

ILDG/JLDG Project

ILDG: International Lattice Data Grid

JLDG: Japan Lattice Data Grid

- for lattice QCD (Computational Elementary Particle Physics) community to share data
- worldwide/nationwide projects

- Overview of ILDG/JLDG
- CCS contribution 2008-2013

External Review : Feb 18 2013

T. Yoshie

- **CCS activity: a joint collaboration of Divisions**
 - High Performance Computing Systems (O. Tatebe)
 - Computational Informatics (T. Amagasa)
 - Particle Physics (Y. Kuramashi , T. Yoshie w/ fellows)
(Prior members: A. Ukawa, M. Sato, N. Ishii)

- **Talk outline**
 - (some details will be presented tomorrow)
 - 1. ILDG Overview
 - 2. CCS contribution to ILDG (2008-2013)
 - 3. JLDG Overview
 - 4. Progress of JLDG (2008-2013)
 - 5. Summary for 2008-2013 and Future

ILDG Overview: Background

- Lattice QCD (LQCD)
 - Numerical simulation on discretized space-time to understand hadron/nuclear physics from QCD (the fundamental theory of quarks/gluons)
- Fundamental data: gauge configurations
 - need huge computer resource to be generated
 - are valuable: can be used to study various physics
- Sharing configurations worldwide
 - configurations are made public
 - after completed physics study of interest
 - other groups can study other physics
 - enhances research activities in the community

ILDG Overview: before 2007

- Proposal of ILDG in 2002
 - to provide standard method of sharing config.
- Design strategy
 - realize ILDG as a grid of regional grids (RG)
 - interoperate RGs with common Interface
 - data format, markup language QCDml (Metadata WG)
 - catalogue services (WSDL), query and download tools, authentication (VOMS) (Middleware WG)
- system construction completed in 2007

CCS contribution in this period was reviewed in 2007

DiGS

DiGS: distributed grid storage
developed at EPCC, Edinburgh

**UKQCD (QCDgrid/DiGS),
UK, Edinburgh**

**LDG [lattice forum data grid],
Germany/France/Italy/...
DESY**

dCache

**JLDG, Japan
Tsukuba CCS**

**USQCD, USA
Fermilab/JLab**

dCache

Gfarm

**gfarm: grid data farm
developed at
AIST and Tsukuba**

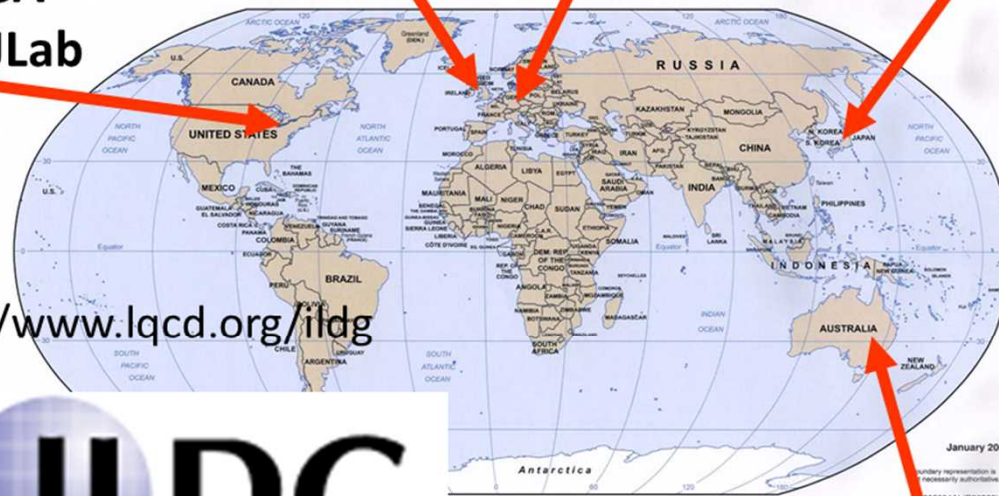
<http://www.lqcd.org/ildg>



**dCache: distributed data storage
caching system
developed by a joint collab.
of DESY and FNAL**

**CSSM, Australia
Adelaide**

dCache



CCS Contribution to ILDG (2008-2013)

- Contribution to the ILDG activity
 - operate the gateway between ILDG and JLDG (JLDG works as the Japanese grid of ILDG)
 - T.Y. joins the Metadata working group
 - update QCDml
 - T.A. joins the Middleware working group
 - system upgrade and maintenance
 - T.Y. and Y.K. the ILDG board member (chair in 2009, hosted two video workshops)
 - hosts Plone (official web page) and Inca (monitoring system) since 2013

- Contribution to the community
 - Faceted Navigation System
 - web application to help users search ensembles (ensemble: set of configurations with common physics parameters)
 - developed by T. Amagasa with discussion on facets with physics members
 - public release of gauge configurations
 - PACS-CS configurations released in 2009 and 2013
 - 10 ensembles 3800 config. 8TB
 - Access from outside Japan over 2500 times
 - (Access from inside Japan is not recorded)
 - Config. generated by major LQCD Collab. in Japan (CP-PACS, JLQCD) were already archived
 - 59 ensembles, 39K configurations, 14.5TB (in total)

Faceted Navigation

- Narrowing ensemble search based on facets
 - facets: categories of XML documents (in this case, physics parameters in markup language QCDml)

QCDml Faceted Navigation

rgrid
[cssm \(22\)](#)
[ldg \(6\)](#)
[JLDG \(54\)](#)
[ldc \(130\)](#)
[ukqcd \(9\)](#)
[USQCD \(39\)](#)
[www.lqcd.org \(1\)](#)

collaboration
[CP-PACS \(12\)](#)
[CP-PACS+JLQCD \(30\)](#)
[CSSM \(22\)](#)
[dik \(2\)](#)
[etmc \(54\)](#)
[JLQCD \(6\)](#)
[LHFC \(8\)](#)
[MLC \(31\)](#)
[PACS-CS \(6\)](#)
[qcdsf \(67\)](#)
[RBC-LKQCD \(9\)](#)
[theta \(7\)](#)
[UKQCD \(7\)](#)

projectName
[2+1 DMF \(9\)](#)
[2+1 Dynamical AsqtAD \(31\)](#)
[asqtad_3264_b7095_Ione \(1\)](#)
[Baryon Resonances \(1\)](#)
[clover_nF2 \(36\)](#)
[clover_n2p1 \(39\)](#)
[Dynamical FUG Studies \(2\)](#)
[Electromagnetic Form Factors \(1\)](#)
[FUG Overlap Studies \(6\)](#)
[Flux Tube Test \(1\)](#)
[Gluon Propagator \(6\)](#)
[Long_asqtad_run \(2\)](#)
[Pentaquark Volume Dependence \(1\)](#)
[Quark Propagator Studies \(3\)](#)
[RQNF2 \(NF=2 full QCD with iwasaki RG gauge and tadpole improved clover quark action\) \(12\)](#)
[RQNF2+1 \(NF=2+1 full QCD with iwasaki RG gauge and non-perturbatively O\(a\) improved wilson \(clover\) quark action\) \(36\)](#)
[RgDvNF2 \(NF=2 full QCD with iwasaki RG gauge and overlap quark action with topology fixing extra Wilson](#)

Filter Condition(s):
>>

Ensemble(s) (261):

#1 [12/12/12/24] mc://JLDG/CP-PACS. iwasakiRGGluonAction (beta=1.800) tpCloverQuarkAction (nf=2/kappa=0.140) [Show XML] [Show LFNs]

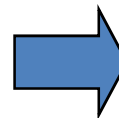
#2 [12/12/12/24] mc://JLDG/CP-PACS. iwasakiRGGluonAction (beta=1.800) tpCloverQuarkAction (nf=2/kappa=0.143) [Show XML] [Show LFNs]

#3 [12/12/12/24] mc://JLDG/CP-PACS. iwasakiRGGluonAction (beta=1.800) tpCloverQuarkAction (nf=2/kappa=0.144) [Show XML] [Show LFNs]

#4 [12/12/12/24] mc://JLDG/CP-PACS. iwasakiRGGluonAction (beta=1.800) tpCloverQuarkAction (nf=2/kappa=0.146) [Show XML] [Show LFNs]

#5 [16/16/16/32] mc://JLDG/CP-PACS. iwasakiRGGluonAction (beta=1.950) tpCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

#6 [16/16/16/32] mc://JLDG/CP-PACS. iwasakiRGGluonAction (beta=1.950) tpCloverQuarkAction (nf=2/kappa=0.139) [Show XML] [Show LFNs]



QCDml Faceted Navigation

rgrid
[JLDG \(6\)](#)

collaboration
[PACS-CS \(6\)](#)

projectName
[RQNF2+1 \(NF=2+1 full QCD with iwasaki RG gauge and non-perturbatively O\(a\) improved wilson \(clover\) quark action\) \(6\)](#)

date
[2009 \(6\)](#)

size
[32/32/32/64 \(6\)](#)

numberOfFlavours
[2+1 \(6\)](#)

gluon
[iwasakiRGGluonAction \(6\)](#)

quark
[npCloverQuarkAction \(12\)](#)

beta
[1.900 \(6\)](#)

kappa
[0.1364000 \(6\)](#)
[0.1366000 \(1\)](#)
[0.1370000 \(1\)](#)
[0.1372700 \(1\)](#)
[0.1375400 \(2\)](#)
[0.1377000 \(1\)](#)
[0.1378100 \(1\)](#)

mass
mu

Filter Condition(s):
>> rgrid=JLDG >> collaboration=PACS-CS

Ensemble(s) (6):

#1 [32/32/32/64] mc://JLDG/PACS-CS. iwasakiRGGluonAction (beta=1.900) npCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

#2 [32/32/32/64] mc://JLDG/PACS-CS. iwasakiRGGluonAction (beta=1.900) npCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

#3 [32/32/32/64] mc://JLDG/PACS-CS. iwasakiRGGluonAction (beta=1.900) npCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

#4 [32/32/32/64] mc://JLDG/PACS-CS. iwasakiRGGluonAction (beta=1.900) npCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

#5 [32/32/32/64] mc://JLDG/PACS-CS. iwasakiRGGluonAction (beta=1.900) npCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

#6 [32/32/32/64] mc://JLDG/PACS-CS. iwasakiRGGluonAction (beta=1.900) npCloverQuarkAction (nf=2/kappa=0.137) [Show XML] [Show LFNs]

Publications

- Building the International Lattice Data Grid
G. Beckett, B. Joo, C.M. Maynard, D. Pleiter, O. Tatebe, T. Yoshie
Comput.Phys.Commun.182:1208-1214,2011
- Making Use of the International Lattice Data Grid
Tomoteru Yoshie
Plenary talk at Lattice 2008, PoS LATTICE2008:019,2008
- A Faceted-Navigation System for QCDml Ensemble XML Data
Toshiyuki Amagasa, Noriyoshi Ishii, Tomoteru Yoshie, Osamu
Tatebe, Mitsuhisa Sato, Hiroyuki Kitagawa
Proc. International Conference on P2P, Parallel, Grid, Cloud and
Internet Computing (3PGCIC), Fukuoka, Japan, pp. 132-139,
November 2010.

JLDG Overview: Concept and System

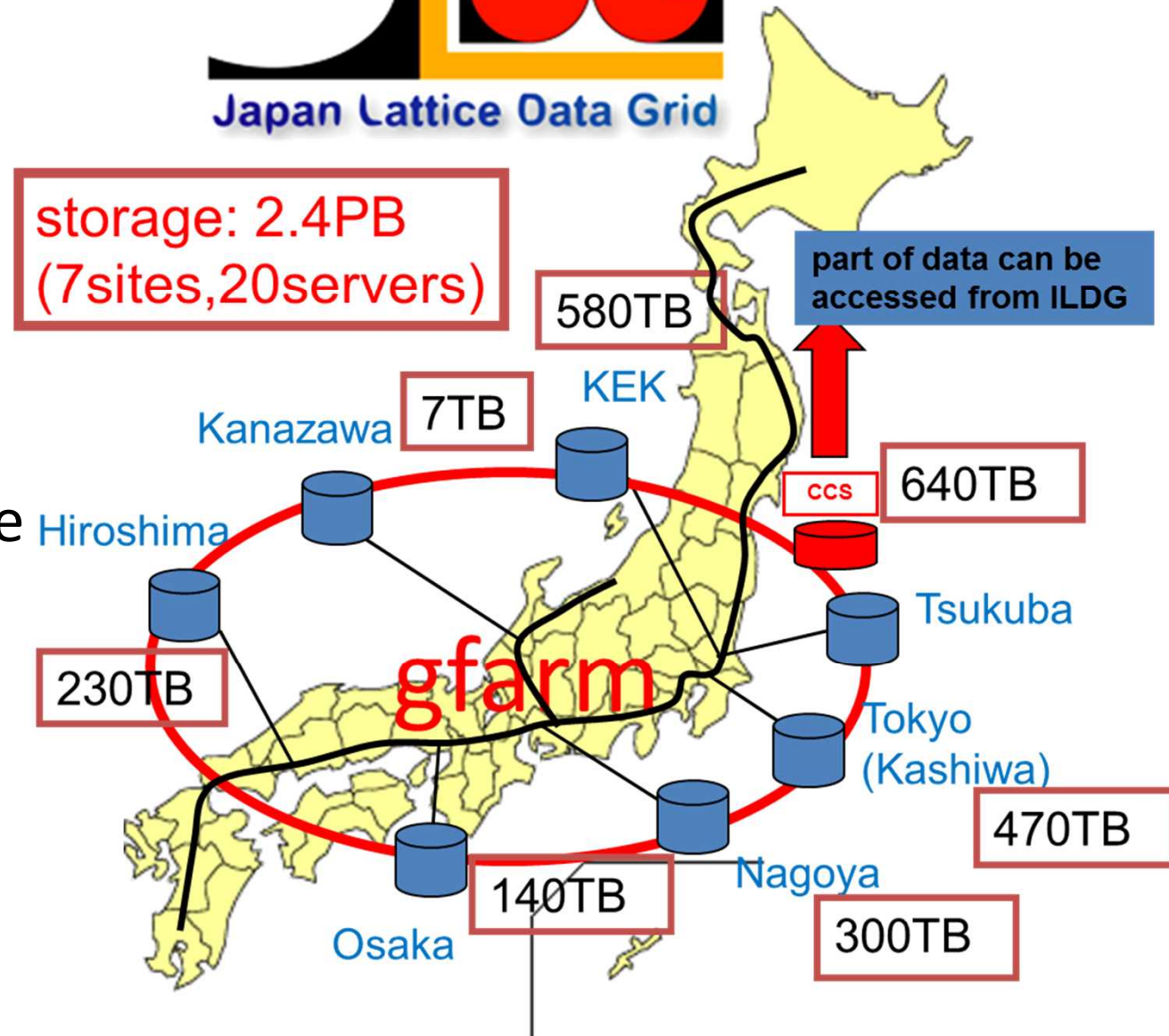
- Purpose
 - Large LQCD collaborations in Japan use various supercomputers distributed over distant sites
 - JLDG provides such collaborations with an efficient method of data management and sharing
 - Because the file system looks the same from any sites, users can do analyses (measurement of physical quantities) on a supercomputer on a site, using data generated and stored in the JLDG at a different site.



7 sites

1Gbps VPN
(HEPnet-J/sc)

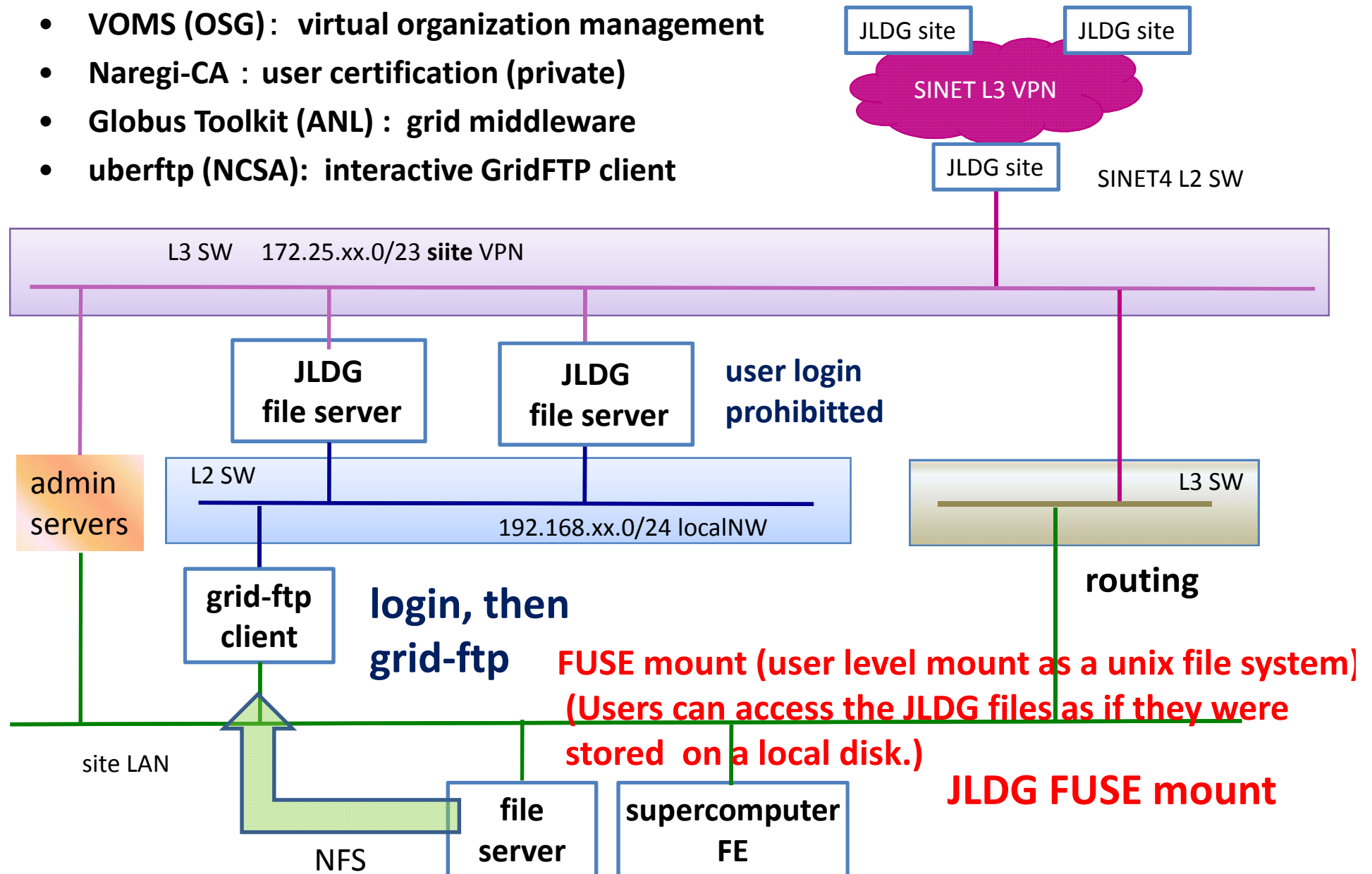
File systems are
bounded into
a single FS



Gfarm: a grid-based file system software (O. Tatebe)

JLDG software components and site network

- **Gfarm** (AIST, Tsukuba): global file system
- **VOMS** (OSG): virtual organization management
- **Naregi-CA** : user certification (private)
- **Globus Toolkit** (ANL) : grid middleware
- **uberftp** (NCSA): interactive GridFTP client



JLDG Overview: Operation Policy

- Any lattice QCD collaborations in Japan can use the JLDG without charge with no quota
- can store data of any type (configurations, quark propagators, etc.) if these data should be shared within collaboration
- JLDG team discusses everything of JLDG
 - developers (computer scientists at Tsukuba)
 - representatives of JLDG sites
 - representatives of collaborations
- No JLDG specific budgets
 - part of physics/computer science budget is devoted

Progress of JLDG 2008-2013 : Chronology

- ✓ **2005/11 Start of Development**
- ✓ **2007/03 Prototype implementation on 5 sites**
- ✓ **2008/06 Official start of operation, connected to ILDG**
- ✓ **2009/12 Research groups started to store daily research data (user/group access control)**
- ✓ **2011/12 FUSE mount (gfarm2fs) operation started**
- ✓ **2012/06 Two new sites joined JLDG**
- ✓ **2013/12 Cooperation with HPCI Shared Storage mount both JLDG and HPCI SS file systems, copy files in multiple streams**
- ✓ **2014/03 More 2 sites will join JLDG**

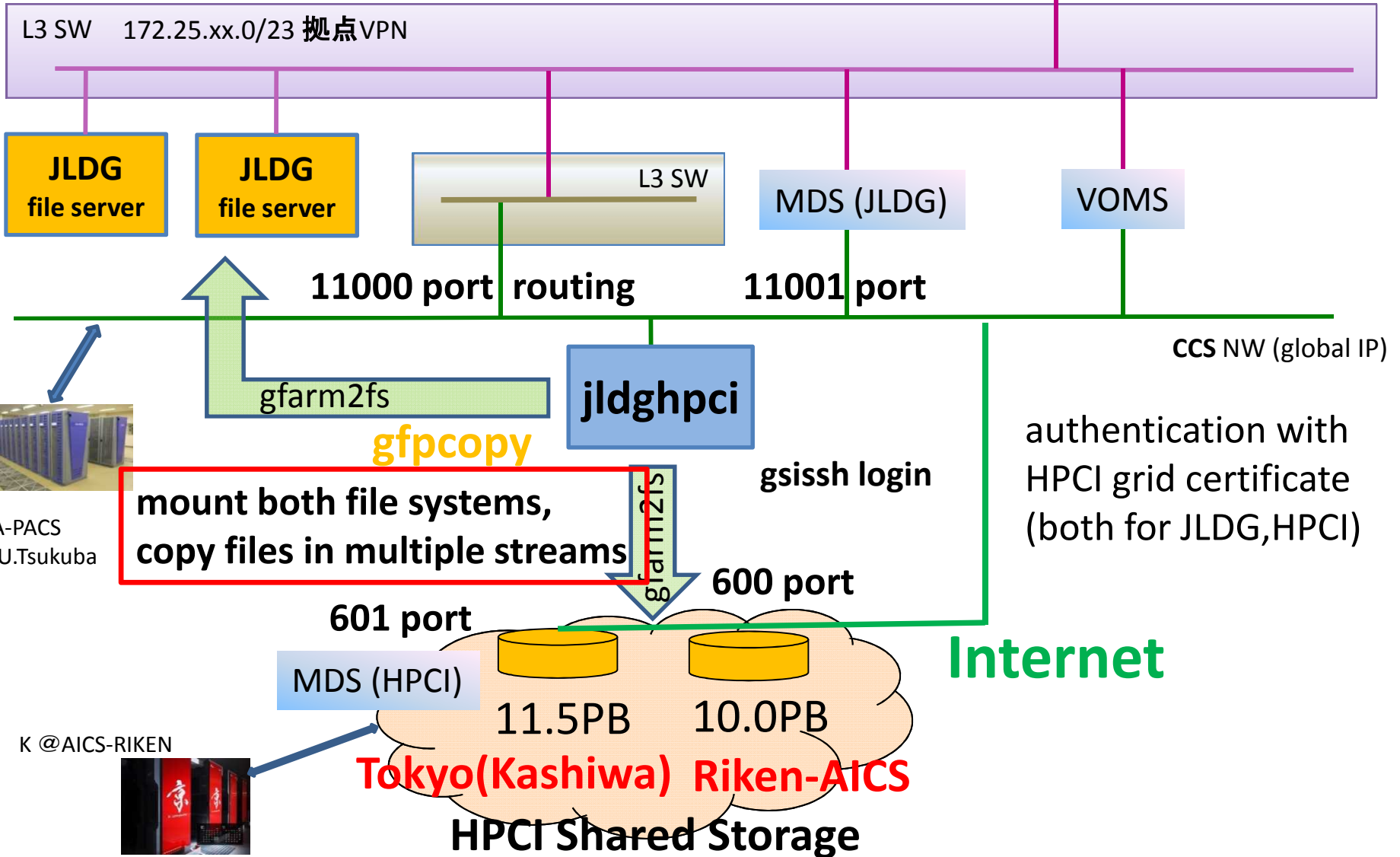
HPCI: national project started in 2011 for constructing High Performance Computing Infrastructure.

cooperation with HPCI shared storage

@Tsukuba, CCS JLDG(7-sites)



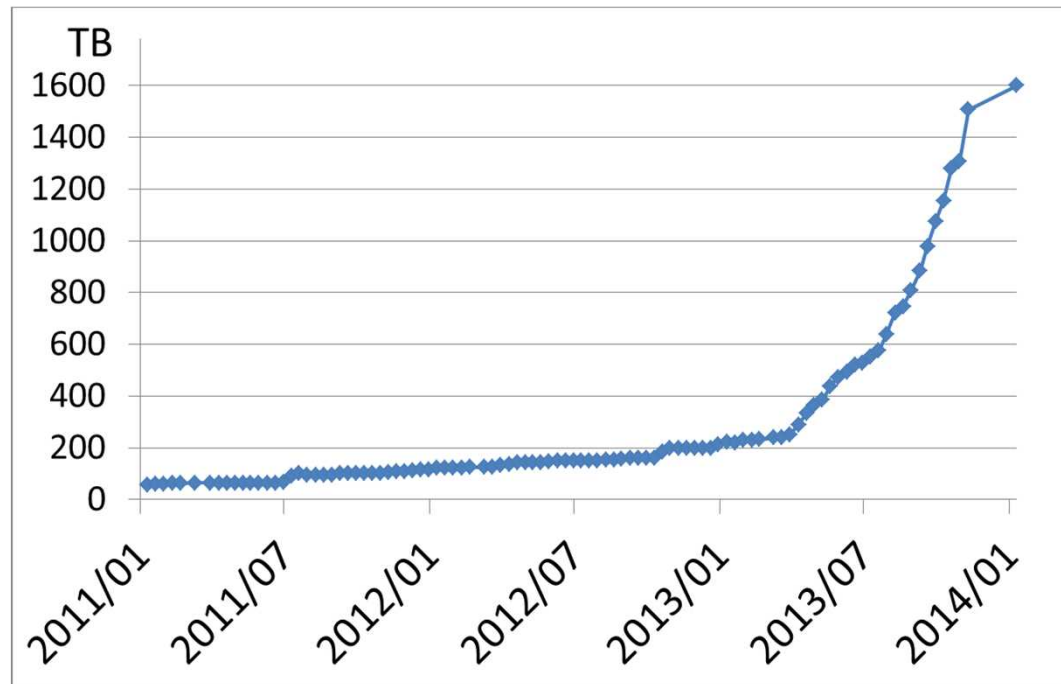
SINET L3 VPN



parallel copy of large and many files: 90MB/s (1Gbps NW)

JLDG Statistics

- 11 research groups, 67 users
- 1.6PB data, 57M files
- 66 publications for works used the JLDG (as of Feb. 2013)



JLDG Disk Usage

Summary for 2008-2013 and Future

- JLDG has grown up to an useful infrastructure for LQCD community in Japan
- ILDG has been in stable operation
- New movement of ILDG
 - assigning each ILDG ensemble a unique DOI
 - interoperation with Globus Online
- JLDG
 - computer cooperation via JLDG
 - e.g. automatic submission of measurement job on a supercomputer triggered by configuration store from a different supercomputer