PBS Professional
Stronger, Faster, Better!

The #1 Software for HPC Workload Management

Scott J. Suchyta
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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

<table>
<thead>
<tr>
<th>10x+ faster Job Dispatch Rate</th>
<th>~5x larger System Size</th>
<th>10x better Job Throughput</th>
<th>Huge MPI Job Start</th>
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</thead>
<tbody>
<tr>
<td>50-150 jobs per second</td>
<td>Tested to 50k hosts / 1Ms cores</td>
<td>1,000,000+ jobs per day</td>
<td>20k-way MPI job starts in minutes</td>
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<tr>
<td>Job Priority Scheduling Formula</td>
<td>New Fairshare Usage Formula</td>
<td>Preemption</td>
<td></td>
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<tr>
<td>Full math functions, e.g., <code>sqrt()</code>, <code>ceil()</code>, <code>floor()</code></td>
<td>General formula for fairshare usage</td>
<td>Fine-grained targeting for preemption</td>
<td></td>
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<tr>
<td>Conditional expressions (ternary operators)</td>
<td>Enables accruals per-Q, license sharing, time-of-day, power use, even combinations of these</td>
<td>Configurable at the queue level, by App type, or any set of jobs; admin controlled</td>
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<td>Threshold for job start eligibility</td>
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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 mulit-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

PBS Pro®
Dual-licensing

Private Sector
- Risk averse
- Later adopters
- Natural Competitors
- Commercial
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’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.
Thank You