

Scan Performance

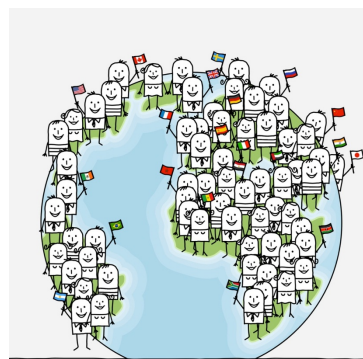
Prof. Hasso Plattner

Scan Performance (I)

8 billion humans

□ Attributes:

- first name
- last name
- gender
- country
- city
- birthday
- 200 byte



□ Question: How many women, how many men?

□ Assumed scan speed: 4MB/ms/core

Scan Performance (2)

Row Store – Layout

Table: world_population

	First Name	Last Name	Gender	Country	City	Birthday
Row 1						
Row 2						
Row 3						
...						
Row 8 x 10 ⁹						

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Scan Performance (3)

Row Store – Layout

Table: world_population

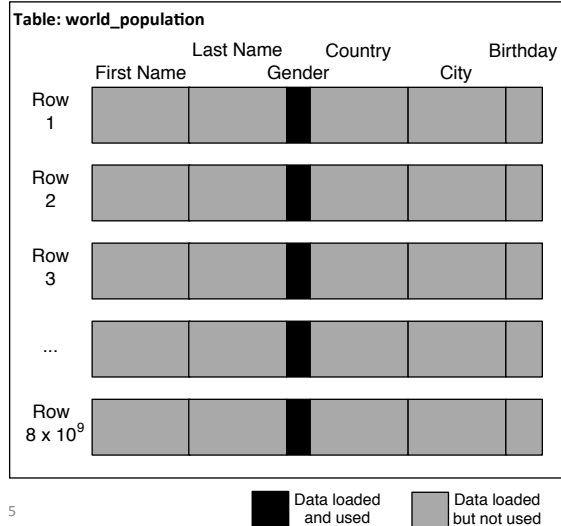
	First Name	Last Name	Gender	Country	City	Birthday
Row 1						
Row 2						
Row 3						
...						
Row 8 x 10 ⁹						

□ Table size:
8 billion tuples ×
200 bytes per
tuple ≈ **1.6 TB**

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Scan Performance (4)

Row Store – Full Table Scan

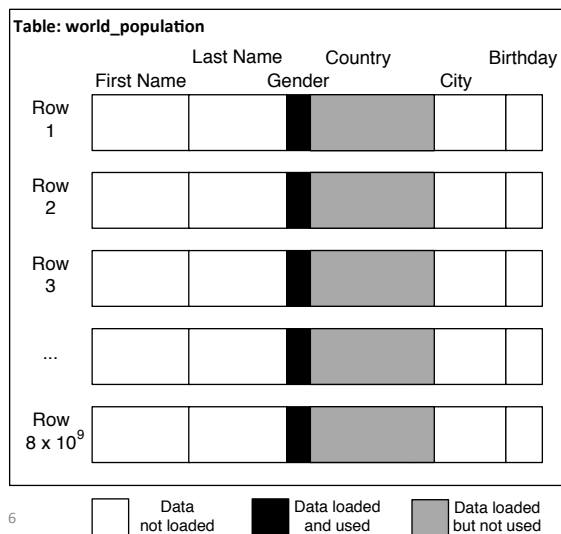


□ Table size:
8 billion tuples ×
200 bytes per
tuple ≈ **1.6 TB**

□ Scan through
all rows with
4MB/ms/core
→ **400 s**
with 1 core

Scan Performance (5)

Row Store – Stride Access “Gender”

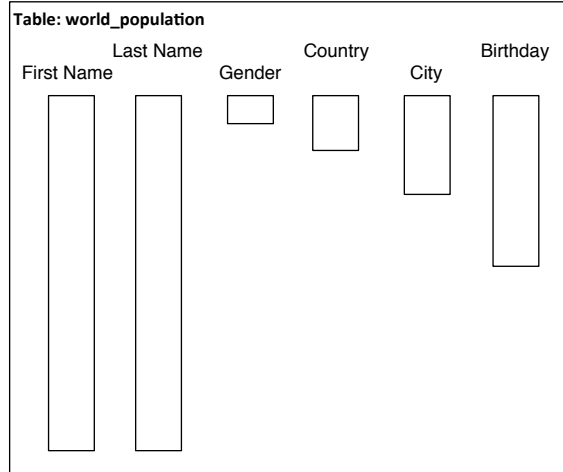


□ 8 billion cache
accesses à 64 byte
≈ **512 GB**

□ Read with
4MB/ms/core
→ **128 s**
with 1 core

Scan Performance (6)

Column Store – Layout

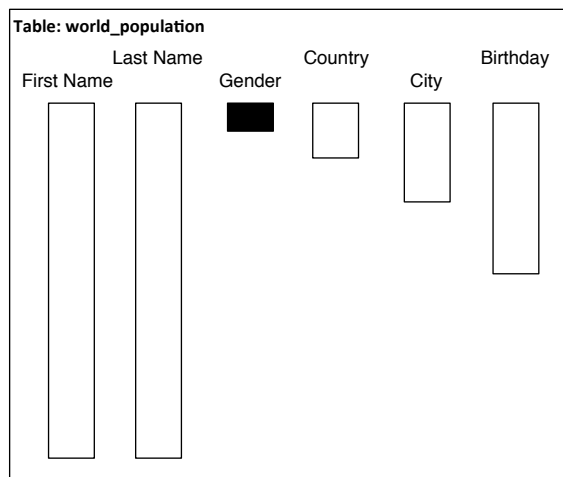


- Attribute vector size **≈ 91 GB**
- Dictionary size **≈ 700 MB**
- Table size **≈ 92 GB**
- Compression factor **≈ 17**

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Scan Performance (7)

Column Store – Full Column Scan “Gender”



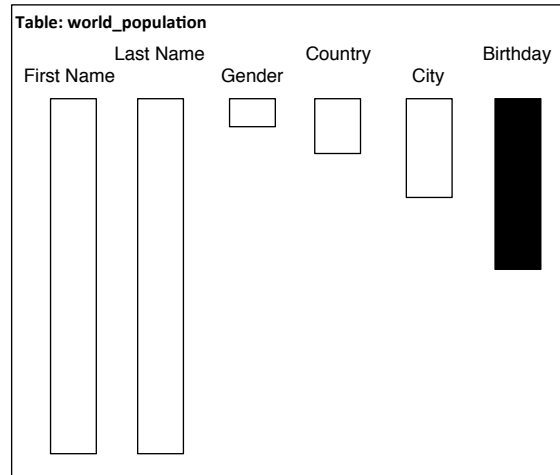
- Size of attribute vector “Gender”:
8 billion tuples ×
1 bit per tuple
≈ 1 GB
- Scan through column with
4MB/ms/core
→ 0.25 s with 1 core

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□ Data not loaded ■ Data loaded and used ▒ Data loaded but not used

Scan Performance (8)

Column Store – Full Column Scan “Birthday”



- Size of attribute vector “Birthday”:
8 billion tuples ×
2 byte per tuple
≈ **16 GB**
- Scan through column with
4MB/ms/core
→ **4 s** with 1 core

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□ Data not loaded ■ Data loaded and used ▒ Data loaded but not used

Scan Performance Summary

How many women, how many men?

	Row Store		Column Store
	Full table scan	Stride access	
Time in seconds	400	128	0.25
Factors compared to best in class	1,600	512	1

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