Transforming the world of energy using open standards

Challenges and Solutions for GOOSE Traffic Monitoring

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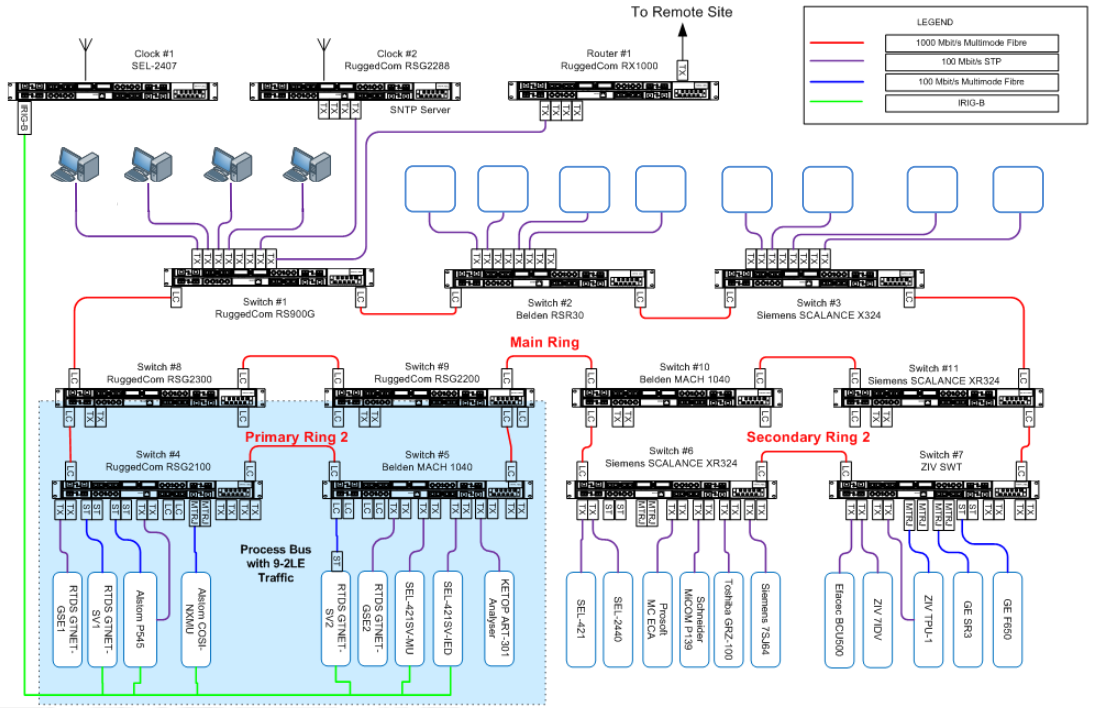
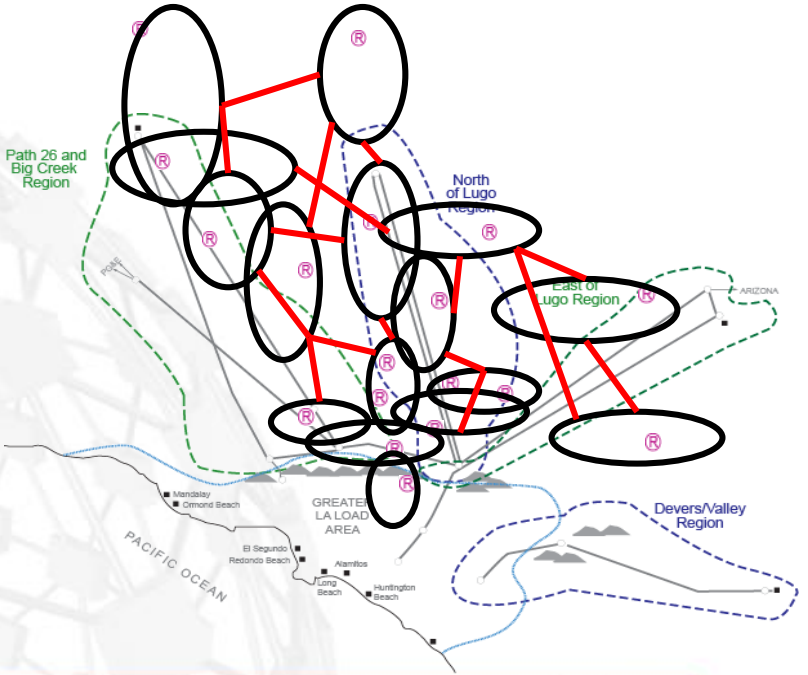
GOOSE on Station Bus

- IEC 61850 GOOSE Messaging uses multicast technology for station level time-critical protection and automation messaging
- Each device is typically publishing multiple GOOSE control blocks and subscribing to multiple GOOSE control blocks from other devices in the substation
- Large substations can have many hundreds of publish-subscribe relationships between devices



New Applications of GOOSE: Wide Area Protection with Routable GOOSE (R-GOOSE)

- R-GOOSE uses IP Multicast services letting the routers determine the paths
- Publish/subscribe relationship are harder to determine
- Physical access to communicating peers is not available



The Challenge of GOOSE

- With messages being transmitted as fast as 4-10 ms per message it can be very difficult for the substation engineer to debug these systems using traditional network monitoring or by monitoring a single device
- Looking at messages does not indicate if the devices that should be processing those messages are, in fact, processing those messages
- With R-GOOSE moving from device to device is not practical

The GOOSE Monitor Solution

- The GOOSE Monitor is designed to provide an intuitive visualization of the real-time GOOSE messaging occurring on station bus that enables the engineer to quickly identify what is working and what is not working

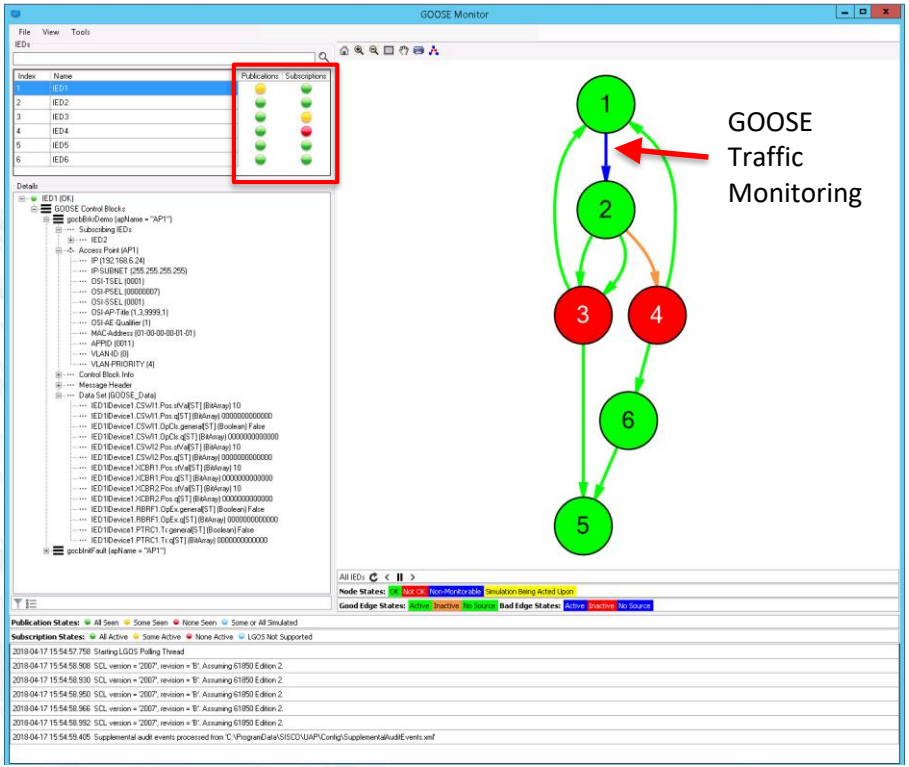
- Allows the engineer to cut through the complexity and focus their attention on where the problems are

GOOSE Monitor Provides Answers

- Are GOOSE messages being published as expected?
- Are GOOSE messages being received by the IEDs as expected?
- What data is being published in each GOOSE message?
- Is the flow of GOOSE messages as expected?
- Are their simulated GOOSE messages on the network?

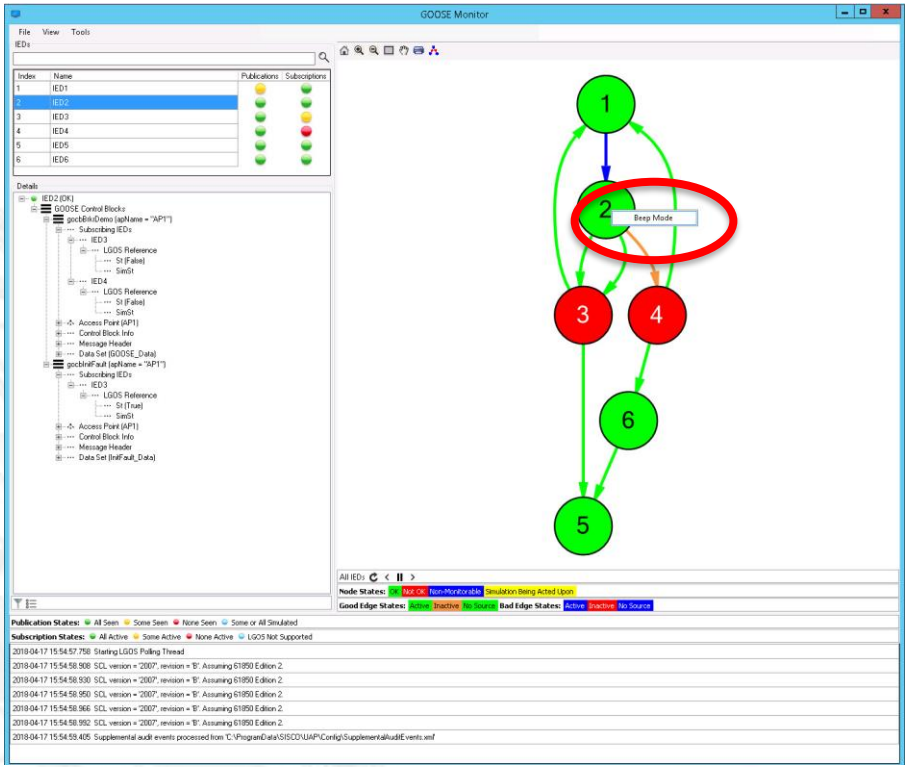
GOOSE Monitor Visualization

- GOOSE configuration is automatically generated from SCD file:
  - Graph diagram
  - LGOS subscriptions
  - Addressing, etc.
- Pub/Sub colors (user configurable) represent GOOSE traffic (Pub) and LGOS state (Sub)
- Node colors (devices) state of GOOSE subscriptions via LGOS
- Edge colors (arrows) represent GOOSE messaging/traffic state



GOOSE Monitor – Device 2 a Problem?

- What is going on with Device 2?
- Click on Device 2 and details are brought up.
- Right click on Device 2 to enable “Beep Mode”
- Beep Mode displays an isolated view of the selected device.



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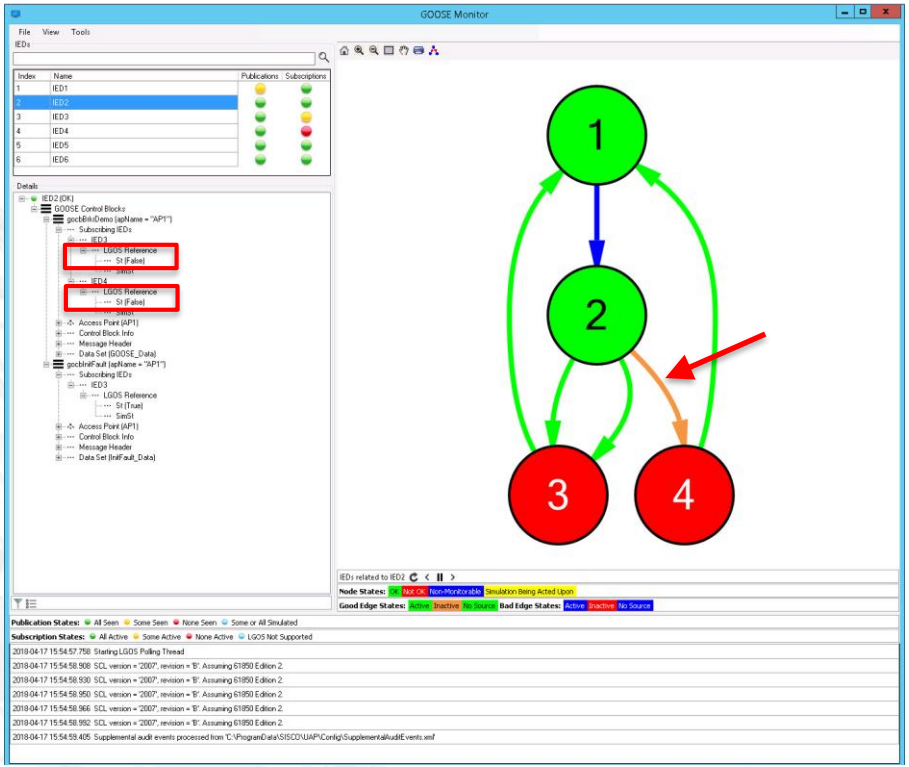
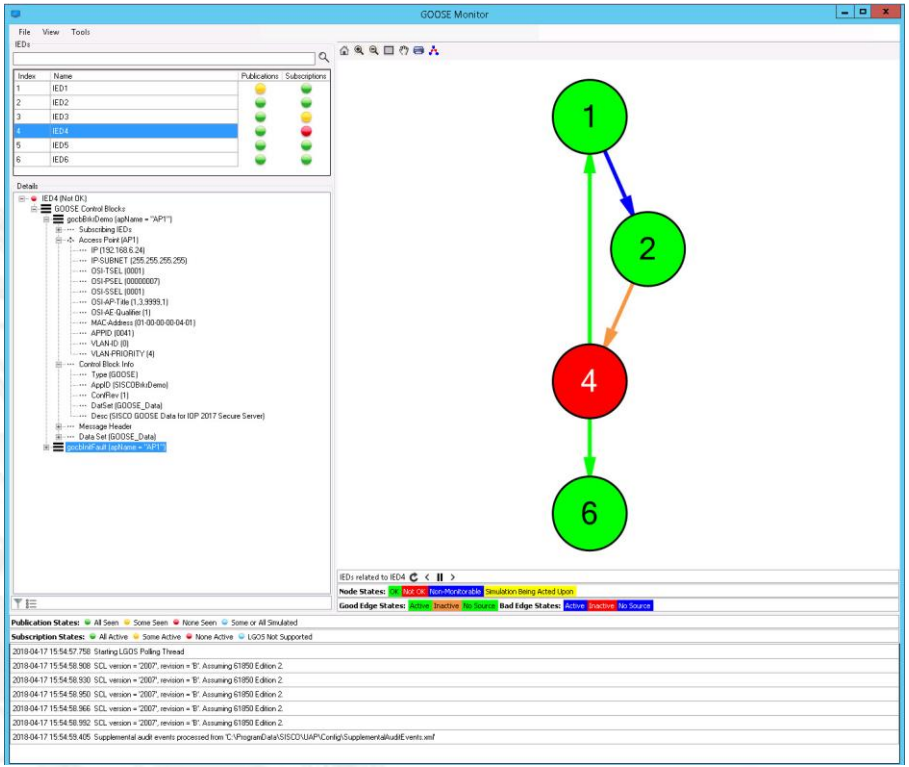
GOOSE Monitor – Beep Mode

- Displays an isolated view involving only the selected device
- Enables the engineer to focus on the more likely causes for problems
- Details screen show the state of the LGOS subscriptions in subscribed devices
- Edge color shows Device 4 is likely missing messages from Device 2



GOOSE Monitor – Beep Mode to Device 4

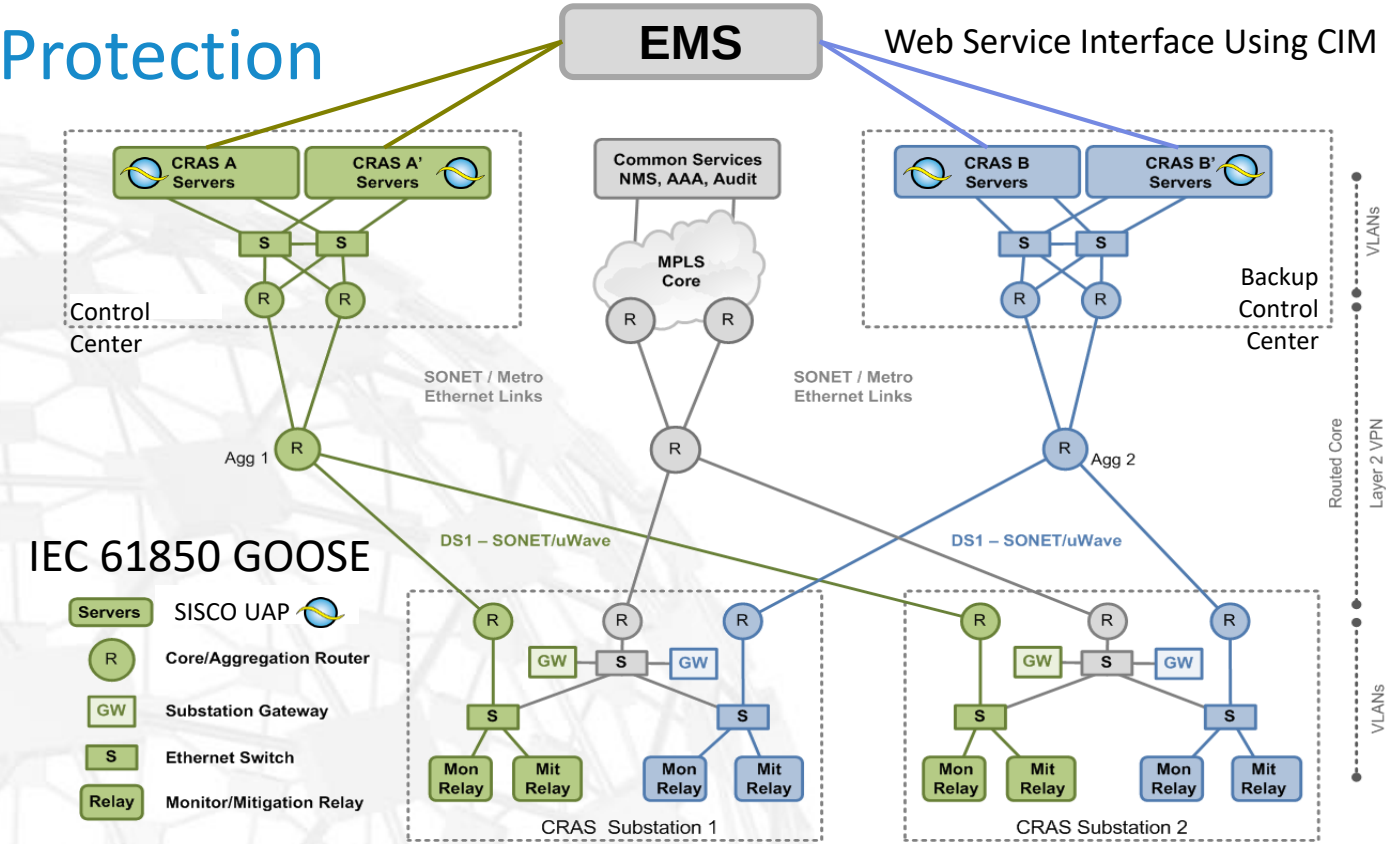
- Beep Mode allows the engineer to follow the publisher and subscriber relationships through the system to track down root causes of problems



GOOSE Monitor

- An essential tool to facilitate quicker identification of the cause of problems in a complex GOOSE pub/sub network
- Provides an intuitive and simplified view of network relationships and GOOSE traffic status to help the engineer focus on what is important

Wide Area Protection using Centralized Remedial Action Systems C-RAS

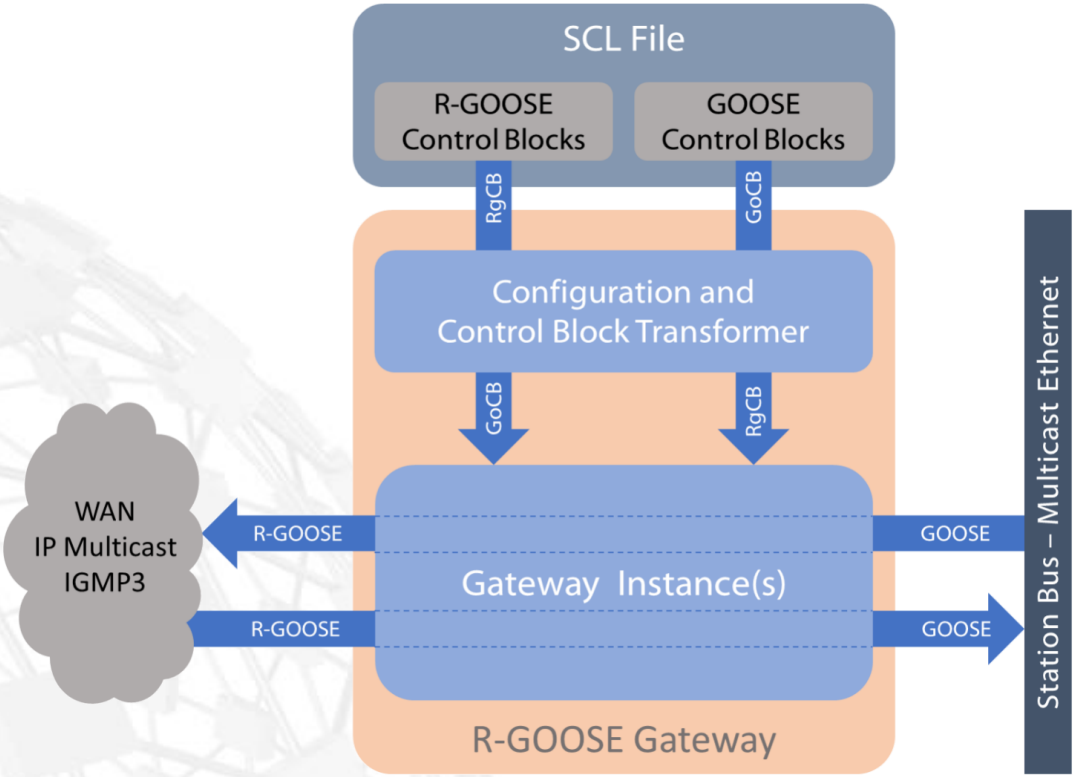


Migration and Integration of Wide Area and Local Protection

- Requires integrating wide area communications with devices designed for local operation
- Protocols used over wide area networks are customized for routers as compared to local communications
- A simple transparent means to go to/from these 2 worlds help with integration and allows migration of existing systems

R-GOOSE Gateway

- Translates Ethernet Multicast GOOSE messaging to/from IP Multicast GOOSE (R-GOOSE) with minimal latency
- Configures with SCL and autogenerates the necessary GoCB and RgCBs needed on either end of the gateway
- Supports execution of multiple gateway instances and multiple network interfaces



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Thank You

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