

[Template] Targeted Database Migration Checklist: <client name>

1. Initial Audit

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A. Source Server - <hostname><IP>

I. SQL Server Level Settings

	Task	Pending	Notes
1	<input type="checkbox"/> If non-MI DBs exist, run by customer	<input type="checkbox"/>	
2	<input type="checkbox"/> If disabled jobs exist, run by customer	<input type="checkbox"/>	<div><pre>SELECT @@servername as ServerName, name as JobName, date_modified as LastModifiedDate FROM msdb.dbo.sysjobs WITH (NOLOCK) WHERE enabled = 0 ORDER BY name</pre></div>
3	<input type="checkbox"/> If processor affinity settings are vanilla, check-off 1B-II-2	<input type="checkbox"/>	
4	<input type="checkbox"/> If Dashboard objects do not exist, check-off section 2b	<input type="checkbox"/>	
5	<input type="checkbox"/> If non-MI SSIS & SSAS objects exist, run by customer	<input type="checkbox"/>	
6	<input type="checkbox"/> If IP and hostname will be changed post the migration, uncheck 2A-I-12 and 3-29	<input type="checkbox"/>	

II. DB Level Settings

	Task	Pending	Notes
1	<input type="checkbox"/> If [medical] does not "Auto Shrink", check-off "Day Of" Task #14	<input type="checkbox"/>	
2	<input type="checkbox"/> Ensure [medical_test] uses simple recovery with TLs shrunk	<input type="checkbox"/>	
3	<input type="checkbox"/> Ensure PAGE_VERIFY CHECKSUM is enabled < https://docs.microsoft.com/en-us/troubleshoot/sql/admin/troubleshoot-dbcc-errors#investigate-root-cause-for-database-consistency-errors >	<input type="checkbox"/>	

B. Target Server - <hostname><IP>

I. Windows Server Level Settings

	Task	Pending	Notes
1	<input type="checkbox"/> Ensure that the same services/programs exist (ex. SSIS, SSAS, SSDT for Visual Studio)	<input type="checkbox"/>	<p>Ensure that SQL Server Agent and SQL Server Browser has "automatic" startup type</p> <p>Here is a Microsoft KB for installing SSDT for Visual Studio:</p> <p>https://docs.microsoft.com/en-us/sql/ssdt/download-sql-server-data-tools-ssdt?view=sql-server-ver15</p> <p>Here is the download page for Visual Studio's "SSIS Projects" extension, which is also needed to configure the dtsx packages:</p> <p>https://marketplace.visualstudio.com/items?itemName=SSIS.SqlServerIntegrationServicesProjects</p> <p>Here is a Microsoft KB for installing SSIS:</p> <p>https://docs.microsoft.com/en-us/sql/integration-services/install-windows/install-integration-services?view=sql-server-ver15</p>
2	<input type="checkbox"/> Ensure that Windows has been activated	<input type="checkbox"/>	
3	<input type="checkbox"/> Run services in target with service acct as in source	<input type="checkbox"/>	<p>As reference, this article lists the permissions recommended by Microsoft:</p> <p>https://docs.microsoft.com/en-us/sql/database-engine/configure-windows/configure-windows-service-accounts-and-permissions?view=sql-server-ver15#Serv_Perm</p>
4	<input type="checkbox"/> Ensure that network protocols are same as source	<input type="checkbox"/>	If changes are made, restart the SQL Server service
5	<input type="checkbox"/> Confirm if server will be used for SQL Server only, or for the main app as well	<input type="checkbox"/>	
6	<input type="checkbox"/> Ensure enough memory, CPU, storage, & drives were provisioned. See if dedicated drives (not C:\) can be provided for both the data and backups.	<input type="checkbox"/>	<p>If changes are made, reconfigure SQL Server accordingly (ex. set default backup directory, or set max server memory)</p> <p>Note:</p> <ul style="list-style-type: none"> • If the server will be used for the main app as well, make sure it has enough space to house the MEDINFO folder as well. • If the server will be used for the main app, recommend that the drive names are the same
7	<input type="checkbox"/> Ensure firewall settings are same as source. If it is off in source but on in target, add inbound & outbound rules to open SQL Server ports (TCP 1433 & 1434, UDP 1434)	<input type="checkbox"/>	https://msdn.microsoft.com/en-us/library/cc646023.aspx

II. SQL Server Level Settings

	Task	Pending	Notes
1	<input type="checkbox"/> Verify MSSQL 2012+ with latest CU is installed	<input type="checkbox"/>	<p>https://docs.microsoft.com/en-us/sql/database-engine/install-windows/latest-updates-for-microsoft-sql-server?view=sql-server-ver15</p> <p>https://sqlserverbuilds.blogspot.com/</p>
2	<input type="checkbox"/> Ensure that processor affinity settings are the same as source	<input type="checkbox"/>	
3	<input type="checkbox"/> Ensure that mixed authentication is enabled	<input type="checkbox"/>	

2A. Prepwork

▼ [Click here to expand...](#)

I. SQL Server Level Settings

	Task	Pending	Notes
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1	<input type="checkbox"/> Copy latest full backup and create dummy DB(s). If non C:\ drives were provisioned in step 1B-I-6, configure instance DB directories accordingly first.	<input type="checkbox"/>	
2	<input type="checkbox"/> Recreate Logins and configure as in source	<input type="checkbox"/>	<p>Disable [sa] if [sa] is disabled in source</p> <pre>grant select, insert, update, delete to mwuser grant exec to mwuser</pre> <p>If creating Logins from scratch, create [usr] Login and tie with [mwuser] User</p>
3	<input type="checkbox"/> Recreate jobs (excluding Maintenance Plans), then disable them	<input type="checkbox"/>	<pre>USE MSDB; GO UPDATE MSDB.dbo.sysjobs SET Enabled = 0 WHERE Enabled = 1; GO</pre> <p>If creating jobs from scratch, here is the list of standard jobs:</p> <ol style="list-style-type: none"> 1. "job_cldictionary_archive" 2. "Cleanup CdsRsnRequests [medical]" (omit for v75) 3. "Appt Search Scrub Data/ Build Cache" (omit for v75) 4. "Dimrun Cutoff (month to date) [medical]" 5. "Dimrun Collections [Medical]" 6. "Import NC Files" (contingent on eRX module evaluation) 7. Patient Portal Job(s) (contingent on Patient Portal module evaluation)
4	<input type="checkbox"/> Recreate Maintenance Plans	<input type="checkbox"/>	<p>If creating Maintenance Plans from scratch, can use Ola Hallengren maintenance solutions.</p> <p>For reference, here is a sample schedule:</p> <ol style="list-style-type: none"> 1. Integrity check for user DBs every Sat at 2am 2. Integrity check for system DBs every Sat at 3am 3. Optimize index for [medical] every Sun at 2am 4. Full backup for [medical] every day at 10pm 5. Log backup for [medical] every hour of every day from 6am to 9pm 6. Cleanup command log every Sat at 12am 7. Cleanup output logs every Sun at 12am 8. Cleanup backup history every Sat at 1am 9. Cleanup job history every Sun at 1am
5	<input type="checkbox"/> Ensure server-level objects are same as source. If no proxy, check-off 2B-1	<input type="checkbox"/>	

6	<input type="checkbox"/> Enable "Optimize for Ad Hoc", "Compress Backup", "xp_cmdshell" settings. <input type="checkbox"/> If "Cost Threshold for Parallelism" is 5, set to 50. <input type="checkbox"/> Set MAXDOP to 8 or lower < https://littlekendra.com/2016/07/14/max-degree-of-parallelism-cost-threshold-for-parallelism/ > <input type="checkbox"/> Ensure instant file initialization (IFI) and Lock Pages in Memory (LPIM) are enabled	<input type="checkbox"/>	<pre> sp_configure 'show advanced options', 1 go reconfigure go sp_configure 'xp_cmdshell', 1 go reconfigure go </pre> <p><https://www.brentozar.com/blitz/instant-file-initialization/> <https://blog.sqlauthority.com/2019/09/16/sql-server-enable-lock-pages-in-memory-lpim/> </p>
7	<input type="checkbox"/> If Patient Portal exists, enable "Database Mail XPs"	<input type="checkbox"/>	
8	<input type="checkbox"/> Set Min Server Memory to 1 GB and Max Server Memory to 80% of server memory	<input type="checkbox"/>	
9	<input type="checkbox"/> Check for "orphaned" users. If none, check-off 3-12.	<input type="checkbox"/>	<pre> EXEC sp_change_users_login 'REPORT' Use [\$databaseName]; GO ALTER USER OrphanUser WITH LOGIN = correctedLoginName SELECT * FROM sys.objects WHERE schema_id = SCHEMA_ID('dbo') </pre>

10	<input type="checkbox"/> Setup and test "Import NC Files" job	<input type="checkbox"/>	<pre> begin tran select * from clparms as [a] where l=1 and a.code='erx' and a. skey='up' update clparms set ALPHA1='D: \MEDINFO\ERX' where l=1 and code='erx' and skey='up' update clparms set ALPHA3='D: \MEDINFO\' where l=1 and code='erx' and skey='up' select * from clparms as [a] where l=1 and a.code='erx' and a. skey='up' rollback tran --commit tran exec util_newcrop_import @filename='NCTSV-201907.EXE', @checkSyslog = 0, @debug = 1 -- using last month's file </pre>
11	<input type="checkbox"/> (Time permitting) Run DMA (Data Migration Assistant)	<input type="checkbox"/>	
12	<input checked="" type="checkbox"/> Note down which objects are configured using IP or hostname	<input type="checkbox"/>	
13	<input type="checkbox"/> Ensure there are 8 equally sized data files for tempdb. If there are less than 8 cores, create the same number for files as cores. If adding files, restart SQL Server. <input type="checkbox"/> If on 2014 and below, enable TF 1117 and 1118	<input type="checkbox"/>	https://wiki.galenhealthcare.com/index.php/Create_Multiple_TempDB_files_for_best_performance <pre> DBCC TRACEON(1117, -1); DBCC TRACEON(1118, -1); </pre>

II. 3rd Party Settings

	Task	Pending	Notes
1	<input type="checkbox"/> If Patient Portal exists, try configuring DB mail or reach out to Support	<input type="checkbox"/>	Confirm whether a maintenance splashscreen should be implemented
2	<input type="checkbox"/> Check if customer uses reporting platform requiring ODBC connection	<input type="checkbox"/>	
3	<input type="checkbox"/> If Interfaces exist, touch bases with Interface	<input type="checkbox"/>	
4	<input type="checkbox"/> If HDL exists, touch bases with HDL engineer	<input type="checkbox"/>	
5	<input type="checkbox"/> If Phone Tree exists, touch bases with Phone Tree engineer	<input type="checkbox"/>	

6	<input type="checkbox"/> If Provider Portal exists, ensure that connection to the new DB server is tested	<input type="checkbox"/>	Confirm whether a maintenance splashscreen should be implemented
7	<input type="checkbox"/> If Hef Exports exist, ensure Proxy, Credential, and export directory are copied over. Also, ensure that an engineer is assigned to re-install and test Box Sync post the migration.	<input type="checkbox"/>	

2B. Dashboard Tasks

☐ Premium Dashboard not used. Disregard section

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	Task	Pending	Notes
1	<input type="checkbox"/> Create SSIS proxy (if used)	<input type="checkbox"/>	
2	<input type="checkbox"/> Migrate SSAS DB(s)	<input type="checkbox"/>	
3	<input type="checkbox"/> Reconfigure, reimport, and test SSIS package(s)	<input type="checkbox"/>	Custom packages may require that certain directories be moved over

3. The Day Of

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	Task	Notes
1	<input type="checkbox"/> If Portal(s) exist, coordinate a time to implement splashscreen	
2	<input type="checkbox"/> Contact client 30 mins prior	
3	<input type="checkbox"/> At specified time, make sure Medinfo users are off	
4	<input type="checkbox"/> Disable jobs in source server and disable SQL Server Agent	<p>Note which jobs are disabled</p> <pre>USE MSDB; GO UPDATE MSDB.dbo.sysjobs SET Enabled = 0 WHERE Enabled = 1; GO</pre>

5	<input type="checkbox"/> Place DB(s) in “read-only” mode	<p>Use GUI if other users are connected</p> <pre>USE [master] GO ALTER DATABASE [dashboardDB] SET READ_ONLY WITH NO_WAIT GO</pre>
6	<input type="checkbox"/> Take “copy only” backup with “verify backup integrity”	
7	<input type="checkbox"/> Transfer backup(s) to new server	
8	<input type="checkbox"/> Drop “bogus” DB(s) in new server	
9	<input type="checkbox"/> Restore backup(s) to new instance	
10	<input type="checkbox"/> Set DB(s) from “read-only” to “read-write”	
11	<input type="checkbox"/> Check Login Permissions	<pre>grant select, insert, update, delete to mwuser grant exec to mwuser</pre>
12	<input type="checkbox"/> Check for "orphaned" users	<pre>EXEC sp_change_users_login 'REPORT' Use [\$databaseName]; GO ALTER USER OrphanUser WITH LOGIN = correctedLoginName SELECT * FROM sys.objects WHERE schema_id = SCHEMA_ID('dbo')</pre>
13	<input type="checkbox"/> Shrink logs (if autogrowth has kicked in)	
14	<input type="checkbox"/> Turn off auto shrink (if used)	

15	<input type="checkbox"/> Ensure that TL autogrowth settings are optimal	
16	<input type="checkbox"/> Setup and test "Import NC Files" job	<pre> begin tran select * from clparms as [a] where 1=1 and a. code='erx' and a.skey='up' update clparms set ALPHA1='D:\MEDINFO\ERX' where 1=1 and code='erx' and skey='up' update clparms set ALPHA3='D:\MEDINFO\' where 1=1 and code='erx' and skey='up' select * from clparms as [a] where 1=1 and a. code='erx' and a.skey='up' rollback tran --commit tran exec util_newcrop_import @filename='NCTSV- 201907.EXE', @checkSyslog = 0, @debug = 1 -- using last month's file </pre>
17	<input type="checkbox"/> Ensure server computer name has been renamed	<p>https://msdn.microsoft.com/en-us/library/ms143799.aspx</p> <p>Default Instance:</p> <pre> sp_dropserver <old_name>; GO sp_addserver <new_name>, local; GO </pre> <p>Named Instance:</p> <pre> sp_dropserver <old_name\instancename>; GO sp_addserver <new_name\instancename>, local; GO </pre> <p>Verify:</p> <pre> SELECT @@SERVERNAME AS 'Server Name'; </pre> <p>If changed, SQL Server will have to be restarted.</p>

18	<input type="checkbox"/> Point MI to new SQL Server, being sure to restart the Net Services and Redirector Service	<p>If MSETUP is using "sa", replace with "usr"</p> <p>If IP is being changed, make sure to use hostname instead</p>
19	<input type="checkbox"/> Conduct unit testing	<pre>select * from clmaster where pname='test' and account=</pre>
20	<input type="checkbox"/> Re-enable jobs and restart SQL Server Agent	<pre>USE MSDB; GO UPDATE MSDB.dbo.sysjobs SET Enabled = 1 WHERE Enabled = 0; GO</pre>
21	<input type="checkbox"/> Take full backup of [medical]	
22	<input type="checkbox"/> Set old DB(s) to offline (be sure that current Login's default DB is not [medical])	<pre>ALTER DATABASE <dbname> SET OFFLINE WITH ROLLBACK IMMEDIATE</pre>
23	<input type="checkbox"/> Run dbcc checkdb	<pre>dbcc checkdb('medical') WITH NO_INFOMSGS, ALL_ERRORMSGs</pre>
24	<input type="checkbox"/> Rebuild indexes	
25	<input type="checkbox"/> Review Error Logs and SQL Server Logs for any errors	
26	<input type="checkbox"/> Remove tmp backups in target and source	
27	<input type="checkbox"/> If Portal exist(s), have Portal engineer remove splashscreen(s) and possibly reconfigure the DB connection	
28	<input type="checkbox"/> Confirm with customer that migration has been completed	

29	<input checked="" type="checkbox"/> After IP and/or hostname is changed, reconfigure affected objects	
30	<input type="checkbox"/> Update SF connect info, SQL Server Version, & SQL DB Server Version	

4. Baselining and Performance Tuning

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Traditionally, this goes as follows:

- Change the Compatibility Level to the latest version
- Collect perfmon counters
- Generate a PAL report and analyze its results
- If any alarming patterns are found, a trace is run during those times to see if they are caused by slow performing queries.

When crossing the SQL Server 2014 threshold, however, Microsoft recommends the following:

- Keep the source Compatibility Level
- Enable Query Store to collect baseline data
- If using SSMS v18+, enable Query Tuning Assistant
- Change Compatibility Level to latest version
- Fix performance regressions with Automatic Plan Correction (SQL 2017+)

A. Collect PerfMon Counters

I. Setup

	Task	Pending	Notes																																				
1		<input type="checkbox"/>	<p>Recommended Settings:</p> <ul style="list-style-type: none"> • For name, use "SQL Server Collector" and select "Create manually (Advanced)" • Select "Create data logs" and only check "Performance counter" • For interval, use 30 seconds at most. Per Scott Whigham, 30 is generally good enough but Brent Ozar recommends going less possible • For the actual performance counters, add the following (selecting <All instances> whenever possible): <table> <thead> <tr> <th>Counter</th><th>Parent</th><th>Insta...</th><th>Computer</th></tr> </thead> <tbody> <tr> <td colspan="4">Memory</td></tr> <tr> <td>Available MBytes</td><td>---</td><td>---</td><td></td></tr> <tr> <td>Page Faults/sec</td><td>---</td><td>---</td><td></td></tr> <tr> <td colspan="4">Paging File</td></tr> <tr> <td>% Usage</td><td>---</td><td>*</td><td></td></tr> <tr> <td colspan="4">PhysicalDisk</td></tr> <tr> <td>% Disk Time</td><td>---</td><td>*</td><td></td></tr> <tr> <td>Avg. Disk Queue Length</td><td></td><td>*</td><td></td></tr> </tbody> </table>	Counter	Parent	Insta...	Computer	Memory				Available MBytes	---	---		Page Faults/sec	---	---		Paging File				% Usage	---	*		PhysicalDisk				% Disk Time	---	*		Avg. Disk Queue Length		*	
Counter	Parent	Insta...	Computer																																				
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PhysicalDisk																																							
% Disk Time	---	*																																					
Avg. Disk Queue Length		*																																					

☐ In "Performance Monitor", start a User Defined "Data Collector Set"

Avg. Disk Queue Length	---	↑
Avg. Disk sec/Read	---	*
Avg. Disk sec/Write	---	*
Current Disk Queue Le...	---	*
Disk Reads/sec	---	*
Disk Writes/sec	---	*

Processor

% Processor Time	---	*
------------------	-----	---

SQLServer:Buffer Manager

Page life expectancy	---	---
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SQLServer:General Statistics

User Connections	---	---
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SQLServer:Memory Manager

Memory Grants Pending	---	---
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SQLServer:SQL Statistics

Batch Requests/sec	---	---
SQL Compilations/sec	---	---
SQL Re-Compilations/...	---	---

System

Processor Queue Length	---	---
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- Use the default directory for saving the data (default is %systemdrive%\PerfLogs\Admin\SQL Server Collector)
- Select "Start this data collector set now" and click "Finish"

	Task	Pending	Notes
1	<input type="checkbox"/> Stop the Data Collector Set from part I and move the file to a computer with PAL installed < https://github.com/clinthuffman/PAL >	<input type="checkbox"/>	
2	<input type="checkbox"/> Generate a PAL report with the data collected	<input type="checkbox"/>	<p>Recommended Settings:</p> <ul style="list-style-type: none"> • Do not restrict to a time range • For the Threshold File, select the Title with the latest SQL Server version available • Under questions: <ul style="list-style-type: none"> • Note down the server's PhysicalMemory and OS <ul style="list-style-type: none"> • If server OS is newer than what's available, select "Windows Server" • For OLTPvsOLAP, this is usually "True" as [medical] is mostly written into and not used for data warehousing • For UsingInMem, this is usually "False" as we haven't used In-Memory tables for [medical] • If unsure, leave as default • For analysis interval, leave as AUTO • In the Execute tab, select "Execute as a low priority process"
3	<input type="checkbox"/> Analyze PAL report and document analysis results	<input type="checkbox"/>	<p>Sample Analysis:</p> <pre> # Memory - Not ideal that paging file has nontrivial usage, but still OK - Available MBytes - On average, there is at least 3 GB of memory available, so we should be fine (B.Ozar recommends > 1 GB) - Paging File % Usage - Avg of 27% and max of 48%, so a lot above what's recommended (B.Ozar recommends "0" or "1") # PhysicalDisk - OK - Read Latency Analysis - Averages for all drives are well under 100 milliseconds (B.Ozar recommendation) - On Mon morning (4/20 /2020) 4:21-10:53am, the C:\ drive spiked to 316 milliseconds - This seems to be a one- off - Write Latency Analysis - Averages for all drives are well under 100 milliseconds (B.Ozar </pre>

recommendation)
- No spikes over 100 milliseconds

Processor - OK

- % Processor Time
- The average utilization is well under 50%, but there are night spikes to around 80% (most likely due to jobs)

SQLServer:Buffer Manager - OK

- Page life expectancy
- While the average value is 321,829 seconds, it made a vertical drop to 15 on Sun night (4/19/2020)
* Probably caused by an index rebuild or by the VM
- Note: B.Ozar recommends at least 180 seconds, while sqlwatch recommends > 300

SQLServer:General Statistics - OK

- User Connections
- Number of user connections spike around noon time
* Max connections is 245

SQLServer:Memory Manager - OK

- Memory Grants Pending
- All zeroes, as recommended by B.Ozar

SQLServer:Batch Statistics - OK

- Re-Compilations/sec
- The ratio percentage of SQL Re-Compilations to SQL Compilations has an average of 0%

			<p>- On Fri (4/17/2020) before 5:28pm, this spiked to 9% (sqlwatch recommends < 10%) - This appears to be a one off</p> <p># System - OK</p> <p>- Processor Queue Length - It is on average below 10 threads per processor, which is acceptable</p>
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B. Update Compatibility Level with QTA

I. Creating baselines with old and new compatibility levels

	Task	Pending	Notes
1	<input type="checkbox"/> Start a "New Database Upgrade Session" by right-clicking the database in SSMS and going to "Tasks > Database Upgrade"	<input type="checkbox"/>	<p>Recommended Settings:</p> <ul style="list-style-type: none"> • Use 7 days for the workload duration, unless otherwise noted by the customer • Select the highest target compatibility lv possible • Check the current plan cache size using a query like: <pre>-- https://stevestedman.com/2012/08/tsql-to-determine-plan-cache-size/ select name, sum(pages_kb) /1024.0 MBUsed from sys.dm_os_memory_clerks where name = 'SQL Plans' group by name;</pre> <ul style="list-style-type: none"> • If the cache size is is <= 1024MB, use the Recommended settings • If more, select Current and manually set a Max Size greater than the cache size. Copy the recommended settings for everything else
2	<input type="checkbox"/> After the specified workload duration has passed, check "Done with workload run" (doing so will update the DB compatibility automatically)		

II. Performance tune regressed queries

	Task	Pending	Notes
1	<input type="checkbox"/> Once the workload duration has passed for the new compatibility lv, check "Done with workload run" and tune any regressed queries	<input type="checkbox"/>	<p>Recommended Settings:</p> <ul style="list-style-type: none"> • In the Analysis tab, select all tunable queries • In the Findings tab, only select queries with a positive % Change

Things to explore for improvement:

- Using SQLWATCH or another performanc reporting tool <<https://sqlwatch.io/>>
- Perfmon recommendations (counters to collect and expected numbers) from "SQL Server Query Performance Tuning" book