Mesos @ Bloomberg

MesosCon 2015

Skand S Gupta
Bloomberg LP
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- **Bloomberg technology helps drive the world’s financial markets**
  - We run one of the world’s largest private network with over 20,000 routers across our network
  - We developed “cloud computing” and deployed “software as a service” well ahead of the general marketplace
  - Our technology, has brought transparency to the global financial markets

- **Bloomberg technologists**
  - More than 3,000 software developers and designers located around the world (London, NYC, SF)
  - BloombergLabs.com (@BloombergLabs) is our platform for dialogue between our experts and the broader tech community

- **Our clients**
  - Over 320,000 subscribers
  - Primarily financial professionals including investment bankers, CFOs, investor relations, hedge funds managers, foreign exchange, etc.
Banks Reported Flawed Interest Data for LIBOR

(WSJ)
• Impacts consumer lending such as mortgages, student loans, etc. (LIBOR + ~3%)
• $450 Trillion worth of financial deals are dependent on it
• Measure of trust in financial system
Banks Reported Flawed Interest Data for LIBOR

(WSJ)

2008

CFTC Orders Barclays to Pay $200 Million Fine

(CFTC)

2012
Banks Reported Flawed Interest Data for LIBOR

CFTC Orders Barclays to Pay $200 Million Fine

Deutsche Bank Pays $2.5 Billion to Settle Rate-Rigging Case

2008
2012
2015
Banks Reported Flawed Interest Data for LIBOR (WSJ)

CFTC Orders Barclays to Pay $200 Million Fine (CFTC)

Deutsche Bank Pays $2.5 Billion to Settle Rate-Rigging Case (NYT)

2008  2012  2015

Fines Totaling $6 Billion!
March 22, 2005: (emphasis added)

U.S. Dollar LIBOR Submitter:

if you need something in particular in the libors i.e. you have an interest in a high or a low fix let me know and there's a high chance I'll be able to go in a different level. just give me a shout the day before or send an email from your blackberry first thing.

New York U.S. Dollar Trader 1:

Thanks - our CP guys have been looking for it a bit higher - not a big deal

U.S. Dollar LIBOR Submitter:

if anything the cash has actually cheapened up since yesterday too albeit by 1/2 tick - true could get some sub 75 days thru the next week

April 1, 2005: (emphasis added)

London U.S. Dollar Trader 1:

COULD WE PLS HAVE A LOW 6MTH FIX TODAY OLD BEAN?

February 28, 2007: (emphasis added)

New York U.S. Dollar Trader 2:

LIBOR HIGHER TOMORROW?

shouldn't be

COME ON. WE ALWAYS NEED HIGHER LIBORS !!!

HAHA

haha, I'll do my best fcker

U.S. Dollar LIBOR Submitter:

NO WORRIES. JUST CURIOUS, U SURVEY THE DEBACLE OF TH PAST 24 HRS>

Source: Commodity Futures Trading Commission
Compliance Platform and Processing Pipeline

Human- and Machine-generated Data
- Chat
- Email
- Social Media
- Voice
- Counterparty
- Trade Data
- Product Data
- Customer Data
- Market Data
- Reference Data

Compliance Platform
- Surveillance Pipeline
- Search, Review, Analyze
- Case Management

Communication Data
- Transactional Data
- User Data

Compliance Storage

Compliance Officers
Work Loads – Complex Event Processing

- Real Time Low Latency Processing
- CPU bound
Work Loads – Text Searches

- Distributed
- Memory bound
Work Loads – Analytics & Reporting

- Ad Hoc
- Distributed
- Reporting: I/O bound
- Analytics: CPU bound
Work Loads

- Real Time Low Latency Processing
  - CPU bound

- Ad Hoc
  - Distributed
  - Reporting: I/O bound
  - Analytics: CPU bound

- Distributed
  - Memory bound
Before Mesos

Lights up during market hours

Can’t get enough resources

Complex Event Processing

Text Search

Reporting & Analytics

Idle, till its not!
Before Mesos

- Time consuming to re-size a static cluster
- Wasted resources
- Operational overhead
Elastic Data Processing and Analytics Stack

- Kafka
- Processing Topologies
- Accumulo
- Monitoring
- Marathon
- Chronos
- Storm
- Service Discovery
- Mesos
- HDFS
- Pre-fabricated Hardware

Open REST API (Play)
Service Discovery (Mesosphere Implementation)

- Only works with Marathon
- No support for multiple Marathons
- Services not running on Mesos
- How do clients discover global port in Marathon?
- How do external clients discover services running on Mesos?
Service Discovery Modifications

Marathon
Marathon
HDFS
Zookeeper

SD Python Endpoint
SD REST Endpoint

Proxy Bridge
HA Proxy
SVC 1
SVC 2
SVC 1
SVC 3

Slave
Slave
Slave

Client

DNS

Bloomberg
Monitoring Applications
Monitoring Applications

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Monitoring Applications

- Log aggregation
- Application statistics
- Alerting!
Monitoring Applications

Mesos Slave
- Log Shipper
- App1
- App2
- App3
- StatsD
- CollectD

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Master

Master
Monitoring Applications

Mesos Slave

Log Shipper

App1

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App3

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Master
Mesos Slave

Log Shipper

App1
App2
App3

StatsD
CollectD

Master
Master
Master

Kafka

Monitoring Applications
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Kafka ➔ ELK
Monitoring Applications
Monitoring Applications

Mesos Slave
  Log Shipper
    App1
    App2
    App3
  StatsD
  CollectD

Master

Kafka → ELK
InfluxDB → Grafana
Monitoring Applications

Mesos Slave
- Log Shipper
  - App1
  - App2
  - App3
- StatsD
- CollectD

Kafka → ELK
InfluxDB → Grafana
Riemann
Alerting

Master

Master

Master

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Access Control

• Applications deployed via Marathon
• Give the power to users to deploy when they want and what they want
• Isolate core services from accidents
• Isolate user applications
Access Control - Deploying Application

1. Launch App
2. Store AppKey
3. Launch App
4. AppKey

Key Store
Reverse Proxy
Marathon
Password W/ SSL
Access Control

1. Update <AppKey>
2. Check Access <AppKey>
3. Update App
4. Success / Failure
Lessons

• Protect your Zookeeper cluster(s)
• Don’t run HDFS on Mesos in your first deployment
• Understand the back-off factor in Marathon
  – https://github.com/mesosphere/marathon/issues/1504
• Clean up the sandboxes periodically (and frequently)
• Build a monitoring infrastructure for applications
• Run multiple clusters
• Mesos is very stable!
We Are Hiring!

http://careers.bloomberg.com
sgupta178@bloomberg.net
@skandsg