



Infrastructure Aspects

Cofinanciado por:





High level view

USERS

Users's Virtual Research Environments

Added-value services (generic platforms & tools)

Federation and distributed computing

CLOUD

HPC

HTC

DATA

INCD operational centres in Lisbon, North, Center regions

Advanced network services provided by PT NREN (RCTS/FCT-FCCN)

Interoperability, Security

I&D, Collaboration, Training, Support



INCD operational centers



Lisbon Region I
(UPGRADE ONGOING)
HPC / HTC / Cloud / Federation
Stratus-A (cloud)
Cirrus-A (farm)
100GbE



North Region I
HTC / HPC
Cirrus-B (farm)



Center Region
(NEW TO BE DEPLOYED)
Tape storage expansion
10GbE



Lisbon Region II
Tape storage
10GbE



North Region II
(NEW TO BE DEPLOYED)
HPC / HTC / Cloud / Federation
Stratus-D (farm)
Cirrus-D (farm)
10GbE



Main services

• HPC

- Slurm batch system
- Infiniband network
- Lustre
- CVMFS
- Access to GPUs A100/V100/T4
- Containers

• HTC

- Slurm batch system
- Ethernet network
- Lustre
- CVMFS
- NFS
- Access to GPUs A100/V100/T4
- Containers

• Cloud

- Openstack
- Virtual networks
- Ceph block storage
- Ceph object storage
- Dashboard and APIs
- Access to GPUs V100/T4



Expected compute capacity after ongoing upgrade

CPU's	RAM	Network	COREs	Place
AMD Epyc 96 CORE	512GB & 1TB	IB200 + 10GbE	4992	North
AMD Epyc 96 CORE (1)	512GB	10GbE + IB56	2304	Lisbon
AMD Epyc 64 CORE (2)	256GB & 512GB	10GbE + IB56	2112	Lisbon
INTEL Xeon 24 CORE	64GB	1GbE	2088	Lisbon
INTEL Xeon 16 CORE	32GB	IB56 + 1GbE	2560	North
Total	62912GB		14056	

(1) Nvidia A100

(2) Nvidia V100 and Nvidia T4



Expected storage capacity after ongoing upgrade

Storage Type	Capacity (RAW)	Place
Lustre	4680TB	Lisbon
Lustre	1920TB	North
Lustre	824TB	North
Ceph (block + object)	1392TB	Lisbon
Ceph (block + object)	2880TB	North
CVMFS	1000GB	*
Tape LTO9	20160TB	Center
Total	32324TB	



Computing Farms

- **Infrastructure**

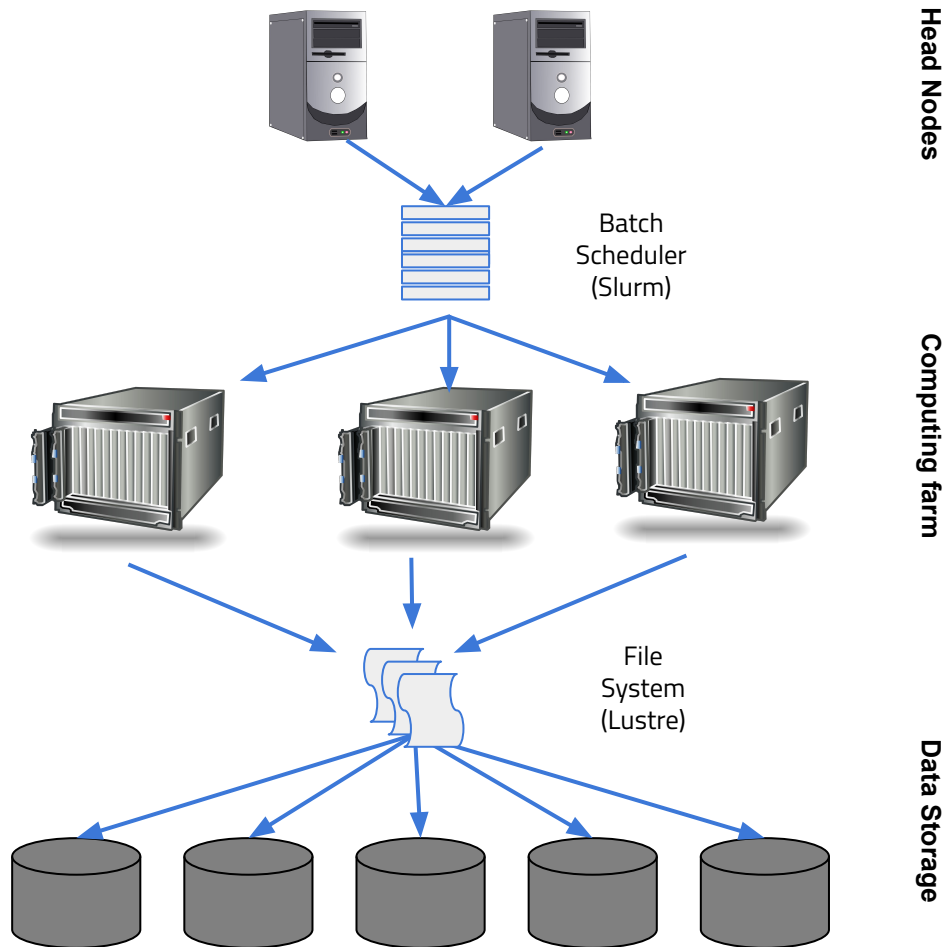
- Slurm batch systems
- Lustre file system
- CVMFS (EGI, LHC, INCD)

- **Software**

- Modules
- udocker and singularity
- Some commercial sw e.g. Intel OneAPI

- **Management**

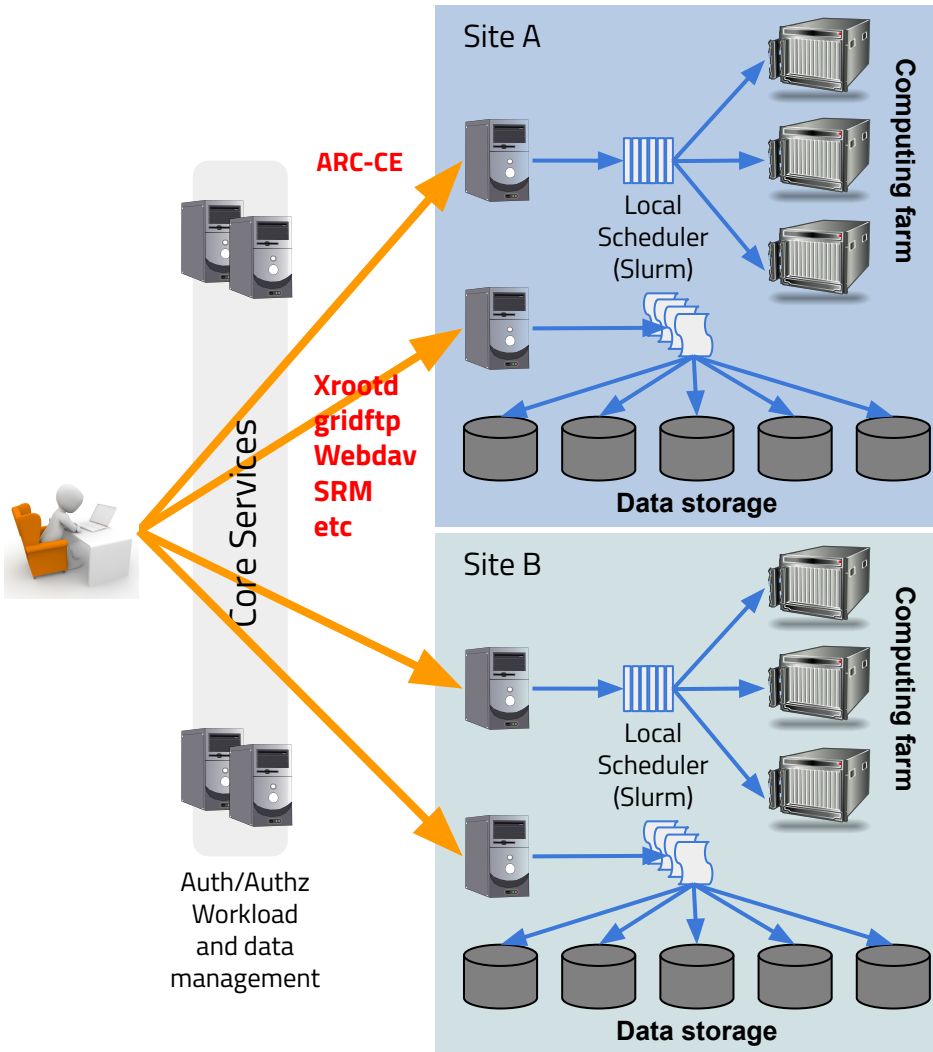
- Nagios
- Prometheus
- Ansible
- Own scripts





Grid

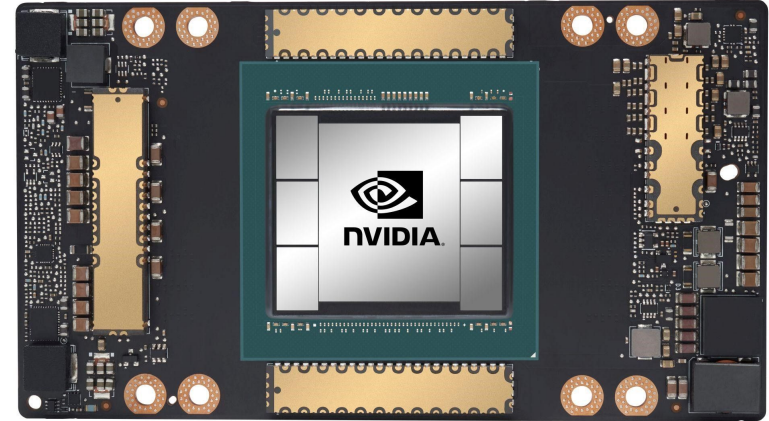
- **Compute**
 - ARC-CE for job management
- **Storage**
 - XRootD
 - StoRM (gridftp, webdav)
 - CVMFS
 - Squid (CMS)
- **Management**
 - Apel
 - Argus
 - BDII
 - Perfsonar
 - Netbox





Access to GPUs

- **GPUs are highly requested**
 - Insufficient resources for the demand
- **Nvidia V100 and T4**
 - Mostly and preferably via the farm either HPC or HTC
 - Access either natively or using udocker or singularity
- **Some older Nvidia GPUs**
 - For training, testing, development and small projects
- **Expecting Nvidia A100**
 - Will be made available in the same way

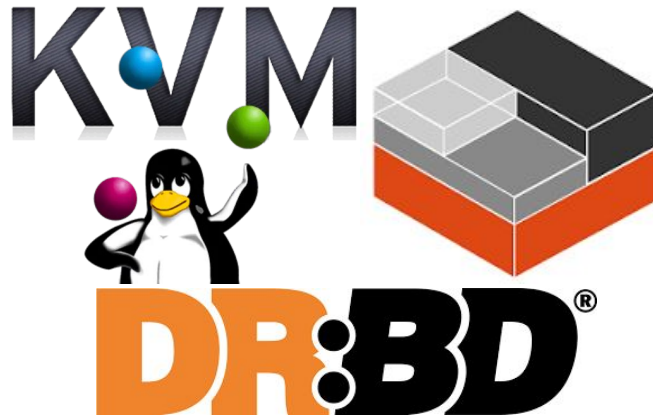
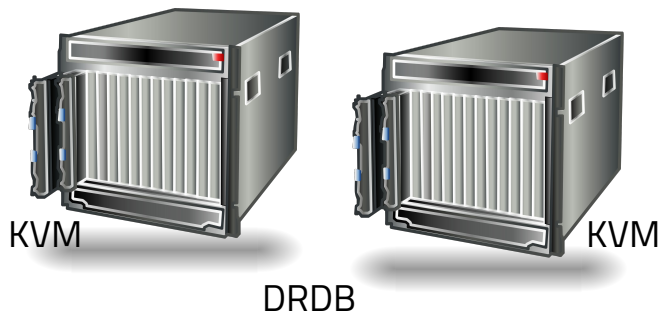




Virtualization

- Simple solution for virtualized datacenter services
 - KVM
 - LXC
 - DRBD
- KVM
 - hardware virtualization
- LXC
 - lightweight virtualization
- DRBD
 - Replicate volumes across hypervisor nodes
 - Provides redundancy
- Heartbeat
 - High availability

Virtualization






Cloud

- **Openstack**
 - Nova, Glance, Cinder, Neutron
 - Using KVM for virtualization
- **Ceph**
 - 3x replicas
 - Block storage
 - Object storage
- **Network**
 - Overlay GRE & Vxlan
 - Provider networks (VLANs)
 - SRIOV
- **Monitoring**
 - Nagios
 - Own tools for more complete accounting including storage
- **Compute**
 - AMD Epyc processors
 - Some GPUs mainly for testing

The image shows the OpenStack login interface. At the top is the OpenStack logo, which is a red square with a white 'O' inside, followed by the word 'openstack' in a black, lowercase, sans-serif font. Below the logo is the text 'Log in'. Underneath is a section titled 'Authenticate using' with a dropdown menu currently showing 'Keystone Credentials'. A light blue tooltip box is visible below the dropdown, containing the text: 'If you are not sure which authentication method to use, contact your administrator.' Below this are three input fields: 'Domain' (with 'default' entered), 'User Name' (empty), and 'Password' (empty with an eye icon for toggling visibility). At the bottom right is a blue 'Sign In' button.

**openstack**

Log in

Authenticate using

Keystone Credentials

If you are not sure which authentication method to use, contact your administrator.

Domain

default

User Name

Password

Sign In



Cloud

- **Openstack**
 - Nova, Glance, Cinder, Neutron, Horizon, Keystone
 - Using KVM for virtualization
- **Ceph**
 - 3x replicas
 - Block storage
 - Object storage (S3 & Swift)
- **Network**
 - Overlay (GRE & Vxlan)
 - Provider networks (VLANs)
 - SRIOV
- **Monitoring**
 - Nagios
 - Own tools for more complete accounting including storage

API server

API server

API server

RabbitMQ
MariaDB
Nova API
Neutron API
Horizon
Keystone

Neutron
Router

Neutron
Router

OVS
Neutron agents

Storage
Gateway

Storage
Gateway

Glance
Cinder
S3 & Swift

Compute

...

Libvirt
Nova-compute
KVM
OVS



Federated cloud

- Information provider registered in GOCDB
- CASO + APEL for accounting
- Integration with the EGI Fedcloud
- EGI Check-in
- Using OIDC
- Also had support for the national NREN federation RCTS AAI



Check-in

Choose your academic/social account

Search...

29 Mayis University
A'SHARQIYAH UNIVERSITY
A*STAR - Agency for Science, Technology and Research
A. T. Still University
AAF Virtual Home
aai.lab.maeen.sa
AAI@EduHr Single Sign-On Service
Aalborg University
Aalto University
Aarhus School of Architecture
Aarhus School of Marine and Technical Engineering
Aarhus University
AARNet
Aba Teachers University

or

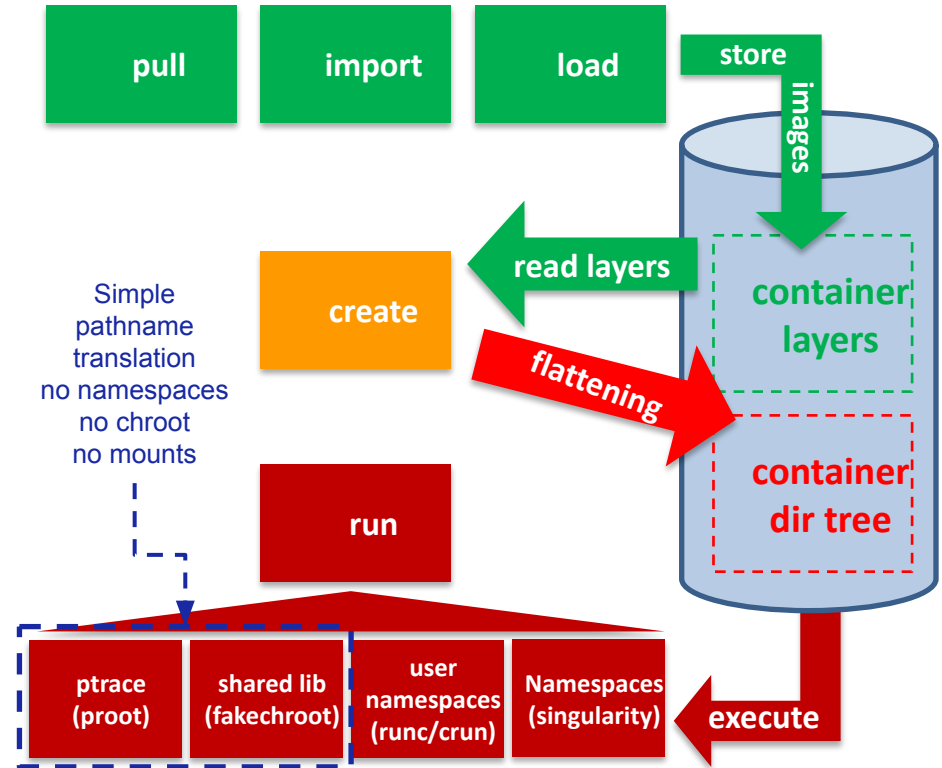
Bitbucket Bitbucket
Facebook Facebook
IGTF IGTF
GitHub GitHub
LinkedIn LinkedIn
Google Google
eduTEAMS eduTEAMS
ID2OPEN ID2OPEN
ORCID ORCID
umbrella umbrella
WeChat WeChat
na na

Can't find your identity provider?



Containers

- **Farm**
 - **udocker**
 - **singularity/aptainer**
- **Cloud**
 - **docker**
 - **docker-compose**
 - **kubernetes**
- **Management**
 - **portainer**
 - **kubernetes**



<https://www.incd.pt>



helpdesk@incd.pt

Thank you

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