Searching over Streams

with Luwak, Kafka and Samza

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The Open Source Search Specialists

- We build, tune and support fast, accurate and highly scalable search, analytics and Big Data applications
- We use (and create) **open source** software
- We're independent, honest and have 15+ years experience
- We also:
  - Run and attend many events & conferences
  - Write extensively about search & related matters
  - Train and mentor
- We're confluent partners






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NLA media access

FT.com FINANCIAL TIMES

REED SPECIALIST RECRUITMENT

Office for National Statistics

News UK

EMBL-EBI

INFOMEDIA

eagle

CabinetOffice

GIG CYMRU NHS WALES Gwasanaeth Gwybodeg Informatics Service

ARACHNYS

CAMBRIDGE UNIVERSITY PRESS

aap

Gorkana Group
Gorkana | durrants | metrica

WESTCOAST

What is a stream?

Log file

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Log file

Append

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Log file

Append

tail -f

How do you search one?

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- Search requires an **inverted index**
- Maps searchable terms to documents in which they appear
- Can also store additional information (positions, frequencies, offsets) for more complex searches, relevancy scoring, highlighting, etc
- Updating is difficult - dealt with in e.g. Lucene by writing multiple small immutable indexes, and merging in the background

FOSDEM

Results for **FOSDEM**

Save

Top / **All**

Lilian @lliillian · 3m

@StOnSoftware @SannyGR @**fosdem** nee staat er volgens mij los van.

View conversation

Henrik Lindberg @hel · 4m

On my way to #**fosdem**

Inderpreet Singh @ip_v1 · 5m

Every once in a while... "@kartben: Where the f@# is my passport when I need it?? :(((#**fosdem** #jfokus :("

FrOSCon @froscon · 9m

Several members of our team will be attending **FOSDEM** this weekend. If you want to meet give us a shout.

miracee @miraceesusanne · 10m

@ScottyTM viel Spass - Grüß Brüssel und alle Freaks der **FOSDEM** - ich trink ein Geb-Bier für Euch mit.

View conversation

Andreas Kupfer @ScottyTM · 11m

On my way to Brussels for #**FOSDEM** with ICE 16. #dbl

FOSDEM

Results for **FOSDEM**

Save

Top / **All**

8 new results

Solarus @Solarus0 · 2m

@lhirlimann deploying a 6to4 proxy is a good practice however. ;) @RatZillaS @**fosdem**

View conversation

Mohamed Hadrouj @hadrouj · 2m

Presentation of Juju by @lazypower at #**FOSDEM** : Full house at the config management room

Searching streams

- Cache all the queries that we're interested in
- Divide the incoming messages into windows, and build indexes on them
- Run cached queries over each index as it becomes available

Log file

Append

1 2 3 4 5 6 7 8 9 10 11 12

yesterday

last hour

last minute

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One document, many queries

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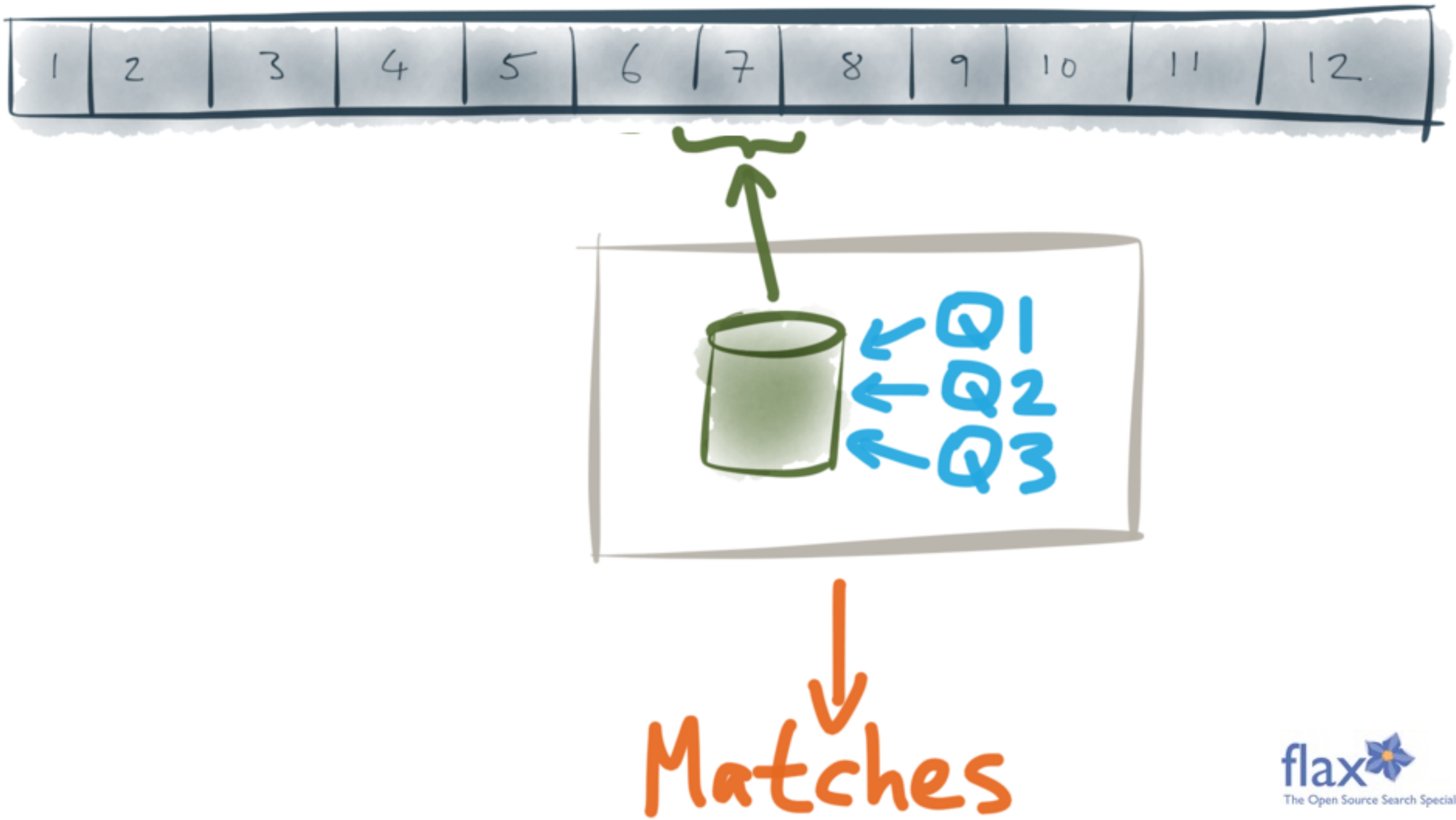
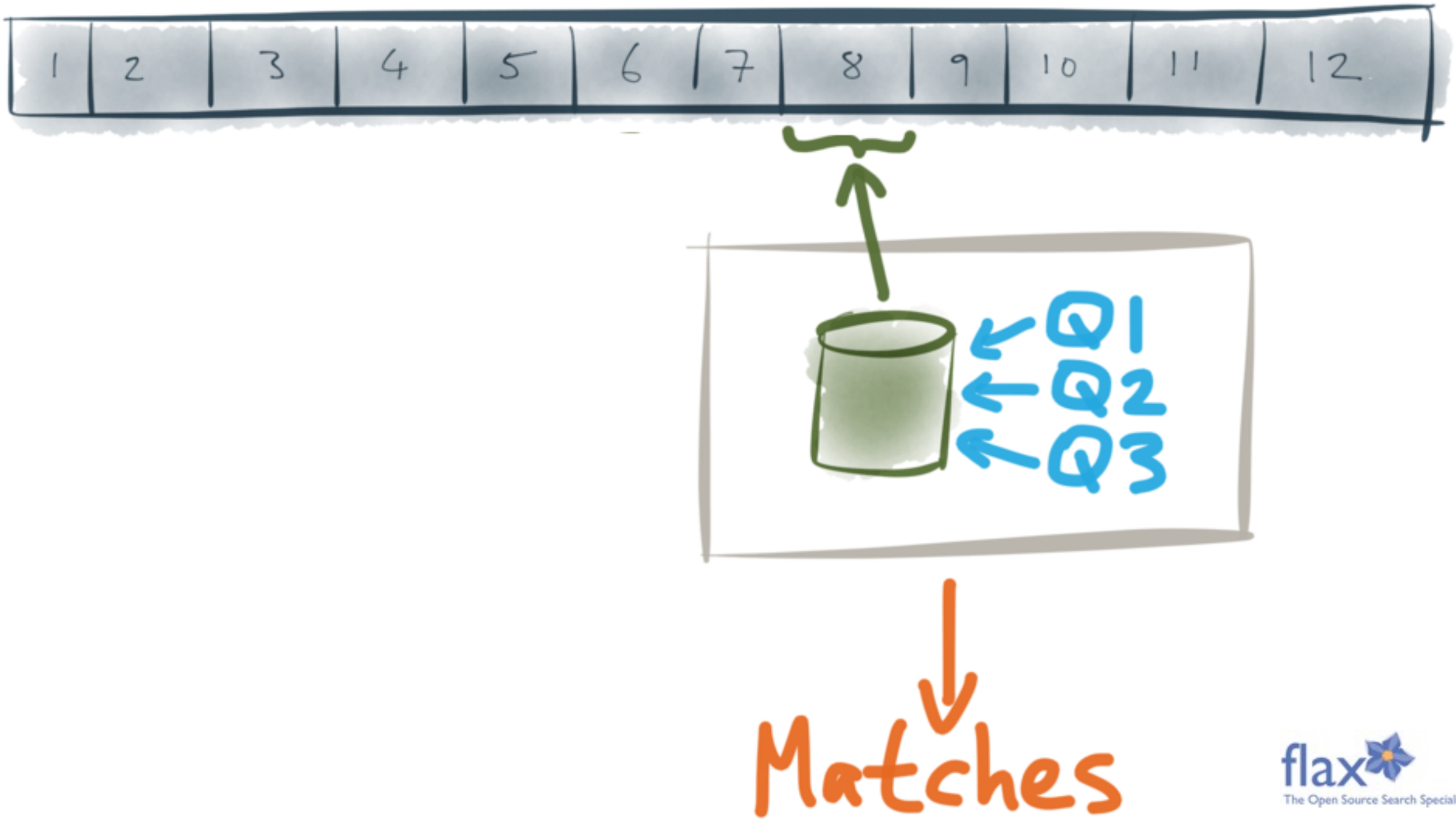
One document, many queries



One document, many queries



- Example: elasticsearch percolator
- Register queries into the percolator index
- Send documents one-at-a-time to elasticsearch, and it reports back which registered queries match

Does it scale?

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Lots of queries = slow!

Complex queries = slow!

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Scaling streaming search

- Batch up documents - trade off latency for throughput
- Try and filter out queries that you know won't match

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Index of queries

Q1: "WHEELS" NEAR "BUS"

Q2: "WHEELS" NEAR "CAR"

Q3: "WHEELS" OR "BUMPERS"

Index of queries

Q1: "WHEELS" NEAR "BUS" → "BUS"

Q2: "WHEELS" NEAR "CAR" → "CAR"

Q3: "WHEELS" OR "BUMPERS"

→ "BUMPERS", "WHEELS"

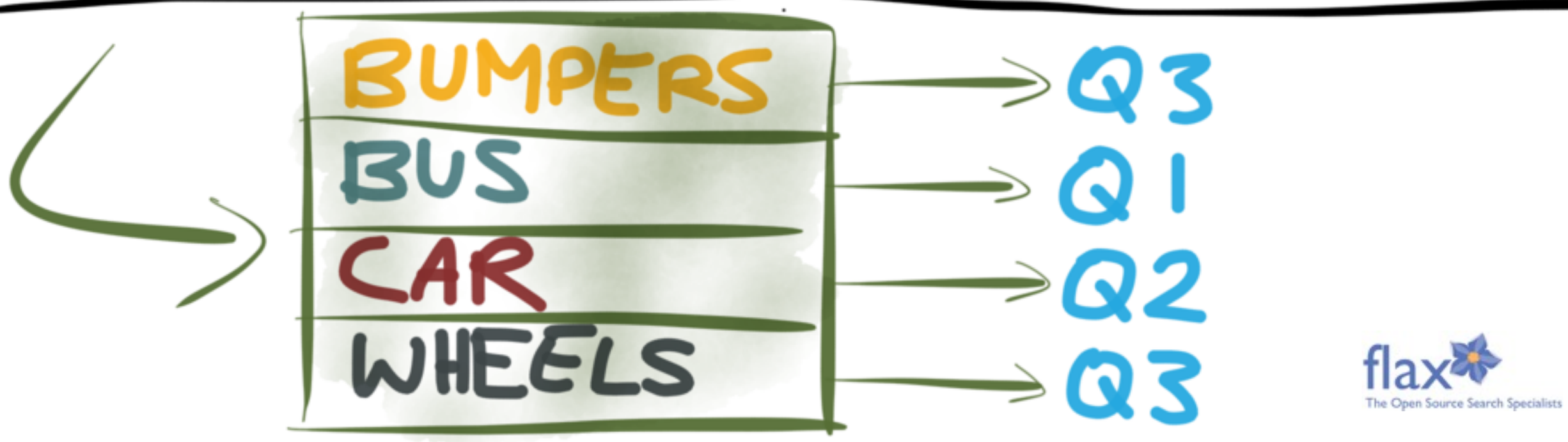
Index of queries

Q1: "WHEELS" NEAR "BUS" → "BUS"

Q2: "WHEELS" NEAR "CAR" → "CAR"

Q3: "WHEELS" OR "BUMPERS"

→ "BUMPERS", "WHEELS"



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Document disjunction

"The wheels
on the bus
go round
and round"

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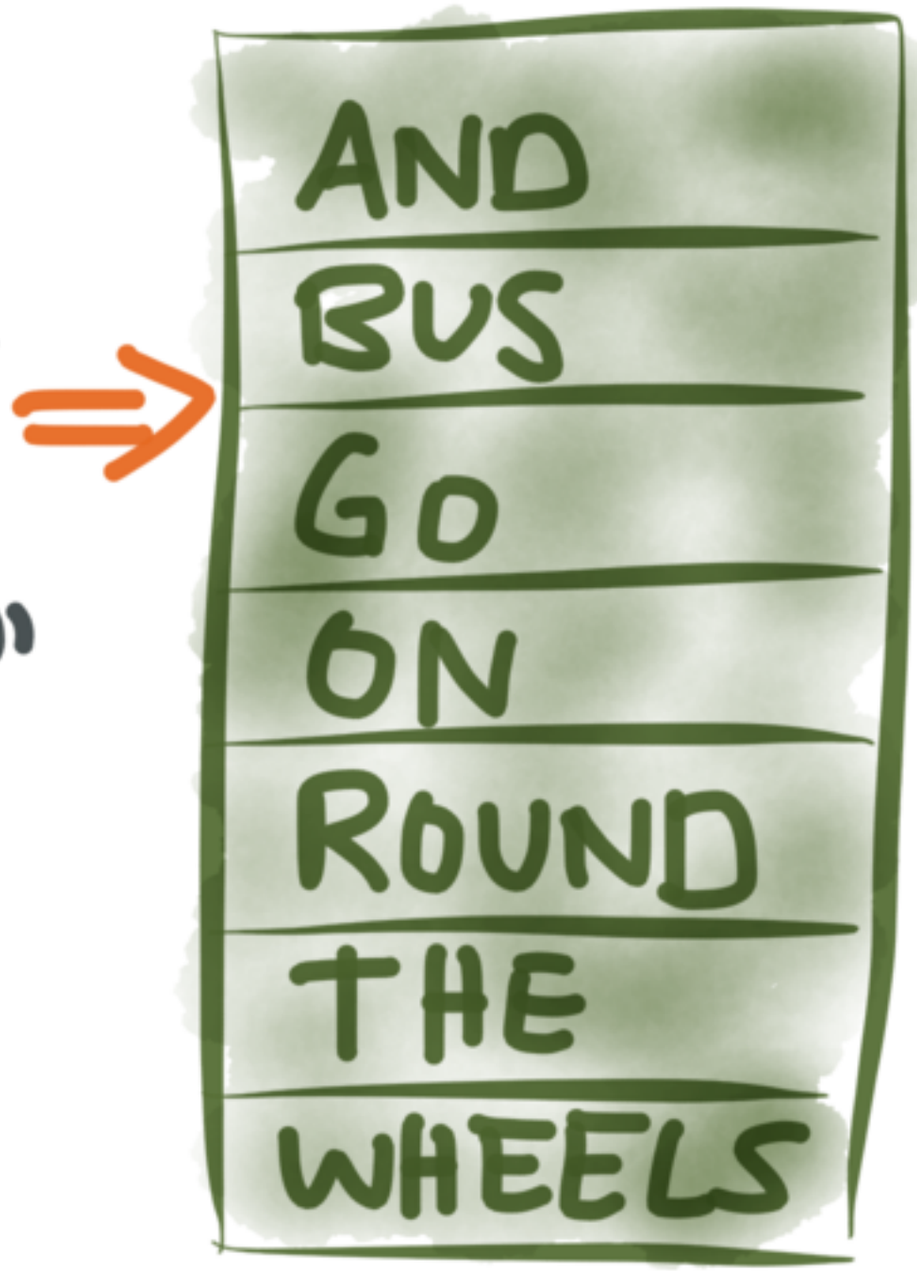
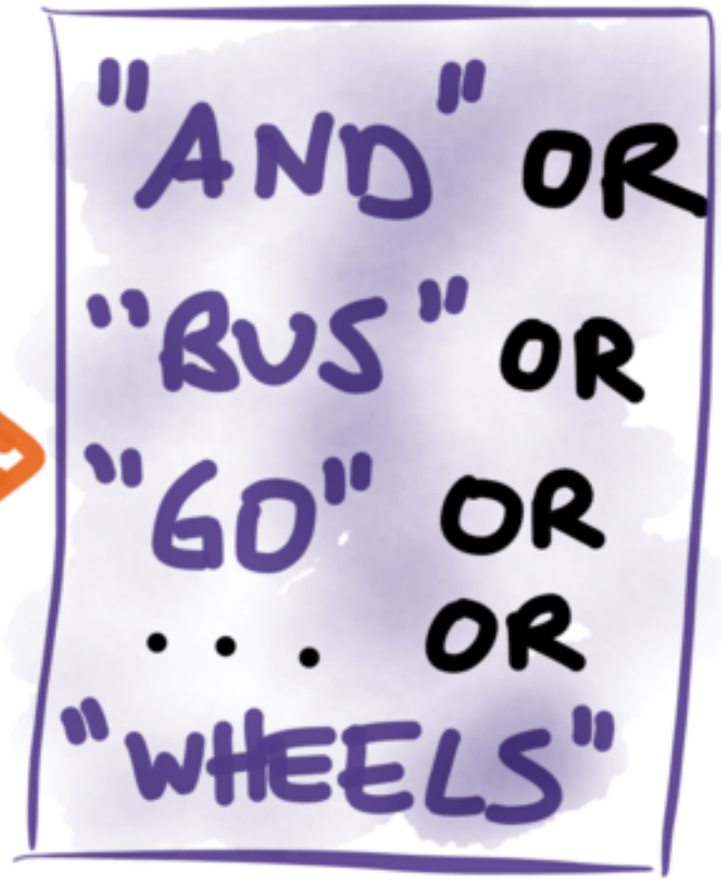
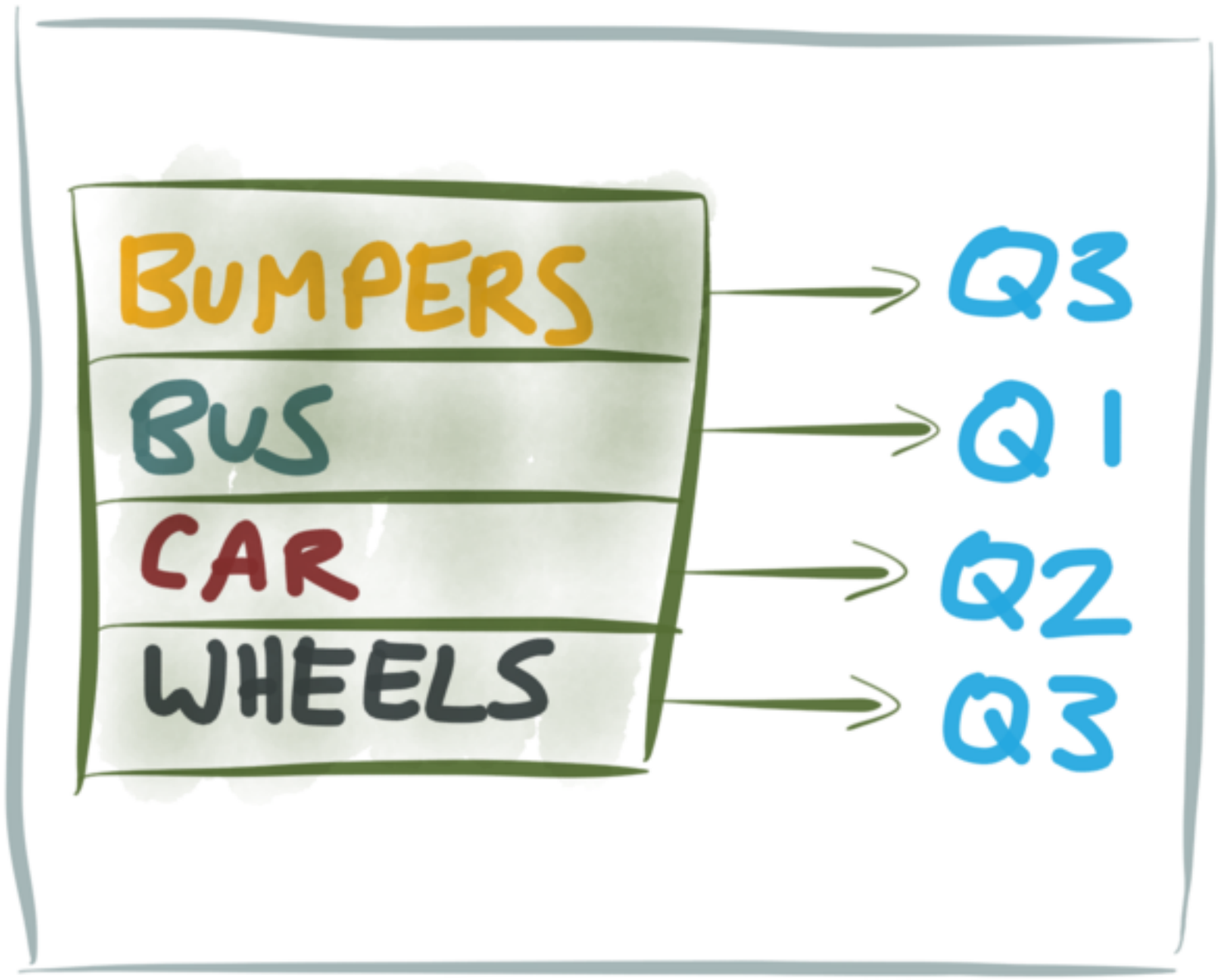




Selecting candidate queries



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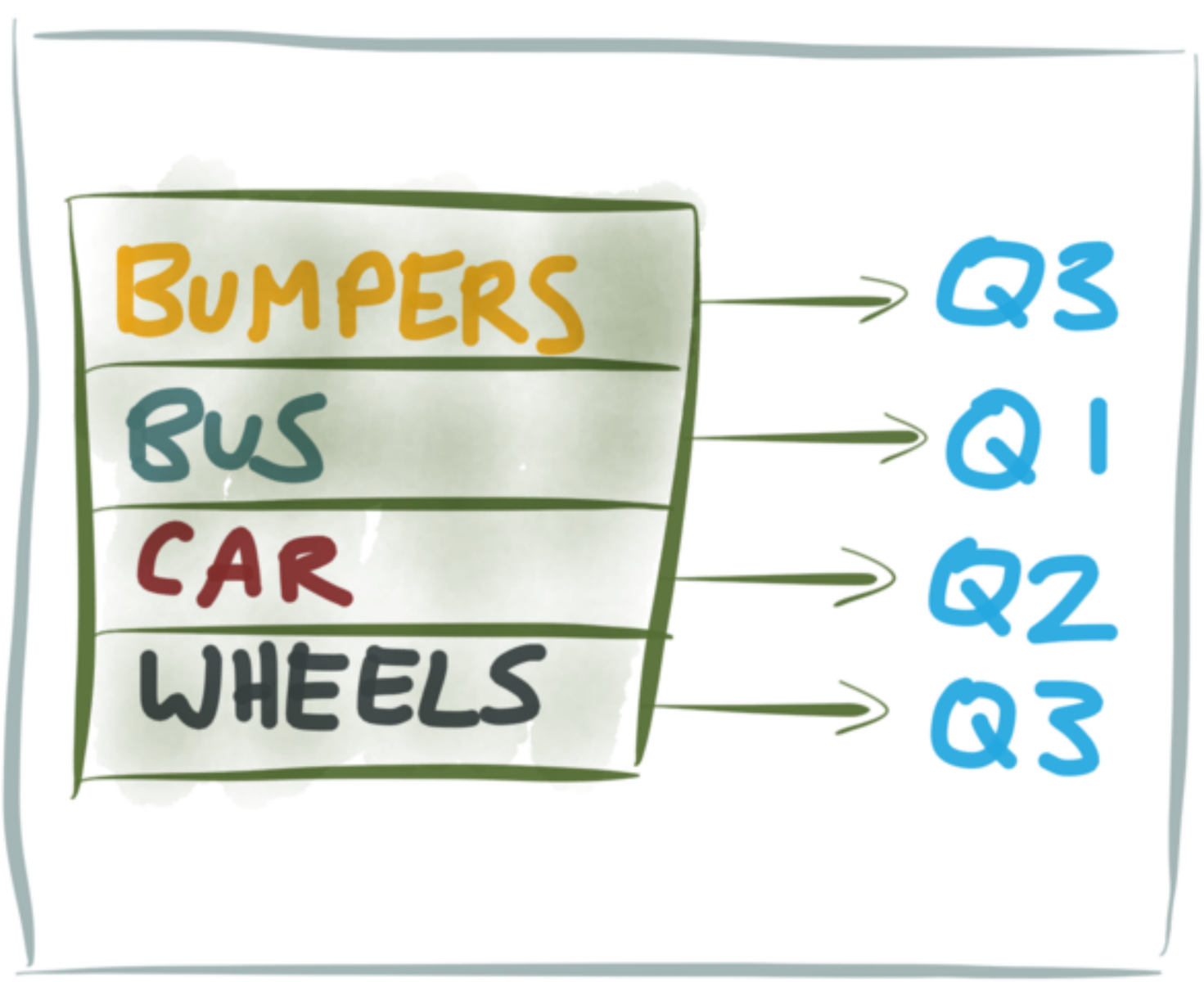
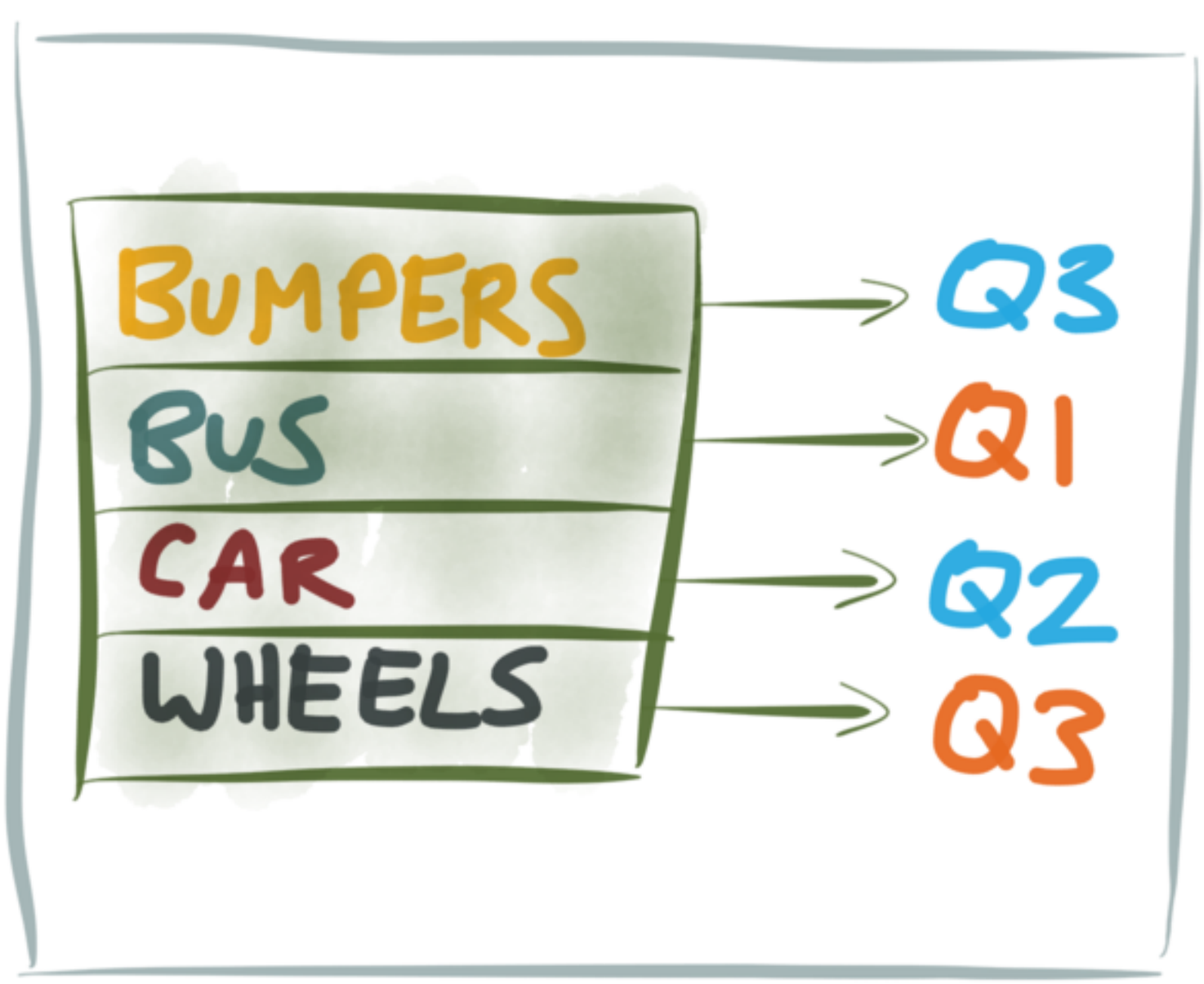
Selecting candidate queries



"AND" OR
"BUS" OR
"GO" OR
...
"WHEELS"

Selecting candidate queries



Q1 and Q3 may match

Q2 doesn't match

Flax Luwak

- Java library for efficiently running queries over document streams
- Builds query indexes and document disjunctions for you
- Can run over single documents for better latency, or document batches for higher throughput
- Much, much faster than just running all queries

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Samza - Luwak

- Experimental project to integrate luwak with Kafka topics
- Samza is a stream-processing library that runs within distributed containers (eg Yarn)
- Reads queries from a Kafka topic
- Reads messages from a Kafka topic, and writes results back out to another Kafka topic

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Samza - Luwak

- Scales with messages by using Kafka partitions
- Scales with queries by partitioning queries up, and recombining messages using local state

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Kafka-Streams

- New stream processing library built directly into Kafka
- In pre-release from Confluent

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Questions?

https://github.com/romseygeek/samza-luwak
https://github.com/flaxsearch/luwak

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