

Fundamentals of Data Engineering

Week 14 - sync session

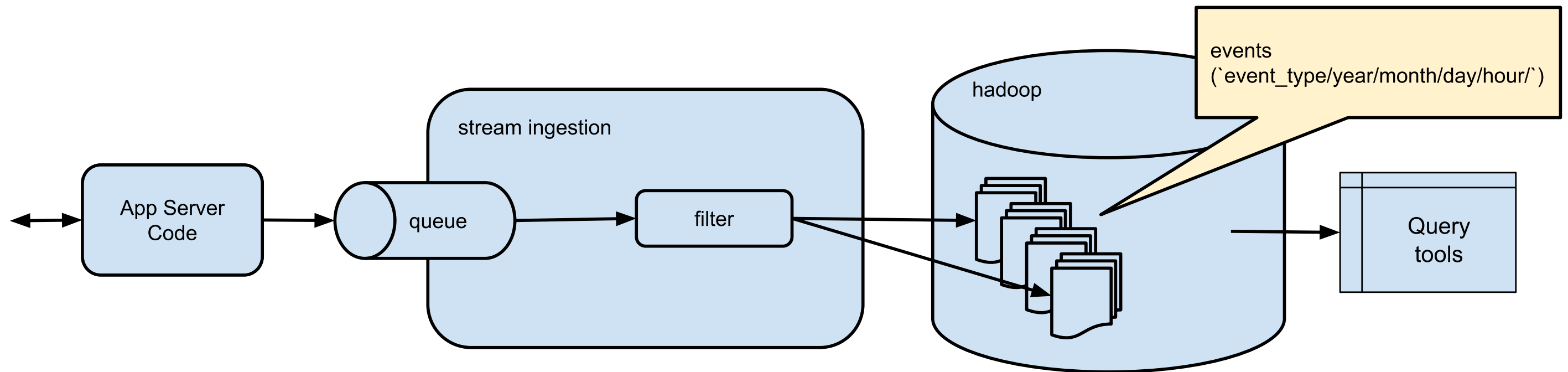
datascience@berkeley

Get Started

```
git pull in ~/w205/course-content  
mkdir ~/w205/full-streaming-stack/  
cd ~/w205/full-streaming-stack  
cp ~/w205/course-content/14-Patterns-for-Data-Pipelines/docker-compose.  
docker-compose pull  
cp ~/w205/course-content/14-Patterns-for-Data-Pipelines/*.py .
```

Announcements

- droplets - copy all your stuff out by 27Apr2018
- repos - fork or clone your repos by 27Apr2018
- future - course-content tagged by semester



Full-Stack Streaming

Setup

The docker-compose.yml

Create a docker-compose.yml with the following

```
---
version: '2'
services:
  zookeeper:
    image: confluentinc/cp-zookeeper:latest
    environment:
      ZOOKEEPER_CLIENT_PORT: 32181
      ZOOKEEPER_TICK_TIME: 2000
    expose:
      - "2181"
      - "2888"
      - "32181"
      - "3888"
    extra_hosts:
      - "moby:127.0.0.1"
```

Spin up the cluster

```
docker-compose up -d
```


Web-app

- Take our instrumented web-app from before
~/w205/full-streaming-stack/game_api.py

```
#!/usr/bin/env python
import json
from kafka import KafkaProducer
from flask import Flask, request

app = Flask(__name__)
producer = KafkaProducer(bootstrap_servers='kafka:29092')

def log_to_kafka(topic, event):
    event.update(request.headers)
    producer.send(topic, json.dumps(event).encode())

@app.route("/")
def default_response():
```

run flask

```
docker-compose exec mids \  
  env FLASK_APP=/w205/full-streaming-stack/game_api.py \  
  flask run --host 0.0.0.0
```

Set up to watch kafka

```
docker-compose exec mids \  
  kafkacat -C -b kafka:29092 -t events -o beginning
```

Streaming

```
#!/usr/bin/env python
"""Extract events from kafka and write them to hdfs
"""

import json
from pyspark.sql import SparkSession
from pyspark.sql.functions import udf, from_json
from pyspark.sql.types import StructType, StructField, StringType

def purchase_sword_event_schema():
    """
    root
    |-- Accept: string (nullable = true)
    |-- Host: string (nullable = true)
    |-- User-Agent: string (nullable = true)
```

Run it

```
docker-compose exec spark spark-submit /w205/full-streaming-stack/wr
```

Check what it wrote to Hadoop

```
docker-compose exec cloudera hadoop fs -ls /tmp/sword_purchases
```

Set up Presto

Hive metastore

```
docker-compose exec cloudera hive
```

```
create external table if not exists default.sword_purchases (  
    Accept string,  
    Host string,  
    User_Agent string,  
    event_type string,  
    timestamp string,  
    raw_event string  
)  
stored as parquet  
location '/tmp/sword_purchases'  
tblproperties ("parquet.compress"="SNAPPY");
```

Query this with presto

```
docker-compose exec presto presto --server presto:8080 --catalog hive
```

What tables do we have in Presto?

```
presto:default> show tables;
```

Describe sword_purchases table

```
presto:default> describe sword_purchases;
```

Query purchases table

```
presto:default> select * from sword_purchases;
```

Add some data

Seed a little data into the stream

```
docker-compose exec mids \  
  ab \  
    -n 10 \  
    -H "Host: user1.comcast.com" \  
    http://localhost:5000/
```

```
docker-compose exec mids \  
  ab \  
    -n 10 \  
    -H "Host: user1.comcast.com" \  
    http://localhost:5000/purchase_a_sword
```

```
docker-compose exec mids \  
  ab \  
    -n 10 \  
    -H "Host: user2.att.com" \  
    http://localhost:5000/
```

```
docker-compose exec mids \  
  ab \  
    -n 10 \  
    -H "Host: user2.att.com" \  
    http://localhost:5000/purchase_a_sword
```


Query purchases table

```
presto:default> select * from sword_purchases;
```

More data

Feed the stream more data

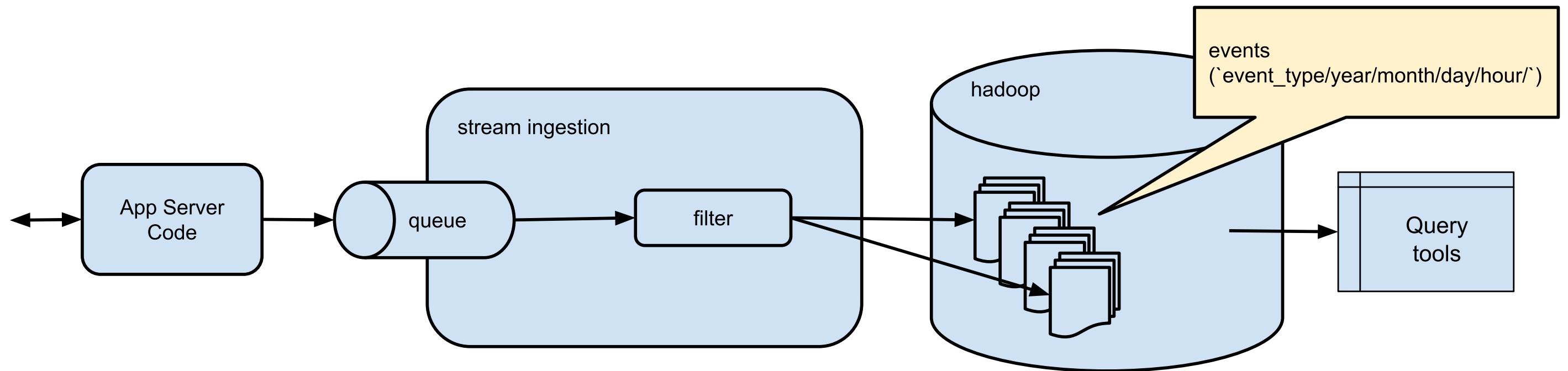
```
while true; do
  docker-compose exec mids \
    ab -n 10 -H "Host: user1.comcast.com" \
    http://localhost:5000/purchase_a_sword
  sleep 10
done
```

Watch presto grow

```
presto:default> select count(*) from sword_purchases;
```

down

```
docker-compose down
```



Building Docker Images

Setup

```
mkdir -p ~/w205/docker/mytools  
cd ~/w205/docker/mytools
```


The Dockerfile

Save this as Dockerfile in
~/w205/docker/mytools/

```
FROM ubuntu:xenial
MAINTAINER Mark Mims <mark@digitalocean.com>

RUN apt-get -qq update \
    && apt-get -qq install -y jq apache2-utils
```

Build

```
docker build -t <tag> <path>
```

so, from a folder containing a Dockerfile,

```
docker build -t mytools .
```

check build ids and tags

```
docker images | grep mytools
```

test a build

```
docker run -it --rm mytools bash
```

then at the prompt

```
which jq
```

What did we do?

```
docker run -it --rm ubuntu:xenial which jq  
docker run -it --rm mytools which jq
```

Iterate

You can do more in a Dockerfile

```
FROM ubuntu:16.04
MAINTAINER Mark Mims <mark@digitalocean.com>

ENV SPARK_VERSION 2.2.0
ENV SPARK_HADOOP_VERSION 2.6

ENV SPARK_HOME /spark-$SPARK_VERSION-bin-hadoop$SPARK_HADOOP_VERSION
ENV JAVA_HOME /usr/lib/jvm/java-8-oracle

ENV SPARK_TEMPLATE_PATH $SPARK_HOME/templates
ENV SPARK_CONF_PATH $SPARK_HOME/conf

ENV PATH $SPARK_HOME/bin:$PATH

RUN echo oracle-java8-installer shared/accepted-oracle-license-v1-1
```

Examples of different Dockerfiles

- [nginx](#)
- [mongo](#)
- [mysql](#)
- [python](#)
- [etc...](#)

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