Deep Dive into Memory-Optimized TempDB

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She/Her

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Meet Your Presenter

Haripriya Naidu

- SQL DBA with 11 years experience
- AWS Certified Solutions Architect
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- New Stars of Data 2024

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Today's Agenda

The Problem

TempDB contention issues

Memory-Optimized TempDB

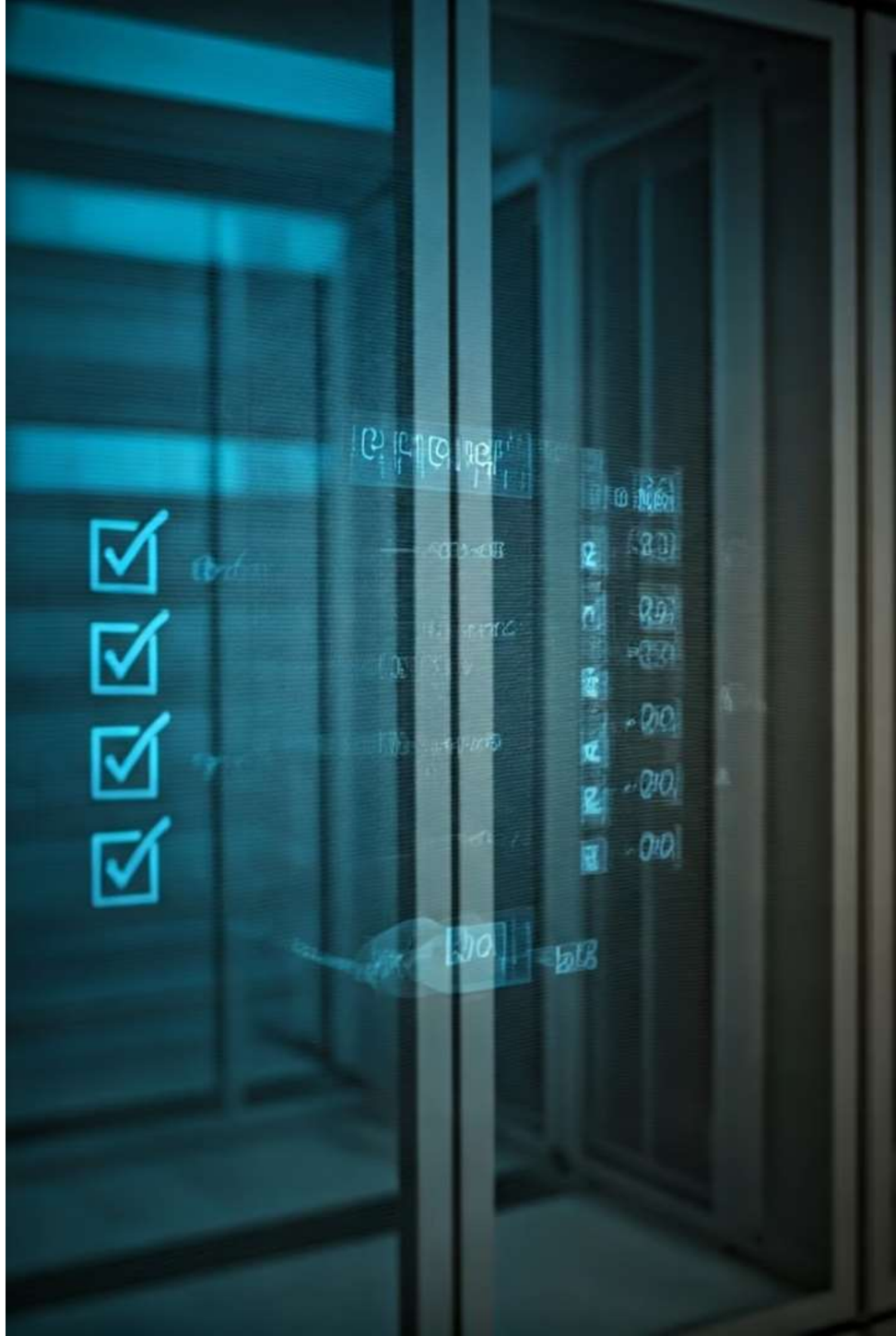
What it is and how it works

Implementation

How to enable and verify

Performance Impact

Real-world results



The TempDB Problem

TempDB Contention

Common bottleneck in busy systems

Multiple Files Not Helping

Traditional solution insufficient

PAGELATCH Contention

Occurs on system objects

Metadata Bottlenecks

System objects create performance issues

What is Memory-Optimized TempDB?

In-Memory Technology

Uses Hekaton engine

Latch-Free Design

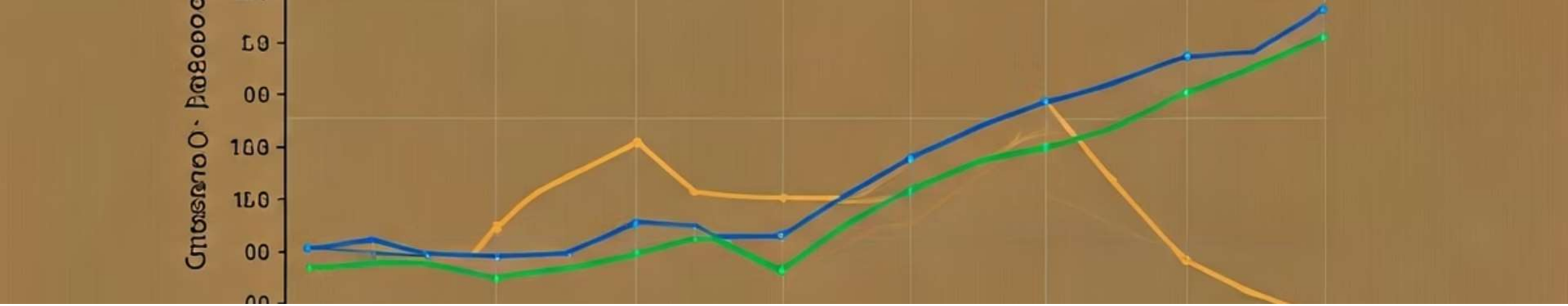
Eliminates contention

Non-Durable

Optimized for performance

System Objects

12 objects moved to memory



Key Feature Benefits

SQL Server 2019+

New feature starting with SQL 2019

12 System Objects

Moves key system tables to memory

Latch-Free Design

Eliminates waiting on metadata operations

Non-Durable

Optimized for TempDB's temporary nature

Technical Implementation

object_id	name	delivered	description
3	sysrscols	RTM	Stores column information like offsets, change frequency, types, and max in-row values.
5	sysrowsets	CU2	Contains a row for each partition rowset for an index or a heap.
7	sysallocunits		Contains a row for each storage allocation unit.
9	sysseobjvalues	RTM	Stores column information like default values.
34	sysschobjs		Stores a row for each object.
40	sysmultiobjvalues		Stores information about entities like column encryption keys.
41	syscolpars		Stores a row for each table/view column and procedure/function parameter.
54	sysidxstats		Stores a row for each index or statistic.
55	sysiscols		Stores a row for each persisted index and statistics column.
60	sysobjvalues		Stores a wide range of properties for entities.
74	syssingleobjrefs		Stores a row for N:1 dependencies (think tying partition schemes to tables).
75	sysmultiobjrefs		Stores a row for N:N dependencies (think `sys.sql_dependencies`).

Architecture

Leverages In-Memory OLTP

System Tables

12 critical objects moved to memory

Performance Impact

Dramatically reduces contention

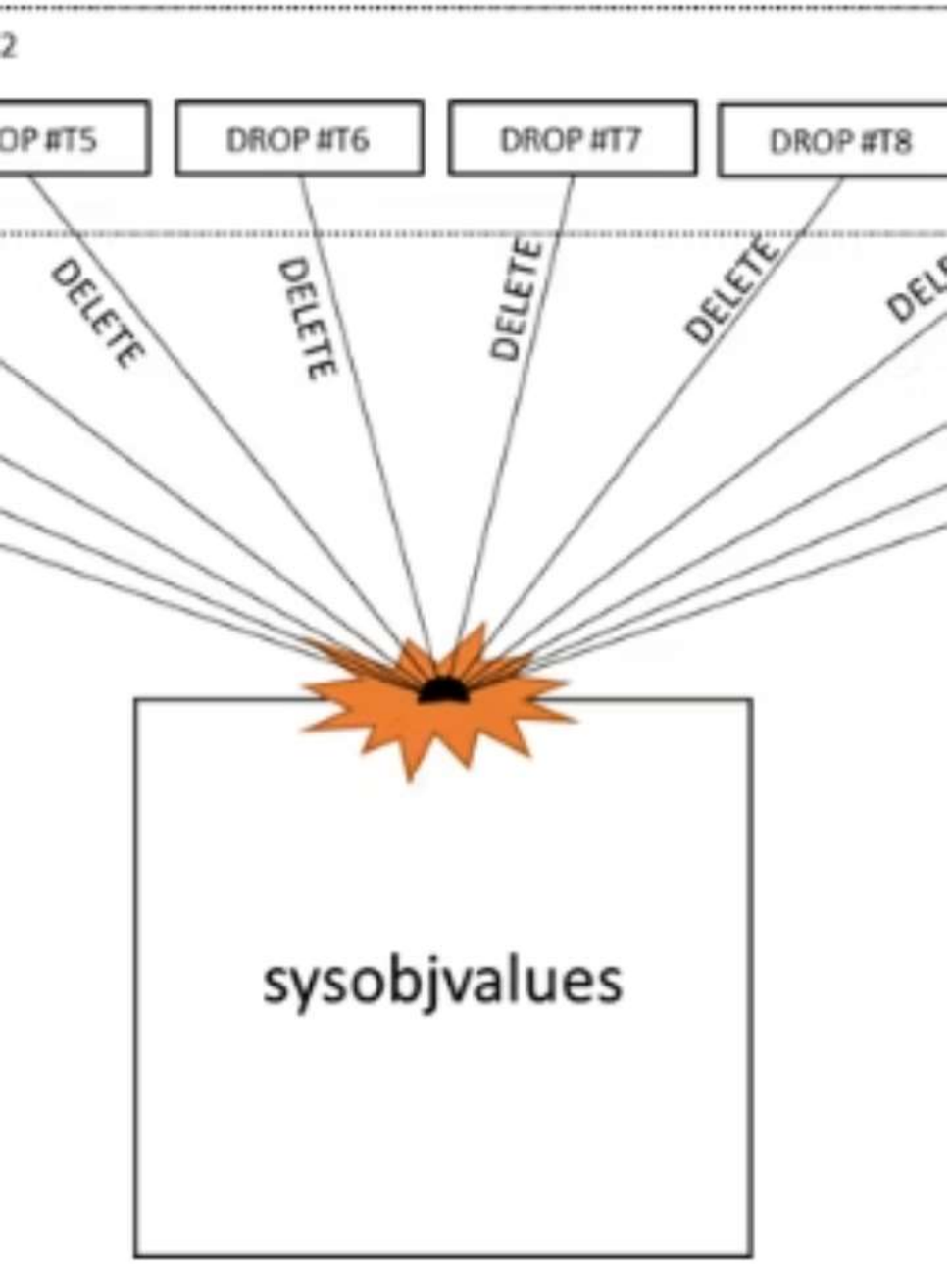
What It Solves (And Doesn't)

Solves

- PAGELATCH on system objects
- Metadata contention
- Temp table creation bottlenecks

Doesn't Solve

- User object contention
- PAGELATCH on user temp tables
- I/O bottlenecks



Identifying Metadata Contention

Look for PAGELATCH waits

On system object pages

Temp table churn

Frequent create/drop operations

Wait statistics

High PAGELATCH_UP on TempDB

DMV queries

sys.dm_os_waiting_tasks

How to Enable the Feature

Enable Trace Flag

Set TF 13553 at startup

Restart SQL Service

Required for activation

Verify Configuration

Check sys.dm_os_loaded_modules

Monitor Performance

Compare before/after metrics