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Dell EMC Extreme Scale Infrastructure Brings Power to the Edge

A Heavy Reading white paper produced for Dell EMC



AUTHOR: ROZ ROSEBORO, SENIOR ANALYST, HEAVY READING

INTRODUCTION

Communications service providers (CSPs) are continually evolving their business models, adding services and products that bring new revenue streams, but they also face new competitors. Web-based service providers with nimble, modern hyperscale infrastructures don't have the legacy infrastructure challenges that CSPs typically have. At the same time, fog computing and mobile edge computing (MEC), along with the Internet of Things (IoT) and 5G, are driving demand for more distributed infrastructure closer to the edge of the network. In order to keep pace with these competitors and satisfy customers that expect instant access to applications and services, CSPs need partners to help them modernize their infrastructure to level the playing field.

Dell EMC's Extreme Scale Infrastructure (ESI) division has been delivering optimized solutions for hyperscale players for more than 10 years, and is now bringing this experience to CSPs, while also helping them enable edge computing initiatives. ESI provides the technology CSPs need, designed to their specifications, based on open standards and backed by Dell EMC's global support capabilities.

This white paper discusses how the changing competitive landscape is driving change at the edge of CSP networks. Further, it explains the impact that fog computing and MEC will have on infrastructure transformation. The paper also provides an overview of the range of capabilities supported by Dell EMC's ESI division, including a discussion of its genesis as a solutions provider to the hyperscale market. Finally, it discusses how Dell EMC is helping CSPs transform infrastructure at the edge with its micro Modular Data Center and DSS 9000 rack-scale infrastructure.

CHANGING USER EXPECTATIONS ARE CREATING NEW CHALLENGES AT THE EDGE

CSPs face an ever-changing competitive landscape. New threats from the hyperscale players such as the large public cloud providers are forcing them to transform their architectures and business processes. They are pressured to be as nimble as these competitors are in taking advantage of new opportunities, but the challenge often resides in their legacy infrastructure and systems that were designed in a different era for a different set of services. These new competitors have also changed user expectations: Consumers and enterprises alike now expect all of their applications and services to be available at any time, accessible instantly from multiple devices.

To address these challenges, CSPs are looking to transform their infrastructure, especially at the edge. The number of devices – from smartphones and wearables, to IoT sensors and Smart grids – are increasing the complexity and traffic volumes exponentially. The best way to be able to provide the quality experience its customers demand, while also minimizing transport/backhaul costs and supporting real-time analytics, is to process, store and analyze data closer to the end user.

The term "fog computing" essentially describes providing the processing power of a data center at the farthest edge of the service provider network. MEC is a related concept, whereby virtualization is used to move applications and processing closer to the end user, potentially

in a base station. In both cases, the goal is to minimize latency and allow for real-time analysis and decision-making. CSPs have a built-in advantage through their broad presence via regional central offices and base stations, but they need modern solutions and capable partners to capitalize on this opportunity.

The architectures needed to support fog computing and MEC require different types of network infrastructure and facilities to house that infrastructure. CSPs want to ensure these products are designed to their specifications, while also being open, agile and flexible. Essentially, it is about being able to better compete with the hyperscale players while avoiding the vendor lock-in, which has inhibited CSPs in the past.

ADAPTING HYPERSCALE FOR CSPs

Dell EMC's Extreme Scale Infrastructure (ESI) division was formed nearly 10 years ago – albeit under the name Dell Data Center Solutions – to provide tailored solutions to hyperscale companies during their rapid expansion. It started with designing servers for customers' particular workloads and quickly expanded to include rack-level integrated solutions built to customer specifications and eventually to optimized modular data centers (MDCs) – thinking not only about IT needs (performance, scalability and manageability), but also facility needs (power and cooling requirements, construction, system management, security, etc.). Today, it is bringing that same approach to CSPs and other service providers.

Combining its hyperscale expertise with a flexible, repeatable operating model, ESI validates nonstandard components into its existing Dell EMC products, as well as designs and builds customer-specific solutions. These solutions include modular data center infrastructure that can be pre-integrated with IT and validated against leading software solution stacks that CSPs use today. As part of its value-add, ESI leverages Dell EMC's global support and supply-chain strength to service its customers around the world.

Figure 1: ESI Capabilities



Source: Dell EMC

Most recently, as a result of its engagements with CSPs, ESI has introduced a micro MDC. MDCs allow for a different method of deploying data center capacity, and they can be placed anywhere data capacity is needed. Dell EMC's concept of a micro MDC is a smaller, more nimble version that is designed for CSPs that want to enable edge computing in various locations quickly and efficiently.

DELL EMC'S ESI ADDRESSES FACILITIES & PRODUCT REQUIREMENTS AT THE EDGE

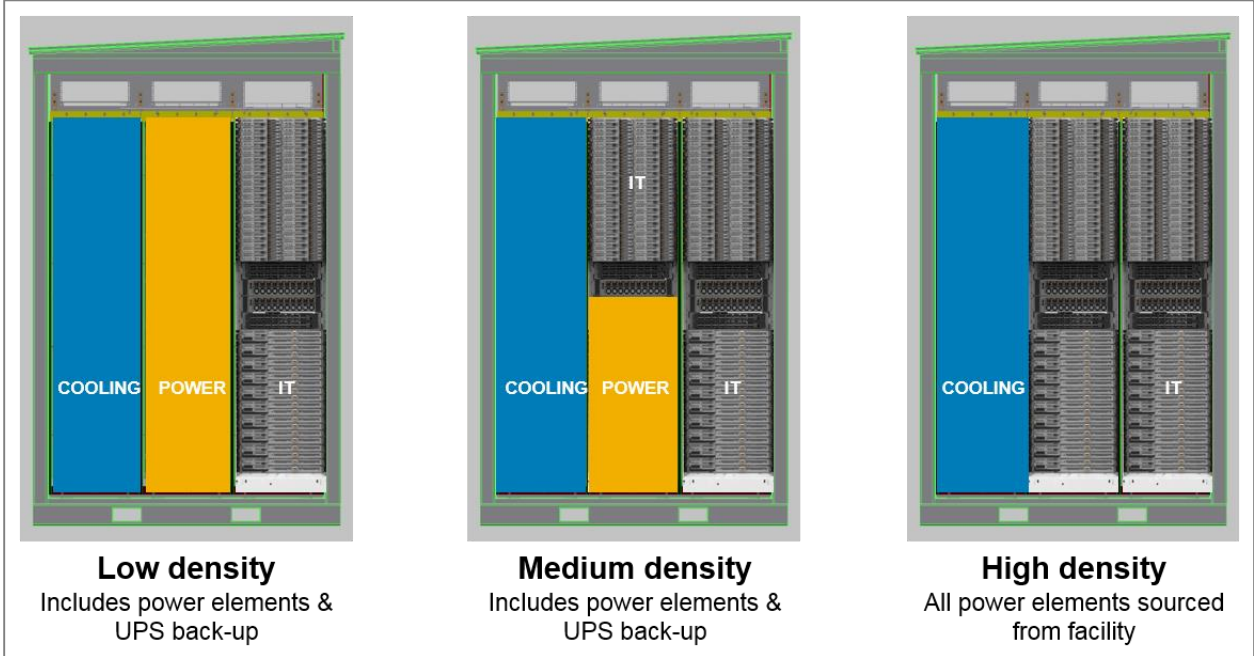
Micro MDCs Optimize Efficiency at the Facilities Level

ESI initially developed MDCs to support hyperscale players' requirement to purchase huge volumes of racks at a time for their centralized data centers in a way that would reduce time to market and the cycle time from decision to go live. CSPs, however, have much more distributed locations to consider – especially with the advent of IoT and fog computing. They need the ability to purchase smaller modules but still achieve the same time to market and cycle time goals. To serve these requirements, ESI developed the concept of a micro MDC.

Dell EMC's micro MDCs are designed to provide local compute, storage and networking at the edge of the network, along with integrated power and cooling. With everything built to the customers' requirements, ESI can also include IoT gateways, ultimately speeding the storage, processing and analyzing of local data while providing rapid installation. These micro modules support the same capabilities that its larger MDCs offers, including cable management, smoke detection, fire suppression/containment, along with security and monitoring. Power capacity and density are sized according to customer needs.

Dell EMC's micro MDCs are managed as a unified software-defined environment, meaning operators have the ability to administer and manage multiple MDCs and the associated IT from a single pane of glass. With a footprint smaller than half of a parking space, micro MDCs deliver pre-integrated IT, power and cooling and management as a complete, easily deployable solution. The micro MDCs from ESI can be customized to meet the needs of individual CSPs and optimized based on workloads, capacity or environmental conditions. They can be configured with whatever IT the customer chooses, including equipment from other vendors. **Figure 2** illustrates the different ways a micro MDC can be configured.

Figure 2: Micro MDC Configurations



Source: Dell EMC

Dell EMC micro MDCs were designed to be adaptive, meaning they are effective in a wide range of environmental conditions (e.g., cold/dry, hot/humid). Because of the availability of 100 percent free-air or closed-loop mechanical cooling, they can be deployed either indoors or outdoors. They also support concurrent serviceability and dual power feeds to provide high availability.

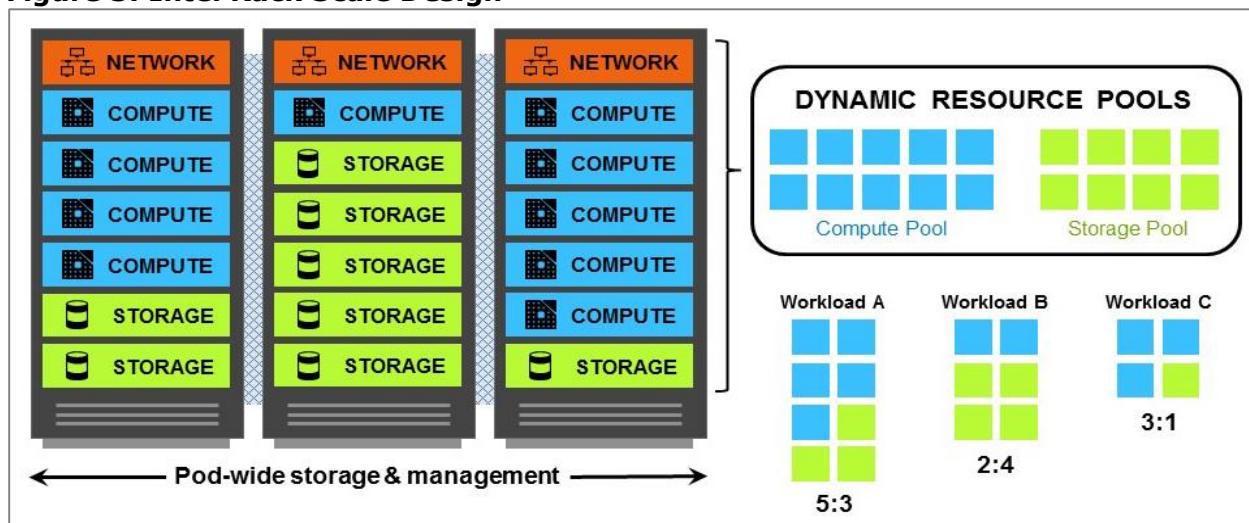
DSS 9000 Built on Hyperscale Principles

While MDCs themselves provide flexibility and agility, CSPs will not reap the full benefit unless their edge IT infrastructure shares those characteristics. ESI developed the DSS 9000 using hyperscale principles to offer the scalability, flexibility and manageability CSPs need as they distribute more processing power closer to the edge. The DSS 9000, recognized by the Open Compute Project (OCP) as OCP-inspired, delivers modular-rack level infrastructure with compute, storage, networking, shared power and cooling and next-generation management using Redfish application programming interfaces (APIs) as the foundation for integrating Intel's Rack Scale Design (RSD). The combination allows users to allocate shared pools of compute, storage and networking dynamically across workloads as they need them and within the cloud environment of their choice.

Redfish is an open API developed with the industry's management standards working body, DMTF, to allow multiple types of hardware to be managed by a single management system. CSPs must support a diverse range of infrastructure to deliver connectivity and value-added services, so they will value the greater flexibility and reduced opex that comes from simplifying the management domain.

As shown in **Figure 3**, a Redfish-compliant hardware resource manager, such as Intel RSD, enables compute, networking and storage resources across the infrastructure to be pooled, connected through a network fabric, and managed as a single entity. The advent of network functions virtualization (NFV) and IoT will lead to workload requirements varying widely, and automatically scaling to the different ratios of resources will be critical to achieving the service agility CSPs need. Cloud management systems such as OpenStack will dynamically assign the proper combination of resources to address the particular requirements of each workload.

Figure 3: Intel Rack Scale Design



Source: Dell EMC

The DSS 9000 can be delivered as part of a micro MDC deployment or as a standalone solution, and it can be configured with third-, half- and full-width compute and storage sleds. Because it is network-agnostic, customers have their choice on networking solutions and can more quickly integrate the DSS 9000 into their existing network fabric.

ESI sees CSPs shifting from away from purchasing monolithic 1U and 2U servers, and instead moving to rack-level infrastructure. This enables customers to buy pre-built racks of compute, storage, networking and management that can be rolled into a "parking spot" versus having to purchase, deploy, setup and manage monolithic servers. CSPs will be deploying more distributed resources in preparation for their 5G rollouts, so a repeatable process that allows them to do so efficiently will be valuable.

While this design allows administrators to address and manage the infrastructure as a whole, ESI also built the DSS 9000 as a disaggregated solution that offers component-level flexibility – meaning customers can independently upgrade their compute, storage or networking capabilities as needed. This will allow CSPs to more tightly manage their costs by more granularly adjusting to changing demand, similar to the way their hyperscale competitors do.

CONCLUSION

CSPs that transform their networks and systems by leveraging some of the same hyperscale principles as their new competition have a huge opportunity to become much more agile and flexible and better meet the demands of their customers. This transformation will support IoT and lay the foundation for 5G. More distributed architectures offer the promise of better quality service and real-time processing of increasing levels of traffic.

Dell EMC's ESI division is poised to assist CSPs on this journey, offering them tailored solutions to meet their unique requirements. ESI brings knowledge it has gained from working with the hyperscale players over the past decade, and applies it to the unique needs and challenges that CSPs face. ESI's micro MDC and DSS 9000 rack-scale infrastructure exemplify this strategy.

ESI's micro MDCs give CSPs an efficient and cost-effective way to start small and build incrementally as their business grows and they start seeing total cost of ownership (TCO) benefits. Combined with the DSS 9000, CSPs have an IT infrastructure solution that enables them to support existing and future services in a more flexible, scalable and manageable manner.