

SOLUTION BRIEF

Communications Service Providers
Workload Placement



Veryx, Intel Aid Workload Placement on OpenStack*-Managed Cloud

The Veryx Optimal Server Selection Algorithm relies on performance of Intel® Xeon® processors to select the right infrastructure for workload placement.



Overview

As network functions virtualization (NFV) solutions become more sophisticated and as Intel® architecture-based servers add new hardware features with improved performance for specialized processing, placing these workloads—either virtual machines (VMs) or virtual network functions (VNFs)—on the right server is a critical element of virtualized infrastructure platforms like OpenStack*-managed clouds.



Today, the choices for communications service providers (CommSPs) are to manually place workloads or to count on the rudimentary workload placement tools that are a part of OpenStack. But with the prospect of service quality being negatively impacted by suboptimal workload placement, CommSPs need better tools. Veryx® Technologies, an Intel® Network Builders ecosystem member, has developed its Optimal Server Selection Algorithm (OSSA) plugin to factor in more data to select server that is best-configured for workload placements.

The Challenge

CommSPs are adopting NFV services, in part, to improve network agility through automated service deployment and initiation and the ability to remotely move workloads when they need added resources. Many workloads have specific hardware needs that must be accommodated for proper performance. Some need to be run on high availability servers; others, such as encryption, are compute-centric and need higher-performance processors. Placing these workloads on the right hardware ensures that the VM or VNF has access to the resources it needs.

For NFV services based on OpenStack, there are two primary ways to place workloads. They can be placed manually on a specific server. This method allows very precise workload placement, but keeping a manual inventory of the capabilities and current workloads of all servers in a scaled-out data center makes this option very hard to scale.

Optionally, OpenStack itself has a workload scheduler function as part of its OpenStack Nova project (also known as OpenStack Compute). The Nova Scheduler Service has about 20 filters that can be used to narrow down the hypervisor and server options for a workload placement.

These filters let Nova Scheduler search the server inventory using key application requirements such as a certain number of available CPU cores, amount of RAM, amount of storage, etc. When Nova Scheduler finishes searching servers, it returns a list of the qualified hypervisors and then randomly selects one of those hypervisors and sends a command to the Nova Conductor to create the workload on that hypervisor.

The challenge with this system is the random hypervisor assignment and relative lack of granularity in the filters. This can lead to uneven distribution of workloads across the available hypervisors, or workload placements that don't incorporate key factors such as network path performance (latency, loss, etc.).

The Solution

Veryx's Optimal Server Selection Algorithm (OSSA) OpenStack plugin uses an algorithm that adds more filter criteria to assess the capacity and features of the available servers. Once a pool of possible servers is identified, then OSSA replaces random assignment with profile-based final placement criteria to select the right server from that pool so that the workload has all of the resources it requires.

The OSSA plugin is a part of Veryx's RETINA™ suite of tools for unified proactive cloud and data center monitoring. RETINA includes network monitoring and diagnostic tools to help IT administrators/data center administrators get a comprehensive view of their infrastructure and also provides the ability to anticipate faults that can lead to degradation of server quality levels and network paths.

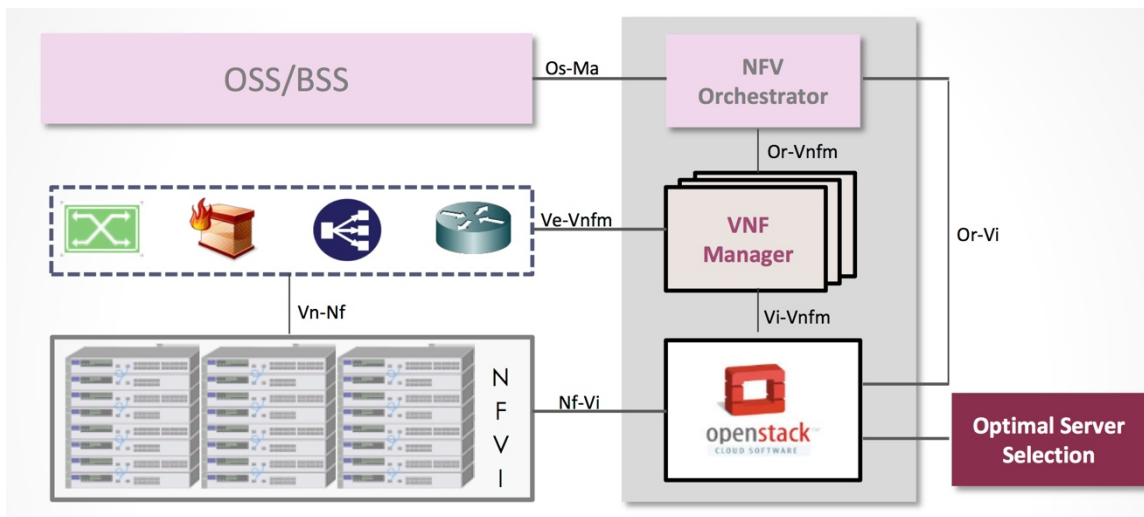


Figure 1. Where the OSSA plugin fits in a NFV environment.¹

Optimal Server Selection Algorithm (OSSA)

OSSA connects to OpenStack Nova where it inventories the server configurations and status of all servers managed by that OpenStack instance. When a workload placement request comes into OpenStack Nova, it sends the workload requirements to the OSSA. The plugin then searches the available hypervisors based on any of the following parameters that are relevant:

- Number of vCPUs
- RAM size
- Disk size
- CPU pinning
- PCI pass-through
- SR-IOV support
- CPU oversubscription ratio
- RAM oversubscription ratio
- Disk oversubscription ratio
- Server availability
- Server threat metric
- Application bandwidth
- CPU-to-RAM ratio

From the pool of servers identified as having the parameters and performance needed to host the application, the OSSA then applies one of four pre-defined profiles to further identify the right server for the workload. These ranking parameters include:

- Compute intense profile
- Storage intense profile
- Memory intense profile
- Network intense profile

The final metric evaluated by the OSSA plugin for server ranking is network interface performance. This parameter recognizes that throughput and latency have a critical impact on workload performance. Once its analysis is done, the OSSA plugin feeds its hypervisor recommendation to Nova Conductor, which places the software instance on that server.

Learning Algorithm

As part of RETINA suite, OSSA has access to performance data that can provide ongoing updates to help the algorithm deliver even better server-workload fit recommendations. In addition to the RETINA controller, the suite includes test agents, TAPs, network elements and orchestrators that are used to collect data that for network & server monitoring and diagnostics. This data adds to the information available to the OSSA for workload placement.

OSSA Performance Validation

Veryx and Intel teamed up to prove the functionality of the OSSA plugin using servers powered by Intel® Xeon® processors E5-2600 and Intel Xeon processors E5-2400. These processors offer the processing performance the OSSA plugin needs for evaluation of placement parameters and profiles. The results of the PoC demonstrated that the algorithm selected the most appropriate server in the majority of placements and can substantially reduce the need for administrator intervention to manually relocate instances.²

Conclusion

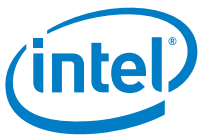
Workload placement will grow in importance as NFV matures. For example, as VNF developers embrace the Enhanced Platform Awareness (EPA) features that are built into OpenStack additional compute resources can be made available to VNFs to improve performance. Veryx has plans to fully embrace EPA (it already supports some features such as CPU pinning). Veryx will also port the OSSA plugin to other NFV orchestrators. Powered by Intel architecture CPUs, the Veryx OSSA plugin offers network administrators a new alternative for the important job of workload placement.

About Veryx

Veryx Technologies provides testing, visibility, and monitoring solutions for network service providers, cloud service providers, data centers, enterprise IT, and network equipment vendors. Service providers and equipment vendors use Veryx solutions for network testing, performance monitoring, and equipment validation for technologies such as carrier Ethernet, IP, cloud, SDN, NFV, and smart networks.

About Intel® Network Builders

Intel Network Builders is an ecosystem of independent software vendors (ISVs), operating system vendors (OSVs), original equipment manufacturers (OEMs), telecom equipment manufacturers (TEMs), system integrators (SIs), enterprises, and service providers coming together to accelerate the adoption of network functions virtualization (NFV)-based and software-defined networking (SDN)-based solutions in telecom networks and in public, private, and hybrid clouds. The Intel Network Builders program connects service providers and enterprises with the infrastructure, software, and technology vendors that are driving new solutions to the market. Learn more at <http://networkbuilders.intel.com>.



¹ Figures provided courtesy of Veryx Technologies.

² Test conducted by Prowess Consulting. Configurations: Servers used the Intel® Xeon® processor E5-2609 v2, 16 GB RAM, the Intel® Ethernet Controller XL710 family, 1 GbE NIC, and 1 GbE switch or the Intel Xeon processor E5-2407 v2, 8 or 16 GB RAM, the Intel Ethernet Controller XL710 family, 1 GbE NIC, and 1 GbE switch. Software: OpenStack orchestration software, KVM hypervisor, and Ubuntu® 16.04 LTS.

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