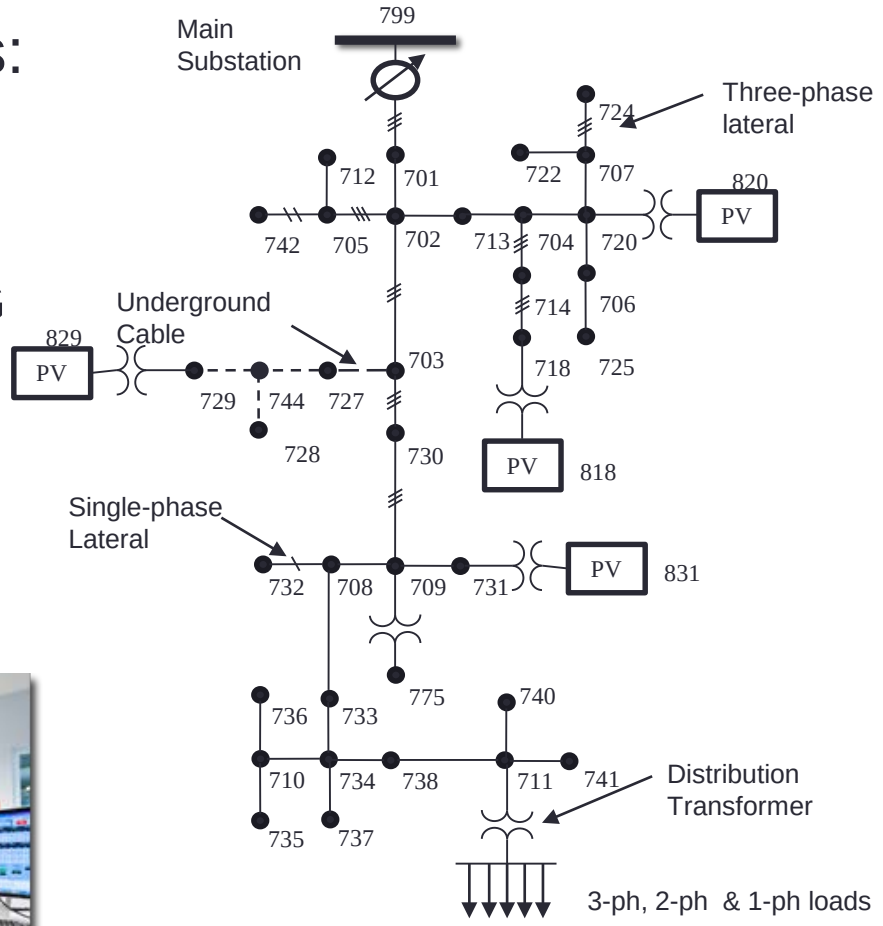
FAULT LOCATION IDENTIFICATION IN SMART DISTRIBUTION NETWORKS WITH DISTRIBUTED GENERATION

Presented by:
Jose D. Cordova, MS Candidate
Advisor:
Omar Faruque, Ph.D.

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

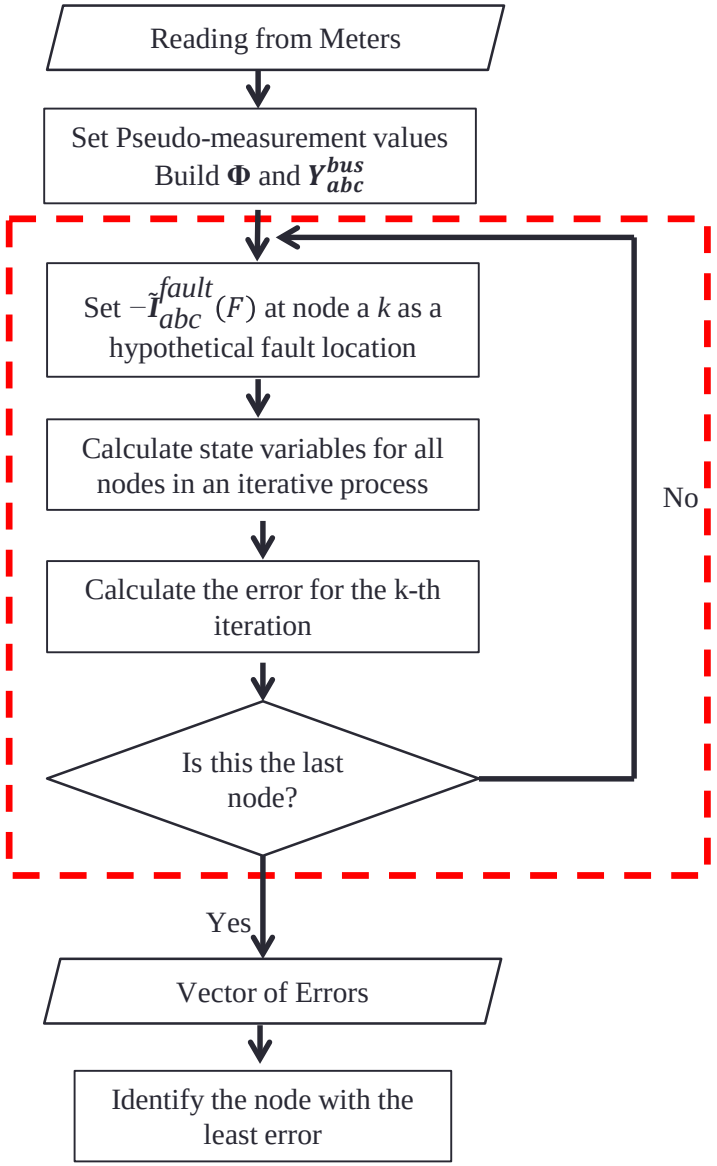
Fault location identification in distribution networks: Research objective

- 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



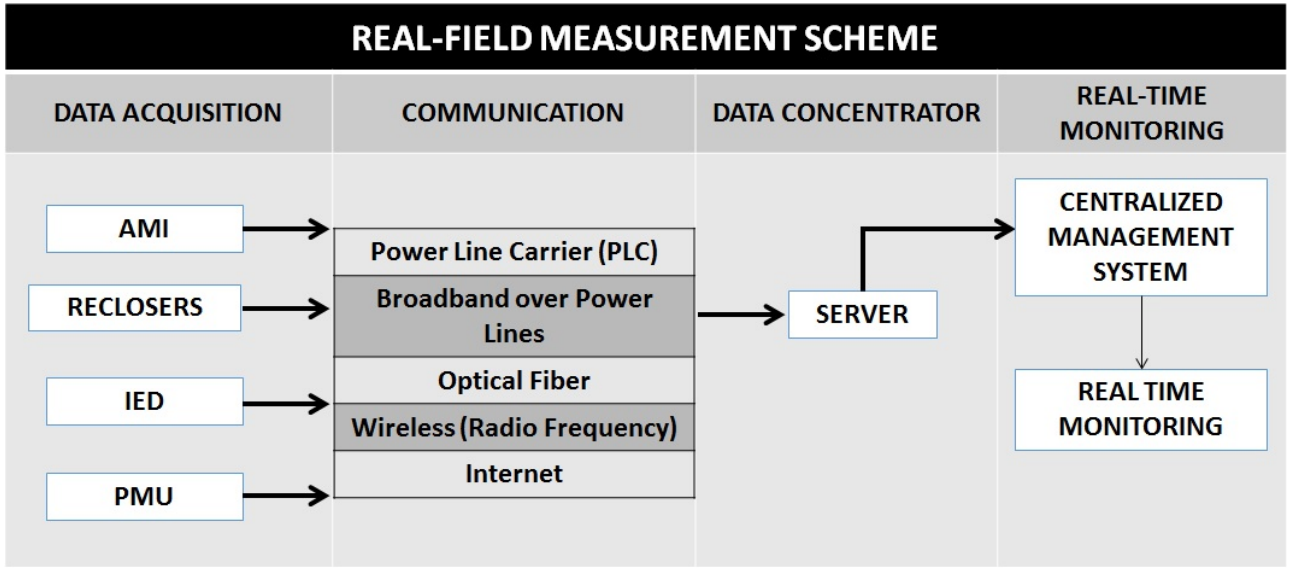
MODIFIED
IEEE 37 NODES TEST FEEDER

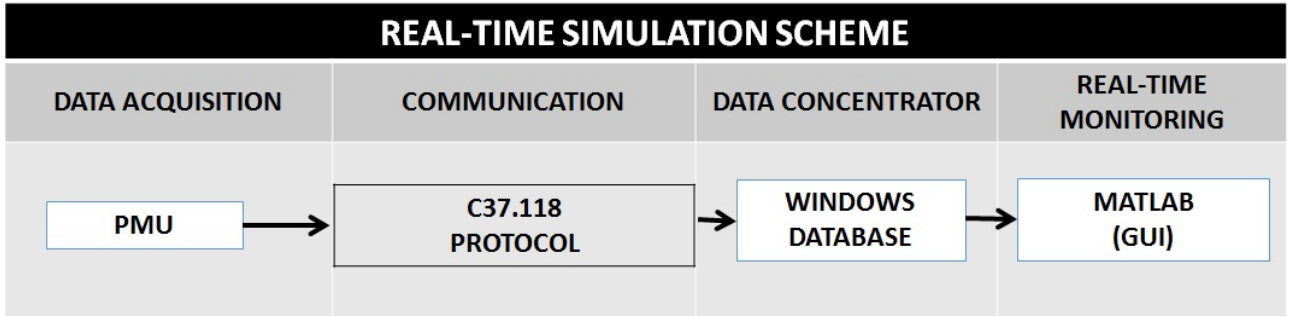
Fault location identification method based on State Estimation (SE)



- 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

Developers: Jose Cordova, Omar Faruque.

Sole