Business Trends

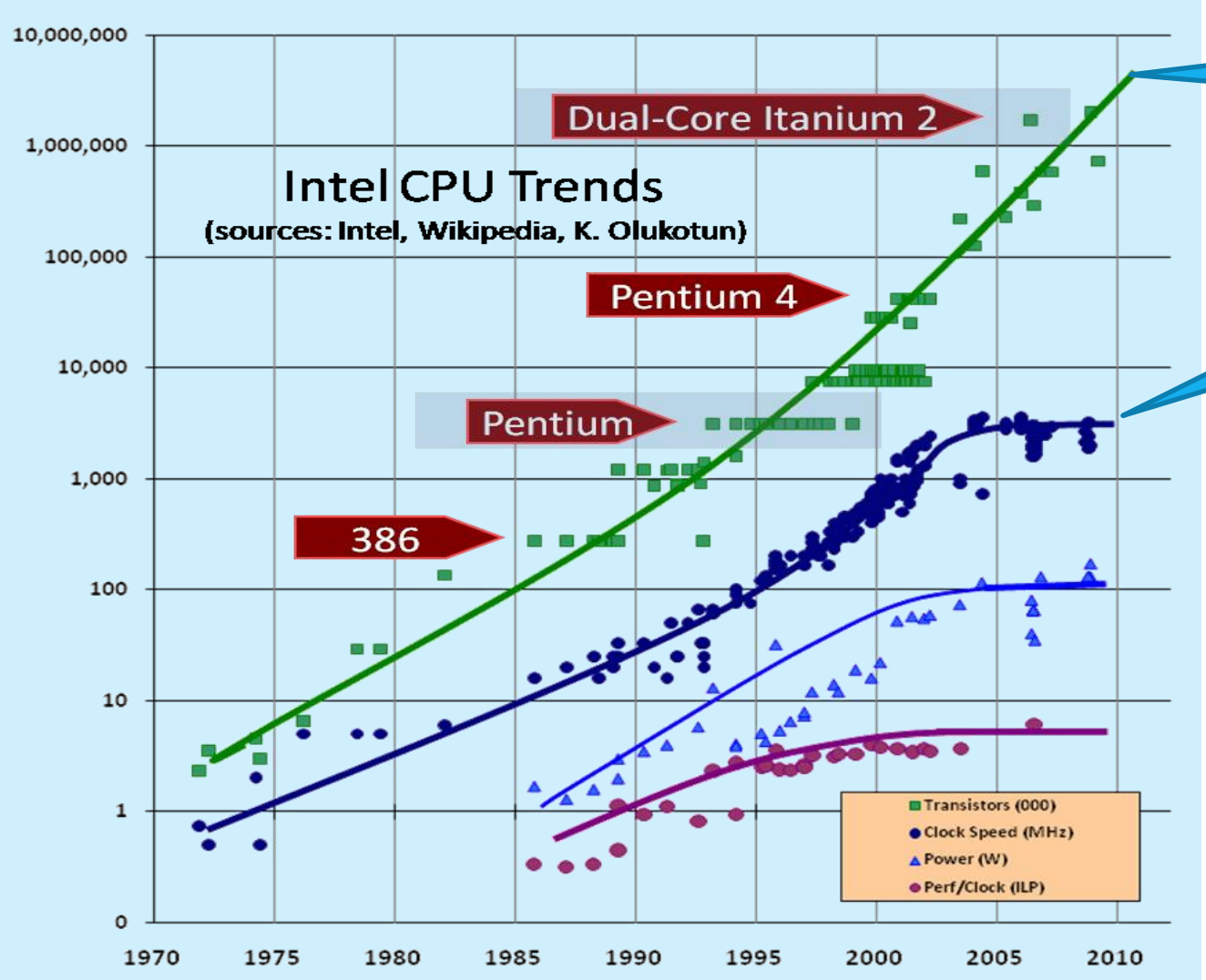
Market need in OLTP space

- Ever higher throughput
- Lower latency
- At a lower cost

Examples

- Credit-card transactions: validate, authorize and complete the transaction
- Online-betting: ability to place the bet quickly
- Session state: high traffic E-commerce website

Hardware Trends



Moore's Law means more transistors and therefore cores, but…

CPU clock rate stalled…

Meanwhile RAM cost continues to drop

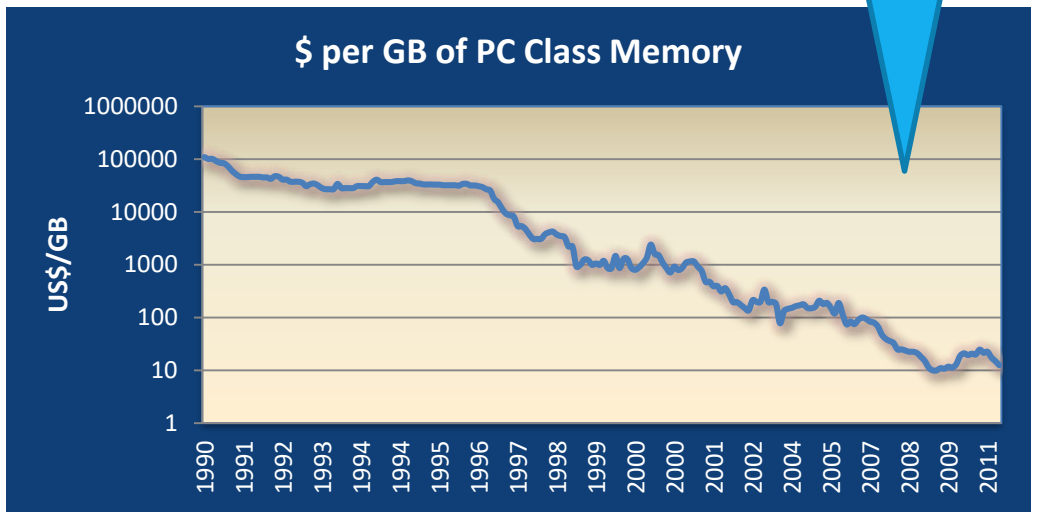


Chart reference http://www.gotw.ca/publications/concurrency-ddj.htm

SQL Server Initiatives

In-Memory OLTP is one of many SQL Server initiatives to take advantage of plentiful memory and processor cores

Specialized database engines for particular workloads:

- Column store indexes for SQL Server 2012/2014 and PDW
- In-Memory Analytics – Power Pivot for Excel
- App Fabric Cache – mid-tier caching solution
- Stream Insight – real-time data stream analytics
- **In-Memory OLTP for SQL Server 2014**

Myths

1. In-Memory OLTP is like DBCC PINTABLE
2. In-Memory databases are new separate products
3. You can use In-Memory OLTP in an existing SQL Server app with NO changes whatsoever
4. Since tables are in memory, the data is not durable or highly available; data is lost after a server crash

In-Memory OLTP Pillars

Customer Benefits

- High performance data operations
- Efficient business-logic processing
- Frictionless scale-up
- Hybrid engine and integrated experience

Architectural Pillars

Main-Memory Optimized

- Optimized for in-memory data
- Indexes (hash and range) exist only in memory
- No buffer pool, B-trees
- Stream-based storage

T-SQL Compiled to Machine Code

- T-SQL compiled to machine code via C code generator and VC
- Invoking a procedure is just a DLL entry-point
- Aggressive optimizations at compile-time

High Concurrency

- Multi-version optimistic concurrency control with full ACID support
- Core engine uses lock-free algorithms
- No lock manager, latches or spinlocks

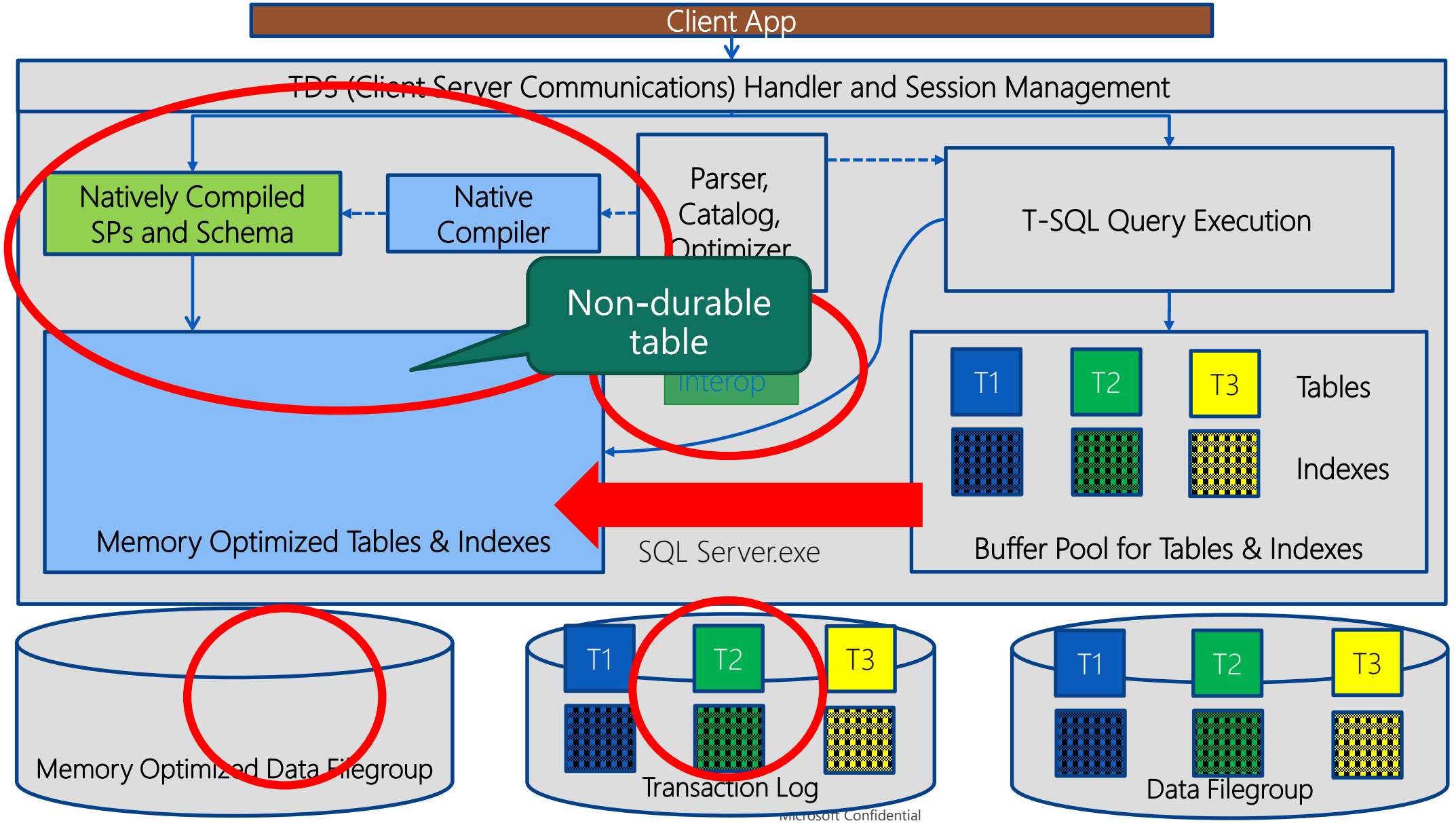
SQL Server Integration

- Same manageability, administration & development experience
- Integrated queries & transactions
- Integrated HA and backup/restore

Drivers

- Hardware trends
  - Steadily declining memory price, Non-volatile RAM
  - Stalling CPU clock rate
  - Many-core processors
- Business
  - TCO

In Memory OLTP Architecture



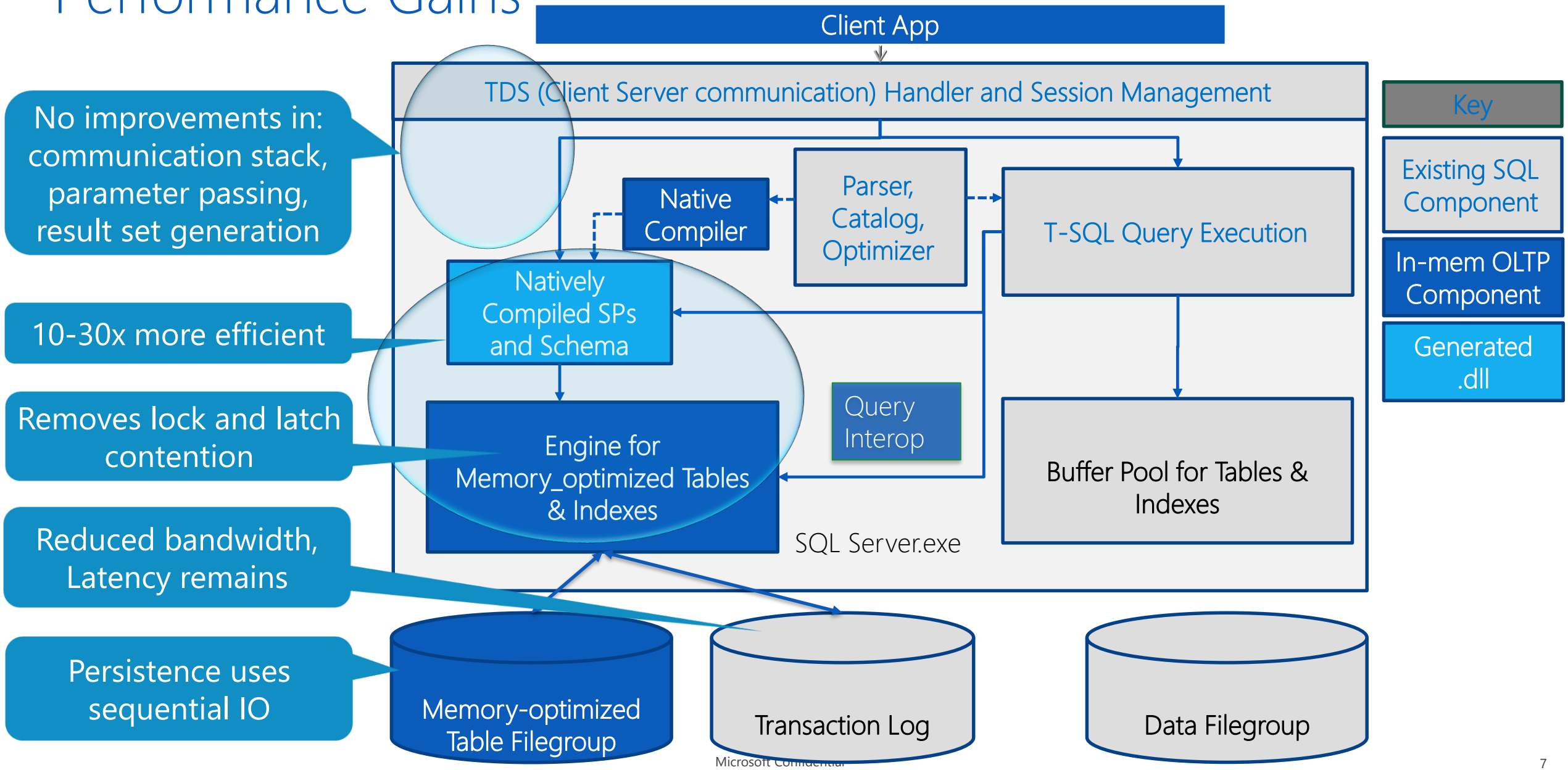
Key

Existing SQL Component

In-mem OLTP Component

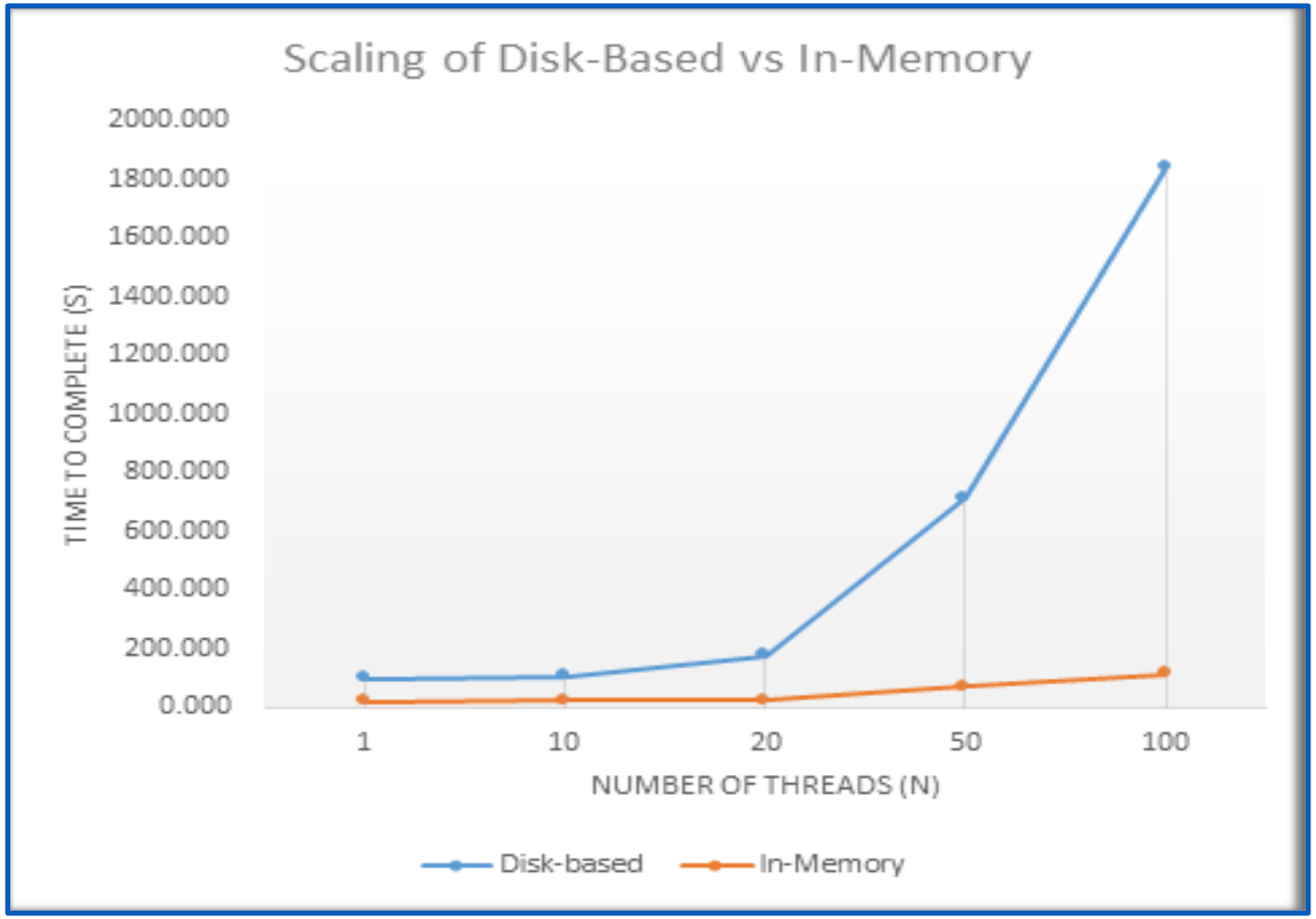
Generated .dll

Performance Gains



Scalability

```
ostress.exe -S. –E
-dAdventureWorks2012
-Q"EXEC
Demo.usp_DemoInsertSalesOrders
@use_inmem = <0,1>,
@order_count=100000
@usenative=<0,1>
"
–n<varies>
```



Types of Candidate Workloads

Application has OLTP characteristics

- Relatively short transactions
- High degree of concurrency, transactions from many sessions

Suited for in-memory processing

- Critical path data can fit in memory
- Currently encounter locking or latching bottlenecks

Code characteristics

- Stored procedures used
- Code can be modified and isolated to subset of tables or stored procedures