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Table Distribution in Dedicated SQL Pool: That is not "a simple table"

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#GLOBALAZURE 2023

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How many Synapse users here?

How many have faced something like this?

(SQLDev): Dove appoggiamo il nuovo DWH?

(PM): Ho sentito parlare di una cosa che si chiama Synapse. Ti puoi collegare con SQL Server Management Studio, puoi creare viste, stored procedure ed anche tabelle. Usiamo quello che "fa figo".

(SQLDev): Ah bene, ma devo studiarlo prima di partire.

(PM): Macché è come SQL Server nel cloud, non c'è niente da sapere.

...

qualche tempo dopo, appena il progetto è andato in test (o peggio produzione)

...

(SQLDev): Houston... Abbiamo un problema...

About me

- BI & Power BI Engineer Lucient ITALIA
- More than 10 years in Microsoft “Data Realm”
- Giving my little contribution to the community
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- Repository: **github.com/R1k91**

Agenda

- Azure Synapse SQL Pools Architecture
- Distribution types
- Distribution strategy can affect query performance
- Distribution strategy can affect ingestion performance

Synapse SQL

“Synapse SQL is the ability to do T-SQL based analytics in Synapse workspace.

Synapse SQL has two consumption models: dedicated and serverless.”

It’s a distributed architecture

<wrksp_name>.sql.azuresynapse.net

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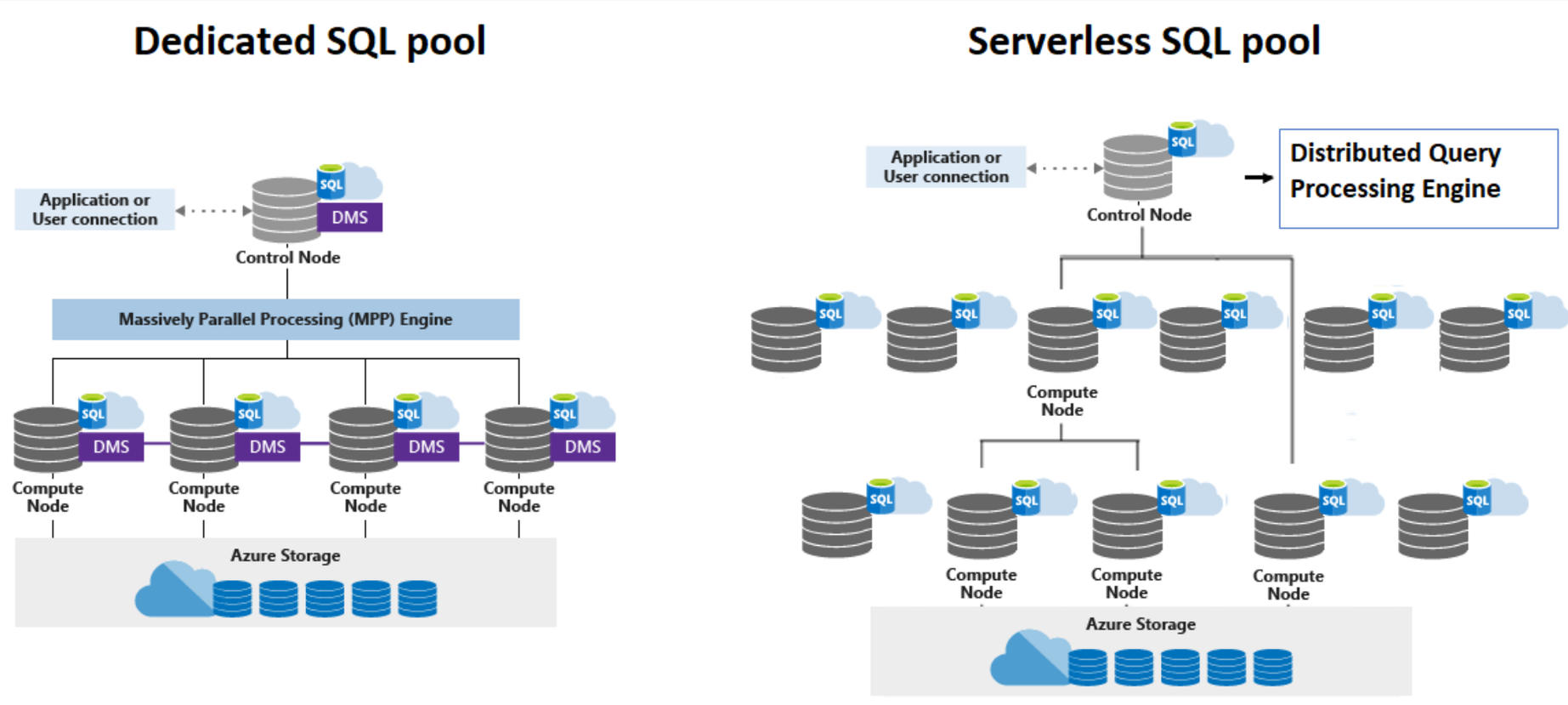
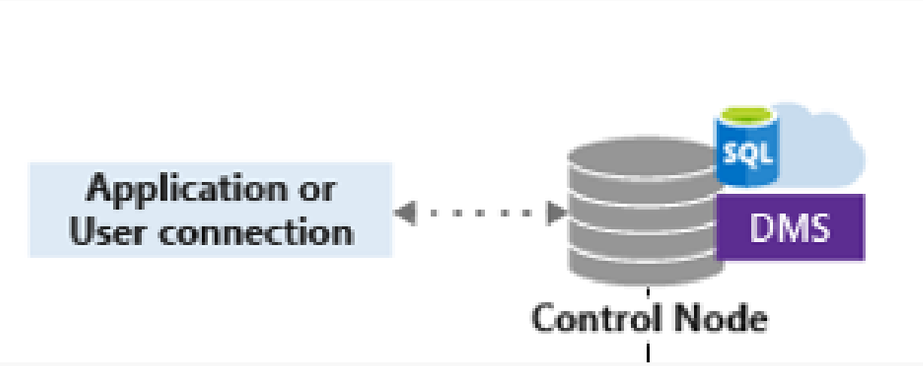


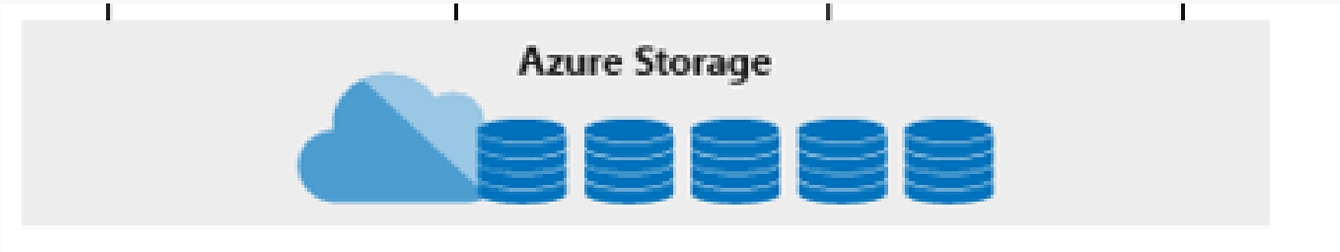
Control Node

- Architecture brain
- Architecture front-end
- Runs the distributed query engine (DQE)
- Transforms T-SQL query in parallel queries running against each distro



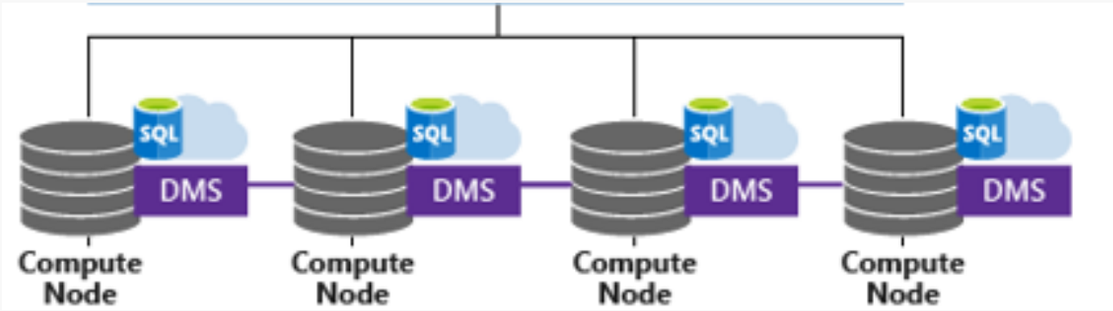
Storage - Distribution

- Data stored on Azure storage
- Data divided into shards (aka distributions)
- There’re always 60 distributions
- Types of sharding
  - Replicate
  - Round Robin
  - Hash



Compute node(s)

- From 1 to 60 nodes according to DWU
- Distributions map to Compute nodes

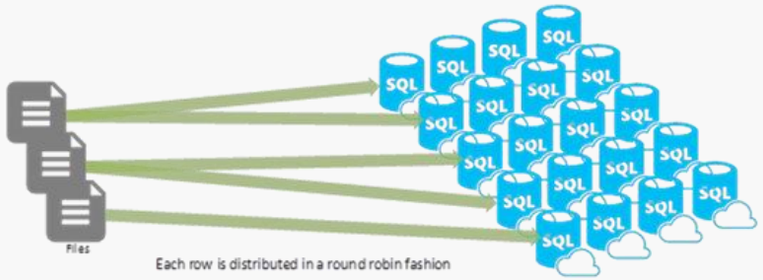


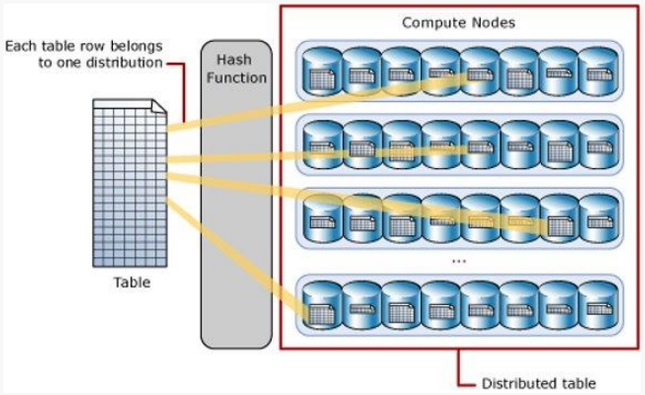
60 smaller queries

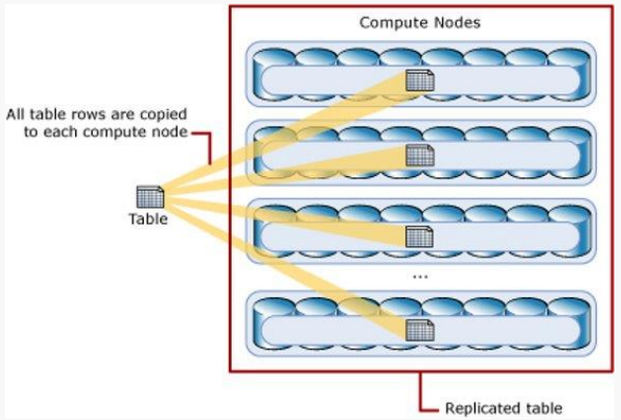
- Query is always divided into 60 smaller queries against 60 distributions
- Distributions per compute node depends on DWU

Performance level	Compute nodes	Distributions per Compute node	Memory per data warehouse (GB)
DW100c	1	60	60
DW200c	1	60	120
DW300c	1	60	180
DW400c	1	60	240
DW500c	1	60	300
DW1000c	2	30	600
DW1500c	3	20	900
DW2000c	4	15	1200
DW2500c	5	12	1500
DW3000c	6	10	1800

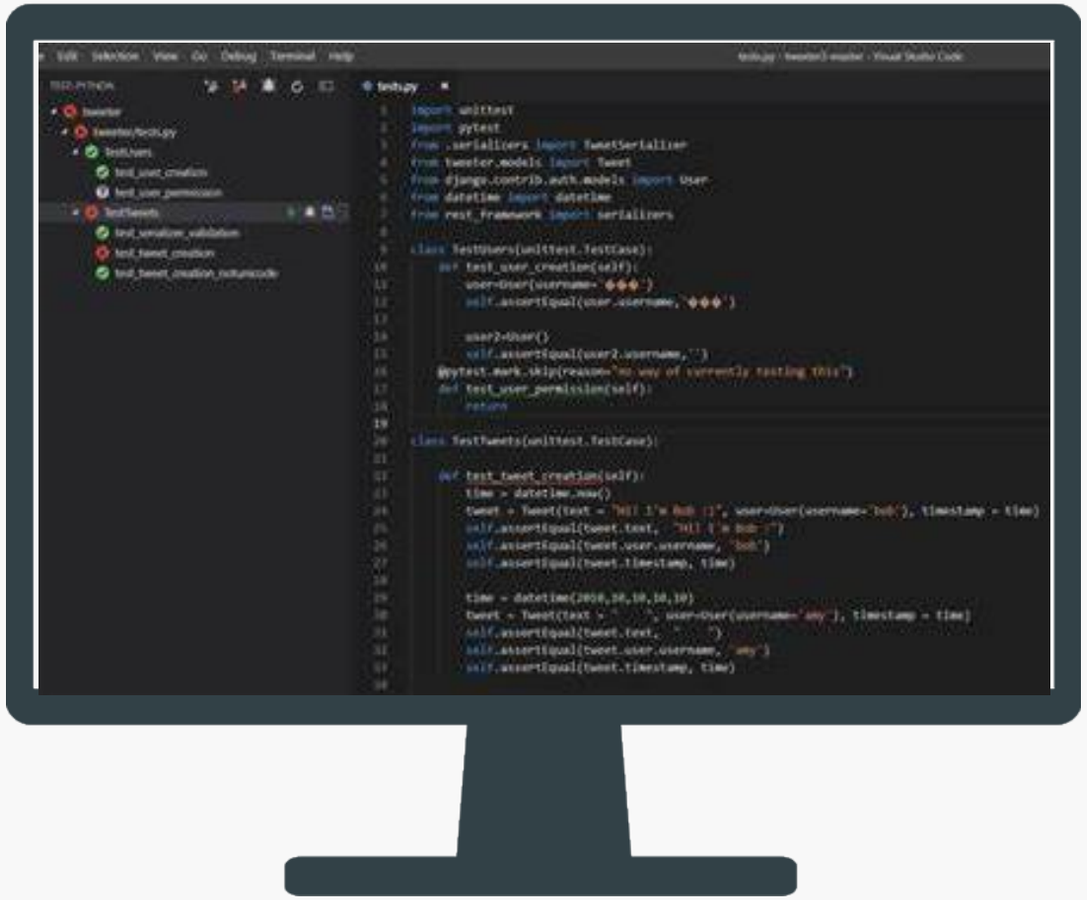
Sharding Types





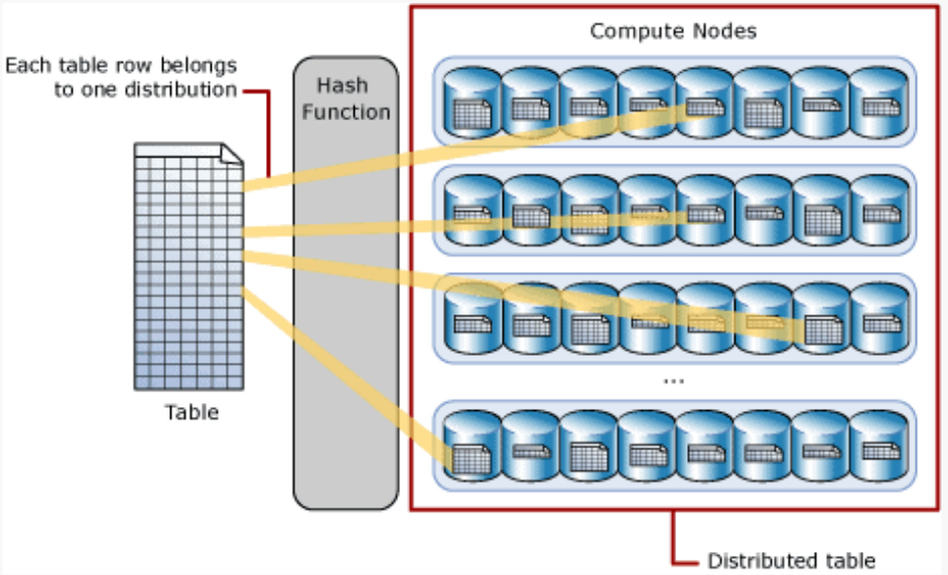


Let’s dig in



Data Skewness

- Data aren’t distributed evenly across distributions
- Unbalanced load on compute nodes



Data Movement

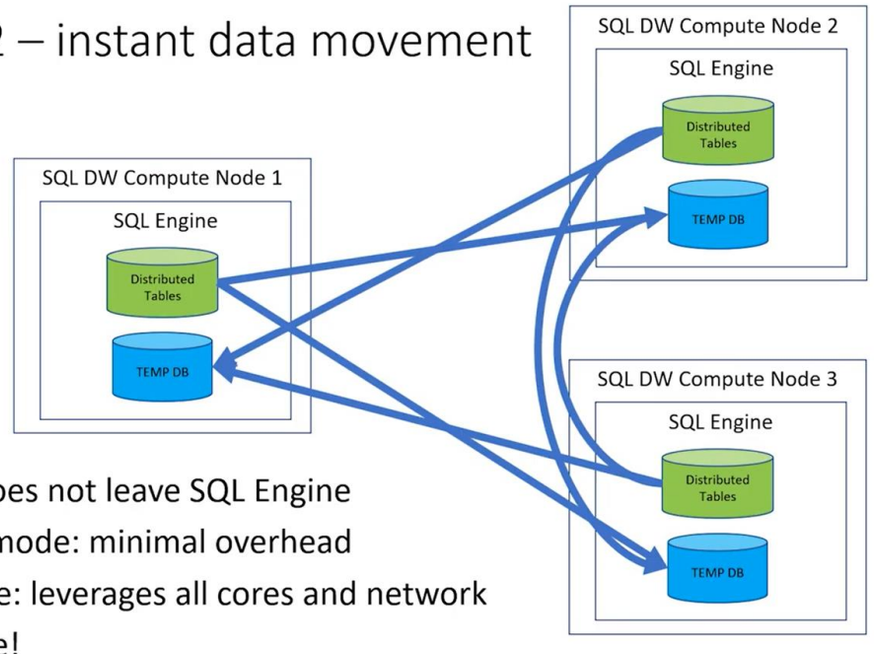
```
select *
from   sys.dm_pdw_request_steps
where  request_id = (select   top 1 request_id
                     from     sys.dm_pdw_exec_requests
                     where    [label] = 'tpch_q14'
                     order by submit_time desc)
```

100 %

Results | Messages

	request_id	step_index	operation_type	distribution_type	location_type	status	error_id	start_time	end_time	total_elapsed_time	row_count	c
1	QID1314265	0	RandomIDOperation	Unspecified	Control	Complete	NULL	2018-08-14 20:34:45.777	2018-08-14 20:34:45.777	0	-1	T
2	QID1314265	1	OnOperation	AllDistributions	Compute	Complete	NULL	2018-08-14 20:34:45.777	2018-08-14 20:34:45.917	140	-1	C
3	QID1314265	2	ShuffleMoveOperation	AllDistributions	Compute	Complete	NULL	2018-08-14 20:34:45.917	2018-08-14 20:34:50.480	4562	204844163	S
4	QID1314265	3	OnOperation	Unspecified	Control	Complete	NULL	2018-08-14 20:34:50.480	2018-08-14 20:34:50.510	31	-1	C
5	QID1314265	4	PartitionMoveOperation	Unspecified	DMS	Complete	NULL	2018-08-14 20:34:50.510	2018-08-14 20:34:55.150	4640	60	S

Gen2 – instant data movement



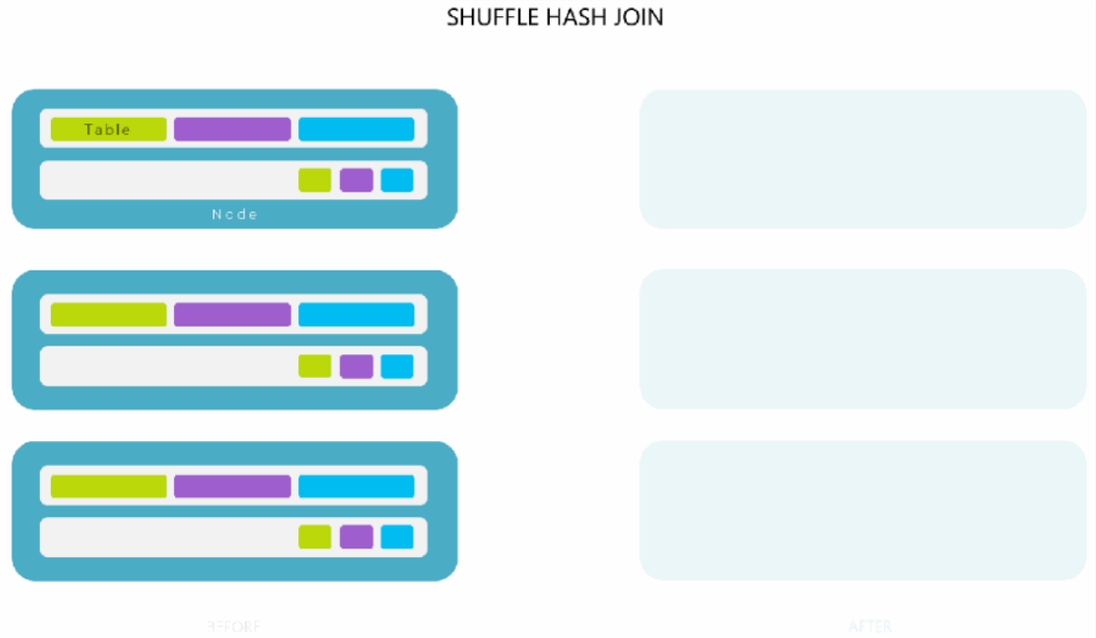
Data does not leave SQL Engine

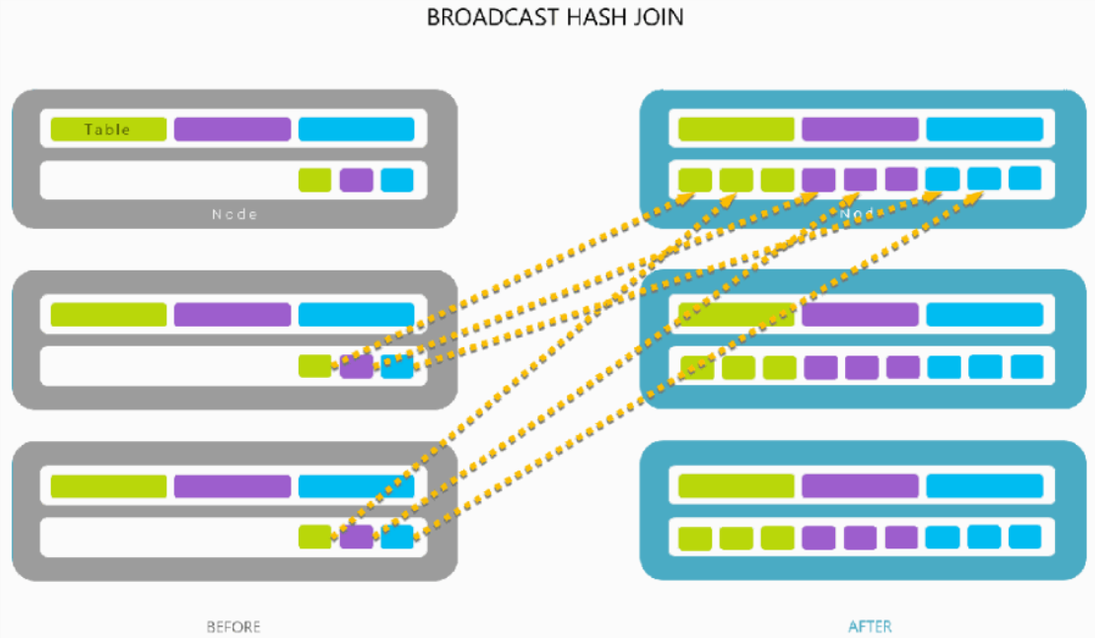
Batch-mode: minimal overhead

Scalable: leverages all cores and network

It's Free!

Shuffle vs Broadcast





Some resources

- Dedicated SQL pool (formerly SQL DW) architecture - Azure Synapse Analytics | Microsoft Learn
- Memory and concurrency limits - Azure Synapse Analytics | Microsoft Learn
- Shuffle vs. Broadcast Join, Visually and Concisely – Book of Architectures (jixjia.com)

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Q&A


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