

Open Broadband

May 20th, 2022

**Paving the way to controller-led,
automated and autonomous software
defined access networks (SDAN)**



Kurt Pynaert, Nokia

Broadband Zero – Nokia’s portfolio strategy

Zero left behind

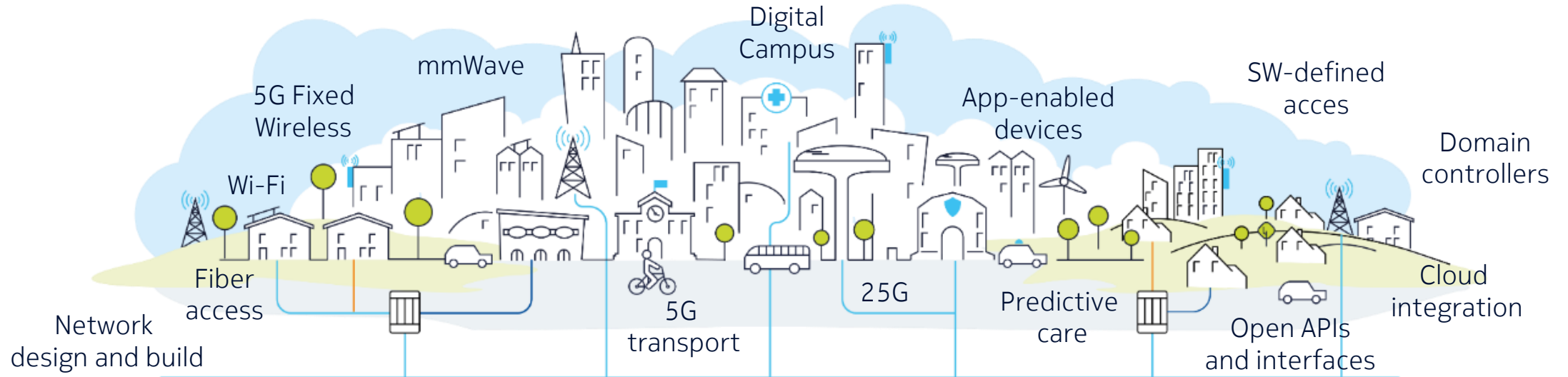
Connect everyone and everything

Zero limits

Innovative technologies for new use cases and business models

Zero touch

Automate and optimize the network



Zero waste

Delivering the benefits of broadband while minimizing environmental impact

SDN is Network Automation

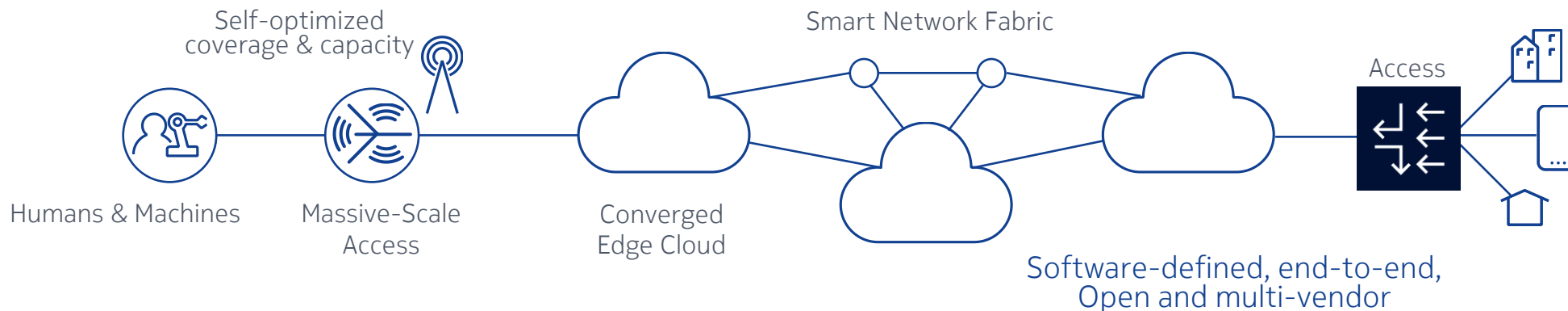
SDN is a method to enable a very high degree of **automation** in your entire network!

More intelligent,
programmable and
open automated
network

Reduce operational
costs and improve
the networking
experience

Instruct the
physical and virtual
network to do
tasks with machine
learning and
analytics

End-to-end
solutions with
increased
intelligence &
automation



Future readiness - the future is very different from the past

	Past	Future
Solutions	Technology-driven	Society/Value-driven
Driver	Consumer (BW)	+ Industry 4.0, e-health ... (Latency & SLA, 5G Services)
Architecture	Centralized	Distributed (dense & scale)
Software	Monoliths w/ limited APIs	Modular w/ Open API
Standards	Definitive	Iterative & Open
Investment	Singular (Operator only)	Singular and/or Shared (InP/VNO, NH, NaaS, MT)
Flexibility	Limited (Provisioned)	Large (Software definable)
Sharing	Static and Limited (HW VPNs)	Dynamic and Infinite (Network Slices)
Innovation Speed	Per annum/decade (new Services)	Per month/week (new Apps)

Technology and architecture enablers for open broadband

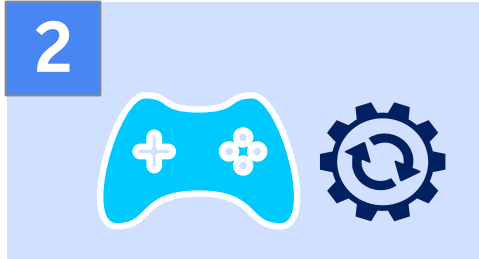
One Fiber Access



1

Broadband access for all: residential, business, MxH, enterprises, 5G services, Industry 4.0 applications

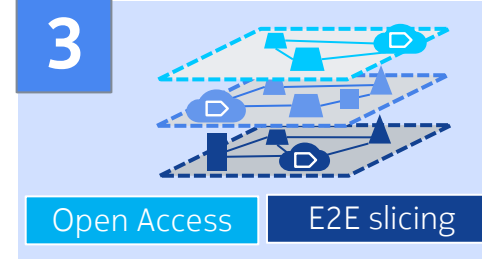
Controller-led networks



2

Intent-based networking, abstraction & automation, closed-loop automation, and programmability

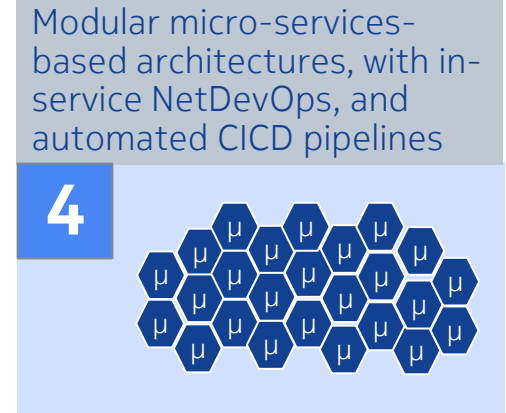
Network Slicing - NaaS



3

Multiple logically isolated networks with purposed SLA, individual logical networks for new use-cases

Cloud-native μ Services



4

Modular micro-services-based architectures, with in-service NetDevOps, and automated CI/CD pipelines

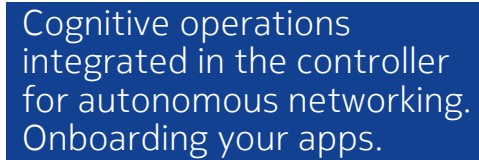
API-ification, standards



5

Open API architecture and controller platform with a vendor-agnostic experience. **Standardization is key!**

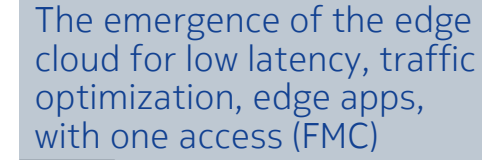
Apps and AI/ML



6

Cognitive operations integrated in the controller for autonomous networking. Onboarding your apps.

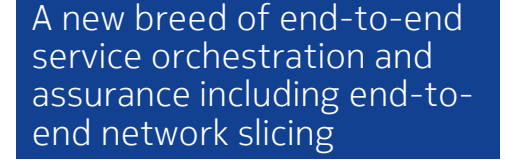
Converged Access Edge



7

The emergence of the edge cloud for low latency, traffic optimization, edge apps, with one access (FMC)

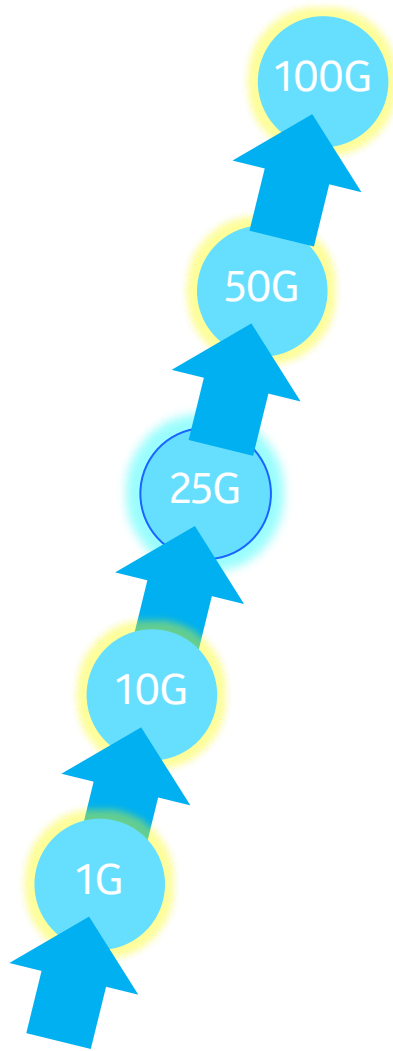
E2E Orchestration



8

A new breed of end-to-end service orchestration and assurance including end-to-end network slicing

One fiber access – open broadband access



Virtualized and software-defined access

- Controller-led access network with closed-loop automation and cognitive operations
- Scaled with cloud elasticity, with different cloud deployment models
- Flexibly programmable for resource optimization, services and network slicing

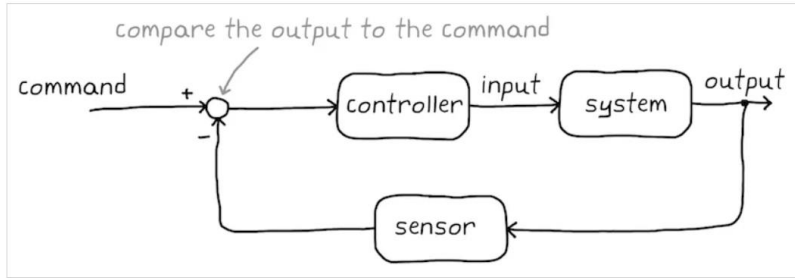


Ultra-capacity long reach fiber access

- PON capacity for residential, business, enterprises and MxH (anyhaul)
- PON supports 5G services and Industry 4.0 applications, TSN readiness
- 40/60 km reach enables OLT centralization, CO consolidation, and Edge

One ubiquitous access delivered over long fibers

A controller – what is it and what does it do



Control engineering (the command is the intent)

1

Abstraction

via Intent-based networking (IBN)



Intent-based

2

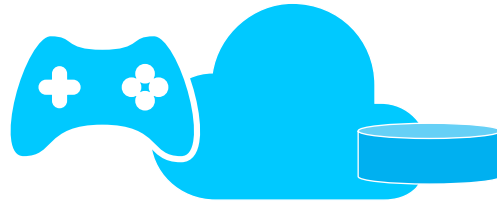
Programming the Network



API-ification

3

Network **Virtualization**



4

SDN Control Plane

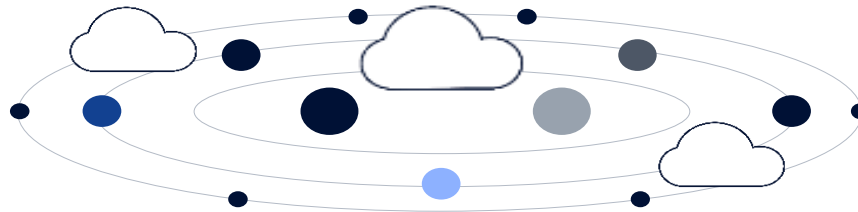


Closed-loop automation (CLA)

5

Streaming Telemetry, Sensors

- Network as a combination of
- Physical network functions (PNF)
 - Virtual network functions (VNF)
 - Cloud-native functions (CNF)

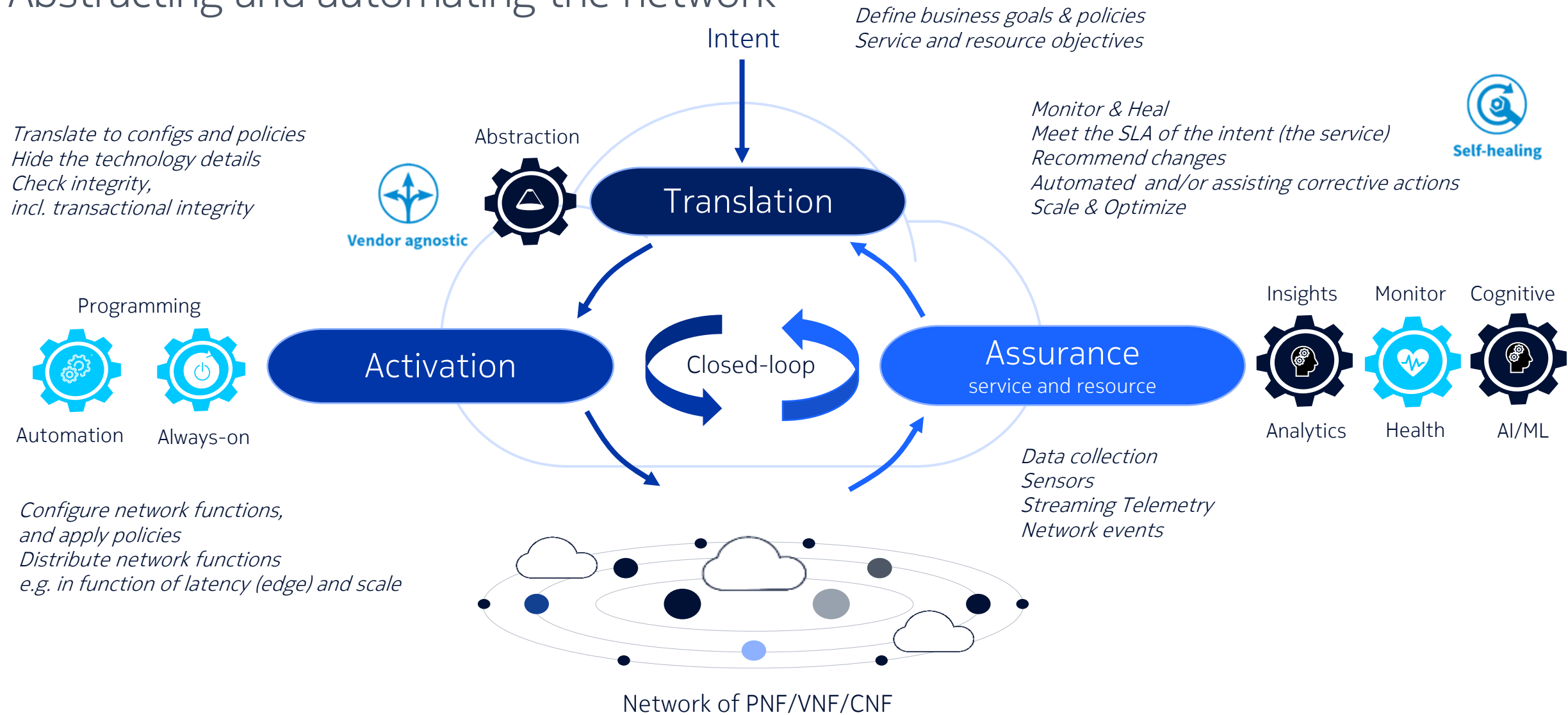


Vendor agnostic

From open-loop systems to closed-loop systems with closed-loop automation and autonomous control engineering applied on networks

Intent-based networking

Abstracting and automating the network



An automated and autonomous network that monitors, optimizes, scales and heals itself

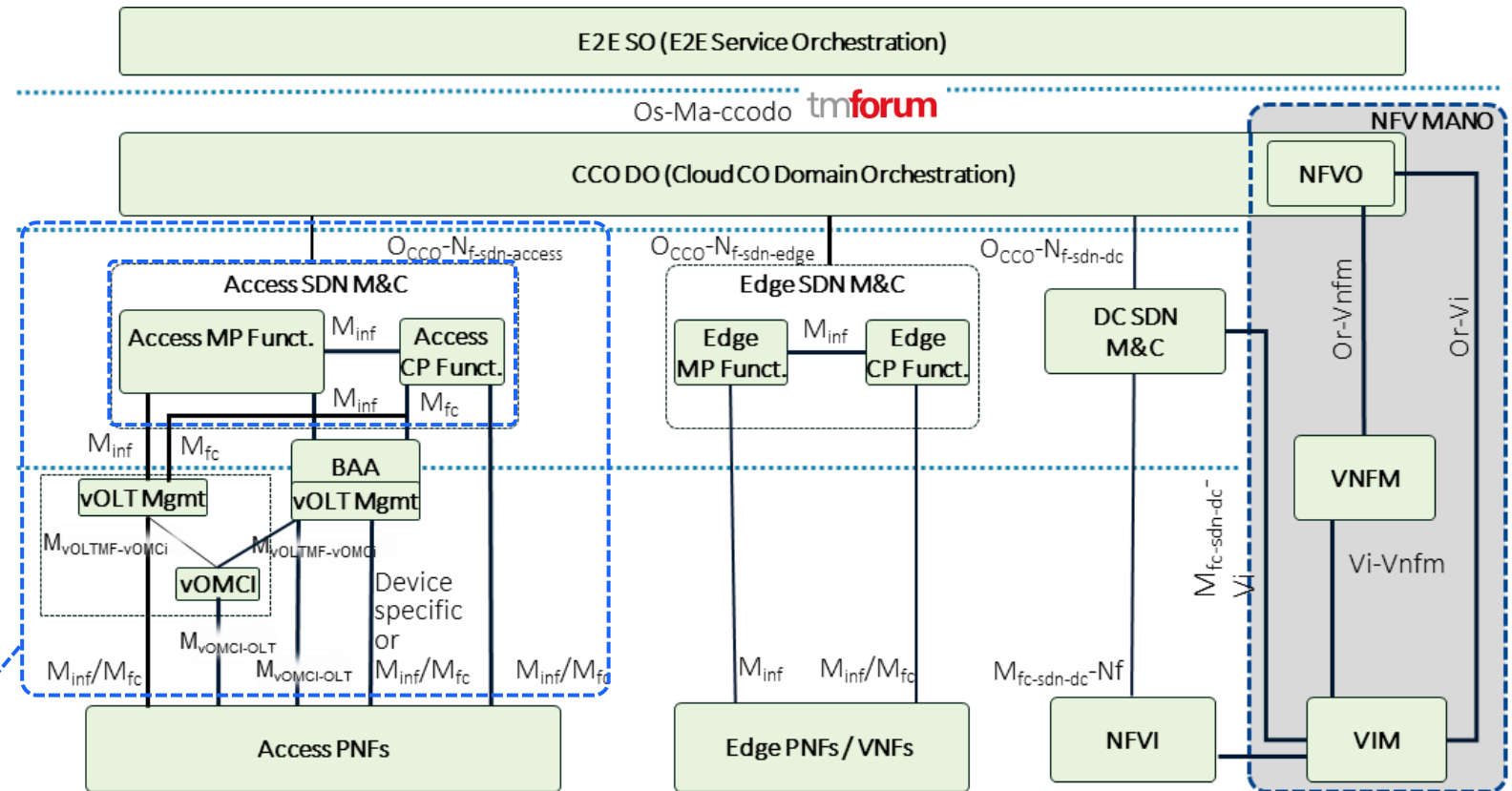
Standardization is key

Nokia embraces and complies to Cloud CO

✓ **Domain Orchestrator** as a technology-agnostic function offering generic Design, Orchestration, Inventory and Assurance capabilities. CCO DO typically conforming to TMF APIs.

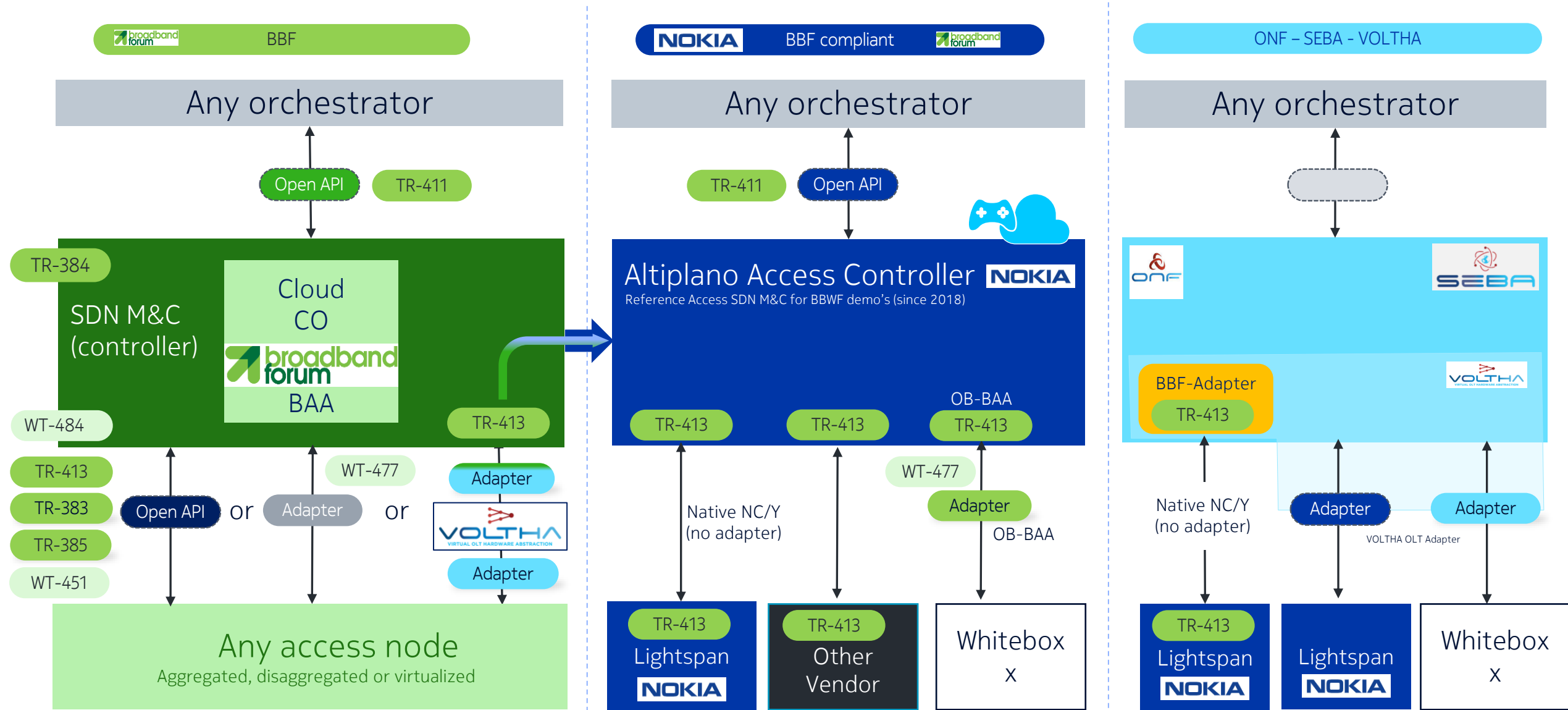
✓ **Access SDN Management & Control** layer cater for the technology-specifics. The SDN Controller is providing an abstract view of the Access Network towards the Orchestrator and is responsible for resource control and automation operations within the domain.

Nokia Altiplano as Access SDN M&C



Nokia conducting **proof-of-concepts** with 3rd parties (suppliers) and operators

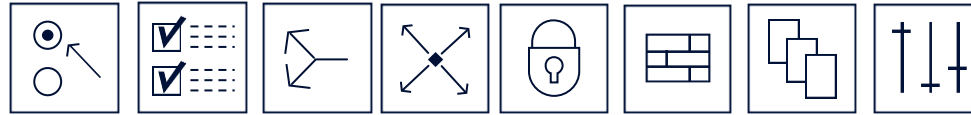
Testing the **maturity** of native NC/Y, multi-vendor, 3rd pty OLT, vOLT (WT-477)



An **open controller** – develop and onboard your own **applications**

From closed to open systems that enable augmentation of the architecture

Mix and match
best-in-class apps

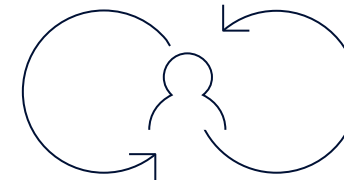


Hot-deployable apps (micro-services)
In-Service-Software-Upgrade (ISSU)
SW campaign management

Open API

Open message bus
Custom workflows and intents (IBN)

Partner program
& developer portal

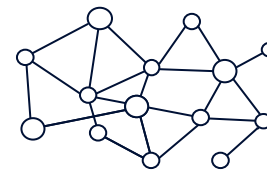


Cloud-native
Micro-services
DevOps paradigm

Open platform with rich set of
pre-integrated applications & services



Traditional, SDN-enabled
chassis-based and/or disaggregated access nodes



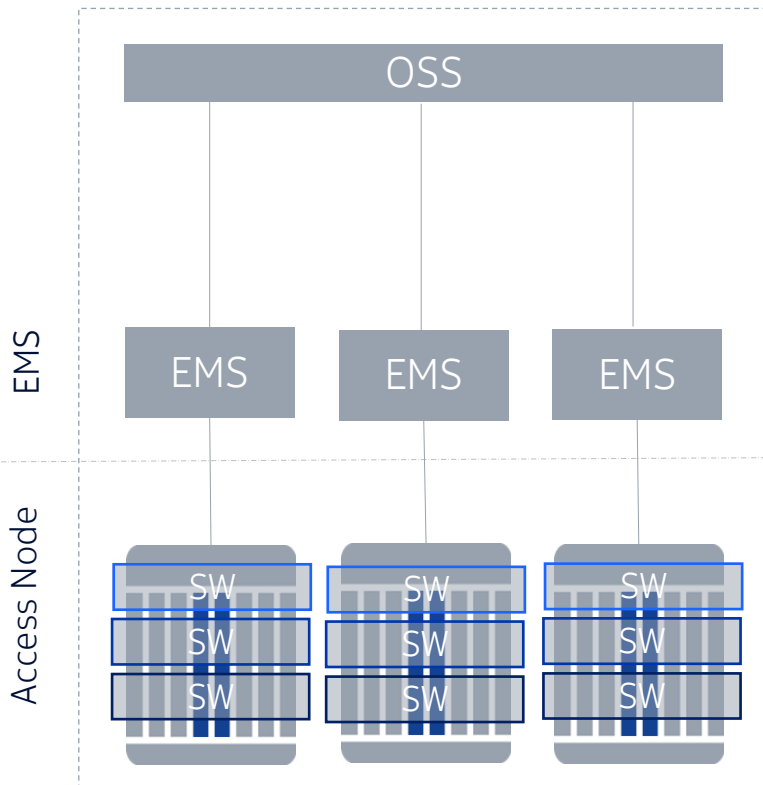
Multi-vendor networks
Single-pane-of-glass

TCO analysis - trade-off between flexibility and the TCO

Nokia supports chassis-based and disaggregated access (SDAN POD) solutions

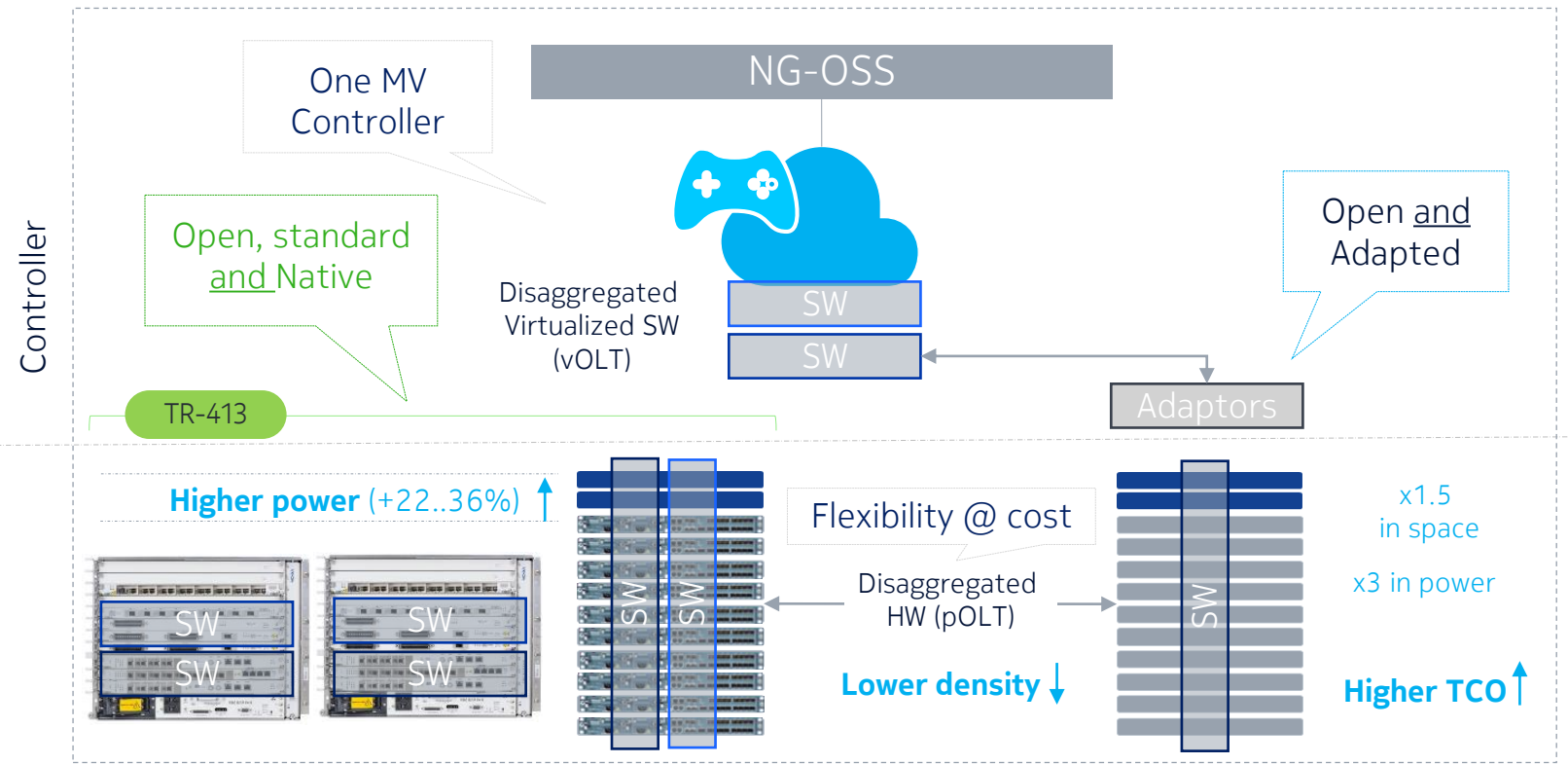
Traditional access networks

Static, monolithic and proprietary



Software defined access networks

Dynamic control, highly modular, disaggregated, open and standardized



Chassis-based best suited for high-density centralized deployments

Lowest power/sub

Key takeaways

1. SDN is a method to enable a very high degree of automation in your entire network!
2. Prepare for the future --- a paradigm shift with cloud-native software defined networks
3. Paving the way to controller-led autonomous and automated networks
4. The intent-based networking paradigm is gaining traction in all network domains
5. Standardization is key! more important with highly modular architectures (# integration points go up)
6. Productization and integration efforts to be factored in (ifo. maturity, deploy-ability and operability)
7. Evaluate the TCO holistically (ifo. maturity, flexibility, integration costs, density, power, supply lock-in)

THANK YOU



Kurt Pynaert, Nokia