The Best Foundations Are Versatile

Building Open, Scalable Service Delivery Infrastructures with Dell Telecom Multi-Cloud Foundation in CSP Distributed Clouds

Robust, Versatile, and Distributed Clouds Are the Platform of Choice for Future CSP Operations

Communication Service Providers (CSPs) are committed to the vision that the most valuable services in the future will be delivered with the simplicity and the agility of the cloud. While it takes time to implement this vision at broad scale, compelling evidence of their commitment abounds. For example, the entire architectural framework of the 5G network core is rooted in the principles of cloud-native design.[1] As the implementation of core and edge 5G solutions is progressing, the use of container-based microservices and cloud-native architectures as the predominant framework for implementation of new software functionality is expanding[2]. CSPs clearly see their future as based in a cloud-native service delivery paradigm.

Among the lessons CSPs have taken from cloud providers is that using robust software and automation to simplify deployments and operations at scale across large infrastructure footprints is critical in making services more attractive.

While understanding this is the case, **accomplishing** it in a CSP's environment involves considering two additional dimensions in a CSP's distributed cloud that are generally not present in the same way in the largest cloud providers' deployments:

[1] See System Architecture Milestone of 5G Phase 1 is Achieved for a description of this framework.
[2] See, for example, O-RAN Use Cases and Deployment Scenarios for descriptions of using cloud-native solution designs in 5G Open RAN implementations.

- first, the **variety of footprints** in which a CSP's cloud needs to run is more diverse than a hyperscale cloud provider's typical environment;
- and second, the **diversity of functions** to support in a CSP's environment (including a range of networking functions running in combination with distributed applications) is greater than those present in a typical hyperscaler's deployment.

Knowing they need to address these requirements, CSPs have begun to focus on using an open, modular, distributed, and highly automated cloud as the foundation that will allow them to deliver services with highest value to their stakeholders moving forward. Supporting workload versatility and running efficiently at scale are foremost among the requirements that need to be met.

Target Architectures Are Converging on a Three-Layer Technology Stack

The model they are pursuing is generally composed of three layers of technology stack. The layers include a base layer built on general-purpose, industry-standard hardware; a mid-layer of cloud infrastructure software providing the software environment that application workloads require for their execution; and a third highest layer of a wide and growing array of network and application workloads that run at various points in the cloud, using the foundation layers as a consistent underlay for their delivery.

Figure 1 illustrates this technology stack framework as it is generally employed.

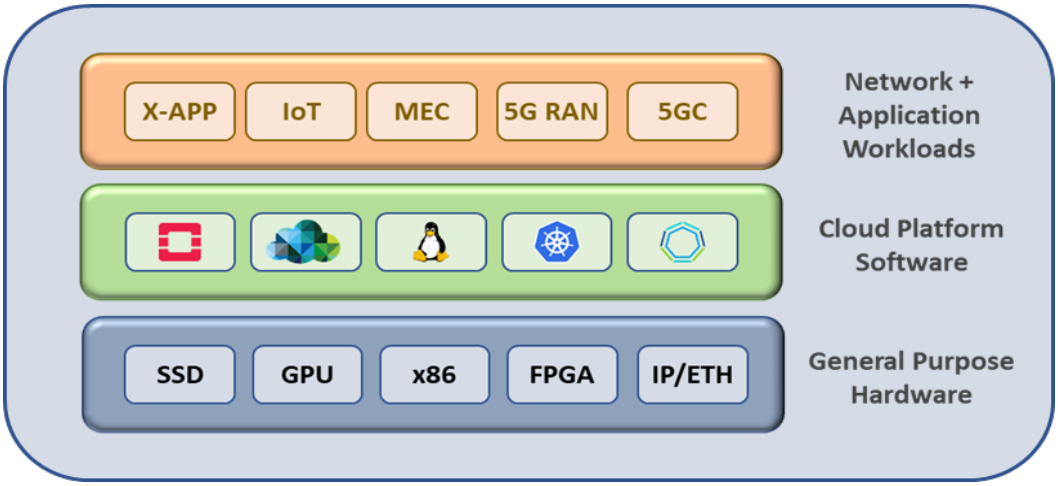

Figure 1. Distributed Cloud Technology Stack

At a cursory level this hierarchy could be seen as intuitive, almost elementary. Its characteristics have been present in system infrastructures since virtual computing began and have continued to evolve in both cloud and network deployments over the past half-dozen years. The difference **today** is in the **diversity of functions** that need to run **at each layer of the stack** to meet different requirements, as well as in the **combinations** in which they must be deployed in a CSP's distributed cloud.

Understanding these needs, CSPs are concluding that their stack combinations can only be deployed reliably and successfully through the use of robust automation designed for both flexibility **and** consistency of operations at scale. Using such software in each layer of the stack and for integrating the layers with each other allows them to simplify deployment of hardware and operating system features needed in support of their applications. It allows them to deploy their infrastructures more rapidly in a distributed footprint versus working with limited function toolsets and homegrown scripts on a node by node and a site by site basis at great operational cost.

Dell Telecom Multi-Cloud Foundation Is an Innovative Solution That Accomplishes These Goals

A marquee example of an innovative solution capable of providing this versatility to CSPs is Dell Telecom Multi-Cloud Foundation. Telecom Multi-Cloud Foundation offerings provide validated and integrated cloud technology stacks to meet the requirements of CSPs' distributed clouds from core to edge. The nucleus of these offerings, present in all of their configurations, is a combination of Dell Bare Metal Orchestrator, Bare Metal Orchestrator Modules, and Dell hardware. Turnkey offerings include that technology baseline **and** mid-layer cloud software from ecosystem partners suited to CSPs' diverse workload needs. Dell provides design validation and testing of the integrated solutions, along with guidance, coordination, and management of deployments with its ecosystem partners for CSPs. A view of Telecom Multi-Cloud Foundation and how it aligns with CSPs' distributed infrastructures is shown in Figure 2.

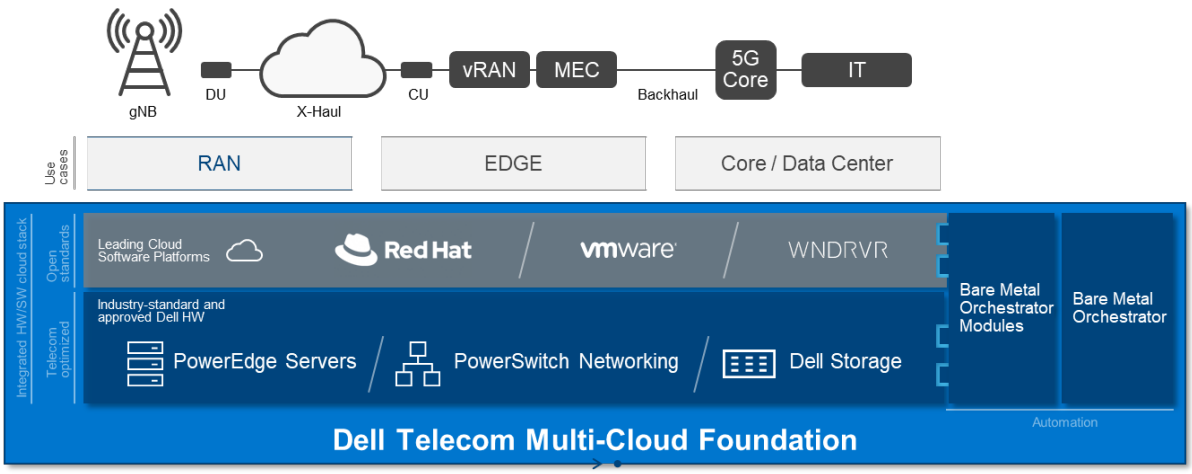

Figure 2. Elements of Dell Telecom Multi-Cloud Foundation

To look at this one click down and see how Telecom Multi-Cloud Foundation addresses the requirements that we have identified, let's look at how it supports operations at each of the two foundation layers of the stacks. First, it supports deployment of a rich hardware underlay for a CSP's distributed cloud, including server, storage, and networking at both core and edge. This includes servers using a variety of core counts, memory capacities, auxiliary processors (such as GPUs and accelerators), a variety of network elements, and a range of site physical footprints. Management of hardware throughout the cloud is supported via close integration with Dell's innovative, highly scalable Bare Metal Orchestrator hardware life-cycle management solution.

At the next layer up, Telecom Multi-Cloud Foundation supports streamlined deployment and operation of diverse cloud software infrastructure offerings in a variety of combinations wherever they are needed in the cloud. It provides interfaces and functionality that simplify deployment and operation of virtual machine-based and container-based cloud software infrastructures in the distributed underlay hardware of the cloud. Cloud software infrastructures from ecosystem partners Red Hat®, VMware, and Wind River—all prominent in CSPs' distributed cloud environments—will be supported in its offerings over a series of releases.

By simplifying deployment and operations in each of the two foundation layers in CSPs' distributed cloud stacks (the hardware and cloud software infrastructure layers) Dell is making a significant contribution to the agility and efficiency of CSPs' operations, helping them harness the innovations that their own and their partners' developers can produce for delivery using an agile, highly distributed service delivery cloud. Dell Telecom Multi-Cloud Foundation is a creative and welcome addition to the technologies available to simplify service deliveries and bring innovative offerings to market faster on an ongoing basis.

For an analysis of the contribution Dell Telecom Multi-Cloud Foundation can make to accelerating CSPs' revenue and reducing their OpEx, read our companion white paper, *The Economic Benefits of Dell Telecom Multi-Cloud Foundation*, published concurrently with this technology directions brief.

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