CS 744: MESOS

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Fall 2022
- Assignment 1: Due Sep 28th at 11am!
- Assignment 2 out soon!
- Project details
  - Create project groups
  - Bid for projects/Propose your own
  - Work on Introduction
- Final report / poster presentation
Scalable Storage Systems

Datacenter Architecture

Applications

- Machine Learning
- SQL
- Streaming
- Graph

Computational Engines

Resource Management

Datacenter Architecture
How do we share CPU between processes?
CLUSTER SCHEDULING
TARGET ENVIRONMENT

Multiple MapReduce versions

Mix of frameworks: MPI, Spark, MR

Avoid per-framework clusters. Why?
CONSTRAINTS

Examples of constraints

- Data locality → soft constraint
- GPU machines → hard constraint

Constraints in Mesos:

- Applications can reject offers
- Optimization: Filters
DESIGN DETAILS

Allocation:
- Tasks are short, allocate when they finish
- Long tasks? Revocation beyond guaranteed allocation

Isolation
- Containers (Docker)
FAULT TOLERANCE

- Hadoop scheduler
- MPI scheduler
- Mesos master
- Standby master
- Standby master
- ZooKeeper quorum
- Mesos slave
  - Hadoop executor
  - MPI executor
  - task
HANDLING PLACEMENT PREFERENCES

What is the problem?
  More frameworks have preferred nodes than available
  Who gets the offers?

How do we do allocations?
  Lottery scheduling – offers weighted by num allocations
CENTRALIZED VS DISTRIBUTED

Framework complexity

Fragmentation, Starvation

Inter-dependent framework
COMPARISON: YARN

Per-job scheduler

AM asks for resource
RM replies
COMPARISON: BORG

Single centralized scheduler

Requests mem, cpu in cfg
Priority per user / service

Support for quotas / reservations
SUMMARY

• Mesos: Scheduler to share cluster between Spark, MR, etc.
• Two-level scheduling with app-specific schedulers
• Provides scalable, decentralized scheduling
• Pluggable Policy? Next class!
DISCUSSION

https://forms.gle/DIsqfzD3GqxQC4Y97
What are some problems that might arise if you wanted to use Mesos with frameworks that had very low latency tasks (e.g., for interactive analytics)
Next class: Scheduling Policy

Further reading
• https://www.umbrant.com/2015/05/27/mesos-omega-borg-a-survey/
• https://queue.acm.org/detail.cfm?id=3173558