

# PowerStream: Propelling Energy Innovation with Predictive Analytics

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# Topics

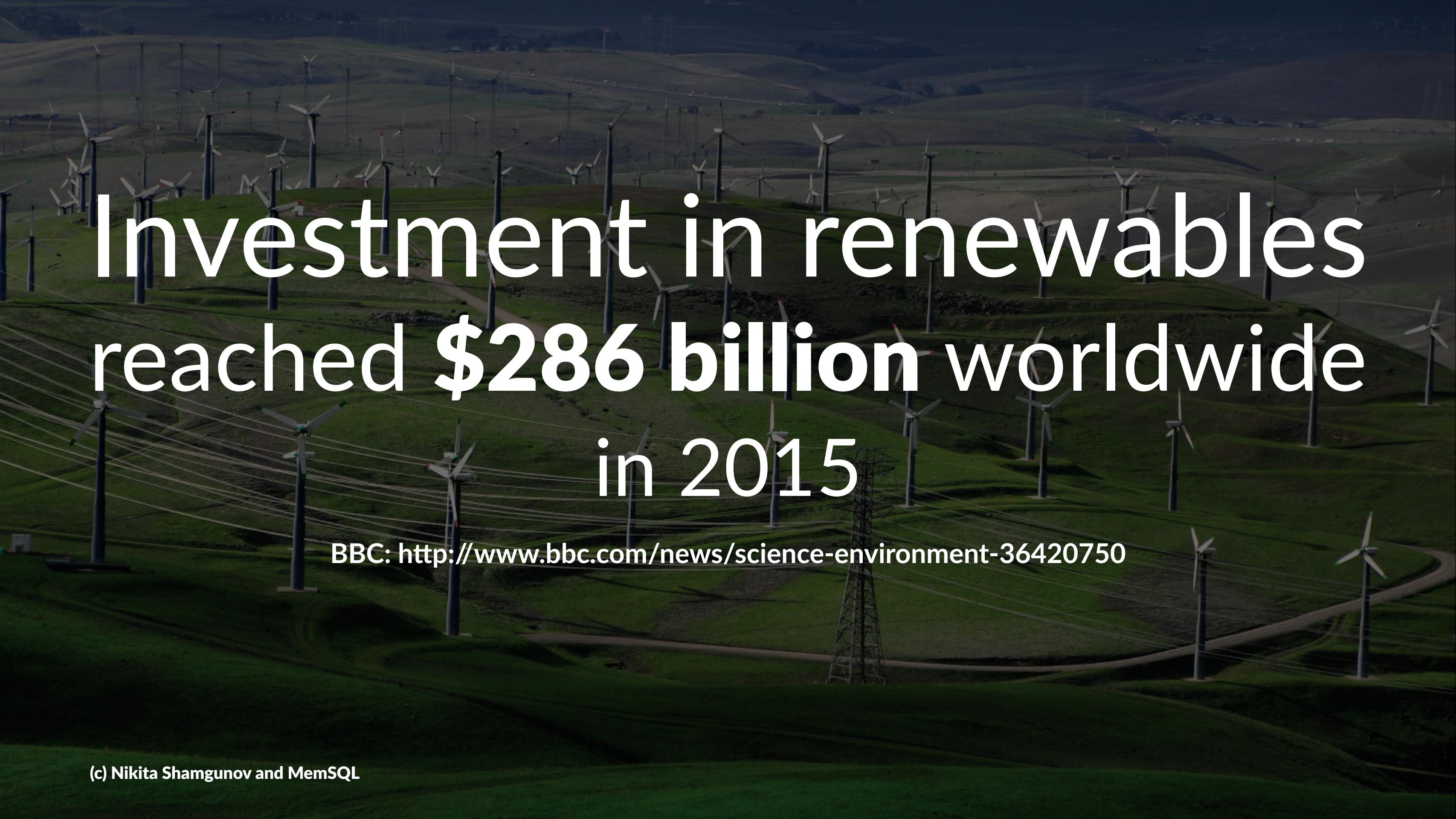
- Renewable Energy
- PowerStream
- Demo
- Q&A

# Renewable Energy in the News

# Germany Just Got Almost All of Its Power From Renewable Energy

May 15, 2016

Bloomberg: <http://www.bloomberg.com/news/articles/2016-05-16/germany-just-got-almost-all-of-its-power-from-renewable-energy>

A wide-angle photograph of a massive wind farm. Numerous wind turbines are scattered across rolling green hills under a clear blue sky. Power lines crisscross the landscape, connecting the turbines to a central grid.

Investment in renewables  
reached **\$286 billion** worldwide  
in 2015

BBC: <http://www.bbc.com/news/science-environment-36420750>

# Introducing PowerStream

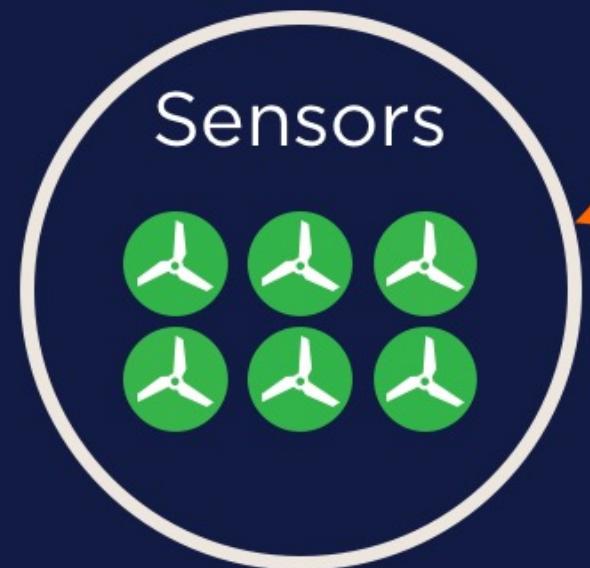
# MemSQL PowerStream

## Predicting the global health of wind turbines

# MemSQL PowerStream

**197,000** wind turbines around the world

Wind Turbine



Wind Farm





**1 to 2 million** data points per second  
with MemSQL *Streamliner*



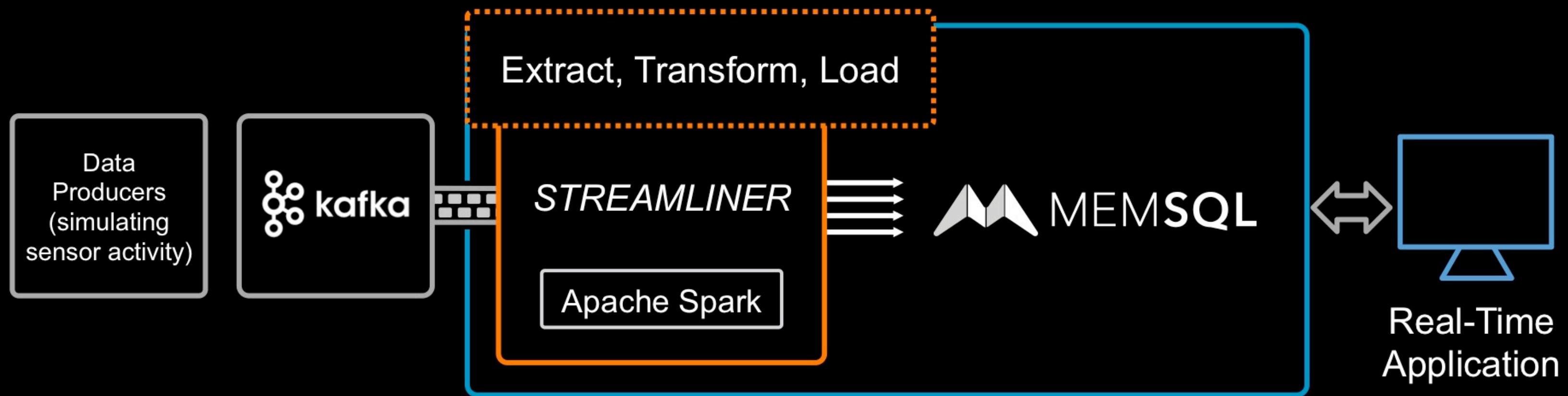
# MemSQL PowerStream

Internet-of-Things simulation depicting health of wind turbines globally.

7 machines - AWS C4-2X  
large instances, at  
**\$0.311** per hour per machine,  
annual cost ~ **\$19,000**.



# Streamliner Architecture for PowerStream



Visualizing data from **2 million sensors** and  
**197,000 wind turbines** from around the world.  
All data generated in real time by [MemSQL](#).

Writes / Second      **1.1M**

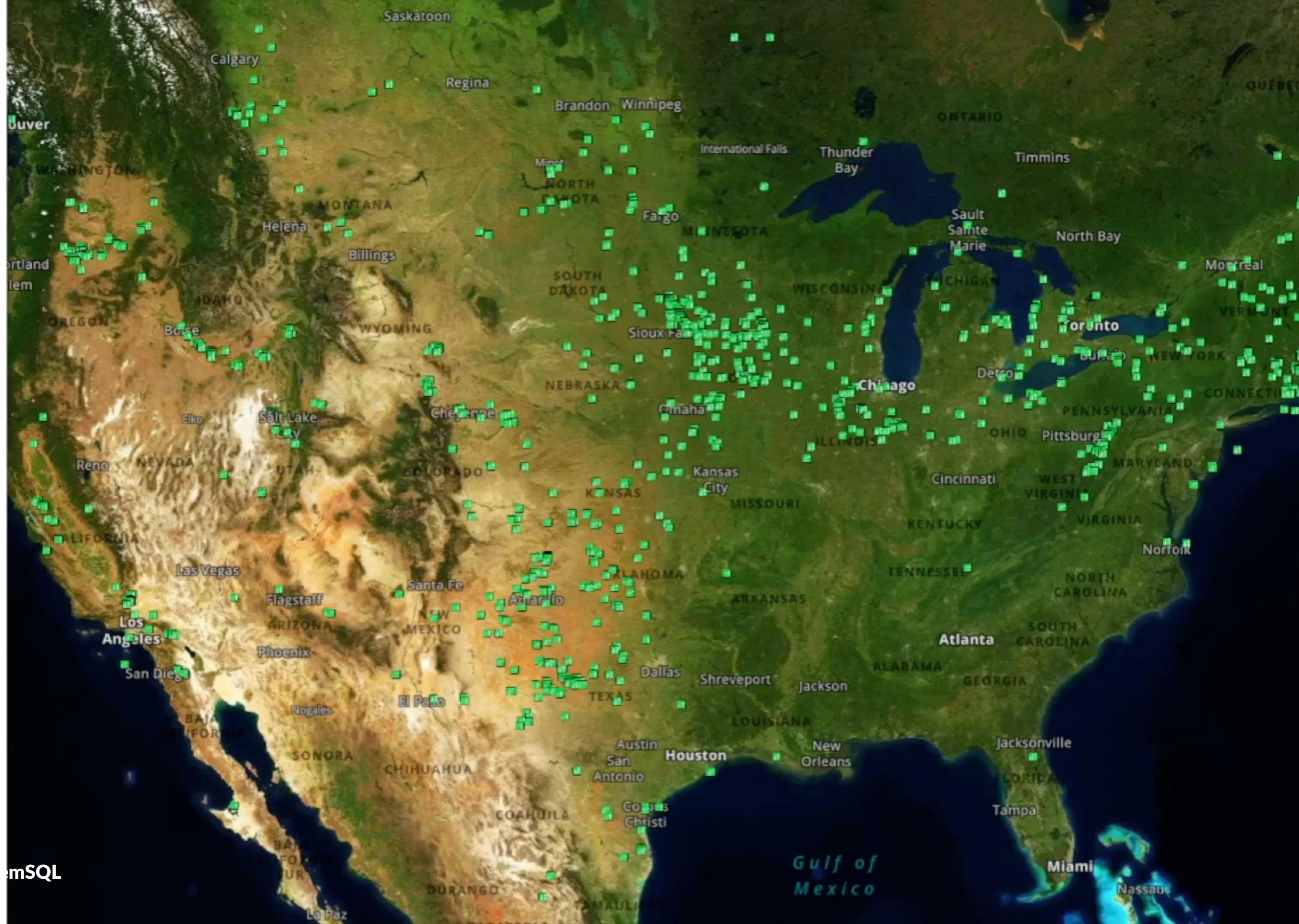
Reads / Second      **198K**

Windfarm Sensor Breakdown

 1K       0

Alerts

-  Windfarm in Germany/Nordrhein-Westfalen/Steinfurt
-  Windfarm in Germany/Sachsen-Anhalt
-  Windfarm in Germany/Niedersachsen/Salzgitter
-  Windfarm in Germany/Schleswig-Holstein/Wiemersdorf
-  Windfarm in Germany/Niedersachsen
-  Windfarm in Germany/Sachsen-Anhalt/Aschersleben
-  Windfarm in Germany/Sachsen
-  Windfarm in Germany/Schleswig-Holstein
-  Windfarm in Germany/Nordrhein-Westfalen/Rüthen
-  Windfarm in Germany/Baden-Württemberg



Visualizing data from **2 million sensors** and  
**197,000 wind turbines** from around the world.  
All data generated in real time by [MemSQL](#).

Writes / Second

2M

Reads / Second

2K

Turbine Sensor Breakdown

90

0

Alerts

Windfarm in Germany/Nordrhein-Westfalen/Steinfurt

Windfarm in Germany/Sachsen-Anhalt

Windfarm in Germany/Niedersachsen/Salzgitter

Windfarm in Germany/Schleswig-Holstein/Wiemersdorf

Windfarm in Germany/Niedersachsen

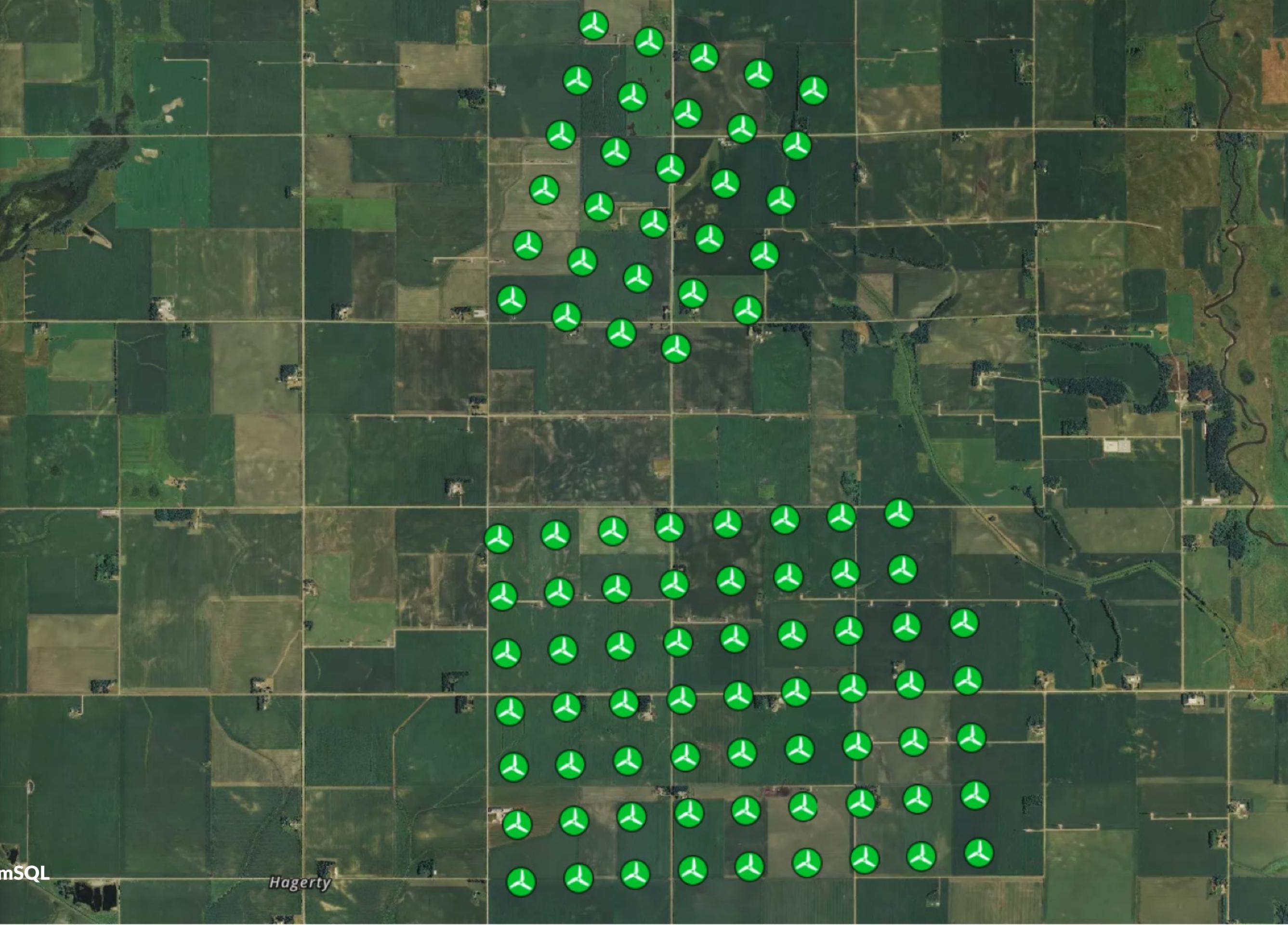
Windfarm in Germany/Sachsen-Anhalt/Aschersleben

Windfarm in Germany/Sachsen

Windfarm in Germany/Schleswig-Holstein

Windfarm in Germany/Nordrhein-Westfalen/Rüthen

Windfarm in Germany/Baden-Württemberg



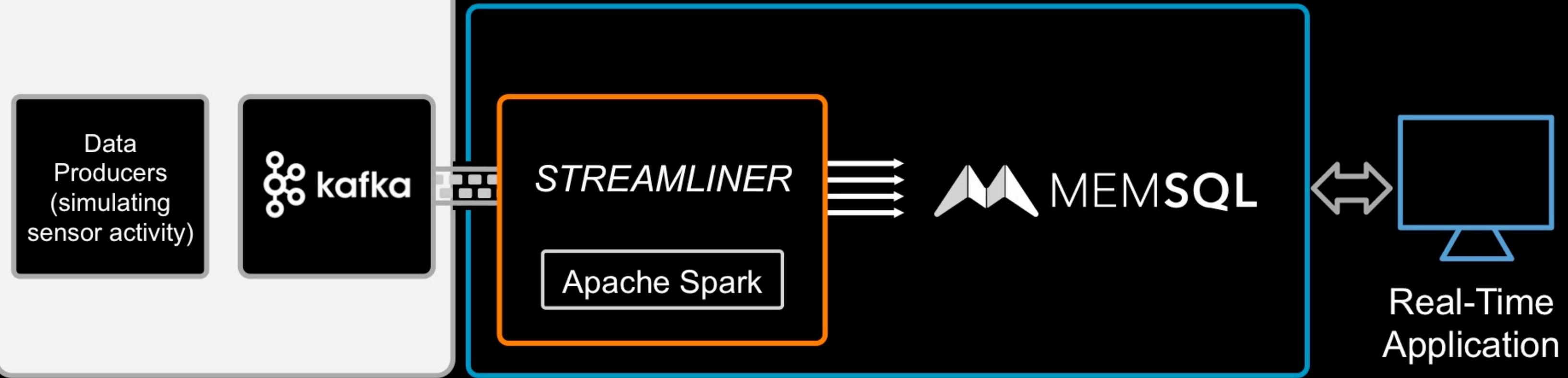
# Demo Sequence

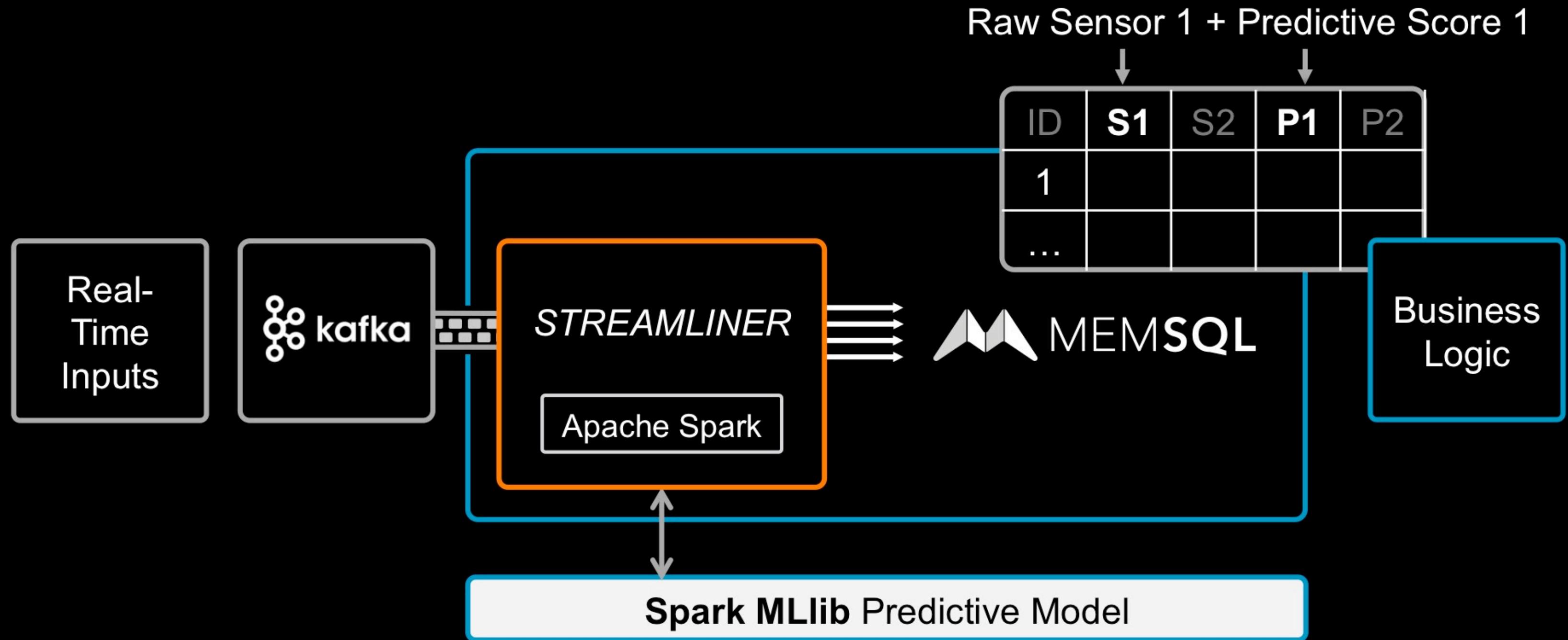
- Part I
  - High Speed Ingest
  - Predictive Analytics
  - Business Intelligence
- Part II
  - Spark SQL Pushdowns

# MemSQL and Spark Real-time application

Demo part I

## High Speed Ingest



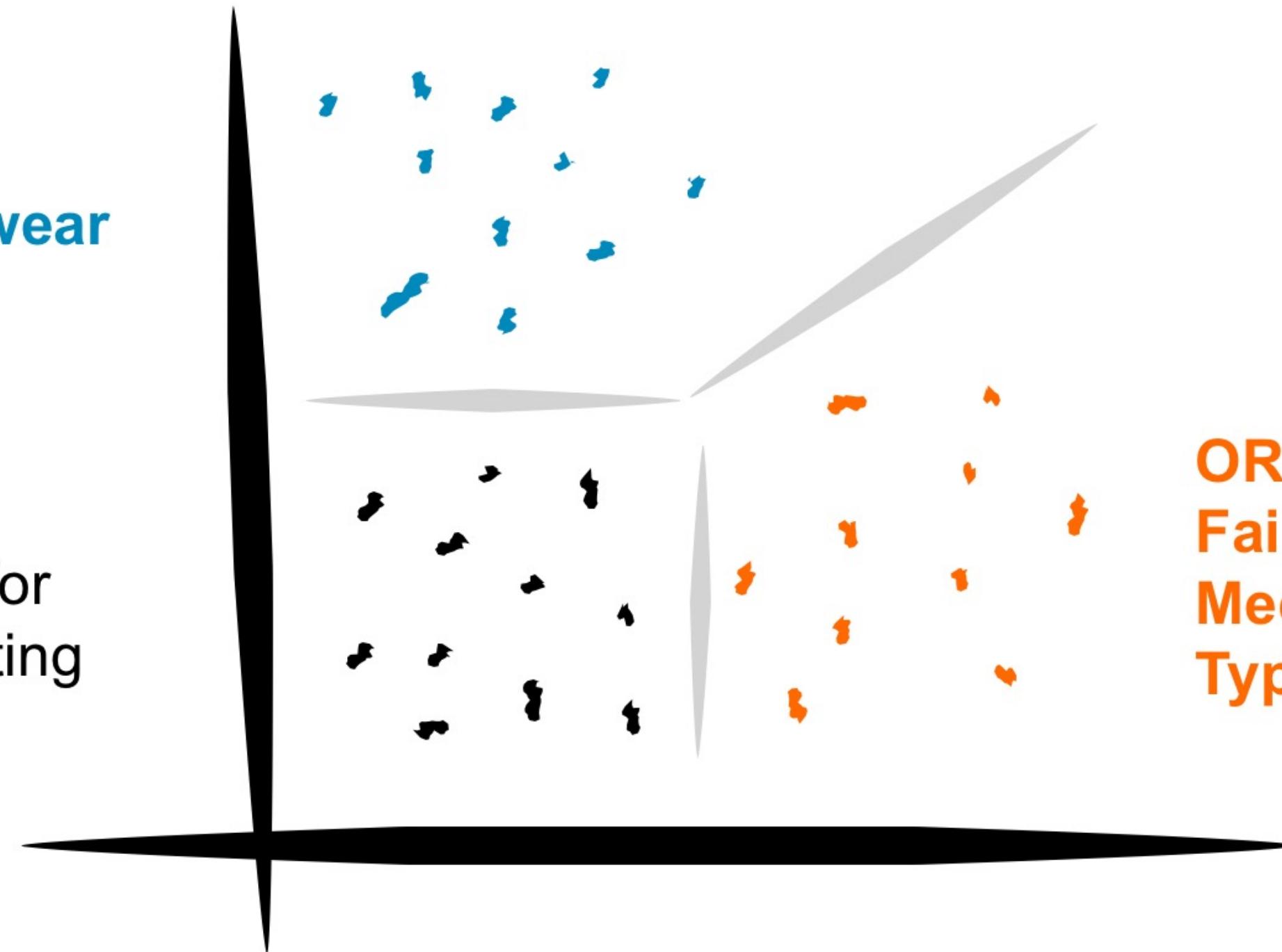


# Classification

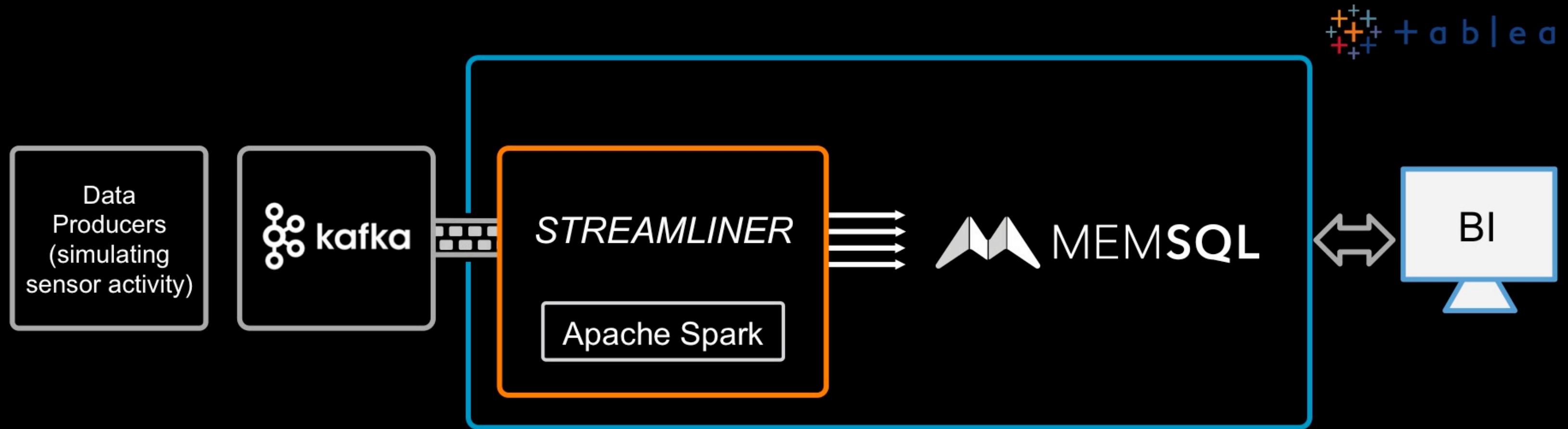
**BLUE**  
**Failure**  
**Mechanical wear**  
**Type 1**

**BLACK**  
training data for  
turbine operating  
normally

**ORANGE**  
**Failure**  
**Mechanical wear**  
**Type 2**



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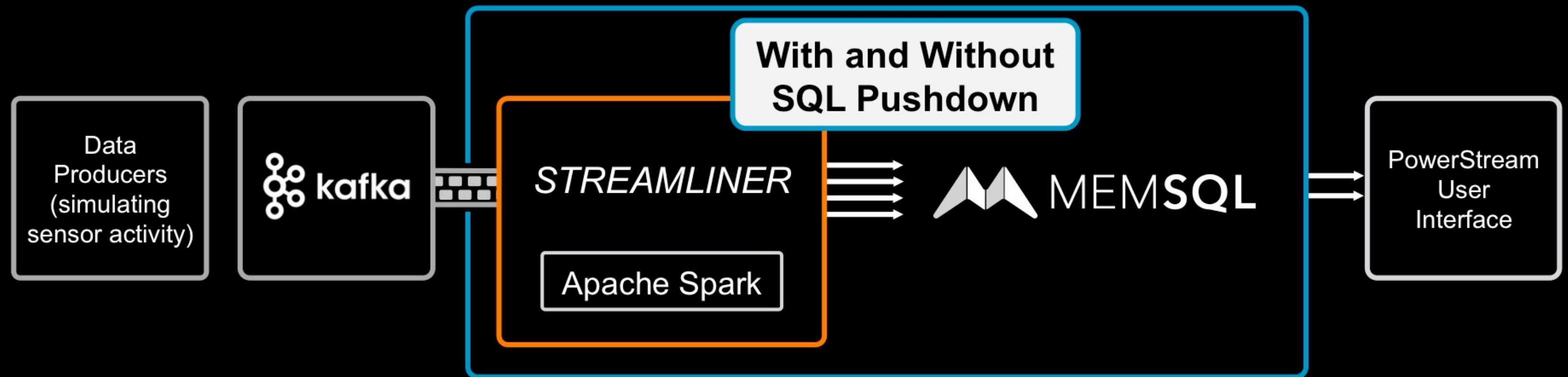


# Demo Part I

# MemSQL and Spark

# Better together

Demo part II

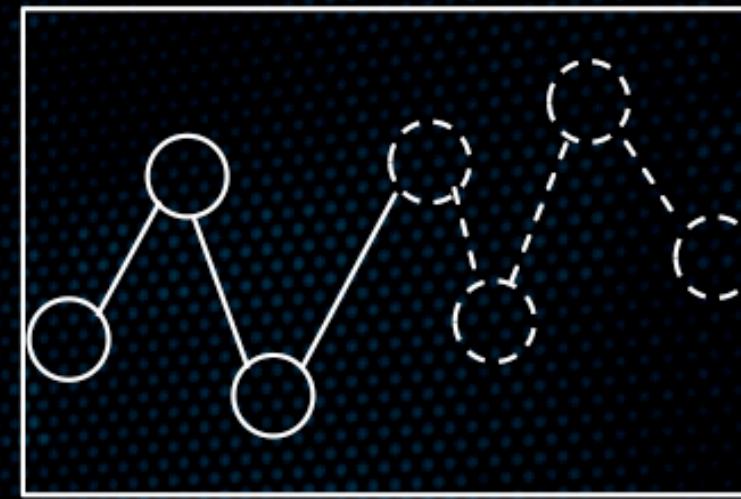
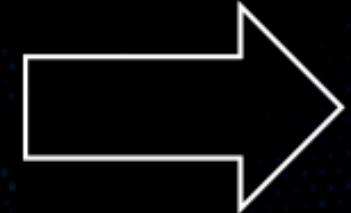


# SQL Pushdown

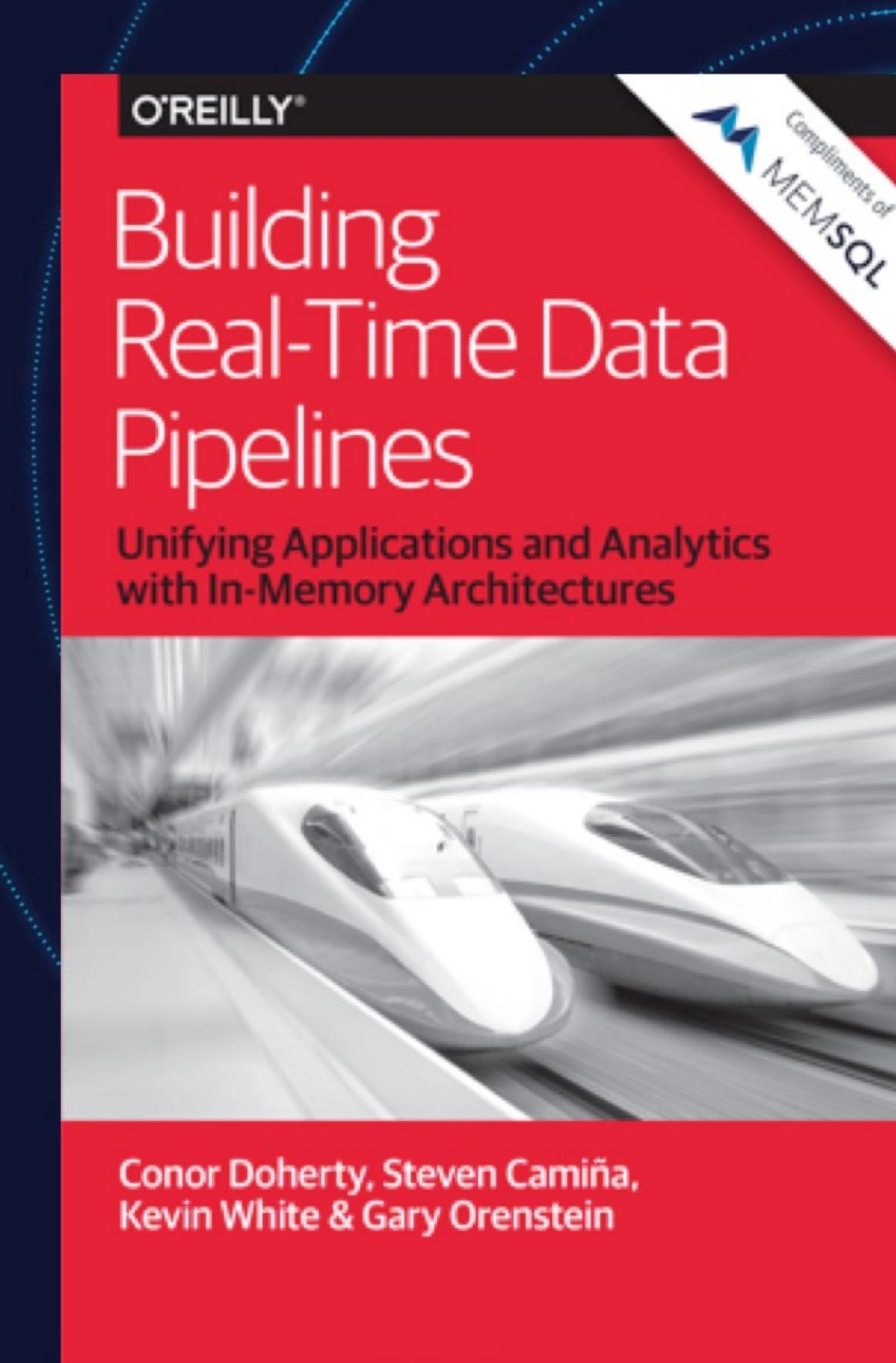
- Delegate SQL query processing to a database
- Enhance speed and concurrency
- Complement other Spark capabilities
- Use Spark as a high level interface
- Command line example with and without pushdown

# Demo Part II

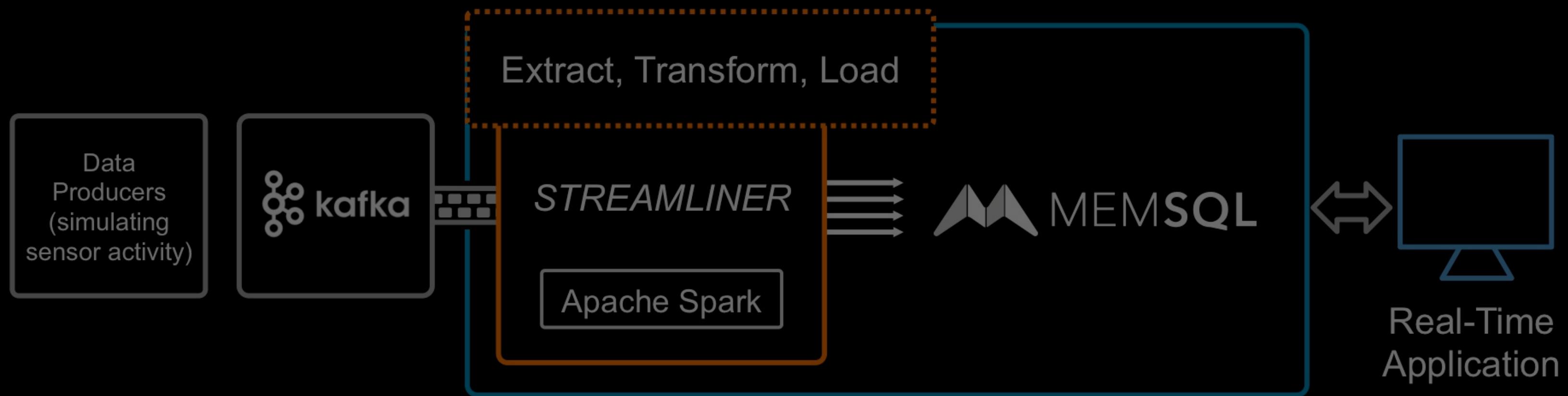
# From a Real-Time Dashboard to Predictive Applications



# Get the blueprint



# Questions and answers



# THANK YOU.

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