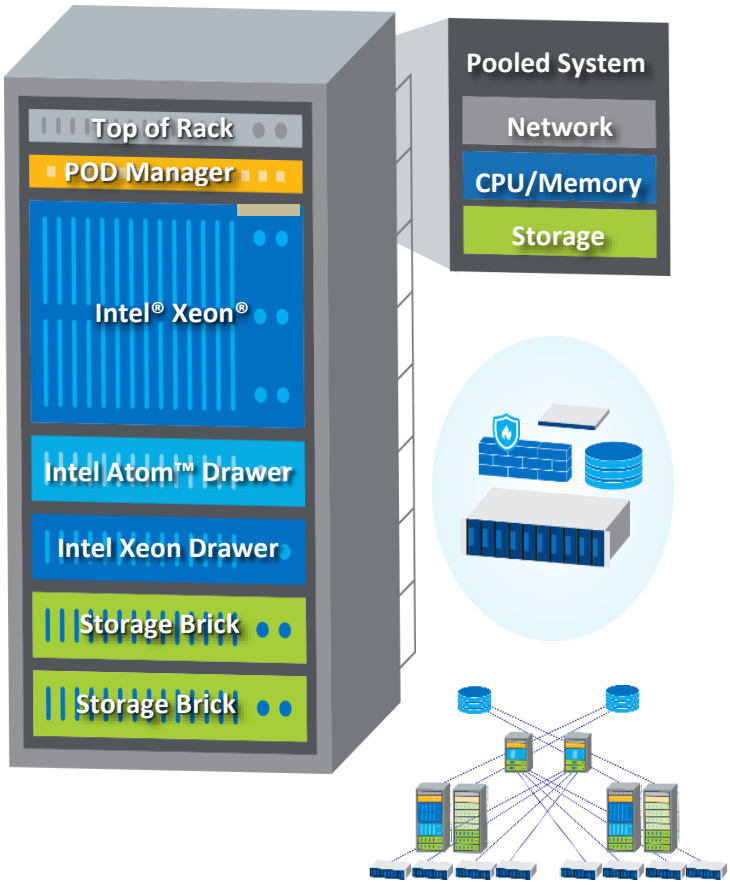
The Case for Rack Scale Architecture

An introduction to the next generation of Software Defined Infrastructure

Intel® Data Center Group



Revision 1.0
September 2014

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Revision History

Revision	Date	Comments
1.0	September 8, 2014	Initial Release

Introduction

Rack Scale Architecture (RSA) implementations represent the next generation of Software Defined Infrastructure that can be dynamically provisioned across compute, network and storage resources. The fundamental premise for an RSA-based solution is the customers' ability to "right-size" their end-to-end infrastructure needs according to anticipated workload performance and capacity requirements, across pooled resources.

As cloud environments become the predominant IT Infrastructure of choice (public, private and hybrid), it is critical that these new software defined architectures have clearly defined business and technical customer value goals regarding Infrastructure Flexibility, Composability and Total Cost of Ownership (TCO). Software Defined Infrastructures, and the RSA implementation described, will provide efficient, effective and standards-based management interfaces that can be easily used by customers and that are extensible in such a way that technology partners and cloud service providers can easily integrate tools and products.

Customer Cloud Expectations

The migration of many corporate applications to web-based models and interfaces drove the first wave of standardization and ubiquitous access and, because of the relative ease of deployment, the first set of problems including server sprawl, performance degradation at scale, and poor governance, to name a few. As some of these problems were addressed through virtualization technology and tools, better practices, and the application of corporate policies and processes, a new set of similar challenges emerged. These challenges included Virtual Machine (VM) sprawl, "bursty" application behavior, over- and under-provisioned resources, infrastructure deployment that could not keep up with new service demand, and other issues that resulted from deploying cloud-based applications on existing technologies and architectures. Clearly, a much more intelligent and flexible infrastructure architecture model was needed to meet these challenges and brought about the advent of Intel Corporation's Rack Scale Architecture.

Rack Scale Architecture

As previously described, Infrastructure Flexibility, Composability and effective methods of containing TCO are the fundamental value propositions of RSA. The following pages describe each in more detail.

Flexibility

Historically, each corporate line of business demanded dedicated IT Infrastructure in order to meet business goals and achieve relatively good application performance. Ultimately, this lead to a server sprawl challenge but also produced a secondary effect—under-utilized resources. The result of those acquisitions created silos of technology across performance, capacity and cost vectors.

RSA alleviates both the technology silo as well as the utilization challenges by pooling compute, network and storage resources and allowing discreet provisioning-on-demand. Cloud implementations are flexible and dynamic by definition. Therefore, proactive methods of infrastructure resource discovery, information gathering and intelligent visibility must be built into the environment. The result of this level of resource management provides much more efficient and effective methods for consumption-based billing and helps to prevent over- and under-provisioning.

Composability

Effectively matching workloads to right-sized IT Infrastructure resources is yet another major challenge for customers. Part of the challenge is that the workload may, in fact, require resources

across compute nodes, across rack, or even across multiple rows of compute, network and storage racks. Besides visibility of available resources, the ability to match multiple workloads to resources that can adhere to service quality and service level requirements may well become one of the most critical functions required of an RSA implementation. Add on the ability to decompose these resources and add them back to the various pools and the Composability value proposition becomes very compelling for Cloud computing environments.

Total Cost of Ownership

As previously described, there are a variety of challenges associated with legacy infrastructures that are driving the need for new Software Defined Infrastructure technologies. However, a significant lesson learned from the past also includes the fact that technology can have a very long life within the data center. This implies that, as new workloads, applications and technologies are added, RSA must allow for the continued management of legacy resources as well as allow for extensibility as new technology is introduced. The answer to this challenge is the ability to manage existing and new resources by abstracting the hardware using standards-based RESTful Application Programming Interfaces (APIs). Investment protection, integration of new software tools, the ability to pool resources ac-cording to functional or performance capability, and the ability to define new classes of performance- and functionality-based resource pools as new software and hardware technologies emerge, can all be realized within an RSA construct.

Conclusion

Software Defined Infrastructure will utilize the Rack Scale Architecture software and related components to exemplify to customers, and the industry, that it is feasible to provision and manage resources at the Data Center level to reduce complexity, provide much more flexibility and allow for future proofing and investment protection while still achieving dynamic allocation of IT resources.

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