

5G Private Networks

“Virtual Private Networks empowered by 5G features”

Virtual Private Networks are an appealing service requested by business customers, due to the cost of connectivity resources and infrastructure management, which are very often matter of saving strategies as OPEX reduction. 5G networks offer the opportunity to deliver an infrastructure virtually dedicated to Enterprise Customers and built through the concatenation of network slices obtained by one or more Network Providers.

The functional element that allows full interoperability among several geographical areas covered by the private network is represented by 5G Network Slicing – as managed by 5GEF – combined with SDN Wide Area Networking (SD-WAN) technology.

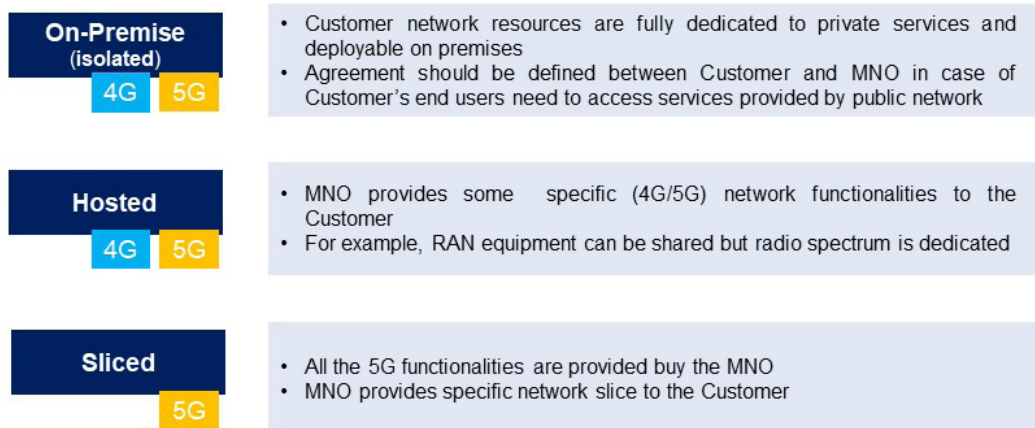
Private Networks require 5G Core components as well as 5G Radio stage. There may be different implementation models :

- On premise – The Customer is the owner of a complete 5G infrastructure, where RAN and Core components are deployed and managed independently (isolated) from external public Operators or Service Providers. This model is not anyway allowed in all countries, due to possible limitations in using public radio frequencies or about security regulations.
- Hybrid – The Customer is the administrator of a complete 5G infrastructure, where RAN and Core components may be owned by the Customer itself and third parties (Operators, Service Providers). The solution requires contractual agreements between the parties, in order to manage appropriately the whole network.



- Sliced – The Customer is the administrator of a complete 5G infrastructure, where RAN and Core components are owned by Operators or Service Providers. The solution is provided through network slicing practice, where the slices are completely dedicated to the Customers as per their requirements, with a pay per use logic (cloud services).

5G Enabling Fabric is focused on Sliced Private Networks, as a best

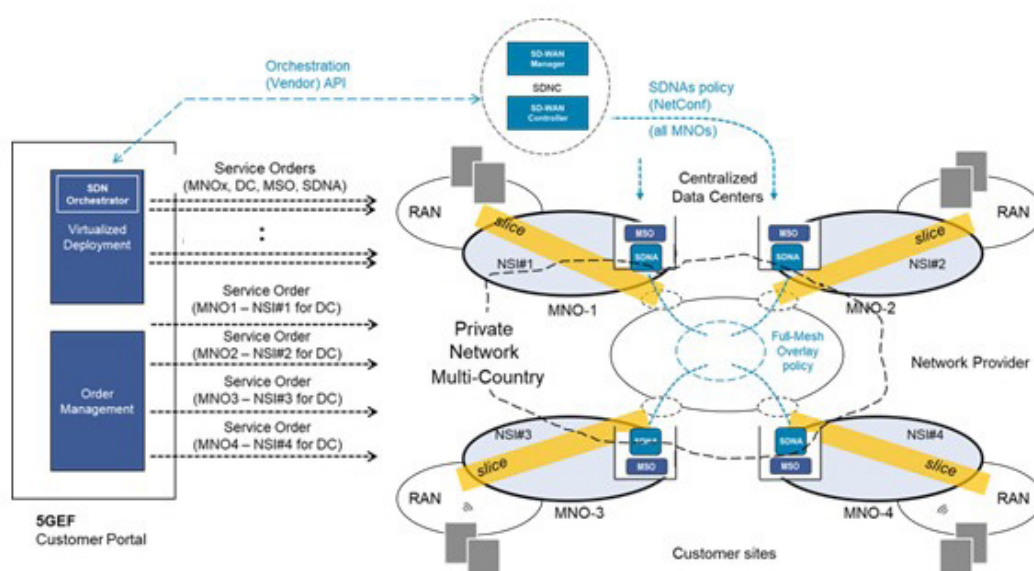


Indeed, 5GEF is capable to automatically create a network infrastructure by building the individual Network Slices that compose it. Those slices are then configured and activated according to the topology of the network as requested by the customer, on the basis of the locations of its pertinence. 5GEF executes also the automatic deployment of the SD-WAN appliances (SDNA) needed for connectivity (full mesh), by loading them as VNFs on top of the servers - or data center platforms - available to the Customer. An external SDN Controller (SDNC) drives the SDNAs under core 5GEF instructions.



In the picture below, 5GEF is shown as an orchestrator capable to allocate network slices, even belonging to different network providers, with the idea to create (in Data Center environments) the opportunity to manage a unique 5G infrastructure geographically distributed where need.

Mash-up Service Orchestrator (MSO) is a light software module composed by NTT DATA, capable to manage the local interoperability of applications and SD-WAN appliances in (Edge)Data Center sites.



Concept

“5G Private
Networks
support
business
needs”

The idea is basically to get resources from different network or service providers and orchestrate them aiming to compose a whole 5G environment, as need by the Customers. In that sense, some general features are supported.

- No Technology Vendor constraints
- Standard 3GPP (GSMA) Network Slicing model
- Support of 5G NSA or SA architectures

5GEF assures flexibility and full interoperability among different network domains.

- 5GEF interoperates with different MNOs or Carriers, aiming to create Network Slices.
- SD-WAN technology gives the opportunity to establish mutual connectivity among Customers sites.

5G Enabling Fabric (5GEF®)

“Enabling
5G Private
Networks as
use cases for
Operators”

5GEF is a cloud based platform specifically designed for configuring and delivering business services to enterprise customers or Telco Operator environments.

NTT DATA's solution provides Telcos and MNOs with a modular platform for deploying business applications provided by any relevant vendor, to virtually any location worldwide. In case of 5G (Sliced) Private Networks, software components are deployed as fully virtualized, and activated by remote in few-clicks.

A slice-oriented architecture supports delivery of secure, dedicated services on a global shared platform, while an abstraction layer enables customer self-selection for automated launch of configurable use cases.

Additional key features:

- Standard Network Slicing model (GSMA)
- Now Ready for 4G or 5G NSA early deploy
- Focused on 5G SA solutions
- Deliverable for Cloud Service Providers
- Supported Pay-per-use and SaaS applications
- 3GPP NSMF, CN NSSMF.

The innovation introduced by 5GEF offers the opportunity for Telco Operators to play as Cloud Service Providers in terms of flexibility, fast service delivery and resources optimization in a completely orchestrated and simplified way for the Customers.