Index

- What is Hama?
  - Bulk Synchronous Parallel
  - Schematic diagram of a superstep
- Hama Characteristics
  - Internals
- Why Hama and BSP?
- Hama In Korea Telecom
- Performance Evaluation
  - SSSP
  - K-means clustering
  - PageRank
About Me

- Founder of Apache Hama.
- Employee for Korea Telecom.
What Is Hama?

- Apache Incubator Project.
- BSP (Bulk Synchronous Parallel) for massive scientific computations.
- Written In Java.
- Currently 3 releases, 3 main committers and 2 more active contributors.
Bulk Synchronous Parallel?

- Parallel programming model introduced by Valiant.
- Consist of a sequence of supersteps.
- Conceptually simple and intuitive from a programming standpoint.
- Used for a variety of applications e.g., scientific computing, genetic programming, ...
Schematic diagram of a superstep

Local Computation

Idle

Communication

Idle

Barrier

Synchronization
Hama Characteristics

- Provides a Pure BSP.
  - Job submission and management interface.
  - Multiple tasks per node.
  - Input/Output Formatter.
  - Checkpoint recovery.
- Supports to run in the Clouds using Apache Whirr.
- Supports to run with Hadoop YARN.
Internals

- Hadoop RPC is used for BSP tasks to communicate each other.
- Collection and bundling of messages as a technique to reduce network overheads and contentions.
- Zookeeper is used for Barrier Synchronization.
Why Hama and BSP?

- Supports message passing paradigm style of application development.
- Provides a flexible, simple, and easy-to-use small APIs.
- Enables to perform better than MPI for communication-intensive applications.
- Guarantees impossibility of deadlocks or collisions in the communication mechanisms.
Hama In Korea Telecom

- **Structural Analysis of Network Traffic Flows.**
  - traffic mining, engineering, anomaly detection, traffic forecasting and capacity planning
  - Currently BSP jobs are experimentally running on 512 multi-cores machines.
Performance: SSSP algorithm

- A SSSP for a random graph (100 million vertices, 1 billion edges) is computed in **30 minutes** on 512 cores machines.
Performance: PageRank

- A PageRank for 30 million random web pages (10 anchors per page) is computed in 20 minutes on 256 cores Hama cluster!
What’s Next?

- Fault Tolerant System.
- Message Compression for High Performance.
- Add some frameworks on top of Hama.
- Add other RPC libs.
- Elegant Web UI.