

Energyn Project

Presentation to ESA NAVISP Industry Day



18th January 2019



Agenda


- I. Enersyn Rationale & Background
- II. Key Functionalities & Performance
- III. Results Achieved to Date
- IV. Future Work & Way Forward

The Enersyn Project

- €1.622m project part funded by ESA under NAVISP 2 Programme
- Powerline Technologies is lead contractor with subcontractors Chronos and University of Strathclyde
- Follows on from SYNAPS project which developed sensor system for detection classification and location of transient cable faults for the electricity distribution industry
- Aims to develop a new type of instrumentation platform for the electricity distribution industry

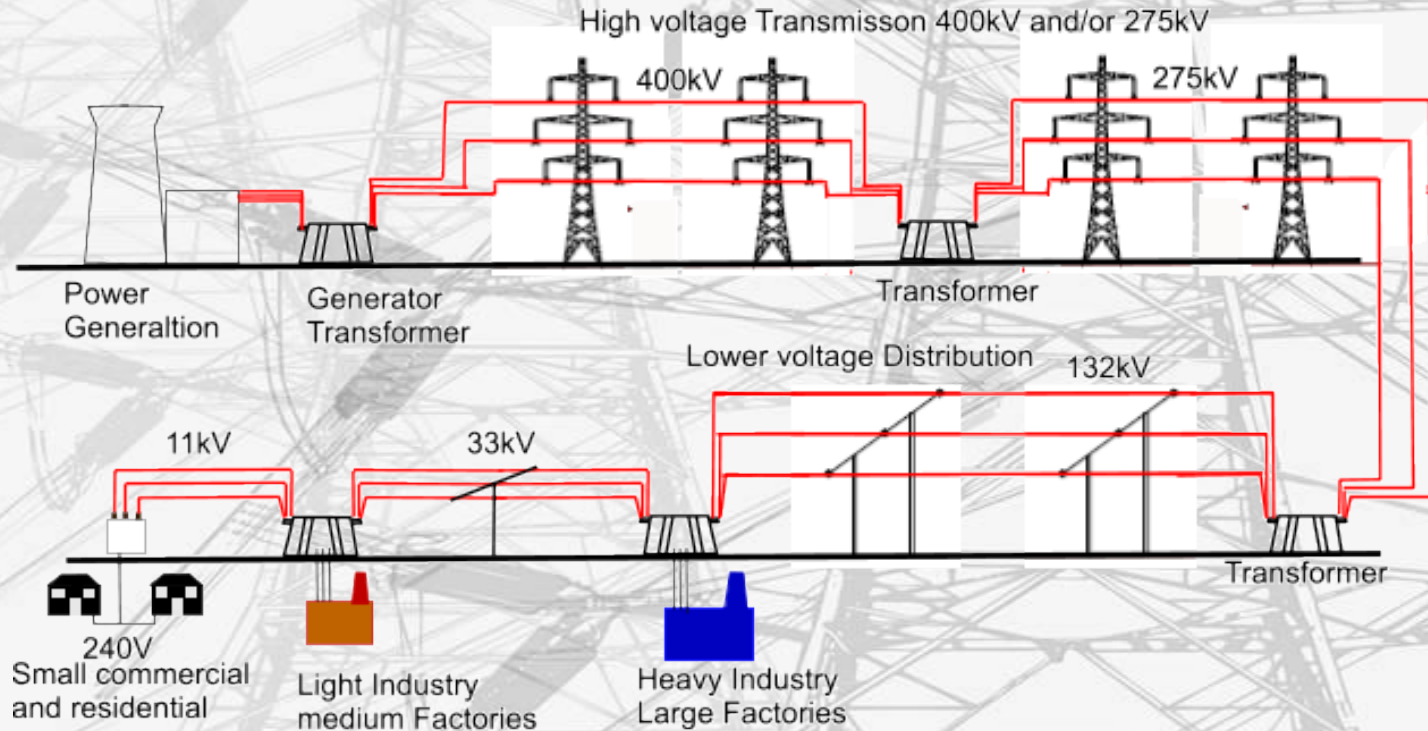


Powerline Technologies

- Based in Bristol
- Background & expertise in grid automation & ‘smart grid’
- 51% owned by Fundamentals Ltd  **FUNDAMENTALS**
- Focus on electricity distribution applications
- Innovation in machine learning and artificial intelligence



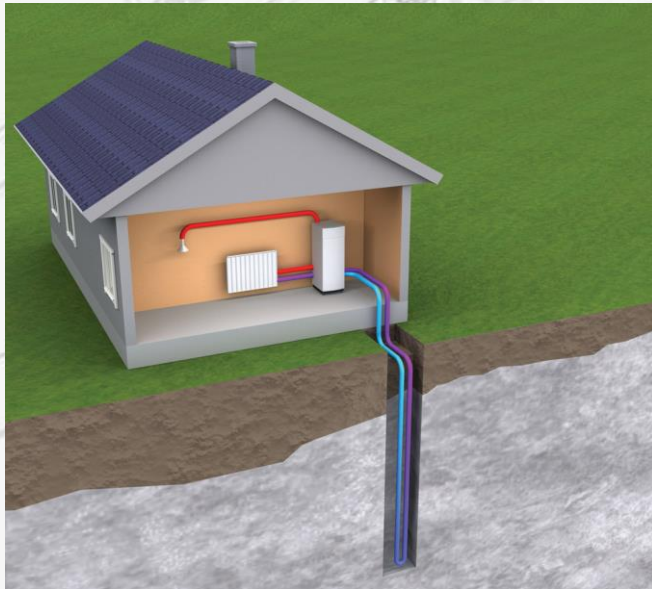
Traditional Electricity Grid



Simplified UK Electrical Power Transmission system



Transition to the Smart Grid

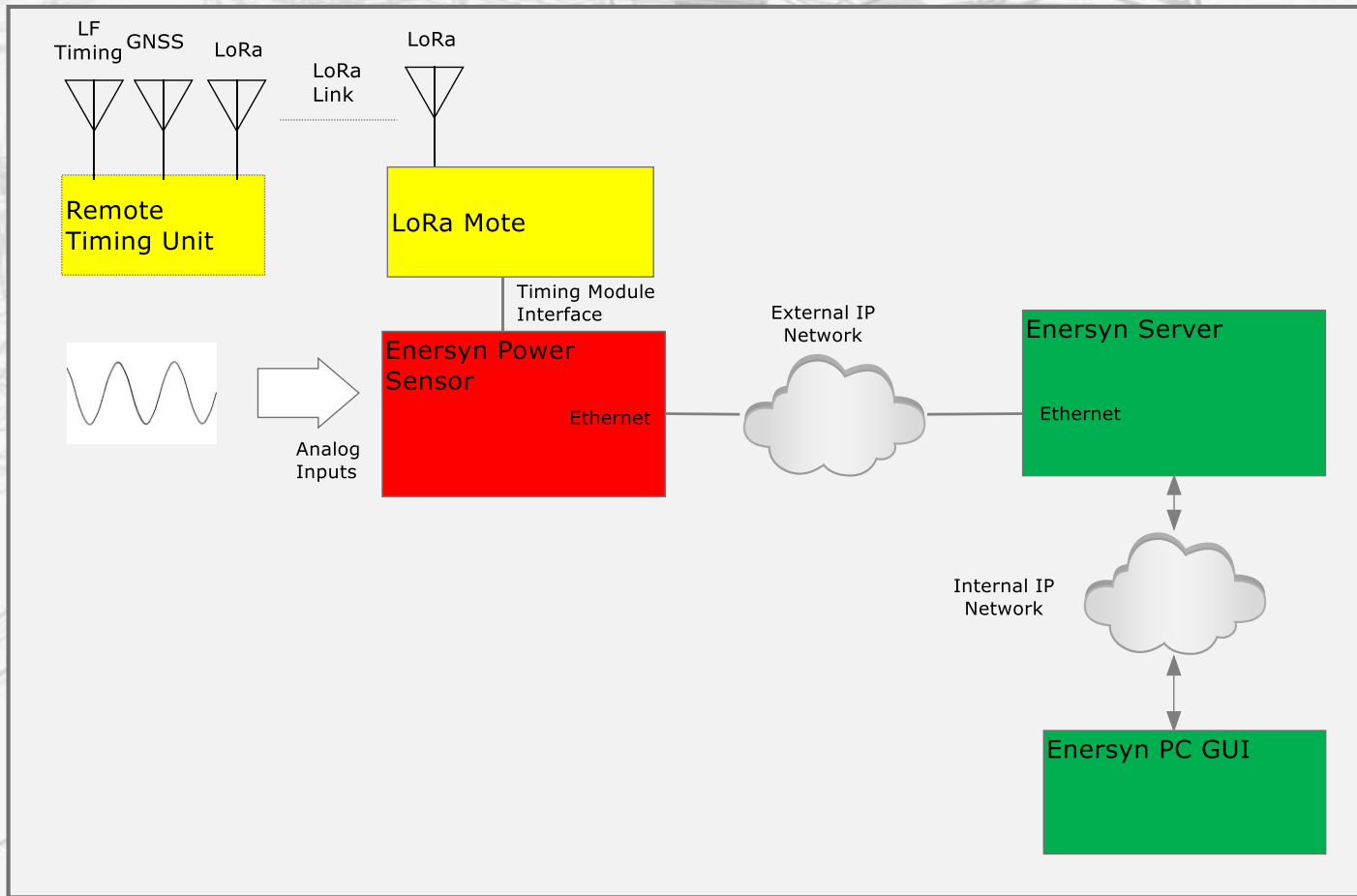


What is Enersyn?

- New type of power system analysis system uses high sample rate waveform analysis
- Provides rich, fine grain picture of power network operation
- ‘Multiple-app’ platform ‘like a smartphone’
- Uses state-of-art mathematical techniques
 - Deep machine learning
 - Event Driven microPMU
- Resilient timing source enabling accurate time stamping of data
- Powerful data analysis features



Energyn Overview



Energyn Sensor

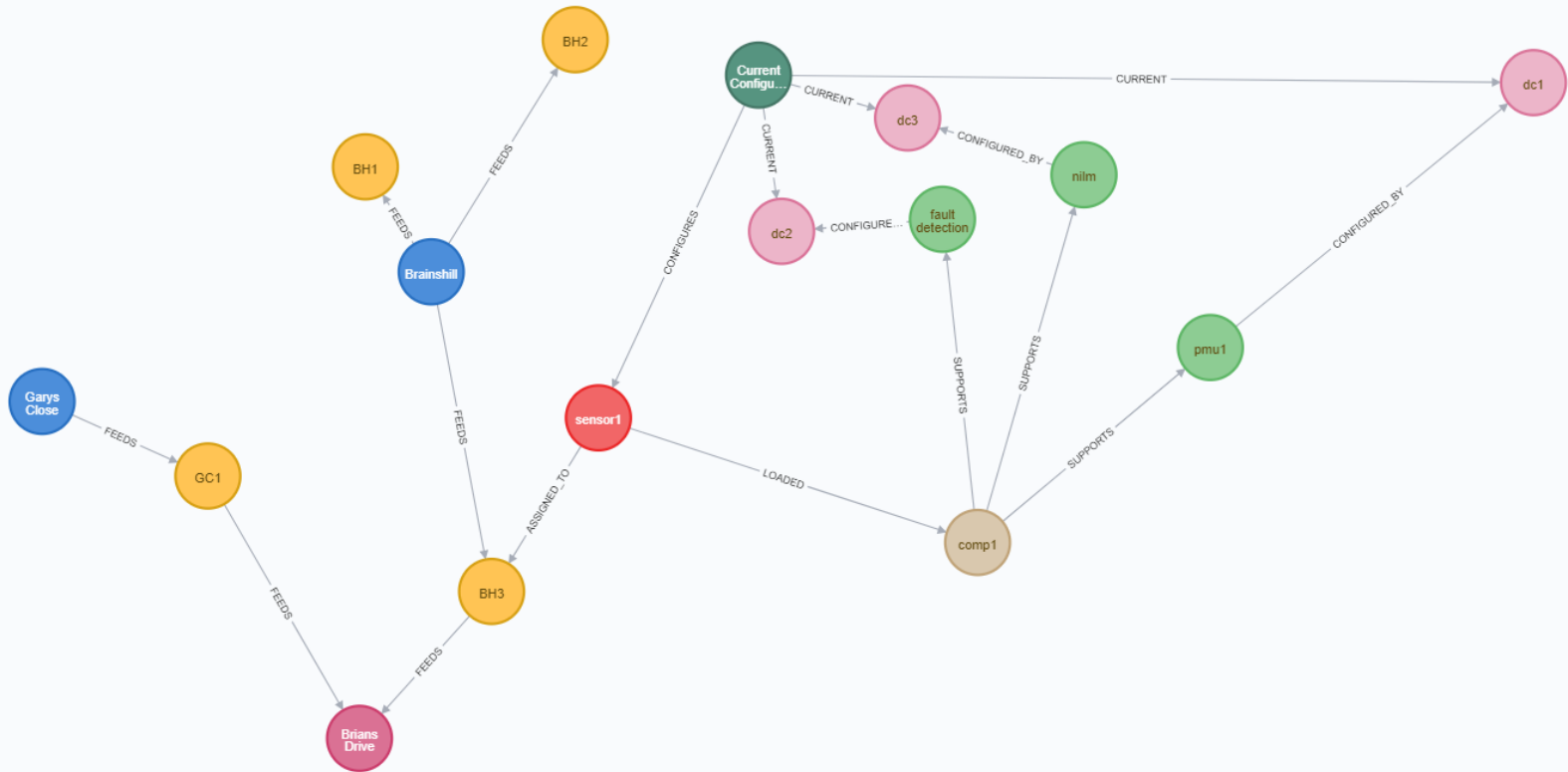
- High speed multi-channel data capture (100KHz)
 - Captures high speed transients for accurate event detection
- Accurately detects network events using 'deep machine learning' and microPMU techniques
 - 'Transient' faults
 - EV signatures
 - 'Unusual' power flows
- Sends waveform data to server for further analysis
- Event driven approach minimises data transmission and storage costs
- 'Shoebox' sized outline



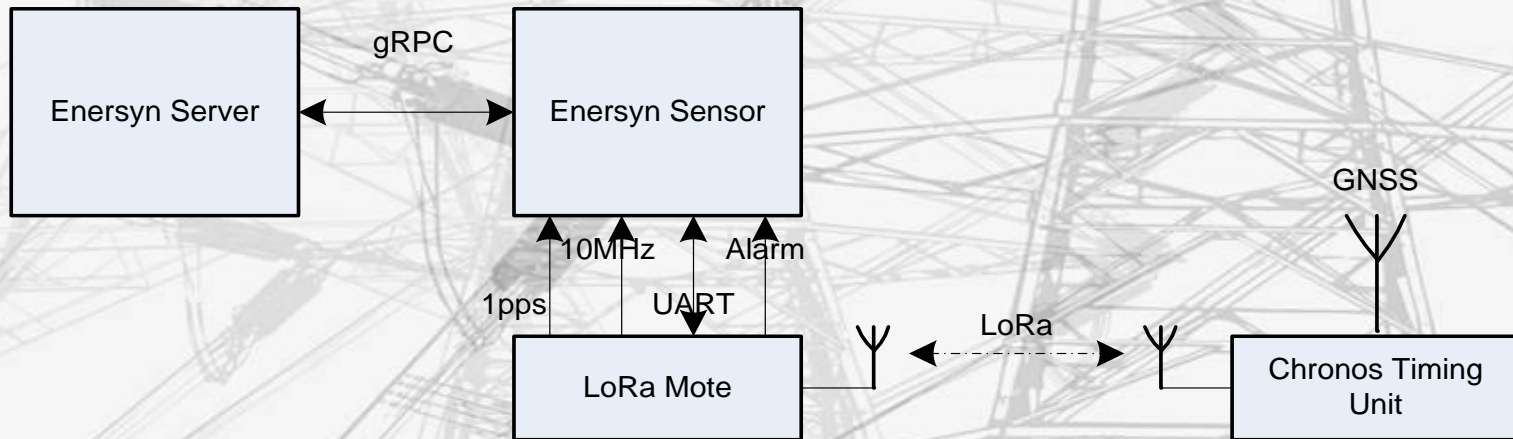
Energyn Server

- Performs three functions:
 - Manages sensors including software updates
 - Manages and processes events
 - Provides tools for onward data analysis
- Based on Docker container model
- Modular software built from standard containers
- Easy to add or modify functionality
- Graph database for data storage

Graph Data Model



Energyn Timing Module



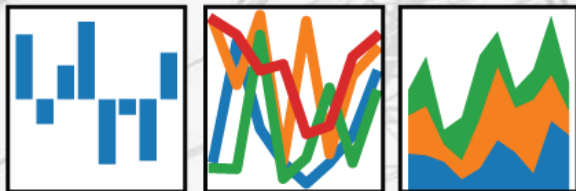
GUI



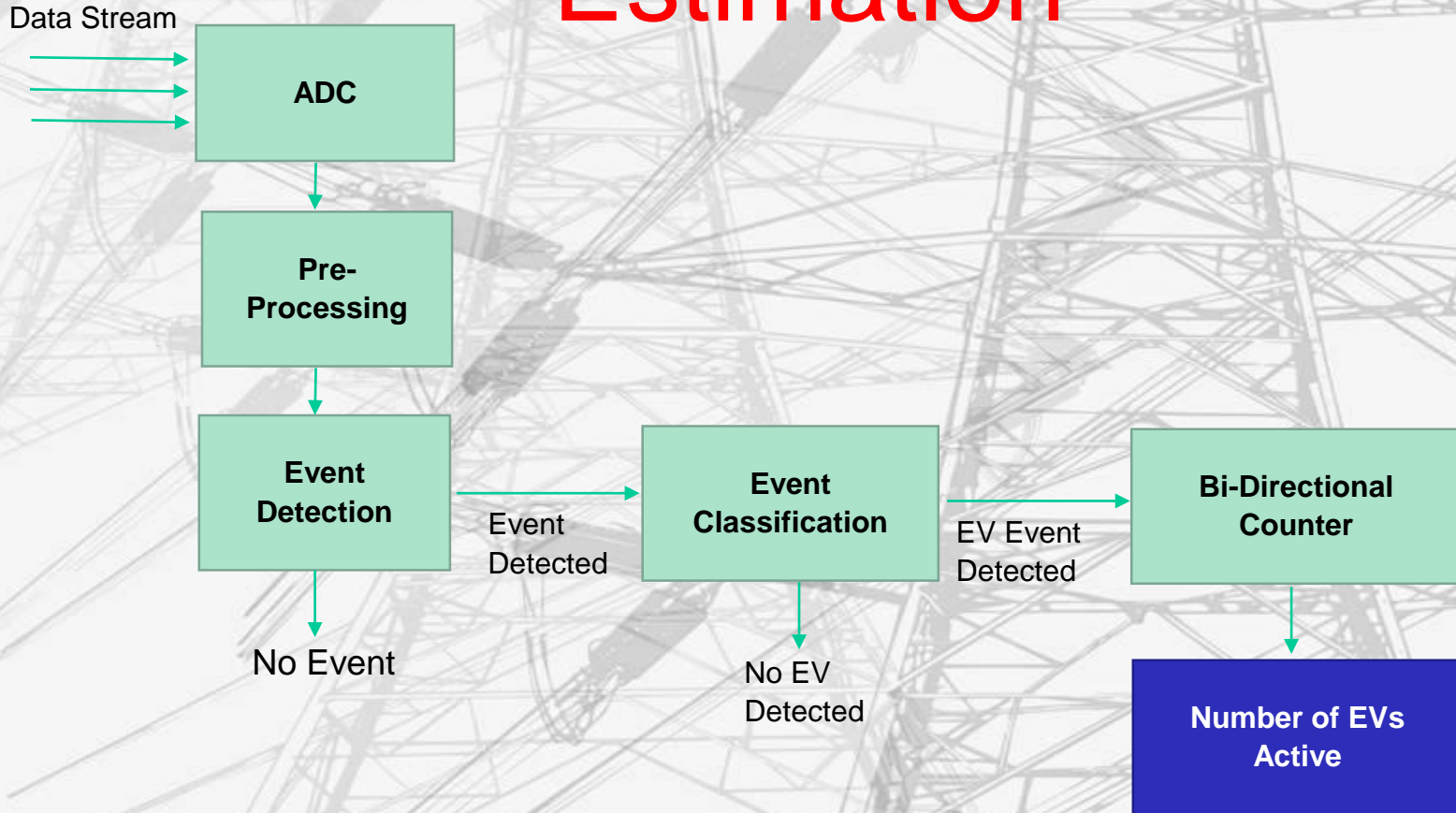
- ‘Traditional’ desktop app
- Support for operational management and configuration of sensors
- Support for data analytics
- Integration of pandas and graph data model for further data analysis

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Energysyn Apps – EV Loading Estimation



Current Status & Future Work

- Sensor design and CAD files completed
- Prototype manufacture about to commence
- Prototype Timing Unit completed
- Preliminary algorithm development completed

Future Work:

- Algorithm refinement
- Build & test sensor hardware, embedded software and firmware
- Complete server & GUI development
- Integrate at test at University of Strathclyde PNDC

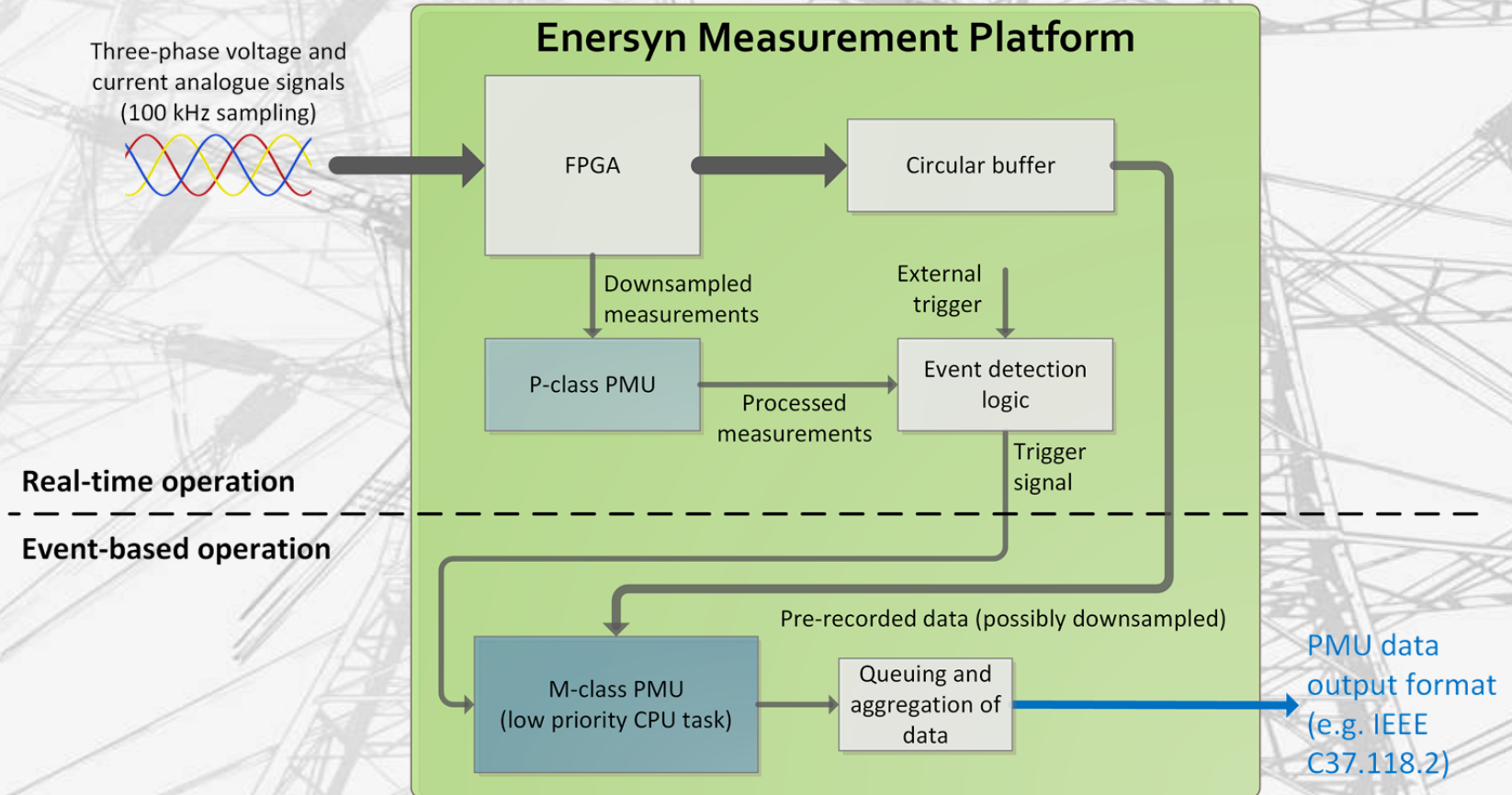




DNO Liaison

- Eversyn includes programme of ongoing liaison with DNOs
- Initial meetings with questionnaire
- Ongoing workshops with PNDC
- We need to understand:
 - How the Eversyn vision fits in with DNO processes and systems
 - How Eversyn can help DNOs to transition to DSOs
 - Feedback on Eversyn apps and ideas for new apps
 - How we can engage with DNOs going forward

Energysyn Apps – microPMU



Event Example – ‘Transient Fault’

