Transactional Replication
A Deeper Dive

Drew Furgiuele, Senior DBA
IGS Energy

About me

I'm a Senior SQL Server DBA at IGS Energy in Dublin, Ohio. I've been using SQL Server since SQL Server 2000 and I love it. I also enjoy DevOps, release management, and PowerShell.

Contact Info

dfurgiuele@igsenergy.com

@pittfurg

http://www.port1433.com

http://www.genesface.com

What's In This Presentation?

- How transactional replication works

- Security model

- Monitoring

- (Some) Knobs and levers.

- Replication and HA

When Should You Consider Transactional Replication?

- Reporting instances
- Concurrent Copies of Data

When You SHOULDN'T Consider (Any) Replication

- As a DR practice
- As a real-time source of data

Publishers, Publications, and Artciles

- A *publisher* is the server you're replicating data *from.*

- A *publication* is a definition (or collection) of *tables and/or views you want to replicate*. A publisher can have multiple publications.

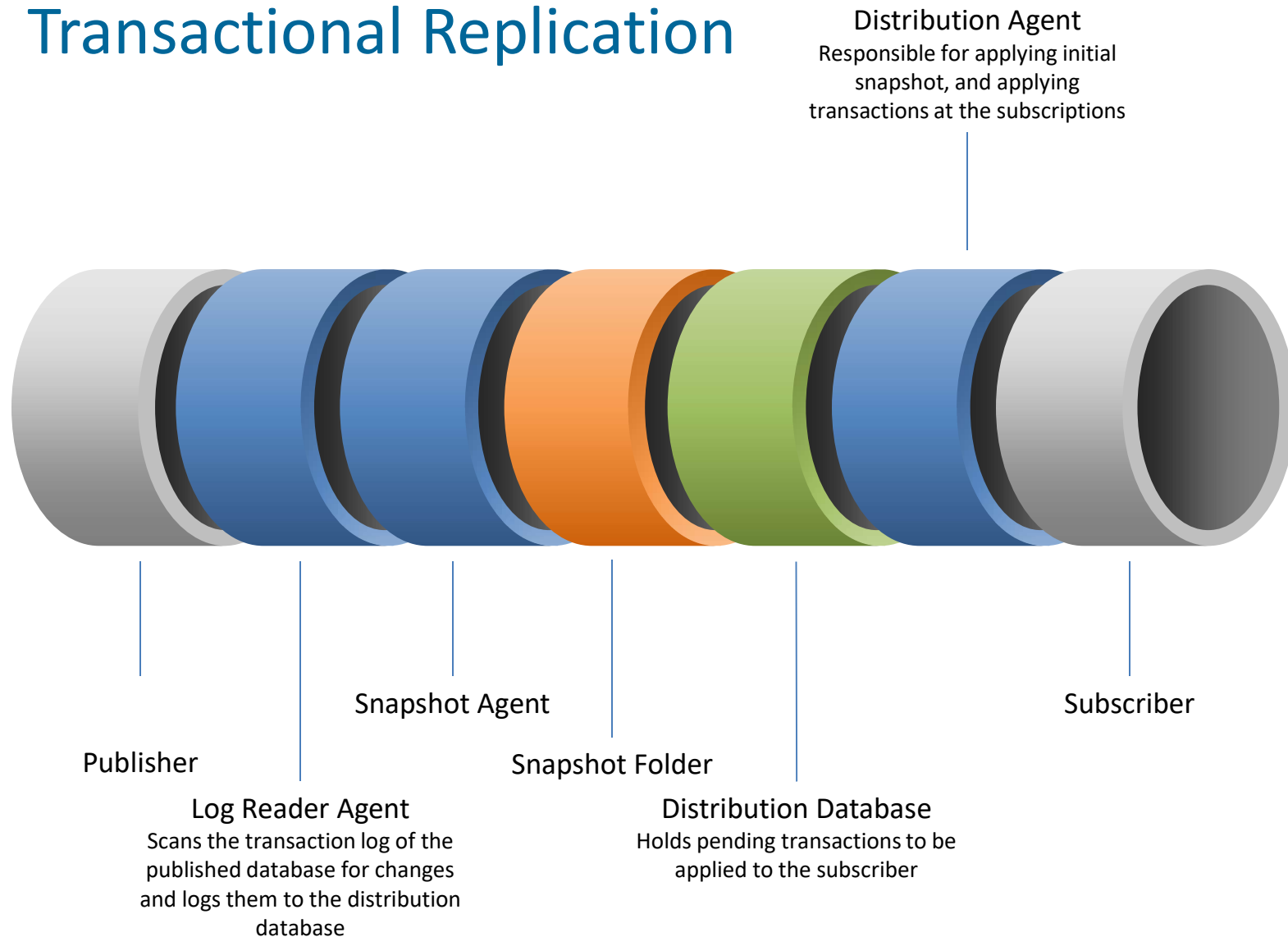- An article is a *single object* in a *publication*.

Subscribers

- A subscriber is a target of replication

- A subscription is a target for a publication.

- Can be different versions of SQL Server

- You should strongly consider read committed snapshot isolation for the transactional replicas

The Distributor

- The distributor is the "traffic cop" for replication.

- Holds information about publications and subscriptions.

  - In transactional replication, it also holds transactions waiting to be processed at subscribers

- Distributors can be:

  - Same-instance distributors

  - Standalone distributors

Transactional Replication

Distribution Agent
Responsible for applying initial snapshot, and applying transactions at the subscriptions

Snapshot Agent

Subscriber

Publisher

Log Reader Agent
Scans the transaction log of the published database for changes and logs them to the distribution database

Snapshot Folder

Distribution Database
Holds pending transactions to be applied to the subscriber

Replication Agents

- SQL Server Replication uses agents to manage and monitor replication.
  - Actual executables.
- Snapshot Agent.
- Log Reader Agent.
- Distribution Agent.
- Each publication has its own agent(s).
- Push and Pull Agents.

Security and Permissions

- For snapshot agents: **db_owner** on published database(s), **db_owner** on the distribution database, and read/write permissions on the network snapshot share.

- For distribution agents: **db_owner** on distribution, **db_owner** on subscriber database, and read access to the snapshot network share.

- For log reader agents: **db_owner** in both distribution database and published database(s).

- You can also impersonate the SQL Agent account, but it's not best practice.

- More best practices for replication security:
  https://msdn.microsoft.com/en-us/library/ms151227(v=sql.110).aspx

Demo: Setting up a Replication

What happens when a transaction is replicated?

- What gets replicated?

- Monitoring transactions

- When is a statement not a statement?

- Your transaction will be multiple statements

- Different behaviors are possible

Let's replicate some transactions!

Monitoring Latency

- You can use replication monitor.

- You can use TSQL.

- You can even use PowerShell!

Things to remember when something is replicated…

- Truncate table

- Renaming objects

- Object dependencies

- Changing data at a subscriber?

Common Trouble Spots

- Snapshots and objects.

- Distribution cleanup jobs.

- Replication and continuous integration.

- Transactions that break replication.

What To Do When It Breaks

- Is replication actually doing anything?

- The replication monitor

- What's that red "X" mean?

- DR and replicated databases

- Job Agent Alerts!

Replication and HA

- Bad news first: you can't put the distribution database into an availability group.

- But you can replicate databases that are in an availability groups!

Replication and HA, continued

- Just make sure:
  - Add all nodes as a publisher at the distributor
  - Enable replication on all databases on the other nodes manually with TSQL.
  - Additional permissions for the agents.
  - Consider TF 1448?

Replication and TDE

- Does replication "break" TDE?
- Remember:
    - By default, NOTHING in replication is encrypted!
    - You can enable SSL communication in the agent profile.
    - BCP files are NOT encrypted!
    - Your publisher replication is not a guarantee of replication at a subscriber.

"New:" Replication and Azure

- You can replicate to Azure SQL Database
  - SQL Server 2016
  - SQL Server 2014 SP1 (CU3)
  - SQL Server 2012 SP2 (CU8)
- Geolocation

Levers and Knobs

- Initialize from Backup.
- Replicating Stored Procedures.
- Transactional Replication Tuning.
  - Splitting articles.
  - Filtering articles.
- Agent Profiles.
- Article Owners.
- Replicating to Azure SQL Database.
- Agent Profiles.

Would you like to know more?

- MSDN: https://msdn.microsoft.com/en-us/library/ms151198.aspx

- SQL Server Central: http://www.sqlservercentral.com/stairway/72401/

- More on SQL Server Replication To Azure SQL Database:
  https://msdn.microsoft.com/library/mt589530.aspx

Questions?

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