

# Arthur D Little

## Access Transformation

A skydiver in a green jumpsuit and black helmet, smiling and waving, against a blue sky with white clouds. The skydiver is wearing a red harness and has a clear visor. The background is a vast, bright blue sky with scattered white clouds.

So why is it such a big deal?

Santa Clara,  
September 2019

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## Who are we?



Salman Ali  
Arthur D. Little

Focused on Technology and Innovation Management

- Sectors: Telecoms, Energy, Banking, Travel, Infrastructure
- Topics: Platforms as businesses, Telco Transformation, Open Innovation

Which means

- Observer of changes
- Help clients make the transition



Tom Anschutz  
AT&T

Part of the D2.0 team focused on cloudifying the telco

- Leads Telco transformation activities, standards & community development related to all aspects of access networks
- Topics: Open Compute hardware, Open Source software, SDN and NFV

Which means

- He dreams about transforming access networks and then wakes up and gets the job done!
- Affects change globally



Hans-Joerg Kolbe  
Deutsche Telekom

Head of Access 4.0 DevOps Org

- Chief Product Owner Access 4.0
- Co-responsible for system design and architecture
- Leading transformation
- Topics: SDN, NFV, CORD, Access, 5G, WhiteBoxes, Cost engineering, Standards & OpenSource

Which means

- He gets people to agree on important stuff!
- Knows how hard it is!
- Creates impact



David Artuñedo  
Telefónica

Founder & CTO Onlife Networks

- Internal Startup of 15 people using NFV/SDN technologies on OCP Hardware to rearchitect Telco Central Offices.
- Topics: Edge Computing, services personalization, access networks virtualization (mobile and fixed)

Which means

- Must manage complex organizational issues with high uncertainty
- Owns a P&L and must deliver on targets and KPI

We have come together to explain why **access transformation** deserves a lot more attention

### A little bit of context

- AT&T, Deutsche Telekom and Telefónica have been collaborating on this topic since 2015
- Broad **alignment on direction and objectives**, but **differing approaches** on (i) Software stack and (ii) business drivers i.e. cost vs. revenue focus
- In Jan 2018 the parties agreed to develop a joint paper to **share learnings** and **encourage community development**
- Kick-off In Darmstadt in Feb 2018, team and contributors
  - **Arthur D. Little:** Salman Ali, Mariana Atilano Carlos Mira, Jesús Portal
  - **AT&T:** Tom Anschutz, Mitch Olson, Earl Pope
  - **Deutsche Telekom:** Bodo Jacobs, Hans-Joerg Kolbe, Manuel Paul, Robert Soukup, Fabian Schneider
  - **Telefónica:** David Artuñedo, Alfonso Carrillo, David López Meco, Patrick López



Who dares wins!

*How access transformation can fast-track evolution of operator production platforms*

<https://www.adlittle.com/en/who-dares-wins>

## Major forces are reshaping the telecoms industry

### Forces for change

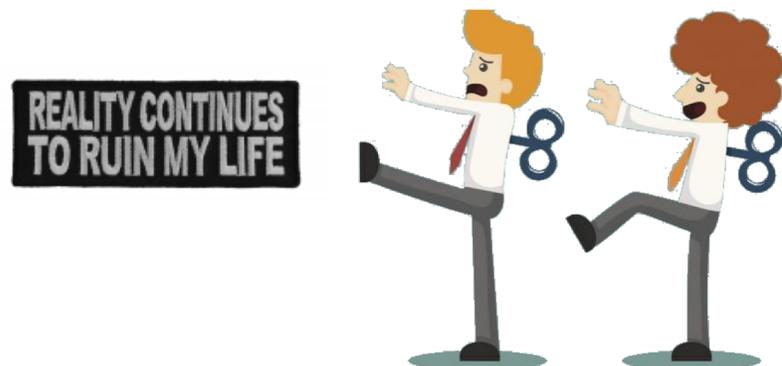
- I Demand growing faster than revenues
- II. Technological convergence pushing open DC technologies, tools and techniques as alternatives to proprietary technology
- III. Increasing value generated by 3<sup>rd</sup> parties: OTTs, cloud players and ecosystem players; and Operators want in!

### Challenges facing Operators

- ..... low willingness to pay for plain vanilla-networking services
- .... It is not yet apparent what is the right architecture (and hence skills) for competitiveness in the future. No credible supply chain, mass restructuring is a sensitive topic
- ..... even if the figurative “Killer app” was known, most Operators would be unable to execute: footprint focus, funding and governance, procurement and hiring challenges limit ability to address new opportunities in a timely manner

# The origin of the problem is **how the industry innovates**

### Network engineers



### Cloud nerds



#### Modus Operandi

- Cost driven stability culture
- Interoperability- and compatibility-focus
- Specification driven by SDOs (vendors and operators) determine the roadmap, setting direction + pace
- Developed through consensus building

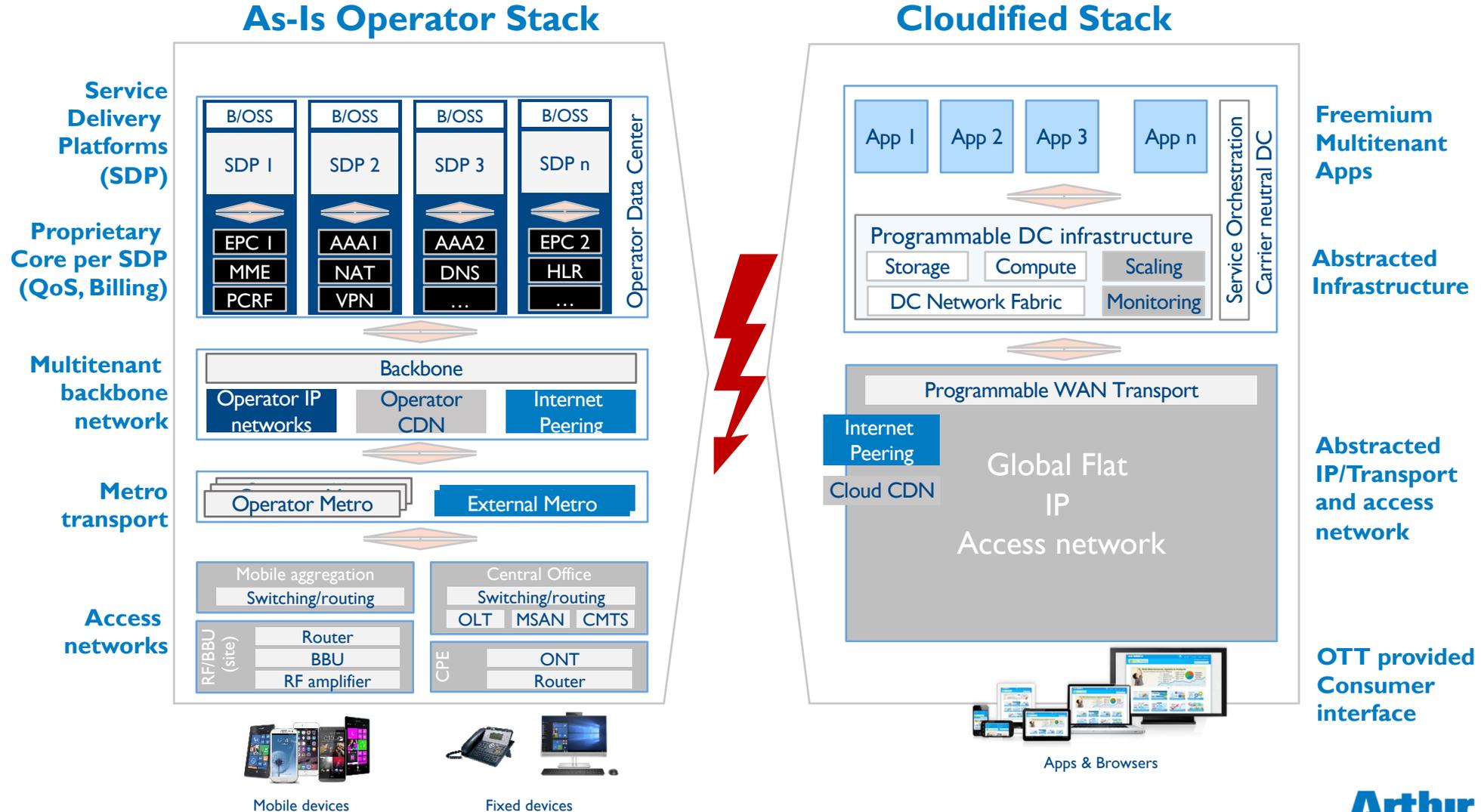
#### Outcome:

**Complex and detailed specs that balance conflicting interests of operators and vendors rather than emphasize innovation.**

- Speed and scalability culture
- Designs developed drawing on community: Opensource software and hardware
- Constantly looking for the proprietary edge vis-a-vis cloud competitors and Own the roadmap
- Software engineering cultures: if it aint good enough show me how to do it better

**Solutions that are engineered for purpose**

# Creating architectures that are immiscible



## Operators need fit for purpose *solutions that mimic cloud patterns*

### Disaggregation

- “Take control” of the production platform
- Built on opensource hardware and software technologies
    - Common architectures that do not distinguish between fixed and mobile
    - Replaces proprietary telecoms equipment with Lego™ like general purpose hardware
  - Produce the relevant functions in software, managed by automation tools
    - Drive consolidation
    - Lowers barriers to experimentation



Enable adoption of cloud technologies and aligning the operating model with cloud ways of working

### Softwarisation

- Softwarize the operating model
- Infrastructure engineered, provisioned, and orchestrated just like cloud services in webscale data centers
  - Enables new ways of working
    - Platform based thinking
    - Exploits platform logic to accelerate speed at which products are created and launched
  - Use of DevOps techniques to develop and launch services
  - Enables platform oriented business opportunities with 3rd parties
    - Latency sensitive workloads

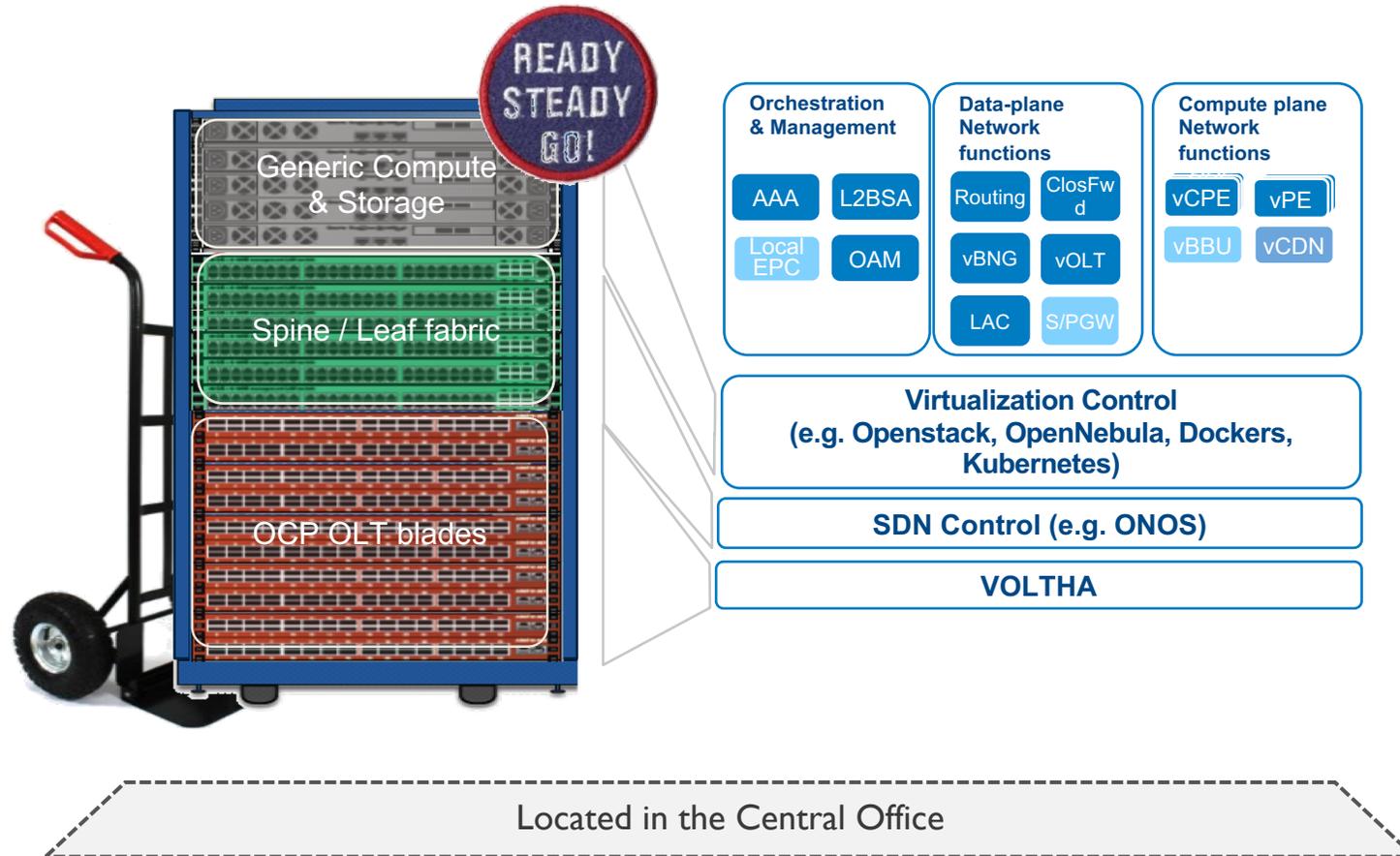
This has lead to numerous designs being championed by  as well as others including **YOURS**

# A real alternative is emerging - The stack is maturing to become carrier grade

## The converged central office pod “CCOpod”

### Inspired by Central Office Re-architected as a Data center project (CORD)

- Modular, all white box design
- Central office pod provides access, aggregation, IP edge, split RAN base band processing, routing and edge “cloud” services
- Engineered for the central office environmental conditions



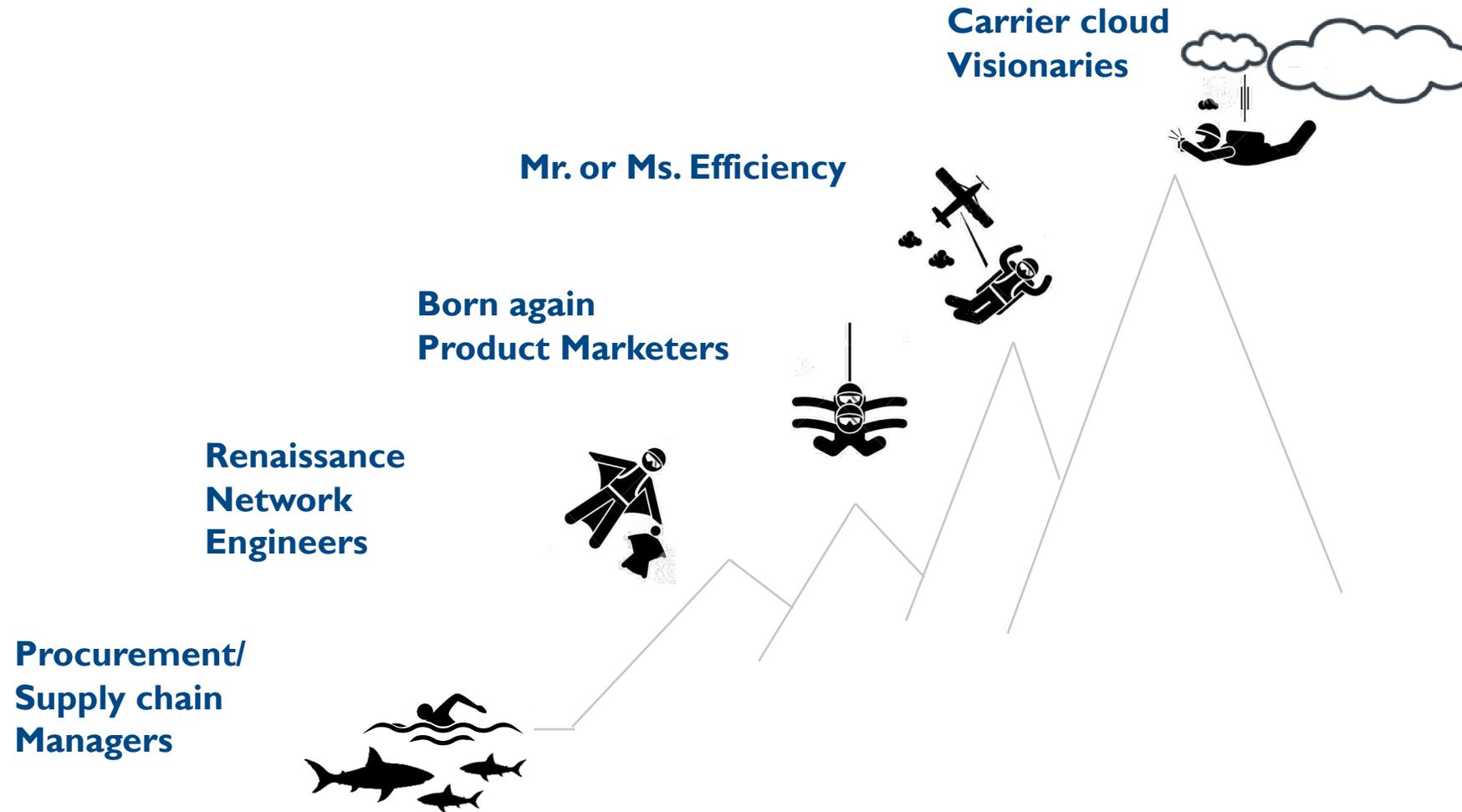
Hardware stack is performant and mature for the Central Office

The haze around reliability through software is being lifted (aka carrier grade software)

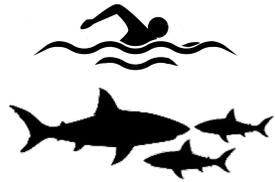
Provides a safe area to incubate new service and business models

So why is it such a big deal?

## CCOpod creates new options for everyone from technologists to strategists

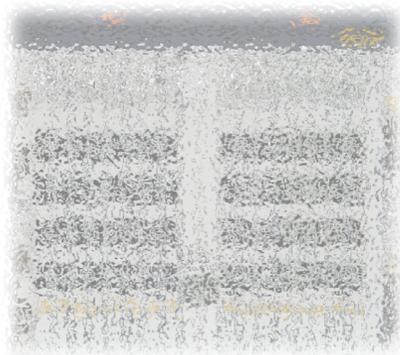


# Procurement/supply chain might see the components as a **powerful negotiating tool**



**Procurement/  
Supply chain  
Managers**

## Traditional OLT



Weighted average  
\$300-700 per port  
80% B+ Ports  
20% C+ Ports

Front plane: 280Gbps  
Backplane: 2x40Gbps

## Open compute OLT blade



\$130-180 per port  
80% B+ Ports  
20% C+ Ports

Front plane: 120Gbps  
Backplane: 6x40Gbps

**Use of DC grade equipment** allows operators to access same economics as cloud ecosystem

**Access to wider Cloud and IT supplier base** including OEMs, Chip makers & contract manufacturers

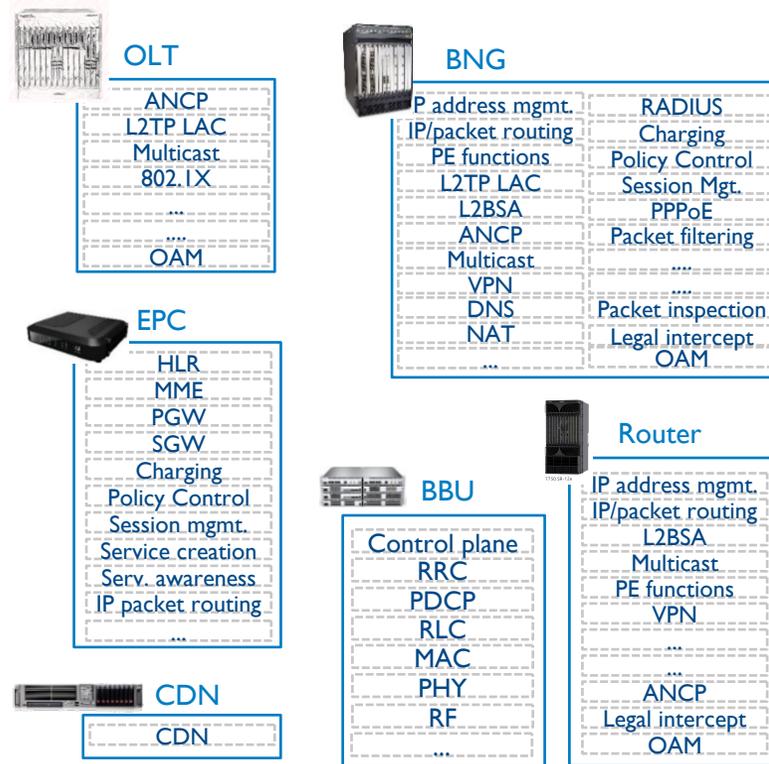
# So why is it such a big deal?

## Network engineers will see CCO pod eliminate functional clutter ....

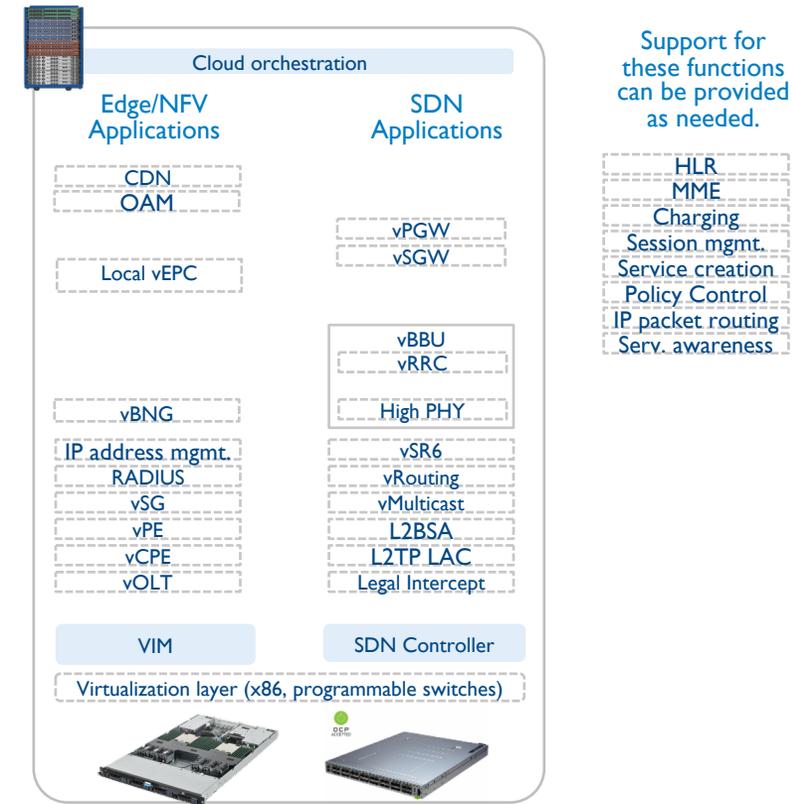


**Renaissance  
Networking  
Engineers**

### Traditional fixed and mobile equipment



### Converged Central Office Pod



▶ NFV/SDN and Cloud are combined to provide a substrate for software-based network functions that provide an alternative to traditional network solutions

# So why is it such a big deal?

....as well as realize the design is **more cost efficient & scalable**

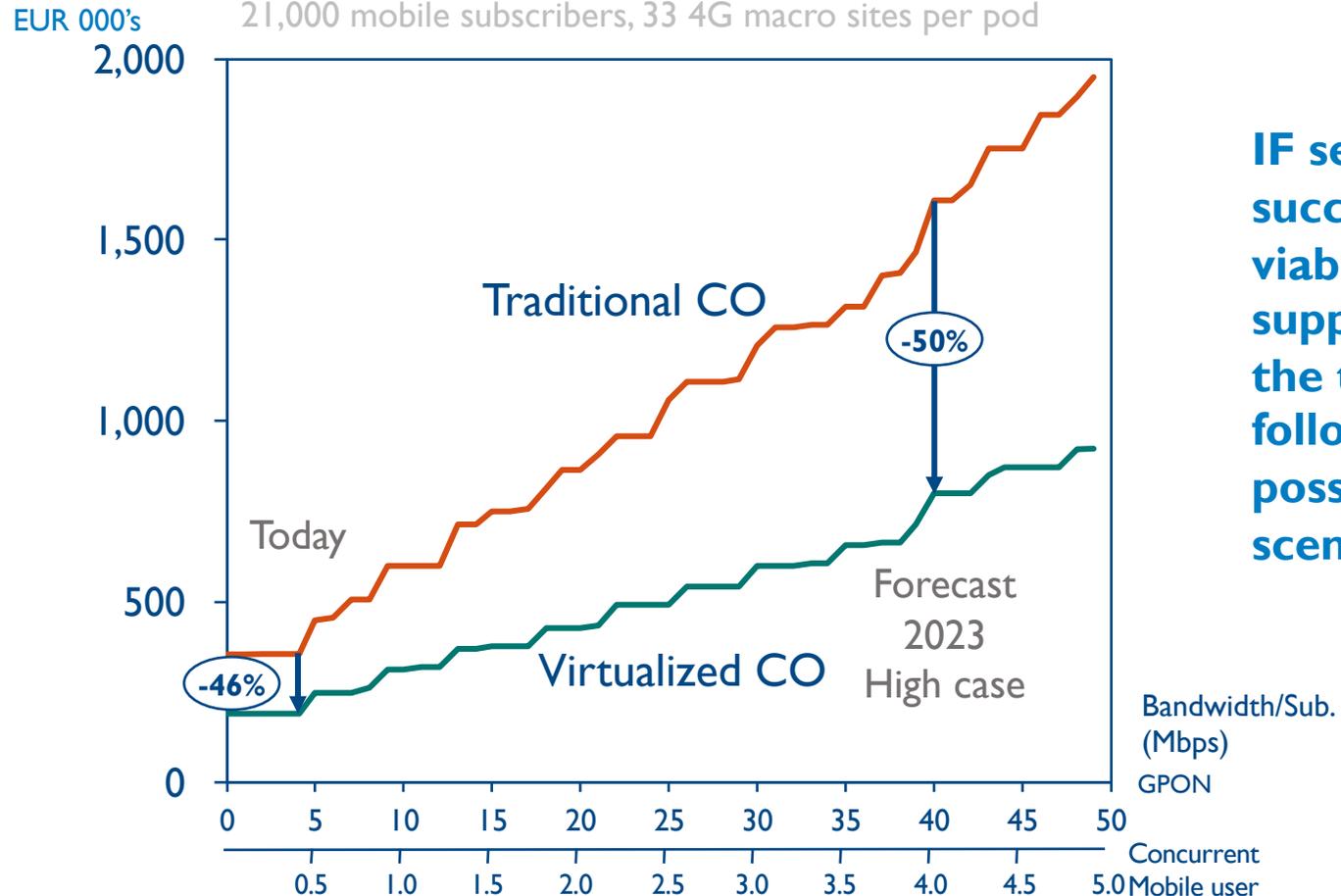


**Renaissance  
Networking  
Engineers**

## Example: **Arthur D. Little** converged central office scenario

30,000 homes passed (30% connected)

21,000 mobile subscribers, 33 4G macro sites per pod



**IF service providers succeed in creating a viable ecosystem of suppliers who support the technology, the following savings are possible in a greenfield scenario**

Note: Analysis and statements have been developed by Arthur D. Little in their entirety based on their experience and beliefs and expectations and are subject to significant risks and uncertainties. While AT&T, DTAG and Telefonica have reviewed the model used in this work, we expressly disclaim these estimates or statements and they do not represent our specific approach, strategy or plans.

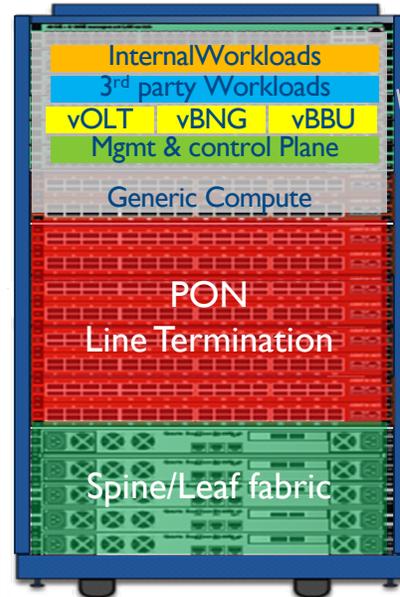
## So what's the big deal?

Product marketers will see something they've never had – A **safe place to test ideas** and provide 3<sup>rd</sup> parties access to the network



**Born again  
Product  
Marketers**

### Edge Platform



### Internal and 3<sup>rd</sup> party Workloads

Product Innovator  
Sandbox



Located in the Central Office

**A consumable  
delimited  
developers  
platform, in the  
traffic flow.**

**Provides a safe  
area to prototype  
and test new  
solutions**

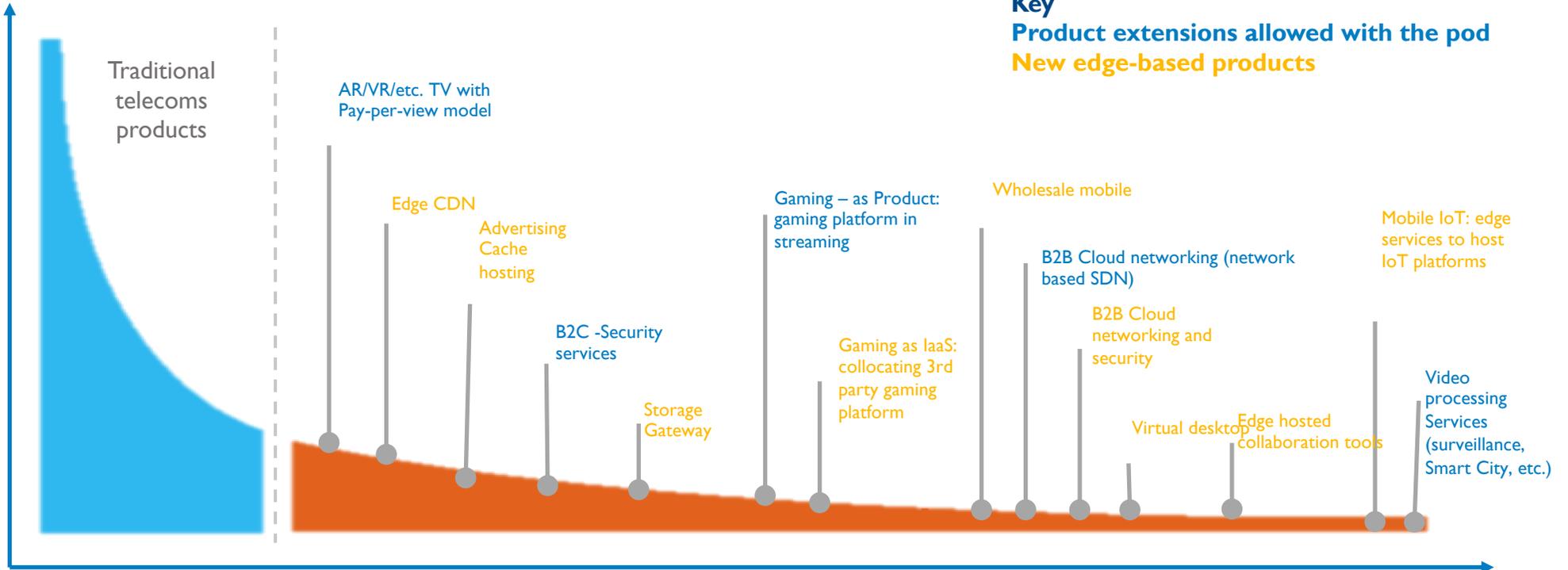
# So why is it such a big deal?

## Allowing operators to experiment with new value pools @lower regret costs



**Born again  
Product  
Marketers**

**% Penetration**



**Key  
Product extensions allowed with the pod  
New edge-based products**

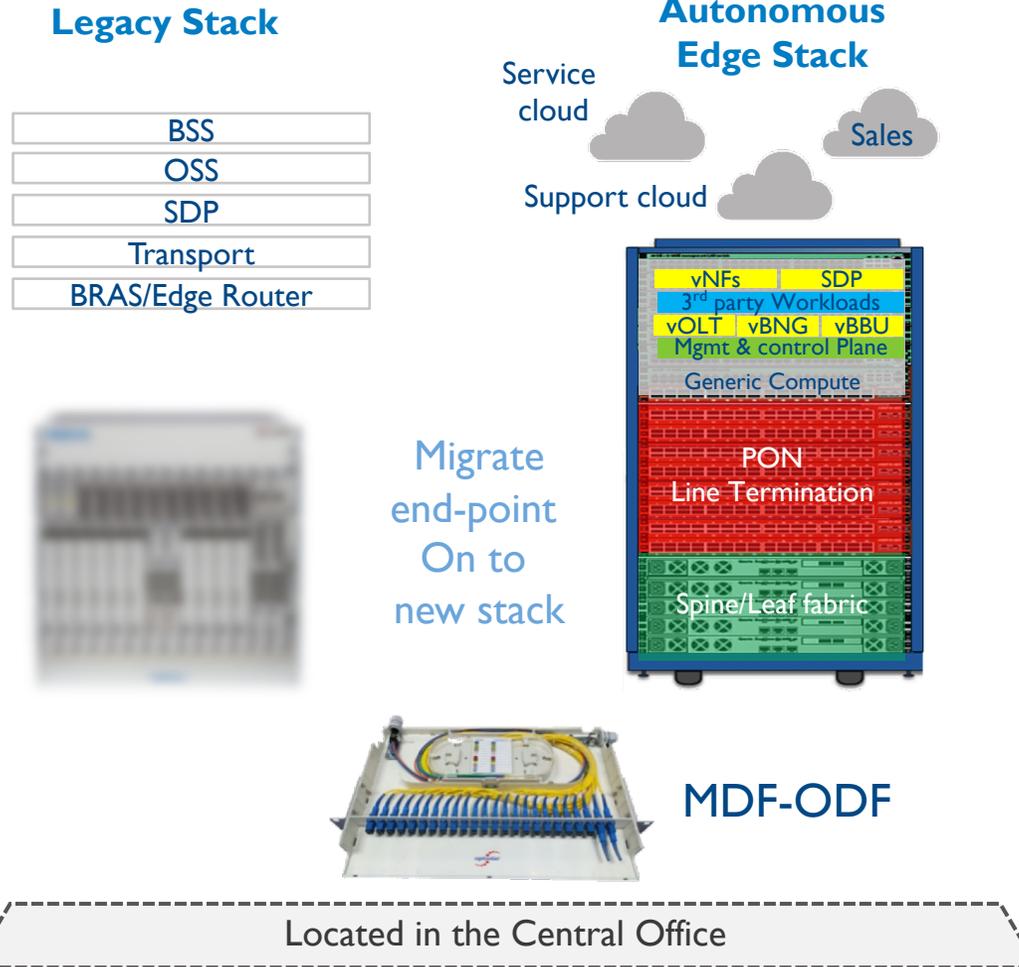
No of platform features

## So why is it such a big deal?

Mr Or Ms. Lean might be tempted to **rebuild the entire telco stack at the edge**



**Mr. or Ms.  
Efficiency**



**Pod as an edge  
production platform**  
enables legacy platform  
retirement

**Sideline legacy** rather than  
transform

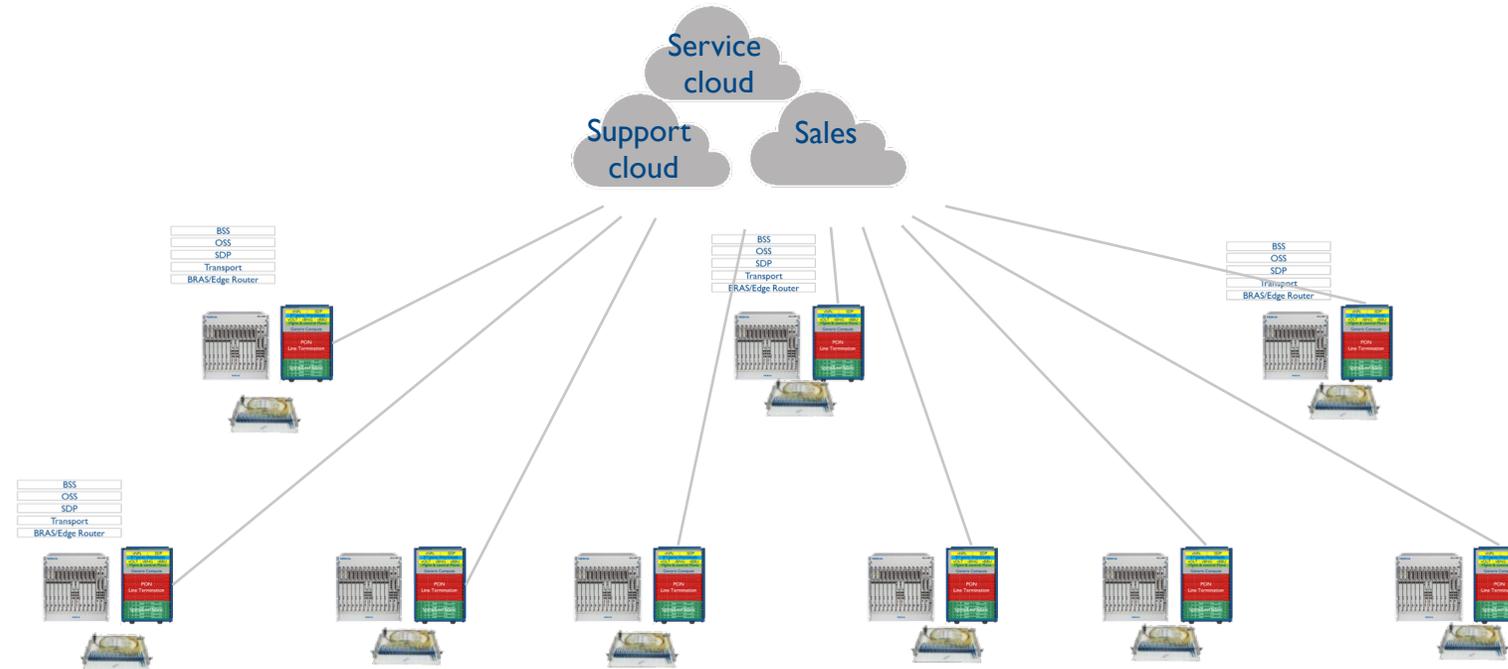
Possible to **branch back**  
into the legacy stack to  
smooth over complexities

## So why is it such a big deal?

At scale, this may be a new design for a **new kind of telecoms operator**



Mr. or Ms.  
Efficiency



## So why is it such a big deal?

# Cloud visionaries might use the platform to develop new niches and/or go global



## Cloud Visionaries

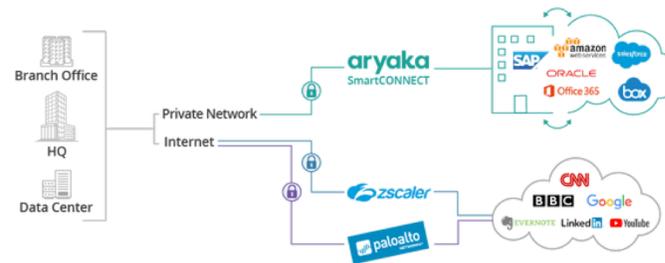
### Cloud peering fabric

On-demand SDN platform which provides a portal, accessed via a web-browser, APIs, Android or iOS apps, to order, activate and manage local, regional, global connectivity with **total visibility and control** and choose from port-to-port, port-to-Cloud, port-to-IX services

	DC Markets*	Notes
EQUINIX	62	US, Europe, Asia
Megaport	211	Worldwide
packetfabric	102	Mainly US
epsilon	84	Asia to Europe
consoleconnect <small>by PCCW Global</small>	31	US, Europe, Asia

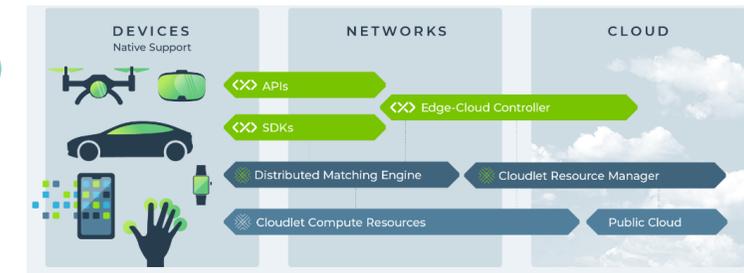
### Cloud network

Use of overlay networking using a combination of public and private backbone connectivity with 3<sup>rd</sup> party accesses to data center, public cloud, branches as well as mobile devices



### Cloud edge

Allows developers to deploy code anywhere on demand from the public cloud to edge for a range of applications



## (We think) the CCO pod provides **real answers to hard problems**

### Forces for change

- I. **Demand growing faster than revenues**
- II. **Technological convergence pushing open DC technologies, tools and techniques as alternatives to proprietary technology**
- III. **Increasing value generated by 3<sup>rd</sup> parties: OTTs, cloud players and ecosystem players and **Operators want in!****

### How the CO pod changes everything

- Use of DC grade equipment **allows operators to access same economics as cloud ecosystem**
- **Access to wider Cloud and IT supplier base** including OEMs, Chip makers & contract manufacturers
- **Lower operating cost and complexity** through workload and infrastructure pooling
- **Pod as a production platform** to enable legacy platform retirement
- **Provides a safe area** to prototype and test new solutions to intractable legacy systems, services and applications problems
- **Retooling product innovation:** CI/CD A/B testing etc.
- **Catapults carrier production platform to emulate cloud** ways of working, adopt agile DevOps, re-learning and experimentation with technology as well as opensource solutions
- **Potential new revenues** associated with product extensions and new edge based services



**ACCESS 4.0**

## Access Ambition

*“We develop a cost-efficient, lean-to-operate and scalable access platform to deliver Gigabit products”*

*Renaissance network engineers: Goal is to re-design BB access leveraging data center concepts*

- Increase feature agility & automation
- Design based on commodity/open HW and SW where possible, allow for new entrants
- Initial focus is on FTTH/B; Later phases to include DSL/FTTC, edge computing and mobile backhaul/access

*Use “Design to Cost” (DtC) principles to lower total costs*

- Significantly reduce upfront and lifecycle costs
- Lower the bar for product & service development
- Actively manage cost-to-value ratio from day one

*Make it work in the real world*

- Set up a dedicated core organization in DT for Access 4.0
- *PL-DEVOPS* principle applied from beginning
- Learn every day, be brave without overloading scope
- Utilize partners expertise for hardening and production-grade development, while leveraging open-source and community efforts (“Collaborate & Win with Partners”)
  - Run project in 9 agile teams. Main partners: Reply, rtbrick, RadiSys, Community

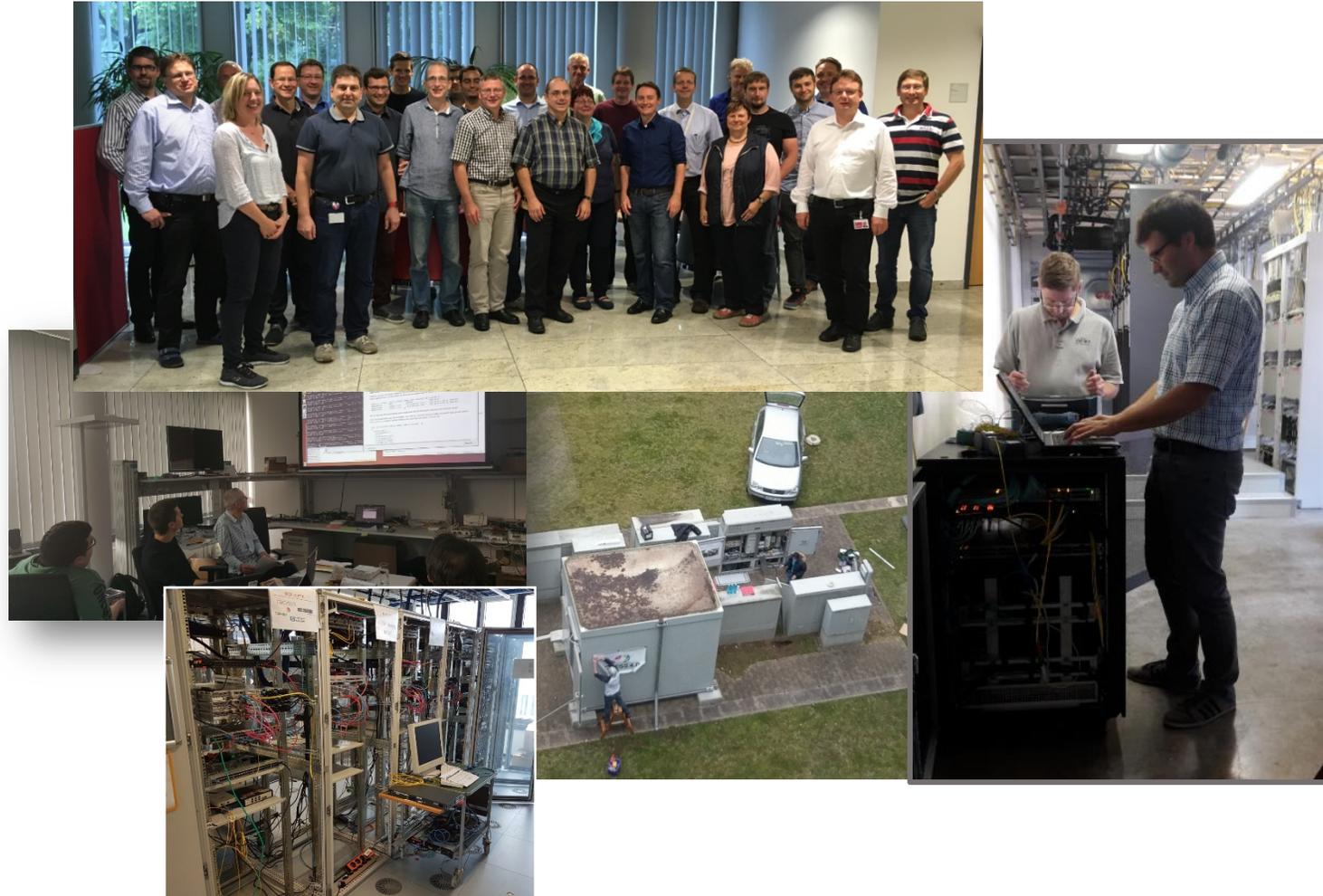
**“Retain deep in-house understanding of all solution components, to allow rapid prototyping”**



## How to instigate changes



- Network Innovation Center @ Darmstadt & Berlin
- Multi disciplinary focus
- Early transfer into production network
- Collocated teams: DT & Partners





## Access Vision

Exploit the transformational power of “*Access Network virtualization + Edge Computing*”

*Seek, develop and monetise disruptive use cases that take advantage of the edge*

- High bandwidth
- Low latency
- AI in real time as a service
- Early candidates are video and computer vision

*Thought leadership for next generation of edge applications*

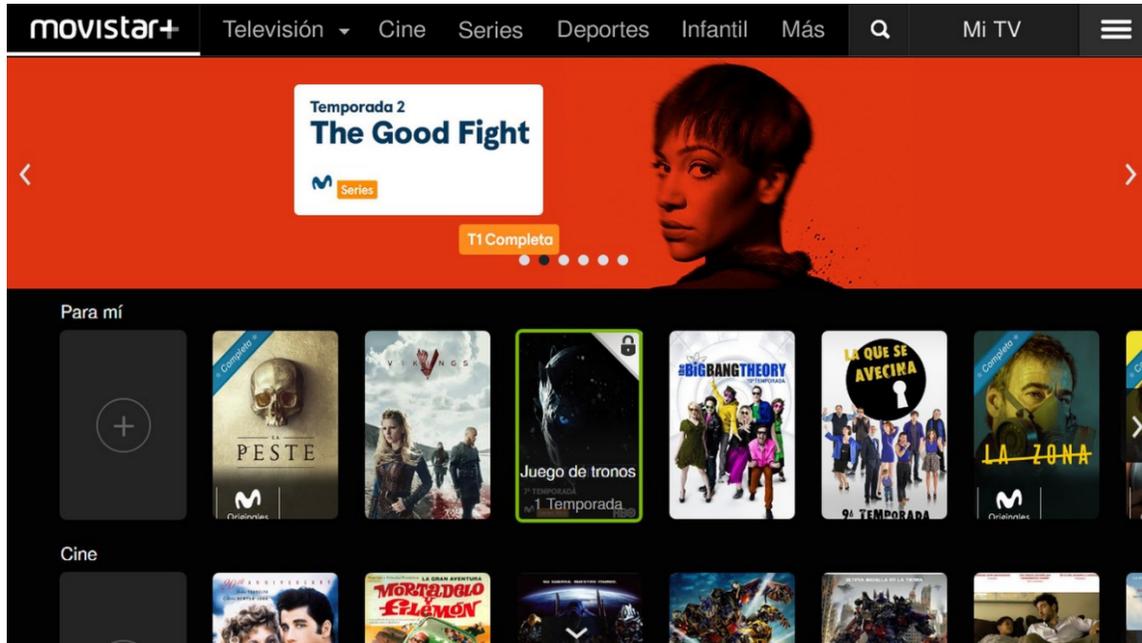
- Privacy
- Security
- Data Value and control

*Develop sticky partnerships*

- Cross industry strategic relationships
- Develop and retain early mover advantage: team, know-how, APIs and seek benefits

# Initial concepts

## CDN@Edge



**1 week = 8.5TB saved**

**1 month = 36.5 TB saved**

**1 year = 443.5 TB saved**

## Storage @Edge: Deploying the Storage Gateway at the ISP Edge



**Edge is x10+ faster**

**Uses +70% of Broadband  
Access capacity**

# Remote Video Production

LIVE EVENT



NFVI

vCompression Engine

Media Process Engine

Cognitive Services

EDGE

5G MEDIA

EDGE

5G MEDIA



5G-MEDIA is a project partially funded by the European Commission Horizon 2020 5G-PPP Programme under Grant Agreement number 761999

5G-MEDIA APP

# AI for Video Analytics

# 360° Video

Want you see yourself on the screen?  
Activate GDPR consent in our tablet!

Viewing Statistics

GDPR Aceptada | GDPR No Aceptada

Thank you for participating!

rocio | adriano

LIVE

Plaça Gran Via Av. Joan Carles I 64 08908 L'Hospitalet de Llobregat Barcelona

Telefonica M+ movistar W wayra

con la colaboración de ybvr°

180° | 360° | 180°

## How to instigate changes



Telefónica



OnLife Networks

- Onlife Networks operates like a **start-up**
- DevOps hackers, network and software developers, data scientists, working together with marketing and UX experts
- Live customers in commercial network





## Access Strategy

*Seek to define disaggregated, cloudified, fixed broadband architecture*

- Do the easier thing first, learn by doing/deploying
- Build consensus on a community approach through SEBA
- Develop our skills and practices to deploy an open, flexible system with low TCO
- Explore how telcos can engage in community practices and gains

*Follow-up with disaggregated, cloudified RAN architecture*

- Build on skills developed in wireline work
- Build consensus toward a community approach through O-RAN and COMAC
- Divide and conquer the space by using communities to deliver

*Enable hosting of broader edge cloud ecosystem*

- Following the same methods as before

*Mine convergence benefits from the overall system*

- Internal unification
- Seek benefits from technological convergence

## How to instigate changes

AT&T  
FOUNDRY<sup>+</sup>

- Works like a **start-up**
- Software developers and network engineers working together



## Join us



### 1<sup>st</sup> step: **Be Brave(r)**

- Consider all that can be done with **an open mind**
- Create a **stretch program** linked to corporate priorities
- **Involve all relevant stakeholders** in company from the beginning (engineering, operations, planning, finance, purchase,...)
- Ask for **money and staff**
- Make a **formal commitment** (Out loud)

### 2<sup>nd</sup> step: **Leap (higher)**

- **(re-) Launch** the program
- **Receive support, support** and reshape **the community: ONAP, OCP, OEC, TIP, BBF** and of course the 

Recognize there are **no downside risks**. The learnings are valuable regardless of the outcome

# Arthur D Little

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients to build innovation capabilities and transform their organizations.

Our consultants have strong practical industry experience combined with excellent knowledge of key trends and dynamics. ADL is present in the most important business centers around the world. We are proud to serve most of the Fortune 1000 companies, in addition to other leading firms and public sector organizations.

For further information please visit [www.adlittle.com](http://www.adlittle.com) or [www.adl.com](http://www.adl.com).

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