

B-tree index

even smaller index

primary keys range	reference to index
0 - 3	reference
4 - 7	reference
...	...

1. load the entire index
into memory

smaller index

primary keys range	reference to index
0 - 1	reference
2 - 3	reference
4 - 5	reference
6 - 7	reference
...	...

2. load only the relevant chunk
into memory

one big index

primary keys	key	position
0	record 0 key	0
1	record 1 key	258
2	record 2 key	431
3	record 3 key	629
4	record 4 key	872
5	record 5 key	1007
6	record 6 key	1325
7	record 7 key	2037
...

3. load only the relevant chunk
into memory

data file

record 0
record 1
record 2
record 3
record 4
record 5
record 6
record 7
...

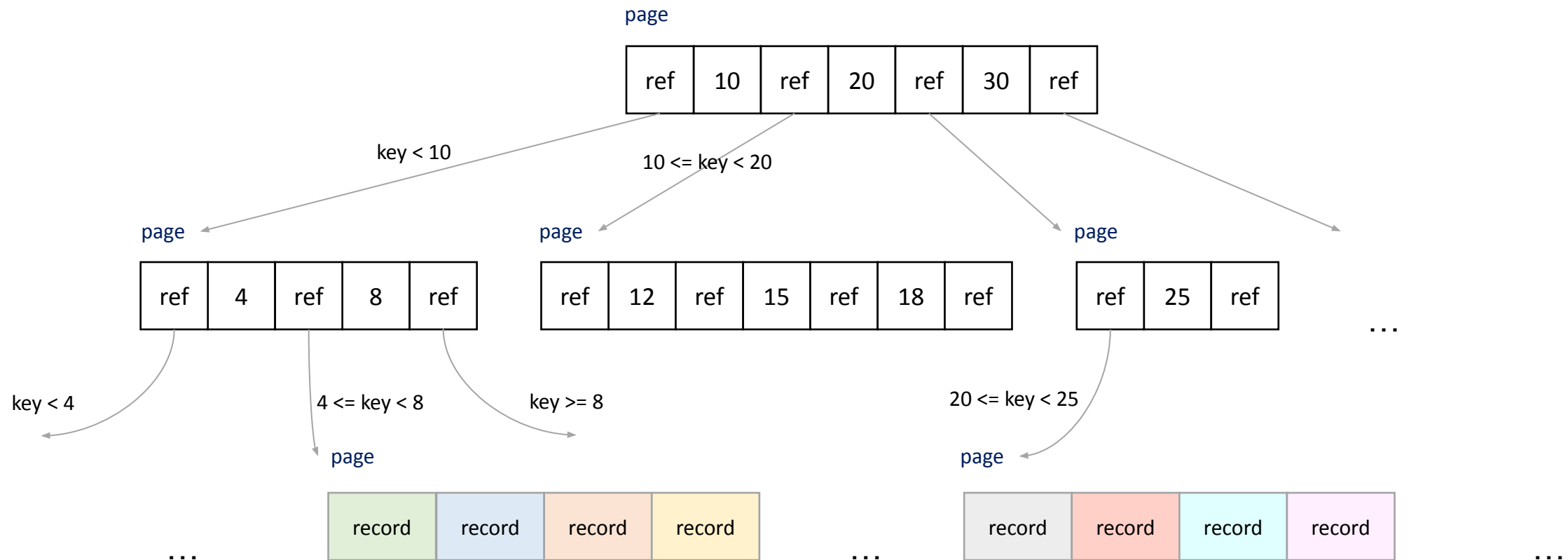
4. retrieve record's bytes
from disk

B-tree index

B-tree

self-balancing tree data structure

insert, delete, search - $O(\log(n))$



B-tree index

how databases use B-tree indexes

Last Name	First Name	Age
Green	Rachel	24
Geller	Monica	24
Buffay	Phoebe	26
Tribbiani	Joey	25
Bing	Chandler	26
Geller	Ross	26

generated
primary key

10

23

1

18

15

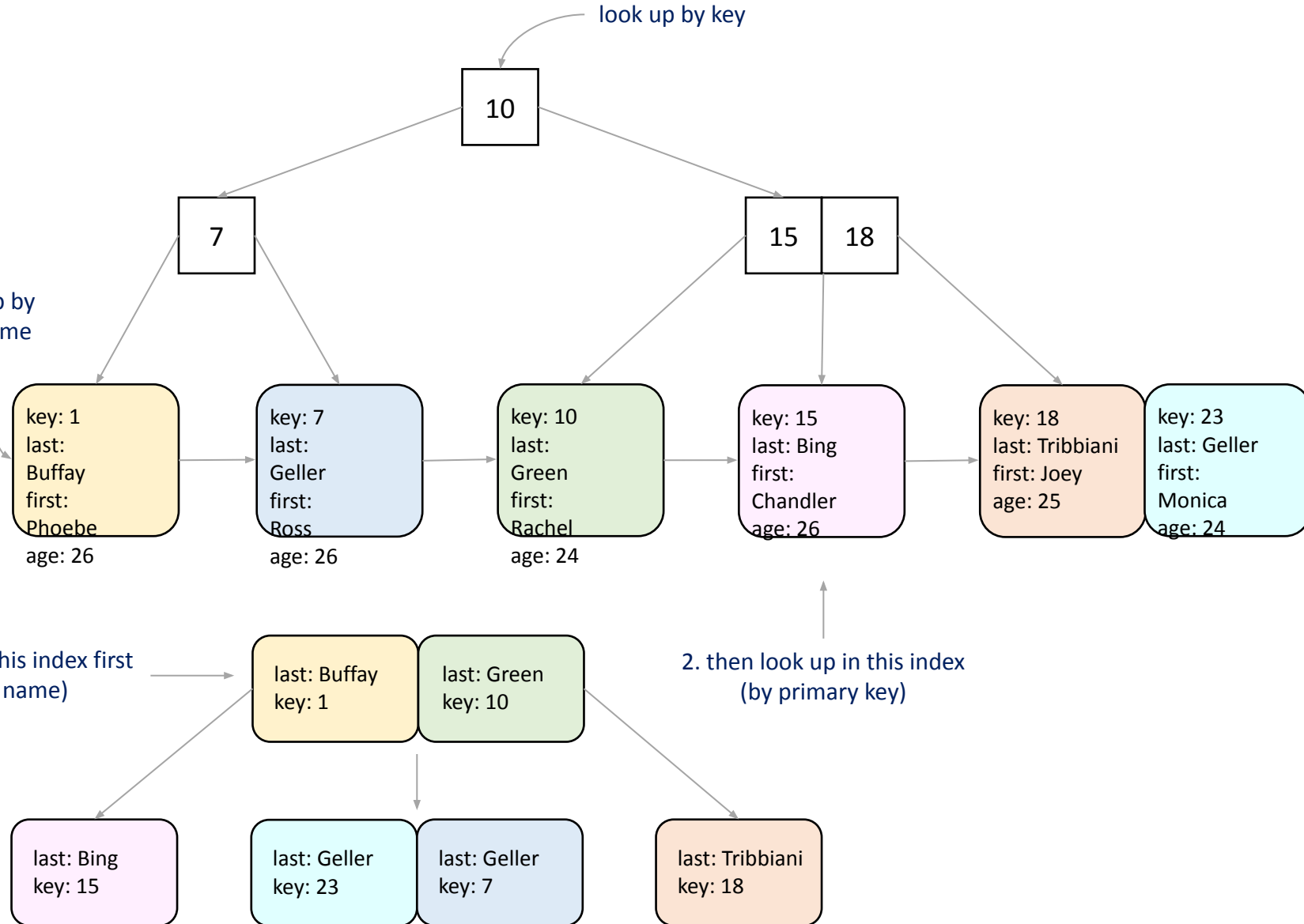
7

look up by
last name

look up by key

1. look up in this index first
(by last name)

2. then look up in this index
(by primary key)



B-tree index

how messaging systems use B-tree indexes

e.g. KahaDB, file-based message store in ActiveMQ

