Elastic Services Controller

Sophisticated management of virtualized services

As you strive to improve your rate of innovation, lower your costs, and improve customer experience, virtualization has inevitably become part of your strategy. The move from physical infrastructure to virtual infrastructure pays dividends because building service delivery around virtualized network functions (VNFs) allows your organization to be more responsive to the market and more flexible in pursuing new opportunities. However, these benefits come at a price: without a capable VNF Manager (VNFM), increased operational complexity can diminish the benefits you were hoping for.

The Cisco® Elastic Services Controller (ESC) was designed with the recognition that a VNFM needs to do more than just simply stand up new VNFs. A service has a lifecycle, its component VNFs inherit that lifecycle, and a VNF Manager must manage those VNFs across that lifecycle. From onboarding and deployment to scaling and fault recovery to tear down, how well a VNFM manages that lifecycle will directly affect the gains your organization will realize. This is exactly where ESC separates itself in the marketplace: sophisticated management of VNFs throughout their lifecycle.

Benefits

- Comprehensive lifecycle management of VNFs
- ETSI-complaint gVNFM
- Broad support of third-party VNFs
- Intelligent handling of multi-VNF services
- Advanced analytics and service monitoring/recovery
- Context-sensitive, customizable workflows

Figure 1 - ESC Lifecycle Stages Framework

Smarter tools, better results

Physical infrastructure has the advantage of being operationally simple. You design it once, you build it once, you test it once, and then you run it with basic "care and feeding" until it's time to replace it. This approach requires you to be a bit of a fortune teller: How much will your business grow? What will competitors be doing? Which applications and services will customers flock to? Which ones will they flee? The rigidity of physical infrastructure will limit your decisions. Predict well (or get lucky), and you're a hero. Predict poorly (or get unlucky), and your organization is dealing with wasted OpEx, poor customer experiences, and missed revenue opportunities.

Virtualization promises to reduce this risk by making your infrastructure investments fluid—you can move your resources to where they can do the most good for you. And, as circumstances change, you can redeploy your infrastructure to meet these new challenges. The caveat is that this requires a greater level of operational sophistication than physical infrastructure. Instead of building it once, you are constantly building, evaluating, and tearing down your virtual infrastructure in response business needs and customer demands.

This is where ESC excels. It gives you sophisticated tools to manage your services and the component VNFs across the entire lifecycle: from onboarding and deploying new VNFs to monitoring health, to scaling up or down instances in response to demand, to attempting to automatically remediate issues, to "spinning down" instances and freeing resources for other applications and services.

VNF Lifecycle Management

Cisco ESC provides an integrated framework of tools that follow a VNF throughout its entire lifecycle. This includes a formal Lifecycle Stages (LCS) framework (see figure 1) that allows you to define and vary policy based on lifecycle stage:

Onboarding: making a new VNF available for use. This includes preparing a VNF image, defining resource and networking requirements, defining monitoring metrics and thresholds, VM placement policy, lifecycle stages, and scaling rules.

Deploy: triggered by a request from an up-stack component, ESC will deploy one or more VNFs, including spinning up the virtual machine (VM) and associated resources, applying affinity rules (for example, explicitly grouping or separating VNFs), loading the VNF image, applying Day-0 configuration and, finally, applying any other operation parameters or monitoring rules.

Monitor: will track specific key performance indicators (KPIs) for a VNF. A set of core metrics—such as ping, memory usage, CPU load, and output bit rate—are tracked for every

VNF. ESC also allows users to define additional metrics to monitor. ESC further allows the creation of rules, so If a defined threshold is exceeded, a specific action is taken. The actions can be predefined, built-in actions or custom user-defined scripts.

Scale: because ESC monitors such metrics as memory and CPU, it can elastically scale instances of a VNF in response to shifting demand. The deployment configuration specifies scaling triggers and the maximum and minimum number of instances of a VNF. ESC will dynamically scale out and scale in between those two bounds based on the specified thresholds.

Heal: because of ESC's monitoring framework, it can monitor the health of VMs and attempt to automatically recover from failures. Health KPIs and policies are defined as part of deployment. If a threshold is triggered, ESC can either attempt an auto recovery or send a signal up-stack and await further instructions. Recovery actions can vary by lifecycle stage and include predefined, built-in actions or custom user-defined scripts.

Update: ESC allows you to update an existing deployment. For example, VMs, resources, KPIs, Day-0 configuration, IP addressing, and the VNF image can all be updated, although specifics vary by deployment environment.

What is ESC?

Cisco ESC runs as a virtual machine. It can be installed in a standalone or high availability (HA) configuration on OpenStack, VMware vCenter, KVM, or Amazon Web Services (AWS) and manages deployment of VNFs on Red Hat

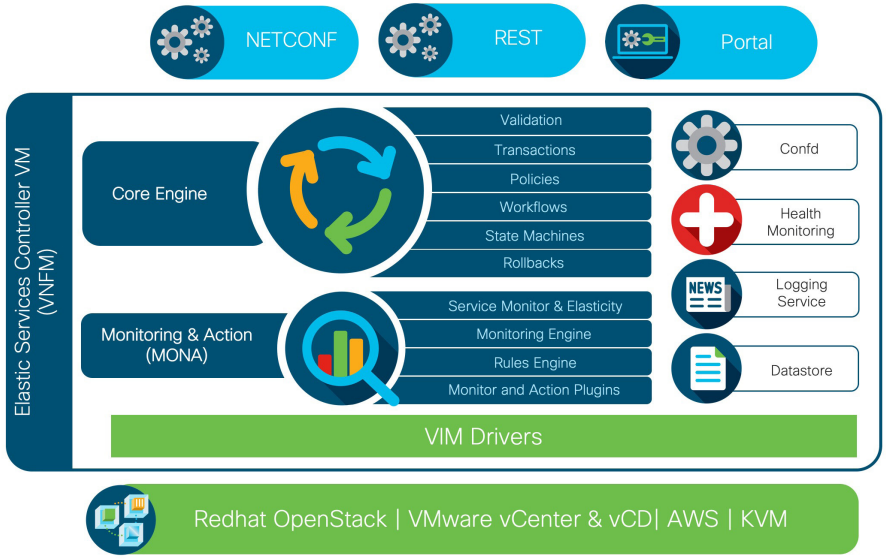

Figure 2 - ESC architecture

ETSI MANO

The European Telecommunication Standards Institute (ETSI) created MANO: a three element model for management and orchestration of VNFs:

NFV Orchestrator (NFVO): manages and coordinates resource and service orchestration

Virtual Network Function Manager (VNFM): manages lifecycle, fault management, and scaling of VNFs

Virtualized Infrastructure Manager (VIM): manages the lifecycle of NFV infrastructure (NVFI), tracks VMs and associated resources, and handles fault and performance management

ESC is a complaint VNFM and will work with any other compliant NFVO and VIM. Cisco also offers an complaint NFVO with Cisco Network Services Orchestrator (NSO) and the NFVO core function pack. One advantage of pairing NSO and ESC is that NSO then provides a common orchestration layer across both your physical and virtual infrastructure. Finally, Cisco also offers a VIM, for infrastructure management. You can mix and match Cisco components with other vendors' compliant MANO components – but Cisco also offers the simplicity of a complete, standards-compliant MANO stack.

Resources

cisco.com/go/ESC

cisco.com/go/NSO

cisco.com/go/services

Ver 1.00 05/19

OpenStack and VMware vCenter Virtualized Infrastructure Managers (VIMs) as well as vCloud Director and AWS. With its standards-based software interfaces, ESC can operate as a standalone generic VNFM (gVNFM) or be deployed in concert with Cisco Network Service Orchestrator (NSO) and its NVFO core function pack as a full NVF Management and Orchestration (MANO) stack. ESC can manage both simple services and complex multi-VM services.

Components

Core engine: provides the central VNF lifecycle management functions of ESC. In addition, it handles such duties as applying policy from higher layers in the orchestration stack (VNF placement, startup order, etc.), coordinating and tracking multistep and/or multi-VNF lifecycle requests, and a database-style ability to implement, roll back, and resume transactions.

MONA: provides sophisticated instrumentation and analytics of VNFs and includes a rules engine that triggers predefined or customer-defined actions based on metric thresholds and lifecycle stage (see figure 3).

Beyond these two key components, ESC also has components to monitor ESC for HA, a logging module, and a ConfD module for northbound NETCONF/YANG clients.

The Cisco Advantage

The ability of Cisco to weave together operational experience, industry insights, and leading technologies together makes us an outstanding partner in your virtualization efforts. Cisco ESC leverages this expertise to provide you with the powerful tools that increase your real-world operational capabilities, which, in turn, strengthen your business.

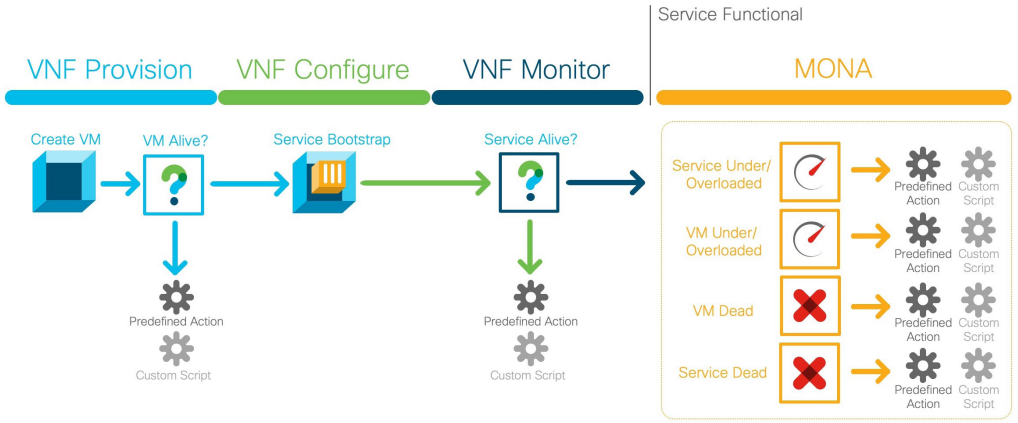

Figure 3 - Rules and customizable actions