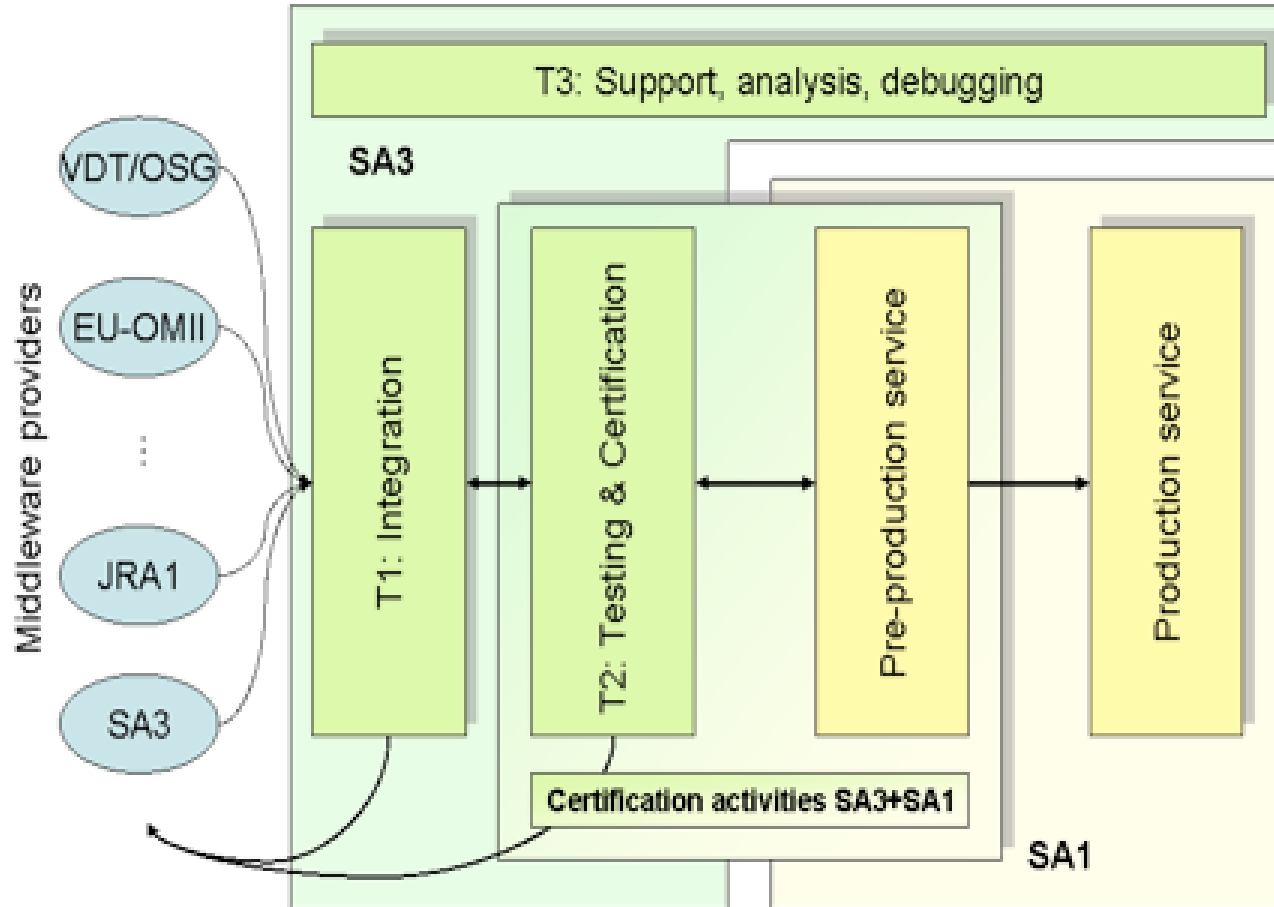


Usage of virtualization in gLite certification

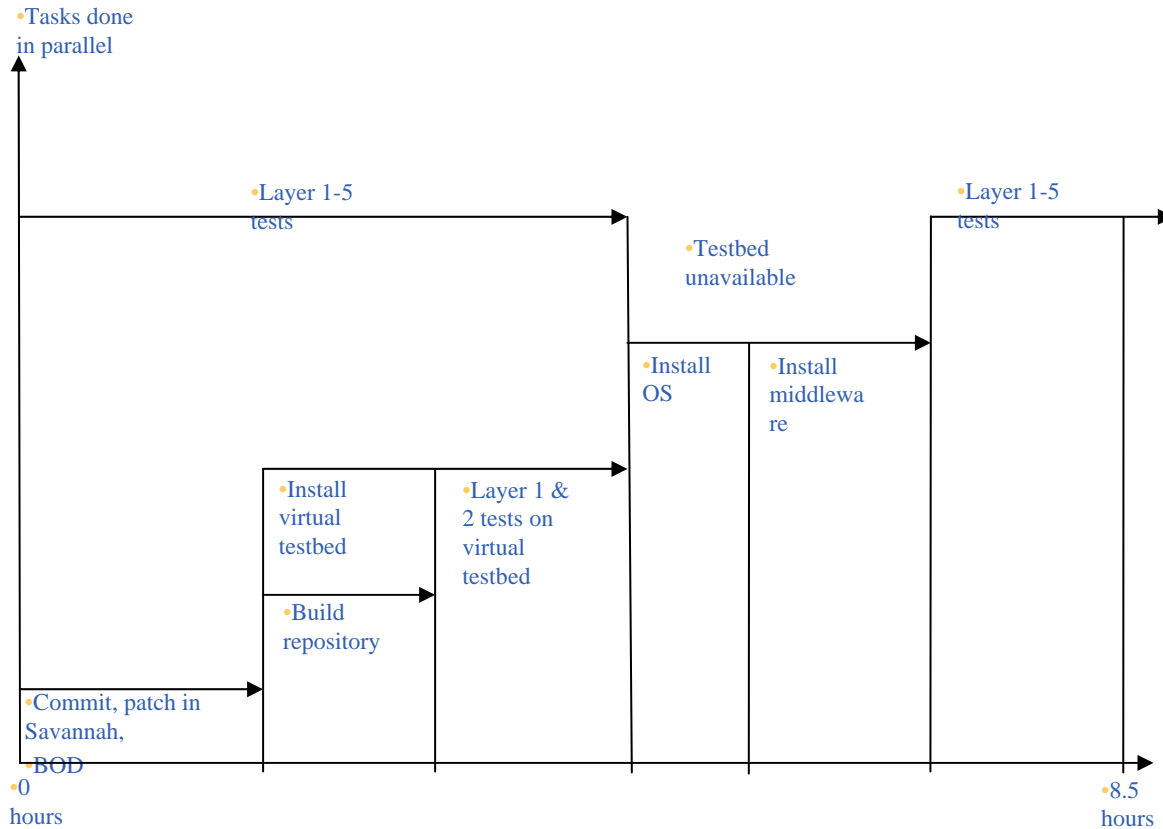
Andreas Unterkircher
CERN Grid Deployment

- 1. gLite certification**
- 2. Virtualization with the CERN gLite certification team.**
- 3. Image generation**
- 4. SmartDomains: Xen management with SmartFrog**
- 5. Our portal: vGrid**
- 6. Screenshots**
- 7. Final remarks**



- **Approx. 60 machines at CERN plus several external sites.**
- **All gLite services are present.**
- **Daily regression tests.**
- **Installation (rpm) and configuration of patches.**
- **Special tests for patches.**

- **Certification of several patches at the same time can cause conflicts but we have to certify patches in parallel.**
- **A non functional patch may spoil the whole testbed.**
- **Patches often fail already at an early stage.**
 - Rpm installation fails.
 - Configuration fails.
- **Failed patches can pollute a machine, a complete reinstallation might be necessary.**
- **For testing one might want to switch between different versions of a service quickly.**



Usage of virtualization to prevent patches failing at installation or configuration step to stop the whole certification process

- **OS: SLC3, SLC4 others to come according to needs (Debian).**
- **Virtualization tool: Xen.**
- **Need to generate images easily.**
- **Management of VMs: start/stop several machines (whole grid site) with one click.**
- **Management of images: save/retrieve images for later use.**

- Custom image generation for SLC3, SLC4 and Debian on SL machines.
- Management of Xen virtual machines with SmartFrog (SmartDomains project).
- vGrid portal to manage the whole chain (image generation and storage, VMs).
- IT Linux support team provides Xen rpms.
- Done in collaboration with CERN openlab.



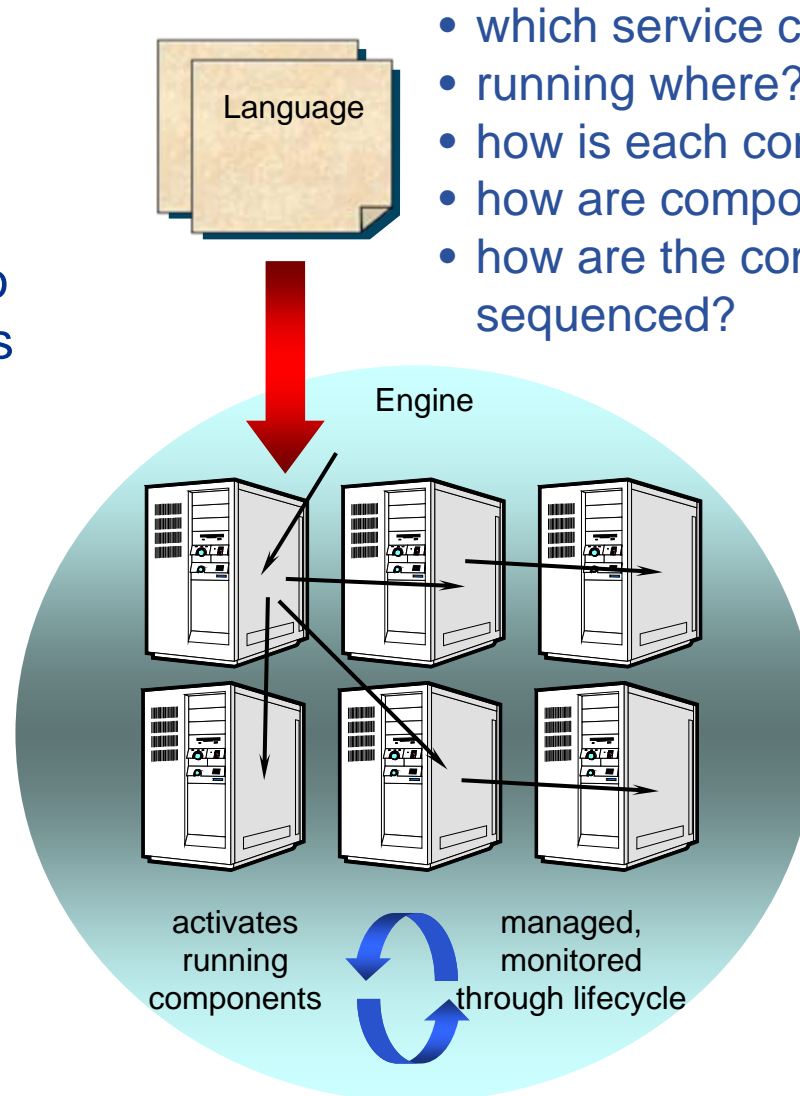
- How to make sure that some image boots under Xen ?
- Xen domU kernel must match the image.
- Image might start services that don't work in the guest environment.
- Networking might not work in the guest environment. For gLite services we need to know the hostnames in advance.
- Image generation should be possible without (re)installing a physical machine...

- **Bash scripts that generate a complete SLC3, SLC4 or Debian distribution under some directory and produce a .tar.gz or .img.**
- **Support for yum/apt groups make it possible to produce special images easily (e.g. glite-UI on SLC4).**
- **Further customization:**
 - Also install individual rpms.
 - Place files into the image (e.g. ssh keys).
 - Set a root password.
- **Network is configured to take parameters from Xen.**
- **Produces all the necessary files to ensure that the image boots (/dev,/etc/fstab,...).**

- **Can be launched by the user on his/her machine (but you need to be root).**
- **Driven by command line options.**
- **Can be easily integrated into some portal.**
- **Can be run in a VM.**

- **Smart Framework for Object Groups**
- **Developed by HP Labs Bristol.**
- **Java, Open Source.**
- **Describes distributed software systems as collections of cooperating components and allows to activate and manage them.**

- **Language**
 - templates / descriptions
- **Engine**
 - interprets descriptions to activate running services
- **Components**
 - make up the running service
 - deployed, configured & activated by the engine



- which service components?
- running where?
- how is each component initialised?
- how are components related?
- how are the component lifecycles sequenced?

- **SmartFrog components to manage Xen VMs.**
- **Developed at CERN openlab.**
- **Two main components**
 - StorageBackend (LVM or loopback): contains image, creates/deletes images, possibility to save image.
 - XenDomain: manages domU (start, stop).

```

sfConfig extends Compound {
  sfProcessHost "host2.cern.ch";
  myShell extends BashShell;
  lvm extends LVMStorageBackend {
    shell LAZY ATTRIB myShell;
    baseImage "/data/slc3.tar.gz";
    volumeSize "1G";
    swapSize "512M";
    volumeBaseName "xen-domain";
    usingExistingVolumes false;
    keepVolumes "false";
    saveImage true;
    saveImagePath "/tmp";
    saveImageExtension "tgz";}

```

```

Vml extends XenDomain {
  shell LAZY ATTRIB myShell;
  storageBackend LAZY ATTRIB lvm;
  domainName "vm1";
  hostname "vm1.cern.ch";
  ip "111.222.333.444";
  netmask "255.255.0.0";
  kernel "/boot/vmlinuz-xen";
  ramdisk "/boot/initrd-xen";
  memory 512;
  extra "fastboot"
  domainLivenessDelay 2000;
  domainLivenessFactor 3;
  domainLivenessCheck true;
}}

```

```
Commandline: sfStart host1.cern.ch myVM textfile.sf
```

- **Manages the lifecycle of one VM session: put image in place, start VM, stop VM, delete/leave/save image.**
- **Error handling: if start of Xen domU fails, the image is also being deleted.**
- **Leverages several SmartFrog features:**
 - Include directives and overriding of attributes allows for easy to read configuration files. Default values can be grouped in common include files.
 - Start/stop several VMs on different physical machines with one click. Other workflows also possible.
 - Management console allows to view and change the status of the deployed VMs.
 - SmartFrog security features.

- **10 SLC4 machines with Xen 3.0.1, LVM and SmartFrog.**
- **28 hostnames/IP numbers for use with virtual machines. For gLite services we need known hostnames.**
- **vGrid portal to**
 - Generate SmartFrog configuration files.
 - See which hostnames are currently in use.
 - View log files on Xen servers.
 - On demand image generation (under development).
 - Start VMs (under development).

SmartFrog
management
console

File Help Mng. Console

Refresh node Refresh all tabs

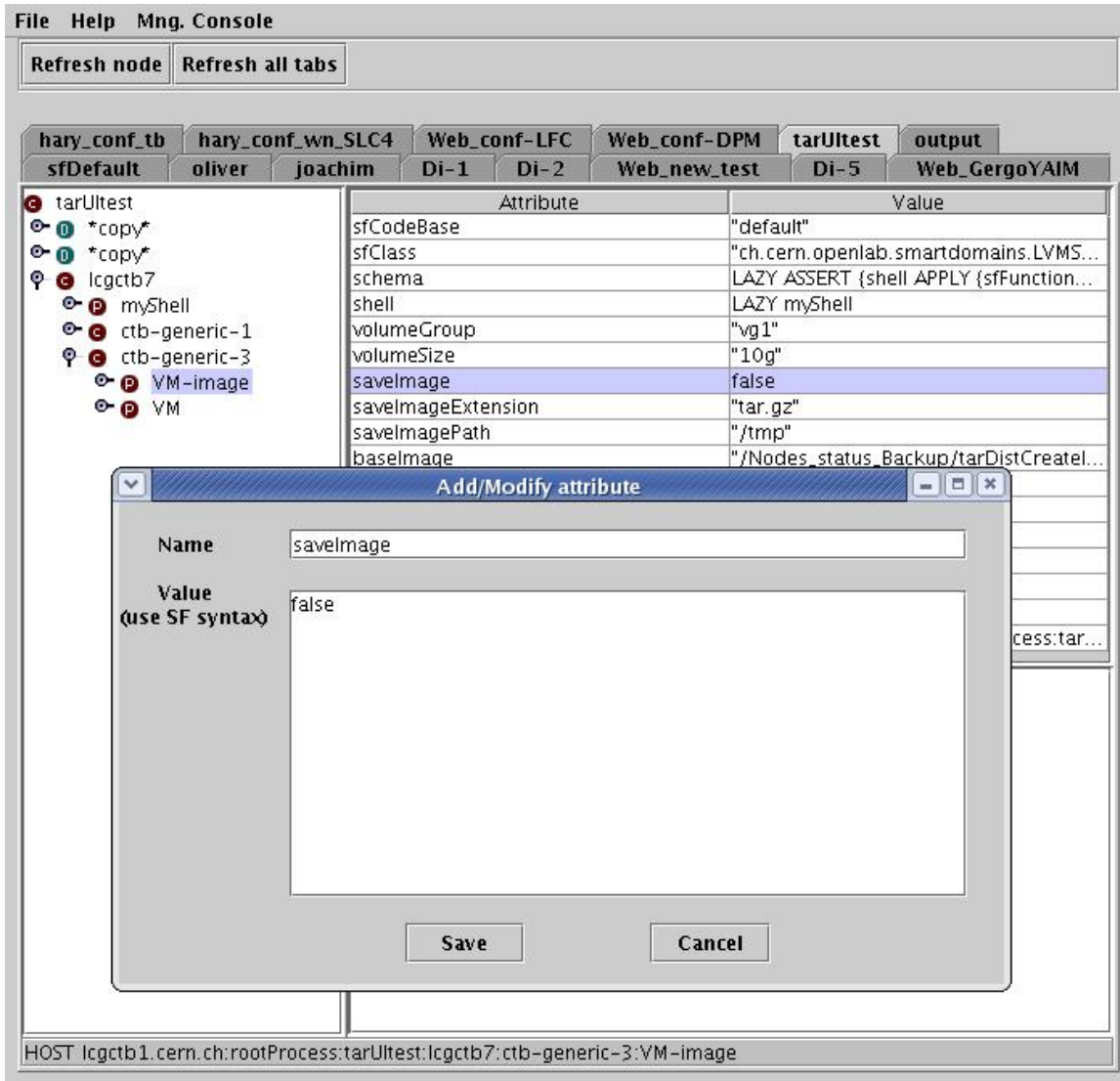
hary_conf_tb hary_conf_wn_SLC4 Web_conf-LFC Web_conf-DPM tarUlltest output
 sfDefault oliver joachim Di-1 Di-2 Web_new_test Di-5 Web_GergoYAIM

tarUlltest

- *copy*
- *copy*
- lcgctb7
 - myShell
 - ctb-generic-1
 - ctb-generic-3
 - VM-image
 - VM

Attribute	Value
sfCodeBase	"default"
sfClass	"ch.cern.openlab.smartdomains.XenDo..."
schema	LAZY ASSERT {shell APPLY {sfFunctionCla...
storageBackend	LAZY VM-image
shell	LAZY myShell
kernel	"/boot/vmlinuz-2.6-xen"
ramdisk	"/boot/client-initrd-2.6.12.6-xen3_12...."
memory	512
netmask	"255.255.0.0"
gateway	"128.142.1.1"
ip	"128.142.200.142"
hostname	"ctb-generic-3.cern.ch"
domainName	"ctb-generic-3"
sfLivenessDelay	240L
sfLivenessFactor	2
sfHost	lcgctb7/128.142.200.204
sfProcess	"rootProcess"
undefined	"starting"

HOST lcgctb1.cern.ch:rootProcess:tarUlltest:lcgctb7:ctb-generic-3:VM



The screenshot shows a web interface for managing SmartDomains. At the top, there are menu items: File, Help, Mng. Console. Below that are buttons for 'Refresh node' and 'Refresh all tabs'. A navigation bar contains several tabs: hary_conf_tb, hary_conf_wn_SLC4, Web_conf-LFC, Web_conf-DPM, tarUltest, output, sfDefault, oliver, joachim, Di-1, Di-2, Web_new_test, Di-5, and Web_GergoYAIM. The main content area shows a tree view on the left with 'tarUltest' selected, and a table of attributes on the right. The 'saveImage' attribute is highlighted in blue. A dialog box titled 'Add/Modify attribute' is open in the foreground, showing the 'Name' field with 'saveImage' and the 'Value' field with 'false'. At the bottom of the dialog are 'Save' and 'Cancel' buttons. The status bar at the bottom of the window reads: 'HOST: lcgctb1.cern.ch:rootProcess:tarUltest:lcgctb7:ctb-generic-3:VM-image'.

Attribute	Value
sfCodeBase	"default"
sfClass	"ch.cern.openlab.smartdomains.LVMS..."
schema	LAZY ASSERT {shell APPLY {sfFunction...
shell	LAZY myShell
volumeGroup	"vg1"
volumeSize	"10g"
saveImage	false
saveImageExtension	"tar.gz"
saveImagePath	"/tmp"
baseImage	"/Nodes_status_Backup/tarDistCreatel..."

Modification of an attribute while the VM is running.

File Help Mng. Console

Refresh node Refresh all tabs

Web_conf-LFC Web_conf-DPM tarUtest output

Web_GergoYAIM hary_conf_tb hary_conf_wn_SLC4

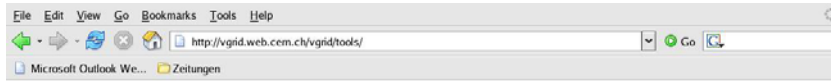
sfDefault oliver joachim Di-1 Di-2 Web_new_test Di-5

Attribute	Value
sfCodeBase	"default"
sfClass	"org.smartfrog.sfcore.compound.C..."
sfCanTerminate	true
	"/Nodes_status_Backup/tarDistCre..."
	false
	"/tmp"
	512
	240L
	2
	lcgctb7/128.142.200.204
	"rootProcess"
	"HOST lcgctb1.cern.ch:rootProcess..."

HOST lcgctb1.cern.ch:rootProcess:tarUtest:lcgctb7:ctb-generic-3

Termination of a VM.

- Terminate Component - NORMAL
- Terminate Component - ABNORMAL
- Detach and Terminate Comp
- Detach Component
- Diagnostics Report
- sfParentageChanged
- Add Scripting Panel
- Instrospector



Project Contributors:
 Andreas Unterkircher, Dimitar Shiyachki, Havard Bjerke,
 Olivier Pernet, Omer Khalid, Xavier Grehant

SF Component Description Generator for SmartDomains

- [Home](#)
- Tools**
- [Auto-SF](#)
- [On-Demand Image](#)
- Monitor**
- [SF Logs](#)
- [VM Ping](#)

Please select number of hosts:

Please select Virtual machine per host (maximum):

Please select a template:



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Specific Variables

	SF							
+ ▾	Process	lccctb1.cern.ch						
	Host 1							
		Host Name	IP Address	Volume Base	Keep Volumes	Existing Volumes	Save Image	Save Format
+ ▾	Virtual Machine 1	ctb-ce-1.cern.ch	128.142.68.67	vol1	True ▾	False ▾	False ▾	Tar ▾
		Base Image	Save Image Path					
		/Nodes_status_Backup/ce-1-v302-patches.tgz	/Nodes_status_Backup					
+ ▾	Virtual Machine 2	ctb-ui-1.cern.ch	128.142.68.65	vol2	True ▾	False ▾	False ▾	Tar ▾
		Base Image	Save Image Path					
		/Nodes_status_Backup/ui-1-v302-patches.tgz	/Nodes_status_Backup					
	Virtual							

Done



SF Remote Log Reader

List of hosts available in the cluster

kgcb1.cern.ch
kgcb2.cern.ch
kgcb3.cern.ch
kgcb4.cern.ch
kgcb5.cern.ch
kgcb6.cern.ch
kgcb7.cern.ch
kgcb8.cern.ch



vGrid Portal

ctb-bdii-1.cern.ch	In Use
ctb-ce-1.cern.ch	In Use
ctb-ce-2.cern.ch	In Use
ctb-conf-bdii.cern.ch	In Use
ctb-conf-ce.cern.ch	In Use
ctb-conf-fs.cern.ch	In Use
ctb-conf-lfc.cern.ch	In Use
ctb-conf-mon.cern.ch	Available to use
ctb-conf-sc.cern.ch	In Use
ctb-conf-si.cern.ch	In Use
ctb-conf-wms.cern.ch	In Use
ctb-conf-wn-1.cern.ch	In Use
ctb-fs-1.cern.ch	Available to use
ctb-generic-1.cern.ch	In Use
ctb-generic-2.cern.ch	In Use
ctb-generic-3.cern.ch	In Use
ctb-generic-4.cern.ch	In Use
ctb-generic-5.cern.ch	Available to use
ctb-generic-6.cern.ch	In Use



and software packages if needed. Click "Create image...", and the image will be created and put in the [repository](#). If you check the "Download image upon creation" checkbox, the image will be downloaded when the image creation is finished.

If you do not enter a "Name", the image will be named after the md5 checksum of the image configuration parameters. If an image with the exact same parameters exists in the repository, it will not be recreated and can be downloaded immediately.

If you want to use wget, then here is an example url:
"http://www.cern.ch/osfarm/create?name=&download=on&distro=SLC4&arch=i386&filetype=.tar&group=core&group=base&package="

Name

Download image upon creation.

Distro

Architecture

Filetype

Software packages

SLC Yum groups
 gLite meta packages
 gLite packages

http://cern.ch/osfarm/

ch.9085/

- The system is in heavy use since October 2006.
- We have basic SLC3/4 images on every Xen server. Users install gLite services on top of them.
- About 10 users.
- SmartFrog is easy to install and runs on all platforms.
- We have no scheduler. Users have to decide which hostname they use on which Xen server.
- **Some use cases**
 - Creation and testing of tarball UI and WN.
 - Yaim development.
 - A full testbed for WMS patch certification.
 - Testing apt-get dist upgrade.

- **Upgrade to Xen 3.0.2 using rpms provided by CERN Linux Team. Enables us to have AFS enabled VMs.**
- **SmartDomains and vGrid are under constant development.**
- **Image storage.**
- **On demand image generation.**
- **Scheduler for VM creation.**

SmartFrog: <http://www.smartfrog.org/>

SmartDomains: <http://sourceforge.net/projects/smartdomains/>

vGrid: <http://vgrid.web.cern.ch>

Image creation scripts: <http://isscvcs.cern.ch/cgi-bin/cvsweb.cgi/vgrid/ch/cern/osfarm/scripts/?cvsroot=vgrid>

CERN Linux Support Xen HowTo:

<https://twiki.cern.ch/twiki/bin/view/LinuxSupport/XenHowTo>

CERN openlab: <http://cern.ch/openlab>

People involved:

Andreas Unterkircher, Omer Khalid, Dimitar Shiyachki, Havard Bjerke, Xavier Grehant, Olivier Pernet, Jarek Polok

