Europe's Premier Community SQL Server Conference

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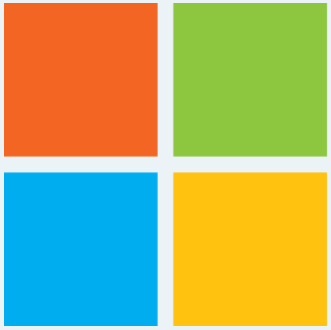

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Please visit our Gold Sponsor stands,

we couldn't do it without you…

Silver, Bronze and Exhibitors

All of you…

Fusion IO Lounge

- Don’t forget to check out the Fusion IO Lounge
- Find out about SQL Relay, SQL Saturdays, Pass and the User Groups in your area!

Housekeeping

- Health and Safety
  - If there is a fire alarm today, make your way outside to the meeting point in the main car park
  - There is no fire drill today
- Breaks
  - A.M. - 10:30, 11:50
  - Lunch - 13:00-13:40
  - P.M. - 15:50
  - Sponsor Prize Giving Exhibition Hall – 17:15
- Smoking
  - Don’t do it mate - it’s not worth it…
- Prayer Room – ask at the Hotel reception

Internet and Guide Book

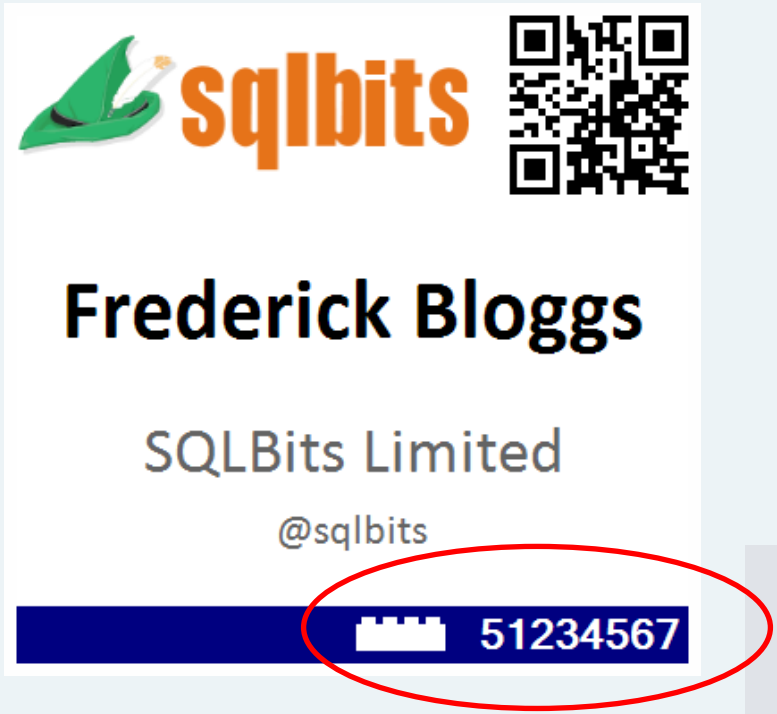
Wi-Fi – The details are as follows:

- Connect to ‘Venues Wi-Fi’
- Open the web browser
- Enter your email and password: **venues**
- Click to accept the terms and conditions
- Click on FREE Wi-Fi icon

Guide Book

Use the iPad app or browse
http://m.guidebook.com/g/sqlbits11

Fusion IO Lego Draw



Fusion IO will be drawing numbers at random throughout the day and tweeting the winners of their Lego IO drive competition

Microsoft® SQL Server® 2012

Enjoy SQLBits 11

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sql bits
Data Loading @ Warp Speeds
Ami Levin
MVP
Microsoft
Most Valuable
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SolidQ
Think Big. Move Fast.

SolidQ Optimization Course

Architecture
CPU
Memory
Files and File Groups
Disk Subsystem
Physical Architecture
Storage Internals
Transaction Log
TempDB
Performance tuning tools
Concurrency
Locking
Data Types
Statistics
Indexing
Execution plans
Poor coding Practices
Plan Guides
Query Hints
UDFs
Computed Columns
Partitioning
Optimizing Data Loading
Database Maintenance

Agenda

- **Minimally logged operations**
- Bulk load mechanisms
- Common scenarios
- Optimizing bulk load performance
- Future technologies

Bob Needs to Import Data

Recovery Models

- FULL
  - Requires log backups
  - No work is lost due to a lost or damaged **data** file
  - Can recover to an arbitrary point in time
- SIMPLE
  - No log backups
  - Automatically reclaims log space
  - Changes since the most recent backup are unprotected

Recovery Models

- BULK LOGGED
  - An adjunct of the full recovery model that permits high-performance bulk copy operations
  - Requires log backups
  - Reduces log space usage by using minimal logging for most bulk operations
  - Point-in-time recovery is not supported
  - Designed as a temporary mode for loading

Minimally Logged Operations

- Keeps track of extent allocations and metadata changes
- An operation can be a bulk load operation without being minimally logged
- A minimally logged operation can participate in a transaction

Metadata Only Operations

- DROP TABLE
  - Check dependencies first
- TRUNCATE TABLE
  - Only when not referenced by FK
  - No support for partition level
- INDEX DROP / CREATE / REBUILD
- SWITCH Partition
  - After the data is already loaded into a staging table

Bob Uses BULK LOGGED

Trace Flag 610

- By default, only loading of empty heaps can be minimally logged
- TF 610 Allows minimally logged inserts into indexed tables
  - Only for newly allocated pages
  - Causes very large writes on commit
    - Large buffer pools
    - Large transactions
  - Designed to save log writes
    - Not to improve INSERT performance

Bob Uses Trace Flag 610

Minimal Logging Conditions

Table Indexes	Rows	Hints	W/O TF 610	With TF 610	Parallel
Heap	Any	TABLOCK	Minimal	Minimal	Yes
Heap	Any	None	Full	Full	Yes
Heap + NC Index	Any	TABLOCK	Full	Depends (3)	No
Clustered	Empty	TABLOCK, ORDER (1)	Minimal	Minimal	No
Clustered	Empty	None	Full	Minimal	Yes (2)
Clustered	Any	None	Full	Minimal	Yes (2)
Clustered	Any	TABLOCK	Full	Minimal	No
Clustered + NC Index	Any	None	Full	Depends (3)	Yes (2)
Clustered + NC Index	Any	TABLOCK	Full	Depends (3)	No

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- **Bulk load mechanisms**
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Bulk Load Mechanisms

- SSIS data destinations
- BCP
- BULK INSERT
- INSERT ... SELECT
- SELECT INTO
- Also
  - WRITE clause, WRITETEXT/UPDATETEXT
  - MERGE
  - Index operations

Bulk Load Mechanism

	SSIS Destination		BULK INSERT	BCP	INSERT … SELECT
	SQL	OLE DB			
Protocol	Shared Memory	TCP/IP Named Pipes	In Memory	TCP/IP Shared Memory Named Pipes	In Memory
Data Source	Any	Any	Data File Only	Data File Only	Any OLE DB
Bulk API Support	Not Native	Not ORDER Not Native	All	All	No Hints Allowed
Lock on heap TABLOCK	BU	BU	BU	BU	X
Transform in transit	Yes	Yes	No	No	Yes
I/O Read block	Depends(3)	Depends(3)	64 KB	64 KB	Up to 512 KB

Bob Uses Bulk Insert

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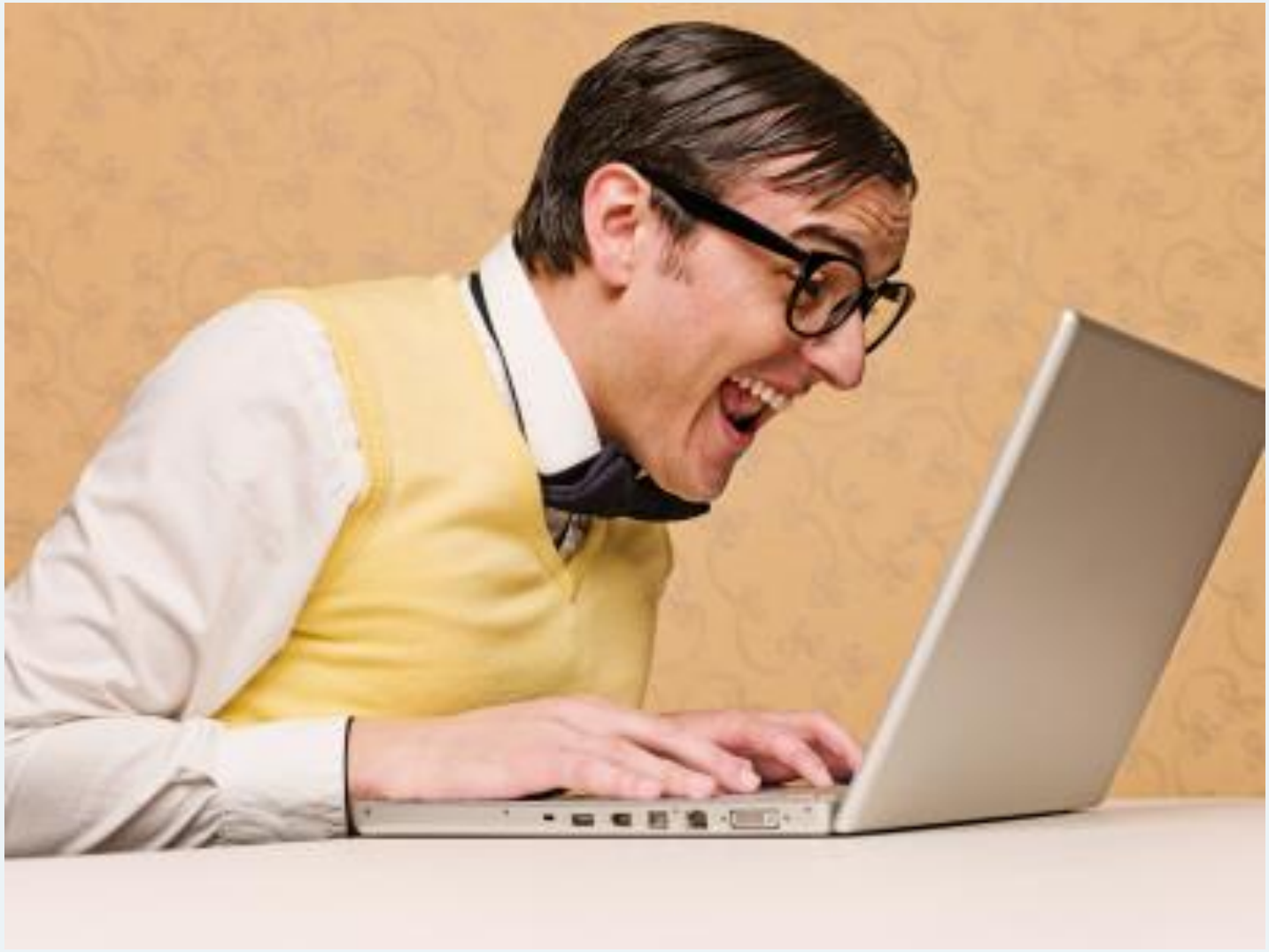
Empty, Non-partitioned Table

- Drop or disable indexes
- Source data in SQL Server
  - SELECT INTO / INSERT SELECT
- Source data outside instance
  - BCP / BULK INSERT / INSERT SELECT or SSIS
- Parallel loading with BU locks *(TABLOCK hint)*
  - Only with BCP / BULK INSERT and SSIS

Bob Loads an Empty Heap



Loading Pre-sorted Data

- Use ORDER hint to eliminate sorting when inserting sorted input data into a clustered table
- For non empty tables, requires TF 610 and BATCHSIZE = 0
- Use both TABLOCK and ORDER
  - Hinders parallel loading
- You can use an empty staging table for initial load and then INSERT SELECT

Bob Loads an Empty Cluster

Non-partitioned Table with Data

- Consider dropping indexes
  - May be required for concurrent activity
  - Indexed tables do not support BU locks
  - Experiment with BATCHSIZE
    - Avoid lock escalation!
- Try to use non overlapping input streams
  - Avoid blocking
- Use TF 610

Loading a Partitioned Table

- Use multiple parallel loads into multiple staging tables and then switch in
  1. Create empty staging tables
  2. Apply bulk load optimization on each staging table
  3. Switch back in to main table
  4. Clean up staging tables
- Switch out if you need to load a partition with data

Delete A Table or a Partition

- Delete entire table
  - Remove all referencing FK and TRUNCATE
  - Remove all dependencies and DROP
- Delete partition
  - Create a temporary staging table with the same schema and indexes
  - Switch out from main table
  - DROP or TRUNCATE

Deleting Many Rows

1. Create a temporary staging table as a schema copy of the main table
2. Bulk load the rows you want to keep into the temporary partition
3. Switch out and truncate the old data
4. Rebuild indexes and switch back into main table
5. Drop the temporary table

Agenda

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- Bulk load mechanisms
- Common scenarios
- **Optimizing load performance**
- Future technologies

Rules of Thumb

- Make sure minimal logging is utilized
- Take advantage of ordered loading
  - Remember collation order
- Drop, disable or bypass triggers
- Drop, disable or bypass constraints
  - Remember to validate constraints after the load ends or they remain untrusted
- Use native format when possible
  - Be very careful with potential conversions

Concurrent Activity Isolation

- NOLOCK or READ UNCOMMITTED is commonly used for queries running against tables being loaded or modified
  - Potential for wrong results - very risky
- RCSI can be used but…
  - Database setting - impacts entire workload
  - TempDB overhead for UPDATE / DELETE
- However, both may be blocked
  - Must eliminate the TABLOCK hint

Parallelizing Loads

- Client loader is sometimes the bottleneck
- Partition the input and use parallel threads or multiple client machines
  - 1 process per available CPU
  - Monitor PFS contention
- Partition the data to even segments to maximize parallelism benefit
- Split the load into batches
- Recreate indexes in parallel

Scheduler Contention

- SOS_SCHEDULER_YIELD wait type may indicate that concurrent loaders were assigned to the same core
- Configure soft-NUMA with 1 node per CPU and use different TCP port numbers to control assignment of loader to scheduler *(requires instance restart)*
- In SQL 2012, use Resource Governor with the AFFINITY resource pool option

Maximize T-Log Throughput

- Avoid physically shared resources
- Normally, T-Log activity is sequential
  - Optimize RAID for sequential access
- Staging tables can be created in a separate database
  - Log can be put on a dedicated physical drive or array
- Optimize recovery interval which controls the frequency of checkpoints

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Parallel Data Warehouse

- Appliance with a “special” SQL Server
- Massive parallel processing (MPP)
- xVelocity updateable columnstore indexes
- Big data integration (polybase)
- Straight forward easy scale out

Hekaton

- Announced at PASS summit 2012
- In-memory transactional engine
- Integrated into SQL Server engine
- Lock and latch free optimistic MVCC
- Precompiled execution modules
- Much more I can’t discuss yet…
- Planned for next major release

Resources

- http://technet.microsoft.com/en-us/library/dd425070.aspx
- http://technet.microsoft.com/en-us/library/cc966380.aspx
- http://msdn.microsoft.com/en-us/library/ms190692.aspx
- http://msdn.microsoft.com/en-us/library/ms177445.aspx
- http://msdn.microsoft.com/en-us/library/ms190421.aspx
- http://msdn.microsoft.com/en-us/library/ms188267.aspx
- http://msdn.microsoft.com/en-us/library/ms130771.aspx
- http://blogs.msdn.com/b/sqlcat/archive/2006/05/19/602142.aspx
- http://sqlblog.com/blogs/linchi_shea/archive/2007/08/23/performance-impact-finding-the-most-optimal-batch-size.aspx
- http://www.technologyfirst.org/magazine-articles/44-december-2008/312-sql-server-bulk-import-optimization.html
- http://sqlcat.com/sqlcat/b/technicalnotes/archive/2008/12/09/diagnosing-transaction-log-performance-issues-and-limits-of-the-log-manager.aspx

Coming up…

Speaker	Title	Room
Leonard Lobel	Geospatial Data Types in SQL Server 2012	Theatre
Mark Stacey	Analysis Services for the DBA	Exhibition B
Dennis Lloyd Jr	Thwarting Database Defects	Suite 3
Dmytro Andriychenko	Kerberos for SQL Server and SharePoint the easy way	Suite 1
Justin Langford	Using Windows Azure to provide SQL Server Disaster Recovery	Suite 2
Dave Ballantyne	Estimation, Statistics and “Oh My!”	Suite 4

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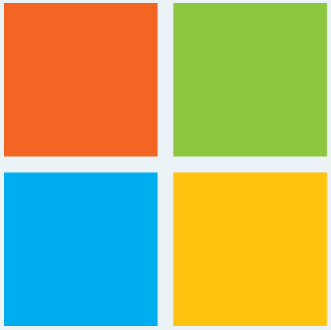

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After…

Sponsor Competition Draws in the Exhibition Hall 17:15

Community Events

SQL Saturday Edinburgh	7/8 June	www.sqlsaturday.com/202/
SQL Relay	17/27 June	www.sqlrelay.co.uk
SQL Saturday Dublin	21/22 June	www.sqlsaturday.com/229/
SQL Saturday Cambridge	27 September	www.sqlsaturday.com/228/
UK User Groups	All the time	www.sqlserverfaq.com

Feedback

- Please complete feedback

- http://sqlbits.com/SQLBitsXIThursday
- http://sqlbits.com/SQLBitsXIFriday
- http://sqlbits.com/SQLBitsXISaturday
- http://sqlbits.com/SQLBitsXI (General feedback)

We hope you had a great conference day!

Keep checking www.sqlbits.com for slides, videos and news of the next conference

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That's all Folks!