250 million Smart Meter

Integration of Smart Meters with Distribution Automation and SCADA Systems

Presented by

Sylvain Jouhanneau - Director

EDF International Networks - India

EDF International Networks, 100% subsidiary of EDF Group, offers

engineering and operation capabilities

to power distribution companies, development banks &

investment funds, with **3 types** of contract structure:

- **Consulting** – Assessment of all areas
  of a power distribution company

- **Project management** on specific technical
  developments (for ex. Strategy, management &
  implementation of smart meter systems)

- **Direct or delegated management**
  of power distribution concessions or companies

EDF INTERNATIONAL NETWORK services

Technical performance

- General technical assistance
- Technical audit
- Network Planning:
  Master plan & Smart Planning
- Emergency planning
- Network monitoring
- Operation & Maintenance
- Engineering
- High/Medium/Low
  Voltage Live Works
- Protection plan

Support functions

- Training
- Framework and standards
- Prevention, safety and health
- Supply chain
- Emergency management
- Human Resources
- Information Technologies

Innovation

- Smart metering
- Smart grid
- Renewable integration planning
- Microgrids
- Automation
- Data management
- Digitalization
- Predictive maintenance
- Smart electrification

Economic performance

- Technical losses
- Non technical losses
- Customer management
- Metering, billing and recovering chain
- Pricing regulation
- Performance management
- Delegated management

100% owned by EDF Group (subsidiary since January 2008)

€14 billion turnover

€ 4.0 billion EBITDA

Electricity distribution, a regulated activity, overseen by the French Energy Regulatory Commission (CRE)

Enedis manages the public electricity distribution network for 95% of mainland France

Our public service mission: continuity and quality of service with non-discriminatory access to the network, regardless of the electricity supplier.

1.35 million km Power Lines

36 million Connected Customers
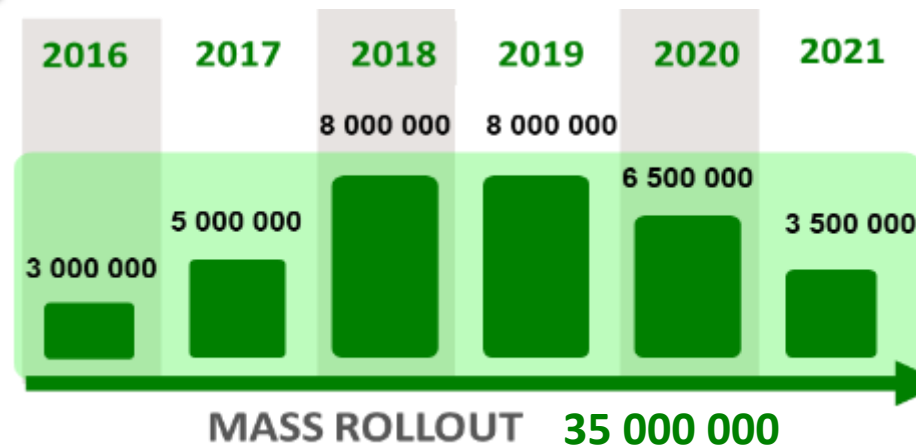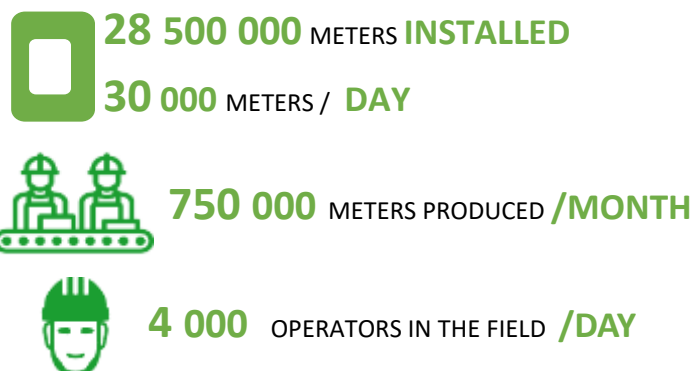
38,500 Employees

11 million Customer Interventions / Year

400 000 generation facilities connected to the distribution grid in France

French Smart Meter Program: 35 million of Linky

On time

28 500 000 METERS **INSTALLED**

30 000 METERS / **DAY**

750 000 METERS PRODUCED **/MONTH**

4 000 OPERATORS IN THE FIELD **/DAY**

2016	2017	2018	2019	2020	2021
3 000 000	5 000 000	8 000 000	8 000 000	6 500 000	3 500 000

MASS ROLLOUT 35 000 000

Quality

99% SUCCESS RATE OF REMOTE OPERATION

99 % DAILY COLLECTION RATE (23h59)

>1.5 billion **DATASETS**
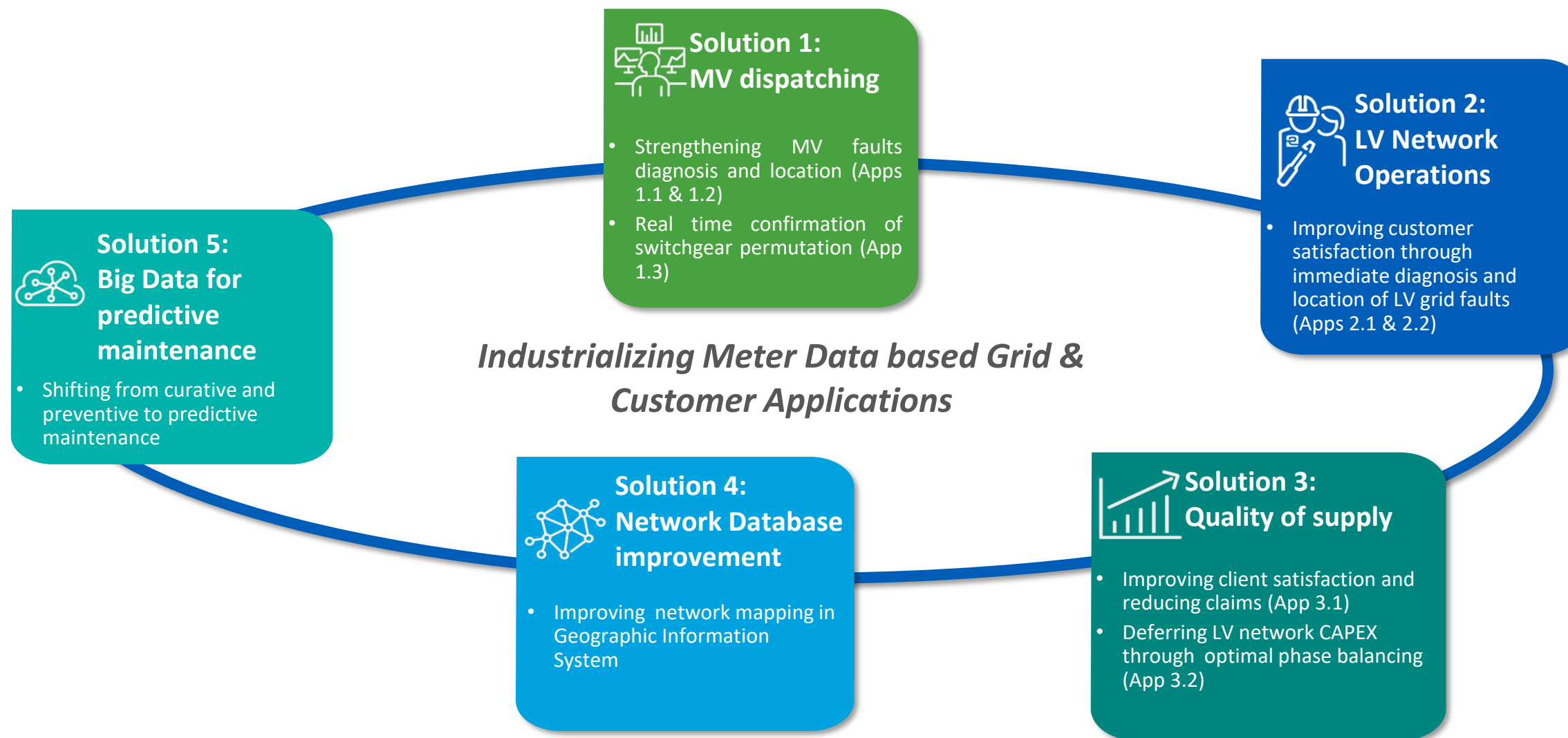COLLECTED / TRANSFERRED / STORED PER DAY

Budget

€4.2 billion (updated from initial forecasts of €5bn)
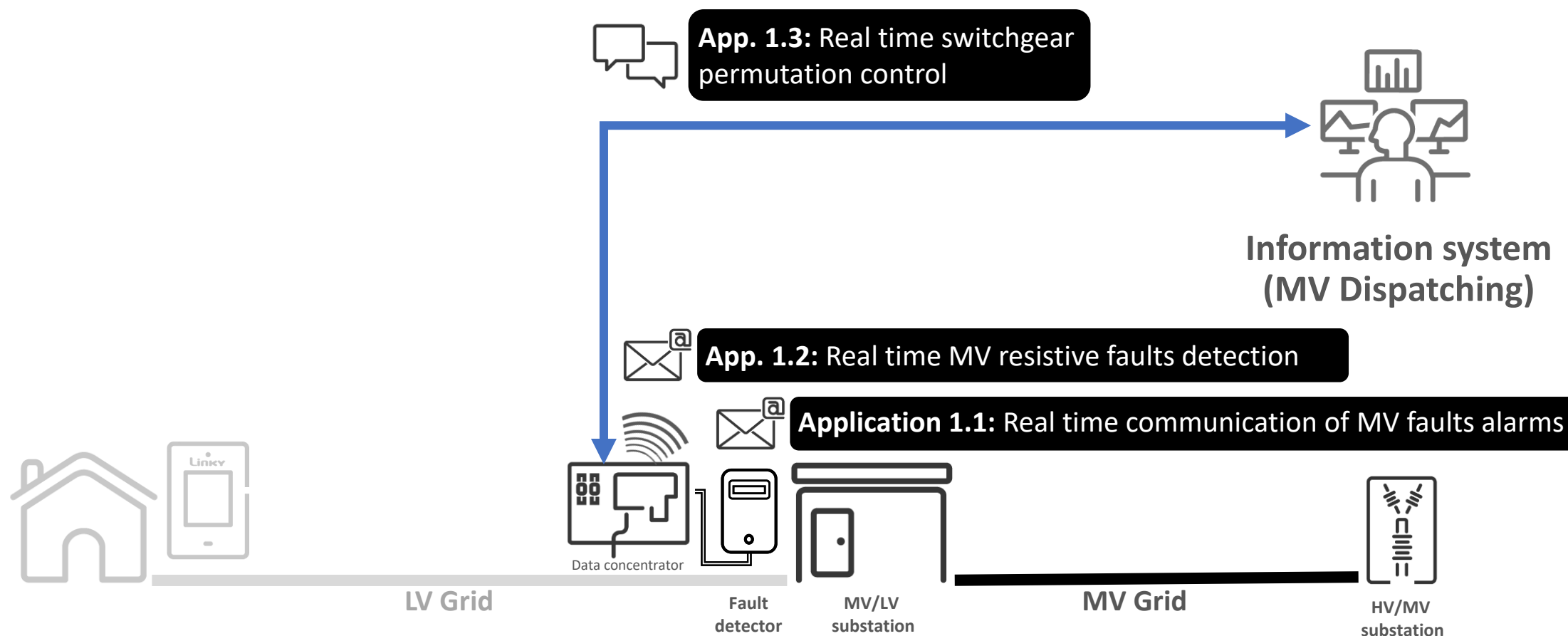
CAPEX BY 2021

Customer Satisfaction

Over 90% are satisfied with the installation

5

EDF

Solution 1:
MV dispatching

- Strengthening MV faults diagnosis and location (Apps 1.1 & 1.2)
- Real time confirmation of switchgear permutation (App 1.3)

Solution 2:
LV Network Operations

- Improving customer satisfaction through immediate diagnosis and location of LV grid faults (Apps 2.1 & 2.2)

Solution 5:
Big Data for predictive maintenance

- Shifting from curative and preventive to predictive maintenance

Industrializing Meter Data based Grid & Customer Applications

Solution 4:
Network Database improvement

- Improving network mapping in Geographic Information System

Solution 3:
Quality of supply

- Improving client satisfaction and reducing claims (App 3.1)
- Deferring LV network CAPEX through optimal phase balancing (App 3.2)

6

The AMI system helps detect and locate incidents which were not detectable until now, thus improving the **observability on both LV and MV networks**.
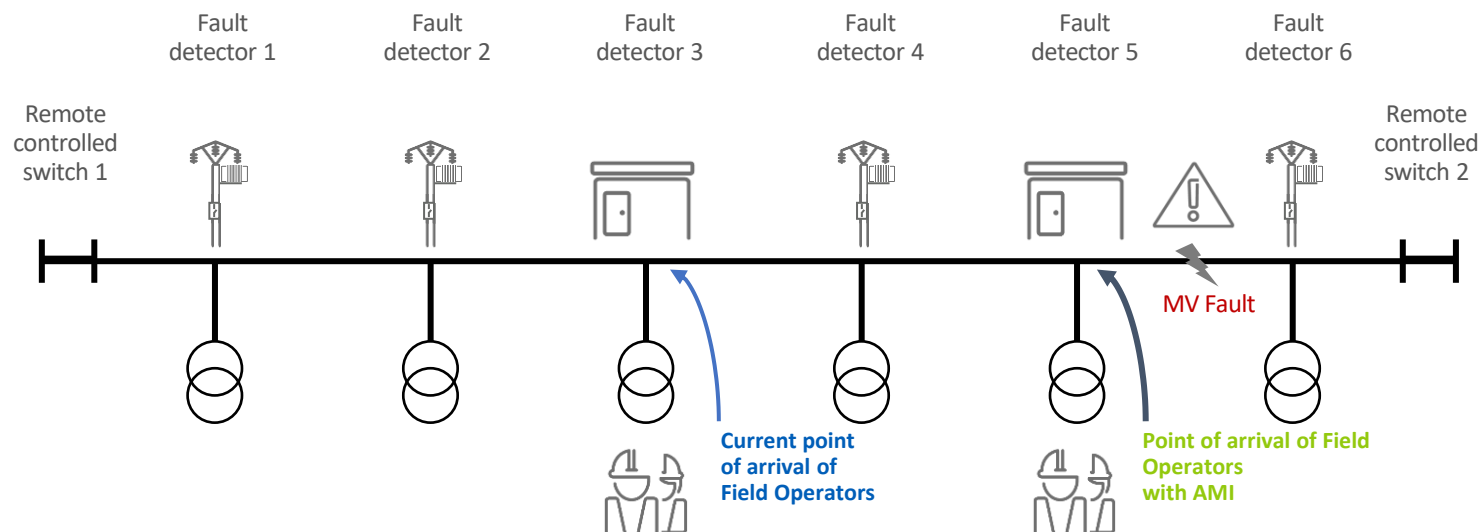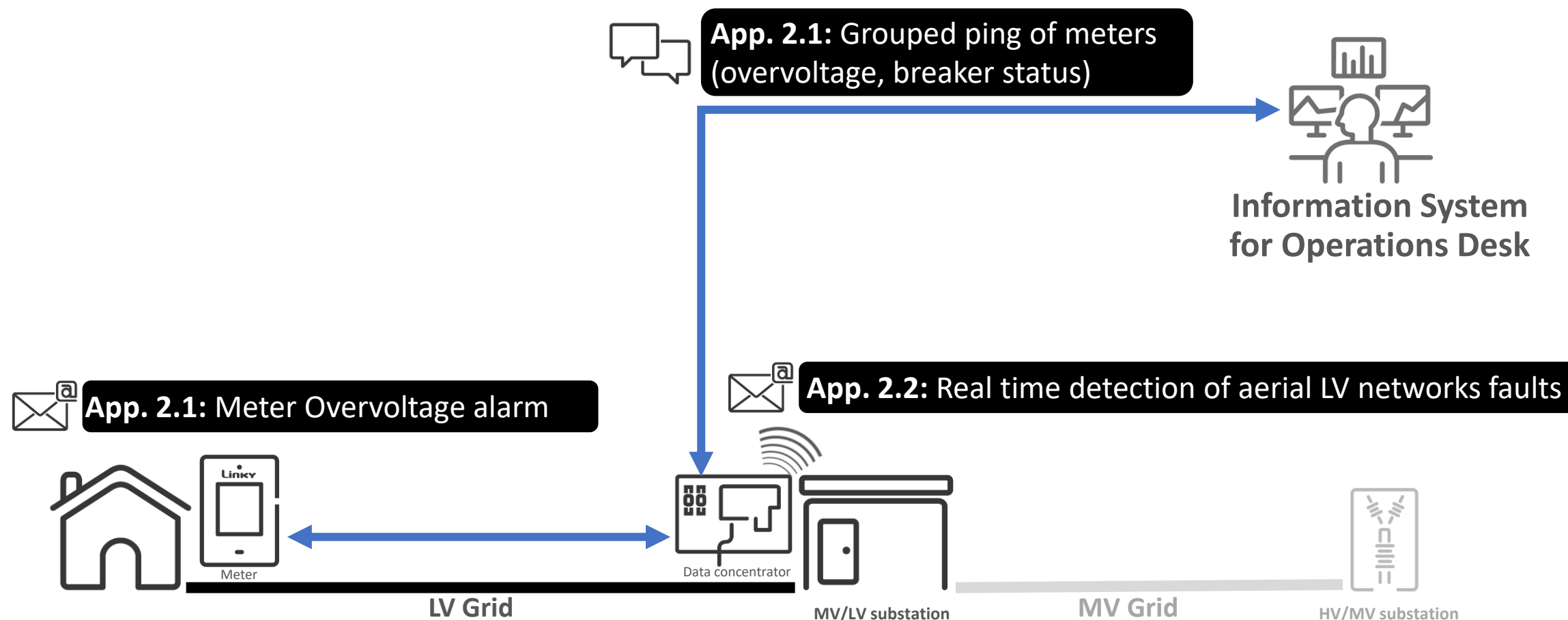
Improvement of MV network fault management

Remotely transmit information from sensors / fault detectors

Being notified of the power loss of a Data Concentrator

Example of solved situation

- A fault occurs on the MV network
- The AMI system transmits the information from fault detectors
- The MV Dispatching Center uses the information to locate precisely the fault, and send an operator on the field

Fault detector 1 Fault detector 2 Fault detector 3 Fault detector 4 Fault detector 5 Fault detector 6

Remote controlled switch 1

Remote controlled switch 2

MV Fault

Current point of arrival of Field Operators

Point of arrival of Field Operators with AMI

8

App. 2.1: Grouped ping of meters (overvoltage, breaker status)

Information System for Operations Desk

App. 2.1: Meter Overvoltage alarm

App. 2.2: Real time detection of aerial LV networks faults

Meter

Data concentrator

LV Grid

MV/LV substation

MV Grid

HV/MV substation

9

The AMI system helps detect and locate incidents which were not detectable until now, thus improving the **observability on both LV and MV networks**.
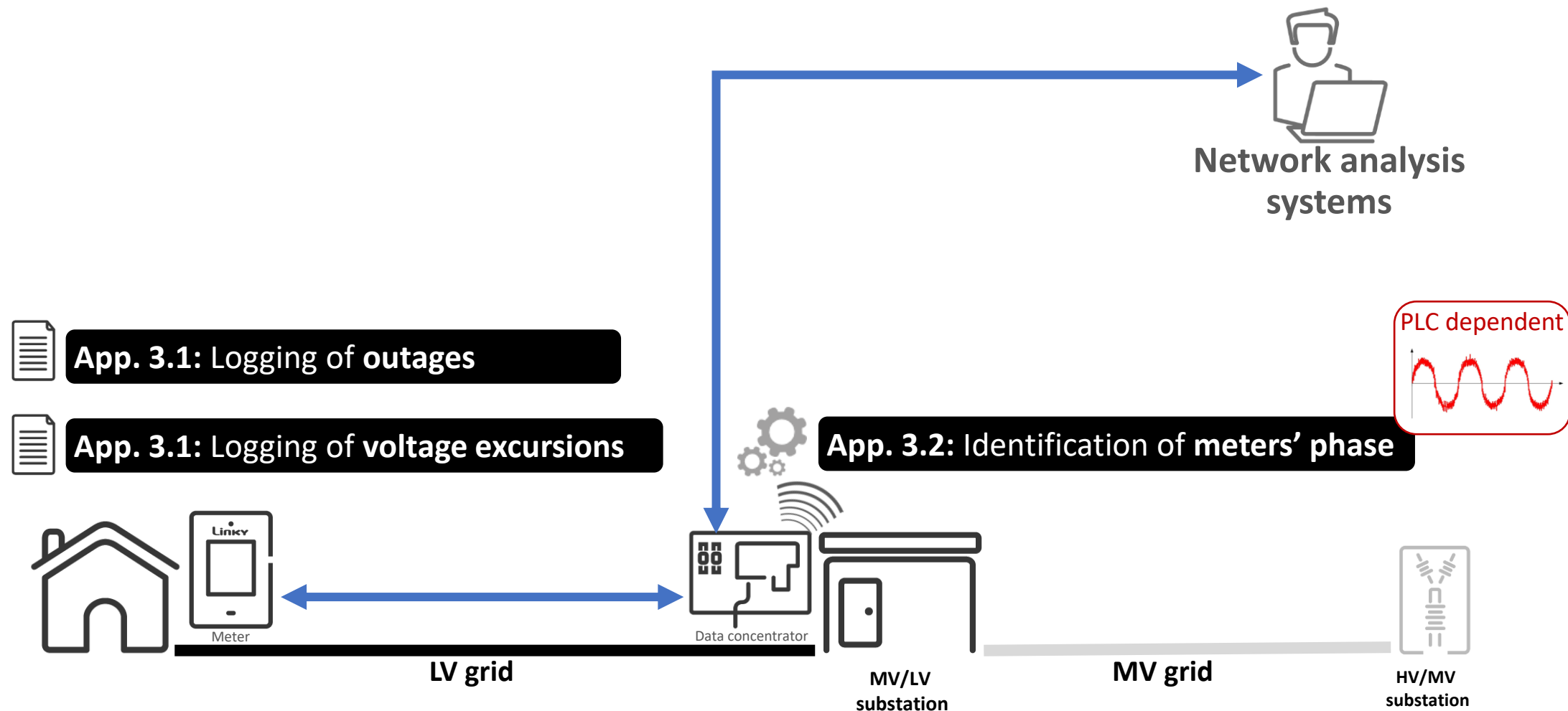
 LV network monitoring

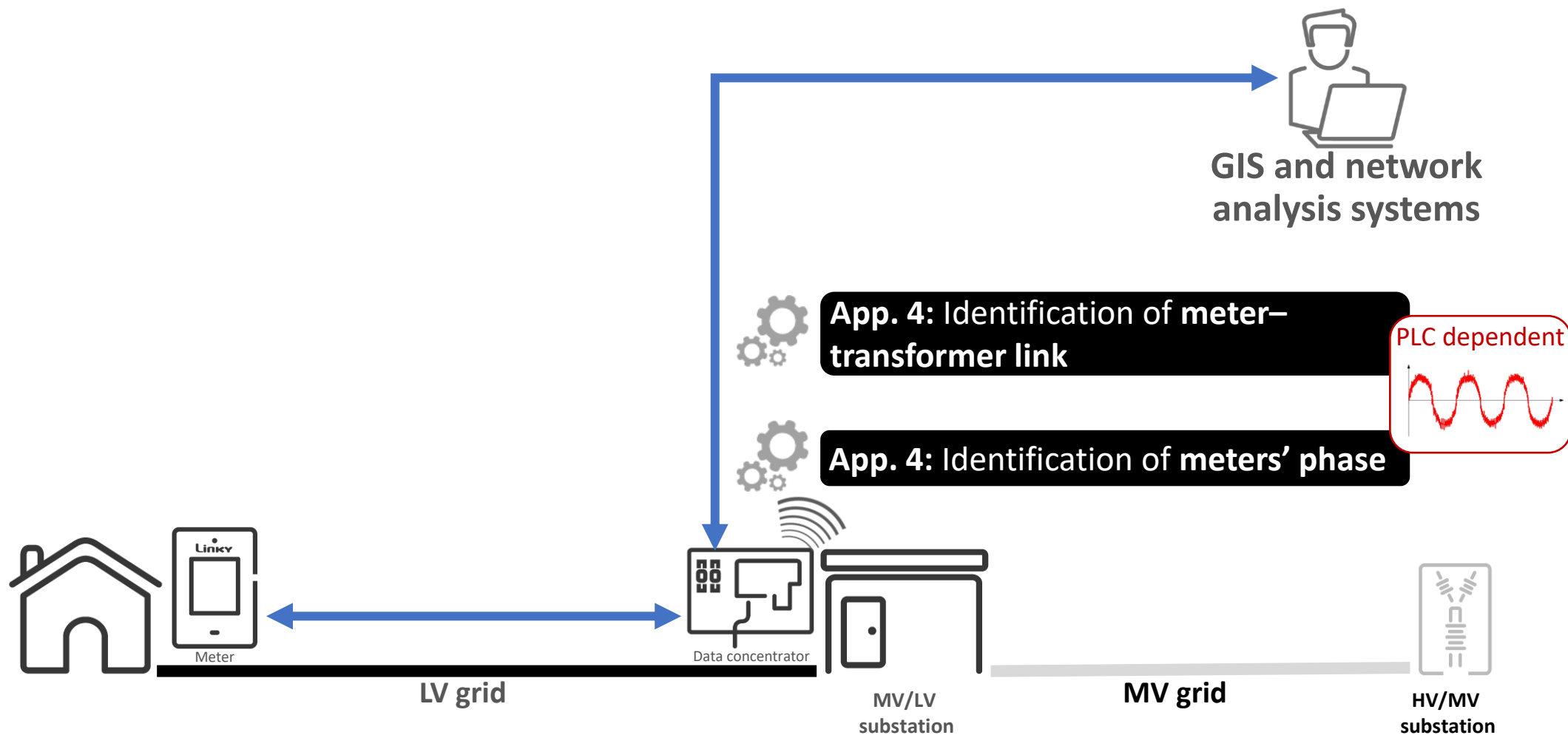**Detect and locate an overvoltage situation**
Being notified of a fuse failure or a phase loss
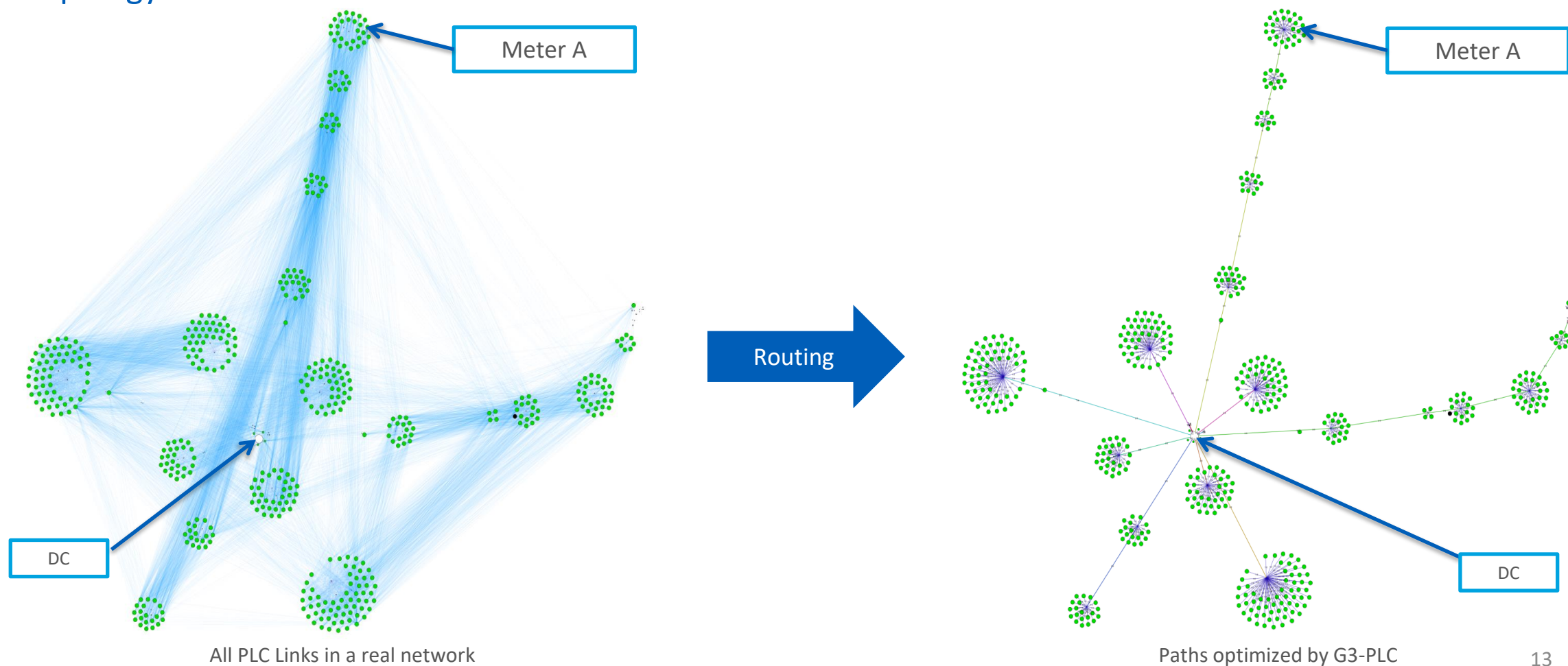
Example of solved situation

- An overvoltage occurs on the network and impacts a customer.
- The breaker of his smart meter opens. An alarm is sent to the central system
- The problem is identified thanks to the central system: it is a neutral conductor failure, invisible to the eye, which is solved after a field intervention.

Network analysis systems

App. 3.1: Logging of **outages**

App. 3.1: Logging of **voltage excursions**

App. 3.2: Identification of **meters' phase**

PLC dependent

Meter

Data concentrator

LV grid

MV/LV substation

MV grid

HV/MV substation

GIS and network analysis systems

App. 4: Identification of **meter–transformer link**

PLC dependent

App. 4: Identification of **meters' phase**

Linky

Meter

Data concentrator
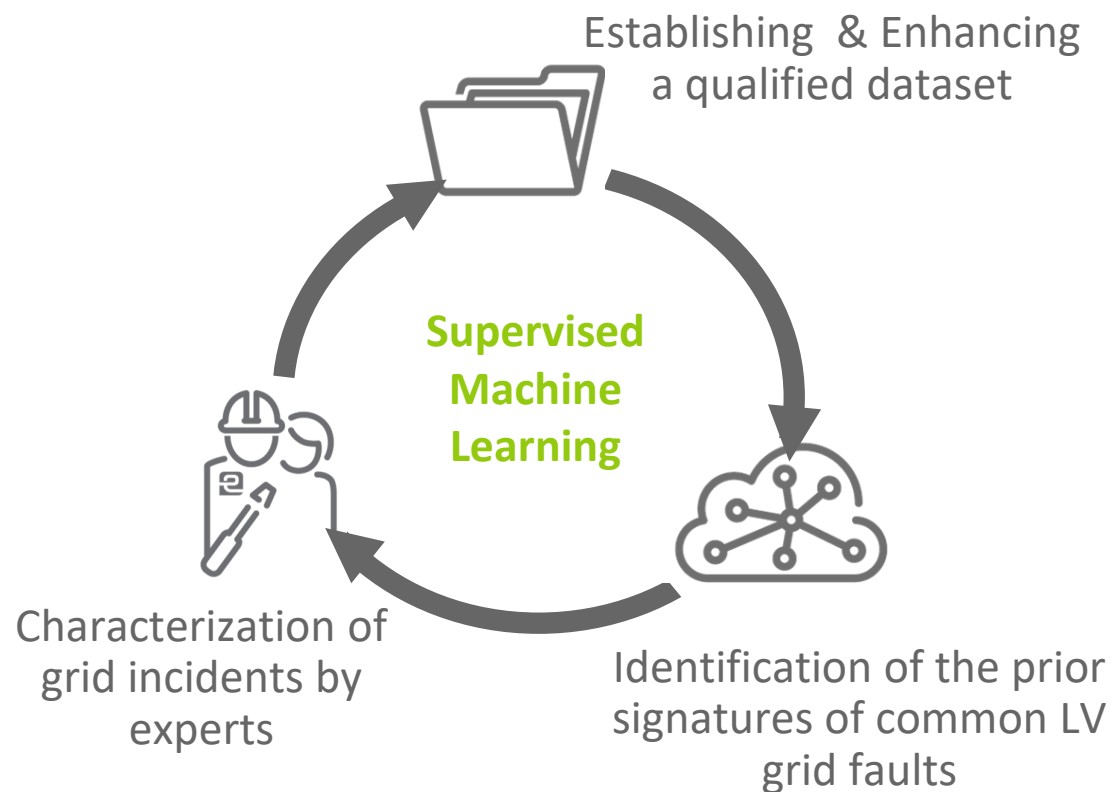
LV grid

MV/LV substation

MV grid

HV/MV substation

12

➢Beauty of PLC : telecom links ≈ electrical links,

➢Use of the telecom topology created by G3-PLC routing and a community detection algorithm to (re)establish the electrical grid topology

Meter A

DC

All PLC Links in a real network

Routing

Meter A

DC

Paths optimized by G3-PLC

13

Establishing & Enhancing a qualified dataset

Supervised Machine Learning

Characterization of grid incidents by experts

Identification of the prior signatures of common LV grid faults

Detection of oncoming grid faults requiring preventive field intervention

- India's first end-to-end smart pre-paid solution with real-time remote connect-disconnect facility.

- Infra-design and installation of around 1.8 million smart meters, integrating with the existing billing system of the Bihar Discoms.

- Data supervisory control and management systems as well as network operation and maintenance

- Installation of 85 000+ smart meters

- Solution has pan India Scalability

A robust solution to bring quick wins to DISCOM

The project is part of the contract awarded by EESL for commissioning and installation of 5 million Smart Meters

AMI solution designed to work in **both Pre-paid and post-paid mode**. Around 2k meters are in Post-paid mode.

Cloud based network platform to support all the applications like Head End System, MDMS etc. over GPRS communication technology

Consumers are getting their daily consumption and monthly billing through **Smart Consumer Mobile App.**

Staggered Disconnection

Dashboards and Analytics to support Discom with real-time data

Net Metering functionality

Time of Use (ToI) functionality

Load Curtailment functionality with separate User Interface (UI)

Thank You