

Building an Always On Foundation for Availability Groups



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Module Overview



Windows cluster setup demo

Configuring your windows cluster

- Quorum voting
- Node weight
- Cluster validation
- Troubleshooting
- Multi-subnets
- Firewalls



Sample Abacos Cluster



Quorum

The minimum number of members of an assembly required to conduct the business of a group



Understanding Quorum



Six or More Present to Form Quorum



No Quorum



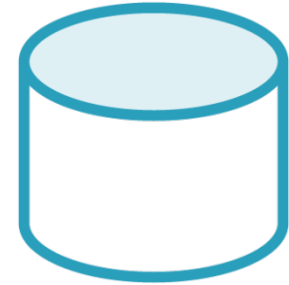
Understanding Quorum



Subnet 1



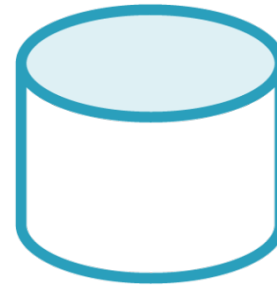
Subnet 1



Subnet 2



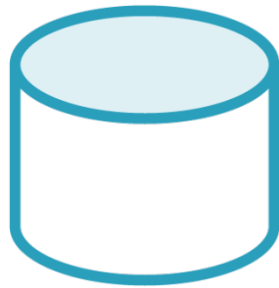
Subnet 1



Subnet 2
Primary



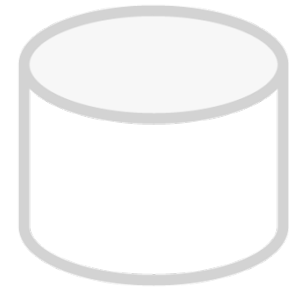
Understanding Quorum



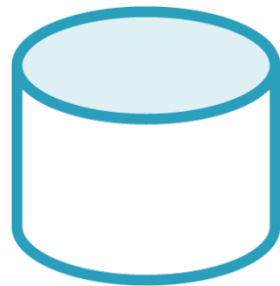
Subnet 1



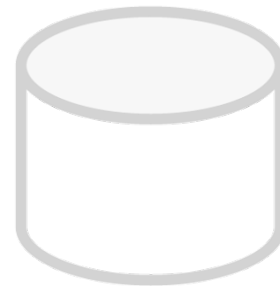
Subnet 1



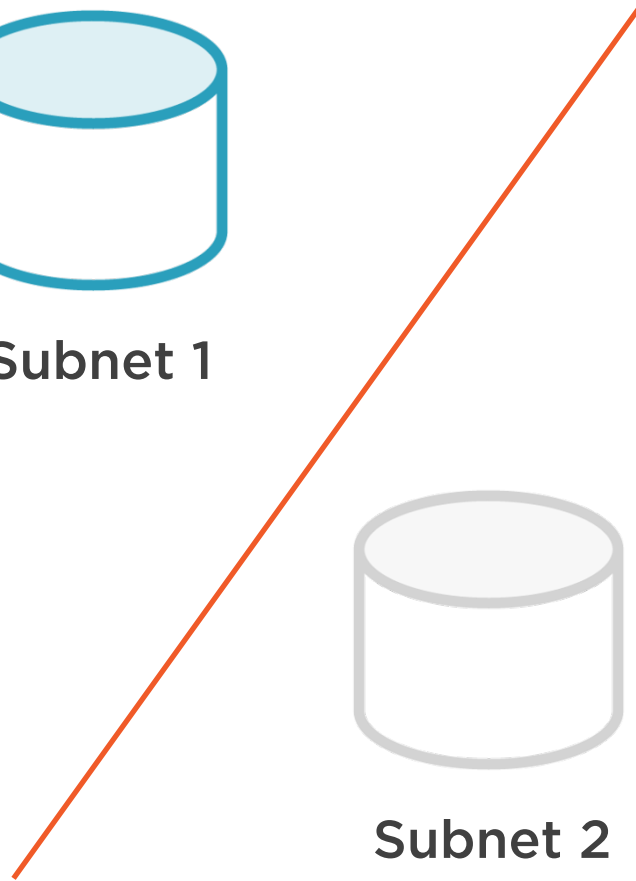
Subnet 2



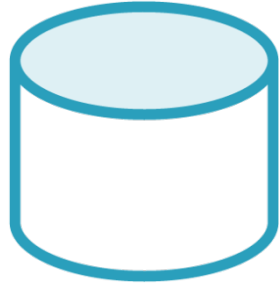
Subnet 1



Subnet 2



Valid Quorum



Subnet 1
Primary



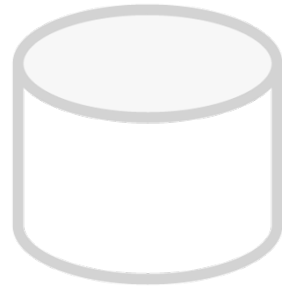
Subnet 1



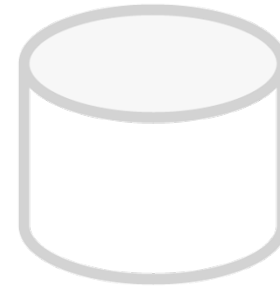
Subnet 1



Cannot Form Quorum



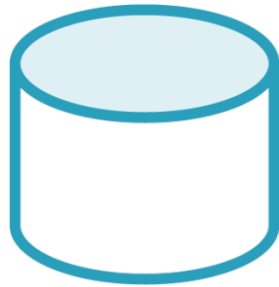
Subnet 2



Subnet 2



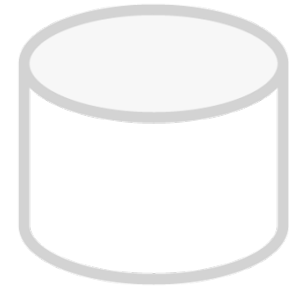
Split Brain



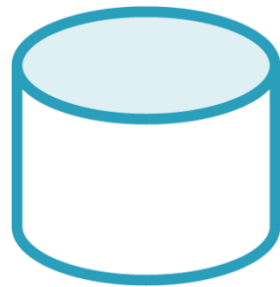
Subnet 1
Primary



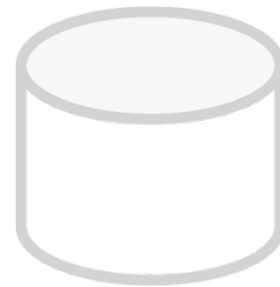
Subnet 1



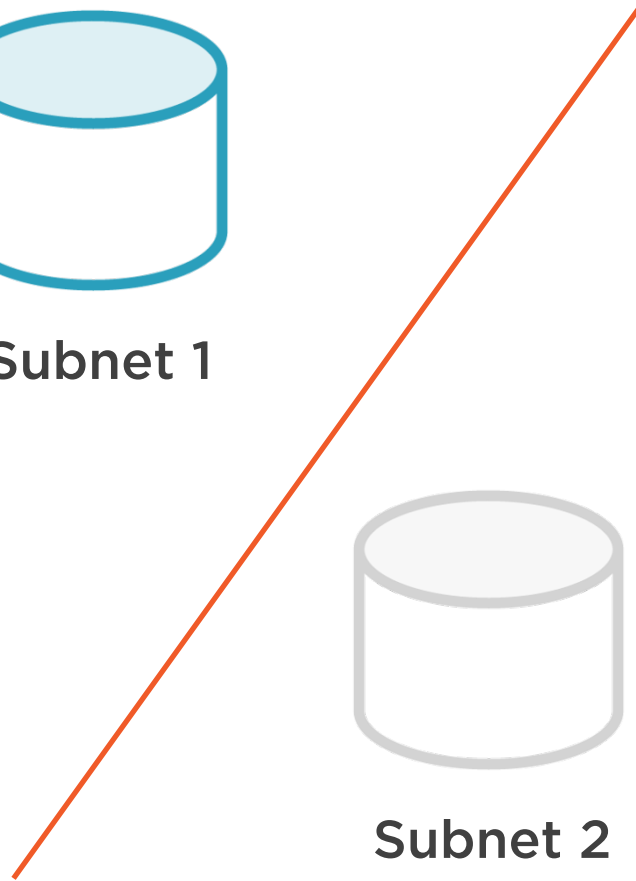
Subnet 2
Primary



Subnet 1



Subnet 2



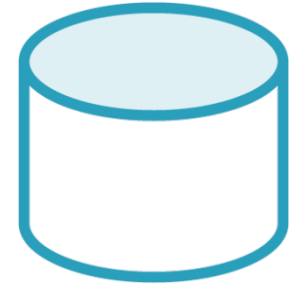
5 Node Cluster



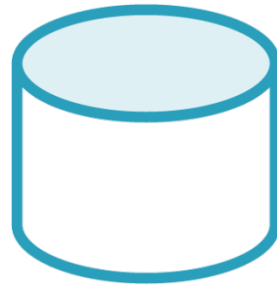
Subnet 1



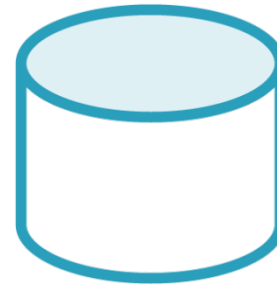
Subnet 1



Subnet 2



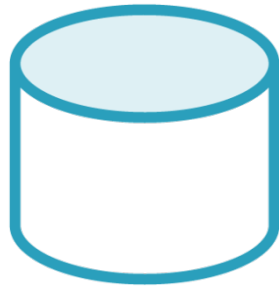
Subnet 1



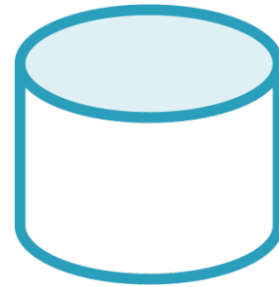
Subnet 2
Primary



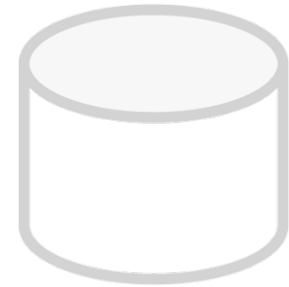
Outage Occurs



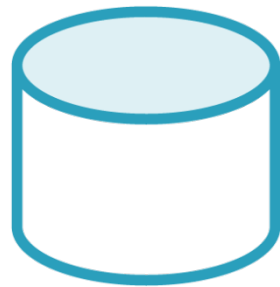
Subnet 1



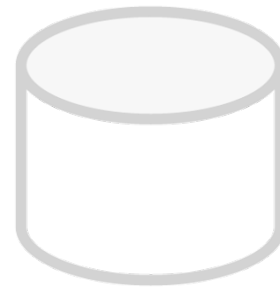
Subnet 1



Subnet 2



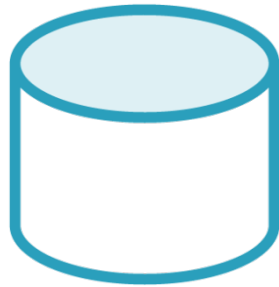
Subnet 1



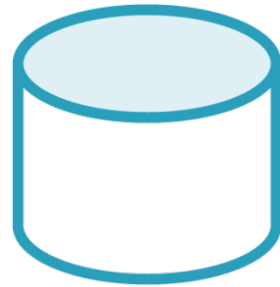
Subnet 2
Primary



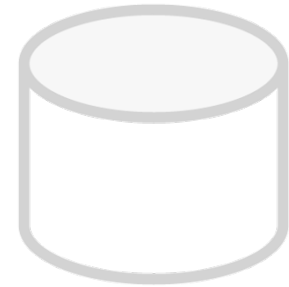
Nodes That Form Quorum Select New Primary



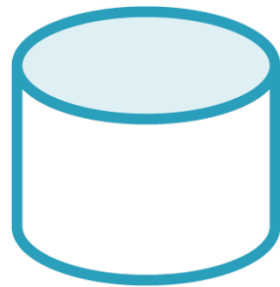
Subnet 1



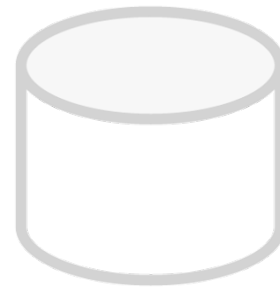
Subnet 1
Primary



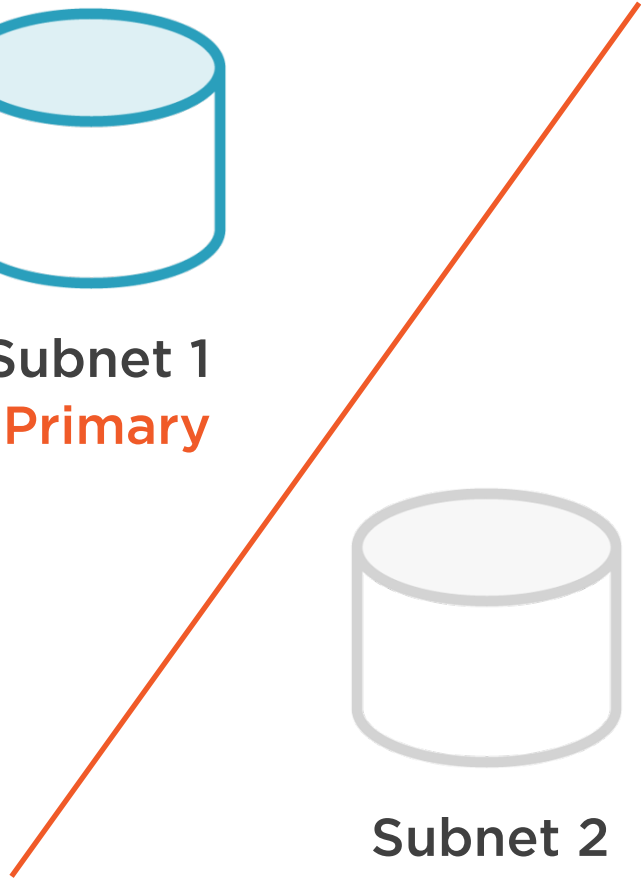
Subnet 2



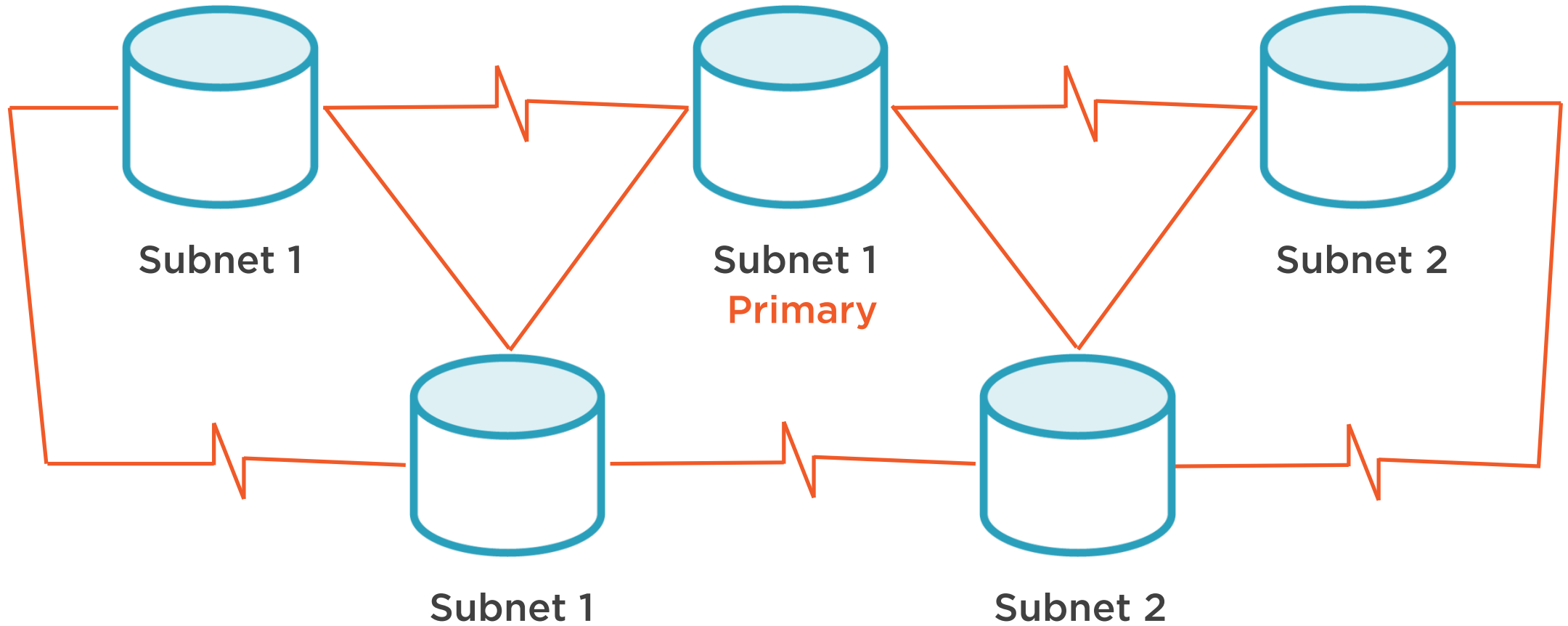
Subnet 1



Subnet 2



Understanding Quorum



Network redundancy and
bandwidth are key to a
healthy cluster and solid
quorum



Always On Quorum Modes



Node Majority



Node and File
Share Majority



Node and Disk
Majority



Disk Only



Node Majority



Any combination of nodes that form a majority establish quorum and can select a primary node

Important: Failure of any single node should leave enough remaining nodes to still establish quorum

Node and File Share Majority



Any combination of nodes and designated file share(s) that form a majority establish quorum and can select a primary node

Important: File share should reside on a server that all nodes can see. File share should be separate from other nodes

Node and Disk Majority / Disk Only



Majority: Any combination of nodes and shared disk resource that form a majority establish quorum and can select a primary node

Disk Only: The shared disk being the protected resource will select any node it can communicate with as the primary node

Always On

Availability Groups



Failover Clustering



Sample Abacos Cluster



Getting quorum right is
critical to cluster high
availability!



Sample Abacos Cluster



Quorum Configuration Best Practices



No vote by default



Include all primary replicas



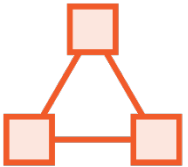
Include all possible automatic failover owners



Quorum Configuration Best Practices



Exclude secondary site nodes



Odd number of votes



Re-assess vote assignment post failover



Demo



Cluster quorum configuration demo



Sample Abacos Cluster

Subnet 1



Subnet 2



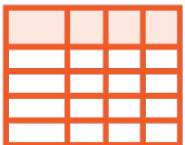
Always On AG Without a Domain



A DNS server and common DNS suffix across all nodes



Same local administrator with same password on all nodes

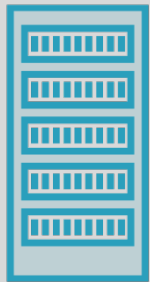


Registry setting: LocalAccountTokenFilterPolicy -Value 1
(allows a local admin to remotely administer another server)

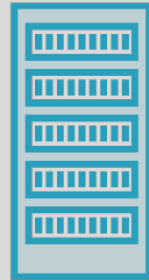


Sample Abacos Linux Cluster

Subnet 2



AbacosLx1



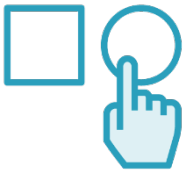
AbacosLx2



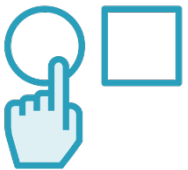
AbacosLx3



Always On Availability Group on Linux



Windows begins with cluster and then builds AG on that cluster



Linux begins with AG and then configures cluster by adding AG



Popular Linux cluster that supports AG is Pacemaker

<https://docs.microsoft.com/en-us/sql/linux/sql-server-linux-availability-group-overview>



Availability Groups Without a Cluster



Availability Groups Without a Cluster



Availability Group Without a Cluster



No auto-failover



Often called a read-scale availability group

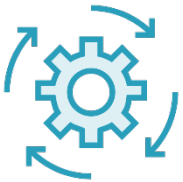


Common for DR, relaxed SLAs, or scaling out reads

Running an AG Without Quorum



Manual failover mode relieves need for quorum



Manual failover may avoid outages due to poor network condition



Forcing quorum can also over-ride cluster node voting



Summary



Cluster configuration

- Multi-subnet
- Firewalls
- Troubleshooting

Quorum modes

Cluster without a domain

AG without a cluster or a domain



Microsoft SQL Server Always On Availability Groups Checklist

*Node = each individual windows server participating in the cluster
Replica = each individual sql server instance participating in the group
Database = each individual database participating in the group*

Configure Always On

(Operating System)

- Enable windows clustering on each node
 - Server Manager – Enable Failover Cluster Feature
- Add participating nodes to cluster
 - Failover cluster manager – create cluster
- Validate cluster
 - Validate all steps
 - Disk warnings related to shared disks are ok, AG doesn't need shared disks
 - Verify redundant networks that validation can't identify
- Create cluster
 - Create cluster
 - Configure quorum per best practices
 - No vote by default
 - Include all primaries
 - Include failover target nodes
 - Exclude secondary / asynchronous sites
 - Ensure odd number of voting nodes
 - Re-assess post failover scenarios
 - Establish file share witness if necessary
- Multi-subnet?
 - Firewall requirements
 - UDP 3343 – cluster service
 - TCP 3343 – node joining
 - TCP 135 – RPC calls between nodes
 - UDP 137 – Cluster administration
 - UDP 1024-65535 – Randomly allocated ports
 - UDP 49152-65535 – Randomly allocated ports
 - TCP 139/445 – File share witness
 - UDP 137/138 – File share witness and SMB / netbios
 - TCP 1433 – SQL Server
 - TCP 7022 or custom port – Mirror endpoint needed for AG
- Review event logs and c:\windows\cluster\reports logs
 - Dump cluster event log with PS `Install-Module FailoverClusters` `Get-ClusterLog`

Optional: configure Always On failover cluster with no domain

- DNS server with shared DNS suffix
- Local administrator with same name and same password
- Registry setting: LocalAccountTokenFilterPolicy –Value 1
- Create cluster as above
- <https://bit.ly/2NTq8O3> - Microsoft documentation with additional information

