Implementacija failover klastera

9. PREDAVANJE

Module Overview

- Overview of Failover Clustering
- Implementing a Failover Cluster
- Configuring Highly Available Applications and Services on a Failover Cluster
- Maintaining a Failover Cluster
- Implementing a Multisite Failover Cluster

Lesson 1: Overview of Failover Clustering

- What Is High Availability?
- Failover Clustering Improvements in Windows Server 2012
- Failover Clustering Improvements in Windows Server 2012 R2
- Failover Cluster Components
- What Are CSVs?
- New CSV Features in Windows Server 2012 R2
- What Are Failover and Failback?
- What Is Quorum?
- Quorum Modes in Windows Server 2012 Failover Clustering
- How Quorum Works in Windows Server 2012 R2 Failover Clustering
- Failover Cluster Networks
- Failover Cluster Storage

What Is High Availability?

- Availability is a level of service expressed as a percentage of time
- Highly-available services or systems are available more than 99 percent of the time
- High availability requirements differ based on how availability is measured
- Planned outages typically are not included when calculating availability

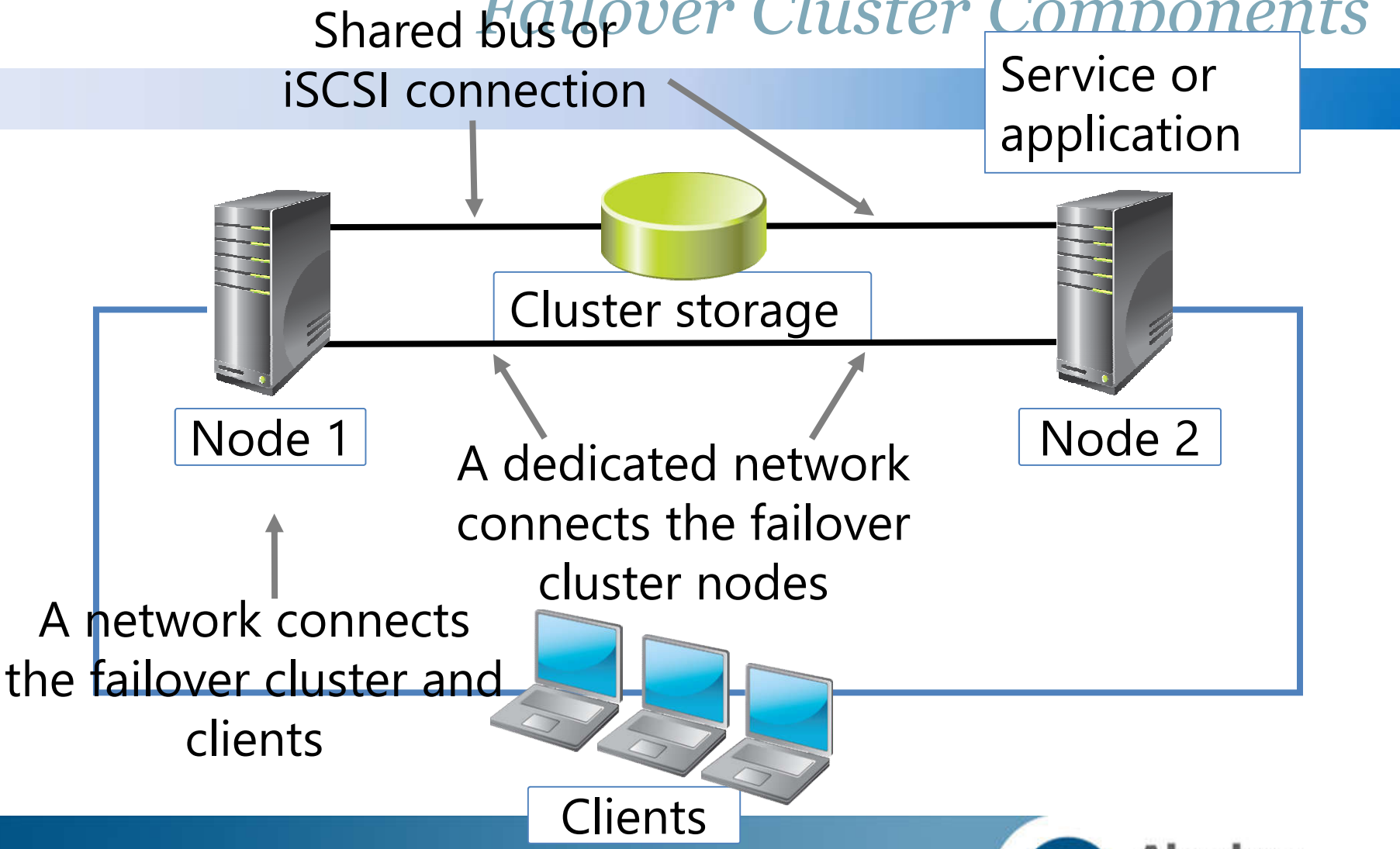
Failover Clustering Improvements in Windows Server 2012

Failover clustering improvements in Windows Server 2012	Removed and deprecated failover clustering features in Windows Server 2012
• Increased scalability • Improved CSVs • Cluster-aware updating • Active Directory integration improvements • Management improvements	• Cluster.exe command-line tool • Cluster Automation Server (MSClus) COM interface • Add-ClusterPrintServerRole cmdlet • Printer cluster

Failover Clustering Improvements in Windows Server 2012 R2

- Significant new features of failover clustering in Windows Server 2012 R2 include:
  - Quorum changes and dynamic witness
  - Force quorum resiliency
  - Tie breaker for 50% node split
  - Global Update Manager mode
  - Cluster node health detection
  - AD DS-detached cluster

Failover Cluster Components



What Are CSVs?

The benefits of CSVs include:

- Fewer LUNs required
- Better use of disk space
- Resources in a single logical location
- No special hardware required
- Increased resiliency

To implement CSV:

1. Create and format volumes on shared storage
2. Add the disks to failover cluster storage
3. Add the storage to the CSV

New CSV Features in Windows Server 2012 R2

- CSVs in Windows Server 2012 R2 provide the following enhancements and new functionalities:
  - Optimized CSV placement policies
  - Increased CSV resiliency
  - CSV cache allocation
  - CSV diagnosis
  - CSV interoperability

What Are Failover and Failback?

- During failover, the clustered instance and all associated resources are moved from one node to another
- Failover occurs when:
  - The node that currently hosts the instance becomes inactive for any reason
  - One of the resources within the instance fails
  - An administrator forces a failover
- Cluster service can failback after the offline node becomes active again

What Is Quorum?

- In failover clusters, quorum defines the consensus that enough cluster members are available to provide services
- Quorum:
  - Is based on votes in Windows Server 2012
  - Enables nodes, file shares, or a shared disk to have a vote, depending on the quorum mode
  - Enables the failover cluster to remain online when sufficient votes are available

Quorum Modes in Windows Server 2012 Failover Clustering

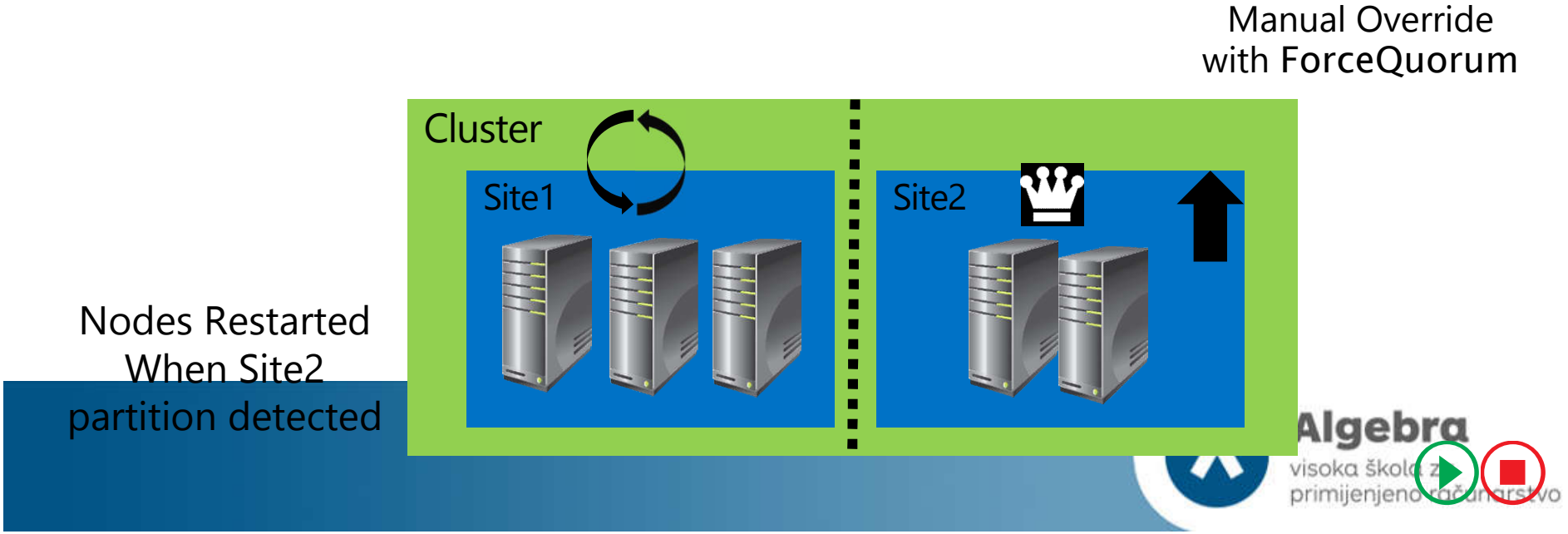
Quorum mode	What has the vote?	When is quorum maintained?
• Node Majority	Only nodes in the cluster have a vote	Quorum is maintained when more than half of the nodes are online
• Node and Disk Majority	The nodes in the cluster and a disk witness have a vote	Quorum is maintained when more than half of the votes are online
• Node and File Share Majority	The nodes in the cluster and a file share witness have a vote	Quorum is maintained when more than half of the votes are online
• No Majority: Disk Only	Only the quorum-shared disk has a vote	Quorum is maintained when the shared disk is online

How Quorum Works in Windows Server 2012 R2 Failover Clustering

- The legacy concept of quorum mode is removed
- Dynamic quorum automatically adjusts votes to maintain cluster functionality
- You can define which nodes have a quorum vote
  - Configurable for 1 vote or 0 votes
- Always configure a witness disk with Windows Server 2012 R2
  - Clustering will determine when it is best to use it
- Witness vote dynamically/automatically adjusted based on cluster membership with dynamic quorum
  - Odd node votes (3) + no witness vote (0) = 3
  - Even node votes (2) + witness vote (1) = 3

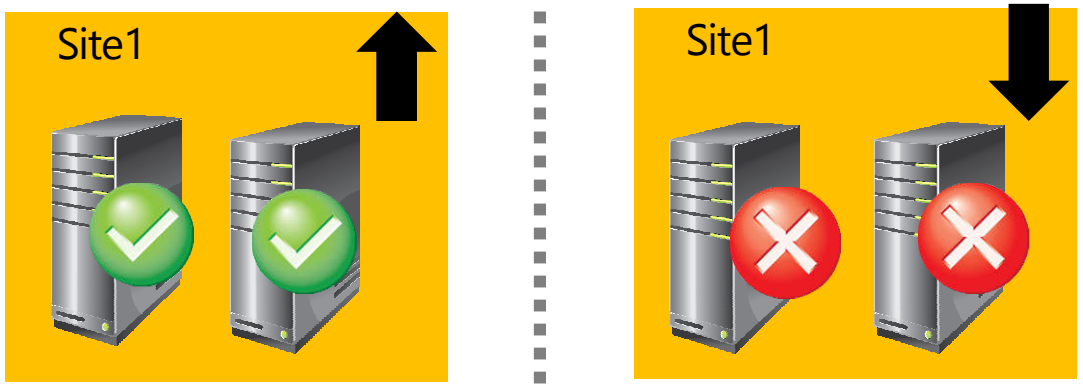
Force Quorum Resiliency in Windows Server 2012 R2

- The cluster detects partitions after a manual ForceQuorum
- ForceQuorum partition is deemed authoritative
- Partitioned nodes restarted and rejoined
- Cluster brought back into a single view of membership



Quorum Tie Breaker in Windows Server 2012 R2

- Cluster will survive simultaneous 50% loss of votes
- Balanced multi-site clusters with complete site partition
- One site automatically elected to win
- Winning site can be controlled with the LowerQuorumPriorityNodeID cluster common property
- Nodes in the other site drop out of the cluster



Failover Cluster Networks

Network	Description
• Public network	Clients use this network to connect to the clustered service
• Private network	Nodes use this network to communicate with each other
• Public-and-private network	Required to communicate with external storage systems

- One network can support both client and node communications
- Multiple network cards are recommended to provide enhanced performance and redundancy
- iSCSI storage should have a dedicated network

Failover Cluster Storage

- Failover clusters require shared storage to provide consistent data to a virtual server after failover
- Shared storage options include:
  - Serial attached SCSI
  - iSCSI
  - Fibre channel
  - Shared VHDX (2012 R2)
- You can also implement clustered storage spaces to achieve high availability at the storage level

Lesson 2: Implementing a Failover Cluster

- Preparing for Failover Cluster Implementation
- Hardware Requirements for Failover Cluster Implementation
- Network Requirements for Failover Cluster Implementation
- Infrastructure Requirements for Failover Cluster
- Software Requirements for Failover Cluster Implementation
- Migrating and Upgrading Failover Clusters

Preparing for Failover Cluster Implementation

Use failover clustering when:

- High availability is required
- Scalability is not required
- The application is stateful
- Client or protocol automatically reconnects to the application
- Application uses IP-based protocols

Hardware Requirements for Failover Cluster Implementation

The hardware requirements for a failover implementation include:

- Server hardware components must have the Certified for Windows Server 2012 logo
- Server nodes should all have the same configuration and contain the same or similar components
- All tests in the Validate a Configuration Wizard must pass

Network Requirements for Failover Cluster Implementation

The network requirements for a failover implementation include:

- The network hardware components must have the Certified for Windows Server 2012 logo
- The server should be connected to multiple networks for communication redundancy, or to a single network with redundant hardware, to remove single points of failure
- The network adapters should be identical and have the same IP protocol versions, speed, duplex, and flow control capabilities

Infrastructure Requirements for Failover Cluster

- The infrastructure requirements for a failover cluster implementation include:
  - The nodes in the cluster must use DNS for name resolution
  - All servers in the cluster must be in the same Active Directory domain
  - The user account that creates the cluster must have administrator rights and permissions on all servers, and the Create Computer Objects permission in the domain
- Failover cluster infrastructure recommendations include:
  - The same roles should be installed on each cluster node
  - The AD DS role should not be installed on any of the cluster nodes

Software Requirements for Failover Cluster Implementation

The software requirements for a failover cluster implementation include:

- All nodes must run the same edition of Windows Server 2012 or 2012 R2, which can be any of the following:
  - Windows Server 2012 or 2012 R2 Standard, Full or Server Core installation
  - Windows Server 2012 or 2012 R2 Datacenter, Full or Server Core installation
- All nodes must run the same processor architecture (x64-based)
- All nodes should have the same service pack and updates

Migrating and Upgrading Failover Clusters

You can migrate clustered roles from one cluster to another, and you can perform migration by:

- Migrating clustered roles to a new cluster with new servers
- Performing in-place migration with only two nodes

The Cluster Migration Wizard migrates roles, but not data or folders

Lesson 3: Configuring Highly Available Applications and Services on a Failover Cluster

- Identifying Cluster Resources and Services
- The Process for Clustering Server Roles
- Failover Cluster Management Tasks
- Managing Cluster Nodes
- Configuring Application Failover Settings

Identifying Cluster Resources and Services

- Clustered services:
  - Are services or applications that are made highly available by installing them on a failover cluster
  - Are active on one node, but can be moved to another node
- Resources:
  - Are the components that make up a clustered service
  - Are moved to another node when one node fails
  - Can only run on one node at a time
  - Include components such as shared disks, names, and IP addresses

The Process for Clustering Server Roles

1. Install the failover clustering feature
2. Verify the configuration and create a cluster
3. Install the role on all cluster nodes, using Server Manager
4. Create a clustered application by using the Failover Cluster Management snap-in
5. Configure the application
6. Test the failover

Failover Cluster Management Tasks

The most common management tasks include:

- Managing nodes
- Managing networks
- Managing permissions
- Configuring cluster quorum settings
- Migrating services and applications to a cluster
- Configuring new services and applications
- Removing the cluster

Managing Cluster Nodes

To manage cluster nodes, you can:

- Add nodes after you create a cluster
- Pause nodes, which prevents resources from running on that node
- Evict nodes from a cluster, which removes the node from the cluster configuration

All of these actions are available in the Failover Cluster Management Actions pane

Configuring Application Failover Settings

The considerations for using preferred owners include:

- Preferred owners are set on the clustered application
- Multiple preferred owners can be set in an ordered list
- Setting preferred owners gives control over:
  - The order in which an application will select a node to run on
  - The applications that can be run on the same nodes in an Active/Active configuration

The options to modify failover and failback settings include:

- Setting the number of times the cluster service will restart a clustered application in a set period of time
- Setting or preventing failback of the clustered application to the preferred node when it becomes available

Lesson 4: Maintaining a Failover Cluster

- Monitoring Failover Clusters
- Backing Up and Restoring Failover Cluster Configuration
- Maintaining and Troubleshooting Failover Clusters
- What Is CAU?

Monitoring Failover Clusters

Some of the tools you can use to monitor clusters include:

- Event Viewer
- Tracerpt.exe
- Performance and Reliability Monitor snap-in
- MHTML-formatted cluster configuration reports
- Validate a Configuration Wizard

Backing Up and Restoring Failover Cluster Configuration

When backing up failover clusters, keep in mind that:

- Windows Server backup is an optional Windows Server 2012 feature
- Backup and restore operations involve the VSS
- Third-party tools are also available to perform backups and restores
- You must perform system-state backups

Two types of restore are:

- A non-authoritative restore completely restores a single node in the cluster
- An authoritative restore restores the entire cluster configuration to a point in time

Maintaining and Troubleshooting Failover Clusters

Failover cluster troubleshooting techniques include:

- Reviewing events in logs, such as: cluster, hardware and storage
- Using the Validate a Configuration Wizard
- Defining a process for troubleshooting failover clusters
- Reviewing storage configuration
- Checking for group and resource failures

What Is CAU?

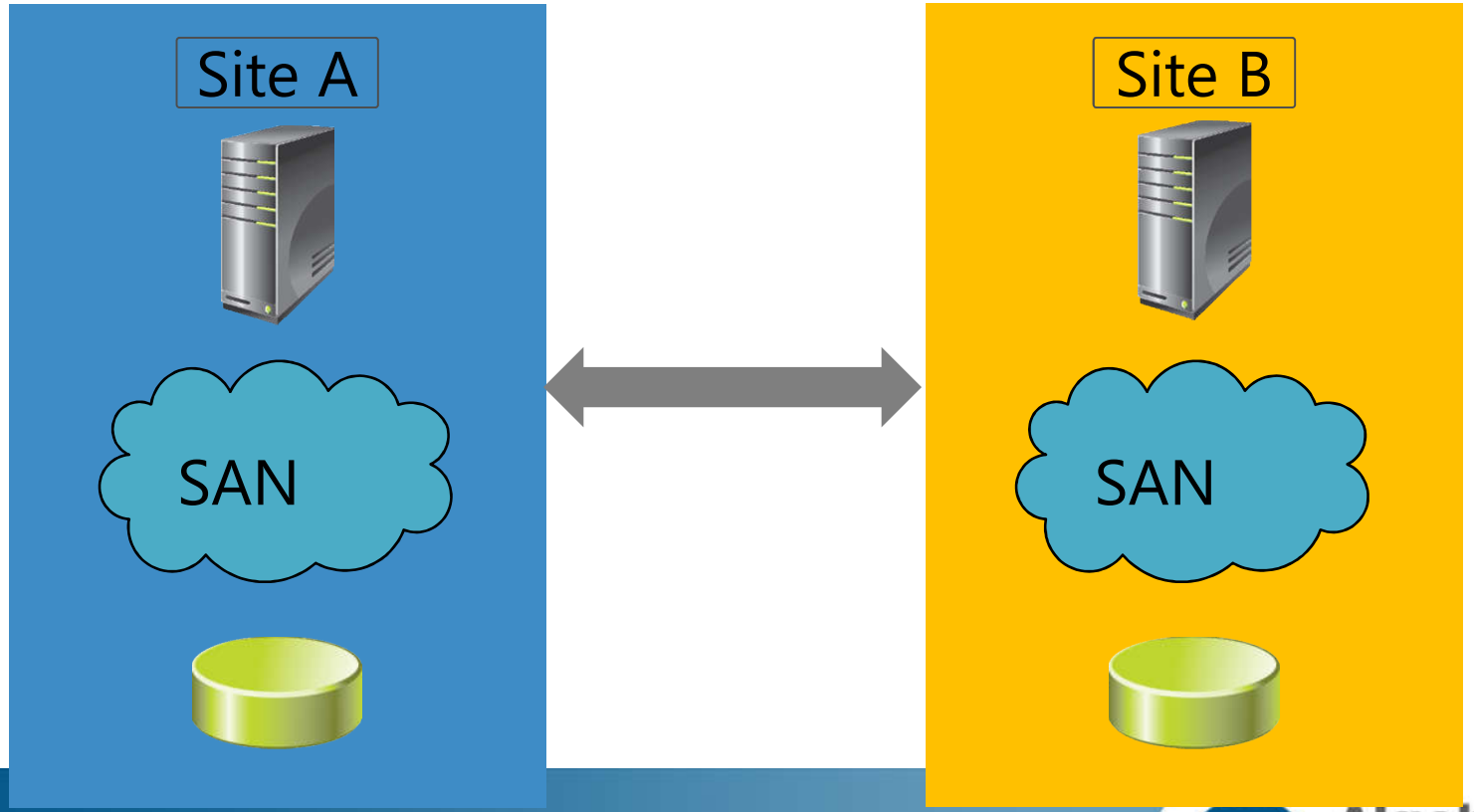
- CAU:
  - Automated feature specific to Windows Server 2012
  - Updates nodes in a cluster with minimal or zero downtime
- Benefits:
  - Cluster updating is completely automatic
  - Can be scheduled
  - No downtime
- CAU can work in two modes:
  - Remote-updating mode
  - Self-updating mode

Lesson 5: Implementing a Multisite Failover Cluster

- What Is a Multisite Cluster?
- Prerequisites for Implementing a Multisite Failover Cluster
- Synchronous and Asynchronous Replication
- Selecting a Quorum Mode for Multisite Clusters
- Process for Configuring a Multisite Failover Cluster
- Challenges with Implementing a Multisite Cluster
- Multisite Failover and Failback Considerations

What Is a Multisite Cluster?

A multisite cluster is a cluster that has been extended so that different nodes in the same cluster reside in separate physical locations



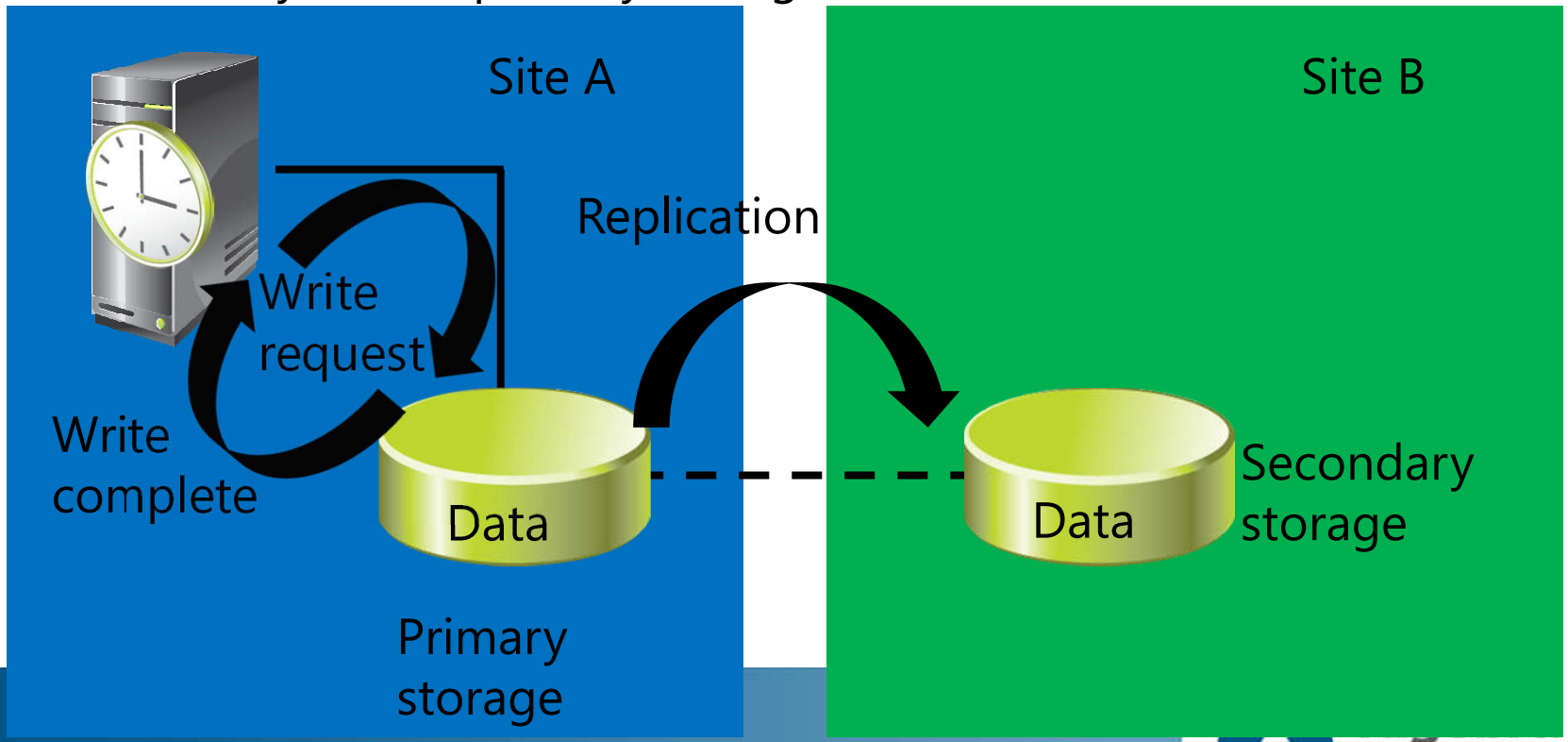
Prerequisites for Implementing a Multisite Failover Cluster

To implement a multisite failover cluster, you must provide the following:

- ✓ Additional hardware to support enough nodes on each site
- ✓ Same operating systems and service packs on each node
- ✓ At least one low-latency and reliable network connection between sites
- ✓ Storage replication mechanism
- ✓ A storage infrastructure services on each site

Synchronous and Asynchronous Replication

- In synchronous replication, the host receives a "write complete" response from the primary storage after the data is written successfully to both storage locations
- In asynchronous replication, the host receives a "write complete" response from the primary storage after the data is written successfully on the primary storage



Selecting a Quorum Mode for Multisite Clusters

When designing automatic failover for geographically dispersed clusters:

- Use Node Majority or Node Majority with File Share quorum for Windows Server 2012 and older
- Use Dynamic Quorum for Windows Server 2012 R2
- Use three locations to allow automatic failover of a single virtual server:
  - All three locations must be linked directly to each other
  - One location is only a file-share witness

Process for Configuring a Multisite Failover Cluster

High level steps for implementing a multisite failover cluster:

1. Ensure that enough nodes are available
2. Ensure that network connections between sites is reliable
3. Provide a storage replication mechanism
4. Provide key infrastructure services on both sites
5. Validate cluster configuration
6. Configure the clustered role and quorum
7. Configure and validate failover and failback

Challenges with Implementing a Multisite Cluster

Challenge	Description
Requires a separate or third-party data replication solution	• Hardware (block level) storage-based replication • Software (file system level) host-based replication • Application-based replication, such as Exchange 2007 Cluster Continuous Replication
Can be either synchronous or asynchronous replication	• Synchronous. No acknowledgement of data changes made in Site A until the data is successfully written to Site B • Asynchronous. Data changes made in Site A will eventually be written to the storage in Site B

- Inter-node communications are time sensitive; you might need to configure these thresholds to meet the higher WAN latency
- DNS replication might impact client reconnect times when failover is based on hostname
- Active Directory replication latency might affect application data availability
- Some applications might require all of the nodes to be in the same Active Directory site

Multisite Failover and Failback Considerations

- When implementing multisite clusters in a disaster recovery scenario, you should consider the following:
  - Failover time
  - Services for failover
  - Quorum maintenance
  - Storage connection
  - Published services and name resolution
  - Client connectivity
  - Failback procedure