Building Active/Passive Clusters with Oracle Fusion Middleware 11g

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Demanding **web** & **call-centre** applications

Architecture & development strategy; health-checks; disaster recovery; tuning

Oracle Fusion Middleware
(clusters, J(2)EE, ADF, SSO, OID, Reports, etc)
ADF Application (esp. strategy & admin)

Database & related technologies
(OS, load balancers, firewalls, …)
Agenda

1. CFC & High Availability Concepts
2. Setting up Fusion Middleware 11g for CFC
3. Installation Approach for ASCRS
Why Cluster?

- Higher Availability
  - Active → Active
  - Active → Passive
  - Active → Active → Active → Active

- Scalability
Active - Active

Node 1

Node 2

Note: no firewalls etc shown!
Active – Passive

Node 1

Node 2

databases etc
Active-Passive Pros/Cons

✔ Licensing
  – OFM is only running on one node at once
  – no licence req. on standby if <10 days’ usage pa
✔ Hardware/skills: no load balancer required
✔ Provides protection from node failure
✔ Can standardise across all sorts of systems
✘ ‘Unused’ standby server (test etc though)
✘ Failover time & loss of sessions
✘ Needs shared storage
Failover – In this type of recovery, nodes are arranged in a cluster and share one disk array. When the primary node fails, one of the surviving nodes in the cluster acts as the primary node. Solutions like Oracle Failsafe (…), or third party vendor solutions (e.g. Veritas, HP Service Guard, HACMP, Linux HA - Heartbeat) are used to manage Failover environments. In this type of environment, Oracle permits licensed Oracle customers to run some Technology Programs on an unlicensed spare computer for up to a total of ten separate days in any given calendar year. Once the primary node is repaired, you must switch back to the primary node. Once the failover period has exceeded ten days, the failover node must be licensed. Downtime for maintenance purposes counts towards the ten separate days limitation.

A/P plus P/A

Better use of hardware, but maybe not licences. Various permutations but often end up going A/A

Both nodes need to be licenced

Node 1
Web-tier (A)
AS (P)

Node 2
Web-tier (P)
AS (A)

databases etc
Why use Cluster Software?

• A cluster needs:
  – communication between nodes
  – to know what nodes are available
  – coordinated start-up and shutdown

• There are several popular commercial and open-source cluster managers. You could write your own… …or just manually do it!
Cluster Software Requirements

- VIP Management
- Filesystem Management
- Application Startup/Shutdown

App Server depends on VIP & Filesystem
What is a VIP?

- a ‘floating’ IP address which can exist on any node in cluster
- only active on one node at once
- is only moved in case of failure/shutdown of the node it’s currently running on
- each Virtual IP (VIP) has a corresponding Virtual Hostname (Vhost), e.g.
  - Node 1: pwls1.lon.example.com
  - Node 2: pwls2.lon.example.com
  - Virtual host: store.example.com

‘public’ view
Architecture & Processing

Node 1
- VIP
- AS
- Cluster Software
- FS

Node 2
- VIP
- AS
- Cluster Software
- FS

Interconnect (typ. ethernet)

public network (ethernet)

Oracle Software & Configuration

Shared storage (e.g. SAN or NAS)

Fibre, Ethernet, Infiniband
By the way…

• There are other ways to do active/passive failover:
  – (WLS itself) Whole Server Migration
  – Virtual Machines
Overall Process

• Install cluster management software
• Configure cluster resources for:
  – virtual hostname and virtual IP address
  – filesystem for Oracle Home
• Install Oracle Fusion Middleware
  – 10g iAS: specify the Vhost/VIP
  – 11g OFM: reconfiguration
• Set up cluster resource for running OFM
3rd Party Clusterware

- Install & set-up (typically done by sys. admin)
History: 10g App Server

- iAS 10.1.2
  - Set in installer HA screen
  - ORACLE_HOMENAME env variable
  - OUI_HOSTNAME command line option

- OAS 10.13
  - VIRTUAL_HOST_NAME env variable
  - OUI_HOSTNAME command line option
OFM 11gR1 High Availability Guide says to create a CFC:

- “Transform the Administration Server or Enterprise Manager instance"
- “Transform all managed servers in the deployment"
- “Transform the Oracle instances (non-Java EE deployments)”
Why do I have to ‘Transform’ the Admin Server

- Singleton service – runs in only one place at once
- Rest of env is usually A-A and often have dedicated management server including AS
Transforming the Administration Server for Cold Failover Cluster

- Create a Machine in the first domain called <Vhost>
- Associate admin (and any managed servers) with the new Machine
- Change the Listen Address of the Admin Server to <Vhost> & restart it
2.2.2.3 Transforming the Administration Server for Cold Failover Cluster (contd.)

• Change any existing Oracle Instances to point to admin server on <Vhost> - change the OPMN instance.properties for each

• Change any EM agents to refer to EM FMC running on <Vhost> (two params) & restart
12.2.2.4 Transforming Oracle WebLogic Managed Servers

- If managed servers on CFC host then on each change Listen Address to <Vhost> & restart
12.2.2.5 Transforming Node Manager

- “Decide whether you want to fail over the node manager, or have one running all the time on each node”
  - If using ASCRS then NM config must be under WL_HOME ⇒ will move ⇒ NM must failover

- Change the node manager properties file to set ListenAddress to <Vhost>. Restart NM
If OPMN already registered with Admin Server (likely if you wanted to test your installation) then update to <Vhost>

- topology.xml
- opmn.xml
- instance.properties
2.2.2.7 Transforming Oracle Enterprise Manager for an Oracle Instance

- You probably have Oracle instances, e.g. Web-Tier, OID etc, update:
  - emd.properties
  - targets.xml
- Restart agent
- Change the targets.xml in the domain/sysman/state directory of the Admin Server
12.2.2.8 Transforming Web Tier Components and Clients

- Change Listen to `<Vhost>` in `httpd.conf` & restart
12.2.3 Transforming Oracle Fusion Middleware Components

- ...
Pros & Cons

✗ Tedious work for something that, at least at installation time, should be easy
✓ At least it’s in main documentation
✓ You can convert to CFC at a future point

⇒ transform WebLogic to CFC as soon as possible
  – make AdminServer listen on VIP from start (e.g. during domain creation), i.e. before installing EM, Web-tier, etc
  – transform other installs as you go along
• Now you can choose your clusterware…
ASCRS

- Wrapper around Oracle Clusterware (aka CRS)
- Perl/java calling WLST etc
- New in 11gR1
- Manages resources:
  - VIP
  - Shared Disk
  - Application Server/Middleware
  - (Database & Listener…)

- Most suitable if you don’t have 3rd party clusterware but have RAC experience
Oracle Clusterware Key Components

• Network
  – Public network
  – Interconnect (private)

• Shared storage
  – Oracle Cluster Registry (OCR)
  – Voting Disk
Base Oracle Clusterware

Node 1
- CRS_HOME on local disk
- Clusterware

Node 2
- CRS_HOME on local disk
- Clusterware

Public network (ethernet)

Interconnect (typ. ethernet)

Fibre, Ethernet, Infiniband

OCR
Voting Disk

Shared storage (e.g. SAN or NAS)
• Install Oracle Clusterware 11gR1
• Copy <ascrs> directory from OFM 11g Companion DVD into the CRS_HOME
Oracle Clusterware plus ASCRS

Node 1
- ASCRS
- Clusterware
- CRS_HOME on local disk
- Interconnect (typ. ethernet)

Node 2
- ASCRS
- Clusterware
- CRS_HOME on local disk
- Fibre, Ethernet, Infiniband

Public network (ethernet)

Oracle Software & Configuration
OCR
Voting Disk

Shared storage (e.g. SAN or NAS)
Example – Create VIP

```bash
ascrsctl create -name cluster4 -type vip \
    -ipAddr cluster4-vip -netmask 255.255.255.0 -interface eth0
```

Prompted as root to run:
```
/opt/grid/crs1110/crs/public/ora.cluster4.cfcvip.cre.root
```
Example – Create Shared Disk

touch /opt/oracle/.ascrssf
umount /opt/oracle

ascrsctl create -n cluster4 -type disk -path /opt/oracle \
-mc "<your script*> start /opt/oracle /dev/sdc1" \
-umc "<your script*> /opt/oracle /dev/sdc1"

Prompted to run as root:
/opt/grid/crs1110/crs/public/ora.cluster4.cfcdisk.cre.root

* Don’t just use mount / umount – write a script to check usage, fsck etc and install under CRS_HOME! e.g.
/opt/grid/crs1110/crs/public/veriton_cfc_orahome.sh
Example – Create AS Resource

ascrsctl create -n adminserver -type as \\n-ch /opt/oracle/user_projects/domains/cfc \\n-disk cluster4 -vip cluster4
# Status & Management

```
$ ascrsctl status | egrep "cfc|Name|---" 
```

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Target</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>ora.adminserver.cfcas</td>
<td>WebLogic Domain</td>
<td>ONLINE</td>
<td>ONLINE on westfield37</td>
</tr>
<tr>
<td>ora.cluster4.cfcdisk</td>
<td>Shared Disk</td>
<td>ONLINE</td>
<td>ONLINE on westfield37</td>
</tr>
<tr>
<td>ora.cluster4.cfcvip</td>
<td>Virtual IP</td>
<td>ONLINE</td>
<td>ONLINE on westfield37</td>
</tr>
</tbody>
</table>

ascrsctl start -n ora.adminserver.cfcas

ascrsctl stop -n ora.adminserver.cfcas

ascrsctl switch -n ora.adminserver.cfcas
ASCRS notes

- Unix only
- Docn now says ASCRS supports Oracle Clusterware 10.2.0.4 or 11.1.0.7+
  - Big clusterware packaging changes in Database 11gR2…next?
- ASCRS is supported only on Unix platforms
- The ASCRS installation user account should be the same as the owner of the CRS home
- Decide on naming strategy along with database products
  - with db 11.2 "grid" is becoming common practice
Summary

• Cold-failover cluster provides fair resilience for unattended recovery from failures

• Additional costs = minimal:
  – no extra Oracle licences/support
  – extra server (maybe with HBA or iSCSI)
  – time/effort to install

• You will need shared storage (e.g. SAN/NAS)

  ➔ cost-sensitive projects where availability is important but load doesn’t justify multiple active servers

  ➔ Standardised HA across broad IT environments
References

• Oracle® Fusion Middleware High Availability Guide
  11g Release 1 (11.1.1)
  http://download.oracle.com/docs/cd/E12839_01/core.11
  11/e10106/ap_crs.htm#CHDHGHBD
Shameless Plug!

• UKOUG App Server & Middleware SIG Wed 2nd March 2011
  – Theme: Fusion Middleware 11g Upgrade
  – Dual venue… speakers at both plus broadcast
    • Oracle City Office, London
    • Fujitsu Office, Warrington
  – 1 FREE place for most UKOUG membership packages
Any questions?

Thank you for listening!

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