

LLR Computing Resources

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- The IT team at LLR **started managing computing services** to allow the LLR **CMS group** to be **present and active in WLCG**
 - ❑ in 2005 LLR **joined** the newborn **GRIF** T2 WLCG site
 - ❖ along the years LLR has become the **«CMS-pole» of GRIF**;
 - ❑ the local grid site turned out being a **very precious resource**;
- ... along the years, as the **landscape evolved**, we've tried to adapt our computing offer and **keep up with new needs and new technologies**
 - ❑ other groups expressed computing needs (not necessarily "grid-compliant");
 - ❑ **HPC, manycores, Cloud, ...**



General Guidelines

- We provide “**local**” **computing solutions** when/if they are needed
 - ❑ we are **complementary to** the activity of **computing centers**;
 - ❑ we provide users with tailored solutions to their specific needs.

- We try, as much as possible, to **mutualize resources and competences**
 - ❑ more **effective usage of resources**;
 - ❑ possibility to **absorb peaks** of requests;
 - ❑ **ease of administration**.

➤ Polytechnique provides a **fully equipped machine room**

❑ **600kW** cooling and electric power, **400kW under USB**

❖ electric energy/room maintenance/monitoring.. all provided by the Ecole;

❑ **~200m²** shared with other (~12) labs

❖ we currently have 10 racks (over 50. max possible 72);

❑ **renewed Fall 2014.**

➤ Very good **WAN NW** by **IN2P3/Renater/Saphir**

❑ **GrifOPN**

❑ **LHCOpn/LHCOne**



- LLR is one of the 6 **members of the GRIF Tier-2**
 - ❑ **~2.5k cores** (HTCondor + CREAM), **1PB** storage (DPM);
 - ❑ the **CMS "pole"** of GRIF
 - ❖ contacts with central CMS computing;
 - ❖ GRIF is one of the most reliable and active CMS T2's;
 - ❖ some general **CMS-related services/activities**: Xrootd EU redirector, CMS Middleware readiness testbed;
 - ❑ other active "local" VO's: ILC, T2K, Hess, Harpo.
- Local **Tier-3**
 - ❑ **~500 cores** (depends on needs);
 - ❑ shares T2 grid storage + NFS (~50TB)
 - ❖ ~50% CMS grid storage is user data;
 - ❑ **easy access**: batch, interactive access;
 - ❑ **important resource for our CMS group.**





The HPC Clusters

- Around 2012 we started managing some **HPC resources**
 - ❑ **driven by Galop** which needs a **local resource for developing** its PIC code (SMILEI)
 - ❖ **replicating PRACE/GENCI conditions** (high. tech. profile);
 - ❖ CMS as well: Higgs analysis in the VBF and ttH channels;
 - ❑ clusters are **mutualized with** the **LSI** lab
 - ❖ sharing usage, contributing to purchases and management;
 - ❖ MoU (to be signed) ruling collaboration.

- ❑ **JollyJumper**: 672 cores, FDR (56 Gb/s) IB connection
 - ❖ 2 x E5-2697 (12cores), 2.7GHz, 2GB/core ram;
- ❑ **Rantanplan**: 128 cores, QDR (40Gb/s) IB connection
 - ❖ 2 x E5620 (4cores), 2.4GHz, 6GB/core ram;
- ❑ **SPS NFS storage** (15TB) 10Gb/s and FDR IB NW.

- **P2IO** proj: **GPGPU/manycore R&D with OpenCL** (2012)
 - ❑ **heterogeneous** manycore/GPU devices for testing the code
 - ❖ **portability** being one of the key features of OpenCL;

- ✓ 2 nodes with 2 Nvidia K20 GPU cards each;
- ✓ 2 nodes with 2 Intel Xeon Phi cards each;
- ✓ 1 node with 6 Nvidia Titan GPU cards;
- ✓ 1 node with 2 AMD FirePro GPU cards;



- ❑ **dev. activity** by members and externals (e.g. CERN);
- ❑ **training**: JDEV '13, IN2P3 School '16;
- ❑ "small" productions;
- ❑ **playground** for getting in touch with **new tech's**
 - ❖ e.g. CMS users currently testing **deep learning** algorithms (via python) on **GPU-aware dockers**.



What about Cloud?

- **Many Cloud and Cloud-related projects around us**
 - ❑ LAL/Orsay OpenSTACK Cloud. Indigo DataCloud/Fed. clouds projects.
- Some **attempts** to build a computing cloud **at LLR**
 - ❑ started with a stratuslab cloud project. Now looking to Openstack;
 - ❑ partners in the proposed P2IO CEPH project;
 - ❑ **not a clear need by users**. Thus we have **never really raised the priority** to a level which could push us to production mode.
- Should we raise the priority of such projects?
 - ❑ not clear if there is a **general strategy by in2p3**;
 - ❑ at equal money/manpower this is a **resources trade-in with other computing platforms** (Grid, HPC, ...).

- Longstanding experience in **managing and delivering computing services**
 - ❑ **driven by users** requirements. **Mutualizing** resources when possible;
 - ❑ begun with **CMS Grid**. Following the evolution of needs and technologies we slowly drifted to **include HPC**;
 - ❖ the same approach hasn't led us to Cloud yet;
- **Know-how** acquired
 - ❑ manage **heterogeneous resources** and computing services: HTC, HPC, GPUs, satellite services...;
 - ❑ "customer care": quickly provide **flexible solutions to users needs**;
 - ❑ deal with **mutualized/federated "environments"**: GRIF, LLR/LSI,...

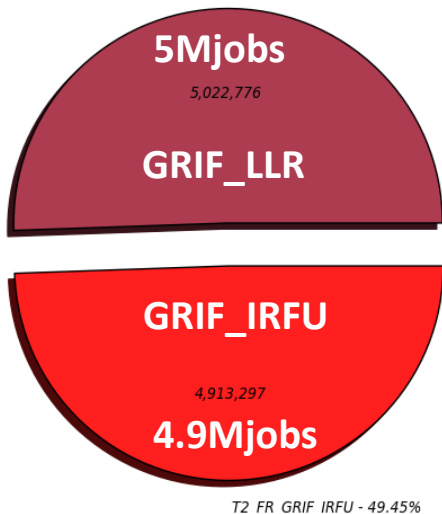
Backup Slides



CMS Grid site

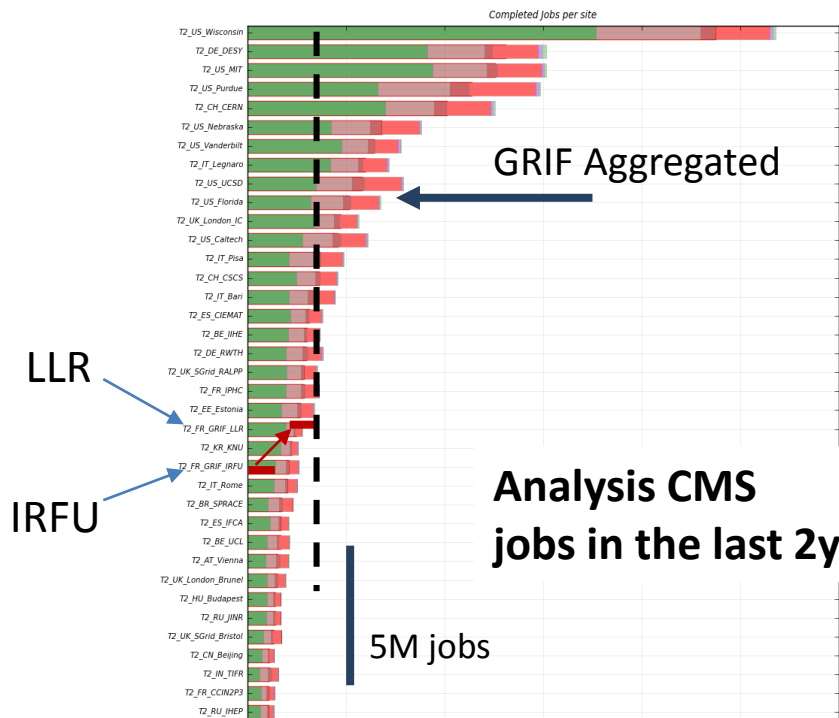


Completed jobs (Sum: 9,936,073)
T2_FR_GRIF_LLRLR - 50.55%



T2_FR_GRIF_LLRLR - 50.55% (5,022,776)

T2_FR_GRIF_IRFU - 49.45% (4,913,297)



Site Availability using CMS_CRITICAL_FULL

From 2015/07 to 2016/07

T2_FR_GRIF_LLRLR

T2_FR_GRIF_IRFU

