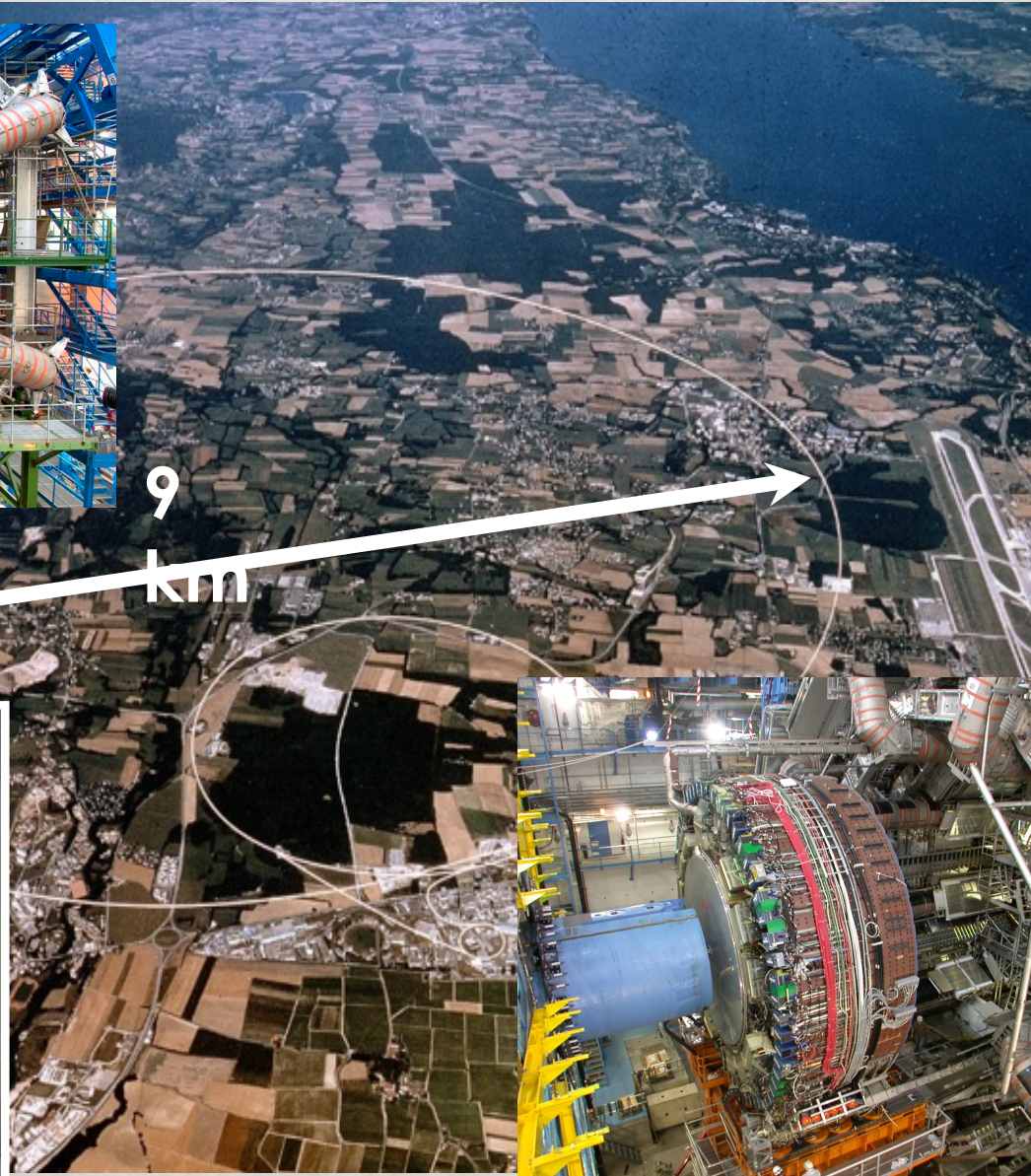
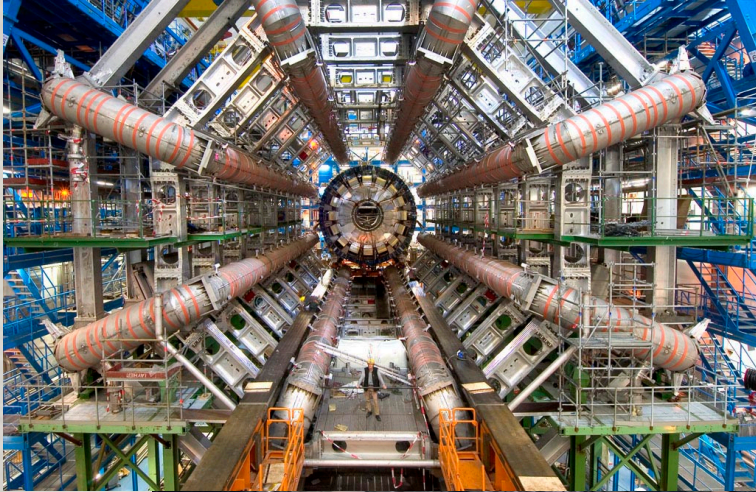


XTREMWEB-HEP

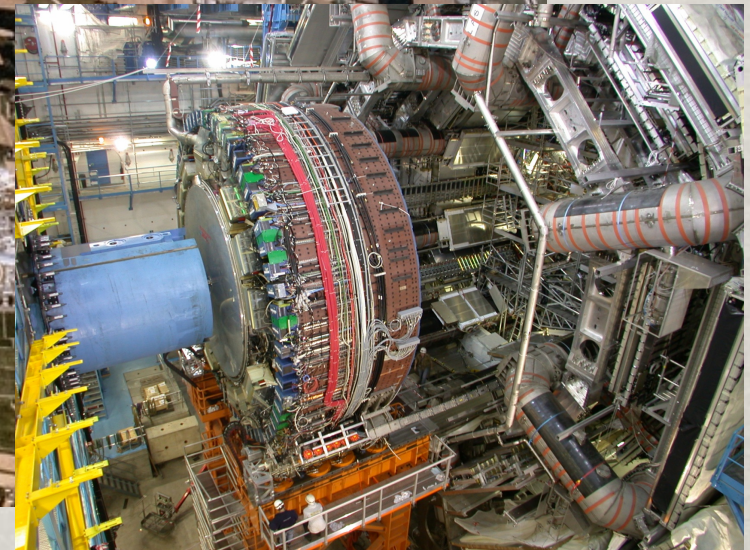
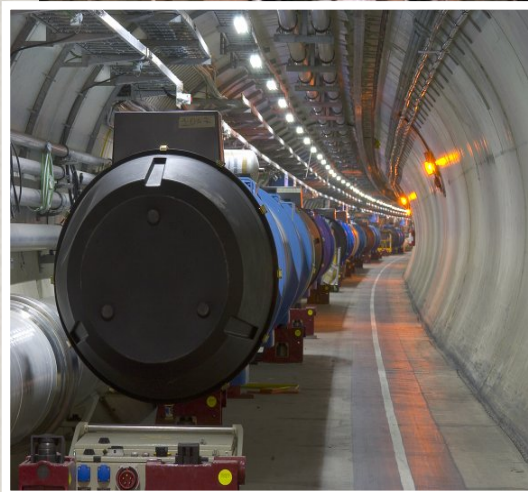
A BEST EFFORT VIRTUALIZATION MIDDLEWARE

Oleg Lodygensky
Laboratoire de l'Accélérateur Linéaire

HIGH ENERGY PHYSIC



© CERN
Geneva



XTREMWEB-HEP

- Introduction
- Security
- Virtualization
- Internode connection
- Intergrid connection
- Applications
- Platform access
- Discussion

VOLUNTEER COMPUTING

	Volunteer cluster	Volunteer computing			
	Condor	Boinc	OurGrid	XtremWeb	XWHEP
volunteer resources	✓			✓	
multi OSes	✓			✓	
type	cluster			desktop grid	
deployment	per domain			global	
firewall bypassing	✗			✓	
shared FS	✓			✗	
authentication	delegated			included	
authorization	delegated	✗	✓	✗	✓
Open ID	✗	✗	✗	✗	✓
X509	✗	✗	✓	✗	✓
Sandbox	✓	✓	✓	✓	✓
Heartbeat signal	✗	✗	✗	✓	✓
data	✓	✓	✗	✗	✓
multi users	✓	✗	✓	✓	✓
multi applications	✓	✗	✓	✓	✓
volunteer experience	✓	✓	✗	✗	✗
large deployment	✗	✓	✗	✗	✗

XWHEP: A SECURED BEST EFFORT VIRTUAL CLUSTER

Main features

- multi applications
- multi users
- certified server
- TSL communications
- authentication
 - ✓ X509 cert
 - ✓ OpenId
- authorisations
- access rights
- confinement
- virtualization
- p2p communications

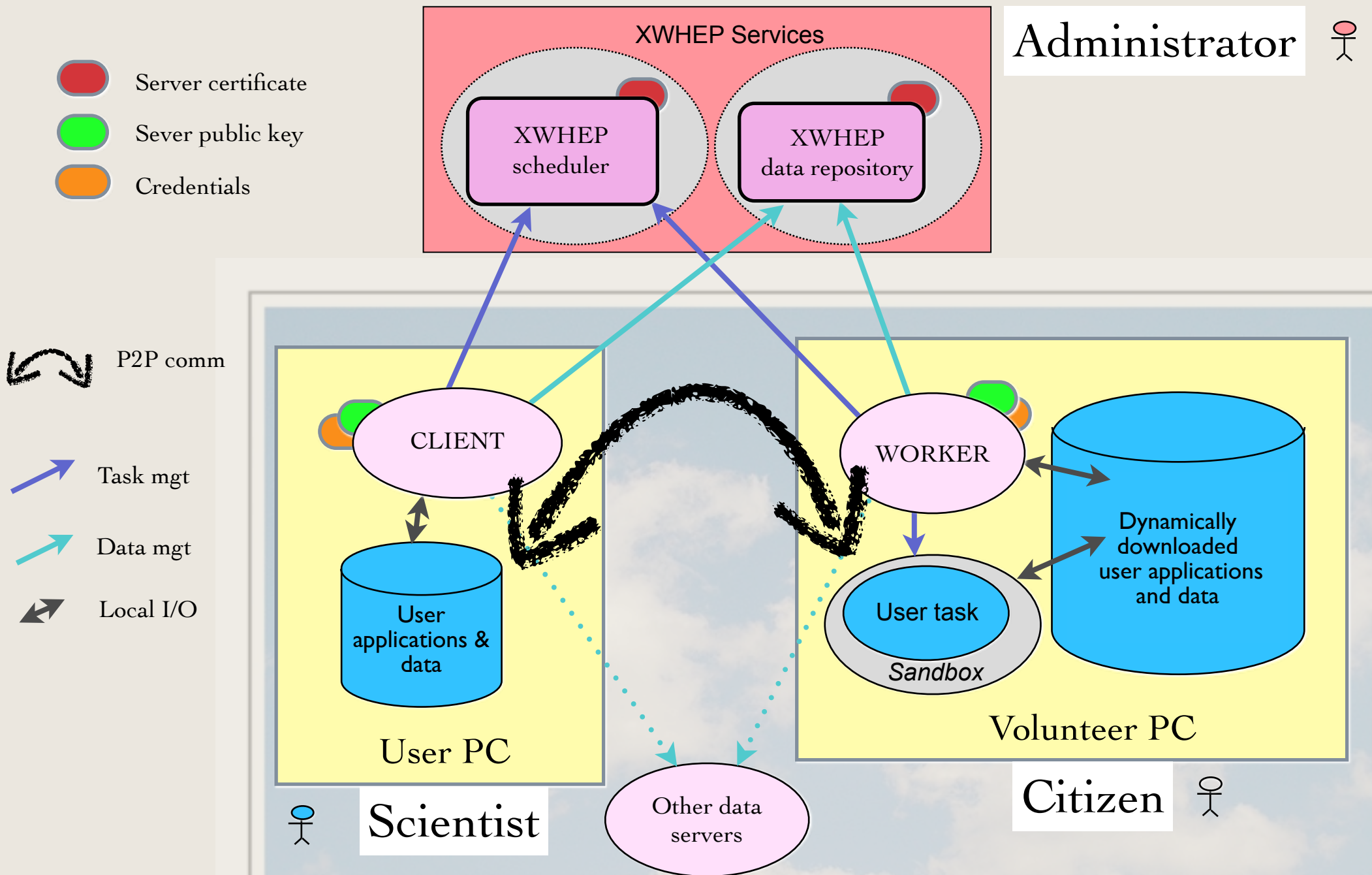
Informations

- since 2006
- 600K€ E.U. funded
- 300K€ ANR funded

Goals

- secured ressource broker
- grid interconnection
- virtualization
- p2p communications
 - C/S
 - M/W
 - MapReduce

XTREMWEB-HEP : A 3 TIERS ARCHITECTURE

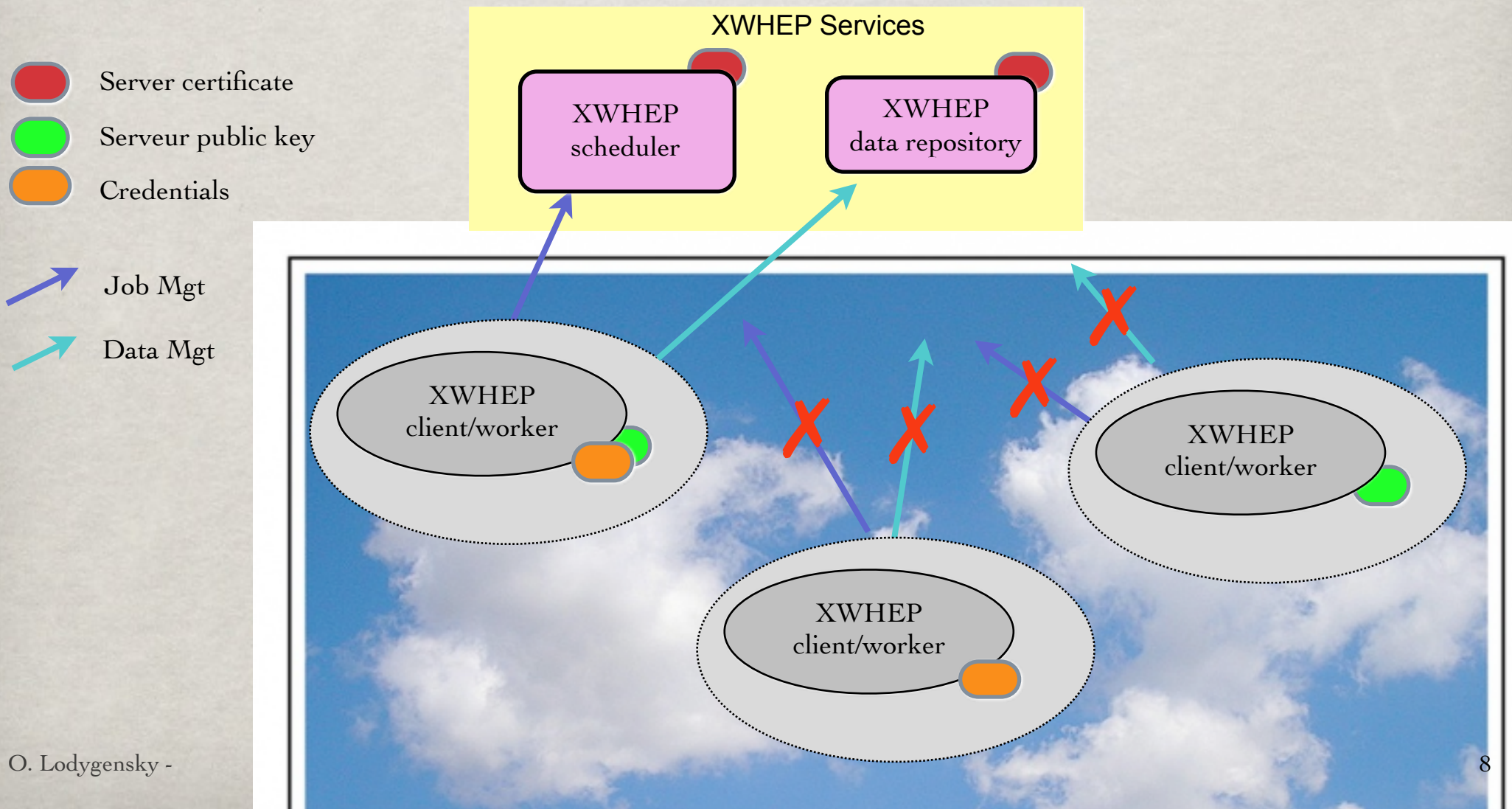


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 - ✓ authentication
 - ✓ authorization
 - ✓ access rights
 - ✓ confinement
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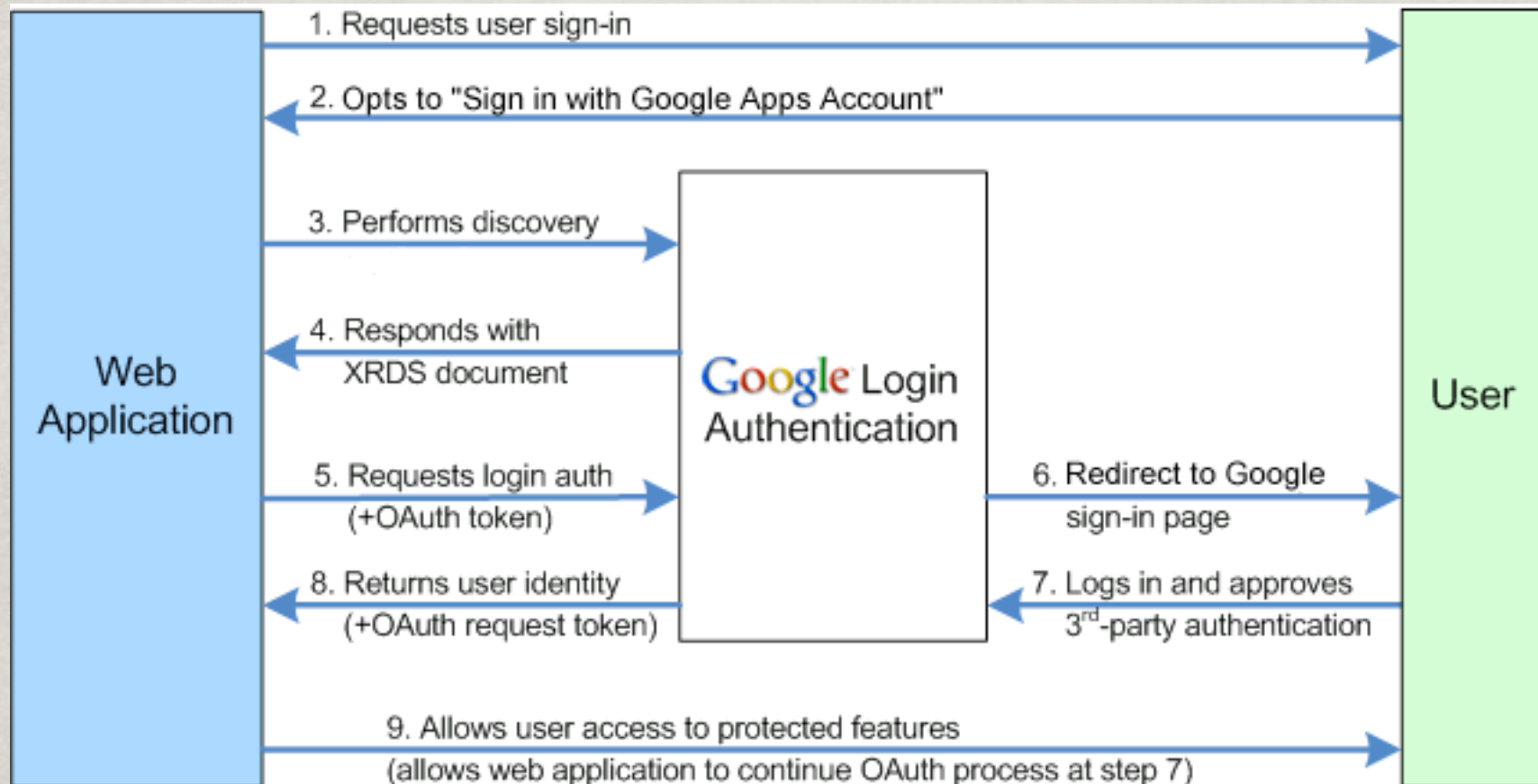
AUTHENTICATION: CERTIFICATES

Distributed parts connect using services public key and must present valid credentials



AUTHENTICATION : OPENID

Credentials may be certified by a third party



<https://developers.google.com/accounts/docs/OpenID>

AUTHORIZATION

Credential is associated to a usage level.

Administrator

- manage public applications
- manage jobs, datas etc.
- manage users and usergroups
- manage workers

Standard user

- manage private applications
- manage its own jobs and datas

Group Administrator

- manage its group
 - ▶ applications
 - ▶ users
 - ▶ jobs
 - ▶ datas

Worker user

- This is used to deploy workers
- **no action allowed**
 - user rights delegation
 - ▶ can compute user job
 - ▶ can update user job
 - ▶ can upload user job results

ACCESS RIGHTS

Request completions depend on **access rights**.

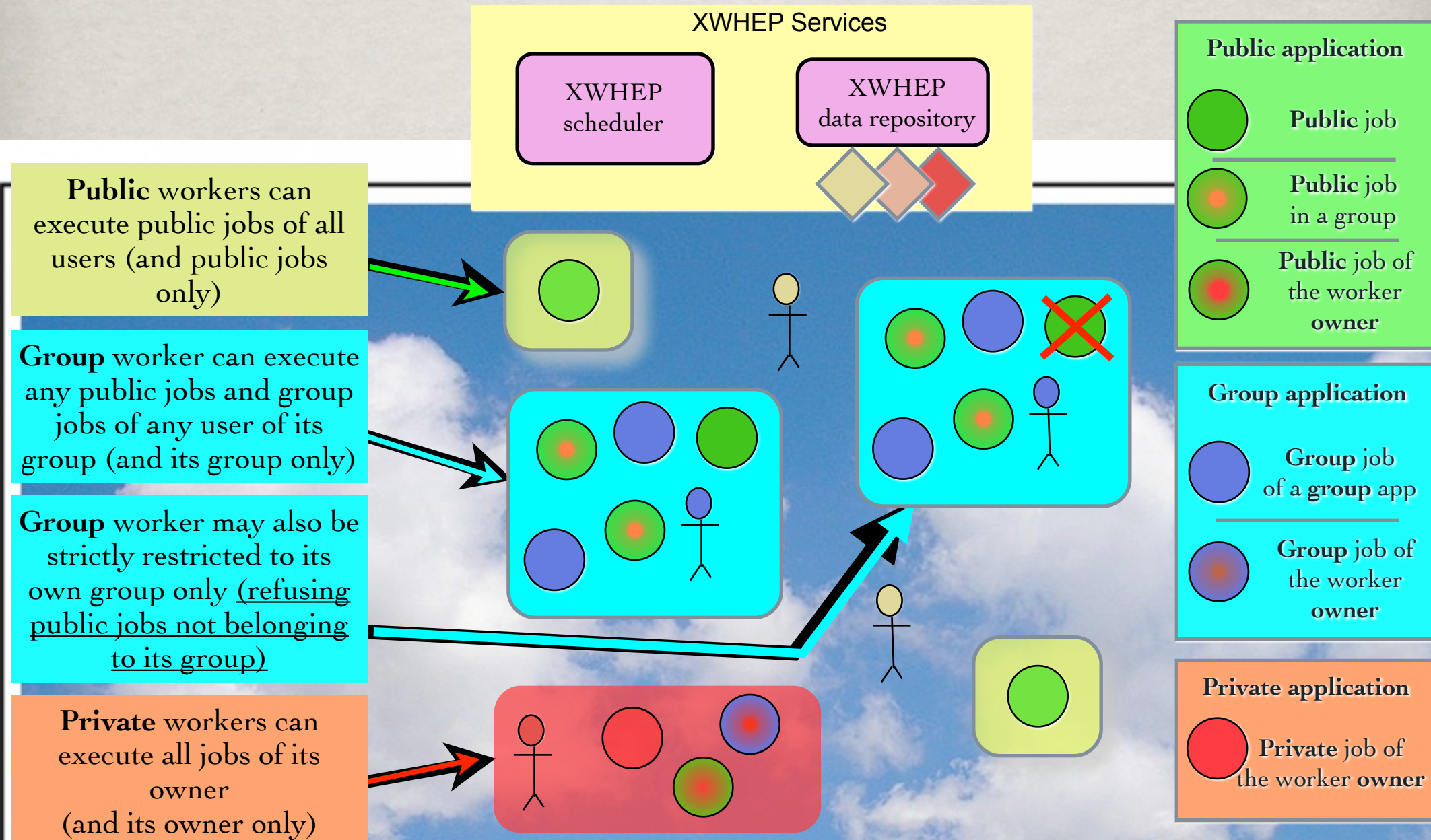
All objects (applications, datas, users, jobs, usergroups etc) are associated to access rights (AR) that allow/deny accesses (read, write, execute).

Access rights define access types

Access Types	Default Access Rights	Min Authz
Private	700	Std user
Group	750	Group admin
Public	755	Admin

CONFIDENTIALITY

Authorisations and access rights define confinement levels



XTREMWEB-HEP

- Introduction
- Security
- Virtualization
 - ✓ contextualization
 - ✓ security
 - ✓ use cases
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VIRTUALIZATION



The logos for PayPal and Monéo. The PayPal logo is in blue and black text on a white background. The Monéo logo is a blue rectangle containing a white stylized 'm' symbol and the text "MONÉO" in white.

Real

Virtuel



VM OVER XWHEP

Centralized and securized services store applications and data

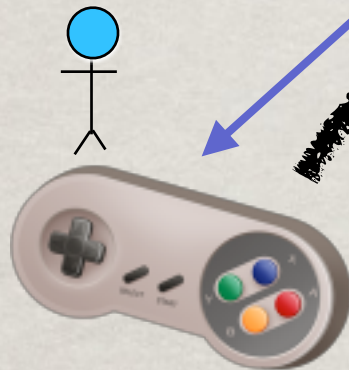
- scheduler
- repository
- etc.



Distributed resource may declare the virtualbox application.



Remote Execution



StratusLab proposes distributions with the IaaS paradigms.



Distributed User

- submit a virtualbox job with a virtual disk

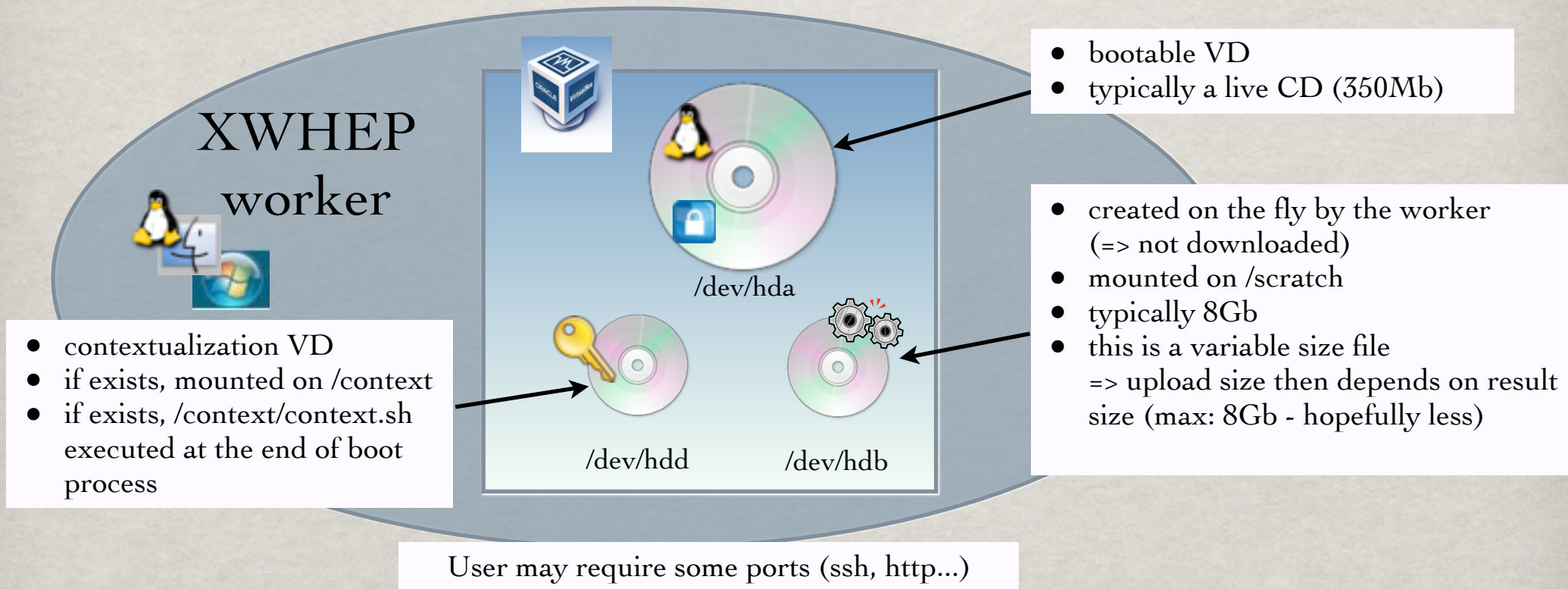
Distributed resource (volunteer PC)

- download the virtual disk
- create and run a new VM inside **its local VirtualBox**

VM : CONTEXTUALIZATION

Following HEPiX Virtualization Working Group recommendation

“Contextualization is defined as the process by which a Virtual Machine instance is configured based on a master Virtual Machine Image. In general, contextualization consists in passing arbitrary data to the Virtual Machine at boot time”



VM : SECURITY

All XWHEP security paradigms apply

- authentication
- authorization
- access rights

Virtual machines :

- recent OS including last known bugs and security corrections
- root access denied
- “sudo” usage disabled
- no access to LAN
- connection only using electronic keys

VM : USE CASE

- HEP applications are linked to ROOT (<http://root.cern.ch>)

- DG resources don't have ROOT

➔ submitted jobs will not run

✓ Deploy a VM with ROOT and XWHEP worker

✓ Submit such VM on the fly

➔ the native worker shares VirtualBox

➔ the native worker launches the VM

➔ the virtualized worker shares ROOT

➔ the virtualized worker run HEP jobs

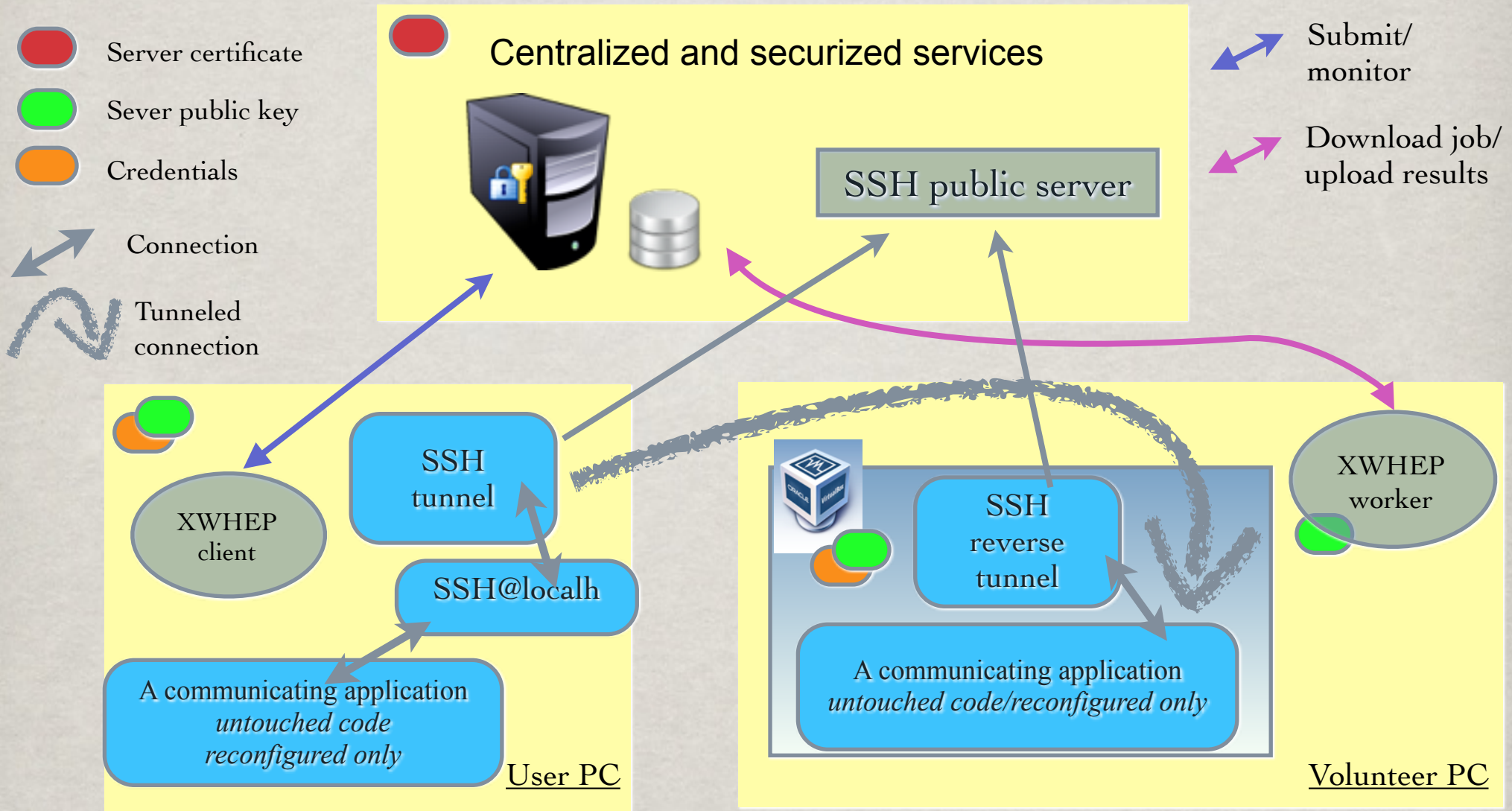


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INTERNODE COMMUNICATIONS

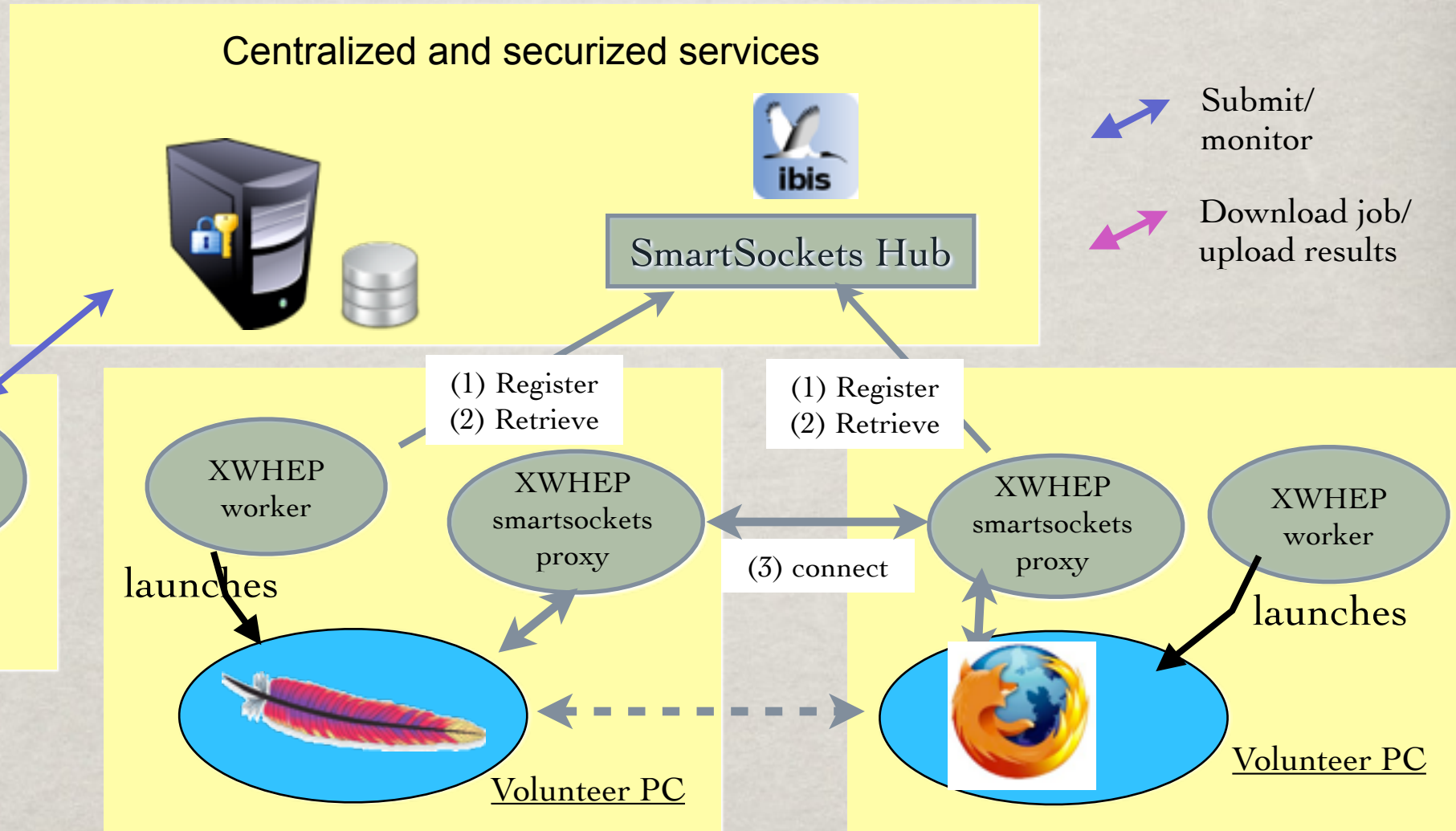
Interconnect jobs and applications over DG



Bypassing Fire Walls and NAT

INTERNODE COMMUNICATIONS

Interconnect jobs running on volunteer resources



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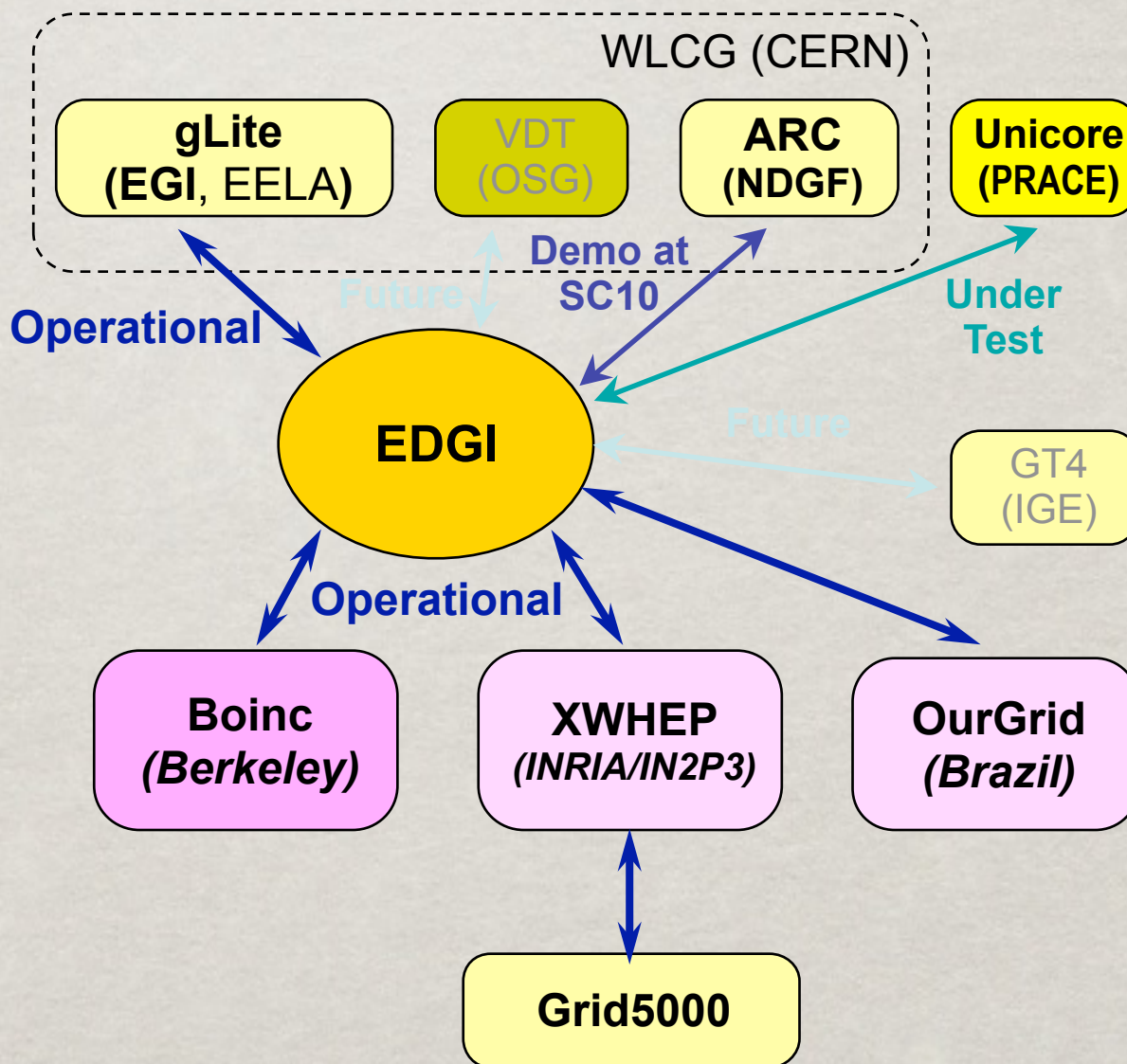
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INTER GRID CONNECTIONS



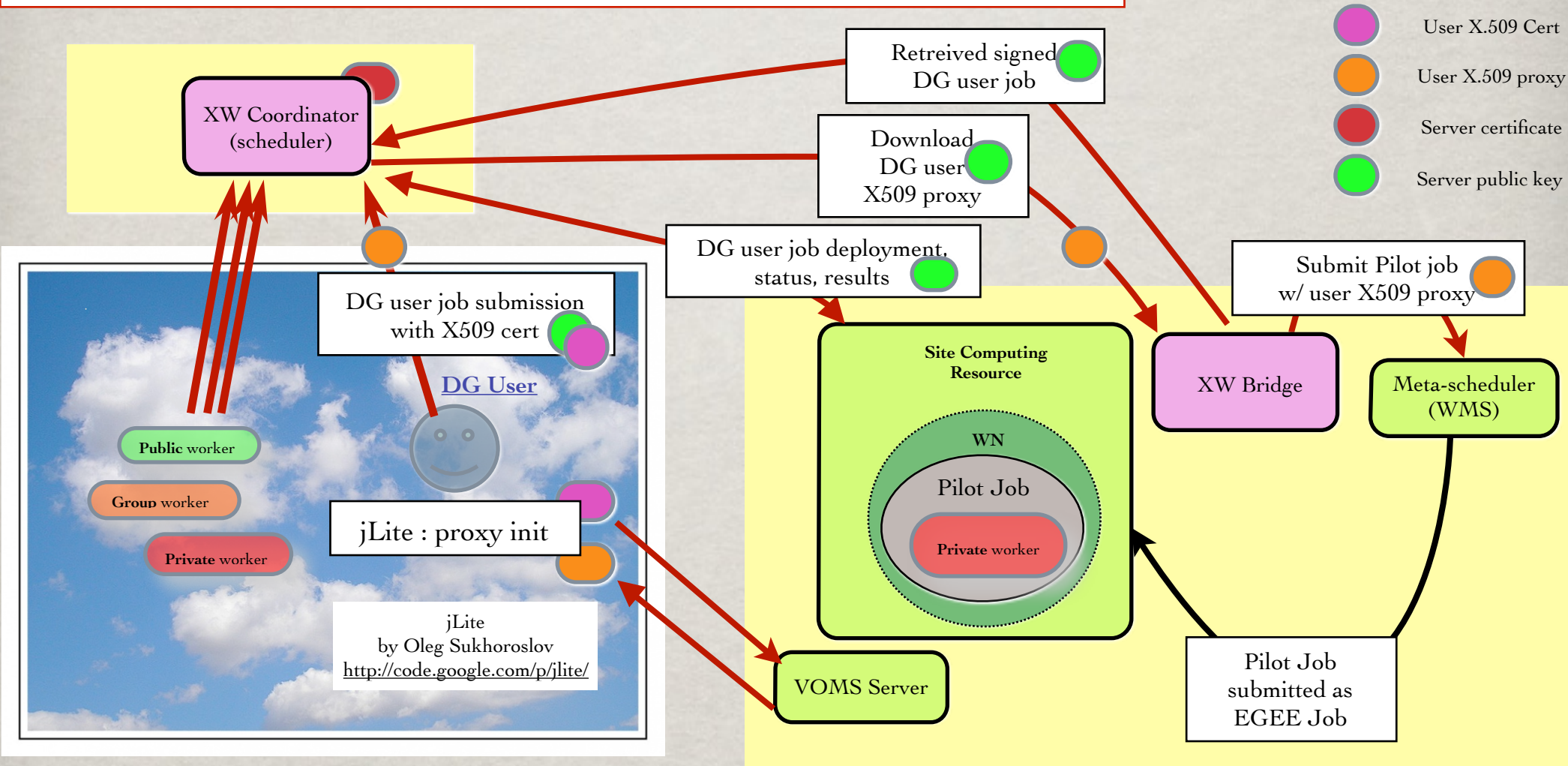
EDGeS & EDGI FP7 projects

- Integrate Service Grids and Desktop Grids
- Enable very large number of computing resources (100K-1M processors)
- Attract new scientific communities
- Provide a Grid application development environment
- Provide application repository and bridges for the execution in the SG-DG system



PILOT JOBS

Security, monitoring and logging are the main issues in Pilot Jobs. (<http://edms.cern.ch/document/855383>)



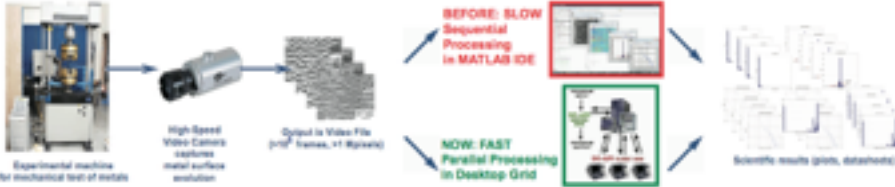
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APPLICATIONS

2. Typical Experimental Workflows: Sequential and Parallel at BOINC and XtremWeb DG platforms

Multiscale/VideoP with 4GL MATLAB-code was successfully ported and tested on BOINC-based local DG at IMP with Windows-workers[2] and on XtremWeb DG [4] at LAL with Linux-workers; now the work is going on delivering it to EGEE through EDGeS XtremWeb->EGEE Bridge [5].

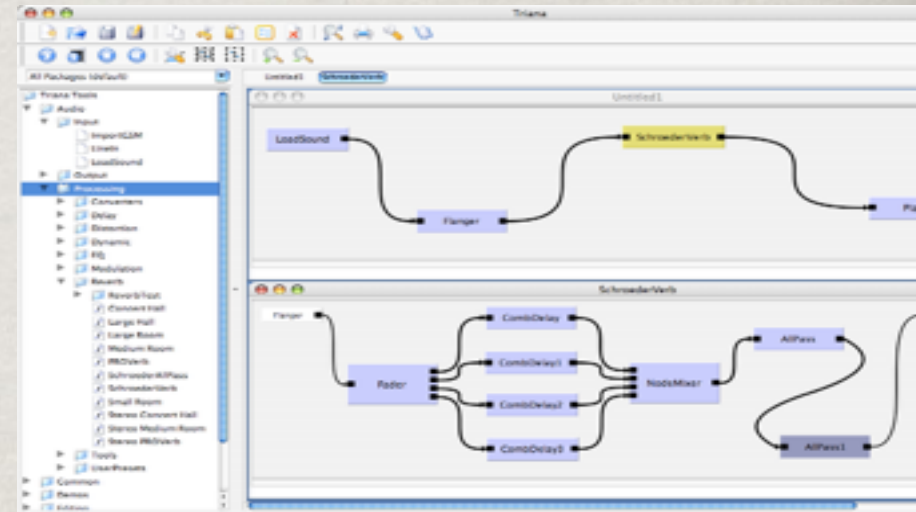


The main achievement: applicability and feasibility of integration of typical scientific application coded in 4GL environments with DCI on the basis of Desktop Grid for high-performance distributed computing were proved, tested and demonstrated.

The further increase of performance is possible by delivering 4GL-based applications to global computing resources of EGEE on the basis of XtremWeb desktop grid platform [4] and EDGeS XtremWeb->EGEE Bridge [5].

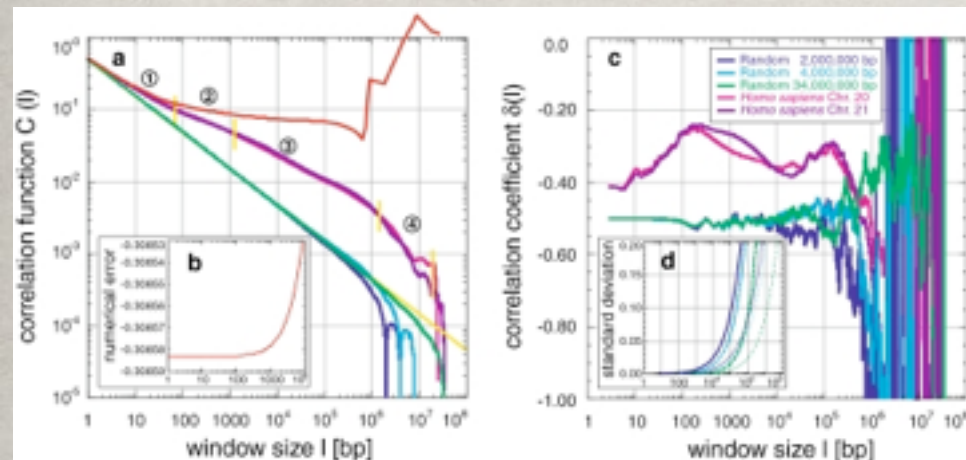
Porting Multiparametric MATLAB Application for Image and Video Processing to Desktop Grid for High-Performance Distributed Computing

Yuri Gordienko, Institut de Physique du Metal - Kiev - Ukraine



DART: A Framework for Distributed Audio Analysis and Music Information Retrieval

Eddie Al-Shakarchi, Cardiff University - UK



DNA Correlation Applications

A. Abuseiris, Erasmus - NL

- Detect and Study HECR
- The world largest detector
- \$100M (30% USA; 30% South America; 40% others)
- More than 40 labs
- Computing needs
 - > Up to 100Mh/year
 - > 10-100 hours per simulation

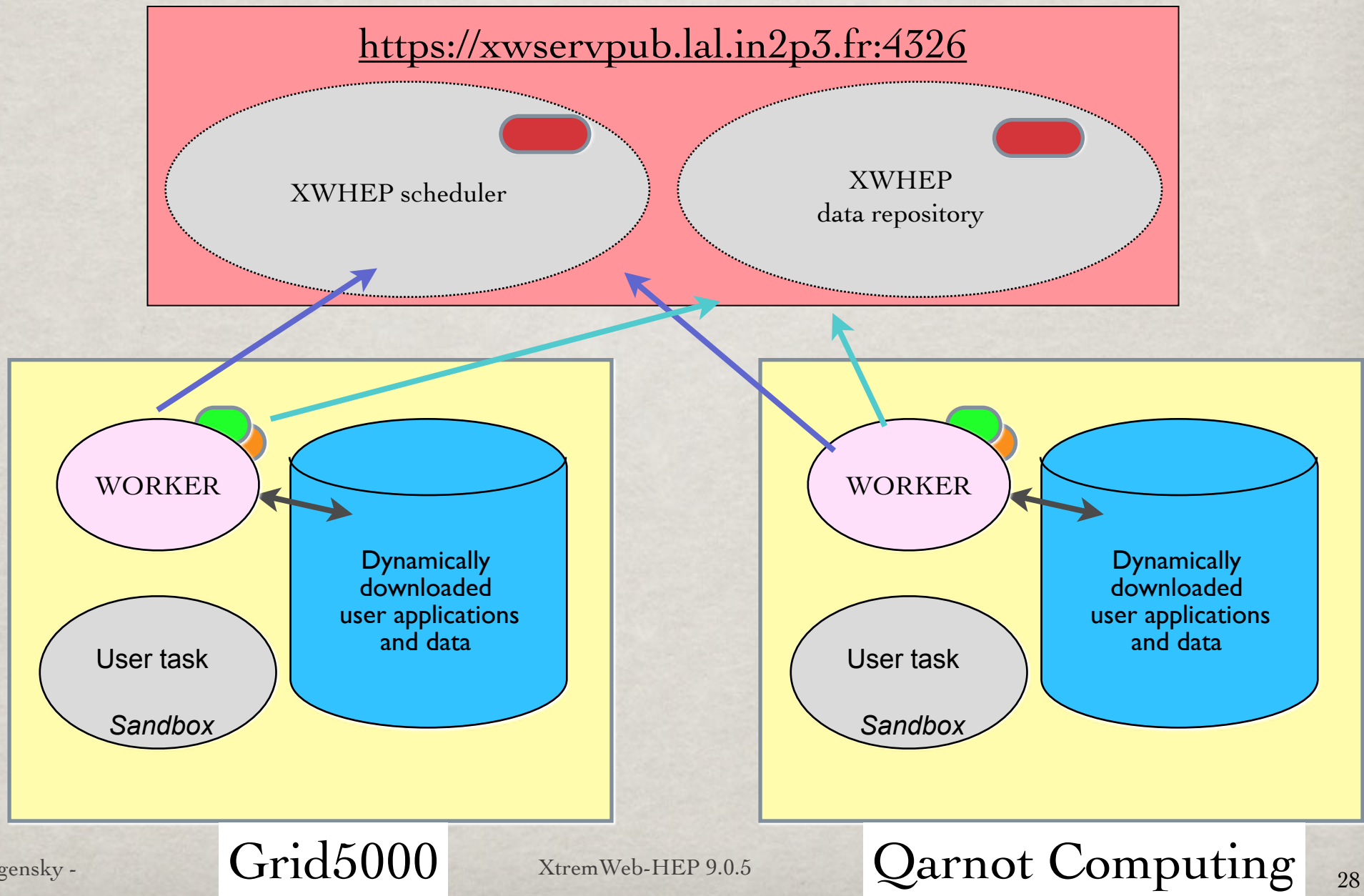
High Energy Cosmic Rays

A. Cordier LAL - France

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 - ✓ Portal
 - ✓ API
- Discussion

OUR PLATFORM



PORTAL

The screenshot shows a web browser window with the URL `https://xwservpub.lal.in2p3.fr:4326`. The page title is "XtremWeb-HEP 9.0.5-head". The logo for "LABORATOIRE DE L'ACCELERATEUR LINEAIRE" is visible in the top left. The user is logged in as `oleg.lodygensky@gmail.com`. The navigation menu includes "Overview", "Applications", "Data", "Jobs", "Group of jobs", "Help", and "API". Below the menu are buttons for "Refresh", "Send", "Details", "Delete", and a "Web workers" toggle. The main content area is titled "Applications" and contains a table with columns "Select", "UID", "Name", and "Type". The table lists several applications, including "moca", "correlizer", "dart.jar", "dsp", "larbin-crawler", "guineapig", "ls", "guineapig-pp-1.1.1", "autodock305.sh", and "ubuntu-11-dg-2.iso".

LABORATOIRE DE L'ACCELERATEUR LINEAIRE

XtremWeb-HEP 9.0.5-head

Logged in as oleg.lodygensky@gmail.com

Overview Applications Data Jobs Group of jobs Help API

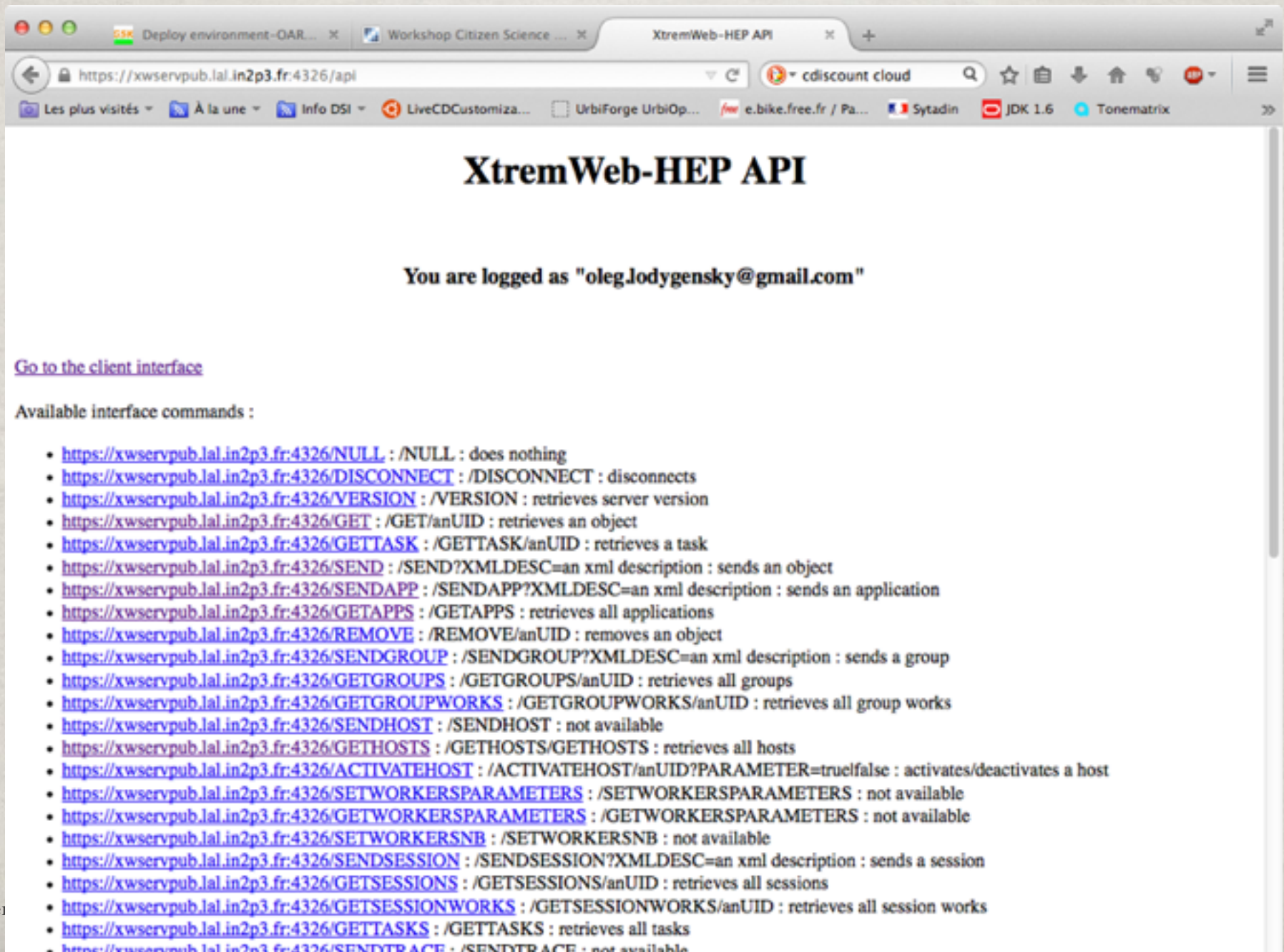
Refresh Send Details Delete Web workers

Select all Submit a job Applications [show/hide](#)

Select	UID	Name	Type
<input type="checkbox"/>	280e14e-708e-4d14-95ae-81e5a1894e7	moca	DEPLOYABLE
<input type="checkbox"/>	298ae006-3525-4079-95ab-63a986ad1127	correlizer	DEPLOYABLE
<input type="checkbox"/>	480716e4-7d18-40d0-380e-7601b734d072	dart.jar	DEPLOYABLE
<input type="checkbox"/>	8e3cb5e1-97a5-416e-9942-dc7e41090a02	dsp	DEPLOYABLE
<input type="checkbox"/>	a470723a-8210-4627-3d3b-ccc568a0b128	larbin-crawler	DEPLOYABLE
<input type="checkbox"/>	3ae32138-8ae7-409e-a2ae-50d573185fa	guineapig	DEPLOYABLE
<input type="checkbox"/>	4af6e799-1d70-4893-8712-156a4b2d3073	ls	DEPLOYABLE
<input type="checkbox"/>	ea8321e9-4726-48e9-a3a2-1919ce4e2d65	guineapig-pp-1.1.1	DEPLOYABLE
<input type="checkbox"/>	0115444e-9175-471a-94d1-3d4937d31005	autodock305.sh	DEPLOYABLE
<input type="checkbox"/>	086ee05e-2295-4698-ae09-2e7e58a2e542	ubuntu-11-dg-2.iso	VIRTUALBOX

Web interface (v 1.1) [XtremWeb-Hep.org](#)

API



Deploy environment - OAR... Workshop Citizen Science ... XtremWeb-HEP API

https://xwservpub.lal.in2p3.fr:4326/api

cdiscount cloud

Les plus visités À la une Info DSI LiveCDCustomiza... UrbiForge UrbiOp... e.bike.free.fr / Pa... Sytadin JDK 1.6 Tonematrix

XtremWeb-HEP API

You are logged as "oleg.lodygensky@gmail.com"

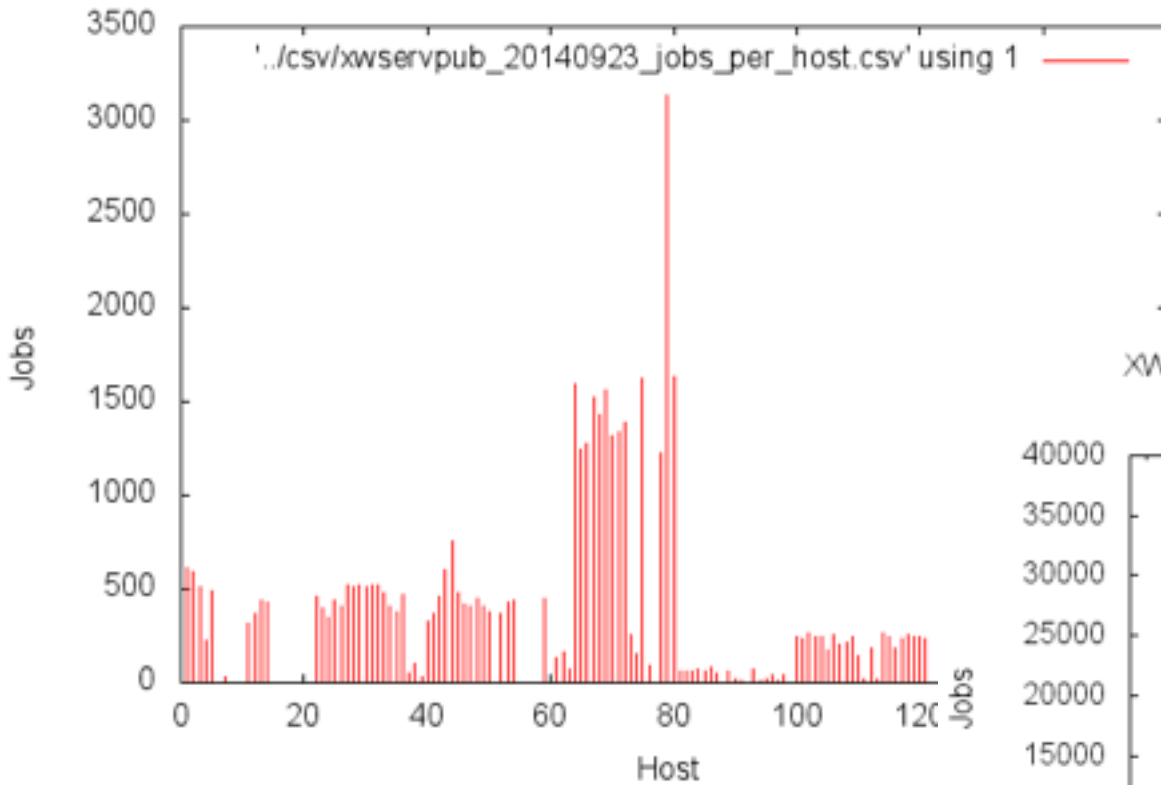
[Go to the client interface](#)

Available interface commands :

- <https://xwservpub.lal.in2p3.fr:4326/NULL> : /NULL : does nothing
- <https://xwservpub.lal.in2p3.fr:4326/DISCONNECT> : /DISCONNECT : disconnects
- <https://xwservpub.lal.in2p3.fr:4326/VERSION> : /VERSION : retrieves server version
- <https://xwservpub.lal.in2p3.fr:4326/GET> : /GET/anUID : retrieves an object
- <https://xwservpub.lal.in2p3.fr:4326/GETTASK> : /GETTASK/anUID : retrieves a task
- <https://xwservpub.lal.in2p3.fr:4326/SEND> : /SEND?XMLDESC=an xml description : sends an object
- <https://xwservpub.lal.in2p3.fr:4326/SENDAPP> : /SENDAPP?XMLDESC=an xml description : sends an application
- <https://xwservpub.lal.in2p3.fr:4326/GETAPPS> : /GETAPPS : retrieves all applications
- <https://xwservpub.lal.in2p3.fr:4326/REMOVE> : /REMOVE/anUID : removes an object
- <https://xwservpub.lal.in2p3.fr:4326/SENDGROUP> : /SENDGROUP?XMLDESC=an xml description : sends a group
- <https://xwservpub.lal.in2p3.fr:4326/GETGROUPS> : /GETGROUPS/anUID : retrieves all groups
- <https://xwservpub.lal.in2p3.fr:4326/GETGROUPWORKS> : /GETGROUPWORKS/anUID : retrieves all group works
- <https://xwservpub.lal.in2p3.fr:4326/SENDHOST> : /SENDHOST : not available
- <https://xwservpub.lal.in2p3.fr:4326/GETHOSTS> : /GETHOSTS/GETHOSTS : retrieves all hosts
- <https://xwservpub.lal.in2p3.fr:4326/ACTIVATEHOST> : /ACTIVATEHOST/anUID?PARAMETER=truelfalse : activates/deactivates a host
- <https://xwservpub.lal.in2p3.fr:4326/SETWORKERSPARAMETERS> : /SETWORKERSPARAMETERS : not available
- <https://xwservpub.lal.in2p3.fr:4326/GETWORKERSPARAMETERS> : /GETWORKERSPARAMETERS : not available
- <https://xwservpub.lal.in2p3.fr:4326/SETWORKERSNB> : /SETWORKERSNB : not available
- <https://xwservpub.lal.in2p3.fr:4326/SENDESESSION> : /SENDESESSION?XMLDESC=an xml description : sends a session
- <https://xwservpub.lal.in2p3.fr:4326/GETSESSIONS> : /GETSESSIONS/anUID : retrieves all sessions
- <https://xwservpub.lal.in2p3.fr:4326/GETSESSIONWORKS> : /GETSESSIONWORKS/anUID : retrieves all session works
- <https://xwservpub.lal.in2p3.fr:4326/GETTASKS> : /GETTASKS : retrieves all tasks
- <https://xwservpub.lal.in2p3.fr:4326/SENDTRACE> : /SENDTRACE : not available

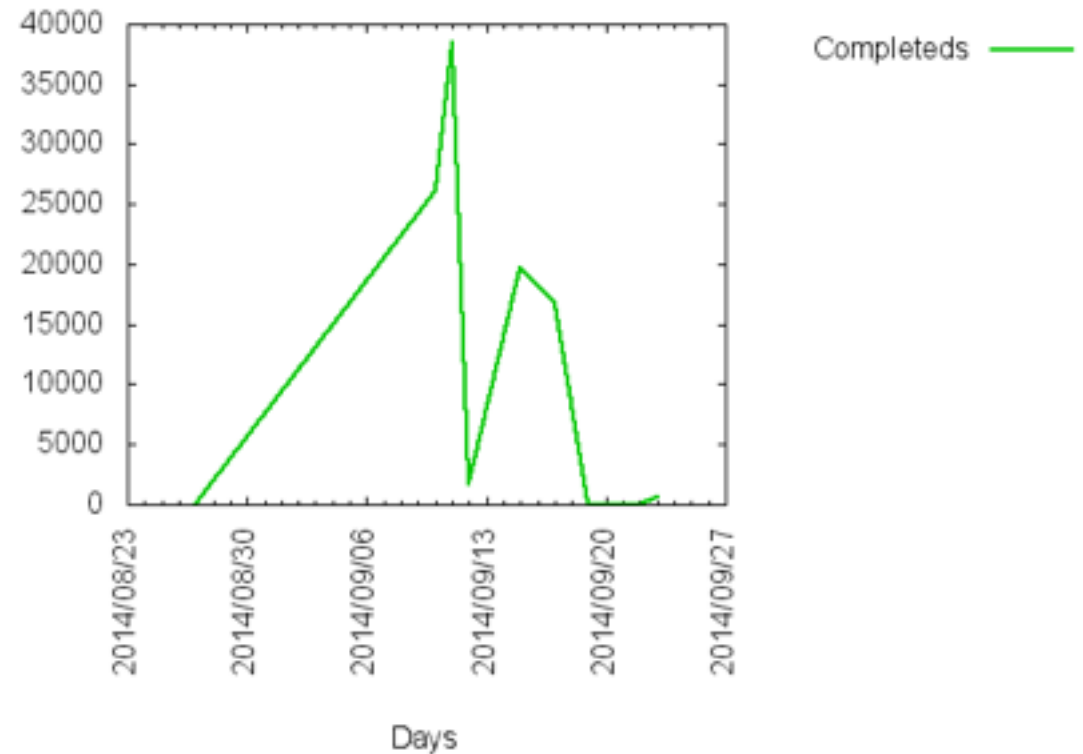
LAST MONTH - BEST EFFORT

XWHEP : Executed Jobs per host
xwservpub_20140923



Site	#hosts	#CPU
Grid5000	170	1148
Qarnot	73	584

XWHEP : Completed Jobs last month, per day
xwservpub_20140923



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DISCUSSION

Under work

- OpenSAML / Shibboleth
- Map reduce

<http://www.xtremweb-hep.org>