

Network Virtualisation

An Opportunity to
Build Mouldable
Networks?

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Recovering the position in the Telecom value chain

Business development requires a continuous evolution of our network

The **explosion of digital services** makes **connectivity services** more needed than ever



Smartphone is changing everything

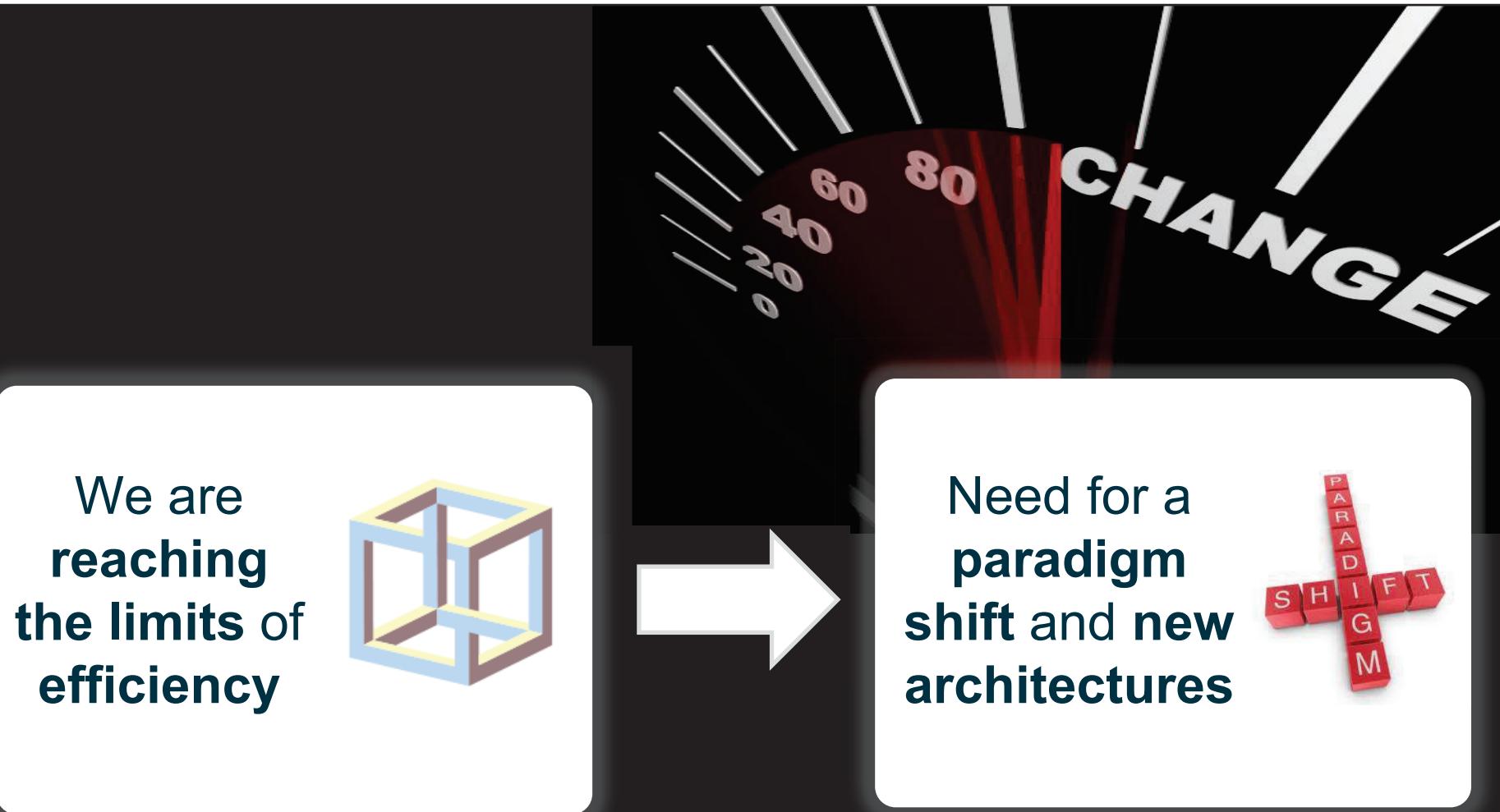
“The network makes the cloud”, Alcatel Lucent

Reduction of **Time to Market**

Increase of traffic in telco networks

New **ways of communication** and increasing number of “**always-on**” users

Besides savings from economies of scale, is there **room for more efficiency**? Can we obtain **more for less**?



Our challenge is providing a differentiated user experience while overcoming rigidity of current technology

Because today's decisions are tomorrow's legacy...



... flexibility becomes the only way to efficiently adapt to our customers needs in a scenario with increasing uncertainty



But the network is still unable to evolve fast enough

Network elements are

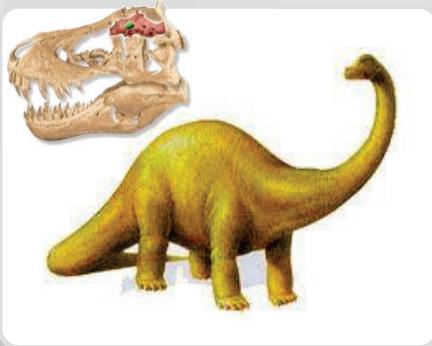
- ✓ Vertically integrated
- ✓ Proprietary
- ✓ Complex to operate

... which has resulted in great challenges for introducing new ideas and differential features by telco operators

“The network is the barrier for the cloud”, Nicira Networks

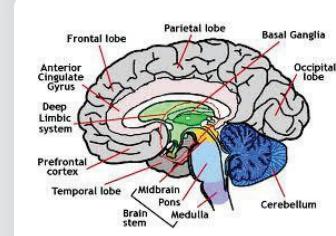
We have entered the Software-defined era: Telco evolution focus is shifting from hardware to software

Big old telcos



- Very intensive in hardware
- Software is not a core

Internet players



- Very intensive in software
- Hardware is a necessary support

HARDWARE

SOFTWARE



We need to adapt to survive

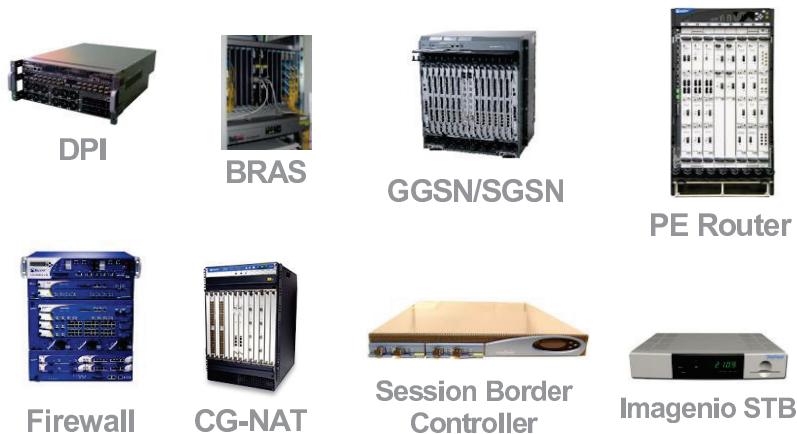
A close-up photograph of a person's hand holding a glowing, molten metal object, likely a piece of wire or a small rod. The metal is bright white and yellow, contrasting sharply with the dark, smoky background. Numerous small, sharp sparks are flying outwards from the glowing object, creating a dynamic and energetic visual effect.

SOFTENING THE HARDWARE: An opportunity for more flexible networks?

Network Virtualisation provides a mean to make the network more flexible by minimising dependence on HW constraints

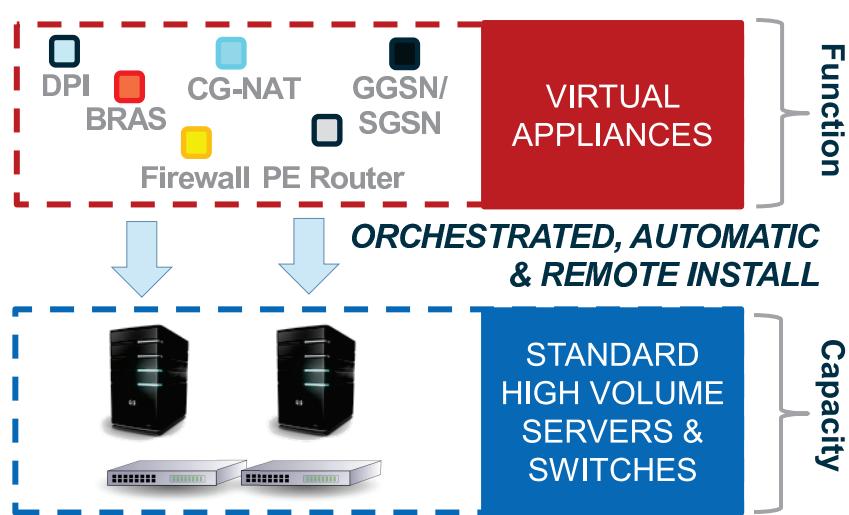
Network functionalities are drawn to SW, minimising dependence on HW constraints

Traditional Network Model: APPLIANCE APPROACH



- Network functionalities are **based on specific HW** with specific SW linked to HW vendors
- **One physical node per role**

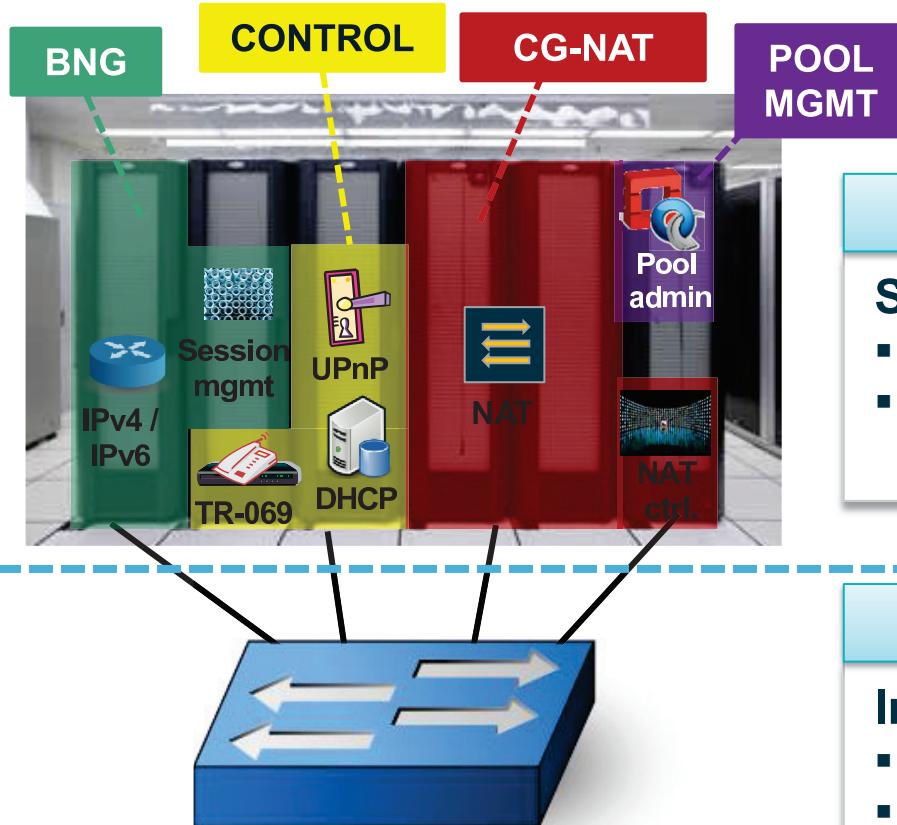
Virtualised Network Model: VIRTUAL APPLIANCE APPROACH



- Network functionalities are **SW-based over COTS HW**
- **Multiple roles over same HW**

Network Virtualisation (NV) = NFV + SDN

Once IP edge elements are SW-based, network HW can be managed as a pool of resources for SW-defined functions



NFV

SW-defined network functions

- High and predictable performance
- Homogeneous orchestration of compute domain

SDN

Interconnecting VMs (a.k.a. backplane)

- Data encapsulation
- Easy orchestration together with compute domain

BUT, WHERE ARE WE TODAY?

“The future depends on what you do today.”
— Mohandas Karamchand Gandhi

There are still challenges to be solved in NV...

AVOID VERTICAL INTEGRATION WHILE ASSURING PERFORMANCE



Software appliances
(network functions)
must be portable

E2E ORCHESTRATION AS SIMPLE AS POSSIBLE



FOSTER A NEW ECOSYSTEM

- Engaging established vendors
- Lowering entry barriers for new players



WIND RIVER



NETWORK
WARS

NEC

ERICSSON

BROCADE



JUNIPER
NETWORKS

Telefónica

... which the industry has difficulties to address



VERTICALLY INTEGRATED SOLUTIONS
(SW + HW + Orchestrator by same vendor)



INCUMBENT PRODUCTS conflicting with
SW-BASED PRODUCTS DEVELOPMENT



OPERATORS unaware of **ISVs** **PRODUCTS**



CLOUD ENVIRONMENTS sold as **NETWORK VIRTUALISATION ENVIRONMENTS**

Wasn't cloud computing addressing them?

The network differs from the computing environment in 2 key factors...

①

Data plane workloads
(which are huge!)

HIGH PRESSURE ON PERFORMANCE

②

Network requires shape
(+ E2E interconnection)

GLOBAL NETWORK VIEW IS REQUIRED FOR MANAGEMENT

...which are big challenges for vanilla cloud computing.

AN ADAPTED VIRTUALISATION ENVIRONMENT IS NEEDED TO OBTAIN CARRIER-CLASS BEHAVIOUR

From Cloud Computing to Network Virtualisation

CLOUD COMPUTING

1. PERFORMANCE BOUND TO CPU

2. AGGREGATED VIEW OF RESOURCES (CPU, memory, etc.)

3. ENDPOINTS

Applications need the OS

4. NODE-CENTRIC

Shapeless interconnection

5. MANY AND SMALL VMs

NETWORK VIRTUALISATION

1. PERFORMANCE BOUND TO I/O & MEMORY ACCESS

2. NUMA VIEW

Internal architecture is relevant for guests

3. MIDDLEPOINTS

Data-plane network functions bypass the OS

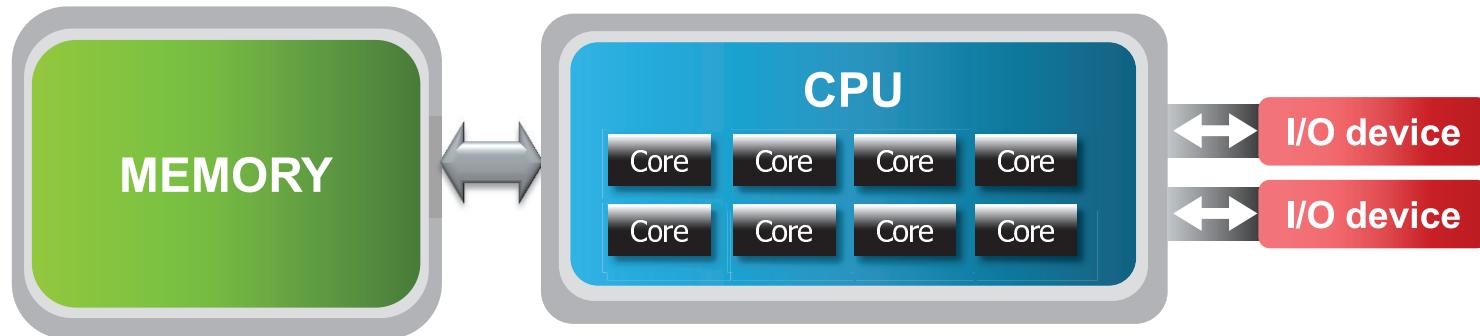
4. NETWORK-CENTRIC

The network has a shape

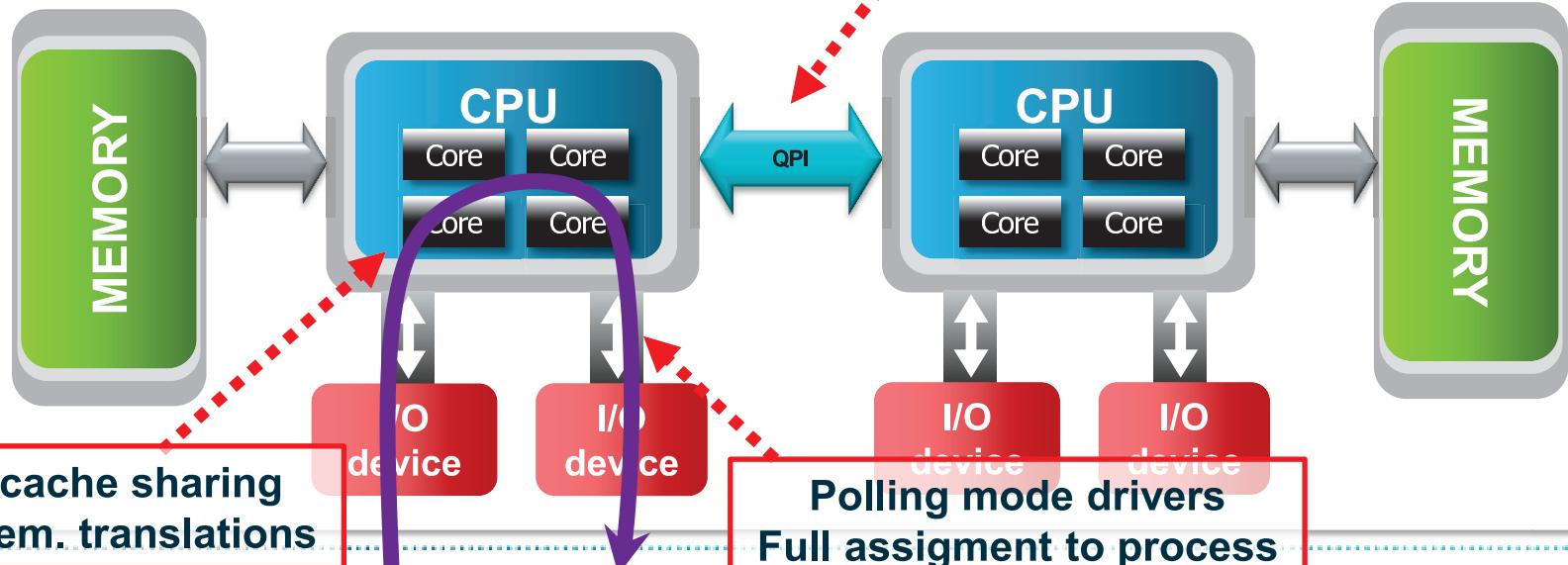
5. FEW AND LARGE VMs

#1. Data plane performance requires proper HW view at guest

CLOUD COMPUTING VIEW

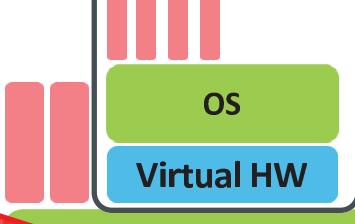
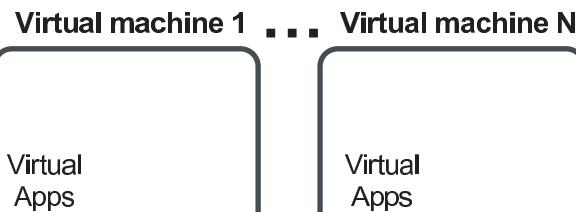


NETWORK VIRTUALISATION VIEW



#2. Hypervisor & OS may be bypassed for data plane apps

CLOUD COMPUTING



BOTTLENECK

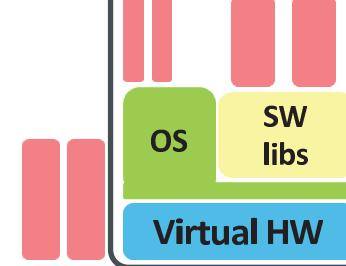
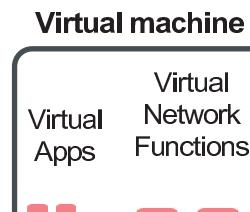


Hardware

UPSTREAM TRAFFIC

DOWNTREAM TRAFFIC

NETWORK VIRTUALISATION



DATA PLANE IS MANAGED DIRECTLY

BYPASSED OS + Hypervisor

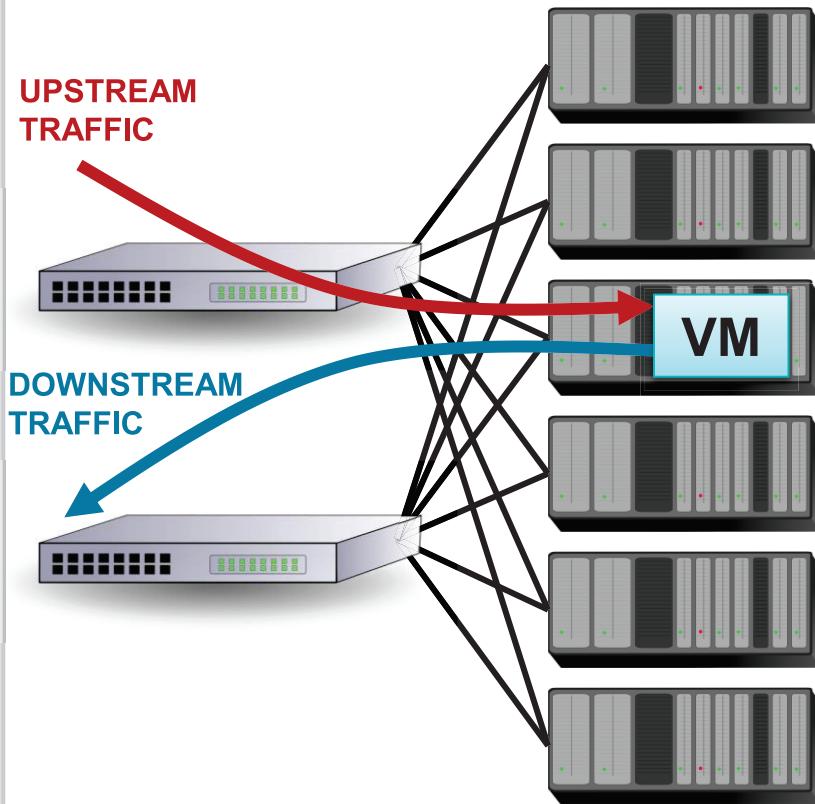


Hardware

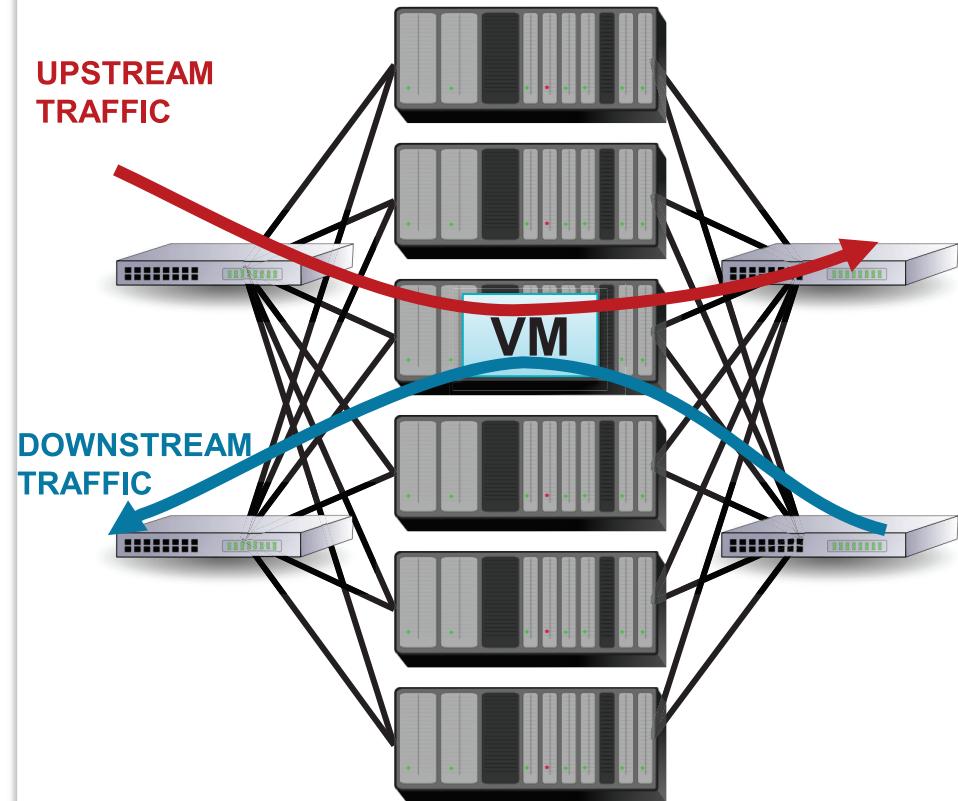
TRAFFIC

#3. Often the traffic goes across the network function (no communication endpoint)

CLOUD COMPUTING

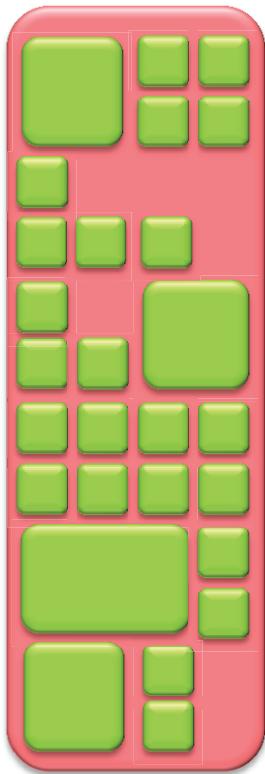


NETWORK VIRTUALISATION



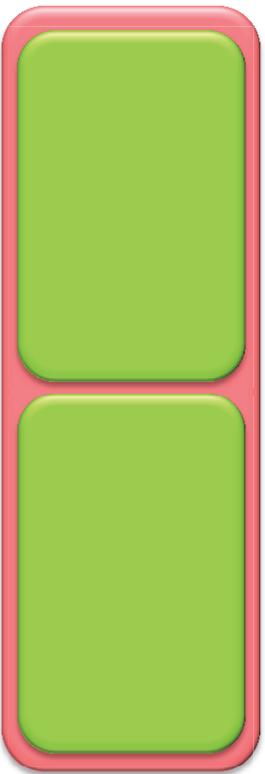
#4. Multi-tenancy is often better managed at app level

CLOUD COMPUTING



**High multi-tenancy requirements
in the hypervisor.**

NETWORK VIRTUALISATION



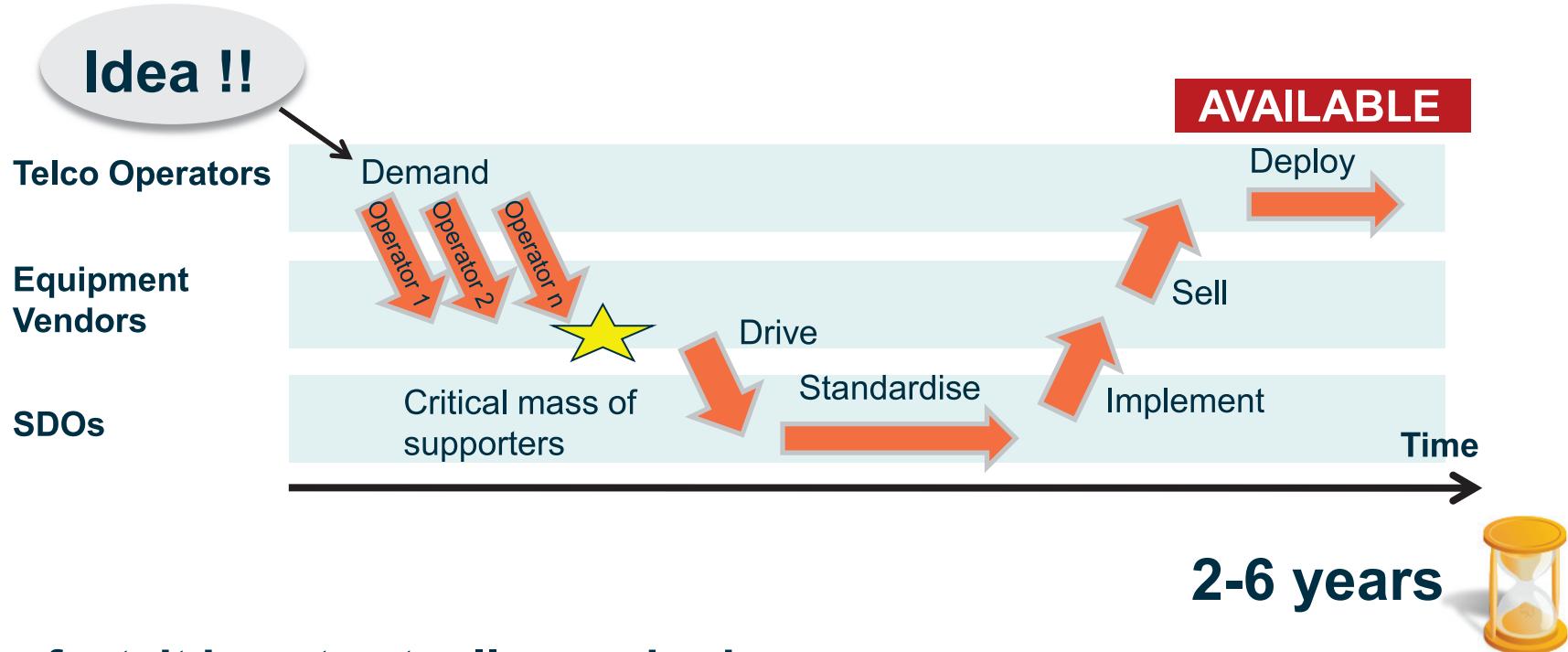
- Low multi-tenancy in hypervisor
- Multi-tenancy is at VNF (e.g SW-BNG)

BUILDING THE FUTURE

“The future always comes too fast and in the wrong order.”

— Alvin Toffler

Traditional telco cycle would be too slow to drive alone a transformation of this kind...



In fact, it is not actually required



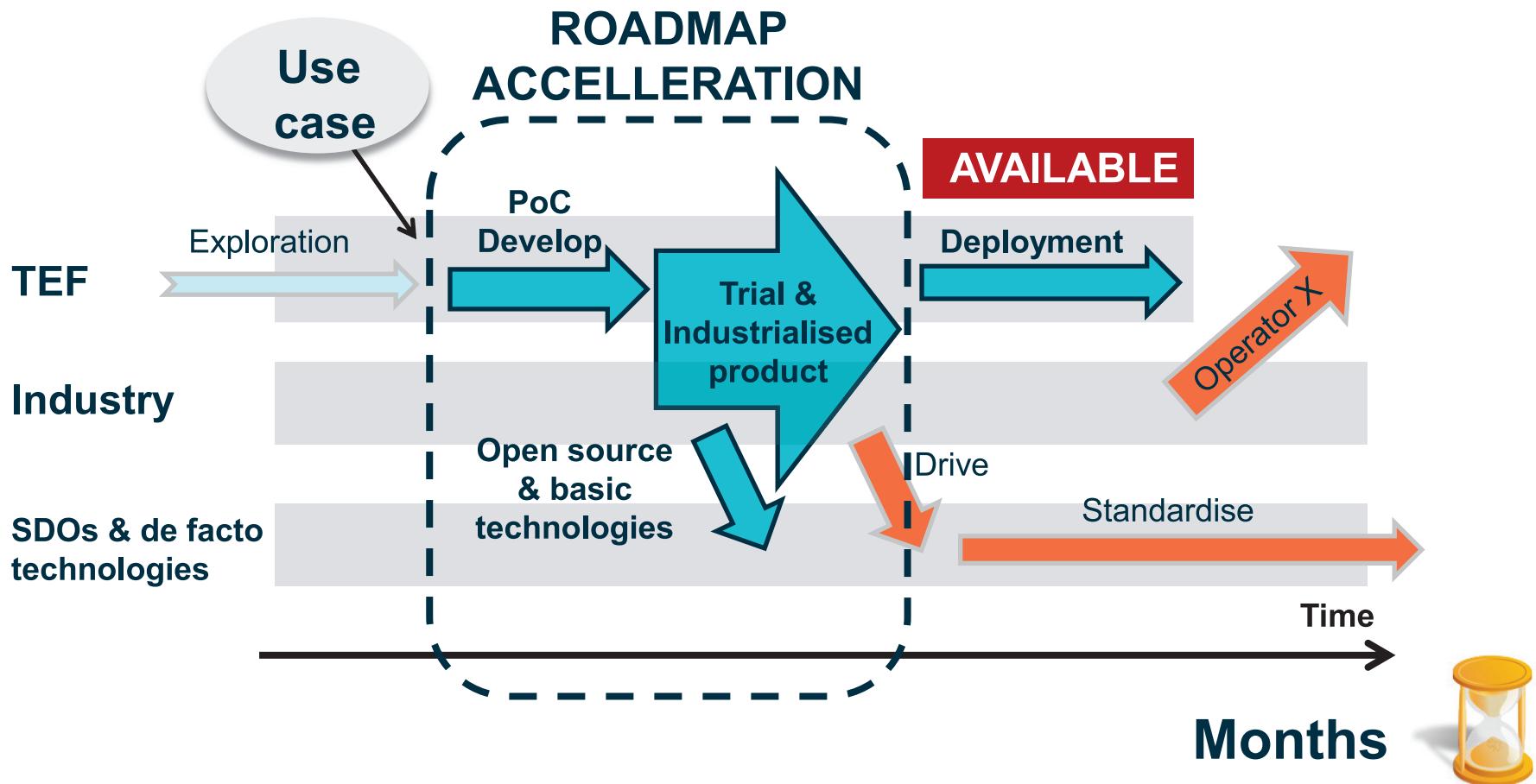
Basic virtualisation technologies already available



No need to assure HW economies of scale (granted!)



Instead, transformation can be steered by selected use cases, co-developed in a fast lane, leveraging on internal development strengths



Strategic partnerships together with an adequate presence in key SDOs are required to be successful

Industry



Put
Your
Logo
Here!

SDOs & de facto technologies



DPDK.org



KVM



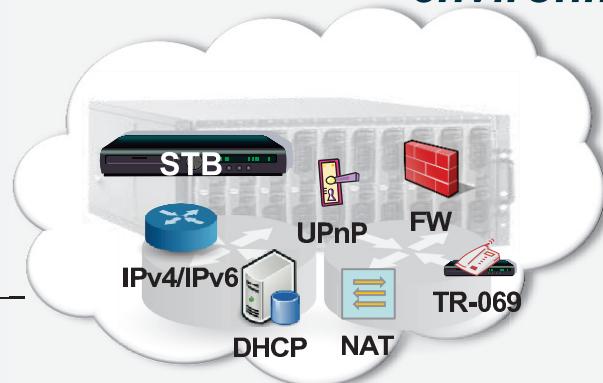
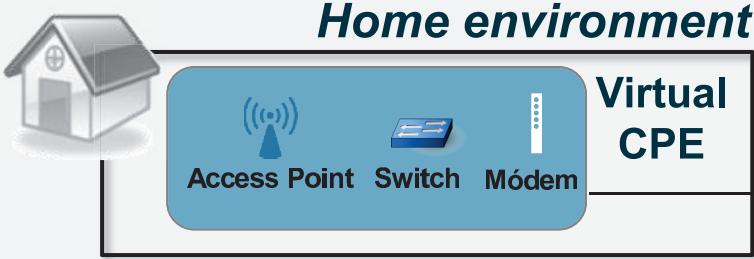
TIME IS NOW: USE CASES BENEFITING FROM NV TODAY

“Space we can recover, time never.”
— Napoleon Bonaparte

Virtual CPE: recovering positions in the value chain

Shifting network functions deployed in home environment to the **network**...

Telco Network environment



- Simple, stable along the time and cheaper customer premises equipment
- Quick and transparent migration to IPv6



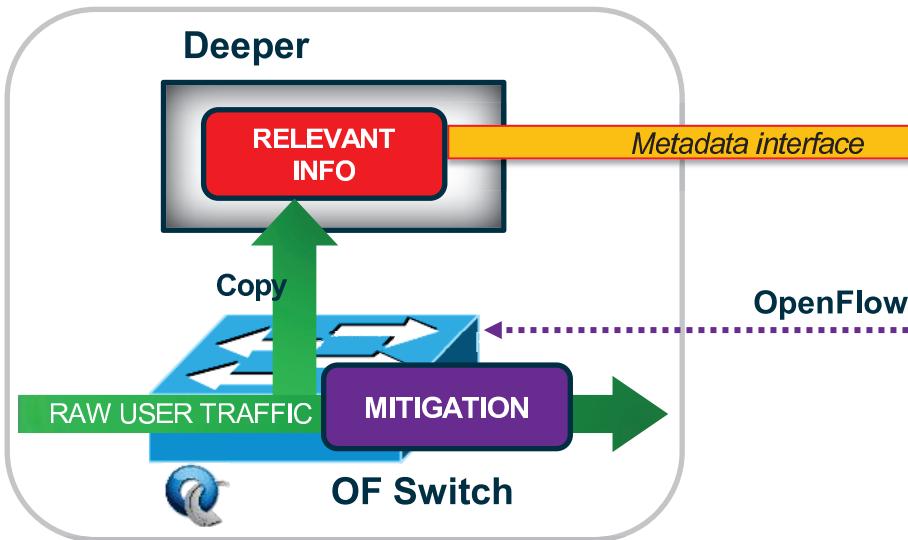
- Service evolution and operation is supported inside telco network
- Monetize cloud and video services (virtual set top box)
- Monetize security and digital identity features

MATURITY LEVEL

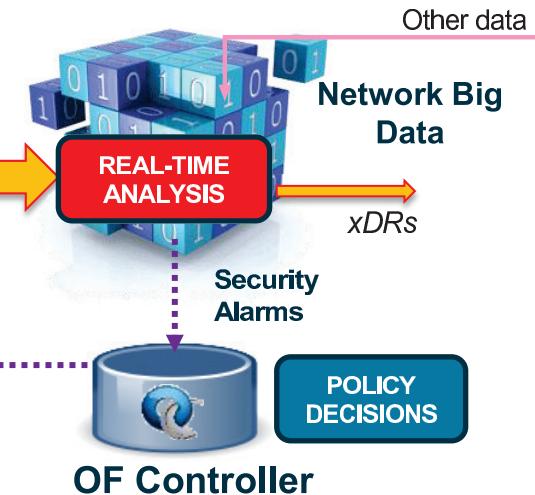
EXPLORE | PoC | TRIAL | DEPLOY

Virtual DPI Probe: Enhancing BI and Security

POINT OF PRESENCE



Centralised intelligence & orchestration



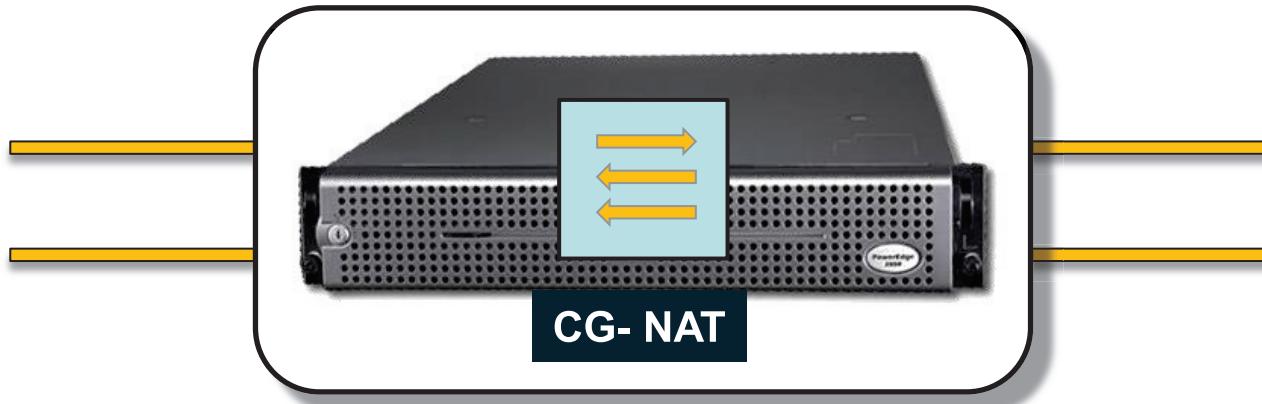
- >80 Gbps line rate per server
- Stable signatures

- Flexible data analysis and signature upgrade
- Forensic analysis feasible.

MATURITY LEVEL



SW CG-NAT: Low-cost high-performance NAT



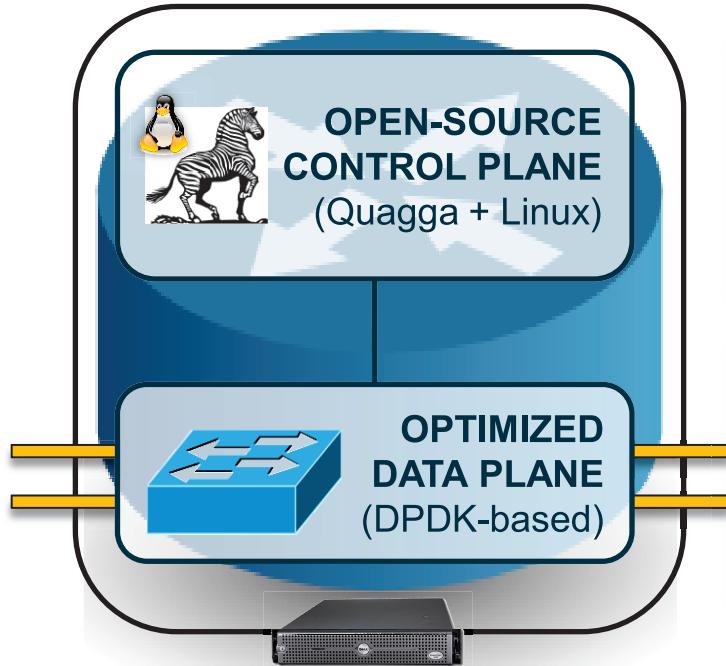
- NAT44 function** (translates from a private IPv4 address and port to a public IPv4 address and port, and vice-versa)
- 40 Gbps full-duplex line rate per server**
- Support of overlapping addresses and tunnellings**
- Auto-provisioning of NAT sessions per access line**

MATURITY LEVEL

EXPLORE PoC TRIAL DEPLOY

Quagga-DPDK router: The open source way

Leverage on open source routing project (Quagga) as rich and widely tested protocol suite while assuring data plane performance



- ✓ Common routing protocols supported and extended by open source project.
- ✓ Well-known router command line.
- ✓ High-performance line-rate data plane.
- ✓ Running in separate process, does not lead to licensing issues.

MATURITY LEVEL

EXPLORE | PoC | TRIAL | DEPLOY

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COMMENTS / QUESTIONS:

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