Resilience & 5G

SOME CONTROL & LIABILITIES ISSUES
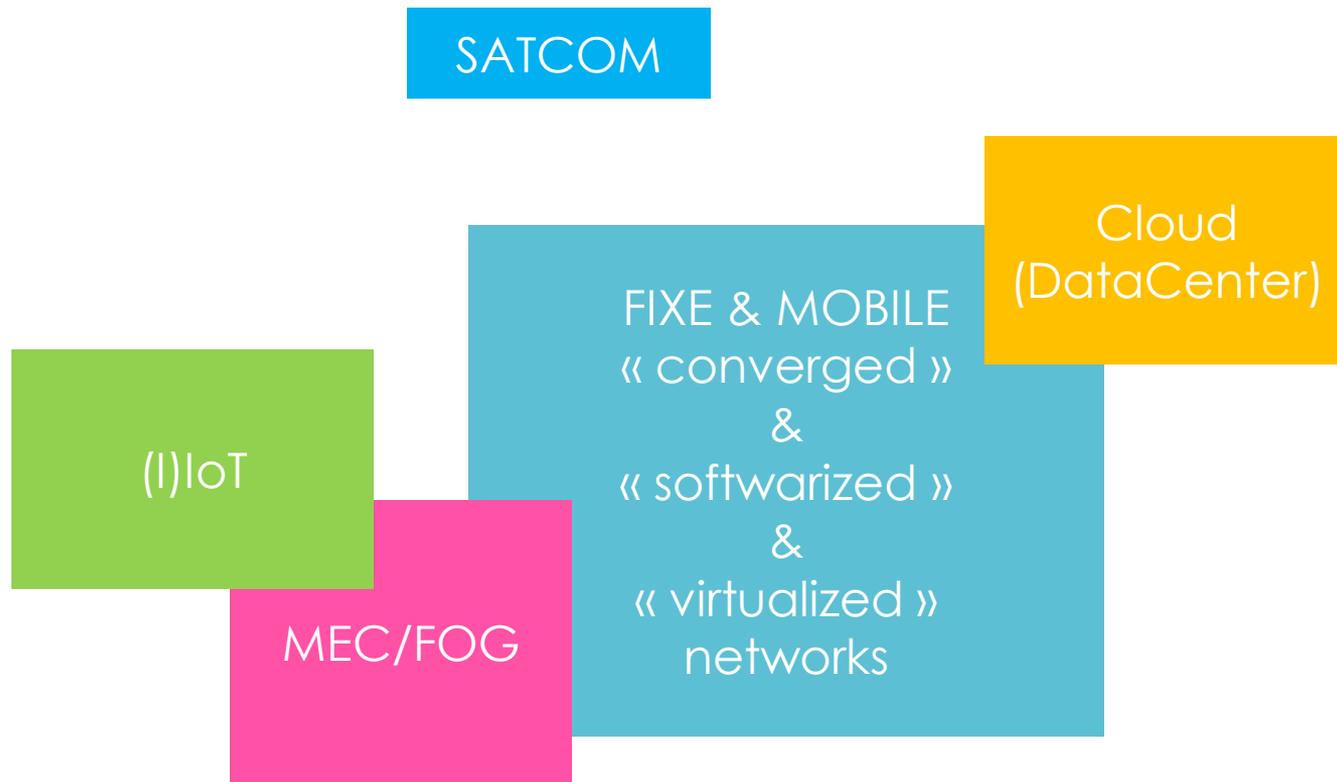
EMMANUEL DOTARO, THALES

DRCN 2016, PARIS

No claim for a definitive 5G vision

> But Inspired by 5GPPP, 5GMF, 5GForum, 4G americas, ETSI, 3G, IETF, OPNFV, ONF, Opendaylight, NGMN, Openstack,…and some others….

> …leading to a very first set of observation:

- that's a lot of people…
- Stakeholders are differents
  – Is it IT or GAFA or OTT against Service Providers ?
- market is evolving

> Is there a rough consensus ?

- Is interoperability still an objective ?

Seeds for better resilience ?

SATCOM

Cloud (DataCenter)

(I)IoT

MEC/FOG

FIXE & MOBILE « converged » & « softwarized » & « virtualized » networks

Brokers / Virtual Service Providers

Cloud Service Providers

Network Service Providers

Slice

The 5G Infrastructure Public-Private Partnership

Beyond the buzz: Maybe more reasons to (re-)think about resilience

Architecture & Actors: new Scope & Mix

> ICT convergence

- More complex composition of sub-systems/services with respective security levels/policies etc…
- Mutualization, less infrastructure ownership, more service usages (XaaS)

> Multi-segment (often multi-party) horizontal End-to-End integration

- IoT newcomers, NSP, IT,...more segments/fragments
- Mobile Edge Computing (although a way to reach 1ms objective)
- Same End-to-End principle ? And thus reliability from unreliable parts ?

> Verticals including mission critical: ICT + OT convergence

- Smart cities, transport, industry…resilience, security (and safety) requirements increase, is it still "neutral" ?

Beyond the buzz: Maybe more reasons to (re-)think about resilience

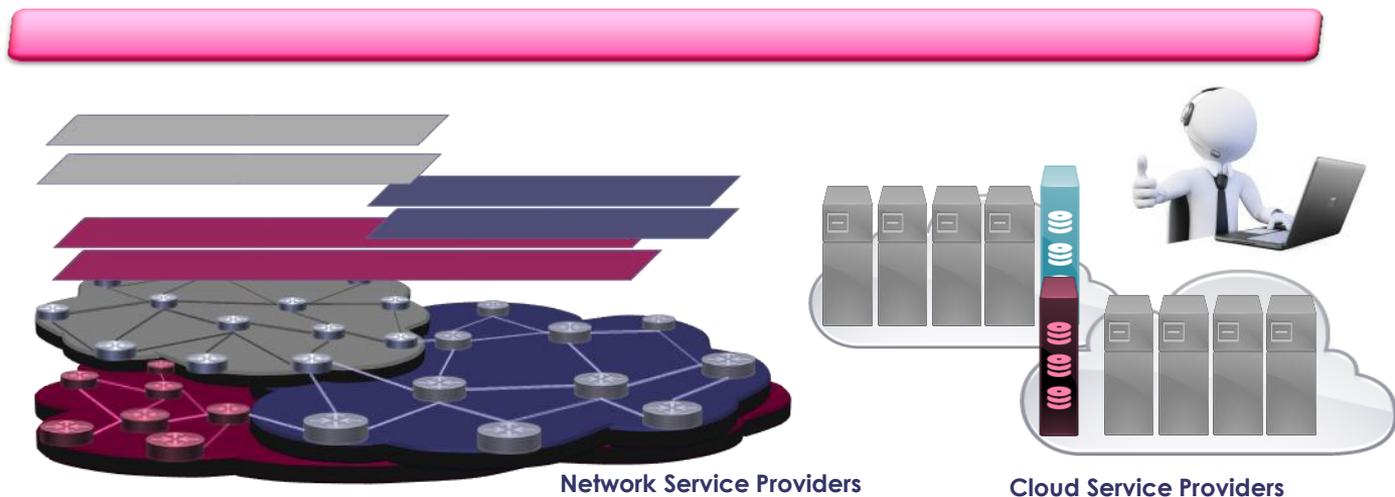> Multi-layer vertical integration plus Multi-tenant "slices"

- Virtual operators and brokers
- Yet another instance of blind overlays and multi-layer or equivalent issues
    – Yes you may change the topology, and it's new control power !

> Slice

- Analytics
- policies

> Analytics layer
> Policy layer

Network Service Providers

Cloud Service Providers

5G: selected resilience-related comments about technologies

Main Technology evolutions

> Softwarization

- Really ?
- Actually more interfaces/APIs (although risks), different distribution and life cycle
- Stateful vs. stateless, CP/DP interactions, controllers failover,…

> Virtualization

- Any difference ? At least in terms of security

> Multi-RAT

- In parallel, flow/bearer matching/arbitration policy?
- Mobility management: vertical handover/roaming multi-provider ?

> Wireless backhauling

- Recovery resources, sensitivity to shared risk ?

5G: selected resilience-related comments about technologies

> Autonomic/Plug'n Play smart control

- Analytics
- Multi criteria optimization under resilience constraints
- …but who's doing what ?

> Service management

- Priority, precedence
- Life cycle

> Traffic encrypted

- Not specific to 5G

5G systems should be different in nature

> Summarized as metamorphic

5G services should encompasse mission critical requirements
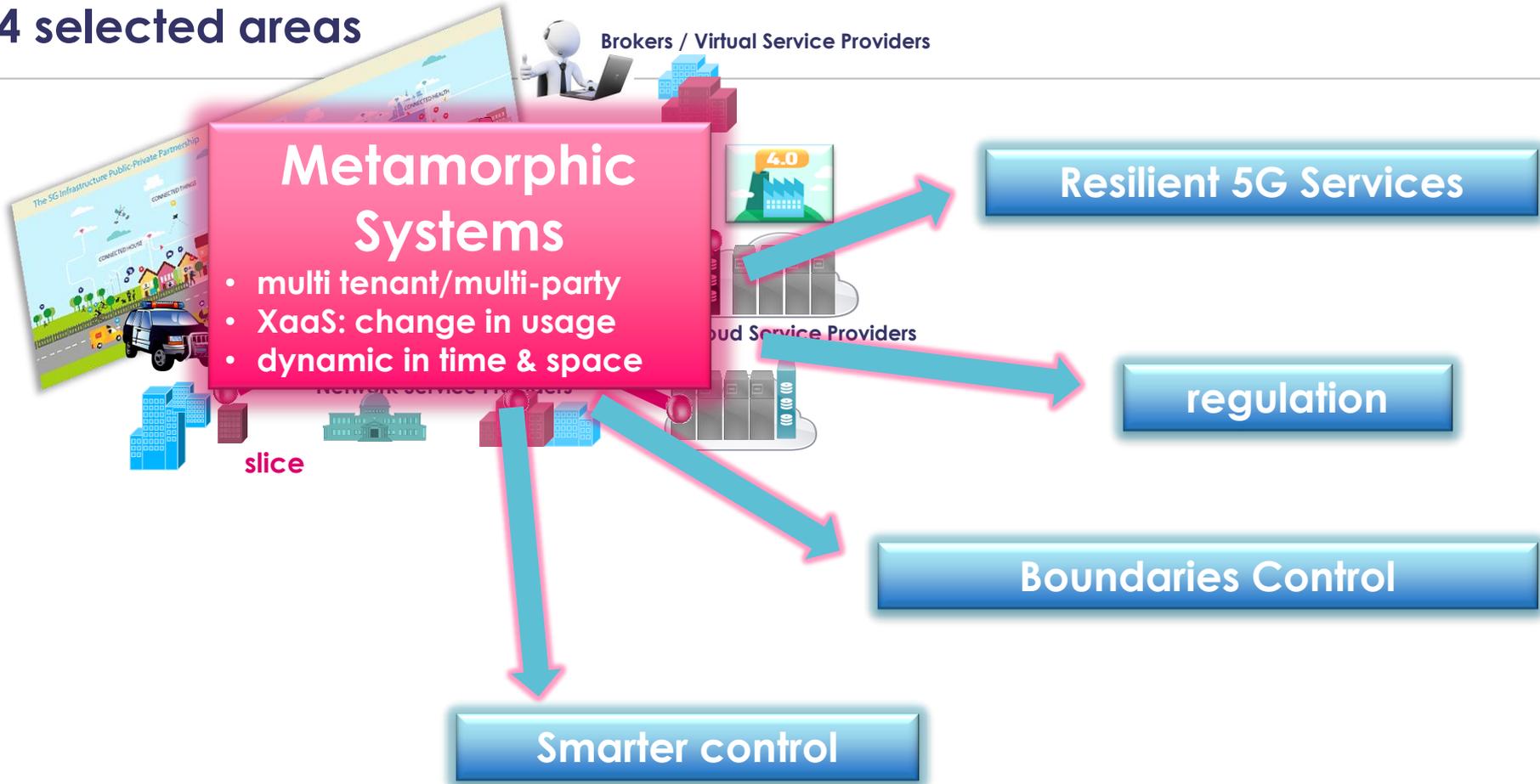
> Including infrastructure for verticals

5G stakeholders role distribution is expected to face major changes

> Tenants (w/ slices), virtual operators, brokers, OTT, providers (IoT, MEC, Networks, clouds)

Brokers / Virtual Service Providers

Metamorphic Systems
- multi tenant/multi-party
- XaaS: change in usage
- dynamic in time & space

Cloud Service Providers

Network Service Providers

slice

Resilient 5G Services

regulation

Boundaries Control

Smarter control

Where is the menu ?

5G Resilient Services: related issues

Discovery

> Similar to PCC-PCE requirements but…

> … authority perimeter may vary

> … security (authentication at least) must be in the loop

Exposure

> Providers or virtual providers should be able to expose in some way their service catalog

> Updates and refresh as per resource evolution is an adjacent issue

Template

> Clearly a gap in the 5G picture, there is no standard way to describe services as well as their resilience properties/attributes

5G Resilient Services: related issues

Request/APIs/Negociation

> Tenants/applications should be able to request and negociate (such as tolerance margins) resilient 5G services. This is where the nICT convergence should aply, using same tools, APIs, protocols.

> Concurence among applications/tenants requests should be arbitrated under some policies (including priorities and precedence for service continuity and/or critical services)

Composition/market place

> How to compose the relevant end-to-end service, including entire slice, on top of multi-party offer (hundreds of potential providers)

> From multi-criteria computation to game theory application

Assurance and verification

> SLA means ways to assure and verify actual delivery !

Keep control

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Do we have equivalent control compared to « old style » networking

> What do we keep from

- Monitoring,P&R mechanisms, Restart mechanisms
- Hold-of timers (wrt to the the increased number of layers/dependencies)
- …

Performances of failover mechanisms ?

> Depending on number of distributed controllers, controllers and NFV placement, heartbit (or not), overhead optimization,…

Being smart ?

> Going Software Defined Resilience

- Fine grain service resilience with minimal service disruption

SLICE

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Underlayer dependencies and liabilities

New Boundaries issues

> Strategy: OTT tenant (self) resilience

> What about underlayer disjointness, shared risk knowledge

> Control: event knowledge or detection as per service usage and openess

> Dynamic assesment of resources/services states

> Root cause analysis ?

> Liabilities

> Forensic

> Xdomain data exchanges in confidentiality

- Multi-party computing application

> Blockchain usage for distributed trust and traces of operations

> …

Who's to blame/regulation

Regulation & Standards…

▌ Multi-actors liabilities is a risk for emerging concepts adoption…

> Distribution considering vertical/horizontal dependencies

▌ Tracability and forensic issues applied to multi-tenant/party virtualized context

▌ Issues of evaluation and certification

▌ No standards for resilience attributes of services

conclusion

▎**Change in system nature and multi-tenant/multi-party architecture generates de facto renewed questions on resilience approaches**

▎**Resilience compliance and application in a XaaS world mandates tools, workflows, standards in the service plane**

▎**Distribution of control specific to SDN and 5G picture not yet mature but coming with entire field of optimization and smart solutions**

▎**Slice paradigm giving power to the tenants but also re-introducing known multi-layer issues to be addressed or falling into same old dependencies**

▎**Clarity of liabilities (teannts vs. virtual operators vs. brokers vs. actual providers) may require some regulation….**

Thanks