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SQLRally NORDIC

NOVEMBER 4-6 2013, STOCKHOLM



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HIGH AVAILABILITY OF SQL SERVER IN THE CONTEXT OF SLA

about the speaker

- Polish SQL Server User Group Leader
- Microsoft Certified Trainer (MCP, MCSA, MLSS, MLSBS, MCTS, MCITP)
- SQL Server MVP (four years in a row)
- Blogger, Influencer, Technical Writer
- Last 8 years living in Data Center in Wrocław
- Generally about 14 years in IT/banking area
- Speaker at SQL Server Community Launch, Time for SharePoint, CodeCamps, SharePoint Community Launch, CISSP Day, SQL in the City, InfoTRAMS, SQL Bits, SQL Saturday, CareerCon, Sharepoint & SQL Connection, IT Camp...
- Deep Dives Co-Author:

**High availability of SQL Server in the context
of Service Level Agreements (Chapter 18th)**

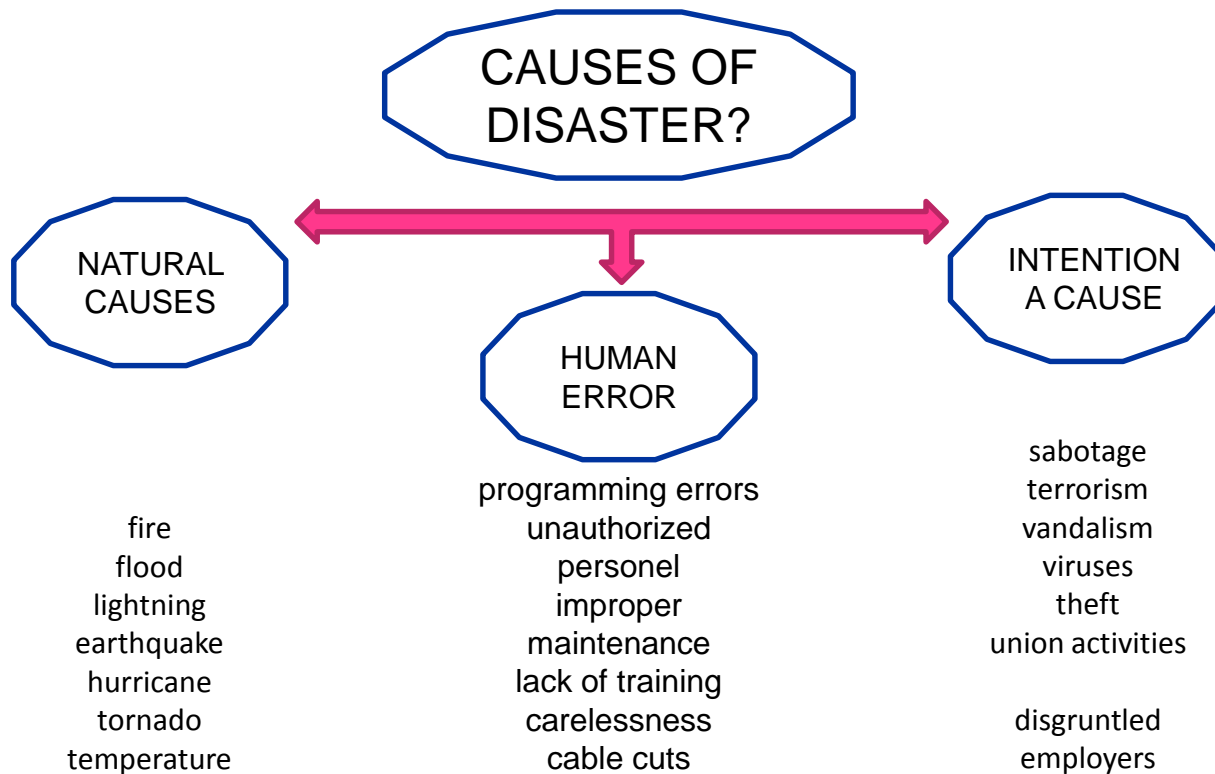


BACK TO THE SCHOOL:

What is High Availability?

- High Availability (**HA**) to ensure the continued operation of equipment and systems for the purposes (usually) in an enterprise production environment.
- Is designed to prevent data loss as a result of:
 - software bugs,
 - manufacturing defects
 - hardware failure
 - natural disasters
 - human error
 - other unforeseen events

What is The Disaster?



Two Kinds of Monsters

PSO > USO > SLA

- PSO **Planned System Outages** – Planned System Unavailability
 - Minimum planned unavailability, due to the need to carry out modernization work, installing patches, replacement / extension of hardware,
 - Agreed/accepted by/with the client and not affecting the provisions of the HA, and SLA, until...
- USO **Unplanned System Outages** – Unplanned System Unavailability
 - an error that prevents a partial or total work environment in a tangible, measurable customer
 - resulting in high costs if you need repairs, as well as penalty payments for non-SLA

Performance Metrics (HA)

- What it really is the availability of the order of 99.99%?
- Availability 99.99% to 0.01% **UNAVAILABILITY** in a requested period (eg annual), which ...
- How much is that in terms of the unavailability of the server / environment / database:

$$\text{Availability} = \text{MTBF} / \text{MTBF} + \text{MTTR}$$

- **MTBF** -> Mean Time Between Failures
- **MTTR** -> Mean Time To Repair

Performance Metrics (HA vs ITIL)

Formula One / formula provides a means whereby the availability of a service can be calculated for a specified period:

$$\frac{\text{Agreed Hours} - (\text{Incident(s)} \times \text{Duration})}{\text{Agreed Hours}} \times \frac{100}{1}$$

Formula Two / formula provides a means of calculating the availability of a specific group, region or location, where the service is delivered:

$$\frac{\text{Agreed Hours} \times \text{No. of Users} - \text{sum of} (\text{Incident} \times \text{Duration} \times \% \text{ of Users Affected})}{\text{Agreed Hours} \times \text{No. of Users}} \times \frac{100}{1}$$

In search of Five 9's

Availability %	Downtime per year	Downtime per month*	Downtime per week
90%	36.5 days	72 hours	16.8 hours
95%	18.25 days	36 hours	8.4 hours
98%	7.30 days	14.4 hours	3.36 hours
99%	3.65 days	7.20 hours	1.68 hours
99.5%	1.83 days	3.60 hours	50.4 min
99.8%	17.52 hours	86.23 min	20.16 min
99.9% ("three nines")	8.76 hours	43.2 min	10.1 min
99.95%	4.38 hours	21.56 min	5.04 min
99.99% ("four nines")	52.6 min	4.32 min	1.01 min
99.999% ("five nines")	5.26 min	25.9 s	6.05 s
99.9999% ("six nines")	31.5 s	2.59 s	0.605 s

<http://bit.ly/1dx9EjG>



Metrics (basic components) part 1

Basic Nomenclature:

Avail. Comp. 1 = Ac_1 / Avail. Comp. 2 = Ac_2 / Avail. Comp. 3 = Ac_3 / Avail. Comp. n = Ac_n
Avail. System = As

Basic Equations

- **EQUATION #1: $As = Ac_1 * Ac_2 * Ac_3 * ... Ac_n$**
 - $85\% * 90\% * 99.9\% * 98\% * 85\% * 99\% * 99.99\% * 95\% = 59.87\%$
- **EQUATION #2: $As = Ac_1 + ((1 - Ac_1) * Ac_2)$**
 - $97.75\% * 90\% * 99.9\% * 98\% * 97.75\% * 99\% * 99.99\% * 95\% = 79.10\%$
 - $97.75\% * 99\% * 99.9999\% * 99.96\% * 97.75\% * 99.99\% * 99.99\% * 99.75\% = 94.3\%$
- **EQUATION #3: $As = Ac(n-1) + ((1 - Ac(n-1)) * Acn)$**
 - $94.3\% + (1-94.3\%) * 94.3\% = 99.675\%$

Comp	Avail.
Web	85%
Application	90%
Database	99.9%
DNS	98%
Firewall	85%
Switch	99%
Data Center	99.99%
ISP	95%

- $85\% + (1-85\%) * 85\% = 97.75\%$
- $97.75\% + (1-97.75\%) * 85\% = 99.662\%$
- $99.662\% + (1-99.662\%) * 85\% = 99.949\%$

Metrics (basic components) part 2

Avail %	1 Component	2 Components	3 Components	4 Components
Web	85%	=B2+((1-B2)*\$B2)	=C2+((1-C2)*\$B2)	=D2+((1-D2)*\$B2)
Application	90%	=B3+((1-B3)*\$B3)	=C3+((1-C3)*\$B3)	=D3+((1-D3)*\$B3)
Database	99.9%	=B4+((1-B4)*\$B4)	=C4+((1-C4)*\$B4)	=D4+((1-D4)*\$B4)
DNS	98%	=B5+((1-B5)*\$B5)	=C5+((1-C5)*\$B5)	=D5+((1-D5)*\$B5)
Firewall	85%	=B6+((1-B6)*\$B6)	=C6+((1-C6)*\$B6)	=D6+((1-D6)*\$B6)
Switch	99%	=B7+((1-B7)*\$B7)	=C7+((1-C7)*\$B7)	=D7+((1-D7)*\$B7)
Data Center	99.99%	❖	=B8+((1-B8)*\$B8)	❖
ISP	95%	=B9+((1-B9)*\$B9)	=C9+((1-C9)*\$B9)	=D9+((1-D9)*\$B9)
System Avail %	=b2*b3*b4*b5 *b6*b7*b8*b9	=c2*c3*c4*c5 *c6*c7*b8*c9	=d2*d3*d4*d5 *d6*d7*d8*d9	=e2*e3*e4*e5 *e6*e7*d8*e9
	59,87%	94,30%	99,21%	99,88%

BACK TO THE SCHOOL:

What is SLA?

- The origins date back to 1980 and the agreements between operators and end customers.
- **Mutually negotiable** contract for the provision of services (not just IT, but these in particular)
- It must be concluded formally, though legally permissible is an informal agreement
- Including the level and range of services provided by means of **measurable indicators** (level of accessibility, usability, performance)
- The contract should have specified **minimum** and **maximum** range for each subject to its services

Metrics of Service Level Agreement?

There is no specific SLA measurement WITHOUT indicators!

SAMPLE CALL CENTER / SERVICE DESK:

- **ABA (Abandonment Rate):** Percentage of calls abandoned while waiting for a response.
- **ASA (Average Speed to Answer):** Average time (usually in seconds) required for the connection of boards help.
- **TSF (Time Service Factor):** Percentage of calls answered in precise time frame, such as 80% in 20 seconds.
- **FCR (First Call Resolution):** Percentage of calls where the problem was solved without having to switch to another expert
- **TAT (Turn Around Time):** The time it takes to complete certain tasks.

High Availability Solutions – part 1

<http://technet.microsoft.com/en-us/library/ms190202.aspx>

- 2012
 - AlwaysOn Failover Cluster Instances
 - AlwaysOn Availability Group
 - Database Mirroring
 - Log Shipping
- 2005 / 2008 / R2
 - Failover Clustering
 - Database Mirroring
 - Log Shipping
 - Replication

High Availability Solutions – part 2

- Database Mirroring
- Database Snapshots
- Windows Clustering
- SQL Server Replication
- Hot-add memory and CPU
- Online Index Operations
- Table and Index Partitioning
- Failover Clustering
- Peer-To-Peer Replication
- AlwaysOn Availability Group
- AlwaysOn Failover Cluster Instances
- Enhanced AlwaysOn
- Enhanced Resource Governor
- Enhanced Separation of Duties
- Backup to Azure Storage
- AlwaysOn Integration with WAIS
- SSMS Migration Wizard for WAIS

Why SLA is so important?

- In fact, it's more than just a signed agreement between the client and your boss.
- It is also a contract that YOU need to meet
- If it's signed an agreement to zero downtime and zero data loss (abstraction?) Then you need to make sure that if corruption can fulfill this contract (change / delete data on purpose by the authorized user).
- If you can not meet the SLA, the business is exposed to downtime and data loss
- The end result is to submit your CV to a recruitment agency ...

SLA and DBA... WHY? Part 1

- Production (operational) hours:
 - hours where instance/partition/database/table/index must be available
 - almost always depends of...
- Percentage of time of service availability:
 - how much percent of availability of instance/partition/database/table/index is enough
- Maintenance hours:
 - Announced IN ADVANCE hours of maintenance
- „Helper” solutions/procedures for users
 - time of response from Help Desk (first line of support)
 - time of reaction for problem by DBA (second line of support)

SLA and DBA... WHY? Part 1

- Numbers of users in system
 - number of transactions | in a period of time
 - acceptable levels of availability for different services and access levels
 - minimum time for replication (data, files, backup, etc)
- Recovery Time
 - deleting data (by human error)
 - deleting data (by disgruntled employers)
 - database corruption
 - SQL Server crash
 - OS Server crash
 - read-only mode – for merchandisers, sellers
- Space requirements
 - maximum amount of space for database, user data, tables, reports, backup, logs
 - maximum number of users in specific roles (dba, manager, developer)

Do you think you can meet your SLA?

- You need to know what are the conditions / requirements for SLA if you meet them
- As you can accomplish if you do not know that there is an SLA?
- As you review the contract if you did not invite anyone to the meeting on the creation of a Service Level Agreement?
- The end result is to submit your CV to a recruitment agency ...

Do you think you can meet your SLA?

- The recovery plan looks great on paper - but if ever you test it?
- Suppose this situation:
- We allow 20 minutes is not available for database size of 100 GB.
- We are able to within the last 15 minutes substitute a copy of the user database
- What will you do in case of damage to the database?
- What will you do in the event of disk failure?
- What will you do in case of burning the motherboard?
- What do you do when cutting the cable FC?
- How much time it will take to recover from a backup?
- How much time it will take to bring tape with backup from a second location 25 kilometers away in the city center at 2PM?

**Do you still meet the SLA
15 minutes of downtime?**

Summary

- You need to know about the existence of SLA
- You are a „part” of Service Level Agreement
- You should be co-creator in a Service Level Agreement
(looking for requirements / features / technology)
- You need to have contingency plans - TESTED
- You must have knowledge of their responsibilities
- You must/should be able to meet the technical aspects of SLA

Moment for Q & A



about me...

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THANK YOU!

- For attending this session and PASS SQLRally Nordic 2013, Stockholm
- Please don't forget filling survey and evaluation form