# I. Problem Statement of Supervised Heterogeneous Network Slicing (NS)
# II. NS Use Cases
# III. NS Information Model
# IV. NS Interconnection
# V. NS Next Steps towards IETF101

draft-geng-coms-problem-statement-01


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draft-netslices-usecases-02


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draft-defoy-coms-subnet-interconnection-01


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# Problem & Use Cases

draft-geng-coms-problem-statement-01
draft-netslices-usecases-02

# Recap from IETF99 and Clarifications

- **Feedback from IETF99 non-WG forming BoF**
  - Network Slicing topics – Standardization high impact but is it **TOO BIG for one WG**
    - Focus moved to common operation an management of network slicing (COMS)
  - No clear requirement from 3GPP, should we work on Network Slice in IETF?
    - **The answer is an absolute YES**
    - Popularized by activity in 3GPP/ITU-T but not a 3GPP/ ITU-T-owned concept
    - Supporting either backhaul or common Internet/Service Evolution
    - Future business model of network **asks for network slicing capability**.
      - Greater dedication of bandwidth/jitter/network functions of Internet for vertical industries
      - Widely distributed computing/storage resources that are associated with transport connectivity and functionalities (SDN/NFV)
      - Much finer QoS/QoE granularity and more flexible configuration

# Recap from IETF99 and Clarifications

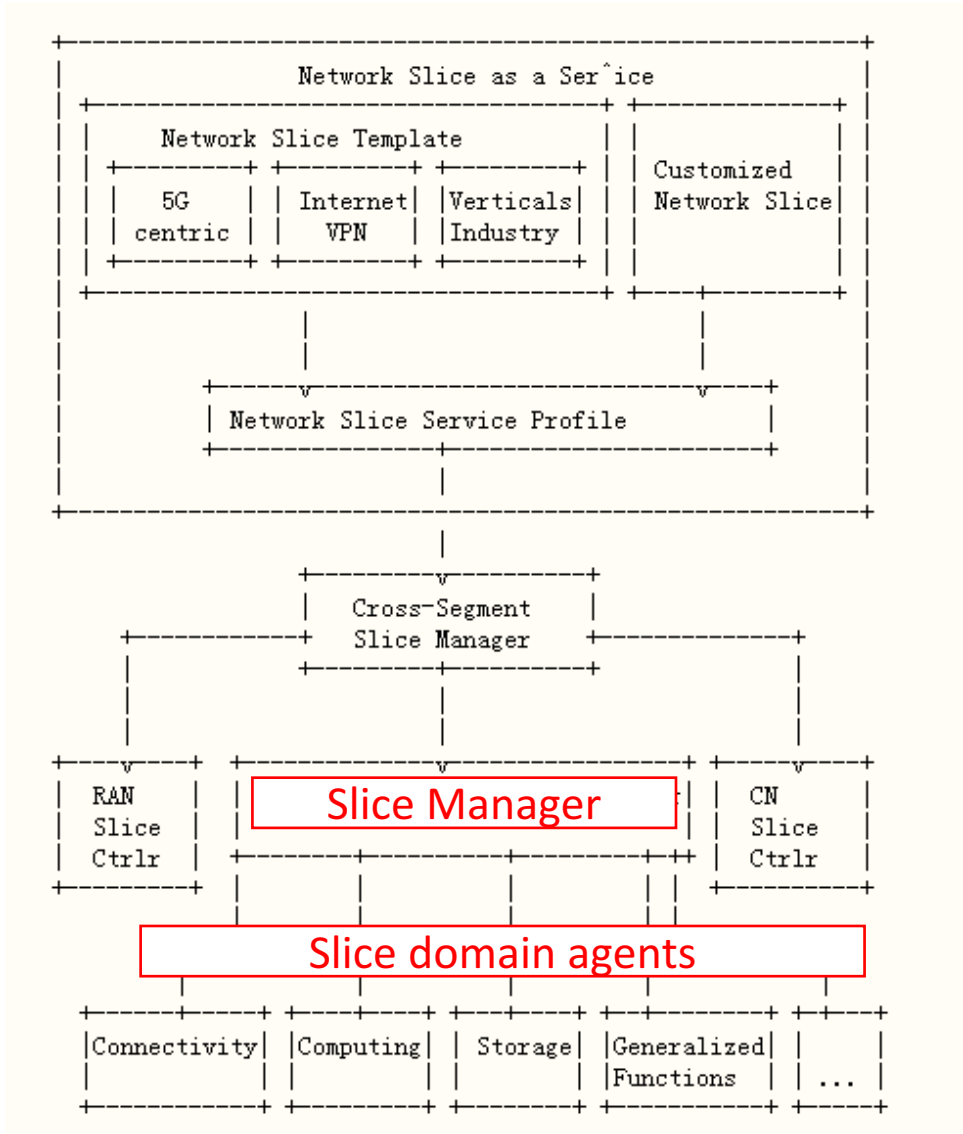
- **Network Slicing** - A management mechanism that Network Slice Provider can use to allocate dedicated network resources from shared network infrastructures to Network Slice Tenant.
- **Network Slice** - A network slice is a managed group of dedicated network **components** (including both resources and generalized network/service functions) to meet certain network functionality and performance characteristics required by the network slice tenant(s)

# Problem Statement- Supervised Heterogeneous Network Slicing

**Network slice creation** - Created using pre-defined templates or with the manner of customization

**Cross-segment Slice Manager** - decomposes the network slice service profile and assigns corresponding segment network slice information to multiple segment slice managers

**Slice Manager**– translate service model to resource-level description, coordinates heterogeneous network slice domain agents



# Problem Statement- Components for network slicing

| Connectivity | Computing | Storage | Generalized Function | Others |
|---|---|---|---|---|
| • Node<br>• Link<br>• Topology<br>• Bandwidth<br>• … | • CPU<br>• RAM<br>• Virtual resources<br>• … | • General storage<br>• CDN | • PNF/VNF including<br>  • NAT<br>  • DHCP<br>  • Firewall<br>  • …<br>• Service Instances<br>• Monitors/Management | • ICN<br>• … |

- Network slicing does not have any constraints on what type of resources NSPs may or may not use as part of the network slice creation. This is completely subjected to NSP's policy.
- COMS endeavors to provide a prototype catalogue of the resource/network functions/services components for network slice creation.

# Problem Statement - Common Operation and Management for Network Slice (COMS)

## Main Functionalities of COMS

- Common resource negotiation and abstraction
- Exchanging information between multiple management domains
- Operations and monitoring across multiple management domains
- Network-slice operational control (i.e. life-cycle management)
- Management capability exposure to NST

## Common Information Model

- Provides network-slice level abstraction in network components view point, with a compatible granularity that is exposed from the underlay capabilities

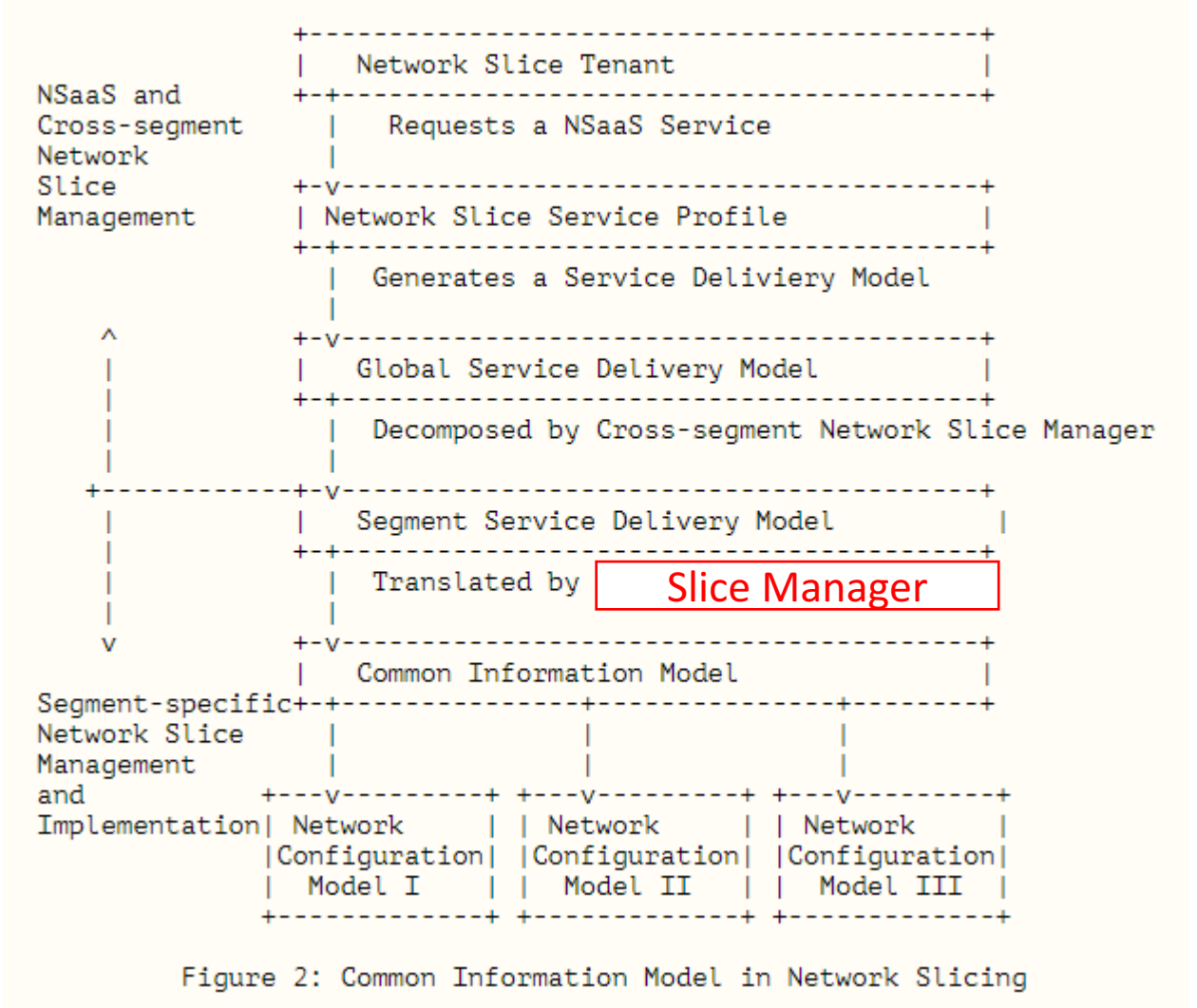


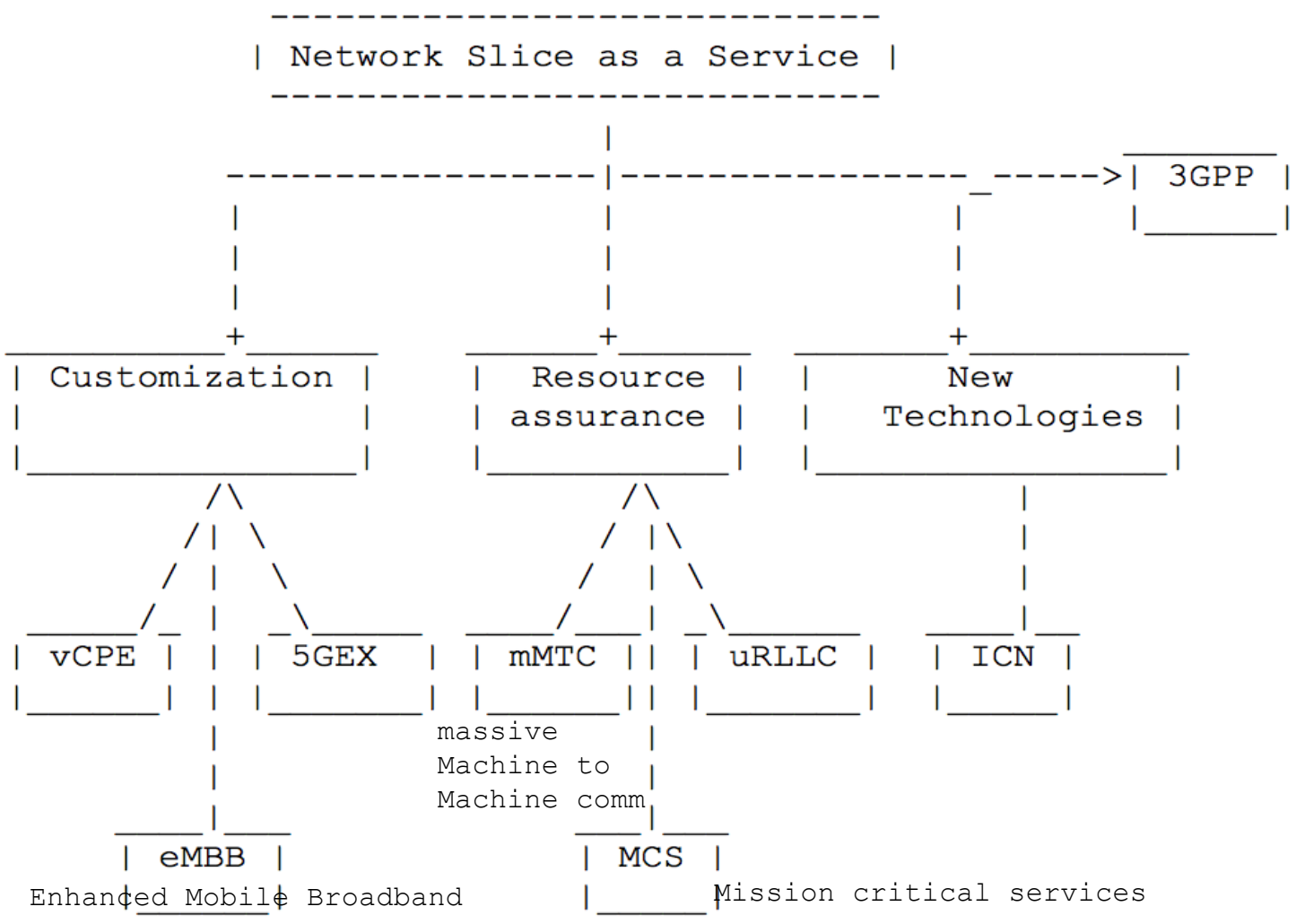

Figure 2: Common Information Model in Network Slicing

# Problem Statement – The scope of the work

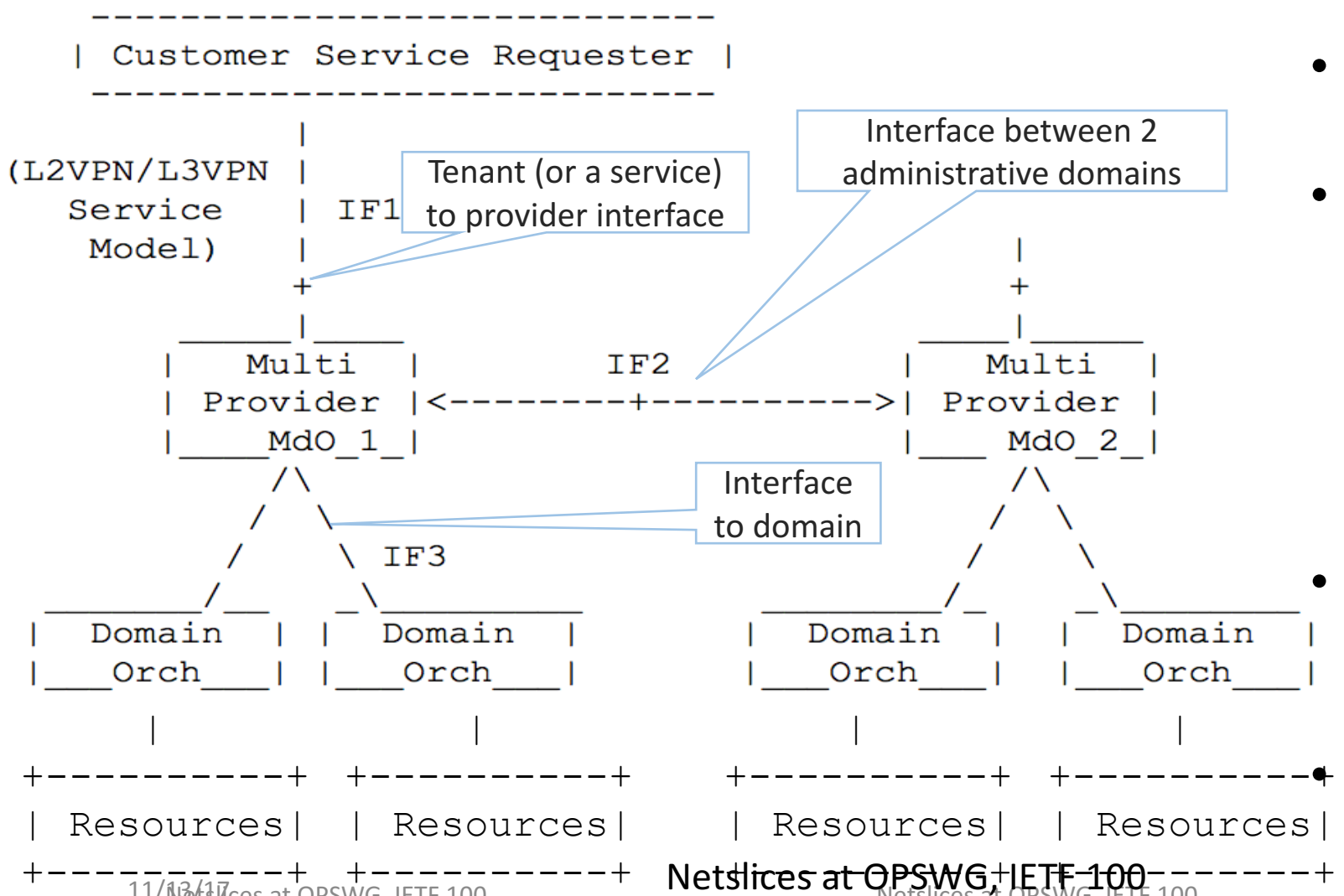
- The common information model acts as the key element in COMS
- Other OAM concerns including
  - Network slice monitoring and orchestration
  - Life cycle management
  - Fault detection and protection mechanisms
  - Network slice interconnect and composition(East-west bound interface)
  - Support for Service delivery model (NBI)
  - Support for mapping to specific administrative domains (SBI)

# Use Case Recap: Netslices use case organization

- **Purpose**: Created categories of use cases where network slicing is beneficial
- **Customization**: Allows a network operator to offer differentiated services
- **Resource assurance**: Mechanisms to reserve, operate and manage resources with strict bounds.
- **New technologies**: Allow non-IP based technologies to be deployed over common infrastructures.



# New Use Case -5G-EX




- 5G-EX project is a part of H2020 EU framework that funds it.
- In 5G-EX scenario, a network operator needs to offer end to end network connectivity services to its customer
  - across different geographies
  - Different admin domains
- Operators desire standard interfaces for coordination – IF1, IF2, IF3.
- Coordinate resources without exposing internal details.


Netslices at OPSWG, IETF 100 10 10

# Solution-based drafts

draft-qiang-coms-netslicing-information-model-01

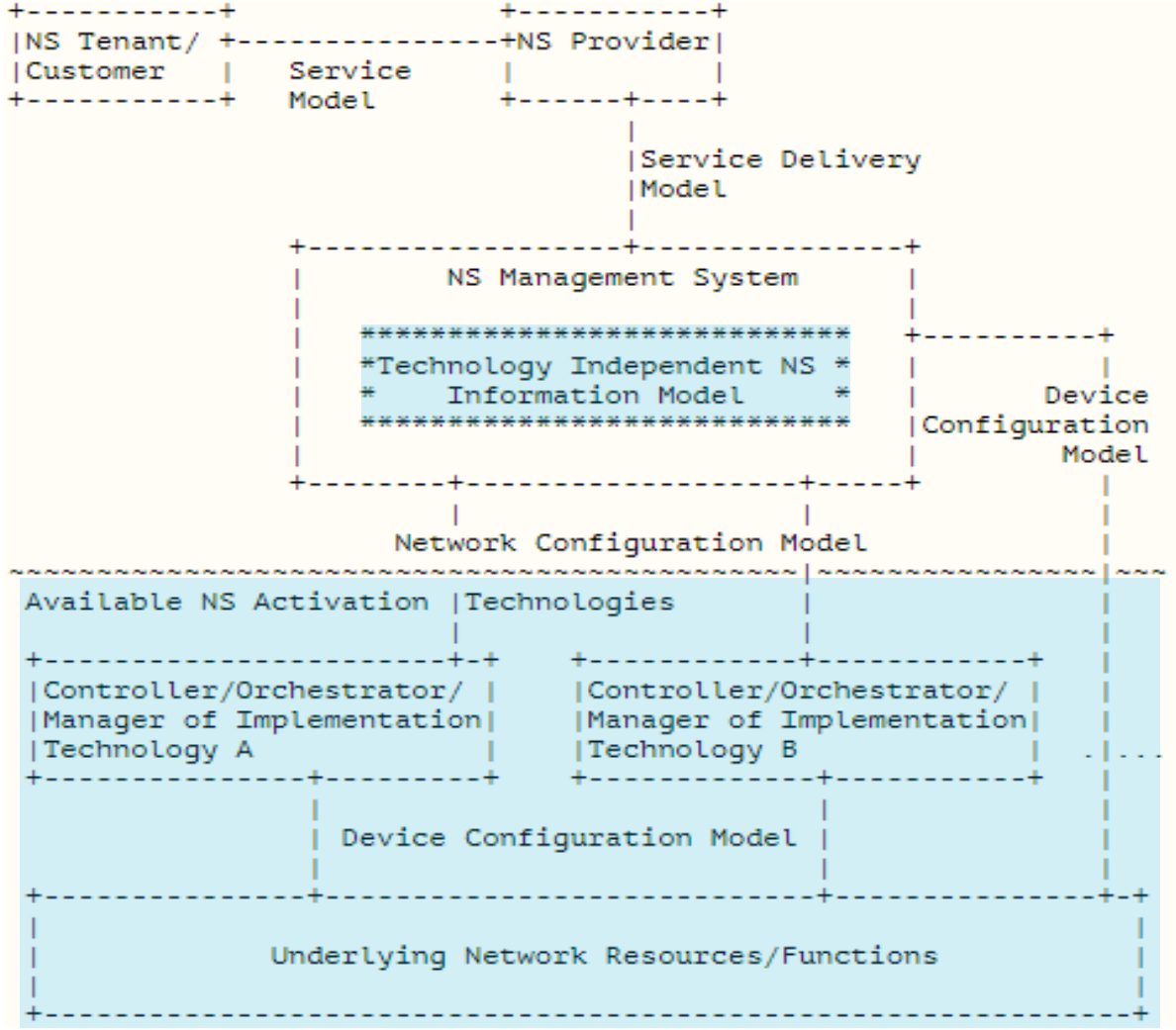
draft-defoy-coms-subnet-interconnection-01

# Common Operation and Management of Network Slicing – Architecture Overview

- Modeling network slice at a conceptual level, independent of any specific implementations.

- Describing the entities that compose a network slice, their properties, attributes, services and operations, and the way they relate to each other.

- Supporting NS specific management and operation, and can be mapped to specific implementation technologies.




Related Draft: [draft-qiang-coms-netslicing-information-model-01]

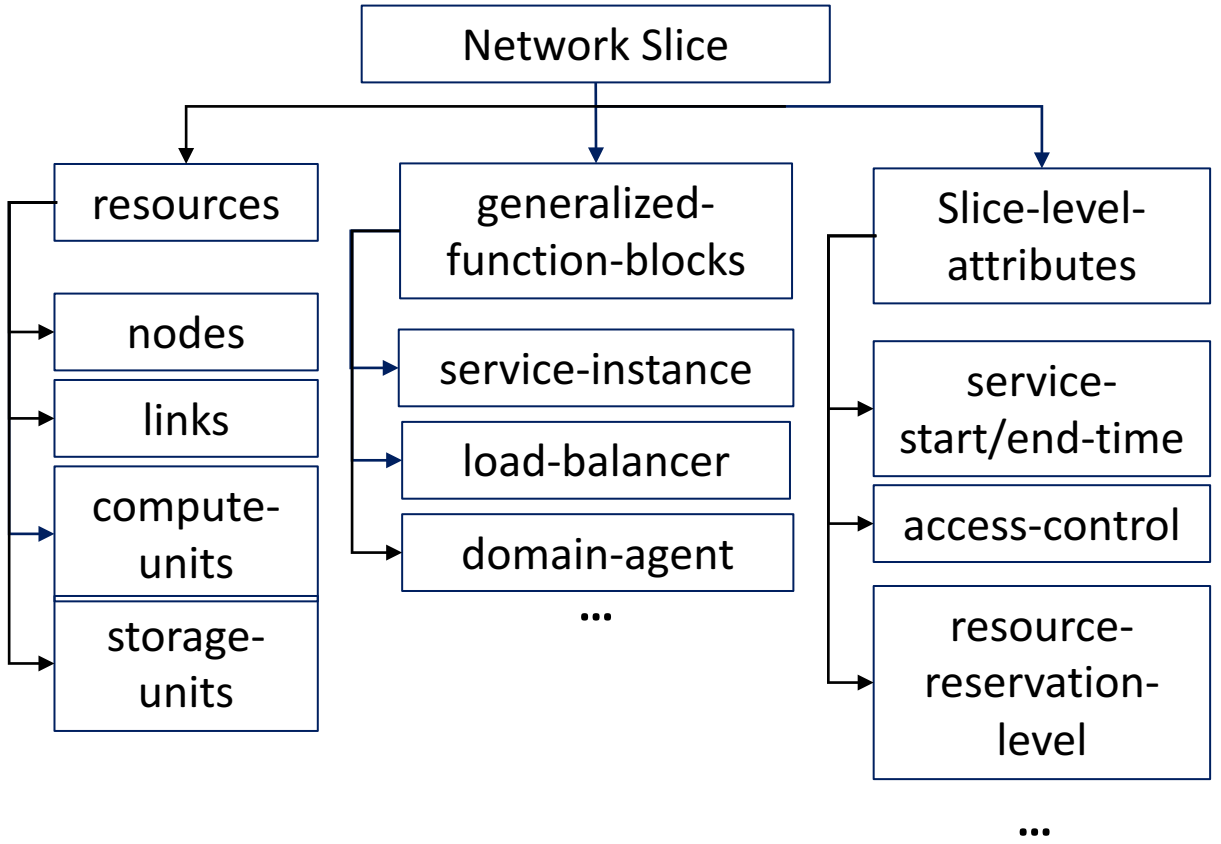
# COMS Information Model

- COMS Info Model is an implementation independent tool to segment network resources/services and to offer customized network architectures for diverse NS use cases that share the same underlying infrastructure.

- Augmenting on I2RS (network topology relevant).

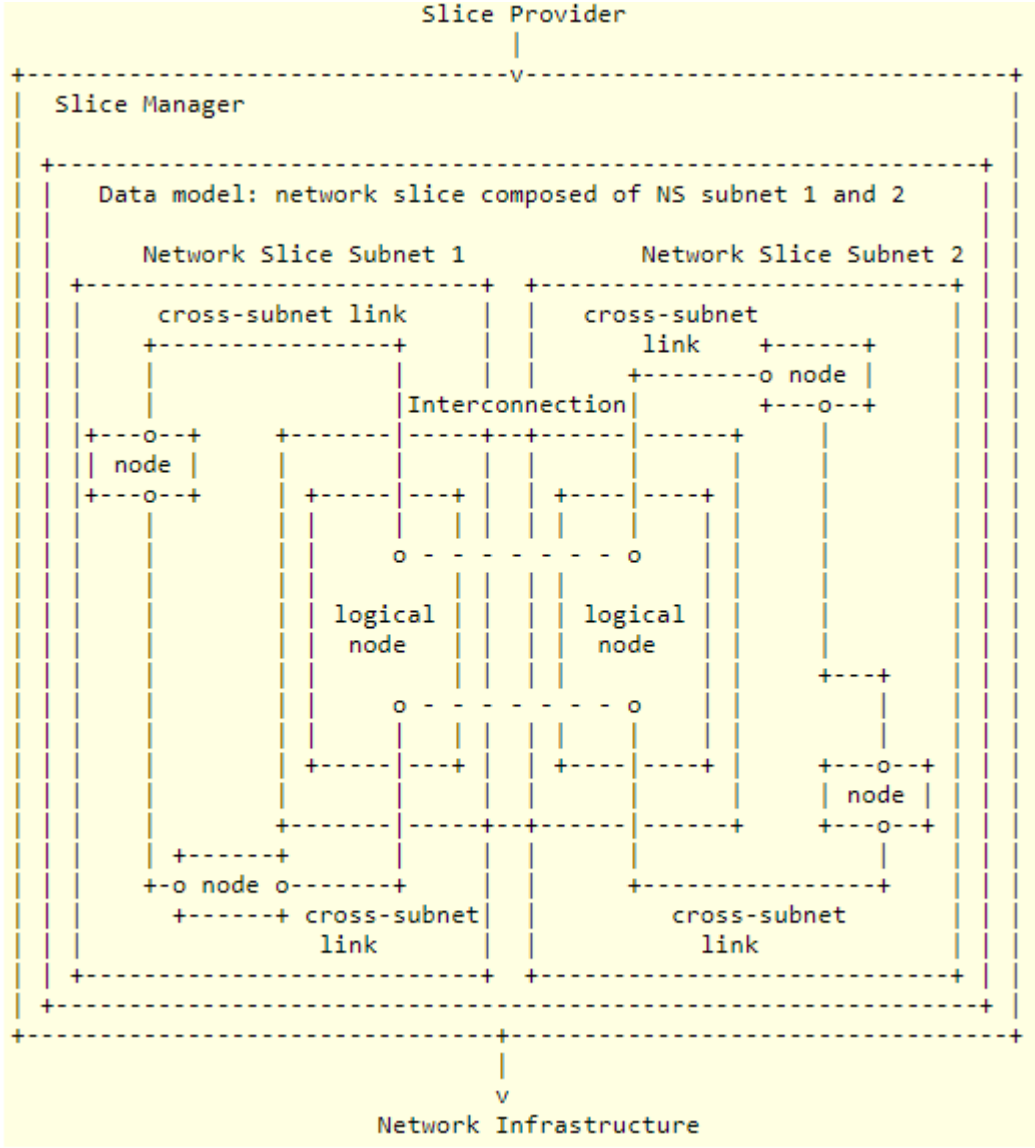
- compute/storage-unit and (forwarding) node can be bound together.

- Supported operations on NS: construct, delete, modify, monitor set element value, get_element_value, etc.



# Network Slice Subnet Interconnection

- **Slice subnet**: a network slice with unconnected links + also a unit of network management.
- **Subnet interconnection**: interconnecting nodes from different subnets, respecting a set of constraints (throughput, QoS, etc.)
- NS model from *draft-qiang-coms-netslicing-information-model* can be used to describe NS subnets.
  - A “network” element of the network list represents a slice subnet.
  - Slice subnets can be interconnected to form a larger slice (or a larger slice subnet), which can itself also be represented using another “network” element
  - This enables recursive composition of slice subnets
- Some nodes and termination points will be used as *interconnection anchors*:
  - Need to define new attributes for those *logical nodes* and *logical termination points*, e.g. to express constraints on interconnection




Draft: draft-defoy-coms-subnet-interconnection-01

# Next Steps – Towards IETF101

- Review and feedback from the group and Update and consolidate drafts
- Align terminologies among related drafts
- *COMS-centric working items*
  - Service delivery and network configuration model design (NBI/SBI of NS manager)
  - Interfaces and data model for Network slicing OAM interfaces and data models
    - Life-cycle management, fault detections, monitoring and etc.
    - Information exchange between multiple NS domain agents
  - Management capability exposure to NST

**Network Slicing Demo on Thursday at Coffee Break area – ALL DAY**