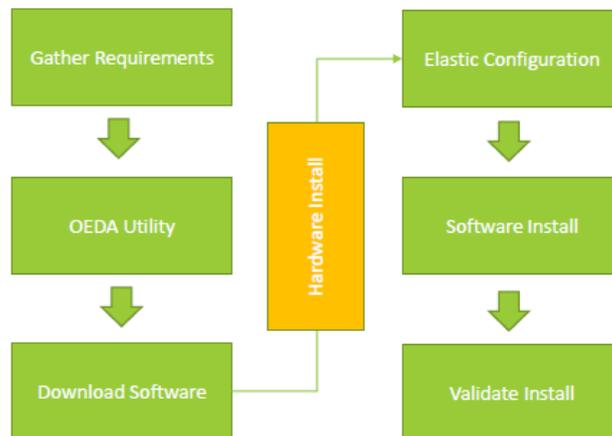


Introduction

Exadata Machine was first introduced by Oracle in 2008 and now it has become one of the most popular database platform to host Oracle databases. Exadata machine is like a mini data center in itself, comprising of Database Servers, Storage Servers, InfiniBand Switches and Ethernet switch working together to deliver outstanding database performance. Over the years Exadata went through few different deployment processes, while Oracle tries to make it simpler and error free. This article will take you through different phases of Exadata deployment and clearly define responsibilities of each group involve during the process. At minimum, you should treat Exadata deployment as a small project and permanently dedicate resources for it.

Basically Exadata deployment will involve many phases and it can take up to few weeks before you can login to Oracle Database running on your Exadata Machine. It start by planning for target Exadata machine which include capacity planning, key deployment decisions and licensing considerations. Once you have narrowed downed your Exadata configuration, you can download and run Oracle Exadata Deployment Utility to generate different configuration files. OEDA utility will also give you the list of software and patches that you need to download from Metalink. After downloading and copying all the software to target Exadata machine, you can apply Elastic Configuration and deploy Oracle software to Exadata Machine. Finally, verify all the software and hardware components once Exadata deployment is completed.

Overview



Planning

Exadata is a big investment, so it is important that you plan Exadata deployment very carefully. Following are some important considerations for your Exadata deployment.

Capacity Planning: You might be buying Exadata machine for a particular application or may be planning to consolidate databases to Exadata platform. In any case you should perform detail analysis of your existing database or databases, in order to do capacity planning for your Exadata Machine. It is important to understand that Exadata offload a lot of processes to storage nodes, hence requiring less CPU's on compute nodes and also provide extra ordinary compression ratio using Hybrid Columnar Compression, hence requiring less storage. Therefore, Capacity planning for Exadata is little different than traditional hardware but basics will still apply. You should gather information about CPU, IOPs and Physical Memory of an existing system and use them to size your Exadata machine.

Deployment Decisions: Once you have size your Exadata machine, it is time for you to make some important deployment decisions. Exadata deployment decision can have lasting impact on your hosted databases, For example changing ASM diskgroup redundancy will require recreating that disk group causing application outage. Therefore, it is important to consider Exadata deployment decisions like ASM Redundancy Level, Virtualization, Network Isolation, Role Separation and Storage Type in detail before moving to next phase of Exadata Deployment Life Cycle. ASM redundancy is probably the most important Exadata deployment consideration, since it will hard to change it after the deployment. Even though Oracle recommend using High redundancy level for Exadata machine, you have option to choose normal redundancy based on your requirements. If you are planning to deploy non-production databases, you might want to use normal redundancy to efficiently utilize expensive Exadata storage. It is also important to note that external ASM redundancy is not supported with Exadata systems. As many of you already know that virtualization is supported with the release of X5 and it has become an important deployment consideration for many customers. I will not get into details in this article but there many benefits of using virtualization with Exadata Machine including license cost savings, security and isolation. It is also important to understand that virtualizing Exadata machine comes with administrative overhead. Now you have multiple clusters to maintain instead of one. Network isolation can also be important to you, if you have consolidated number of databases to Exadata machine. You can achieve network isolation using two options, private Vlan and InfiniBand partitioning. You may also want role separation, you can deploy Exadata with Oracle user being a sole owner of GRID and RDBMS software or have role separation by having two separate owners for GRID and RDBMS software. You can decide to choose either way based on you organization standards. Next you need to decide what type of storage disk you want for your Exadata machine. Exadata machine comes with two storage disk options, Extreme Flash IO and high capacity. As it is hinted with their names, one is design to provide you with more performance and better IO response time vs other is design to provide you with higher storage capacity. My recommendation will be to choose high capacity disks because new Exadata machines comes with tera bytes of flash cache and your application will be performing most of the read and write from flash cache. Similarly, you need to decide backup location for your databases running on Exadata machine. Given, Exadata storage is not cheap, it best to use Oracle supported NFS mount like ZFS or any other Oracle supported backup solution.

Licensing Considerations

When you buy Exadata machine, you will at least need to buy Oracle database Enterprise Edition and Exadata Storage Software licenses. Given that Exadata compute nodes come with high number of CPU's, you are looking at significant investment to purchase Exadata machine. As a customer, you have two options to control Exadata Software licensing cost. First you can use Capacity on Demand (CoD) option to disable a subset of the cores on Exadata database servers to reduce licensing requirements. The maximum number of cores that can be disabled on an Exadata X5-2 Database Server is 60%. Secondly, Exadata now supports Oracle Virtual Machines (OVM). OVM can be used to create virtual machines with specific number of core to reduce licensing requirements, similar to Capacity on Demand (CoD) option. . You can also use virtual machine to save money on licensing, since the options can be licensed on just the virtual machines using them instead of every physical core in the server. Additionally, if you are planning to use Oracle Advance compression or Oracle Advance Security to option and you don't have existing licenses for it, consider buying them for following reasons. You might be required to buy Oracle advance Security option for compliance reasons. Especially, if your database contain credit card information, you need to encrypt data at rest and on the network. Secondly, Even though Exadata comes with its own free compression called Hybrid Column compression, but it does not support OLTP operations. Oracle Advance compression not only help you save some very expensive storage, it can also improve performance by reducing IO foot Print

OEDA Utility

If you are one of early adopters of Exadata machine you probably remember old Exadata configuration excel sheet used for Exadata installation. But few years back, Oracle introduced a Java base utility called Oracle Exadata Deployment Assistant (OEDA) in effort to simplify Exadata install process. You need download latest OEDA version and generate Exadata configuration files before the delivery of Exadata Machine. Once downloaded, work with network and database administrators to fill out following sections.

- IP addresses (Private & Public Network)
- Domain Naming services (DNS)
- Network time protocol (NTP)
- Cluster name
- Disk Group name and their redundancy
- Email information for alerts
- Oracle configuration Manager (OCM)
- Auto Service request (ASR)
- Grid Control Agent (OEM 12c)

If you are able to successfully run OEDA utility, it should generate following configuration files for Exadata install:

- OEDA XML file
- Network Check Script
- Installing Template

- Pre-configuration Files

Oracle will deliver and install Exadata Hardware on site

Download Software

This deployment phase can be completed in parallel with any other phase, as long as you have ran OEDA utility. It is important to understand that you will not be able to deploy Exadata software without downloading all the necessary software and patches from Oracle support. You can get the list of all the software and patches from Exadata configuration file generated by OEDA utility. This phase consists of two parts, download software & patches from Oracle support and then transfer them to Exadata machine. You can download software & patches before you have possession of Exadata machine and once Exadata machine is on your network, you can transfer them to machine.

Here is the example of Software and Patches from Exadata configuration file:

Download the following files from MOS into the Oracle Exadata Deployment Assistant's WorkDir directory

```
linuxamd64_12102_database_1of2.zip  
linuxamd64_12102_database_2of2.zip  
linuxamd64_12102_grid_1of2.zip  
linuxamd64_12102_grid_2of2.zip  
p21923026_12102160419DBEngSysandDBIM_Linux-x86-64.zip  
p22674709_121020_Linux-x86-64.zip  
p22899531_121020_Linux-x86-64.zip  
p23200778_12102160419DBEngSysandDBIM_Linux-x86-64.zip  
p6880880_121010_Linux-x86-64.zip  
exachk.zip
```

Patch for bug 23200778 is required for all bundle patches. If it is not available on My Oracle Support for your database version, contact Oracle Support

Elastic configuration

Hopefully by now you have Oracle Exadata machine shipped to your data center and it is ready for next deployment phase. Oracle Exadata machine is shipped with factory default IP addresses. Starting with Oracle Exadata Storage Server Software release 12.1.2.1.0, the NET0 IP addresses are assigned dynamically by the elastic configuration procedure during the first start of the system. The addresses are in the 172.16.2.1 to 172.16.7.254 range. Prior to connecting Oracle Exadata Database Machine to the network, ensure these IP addresses do not conflict with other addresses on the network. Oracle recommends running the script before connecting the network to avoid problems, even if a check was performed as part of planning process before the machine was delivered. To initiate elastic configuration process, you will need the configuration file generated by Oracle Exadata Database Machine Deployment

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Assistant. The procedure can be run from any database node (usually the first node,) and also from a cell in cases where expansion involves adding only cell nodes. This is a very important step and you only need to run this step from 1 node only. This step will use your Exadata configuration file to assign new IP addresses and reboot all exadata nodes including storage nodes. Once this phase is complete, connect through ssh and run `iphosts` to see if new IP addresses has been assigned. It is important that you don't see any elastic keyword on the screen, otherwise your elastic configuration is not completed.

Example of running elastic configuration:

- `./applyElasticConfig.sh -cf customer_name-configFile.xml`

```
[root@node8 linux-x64]# pwd
/opt/oracle.SupportTools/onecommand/linux-x64
[root@node8 linux-x64]# ./applyElasticConfig.sh -cf [REDACTED].xml
Applying Elastic Config...
Applying Elastic configuration...
Searching Subnet 172.16.2.x
6 live IPs in 172.16.2.x
Exadata node found 172.16.2.37
Configuring node : 172.16.2.46
Done Configuring node : 172.16.2.46
Configuring node : 172.16.2.40
Done Configuring node : 172.16.2.40
Configuring node : 172.16.2.38
Done Configuring node : 172.16.2.38
Configuring node : 172.16.2.37
Done Configuring node : 172.16.2.37
Configuring this node. Validate that it restarts with the right configuration
Configuring node : 172.16.2.44
|||||
Broadcast message from root@[REDACTED]dbadm01.[REDACTED].com
      (unknown) at 10:55 ...
I
The system is going down for reboot NOW!
Completed configuring node : 172.16.2.44
Completed elastic configuration
Completed Applying Elastic Config...
Ending applyElasticConfig
[root@node8 linux-x64]#
```

Now you can connect Exadata Machine to Your Network

Software Install

During this phase, we actually install and configure Oracle software including Oracle Grid and RDBMS on Exadata machine. If you have ever install Oracle Real Application Cluster in your organization, this phase will look very familiar to you. This phase is similar to installing Oracle Real Application Cluster on any other supported hardware configuration but more comprehensive. This process is developed by Oracle engineers to simplify and automate software install process on Exadata machine. This phase consist of 19 steps and you can run them one by one or you can run all of them together. I strongly recommend doing it 1 by 1. The following steps are performed by the Oracle onecommand utility and actual steps for a specific deployment may differ depending on the deployment options chosen. For example, the "Update Nodes for Eighth Rack" step is performed only if you are doing an eighth rack deployment.

1. Validate Configuration File
2. Update Nodes for Eighth Rack
3. Create Virtual Machine
4. Create Users
5. Setup Cell Connectivity
6. Create Cell Disks
7. Create Grid Disks
8. Configure Alerting
9. Install Cluster Software
10. Initialize Cluster Software
11. Install Database Software
12. Relink Database with RDS
13. Create ASM Diskgroups
14. Create Databases
15. Apply Security Fixes
16. Install Exachk
17. Setup ASR Alerting
18. Create Installation Summary
19. Resecure Machine

Once you have completed all the 19 steps successfully, you have almost completed your Exadata deployment. Please make sure to change all the root password when login for first time. So far all the operating system users are configured with default passwords.

Validate Install

As I have mentioned, your Exadata deployment almost completed at previous phase but you should validate your Exadata install before you start deploying any databases on it. Exadata machine is like a mini data center, containing many different types of hardware including database servers, storage and network switches. You should validate all the Exadata components including software and hardware. You can start by reviewing log files from Exadata software deployment phase, each step will generate a log file. Secondly, review `exachk` and installation summary report generated by `oncecommand` utility for any reported errors. If you find any issues during this phase, it is important to get Oracle support involve to resolve these issues.

Conclusion

Even though Oracle have invested a lot of time and effort to simplify Exadata deployment process but still there are a lot of moving parts and many hardware components. You might find Exadata deployment process little complex, especially if this the first time you are deploying Exadata machine in your organization. I hope this article help you understand Exadata deployment process better and make you feel comfortable enough to choose Exadata as your Oracle database platform. Good Luck