Incorporating a Test and Development System
Within the Production System

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Outline

- Test and Development Systems
- The Problem...
- Systems Description
- Motivation
- Implementation
- Challenges
- Story of Success
Value of a Test and Development System

- Evaluate the impact of new software levels
  - Without impacting production operations

- Provide an upgraded environment to rebuild and test applications
  - Mission Critical applications MUST work on new software/OS levels
  - Rebuilding large applications can take a significant effort and time

- Provide an environment for experimentation
  - Develop and optimize processes and procedures
The Problem

- So much money, so little hardware…

- Tradeoff
  - Buy more compute capacity
  - Buy TDS capability

- In Production HPC, TDS should prevail
  - But often doesn’t…

Non cogito, ergo sum…

Sometimes thinking is a bad idea.

https://www.1843magazine.com/content/ideas/ian-leslie/non-cogito-ergo-sum
Hardware Description

- **Compute Nodes (12)**
  - 8 x NVIDIA Tesla K80 GPUs
  - 256 GB of memory
  - 2 x Intel Xeon CPU E5-2690 v3

- **Post Processing Nodes (5)**
  - 256 GB of memory
  - 2 x Intel Xeon CPU E5-2690 v3

- **Login Nodes (3)**
  - 128 GB of memory
  - 2 x Intel Xeon CPU E5-2690 v3
Motivation

- Production weather forecasting system for Switzerland
  - Possibilities for test time are few and far between and short

- Without a TDS
  - Higher risk of introducing problems during tests

- Testing is time consuming
  - Many man-hours required to rebuild and re-validate

- Major upgrades are disruptive
  - Red Hat 6 -> Red Hat 7

- Specialized hardware is very expensive
  - And no money…
The Big What If...

What if we could “borrow” hardware from the production system and use it like a TDS and pigs could fly?

http://kineticmotions.ca/what-if

This simple question set in motion a series of events that would ultimately solve the problem.
Implemention Details

**FINAL CONFIGURATION WITH TDS**

- **Use VLANs**
- **Add disks**
- **Break the HA**

**Diagram Details**

- **GPU NODES 2-12**
- **PP NODES 2-5**
- **LOGIN NODES 1-2**

- **MGMT_1 ACTIVE**
- **MGMT_TDS ACTIVE**

- **TDS**
- **CSCS**
- **ETH Zürich**
Challenges

- No upgrade path to Red Hat 7 for the Cray Advanced Cluster Engine (ACE)
  - After 7 months, enough was enough
    - Switched to Bright Cluster Manager (BCM), through Cray

- No migration path from ACE to BCM
  - Need to do a fresh install
  - Took a while to get all the rpms right

- No High Availability for the system if H/A is broken
  - Acceptable risk due to other redundancies

- How many custom images?
  - End result only 1, personalize at boot time
And the Second System?

- Process repeated to prepare second system
  - Much faster having already worked it out

- Complicated but careful migration plan to new O/S
  1. Boot entire backup system to new O/S
  2. Switch production to backup system
  3. Run for 24 hours
  4. Boot primary system to new O/S
  5. Switch production to primary system

- Safety Precautions
  - Previous O/S available on second management workstations
  - A reboot returns system to previous levels
A Success Story

- Very Successful!
  - No interruption to production runs
  - Viable solution for future software updates
    - Capability remains in place
    - Red Hat 7.3 -> Red Hat 7.5 later this year…

- But still, there are challenges
  - Restoring H/A to management workstations
It Takes People…

- Thank-You to Cray for helping to work through our problems and frustrations
- Thank-You to Bright Computing for helping with the migration to BCM
Grazie per la vostra attenzione.
Thank-You for your attention.