

Federated Storage Studies.

Develop and implement a prototype to federate WLCG centers of different levels (T1, T2) and University clusters within one National Cloud for the LHC data handling, storage, processing and analysis.

WLCG demonstrator R&D Project Proposal

Alexei Klimentov, Dirk Duellmann

*WLCG Management Board
April 19, 2016*

Project participants

- A.Kryukov⁷, D.Krasnopevtsev^{1,6}, E.Lyublev³, R.Mashinistov¹, A.Petrosyan², A.Poyda¹, E.Ryabinkin¹, S.Smirnov⁶, D.Duellmann⁸, P.Hristov⁸, M.Lamanna⁸, A.Peters⁸, P.Fuhrmann⁹, T.Mkrtchan⁹

- LHC Experiments (and beyond LHC)

^A ALICE

^B ATLAS

^C CMS

^D LHCb

^E NICA

^F XFEL

Duration 1.5 year, 2016-2017
RF team contribution 3 FTE/year

- Institutes and WLCG centers

¹National Research Center “Kurchatov Institute” (Moscow)^{A,B,D,F} *Leading Institute*

²Joint Institute of Nuclear Research – JINR (Dubna)^{A,B,C,E}

³Institute For Theoretical and Experimental Physics – ITEP (Moscow)^{A,B}

⁴Petersburg Nuclear Physics Institute – PNPI^B

⁵St.-Petersburg State University – SPbSU^a

⁶Moscow Engineering Physics Institute – MEPhI^B

⁷Skobeltsyn Institute of Nuclear Physics – SINP (Moscow)^C

⁸The European Organization for Nuclear Research – CERN (Geneva)

⁹The German Electron Synchrotron – DESY (Hamburg)

Leading PI – Alexei Klimentov

Co-PI – Andrey Kirianov, Andrey Zarochentsev

<https://twiki.cern.ch/twiki/bin/view/Sandbox/PrototypeofrussianFederatedStorage>

3/2/2016

Alexei Klimentov

2

R&D Project Motivation and Status

Motivation

R&D project to prototype and implement a federated data storage system between Russian WLCG sites and University clusters

- This project intends to implement a federated distributed storage for all kind of operations such as read/write/transfer(3rd party), and access via WAN from heterogeneous computing resources, such as Grid centers, University clusters, academic and commercial clouds and supercomputers.
- to demonstrate how data reconstruction and analysis payloads (for at least two LHC experiments ATLAS and ALICE) and for bioinformatics applications (genome sequencer group of NRC-KI) running on WLCG facilities, on super-computers and Academic cloud can access federated data

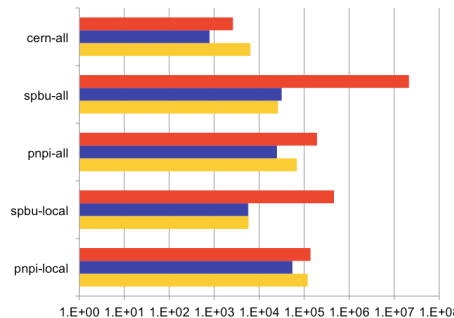
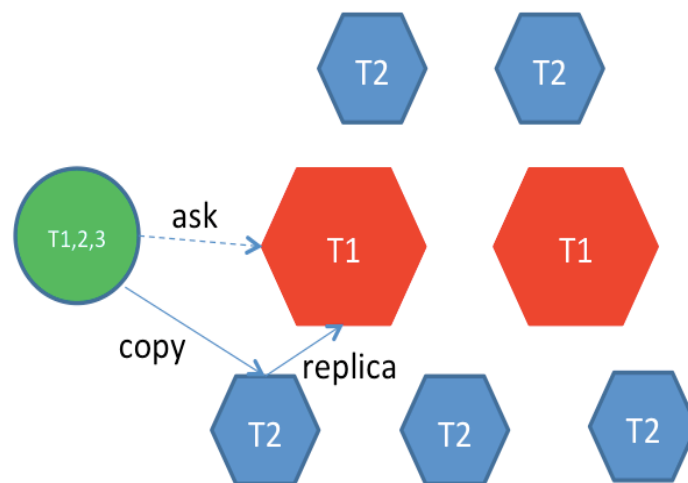
Underlying (primary) technologies : EOS, dCache

Architecture Prototype and First Results

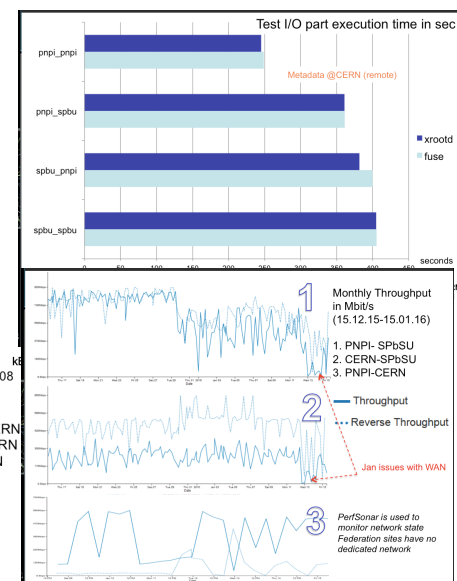
T1 sites as end-points and primary storage servers.

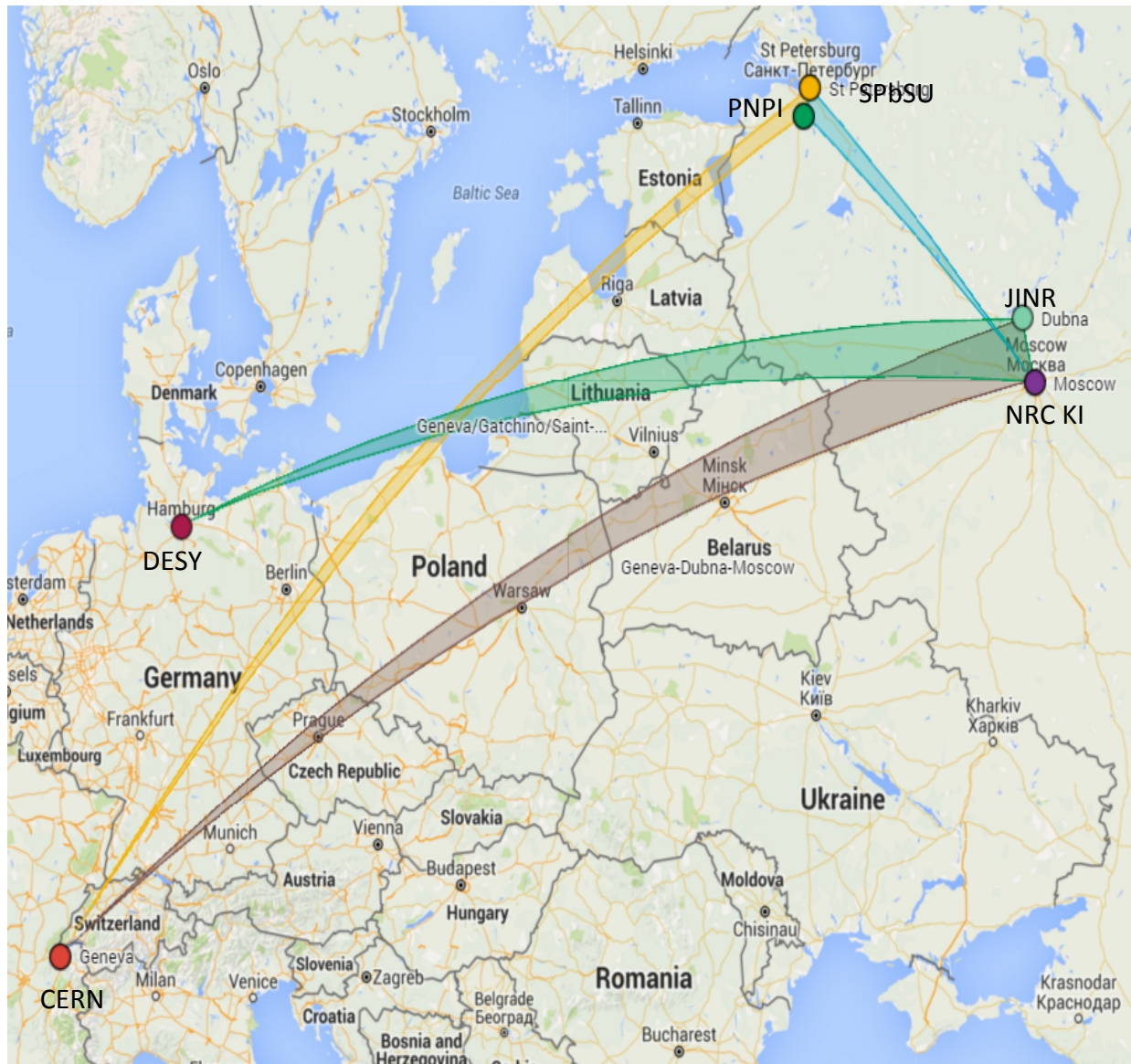
T2 sites – “secondary” storage servers

T1,2,3 – clients .



- **Legend**
 - CERN-ALL : client@CERN, data@PNPI+SPbSU, MGM@CERN
 - SPBU-ALL: client@SPbSU, data@PNPI+SPbSU, MGM@CERN
 - PNPI-ALL: client@PNPI, data@PNPI+SPbSU, MGM@CERN
 - SPBU-LOCAL : client@SPbSU, data@SPbSU, no federation
 - PNPI-LOCAL : client@PNPI, data@PNPI, no federation





The First Results (Cont'd)

Computing models for the Run3 and HL-LHC era anticipate a growth of storage needs.

The reliable operation of large scale data facilities need a clear economy of scale.

A distributed heterogeneous system of independent storage systems is difficult to be used efficiently by user communities and couples the application level software stacks with the provisioning technology at sites.

- Federating the data centers provides a logical homogeneous and consistent reliable resource for the end users

Small institutions have not enough people to support fully-fledged software stack.

- In our project we try to analyze how to set up distributed storage in one region and how it can be used from Grid sites, from HPC, academic and commercial clouds, etc.

Tested (EOS) : T2 (ATLAS, PNPI, Gatchina), T2 (ALICE, SPbSU, Petergof), CERN

Tested (EOS) : T2 (ATLAS, PNPI, Gatchina), T2 (ALICE, SPbSU, Petergof), T1 (NRC-KI, ATLAS, ALICE)

Planned : T0 (JINR, Dubna, NICA), T0 (CERN, LHC) ; EOS

Planned : NRC-KI (T1)/JINR(T1), MEPHI, SINP, PNPI, SPbSU : EOS, dCache

Planned : DESY, NRC-KI : dCache