SOLUTION BRIEF

Communications Service Providers
Management and Orchestration

MANO Solution by Altran* Uses AI to Predict VM Failures

Neutral* is an open source solution that uses artificial intelligence and deep learning to understand virtual infrastructure failure conditions and provide the ability to react before a service outage.

Management and orchestration (MANO) platforms are important tools for deploying and maintaining complex virtualized services. Virtualized services can be composed of multiple virtual network functions (VNFs) from different vendors and an open source virtual infrastructure. MANO solutions provide the tools to simplify and automate interactions with these environments throughout their lifecycle. But virtualized systems are always changing and often shifting from server to server. This can cause resource issues that can impact a virtualized service.

Intel® Network Builders ecosystem member Altran* has developed Neutral,* a software platform that offers complete MANO services and can track the hardware usage of virtual machines and virtual services to provide a warning when it predicts that there will be a virtual machine (VM) failure, giving network managers the ability to alleviate a service outage.

The Challenge

The key to the success of virtualized services is that they represent a new way to provision services using open source and commercial software elements running on industry standard servers. This paradigm replaces the legacy fixed-function service appliances that offer a singular service offering that often requires proprietary interfaces and unique knowledge to maintain and scale. The virtualized approach increases service deployment agility, reduces solution cost, and enables on-demand services.

Virtualized services, however, can be complex, and managing these solutions is a challenge for communications service providers (CommSPs) who are used to turning to a single vendor to service a system. There could now be multiple vendors and open source tech support resources required to isolate and fix an issue. MANO solutions are designed to reduce this complexity by managing and orchestrating all virtualized resources, including virtual machines (VM), VNFs, operating systems and virtualized compute, storage, and memory functions. The typical functionality within a MANO solution includes:

- **NFV service and resource orchestrators:** Two abstraction layers that are combined to manage the integration of new network services and VNFs into a virtual framework. NFV orchestrators also validate and authorize NFV infrastructure (NFVI) resource requests.
- **VNF managers:** Function blocks that oversee the lifecycle of VNF instances from deployment to termination.
- **Virtual infrastructure manager (VIM):** A feature that controls and manages compute, storage, and network resources in the NFV infrastructure.

MANO solutions can't typically anticipate a VM problem to warn network managers of an issue before there's a service failure. Virtualized infrastructures are dynamic because VNFs have resource needs that scale with usage or number of users. New VNFs can also be deployed alongside existing VNFs and compete with the existing VNF for memory, compute, and storage resources.

This dynamism can easily result in overloading the CPU or memory and cause a total failure of the service. With no warning, there's nothing the CommSP can do to avoid a service outage and potentially violate service level agreements, which is costly.

Altran's Neutral, however, is a MANO solution that features neural networking and artificial intelligence to monitor key hardware health metrics in order to provide a predictive warning that allows the transition of services to back up servers before there is a service outage.

The Solution

Neutral is an open source platform that utilizes software defined networking (SDN) and network functions virtualization (NFV) to deliver the full range of MANO services that are used to design, monitor, and control virtual networks and services. Neutral has additional features that are designed to predict the performance of virtual assets and warn of potential hardware failure. This provides a warning and a window of opportunity to back up the server and provide a transition to a new server before a service fails.

The full capabilities of Neutral are shown in Figure 1. Standard MANO features for service onboarding, virtual network design, virtual network deployment, orchestration, and alerting are designed with automation functionality. All of these NFV functions sit on top of a VIM that facilitates the design and deployment of the virtual services.

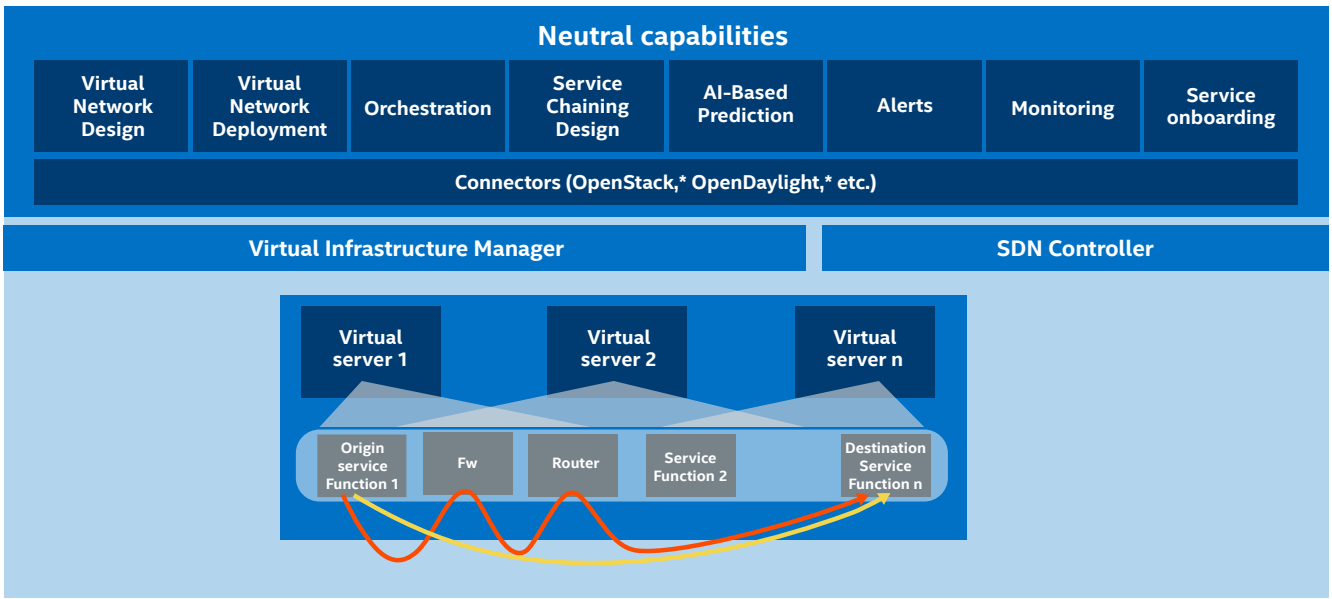

Figure 1. Block diagram of Neutral MANO capabilities.

This function is augmented by an SDN-based abstraction layer that provides simplified service chaining. Without any knowledge of the network designs, a user can arrange connections and services in a drag-and-drop user interface to define or change a service chain. This opens the door to more dynamic services that can be deployed by a customer service representative while a customer is on the telephone.

Defining automation rules is a technical challenge for most MANO systems, but Neutral has a built-in natural language interface to its rules functionality that simplifies the creation of rules. The system can understand statements such as "If an instance is in a critical state, restart the instance" and turn that into a rule that will be enforced by the system. The rules can trigger a wide range of responses, including sending an email, sending comments to a VIM, creating a redundant server, and others.

Artificial Intelligence and Deep Learning Capability

Neutral uses artificial intelligence (AI) to manage deployed services and servers. The AI algorithm monitors all resources in the virtual ecosystem for performance malfunctions and then to automatically send an alert that will enable network managers to take action or trigger a rule that allows another system to take action to avoid a service outage.

Overloading of hardware resources can cause either the VM or the service to fail. Neutral's AI and deep learning capabilities can provide a predictive warning that can trigger an automatic response or alert network managers in order to alleviate service outages.

Neutral provides this early warning functionality by using AI to feed and train a series of neural networks. One class of

neural network monitors the VM usage of memory, hard disk space, and CPU usage. It uses this data to constantly learn from the VM's operation and to use that data to predict the odds of a machine failure in the near future. The other type of neural network is trained on monitoring the performance of each service (all VNFs in a service chain) to determine the memory and CPU usage the service is consuming. Data from these neural networks is processed by Neutral's artificial intelligence algorithms and can trigger responses if they reach dangerous levels.

Optimized for Intel® Xeon® Processor-Based Servers

The Altran Neutral MANO solution is optimized to run on cloud servers based on Intel Xeon processors which provide significant performance and power efficiency benefits for scaled-out data center and network virtualization applications. With built-in virtualization support, the Intel Xeon processors are well suited for SDN and NFV applications. These include Intel Xeon Scalable processors, which feature new technology for compute, network, and storage workloads. This processor family is based on an entirely new processor architecture with the scalability to deliver workload-optimized performance in NFV applications.

Conclusion

MANO solutions are designed to help manage virtualized service complexity and ensure that services run smoothly. By adding AI and neural network deep learning of key hardware metrics, Neutral provides essential functionality for ensuring that virtualized infrastructures deliver services reliably.

About Altran

Altran is a global leader in engineering and R&D services (ER&D), following its acquisition of Aricent. Altran works alongside its clients, from initial concept through industrialization, to invent the products and services of tomorrow. For over 30 years, the company has provided expertise in aerospace, automotive, defense, energy, finance, life sciences, railway, and telecommunications. The Aricent acquisition extends this leadership to semiconductors, digital experience, and design innovation. Combined, Altran and Aricent generated revenues of €2.9 billion in 2017, with some 45,000 employees in more than 30 countries.

About Intel® Network Builders

Intel® Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at http://networkbuilders.intel.com.

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