# Oracle Flex Clusters

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# Objectives

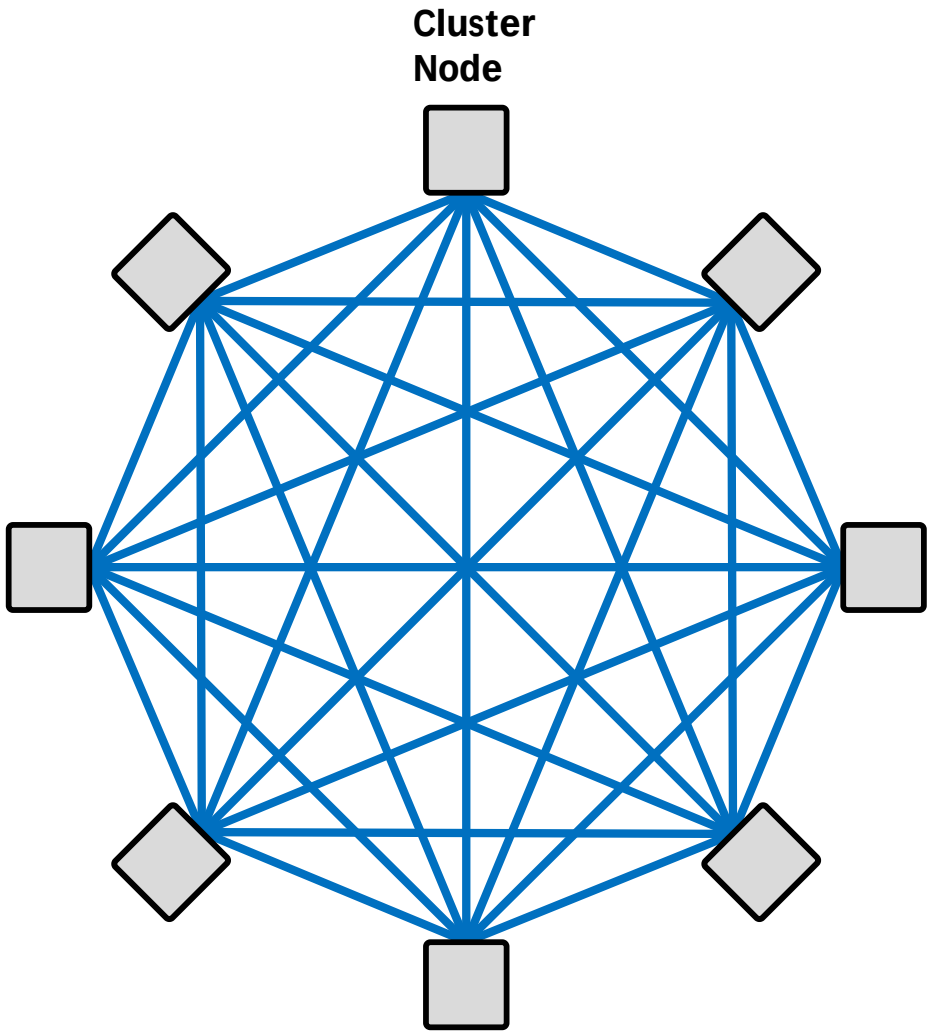
In this lecture, you will learn how to perform the following:

- Understand the advantage of Flex Clusters
- Describe Oracle Flex Cluster Architecture
- Create a Flex Cluster database
- Understand the difference between Hub and Leaf nodes
- Convert a cluster to Flex cluster
- Manage Oracle Flex clusters
- Describe Oracle Flex ASM

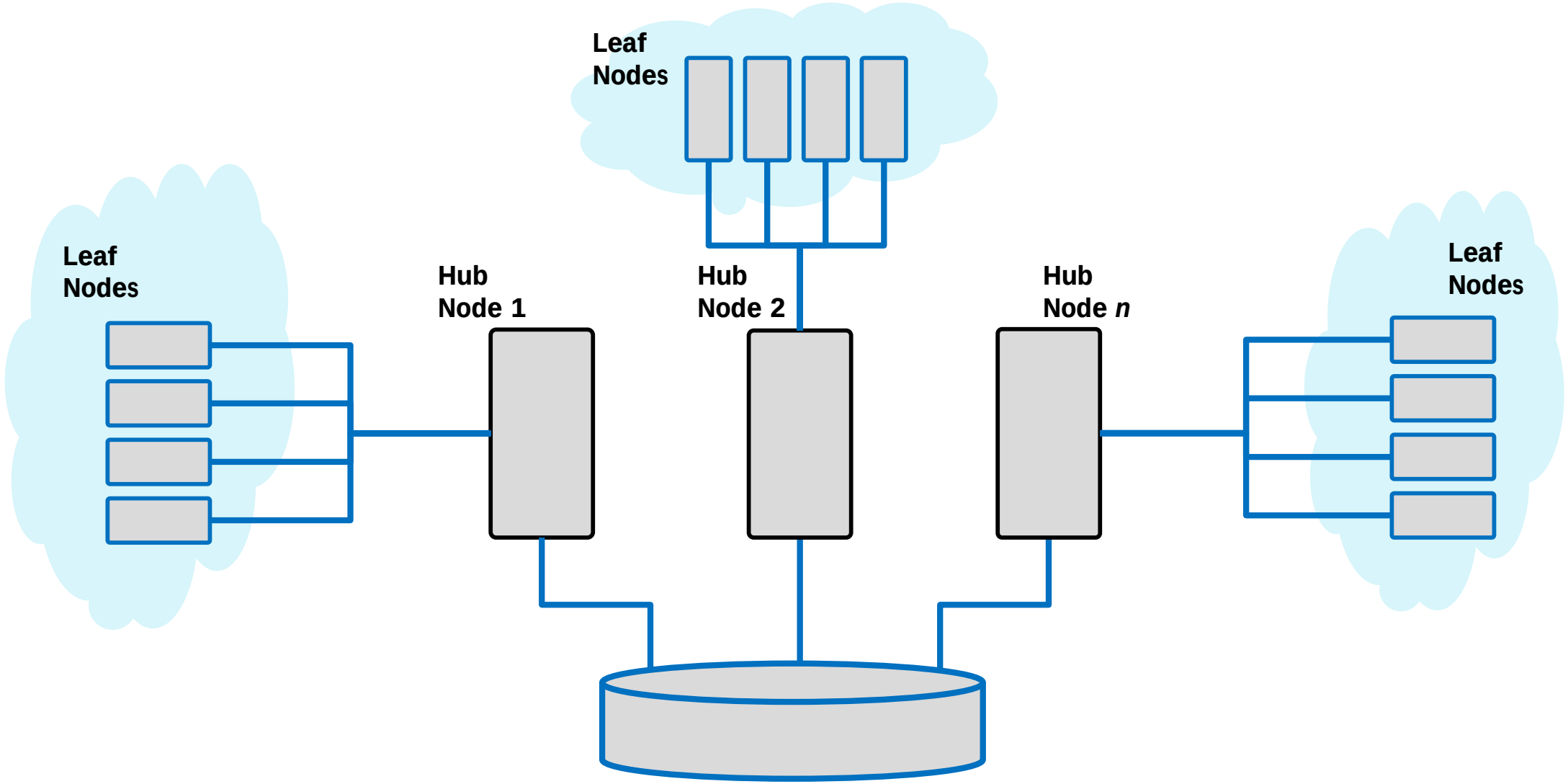
## Before Oracle Flex Clusters: Number of Interconnect links

**Number of Interconnect Links = N * (N-1)/2**

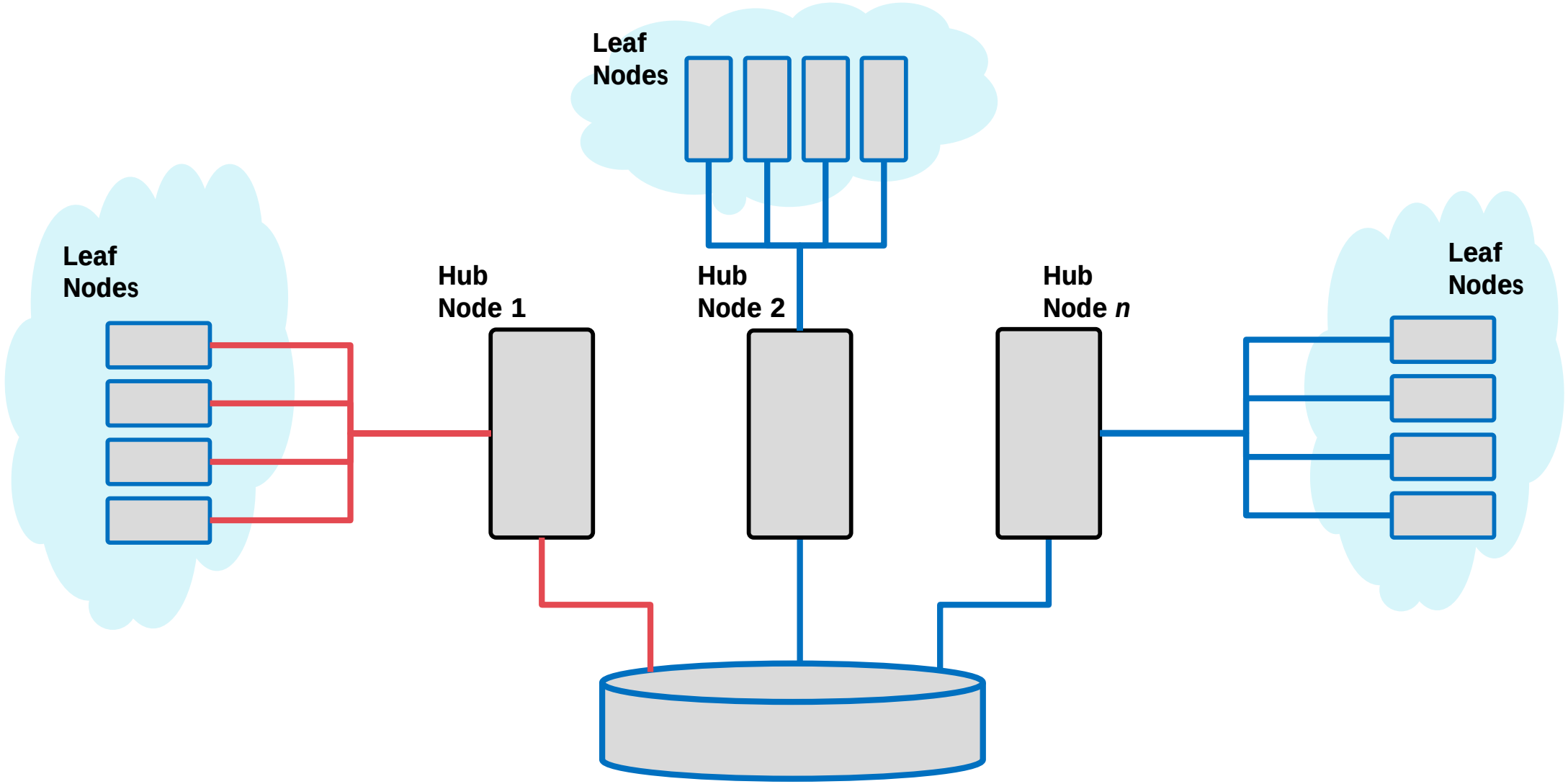
**For 100 nodes: 4950**



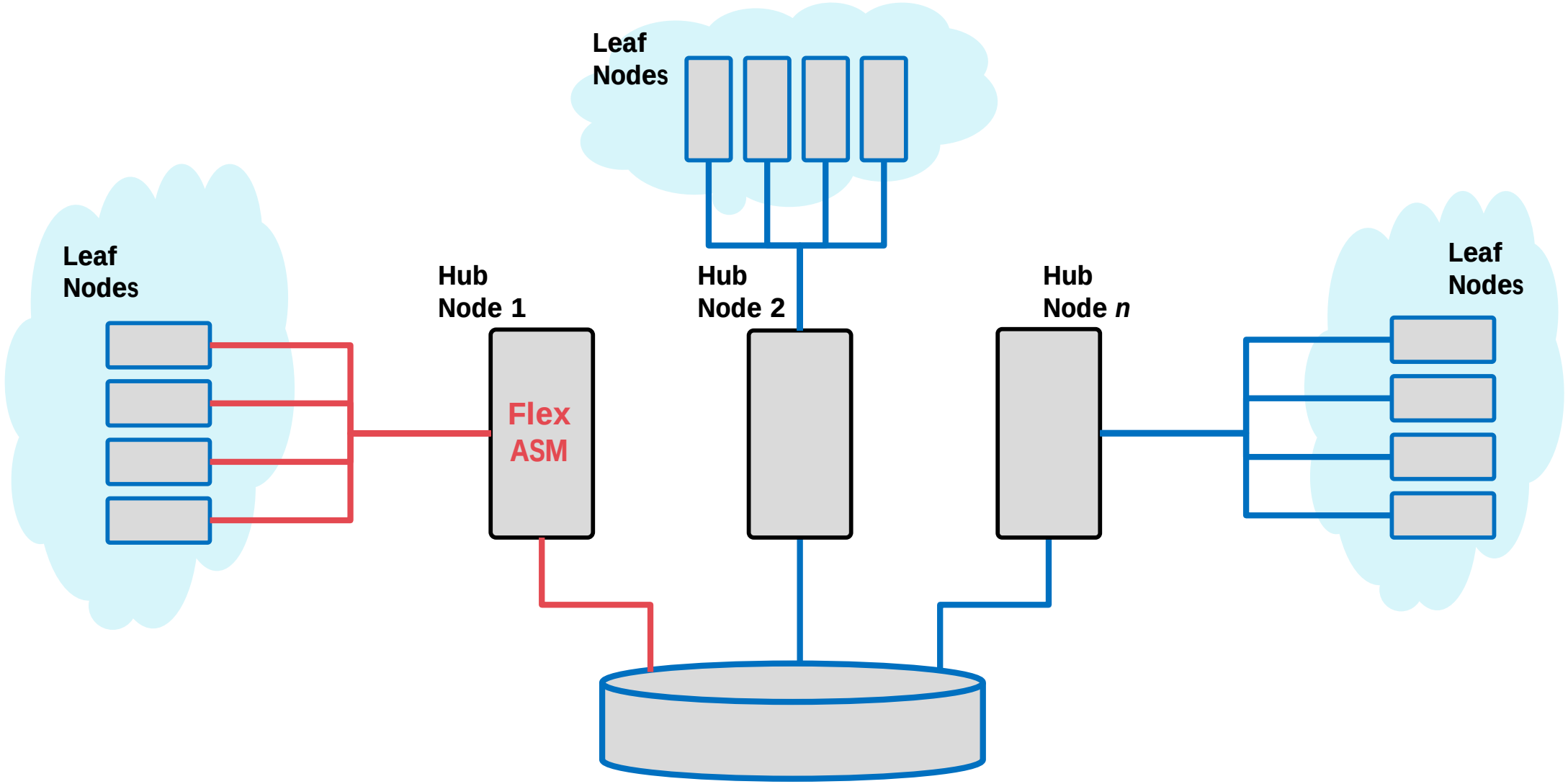
# Oracle Flex Clusters Architecture



# Oracle Flex Clusters Architecture



# Oracle Flex Clusters Architecture



# Oracle Flex Cluster Architecture Concepts

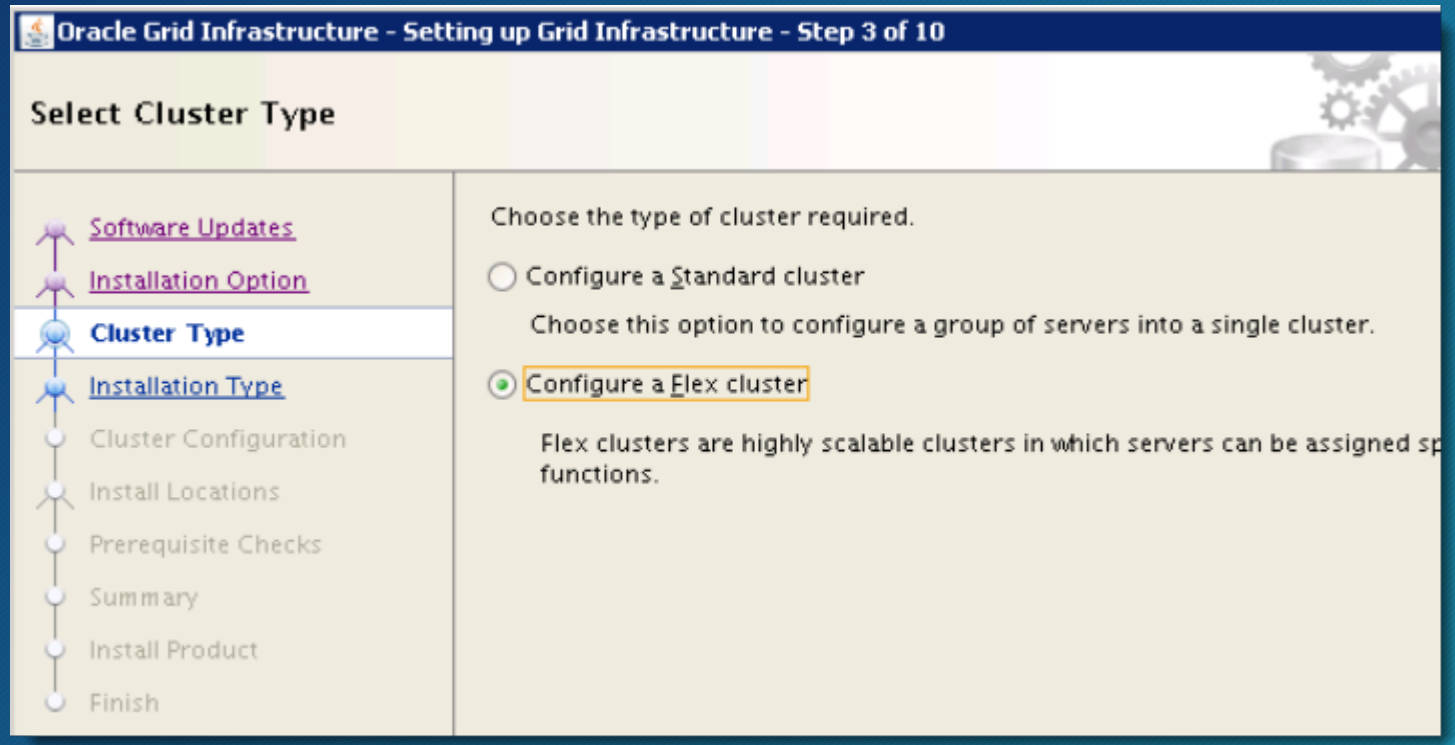
- A Leaf node connects to the cluster through a Hub node
- The cluster heartbeats for Leaf nodes occur between Leaf nodes and their attached Hub nodes
- Reduces number of interconnect paths among cluster nodes:
  - 16-node RAC: requires 120 connection paths
  - With 4 hub nodes and 12 leaf nodes: 6 interconnect among the hubs + 12 interconnect among the leaves = 18 connection paths
- Provides high scalability when the number of nodes is high
- Requires Flex ASM

# Oracle Flex Cluster Architecture Concepts (cont)

- If a hub node fails, its leaf nodes fail, unless they are designed to failover to another hub node
- If a leaf node fails, the services running on it fails over to the other leaf nodes that are connected to the same hub node
- Can be configured:
  - When you create a new cluster configuration
  - Change an existing cluster from standard mode to Flex Cluster
- GNS must be configured:
  - Standard: GNS VIP and a subdomain delegation are configured in DNS
  - Static: GNS VIP along and all cluster names, VIP names, and their addresses are static and registered in DNS

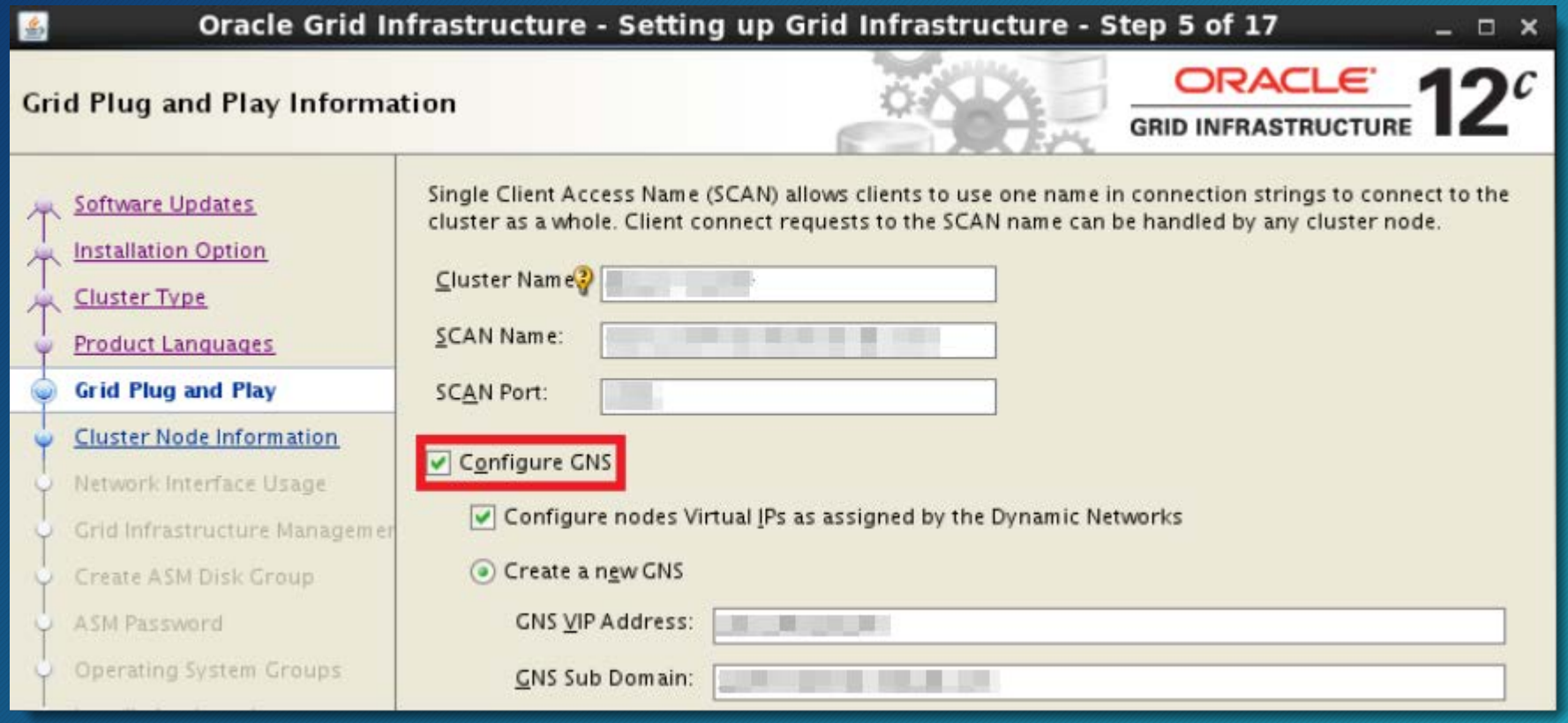
# Creating a Flex Cluster

- When installing Grid Infrastructure:



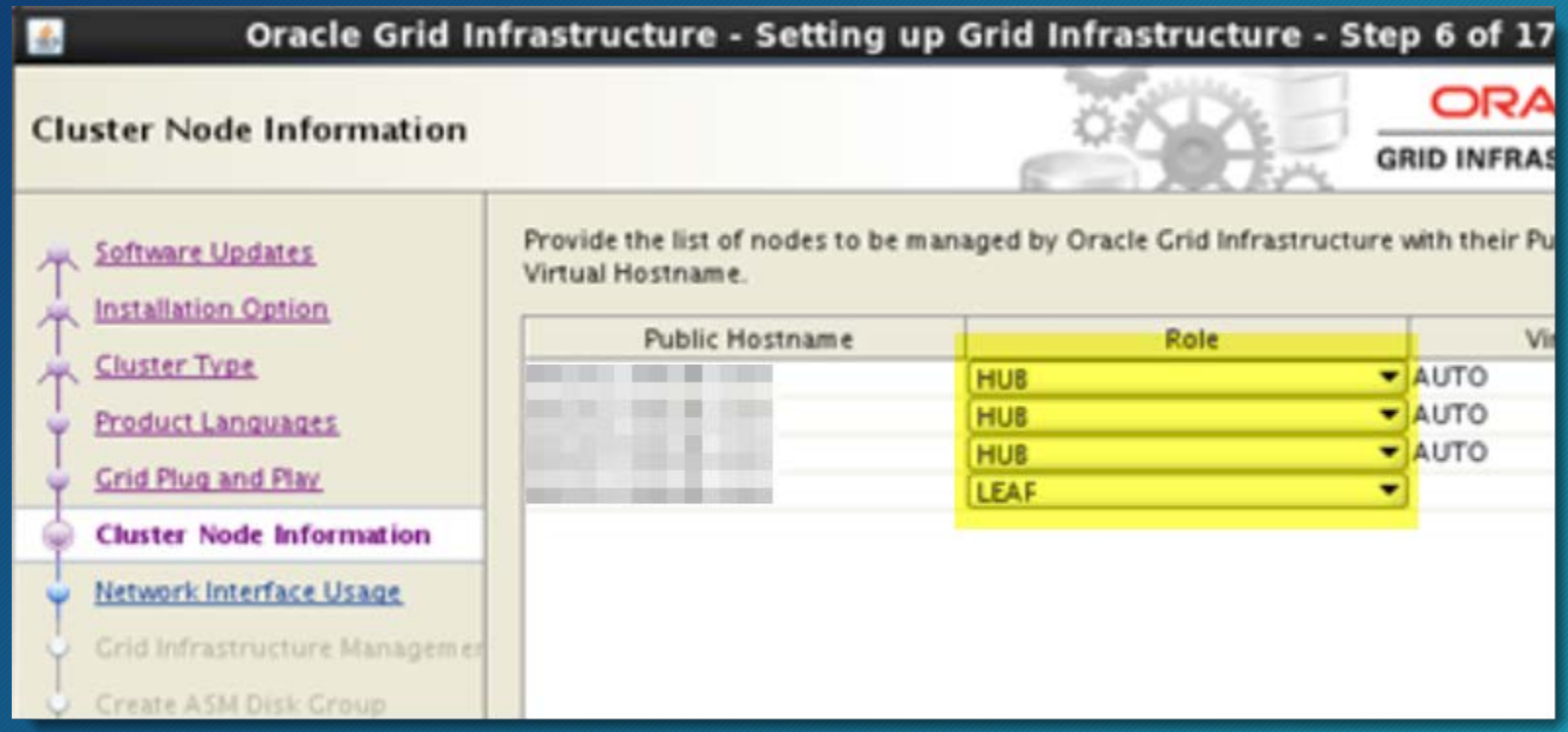
# Creating a Flex Cluster (cont)

- GNS must be configured:



# Creating a Flex Cluster (cont)

- Defining the hub and leaf nodes:



# Converting Cluster Mode to Flex Cluster

- Make sure GNS is configured:

```
srvctl status gns

GNS is running on node hsrv1
GNS is enabled on node hsrv2
```

- To configure the GNS:

```
srvctl add gns –vip <VIP_address> –domain <doman_name>
```

- Enable Oracle Flex ASM option using ASMCA utility.

# Converting Cluster Mode to Flex Cluster (cont)

- As root, convert the standard cluster to Flex Cluster:

```
crsctl set cluster mode flex
```

- Restart the Clusterware technology stack:

```
crsctl stop crs
crsctl start crs –wait
```

# Obtain Information about Flex Cluster

- To check the role of the current cluster node:

```
crsctl get cluster mode status
Cluster is running in "flex" mode
```

- To list hub and leaf nodes:

```
crsctl get node role status –all

Node 'hsrv1' active role is 'hub'
Node 'lsrv1' active role is 'leaf'
Node 'lsrv2' active role is 'leaf‘
...
```

# Managing Oracle Flex Clusters

- To change the role of a node:

```
crsctl set node role [-node node_name] {hub | leaf}
```

- To display the role of current node:

```
crsctl get node role config
```

- To display the role of a particular node:

```
crsctl get node role status -node srv2
```

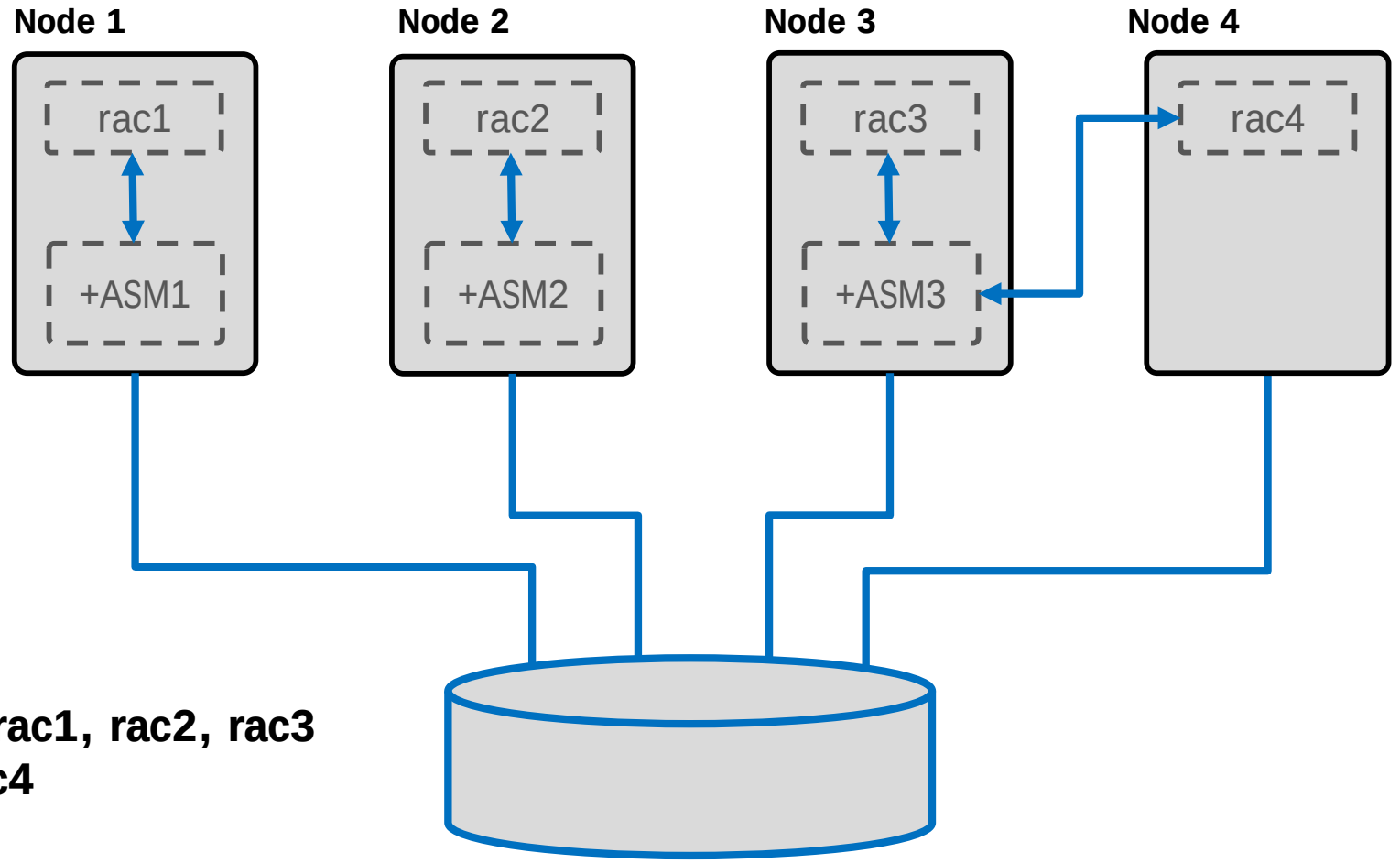
- To check the hubsize of the Flex Cluster:

```
crsctl get cluster hubsize
```

# About Oracle Flex ASM

- Introduced in 12c
- Standard Oracle ASM (the only option on 11g):
  - ASM instance must run in every database RAC node
  - ASM instance consumes from the node resources
  - ASM instance failure causes the database instance to fail
- On Oracle Flex ASM:
  - Not all database instances have ASM instances running in them
  - A network must be configured to connect the ASM instances
  - Database instances with no ASM instances use this network

# Oracle Flex ASM Architecture




**Oracle ASM Clients: rac1, rac2, rac3**
**Flex ASM Clients: rac4**

# Flex ASM and Flex Cluster

- Oracle Flex Cluster requires Flex ASM
- If Flex Cluster was enabled during Grid installation, then Flex ASM is automatically enabled
- If you intend to convert a standard cluster to Flex Cluster, you must configure Flex ASM first
- When Flex ASM is enabled: not all Hub nodes have ASM instances
- Oracle Flex ASM can run on a standard cluster

# Summary

In this lecture, you should have learnt how to perform the following:

- Understand the advantage of Flex Clusters
- Describe Oracle Flex Cluster Architecture
- Create a Flex Cluster database
- Understand the difference between Hub and Leaf nodes
- Convert a cluster to Flex cluster
- Manage Oracle Flex clusters
- Describe Oracle Flex ASM

# Oracle Continuing Education

Oracle Maximum Availability technologies:

- Oracle Data Guard
- Oracle GoldenGate
- Oracle Multitenant Architecture
- Oracle Automatic Storage Management
- Oracle Database Cloud