

**B5G**



**bpi**france

**THALES**  
Building a future we can all trust

# A 6G Differentiated Services Vision and related Challenges

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*"This work was partly carried out in the context of Beyond5G, a project funded by the French government as part of the economic recovery plan, namely "France Relance", and the investments for the future program."*



# Let's start with some provocative statements



OPEN

{OPEN}



## SAMPLES...

“You’re just a pipe”

...These are utilities...

...even something like sub-utilities as you don’t pay as you use

...You’re just not Over the Top

...you’re not software predominant, software is god

...you’re not trendy, you are the bad guys

...You have too many standards & regulations

...**No you can’t...!** → Net Neutrality 😊

**Do**  
(differentiated)  
(Services)  
**or**  
(almost)  
**Die**

# Services...need some clarification ?

OSI model

Layer		Protocol data unit (PDU)	Function <sup>[27]</sup>	
Host layers	7	Application	Data	High-level protocols such as for resource sharing or remote file access, e.g. HTTP.
	6	Presentation		Translation of data between a networking service and an application; including character encoding, data compression and encryption/decryption
	5	Session		Managing communication sessions, i.e., continuous exchange of information in the form of multiple back-and-forth transmissions between two nodes
	4	Transport		Segment, Datagram
Media layers	3	Network	Packet	Structuring and managing a multi-node network, including addressing, routing and traffic control
	2	Data link	Frame	Transmission of data frames between two nodes connected by a physical layer
	1	Physical	Bit, Symbol	Transmission and reception of raw bit streams over a physical medium



- > Infranet initiative, IPsphere
- > 5G SBA ?
- > Micro-services ?
- > IaaS, PaaS, SaaS... NaaS more than two decades ago



INTERNATIONAL TELECOMMUNICATION UNION

**CCITT**

THE INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE

**E.800**

(11/1988)



SERIES E: OVERALL NETWORK OPERATION, TELEPHONE SERVICE, SERVICE OPERATION AND HUMAN FACTORS

Quality of services; concepts, models, objectives, dependability planning – Terms and definitions related to the quality of telecommunication services

**...will come back on QoS !**

**...XaaS** 

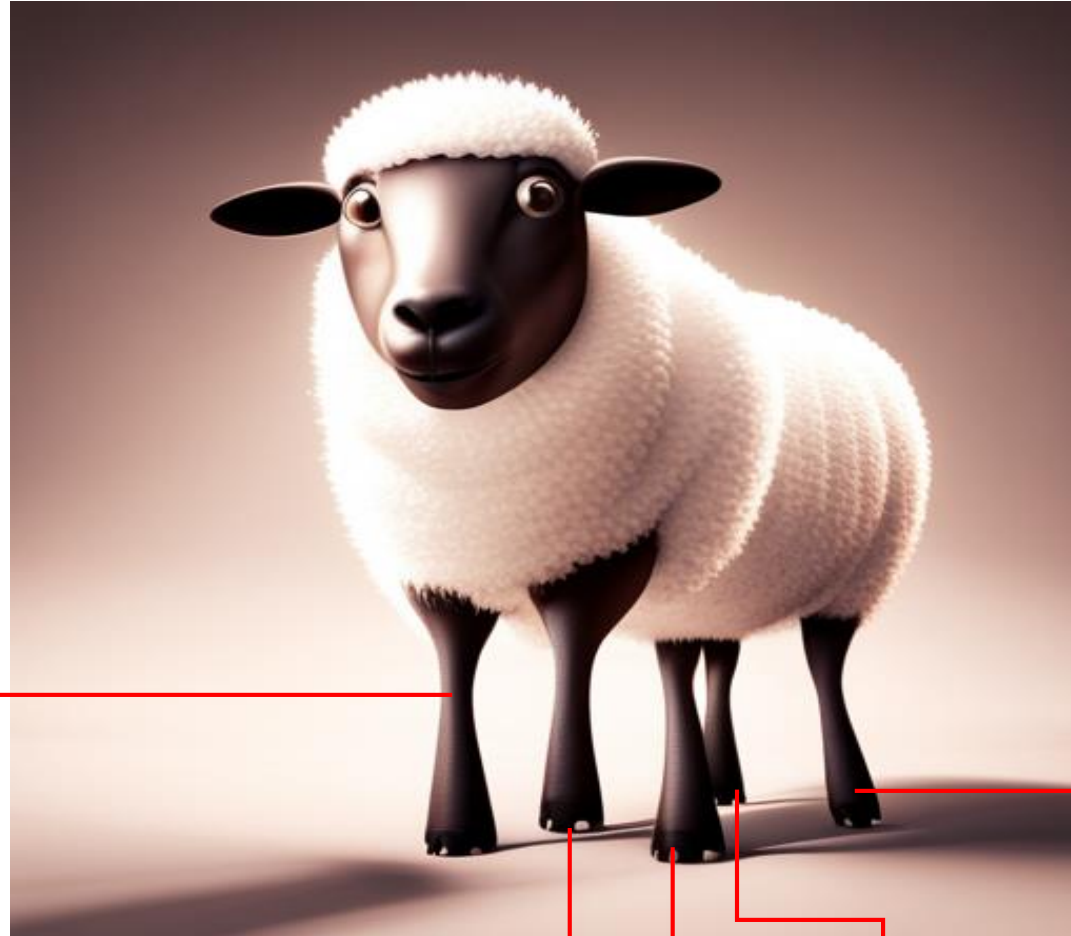
[computing, communications, security, AI, sensing, storage, applications,...]

**It should not be limited to vertical (North/south), it's also (before ?) multi-lateral (East/West), multi-authorities/liabilities**

# Why is it different ? Why now ? What's new ?

- > Game is changing and stakeholders are different
- > Cloud computing was the first real tentative of pay-as-you-go (what you need)
- > World Wide landscape much different
- > Fair share debate revival
- > Net Neutrality...is not that *neutral...we're talking 10's billions per year of CAPEX*
- > Because it's 6G and 6G is not just one hop in radio (even at THz)
- > ...this is time for convergence...or some kind of collapse

# 6G MegaTrends



- From 5G ...
- SW predominance
- Orchestration
- SBA
- Private & Public Use cases
- XaaS usages

Converged Communication & Computing

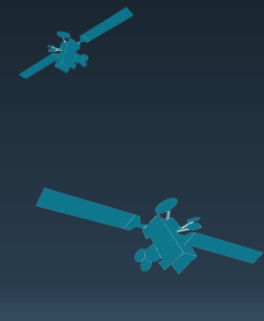
Differentiated Security

3D  
AI-Native

ISAC: Integrated Sensing And Communications

OPEN

# Space Edge Infrastructure

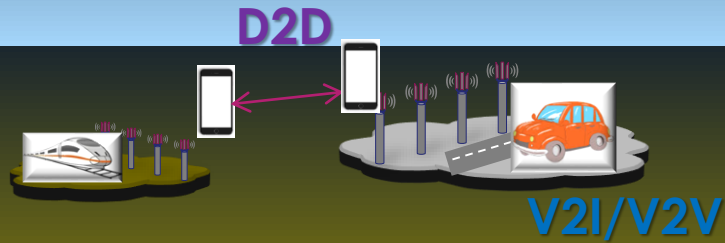


**HOLISTIC AI-NATIVE Control & Management**  
Policy-based, Intent-based...  
SENSING/COMS fusion → Control loops

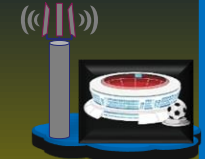
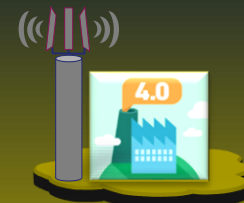
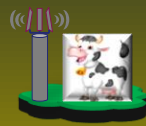
**DISTRIBUTED** [COMPUTING AI E2E SECURITY] **CONTINUUM 3D**



**Deployable bubble**  
Infra-less, non-cellular

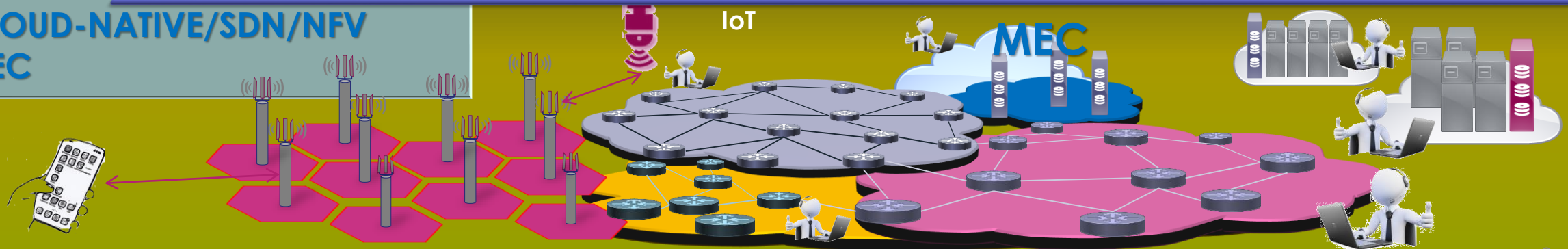


**PRIVATE**



**E2E SLICES**

**CLOUD-NATIVE/SDN/NFV**  
**MEC**



**3G**

**4G**

**6G**

**5G**

Service Based Architectures

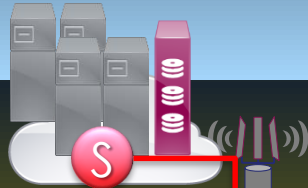


# Aerospace Digital Services pos.

Space Edge Infrastructure

ATM, Entertainment, observation,

PRIVATE



Private, public, multi-lateral, multi-party, critical or not  
Communication, Computing, Sensing, AIs, Security

IoT

3G

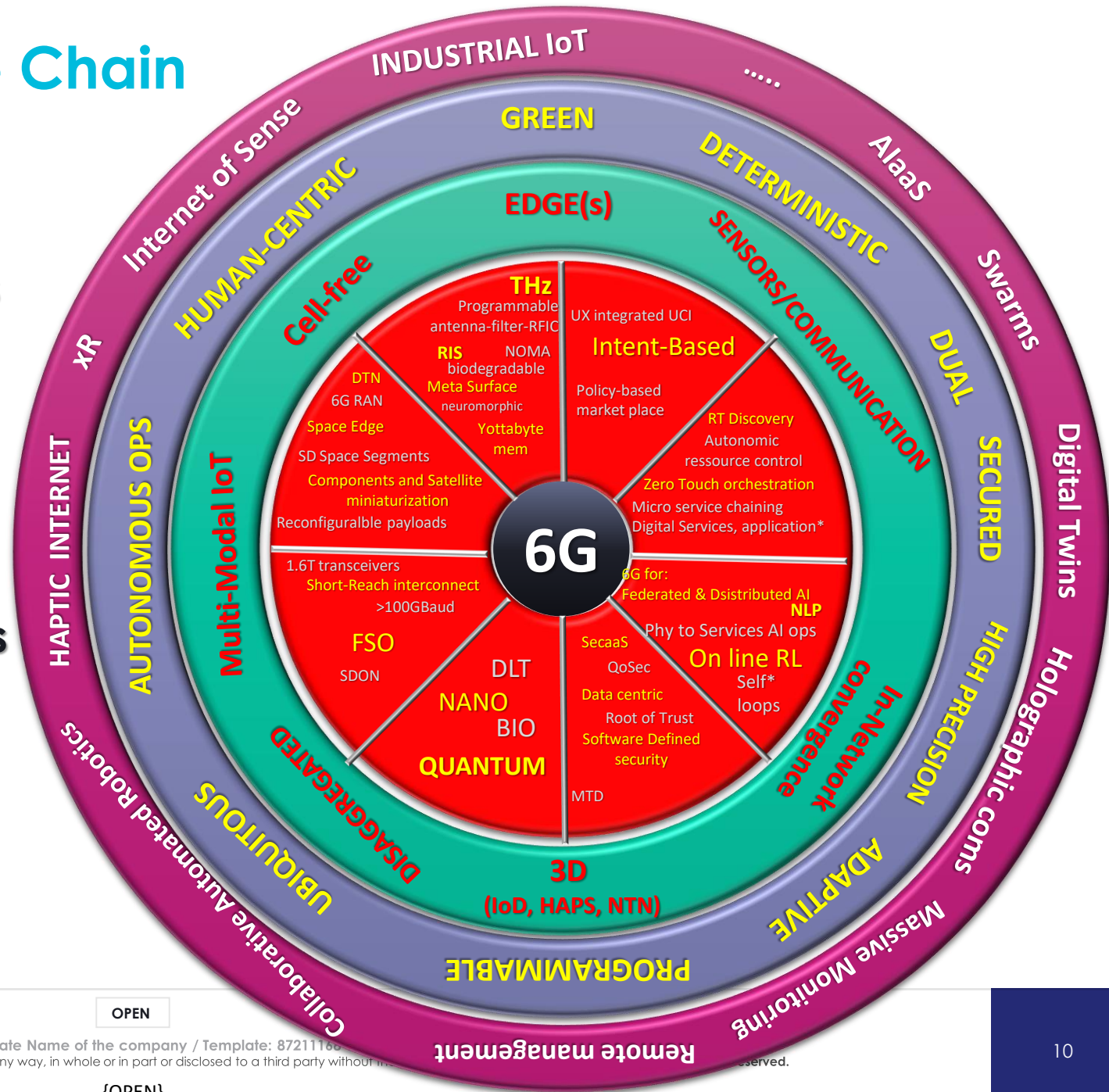
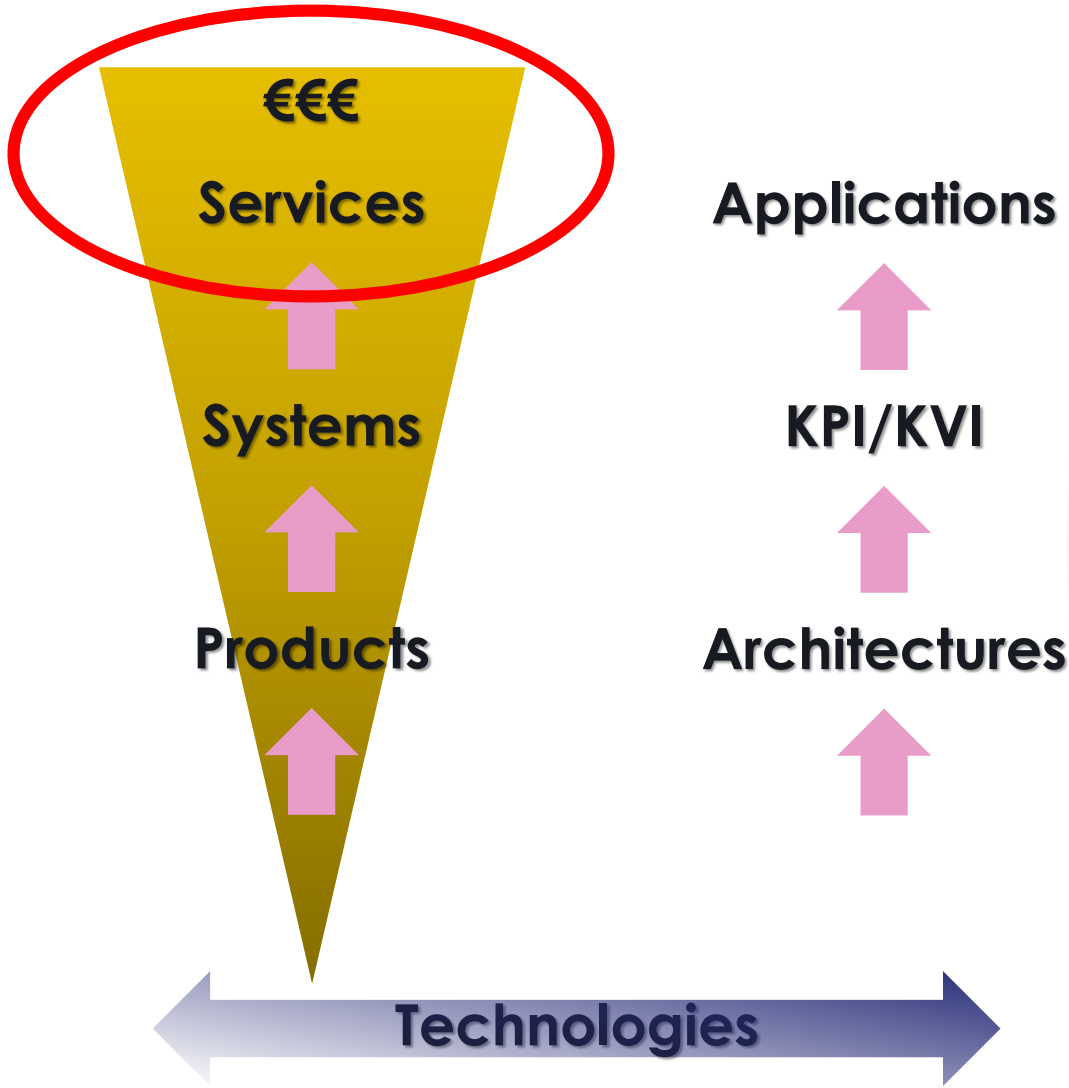
4G

6G

5G

Service Based Architectures

# Technologies Vs. Value Chain



## INTERMEDIATE CONCLUSION

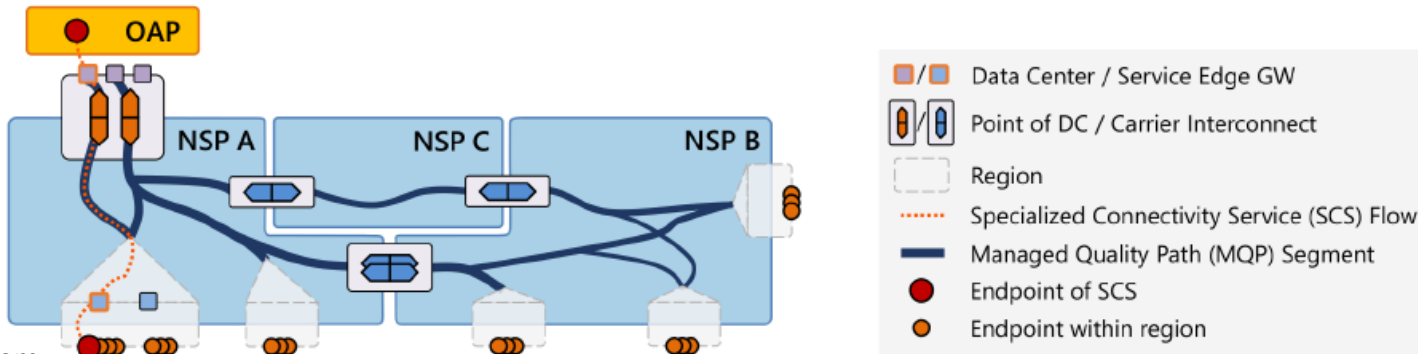


**Value of 6G tech should end in “services”**  
**Scope can’t be limited to connectivity**



# Back to the Architecture

> Telco, network centric oriented vision (telco facing for B2C and linking to B2B)



+ more (actual) user (needs) oriented than before

- still limited in scope..., 2D only, no Sec, no AI, no Sensing

From  
Towards Smart Public Interconnected Networks and Services – Approaching the Stumbling Blocks  
Håkon Lønsethagen, Stanislav Lange, Thomas Zinner, Harald Øverby, Luis M. Contreras, Nicola Ciulli, Emmanuel Dotaro  
To appear in IEEE Com Mag

> NSP, CSP, xSP, are all providers of composite digital services

> Potential for a one-stop-shop ? God view ?? Policies ??

▶ A (open ?) Market place

– (hub and spoke, logically centralized)?,

▶ Alliances,...?

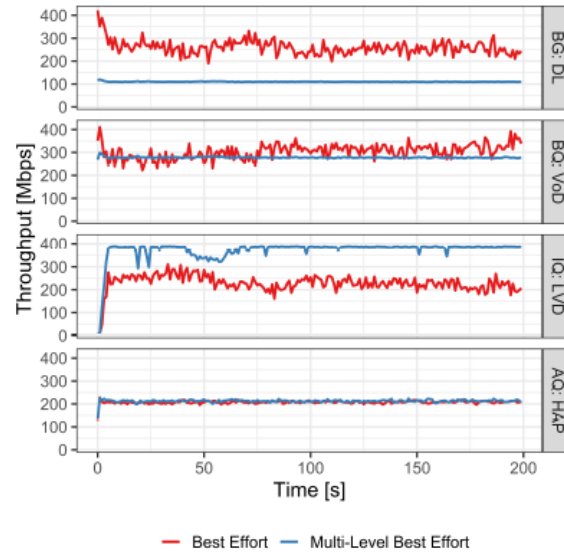
How to make E2E (3D) appropriate and meaningful services



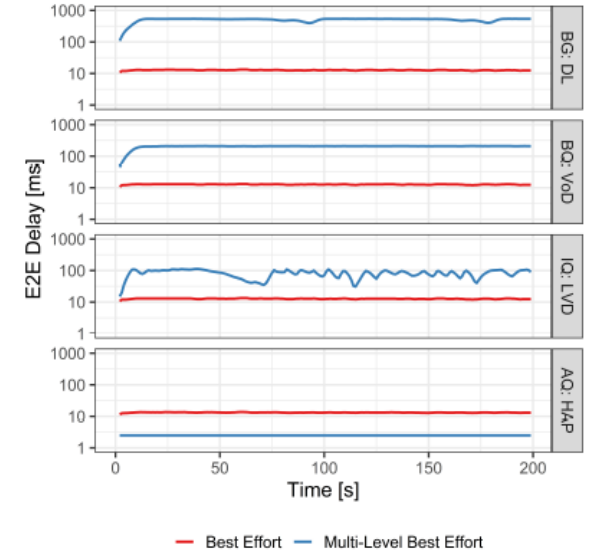
# One size fits all ?

## > Multiple CoS ?

- ▶ Each remaining Best Effort ?
- ▶ A la 5G ?
- ▶ Per slice ?



(a) Time series of aggregated per-application throughput.



(b) Time series of aggregated per-application delays.

> So many degrees of freedom in the systems thanks to tech and renewed architectures

> Time, flexibility aspects are becoming reality

> Overprovisioning is greedy...who's paying ? Who takes care about sustainability ?

> Equality <> Equity

# KPIs, KVIs, (S)SLA,...

- Back to E.800 and decades of QoS
- Not just delays, throughput (looks that there is no packet losses anymore)
- What about GRT for example ?
- What about CO<sup>2</sup> and other environmental impacts ? (reaching fridge SOTA ?)
- What about ethical values (privacy, AI, ..)
- What about Security ? Nuclear Power Plant C2 vs. Cats video streaming ??
  - DiffSec
  - SSLA
  - QoSec (CIA + NIST Framework 2.0 + pentest + ...)

## What's inside the box ?



# Users / Services interface, the access issues

## > Universal APIs ?

- Machines, humans, enterprise, governmental organizations...
- Service2service (B2B) is also mandatory !

## > One or several Digital Services access

- Under regional policies/regulation ?

## > Intent-based relationship ?

## > Monitoring a service as a service ?

## > Value capture → strategic impact

## > Technology & innovation slowdown, architecture ossification are direct consequences of blocked value by lack of differentiation...no differentiation no ROI

## ANOTHER INTERMEDIATE CONCLUSION



**Diversity of needs can not have an undifferentiated answer**  
**Sustainable usage of Digital services mandates user awareness**





# Gaps and Challenges: you don't know what you are using !

## > Standardization of renewed SLA, SSLA

- New attributes, new services e.g. AlaaS
- Functional and non-functional properties, KPIs
- Exposure, Measurement methodologies

## > Same for APIs, B2C, B2B interfaces

## > Scalability of service combination/catalogues, exposure of Services w/ SLA

## > Service discovery protocols (wide sense)

## > Identity federation, liabilities, billing across aggregated/composed services

## > Continuous monitoring tools

## TAKE AWAY



**Value of technology should remain under control**

**Users see (only) Services**

**Workflows and Life Cycle of 6G services are a unique opportunity to exist**

**Plenty of research & innovation challenges**





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Thanks  
Questions ?

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