

Raw data from aircraft transmitted on 1090MHz every second.

ADS-B Data (Automatic Dependent Surveillance-Broadcast)

```
*8dadda2458b98329a6f62d077119;
*8dadda249915839348042fa51d63;
*5daa735a0d9853;
*02e59190f52204;
*8da6a88258c396a1494ac5cab6ac;
*5daa735a0d9843;
*5dadda2497766c;
*8da97fe8e1069b00000000c3a3c1;
*8da6a88299456f9280082db1ee80;
*8da97fe899146316981c187fe5e1;
*5da40302eec409;
```



Receive data within a 150 mile radius based on antenna location and area.

Overview

This working example provides a great overview of streaming sensor data into a small low cost Vertica single node database. Live data feeds are captured in real-time. Depending 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 Vertica 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 Vertica geospatial functions to calculate distance, airspeed and routing.

IoT Device (edge)

Raspberry pi Model 3
 CPU Broadcom BCM2837
 1.2 GHz quad-core ARM Cortex A53
 1 GB LPDDR2-900 SDRAM.

Download dump1090 from github:
<https://github.com/MaLcoImRobb/dump1090>

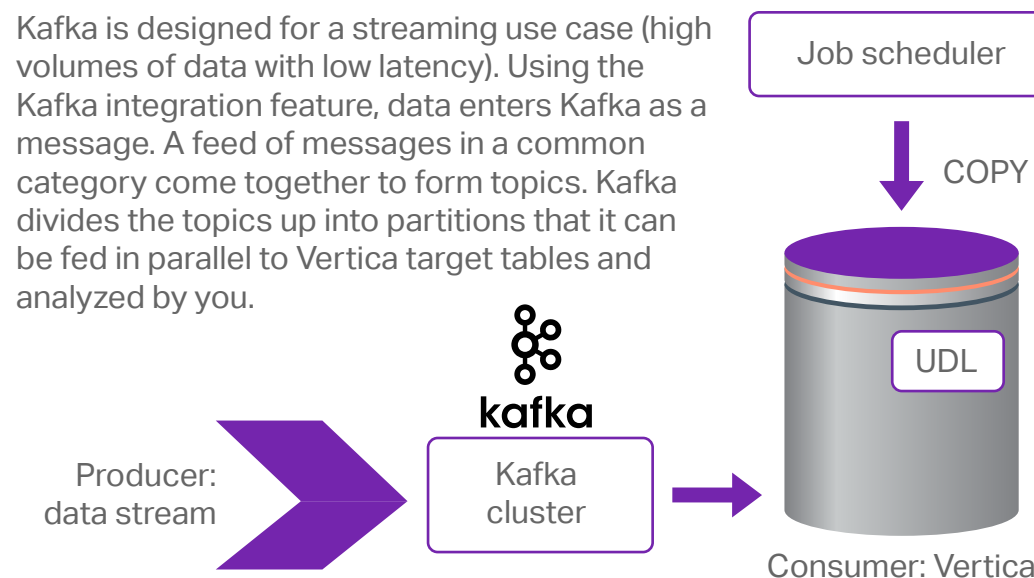
Example decoded message

```
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

Optional: 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 Vertica target tables and analyzed by you.



Commands to collect dump1090 data and load into Vertica

netcat command retrieves 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 &
```

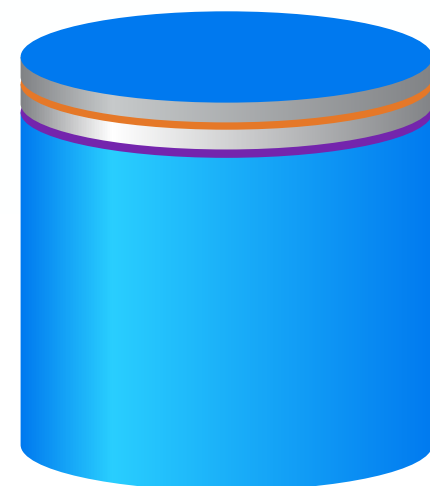
Cat newest batch of rows pipe to ssh command to Vertica server, dumpfix reformats date into standard TIMESTAMP format for Vertica COPY.

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

Aircraft Registration Data
 Downloadable from the FAA website:
www.faa.gov
 Search for 'aircraft registration 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

```
Vertica 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
);
```



Vertica 8.1.0 Database Server
 1-node, < \$1,000, Intel i5 CPU
 3.20GHz, SSD Disk,
 16GB RAM, CentOS 7

Edge Analytics



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

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

