



DesignNews

5G Tech for Industrial Automation

DAY 4 : 5G Network Management

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Course Overview

In this course we will analyze the impact of 5G technology on the industrial automation space. 5G has the ability to replace all of the wireless, and most of the wired, technologies in in the IIoT (Industrial Internet of Things), providing direct connection to the cellular infrastructure. This brings with it a simplified and more robust network architecture. It allows direct connection to remote computing resources including cloud computing. We will look at how this will roll out and what the near future will bring as 5G evolves rapidly.

Class Overview

Whole new approaches to network management and control are required in the 5G environment. The extensive nature and reach of 5G will have an effect on how networks are configured, controlled and secured. Moving from a number of protocols and the attendant gateways to a unified architecture affects management strategies and implementations.

Agenda

- Concepts
- Network Management Framework
- Management Tools

Concepts

- The goals of Network Management are:
 - Configuration of the network
 - Monitoring of the network
 - Fault detection, identification and resolution
 - Network analysis
 - Traffic
 - Utilization
 - Capacity planning

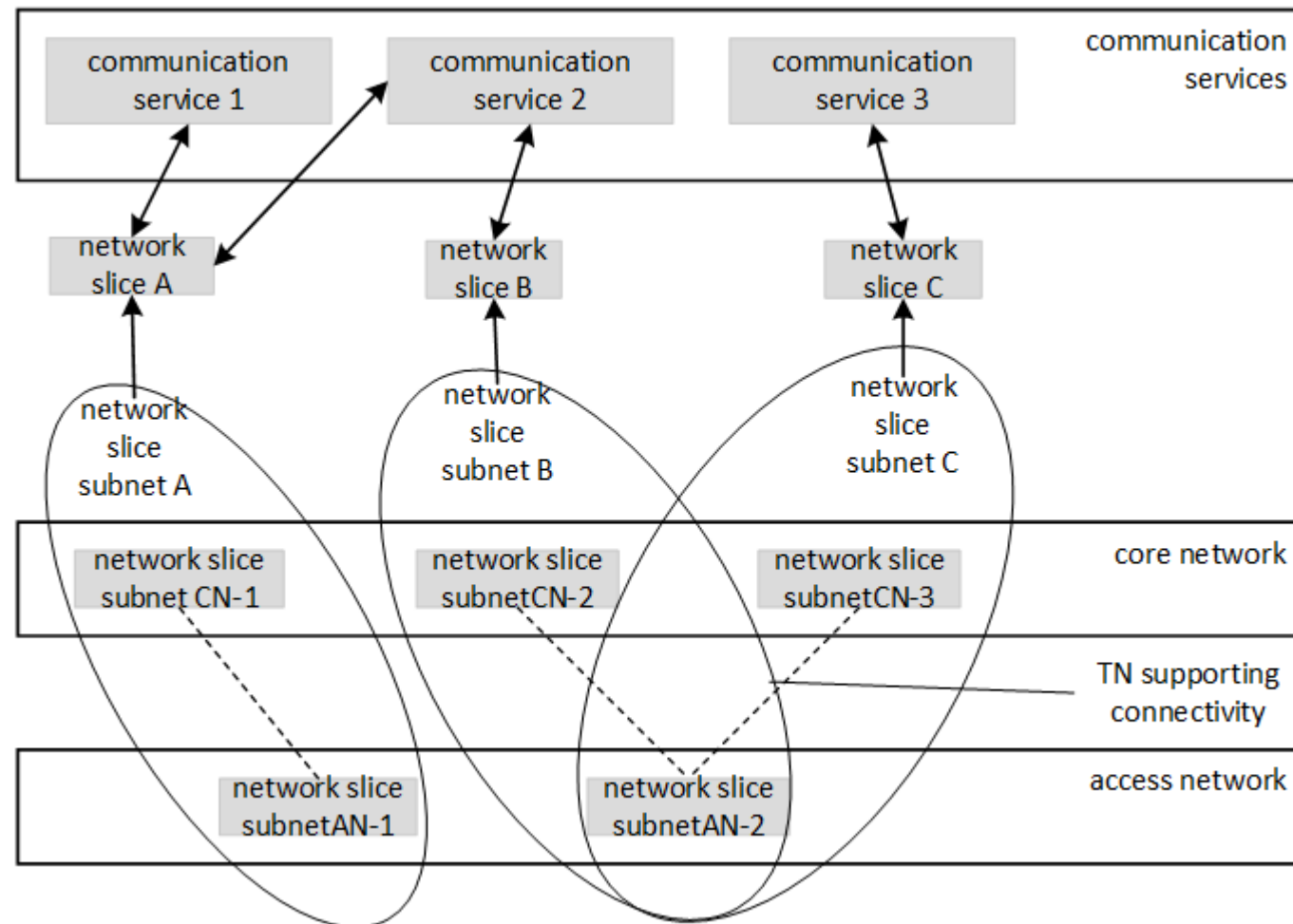
Concepts

- 5G networks require extensive management resources due to the ability to mix a wide variety of devices, each with different requirements.
- In 5G networks we will configure the network into Network Slices.
- From a management point of view we have three levels:
 - Access Network
 - Core Network
 - Communication Services

Concepts

- Although 5G networks can be complex, they have the capability to replace a large number of disparate networks of differing types utilizing just one technology framework.
- This actually simplifies planning and analysis of the network infrastructure.
- There are commercially available tools to aid in these tasks which help in setting up and manning a Network Operations Center (NOC) allowing full visibility into the network environment.
- With older technologies, wireless or wired, there was often no global view.

Concepts



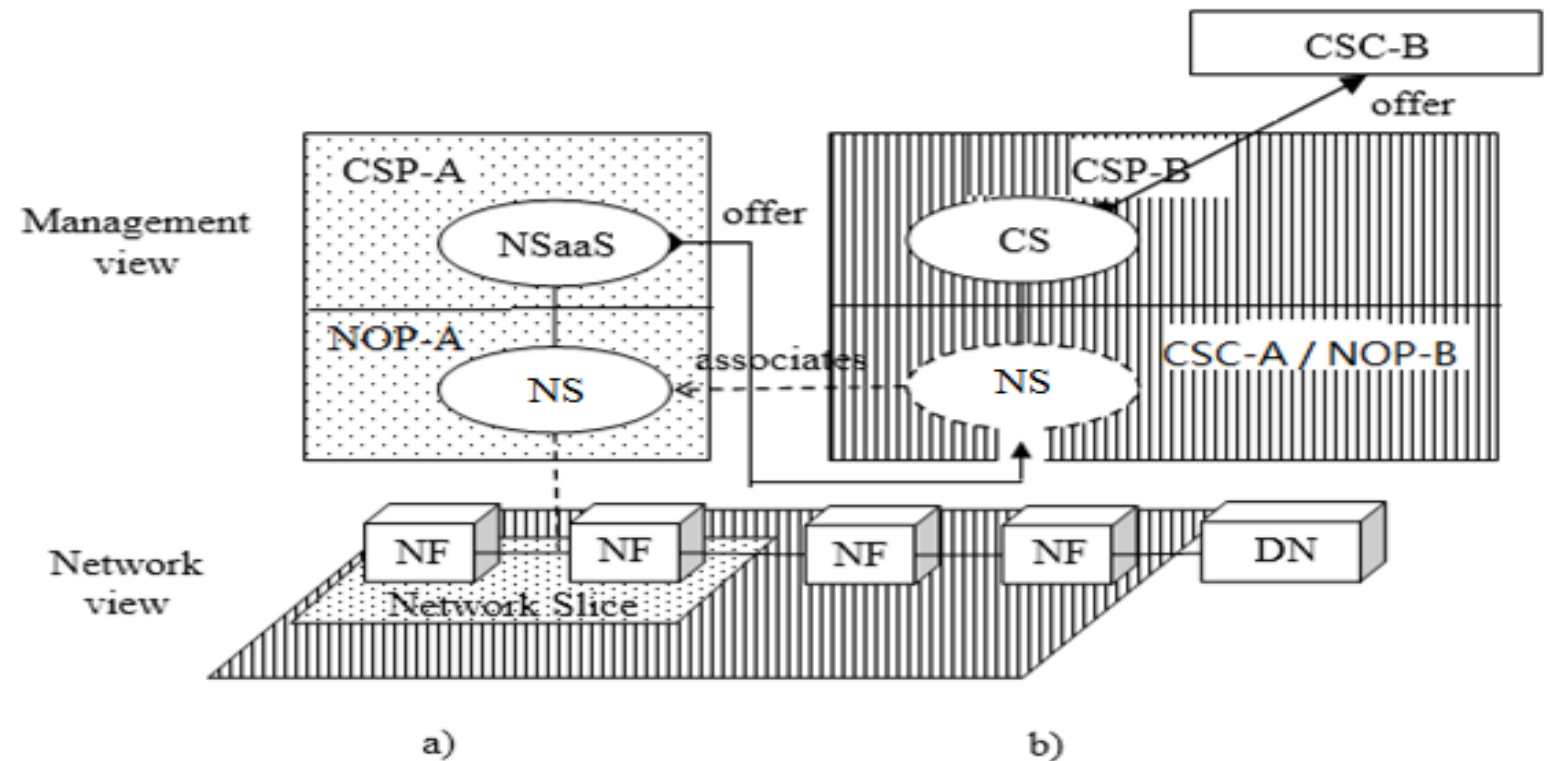
Concepts

- Each of the types of communication service providers have different requirements.
- We use Network Slices to assign resources in the network to each service and coverage area.
 - This creates subnets, which can be configured, monitored and controlled to enable each type of service.
- This allows control of resource usage and tracking for capacity control and analytics.

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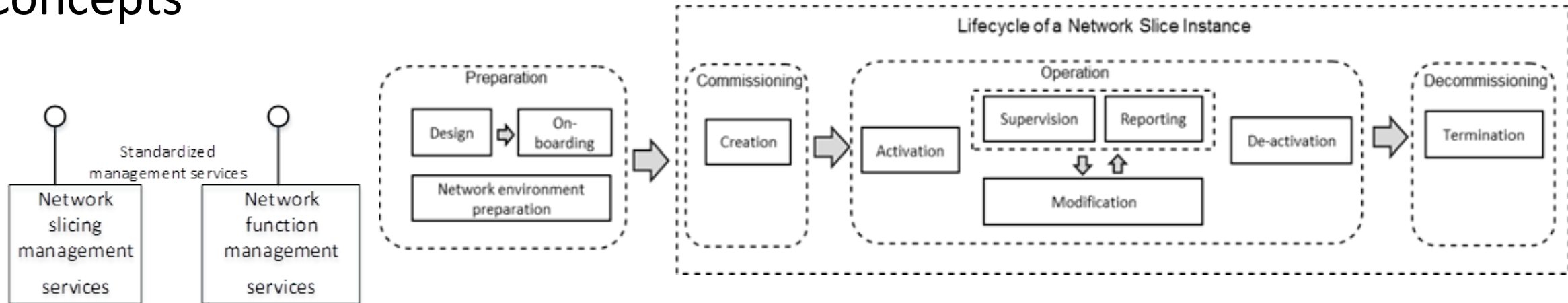
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Concepts



Examples of Network Slice as a Service (NSaaS) being utilized to deliver communication services to end customers

Concepts

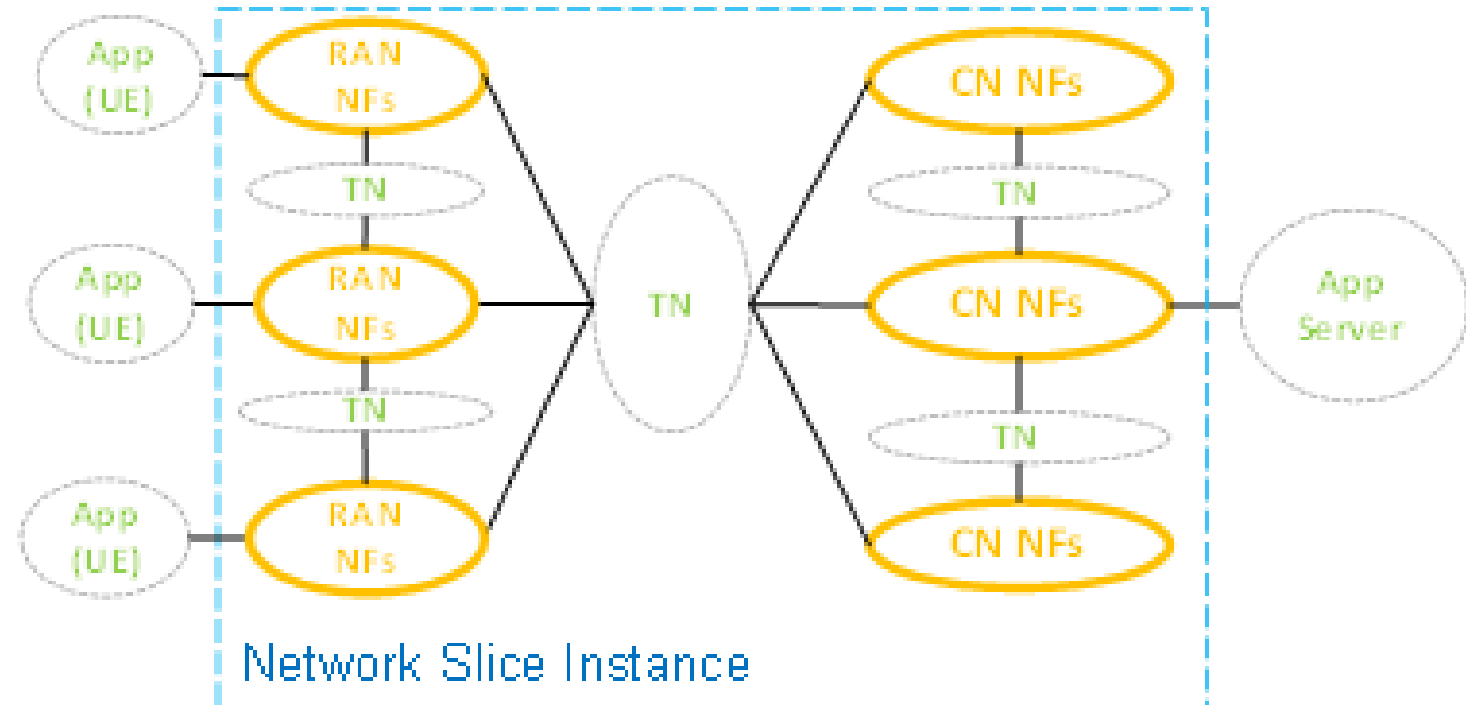


Standardized network slicing management services and network function management services

Management aspects of network slicing

Concepts

Example of a
network slice



Network Management Framework

- The NMF provides a standard for developing and utilizing tools to manage 5G networks.
- A wide variety of components must be managed, and the intent is to automate this function as much as possible.
- The framework is flexible and extensive.
 - Many configurations can be created so that they are suitable to goals of the network and application.

Network Management Framework: Key Terms

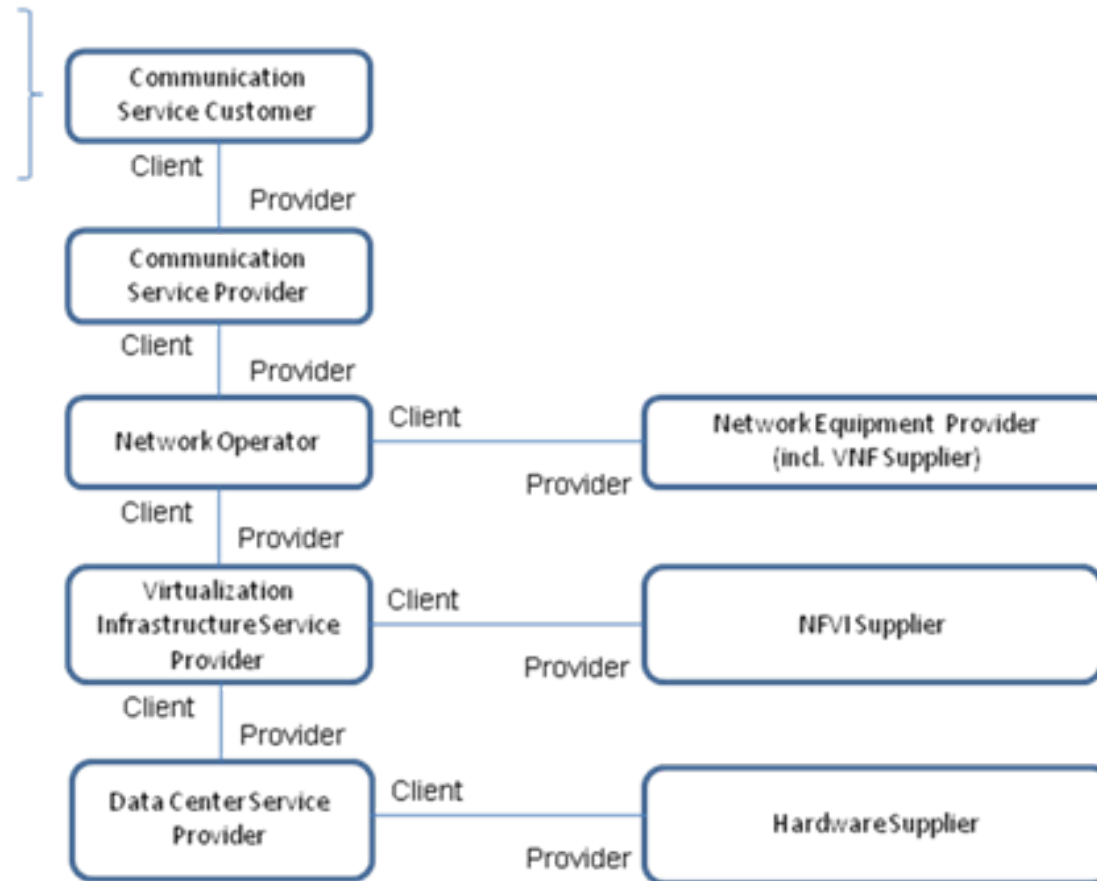
- CM Configuration Management
- LCM Lifecycle Management
- MDAS Management Data Analytics Service
- MnF Management Function
- MnS Management Service
- NF Network Function
- NFV-MANO Network Functions Virtualization Management and Orchestration
- PM Performance Management
- SBMA Service Based Management Architecture

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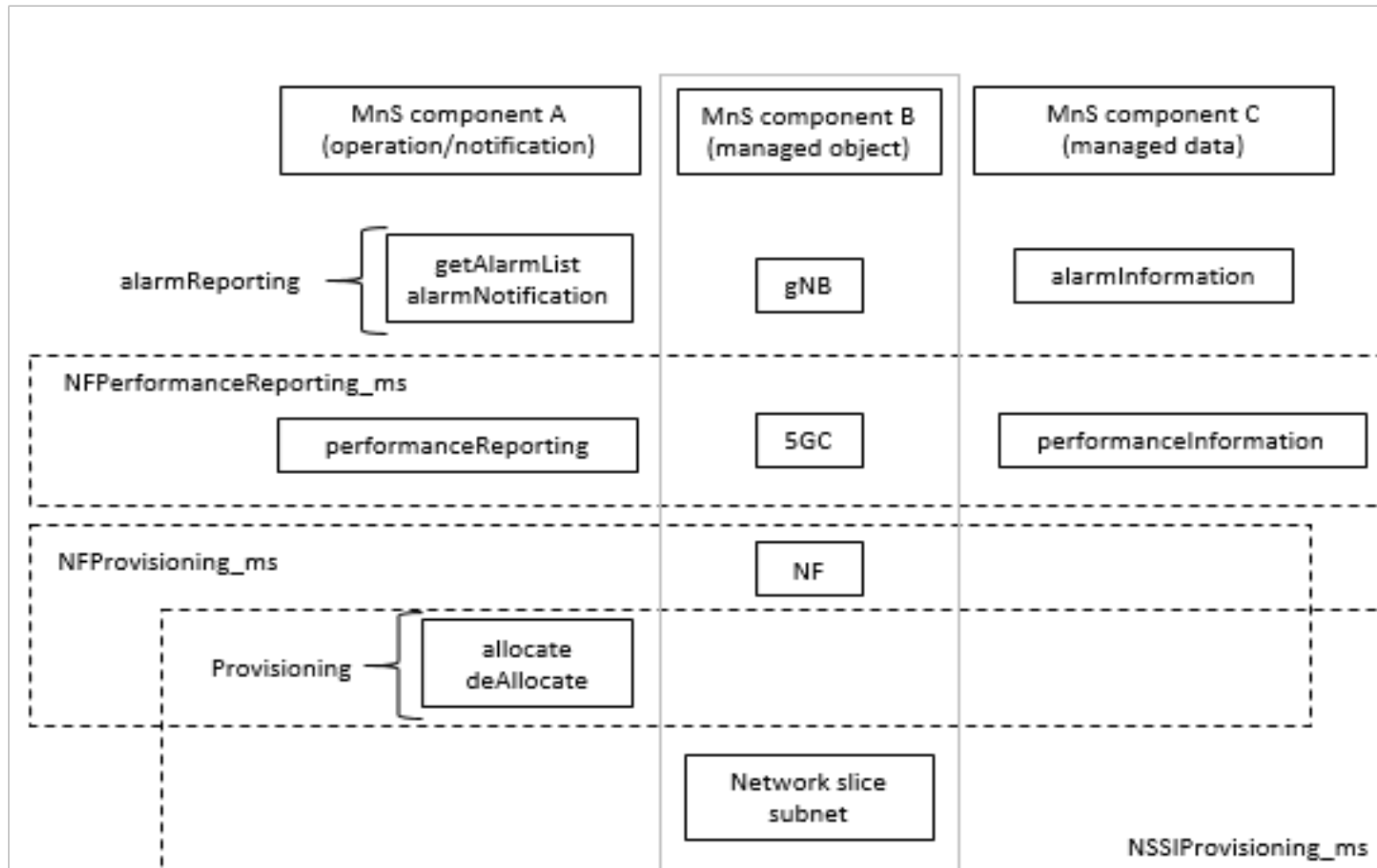
Network Management Framework

E.g.: End user,
Small & Medium Enterprise,
Large enterprise,
Vertical,
Other CSP, etc.



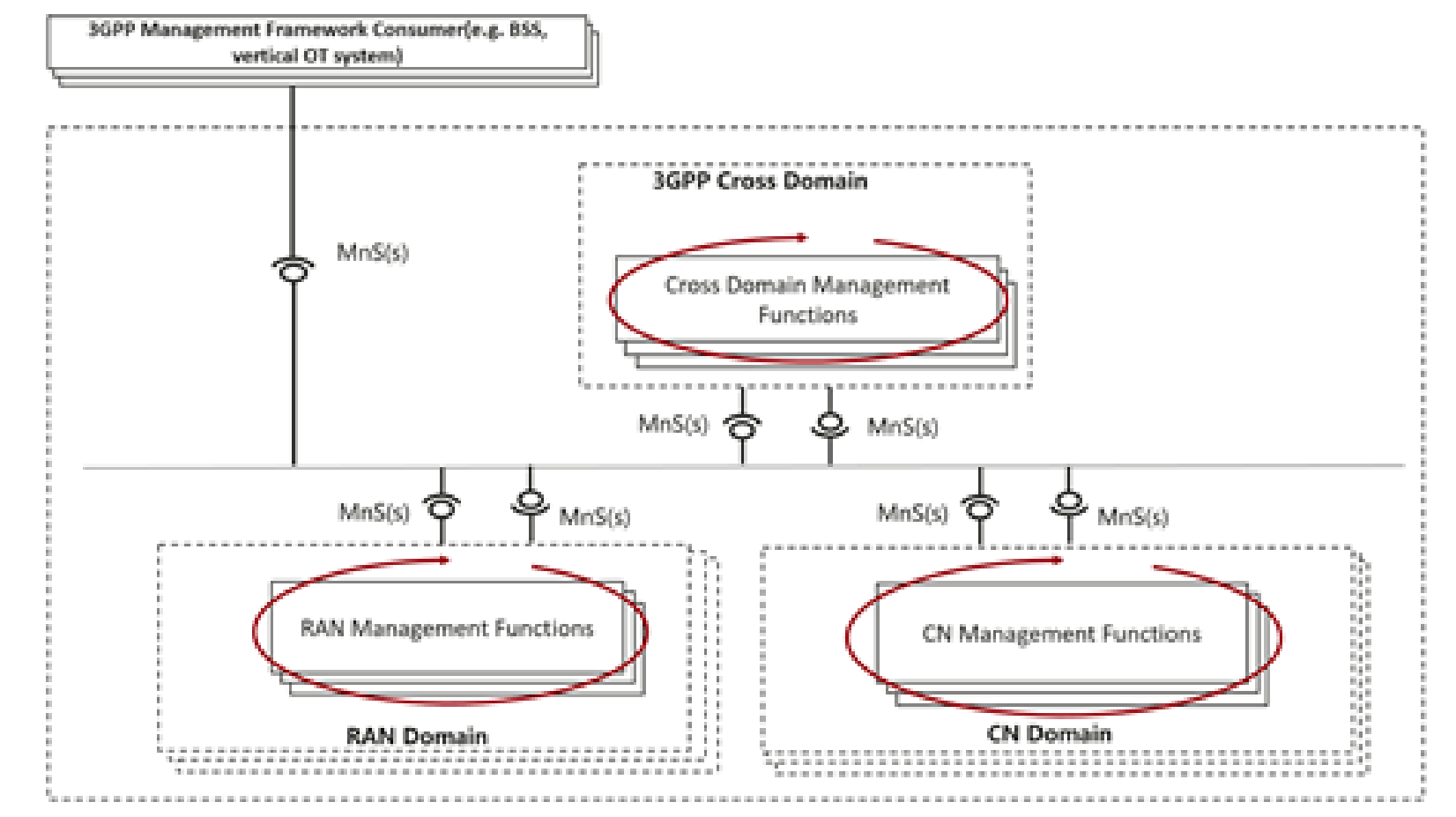
Network Management Framework

Example of Management Service and component types

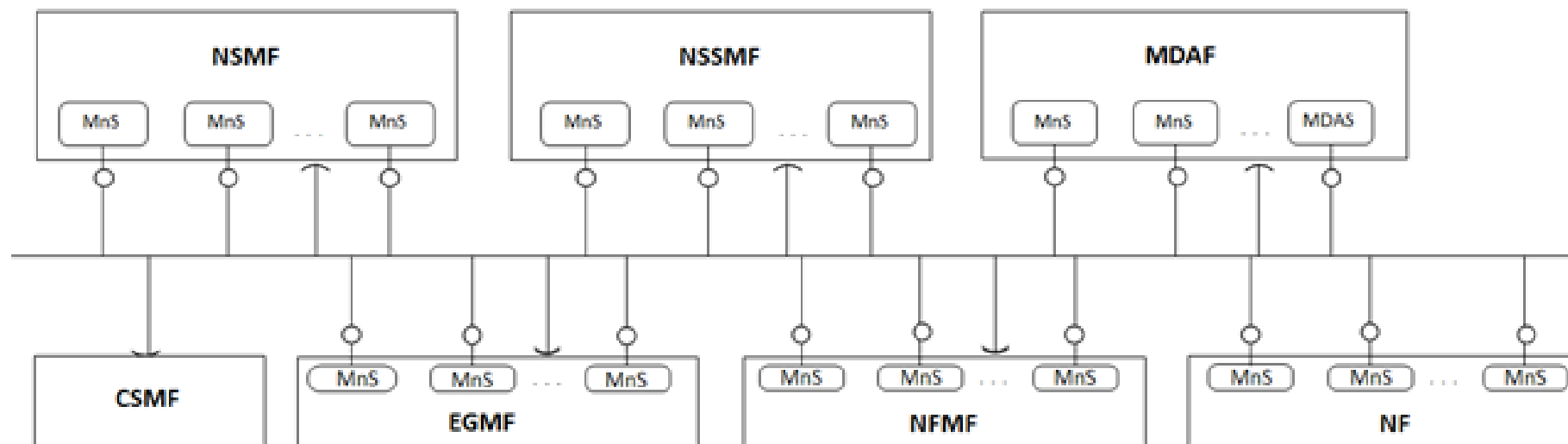


Network Management Framework

An example of Management Service deployment framework.



Network Management Framework



MnS - Management Service

NSMF: Network Slice Management Function

NSSMF: Network Slice Subnet Management Function

MDAF : Management Data Analytics Function

CSMF: Communication Service Management Function

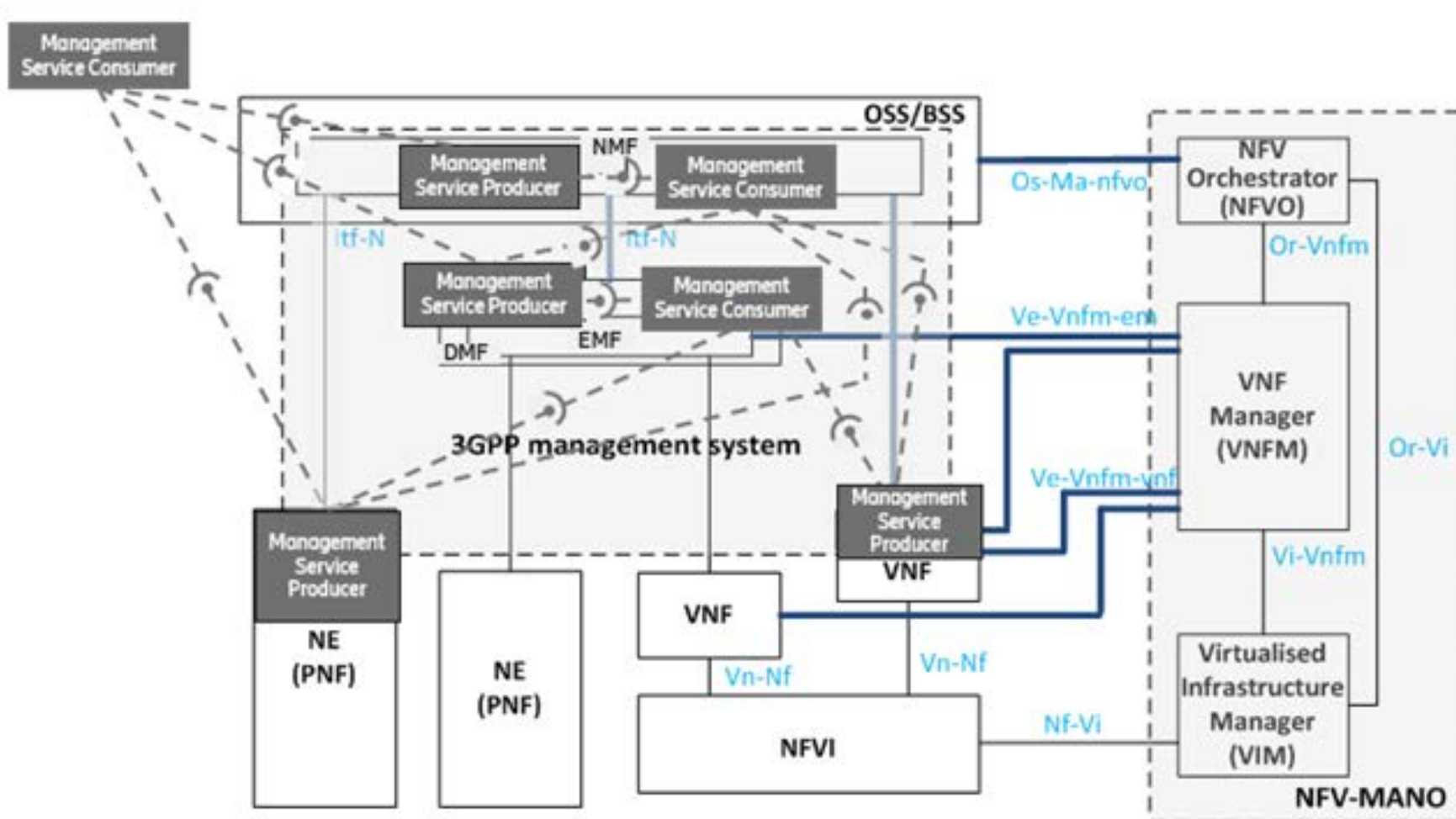
EGMF: Exposure Governance Management Function

NFMF: Network Function Management Function

NF: Network Function

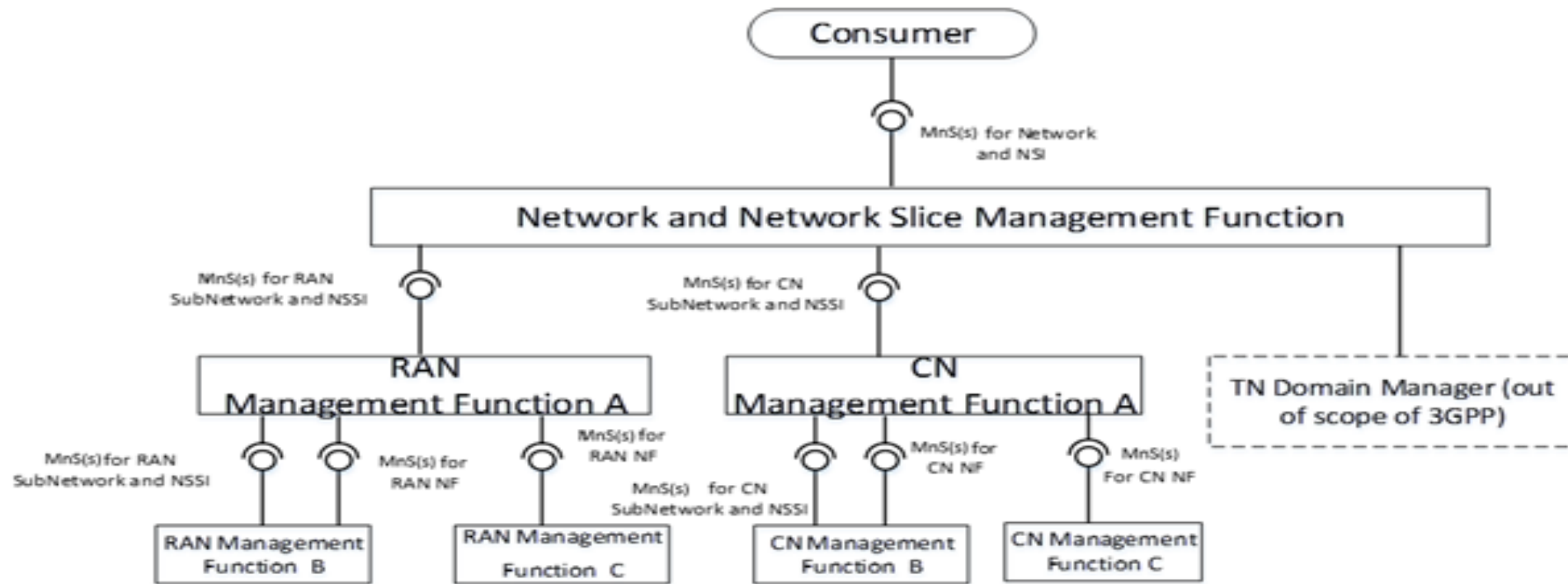
Example of functional management architecture

Network Management Function



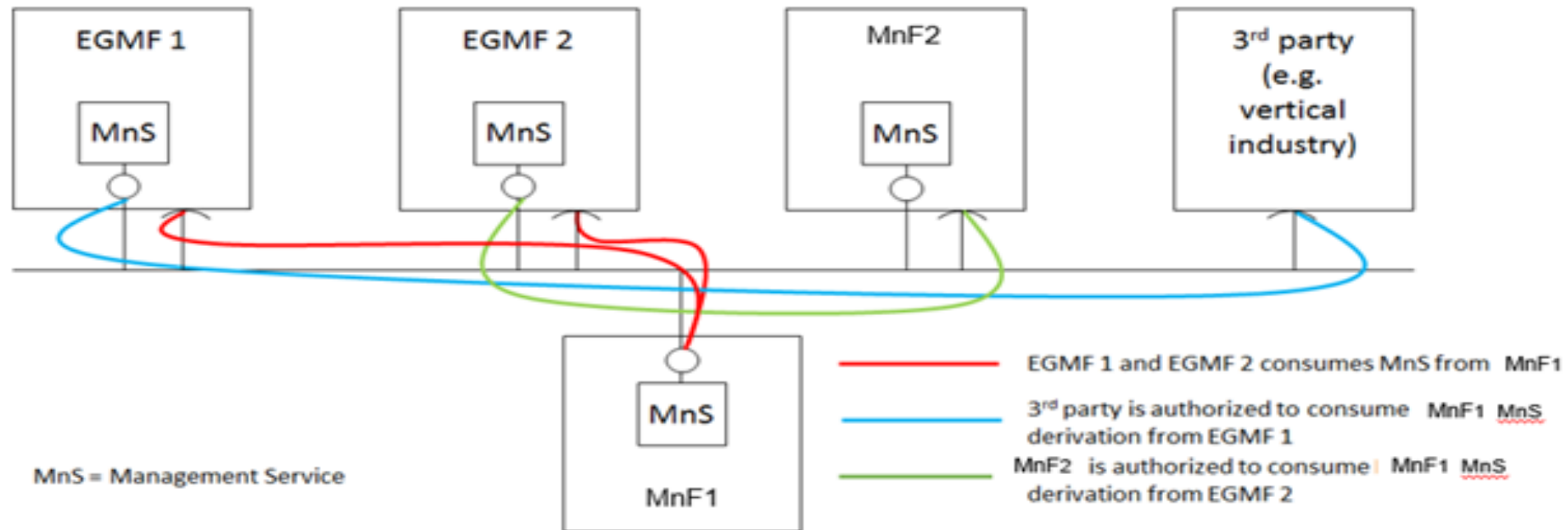
Example of Management service producer and consumer interaction

Network Management Function



An example of deployment scenario for management of a mobile network including network slicing

Network Management Function



MnF-1 Management Service (MnS) exposed through Exposure Governance Management Function 1 (EGMF 1) and through Exposure Governance Management Function 2 (EGMF 2)

Management Tools

- There are a number of management tool vendors.
- Alternatively, you can develop your own, or integrate the 5G framework into an existing implementation.
- Major vendors of network equipment provide tools and systems to manage networks.
 - These can generally be extended and integrated into your own NOC.

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Management Tools

- For flexible implementation, many of these tools can operate in the cloud.
 - If multiple sites are being managed, a cloud implementation will be preferable.
- Alternatively, on-premises equipment can be used.
- Open-source tools are becoming available as well.
 - These will typically require more programming staff.

Management Tools



Thank you for attending

Please consider the resources below:

- 3GPP Standards for Network Management



Thank You

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