PBS Works
The #1 Solution for HPC Workload Management

Victor Wright
September 8, 2015
HPC works better with Altair.

Powerful, reliable products.
Unbeatable service & support.
Altair is the only company that...

...**makes** HPC middleware:  

...**develops** HPC applications:

...and **uses** these to do HPC every day:

**Altair Knows HPC**
We build software for your:

**End Users**

- Easy

**Systems**

- Fast | Reliable | Streamlined

**Managers**

- Transparent | Agile
Our Software Focuses on 3 Key Targets…

End Users

- Make it easy to run jobs
- Deliver results faster
- Help users prioritize and manage workload
- Run jobs efficiently and avoid traffic jams

We can do our jobs more effectively…. It just works better.

– Gestamp North America
Our Software Focuses on **3 Key Targets…**

Systems

- Get results as fast as possible
- Trust your HPC environment to perform
- Fully use expensive hardware and software
- Minimize downtime

*We’re getting better utilization on all our servers.*

– Chrysler
Our Software Focuses on **3 Key Targets**…

**Managers**

- Keep multiple users happy
- Easily manage resource contention
- Respond quickly to changes in demand
- Easily customize the system to meet complex requirements

*We install it and it pretty much just runs.*

– Scripps

*HPC administration overhead has been reduced significantly.*

-- Clemson
Altair PBS Works

End Users

Visualization & Management Portals
- Compute Manager
- Display Manager

Workload Management & Job Scheduling
- PBS Professional
- Resource Management

Analytics & Reporting
- PBS Analytics
- Software Asset Optimization

Managers
For End Users: Visualization & Management Portals

No IT Degree Needed

- Drag-and-drop simplicity
- Monitor progress, view, steer, fix, rerun
- Analyze results & collaborate, all in browser
- Application-awareness
- 3D remote visualization (zero client install)
- Secure access anywhere … anytime

Computer Manager | Display Manager
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

"Without its flexibility, it wouldn't have been able to handle what we're doing."

– NASA Ames

PBS Professional®
For Managers: Analytics and Reporting

License Optimization, Capacity Planning & Chargeback

HPC Workload (Jobs / Hardware)

“Maximizing license utilization means we don't have to buy a new license, set up another workstation, and hire another engineer to keep up with demand.”

– Trelleborg

Global Software Licenses

“It would be close to impossible to optimize our software park without SAO... We now can detect double licenses, unclosed sessions and much more.”

– Segula
Altair is Delivering Big Data Solutions…

“Display Manager is our most significant functionality update since the move to HPC itself. In most cases we are saving a full day of time or more.”
–PING

“Integrated with Clemson’s “Hadoop on demand”… yields major efficiency benefits.”
–Clemson PBS Case Study

“PBS schedules Hadoop on Cray systems”
–Cray, CUG 2014
Altair is Building HPC Clouds…

Access to: HyperWorks on the Cloud

HyperWorks Unlimited Physical Appliance
On-premises, CAE private cloud appliance, unlimited use of HyperWorks

HyperWorks Unlimited Virtual Appliance
Off-premises, CAE publiccloud appliance using existing HyperWorks & PBS Works

Simulation Cloud Suite
Comprehensive software suite for simulation life cycle management

“All the configuration work is done for us, we have all the software we need for unlimited exploration, and it’s affordable. It’s almost too good to be true.”

–Stanley Black & Decker
Why Altair for HPC?

User-Focused Vendor
- Industry leader in user satisfaction
- Easy to work with, from execs to engineers
- Global support with experts in 22 countries

Respected Leader
- Proven for 30 years
- Thousands of clients
- Staff of seasoned experts and thought leaders

HPC Expertise
- Only vendor to create – and also use – both HPC middleware and applications
- Reliable products engineered by HPC experts who understand user needs

Strong Partnerships
- High-level relationships ensure clients get industry-leading quality
- Close collaborations for seamless, well-documented integrations

“Altair’s expertise and dedication to success is unbeatable.”
– Weizmann Institute
Why PBS Works: Business Value

**Save Money**
- Increase ROI by maximizing hardware and software use
- Spend less on power and data center footprint

**Save Time**
- Get results faster
- Reduce time to run jobs and manage workload

**Gain Peace of Mind**
- Get first-rate customer service
- Know your supplier plays well in the technology ecosystem
- Reduce risk with market-leading technology and supplier staying power

**Ensure User & Admin Satisfaction**
- Make it easier to use and manage HPC systems
- Ensure your team gets the best, most responsive global support

**Stay Competitive**
- Deliver higher-quality products faster
- Be prepared for game-changing technologies (e.g. cloud, Xeon Phi, Control Groups)
What Altair users and partners are saying…

“The cost savings to the government is huge.”

“Altair did all the customizations we needed & drew on their engineering expertise to make creative suggestions. They are problem solvers.”

“PBS beat the competition in both performance and flexibility… Altair really knows HPC.”

“Altair’s engineering leadership was a key decision factor… no other single vendor has the expertise we needed.”

“We’ve been very pleased with Altair’s responsiveness to our product feedback.”

“The product’s flexibility, and the company’s expertise and support, is simply unparalleled.”
HPC improves people’s lives
## The PBS Works Difference: Key Differentiators

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<thead>
<tr>
<th>Everyone claims…</th>
<th>Altair goes the extra mile…</th>
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<tbody>
<tr>
<td><strong>Comprehensive solutions</strong></td>
<td>Altair is the <strong>only HPC provider</strong> with scheduling and workload management + portals + analytics + cloud</td>
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<td><em>Others fill gaps by partnering (or not at all)</em></td>
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<td><strong>Secure, robust, scalable</strong></td>
<td>PBS is the <strong>only scheduler</strong> with global EAL3+ security certification and the <strong>only scheduler</strong> to support SELinux (MLS)</td>
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<td><em>Others “say” secure…</em></td>
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<td><strong>Flexible scheduling policies</strong></td>
<td>PBS allows any arbitrary formula to express any policy, including exceptions</td>
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<td><em>Others offer static tables/coefficients…</em></td>
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<td><strong>Scheduling by MPI rank</strong></td>
<td>PBS lets you <strong>allocate resources by MPI rank</strong> (e.g. rank 0 gets 8GB, others get 1GB) for less waste and faster turnaround</td>
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<td><em>Others force use of max resources…</em></td>
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<td><strong>Submission filtering</strong></td>
<td>PBS delivers an <strong>extensible plugin framework</strong></td>
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<td><em>Others have a monolithic shell script…</em></td>
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<td><strong>Job array support</strong></td>
<td>PBS implements <strong>10,000+ way parameter studies</strong> via a single object for massive scaling and performance</td>
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<td><em>Others provide syntactic sugar…</em></td>
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<td><strong>Service and support excellence</strong></td>
<td>Altair is known for marketing-leading customer focus -- <strong>we work with customers to get to the right solution, period.</strong></td>
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<td><em>Others just don’t go the extra mile…</em></td>
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## PBS Works History

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<td>PBS developed for NASA</td>
<td>Early production grids built using PBS</td>
<td>PBS Pro 5.0: enhanced, hardened, commercial</td>
<td>Altair acquires PBS Pro</td>
<td>Clouds powered by PBS Pro Compute Manager</td>
<td>PBS Works named #1 HPC Software</td>
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<td>PBS Analytics</td>
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<td>PBS Professional 13.0</td>
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<td>Topology-aware scheduling</td>
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<td>Running on all 7 continents</td>
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<td>Green Provisioning™</td>
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<td>EAL3+ Security</td>
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<td>Plugin Framework</td>
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<td>GPU Scheduling</td>
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Partnerships with HPC Vendors Worldwide

All major platforms and operating systems supported
Key Application Integrations

• PBS Works products are integrated with the most popular and widely used software across all vertical industries

• Hundreds of commercial, open source and proprietary code integrations

Plus:

• Amber

• LAMMPS

• NAMD

• CFX

• PERMAS

• NONMEM

• openFOAM

...and many more!
Key Application Integrations

- PBS Works products are integrated with the most popular and widely used software across all vertical industries
- Hundreds of commercial, open source and proprietary code integrations
PBS Works Directions

Cloud Computing

GUIs / Mobile

Green Computing / Power Management

Big Data

GPUs and Co-processors

Exascale