

PBS Professional Stronger, Faster, Better!

The #1 Software for HPC Workload Management

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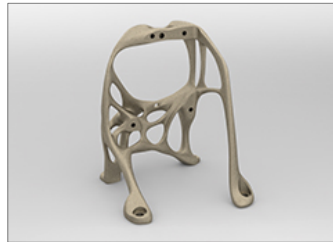


The Core of Our Business

Software



HyperWorks®
Engineering simulation
and performance
optimization technology



solidThinking®
Design, cloud BI,
manufacturing, systems
development Technology



PBS Works™
HPC job scheduling,
management, monitoring
and reporting technology



Cloud Solutions
Physical and virtual CAE
appliances, public/private
management, user portal tools



Partner Alliance
Partner applications
enabled through Altair's
software licensing model

#1 Platform Provider for High-end Simulation and Optimization; Fastest Growing Overall

We Build Software for Your:

End Users



Easy

Visualization & Management Portals

- Compute Manager
- Display Manager

Systems



Fast | Reliable | Streamlined

Workload Management & Job Scheduling

- PBS Professional

Managers



Transparent | Agile

Analytics & Reporting

- PBS Analytics

For Systems: Workload Management & Job Scheduling

Faster time-to-results, better throughput and utilization

- EAL3+ security certification and SELinux support
- Policy-driven, topology-aware scheduling
- Accelerator/Co-processor scheduling
- Green Provisioning™ for power management
- Cgroups and fairshare available
- Proven to run millions of jobs per day
- Backfill, sharing, and shrink-to-fit jobs maximize usage
- Extensible plugin framework
- Open architecture to implement virtually any policy



*NASA's Workload Manager of Choice
for All NAS HPC Resources*

~200k cores scheduled by PBS Professional

PBS Professional®

PBS Professional 13 Architected for Exascale

Speed • Scale • Resilience

plus cgroups, expanded plugins,
scheduling policy extensions,
usability improvements, and more!



PBS Pro v13: Scalability & Performance

**10x+ faster
Job Dispatch Rate**

50-150 jobs per
second

**~5x larger
System Size**

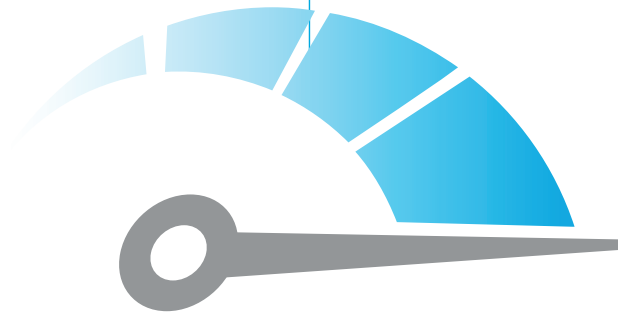
Tested to 50k
hosts / 1Ms cores

**10x better
Job Throughput**

1,000,000+ jobs
per day

**Huge MPI
Job Start**

20k-way MPI job
starts in minutes



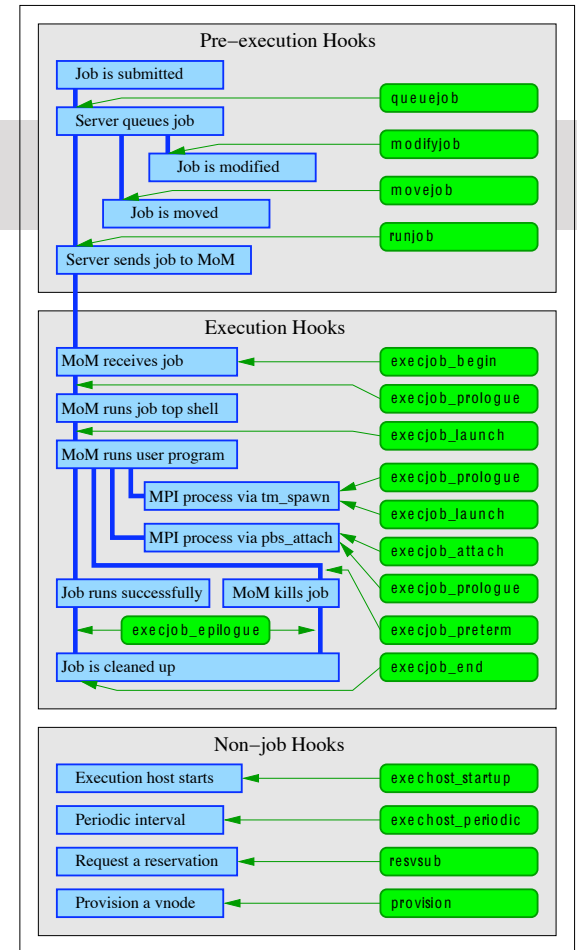
PBS Pro v13: Scheduling Policy Extensions

Job Priority Scheduling Formula	New Fairshare Usage Formula	Preemption
<p>Full math functions, e.g., sqrt(), ceil(), floor()</p> <p>Conditional expressions (ternary operators)</p> <p>Threshold for job start eligibility</p>	<p>General formula for fairshare usage</p> <p>Enables accruals per-Q, license sharing, time-of-day, power use, even combinations of these</p>	<p>Fine-grained targeting for preemption</p> <p>Configurable at the queue level, by App type, or any set of jobs; admin controlled</p>

PBS Pro v13: Plugin (“Hooks”) Enhancements

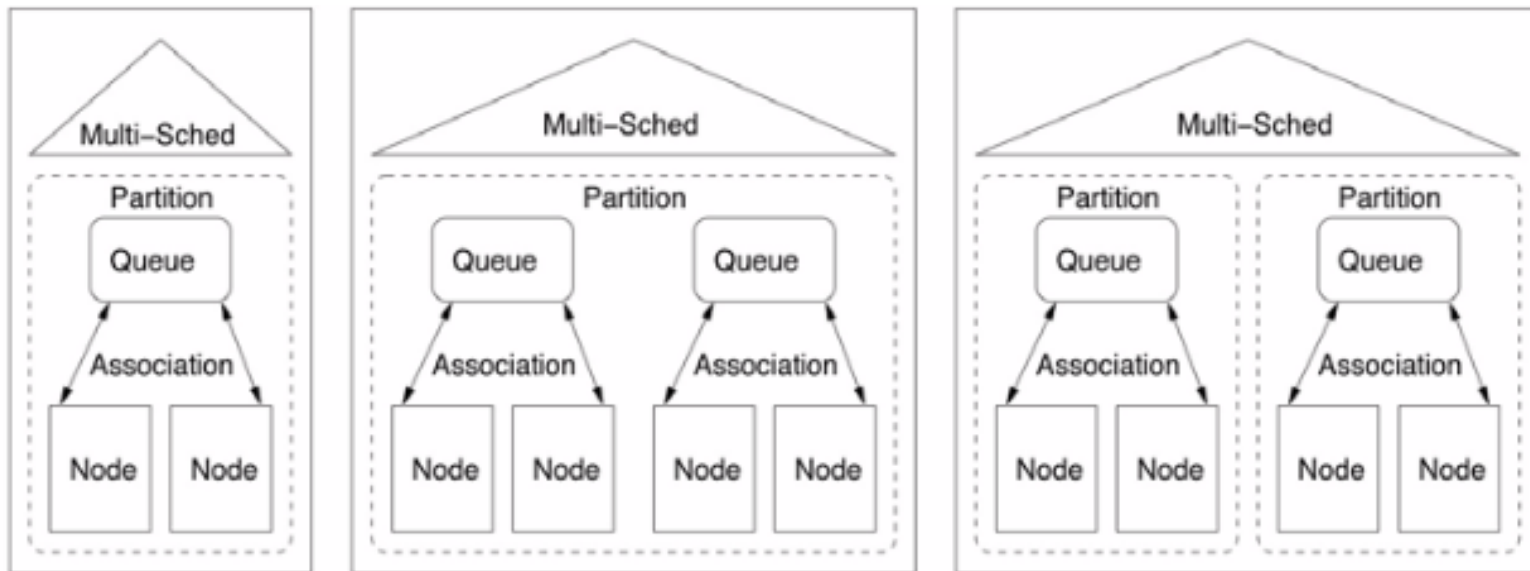
Hooks for Agility & Innovation

- New events at job launch, host boot, and task attach
- Add custom usage measurements, available to users on the fly via qstat and accounting reports
- Easier hooks authoring: per-hook config files, offline debugging support, and improved logging for troubleshooting



Multi-Sched Scheduling

- Multi-Sched daemon
 - Individual sched_config file
 - Manages its own partitions
 - Multiple multi-sched daemons
- Configurations
 - One queue in a partition
 - Multiple queues in one partition
 - Multiple queues in multiple partitions



The HPC World

Public Sector

Risk takers

Early adopters

Natural Collaborators

Open Source

Private Sector

Risk averse

Later adopters

Natural Competitors

Commercial

PBS Pro[®]
Dual-licensing

Aggressively Open & Community Oriented

Altair is making a BIG investment...

- Opening the full core of PBS Pro
 - not just a weak subset or older version
- Adding staff to support the community
- Reorganizing to behave as one of the (hopefully many) contributors
- Using community-accepted practices
 - OSI-approved license
 - Github, JIRA, open roadmaps, ...
- Focusing on longevity
 - For a viable, sustainable community



www.pbspro.org

PBS Pro Adoption Across the Broader HPC World



- Nurturing a community “standard” HPC stack
- Founding member with Intel, Cray, others
 - Technical Steering Committee (Scott Suchyta)
- PBS Pro included in
 - OpenHPC v1.2 (released at SC16)
 - Intel HPC Orchestrator (May 2017)
- Several Hardware Vendors leading with PBS Pro

Altair to Open Source PBS Professional® HPC Technology in 2016
Altair collaborates with Intel to integrate PBS Professional with OpenHPC software stack
TROY, Mich., Nov. 16, 2015 - Altair announced today it will provide an open source licensing option for its market-leading HPC workload manager, PBS Professional® (PBS Pro). Scheduled for release to the open source community in mid-2016, PBS Pro will offer different licensing options for commercial and open source users.

“Altair’s decision to open source PBS Professional, an established, production hardened HPC middleware technology, is a key milestone in moving the OpenHPC community closer to achieving exascale computing,” says Charles Wuischpard, vice president and general manager of HPC Platform Group at Intel Corporation.

Intel Corporation. Charles Wuischpard, vice president and general manager of HPC Platform Group at Intel Corporation. “Altair’s expertise in technical computing and development of distributed highly parallel CAE applications exploit the benefits of HPC. We look forward to continuing to work with Altair as a key partner in socializing advancements and broadening the accessibility of HPC to more industries and workloads.”

Thank You