

SQL Server Availability Groups for Dummies



Contact...



contactme@sturmovik.net



@retracement



tenbulls.co.uk

Likes...



Guilty pleasures...



Badges...



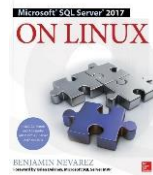
Master: SQL Server



Community...



Tech ed/ reviewer...



2nd ed
(Coming soon!)

Agenda



In the beginning



Preparing Windows and SQL for availability Groups



Implementing Availability groups

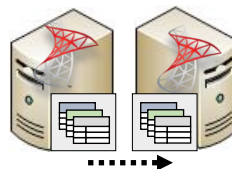


Readable secondaries and offloading backups

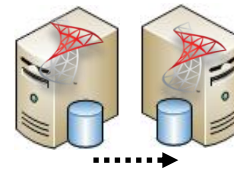
In the beginning...



- 1995 – Replication ships with SQL Server 6.0
- 1997 – Windows NT introduces Wolfpack making SQL Clustering possible
- 2000 – Immediate updating subscribers with SQL Server 2000
- 2005 – Peer-to-Peer Transactional Replication added in SQL Server 2005
- 2005 – Database Mirroring added in SQL Server 2005
- 2012.....



Replication



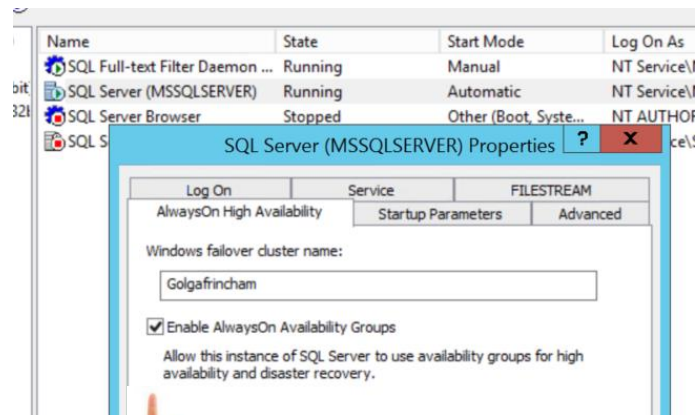
Database Mirroring

Availability Groups are...



Preparing for Availability Groups

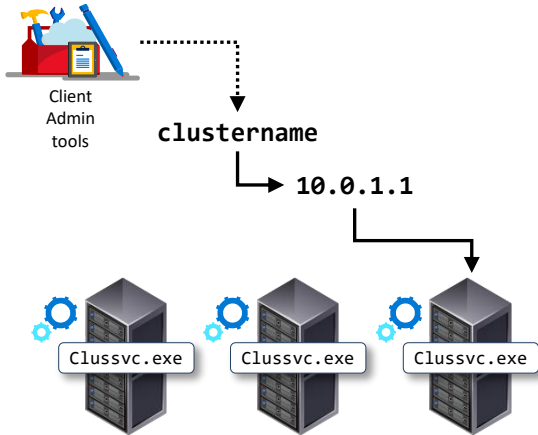
- Setup Windows Servers *₁
- Enable Failover-Clustering Feature in Windows
 - Add-WindowsFeature failover-clustering -IncludeAllSubFeature -IncludeManagementTools
 - Or install through GUI
- Create Windows Cluster across servers
- Install SQL Server on each Server *₁
- “Enable AlwaysOn Availability Groups” for SQL Service
- (optional) Configure Quorum/ node weighting
- Configure SQL Security.



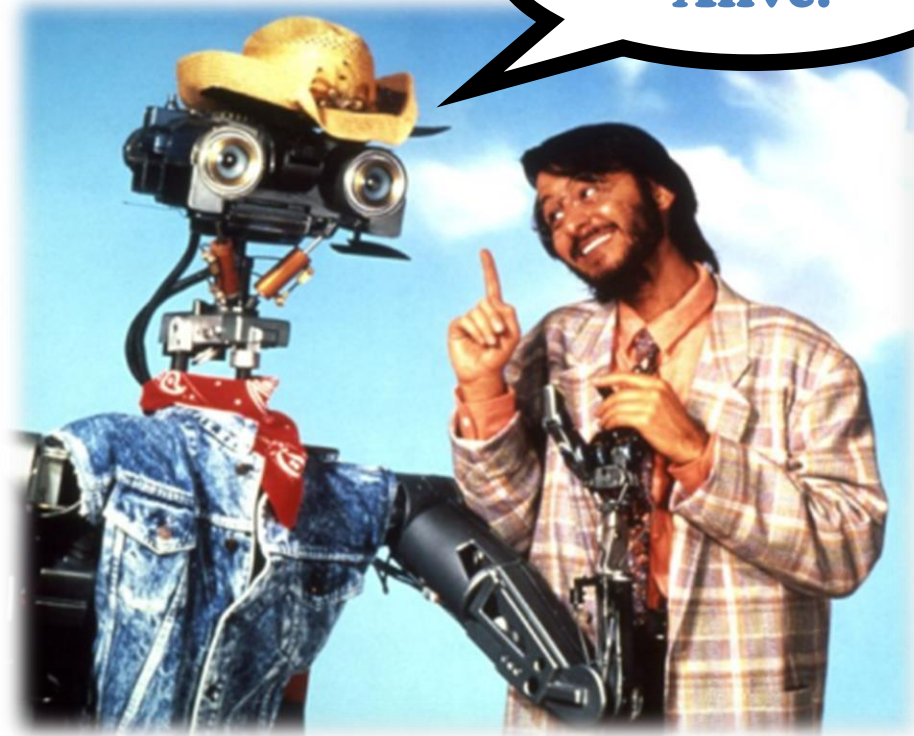
Warning! Enabling AlwaysOn
requires service restart

**1 If SQL Server is already installed, you do not need to do these steps!*

Windows Cluster & Quorum



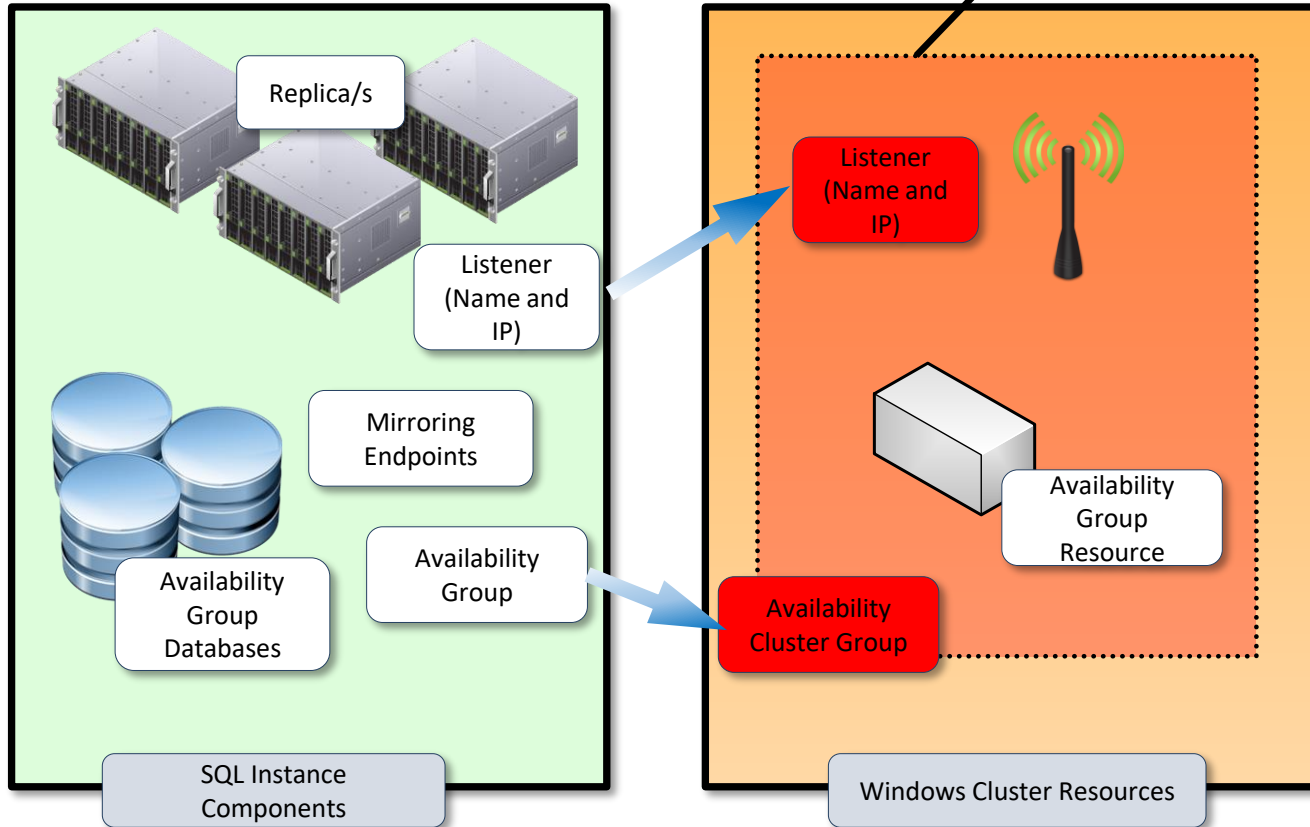
- Is one or more nodes down?
 - Connect to node through name or '.'
 - Node weighting
- Is cluster alive (or is just cluster name down)?
 - Connect to Cluster IP
 - Use PowerShell
 - Resolve issues/ force quorum



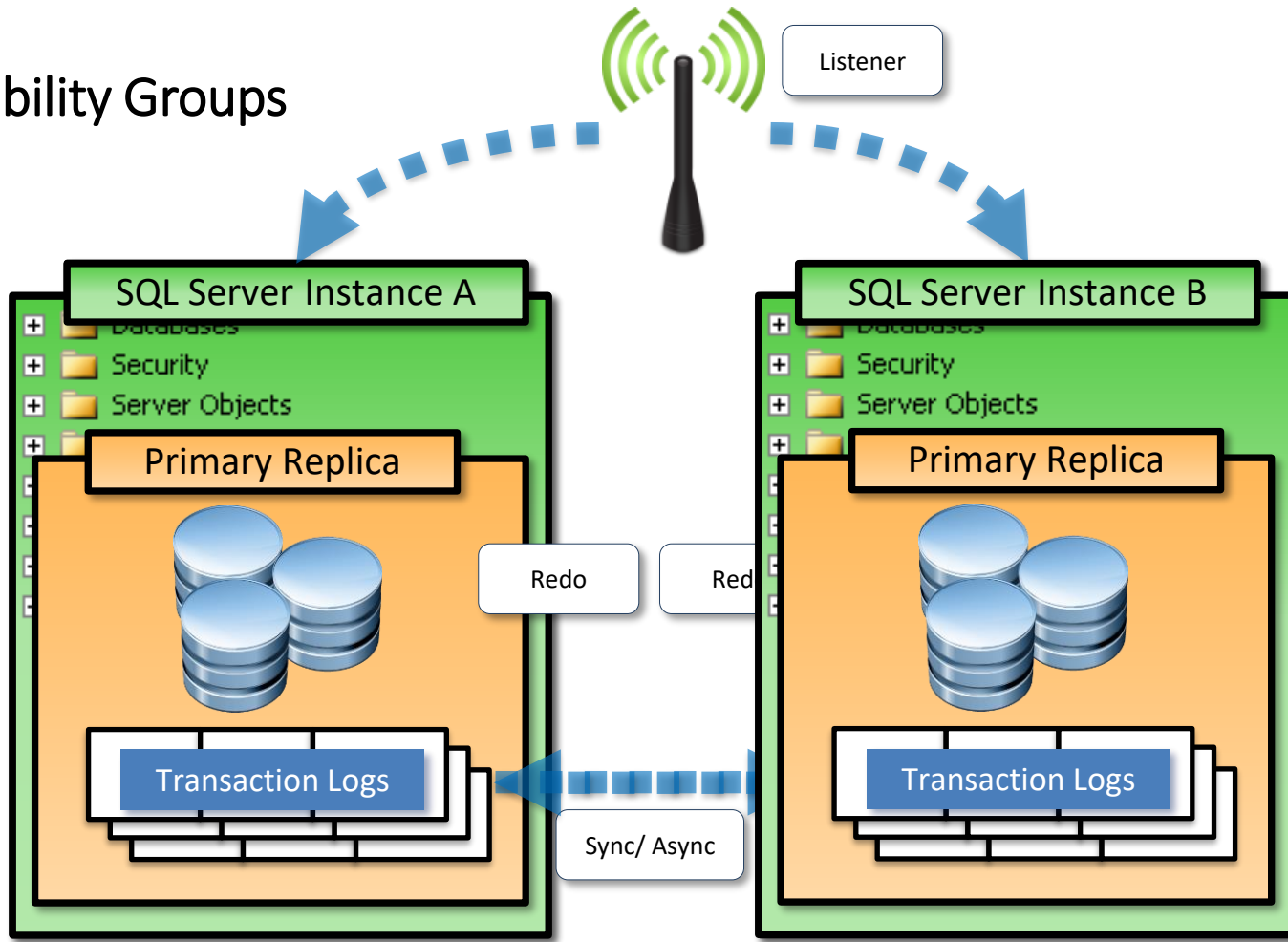
Demo

Cluster preparation, and SQL security

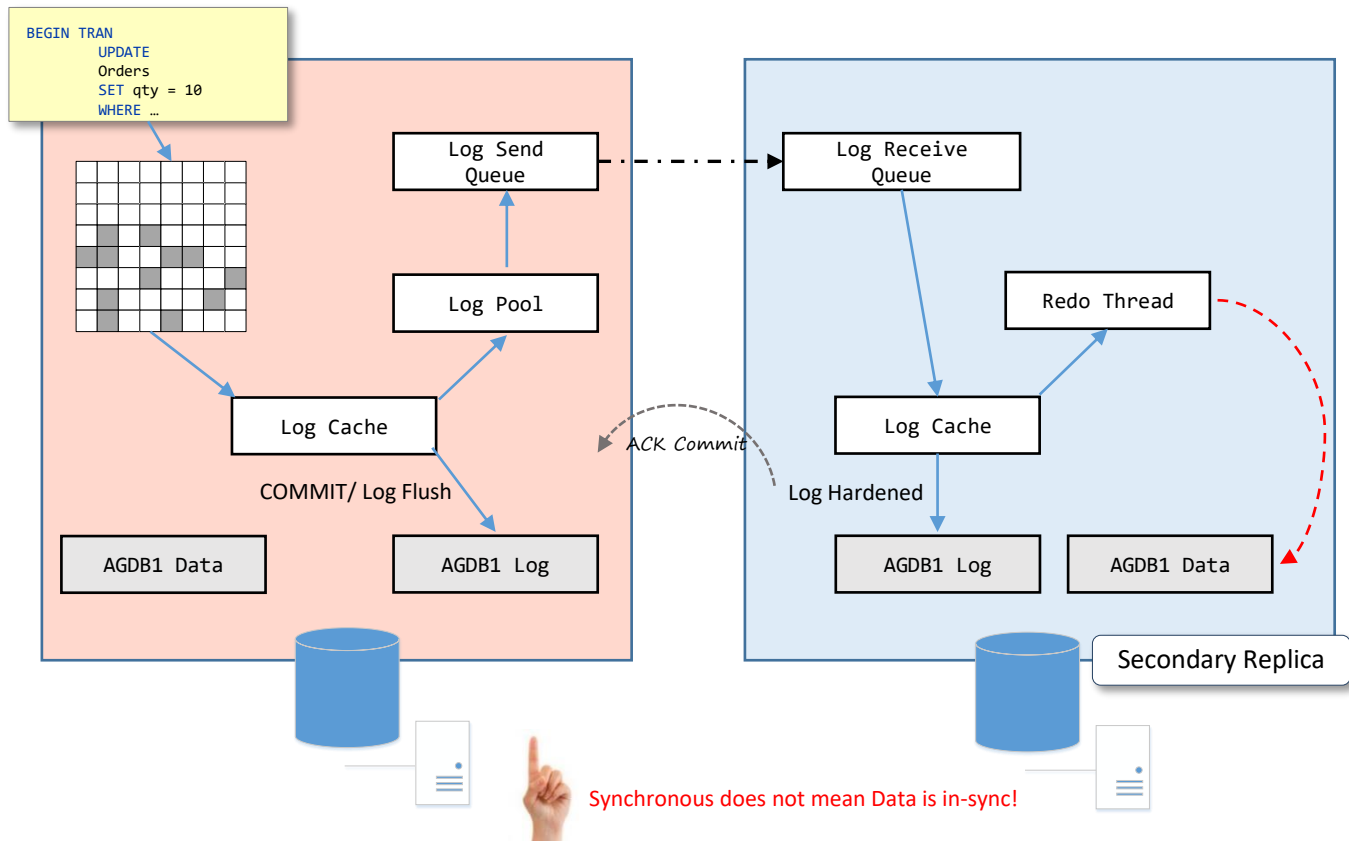
Availability Group consists of...



Availability Groups



Availability Group DB Data Movement



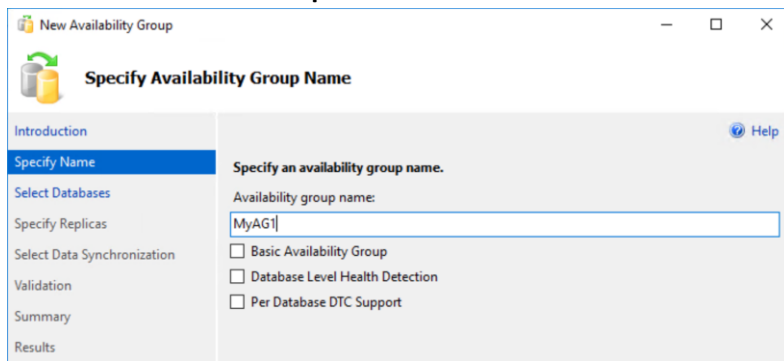
Synchronous does not mean Data is in-sync!

Feature	SQL 2012	SQL 2014	SQL 2016	SQL 2017	SQL 2019
Replicas	5 (max 2 sync with automatic failover, rest async)	9 (max 3 sync with 2 automatic failover, rest async)	9 (max 3 sync with automatic failover, rest async)	9 (max 3 sync with automatic failover, rest async)	9 (Max 5 sync with automatic failover, rest async)
Automatic Page Repair	YES	YES	YES	YES	YES
SSIS Catalog Support		Partial	Full	Full	Full
Replica Wizard		(on-premises) Replica Only	Azure Replica and (on-premises) Replica	Only via T-SQL was Removed in SSMS 17.0+	Only via T-SQL was Removed in SSMS 17.0+
Database level failover			YES	YES	YES
Basic Availability Groups			YES	YES	YES
MSDTC support			YES	YES	YES
Log transport optimizations			YES	YES	YES
Read-only routing load balancing			YES	YES	YES
gMSA support			YES	YES	YES
Linux Support				YES	YES
Read-scale AG				YES	YES
Availability Groups on K8s					Eventually (not RTM)

Basic Availability Groups

- Standard Edition (or Enterprise^{*1})
- 2 replicas (configured on setup)
 - No upgrade to advanced AG
 - Cannot add or remove replicas
 - **No support for replicas prior to 2016**
 - Sync or Async
- No offloaded backups and no readable replica (snapshot possible but licensing needed!)
- 1 Availability Group with 1 Database replica

^{*1} If instances are upgraded to Enterprise the BAG will remain



Demo

Create and configure Availability Groups

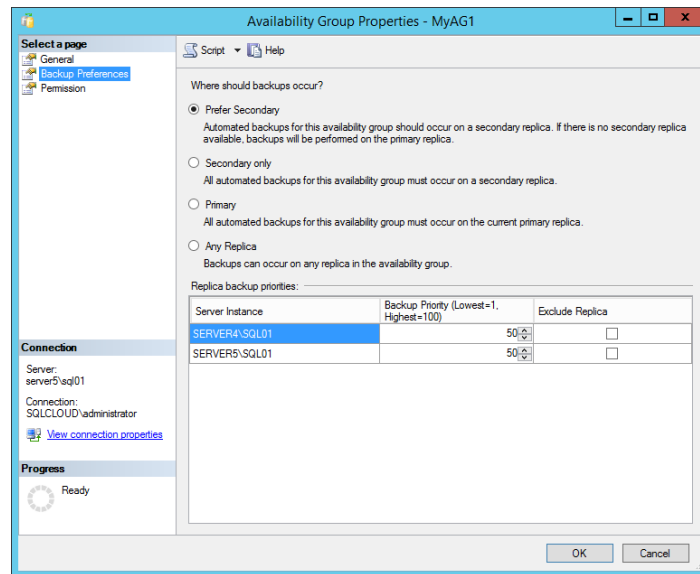
Readable Secondaries

- Enabling Readable Secondary adds version pointer to each row (on change)
 - Query isolation level transparently mapped to SNAPSHOT
 - Risk of page splits and IO overhead
- Stale or missing statistics on primary cannot be auto-updated by query on secondary (since database is read only)
 - Auto-created in TempDB (must be explicitly dropped or instance restart) - most recent statistics in replica preferred
- DDL operations can block redo thread and reporting workloads!

Availability Replicas						
Server Instance	Role	Availability Mode	Failover Mode	Connections in Primary Role	Readable Secondary	Session Timeout (seconds)
SERVER4\SQL01	Secondary	Synchron... ▼	Autom... ▼	Allow all conne... ▼	No ▼	10
SERVER5\SQL01	Primary	Synchron... ▼	Autom... ▼	Allow all connecti... ▼	No ▼	10

Backups on Database Secondary Replicas

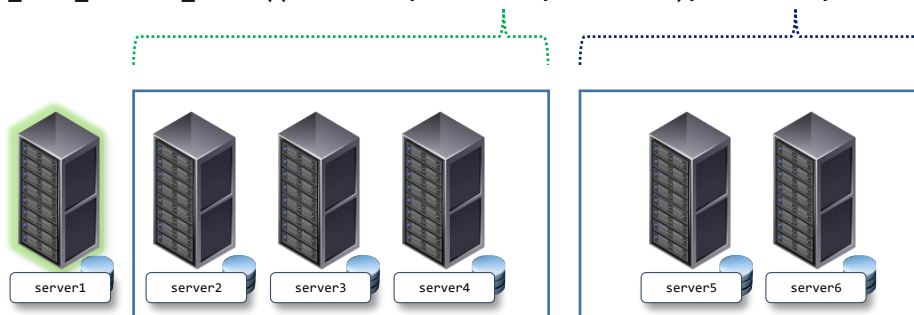
- “Offload” backups to secondary replicas
 - Use `sys.fn_hadr_backup_is_preferred_replica(<db_name>)`
 - Secondary replicas must be in SYNCHRONIZED or SYNCHRONIZING state
 - Store to central location
- By default secondaries preferred
- Do not support Differential or Full without COPY_ONLY.



Read only routing –and load balancing

- Read only routing list must be configured on primary role (that listener will connect to)
- Secondary roles must be configured with Read-Only Routing url
- Applications must
 - Connect through Listener
 - Connection string must specify Application Intent=ReadOnly
- Parentheses identifies load balanced set.

```
READ_ONLY_ROUTING_LIST=(( 'server2', 'server3', 'server4'), 'server5', 'server6')
```



Demo

Read-only routing and backups

In Summary...

- Availability groups are not all Butterflies and Unicorns so choose an HA solution appropriate to your requirements.
- Failover Clustering is a very mature technology but requires specialist skill and understanding. It does not provide scalability. In the context of AGs it is relatively easy to manage
- Availability Groups partially provide reporting query scalability and arguably provide a level of DR – so AGs can be thought of as bringing HADR and Scale to a solution.

Thank you for listening!

Email: contactme@sturmovik.net

Twitter: [@retracement](https://twitter.com/retracement)

Blog: <http://tenbulls.co.uk>

Slideshare: <http://www.slideshare.net/retracement>

Demo: https://github.com/retracement/availability_groups_for_dummies

