Oracle RAC on Microsoft Azure

Deployment Process Demonstration

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About SkyCluster for Azure

Ensuring high availability of backend relational databases is a critical part of the cloud strategy - whether it is a lift-and-shift migration or a green-field deployment of mission critical applications. FlashGrid SkyCluster is an engineered cloud system designed for database high availability. SkyCluster is delivered as a fully integrated Infrastructure-as-Code template that can be customized and deployed to Azure account with a few mouse clicks. Key components of FlashGrid SkyCluster for Azure include:

- Azure Virtual Machines
- Azure Managed Premium SSD block storage
- FlashGrid Storage Fabric software
- FlashGrid Cloud Area Network software
- Oracle Grid Infrastructure software
- Oracle RAC database engine

By leveraging the proven Oracle RAC database engine FlashGrid SkyCluster enables the following use-cases:

- Lift-and-shift migration of existing Oracle RAC databases to Azure.
- Migration of existing Oracle databases from high-end on-premises servers to Azure without reducing availability SLAs.
- Design of new mission critical applications for the cloud based on the industry proven and widely supported database engine.

About This Demo

This brief demo the main steps of deploying SkyCluster with Oracle RAC on Azure. The target audience is Azure cloud architects and engineers and database architects and administrators.

More detailed information is available in the following documents:

- White paper: Oracle RAC in Microsoft Azure Enabled by FlashGrid SkyCluster
- FlashGrid SkyCluster Deployment Guide for Oracle RAC in Azure
Step 0: Select one of standard configuration templates

Since majority of deployments have 2 or 3 RAC nodes, these two standard configuration are readily available at [https://www.flashgrid.io/skycluster-for-azure/](https://www.flashgrid.io/skycluster-for-azure/)

Click on a button that corresponds to either 2, or 3 RAC nodes. It will open SkyCluster Launcher tool. (For configurations other than 2 or 3 RAC nodes contact FlashGrid support.)
Step 1: Enter basic information about the cluster

At this step you need to enter information such as Azure Cloud type, operating system, and the SSH key that you will use for accessing the VMs.
Step 2: Select database version

Select which version of the database you are planning to use, along with Patch Set Update / Release Update version for it.
Step 3: Provide location of Oracle installation files

You need to upload the listed Oracle installation files to a Blob Storage Container and provide URL of the container. Cluster initialization script will download and install the files.
Step 4: Configure cluster nodes

Provide hostnames, Availability Zone placement (for regions where AZs are supported), and sizes of the cluster nodes.
Step 5: Configure storage

Specify ASM disk groups that will be created. The corresponding disks will be automatically attached to the nodes.

![Storage Configuration Screen]

- **Disk Group Name**: DATA, FRA
- **# Disks per Node**: 3, 3
- **Disk Size, GIB**: 1024, 512

**Storage Profile**: database
Step 6: Specify memory allocation

If needed, customize database memory allocation percentages. These percentages are used for automatic configuration of HugePages when database node boots up based on the total memory.
Step 7: Specify listener ports

If needed, customize SCAN and Local listener port numbers.
Step 8: Provide information about target VNet

In most cases the cluster must be deployed in an existing VNet. Provide information about the VNet and other network resources. Alternatively, you can choose to create a new VNet.

Network

Select to create a new virtual network (VNet) or specify parameters of an existing VNet. For an existing VNet, FlashGrid recommends configuring NSG rules by using an Application Security Group (ASG) for the cluster node VMs. You can configure one ASG per cluster or a separate ASG for each cluster. Regardless of how security groups are configured, the following ports must be open:

- UDP 4001, 4002, 4003 and TCP 32606 between the cluster node VMs
- TCP ports 1521 (or custom SDN Listener port) and 1522 (or customized Local Listener port) for client and app server access

Create new VNet

Uncheck if using an existing VNet.

VNet Resource Group (if using existing VNet)

VNet Resource Group of the existing VNet where the VNet will be created. Keep blank if creating a new VNet.

VNet Name (if using existing VNet)

Name of the existing VNet where VMs will be created. Keep blank for creating a new VNet.

Subnet Name (if using existing VNet)

Name of a subnet in the existing VNet. Keep blank for creating a new VNet.

Network Security Group (only for existing VNet, optional)

Keep blank to use the NSG attached to the subnet. If using an existing VNet you can specify an NSG that will be assigned to VM NICs. The NSG must be in the same Resource Group as the VNet. The NSG must have the following ports open: VirtualNetwork UDP ports 4001, 4002, 4003 and TCP ports 22, 32606, 3121 (or custom SDN Listener port), 1522 (or customized Local Listener port),

Application Security Groups (if using existing VNet)

Provide list of ASGs that will be assigned to VM NICs. Keep empty if creating a new VNet.

Assign Public IP to Cluster Nodes

ATTENTION: Enabling Public IPs is NOT recommended on production clusters for security reasons. Enable if SSH access via internet without VPN is required.
Step 9: Configure DNS

Specify domain name that will be assigned to cluster nodes. You can also replace the default Azure DNS server with your own list of DNS servers.

**DNS**

Within the cluster host name resolution is performed by DNSMASQ service configured locally. For resolving cluster node names on clients or app servers need to add corresponding records to your DNS servers. For resolving host names that are outside of the cluster (e.g., storage service endpoint) on the cluster nodes, you can use Azure-provided DNS server (default) or custom DNS servers.

1. **Domain Name**
   - example.com

   The domain name will be configured on all nodes of the cluster. The domain must be in a zone hosted on your DNS servers.

2. **DNS Servers**
   - 168.63.129.16

   Keep the 168.63.129.16 address to use Azure-provided name resolution for host names external to the cluster. To use your own DNS servers, provide their IP addresses.
Step 10: Select time zone and time servers

You can provide your own list of time servers or keep the default list of Google time servers.
Step 11: Configure email alerts

Specify list of emails where alerts will be sent for errors that may happen during operation of the cluster.
Step 12: Specify tags

Optionally, specify the list of tags that will be assigned to VMs and disks.
Step 13: Validate configuration

Click Validate to confirm that the provided configuration is consistent.
Step 14: Generate Azure Resource Manager (ARM) template

When you click Launch SkyCluster, ARM template will be generated and Azure Portal will open.
Step 15: Deploy the ARM template

On Azure Portal select target subscription, create new resource group for the cluster, select the target region, and click Purchase.
Step 16: SSH in to the first node

After the deployment of the ARM template is complete, use SSH to connect to the first node of the cluster as user `az-admin`. If the cluster init already finished (takes 60-90 minutes) then you will see the following message.

```
CLUSTER INITIALIZATION COMPLETED SUCCESSFULLY

Please follow the steps below to finalize cluster configuration:

1. Run `flashgrid-cluster` to verify status of the cluster.

2. Protect the cluster from accidental deletion:
   - in AWS/GCP enable instance termination protection for each node
   - in Azure add a lock to the cluster resource group

3. Add records to the DNS servers used by clients and app servers:
   
   rac1.example.com 10.100.0.5
   rac2.example.com 10.100.0.4

4. Test email alerts from each node: $ flashgrid-node test-alerts

5. Disable database features that you do not have a license for.

6. See FlashGrid Knowledge Base for instructions for the following tasks:
   - Changing temporary ASM password: kb.flashgrid.io/asm-password
   - Creating a database: kb.flashgrid.io/createdb
   - Connecting clients to a database: kb.flashgrid.io/connect-clients
   - Maintenance procedures (reboot, etc.): kb.flashgrid.io/maintenance

7. Before putting cluster in production, upload diag for review by support
   $ sudo flashgrid-diags upload-all

Submit support requests at flashgrid.io/support

To stop seeing this message after login, run `sudo rm /etc/motd`
```

[az-admin@rac1 ~]$
Step 17: Check status of the cluster

```
# sudo flashgrid-cluster
```

```
[az-admin@rac1 -]# flashgrid-cluster
FlashGrid 19.6.13.0-prime-ep2e47-f06df20109d66e13b623bdad1e30d7f20109df6
License: via Marketplace Subscription
Support plan: 24x7

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FlashGrid running: OK
Clocks check: OK
Configuration check: OK
Network check: OK

Querying modes: rac1, rac2, racq ...

Cluster Name: myrac
Cluster status: Good

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Node Status ASH_Node Storage_Node Quorum_Node Failgroup
racl Good Yes Yes No RAC1
rac2 Good Yes Yes No RAC2
racq Good No No Yes RACQ

GroupName Status Mounted Type TotalMiB FreeMiB OfflineDisks LostDisks Resync ReadLocal Vote
DATA Good AllNodes NORMAL 3145728 3145336 0 0 No Enabled None
FRA Good AllNodes NORMAL 3145728 3145336 0 0 No Enabled None
GRID Good AllNodes NORMAL 18340 9466 0 0 No Enabled None
```

The cluster is ready. You can now create your database using DBCA.
Additional Information

For more information see https://www.flashgrid.io/skycluster-for-azure or email info@flashgrid.io

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