Nokia Network Services
Platform for power utilities

NOKIA

The Nokia Network Services Platform (NSP) takes utilities well beyond the traditional boundaries of element and network management. It enables unified, end-to-end management of IP/MPLS and Carrier Ethernet networks with packet optical and microwave transport, as well as the services they deliver. Fast and easy configuration reduces deployment time and increases flexibility. Proactive service assurance helps resolve problems before affecting operations. Intelligent alarm correlations capabilities assists to identify root causes, expediting service restoration. The Nokia NSP is also ready to evolve to a software defined networking (SDN) controller today.

Utility network challenges

The pressure is on. Utilities are transforming their WAN communications infrastructure to converged IP/MPLS-based networks. Driven by distribution automation, they are also starting to extend mission-critical broadband connectivity beyond low-voltage substations into the field area network (FAN) wirelessly using cellular technology such 4G/LTE. To rapidly plan, deploy and troubleshoot this new generation of networks and applications while controlling costs, a converged network services management solution is essential.

Traditional element and network management solutions often do not allow utilities to keep pace with the size and complexity of today's networks. Manual processes that use a command line interface (CLI) are too slow and error-prone. Reactive problem detection leads to longer outages affecting grid reliability and safety. Insufficient information on how the network is used and uncertainty about how planned changes will affect the network and users make network planning very challenging and sometimes incomplete.

The Nokia Network Services Platform (NSP) takes mission-critical WAN operators beyond the traditional boundaries of element and network management. It enables unified, end-to-end network services management across IP/MPLS, optical and microwave transport domains and the mission-critical data they deliver. Template-based provisioning greatly reduces deployment complexity and increases roll out velocity. Advanced OAM tools enables operators to proactively assure service and network performance, as well as restore faults before they affect users.

Importance of management for smart grid implementations

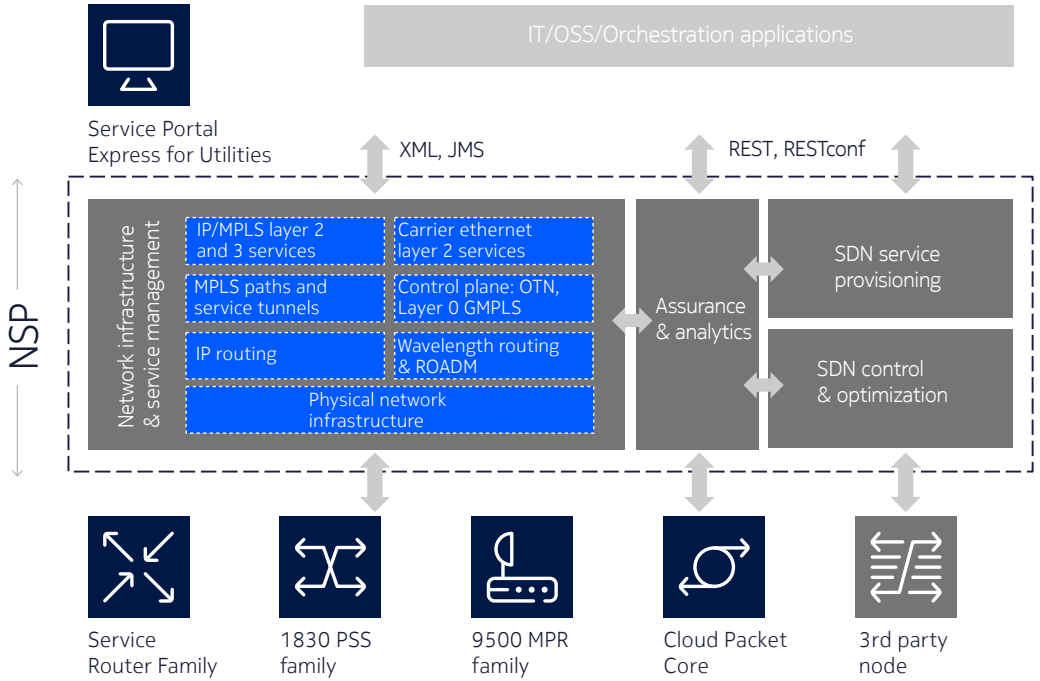


Figure 1. Nokia NSP: network services management of multi-layer multi-domain network, with evolution to SDN

Utilities worldwide are implementing smart grid technologies to:

- Increase the inclusion of distributed energy resources
- Deploy smart meters for more real-time information and control, both by consumers and the utilities
- Improve grid efficiency and reduce costs
- Meet new regulations

Accordingly, utilities adopt an IP/MPLS converged communications infrastructure to adapt these and other existing applications. This IP transformation of the grid communications imposes new technologies and infrastructure designs and complexities, increasing the network operator's role and responsibilities.

A converged network reduces the overall effort and cost by reducing the number and types of network elements while increases increase the requirements for flexibility and visibility. Without superior element, network and services management tools, the task can be an immense challenge.

The smart grid also has many elements that need to be managed in addition to the network infrastructure. Utilities needs an overall network view as well as information about and control of the network and its applications. The Nokia NSP meets these needs because it is designed to effectively integrate into an umbrella operations support system (OSS).

Accelerate the configuration process

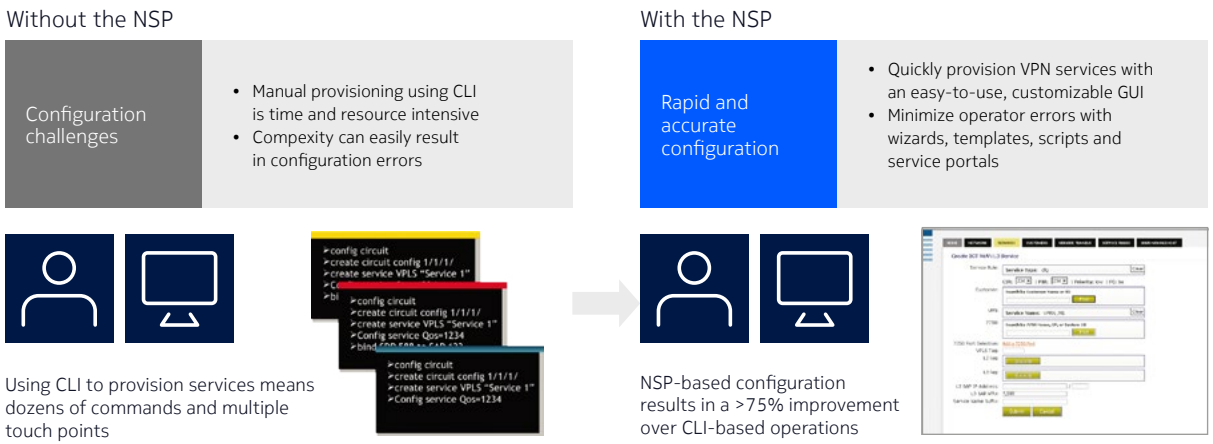


Figure 2. Effective and efficient configuration with the NSP

Agility is key to maintaining a dynamic, yet reliable, communications network. Utilities must be able to quickly and easily configure and change network elements, routing infrastructure and services.

Configuration using an element management tool such as CLI is cumbersome and can lead to network issues. Introducing new equipment and services can be unnecessarily delayed, impeding smart grid applications deployment and affecting business objectives. The NSP gives utilities several options to accelerate the configuration process and minimize the risk of misconfigurations (see Figure 2):

- Easy-to-use graphical forms, for point-and-click element, network and service configuration
- Wizards to guide operators step-by-step through complex tasks
- Advanced scripting, templating and rules-based configuration, allowing customization of the utilities for specific network or service requirements. This customization also allows non- expert resources to handle more complex tasks and eliminates repetitive data-entry activities.
- Further automation and zero-touch configuration for various operational teams, by deploying the Nokia Service Portal Express for Utilities or a custom-built service portal
- When configuration is complete, a single click allows operators to verify that complex services are operating correctly across all layers.

Enable proactive service assurance

Any quality of service (QoS) degradation or intermittent outage in a utility's mission-critical WAN can directly impact power reliability and quality, resulting in loss of revenue, and can even compromise worker and customer safety. Therefore it is necessary to continually assure network services are up and running. With network and application environments becoming increasingly complex, implementing service assurance with traditional element- and network- centric tools and CLI is inefficient and resource-intensive.

With the NSP, utilities can proactively identify and resolve potential problems in the network before they impact the network services supporting grid applications. For example, scheduled test suites provide detailed information on network performance and assurance thresholds for any applications where increased latency, jitter or packet loss will diminish QoS and affect application performance.

Rules-based alarm notifications, such as threshold-crossing alerts, and escalating test-failure alerts further automate fault management and ensure adherence to QoS objectives or service level agreements (SLAs).

When a problem does occur, the NSP offers a comprehensive set of tools that let utilities quickly find and resolve the issue. Integrated graphical views of the physical and logical topology depict all paths traversed by a service, including the actual routes across the network. And enhanced alarm correlation reduces the number of alerts by providing a single entry that identifies the root cause of the problem.

Enhance network planning and performance reporting

Network administrators often lack visibility on how the network is used and on how planned changes and unforeseen outages will affect the network, utility operations and users.

The NSP provides a distributed platform for real-time statistics and offers the detailed information needed to avert network bottlenecks and service degradation. Historical and real-time statistics graphing help administrators better understand performance issues before they become a problem.

Control plane assurance management

The Control Plane Assurance Manager (CPAM) is a multivendor route analytics application that delivers unprecedented real-time visualization, surveillance and troubleshooting for dynamic IP/MPLS networks and services. It helps utilities to quickly identify IP routing and MPLS path misconfigurations, malfunctions and undetected updates, further decreasing troubleshooting times and accelerating problem resolution (see Figure 3).

Operators can use the CPAM application to simulate planned control plane configuration changes and operational maintenance, such as node upgrades, as well as carry out what-if scenario analysis.. With graphical analysis of the simulated topology, operators can pre-validate the impact of the changes before they take effect in the live network. This pre-validation reduces the risk of service degradations and interruptions.

Analytics and reporting

Analytics and reporting application delivers accurate, timely, application-level traffic intelligence for business and operational planning. It provides intelligence on which VPN sites (e.g. substation) are most active with what applications. It also provides insight into improving application performance and QoS optimization by collecting, warehousing, aggregating and analyzing performance and volumetric data for application traffic flows.

Accordingly utilities are able to better understand how the network is being used and to make informed decisions during network re-optimization and expansion.

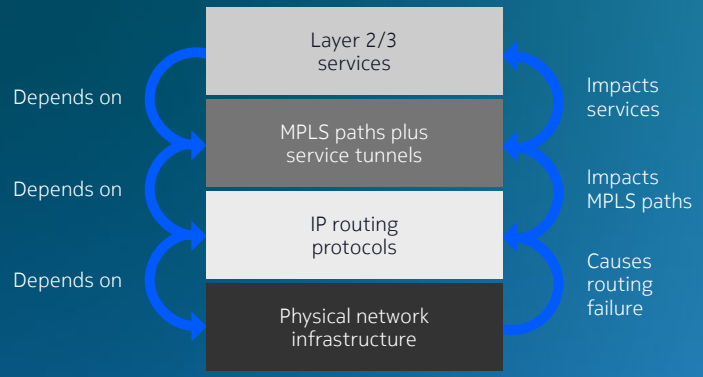


Figure 3. Control plane assurance management is key to understand and correlate control plane failure with services

"The 5650 CPAM (now renamed CPAM application) has proven an invaluable tool for troubleshooting complex BGP configurations. It allowed us to graphically visualize the AS path topology, enabling us to quickly diagnose BGP issues that occurred after an upgrade scenario. We look forward to continue to leverage the significant value the CPAM has added to our overall network assurance capabilities as we introduce new services and our network grows."

Jeff Fry, Manager, Telecommunication Engineering Transmission and Technology, Ausgrid

Operational fit and flexibility when introducing IP/MPLS

With the NSP, network operators gain a management solution that easily adapts to their existing environment. Span-of-control and scope-of-command features allow operators to assign administrator privileges based on geography, organization, job function or individual responsibilities. The ability to deploy the 5620 SAM in a high-availability, redundant configuration helps ensure full availability of network and service operations, even during catastrophic failures.

The NSP functionality is accessible through a powerful, open OSS interface. Using XML and Java Messaging Service (JMS), any or all capabilities can be integrated with other vendors' applications. The Nokia OSS Connected Partner Program provides certification for pre-integrated products from leading independent software vendors, reducing integration time and costs.

Nokia Service Portal Express

- Offers customized, web-based service portals for network operators to simplify workflows for service monitoring and configuration
- Simplifies the adoption of new technology, with the Nokia Service Portal Express for Utilities, to help utilities accelerate the transition to IP/MPLS for their smart grid with a consistent, policy-based approach to managing the network.

Independent research has confirmed the NSP increases administrator productivity by

75%

while reducing script development costs by

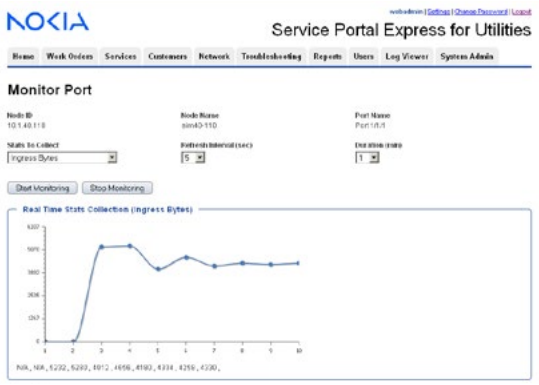
50%

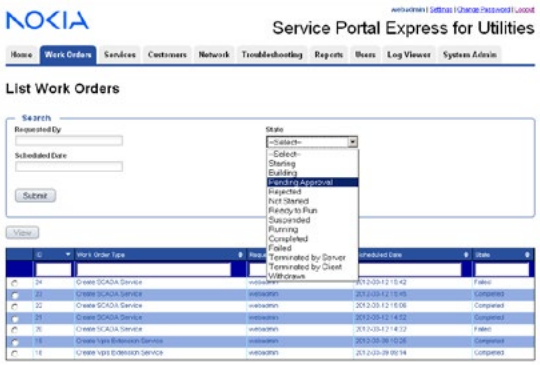
Source: Forrester Consulting

Nokia Service Portal Express for Utilities

The Nokia Service Portal Express for Utilities is designed for utilities, using utility-specific terminology and tasks. It simplifies day-to-day network management tasks, such as provisioning new network services, troubleshooting problems and creating reports. Its user interface includes a predefined set of profiles, such as Supervisory Control and Data Acquisition (SCADA), teleprotection and video surveillance, with pull-down menus that simplify use and greatly reduce the possibility of user error. Security and peace of mind are provided by pre-defined workflow routing, authorization and validation algorithms while network metrics can be easily retrieved in reports designed specifically for utilities.

The Service Portal Express for Utilities enables staff from various operational teams to perform routine network management tasks without needing specialist network knowledge. This puts the power in the hands of those who need it, when they need it, freeing up the IP/MPLS network experts to focus on their essential tasks.



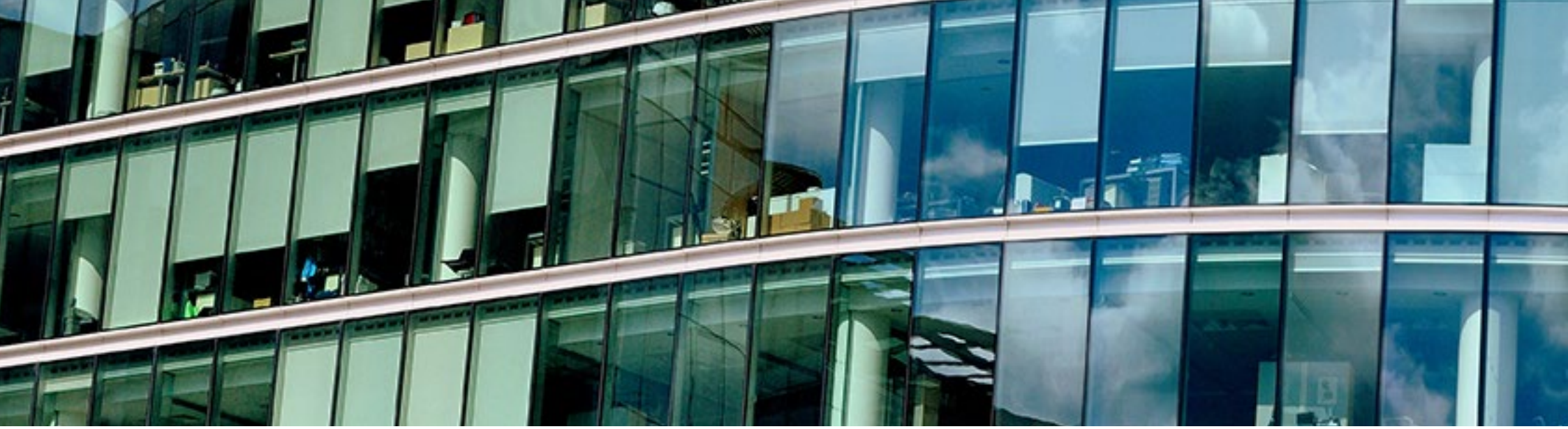


Ready to evolve to SDN, today

As power grids are becoming intelligent and responsive, utility communications networks have to evolve in time to become more automated, dynamic and optimized to support smart grid applications efficiently and scalably.

The Nokia NSP can be expanded to include full SDN controller capabilities to help utilities meeting communications requirements more proficiently in the following ways:

- Abstracted, optimal service provisioning intelligently to achieve requirements including latency, maximum number of hops or bandwidth
- Real time network self-tuning in response to changing traffic demand and pattern
- Automated path optimization to get more out of network assets with no reliability compromise
- Furthermore, with simple REST/ RESTCONF Application Programming Interfaces (APIs), IT and Operations Support Systems (OSSs) and service orchestrators can integrate seamlessly with the NSP, resulting in optimal network management and operation efficiency.



Continue evolving with Nokia

Nokia has a long tradition of excellence in network management and leadership in mission-critical WAN solutions. We also continue to enhance our network and service management solutions far beyond conventional systems allowing utilities to implement the lean and scalable lean, flexible and scalable processes required to deliver a reliable, versatile network that meets grid application performance requirements today and tomorrow:

- Accelerates reliable provisioning processes
- Continually monitor service and network performance
- Proactively prevents user-affecting problems
- Offers fast and simplified fault resolution
- Delivers unmatched network visibility and application usage
- Simplifies network migration from legacy technologies to IP/MPLS.

With more than 500 deployments, including some of the world's largest and most advanced networks in critical infrastructures supporting mission-critical operations, the Nokia NSP is a proven solution that sets the standard for each aspect of network operations. With an architecture that is modular, extensible and scalable, the Nokia NSP helps utilities address today's challenges with a foundation that will support the continued evolution of smart grid.

The Nokia advantage

Nokia has provided the highest level of technology and service to the world's leading utility utilities for more than 25 years. We are bringing communications technology to the smart grid and helping utilities support mission-critical operations with uncompromising reliability and security. Nokia has a long tradition of excellence and leadership in network management.

Please visit **networks.nokia.com/power-utilities** to learn more about our utilities communications solutions.

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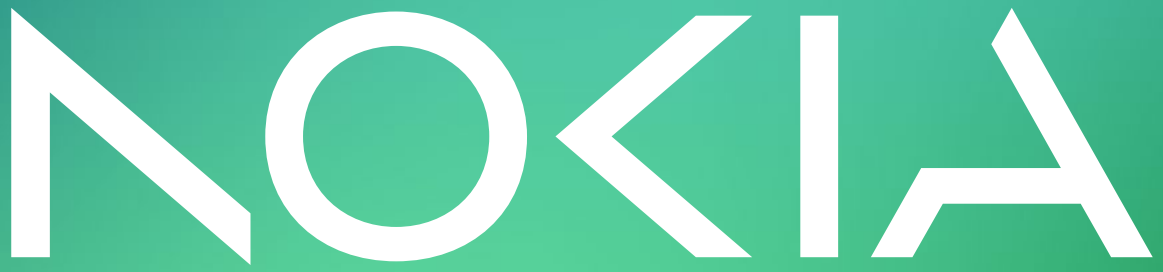

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.