Apache Hama
a BSP for Advanced Analytics

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I am ..

- PMC member and Committer of ..
  - Apache Hama
  - Apache BigTop
  - Apache MRQL

- Oracle corp. (2012 ~ 2013)
- Korea Telecom (2011 ~ 2012)
- NHN, corp. (2006 ~ 2011)
Agenda

1. Introduction of Hama
   a. What's Hama?
   b. Why Hama?
      i. Evolution of the World Wide Web
      ii. Evolution of the Infrastructure
      iii. Transition of the Technologies
      iv. So, why Hama?
   c. Benchmarks
      i. Hama vs. Spark - KMeans

2. Use cases of Apache Hama
   a. Netflow Analytics at Korea Telecom
   b. SiteRank at Sogou.com

3. What's Next?
Introduction of Hama BSP
What's Hama?

- Apache Top Level Project
- Written in Java
- a general BSP computing engine
  - Java, Python, and C/C++ Interface
  - MRQL - BSP Query Language
- 8+ Active committers!
What's BSP?

- a Parallel computing model on Message-Passing Architecture
MapReduce vs. Hama BSP

VS

Data-Intensive

Complex
Computation-intensive
MPI on YARN vs. BSP

How can you solve the below problems of MPI?

- Data partitioning and data locality aware task scheduling
- Job Fault Tolerance
- Deadlock or Race Conditions
- Complexity of Interface

The BSP is answer!
Hadoop Ecosystem

HDFS

MapReduce

Apache Hama (BSP)

Apache MRQL

Spark, MPI, …, etc.

Hive, Mahout, …, etc.
Why Hama?
Evolution of the WWW

● 1990 ~ : Web Documents

Web 2.0

Blog, Open API

Smartphone

Social Network

● ~ 2013 : Responsive Apps for multi-devices
Evolution of the Infrastructure

- 1990 ~ : Server/Web Hosting

  Google Apps
  Cloud Computing
  IaaS, PaaS, SaaS

- ~ 2013 : Cloud/App Hosting
Transition of the Technologies

- **2003 ~ :**
  - SQL Database connectivity interface
  - Web-scale data processing
    - MapReduce
    - Hive, Pig, Mahout, …

- **2007 ~ :**
  - Key/Value interface
  - Realtime, ML and Graph Processing
    - Storm
    - Apache Hama!
    - GraphLab, Spark, …, etc.
So, why Hama?

- Simple and Flexible message-passing programming Interface

And,

- Machine Learning Package
  - K-Means clustering is almost 500x ~ 1000x faster than Mahout MR version

- Graph Package (Google's Pregel)
  - PageRank is almost 10 ~ 20x faster than MapReduce version
Benchmarks with 256 cores

- SSSP on random 1 Billion edges
  400 secs!

- PageRank on Wikipedia link DataSet, contains 5,716,808 pages and 130,160,392 links.
  17 secs!
Hama vs. Spark - KMeans

Seconds

K-Means Clustering (20 million data points)

- Hama 0.5 version
- Spark Latest

Nodes
Use cases of Apache Hama
Netflow Analytics at Korea Telecom

Weather forecasting for Clouds

- 4 Full Racks
- Used as a Real-time event processing
  - Monitoring the network usage of each VMs as a real time
  - Detecting anomaly traffics
  - Sharing the risks among Servers
  - Billing, …, etc.
SiteRank at Sogou.com

Sogou.com runs SiteRank algorithm on a 7,200 cores Hama cluster.

- SiteRank is the ranking generated by applying the classical PageRank algorithm to the graph of Web sites.
- Dataset is about 400GB contains about 600M vertices and 6B edges.
What's Next?

- Performance Improvement
- Fault-Tolerant
- Asynchronous Scalable Messaging
- GPU acceleration
- NoSQL In/Out Formatters

- Develop the Hadoop Ecosystem
Hadoop Ecosystem

- HDFS
- MapReduce
- Apache Hama (BSP)
- Apache MRQL
- YARN
- Hive, Mahout, …, etc.
- Spark, MPI, …, etc.
Thanks, Questions?