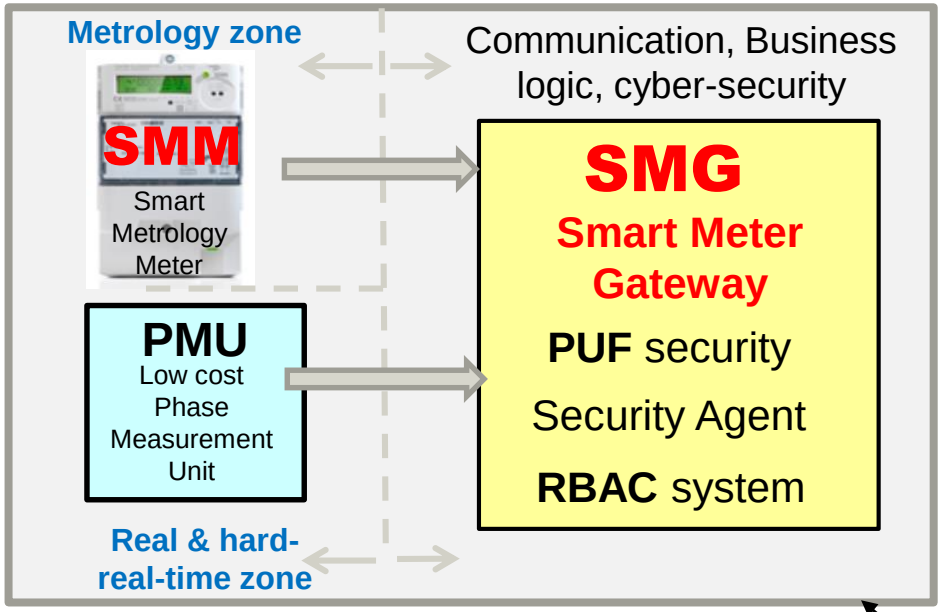
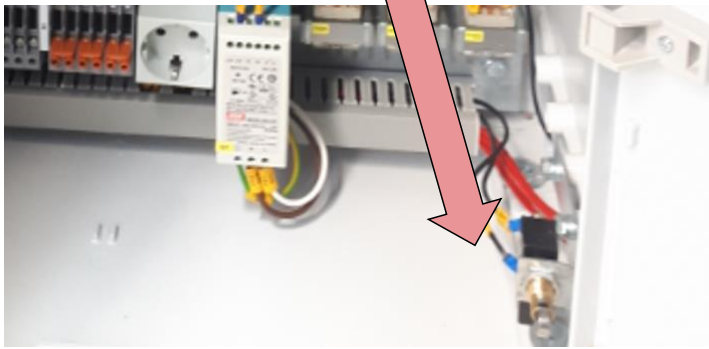


NORM (Next Generation Open Real Time Smart Meter)

NORM

Detecting tampering at device level

Physical intrusion detection (switch)



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Data security assessment on each level, using **frequency as real-time "marker"**

Checking consistency at each grid level to detect abnormalities:

Abnormalities at **NORM** level:
- Frequency from meter (each 1 second)
- Frequency from PMU (each 1 second)

Abnormalities at local grid level:
- Grid frequency from **NORM**_1
- ……
- Grid frequency from NORM_n

Abnormalities at national and Pan-European level:
- Frequencies from regional/national grid 1
- ……
- Frequencies from regional/national grid n

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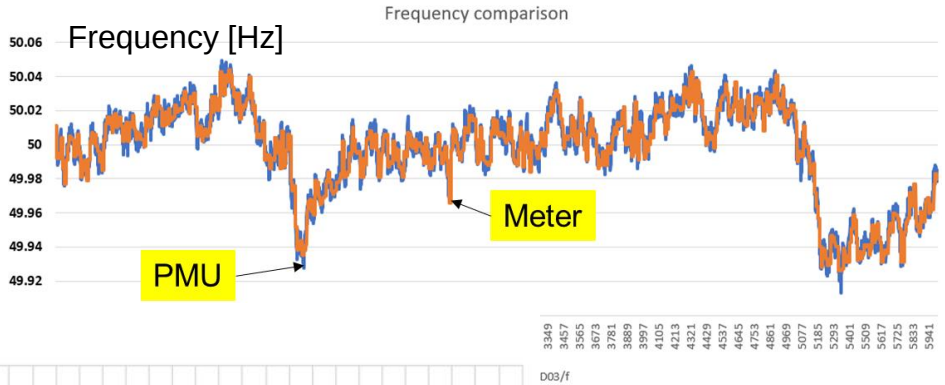
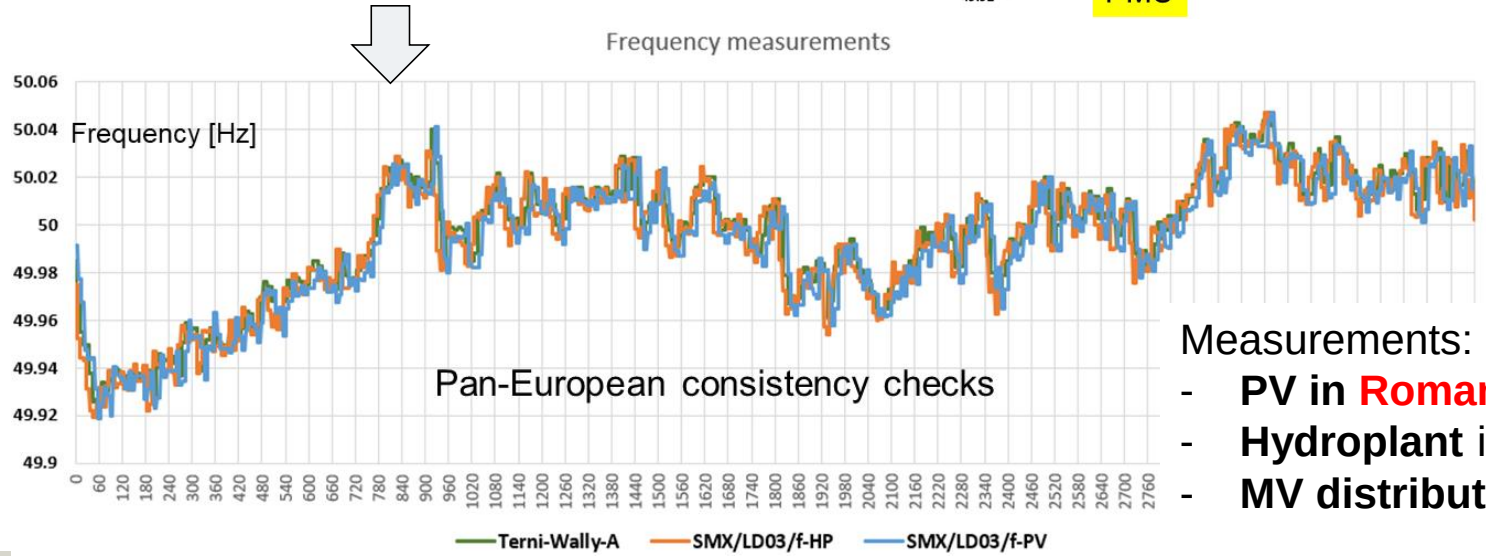
Normal data measurement (without abnormalities) at different levels:

Detecting possible abnormalities
Comparing frequency measurements at different scales at local (NORM), **national** and **Pan-European** level:





Measurements:
- **PV in Romania**
- **Hydroplant** in **Romania**
- **MV distribution** in Terni / **Italy**

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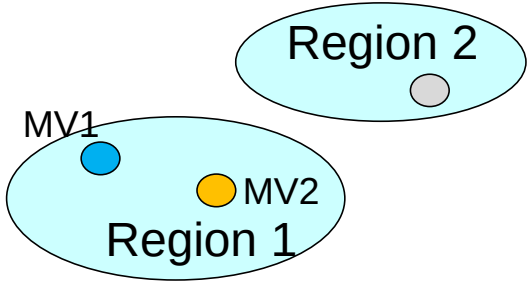
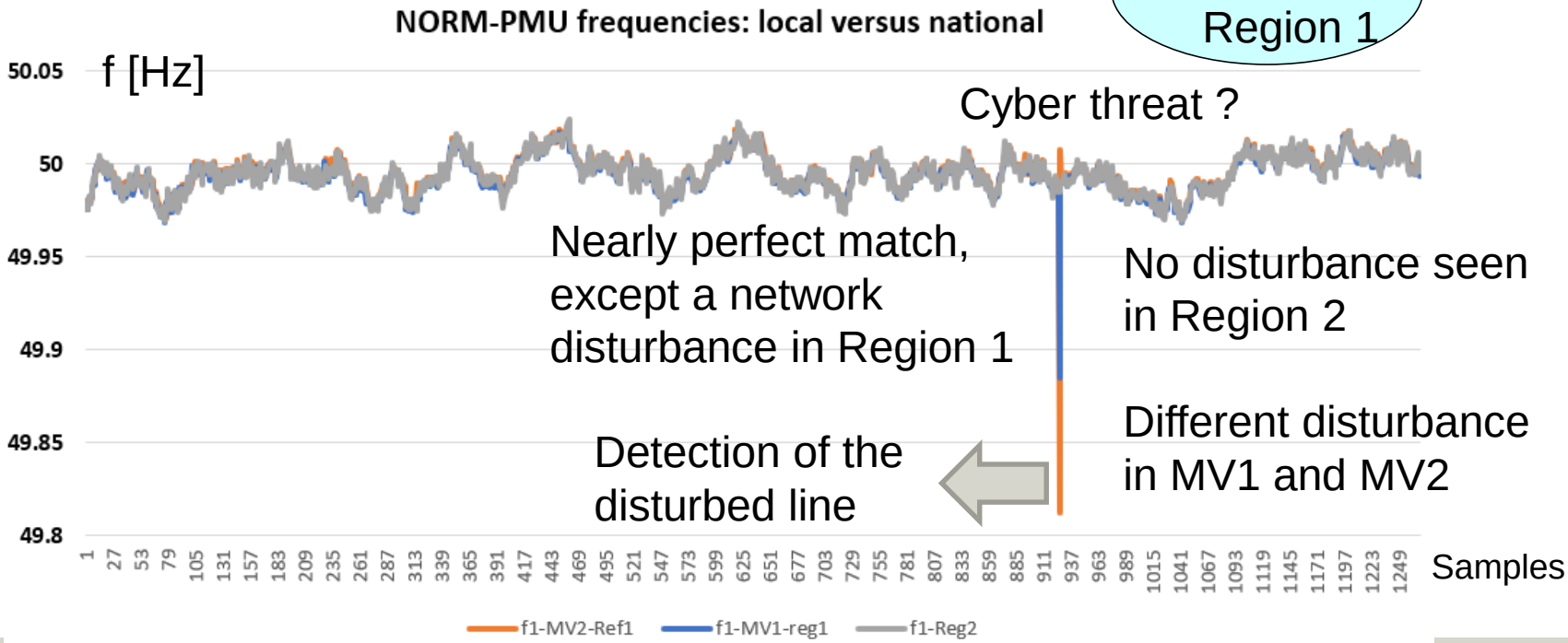
Measurements with abnormalities at grid level:

Patterns in grid measurements to detect suspicious data





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Recap.
Different security related measures are applied to NORM:

Data integrity check: Performed inside NORM

Detecting tampering at NORM device level

Role-based Access Control (privacy, limited damage)

Security Agent and CI-SOC recognizing bad traffic

High level encryption: PUF technologies

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Thank you for your attention

Questions ?

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