

BROUGHT TO YOU BY CANSO

Nokia: Supporting safety with ANSP communications network upgrade to IP/MPLS

Tuesday 28 September 2021

15:00 – 16:30 CEST



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BEFORE WE START

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BEFORE WE START

Any questions?

Please feel free to submit your technical or content related questions into the Questions pane and press send.

We will do our best to answer all your questions live during the panel.





Moderator



Coleen Hawrysko

CANSO Operations Programme Manager



Speakers







Mervyn Harris

Global Head of Air Traffic Management and Space,

Nokia

Benoit Leridon

IPR Business Development Director,

Nokia

Arnaud Collet

Head of Network Services, Skyguide



CANSO webinar

Supporting safety with ANSP communications network upgrade to IP/MPLS

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28 September 2021



Agenda

- 1. Introduction
- 2. Nokia overview
- 3. Understanding of ANSP business
- 4. Skyguide experience in implementing safety critical network
- 5. Nokia's vision for ANSP network solutions

NOKIA

6. Q&A





Speaker



Mervyn Harris

Global Head of Air Traffic Management and Space,

Nokia

Focused on leadership through best-in-breed technology

Mobile networks

5G, O-RAN and vRAN leadership

Network infrastructure System performance and automation

Cloud and network services

Cloud-native software and as-a-service delivery Nokia technologies

Technology innovation and incubation



Nokia internal us



Nokia in aviation



Connected with the industry



Memberships



Nokia internal use

ANSP current situation

Air traffic increase

Legacy technology

Fragmented

Silo "need-based" strategy

NOKA

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Need for a change

Drivers

- Support for legacy applications
- New applications → IP-based
- Cost for legacy environment
- Cost optimized
- Maintain safety and security
- Secure operational ontinuity
- Capacity

Challenges

- Investment capability
- Lack of technical guidelines

NOKIA

Nokia's value proposal to ANSPs Ground-to-ground communication services Safety **Continue using your** first existing applications NOKIA Prioritizing safety and Reduce Trust security in every connection cost



Why Nokia?

Safety

Trust

Security

Design Nokia design meets most of ATC's safety requirements

Resiliency and predictability Key characteristics of Nokia's IP/MPLS technology

References

Nokia serves a number of ANSPs globally

End-to-end security All traffic types and topologies

Compliance assurance

Ensure network configuration is according to gold standards

ANSP high performance networking

Ground-to-ground network upgrade without changing the applications



NOKIA

Role of Nokia in ANSP certifications

	Regulatory	Safety case	ED standards					
What	 Working with ANSPs and key regulatory organizations globally 	 Support ANSPs in developing ATC safety cases and supporting Safety Case – Part 2/3 	 Meeting ED Standard Nokia supports the WAN requirements to meet W67 ED136, ED 137 (VoIP), ED 138 (latency, jitter, packet loss) and ED 139 standards Nokia ANSP solution is to support data, voice and radar communications services 					
How	 Developing standards Implementation alignment between ANSPs 	 Design the network to meet safety standards Provide continuous reports for safety requirements 						
Where	 Member ICAO CNS Member Eurocontrol working group (vote) 	 Avinor Skyguide Isavia skyguide skyguide AVINOR 	 Avinor Skyguide Isavia skyguide AVINOR 					



A2G connectivity



European aviation network LTE air-to-ground

Commercial network details

- First Europe-wide integrated LTE network with 300 base stations
- Increased bandwidth for fastest broadband access via smallest on-board antennas even in high-density flight areas
- Partners: DTAG, Thales and Inmarsat

THALES **T**...)) inmarsat NOKIA

World's first and only home-like internet experience on board based on an LTE connection to the aircraft and Wi-Fi inside the cabin

Results

- Unmatched in-flight connectivity for 30 countries
- German Innovation Award
- First customer: British Airways launched passenger Wi-Fi services in Nov. 2018, set to disrupt the market



Future All Aviation CNS Technology (FACT)



Nokia internal use





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Speaker



Arnaud Collet

Head of Network Services,

Skyguide

- 1. Skyguide introduction
- 2. CNS Strategy
- 3. Network evolutions
- 4. IP/MPLS by Skyguide hints and feedback

Skyguide – Brief presentation

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- Swiss ANSPs Skyguide since 2001/SwissControl previously
- HQ in Geneva
- 1'367 FTE/796 ATCOs
- Civil and Military air navigation services
- Operation on 14 locations
- One of top busiest and complex airspace in Europe
- 41% of airspace is delegated



CNS Strategy - Overview

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Communications :

— Today :

- Legacy VCS close to life cycle
- E1/E&M connectivity on VCS and radios
- Same setup for R2 ATCO Tel services
- Successful trial with "R2 over IP" (SIP) with SBC
- Rollout of IP ready radios completed

— Tomorrow :

- IP end to end for radio and Tel services
- Target 2028

Navigation :

- Today :
 - Legacy VOR/DME at specific location
 - Almost "stand alone"/heart bit
- Tomorrow :
 - PBN initiative triggers evolution
 - New gen DME on mountain sites (maximise coverage)
 - Permanent IP connectivity to swiss supervision

Surveillance :

- Today :
 - No more primary radar/secondary only (civil)
 - Serial interfaces/Pline for IP conversion
 - MLAT experiment successfully completed into a test region
- Tomorrow :
 - MLAT Swiss deployment already on track
 - IP Multicast for surveillance data
 - Get rid of secondary radars

From SDH/PDH (-> 2020)

- SDH Backbone network providing :
 - IP interconnect
 - E1 services to PDH nodes
- PDH network providing :
 - Connectivity services to CNS
 - Wide panel of interfaces :
 E1/E&M/Serial Sync or
 Async/DTU,...
- → Outdated & unsupported technologies

To IP/MPLS (2012 ->)

- First IP/MPLS attempt with regionetwork (2012)
 - 11x regional airports
 - SAR8 7705 (access)/SR 7750 (core)
- Then national network (2018/2021):
 - 84x nodes SAR8
 - 1'080 services migrated
- And international ones (2018/2021):
 - DFS : 6x SAR8/25x services
 - DSNA : 30x SAR8/60x services
 - ENAV : 5x SAR8/22x services

Network evolutions

	PDH	IP/MPLS
PROS	 Predictive routing (RTD) ! Allocated bandwidth via TS (no risk of congestion) Diversity of Interfaces 2x release update over 15y 	 One box fits all (core & access) Handling of legacy & IP services Simple to Smart QoS settings End-to-end services separation (tunneling) Security improvement (encryption) Reliable/mature technology
CONS	 2Mb/s max Not IP ready Rack space 	 Regular release upgrade (testing) Requires MTU above 1980 (or 2080 if encrypted)

IP/MPLS by Skyguide – Hints and feedback

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3x IP/MPLS networks today in operation:

- Swiss national
- International (Skyguide-DSNA/DFS/ENAV)
- Regional

All dual core networks (routing error mitigation)

IP/MPLS allows perfect "cohabitation" of legacy services (serial, E&M, E1 G703,...) and IP services. IP/MPLS is a trigger for network convergence to a single platform. Prefer migration of full radio chain (Rx and Tx) instead of Rx first then Tx (ATCOs perceived "sound" difference). Up to 6x radio sites were migrated in a single night.

Most used services are :

- Pseudo Wire : Tunnelling for E1 voice/Eth
- VPLS Ethernet : Virtual Private Lan Srv
 Planned :

VPRN IP : Virtual Private Routed Network

QoS :

- Mandatory to limit/avoid congestion (LAN Admin vs Time Critical services)
- From simplest to most sophisticated setup

Network Synchronisation :

- Required for Pseudo Wire E1 services
- SyncE and PTP
- PTP more complicated but needed when Ethernet transport layer continuity is not achieved (DWDM, SDH, Telco,...)



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Speaker



Benoit Leridon

IPR Business Development Director,

Nokia



Nokia's vision for ANSP Network

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evolution



Benoit LERIDON 14/09/2021



Key trends in ANSP market

Safety

- Availability
- Life cycles
- Cyber security
- All referring to both: applications and networks

Flexibility

- Integration of very different applications
- Low/high bandwidth
- TDM/IPv4/IPv6
- Unicast/multicast
- Underlay technologies
- Private cloud (critical)/ public cloud (IT)

Control

- User friendly operations
- Ease of decision/ troubleshooting
- Anticipate issues
- Safe DevOps







Maximizing availability of ground-to-ground networks



Highlights

- Dual telco minimizes dependencies and common mode failure scenarios
- Benefit of IP/MPLS traffic engineering for flow control
- Dual telco approach allows to cope with degradation scenarios

Benefits

- True end-to-end resiliency can be achieved from applications to server
- Leverages dual attachment or device replication to eliminate any application failure
- Static load balancing allows better use of bandwidth

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Ensuring application delivery Granular level of QoS



Highlights

- Hierarchical QoS allowing fine grain VPN and application protection
- Multiple options of ingress and egress control through shaping and policing
- Reliable hardware control via programmable network processor (7705 SAR, 7750 SR)

Benefits

- H-QoS facilitates definition of priorities between applications
- Full control on network behavior under all circumstances
- Contributes to ED standards (W67 ED136, ED 137 (VoIP), ED 138 (latency, jitter, packet loss) and ED 139)

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Increasing pressure of safety End-to-end cyber security toolkit



Highlights

- Need for a solid software foundation as an entry point
- Leverage IP/MPLS segmentation to provide application protection

Benefits

- Full trusted framework for perimeter intrusion protection per VPN
- Network is the first level of defense for applications
- Contributes to safety standards and regulator cybersecurity constraints



ATC networks today

A high-level view



Highlights

- Network segmentation (and micro-segmentation) with IP/MPLS VPN provide application separation
- Custom QoS and security, with full control thanks to adapted network processor
- Each VPN has a limited set of resources in the routers

Benefits

- Adapts network to applications and not vice versa
- Protects most critical applications from others
- Protect bandwidth between applications

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Following ATC application life cycles Leveraging IP/MPLS functions



Highlights

- IP/MPLS router with legacy integration replacing need for PDH-mux
- High capacity router allowing very low packetization delays
- Demonstrated adequation to voice applications

Benefits

- Manage end-of-life of PDH-mux by up-to-date technology
- Manage life cycle of applications by changing the network without changing the applications
- Fast packetization contributes to compliance to Eurocare standards (ED-138)

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Facilitate operations via more agile operation tools

SDN in action



Highlights

- More programmable functions available for automated tasks (in nodes and in NMS)
- More flexibility in versioning (NE versus NMS)
- Promise of more opened interfaces
- More dynamic information from the network with more use of AI

Benefits

- Lower cost of repetitive tasks with lower error risks
- More integration of OSS tools
- Simplified multi layer management
- More anticipated reaction (whatif, dynamic adaptation, etc.)

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Monitoring applications and networks

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Highlights

- NSP provides status of network per service or per region, facilitating day-to-day monitoring
 - For example: one folder per application
- NSP provides topology-oriented monitoring (shows connectivity, alarms, load, ..)
 - For example one folder per underlay
- Set of tools to detect network degradation including thresholds

Benefits

- Application-oriented monitoring
- Anticipation of the impact degradation of networks on applications

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Ensuring SLAs and manage degradation



Highlights

- Routers OAM tools allow for very precise management of network behavior (latency jitter and packet loss)
- OAMs can be triggered at link level or VPN level
- SLA measurement can happen permanently or on demand

Benefits

- Easy reporting and mapping against carrier SLAs
- NSP facilitates orchestration of OAM tools (one click action)
- Scenarios allow manual redirection of traffic on non degraded telco



IP portfolio overview Critical networks reimagined

Controlled Highly robust All application networks securely operations integrated

Vokia internal use

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QUESTIONS AND ANSWERS

THANK YOU



SHAPING OUR FUTURE SKIES