SQL Server Disaster Recovery

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Motivation

SQL Server is a critical service, core of the Microsoft infrastructure and many LOB applications. Proper disaster recovery procedures are essential, especially in case where you face a real disaster and need to recovery the system as fast as possible.
About Me

Lead Database Administrator, SQL Team at&tCzech Republic

Microsoft MVP Data Platform

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Session Agenda

• Disaster Recovery
• High Availability vs. Disaster Recovery
• SQL Server 2017 features for High Availability & DR
High Availability

Database Service Management

Online ➔ Offline ➔ Online ➔ Offline ➔ Online

Time between failure ➔ Time to repair

IT Operations

Online ➔ Offline ➔ Online ➔ Offline ➔ Online

Uptime ➔ Downtime

\[
\text{Availability} = \frac{MTBF}{MTBF + MTTR}
\]

\[
downtime \text{ per year (in days)} = (1 - \text{uptime ratio}) \times 365
\]

\[
\text{uptime ratio} = \frac{Availability}{100}
\]
High Availability

• Operations Log (12 hours)
  – Recovered from previous failure at 00:00:00 Hours
  – Malfunctioned again at 10:00:00 Hours
  – Repaired and operational at 10:06:00 Hours

• Availability (Service)
  – Mean Time Between Failures (MTBF) = 10 Hours
  – Mean Time To Repair (MTTF) = 0.1 Hour
  – Availability = 10/(10+0.1) = 99%

• Downtime (Systems)
  – Uptime ratio = 99/100 = 0.99
  – Downtime per year (in days) = (1-0.99)*365 = 3.65 Days

<table>
<thead>
<tr>
<th>Availability</th>
<th>Downtime per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>99%</td>
<td>3.65 Days</td>
</tr>
<tr>
<td>99.9%</td>
<td>8.76 Hours</td>
</tr>
<tr>
<td>99.99%</td>
<td>52.56 Minutes</td>
</tr>
<tr>
<td>99.999%</td>
<td>5.26 Minutes</td>
</tr>
<tr>
<td>99.9999%</td>
<td>31.5 Seconds</td>
</tr>
<tr>
<td>99.99999%</td>
<td>3.15 Seconds</td>
</tr>
</tbody>
</table>
What is causing downtime

• **Planned**
  – Software releases
  – OS Patch releases
  – SQL Server service packs and hotfixes
  – Database maintenance and upgrades

• **Unplanned**
  – Hardware component failure
  – Security breaches
  – Human error
  – Natural disasters
RTO & RPO

Business Continuity Plan

Business Function

Database Service Management

Online → Offline → Online

IT Operations

Online → Offline → Online

Recovery Time Objective

Data loss

Recovery Point Objective
Mission-critical availability

- Reliable
  - Detects failures reliably
  - Handles multiple failures at a time
- Integrated
  - Provides a unified, simplified solution
  - Streamlines deployment, management, and monitoring
- Flexible
  - Reuses existing investments
  - Offers SAN/DAS environments
- Efficient
  - Allows use of HA hardware resources
  - Supports fast, transparent failover
## High availability and disaster recovery

### Simple HADR

**VM failure**
- Resilience against guest and OS-level failures
- Planned & unplanned events
- Minimum downtime for patching and upgrades
- RTO in minutes

**Backup/Restore**
- Protection against accidental or malicious data corruption
- DR protection
- RTO in minutes to hours

### Standard HADR

**Failover cluster**
- Instance-level protection
- Automatic failure detection and failover
- RTO in seconds to minutes
- Resilience against OS and SQL Server failures

**Basic Availability Groups**
- Availability groups with two replicas
- Replaces database mirroring

**Log shipping**
- Warm standbys for DR

### Mission-critical HADR

**Availability Groups**
- Database-level protection
- RTO in seconds
- No data loss
- Recover from unplanned outage
- No downtime for planned maintenance
- Offload read/backup workload to active secondaries
- Failover to geographically distributed secondary site
DEMO
Follow up

- Kurzy v GOPASu
- MOC20465 - Návrh databázového řešení Microsoft SQL Server 2014/2016
- MOC20462 - Administrace databázového serveru Microsoft SQL Server 2012/2014