Using Middleware Between SCADA and a Network Management System to Handle Incorrect Data or Non-typical Device Functions

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Goals and Objectives

➢ Current State

- ➢ Georgia Power, Gulf Power, Mississippi Power Company – Southern Company
- ➢ Utilize the Oracle Network Management System NMS 1.10.0.6.26
- ➢ Operate a similar advanced Distribution Automation architecture
- ➢ With a variety of devices and device technologies that we need to control and interrogate by the NMS
- ➢ LiveData Protocol Server as the middleware for the ICCP interface to the NMS as a one way communication for receiving real-time telemetry of digital /analog points and instantaneous operations
- ➢ Implemented the Fault Location Analysis (FLA) tool

➢ Future State In the next 2 years

- ➢ Implement state-of-the-art upgrades to the NMS 1.12.0.3.
- ➢ Including DMS functionality:
  - ➢ Fault Location Isolation Service Restoration FLISR
  - ➢ Suggested Switching
  - ➢ Feeder Load Management
- ➢ This functionality will push the boundaries of the architecture
- ➢ Managing more points and eventually requiring the NMS to support bi-directional control

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Goals and Objectives

➢ Challenges

- ➢ Variety of devices used across the 3 entities differ in type and behavior
  - ➢ Different devices send the same kind of data in different ways
  - ➢ Unforeseen behavior – fast momentaries
- ➢ NMS data expectations
  - ➢ Single phase vs. 3 phase devices
  - ➢ Single status point (even for bi phase devices)

➢ Objectives

- ➢ Ensure the OMS receives the most current and correct information from SCADA
- ➢ Maintain a common code base across the three entities
- ➢ Prepare for the DMS functionality
- ➢ Extensive use of the middleware filtering and algorithms to overcome device and data anomalies
- ➢ To manage reliable reporting of momentary interruptions, fault currents, and fault targets

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Scenario 1 – Different Devices sending same data in different ways

- ➢ NMS data expectation:
  - ➢ **FAULT TARGETS**   Per phase fault targets
  - ➢ **FAULT CURRENTS**   Per phase fault currents
  - ➢ **STATUS**   Single status <u>even on bi phase devices</u>
- ➢ 351RS and 651R Reclosers
  - ➢ **FAULT TARGETS**   send per phase fault targets   ✓
  - ➢ **FAULT CURRENTS**   send per phase fault current   ✓
  - ➢ **STATUS**   send per phase status points <u>that must be combined into 1 single status</u>
- ➢ 351R Reclosers and Breakers
  - ➢ **FAULT TARGETS**   send per phase fault targets   ✓
  - ➢ **FAULT CURRENTS**   send only 1 fault current <u>that must be extrapolated based on per phase targets</u>
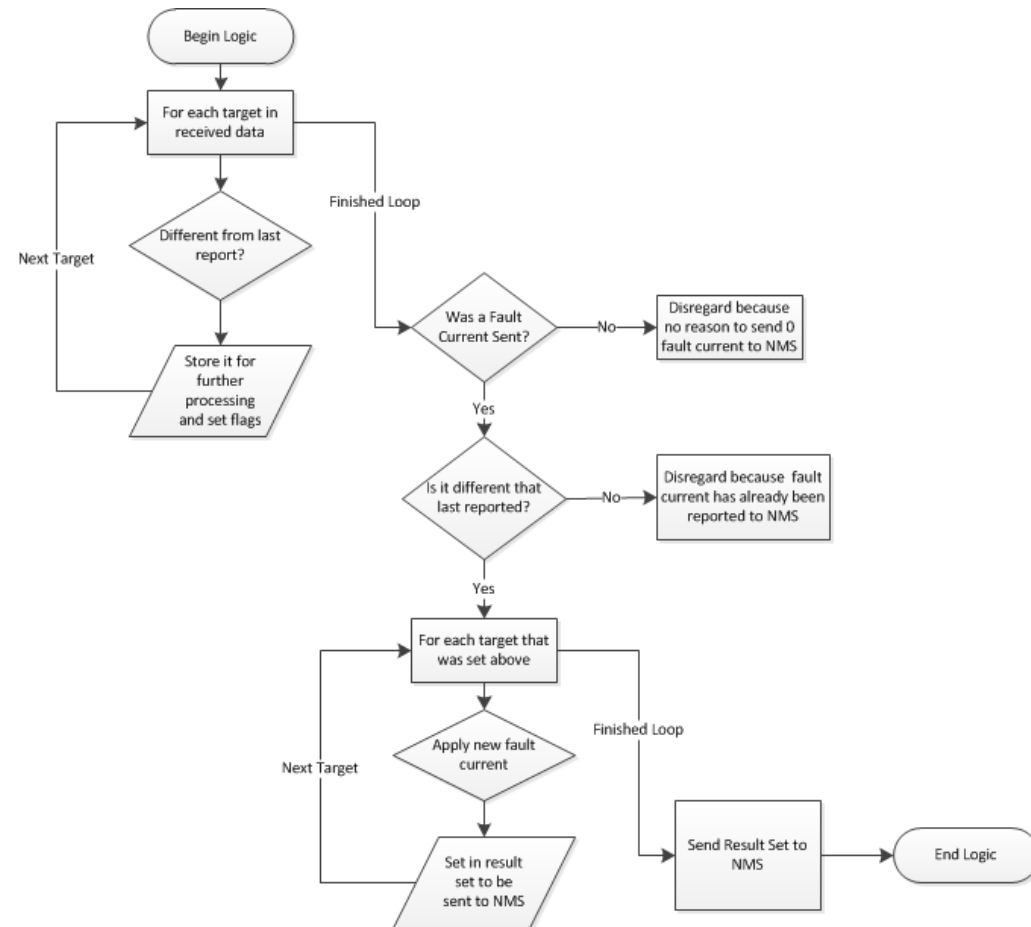 - ➢ **STATUS**   send only 1 status
- ➢ LiveData Python Scripts

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Scenario 1 – Different Devices sending same data in different ways

➢ **LiveData Python Scripts**

    ➢ **SC_DataFlowFilters.py**

        1. 351R Reclosers and Breakers single fault current is extrapolated to phases with targets

        2. Handles fault current and targets not clearing

        3. Logic dual purpose. Allows NMS to get correct information but also prints detailed information to logs about device data to help in locate device anomalies.

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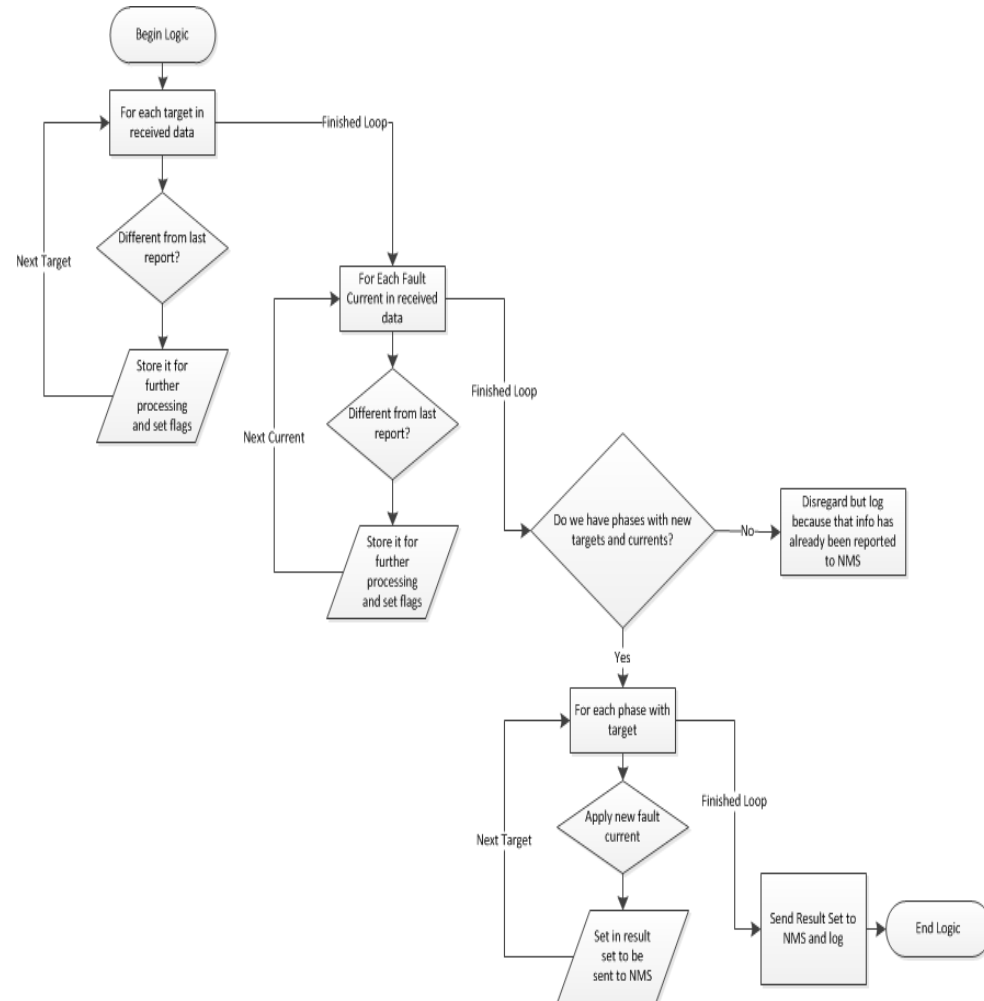## Scenario 2 – Induced Fault Currents without Fault Target

➢ On some fault events, induced currents were observed without phase targets

➢ FLA would use these currents in calculation which would skew the prediction or not predict at all

➢ Loss of confidence in system due to bad predictions

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Scenario 2 – Induced Fault Currents without Fault Target

➢ LiveData Python Scripts

    ➢ SC_DataFlowFilters.py

        1. Check to make sure that a fault target is set before being sent to NMS. If target not set for particular phase, then disregard.

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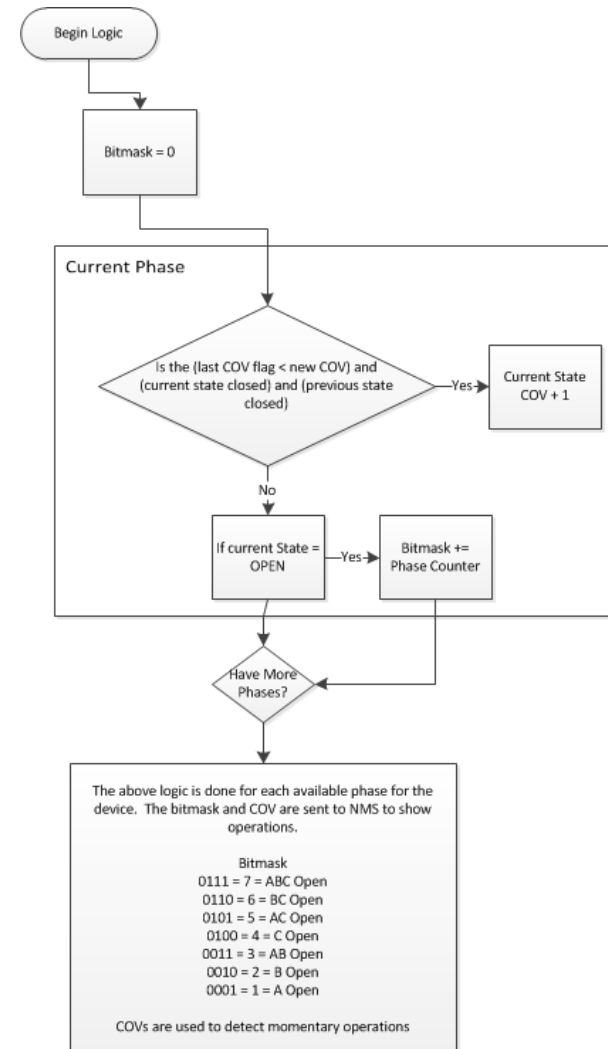## Scenario 3 – Capturing Fast Momentaries

➢ Missing Momentaries
  ➢ DSCADA showed the momentary, but NMS system didn't get a momentary or fault event ???

  ➢ Appeared to be instantaneous operations

  ➢ Couldn't replicate in testing

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Scenario 3 – Capturing Fast Momentaries

➢ LiveData Python Scripts

   ➢ PhaseEncode.py

      1. Encodes multi phase device status into single status point using bit mask

      2. Handles fast momentaries

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Questions

➢ ???