Elektro Celje

SUCCESS STORY

Elektro Celje with modern robust electricity distribution network enables a reliable supply of electricity and delivers sustainable services

We are part of Slovenia's critical infrastructure and at the same time a provider of essential services, so we are bound by strict legislation that affects our operations and business. That is why we make all our decisions prudently and thoughtfully.

Damjan Bobek,
Head of Telecommunications Department, Elektro Celje d. d.

Photo: Aleš Rosa

SMART COM

Extreme networks
Technology partner

As one of the five electricity distribution companies in Slovenia, Elektro Celje d. d. is part of the electricity system of the Republic of Slovenia and thus plays a key role in the development of the country's cost-effective distribution network to ensure high-quality and reliable supply of electricity to consumers.

The company provides for the administration, management and operation of the distribution system as well as maintenance, construction and renovation of power distribution lines and devices in an area that covers 4,345 km² or 22 percent of the country's surface area. The entire length of electricity infrastructure, through which more than 173,000 customers are supplied, represents the second longest network in the country.

Planning, administration, management and operation of the distribution network is crucial for the smooth functioning of the electricity distribution system of Elektro Celje d. d. Reliable and secure functioning of the network is also achieved through introducing **modern information and telecommunications support**, which is based on the latest technological solutions.

Over the years, the complexity of the telecommunications system, which was built on the basis of Ethernet technology, increased, resulting in the decreased controllability of the network. Therefore, during the last cycle of system renovation the decision was reached to gradually introduce a new technology, namely **fabric technology by the provider Extreme Networks**.

A system based on fabric technology, in conjunction with the building blocks of automation and management, enables an effective control of the network which is facing an increasing number of user requirements and a rapidly developing field of various applications and systems in smart networks.

The system provides high availability and above all higher level of cybersecurity and it also enables the introduction of services according to the principles of sustainable development for a wide range of different user systems.

The project was successfully carried out with the long-term partner Smart Com d.o.o., which participated in the development, planning and implementation of this solution.

The company Elektro Celje d. d. is the owner of the electricity distribution infrastructure, which includes 12,994 km of low-voltage networks, 1,258 km of medium-voltage cable lines, 72 km of 110 kV transmission lines, 2,440 km of medium-voltage transmission lines, 19 distribution substations, 16 distribution stations and 3,593 substations.

Our motto is that we are here for our employees; we are at the service of the company and the employees. We are a kind of in-house service provider. At the same time, our primary mission is to take care of our OT services.

Damjan Bobek,
Head of Telecommunications Department,
Elektro Celje d. d.

Photo: Aleš Rosa

With years and experience, we have learned that it is necessary to focus on technology that will enable high availability and security, which was initially possible with Ethernet. Eventually we used everything the Ethernet has to offer (network segmentation, implementation of security mechanisms etc.), so we started thinking about a new solution that will ensure that system and routine operations will be as few as possible and as simple as possible. At the same time this solution had to offer advanced security, which is what we want from modern networks.

Tomi Kolar,
expert in network technologies
and cybersecurity, Elektro Celje d. d.

Photo: Aleš Rosa

The Challenge

In Elektro Celje d. d., Ethernet technology is vital for the operation of ICT system, as it enables high availability and security, as well as supports all key services. However, the natural technological development required consideration regarding network and security planning, since upgrading existing technology and installed equipment no longer made sense. The risk that over ten-year-old technology or equipment could fail at any time was too high, and it was necessary **to upgrade or overhaul the system**. An additional motive were the maintenance costs of the built-in advanced devices of a higher price range, which increased rapidly as the devices aged.

The Solution

Several options were available, from the choice of technology, the choice of specific firmware and the implementation or choice of the right time for implementing the solution in production because the network would need to be interrupted, which is extremely important for the success of the project.

After careful consideration and an analysis of options and a maturity check in terms of capabilities, efficiency and increasing the level of cybersecurity, the fabric technology (which basically still uses Ethernet/IP protocols) turned out to be the best solution for upgrading the Ethernet network.

In cooperation with the experts of the system integrator Smart Com d.o.o., Elektro Celje d.d. set up this extensive project in several steps and carried out the migration in several manageable phases. Today, the company has the latest network technology in the entire network, which is compatible with other parts of the Ethernet/IP network.

Positive impacts

- Significantly easier network management and troubleshooting through a unified and comprehensive centralised management system ExtremeCloud IQ.
- Enabled high availability and guaranteed automatic redirection of traffic flows to a detour route in the event of a network failure.
- Flexibility of the network architecture (high degree of flexibility in deploying services etc.).
- Higher levels of cybersecurity at the network architecture level. The possibility of implementing advanced cybersecurity mechanisms in both business (IT) and process (OT) sections.
- Significantly lower network operation and maintenance costs. The new equipment consumes considerably less energy, which is also an advantage from a sustainability point of view.
- Optimization of work processes, as the introduction of automation saves a significant amount of time in daily routine work as well as in troubleshooting network problems.

Reliability and security of network operation

In Elektro Celje d. d., the Telecommunications Department has an important role in the operation and development of the electricity distribution system. With a relatively small team, the department manages the entire spectrum of **telecommunications systems as well as cybersecurity systems**, managing their development, implementation and operation.

The Department team manages a whole range of subsystems in the field of telecommunications systems, which include: optical network, Ethernet network, IP/MPLS network in several redundant rings, digital radio system for voice and narrowband data connections, telephone system with a call centre and CRM system for managing customer relationships, a microwave link system, a corporate video conferencing system and a wireless network.

In the field of cybersecurity systems, the Department fully manages advanced firewalls and software tools for cybersecurity and an anomaly detection system (ADS) for a process network that is supported by artificial intelligence and provides visibility over services, protocols and devices in the network. The system protects the network and services in the process part, i.e. at the level of distribution substations and distribution stations as well as the administration distribution centre.

The Department also deals with the marketing of surplus optical fibre telecommunications capacities and the leasing of other telecommunications infrastructure.

Implementation of modern information and telecommunications support

Elektro Celje d.d. was one of the first electricity undertakings to introduce Ethernet/IP technology into their IT and OT systems more than two decades ago (in 2002) as the main technology for the communication network. This later proved to be extremely important both from a financial point of view (the construction of special 'legacy' telecommunication networks was avoided) and from the point of view of network operation and optimal use of technological capabilities.

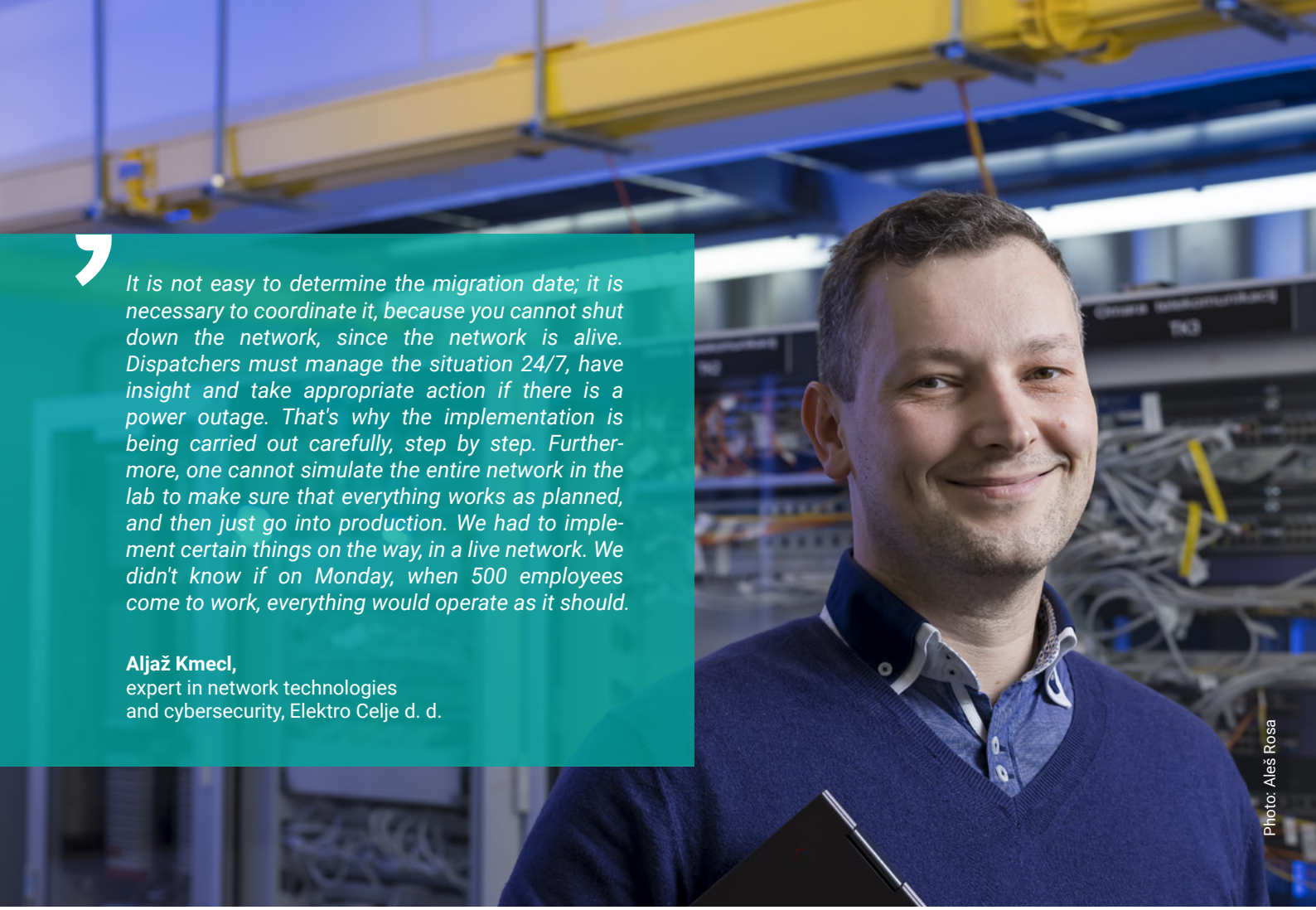
> *A project like this happens every 10 years, although you wish it happened every 20 years (laughter), because there are too many unknowns and discomfort when making the shift switch. The fact that the equipment worked flawlessly and extremely reliably all the time is great plus. This was equipment of a higher price and technological range, and in all the years we had only one failure of the control card. We solved it extremely quickly because we know the equipment well and can manage it internally. Of course, for more complex challenges, we also have the support of Smart Com experts, who are specialists in advanced networks and cybersecurity of process environments.*

Damjan Bobek,
Head of Telecommunications Department,
Elektro Celje d. d.

> *Few people probably imagine what our electricity distribution ICT network is like. It comprises 50+ telecommunication nodes in several 10 business facilities, it is a network of extremely large dimensions/loading gauges.*

Damjan Bobek,
Head of Telecommunications Department,
Elektro Celje d. d.

Photo: Aleš Rosa



It is not easy to determine the migration date; it is necessary to coordinate it, because you cannot shut down the network, since the network is alive. Dispatchers must manage the situation 24/7, have insight and take appropriate action if there is a power outage. That's why the implementation is being carried out carefully, step by step. Furthermore, one cannot simulate the entire network in the lab to make sure that everything works as planned, and then just go into production. We had to implement certain things on the way, in a live network. We didn't know if on Monday, when 500 employees come to work, everything would operate as it should.

Aljaž Kmecl,
expert in network technologies
and cybersecurity, Elektro Celje d. d.

Photo: Aleš Rosa

Today, Elektro Celje d. d. has its own IP/Ethernet and MPLS telecommunications network based on the technology of multilayer Ethernet switches, connected in a topological structure of two rings, which terminate at the main location in Celje. **The network provides services to all users** of the Elektro Celje d. d. company, both business and process ones.

With the above-mentioned architecture, the company achieved significant savings, since such a network, compared to several separate ones, requires significantly fewer resources in the investment as well as in the operational phase. In addition, with the strategic decision that all user systems are based on IP/Ethernet technology, Elektro Celje d. d. has achieved network uniformity and consequently reduced costs.

Network management, users and services is easier and more transparent in a converged network. On the other hand, the technology also makes it possible to **introduce new functionalities and mechanisms**, when the need arises. This regards mainly the large number of different services, users and cybersecurity mechanisms, which have become crucial for the reliable, available and safe provision of services to the technological processes of managing the power network of the electric distribution network of Elektro Celje d. d.

For easier and more efficient handling, both in terms of control and management, and in terms of providing functionality for different users, the IP/Ethernet network is segmented into WAN, LAN and data centre domains.

We use 10 Gb/s between the nodes inside the facilities (especially in the data centre). In between the distribution stations, which represent our backbone (the network that runs from the Austrian to the Croatian border through Celje), or for our OT services, which do not need that much bandwidth, we use 1 Gb/s. We could have switched to a 10 Gb/s ring a decade ago, but there is no need for that, and we prefer to invest the funds elsewhere. For now, 1 Gb/s is enough.

Damjan Bobek,
Head of Telecommunications Department,
Elektro Celje d. d.

Converged network structure based on modern Extreme Networks solutions

In the first phase of the renovation, the core of the network was replaced in the LAN segment, namely switches which were 10 years old and older were replaced by **core switches VSP8404 by Extreme Networks technology provider**, which are based on fabric technology. At the location where a large number of users are located, **X460-G2 access (user switches) by Extreme Networks** are connected to the core switches, which represent the backbone of the LAN network. Access switches are intended to connect users (across the floors of the administrative building) and servers and implement functionalities to ensure cybersecurity at the network level, such as the 802.1x authentication mechanism and network access control. Due to the improvement of performance in the network, the existing ring connection was switched to double connection of each switch or switch stacks on a core switch during the renovation.

In the data centre and backup data centre in the town of Dravograd, they have dedicated switches for connecting server systems. Due to the compatibility of most of the access switches from Extreme Networks with fabric technology, switches for connecting users are expected to migrate to the fabric technology in the future as well. The Fabric Attach functionality currently enables them to use built-in switches that are not yet based on fabric technology and can be connected to the network or to switches that are in the core and already run on fabric technology.

With the described network design, the company has **increased the degree of automation in the network and simplified management**, which increased the efficiency and speed of performing administrative tasks in the management and functioning of the IP/Ethernet network.

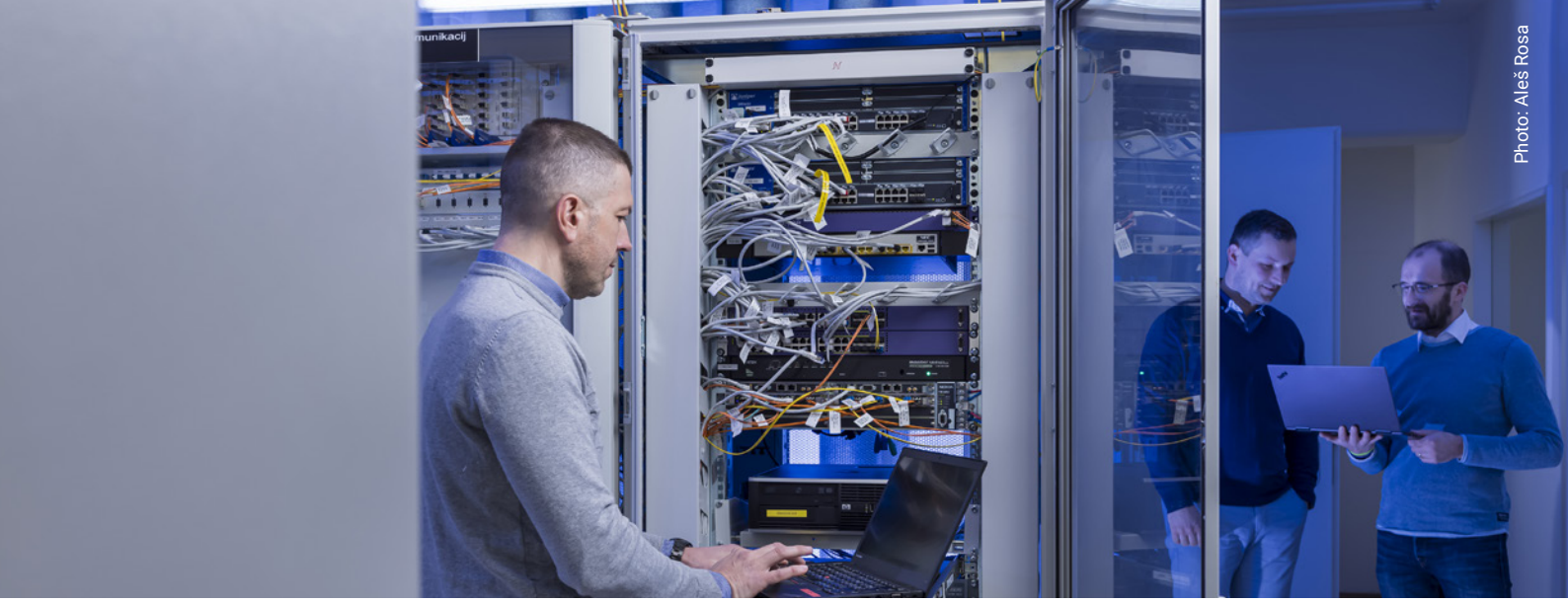
This is well illustrated by the example of establishing a VLAN service, which is a basic service in a telecommunications network. Today, **significantly fewer steps** are necessary to establish a service since it is created at the edge of the network (at one and the other end), and in between, built-in automation mechanisms ensure adequate connectivity via the shortest path. High availability is important here and it is ensured by automatically redirecting all traffic to a backup path in the event of an error, which means that the service for the end user is always working. With a small team managing a network, transparency and efficiency are very important so that routine tasks are as automated as possible, without manual intervention in the core of the network, which reduces the possibility of configuration errors to practically zero level and thus prevents the possibility of service downtime.

The network also enables a **higher level of cybersecurity** as it is built into the network level, and thus already at the very edge of the network so the team can provide greater resistance to advanced cyber threats. Hyper-segmentation is enabled, and the physical level of the network is completely separated from the service level, which makes the topology of the network and devices invisible to users and potential attackers, thus significantly increasing resistance to potential cyber incidents.

Users probably do not notice the difference at first or at all. It is essential for them that the services for which we are responsible function smoothly or that they can carry out their work process without interruption. They do not concern themselves with what is in the background. This means that the communication network is working flawlessly. We, who manage the network, are able to perform this task significantly easier after the renovation. As a cybersecurity expert, I see also other advantages; from a cybersecurity point of view, these types of connections are significantly more secure. At the same time, quite a few new possibilities have opened up for us, which we will gradually implement in the future.

Tomi Kolar,
expert in network technologies
and cybersecurity, Elektro Celje d. d.

Photo: Aleš Rosa



Ease of operation, high availability, security and flexibility for all types of services

The network in all segments – WAN, LAN and data centre – is administered and managed by **a unified umbrella system for control and management ExtremeCloud IQ** by Extreme Networks, which allows them to easily manage the network and users via **an intuitive graphical interface**, as well as access policies at the very edge of the network, which is ensured by the functionality of the central management of network access control (NAC).

With the help of the control system, the establishment (configuration) and control of the network as well as the manipulation of services at the edge of the network are simplified. In addition to the automatic establishment of a service when a certain user connects to the network, this includes a mechanism that also automatically deletes the service in the event that the user disconnects from the network. Consequentially, **a significantly higher level of security is ensured at the edge of the network** since the connection points do not have any service set in advance, which means that a potential attacker who would connect to such a point without authorization cannot enter the network.

Today, Elektro Celje d. d. owns a very reliable and robust network, and its teams are always acquainted with the current state of the network, while its users enjoy greater safety and smooth communication.

Extreme Networks as a leading technology provider of wired and wireless systems for LAN networks with an innovative approach to the market offers a unique switch technology with this universal hardware. This enables users to be extremely flexible and adapt to the various requirements that appear in the ICT network. With fabric technology, this innovation is becoming even more important, especially with relation to gradual migrations, where it is necessary to ensure the functioning of various existing network segments with the new ones.

Main features – functionalities of the ExtremeCloud IQ (XIQ)

From one graphical interface, one database, easy network management, to insight into all network parameters:

- ✓ List of all equipment or network elements (inventory) also from other technology providers: 'multivendor'
- ✓ Display of physical topology (EDP, LLDP)
- ✓ Display of link occupancy: utilization, metres, long-term traffic statistics
- ✓ Configurations (backup, restore, configuration comparison)
- ✓ Display of busy/free network connections (not just link up/down)
- ✓ Alarm system
- ✓ Reporting system

Key functionalities of the Extreme Networks Network Access Control (NAC)

- ✓ List of rules: assignment of the user to the appropriate group
- ✓ Authentication type: 802.1x, MAC
- ✓ Parameters for distinguishing users
- ✓ User group (local LDAP)
- ✓ End systems (MAC addresses of devices)
- ✓ Type of device (e.g. Android, Windows etc.)
- ✓ Location group (IP addresses of switches)
- ✓ Time group (Mon–Fri/08:00–16:00)

Elektro Celje

In critical infrastructure environments, such as electricity, the network must function flawlessly, without errors and enable the longest possible operating cycle. Both the IT and the OT environment are not inclined to very frequent changes, as this might lead to too many disturbances and affect the reliability and continuous (24/7) functioning of services.

Fabric technology, which relies on a high level of automation in the network architecture itself, enables simplified and efficient functioning, especially for business (IT) segments. Due to its reliability, maturity, standardization and ease of operation, it is also suitable for process (OT) segments.

If you want to simplify managing as well as planning and building a flexible and resilient network to support the digitization of business operations and the introduction of modern services, a network infrastructure based on fabric technology is the right choice for you.

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