Bright Cluster Manager
For HPC, Hadoop and OpenStack

Craig Hunneyman
Director of Business Development
Bright Computing

Craig.Hunneyman@BrightComputing.com
Agenda

- Who is Bright Computing?
- What is Bright Cluster Manager?
- Cray & Bright Computing Partnership
- Bright HPC
- Bright Hadoop
- Bright OpenStack
- Quick Demo – Custom Metrics
- Summary – Why Bright?
Who Is Bright Computing?
What Is Bright Cluster Manager?

- Founded in 2009
- Enterprise Infrastructure Software Company
- Global Company
- 65 Employees
- 24 Developers
- 500+ Customers Worldwide
- 20+ Resellers
- Award Winning…

[Image of awards: Red Herring 100 Winner, Deloitte Technology Fast50, Best of Show, Merck Global Services Technology Symposium, Winner 2013 Highest Growth]
What Is Bright Cluster Manager?
What Is Bright Cluster Manager?

- Developed for
  - HPC clusters (CPU, GPU, Xeon Phi, Lustre)
  - Hadoop clusters
  - OpenStack clusters
  - Extending to public clouds, building private clouds
  - Server farms & workstations

- A unified, integrated solution — not yet another toolkit
  - Designed & written from the ground up
  - Single daemon, single database, single GUI & CLI
  - Not dependent on 3rd party tools like Ganglia, Nagios, Cfengine, SystemImager, etc.

- Unrivaled ease-of-use (little HPC or Linux expertise needed)
- Scalability to thousands of nodes, out of the box
- Advanced enterprise features
  - Head node & slave node failover, workload management integration, RBAC & auditing, image revision control, multi-cluster, etc.
  - Boot & provision over IB, load-balanced provisioning, etc.
- Proven across hundreds of organizations:
  - Boeing, SpaceX, Saudi Aramco, Sinopec, Merck, Roche, PACCAR, CD-adapco, ING Bank, TACC, NASA, Fermilab, Sandia, Berkeley, VT, Stanford
Cray & Bright Computing Partnership
Bright on Data Management Platform

- Bright Cluster Manager default for Data Management Platform since 2010:
  - Cray Integrated Management System [CIMS] (was esMS)
  - Cray Development Login [CDL] (was esLogin)
  - Cray Data Mover [CDM] (was esDM)
  - Lustre File System by Cray [CLFS]
    - Lustre MDS
    - Lustre OSS
    - esAUX
  - Bright does provisioning, monitoring, alerting, automation, health checking, access control, Lustre failover, etc.

- Bright on XC
  - PoCs
- Bright on TAS
- Bright on CCS
  - 3 Customer Sites
Cray/Bright Customers
Bright HPC
About Bright Cluster Manager

- Deployment
- Provisioning
- Dashboards
- Monitoring
- Visualization
- Health checking
- Workload management
- Cloud extension
- Environment specific
  - HPC
  - Hadoop
  - OpenStack (Private cloud)
About Bright Cluster Manager

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- **Provisioning**
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Users & Workload Management

User Environment & User Portal
- Rich collection of libraries, compilers, development tools included & pre-configured
- Easily extensible, web-based User Portal for users
- Intel Cluster Ready

Workload Manager (WLM) Integration
- All common WLMs supported
- Automatically installed, configured, maintained, monitored
- CUDA & OpenCL
- GPU driver automatically recompiled against running kernel
- Easy switching between versions
- Support for most NVIDIA GPUs and some ATI
- Added to WLMs as consumable resources
- Comprehensive GPU metric monitoring and health checking
- Configuration
Xeon Phi Management

- Driver, runtime, SDK, MIC-OFED, flash utils
- Setup wizard
- User environment fully set up
- MIC driver automatically recompiled against running kernel
- Appears as a first-class device type in management infrastructure
- Added to WLMs as consumable resources
- Three run modes: offload, native, symmetric
- 17 default Phi health checks pre-configured
- Full control through CMGUI, CMSH, APIs
Hadoop Deployment & Management

- Bright makes it easy to create a turnkey Hadoop cluster from bare metal
- Apache Hadoop, Cloudera, Hortonworks
- Bright makes it easy to manage both Hadoop and the cluster it’s running on
  - Visualize a complete set of Hadoop metrics from the HDFS, JVM, Job, and RPC sub-systems
  - Assign Hadoop roles to nodes (DataNode, JobTracker, TaskTracker, Namenode, etc.)
  - Comprehensive HDFS management (create, remove, modify, format, retire, re-balance, etc.)
  - Mix Hadoop and batch jobs
  - Automatic failover to secondary name node
  - Hadoop health management
  - Available as an add-on to Bright v7.0
Bright Cluster Manager
Bright OpenStack
OpenStack Deployment & Management

- Bright makes it easy to create a turnkey OpenStack clusters from bare metal
- Manage OpenStack and the cluster it’s running on
  - Enabled during initial Bright install, or afterwards
  - Assign OpenStack roles to nodes (Nova, Glance, Cinder, Horizon, Neutron, Keyston, etc.)
  - Assigning a role will write out config files, start/stop/monitor services, add/remove entries to Keystone
  - OpenStack configuration automatically updated with cluster changes (e.g. hostname, network settings)
  - Use Bright to deploy images to virtual machines
  - Essential VM management available through Bright management interface & tools (e.g. create, remove, power on/off)
  - Available as an add-on to Bright v7.0
  - Ceph storage support included
## OpenStack

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<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Human ID</th>
<th>Created</th>
</tr>
</thead>
<tbody>
<tr>
<td>vnode001</td>
<td>ACTIVE</td>
<td>vnode001-bright-managed</td>
<td>2014-05-05T13:01:27Z</td>
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<td>vnode002</td>
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<td>2014-05-05T13:06:11Z</td>
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<td>vnode003</td>
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<td>vnode005</td>
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<td>vnode005-bright-managed</td>
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<td>vnode006</td>
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<td>vnode006-bright-managed</td>
<td>2014-05-05T13:08:02Z</td>
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<td>vnode008</td>
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<td>vnode011</td>
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<td>vnode012</td>
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<td>vnode014-bright-managed</td>
<td>2014-05-05T13:12:12Z</td>
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</tbody>
</table>

### Event Viewer

<table>
<thead>
<tr>
<th>Time</th>
<th>Cluster</th>
<th>Source</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/May/2014 12:33:46</td>
<td>OpenStack Demo Cluster</td>
<td>openstack2</td>
<td>Service named was reloaded on openstack2</td>
</tr>
<tr>
<td>05/May/2014 12:32:30</td>
<td>OpenStack Demo Cluster</td>
<td>openstack2</td>
<td>Check 'openstackvmsok' is in state PASS on openstack2</td>
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<tr>
<td>05/May/2014 12:29:45</td>
<td>OpenStack Demo Cluster</td>
<td>Unknown</td>
<td>Service slurm_client was restarted on false</td>
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<tr>
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<td>OpenStack Demo Cluster</td>
<td>openstack2</td>
<td>Service slurm was restarted on openstack2</td>
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<tr>
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<td>openstack2</td>
<td>Service named was reloaded on openstack2</td>
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<td>05/May/2014 12:23:09</td>
<td>OpenStack Demo Cluster</td>
<td>node001</td>
<td>Service openstack-nova compute was restarted on node001</td>
</tr>
<tr>
<td>05/May/2014 12:22:53</td>
<td>OpenStack Demo Cluster</td>
<td>node001</td>
<td>Service openstack-nova compute was restarted on node001</td>
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<tr>
<td>05/May/2014 12:09:34</td>
<td>OpenStack Demo Cluster</td>
<td>openstack2</td>
<td>Check 'openstackvmsok' is in state FAIL on openstack2</td>
</tr>
</tbody>
</table>
Ceph

Overview

- Osd: 3
- Number of monitors: 1
- Number of placement groups: 576
- Status:
  - Ceph space: 70.65 GB used vs total 321.6 GB

Ceph OSD Pool Information

- openstack2: 0 KB, 0 Objects, 0 Clones, 0 Degraded, 0 Unfound, 0 Rd, 0 Rd KB, 0 Wr, 0 Wr KB
- openstack2 backups: 0 KB, 0 Objects, 0 Clones, 0 Degraded, 0 Unfound, 0 Rd, 0 Rd KB, 0 Wr, 0 Wr KB
- openstack2 data: 0 KB, 0 Objects, 0 Clones, 0 Degraded, 0 Unfound, 0 Rd, 0 Rd KB, 0 Wr, 0 Wr KB
- openstack2 images: 6292480 KB, 0 Objects, 7 Clones, 0 Degraded, 0 Unfound, 491 Rd, 6531 Rd KB, 38 Wr, 0 Wr KB
- openstack2 metadata: 0 KB, 0 Objects, 0 Clones, 0 Degraded, 0 Unfound, 0 Rd, 0 Rd KB, 0 Wr, 0 Wr KB
- openstack2 rbd: 0 KB, 0 Objects, 0 Clones, 0 Degraded, 0 Unfound, 6556821 Rd, 554857 Rd KB, 134184 Wr, 0 Wr KB
- openstack2 volumes: 0 KB, 1 Objects, 0 Clones, 0 Degraded, 0 Unfound, 0 Rd, 0 Rd KB, 0 Wr, 0 Wr KB

Metric: AlertLevel

Nodes configured for Ceph:
- OSD: networknode, node001, node002
- Monitor: openstack2
Managing OpenStack Clusters

- Managing OpenStack Clusters even more difficult than other types of clusters
- Without proper infrastructure, OpenStack will not be able to run
- Setting up OpenStack manually is often extremely complex for production setups
- Bright Cluster Manager provides single-pane-of-glass to manage and monitor all aspects of OpenStack cluster
- Includes:
  - Hardware (set up, configuration, monitoring)
  - Operating system (provisioning, updates)
  - OpenStack installation
  - OpenStack configuration
- Bright Cluster Manager provides perfect environment for OpenStack to run on
Ease of Installation

- Deploying OpenStack private clouds made simple
- Bright pre-packages OpenStack (Icehouse) on the DVD
- Bright installs Linux, OpenStack & itself
- OpenStack can be enabled during installation or afterwards
- OpenStack will run as services on top of Bright cluster
- Bright configures, manages and monitors physical cluster (hardware + OS + other middleware)
- Virtual Machines are managed through OpenStack
- Support various network setups (VLAN, VxLAN, flat, etc.)
- Bright integrates with Ceph, can be used for OpenStack
- Configuration wizard to guide the setup process
OpenStack
Use Case
USE CASE: Problem

- Developers need clusters to test their code
- Support engineers need clusters to reproduce issues
- Need to quickly spin up clusters with:
  - Different version of Bright, including custom builds
  - Different base distributions (e.g., RedHat, CentOS, SUSE, etc.)
  - Different types of configurations
- Limited amount of hardware available
- Manual setup becomes tedious and time consuming
USE CASE: Solution

- We drink our own Champagne
- Build our own private cloud
- Runs Bright to manage the hardware and OS
- Use Bright to deploy and configure OpenStack
- Create set of end-user tools to spin up virtual clusters
  - Command-line driven
  - Make use of OpenStack API’s
  - Use web based dashboards for console access
- Each user has an isolated environment
- Users have full control over their virtual clusters
- Virtual clusters directly accessible from office network
- Load is balanced automatically
- Capacity can now be expanded easily
Quick Demo
Custom Metrics
Summary
Summary - Why Bright?

1. Easy to learn and use
   a. Management GUI, user GUI and command-line interface
   b. Less skilled sys admins required
   c. New sys admins quickly productive
2. Industry standard & compatible with ISV applications
   a. Intel Cluster Ready
   b. Standard Linux distributions & kernels
   c. Works with all common workload managers
   d. Bright makes it easy to swap between Bright mode (CCM-like) and native Cray mode
3. Gives great management & monitoring control
   a. Graphing & Rackview
   b. Thresholds, actions, alerts, alarms
   c. Health checking
4. General
   a. No separate management server (esMS) for external nodes required
   b. A consistent software stack for both external nodes and mainframe
   c. Management node can be run in failover mode
5. Roadmap
   a. Access to cutting-edge features (e.g. cloud extension, GPU/Phi management, monitoring)
   b. 2 releases per year
May Cray’s future be “Bright”!