



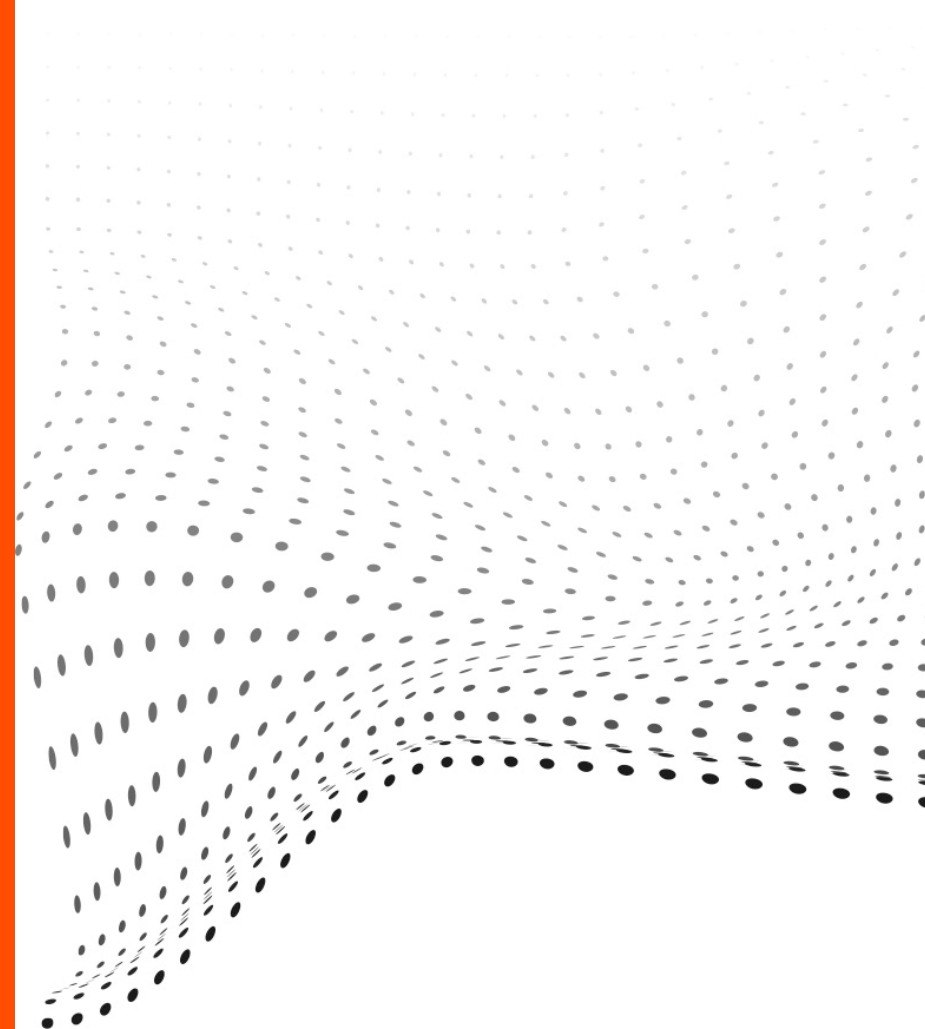
SOLUÇÕES  
EM GERENCIAMENTO  
DE DADOS

# Zero to Hero in 16 Hours: HADR on SQL Server



# Module 5: AOFCI

Always On Failover Cluster Instances

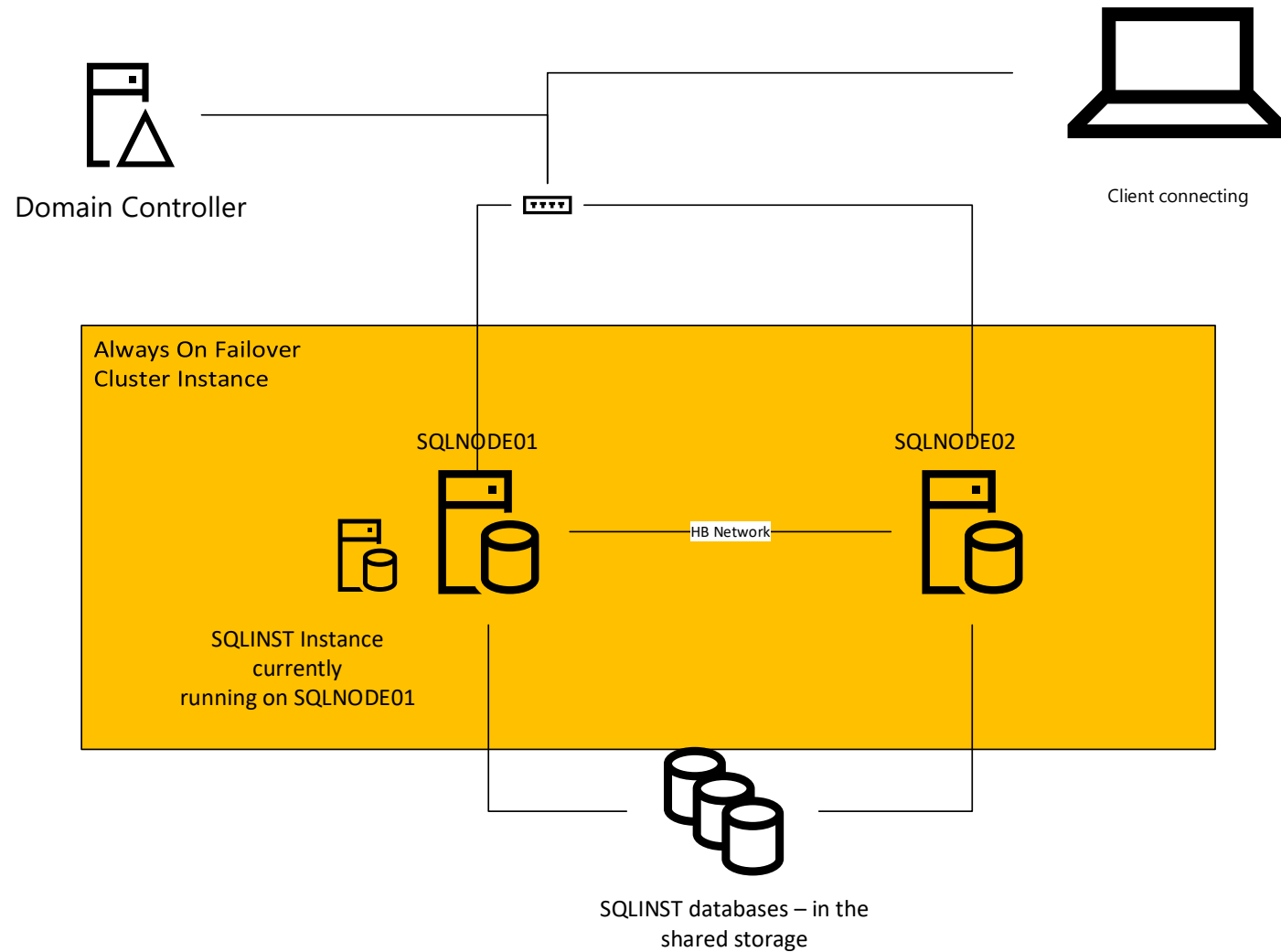


# Goals

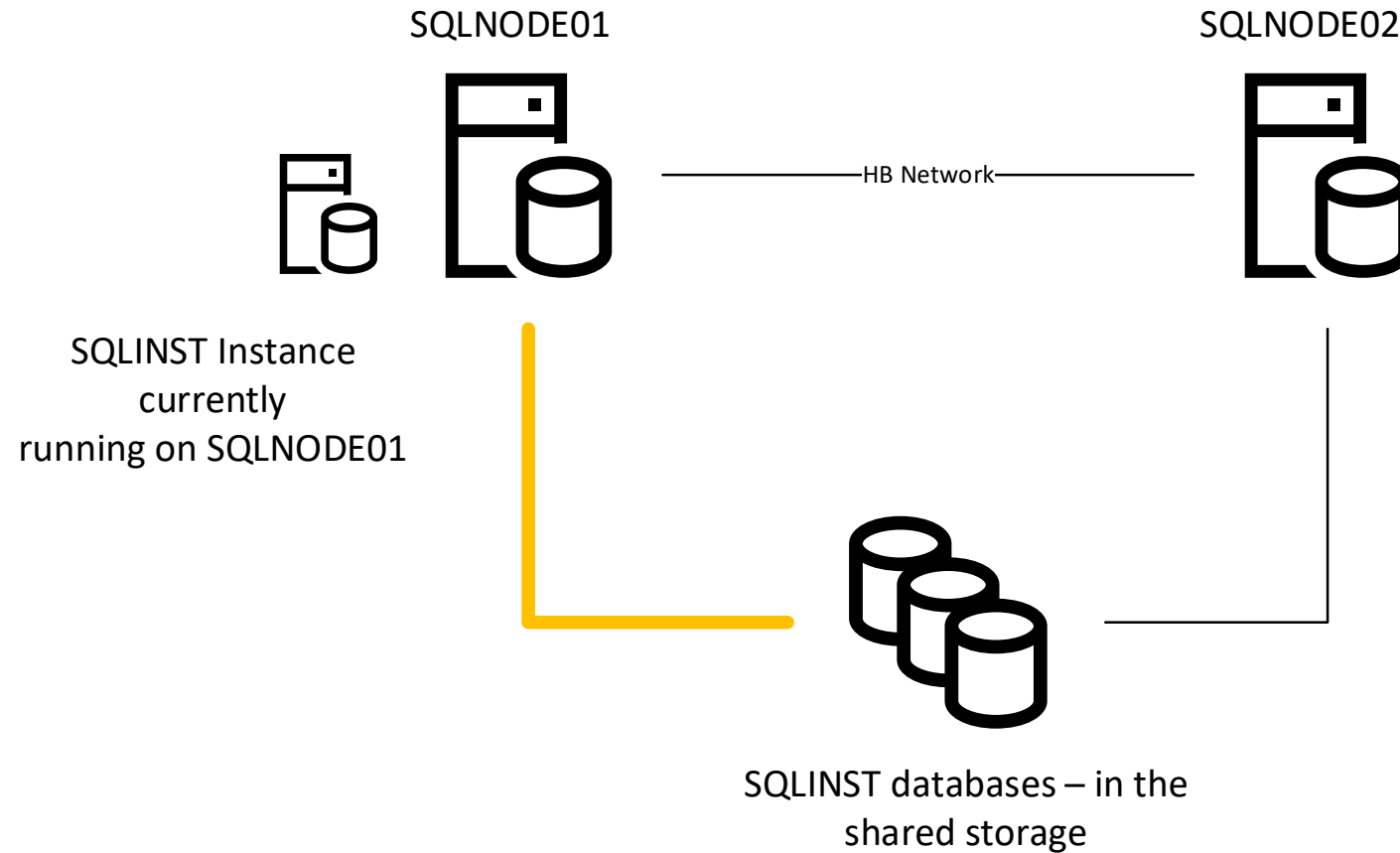


- AO Failover Cluster Instances
- Deploying
- Monitoring
- Options

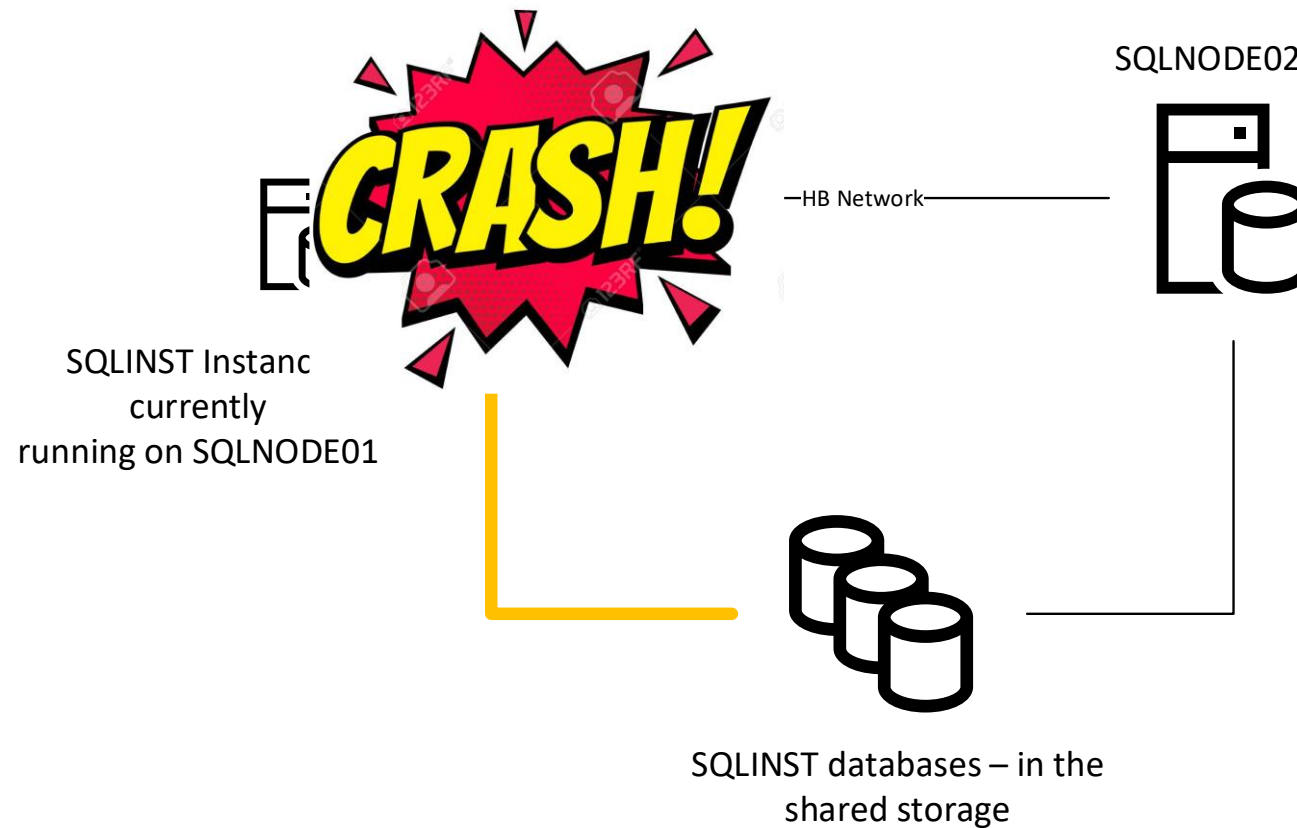
# Failover Cluster Instance – SQL SERVER Cluster



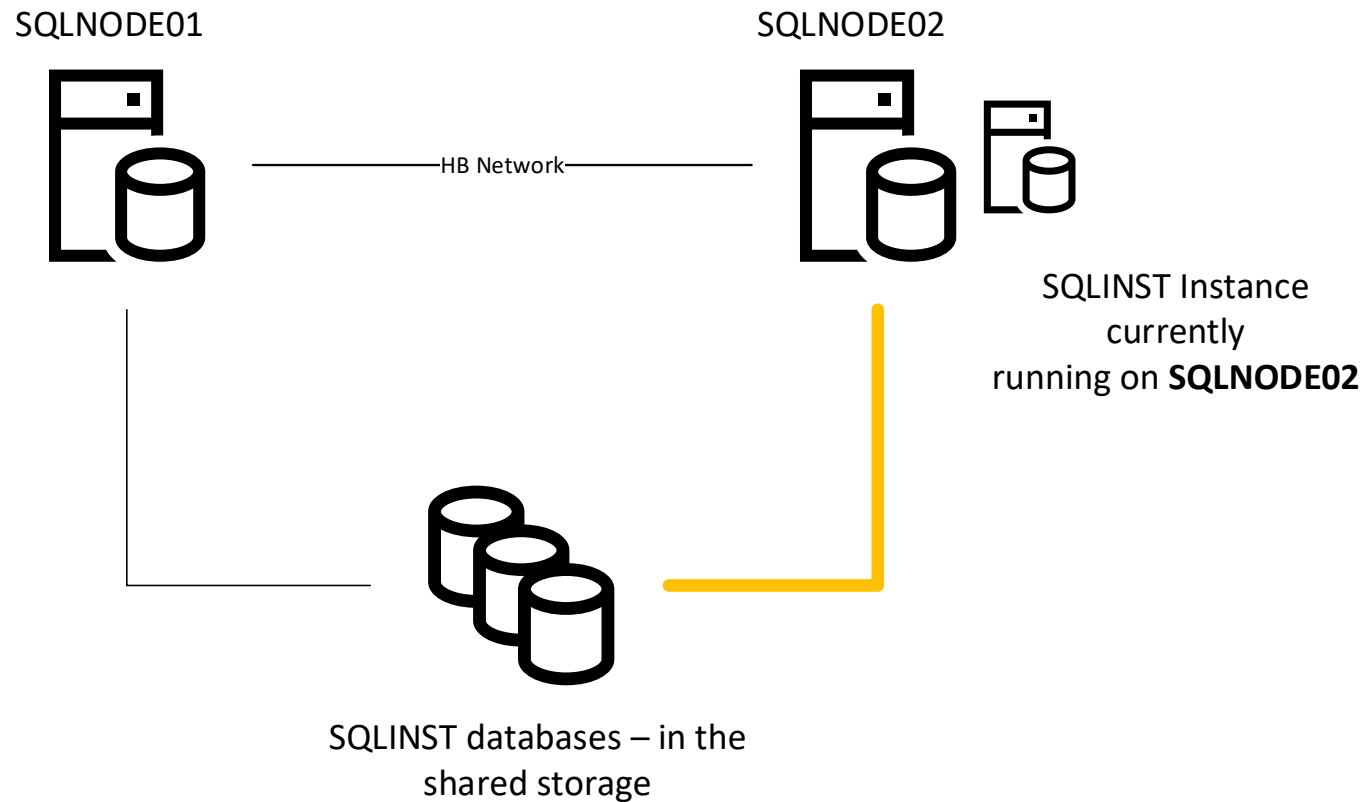
# AO Failover Cluster Instance – basic functionality



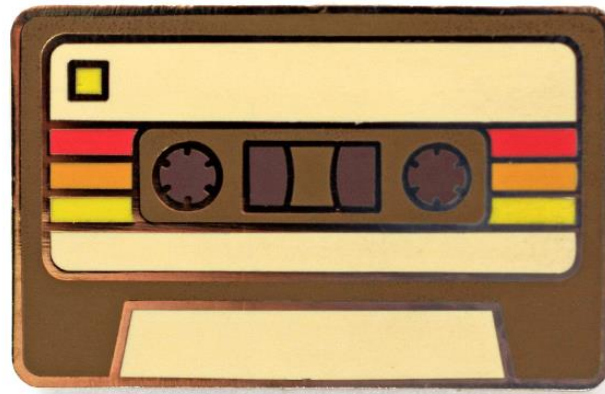
# AO Failover Cluster Instance – basic functionality



# AO Failover Cluster Instance – basic functionality

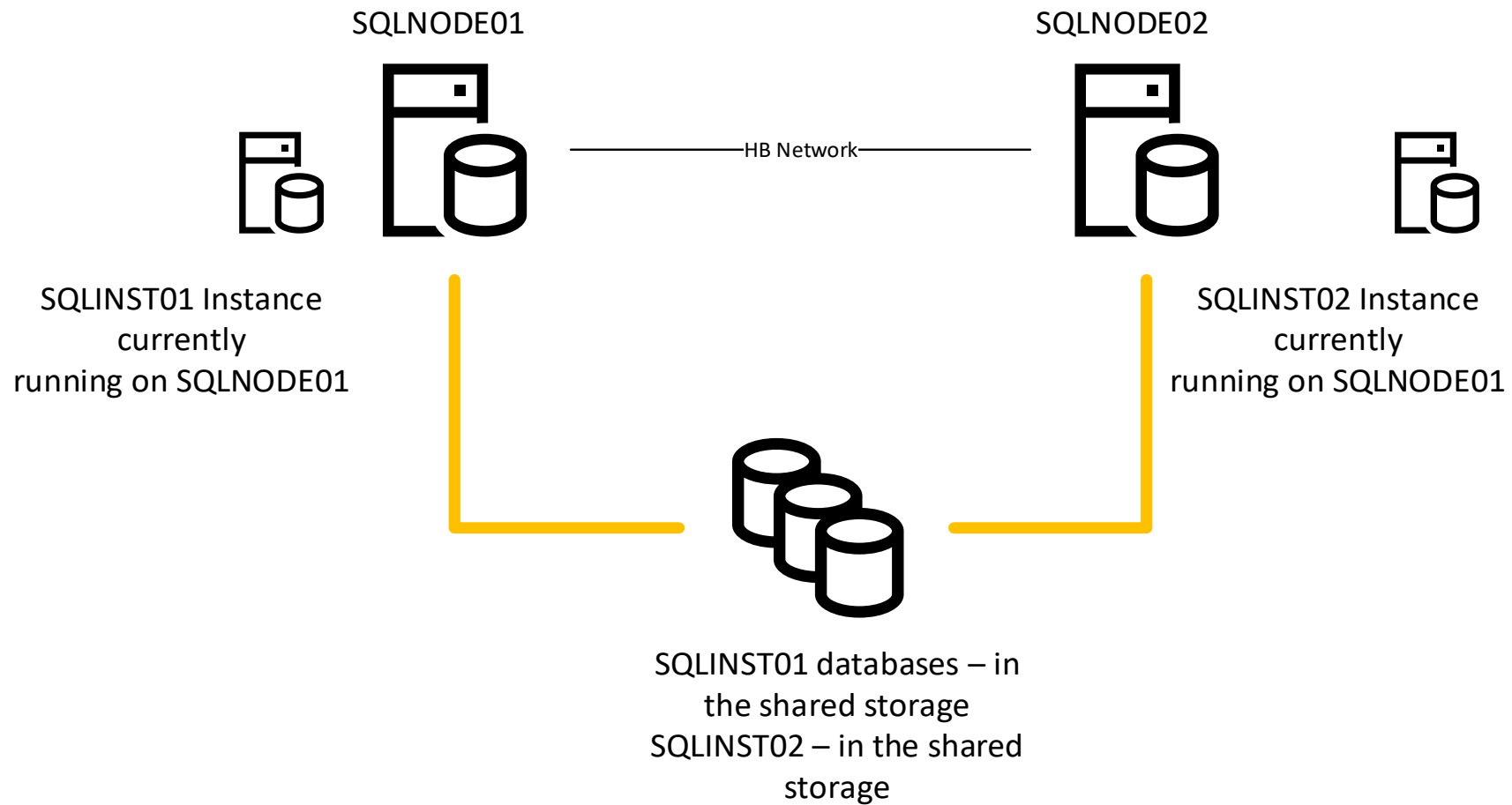


# Demo





# FCI “active-active”

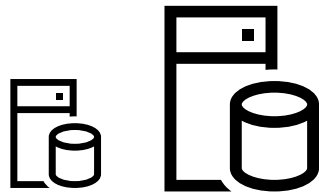


# FCI “active-active” Best Practices – Plan resources!



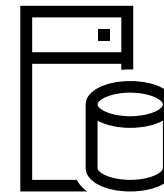
Total Memory: 100 GB  
SQLINST01: 40 GB MAX  
Disks: S,O,P

SQLNODE01



**SQLINST01** Instance  
currently  
running on SQLNODE01

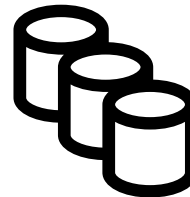
SQLNODE02



**SQLINST02** Instance  
currently  
running on SQLNODE01

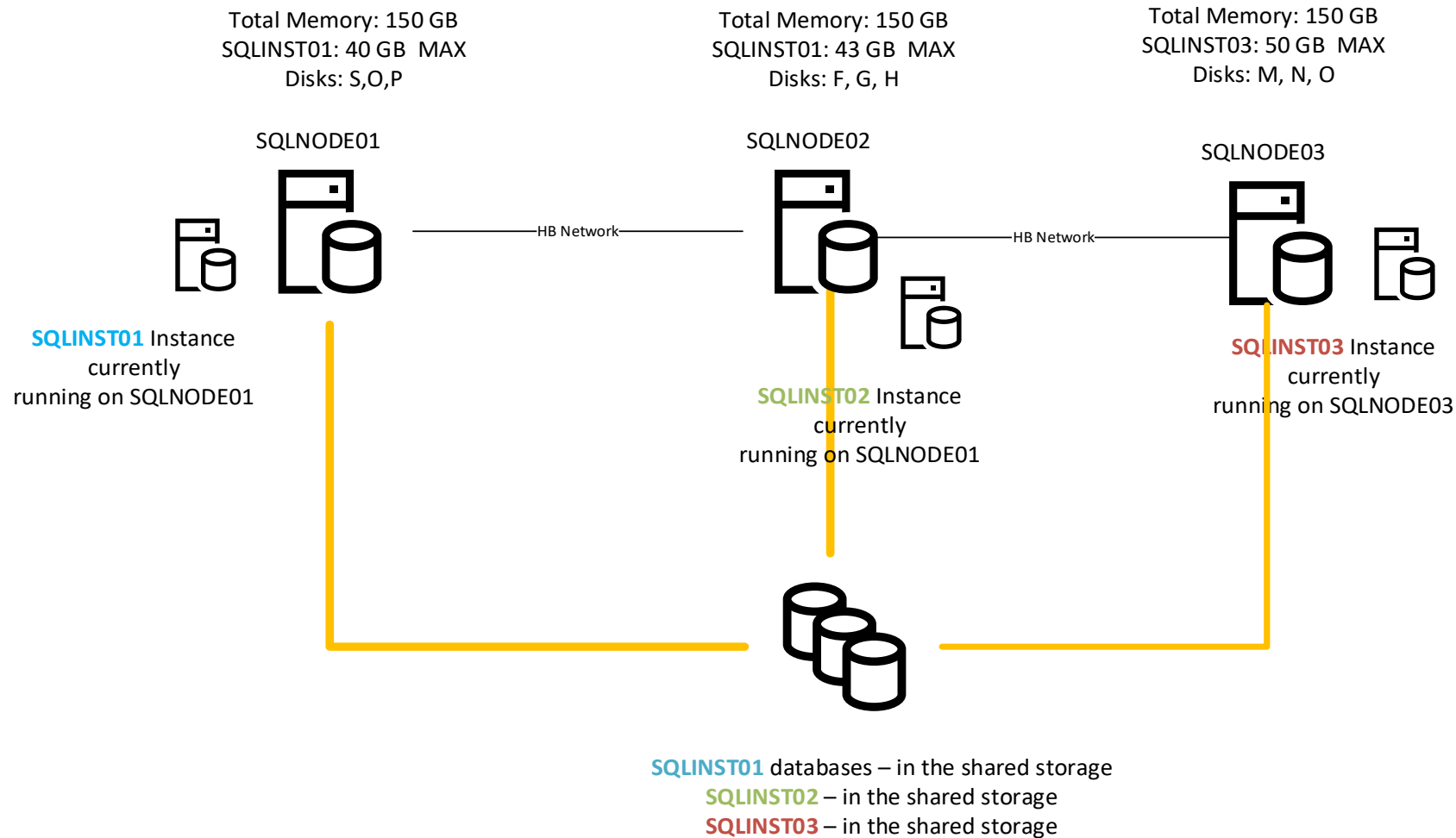
Total Memory: 100 GB  
SQLINST01: 43 GB MAX  
Disks: F, G, H

HB Network



**SQLINST01** databases – in  
the shared storage  
**SQLINST02** – in the shared  
storage

# FCI “active-active” Best Practices – Plan resources!



# Deploy steps



1. Servers are properly added to the AD
2. OS is properly configured
3. Define Ips, VIPs and Disks
4. Create a SQL SERVER Service user in the Domain
5. Install SQL SERVER on the first node with the 'Failover Cluster Option'
6. Install the SQL SERVER binaries on the remaining nodes
7. Test the failover steps

# Deploy steps



Failover Cluster Manager

File Action View Help

ClusterPombo.datalab.com

Roles  
Nodes  
Storage  
Disks  
Pools  
Enclosures  
Networks  
Cluster Events

### Cluster ClusterPombo.datalab.com

**Summary of Cluster ClusterPombo**  
ClusterPombo has 0 clustered roles and 2 nodes.

**Name:** ClusterPombo.datalab.com  
**Current Host Server:** SQL11  
**Recent Cluster Events:** Critical: 7, Error: 2  
**Witness:** File Share Witness (\datalab\sharedwitness)

**Networks:** DATA, iSCSI, HB  
**Subnets:** 3 IPv4 and 0 IPv6  
**Storage Spaces Direct (S2D):** Disabled

#### Configure

Configure high availability for a specific clustered role, add one or more servers (nodes), or copy roles from a cluster running Windows Server 2016 or supported previous versions of Windows Server.

[Configure Role...](#) [Failover cluster topics on the Web](#)  
[Validate Cluster...](#)  
[Add Node...](#)  
[Copy Cluster Roles...](#)  
[Cluster-Aware Updating...](#)

#### Navigate

[Roles](#) [Nodes](#) [Storage](#) [Networks](#)  
[Cluster Events](#)

#### Cluster Core Resources

Name	Status	Information
<b>File Share Witness</b>		
File Share Witness (\datalab\sharedwitness)	Online	
<b>Server Name</b>		
Name: ClusterPombo	Online	
IP Address: 192.168.10.51	Online	

# Deploy steps



Failover Cluster Manager

File Action View Help

Failover Cluster Manager

ClusterPombo.datalab.com

- Roles
- Nodes
- Storage
  - Disks**
  - Pools
  - Enclosures
- Networks
- Cluster Events

**Disks (3)**

Search

Name	Status	Assigned To	Owner Node	Disk Number	F
SQL_DATA	Online	Available Storage	SQL11	2	
SQL_LOG	Online	Available Storage	SQL11	3	
SQL_TEMPDB	Online	Available Storage	SQL11	1	

# Deploy steps



Failover Cluster Manager

ClusterPombo.datalab.com

- Roles
- Nodes
- Storage
  - Disks
  - Pools
- Enclosures
- Networks
- Cluster Events

### Nodes (2)

Search

Name	Status	Assigned Vote	Current Vote	Site
SQL11	Up	1	1	
SQL12	Up	1	1	

<

#### SQL11

**Status:** Up

**Node ID:** 1

**Uptime:** 1:52:53

**Memory:** 1.76 GB Available, 4.00 GB Total

**Processors:** (6) Intel(R) Xeon(R) CPU E5-2673 v3 @ 2.40GHz

**CPU Usage:** 1%

**Operating System:** Microsoft Windows Server 2016 Standard Evaluation

**Version:** 10.0.14393

**Service Pack:** No Service Pack Installed

**System Type:** x64-based PC

**Manufacturer:** Microsoft Corporation

**Model:** Virtual Machine

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Summary | Network Connections | Roles | Disks | Pools | Physical Disks

Node: SQL11

# Deploy steps



Failover Cluster Manager

ClusterPombo.datalab.com

- Roles
- Nodes
- Storage
  - Disks
  - Pools
  - Enclosures
- Networks**
- Cluster Events

### Networks (3)

Search

Name	Status	Cluster Use	Information
DATA	Up	Cluster and Client	
iSCSI	Up	None	
HB	Up	Cluster Only	

DATA

**Subnets:** 192.168.10.0/24

Summary Network Connections



# Deploy steps



SQL Server Installation Center

Planning

**Installation**


Maintenance


Tools


Resources


Advanced


Options


 [New SQL Server stand-alone installation or add features to an existing installation](#)  
Launch a wizard to install SQL Server 2017 in a non-clustered environment or to add features to an existing SQL Server 2017 instance.


 [Install SQL Server Reporting Services](#)  
Launch a download page that provides a link to install SQL Server Reporting Services. An internet connection is required to install SSRS.

 [Install SQL Server Management Tools](#)  
Launch a download page that provides a link to install SQL Server Management Studio, SQL Server command-line utilities (SQLCMD and BCP), SQL Server PowerShell provider, SQL Server Profiler and Database Tuning Advisor. An internet connection is required to install these tools.

 [Install SQL Server Data Tools](#)  
Launch a download page that provides a link to install SQL Server Data Tools (SSDT). SSDT provides Visual Studio integration including project system support for Azure SQL Database, the SQL Server Database Engine, Reporting Services, Analysis Services and Integration Services. An internet connection is required to install SSDT.

 [New SQL Server failover cluster installation](#)  
Launch a wizard to install a single-node SQL Server 2017 failover cluster.

 [Add node to a SQL Server failover cluster](#)  
Launch a wizard to add a node to an existing SQL Server 2017 failover cluster.

 [Upgrade from a previous version of SQL Server](#)  
Launch a wizard to upgrade a previous version of SQL Server to SQL Server 2017.

# Deploy steps



## Instance Configuration

Specify the name and instance ID for the instance of SQL Server. Instance ID becomes part of the installation path.

- Global Rules
- Microsoft Update
- Install Setup Files
- Install Failover Cluster Rules
- Product Key
- License Terms
- Feature Selection
- Feature Rules
- Instance Configuration**
- Cluster Resource Group
- Cluster Disk Selection
- Cluster Network Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Ready to Install
- Installation Progress

Specify a network name for the new SQL Server failover cluster. This will be the name used to identify your failover cluster on the network.

SQL Server Network Name:

☐ Default instance

☒ Named instance:

Instance ID:

SQL Server directory: C:\Program Files\Microsoft SQL Server\MSSQL14.LAB01

Detected SQL Server instances and features on this computer:

Instance	Cluster Network Name	Features	Edition	Version	Instance ID
MSSQLSERVER		SQLEngine	Developer	14.0.1000.169	MSSQL14.MSSQLSERVER

# Deploy steps





## Cluster Resource Group

Create a new cluster resource group for your SQL Server failover cluster.

- Global Rules
- Microsoft Update
- Install Setup Files
- Install Failover Cluster Rules
- Product Key
- License Terms
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group**
- Cluster Disk Selection


Specify a name for the SQL Server cluster resource group. The cluster resource group is where SQL Server failover cluster resources will be placed. You can choose to use an existing cluster resource group name or enter a new cluster resource group name to be created.

SQL Server cluster resource group name:

Qualified	Name	Message
	Available Storage	The cluster group 'Available Storage' is reserved by Windows Failover Clustering and cannot be used as a cluster resource group.
	Cluster Group	The cluster group 'Cluster Group' is reserved by Windows Failover Clustering and cannot be used as a cluster resource group.

# Deploy steps



 Install a SQL Server Failover Cluster

## Cluster Disk Selection




Select shared cluster disk resources for your SQL Server failover cluster.

Global Rules  
Microsoft Update  
Install Setup Files  
Install Failover Cluster Rules  
Product Key  
License Terms  
Feature Selection  
Feature Rules  
Instance Configuration  
Cluster Resource Group  
**Cluster Disk Selection**  
Cluster Network Configuration  
Server Configuration  
Database Engine Configuration

Specify the shared disks to be included in the SQL Server resource cluster group. The first drive will be the first drive but this can be changed on the Database Engine or Analysis Services configuration pages.

- ☒ SQL\_DATA
- ☒ SQL\_LOG
- ☒ SQL\_TEMPDB

Available shared disks:

Qualified	Disk	Message
	SQL_DATA	
	SQL_LOG	
	SQL_TEMPDB	

# Deploy steps



Install a SQL Server Failover Cluster

## Cluster Network Configuration

Select network resources for your SQL Server failover cluster.

- Global Rules
- Microsoft Update
- Install Setup Files
- Install Failover Cluster Rules
- Product Key
- License Terms
- Feature Selection
- Feature Rules
- Instance Configuration
- Cluster Resource Group

Specify the network settings for this failover cluster:

<input checked="" type="checkbox"/>	IP Ty...	DHCP	Address	Subnet Mask	Subnet(s)	Network
<input checked="" type="checkbox"/>	IPv4	<input type="checkbox"/>	192.168.10.61	255.255.255.0	192.168.10.0/24	DATA

# Monitoring



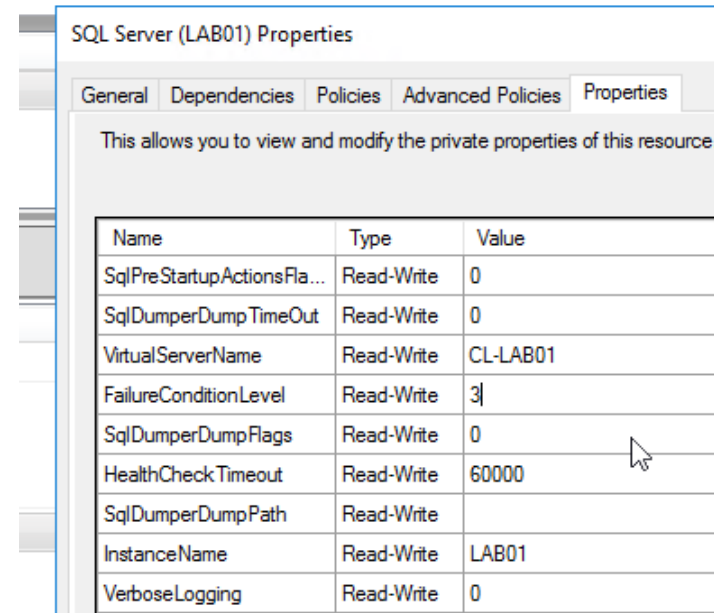
- Mainly on the Failover Cluster Manager in Windows
- Some DMVs are useful: `sys.dm_hadr_cluster`, `sys.dm_hadr_cluster_members`, `sys.dm_os_cluster_nodes`, `sys.dm_hadr_cluster_networks` (`hadr*` are only for Ags)

# Options and parameters



- Sp\_server\_diagnostics -> runs every 1/3 of the HealthCheckTimeout (milliseconds)

Level	Condition
0	No automatic failover or restart
1	Failover or restart on server down
2	Failover or restart on server unresponsive
3	Failover or restart on critical server errors
4	Failover or restart on moderate server errors
5	Failover or restart on any qualified failure conditions



SQL Server (LAB01) Properties

General Dependencies Policies Advanced Policies Properties

This allows you to view and modify the private properties of this resource.

Name	Type	Value
SqlPreStartupActionsFla...	Read-Write	0
SqlDumperDumpTimeOut	Read-Write	0
VirtualServerName	Read-Write	CL-LAB01
FailureConditionLevel	Read-Write	3
SqlDumperDumpFlags	Read-Write	0
HealthCheckTimeout	Read-Write	60000
SqlDumperDumpPath	Read-Write	
InstanceName	Read-Write	LAB01
VerboseLogging	Read-Write	0

**Fim do módulo**

