Simplify your TDM-to-IP evolution with Nokia
A guide for U.S. Federal Government organizations
Contents

Transformation can’t wait
Adapt legacy interfaces for IP/MPLS transport
A complete platform for network modernization
What about delay, jitter and synchronization?
What about availability and resiliency?
What about network security?
Why choose Nokia as your partner?

Resources
Transformation can’t wait

For years, TDM and SONET/SDH networks have delivered resilient, reliable and secure voice, video and telemetry data services for mission-critical applications. However, with the shift to packet technology in the telecommunications industry, the Federal Communications Commission (FCC) started to speak about “The IP Transition: Starting Now” as early as November, 2013.

With equipment suppliers discontinuing legacy TDM equipment production and support, and service providers like AT&T and Verizon no longer accepting new TDM circuit requests and now discontinuing existing circuits in favor of Ethernet, the time to transition is now.

While all of this creates an urgent need for network transformation, many federal agencies, still rely on legacy TDM services and applications — and will for years to come, largely because it is impractical to replace everything at once. Agencies need a way to start their transition to IP networks, while keeping older applications up and running just a little longer.

Nokia offers a field-proven solution: the 7705 Service Aggregation Router (SAR) for federal agencies and departments needing to move from TDM to IP with continuity of operations.

Nokia is one of the world’s top-ranked IP networking companies. With customers in more than 130 countries and hundreds of critical infrastructure IP/MPLS deployments — including more than 270 in the government and defense sectors — Nokia has the experience, expertise and technology to ensure a smooth, seamless and future-proof migration.

![Figure 1. Current state of federal government networks infrastructure](image-url)
Nokia 7705 SAR
Adapt legacy interfaces for IP/MPLS transport

The Nokia 7705 Service Aggregation Router (SAR) supports most common legacy data and voice interfaces, adapting them into point-to-point TDM circuits (pseudowires) for transport across MPLS-enabled Ethernet (FE/GE/10GE) interfaces.

Figure 2. Network modernization with the Nokia 7705 SAR
Nokia 7705 SAR
A complete platform for network modernization

The Nokia 7705 SAR does more than just solve the TDM-to-IP migration challenge. It can also:

- Replace other legacy networking technologies, such as frame relay and asynchronous transfer mode
- Support advanced Ethernet (layer 2) and IP (layer 3) services
- Offer rapid service provisioning, management, assurance and troubleshooting via the Nokia Network Services Platform
- Enable future evolution to software-defined networking

Despite these benefits, federal agencies that have relied on TDM and SONET/SDH technologies may still be wary of migrating to an IP-based solution unless they get answers to three key questions:

- What about delay, jitter and synchronization?
- What about availability and resiliency?
- What about network security?

Figure 3. Ready for future services with the Nokia 7705 SAR
What about delay, jitter and synchronization?

TDM applications require constant, reliable data delivery as well as precise frequency synchronization across the network to prevent circuit errors such as frame slips and buffer overruns/underruns. For this reason, some users worry about the ability of IP/MPLS over Ethernet to meet stringent delay and synchronization requirements.

In fact, IP/MPLS provides assured quality of service characterized by deterministic delay and jitter. All TDM traffic can be classified as high-priority to ensure latency budgets are met consistently while network jitter is minimized and absorbed by playout buffer.

How the Nokia 7705 SAR solves the synchronization problem

Highly precise synchronization distribution often requires a mix of technologies to adapt to local conditions from one facility to the next. Some may have GPS receivers, for example, while others do not. Others may already have synchronization provided via a T1 interface for other tenants in the same building.

The 7705 SAR supports numerous synchronization technologies, including:

- External reference sources such as GPS or stratum 1 primary reference clock (PRC)
- Timing over packet technologies such as Packet Timing Protocol (IEEE1588) or adaptive and differential clock recovery
- Line timing such as synchronous Ethernet (ITU-T G.8261x), TDM trunks or internal stratum 3 clock
What about availability and resiliency?

High network availability is key to mission success. At the heart of high availability is strong network resiliency. The speed at which SONET/SDH can recover from a network failure has become the measuring stick for any new communications technology.

IP/MPLS was architected to protect traffic with the same reliability and recovery speed as legacy SONET networks. It also supports multi-fault resiliency, meaning communications can be restored even when multiple failures occur (provided physical reachability exists).

How the Nokia 7705 SAR solves the availability problem

The 7705 SAR's built-in redundancy and traffic rerouting capabilities provide strong resiliency if a link or specific piece of equipment fails. Using a suite of dynamic routing and recovery capabilities (such as fast reroute), the 7705 SAR delivers service restoration in just tens of milliseconds.

Available in two modular form factors, the 7705 SAR provides not only power redundancy but also control and switch fabric redundancy, which allows the device to keep functioning even in the event of a control/switch module failure.

<table>
<thead>
<tr>
<th>7705 SAR-18</th>
<th>7705 SAR-8</th>
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<tbody>
<tr>
<td>140 Gb/s (HD)</td>
<td>60 Gb/s (HD)</td>
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<tr>
<td>40x 10Gb/s + 12 x 2.5 Gb/s adapter card slots</td>
<td>2 x 10 GB/s + 4 x 2.5 Gb/s adapter card slots</td>
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<tr>
<td>Up to 28 x 10GE ports</td>
<td>Up to 12 x 10GE ports</td>
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<td>Up to 136 x GE ports</td>
<td>Up to 48 x GE ports</td>
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What about network security?

TDM networks that use circuit switching technology are closed and timeslot-based (with channels reserved for specific applications), making it hard for hackers to get access and carry out cyberattacks. Open, standards-based IP networks that use packet switching technology are more vulnerable to threats. Virtual private network (VPN) services, however, allow an IP/MPLS network to be segmented into many different closed domains.

Tunnel-based VPN communications also provide a first line of defense against illicit traffic. Without specific tunnel information (such as the MPLS label) known only to network insiders, it is very difficult for an attacker to penetrate the tunnel and inject malicious traffic.

How the Nokia 7705 SAR solves the security problem

The 7705 SAR provides a robust set of security features to ensure network integrity in the event of session hijacking, spoofing and denial of service (DoS) attacks, including:

- An application-aware firewall that mitigates attacks such as DNS/ICMP replay
- Application-level gateways to ensure extra security for FTP/TFTP connections
- Hardware-based encryption capabilities (such as IPsec, network group encryption, advanced key exchange and distribution algorithms) to protect data confidentiality, integrity and authenticity, while preserving high throughput and minimizing latency
Why choose Nokia as your partner?

The Nokia 7705 SAR has everything federal agencies need to continue carrying out their missions as they migrate TDM applications to a converged IP/MPLS network.

With more than 450,000 chassis deployed globally, including delay-sensitive applications for public sector and power utilities, the 7705 SAR is proven to meet all the key mission-critical requirements for robust, reliable and secure network connectivity:

- The ability to concurrently support new, bandwidth-intensive applications such as video surveillance, video conferencing and high-speed data transfer to meet both existing and future network requirements
- A strong set of security features, including firewalls, gateways and encryption
- JITC certified and FIPS 140-2 compliant (certification in process)

Awards and accolades for the Nokia 7705 SAR

- Smart Grid Product of the Year, 2014–2017
  TMCnet – IoT Evolution World
- Smart Grid, Metering & Infrastructure Security Award, 2016
  European Smart Energy Awards
  Frost & Sullivan
- Hot Product, 2014
  Association of Public Safety Communications Officials

What’s next?

When it comes to network migration and evolution, Nokia is a partner you can count on. Click here to discover more about the Nokia 7705 Service Aggregation Router.
References

7705 Service Aggregation Router portfolio

7705 Service Aggregation Router legacy interface cards

IP transformation of defense networks

Transformation of mission-critical communications networks
About Nokia
We create the technology to connect the world. Powered by the research and innovation of Nokia Bell Labs, we serve communications service providers, governments, large enterprises and consumers, with the industry's most complete, end-to-end portfolio of products, services and licensing. From the enabling infrastructure for 5G and the Internet of Things, to emerging applications in digital health, we are shaping the future of technology to transform the human experience.

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