

AUTOMATED RECONFIGURATION POWER OUTAGE MANAGEMENT

#### **Team Members**

Lamine Bassene Damel Goddard Oluwabunkunmi Olusanya Chibuzo Ononiwu Luan Watson

# CONTENTS



- Background
- Current State of Art
- Problem formulation
- Solution Approach
- Tasks and Project Management
- Cost and Resources
- Conclusion

## BACKGROUND



#### BACKGROUND

- About 92 percent of all customer outages result from problems on the power distribution system
- ♦ Many utility companies aim to reach an annual System Average Interruption Duration Index (SAIDI) ≤ 60 minutes

 $SAIDI = \frac{Sum of all customers interruption durations}{Total number of customers served}$ 



# BACKGROUND

## Outage impact on customers

- Regular activities are limited
- Both customers & utility companies lose money

#### **Primary Focus**

- System reconfiguration
- Limiting affected customers
- Improving network reliability



# CURRENT STATUS OF ART

- Faults were isolated using manual switches by personnel
- Automated approach to selfreconfiguration on three phase networks
- All three phases are reconfigured to isolate and reduce the affected area
- Drawback: Does not identify and isolate any single phase faults



# PROBLEM FORMULATION

The automated reconfiguration power outage management technologies that ar available today tend to neglect single phase outages in complex networks.



# DESIGN REQUIREMENTS

Function	Requirement	
Fault detection	Sensor response time: t≤10 ms Reclosing	
Reconfiguration and Fault Isolation	Automated switches must reconfigure and isolate fault within 50 ms	
Outage Area reduction (Area=No. of Customers)	Reduce Outage Area≤50% Total affected Area	
Fault Summary Report	Record and summarize fault data (location, response time, SAIDI)	

## SOLUTION APPROACH



# SYSTEM FUNCTION OVERVIEW



#### DISTRIBUTION NETWORK



### **DISTRIBUTION NETWORK**





# VERIFICATION PLAN & DELIVERABLES

#### **Verification Plan**

Acti on	Evaluation
1	Induce fault on prototype system
2	Verify that system detects fault in t≤10 ms
3	Verify that system reconfigures to minimize total outage area in t≤50 ms
4	Verify that system minimizes outage area by at least 50% of total outage area

#### Deliverables

Complete system including •Software (Reconfiguration Algorithm)

•Small scale prototype to demonstrate system capabilities

# TASKS & PROJECT MANAGEMENT

Date	Tasks
November 2012	Acclimation with Atom Microprocessor
December 2012	Algorithm Formulation
January 2013	Implementation of Algorithm (coding)
February 2013	Integration of system
March 2013	Test Prototype
April 2013	Perform necessary corrective actions
April to Mid May 2013	Complete Final report and Presentation

## COSTS AND RESOURCES

#### Parts

Intel Atom Board:\$200 (provided)

- •Solid State relays:\$70
- •Sensors:\$80
- •RF transceiver:\$60
- •Additional Parts:\$60

Total:\$ 270

#### Resources

Power GenerationLab power supplyMobile studio

•Visual Studio C++

#### CONCLUSION

 Being able to recognize and isolate single and three phase faults in a network can improve the reliability of electricity and SAIDI by reducing outage areas (Customers affected)

# QUESTIONS



## CURRENT STATUS OF ART

