SQL Server High Availability

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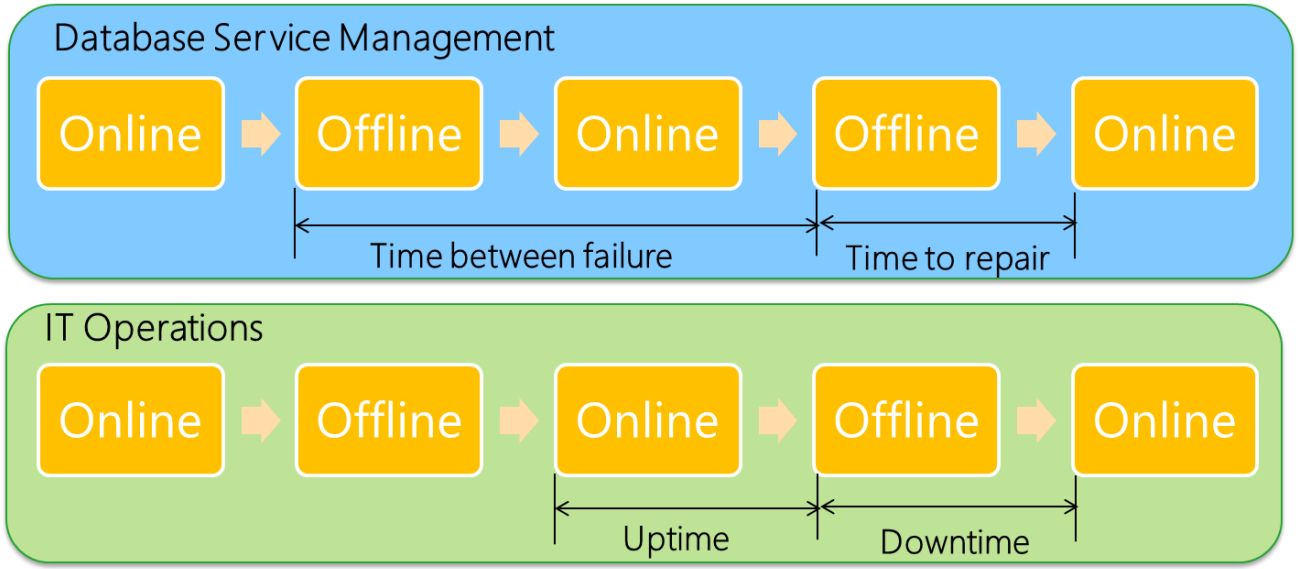
Session Agenda

- Understanding High Availability
- Common terms
- Planned and Unplanned Downtime
- Disaster Recovery
- High Availability vs. Disaster Recovery
- SQL Server 2016 features for High Availability

High Availability



$$Availability = \frac{MTBF}{MTBF + MTTR}$$

$$downtime\ per\ year\ (in\ days) = (1 - uptime\ ratio) * 365$$

$$uptime\ ratio = \frac{Availability}{100}$$

Example

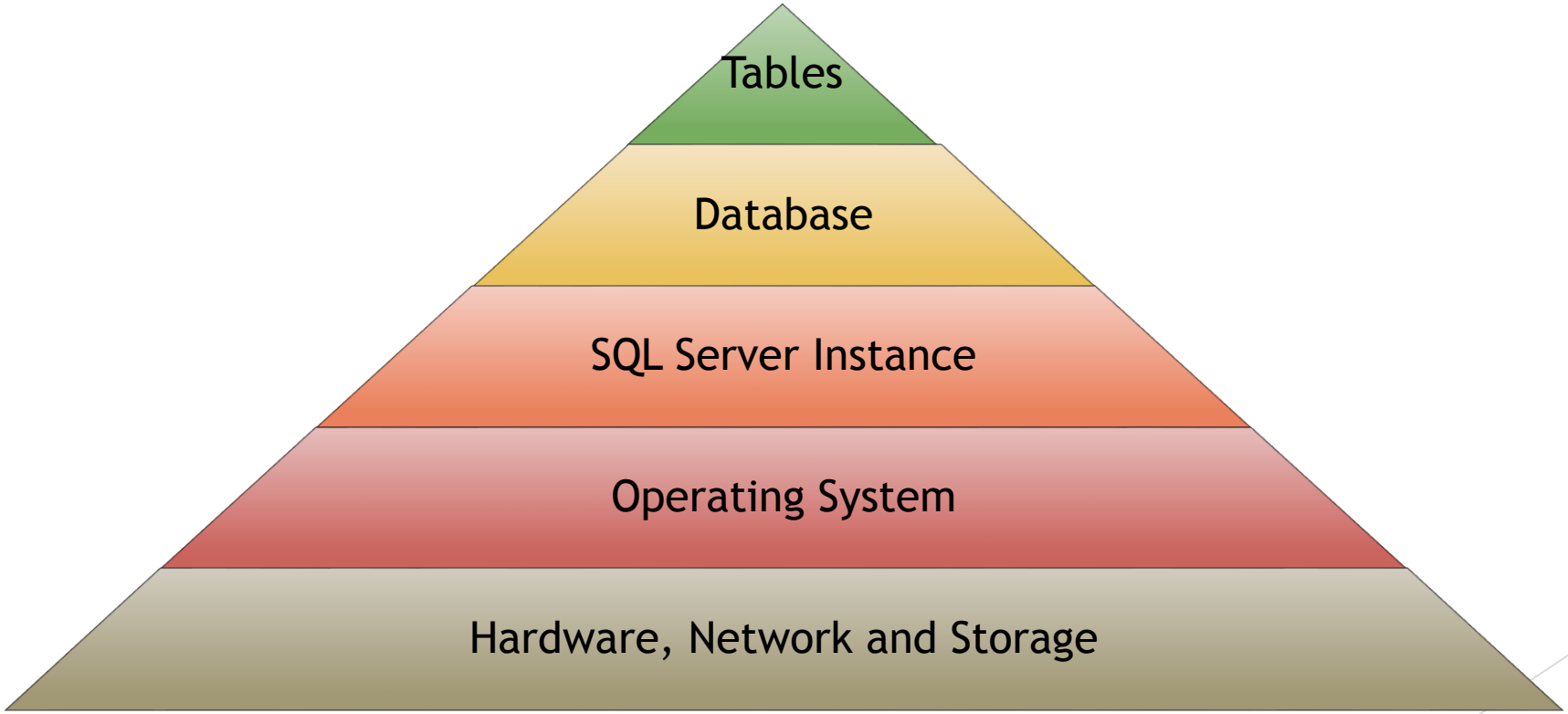
- Operations Log (12 hours)
  - Recovered from previous failure at 00:00:00 Hours
  - Malfunctioned again at 10:00:00 Hours
  - Repaired and operational at 10:06:00 Hours
- Availability (Service)
  - Mean Time Between Failures (MTBF) = 10 Hours
  - Mean Time To Repair (MTTF) = 0.1 Hour
  - Availability = 10/(10+0.1) = 99%
- Downtime (Systems)
  - Uptime ratio = 99/100 = 0.99
  - Downtime per year (in days) = (1-0.99)*365 = 3.65 Days

Availability	Downtime per year
99%	3.65 Days
99.9%	8.76 Hours
99.99%	52.56 Minutes
99.999%	5.26 Minutes
99.9999%	31.5 Seconds
99.99999%	3.15 Seconds

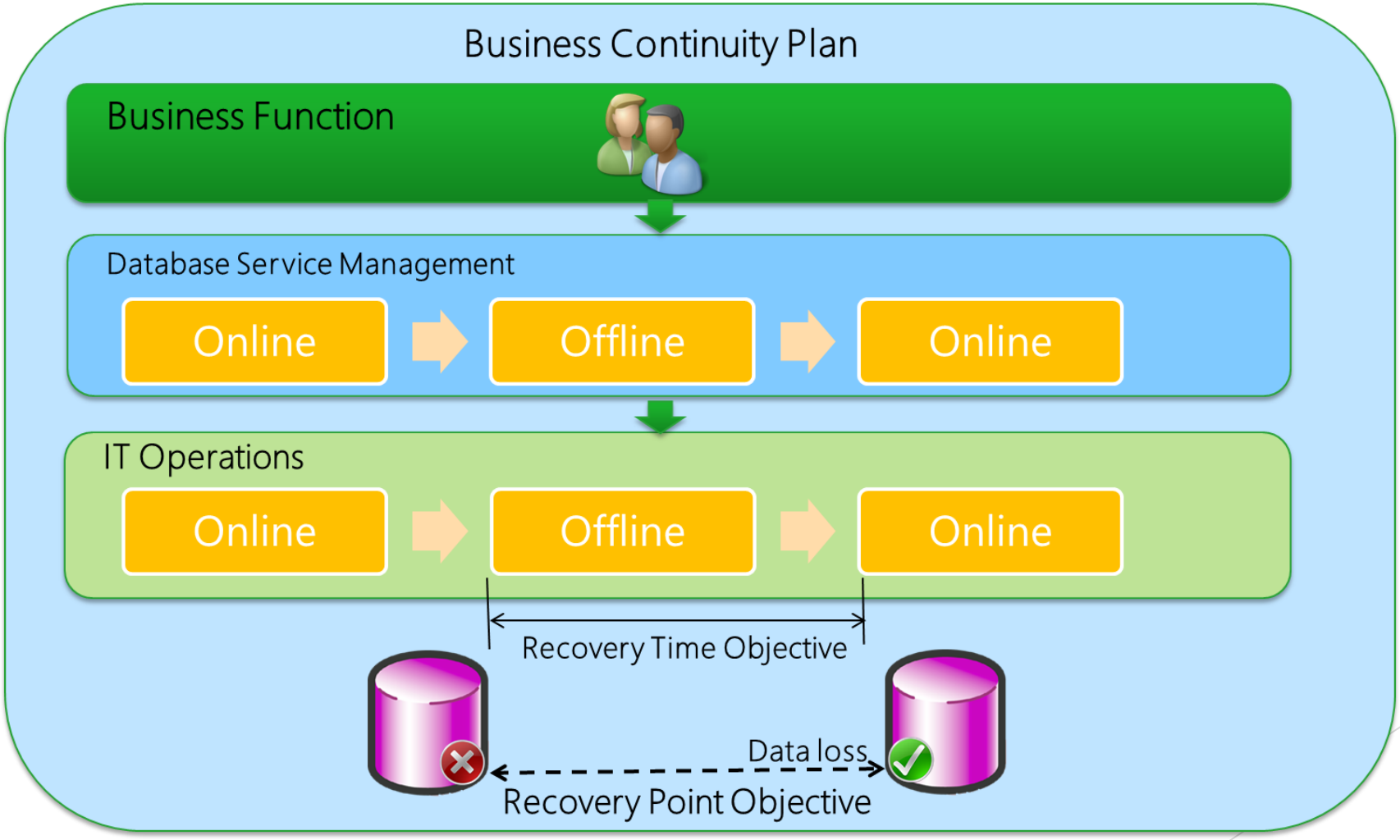
What is causing downtime?

- **Planned**
  - Software releases
  - OS Patch releases
  - SQL Server service packs and hotfixes
  - Database maintenance and upgrades
- **Unplanned**
  - Hardware component failure
  - Security breaches
  - Human error
  - Natural disasters

Components of server high availability



RTO & RPO

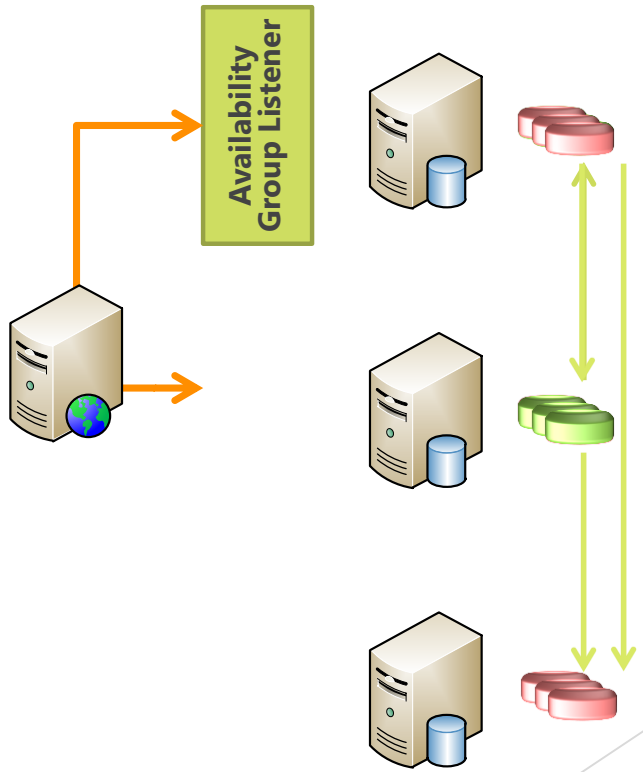

Business Continuity Plan
Business Function
Database Service Management
Online
Offline
Online
IT Operations
Online
Offline
Online
Recovery Time Objective
Data loss
Recovery Point Objective

High Availability in SQL Server

- Basic AlwaysOn Availability Groups
- AlwaysOn Failover Clustering
- Database Mirroring
- Log Shipping
- Replication

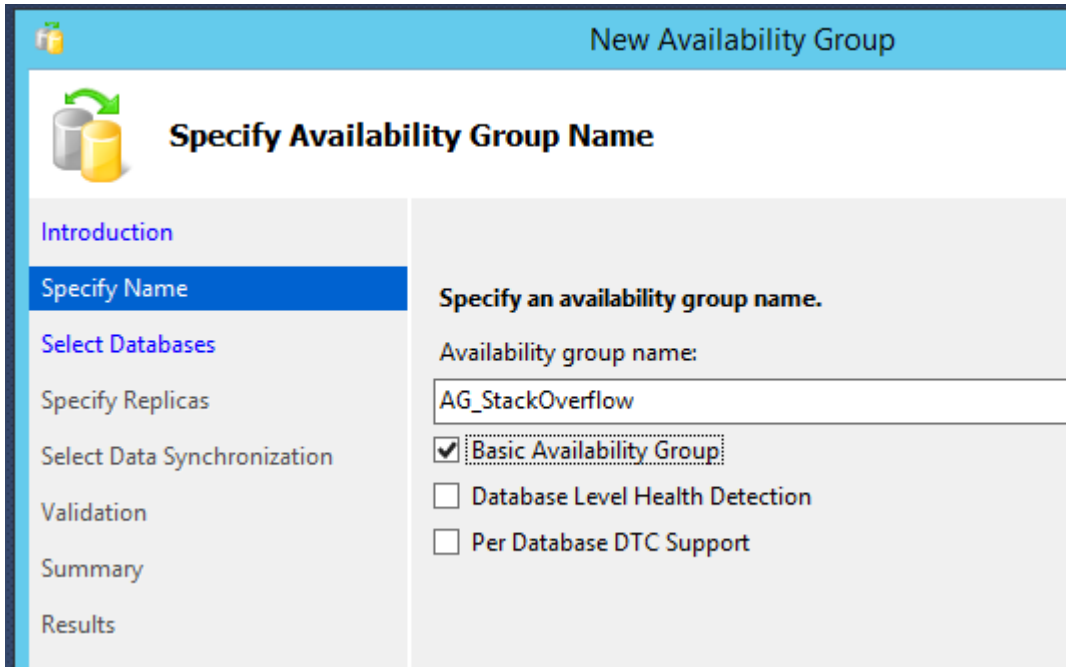
AlwaysOn Availability Groups

- Multiple database coordinated failover for applications that require multiple databases on a single instance (e.g. SharePoint)
- Simplified application connectivity and automatic redirection through the implementation of Availability Group Listener and Application Virtual Name
- Built in compression and encryption
- Synchronous or asynchronous data movement
- Automatic or manual failover modes with configurable failover trigger levels
- Automatic repair of page corruptions
- Readable secondary replicas
- Support for FILESTREAM, FILETABLE, RBS and Service Broker
- Simplified configuration wizards, PowerShell integration and Availability Group Dashboard for monitoring



Basic AG Limitations

- One database in AG
- No readonly access
- No backup on secondary
- Two nodes only



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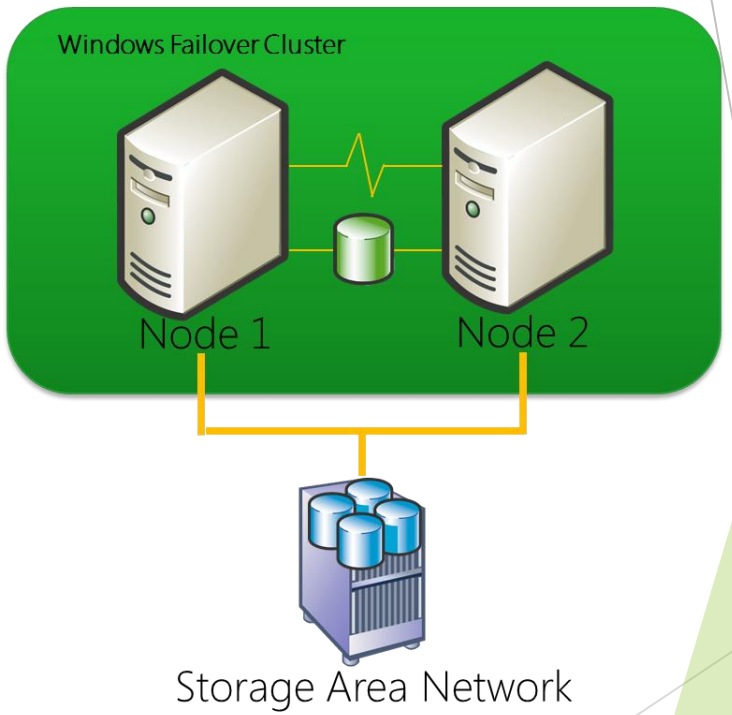
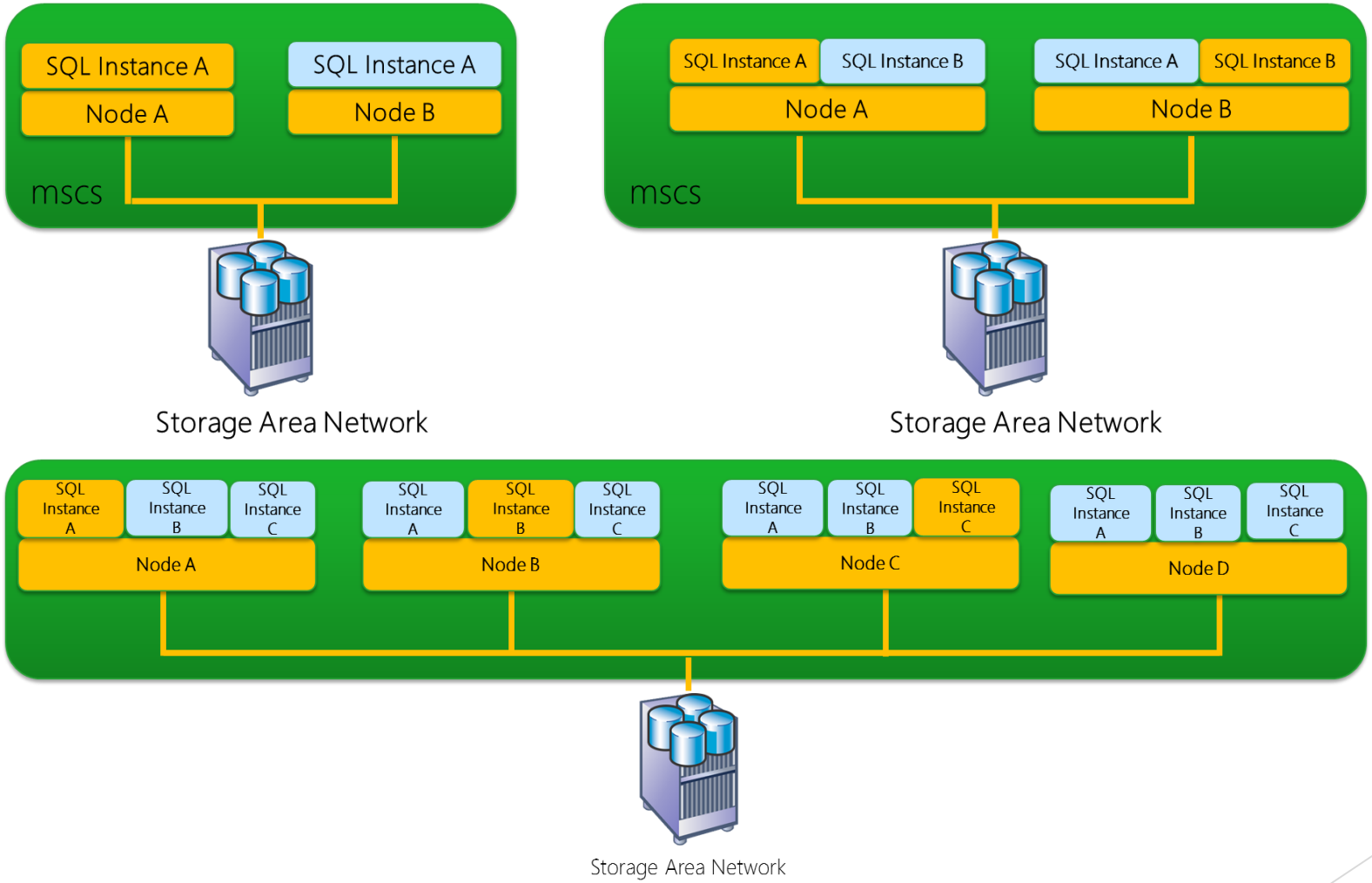
AlwaysOn Availability Groups

Failover Clustering

- Instance level Configuration
- A/P and A/A cluster
- Up to 64 nodes
- Shared storage between nodes



Common Cluster Scenarios



Database Mirroring

- Database level Configuration
- High performance vs. High Safety
- Automatic or manual failover

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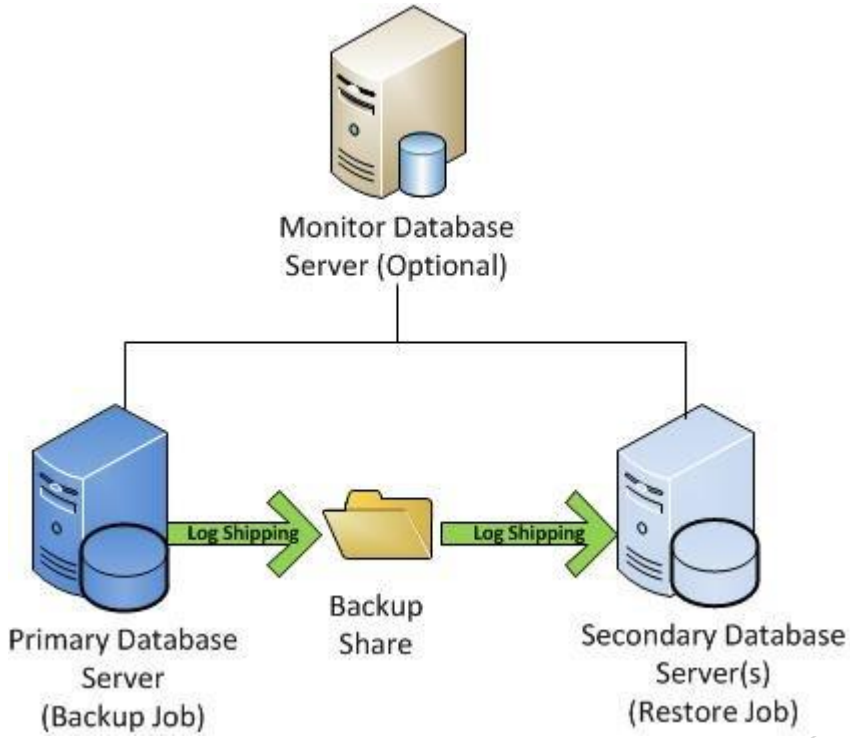
Database Mirroring

Log Shipping

- Scheduled backup and restore of transaction log
- Can include monitoring server



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Log Shipping

Edition Comparison

Technology	Standard	Enterprise Core
Clustering	Yes (2 nodes)	Yes (OS max)
MultiSubnet Cluster		Yes
Mirroring	Yes (Full Safety)	Yes
Log Shipping	Yes	Yes
Change tracking	Yes	Yes
Merge replication	Yes	Yes
Transactional replication	Yes	Yes
Peer to Peer		Yes
AlwaysOn AG		Yes
AlwaysOn AG Basic	Yes	No !
Database Snapshot		Yes

Summary

- High availability overview
- Disaster Recovery
- Common HA/DR Scenarios
  - AlwaysOn
  - Clustering
  - Mirroring
  - Log Shipping
  - P2P Transactional Replication

Session End

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