Lessons learnt from Migrating to a Stateful Streaming Framework

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Appier

Outline

- Use case in Appier
- Moving from micro batch to true streaming
- Tips to conquer obstacles during the migration
- Challenge from design in streaming way

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- **Use case in Appier**
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About Appier

Appier is a technology company which aims to provide artificial intelligence platforms to help enterprises solve their most challenging business problems.

http://www.appier.com/en/index.html

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Use case

- Retargeting
- Fraud detection
- Real time recommendation
- ...

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Outline

- Use case in Appier
- **Moving from micro batch to true streaming**
  - Disadvantage from micro batch
  - New requirements
  - Our solution by using Flink
- Tips to conquer obstacles during the migration
- Challenge from design in streaming way

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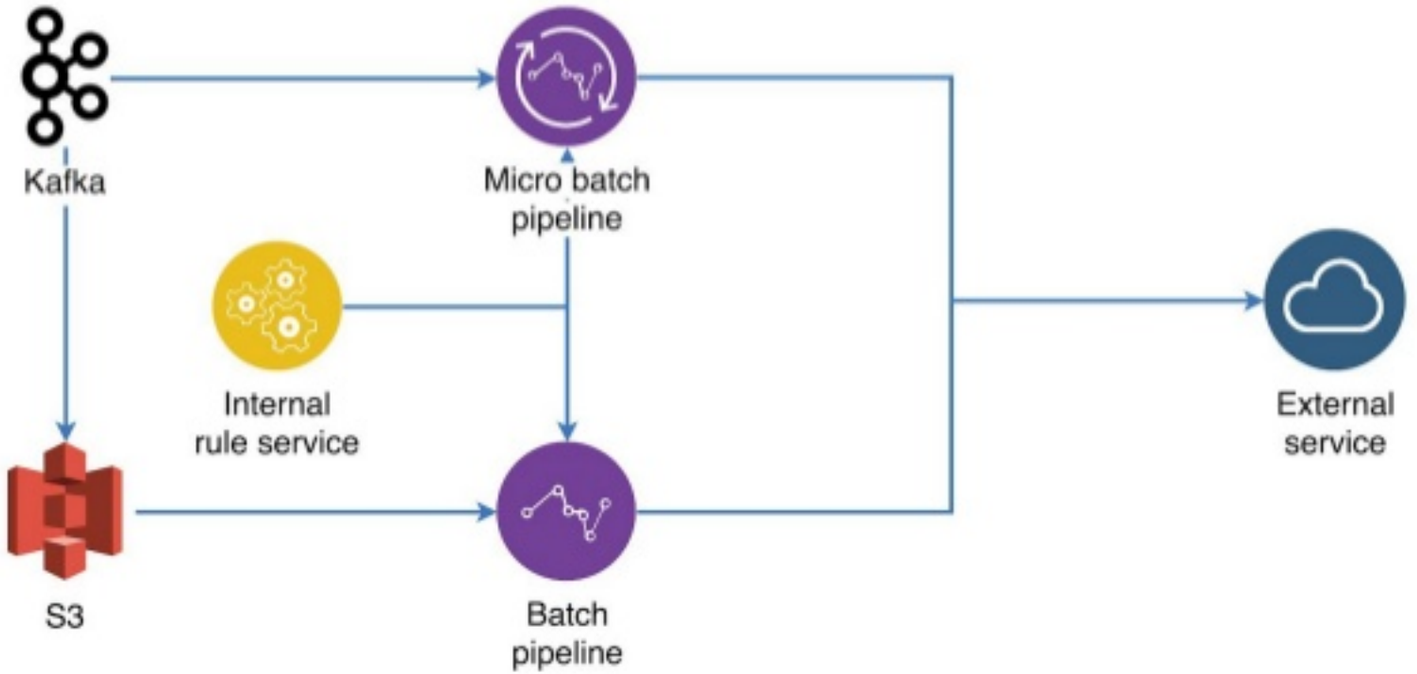
Dynamic Rule Service: Previous design



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Disadvantage from micro batch

- High latency
- Struggle with back pressure
- Hard to maintain states

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New requirements

- “Who visited this site twice in the past week”
- “Who viewed this product in the site but didn’t put into cart”
- “Who visited the certain pattern of some pages and bought this product”

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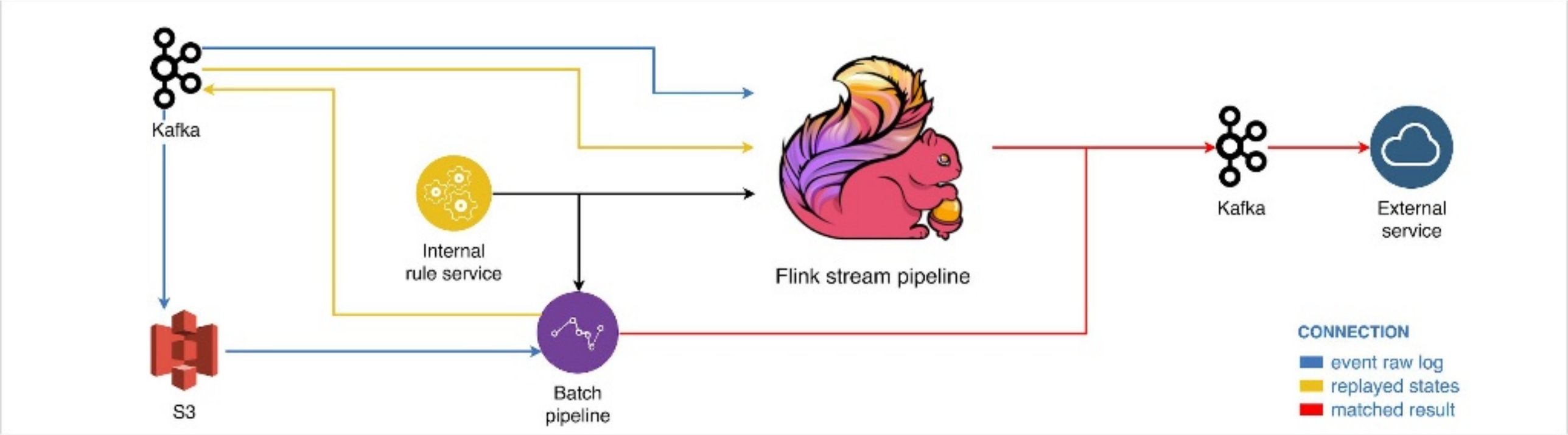
Dynamic Rule Service with Apache Flink



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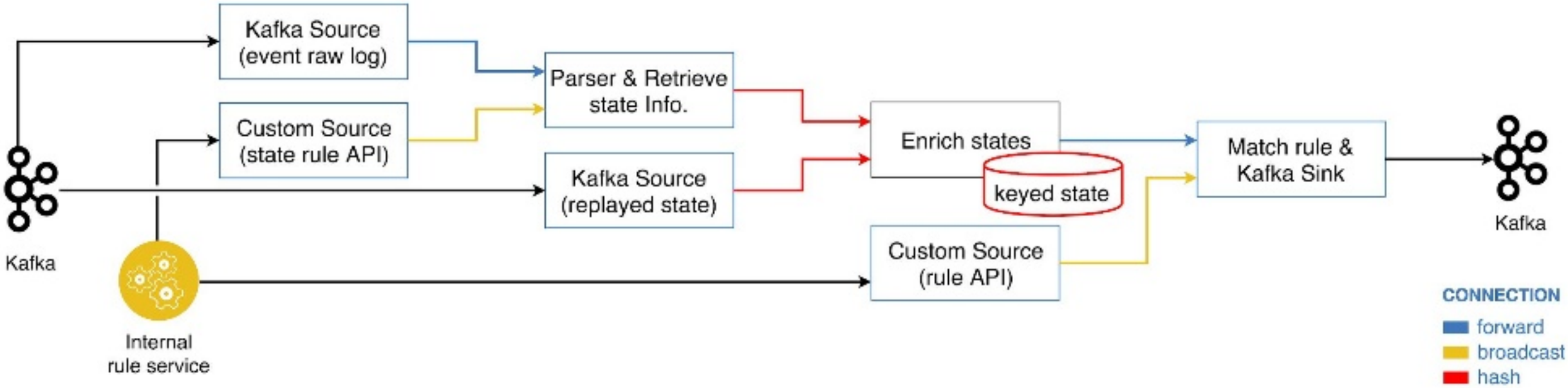
Detail of JobGraph (Apache Flink 1.4.0 release)



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Improvements

- Support more needs for stateful rules
- Flexible architecture
- Performance efficiency
- Cost efficiency

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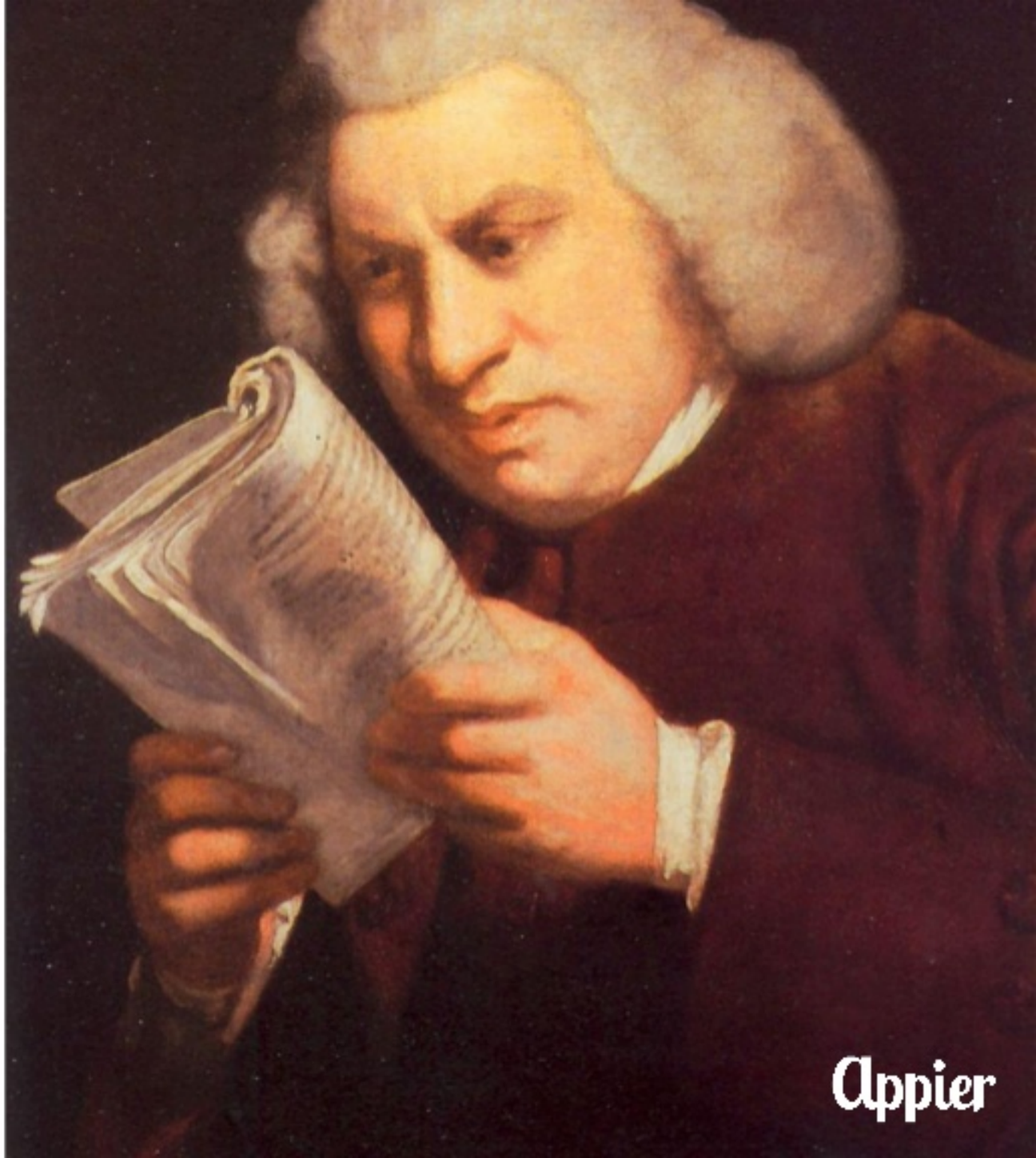
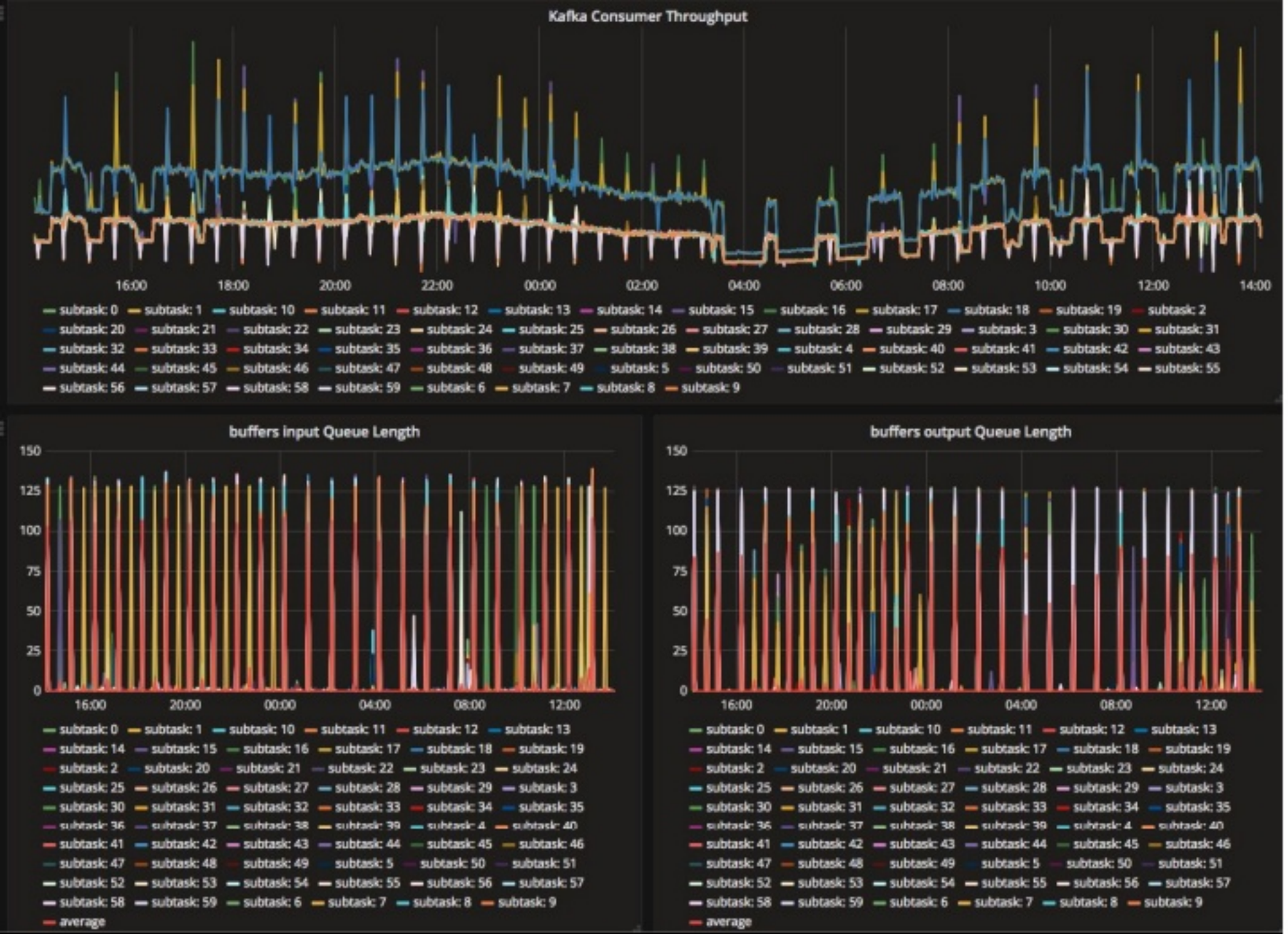
Tip 1:
Document and Mailing List are your best friends

Case Study:
taskmanager.exit-on-fatal-akka-error: true

https://ci.apache.org/projects/flink/flink-docs-release-1.4/ops/config.html#jobmanager--taskmanager





Tip 2:
Monitor and alert are important

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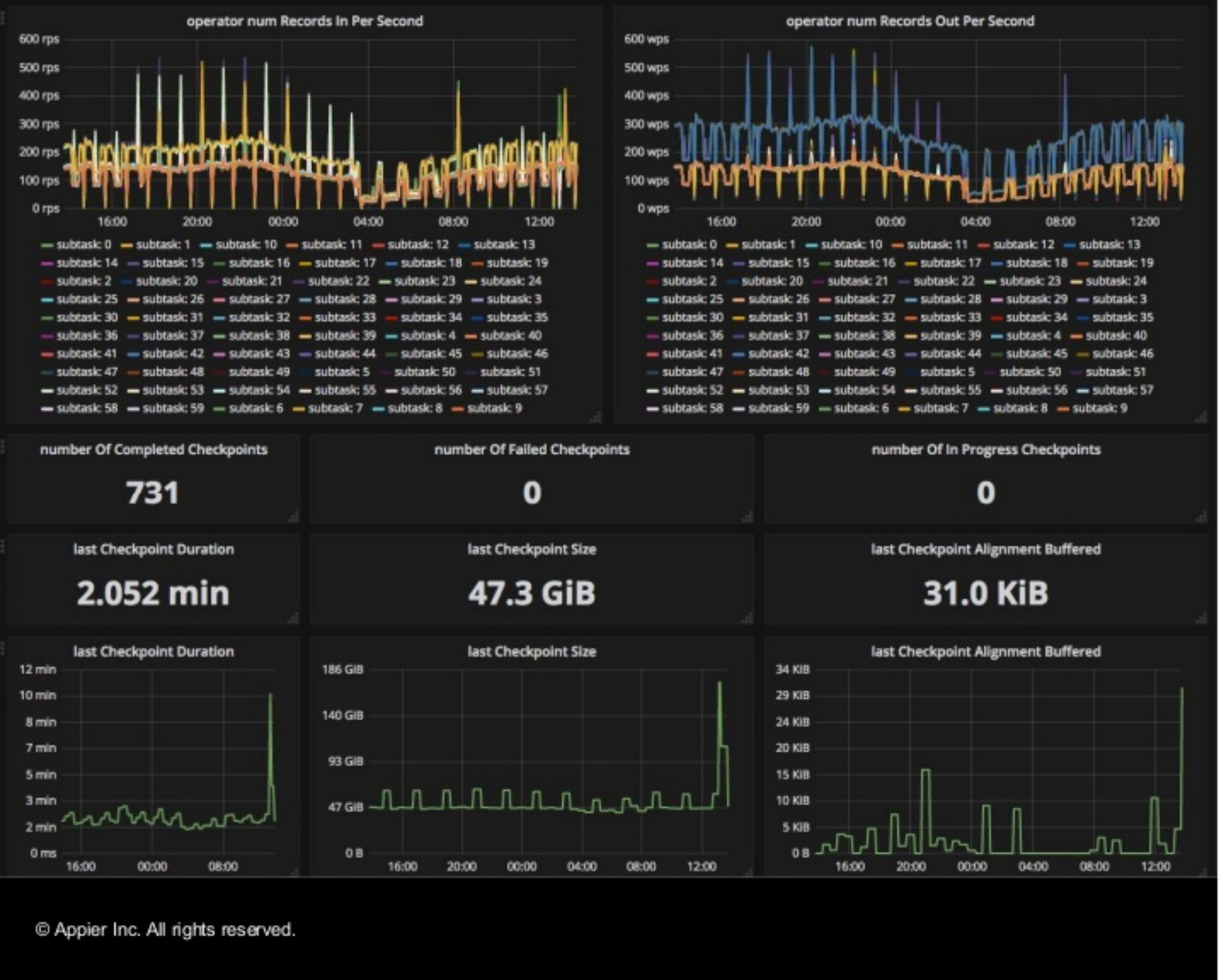

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Prometheus Alerts Graph Status Help

FlinkCheckpointAlignmentTimeOver30Secs (0 active)

```
alert: FlinkCheckpointAlignmentTimeOver30Secs
expr: max(flink_taskmanager_job_task_checkpointAlignmentTime)
  BY (job_name, job_id, task_attempt_num, task_name) / 1000 / 1000 / 1000 > 30
for: 100m
labels:
  receiver: rt-alert
annotations:
  description: 'Flink Job: {{$labels.job_name}}({{$labels.job_id}}) checkpoint alignment
    time takes more than 30 seconds on task {{$labels.task_name}}'
```

FlinkCheckpointDuration10Mins (0 active)

FlinkCheckpointFailed (0 active)

FlinkProcessTimeOver30Secs (0 active)

```
alert: FlinkProcessTimeOver30Secs
expr: sum(increase(flink_taskmanager_job_task_operator_process_time_latency{operator_name="match_rule"}[2m]))
  BY (job_name, job_id, task_attempt_num) / sum(increase(flink_taskmanager_job_task_operator_numRecordsIn{operator_name="match_rule"}[2m]))
  BY (job_name, job_id, task_attempt_num) > 30000
for: 10m
labels:
  receiver: rt-flink-alert
annotations:
  description: 'Flink Job: {{$labels.job_name}}({{$labels.job_id}}) process time takes
    more than 30 seconds for 10 minutes.'
```

FlinkTaskManagerHighGC (0 active)

```
alert: FlinkTaskManagerHighGC
expr: max(increase(flink_taskmanager_Status_JVM_GarbageCollector_G1_Old_Generation_Time[10m])
  + increase(flink_taskmanager_Status_JVM_GarbageCollector_G1_Young_Generation_Time[10m]))
  WITHOUT (tm_id) / 10 / 60 / 1000 > 0.03
for: 30m
labels:
  receiver: rt-flink-alert
annotations:
  description: Flink Taskmanager instance {{$labels.instance}} high GC ratio
```

Tip 2: Monitor and alert are important

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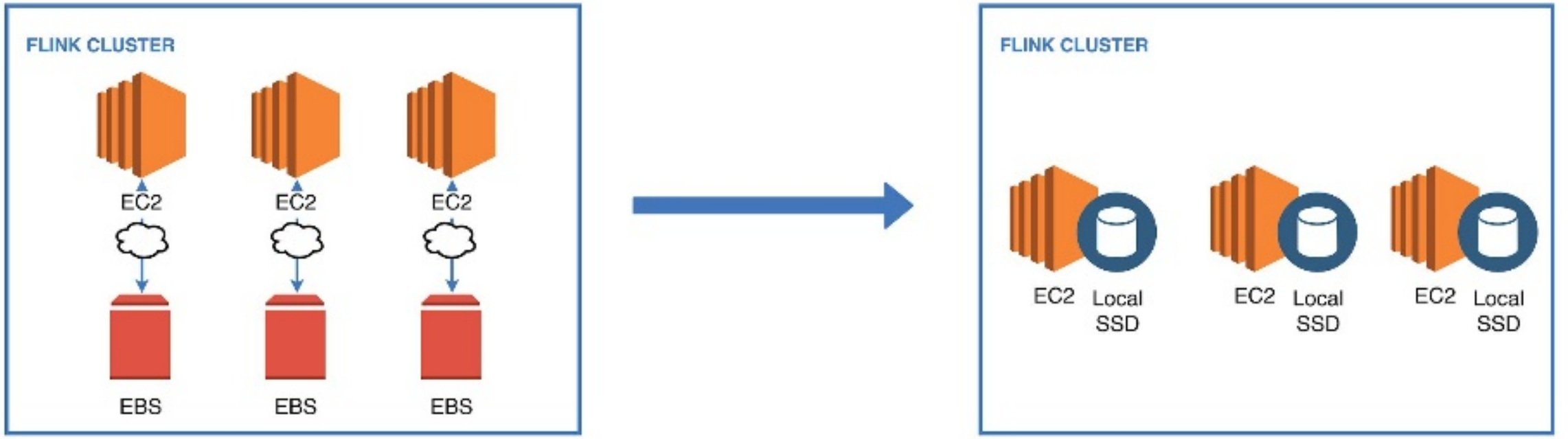

Tip 3:
Be familiar with your environment and your job

Case Study:

checkpoint stuck with rocksdb statebackend and s3 filesystem

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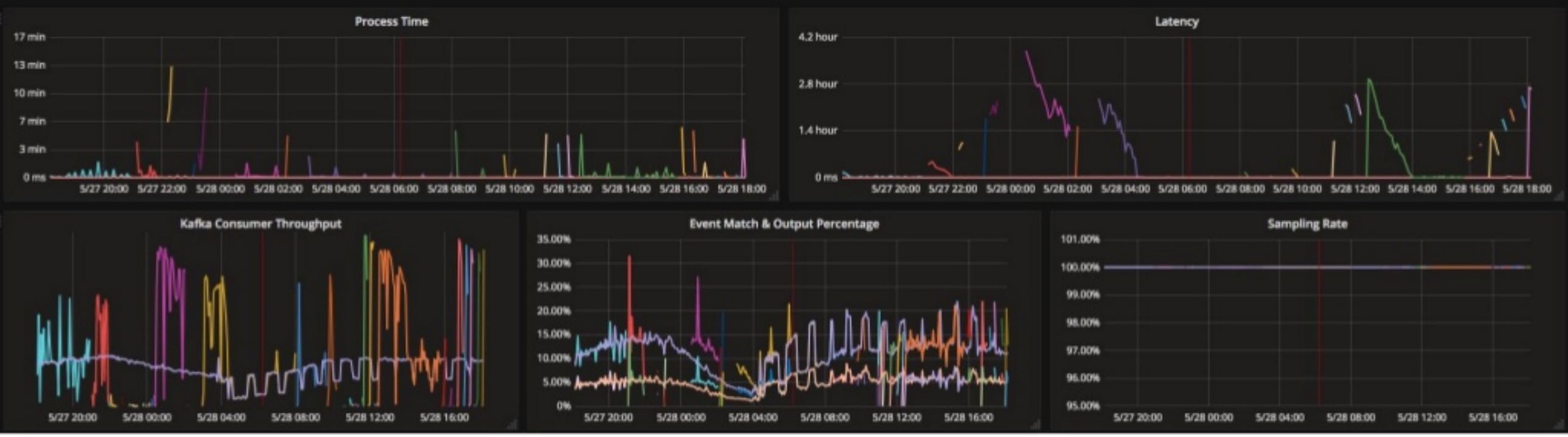

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Case Study: Verify bottleneck of our streaming job

- ✗ network performance issue
- ✔ memory bound job met the resource limitation

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Challenge from design in streaming way

- **Replay expired data or rebuild states are complex**
- **How to expose user-defined metrics well**
  - Current matched count for each rule
    - Too expensive to use querible states
- **End-to-end verification is a tough job**
  - How to verify those replay data is prepared

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TL;DR

- Documents and information from mailing list help a lot.
- Monitor and alert let you respond to problem and diagnose it quickly.
- Stateful streaming is environment sensitive. Be careful of it.
- Community is always behind you.

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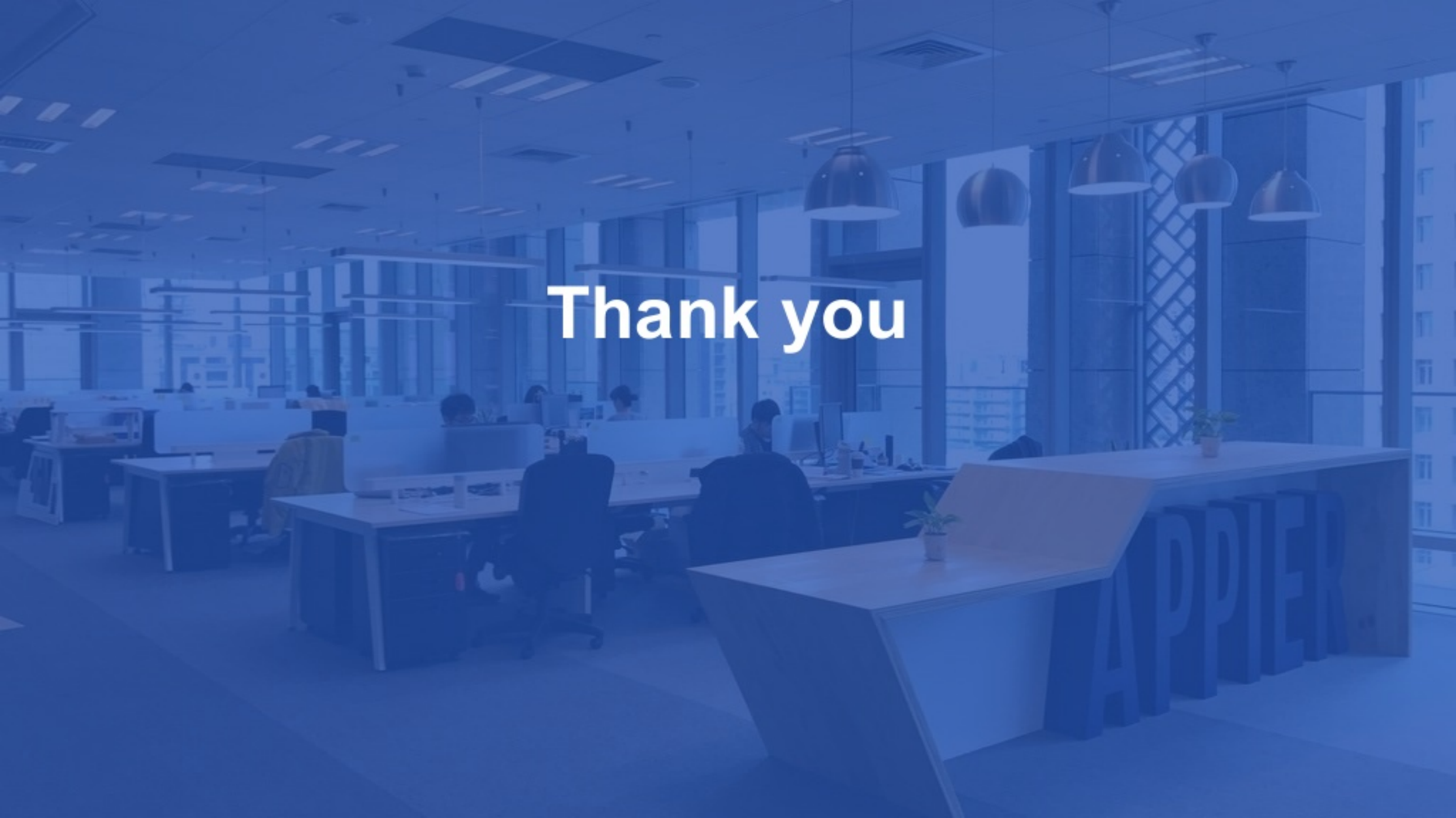
Thank you
APPIER