

# SQLskills Immersion Event IE2: Performance Tuning

**Microsoft PFE Immersion  
Reading, UK  
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**Course version: June 2012**



## Immersion Events IE1 & IE2

- IE1 – Internals and Performance
  - About solving problems through design, indexing and maintenance
  - Heavily tied to internals
  - Generally requires three things:
    - Know your data
    - Know your workload
    - Know how SQL Server works
- IE2 – Performance Tuning
  - About finding problems – understanding the MANY different angles from which you need look
  - No single topic will solve all of your problems
  - Some topics will be more immediately valuable
  - Over time, you'll probably tackle all of them...

## Instructors

- Why do we need multiple?
  - Different perspectives
  - Different areas of expertise
  - Different problem solving skillsets
  - No one knows everything...
- This class is about knowing:
  - Where to look
  - What tools are available
  - All sorts of tips/tricks/best practices along the way!

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- Writer/Editor for SQL Magazine [www.sqlmag.com](http://www.sqlmag.com)
- Author/Instructor for SQL Server Immersion Events
- Instructor for multiple rotations of both the SQL MCM & Sharepoint MCM
- Author/Manager of SQL Server 2005 Launch Content, co-author/Manager for SQL Server 2008 Jumpstart Content, Author/Speaker at TechEd, SQL Connections, SQLPASS, ITForum, Conference Co-chair for SQL Connections
- Author of several SQL Server Whitepapers on MSDN/TechNet: Partitioning, Snapshot Isolation, Manageability, SQLCLR for DBAs
- Author/Presenter for more than 25 online webcasts on MSDN and TechNet (two series and other individual webcasts)
- Co-author MSPress Title: SQL Server 2008 Internals, the SQL Server MVP Project (1 & 2), and SQL Server 2000 High Availability
- Presenter/Technical Manager for SQL Server HOL DVDs

**We love this stuff... feel free to ask questions!**

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## Author/Instructor: Paul S. Randal

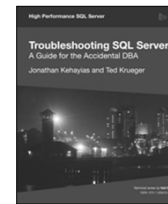


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- Course/exam author/instructor for MCM certifications (SQL & SharePoint)
- Contributing Editor of TechNet and SQL Server Magazines, author of the SQL Q&A columns, articles on DBA topics, multiple 2008 whitepapers
- 5 years at DEC responsible for the VMS file-system and check/repair
- Almost 9 years as developer/manager in the SQL Storage Engine team through August 2007, ultimately responsible for Core Storage Engine
  - Wrote DBCC component, other Storage Engine code, DBCC CHECKDB/repair for SQL 2005
- Regular presenter at worldwide TechEds, SQL PASS and other conferences on disaster recovery, HA, maintenance, and internals
- Wrote and presented SQL Server 2008 training for Microsoft
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- Microsoft Certified Master: SQL Server 2008
- SQL Server MVP since October 2008
- Author of Using Extended Events whitepaper on MSDN
- Developer Extended Events Manager SSMS Addin for SQL Server 2008 Open Source project on Codeplex
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- Microsoft Certified Master: SQL Server 2008 & 2005
- 14 years as a SQL professional, included 5+ years with Microsoft as a support engineer & consultant
- SQL MCM program manager from 2009 - 2011
- Author of *SQL Server 2008 Transact-SQL Recipes* (APress), *SQL Server 2005 T-SQL Recipes* (APress) and *SQL Server 2000 Fast Answers* (APress)
- Co-author of the SQL Server white papers, including "High Availability and Disaster Recovery for Microsoft's SAP Data Tier" and "SQL Server 2008 Failover Clustering" and technical reviewer for numerous other publications



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## M1: SQL Server IO – Storage Needs

- Files, filegroups, and physical DB layout
- Data: writing, logging, reading, restoring
- Always a special case: tempdb
- Basic monitoring

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## M2: IO for DBAs

- Defining storage terminology
  - IOPS, MB/sec, Latency
- Magnetic vs. Solid State Drives (SSDs)
- RAID configurations
- Mount points
- Partition alignment
- Testing with SQLIO and IOMeter
- Direct-attached storage
  - Traditional vs. PCI-Express drives

## M3: IO – SANs for DBAs

- SAN components
- Pathing/multi-pathing
- iSCSI vs. fiber channel (FC)
- Shared vs. dedicated arrays
- Cache (on the drives, SAN controller, RAID controller, and Windows)
- Clustering
- Appendix: snapshot backups (SAN, not SQL)

## M4: SQLOS

- Understanding Windows Scheduling
- Server hardware and NUMA
- The purpose of SQLOS
  - CPU Scheduling
  - Memory allocation
- Edge cases for tweaking
- DMV monitoring and troubleshooting (basics)

## M5: Waits and Queues

- Introduction
- Thread lifecycle
- DMVs
- Common wait types
- Demos

## M6: Extended Events

- Extended Events core concepts
- Execution lifecycle and dispatching
- DDL and event session basics
- Event targets
- Usage scenario demos
  
- Appendix

## M7: Query Plan Analysis

- Why look at query plans?
- How to capture query plans
- How to analyze query plans
- Understanding common operators
- Common query plan patterns to watch for and investigate further

## M8: CPU Performance Tuning

- Defining CPU performance issues
- SQL Server vs. external CPU issues
- Kernel vs. User time
- Where to find the SQL Server CPU consumers
- What to look for and how to remediate
- Controlling CPU with Resource Governor (overview and application)

## M9: Plan Cache & Index Analysis

- Part I: Understanding/Analyzing Plan Cache
- Part II: What's in the Plan Cache?
- Part III: Understanding/Optimizing Stored Procedures
- Part IV: A Cautionary Tale about Scalar Functions
- Part V: Index Analysis

## M10: Memory Performance Tuning

- How to identify memory issues
- Internal memory pressure
- External memory pressure
- Virtual address space issues
- Resource semaphores
- DBCC commands

## M11: Benchmarking/Baselining

- Benchmark vs. baseline
- Data collection methods and tools
  - This module will focus on the “how”
    - *The “what” (counters, statistics) are woven in with the prior modules on IO, CPU and Memory*
  - Performance Monitor
    - Collector Sets and Counter Logs
    - PAL Tool
  - SQL Trace data
    - Interoperability with Performance Monitor
  - Replay Markup Language Utilities (intro discussion)

## M12: Collecting Performance Data

- The Default Trace
- Reading trace data using T-SQL
- ReadTrace
- SQLDiag
- SQL Nexus
- Deadlock analysis
- SQL Server 2012 Extended Events UI
- Extended Events advanced troubleshooting

## Reference: Performance Problems Solved!

- Wrap-up
- Sample stories and problem solving strategies that worked!