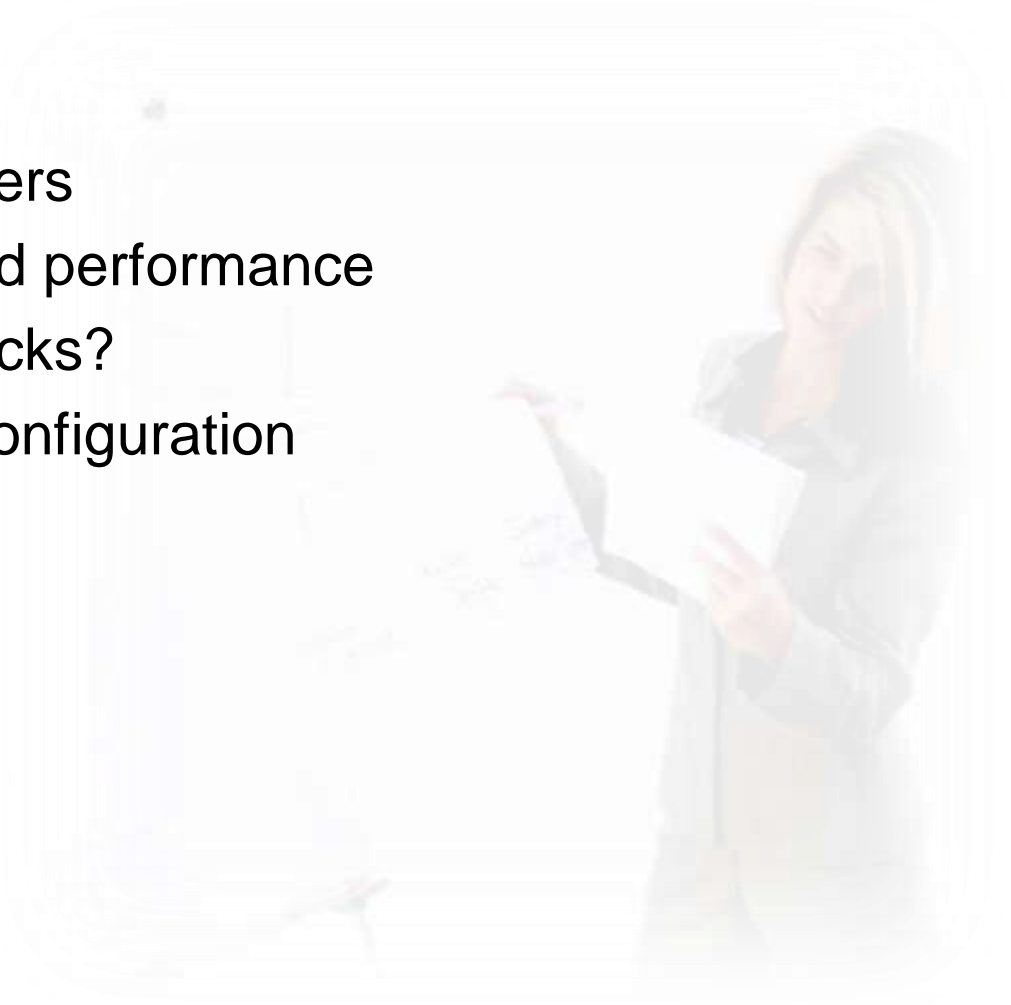


The 5-minute SQL Server Health Check

- Christian Bolton – Technical Director, Coeo Ltd.
- Kevin Kline – Technical Strategy Manager, Quest Software

Agenda

- Introducing your speakers
- Hardware utilization and performance
- Where are the bottlenecks?
- Database and server configuration
- Database maintenance
- Health check summary



Kevin Kline

- SQL Server Expert for Quest Software
- Former developer, DBA, and enterprise architect since '86
- Former president of PASS (www.sqlpass.org)
- Microsoft MVP since '04
- Author of *SQL in a Nutshell* and 8 other books
- Twitter **@kekline**
- Blogs at <http://sqlblog.com> and <http://KevinEKline.com>



Christian Bolton

- Technical Director of Coeo Ltd
- Microsoft Certified Architect (MCA), Master (MCM), and MVP for SQL Server
- Lead Author of Professional SQL Server 2008 Internals and Troubleshooting
- Twitter: **@christianbolton**
- Blogs at:
sqlblogcasts.com/blogs/christian



Hardware Utilization and Performance

Hardware utilization and performance

Memory

Storage

CPU

Hardware utilization and performance

Memory

Check the following perfmon counters:

- Memory/Available Mbytes
 - > 100
- SQLServer:Memory Manager/Target Server Memory
- SQLServer: Memory Manager/Total Server Memory
 - Should be close to Target SQL Server Memory
- Buffer Manager: Page Life Expectancy
 - > 300 seconds

Hardware utilization and performance

Storage

- Check the following perfmon counters:
 - Logical Disk: Avg. Disk sec/Read
 - Logical Disk: Avg. Disk sec/Write
- We want these to be <5ms on a transaction log drive and <10ms on a data file drive
- 10-20ms is generally acceptable
- >20ms is considered to be unacceptable

Hardware utilization and performance

Storage

- Check the file latency within SQL Server using
 - `sys.dm_io_virtual_file_stats (db_id,file_id)`

- Use this script to get the latency for each file:

```
select db_name(database_id),  
io_stall_read_ms/num_of_reads AS 'Disk Read Transfer/ms',  
io_stall_write_ms/num_of_writes AS 'Disk Write Transfer/ms'  
from sys.dm_io_virtual_file_stats (2,1)
```

	(No column name)	Disk Read Transfer/ms	Disk Write Transfer/ms
1	tempdb	1	1

Hardware utilization and performance

Storage

- RAID10 provides the best performance and availability
- Disk Sector Alignment can yield up to 40% improvement in some scenarios
 - Windows Server 2008 automatically implements sector alignment

Hardware utilization and performance

CPU

- Perfmon counters:
- %Privileged Time vs. %User Time
 - User Time should be > 70% of CPU usage
 - Low memory can increase Privilege Time
- Check Process:sqlservr %processor time
 - To see if SQL Server is the culprit
- However, I tend to use waits to diagnose SQL CPU issues....

Where are the Bottlenecks?

Where are the bottlenecks?

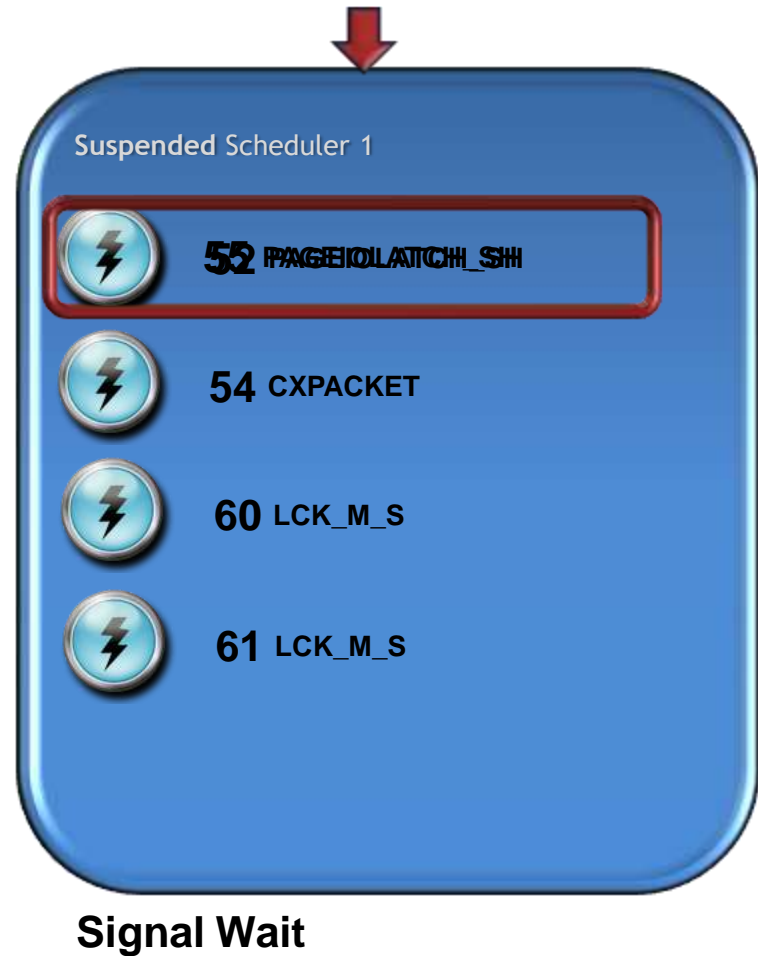
Using SQL Server waits

- Anytime a task in SQL Server is waiting for something
 - It is reported as a wait type
- SQL Server 2005 aggregates wait type information
- We can use it to see what the bottlenecks are on the server

SQL Server waits



SQL Server "wait"



Common wait types

PAGEIOLATCH_*

- Latch on a memory address while data is pulled from disk

OLEDB

- Wait on the OLEDB provider
 - Full-Text Search
 - Lots of linked servers

CXPACKET

- Query parallelism

Common wait types

SOS_SCHEDULER_YIELD

- Yielding processor time
- See signal wait

WRITELOG

- Writing transaction log to disk

LCK_M_*

- Waiting for a lock



Wait types to discount

WAITFOR

- T-SQL WAITFOR command

SQLTRACE_BUFFER_FLUSH

- Default trace

LAZYWRITER_SLEEP

- System process waiting to start

Other Interesting Wait Types

SLEEP_BPOOL_FLUSH

- Checkpoint I/O throttling

RESOURCE_SEMAPHORE_QUERY_COMPILE

- Throttling query compilations
 - Compilations, re-compilations, non-cacheable plans

RESOURCE_SEMAPHORE

- Waiting for a query memory grant

Dynamic management views

sys.dm_os_exec_requests

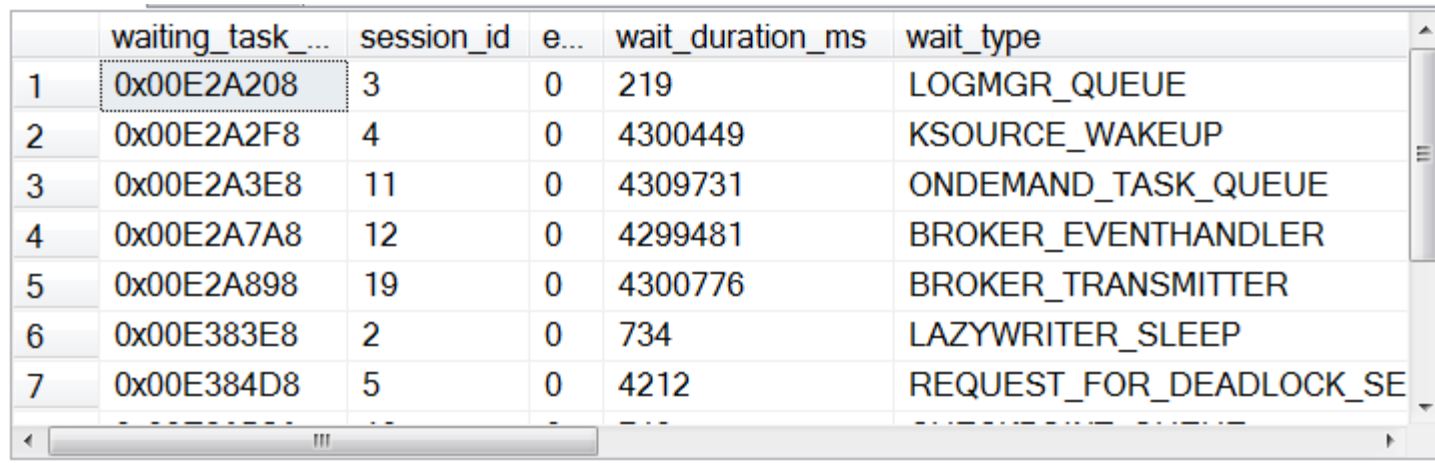
- Wait information
- Session level only
- Limited use for waits

	sessi...	start_time	status	command	sql_handle	stat...	sta...	plan_handle
14	17	2008-02-...	sleeping	TASK M...	NULL	NULL	NU...	NULL
15	18	2008-02-...	background	BRKR T...	NULL	NULL	NU...	NULL
16	19	2008-02-...	background	BRKR T...	NULL	NULL	NU...	NULL
17	20	2008-02-...	sleeping	TASK M...	NULL	NULL	NU...	NULL
18	21	2008-02-...	sleeping	TASK M...	NULL	NULL	NU...	NULL
19	55	2008-02-...	running	SELECT	0x02000...	0	-1	0x060001...
20	61	2008-02-...	running	SELECT	0x03000...	2462	2546	0x050005...

Dynamic management views

sys.dm_os_waiting_tasks

- Wait information
- Task level
- Very accurate
- Transient data



	waiting_task_...	session_id	e...	wait_duration_ms	wait_type
1	0x00E2A208	3	0	219	LOGMGR_QUEUE
2	0x00E2A2F8	4	0	4300449	KSOURCE_WAKEUP
3	0x00E2A3E8	11	0	4309731	ONDEMAND_TASK_QUEUE
4	0x00E2A7A8	12	0	4299481	BROKER_EVENTHANDLER
5	0x00E2A898	19	0	4300776	BROKER_TRANSMITTER
6	0x00E383E8	2	0	734	LAZYWRITER_SLEEP
7	0x00E384D8	5	0	4212	REQUEST_FOR_DEADLOCK_SE

sys.dm_os_waiting_tasks example

```
SELECT wt.waiting_task_address,  
       wt.session_id,  
       wt.wait_duration_ms,  
       wt.wait_type,  
       wt.blocking_session_id,  
       wt.resource_description,  
       [text],  
       query_plan  
FROM   sys.dm_os_waiting_tasks wt  
       INNER JOIN sys.dm_exec_requests er ON wt.session_id = er.session_id  
       CROSS APPLY sys.dm_exec_sql_text(sql_handle)  
       CROSS APPLY sys.dm_exec_query_plan(plan_handle)  
WHERE  wt.session_id > 50
```

address	session_id	wait_duration_ms	wait_type	blocking_session_id	resource_description	text	query_plan
058274C8	78	91	WAITFOR	NULL	NULL	create procedure sys.sp_replmonitorrefreshjob (@ite...	<ShowPlanXML>
0581D708	91	137	TRACEWRITE	NULL	NULL	create procedure sys.sp_trace_getdata (@traceid int, ...	<ShowPlanXML>
1A573948	233	2	PAGEIOLATCH_SH	NULL	10:1:5074477	CREATE FUNCTION [dbo].[udf_CalculateOrderValueGr...	<ShowPlanXML>
05809708	257	0	CXPACKET	257	exchangeEvent id=Port8...	CREATE PROCEDURE [dbo].[usp_MainMatrixStyleCol...	<ShowPlanXML>
07782088	257	1	CXPACKET	257	exchangeEvent id=Port8...	CREATE PROCEDURE [dbo].[usp_MainMatrixStyleCol...	<ShowPlanXML>
07782748	257	1	CXPACKET	NULL	exchangeEvent id=Port8...	CREATE PROCEDURE [dbo].[usp_MainMatrixStyleCol...	<ShowPlanXML>
E0D5C508	257	2	CXPACKET	257	exchangeEvent id=Port8...	CREATE PROCEDURE [dbo].[usp_MainMatrixStyleCol...	<ShowPlanXML>
0581DDC8	257	1	CXPACKET	257	exchangeEvent id=Port8...	CREATE PROCEDURE [dbo].[usp_MainMatrixStyleCol...	<ShowPlanXML>

Dynamic management views

sys.dm_os_wait_stats

- Wait information
- Cumulative by wait type
- Persistent data
- Transient data

	wait_type	waiting_tasks_count	wait_time_ms	max_wait_time_ms
1	LAZYWRITER_SLEEP	1467	1412932	1232
2	SQLTRACE_BUFFER_FLUSH	352	1406005	4056
3	CXPACKET	17884	388052	4492
4	WRITELOG	11577	180352	2106
5	PAGEIOLATCH_UP	5357	30981	764
6	SOS_SCHEDULER_YIELD	542099	11466	312
7	PAGEIOLATCH_SH	267	10374	93

SQL Server 2008

SQL Server 2005

- 230 wait types

SQL Server 2008

- 475 wait types
- PREEMPTIVE_*
- FT_*

Database and Server Configuration

Database and Server Configuration

Database Configuration – Autogrowth

- Can impact performance and introduce fragmentation
- Set fixed MB growth amounts
 - SQL Server can use Windows 2003 instant file initialization so large MB values are OK
 - If the service account isn't a local admin you need to assign it the 'Performance Volume Maintenance Tasks' security policy
 - However, it doesn't work for Transaction logs so be a bit more conservative
- Autogrowth is a last resort, size your database appropriately

Database and Server Configuration

Tempdb

- Size appropriately
 - Autogrown tempdb will reset after restart
- Move onto its own disk array
 - Set the size to fill 90% of the drive
 - Maybe overkill
 - Never need to autogrow
 - No performance disadvantage
 - Microsoft IT
 - 200GB drive
 - 180GB TempDB

Max Server Memory

- By default SQL engine will *not* acquire all requested memory upon startup
- Configure Max Server Memory
 - Leave some headroom for the OS and for memory requests outside the buffer pool

Option 1

- Run without max server mem
- Monitor at peak load
 - Memory Manager: Total Server memory (KB)
- Configure max server mem to peak figures

MAX Server Memory

Option 2

- Calculate worse case
- 2GB for the OS
- xGB for worker threads based on table below (2MB each on x64)
- 1GB for Multi-page allocations, linked servers etc
- 1-3GB for other applications

Number of CPU's	32-bit computer	64-bit computer
<= 4 processors	256	512
8 processors	288	576
16 processors	352	704
32 processors	480	960

Max Server Memory

Scenario

- 8 cores, 32GB RAM
- 2GB for the OS
- 1GB for worker threads
- 1GB for Multi-page allocations, linked servers etc
- 1GB for backup program
- = 5GB

- Max Server Memory to 27GB

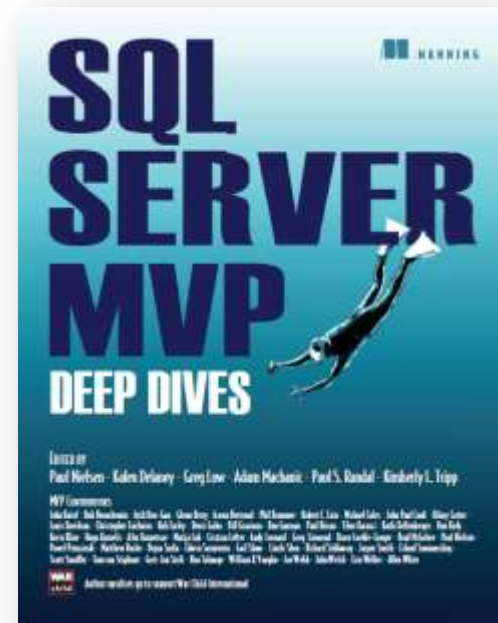
Database Maintenance

Database Maintenance

What should I be running?

- CHECKDB
- Index maintenance
 - Rebuild or Reorganize
- Statistics Maintenance
 - Auto-update statistics
 - Index rebuilds

Where to go next...



Health Check Summary

SUMMARY

- Check Memory, Disk, and then CPU
- Check waits to find bottlenecks
- Check database settings
- Check Max Server Memory setting
- Check database maintenance in place
- Deploy tools like PerfStats or the Quest tool set for further analysis

SQL Server Health Check with Quest Software

Solution Area	Product	Description
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Backup and Recovery

LiteSpeed[®]
for SQL Server

Fast, flexible backup and recovery with industry-leading compression technology



Performance Management

Spotlight[®] ENTERPRISE EDITION
on SQL Server
Foglight[®] Performance Analysis
for SQL Server

Discover and resolve performance issues in production before they impact end users and service levels



Capacity Management

Quest[®] Capacity Manager
for SQL Server

Gain control of disk space, growth rates and index maintenance



Development

Toad[®]
for SQL Server

Plan and develop applications that deliver both functionality and optimal performance



Administration

Toad[®]
for SQL Server

Comprehensive schema, object, security and change management



Community, Knowledge, Training

SQLServerPedia

Be part of the community and learn about SQL Server with Quest's free online resources

Online Resources



SQLServerPedia.com has over 25 top industry bloggers, wiki articles, book reviews, and free SQL Server training videos all accessible without registration.



SQLServer.Quest.com is our dedicated SQL Server community site with forums, downloadable add-ons and access to product managers & developers.



Quest.com/backstage is our “Backstage” area with all of our brochures, posters, and t-shirts, plus upcoming events like our Pain of the Week webcasts.