OSCAR on PS3

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Overview

- Introduction
- What is in PS3?
- Purpose of having PS3 cluster
- Deploying OSCAR on PS3
- Kboot + SIS
- OSCAR implementation overview
- Current status / Future work

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Introduction

- Open Source Cluster Application Resources
- Software stack to ease deployment of Linux cluster
- Project started around year 2000 - 2001
- Open Source, core members from Academia/Research and Industry
- 191,000 + downloads from SourceForge

- Mostly written in perl
- 1278 files, 485 directories in trunk
- GPL license
- Mature and well-established codebase
- Timely updated documentation
- Well-commented source code

OSCAR core members

- Intel
- NEC
- Louisiana Tech University
- The University of Texas
- Oak Ridge National Laboratory
- Indiana University / Pervasive Technology Labs

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Who uses OSCAR

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OSCAR Features

- Linux distribution agnostic
- Flexible, modular, customizable
- Image-based
- Supports heterogeneous cluster configurations
- Virtual console

OSCAR Components

- Deployment / Provisioning
  - System Installation Suite (SystemInstaller, SystemImager, SystemConfigurator)
- Infrastructure
  - OSCAR Database API (ODA)
  - OSCAR Package Downloader (OPD)
  - Yume (enhanced Yum), Rapt(for debian)
- Resource Manager / Scheduler
  - TORQUE
  - Sun Grid Engine (SGE)
- Parallel Libraries
  - MPI: Open MPI, LAM/MPI, MPICH
  - PVM

OSCAR Components (continued)

- Administration
  - C3 / SC3
  - OPIUM / Sync_files
  - Switcher
- Monitoring
  - Ganglia
- Security
  - Pfilter
- Third-party add-on packages

What is in PS3?

- 3.2GHz Cell Processor
- Power PC-base core
- 7 x SPE @3.2GHz
- 7 x 128b 128 SIMD GPRs
- 7 x 256KB SRAM for SPE
- 218 GFLOPS of total floating point performance
- 256MB XDR Main RAM
- 256MB GDDR3 VRAM
- 60GB HDD

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Purpose of having PS3 cluster

- Light weight but powerful cluster
- New research approach to get the full performance of SPU
- New support of YDL5.0 and PPC64
- Utilizing CorePy to the PS3 cluster

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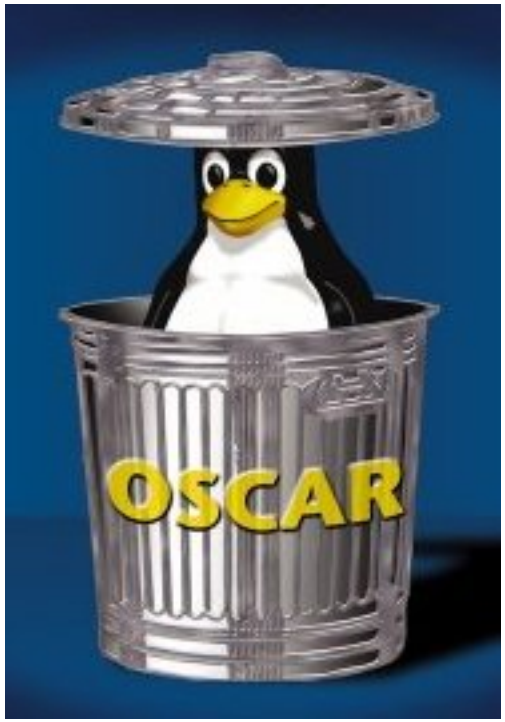
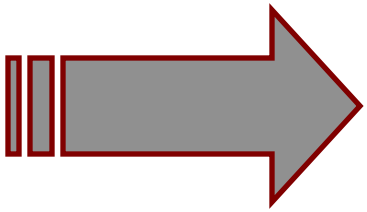
Deploying OSCAR on PS3





Requirements

- OSCAR 5.1
- 2 x PS3 machines or more
- USB Key
- OtherOS Installer
- HDMI - DVI connector
- YDL 5.0 (PPC) DVD
- USB Keyboard and USB mouse
- Network

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Step 1. Install YDL5.0 on a PS3

- Download the OtherOS installer specially built for OSCAR
- Save it to the USB key (FAT format)
- Power on PS3 on the game mode
  - Settings Menu -> System Settings -> A partition setting for hard disk: custom
    - 60GB = 10GB(Game) + 50GB(Linux)
  - Settings Menu -> System Settings -> Install Other OS
  - Click on OK to start the installation
  - Settings -> System Settings -> Default System and select "Other OS”

Step 1. Install YDL5.0 on a PS3

- Insert YDL5.0 DVD
- Restart PS3 to boot with Other OS
- Type in “install” at the kboot prompt
- Do the YDL5.0 installation

Step 2. Install OSCAR

- Once YDL5.0 is fully installed and up, download OSCAR 5.1
- Follow the ordinary OSCAR installation instruction
- At the OSCAR installation step 6. “Setup Networking…”, prepare PS3 client nodes to boot up with OtherOS
- Finish up the OSCAR installation

Kboot + SIS

- Special therapy of OSCAR on PS3
- Kboot does what PXEboot is supposed to do on X86 machines
- SIS could support PPC or PPC64

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Kboot

- A boot loader based on Kexec
- Navigate with automounting
- Access (read) files on the network
  - HTTP, FTP, TFTP
- Command execution
- Network configuration
- Outbound and inbound SSH
- Timeouts, startup message, root device, initrd

Kboot

- How PXEboot works?
  1. The PXE-booting host initiates a PXE boot by issuing a broadcast
  2. A DHCP server authoritative for the network responds.
  3. The PXE-booting host downloads the NBP via tftp.
  4. The pxelinux.0 binary starts running on the PXE-booting host.
  5. The pxelinux.0 binary then evaluates the configuration file.
  6. Using the downloaded kernel and initrd, the pxelinux.0 binary boots the kernel with the kernel command line found in the configuration file downloaded in step 3.

How kboot replaces PXEboot?

- A client node initiates a kboot by issuing a broadcast
- A DHCP server authoritative for the network responds
- kboot triggers the download of kernel of SIS image server with the kboot.conf file via tftp
- When a client node boots up with the SIS kernel, it is imaged with the oscarimage of OSCAR server node via rsync/multicasting/bittorrent
- Once a client node is imaged, it does not re-image and boots up with its own OS

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SIS

- SystemImager + SystemInstaller + SystemConfigurator
- SystemConfigurator has not been fully updated to support PPC64
- Need to update oscar systemimage manually since SystemConfigurator does not know how to deal with oscarimage:/etc/systemconfig/systemconfig.conf

Kboot

- kboot.conf

```
default=kboot
timeout=2

# udhcpc stores the tftp-server ip via the $siaddr variable
script=/sbin/udhcpc.script

# busybox does not have chmod, so use this hack to create a temporary executable script
cp $script tmp
script=tmp/udhcpc.script

echo '#!/bin/sh' > $script
echo 'echo $siaddr' >> $script

imageserver=`udhcpc -s $script | tail -n 1`

hex=`ifconfig eth0 | grep "inet addr" | awk '{print $2}' | awk -F ":" '{print $2}' | awk '{n=split($
1,d,"."); for(i=1;i<=n;i++) printf "%02X", d[i]}'`

kboot="(tftp -g -r kboot.cfg/$hex -l etc/kboot.conf $imageserver >/dev/null 2>&1 || tftp -g -r kboot
.cfg/default -l etc/kboot.conf $imageserver) && kboot"
```

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OSCAR implementation overview

```
[root@peach ~]# cd $OSCAR_HOME
[root@peach oscar]# ./install_cluster eth0
```

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Current Status / Future work

- OSCAR Releases
  - Last official release is 5.0, released on 12 November, 2006
  - Last unofficial release is 5.0.1, released in April, 2007
  - Official release 5.1 will be released on 11 November, 2007

Current Status / Future work

- OSCAR 5.1 Highlights
  - Support Power PC and Power PC64
  - ODA (Database) enhancements
  - Support SUSE, Debian, Yellow Dog Linux
  - Various software package updates
  - New OSCAR Package (OPKG) structure
  - Merge the several official OSCAR web sites to the one

OSCAR Resources

- Official website: http://svn.oscar.openclustergroup.org
- SVN repository: http://svn.oscar.openclustergroup.org/oscar
- Sourceforge Website: http://www.sf.net/projects/oscar

Questions?