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Change the pace of deployment

HPE Distributed Cloud Networking

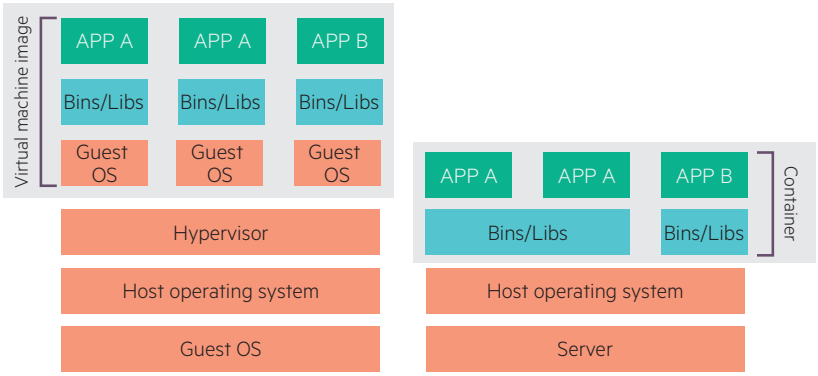
What are containers?

There is a growing shift in the industry towards running applications in containers-given its tremendous impact in server virtualization and cloud application deployments. According to a recent whitepaper[1] on containers from the OpenStack® Foundation:

Containers are isolated, portable environments where you can run applications along with all the libraries and dependencies they need. Containers aren't virtual machines. In some ways they are similar, but there are even more ways that they are different. Like virtual machines, containers share system resources for access to compute, networking, and storage. They are different because all containers on the same host share the same OS kernel, and keep applications, runtimes, and various other services separated from each other using kernel features known as namespaces and cgroups. Docker added the concept of a container image, which allows containers to be used on any host with a modern Linux® kernel. Soon Windows® applications will enjoy the same portability among Windows hosts as well. The container image allows for much more rapid deployment of applications than if they were packaged in a virtual machine image.

The benefits of containers

The key advantage of containers over the more traditional hypervisor and virtual machine-based approach is that each container workload can share a host operating system (OS). Each virtual machine (VM) must have its own host or guest OS image. This takes up considerable space in memory, and takes more time (minutes rather than fractions of seconds) to deploy and provision. Containers can increase the number of workloads per server (workload density), which improves resource utilization. This also takes on-demand cloud services to another level with the ability to spawn potentially thousands of new application workload instances in only a few seconds.



Source: OpenStack Foundation

Figure 1: Virtual machines versus containers

This latter attribute has given rise to the exciting new concept of microservice architectures. With such lightweight, efficient workload instances, monolithic applications can be broken down into small, reusable, easily allocated components in a much more modular fashion. Application developers and cloud architects can take advantage of this modular design with microservices that are potentially very short-lived. Microservices can be deployed to address changing business requirements on demand. They can be deployed at a specific location where resource utilization can be maximized, such as local to persistent storage or another application service.

Supporting DevOps

The portability of lightweight, efficient containers has also been a boon to advancements in DevOps. DevOps is an increasingly popular application development methodology that better aligns application development organizations with IT departments. DevOps makes it easier to quickly develop, test and deploy new applications. It enables a process called continuous integration, meaning small incremental changes to applications (potentially as microservices) can be rolled out very quickly to meet immediate business requirements. This level of responsiveness can replace traditional monolithic application development cycles.

A great deal of infrastructure and deployment automation is also required to achieve the rapid, incremental on-demand deployments required by DevOps. This can only be achieved with a policy-based SDN automation platform, where infrastructure changes, application provisioning and cloud orchestration are all handled programmatically, rather than manually by IT.

Deployment implications: containers versus virtual machines

In spite of their many advantages, containers are not always preferable to VMs, and in some cases, the best option may be to deploy both containers and VMs. VM technology has been around nearly ten years longer than the most recently adopted container formats spearheaded by Docker. This level of maturity provides VMs some key advantages for mission-critical applications like security, high-availability features, and orchestration tools.

From a security perspective, because containers share the same OS kernel, the "attack surface" from one container workload to another is quite large and it's relatively complex to ensure complete isolation of tenant applications in a multi-tenant environment. With each VM running in its own OS, the connections between VMs are only through the shared hypervisor, a considerably less complex infrastructure component to monitor and secure. Some organizations are at least suggesting that containers can even be run inside a VM host purely for the added security benefits in production environments. However, this clearly defeats some of the advantages of a

[1] **Exploring Opportunities: Containers and OpenStack. OpenStack 2015**

Integration based on the Docker Open Source Project

pure container-based deployment. VMware® has also just recently announced something called vSphere® Integrated Containers.

There is no doubt that VMs and containers are going to exist side-by-side in enterprise private clouds and service provider networks for many years to come. Since both VM and container formats of server virtualization require virtual networking infrastructures (virtual Ethernet ports, overlay network, and Software-defined Networking (SDN) foundation), it is critical to choose an SDN platform that is designed from the ground up for both environments. HPE Distributed Cloud Networking (DCN) is just such a virtual networking and SDN platform.

HPE Distributed Cloud Networking

With the automated instantiation of network servers, DCN drives the network to be dynamic. HPE DCN is implemented as a non-disruptive overlay for all virtualized and physical server resources. It is agnostic to the underlying server and network hardware, and flexible enough to deploy in any Docker container, hypervisor, or bare-metal environment. As the leading open, vendor-agnostic SDN and virtual networking platform in the industry, HPE DCN provides the ideal solution for heterogeneous cloud environments. It provides the flexibility to deploy new application and cloud technologies and services in the future without fundamentally changing out the infrastructure.

HPE DCN can scale to meet the demands of thousands of tenants with unique application requirements, distinct security policies and committed service levels. It can unify complex topologies such as public and private clouds with multiple datacenters and bare metal servers into a single manageable cloud network.

What about cloud orchestration?

HPE takes the most open, vendor agnostic approach to cloud orchestration tools and platforms of the leading SDN vendors, particularly with regards to support for OpenStack. OpenStack is one of the leading cloud platform technologies evolving to support containers. The OpenStack container whitepaper mentioned above states: Containers are an evolving technology and OpenStack is evolving to support them, just as it has supported other emerging technologies in the past. Rather than create new vertical silos to manage containers in their data centers, IT organizations find value in OpenStack providing a cross-platform API to manage virtual machines, containers and bare metal.

Container support is just another example of the basic value proposition for OpenStack. By utilizing OpenStack as the foundation of a cloud strategy, you can add in new, experimental technologies, and then deploy them to production when the time is right. This is possible with a single underlying cloud infrastructure—without compromising multi-tenant security and isolation, management and monitoring, storage and networking and more.

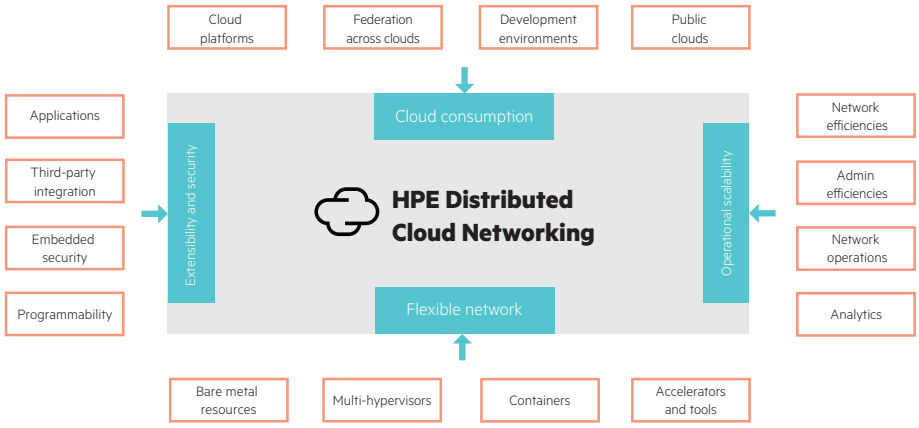


Figure 2: HPE DCN provides flexible support for VMs, containers, and bare metal applications

Organizations also need the flexibility to run other cloud management systems across their container and VM environments besides OpenStack. While OpenStack was designed and evolved primarily alongside the deployment of traditional VM-based cloud architectures, many organizations are looking at a range of container-specific orchestration tools such as Docker Swarm, Kubernetes and Apache Mesos.

Much like OpenStack's primary purpose, these tools automate the resource allocation, container packaging, deployment and provisioning in large-scale cloud environments and help IT administrators cope with container sprawl. In fact, each of these container orchestration engines can run within OpenStack, which can orchestrate across the entire infrastructure (including servers, network, storage), as well as across VM, container-based and bare-metal applications. HPE DCN provides the unique advantage of providing a platform-agnostic, vendor-neutral approach for these types of deployments.

Learn more at **hpe.com/networking**

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