Planning for an OpenStack Configuration

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This article discusses topics related to planning for the installation and configuration of OpenStack in a production environment. It incorporates some best practices that can help manage, if not minimize, the complexity of OpenStack configurations. The article also includes hardware and software requirements for an OpenStack deployment.

Overview of OpenStack Configuration

The underlying physical infrastructure constitutes the foundation of any OpenStack cloud configuration. Thus, planning for an OpenStack deployment should begin with considering the hardware systems to be used for the OpenStack installation.

In a single node configuration, the preparation of a physical system is relatively simple. This configuration, however, is unsuitable for production use because a production environment requires multiple hardware resources. Although adding more resources means that the efficiency of the cloud infrastructure increases, so does the complexity.

Planning the Hardware Deployment

Where possible, deploy symmetrical hardware for the cloud, which means using the same type of server for the entire OpenStack framework. Also, implement the same hardware configuration on these servers as much as possible, for example, by using the same host bus adapters (HBAs) on the same HBA slots, similar disk configurations, and so on. By using similarly configured hardware, you gain the following advantages:

- Management of spare systems for the OpenStack setup is more efficient because you are basically storing only one type of server.
- In case of system failure, replacing or swapping hardware is easier.
- Troubleshooting software problems is less complicated because references to different object names such as ports and disks are the same throughout the infrastructure.

The systems must meet the hardware requirements to support the specific Oracle Solaris release that supports OpenStack. These requirements include sufficient disk, memory, and CPU resources to host kernel zones and OpenStack services. For additional information, see “OpenStack Installation Requirements” on page 2.

For best performance in a production environment, you should use dedicated systems for the cloud. The systems should be intended for running OpenStack only.

Dedicated systems are not a requirement. However, if other programs are installed on the same OpenStack systems, then OpenStack services would be degraded if resources such as memory, bandwidth, connection counts and so on are diverted for the other programs.

Using dedicated systems also helps in troubleshooting. When problems occur, you would not need to isolate OpenStack and non-OpenStack services first to determine whether the problems are OpenStack related. Instead, you can immediately work on tracing the root cause within the context of the cloud setup.

OpenStack Installation Requirements

Oracle Solaris systems on which you install OpenStack must meet the following requirements:

- **Operating system.** Your systems must be running an Oracle Solaris release that supports the specific OpenStack version you want to install. For instructions to install the operating system, refer to the installation books in the applicable library in Operating Systems Documentation. The installation shelf also contains documents for updating the operating system.

  To download installation images, go to the Oracle Technology Network site. From the Downloads tab, click Solaris.
- **Hardware.** To ensure that your systems support the Oracle Solaris , refer to one of the following:
  - The appropriate systems requirements data sheet provided in the Oracle Technology Network site. On the same page for downloading installation images, the system requirements information is found under the heading Key Resources.
  - The system requirements information in the release notes of the Oracle Solaris version you are installing.

  You need up to 5 GB additional space to install OpenStack, depending on the OpenStack services you install on each node. Ensure that you have enough CPUs, memory, and disk space on your Compute nodes to support the desired number of VM instances. Your systems should have 100-200 GB of ZFS storage for VM instance images and for creating VM instances.
- **Virtualization support.** Your systems should support kernel zones. VM instances can be either non-global zones or kernel zones.

  To verify if your system supports virtualization, type the `virtinfo` command on a terminal window. The command output should display the information as shown in the following example:

  ```
  # virtinfo
  NAME             CLASS
  non-global-zone  supported
  kernel-zone      supported
  ```

  For kernel zone support, your system must fulfill the following additional requirements:
  - A minimum of 8 GB of physical RAM.
  - Sufficient tuning of the ZFS Adaptive Replacement Cache (ARC) on the host to prevent memory errors. For more information, see "Tuning the Host ZFS ARC to Reserve Memory for Kernel Zones" in *Creating and Using Oracle Solaris Kernel Zones*.

  Note - Kernel zones cannot run in Oracle VM Server for x86 guests or on Oracle VM VirtualBox.

  For more information about kernel zone installation requirements, see the following resources:
  - *Creating and Using Oracle Solaris Kernel Zones* that contains hardware and software requirements for kernel zones. This book is in your Oracle Solaris version's library in Operating Systems Documentation.
  - The `README` file for your Oracle Solaris version's archive.

    Go to the Oracle Technology Network site. On the same page for downloading installation images, the `README` file is under the Unified Archives section.
- For OpenStack deployment in a production environment, use a network database such as MySQL. Most of the OpenStack services maintain their local state in a SQL database or set of tables. The default database that is used is SQLite, which is useful for demonstration in a single node OpenStack configuration. However, SQLite is not suitable for use in real world scenarios. Further, it lacks support for certain database operations that can complicate upgrade processes and make them extremely difficult to perform.

Preparing for the Oracle Solaris Installation

For more information about planning and preparing for installing Oracle Solaris, see the appropriate installation books in the applicable library in Operating Systems Documentation.

Follow best practices about backing up the current state of your system before installing OpenStack, such as creating a backup boot environment or creating a snapshot of the entire system. With these backups, you can revert to the pre-OpenStack state of the machine. For further details, refer to your Oracle Solaris version's installation documentation as well as the ZFS file system documentation in the same library.

Enforcing Security

Oracle Solaris is secure by default. However, after installation, you can adopt additional security measures to fulfill corporate requirements. For procedures to tighten security on Oracle Solaris systems, refer to the security books in your Oracle Solaris version's library. These books provide information and procedures to fine-tune security on your Oracle Solaris systems, such as setting permissions, maintaining password settings, setting strong password constraints, auditing, and so on. For general guidelines on security, see *Oracle Solaris Security and Hardening Guidelines* in the same library.

Regarding security issues that are specific to OpenStack, prepare passwords for the default processes and services that access the different nodes of the cloud framework. By default, user account names and their corresponding passwords follow the OpenStack service name. For example, for the Cinder component, the user name is `cinder` and its password is `cinder`. Likewise, for the Neutron component, the user name and password are both `neutron`. This default setup is useful for a quick setup and testing of OpenStack in an isolated environment. When configuring for a production environment, make sure that you specify secure passwords where passwords are required in the configuration files.

Planning the Network Architecture

In a single-node configuration whose purpose is to enable you to evaluate OpenStack, one network interface card is sufficient. However, using a single network interface for a multinode configuration is insufficient to provide the bandwidth to service a cloud's heavy network traffic. If you use a single network interface in an enterprise OpenStack setting, performance quickly becomes a serious issue.

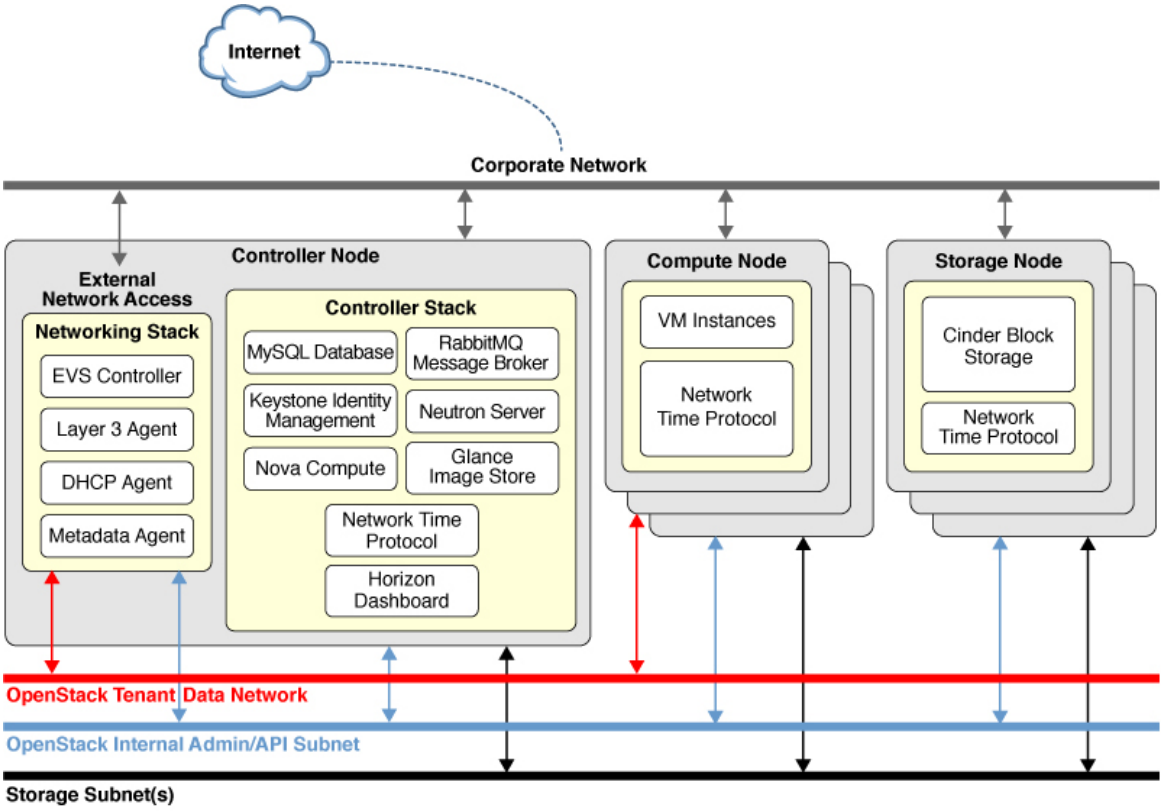
Isolating Different Types of Network Traffic

Different types of network traffic traverse the cloud infrastructure. You should have separate networks or subnets to host each type of traffic, for example:

- Guest or tenant network – Hosts traffic among the virtual machines (VMs) in the OpenStack cloud.
- Storage network – Hosts traffic between the VMs and their application datasets that are on external storage systems.
- Management or API network – Hosts traffic among the OpenStack components that manage the entire operation of the cloud infrastructure, including administrator-generated traffic.
- External network – Hosts traffic between the virtual entities such as the VMs and their private networks in the OpenStack cloud and the wider network, which consists of both the corporate network and the Internet.

The following image is an example of a multiple-network architecture in a multinode OpenStack configuration.

FIGURE 1 Example of a Multiple Network Architecture



In this example, you can expand the architecture further as needed. For example, if you decided to use redundant storage systems, then you create separate storage subnets to manage the traffic to each system.

With different networks for specific traffic, you obtain the following advantages:

- **Reliability and availability of the network** – Multiple networks avoid the risk of a single point of failure inherent in single-network configurations.
- **Performance and scalability** – Compared to using a single network interface, having multiple interfaces to function as different network traffic paths prevents potential congestion and its consequent performance degradation.
- **Security** – Separating the networks ensures control of access to different parts of the OpenStack framework.
- **Manageability** – Managing the entire OpenStack framework is easier for the cloud administrator.

Following a Uniform Network Design

In Oracle Solaris, network adapter datalinks follow the naming convention `net`*n*, where *n* is a number beginning from zero. The number is assigned based on the order by which the adapters are detected during the kernel boot process.

Use the same type of network adapter on each hardware node and install them on the same option slots on the motherboard. On every server, configure each network adapter port for the same network. For example,

the interface `net0` in all the systems would be used for connecting to the external network, with `net1` reserved for the guest network, and so on. In this manner, the interface port numeration in the kernel and the device link names remain consistent on each OpenStack node. Having a uniform network configuration facilitates subsequent OpenStack configuration steps, specifically when you set up the Elastic Virtual Switch (EVS) in Neutron.

Assigning Logical Host Names

Using logical host names is a good practice that applies to any network configuration scenario. An enterprise OpenStack infrastructure requires several IP addresses. Specifying IP addresses to configure the cloud complicates configuration in requiring you to remember and manage these numbers. OpenStack configuration information is stored in databases. Without any deep knowledge of these databases and the way they store OpenStack information, correcting the database would be difficult should you need to change IP address configuration.

Prepare a mapping of host names and IP addresses that you will use for the setup. Use DNS or the `/etc/hosts` files for name resolution. Test the configuration to ensure that it is functioning properly. Then, after installing Oracle OpenStack for Oracle Solaris, when defining connection parameters in the configuration files, specify host names instead of the IP addresses.

Planning the Multinode OpenStack Architecture

The flexibility of OpenStack offers you a variety of ways to distribute its components across multiple nodes or systems. The sample architecture in Figure 1 shows only one way of deploying the components on three nodes:

- Storage node
- Compute node
- Controller node

In the figure, the Controller node combines OpenStack components such as the MySQL database, the EVS controller, and the message broker software (RabbitMQ).

However, you can also subdivide the components further. For example, you might have the following component distribution across five nodes:

- Node 1: RabbitMQ
- Node 2: MySQL database
- Node 3: OpenStack Controller components such as Keystone, Glance, Horizon, and so on
- Node 4: Elastic Virtual Switch
- Node 5: L3 Agent

In addition, you can have multiple storage and compute nodes. Other non-core OpenStack components such as Ironic can be in their own nodes as well.

Because of this flexibility, you can design your OpenStack infrastructure based on the available resources as well as on how you want to group the components in each node. Then, you can install only those OpenStack packages you want on each system instead of installing the entire OpenStack package on all of the systems.

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