

CUSTOMER SUCCESS STORY

CUSTOMER: NORTH AMERICAN ELECTRIC UTILITY
INDUSTRY: POWER UTILITIES
REGION: NORTH AMERICA
PRODUCT: RAPTOR®

THE CHALLENGE

Among their many substations, our utility customer has a few substantial, large substations, dams and two Control Centers, the central hub controlling all the substation-related operation management IP telephony and surveillance system. They were using flat Layer 2 networks, which had some redundancy issues with two control centers connecting to all the substations using Fiber and Radio Link. This, in turn, impacted their SCADA and other substation application communication and overall network security.

The system needs to prioritize SCADA, substation application traffic, and video traffic over others so that there are no communication interruptions and can have high priority using either the primary or backup link.

The system requires an industrial-rated networking device with a wide operational temperature range (-40°C to +85°C) capable of passing SCADA, Video Surveillance, Network Timing and other Substations' Management traffic from the substation to the Control Centers securely and redundantly.

THE SOLUTION

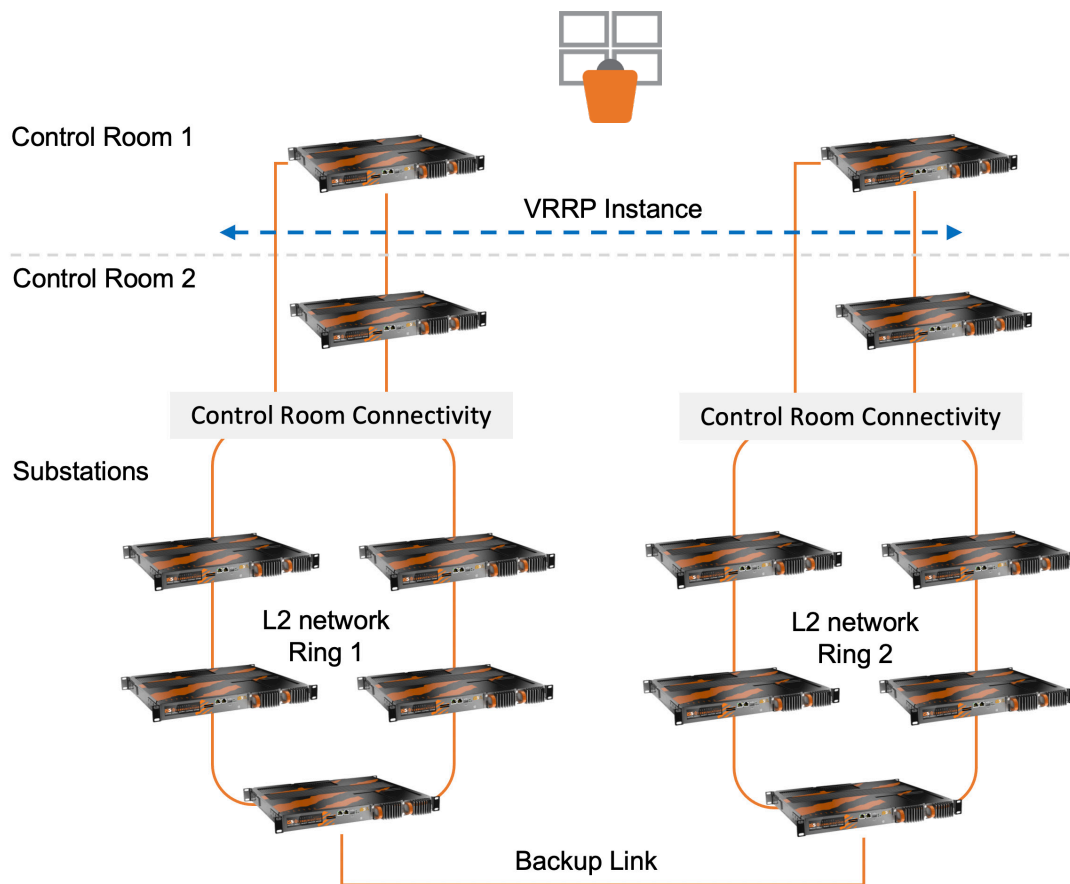
iS5Com proposed a new network design which has a two-ring network connected to two control centers. Each control center manages one ring and acts as a backup for the second ring, thus segregating the large Layer 2 network into two segments.

The new network design was implemented using iS5 Communication's RAPTOR, an Intelligent Cyber Secure Platform running the iBiome® OS, which has been specifically designed to protect and secure critical infrastructures in the harsh environments found in utility and substation applications. A RAPTOR was installed at each Substation location and Control Center for redundant and secure intercommunication of the SCADA Services.

From i5Com's perspective, the best way to design and implement this type of network is to use a combination of Layer 2 and Layer 3 functionality. In the Control level, we implemented both Layer 2 and Layer 3 functionality so that:

- All the inter VLAN routing is managed from core RAPTORS in the control center
- The network security policy is efficiently managed
- Spanning tree Root Bridge is easily managed from the core level for multiple application VLANs
- All external direct communication can be restricted to substation network to secure the OT Network
- Traffic load balancing and prioritization

Figure 1 - Logical Network Connectivity Diagram



We also implemented backup RAPTORS for all the Primary core RAPTORS for gateway redundancy and high availability in such a way that it only acts as a backup of the core RAPTORS. The backup RAPTORS also shares the network traffic load so that in the event of a failure of both core RAPTORS, backup RAPTORS can take over without any interruptions.

For redundancy, each substation RAPTORS is connected with a dual-link, and the complete substation network is connected with two network rings to the Control Center. Spanning-tree configured is such an efficient way so that if the primary link goes down in the substation RAPTORS, the backup link automatically becomes active for the substation network communication.

We also have used QoS configuration for some critical application traffic prioritization and better bandwidth optimization. Network configured in such an optimized way so that all the Substation Merging Unit, RTU Metering device, Teleprotection, and other Substation devices can be synchronized network timing with the Central time server.

For security reasons, all the unused ports of the RAPTOR were shut down in the substation's network, and a security policy was implemented for unauthorized access and local traffic. SNMP was configured to manage all the devices from the Central Network Management System for high visibility of the substation network.

The RAPTOR commissioning process developed essential time-saving benefits by using configuration tools console, ssh and web GUI. This process provided a consistent method to configure the devices and helped minimize errors during the setup. Another benefit of the deployed iS5Com solution was a noticeable performance increase over the initial network setup. While this solution is very complex, it is very effective.

BENEFITS

- **100% redundant** – all the substation RAPTOR's are equipped with a dual power supply and a redundant link connected to the control center in a ring network for first traffic switching. Both control centers RAPTOR's are redundant to each other to take control of the substation network in case of failure.
- **100% visibility** to meter data that feeds into the energy management system independently of Customer Energy System.
- **100% availability** to RTU, IED, power meter, surveillance camera through the RAPTOR.
- **100% reliability** of the utility grade hardened RAPTOR device provides long-term performance at interchange metering locations where temperature extremes are vital.
- **Reliable** – meets or exceeds the standards set out in IEC 61850-3 and IEEE 1613 for the industrial communication equipment in substation environments.
- **Flexible** – The iBiome is an all-encompassing operating system that supports switching and routing on a single platform. The iMX350 has been designed for future scalability. Its modular system of field-replaceable modules, hot-swappable power supplies, and its ability to run third-party software applications makes it a very flexible platform for today and the future.
- **Easy to Use** RAPTOR Management application interface and configuration tools simplify large network rollouts. Future configuration changes, if necessary, can be done remotely and on a large scale through the use of scripts.
- **Secure remote access** to the RAPTOR device configuration is facilitated through SSH and HTTPS.

ABOUT iS5 COMMUNICATIONS INC.

iS5 Communications Inc. (“iS5Com”) is a global provider of integrated services and solutions, and manufacturer of intelligent Industrial Ethernet products. Our products are designed to meet the stringent demand requirements of utility sub-stations, roadside transportation, rail, and industrial applications. iS5Com’s services and products are key enablers of advanced technology implementation such as the Smart Grid, Intelligent Transportation Systems, Intelligent Oil Field, and Internet of Things. All products have the ability to transmit data efficiently without the loss of any packets under harsh environments and EMI conditions.



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