SQLintersection

Session: Thursday, 10:00am-11:00am

TempDB: The Good, The Bad, and The Ugly

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SQL intersection

Microsoft

Speaker: Pam Lahoud

Microsoft

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Reminder: Intersect with Speakers and Attendees

- **Tweet *tips and tricks* that you learn and follow tweets posted by your peers!**
  - Follow: #SQLintersection and/or #DEVintersection
- **Join us – Wednesday Evening – for SQLafterDark**
  - Doors open at 7:00 pm
  - Trivia game starts at 7:30 pm

    Winning team receives something fun!
  - Raffle at the end of the night

    Lots of great items to win including a seat in a five-day SQLskills Immersion Event!
  - The first round of drinks is sponsored by SentryOne and SQLskills

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SQLskills immerse yourself in sql server & SentryOne™

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Overview

Why is TempDB causing me pain and what is Microsoft going to do about it??

- Introduction
- Some history…
- TempDB – Today and Tomorrow
- Demo – Introducing Memory-Optimized TempDB Metadata

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Introduction

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What makes TempDB so special?

Basically just a database

- Structure is the same as other user databases
- Re-created every time the server is restarted
- Transactions minimally logged

Workload is different

- Used for temporary (non-durable) storage
- Objects and data frequently being created and destroyed
- Very high concurrency

Critical to performance

- Data that can't fit in memory stored here – access needs to be fast
- Often used to store intermediate query results – direct impact to query performance

What is stored in TempDB?

Temp Tables

DBCC CHECK

Triggers

Statistics updates

Table Variables

Hash Worktables

Cursors

Spools

Some history…

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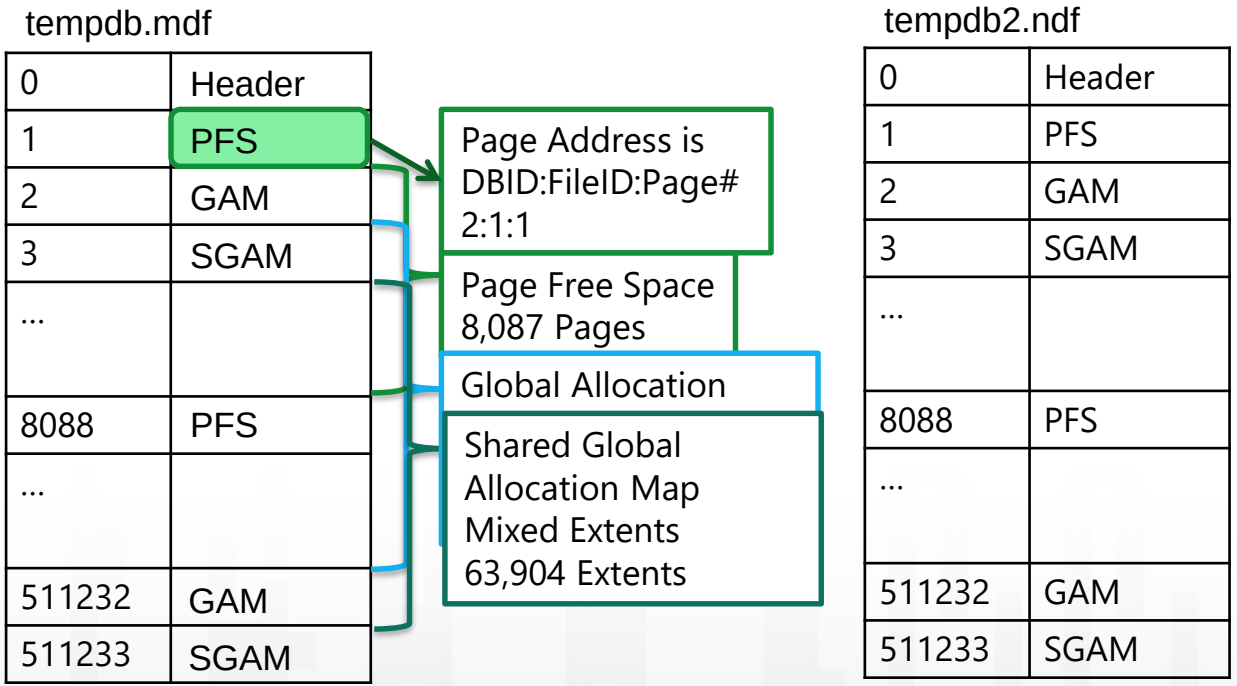
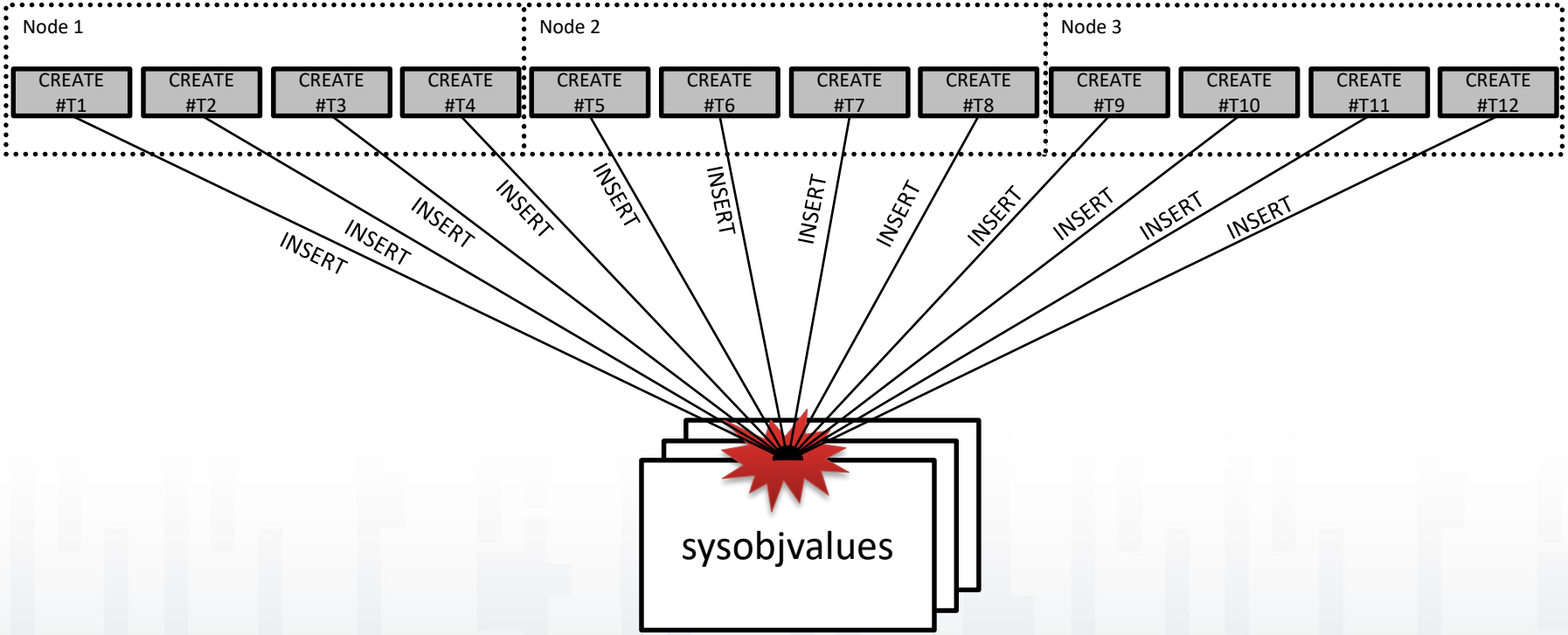
TempDB Journey

Object Allocation Contention



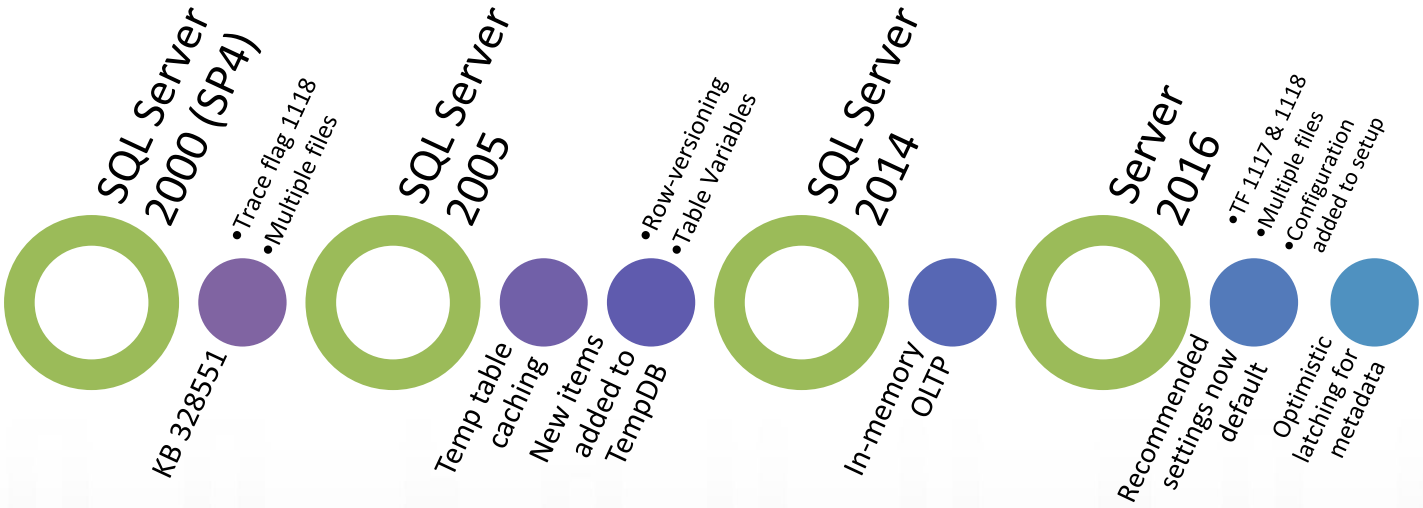
Microsoft Confidential

Metadata Contention

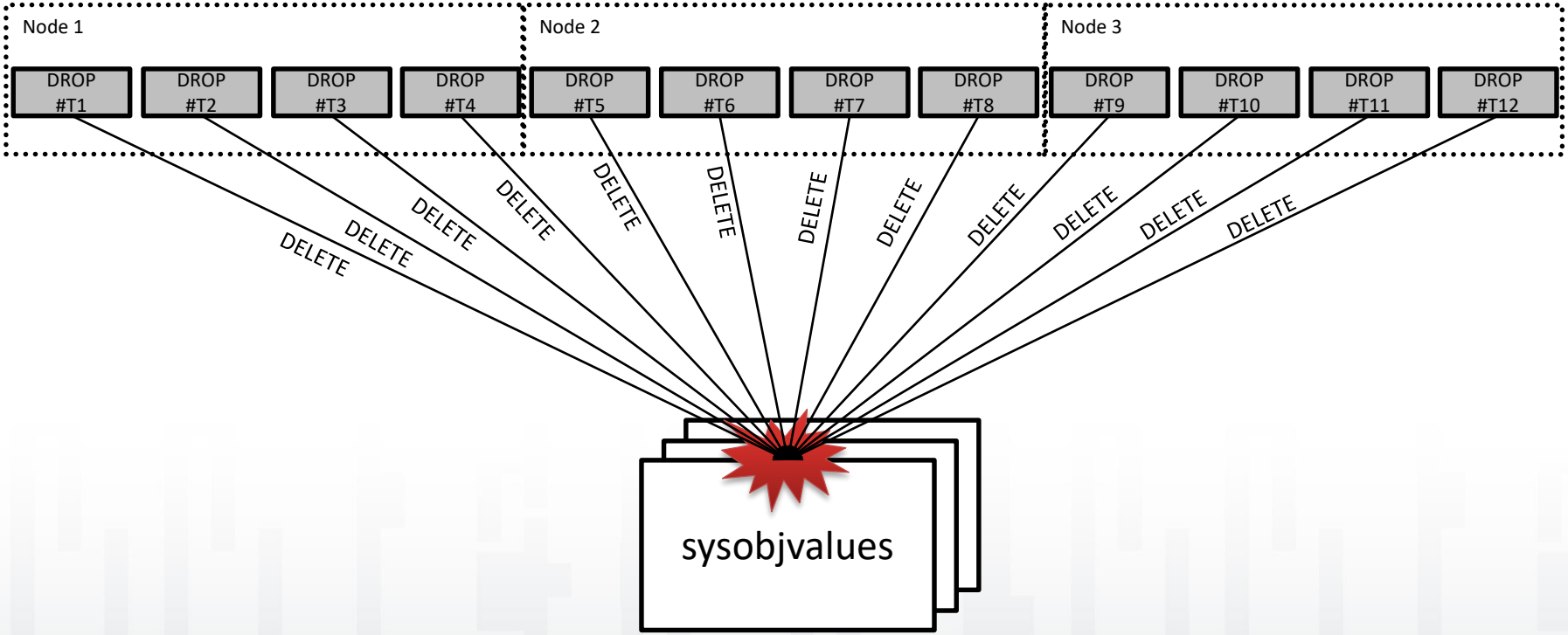


TempDB Journey

TempDB Journey

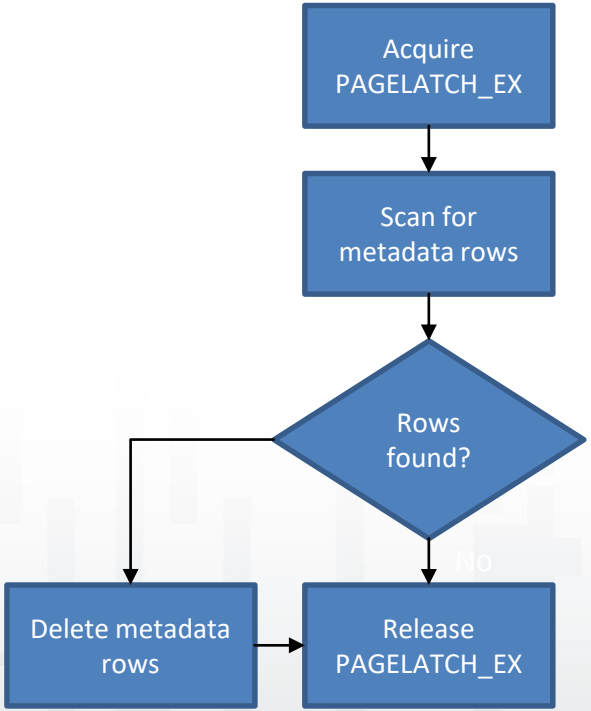


Metadata Contention – The Sequel

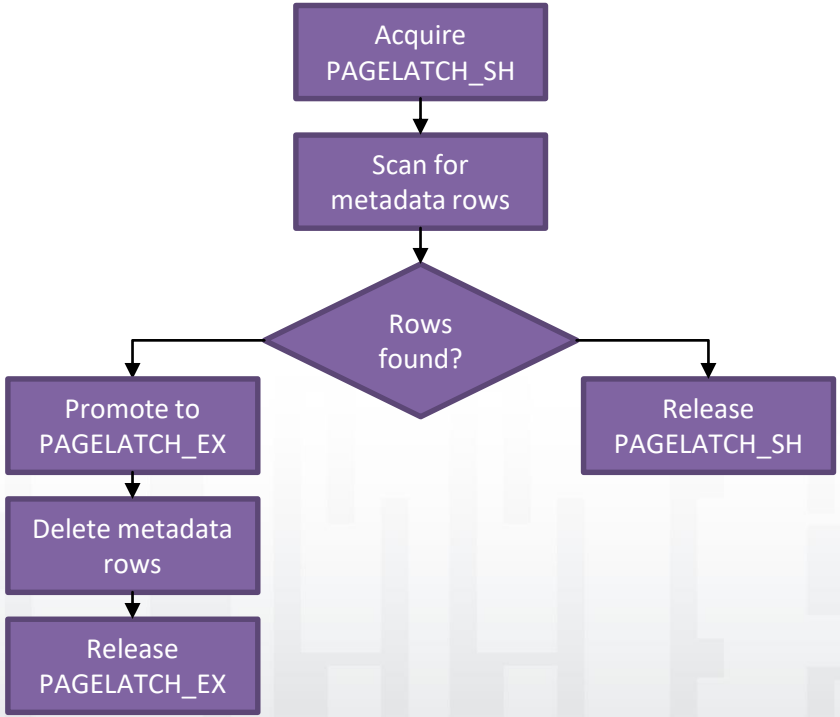


Metadata Contention 3 – Latch On Latch Off

Old latching algorithm



Optimized latching algorithm



TempDB Journey

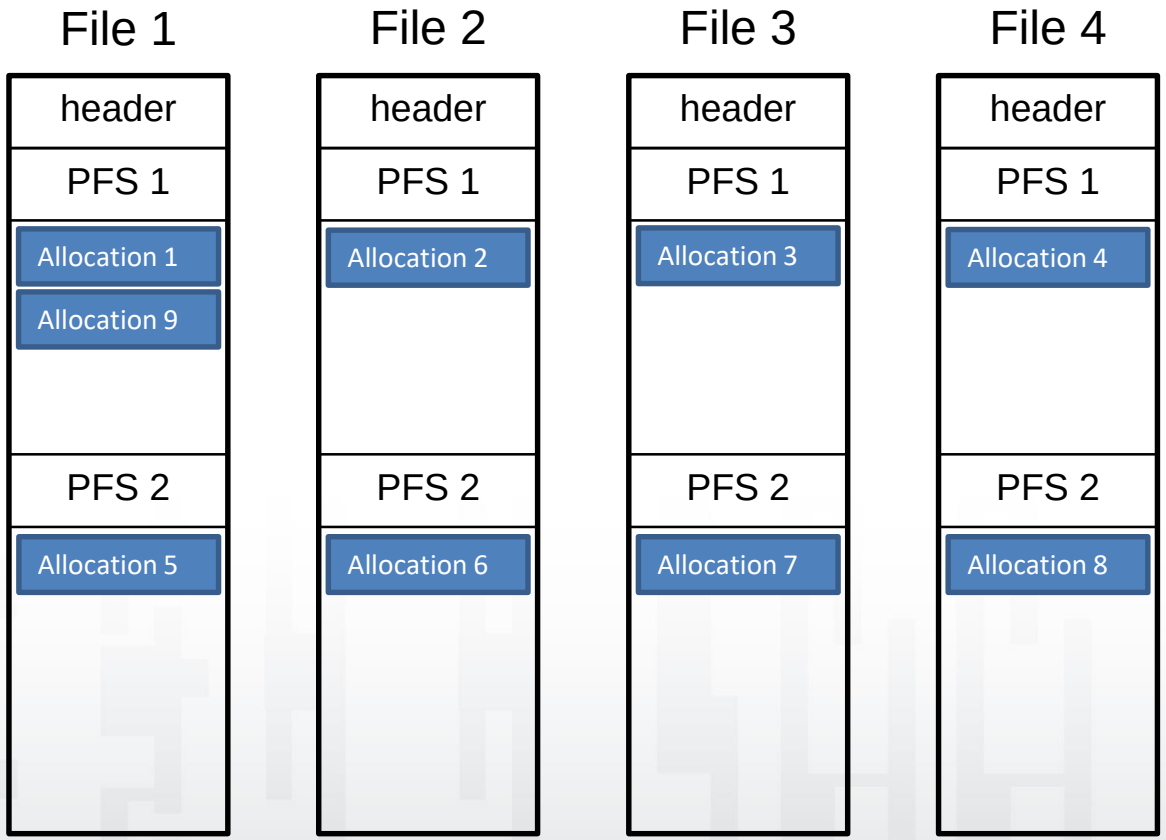
Object Allocation Contention – The Sequel

SQL Server 2017 CU7

SQL Server 2016 SP1 CU9

SQL Server 2016 SP2 CU1

SQL Server 2014 SP3



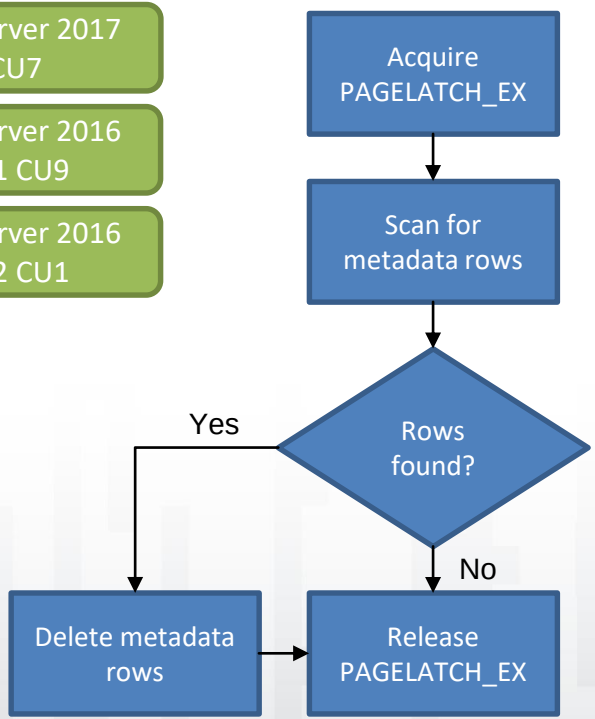
Metadata Contention 3' – Latch Chance

Old latching algorithm

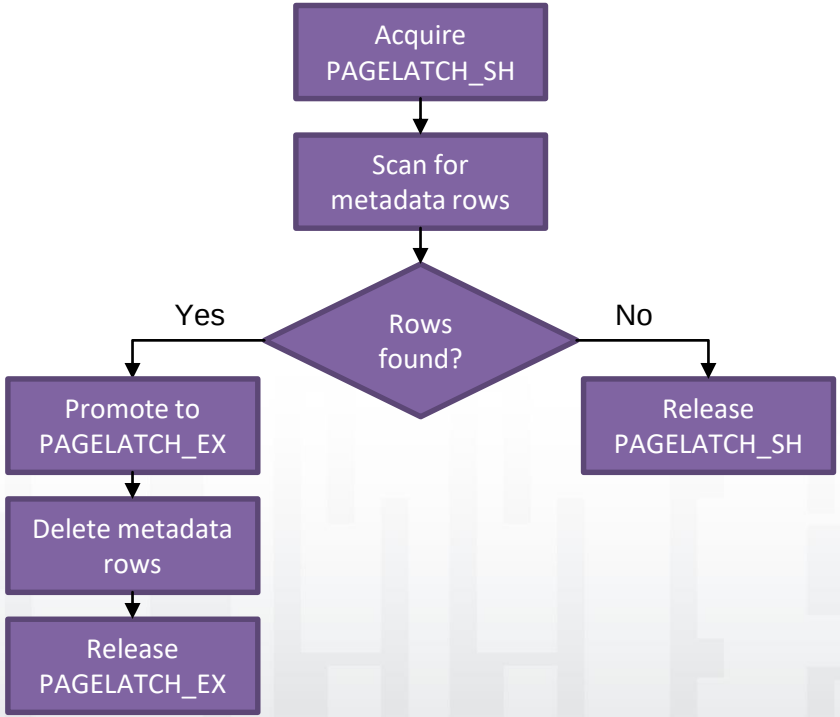
SQL Server 2017 CU7

SQL Server 2016 SP1 CU9

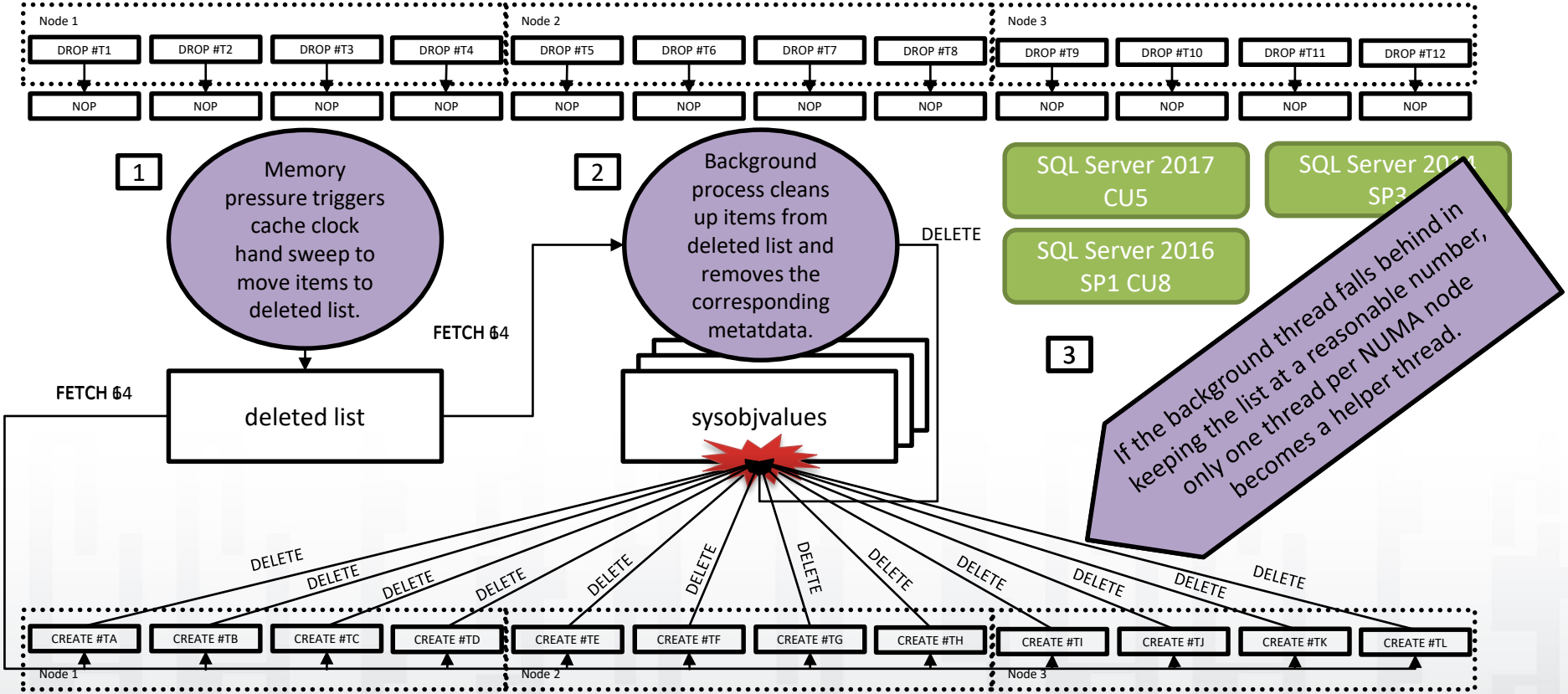
SQL Server 2016 SP2 CU1



Optimized latching algorithm



Metadata Contention 4 – Going Async



TempDB

Today and tomorrow

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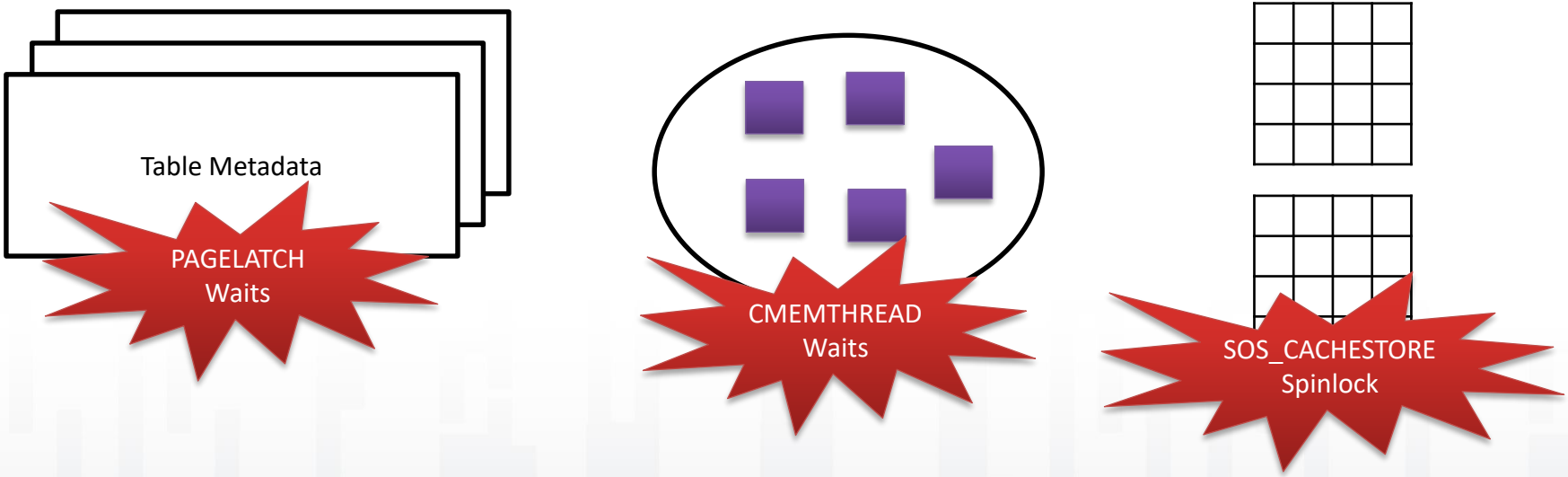
New and Improved! Temp Table Cache Contention



Types of TempDB Contention

Object Allocation Contention

- Contention for metadata pages used to manage space allocation in a data file
- Look for PAGELATCH waits on PFS and GAM pages

Metadata Contention

- Contention for pages that belong to system objects used to track table metadata
- Look for PAGELATCH waits on pages that belong to system objects

Temp Table Cache Contention

- Contention for memory objects associated with the Temp Table Cache
- Look for either CMEMTHREAD waits or SOS_CACHESTORE spinlock waits (both can be due to other causes)

Where are we now?

Configuration

- Ensure that you have multiple equally sized files
- Start with the lesser of 1 per core or 8 and increase as needed
- Enable TF 1117 and 1118 if you are on SQL Server 2014 or earlier

Version

- Ensure you are on the latest service pack and CU to take advantage of all improvements
- If you are running SQL Server 2016 SP1 CU2 to SQL Server 2016 SP2 CU2, either upgrade or enable TF 3427

Code Changes

- Do not alter temp tables after they have been created
- Do not truncate temp tables
- Move index creation statements to the new inline syntax
- Avoid using temp tables inside ad-hoc batches

Potential Directions

One TempDB per user database

- Doesn't improve scalability for a single user database
- Wouldn't solve the problem long-term

In-Memory TempDB

- Different data structures and performance patterns
- Not all data types and surface area supported

Where are we going?

TempDB Enhancements in SQL Server 2019

New Page Cracker allows you to quickly and easily diagnose contention

- sys.dm_db_page_info
- sys.fn_PageResCracker

Accelerated Database Recovery

- Leverages a new feature called **Persistent Version Store**

Default Changes

- Temp table cache improvements
- Concurrent PFS updates

Opt-In

- Memory-optimized metadata tables

Demo

Let's Hekatonize!!!!

troducing…

TempDB emory Optimized Metadata

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Review

Why is TempDB causing me pain?

- Everything gets dumped into TempDB
- Object allocation contention
- Metadata contention

And what is Microsoft going to do about it??

- SQL Server 2019 Improvements
  - Memory-optimized TempDB Metadata
  - Temp table cache improvements
  - Concurrent PFS updates

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Continue learning with our new book	https://aka.ms/LearnTSQLQuerying https://aka.ms/LearnTSQLQuerying_errata
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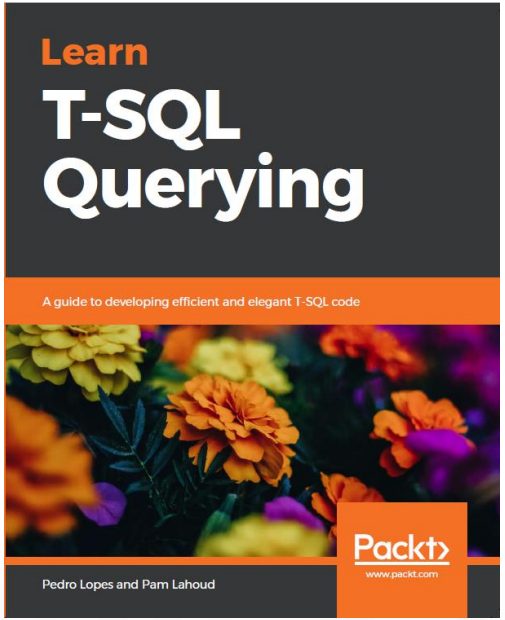

Questions?

Microsoft

Don’t forget to complete an online evaluation!

TempDB: The Good, The Bad, and The Ugly

Your evaluation helps organizers build better conferences and helps speakers improve their sessions.

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Thank you!

Save the Date!

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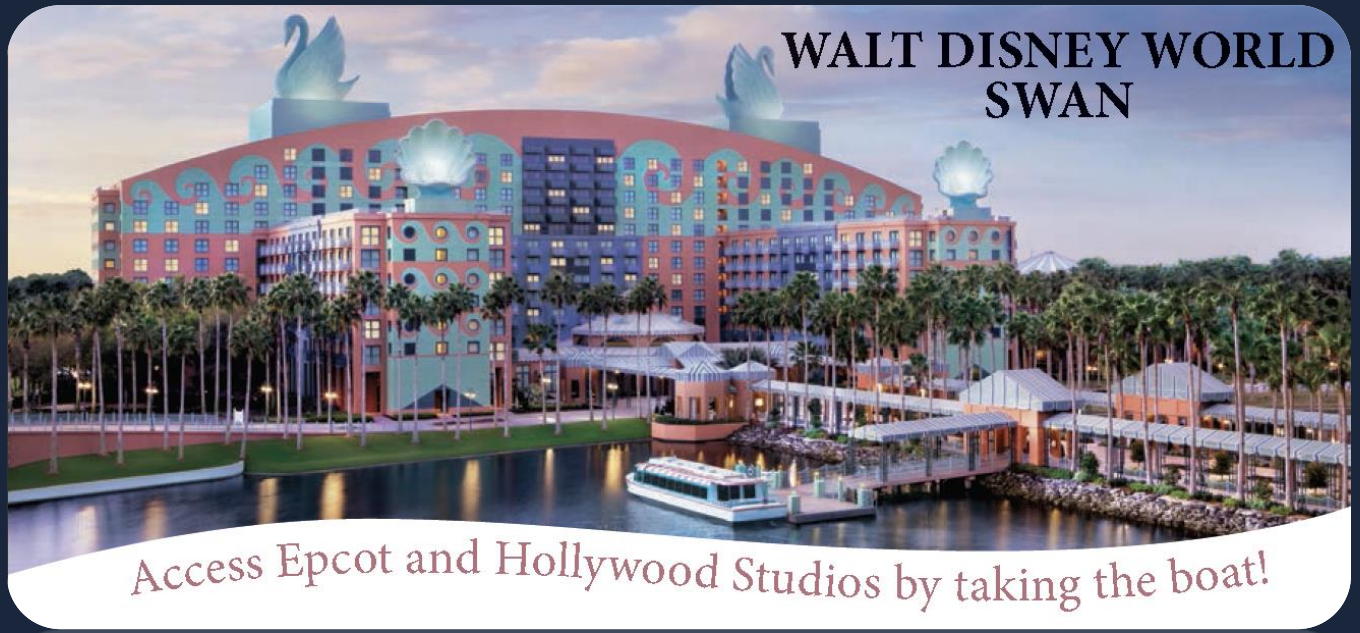

2020

Week of April 6

We're back in Orlando!

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Leave the every day behind and enter a world of wonder and enchantment at the Walt Disney World® Resort. Located in the heart of the most magical place on earth, the Walt Disney World Swan and Dolphin Resort provides a truly extraordinary backdrop for our event! Beautiful tropical landscaping, tranquil waterways, and classic art and architecture work together to create a stunning landmark!