7th European GSE / IBM Technical University for z/VSE, z/VM and Linux on System z

IS01 / VM04

Graphical Management of z/VM virtual Servers

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Agenda
Systems Management with focus on System z

- **xCAT**
  - Introduction
  - Demo
    - Overview Demo Environment
    - Virtual Server Management
    - Virtual Server Provisioning
    - Ganglia

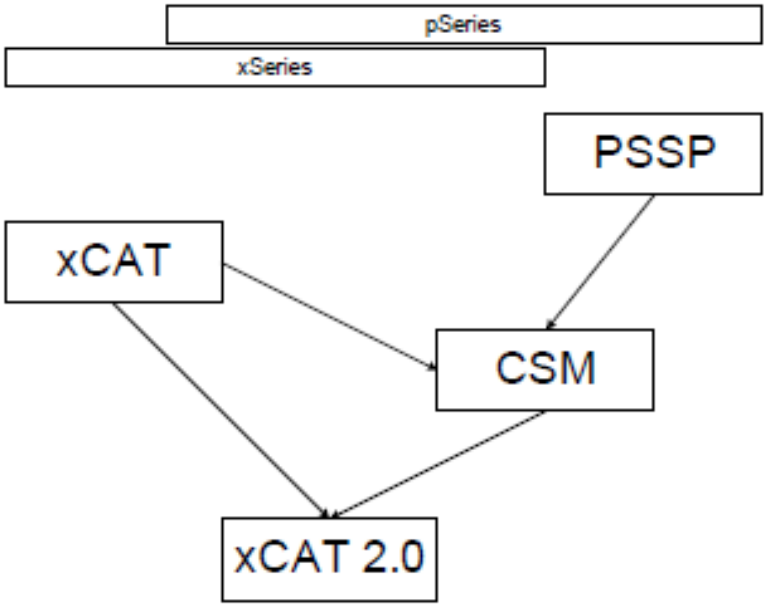
- **CSL WAVE**
  - Introduction
  - DEMO

xCAT Overview

- **xCAT** stands for E**x**treme **C**loud **A**dministration **T**oolkit
- Tool to manage, provision, and monitor physical and virtual machines (x, p and z)
- Command-line or Web-based and easy to use
- Open sourced in 2007 by IBM and licensed as EPL (Eclipse Public License)
- Used by NASA, University of Toronto, IBM, Adaptive Computing, Los Alamos Lab., and more!
- xCAT is used to manage virtual servers within multiple z/VM partitions.
- The xCAT management node (MN) can be installed on any Linux.
- It communicates with a System z hardware control point (zHPC) over SSH, which is required on each z/VM partition (member) in order to manage it. The zHCP is a zLinux, and its purpose is to interface with the SMAPI and CP layer.
- It utilizes a C socket interface to communicate with the SMAPI layer and VMCP Linux module to communicate with the CP layer.
- xCAT mainly relies on Linux VMCP modules to perform its actions. However, more complicated actions, such as creating/deleting/editing virtual servers, require SMAPI.

xCAT History

- October 1999
  - xCAT Zero created for Web 1.0
- January 2000 – Present
  - xCAT used WW for scale-out Linux and Windows clusters
  - xCAT Community: 273 members from at least 16 countries
- May 2007
  - xCAT and CSM developers begin work together on xCAT 2
- October 2007
  - xCAT 1.3.0 released
  - xCAT 2.0-alpha (Linux Only)
- 2008
  - xCAT 2.0 and 2.1 released
    - xSeries and pSeries
    - Linux and AIX, Windows and Xen
    - Open Source. CLI and GUI
- 2009 (10 years)
  - xCAT 2.2 and 2.3 released
    - Satellite support
- 2010
  - xCAT 2.4 and 2.5 released
- 2012
  - Support for System z and z/VM
- 2013
  - xCAT 2.8.1, z/VM Live Guest Relocation (LGR) support



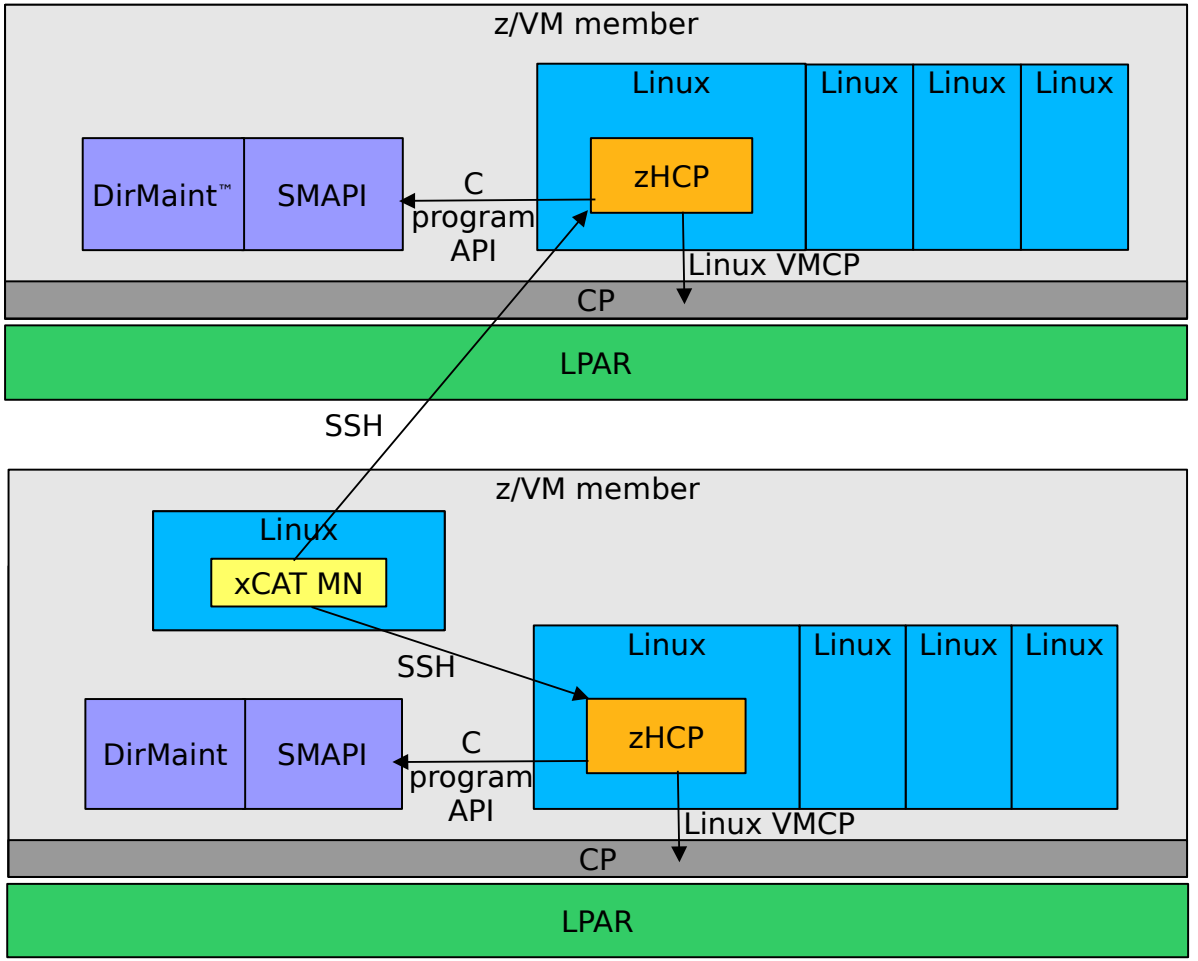
xCAT Features

Feature	Description
▪ Lifecycle management	▪ Power on/off any virtual machine (VM) ▪ Create VM based on a user directory entry ▪ Edit the user directory entry of an existing VM ▪ Delete any VM
▪ Inventory	▪ Collect the software (OS version and z/VM host) and hardware inventory (CPUs, disks, and networks) of any VM ▪ Collect the inventory of resources of resources available for any z/VM, such as the networks available and the disks available in any disk pool
▪ Image management	▪ Clone any Linux VM ▪ Install a brand new Linux on any VM using AutoYast or Kickstart ▪ Create new Linux VM based on a shared NFS read-only root filesystem
▪ Network management	▪ Add or delete network devices to any VM ▪ Supports layer 2 and 3 QDIO GuestLANs, vSwitches, and HiperSockets
▪ Storage management	▪ Add or delete ECKD or FBA disks from a disk pool ▪ Add or delete ECKD or FBA disks from VM
▪ Operating system (OS) management	▪ Upgrade the Linux OS ▪ Add, update, or delete software packages on any Linux VM ▪ Includes basic xCAT features, such as remote shell, post-scripts, rsync, etc.
▪ Monitoring	▪ Monitor any Linux VM, gathering network, disk, CPU load, and memory usage via Ganglia

xCAT Architecture on System z

xCAT MN:
Management **N**ode
(single instance)
Central management server
running on normal Linux

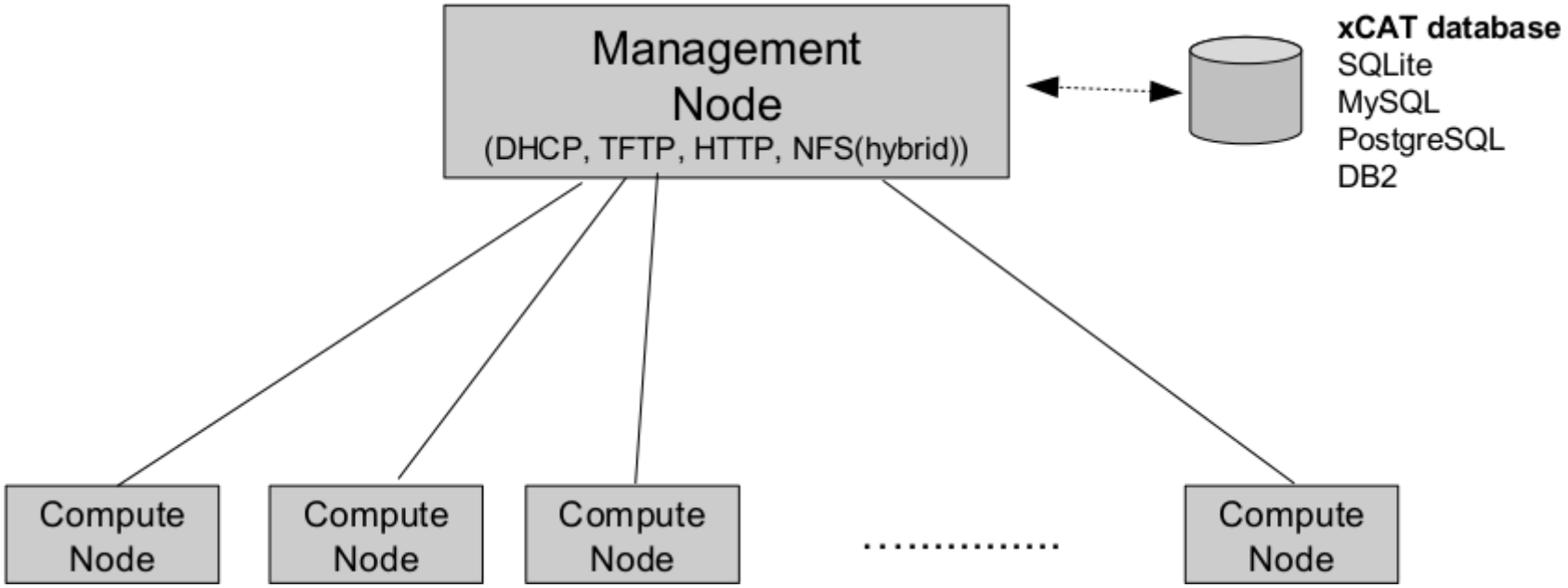
zHCP:
System **z** **H**ardware **C**ontrol **P**oint
(one per z/VM member)
Runs on privileged VM and
manages other VMs via SMAPI
and CP



http://clientcenter.de.ibm.com/democenter/

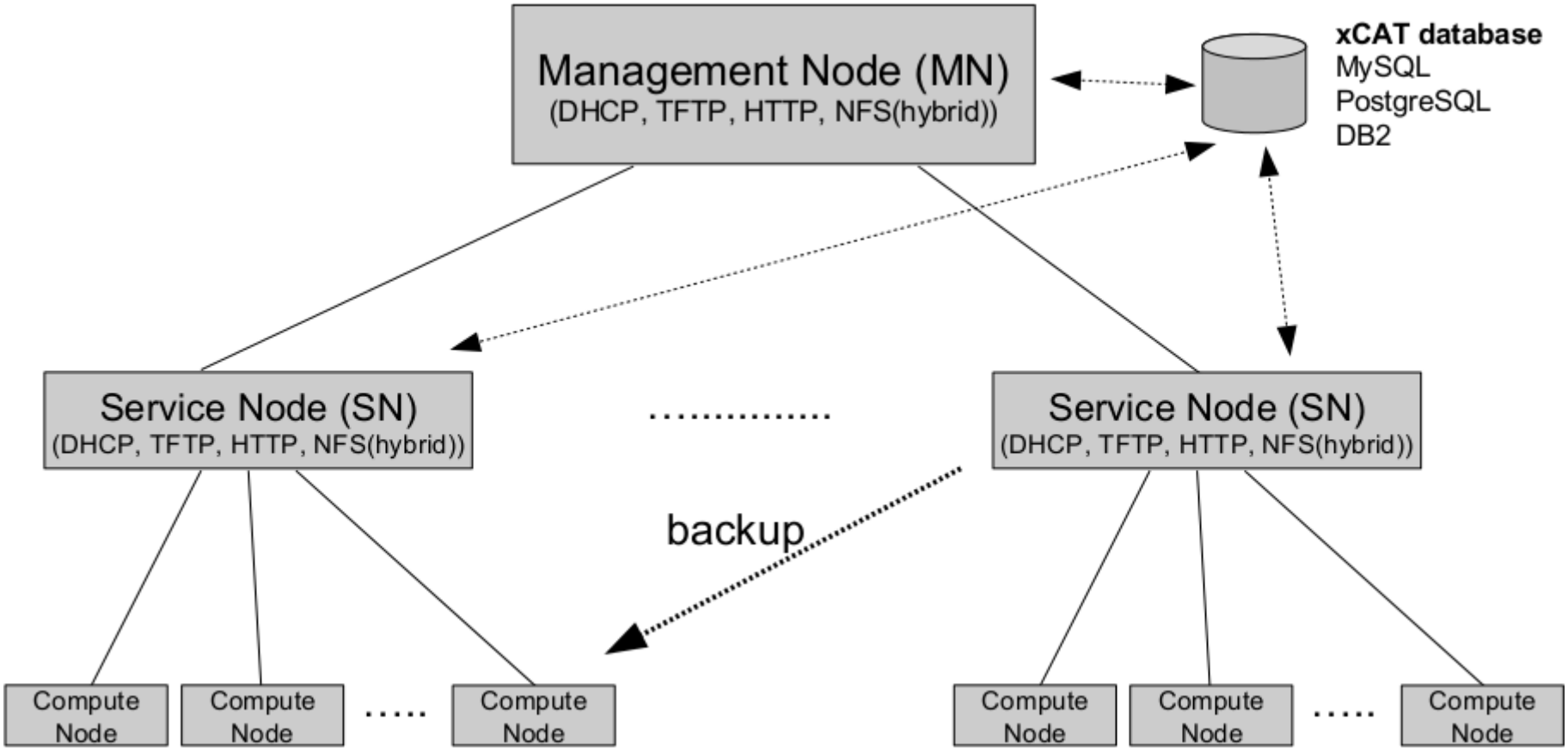
xCAT Simple Infrastructure

- A single xCAT Management Node (MN) for N number of nodes.
  - A single node DHCP/TFTP/HTTP/NFS server.
  - Scales to ~128 nodes.
    - If staggered boot is used, this can scale to 1024 nodes (tested)



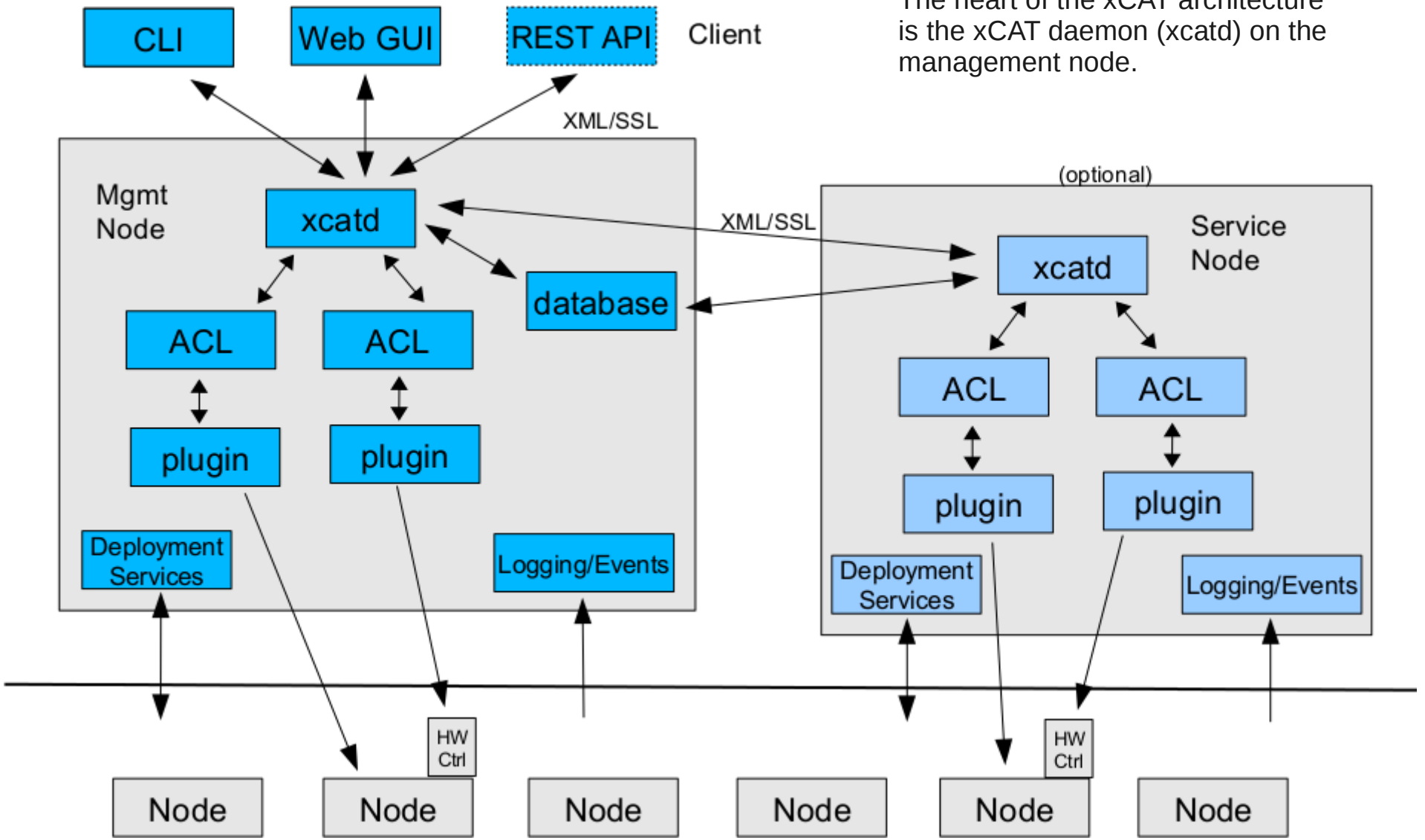
xCAT Hierarchial Infrastructure

- A single xCAT Management Node (MN) with multiple Service Nodes (SN) providing boot services to increasing scaling.
- Can scale to 1000s and 100000s of nodes.

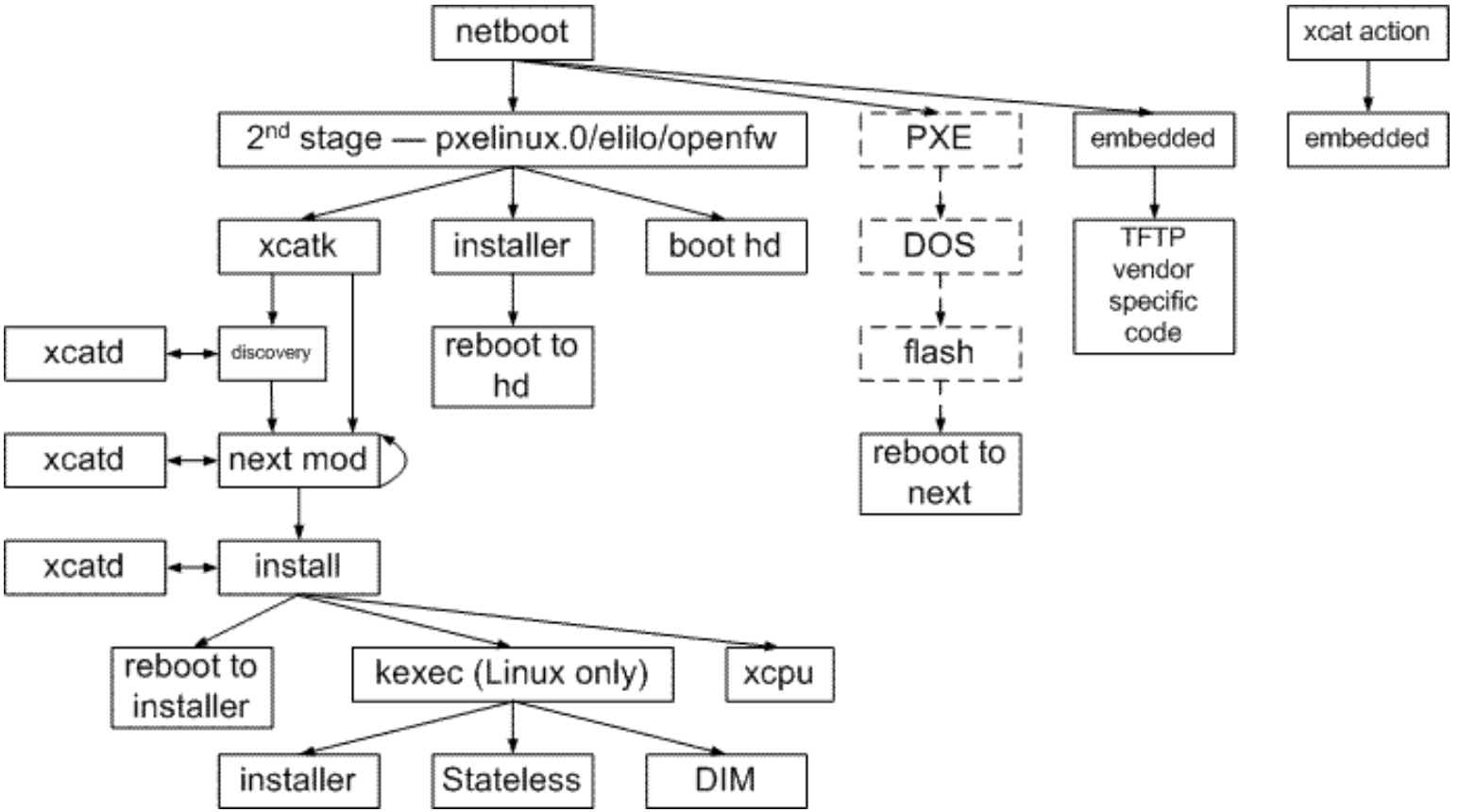


xCAT (Extreme Cloud Toolkit) – Architecture

The heart of the xCAT architecture is the xCAT daemon (xcatd) on the management node.



xCAT (Extreme Cloud Toolkit)



xCAT Tables and Database

- xCAT stores all information about the nodes and subsystems it manages in a database.
  - xCAT default database is located in /etc/xcat in sqlite tables. xCAT can be instructed to store the tables in MySQL, PostgreSQL or DB2 LUW as well.
- For most installations you won't need to even fill up half of the tables!
  - And for the tables that you do need, in most cases you'll only need to put one line in the table!
- There are lot of tables but only some tables are for common to Linux and AIX, some are for only AIX, some just for monitoring, some for advanced functions (virtual machines, iSCSI settings), …
- xCAT comes with a rich set of functions for manipulating tables, either implicitly via the tooling, with the web-based GUI or per command-line (simple table editing function).

xCAT Common Tables

Table	Description
site	Controls settings that are primarily used for the management node in how xCAT will behave.
nodelist	The list of all the nodes in the cluster, including each node's current status and what groups it is in.
nodehm	Settings that control how each node's hardware is managed. Typically, an additional table that is specific to the hardware type of the node contains additional info. E.g. the ipmi, mp, and ppc tables.
ipmi	Settings for nodes that are controlled by an on-board BMC via IPMI.
mp	Contains the hardware control info specific to blades. This table also refers to the mpa table, which contains info about each Management Module.
mpa	Contains info about each Management Module and how to access it.
networks	Describes the networks in the cluster and info necessary to set up nodes on that network.
noderes	Resources and settings to use when installing nodes.
passswd	Contains default userids and passwords for xCAT to access cluster components. In most cases, xCAT will also actually set the userid/password in the relevant component when it is being configured or installed. Userids/passwords for specific cluster components can be overidden in other tables, e.g. mpa, ipmi, ppchcp, etc.
chain	Controls what operations are done (and it what order) when a node is discovered and deployed.
switch	Contains what switch port numbers each node is connected to.
nodetype	A few hardware and software characteristics of the nodes.
mac	The MAC address of the node's install adapter. Normally this table is populated by getmacs or node discovery, but you can also add entries to it manually.

xCAT Used Tables

Table:	Description:
site.in	global settings for whole cluster, incl. data of timezone, DHCP, etc.
hosts.in	all hosts
hypervisor.in	generic hypervisor information
zvm.in	z/VM specific hypervisor information
osimage.in	basic information about an OS image that can be used to deploy cluster nodes
linuximage.in	information about a Linux OS image that can be used to deploy cluster nodes
postscripts.in	post provisiioning tasks
mac.in	network, dhcp and more information on the node's install adapter
monitoring.in	about gangilia
networks.in	network related information
nodehm.in	control information on node hardware
nodelist.in	node status and group relationship
nodetype.in	hardware and architectural information
passwd.in	contains default userids and passwords for xCAT to access cluster components
policy.in	controls authorizations to run xCAT operations ('ACL' for xCAT)
mp.in	BladeCenter Advanced Management Module (AMM)

xCAT Commands

- xCAT Commands used on the CLI interface can be divided in several groups.
- There are commands for:
  - Database support
    - chtab, chdef, nodels, mkrrbc, mkrrnodes, modech, tabdump, tabedit, ...
  - Hardware control
    - getmacs, rcons, renergy, rnetboot, reventlog, ...
  - Monitoring
    - monadd, monls, monstart, monstop, ...
  - Inventory
    - rinv, rvitals, sinv
  - Parallel commands
    - pscp, psh, prsync, pping, ...
  - Deployment
    - copycds, genimage, liteimg, …
  - CSM to xCAT migration Tools
  - Others
    - makenetworks, makehost, makedhcp, ...

… for more information see references slide ...

xCAT Commands

command	Description
rpower	Remote power control of nodes *rpower noderange [--nodeps] [on|onstandby|off|suspend|stat|state|reset|boot]*
rvitals	Retrieves remote hardware vitals information. *Blade specific: rvitals noderange {temp|wattage|fanspeed|leds|summary|all}*
rspreset	Resets the service processors associated with the specified nodes. *rspreset noderange*
rinv	Remote hardware inventory. *rinv noderange {pci|model|serial|asset|vpd|mprom|deviceid|guid|firm|diag|bios|mparom|mac|all}* *Blade specific: rinv noderange {mtm|serial|mac|bios|diag|mprom|mparom|firm|all}*
getmancs	Collects node MAC address. getmacs [-h| --help | -v| --version] *Blade specific:*getmacs noderange [-V| --verbose] [-d] [--arp]
rcons	Remotely accesses the serial console of a node rcons singlenode [conserver-host] [-f] [-s]
nodestat	Display the running status of each node in a noderange nodestat [noderange] [-m|--usemon] [-p|--powerstat] [-u|--updatedb]
rbeacon	Turns beacon on/off/blink or gives status of a node or noderange. rbeacon noderange {on|blink|off|stat}
sinv	Checks the software configuration of the nodes in the cluster. sinv [-o output] [-p template path] [-t template count] [-s seed node] [-i] [-e] [-r] [-V] [[-f command file] | [-c command]]

xCAT Commands

command	Description
updatenode	Reruns postsctipts or runs additional scripts on the nodes. *updatenode noderange [-V|--verbose] [-F|--sync] [-S|--sw] [-P|--scripts [script1,script2...]] [-s|--sn] [-A|--updateallsw] [-c|--cmdlineonly] [-d alt_source_dir] [attr=val [attr=val...]]*
nodeset	*set the boot state for a noderange* *nodeset [noderange] [boot|install|stat|iscsiboot|netboot|statelite|runcmd=bmcsetup|osimage=<imagename>]*
genimage	*Generates a stateless image to be used for a diskless install.* *genimage [-i nodebootif] [-n nodenetdrivers] -o OS -p profile [-l rootlimit] [-r additional_nics] [-k kernel_version] [--permission permission]*
copycds	*Copies Linux distributions and service levels from CDs/DVDs to install directory.* *copycds [{-n|--name|--osver}=distroname] [{-a|--arch}=architecture] {iso|device-path} ...*
nodels	Lists the nodes, and their attributes, from the xCAT database. nodech noderange table.column=value [...]
nodeadd	Adds nodes to the xCAT cluster database. nodeadd noderange groups=groupnames [table.column=value] [...]
rinstall	Begin installation on a noderange. rinstall [-o|--osver] [-p|--profile] [-a|--arch] [-c|--console] [noderange]

xCAT Monitoring Commands

command	Description
monls	*list the current or all the monitoring plug-in names, their status and description.*
monadd	*add a monitoring plug-in to the 'monitoring' table. This will also adds the configuration scripts for the monitoring plug-in, if any, to the 'postscripts' table.*
monrm	*remove a monitoring plug-in from the 'monitoring' table. It also removes the configuration scripts for the monitoring plug-in from the 'postscripts' table.*
moncfg	*configure the 3rd party monitoring software on the management server and the service node for the given nodes to include the nodes into the monitoring domain. It does all the necessary configuration changes to prepare the software for monitoring the nodes. The -r option will configure the nodes as well.*
mondecfg	deconfigure the 3rd party monitoring software on the management server and the service node for the given nodes to remove the nodes from the monitoring domain. The -r option will deconfigure the nodes as well.
monstart	start 3rd party software on the management server and the service node for the given nodes to monitor the xCAT cluster. It includes starting the daemons. The -r option will start the daemons on the nodes as well.
monstop	stop 3rd party software on the management server and the service node for the given nodes from monitoring the xCAT cluster. The -r will stop the daemons on the nodes as well.
monshow	displays the events that happened on the given nodes or the monitoring data that is collected from the given nodes.

xCAT Command-Line Samples

lstree

```
CEC: 17C07
|__LPAR: ZLP9
   |__zVM: TMCC40
      |__VM: tmcc40 ()
      |__VM: zcat40 (ZCAT40)
      |__VM: zhcp40 (ZHCP40)
      |__VM: zlin80 (ZLIN80)
      |__VM: zlin81 (ZLIN81)
|__LPAR: ZLPC
   |__zVM: TMCC13
      |__VM: tmcc13 ()
      |__VM: zhcp13 (ZHCP13)
      |__VM: zlin092 (ZLIN092)
CEC: 7B440
|__LPAR: LP1
   |__zVM: TMCC17
      |__VM: tmcc17 ()
      |__VM: zhcp17 (ZLIN251)
      |__VM: zlin231 (ZLIN231)
      |__VM: zlin232 (ZLIN232)
      |__VM: zlin233 (ZLIN233)
      |__VM: zlin235 (ZLIN235)
      |__VM: zlin236 (ZLIN236)
|__LPAR: LPB
   |__zVM: TMCC12
      |__VM: tmcc12 ()
      |__VM: zhcp12 (ZHCP12)
CEC: D02D5
|__LPAR: ZLPA
   |__zVM: TMCC11
      |__VM: tmcc11 ()
      |__VM: zhcp11 (ZHCP11)
      |__VM: zlin070 (ZLIN070)
      |__VM: zlin107 (ZLIN107)
      |__VM: zlin119 (ZLIN119)
      |__VM: zlin120 (ZLIN120)
|__LPAR: ZLPD
   |__zVM: TMCC14
      |__VM: tmcc14 ()
      |__VM: zhcp14 (ZHCP14)
```

lsvm zlin119

```
zlin119: USER ZLIN119 ******** 1024M 1024M G
zlin119: CPU 01
zlin119: IPL A00F
zlin119: MACHINE ESA 3
zlin119: OPTION APPLMON CHPIDV ONE
zlin119: *  VMRELOCATE ON DOMAIN SSI
zlin119: VMRELOCATE ON DOMAIN SSI
zlin119: DEDICATE A00F A00F
zlin119: CONSOLE 0009 3215 T
zlin119: NICDEF ED00 TYPE QDIO LAN SYSTEM INTRANET
zlin119: NICDEF EA00 TYPE QDIO LAN SYSTEM DEMOLAN
zlin119: SPOOL 000C 2540 READER *
zlin119: SPOOL 000D 2540 PUNCH A
zlin119: SPOOL 000E 1403 A lsdef zlin119
Object name: zlin119

appstatus=xend=down,sshd=up,rdp=down,https=down,
pbs=down,msrpc=down
    appstatustime=02-12-2013 14:12:38
    arch=s390x
    groups=LGR
    hcp=zhcp11.z0plex.com
    hostnames=zlin119.z0plex.com
    ip=192.168.9.119
    mgt=zvm
    os=sles9sp4
    postbootscripts=otherpkgs
    postscripts=syslog,remoteshell,syncfiles
    status=ping
    statustime=12-04-2012 11:14:09
    userid=ZLIN119
```

nodestat zlin119

```
zlin119: sshd
```

tabdump zvm

```
#node,hcp,userid,nodetype,parent,comments,disable
"zhcp40","zhcp40.z0plex.com","ZHCP40","vm","TMCC40",,
"zlin80","zhcp40.z0plex.com","ZLIN80","vm","TMCC40",,
"zlin81","zhcp40.z0plex.com","ZLIN81","vm","TMCC40",,
"zhcp17","zhcp17.z0plex.com","ZLIN251","vm","TMCC17",,
"7B440",,,"cec",,"z10",
"LP1",,,"lpar","7B440","z10",
"LPB",,,"lpar","7B440","z10",
"TMCC17",,,"zvm","LP1",,
"TMCC12",,,"zvm","LPB",,
"17C07",,,"cec",,"zEC12",
"ZLP9","null",,"lpar","17C07","zEC12",
"ZLPC","null",,"lpar","17C07","zEC12",
"TMCC40",,,"zvm","ZLP9",,
"TMCC13",,,"zvm","ZLPC",,
"zcat40","zhcp40.z0plex.com","ZCAT40","vm","TMCC40",,
"tmcc40","zhcp40.z0plex.com",,"vm","TMCC40",,
"tmcc17","zhcp17.z0plex.com",,"vm","TMCC17",,
"tmcc11","zhcp11.z0plex.com",,"vm","TMCC11",,
"tmcc12","zhcp12.z0plex.com",,"vm","TMCC12",,
"tmcc13","zhcp13.z0plex.com",,"vm","TMCC13",,
"tmcc14","zhcp14.z0plex.com",,"vm","TMCC14",,
"zhcp11","zhcp11.z0plex.com","ZHCP11","vm","TMCC11",,
"zhcp12","zhcp12.z0plex.com","ZHCP12","vm","TMCC12",,
"zhcp13","zhcp13.z0plex.com","ZHCP13","vm","TMCC13",,
"zhcp14","zhcp14.z0plex.com","ZHCP14","vm","TMCC14",,
"D02D5",,,"cec","null","z196",
"ZLPA",,,"lpar","D02D5",,
"ZLPD",,,"lpar","D02D5",,
"TMCC11",,,"zvm","ZLPA",,
"TMCC14",,,"zvm","ZLPD",,
,,,"lpar",,,
,,,"zvm",,,
"zlin232","zhcp17.z0plex.com","ZLIN232","vm","TMCC17",,
"zlin231","zhcp17.z0plex.com","ZLIN231","vm","TMCC17",,
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"zlin235","zhcp17.z0plex.com","ZLIN235","vm","TMCC17",,
"zlin236","zhcp17.z0plex.com","ZLIN236","vm","TMCC17",,
"zlin119","zhcp11.z0plex.com","ZLIN119","vm","TMCC11",,
"zlin070","zhcp11.z0plex.com","ZLIN070","vm","TMCC11",,
"zlin107","zhcp11.z0plex.com","ZLIN107","vm","TMCC11",,
"zlin092","zhcp13.z0plex.com","ZLIN092","vm","TMCC13",,
"zlin120","zhcp11.z0plex.com","ZLIN120","vm","TMCC11",,
"zlin024","zhcp11.z0plex.com","ZLIN024","vm","TMCC11",,
```
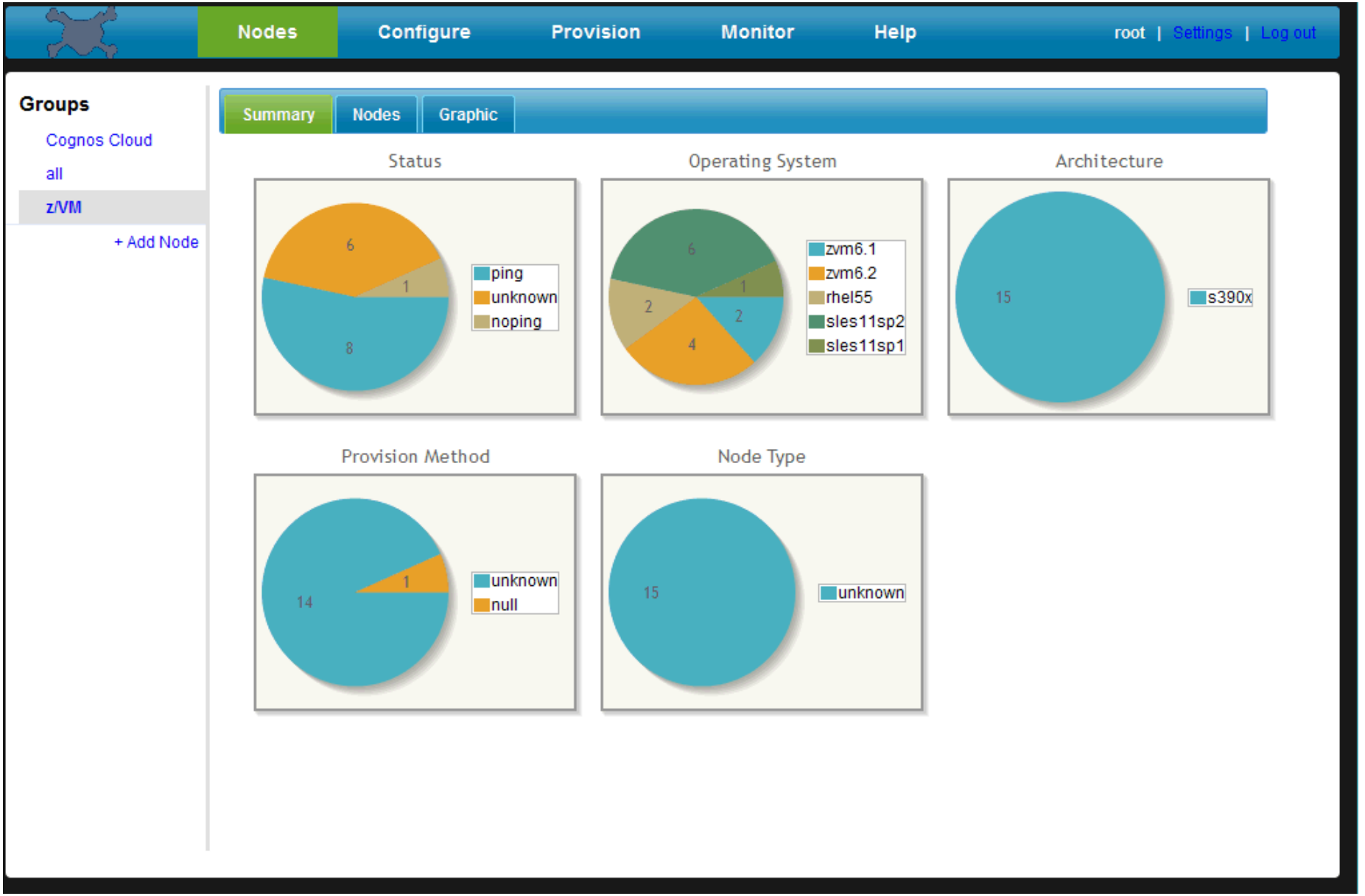
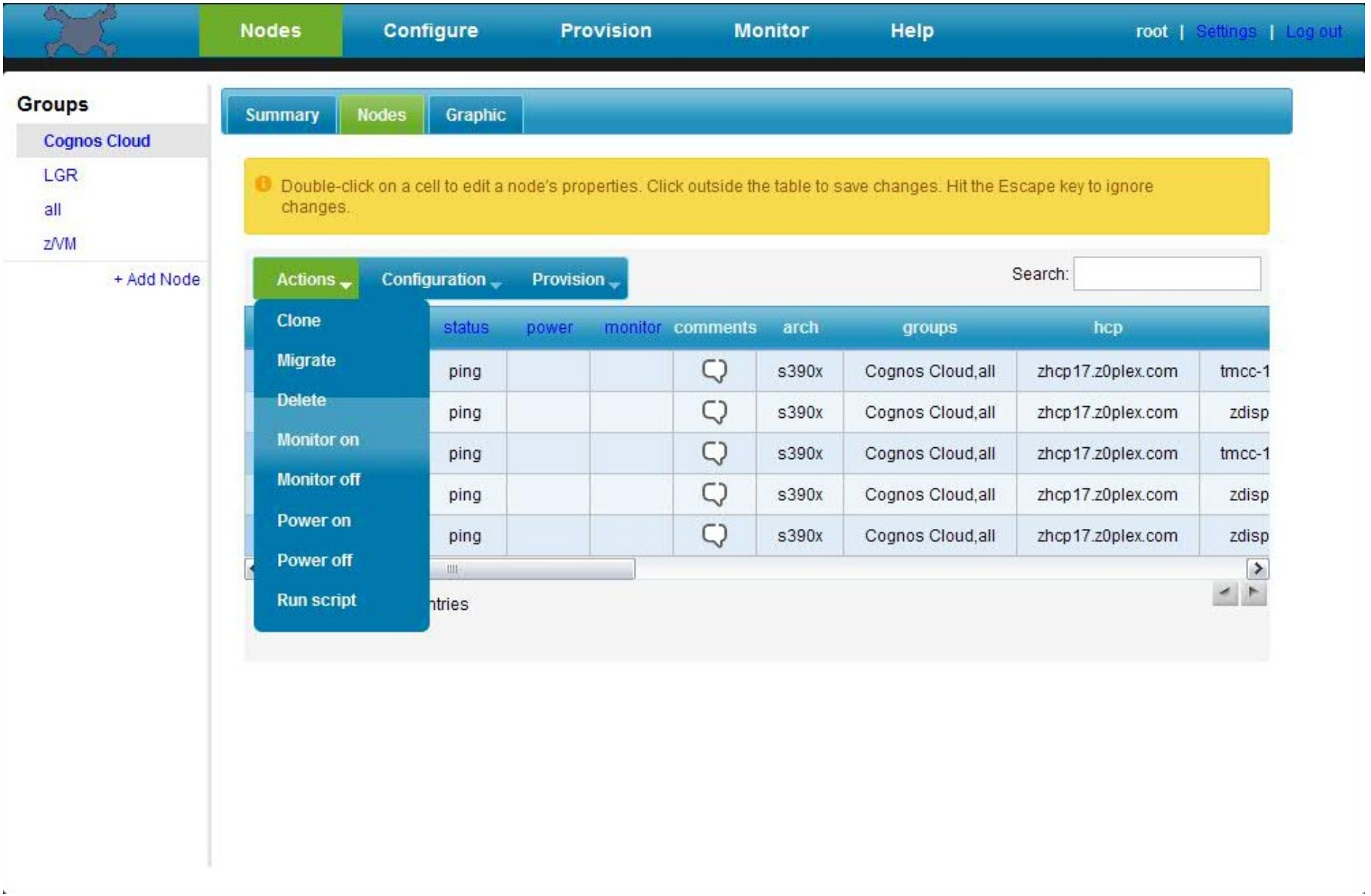
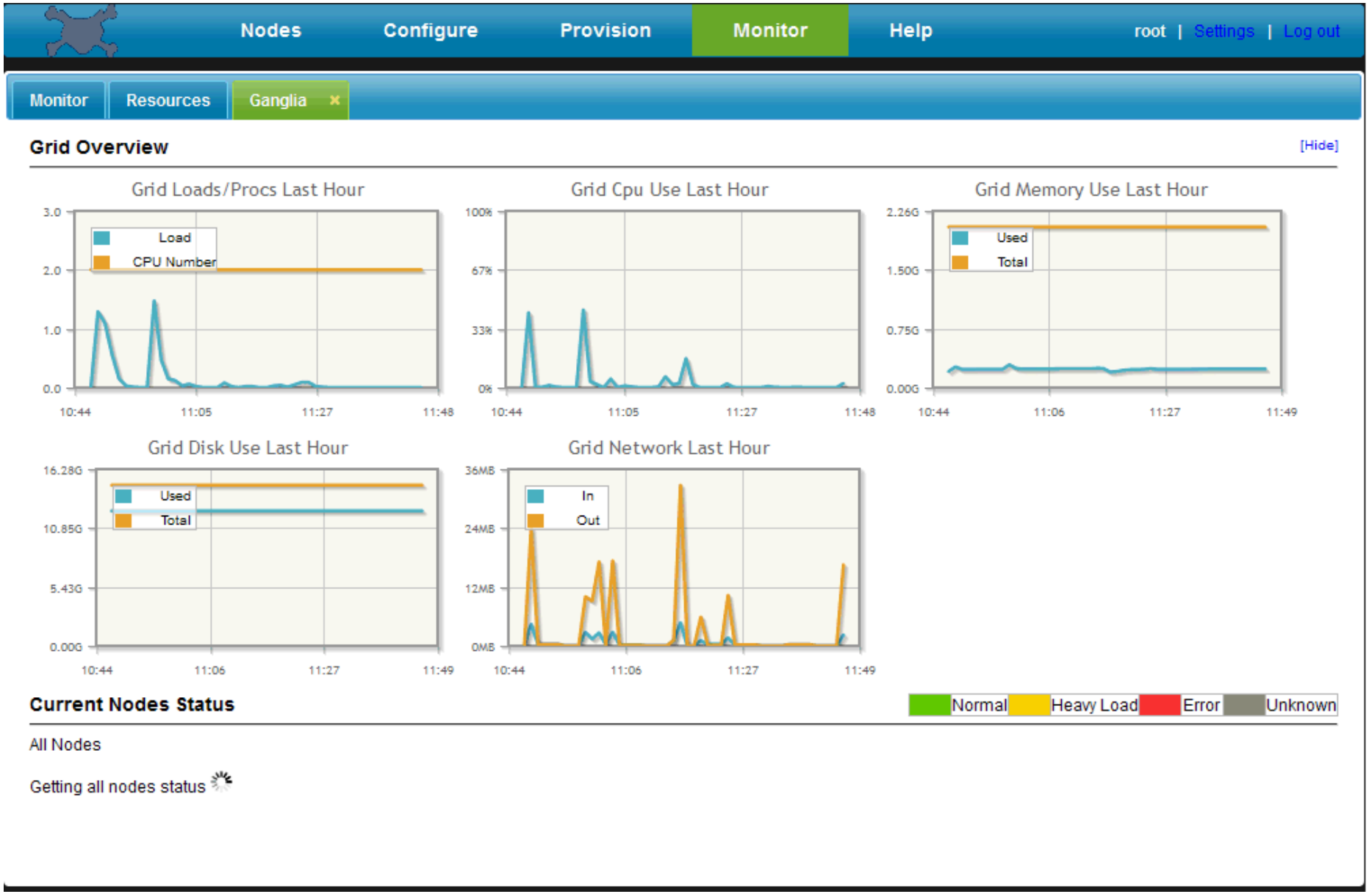

xCAT GUI – Nodes, Summary



xCAT GUI – Nodes, Actions, incl. Migrate



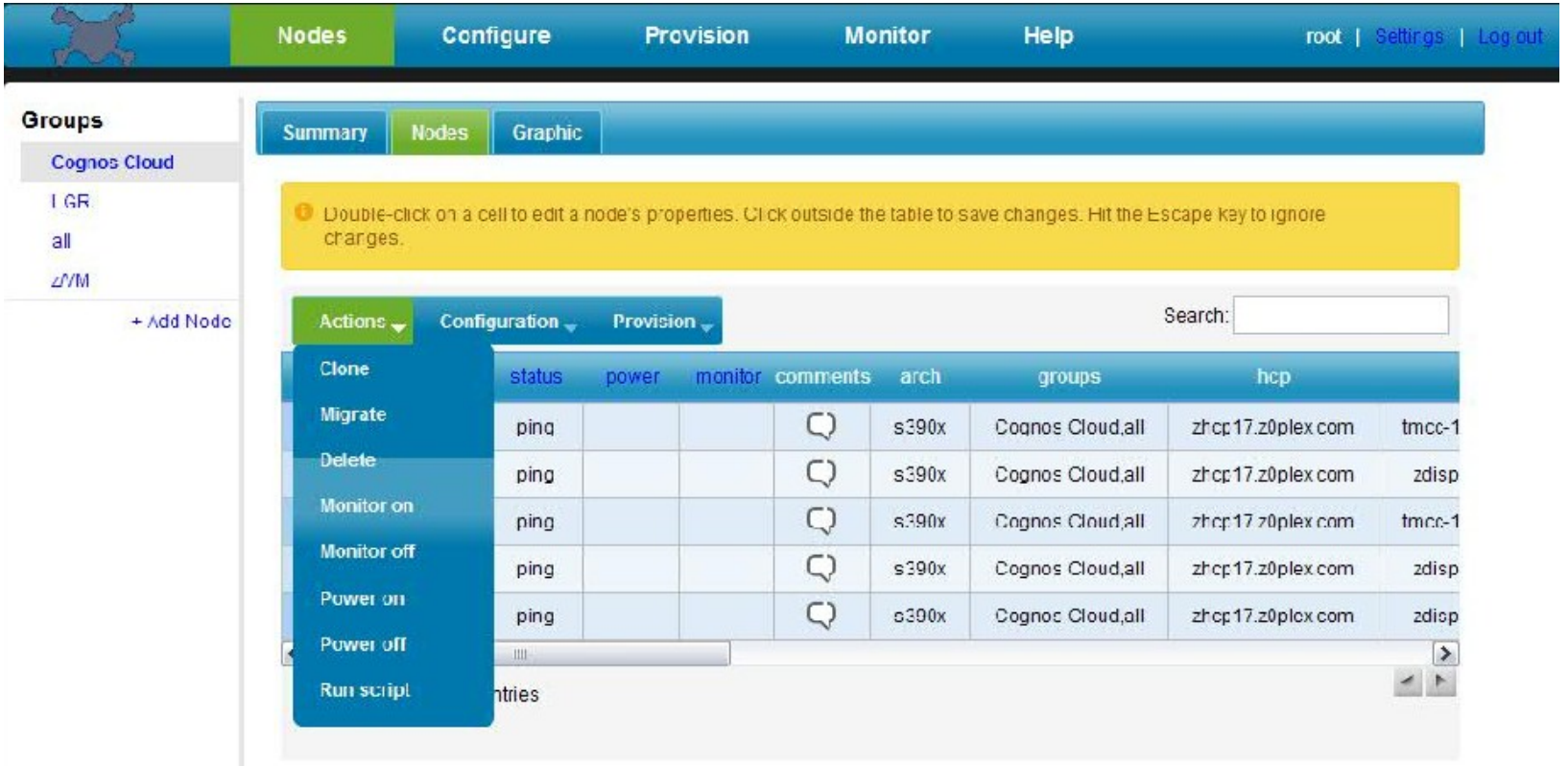
xCAT GUI – Monitoring, Ganglia



xCAT References

- Extreme Cloud Administration Toolkit (xCAT) Home
  http://xcat.sf.net/ or http://xcat.sourceforge.net/
- Extreme Cloud Administration Toolkit (xCAT) – Overview
  http://www-03.ibm.com/systems/software/xcat/index.html
- Extreme Cloud Administration Toolkit (xCAT) – Support
  http://www-03.ibm.com/systems/software/xcat/support.html
- Cloud Computing with xCAT on z/VM (by Thang Pham)
  http://www.vm.ibm.com/sysman/xcatinfo.pdf
- Cloud Computing with xCAT on z/VM - Frequently Asked Questions
- http://www.vm.ibm.com/sysman/xcatfaq.pdf
- xCAT DB: http://xcat.sf.net/man5/xcatdb.5.html
- xCAT Man Pages: http://xcat.sf.net/man1/xcat.1.html
- xCAT Wiki: http://xcat.wiki.sourceforge.net/
- xCAT Bug List
  - https://sourceforge.net/tracker/?group_id=208749&atid=1006945
- Mailing list
  - https://lists.sourceforge.net/lists/listinfo/xcat-user
  - Archive: http://sourceforge.net/mailarchive/forum.php?forum_name=xcat-user
- xCAT Source
  - http://xcat.svn.sourceforge.net/svnroot/xcat/xcat-core/trunk/
- xCAT Cookbooks (documentation)
  - http://xcat.svn.sourceforge.net/viewvc/xcat/xcat-core/trunk/xCAT-client/share/doc/index.html

xCAT DEMO



Summary

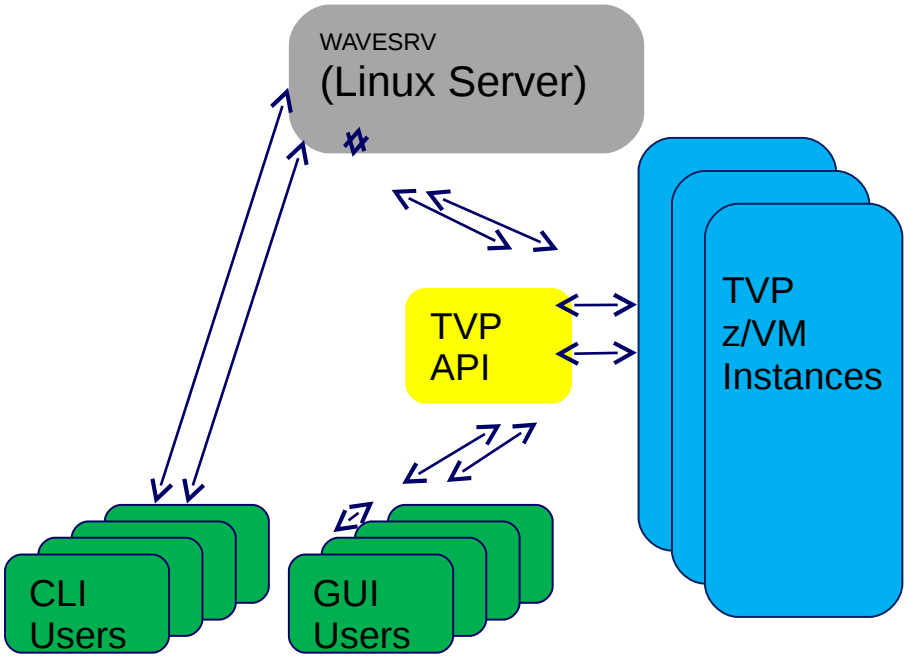
- This presentation showed an Open Source appplication that is supportive in terms of systems management and monitoring on the System z platform (and beyond).
- The approach of xCAT, doing the control via SMAPI,
  is also used in other systems management applications, like for example:
  - IBM Systems Director
  - CSL WAVE © (ISV)
- IBM z/VM 6.3 includes xCAT support

Introduction … CSL-WAVE

CSL-WAVE (**W**eb **A**ccess to **V**M **E**nvironments)

CSL-WAVE High Level Overview

- Management, Provisioning, Automation and Simplification solution for virtual server farms
- Focused on System z with z/VM environment
- Based on a 3-Tier Architecture:
  - CSL-WAVE Server - Running our BTS (Background Task Scheduler) and the knowledge-base DB
  - Modular TVP (Target Virtualization Platform) API that drives SMAPI and our Service Machines
  - GUI Clients and CLI users login to manage the virtual server farm(s)



CSL-WAVE Foundation

- **Knowledge Base:**
  Keeps track of the managed systems' components and their associated metadata
- **Task Scheduler:**
  Employs Work Units (WU) processing architecture using BTS Worker threads
- **Common Output Repository (COR):**
  Where output generated by each BTS WU is stored in a Spool-like fashion
- **Message Brokers:**
  Efficiently move messages across all system components
- **Security Enforcer:**
  Controls the Scope and Permissions of every user action
- **Device Management:**
  Simple and Automatic control of all virtual devices as well as real/dedicate devices

CSL WAVE - Overview

- **Graphical management** of your z/VM Complex with no limits on the number of CPCs, z/VM LPARs or SSI clusters.
- **Extremely intuitive** Point-and-Click and Drag-and-Drop gestures.
- **Full abstraction** of the underlying z/VM Environment, so Linux System Administrators can be productive day-one.
- **Simplification and automation** of all day-to-day tasks
- **Provisioning** of all virtual entities (Guests, Network and Storage)
- **Advanced security** architecture to enable delegation of authorities
- **Flexible reporting** capabilities on all managed entities, including internal CSL-WAVE resources
- **Comprehensive logging** with external integration options

CSL-WAVE Main Features

Using the architecture and technologies,
CSL-WAVE facilitates advanced capabilities in these areas:

1) Simplification
2) Automation
3) Provisioning
4) Graphical Control
5) Auto-Detection
6) Enhanced Server Farm Administration
7) Network Support
8) Extended Security

Computer Solutions Leaders International (CSL)
Web Administration VM Environment (WAVE)

- ***NEW* Full FCP Support**
  - CSL-WAVE Verison 3.1 introduces full support for FCP attached storage to z/VM and to z/Linux Guests. Full inventory management, including visual disk mapping is available directly from the GUI client. FCP support is also integrated into z/VM Guest cloning and Storage Management!
- ***NEW* Virtual-to-Real Ratio Monitoring**
  - The lastest version of CSL-WAVE provides an integrated Virtual-to-Real memory monitor gauge as part of the System Status and Dashboard displays.
- ***NEW* Innovative and exciting features**
  - CSL-WAVE Version 3.1 includes support for pausing and resuming virtual guests, advanced shared directory support (both SSI and non-SSI), enhanced filtering capabilities, graphical enhancements, and performance improvements - All using our industry-proven agentless, low-overhead technology.
- **z/VM 6.2, SSI and LGR Support**
  - CSL-WAVE version 3.0 is among the first products in the world to provide full support for z/VM 6.2, along with SSI and LGR. Relocating a z/VM guest is as easy as dragging it from one z/VM system to another!
- **Automation and Simplification**
  - CSL-WAVE completely abstracts the underlying hypervisor (z/VM) layer. Interaction is done using point-and-click and drag-and-drop gestures.
- **Provisioning**
  - CSL-WAVE provides unique and advanced provisioning features. Quick and effortless creation of new z/Linux guests, virtual networks and storage provisioning are only a mouse click away!
- **Automatic Detection**
  - Once a z/VM System is introduced to CSL-WAVE management, the product automatically detects all the resources defined to the system. In a matter of minutes your entire z/Linux Server Farm is laid out graphically.
- **Enterprise Enabled**
  - With the new Enterprise Viewer and Dashboard, it is even simpler to manage and monitor your entire z/VM farm. Manage guests across LPARs and CECs and monitor all of your z/VM Systems from a central location.

Computer Solutions Leaders International (CSL) (ISV)
Web Administration VM Environment (WAVE)

- **Complete provisioning and management solution for z/VM environment**
  - Offers provisioning of all aspects of the z/VM hypervisor, including server, network and storage provisioning
- **Gives Linux administrators the freedom to manage their Linux on System z servers without the need to employ a zVM system programmer for every VM USER environment change needed for their Linux on System z servers**
  - System administrators do not need to have any knowledge or understanding of the physical or virtual infrastructure hosting their virtual servers
- **Fully abstracts the virtual and physical resources while providing automation of operating procedures**
- **Currently runs and is supported on the following:**

Linux on System z Versions	z/VM Versions	Client and Server Versions
SLES 9 (31 and 64-bit)	z/VM 5.2	Windows (XP and above)
SLES 10 (All service packs)	z/VM 5.3	Mac (OS X and above)
SLES 11 (All service Packs)	z/VM 5.4	Linux on System z - See supported deployments on the left
RHEL 4 (From 4.7)	z/VM 6.1	Linux (x86) - Same deployments as with Linux on System z
RHEL 5 (All Service Packs)	z/VM 6.2	
RHEL 6	z/VM 6.3 (with CSL WAVE 3.2)	

CSL WAVE – Architectural Overview

The GUI Client

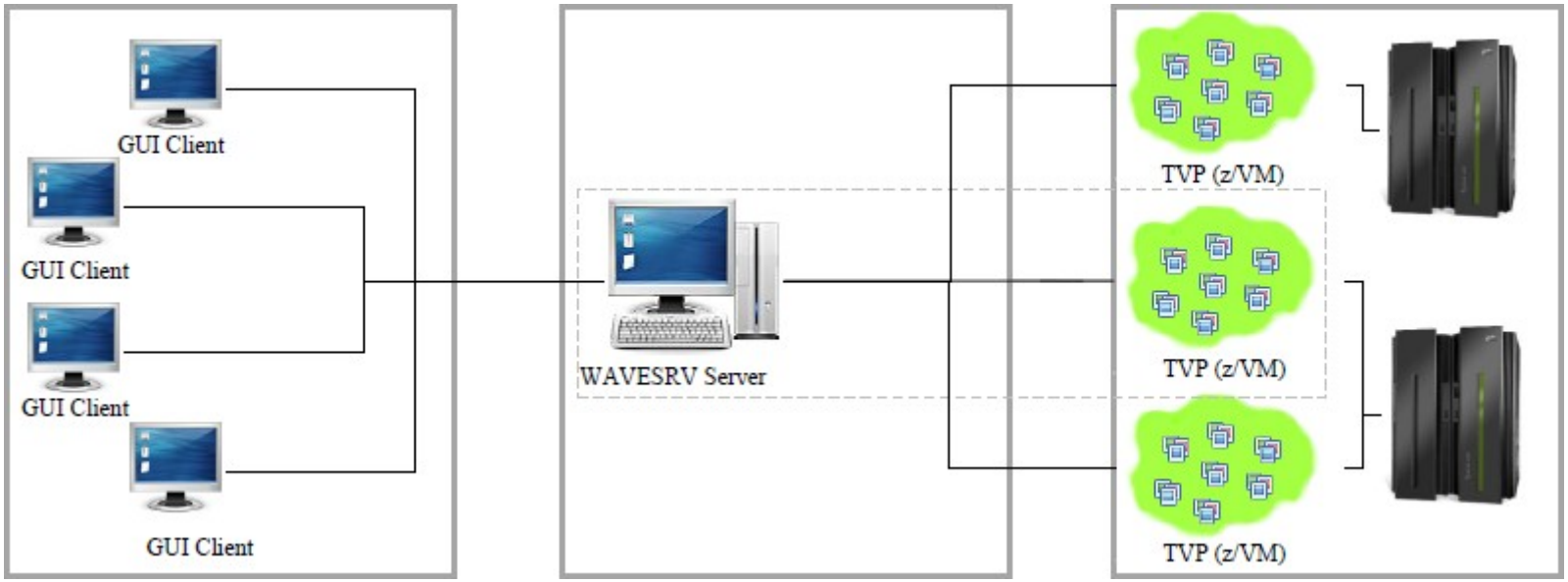
The GUI Client can run on any platform supporting Java (Windows, Mac, and Linux). It provides a graphic interpretation of the knowledgebase and allows the user to interact with the TVP using Point-and-Click and Drag-and-Drop operations.

The BTS (WAVESRV)

This server can be a physical or virtual one and hosts the application database and BTS (Background Task Scheduler). There is no limitation on the number of TVPs or virtual guests that one BTS server can manage.

The TVP

The Target Virtualization Platform (TVP) represents the hypervisor which hosts the virtual guests. The BTS and the GUI Clients utilize the TVP API to query and perform changes to the TVP and hosted virtual guests.



CSL-WAVE, Get z Power without z Learning Curve: http://csl-int.com/pages_docs/CSL-WAVE-Overview-Brochure-w30-features-rev-a.pdf

System z Cloud Blueprint

Integrate	Automate	Orchestrate
"Take out cost" Consolidate and Virtualize	***"Simplify" Automate and Manage Better***	***"Orchestrate" Service Lifecycle Management***
Differentiation	*Standardization*	*Service Management*
▪ Rapid deployment of Linux virtual servers for less than $1 a day ▪ Industry leading "gold standard" security for tenant isolation ▪ Elastic scaling achieved by dynamically adjustable capacity at sustained performance ▪ Multisystem virtualization simplifies management by clustering shared resources	▪ Automated provisioning and de-provisioning ▪ Pool standardized virtualized building blocks ▪ Plug-and-play capacity across hardware generations ▪ Capture and catalog virtual images in the data center ▪ Automated methods for faster delivery of services with higher levels of control	▪ Integrated virtualization management with IT service delivery processes ▪ Self-service provisioning ▪ Automated service lifecycle management including dynamic instantiation of cloud services ▪ Pay for use ▪ Optimize IT resources to reinvent business processes

Client Cloud Journey: Virtualization/Consolidation → Simplification/Standardization → Orchestration

System z Cloud Ecosystem

Integrate → **Automate** → **Orchestrate**

IBM Products & Offerings

- **zEnterprise: zEC12, zBC12**
- **Linux on System z**
- **z/VM 6.3** **New**
- **Tivoli Provisioning Manager**
- **SmartCloud Entry**
- **SmartCloud Provisioning**
- **Tivoli Service Automation Manager**
- ***Cloud Ready for Linux on System z***
- **SmartCloud Orchestrator**

System z support currently in development

ISV Solutions

CSL Wave
- Provided by **CSL International**
- Hypervisor manager
- Provides simplified user interface for z/VM system programmer tasks.

IBM announced intention to acquire

zPRO
- Provided by **Velocity Software**
- Add-on feature to Velocity's zVPS product that provides performance management
- Provides golden image creation, cloning, and operational controls

APPLogic
- Provided by **Computer Associates**
- Manages both distributed and z/VM environments.

MOAB
- Provided by **Adaptive Computing**
- Provides a policy based cloud management based on xCAT

Open Source Options

xCAT
- Extreme Cloud Administration Tool
- Now shipped in z/VM 6.3

OpenStack
- Being enabled with z/VM 6.3
- Used as a code base for SmartCloud Entry / Provisioning / Orchestrator

CSL-WAVE Benefits

- Enables System z-based virtualization as a practical and economical solution for:

  "Virtual Server Farms with NO LIMITS"
- Allows easy management of ANY-SIZE server farm
- Multiple z/VMs managed via central control (EV)
- Standardize the management UI regardless of the HW platform (z9 BC/EC, z10 BC/EC, z196/z114, zEC12/zBC12)
- Extended IT team control over the server farm whilst cutting costs
- Delegate administrative authority with full control of Scopes and Permissions

CSL-WAVE Value Proposition Summary:

- **CSL-WAVE** is a **best of breed** virtualization enabler and virtual server provisioning management solution
- **Simplification** and **Automation** of System z virtual server farm management via an intuitive and rich **GUI**
- All managed Linux images remain **Agent-Free**
- CSL-WAVE **does not have any architectural limitation** to the capacity it can manage …
- **Goal driven** user experience

- All of the above value points geared towards:

Driving your IT COSTS DOWN!

xCAT and CSL WAVE Comparison

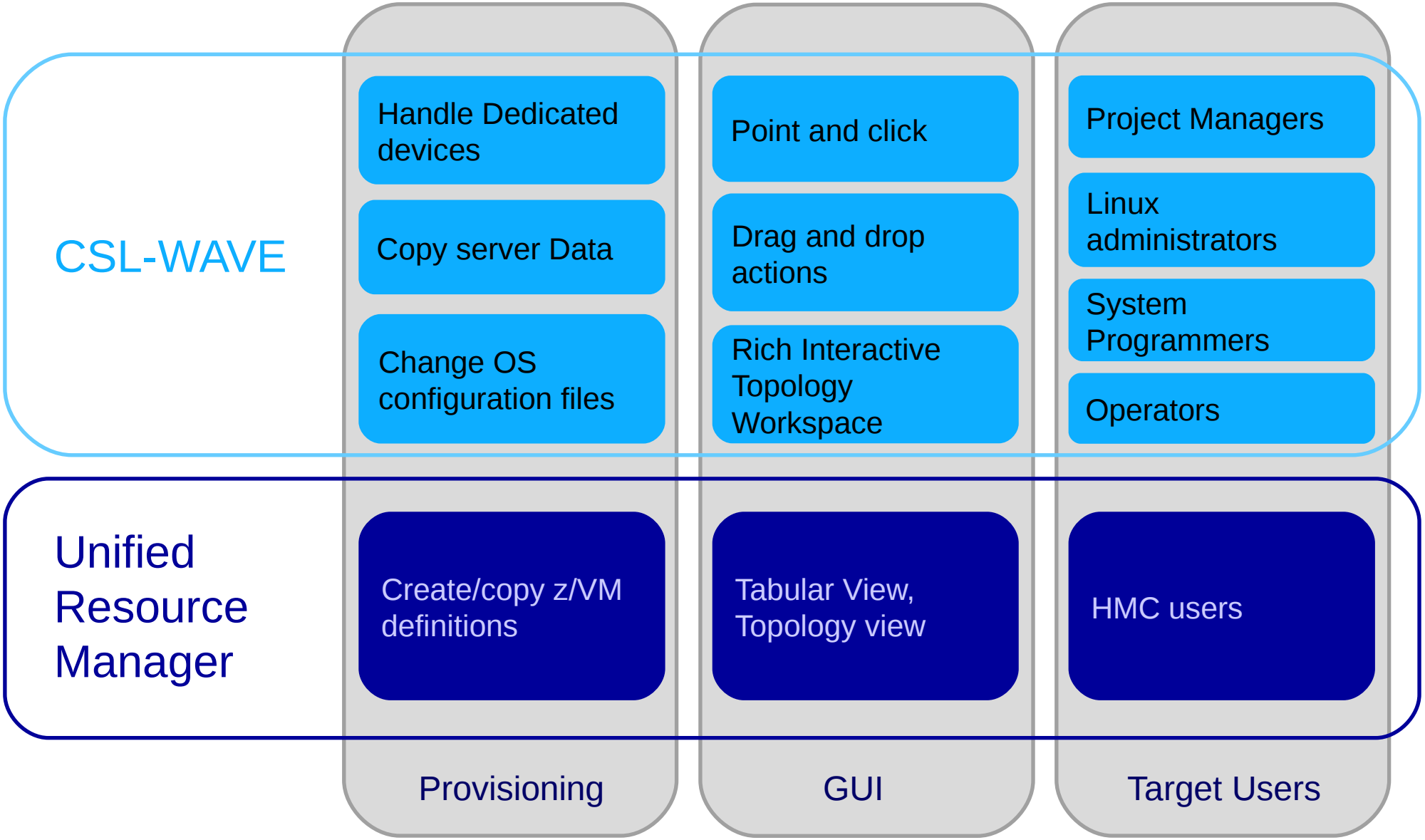
xCAT (full “sourceforge” version)	**CSL WAVE**
o fits to the Integrate level of the Cloud Ecosystem	o fits to the Integrate level of the Cloud Ecosystem
+ open source (freely available)	- commercial (cost)
+ (commercial) support available	+ (commercial) support available
+ multi-platform, multi-hypervisor (open for other hypervisors, like KVM)	- supports z/VM only / exclusively + optimized for z/VM
+ offers a scripting / Linux bash cmd-line environment	- offers only a basic scripting / cmd-line environment
+ Web-based GUI	+ Java Web-Start based and easy to use GUI, with “drag 'n drop” support
- slightly reduces the need of a z/VM sys. prog. sys. prog. still required for setup and maintenance	- significantly reduces the need of a z/VM sys. Prog. sys. prog. still required for setup and maintenance
+ quite easy to setup	+ quite easy to setup
- has some limitations on System z (discovery, monitoring)	+ supports nearly any System z feature
+ provisioning based on cloning and network install (supports Red Hat Kickstart and SUSE AutoaYast)	- provisioning mainly based on cloning
- monitoring is only basic, but can be manually enhanced	+ incl. comprehensive monitoring
- does not offer discovery (on System z)	+ incl. discovery of environment
+ supports z/VM single System Image and Live Guest Migration	+ supports z/VM single System Image and Live Guest Migration
+ supports Linux OS upgrades (out-of-the-box)	
- xCAT shipped with z/VM 6.3 is a stripped down and locked down version only, that provides a rudimentary self-service portal (unlike the full Open Source “sourceforge” xCAT)	

http://pic.dhe.ibm.com/infocenter/zvm/v6r3/topic/com.ibm.zvm.v630.dmse6/conxcat.htm

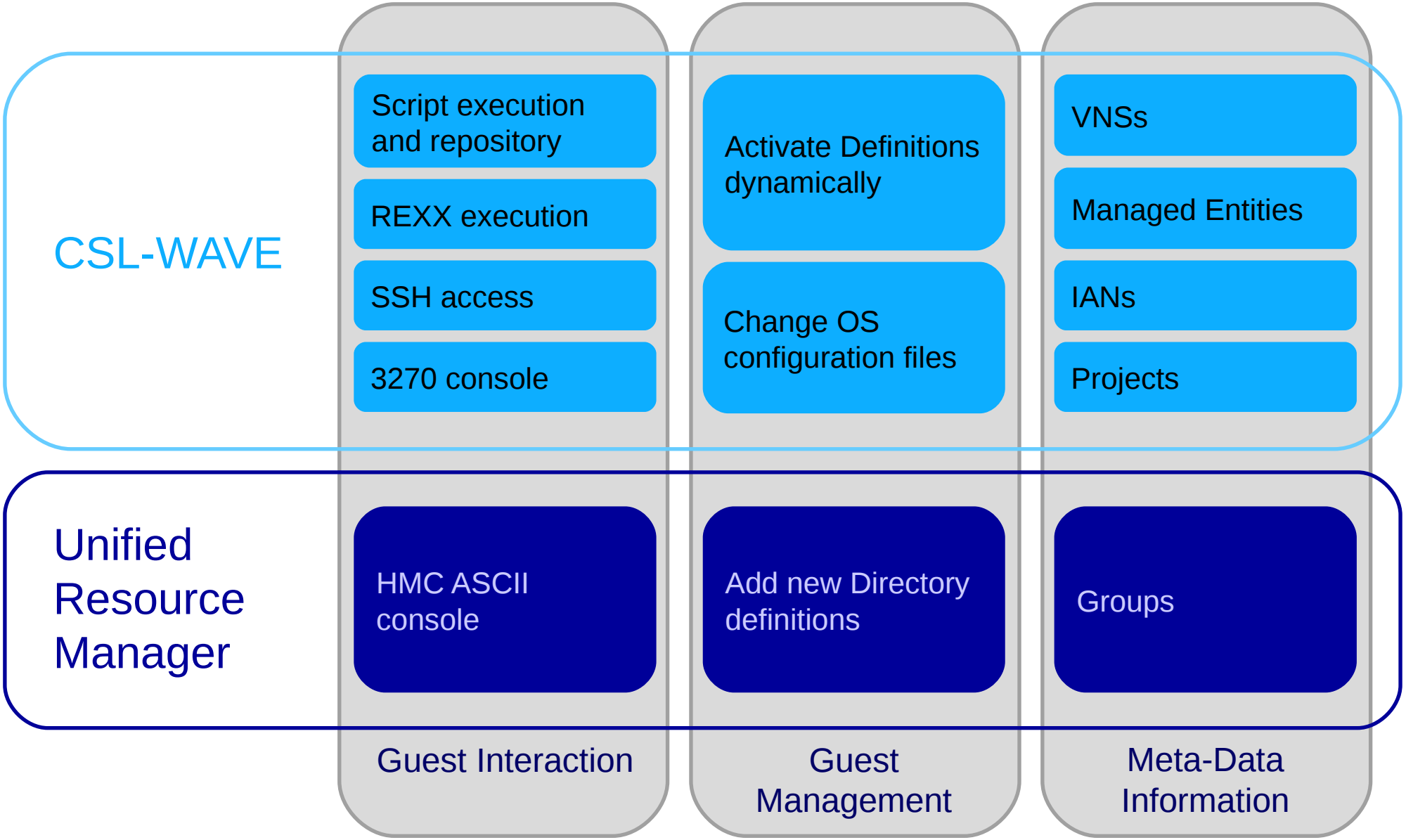
CSL-WAVE and z/Manager aka Unified Resource Manager

- The Overall design of CSL-WAVE as of v2.0 is geared towards taking advantage of Infrastructure Management APIs
- The z/Manager's API plays well in this scheme
- Our modular API allows us to complement and extend the z/Manager (management) value proposition
- As CSL-WAVE Provides end-to-end control of all management aspects of virtual server farms
- Standardize the management UI regardless of the HW platform (z9 BC/EC, z10 BC/EC, z196/z114, zEC12/zBC12)

Synergy with the z/Manager aka Unified Resource Manager



Synergy with the z/Manager aka Unified Resource Manager (Cont.)



Let's start the demo ...

Storyboard – 1

- WAVE graphical user interface
  - Workspace
  - Tabs
  - Context sensitiv interaction
  - User Manager
  - Project Manager
  - Managed Parameters
  - Site Management
- Hardware Viewer
  - Add CPC
  - Add Entity
  - Add z/VM
  - Using z/VM user groups
    - Group: USER LOCAL
    - Switch views
    - Search guest
    - Create group
- (Enterprise Viewer)

Storyboard – 2

- Dashboard Viewer (run through all Tabs)
  - CPU utilization
    - Graphical View
    - Textual View
    - VM Utilization
  - Virtual to Real Ratio
  - Using z/VM user groups
    - Group: USER LOCAL
    - Switch views
    - Search guest
    - Create group

- Guest Details (Hardware Viewer)
  - Select guest zlin71
  - Show status (w or w/o agent)
  - Options
  - Guest Start/Stop
  - Create new:
    - Create VM user
    - Install Linux
  - Clone
    - based on existing guest definition
    - based on prototype
  - (Add new network to z/VM and Linux guest)
  - (Add new filesystem to Linux guest)

Storyboard – 3

- Discovery (auto detection)
- Automation (scripting)
  - Linux (Shell/Bash)
    - Execute Bash script
    - User Script Manager
  - z/VM (REXX)
    - Execute REXX scripts
    - Edit and maintain REXX scripts via z/VM WAVEWRKS server
- Network
  - System view
  - Show Network (run through all Tabs)
- Reporting
  - Printing
- (Accounting)

Storyboard – 4

- General z/VM administration tasks
  - Manage Page space
  - Manage Pool space
  - Recycle service machines (SMAPI or WAVE)
  - Shutdown and re-IPL z/VM

- (Backup / Restore of CSL repository database)

References – CSL WAVE

- CSL International - CSL WAVE v3.1
  http://www.csl-int.com/product.asp?rec=7
- CSL-WAVE Brochure
  http://csl-int.com/pages_docs/CSL-WAVE-Overview-Brochure-w30-features-rev-a.pdf
- CSL-WAVE self-running demos
  http://www.youtube.com/user/CSLInternational
- The Power of Enterprise Linux made Easy - IBM ELS & CSL-WAVE
  http://www.youtube.com/watch?v=pZ9ssEEnll0&feature=youtu.be

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