Map Reduce	Spark- App	Other YARN App	Hadoop/Spark App	HPC App (e.g. MPI)	Appli- cation
YARN Spark Pilot-Job		Hadoop Application Scheduler (e.g. Spark, Tez, LLama)	Pilot-Job	Application-level Scheduling	
HPC Scheduler (Slurm, Torque, SGE)			YARN/HDFS		System-level Scheduling
Mode I: Hadoop on HPC			Mode II: HPC on Hadoop		Syst