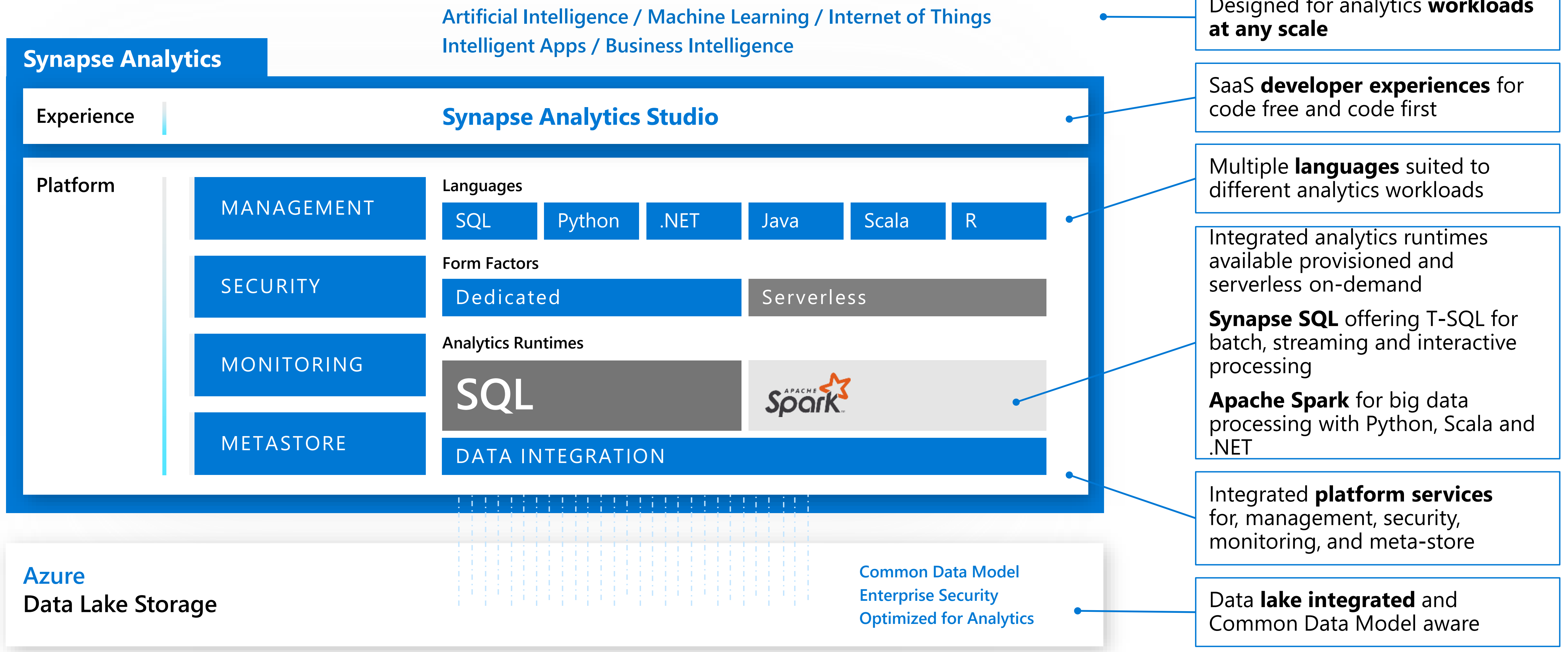
Aas Trailblazers

Unleashing insights

Azure Synapse Analytics

Limitless analytics service with unmatched time to insight



Designed for analytics **workloads at any scale**

SaaS **developer experiences** for code free and code first

Multiple **languages** suited to different analytics workloads

Integrated analytics runtimes available provisioned and serverless on-demand

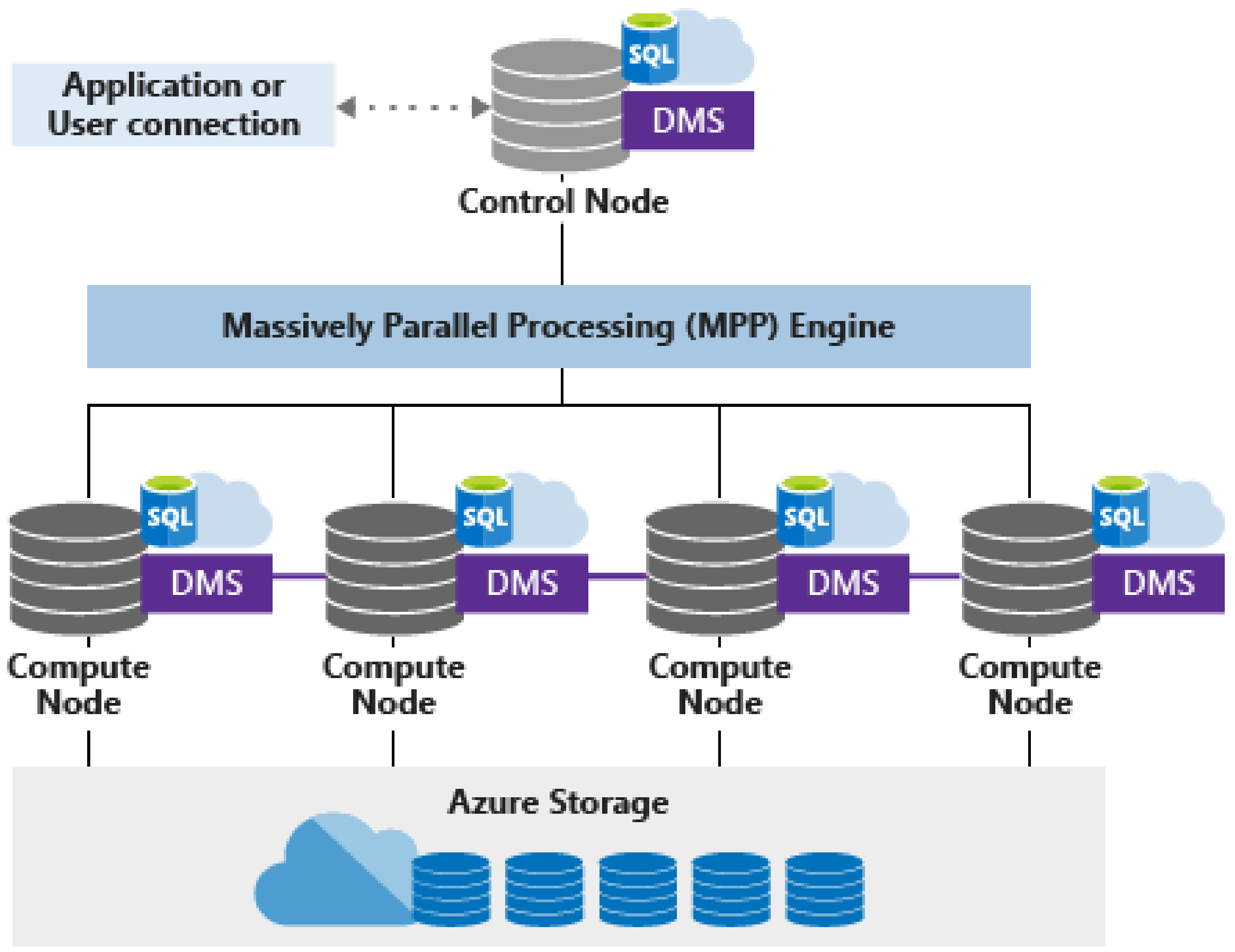
Synapse SQL offering T-SQL for batch, streaming and interactive processing

Apache Spark for big data processing with Python, Scala and .NET

Integrated **platform services** for, management, security, monitoring, and meta-store

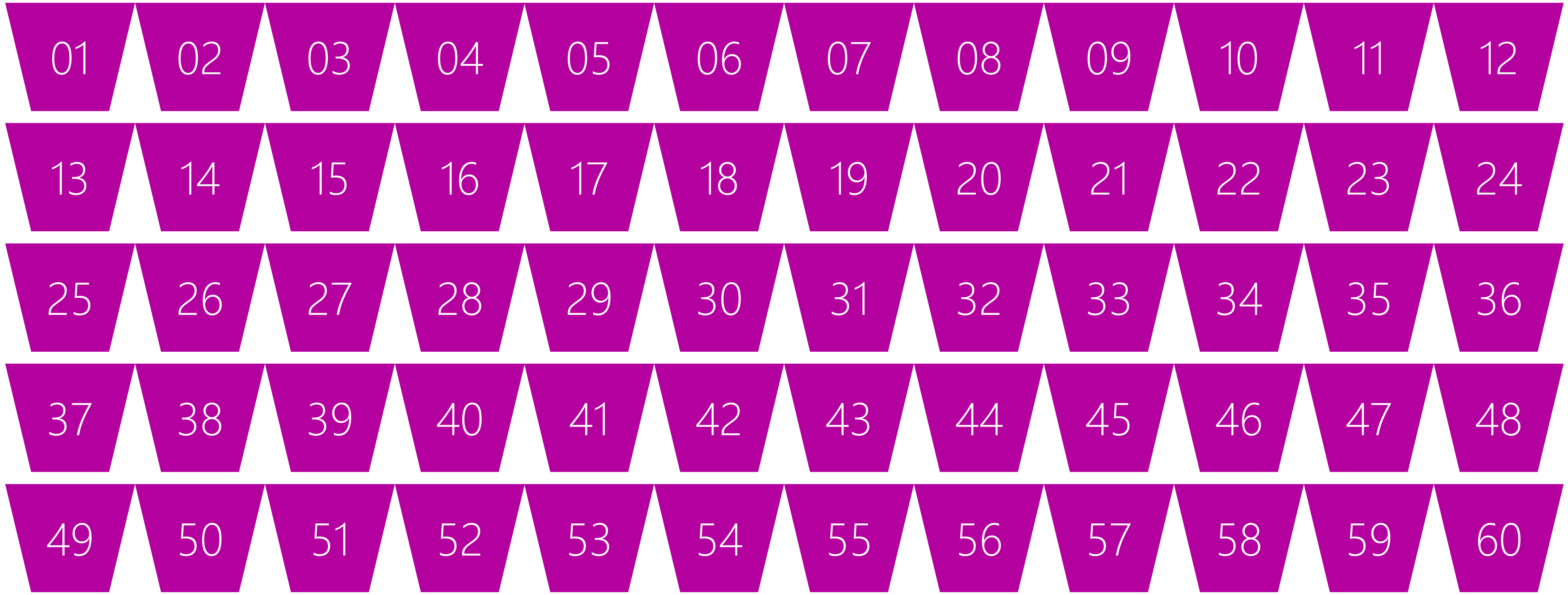
Data **lake integrated** and Common Data Model aware

Synapse SQL – MPP Architecture



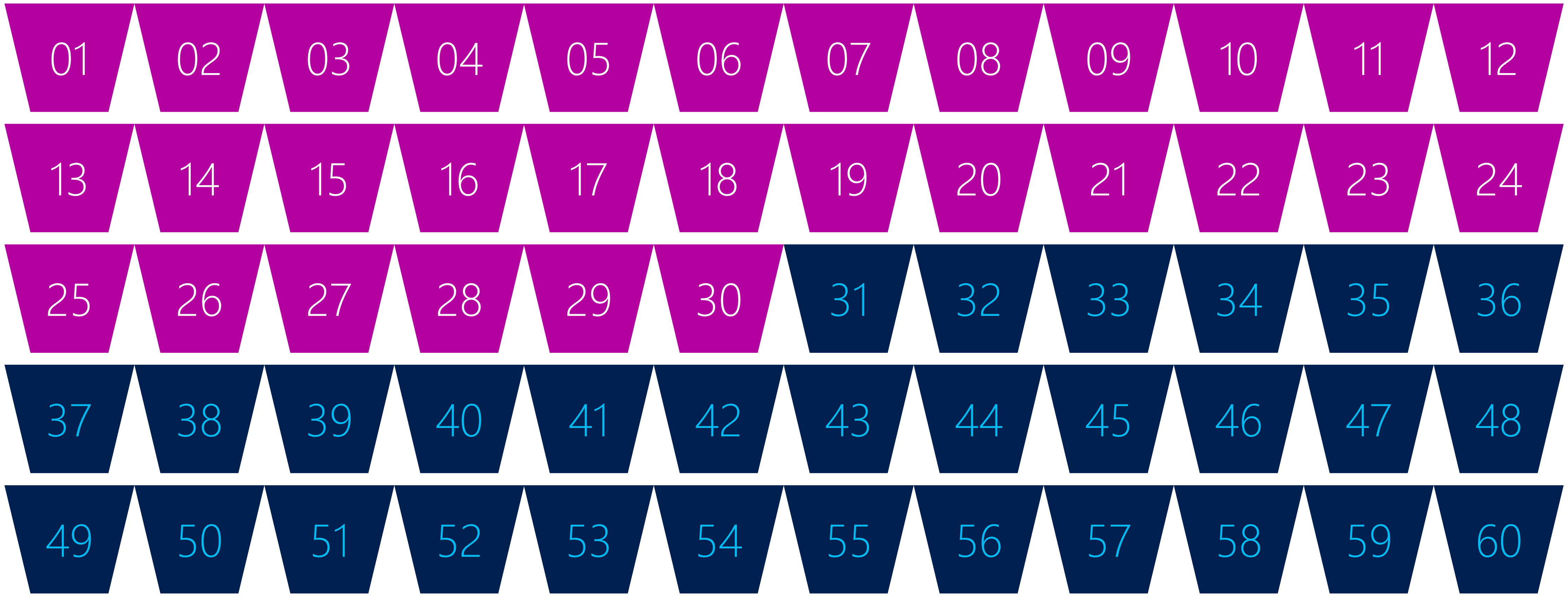
Mapping Compute in dedicated SQL Pool

1 Compute Node



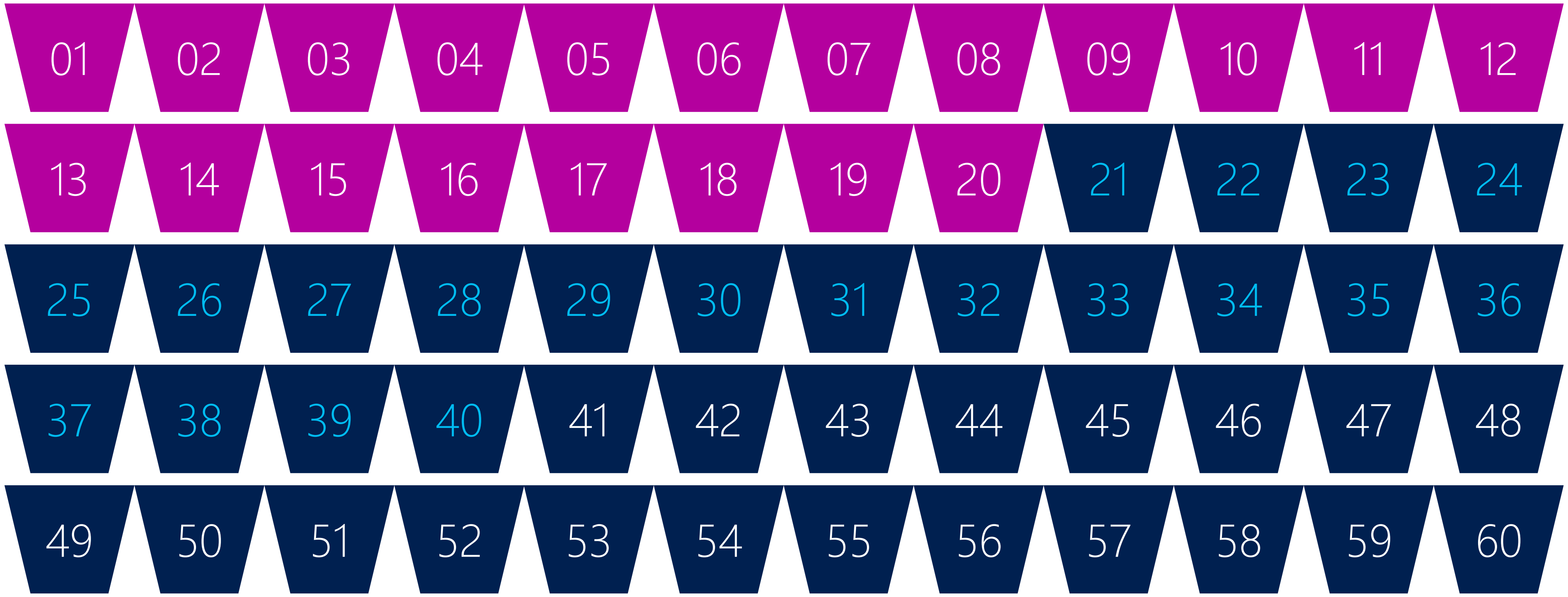
Mapping Compute in dedicated SQL Pool

2 Compute Nodes



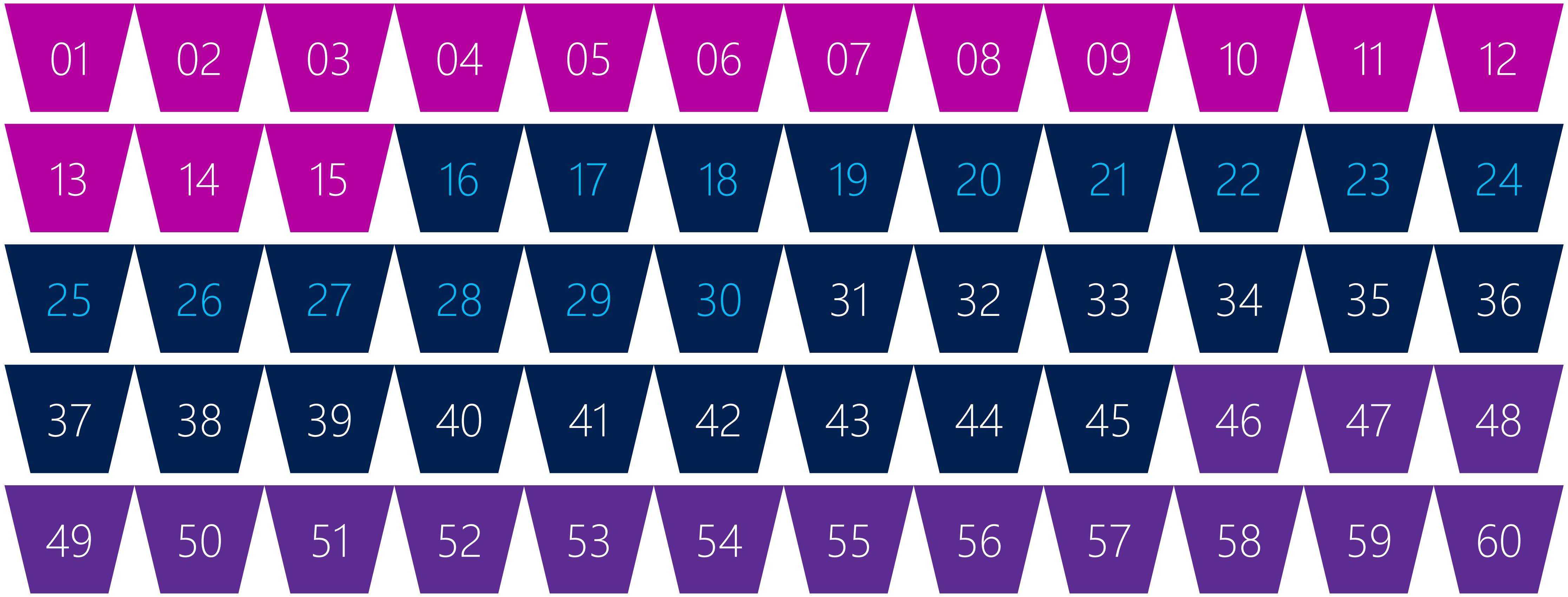
Mapping Compute in dedicated SQL Pool

3 Compute Nodes



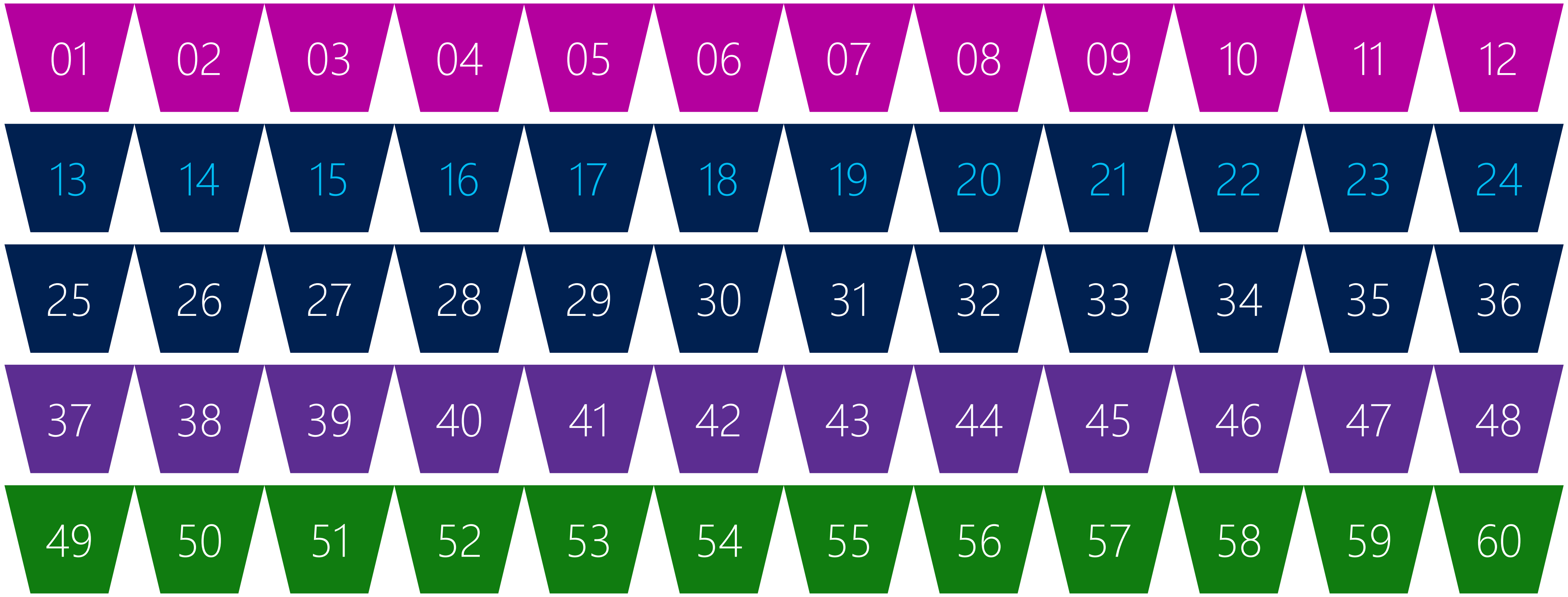
Mapping Compute in dedicated SQL Pool

4 Compute Nodes



Mapping Compute in dedicated SQL Pool

5 Compute Nodes



Pausing compute in dedicated SQL Pool

Compute Nodes - Released

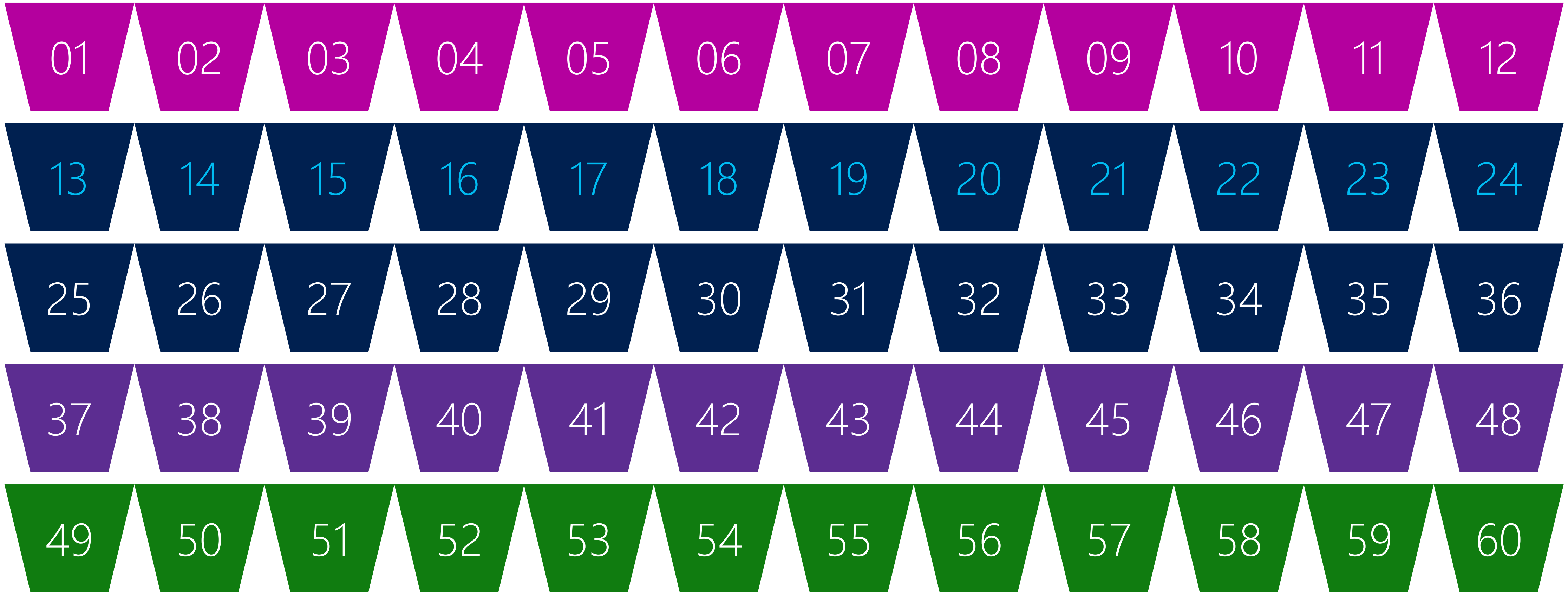
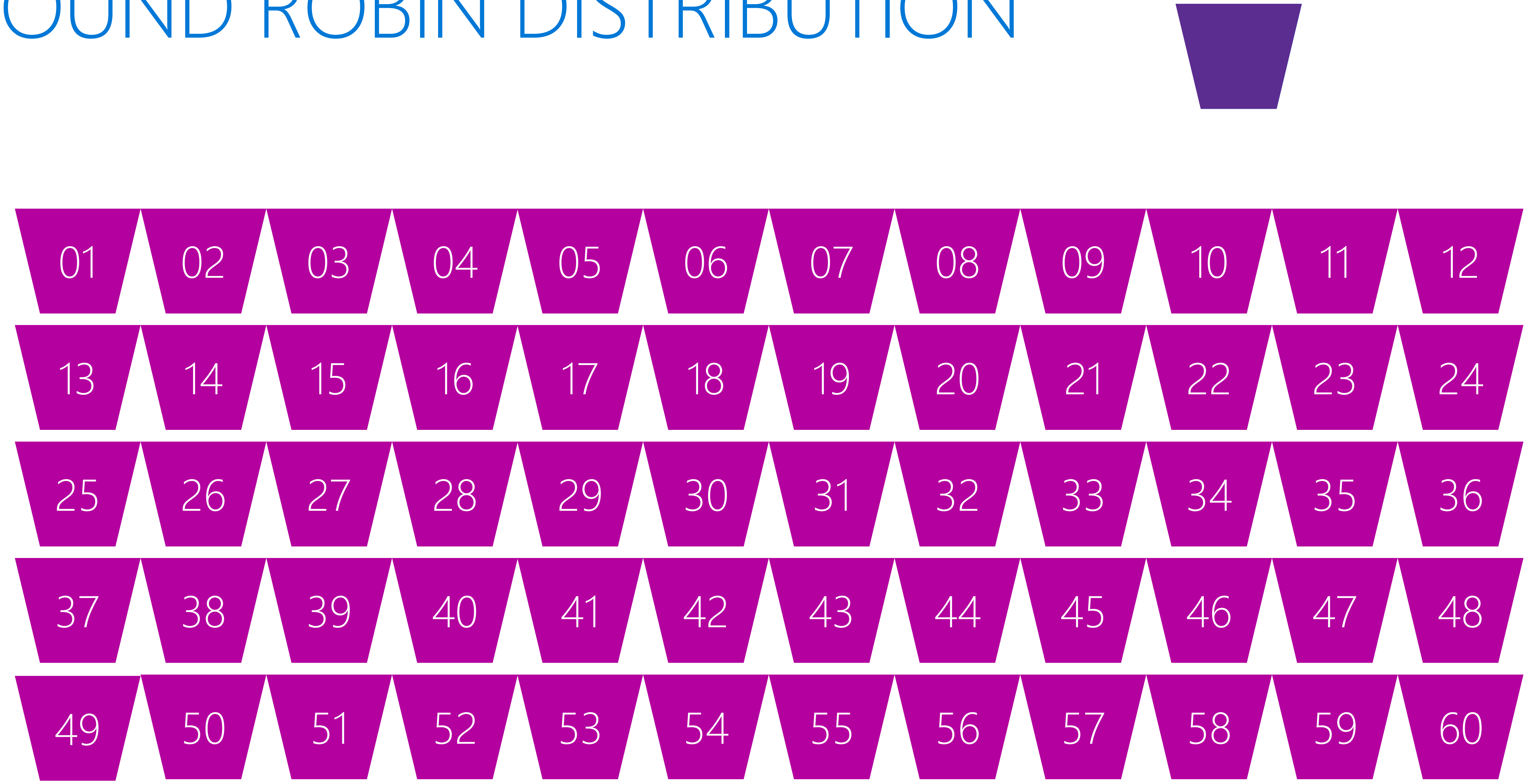


Table types

- Distributed table
  - **Round-Robin (default)**
  - **Hash key**
- Replicated table
- External table

ROUND ROBIN DISTRIBUTION



Synapse SQL – MPP Architecture

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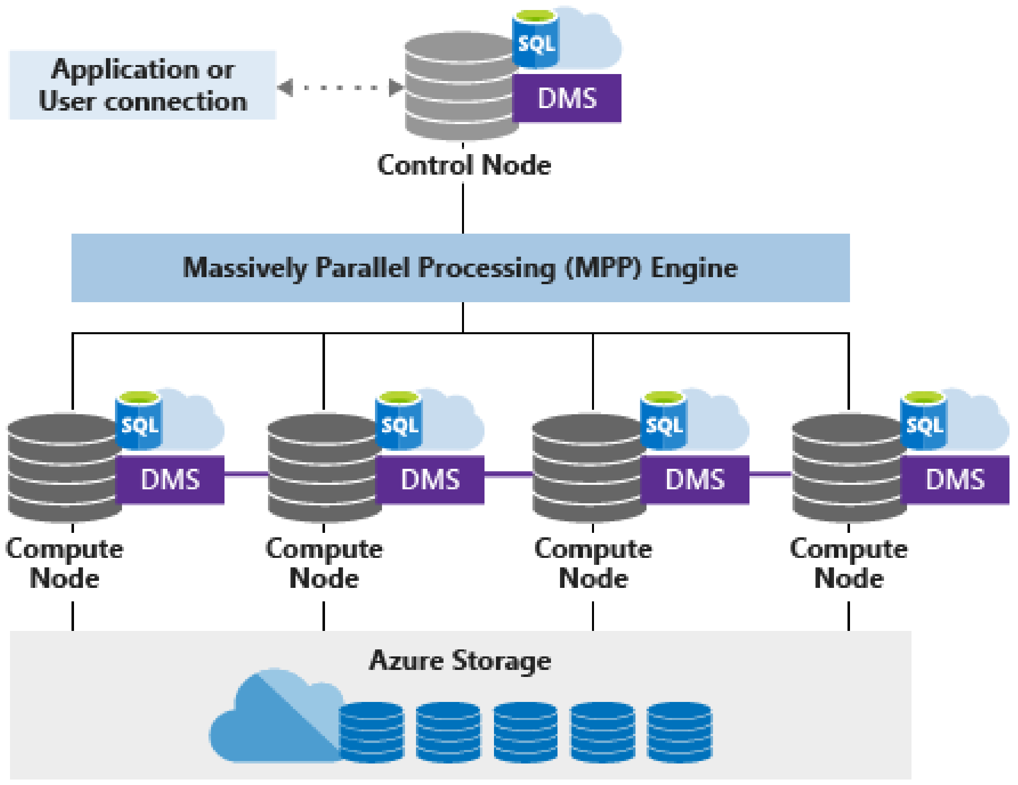

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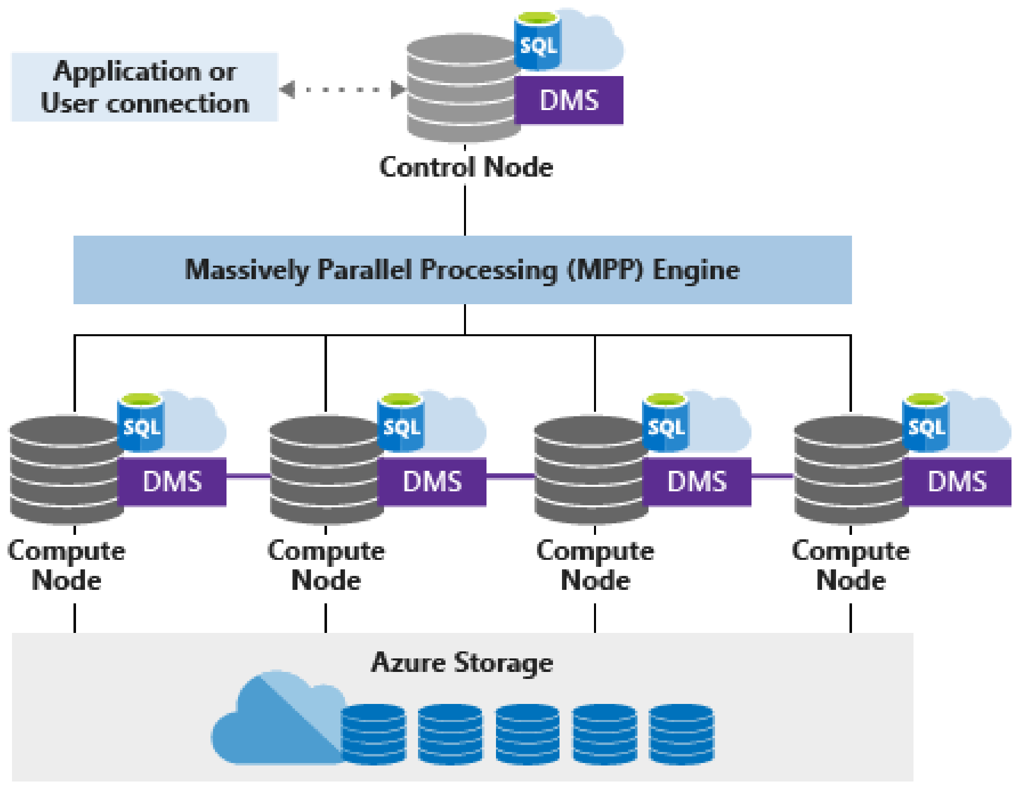

Round Robin Distribution

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Synapse SQL – MPP Architecture

```
SELECT ProductKey, Sum(Amt)
FROM TableName
GROUP BY ProductKey
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```

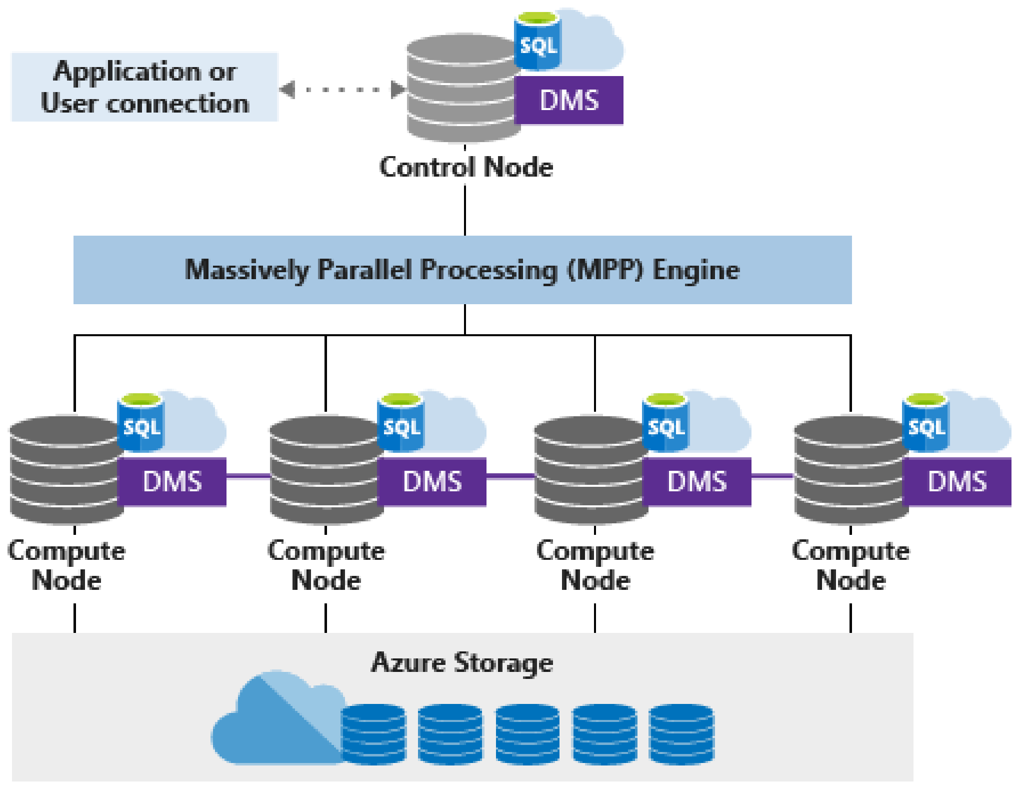

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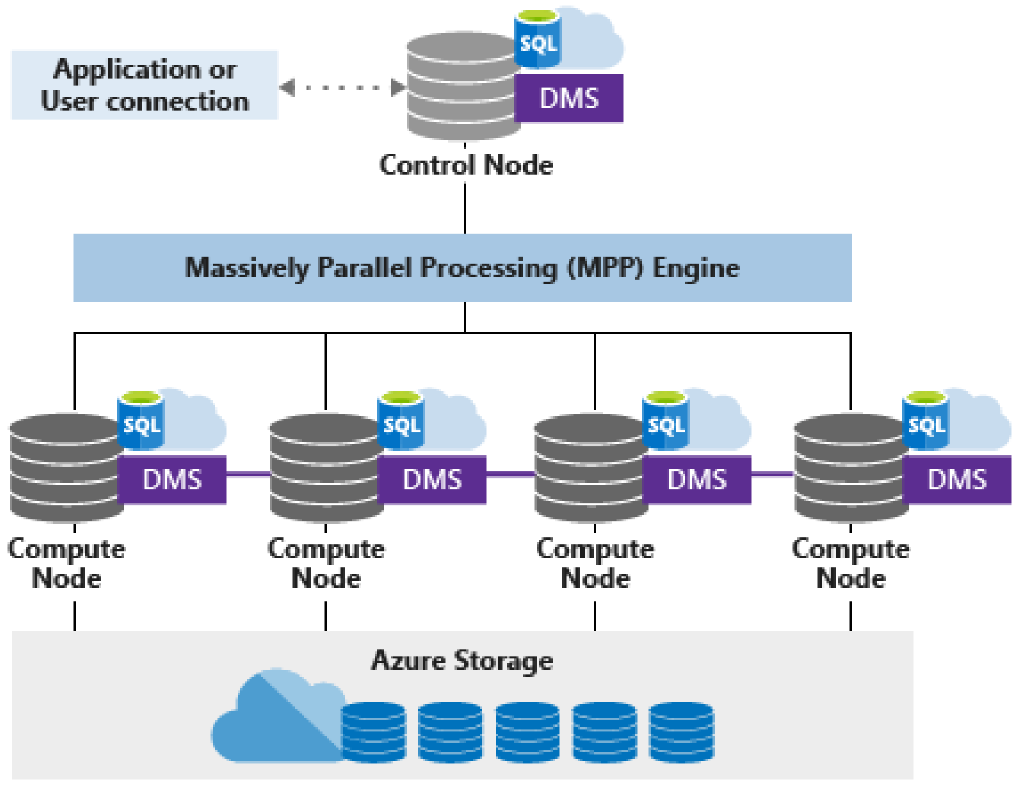
Synapse SQL – MPP Architecture



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Shuffle data across based on ProductKey to serve query

https://azure.microsoft.com/en-us/blog/lightning-fast-query-performance-with-azure-sql-data-warehouse/

Synapse SQL – MPP Architecture

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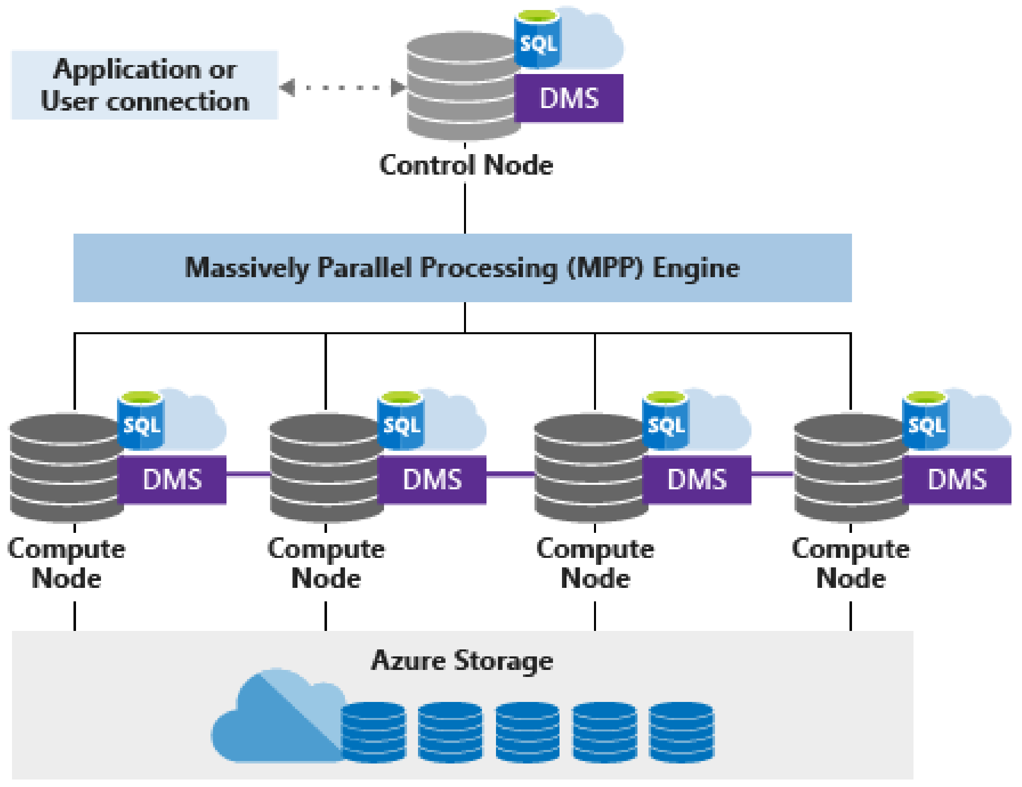

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Synapse SQL – MPP Architecture

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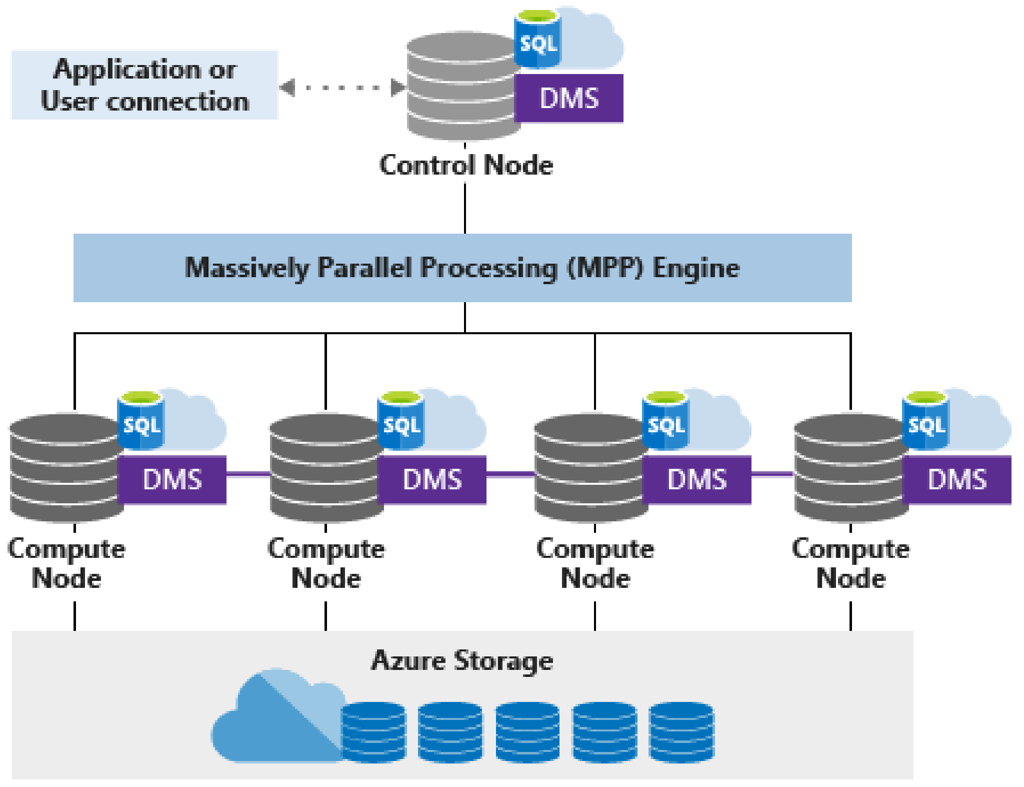

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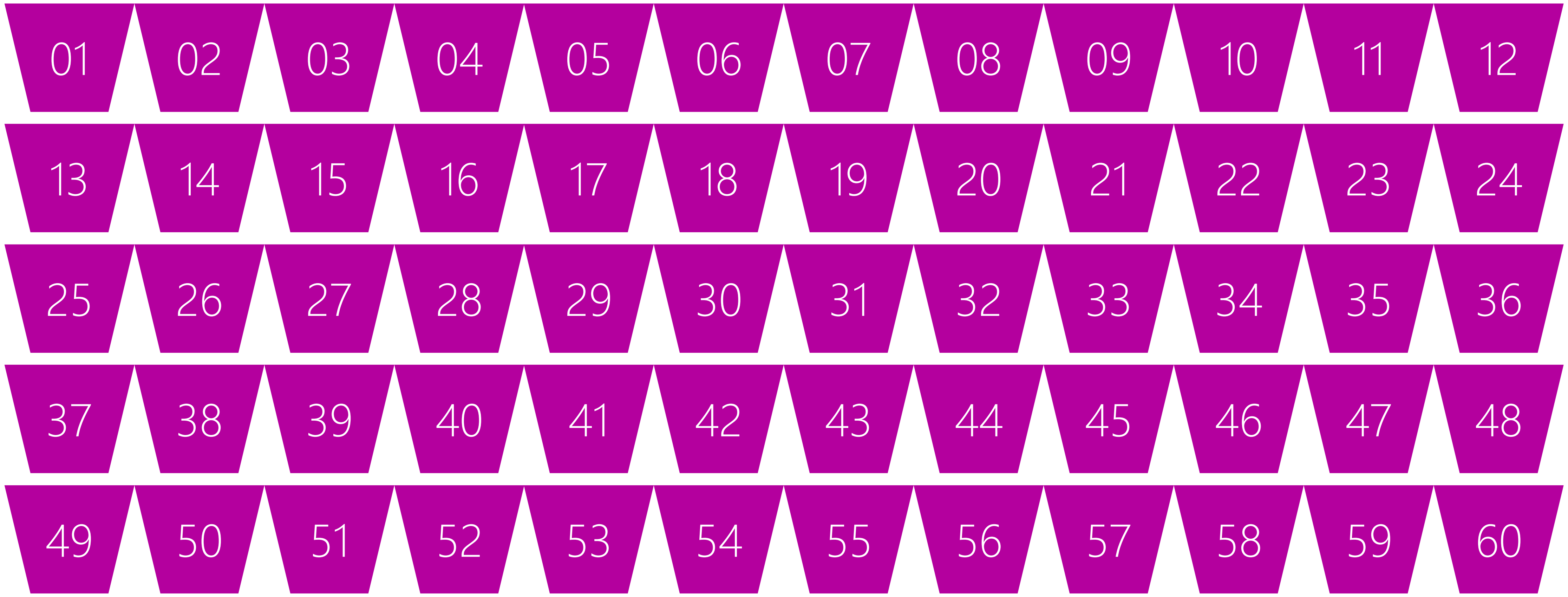
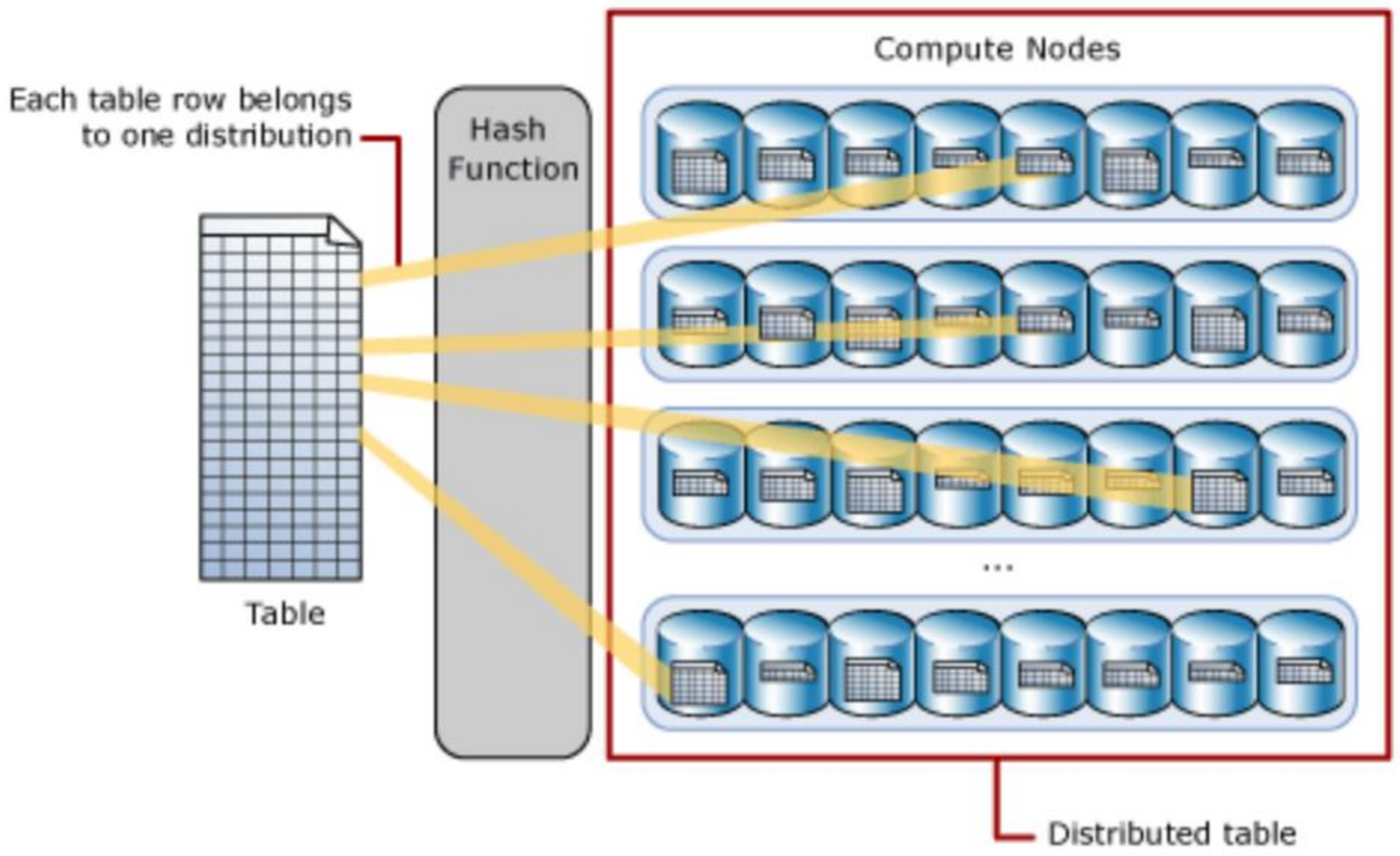
HASH DISTRIBUTION

01



HASH DISTRIBUTION



https://docs.microsoft.com/en-us/azure/synapse-analytics/sql-data-warehouse/sql-data-warehouse-tables-distribute

Synapse SQL – MPP Architecture

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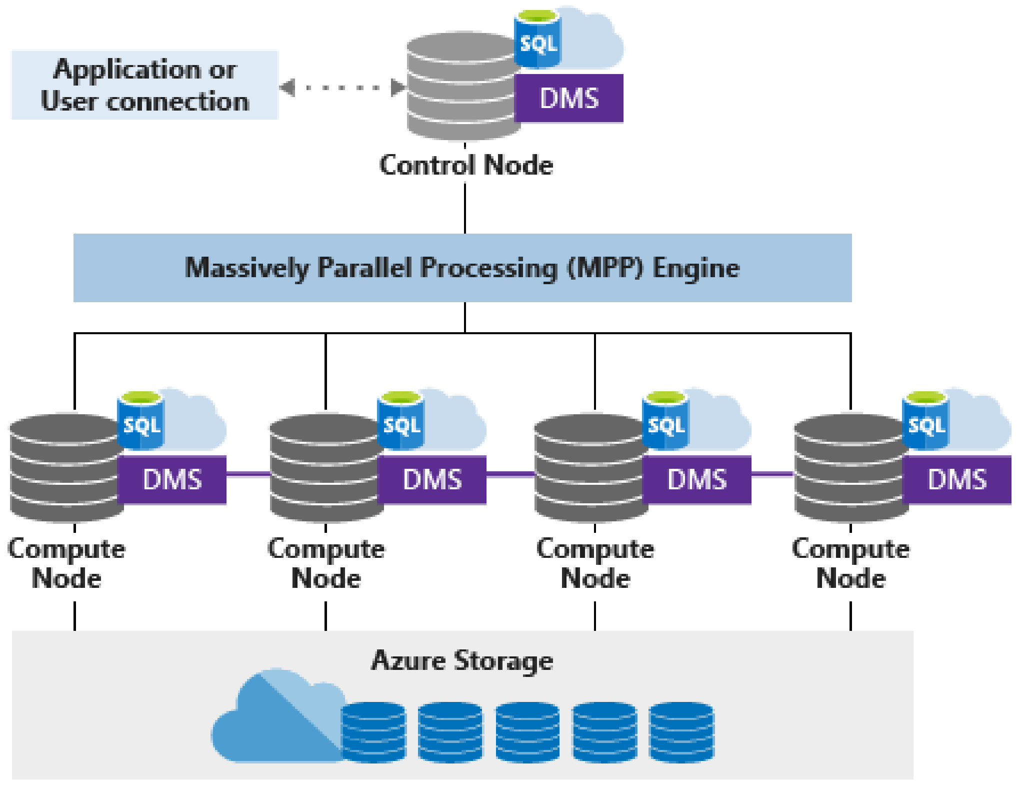

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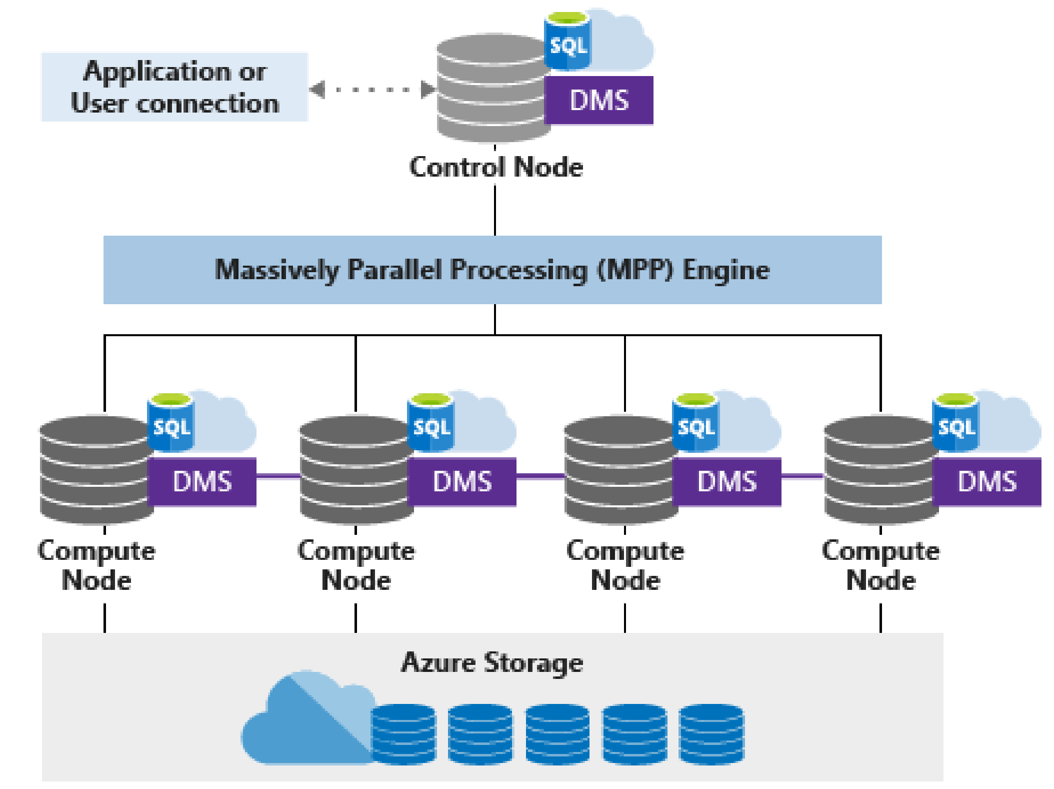

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Hash distribution based on ProductKey

Synapse SQL – MPP Architecture

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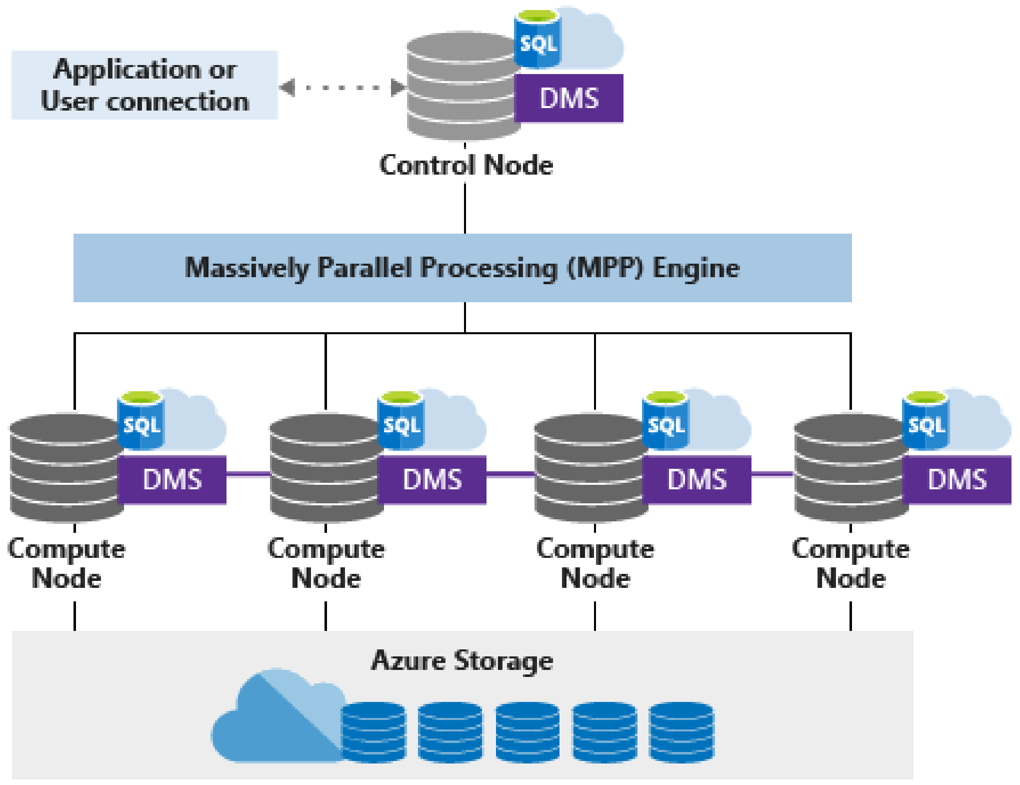

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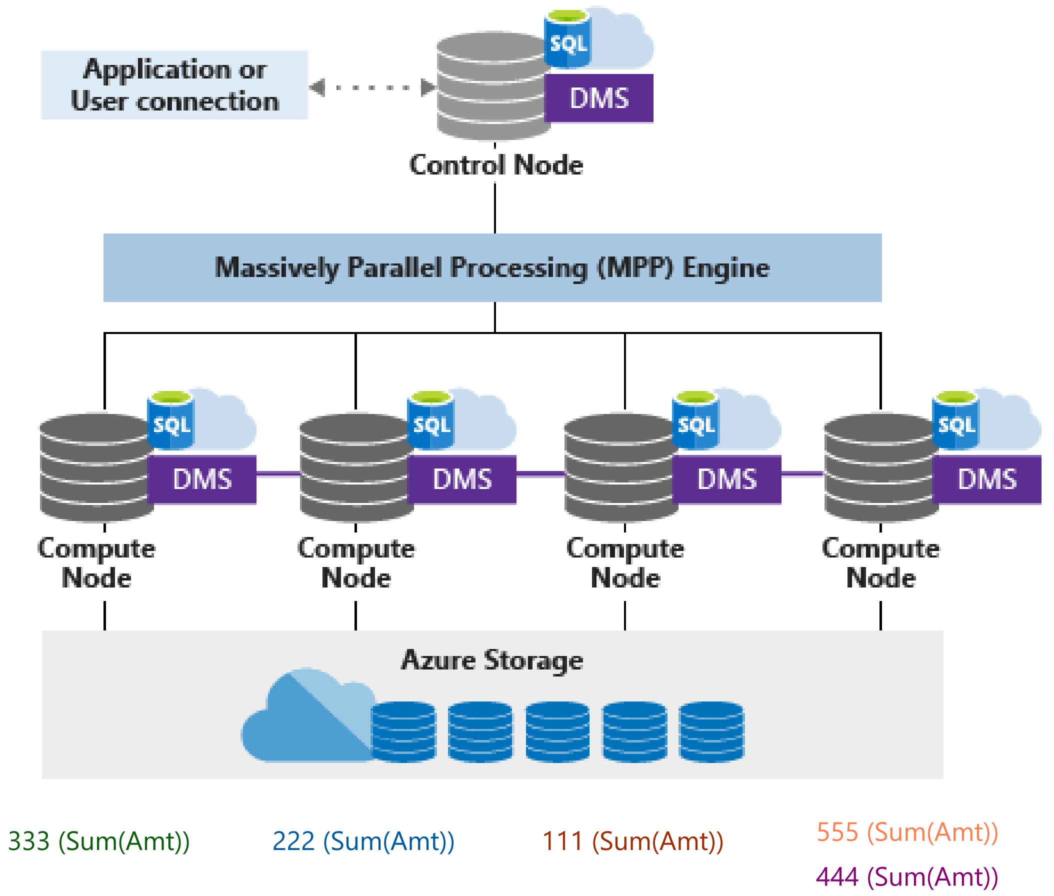

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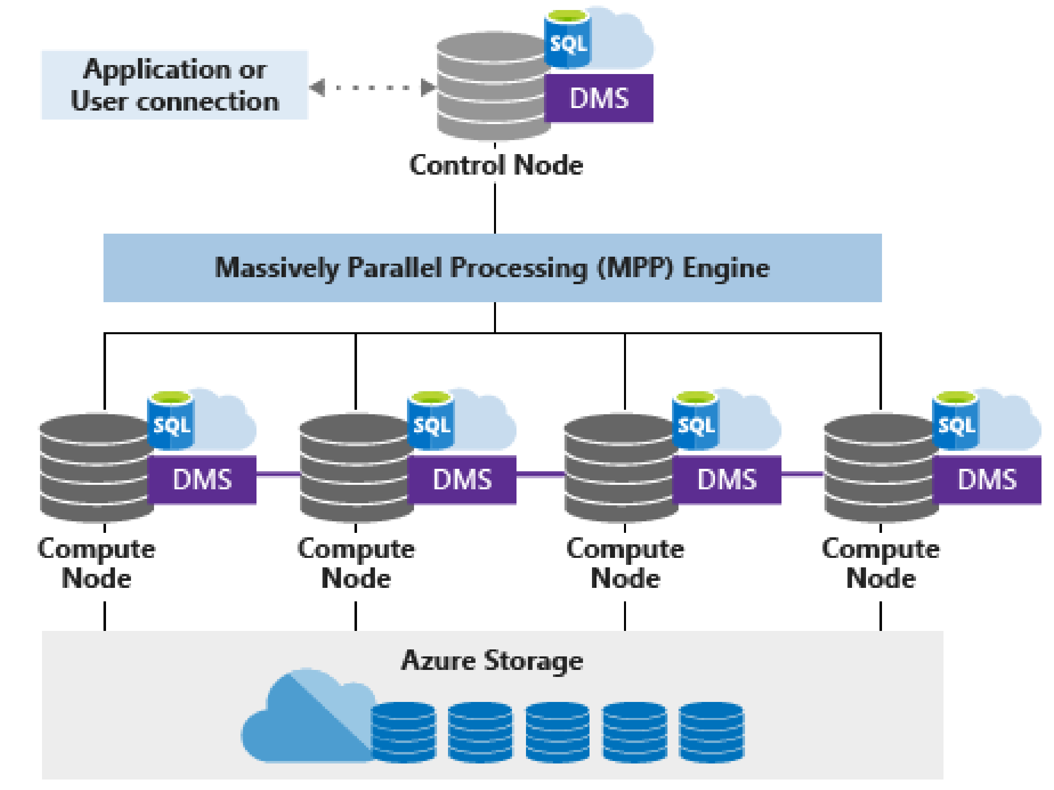

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Demo

Round-Robin distributed tables

- Distributes table rows evenly across all distributions
- Rows with equal values are not guaranteed to be assigned to the same distribution, resulting in more data movement
- Consider using the round-robin distribution for your table in the following scenarios:
  - When getting started as a simple starting point since it is the default
  - If there is no obvious joining key
  - If there is not good candidate column for hash distributing the table
  - If the table does not share a common join key with other tables
  - If the join is less significant than other joins in the query
  - When the table is a temporary staging table

Hash distributed table

- Hash function is used to assign each row to one distribution – deterministic hash function
- Identical values always hash to the same distribution
- Distribution column should have an even distribution of values
- Hash-distributed tables work well for large fact tables
- Consider using a hash-distributed table when:
  - The table size on disk is more than 2 GB.
  - The table has frequent insert, update, and delete operations.

Selecting a right distribution key

For large fact tables, best option is to Hash Distribute

- All of the distributions should have approximately the same number of rows
- Distribute on column that is joined to other fact tables
- Primary or surrogate key

However, be mindful of …

- Hash column should have highly distinct values (Minimum >60 distinct values)
- Avoid distributing on a date column
- Avoid distributing on column with high frequency of NULLs and default values (e.g. -1)
- Distribution column is NOT updatable. Updates to data in the distribution column could result in data shuffle operation.
- For compatible joins use the same data types for two distributed tables

Selecting a right distribution key

Choose a distribution key that minimizes data movement

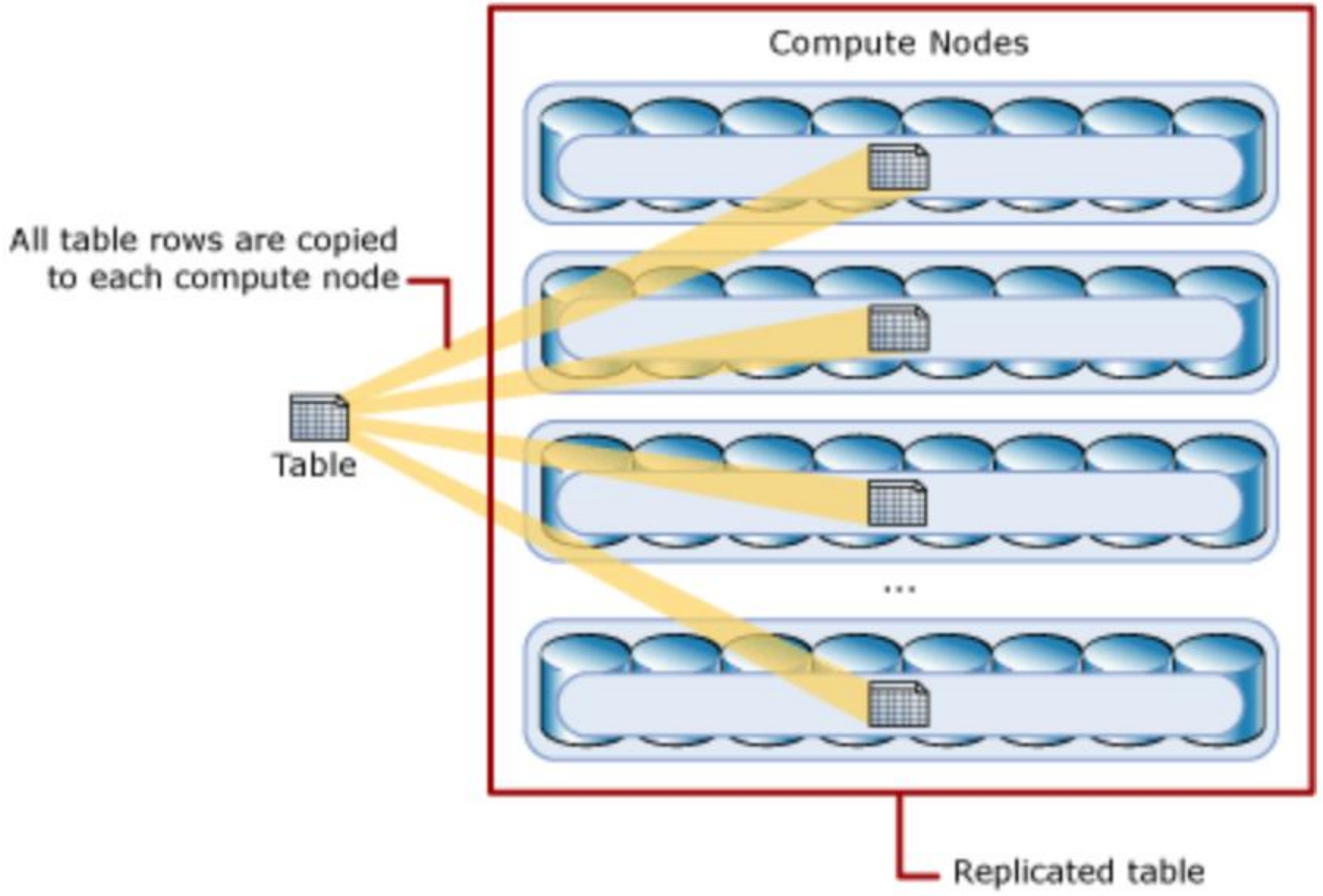
- Data movement commonly happens when queries have joins and aggregations
- Distribution key - JOIN, GROUP BY, DISTINCT, OVER, and HAVING clauses
- Is not used in WHERE clauses. This could narrow the query to not run on all the distributions.
- Is not a date column. WHERE clauses often filter by date. When this happens, all the processing could run on only a few distributions.

If there are no distribution columns that make sense, then use Round Robin as last resort

Replicated Tables

- Replicated table has a full copy of the table on each Compute node
- Replicating a table removes the need to transfer data among Compute nodes before a join or aggregation.
- Ideal for small dimension tables (<2 GB compressed) – not a hard limit though, if the data is static and does not change, you can replicate larger tables.
- Replicated tables may not yield the best query performance when:
  - The table has frequent insert, update, and delete operations. These DML operations require a rebuild of the replicated table. Rebuilding frequently can cause slower performance.
  - The data warehouse is scaled frequently. Scaling a data warehouse changes the number of Compute nodes, which incurs a rebuild.
  - The table has a large number of columns, but data operations typically access only a small number of columns

Replicated Tables



https://docs.microsoft.com/en-us/azure/synapse-analytics/sql-data-warehouse/design-guidance-for-replicated-tables

Dimension Table

Small dimension table (< 60M rows)

- Clustered index
- Round Robin
- Replicated tables

Large dimension table

- Same design as fact table
- Clustered columnstore (by default) and distribute on join key

Demo