

SQLskills Immersion Event

IEPTO1: Performance Tuning and Optimization

Module 0: Overview



SQLskills Immersion Event

- **Agenda (see inside front page)**
- **Monday: Modules 1-2-3**
 - Free evening
- **Tuesday: Modules 3-4-5**
 - Free evening
- **Wednesday: Modules 6-7**
 - Australian SQL Server User Group
 - <http://www.sqlserver.org.au/Events/ViewEvent.aspx?EventId=721>
- **Thursday: Modules 8-9**
 - Join us after class for an end-of-day wind-down with a glass of wine!
- **Friday: Modules 10-11**
 - 5:30pm – Class ends!

Exclusive Sponsor



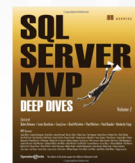
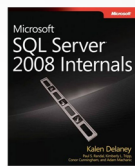
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Author/Instructor: Kimberly L. Tripp

- Consultant/Trainer/Speaker/Writer
- President/Founder, SYSolutions, Inc.
 - e-mail: Kimberly@SQLskills.com
 - blog: <http://www.SQLskills.com/blogs/Kimberly>
 - Twitter: @KimberlyLTripp
- Author/Instructor for SQL Server Immersion Events
- Instructor for multiple rotations of both the SQL MCM & Sharepoint MCM
- Author/Manager of SQL Server 2005 & 2008 Launch Content
- Author/Speaker at Microsoft TechEd, SQLPASS, ITForum, TechDays
- 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
- Author/Presenter for multiple online courses at Pluralsight
- Co-author MSPress Title: SQL Server 2008 Internals, the SQL Server MVP Project (1 & 2), and SQL Server 2000 High Availability
- Owner and Manager of the SQLIntersection conference

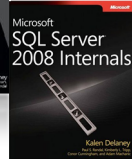
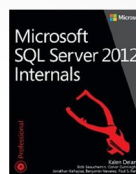


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Author/Instructor: Paul S. Randal

- Consultant/Trainer/Speaker/Author
- CEO, SQLskills.com
 - Email: Paul@SQLskills.com
 - Blog: <http://www.SQLskills.com/blogs/Paul>
 - Twitter: @PaulRandal
- Contributing Editor of TechNet Magazine, author of the SQL Q&A column, articles on DBA topics, multiple whitepapers for Microsoft
- 5 years at DEC responsible for the VMS file-system and chkdsk equivalent
- 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 conferences on HA/DR, administration, performance, and internals (#1 rated session and workshop at PASS Summit in 2013)
- Course author/instructor for Microsoft Certified Master qualifications
- Owner and Manager of the SQLIntersection conference
- (I also like diving, electronics, robotics, Arduino, books, sheep...)



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M1: Database Structures

- Records
- Pages
- Extents
- Allocation bitmaps
- IAM chains and allocation units
- Appendix: Rarely used structures: sparse columns and FILESTREAM

M2: Data File Internals/Maintenance

- Physical layout considerations
- Allocation algorithms
- Instant initialization
- Auto-grow
- To shrink or not to shrink?
- Data compression
- Tempdb

M3: Locking and Blocking

- The anatomy of a data modification
- Locking and blocking
 - Granularity
 - Escalation
 - Duration
- Troubleshooting locking behavior
 - Blocking situations
 - Detecting and avoiding
 - Deadlock situations
 - Detecting and avoiding

M4: Versioning

- Understanding isolation levels
- Isolation in SQL Server
 - By default, uses locking
 - Optionally, can use versioning (and locking)
- Controlling isolation levels
- Statement-level read consistency
- Transaction-level read consistency
- Overhead/Monitoring
- Isolation summary

M5: Logging, Recovery, and the Transaction Log

- Transaction log architecture
- Log records
- Checkpoints and recovery
- Transaction log operations
- Recovery models
- Log file provisioning and maintenance

M6: Index Internals

- Index concepts
- Table structure
- Index internals
 - Heaps
 - Why cluster
 - Table usage
 - Employee table case study
- Clustering key columns in nonclustered indexes
- Summary
 - What do we know?
 - What should we do?
 - Suggestions for the clustering key!

M7: Index Fragmentation

- Data access methods
- What is fragmentation?
- How does fragmentation happen?
- Detecting, mitigating, removing fragmentation

- 2010 PASS presentation on GUIDs
 - **Tales from the Trenches: GUIDs - Use, Abuse and How to Move Forward**
<https://passmedia.sqlpass.org/SummitOnDemand/2010/Top10/AD372S.wmv>

M8: Internals and Data Access

- Data access patterns
- Covering
 - Understanding selectivity
 - Understanding the “tipping point”
- What methods exist for covering?
 - Nonclustered indexes (all releases)
 - Using indexed views (SQL Server 2000+)
 - Using INCLUDE (SQL Server 2005+)
 - Using filtered indexes (SQL Server 2008+)
 - Using filtered statistics (SQL Server 2008+)
- Too many cooks in the kitchen...
- Index consolidation

M9: Statistics – Internals and Updates

- Cost-based optimization
- Data access patterns
- Statistics
 - What do they look like?
 - What are they telling us?
 - How do you see them
 - When/how do they get created
 - When/how do they get updated
- Additional resources

M10: Cardinality Estimation Issues

- Selectivity and estimates
- Query complexity
- Estimates from statistics
 - Sampling
 - The histogram
 - Filtered statistics
 - Uneven distribution
- Changes to cardinality estimation in SQL Server 2014

M11: Indexing Strategies

- Indexing for performance
- Indexing for AND
- Indexing for OR
- Indexing for joins
- Indexing for aggregates
- Indexed views (for aggregates)

Appendix: Database Development & Design

- Whose Job Is It?
- Resources
 - Pluralsight: SQL Server: Why Physical Database Design Matters
 - Author/Presenter: Kimberly L. Tripp, SQLskills.com
 - <http://pluralsight.com/training/Courses/Description/sqlserver-why-physical-db-design-matters>
 - Pluralsight: Developing and Deploying SQL Server ISV Applications
 - Author/Presenter: Erin Stellato, SQLskills.com
 - <http://pluralsight.com/training/Courses/Description/sqlserver-developing-deploying-supporting-isv-applications>
- Things to consider
 - Data type best practices
 - Understanding row width (vertical partitioning)
 - Application inconsistencies in types
 - The cost of poor design

Introductions

- **Name**
- **Company name**
- **Where you're based geographically**
- **The job role that describes you best:**
 - Database Administrator
 - Database Developer
 - Database Architect
 - Jack of all trades?
- **What version you focus on most**
- **What versions you support**
 - Don't be shy, you're not the only one that has SQL Server 2000 😊