



# Brian Bønk Rueløkke

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Microsoft

FastTrack Recognized  
Solution Architect  
Power BI  
2022 >>



Microsoft

Certified Trainer

2018 >>



TOGAF®9  
Certified

# Agenda

THE SETUP

DEMO

POP THE HOOD

DEMO

# THE SETUP

- NYC Taxi data from <https://www.nyc.gov>
- Data from Jan 2009 to Aug 2022
- Stored as parquet & csv files in ADLSg2
- 1.685.246.650 trips / rows

THE DATALOAD



DEMO

Pre-recorded

»

Data Factory

Validate all

Publish all

Preview experience Off

» NYC Taxi Parquet

Activities

Search activities

Move & transform

Azure Data Explorer

Azure Function

Batch Service

Databricks

Data Lake Analytics

General

HDInsight

Iteration & conditionals

Machine Learning

Power Query

✓ Validate

▶ Debug

⚡ Add trigger

Lookup

Get filelist for NYC  
parquet

ForEach

For each file  
parquet

Activities

Copy NYC  
Taxi

ForEach

For each file  
CSV

Activities

Create  
CSV from...

Parameters

Variables

Settings

Output

+ New

# THE SERVERLESS SQL POOL

# DEMO

Pre-recorded



```
1 -- create database
2 create database Chester
3
4 --use new database
5 use Chester;
6
7 --create schema
8 create schema nyctaxi
9
10 -- create credentials for containers in storage account
11 CREATE DATABASE SCOPED CREDENTIAL NYData
12 WITH IDENTITY='SHARED ACCESS SIGNATURE',
13 SECRET = 'sv=2021-06-08&ss=bfqt&srt=sco&sp=rwdlacupyx&se=2099-11-21T19:24:43Z&st=2021-11-21T11:24:43Z&spr=https&sig=qv3FPPcU0f3tPbs9LuMwXos2sA%2F3phLjIJe9o1lqzVU%3D'
14 GO
15
16 -- create the external data source
17 CREATE EXTERNAL DATA SOURCE ChesterDataSource WITH (
18     LOCATION = 'https://brianboenk.dfs.core.windows.net',
19     CREDENTIAL = NYData
20 );
21
22 -- create the external file format
23 CREATE EXTERNAL FILE FORMAT SynapseParquetFormat
24 WITH (
25     FORMAT_TYPE = PARQUET
26 );
27
28 -- create nyctaxi.allparquet view
29 create or alter view nyctaxi.allparquet as
30 SELECT
31     *
32 FROM
33     OPENROWSET(
34         BULK 'https://dslhowtobeadataengineer.dfs.core.windows.net/nyctaxi/parquet/yellow_tripdata_*.parquet'
```

No results to show

Your query yielded no displayable results





THE COPARISON

DEMO

Live coding  
(hopefully no demo-ghost 👻)



# THE COPARISON

- Raw parquet files are fastest when doing a full load
- External tables are fastest when working with filter predicates (more on this later)
- CSV files are ok for smaller datasets (<100mb)

POP THE HOOD

DEMO

Live coding  
(hopefully no demo-ghost 👻)



# Documentation from Microsoft

Maximum size of the result set	Up to 400 GB shared between concurrent queries.
Maximum concurrency	Not limited and depends on the query complexity and amount of data scanned. One serverless SQL pool can concurrently handle 1,000 active sessions that are executing lightweight queries. The numbers will drop if the queries are more complex or scan a larger amount of data.

# External table's performance

*In ad-hoc query scenarios, such as `SELECT FROM EXTERNAL TABLE`, PolyBase stores the rows that are retrieved from the external data source in a temporary table. After the query completes, PolyBase removes and deletes the temporary table. No permanent data is stored in SQL tables.*

[CREATE EXTERNAL TABLE \(Transact-SQL\) - SQL Server | Microsoft Learn](#)



**TempDB?**

TempDB?



# DEMO

Live coding  
(hopefully no demo-ghost 👻)

# The TempDB

Results		Messages							
	file_id	file_guid	type	type_desc	data_space_id	name	physical_name	max_size_gb	growth
1	1	NULL	0	ROWS	1	tempdev	C:\WFRoot\DB.4\Fabric\work\Appl...	106	4096
2	2	NULL	1	LOG	0	templog	C:\WFRoot\DB.4\Fabric\work\Appl...	16	8192
3	3	3e22194b-26f4-4421-a833-762c...	0	ROWS	1	tempdev2	C:\WFRoot\DB.4\Fabric\work\Appl...	106	4096
4	4	a3022e02-3b2c-40f4-a392-27e9...	0	ROWS	1	tempdev3	C:\WFRoot\DB.4\Fabric\work\Appl...	106	4096
5	5	97f123e0-f69b-429a-bd8e-42e0...	0	ROWS	1	tempdev4	C:\WFRoot\DB.4\Fabric\work\Appl...	106	4096

*The maximum number of concurrent PolyBase queries is 32*

[CREATE EXTERNAL FILE FORMAT \(Transact-SQL\) - SQL Server | Microsoft Learn](#)



# Considerations

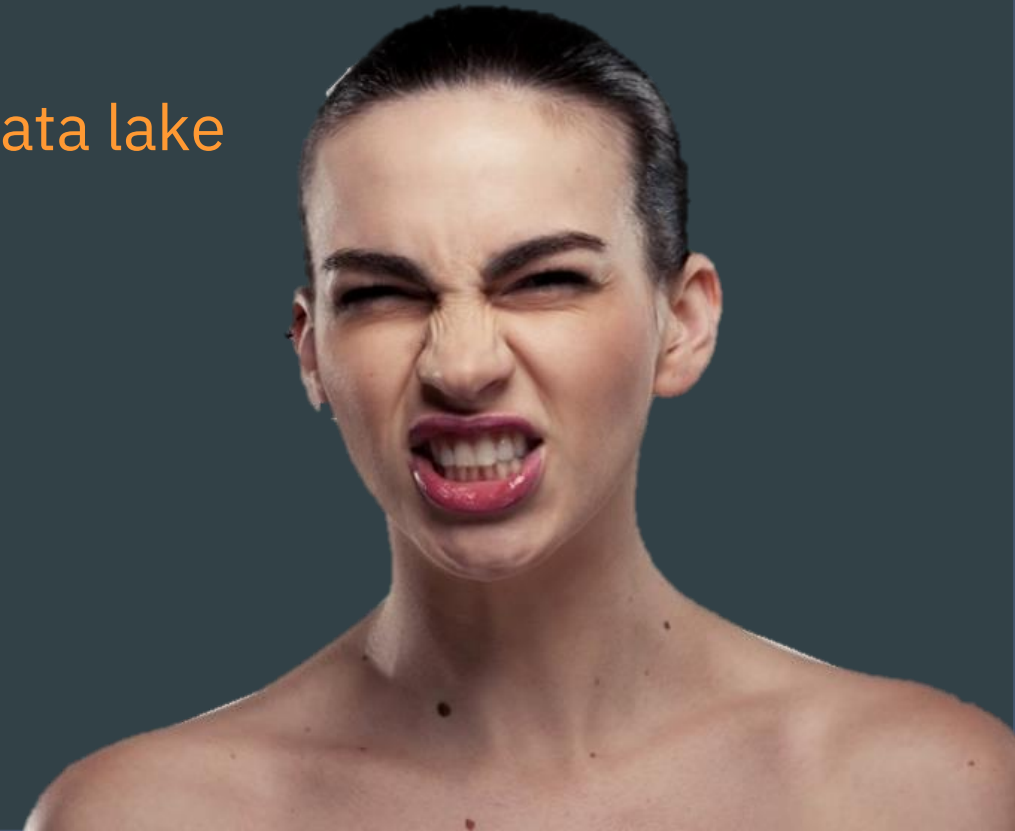
SELECT .... FROM <external\_table> WHERE <field> = <value>

External tables loaded to Serverless has no index

Search predicate often is pushed down to the data lake

Joins on 100 rows pr table

Joins on 10 mio rows pr table



This just in... (From Microsoft Nov 11, 2022)

*..Queries process the entire dataset and don't benefit at all by partitions...*

# This just in... (From Microsoft Nov 11, 2022)

Upload Add Directory Refresh Rename Delete Change

Authentication method: Access key (Switch to Azure AD User Account)

Location: [REDACTED] / FACTINTERNETSALES\_PARTITIONED / year=2022

Search blobs by prefix (case-sensitive)

Name

- ☐ [..]
- ☐ month=1
- ☐ month=2
- ☐ month=3
- ☐ month=4

```
1 SELECT Top 10 *
2 FROM
3     OPENROWSET(
4         BULK 'https://[REDACTED].dfs.core.windows.net/[REDACTED]FACTINTERNETSALES_PARTITIONED',
5         FORMAT = 'PARQUET'
6     ) r
7 WHERE ORDERDATEKEY = 20220119
8
```

114 %

Results Messages

	PRODUCTKEY	ORDERDATEKEY	DUE DATEKEY	SHIPDATEKEY	CUSTOMERKEY	PROMOTIONKEY	CURRENCYKEY	SALESTERRITORYKEY	SALESORDERKEY
1	19668	20220119	20220120	20220121	40220	1649	14	5	SO4022020
2	19668	20220119	20220120	20220121	5402	1649	14	5	SO5402202
3	19668	20220119	20220120	20220121	1987	1649	14	5	SO1987202
4	19668	20220119	20220120	20220121	33491	1649	14	5	SO3349120
5	19668	20220119	20220120	20220121	45440	1649	14	5	SO4544020
6	19668	20220119	20220120	20220121	38780	1649	14	5	SO3878020
7	19668	20220119	20220120	20220121	32806	1649	14	5	SO3280620
8	19668	20220119	20220120	20220121	5394	1649	14	5	SO5394202
9	19668	20220119	20220120	20220121	32811	1649	14	5	SO3281120
10	19668	20220119	20220120	20220121	5392	1649	14	5	SO5392202

# This just in... (From Microsoft Nov 11, 2022)

Results Messages

Statement ID: {71C1401F-4375-42FC-A189-7705AB5CF2F3} | Query hash: 0x7A3A4ECC0D0E0871 | Distributed request ID: {423CA2C2-0C81-4F50-8880-86ADB5EAC854}.  
Total size of data scanned is 46 megabytes, total size of data moved is 1 megabytes, total size of data written is 0 megabytes.

(10 rows affected)

Completion time: 2022-11-10T11:29:57.0647663+01:00

Authentication method: Access key (Switch to Azure AD User Account)

Location: [REDACTED] / FACTINTERNETSALES\_PARTITIONED / year=2022 / month=1

Search blobs by prefix (case-sensitive)  ☐ Show deleted objects

	Name	Modified	Access tier	Archive status	Blob type	Size
<input type="checkbox"/>	📁 [.]					
<input type="checkbox"/>	📄 part-00173-f15597b8-9dec-4a0c-a269-4f0fa421aa25.c000.s...	11/4/2022, 2:29:31 PM	Hot (Inferred)		Block blob	8.18 MiB

This just in... (From Microsoft Nov 11, 2022)

But – we just have to do it correctly...

# This just in... (From Microsoft Nov 11, 2022)

```

11 SELECT Top 10 r.filepath(1) [Year], r.filepath(2) [Month], r.filename() [FileName],*
12 FROM
13     OPENROWSET(
14         BULK 'https://[REDACTED].dfs.core.windows.net/[REDACTED]/FACTINTERNETSALES_PARTITIONED/*/*/*.parquet',
15         FORMAT = 'PARQUET'
16     ) r
17 WHERE ORDERDATEKEY = 20220119
18     and r.filepath(1)='YEAR=2022' --(1) first level -> Year -> physical name of the folder
19     AND r.filepath(2)='MONTH=1' --(2) second level -> Month -> physical name of the folder
20

```

14 %

Results Messages

	Year	Month	FileName	PRODUCTKEY	ORDERDATEKEY	DUE DATEKEY	SHIPDATEKEY	CUSTOMERKEY	PROMOTIONKEY	CURRENT
1	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	5402	1649	14
2	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	1987	1649	14
3	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	32806	1649	14
4	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	40220	1649	14
5	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	33491	1649	14
6	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	5394	1649	14
7	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	5392	1649	14
8	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	45440	1649	14
9	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	38780	1649	14
10	year=2022	month=1	part-00173f15597b8-9dec-4a0c-a269-4f0fa421aa25....	19668	20220119	20220120	20220121	32811	1649	14



# This just in... (From Microsoft Nov 11, 2022)

```
11 SELECT Top 10 r.filepath(1) [Year], r.filepath(2) [Month], r.filename() [FileName],*
12 FROM
13     OPENROWSET(
14         BULK 'https://[redacted].dfs.core.windows.net/[redacted]FACTINTERNETSALES_PARTITIONED/*/*/*.parquet',
15         FORMAT = 'PARQUET'
16     ) r
17 WHERE ORDERDATEKEY = 20220119
18     and r.filepath(1)='YEAR=2022' --(1) first level -> Year -> physical name of the folder
19     AND r.filepath(2)='MONTH=1' --(2) second level -> Month -> physical name of the folder
20
```

14 %

Year	Month	FileName	PRODUCTKEY	ORDERDATEKEY	DUEDATEKEY	SHIPDATEKEY	CURRENT
------	-------	----------	------------	--------------	------------	-------------	---------

14 %


Results Messages

Statement ID: {7FFC48D6-8161-494D-8FEB-15BB346AE3B8} | Query hash: 0x27877913FB387648 | Request ID: 0AF444D04B).

Total size of data scanned is 9 megabytes, total size of data moved is 1 megabytes, total size of data written is 1 megabytes.

(10 rows affected)

Completion time: 2022-11-10T11:37:35.5970053+01:00



This just in... (From Microsoft Nov 11, 2022)

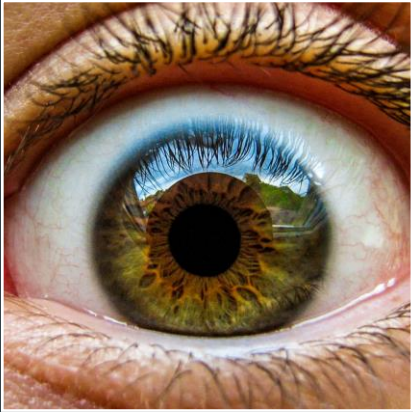


But wait

# All the time in the world

Maximum query duration	30 minutes.
Maximum size of the result set	Up to 400 GB shared between concurrent queries.
Maximum concurrency	Not limited and depends on the query complexity and amount of data scanned. One serverless SQL pool can concurrently handle 1,000 active sessions that are executing lightweight queries. The numbers will drop if the queries are more complex or scan a larger amount of data.

# 3 possibilites



Views



CETAS



Raw Parquet

# 3 possibilities



## Views

- Move data once
- Implement partitioning correctly and according to needs



## CETAS

- Precalculated data
- Moves data twice – once for loading/update and once for reading



## Raw Parquet

- Can be handled from ADF/Synapse
- Can be read from Power BI OOTB
- No partitioning

# Key take aways



Work with data  
to fit the known  
TempDB  
configuration  
and file sizes



Know that you  
only have 100  
GB for #-tables,  
CTE's and table  
variables



Refit the data  
pipelines to  
partition your  
files to fit the  
engine



Can you do  
incremental  
loading, then  
do it – also in  
Power BI



Move your joins  
to after Synapse  
serverless –  
Power BI does a  
very good job





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