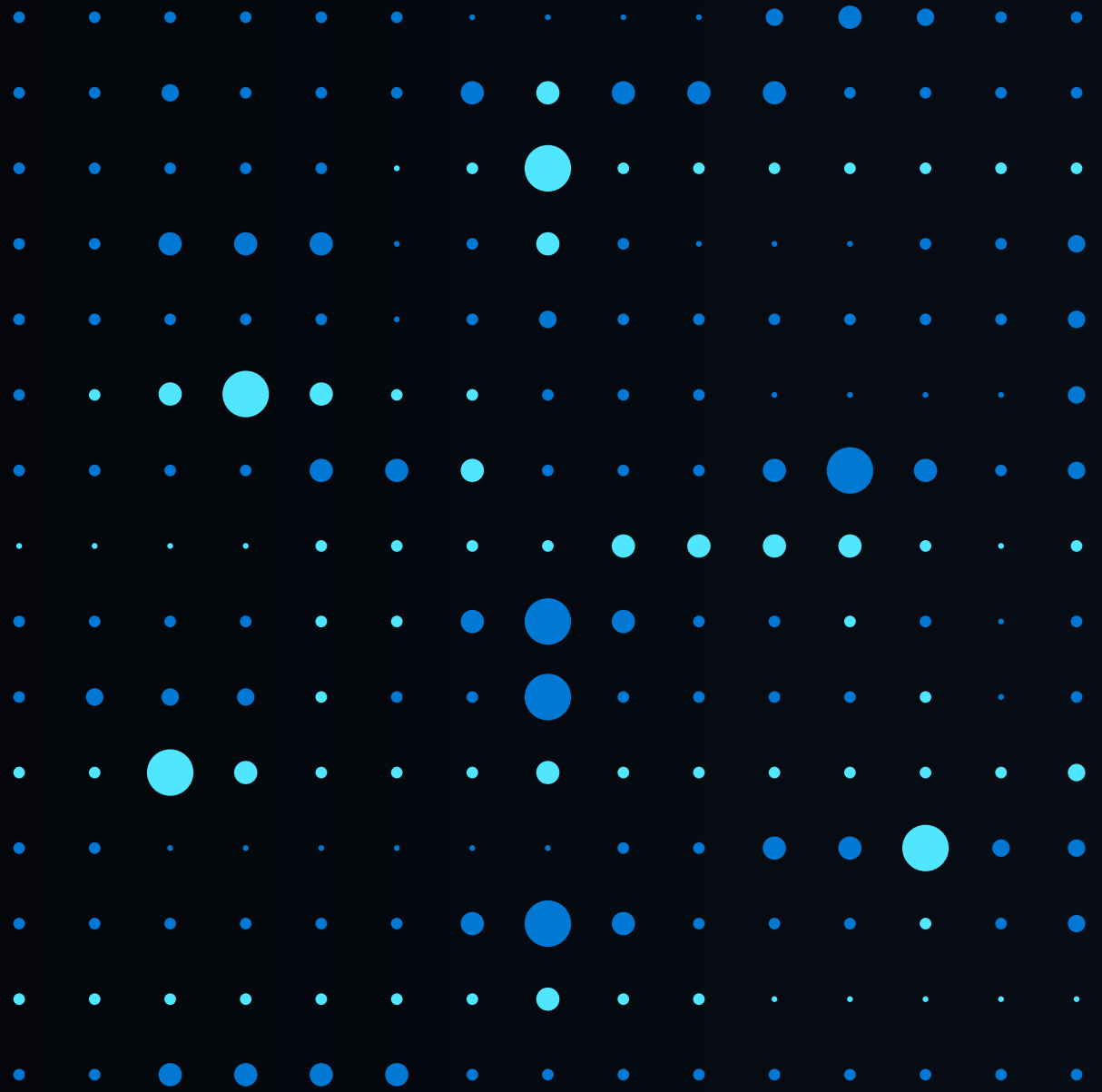
Microsoft

# Massively Parallel Processing (MPP) Architecture in Synapse SQL Pools

John Deardurff
Cloud Solution Architect - Engineer



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Microsoft Certified Trainer (Regional Lead)
MVP: Data Platform (2016 – 2018)

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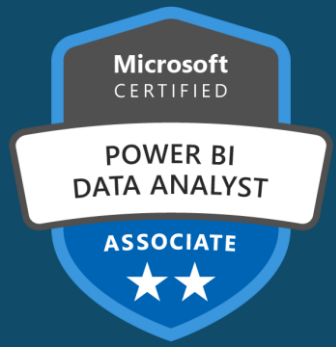


# Key Concepts

## Azure Synapse Intro

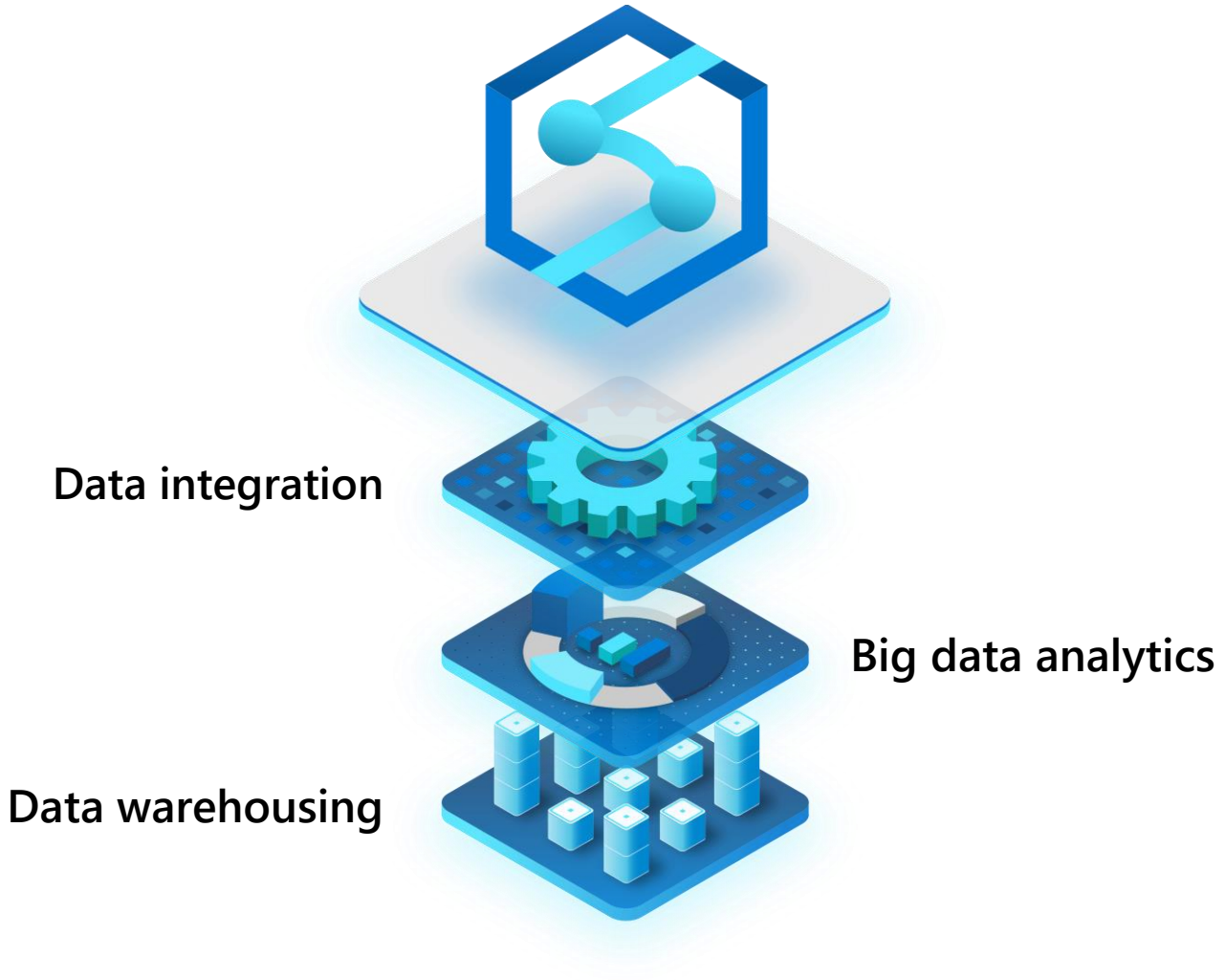
## MPP Architecture

- Control Node
- Compute Nodes
- Table Distributions

## Scaling Compute

# Azure Synapse Analytics

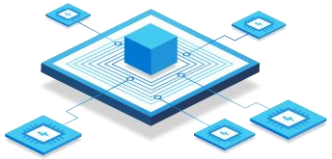
- The **first** unified, cloud native platform for converged analytics
- Azure Synapse is the only unified platform for analytics, blending big data, data warehousing, and data integration into a single cloud native service for end-to-end analytics at cloud scale.



# What is Synapse


## Synapse SQL

Query and analyze data with T-SQL using both provisioned and serverless models



## Apache Spark for Synapse

Quickly create notebooks with your choice of Python, Scala, SparkSQL, and .NET for Spark

## Synapse Pipelines

Build end-to-end workflows for your data movement and data processing scenarios

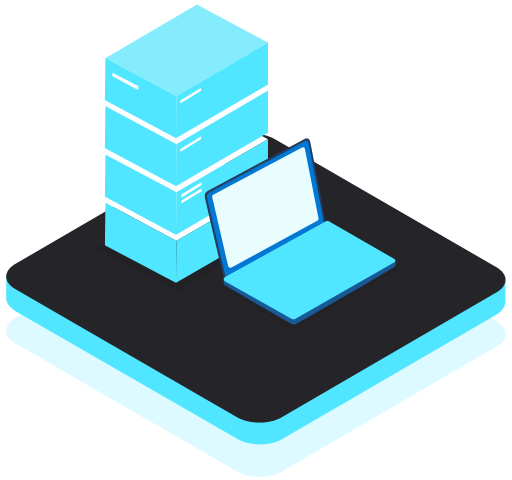
## Synapse Studio

Execute all data tasks with a simple UI and unified workspace environment

# SQL: Serverless vs Dedicated

- Serverless pay-per-query ideal for ad-hoc data lake exploration and transformation
- Dedicated clusters optimized for mission-critical data warehouse workloads

**Serverless (On-Demand)**



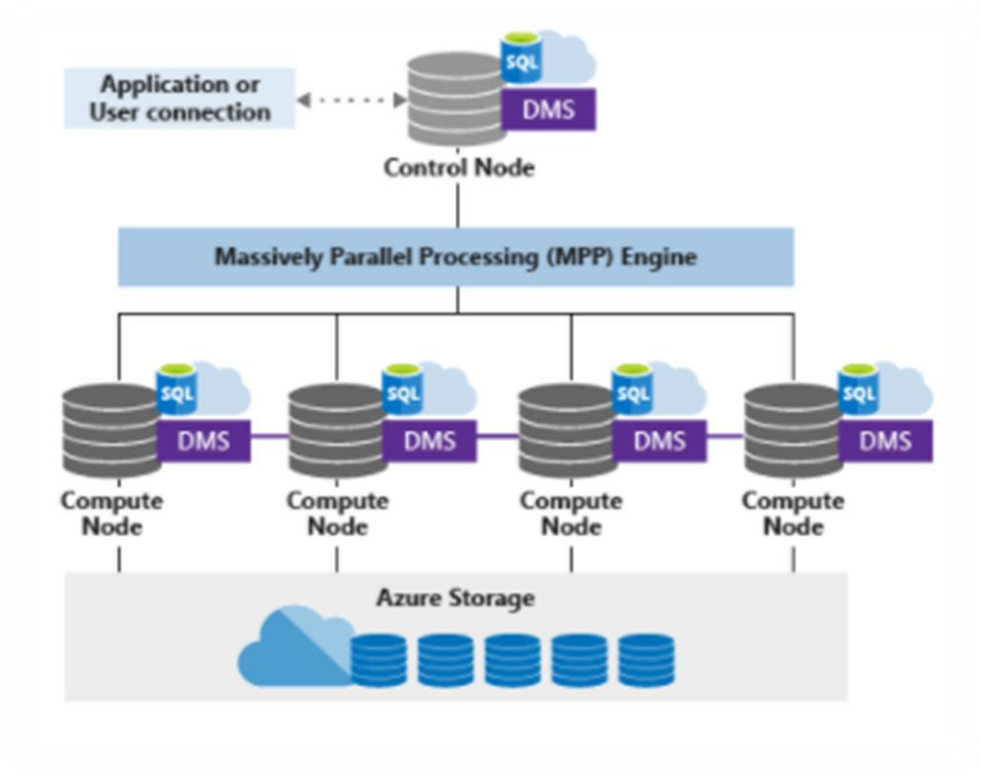
**Dedicated (Provisioned)**

# Key Concepts

- Control Node
- Compute Nodes
- Distributions

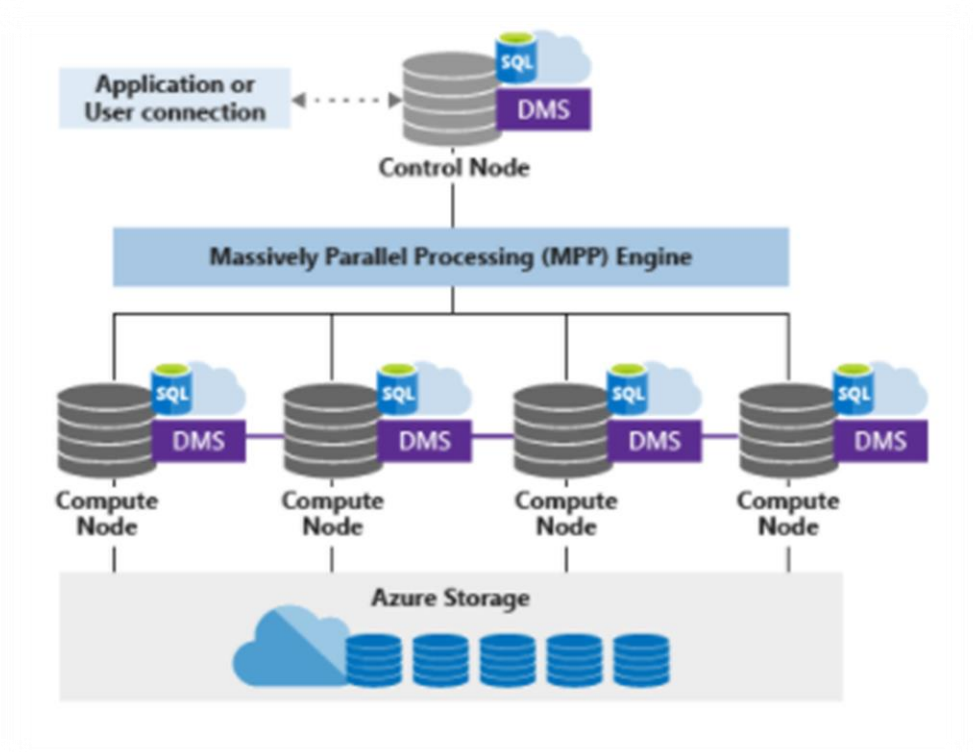
# Control Node

- The brain of the MPP architecture
- It is the front end to that interacts with applications and connections
- The distributed query engine runs on the control node
- Responsible for optimizing and coordinating queries



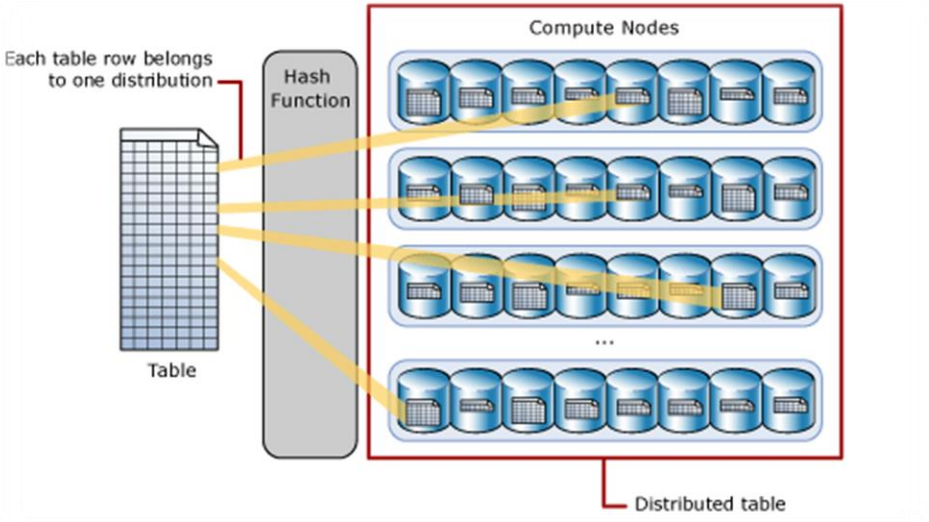
# Compute Nodes

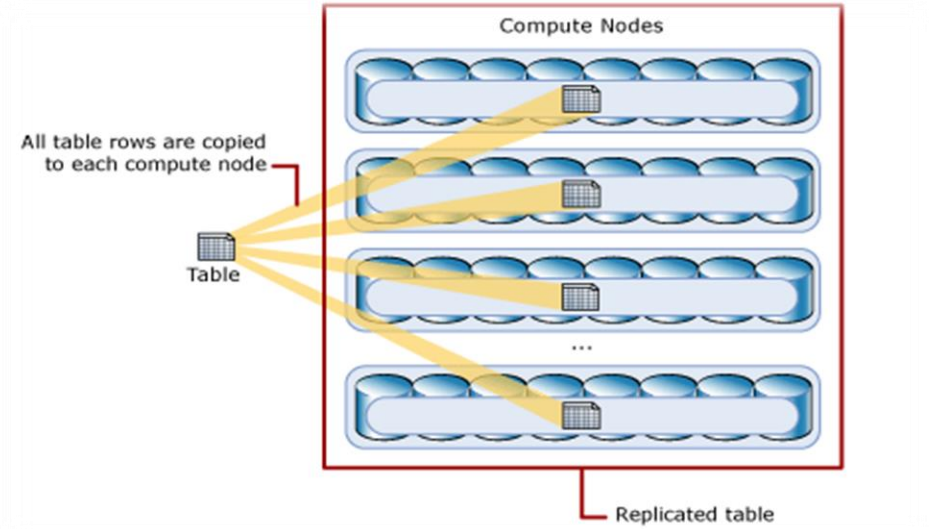
- The brawn of the MPP architecture
- Provides computational power
- Number of compute nodes can range from 1 to 60



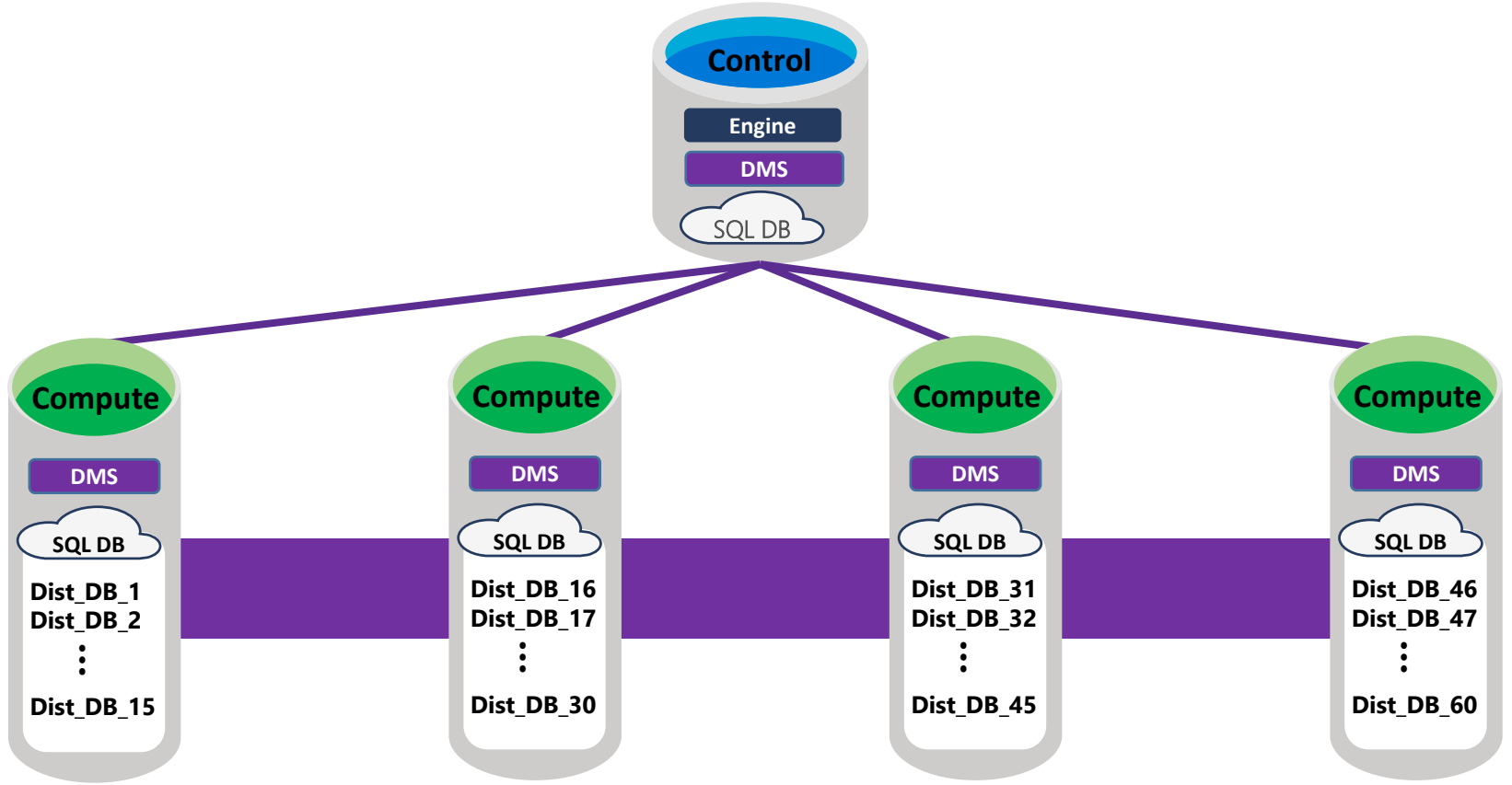
# Distributions

- The work is divided into 60 distributions
- Various ways to distribute the data:
  - Hash-distributed tables
  - Round-robin distributed tables
  - Replicated tables

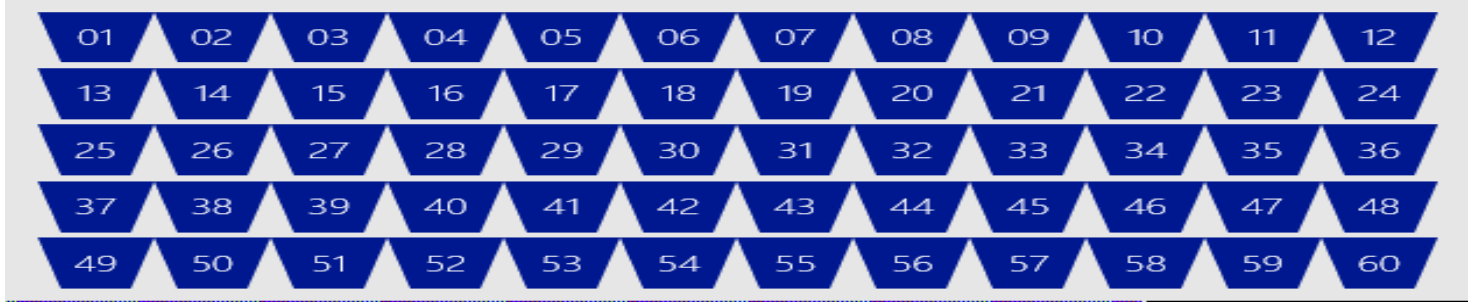


# Synapse SQL MPP Architecture (DW2000)

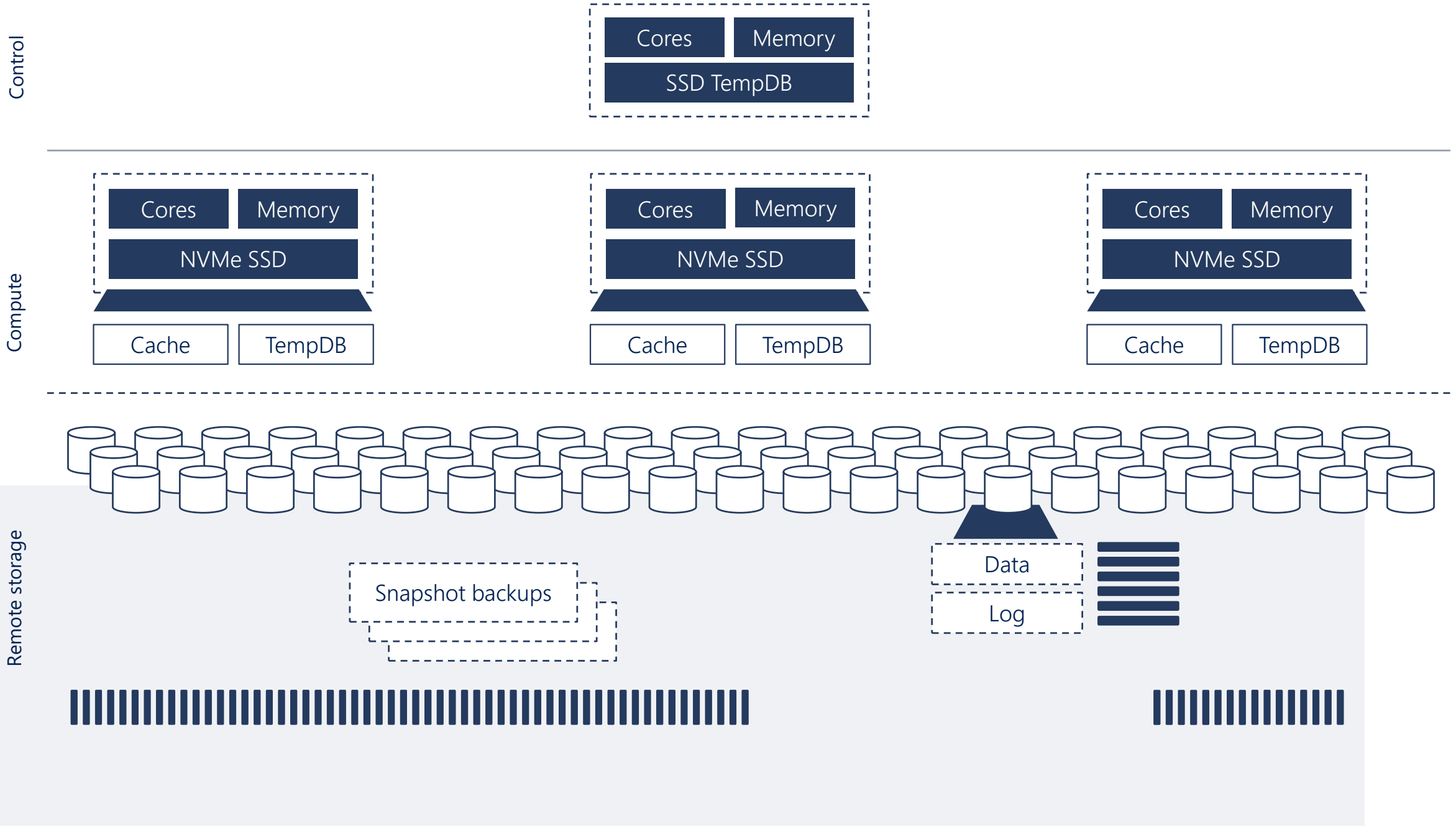



Blob Storage



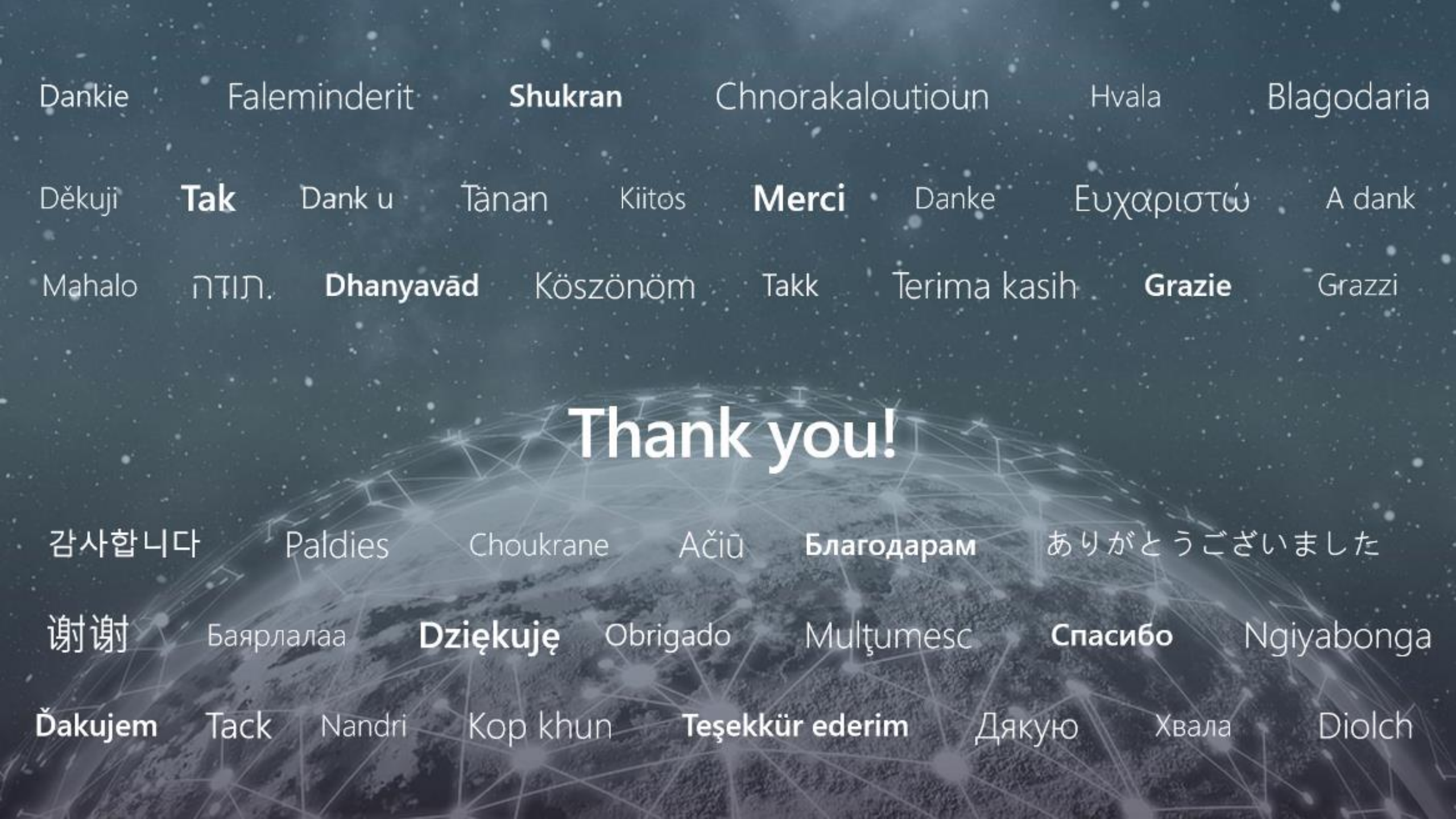
# Scaling Compute

| cDWU | # of Compute Nodes | # Distributions per node | Memory per data warehouse (GB) | Tempdb (TB) | Adaptive Cache (TB) |
|---|---|---|---|---|---|
| DW100c | 1 | 60 | 60 | .4 | .3 |
| DW200c | 1 | 60 | 120 | .8 | .6 |
| DW300c | 1 | 60 | 180 | 1.2 | .9 |
| DW400c | 1 | 60 | 240 | 1.6 | 1.2 |
| DW500c | 1 | 60 | 300 | 2 | 1.5 |
| DW1000c | 2 | 30 | 600 | 4 | 3 |
| DW1500c | 3 | 20 | 900 | 6 | 4.5 |
| DW2000c | 4 | 15 | 1200 | 8 | 6 |
| DW2500c | 5 | 12 | 1500 | 10 | 7.5 |
| DW3000c | 6 | 10 | 1800 | 12 | 9 |
| DW5000c | 10 | 6 | 3000 | 19 | 15 |
| DW6000c | 12 | 5 | 3600 | 23 | 18 |
| DW7500c | 15 | 4 | 4500 | 29 | 22.5 |
| DW10000c | 20 | 3 | 6000 | 39 | 30 |
| DW15000c | 30 | 2 | 9000 | 58 | 45 |
| DW30000c | 60 | 1 | 18000 | 117 | 90 |


Control
Cores
Memory
SSD TempDB
Compute
Cores
Memory
NVMe SSD
Cache
TempDB
Cores
Memory
NVMe SSD
Cache
TempDB
Cores
Memory
NVMe SSD
Cache
TempDB
Remote storage
Snapshot backups
Data
Log

# Table Distribution Options

| Hash Distributed | Round Robin (Default) | Replicated |
| --- | --- | --- |
| • Data divided across nodes based on hashing algorithm<br>• Same value will always hash to same distribution<br>• Multi-column now available. | • Data distributed evenly across nodes<br>• Easy place to start, don’t need to know anything about the data<br>• Simplicity at a cost | • Data repeated on every node<br>• Simplifies many query plans and reduces data movement<br>• Best with joining hash table |


Dankie
Faleminderit
Shukran
Chnorakaloutioun
Hvala
Blagodaria
Děkuji
Tak
Dank u
Tänan
Kiitos
Merci
Danke
Ευχαριστώ
A dank
Mahalo
תודה.
Dhanyavād
Köszönöm
Takk
Terima kasih
Grazie
Grazzi
Thank you!
감사합니다
Paldies
Choukrane
Ačiū
Благодарам
ありがとうございました
谢谢
Баярлалаа
Dziękuję
Obrigado
Mulţumesc
Спасибо
Ngiyabonga
Ďakujem
Tack
Nandri
Kop khun
Teşekkür ederim
Дякую
Хвала
Diolch