FREQUENTIS
FOR A SAFER WORLD

vitalsphere
ATM-grade networks

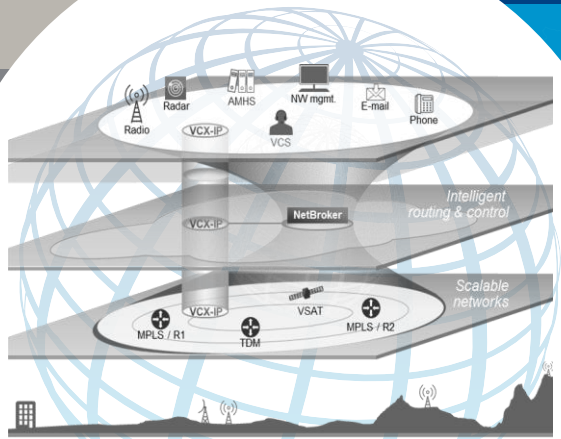
(SNMC/26) (Ouagadougou, Burkina Faso, 19-23 November 2018)

Why Networks are becoming a central technology in ATM

Deliver more safe and secure capacity for airspace users at lower cost.

Strategic drivers

- **New ATC Center Models**
  (Contingency, Dynamic Sectorization)
- **COMs Migration to IP**
  (Radios TDM+IP in different networks)
- **New IT concepts**
  (Centralization, Data exchange)
- **Centralized Monitoring**
  (SMOT)
- **New ATM Concepts**
  (SWIM, ASBU, CDM, etc.)



Intelligent ATM Networks

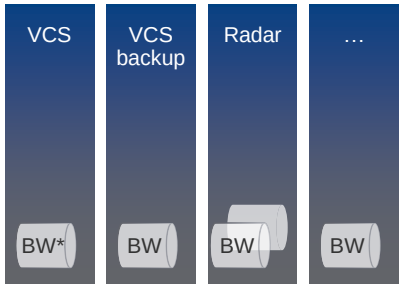
Operational needs

- Exchange of data and voice
- Efficient use of Network
- Intelligent network routing
- Use of different networks
- Permanent monitoring or network

Taking advantage of converging network benefits while avoiding downsides

IP network technology erodes the basis of traditional individual networks for ATM applications

Traditional
networking

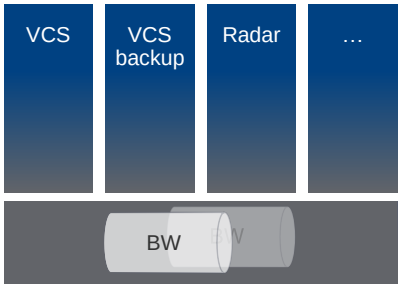


Silos

- Expensive to maintain
- Many different technologies
- Lots of specialists needed

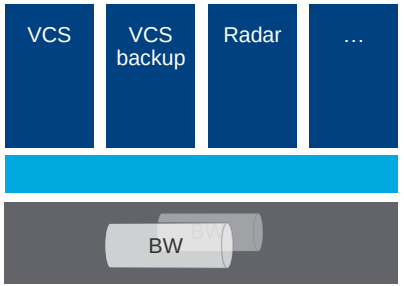
*) Bandwidth

Converged
IP network



- Reduce OPEX/CAPEX
- Non-deterministic behaviour
- Competition among applications
- Unclear demarcation application / networking

ATM-grade
IP or hybrid network



- \+ Increased availability
- \+ Brown-out detection
- \+ Path diversity
- Deterministic routing
- Defined competition among applications

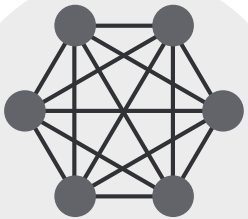
Optimizing communication with the right network topology

Supporting any topology

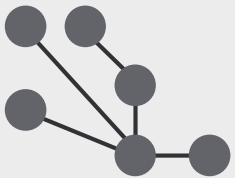
Sites with multi-layered information topologies

- Star
  - Point-to-point
  - Point-to-multipoint
- Hierarchical
- Mesh

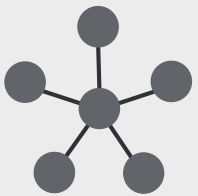
TOPOLOGIES



Meshed



Hierarchical



Star

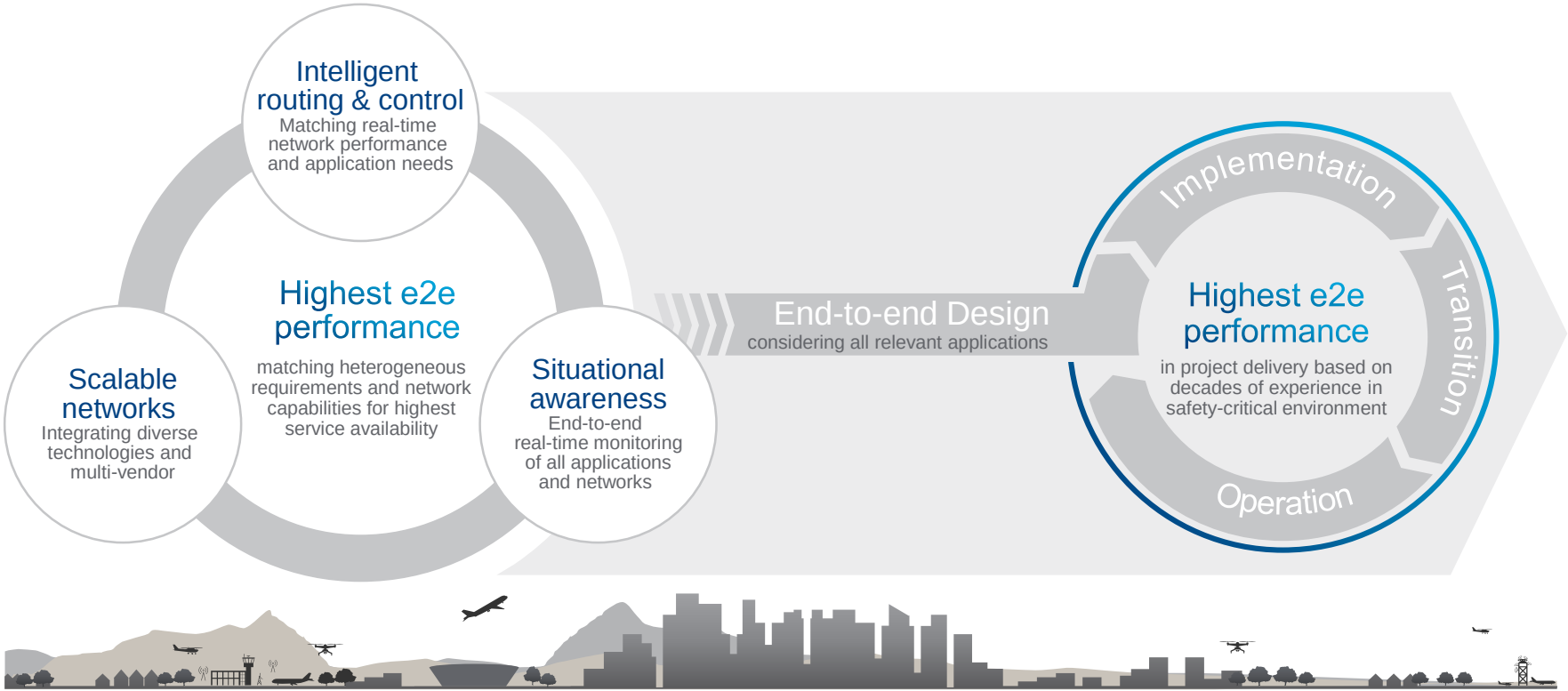
Dynamic sectorization

Radar multicast

Interconnect AFTN switches, MTA and AFTN/AMHS gateways

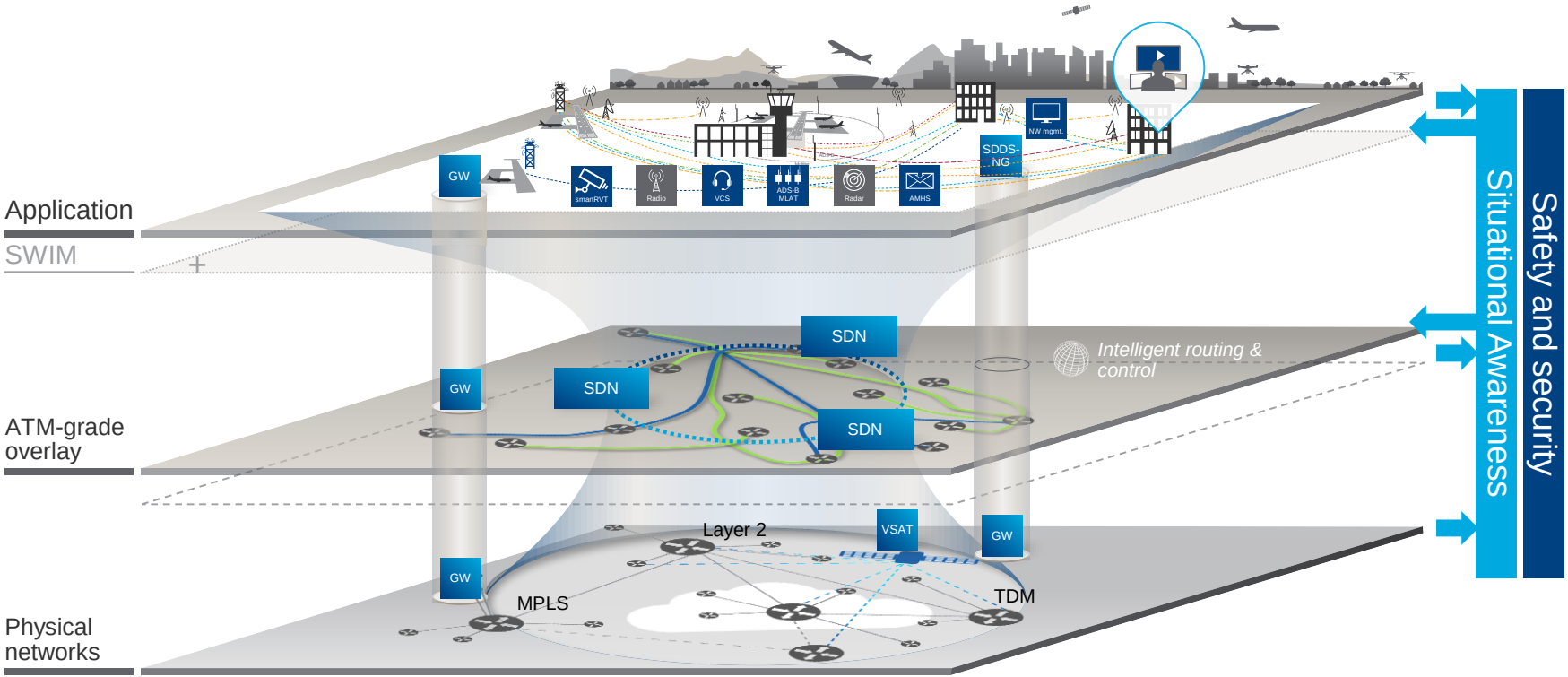
ATM-grade network performance

Brokering between ATM-specific applications and non ATM-specialized backbones



ATM-grade performance by dedicated overlay networks

Brokering network capacity between ATM-specific applications & non-ATM specialised backbone



Building ATM-grade networks by introducing SDN overlays

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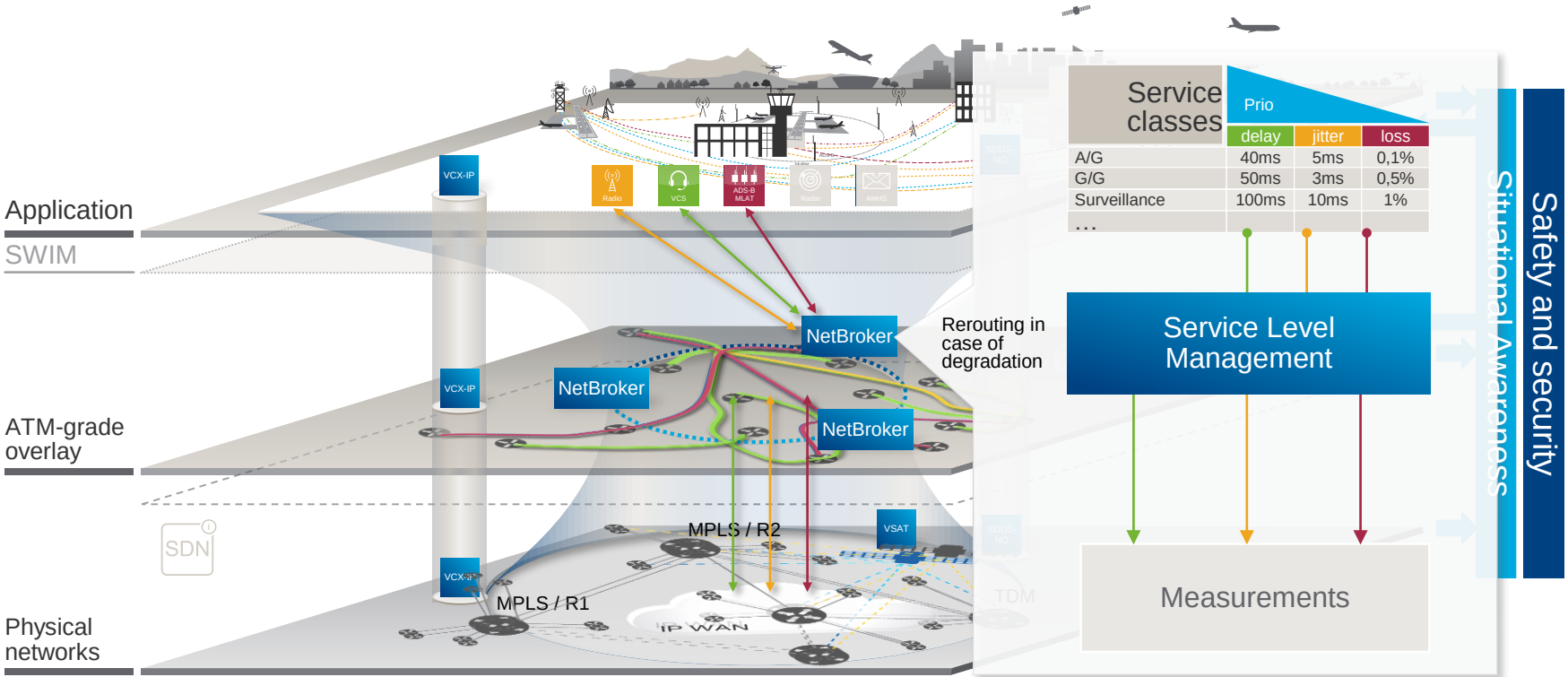
Brokering network capacity between ATM-specific applications and non-ATM specialised backbone



Service classes

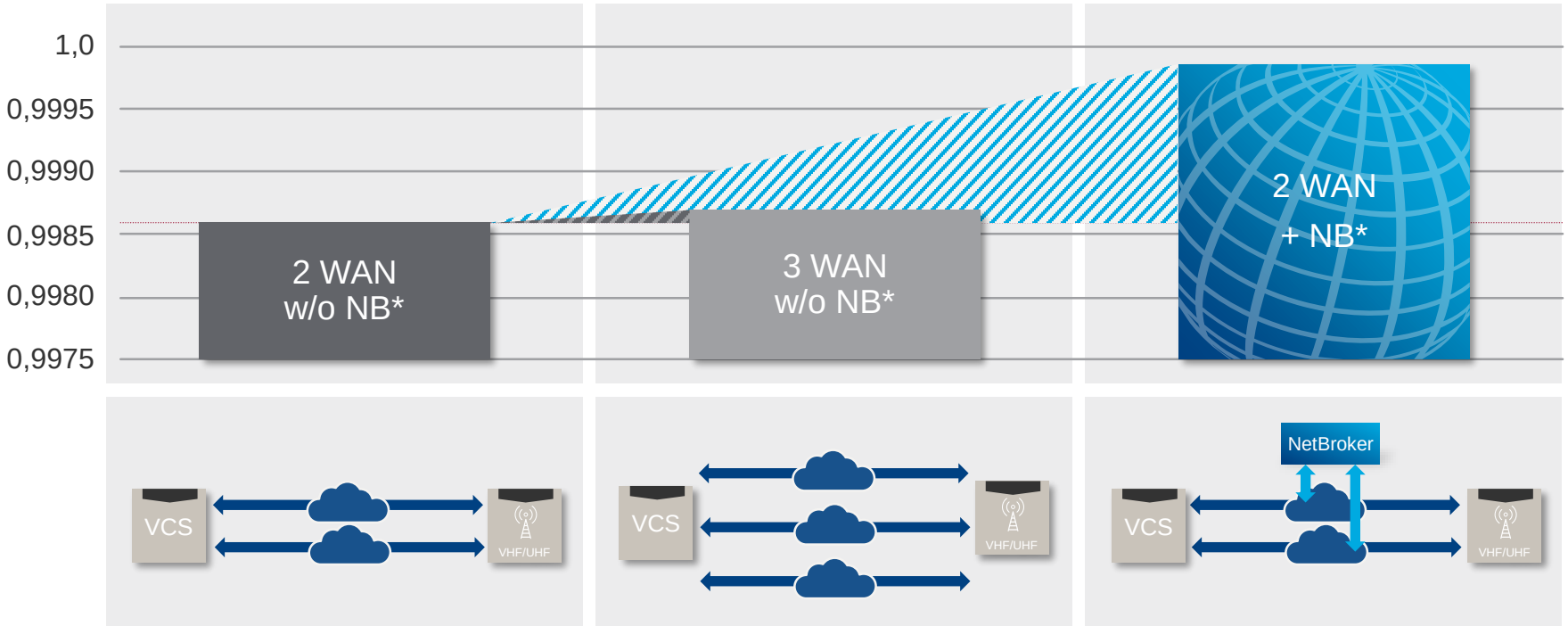
Example definition

Class	Example applications	Control based of	Max. Delay / Max. Jitter	Max. Packet Loss / Minimum BER	QoS class / Bandwidth requirements	Other capabilities	allowed to use WAN 1	allowed to use WAN 2	allowed to use WAN 3
1	A/G	per call	<50ms <10ms	<0,1% < 1x10–7	EF 100% in each WAN	Admission control ED-137 compliance	Yes	Yes	Yes
1	Remote tower video	per connection	<50ms <10ms	<0,1% < 1x10–7	EF 100% in each WAN	Admission control Degraded modes	Yes	Yes	Yes
1	RADAR	per connection	<50ms <10ms	<0,1% < 1x10–7	High prior AF 100% in each WAN	Admission control Data forking	Yes	Yes	Yes
1	G/G	Per call	<50ms <10ms	<0,1% < 1x10–7	EF 100% in each WAN	Traffic shaping	Yes	Yes	Yes
2	AMHS	per class	<50ms <10ms	<0,5% < 1x10–7	AF33	Traffic shaping	Yes	Yes	Yes
3	MET	per class	<50ms <10ms	<0,5% < 1x10–7	AF32	Traffic shaping	NO	Yes	Yes
4	Administrative	per class	n/a		BE elastic	---	NO	NO	Yes

Operational Services | Operational Applications | Privileged Applications | Administrative Applications

Automatic SLA management increases availability more than additional WAN

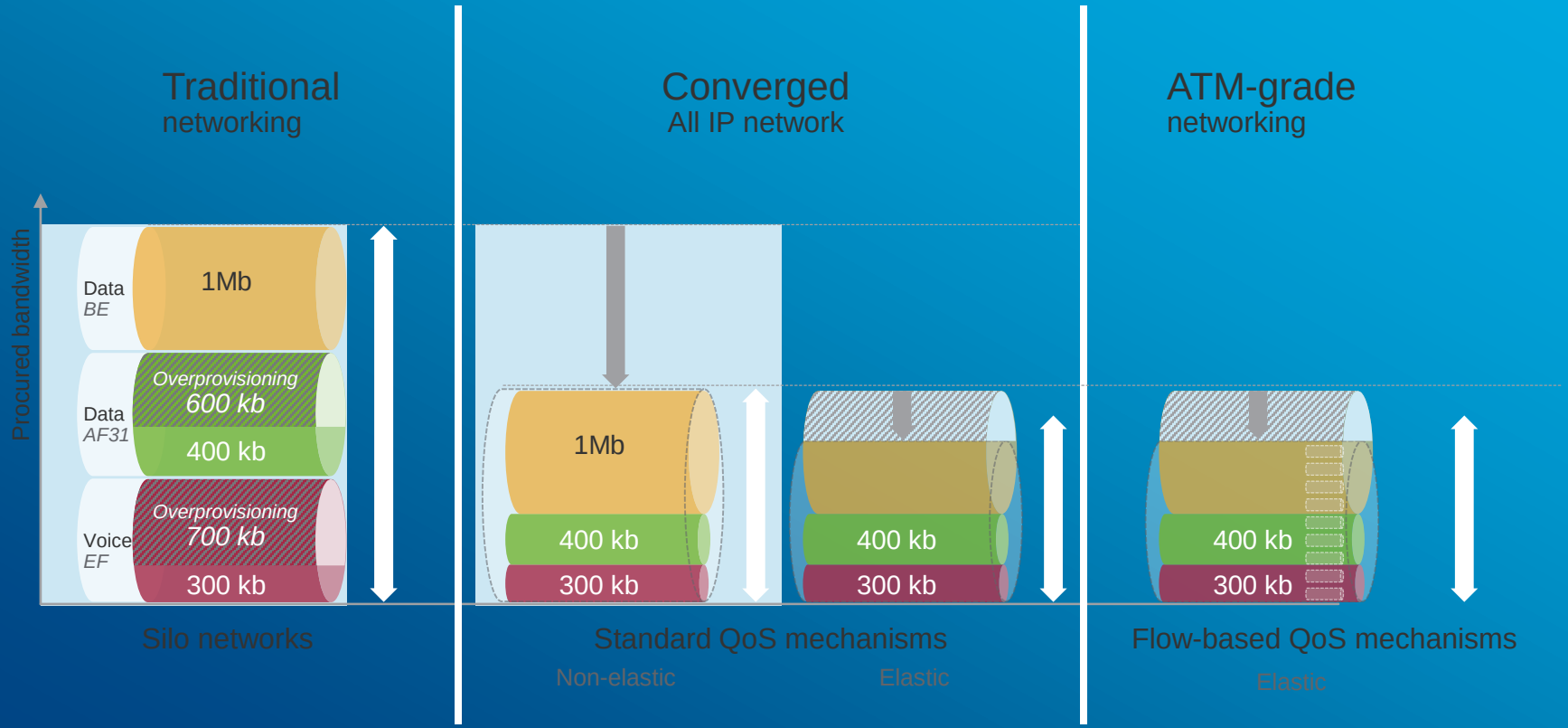
Comparison of radio service availability with four legs in CLIMAX operation



*) NetBroker

Additional Bandwidth savings enabled by deterministic SLA management

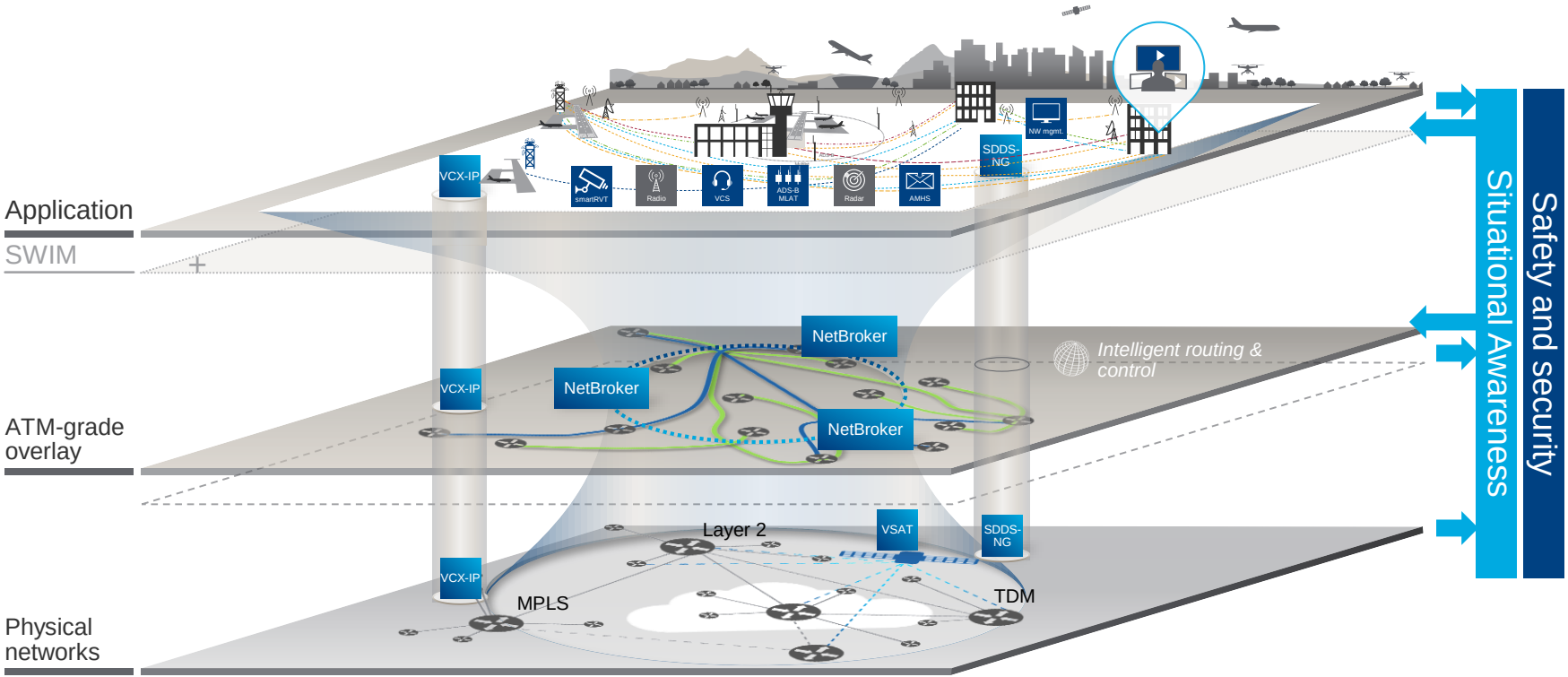
Capacity saving potential in converged networks



Enabling transition of safety-critical voice and data applications to IP networks

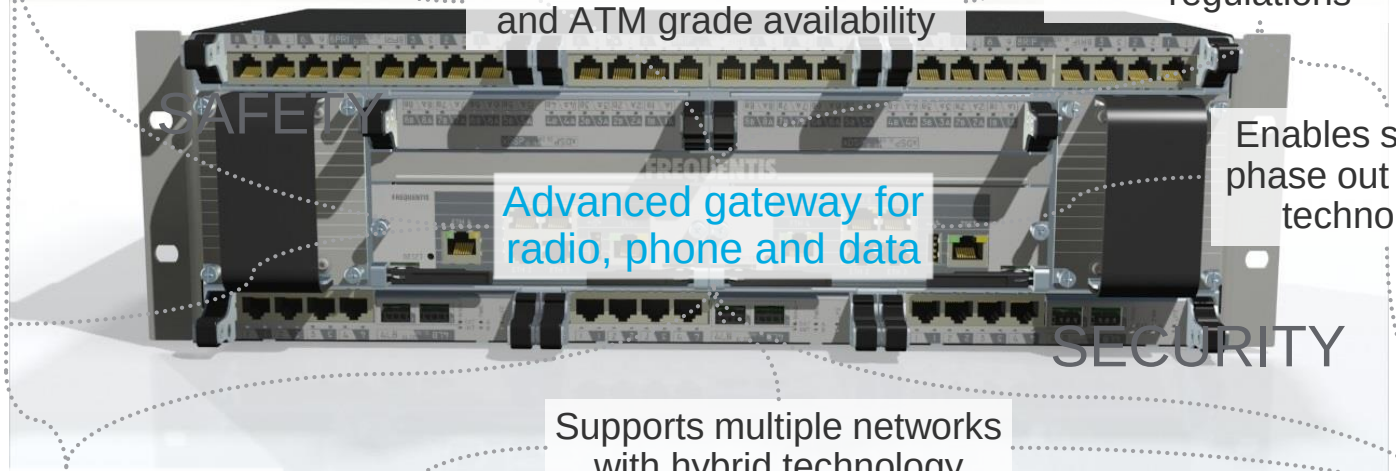
ATM-grade performance by dedicated overlay networks

Brokering network capacity between ATM-specific applications & non-ATM specialised backbone



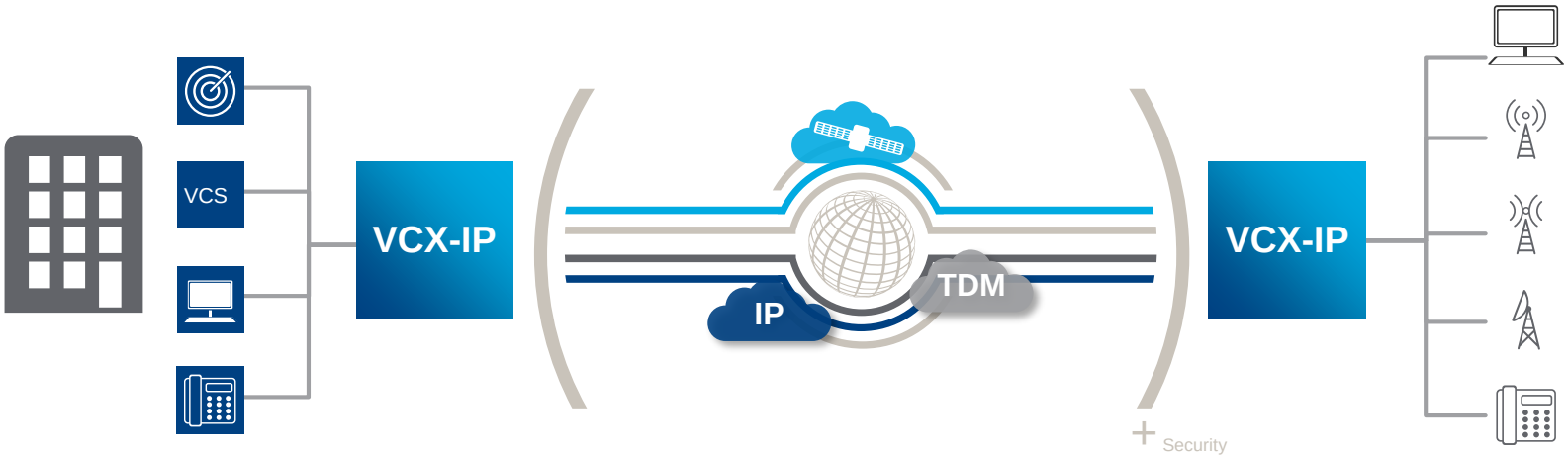
VCX-IP network solution

… what is it?



VCX-IP network solution – the application level gateway

ATM-grade solution for safety-critical voice and data applications – from legacy to all-IP



Echo-free radio communication

\+ Protecting legacy investment

Highest availability

Uninterrupted operations

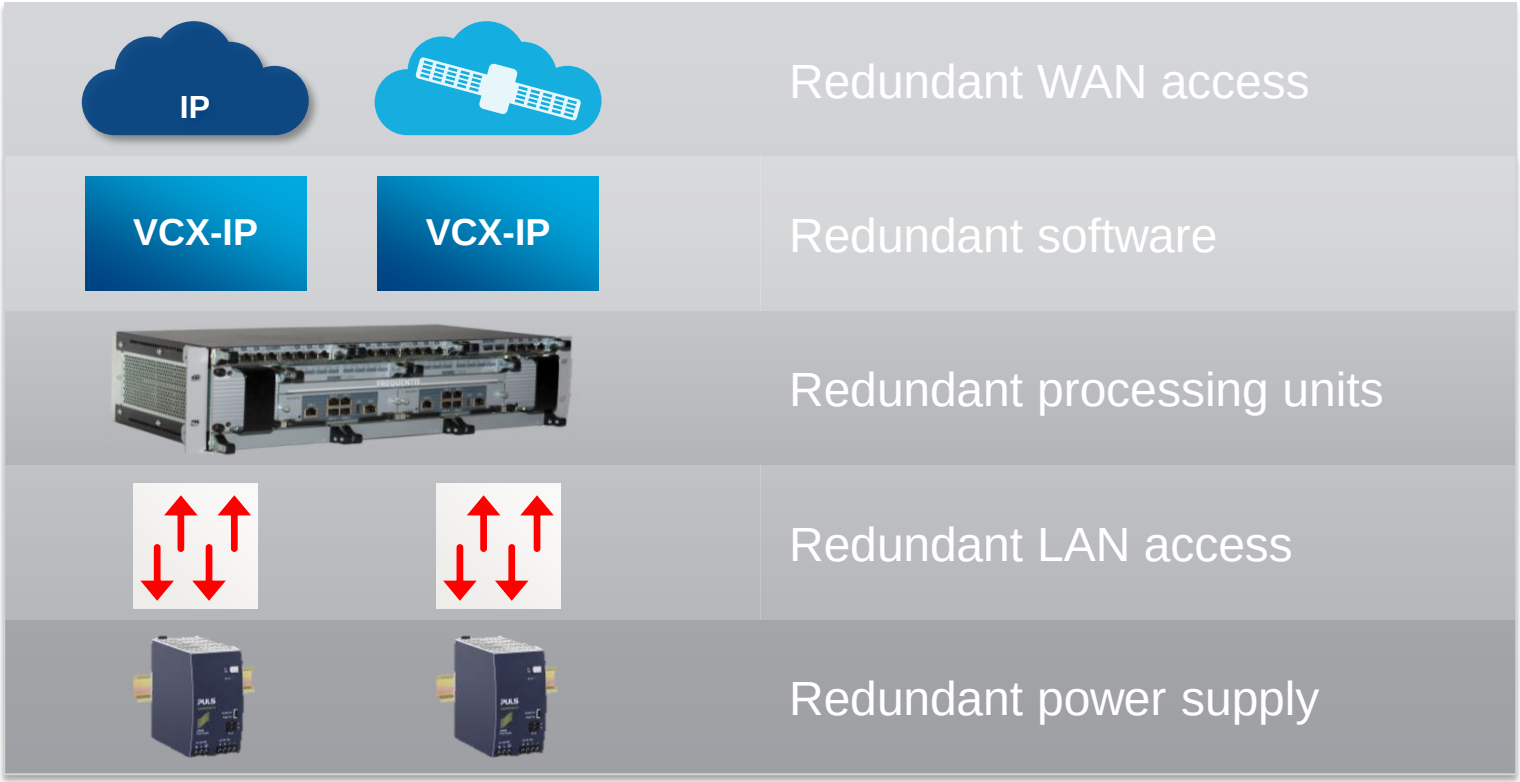
Optimized bandwidth usage

Redundancy
Hot-pluggable interfaces

Admission control

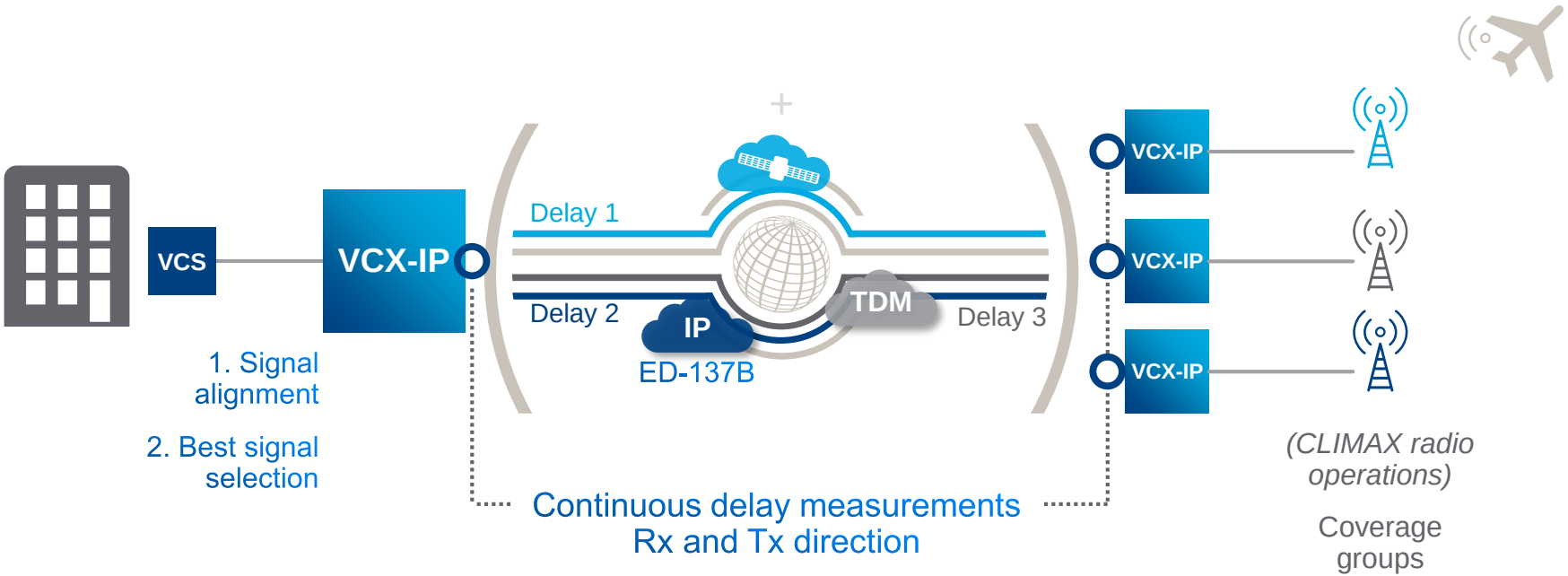
Highest safety and availability

VCX-IP offers multi-level redundancy

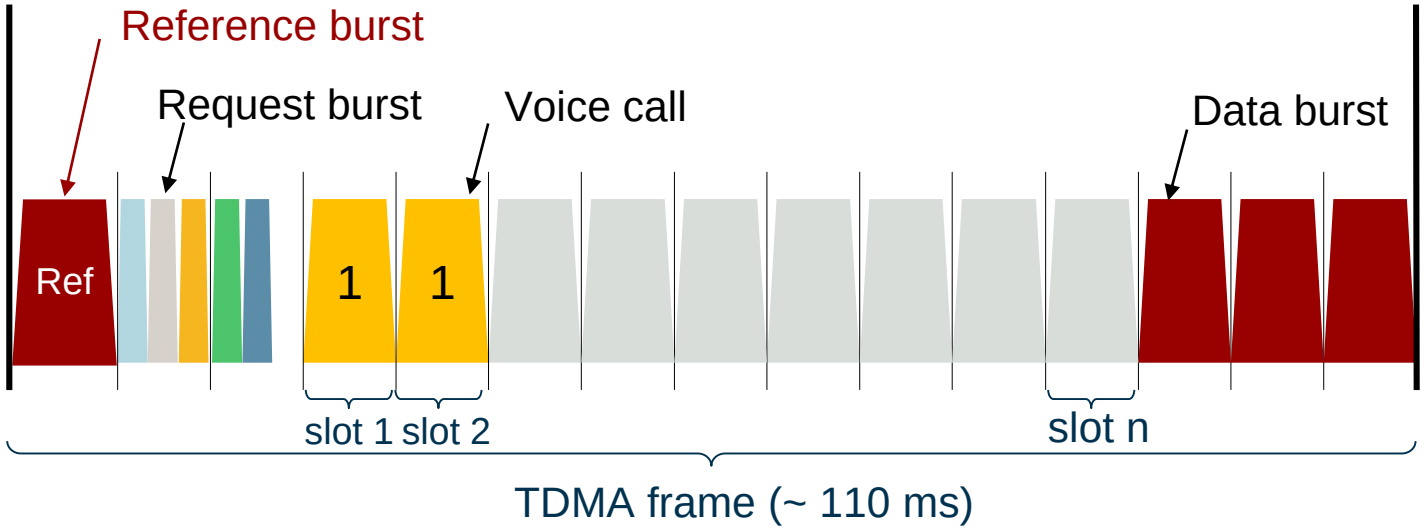


Bi-directional dynamic delay compensation over any WAN and in any combination

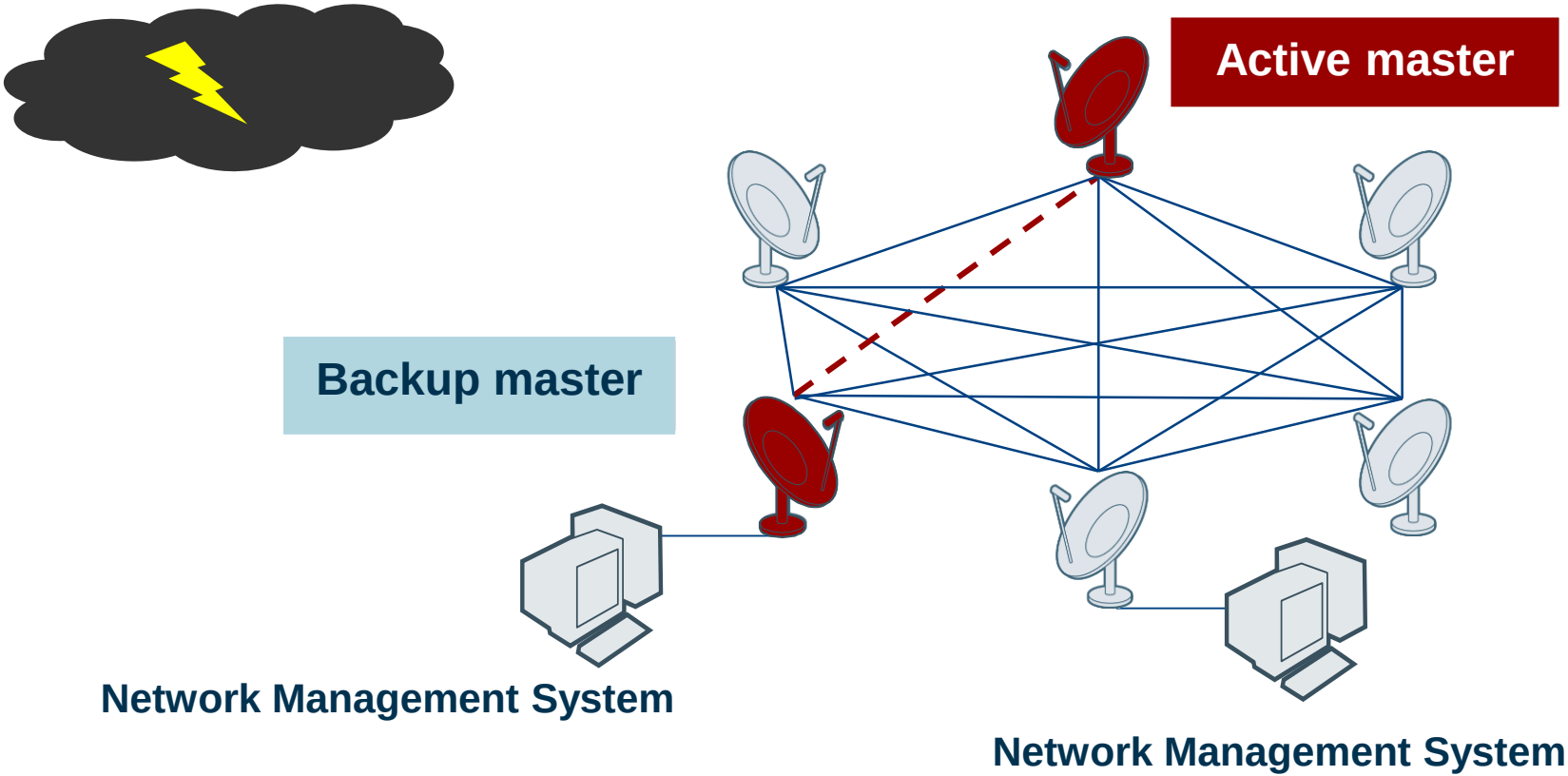
Best signal selection based on synchronized audio receptions



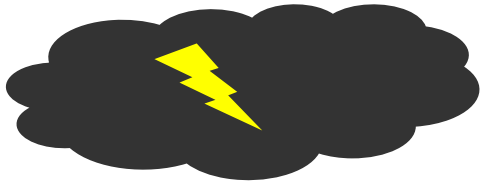
Satellite links - TDMA-Frame Structure

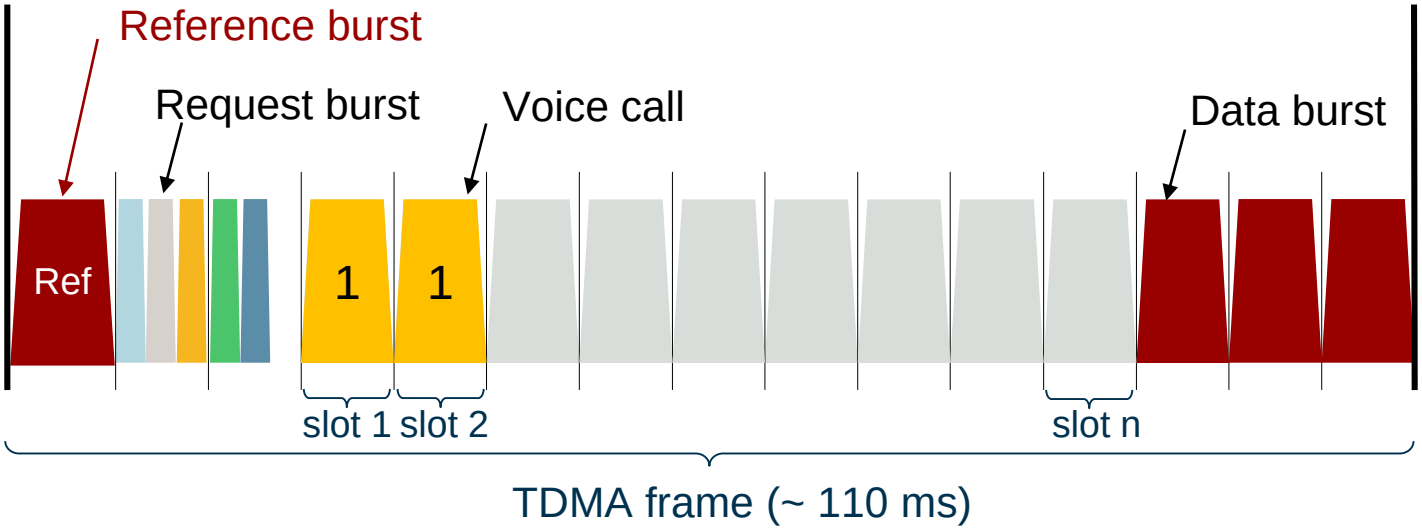


Satellite links – Active/Backup system switchover upon link failure



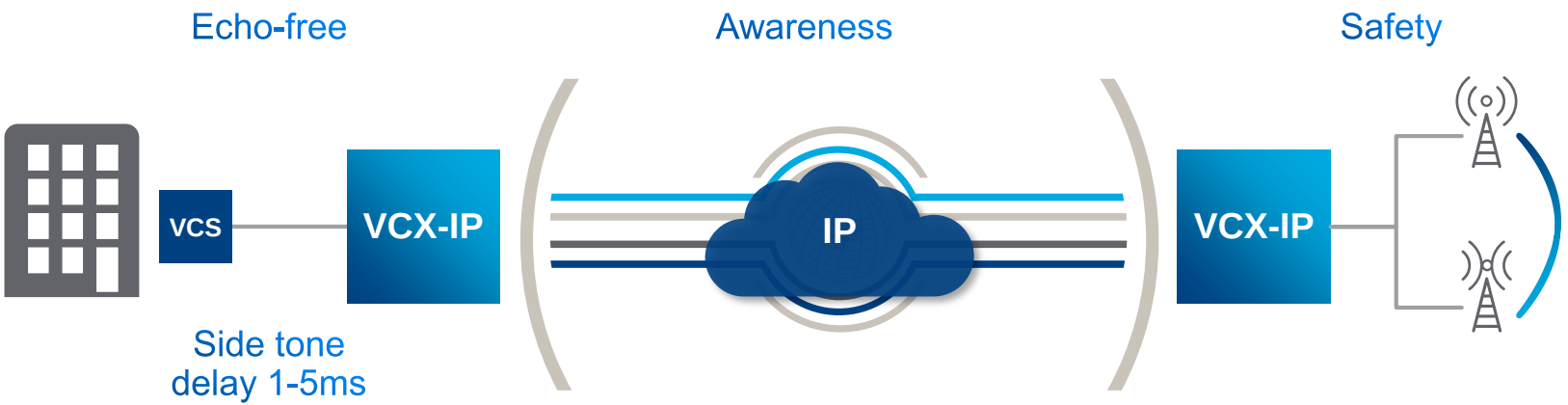
Satellite links – Effect of active/backup switch in TDMA-frame structure





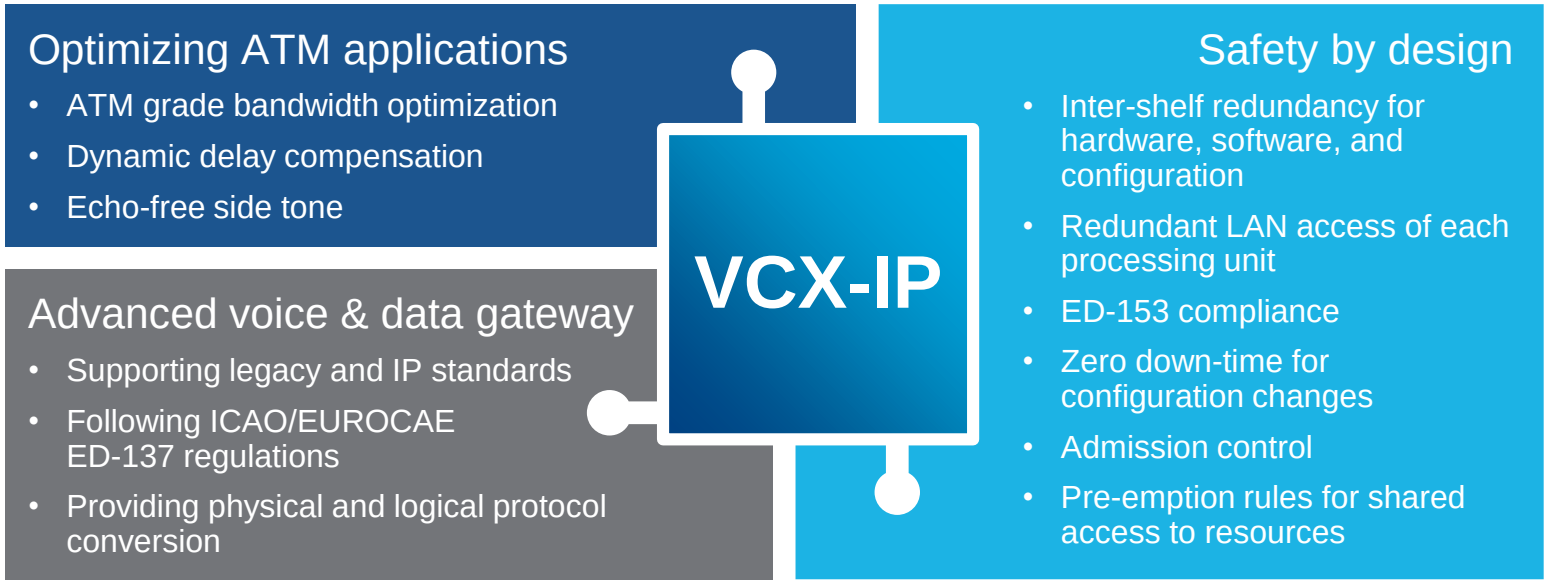
Elimination of echo in higher delay networks

Local side-tone generation with remote loop check



Enabling safety-critical voice and data applications in a non-deterministic network

The market leading network solution for safe migration to VoIP in air traffic management

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