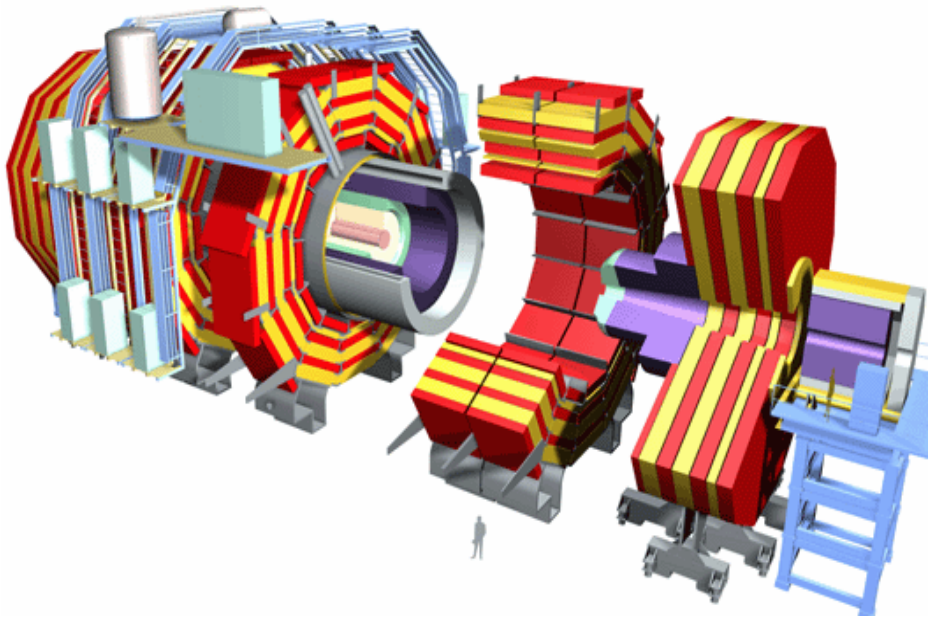
CMS Heavy Ion Tier2 Centre at the Seoul Supercomputer Center



HPC Asia 2007 Conference
Sep. 12, 2007

Inkyu PARK
Dept. of Physics, University of Seoul

Prof. H.S. Min, J.W. Park S.G. Kang, G.R. Hahn, M.K. Choi, Y.S. Kim

Contents

Open Science Grid

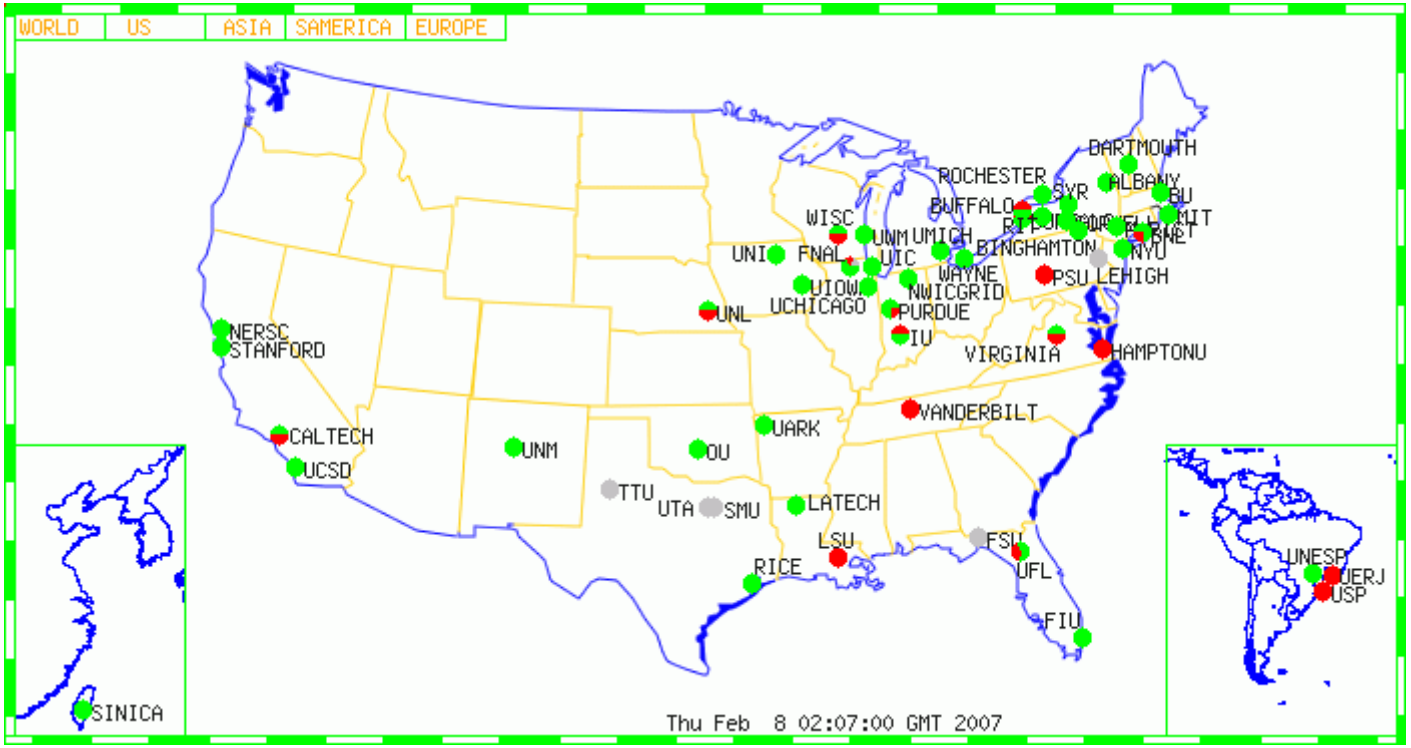
OSG (Open Science Grid)

- OSG is a distributed computing infrastructure for scientific research
- Consortium of universities, national lab, computing industries.
- Contribute and share resources benefit
- Supported by NSF and DoE
- www.opensciencegrid.org

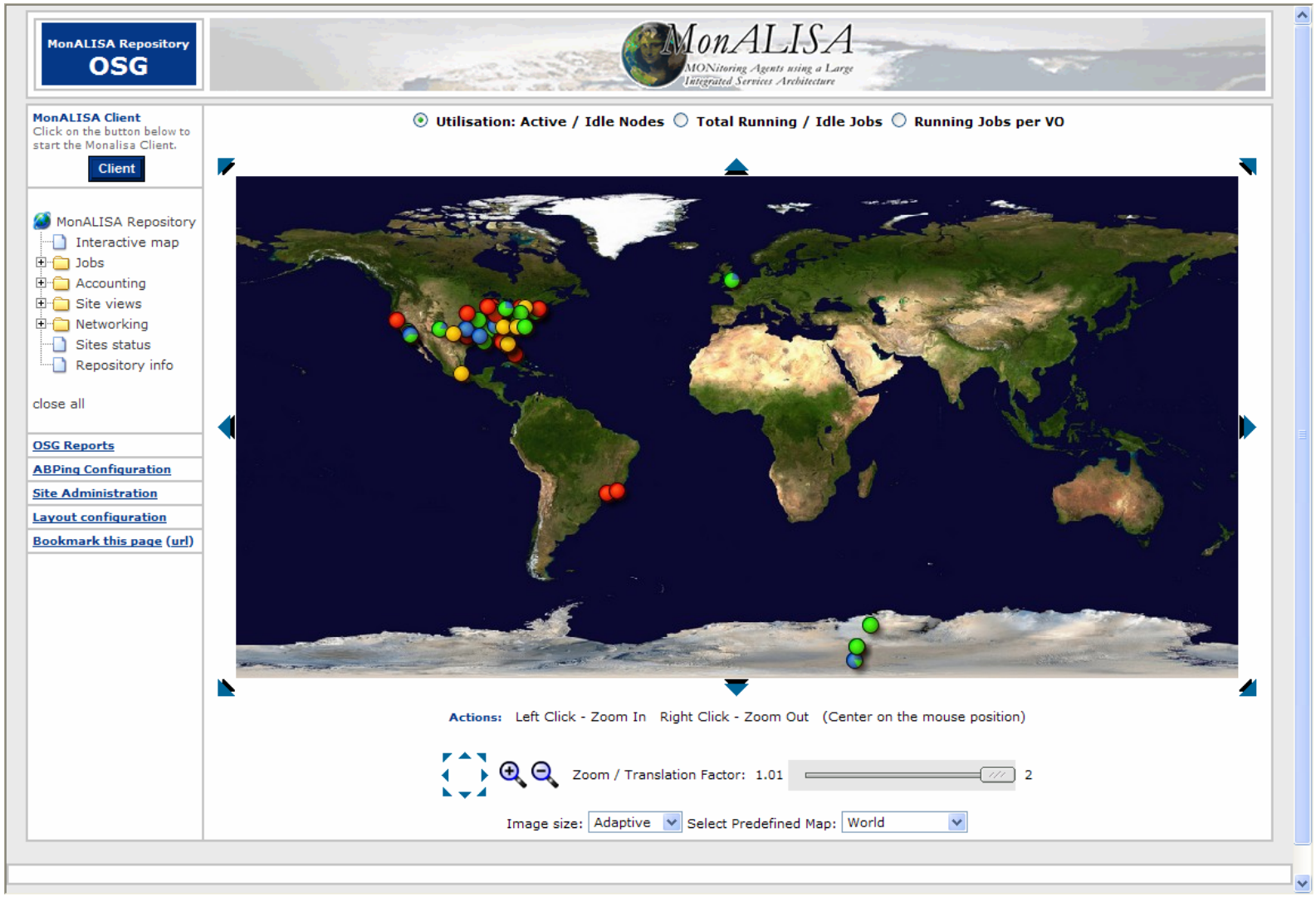
- Many VOs
  - GADU (bio), Football pooling problem (Math)
  - CDF, STAR, Susy simulation, etc. (Physics)

OSG GridCat


View Live Grid Status

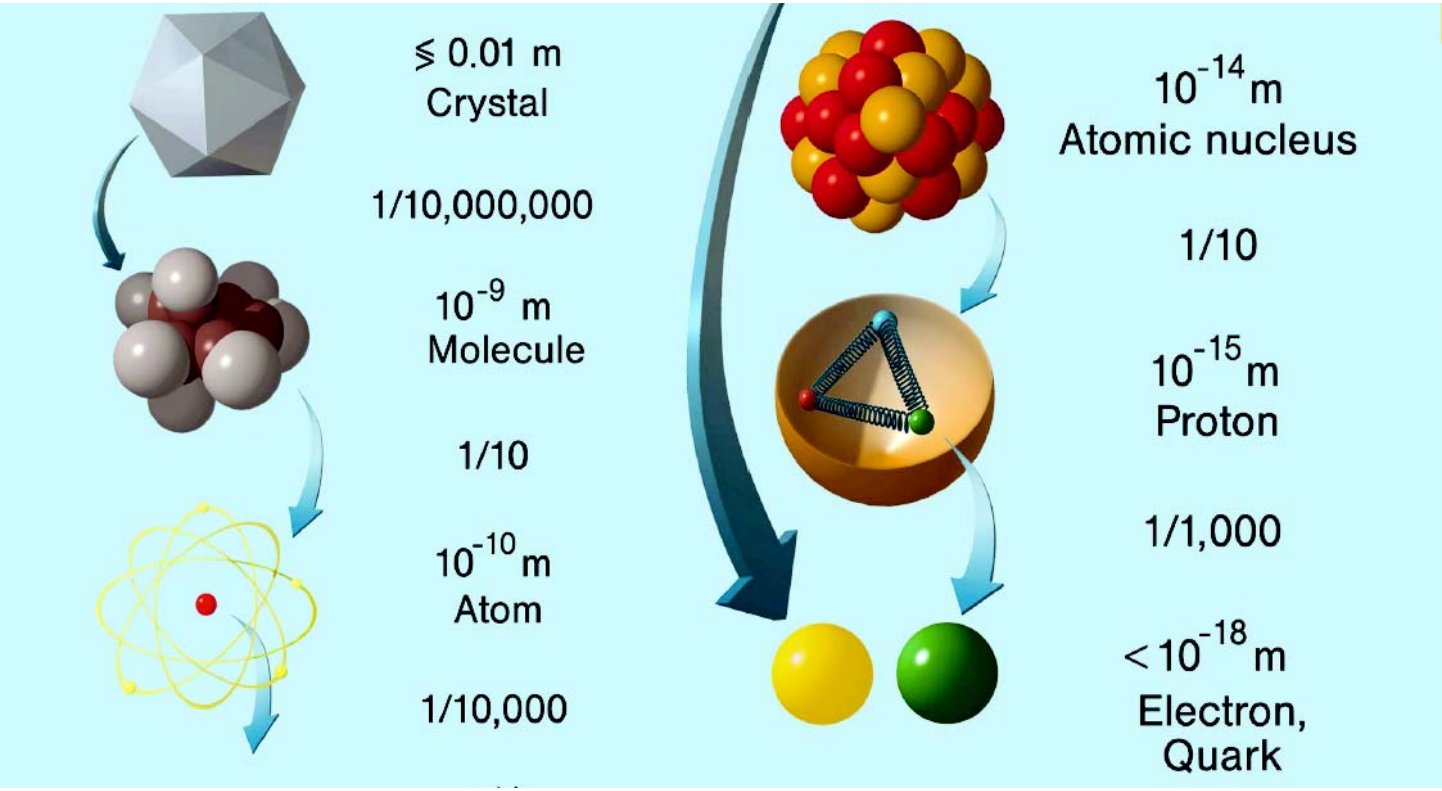

WORLD
US
ASIA
SAMERICA
EUROPE
DARTMOUTH
ROCHESTER
ALBANY
SYR
BU
BUFFALO
MIT
WISC
UNM
UMICH
BINGHAMTON
BNL
NYU
UNI
FNAL
UIC
WAYNE
PSU
LEHIGH
UIOW
NWICGRID
UCHICAGO
PURDUE
UNL
IU
VIRGINIA
HAMPTONU
NERSC
STANFORD
VANDERBILT
CALTECH
UARK
UNM
OU
UCSD
TTU
UTA
SMU
LATECH
LSU
FSU
RICE
UFL
FIU
UNESP
UERJ
USP
SINICA
Thu Feb 8 02:07:00 GMT 2007

MonALISA


MonALISA Repository
OSG
MonALISA
MONitoring Agents using a Large Integrated Services Architecture
MonALISA Client
Click on the button below to start the Monalisa Client.
Client
MonALISA Repository
Interactive map
Jobs
Accounting
Site views
Networking
Sites status
Repository info
close all
OSG Reports
ABPing Configuration
Site Administration
Layout configuration
Bookmark this page (url)
Utilisation: Active / Idle Nodes
Total Running / Idle Jobs
Running Jobs per VO
Actions: Left Click - Zoom In Right Click - Zoom Out (Center on the mouse position)
Zoom / Translation Factor: 1.01
2
Image size: Adaptive
Select Predefined Map: World

LHC/CMS Experiment & Grid computing

The Question in Particle Physics

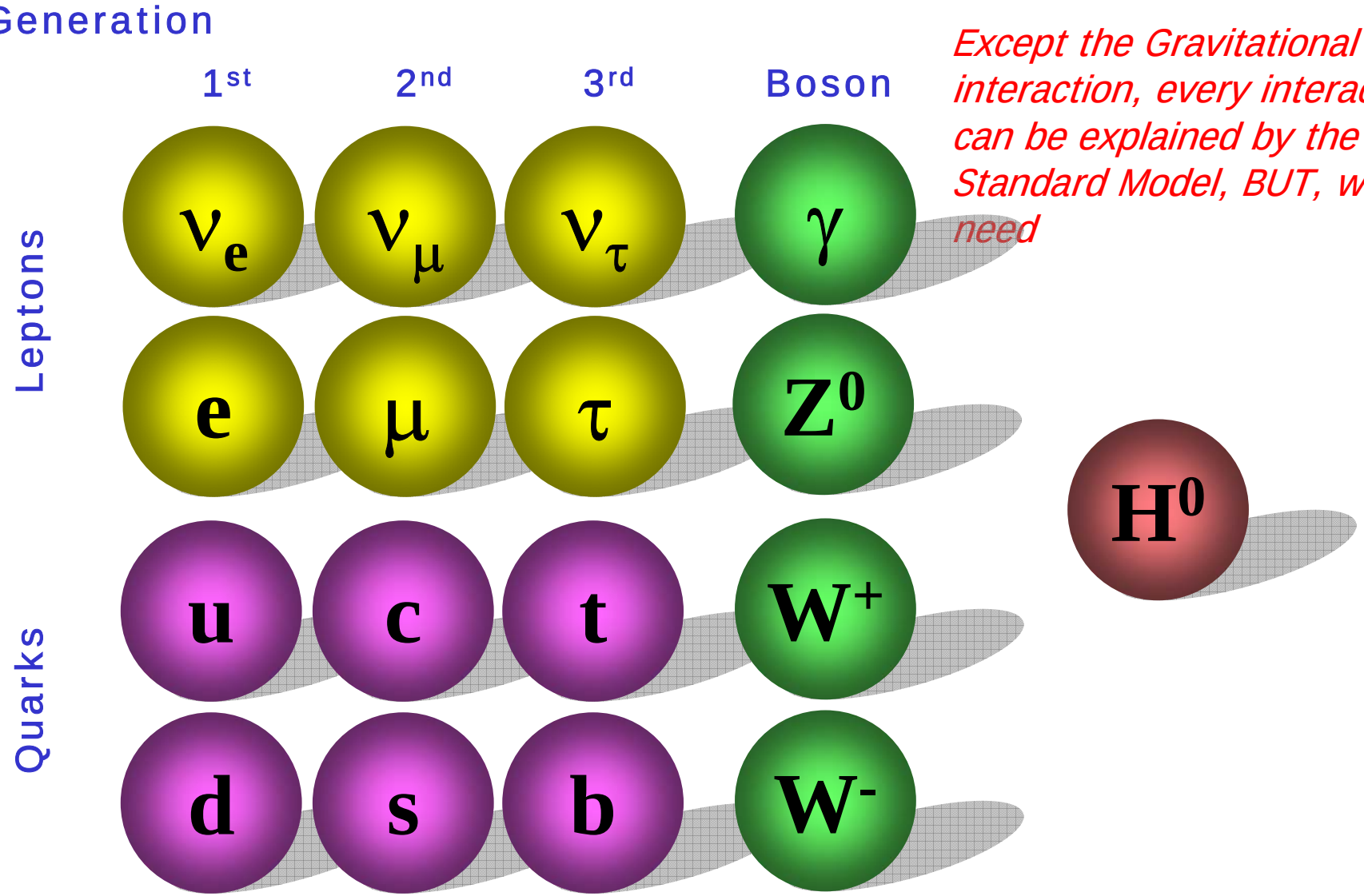


The origin of everything → Elementary particles

Matter → fermions

Interactions → bosons

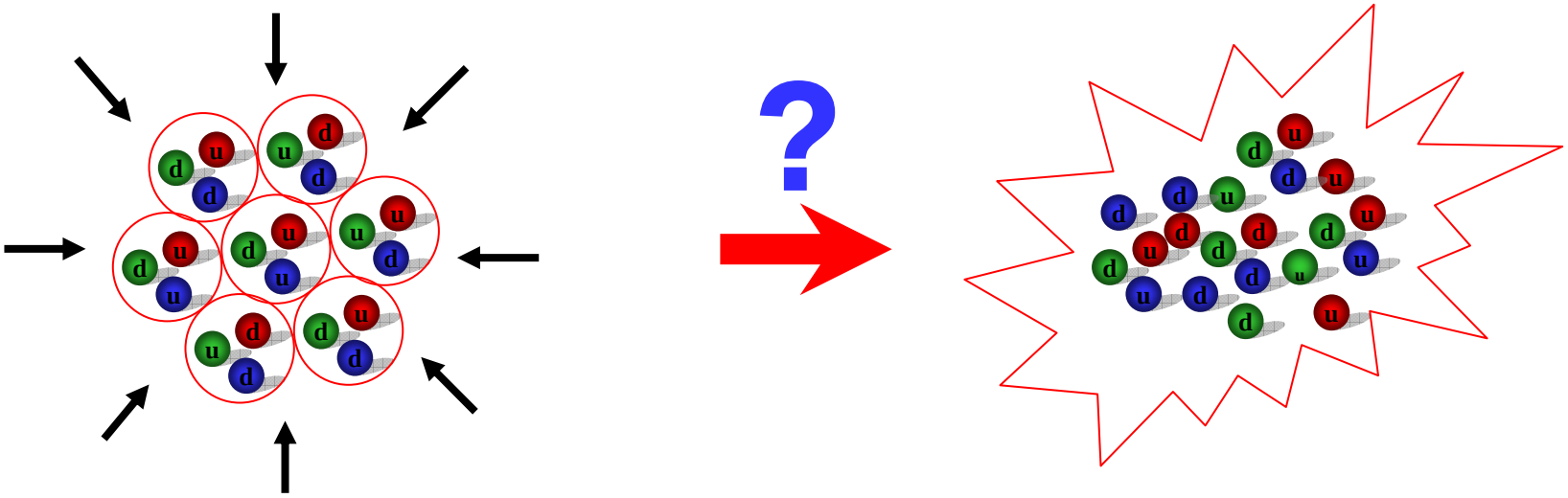
Electromagnetism + Weak + Strong



Except the Gravitational interaction, every interaction can be explained by the Standard Model, BUT, we need

The Question in Nuclear Physics

Atoms become plasma at high temperature and high density. How about the nuclear?

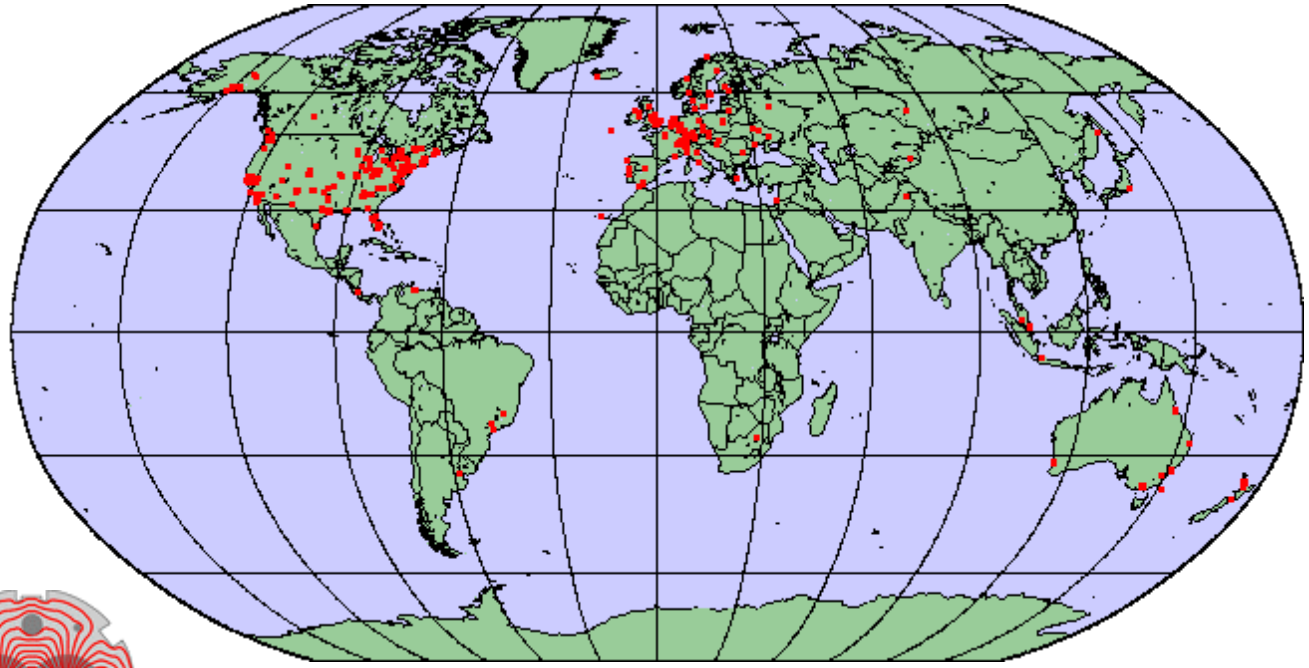


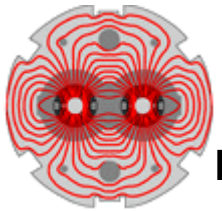
Can we create a new matter state with a high energy ion collider?

The current QCD works anyway, because the Quark-Gluon-Plasma is colour neutral!!

Another kind of Olympic game

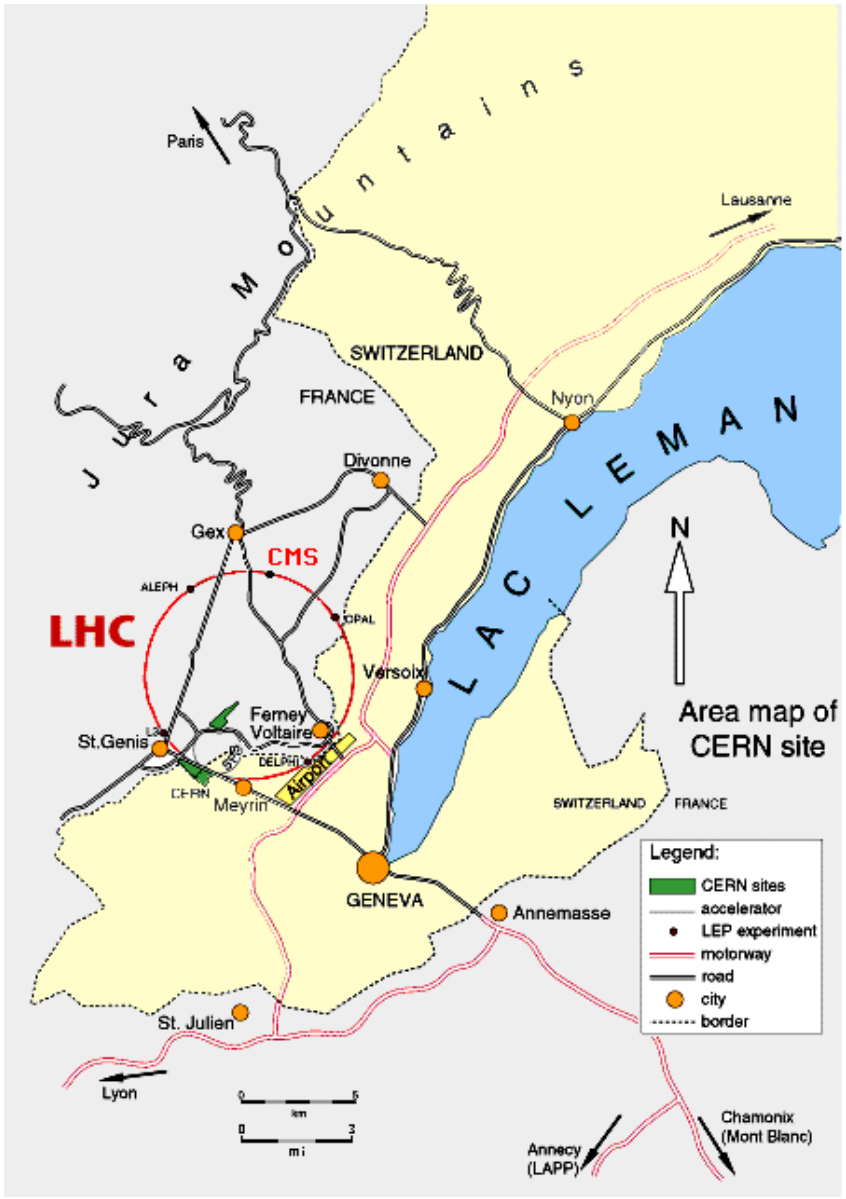
- For the two discoveries + more, ~ few thousands physicists work together.
  - 7000 physicists from 80 countries!
- Collaborate but at the same time compete.





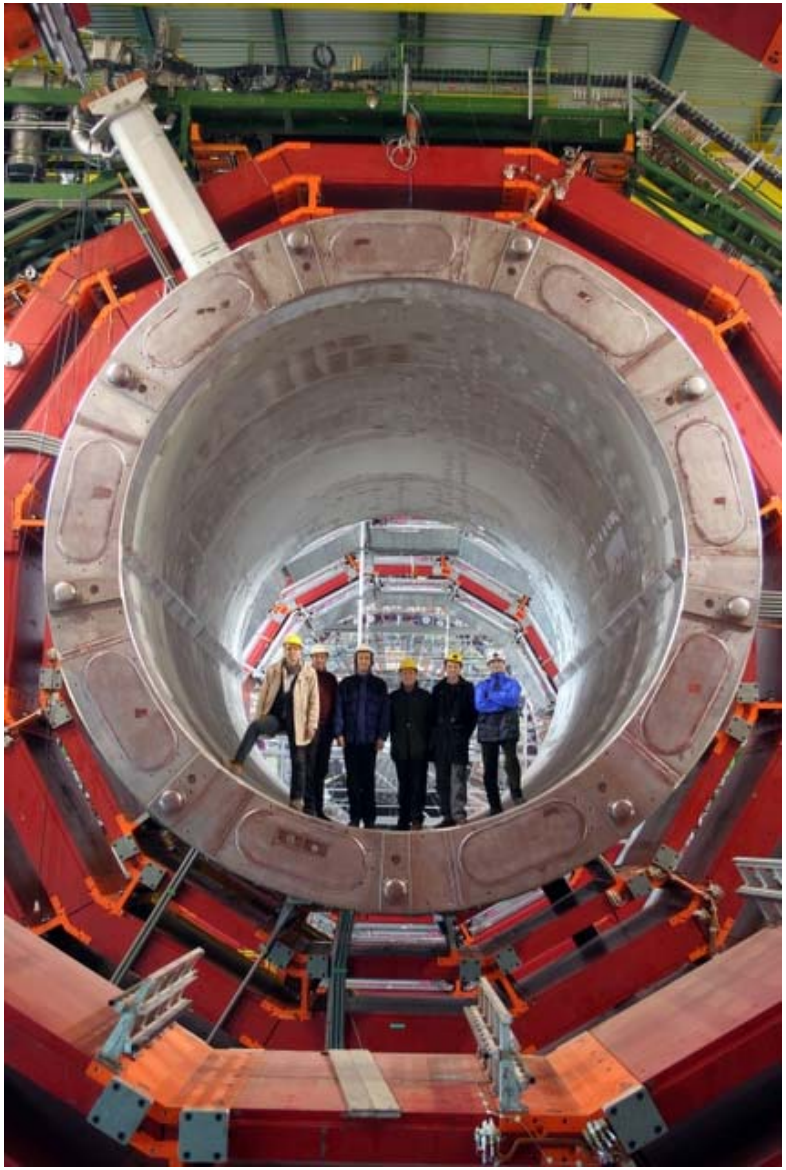
LHC Olympic game

LHC (Large Hadron Collider)

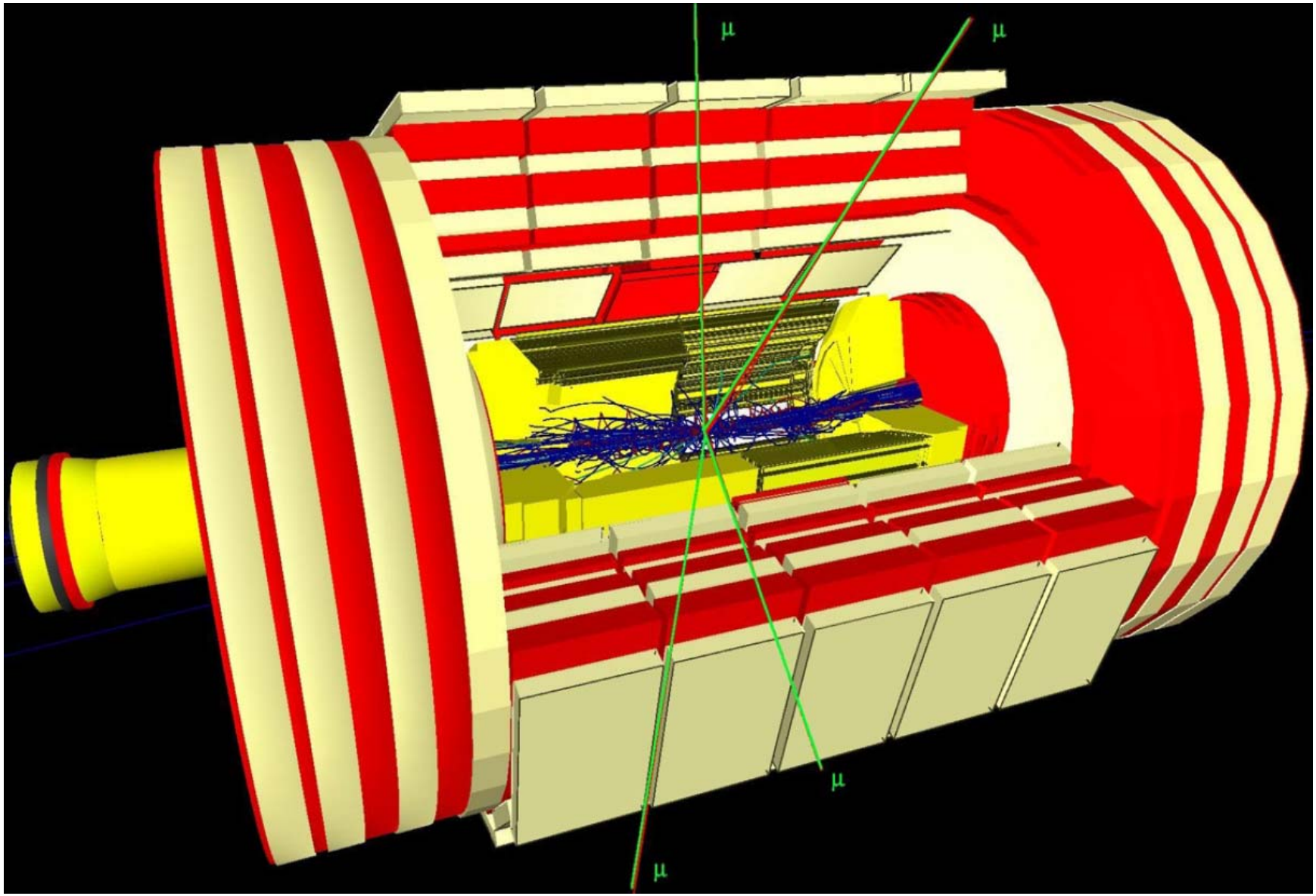


- 14TeV for pp, 5.5TeV/n for AA
- Circumference ~ 27km
- few Billion Dollars / year
- bunch crossing rate ~ 40MHz
- start running this year!!

CMS detectors

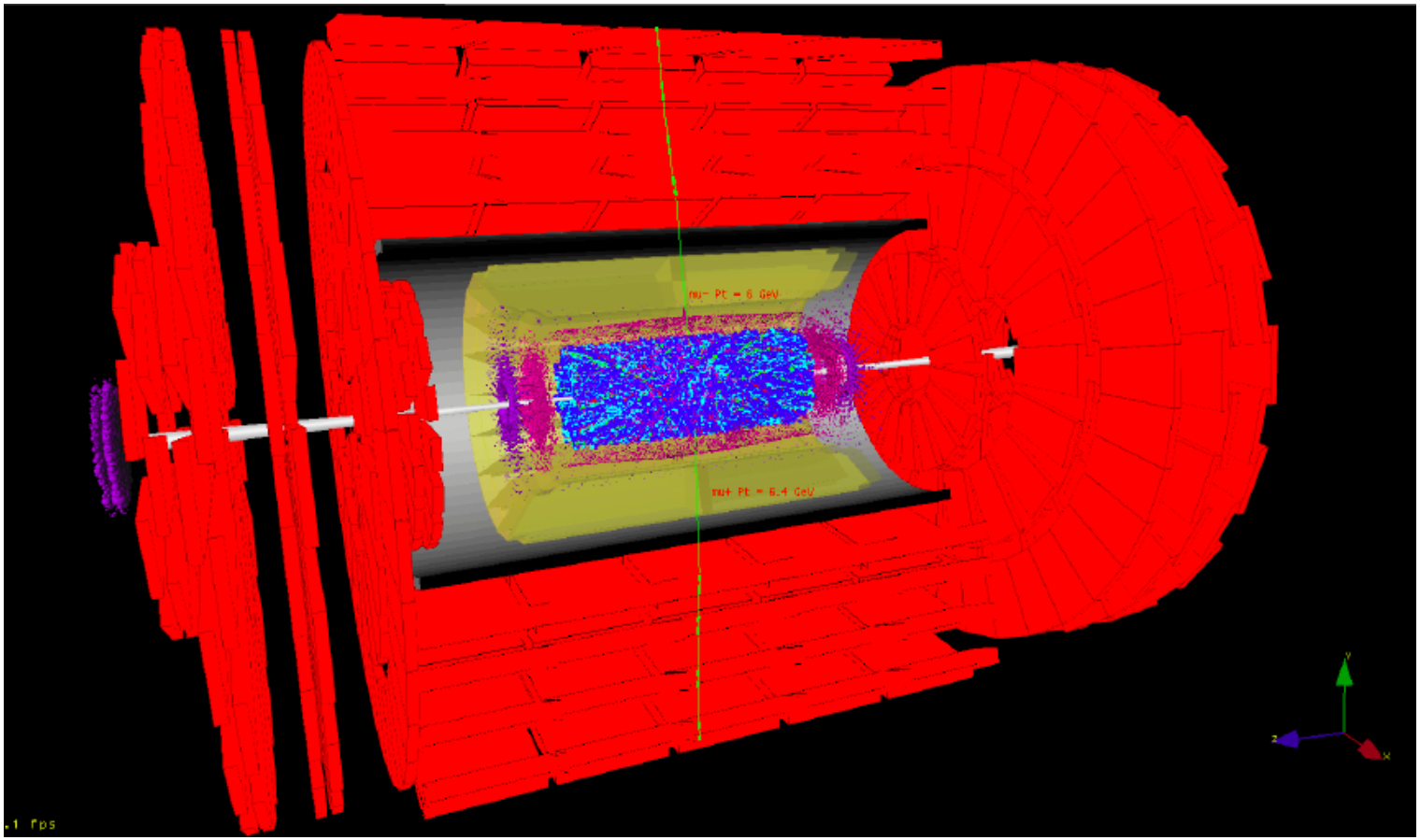


pp → Higgs → μ+ μ- μ+ μ-



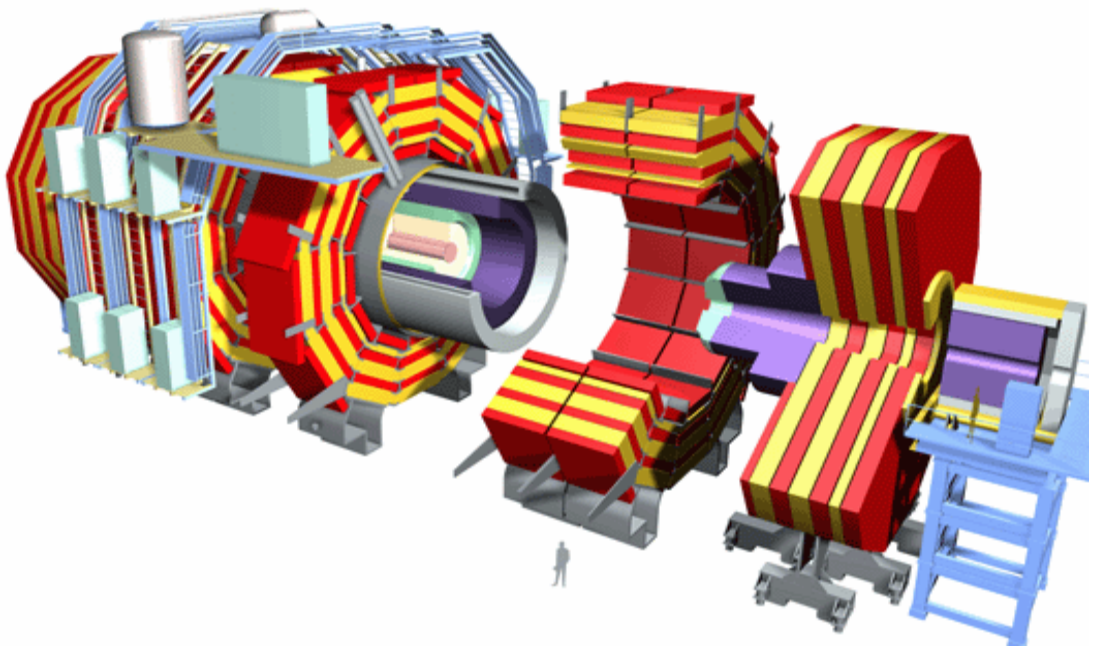
AA → hot ball + Υ → μ+ μ-

Pb+Pb event (dN/dy = 3500) with Υ -> $\mu^+\mu^-$



Pb+Pb event display: Produced in pp software framework (simulation, data structures, visualization)

CMS, raw data



Event data structure		
EDM	Data	MC
	FEVT	SimFEVT
RAW	Digitized detector	Generated, simulated
RECO	Reconstructed	
AOD	Physics extracted	

- 16 million channels → ADC (12-16bit) → Zero suppression → 2MBytes raw data (p+p)
- Data containers:
  - Run header, Event header, RAW data, Reconstruction data, AOD, calibration, slow control, etc.

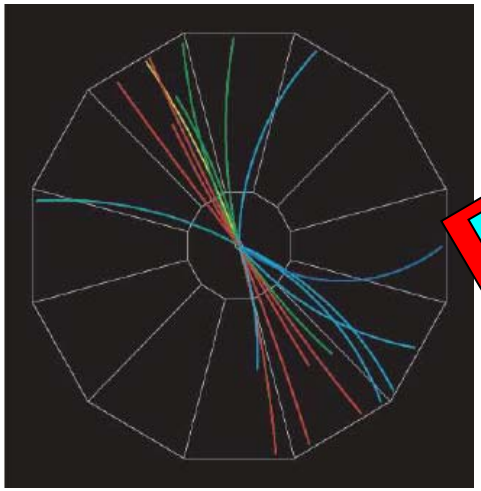
Data size

Estimation	pp	AA
Beam time / year (s)	10^7	10^6
Trigger rate	150Hz	70Hz
# of events	1.5×10^9	0.7×10^8
Event size	2.5MB	5MB
Data produced / year	3.75 PB	0.35 PB
10 years LHC run	40 PB	4 PB
MC data required	= PB	= PB
Order of magnitude	~ 100 PB	

Yearly computing size

- 10 PB : Compact Disc (700MB)
  - 150 millions CD
- each CD is 1mm thick
  - 150 km
- with D 0 km
- wit → 1,000,000

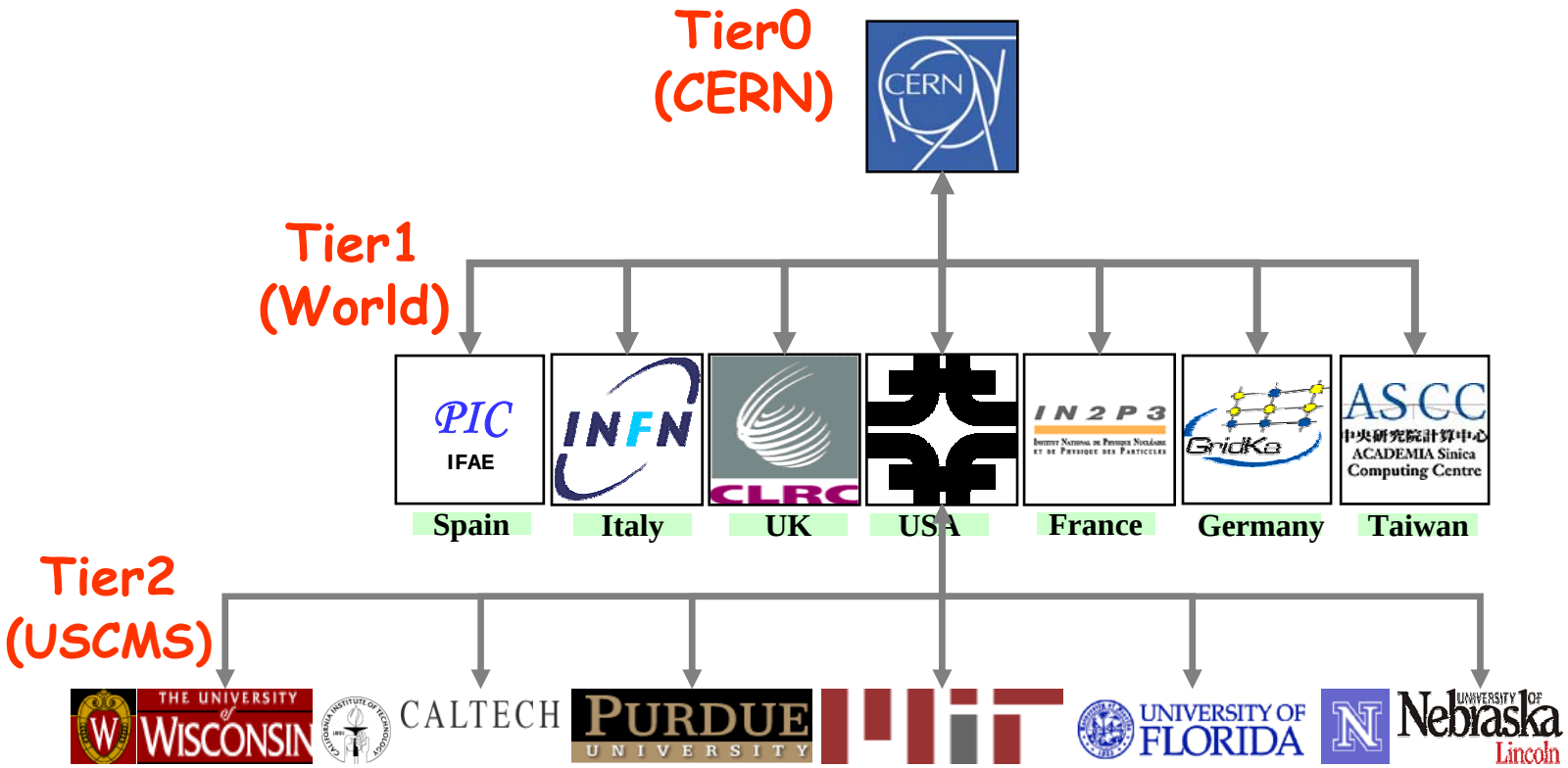
Who can save us?



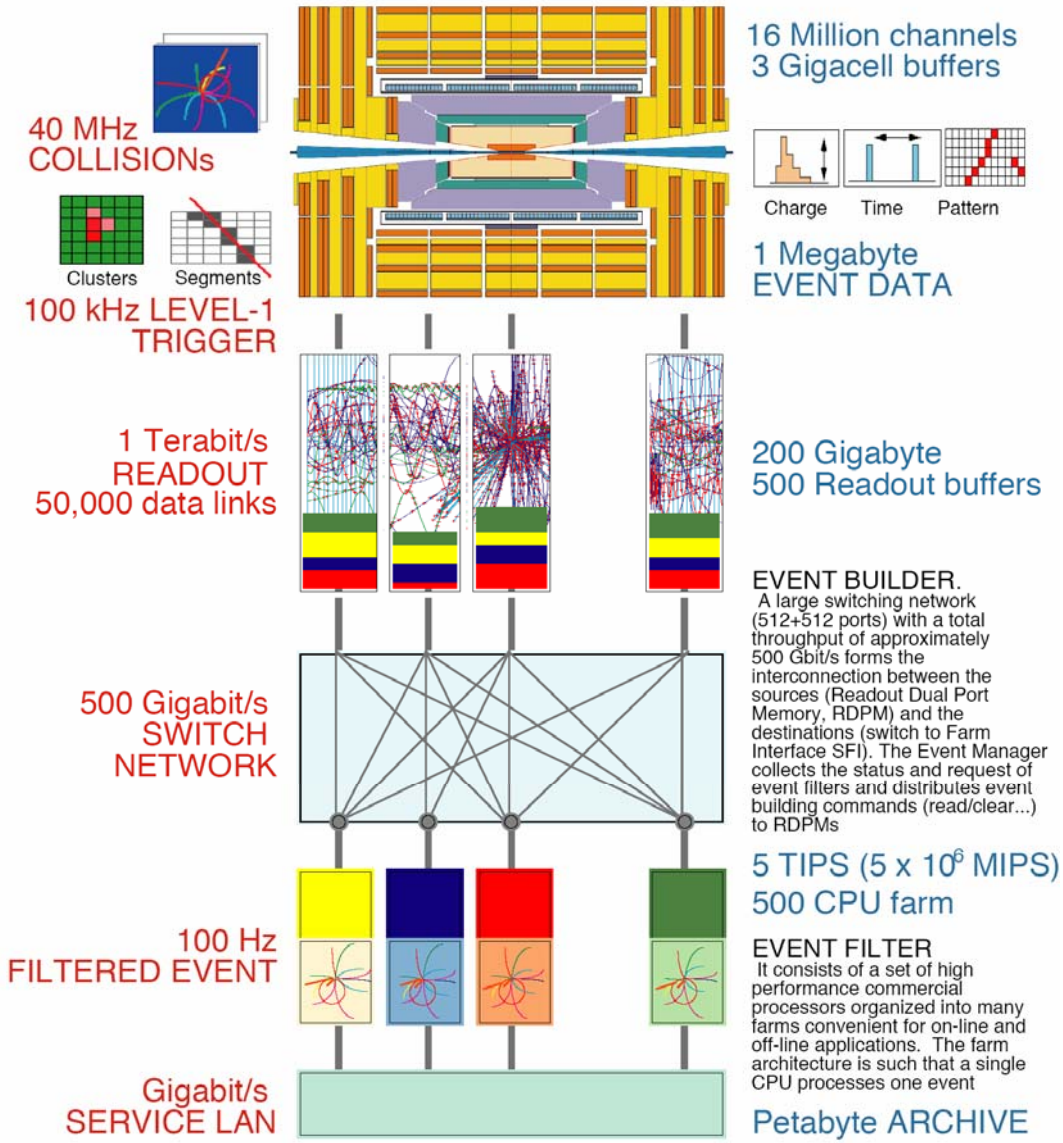
imulate AA
- 1-6 hours/events
- ~ 10^8 hours to create AA MC
- ~ 10^4 CPU needed

- To reconstruct Data & MC
- Reprocessing
- Data analysis etc.
- Needs few tens of MSI2K
  - newest CPU ~ 1000SI2K
- pp + AA→ Order of ~10^5 CPUs

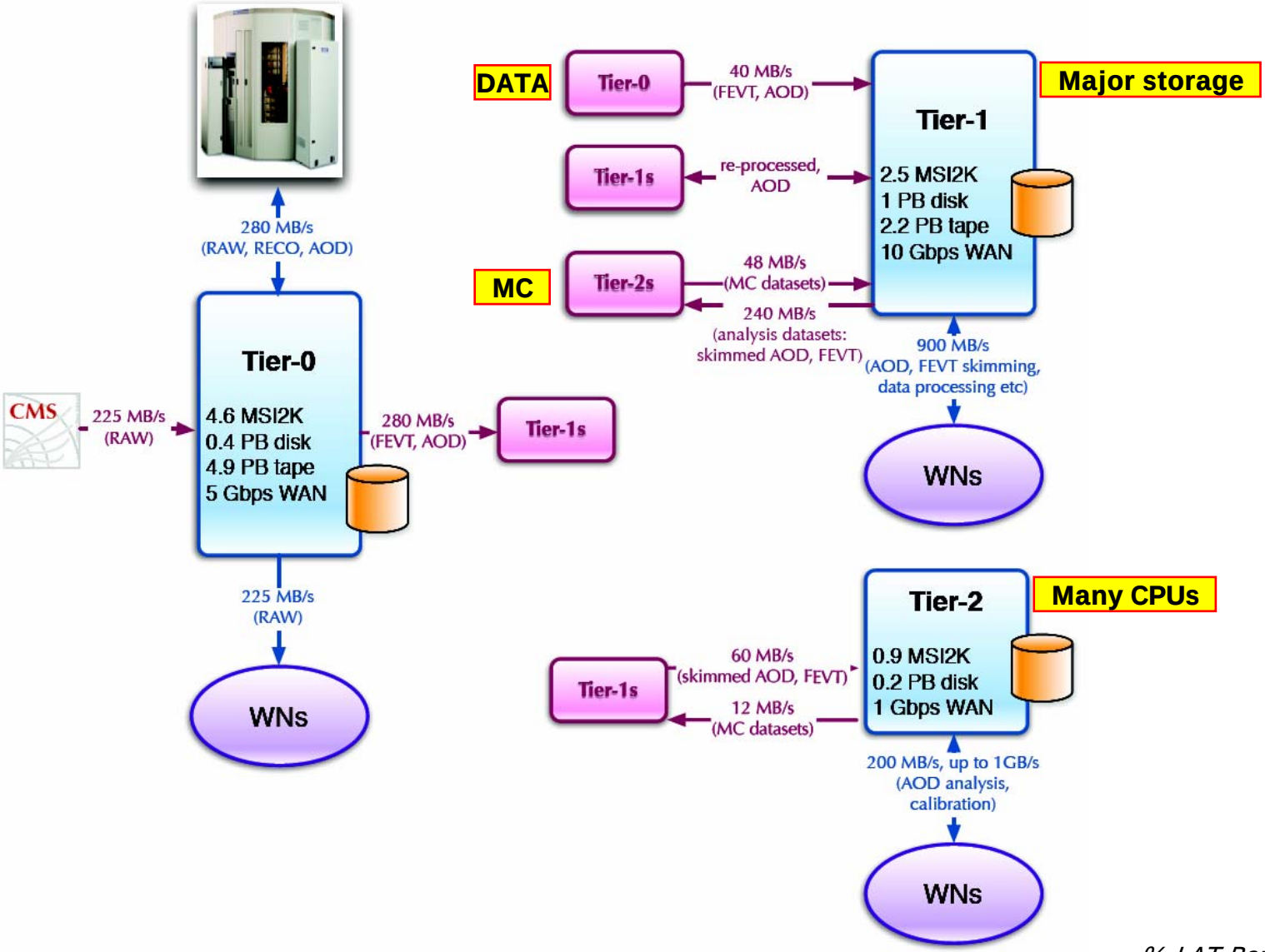
CMS Computing Tier



What happens at Tier0



Tier 0 ←→ Tier 1 ←→ Tier 2



% LAT Bauerdick, 2006

OSG based CMS-Tier2 @ Seoul Supercomputer Center (SSCC)

CMS Tier 2 requirement (OSG)

- Network: 2-10Gbps
  - Gbps intranet → 2 Gbps out bound
- CPU: 1 M SI2K
  - ~1000 CPU
- Storage: 200TB
  - dCache system
- OSG middle ware
  - CE, SE
- Batch system
  - Condor + PBS
- CMS softwares
  - CMSSW et al. at $OSG_APP

None of Korean institutions have this amount of facilities for CMS Tier2

% Plan for KNU → CMS Tier 1, KISTI → ALICE Tier 2

Seoul SuperComputer Center

- SSCC (Seoul Supercomputer Center), established in 2003 with a funding of ~$1M$
- Upgrade 2007: funding of ~$0.2M$
- Total of 256 CPUs + Giga switches + KOREN2

2007 upgrade

- + 10Giga bps switch
- SE: Storage of 120TB
  - ~ 400 HDD of 300GB
- CE: 128 CPUs
  - MC generation
- + new 64bit HPC
- + KREONET
- Operate OSG

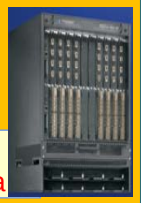
CMS TIER2 TIER3 setup

SSCC

dCache pool (200TB)

Nortel Passport 8800(Gb) 2ea

Extream BlackDiamond 8810(10Gb/Gb)



Foundry BigIron16(Gb) 2ea

Condor Computing pool(+120 CPUs)

Gate, Web, Condor-G dCache/gFTP, Ganglia

KREONET (GLORIAD) KOREN (APII, TEIN)

1-2 Gbps

SPCC

64bit cluster (+ 100CPUs)

Extream BlackDiamond 8810(10Gb/Gb)

Nortel Passport 8800(Gb)

D-Link L3 Switch(Gb)

- 120 TB storage
  - dCache
- 0.1M SI2K
- 2 Gbps network
- OSG

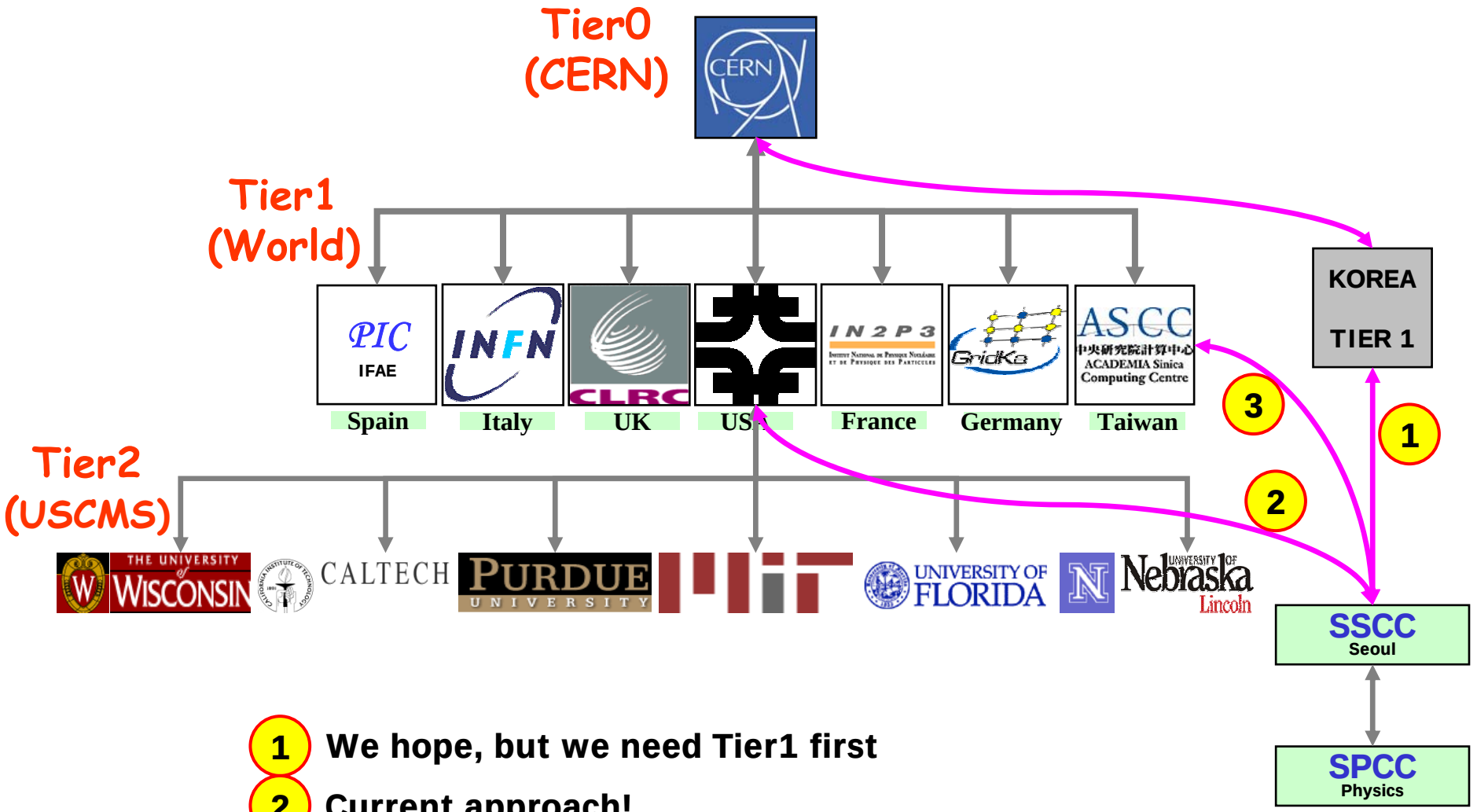
CMS-HI Tier 2

20Gbps

Analysis Tier 3

- 64bit 3GHz CPU
  - 64 machines
- 32bit 2GHz CPU
  - 32 machines
- 8TByte storage

Tier 2 connection



1. We hope, but we need Tier1 first
2. Current approach!
3. Geographical distance doesn't really matter.

Center organization

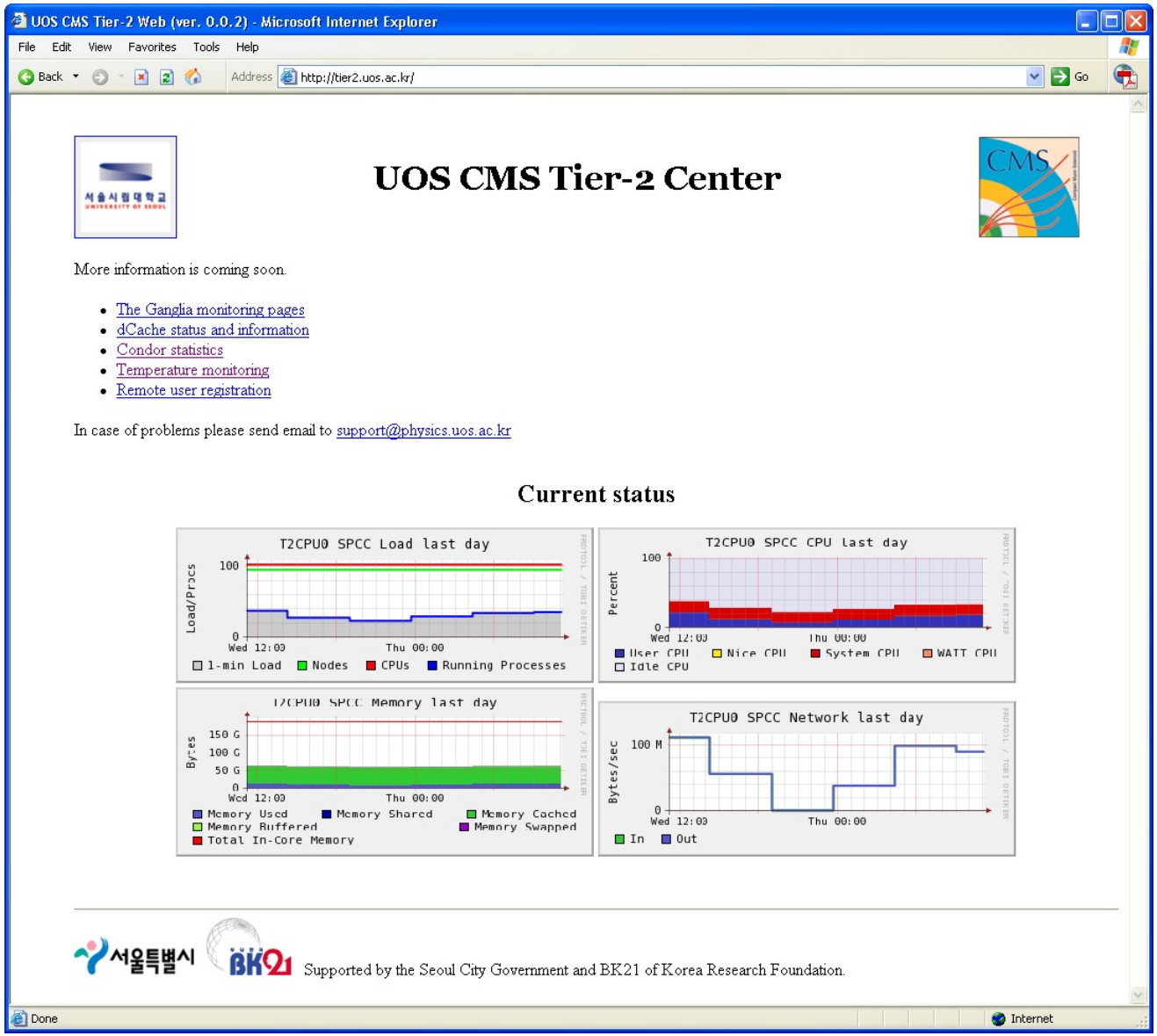
- Spokesperson, Director
- 3 Ph.D. researchers
- 4 admins/operators, 2 application managers, 2 staffs

Deputy spokesperson
Prof. Hyunsoo Min

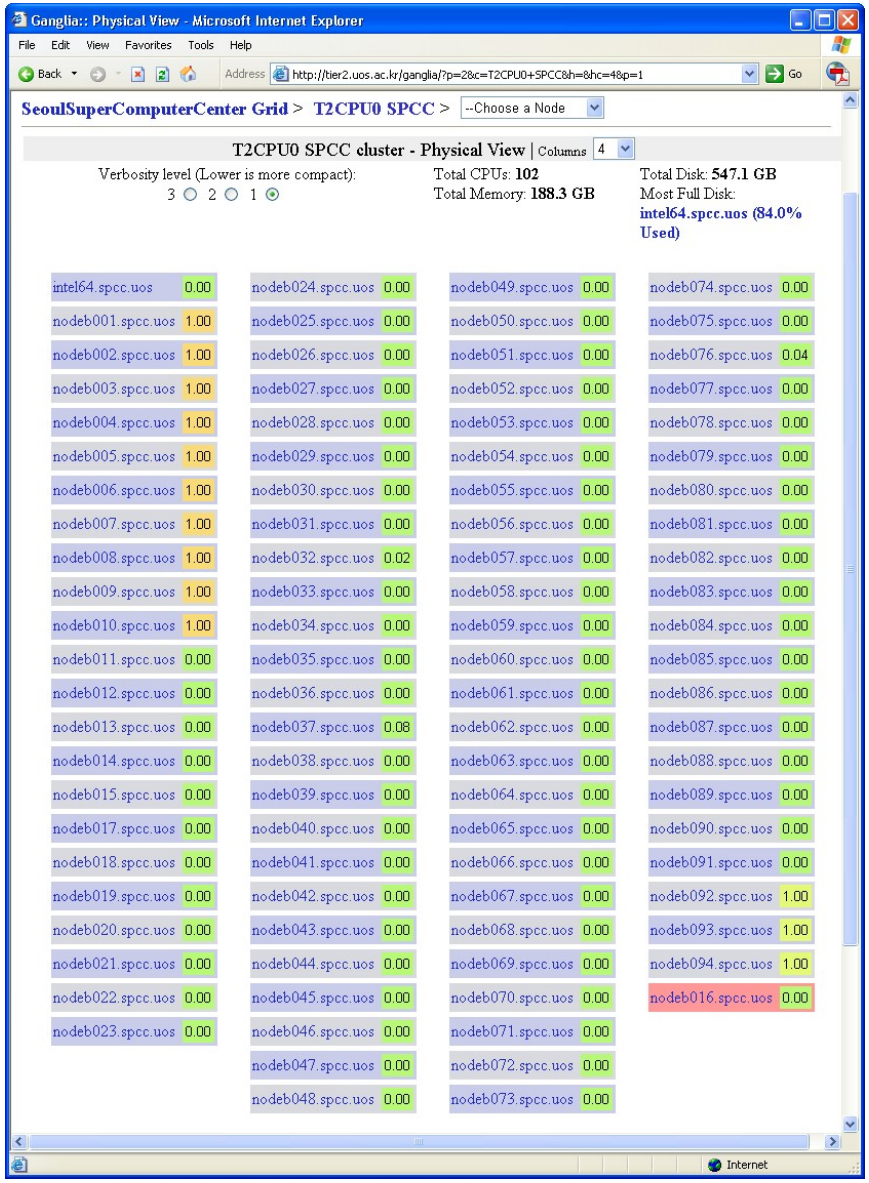
Director
Prof. Inkyu Park

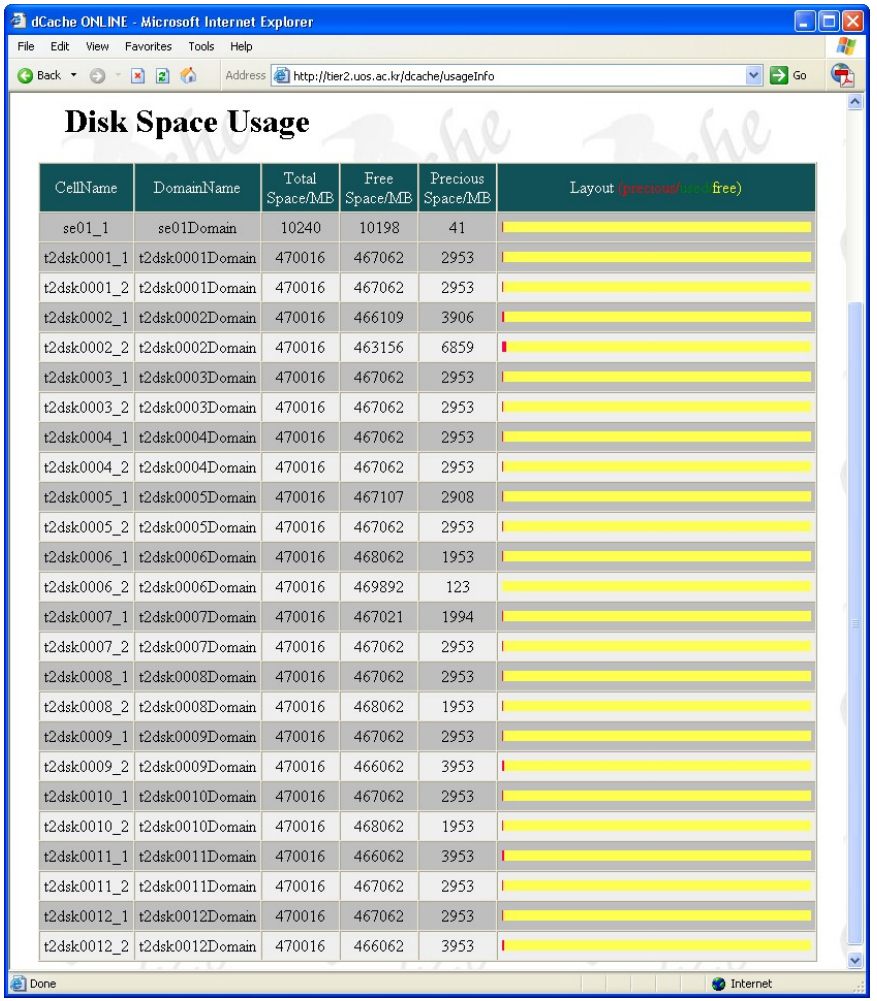
System	Software	Web	User support
J.W. Park	G.R. Hahn	M.K. Choi	Y.S. Kim

Current Tier2 status



CE and SE status



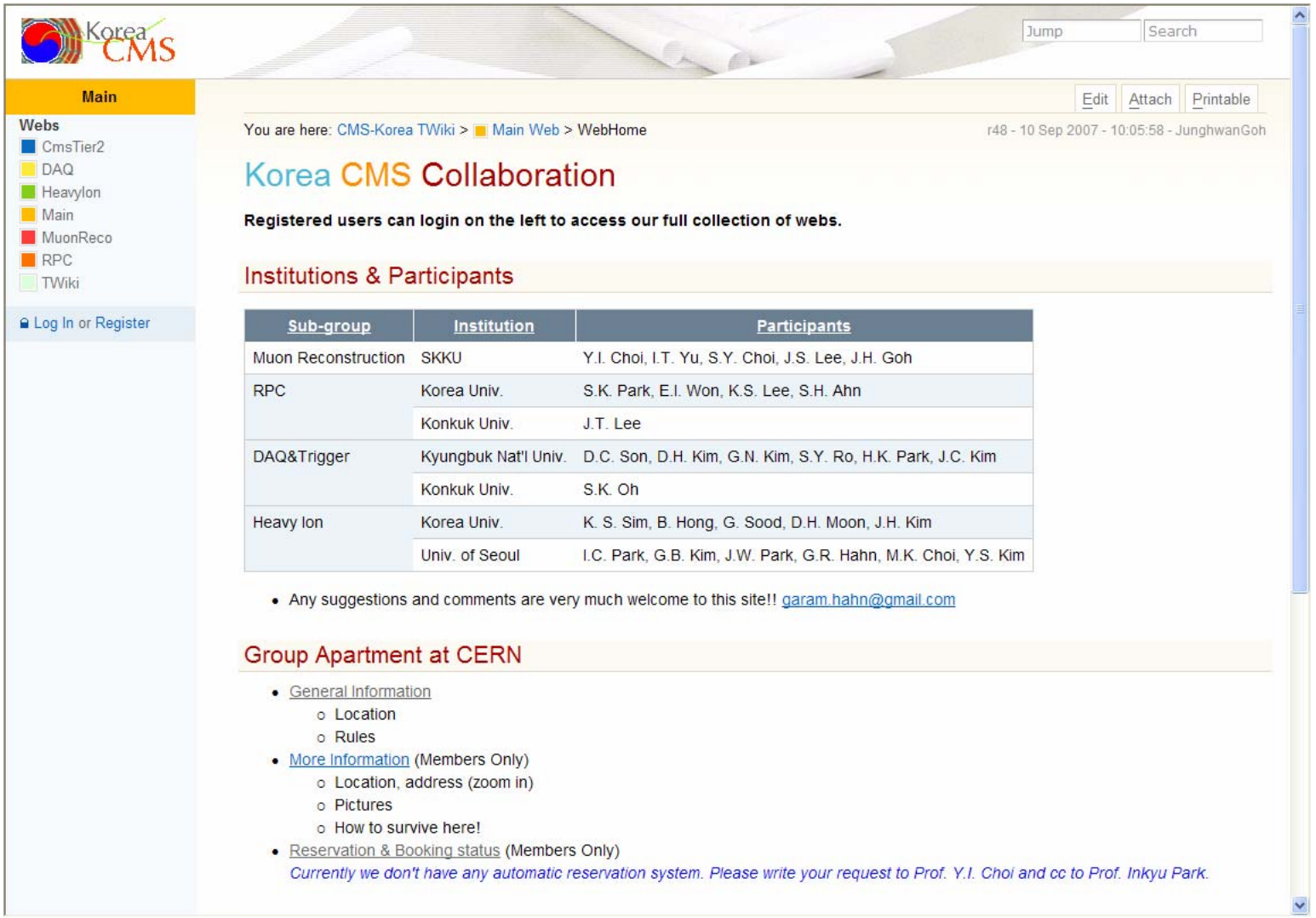


CellName	DomainName	Total Space/MB	Free Space/MB	Precious Space/MB	Layout (precious/used/free)
se01_1	se01Domain	10240	10198	41	
t2dsk0001_1	t2dsk0001Domain	470016	467062	2953	
t2dsk0001_2	t2dsk0001Domain	470016	467062	2953	
t2dsk0002_1	t2dsk0002Domain	470016	466109	3906	
t2dsk0002_2	t2dsk0002Domain	470016	463156	6859	
t2dsk0003_1	t2dsk0003Domain	470016	467062	2953	
t2dsk0003_2	t2dsk0003Domain	470016	467062	2953	
t2dsk0004_1	t2dsk0004Domain	470016	467062	2953	
t2dsk0004_2	t2dsk0004Domain	470016	467062	2953	
t2dsk0005_1	t2dsk0005Domain	470016	467107	2908	
t2dsk0005_2	t2dsk0005Domain	470016	467062	2953	
t2dsk0006_1	t2dsk0006Domain	470016	468062	1953	
t2dsk0006_2	t2dsk0006Domain	470016	469892	123	
t2dsk0007_1	t2dsk0007Domain	470016	467021	1994	
t2dsk0007_2	t2dsk0007Domain	470016	467062	2953	
t2dsk0008_1	t2dsk0008Domain	470016	467062	2953	
t2dsk0008_2	t2dsk0008Domain	470016	468062	1953	
t2dsk0009_1	t2dsk0009Domain	470016	467062	2953	
t2dsk0009_2	t2dsk0009Domain	470016	466062	3953	
t2dsk0010_1	t2dsk0010Domain	470016	467062	2953	
t2dsk0010_2	t2dsk0010Domain	470016	468062	1953	
t2dsk0011_1	t2dsk0011Domain	470016	466062	3953	
t2dsk0011_2	t2dsk0011Domain	470016	467062	2953	
t2dsk0012_1	t2dsk0012Domain	470016	467062	2953	
t2dsk0012_2	t2dsk0012Domain	470016	466062	3953	

SE : currently 12TB

CE : currently 102 CPUs

Documentation by Twiki



Korea CMS

Jump Search

Main

Webs
- CmsTier2
- DAQ
- Heavylon
- Main
- MuonReco
- RPC
- TWiki

Log In or Register

Edit Attach Printable

You are here: CMS-Korea TWiki > Main Web > WebHome

r48 - 10 Sep 2007 - 10:05:58 - JunghwanGoh

Korea CMS Collaboration

Registered users can login on the left to access our full collection of webs.

Institutions & Participants

Sub-group	Institution	Participants
Muon Reconstruction	SKKU	Y.I. Choi, I.T. Yu, S.Y. Choi, J.S. Lee, J.H. Goh
RPC	Korea Univ.	S.K. Park, E.I. Won, K.S. Lee, S.H. Ahn
	Konkuk Univ.	J.T. Lee
DAQ&Trigger	Kyungbuk Nat'l Univ.	D.C. Son, D.H. Kim, G.N. Kim, S.Y. Ro, H.K. Park, J.C. Kim
	Konkuk Univ.	S.K. Oh
Heavy Ion	Korea Univ.	K. S. Sim, B. Hong, G. Sood, D.H. Moon, J.H. Kim
	Univ. of Seoul	I.C. Park, G.B. Kim, J.W. Park, G.R. Hahn, M.K. Choi, Y.S. Kim

- Any suggestions and comments are very much welcome to this site!! garam.hahn@gmail.com

Group Apartment at CERN

- General Information
  - Location
  - Rules
- More Information (Members Only)
  - Location, address (zoom in)
  - Pictures
  - How to survive here!
- Reservation & Booking status (Members Only)

Currently we don't have any automatic reservation system. Please write your request to Prof. Y.I. Choi and cc to Prof. Inkyu Park.

Remarks & Summary

Summary

- Seoul SuperComputing Centre (SSCC) becomes an OSG based CMS Tier2 centre
  - CE :102 CPUs → 200CPUs
  - SE: 12 TB → 140TB
- Both Tier2 & Tier3 setups are ready to run
- Network optimization is underway
  - KREONET-GLORIAD
  - KOREN-APII-TEIN
- An official launching of CMS Tier2 are coming
  - Many thanks to Gov. of Seoul, CERN, MOST, KISTI, KISDI, etc.