Building a Real-Time Data Pipeline: Apache Kafka at Linkedin

Hadoop Summit 2013

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June 2013

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Network update stream

We have a lot of data.

We want to leverage this data to build products.

Data pipeline

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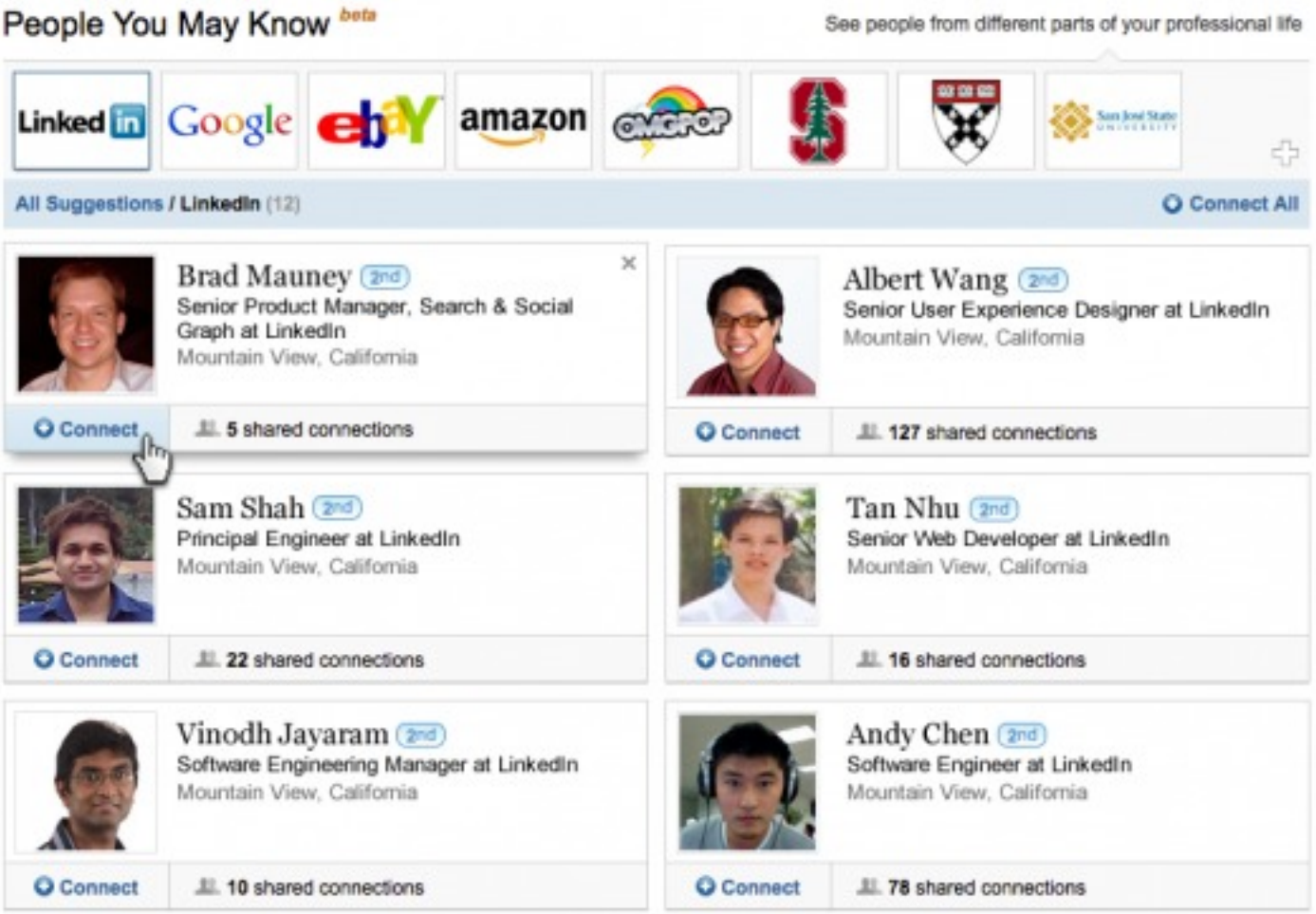
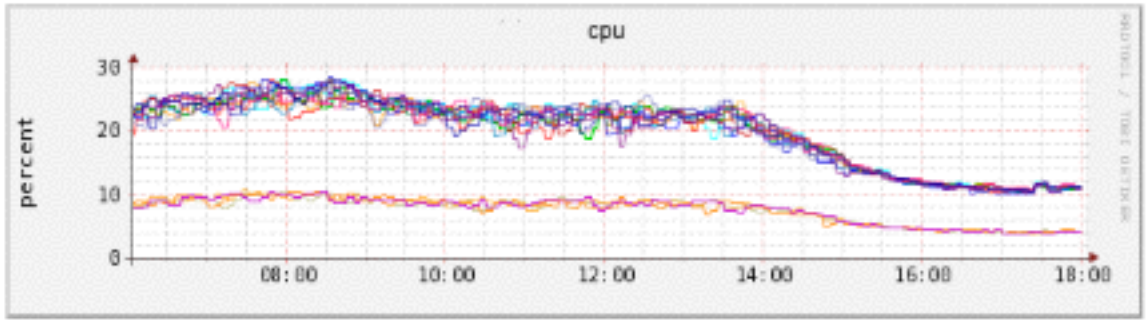
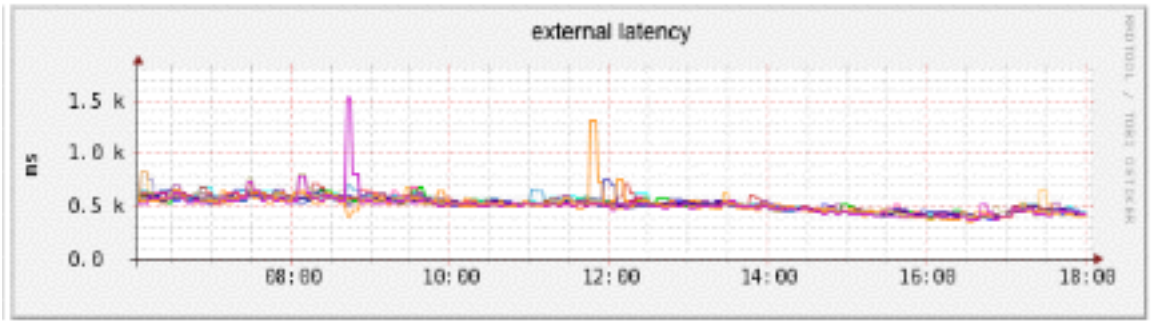
People you may know



System and application metrics/logging





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How do we integrate this variety of data and make it available to all these systems?

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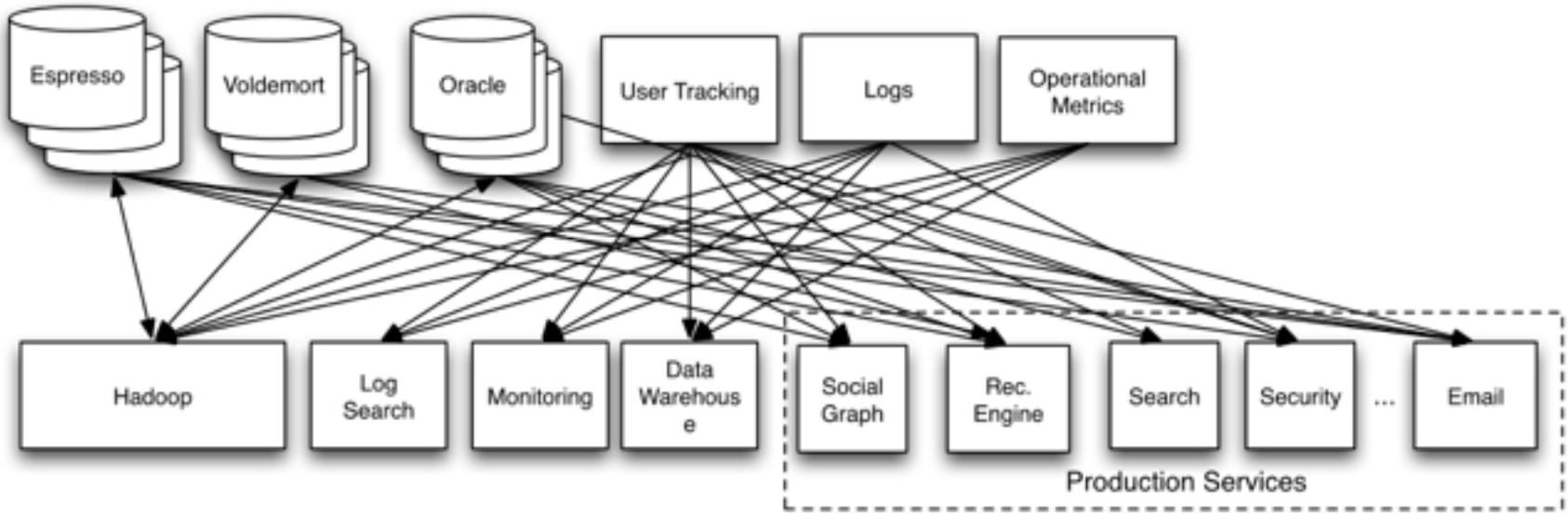
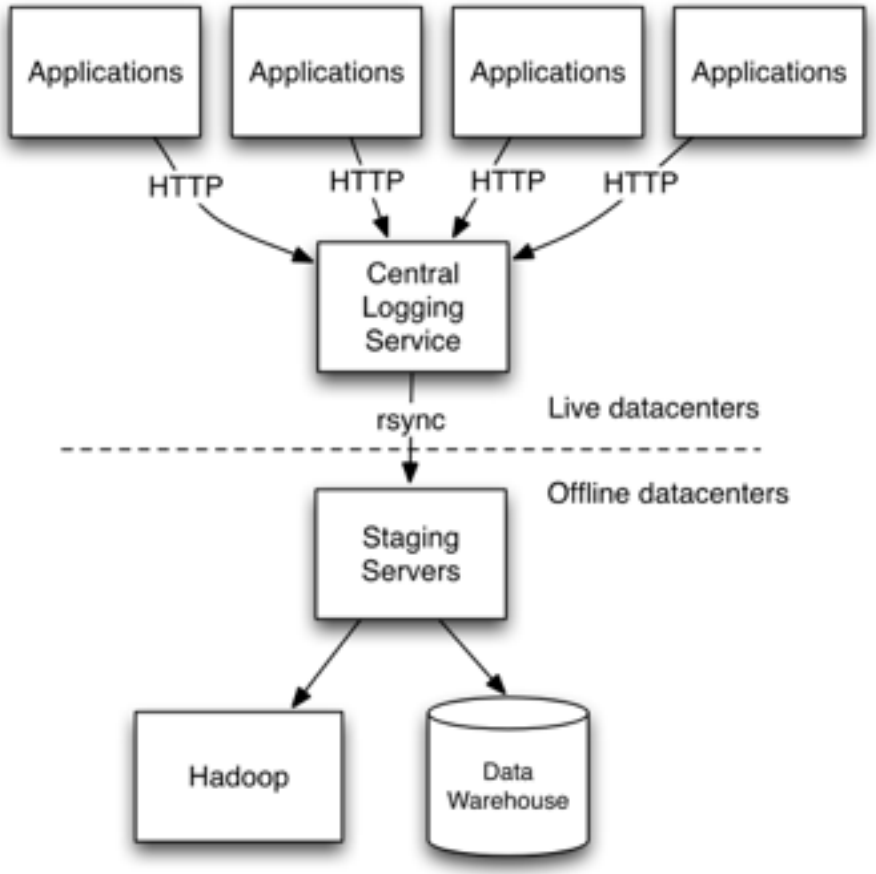
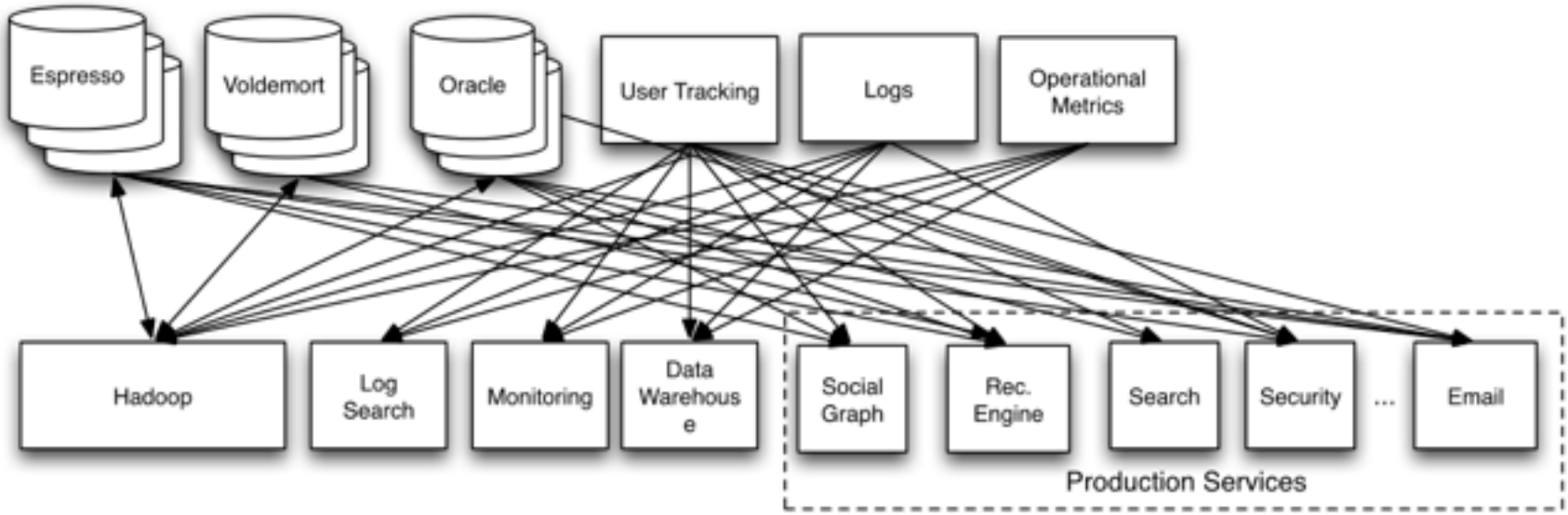
Point-to-point pipelines



LinkedIn's user activity data pipeline (circa 2010)



Point-to-point pipelines



Four key ideas

1. Central data pipeline
2. Push data cleanliness upstream
3. O(1) ETL
4. Evidence-based correctness

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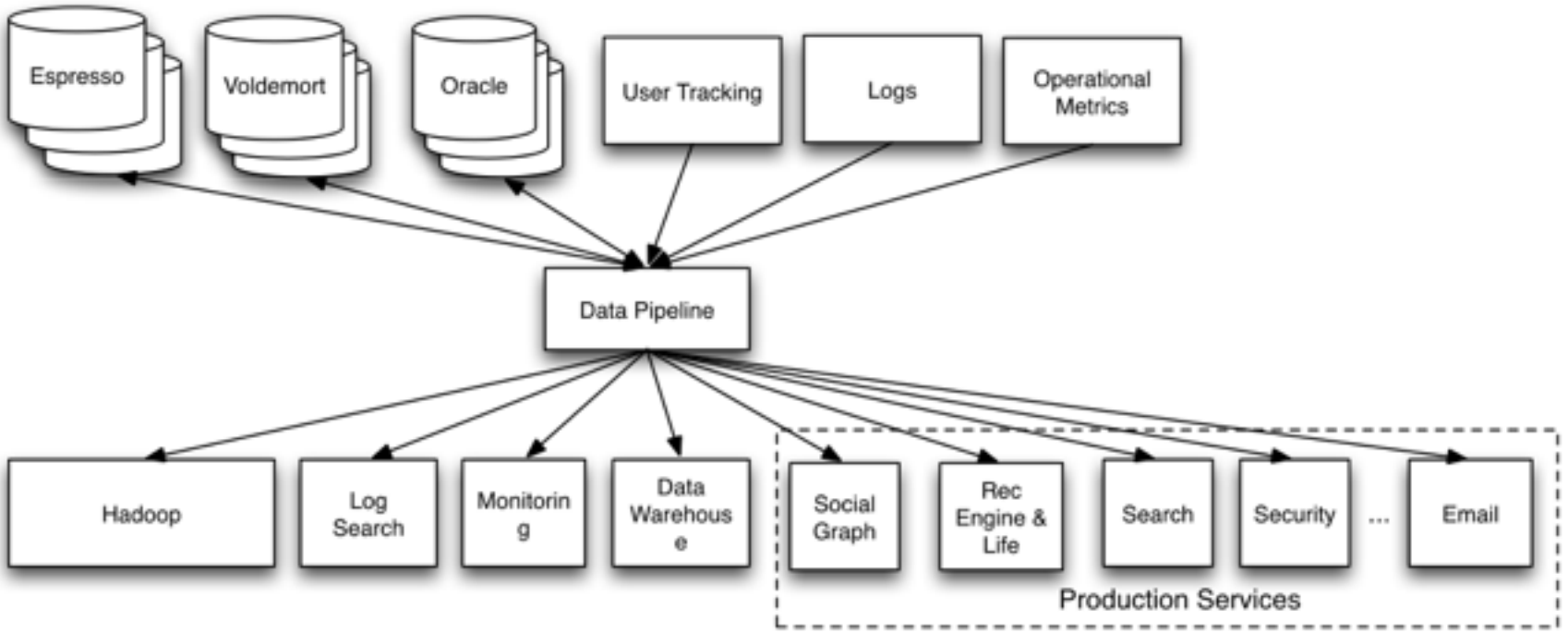
Central data pipeline



First attempt: don’t re-invent the wheel

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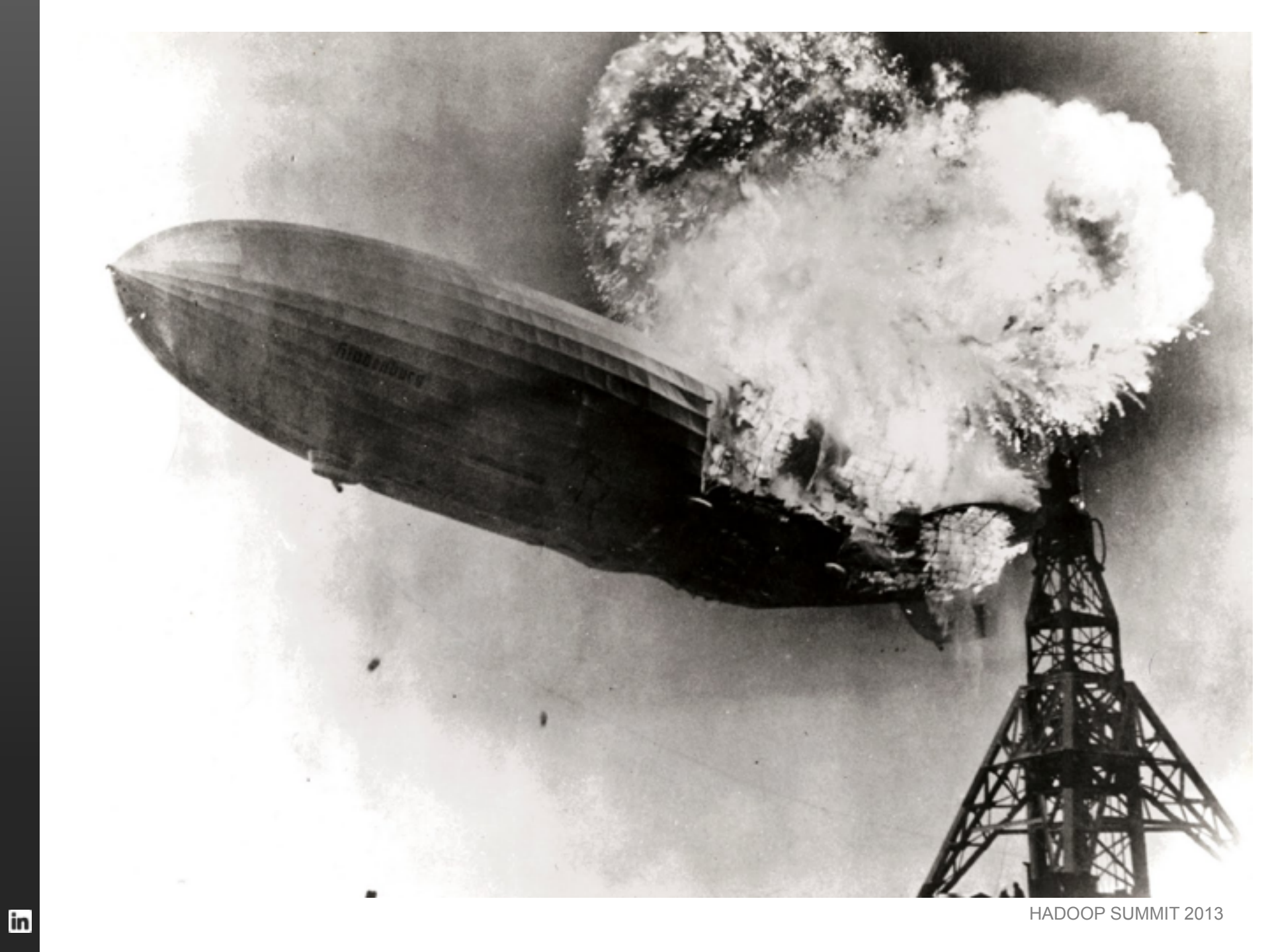

Second attempt: re-invent the wheel!

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Use a central commit log

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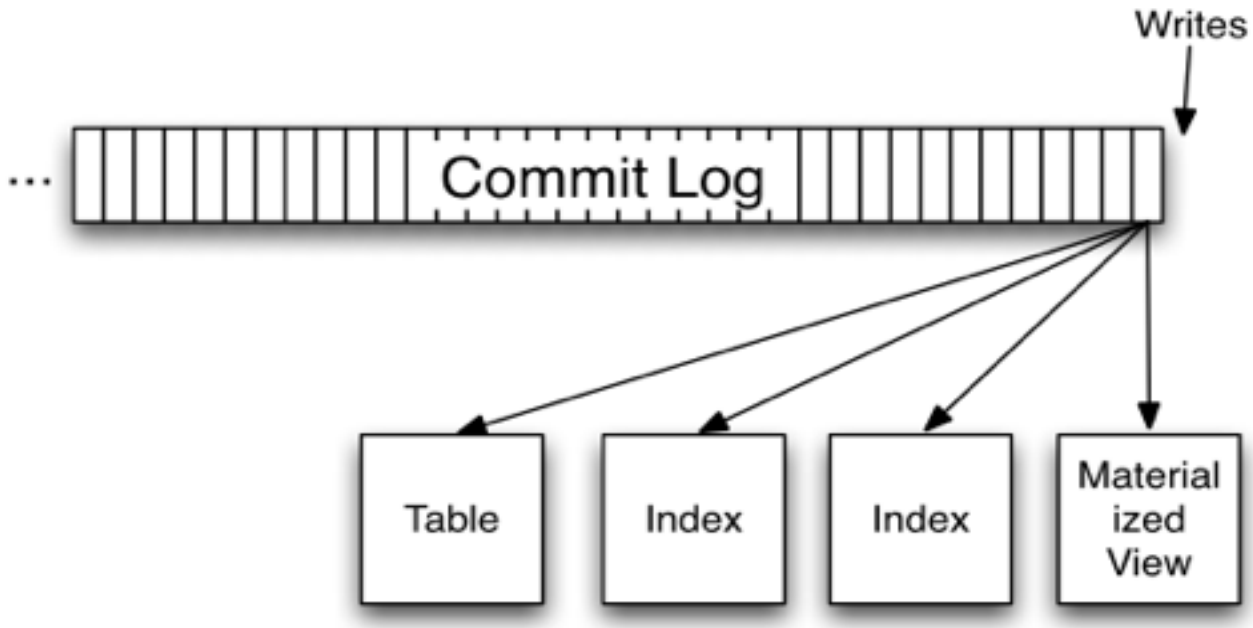
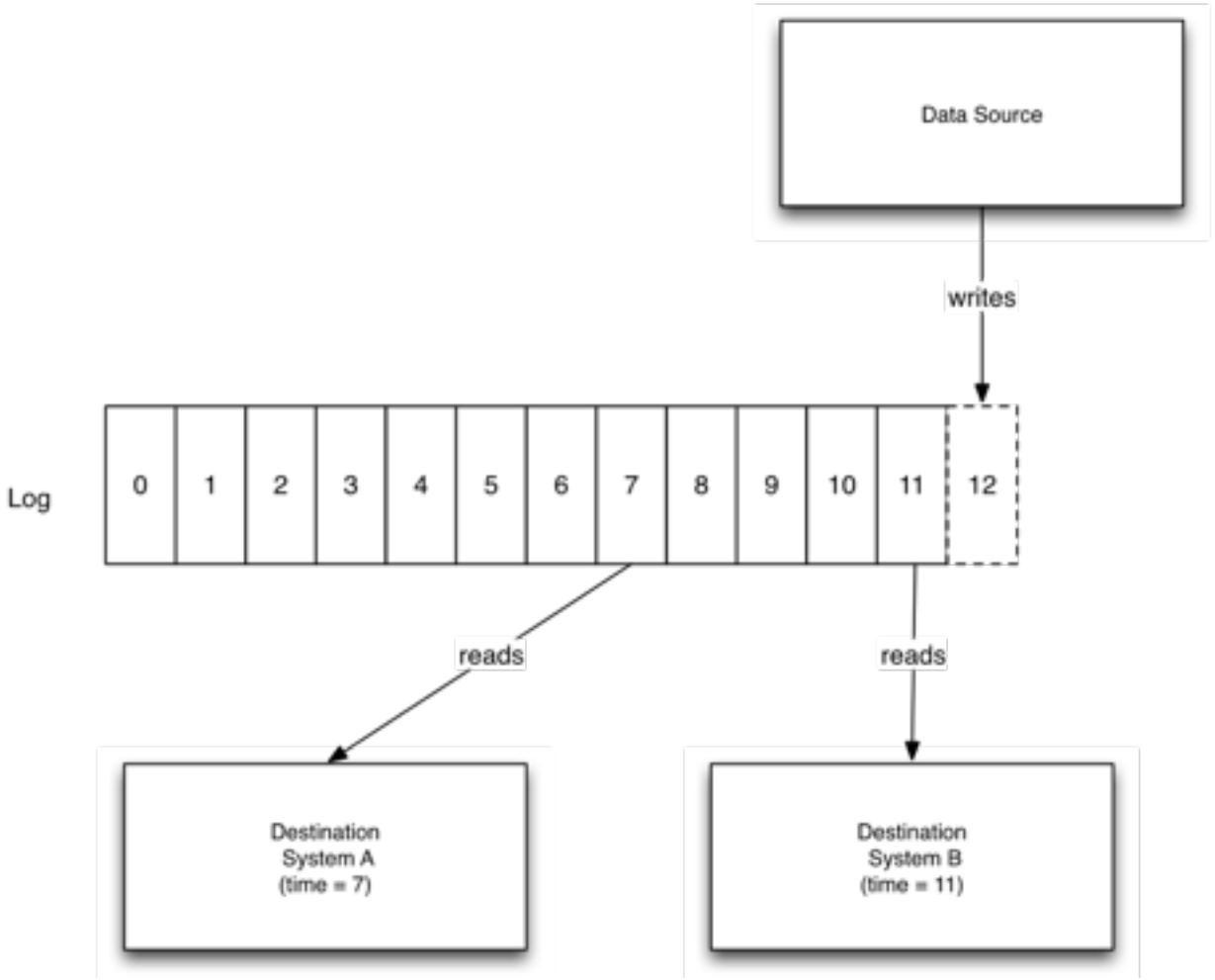
What is a commit log?



The log as a messaging system



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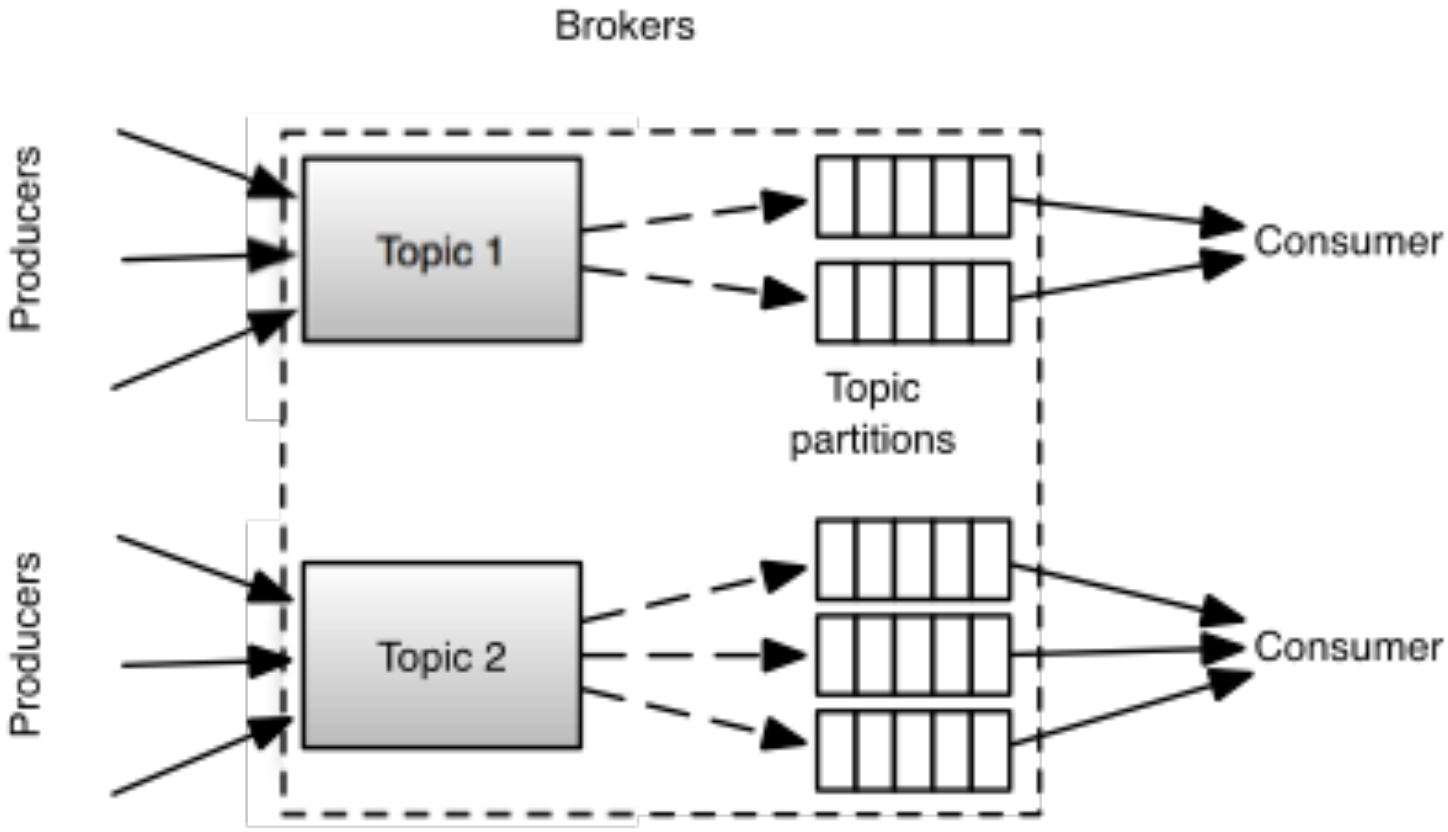
Apache Kafka



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Usage at LinkedIn

- 16 brokers in each cluster
- 28 billion messages/day
- Peak rates
  - Writes: 460,000 messages/second
  - Reads: 2,300,000 messages/second
- ~ 700 topics
- 40-50 live services consuming user-activity data
- Many ad hoc consumers
- Every production service is a producer (for metrics)
- 10k connections/colo

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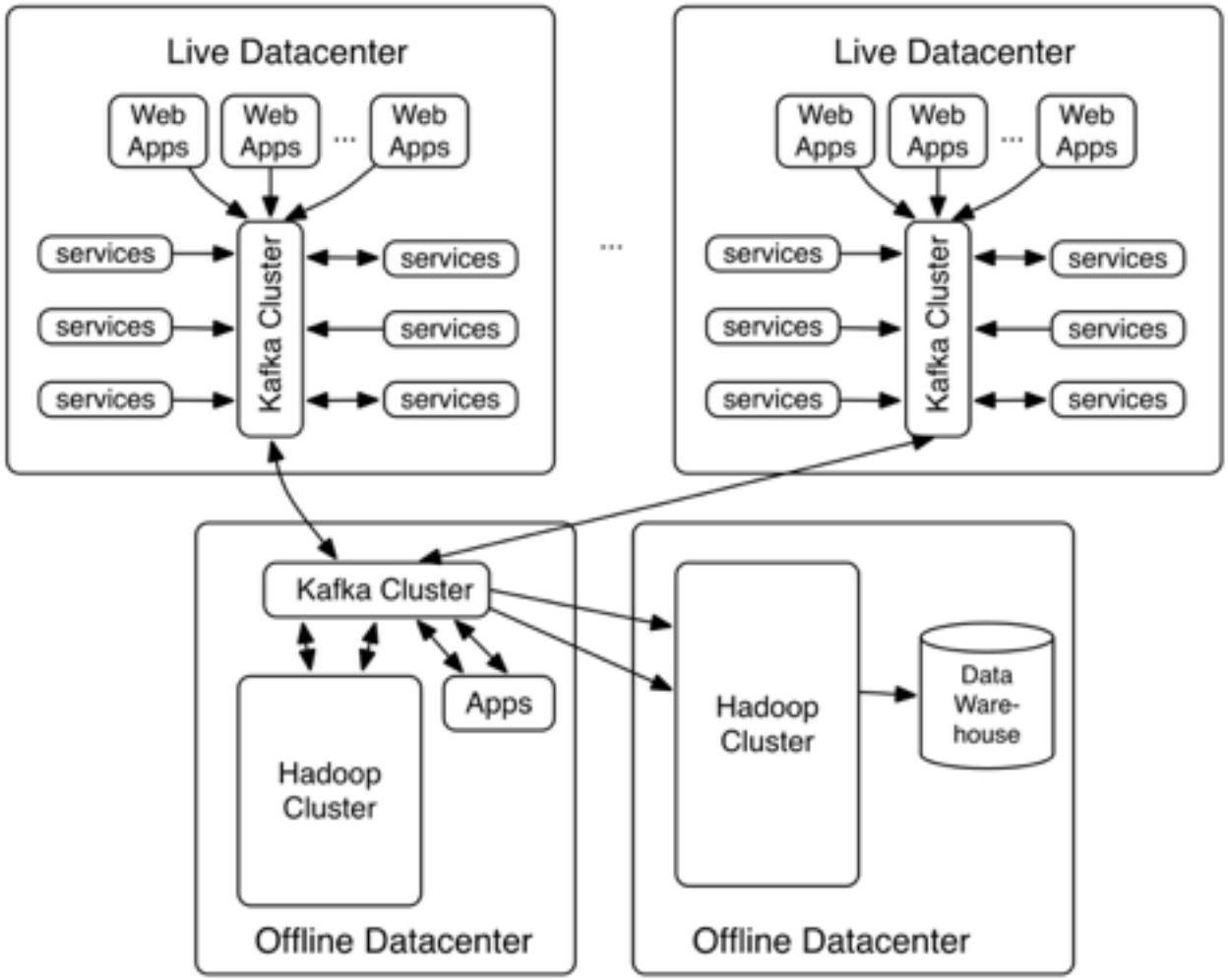
Usage at LinkedIn



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Four key ideas

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Standardize on Avro in data pipeline

```
{
  "type": "record",
  "name": "URIValidationRequestEvent",
  "namespace": "com.linkedin.event.usv",
  "fields": [
    {
      "name": "header",
      "type": {
        "type": "record",
        "name": ”TrackingEventHeader",
        "namespace": "com.linkedin.event",
        "fields": [
          {
            "name": "memberId",
            "type": "int",
            "doc": "The member id of the user initiating the action"
          },
          {
            "name": ”timeMs",
            "type": "long",
            "doc": "The time of the event"
          },
          {
            "name": ”host",
            "type": "string",
            ...
...
```

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Four key ideas

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Hadoop data load (Camus)

- Open sourced:
  - https://github.com/linkedin/camus
- One job loads all events
- ~10 minute ETA on average from producer to HDFS
- Hive registration done automatically
- Schema evolution handled transparently

Four key ideas

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Does it work?

"All published messages must be delivered to all consumers (quickly)"

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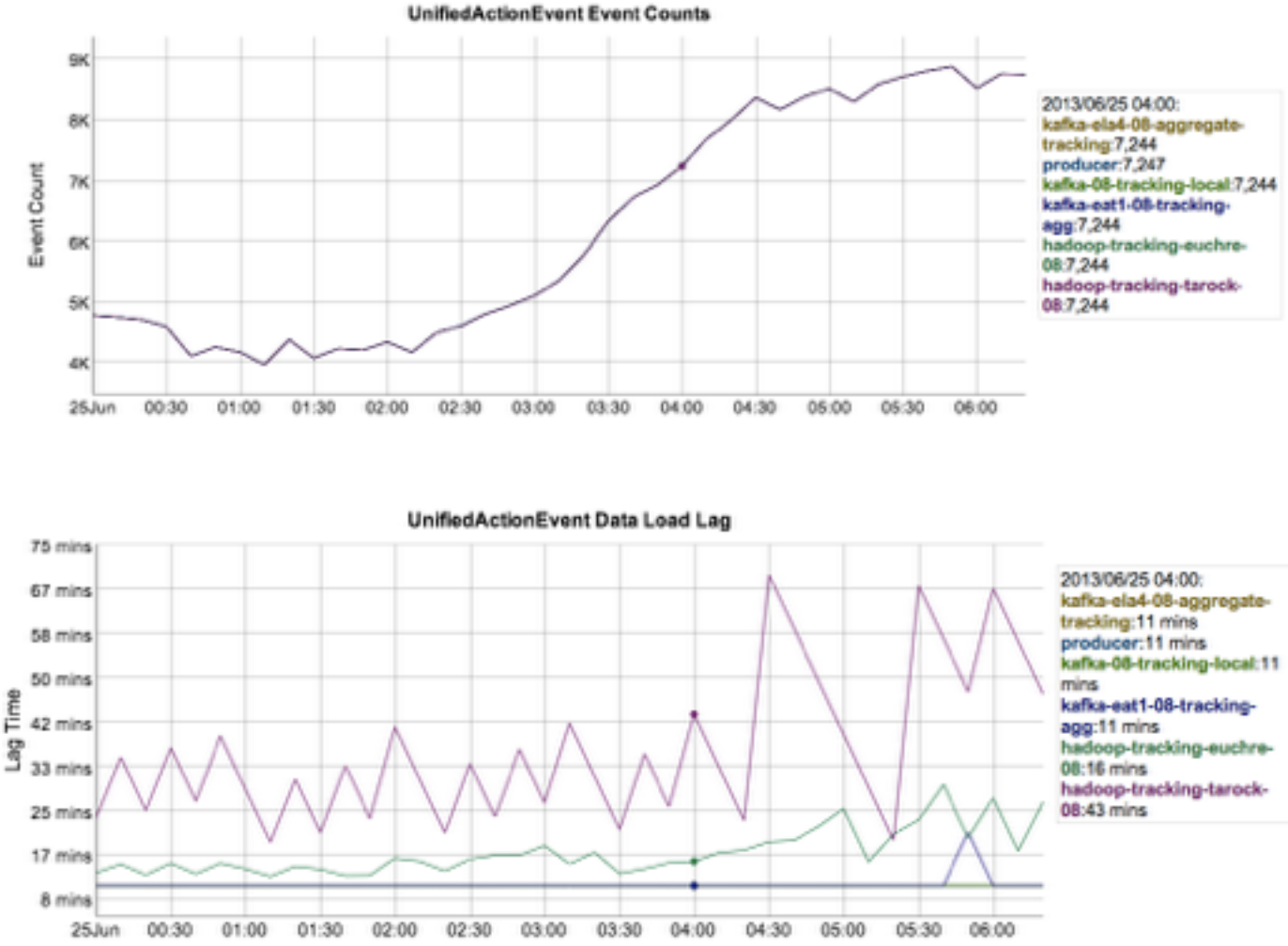
Audit Trail


UnifiedActionEvent Event Counts
Event Count
9K
8K
7K
6K
5K
4K
25Jun
00:30
01:00
01:30
02:00
02:30
03:00
03:30
04:00
04:30
05:00
05:30
06:00
2013/06/25 04:00:
kafka-ela4-08-aggregate-tracking:7,244
producer:7,247
kafka-08-tracking-local:7,244
kafka-eat1-08-tracking-agg:7,244
hadoop-tracking-euchre-08:7,244
hadoop-tracking-tarock-08:7,244
UnifiedActionEvent Data Load Lag
Lag Time
75 mins
67 mins
58 mins
50 mins
42 mins
33 mins
25 mins
17 mins
8 mins
25Jun
00:30
01:00
01:30
02:00
02:30
03:00
03:30
04:00
04:30
05:00
05:30
06:00
2013/06/25 04:00:
kafka-ela4-08-aggregate-tracking:11 mins
producer:11 mins
kafka-08-tracking-local:11 mins
kafka-eat1-08-tracking-agg:11 mins
hadoop-tracking-euchre-08:16 mins
hadoop-tracking-tarock-08:43 mins

Kafka replication (0.8)

- Intra-cluster replication feature
  - Facilitates high availability and durability
- Beta release available

  https://dist.apache.org/repos/dist/release/kafka/
- Rolled out in production at LinkedIn last week

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Join us at our user-group meeting tonight @ LinkedIn!

- Thursday, June 27, 7.30pm to 9.30pm
- 2025 Stierlin Ct., Mountain View, CA
- http://www.meetup.com/http-kafka-apache-org/events/125887332/
- Presentations (replication overview and use-case studies) from:
  - RichRelevance
  - Netflix
  - Square
  - LinkedIn

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