

CASE STUDY

MARKET: **POWER UTILITIES**

REGION: **LUXEMBOURG**

COMPANY: **CREOS**

CREOS LUXEMBOURG SAVES TIME AND MONEY WITH IP/MPLS NETWORK

Luxembourg's national electricity and gas distributor is deploying an advanced IP/MPLS network for enhanced reliability, better performance and cost savings.



Creos Luxembourg S.A., a subsidiary of Enovos International S.A., owns and manages electricity and natural gas networks in Luxembourg. Its 300,000 customers are currently served through approximately 9,200 km of power lines, 1,870 km of gas pipes, four regional distribution centers and a staff of 640. Creos has successfully embarked on an ambitious, multi-faceted IP/MPLS network project to replace its existing TDM-based communications system. Thanks to the IP/MPLS technology, Creos is converging mission-critical services such as teleprotection, differential protection, closed circuit TV (CCTV) and supervisory control and data acquisition (SCADA) systems onto a single network infrastructure. The IP/MPLS network will also be the communication backbone for a Creos-owned TETRA network, to be deployed by the end of 2015 and covering the entire territory of Luxembourg. It allows remote grid monitoring, improved fault isolation and system safety, enhanced operational performance and cost savings using unified network management.

CHALLENGES

- Meeting the European Union's 20-20-20 energy savings objectives
- Creating a reliable and flexible communications network for the next 10 or 20 years, while supporting legacy systems
- Dealing with the explosion in packet-based services
- Handling great complexity and the ability to perform reliably under extreme conditions, with teleprotection latency of 5 or 6 ms
- Installing smart meters to 95 percent of its 300,000 customer base by the end of 2018

SOLUTIONS

- Alcatel-Lucent IP/MPLS infrastructure, which extends IP/MPLS capabilities from the core to the substations
- Alcatel-Lucent 7705 Service Aggregation Routers (SAR), including SAR-8 and SAR-18
- Alcatel-Lucent 7210 Service Access Switch (SAS)
- 5620 Service Aware Manager (SAM)

BENEFITS

- Optimized OPEX thanks to the converged architecture and the ease of network management
- Support for existing services while incorporating new IP and Ethernet applications
- Ready to handle the massive amount of data generated by thousands of smart meters
- Required reliability level to maintain uninterrupted operations
- Capability to quickly isolate faults to prevent damages to expensive substation equipment and instability in the power system
- Ability to prioritize traffic redirection according to service priority and to fully separate traffic from different operations, for a secure environment and effective bandwidth allocation



“For us there is no difference in teleprotection between the classical interconnection and our IP/MPLS network.”

Patrick Colling, Communications Expert, Creos

THE CHALLENGES

In 2011 Creos Luxembourg recognized the need for a fresh round of investment in its communication network infrastructure. “CCTV and all packet-based services are exploding, so we had to start thinking about whether our network is prepared for the next 10 or 20 years,” says Patrick Colling, Communications Expert for Creos. “We also have a national goal of producing 11 percent renewable energy by 2020, and we intend to meet the European Union’s 20-20-20 energy savings objectives by installing smart meters with our customer base. After testing we saw that IP/MPLS would provide the best support for us in the utility sector.”

Creos understood that its new technology would have to perform under extreme conditions, would need to be easy to manage and would have to deal with all of the complexities typically found in utility operations. “We need to have the knowledge of where our traffic is going. We have to know where our services are in case of interruption of land lines, and react very quickly if necessary, with the ability to separate services, to have full control in the case of emergency,” says Colling. “Teleprotection was a critical consideration. With latencies of 5 ms to 6 ms between connecting nodes, you need to have a very high level of control to guarantee service.”

Creos also needed to migrate its legacy systems to the new network. “We have SCADA internally, and gateways from the SCADA to the outside using different protocols – IEC 101 from 200 bps up to 4,800 bps as well as IEC 104,” notes Colling. Inside of one year Creos had to evaluate the available technologies and create a very stable network design that would be ready for the future.

WHY ALCATEL-LUCENT?

Creos felt it was important that the project’s technology partner fully understood its needs, would have both the technical solutions and proven experience in the industry and would always be available to provide guidance. “If you are alone without the right support, or support you can trust, that is not a good place to be,” Colling says. “The relationship between the vendor and the customer is as important as the technologies themselves.”

To satisfy these requirements Creos turned to Alcatel-Lucent. “It was the only company that offered standard Layer 3 functionality,” says Colling. “Pricing was a factor as well. Alcatel-Lucent’s was an open price that everyone could see, whereas often in the market you will see one price at the beginning and something else later. Last but not least, we had over 12 years of a very good experience with

PDH/SDH equipment that we previously had acquired from Alcatel-Lucent, so we had confidence that its new generation technology would come through for us.”

THE SOLUTIONS

Creos’ high-voltage network is now operating with advanced intelligence, supported by a 10 Gbps backbone interconnected to several 1 Gbps full mesh rings. This proven converged IP/MPLS communications network solution encompasses new generation products supporting network resiliency, quality of service, virtualization and security, all managed by a unified platform.

Creos also successfully conducted interoperability and performance testing with third-party current differential protection equipment over a distance of 104 km using 10 Gbps and 1 Gbps fiber links passing through 11 routers. During testing, Alcatel-Lucent’s IP/MPLS network consistently delivered results of below 5 ms latency across the network and less than 200 microseconds jitter, meeting the requirements for essential service support such as differential protection and teleprotection. “For us there is no difference in teleprotection between the classical interconnection and the IP/MPLS network.” Colling says.

Additionally, Creos is deploying a new generation of smart meters to better control flows and encourage customers to consume less power while allowing remote reading and better management of network charges. Currently Creos is testing a few thousand operational smart meters using different technologies for communications with medium-voltage stations, with a rollout to begin in mid-2015.

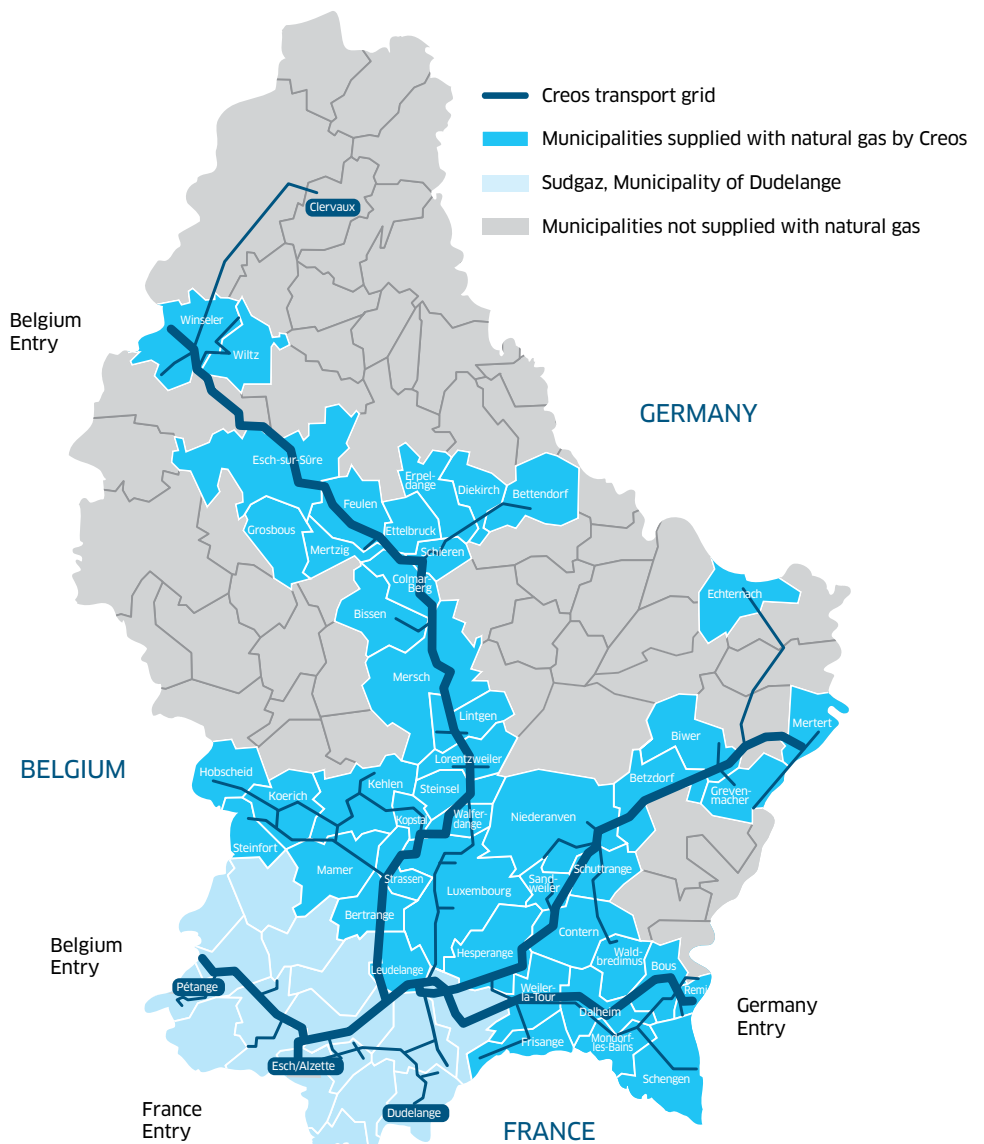
“We think our network is prepared and ready for the next 10 or 20 years.”

THE BENEFITS

Colling says that Creos has had no qualms about making its transition to IP/MPLS. “We were convinced after testing and analyzing the technology that it would operate as needed. Today we can say ‘we need IEC 101 or IEC 104’ or ‘we need 10 or 100 Gigabits’ and we get it.” Operational ease is also a big plus. With PDH and SDH one had to execute numerous time consuming and complicated actions before transporting that type of data over non-analog support.

“For the first time in my 30-year working life I am fond of the technology; the IP/MPLS,” says Colling. “It is the first time I can introduce a new service into my transport medium directly and easily. Now if someone bought a camera and asks to make it operational immediately, connecting two specific points, I can say yes. Two or three years ago you had to ask for documentation, get information on the interface, look at the capacity of the modem and so forth. Today that is mostly unnecessary. IP/MPLS just makes things easier.”

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NEXT STEPS

Creos now is focused on bringing IP/MPLS to the medium-voltage network, working closely with a third-party fiber optic operator in Luxembourg. "The plan is that inside a timeline of five to 15 years we will have 1,500 medium-voltage stations (about 50 percent of the total) interconnected with fiber optics. These stations will be able to fully interact with the high-voltage stations, and all will be IP/MPLS-based," Colling says. Currently, for controlling the medium voltage network, Creos is relying on an interim TETRA-based solution using the IP/MPLS network in the high-voltage stations as the backbone to support communications between the medium-voltage stations and the data center where the TETRA servers are located. "The benefits in using high-voltage stations as TETRA base stations are that we have no new ground to acquire, and there are no extensive installation costs since we already have our own cabinets and support there, so we only have to invest in the equipment for 55 TETRA base stations. The IP/MPLS network has allowed us to reduce the costs of the TETRA network rollout, offering more flexibility, higher bandwidth and better security" notes Colling.

By 2018, Creos will have installed smart meters with 95 percent of its customer base. Meter data will be collected every 15 minutes, brought to a central platform in Luxembourg, then brought by apps back to the customer and injected as data for SCADA and billing, generating a massive amount of data that will be easily supported by the new IP/MPLS network infrastructure.

SUMMARY

A multitude of intelligent sensors connected to the new IP/MPLS network will allow Creos to constantly monitor energy flow and respond instantly in the case of a power interruption. It will provide the capability to scale, incorporate new technologies and manage diverse generation sources, helping Creos to meet Luxembourg's national goal of 11 percent renewable energy by 2020. Having



multiple services on a single converged network will enhance efficiency, while smart meters installed in homes will continuously monitor consumption, further enhancing efficiency and cost savings.

Colling suggests that when embarking on an investment of this magnitude it is important to visit peers in order to enrich your understanding of the new technology. "This year we had other utilities coming to Luxembourg to visit. We had an exchange and everyone went home with a better understanding. That is the most important first step. With an exchange of experiences you can save a lot of time and money."

Creos' partnership with Alcatel-Lucent has been critical to the success of the project. "The working relationship from our side has been excellent," Colling says. "That understanding of our needs and our business is the most important thing". And how does Colling summarize the value Alcatel-Lucent has brought to the project? "Keeping delays reasonable, staying close to the field and supporting it, and already having that understanding of our needs. We trust in it, and it is working well."

Colling adds, "Our SDH/PDH equipment has been running for 12 years without any fault, and now for two years we've had IP/MPLS. We expect it to be as stable over the next 10 years and beyond."