

Walmart eCommerce Search System Architecture: intro and evolution

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CNUTCon 2017

全球运维技术大会

上海·光大会展中心大酒店 | 2017.9.10-11

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10大职业技术领域课程

SPEAKER INTRODUCE

曹宁

WalmartLabs Engineering Manager

- Ning Cao is an engineering manager in search runtime team at WalmartLabs. Prior to that, he worked at Google, Huawei.
- Ning received his Ph.D. in Electrical and Computer Engineering at Worcester Polytechnic Institute. His publications have 4000+ citations.

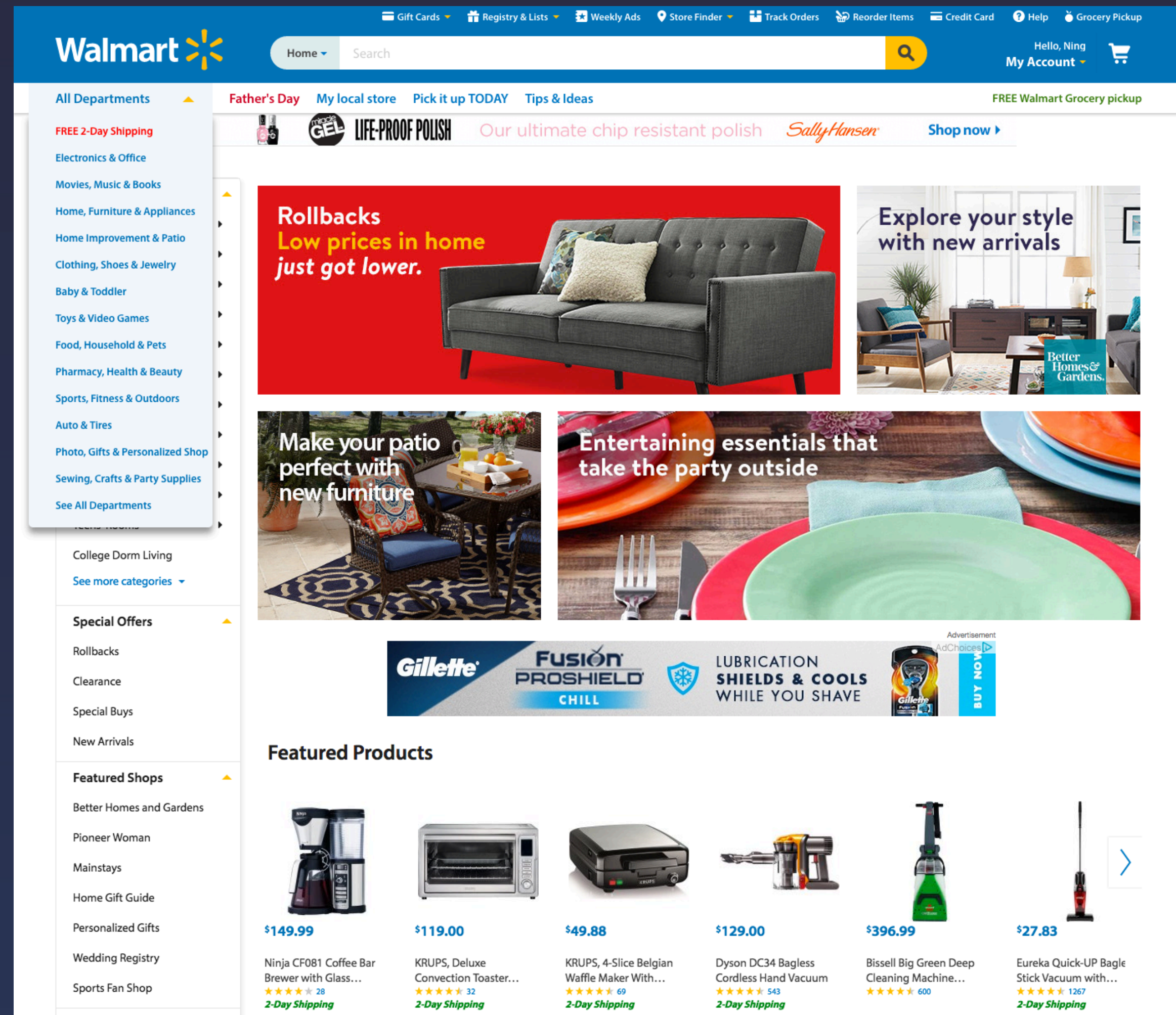
SPEAKER
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- Walmart eCommerce Search
- Search Architecture Evolution
- Experience & Lessons

Walmart eCommerce Search

- Search
- Browse
- Category Pages



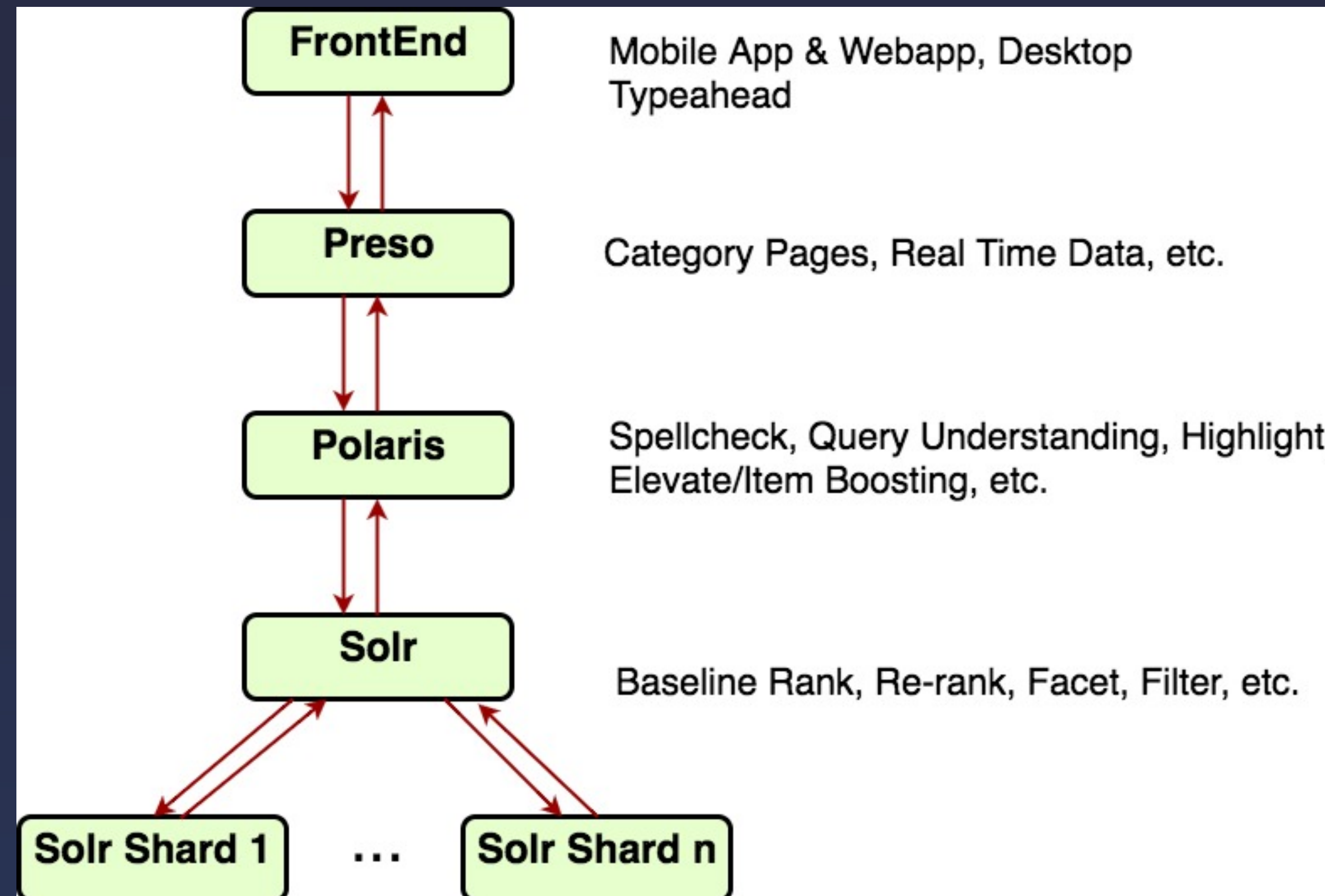
Walmart eCommerce Search

- Performance Challenges in Search Backend
 - Increasing index size
 - ~8x in past 3 years
- Real time update

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 - Metadata Store
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Search Runtime Architecture Overview



Search Runtime Architecture Overview

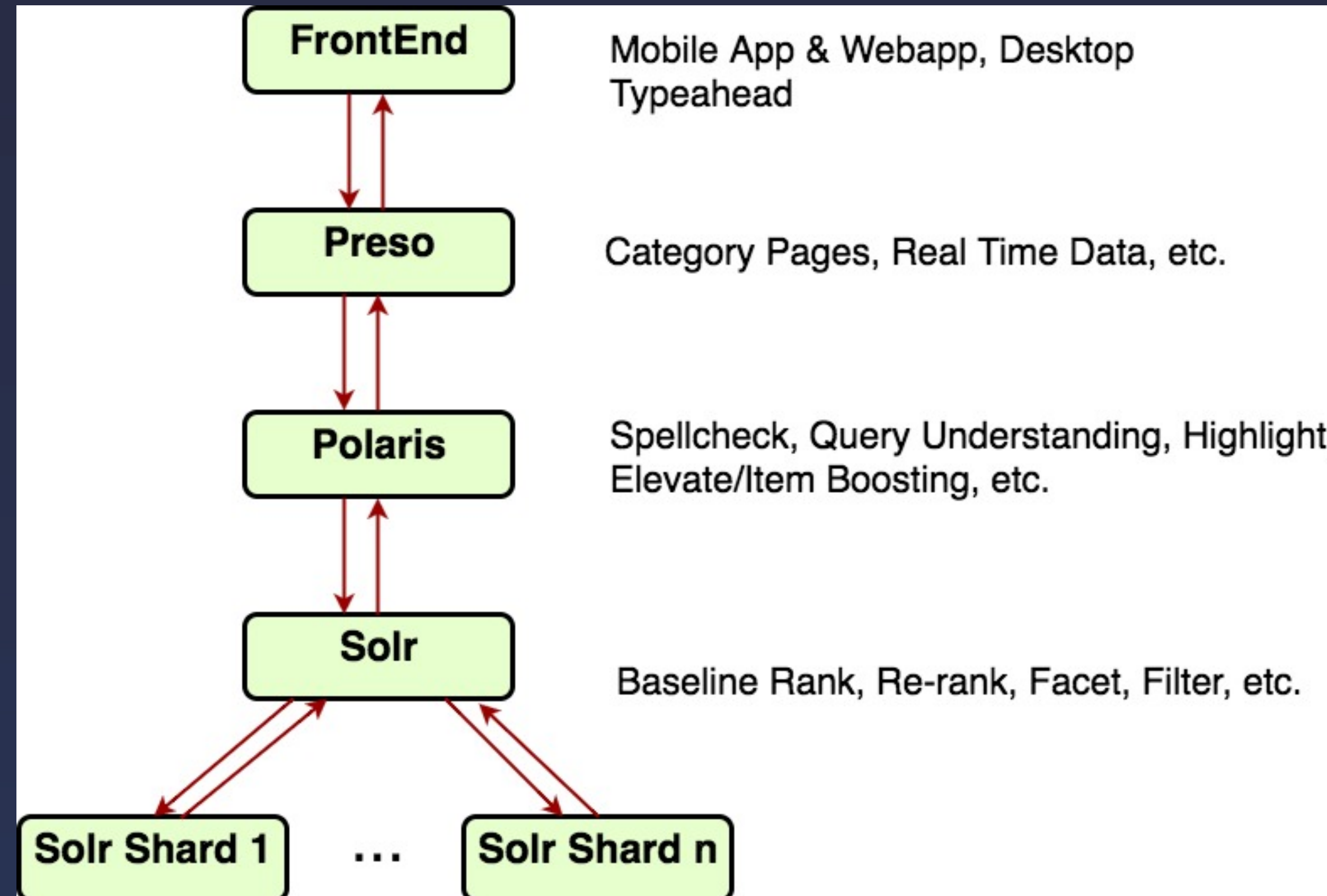
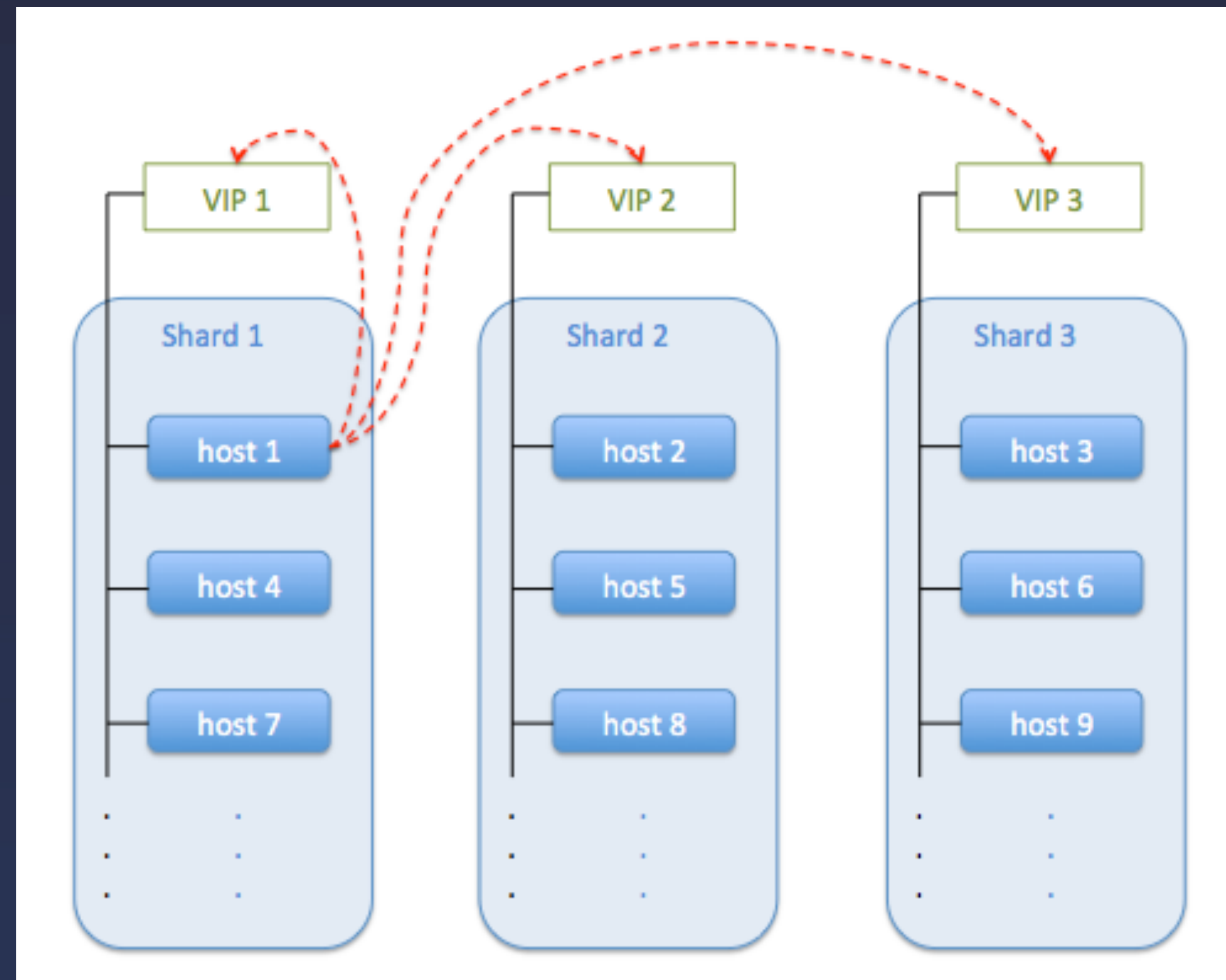


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Distributed Search

- Load-balanced Shard VIP



Distributed Search

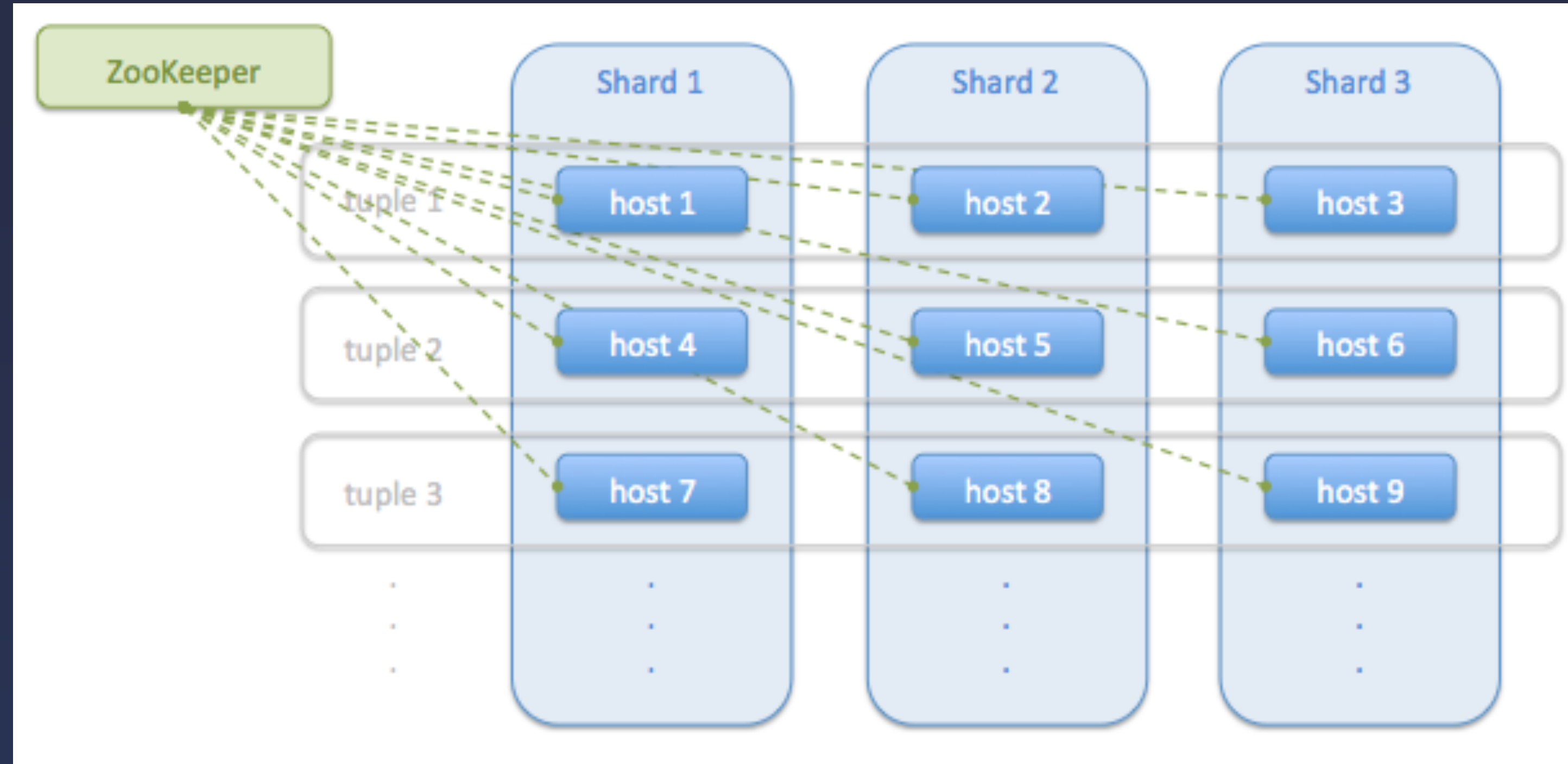
- Problems with Load-balanced Shard VIP
 - Performance bottleneck
 - Hard to troubleshoot
 - Unnecessary re-routing
 - Increasing open connections between VIP and Solr shard

Why Not SolrCloud

- Problems with SolrCloud
 - Unable to utilize offline SolrCloud for index update
 - Inefficient indexing: # of shards
 - Must build two sets of SolrCloud to index all shards at same time

Distributed Search Cloud

- Tuple-based Polaris Cloud



Distributed Search Cloud

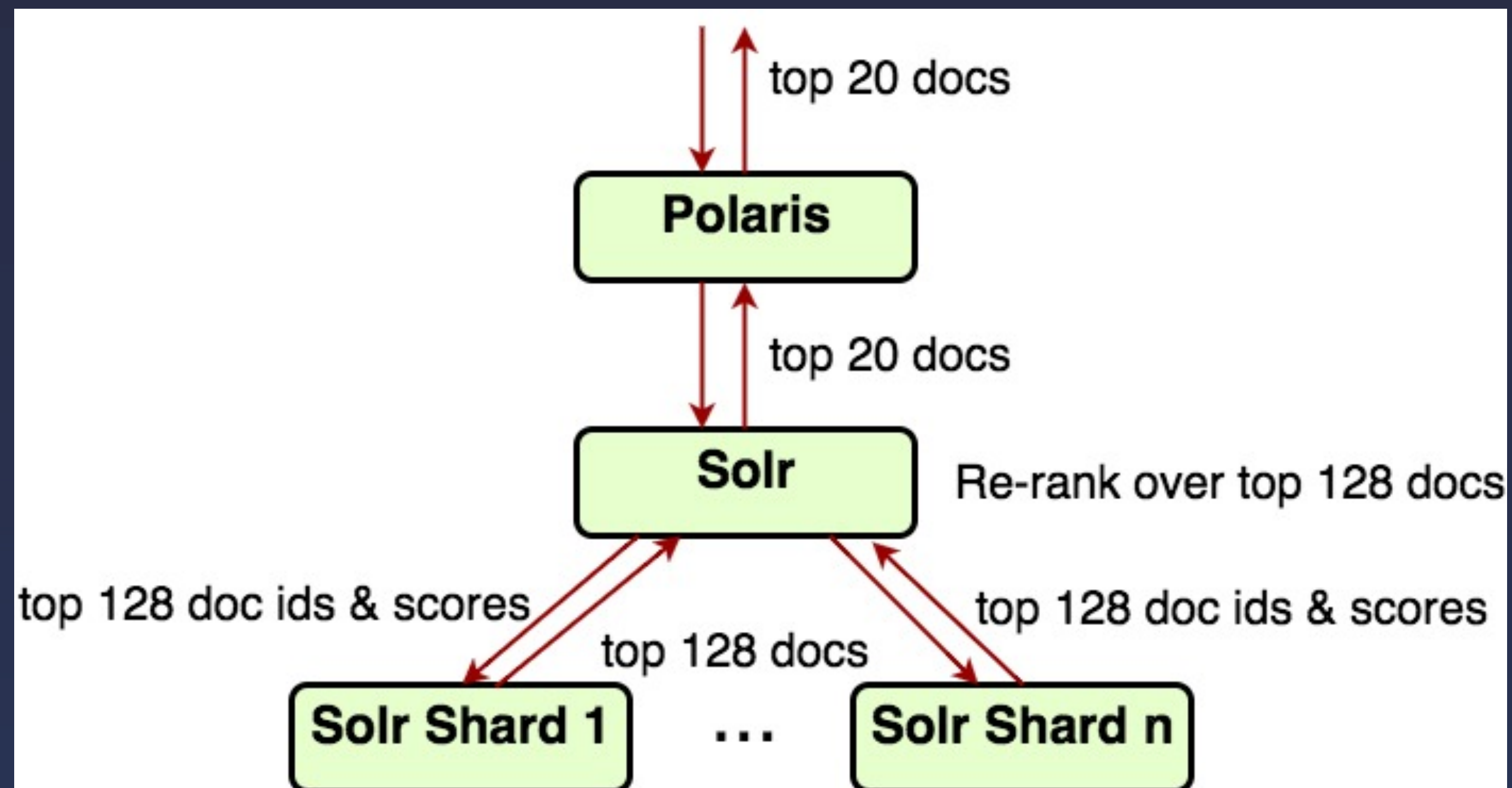
- Tuple-based Polaris Cloud
 - Fallback
 - Last-known-state use
 - Cached sharding data from ZooKeeper
 - Sharding data from live update

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Re-rank Migration

- Re-rank plugin in Solr

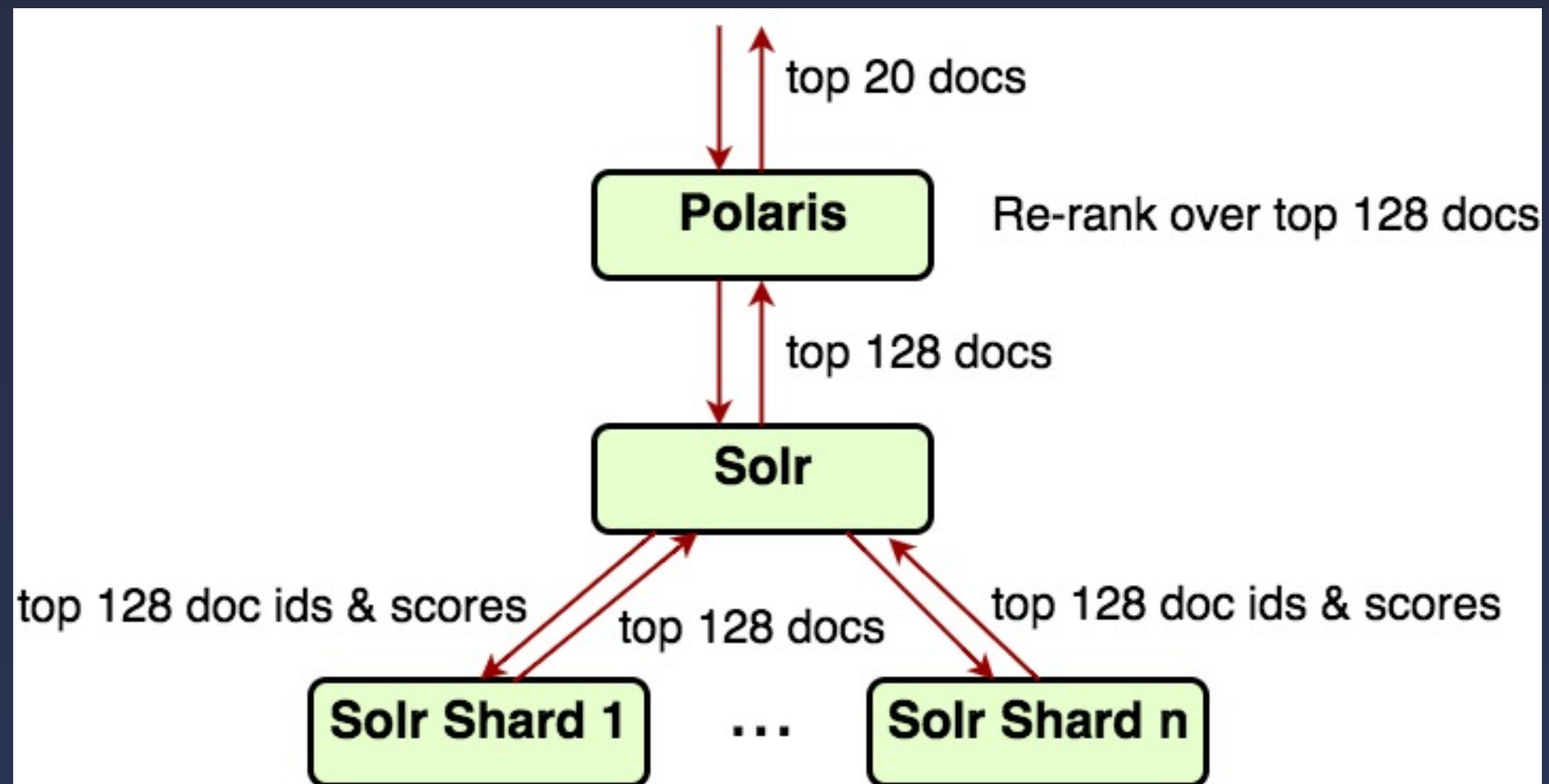


Re-rank Migration

- Re-rank plugin in Solr
 - Implemented before Solr Re-rank
 - Need code change during Solr update
 - Unable to evaluate/migrate to other search engines

Re-rank Migration

- Re-rank in Polaris



Re-rank Migration

- Re-rank plugin in Polaris
 - Pros:
 - Solr update
 - Search engine migration
 - Cons:
 - Network overload between Polaris and Solr
 - Serialization & Deserialization

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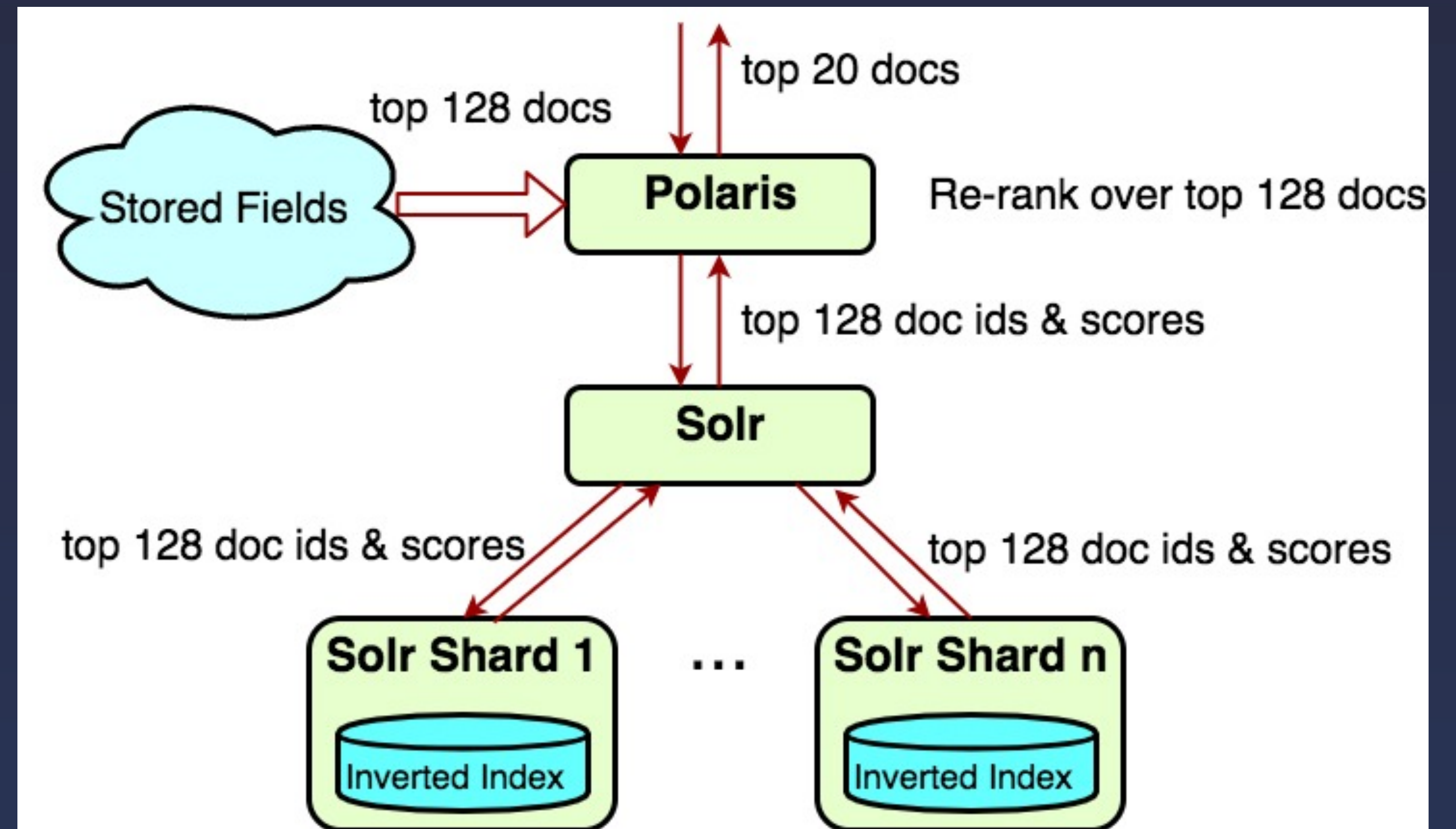
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Metadata Store

- Backend challenges caused by large Solr index
 - Search performance
 - Full index generation time
 - Index replication overhead
 - Real time update throughput

Metadata Store

- How to reduce Solr index size?
- Move stored fields out of Solr

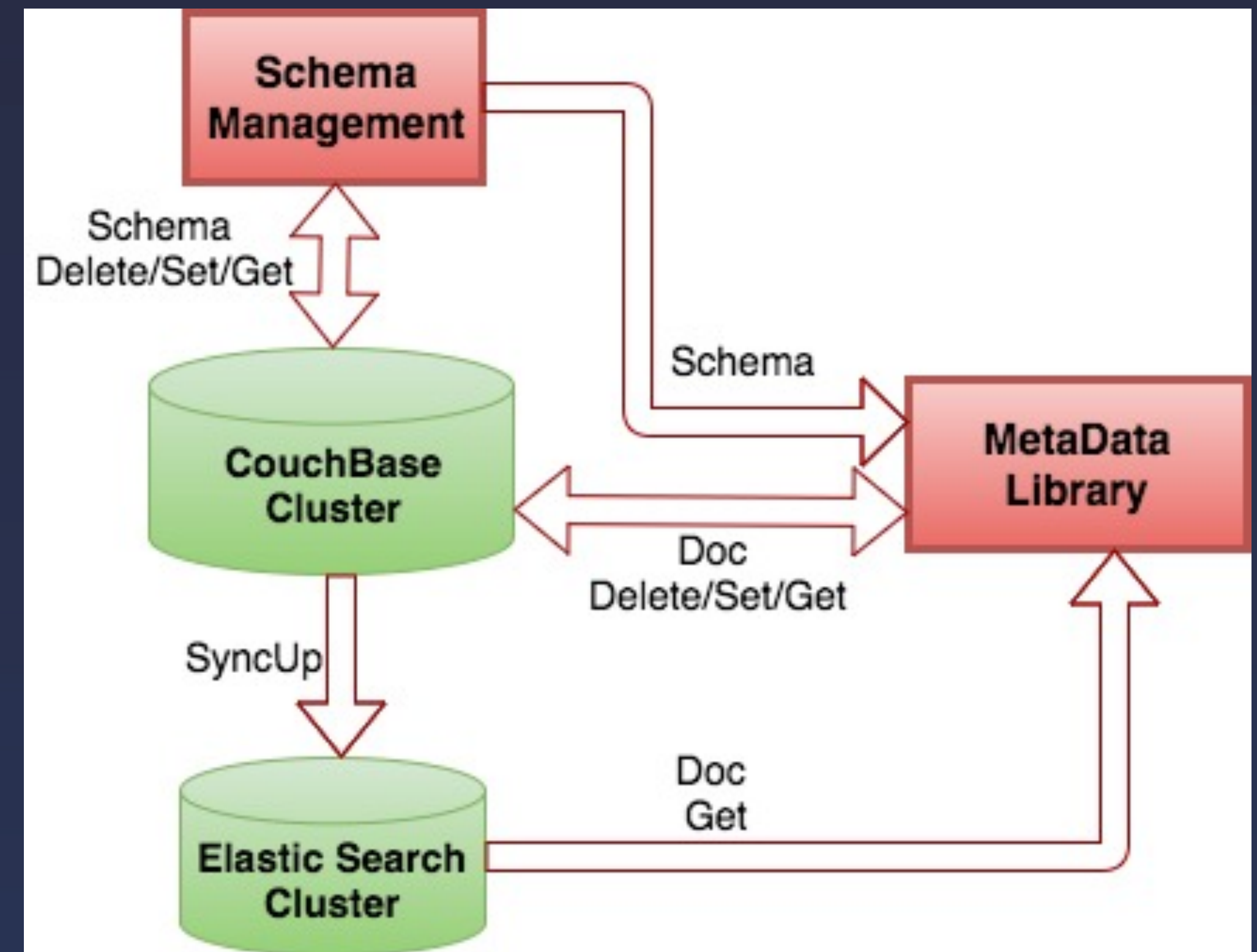


Metadata Store

- Design Goal: store fields for re-rank and response
- Scalability: easy to scale
- Performance: fast data retrieval, high read and write throughput
- Functionality: support structured queries

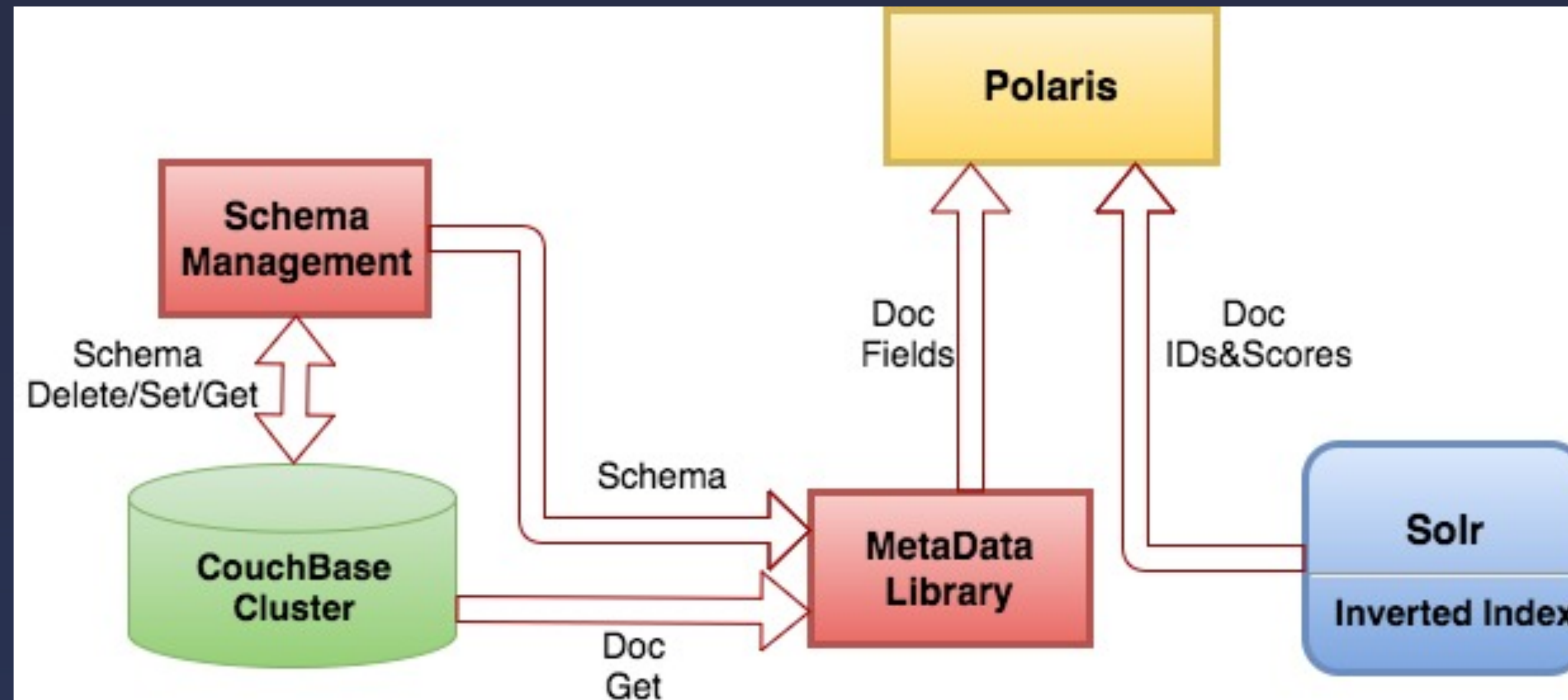
Metadata Store

- Metadata Store Design
 - Primary data store: Couchbase
 - Secondary data store: Elastic Search
 - Data format: Avro



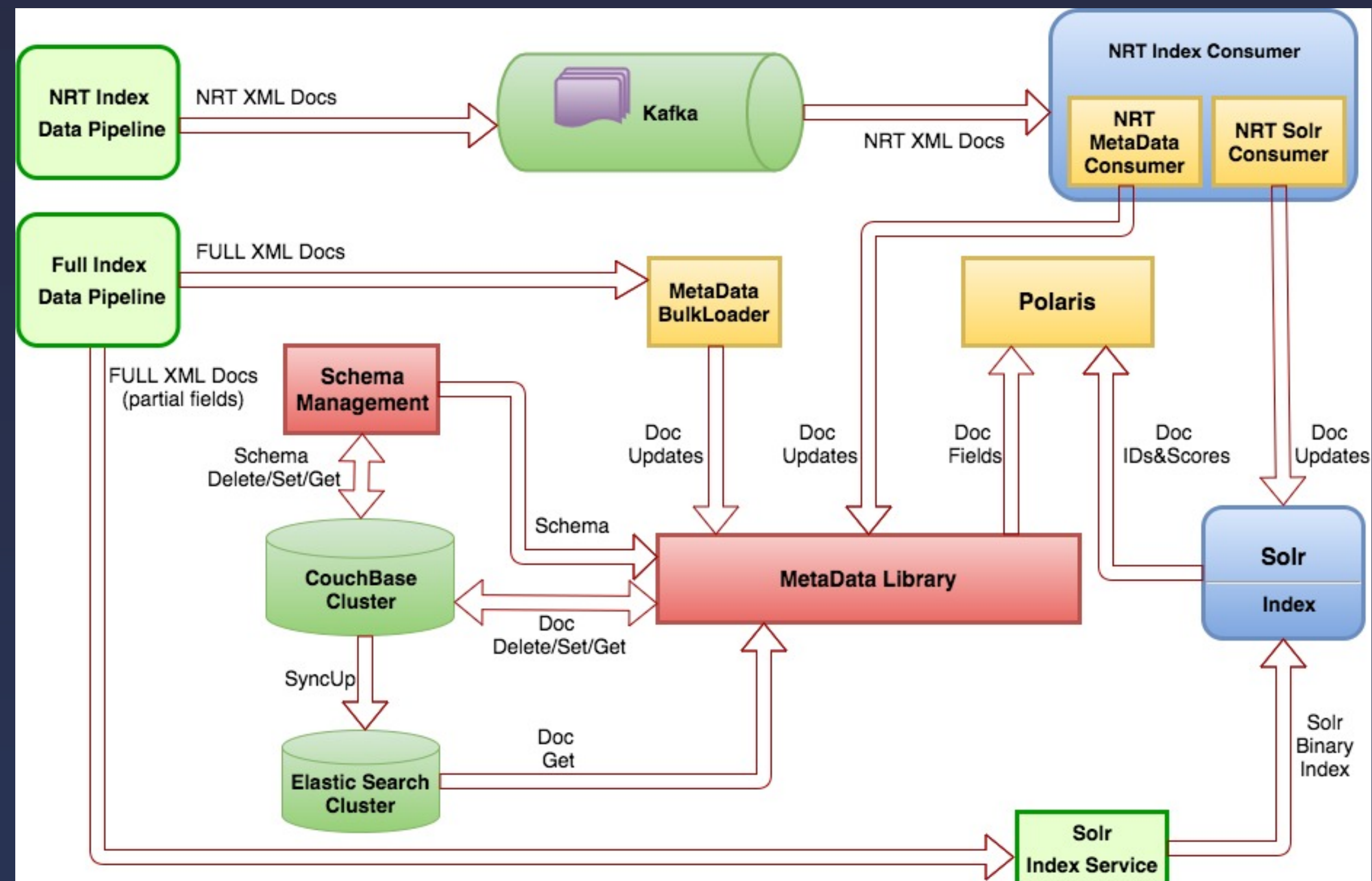
Metadata Store

- Search with metadata store



Metadata Store

- Update with metadata service



Metadata Store

- Gains:
 - Search latency: 10%
 - Index size: 25%
 - Real time update
 - Larger re-rank size

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Experience & Lessons

- How to utilize open source software
 - Adopt
 - Customize
 - Replace/Self-dev

Experience & Lessons

- Microservices
 - Different tech stacks
 - Operation overhead, Performance tuning
- Microservices framework
 - Rate control, perf monitor, config management, authentication, logging, etc.

THANKS

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