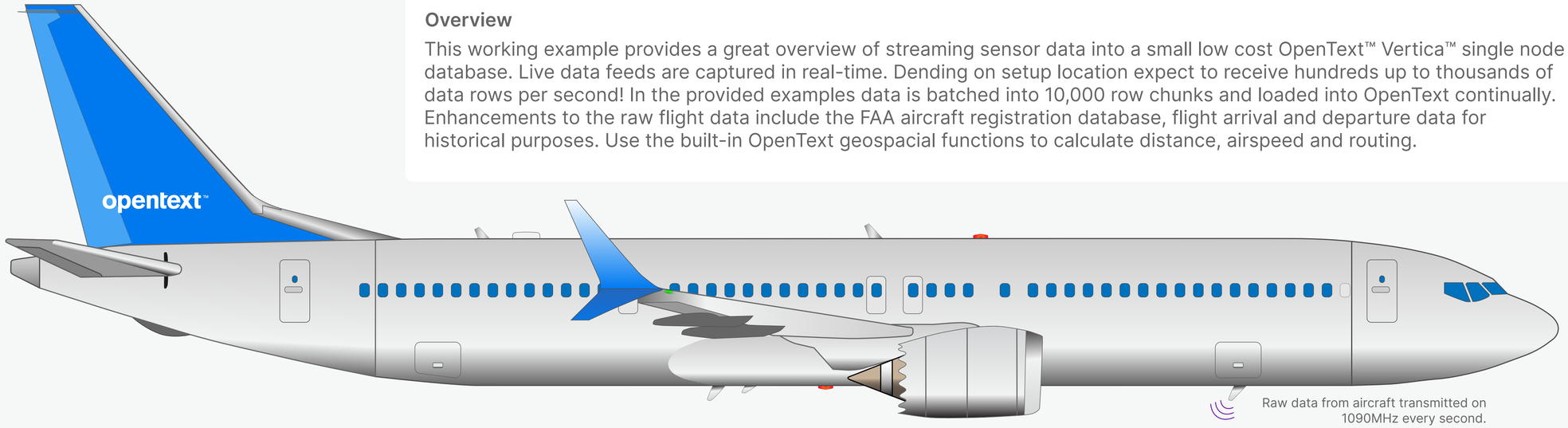
opentext™

Visual Guide—IoT Flight Demo

Overview

This working example provides a great overview of streaming sensor data into a small low cost OpenText™ Vertica™ single node database. Live data feeds are captured in real-time. Dending on setup location expect to receive hundreds up to thousands of data rows per second! In the provided examples data is batched into 10,000 row chunks and loaded into OpenText continually. Enhancements to the raw flight data include the FAA aircraft registration database, flight arrival and departure data for historical purposes. Use the built-in OpenText geospacial functions to calculate distance, airspeed and routing.



Raw data from aircraft transmitted on 1090MHz every second.

Aircraft Registration Data

Downloadable from the FAA website: www.faa.gov
Search for "aircraft regirstration database"

Dumpfix REGEX for Data Strings

```
[0-9]{4}\/[0-9]{2}\/[0-9]{2}\,
```

Before

```
2017/04/24,22:03:33.105
```

After

```
2017-04-24 22:03:33.105
```

OpenText SQL

```
create table dump1090 (
   record_type          char(3),
   record_type_number   integer,
   sg_session_id        integer,
   sg_aircraft_id       integer,
   hex_ident            varchar(10),
   sg_flight_id         integer,
   msg_gen_ts           timestamp,
   msg_log_ts           timestamp,
   call_sign       varchar(12),
   altitude             integer,
   ground_speed          integer,
   track                 integer,
   latitude             decimal(8,5),
   longitude            decimal(8,5),
   vertical_rate         integer,
   squawk                varchar(12),
   alert                 integer,
   emergency       integer,
   spi             integer,
   is_on_ground         integer
);
```

Bill of Materials

(1) 1090MHz ADS-B Antenna - 66cm / 26in	$39.00
(2) RF pigtail cable SMA male to N male RG58 5M	$18.00
(3) FlightAware Pro Stick ADS-B USB Receiver	$18.00
(4) USB 3.0 Extension Cable -1 Foot	$5.59
(5) Raspberry Pi 3 Kit, with case and power supply	$49.00
(6) SanDisk 32GB microSDHC UHS-3 Card	$18.75
Total	**$148.34**

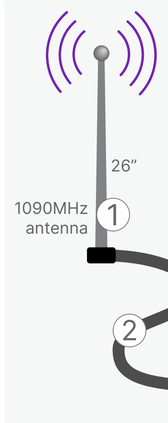
What is ADS-B?

Automatic Dependent Surveillance-Broadcast

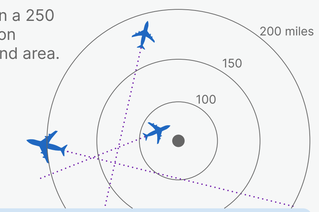
ADS-B is different from radar and does not depend on centralized controllers watching radar scopes. Instead, aircraft self-report GPS positions in a networked environment allowing pilots to see the entire air traffic picture around them in real-time.

ADS-B RAW Data Stream

```
*8DAD18CE58C3873D9F8F8420BCC1;
*02E19716E1A61C;
*8DACD14358AF973CB35031FDA24C;
*8DAD18CEF83300020049B8A769AA;
*8DA7C3C958B97334CE42920E8171;
*5DAD4171106B48;
*5DABD69D0A7626;
*5DA7C3C9863D24;
*5DA7133FE6FDF1;
*5DA7C3C9863D24;
*20001717126DEA;
*02E195B9052F1B;
*8DAC45AC58A586A30CEE2BF81664;
*02E19716E1A61C;
*00E616906B27E0;
*8DA7133F990A2B91180887DF2374;
*00E616906B27E0;
*8DA7C3C9990CC2A5E01407B151F7;
*8DAC45ACEA3E9866F33C082A7F0D;
*8DAC741960C38665FEEF4D075F01;
*5DAC45ACDE5024;
*02461998CE5C5D;
*02E19498F583CD;
*8DA7133F58BF03D1851F0FB28043;
*5DACD143054A5E;
*8DA7133FEA485865213E88486130;
```



Receive data within a 250 mile radius based on antenna location and area.



Download dump1090 from github:
`https://github.com/MalcolmRobb/dump1090`

IoT Device (edge)

Raspberry pi Model 3 • CPU Broadcom BCM2837 • 1.2 GHz Quad-Core ARM Cortex A53 • 1 GB LPDDR2-900 SDRAM

Example decoded message

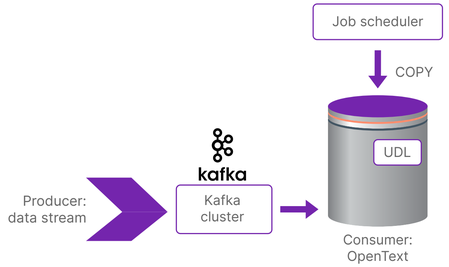
```
MSG,3,1,1,A260BC,1,2017/04/24,22:03:33.105,2017/04/24,22:03:33.121,,36000,,,34.65033,-92.28835,,,,,,0
```

Dump1090 is a simple Mode S decoder for RTLSDR devices

Data batch sent from raspberry pi into the pipe
OpenText COPY statement loads each batch

Kafka Integration

Kafka is designed for a streaming use case (high volumes of data with low latency). Using the Kafka integration feature, data enters Kafka as a message. A feed of messages in a common category come together to form topics. Kafka divides the topics up into partitions that it can be fed in parallel to OpenText target tables and analyzed by you.



Edge Analytics

```
mkfifo
/home/dbadmin/dump.pipe
```

PIPE

OpenText 9.0.1 Database Server
Intel i5 CPU 3.20GHz, SSD Disk, 16GB RAM, CentOS 7

Microsoft Azure

Google Cloud Platform

amazon web services

Collect data from multiple OpenText edge devices into a central location cloud or private data center to provide broad historical coverage, predictave analytics.

Commands to collect dump1090 data and load into OpenText

netcat command retreives a 10,000 row batch

```
nc localhost 30003 | head -10000 > batch.txt
```

From raspberry pi initiate vsql COPY with named pipe

```
ssh dbadmin@192.168.1.8 "/opt/vertica/bin/vsql -U dbadmin -c \"COPY DUMP1090 FROM LOCAL '/home/dbadmin/dump.pipe' DELIMITER ',' NULL '' DIRECT ;\"" >> load.log &
```

Cat newest batch of rows pipe to ssh command to OpenText server, dumpfix reformats date into standard TIMESTAMP format for OpenText COPY.

```
cat batch.txt | ssh dbadmin@192.168.1.8 "cat - | /home/dbadmin/dumpfix > \
    /home/dbadmin/dump.pipe" >> load.log
```