Extending Your Availability Group for Disaster Recovery

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PASS

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Kingfisher TECHNOLOGIES

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Agenda

- Availability Groups: A Brief Intro
- Multi-Subnet Availability Groups: Differences, When, Why, & How
- Walkthrough
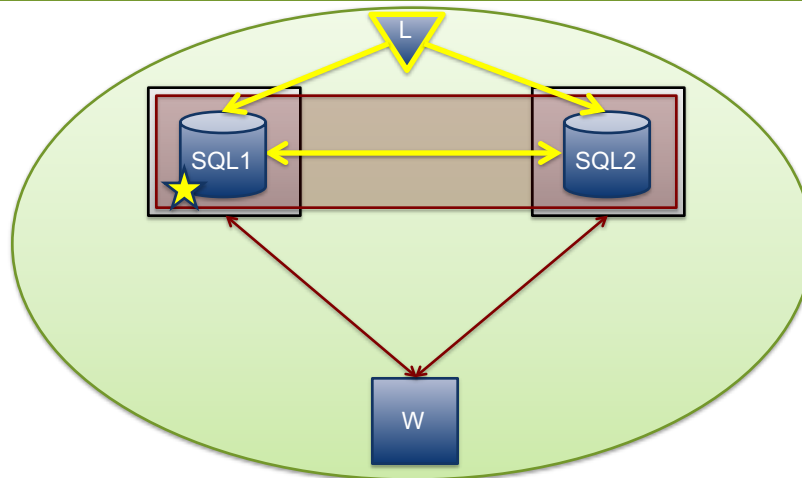- Troubleshooting

AVAILABILITY GROUPS: A BRIEF INTRODUCTION

HA/DR Before SQL Server 2012

- Replication
- Log shipping
- Failover cluster
- Database mirroring

Availability Groups

Availability Groups

- Uses Windows Server Failover Cluster
- No shared storage
- Up to 4 secondary replicas (8 in 2014)
- Secondary replicas can be readable
- Backups can be offloaded to secondary replica
- Synchronous or asynchronous
- Automatic or manual failover
- Can be geographically distributed
- Can be combined with other HA/DR methods

Limitations

- Operates at database level
- Practical limit to number of databases per AG
  - Worker Thread Exhaustion
- Licensing
  - Enterprise Edition only
  - Must license all servers
  - … Except those used strictly for disaster recovery

Limitations: Worker Thread Exhaustion

- Required (per AG)
  - 1 per database in primary replica
  - 1 per database for each secondary replica
  - 1 for each secondary replica
  - +1 if using secondary replica backup
- Limit: Max Worker Threads − 40
- Light Usage: (D * 2) + 1
- Heavy Usage: (D * 5) + 1

Limitations: Worker Thread Exhaustion

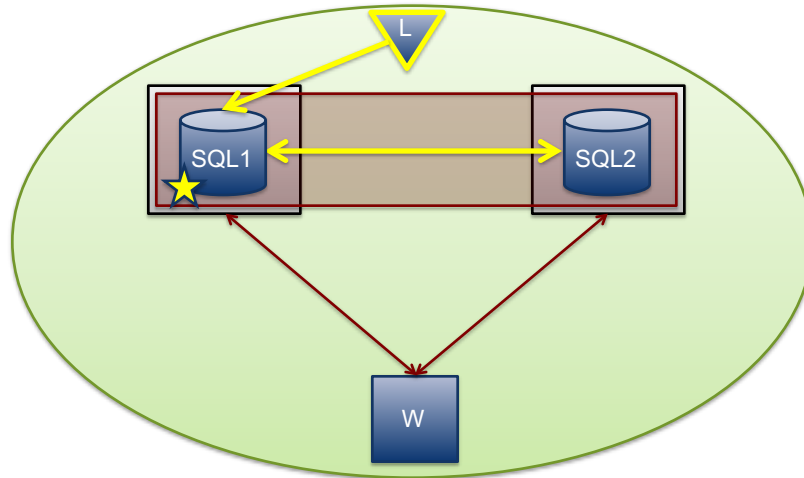| # CPU Cores	32-bit	64-bit
<= 4	256	512
8	288	576
16	352	704
32	480	960
64	736	1472
128	4224	4480
256	8320	8576

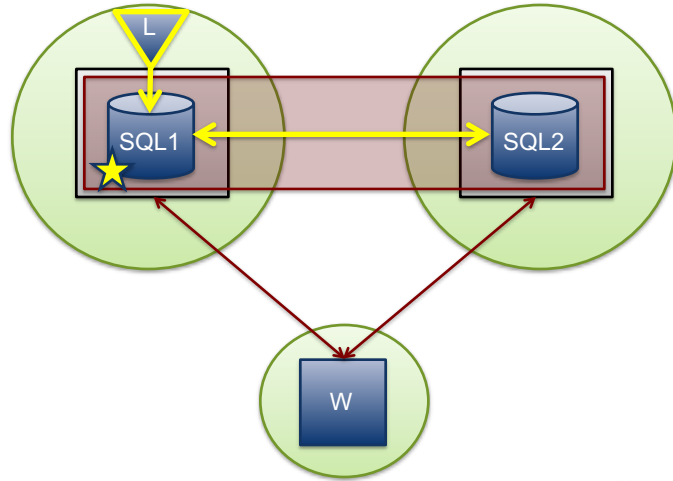Source: MSDN (http://bit.ly/1DB0nWi)

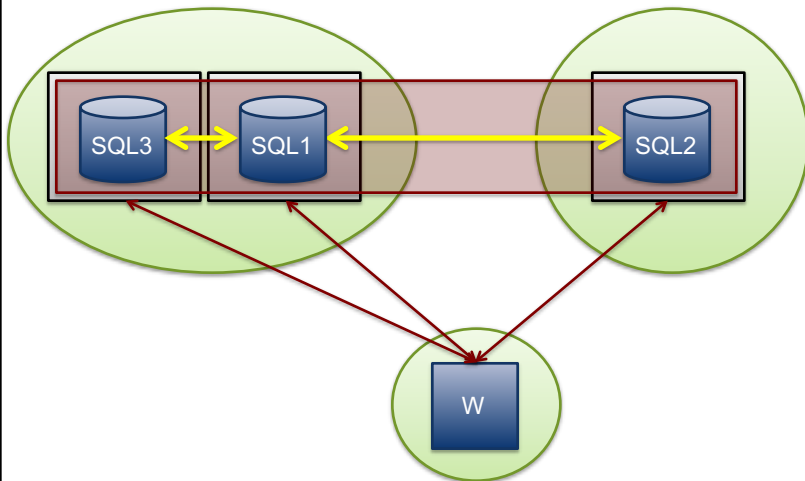# MULTI-SUBNET AVAILABILITY GROUPS

Typical Availability Group (HA)

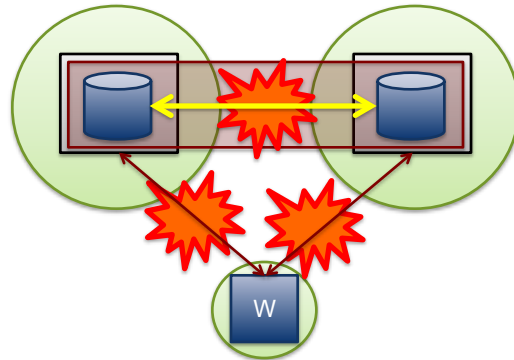Simple Multi-Subnet Availability Group

HA+DR – Best of Both Worlds

Potential Pain Points

- It's the network
  - Latency
  - Firewalls
  - Addressing
  - Active Directory
  - DNS

Why Use Multi-Subnet AGs?

- Disaster recovery
- Reporting in remote locations

Prerequisites

- Windows Server Failover Cluster (WSFC)
  - Quorum (File share witness)
  - Node weight ("votes")

Prerequisites

- Separate subnet/NICs for heartbeat traffic
- IPs on all subnets
  - Public – One per server
  - Heartbeat – One per server
  - Cluster – One per subnet
  - Listener – One per subnet
- FQDNs
  - Cluster
  - Listener

Prerequisites

- Open ports

TCP/UDP	Port	Description
TCP	1433	SQL – AG Listener
TCP	5022	SQL – AG/DBM Endpoint
TCP/UDP	3343	Cluster Network Communication
TCP	135	Cluster DCOM
UDP	137	Authentication
	ICMP	Ping
TCP/UDP	49152-65535	Dynamic Ports (Configurable)

Prerequisites

- File share for initial data synchronization
- Service account (SQL)
- Active Directory/DNS security
  - Cluster machine account (*domain\cluster*$)
- Mechanism for synchronizing server objects
  - Jobs
  - Logins

WALKTHROUGH

SQL saturday PASS

SPECIAL CONSIDERATIONS

SQL saturday PASS

Special Considerations

- Synchronous or asynchronous?
  - Synchronous
    - High availability
    - No data loss is acceptable
    - WAN latency must be low
  - Asynchronous
    - Disaster recovery
    - Distributed reporting
    - Data loss must be acceptable
  - Hybrid

Special Considerations

- Do you need automatic failover?
  - Latency must be low (<1 sec *roundtrip*)
    - CrossSubnetDelay (Def 1000, Max 5000)
    - CrossSubnetThreshold (Def 5, Max 120)
  - Usually reserved for high availability scenarios

Special Considerations

- IP Handling
  - Works best with SQL Server Native Client v11 or SQL Server ODBC v11
  - Other drivers cannot support MultiSubnetFailover property
    - Manual adjustments required
   - Slower reconnection after failover

Special Considerations

- IP handling
  - Register all listener IPs
    - SQL driver must be able to support MultiSubnetFailover
    - RegisterAllIPs = 1
      HostRecordTTL = 300
  - Register only current listener IP
    - RegisterAllIPs = 0
    - HostRecordTTL = as low as possible
    - Cluster must be able to update DNS
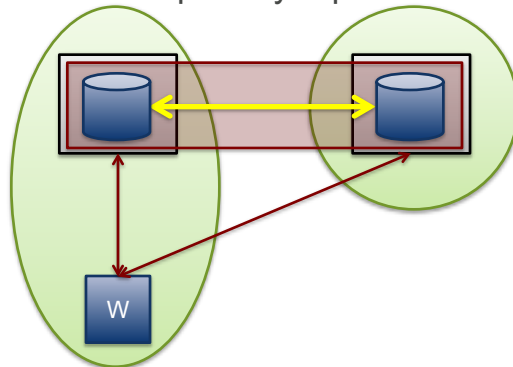   - Much slower failover

Special Considerations

- Where to put the witness?
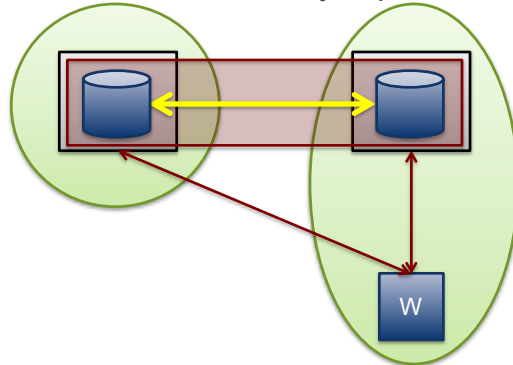 - 3rd datacenter
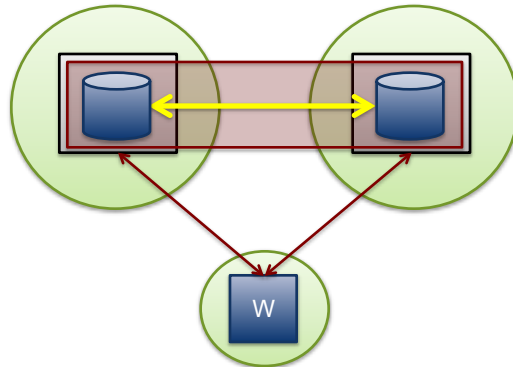
Special Considerations

- Where to put the witness?
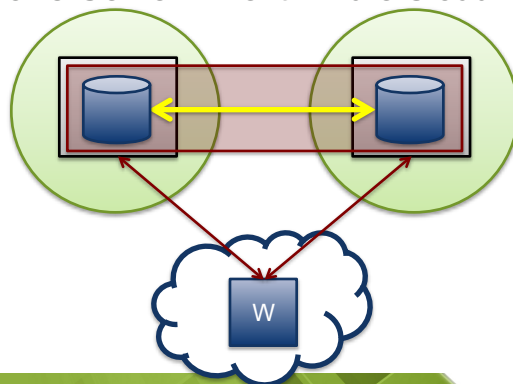 - Co-located with primary replica

Special Considerations

- Where to put the witness?
  - Co-located with secondary replica

Special Considerations

- Where to put the witness?
  - Windows Server v.Next: Azure Cloud Witness

TROUBLESHOOTING AVAILABILITY GROUPS

Troubleshooting

- SQL Server
  - Availability Group Dashboard
  - Extended Events
    - Special session for availability groups
  - DMVs (sys.dm_hadr_*)
  - Instance log
- Third-party SQL utilities
  - SQL Sentry Performance Advisor
  - Idera Diagnostic Manager

Troubleshooting

- Windows
  - Logs – Application, System
  - Cluster logs
    - Including cluster.log
  - PerfMon
  - SCOM
- Network utilities
  - iperf
  - Packet trace (Wireshark)

Review

- Availability groups can be a great disaster recovery solution!
- Additional considerations when multiple subnets are involved
  - Network latency
  - Firewall configuration
  - Active Directory configuration
  - DNS configuration

Any Questions?

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Thank you for attending!

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