



Infraestructura GRID en el IFCA

UIMP – GRID & e-Science. Santander 15-19 Jun 2009

Overview

- Introduction
- Visiting the IFCA
- Basic Room Infrastructure: Power, Cooling, ...
- Computing Power
- Storage
- Network
- Monitoring and Administration
- Basic Grid Components
- Resource Integration in Grid Projects
- Challenges
- Human Infrastructure

Introduction

- Infrastructure ?

- Wikipedia:

Infrastructure can be defined as the **basic physical and organizational structures** needed for the operation of a society or enterprise, [1] or the **services and facilities** necessary for an economy to function. [2]

Infrastructure @ IFCA

- ... several “independent” parts:

Global Coordination
Project Management

Global Support
Dissemination and Outreach

Hardware Deployment
Maintenance

System Administration
Users Support

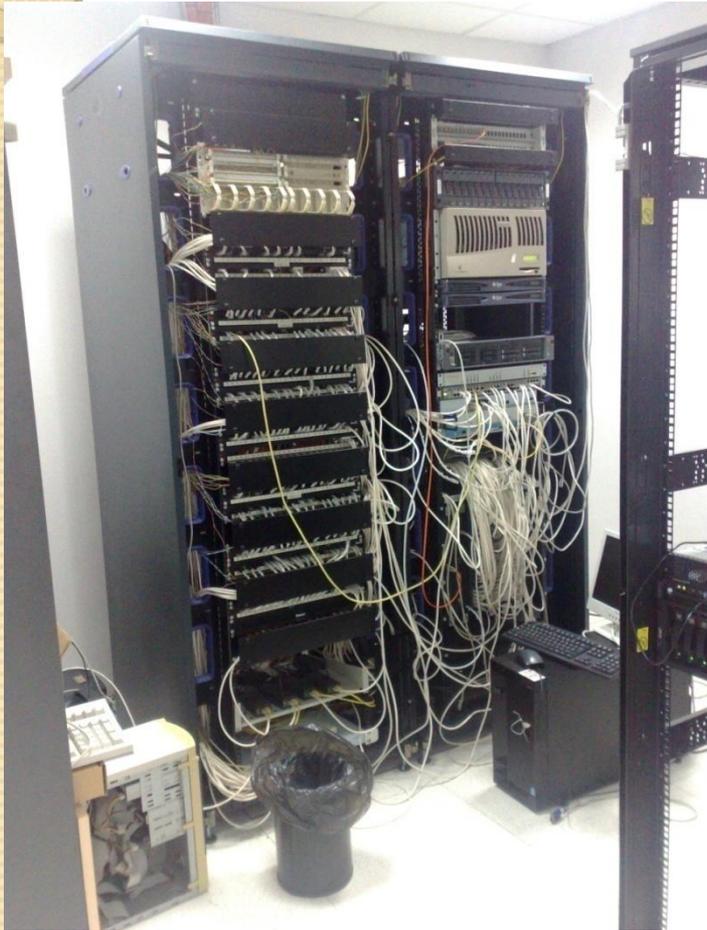
Software and Middleware
Development

Application Integration
Final Users

Transferencia Tecnológica
Colaboración con Empresas

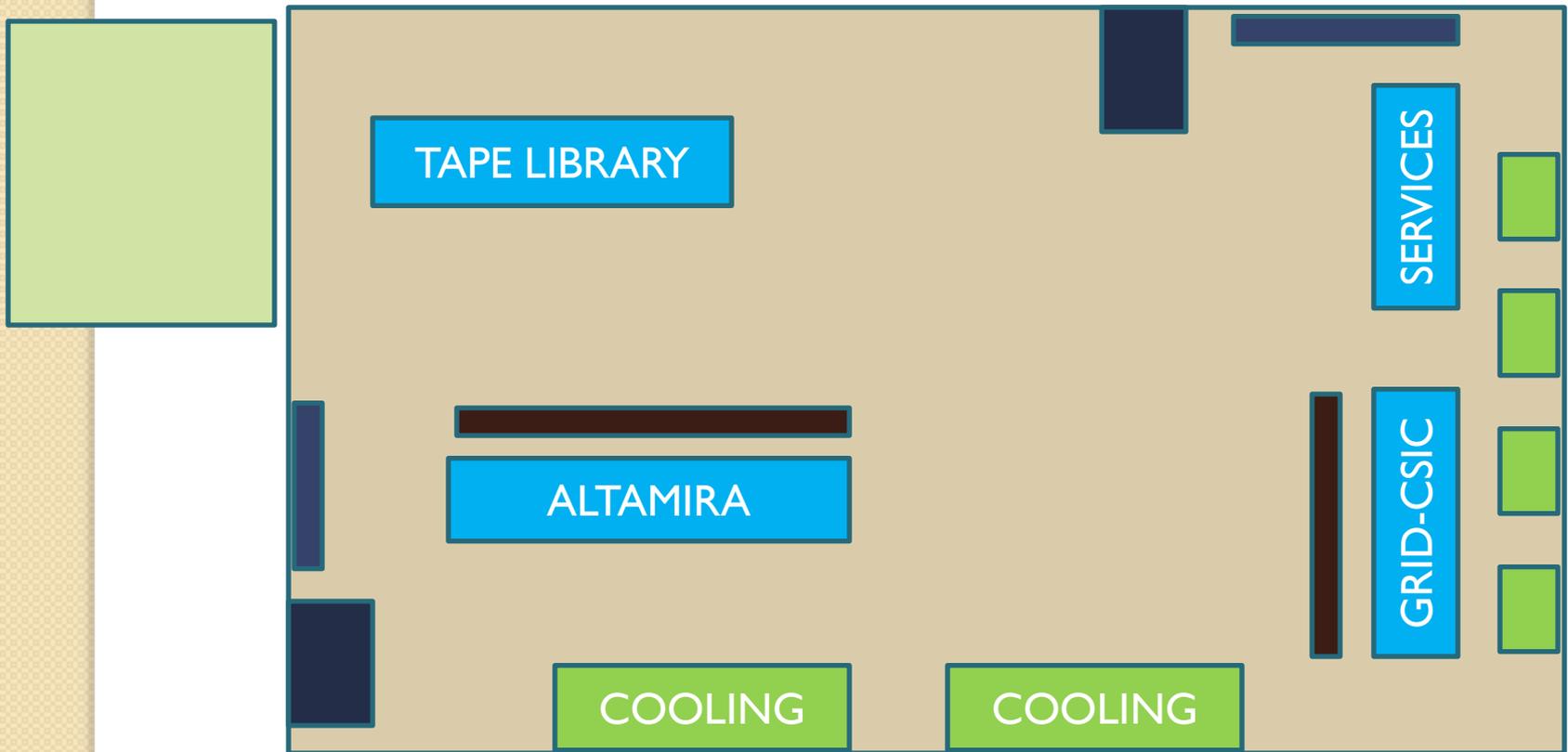
Visiting the IFCA

- Communications Room + few servers in floor 0



Visiting the IFCA

- Computing Room in floor -2



Basic Room Infrastructure

- Room. Suelo Técnico.
- Electrical Power. UPS.



Basic Room Infrastructure

- Cooling Systems.
- Detección de Fuego y Extinción.



Big initial effort + Maintenance

Altamira (RES)

Red Española de Supercomputación

- Job submission using grid middleware
 - **KEPLER** allows Drag&Drop creation and execution of workflows for distributed applications + **UNICORE**



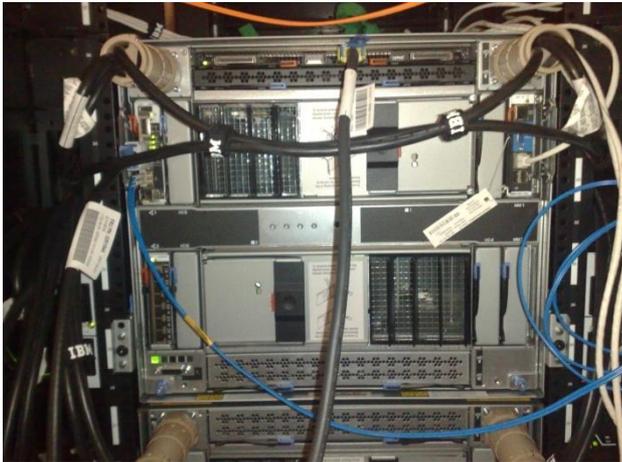
Computing Power

| Cluster | Nodes | Model | Processor | Cores | Freq.Total | RAM Memory | RAM Total | Hard Disk | HD Total |
|--------------|------------|----------------------|--|-------------------|------------------|---|------------|---------------------------------|----------------|
| GRID-CSIC | 182 | IBM Bladecenter HS21 | 2 Pentium Xeon Quad Core 2.3GHz | 1456 Cores | 3348.8GHz | 16GB = 8x2GB | 2912GB | 080GBo = 80GBo SAS | 14.5TBo |
| CMS | 28 | IBM Bladecenter HS21 | 2 Pentium Xeon Quad Core 2.3GHz | 224 Cores | 515GHz | 16GB = 8x2GB | 448GB | 080GBo = 80GBo SAS | 2240GBo |
| INGRID | 20 | IBM x3550 | 16 x 2 Pentium Dual Core 2.3GHz + 4 x 2 Pentium Quad Core 2.3 GHz | 96 Cores | 220GHz | 16 x 4048MB = 2x2GB + 4 x 8098 = 4 x 2GB | 048GB | 073GBo = 73GBo SAS | 1460GBo |
| EIFCA | 90 | IBM x336 | 2 Pentium Xeon 3.2GHz | 180 Cores | 576GHz | 2048MB = 2x1GB/4x512MB | 180GB | 480GBo = 80GBo + 400GBo SATA | 43200GBo |
| GRID | 80 | IBM x220 | 2 Pentium III 1.26GHz | 160 Cores | 201.6GHz | 0640MB = 128MB+512MB | 050GB | 140GBo = 33GBo SCSI + 60GBo IDE | 7440GBo |
| EGAES | 20 | IBM x206 | 1 Pentium IV 3.2GHz | 20 Cores | 64GHz | 1280MB = 256MB+1GB | 030GB | 480GBo = 80GBo + 400GBo SATA | 9600GBo |
| TOTAL | 420 | IBM xSeries | | 2736 Cores | 4926.6GHz | | 3TB | | 78,4TBo |



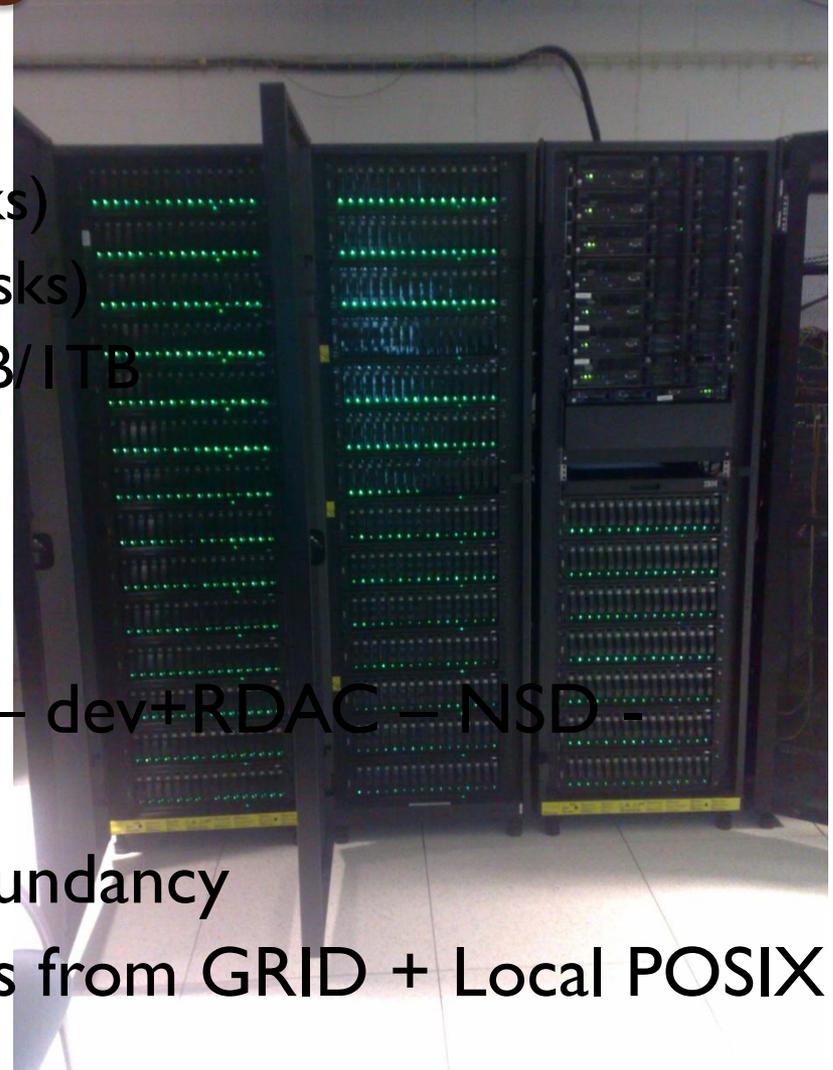
TORQUE + MAUI .Access from several Grid CE and direct queue access for Local Users

Bladecenter HS21 XM (Grid-CSIC)



Massive Storage

- Based on GPFS
 - IBM ds4700 (16 disks)
 - + 6 x exp810 (16 disks)
 - Disks 500GB/750GB/1TB
 - 1 IFCA
 - 2 CMS (+2)
 - 2 Grid-CSIC
- Array – LD – LUN – dev+RDAC – NSD – Filesystem
- Performance + Redundancy
- SRM (storm): Access from GRID + Local POSIX

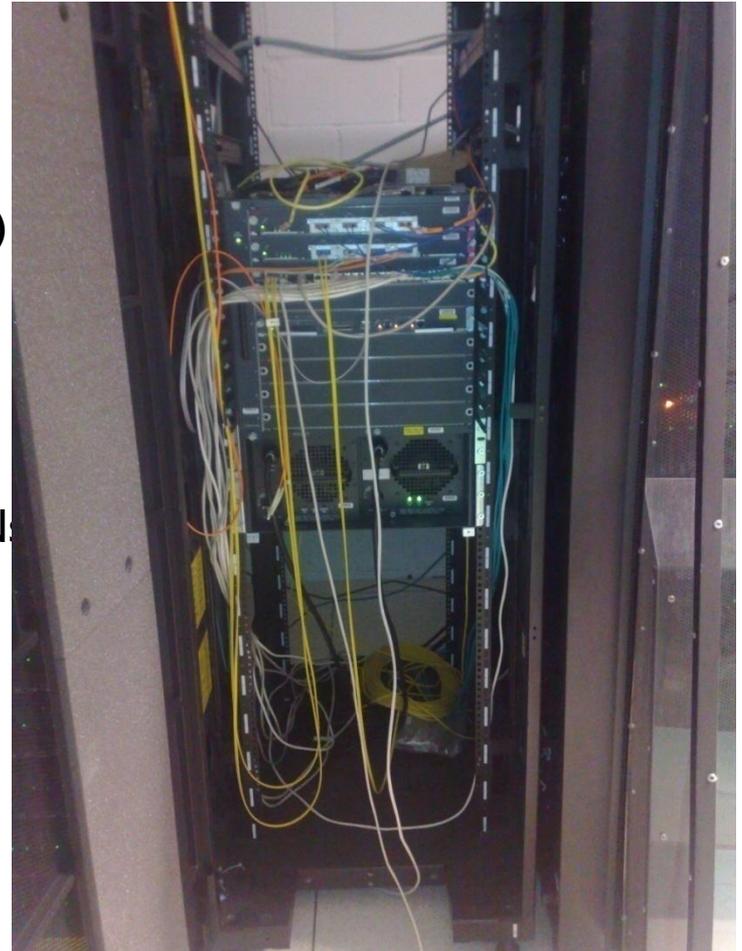


Network

- CISCO 6509
- 2x 4 10Gbps ports card
 - Storage + Blade Centers
- 1x 24 1Gbps ports card (services)
 - Several Services + other switches
- Backbone 40Gbps
- Performance, Stability

- Private Networks (different VLANs)
 - Altamira
 - Grid
 - Administration

- Conexión to RedIRIS
 - 1+1 Gbps
 - To be upgraded next year ?



Monitoring

- Ganglia
- WNs / Storage / Projects
- Nagios
- Job Mon-Arch
- Cacti

- GRID Projects Tools
- CMS Monitoring Tools



- Development of Software “AGRESTE”: A Great Resource Supervision Tool
 - Monitoring and warning supervision tool for large clusters
 - Very light and modular design
 - Under development, first prototype running

Administration Hardware Tools

The image displays three screenshots of IBM management software. The top-left screenshot shows the 'IBM System Storage DS Storage Manager 10 (Enterprise Management)' interface, listing various storage subsystems like GPF5_01-1FCA_01 and GPF5_02-GAES_01. The top-right screenshot shows the 'GPFS_05-GCSIC_02 - IBM System Storage DS Storage Manager 10 (Subsystem Management)' interface, displaying a logical/physical view of RAID configurations and physical enclosures (Enclosure 50-54). The bottom-left screenshot shows the 'IBM BladeCenter H Advanced Management Module' interface, displaying a 'System Status Summary' and a table of blades.

System Status Summary

System is operating normally. All monitored parameters are OK.
The following links can be used to view the status of different components.

- Blades
- I/O Modules
- Management Modules
- Power Modules
- Power Module Cooling Devices
- Chassis Cooling Devices
- Media Tray

Blades

Click the icon in the Status column to view detailed information about each blade.

| Bay | Status | Name | Pwr | Owner** | | cKVM* | I/O Compatibility | WOL* | Local Control | | | |
|-----|--------|-----------------|-----|---------|-----|-------|-------------------|------|---------------|-----|-----|------|
| | | | | KVM | MT* | | | | Pwr | KVM | MT* | BEM* |
| 1 | OK | SN#YK105385D19Y | On | | | | OK | Off | * | * | * | ---- |
| 2 | OK | SN#YK105385D1DZ | On | | | | OK | Off | * | * | * | ---- |
| 3 | OK | SN#YK10538591RA | On | | | | OK | Off | * | * | * | ---- |
| 4 | OK | SN#YK105385D15X | On | | | | OK | Off | * | * | * | ---- |
| 5 | OK | SN#YK105084T1H6 | On | | | | OK | Off | * | * | * | ---- |
| 6 | OK | SN#YK105385D113 | On | | | | OK | Off | * | * | * | ---- |

- Private Network
- Expert tools
- ssh, and a scripts

Basic GRID Components

- UI, CE, SE, BDII, RB, VOMS, SRM(storm),
...

- Scalability problems
 - Pools of UIs, CEs, SEs
- Services non shared by different projects



Resource Integration in GRID Projects. Problems and Challenges

- Stability versus Updated
- Several services have to be replicated (CE, MON)
- Others have to be modified (CrossBroker access to several top BDII)
- Resource allocation
- CMS requirements
- Grid Users + Local Users – security
- Abuses , users and Vos
- Dangerous jobs detection (8 cores/node mix)
- Complex Environment
 - Not allways easy to locate of the sources of a problem

Human Infrastructure

e-Ciencia

@



Instituto de Física de Cantabria

▶ Inicio

▶ Agenda

▶ IFCA Wiki

▶ Proyectos Actuales:

▶ Iniciativas Nacionales:

▶ Iniciativas en el CSIC:

▶ Iniciativas Locales:

▼ Iniciativas con Empresas:

Monitoring (CIC-SL)

Simulación de Embalses
(Ecohydros-SL)

▶ Proyectos Finalizados:

▶ Equipo de Trabajo

▶ Infraestructura

▶ Presentaciones

▶ Cursos

▶ Información:

e-Ciencia@IFCA > Equipo de Trabajo

e-Ciencia@IFCA: Equipo de Trabajo

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Fab' Grid Room

Inauguraci

Es
Consejero de Ind
Ex

Di



The Rebellion of the Grid , Hunterwasser / Maite Marco