

SQLskills Immersion Event

IEPTO1: Performance Tuning and Optimization

Module 0: Overview



Daily Course Format: Mon, Tue, Wed, Th, and Fri

- **Class runs for TEN half days**
 - Monday, October 5 through Friday, October 9, 2020
 - **AND**, Monday, October 12 through Friday, October 16, 2020
- **Each day**
 - Lecture: 90 minutes from 9am until 10:30am PT
 - Please use "CHAT" for questions **during** the lecture
 - Open Q&A: 30 minutes from 10:30am until 11:00am PT
 - Will address unanswered questions from chat
 - Mandatory break: 30 minutes from 11:00am until 11:30am PT
 - Everyone needs a bit of a break!
 - Lecture: 90 minutes from 11:30am until 1:00pm PT
 - Please use "CHAT" for questions **during** the lecture
 - Open Q&A: up to 60 minutes from 1:00pm until 2:00pm PT
 - Will address unanswered questions from chat
 - Can open up for "open mic" questions

**Time
Conversions**
9:00am PT
= Noon ET
= 4:00pm UTC
Use this to see the
exact time in YOUR
time zone:
[IEPTO1](#)



Class Format: No LABS???

- **Class time – lecture / demo / questions! And, please [ASK questions!](#)**
 - There are no stupid questions... everyone started with ZERO knowledge about SQL Server!
 - If you're thinking it – you're probably not alone... speak up!
- **Why not lab time?**
 - Historically folks defer on labs to respond to email, etc.
⇒ losing valuable class time
 - We can spend more time on content
⇒ covering both MORE content and in more depth!
 - You receive all of the demo code and samples; you can reproduce everything we show you and pick where to really focus your attention!
 - You can take time to really study the content that's most appropriate to you
 - You can skip content that's not appropriate
 - You can take the RIGHT time for each/every exercise (rather than some being done quickly and others needing more time... potentially getting frustrated without enough time)

Course Resources, Pluralsight Access, and Alumni

- **Paul (paul@sqlskills.com) will send you an email for a FREE 30-day access to ALL SQLskills online training classes on Pluralsight**
 - No strings attached, no credit-card required
 - If you don't receive it, send mail to Paul
- **Course resources will be sent upon course completion**
- **We may want to update a slide or two, add some notes/resources based on questions and discussions, and process the recordings**
 - Please do not distribute; this is for course attendees only
 - Full details / access information will be sent upon course completion
- **Email us: Training@SQLskills.com if you have any problems finding or accessing any of your course materials**
- **And, now that you've attended one of our courses; you can ALWAYS register using the 'alumnus' discount (without quotes); we hope to see you again!**



Course Resources

- **Course content (this slide deck)**
 - One “two-slides per side” PDF for optimal printing (save some trees!)
 - One “full slide” PDF for optimal viewing and/or online note-taking
- **Demos**
 - All instructor-led demo scripts
 - All reference scripts
- **Reference links and additional resources**
- **Online recordings for these sessions**
- **Upon completion look for a “BadgeMe” email**



Please do not redistribute: These resources are for attendees only.
Please respect our IP and time in creating these resources
and do not share/forward.



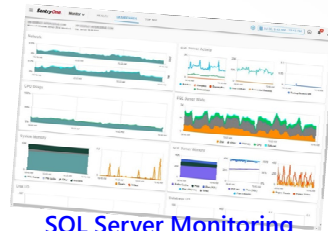
5

© SQLskills, All rights reserved.
<https://www.SQLskills.com>

Recommendation: Leverage Great Products!

SentryOne™

- Even with as much training as we will provide, you can't know everything
- SQL Server is powerful, complex, and has lots of different potential issues let third party software help!
- SQLskills partners with SentryOne because we really feel they've made the best suite of SQL Server products available
- **LEARN MORE:** Join Andy Yun, Principal Solutions Engineer from SentryOne on Monday, October 19, at 10:00am PT
 - **Going Beyond Just Monitoring With SentryOne**
 - <https://global.gotomeeting.com/join/232239365>
 - Attendees of the GoToMeeting will EACH receive:
 - SQL Sentry Premium subscription license (6 months)
 - Raffle for additional SentryOne gift pack
 - Plus, get your questions answered!
 - Email Andy your specific monitoring questions
 - MailTo: ayun@sentryone.com



[SQL Server Monitoring](#)



6

© SQLskills, All rights reserved.
<https://www.SQLskills.com>



Kimberly L. Tripp
Founder / President, SQLskills

✉ Kimberly@SQLskills.com
 🐦 [@KimberlyLTripp](https://twitter.com/KimberlyLTripp)
 🌐 www.sqlskills.com/blogs/Kimberly













Consultant / Trainer / Speaker / Writer

- Author / instructor for SQL Server Immersion Events: IEPTO1, IEPTO2, and IEHADR
- Author / presenter for Pluralsight
- Instructor and exam author for SQL Server and Sharepoint MCMS
- Author / manager of SQL Server 2005 and 2008 Launch Content
- Author / speaker at Microsoft TechEd, SQLPASS, ITForum, TechDays, and SQLIntersection
- Author of SQL Server Whitepapers on MSDN/TechNet: Partitioning, Snapshot Isolation, Manageability, SQLCLR for DBAs
- Author / presenter for MSDN and TechNet (25+)
- Instructor / SME for Microsoft University

Data Platform MVP

- 17 years: 2002-2019

When I'm not working with SQL

- Traveler/adventurer and avid diver / photographer: www.BlueWaterImages.com
- @KimberlyLTripp on Insta



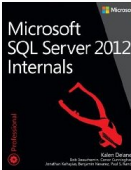
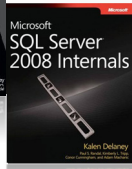








7

© SQLskills, All rights reserved.
<https://www.SQLskills.com>

**Author/Instructor:
Paul S. Randal**

- Consultant/Trainer/Speaker/Author
- CEO, SQLskills.com
 - Email: Paul@SQLskills.com
 - Blog: <https://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 sessions at multiple PASS Summits)
- Course author/instructor for Microsoft Certified Master qualifications
- Owner and Manager of the SQLIntersection conference
- (I also like diving, electronics, robotics, Arduino, books, sheep...)


8

© SQLskills, All rights reserved.
<https://www.SQLskills.com>

M1: Database Structures

- Records
- Pages
- Extents
- Allocation bitmaps
- IAM chains and allocation units

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
- Indexing for Performance
 - What do we know?
 - What should we do?
 - Suggestions for the clustering key!

M7: Index Fragmentation

- Data access methods
- What is index fragmentation?
- How does index fragmentation happen?
- Detecting index fragmentation
- Avoiding index fragmentation
- Removing index fragmentation

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: Indexing Strategies

- **Indexing for performance**
 - Design strategies
 - Overall strategies
- **Using the tools for tuning**
 - SET STATISTICS IO ON
 - Showplan
 - Missing indexes
- **Indexing for AND**
- **Indexing for OR**
- **Indexing for joins**
- **Indexing for aggregates**
- **Indexed views vs. columnstore indexes**
- **Rowstore indexes vs. columnstore indexes**

M11: Cardinality Estimation Issues

- Selectivity and estimates
- Query complexity
- Estimates from statistics
 - Sampling
 - The histogram
 - Filtered statistics
 - Uneven distribution
- Migrations / Upgrades / Regressions
- Appendix: Changes to Cardinality Estimation (CE) in SQL 2014

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