

The OSS of the Future

Introduction

As the multi-trillion dollar communications industry looks forward to the fifth generation of mobile technology, seizing the range of growth opportunities attached to 5G demands more than just technology transformation – it demands a “fifth generation” business. This requires a holistic business transformation, encompassing new approaches to strategy and innovation; customer centricity; digital business operations and agility; and the ability to engage in new, multi-sided and platform-based business models.

IT systems, typically referred to as Operations Support Systems (OSS/BSS) hold the key to monetizing these new opportunities at scale, but transformation of these systems is not easy – they run the existing business, and often represent long-term capital investments. As more service providers grapple with the challenges of overhauling their OSS/BSS systems, it is clear that a new and radical approach is needed if CTIOs are to meet their Total Cost of Ownership (TCO) and agility goals. A new generation of systems is needed, embracing state of the art IT technology such as Service Oriented Architectures (SOA) and microservice based approaches, open source, virtualization and cloud architectures.

TM Forum has been at the forefront of transformation in the communications IT industry for over 28 years and has already delivered a suite of highly successful [toolkits](#) and [Open APIs](#) used widely to underpin transformation efforts. As virtualization of existing networks gather pace and planning for 5G begins, the urgency for change in the OSS in particular is clear. We believe now is the time to bring the industry together and set one clear vision for the OSS of the Future, providing a clear target for service providers and suppliers in their transformation journey. In short, we believe it’s time to reimagine how OSS and BSS systems are architected, built, procured and managed.

This whitepaper represents the substantial progress made on this vision to date, and an invitation for members to get involved in the work.

The service provider of the future – flexible and agile

The challenges to the existing business models of communications service providers (CSP) are well documented. Although providers around the world are each pursuing their own strategic response to these challenges, in almost all cases this will be a combination of renewing and refining their existing offers and business models to become ever more competitive, as well as exploring completely new service offerings and the potential for new business models.

5G in particular presents a unique opportunity to exploit new technical capabilities such as massive machine type communications for Internet of Everything (IoE) applications, and ultra low latency technology which opens up opportunities for world changing applications such as self driving cars. The business potential for these has been explored in many [TM Forum research reports](#), and members are collaboratively exploring the opportunities in the [TM Forum Internet of Everything program](#).



A new business model that has received significant attention recently is the concept of platform-based business models or marketplaces, many providers believe a business model along these lines will be required to fully exploit the opportunities presented by 5G and the IoE. Platform business models are explored in some detail in the TM Forum research report [Platforms: how to join the revolution](#) and TM Forum members are collaboratively creating a reference business architecture under the Digital Platform Reference Architecture project.

This combination of refining existing business whilst exploring the new growth opportunities creates a set of key business requirements that the reimagined OSS of the future must meet. In the OSS futures project TM Forum members are developing a shared understanding of those requirements to guide the architecture and design of future systems. The key requirements identified so far can be considered in two broad groups:

Increasing agility by maximizing flexibility

The service provider of the future has been described above as operating a combination of business models, and the expectation is that individual services will themselves be offered in multiple business models. New services will be co-created with customers to fit specific and unique needs. The OSS Futures project is studying the business requirements needed to satisfy this flexibility, for example:

- It is expected that products will be created from service components provided by multiple partners, therefore management information (such as service definition meta-data or usage data) must be capable of being shared across partners in an open and trusted manner
- Pay per use, as-a-Service and outcome-based business models must be supported throughout the ecosystem, so flexible capacity must be matched by flexible licensing models and associated trusted data
- Product Management and service design teams need to be empowered to create new products by having a clear view of the underlying customer facing service capabilities that are available for inclusion in customer products

Increasing agility by minimizing time

Whilst many aspects of time reduction to increase business agility are being studied, one of the most crucial is the time to incorporate new functionality. The communications industry of today works on a timescale where network software is updated only every few months and new functionality requires extensive adaptation and testing. The OSS of the future is expected to work to a very different set of timescales for example:

- It must be possible to confidently onboard new functionality or services with minimal or no adaptation of the new functionality or the existing systems
- Onboarding, testing and verification of new functions or services should be extremely low cost (therefore automated)
- "Release Frequency" the waiting time for a new service to be deployed should be 1 day, and the cost overhead of a release should be reduced through automation
- The Concept to Cash time for a new service should be as short as possible (target 6 months)

Many of these requirements are typical of a DevOps operating paradigm, the operational impacts of which have been extensively explored in the Operations Center of the Future work within the TM Forum Zero Touch Orchestration and Operations Management or [ZOOM project](#).

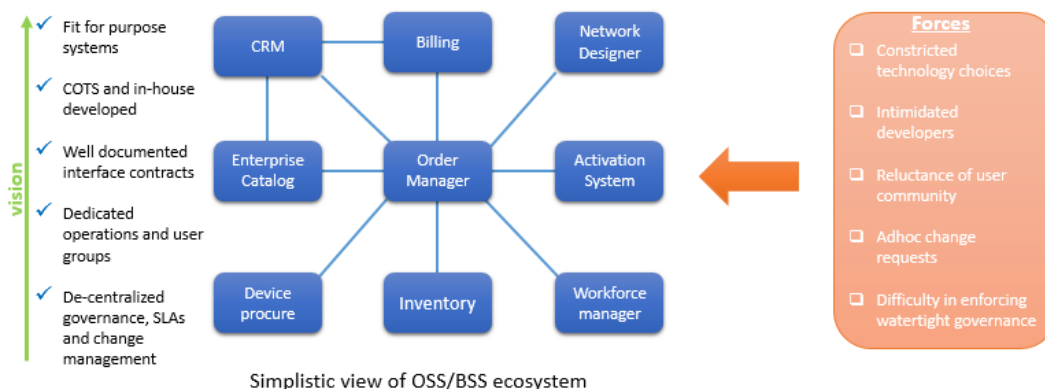
Rethinking the role of the OSS

The term Operations Support System comes from a time when a communications service provider's primary business was the building and operation of a complex telecommunications network. Although the networks were complex, the services offered to customers were relatively few and simple, and the pricing and business models were similarly straightforward. The role of the OSS was to make the operation of the network as efficient and reliable as possible, typically supporting teams responsible for separate aspects of operations.

In today's digital marketplace, we have seen that the business of the service provider is vastly more complex and dynamic, and so the role of the OSS has broadened. It is perhaps more helpful today to think of the role of the OSS as connecting the business systems, customers and partners to the underlying infrastructure that delivers the services. No longer is configuration and provisioning the responsibility of a specialist team, reconfiguration and provisioning will be initiated by many events from many sources, performance data is not just needed by assurance and planning teams, but is essential to a vast number of automated processes.

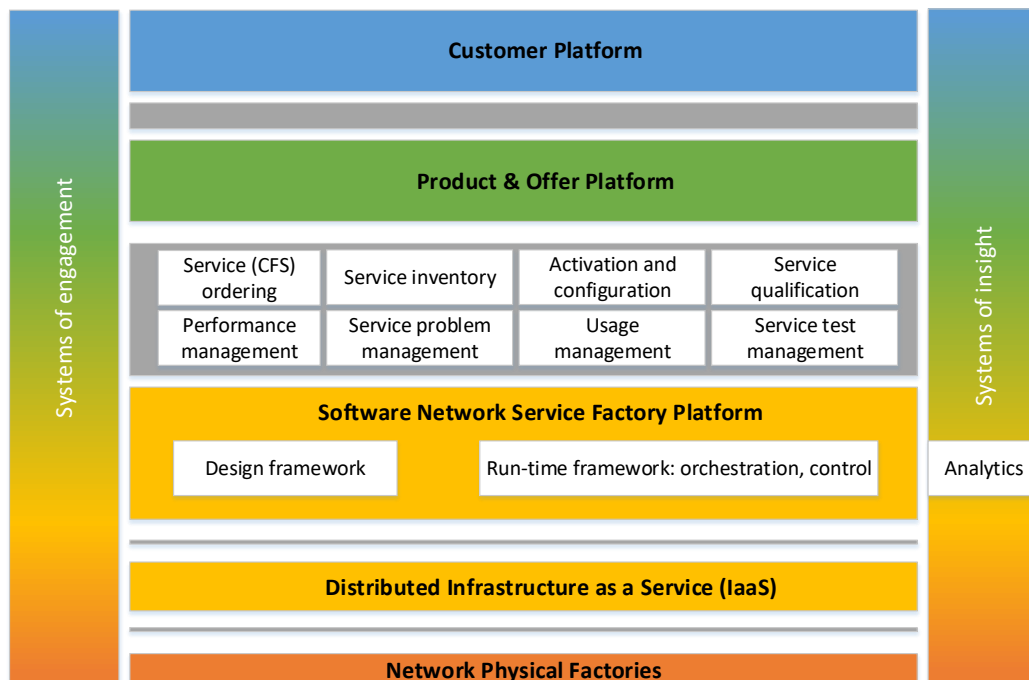
The OSS reimagined - from vertical to horizontal

Most of the OSS systems created until recently typically consist of vertical applications where either commercial of the shelf (COTS) software and custom software would typically provide a tightly integrated application to cover one vertical area of functionality, such as assurance, and these would then be integrated horizontally to enable them to interwork. Whilst there have historically been several clear advantages to this type of architecture, and it was a good match for the general approach to operations, it also has a significant downside: the changes needed to introduce new services are typically slow, expensive and complex. This type of architecture tends to degrade over time as changes occur and agility actually reduces, the precise opposite of what the business demands. This effect is particularly well described in a White Paper by Infosys [Published on the TM Forum website](#)



Source:- Infosys

There is clear agreement today that a horizontal SOA based layered approach to the OSS architecture is better suited to delivering on the business requirements, and far better aligned to the operational mode of today's service providers. However, as described in the Infosys white paper, horizontal layering and a SOA approach alone are not themselves sufficient. The architecture must also display a number of other key characteristics, or obey a number of key principles.



Source :- Orange

The highly simplified layered model shown above was contributed by Orange and can be used to describe some of the key characteristics: It clearly shows how the horizontal layers or platforms are decoupled and how operational processes such as order fulfillment run vertically through the model. The TM Forum OSS futures project has already identified a number of key design principles of such a platform.

Loose coupling of components

- The Inter-dependencies between components of OSS must be minimized with the goal of reducing the risk that changes in one component will require changes in any other component.
- This implies that each component should not be aware of the inner workings of other components

All capabilities exposed by standardized APIs

- Each component of OSS should expose its capabilities through well-defined standardized APIs
- OSS components will only communicate with each other through well-defined standardized APIs
- APIs must be exposed in a secure manner that allows simple connection and policy enforcement enabling them to be exposed to internal and external consumers
- Building on loose coupling and high cohesion APIs should exhibit properties of microservices such as independently deployable, independently scalable, easily replaceable lending themselves to decentralized continuous delivery processes

The TM Forum [Open API program](#) is working with requirements being defined by the TM Forum [ZOOM project's](#) hybrid infrastructure platform team to create a complete set of open APIs to satisfy this design principle.

Policy-driven autonomic support with zero-touch orchestration, network self-healing and self-organization

- Policies will define operations that can be used autonomically by different domain controllers providing activation and remediation functions
- Standardized product to resource facing services, will allow zero-touch orchestration of components exposed over micro-services
- Network self-healing will be a capability of OSS remediation and discrete and composite levels
- Self-organization will be achievable through micro-service orchestration controlled by internal and external agents

Metadata-Driven and Catalogue-Based with self-declared and well-described components

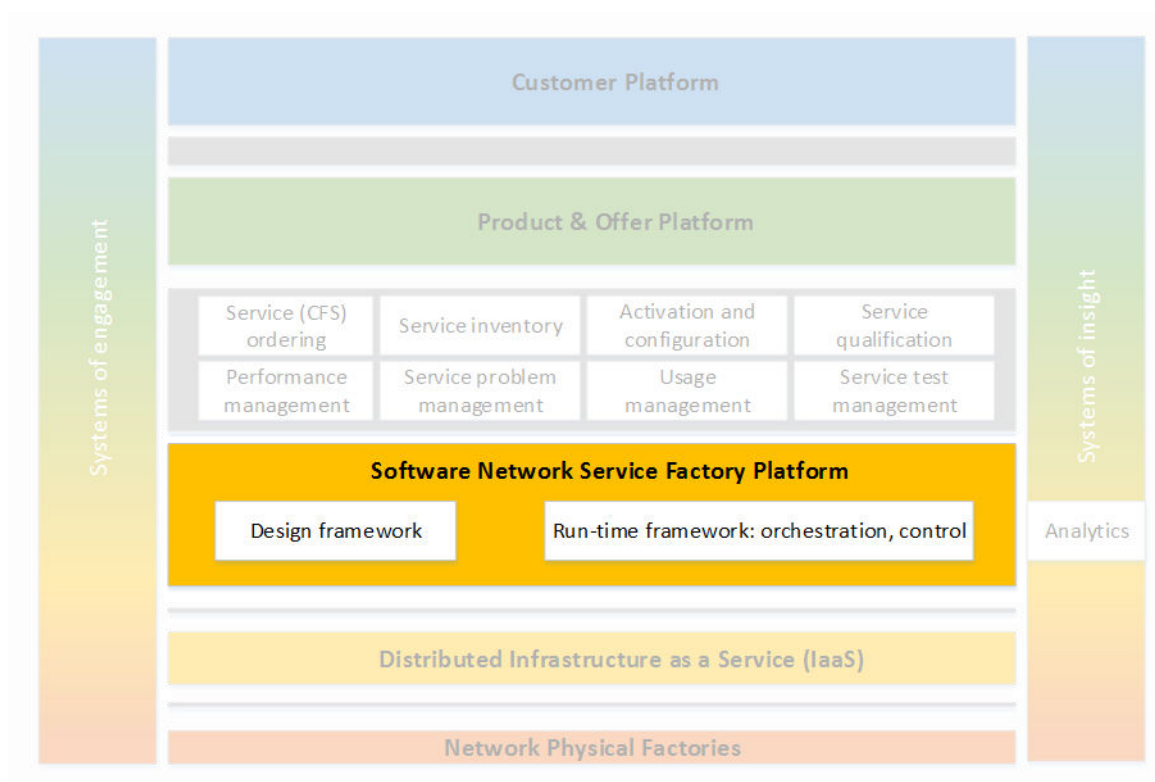
- To support dynamicity of interactions in near real time, both the OSS and service components should expose their information (description, data, dependencies, relationship etc.) through well-defined metadata
- Metadata and its content can be stored in various catalogs, with access rights and other governance functions, catalogue can effectively support multi-stakeholders to use, discover and change the content of the metadata as well as adding metadata extensions (by following the standards) throughout the service/product lifecycle

Detailed studies of many of these principles have already been carried out within the TM Forum [ZOOM project](#), and best practices, technical reports and guides are available within the [Agile OSS toolkit](#). The OSS futures project will continue to develop these principles and focus on how they work together at the highest levels.

The role of Open Source – the network operating system

The importance of Open Source solutions, and the communities that create them, has increased dramatically in recent years in the OSS ecosystem. These Open Source groups are working on areas that typically complement the role of industry forums and standards groups such as TM Forum. This complimentary role is discussed in some detail in a recent [Linux Foundation Whitepaper](#).

Perhaps the highest profile area of Open Source activity in OSS today is in the network service layer of the architecture described above.

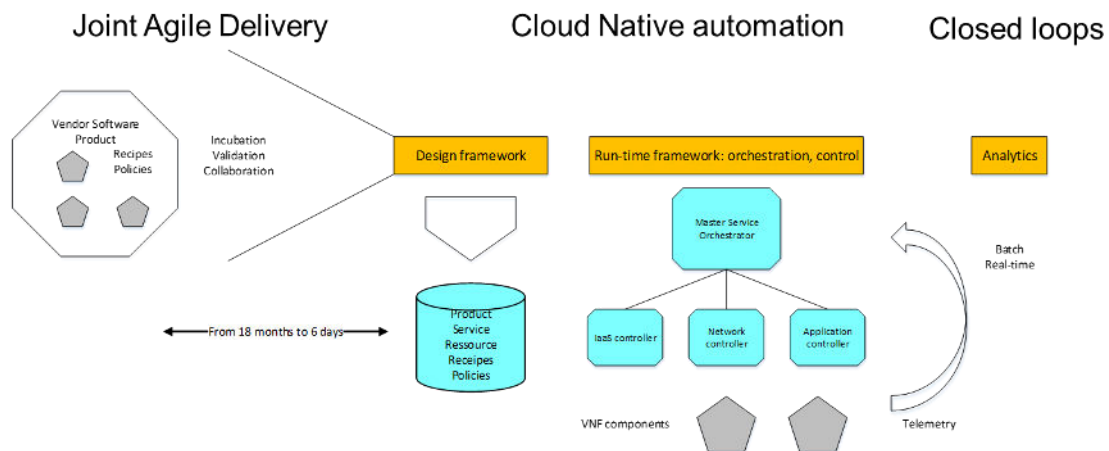


Source :- Orange

The network itself is composed of a large number of virtualized functions, running in a cloud environment. Network services are offered by dynamically configuring and combining these functions together. This concept is often described as Network as a Service or NaaS where a network service that would previously have required the physical interconnection of network infrastructure devices, can now be dynamically created and managed from virtual elements.

The network viewed in this way can be considered as a type of platform architecture, and this concept is explored in detail in the TM Forum document [Hybird Infrastructure Platfrom Blueprint](#) which is being actively developed as part of the [ZOOM project](#).

It can be clearly seen that there is a need for a standards based environment to combine virtual network functions (VNFs) into such a network service platform, and this is the problem that is being addressed by a number of Open Source projects, including Open Source MANO (OSM) and the Open Network Automation Platform (ONAP) projects.



Source:- Orange

These two projects vary in the details of their scope but at the broadest level create an environment which abstracts and effectively isolates the layers above from the complexity of the individual VNFs. Such a solution presents the wider OSS with a consistent set of interfaces to bring new VNFs into the platform, combine them into network services, and then manage those services.

Onboarding – enabling a marketplace for network functionality

Key for service provider's competitiveness will be the ability to bring new network functions from a wide range of vendors into the network service platform. Although this platform is described as a cloud environment above, it must be realized that a VNF is quite unlike a typical enterprise workload being deployed in a conventional cloud environment. A VNF has complex requirements and complex interdependencies with other VNFs. This complexity does not stop at the initial deployment or onboarding phase; it extends throughout the lifecycle. In order for the management of a large number of VNFs from multiple vendors to be efficient this onboarding and lifecycle management must be automated. This is an area which has been explored extensively by a TM Forum catalyst team, which generated significant interest with their presentations at both TM Forum's [Innovation InFocus event](#) and at [TM Forum Live! Asia](#) and will be showcasing their latest work at [TM Forum Live! 2017](#). Key to this work are the concepts of a VNF package, described by a standard vendor and platform independent metamodel that provides all the information needed for lifecycle management.

Modelling the OSS of the future with Frameworkx

The need for a standardized information model is as great or greater than it has ever been, and the [TM Forum Information Framework \(SID\)](#) is continually being refined to model the new concepts required for virtualized and hybrid networks. [The Business Process Framework \(eTOM\)](#) is being extended to better model DevOps practices through work in the ZOOM team but has been clearly demonstrated to model the processes that the OSS of the future will need to support. In their book [Reference Architecture for the Telecommunications Industry](#), Christian Czarnecki and Christian Dietze show how the Business Process Framework can be used as a key tool in transforming to an agile digital business.

The biggest area of development is the [Application Framework \(TAM\)](#), which was originally developed to model a vertically architected OSS. With the move to a services based

architecture then a functional model, which describes the functions of components as exposed by APIs, is a better modeling paradigm. The TM Forum will create a major evolution on the TAM, and it may be that the Process Framework is the top level view of this model, with processes being executed vertically by chaining functions in the horizontal layers. Work is going on within the TM Forum [Core Framework Project](#) to develop such a functional model. Mappings between this model and the legacy application view are expected to be highly valuable in migration projects.

The TM Forum OSS Futures project

Many of the principles described in this document have already been explored in detail through the ongoing work of the TM Forum [Open API program](#), and the TM Forum [ZOOM project](#). The OSS Futures project is looking to augment this by creating an overall vision and set of principles that can be used by service providers to guide the transformation and design of their future OSS solutions. The initial phase is working with a range of tier 1 providers around the globe to capture a clear vision and set of requirements, and drive consensus whilst in parallel consulting with solution providers (vendors and systems integrators). In the next phase the solution providers will join the project so that their knowledge and experience can accelerate the development of common, practical solutions that can be deployed in complex multi vendor environments.

Over the next few months, we plan to launch a series of new exploratory Catalyst projects to better understand and showcase the practical challenges of realizing this new vision, and in parallel publish a clear set of requirements with global CSP consensus by September this year. Following this, we will move into the execution of the next phase at our September 2017 collaboration event [Team Action Week](#), in Vancouver.

As always we welcome all TM Forum members to contribute to this project and shape the vision for the IT systems that will power the heart of Digital Service Provider (DSP) businesses for the next decade.