An Open-Source Infrastructure for Real-Time Automatic Agricultural Machine Data Processing

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More info on ISOBlue 2.0:

CONNECTED MACHINERY

CLOUD

WEB/MOBILE APPS

- **Ag machine data no longer "trapped".**
- **Real-time diagnostic info, as-harvested, as-applied data.**

- **Microservice-based (scalable).**
- **Handles massive amount of incoming data.**
- **Stream-processes data continuously.**

- **Offer intuitive visualizations to end users.**
- **Process both historic and real-time data.**
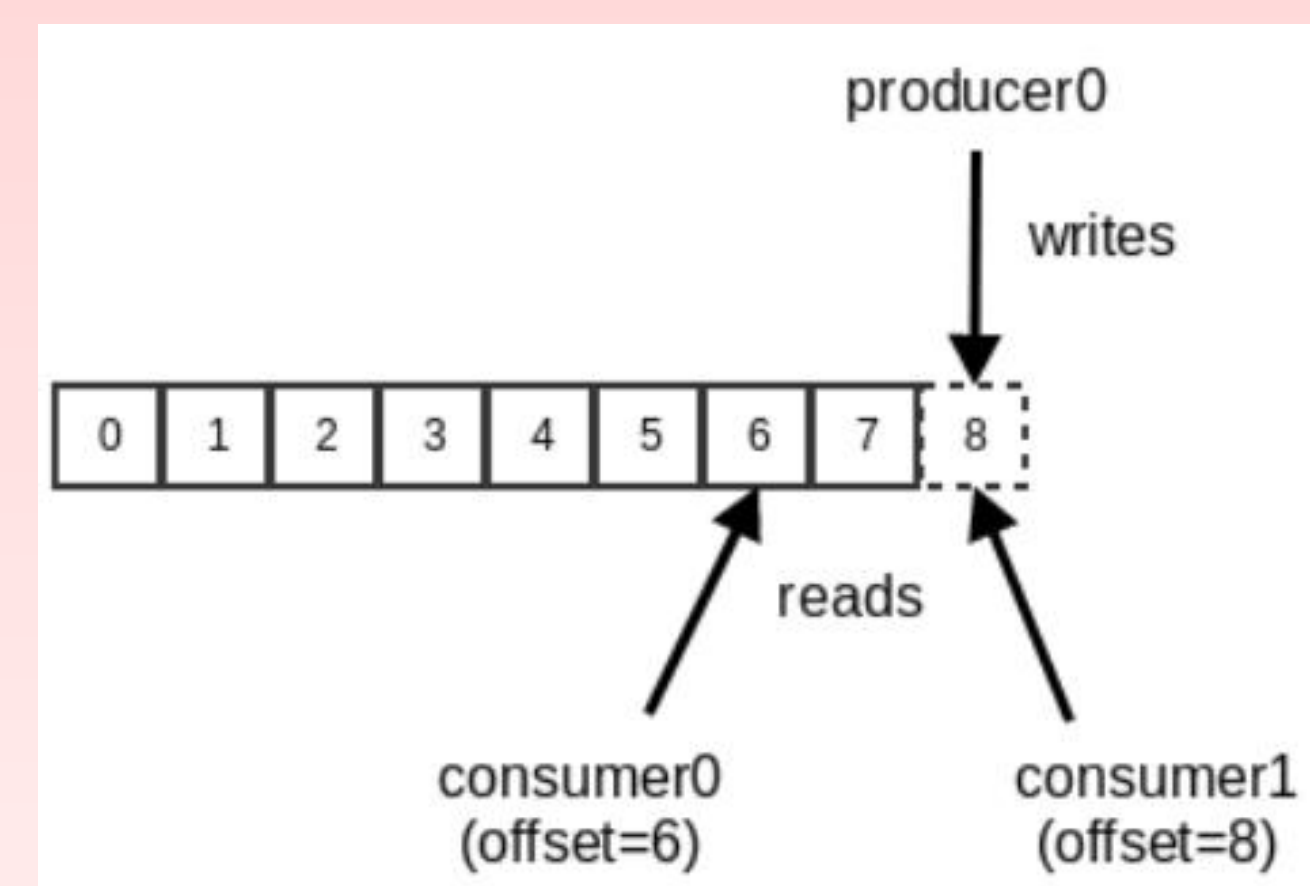

Connected Machinery via ISOBlue 2.0

Figure 1 (left to right): an assembled and a deployed ISOBlue 2.0.

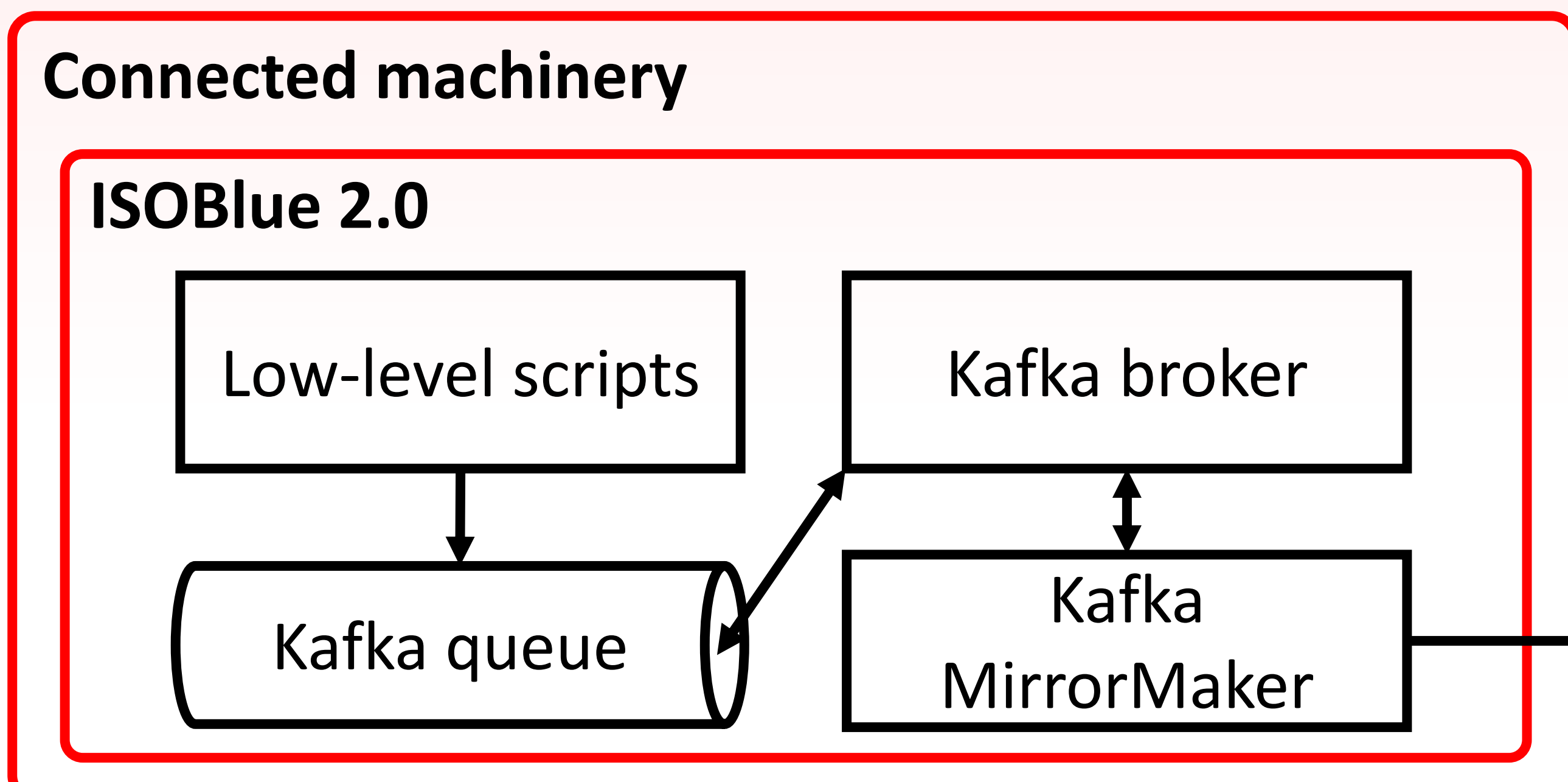ISOBlue 2.0 [1] is an **open-source** ag IoT. It is made to:
- Be dust and weatherproof.
- Be wake on CAN activity.
- Collect machine data via ISOBUS diagnostic port.
- Opportunistically stream collected data to Cloud via a 4G/LTE connection.

Apache Kafka [2] manages the collected log on ISOBlue 2.0; it is capable of handling massive amount of incoming data.

Figure 2: high-level Kafka workflow.

Workflow & Software Used

Connected machinery

ISOBlue 2.0
- Low-level scripts
- Kafka broker
- Kafka queue
- Kafka MirrorMaker

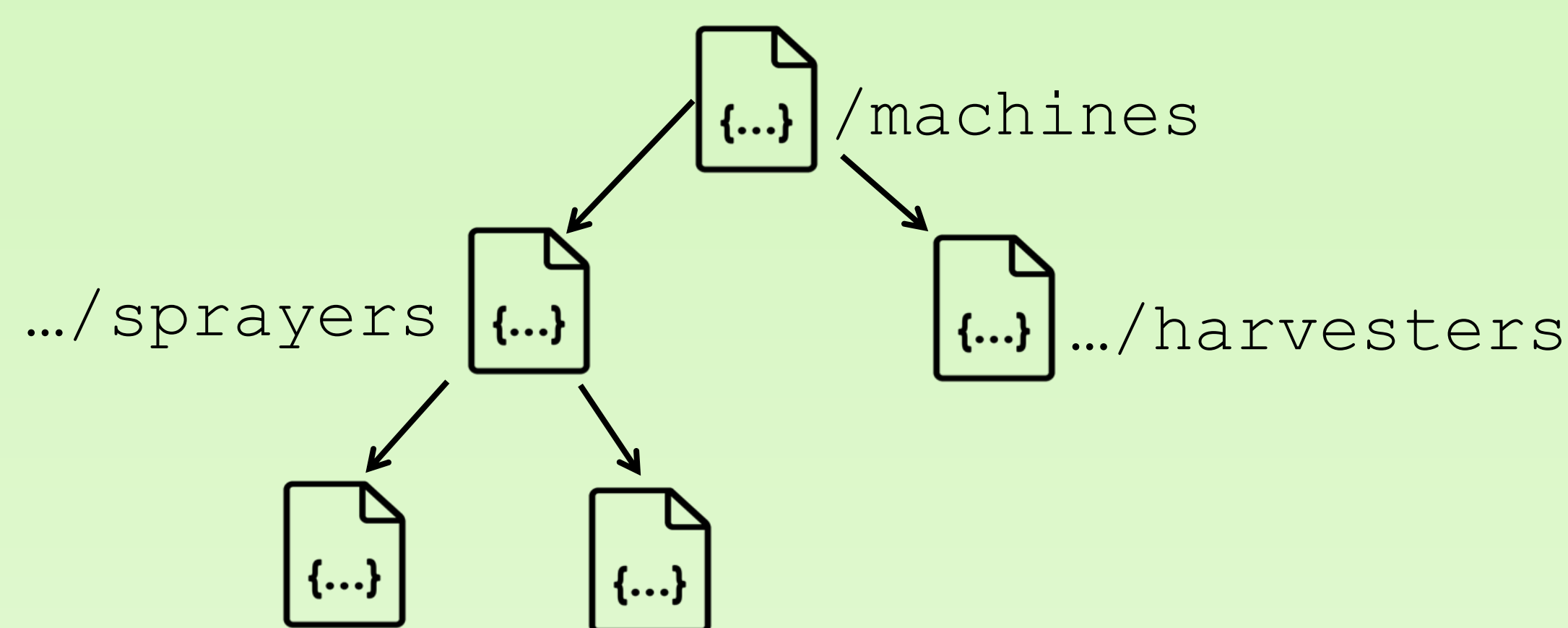yocto PROJECT · AVRO · kafka

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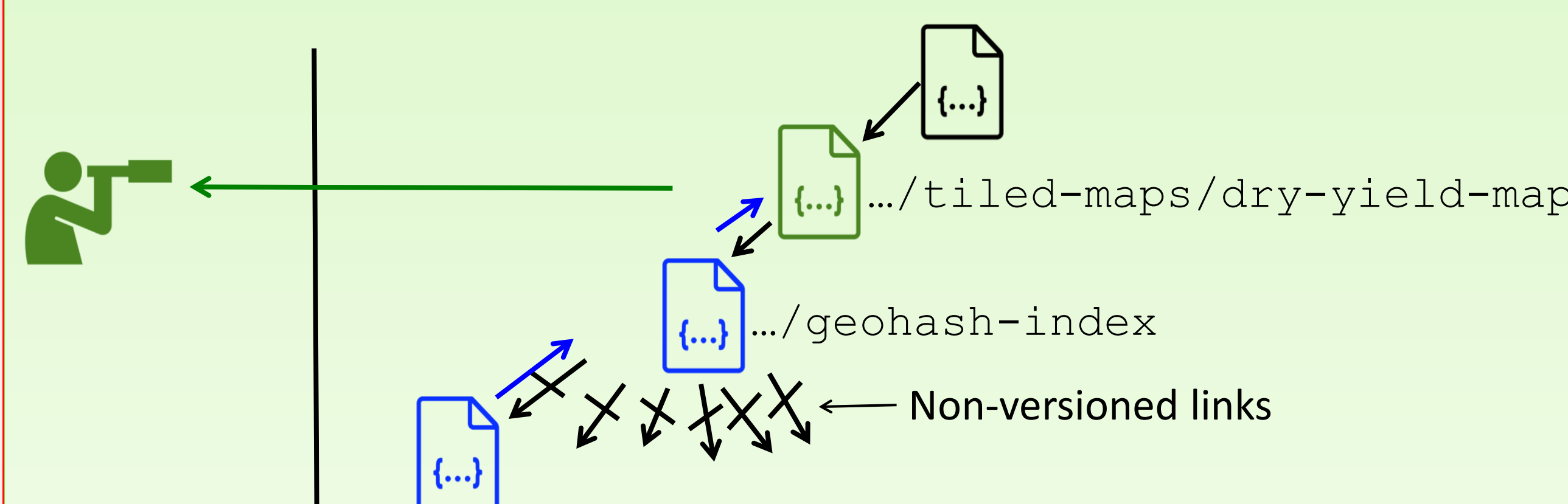## Cloud Architecture Powered by OADA API

Open Ag Data Alliance

Open Ag Data Alliance (OADA) API [3] is an **open-source** ag data exchange API that offers data security, privacy and interoperability.
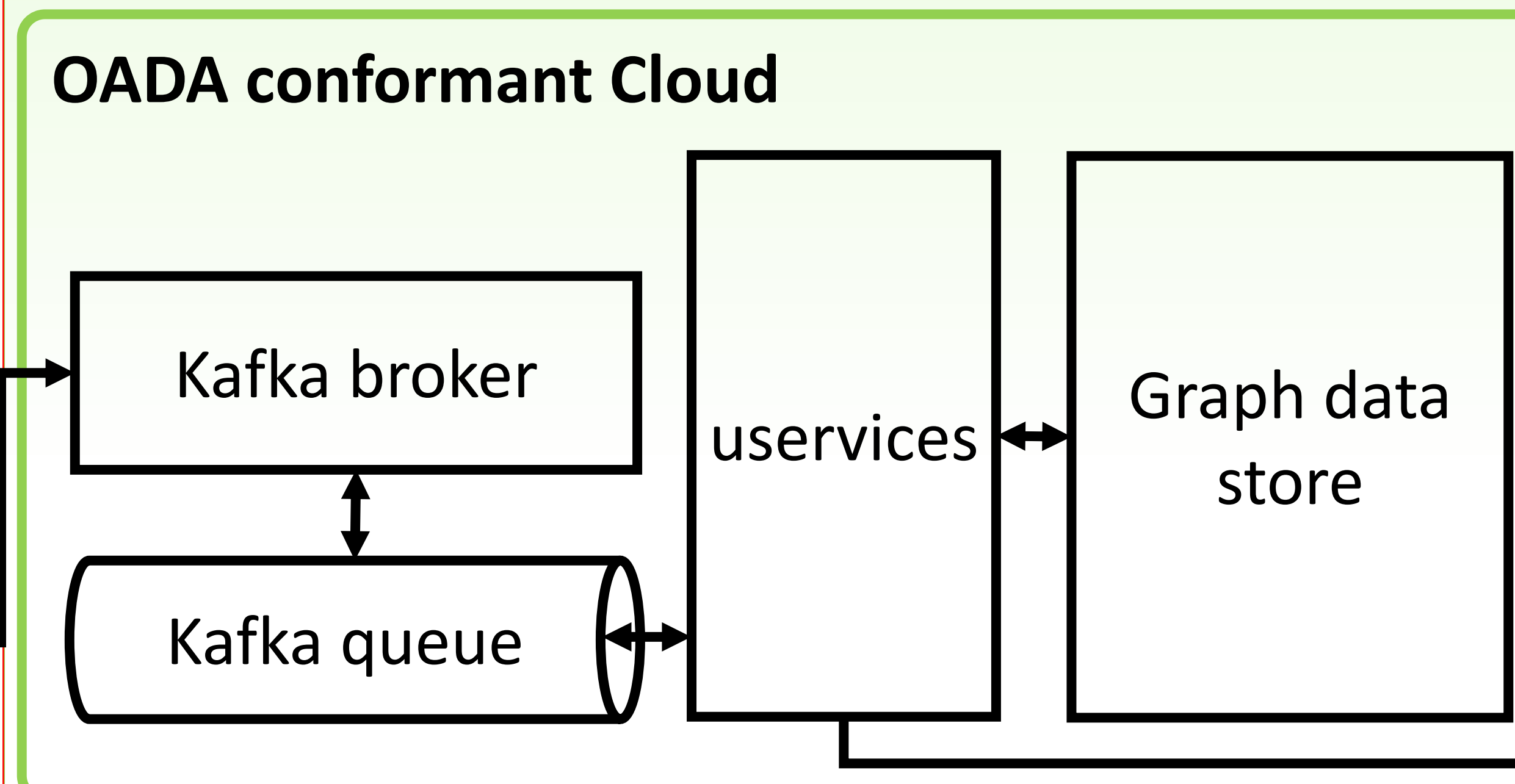
Graph database and linked resources in OADA:

```
{...} /machines
.../sprayers {...}          {...} .../harvesters
       {...}  {...}
```

Resource-watching microservice in OADA:

```
{...}
{...} .../tiled-maps/dry-yield-map
{...} .../geohash-index
{...}  ← Non-versioned links
```

Workflow & Software Used

OADA conformant Cloud
- Kafka broker
- Kafka queue
- uservices
- Graph data store

node JS · kafka · docker
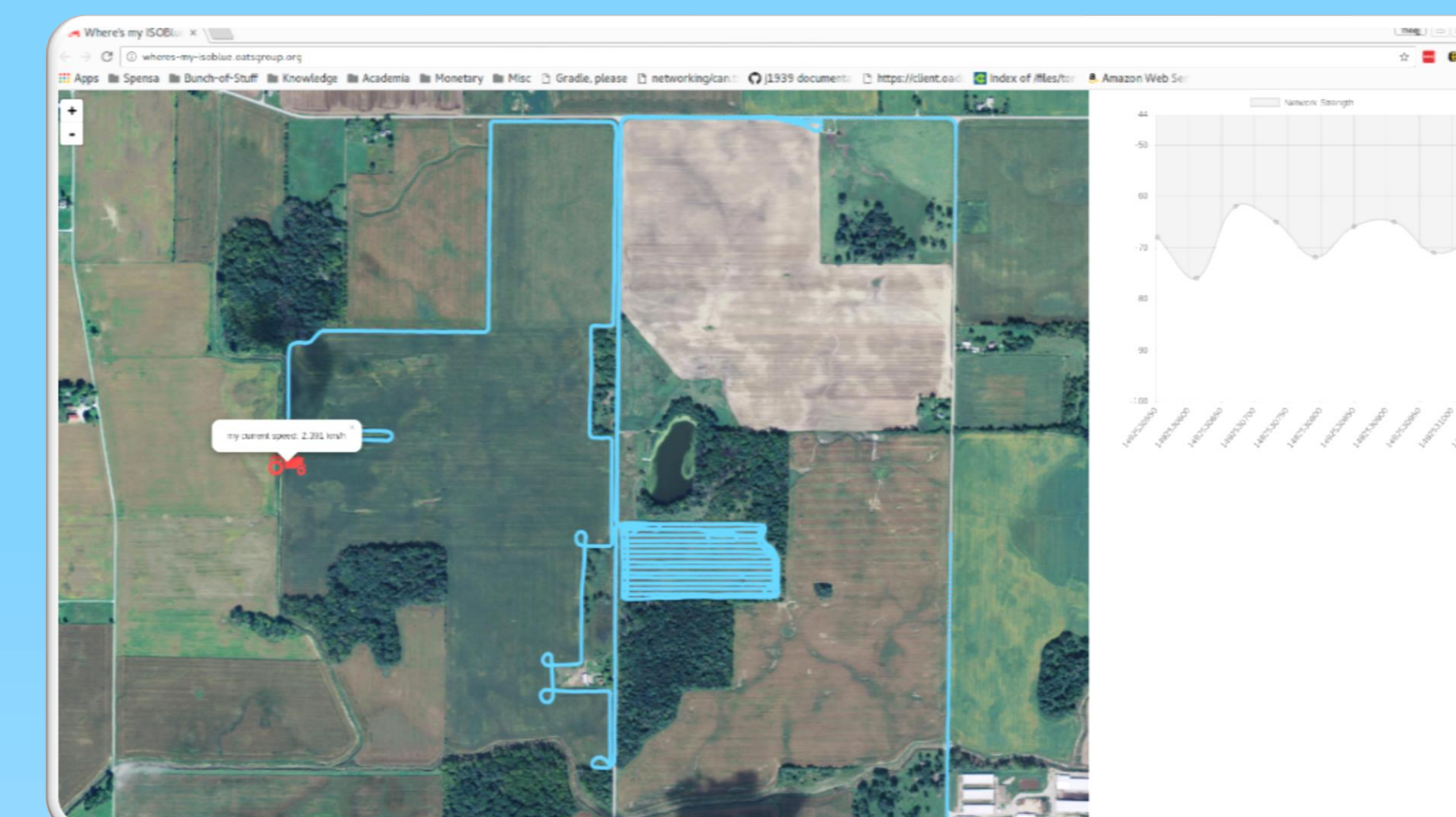

Real-time Data Viz & Analytics via Apps

Figure 3: a screenshot of where-is-my-isoblue web app interface.

Where-is-my-ISOBlue [4] is a proof-of-concept web app that displays the real-time GPS tracks and debug info for different deployed ISOBlue 2.0s.

Figure 4: a screenshot of TrialsTracker web app interface.

TrialsTracker [5] enables user to "aggregate-by-finger" to compute average field yield and compare trails with both historic and streaming data.

Workflow & Software Used

Applications
- TrialsTracker
- Where-is-my-ISOBlue
- Websockets

Leaflet · React · pouchdb

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[1] https://www.isoblue.org/ [2] https://kafka.apache.org/ [3] http://openag.io/ [4] https://github.com/OATS-Group/wheres-my-isoblue [5] https://github.com/OpenATK/TrialsTracker