

Making Energy HPC Accessible, Usable, and Affordable

Altair and UNLV's NSI Partnership

Joseph Lombardo
Executive Director, National Supercomputing Institute (NSI)
& Dedicated Research Network
University of Nevada, Las Vegas

HPC works better with Altair



Powerful, reliable products. Unbeatable service and support.

Altair Builds 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
- Software Asset Optimization

About the National Supercomputing Institute (NSI)

- Full-service supercomputing facility
- Mission for excellence in education and research in supercomputing and its applications
- Provides supercomputing training and services to academic and research institutions, government and private industry
- Supports energy, the environment, medical informatics and health care
- Serves researchers at the University of Nevada Las Vegas and other statewide, nationwide and global research



NSI @ Switch

- 2014 - UNLV moved its NSI facilities to Switch facility in Las Vegas
- Hosted on Cherry Creek system – large Intel system for scientific and economic R&D
- 26,000 compute cores
- Intel Xeon E5-2697v2 12C 2.700GHz, Intel Truscale, Intel Xeon Phi 7120P
- Dedicated Research Network (DMZ) with 100Gb/s potential



Switch SUPERNAP and Intel Partner with UNLV to Boost Scientific Research and Economic Development

Intel's "Cherry Creek" supercomputer brings world-class computing power to UNLV; Switch SUPERNAP to lead high-tech industry partnerships.

Altair & NSI

Altair and UNLV have partnered together to provide a ubiquitous cloud solution.

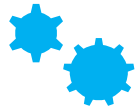
- More than just a cloud for simulation cycles – it's a colocation cloud environment to purchase
- Create and use **customized HPC appliances**, **pay less** for it, and **obtain results faster** than any other IaaS providers all while having support options
- Efficient environments are capable of handling **all** types of workloads up to and including HPC
- Use HyperWorks Unlimited – available in both physical and virtual formats, offering unlimited use of Altair's software



Overview of the platform

NSI + Altair

Build and manage your own HPC appliance

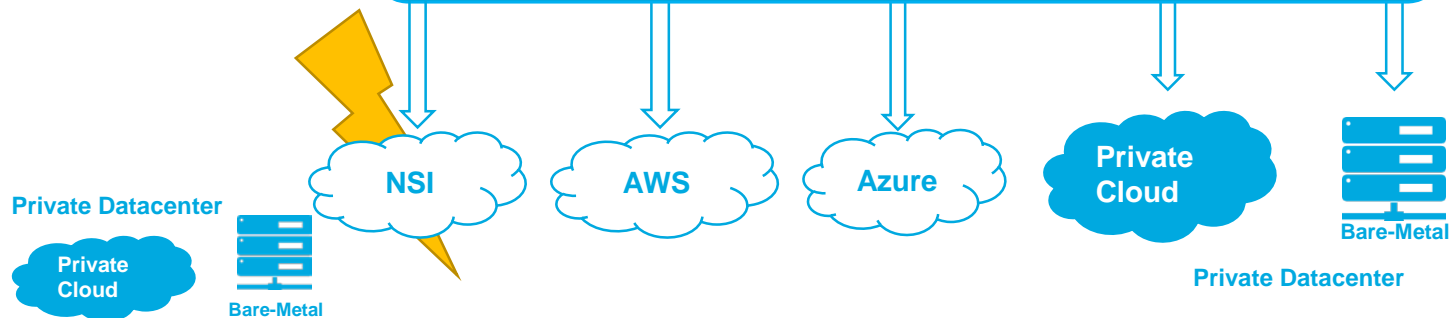


ALTAIR APPS

PBS Works
HyperWorks

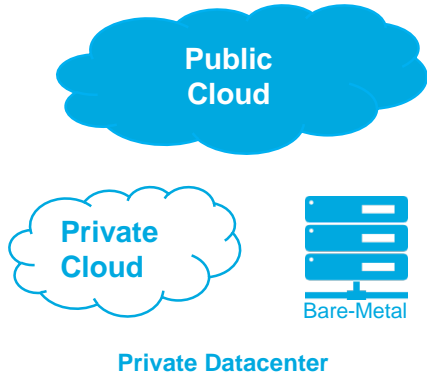
HPC APPS

Commercial apps
Open source apps



Benefits 1/2

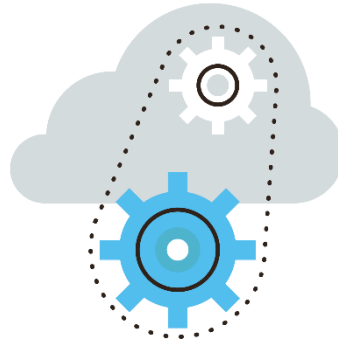
Multi Cloud Management



Everywhere: Deploy public, private cloud and bare metal

Everything - BYOL: Manage the entire life-cycle of your stack and applications/licenses

Deployment Made Simple



Fast: One click deployment in minutes

Intuitive: Build complex architecture graphically

Security and Governance



Secure: Set-up and customize your security policies

Rights Management: Role based access control

Benefits 2/2

Lifecycle Management



Appliance Lifecycle: Create, deploy and remove appliances

Analyze: Aggregate logs and monitoring

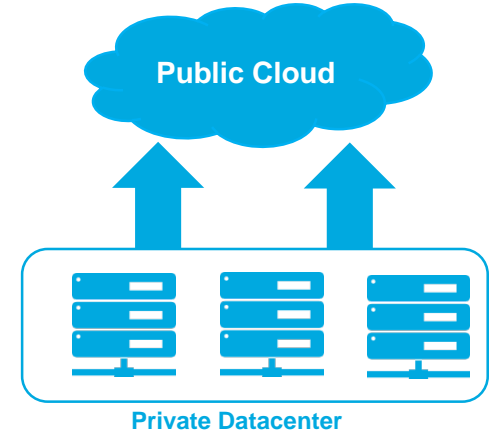
Cost Control



Optimize: Enact policies to optimize your consumption

Management: Create quotas for your users

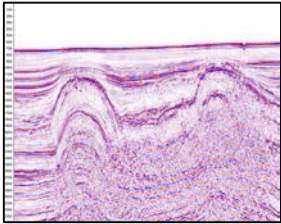
Cloud Bursting Management



Burst: Manage your peak load in the cloud

Automated: Create your rules to pilot your bursting

HPC Benefits for Energy Companies



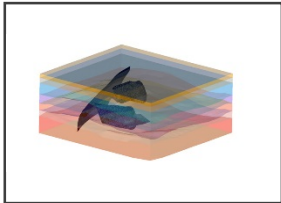
Seismic Reservoir Processing

- HPC increases the speed of reservoir simulation of geology, geophysics and production to decrease uncertainty and risk to better predict and improve field performance
- PBS Works improves memory utilization, optimizes hardware allocation, allows for project prioritization and provides round-the-clock computation



Fracking

- Hydraulic fracturing often takes place >1 mile below groundwater supplies
- Mechanical engineers use sophisticated numerical models to more accurately predict prime locations, simulate reservoir activations and optimize recovery



Mechanical/Fluid Simulations and Other Applications

- With FEA, uncertainty analysis and optimization techniques, engineers and scientists characterize and predict how rock formations will react to drilling, completion and production operations
- PBS Works enables direct connectivity to HPC resources locally and in the cloud

Case Study: Simulation of Hydraulic Fracturing

Hydraulic fracturing can cause cracks in well casings and contaminate ground water layers.

Goal was to discover exactly where cracks occurred and how they would grow.

Process:

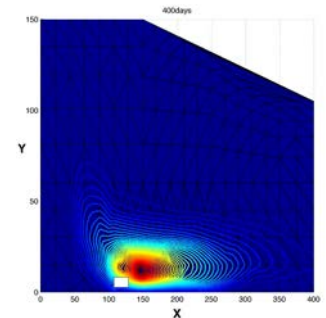
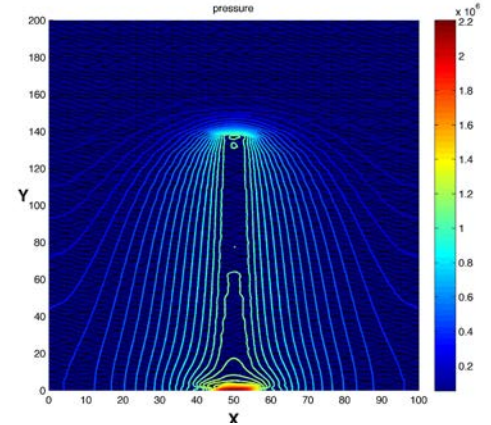
- Created a coarse mesh with localized refinement/unrefinement then evolved as both h- and p- adaptation occurs
- Solved pressure and displacement equations for fracture and rock elements in sublayer

Results:

- Discovered cracking occurs in small regions of the domain but growth location and direction remains uncertain

HPC Benefits:

- MP parallel processing and Hp-adaptation used to reduce storage and computation time in calculation fracture propagation
- In this study, MPI parallelization is employed using the UNLV Intel Cherry Creek HPC consisting of 26,000 cores



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 over 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

Visit us at Supercomputing 2016



Join Altair at SC'16

November 14-17

Booth #1811

Free workshops, tutorials, talks, demos... and much more!

Acknowledgements

Fracking:

- Darrell Pepper, Professor of Mechanical Engineering
- darrell.pepper@unlv.edu

Thank You