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AWS INNOVATE

ONLINE CONFERENCE 2017

Serverless Data Processing on AWS

Daniel Zoltak

What to Expect From the Session

Together, we will:

- Explore a real use cases of **IoT Analytics** using the **Amazon Kinesis** family of services.
- See a demo of IoT and Amazon Kinesis in action.
- Take a deep dive into underlying **reference architectures** and **implementation.**

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What to Expect From the Session

By the end of this session, you will:

- Have an appreciation of the AWS services required to build a **serverless** IoT **analytics** platform.
- Be able to describe the role and functionality of Amazon Kinesis **Firehose**, Amazon Kinesis **Streams**, and Amazon Kinesis **Analytics**.
- Understand how to **acquire**, **process**, and **store** IoT data.

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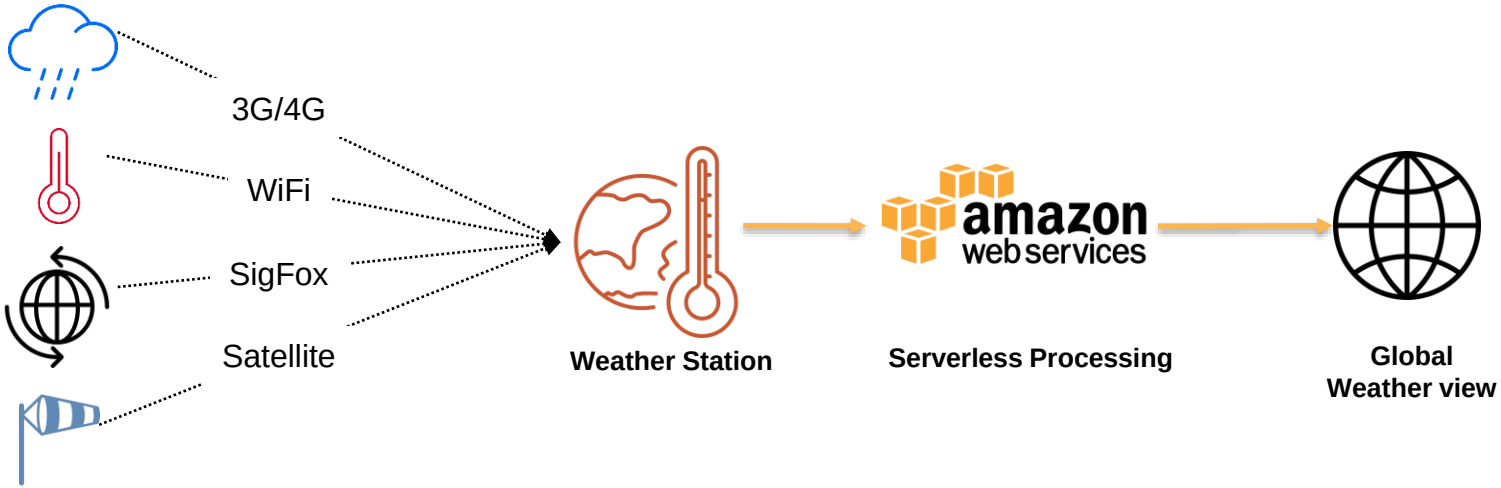
What You Are About to See



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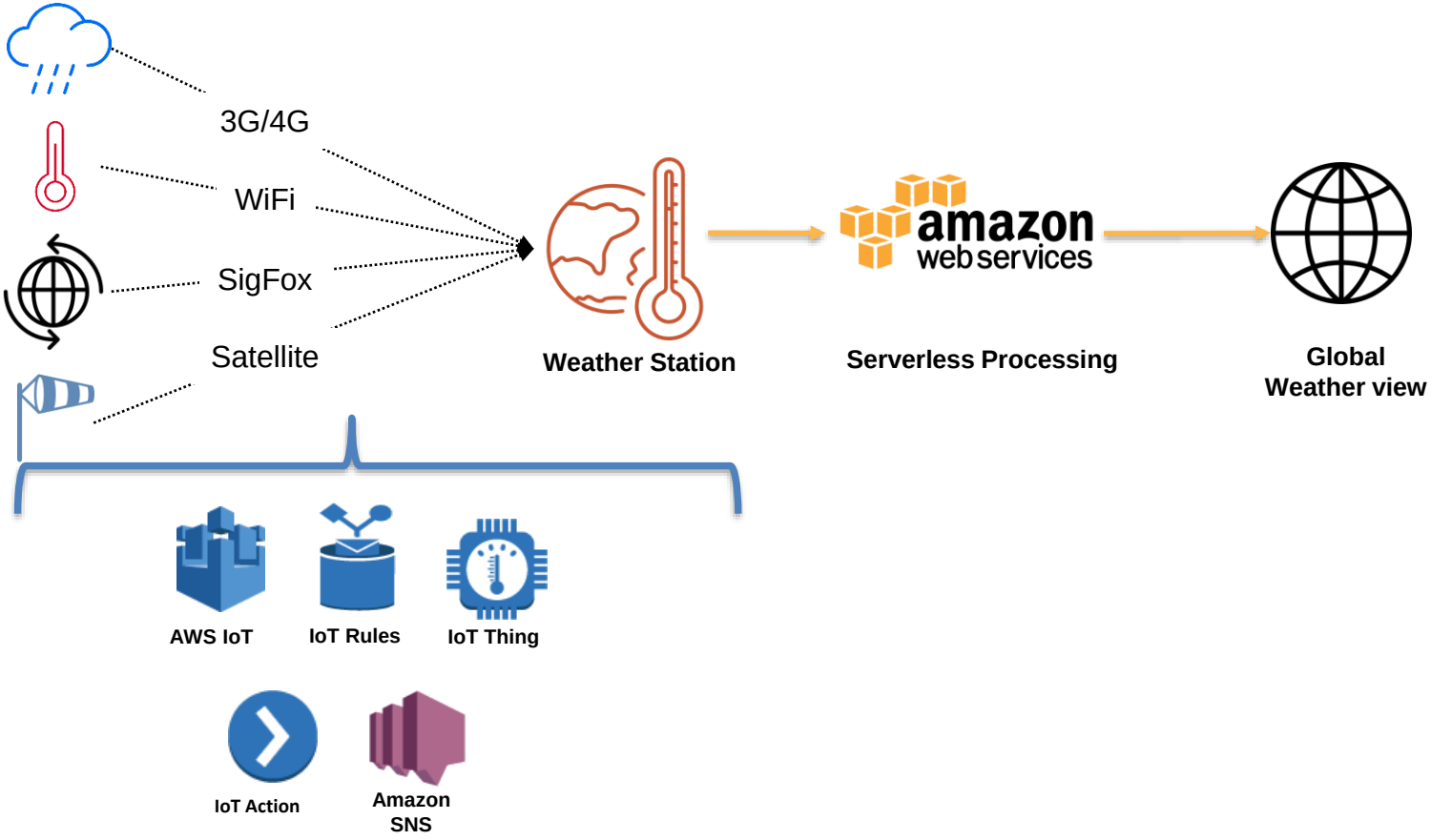

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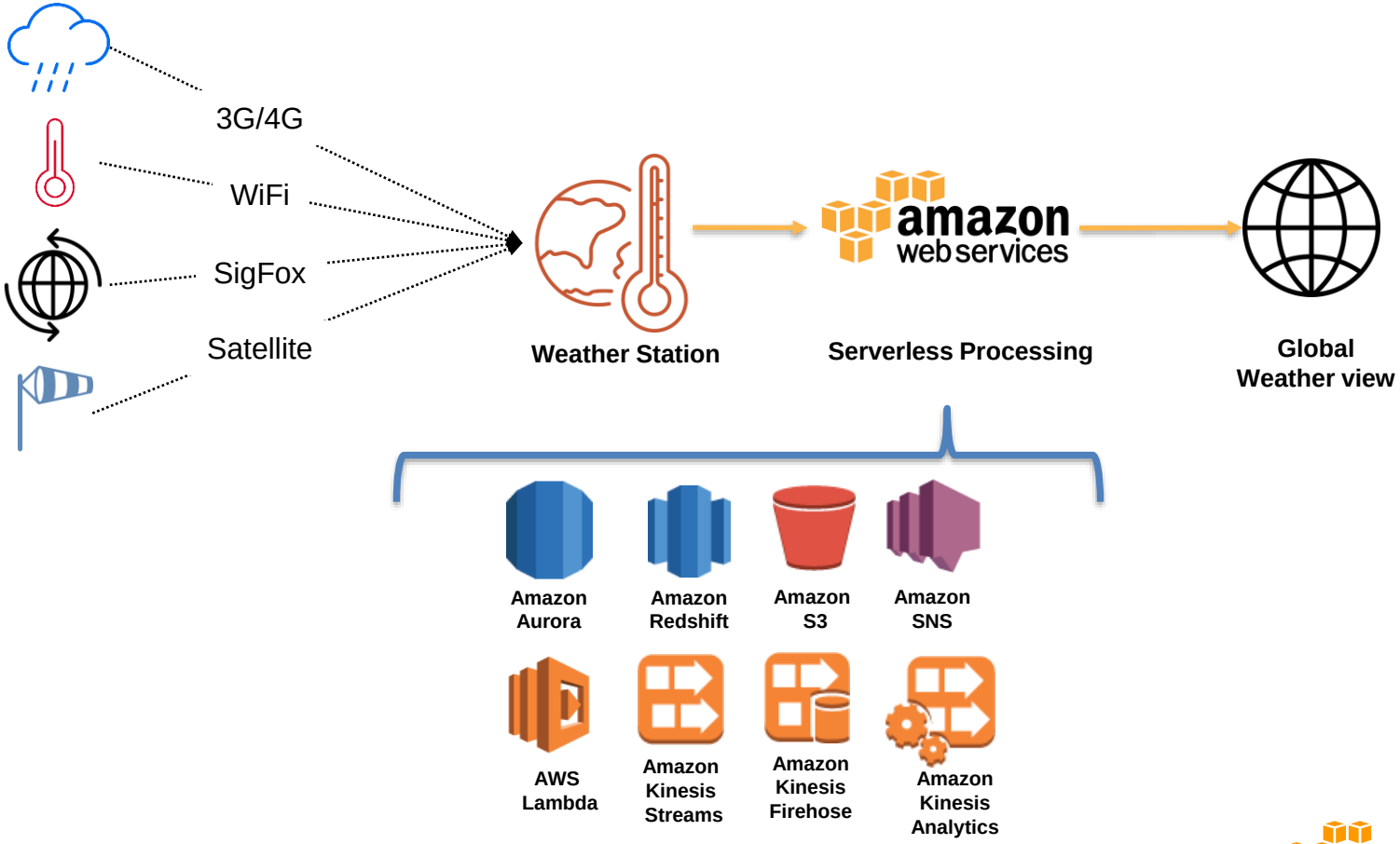

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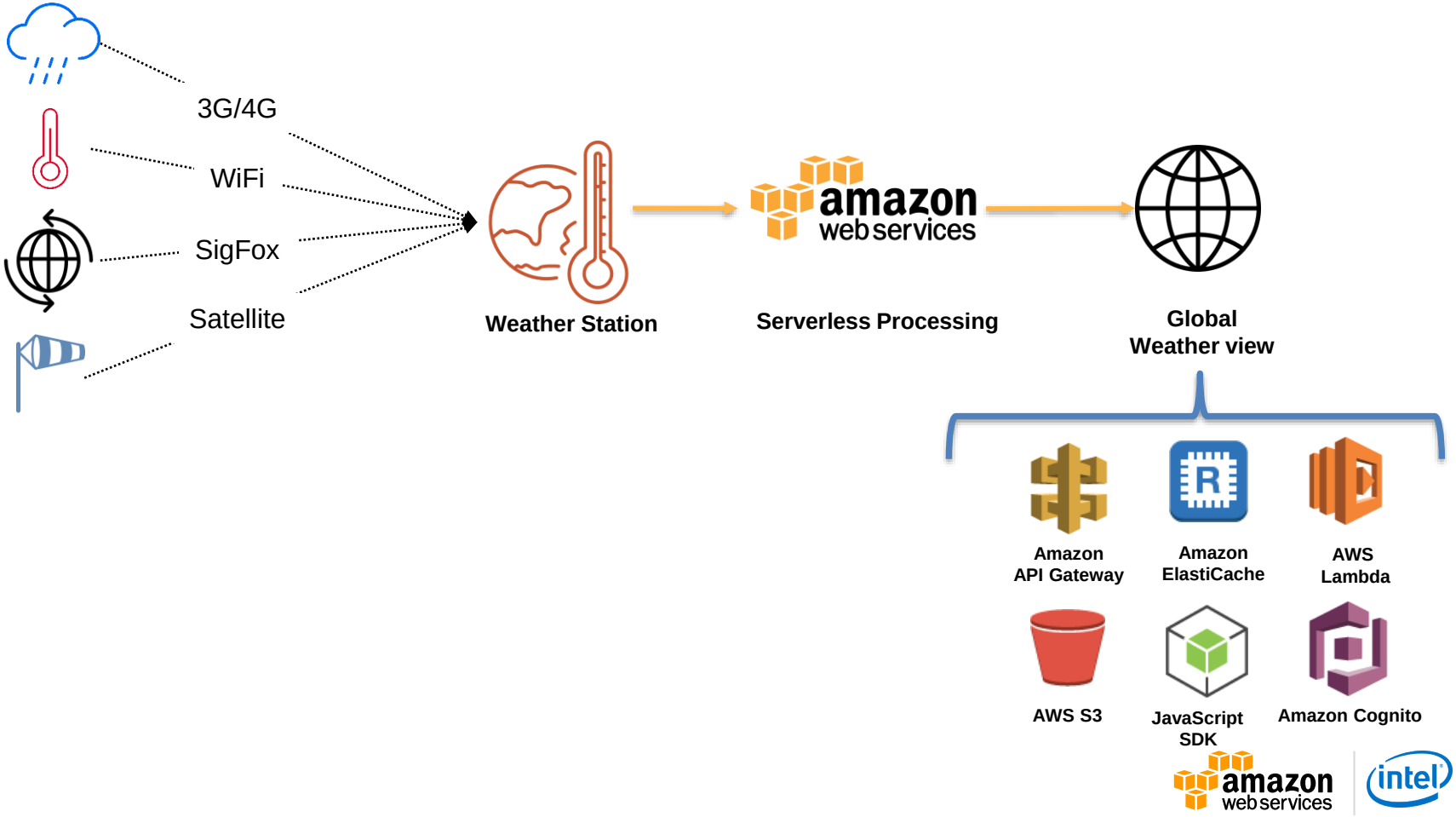

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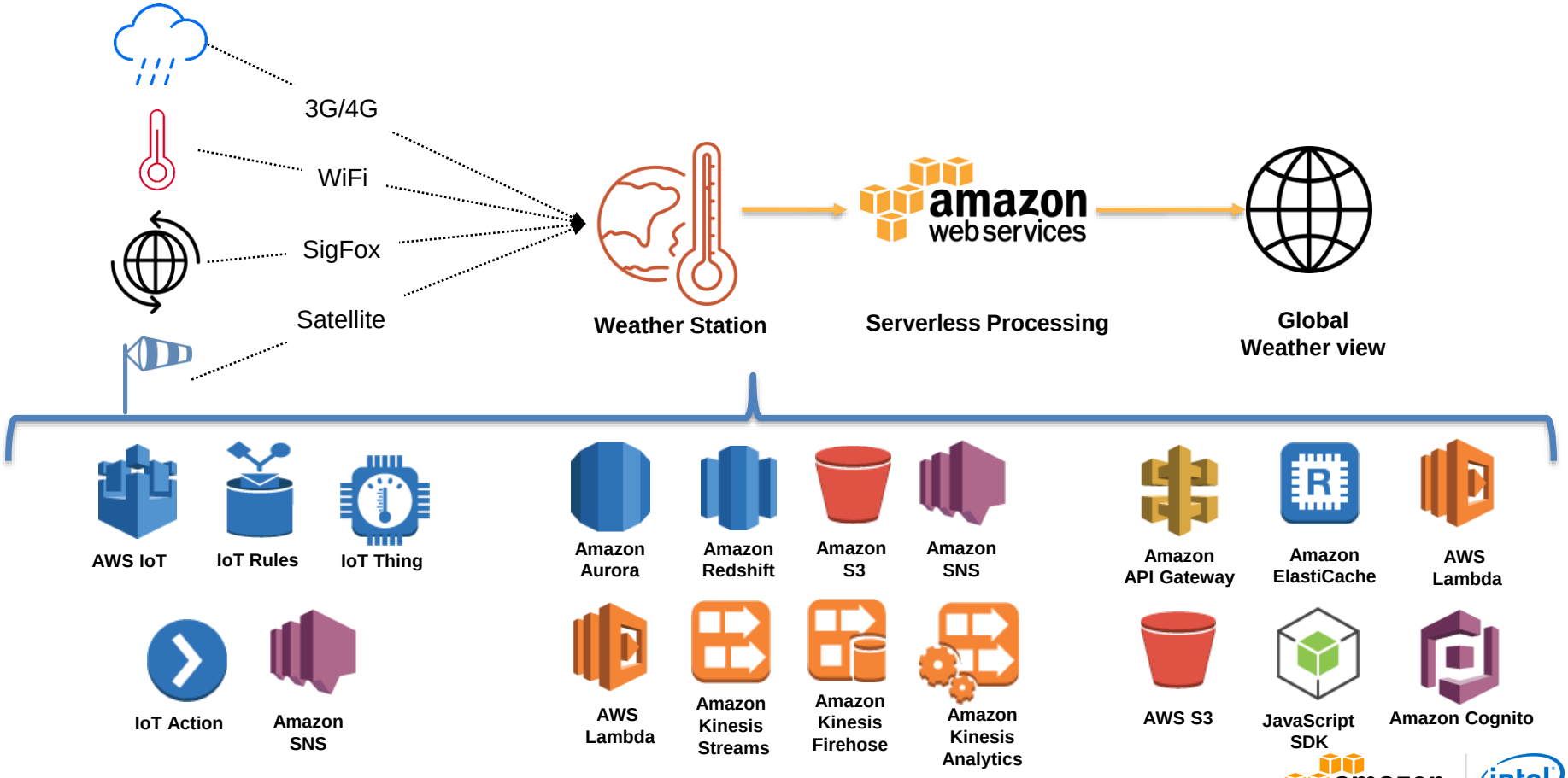

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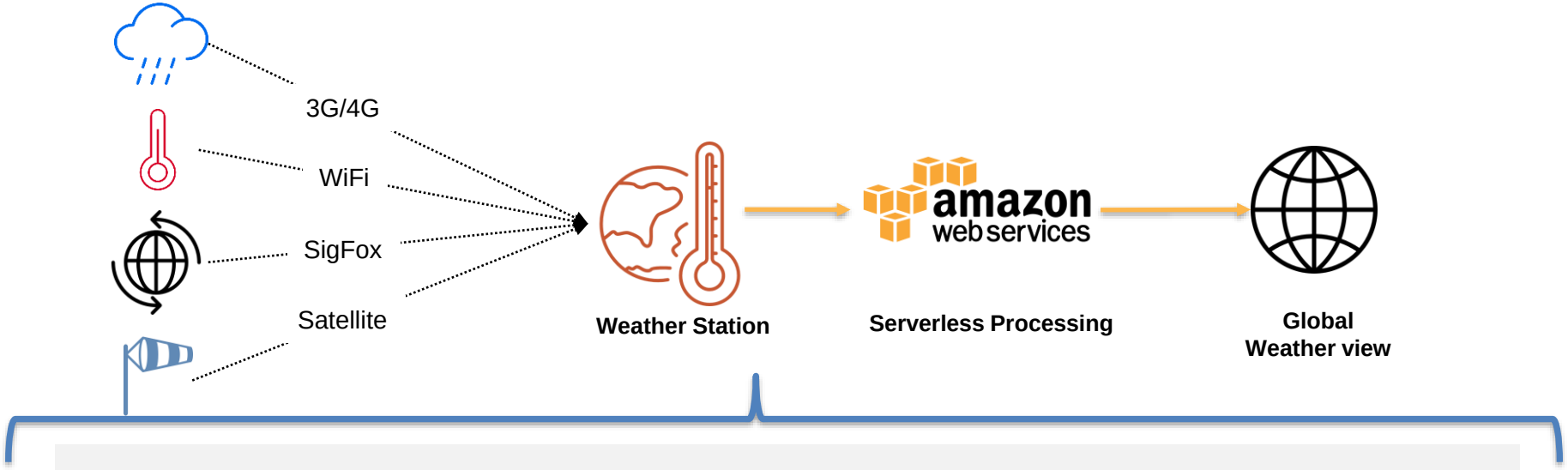

10 AWS features and services
&
0 servers to manage

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Demo

View Demo: https://s3-ap-southeast-1.amazonaws.com/mktg-apac/Final+AWS+Innovate+Videos/AWS+Innovate+-+Demos/Serverless+Data+Processing+on+AWS+(Level+300)+-+Demo+1.mp4

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What Do Our Customers Ask For?

Our customers ask us to help them

- Ingest **large volumes** of real-time data from a large fleet of distributed IoT devices at scale.
- Perform advanced **analytics** of streaming data in real-time.
- **Process** and store large volumes of data.
- Eliminate capacity planning, **scaling**, and the management of infrastructure.

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What Do Our Customers Ask For?

Designing for failure in global, real-time, distributed systems is hard.

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Designing for failure in global, real-time, distributed systems is hard.

Infrastructure required to process billions of devices sending trillions of messages is expensive.

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What Do Our Customers Ask For?

Designing for failure in global, real-time, distributed systems is hard.

Infrastructure required to process billions of devices sending trillions of messages is expensive.

Management overhead and scale limitations impede innovation.

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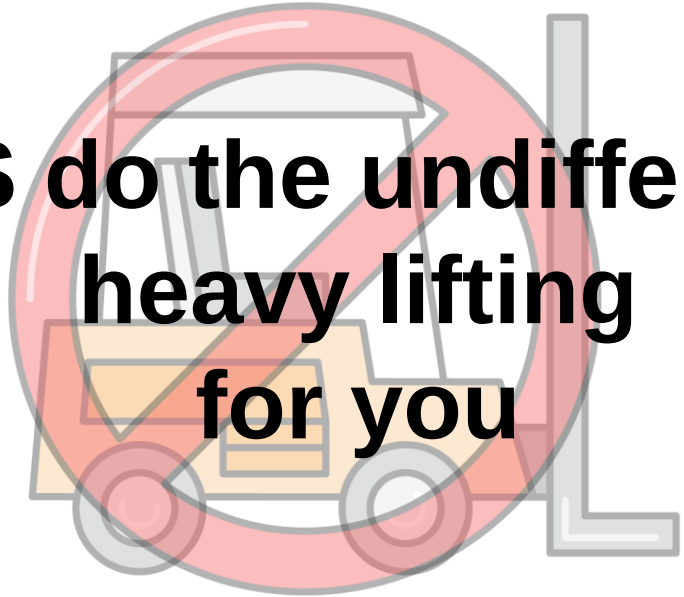
What Do Our Customers Ask For?



Let AWS do the undifferentiated heavy lifting for you

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Reference Model

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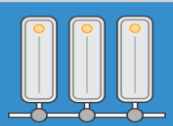
Reference Model

SECURITY



NETWORKING

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Reference Model

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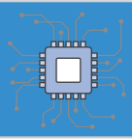
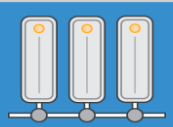


COMPUTE



NETWORKING

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Reference Model

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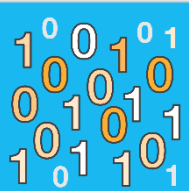
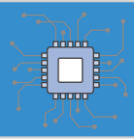


DATA SOURCE



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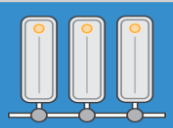

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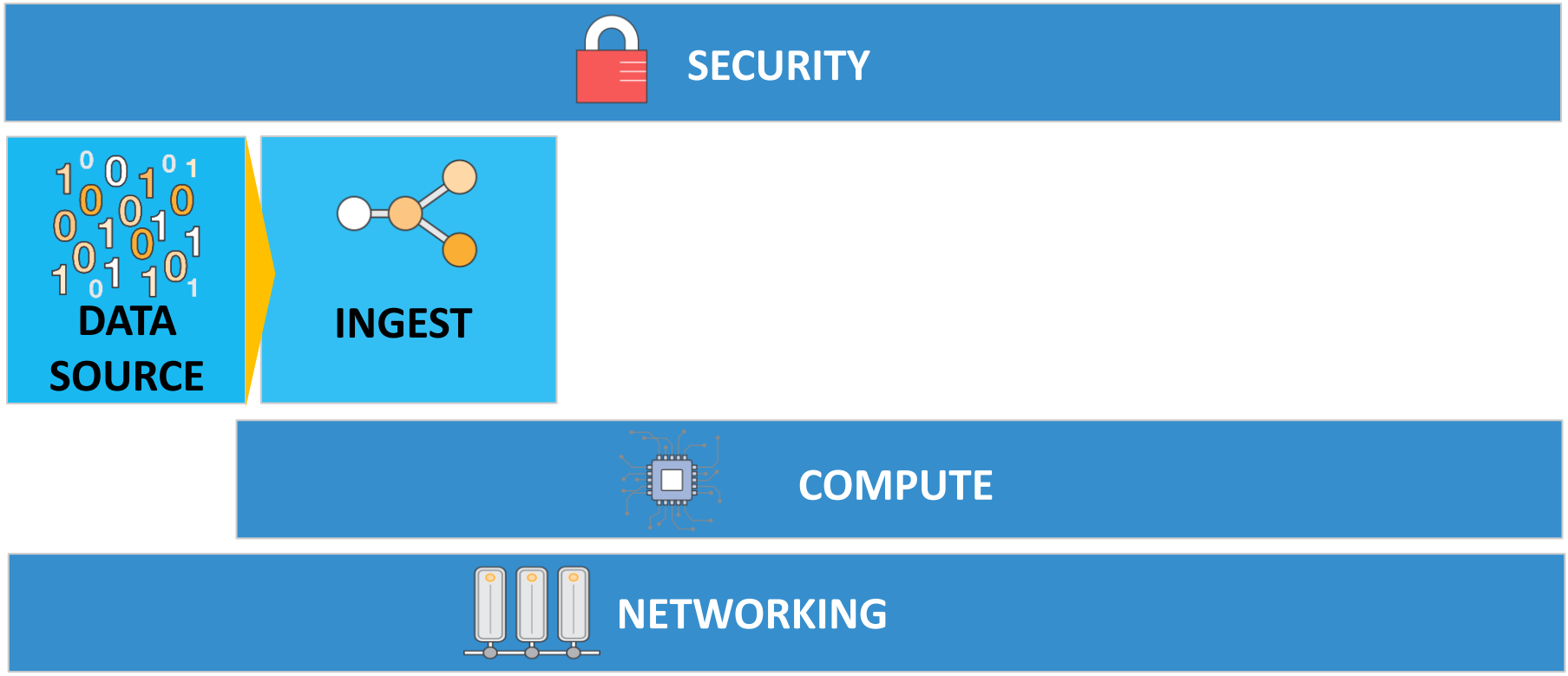

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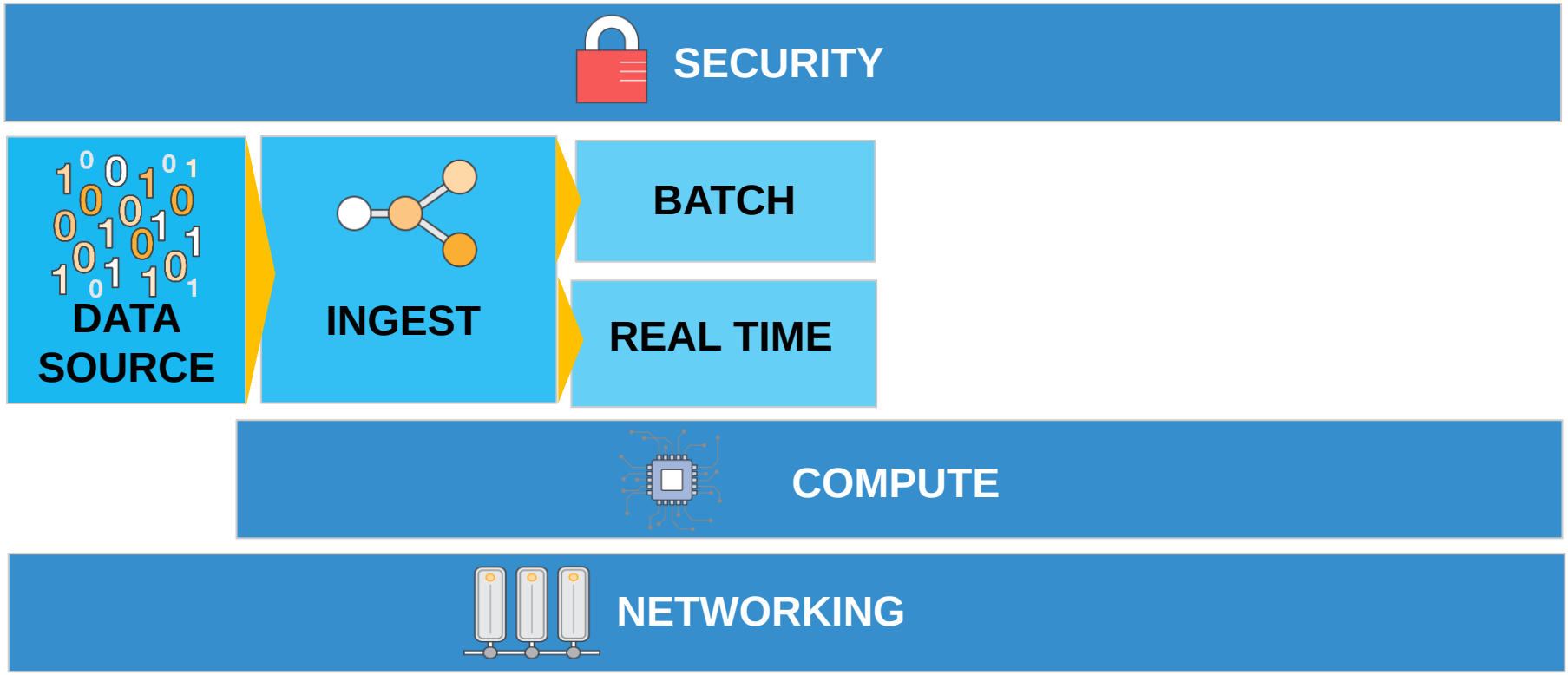

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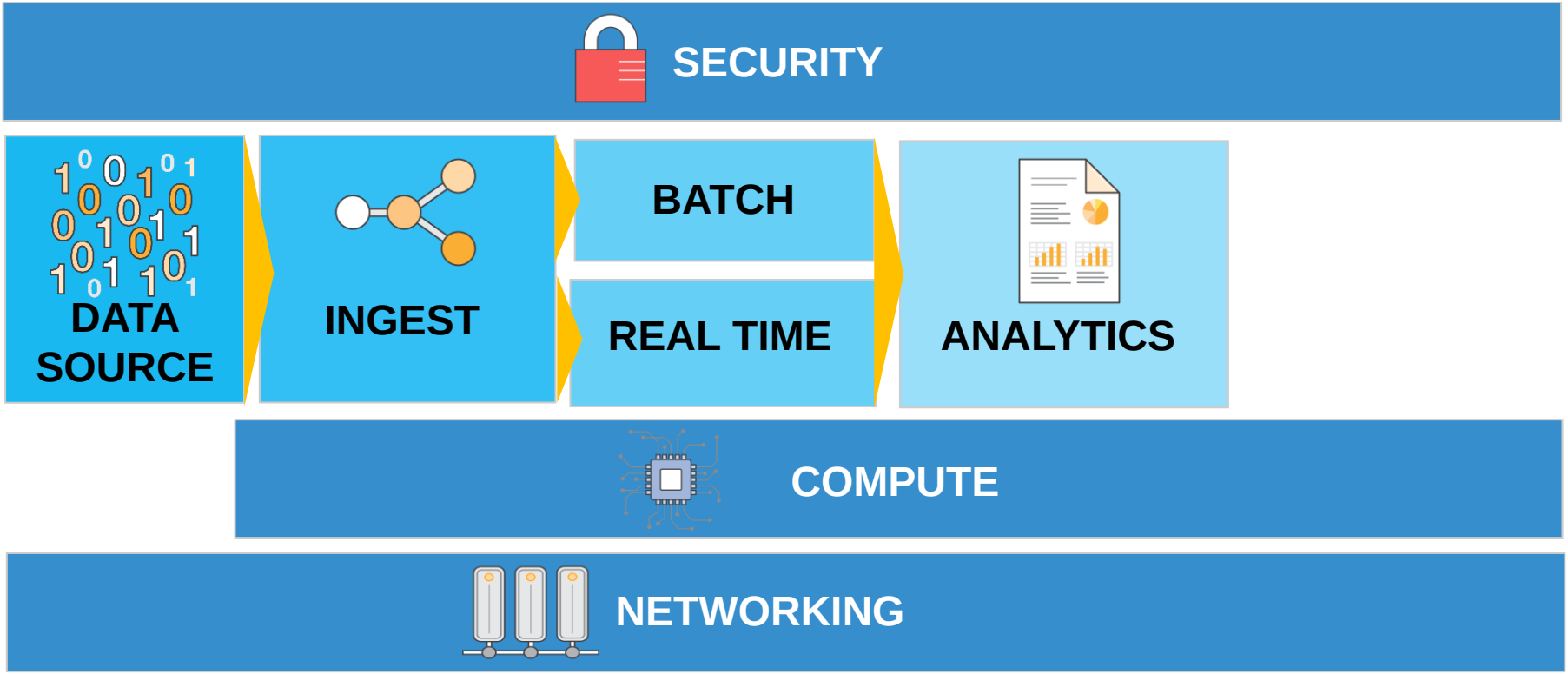

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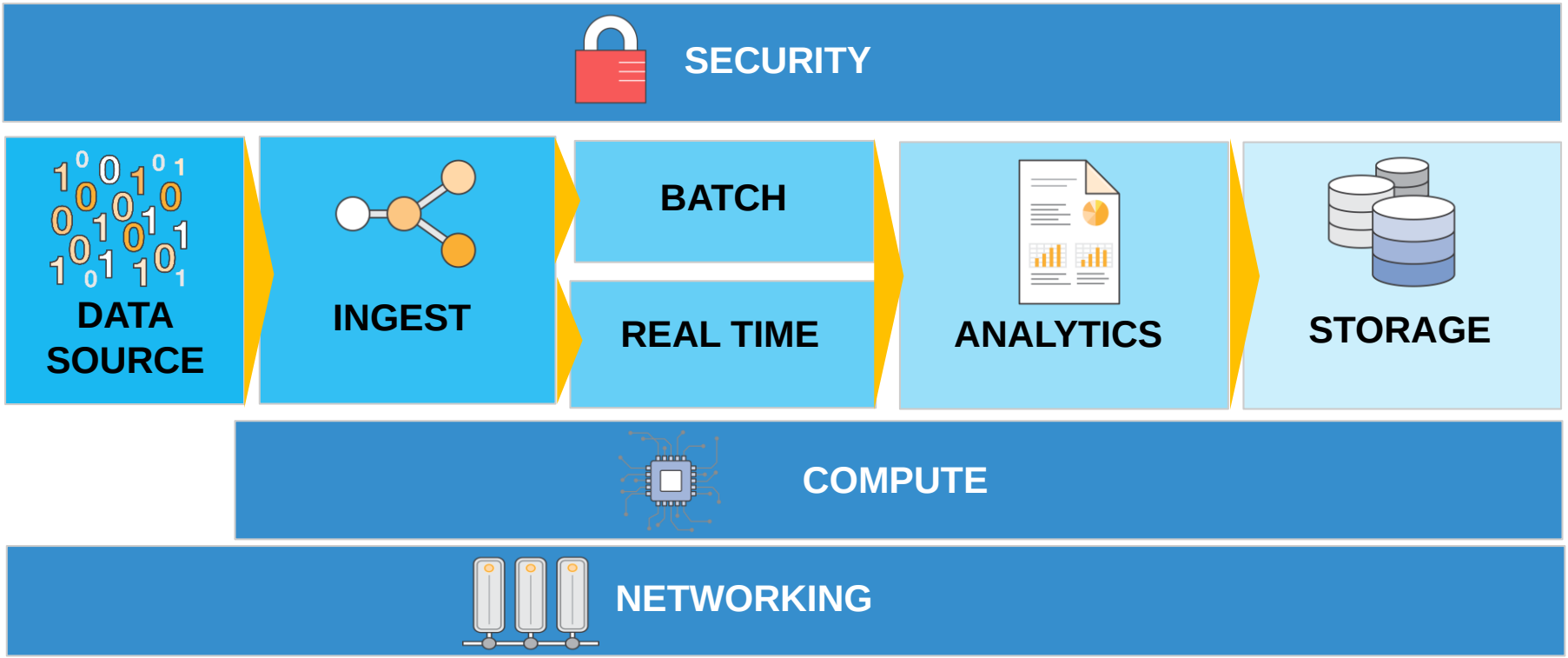

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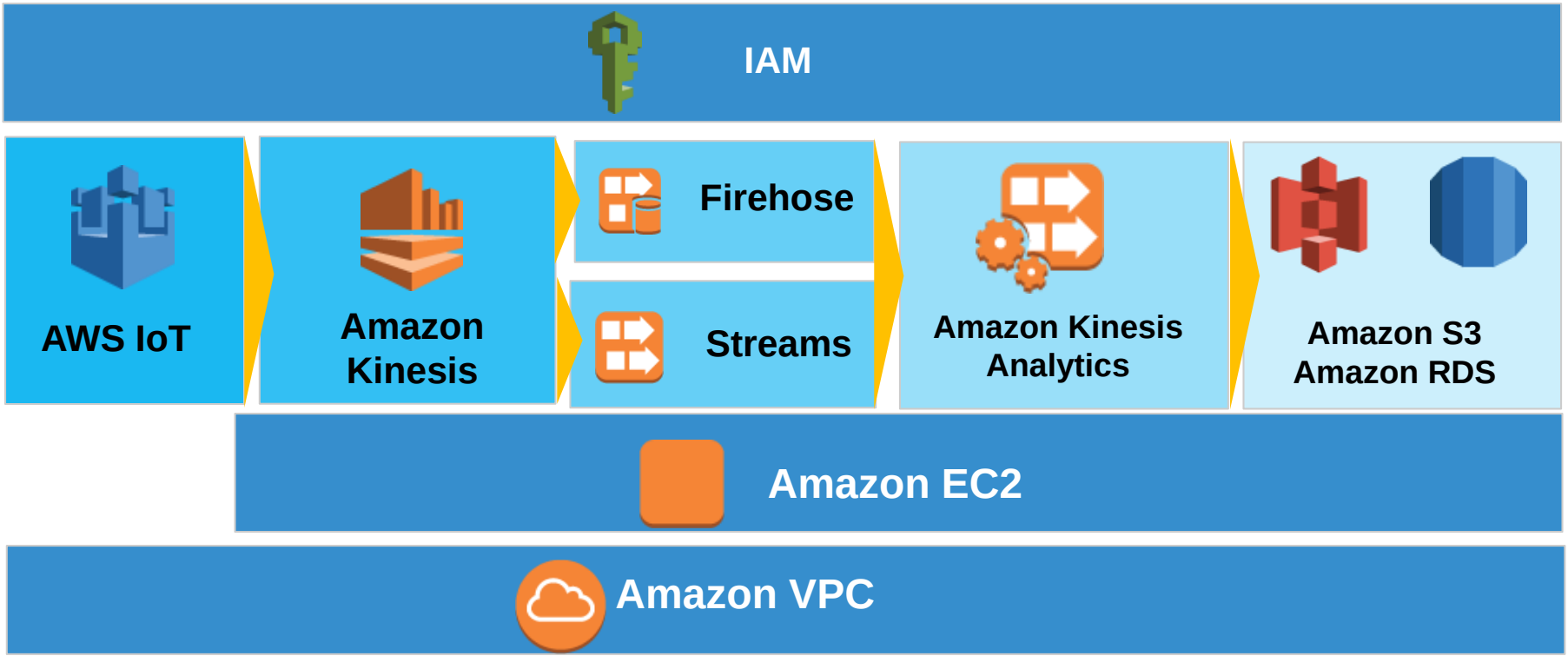
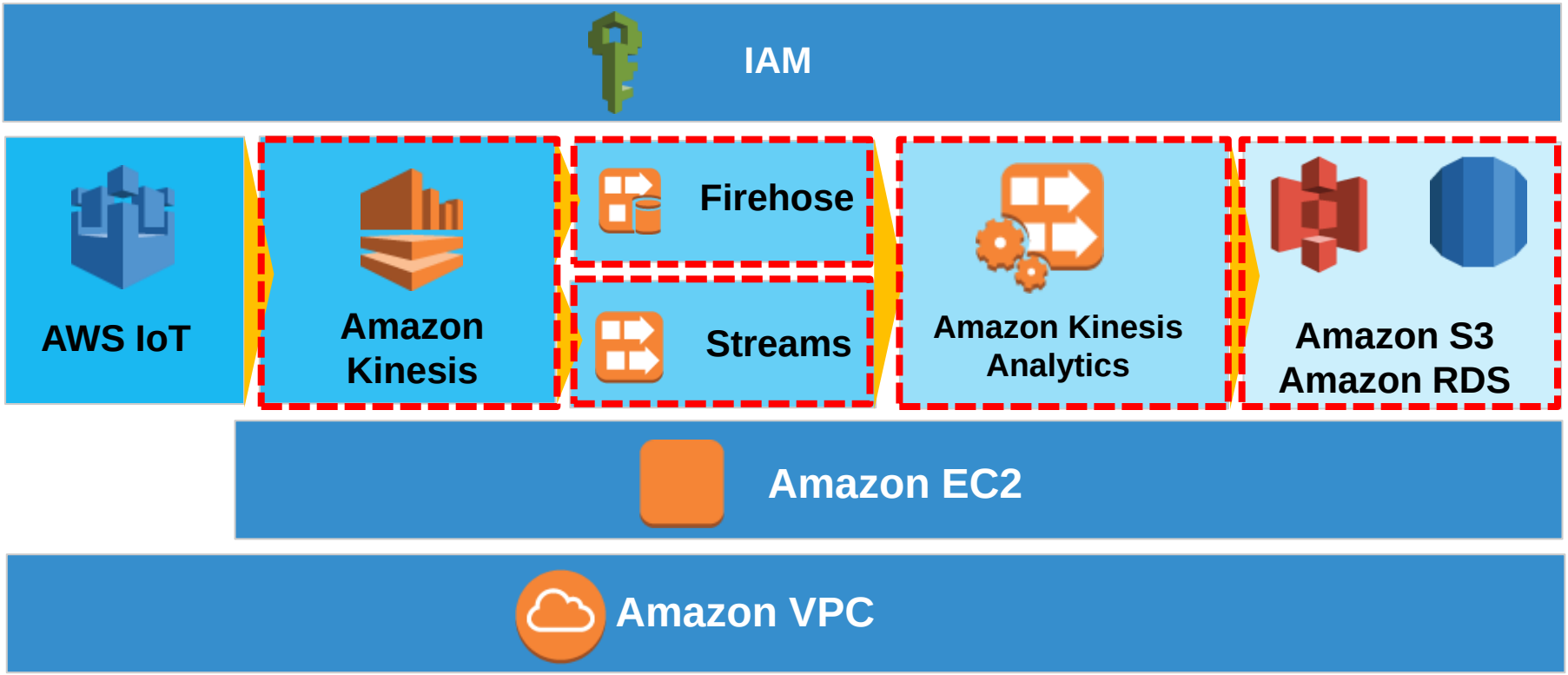
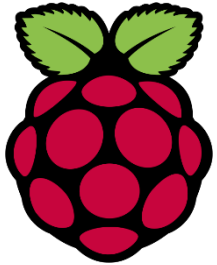


Reference Model - Focus Today

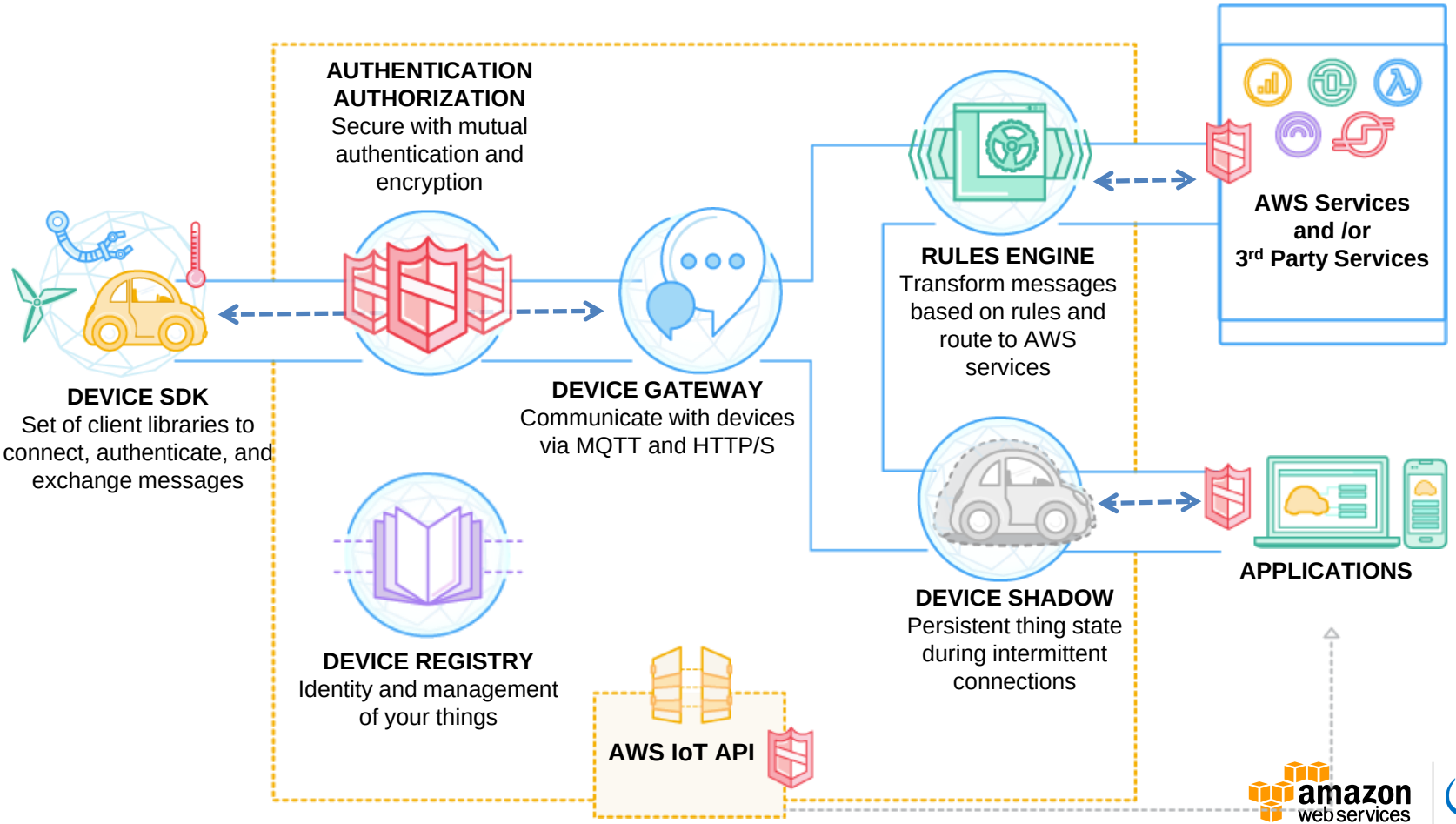


What Is An IoT “Thing”?

- Mobile Devices
  - IOS, Android, Kindle, Tablets.
- Maker Devices
  - Arduino, Raspberry Pi, Intel Edison.
- Embedded devices and wearables
  - Health and fitness management; safety and tracking.
- Smart Home
  - Smoke alarms, temperature sensors, light globes, and switches.



AWS IoT Framework



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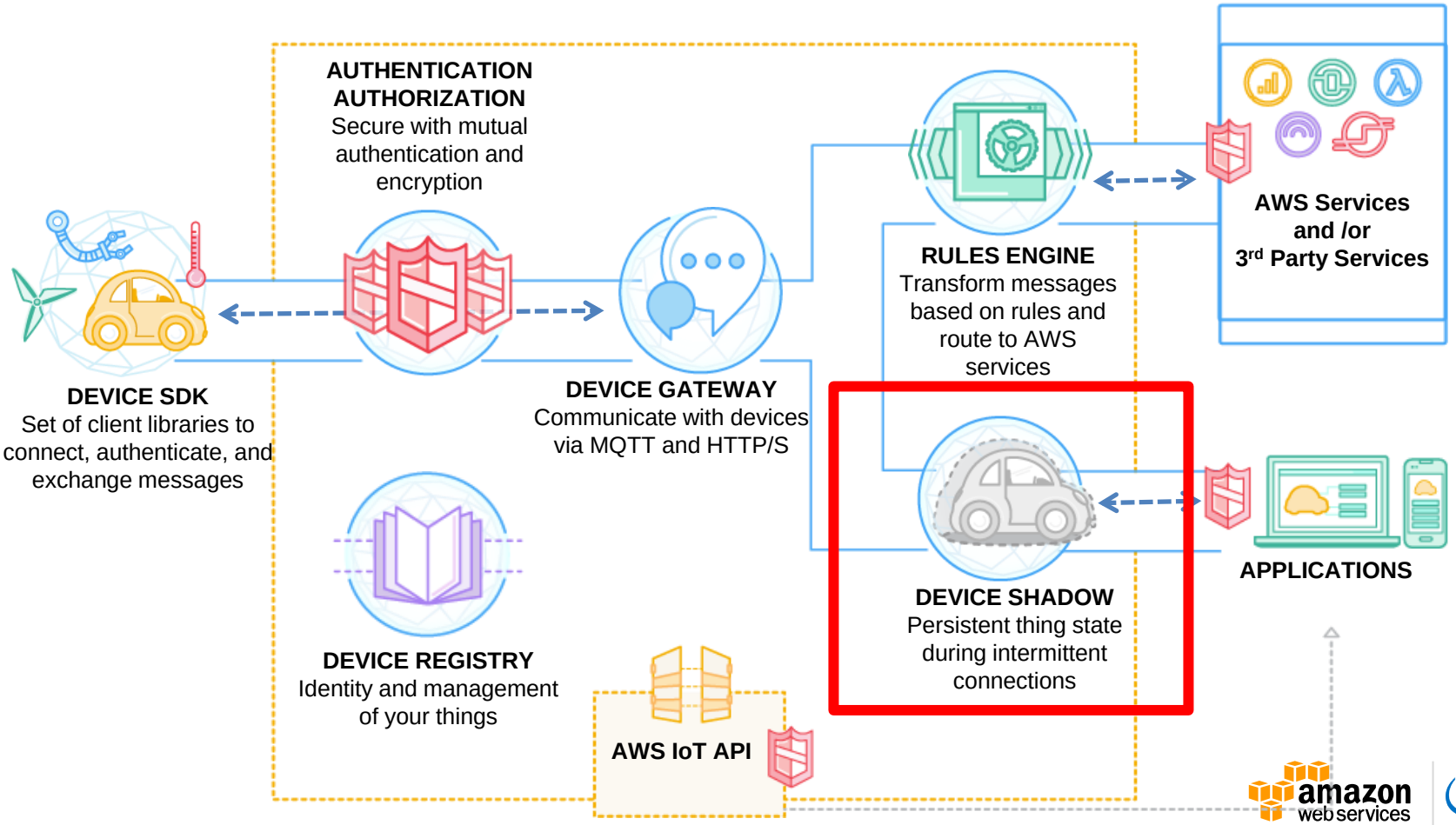

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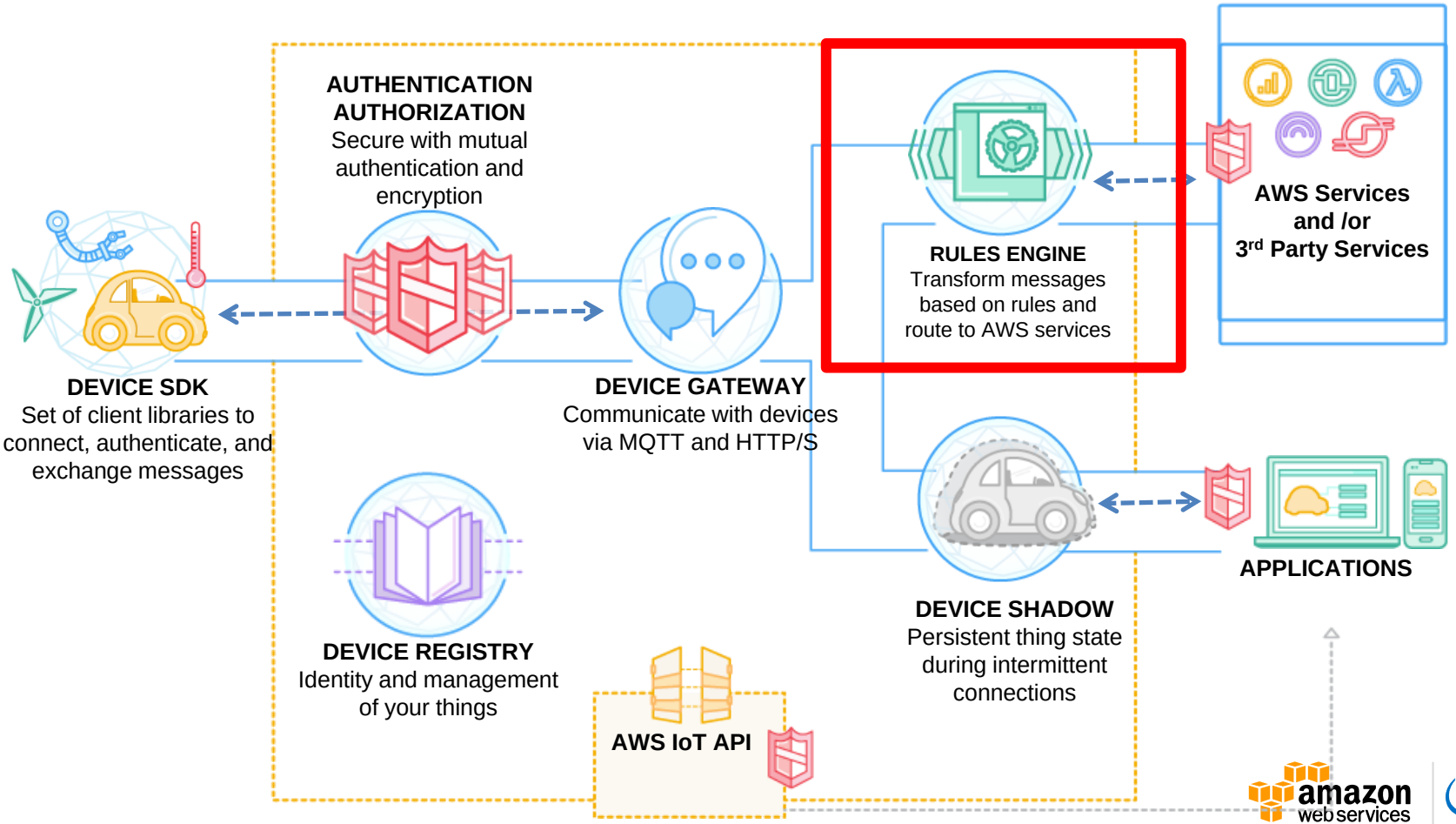

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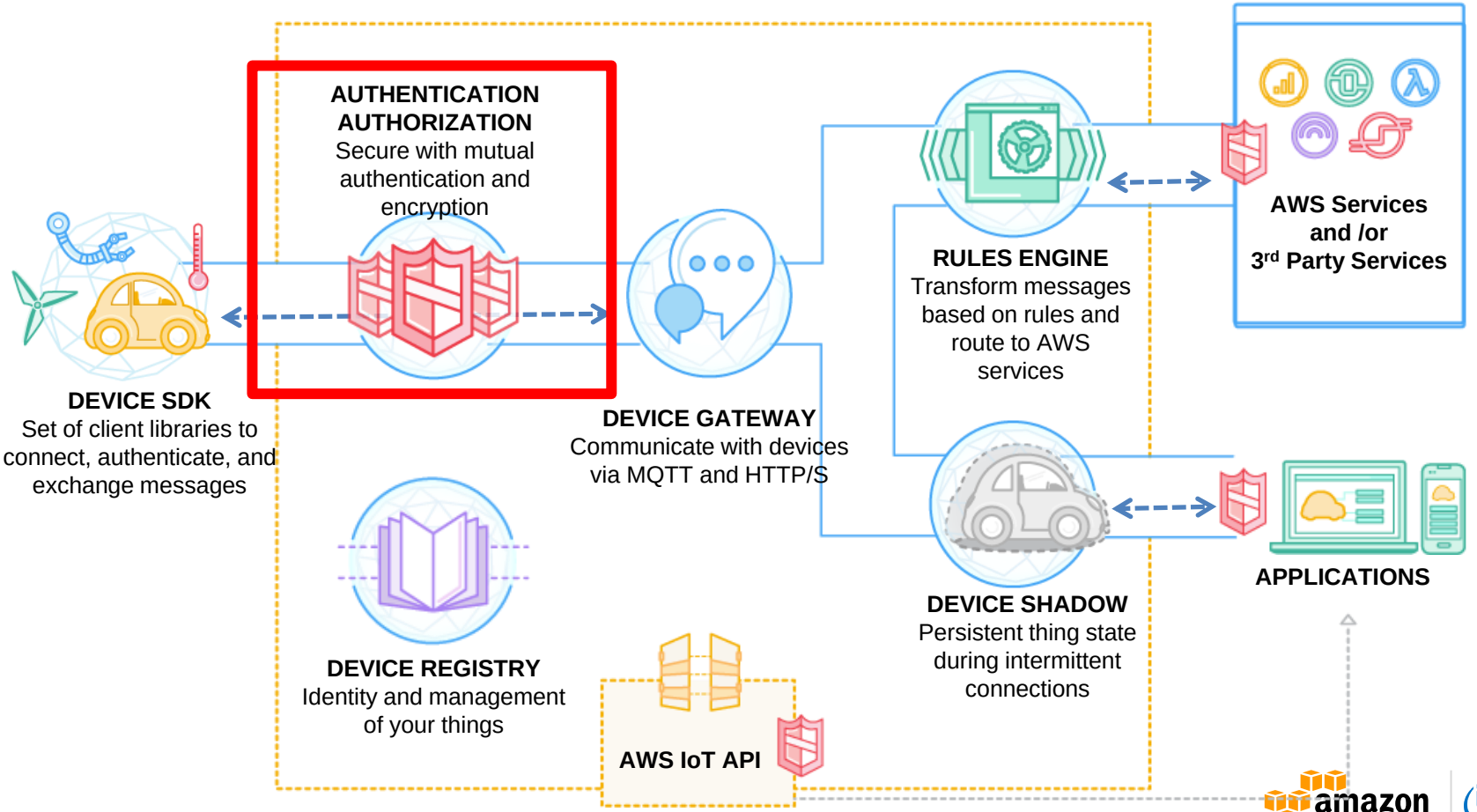

Global Weather Service Architecture

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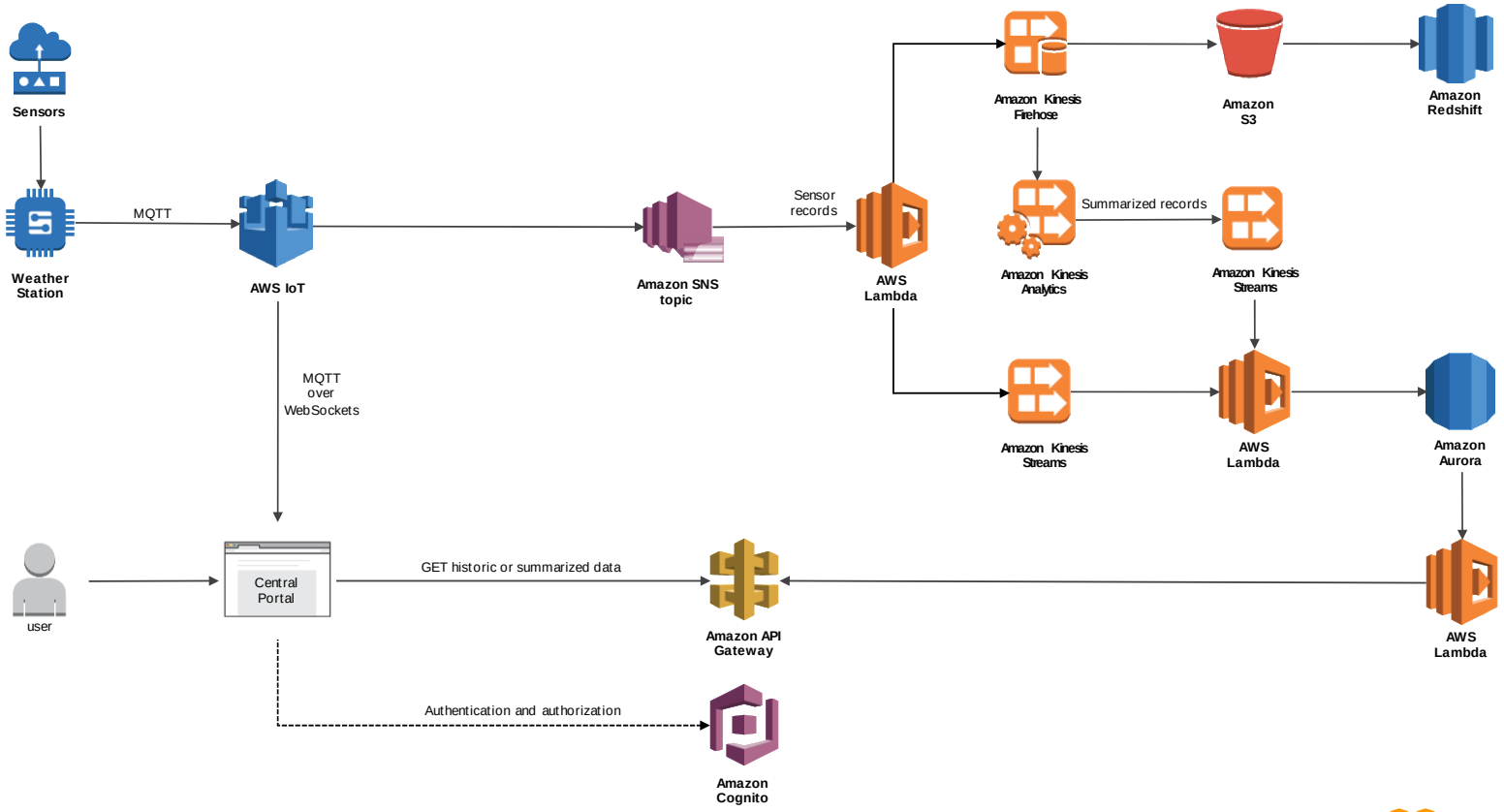
Global Weather Service Architecture



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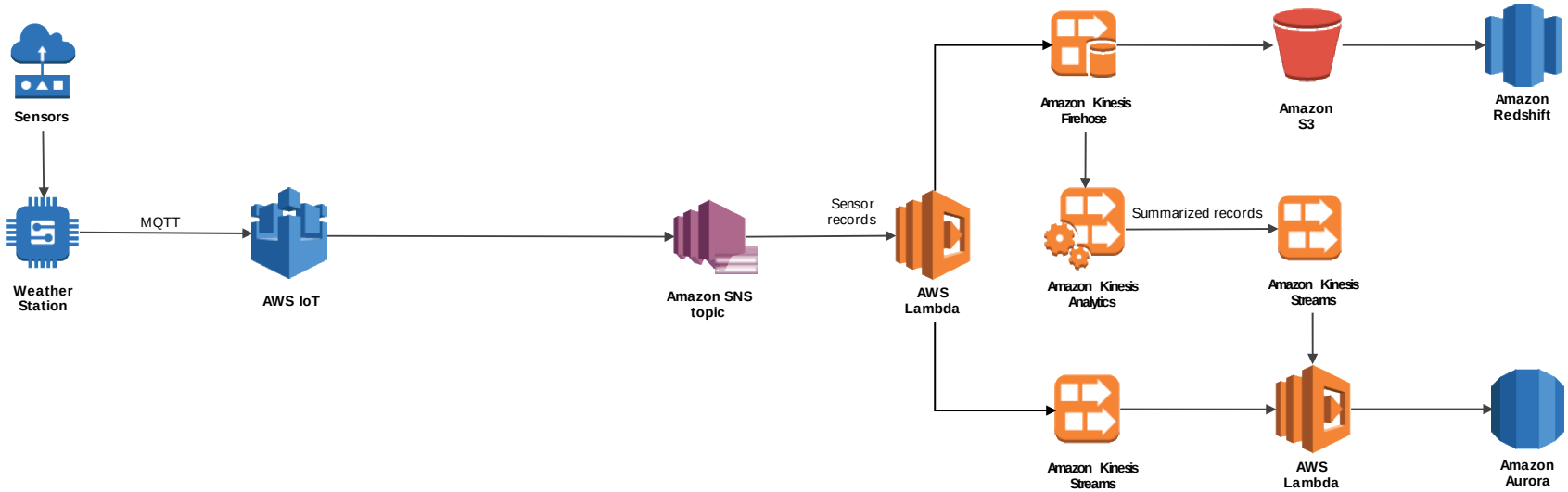
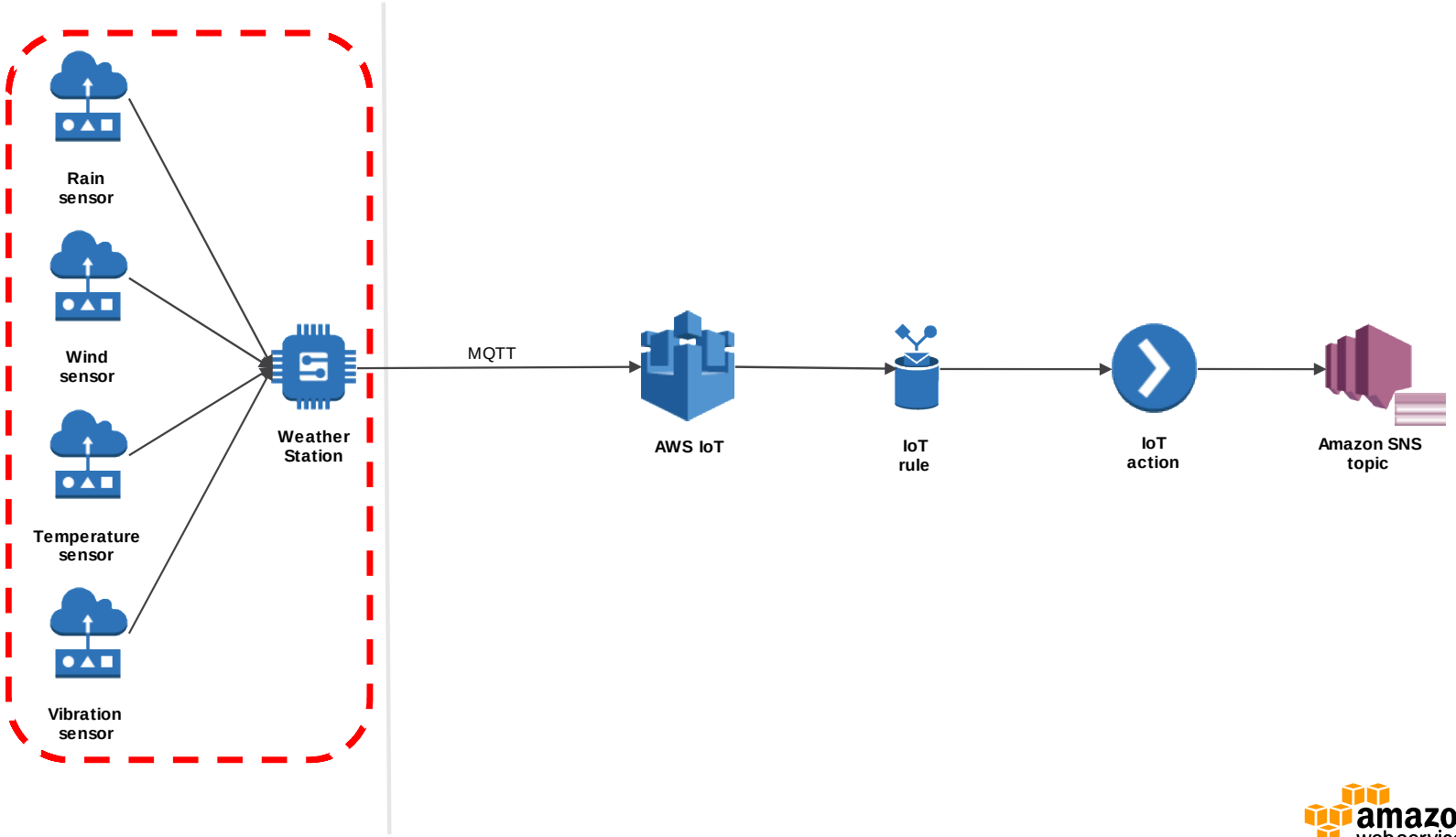


Acquisition Architecture



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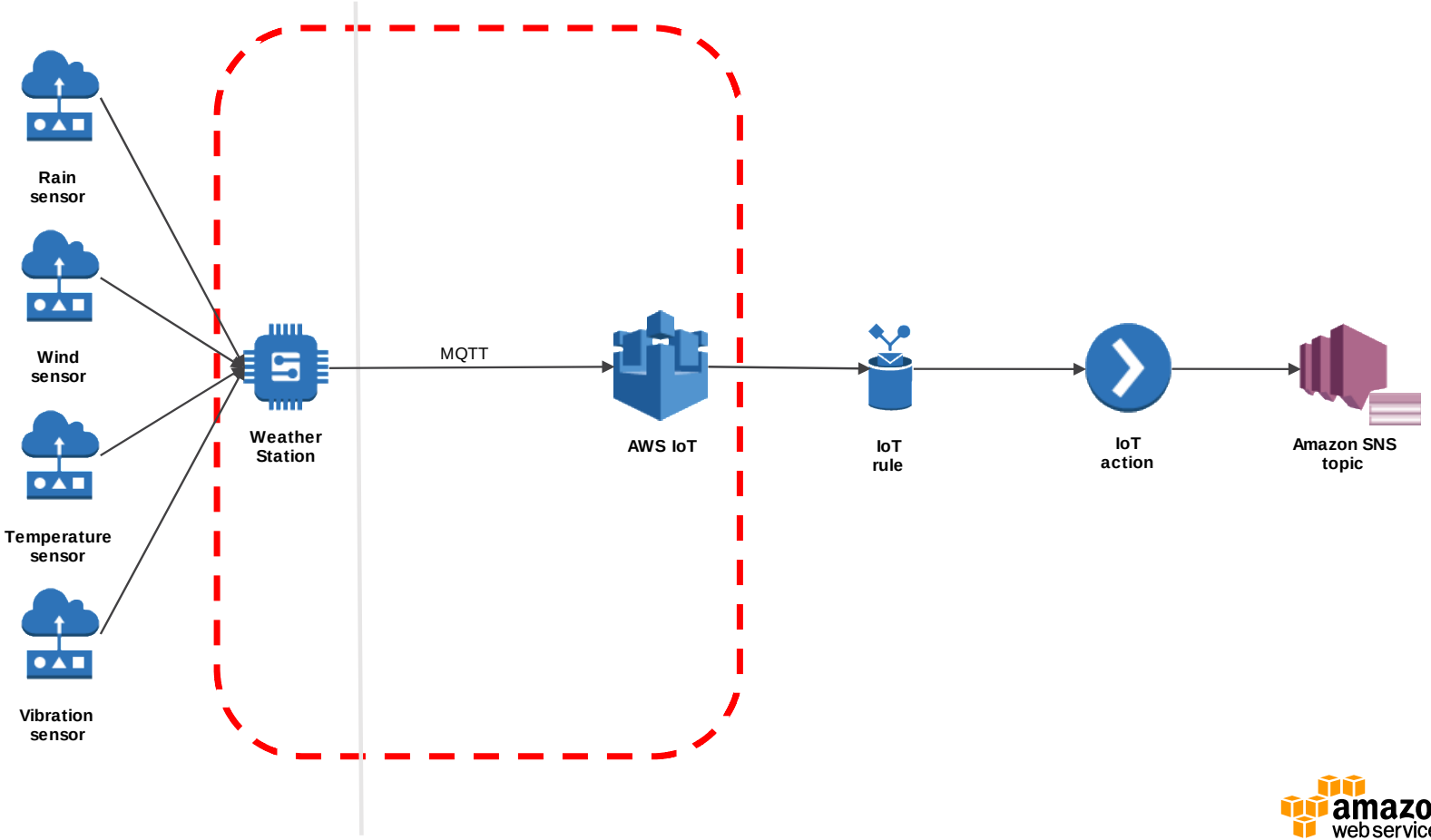

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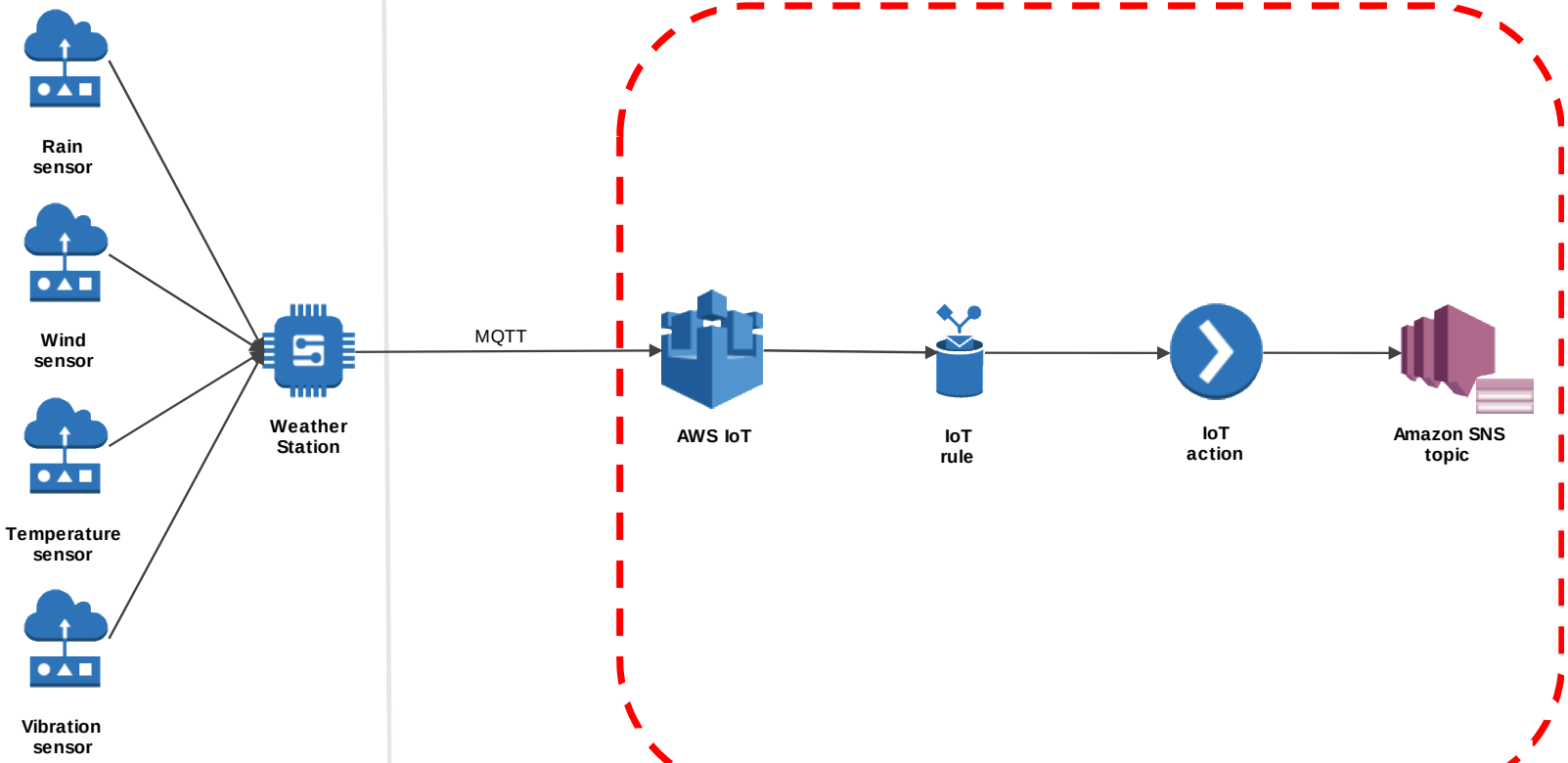

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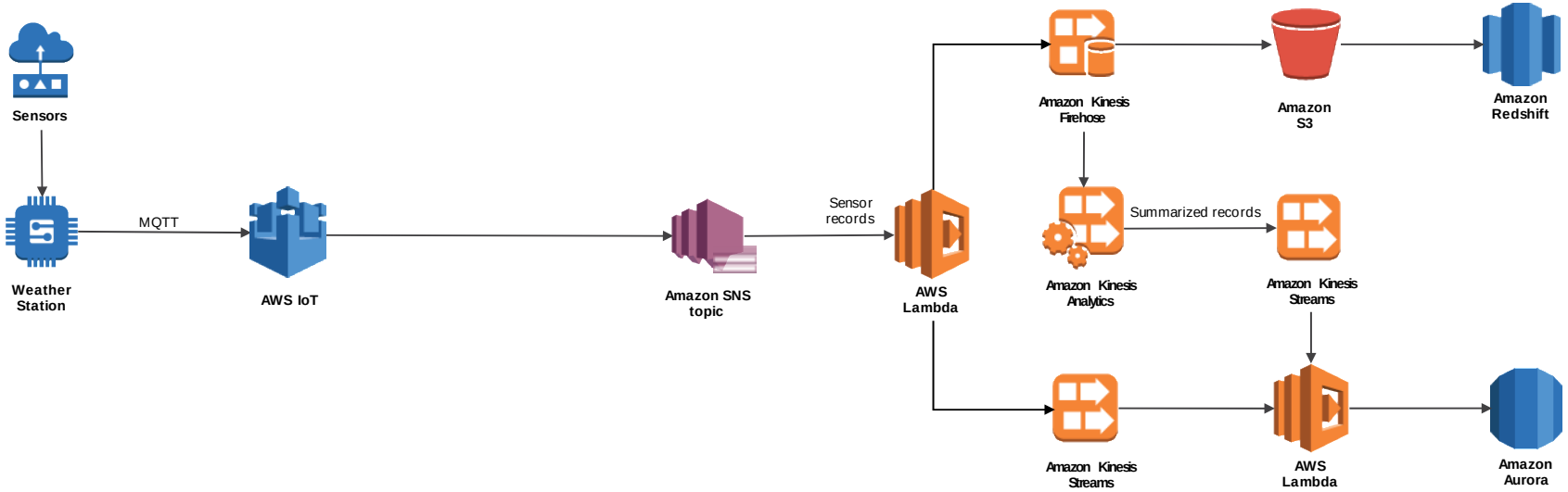
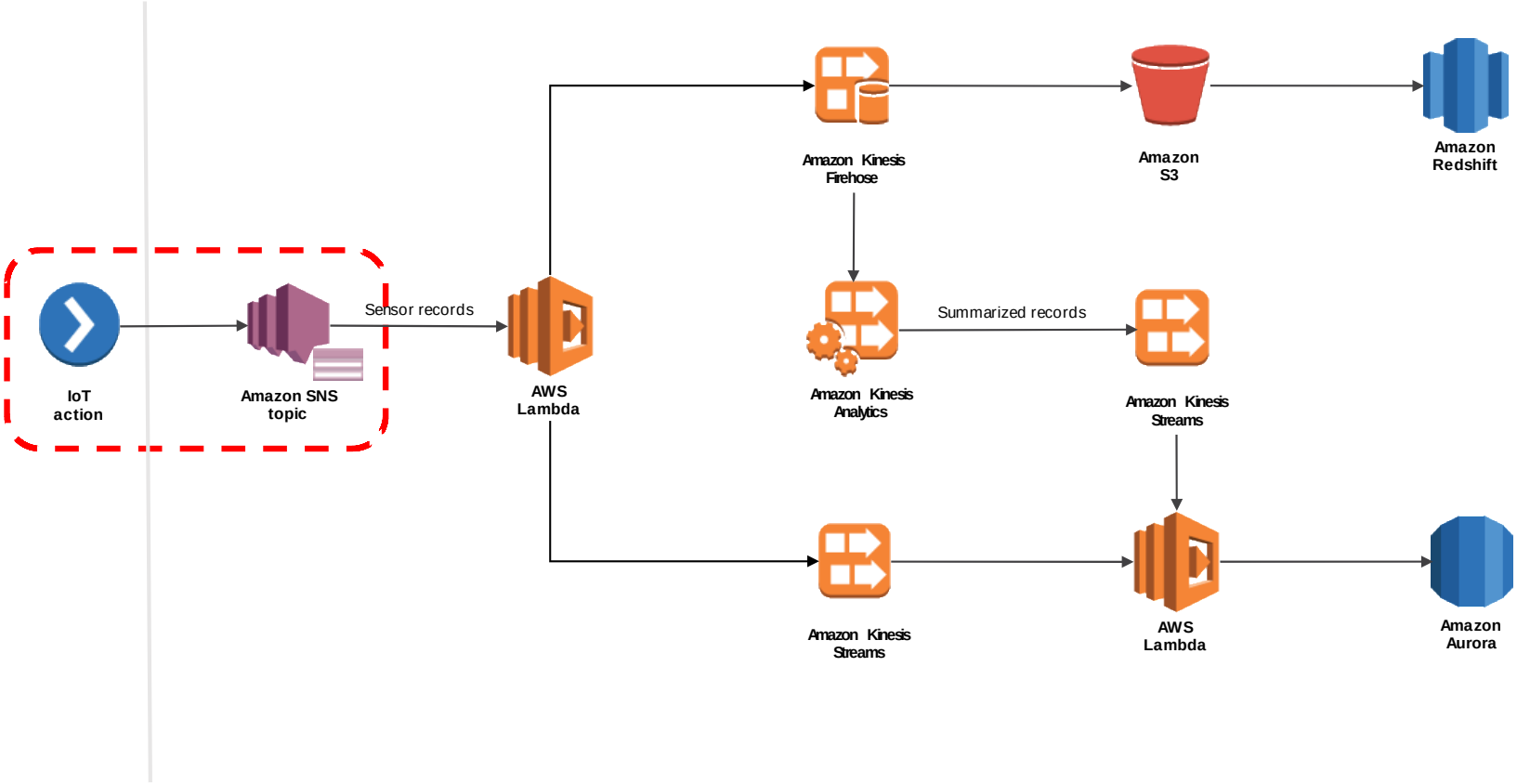


Processing Architecture



AWS IoT – Rule Setup

Incoming MQTT Topic structure

```
weather/<state>/<city>/<station_id>/<sensor_type>/<sensor_id>
```

AWS IoT – Rule Setup

```
SELECT * FROM
topic(6) AS sensor_id, topic(4) AS station_id,
topic(5) AS sensor, sensor_timestamp,
cast(sensor_value as float) AS sensor_value,
cast(sensor_value_smoothed as float) AS sensor_value_smoothed,
cast(direction as int) AS direction
```

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AWS IoT – Rule Setup

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SELECT * FROM
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cast(direction as int) AS direction
```

References the AWS IoT MQTT topic segment

<topic 1>/<topic 2>/…/<topic n>

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AWS IoT – Rule Result


```
{
  "value": 0.610802791886758,
  "direction": -1,
  "smoothed": 0.9843152123890655,
  "timestamp": 1472611226005
}
```

Incoming payload

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AWS IoT – Rule Result

```
{
  "value": 0.610802791886758,
  "direction": -1,
  "smoothed": 0.9843152123890655,
  "timestamp": 1472611226005
}
```

Incoming payload

```
{
  "sensor_id": "bQ7KcaMEas",
  "station_id": "vzqHb8vghO",
  "sensor": "vib",
  "timestamp": 1472611226005,
  "value": 0.610802791886758,
  "value_smoothed": 0.9843152123890655,
  "direction": -1
}
```

Transformed payload

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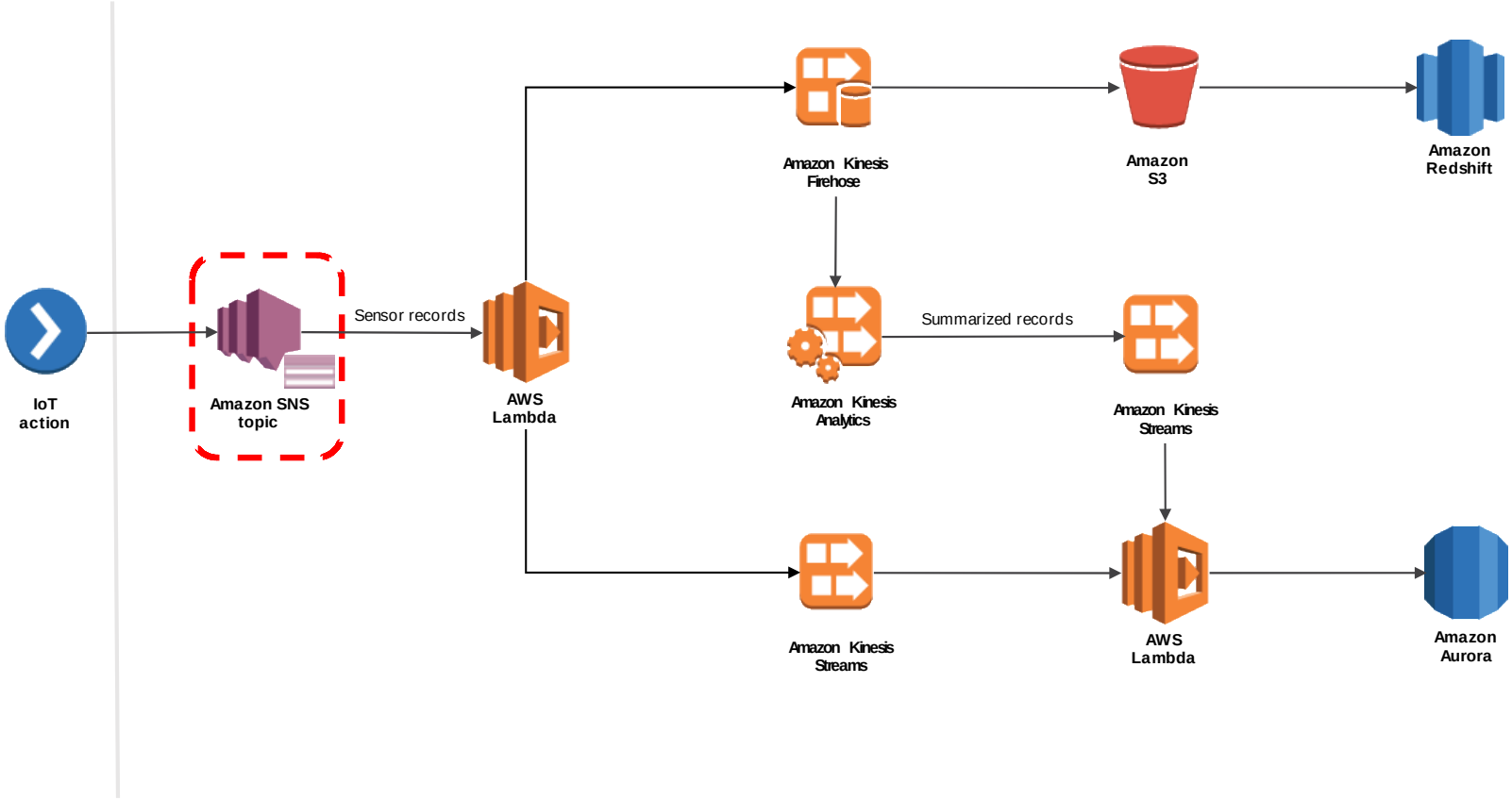
Processing Architecture



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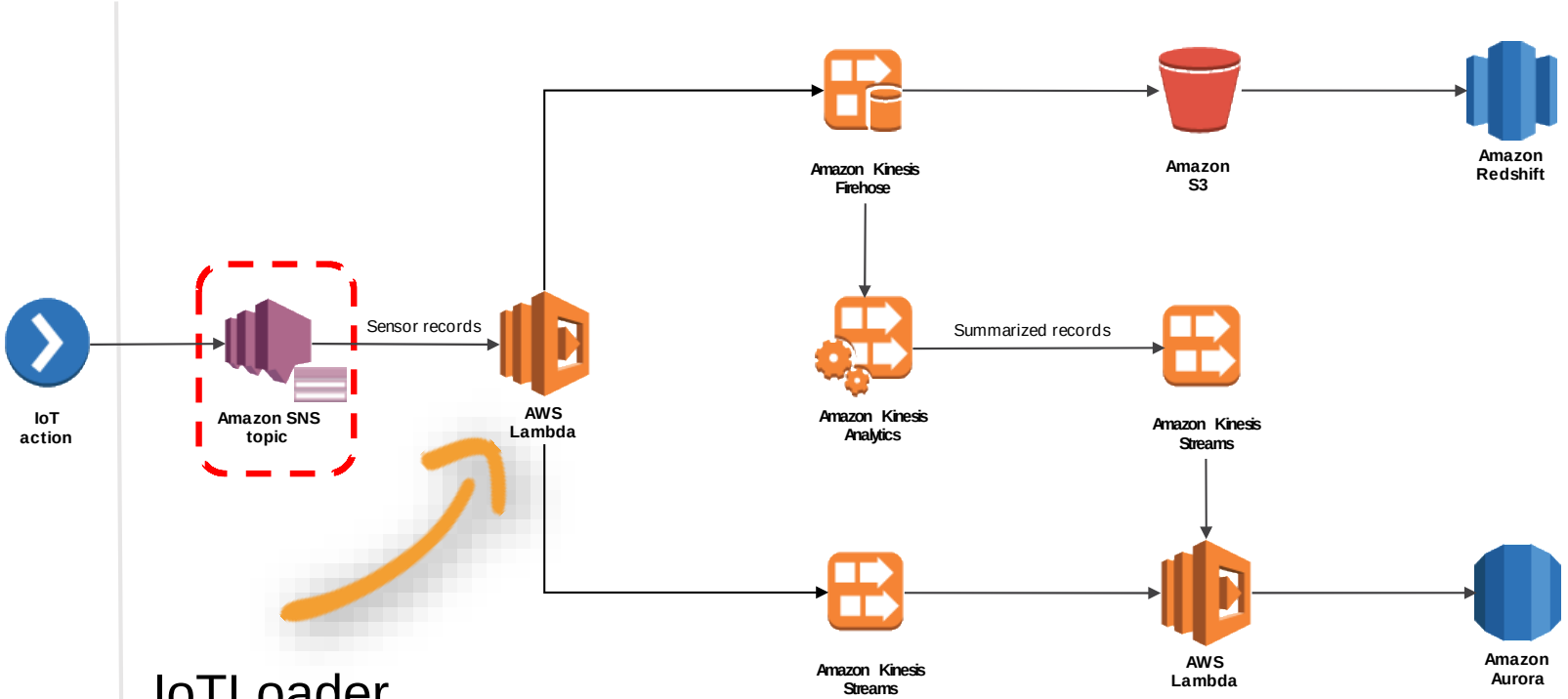
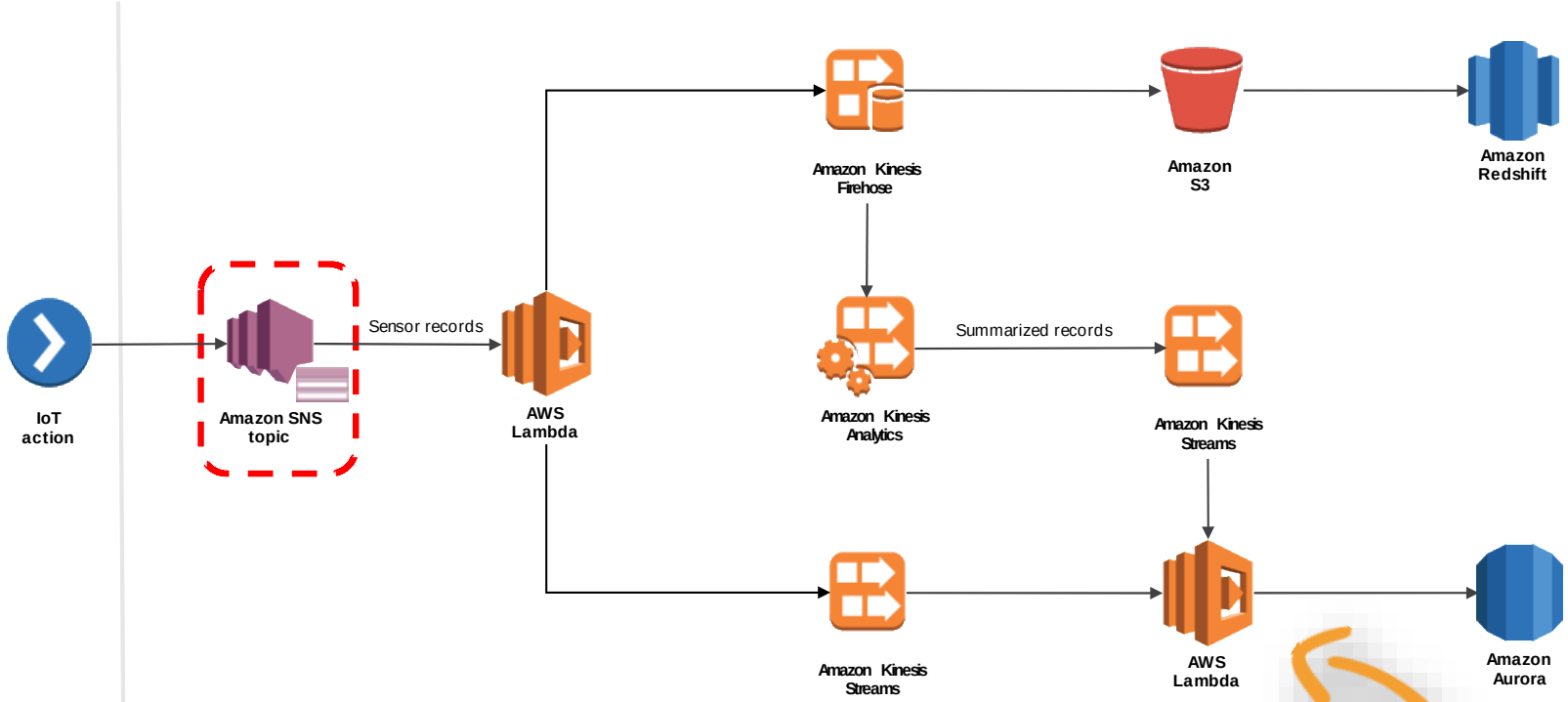


IoTLoader

- Process sensor data records from an AWS IoT action and injects them into an Amazon Kinesis stream and Amazon Kinesis Firehose delivery stream.

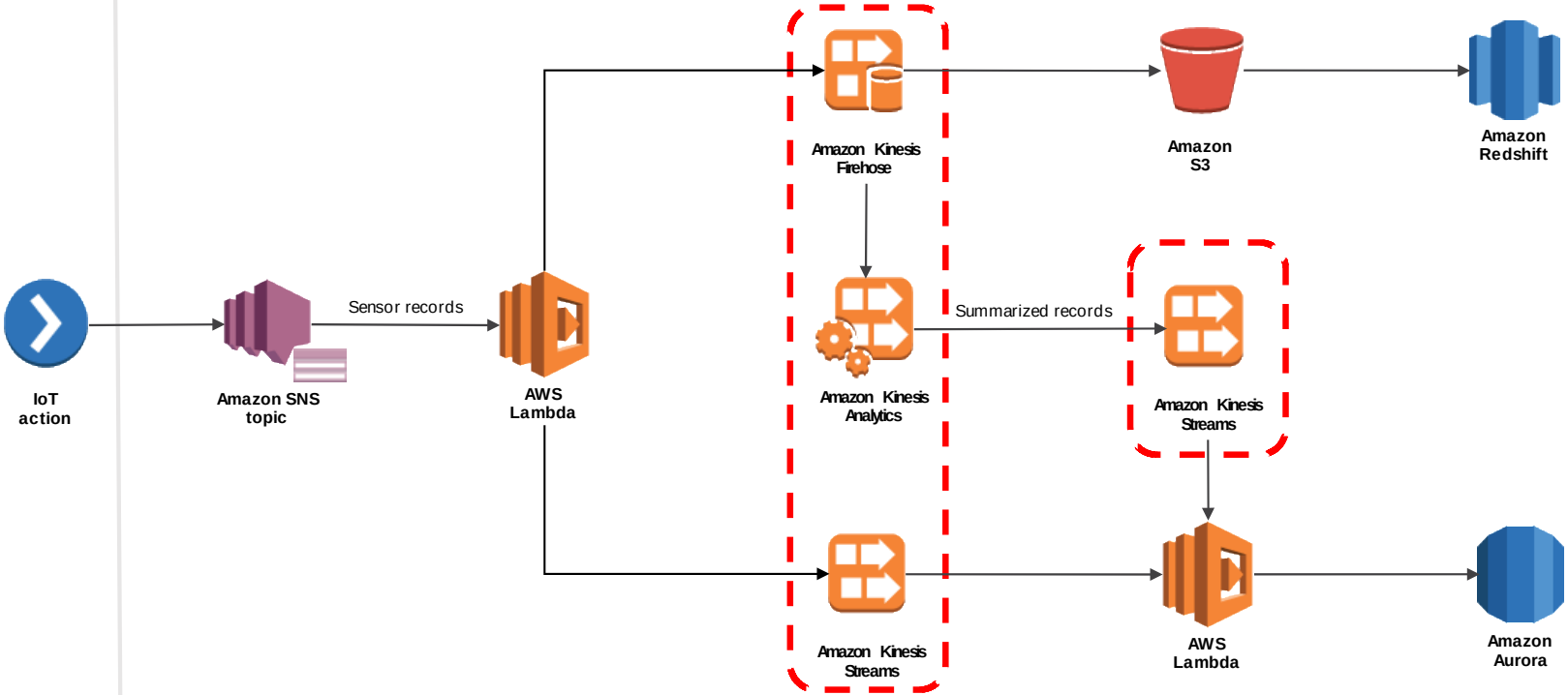
Processing Architecture



RdsLoader

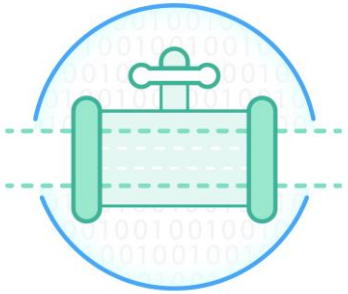
- Process sensor data records from an Amazon Kinesis stream and inserts them into an Amazon Aurora RDS database.

Processing Architecture



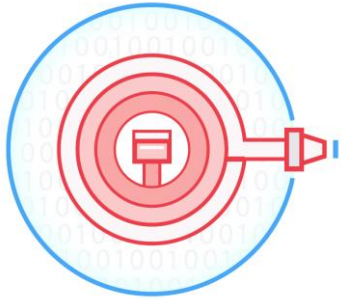
Amazon Kinesis: Streaming Data Made Easy

Services make it easy to capture, deliver, process streams on AWS



Amazon Kinesis Streams

- For technical developers
- Build your own custom applications that process or analyze streaming data



Amazon Kinesis Firehose

- For ETL, data engineer
- Easily load massive volumes of streaming data into S3, Amazon Redshift and Amazon Elasticsearch Service

Amazon Kinesis Analytics

- For all developers, data scientists
- Easily analyze data streams using standard SQL queries

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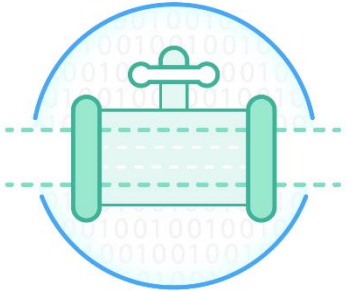
Amazon Kinesis - Streaming Data Made Easy



Amazon Kinesis Streams

Low latency streaming ingest at scale

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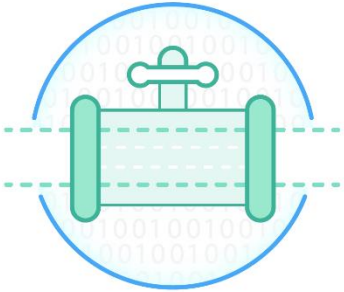
Amazon Kinesis - Streaming Data Made Easy



Amazon Kinesis Streams

Low latency streaming ingest at scale

Amazon Kinesis Analytics

Streaming analytics in near real-time

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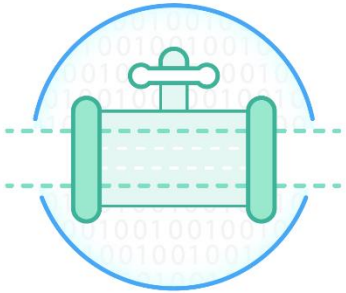
Amazon Kinesis - Streaming Data Made Easy

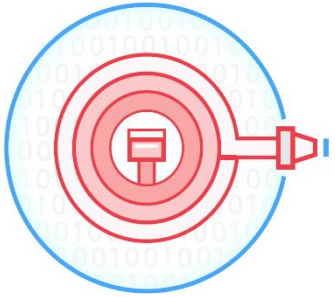


Amazon Kinesis Streams

Low latency streaming ingest at scale

Amazon Kinesis Analytics

Streaming analytics in near real-time



Amazon Kinesis Firehose

Batch data delivery based on time/size into S3

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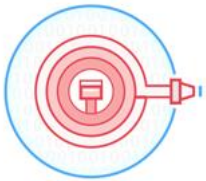
Amazon Kinesis Firehose vs. Amazon Kinesis Streams

Amazon Kinesis Streams

Amazon Kinesis Streams is for use cases that require **custom processing**, per incoming record, with sub-1 second processing latency, and a choice of stream processing frameworks.



Amazon Kinesis Firehose

Amazon Kinesis Firehose is for use cases that require zero administration, ability to **use existing analytics tools based on Amazon S3, Amazon Redshift, and Amazon Elasticsearch Service** and a data latency of 60 seconds or higher.

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Use SQL To Build Real-Time Applications

Connect to streaming source

Easily write SQL code to process streaming data

Continuously deliver SQL results

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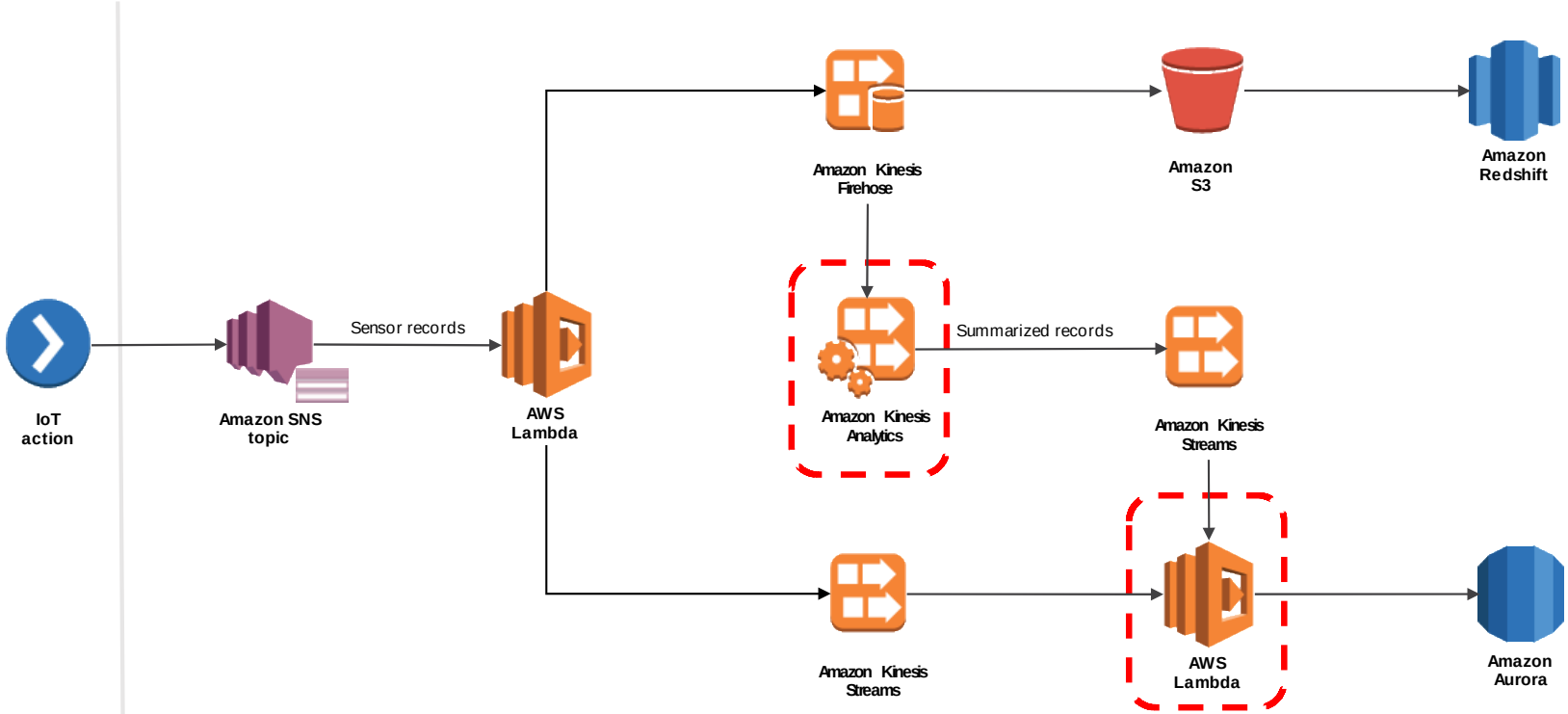
Processing Architecture



Amazon Kinesis Analytics – Answering Questions

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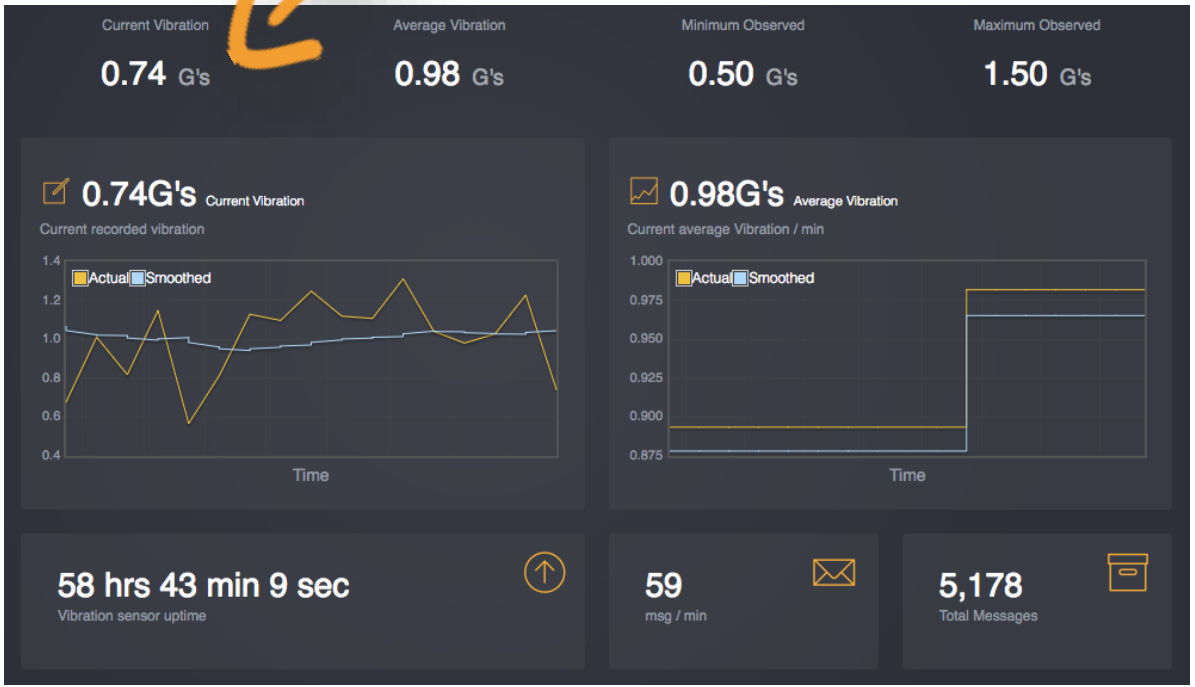
Amazon Kinesis Analytics – Answering Questions

What is the current value ?



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Amazon Kinesis Analytics – Answering Questions

What is the average value ?

Amazon Kinesis Analytics – Answering Questions

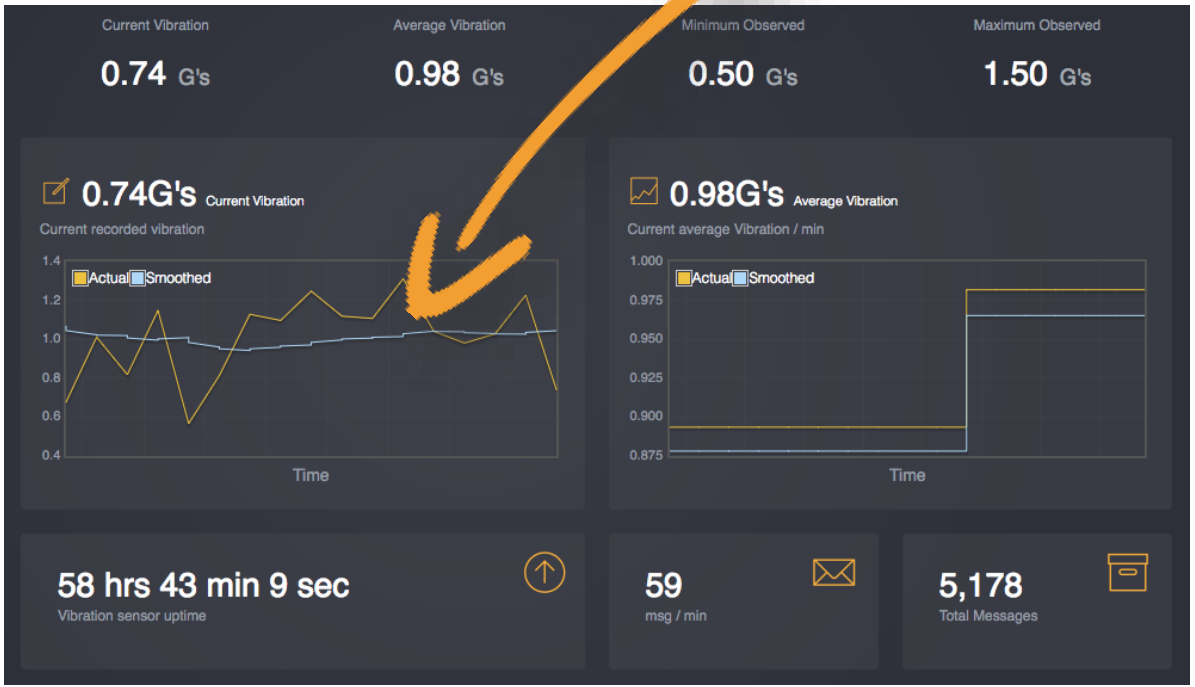
What is the minimum value ?

Amazon Kinesis Analytics – Answering Questions

What is the maximum value ?

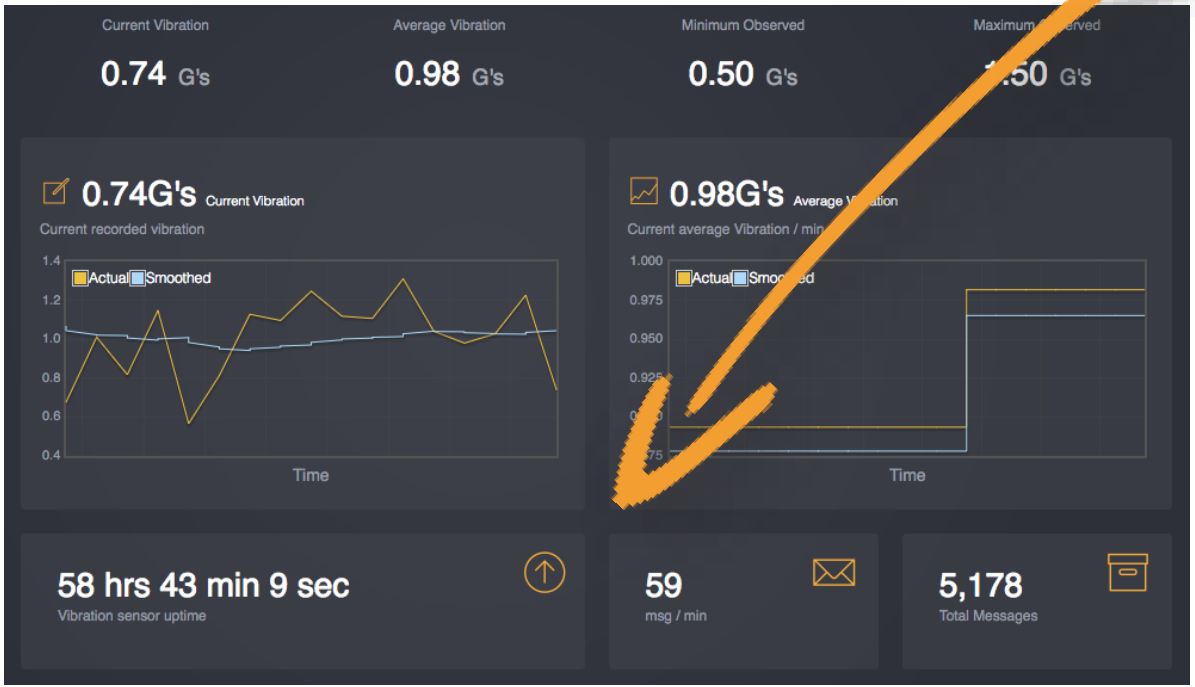
Amazon Kinesis Analytics – Answering Questions

Visual graphs for short term trending



Amazon Kinesis Analytics – Answering Questions

Service performance statistics



Amazon Kinesis Analytics – Processing Setup

```
1  CREATE OR REPLACE STREAM "DESTINATION_SQL_STREAM" ("sensor_id" VARCHAR(32), "sensor" VARCHAR(15),
2      "station_id" VARCHAR(32), "sensor_avg_value" double, "sensor_smooth_avg_value" double,
3      "60sec_sum_of_sensor_value" double, "60sec_number_of_msg" int, "record_timestamp" TIMESTAMP);
4
5  CREATE OR REPLACE PUMP "STREAM_PUMP" AS INSERT INTO "DESTINATION_SQL_STREAM"
6  SELECT STREAM "sensor_id", "sensor", "station_id",
7      AVG("sensor_value"), AVG("sensor_value_smoothed"),
8      SUM("sensor_value") AS "60sec_sum_of_sensor_value",
9      count(*) AS "60sec_number_of_msg", ROWTIME AS "record_timestamp"
10 FROM "SOURCE_SQL_STREAM_001"
11 GROUP BY "sensor_id","sensor","station_id",
12     FLOOR(("SOURCE_SQL_STREAM_001".ROWTIME - TIMESTAMP '1970-01-01 00:00:00') SECOND / 60 TO SECOND);
```

Cancel

Source data | Real-time analytics | Destination

Applicati

In-application streams:

DESTINATION_SQL_STREAM

error_stream

Pause results New results will be added every 2-10 seconds

Scroll to bottom when new results arrive.

Filter by column name

ROWTIME	sensor_id	sensor	station_id	sensor_avg_value	sensor_sm
2016-11-11 01:44:00.0	813c174428fc4843	temp	qwbKAMlbZW	63.23000000000001	63.230000
2016-11-11 01:44:00.0	caaed84a552deebf	rain	qwbKAMlbZW	0.0	0.0

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Amazon Kinesis Analytics – Processing Result

Emitted payload


```
{
  "sensor_id": "dc2b8383eb79fe49",
  "sensor": "vib",
  "station_id": "qwbKAMlbZW",
  "sensor_avg_value": 1.072153418386984,
  "sensor_smooth_avg_value": 1.015843804467917 2,
  "60sec_sum_of_sensor_value": 64.32920510321904,
  "60sec_number_of_msg": 60,
  "record_timestamp": "2016-11-09 06:29:00.0"
}
```


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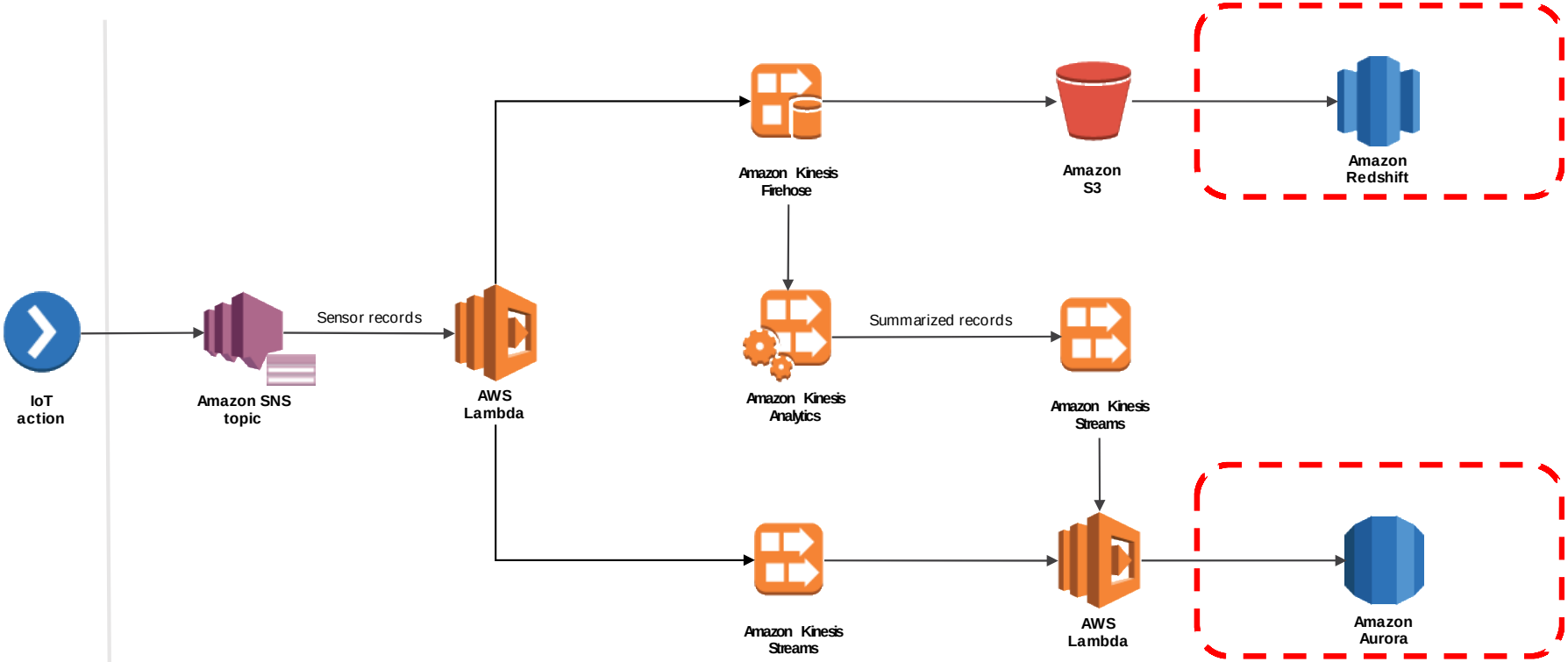
Processing Architecture



Data Store Summary

Amazon S3

- Raw long term storage for warm data
- Lifecycle management
- Reprocess and reload data

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- Optimized for data warehousing and analytics
- Query large amounts of data fast
- Scale to increase performance

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Data Store Summary

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Amazon Aurora

- Optimized for distributed data access
- Scale read throughput
- Fault tolerant

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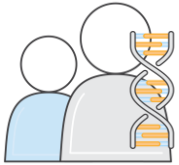
Summary

IoT with real-time analytics provides meaningful information, not just data

Scale without intervention or cost



Remove management and scaling overhead to accelerate innovation

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