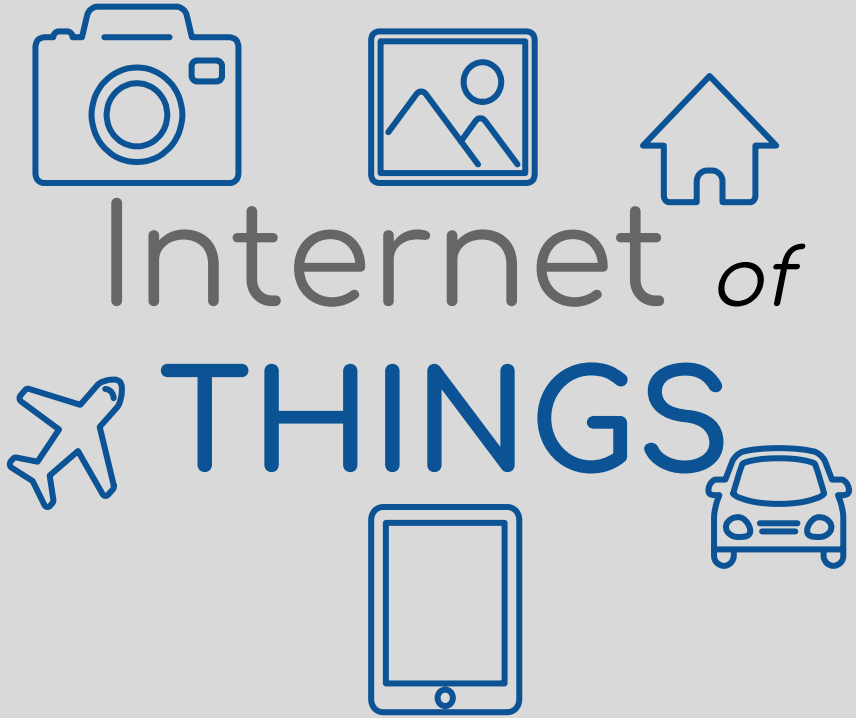


"Breaking down the infrastructure behind IoT ecosystems"

Quang-Duy Tran
Marc Garnica Caparrós

17th of May, 2018
Cloud Computing & Big Data Analytics

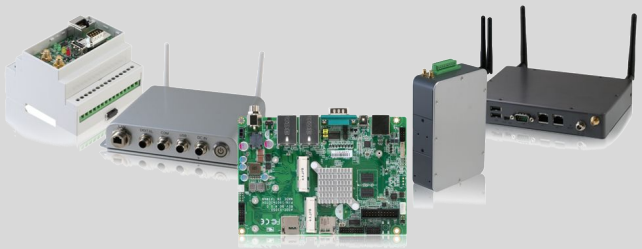
Behind the curtain?

Architecture

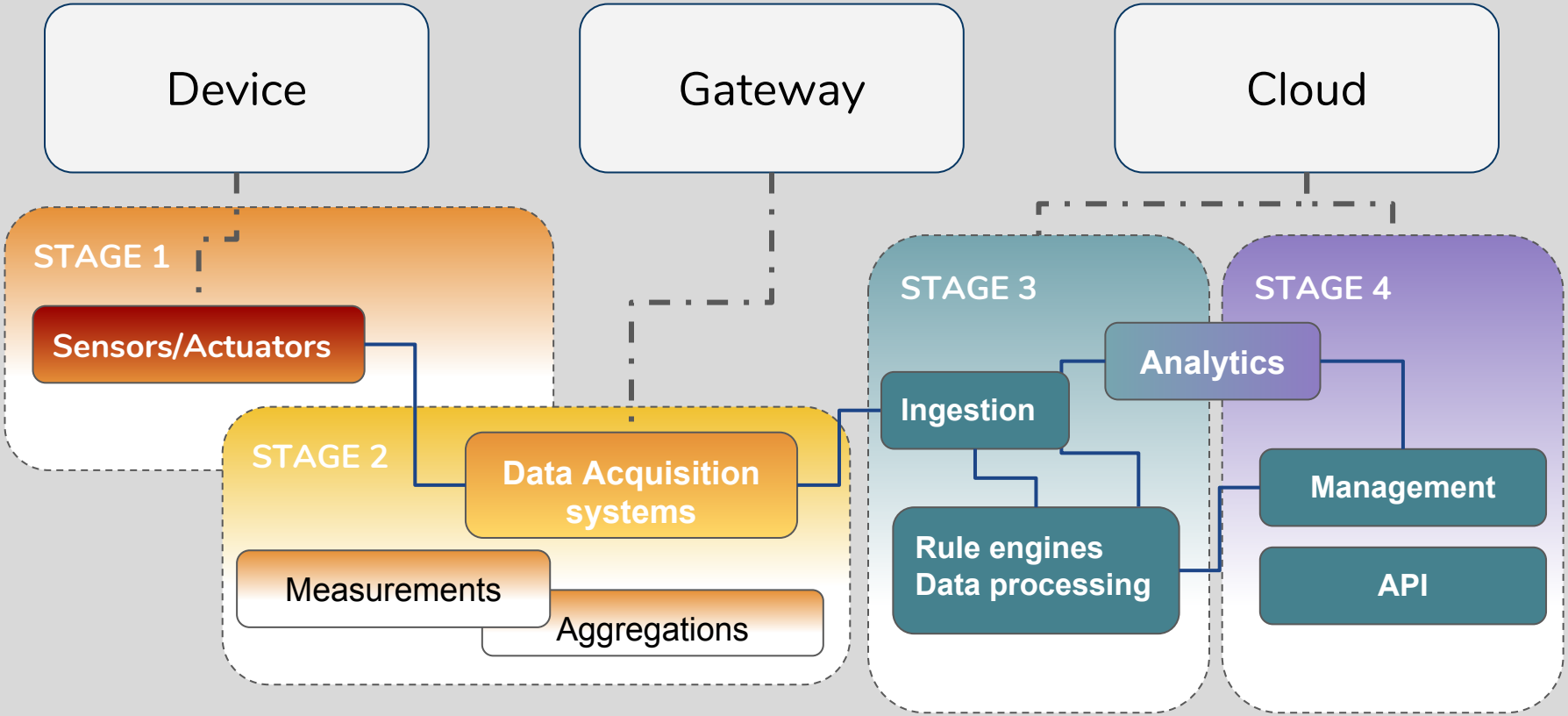
Device

Gateway

Cloud



Architecture - Dataflow



Architecture - Dataflow

Device

Gateway

Cloud

STAGE 1

- First level of interaction
- Type of information
- Metadata and commands
- Device management

Architecture - Dataflow

Device

Gateway

Cloud

STAGE 1

- First level of interaction
- Type of information
- Metadata and commands
- Device management


```
{
  "DeviceProperties": {
    "DeviceID": "deviceid1",
    "HubEnabledState": null,
    "CreatedTime": "2016-04-25T23:54:01.313802Z",
    "DeviceState": "normal",
    "UpdatedTime": null
    },
  "SystemProperties": {
    "ICCID": null
  },
  "Commands": [],
  "CommandHistory": [],
  "IsSimulatedDevice": false,
  "id": "fe81a81c-bcbc-4970-81f4-7f12f2d8bda8"
}
```

Architecture - Dataflow

Device

Gateway

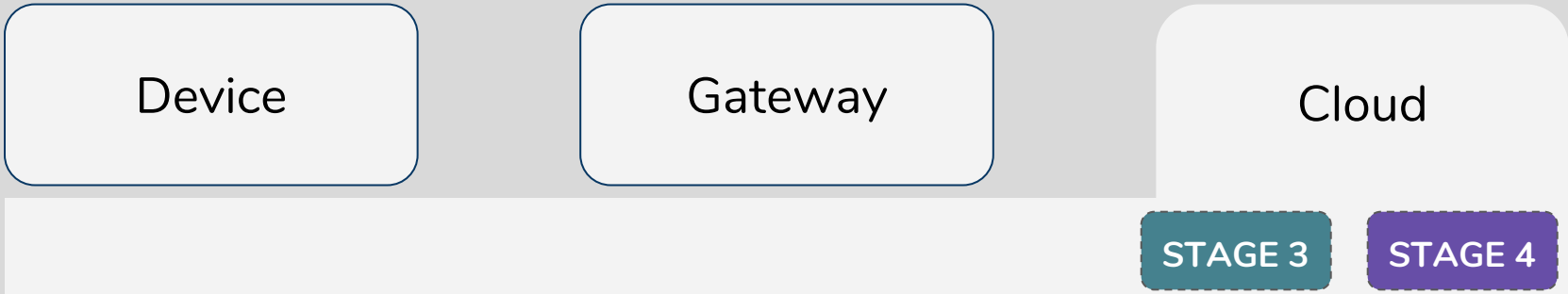
Cloud

STAGE 1

STAGE 2

- Usually underrated
- Simple operations and aggregations. ⚠
- Protocols conversion

Architecture - Dataflow



- Ingestion
- Storage
- Rule processing and stream analytics
- Analytics
- Archival storage

Architecture - Dataflow

Device

Gateway

Cloud

Ingestion:

- Process of importing, transferring, loading and processing the data
- Data consumed in high volume and velocity, from different sources
- Ingest data in real-time or by batches

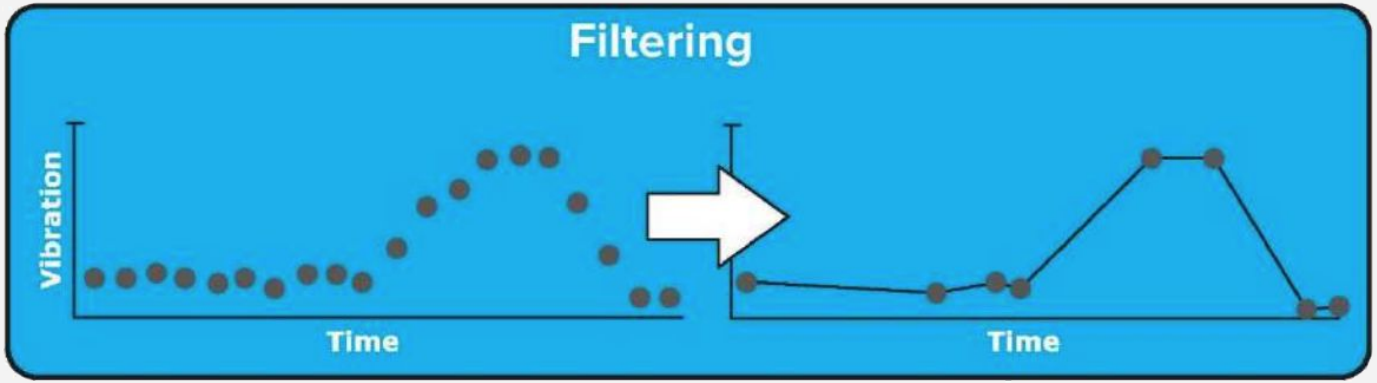
Architecture - Dataflow

Device

Gateway

Cloud

Ingestion: filtering data



Architecture - Dataflow

Device

Gateway

Cloud

Storage:

- Sensor data: small in size, generated frequently, could be millions per second.
  Use NoSQL databases: HBase, Cassandra
- Multimedia data: text, sound, video. Large in size
  Store using BLOB (Binary Large OBject)

Architecture - Dataflow

Device

Gateway

Cloud

Stream analytics:

- (Near) real-time analytics, analyze and make decisions quickly
- Used in cyber security, energy, supply chain, marketing, etc
- Stream operation: aggregation, pattern detection, correlations
- Apache Storm: distributed real-time computing system, can process millions of tuples per second

Architecture - Dataflow

Device

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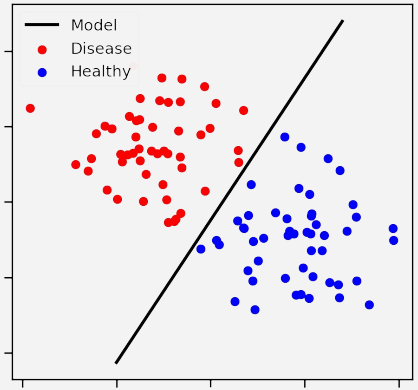
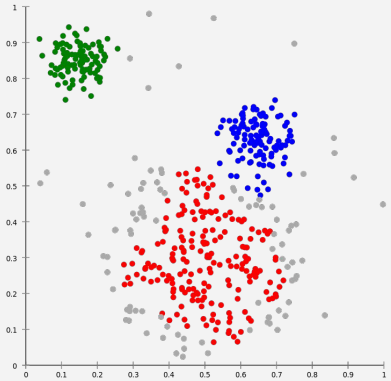
Cloud

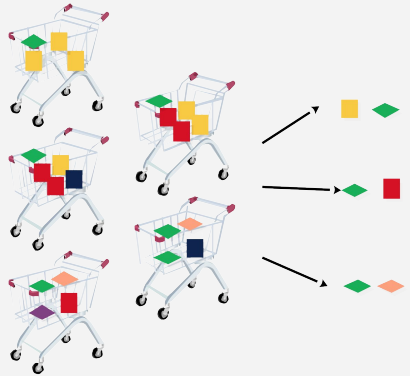
Analytics: data mining techniques



Classification



Clustering



Association rules

Architecture - Dataflow

Device

Gateway

Cloud

Archival storage

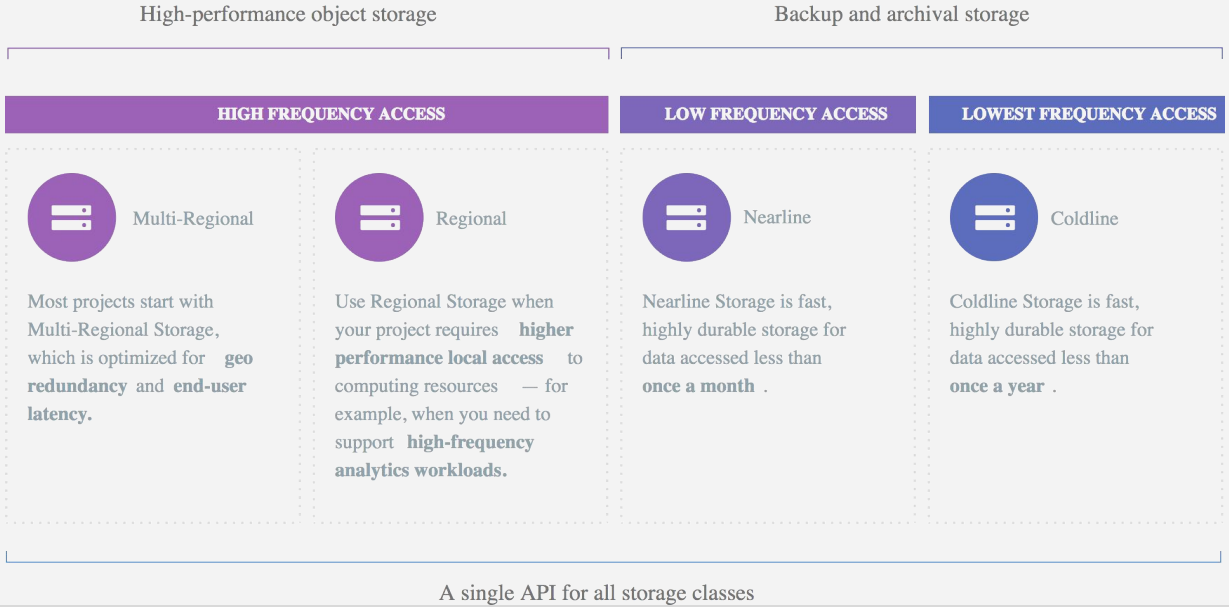
- Infrequently accessed data are stored in another region
- Used for references, keeping older version of changed file

Architecture - Dataflow

Device

Gateway

Cloud



Cloud providers

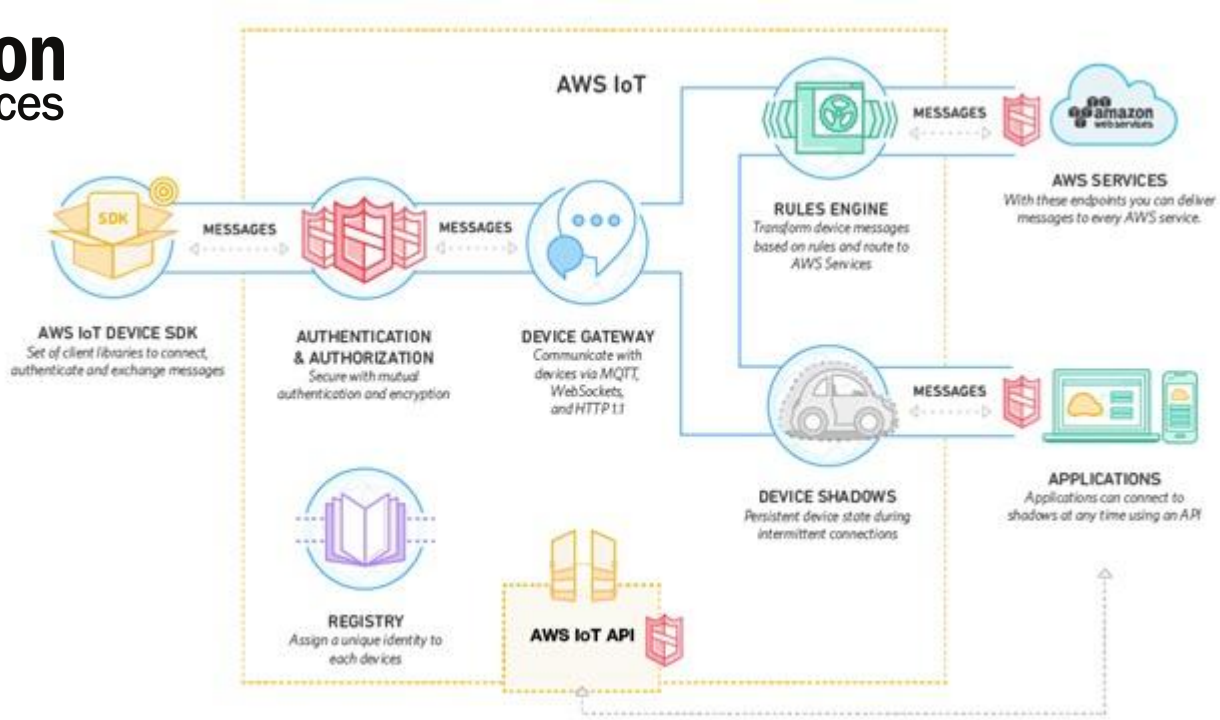
Features

Experience

Integration

Pricing

amazon web services



Features

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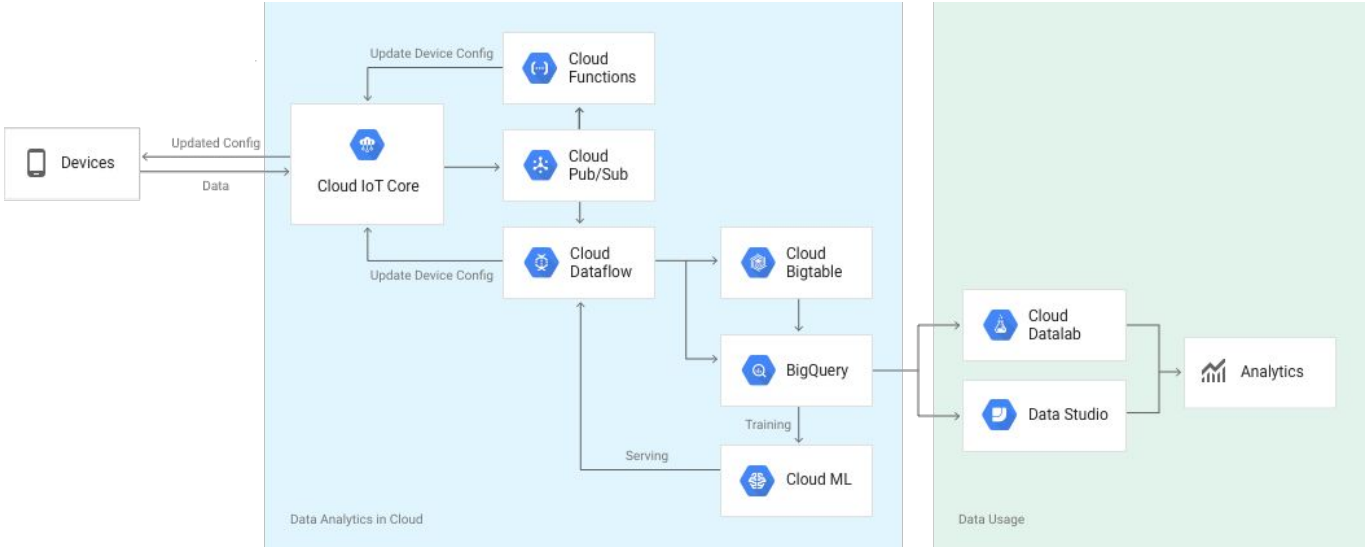
Google Cloud



Features

Experience

Integration

Pricing

Google Cloud

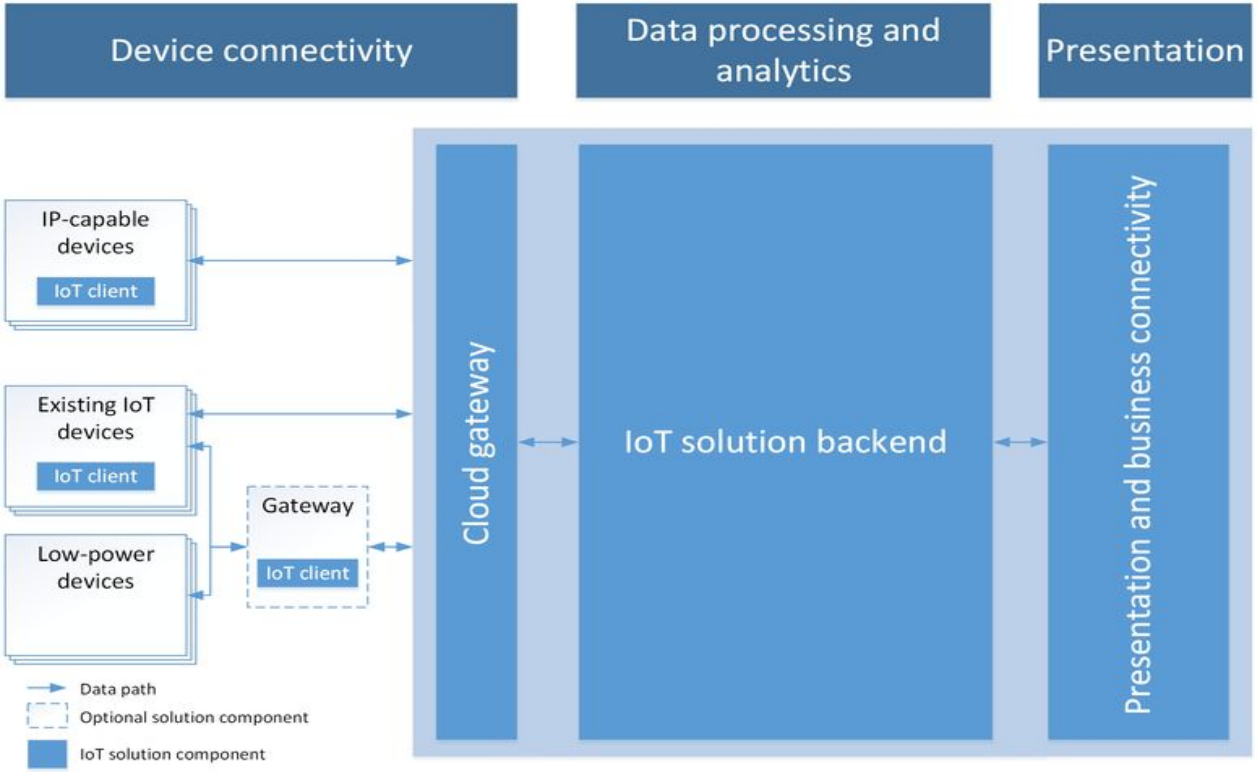
Features

Experience

Integration

Pricing

Microsoft Azure



Features

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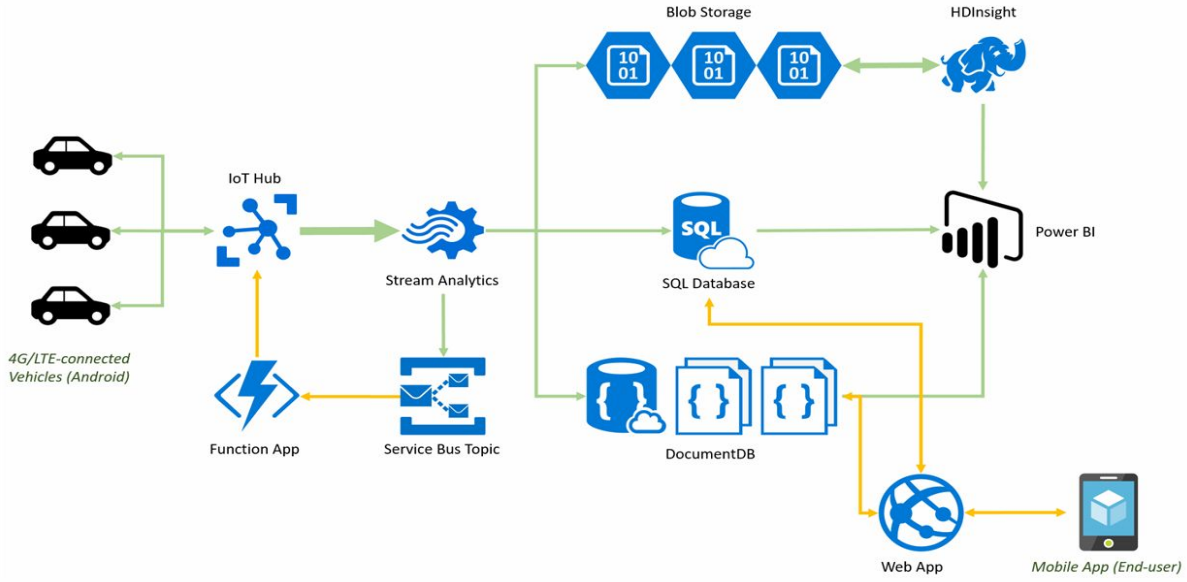
Microsoft Azure



Features

Experience

Integration

Pricing

Conclusions

Q&A