

The dangerous Beauty of Bookmark Lookups



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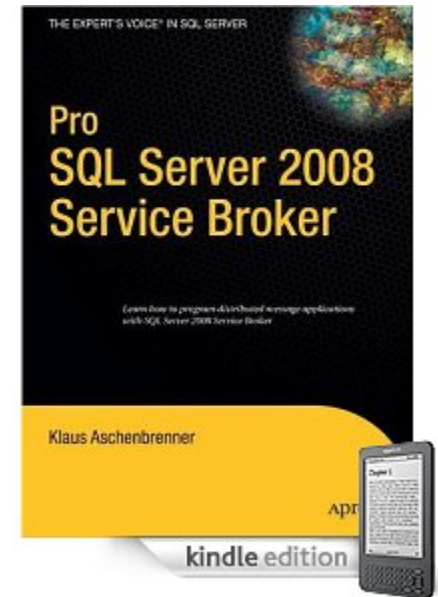
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About me

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Agenda

- Bookmark Lookups
- Tipping Point
- Parameter Sniffing/Statistics
- Deadlocks

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- **Bookmark Lookups**
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Bookmark Lookup

- Occurs when query is not satisfied by a Covering Index
 - Base table must be touched
 - Index Page + Data Page access occurs
- 2 kinds of Bookmark Lookup
 - Clustered Key Lookup (Clustered Table)
 - RID Lookup (Heap Table)

Covering Index

- Non-Clustered Index that satisfies a complete query
 - Without touching the base table
 - No access to the data page containing the data
- The following referred columns must be present in the Non-Clustered index
 - SELECT
 - WHERE
- Otherwise
 - Traditional „Bookmark Lookup“

INCLUDE Property

- Includes columns in the leaf-pages of the index
- Columns are not included in the navigation hierarchy
- Navigation hierarchy is very small
- Benefits
 - More elegant covering index
 - More than 900 bytes per index possible
 - More than 16 columns per index possible

Demo

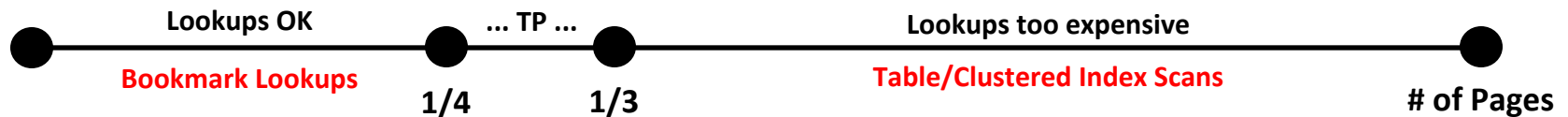
Bookmark Lookups

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Tipping Point

- Defines whether to do a Bookmark Lookup or a Table/Clustered Index Scan
- Bookmark Lookups are only done when the Non-Clustered Index is selective enough
- Covering Index will not have a Tipping Point



Tipping Point Sample

- 80.000 records per 4.000 bytes
 - 12,5% - 16,7% records
- 80.000 records per 400 bytes
 - 1,25% - 1,67% records
- 80.000 records per 40 bytes
 - 0,125% - 0,167% records
- Doesn't depend on the number of records
- Depends on the size of the records!!!

Demo

Tipping Point

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Parameter Sniffing

- SQL Server compiles Stored Procedures
 - On their first use
 - Considers input parameters for generating an Execution Plans
 - Execution Plans are cached for further usage
- Different Values
 - Compiled Value
 - Runtime Value

Problems

- Sub-optimal Execution Plans
- High I/O
 - Because of inappropriate Index Usage
 - Leads to bad performance
- Resolutions
 - Query Hints
 - Don't consider input parameters
 - „Override“ SQL Servers behaviour

Query Hints

- RECOMPILE
 - Stored Procedure Level
 - Statement Level
 - Performs better
 - Leads to better Execution Plans
- OPTIMIZE query hint
 - For specific values
 - FOR UNKNOWN
 - Density Vector of the underlying Statistics object is used
 - Only SQL Server 2008 onwards
- Plan Guides can be attached to existing queries
 - We don't have to change/rewrite our applications

Other Resolutions

- Use local variables instead of parameters
 - SQL Server can't „sniff“ their values...
- Trace Flag 4136
 - Disables parameter sniffing completely
 - KB980653
 - Do we really want this...?

Demo

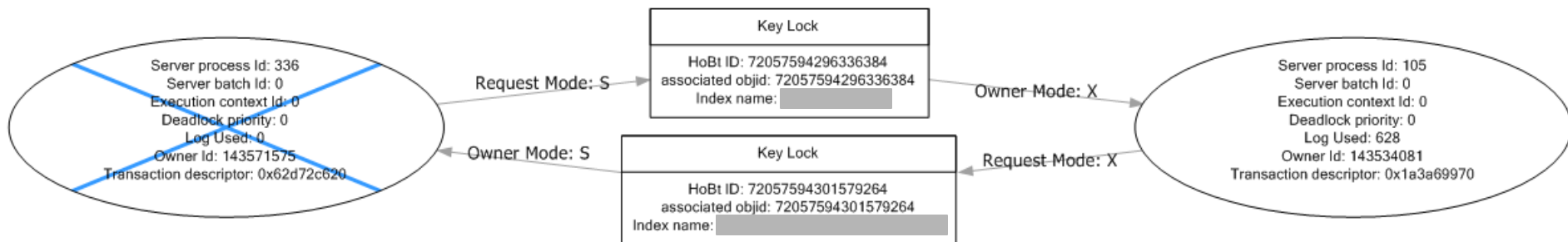
Parameter Sniffing

Agenda

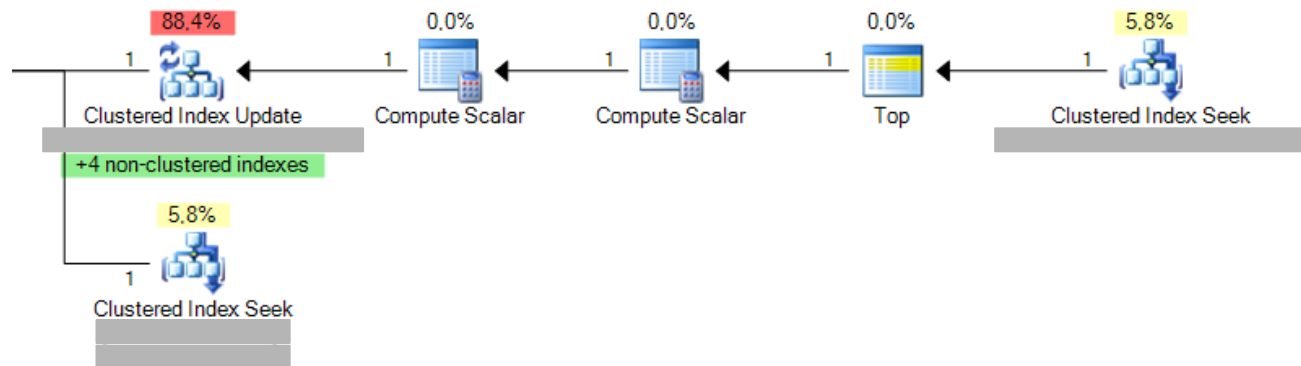
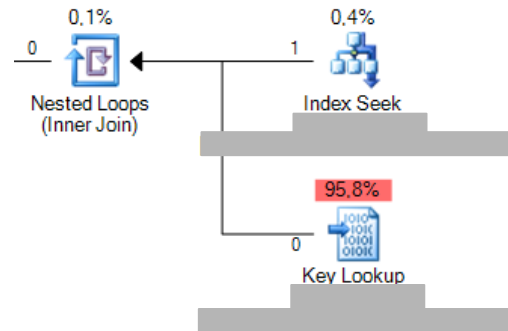
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- **Deadlocks**

Bookmark Lookup Deadlocks

- Bookmark Lookup
 - S-Lock on Non-Clustered Index
 - S-Lock on Clustered Index
- Write Activity
 - X-Lock on Clustered Index
 - X-Lock on Non-Clustered Index



Bookmark Lookup Deadlocks



Demo

Deadlocks

Summary

- Bookmark Lookups
- Tipping Point
- Parameter Sniffing/Statistics
- Deadlocks