SQL Server

Evaluation Report

Database Evaluation Overview

Program Goals

- Assess risks and evaluate health of the SQL Server environment.
- Identify key areas where the environment deviates from Microsoft best practices and configuration guidance.
- Establish assessment results that can generate a remediation plan used to complete improvements to the health of the environment and to resolve or mitigate risks.

Program Phases

- Environmental Assessment: The SQL Server Team collects data from the environment focusing on key known areas.
- Analysis and Reporting: The SQL Server Team analyzes the results to compare against best practices, identify risks and health related problems, and prepares a findings report.
- Remediation Planning: Once problems and risks have been discovered, a full remediation action plan should be established to assist in the effort to remediate and stabilize the environment.

Server Details

Host Name :	WIN-U2IM87IPB8T
SQL Instance Name :	SQL2012
SQL Version :	Microsoft SQL Server 2012 Enterprise Evaluation Edition (64-bit)
SQL Product Level :	RTM

Scorecard

The scorecards for the Evaluation Report are provided below. These show the state of the system with respect to health(current issues) and risk(potential for future issues).

Issue Severity Levels
Critical
High
Medium
Low
No Issues

The following legend will be used throughout the rest of this document:

✓   Indicates that there are no issues in this item

✕   Indicates that there are issues in this item

Consolidated Scorecard

This scorecard gives an executive level summary of the issues discovered.

SQL Parameters			
High	Maintenance	Daily database Full backup	❌
High	Configuration	Database Auto growth	❌
High	Implemetation	Database Data File Configuration	❌
High	Implemetation	Database Log File Configuration	❌
High	Security	NT AUTHORITY\SYSTEM Administrator	❌
High	Configuration	Read Committed Snapshot	❌
High	Configuration	Recovery Model	❌
High	Configuration	Snapshot Isolation	❌
High	Installation	SQL Server Instance Installation Directory	❌
High	Security	SQL Server Network Port	❌
High	Installation	SQL Server Version and Service Pack	❌
Low	Configuration	Default index fill factor	❌
Low	Configuration	Trace flag 1117	❌
Low	Configuration	Trace flag 1118	❌
Low	Configuration	Trace flag 2371	❌
Medium	Configuration	Max Degree Of Parallelism	❌
Medium	Security	Server authentication	❌
High	Configuration	Auto Create Statistics	✅
High	Configuration	Auto Shrink	✅
High	Configuration	Auto Update Statistics	✅
High	Configuration	Compatibility Level	✅
Medium	Security	Blank SQL SA Password	✅
Medium	Configuration	Memory - Max Memory	✅
Medium	Configuration	Memory - Min Memory	✅

SQL Server

Issue: Daily database Full backup			
Issue Type	Maintenance	**Issue Severity**	High
Problem			
The production goals of the organization for the databases, especially the requirements for availability and protection of data from loss.			
Recommendation			
The recommendation is to perform the Full DB compressed backup every day and verify backup integrity. Backup startegy is also depends on other factors such as the nature of each of your databases : its size, its usage patterns, the nature of its content and the requirements for its data.			
Why			
Best practices for backup and restore help make sure that backup and restore operations in database environments are successful and that the environment is protected against data loss or continuity gaps.			
Reference 1			
https://technet.microsoft.com/en-us/library/cc180782.aspx			
Reference 2			
https://technet.microsoft.com/en-us/library/ms191239(v=sql.105).aspx			

Issue: Database Auto growth			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to set the auto growth setting for database enough to start with 200MB to 500MB.			
Why			
An auto-growth event is the process by which the SQL Server engine expands the size of a database file when it runs out of space. The amount by which a database file grows is based on the settings that you have for the file growth options for your database. Each database file that is associated with your database has an auto-growth setting. There are three different settings you can use to identify how your database files will grow. They can grow by a specific size, a percentage of the current size, or not grow at all. If you are not properly managing your auto-growth setting for a database, then your database might experience many auto-grow events, or very few. Auto-growth events. Each time an auto-growth event is performed SQL Server holds up database processing while an auto-growth event occurs. This means that processing against that database will be held up while the auto-growth event completed. This equates to slower response time for those SQL commands that are being processing against the database that is growing.			
Reference 1			
Reference 2			

Issue: Database Data File Configuration

Issue Type	Implemetation	Issue Severity	High
Problem			
By default, SQL Server's databases are installed on the system drive. This is a recipe for disaster under two situations: 1. If your users do something that require the system databases to grow (like never purging backup history from MSDB or building giant temp tables), they can grow until the system drive runs out of space, and Windows will stop dead. 2.If someone else does something to run the system drives out of space (like downloading huge files to their desktop or running big Windows Updates), the system will stop dead.			
Recommendation			
The recommendation is to databse files on separate drive.			
Why			
After this change, you'll have less reliability risk, and your system may even perform faster if the C drive ran on slow storage.			
Reference 1			
Reference 2			

Issue: Database Log File Configuration			
Issue Type	Implemetation	**Issue Severity**	High
Problem			
By default, SQL Server's databases are installed on the system drive. This is a recipe for disaster under two situations: 1. If your users do something that require the system databases to grow (like never purging backup history from MSDB or building giant temp tables), they can grow until the system drive runs out of space, and Windows will stop dead. 2.If someone else does something to run the system drives out of space (like downloading huge files to their desktop or running big Windows Updates), the system will stop dead.			
Recommendation			
The recommendation is to databse files on separate drive.			
Why			
After this change, you'll have less reliability risk, and your system may even perform faster if the C drive ran on slow storage.			
Reference 1			
Reference 2			

Issue: NT AUTHORITY\SYSTEM Administrator			
Issue Type	Security	**Issue Severity**	High
Problem			
It is a member of the Windows Administrators group on the local computer, and is therefore a member of the SQL Server sysadmin fixed server role.			

Recommendation
The recommendation is to disable the account in SQL Server.
Why
Local System Account has extensive privileges on the entire local system and acts as a computer on your company network. This account shows up as NT AUTHORITY\SYSTEM when configuring SQL.
Reference 1
https://technet.microsoft.com/en-us/library/ms143504.aspx
Reference 2

Issue: Read Committed Snapshot			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to set the auto growth setting for database enough to start with 200MB to 500MB.			
Why			
The term snapshot reflects the fact that all queries in the transaction see the same version, or snapshot, of the database, based on the state of the database at the moment in time when the transaction begins. Transactions that modify data do not block transactions that read data, and transactions that read data do not block transactions that write data, as they normally would under the default READ COMMITTED isolation level in SQL Server. When READ_COMMITTED_SNAPSHOT OFF is in effect, the Database Engine uses shared locks to enforce the default isolation level.			
Reference 1			
https://msdn.microsoft.com/en-us/library/tcbchxcb(v=vs.110).aspx			
Reference 2			

Issue: Recovery Model			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to set the full recovery mode for prodcution database.			
Why			
The simple recovery model is generally appropriate for a test or development database. However, for a production database, the best choice is typically the full recovery model, optionally, supplemented by the bulk-logged recovery model. However, the simple recovery model is sometimes appropriate for a small production database, especially if it is mostly or completely read-only, or for a data warehouse.			
Reference 1			
https://technet.microsoft.com/en-us/library/ms175987(v=sql.105).aspx			
Reference 2			

Issue: Snapshot Isolation			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to enable read committed snapshot for the database.			
Why			
The term snapshot reflects the fact that all queries in the transaction see the same version, or snapshot, of the database, based on the state of the database at the moment in time when the transaction begins. Transactions that modify data do not block transactions that read data, and transactions that read data do not block transactions that write data, as they normally would under the default READ COMMITTED isolation level in SQL Server. When READ_COMMITTED_SNAPSHOT OFF is in effect, the Database Engine uses shared locks to enforce the default isolation level.			
Reference 1			
https://msdn.microsoft.com/en-us/library/tcbchxcb(v=vs.110).aspx			
Reference 2			

Issue: SQL Server Instance Installation Directory			
Issue Type	Installation	**Issue Severity**	High
Problem			
By default, SQL Server's instance binary files are installed on the system drive. This is a recipe for disaster because if the system drives out of space or currupt then the SQL Server instance will stop.			
Recommendation			
The recommendation is to installing the latest updates on the SQL server.			
Why			
After this change, you'll have less reliability risk, and your SQL Server instance is safe in case of disaster.			
Reference 1			
https://support.microsoft.com/en-nz/kb/2527041			
Reference 2			

Issue: SQL Server Network Port			
Issue Type	Security	**Issue Severity**	High
Problem			
This is the most common port allowed through the firewall. It applies to routine connections to the default installation of the Database Engine, or a named instance that is the only instance running on the computer.			
Recommendation			
The recommendation is to change the default SQL port.			
Why			

Firewall systems help prevent unauthorized access to computer resources. If a firewall is turned on but not correctly configured, allow attempts to connect to SQL Server on default port.
Reference 1
https://msdn.microsoft.com/en-nz/library/ms177440.aspx
Reference 2

Issue: SQL Server Version and Service Pack			
Issue Type	Installation	**Issue Severity**	High
Problem			
The SQL server is running on service pack version which is unsupported			
Recommendation			
The recommendation is to install the latest updates on the SQL server.			
Why			
A service pack comprises a collection of updates, fixes or enhancements to a software program delivered in the form of a single installable package.			
Reference 1			
https://support.microsoft.com/en-nz/kb/2527041			
Reference 2			
https://support.microsoft.com/en-nz/kb/2755533			

Issue: Default index fill factor			
Issue Type	Configuration	**Issue Severity**	Low
Problem			
The fill-factor option is provided for fine-tuning index data storage and performance. When an index is created or rebuilt, the fill-factor value determines the percentage of space on each leaf-level page to be filled with data, reserving the remainder on each page as free space for future growth.Fillfactor can be a useful tool to help performance, but it's often a performance killer if you use it incorrectly.			
Recommendation			
The recommendation is to set the fill-factor value in percentage from 1 to 100, and the server-wide default is 0 which means that the leaf-level pages are filled to capacity.			
Why			
The fill factor option determines the percentage of space on each leaf-level page to be filled with data, reserving the remainder on each page as free space for future growth. The idea is that an appropriate fill factor should reduce page splits whilst maintaining performance and using space efficiently.			
Reference 1			
https://msdn.microsoft.com/en-us/library/ms177459.aspx			
Reference 2			

Issue: Trace flag 1117			
Issue Type	Configuration	**Issue Severity**	Low
Problem			

The trace flag 1118 is commonly used to assist in TEMPDB scalability by avoiding SGAM and other allocation contention points.
Recommendation
The recommendation is to enable trace flags.
Why
Enabling TraceFlags can help SQL server to handle a certain data load more accurate. Trace flag 1117 is enabled, then when SQL Server has to perform auto-grow of a data file, it auto-grows all of the files at the same time.
Reference 1
https://technet.microsoft.com/en-us/library/ms188396(v=sql.105).aspx
Reference 2

Issue: Trace flag 1118			
Issue Type	Configuration	**Issue Severity**	Low
Problem			
Trace flag 1117 changes the behavior of file growth: if one data file in a filegroup grows, it forces other files in that filegroup to ALSO grow.			
Recommendation			
The recommendation is to enable trace flags.			
Why			
Enabling TraceFlags can help SQL server to handle a certain data load more accurate. Trace flag 1118 forces uniform extent allocations of the Tempdb datafiles instead of mixed page allocations.			
Reference 1			
https://technet.microsoft.com/en-us/library/ms188396(v=sql.105).aspx			
Reference 2			

Issue: Trace flag 2371			
Issue Type	Configuration	**Issue Severity**	Low
Problem			
2371 - Trace flag 2371 that you can use to control when the query optimizer generates autostats on a table. when a table becomes very large, the old threshold (a fixed rate – 20% of rows changed) may be too high and the Autostat process may not be triggered frequently enough. This could lead to potential performance problems.			
Recommendation			
The recommendation is to enable trace flags.			
Why			
Enabling TraceFlags can help SQL server to handle a certain data load more accurate. Trace flag 1118 forces uniform extent allocations of the Tempdb datafiles instead of mixed page allocations. When trace flag 1117 is enabled, then when SQL Server has to perform auto-grow of a data file, it auto-grows all of the files at the same time.			
Reference 1			
https://technet.microsoft.com/en-us/library/ms188396(v=sql.105).aspx			
Reference 2			

Issue: Max Degree Of Parallelism

Issue Type	Configuration	Issue Severity	Medium
Problem			
The Max Degree of Parallelism is a server wide configuration that by			
Recommendation			
The recommendation is to set the max degree of parallelism.			
Why			
When SQL Server runs on a computer with more than one processor or CPU, it detects the best degree of parallelism, that is the number of processors employed to run a single statement, for each query that has a parallel execution plan. You can use the max degree of parallelism option to limit the number of processors to use for parallel plan execution and to prevent run-away queries from impacting SQL Server performance by using all available CPUs.			
Reference 1			
https://msdn.microsoft.com/en-us/library/ms189094.aspx			
Reference 2			

Issue: Server authentication

Issue Type	Security	Issue Severity	Medium
Problem			
The sa account is a well-known SQL Server account and it is often targeted by malicious users. Do not enable the sa account unless your application requires it. It is very important that you use a strong password for the sa login.			
Recommendation			
The recommendation is to set it to Windows Authentication.			
Why			
When a user connects through a Windows user account, SQL Server validates the account name and password using the Windows principal token in the operating system. This means that the user identity is confirmed by Windows. SQL Server does not ask for the password, and does not perform the identity validation. Windows Authentication is the default authentication mode, and is much more secure than SQL Server Authentication. Windows Authentication uses Kerberos security protocol, provides password policy enforcement with regard to complexity validation for strong passwords, provides support for account lockout, and supports password expiration. A connection made using Windows Authentication is sometimes called a trusted connection, because SQL Server trusts the credentials provided by Windows. By using Windows Authentication, Windows groups can be created at the domain level, and a login can be created on SQL Server for the entire group. Managing access from at the domain level can simplify account administration.			
Reference 1			
https://msdn.microsoft.com/en-nz/library/ms188670.aspx			
Reference 2			
https://msdn.microsoft.com/en-us/library/ms144284.aspx			

Issue: Auto Create Statistics

Issue Type	Configuration	Issue Severity	High
Problem			
Recommendation			
The recommendation is to enable auto create statistics for database.			
Why			
Accurate statistics about the data held in tables are used to provide the best execution strategy for SQL queries. but if the statistics don't accurately reflect the current contents of the table you'll get a poorly-performing query. If you've set the option AUTO CREATE STATISTICS OFF and overlooked the task of creating statistics manually, the optimizer will suffer from missing statistics.			
Reference 1			
Reference 2			

Issue: Auto Shrink			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to disable auto shrink for database.			
Why			
One other common thing I see is to have auto-shrink set on for one or databases. This is bad for several reasons: - Shrink causes index fragmentation. - Although it doesn't have any effect like long-term blocking, it does take up a lot of resources, both IO and CPU. - Repeatedly shrinking and growing the data files will cause file-system level fragmentation, which can slow down performance			
Reference 1			
Reference 2			

Issue: Auto Update Statistics			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to enable auto update statistics for database.			
Why			
When data changes, SQL Server will automatically maintain the statistics on indexes that explicitly create, if that setting is enabled.			
Reference 1			

Reference 2

Issue: Compatibility Level			
Issue Type	Configuration	**Issue Severity**	High
Problem			
Recommendation			
The recommendation is to set the compatibility level. Same as version of SQL Server (10.5 or 11)			
Why			
Whenever you move to a newer version of SQL Server or upgrade an existing server to a newer version using either the backup & restore method or detach & attach method, the compatibility level of the individual databases on it do not automatically get upgraded as well. This means your databases will still act as though they are running on an earlier version of SQL Server. This is actually intentional as occasionally features and behaviors will change between versions so its better to give the final decision to upgrade a level or not. In reality this is not a major problem, but in the long run you will not be able to take advantage of newer features unless you upgrade your databases compatibly level to the current version.			
Reference 1			
Reference 2			

Issue: Blank SQL SA Password			
Issue Type	Security	**Issue Severity**	Medium
Problem			
The sa account is a well-known SQL Server account and it is often targeted by malicious users. Do not enable the sa account unless your application requires it. It is very important that you use a strong password for the sa login.			
Recommendation			
The recommendation is to set strong password for SA.			
Why			
While you install Microsoft SQL Server, if you choose the SQL Server and Windows mode option for Security Authentication, you receive a prompt in which you must enter a password for the system administrator (SA) account. If you install SQL Server with the Windows only mode option, and then you later change the Security Authentication to SQL Server and Windows mode, the SA password is left blank (NULL).			
Reference 1			
https://msdn.microsoft.com/en-nz/library/ms188670.aspx			
Reference 2			
https://msdn.microsoft.com/en-us/library/ms144284.aspx			

Issue: Memory - Max Memory			
Issue Type	Configuration	**Issue Severity**	Medium
Problem			

By default, SQL Server's max memory is 2147483647 – a heck of a lot more than you actually have. SQL Server will just keep using more and more memory until there's none left on the system. If the operating system has no memory available, it will start using the page file instead of RAM. Using the page file in place of memory will result in poor system performance – operations that should be fast and in memory will read and write to disk constantly.	
Recommendation	
The recommendation is to set min server memory and max server memory to span a range of memory values.	
Why	
Use min server memory to guarantee a minimum amount of memory available to the SQL Server Memory Manager for an instance of SQL Server. SQL Server will not immediately allocate the amount of memory specified in min server memory on startup. However, after memory usage has reached this value due to client load, SQL Server cannot free memory unless the value of min server memory is reduced.	
Reference 1	
https://msdn.microsoft.com/en-us/library/ms178067.aspx	
Reference 2	

Issue: Memory - Min Memory			
Issue Type	Configuration	**Issue Severity**	Medium
Problem			
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Reference 1			
https://msdn.microsoft.com/en-us/library/ms178067.aspx			
Reference 2			