Motivation for Management of Network Slicing and IETF COMS work from Operator’s View Point

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Multi-domain problem / COMS use case

• Vertical customers can request services that lay outside the footprint of their primary provider
  o How to resolve this?

• Dynamic and automated interaction with other providers are needed but ...
  o How we can charge and bill for that service?
  o How we can ensure SLAs among providers?
  o How we can know about the capabilities of other providers for a comprehensive e2e service provision?

• Current wholesale and interconnection services and mechanisms are not enough in the era of virtualization and programmability

• In the case of Telefónica multi-domain refers to either interconnections with other providers as well as interconnections among affiliates (up to 15 Networks in Telefónica group!)
Interconnection models in place

- Nowadays, **interconnection** is conceived as **pure IP traffic interchange**, which limits the capability of taking advantage of new advances like network virtualization.
- The current interconnection model is **not aware of peer’s network resources** (i.e., load conditions, etc).
  - Not feasible to implement an optimal delivery of traffic (/service) among peers.
- All these **environments are static**, requiring long interactions for setting up any inter-provider connection.
- **Manual operation** of current interconnections prevents any flexibility.
  - Automation for both the **interconnection** sessions and the **service deployment** on top of that is needed to reach the goal of flexibility.
Challenges of multi-domain service provision

- **Strict SLAs**, associated to penalties
  - **guaranteed service** is a must (latency, bandwidth, availability)

- **High customization** in provisioning
  - **automation** as the way for simplifying the provisioning and
  - **programmability** to reduce time to market ($\approx$ time to revenue)

- **Need for segregation**
  - Physical separation (e.g., dedicated backbones) $\rightarrow$ **not cost efficient**
  - Overlay, in the form of VPN as overlay solution $\rightarrow$ **not flexible nor agile**
  - Slicing, through network resource (including SF) allocation $\rightarrow$ **dedicated resources per customer/service** to ensure isolation on top of the same infrastructure

- **Need for standardized Slice – aware Customer / Tenant Service Interface and Service Delivery Interface** in a single and multiple domain

- **Need for interoperable slicing protocols and enablers**

- **Other network segments / slices** become an integral part (E.g., Radio for IoT)
  - $\rightarrow$ **Need for a truly convergent network**
New interconnection model

- New business and partnership ecosystem enabled through APIs
- New potential revenue sources
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- Deployment of SFs working cleanly in IT PoPs
- Capability for trading slices of resources

From dedicated **physical networks with dedicated control and dedicated services and resources** for different applications to a “network factory” where **resources and network functions are traded and provisioned**

- Traditional interconnection at global level will be maintained for conventional services
- Direct interconnection deeper in the network with programmability and virtualization
Multi-domain problem

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- Resources (incl. SFs) need to be allocated for the new situation
- Proper Control and Mngmt Interfaces should be offered by the remote domain

Need for scaling SFs in the origin domain
It could not be sufficient

Opportunity for instantiating SFs in proximity
Better service fit
Multi-domain problem

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Multi-domain requires standard mechanisms

- Multi-domain implies integration of distinct administrative domains
- Standard procedures are required to minimize integration costs
  - Flexibility, agility, etc
  - E.g., BGP
- Different functional behavior to be considered
  - Control of resources and SFs
  - Topology of resources and SFs
  - Lifecycle management of the slice
  - Monitoring
  - etc

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Concluding remarks

- Expecting realization of Multi-domain network slices - Standard protocols and service interfaces are required to minimize integration costs and maximize interoperability.
- Group of solutions are needed (e.g. COMS solutions).
- IETF is an appropriate and unique SDO place for creating it.

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Backup
Evolution of wholesale services

• **Operators** start deploying its **own computing capabilities**
  - UNICA environment in the case of Telefónica

• Operators can leverage on these capabilities for creating **service offerings** to external (vertical / wholesale) customers
  - E.g., by deploying (or requesting) specific service functions and service graphs
  - It is necessary to find proper mechanisms for **trading** these capabilities (at resource and service function level)
  - It is necessary as well to implement **protocols / APIs** that could allow this to happen in an **automated** way
  - And it is also necessary to properly **configure and manage** them either from the provider or the customer perspective!!

• **Adaptation** to **variable demands** and **changing service endpoints** require more dynamic and responsive mechanisms for service delivery