Cluster management with Apache Mesos

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Credits for the lecture material:
Mesos website / NSDI'11 presentation

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What is Mesos?

An operating system for data-centers

Why Mesos?

Background

Data-centers are running a wide range of distributed frameworks for a wide range of different tasks:

No single framework is optimal for a given task

Problem

- Want to run multiple frameworks in a cluster
  - Maximize resource utilization
  - Share data across these frameworks

Alternative approaches

- Static partitioning of resources
  - Poor utilization
  - Impedes elasticity

- Monolithic scheduler
  - Fine/grained scheduling of resources
  - **Pros:** Improved utilization, global optimizations
  - **Cons:** complexity, responsiveness, difficult to grow for new frameworks

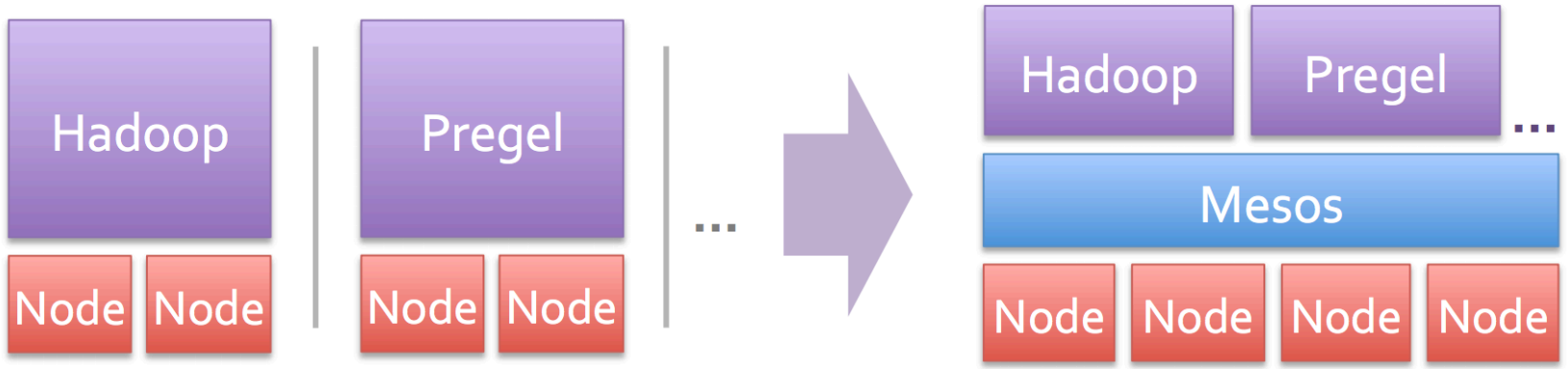
Mesos goals

- High utilization of resources
- Diverse generic platform
- Scalability
- Reliability

A microkernel design that
pushes the scheduling logic to the frameworks

Mesos design

A cluster manager platform
over which multiple diverse frameworks can run on



Design principle

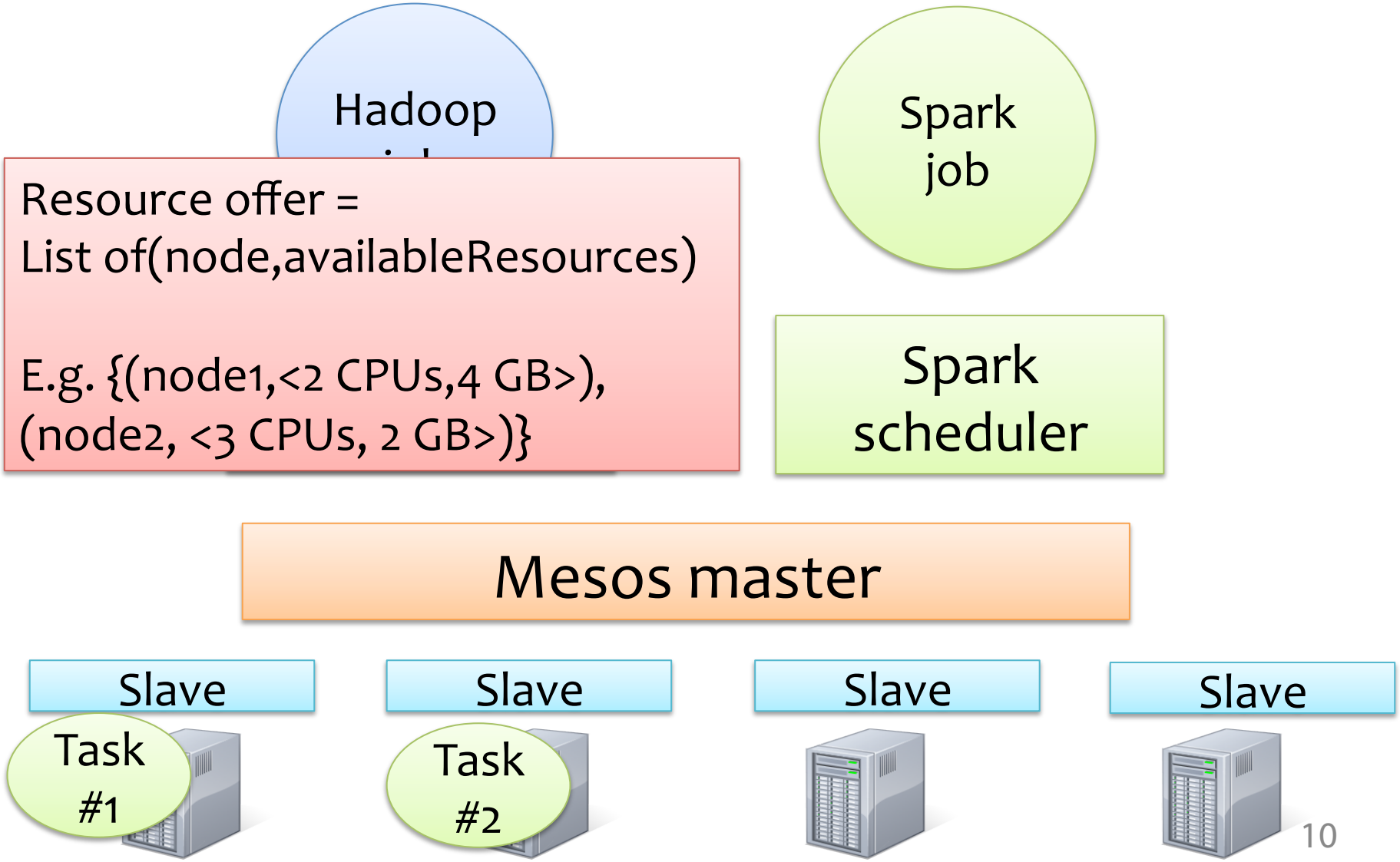
Two level scheduling:

1. **Mesos** controls resource allocation to schedulers
2. **Schedulers** make decision about what to run on given allocated resources

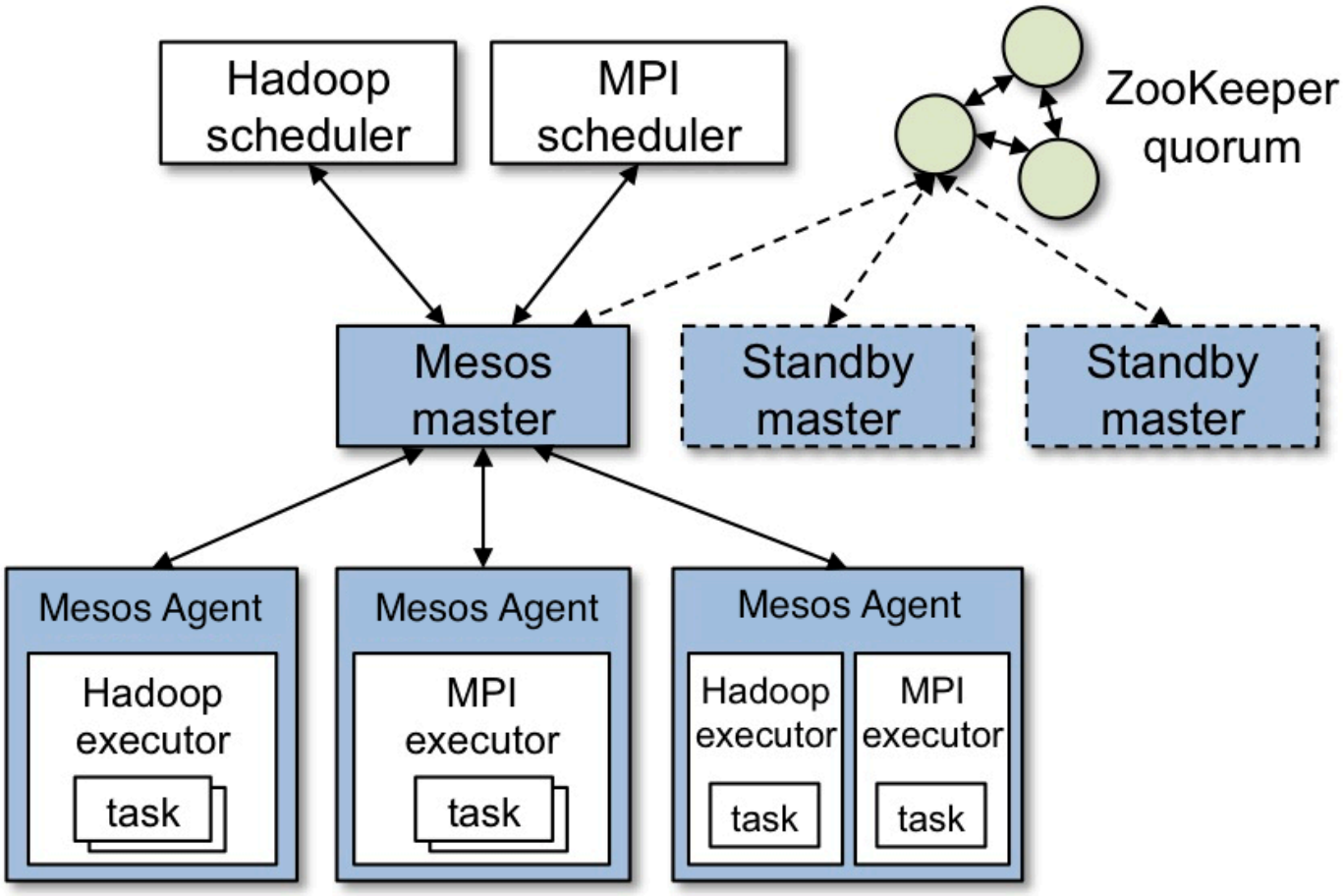
Resource offer

- Offer available resources to frameworks:
  - Let them pick which resources to use and which tasks to launch
- Advantage:
  - Keeps Mesos simple, lets it support future frameworks
- Limitation:
  - Decentralized decisions might not be optimal

Example: Resource offer



Mesos architecture



Summary

- Apache Mesos
  - Resource manager for distributed systems
  - A distributed micro-kernel design
  - Can support a wide-range of frameworks

- Resources:
  - Apache Mesos [NSDI'11]: http://mesos.apache.org/
  - Apache YARN [SoCC'13]: https://hadoop.apache.org/docs/current/hadoop-yarn/hadoop-yarn-site/YARN.html

Thanks!

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