



TYL:COMP_03

GRID Interoperability

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Project Outline

- CC-IN2P3 and KEK Computing Research Center are collaborating for establishing Grid interoperability among the different middleware
 - Also covers other Grid/Cloud computing issues
- Leader
 - CC-IN2P3: Dominique Boutigny
 - KEK CRC: Mitsuaki Nozaki



Workshop

- Once a year regularly
- We had a workshop on March 13-13, 2012 in the last JFY
 - 5 Japanese visited CC-INP3 and another Japanese joined via video
 - Grid operation
 - Activities related computing in Belle2 and ILC were introduced and we discussed how we solve their needs
 - Belle II Grid is a big mater of KEK and experiences in LHC certainly will help us
 - Presentations for R&D in the both sides
 - SAGA, iRODS and etc
 - Preparation for a big natural disaster was also a topic
- Networking in the technology to connect friends each other and Grid is the technology to share the resource among good friends
 - Building the trust among people collaborating is very important for stable operations



GRID OPERATION



New central computer system at KEK

- The budgets for the central computer system and the B-factory computer system were merged and one new system has been introduced
 - Super Computer is independent
- The system includes data analysis system, **Grid services**, cloud service, web services, mail services and etc.
- KEK replaces the systems every 4-6 years
 - KEK makes a contract as a service, not a hardware purchase
 - Engineers from companies onsite is including



New Central Computer System



Central Computer System
(KEKCC)



B-Factory Computer System



new KEKCC

Service-in on Apr/2012



Features of New KEKCC

- The official operation in production begun on April 1st
- Main Contractor : **IBM**
 - 3.5 years rental system (until Aug/2015)
- 4000 cores of CPU
 - Linux cluster (SL5)
 - Interactive / Batch servers
 - Grid (gLite) deployed
- Storage system for BIG data
 - 3.6PB disk storage (DDN)
 - 3.2PB disk HPSS cache
 - Tape library with max. capacity of 16 PB
 - High-speed I/O, High scalability



KEK supercomputer system

<http://scwww.kek.jp/>

KEKSC is now in service / fully installed soon.

- For large scale numerical simulations
- System-A is running Sep 2011—Jan 2012
- System-A+B/2: March 2012–
- **System-A: Hitachi SR16000 model M1**
 - Power7, 54.9 TFlops, 14TB memory
 - 56 nodes: 960GFlops, 256GB/node
 - Automated parallelization on single node (32 cores)
- **System-B: IBM Blue Gene/Q**
 - 6 racks (3 from Mar 2012, 3 from Oct 2012)
 - 1.258PFlops, 96TB in total
 - Rack: 1024 nodes, 5D torus network
209.7TFlops, 16TB memory
- **Scientific subjects**
 - Large-scale simulation program (<http://ohgata-s.kek.jp/>)





Grid services at KEK

- gLite/EMI
 - Belle, Belle2, ILC, T2K
- iRODS
 - T2K, MLF and other J-PARC experiments
- NAREGI
 - Japanese national infrastructure



Cloud service on KEKCC

- Platform ISF was deployed on the system
 - A commercial product to provide a cloud service
- SL5 is the standard operating system on KEK CC, but we are going to provide a cloud service for people who want their own environment
- Still in preparation and to be announced when the service becomes ready
 - Further development is necessary to install user provided virtual machines



French Asia VO

- CC-IN2P3, KISTI, IHEP and KEK are federating using gLite/EMI
 - IHEP joined the federation recently
 - Computing resource and data sharing between France and Asian countries
 - Geant4 system test could be an application
 - To be discussed
- CC-IN2P3 and KEK using iRODS also

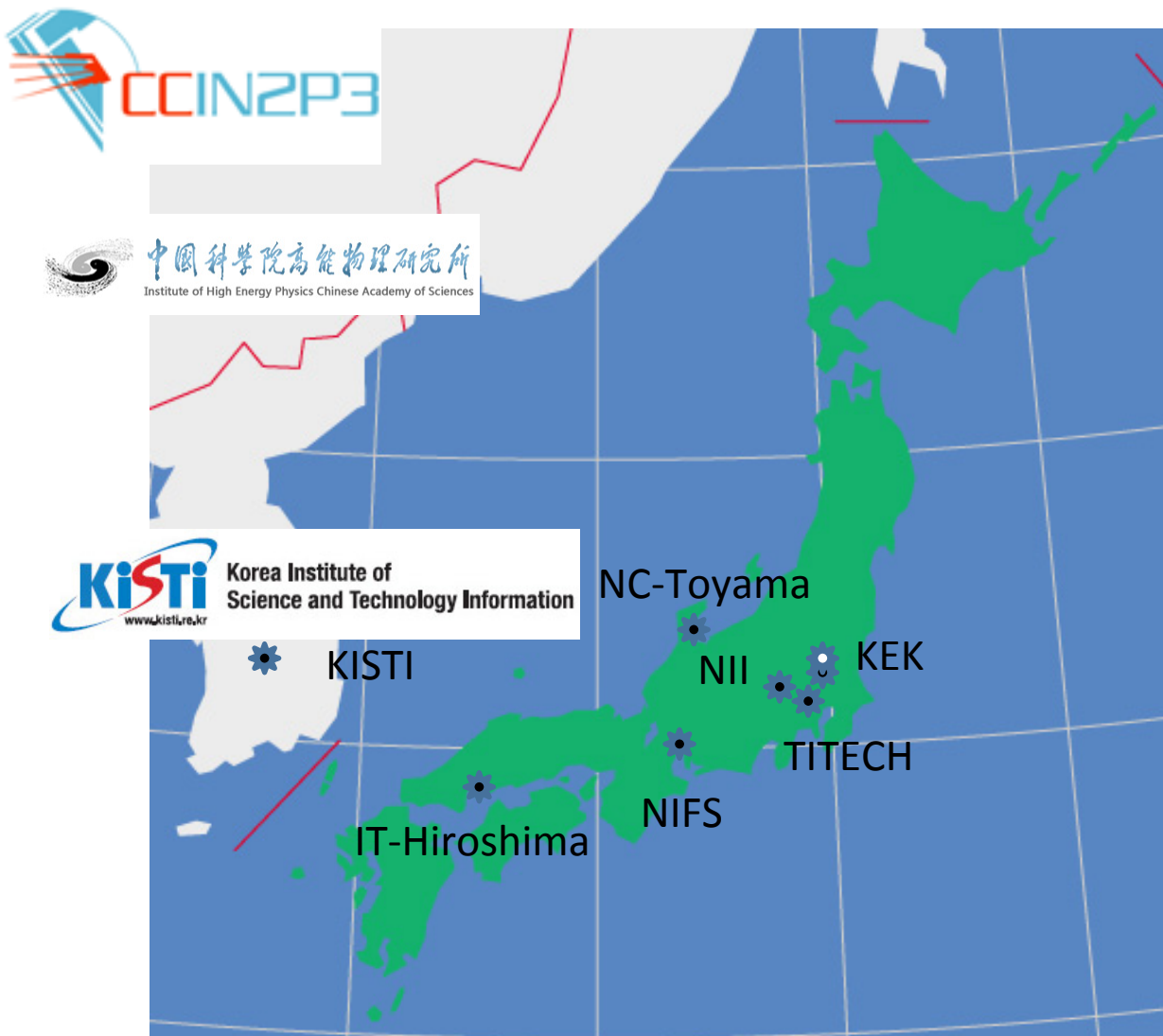


NAREGI@KISTI

- NAREGI is the Grid middleware developed by NII
- KISTI hosts a NAREGI site for the Grid interoperability R&D
- This is the only site outside of Japan where NAREGI is running
 - NII also thanks them for their help
 - CC-IN2P3 had a one before, but the operation was abandoned



The Grid interoperation view from KEK CRC



- ✿ NAREGI
KEK, NII, TITECH, KISTI,
NC-Toyama, NIFS,
IT-Hiroshima
- ✿ GRID: gLite
CC-IN2P3, IHEP, KISTI
- ✿ GRID: Globus
KEK, LSU(XSEDE)
iRODS
CC-IN2P3, QMUL



LSU(USA)



iRODS federation

- iRODS is the alternative data grid solution
 - Easier to deploy and use even for smaller groups
 - CC-IN2P3 deeply involves in the development
- CC-IN2P3, QMUL(UK) and KEK are federating for T2K data sharing and iRODS R&D
- CC-IN2P3 has done gLite and iRODS integration and KEK will follow
 - SRM for iRODS is the common interests



SAGA

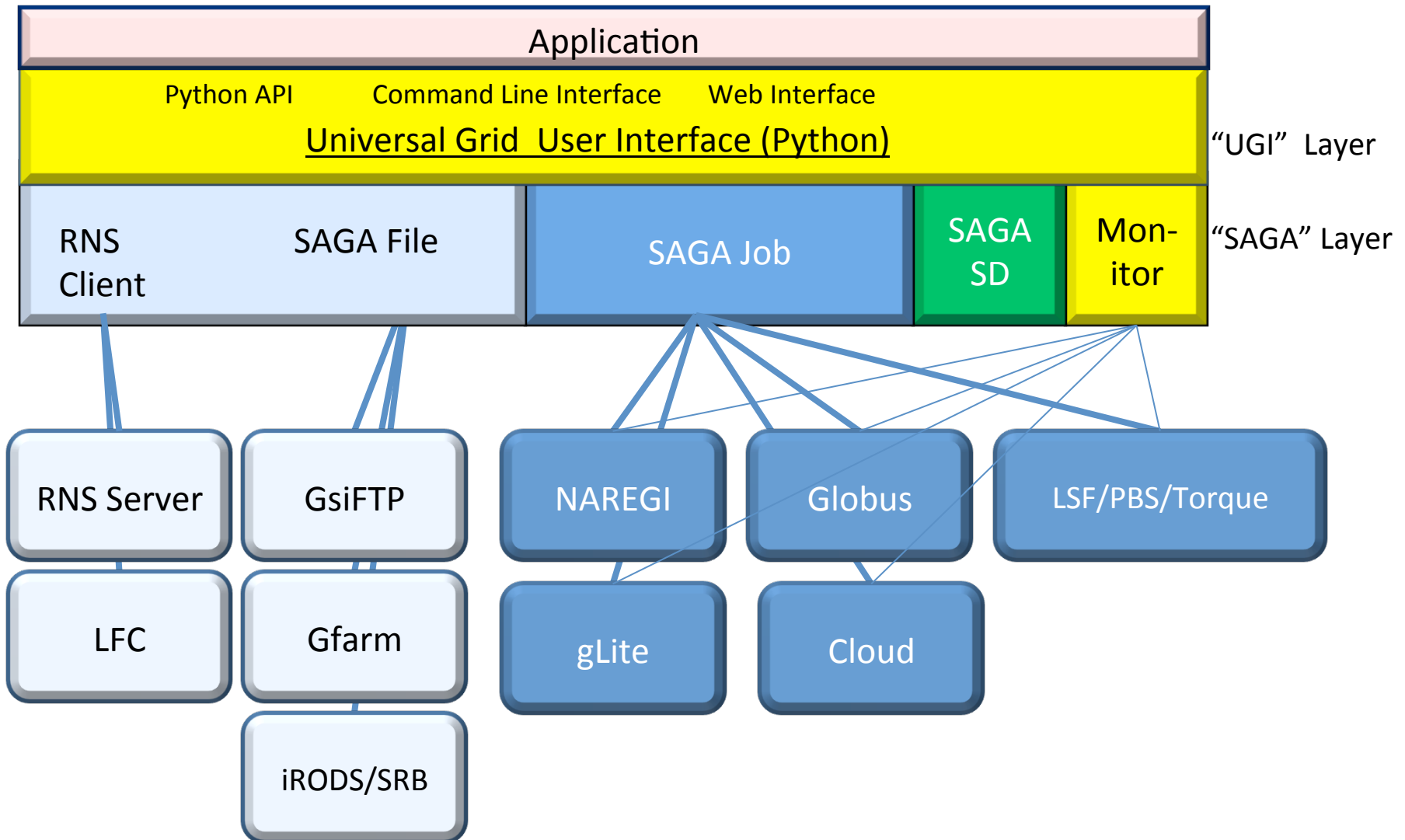


UGI/SAGA

- Providing the unified user environment for job sub handling and file handling for the distributed computing including Grid, cloud, batch and etc.
- UGI has been developed as a python library
 - Web interface can be implemented easily by Django
- SAGA is the underlying layer of UGI
 - Joined the efforts on international standardization
 - Developed the adaptors for the C++ implementation
 - Two independent JAVA implementations are also available
- Applications are implemented using UGI
 - Particle therapy simulation and ILC



Architecture of UGI





UGI Web interface


UGI - Mozilla Firefox

ファイル(E) 編集(E) 表示(V) 履歴(S) ブックマーク(B) ツール(I) ヘルプ(H)

http://kek2-uidev.cc.kek.jp:24881/pts/

Google

UGI



UNIVERSAL GRID INTERFACE

Home

VOMS Proxy Issue

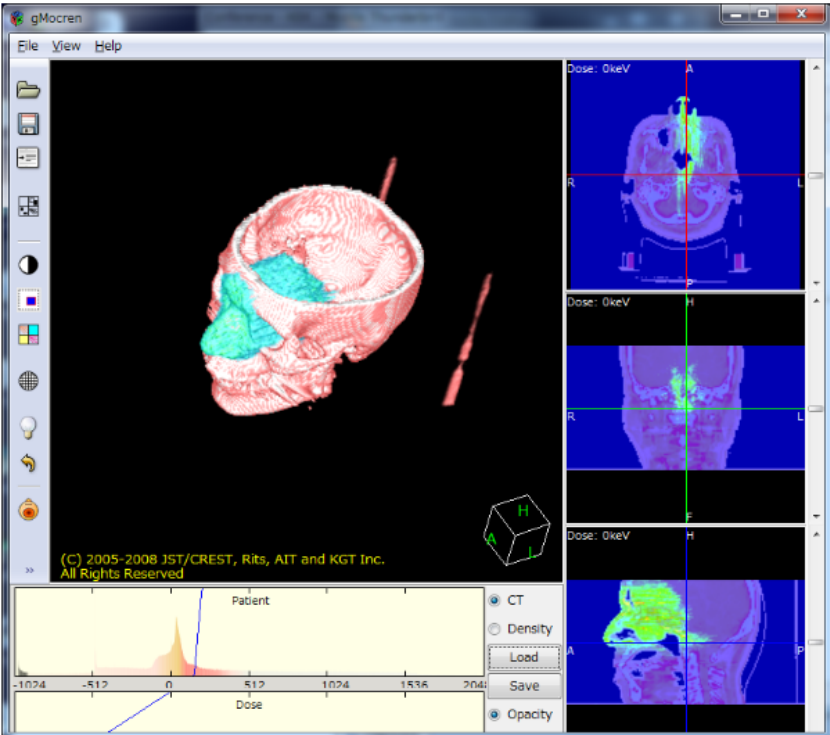
Submit Task

Job Monitor

List GDD Files

Quit Web Server

Demonstration of Particle Therapy Simulation



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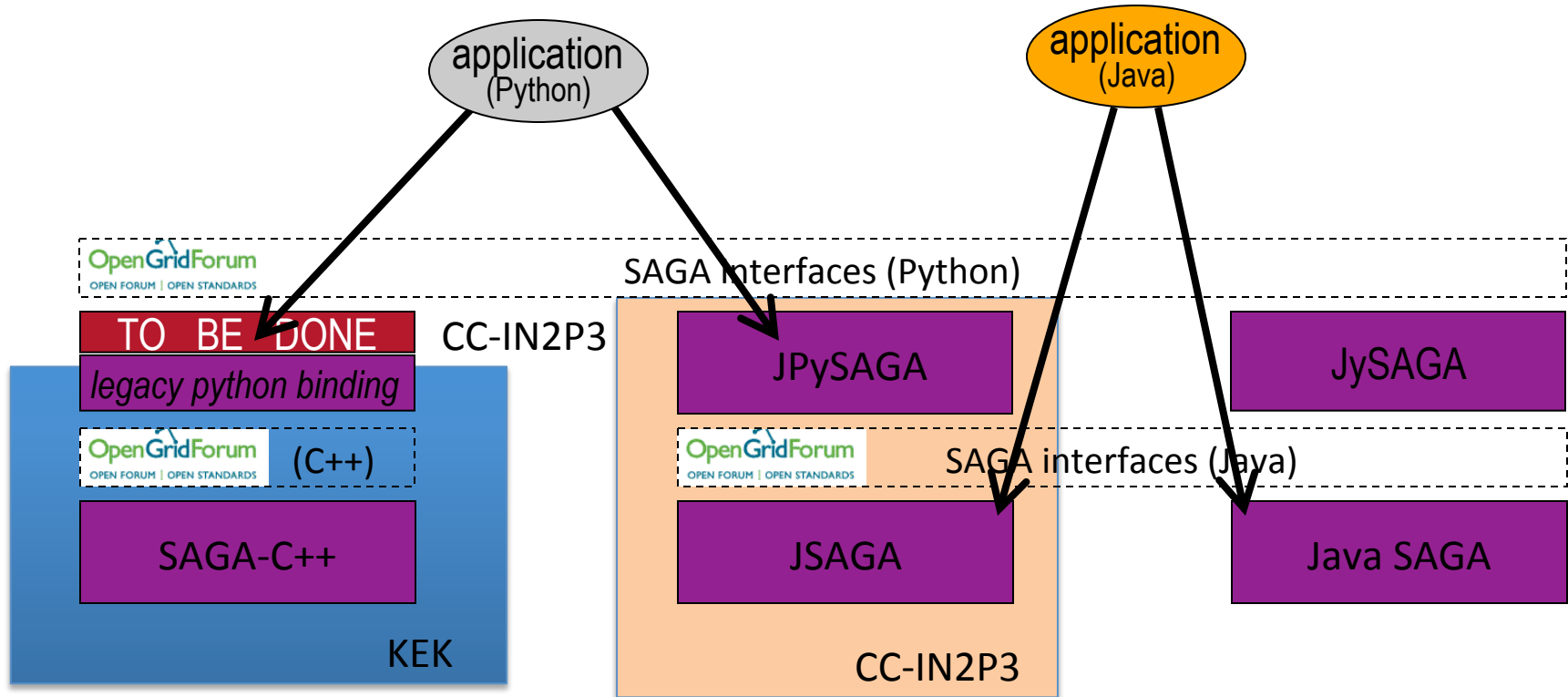


SAGA Discussion with CC-IN2P3

- CC-IN2P3 has been contributed for Java implementation of SAGA
- JPySAGA developed by CC-IN2P3 will integrate the both C++/Python and Java implementations of SAGA
- KEK will use JPySAGA to use the adaptors implemented in Java through JPySAGA



SAGA Python binding





DISASTER RECOVERY



Disaster recovery

- “Disaster” that comes from human error or hardware failure were taken into account before
- We were preparing for “disasters” in such way
 - Regular disk backup
 - System design with high availability
 - UPS
 - Only for 10 minutes
- How we could prepare for the big natural disaster?
 - CC-IN2P3 offered a help to us, but we could make use of it
 - No power supplied in the long time



Damages on computer systems

- UPS was still providing the electricity even after the failure of the KEK electric power facility by the earthquakes
- However, we had to turn off the main breaker to avoid the fire and evacuate the building
- We were still lucky enough
 - Super computer
 - No damage because the system had been shutdown for the system replacement
 - Belle Computing system
 - Many disks were broken
 - Central computer
 - GPFS MDS had inconsistency because of sudden power outage and some files were lost
 - No hardware damage
 - Networking
 - No hardware trouble



Often we say,

**A natural disaster strikes when
people lose their memory of
the previous one.**



Tornado attacked Tsukuba on May 6



<http://pic.twitter.com/6A5AMV8y>

TYL/FKPPL 2012

<http://twitpic.com/9hwhho>

Hojo Area



Damages by the tronado



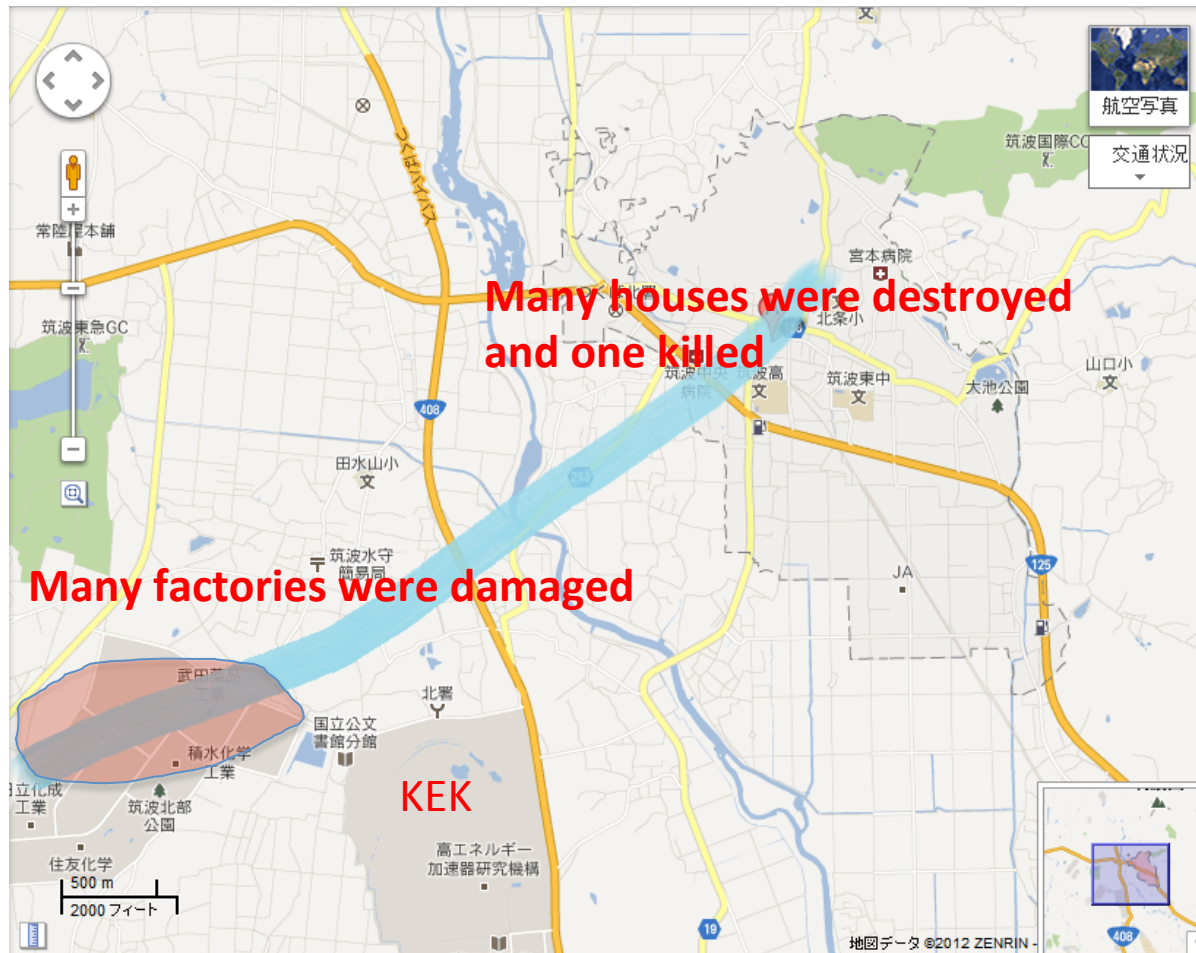
<http://twitpic.com/9hx9jq>



<http://www.integral.co.jp/blog/other/2012/05/10-758>



The path of the tornado





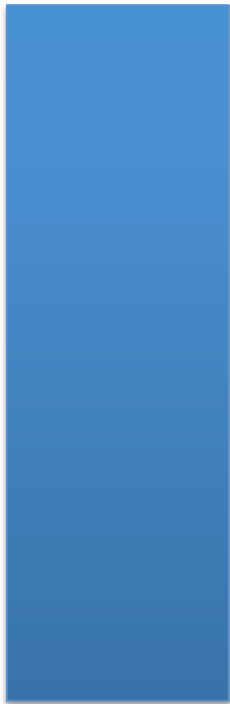
How we prepare for the next one?

- Off-site backup is important
- Stand-by servers on a cloud service is a possibility
 - DNS service should be backed up
- Web service is rather easier
 - Always we may hold the link to the stand-by server on the top page
 - Search engines like google will guide the people
- Mail service
 - Out sourcing ?
 - Everywhere in Japan have a chance for a big earthquake
 - Mail contents are too sensitive to store off-site



New R&D for secure off-site backup

Original file



Encrypt

Encrypted file



File chunks n+1



CC-IN2P3



KISTI



CC-IN2P3



IHEP



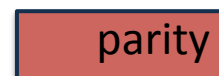
Cloud storage C



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Divided into chunks

TYL/FKPPL 2012



New developments

- KEK starts the development for a secure off-site backup
 - Chop one encrypted file into smaller files and parity
 - There is no chance to be decoded at each sites
- Micro services of iRODS will be developed to automate the processes
- Possibility of utilize a cloud service will be considered also
 - CC-IN2P3 is working to provide a cloud service
- We will discuss with other institutions for the future collaboration



Summary

- Dominique Boutigny and his colleagues at CC-IN2P3 helped Computing Centers in Asian countries to collaborate each other
 - We deeply thank them for their efforts
 - Toward Bellell Grid, collaboration among computing centers is very important also
 - We needed the trigger
- Recovery from the big natural disaster is newly emerging issue
 - Japan is the disaster rich country
 - Earthquakes, typhoons and even tornados