

Cloud meets GRID

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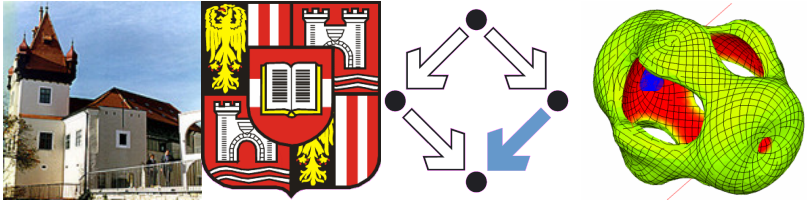


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- Live Demo

IBM CloudBurst Hagenberg Hardware

- approximately 6 TB of SAN Storage
- IBM BladeCenter with 4 Blades
- 72 GB RAM, 12 Cores per Blade
- adds up to 288 GB RAM, 48 Cores

Plug and Play



Throughput on the wire

Or on the light path these days

- Internal Network Switch (Blade to Blade) operates on 10 Gigabit per second
- External connection (currently) 1 Gigabit per second to the University of Linz (JKU)
- 220 public IP Addresses for Virtual Machines

IBM Tivoli Cloud Stack

- Works very well with Windows Clients
- Supports Enterprise Linux Distributions (SUSE, Redhat Enterprise)
- Extremely customizable, although very hard to customize deployment scripts for other Linux distributions

Openstack

Open Source Cloud Computing Stack

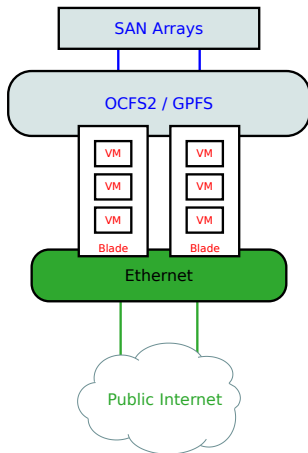
- <http://www.openstack.org>
- Fits our needs
- Open source software stack that can be operated on open source virtualization technology
- Works well enough for Linux guests in combination with Linux-KVM

Virtualization Architecture

- Linux-KVM
- Libvirt
- OCFS2 as cluster-file system, IBM GPFS planned
- No NFS as shared storage, opposed to the Openstack recommendation

Architecture Illustrated

Redundant Fibrechannel and Ethernet Switches neglected for simplicity



Working Features

- CoW-Deployments of Virtual Machines
- Live-Migration
- Snapshotting VMs (and using those snapshots as new templates)
- Firewalling of Virtual Machines
- Multi-Tenancy
- Quotas on Tenants
- Automatic resizing of Virtual Machines

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GridFTP in a sentence

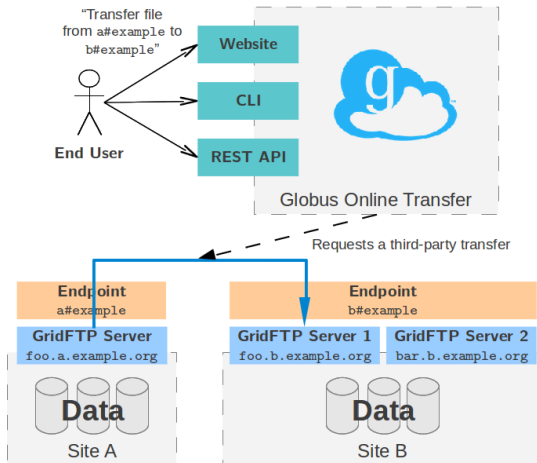
GridFTP is a high-performance, secure, reliable data transfer protocol optimized for high-bandwidth wide-area networks.

Globus Online

The Software-as-a-Service GridFTP Broker

- Takes care of all your transfers
- Re-starts a transfer in case something goes wrong
- Sends out an e-mail once the transfers have completed
- Also supports transfers from your workstation to the GRID
- Anyone can use globus online

Globus Online illustrated



Globus Online live demo

The screenshot displays the Globus Online web interface. At the top, the header includes the Globus logo, the text "globus online", and navigation links for "Manage Data", "Support", and "wogri". Below the header, there are links for "start transfer", "view transfer activity", "manage endpoints", and "dashboard". The main section is titled "Transfer Files" and includes a link to "Get Globus Connect" with the subtext "Turn your computer into an endpoint."

The interface shows two endpoints for a transfer:

- Endpoint 1:** "wogni#gridftp_cloud_risc-software_at". The path is "/~/". The file list includes:
 - bigfile.data (89.48MB)
 - research_data.bin (1.44GB)
 - smallerfile.chunk (8MB)
- Endpoint 2:** "go#ep1". The path is "/~/". The file list includes:
 - bigfile.data (2.23MB)
 - smallerfile.chunk (8MB)

At the bottom, there is a "Label This Transfer" field with a placeholder text "This will be displayed in your transfer activity."

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Cloud meets Grid

What happens if a Grid hooks up with a Cloud

- Combining those two technologies is not too hard
- A GridFTP server can run as a virtual machine inside a cloud stack
- The GridFTP server can export its storage resources to other authorized virtual machines

GridFTP-Virtual Machine

- Basic installation of Globus GridFTP and myProxy for GlobusOnline-Access
- All the users are authenticated and authorized through the LDAP Service
- GridFTP Directory is shared via NFS to authorized users for authorized machines

GridFTP-Client-Images

Boot, authorize and go

- Special VM Image is prepared as NFS and LDAP-Client
- Researcher builds his environment of choice in a VM
- Deployment of such a virtual machine is done within a minute
- No extra setup for GridFTP or Globus Online necessary

Live Demo of Grid Client VM

Project

PROJECT
RISC SW

Manage Compute

Overview

Instances & Volumes

Images & Snapshots

Access & Security

Object Store

Containers

Images & Snapshots

Images

Create Images

<input type="checkbox"/>	Image Name	Type	Status	Public	Container Format	Actions
<input type="checkbox"/>	Windows 7 Professional N Service Pack 1	Image	Active	Yes	OVF	<button>Launch</button>
<input type="checkbox"/>	Debian 6.0 Squeeze	Image	Active	Yes	AMI	<button>Launch</button>
<input type="checkbox"/>	ubuntu 12.04 LTS	Image	Active	Yes	AMI	<button>Launch</button>
<input type="checkbox"/>	Windows Server 2008 R2 Service Pack 1	Image	Active	Yes	OVF	<button>Launch</button>
<input type="checkbox"/>	Cirros Testsystem	Image	Active	Yes	OVF	<button>Launch</button>

Displaying 5 items

Instance Snapshots

Create Snapshot

<input type="checkbox"/>	Image Name	Type	Status	Public	Container Format	Actions
<input type="checkbox"/>	GridFTP-NFS-Client	Snapshot	Active	No	AMI	<button>Launch</button>

Displaying 1 item

Volume Snapshots

<input type="checkbox"/>	Name	Description	Size	Status	Volume ID	Actions
No items to display.						

Displaying 0 items

Fallback slides

[Overview](#)[Log](#)[VNC](#)

Instance VNC Console

If VNC console is not responding to keyboard input: click the grey status bar below.

Connected (unencrypted) to: QEMU (instance-0000006d)

Send CtrlAltDel

```
root@gridftpclienttest:/home# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/vda        2.0G  890M  1.1G  47% /
tmpfs           246M    0  246M   0% /lib/init/rw
udev            10M   116K   9.9M   2% /dev
tmpfs           246M    0  246M   0% /dev/shm
10.131.0.22:/home/ 197G  1.9G  185G   1% /home
root@gridftpclienttest:/home# ls -l
total 44
drwxr-x--- 2 1001 root    4096 Aug  8 06:29 bahmand
drwxr-xr-x 6 1003 www-data 4096 Aug 26 08:53 ileitner
drwxr-xr-x 2 60001 root    4096 Aug 27 07:28 koarl
drwxr-x--- 2 root root    16384 Aug  7 08:45 lost+found
drwxr-x--- 2 root root    4096 Aug  8 06:29 mkrieger
drwxr-x--- 2 1000 root    4096 Aug  8 06:31 pheinzlr
drwxr-x--- 2 1004 users    4096 Aug 23 03:56 vmittlerl
drwxr-x--- 3 1002 root    4096 Aug 16 08:47 wennnerb
root@gridftpclienttest:/home# _
```

Questions?

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