

2015

Smart Grid Network Simulation

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Smart Grid Network Simulation



Introduction

The Smart Grid is the concept of a smarter electric grid, one that can slowly replace the outdated electric grid we have today. As it stands the top-level architecture of the electric grid is much the same as it was back when it was created back in the early 19th century. Part of the Smart Grid is combining the electric grid with our current communications networks to improve efficiency and control transmissions. Once the Smart Grid is in place, functionality can be added, such as adding renewable energy sources, the Advanced Metering Infrastructure (AMI) which will be discussed later, and new measuring devices that read real-time power flow.

So the idea of the Smart Grid is to create a more efficient electric grid, with better sources of energy, that is self managing and provides a better service to the public.

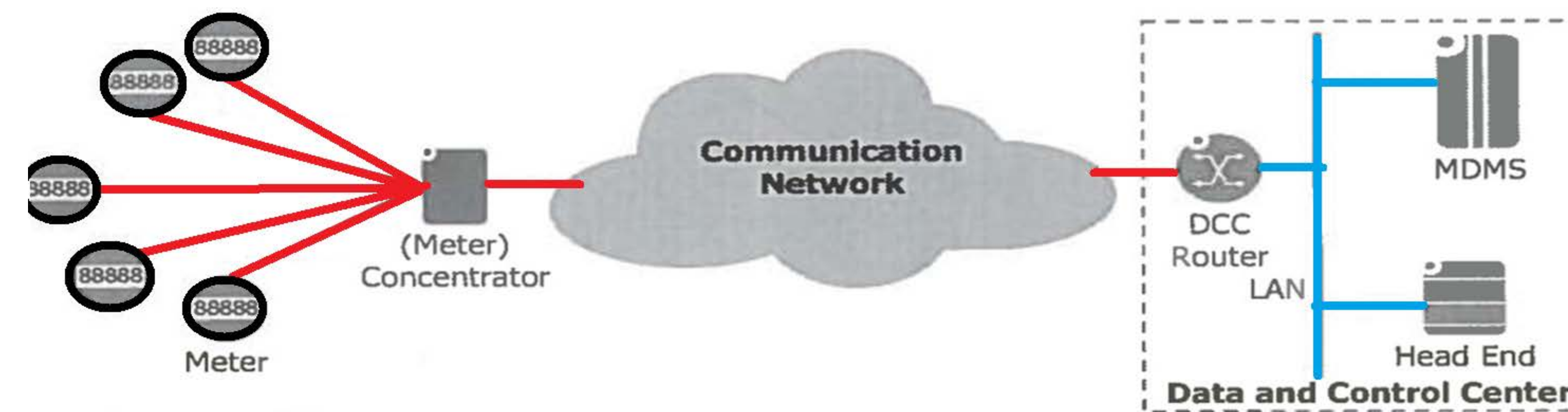
Our project is to create a simulation of the AMI for the purposes of testing different grid configurations. The code we work on is purposed to simulate different situations the grid may be faced with. This includes different methods of transmitting meter data from the meters to a more centralized data centers.

Problem

- In the coming years the United states needs to upgrade our current, out of date, electric grid to an automated Smart Grid
- This Smart Grid must be versatile, able to be adjusted for different scenarios
- Before moving forward with a massive overhaul of the current electric grid, simulations are needed to understand how the grid will behave
- These simulations can be used to maximize size of data sent, speed its sent at and cost of implementing different topological systems

Use Case: Bulk Send

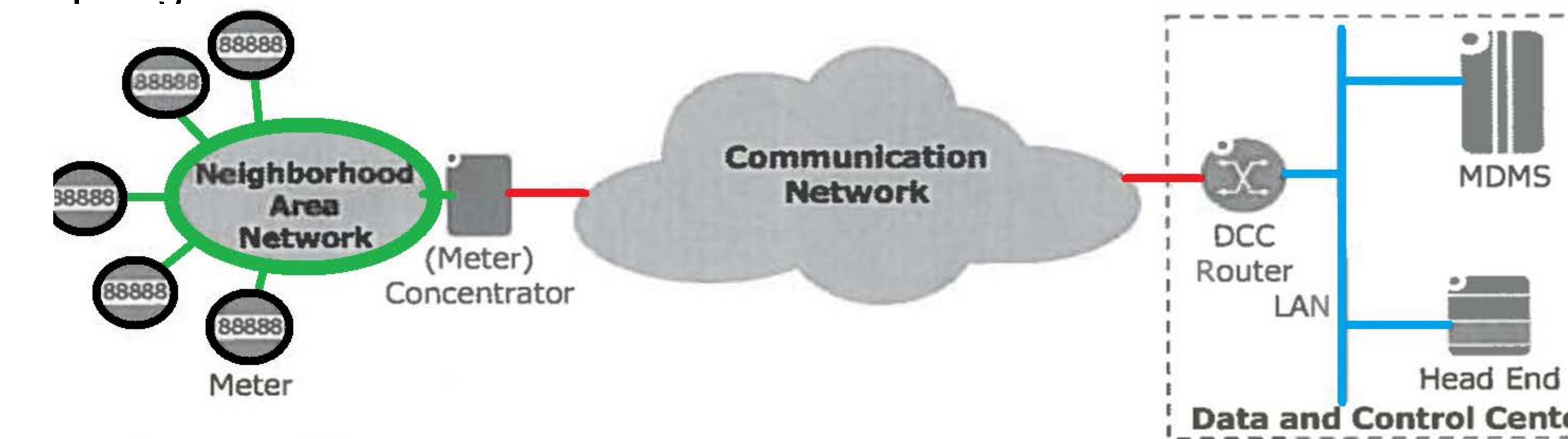
Fall 2014



- Red links are point-to-point connections
- Blue links are a local area network
- Data concentrator collects data from multiple nodes and sends them as a large combined packet(s) to the DCC

UC: Mesh/Data Propagation

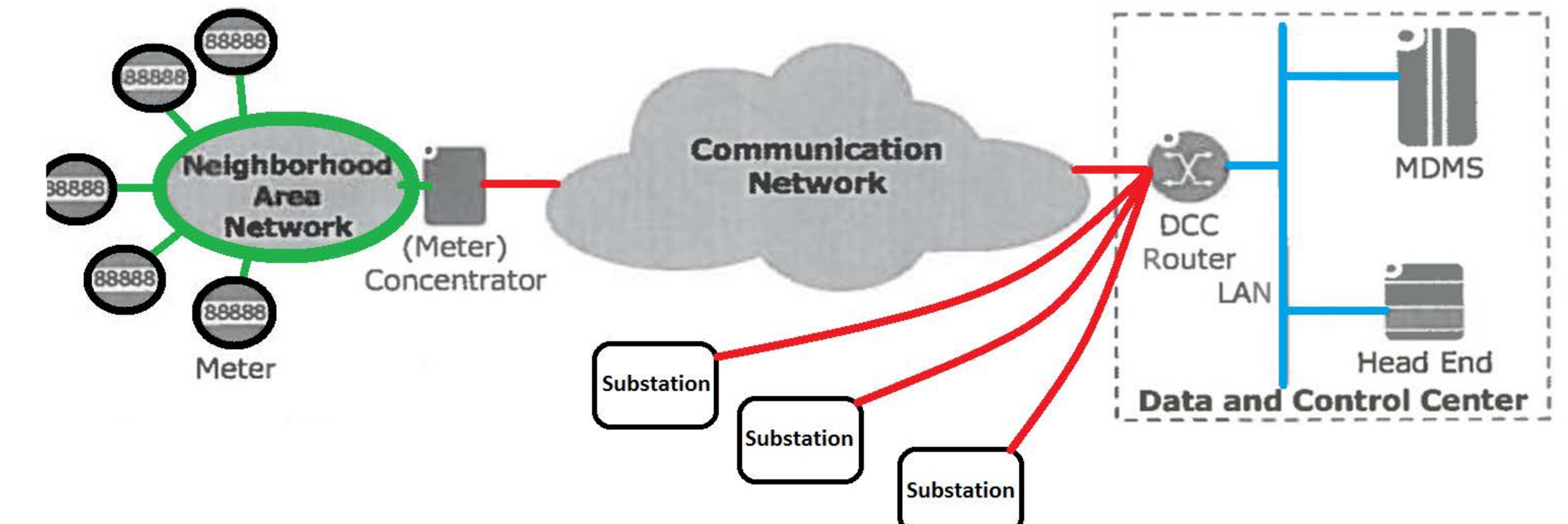
Spring 2015



- Green is the Mesh network over WiFi
- Red links are point-to-point connections
- Blue links are a local area network
- Data propagation allows us to test error rates in the network simulation

UC: Substations

Spring 2015



- Green is a Mesh network over WiFi
- Red links are point-to-point connections
- Blue links are a local area network
- Similar topology to UC: Mesh/Data Propagation
- Added 3 Substations which transmit CCTV to the DCC Router

Solution

- The goal of these simulations is to find the best possible topology for different situations
- With different topology simulations, developers and builders will know which topologies to physically build
- Our group has simulated several use cases which show off the flexibility of the simulation environment
- People who intend to work on the Smart Grid in the future can use our simulations and build on them

