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Closer to the Wire:

Real-time News Alerting @Bloomberg

Katerina Domenikou
Senior Software Engineer
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TechAtBloomberg.com

T- 00:21:09

@tictoc

by Bloomberg

What We Know

Most powerful operational rocket: SpaceX

Payload includes cherry red Tesla Roadster

Falcon Heavy's flight targeting Mars orbit

#tictocnews

Awaiting SpaceX launch of Falcon Heavy

FALCON HEAVY TEST FLIGHT



TicToc by Bloomberg • 614K viewers

0:19 / 35:26



LIFTOFF

BOOSTER ENGINE CUTOFF

PAYLOAD DEPLOY

STAGE 2 SHUTDOWN

SPACE





Source: [instagram/@elonmusk](https://www.instagram.com/elonmusk)

NEWS MOVES MARKETS

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■ Last Price 342.265
┆ High on 06/18/18 373.73
○ Average 316.30
┆ Low on 04/02/18 244.59

Track Annotate News Zoom



342.265

340

320

300

280

260

240

Dec 29

Jan 16

Jan 31

Feb 14

Feb 28

Mar 15

Mar 29

Apr 16

Apr 30

May 15

May 31

Jun 15

2018



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Source: www.pinkcakebox.com





Agenda

- System Requirements
- Architecture Overview #birdseye
- Matcher Application #deepdive

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News Search Ecosystem



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The Document

03/14/2018 21:19:34 [BN]

B

Tesla Executive Upheaval Tests If Musk Can Lead as Well as Dream

- Treasurer and VP of finance leaves the company; shares drop
- Carmaker disclosed its chief accounting officer left March 7

By Dana Hull

(Bloomberg) -- [Tesla Inc.](#) has always been an intoxicating place to work: an adrenaline-fueled, mission-driven boot camp. Some top executives have departed only to return to the unique drama that is working for [Elon Musk](#).

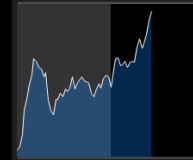
Many others have quit for good. As common as it's been for Tesla to see talent [come and go](#), the recent spate of departures from the electric-car maker is raising what were already high stakes for its billionaire chief executive. Musk is in the midst of a crucially important attempt to mass manufacture vehicles, a feat that's proven incredibly difficult even for a guy famous for flying rockets to space and [landing them back](#) on Earth.

Within the last week, Tesla has confirmed two of its top financial executives have parted ways with the company. In February, its global president of sales and service [left](#) for Lyft Inc. All this churn complicates an already challenging test for Musk: to prove that he can operate his companies as capably as he's shown an ability to dream and build them.

TSLA US Equity
Graphic Dashboard»

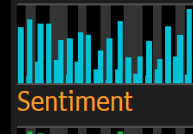
Price 2D

\$289.51



News Chart 5D

Volume



Sentiment

Tesla Inc

Lyft Inc

Elon Musk

Gaby Toledano

Technology

Automobile Industry

United States (US)

Transportation

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NEWS ON TESLA

FUNCTIONS

<UP ARROW> to hide

Autocomplete Feedback

TOP

Top News

SEARCH NEWS ON TESLA

Search Bloomberg for 'NEWS ON TESLA'

TSLA US

\$ F Market



364.70 / 365.30P

1x1



Prev 370.83

Vol 21,186

Search News

Actions

Custom Searches

Translate

Page 1 News

Tesla Inc

My Sources

All Dates

My Lang

Time

Related Search "tesla"

Top Ranked News | More »

Top News

Background & Opinion

- 1) Musk: Germany Is 'Leading Choice' for Europe Tesla Gigafactory BFW 11:20
- 2) Musk Says Tesla Hit With 'Extensive' Sabotage by Rogue Employee BN 00:09
- 3) Musk: If There Is A Way for Me to Help These Kids I Will Do So BFW 07:48

Time Ordered News

- 4) Forbes: Eden's \$160 Million Greenhouses: Where Björk Sings, And Dreams Greater... FOR 11:27
- 5) Elon Musk: @FilmLadd That's ridiculous, lions can't vote, they don't even have op... TWT 11:20
- 6) Musk: Germany Is 'Leading Choice' for Europe Tesla Gigafactory BFW 11:20
- 7) TSLA: Tesla CEO Elon Musk tells employees about another factory FLY 11:17
- 8) Seeking Alpha: Kinder Morgan Got The Cash As Shareholders Expected BLG 11:10
- 9) *MUSK TWEETS GERMANY IS A LEADING CHOICE FOR EUROPE PLANT BFW 11:09
- 10) Elon Musk: @pascal_munz @Zuckerberger @horn Germany is a leading choice for E... TWT 11:08 +
- 11) Tesla Stops Accepting Orders from Chinese Consumers RDP 11:00

The Query

Filters
Src **My Sources** R **M** Lang **My** 06/01/17 00:00 - MM/DD/YY Attachment Pg - - -

Search Criteria
 Search Builder **Manual Edit**

Type	Search Terms
1. Keywords	"brake*" N/3 "fix","bug","error" IN STORYTOP/75
2. Ticker Lists	
3. Companies	TSLA
4. Topics	
5. People	Elon Reeve Musk
6. Regions	
7. Industries	
8. Sources	NH , BN , TWT

Search Criteria
 Search Builder **Manual Edit**

```
KEYWORDS:("brake*" N/3 ("fix" OR "bug" OR "error") IN STORYTOP/75) WITHIN COMPANY:TSLA AND PERSON:1954518 AND WIRE:NH AND (WIRE:BN OR WIRE:TWT)
```

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Key Statistics

325K+

Terminal subscribers

News search

16M

queries per day

Stories available
for search in

~100ms

Average query
response time

<200ms

News volume

2M

stories per day

500

stories ingested
per second

650M

stories in index

News alerting

1.5M

subscriptions

500

stories matched
per second

Alerts delivered in

<100ms

Flexibility A.K.A Complexity



125K+ sources



40 languages



Queries with 1000s of companies

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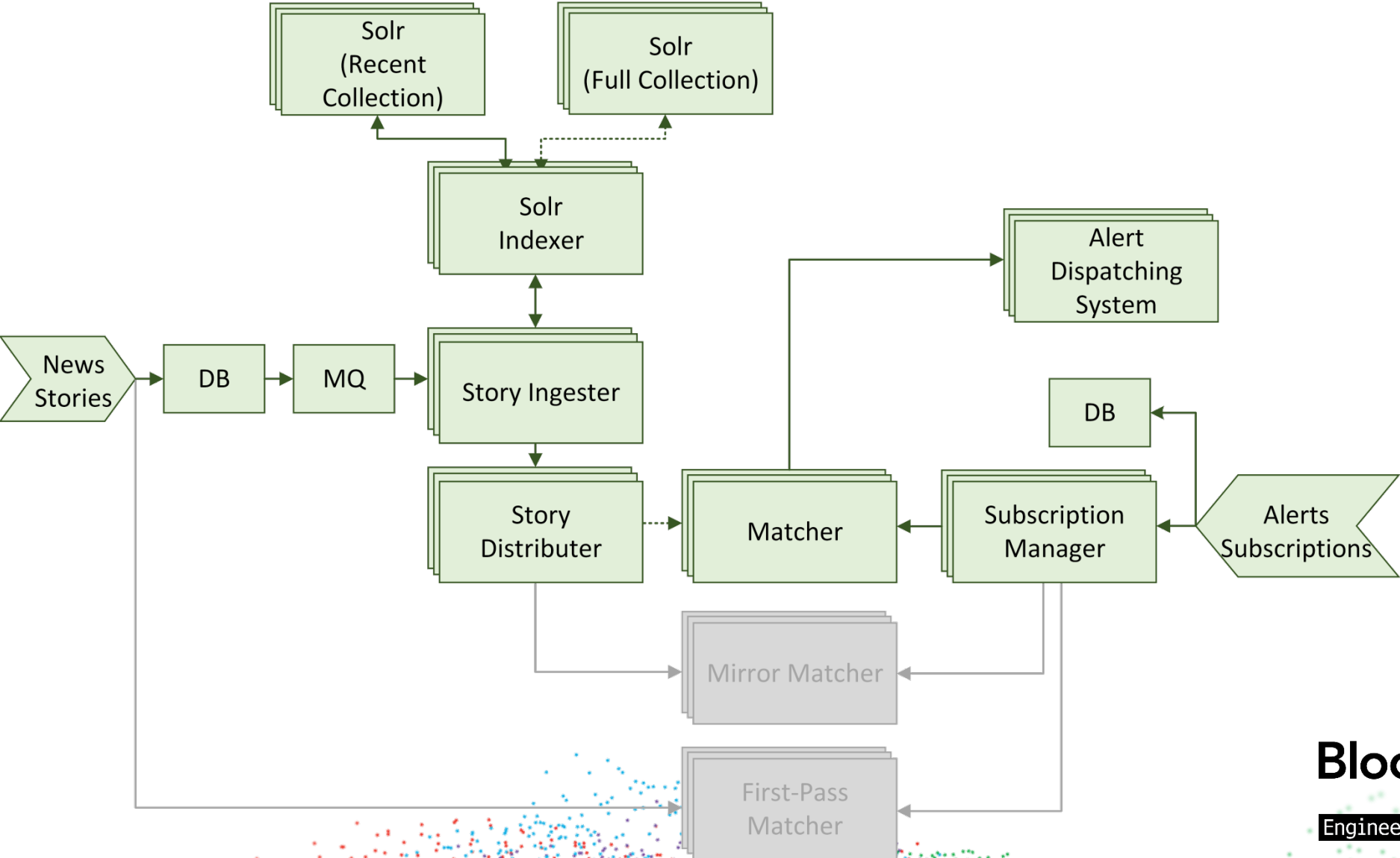
Agenda

- System Requirements
- Architecture Overview `#birdseye`
- Matcher Application `#deepdive`

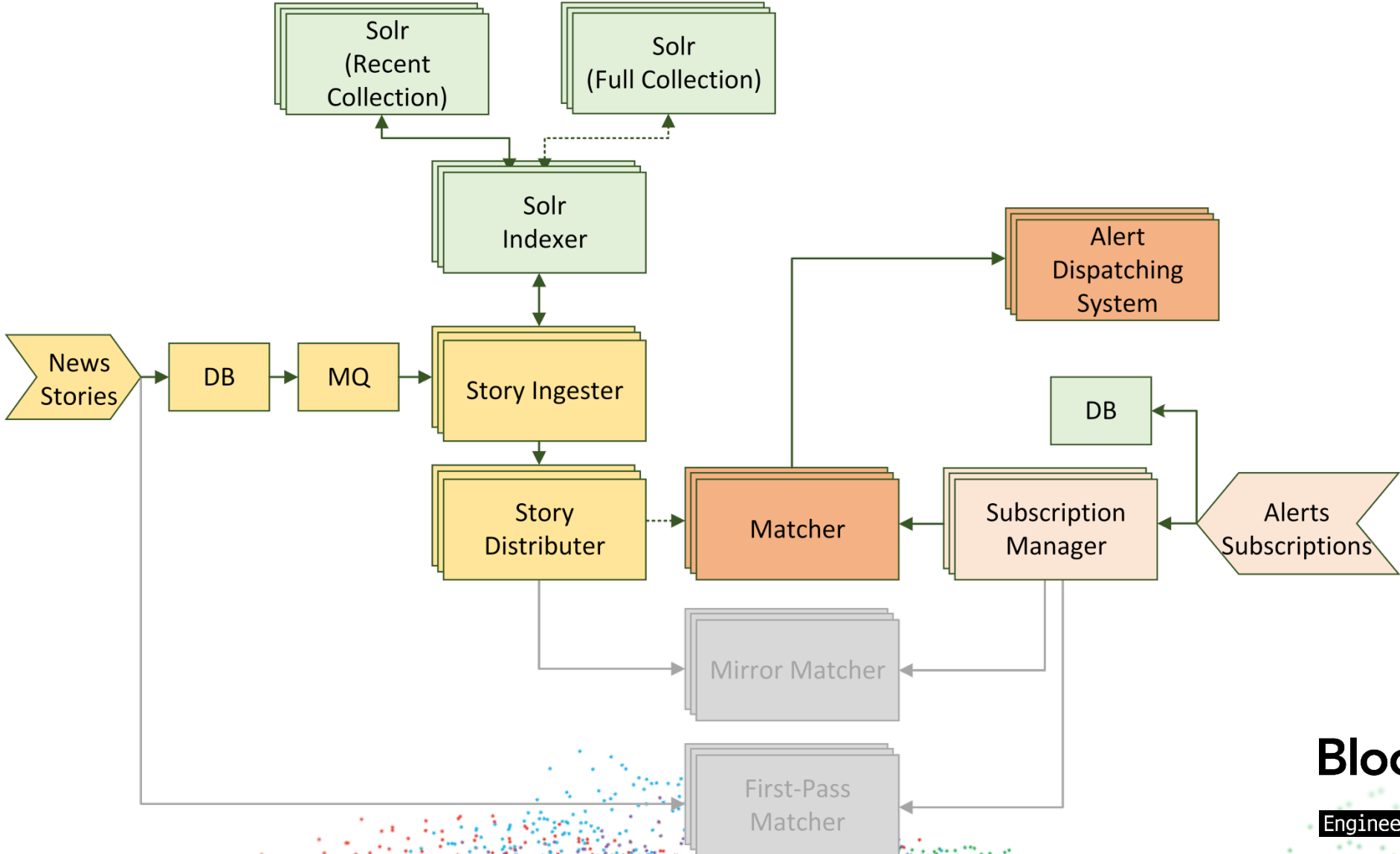
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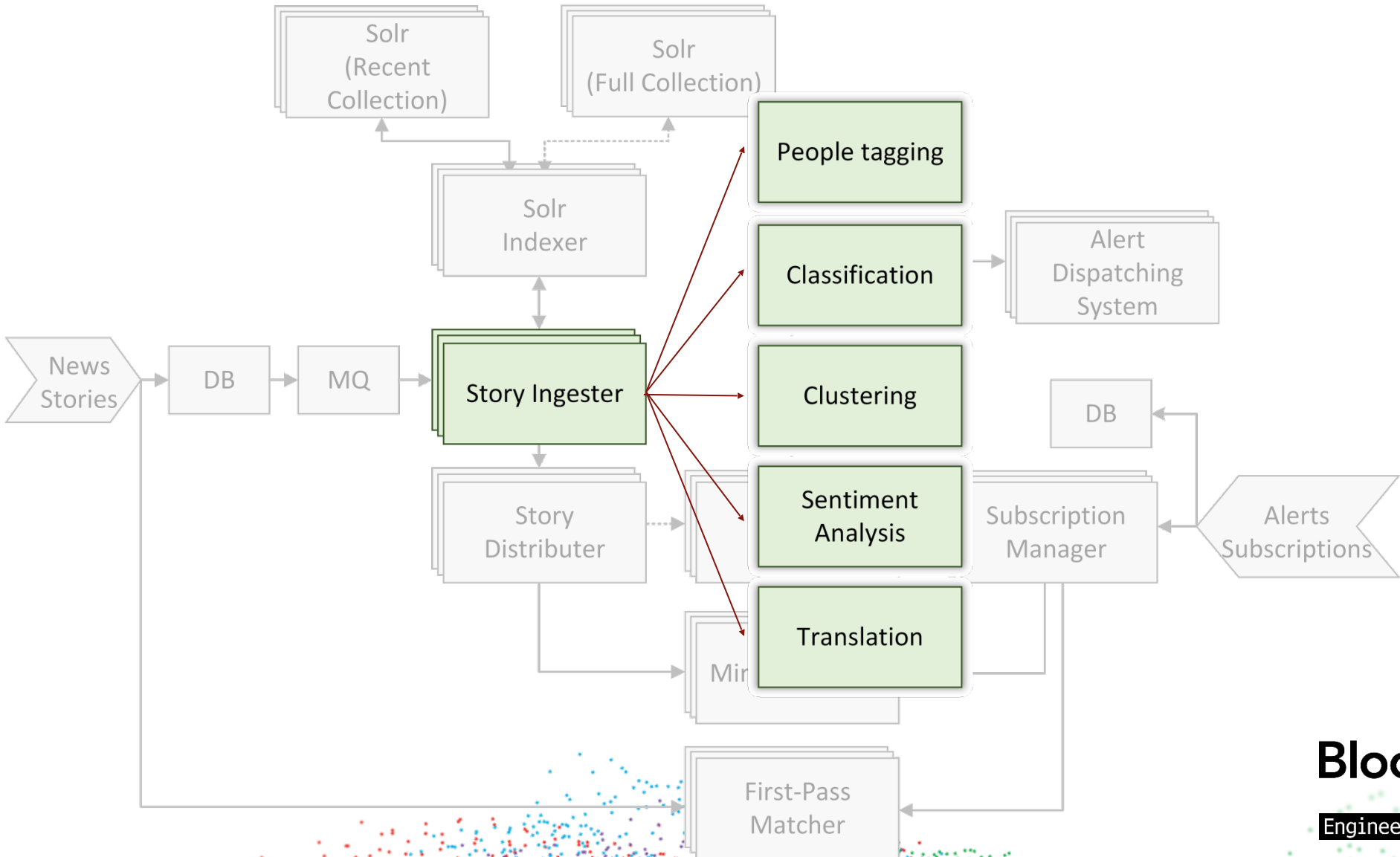
System Overview



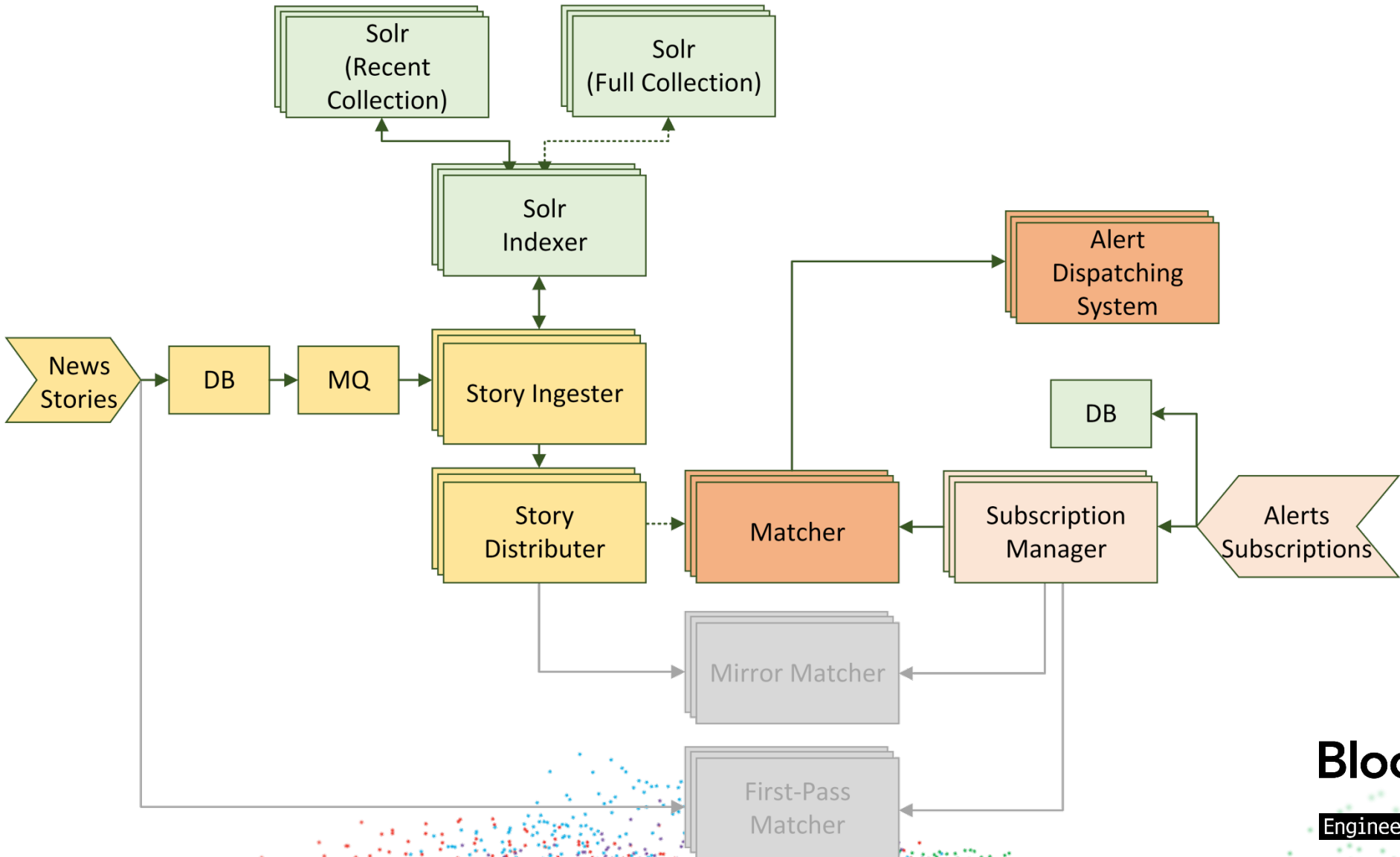
Pipeline



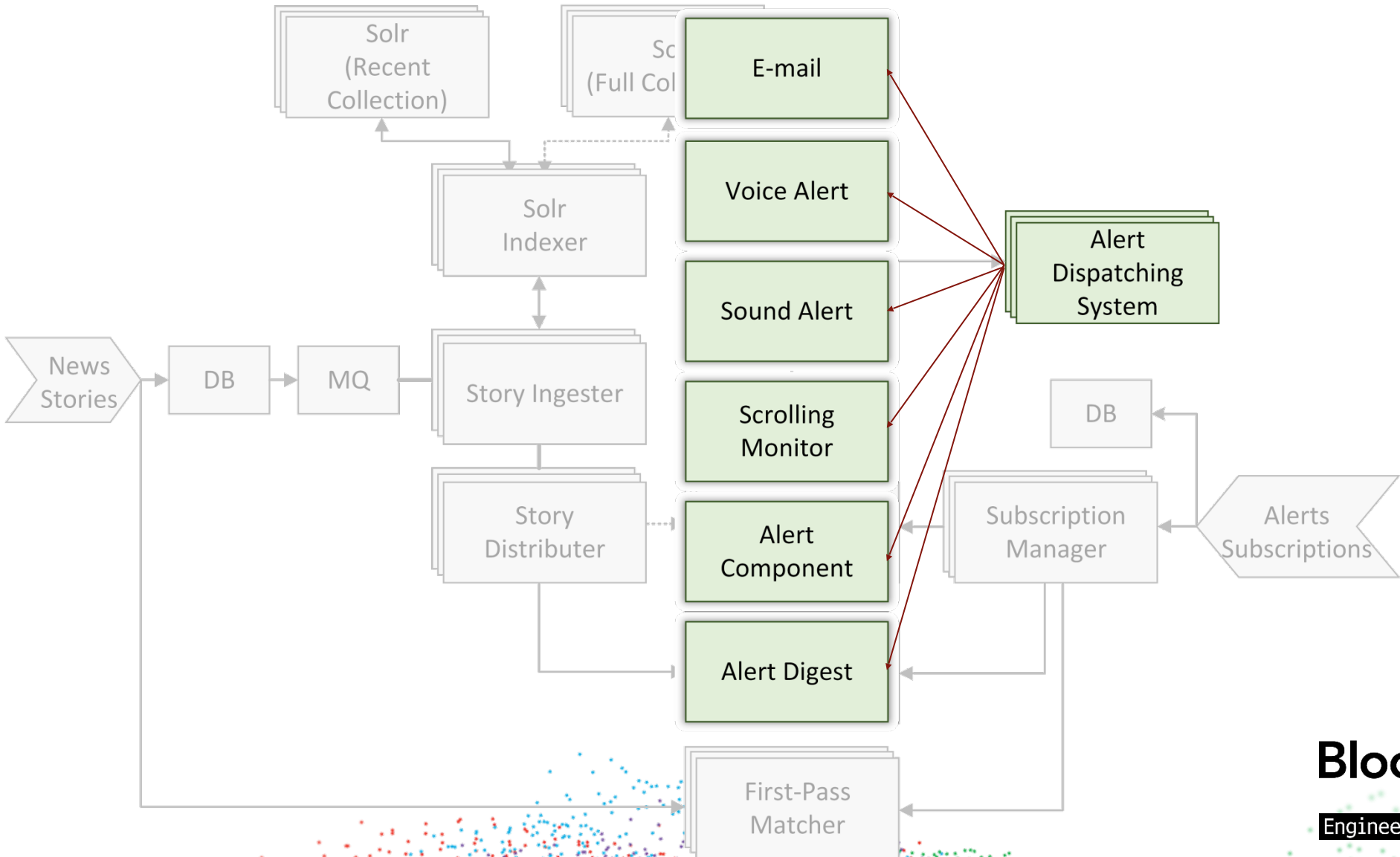
Enrichment



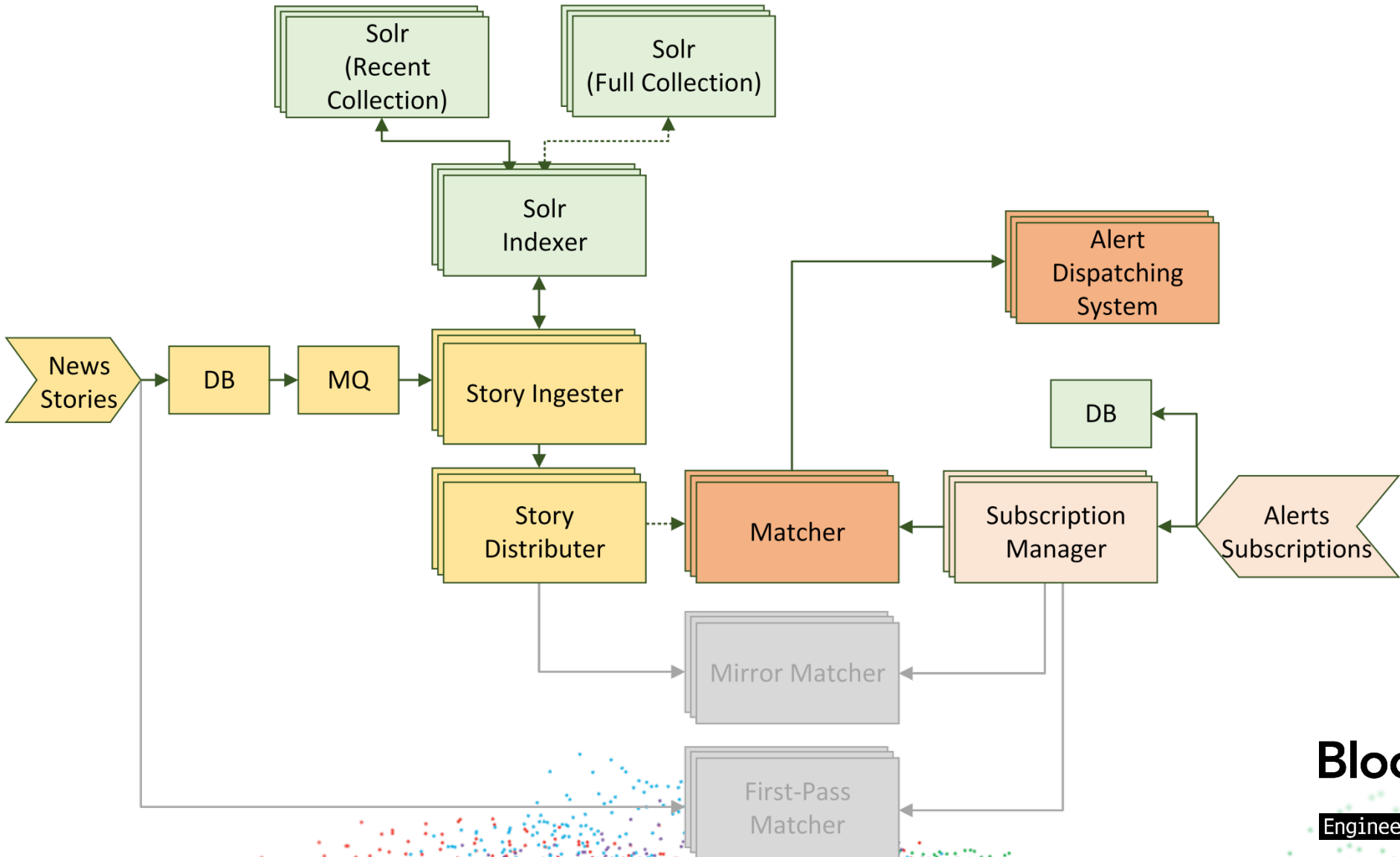
Pipeline



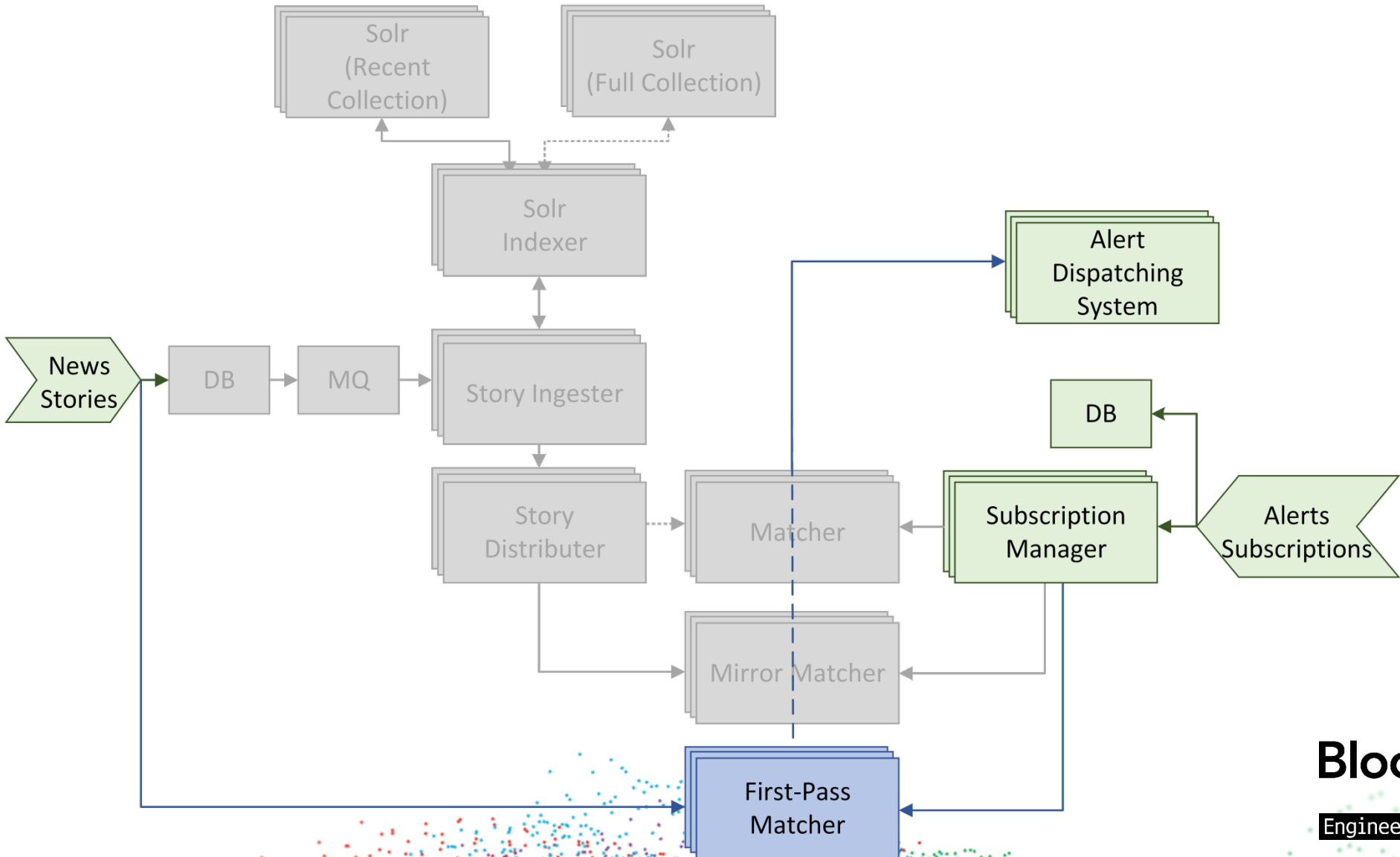
Deliveries



Pipeline



Even Faster Alerts





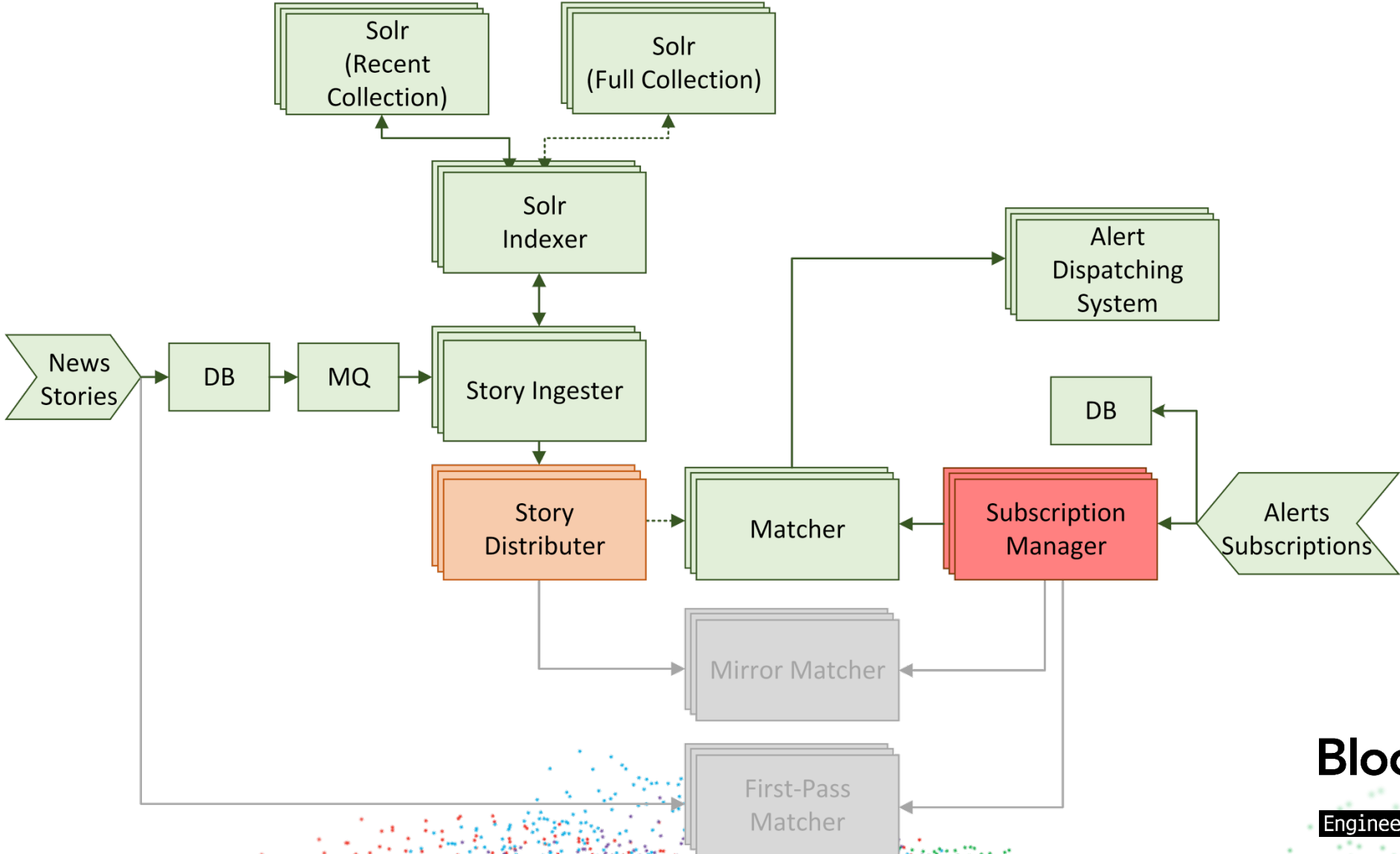
Agenda

- System Requirements
- Architecture Overview #birdseye
- **Matcher Application #deepdive**

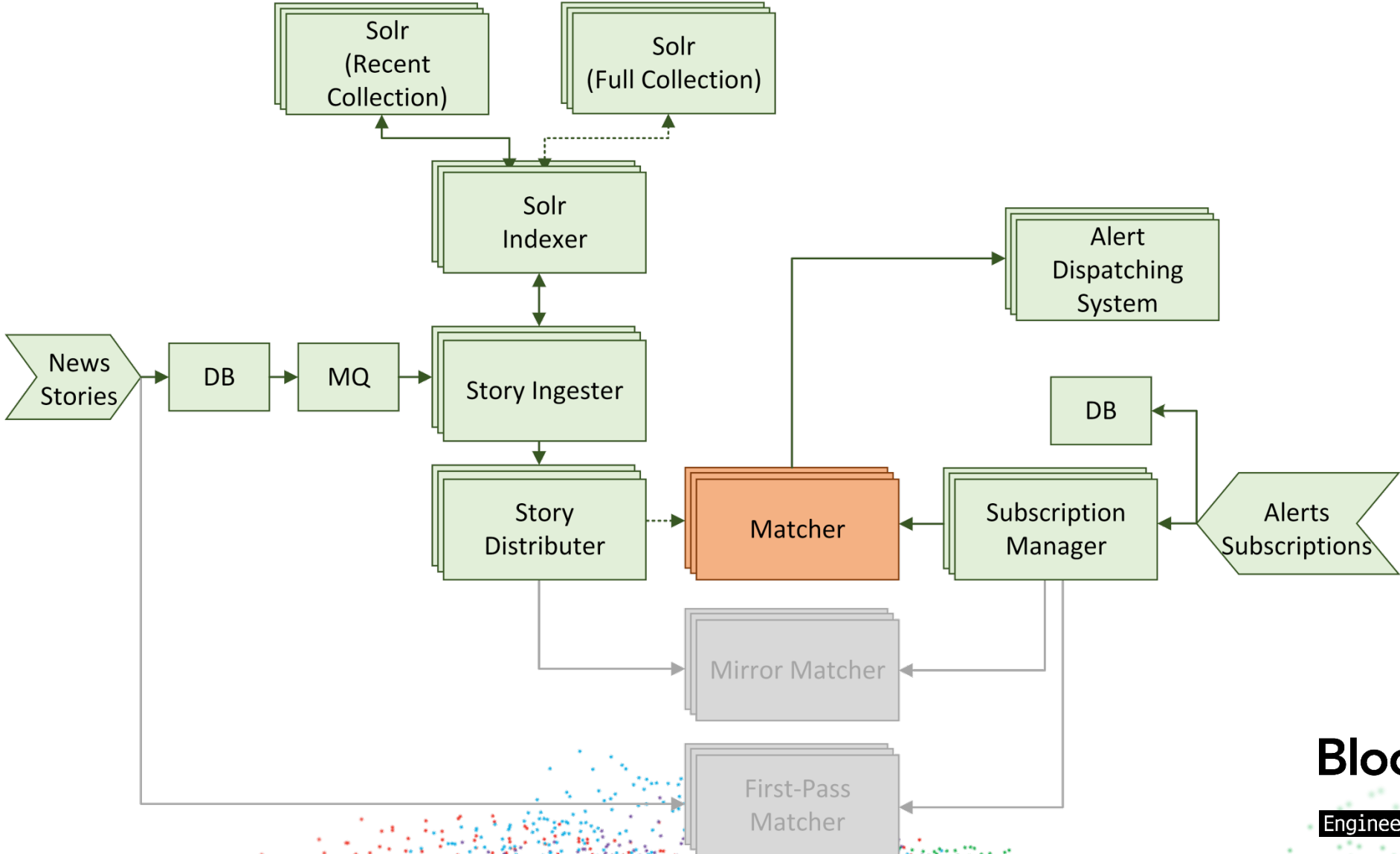
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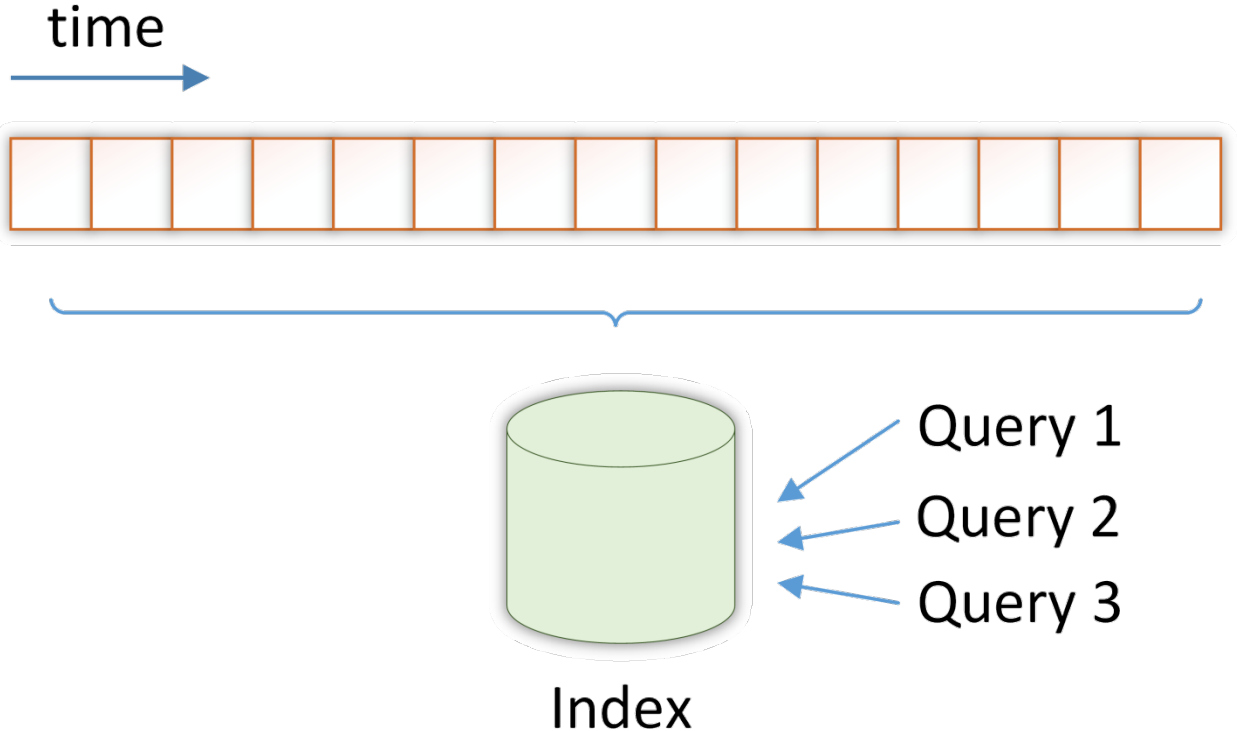
Matcher



Matcher



Search

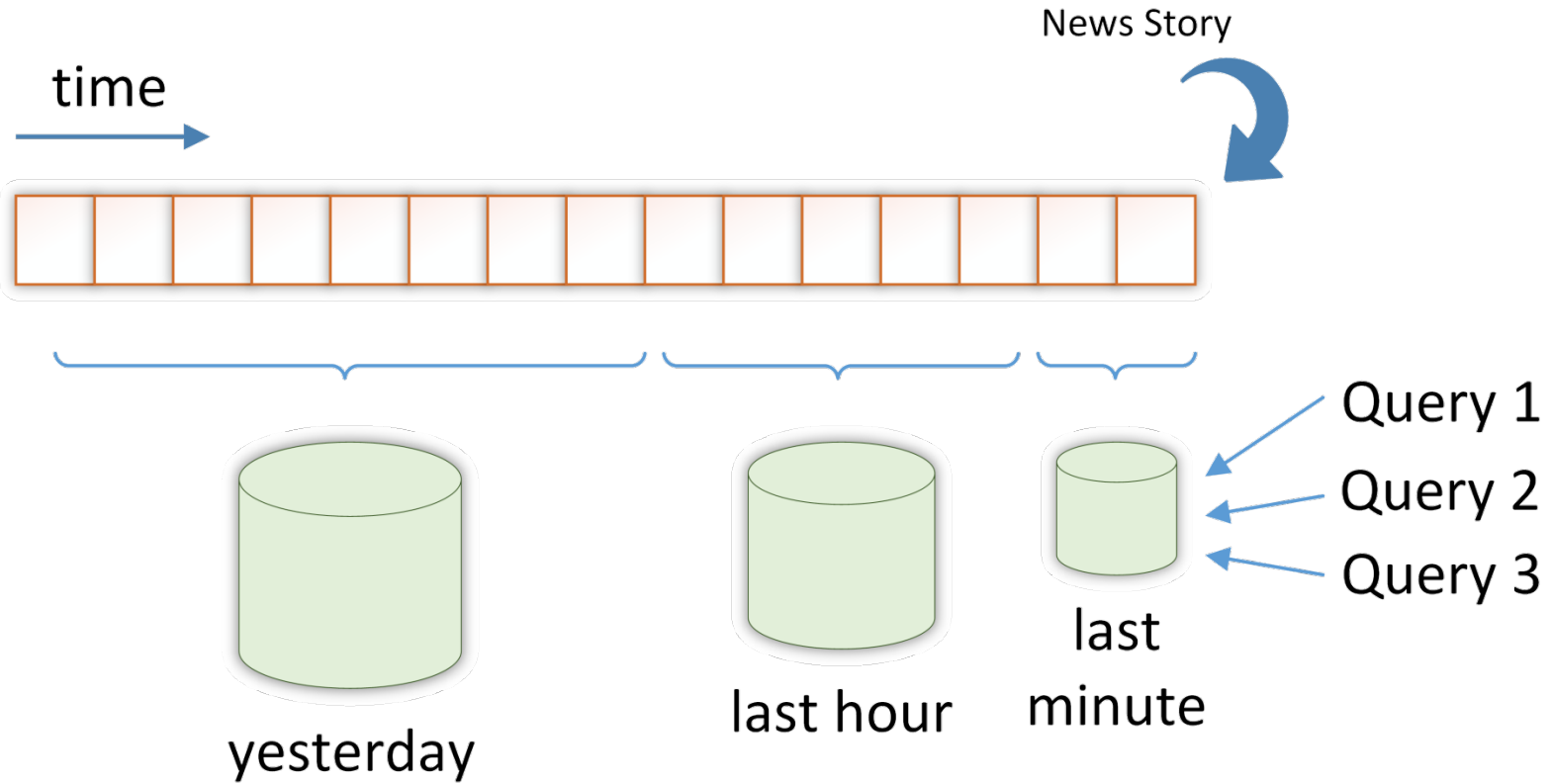


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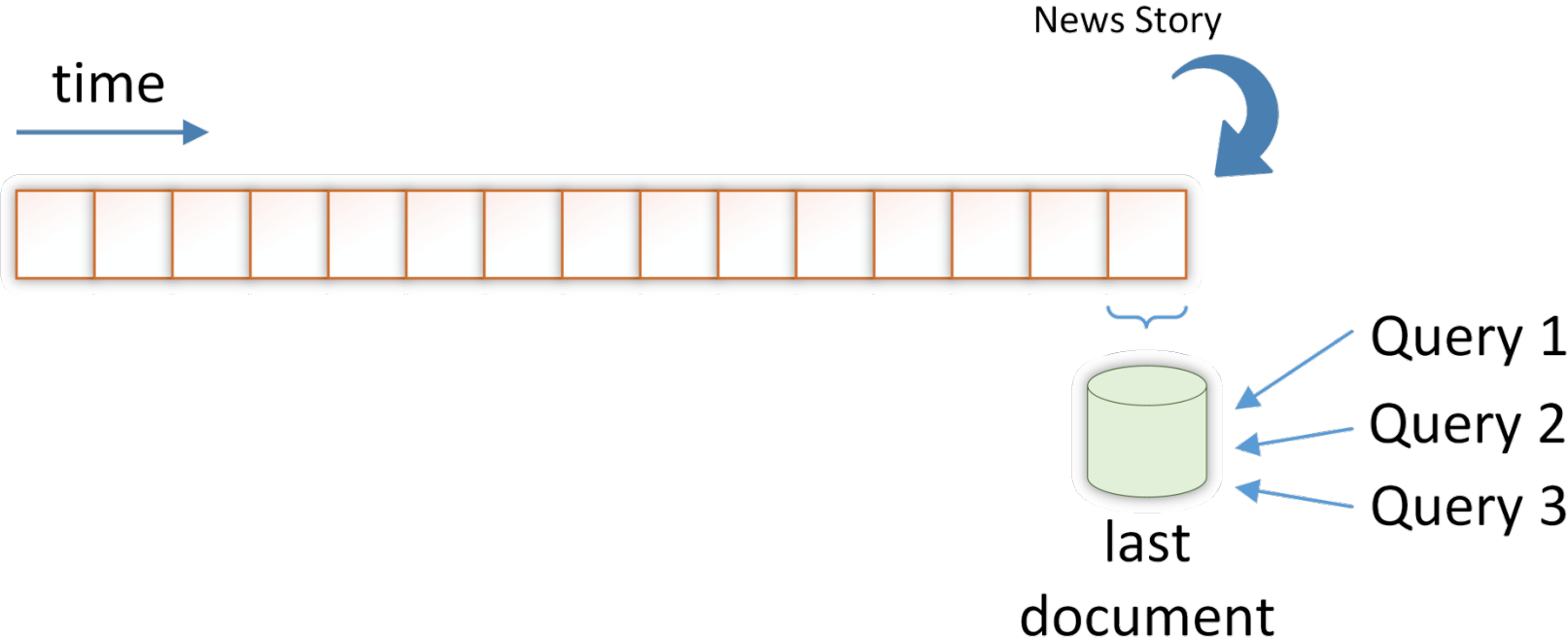
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Streaming Search



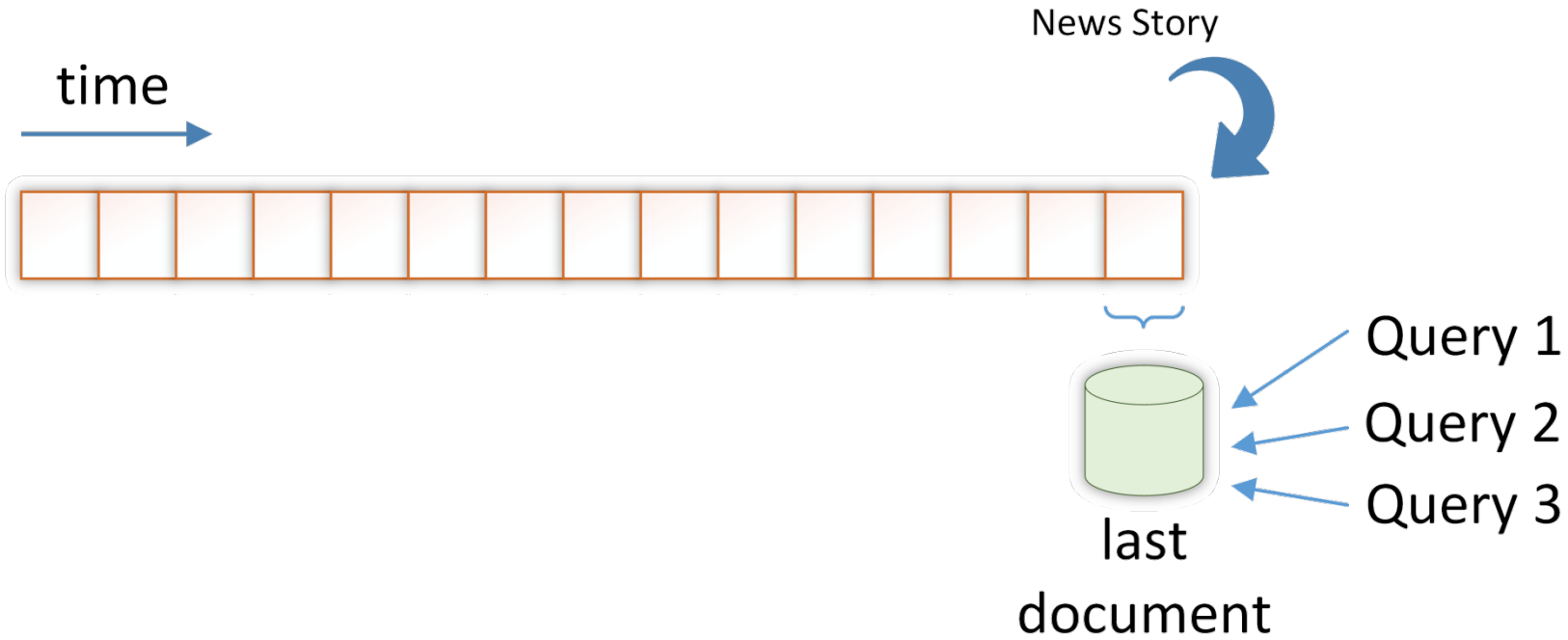
Streaming Search



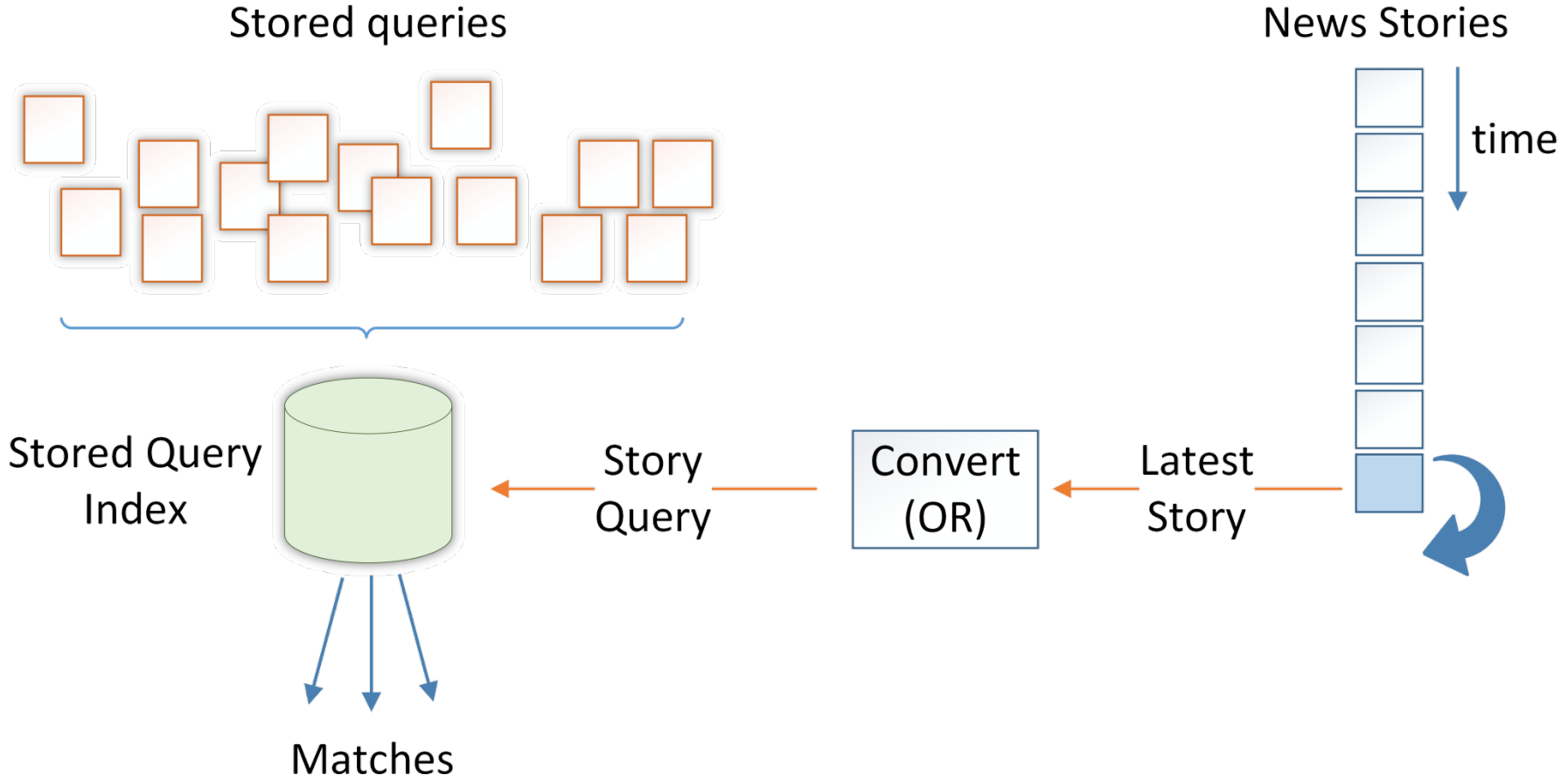
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(Not efficient) Streaming Search



Luwak









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Matching





Stored Queries


- Q1:  AND 
- Q2:  AND 
- Q3:  OR 

Incoming News Stories

“    ”

“  ”

“     ”



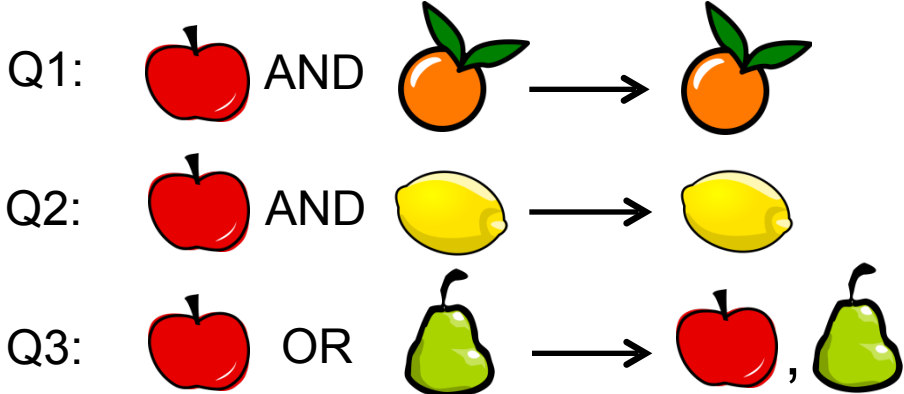
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Query Pre-Processing

Stored Queries



Term-frequency analysis

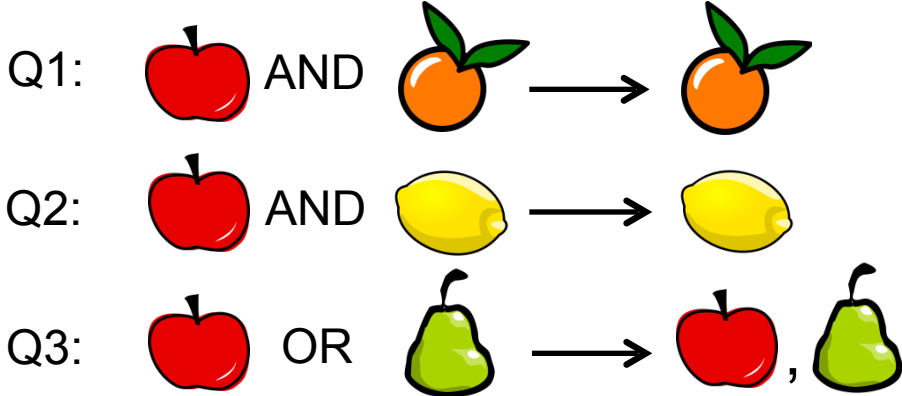
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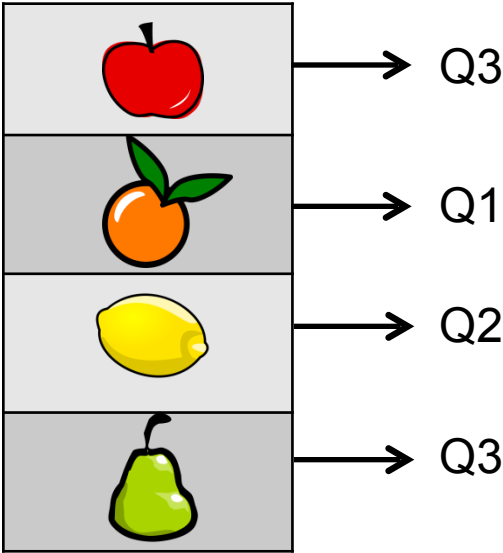


Query Pre-Processing

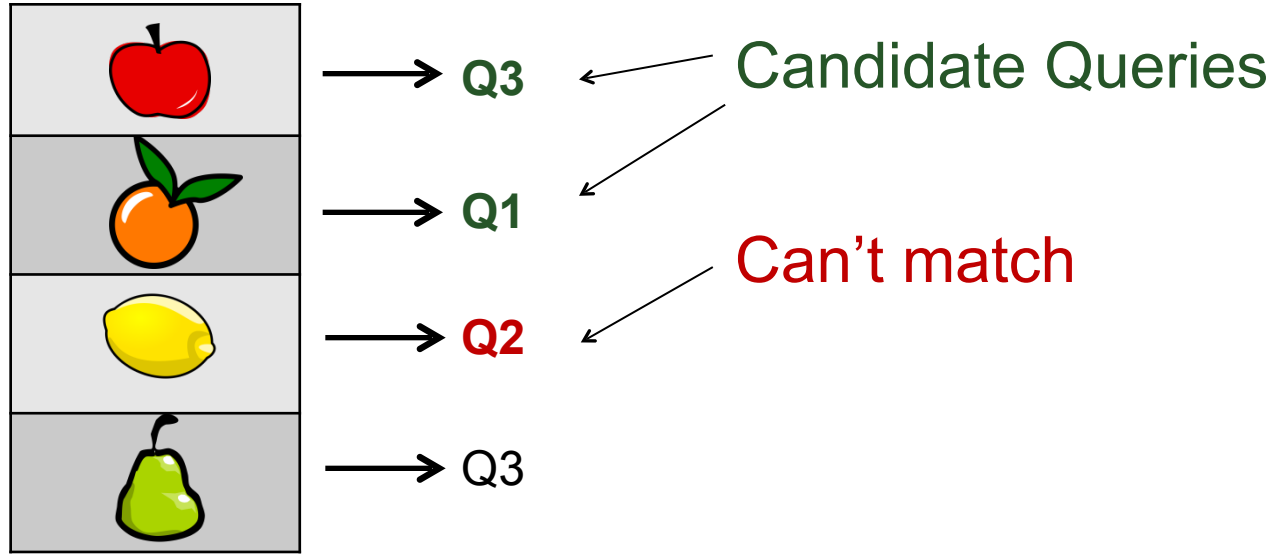
Stored Queries



Stored Query Index



Document Disjunction



Stored Query Index

Query Matching

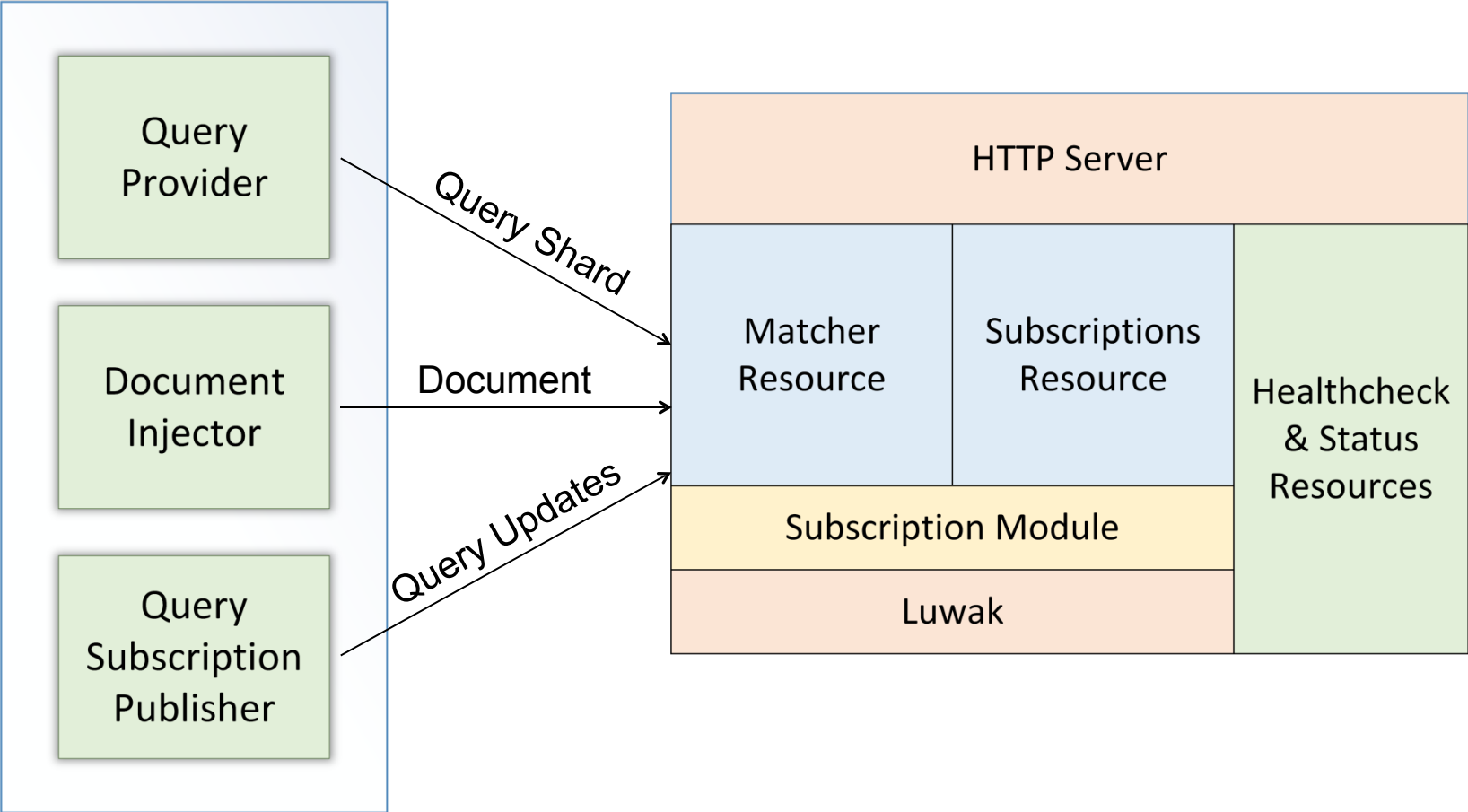
“  ” OR “  ” OR “  ”

Q1:  AND  ✓

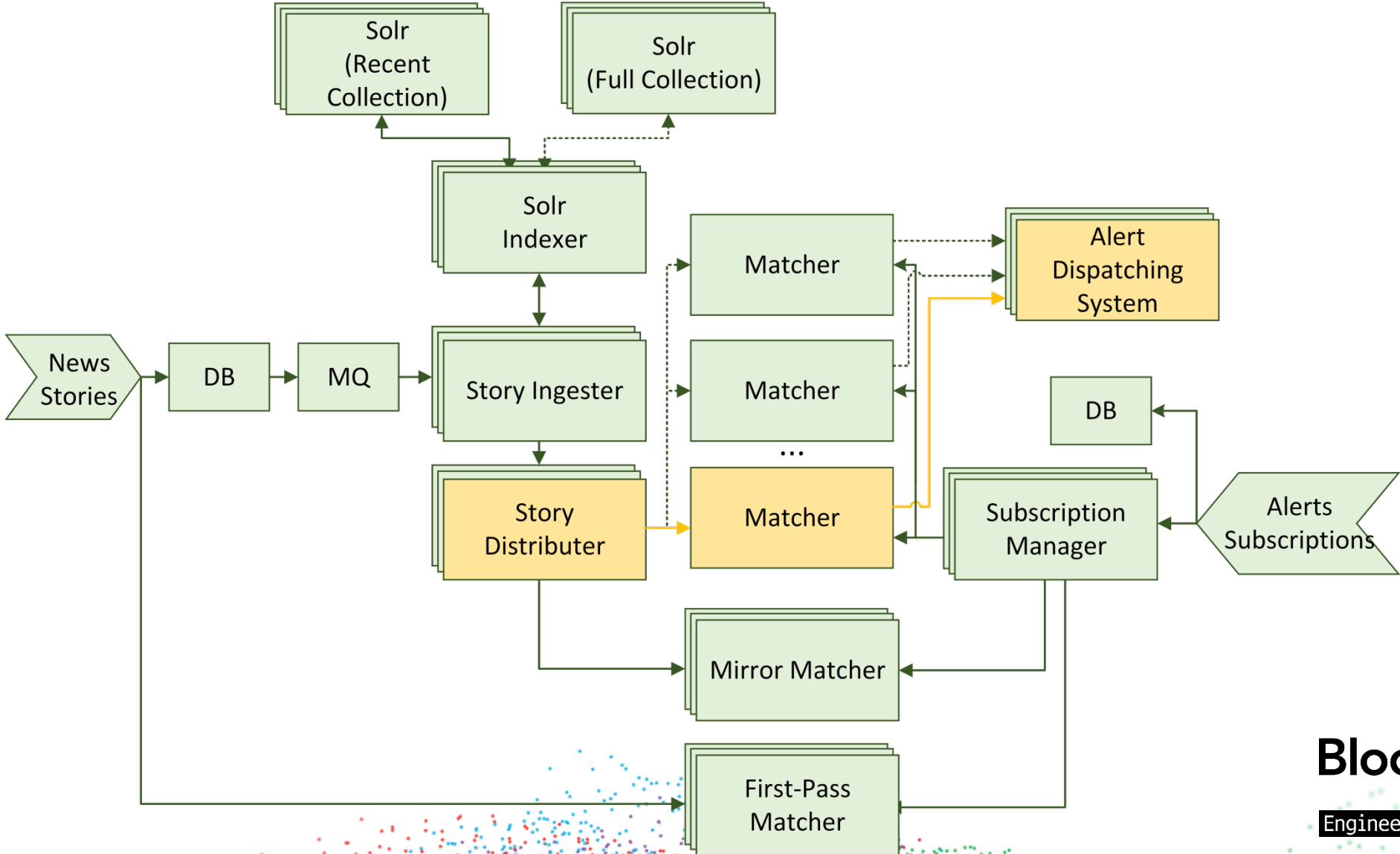
~~Q2:  AND ~~

Q3:  OR  ✓

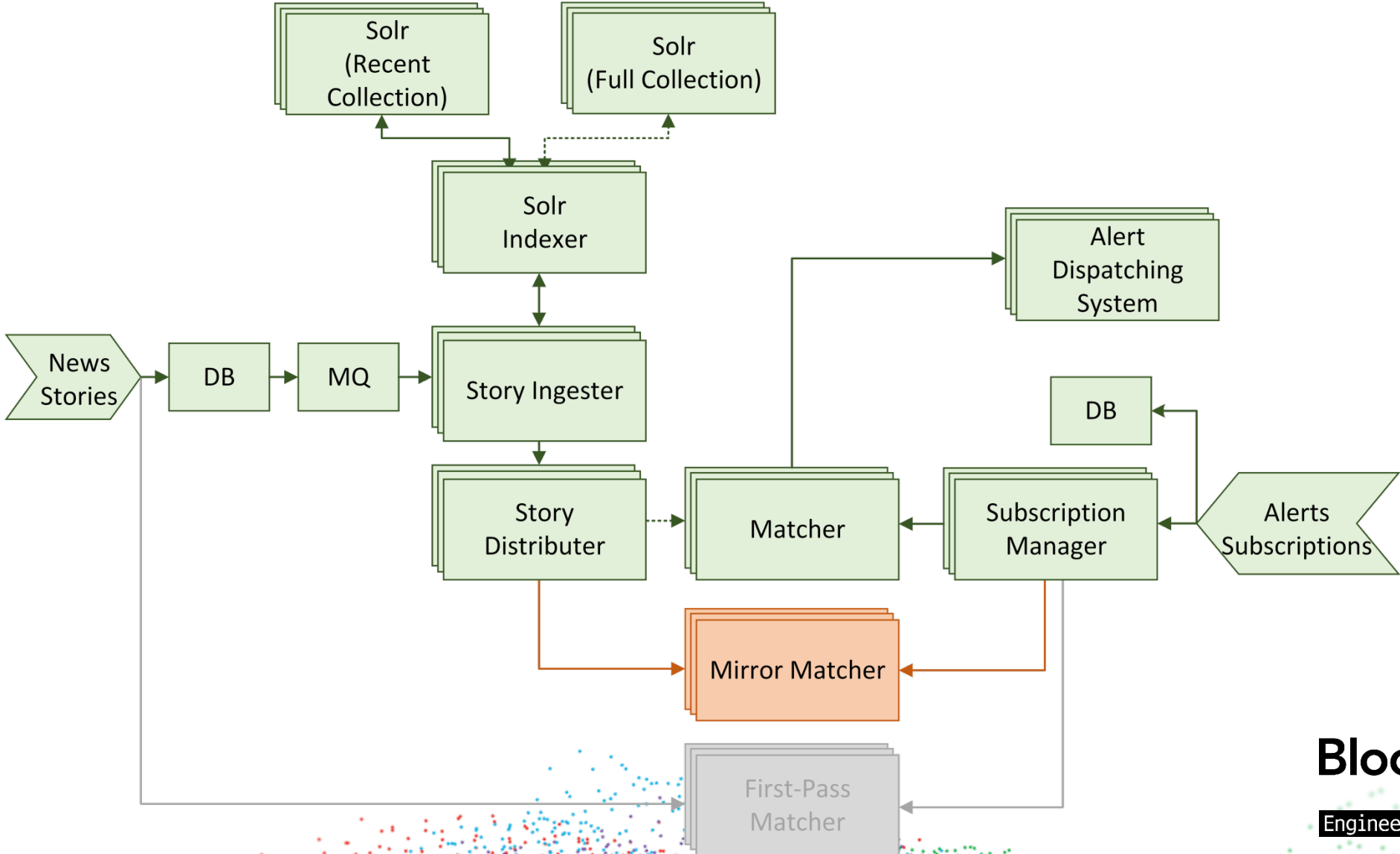
Matcher Application



Sharding



QC: Mirror System





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References

- **Real-time full-text search with Luwak and Samza** <http://www.flax.co.uk/blog/2015/08/26/real-time-full-text-search-with-luwak-and-samza/>
- **Turning search upside down: search for queries with documents** <https://berlinbuzzwords.de/14/session/turning-search-upside-down-search-queries-documents>

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Thank you

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