LUSITANIA Supercomputer

CénitS managed the first Extremadura Supercomputer, LUSITANIA, from its start-up in 2009 until the end of 2017, providing researchers, innovators and technologists a resource capable of satisfying requirements that would not otherwise be possible to meet, providing services of intensive calculation and advanced communications to the research community, companies, institutions and technology centers of Extremadura.

The technical characteristics of LUSITANIA are detailed below:

Compute nodes

- 2 **HP Integrity SuperDome SX2000** with 64 Itanium2 Montvale (1.6 GHz, 18 MB cache) processors each one (128 processors / 256 cores).
- 2x 1TB RAM per node = 2TB RAM (one image).
- 2x 40x146GB SAS disks = 3,6TB to scratch (RAID 5).
- **Suse Linux** "**SLES 10**" operative system (**Windows Server**, **HP-UX**, **Red Hat**, **SLES**, ..., which can run simultaneously).
- **High availability.**

- Up to **16 physical partitions** and **64 virtual partitions**.

Service nodes

- Service of Login / Development / HPC Management.
- 4 x **HP Integrity rx2660**: 4 cores **Intel Itanium-2 dual-core Montvale** (1,6Ghz/18MB “cache built in chip”)” ; 16GB DDR-2 memory; 6 x 146 GB SAS disks.

Management nodes

- 2 x **HP Proliant DL380-G5**: 8 cores **Intel Xeon Quad-Core E5450** (3.0 GHz, 1333 FSB, 80W)”; 8 GB FBD DDR-2 memory; 2 x 146 GB SAS disks.

Cloud computing nodes

- 2 x **HP Proliant DL-380-G7** with 2 cores **Intel Xeon Quad Core E5630** (2,53GHz/4-core/12MB) per server, with 32 GB and 64 GB memory, and 2 x 146 GB SAS disks per server.
- 1 x **HP Proliant DL-380-G5** with 2 cores **Intel Xeon Quad Core E5450** (3GHz/4-core/12MB), 16 GB RAM and 2 x 146 GB SAS disks.
- 2 x **HP ProLiant BL465c** Gen8 Server Blade with 2 x **AMD Opteron 6366 HE** processors (1.8GHz/8-core/16MB), 128 GB RAM and 2 x 300GB SAS disks per server. This servers belong to FI4VDI [1] project, from the Interreg IV B SUDOE program, financed by ERDF.
- 2 x **HP ProLiant BL465c Gen8** Server Blade, with **AMD Opteron 6276** processors (2.3GHz/16-core/16MB), 256 GB RAM per server and 4 x 300GB SAS disks per server. This servers and the Intel Cluster Studio for Linux software belong to SIATDECO [2] (RITECA II) project, co-financed by the European Regional Development Fund (ERDF) through POCTEP 2007-2013.
- 4 x **HP ProLiant BL460c Gen6** Server Blade, with 2 **Intel Xeon E5540** processors (2,53GHz/4-core/8MB), 24 GB RAM per server and 2 x 146GB SAS disks per server. This servers belong to FI4VDI [1] project, from the Interreg IV B SUDOE program, financed by ERDF.
- 4 x **HP ProLiant BL465c Gen8** Blade server with **AMD Opteron 6376** (2.3GHz/16-core/16MB), 128 GB RAM per server and 8 x 300GB SAS per server.
- 1 x **Fujitsu Server PRIMERGY RX350 S8**, with 2 **Intel Xeon E5 2620v2** (2,10GHz/6cores/15MB), 256 GB RAM and 2 x 300GB SAS disks. This server belongs to MITTIC [3] project, co-financed by ERDF through POCTEP 2007-2013.

Computing accelerating units

- 2 x **HP ProLiant WS460c G6** Workstation Blade with **HP BL460c G7 Intel Xeon E5645** (2.40GHz/6-core/12MB), 96 GB RAM per server, 4 x 300GB SAS disks and 2 x **NVIDIA Tesla M2070Q** (448 cuda cores and 6GB GDDR5). This servers and the Intel Cluster Studio for Linux software belong to SIATDECO (RITECA II) project, co-financed by the ERDF through POCTEP 2007-2013.
- 1 x **Intel Xeon Phi Co-Processor 3120P.** This server belongs to MITTIC [3] project, co-financed by ERDF through POCTEP 2007-2013.

Storage

- **Fiberchannel** network with **active-active multipathing** (8 ports x 4 drivers).
- 2 **EVAs 8100** x [(**208 FATA disks** x 1TB) + (**128 FC disks** x 450GB)] = **265,6TB**.
- 2 **DL380-G5** NAS servers running distributed filesystem **HP StorageWorks PolyServe**.
- **HP 3PAR StoreServ 7200** x (14 SAS 10k disks x 900GB) = 11,5TB. This storage unit belongs to FI4VDI [1] project, from the Interreg IV B SUDOE program, financed by ERDF.

Backup

- Backup system over tape library **HP Storageworks EML 245e**.
- Capacity for **245 tapes** of **LTO-4 Ultrium 1840** technology, offering capacity of **392 TB** in 2:1 compression.
- Management and unattended planning backup **HP StorageWorks DataProtector** software.

Network topology

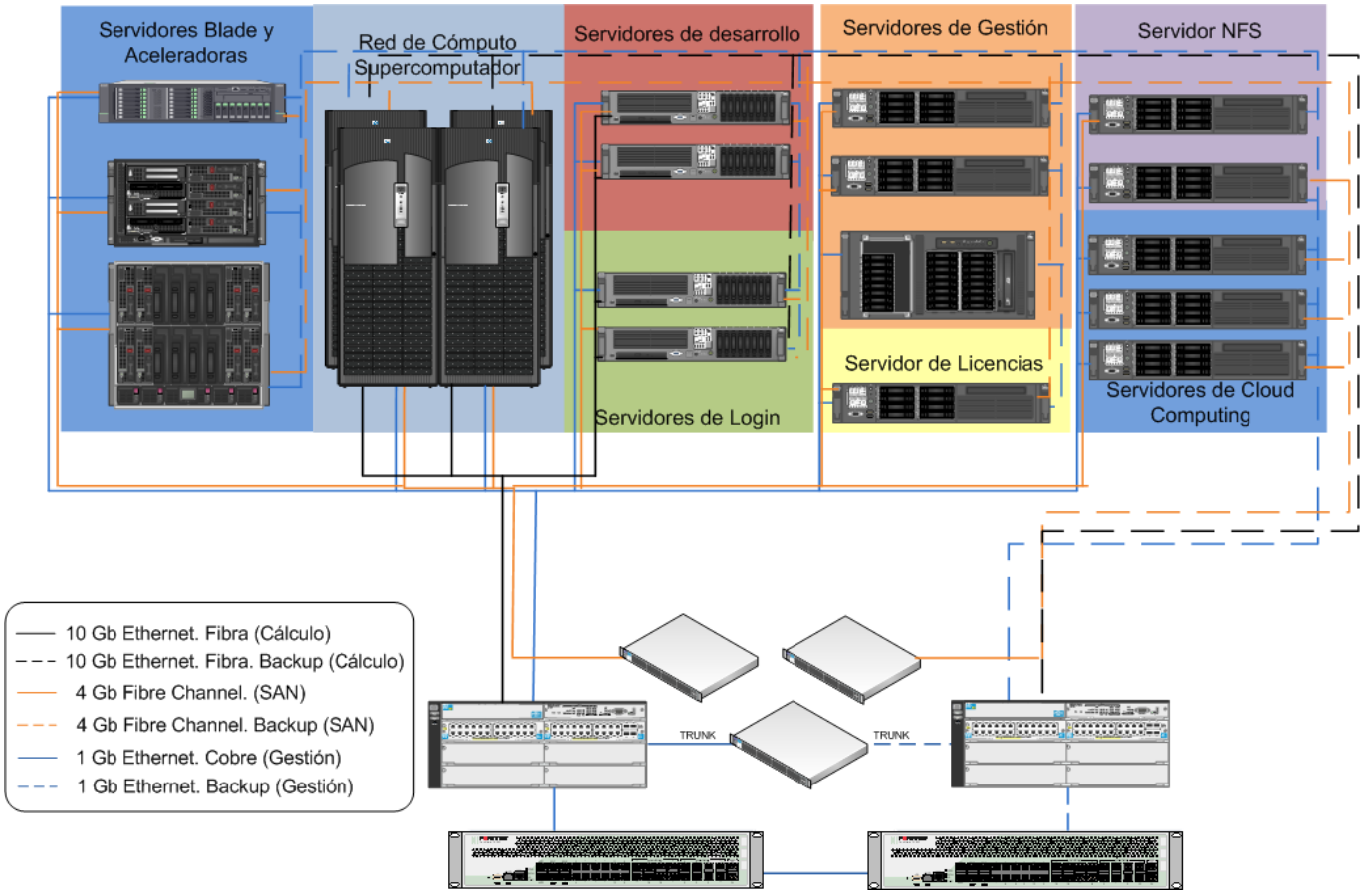
Center connectivity to the outside is solved through a 10Gbps connection with Extremadura Scientific-Technological Network, connecting main cities and technology centers in the region. CénitS is also interconnected with RedIRIS [4] and the GÉANT [5] European network.

Internally, service and computation infrastructure is structured on:

- 2 Fortinet Fortigate 1000C firewall for perimeter security, with up to 10Gbps connections, firewall capability, VPN, antivirus, intrusion detection and bandwidth management. configured as an active-passive redundant cluster of high

performance and high processing capacity

- 2 AppDirector Radware load balancers with load balancing capabilities in applications and remote management capabilities, with an active-passive redundant cluster configuration.
- 2 core switches HP ProCurve 5406ZL with 10Gbps switching capacity for computing network and 1Gbps interfaces for networks and users management. Both switches have 48 ethernet ports and 4 fiber channels each one.
- 2 switches to interconnect users and servers network, 1 HP ProCurve 2626 and 1 HP ProCurve 2810-24G, to allow other servers and users connect to the service networks.



[6]

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Links
[1] http://www.cenits.es/proyectos/desarrollo-red-infraestructuras-federadas-generacion-servicios-virtualizacion-puestos [2] http://www.cenits.es/proyectos/siatdeco-sistema-informacion-ayuda-toma-decisiones-energias-ecologicas [3] http://www.cenits.es/proyectos/modernizacion-e-innovacion-tecnologica-con-base-tic-sectores-estrategicos-tradicionales [4] http://www.rediris.es/ [5] http://www.geant.net/Pages/default.aspx [6] https://www.cenits.es/sites/cenits.es/files/centro/topologia-red-lusitania-2013.jpg