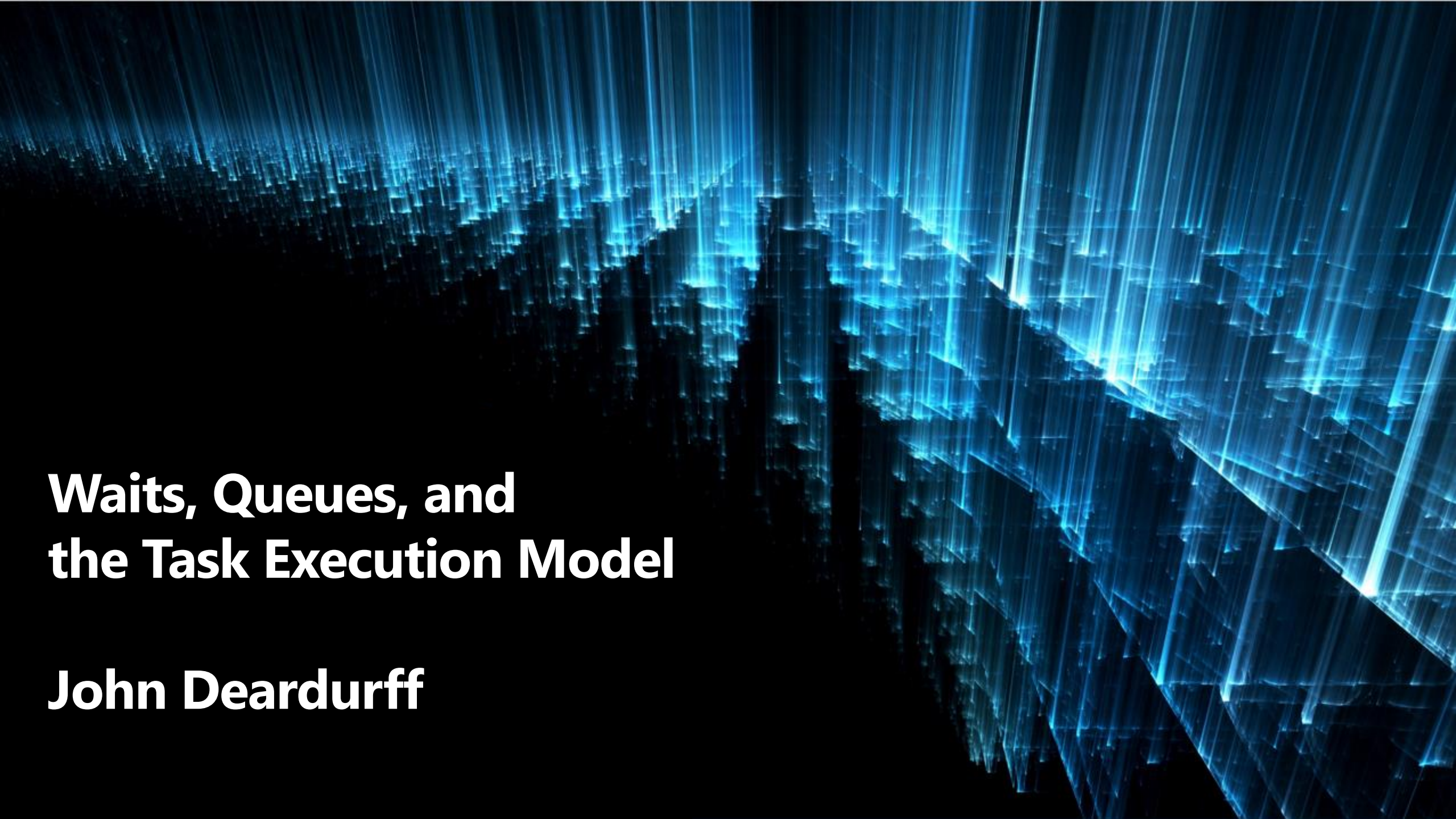


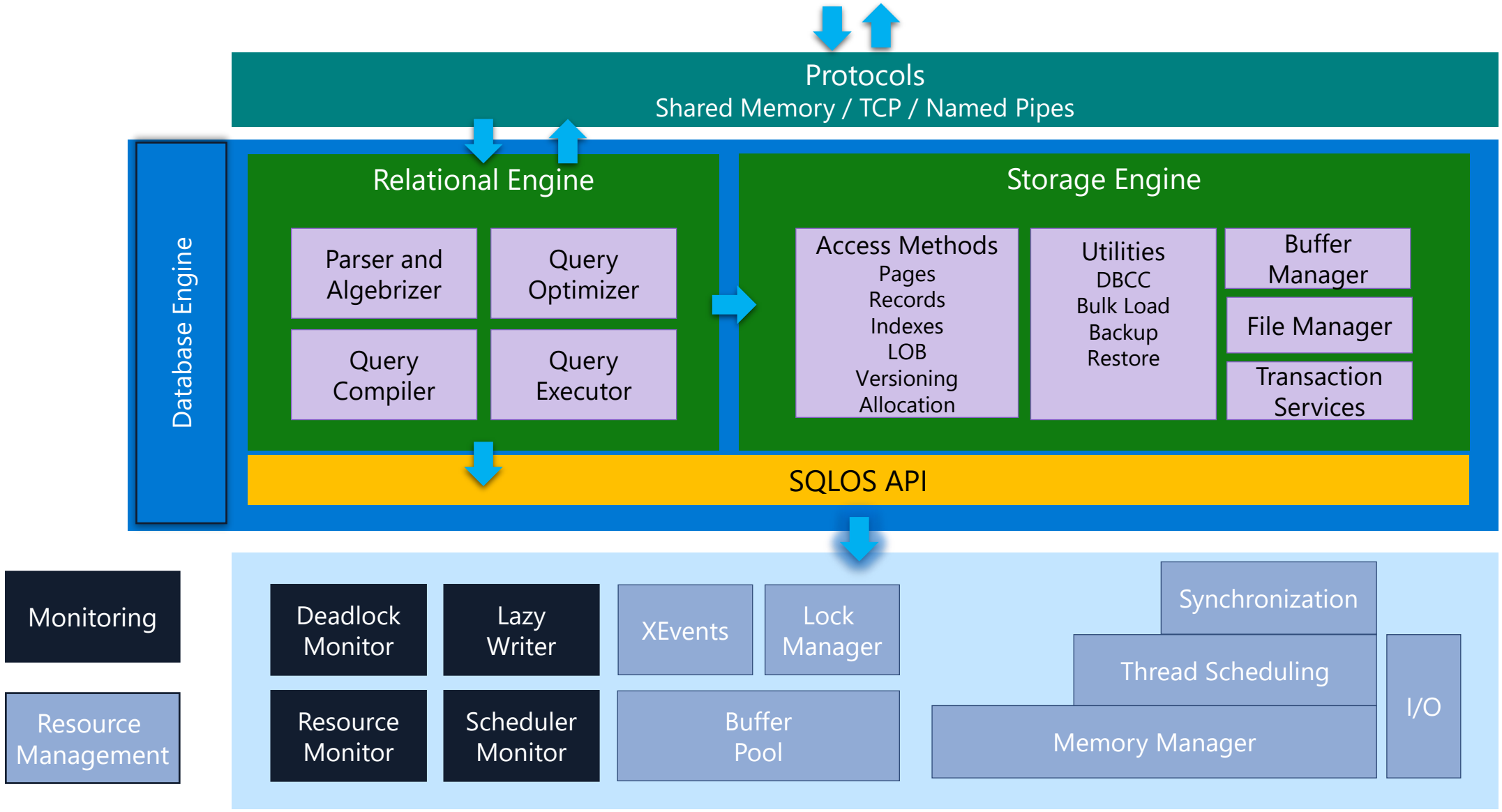
Waits, Queues, and the Task Execution Model

John Deardurff

What does this session cover?

- A Closer look at SQLOS
- Thread Scheduling
- Waits and Queues
- Task Execution Model
- Monitoring Waits

Inside the Database Engine



Preemptive vs. Cooperative Scheduling

Windows uses Preemptive scheduling

- Is driven by the view of prioritized computation
- Means that a low-priority process is pre-empted out of the processor by a high-priority process

SQL Server uses Cooperative scheduling

- Means that the priority of a process doesn't matter
- Is where a process is not preempted, and executes until it explicitly yields the processor

Thread States and Queues

Runnable

- The thread is currently in the Runnable Queue waiting to execute. (First In, First Out).

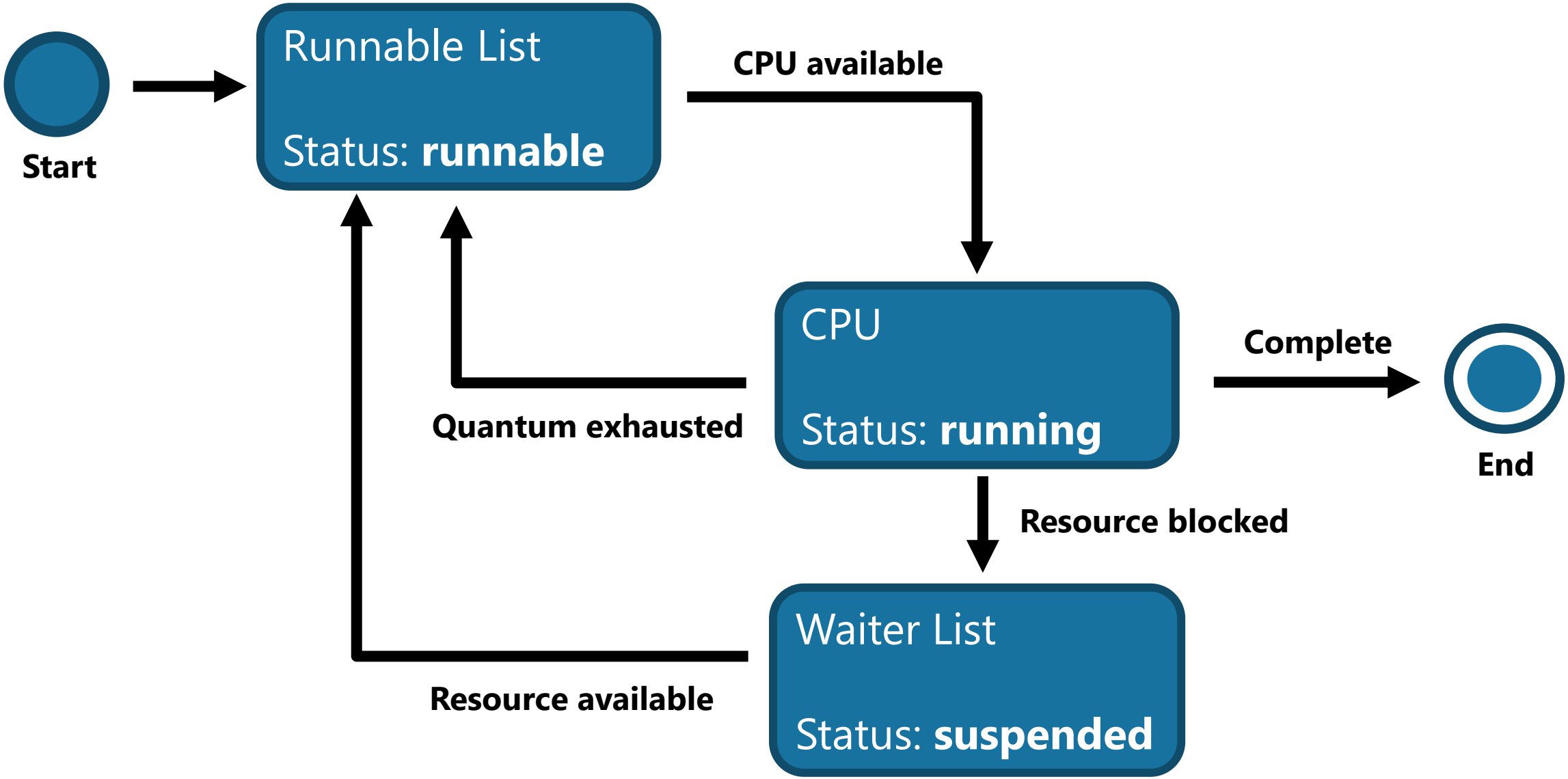
Running

- One active thread executing on a processor.

Suspended

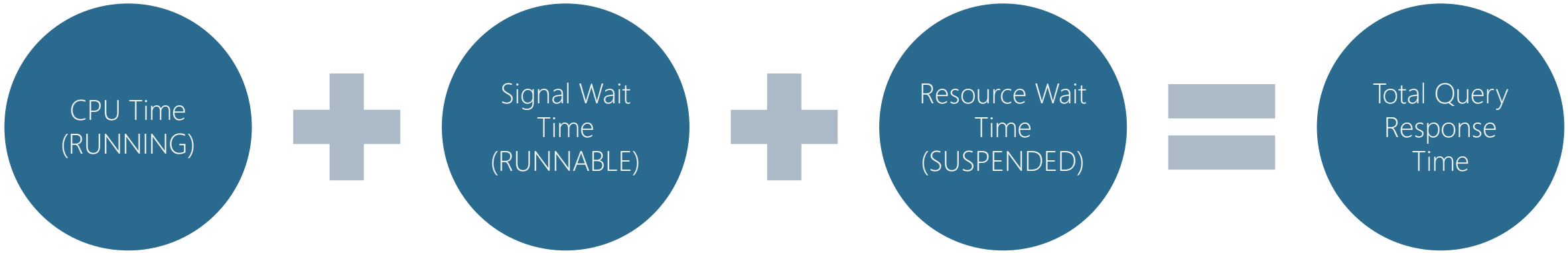
- Placed on a Waiter List waiting for a resource other than a processor. (No specific order).

SQL Server Execution Model



Total Query Response Time

The full cycle between the several task states, for how many times it needs to cycle, is what we experience as the total query response time.



SET STATISTICS IO, TIME ON

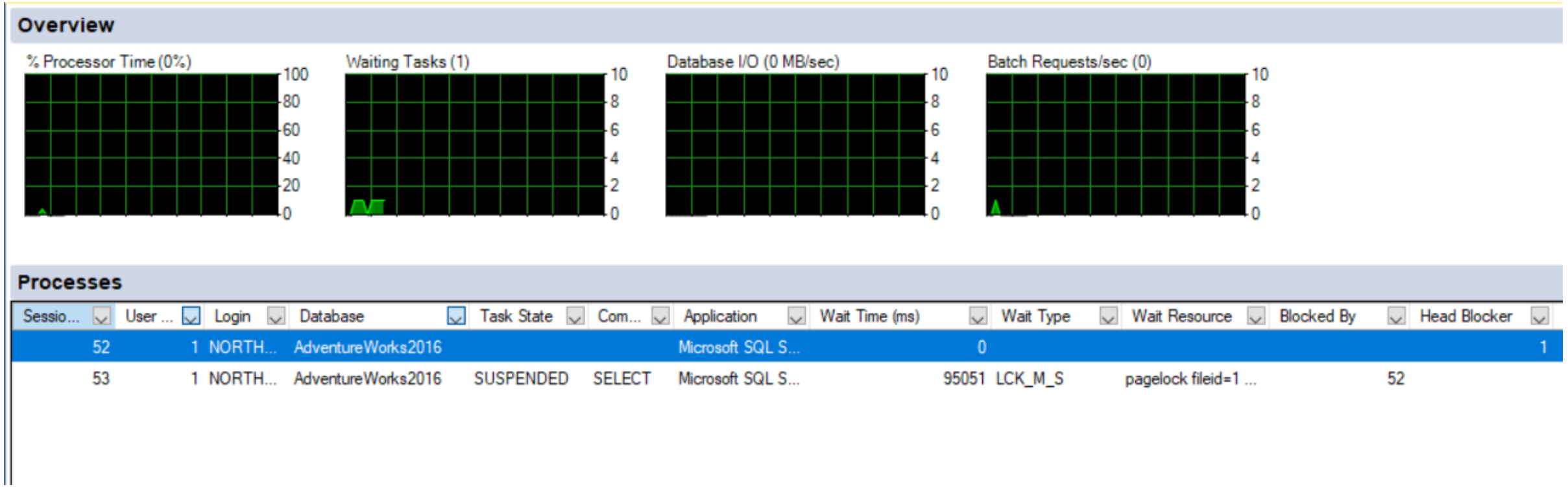
```
SET STATISTICS IO ON
GO
SET STATISTICS TIME ON
SELECT SOH.SalesOrderID, SOH.CustomerID,
OrderQty, UnitPrice, P.Name
FROM Sales.SalesOrderHeader AS SOH
JOIN Sales.SalesOrderDetail AS SOD
ON SOH.SalesOrderID = SOD.SalesOrderID
JOIN Production.Product AS P
ON P.ProductID = SOD.ProductID
SET STATISTICS IO, TIME OFF
```

Used to identify physical reads and logical reads for a query

```
(121317 rows affected)
Table 'Workfile'. Scan count 0, logical reads 0, physical reads 0, page server r
Table 'Worktable'. Scan count 0, logical reads 0, physical reads 0, page server
Table 'SalesOrderDetail'. Scan count 1, logical reads 428, physical reads 0, pag
Table 'Product'. Scan count 1, logical reads 15, physical reads 0, page server r
Table 'SalesOrderHeader'. Scan count 1, logical reads 57, physical reads 0, page

 SQL Server Execution Times:
   CPU time = 94 ms,  elapsed time = 1653 ms.
```

Activity Monitor



Dynamic Management Objects for Waits

- Active wait duration and type: **sys.dm_os_waiting_tasks**
- Session CPU time and memory usage: **sys.dm_exec_sessions**
- Status and session owner of request: **sys.dm_exec_requests**
- Actual query text of waiting task: **sys.dm_exec_sql_text**

Dynamic Management Objects for Waits

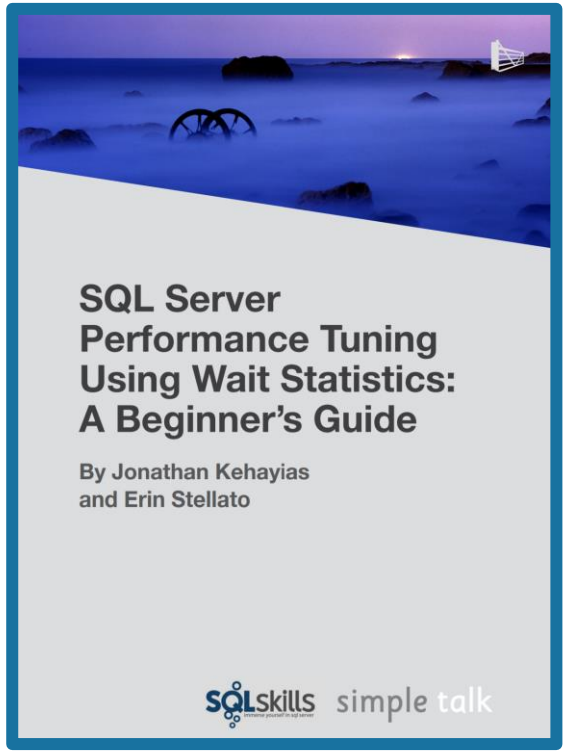
```
--Waiting tasks
SELECT w.session_id, w.wait_duration_ms, w.wait_type,
     w.blocking_session_id, w.resource_description,
 s.program_name, t.text, t.dbid, s.cpu_time,
 s.memory_usage
 FROM sys.dm_os_waiting_tasks as w
      INNER JOIN sys.dm_exec_sessions as s
         ON w.session_id = s.session_id
      INNER JOIN sys.dm_exec_requests as r
         ON s.session_id = r.session_id
      OUTER APPLY sys.dm_exec_sql_text (r.sql_handle) as t
  WHERE s.is_user_process = 1;
```

session_id	wait_duration_ms	wait_type	blocking_session_id	resource_description
58	8563	LCK_M_S	62	keylock hobtid=72057594047365120 dbid=5 id=lock1...

Troubleshooting Wait Types

Aaron Bertrand – Top Wait Types
https://sqlperformance.com/2018/10/sql-performance/top-wait-stats

Paul Randal – SQL Skills Wait Types Library
https://www.sqlskills.com/help/waits/



Demonstration