

Differential Buffer

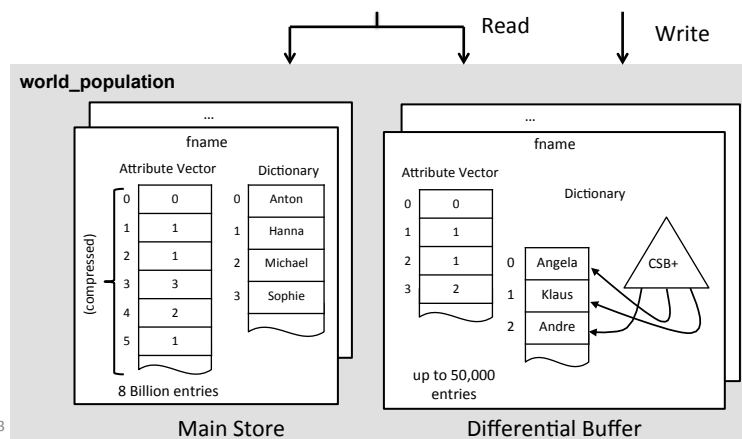
Prof. Hasso Plattner

Motivation

- ❑ Inserting new tuples into a compressed structure can be expensive
 - New values may require a reorganization of the dictionary
 - Number of bits required to encode all dictionary values may change
 - Attribute vector has to be reorganized
- ❑ Deletion of tuples is expensive
 - All attribute vectors have to be reorganized
 - valueIDs of subsequent tuples have to be adjusted

Differential Buffer

- New values are written to a dedicated differential buffer (delta)
- Cache Sensitive B+ tree (CSB+) used for faster search on delta



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Differential Buffer

- Inserts of new values are faster, because dictionary and attribute vector does not need to be resorted
- Range select on differential buffer expensive, based on unsorted dictionary
- Differential Buffer requires more memory:
 - No attribute vector compression
 - Additional CSB+ tree for dictionary

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Tuple Lifetime

Michael Berg moves from Berlin to Potsdam

Table: world_population

recId	fname	lname	gender	country	city	birthday
0	Martin	Albrecht	m	GER	Berlin	08-05-1955
1	Michael	Berg	m	GER	Berlin	03-05-1970
2	Hanna	Schulze	f	GER	Hamburg	04-04-1968
3	Anton	Meyer	m	AUT	Innsbruck	10-20-1992
4	Ulrike	Schulze	f	GER	Potsdam	09-03-1977
5	Sophie	Schulze	f	GER	Rostock	06-20-2012
...	...	...	...	...	...	...
8×10^9	Zacharias	Perdopolus	m	GRE	Athen	03-12-1979

Main Store

Differential Buffer

```
UPDATE 'world_population'
SET    city='Potsdam'
WHERE  fname= "Michael" AND lname="Berg" AND city="Berlin"
LIMIT 1
```

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Tuple Lifetime

- ❑ Problem: Tuples are present in Main Store and Differential Buffer
- ❑ Tuples of a table are marked by a validity vector to reduce the required amount of reorganization steps (like an attribute vector for validity)
- ❑ Invalidated tuples stay in the database table until the next reorganization takes place
- ❑ Search results are reduced using the validity vector
- ❑ 1 bit required per database tuple

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Tuple Lifetime

Michael Berg moves from Berlin to Potsdam

Table: world_population

recid	fname	lname	gender	country	city	birthday	valid
0	Martin	Albrecht	m	GER	Berlin	08-05-1955	1
1	Michael	Berg	m	GER	Berlin	03-05-1970	0
2	Hanna	Schulze	f	GER	Hamburg	04-04-1968	1
3	Anton	Meyer	m	AUT	Innsbruck	10-20-1992	1
4	Ulrike	Schulze	f	GER	Potsdam	09-03-1977	1
5	Sophie	Schulze	f	GER	Rostock	06-20-2012	1
...	...	...	...	...	...	...	...
8×10^9	Zacharias	Perdopolus	m	GRE	Athen	03-12-1979	1

Main Store

0	Michael	Berg	m	GER	Potsdam	03-05-1970	1
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Differential Buffer

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