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Optimizing DAX in Power BI

Tools and techniques

Why DAX is important in performance optimization

Introduction

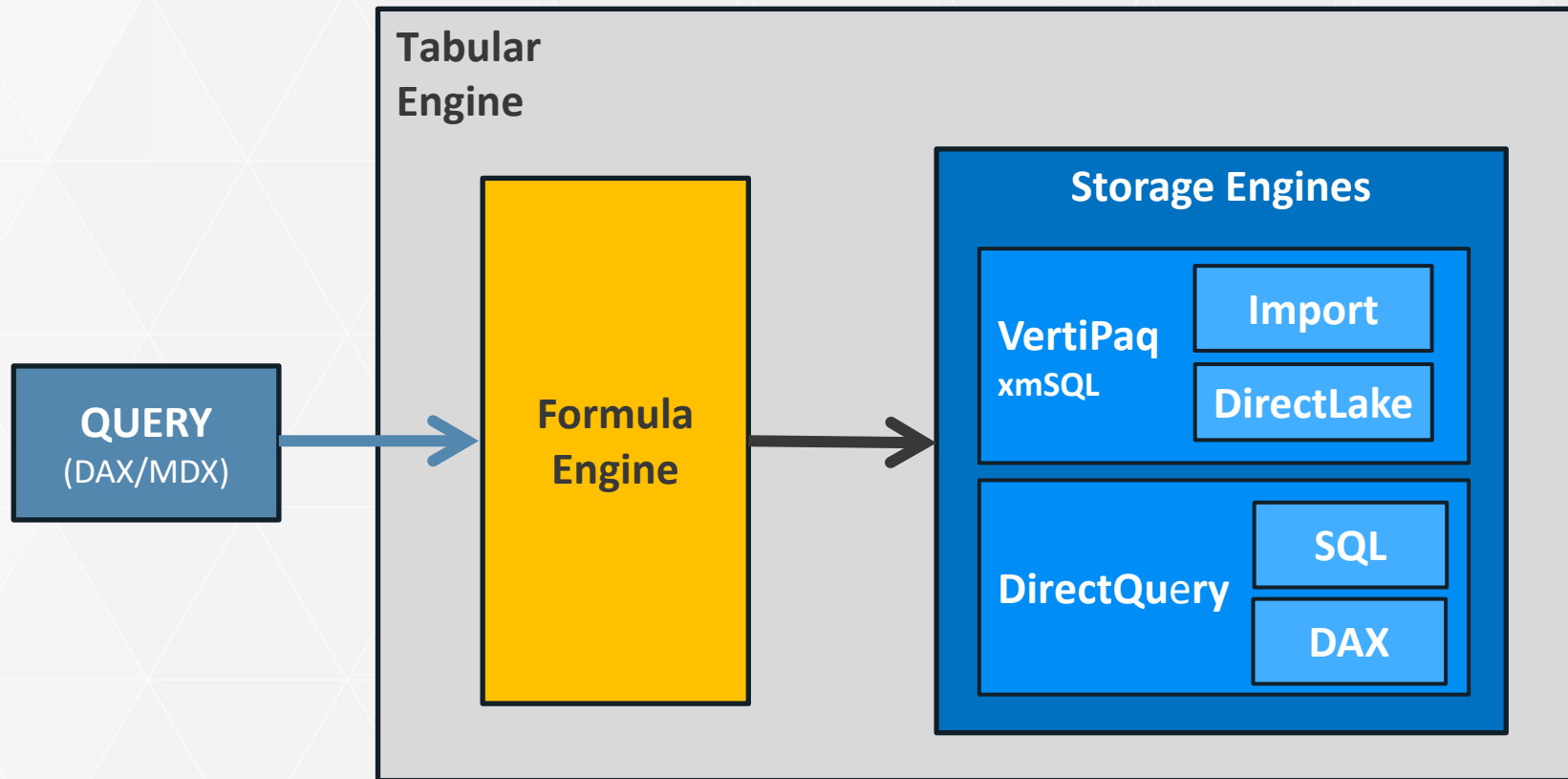
DAX measures and queries

- A Power BI report has one or more visuals
 - Every visual generates one or more DAX queries
 - Every DAX query can consume one or more DAX measures
- Reproduce and reduce performance issue
 - Isolate the slower visual
 - Reproduce the DAX query
 - Isolate the slower measure in the query
 - Optimize the DAX measure
 - Repeat until the report is good!

Optimization matrix

	Processing time	Memory	Query response
Data model	✓	✓	✓
DAX			✓

Tabular query architecture



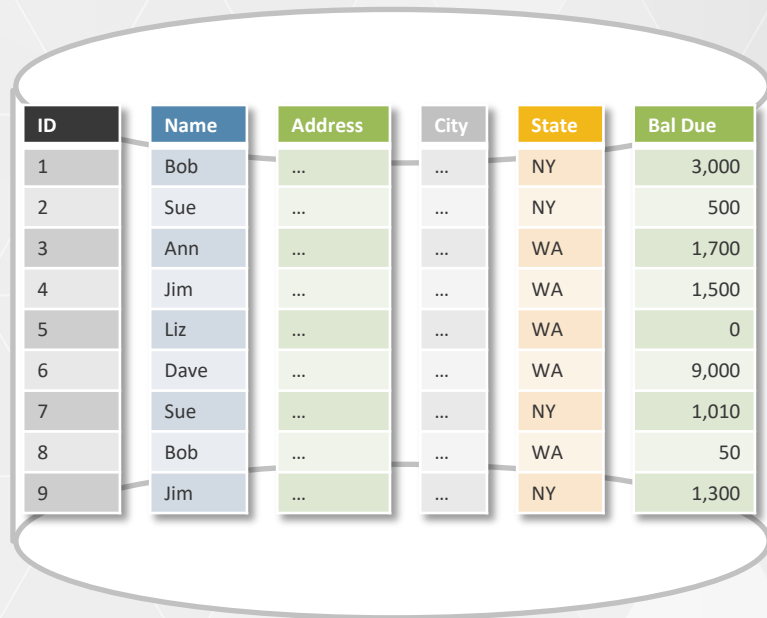
Storage engine for imported data

VertiPaq

Column storage layout

Customers table

ID	Name	Address	City	State	Bal Due
1	Bob	...	...	NY	3,000
2	Sue	...	...	NY	500
3	Ann	...	...	WA	1,700
4	Jim	...	...	WA	1,500
5	Liz	...	...	WA	0
6	Dave	...	...	WA	9,000
7	Sue	...	...	NY	1,010
8	Bob	...	...	WA	50
9	Jim	...	...	NY	1,300



Tables are stored column-by-column with all values from a single column stored in a single block

Compression of one column

Quarter
Q1
Q1
Q1
Q1
Q2
Q2
...
Q2
Q3
Q3
Q3
Q3
Q4
Q4
Q4
Q4
...

HASH

Q.ID
0
0
0
0
1
1
...
1
2
2
2
2
3
3
3
3
...

R.L.E.

Q.ID	Quarter
0	Q1
1	Q2
2	Q3
3	Q4

VertiPaq Store

Quarter	Count
0	4
1	10
2	4
3	15
2	30
1	15

Bravo for Power BI

- Analyze model
 - Quick look at more expensive columns
 - Export VPAX
- Other features: Format DAX, export data, manage dates



Bravo
FOR POWER BI

VertiPaq Analyzer

- Open-source library
- VPAX format
 - Extracted by Bravo, DAX Studio, Tabular Editor, ...
- Excel file to analyze VPAX files



VertiPaq
Analyzer

How to isolate a performance issue before analyzing performance metrics

Isolating performance issues

Isolate and reduce query before optimizing it

- **Performance Analyzer:**
 - Isolate the slower DAX query
- **DAX Studio:**
 - Isolate the slower measure in the query
 - Reduce and simplify the DAX query with a single measure

Performance Analyzer



- Display execution time
- Copy query for each visual
- Export performance data (JSON)
 - Can be opened by DAX Studio
 - Include more details about timing:
 - Data Shape Engine (DSE) – Semantic query, generates DAX
 - Data Model Engine (AS) – DAX query execution
 - Report Canvas (RC) – Visual rendering
 - Documentation: [Performance Analyzer Export File Format](#)

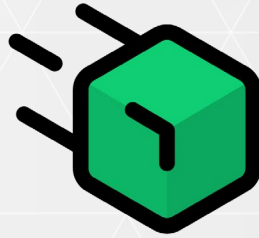
DAX Studio

- Comment measures to find the slower one
- Include measure code in DAX query
 - Include dependent measures for full analysis
- Reduce the query to simplify the query plan



Prevention is better than cure

Static analysis



DAX Optimizer

DAX Optimizer

- Static analysis of the code
- Estimate cost for all the possible execution paths
- Identify anti-patterns in DAX code
- Prioritize efforts by focusing on most critical measures

Walkthrough



Extract VPAX
for a semantic model

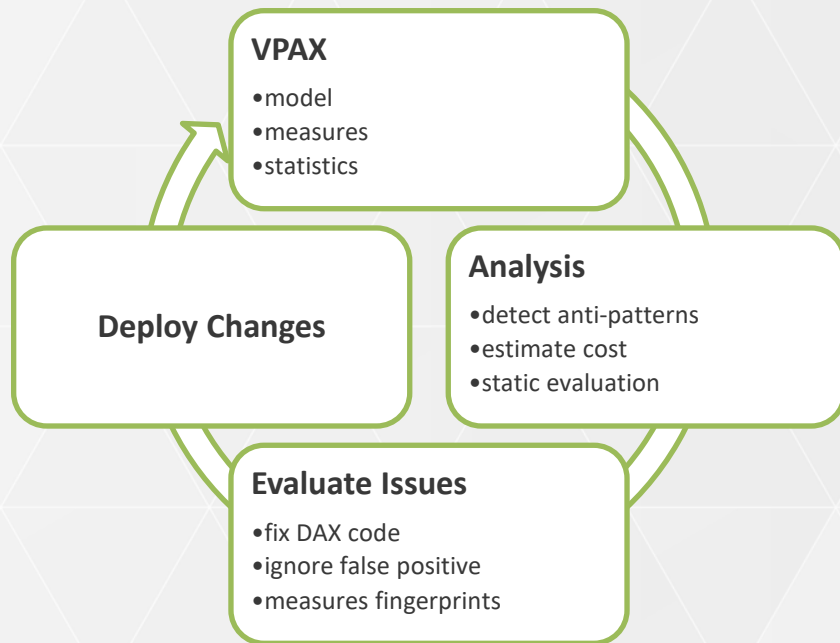


Analyze VPAX with
DAX Optimizer



Review issues and
fix DAX measures

How it works



When to use DAX Optimizer



Emergency medicine
for a critical situation
of slow reports



Preventive tool
to keep DAX in good shape during
development

Conclusions

- Optimize the model
 - Improve processing time
 - Improve query time
- Optimize DAX
 - Improve query time
- DAX Optimizer
 - Identify bottlenecks by analyzing all the measures
 - Improve productivity and code quality



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DAX.do

