Remote Visualization, Analysis …

… and other things

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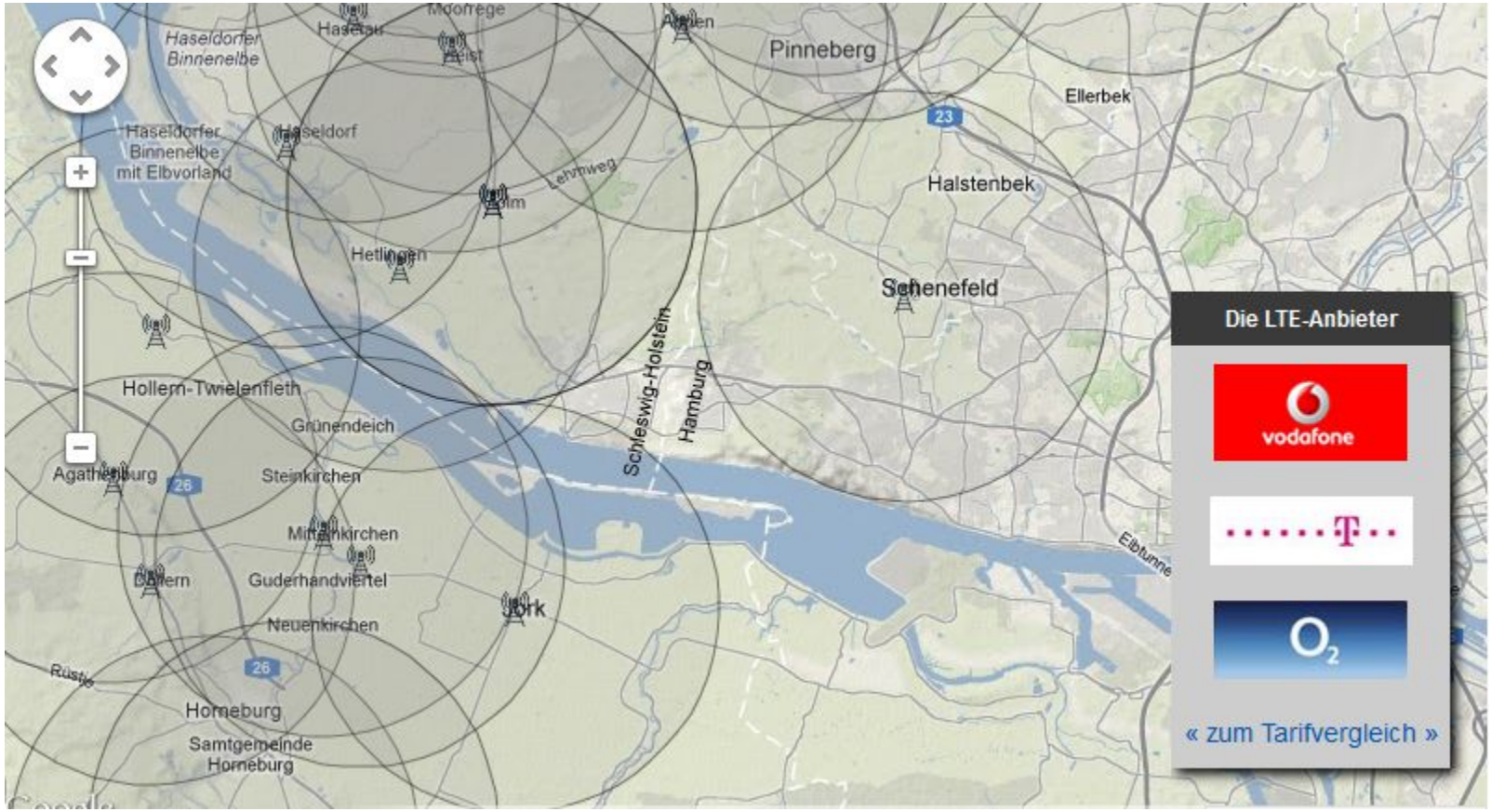
DESY-IT

DESY

The Problems

- Remote analysis (access to data, compute or controls)
  - Simple & secure access to resources
  - Experiment / User specific environment
  - Direct links to standard applications and data
- Data catalogue access
  - Select & download individual slices from HDF5 file
  - View individual slices from HDF5 file – thought to be the easy part
- Pretty much everything requires visual inspection & interactivity
- Not a serious piece of work!
  - Gambling with available infrastructures

The Problems



The Options

- Web services
  - WebGL (js, vrml) visualization of HDF5
  - HTML5 (js) implementation of workflows
  - Largely OS and browser independent – works on tablets as well
  - No special clients required
  - Web-service manages access rights, runs the job; client renders

- Virtual hosts
  - Remote access to login-host or compute node
  - In most cases requires OS specific client installation
  - vm runs jobs and renders
  - transparent access rights
  - User/experiment specific prolog to customize environment

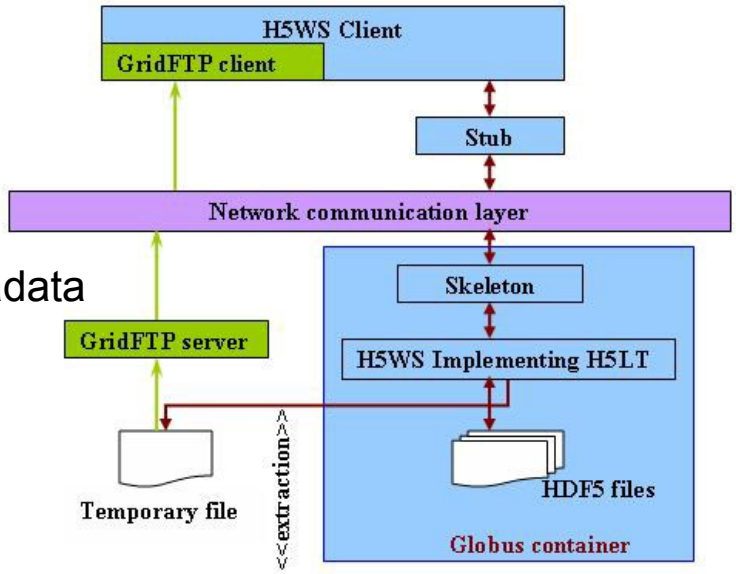
HDF5 Webservice

> H5WS API*

- Query dataset for its metadata (rank, dimensions and type)
- Bring a dataset
- Bring a hyberslab (a cube with specified stride)
- Bring a whole file

> H5WS realization

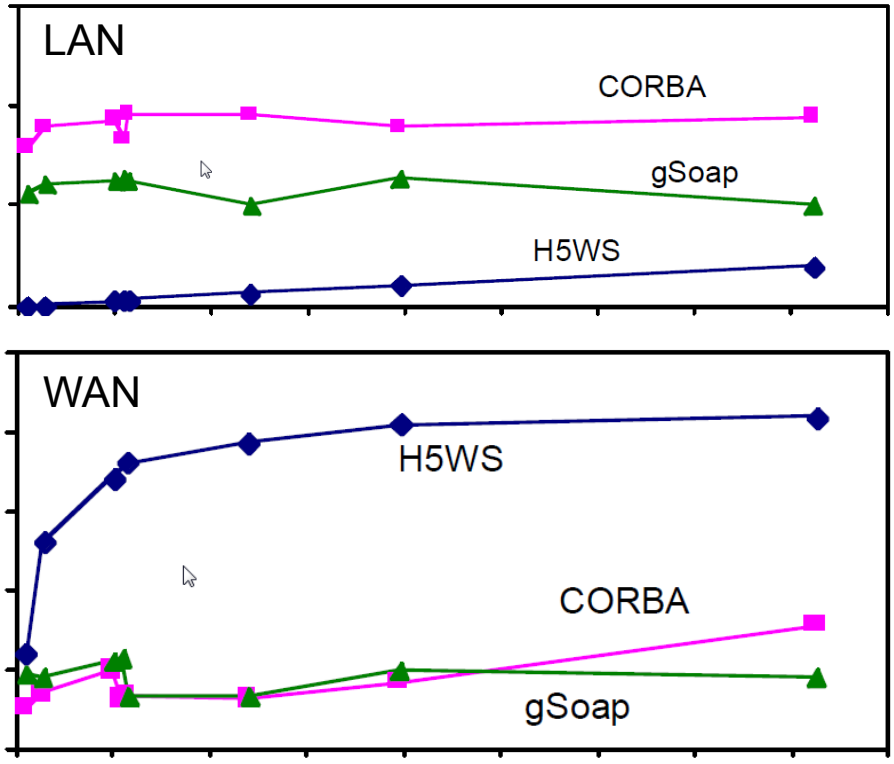
- WSDL native types and SOAP calls for metadata
- Globus toolkit (GridFTP) to fetch data
- Can fetch distributed data sources
- H5LT API to manipulate HDF5
- Should work with ICAT (iRODS,…)



* Stolen from: S. Shasharina, Grid and Component Technologies in Physics Applications, ICALEPS 2007

HDF5 Webservice

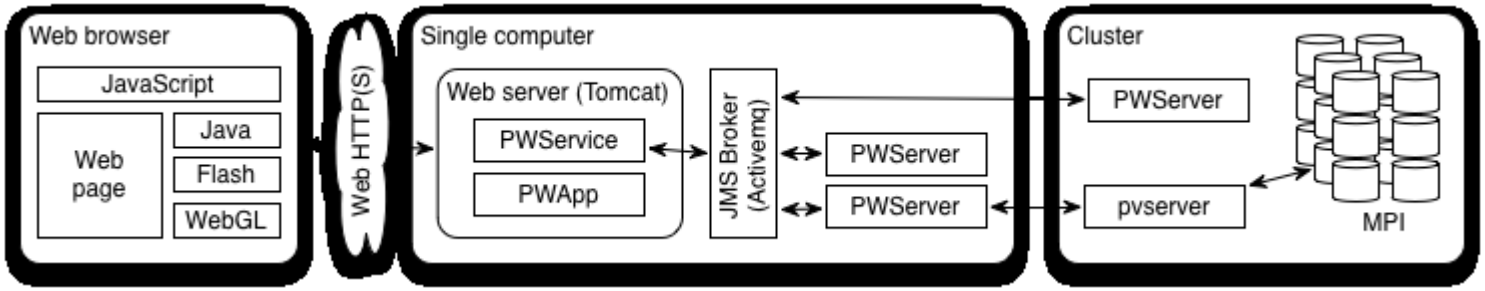
- Fast for WAN, not good enough for LAN
- Complicated setup
- Still need a renderer
- Hardly used; development and support?



Remote Visualization with Paraview

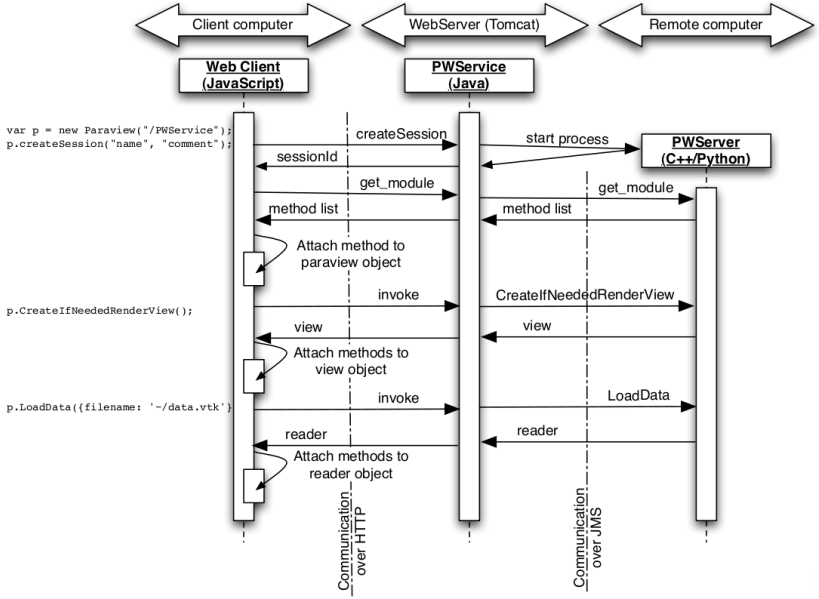
> Paraview Web

- The visualization server (PWServer; a ParaView-based engine) does the actual visualization.
- Calculation can be delegated to a remote ParaView processing server (PVServer) or mpi-cluster.
- The web service component (PWService) manages communication between PWServer and clients.
- Client side: a JavaScript library for creating remote visualizations. Supports WebGL and VRML exports.
- “Easy” integration into Rich Internet Applications (RIAs) with qooxdoo, Dojo, Google Web Toolkit, jQuery, Flex, Java etc.



Remote Visualization with Paraview

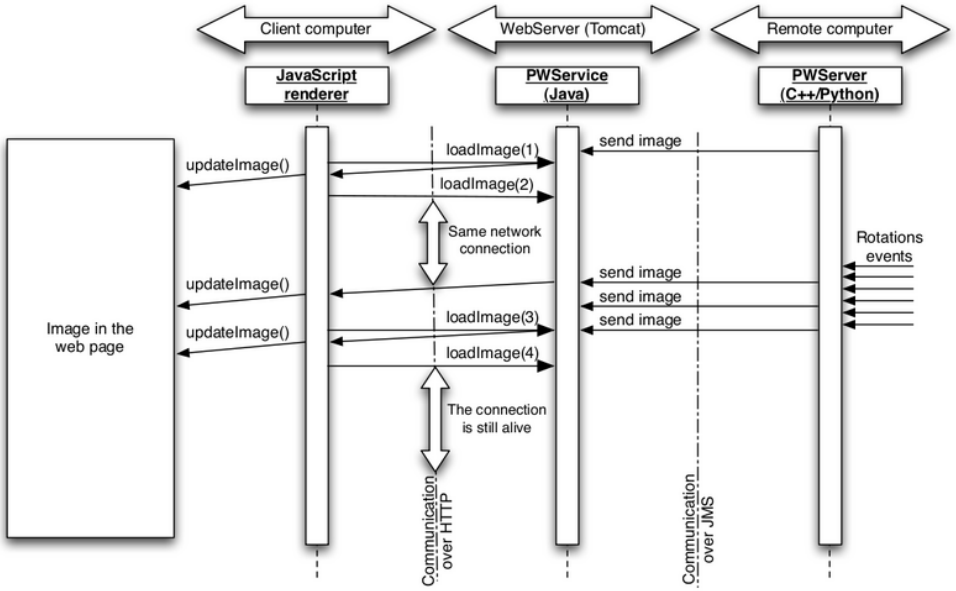
Data processing layer



Wiki: http://www.paraview.org/Wiki/ParaViewWeb_Design

Demo: http://paraviewweb.kitware.com/PW/

Image rendering layer



Remote Visualization with Paraview

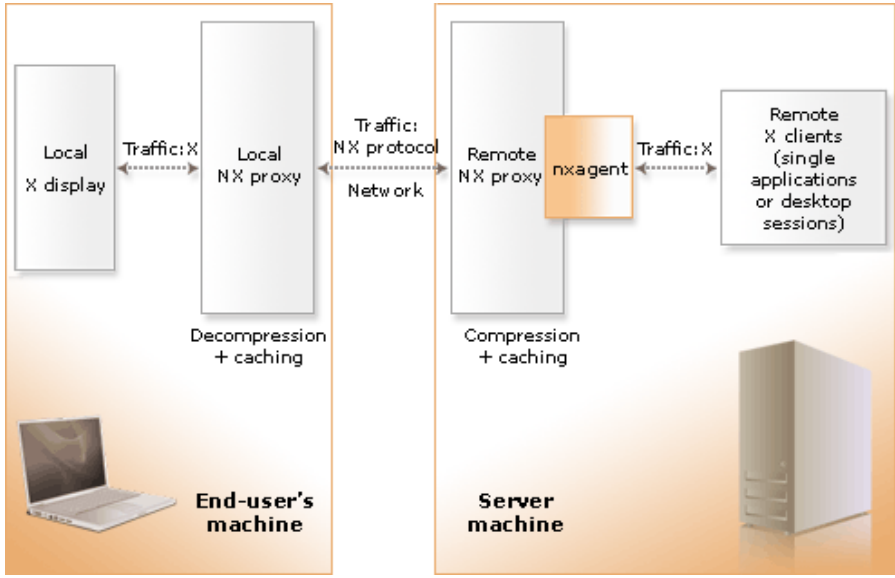
- Setup quite simple.
- Need powerful server hardware (nothing on the client side)
- On a “standard desktop” as PV(W)Server frame rates are low
- But works even on a smartphone reasonably well.
- HDF5 API essentially not existing.
- PW Web can be extended with python modules
- h5py might work, haven’t tried yet.

Remote Analysis on (virtual) hosts

- Available in-house
  - Open Nebula / Spice
  - Nxserver / Web companion
  - Starnet LIVEserver / LIVE client
  - Vmware / ESX
  - Xen-Server / Citrix / etc …

Remote Analysis on (virtual) hosts

- Nomachine NX
  - Public/private key; kerberos
  - nx protocol. With freenx very cost-effective, limited number of sessions.
  - Web companion → just a wrapper to start a java plugin
  - Clients available for OsX, Linux, Windows.
  - Server available for Linux (and Solaris)
  - GL speed fairly limited (on vm)

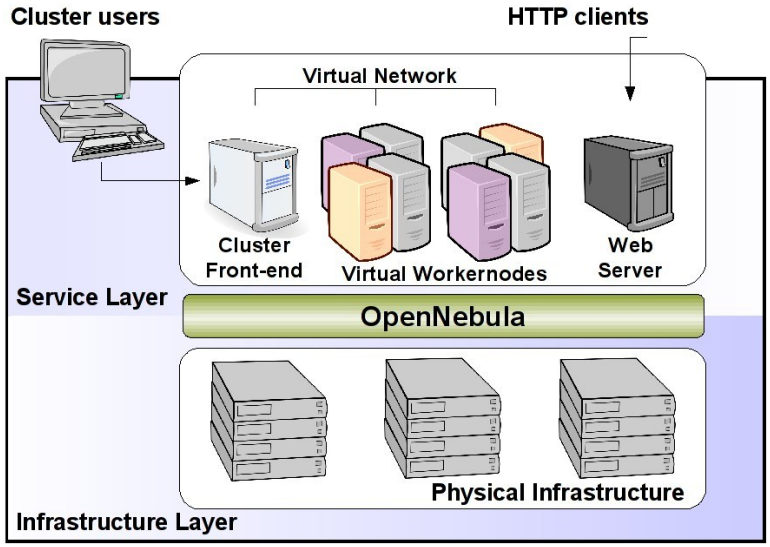


- Starnet Xwin32 LIVEserver
  - Commercial solution, but very affordable
  - Lives completely in user space
  - Portable sessions
  - Clients available for OsX, Linux, Windows.
  - Server available for Linux
  - GL speed fairly limited (on vm)

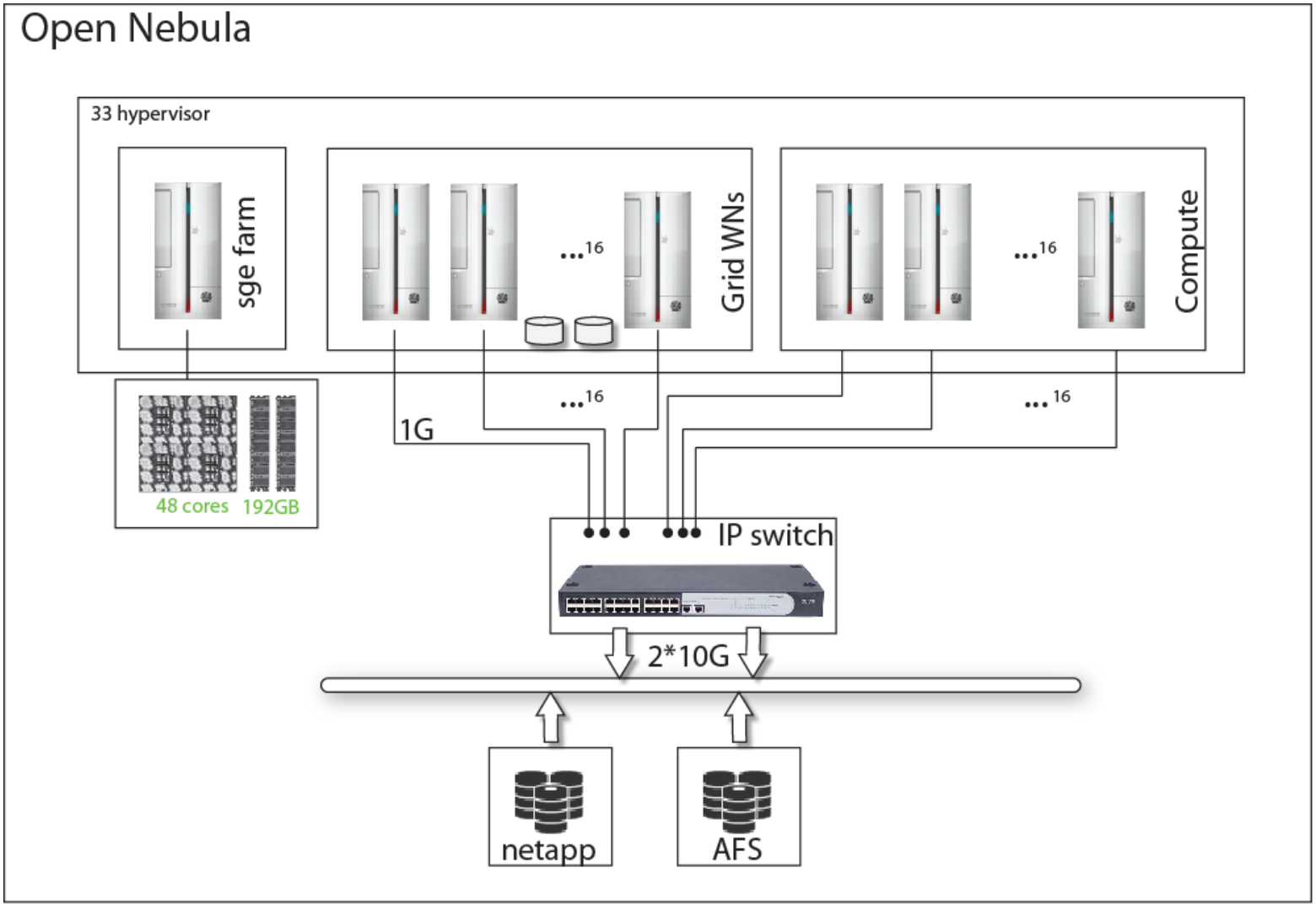
Open Nebula

- OpenNebula is a distributed virtual machine manager
- integral management of your virtual services, including networking and image management.
- shipped with EC2 plug-ins that allow to simultaneously deploy virtual machines in local infrastructure and in Amazon EC2.

- OpenNebula is modular-by-design to allow its integration with any other tool like the Haziea lease manager, or Nimbus that gives you a EC2 compatible interface.
- healthy open source software

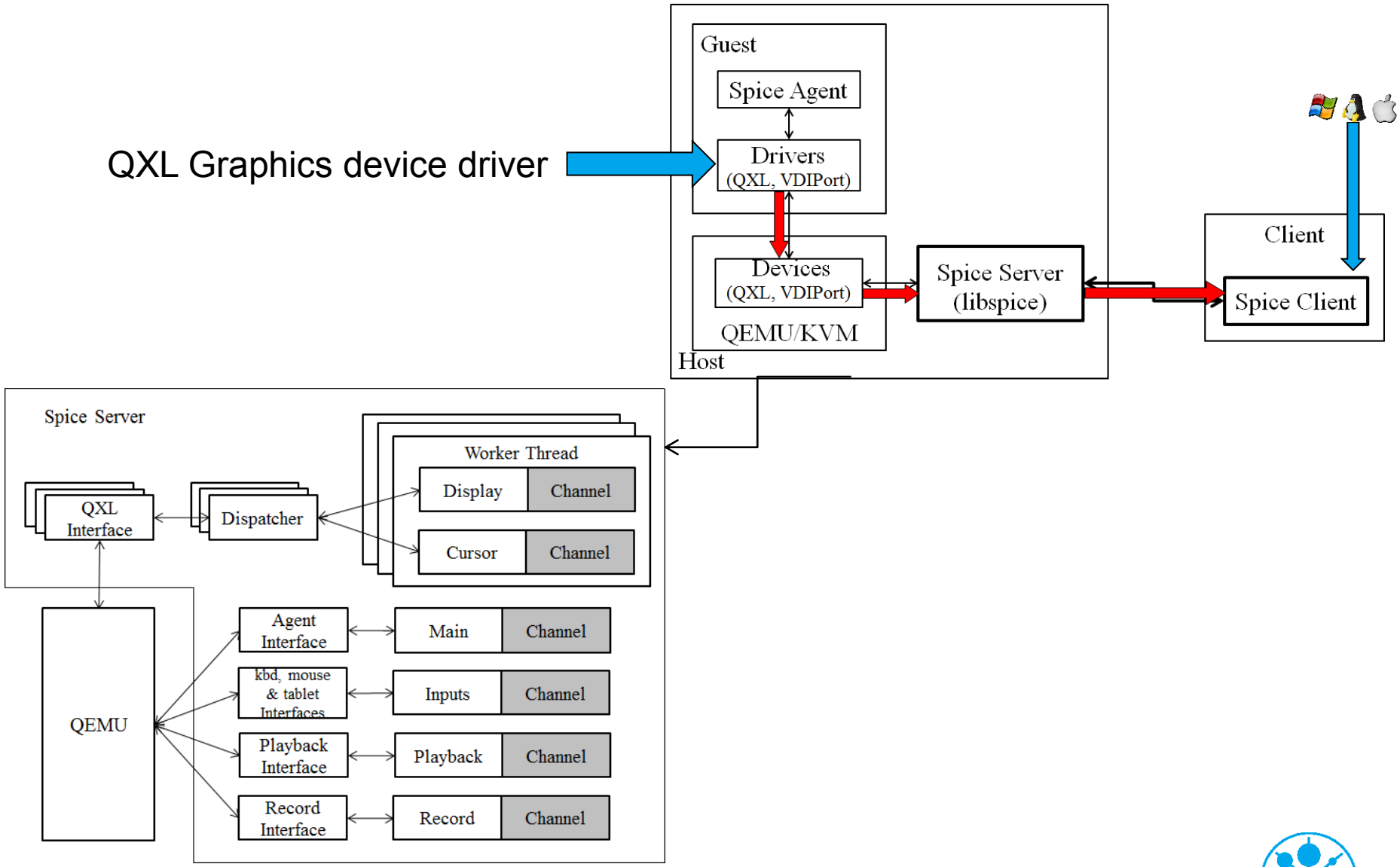


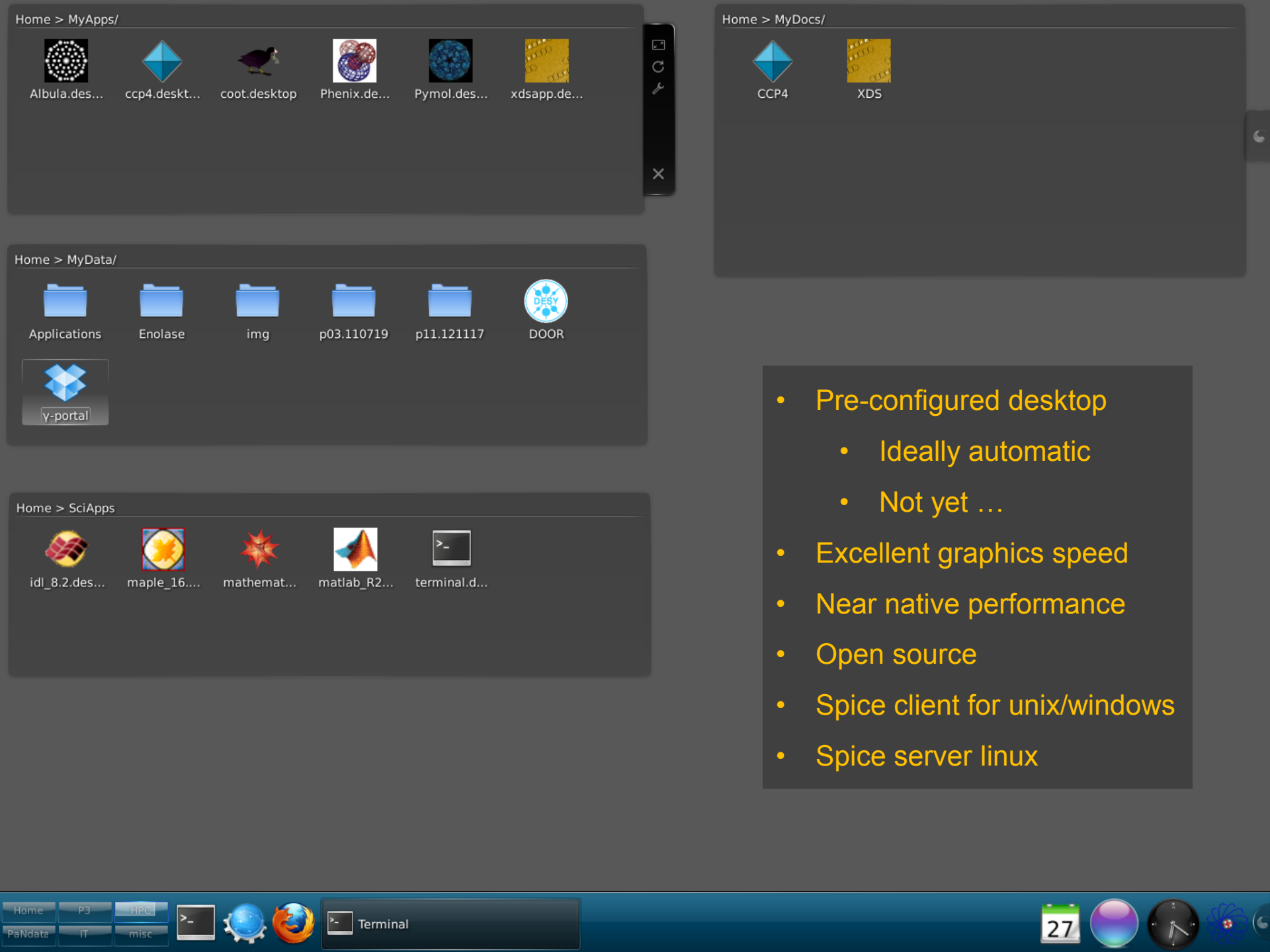
Open Nebula setup



Spice Server – Interfaces

QXL Graphics device driver

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mathemat...
matlab_R2...
terminal.d...
Pre-configured desktop
Ideally automatic
Not yet …
Excellent graphics speed
Near native performance
Open source
Spice client for unix/windows
Spice server linux
Home
P3
HPC
PaNdata
IT
misc
Terminal
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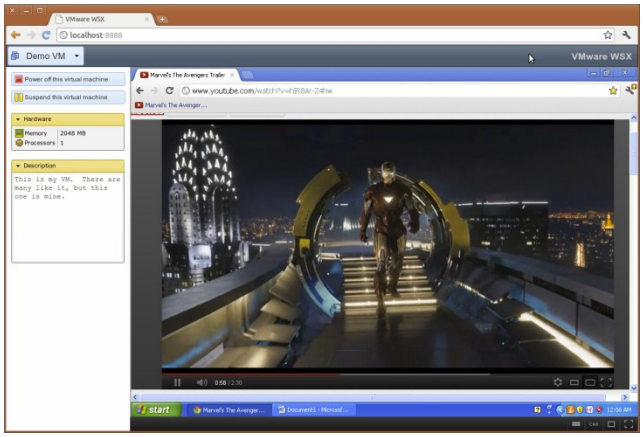
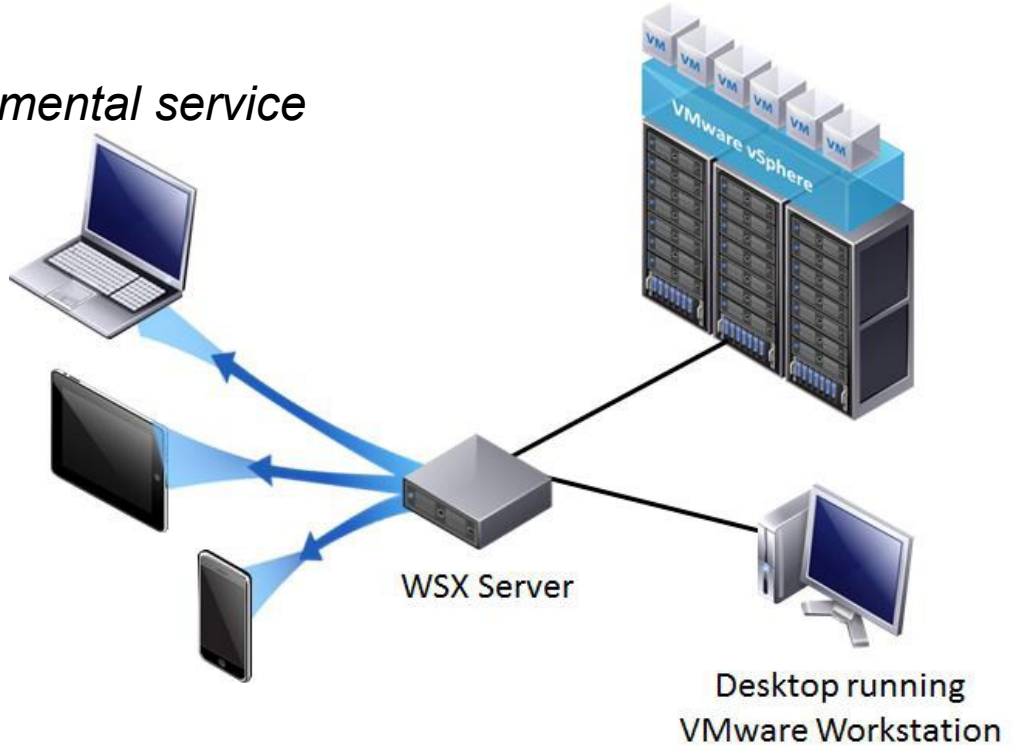
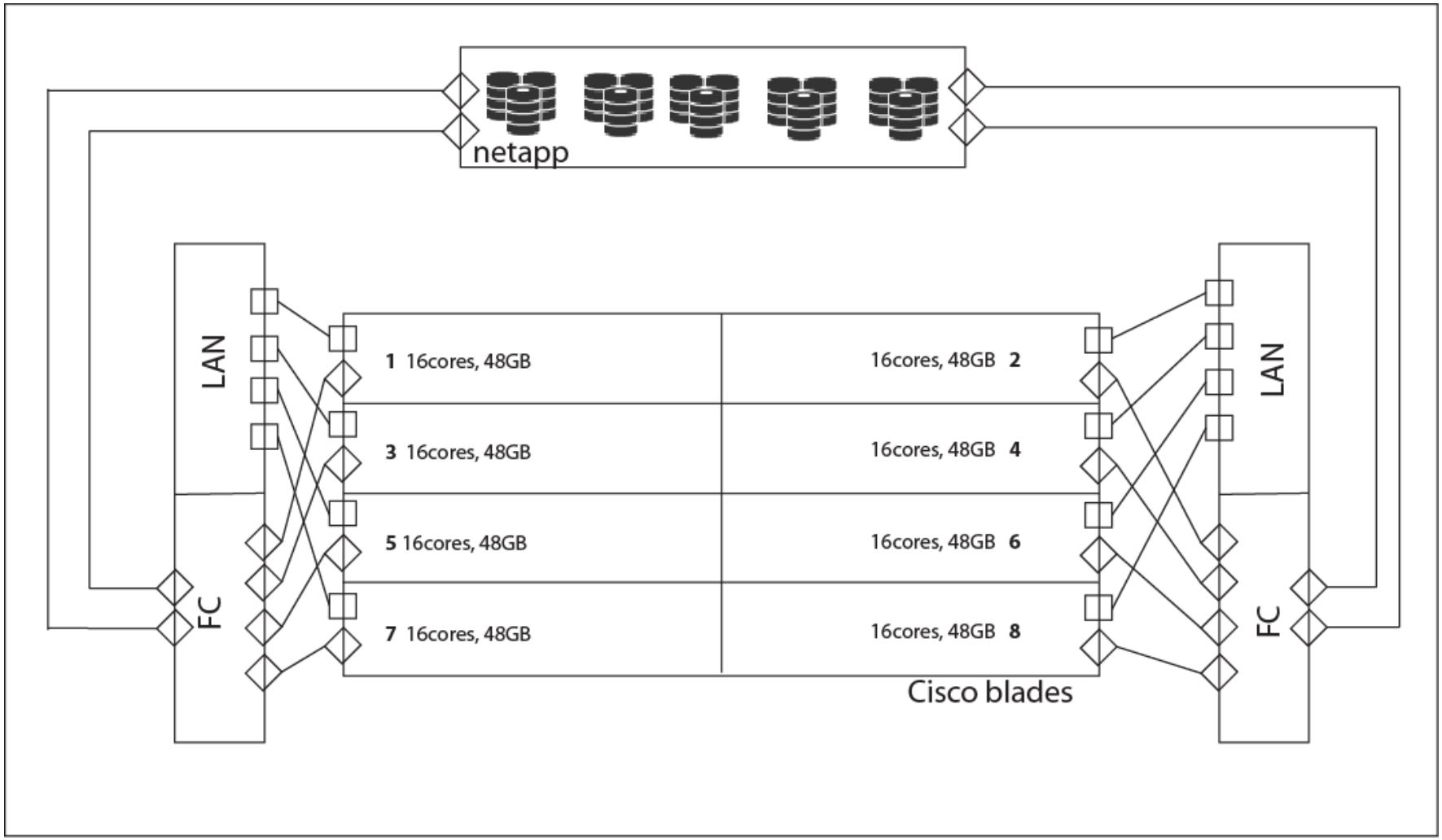
Vmware WSX

- access to vSphere and Workstation shared virtual machines via a web browser
- PC, Mac, or mobile device without installing any plug-ins or applications.
- Supposed to support HD graphics
- Serves Linux and Windows
- WSX is still named a *highly experimental service*

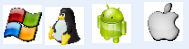
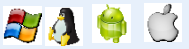




Vmware setup



Summary

	SrvOS	Clients	Graphics	Web	Costs	Effort
H5WS			?	+	+	-
Paraview			o	+	+	o
nomachine NX			+*	-	-	+
LIVEServer			+*	-	o	+
Open Nebula			++	-	+	+
VMware WSX§			?	+	-	?
Citrix			+	-	o	+

* not on virtual host without gl acceleration
$ spice might or might not compile
§ requires vmware workstation