

Configuring Oracle SDN Virtual Network Services in an Oracle Ethernet Switch Environment

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Introduction

This white paper outlines the configuration of the Virtual Network Services feature of Oracle SDN (Software Defined Network) in an environment that uses Oracle Ethernet switches. It assumes you have an understanding of Oracle SDN, Oracle Fabric Manager, and the Oracle Ethernet Switch ES2 family of switches.

The Oracle Ethernet Switch ES2 family of high-density switches eliminates the need for complex tier 1 connectivity, simplifying IT infrastructure and reducing costs through fewer cables and simplified management. Oracle Ethernet Switch ES2-64 and Oracle Ethernet Switch ES2-72 are the latest 10/40 GbE switches from Oracle, supporting industry standards designed for cloud-enabled software defined data centers (SDDCs).

Oracle SDN boosts application performance and management flexibility by dynamically connecting virtual machines (VMs) and servers to any resource in your data center fabric. With it, you can gain the performance benefits of up to 80 Gb/sec server-to-server throughput and realize up to 19 times faster live migration, 12 times faster database queries, and 30 times faster backups than with legacy systems. Oracle SDN provides virtual networking flexibility that costs 50 percent less than legacy networking systems. Virtual Network Services, a feature of Oracle SDN, now extends Oracle SDN and allows for the deployment of firewall, load balancer, routing, and other network functions on-demand. Virtual Network Services makes network and security services easy to deploy, configure, and manage.

For simplicity, only a single tenant with a three-tier architecture (web, application, and database tiers) is depicted in this paper. The following sections delve into the details of the switches and the deployment model for Virtual Network Services.

Oracle Ethernet Switch ES2-64 and ES2-72

Designed to harness the full capabilities of Oracle's high-performance systems, Oracle Ethernet Switch ES2-64 and ES2-72 are ideal network attachment switches for all Oracle's engineered systems, servers, and storage products. These switches provide up to 72 ports of nonblocking, wire-rate, low-latency, cut-through 10 GbE switching. With redundant fans, hot-swappable power supplies, and port-side exhaust or port-side intake airflow options, they can be placed in either server or networking racks. An industry-standard command-line interface (CLI) and unified management enable simple, easy, and dynamic configuration of these switches for network connectivity in virtualized data centers.

Oracle Ethernet Switch ES2-64 features 6x QSFP+ and 40x 10GBase-T ports, and Oracle Ethernet Switch ES2-72 features 18x QSFP+ ports. The 10GBase-T ports on Oracle Ethernet Switch ES2-64 connect directly to the onboard LAN-on-Motherboard (LOM) on Oracle's engineered systems, servers, and storage products, which enables the reuse of the existing cabling infrastructure.

Oracle Ethernet Switch ES2-72 has high port density and is ideal for building scale-out deployments. In addition, with extreme low latency of 400ns, this switch is designed for enhancing Oracle Applications, including Oracle Real Application Clusters (Oracle RAC), as well as financial and high-performance computing (HPC) applications.

Figure 1 shows the Oracle Ethernet Switch ES2-64 and ES2-72 switches.



Figure 1: Oracle Ethernet Switch ES2-64 (left) and ES2-72

For more information on Oracle Ethernet switches, please refer to [product pages](#).

Oracle SDN Virtual Network Services

The Virtual Network Services feature of Oracle SDN provides the ability to deploy on-demand network services such as firewall, router, load-balancer, virtual private network (VPN), and network address translation (NAT) services in a single virtual machine. This virtually eliminates the need for proprietary fixed functions that create bottlenecks in a data center today. These network services can be configured and managed in a single pane using Oracle Fabric Manager. Oracle SDN Virtual Network Services is hardware-agnostic and works seamlessly in both Oracle Virtual Networking and Ethernet switch deployments.

The network services are daisy chained within the Virtual Network Services instance while providing the flexibility to configure either all the services or a subset per tenant. Furthermore, for high availability, two Virtual Network Services instances can be provisioned in an active/standby role with configuration synced to the standby instance. The high-availability feature of Virtual Network Services detects the failure of an active instance and enables the standby instance to take over as the new active instance.

Oracle SDN Virtual Network Services comprises two components:

- » Virtual Network Services application software
- » A plugin for Oracle Fabric Manager

For information on how to install the Oracle SDN Virtual Network Services package, please refer to the [product documentation](#).

Configuration Details

This section outlines general steps for configuring Virtual Network Services for a single tenant using a three-tier architecture. These guidelines can then be extrapolated to multiple tenants. In a typical three-tier architecture, a tenant's applications are organized in three distinct tiers: the web tier (user interface), the application/middleware tier, and the database tier.

Each tier could comprise several servers, and these servers could be either physical servers or virtual machines. The servers handling the user interface are generally referred to as the web tier, which handles queries of and access to the applications. The application/middleware servers together represent the application tier and run the distributed application software. Finally, the database servers that host back-end databases for the applications collectively form the database tier.

Figure 2 depicts an Oracle SDN Virtual Network Services deployment in a three-tier architecture for a particular tenant.

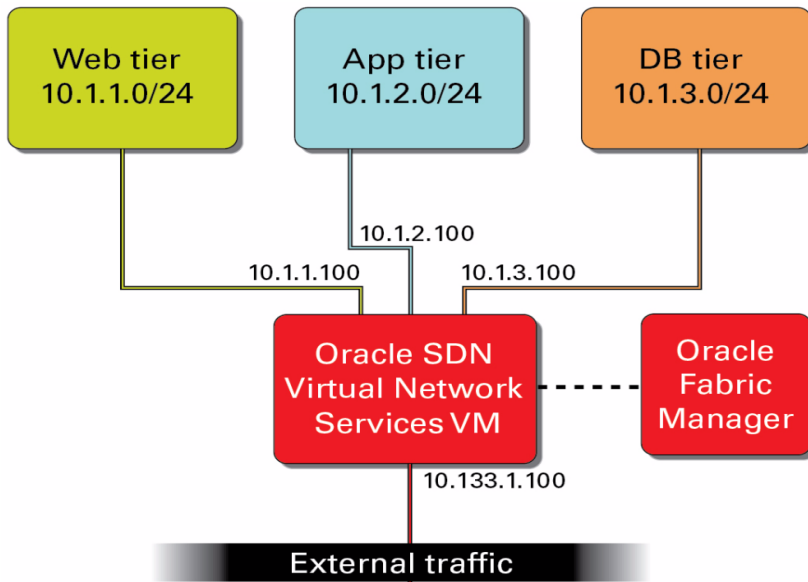


Figure 2: Virtual Network services in a 3-tier architecture for a tenant

An Oracle SDN Virtual Network Services installation requires the following system requirements, and these requirements have to be satisfied prior to configuring the network services.

- » Oracle Virtual Machine 3.2 hypervisor or above: This is on the physical host where the Oracle SDN Virtual Network Services virtual machine will be instantiated.
- » Oracle Fabric Manager 4.3.0: This is the unified management pane for network services deployment and configuration. This software could be installed on either a physical server or a virtual machine. For details on installing Oracle Fabric Manager, please refer to the [product documentation](#).
- » Oracle Linux 6 (64 bits) Update 5: This is on the guest virtual machine where the Virtual Network Services application is installed. This guest machine is referred to as an Oracle SDN Virtual Network Services virtual instance. If high availability (HA) is desired, the Oracle SDN Virtual Network Services application is deployed on two virtual instances with one instance as the HA master and the other as the HA backup.

On the virtual machine where the Virtual Network Services package will be installed, all the virtual network interfaces (vNICs) for east-west traffic within/between the different tiers as well as the north-south traffic coming from the internet need to be created. However, in an Oracle Ethernet Switch ES2 environment, vNICs in different subnets are created for handling both east-west and north-south traffic.

Once the vNICs are created, set the public/management network on the north-south vNIC and Oracle SDN Virtual Network Services virtual machine as the default gateway for all clients accessing the tenant's applications. In addition, all the servers that are in the web, application, and database tiers need to set the Oracle SDN Virtual Network Services virtual machine as the default gateway.

Figure 3 depicts Oracle SDN Virtual Network Services in a three-tier architecture for a particular tenant with firewall, load-balancer, NAT, VPN, and routing services deployed.

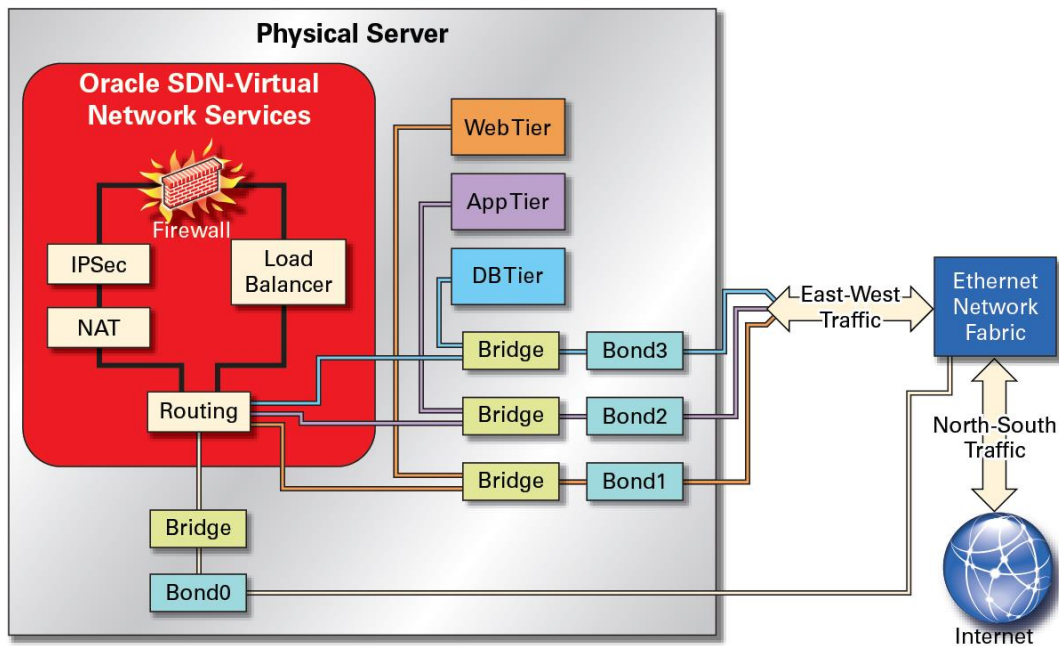


Figure 3: Virtual Network Services deployed per tenant

Deployment with Oracle Ethernet Switch ES2-64 or ES2-72

This section discusses how to deploy virtual network services in an Oracle Ethernet Switch ES2 environment. Consider the setup shown in Figure 4. For simplicity, only three hosts are shown connected to each other via an Oracle Ethernet Switch ES2-64 or ES2-72 switch, which is uplinked to the data center's core network.

Two Oracle SDN Virtual Network Services instances are created for high availability, with the instance on host A as master and that on host B as backup. These instances resolve their roles using the Virtual Route Redundancy Protocol (VRRP), and they exchange configuration information periodically. When the active instance is detected as being down, the backup instance takes over as the active instance. Because the Virtual Network Services instances are set up as active and backup, a high availability IP address will have to be set for this VRRP group. For more information on how to configure Virtual Network Services instances for high availability, please refer to the [Oracle SDN Virtual Network Services Administration Guide](#).

In this deployment example, on each of the hosts a bonded interface called Bond 0 is created, which receives all the external traffic coming from the data center's core network. Given that there is a three-tier architecture, a separate subnet for each tier is created with Bond 1 for the web tier, Bond 2 for the application tier, and Bond 3 for the database tier. Note that it is not absolutely necessary to create separate "Bond" interfaces for different subnets; you could also create different vLANs on Bond 0 to segregate traffic for each tier.

The virtual machines that belong to a particular subnet can talk only to all the other virtual machines in that same subnet. For example, in Figure 4, virtual machines in the web tier, which are shown in green, can send traffic to any other virtual machines in the web tier on any of the hosts, but they can't send traffic to virtual machines in either the application or the database tier. All the virtual machines in the web, application, and database tiers will set their default gateway to point to the HA IP address of the Virtual Network Services instances, which was set earlier. And then any time a virtual machine in the web tier has to send traffic to a virtual machine in the application tier, all the traffic will be sent to the default gateway, which goes to the active Virtual Network Services instance.

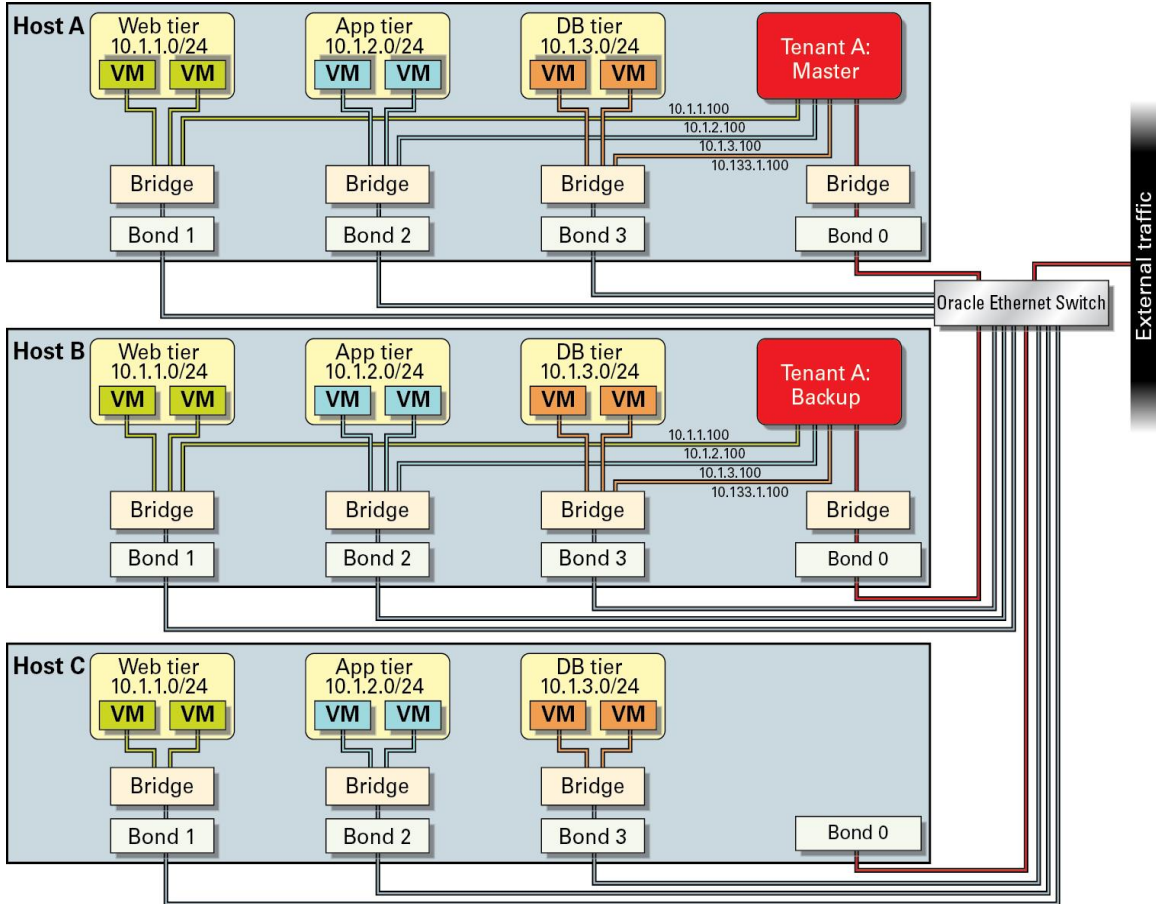


Figure 4: Virtual Network Services deployed with Oracle Ethernet Switch ES2-64 or ES2-72

Once VNS instances are created, high availability is set up and the datapath over the vNICs are established, network services—such as firewall, load balancer, and so on—can be configured from the Oracle Fabric Manager dashboard. The routing feature on Oracle SDN Virtual Network Services is enabled by default.

Here is a detailed explanation of the datapath and packet flow for a sample scenario. Suppose a tenant wants to block all traffic that as a source IP address of 10.129.1.100 on the Bond 2 subnet, and this firewall policy has been set up from Oracle Fabric Manager. Then, when a packet with a source IP address of 10.129.1.100 and a destination IP address of a virtual machine in the web tier is received by the active Virtual Network Services instance, it forwards packet to the web tier virtual machine. The web tier virtual machine processes the packet and then has to send it to the virtual machine in the application tier, so it sends the packet to the active Virtual Network Services instance. Before the Virtual Network Services instance routes the packet over the Bond 2 bridge to the application tier, it applies the firewall policies that are set on the Bond 2 subnet and takes action to drop the packet.

For detailed information on how to configure the different network services, please refer to the [Oracle SDN Virtual Network Services documentation](#).

Conclusion

There are many variables when configuring and deploying Oracle SDN Virtual Network Services. This document is an attempt to simplify the configuration process and reduce risk for Oracle customers by providing information about how to use the Oracle SDN Virtual Network Services feature with Oracle's networking products.

References





For more information, visit the web resources listed in Table 1.

TABLE 1: WEB RESOURCES FOR FURTHER INFORMATION

Web Resource Description	Web Resource URL
Oracle SDN Virtual Network Services	oracle.com/us/products/networking/virtual-networking/sdn/overview/index.html
Oracle Switch ES2-64	oracle.com/networking/switch-es2-64/index.html
Oracle Switch ES2-72	oracle.com/networking/switch-es2-72/index.html
Oracle Fabric Manager	oracle.com/us/products/networking/virtual-networking/fabric-manager/overview/index.html
<i>Ethernet Fabric Operating System CLI Base Reference Manual</i>	docs.oracle.com/cd/E19934-01/html/E26513/



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