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Ingesting Streaming Data for Analysis in Apache Ignite

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Agenda

Product Support Use Case

Continuous Queries in Apache Ignite

Integrating StreamSets Data Collector with Apache Ignite

Demo

Wrap-up

Who is StreamSets?

Seasoned leadership team

cloudera Informatica

Customer base from global 8000

50%

Unique commercial downloaders

2000+

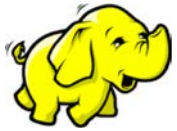
Open source downloads worldwide

1,000,000+

Broad connectivity

50+

History of innovation





Use Case: Product Support

HR system (on-premises RDBMS) holds employee reporting hierarchy

Customer service platform (SaaS) holds support ticket status, assignment to support engineers

Device monitoring system (CSV files / JSON via Kafka) provides fault data

How do we query across data sources?

How do we get notifications of faults for high-priority tickets?

Apache Ignite Continuous Queries

Enable you to listen to data modifications occurring on Ignite caches

Specify optional initial query, remote filter, local listener

Initial query can be any type: Scan, SQL , or TEXT

Remote filter executes on primary and backup nodes

Apache Ignite Continuous Queries

Local listener executes in your app's JVM

Can use BinaryObjects for generic, performant code

Can use `ContinuousQueryWithTransformer` to run a remote transformer

- Restrict results to a subset of the available fields

Continuous Query with Binary Objects – Setup

```
// Get a cache object
IgniteCache<Object, BinaryObject> cache = ignite.cache(cacheName).withKeepBinary();


// Create a continuous query
ContinuousQuery<Object, BinaryObject> qry = new ContinuousQuery<>();


// Set an initial query - match a field value
qry.setInitialQuery(new ScanQuery<>((IgniteBiPredicate<Object, BinaryObject>) (key, val) -
> {
  System.out.println("### applying initial query predicate");
  return val.field(filterFieldName).toString().equals(filterFieldValue);
}));


// Filter the cache updates
qry.setRemoteFilterFactory(() -> event -> {
  System.out.println("### evaluating cache entry event filter");
  return event.getValue().field(filterFieldName).toString().equals(filterFieldValue);
});
```

Continuous Query with Binary Objects – Listener

```
// Process notifications
qry.setLocalListener((evts) -> {
  for (CacheEntryEvent<? extends Object, ? extends BinaryObject> e : evts) {
    Object key = e.getKey();
    BinaryObject newValue = e.getValue();

    System.out.println("Cache entry with ID: " + e.getKey() +
        " was " + e.getEventType().toString().toLowerCase());
    BinaryObject oldValue = (e.isOldValueAvailable()) ? e.getOldValue() : null;
    processChange(key, oldValue, newValue);
  }
});
```

Continuous Query with Binary Objects – Run the Query

```
// Run the continuous query
try (QueryCursor<Cache.Entry<Object, BinaryObject>> cur = cache.query(qry)) {
  // Iterate over existing cache data
  for (Cache.Entry<Object, BinaryObject> e : cur) {
    processRecord(e.getKey(), e.getValue());
  }

  // Sleep until killed
  boolean done = false;
  while (!done) {
    try {
      Thread.sleep(1000);
    } catch (InterruptedException e) {
      done = true;
    }
  }
}
```

Demo: Continuous Query Basics

Continuous Query with Transformer

```
ContinuousQueryWithTransformer<Object, BinaryObject, String> qry =
    new ContinuousQueryWithTransformer<>();

// Transform result - executes remotely
qry.setRemoteTransformerFactory(() -> event -> {
  System.out.println("### applying transformation");
  return event.getValue().field(fieldName).toString();
});

// Process notifications - executes locally
qry.setLocalListener((values) -> {
  for (String value : values) {
    System.out.println(transformerField + ": " + value);
  }
});
```

Demo: Continuous Query Transformers

Key Learnings

Need to enable peer class loading so that app can send code to execute on remote node

- `<property name="peerClassLoadingEnabled" value="true"/>`

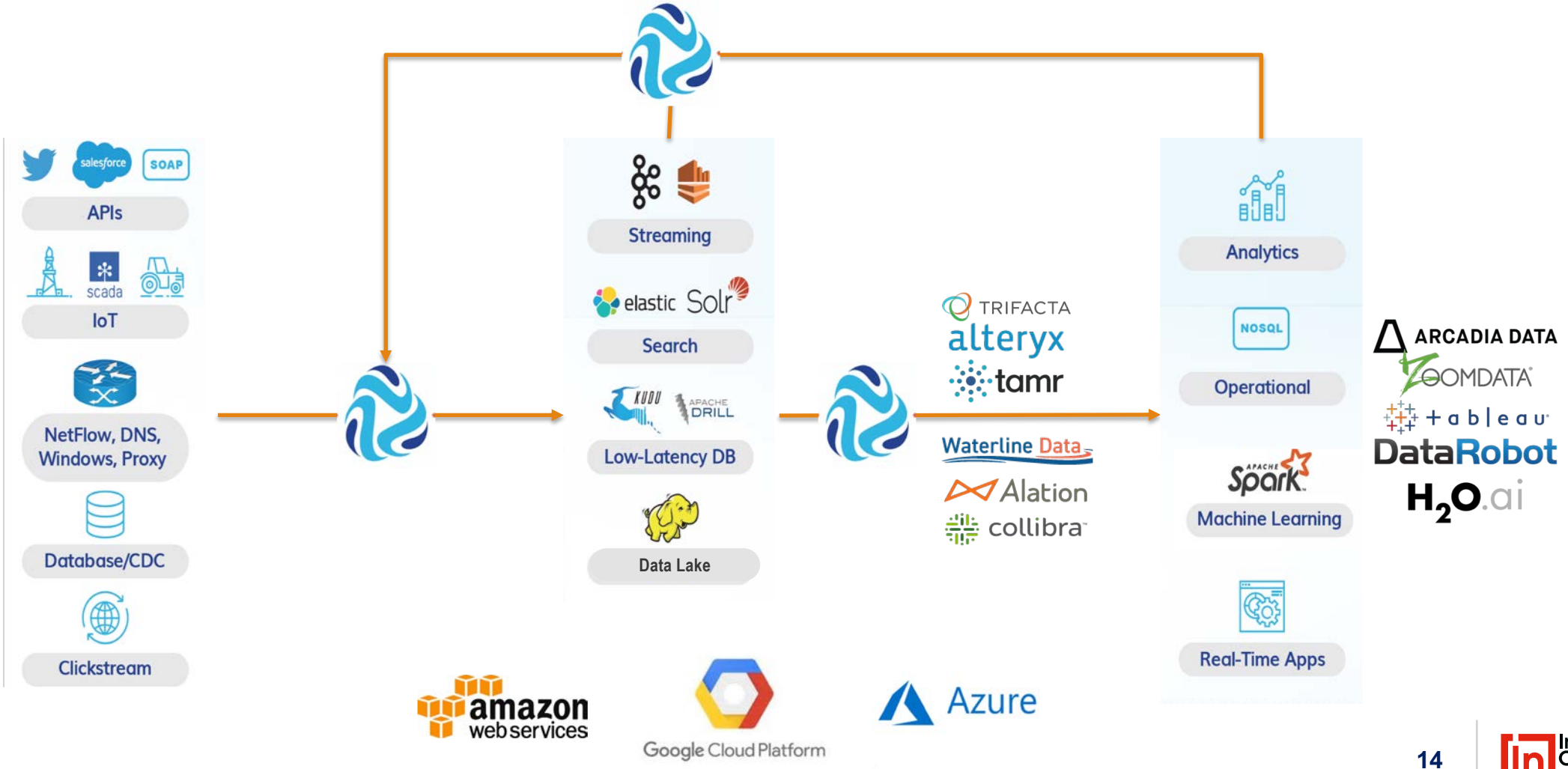
By default, `CREATE TABLE City` … in SQL means you have to use `ignite.cache("SQL_PUBLIC_CITY")`

- Override when creating table with `cache_name=city`

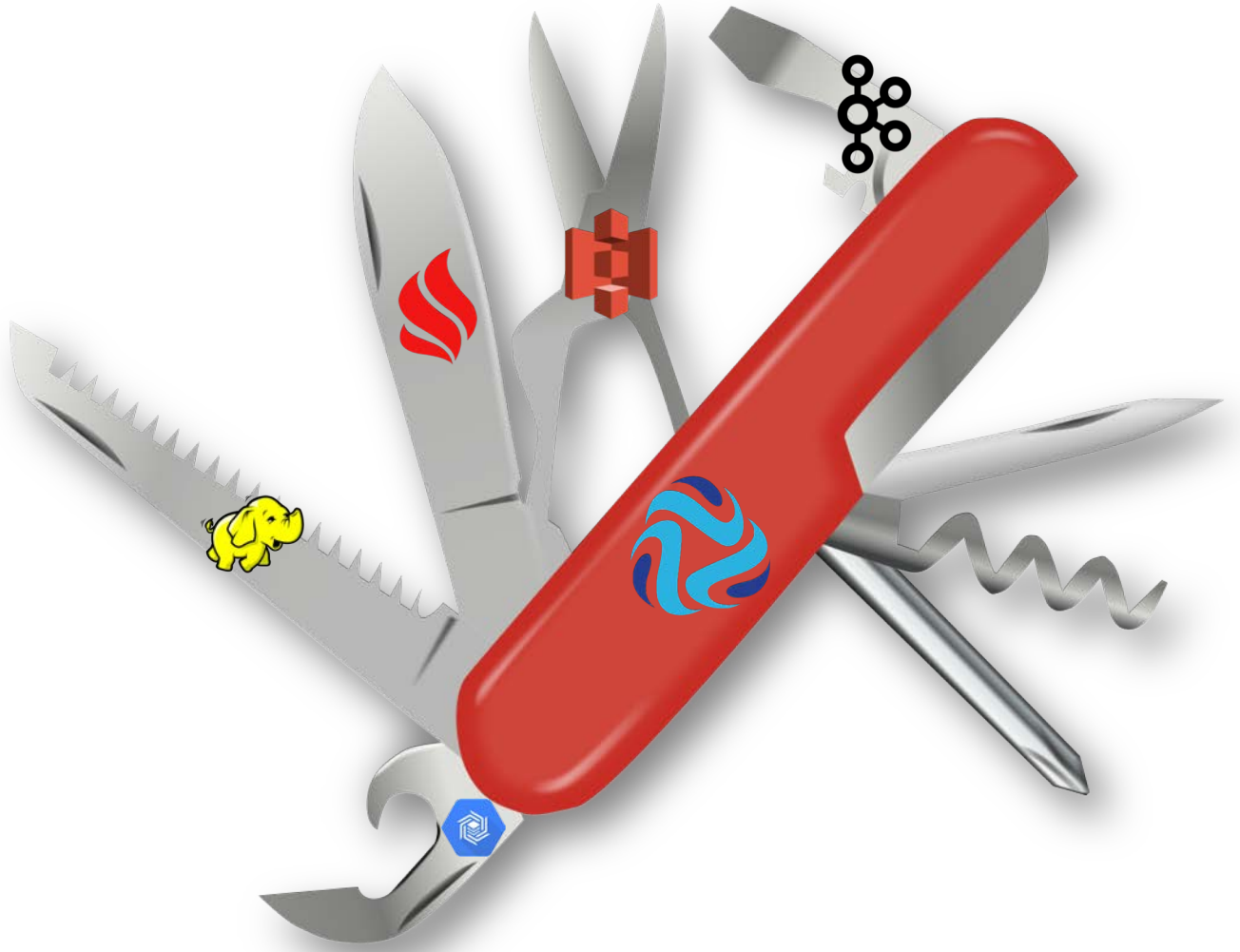
Binary Objects make your life simpler and faster

RTFM! `CacheContinuousQueryExample.java` is very helpful!

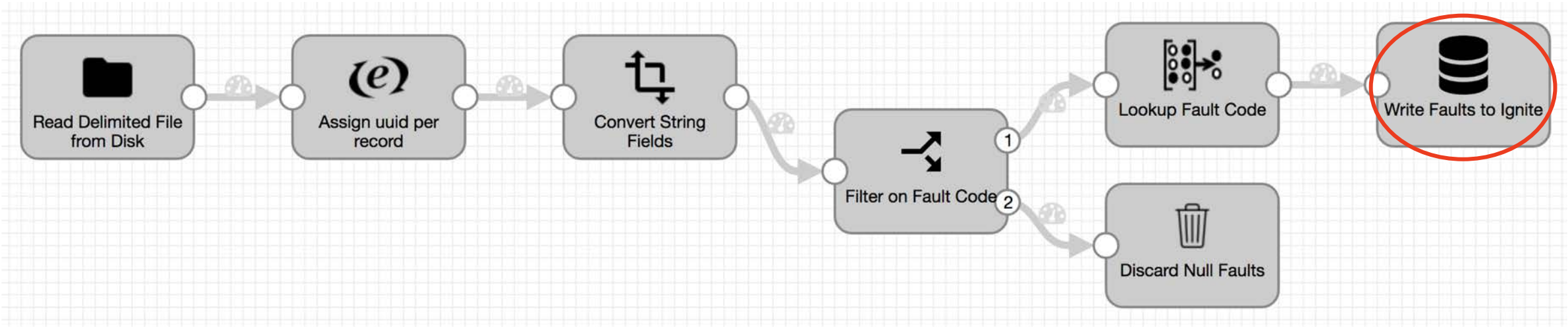
The StreamSets DataOps Platform



A Swiss Army Knife for Data



StreamSets Data Collector and Ignite




```
SerialNumber,Timestamp,FaultCode
7326001,2018-09-18 00:00:00,0
...

INSERT INTO FAULT (FAULT, ID, SERIAL_NUMBER, TIMESTAMP)
VALUES (?, ?, ?, ?)
```

Ignite JDBC Driver

`org.apache.ignite.IgniteJdbcThinDriver`

Thin driver - connects to cluster node

Located in `ignite-core-version.jar`

JDBC URL of form:

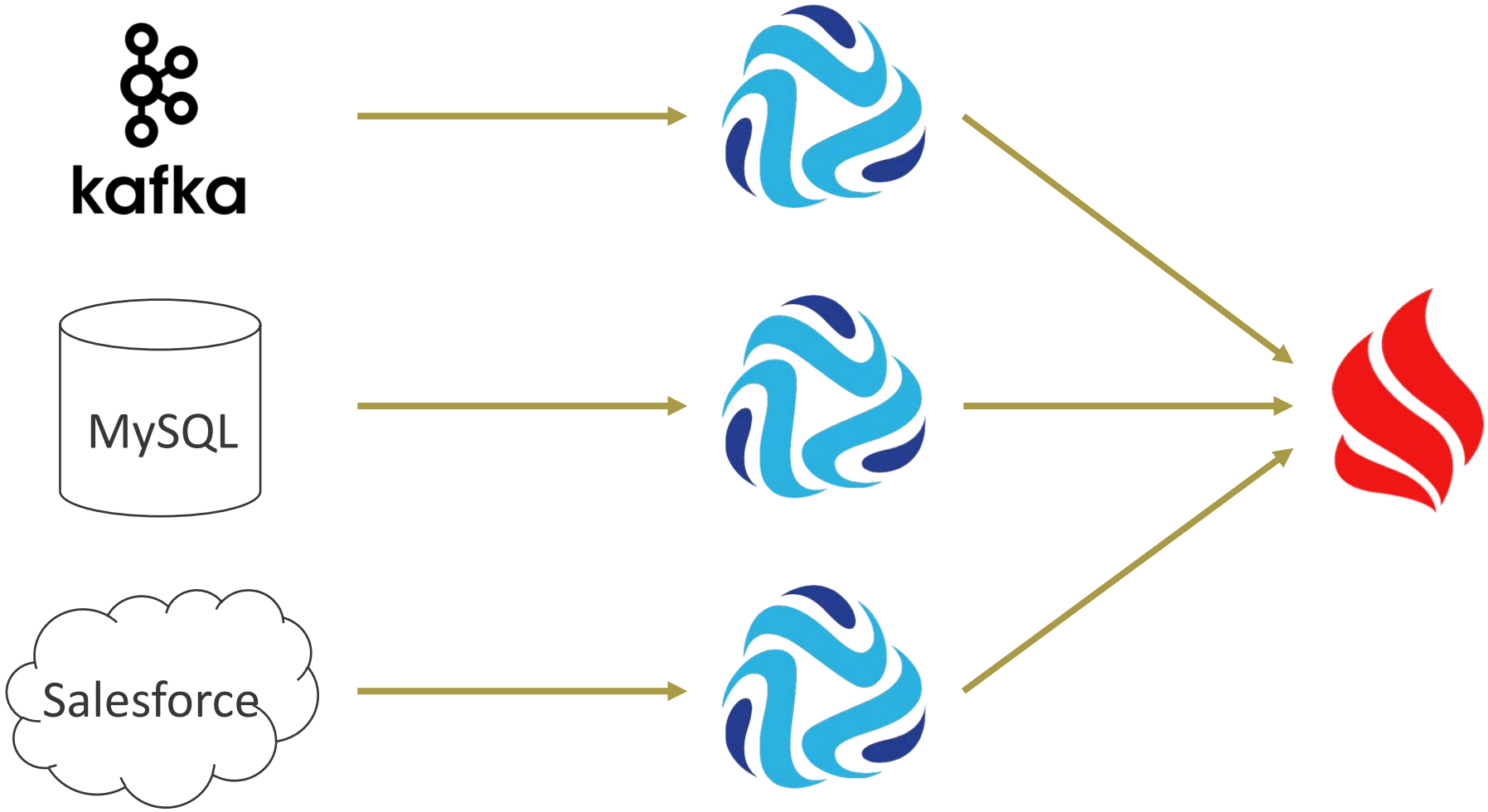
`jdbc:ignite:thin://hostname[:port1..port2][,hostname...][/schema][?<params>]`

NOTE – when querying metadata: table, column names must be `UPPERCASE!!!` - IGNITE-9730

There is also the JDBC *Client* Driver – starts its own client node

Demo: Ingest from CSV

Data Architecture



Demo: Ingest Kafka, MySQL, Salesforce

But…

IGNITE-9606 breaks JDBC integrations ☹

`metadata.getPrimaryKeys()` returns `_KEY` as the column name, returns column name as primary key name

Had to build an ugly workaround into the JDBC Consumer to get my demo working:

```
ResultSet result = metadata.getPrimaryKeys(connection.getCatalog(), schema, table);
while (result.next()) {
  // Workaround for Ignite bug
  String pk = result.getString(COLUMN_NAME);
  if ("_KEY".equals(pk)) {
    pk = result.getString(PK_NAME);
  }
  keys.add(pk);
}
```

Continuous Streaming Application

Listen for high priority service tickets

Get the last 10 sensor readings for the affected device

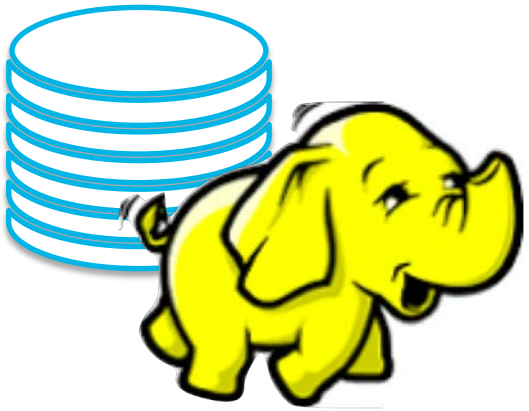
Continuous Streaming Application

```
// SQL query to run with serial number
SqlFieldsQuery sql = new SqlFieldsQuery(
    "SELECT timestamp, fault FROM fault WHERE serial_number = ? ORDER BY timestamp DESC LIMIT 10"
);
// Process notifications - executes locally
qry.setLocalListener((values) -> {
  for (String serialNumber : values) {
    System.out.println("Device serial number " + serialNumber);
    System.out.println("Last 10 faults:");
    QueryCursor<List<?>> query = faultCache.query(sql.setArgs(serialNumber));
    for (List<?> result : query.getAll()) {
      System.out.println(result.get(0) + " | " + result.get(1));
    }
  }
});
```

Demo: Ignite Streaming App

Other Common StreamSets Use Cases

Data Lake Replatforming



IoT

Cybersecurity

Real-time applications

Customer Success

*"StreamSets allowed us to build and operate **over 175,000** pipelines and synchronize 97% of our structured data in R&D to our Data Lake **within 4 months**. This will save us billions of dollars."*

*"We **chose StreamSets over NiFi** as our enterprise-wide standard for our next generation data lake infrastructure because of their singular focus on solving deployment and operations challenges."*

*"It's simple and easy enough that we don't need to find a StreamSets developer to create their own data pipelines. **Before, it could take 90 days** just to find a traditional ETL developer."*

Conclusion

Ignite's continuous queries provide a robust notification mechanism for acting on changing data

Ignite's thin JDBC driver is flawed, but useful

StreamSets Data Collector can read data from a wide variety of sources and write to Ignite via the JDBC driver

References

Apache Ignite Continuous Queries

apacheignite.readme.io/docs/continuous-queries

Apache Ignite JDBC Driver

apacheignite-sql.readme.io/docs/jdbc-driver

Download StreamSets

streamsets.com/opensource

StreamSets Community

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Thank You!

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