



Weather and Climate: Improving the Accuracy of Weather Forecasts

Running HPC systems and clusters with Altair's PBS Professional® scheduler provides weather forecast centers with a rich solution for optimized forecasting. The solution ensures high-performance computing (HPC) resources are more efficiently scheduled to increase system utilization, improve application performance and throughput, and enhance quality of service.

Challenge: Maximizing Weather Forecast Accuracy

The field of numerical weather forecasting and climate modeling is relied upon nearly as much as oil exploration, in terms of impact to the global economy and society.¹ The forecasts delivered by weather forecast centers provide guidance to human forecasters and are the basis of all weather forecasts by national meteorological services and the media.

Advances in this area in recent decades have resulted in far more accurate forecasts. However, as many centers approach petascale performance levels (and processor core counts, main memory sizes and I/O requirements continue to grow), significant operational challenges emerge including:

- Resource conflicts due to more concurrent high-priority jobs
- Complexity of mixed operational and research workload
- Unpredictability of emergency or other high-priority jobs

Thus, without an HPC workload scheduler, the result is unreliable runtimes, sluggish or inconsistent application performance, cost implications around memory requirements, and risk in meeting forecast schedules and maintaining service levels.

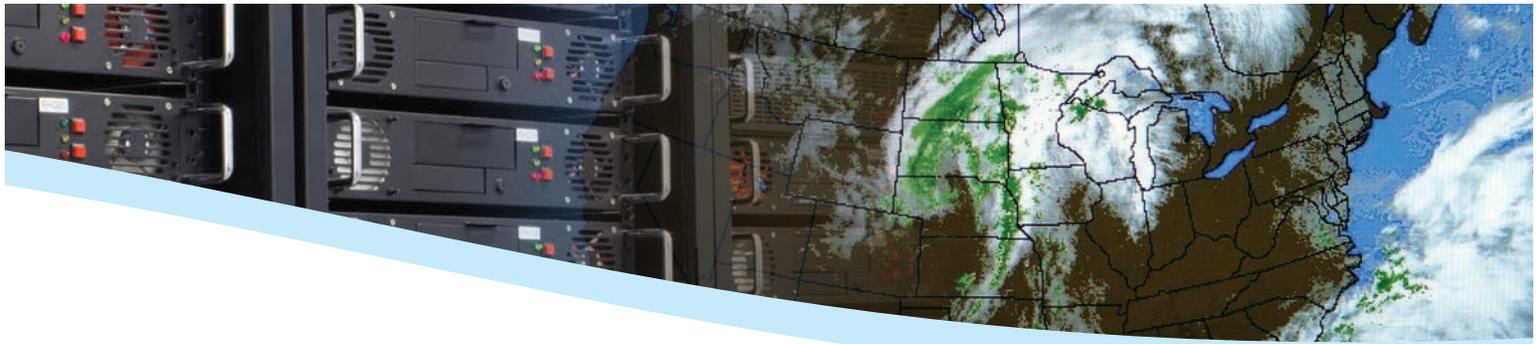
Solution at a Glance

“With Altair we were able to improve the performance and manageability of our numerical weather forecast environment.”

– Danish Meteorological Institute

Features include:

- Commercial-grade job scheduling and management
- Expert support in 19 countries worldwide
- Proven for over 20 years
- Easy to administer with minimal system invention
- High availability for reservations
- Pre-emptive scheduling



Solution: PBS Professional for Optimized Job Scheduling

Using PBS Professional for high-performance workload scheduling enables computing facilities to exploit peak performance capabilities while improving service quality and utilization rates.

With PBS Professional managing workload on x86 clusters or on supercomputers, weather centers can achieve extremely high system utilization levels and increases throughput while providing quick turnaround of high-priority jobs, all with little to no system intervention required.

PBS Professional guarantees the availability of resources reserved in advance, optimizes the usage of non-reserved resources, and improves scheduling forecast so users have greater insight into when jobs will run. The system is highly configurable, permitting sites to easily implement custom scheduling behaviors.

Features

PBS Professional offers the following key features:

- **Integrated application placement, launch and management functionality** for all applications
- **Minimal to no system intervention** required for job execution
- **Unparalleled scalability** from compute nodes to software to I/O
- **Standing and advance reservation features** to provide scheduler with data about future high priority resource requirements
- **Backfilling** to optimize space sharing by examining available resources against outstanding job requests
- **Pre-emptive scheduling** for launching unplanned critical jobs
- **Job arrays** providing a mechanism for grouping related work, so users can submit, query, modify and display work as a single unit
- **Higher utilization** through new "Shrink-to-fit" scheduling allows users to run jobs or portions of jobs immediately before planned outages – one customer reported saving 800,000 CPU hours over two months by using this feature

Benefits

Improved Quality of Service for operations

- Greater availability of resources
- Reliable and repeatable runtimes
- Improved ability to forecast when a job will run
- Reduced execution times to meet production schedules
- Fast turnaround of high-priority jobs

Expert global support

- Ability to respond to critical situations faster and more effectively
- Access to best practices based on our expertise at weather forecasting and climate modelling centers

Optimized performance

- Optimized application throughput and overall system efficiency
- Optimized resource availability
- Avoidance of system thrashing
- Increased uptime

Improved manageability

- Reduced need for process-level management
- Configurability to easily implement custom scheduling behaviors

Altair Customers

Numerous earth sciences, weather forecasting and climate modeling centers use Altair products, including:

- CINECA
- APEC Climate Center
- Belgian Royal Meteorological Institute
- INGV
- HECTOR
- INPE
- Korean Meteorological Administration
- Taiwan Weather Bureau
- Hydrometeo Russia
- Slovenia Meteo
- Israel Meteorological Service
- and many more

"With PBS Professional, we have an enterprise-grade scheduler we can count on, without adding overhead to our IT staff. An open source scheduler just doesn't provide the same value."

– INGV



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To learn more about PBS Works' solutions for the weather & climate industry, please contact your Altair account manager or visit www.pbsworks.com/weather.

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