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Why hyperautomation is key to driving value from 5G SA

Introduction

While 5G is a commonly used term globally, to date its realization lies in the RAN layer, with little change to the operator's mobile core or related systems. Consequently, the main value has been largely limited to faster speeds. In itself this will not justify the huge investments made in spectrum and network upgrades. In order to drive more value, the next step in the 5G journey is the evolution to 5G Standalone (5G SA). This will enable operators to start leveraging enhanced network capabilities such as slicing, edge, ultra-low latency, API exposure and more to utilize the 5G network in a dynamic and differentiated mode of operation.

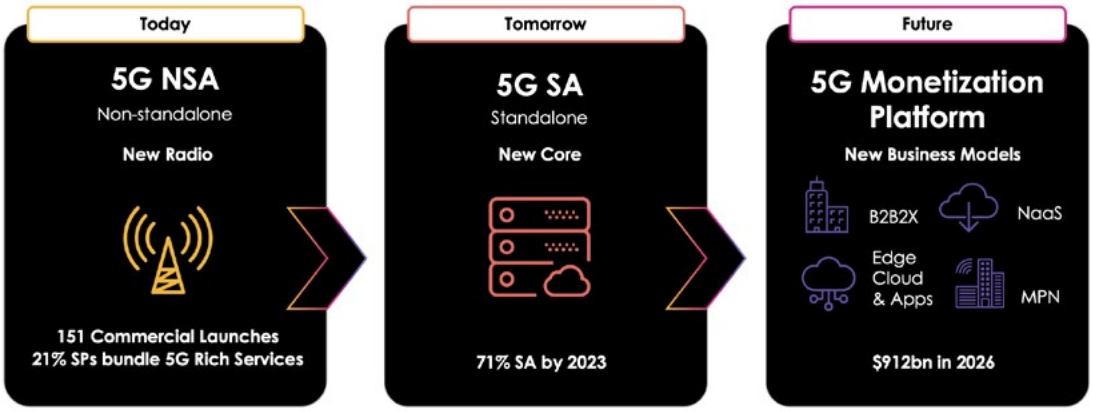

Fig. 1: Network evolution

The long-term vision is 'platformization' of the network, enabling business-driven utilization of network, edge and cloud resources to drive a whole new world of innovative applications and services.

But how do you get there?

The journey to 5G SA automation

As mentioned, the first step lies in network upgrade. Most operators are already in the process of rolling out the new RAN. Many are also exploring edge strategies, such as roll-out options and various models of collaboration with hyperscalers, whilst at the same time discussion is growing on how to collaborate with and leverage the assets of public cloud providers.

Turning to the 5G mobile core, a handful of operators have now launched 5G Standalone cores – but even there the promised 5G benefits are not yet materializing. In parallel with upgrades to the core, many operators are at various stages of exploring 5G slicing, working on PoCs, trials and 5G labs to investigate new use cases, business models and modes of operation to enable and monetize new slice-based services.

Against this background a clear and compelling fact is emerging: the need for hyperautomation. The complexities and dynamic nature of 5G SA and 5G slicing require automation between business requirements and the underlying network, as well as the extension of automation right across the network. This is vital if service providers are to successfully introduce and monetize a wide array of innovative and differentiated services for consumers (B2C), enterprises (B2B) and a broad partner ecosystem (B2B2X).

And yes, it is indeed a journey and one that it is vital to navigate successfully as the new network and use cases are rolled-out and continue to evolve as the ecosystem matures.

Listed below are the major focus areas driving enhanced automation requirements for the 5G Standalone era:

- 5G Core Orchestration
- 5G Edge Orchestration
- vRAN/ORAN Orchestration
- Cloud and beyond
- E2E Slice Orchestration

5G Core Orchestration

Operators are defined by how customers experience their services. The ability to create services that respond to market demand, or that stimulate and enable new applications, is one of the important ways in which operators can leverage 5G to serve their customers better. A 5G SA network with a 5G Core is a necessity for advanced service types such as edge applications, network slicing and mission-critical Internet of Things (IoT). This makes the 5G Core more than just a connectivity layer, albeit a critical one; it is also fundamental to future service creation in operator networks.

The 5G Core encompasses a large number of cloud native functions (NFs) which work together to power new 5G functionalities and operating models. The core can be distributed, with some NFs sitting in the public cloud, some in private cloud (operators' data centers) and some potentially deployed at various edge locations. A classic example is a user plane function (UPF) deployed at an enterprise edge to enable local breakout of traffic.

Furthermore, many operators will deploy a 5G Core from multiple vendors, each supplying closely related groups of NFs to enhance network resiliency, increase operational agility and enable faster service innovation. Heavy Reading's 5G Core Operator Survey, published in April 2021, identified a strong appetite among respondents to use a multi-vendor strategy for the 5G Core. 51% of operator respondents say their company is "likely to use two or three vendors to assemble a 5G Core". A further 17% are "likely to use multiple vendors to create a best-of-breed 5G core," which means an overall majority is in favor of using diverse 5G core suppliers.

A multi-vendor core can decouple service creation from connectivity and allow operators to source the best, independent suppliers to support different service types and integrate with external applications using service exposure APIs. Multi-vendor, distributed 5G core architecture will significantly increase the complexity of operators' service & network operations, as well as introducing the need for a vendor-agnostic 5G core domain orchestration.

The 5G core domain orchestration solution automates the full lifecycle of core services, core network slice subnets and network services (VNFs/CNFs) from onboarding and design to deployment, assurance and optimization by combining service and network resources orchestration with critical, real-time active network resource inventory.

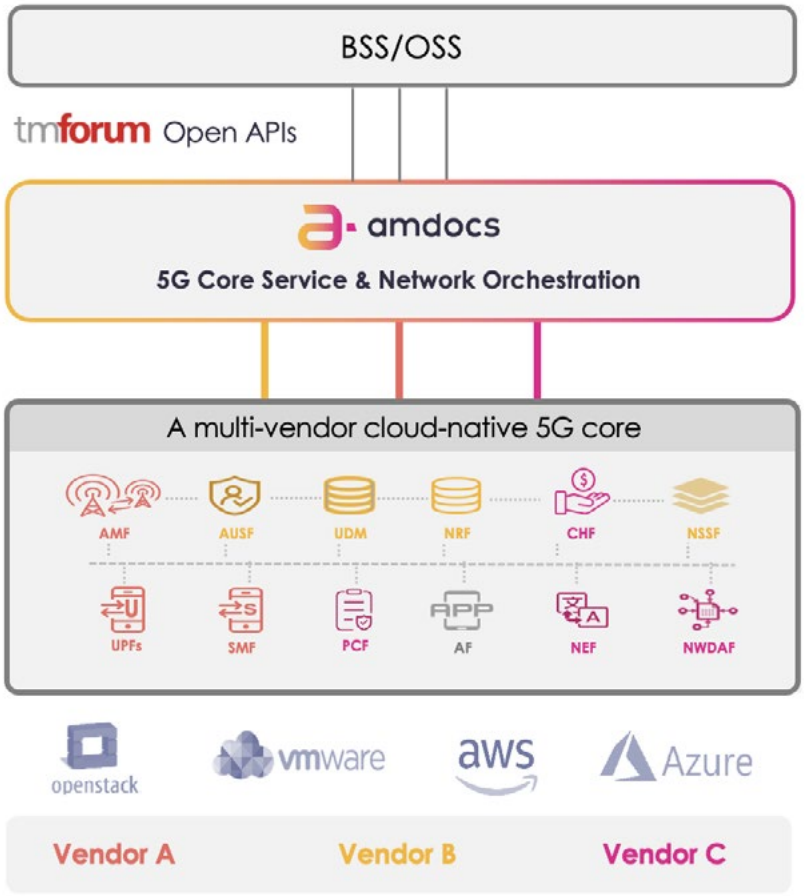

Fig. 2: 5G Core Orchestration

5G Edge Orchestration

A key benefit of the new 5G ecosystem is emerging at the edge. While 5G is not a prerequisite of edge, the dynamic, distributed, multi-vendor operating model of 5G promises to maximize edge benefits. There can be various tiers of edges to be utilized according to specific operational and business requirements. Automation will be required both to manage the edge allocated resources, and to deploy various applications to the edges where they need to be instantiated and scaling them according to real-time and even predicted load.

Edge platforms are resource-constrained compared to other network domains and cloud environments. This mean that the resources of the edge infrastructure must be efficiently utilized to ensure that the expected performance of edge applications is achieved. At the same time, operators will be utilizing multiple infrastructures and environments for their edge platform.

To successfully operate and deliver edge services, operators will need an Edge domain orchestrator that plays a central role as it has visibility over the resources and capabilities of the entire Multi-access Edge Computing (MEC) system. The Edge domain (MEC) orchestrator is involved in choosing the proper resources for an application, enabling it to operate with the required throughput, latency, redundancy, diversity and so on. Automatic workload placement is critical for large-scale deployments. In terms of automation and workload placement, such a solution needs insight into physical resources, cloud platforms, NFs and services.

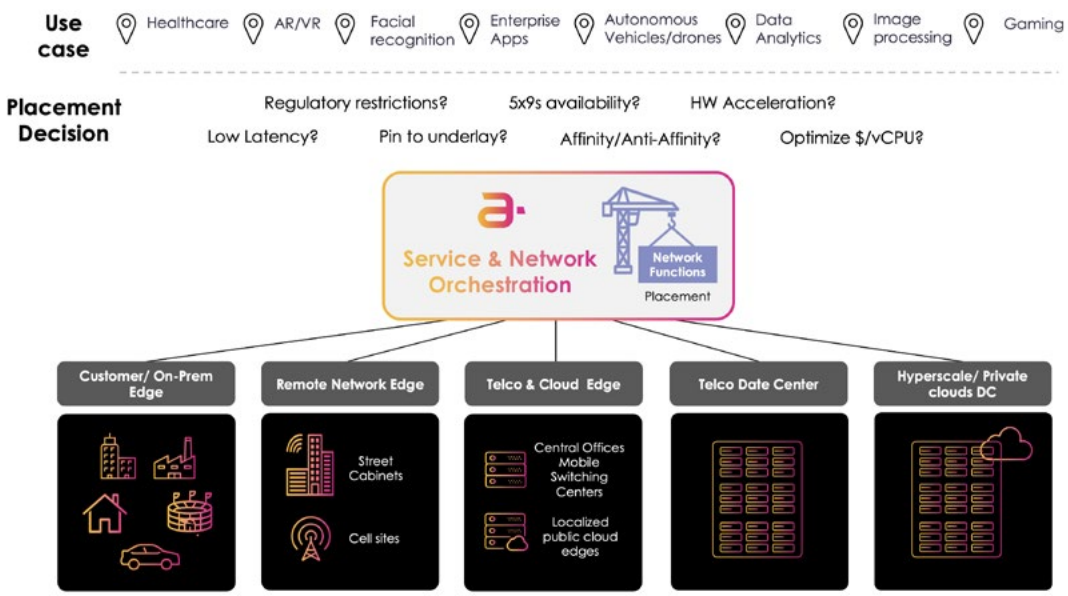

Fig. 3: 5G Edge Orchestration

vRAN/ORAN Orchestration

Another key emerging technology lies at the radio level. With vRAN, the only physical element remaining will be the actual antenna (RU) with all other elements implemented as software. As such these can be orchestrated, deployed, scaled and utilized as needed. A key benefit lies in dynamic control and optimization of the RAN elements and resources in the form of the RAN Intelligent Controller (RIC). This enables automation to get all the way down to the device level.

To achieve this level of automation, the Open RAN Alliance (O-RAN) defines technical specifications and interfaces related to the RAN's service management and orchestration (SMO) framework. The SMO platform is an automation platform for Open RAN radio resources. Hierarchically, it is a component of the operational support system (OSS) and is viewed as a RAN domain controller. The O-RAN defined SMO includes:

- A design environment for rapid application development
- A common data collection platform for management of RAN data as well as mediation for O1, O2 and A1 interfaces
- Support for licensing, access control and AI/ML lifecycle management, together with legacy north-bound interfaces (NBI)
- Existing OSS functions such as service orchestration, inventory and topology, and policy control

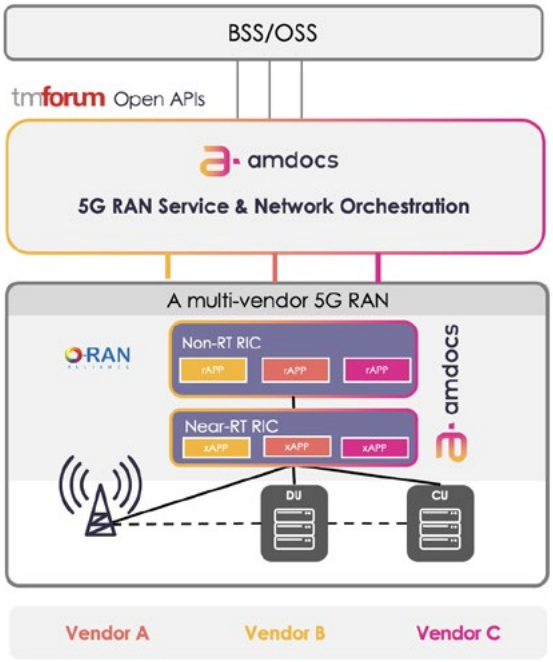

Fig. 4: 5G RAN Orchestration

Cloud and beyond

As mentioned above, collaboration with public cloud providers will be an essential part of 5G SA. As such, any service & network automation and orchestration solutions for operators will need to support the deployment of NFs, services or various applications on public clouds (or in edge extensions of the public cloud providers), enabling service providers to operate their services utilizing a multi-vendor-based hybrid telco cloud infrastructure.

When exploring global services, automation will have to extend between operators (either directly or through public cloud providers) as well supporting services end-to-end. This will require collaboration and well-defined interfaces and protocols to support the automation.

E2E Slice Orchestration

When it comes to monetizing 5G, most operators are investigating the possibilities of network slicing. While initially operators may only be exploring the idea of a small number of fixed network slices with pre-defined parameters to address a particular group of application requirements (starting with well-known trio of eMBB, URLLC and mMTC), over time network slicing is likely to evolve to a scenario where a larger, more diverse number of slices are designed to support more specific business needs. The end goal is frequently envisioned in the form of 'Network Slice as a Service' where an enterprise or partner may order a specific slice according to defined business parameters – potentially even paying per usage in an on-demand model – much like the way they are used to interacting with public cloud providers today.

5G network slicing enables service providers to move away from the rigid 'one size fits all' business model to offer differentiated connectivity services such as ultra-low latency and massive IoT services with varying network performance characteristics. To deliver on this promise, service providers need an end-to-end network slice orchestration and operations solution that can create, provision and manage the end-to-end lifecycle of network slices spanning the RAN, edge, transport and core network domains.

An end-to-end network slice orchestrator will monitor the performance of each individual network slice. It will ensure that each one meets its SLA by triggering the underlying domain controllers to make corrective actions to resolve service degradation.

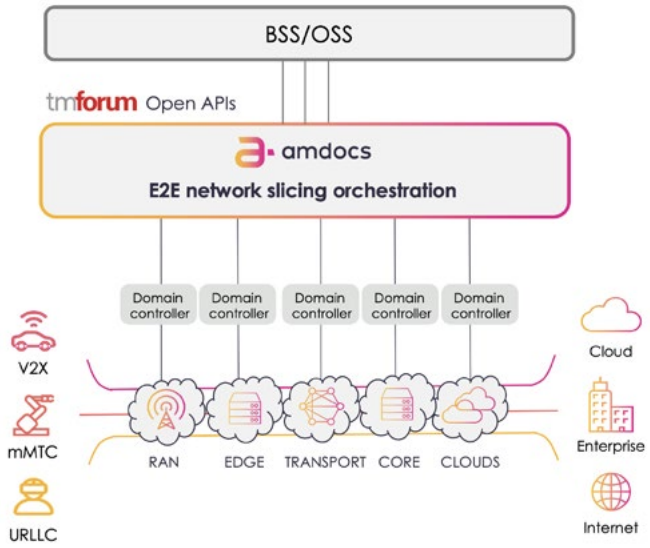

Fig. 5: End-to-end Network Slicing Orchestration

Summary

While the journey to 5G SA hyperautomation is still in its infancy, 5G SA clearly introduces a compelling reason for operators to explore increased levels of automation of operations. This exploration is starting today with the trialing of early use cases and the investigation of the best ways to inject business intent into automation. Implementing enhanced automation in a specific use case is a good place to start as operators can gradually scale up from this single use case and expand towards hyperautomation as the diversity, quantity and dynamic nature of services and the network evolve over time.

Amdocs' approach to 5G SA operations and monetization offers an evolutionary path to enhanced automation and orchestration in each of the network domains detailed above. Our service and network automation platform combined with our extensive industry experience and expertise empowers operators to drive forward towards the goal of holistic, end-to-end, cross-domain hyperautomation of network operations and service lifecycle management (LCM) to unleash the full potential of 5G.

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