



**Unified Automation Intelligence™  
for Data Center, Cloud and HPC**

**Peter ffoulkes, VP of Marketing  
September 2010**

# What Is Moab?

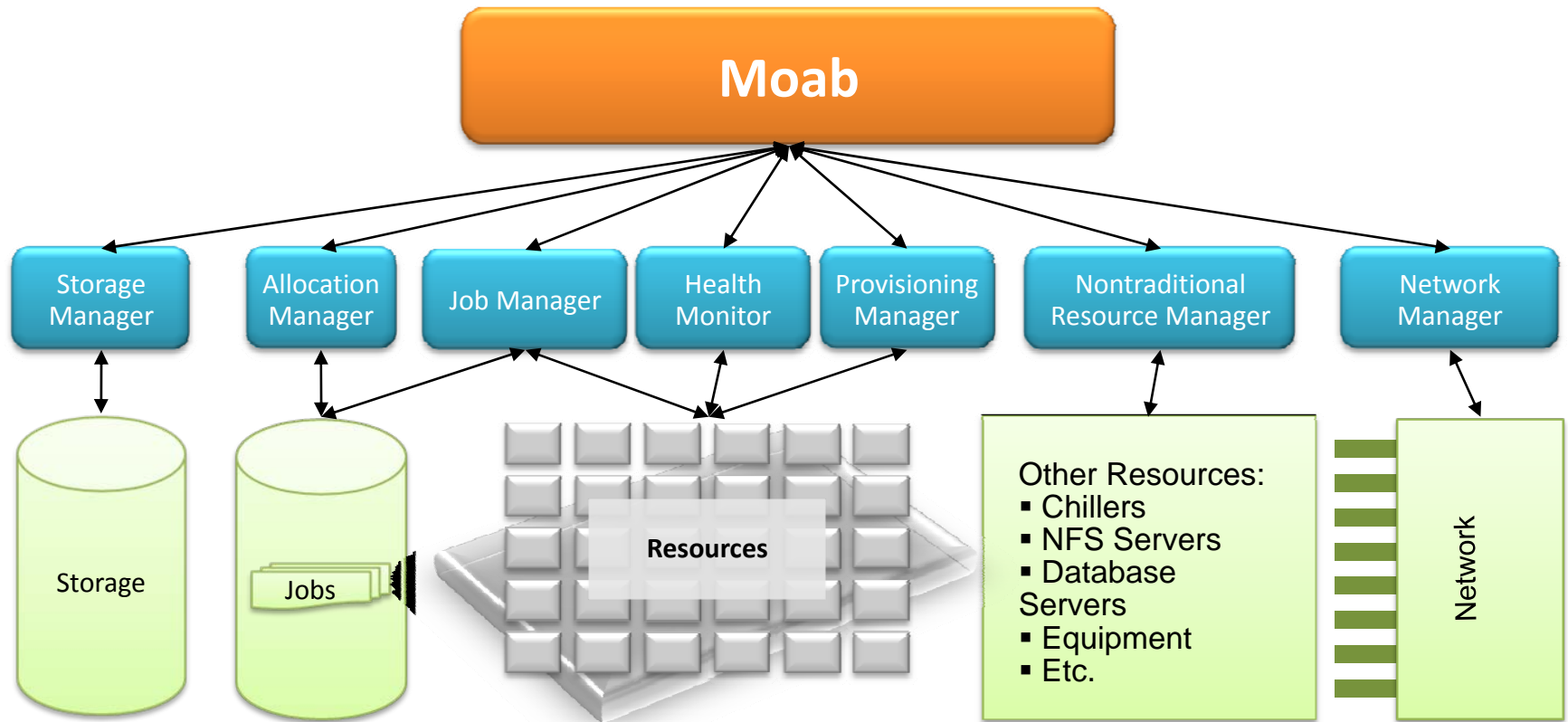
## Unified automation intelligence—the “brain”

Moab . . .

- Accesses infrastructure and workload status information
- Optimizes workload placement in time and space
- Modifies workload for optimum performance
- Analyzes historical data and future commitments
- Makes and enforces intelligent decisions



# Unifying and Integrating the System



# The World's Most Powerful Computing Systems Are Powered by

## Moab

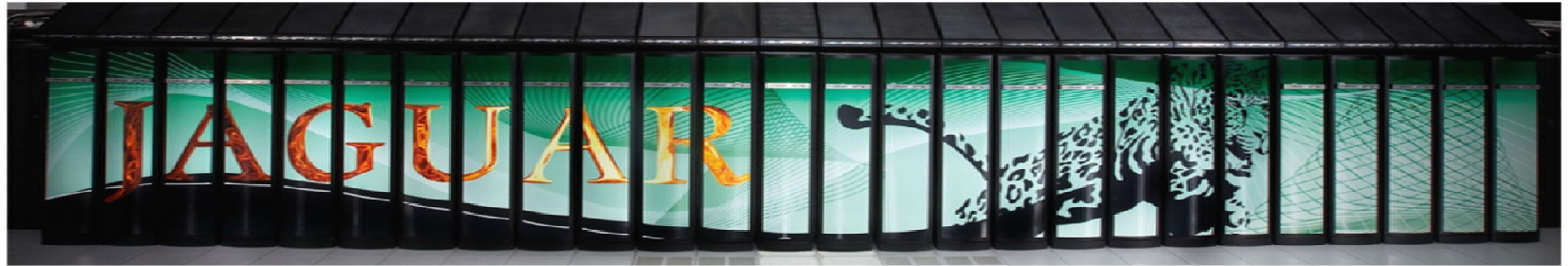
- The world's most powerful system, No. 1-ranked Jaguar, with over 224,000 cores and a speed of 1.75 petaflop/s
- Two of the world's three petaflop/s systems (Jaguar and Roadrunner)
- Half of the top 20 systems in the world (9 systems)
- A quarter of the top 100 systems in the world (24 systems)
- 39% of the compute cores in the top 100 systems in the world

Source: June 2010 rankings from [www.Top500.org](http://www.Top500.org)

### The Top 500 List (June 2010)

|  |                                 |
|--|---------------------------------|
|  1    | Oak Ridge National Laboratory   |
|  3    | Los Alamos National Laboratory  |
|  4    | University of Tennessee         |
|  10   | Sandia National Laboratories    |
|  12   | Lawrence Livermore National Lab |
|  14   | Forschungszentrum Jülich        |
|  17   | Lawrence Berkeley National Lab  |
|  20  | Oak Ridge National Laboratory   |
|  21 | Sandia National Laboratories    |
|  28 | SciNet, University of Toronto   |
|  34 | Lawrence Livermore National Lab |

# Oak Ridge National Laboratory



- Jaguar is the fastest HPC system in the world, running at 1.759 petaflop/s with over 224,000 compute cores
- Diversity of users was severely limiting system workload-management capability
- Moab went into full production after an aggressive evaluation and testing cycle of just over three weeks
- Moab resolved Jaguar's workload-management problems and increased system utilization, decreased downtime, and allowed more control over resources

# U.S. Department of Energy



*“Roadrunner ushers in a new era for science at Los Alamos National Laboratory. Just a week after formal introduction of the machine to the world, we are already doing computational tasks that existed only in the realm of imagination a year ago.”*

Terry Wallace, Associate Director for Science, Technology, and Engineering at LANL

## Overview

ASC integrates the high-performance computing work of Los Alamos, Lawrence Livermore, and Sandia National Labs, as well as academic researchers, into a nationally coordinated program administered by NNSA.

## Challenges

Find a resource- and workload-management solution that would be common to all ASC computing systems, improve usability and manageability, improve ROI across the board, offer enhanced reporting functions, and optimize utilization.

## Solution

Moab Cluster Suite® and Moab Grid Suite®.

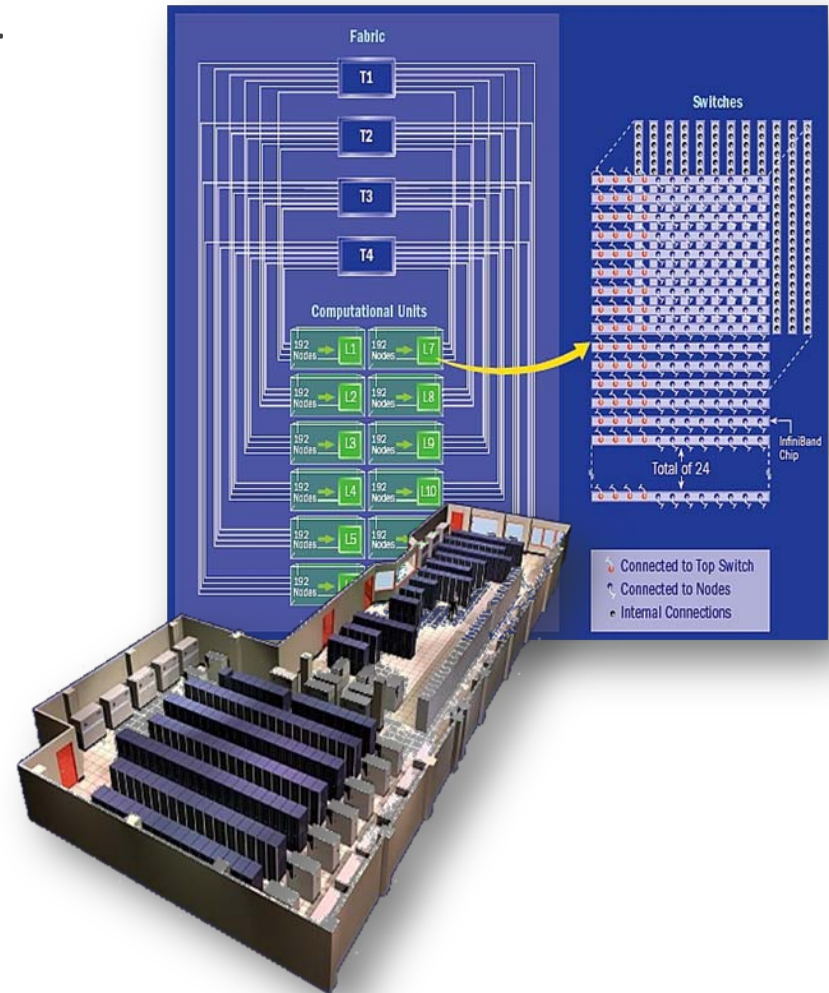
## Results

Moab® provides optimization of NNSA’s compute, network, and storage resources; automated failure detection and recovery; flexible policies; true visualization of cluster activity; detailed accounting; and reduced costs.

# HP: Pacific Northwest National Laboratory

## Chinook: EMSL's Powerful Supercluster

- **2,310** HP DL185 dual quad-core AMD nodes
- **163** teraflop/s supercluster with a Voltaire-based InfiniBand interconnection network
- **12x192-node computational units** for low-latency efficiency



# HP: Pacific Northwest National Laboratory

## Chinook: EMSL's Powerful Supercluster

Topology and job placement matters. Cable distances can have a big impact upon job runtime. We needed a scheduler that would place jobs correctly. Chinook's scheduling software, **Moab**, knows about the system's CUs and has features to schedule jobs within a single CU if the user prefers to minimize latency in that way.

”

Gary Skouson, Pacific Northwest National Laboratory



# SciNet—University of Toronto



***“Why should we pay for cooling when it’s so cold outside? Toronto is pretty cold for at least half of the year. We could have bought a humongous pile of cheap x86 boxes but couldn’t power, maintain or operate them in any logical way.”***

Dr. Daniel Gruner, PhD, chief technology officer of software for SciNet.

## Overview

The University of Toronto’s SciNet Consortium provides resources to the University’s scientific researchers and ten affiliate research hospitals by combining industry-leading innovations in data center design.

## Challenge

SciNet had to show it could meet strict budgets for ongoing energy use while needing to provide multi-OS provisioning capabilities to meet the needs of its wide range of users. SciNet was looking for a very green, very energy-efficient system in a very energy-efficient facility.

# SciNet—University of Toronto



*“This was the first Moab – xCAT implementation on a scale of this size for an adaptive data center. We were pushing the envelope, we expected delays and issues. These large, exotic and ambitious projects require customer and vendors co-operating together. It takes a partnership to deliver one of the greenest data centers in the world.”*

Egan Ford, Executive IT Specialist, IBM



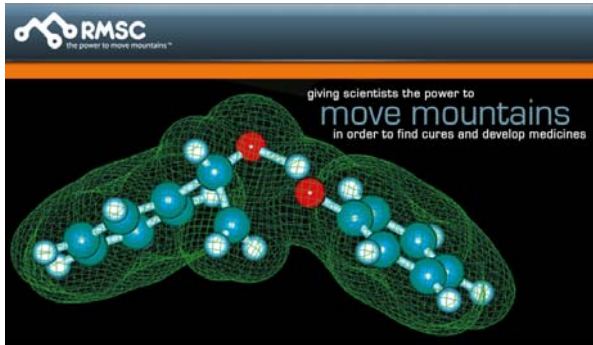
## Solution

- Energy-aware, stateless, on-demand multi-OS provisioning
- Moab Adaptive HPC Suite™ and xCAT provisioning software from IBM
- 4,000 server IBM System x iDataPlex supercomputer system
- 30,000 Intel Xeon 5500 cores, – a theoretical peak of 306 TFlops

## Results

A state-of-the-art data center that saves enough energy to power more than 700 homes yearly. On-demand provisioning allows users to make their OS choice part of their automated job template. SciNet always has several different flavors of Linux running simultaneously.

# Rocky Mountain Supercomputing Centers



## Great American Supercomputing Desert



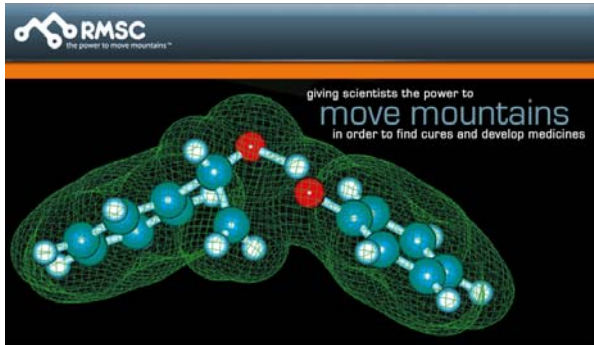
## Overview

Rocky Mountain Supercomputing Centers mission is to establish Montana as a recognized leader in the execution of the next-generation supercomputing business model as a fundamental component of Montana's economic engine.

## Challenge

RMSC represents a public-private collaboration between RMSC, the State of Montana, IBM and other alliance partners, with a unique two tier cloud computing business model delivering Supercomputing as a Service, assisting academia, industry, and government.

# Rocky Mountain Supercomputing Centers



***“Without this kind of flexibility built into the Job Scheduler, our vision at RMSC for a truly dynamic infrastructure would not be possible.”***

*Dr. Phillip Curtiss,  
Chief Technology Architect, RMSC*

## Solution

- Moab Adaptive HPC Suite® from Adaptive Computing
- Microsoft Windows HPC Server 2008 in hybrid environment
- 3.8 TFLOPS “Big Sky” IBM BladeCenter System
- Spillover to IBM Computing on Demand service

## Results

RMSC offers supercomputing platforms as a service (SPaaS) and provides industry with standardized software packages, HPC services, application hosting, and support services.

RMSC maximizes use of its resources and alliance partners in providing a Moab-enabled hybrid-OS (dual boot—RHEL 5.2 and Windows HPC Server 2008) cloud computing-on-demand model for academia, government, and industry as it emerges from the “Great American Supercomputing Desert.”

# CHPC South Africa



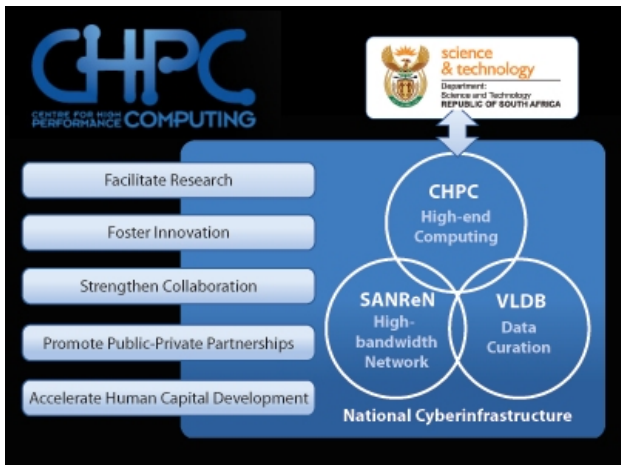
## Overview

The objectives of the Centre for High Performance Computing (CHPC) are to enable South Africa to become globally competitive and accelerate Africa's socio-economic up-lift through effective use of high-end cyber-infrastructure.

## Challenge

“A whole zoo of architectures” –to be integrated: AMD Opteron, Intel Xeon, Power PC, Power 4+ and SPARC processors, a mixture of UNIX (Solaris), Linux (SLES), Microsoft Windows HPC server 2008 operating systems and multiple resource managers.

# CHPC South Africa



***“CHPC encompassed a tricky environment – a whole zoo of architectures – that needed to be integrated.”***

*Dr. Happy Sithole, Director CHCP*

## Solution

Moab Adaptive HPC Suite™ from Adaptive Computing

## Results

Moab’s intelligent management has improved research productivity by eliminating wait times and improving utilization levels to over 95%. Moab’s ability to automatically provision Linux or Microsoft Windows HPC server environments has made Africa’s premier HPC capabilities available to a much wider community, including the producers of Africa’s first animated 3D movie “The Lion of Judah”.

# Baker Hughes: New demands, no new budget



## Overview

Baker Hughes serves the worldwide oil and natural gas industry with reservoir consulting and products and services for drilling, formation evaluation, completion, and production.

## Challenge

Business-critical applications required both Windows HPC Server 2008 and SUSE Linux. Existing resources were already saturated and budget was not available for new system procurement to support Windows applications.

## Dilemma

How to support additional business demand, new application and environment requirements with no additional resources or funding for new hardware and software solutions.

# Baker Hughes: Solution profile



## Solution Requirements

Increase workload management efficiency to make under utilized resources available. Support new Windows-based software environments on existing hardware and within budget constraints.

## Solution Components

- Moab Adaptive HPC Suite™
- Suse Linux Enterprise
- Windows HPC Server 2008
- Microsoft, Novell, and Adaptive Computing “Triple Play” pricing advantage

## Results

The intelligent management of Moab Adaptive HPC Suite delivered improved performance from the cluster to meet Linux resource needs. ROI has been increased by making resources available to support new Windows HPC Server 2008 applications.



# Amazon EC2: Cluster Compute Instances



Currently a single instance type, the Cluster Compute Quadruple Extra Large :

- 23 GB of memory
- 33.5 EC2 Compute Units (2 x Intel Xeon X5570, quad-core “Nehalem”)
- 1690 GB of instance storage
- 64-bit platform
- I/O Performance: Very High (10 Gigabit Ethernet)
- API name: cc1.4xlarge

# Large U.S. Bank



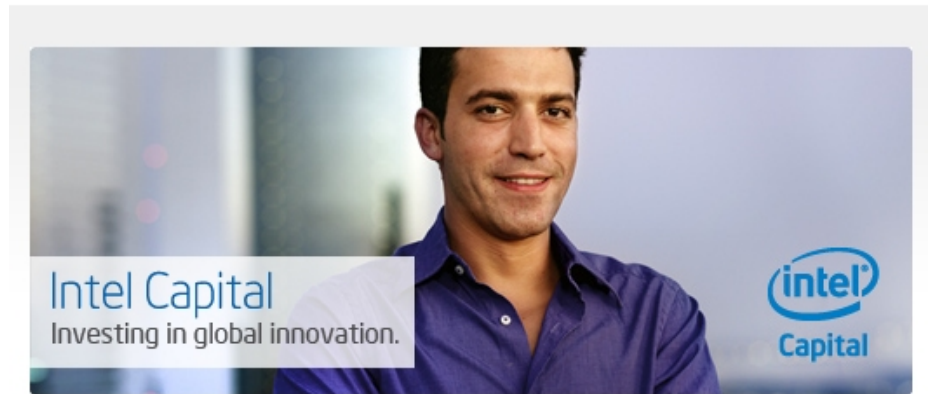
- One of the world's largest financial services companies
- Deploying Moab and IBM's xCAT to manage more than 50,000 servers under a single cloud-management engine
- Moab provides dynamic intelligent workload scheduling and triggering of automatic resource modification (reprovisioning) to meet workload demands

# Breaking News: Tuesday Sept. 14th

## Series A Funding

- Intel Capital
- Tudor Ventures
- Epic Ventures

**\$14M**



# HPC and Cloud Automation

- **Agile:** reduce resource delivery time from weeks to minutes
- **Automated:** mitigate risk and enforce site-specific rules
- **Adaptive:** respond to dynamically changing circumstances according to organizational priorities



**Adaptive**

COMPUTING