Leveraging 5G-ready inventory for DSP transformation

The next generation digital OSS will need to be agile, near real-time, predictive, service-aware and self-organized, and enable management of hybrid networks, demanding a revisit in the way inventory solutions need to be imagined to be future-ready.

In today's world of digital service providers where everything is here and now, service providers are grappling to get their OSS transformed as they embrace 5G, IoT, SDN, NFV and cloud at a time when customer and experience are at the center stage. There is still more to be done in the preparation of next-generation OSS and there is a dire need to revisit core foundational capabilities. It is imperative that inventory demands a specific mention and focus here.

Inventory too, has traditionally been network domains centric and siloed with minimal effort to transform though there has been a consistent push and need to realize end-to-end service management. It has never been more important for CSPs as they are getting their strategies and act together in an effort to transform to being a DSP. In the DSP world, you need the capability to build and decompose new services in near real-time riding on top of a hybrid network. Inventory, therefore, needs to be truly active, adaptive and federated to enable this at a minimum level.

In the 5G world, the expectations of the users of new age digital services will not be limited to providing a communication link between demarcation points. Instead, the expectation is that the services provided by DSPs are intermingled with the core businesses. This will mean that if a DSP is providing an end-to-end service, it should collaborate with the co-system enjoying the service. This would require DSP inventories to have the capability to understand and link to ecosystem resources.

In order to make the best use of this opportunity, CSPs have to ensure that their OSS/BSS solutions are not a bottleneck but further enhance the capabilities, and make them readily and cost-efficiently available to a variety of traditional and new type of customers that 5G will usher in.

Role of inventory in the DSP world

Traditionally, CSPs have been facing multiple issues with inventory management. Not being in sync with the ground reality, domain-specific siloed inventories, non-standardized interfaces, varying customer interfaces, multiple inventories due to mergers and acquisitions (and the associated license fee and workforce) are some of the key issues being faced by CSPs. CSPs have been exploring various techniques and tools for consolidating inventories, and have been grappling with the federation of inventory (where the existing inventory information is rolled up), with varying degrees of success.

This situation has adversely affected some of the key telecom processes like Order-to-Active (O2A) & Trouble-to-Resolve (T2R) which rely on a single source of truth for effective and efficient realization of services. This is true, more so now, in the current context where customer and service experience are at the focal point of DSP transformation.

The emphasis should be on going beyond just the federation of multiple, underlying siloed inventory systems and engraining the ability to decompose the traditional tightly coupled data-business logic-visualization capabilities to loosely coupled independent functions. This will enable future proofing as well as transformation of underlying data with no visible impact on user journeys. This will have to be augmented with machine learning capabilities that offer intelligent and transparent updates of changes in real-time to networks in the hybrid world and support truly active and adaptive minimum inventory with comprehensive audit trails.

This will further need to be enhanced with dynamic and real-time topology models, considering the complexity and dynamic nature of the future network, infrastructure and services riding on them. Some of the other consumers of this capability would be

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automation, self-healing, network optimization, customer behavior analysis, service experience, service anomalies and usage patterns to name a few in the world of unlimited possibilities in DSP era.

Need for inventory federation

With service providers moving toward new generation services and resources, it is equally important that the network inventory systems scale up to the demands as dictated by the modern day OSS. However, service providers today are facing the daunting task of managing multiple inventory solutions where the service and resource information is managed across disparate systems. As a result, it is causing huge delays in introducing new offerings besides imposing operational constraints.

While a unified single source of truth is the end objective of any network inventory solution, it doesn't make financial sense to look at a full-scale transformation from the ground up as it's not financially viable and instead sunset them over a period of time. This is addressed through data federation as a viable and necessary first step in modernizing the OSS as compared to complete replacement of the existing siloed solution in a single go. This enables disparate legacy inventory systems to collaborate in resolving the end-to-end business issues while presenting a common user experience.

The diagram below illustrates the different stages in achieving the end state of unified inventory system starting from inventory federation to complete data migration and network reconciliation.

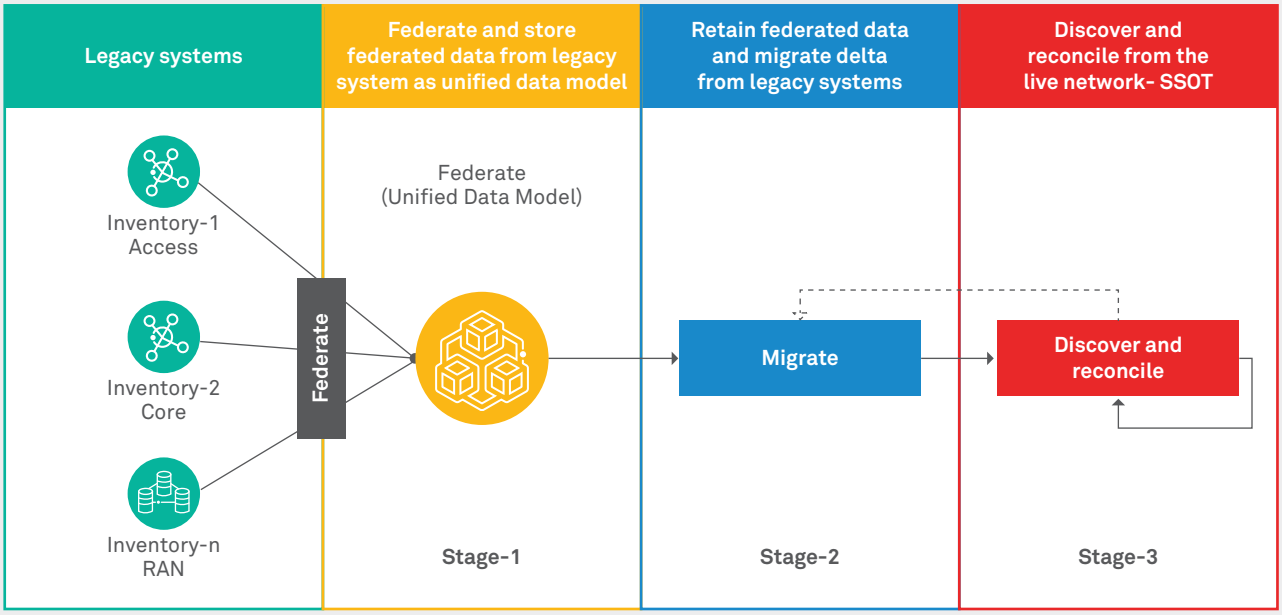

Figure 1: Approach to inventory federation

From the inventory federation point of view, the complexity in terms of rendering end-to-end view, how data is fetched and processed from the underlying legacy systems is completely abstracted from the end users.

To play a role of an inventory federation, it is important that the inventory solution should have:

- Capabilities to provide views encompassing physical, virtual and logical (services) layers of network configurations and resources
- Bidirectional integration for real-time reference of legacy data and synchronization

In the short term, inventory federation offers the following advantages:

- Improved time-to-market of new service offerings as existing systems are leveraged through federation framework
- End-to-end service stitching and view across multiple technology domains, such as, services view across access and the core
- Improved service assurance functions for alarm enrichment and root cause analysis (RCA)
- Unified and common user experience layer for multi-technology domain

Some examples of inventory federation

The below image is an illustration of how the network inventory can be federated from multiple legacy systems, each mastering a particular network technology.

In the below scenario, the federated inventory can interact with the underlying inventory-1 and inventory-2 using the APIs to fulfill the port allocation and configuration as part of the "design and assign" function.

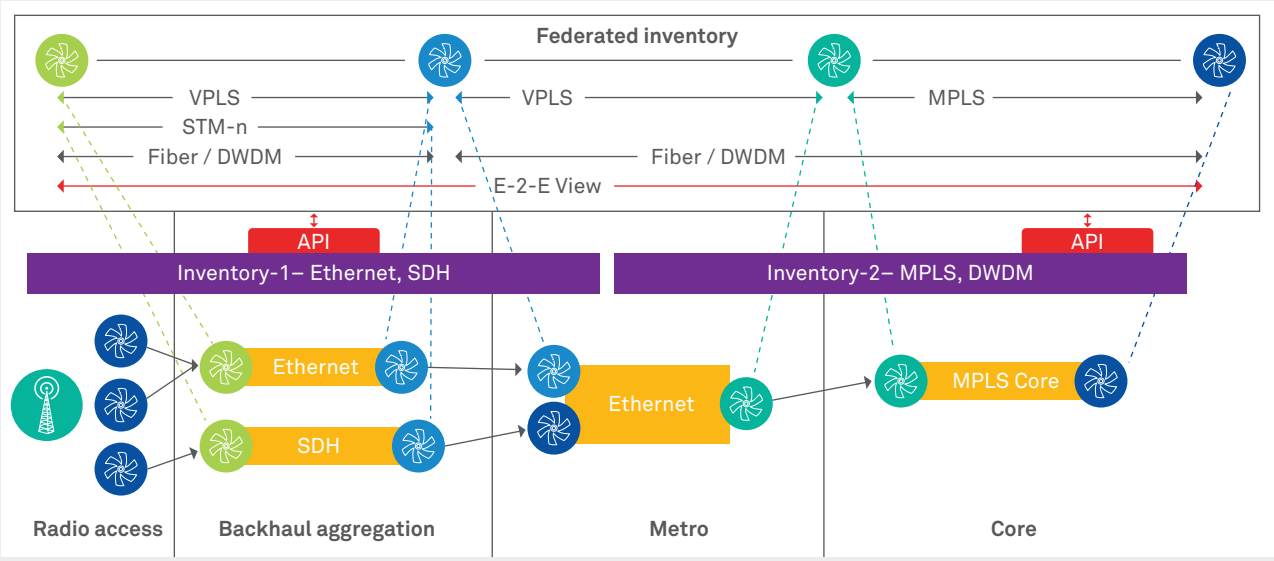

Figure 2: Sample inventory federated view

To meet the immediate requirements, federation is the preferred approach over data migration for the following reasons:

- Data migration is a time-consuming affair and combined with poor data quality/integrity in the respective siloed inventory, it can derail the entire migration program
- Migration of existing inventory functionality to new platform can cause unacceptable time delays. Hence, it is important that the key functions are still leveraged from the existing systems
- Re-alignment can cause disruption of BAU functions. Hence, retiring all the legacy systems at one go is not desired

Inventory federation and beyond

Two key characteristics that we see of the CSP world as a general phenomenon is the moving

away from best efforts to providing end-to-end transparent, guaranteed communication across technology and CSP boundaries. The other characteristic which is subtler and internal-facing is that of the advent of transient entities, (e.g. network slicing, virtual Network function, network service), which can be virtualized or logical entities put together in a short time. This enables CSPs to not only be highly flexible but also be efficient.

Cost efficiency will be a major criterion for 5G market expansion and it is imperative that to be able to succeed, CSPs find answers to this challenge. This will only be possible when they invest in capabilities that offer visibility of resources across technology and network domains at their disposal in real-time as well as near real-time. Hence, inventory solution will play a pivotal role in offering this capability in the new world of hybrid networks for realization of new-age digital services in addition to an opportunity to break out of the current financial situation through right capex and opex planning.

The logical answer to the above is to have a single source of truth with real-time federation across domains, technologies and an enabler for service analytics, 5G, and IoT, among others.

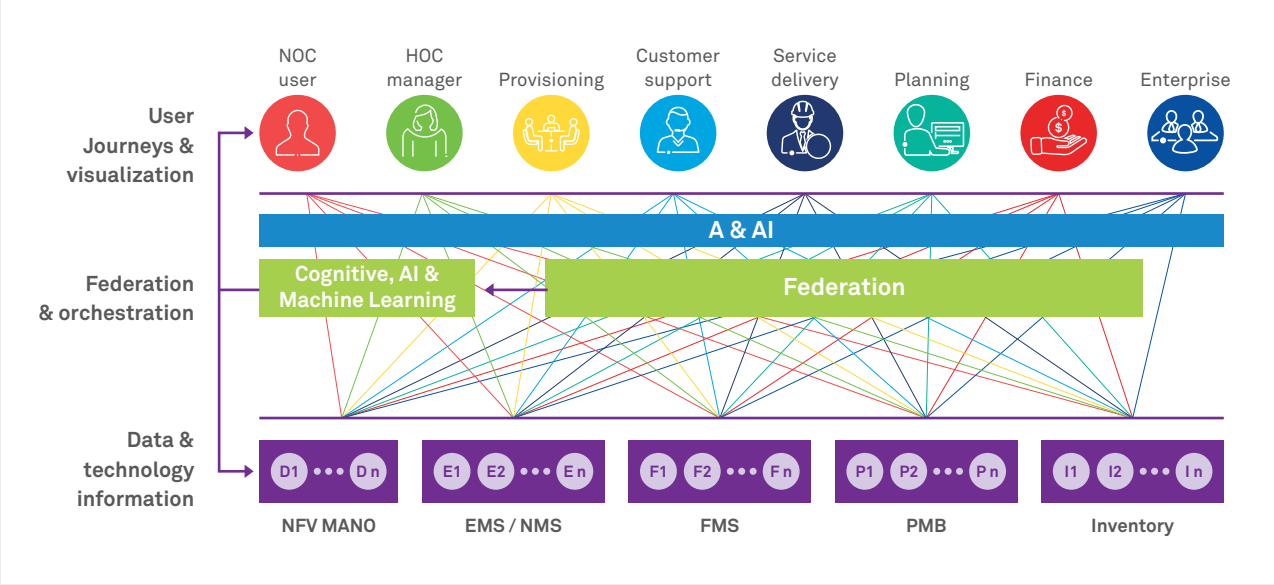

Figure 3: Single source of truth with real-time federation

These techniques do allow CSPs to solve some of the problems like getting an end-to-end view of the resources, single point of control, reduction in license and workforce cost over time. However, CSPs will again need to reinvest on inventory management unless they have a clear vision of future requirements on inventory to enable the 5G market opportunities. Both approaches viz. replacement with a consolidated tool and federation of existing systems need to look beyond solving current issues and focus on future needs.

Beyond federation, it is of paramount importance that the inventory provides a real-time view of available resources, services and their relationships as demanded by next-generation hybrid networks having both physical and virtual layers. By having real-time views, the surrounding systems like service assurance are aided to carry out impact and root cause analysis on the virtualized networks and take necessary remediation through closed loop automation. Hence, any inventory that provides federation capabilities should be “active” in nature where the dynamic changes in the virtualized networks in terms of scale in/out of VNFs and service path changes are captured and updated in real-time, thereby maintaining a live topology.

The below diagram represents a holistic view of the digital OSS, with active and available inventory being at the center, catering to both assurance and fulfilment needs.

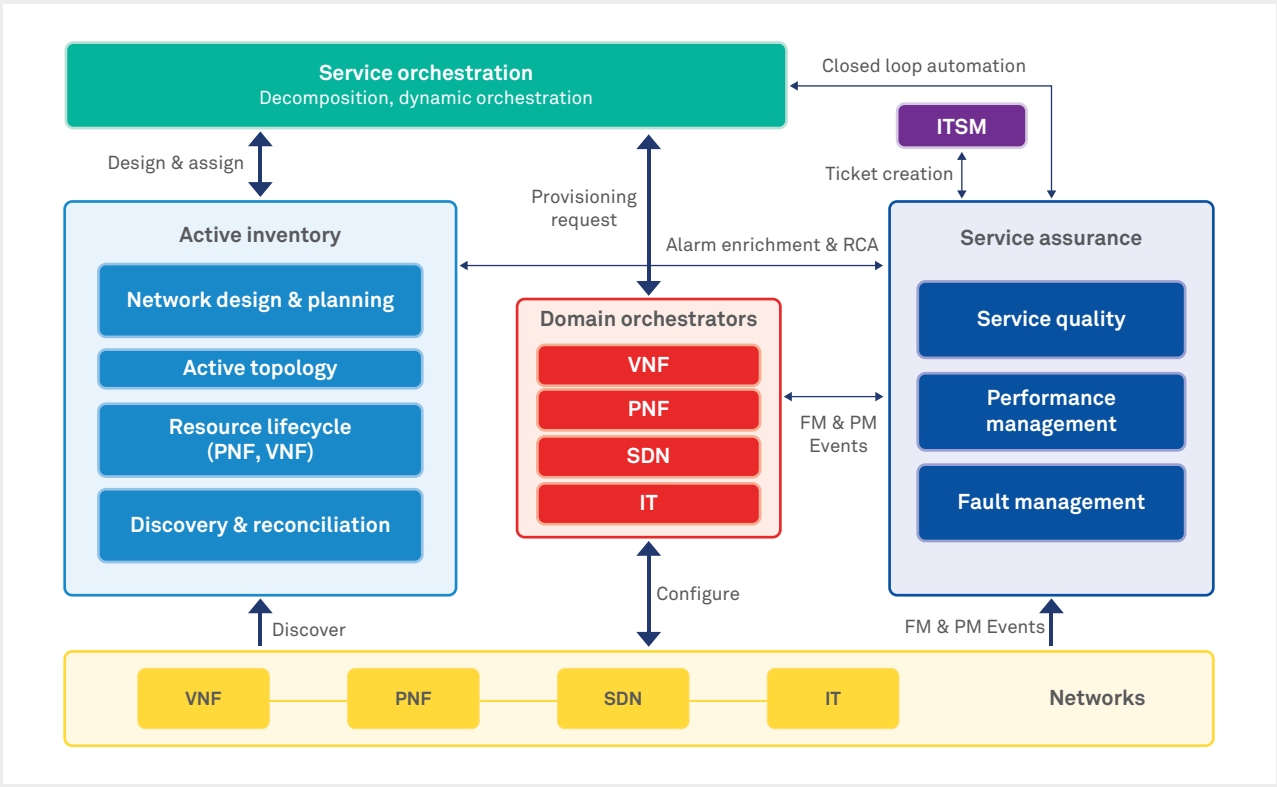

Figure 4: Active inventory role in the overall OSS architecture

Next-gen inventory - Key characteristics

The next-gen inventory management must not only address legacy problems but also be the enabler of new markets and business designs. Below are some of the key characteristics they need to exhibit.

Universal integration

Solution must integrate with a variety of legacy and new inventory tools, networks etc. including ability to maintain inventory of virtual networks, and logical networks like network slices. This would require the tool to not only have the information across the system but also be able to have the latest status on availability.

Multi-layered abstraction

The client base of CSPs are changing and there will be varied sets of clients and partnerships requiring resource allocation and control at different levels of abstraction. Also, the entities at different layers may be shared across customers and transiently associated for specific purposes. Future IM systems must operate at different levels of abstraction network element, subnet, network, service layers etc., with the ability to propagate information across layers. It should be possible to add new layers of abstraction and correlation rules dynamically.

Just-in-time stitching

Real world constraints of resource availability and cost efficiency dictate the need for just-in-time deployment and creation of virtual and logical entities. The IM system must support the ability to create transient networking components (like network slice) by stitching together existing components. Besides designing and stitching together a communication path, IM systems should ensure that the resources are used optimally both in the short term as well as long term. Automated solutions for stitching based on intent is highly desirable.

Slicing and dicing

We are rapidly moving toward a shared economy and telecom technologies like NFV, SDN, network slicing, etc. enable telecom resources to be sliced and diced in myriad ways. The IM systems should support new ways of slicing and dicing of entities and dynamically combine them together. It should be possible to propagate

status across the slices and newly formed entities.

Predictive analytics

In a resource-constrained environment where the time period of services offered can vastly differ, allocation of resources is both a tactical and strategic decision. Historic information and resource usage pattern and inputs on probable future needs should be intelligently analyzed to provide inputs for optimized allocations. Latest AI and analytics techniques can significantly improve resource utilization and drive costs downward which, in turn, can trigger penetration into new markets.

Uniform operations

As the types of resource entities, whether fundamental or derived, increases, it becomes difficult to manage variability. The IM system should allow users to uniformly access resource information and control their allocation as far as possible. Similarly, it should be possible to implement a uniform process in a majority of the cases. This will also enable more consistent behavior.

Real-time enrichment

In the practical world, telecom resources do not exist in isolation and their behaviors might be influenced by external factors like humidity, pollution, vibration etc. Similarly, entities might be going through performance or faults, which should be considered for just-in-time allocation. Hence, the need to support enrichment of inventory information with factual and predictive information. Subsequently, this information is leveraged for making allocation decisions.

Industry standard interfaces

We live in a connected world where value of a function is multiplied by its ability to work with other functions. Future IM systems should not only have a great user interface but also ensure other functionalities can be easily interconnected. Also, automation requirements dictate the need for electronic interfaces. Standards based open API interfaces will reduce integration tax and promote automation.

Conclusion

Inventory management will play a vital role as 5G and associated technologies are rolled out with service and customer experience at the core. It is advisable to look beyond current problems associated with inventory and instead look at it as an enabler of service analytics and new market opportunities that the 5G market could create.

This will not only safeguard the investments that have to be made through this journey but also, in the near future, provide the added advantage over competition. While it is not necessary that a solution will have all the above features available off the shelf, it is advisable to have a clear roadmap for incorporating these capabilities in line with market opportunities.

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