CS 744: MESOS

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Fall 2021
- Assignment 1: Due tonight!
- 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

Resource Management

Computational Engines

Applications

Machine Learning

SQL

Streaming

Graph
BACKGROUND: OS SCHEDULING

How do we share CPU between processes?

CPU

code, static data
heap
stack

code, static data
heap
stack

code, static data
heap
stack
CLUSTER SCHEDULING
TARGET ENVIRONMENT

Multiple MapReduce versions

Mix of frameworks: MPI, Spark, MR

Data sharing across frameworks

Avoid per-framework clusters
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

Isolation
- Containers (Docker)
FAULT TOLERANCE
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/FSkKVbu94nLA4g3v9
What are some problems that could come up if we scale from 10 frameworks to 1000 frameworks in Mesos?
NEXT STEPS

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