

# Solution-in-a-box: Deploying Oracle FLEXCUBE v12.1 on Oracle Database Appliance Virtualized Platform

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## Executive Overview

Oracle Financial Services Software Limited provides IT solutions for financial service industry. The company's portfolio consists of products, IT services, consulting and knowledge process outsourcing services.

The Oracle Database Appliance is an Oracle engineered system, consisting of hardware and software, designed to simplify the deployment, maintenance and support of high availability Oracle Database and Oracle FLEXCUBE UBS solutions.

With Oracle Database Appliance, you have the choice to deploy highly available Oracle Databases directly on the physical hardware or to deploy both Oracle Database and Application Tier servers in a virtual environment within the appliance. This paper describes how to deploy Oracle FLEXCUBE UBS solution on Oracle Database Appliance Virtualized Platform. Each Oracle FLEXCUBE UBS solution deployment consists of at least two Oracle VMs: a database VM and an application VM. This provides a simple, reliable and cost effective solution-in-a-box which is fully supported for production use. The architecture proposed in this paper provides a complete "Bank-in-a-box" solution that includes UBS, ATM and BIP platforms on the ODA.

## Scope

This paper describes how to install Oracle FLEXCUBE UBS solution database and application tiers on the Oracle Database Appliance Virtualized Platform 12.1.2.6 (and later). You need to be familiar with the Oracle Database Appliance documentation and, in particular, how it relates to the Oracle Database Appliance Virtualized Platform. Further information about the Oracle Database Appliance is available at:

[http://docs.oracle.com/cd/E68623\\_01/index.htm](http://docs.oracle.com/cd/E68623_01/index.htm)

Understanding Oracle FLEXCUBE UBS architecture is essential. The documentation library is available at: [http://docs.oracle.com/cd/E64763\\_01/index.htm](http://docs.oracle.com/cd/E64763_01/index.htm)



## Introduction

The Benefits of Deploying Oracle FLEXCUBE UBS solution on Oracle Database Appliance Virtualized Platform:

Using this approach one can realize significant savings throughout the system lifecycle, from researching and benchmarking independent components, through simplifying maintenance and patching, to resolving complex problems across several vendors. Other benefits include the following:

- **Solution in-a-box** – provides an integral Oracle Engineered System that saves you time and money by simplifying deployment, maintenance, and support of high availability database solutions.
- **Pay as you Grow** – The Capacity-On-Demand software licensing model allows you to quickly and incrementally scale from 2 to 72 processors without any hardware upgrades.
- **Simple to implement** – Plug in the appliance and then use the integral Oracle Appliance Manager to provision the firmware, operating system, storage manager and virtualization software. The Appliance Manager also drastically simplifies maintenance by patching the entire appliance, including all firmware and software, in one operation, using an Oracle-tested patch bundle engineered specifically for the appliance.
- **Simple to manage** – Oracle Database Appliance has been engineered with specific focus on simplicity and reliability. This reduces complexity, risk and costs in deploying a highly available solution.
- **High Availability Hardware** – The configuration provides complete redundancy with no single points of failure. If hardware fails or is about to fail, the Automated Service Request capability (phone home) generates automatic requisitions for replacement components such as disks, power supplies, fans etc.
- **Performance** – Oracle Database Appliance is preconfigured and pre-tuned for optimal performance, which reduces maintenance and operating costs. The Oracle Database runs in a special privileged user domain, which eliminates the virtualization overhead.
- **Simple to support** – There is a single point of contact for support. All hardware and software components are supported by Oracle, and there is no need to contact multiple vendors if a problem occurs. When a problem occurs, the Appliance Manager performs the job of the DBA and automatically collates all the logs and system history thereby enabling issues to be logged, analysed and processed more quickly.
- **Oracle Real Application Clusters (Oracle RAC)** – is a clustered version of Oracle Database based on a comprehensive high-availability stack, ensuring high availability, scalability, and agility for any application.

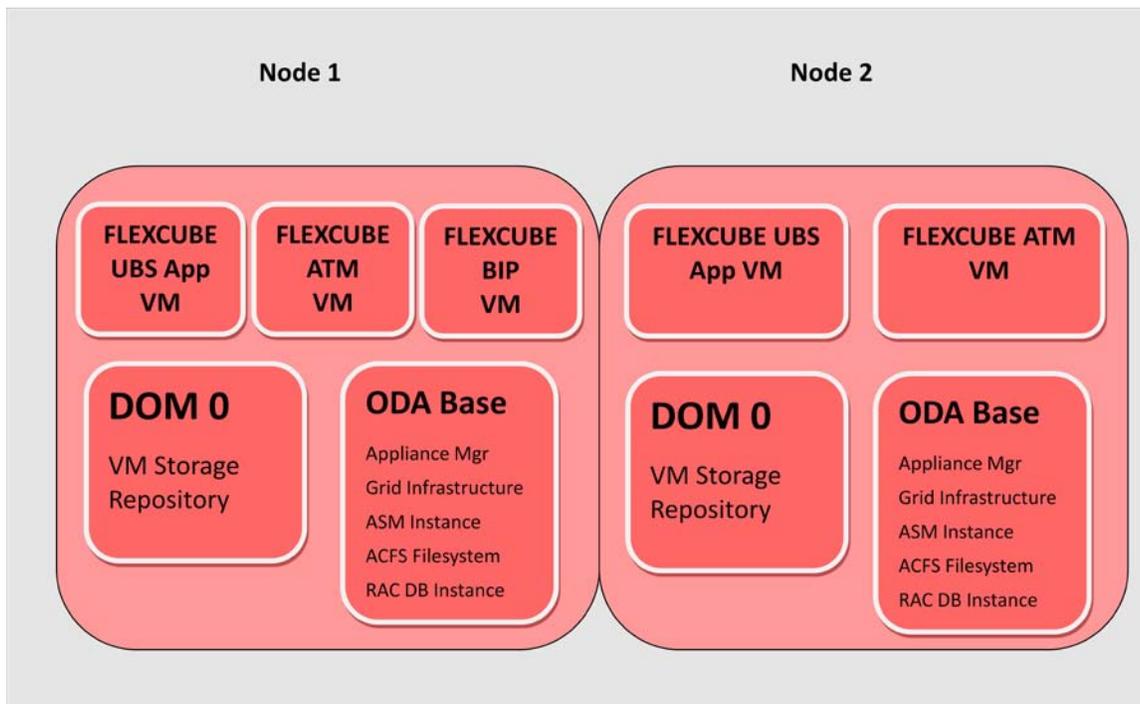
## Oracle Database Appliance Virtualized Platform Deployment Architecture

This section summarizes some of the key architectural points that will make it easier to understand the installation procedure in this paper.

Deploying Oracle Database Appliance Virtualized Platform creates an ODA\_BASE privileged user domain. The Appliance Manager provisions and manages the Oracle Database within the ODA\_BASE domain. This domain is optimized to host database instances, and all the shared disks are directly attached to this domain eliminating any virtualization overhead and thus providing near native disk performance.

The Oracle FLEXCUBE UBS Solution database is deployed on ODA\_BASE as described in this paper and it is considered a best practice as it significantly improves performance and manageability. The Oracle FLEXCUBE UBS application tier will be installed in separate VMs.

On completion of the procedure in this paper, the Oracle Database Appliance will be configured with a two node RAC database and Oracle FLEXCUBE UBS Solution application tier running in two VMs, one on each node. This will also have ATM VM running in two VMs, one on each node, and a BIP VM running on one of the nodes.



*Note: This paper describes deploying the solution on an Oracle Database Appliance X5-2 running ODA software release 12.1.2.6. The steps are applicable for later software and hardware releases, but some of the component versions may be different.*

The following lists the main components of the configuration:

#### Hardware (Oracle Database Appliance X5-2)

- » Two physical servers - each with 36 cores and 256 GB main memory.
- » Shared storage - Sixteen 8 TB disks (128 TB raw) for database files and VM images, four 400 GB SSDs for frequently accessed data and four 200 GB SSDs for database redo logs.
- » Network cards - Four 10G Base-T Ethernet ports.

#### Software on each physical server

##### *Dom0 Management Domain*

- » Oracle VM Server 3.2.9

##### *ODA\_BASE Virtual Machine*

- » Special privileged user domain for database instances.
- » Oracle Linux 6.7
- » Oracle Database 12c (12.1.0.2)
- » Real Application Clusters (RAC) 12c
- » Automatic Storage Management (ASM) 12c
- » Oracle Clusterware 12c
- » 192 GB main memory and 16 cores allocated. This allocation can easily be changed later based on performance analysis and software licensing requirements.

##### *Oracle FLEXCUBE UBS Application Virtual Machine*

- » User domain.
- » Oracle Linux 6.6.
- » WebLogic Server 12.1.3
- » Oracle FLEXCUBE UBS v12.1
- » 48 GB main memory and 8 cores allocated. This allocation can be adjusted later.

##### *Oracle FLEXCUBE ATM Application Virtual Machine*

- » User domain.
- » Oracle Linux 6.6.
- » JDK 1.7 Update 80
- » Oracle FLEXCUBE UBS v12.1 - ATM Module
- » 6 GB main memory and 2 cores allocated. This allocation can be adjusted later.

##### *Oracle FLEXCUBE BIP Application Virtual Machine*

- » User domain.
- » Oracle Linux 6.6.
- » JDK 1.7 Update 80
- » Oracle FLEXCUBE UBS v12.1 - BIP Module
- » 6 GB main memory and 2 cores allocated. This allocation can be adjusted later.

## Installing Oracle FLEXCUBE UBS v12.1 on Oracle Database Appliance Virtualized Platform

This section lists the necessary steps to install Oracle FLEXCUBE UBS v12.1 with Oracle Database 12c on Oracle Database Appliance 12.1.2.6 (or later). The following provides a quick reference to the environment details referred to in this document:

Host	Server 1	Server 2
Dom0	node1-d0	node2-d0
ODA_BASE	node1	node2
FLEXCUBE Application VM	fcapp1	fcapp2
ATM VM	atmapp1	atmapp2
BIP VM	bipapp	

In this document, all passwords are assumed to be *welcome1*. Please change these passwords as appropriate. This document requires access to both nodes of the Oracle Database Appliance as root, grid & oracle users.

### STEP 1: Deploy Oracle Database Appliance Virtualized Platform

1. The Oracle Database Appliance has to be deployed as a Virtualized Platform in order to support Oracle FLEXCUBE UBS application VMs. Oracle Database Appliance Virtualized Platform Setup instructions are provided on the Setup Poster, which is available at:  
[http://docs.oracle.com/cd/E68623\\_01/index.html](http://docs.oracle.com/cd/E68623_01/index.html).  
Follow the instructions to setup the Oracle Database Appliance.
2. The space requirement for the templates and VM images are listed in the following table.

FLEXCUBE VM Templates	Disk Space Required
Oracle FLEXCUBE UBS Application VM (2 VMs)	400 GB x 2
Oracle FLEXCUBE ATM Application VM (2 VMs)	120 GB x 2
Oracle FLEXCUBE BIP Application VM	120 GB
Total Space required	1160 GB

3. Login as the root user on node 1 and create a 1200 GB shared repository which will be used to host the VMs using the following command:

```
$ oakcli create repo appsrepo -size 1200G -dg RECO
```

```
$ oakcli show repo
```

NAME	TYPE	NODENUM	STATE
appsrepo	shared	0	ONLINE
appsrepo	shared	1	ONLINE

## STEP 2: Prepare the Target ORACLE\_HOME and create FLEXCUBE Database

1. Create a new ORACLE\_HOME to host the database. On Oracle Database Appliance, a new Oracle Database home can also be created with oakcli utility. Log in to node1 as the root user and create the ORACLE\_HOME as follows:

```
$ oakcli create dbhome -version 12.1.0.2
```

The newly created ORACLE\_HOME and its version can be queried using the following command:

```
$ oakcli show dbhomes
```

2. Create a new database for FLEXCUBE. Log in to node1 as the root user and create the database as follows:

```
$ oakcli create database -db fcdb -oh <oh_name>
```

oh\_name is the name of the home from Step 1. above

In the dialog box for the above command, select Single Instance, RAC One or RAC as the DB type.

## STEP 3: Create an OEL VM Template

1. Download OEL 6.6 from <http://edelivery.oracle.com/linux>. This will be the guest OS that will be used by the FLEXCUBE Application VM, as well as the ATM and BIP VM.



2. Copy the zip file to /OVS on dom-0 of node 1, i.e., "node1-d0 " and unzip the file.

```
$ unzip V73659-01.zip
```

```
$ ls -lrt
```

```
-rw-r--r-- 1 root root 451594240 Mar 11 2013 OVM_OL6U6_X86_64_PVM.ova
```

3. Import the VM template into the shared repository.

```
oakcli import vmtemplate oel6_6 -assembly /OVS/OVM_OL6U6_X86_64_PVM.ova -
```

```
repo appsrepo -node 0
```

```
$ oakcli show vmtemplate
```

NAME	MEMORY	VCPU	REPOSITORY
oel6_6	2048	2	appsrepo

This VM template will be used to create the FLEXCUBE UBS App VM, as well as the ATM and BIP VM.

#### STEP 4: Create a VM and install FLEXCUBE UBS Application

1. Create a VM from the VM template.

```
$ oakcli clone vm appsrvr1 -vmtemplate oel6_6 -repo appsrepo -node 0
```

```
$ oakcli show vm
```

NAME	NODENUM	MEMORY	VCPU	STATE	REPOSITORY
appsrvr1	0	2048	2	OFFLINE	appsrepo

2. Add network interface to this VM

```
$ oakcli configure vm appsrvr1 -network "vif = ['bridge=net1']"
```

3. Change the memory to 48 GB and 16 vcpus assigned to this VM.

```
$ oakcli configure vm appsrvr1 -vcpu 16 -memory 48G
```

4. Start the FLEXCUBE App Server VM

```
$ oakcli start vm appsrvr1
```

5. Connect to the VNC console of the VM

```
$ oakcli show vmconsole appsrvr1
```

6. Enter the hostname for the FLEXCUBE Server as well as the network information. Here, we assume that the hostname has been given as "fcapp1". Give an appropriate root password as well at this point.

7. After the network information has been entered correctly, you should also be able to SSH into the VM.

8. Login to the VM as root.

9. Follow the Installation Guide for WebLogic Server to install WLS 12.1.3:

[WLS 12.1.3 Installation Guide](#)

10. Follow the Installation Guide for FLEXCUBE Application to install FLEXCUBE:

[FLEXCUBE Installation Guide](#)

## STEP 5: Create a VM and install FLEXCUBE ATM Module

1. Create a VM from the VM template.

```
$ oakcli clone vm atmsrvr1 -vmtemplate oel6_6 -repo appsrepo -node 0
```

```
$ oakcli show vm
```

NAME	NODENUM	MEMORY	VCPU	STATE	REPOSITORY
atmsrvr1	0	2048	2	OFFLINE	appsrepo

2. Add network interface to this VM

```
$ oakcli configure vm atmsrvr1 -network "vif = ['bridge=net1']"
```

3. Change the memory to 6 GB and 4 vcpus assigned to this VM.

```
$ oakcli configure vm atmsrvr1 -vcpu 4 -memory 6G
```

4. Start the FLEXCUBE ATM Server VM

```
$ oakcli start vm atmsrvr1
```

5. Connect to the VNC console of the VM

```
$ oakcli show vmconsole atmsrvr1
```

6. Enter the hostname for the FLEXCUBE ATM Server as well as the network information. Here, we assume that the hostname has been given as "atmapp1". Give an appropriate root password as well at this point.

7. After the network information has been entered correctly, you should also be able to SSH into the VM.

8. Login to the VM as root.

9. Follow the Installation Guide to install the Switch Interface Module for FLEXCUBE UBS 12.1:

[Switch Interface Installation Guide](#)

10. Follow the Installation Guide to install the Gateway Monitor Module for FLEXCUBE UBS 12.1:

[SWIG \(Switch Interface Installation for Gateway\) Monitor Guide](#)

## STEP 6: Create a VM and install FLEXCUBE BIP Module

11. Create a VM from the VM template.

```
$ oakcli clone vm bipsrvr -vmtemplate oel6_6 -repo appsrepo -node 0
```

```
$ oakcli show vm
```

NAME	NODENUM	MEMORY	VCPU	STATE	REPOSITORY
bipsrvr	0	2048	2	OFFLINE	appsrepo

12. Add network interface to this VM

```
$ oakcli configure vm bipsrvr -network "vif = ['bridge=net1']"
```

13. Change the memory to 6 GB and 4 vcpus assigned to this VM.

```
$ oakcli configure vm bipsrvr -vcpu 4 -memory 6G
```

14. Start the FLEXCUBE BIP Server VM

```
$ oakcli start vm bipsrvr
```

15. Connect to the VNC console of the VM

```
$ oakcli show vmconsole bipsrvr
```

16. Enter the hostname for the FLEXCUBE BIP Server as well as the network information. Here, we assume that the hostname has been given as "bipapp". Give an appropriate root password as well at this point.

17. After the network information has been entered correctly, you should also be able to SSH into the VM.

18. Login to the VM as root.

19. Follow the Installation Guide link below to install the BIP Web Services Reports Module for FLEXCUBE UBS 12.1:

[BIP Web Services Report Installation Guide](#)

## STEP 7: Enabling High Availability

1. To provide High Availability (HA) at the application layer, an additional application VM needs to be deployed for both the FLEXCUBE Application as well as the ATM Module. Repeat STEPS 4 and 5 on the second node in the appliance, making necessary changes for the VM names and the hostnames. Generally, a load balancer is used for the application VMs. Customer can go with a hardware load balance or a software load balancer like Oracle HTTP Server can be deployed within the ODA.
2. Load balancing the application servers provide both protection against failure as well as increased scalability.

## STEP 8: Cleanup

1. The OEL VM template can be removed. To remove the template, use the following command:

```
$ oakcli delete vmtemplate oel6_6
```

- 
2. The OEL 6.6 image can also be deleted from /OVS of dom-0 on node 1 using the following command:

```
$ rm -rf OVM_OL6U6*
```

## STEP 7: Environment Validation

1. To check for presence of Application VMs – run the following command as root user on ODA\_BASE on node1:

```
$ oakcli show vm
```

2. To check for presence of a cluster database – run the following command as oracle user on ODA\_BASE on node1:

```
$ srvctl config database -d fcdb -a
```

## Best Practices

This section lists the best practices which should be reviewed once the deployment is complete.

### Consider Resizing the Resource Configuration for ODA\_BASE

A reasonable starting point is to allocate about 50% of the available CPU and memory resources to ODA\_BASE. These can be modified to reflect capacity requirements while remaining within the software licensing restrictions. The number of CPU cores and memory allocations can be changed using the following command as the root user on dom0 (on an X5-2):

```
$ oakcli configure oda_base
Core Licensing Options:
  1. 2 CPU Cores
  2. 4 CPU Cores
  3. 6 CPU Cores
  4. 8 CPU Cores
  5. 10 CPU Cores
  6. 12 CPU Cores
  7. 16 CPU Cores
  8. 24 CPU Cores
  9. 36 CPU Cores
Current CPU Cores      :16
Selection[1 .. 9](default 36 CPU Cores) : 8
ODA base domain memory in GB(min 16, max 244)(Current Memory
128G)[default 192] : 96
```

The core counts above reflect physical cores. The OS inside ODA\_BASE will report virtual cores (vcpu), which equates to a half physical core. The changes are made to ODA\_BASE on both nodes; the resource allocation should be the same across both. The changes take effect when the ODA\_BASE is restarted. To restart the ODA Base, as the root user execute the following command on each node:

```
$ oakcli restart oda_base
```

### Consider Resizing the Resource Configuration for the Application VMs

As with the Oracle Database, the CPU and memory allocation for the application VMs can also be reconfigured after the initial deployment. As VMs are managed from ODA\_BASE, to reconfigure the resources for an application VM, the command is executed as the root user from ODA\_BASE. Use the following example command to change the CPU and memory allocation for an application VM:

```
$ oakcli configure vm appvm -vcpu 32 -maxcpu 32
$ oakcli configure vm appvm -memory 96G -maxmemory 96G
```

This command references virtual cpus (vcpu). The changes are static in nature and require the VM to be restarted. To restart the VMs, use the following commands:

```
$ oakcli stop vm appvm
$ oakcli start vm appvm
```

## Consider implementing Workload Isolation using CPU Pools

Oracle Database Appliance has the ability to isolate workloads within CPU pools. Once assigned, a VM is constrained to only use the CPUs available within that pool. Two pools are created by default when Oracle Database Appliance is deployed: `odaBaseCpuPool` and `default-unpinned-pool`. The `ODA_BASE` domain is allocated to the `odaBaseCpuPool`, and the number of the vCPUs in the `odaBaseCpuPool` is equal to the vCPUs allocated to `ODA_BASE` during deployment or re-configuration.

The Application VMs can also benefit from CPU isolation by creating additional CPU Pools. Once these pools are created and the Application VMs are assigned to these pools, no other VM can use these vCPU resources.

Additional CPU pools have to be created manually on each `ODA_BASE` as the CPU pool is node specific. As the root user, use the following command to create a CPU pool:

```
$ oakcli create cpupool appVmPool -numcpu 4 -node 0
```

To validate the creation of the CPU pool:

```
$ oakcli show cpupool -node 0
```

The Application VM can then be assigned to the new CPU pool as follows:

```
$ oakcli configure vm appvm -cpupool appVmPool
```

## Patching Oracle Database Appliance

Oracle Database Appliance provides an infrastructure for simplified patching as the requisite patches for all components of the Oracle Database Appliance stack (excluding application VM patches) are included in a single bundle patch. This vastly simplifies the end-to-end patching of both hardware and software since a single command is used to patch all the components. Patches for different components present within a bundle patch have been validated to work with each other. This eliminates any adverse patch conflicts for each of the components on Oracle Database Appliance and ensures end-to-end compatibility after patching. The Oracle Database Appliance patch bundles are released regularly to keep up-to-date with the Oracle Database Patches Set Update releases.

It is recommended that you not apply any Grid Infrastructure/Database one-off patches or install any additional OS packages outside of the standard Oracle Database Appliance patching mechanism. In the rare event of a conflict between a one-off patch and the Oracle Database Appliance patch bundle, the recommended approach to address this is to roll back the problem patch prior to applying the Oracle Database Appliance Bundle Patch. If the patch has not been included in the Oracle Database Appliance bundle patch, then it can be reapplied.



## System Sizing

General guidelines on system sizing and capacity can be found in the Oracle Database Appliance documentation, available at: [ODA System Sizing](#)

An Oracle FLEXCUBE UBS workload can vary a lot depending on many factors, such as modules deployed, users per module and business cycles. For an existing system being migrated to Oracle Database Appliance the existing peak CPU, memory, IOPS and storage space utilization can be used as input to the sizing. You should work with your local Oracle representative on the sizing exercise.

## **Conclusion**

The Oracle Database Appliance Virtualized Platform is ideal for small to medium systems running Oracle FLEXCUBE UBS Solution. It enables the Oracle Database and Oracle FLEXCUBE UBS Solution application tier(s) to be deployed on a single system engineered for simplicity and reliability. This solution-in-a-box is very cost effective and flexible.



## Appendix A: References

1. Oracle Database Appliance documentation:  
[http://docs.oracle.com/cd/E68623\\_01/index.html](http://docs.oracle.com/cd/E68623_01/index.html)
2. Oracle FLEXCUBE Universal Banking Release 12.1 Documentation Media Library:  
[http://docs.oracle.com/cd/E64763\\_01/index.htm](http://docs.oracle.com/cd/E64763_01/index.htm)



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**Hardware and Software, Engineered to Work Together**

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