Data centre and directions: Decouple, scale, simplify and automate

by Marcio Saito, CTO, Opengear

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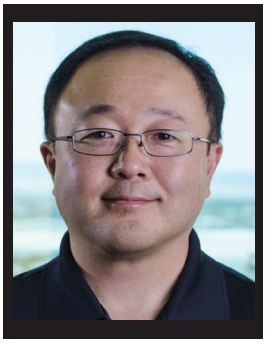

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Marcio is responsible for product and technology strategy for Opengear. He is based in the San Francisco Bay Area and has previously held executive level positions in global technology companies. At Cyclades, he was a pioneer in the Open Source Software movement and helped to establish the concept of out-of-band management for Data Centre Infrastructure. Later, as the VP of Strategy for Avocent, he managed product and engineering teams and led the development of one of the first DCIM solutions in the market. He holds a BSEE degree from University of São Paulo.

In the 1990's, Enterprise Data centre and Networks were evolving to be increasingly complex. In the past decade, Virtualization technologies came to the rescue, enabling a more efficient IT infrastructure where resources were shared among all applications.

More recently, cloud service providers (the likes of Amazon, Google, Microsoft, etc.) have invested in automation and distributed software architectures, achieving efficiency and scalability that is many orders of magnitude higher.

Cloud platforms are available as a service offering and many IT workloads are or have already moved to the cloud (Email, CRM systems, etc.). Competitive pressures will force Enterprise IT to follow in the footsteps of the Cloud movement, to support the remaining core workloads and connectivity that will remain in-house.

It can be argued that we have moved past the point-of-no-return. Use of virtualization is already commonplace for legacy applications. The move to the cloud is in progress and accelerating. Enterprise IT must now embrace this change, focused on achieving competitive efficiency, and looking forward to anticipate the needs of the future. We will look at future scenarios to suggest directions to follow.

Data centre complexity

As of the early 2000's, most enterprise data centre were designed and built based on aggregate capacity specifications (floor area, number of racks, maximum capacity per rack, etc.). Once the physical infrastructure was in place, over the next several years, IT groups would gradually use the capacity by deploying equipment ad-hoc, responding to business services requirements.

Equipment was added and removed regularly, with new custom hardware being deployed for each new application. The result was a mish-mash of rackmount devices, rapidly growing in scale and complexity. That, combined with normal employee turnover, made it impossible to know exactly what equipment existed, why or where it was installed, who owned it, or even what it was doing.

Sophisticated infrastructure management software promised to make sense of these complex conglomerations of infrastructure and harmonize the silos of facilities and IT operations, thus allowing data centre managers to regain control and optimize efficiency. It attempted to do that that by monitoring all capacity metrics, keeping track of assets, their locations, their connections with other systems, and the business services they supported. And to keep the model in sync with reality, they implemented workflow management which ensured infrastructure changes would be modeled in software before being implemented.

Dealing with this complexity was a real problem, and data centre managers struggled to establish the discipline, a high-level of process maturity and adoption of systems and tools across the entire organization, factors that are hard to find in real-world environments.

Decouple: Virtualization technologies

Platform virtualization became popular in Enterprise data centre more than a decade ago. VMware ESX, Microsoft Hyper-V, Linux KVM are examples of hypervisor technologies that allowed the creation of virtual machines executing on a simulated environment that is independent from the underlying hardware resources.

Decoupling dependencies between hardware and software allowed the design of more homogeneous and manageable infrastructures. Resources such as electrical power, computing capacity, data storage and network connectivity can be managed centrally and dynamically shared among all application workloads. When the demand for a specific application fluctuates, it is not necessary to provision new capacity. The allocation of resources can simply be increased for the specific virtual machine serving that application.

Virtualization was key to enable legacy applications, developed to run on a server and have access to all computing resources in its machine, to operate on a shared infrastructure, with dynamic allocation of

resources.

Scale: The cloud

Leveraging the concept of virtualized infrastructures, service providers like Amazon, Google and Microsoft were able to build large-scale operations that are managed with efficiency that is at least one order of magnitude higher than traditional data centre.

They went further and designed a new generation of software applications that was natively designed to run in a distributed and dynamic environment, eliminating the need for virtualization layers. For example, when we access software services like cloud-based CRM or Email, we are using software that is neither running on a specific physical server nor in a virtual machine. The service we experience is result of a collection of distributed cloud software components. If a specific component fails, another instance of it just takes its place without disruption.

Those software providers also created virtualized environments where users can deploy virtual machines to host an application running on the cloud, similar to traditional virtualization, but taking advantage of cloud infrastructure scalability and efficiency.

Simplify: Converged data centre

With Virtualization technologies, data centre have evolved in the direction of reducing complexity instead of managing it – converged infrastructure has begotten the modular data Centre, designed and managed at rack and multi-rack level. As a result, the newer infrastructure is highly homogeneous compared to the traditional ad-hoc data centre.

Which pieces of IT equipment goes in each rack is defined during the design phase, as is power and cooling capacity. Because the infrastructure is built as designed, there is no need for device-level capacity planning, monitoring or management.

Initially, only the so-called hyperscale data centre had enough volume to approach data Centre build-out that way. With Infrastructure-as-a-service, enterprises can outsource capacity and leverage their scale and efficiency. A significant portion of IT workloads have been and will continue to migrate to cloud providers.

But methodologies and technologies will spread, and enterprises will find the need to keep or bring back some of the workloads that are moving to the cloud. The Enterprise Data Centre will evolve.

Automate: Moving into the future

In the 1990's a typical system administrator would be able to manage only a handful of physical servers. In a modern cloud data Centre the ratio can reach 3000 virtual servers per system administrator. That leap in efficiency has been achieved through the steps we described (decoupling, scale, simplification) and the application of automation techniques.

Over are the days of manually provisioning new systems by typing (or cutting and pasting) commands to a console session or moving configuration files around. Modern data centre run with automated provisioning (using Zero Touch Provisioning – ZTP, for example) and leveraging orchestration tools (like Puppet, Chef, and Ansible) for change and configuration management.

The motto is "Infrastructure as Code". Investments in automating provisioning and management of the infrastructure enable us to easily scale. If we automate "Infrastructure as Code" instead of manually building it, and put the code into a versioning system, it becomes possible to upgrade and downgrade the infrastructure. If a change breaks something, it is possible to quickly move back to the last working configuration.

Why should I care? The people impact.

For people working in enterprise IT, the trends we discuss above will have a profound impact not only on the scope of work, but also on the skills required for success. The ability to identify patterns, predict scenarios and proactively program systems to react to those scenarios becomes more important than reactive firefighting.

Translating to skills, programming abilities (e.g. Python scripting) will become relatively more important than knowledge about systems from a specific vendor (e.g. pursuing vendor-specific certifications will become relatively less important).

Prediction: The pendulum moves back (it always does)

In the past decade, we have seen a migration of complexity from the edge of the infrastructure to the cloud. A typical branch office had an email server running in a closet. A typical retail store had a Point-of-Sale server running in the back office. Today, there are only end-user devices at the edge, servers have all moved to the cloud.

In the next decade, we will see complexity moving back towards the edge. Adoption of technologies like AR/VR, IoT, self-driving cars and increasing consumption of rich media content will demand more infrastructure closer to the end user. While many data Centre workloads will continue to move to the cloud, the focus of Enterprise IT will shift to the edge of the network. The ability to provision and manage infrastructure remotely will increase. The need to automate the monitoring and recovery of that infrastructure will prove even more important than it is today.

Conclusion

While the Virtualization and Cloud technologies have become common, their impact on where work is done, how we do the work and who does it is still in progress. Having a historical perspective is important for us to notice the patterns of change and predict what actions to take today to continue to ensure success into the future.

Moving away from integrated systems provided by a dominant vendor and being able to leverage automation technologies are on the immediate agenda for anyone in charge of IT infrastructure. Looking into the future, the most relevant challenges in Enterprise IT will be, not at the core, but at the edge of the network, where being able to automate and secure the provisioning and management of IT equipment will become a critical capability.