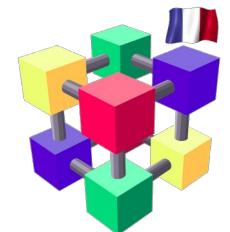




Discussion AF

Journées LCG-France – 25-27 juin 2025 – CC-IN2P3
David Bouvet, Laurent Duflot

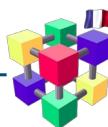
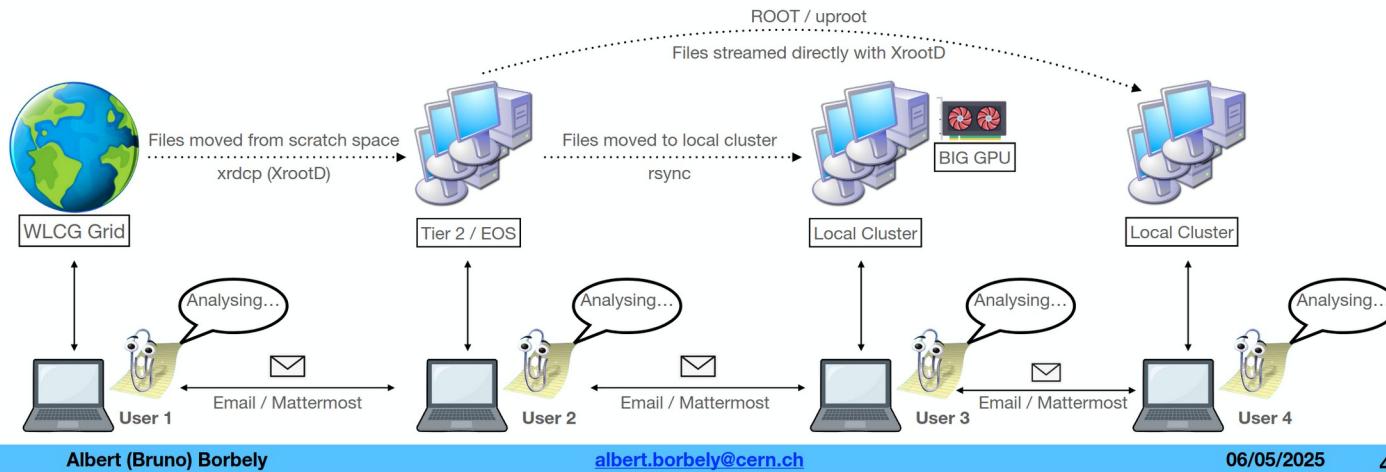




Analysis flow example



- User 1 original processing on the Grid / replicate output
- User 2 works on CERN based resources directly via EOS
- User 3 does GPU based MVA studies on local cluster, uses rsync to cp files
- User 4 works on local cluster, implicitly streams files with XrootD with ROOT



Distribution of resources

How a team can use them

- Central services exist —> tend to be busier (over utilised), teams find it easier to collaborate around
- Distributed nature of funding —> local resources tend to be freer (under utilised), harder to share amongst a team
- This discrepancy is particularly acute for GPUs, some institutes have access to several H100s, some only consumer variants. Big differences in what users can achieve in a given time scale
- Some local clusters are well integrated with a local grid site (Tier 2)



CMS

- Ressource traditionnelle : lxplus, cluster local, portable
- 7 sites offres une AF : 4 US, DESY, INFN, CIEMAT
- Future : utiliser des caches dans les AF, accès batch et interactif, outils permettant de gérer le batch comme faisant partie des *workflows* interactifs (CPU et GPU), utilisation croissante de ML → besoin du bon matériel pour assurer ML à grande échelle.

ATLAS

- Analyse = ~10 % du CPU.
- Avoir des *workflows* d'analyse standardisés, intégrer les GPU dans les *workflows*.
- Explorer différents aspects (taille des données, ML, *workflow*, interactif, batch, grille) et comment ils s'intègrent.
- Plus de cache, plus de ML, AF avec CPU et stockage (IO intensif), interactif (CPU ou GPU) ou batch (CPU ou GPU(HPC)) suivant la taille de l'analyse, outil interactif, *cloud-like facilities*.

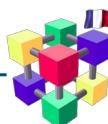
LHCb

- Fournir des outils/systèmes permettant la soumission batch quand nécessaire.
- AF disponible pour toute la VO, pas seulement les chercheurs de l'institut/l'agence de financement fournisseur.
- Traiter et réduire les jeux de données de manière centralisée afin que l'analyse finale puisse être effectuée par l'analyste sur une seule machine
~~ou~~
~~Faire en sorte que les analystes travaillant avec des ressources distribuées aient l'impression de travailler sur une seule machine.~~



- **Challenges** posed by **HL-LHC** are pushing the community to re-think HEP computing
- Faster, more **efficient** analysis **tools**...
- ... but also **better interoperability**, which can help making a **paradigm shift**
- Tools must fit **many** use **cases**:
- **Reusing** existing computing **resources** with **interactive distributed** engines
- **Pushing** a single many-core **machine** to its **limits**

J. Rembser | CERN EP-SFT | WLCG/HSF Workshop 2025



Scope of an iAF

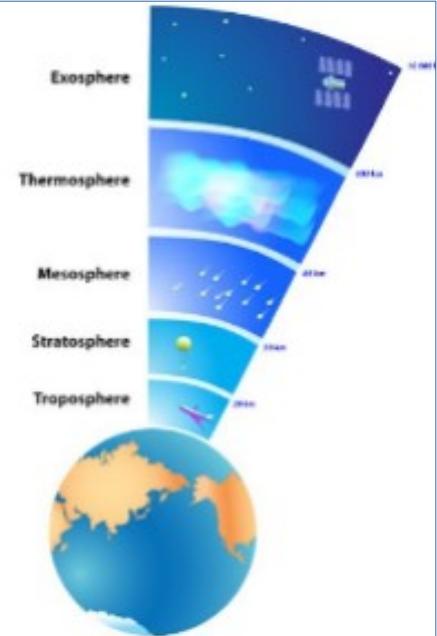
View from the Thermosphere

Aims

- Implementation agnostic
- Interface driven
- Avoidance of highly specific AF application focus
 - Avoiding data/application silos
- Defining core set of interfaces to allow for addressing specific problems

Components of an iAF

- Data/Storage at its core
 - Local scope available, mapping between group scopes if necessary
- Compute cluster for processing scale out
- Auxiliary service infrastructure for service *persistency*
 - Scale out to compute cluster
- Thin Layer for addressing specific problems instead facility optimized for specific application



The [HSF AF White Paper](#) has a list of questions to consider:

- Ability to perform [fast research iterations](#) on large datasets interactively
- Ability to convert [interactive to batch](#)-schedulable workloads
- Ability to interact with the [WLCG](#) and [scale outside](#) of the facility on occasion
- Ability to efficiently [train machine learning](#) models for HEP
- Ability to reproducibly instantiate desired software stack
- Ability to collaborate in a multi-organisational team on a single resource
- Ability to [move analyses](#) to new facilities
- Ability to efficiently access collaboration data as well as make [intermediate data products available](#) to the team
- Ability to express interdependent distributed computations at small and large scales

