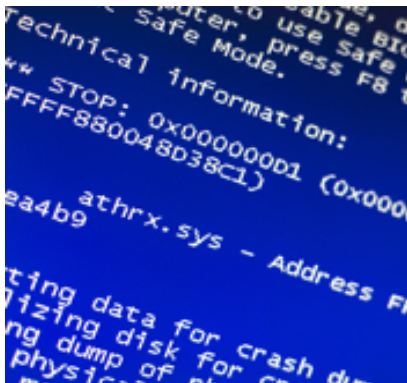


High Availability



For one-server failures:

Windows crash, RAID failure, SQL or Win patch fails, C: full, bad RAM chip, unplugged box

RPO: Max acceptable data loss:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

Disaster Recovery



For widespread outages:

Network switch fails, shared storage (SAN) outage, fire, flood, quake, power outage

RPO: Max acceptable data loss:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

Corruption



SQL and storage bugs:

SAN firmware bug, Microsoft SQL Server bug, examples: MS KB 2969896, 2878968

RPO: Max acceptable data loss:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

"Oops" Queries



For human T-SQL error:

UPDATE without a WHERE, truncate table in prod instead of dev, drop the wrong db

RPO: Max acceptable data loss:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

RTO: Max acceptable downtime:

Current State	Business Goal
	Zero
	1 minute
	1 hour
	1 day

		Zero
		1 minute
		1 hour
		1 day

Recovery Time Objective (RTO) - Downtime

Recovery Point Objective (RPO) - Data Loss

	Zero-1 Sec	1 Minute	1 Hour	1 Day
Zero-1 Sec	>\$1,000,000 Multiple active servers with bidirectional replication (usually requires code changes)*	\$100k-\$500k Clustering w/SAN, sync Availability Groups*, sync database mirroring*	\$100k-\$250k Sync SAN replication*, sync VM replication*	
1 Minute			\$50k-\$250k Async AlwaysOn Avail Groups, async DB mirroring	\$5k-\$100k Log shipping, async SAN replication, async VM replication
1 Hour			\$5k-\$100k Log shipping, async SAN replication, async VM	
1 Day				

* - technically these don't guarantee zero data loss: the secondary can get out of sync.

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 Learn more at www.BrentOzar.com/go/fail - except in Nebraska, as Steve Ballmer explains: BrentOzar.com/go/nebraska



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Comparison of SQL Server Availability Features

	0/0	0 RPO / 1 Minute RTO			0 RPO / 1H RTO		1 Min RPO / 1H RTO		1H RPO / 1H RTO		
	Replication	Failover Clustered Instances (FCI)	Availability Groups - Sync	Database Mirroring - Sync	SAN Replication Sync	VM Replication Sync	AlwaysOn Availability Groups - Async	Database Mirroring - Async	Log Shipping	SAN Replication - Async	VM Replication - Async
Recovery Point Objective (Data Loss)											
Data loss possible	Yes	No*	No*	No*	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Typical RPO goal	Zero	Zero	Zero	Zero	Zero	Zero	1 Minute	1 Minute	1 Hour	1 Hour	1 Hour
Recovery Time Objective (Downtime)											
Failover automatic or manual	Automatic	Automatic	Automatic	Automatic	Optional	Optional	Manual	Manual	Manual	Manual	Manual
Can be failed over by the DBA alone	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No
Easy to fail back and forth for patching	Some	Yes	Yes	Yes	No	No	Yes	Yes	Some	No	No
Multiple live writeable servers	Optional	No	No	No	No	No	No	No	No	No	No
Fails over Agent jobs, SQL logins	No	Yes	No	No	Optional	Yes	No	No	No	Optional	Yes
3rd party apps fail over easily	No	Yes	Yes	Some	Yes	Yes	Yes	Some	No	Yes	Yes
Typical RTO goal	Zero	1 Minute	1 Minute	1 Minute	1 Hour	1 Hour	1 Hour	1 Hour	1 Day	1 Day	1 Day
Groups of Databases											
Are the same point in time	No	Yes	No*	No	Yes	Yes	No	No	No	No	No
Fail over together	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hardware & Software Requirements											
SQL Server minimum version supported	Apps vary	Any	2012	2005	Any	Any	2012	2005	Any	Any	Any
SQL Server minimum edition required	Apps vary	Any	Ent until 16	Any	Any	Any	Ent until 16	Enterprise	Any	Any	Any
May require application changes	Yes	No	No	No	No	No	No	No	No	No	No
Req storage for multiple copies of DBs	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Requires shared storage (SAN)	No	Yes	No	No	Yes	Yes	No	No	No	Yes	Yes
Requires virtualization	No	No	No	No	No	Yes	No	No	No	No	Yes
Can use local solid state storage	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	No
Performance											
Has noticeable performance impact	Maybe	No	Yes	Yes	Maybe	Maybe	Minimal	Minimal	No	Maybe	Maybe
Can offload backups, DBCCs, reports	Yes	No	Yes	No	No	No	Yes	No	Some	No	No