

2494-14

**Workshop on High Performance Computing (HPC) Architecture
and Applications in the ICTP**

14 – 25 October 2013

**Installation Procedures for Clusters
Part 4**

M. Baricevic
CNR–INFN DEMOCRITOS, Trieste

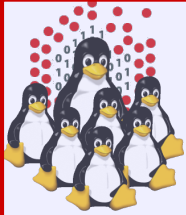
Moreno Baricevic

**CNR-INFM DEMOCRITOS
Trieste, ITALY**



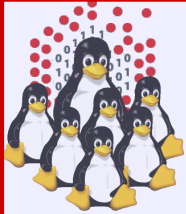
Installation Procedures for Clusters

PART 4 – Hands-on Laboratory



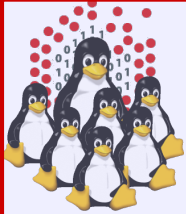
Agenda

- Cluster Services
- Overview on Installation Procedures
- Configuration and Setup of a NETBOOT Environment
- Troubleshooting
- Cluster Management Tools
- Notes on Security
- **Hands-on Laboratory Session**



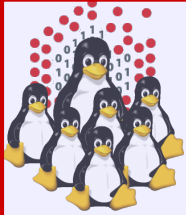
Hands-on Laboratory – Session 1

- Installation of a master node
- Post configuration of the master node
- Setting up NETBOOT services (DHCP, TFTP, PXE, NFS, package repository)
- Installing our first computing node
- Testing the cluster environment



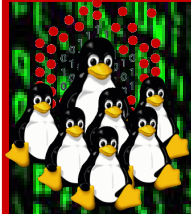
Hands-on Laboratory – Session 2

- Passwordless environment and *c3* tools
- NFS shares
- Installing and configuring the resource management system (*torque+maui*)
- Serial job submission
- *OpenMPI* and parallel job submission
- Compilers and *modules* (optional)



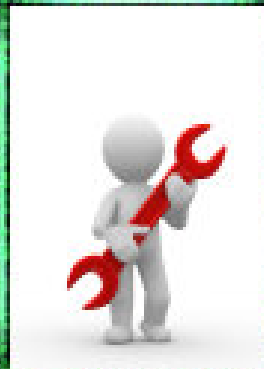
Hands-on Laboratory – Session 3

- Monitoring tools (*ganglia*) (*)
- Configuring DNS (*bind*) (*)
- kickstart %post: further configuration (*)
- NAT setup and IP forwarding (*iptables*) (*)

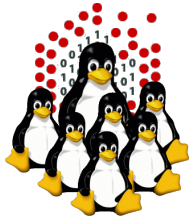


Hands-on Laboratory Session

Let's do it!



<http://edu.escience-lab.org>
<http://elearn.escience-lab.org>



REFERENCES AND USEFUL LINKS

Cluster Toolkits:

- OSCAR – Open Source Cluster Application Resources
<http://oscar.openclustergroup.org/>
- NPACI Rocks
<http://www.rocksclusters.org/>
- Scyld Beowulf
<http://www.beowulf.org/>
- CSM – IBM Cluster Systems Management
<http://www.ibm.com/servers/eserver/clusters/software/>
- xCAT – eXtreme Cluster Administration Toolkit
<http://www.xcat.org/>
- Warewulf/PERCEUS
<http://www.warewulf-cluster.org/> <http://www.perceus.org/>

Installation Software:

- SystemImager <http://www.systemimager.org/>
- FAI <http://www.informatik.uni-koeln.de/fai/>
- Anaconda/Kickstart <http://fedoraproject.org/wiki/Anaconda/Kickstart>

Management Tools:

- openssh/openssl
<http://www.openssh.com>
<http://www.openssl.org>
- C3 tools – The Cluster Command and Control tool suite
<http://www.csm.ornl.gov/torc/C3/>
- PDSH – Parallel Distributed SHell
<https://computing.llnl.gov/linux/pdsh.html>
- DSH – Distributed SHell
<http://www.netfort.gr.jp/~dancer/software/dsh.html.en>
- ClusterSSH
<http://clusterssh.sourceforge.net/>
- C4 tools – Cluster Command & Control Console
<http://gforge.escience-lab.org/projects/c-4/>

Monitoring Tools:

- Ganglia <http://ganglia.sourceforge.net/>
- Nagios <http://www.nagios.org/>
- Zabbix <http://www.zabbix.org/>

Network traffic analyzer:

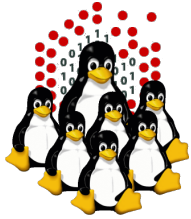
- tcpdump <http://www.tcpdump.org>
- Wireshark <http://www.wireshark.org>

UnionFS:

- Hopeless, a system for building disk-less clusters
<http://www.evolware.org/chri/hopeless.html>
- UnionFS – A Stackable Unification File System
<http://www.unionfs.org>
<http://www.fsl.cs.sunysb.edu/project-unionfs.html>

RFC: (<http://www.rfc.net>)

- RFC 1350 – The TFTP Protocol (Revision 2)
<http://www.rfc.net/rfc1350.html>
- RFC 2131 – Dynamic Host Configuration Protocol
<http://www.rfc.net/rfc2131.html>
- RFC 2132 – DHCP Options and BOOTP Vendor Extensions
<http://www.rfc.net/rfc2132.html>
- RFC 4578 – DHCP PXE Options
<http://www.rfc.net/rfc4578.html>
- RFC 4390 – DHCP over Infiniband
<http://www.rfc.net/rfc4390.html>
- PXE specification
<http://www.pix.net/software/pxeboot/archive/pxespec.pdf>
- SYSLINUX <http://syslinux.zytor.com/>



Some acronyms...

ICTP – the Abdus Salam International Centre for Theoretical Physics
DEMOCRITOS – Democritos Modeling Center for Research In aTOMistic Simulations
INFN – Istituto Nazionale per la Fisica della Materia (Italian National Institute for the Physics of Matter)
CNR – Consiglio Nazionale delle Ricerche (Italian National Research Council)

HPC – High Performance Computing

OS – Operating System

LINUX – LINUX is not UNIX

GNU – GNU is not UNIX

RPM – RPM Package Manager

CLI – Command Line Interface

BASH – Bourne Again SHell

PERL – Practical Extraction and Report Language

PXE – Preboot Execution Environment

INITRD – INITIAL RamDisk

NFS – Network File System

SSH – Secure SHell

LDAP – Lightweight Directory Access Protocol

NIS – Network Information Service

DNS – Domain Name System

PAM – Pluggable Authentication Modules

LAN – Local Area Network

WAN – Wide Area Network

IP – Internet Protocol

TCP – Transmission Control Protocol

UDP – User Datagram Protocol

DHCP – Dynamic Host Configuration Protocol

TFTP – Trivial File Transfer Protocol

FTP – File Transfer Protocol

HTTP – Hyper Text Transfer Protocol

NTP – Network Time Protocol

NIC – Network Interface Card/Controller

MAC – Media Access Control

OUI – Organizationally Unique Identifier

API – Application Program Interface

UNDI – Universal Network Driver Interface

PROM – Programmable Read-Only Memory

BIOS – Basic Input/Output System

SNMP – Simple Network Management Protocol

MIB – Management Information Base

OID – Object Identifier

IPMI – Intelligent Platform Management Interface

LOM – Lights-Out Management

RSA – IBM Remote Supervisor Adapter

BMC – Baseboard Management Controller