Building a real-time analytics dashboard with Streamlit, Apache Pinot, and Apache Kafka

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What is real-time analytics?

Real-time analytics is the discipline that applies logic and mathematics to data to **provide insights for making better decisions quickly**.

On-demand real-time analytics waits for users or systems to request a query and then delivers the analytic results.

Continuous real-time analytics is more proactive and alerts users or triggers responses as events happen.

Gartner

What is real-time user-facing analytics?

Giving our end-users analytical querying capabilities on fresh data.

What is real-time user-facing analytics?

Real-time

The data should be available for querying as soon as possible.

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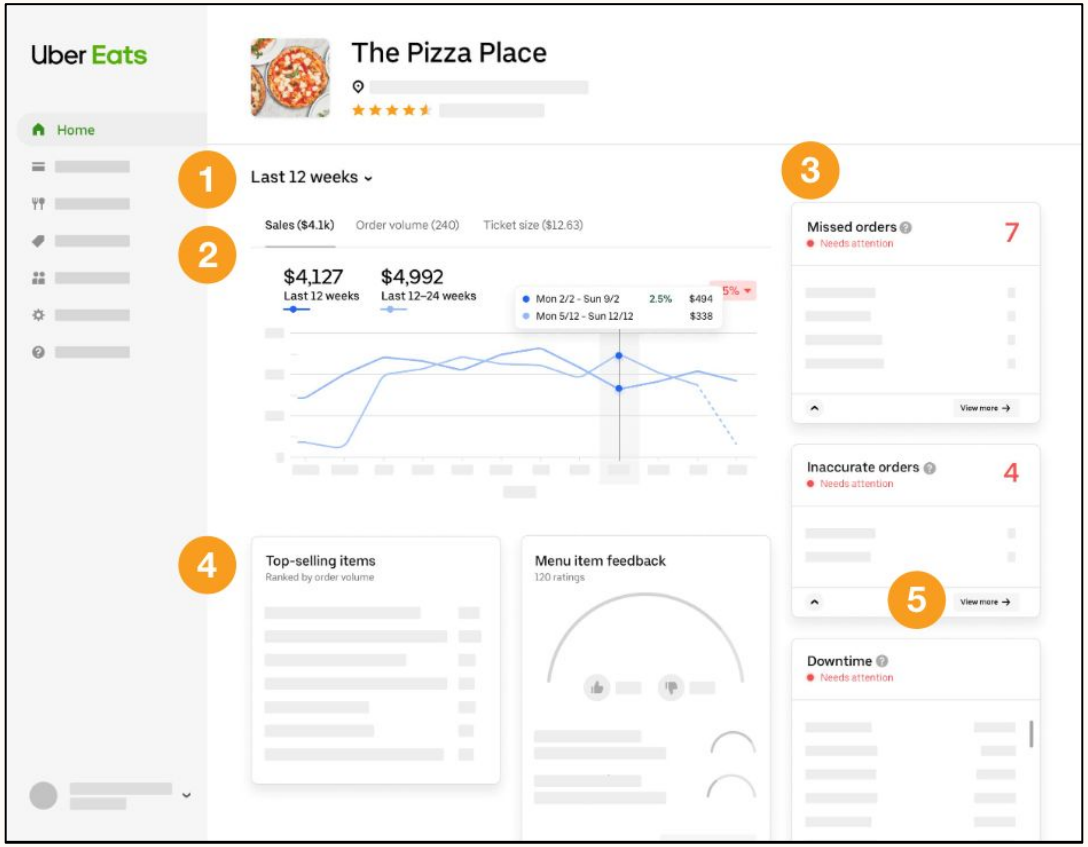
User-facing

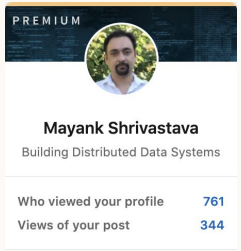
Queries times should be similar to what you'd get with an OLTP database.

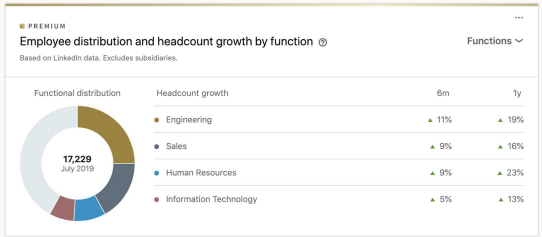
A lot of queries will be executed at the same time.

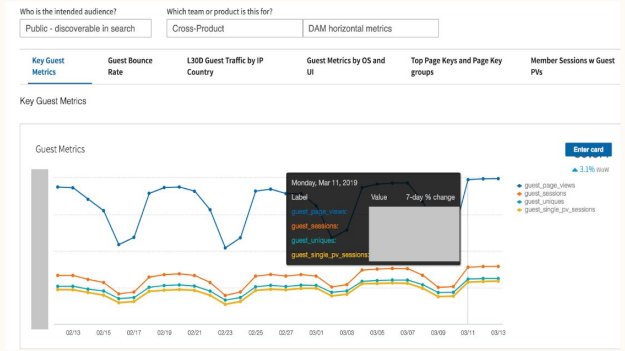
UberEats - Restaurant Manager

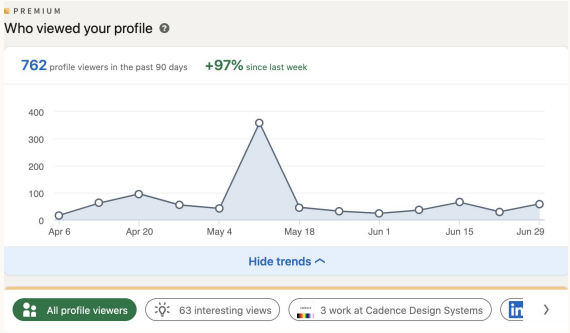


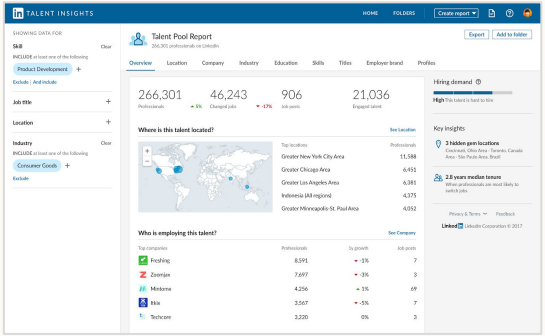
LinkedIn











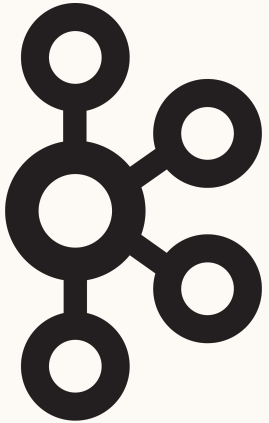
Member Facing Analytics

Enterprise Analytics Products

Internal Products and BI Tools

Let’s build our own dashboard!

What tools are we going to use?



What is Streamlit?

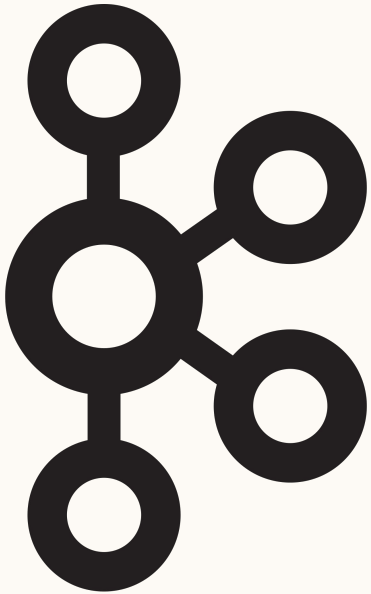
Streamlit

- Python based web application framework
- Makes it easy to create custom data apps
- Integrates with plot.ly, PyTorch, TensorFlow, scikit-learn, and more.
- Apps are shareable using Streamlit Cloud

What is Apache Pinot?

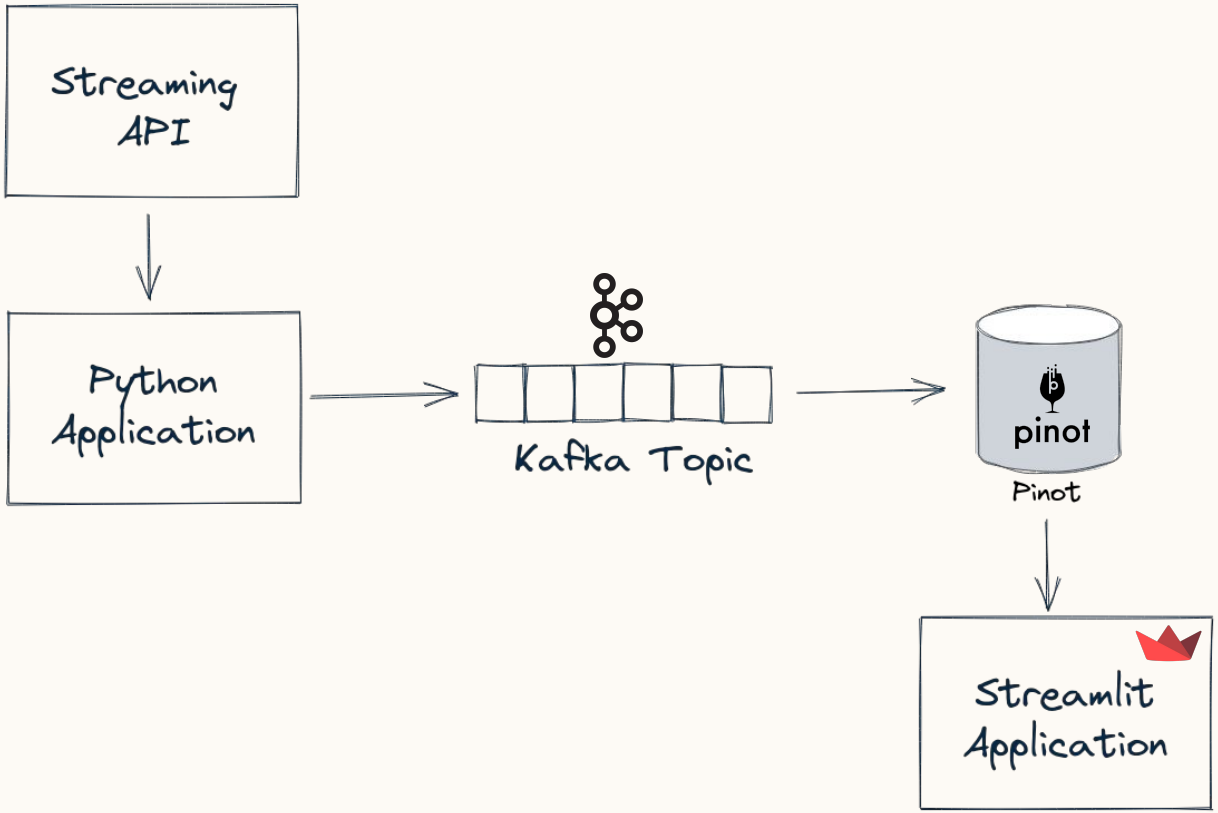
- Distributed OLAP Datastore
- Columnar, Indexed storage
- Queryable using SQL
- Real-time low latency analytics

What is Apache Kafka?



- A distributed event streaming platform
- Publish and subscribe to streams of records
- Store streams of records in a fault-tolerant durable way
- Process streams of records as they occur

Real-time analytics dashboard architecture



Our data set: Wikimedia Recent Changes Feed

- A continuous stream of structured event data describing changes made to various Wikimedia properties.
- Published over HTTP using the Server-Side Events (SSE) Protocol

```
event: message
id:
[{"topic":"eqiad.mediawiki.recentchange","partition":0,"timestamp":1641388001001},{"topic":"codfw.mediawi
ki.recentchange","partition":0,"offset":-1}]
data:
{"$schema":"/mediawiki/recentchange/1.0.0","meta":{"uri":"https://tt.wikipedia.org/wiki/%D0%A2%D3%A9%D1%8
0%D0%BA%D0%B5%D0%BC:%D0%92%D0%B5%D1%80%D0%BC%D0%BE%D0%BD%D1%82_%D1%88%D3%99%D2%BB%D3%99%D1%80%D0%BB%D3%99
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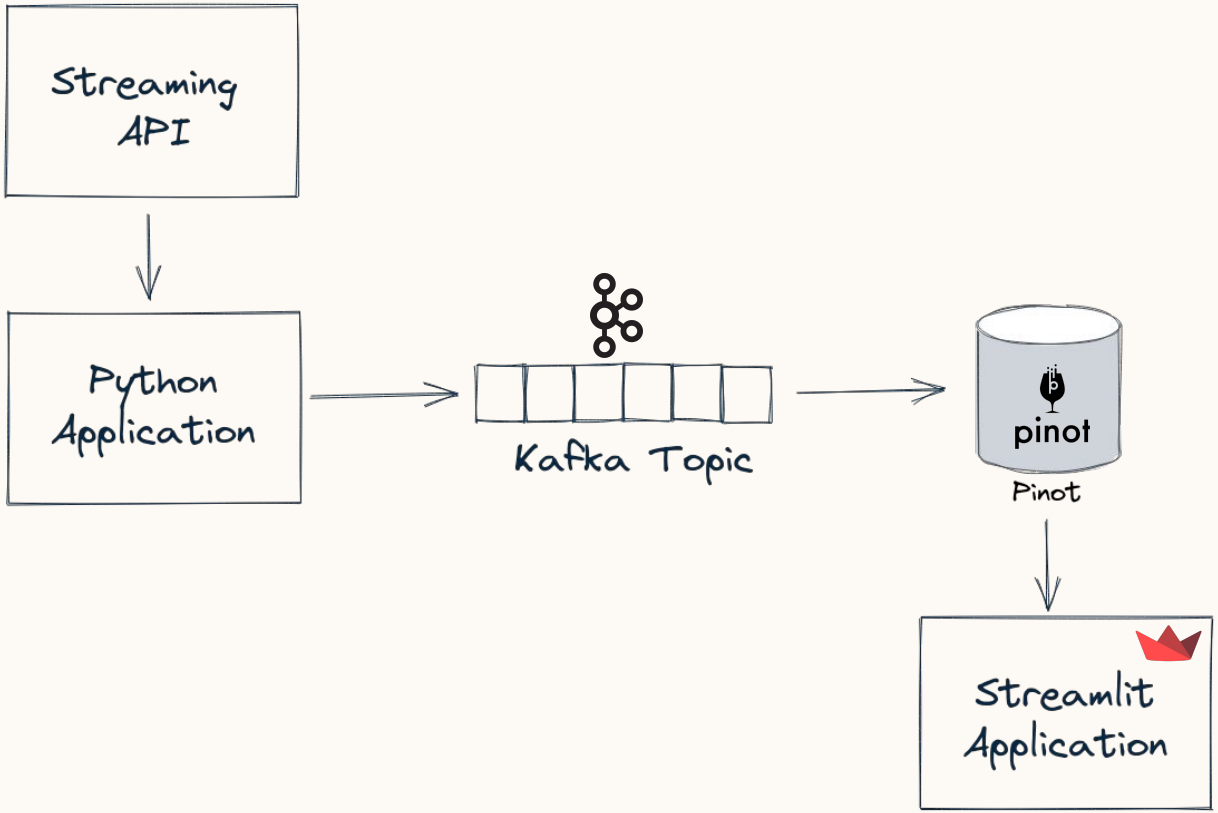
WIKIPEDIA
The Free Encyclopedia

Demo Time

Recap: Real-time analytics dashboard



Resources

- Streamlit - streamlit.io
- Apache Pinot - pinot.apache.org
- Apache Kafka - kafka.apache.org
- Code - github.com/mneedham/pinot-wiki

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The End