ALTRAN MULTI-DOMAIN SERVICE ORCHESTRATOR

A RIGHT APPROACH TO MANAGE TELCO NETWORKS
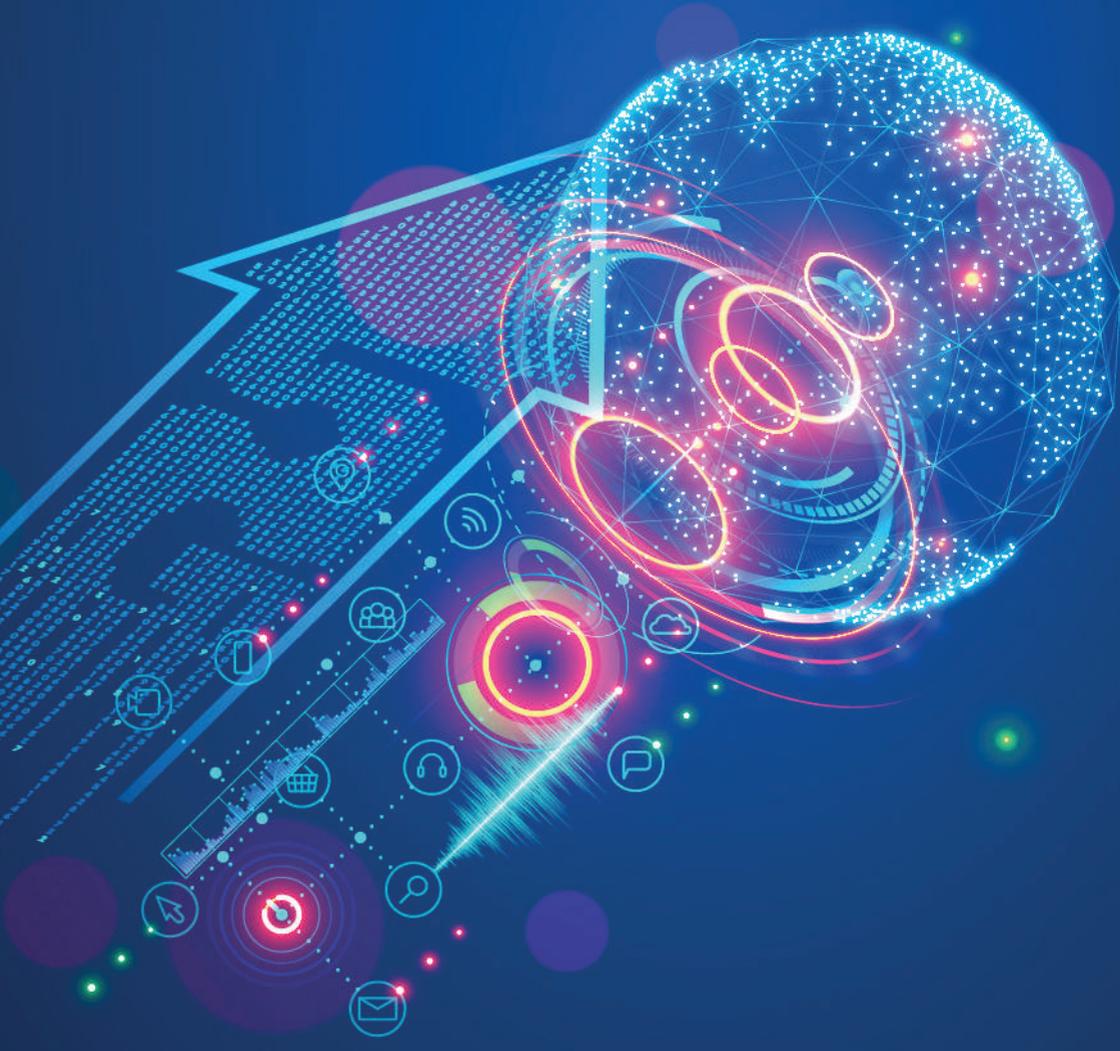
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EXECUTIVE SUMMARY

Telecom networks are evolving to launch 5G services. 5G technology is not only bringing faster throughput over the radio but also changing the eco-system of Telecommunication business. Traditional CSP (Communication Service Provider) business is mostly related to B2C (besides having Corporate and Enterprise customers for their telephony services). The introduction of 5G and IoT services shall bring about major business growth for CSPs through B2B engagements. Network connectivity will be used for more services beyond traditional Voice and Massive Broadband (MBB), such as Connected Vehicle, Public Safety monitoring, Smart Metering, Augmented Reality, Remote Surgery and many more. The network requirement for each of these services is different and it will keep changing based on the needs. This would require On-Demand network capacity provisioning with guaranteed latency and resilience, depending upon the criticality of the services or the applications. Dynamically, CSPs need to provide and build end-to-end network capacity covering Access, Transmission, Core and Applications. The network automation across all layers is the key to implement this capability. Today, CSPs are working on SDN/NFV architecture to achieve network automation and to maximize the usage of network resources. However, most of today's SDN/NFV activities are domain specific – addressing scale-in, scale-out of traffic in a specific domain (mostly in Core network) and more often within the specific Datacenter.

Few CSPs have successfully implemented Core network automation with the help of Network Services Descriptor over Orchestrator. Radio cloud is still in its early implementation phase. Now it is time to discuss Service level orchestration across multiple domains. This paper is an initiative to explain how Altran is going to help CSPs and NEPs to implement Service Orchestrator across the network.

INTRODUCTION

Network and Management Transformation within the CSP industry is at an all-time high. Today the industry landscape is influenced by Transformation and Evolution which are driven by technologies like SDN/NFV, SDWAN, Telco Cloud, Cloud RAN, etc. Using these niche technologies, CSPs aim to run agile and autonomous networks, to deliver enhanced customer experience to the end customers, i.e., B2B or B2B2C.

While the technology is evolving, service providers must manage multi-domain services and orchestrate across seamlessly. However, CSPs must deal with existing physical network functions along with the newly virtualized network services and orchestrate customer demands between existing physical and virtual networks either manually or in a semi-automated way.

The Orchestration within a domain has been addressed by various equipment vendors as well as ETSI (European Telecommunications Standards Institute), as demonstrated below in figure 1. However, the rapidly evolving technologies and services have now posed another challenge of managing customer requests between multiple domains like Core, Access, Transport networks providing end-to-end services in a fully automated way.
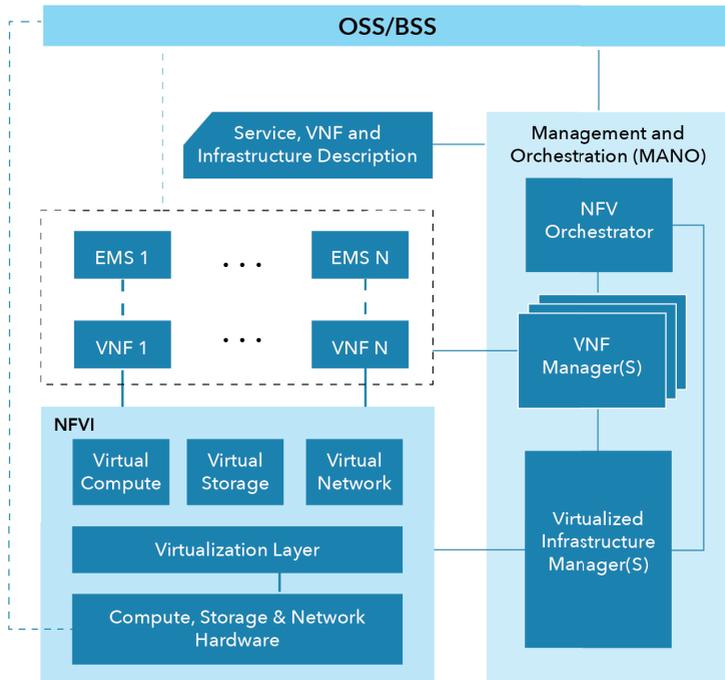
Figure 1: ETSI MANO Architecture[1]

As shown in the above figure, the NFV orchestrator resides close to VNF's implemented largely within a single Datacenter. In reality, the architecture is deployed across multiple Datacenters. The above architecture provided by ETSI has a huge limitation and presents a major gap for the scenario in which there is a need to orchestrate between multiple different domains and vendors.

ETSI addressed the above design issue in the ETSI GR NFV-IFA 028 V3.1.1. As per ETSI, the multi-domain orchestration can be achieved by nesting one of the Domain Orchestrator as a multiple Domain Orchestrator, as demonstrated in below figure 2.

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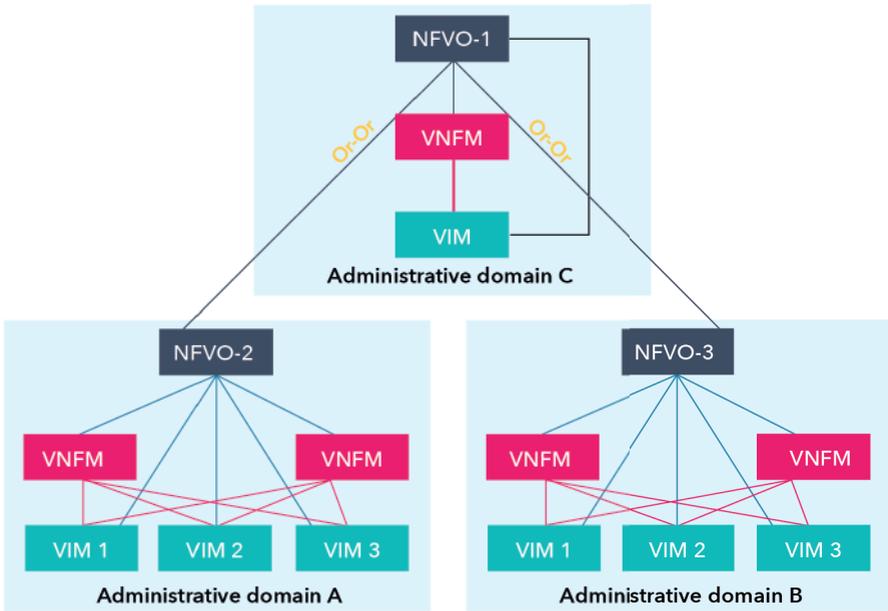
Figure 2: ETSI High Level Multi-Domain Orchestrator Architecture[2]

As shown in the above figure, the Administrative Domain C acts as the multi-domain orchestrator, while Domain A and Domain B NFVO's are integrated with the NFVO of Domain C.

ETSI has addressed the orchestration issue between multiple domains. Meanwhile, based on the old architecture equipment, vendors have already created their own NFVO's which works closely with the existing NFV's and VNFM's. Also, equipment providers today have their method of orchestration using different forms of template descriptors like YAML, XML, JSON, YANG and/or TOSCA modeling languages. As a result, the complexity has increased and created more havoc within the network as service providers want to achieve the solution defined by ETSI.

Most of the service providers have started their own SDN/NFV journey based upon the architecture provided in figure 1. They are now struggling to implement the architecture in figure 2 provided by ETSI due to various challenges, as listed below.

KEY CHALLENGES OF MULTI-DOMAIN ORCHESTRATION

Interoperability Orchestrator – The vendors have come up with their own network orchestration layer or domain orchestration layer with the features being limited to one single domain, e.g., transport, core or radio, with a limited view of the services.

No Standard Interference – Though ETSI has defined the architecture of the multi-domain orchestrator, there is no inter and intra orchestration interfaces being defined or made available by ETSI, leading to Network Equipment Providers (NEPs) supporting their own equipment interfaces and making CSP's dependent on NEPs.

Multi-Tenant challenges – Multi-domain orchestrator provides a way to slice the network into different services like eMBB, NbIoT, mMTC, etc., increasing the network capacity significantly. As a result, service providers are looking forward to providing the service to multiple tenants. There is currently no feature or method defined on how these services can be provided to multiple enterprise customers; the traffic is still segregated.

On Demand Services – The ability to create services based on customer requests by orchestrating multiple domains and dismantle the same on completion of the time window or requested services usage and free the network.

No Standard Templates – ETSI has defined the architecture without defining the data model to realize descriptors like standard templates which can be built using modeling languages.

Self-Healing Services – The main reason for rolling out the service orchestration network is to provide services without any disruption. It should bring in intelligence to predict issues arising within the service in advance prior to its occurrence using zero-touch provisioning and resolution.

While the industry is facing the problem of implementing multi-domain service orchestration, Altran is proposing an approach to achieve the orchestration between multiple domains and multiple vendors to provide undisrupted services to end customers and simplify the management of orchestration.

ALTRAN APPROACH

Altran has decades of experience helping clients around the world to research, deploy, integrate, migrate and support different network elements (Switches, Routers, Transport, etc.). Altran has been helping various NEPs and CSPs to solve multiple challenges arising due to the modernization of the network elements.

As described in the section above, the challenges related to multi-domain orchestration are forming barriers for the service providers in providing robust end-to-end services. While NEPs are trying to collaborate and create a limited view of multi-domain service orchestration and restrict the Service providers' by limiting and bounding them to specific equipment vendors.

As demonstrated in figure 2 and recommended by ETSI, Altran also recommends the use of Domain orchestrator to manage individual domains. Domain orchestrator is managing any issues arising within the network elements and resource management within the specific domain. These deployed Domain orchestrators expose the Open API based Northbound interfaces as described by eTOM and ETSI.

As the Domain orchestrator limits its management services at the domain level and is tightly coupled with a domain, it is important to manage the services end-to-end instead of limiting it to domains only. The Altran approach recommends the deployment of the Service Orchestrator which supports SOA (Service-Oriented Architecture) based architecture and acts as interoperability orchestrator between various domains in a way that they accept the inputs from the consumers for services like eMBB, IoT, etc. We transform the request via the reference design and pass it to respective domains irrespective

of the location of the network element. The services defined within the service orchestrator are generic and can be used again and again.
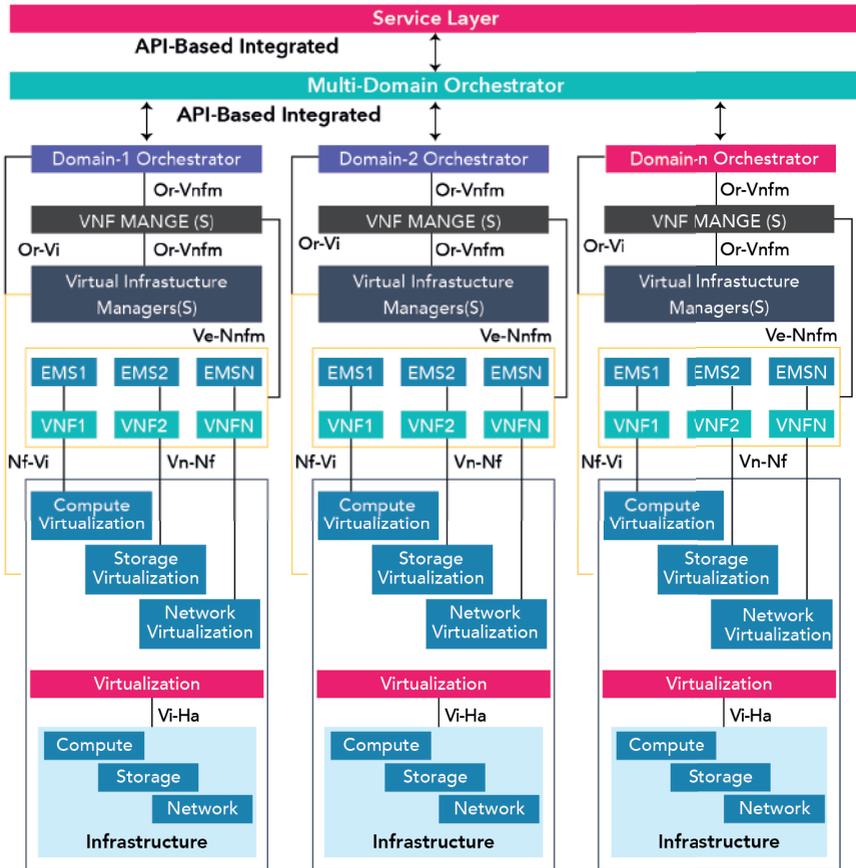
Figure 3 Altran's View of High-level Multi-Domain Service Orchestrator Architecture

The service orchestrator does provide the framework which supports the integration of various domains, but it doesn't provide standardization. Altran provides this support by integrating the Northbound interfaces of domain orchestrator along with Southbound interfaces of the orchestrator services using the Open API defined by eTOM and converting the interface from YAML, YANG, XML, etc., to an understandable format for the service orchestrator and standardize the template with the help of data and service models defined. It is

followed across various domains during the creation or the decommissioning of services.

The templates defined at the service orchestrator level will break the request into the required number of VNF's within each domain along with the number of resources and end-to-end topology to be rolled out. Any additional information required to provision specific VNF by the domain orchestrator will either be auto-generated or hardcoded while translating the services and send to domain orchestrator for provisioning. This provides standardization across the network domains.

By standardizing the templates across domains with the help of data and service model along with integration through Open API, the multitenancy problem is also solved. While defining the data and service model, the Altran approach is to autogenerate the tenant name which is the combination of enterprise customer name and services name, for example (idea_eMBB or idea_IoT). These will be used to define and orchestrate the services across various domains maintaining the integration for services and easily identify the customer-specific tenant.

By solving the problem of multitenancy, we have solved the problem of On-demand services. The important aspect of On-demand service is to understand the capacity of the tenant network and capability to handle and support the request. To fulfil the requested service, the provider will require the performance statistics of the tenant network elements and available capacity which can be extracted using the tenant name. Altran can identify the request using AI/ML algorithms and fulfill them for the short or long term.

The solution of standardization of templates, integration and tenant names make it easier to handle the processes around self-healing. One important aspect as a part of self-healing is continuous performance monitoring. Altran recommends the monitoring of network at every level, i.e., network infrastructure, VNF's and services provided over the VNF's. By standardizing the name of the tenant and services, it would be easier to create the service and tenant.

performance views. Then, Altran recommends the usage of the AI/ML-based algorithms like Random Forest, ARIMA, RNN/ LSTM, etc., to predict the performance of the network services and with the help of service orchestrator, allocate necessary resources to VNF's that are providing services. The combination of the performance stack, service orchestration and AI/ML helps in achieving self-healing networks.
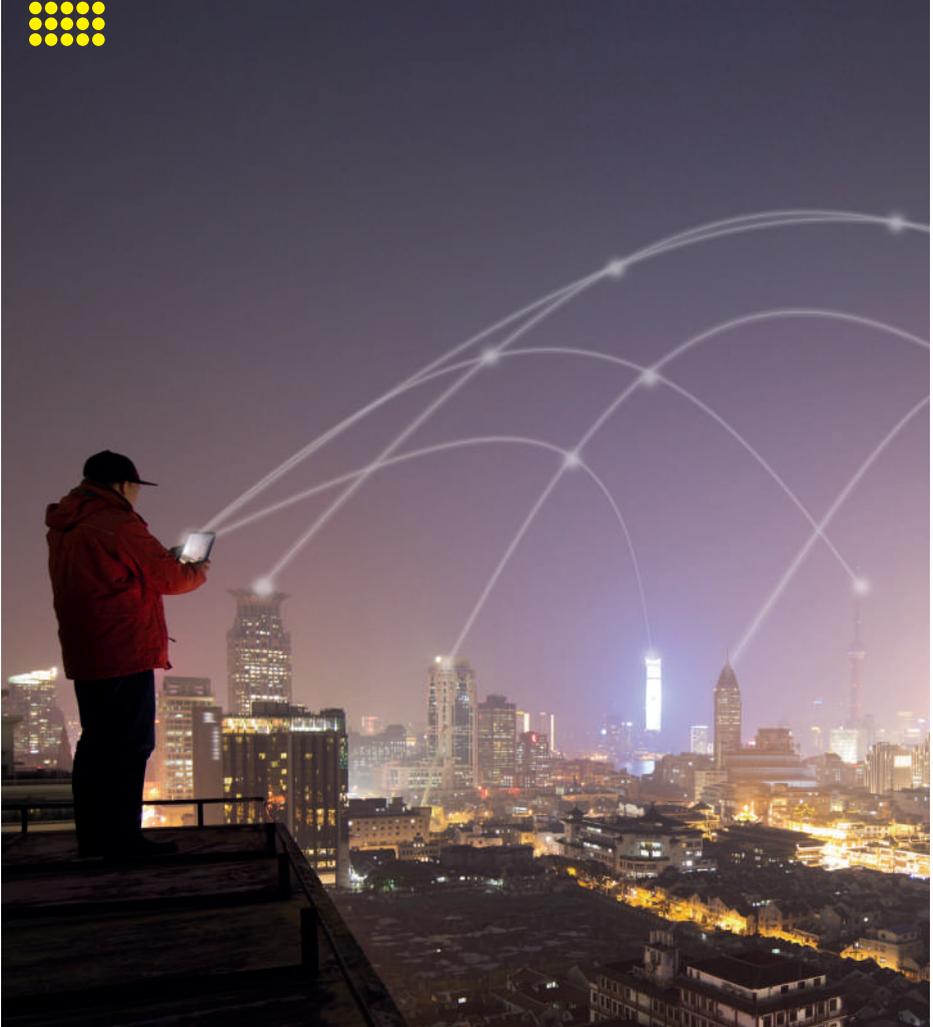
CONCLUSION

It is important to roll out end-to-end multi-domain service orchestrator for efficient management of the evolving networks. The ability to manage and optimize the utilization of the network can be achieved by standardizing the interfaces, service templates and defining the data & service models across the multiple domains. With the help of multi-domain service orchestration combined with Open API and Artificial Intelligence solution based assurance platforms, both multitenancy & on-demand networks can be achieved to provide undisruptive services.

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References

1. https://www.etsi.org/deliver/etsi_gs/NFV-MAN/001_099/001/01.01.01_60/gs_NFV-MAN001v010101p.pdf
2. https://www.etsi.org/deliver/etsi_gr/NFV-IFA/001_099/028/03.01.01_60/gr_NFV-IFA028v030101p.pdf
3. http://www.eurecom.fr/fr/publication/5022/download/comsys-publi-5022_1.pdf7676666

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