

SQLskills Immersion Event IE3: High Availability & Disaster Recovery

Appendix: HA Technology Comparisons



Feature by Feature Comparison

- In previous classes, students have asked for feature-by-feature comparison of all four redundancy technologies

Text Color	Meaning
Green	A really good thing
Black	Neutral
Red	Not a good thing

HA Features: Cost

- How expensive is it to implement the feature?

Technology	
Failover clustering	High
Transactional replication	Low-Medium
Log shipping	Low
Database mirroring	Medium
Availability Groups	Medium

HA Features: Complexity

- How complex is it to implement, maintain, and troubleshoot the feature?

Technology	
Failover clustering	High
Transactional replication	Medium-High
Log shipping	Low
Database mirroring	Medium-High
Availability Groups	Medium-High

HA Features: Standby Type

- What kind of standby is provided?

Technology	
Failover clustering	Hot
Transactional replication	Warm
Log shipping	Warm
Database mirroring	Hot
Availability Groups	Hot, Hot + Warm, or Warm

HA Features: Failure Detection

- How are failures detected?

Technology	
Failover clustering	Automatic
Transactional replication	Manual (but NLB/mid-tier can be used)
Log shipping	Manual (but NLB/mid-tier can be used)
Database mirroring	Automatic
Availability Groups	Automatic

HA Features: Automatic Failover

- Can the technology be configured to automatically failover once a failure is detected?

Technology	
Failover clustering	Automatic
Transactional replication	Manual (but NLB/mid-tier can be used)
Log shipping	Manual (but NLB/mid-tier can be used)
Database mirroring	Automatic (but must be configured to use a Witness)
Availability Groups	Automatic

HA Features: Protects against...

- What kind of failures can be protected against?

Technology	
Failover clustering	Failed server, NOT failed disk (unless SAN replication is configured)
Transactional replication	Failed server, and failed disk (but with potential for data loss, only replicated data is protected, and latency needs to be considered)
Log shipping	Failed server, and failed disk (but with potential for data loss, only log shipped database is protected)
Database mirroring	Failed server, and failed disk (but only the mirrored database, and potential for data loss if database is not SYNCHRONIZED)
Availability Groups	Failed server, and failed disk (but only the protected databases, and potential for data loss if the databases are not SYNCHRONIZED)

HA Features: Transactional Consistency and Currency

- Is the redundant copy transactionally consistent and up-to-date?

Technology	
Failover clustering	Consistent; Current
Transactional replication	Consistent; Latency dictates currency, some data loss possible (and probable)
Log shipping	Consistent; Latency dictates currency, some data loss possible (and probable)
Database mirroring	Consistent; If SYNCHRONIZED, no data loss, otherwise data loss
Availability Groups	Consistent; If SYNCHRONIZED, no data loss, otherwise data loss

HA Features: Performance Impact

- Does having the technology in place affect workload performance?

Technology	
Failover clustering	None (except possibly if synchronous SAN replication is enabled)
Transactional replication	Minimal (need to ensure log reader agent does not cause log drive contention)
Log shipping	Minimal
Database mirroring	It depends (varies from no performance impact to possibly severe impact)
Availability Groups	It depends (varies from no performance impact to possibly severe impact)

HA Features: Failover Time

- Roughly how fast is failover, once a failure has been detected?

Technology	
Failover clustering	Depends on how long crash recovery takes: ranges from seconds to many tens of minutes or more
Transactional replication	Fast (but potentially longer to make as current as possible)
Log shipping	Fast (but potentially longer to make as current as possible)
Database mirroring	It depends on how large the REDO queue is on the mirror
Availability Groups	It depends on how large the REDO queue is on the replica(s)

HA Features: Geographic Dispersion

- How far apart can the failover partners be?

Technology	
Failover clustering	Close
Transactional replication	Far apart (but latency across distances may limit currency)
Log shipping	Far apart (but latency across distances may limit currency)
Database mirroring	Far apart (but latency across distances may limit currency)
Availability Groups	Far apart (but latency across distances may limit currency)

HA Features: Number of Partners

- How many partners can the technology support?

Technology	
Failover clustering	16 in 2008
Transactional replication	Unlimited
Log shipping	Unlimited
Database mirroring	1
Availability Groups	4

HA Features: Reporting

- Can the redundant copy be used for reporting?

Technology	
Failover clustering	No
Transactional replication	Yes, even updates with careful design/peer-to-peer
Log shipping	Yes (with some extra setup)
Database mirroring	Yes, but only through a static database snapshot
Availability Groups	Yes

HA Features with Failover Clusters

High-Availability Feature	Failover Clustering
Standby type	Hot
Failure detection	Automatic
Automatic failover	Yes
Protects against failed server process	Yes
Protects against failed disk	No (but possible with remote mirroring)
Transactionally consistent	Yes
Transactionally current	Yes
Performance impact	None (possibly during failover)
Time to failover	Depends on restart recovery
Locations	Nearby
Hardware Requirements	Limited to HCL Cluster Configurations
Multiple standby/secondary nodes	16 (SQL Server 2008+/Windows 2008+)
Standby available for reporting, etc.	No
Cost	High
Complexity	High

HA Features with Replication

High Availability Feature	Peer-to-Peer Replication
Standby type	Warm
Failure detection	No (but possible with NLB)
Automatic failover	No (but possible with NLB)
Protects against failed server process	Yes (but with potential data loss, and only what's replicated)
Protects against failed disk	Yes (but with potential data loss, and only what's replicated)
Transactionally consistent	Yes
Transactionally current	No. Depends on log reader frequency etc
Performance impact	Minimal
Time to failover	Seconds (potentially more to recover more thoroughly)
Locations	Dispersed
Hardware Requirements	None
Multiple standby/secondary nodes	Unlimited (32 with NLB)
Standby available for reporting, etc.	Yes, even updates with careful schema design
Cost	Low-Medium
Complexity	Medium-High

HA Features with Log Shipping

High Availability Feature	Log Shipping
Standby type	Warm
Failure detection	No (but possible with NLB)
Automatic failover	No (but possible with NLB)
Protects against failed server process	Yes (but with potential data loss, and only select DBs)
Protects against failed disk	Yes (but with potential data loss, and only select DBs)
Transactionally consistent	Yes
Transactionally current	No, since last transaction log backup
Performance impact	File copying on primary
Time to failover	Seconds (potentially more to recover more thoroughly)
Locations	Dispersed
Hardware Requirements	Some
Multiple standby/secondary nodes	Unlimited (32 with NLB)
Standby available for reporting, etc.	Yes (read-only access when logs are not being loaded)
Cost	Low
Complexity	Low

HA Features with Database Mirroring

High-Availability Feature	Database Mirroring
Standby type	Hot
Failure detection	Automatic
Automatic failover	Yes (if in High Availability configuration)
Protects against failed server process	Yes (but only the mirrored database is protected)
Protects against failed disk	Yes (but only the mirrored database is protected)
Transactionally consistent	Yes
Transactionally current	Yes (if in synchronous mode)
Performance impact	Depends on many factors
Time to failover	Depends on the failure and the REDO queue
Locations	Dispersed (performance could be a limiting factor)
Hardware Requirements	Disk space, disk speed, network capacity
Multiple standby/secondary nodes	1
Standby available for reporting, etc.	No (but possible with database snapshots)
Cost	Medium
Complexity	Medium-High

HA Features with Availability Groups

High-Availability Feature	Availability Groups
Standby type	Hot, Hot + Warm, or just Warm
Failure detection	Automatic
Automatic failover	Yes
Protects against failed server process	Yes (but only the replicated databases are protected)
Protects against failed disk	Yes (but only the replicated databases are protected)
Transactionally consistent	Yes
Transactionally current	Yes (if in synchronous mode)
Performance impact	It depends (varies from no performance impact to possibly severe impact)
Time to failover	Depends on restart recovery
Locations	Dispersed (performance could be a limiting factor)
Hardware Requirements	Disk space, disk speed, network capacity
Multiple standby/secondary nodes	4
Standby available for reporting, etc.	Yes
Cost	Medium
Complexity	Medium-High



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Thank you!

