Case Study

Secure Smart Grid for Power Utility

Synopsis

When one of Northern Europe's largest energy suppliers looked into upgrading its infrastructure to Smart Grid, one of its first considerations was to make sure that all IP communications within the network, and all points of contact with outside networks, would be 100% fail-safe, and capable of transitioning between landline and cellular networks. After exhaustive research, the client chose RADiFlow's 3180 compact switch, which was found to provide superior data security over both cellular and land-based IP networks.

When you think of the farthest regions of Northern Europe, what usually comes to mind is a majestic winter wonderland. However, for those in charge of supplying power to each and every town, village and remote outpost, the landscape is less of a wonderland than a difficult operating environment.

This is due not only to the immense size of the region and the freezing winter temperatures, but also the high dispersal of people and infrastructure, which leaves millions of square miles in mostly unpopulated disparate regions devoid of land-based IP coverage.

So when one of Nothern Europe's largest utilities looked into upgrading its infrastructure to Smart Grid, one of the first considerations was making sure that all IP communications within the network, and all points of contact with outside networks, whether accessible by landline or only be cellular, would be 100% fail-safe, and capable of transitioning between landline and cellular networks.

The Challenge

The list of requirements for the Smart Grid project was based on its unique challenges:

- The Smart Grid solution will comply with local government regulations for network security, which prescribe complete separation between sub-networks serving different operational functions--automated meter reading (AMR), remote terminal units (RTUs) and facility lighting.
- The Smart Grid network would cover an extremely large geographical area in disparate, distant regions. In those cases where laying a land-line connection between the different network nodes was either impossible or not cost effective, the proposed solution would allow connecting the IP switches to cellular networks.
- As some parts of the network will utilize both cellular and land-based connections, the network switches would require the capability to integrate both types of networks.
- In case of land-line failure, the network needs to be able to switch to cellular backup, instantly and securely.
- Network communication optimization was a key consideration, so all switches were required to support QoS (Quality of Service), and namely QoS over Cellular.

The Solution

For the Smart Grid project, the client chose RADiFlow's 3180 compact switch, which as all of RADiFlow's products, was designed to operate in extremely harsh environments, with the industry's highest tolerance levels to electromagnetic radiation, as well as vibration, extreme temperature (both high and low) and very high humidity.

For network security, the 3180 utilizes Dynamic Multipoint Virtual Private Network (DMVPN) and Virtual Routing and Forwarding (VRF) to create an airtight segmented connection between different nodes serving various operational needs.

In addition, the 3180 supports SCADA firewall for service validation. Under the IEC-104 protocol, the RADiFlow firewall examines each data packet entering each switch's port and matches it to the rules defined by the user. This provides fail-safe distributed security, basically making it impregnable to external threats.

The 3180 can be installed and swapped on any Din rail-compatible equipment rack. But while it is compact in size—which allows it to be installed in a pole-mounted utility cabinet—it provides a

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variety of communication interfaces, including Ethernet--both copper and fiber--PoE, serial, and cellular.

The 3180 allows parallel network connection through both fiber and cellular interfaces.

For cellular communication, the 3180 utilizes a dual-SIM 2G/3G modem for operational redundancy. The cellular connection option enables a high level of isolation from the network; another advantage of parallel fiber and cellular connection is instant automatic failover, in the case of physical damage to the fiber cable (e.g. if it is severed by a truck or due to extreme weather conditions).

As a critical infrastructure network, the Smart Grid project required prioritizing some communications and protocols over others, in the case of high network load or partial network failure.

To meet this challenge, the 3180 supports dynamic quality of service (QoS) for both fiber and cellular networks. This allows the dynamic setting of automatic rules for prioritization, based on a myriad of operational parameters based on changing needs.

Model 3180

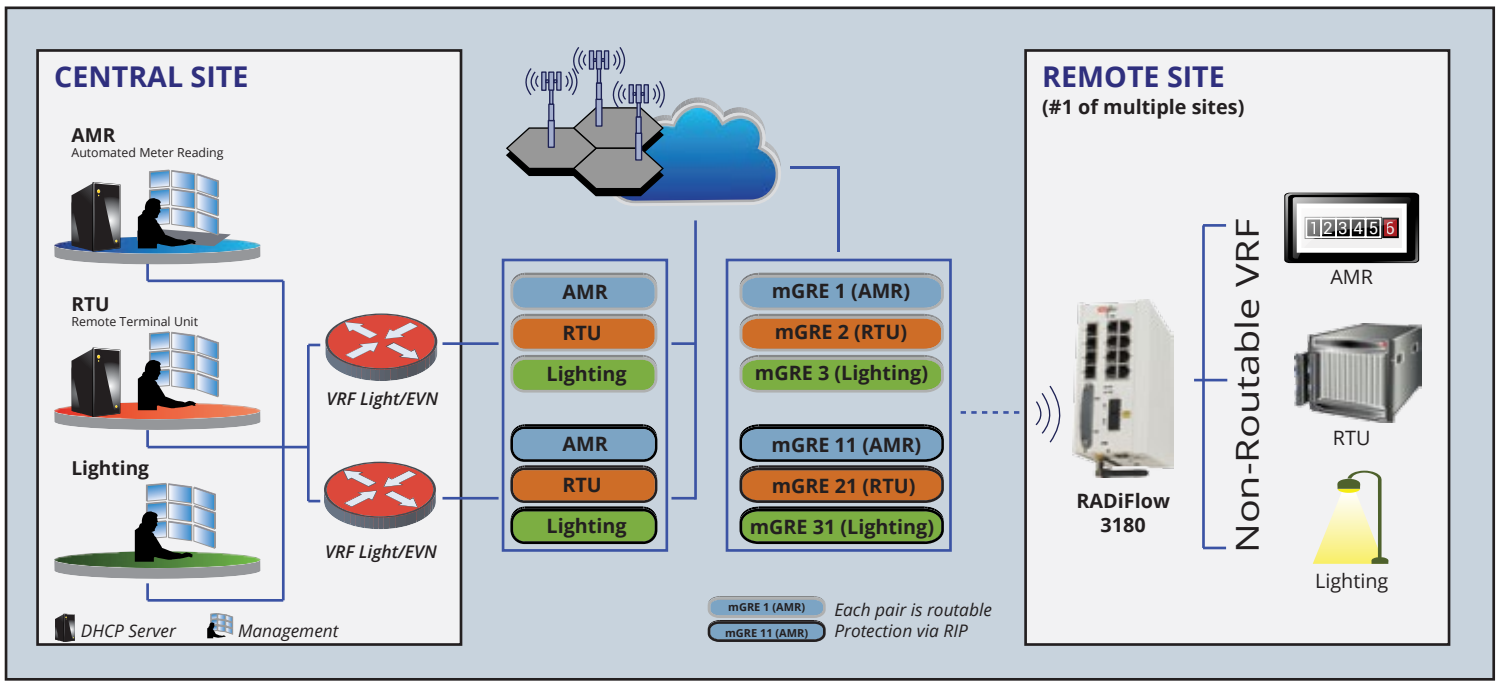
Deciding Factors

The deciding factors for the project were:

- Overall network security, utilizing features designed specifically for SCADA installations, and network segmentation via VRF, DMVPN (including redundant DMVPN) and SCADA firewall.
- Traffic isolation for L2/L3
- Superior remote cellular connection, using a dual-SIM 2G/3G modem
- DMVPN encryption
- VPN tunnel redundancy opposite multiple hubs
- Integrability of legacy devices (serial and ethernet) and PoE.
- Price, vis-à-vis the runner up, a multi-national network hardware manufacturer.

RADiFlow Model 3180 Key Features

- Compact switch with 16x10/100, 2x100/1000 SFP and 4xRS-232 ports with protocol gateway functionality
- 2G/3G cellular modem with dual SIM cards
- 8 Multi/Single Mode ports and 8 PoE ports
- SCADA firewall per port, supporting the IEC-101, IEC-104, IEC-61850, DNP3 and Modbus protocols.
- Integrated VPN agent for inter-site connectivity or remote user access
- Fit for harsh utility environments with fanless cooling.



RADiFlow is a provider of Secure Industrial Ethernet solutions for critical infrastructure applications. It offers an innovative network design for utilities based on its ruggedized switches which contain an integrated SCADA firewall.

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