Public safety backhaul modernization

Use case

Evolve to a full packet mission-critical backhaul network to securely and reliably support new broadband and video services for public safety.

Radios are a lifeline and safety net for first responders. With mobile broadband communications, modernization of existing voice networks and deployment of new video- or sensor-based services, new tools and resources will soon be brought to first responders. Legacy public safety backhaul networks, built to carry voice traffic from LMR/PMR networks, are aging and far from being optimal to efficiently and reliably support these new services. They have to undergo significant evolution.

This use case describes how Nokia can help you modernize your public safety backhaul network to keep delivering to first responders a growing number of more diversified services in a secure, reliable and scalable way.

Challenges

The wide adoption of IP-based, broadband applications in public safety communications will engender three key trends that create a need to reimagine public safety backhaul networks.

Evolution of existing land mobile radio (LMR)/private mobile radio (PMR) systems

Many public safety network operators are upgrading their current land mobile radio (LMR)/private mobile radio (PMR) systems with IP-based technologies. These technologies can support a new revision of radio standards and take advantage of increased channel capacity and improved spectrum efficiency, as well as more efficient voice encoding.

LTE adoption

Major public safety agencies have already endorsed or are in the process of rolling out Long Term Evolution (LTE) as the successor to existing LMR/PMR systems. These agencies recognize that LTE enables the real-time sharing of multimedia information and instant access to a geographic information system (GIS) and other databases equipping first responders with the necessary information to respond to situations more quickly and effectively. As a result, many public safety agencies are now considering ways to augment their existing LMR/PMR systems with LTE.

Budget control

While public safety agencies are revamping their communications networks, governments are under increasing pressure to improve economic efficiency. The idea of network infrastructure sharing, which allows other government agencies to share the new networks, is considered an effective way to attain the goal.

These three trends make it necessary for public safety agencies to rearchitect the backhaul networks that support their daily communications. The new backhaul networks need to exhibit the following key attributes:

1. Scale and versatility to efficiently support current and future services, as backhaul modernization for public safety typically happens once every 15 or more years
2. Security, reliability and resiliency, to continue delivering mission-critical connections even in the most challenging situations—a must for public safety in a more open IP environment
3. Simplicity and cost effectiveness, to meet stringent budget constraints and allow easy and safe network sharing between multiple government agencies.

How we help you

Combining market-leading IP/MPLS, packet microwave and optical transport technologies, Nokia provides a reliable, secure converged backhaul network solution with the following key attributes:

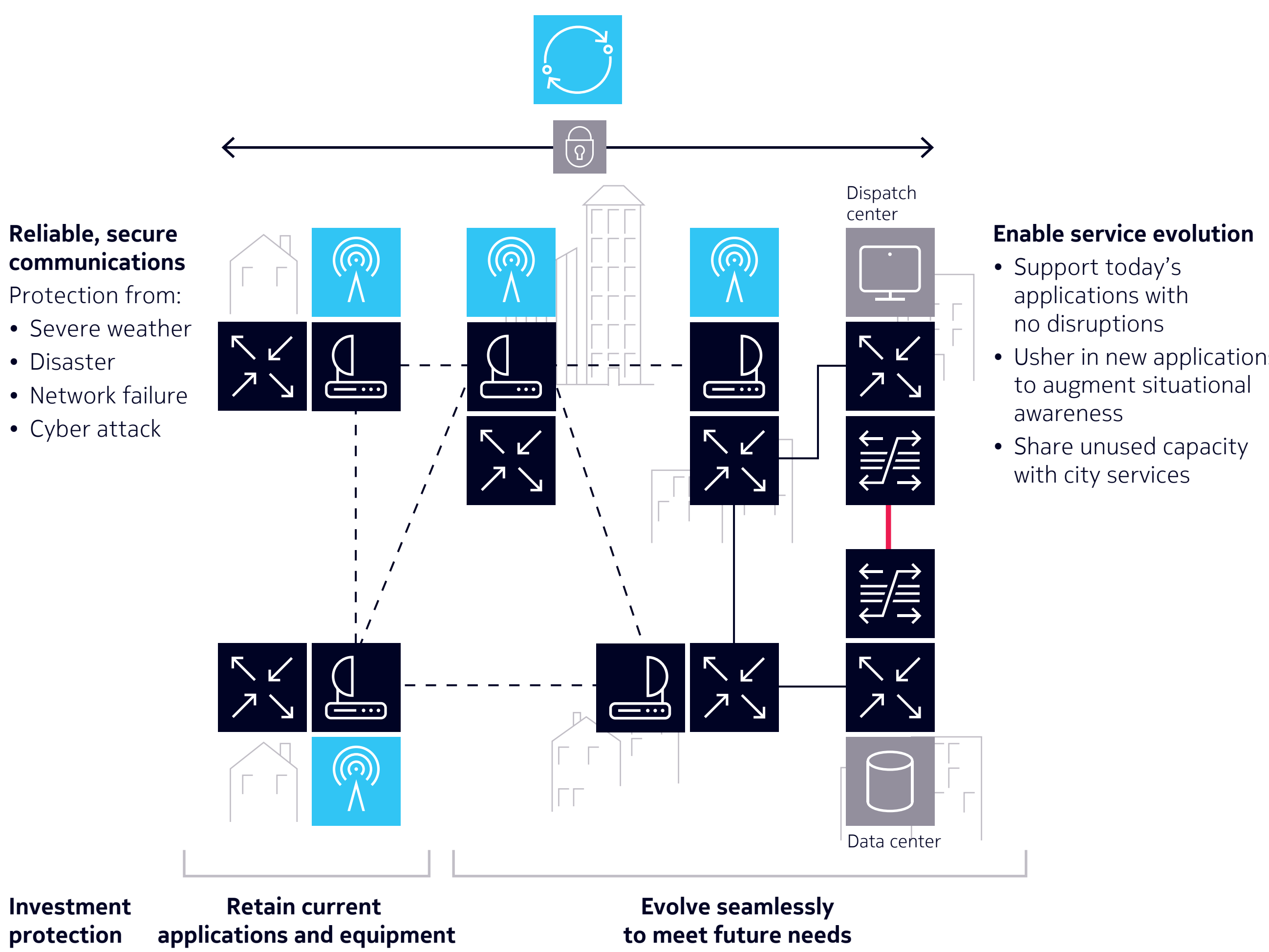
- **Service evolution enablement:**
  - Support today's applications with no disruptions. Our full packet backhaul allows seamless support of today's voice-centric services with assured deterministic quality of service.
  - Augment first responders' situational awareness: With advanced features, full packet microwave systems increase the spectral efficiency, enabling the broadband data services to enhance situational awareness for first responders. Thanks to IP/MPLS VPNs, those services are fully segregated and secure.
  - Leverage unused capacity: Better spectral efficiency of full packet microwave creates additional capacity. It can be shared with other government agencies to improve network economics, with no compromise on critical applications thanks to the multi-tenant paradigm of VPN services and quality of service (QoS) management.
- **Communications protection:**
  - Adaptive to inclement weather: Microwave links are exposed to severe weather conditions, which can impact the quality of the link. Adaptive modulation instantaneously optimizes the quality of the link to weather conditions. Advanced QoS management ensures that critical traffic is treated with the highest priority, thus making those links robust even in the most adverse situations.
  - Resiliency through natural disaster and fiber cut: If a link in a microwave ring is impaired, the traffic is rerouted on the other leg. If a fiber is cut by an excavator, the data is rerouted through a different path, leveraging the MPLS fast reroute mechanism. Even when multi-faults occur, communications can still be restored if physical connectivity exists.
  - Protection against hardware failure: Even in the unlikely event of a hardware failure, the system redundancy scheme ensures nodal availability, thanks to the hot standby capabilities of the microwave radios and the IP/MPLS routers. This allows for nonstop service with no communications interruption.
  - Bulwark against cyber-attacks: Thanks to multi-layer encryption, from a common microwave and optical layer 1 encryption solution to IPSec and Network Group Encryption (NGE), safeguarding the confidentiality, integrity and authenticity (CIA) of communications. Service-aware stateful firewalls can also be used to prevent intrusion.
- **Investment protection:**
  - Graceful service evolution: With a full packet backhaul, current voice-centric services can be complemented with new data services. Being packet-based, they can be seamlessly introduced and natively supported along traditional services to smooth transition and optimize bandwidth usage.
  - Future network evolution: As adoption of new services grows and the network expands, new infrastructures are needed. New optical 10 Gb/s and 100 Gb/s Ethernet links can be added to provide more bandwidth between the data center and the dispatch center. A new microwave direction can also easily be added. Advanced platform simplifies network and services management across technologies, and eventually SDN will provide the automation to dynamically optimize the resources usage, further improve the network quality and lower operational expenditures.

Why our approach is different

The Nokia end-to-end backhauling solution offers the following industry innovations:

- Full backhaul solution integration with IP/MPLS, packet microwave and optical, allowing a choice of optimal technology mix
- IP/MPLS microwave solution with nonstop routing capability
- IP/MPLS services over LTE for hard-to-access sites
- Unified cross-layer management with seamless evolution to SDN for increased network flexibility and optimization.

Figure 1. Public safety backhaul modernization



How you benefit

- High service availability to provide dependable critical connections.
- Network sharing with non-critical government applications to improve network economics.
- Ready for future applications today, eliminating the need for frequent network refresh.
- Simplified and more proficient network management.

Let us help you

Nokia is committed to helping public safety operators and agencies safely embrace mission-critical broadband communication technologies to enhance the way first responders operate. Through our end-to-end public safety solutions and services, we provide mission-critical broadband communications to improve situational awareness, efficiency and safety.

Contact us to learn how our public safety products and solutions can help you increase
first responders' situational awareness and safety.

For more information on our solutions for public safety, visit

https://networks.nokia.com/public-safety

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.

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