SQL KONFERENZ 2026



Exploring Many-to-Many Modeling Between Fact and Dimension in Power BI

What I Learned

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The Real Problem



- Data from a Rule Engine
  - Multiple Rules per Transaction
  - Semi additive measures

Category_06	702
Description_76	688
Description_75	9
Description_77	9

  - Many-to-many between fact and dimension
- Performance issues after migrating from SSAS Multidimensional (Cubes) to SSAS Tabular (both SQL Server 2022)

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The Test Scenario

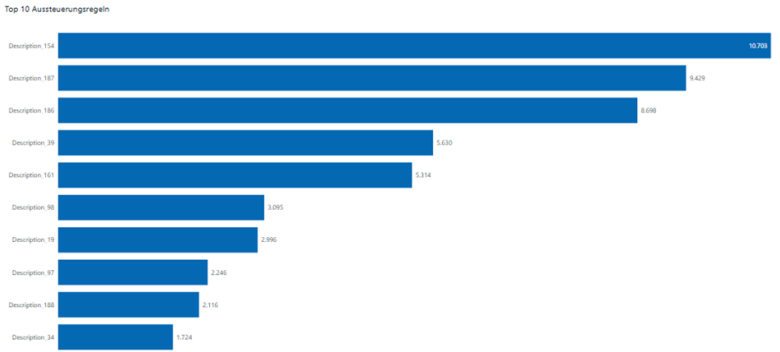
Query 1

Rule Category	Recent Assessments
Category_10	**12.085**
Description_154	10.703
Description_155	1.323
Description_153	903
Description_260	661
Description_158	558
Description_156	404
Description_268	328
Description_257	262
Description_201	143
Description_157	101
Description_152	98
Description_150	34
Description_151	15
Description_159	14
Description_213	2
Category_09	**11.284**
Description_187	9.429
Description_186	8.698
Description_188	2.116
Description_189	103
Description_184	19
Description_183	8
Description_180	2
Description_181	2
Description_271	2
Description_192	1
Total	**14.235**

Metric	Original Dataset	Test Subset
Transactions	15,000K	1,000K
Rule Hits	62,000K	3,500K
Rule Combinations	593K	167K
Hits per Transaction	4.2	3.5
Number of Rules	276	271

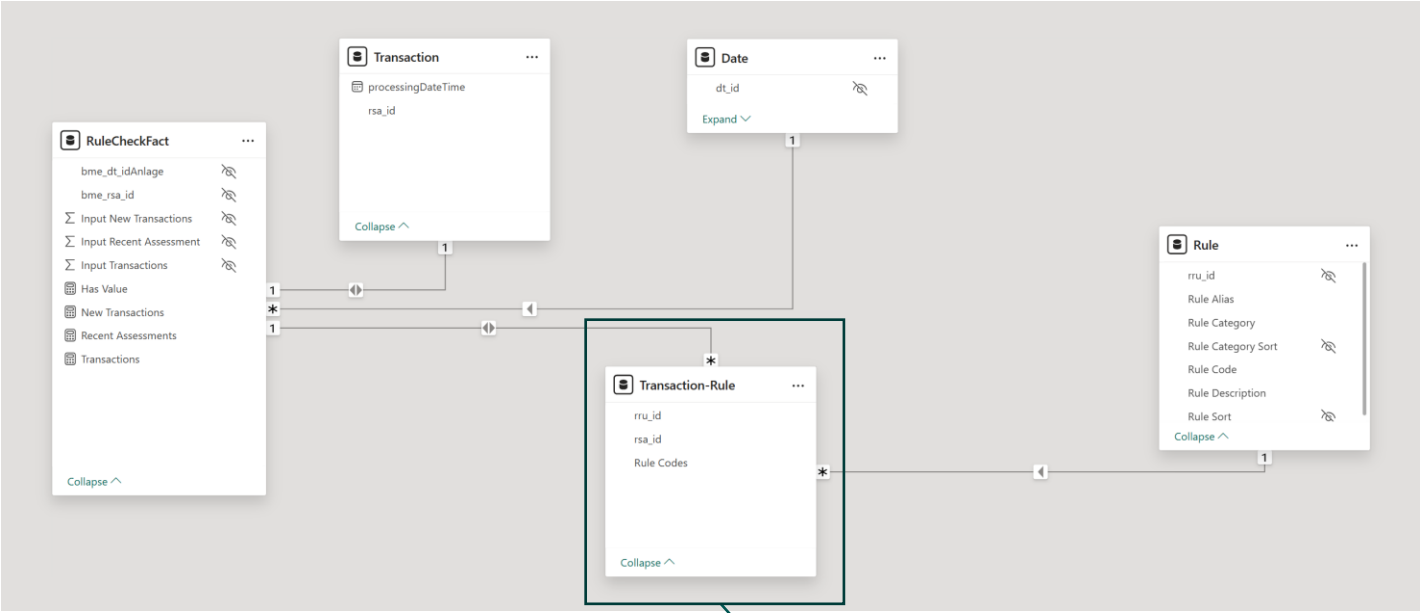
Summary Statistics of Original and Test Data

Query 2





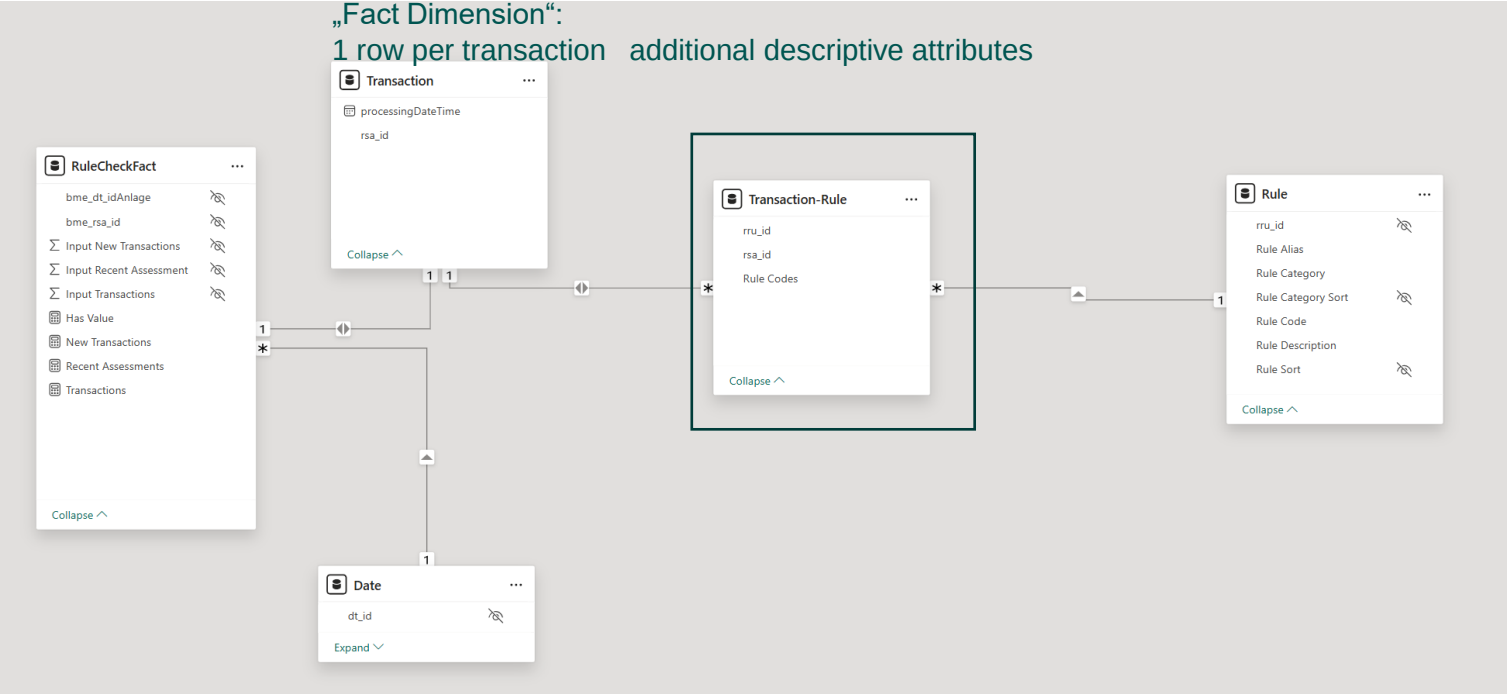
Modeling Approach 1: Fact 1nn1 Cardinality



Classic Modelling Approach

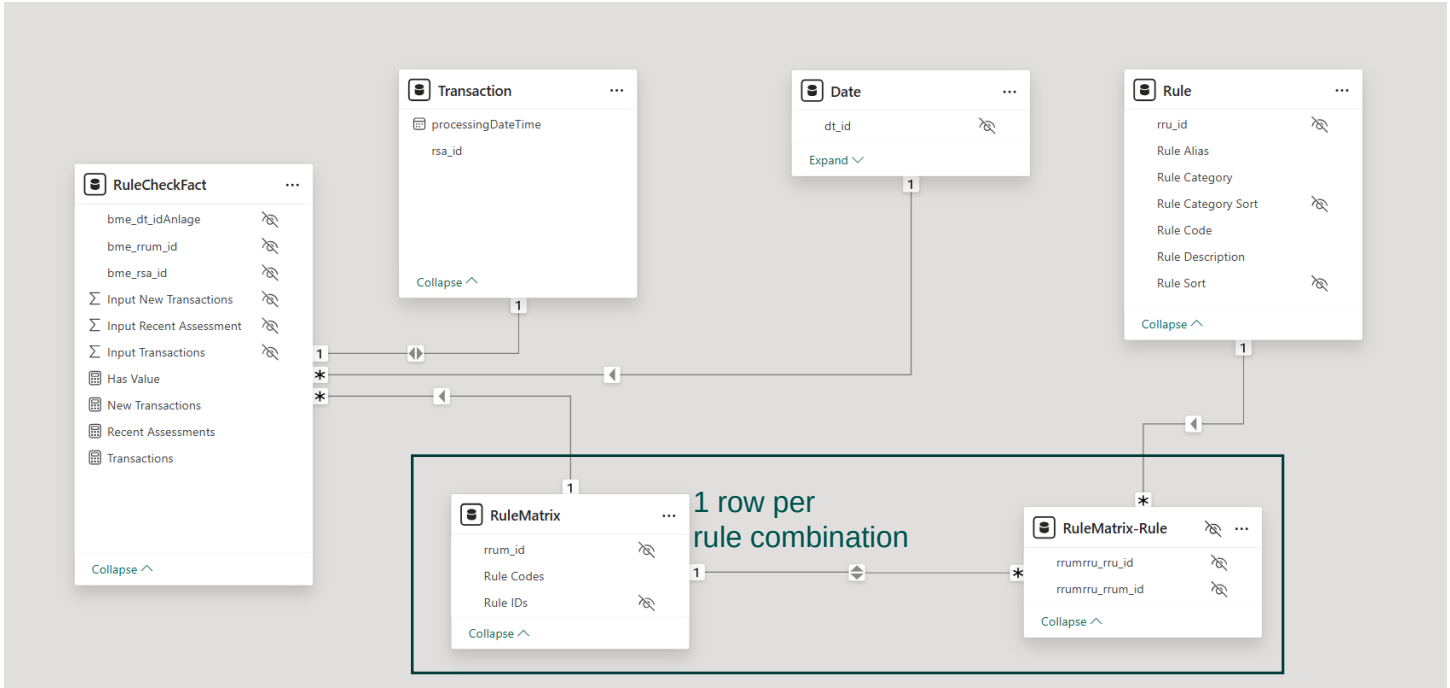
Modelling Approach 2: Fact Dimension 1nn1 Cardinality

„Fact Dimension“:
1 row per transaction additional descriptive attributes



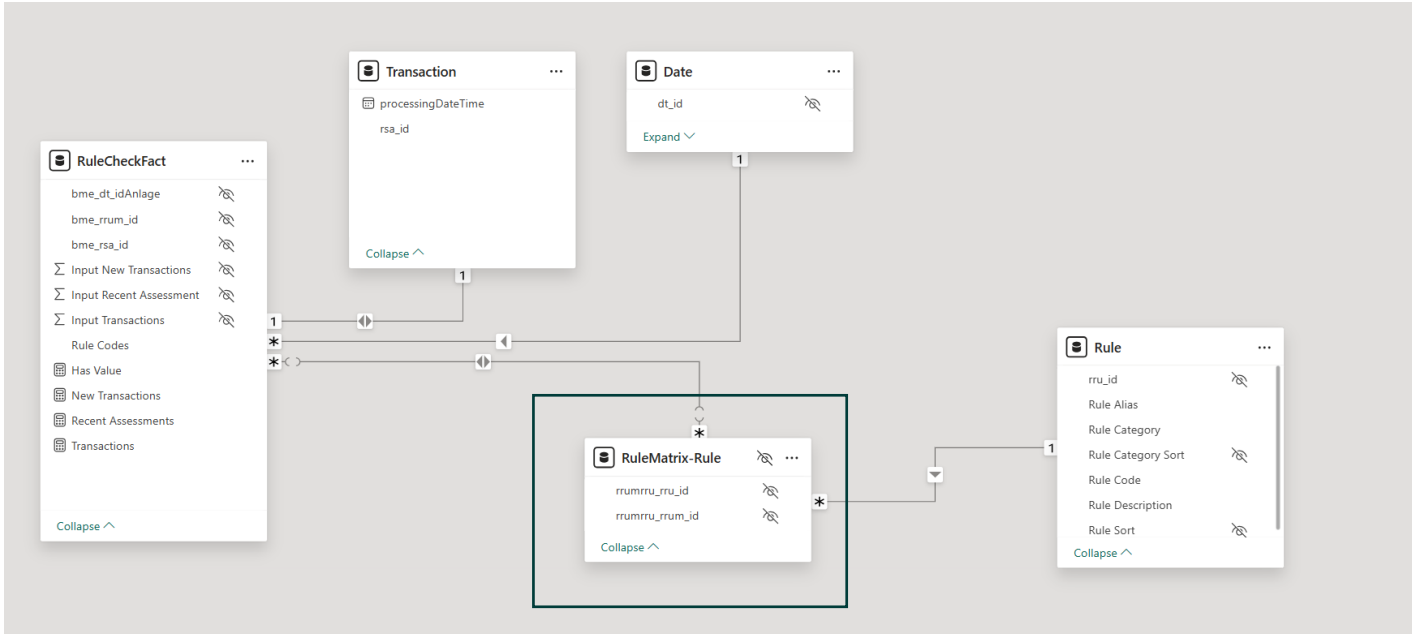
Modeling Approach 3: Matrix 1nn1 Cardinality

Model I used in SSAS Multidimensional



(One) Kimball Modelling Approach

Modelling Approach 4: Matrix Many-to-Many-Cardinality



Many-to-Many-Cardinality
+
Bi-Directional

Feels unnatural!

Must be much slower!

Thinking out of the box

- What is the fact table granularity so far? 1 row per …
  - **Transaction** → Many-To-Many between Fact and Dimension Rule

bme_rsa_id	bme_dt_idAnlage	Input Transactions
-1366719258	20250708	1
-1366669532	20250708	1

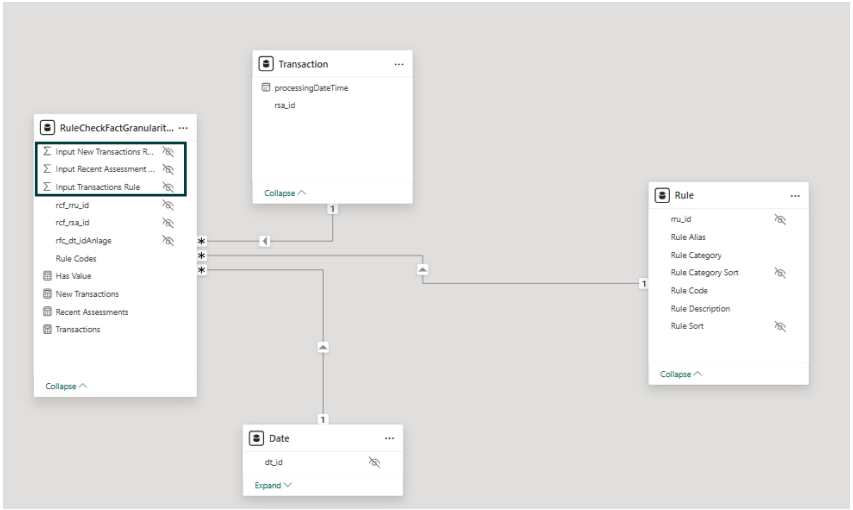
- WHAT IF IT WOULD BE ….
  - 1 row per Transaction and Rule Hit

rcf_rsa_id	rcf_rru_id	rfc_dt_idAnlage	Input Transactions Rule
-1923967381	-1922102364	20200721	1
-1923967381	-1922102215	20200721	1
-1923967381	-1922102206	20200721	1
-1923967338	-1922102340	20200721	1
-1923967338	-1922102308	20200721	1

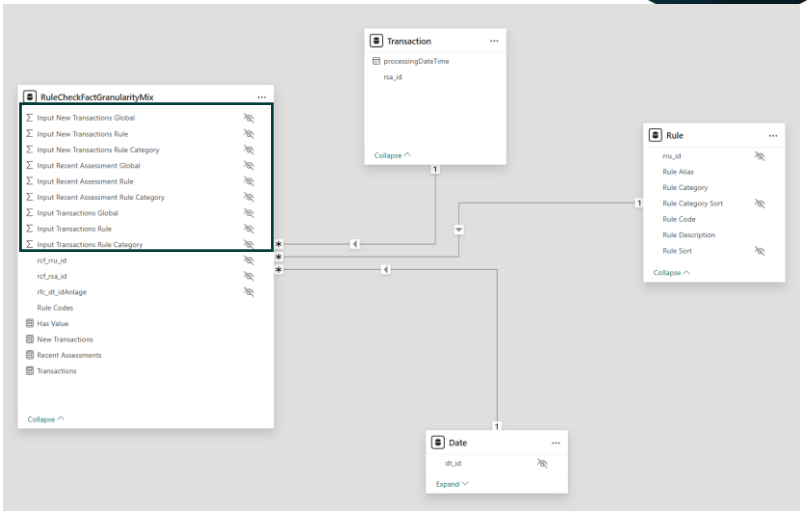


Foto von Buddha Elemental 3D auf Unsplash

Modelling Approach 5+6: Fact Table With High Granularity



Approach 5: Measures DAX only



Approach 6: Measures prebaked in SQL

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How To Measure Performance

- Power BI Desktop → Performance Analyzer
- DAX Studio → Server Timings





DEMO



Test Results

Approach	Granularity	Relationship	PBIX Size (MB)	# Tables for Join	Query 1 Rule Hierarchy	Query 2 Top Rules
6. Fact High Granularity (prebaked)	1 row per rule & transaction	N:1	49	1	23 ms	17 ms
5. Fact High Granularity (DAX only)	1 row per rule & transaction	N:1	51	1	173 ms 7x	17 ms 1x
1. Fact 1nn1 Cardinality	1 row per transaction	1:N, N:1	62	2	338 ms 15x	311 ms 18x
2. FactDimension 1nn1 Cardinality	1 row per transaction	1:1, 1:N, N:1	62	3	422 ms 18x	455 ms 26x
3. Matrix 1nn1 Cardinality	1 row per transaction	N:1, 1:N, N:1	46	3	648 ms 28x	654 ms 38x
4. Matrix MN Cardinality	1 row per transaction	M:N, N:1	40	2	1263 ms 55x	627 ms 36x

Best performing

Initial approach

Tested with DAX Studio on cold cache

Learnings

- Shorter Join-Paths → Better Query Performance
- Many-To-Many-Cardinality → No good fit with my cardinality
- It depends 😜 → Test thoroughly with DAX Studio and think out of the box

Considerations

- Best performing model → extra implementation effort
  - 3 variants per measure based on rule hierarchy → physically stored in fact table
- Acceptable for my case
  - 5 measures
  - 3 levels of Rule hierarchy stable
  - Total Scope: 15 „Input“ Measures

Resources

- Blog Post with test model download
- DAX Studio
- Data Mozart: Troubleshoot DAX Performance



Photo by Melinda Gimpel on Unsplash

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Please provide feedback