Phurti: Application and Network-Aware Flow Scheduling for MapReduce

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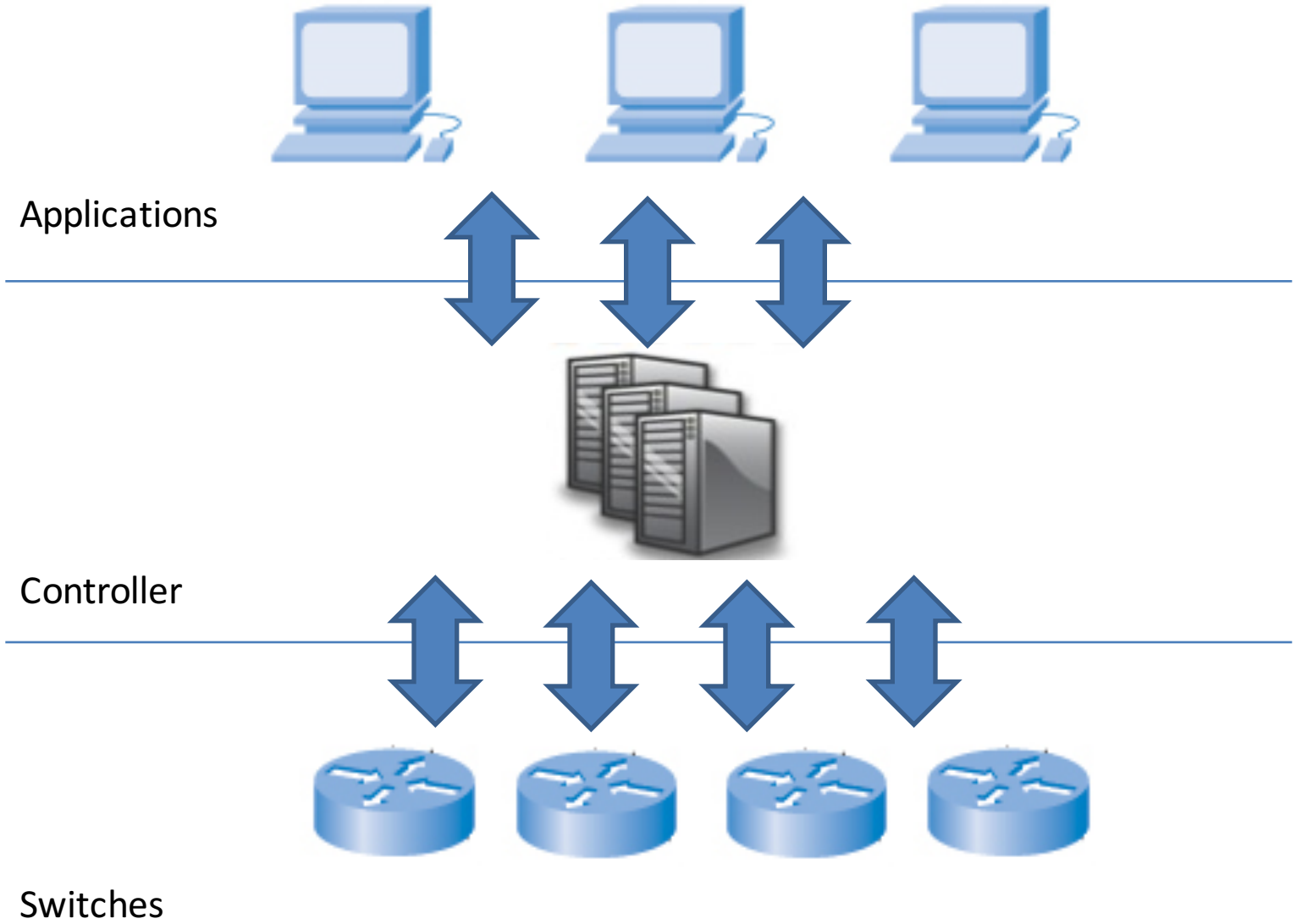
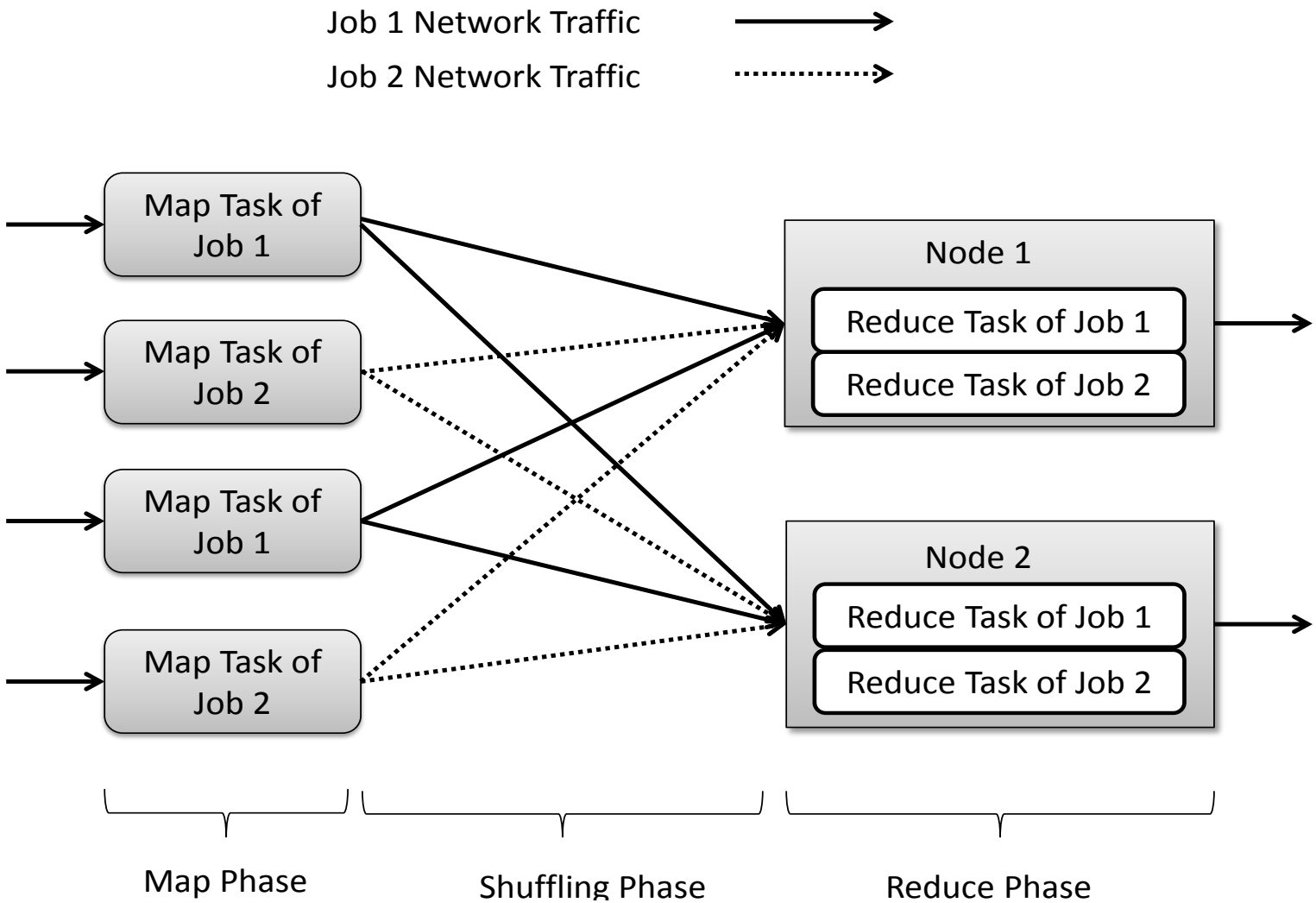
BACKGROUND

Software Defined Networking



Network Traffic for MapReduce Jobs

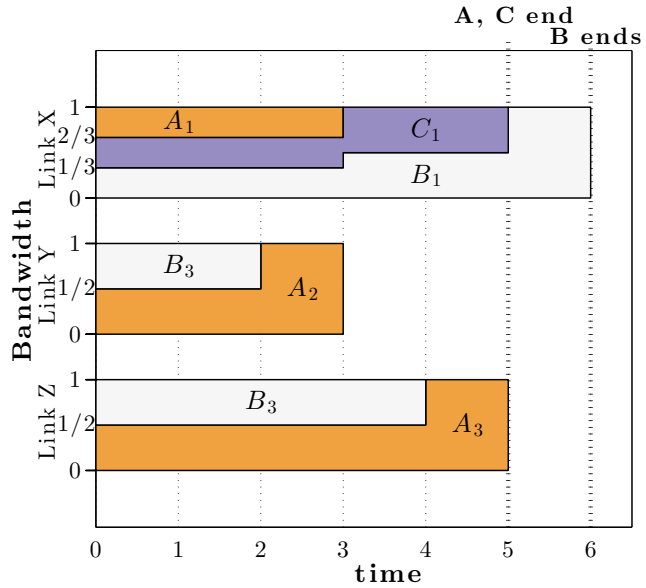


MOTIVATION

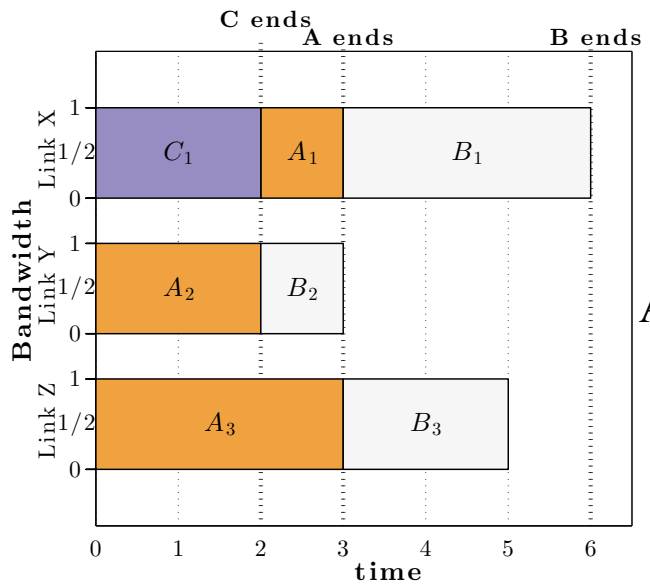
Application-Awareness in Scheduling

ID	Link	Size
A_1	X	1
A_2	Y	2
A_3	Z	3
B_1	X	3
B_2	Y	1
B_3	Z	2
C_1	X	2

Network Flows for jobs

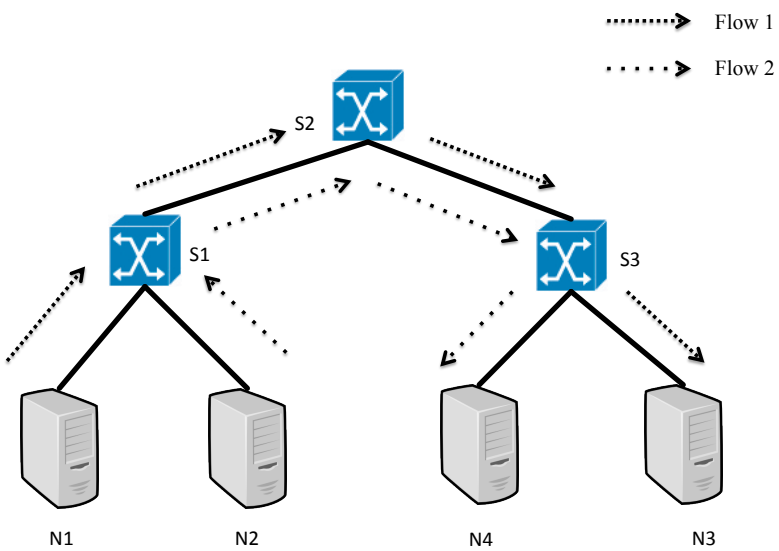


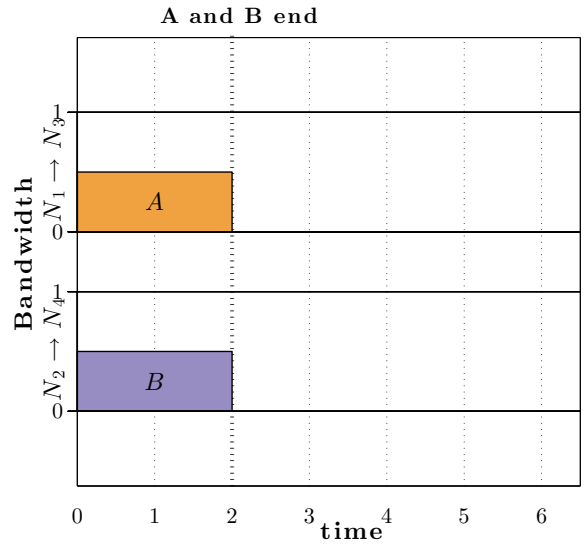
Fair Sharing



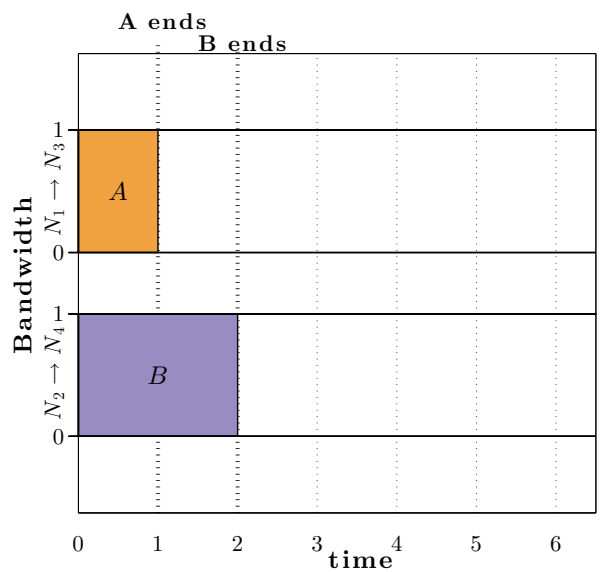
Application-aware Scheduling

Network-Awareness in Scheduling





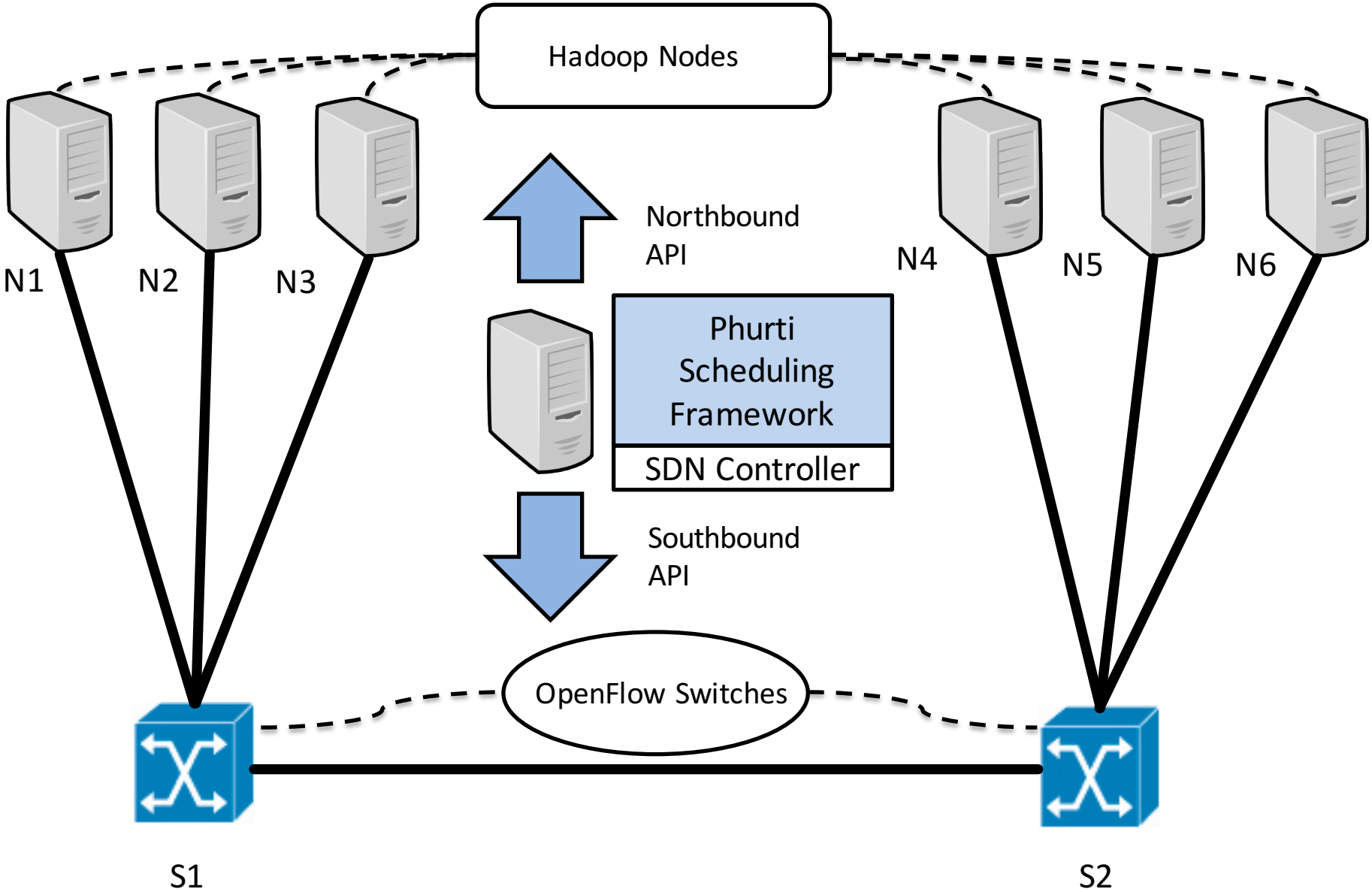
Network-Agnostic Scheduling



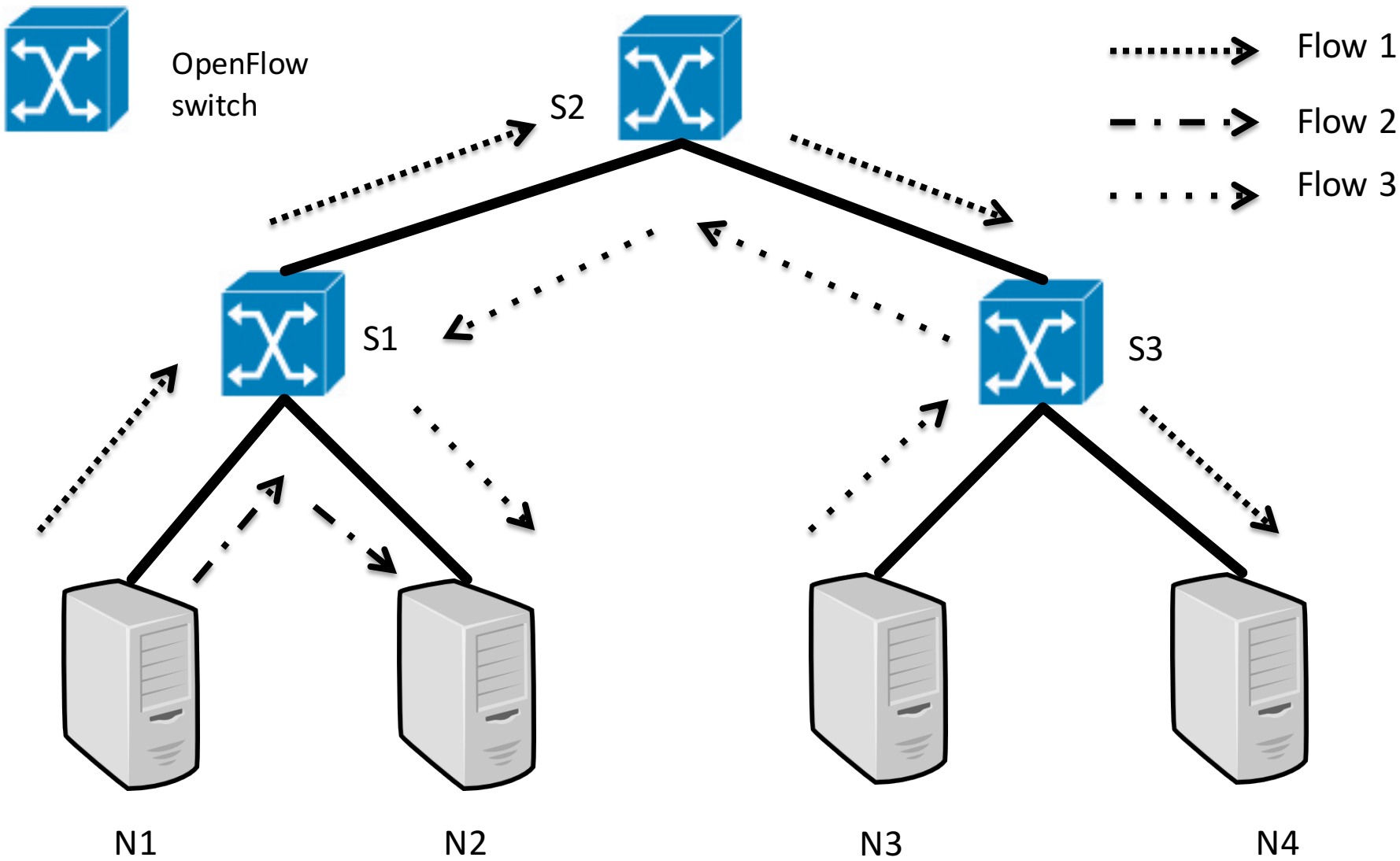
Network-Aware Scheduling

ARCHITECTURE

Phurti Architecture



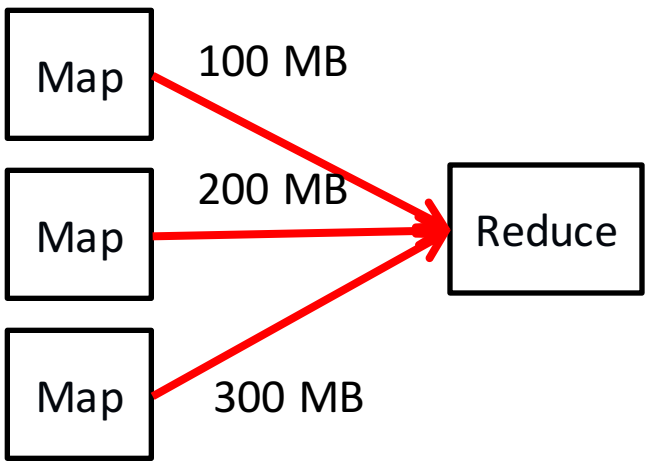
Phurti: Detecting Flow Interference



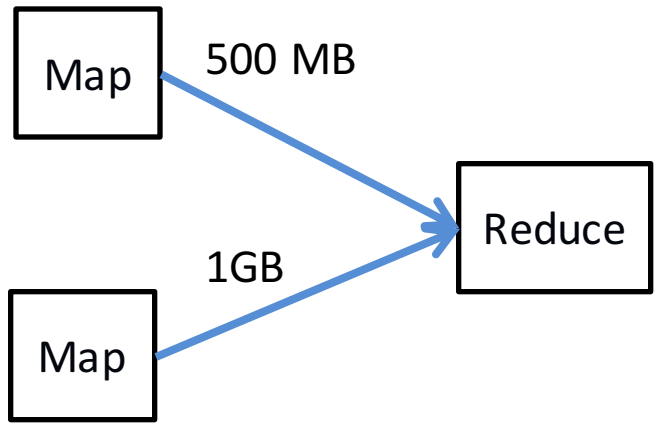
ALOGORITHM

Smallest Maximum Sequential-traffic First (SMSF)

- Sequential-traffic T_ij of a MapReduce job: the traffic a job needs to transmit from host i to host j



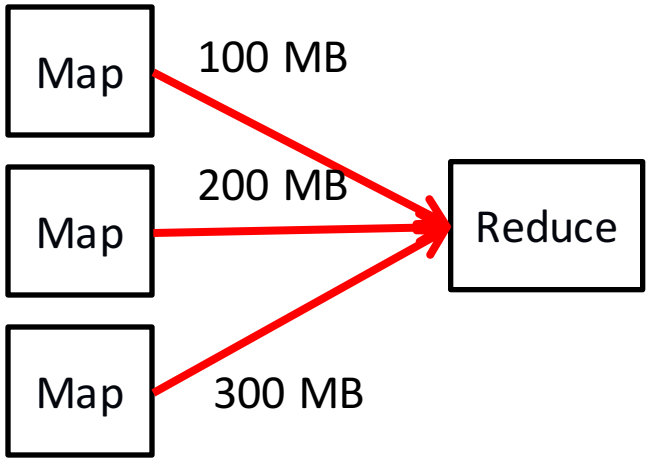
Maximum Sequential-traffic of Job 1: 300MB



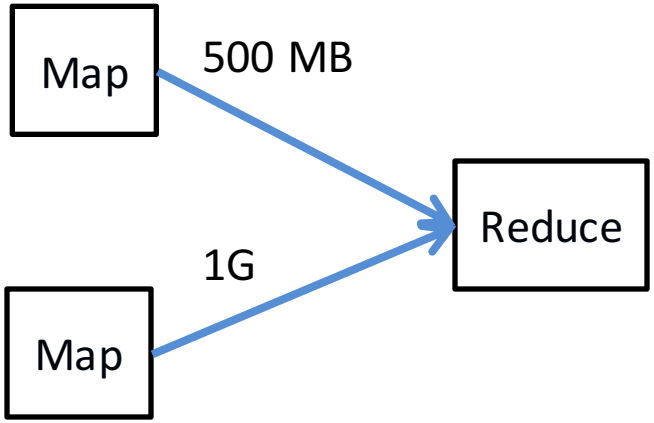
Maximum Sequential-traffic of Job 2: 1G

- Intuition behind SMSF: the size of maximum sequential-traffic of a job will likely determine its shuffle completion time

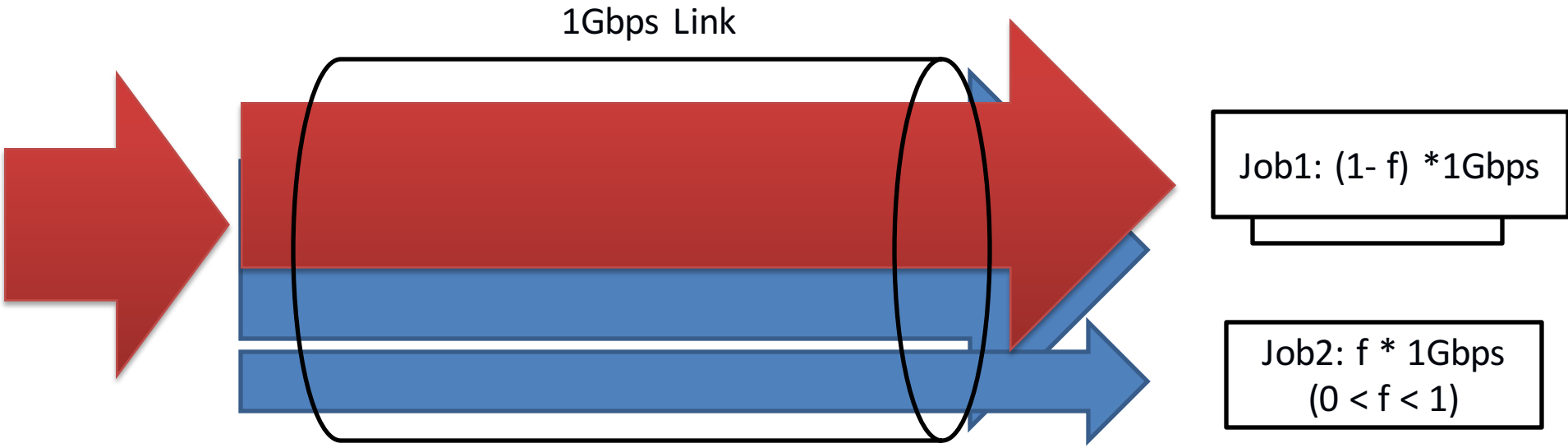
Smallest Maximum Sequential-traffic First (SMSF)



Maximum Sequential-traffic of Job 1: 300MB



Maximum Sequential-traffic of Job 2: 1G



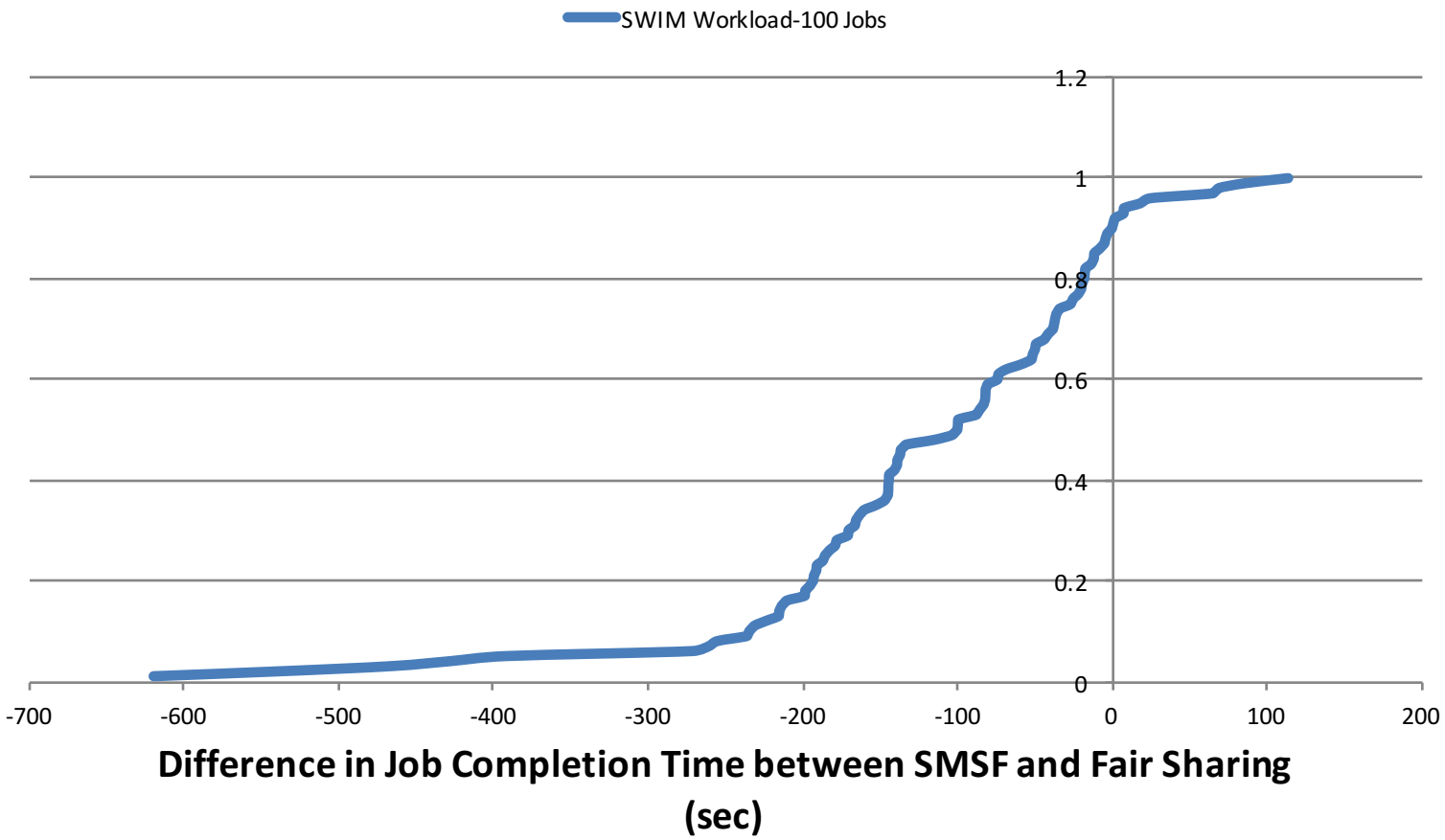
EVALUATION

Evaluation

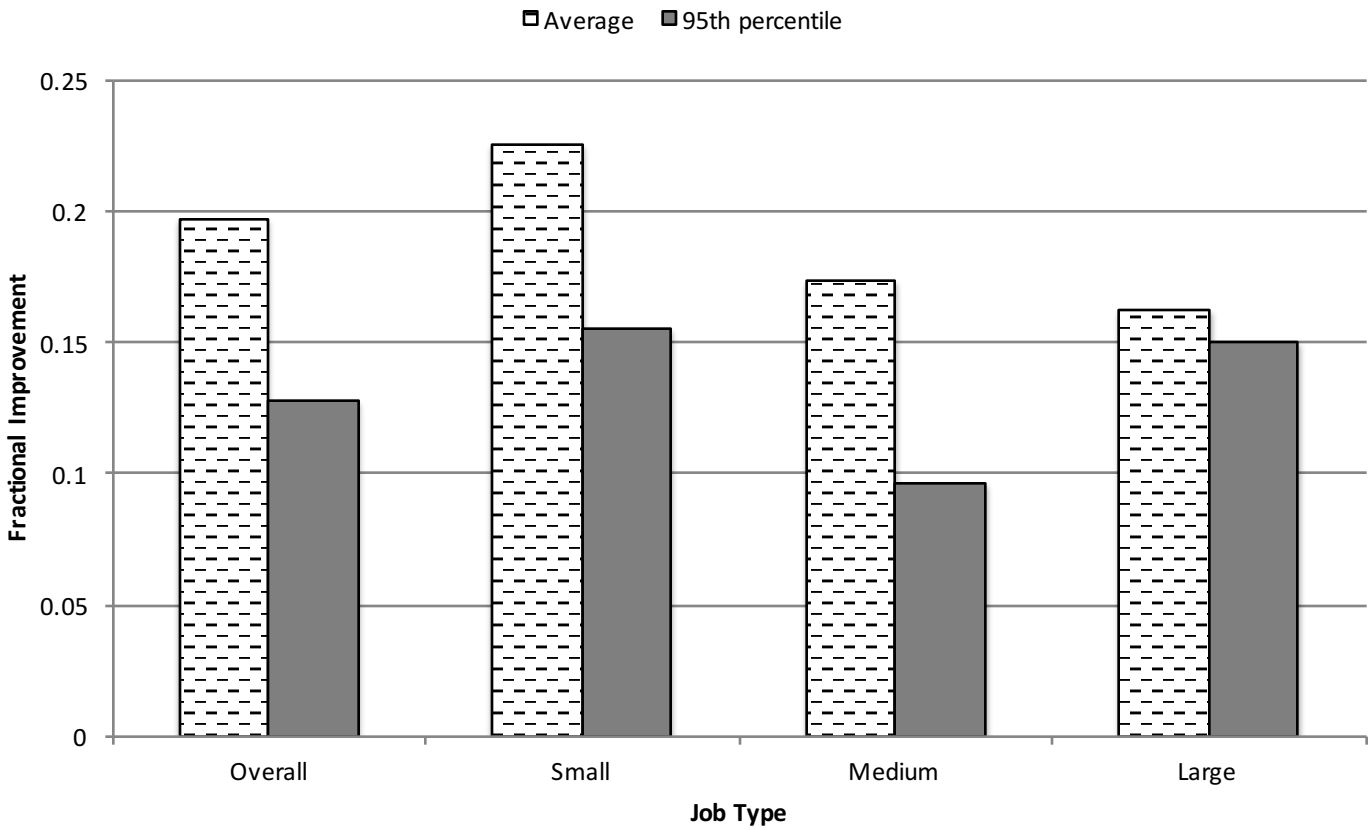
- Testbed: 6 nodes, 2 HP SDN switches
- SWIM workload: workload generated from Facebook Hadoop trace

Job Size Bin	**% of total jobs**	**% of total bytes in shuffled data**
Small	62%	5.5%
Medium	16%	10.3%
Large	22%	84.2%

Job Completion Time: SMSF VS Fair Sharing



Job Completion Time Improvement By Job Types



Questions

ACC Demo


Phurti:
ssurance for
ission-critical
traffic
Local Rescue
Agency
Rescue
Coordination
Center
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Dedicated Network