R2D2

Reliability, Resilience and Defense technology for the grid

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etra I+D

elpros

SCC

Cyber Noesis

guardtime

GRUPO Anticipating a cyber secure world

ICCS

ems services

HEDNO

Elektro Ljubljana Obnovljivi viri energije

NEW by EDP & CTG

E-REDES

edp Labelec

MP institute MIHAILO PUPIN

University of Cyprus

Imperial College London

Rte international

R²D² Workshop

08,07,2025

DERs control for flexibility and congestion management – Slovenian Pilot

ELEKTRO LJUBLJANA / JURIJ CURCK

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Reliability, Resilience and Defense technology for the grid

Pilot Information

- ELEKTRO LJUBLJANA (DSO) – site provider, demonstrator, evaluator of tools
- EL OVE- site provider, demonstrator, evaluator of tools
- ELPROS – technology (tools) provider(PRECOG, IRIS)
- ETRA- coordinator and technology provider(EMMA)
- GUARD- technology provider(PRECOG)

Overall Pilot Needs and Objectives

- Improvement of network operation security based on metering data
- Use of flexibility market to avoid emergency actions and network restoration
- Set up support for flexibility use in resilience purposes and coordination with TSO
- DSO - TSO congestion and power quality coordination

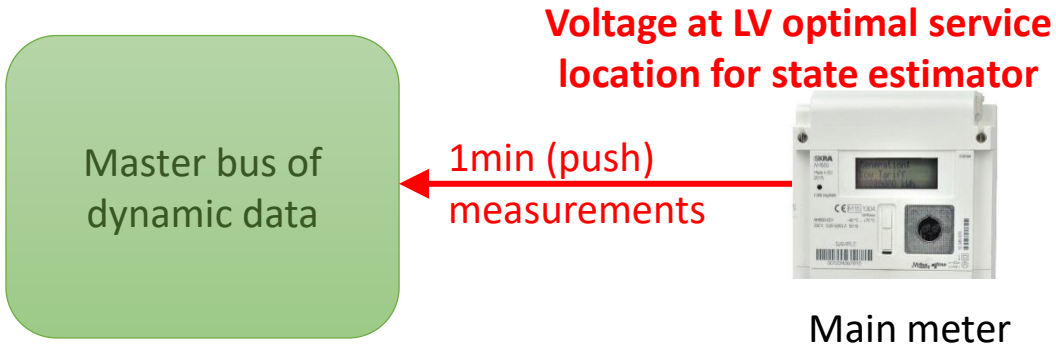
Pilot assets

- 20 MV/LV transformer stations,
- Conected grid users (generators, prosumers)
- RES Generation
  - HPP Zagradec Pr 420 kW
  - PV Ivančna Gorica Pr30 kW
  - PV Stična Pr 192,2 kW
  - PV Šmihel Pr 30 kW

Improvements & Benefits

- Weakness to solve
  - Lack of automation of RES connected to LV grid → UC 7
  - No secure link between SCADA and metering centre (LV measurements of smart meters) → UC 10
  - Lack of information exchange between TSO and DSO in case of restrictions in DSO grid → UC 11
  - Potential modification of TLS messages → UC 38

UC10- Improving of LV network observability based on billing metering system



Every minute smart meters publish measurements

Message (HEX):
00-01-00-01-00-01-04-C8-C4-02-4A-00-00-00-00-01-00-82-04-BC-01-00-01-82-0A-4C-02-08-09-0C-07-E8-05-06-01-01-1E-00-00-FF-88-80-11-08-12-09-32-12-09-08-12-09-3E-12-00-96-12-00-85-12-00-05-02-08-00-11-08-12-09-27-12-09-08-12-09-3E-12-00-B9-12-00-B8-12-00-04-02-08-00-11-08-12-09-1C-12-08-F7-12-09-46-12-00-8E-06-00-00-03-01

UC10- Improving of LV network observability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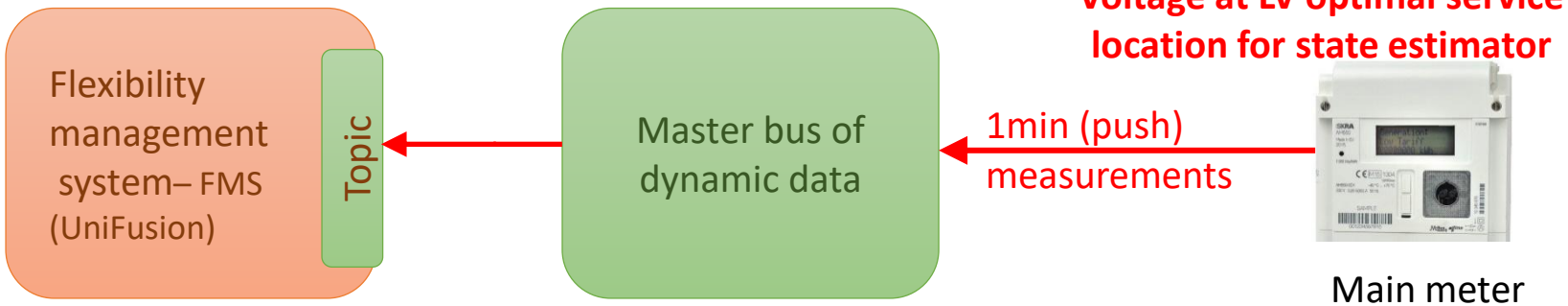

Master bus of dynamic data edits measurements data on xml structure and publishes on topic that flexibility is subscribed

UC10- Improving of LV network observability

UniFusion sends 1min measurements to DSO's ADMS/SCADA

Voltage at LV optimal service location for state estimator

ADMS
State estimator for LV service locations

1min measurements

Flexibility management system – FMS (UniFusion)

Topic

Master bus of dynamic data

1min (push) measurements

Application | Tase2

Tase2 [Tase2]

Clients | Client.PollRecords | Client.Items | Client.DataSets | Client.TransferSets | Server.PollRecords

Pregled telemetrije

3 / 24 [Prikaz 61 - 90 od 693]

Filter [Enota za daljinsko vodenje Vsebuje 'flexi']

Enota za daljinsko vodenje | Vsebuje | flexi | Izvrši

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EC4033765_168290807598_I2_A		2,24 A	13. 05. 2024 12:34:00	Dobro	2,24 A
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ES4254513_168287698523_U1_V		243,90 V	13. 05. 2024 12:34:00	Dobro	243,90 V

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EC4099238_168290807630_U2_V	EnergyMeter/Devices/3-249049/Items/U2_V	235,7	Normal	2024-04-26 12:47:00,000
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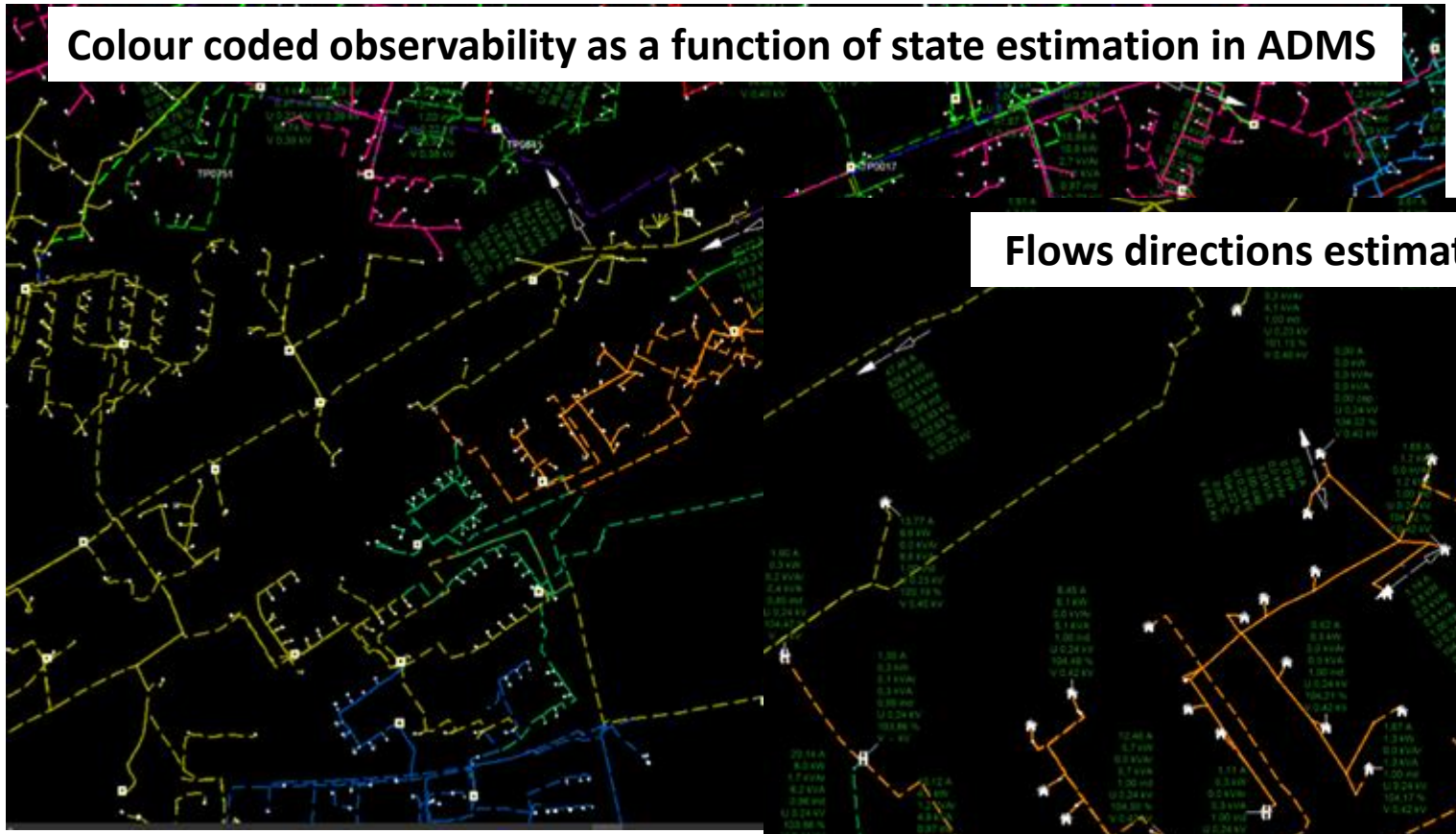
EC4065458_168290806330_U3_V	EnergyMeter/Devices/3-106179/Items/U3_V	226,8	Normal	2024-04-26 12:47:00,000

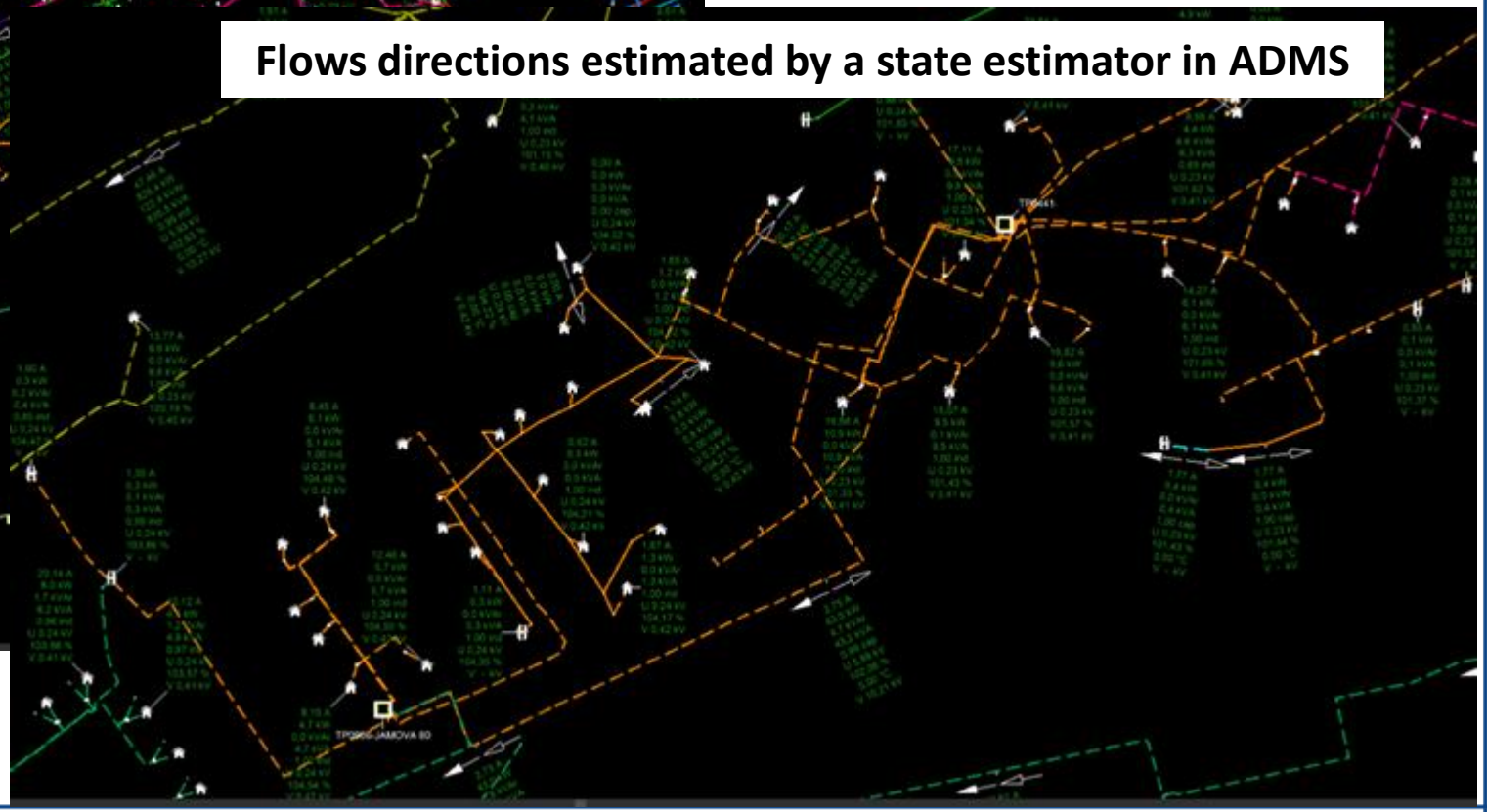
UC10

Benifit: Observability of LV increases, because of 1min measurements from smart meters

Colour coded observability as a function of state estimation in ADMS

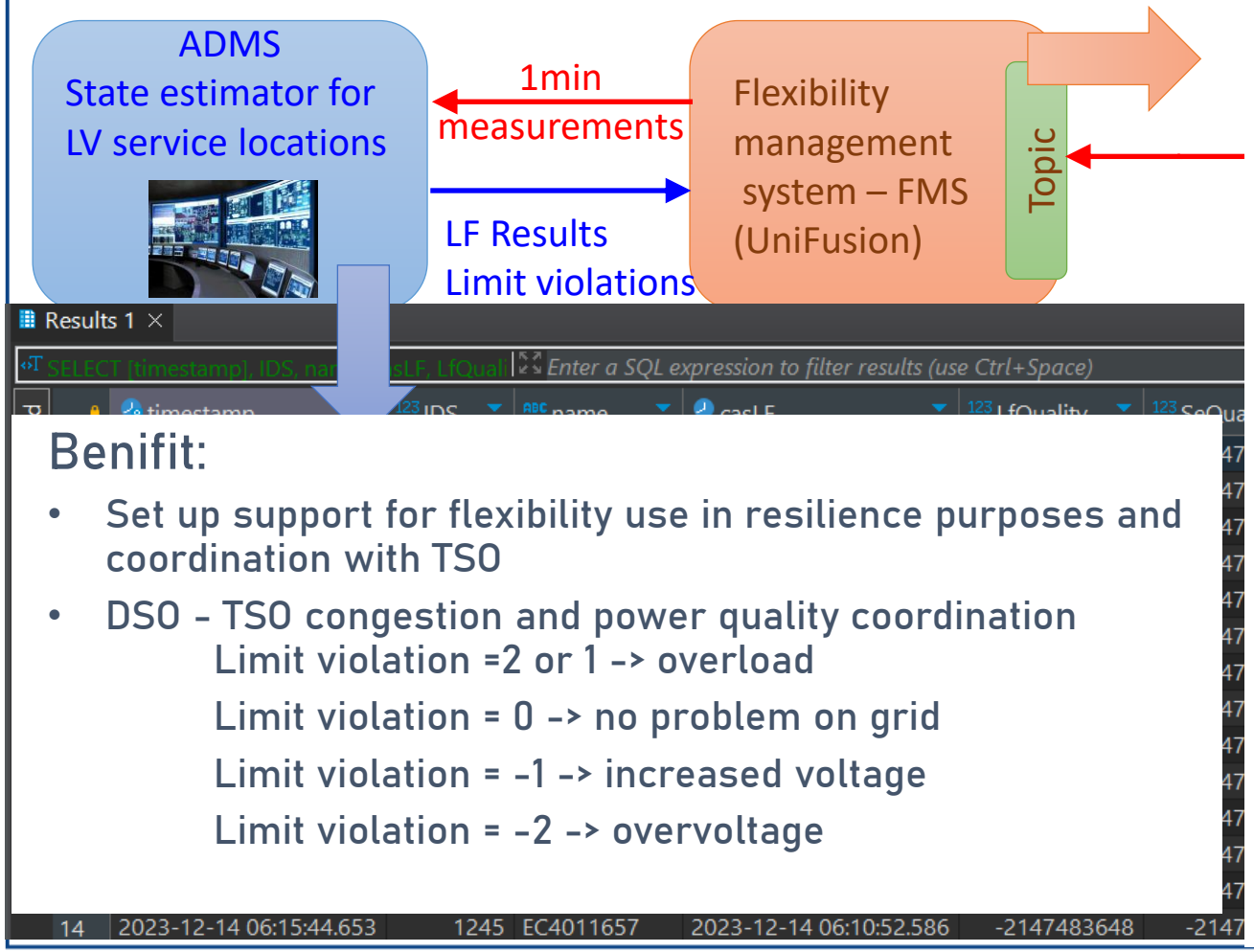


Flows directions estimated by a state estimator in ADMS



Slovenia Pilot

UC10+UC7:DSO – Enhancement in DER control



Benifit:

- Set up support for flexibility use in resilience purposes and coordination with TSO
- DSO - TSO congestion and power quality coordination
  - Limit violation =2 or 1 -> overload
  - Limit violation = 0 -> no problem on grid
  - Limit violation = -1 -> increased voltage
  - Limit violation = -2 -> overvoltage

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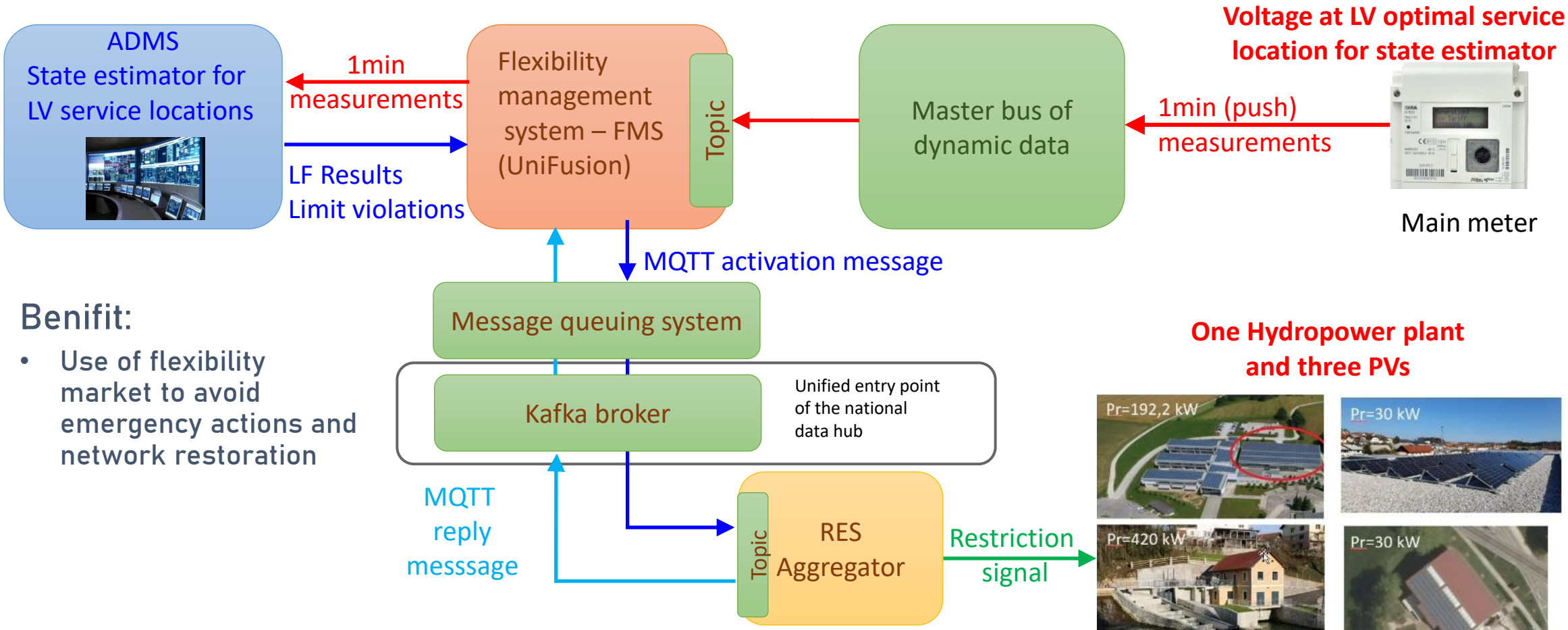
UC10+UC7:DSO – Enhancement in DER control



Benifit:

- Use of flexibility market to avoid emergency actions and network restoration

UC10+UC11:DSO – TSO congestion and power quality coordination in application of system services

ADMS
State estimator for LV service locations

1min measurements

LF Results
Limit violations

Flexibility management system - FMS (UniFusion)

Topic

Master bus of dynamic data

Voltage at LV optimal service location for state estimator

1min (push) measurements

Main meter

MQTT restirctions on DSO grid

Message queuing system

Kafka broker

Unified entry point of the national data hub

Topic TSO

Topic Aggregator 1

Topic Aggregator 2

Besed on Limit violation MQTT restriction messages are send to TSO and all aggregators

Message in case of overloaded grid

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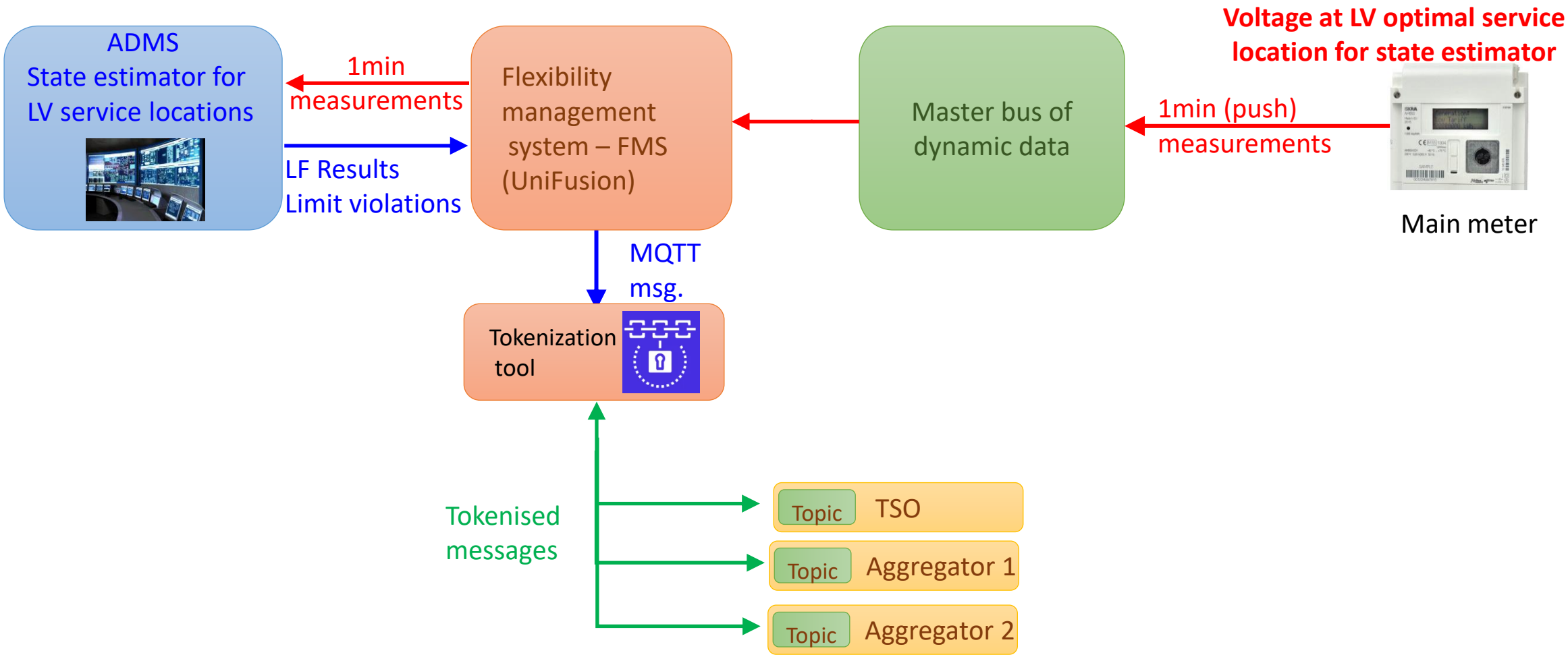
UC38- DSO grid balancing data tokenization



Potential questions o participants

- What happens if ADMs is not getting smart meter readings for improving observability?
- What happens if DER is not limiting their consumption/generation if communication is lost?
- What happens if aggregators are ignoring restrictions on distribution ‘red light’?
- Have you experienced any damage to the system or network infrastructure due to cyber or physical theft attacks?

R2D2

THANK YOU!

/ Connect with us:

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