

FAULT LOCATION IDENTIFICATION IN SMART DISTRIBUTION NETWORKS WITH DISTRIBUTED GENERATION

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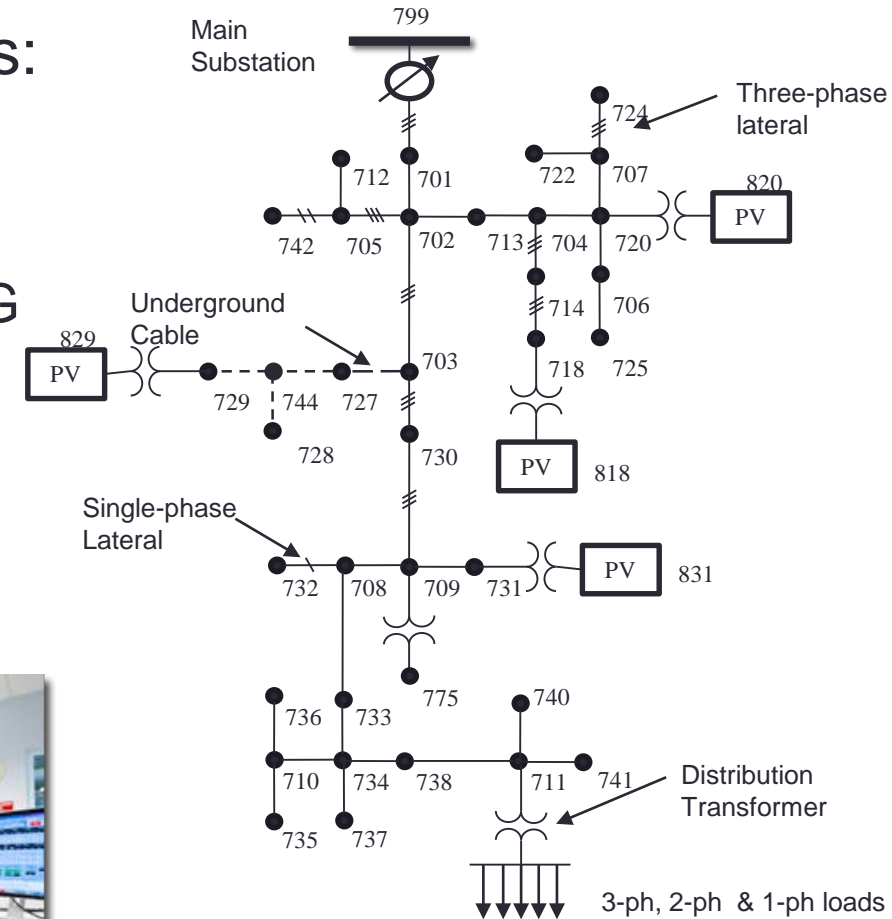
FLORIDA ENERGY SYSTEMS CONSORTIUM - May 20-21, 2015.



Fault location identification in distribution networks: Research objective

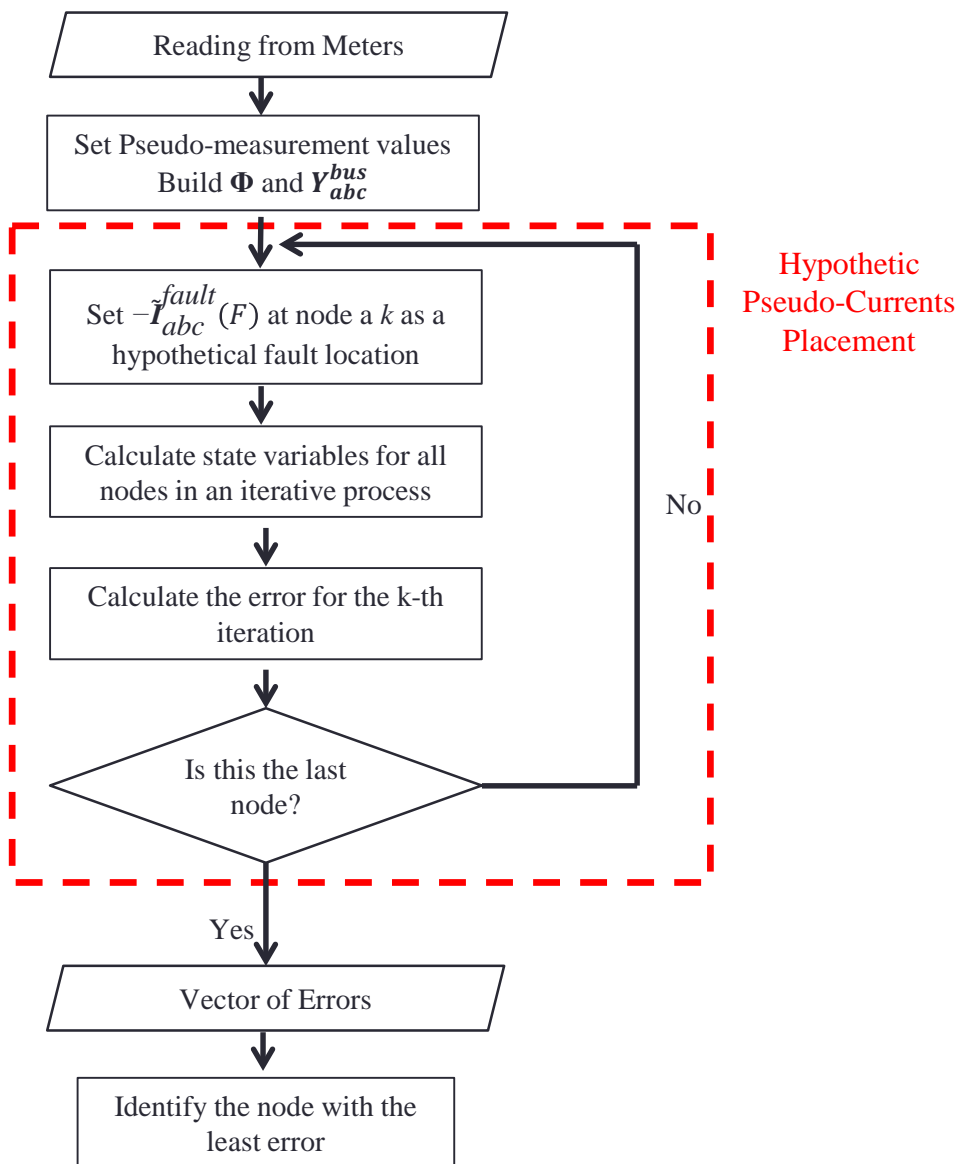
- Developing a fault locating method that considers the following characteristics of modern distribution networks:

- Scarce number of metering points
- Multilateral & multisource nature of distribution networks with DG
- Presence of 3-phase, 2-phase & 1-phase loads
- Laterals and/or branches with less than three phases
- Different transformer configurations
- Involves communication with the Utility Control Center
- Employs AMI, PMU, Smart Reclosers or other IEDs for data collection



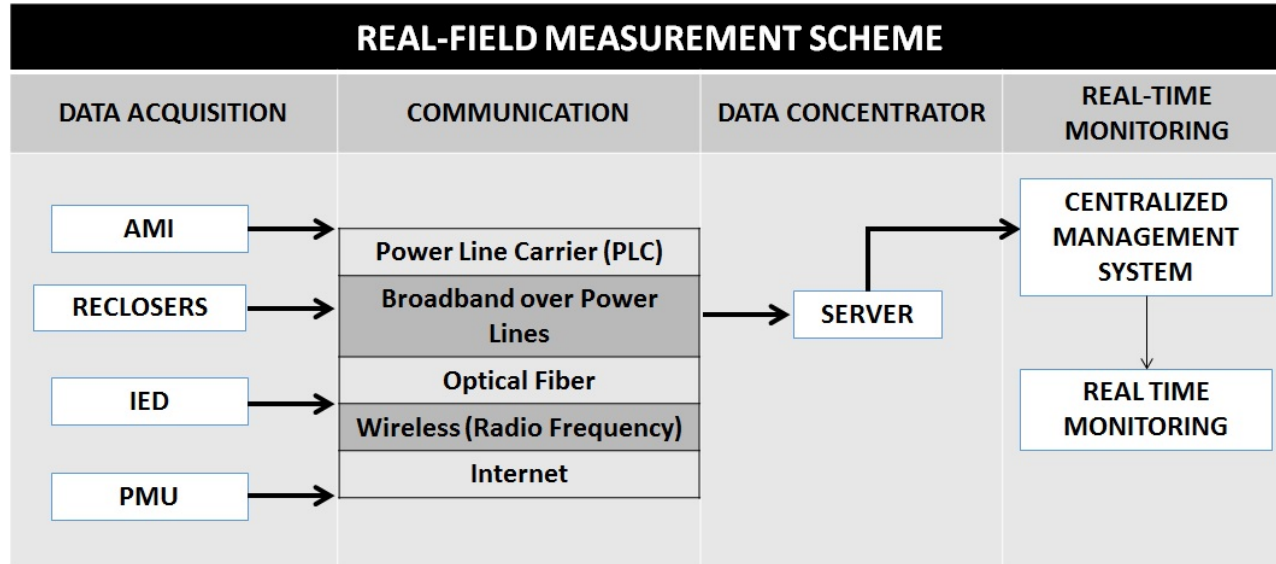
MODIFIED
IEEE 37 NODES TEST FEEDER

Fault location identification method based on State Estimation (SE)



- Optimization method based on *least squares minimization*
- The states of the nodes without measurements must be estimated from the rest of the measured information of the system.
- A hypothetical returning path through the ground is considered for ground faults which is used to locate the real location.
- For line to line faults, the returning fault current through another line is considered for location identification.
- SE gives the “best estimation” of states in the system in spite of missing data.

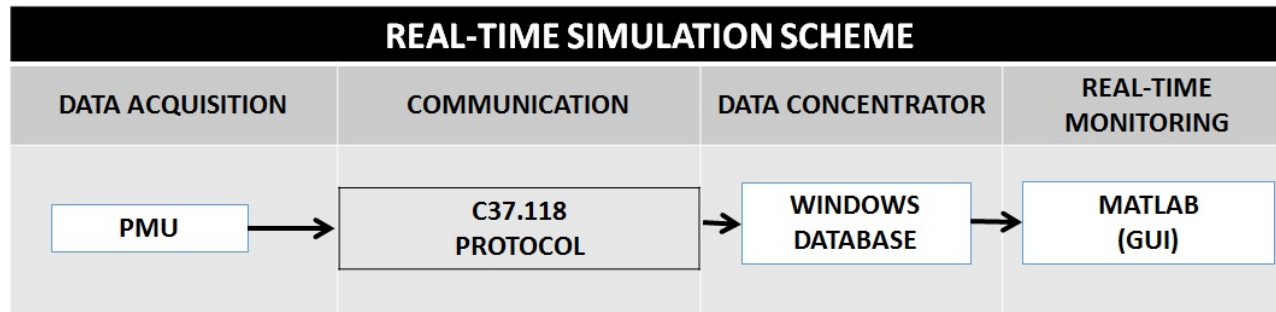
Validation of the Method in Real-Time



The algorithm is expected to work with measurements provided by intelligent electronic devices:

- AMI
- Reclosers
- Power quality meters
- PMUs
- Fault locators, etc.

Validation of the algorithm is performed using off-line and real-time streaming data :



1. MATLAB code with virtual measurements: **OpenDSS** (90% success rate) – Offline case
2. Real-time validation using PMU/AMI data streaming on **Opal-RT/RT-LAB Simulator** (Ongoing)

Fault Location Identification Demonstration

Florida Energy Systems Consortium - May 20, 21 2015

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