Air Traffic Management

Moving towards the ATM networks of the future

Matching network performance and application needs

Moving up to the next level of performance, efficiency, safety and security

ATM strategic focus to turn trends and external factor into opportunities

- Mission critical voice
- Networked communications
- End-to-end IP

Communication

- Data Management
- Data Quality
- Convergence
- SWIM

Information Management

- Performance and efficiency
- Virtual control centres
- Virtual remote towers
- Security and safety

Virtualisation

- New operational concepts
- Intelligent routing
- Scalable infrastructure
- Situational awareness

Intelligent Networks

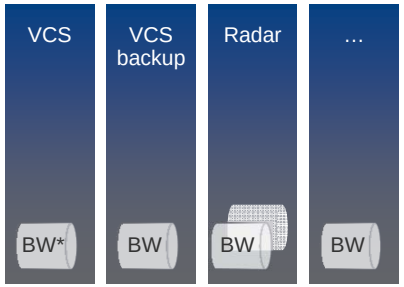
FREQUENTIS

Taking advantage of converging network benefits while avoiding the downsides

Taking advantage of converging network benefits while avoiding downsides

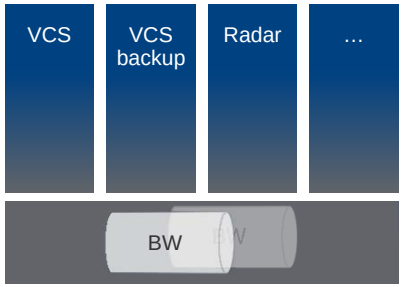
Leveraging cost savings while maintaining safety and performance level

Traditional
networking



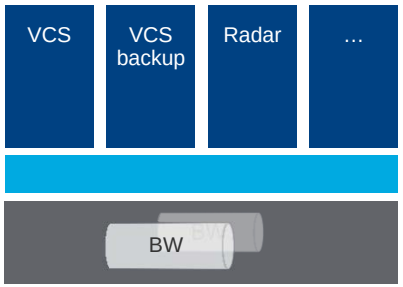
Silos

Converged
All IP network



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

ATM-grade
networking



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

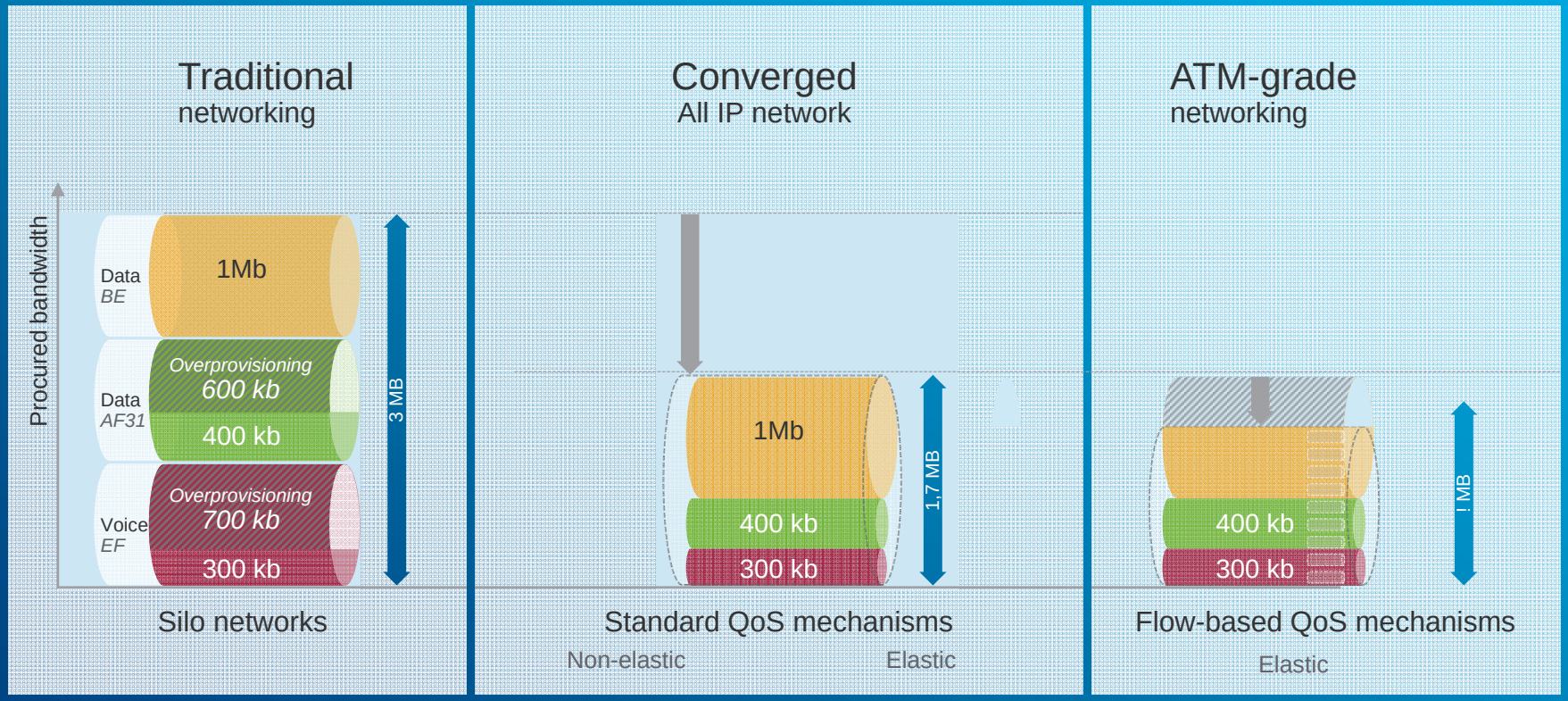
*) Bandwidth

FREQUENTIS

→ back

Additional Bandwidth savings enabled by deterministic SLA managment

Capacity saving potential in converged networks



FREQUENTIS

Building ATM-grade networks by introducing a SDN overlay

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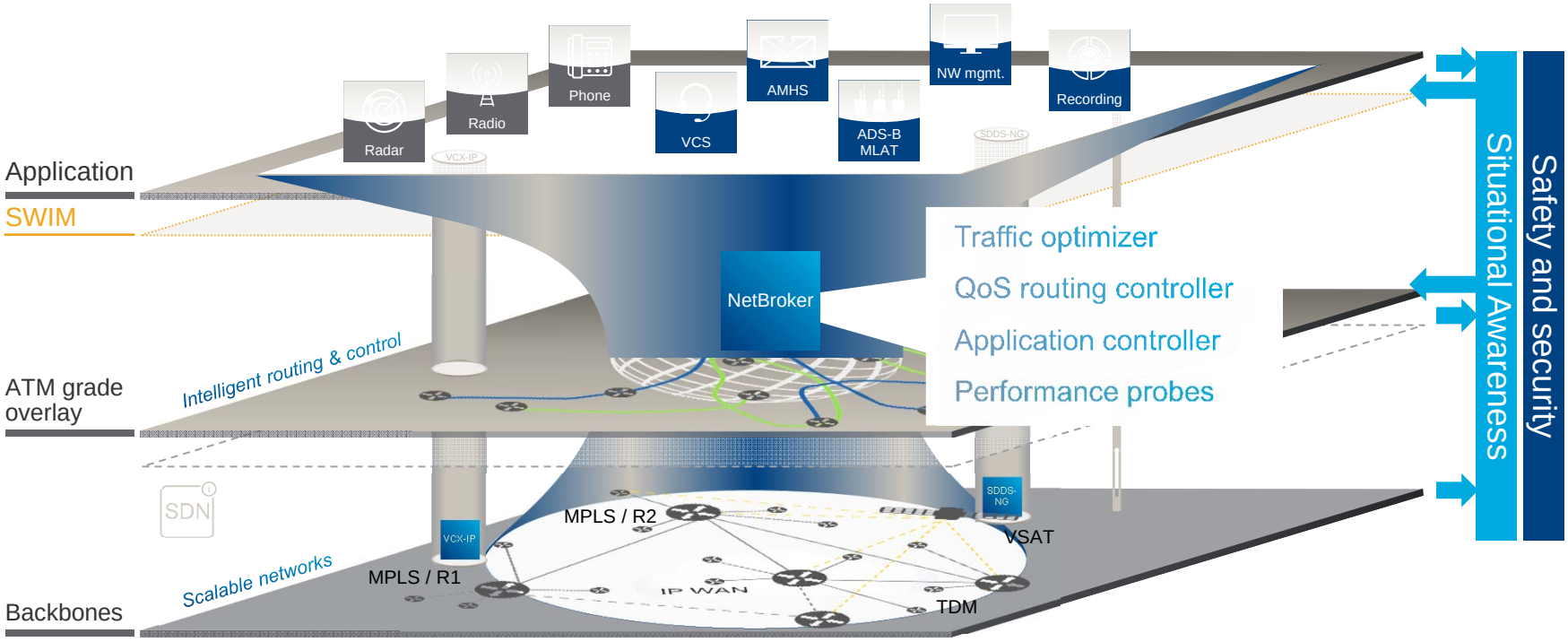
Brokering network capacity between ATM-specific applications and non-ATM specialised backbone



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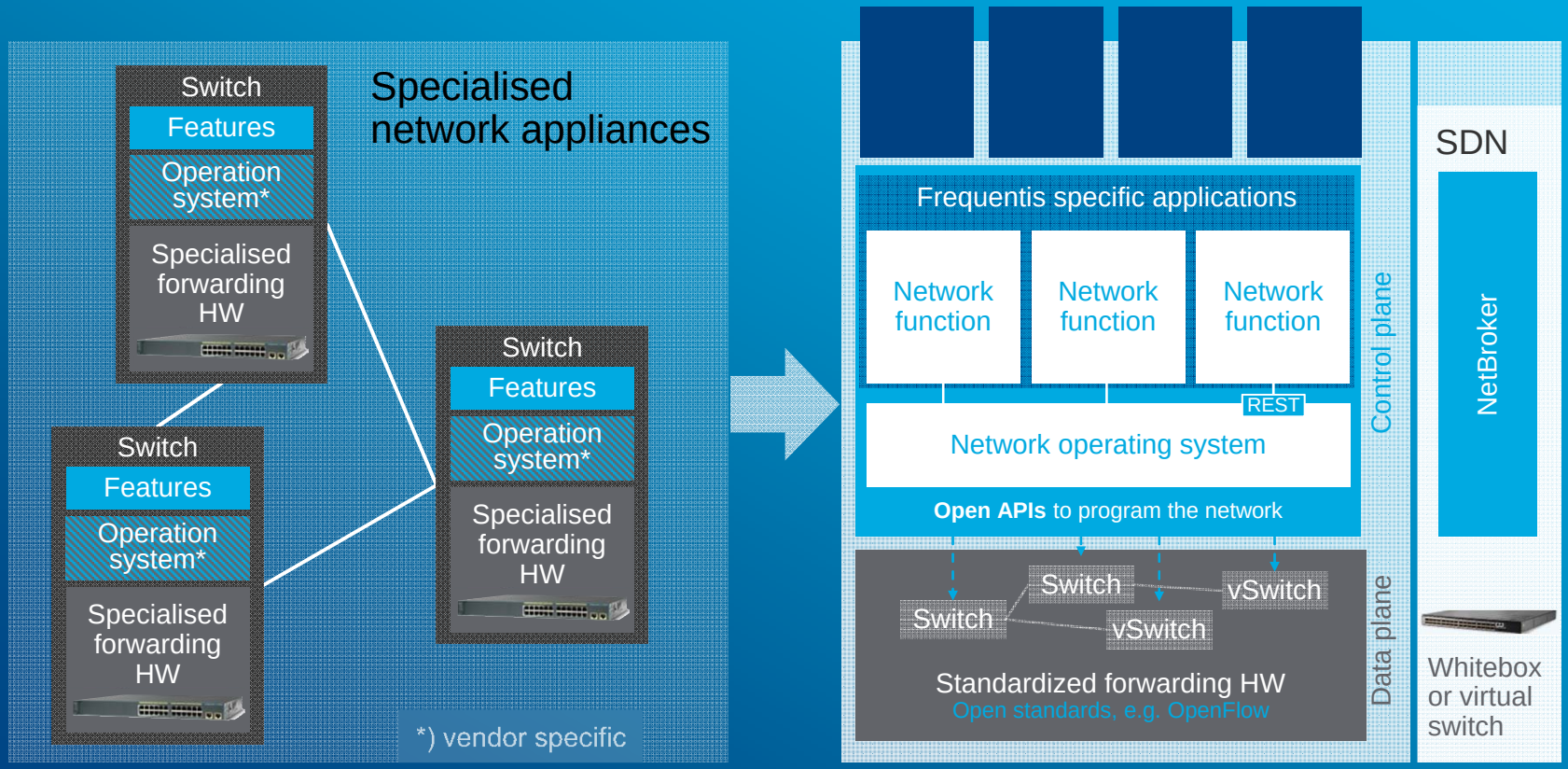
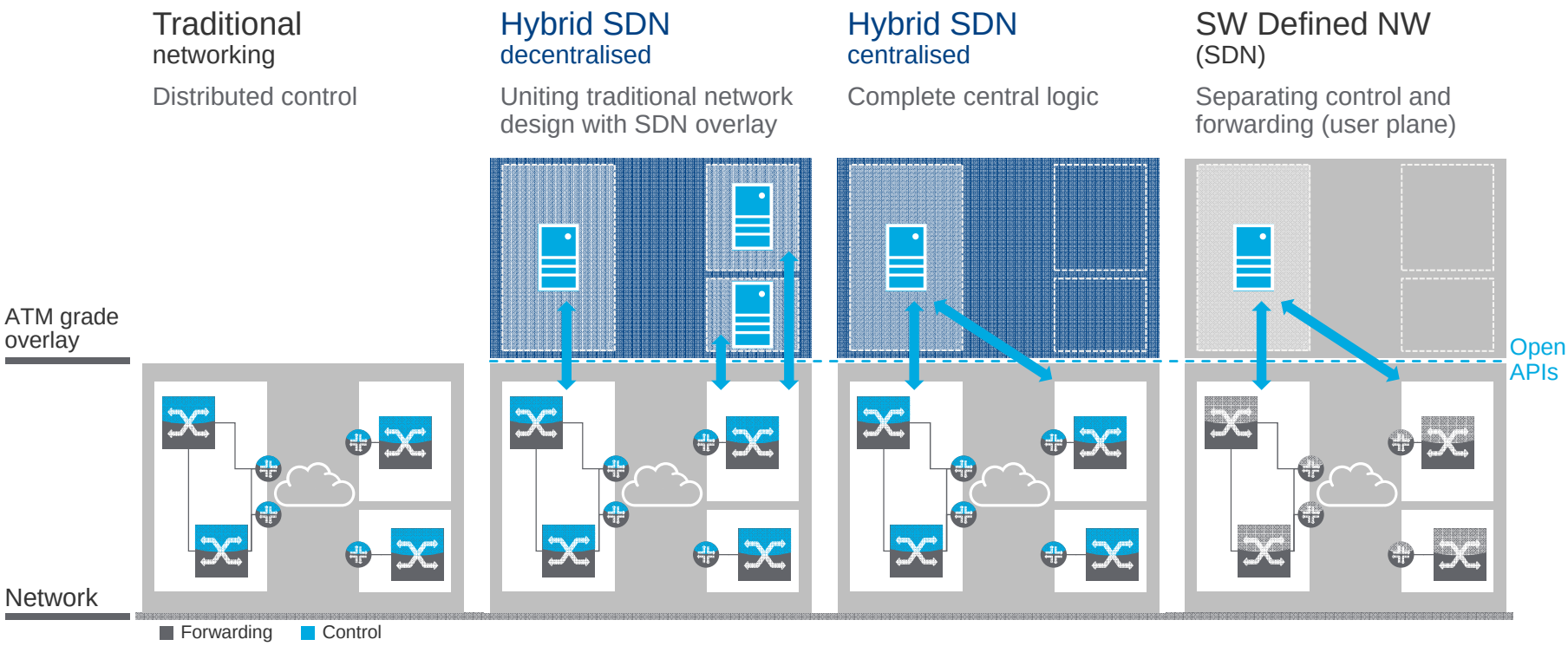
Software Defined Networking = Separation of data and control plane



FREQUENTIS

Growing into a software defined network

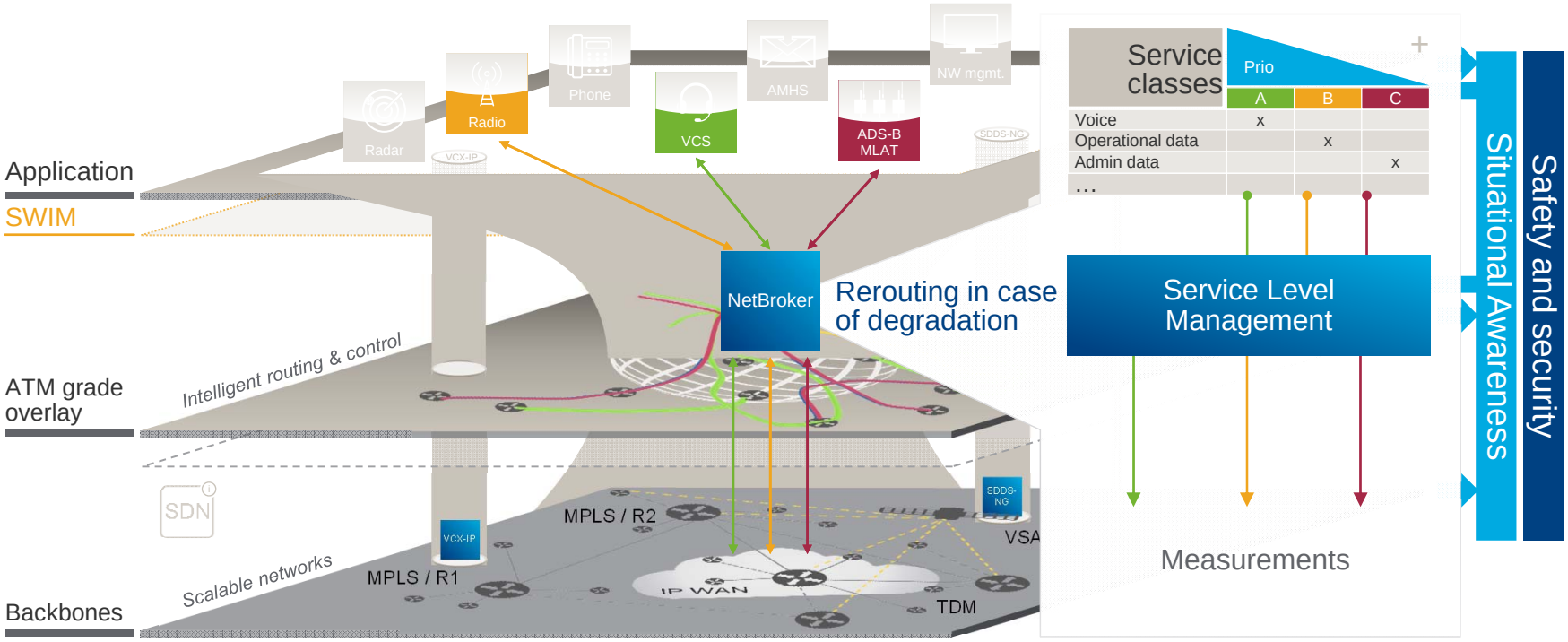
Smooth transition to SDN controlled architectures – hybrid control for ATM grade networks



FREQUENTIS

Building ATM-grade networks by introducing a SDN overlay

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



FREQUENTIS

→ back

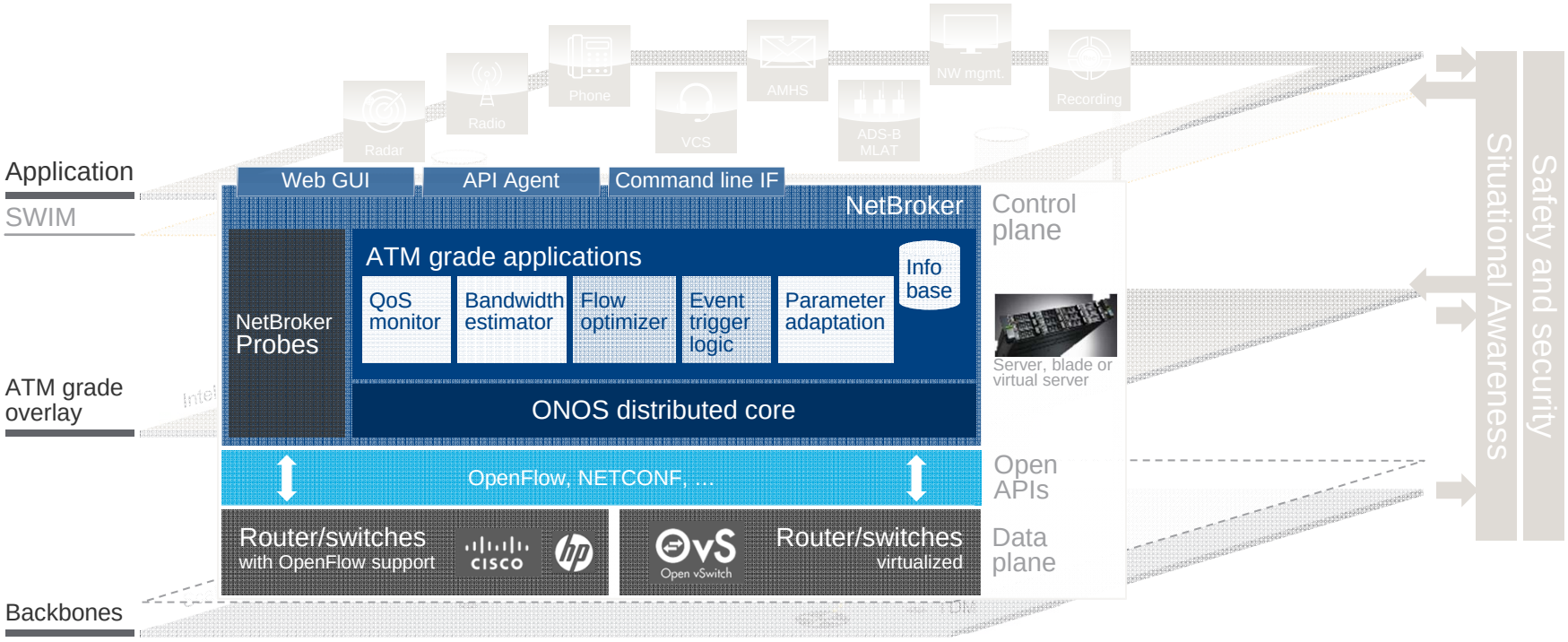
Service classes
Example definition

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	RADAR	per connection	<50ms <10ms	<0,1% < 1x10–7	High prior AF 100% in each WAN	Admission control Data forking	Yes	Yes	Yes
1	Remote Tower	per connection	<50ms <10ms	<0,1% < 1x10–7	High prior AF 100% in each WAN	Admission control Data forking	Yes	Yes	Yes
2	AMHS	per class	<50ms <10ms	<0,5% < 1x10–7	AF33	Traffic shaping	Yes	Yes	Yes
2	OPMET	per class	<50ms <10ms	<0,5% < 1x10–7	AF32	Traffic shaping	NO	Yes	Yes
3	Admin. High	per class	<50ms <10ms	<0,5% < 1x10–7	AF25	Payload encryption	NO	Yes	Yes
4	Administrative	per class	n/a		BE elastic		NO	NO	Yes

Operational Services | Operational Applications | Privileged Applications | Administrative Applications

Building ATM-grade networks by introducing a SDN overlay

Brokering between ATM-specific applications and non-ATM specialised backbone networks



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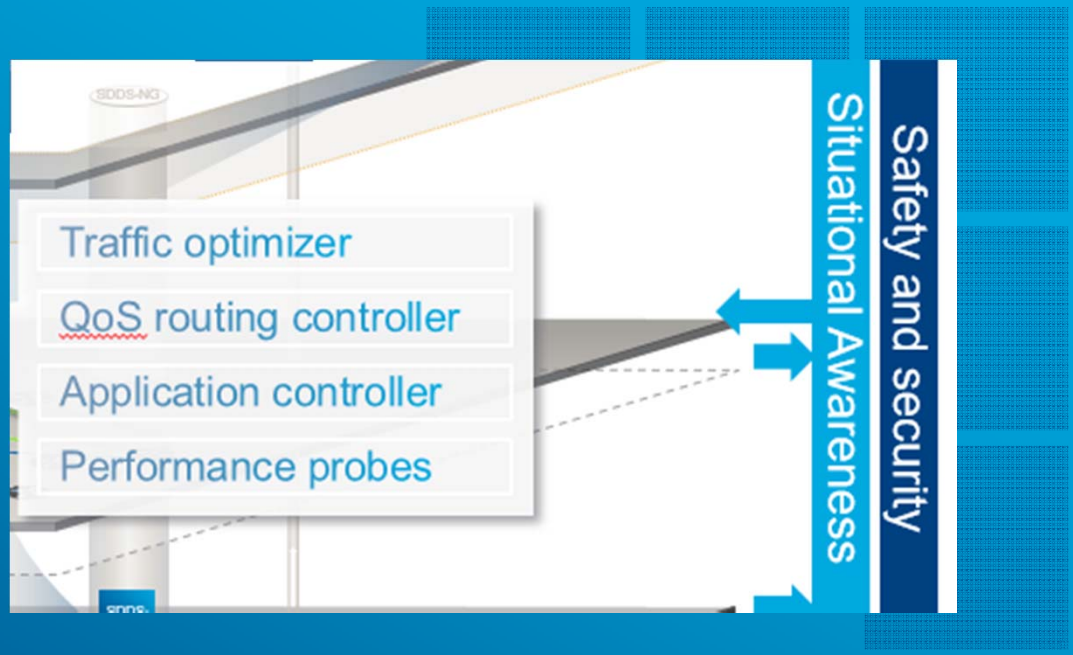
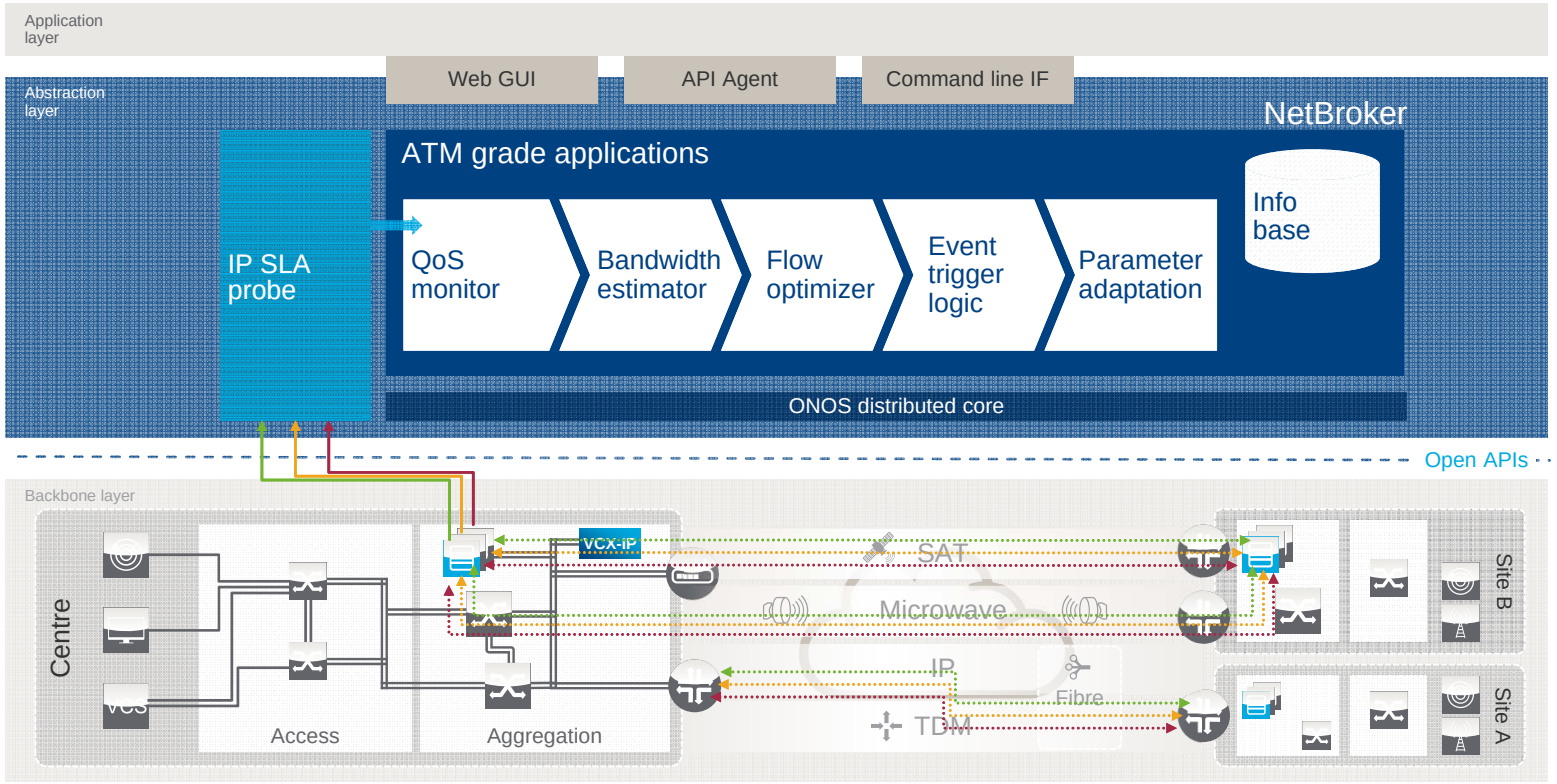
What's in it for you

Features

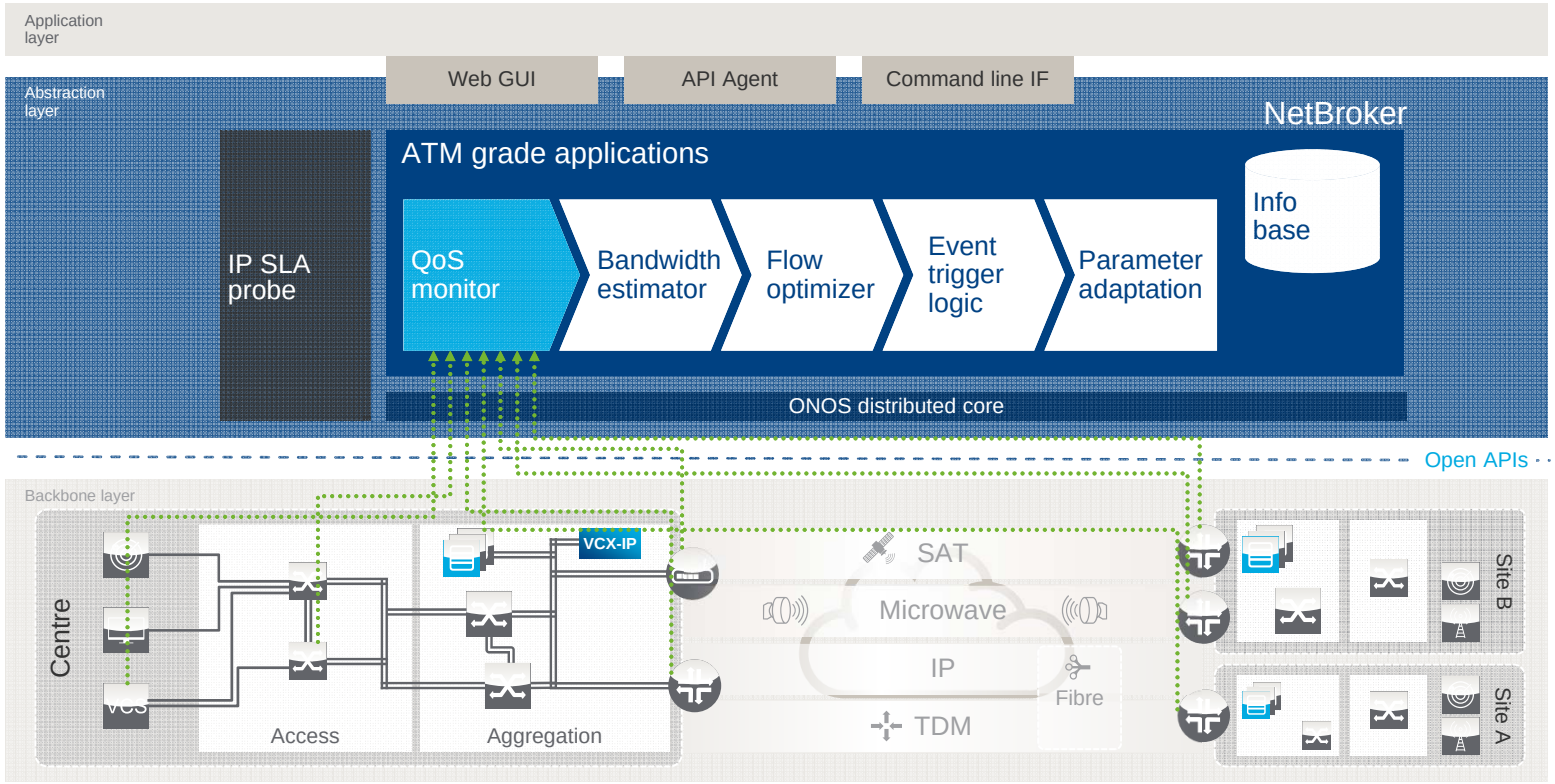


Active probing

- Scalable Networks
- Awareness
  - Cross-layer QoS
  - Active probing
  - Passive monitoring
- Routing
  - WAN selection
  - Flow control
  - xxx
- Safety & security
  - White listing
- Benefits
  - Brownout detection
  - Brownout detection
  - Brownout detection



Passive monitoring



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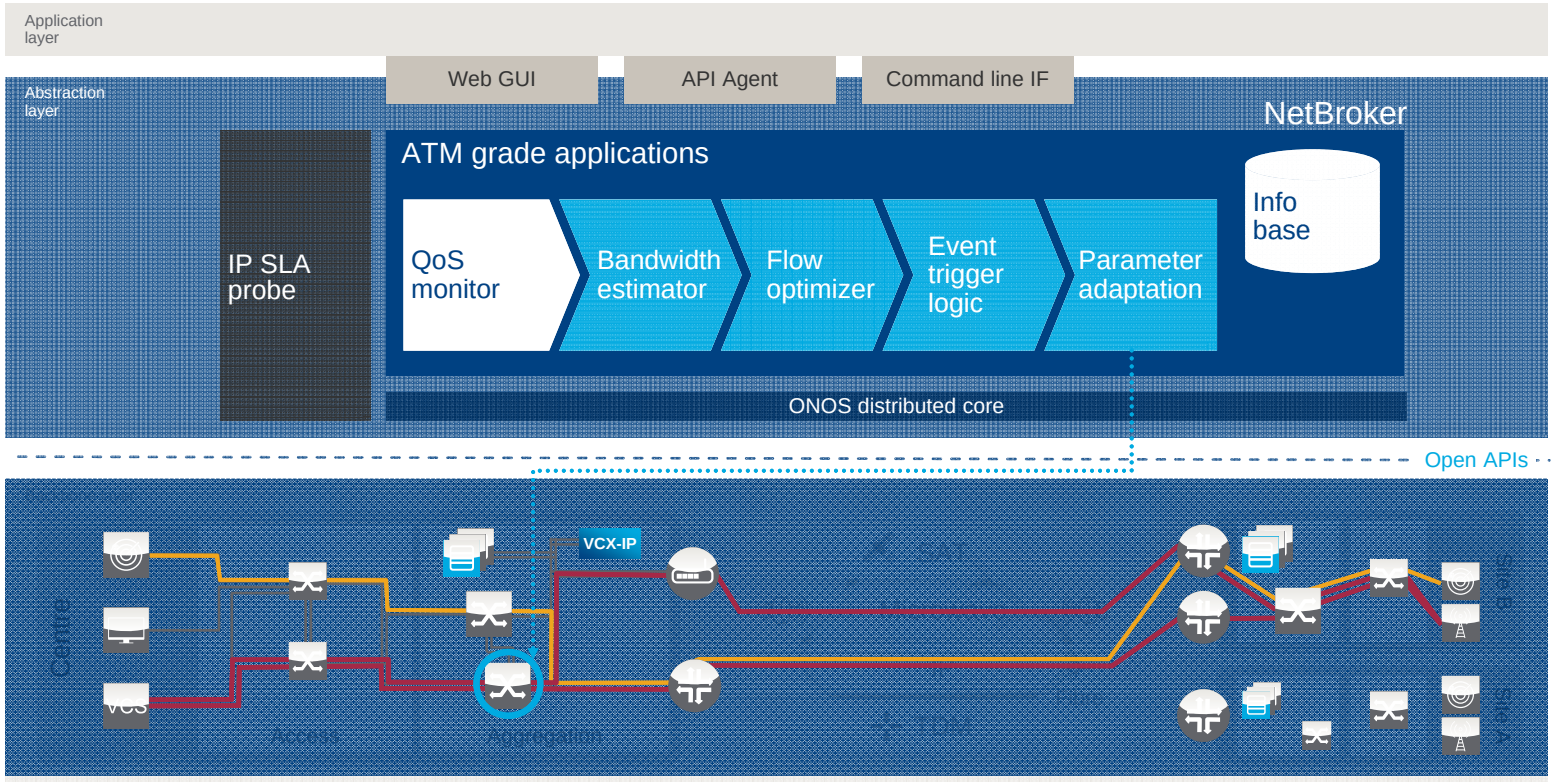
WAN Selection

Brown-out detection and re-routing based on SLAs



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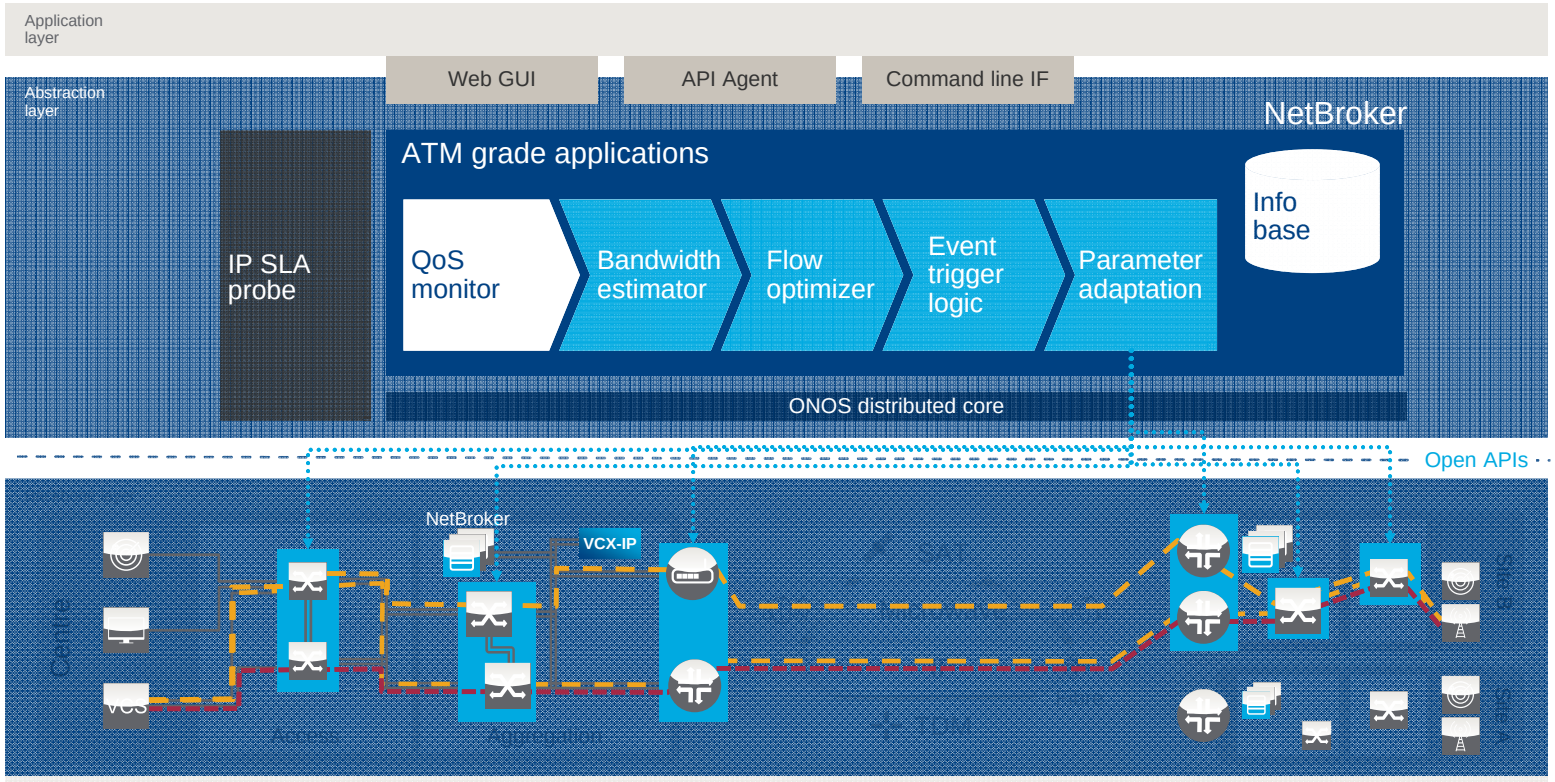
Flow control

End-to-end path diversity for redundant communication streams



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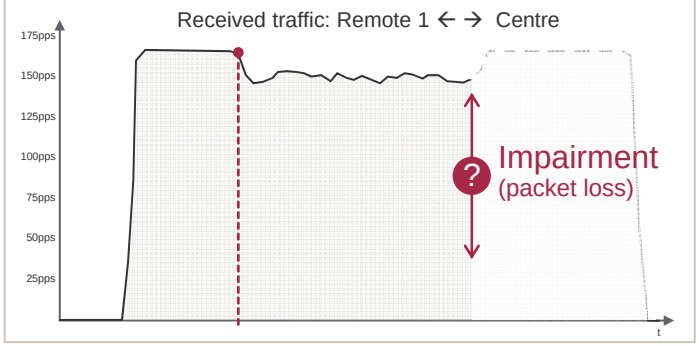
Enhanced network performance with brownout detection & rerouting

Detecting degradation in quality, traffic re-routing if needed to ensure performance

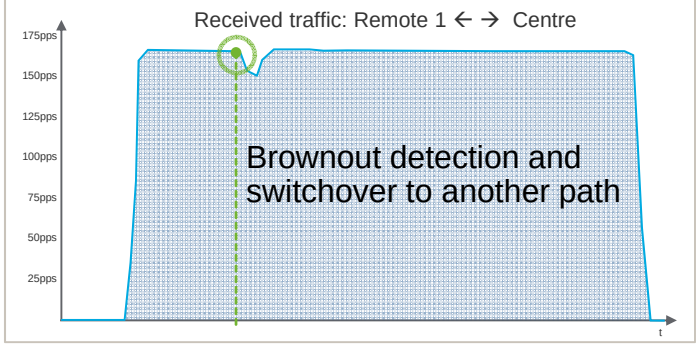
Traditional network



Without overlay: Degradation over time

"May be it returns back to normal… or not"

Network with NetBroker

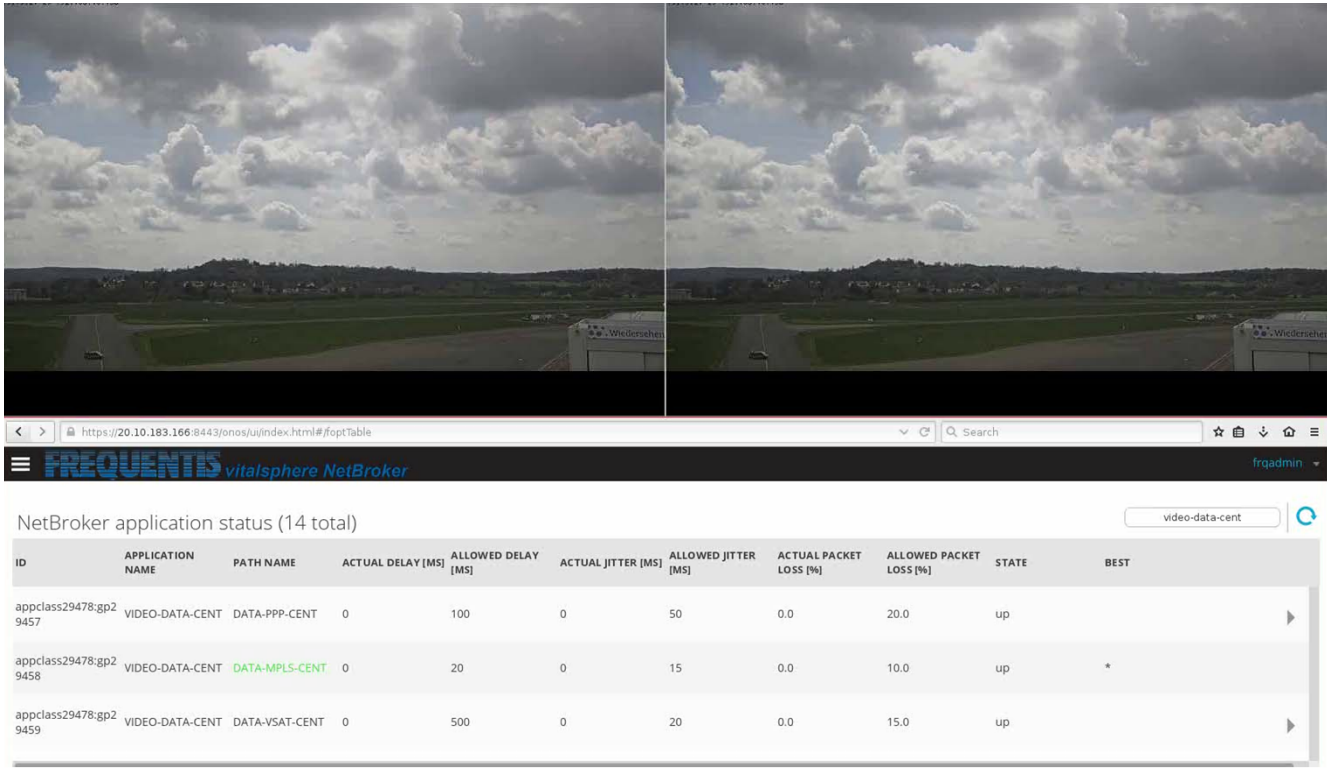


NetBroker senses degradation

- → For some apps more critical than for others
- → Can act according to app needs

Enhanced network performance with brownout detection AND rerouting

Detecting degradation in quality, traffic re-routing if needed to ensure performance



ID	APPLICATION NAME	PATH NAME	ACTUAL DELAY [MS]	ALLOWED DELAY [MS]	ACTUAL JITTER [MS]	ALLOWED JITTER [MS]	ACTUAL PACKET LOSS [%]	ALLOWED PACKET LOSS [%]	STATE	BEST
appclass29478:gp29457	VIDEO-DATA-CENT	DATA-PPP-CENT	0	100	0	50	0.0	20.0	up	
appclass29478:gp29458	VIDEO-DATA-CENT	DATA-MPLS-CENT	0	20	0	15	0.0	10.0	up	*
appclass29478:gp29459	VIDEO-DATA-CENT	DATA-VSAT-CENT	0	500	0	20	0.0	15.0	up	

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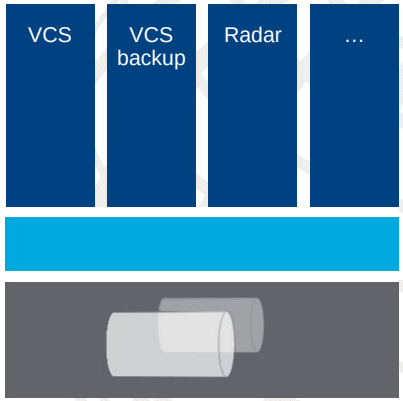
Matching network performance and application needs

Proactively prevent failure and maximise cross-layer quality of service

vitalsphere NetBroker

Introducing an SDN overlay



Brown-out detection

Deterministic prioritization
of traffic for graceful degradation

Increased service availability (RAMMPR)

Bandwidth savings on WAN
due to possible statistical multiplexing

"+ one 9" availibility

1/3 BW saving

$ €

Highest operational experience

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FOR A SAFER WORLD
Air Traffic Management
Defence
Maritime
Public Transport
Public Safety