Data caching in the Virtual Imaging Platform

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on behalf of the VIP project consortium

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Virtual Imaging Platform

Enabling distributed computing for medical image simulation

- **Computed Tomography**

Sindbad

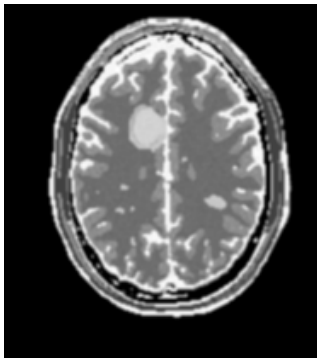
{CEA-Leti}

XCAT

- **Magnetic Resonance Imaging**

SIMRI

{CREATIS}



Brainweb + MS lesions + USPIO

- **Ultrasound imaging**

Field-II

{Technical Univ. Denmark}

Echocardiography

- **Positrons Emission Tomography**

PET-Sorteo

{CERMEP}

Zubal + tumors

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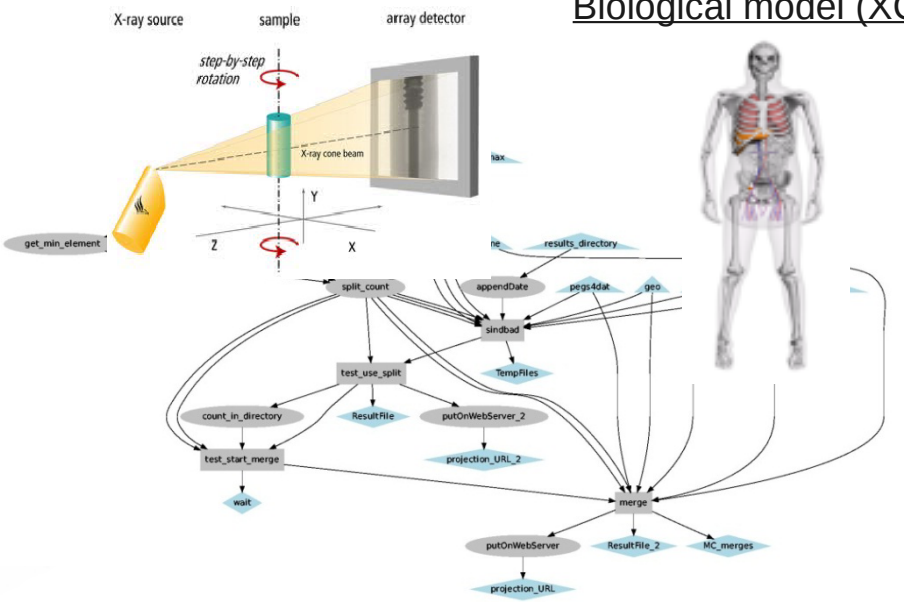
Integration of simulators

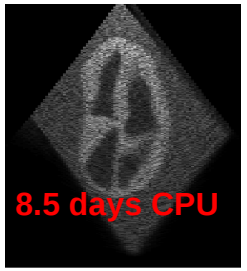
- **Workflow descriptions**
  - Task graphs
  - Data dependencies
- **Motivations**
  - Express data parallelism
  - Automated processing of applications
  - No modification of the simulator codes
- **Integrated 4 simulators**

Example for Sindbad - CT

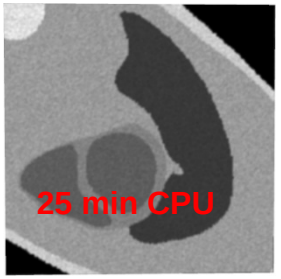
Simulation parameters

Biological model (XCAT)

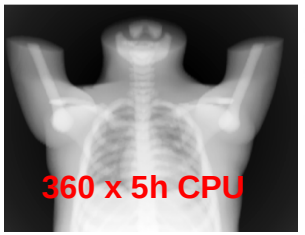




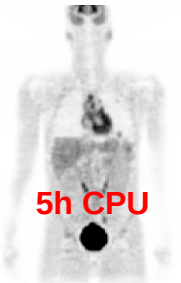
US



MRI



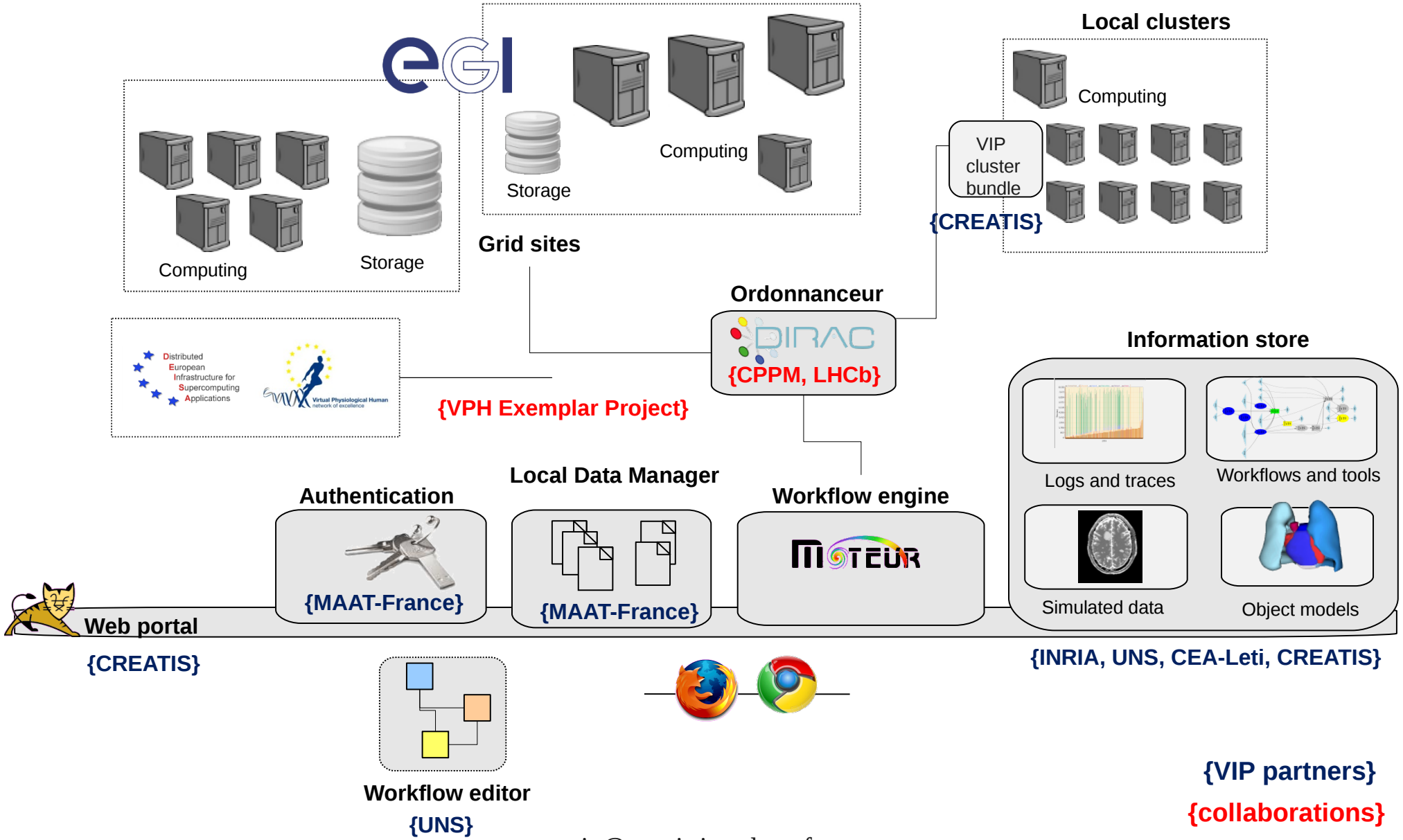
CT



PET

Simulated data

Platform outline



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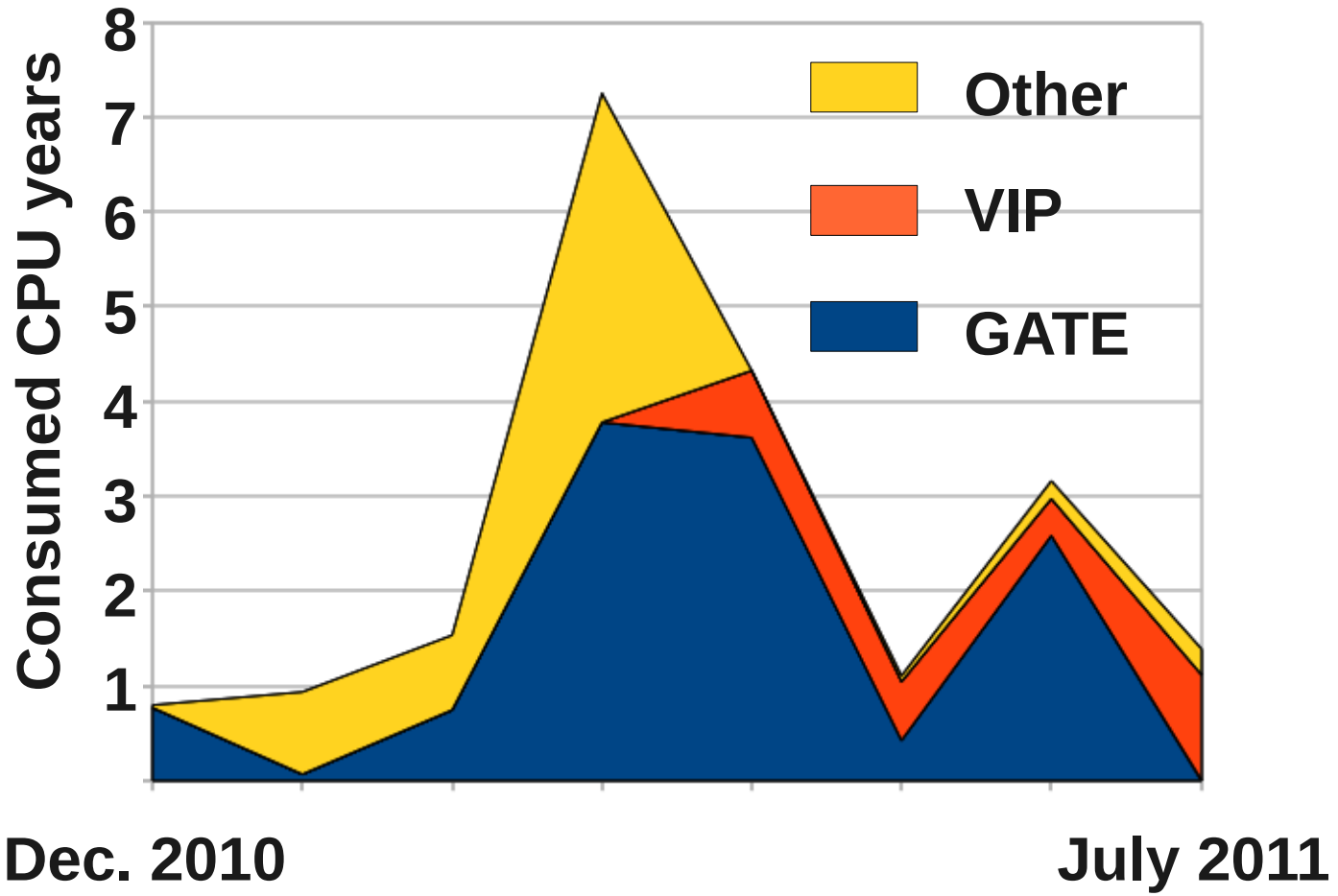
Platform usage

- **Subset of LSGC, biomed VO**



Data management problem

- **EGI three-tier data management**
  - Logical File Catalog (LFC) – single index space
  - Storage Elements (SE) – DPM, dCache, STORM, Castor
  - **Challenge: data availability between 80-95%**

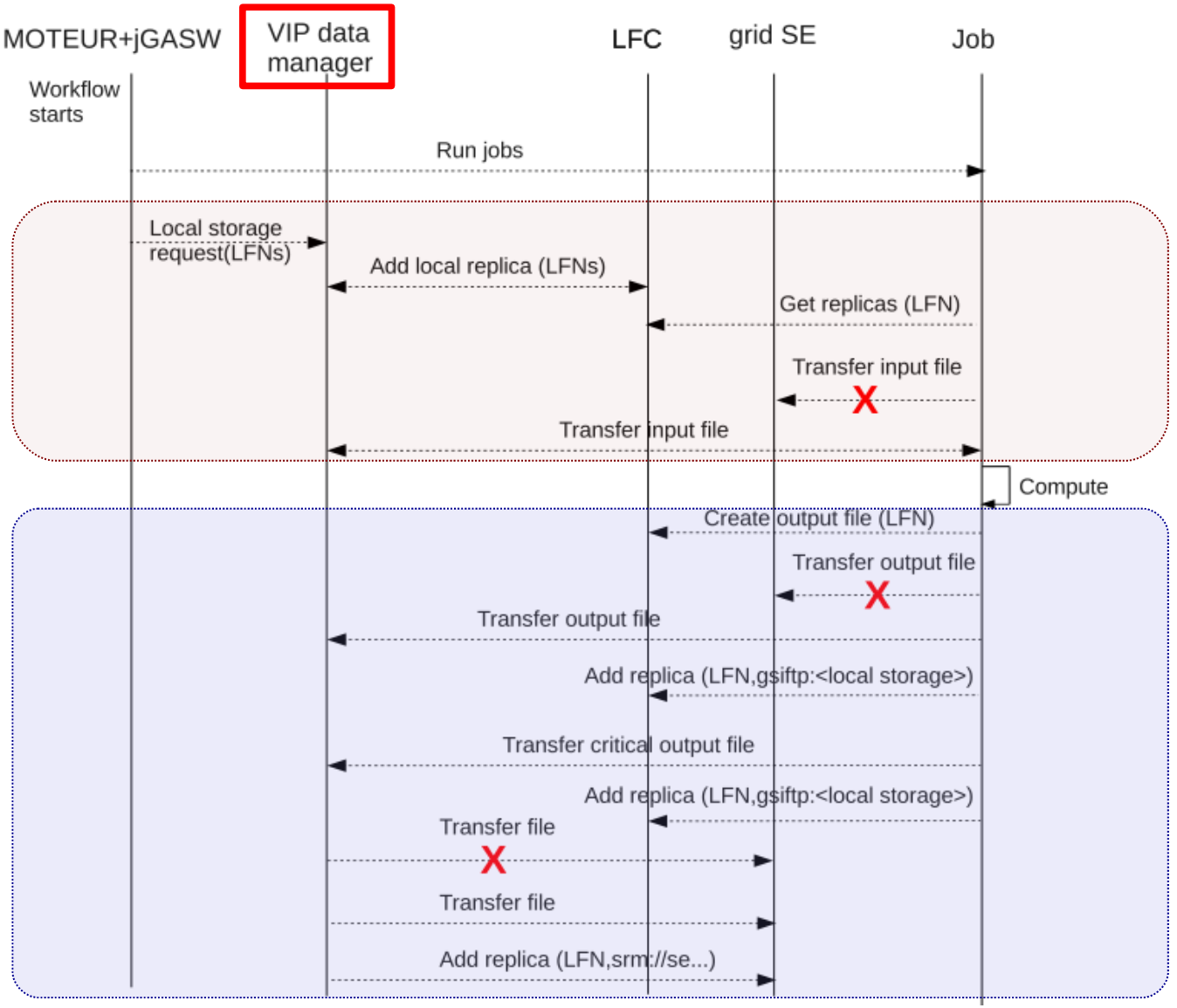
- **Data management in VIP**
  - Users upload input files to process on LFC (web interface)
  - Platform replicates these files 3 times
  - Files are cached by (pilot) jobs
  - Output files are stored on site SE; central SEs as failovers
  - Job error rates due to data transfer issues: 5-10%

Local Data Manager

- **Principle**
  - Dedicated cache SE, used at failover storage
  - Periodically tries to replicate its files to grid SEs
  - Available for users and grid jobs

- **Implementation**
  - Overlay of DPM SE
  - Not published in BDII
  - Accessed using **–no-bdii** options of lcg-utils

Use-cases


MOTEUR+jGASW
VIP data manager
LFC
grid SE
Job
Workflow starts
Run jobs
Local storage request(LFNs)
Add local replica (LFNs)
Get replicas (LFN)
Transfer input file
Transfer input file
Compute
Create output file (LFN)
Transfer output file
Transfer output file
Add replica (LFN,gsiftp:<local storage>)
Transfer critical output file
Add replica (LFN,gsiftp:<local storage>)
Transfer file
Transfer file
Add replica (LFN,srm://se...)
Input download
Output upload

Evaluation

- **Conditions**
  - EGI, biomed VO (production infrastructure)
  - Ultrasonic simulation of 128 jobs
  - Each job has 5 input files + 1 output file
  - Failure rate: 1%

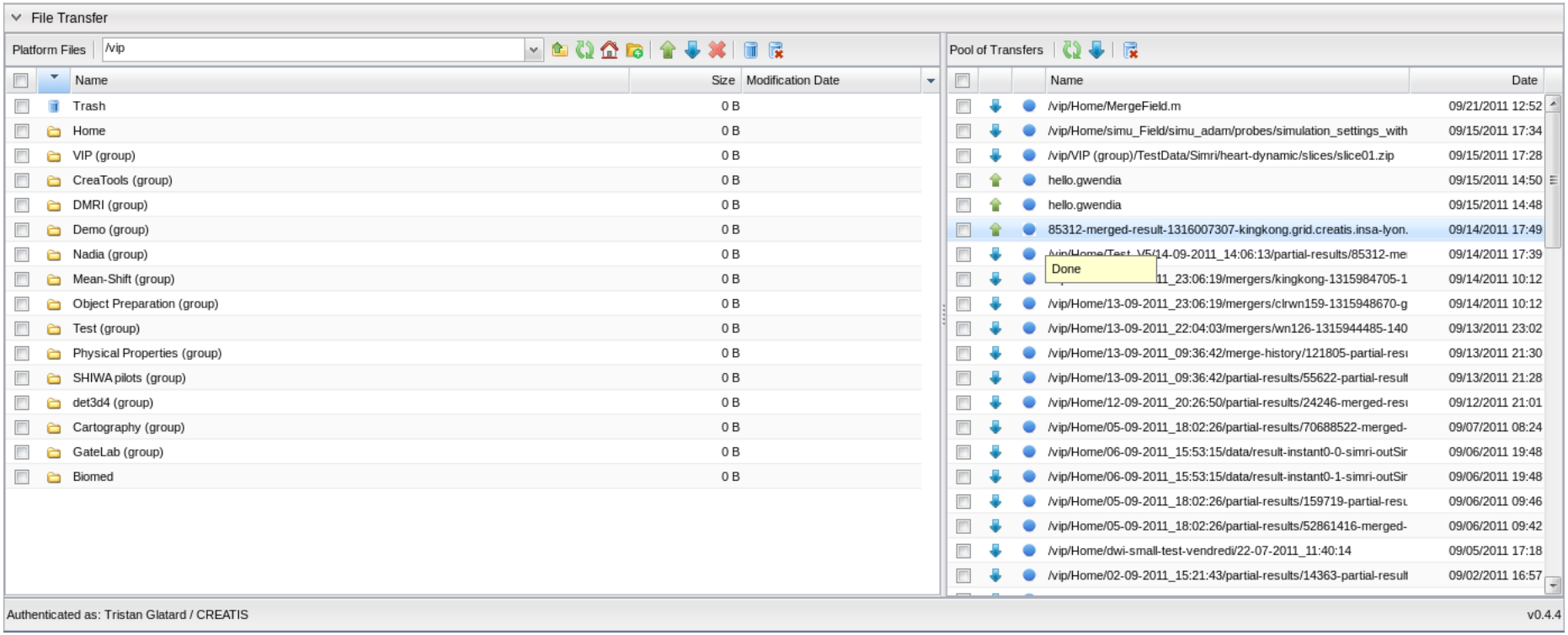
- **Results**

Data manager	Total submitted jobs	Data transfer errors	Total failed jobs
ON	130	0	2
OFF	142	11	14

- **Job data transfers failure rate is almost zeroed when failover dedicated storage is used**

Conclusion

- **Developments related to data management in VIP**
  - Web-interface to access LFC
  - Local cache used as failover SE, periodically tries to replicate its files to grid Ses
- **Substantial improvement of job reliability**
- **Web interface**



Thank you !

- **More information**
  - VIP project website http://www.creatis.insa-lyon.fr/vip
  - VIP platform: http://vip.creatis.insa-lyon.fr
  - Development roadmap: http://vip.creatis.insa-lyon.fr:9002

- **Demo and poster at France-Grilles booth (15:30-16:00)**