

Configuring Oracle SDN Virtual Network Services in an Oracle Virtual Networking 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 Oracle Virtual Networking and Ethernet environment. It assumes that you have an understanding of Oracle SDN, Oracle Virtual Networking, and Oracle Fabric Manager.

Oracle Virtual Networking is a hardware and software solution that streamlines server management. Instead of deploying multiple cards and cables to every server, you can connect servers with a single cable and then create virtual connectivity resources instantaneously with Oracle Fabric Interconnect. The result is up to 100 times faster network and I/O provisioning, 70 percent fewer cables and cards, and 50 percent lower capital cost than with conventional networking.

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 Oracle Virtual Networking and the deployment model for Virtual Network Services.

Oracle Virtual Networking

Oracle Virtual Networking revolutionizes data center economics by creating an agile, highly efficient infrastructure built on your choice of hardware and software. This open architecture enables you to dynamically connect servers, networks, and storage. You create networks and connections entirely in software to enable secure, isolated services that support your business processes and priorities. With Oracle Virtual Networking, all traffic types, including Ethernet and Fibre Channel, traverse a converged infrastructure, resulting in a simpler, more efficient, wire-once environment with flexible connectivity. Products in the Oracle Virtual Networking family include Oracle Fabric Interconnect, Oracle Fabric Manager, Oracle Fabric Monitor, and Oracle SDN.

Oracle Fabric Interconnect employs virtualization to enable you to flexibly connect servers to networks and storage. It eliminates the physical storage and networking cards found in every server and replaces them with virtual network interface cards (vNICs) and virtual host bus adapters (vHBAs) that can be deployed on the fly. Applications and operating systems see these virtual resources exactly as they would see their physical counterparts. The result is an architecture that is much easier to manage, far more cost-effective, and fully open.

Figure 1 shows the Oracle Fabric Interconnect chassis.



Figure 1: Oracle Fabric Interconnect chassis

Oracle Fabric Interconnect provides network and storage connectivity to all attached servers. Within the servers, vNICs and vHBAs appear as conventional Ethernet and Fibre Channel host bus adapters. Furthermore, using Oracle SDN, private virtual interconnect links, which are software defined links between two resources, can be defined. A private virtual interconnect enables you to connect any virtual machine or server to any other resource in the data center, and it can be used to join any number of virtual machines, networks, storage devices, and bare-metal servers in isolated Layer 2 (L2) domains. For more information on Oracle Virtual Networking, 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 [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.

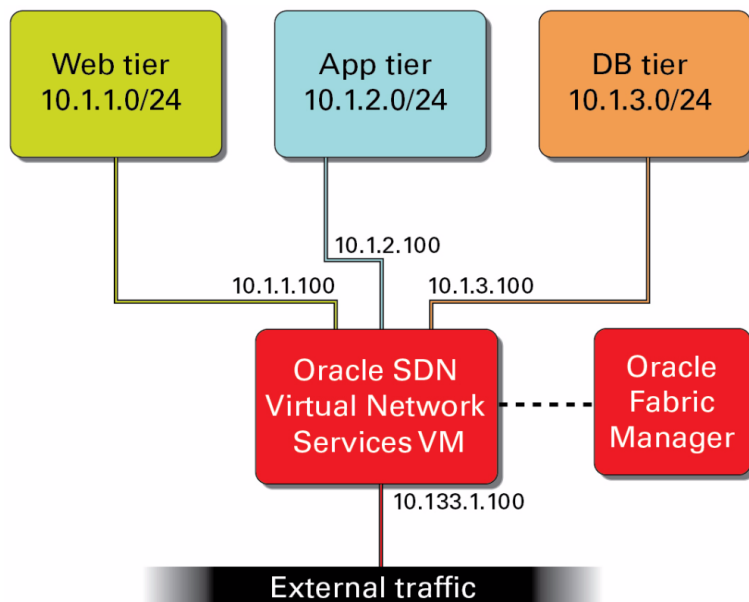


Figure 2: Virtual Network services in a 3-tier architecture for a tenant

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 Oracle SDN Virtual Network Services application is installed. This guest machine is referred to as the 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. In an Oracle Virtual Networking environment, the “private virtual interconnect vnic” carry east-west traffic while “Oracle SDN Vnic” carries external 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.

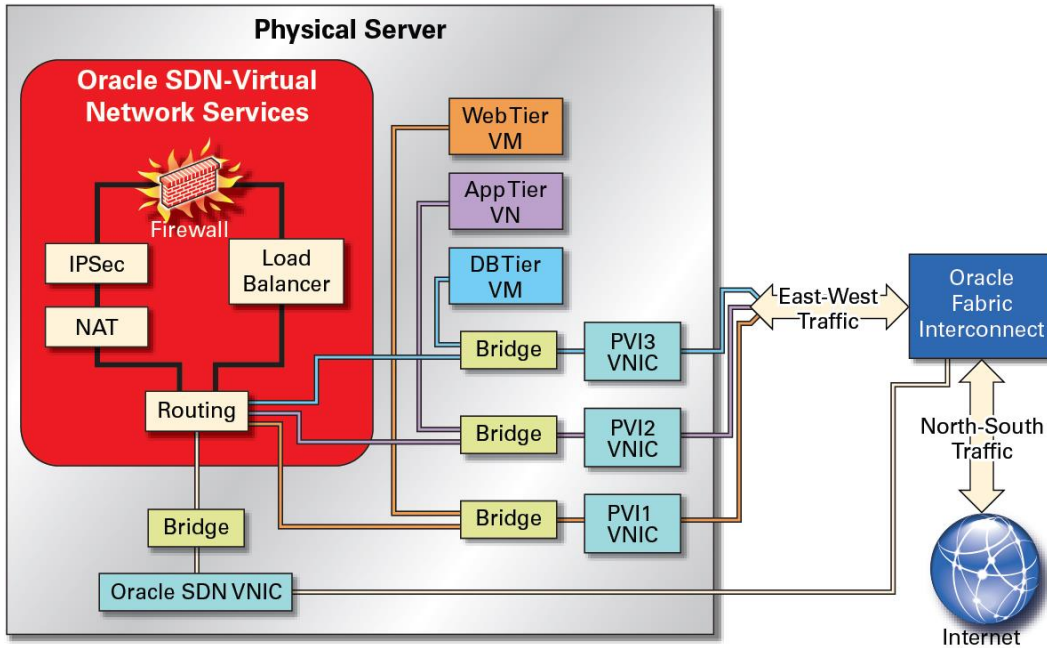


Figure 3: Virtual Network Services deployed per tenant

Deployment with Oracle Virtual Networking

This section discusses how to deploy virtual network services in an Oracle Virtual Networking environment. Consider the setup shown in Figure 4. For simplicity, only three hosts are shown connected to each other via an InfiniBand back-plane over the Oracle Fabric Interconnect chassis. The Ethernet I/O modules within the chassis provide connection 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 Virtual Network Services virtual 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 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](#).

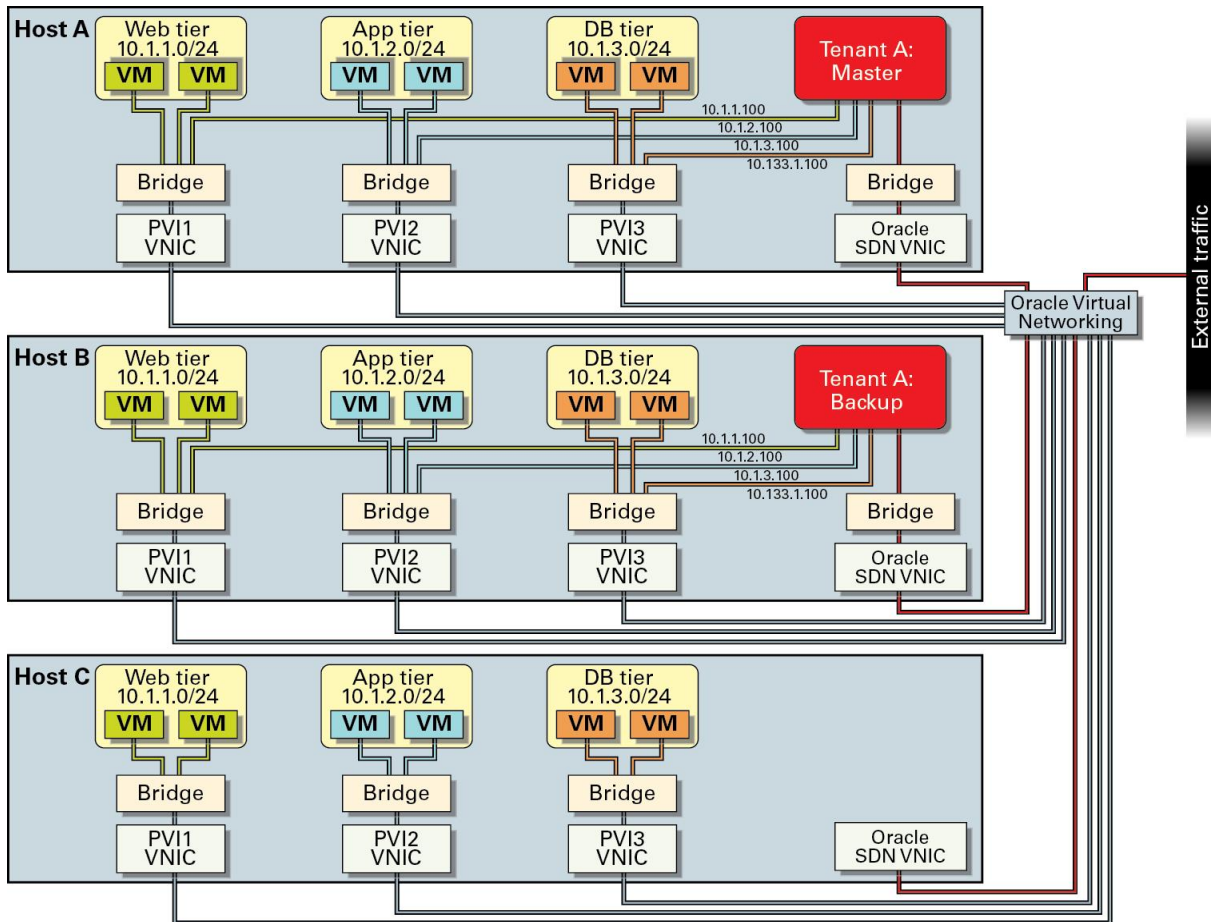


Figure 4: Virtual Network Services deployed with Oracle Virtual Networking

In this deployment example, on each of the hosts a vNIC called Oracle SDN vNIC is created, which receives all the external traffic (north-south) coming from the data center's core network. Given that there is a three-tier architecture, a separate private virtual interconnect (PVI) network for each tier is created with the PVI1 vNIC for the web tier, the PVI2 vNIC for the application tier, and the PVI3 vNIC for the database tier.

The virtual machines that belong to a particular PVI network can talk only to all the other virtual machines in that same PVI network. For example, in Figure 4, the 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 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 that 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.

Once Virtual Network Services 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 and firewall features on Oracle SDN Virtual Network Services are enabled by default.

Here is a detailed explanation of the data path and packet flow for a sample scenario. Suppose a tenant wants to block all traffic that has a source IP address of 10.129.1.100 on the PVI2 vNIC interface and this firewall policy from Oracle Fabric Manager has been set up. 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 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 PVI2 vNIC interface to the application tier, it applies the firewall policies that are set on the PVI2 vNIC interface and takes action to drop the packet.

For more information on how to configure 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 Virtual Networking	oracle.com/us/products/networking/virtual-networking/overview/index.html
Oracle Fabric Manager	oracle.com/us/products/networking/virtual-networking/fabric-manager/overview/index.html
Ethernet Fabric Operating System CLI Base Reference Manual	docs.oracle.com/cd/E19934-01/html/E26513/



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Hardware and Software, Engineered to Work Together

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