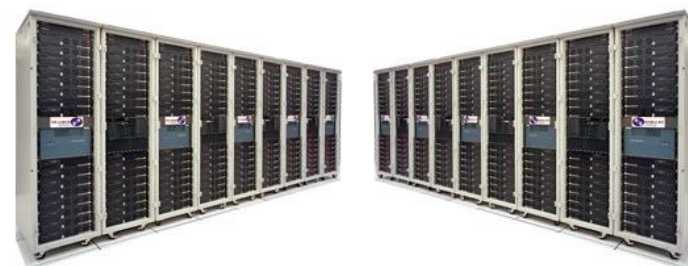
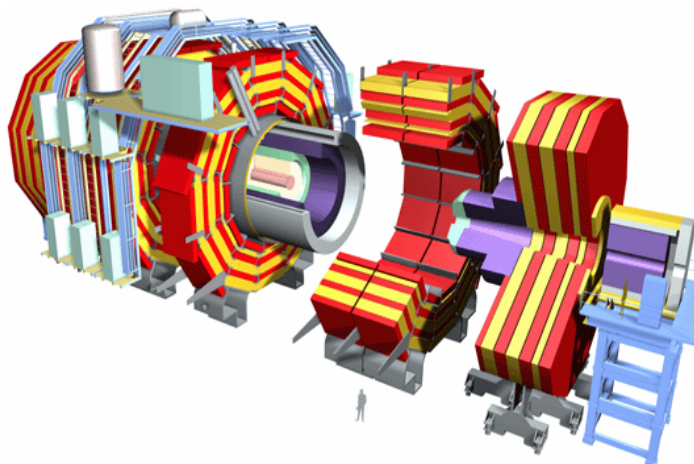




CMS-HI computing in Korea



2007 HIM@APCTP
Dec. 14, 2007

Inkyu PARK
Dept. of Physics, University of Seoul

Prof. H.S. Min, Prof. B.D. Yu, Prof. D.S. Park, Prof. J.D. Noh, ...
S.G. Seo, J.W. Park, G.R. Han, M.K. Choi, S.M. Han, Y.S. Kim, ...



Contents



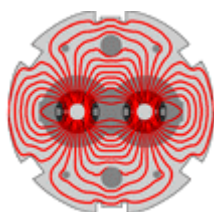
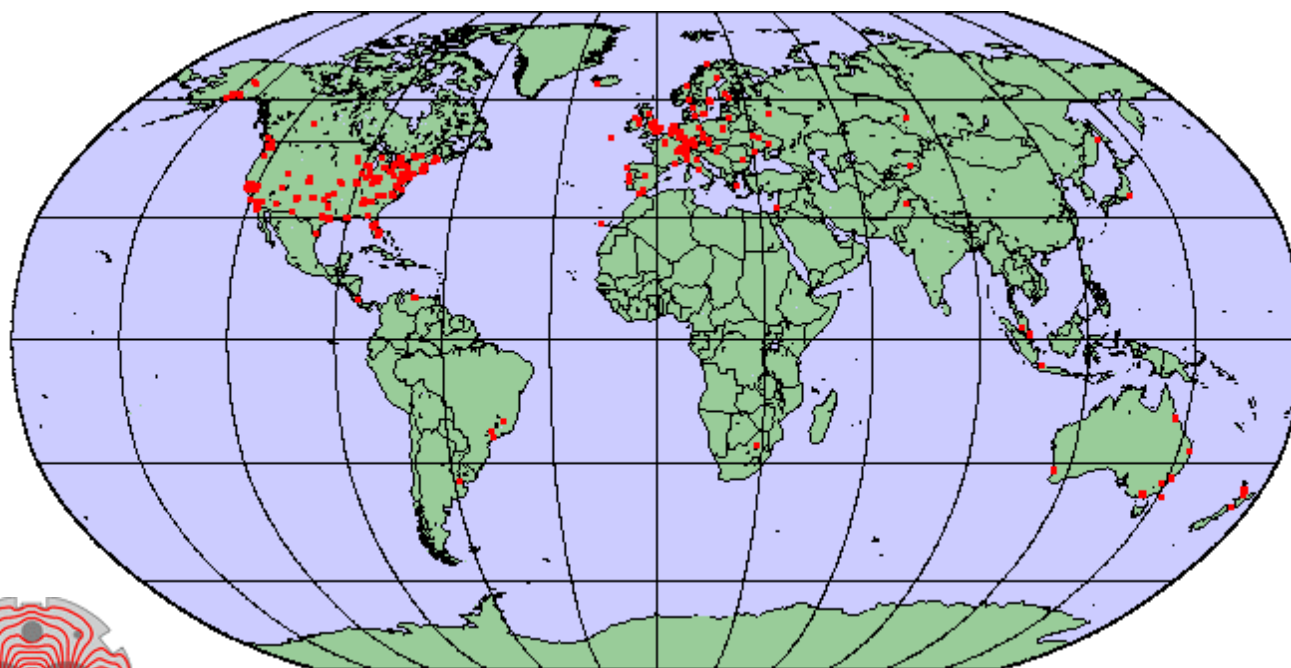
1	CMS computing: Why GRID?	<i>11 pages</i>
2	CMS computing: Tier structure	<i>10 pages</i>
3	WLCG : EGEE & OSG	<i>5 pages</i>
4	OSG based CMS-Tier2 @ SSCC	<i>8 pages</i>
5	Network readiness	<i>12 pages</i>
6	Remarks and Summary	<i>4 pages</i>

CMS Computing

Why GRID?

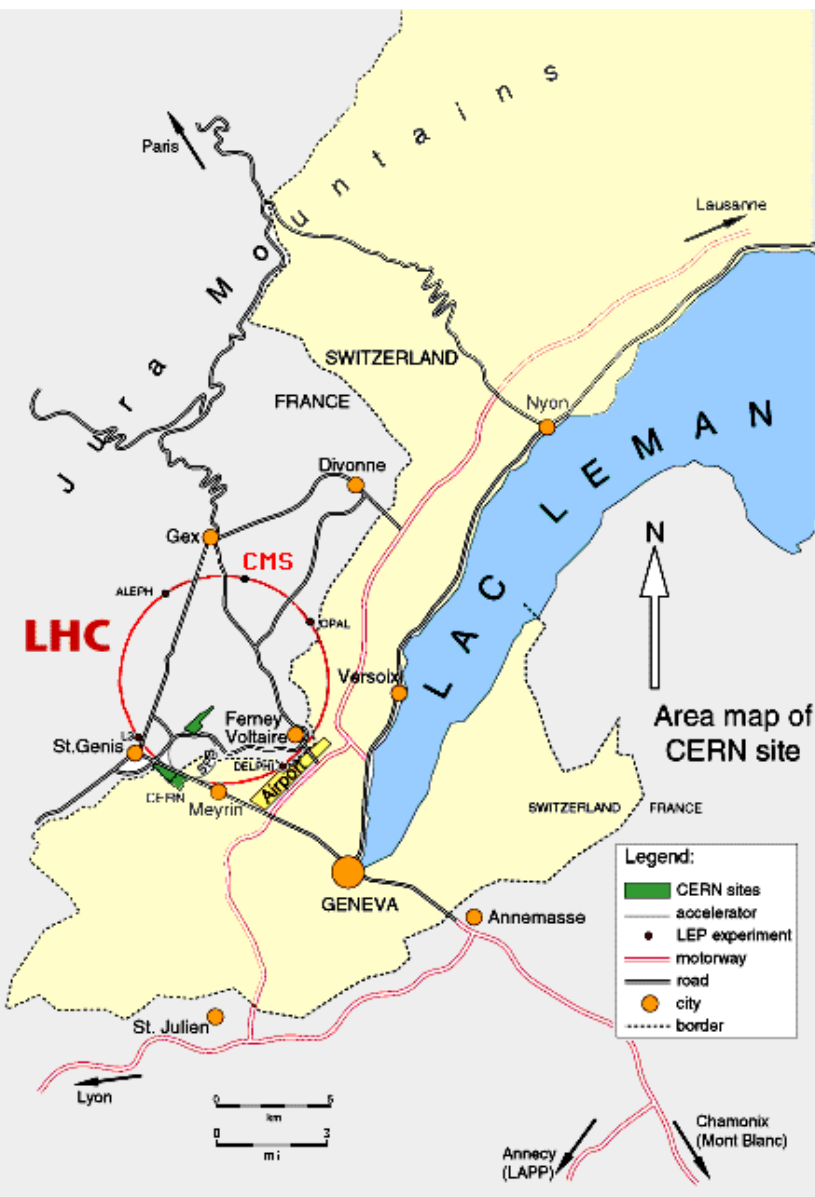
LHC: Another kind of Olympic game

- 💡 **For the HEP and HI 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!!

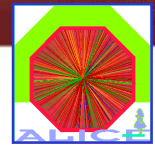
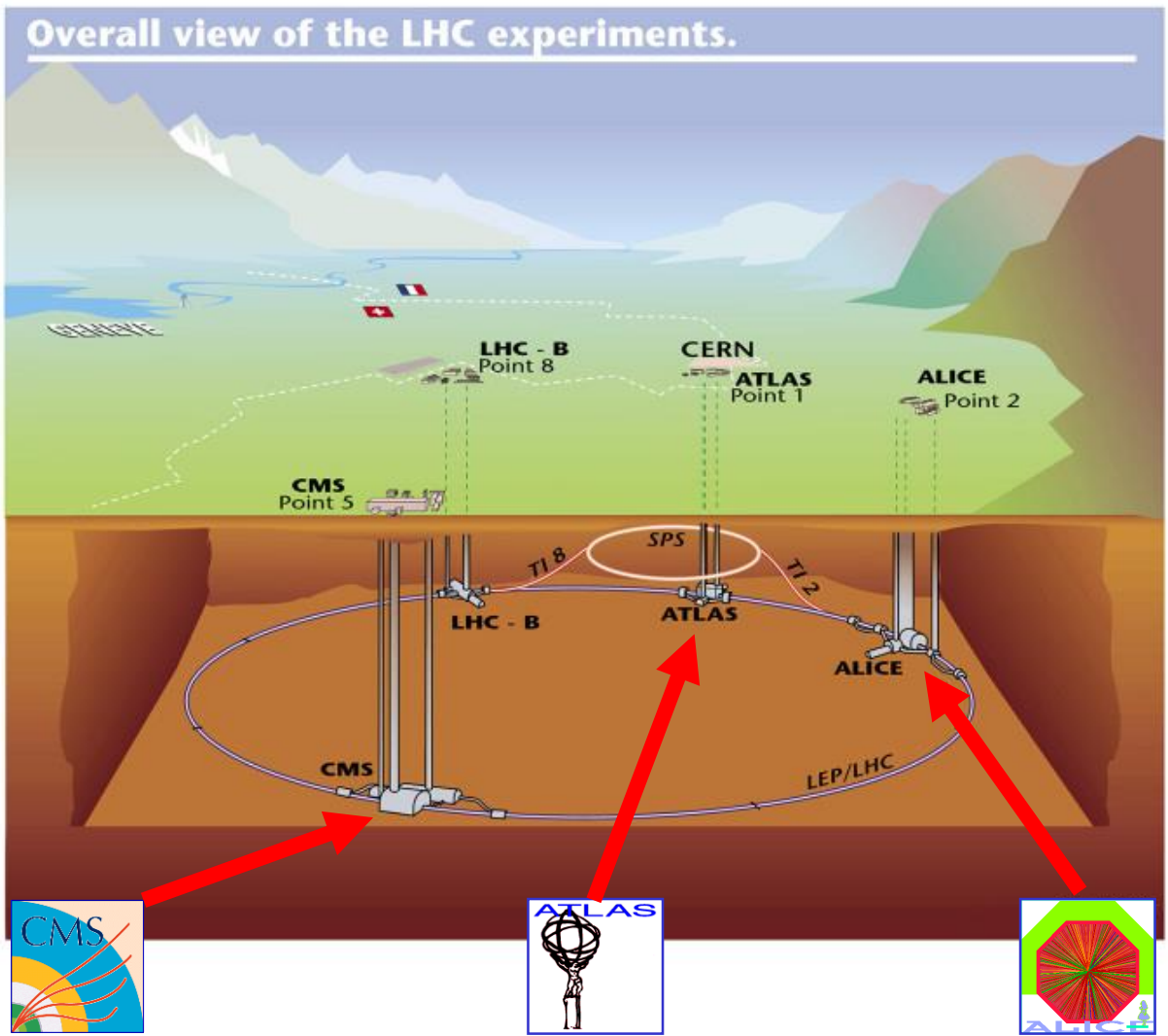


LHC accelerator schedule



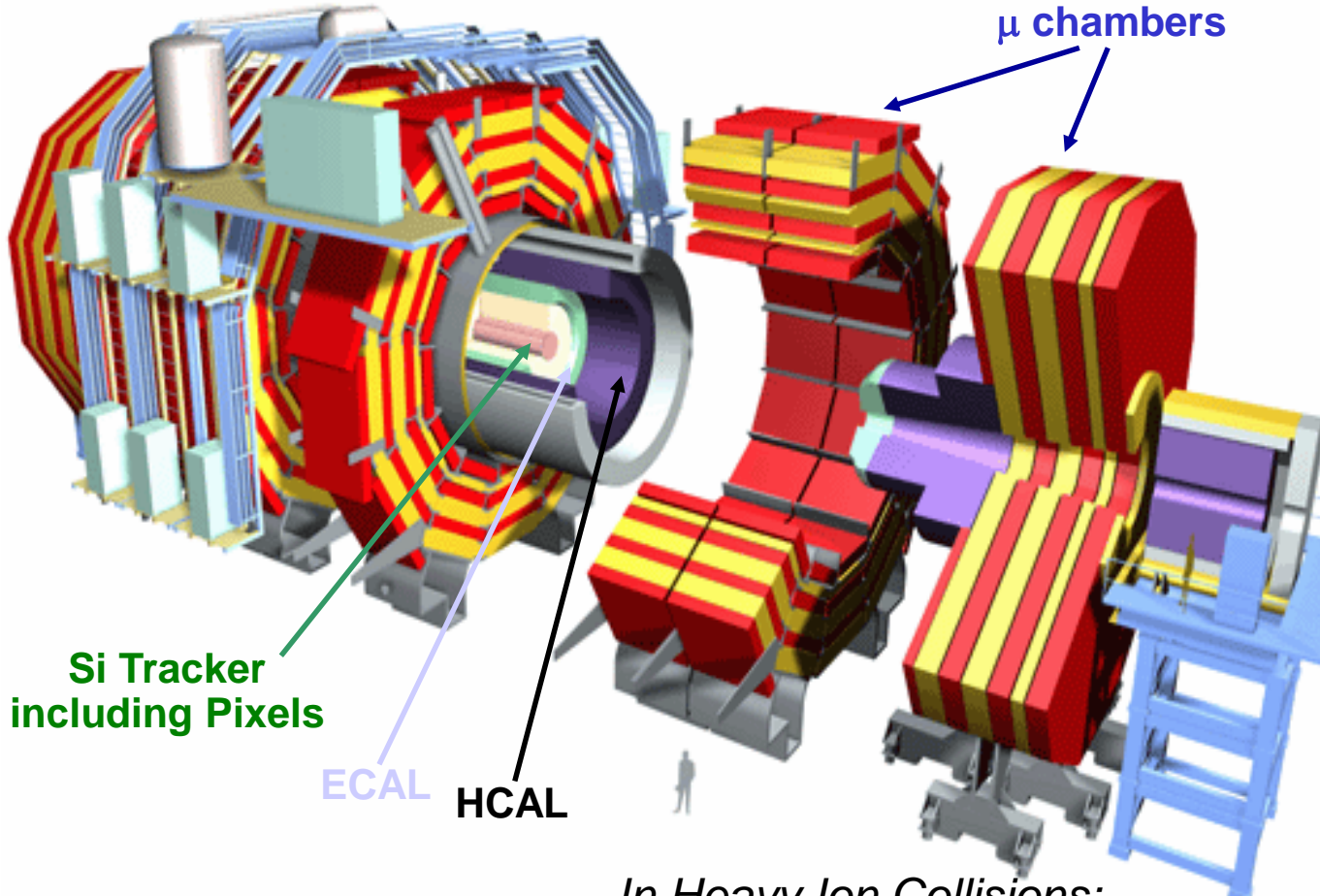
Year	p+p
2008	450+450 GeV, 5×10^{32}
2009	14 TeV, 0.5×10^{33}
2010	14 TeV, 1×10^{33}
2011	14 TeV, 1×10^{34}
...	...

Year	HI (Pb-Pb)
2008	None
2009	5.5 TeV, 5×10^{26}
2010	5.5 TeV, 1×10^{26}
2011	5.5 TeV, 1×10^{27}
...	...



CMS Detectors

Designed for precision measurements in high luminosity $p+p$ collisions



Si Tracker
including Pixels

ECAL

HCAL

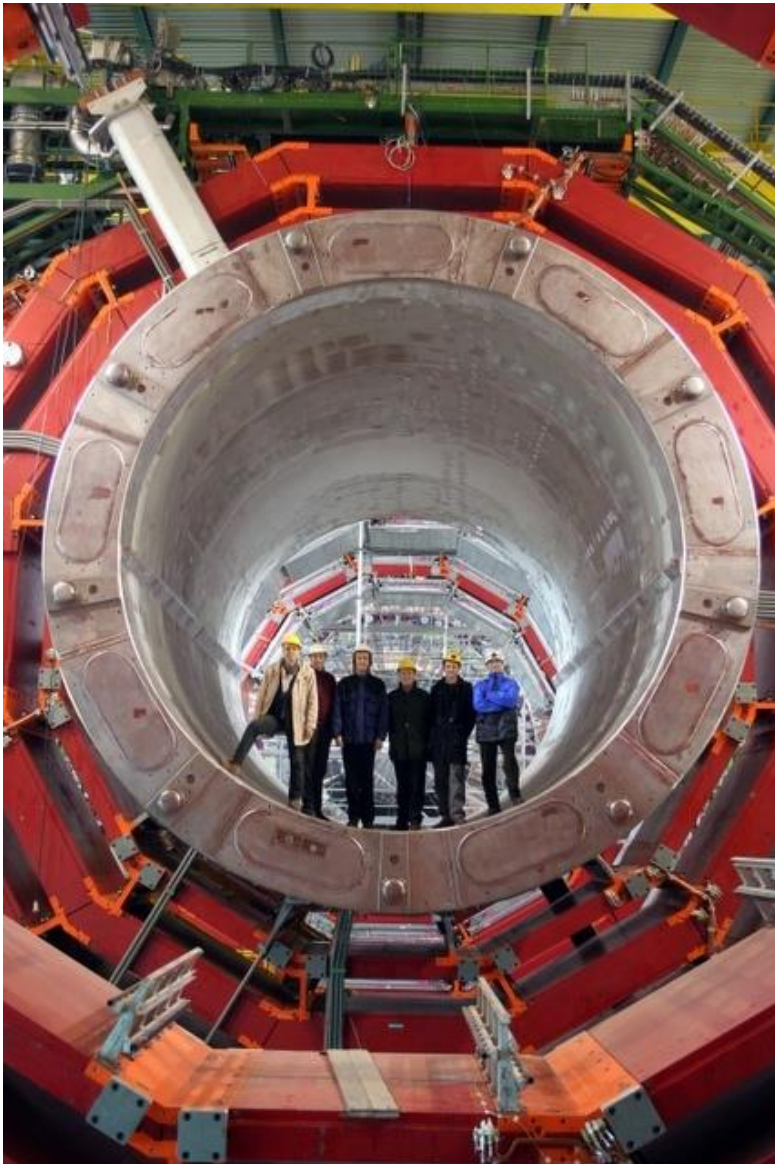
μ chambers

ZDC
($z = \pm 140$ m,
 $|\eta| > 8.2$ neutrals)

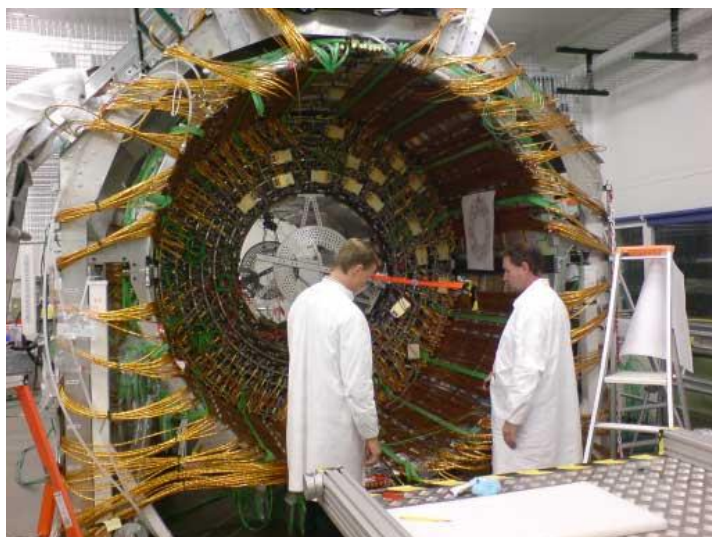
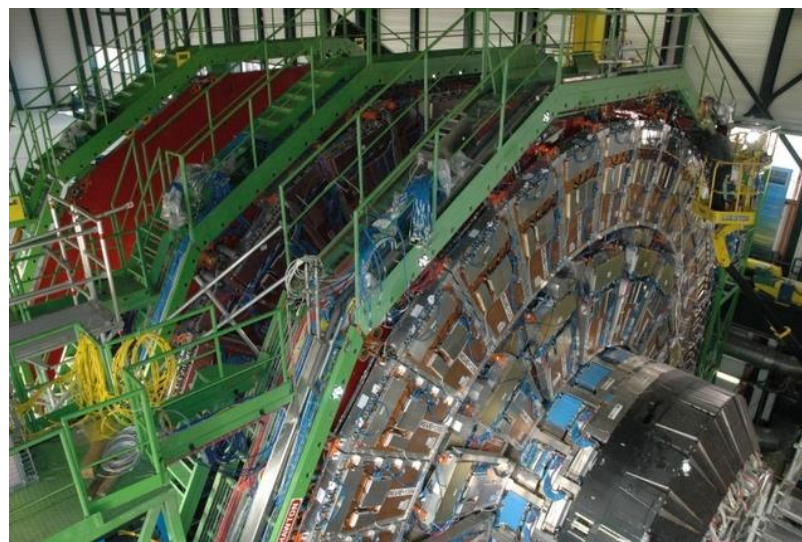
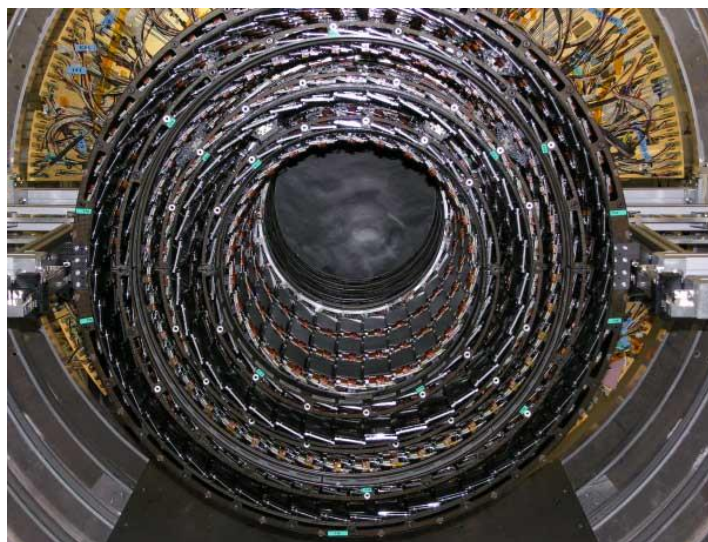
CASTOR
($5.2 < |\eta| < 6.6$)

Hermetic Calorimetry
Large acceptance Tracker
Excellent Muon Spectrometer

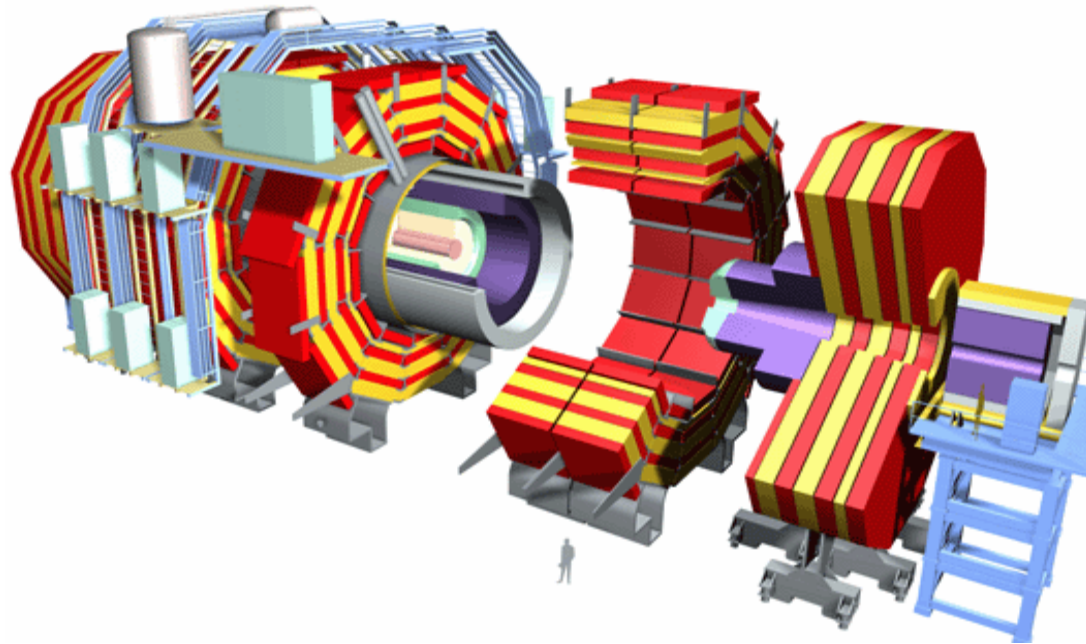
In Heavy Ion Collisions:
Functional at highest expected multiplicities
Detailed studies at $\sim dN_{ch}/d\eta \sim 3000$
cross-checks up to 7000-8000



Wires everywhere!



*Theoretically,
of wires = # of channels
16M wires, soldering, etc...*

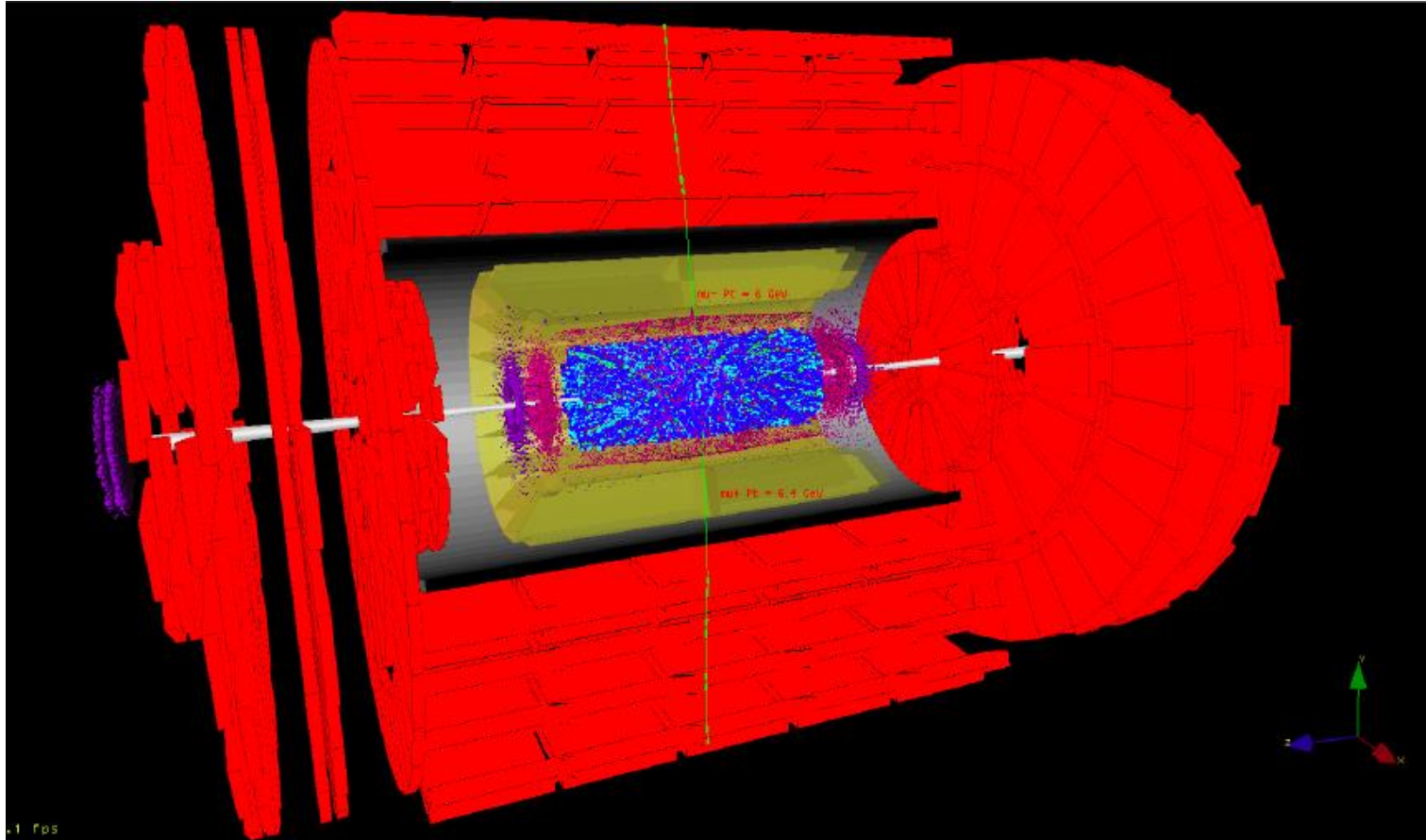


Event data structure		
EDM	Data	MC
	FEVT	SimFEVT
RAW	Digitized detector	Generated, simulated
RECO	Reconstructed	
AOD	Physics extracted	

- 💡 **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.**

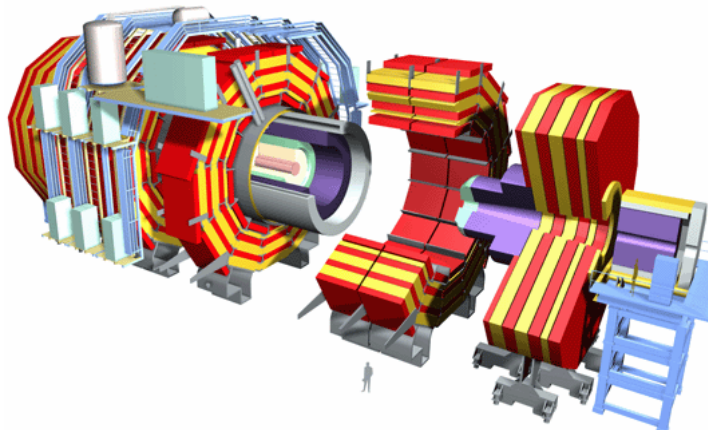
$AA \rightarrow \text{hot ball} + \Upsilon \rightarrow \mu^+ \mu^-$

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



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

Not only data but also MC data



Sensor
→ ADC
→ digitize
→ trigger
→ record

Real data

Data AOD

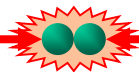
Event reconstruction

Physics reconstruction

GEANT4 detector simulation

MC data

MC AOD

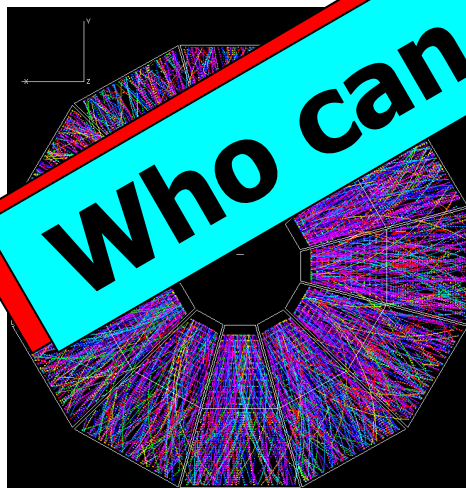
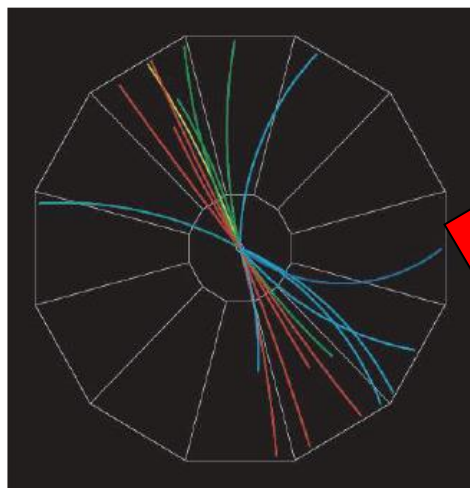


Estimation	pp	AA
Beam time / year (s)	10^7	10^6
Trigger rate	150Hz	70Hz
# of events	1.5×10^9	0.7×10^8
Event size	2.5MB	5MB
Data produced / year	3.75 PB	0.35 PB
10 years LHC run	40 PB	4 PB
MC data required	= PB	= PB
Order of magnitude	~ 100 PB	

Yearly computing size

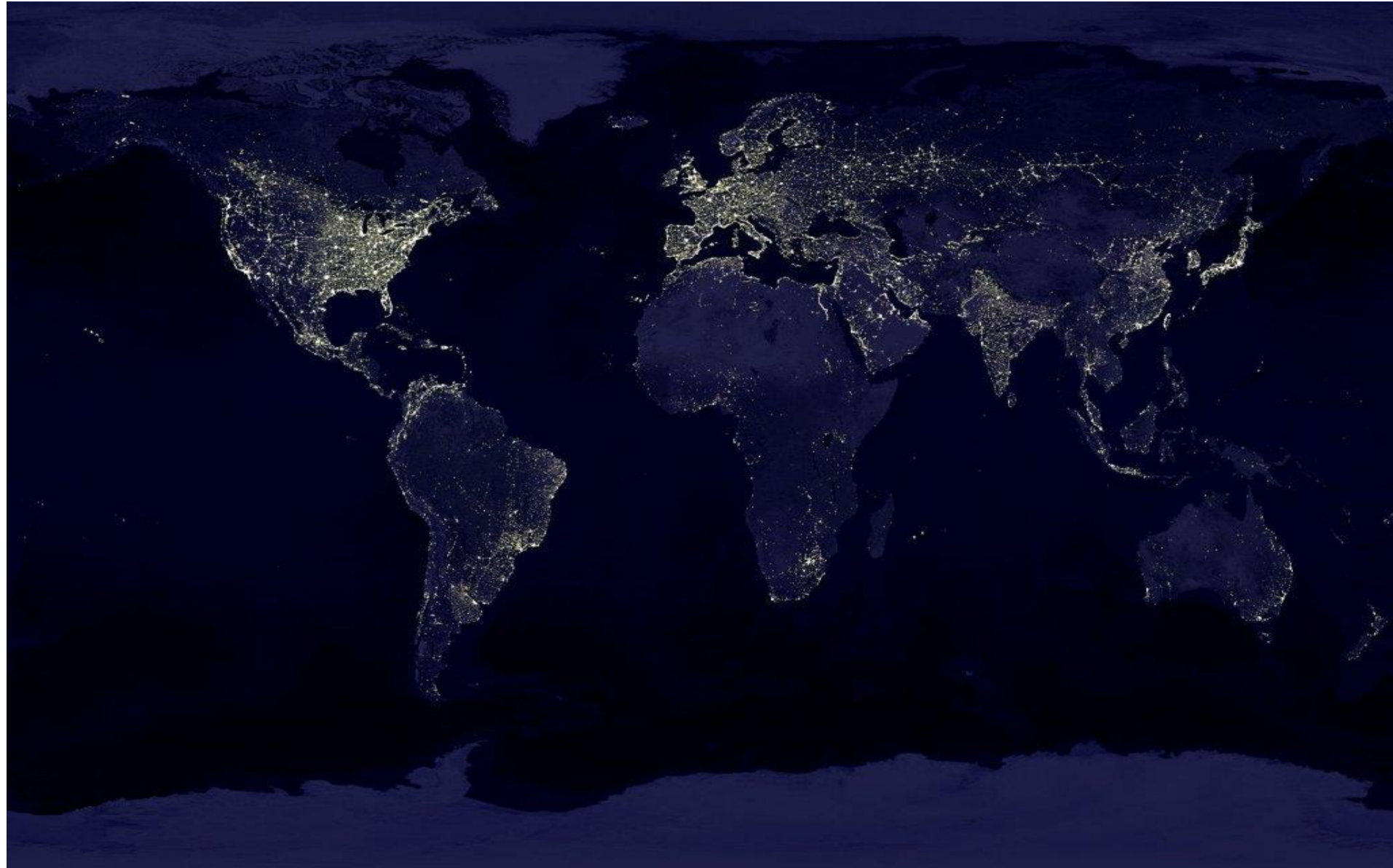
- 🔴 10 PB : Compact Disc (700MB)
 - 150 millions CD
- 🔴 each CD is 1mm thick
 - 150 km
- 🔴 with DVD 100 km
- 🔴 with Blu-ray 100 → 1,000,000

Who can save us?



simulate AA

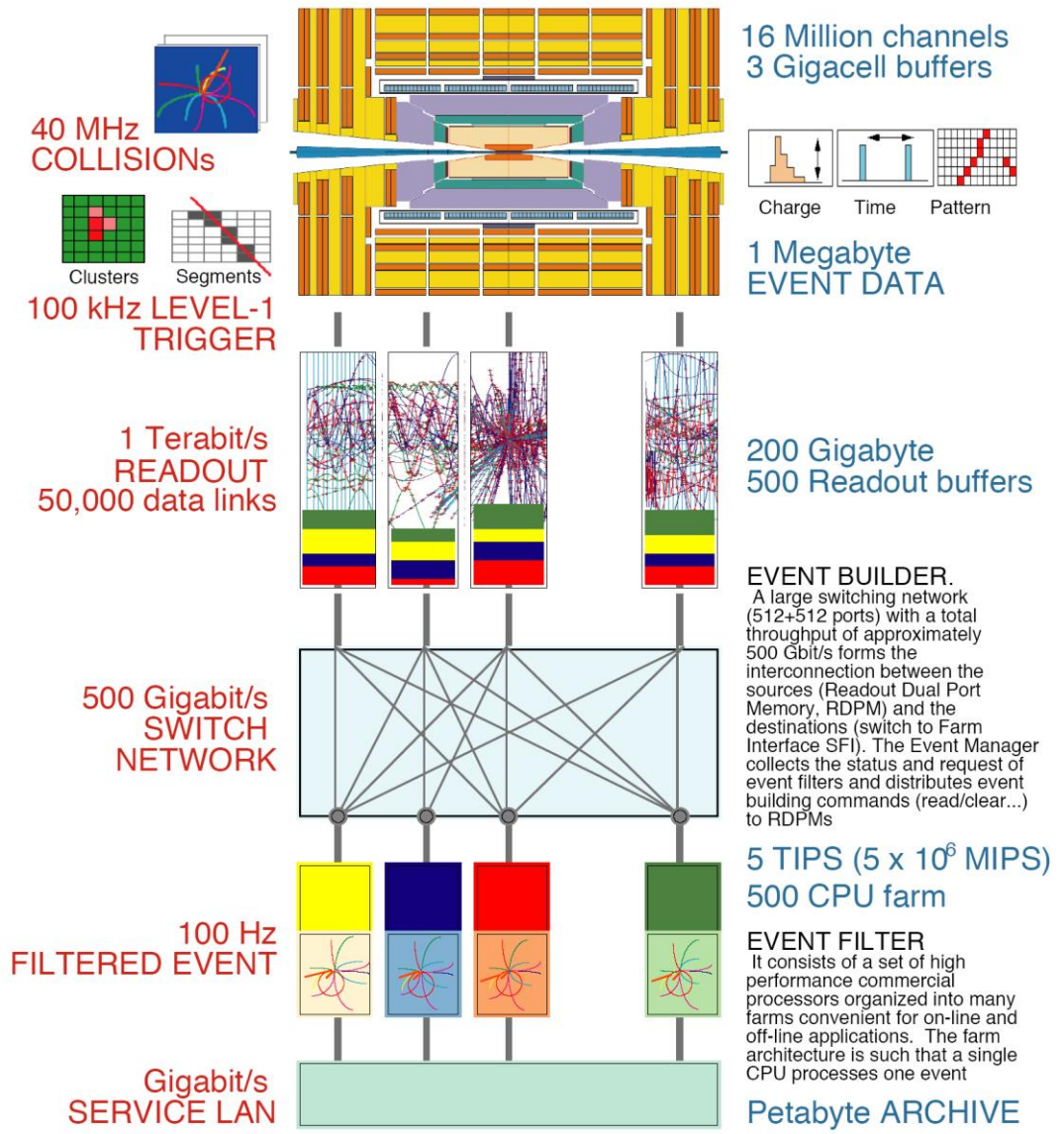
- 1-6 hours/events
- ~ 10^8 hours to create AA MC
- ~ 10^4 CPU needed
- 🔴 To reconstruct Data & MC
- 🔴 Reprocessing
- 🔴 Data analysis etc.
- 🔴 Needs few tens of MSI2K
 - newest CPU ~ 1000SI2K
- 🔴 pp + AA → Order of ~ 10^5 CPUs



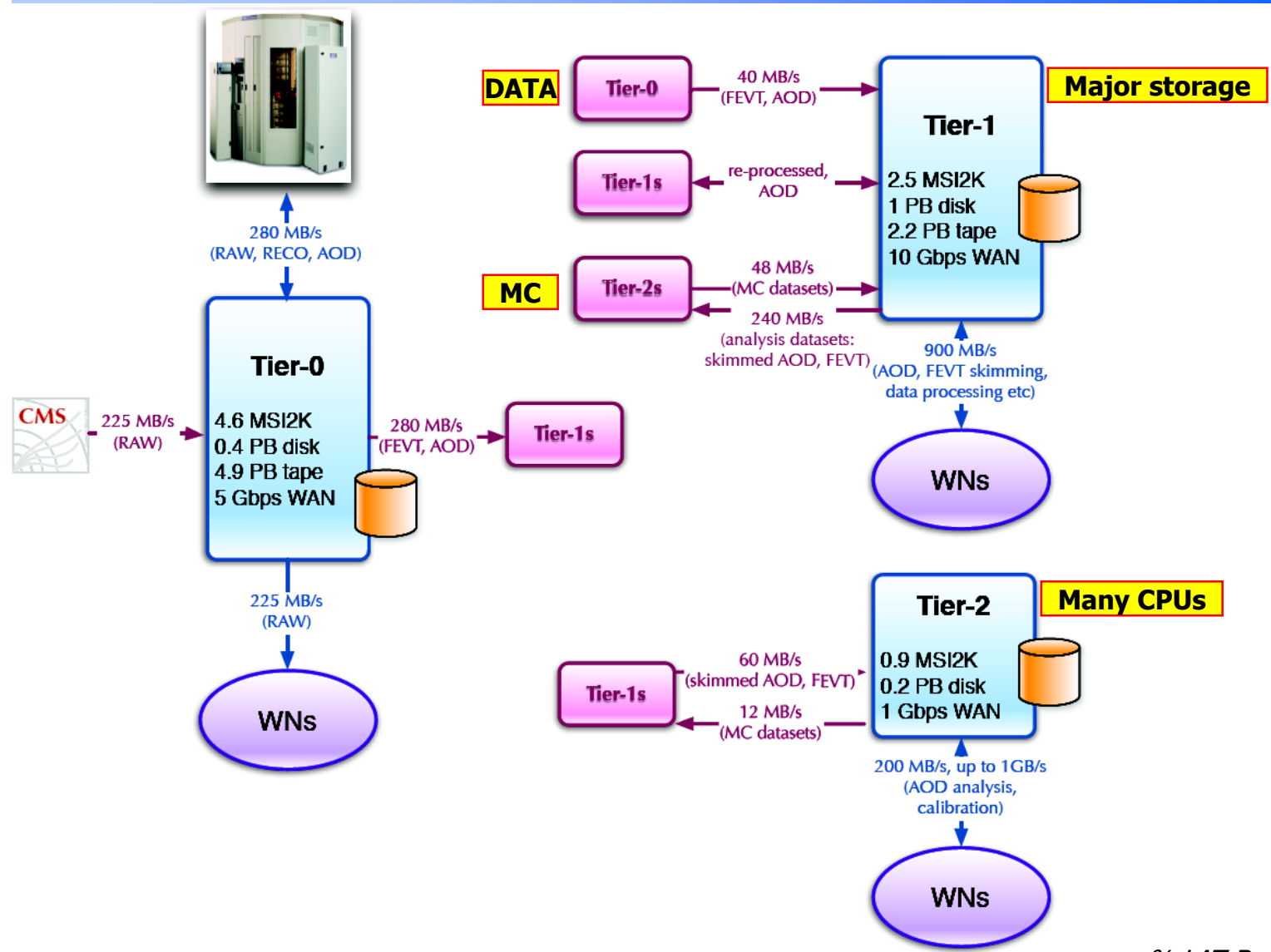
CMS computing:

Tier structure

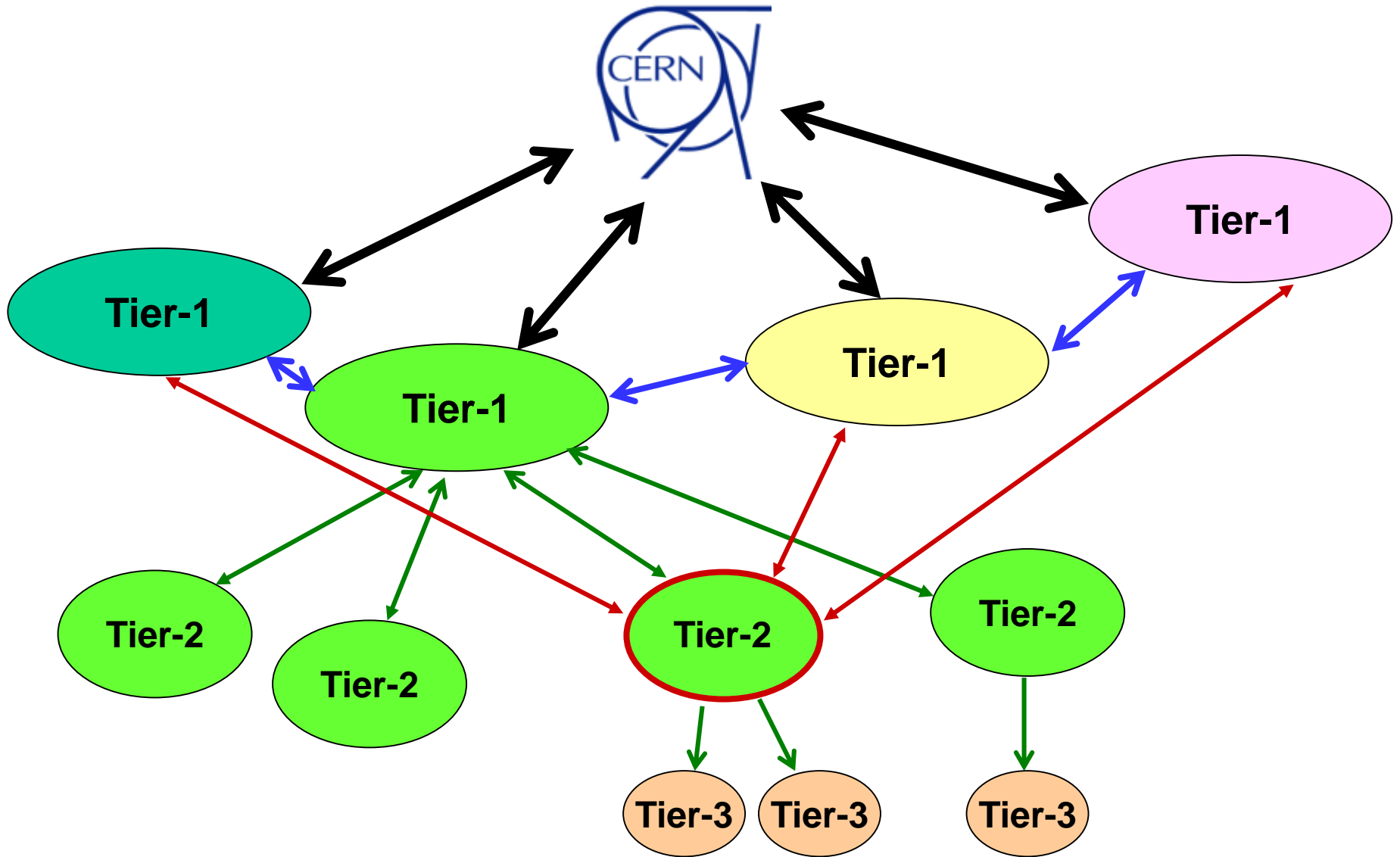
What happens at Tier0



Tier 0 ↔ Tier 1 ↔ Tier 2

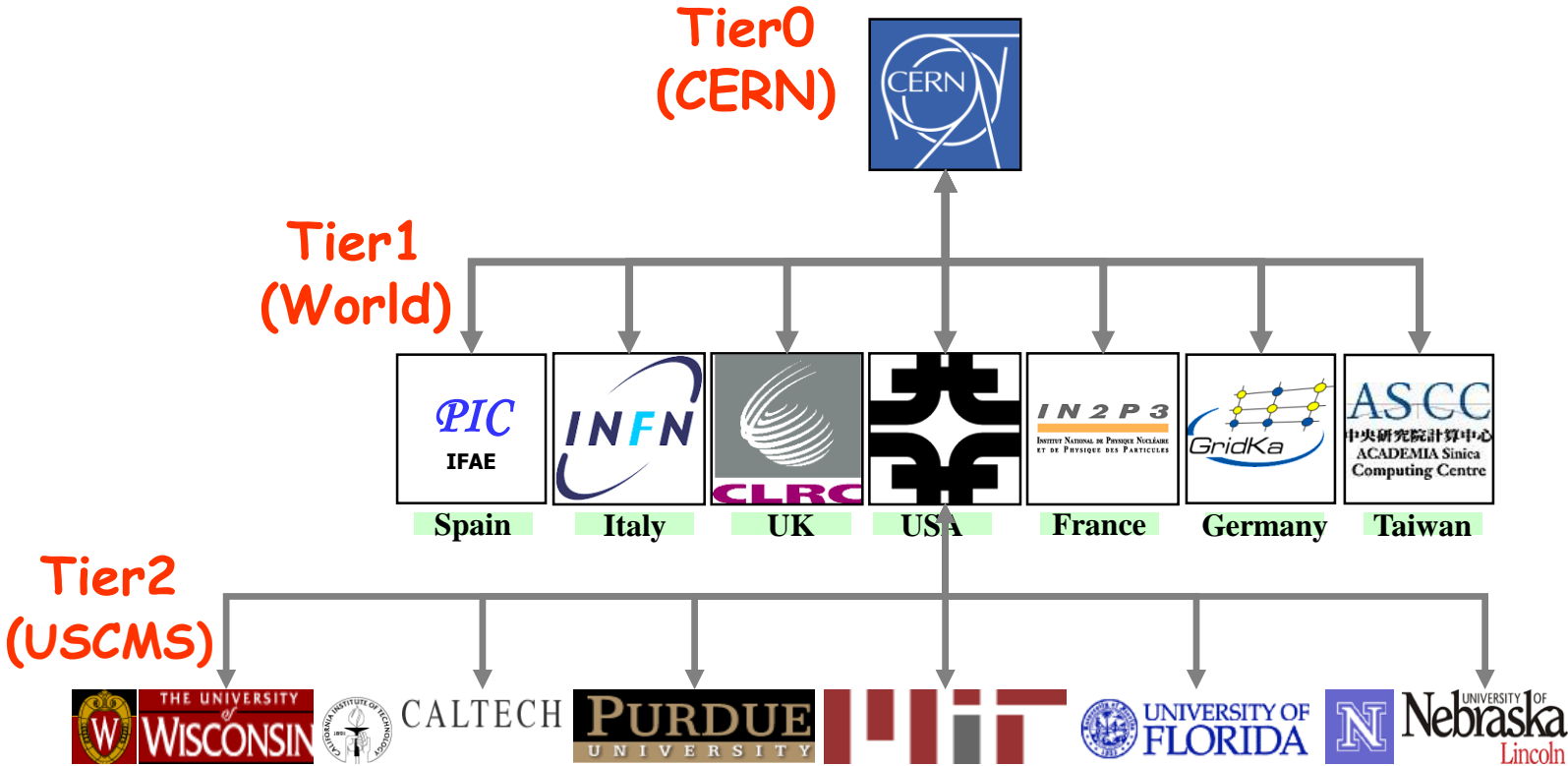


% LAT Bauerdick, 2006





CMS Computing Tier structure

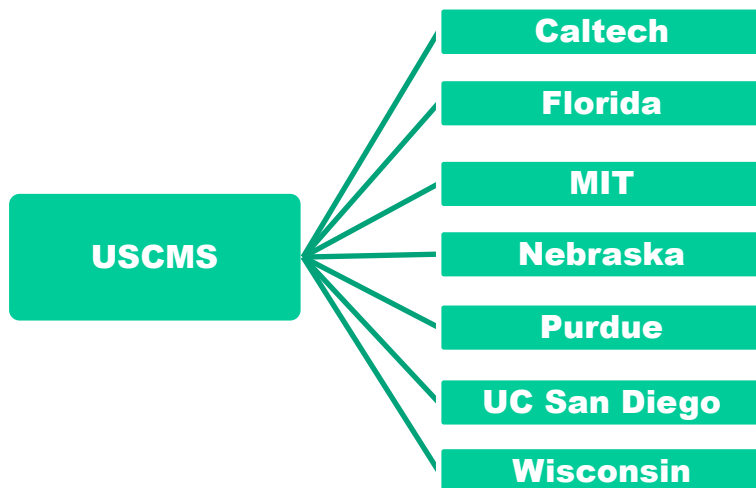




US CMS tier2 case



- 💡 **Total 48 universities**
- 💡 **7 have Tier2, others have Tier3**
- 💡 **CE: 200-3000CPUs (400-1000kSI2K)**
- 💡 **SE: > 100TB**
- 💡 **Network infra: 1-10Gbps**



Site	CPU (kSI2K)	Disk (TB)	WAN (Gbit/s)
Caltech	586	60	10
Florida	519	104	10
MIT	474	157	1
Nebraska	650	105	10
Purdue	743	184	10
UCSD	932	188	10
Wisconsin	547	110	10



US-Tier2 homes



Caltech Tier2 Center

Mission Statement
The Tier2 Center at California Institute of Technology provides computing support for the international scientific community. This project is a joint venture between the [Tier2 Resource](#) and [Center for Advanced Computing Research](#). Our facility is part of the Data Grid hierarchy set up for Large Hadron Collider experiments. It serves as an intermediary between the Tier1 centers at Fermilab and universities in Eastern California. Our primary focus is computing support for the [Compact Muon Solenoid](#) experiment. We provide resources for other HEP experiments as well. Our group is an active member of the [Open Science Grid Consortium](#).

News

Date	Summary	Posted by
12/23/06	New Workstation and Cluster cluster deployed	Rex Hinkle
3/27/06	Message P3 and T2 cluster	Rex Hinkle
2/9/06	New Cluster cluster added (CMT, CMS, T2)	Rex Hinkle

Last modified: Fri Dec 22 15:58:57 PST 2006

<http://www.cacr.caltech.edu/projects/tier2-support/>

THE UNIVERSITY OF FLORIDA Tier2 CENTER

Mission Statement
The Tier2 Center at the University of Florida is a facility supporting the computational needs of scientific and academic organizations in the region and across the globe. The facility is part of the global computing fabric for Large Hadron Collider experiments at CERN and the Fermi National Laboratory, and also one of the four US Tier2. The facility consists of computational clusters, disk storage arrays and a variety of other server nodes.

Project Links

- IT Shop Tracking
- Tier2 Self-Healing
- Tier2 HP Cluster
- Tier2 OS Config
- Tier2 Tools
- GridGate Workshop
- Georgia Hubble
- OSAP Analysis Info
- OSAP Archive

Local CMS Sites

- OSQAR

Grid Projects

- OSQAR
- MOG
- OSQAR
- ULTRAgrid

<http://tier2.ihepa.ufl.edu/>

MIT CMS Tier-2 Facility

More information is coming soon...

- The [CMS website homepage](#)
- [CMS cluster status and information](#)
- [Cluster statistics](#)
- [Tier2 resource monitoring](#)
- [CMS Grid Monitoring](#)
- [Transfer user information](#)
- [Disk usage and file read/write disk usage over cluster](#)

In case of problem please send mail to report@cmsf.mit.edu

Current status

Graphs for last hour: [cpu] [memory] [network] [blocks]

<http://www.cmsf.mit.edu/> (MIT공과대학)

WISCONSIN HIGH ENERGY PHYSICS

Welcome to the CMS Tier-2 center

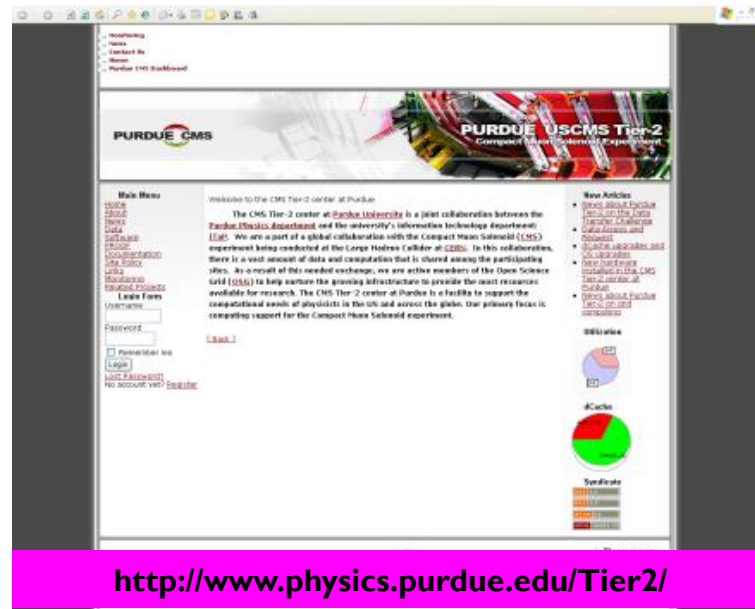
The Wisconsin group operates a large and active CMS Tier-2 computing center, supported by grants from the National Science Foundation. The facility benefits from its collaboration with a strong computer research team and resources alongside with the campus-wide grid - the Grid Laboratory of Wisconsin (GLW). Our Tier-2 computing center is part of the Data Intensive Science (DIS) Network (DISNET), a grid-based facility comprising computing, network, middleware and personnel resources from five universities: Caltech, U.C. San Diego, U. Florida and UW. In addition we are also providing core middleware for the CMS and other grid users through USQ T2E projects such as Rapid-response Adaptive Computing Environment (RAACE).

We are part of the global collaboration with the CMS experiment which is being conducted at the Large Hadron Collider (LHC) at CERN. Our T2 facility will support the computational needs of physicists at the US and across the globe to process the vast amount of data that will be generated by the CMS experiment. At the same time, for the benefit of other science research projects at the US, we are also sharing the T2 computational and storage resources through our active membership in the Open Science Grid (OSG) Consortium.

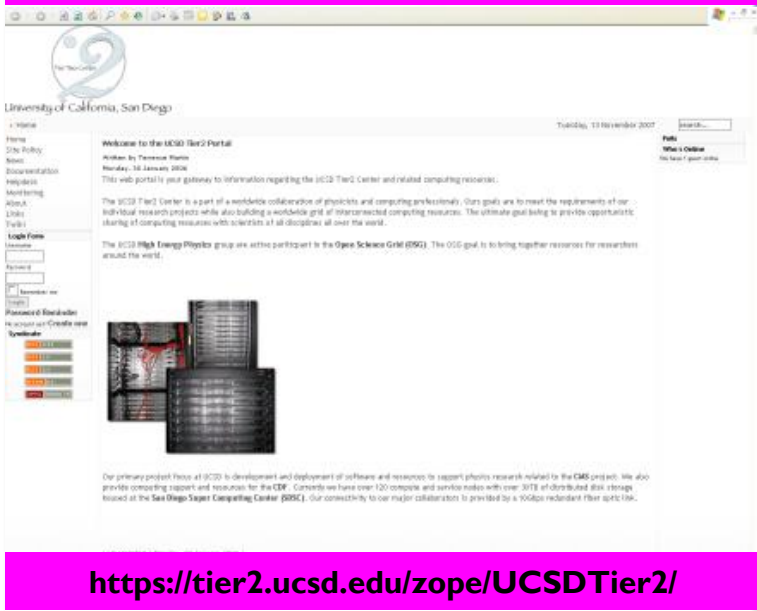
<http://www.hep.wisc.edu/cms/comp/>



<http://t2.unl.edu/cms>



<http://www.physics.purdue.edu/Tier2/>



<https://tier2.ucsd.edu/zope/UCSDTier2/>



Manpower



Tier2기관 성격	책임자, 운영자	이메일주소	학위및 전공, 현직
Caltech 물리학과, 컴퓨팅센터	Ilya Narsky	narsky@hep.caltech.edu	물리학박사, 물리학과
	Michael Thomas	thomas@hep.caltech.edu	물리학, 물리학과 입자물리연구실
MIT 공과대학 물리학과, LNS연구소, Tier2센터	Bolslaw Wyslouch	wyslouch@mit.edu	핵물리학, 물리학과 교수, 책임자
	Ilya Kravchenko	Ilya.Kravchenko@cern.ch	물리학박사, Operation manager
	Constantin Loizides	loizides@MIT.EDU	물리학박사, physics admin
Purdue 대학 물리학과, CMS컴퓨팅센터	Maarten Ballintijn	maartenb@mit.edu	물리학박사, system admin
	Norbert Neumeister	neumeist@purdue.edu	입자물리학, 물리학과 교수, 책임자
	Tom Hacker	hacker@cs.purdue.edu	컴퓨터공학부, 관리자
	Preston Smith	psmith@purdue.edu	물리학과, 매니저
	Michael Shuey	shuey@purdue.edu	물리학과, Physics support
	David Braun	dbraun@purdue.edu	물리학과, Software
	Haiying Xu	xu2@purdue.edu	CMS연구원, 입자물리전공
Wisconsin 대학 물리학과, CMS 컴퓨팅센터	Fengping Hu	fhu@purdue.edu	CMS연구원, 입자물리전공
	Sridhara Dasu	dasu@hep.wisc.edu	물리학, 책임자, 물리학과 교수
	Dan Bradley	dan@hep.wisc.edu	물리학, 입자물리연구실, 연구교수, software
	Will Maier	wcmaier@hep.wisc.edu	물리학, 물리학과 입자물리연구실 연구원, admin
Florida 대학 물리학과	Ajit Mohapatra	ajit@hep.wisc.edu	물리학, 물리학과, 입자물리연구실 연구원, support
	Yu Fu	yfu@phys.ufl.edu	물리학과, OSG 매니저
Nebraska 대학 물리학과, Tier2 컴퓨팅센터	Bockjoo Kim	bockjoo@phys.ufl.edu	입자 물리학 박사, CMS 그리드컴퓨팅 관리자 (한국인)
	Ken Bloom	kenbloom@unl.edu	입자물리학, 물리학과 교수
	Carl Lundstedt	clundst@unlserve.unl.edu	입자물리학박사, 물리학과 연구교수
	Brian Bockelman	bbockelm@cse.unl.edu	CMS 그리드컴퓨팅
	Aaron Dominguez	aarond@unl.edu	Tier2운영, 물리학박사
UC SanDiego 대학 물리학과, Tier2 컴퓨팅센터	Mako Furukawa	mako@mako.unl.edu	CMS물리, 입자 물리학
	Terrence Martin	tmartin@physics.ucsd.edu	물리학과 컴퓨팅센터 스태프
	James Letts	jletts@ucsd.edu	입자 물리학박사, 물리학과 연구원



Check points



- 💡 **Centers: 7-8 universities → 1 or 2 centers**
- 💡 **CE: 400kSI2K**
- 💡 **SE: minimum of 100TB**
- 💡 **Network infra: 1Gbps minimum**
 - **Need national highways, KREONET / KOREN**
- 💡 **1 director, 2 physicists who knows what to do**
 - **+ 3-4 operational staffs**
- 💡 **support CMSSW, Condor, dCache, + more**

CMS Tier2센터 구성요소	최소설치용량 (추천용량)	실사 및 평가 방법
CE (Computing Element)	최소 400kSI2K (800kSI2K 추천)	<ul style="list-style-type: none"> - 개인용 PC숫자는 제외하고 순수히 계산용으로 설치된 것을 확인 - ganglia모니터링과 Condor 모니터링을 통해 클러스터링 및 배치잡 수행성을 확인 - 각각의 CPU의 SI2K 확인
	ganglia모니터링 설치운영 필수	
	Condor 배치시스템 설치 운영필수	
SE (Storage Element)	최소 100TB (200TB 추천)	<ul style="list-style-type: none"> - 사용자 디스크 (user disk)는 제외 - dCache 모니터링을 통해 스토리지로 사용 할 수 있는지를 실사함
	dCache 서버 설치 운용 필수	
Network	최소 1Gbps (10Gbps추천)	<ul style="list-style-type: none"> - KREONET또는 KOREN 연동 확인
Location and equipments	물리학과내 냉방능력을 갖춘 독립 공간 필수 (독립 센터 추천)	<ul style="list-style-type: none"> - 실사를 통해 공간을 확인 - 전력수급확인 필수 - 항온항습 시설 확인 필수
	최소 50kW 급 전력 수급필수	
	최소 20RT급 항온항습장치 필수	
Human resource	LHC/CMS 입자물리 전공자의 운영 책임자 참여 필수	<ul style="list-style-type: none"> - 운영책임자의 CMSSW 사용능력여부 확인 - 운영책임자의 LHC/CMS 실험 파악 정도 확인 - 운영팀 인적구성 및 행정인력 확인
	국내/외국 CMS 물리학자들과의 공동연구 능력 확인	
	운영팀과 행정조직 보유 필수	

WLCG

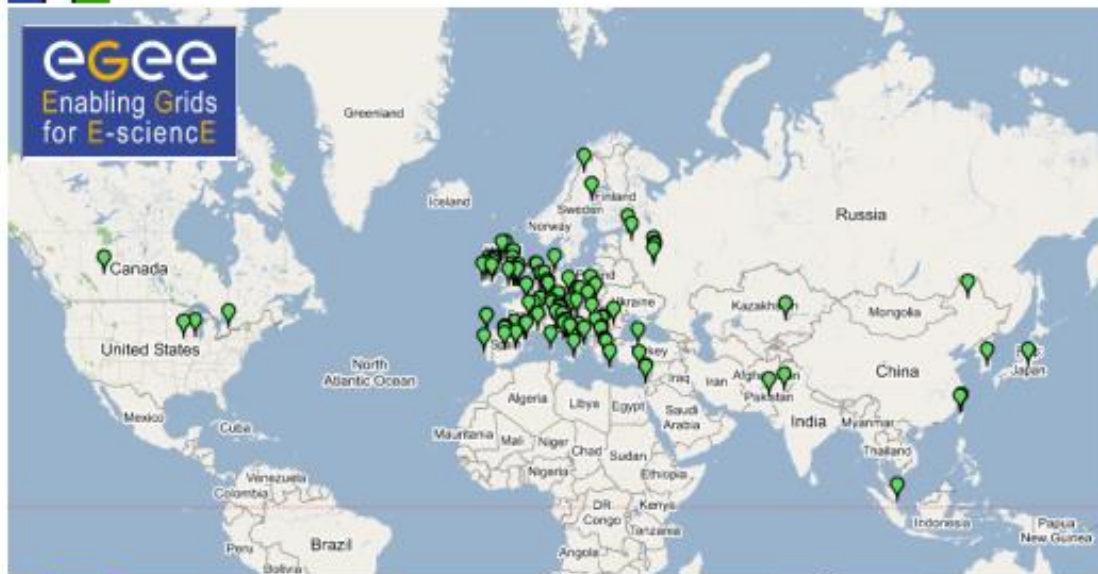
EGEE and OSG



World wide LHC Computing Grid



Grid Projects Collaborating in LHC Computing Grid



EGEE Operations Information	
Active Sites	177
Available CPU	30230
Available Storage (TB)	14393

LastBuild:Sun Apr 8 15:16:01 BST 2007 GstatQuerv:2006-12-15

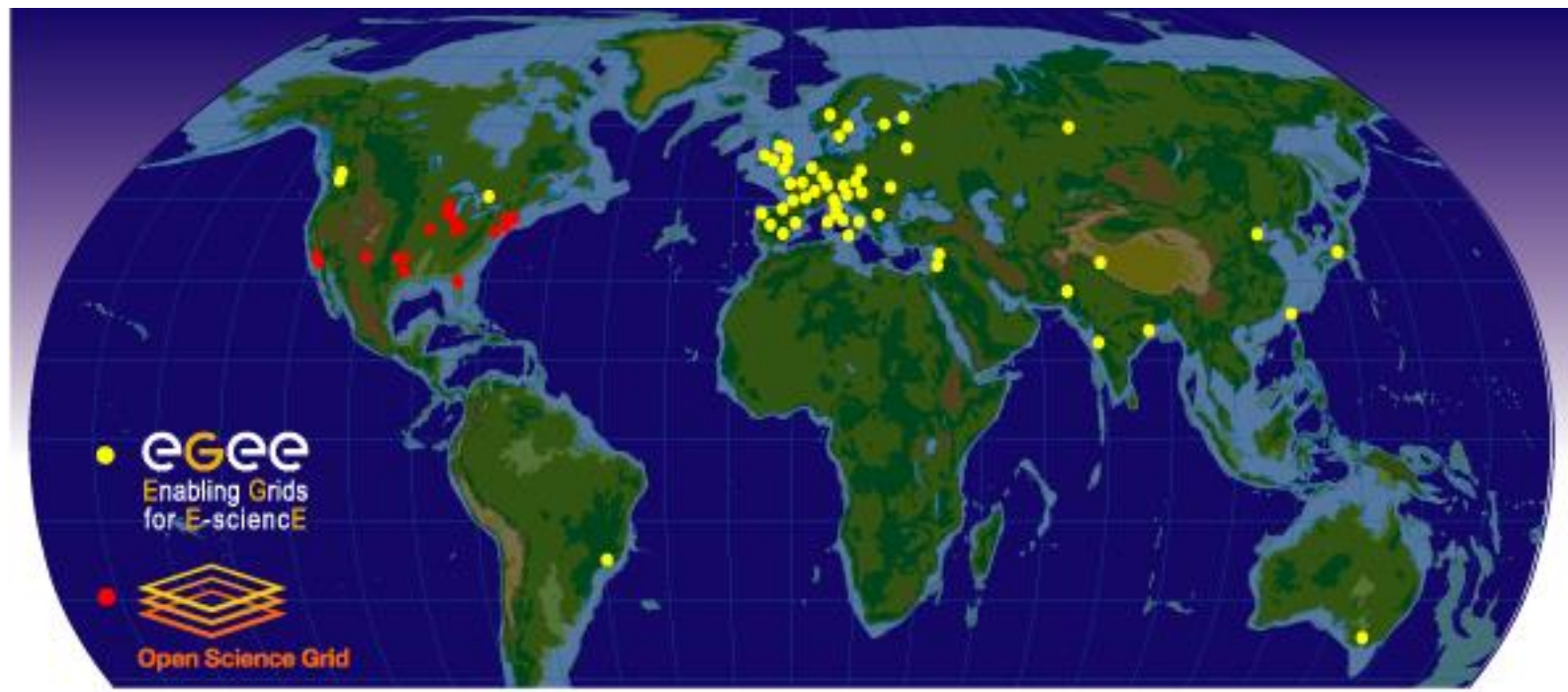


Mon Feb 20 10:38:05 GMT 2006

Click the picture.

LCG uses three major grid solutions

- 💡 **EGEE : most of European CMS institutions**
 - open mixed with LCG... (LCG ~ EGEE)
- 💡 **OSG : all of US-CMS institution**
- 💡 **NorduGrid : Northern European countries**



A map of the worldwide LCG infrastructure operated by EGEE and OSG.



OSG in USA



Europe

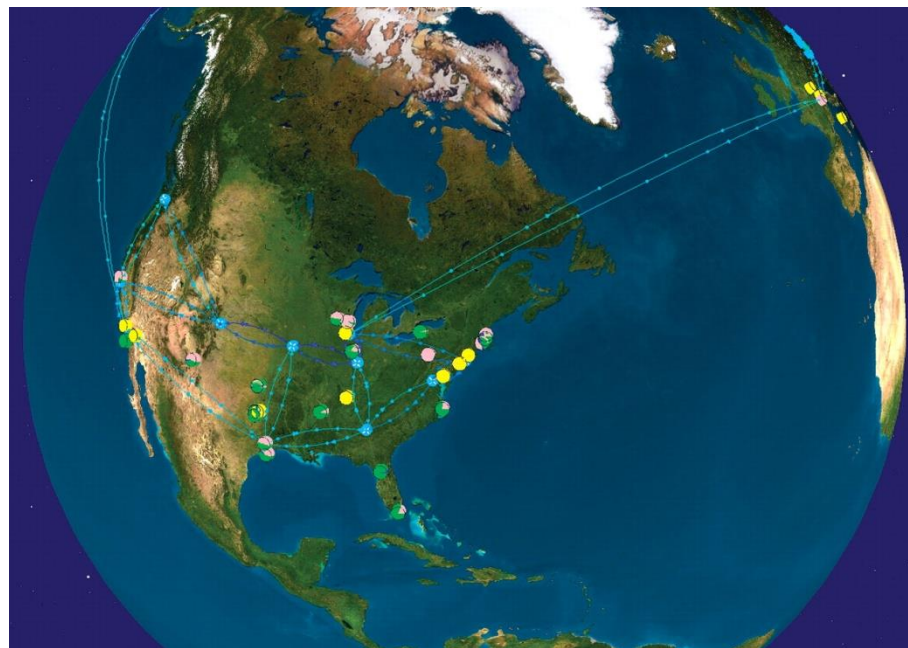
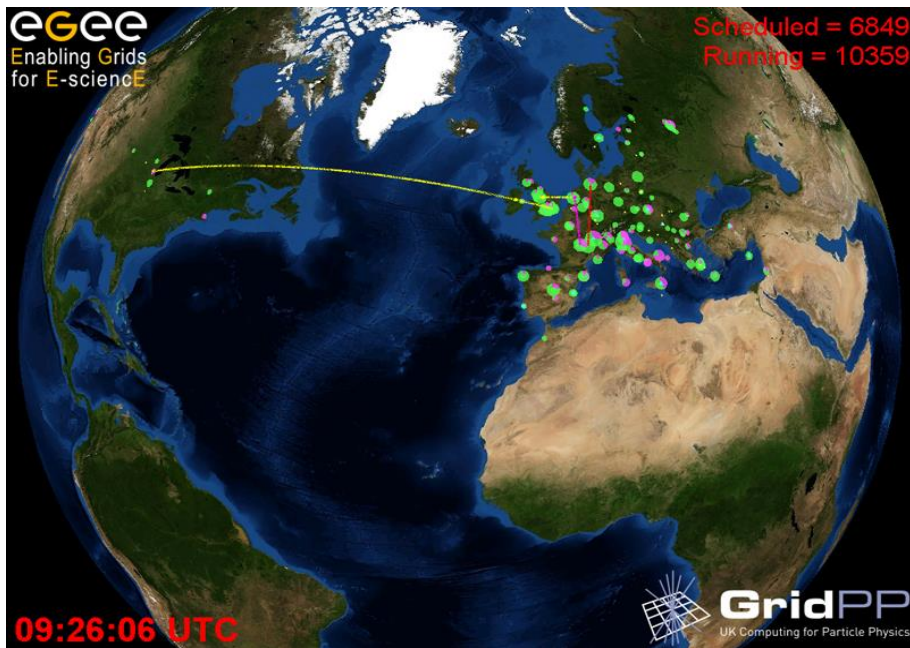


USA



Most of European CMS institutions

Most of American CMS institutions





OSG-EGEE compatibility



- ① **Common VOMS**
 - **Virtual Organization Management System**
- ① **Condor-G interfaces**
 - **multiple remote job execution services (GRAM, Condor-C).**
- ① **File Transfers using GridFTP.**
- ① **SRM for managed storage access.**
 - **Storage Resource Manager**
- ① **Publish OSG BDII to shared BDII for Resource Brokers to route jobs across the two grids.**
 - **Berkeley Database Information Index. c.f. GIIS, GRIS**
- ① **Active Joint Security groups: leading to common policies and procedures.**
- ① **Automate ticket routing between GOCs.**



Software in OSG (installed by VDT)



Job Management

- Condor (including Condor-G & Condor-C)
- Globus GRAM



Data Management

- GridFTP (data transfer)
- RLS (replication location)
- DRM (storage management)
- Globus RFT



Information Services

- Globus MDS
- GLUE schema & providers



Security

- VOMS (VO membership)
- GUMS (local authorization)
- mkgridmap (local authorization)
- MyProxy (proxy management)
- GSI SSH
- CA CRL updater



Accounting

- OSG Gratia



Monitoring

- MonaLISA
- gLite CEMon



Client tools

- Virtual Data System
- SRM clients (V1 and V2)
- UberFTP (GridFTP client)



Developer Tools

- PyGlobus
- PyGridWare



Testing

- NMI Build & Test
- VDT Tests



Support

- Apache
- Tomcat
- MySQL (with MyODBC)
- Non-standard Perl modules
- Wget
- Squid
- Logrotate
- Configuration Scripts

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***

%KISTI → ALICE Tier 2

- 💡 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

- 💡 **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

SSCC

SPCC

KREONET (GLORIAD) KOREN (APII, TEIN)

dCache pool (200TB)

Nortel Passport 8800(Gb) *2ea*

Extream BlackDiamond 8810(10Gb/Gb)

Foundry BigIron16(Gb) *2ea*

Condor Computing pool(+120 CPUs)

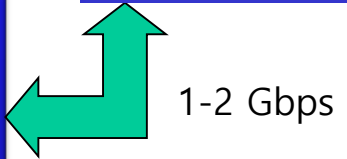
Gate, Web, Condor-G dCache/gFTP, Ganglia

64bit cluster (+ 100CPUs)

Extream BlackDiamond 8810(10Gb/Gb)

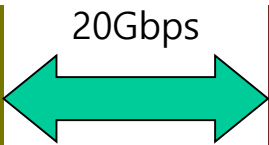
Nortel Passport 8800(Gb)

D-Link L3 Switch(Gb)



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

CMS-HI Tier 2

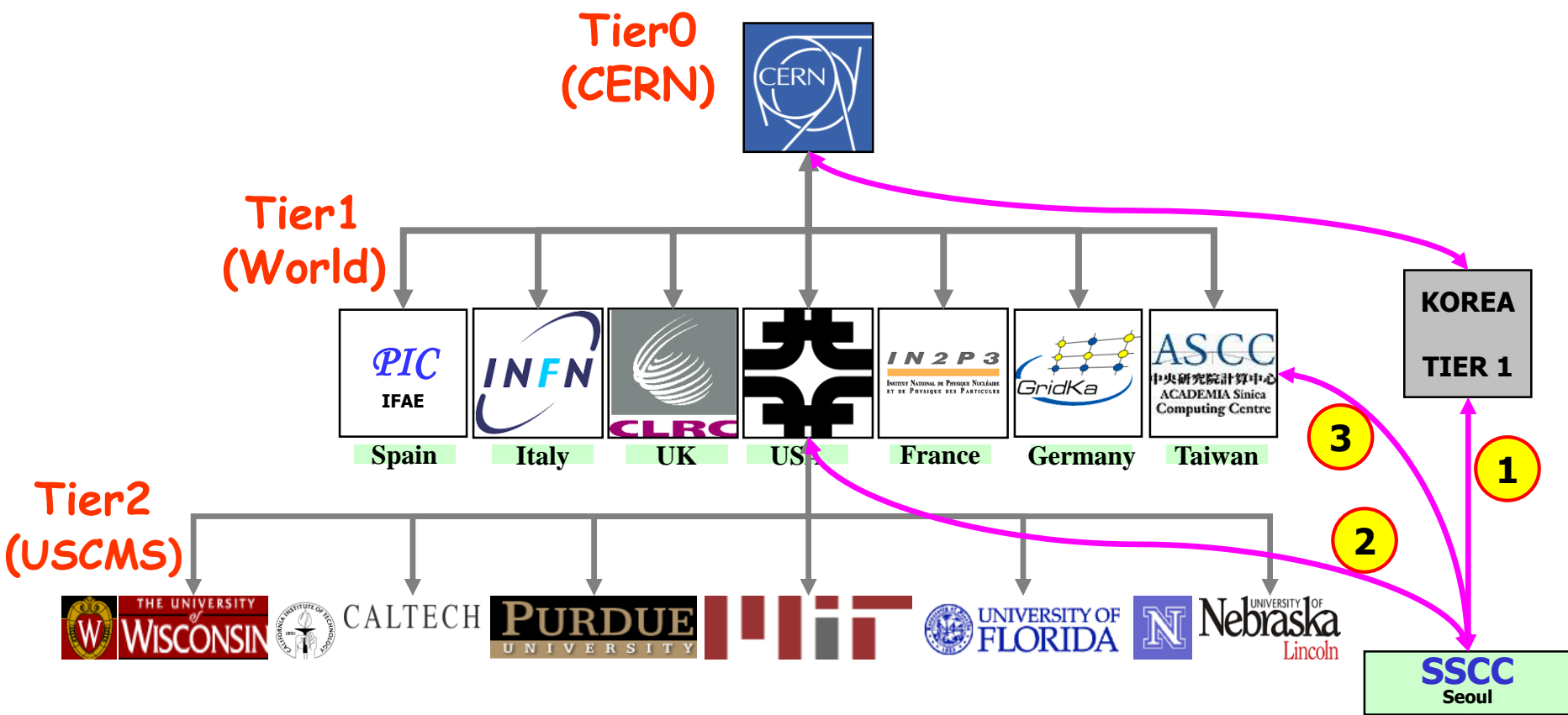


Analysis Tier 3

- 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.




Current Tier2 status




UOS CMS Tier-2 Web (ver. 0.0.2) - Microsoft Internet Explorer

Address: http://tier2.uos.ac.kr/



UOS CMS Tier-2 Center



More information is coming soon.

- [The Ganglia monitoring pages](#)
- [dCache status and information](#)
- [Condor statistics](#)
- [Temperature monitoring](#)
- [Remote user registration](#)

In case of problems please send email to support@physics.uos.ac.kr

Current status

T2CPU0 SPCC Load last day

Y-axis: Load/Pracs (0 to 100)

X-axis: Wed 12:00 to Thu 00:00

Legend: 1-min Load (grey), Nodes (green), CPUs (red), Running Processes (blue)

T2CPU0 SPCC CPU last day

Y-axis: Percent (0 to 100)

X-axis: Wed 12:00 to Thu 00:00

Legend: User CPU (blue), Nice CPU (yellow), System CPU (red), WATT CPU (orange), Idle CPU (white)

T2CPU0 SPCC Memory last day

Y-axis: Bytes (0 to 150 G)

X-axis: Wed 12:00 to Thu 00:00



Legend: Memory Used (blue), Memory Shared (dark blue), Memory Cached (green), Memory Swapped (purple), Total In-Core Memory (red)

T2CPU0 SPCC Network last day

Y-axis: Bytes/sec (0 to 100 M)

X-axis: Wed 12:00 to Thu 00:00

Legend: In (green), Out (blue)

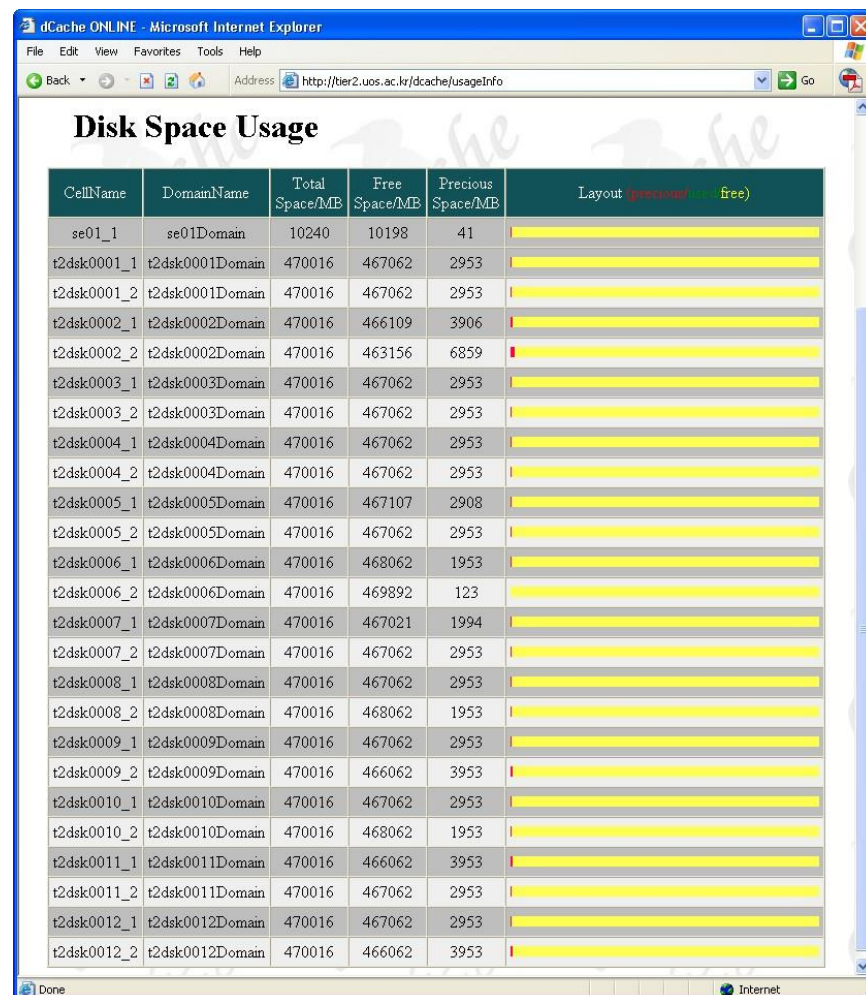



Supported by the Seoul City Government and BK21 of Korea Research Foundation.

Done Internet



CE and SE status




SE : currently 12TB

CE : currently 102 CPUs



Documentation by Twiki





Main

Webs

- CmsTier2
- DAQ
- HeavyIon
- Main
- MuonReco
- RPC
- TWiki

[Log In or Register](#)

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

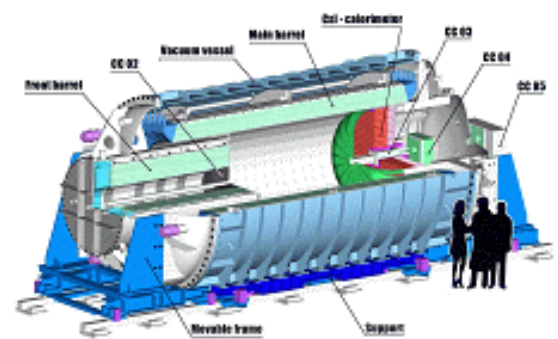
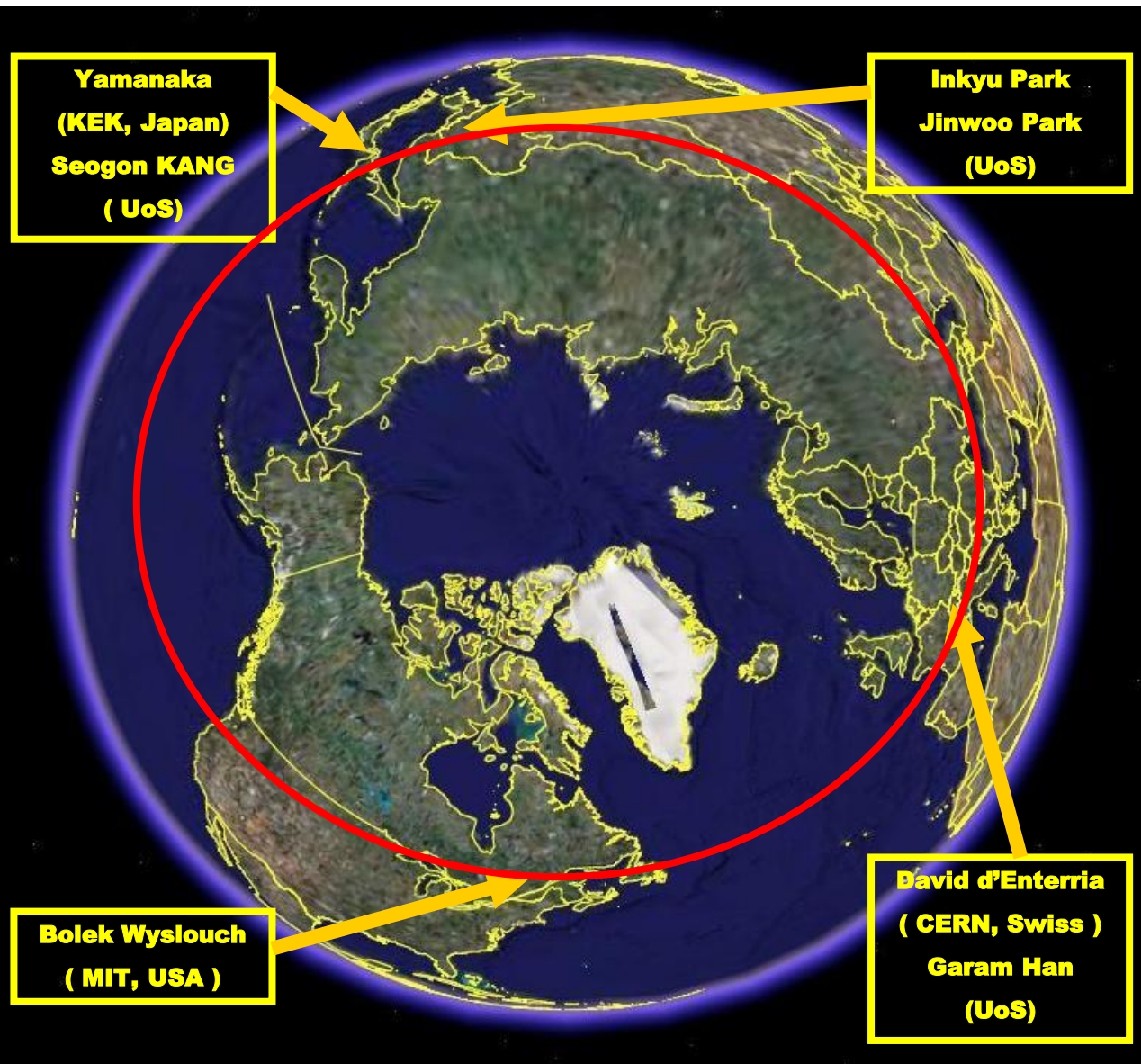
- Any suggestions and comments are very much welcome to this site!! garam.hahn@gmail.com

Group Apartment at CERN

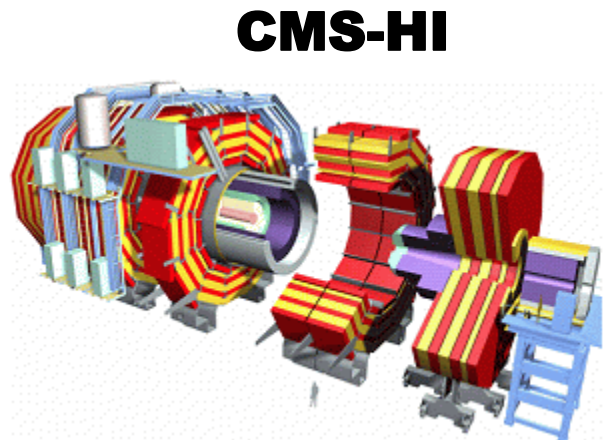
- [General Information](#)
 - Location
 - Rules
- [More Information](#) (Members Only)
 - Location, address (zoom in)
 - Pictures
 - How to survive here!
- [Reservation & Booking status](#) (Members Only)

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

Network readiness



JPARC E391a



CMS-HI

Traceroute example

VisualRoute 2007 Advanced Edition Trial Version

File Edit Options Maps Tools Help

Trace to [none] cgate.mit.edu Start Graph

Trace: cgate.mit.edu Plot: cgate.mit.edu

Report for cgate.mit.edu [18.7.24.65]

Analysis

This trace was started on 2007. 10. 25 오후 10:54:32. The host 'cgate.mit.edu' has been found, and is reachable in 14 hops. The TTL value of packets received from it is 50. In general this route is reasonably quick, with hops responding on average within 126ms. However, all hops after hop 6 in network 'imported inetnum object for SERI-1' respond slightly slower than average. The time taken to perform the DNS lookup was 15ms.

Map

14. Cambridge, MA, USA

1. (South Korea)

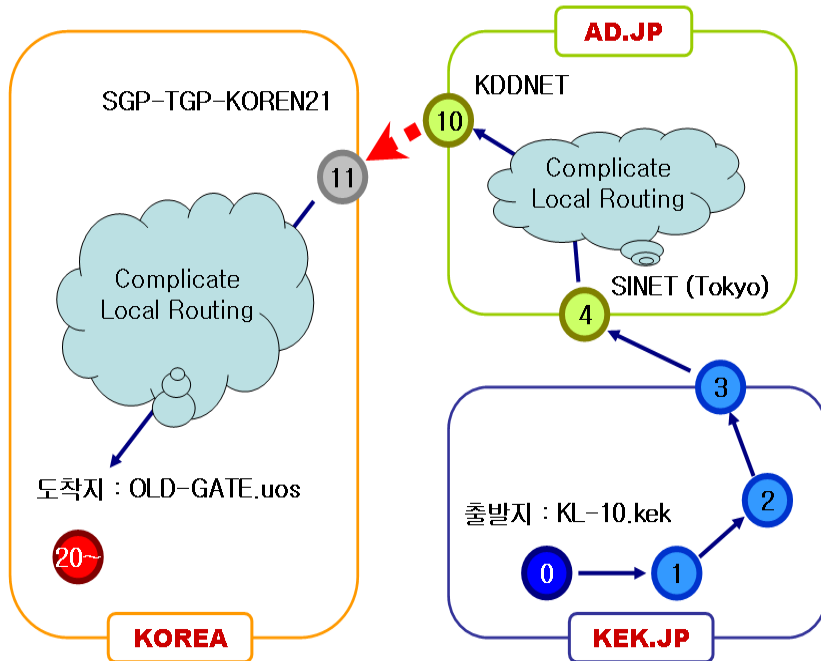
Route Graph

Hop 6: 64.57.28.13
 Avg / min / max ms: 189 / 186 / 202
[so-3-0-0.0.rtr.wash.net.internet2.edu](#)
 Internet2 I2-NEVNET
 Ann Arbor, MI
 Packet loss: 0%

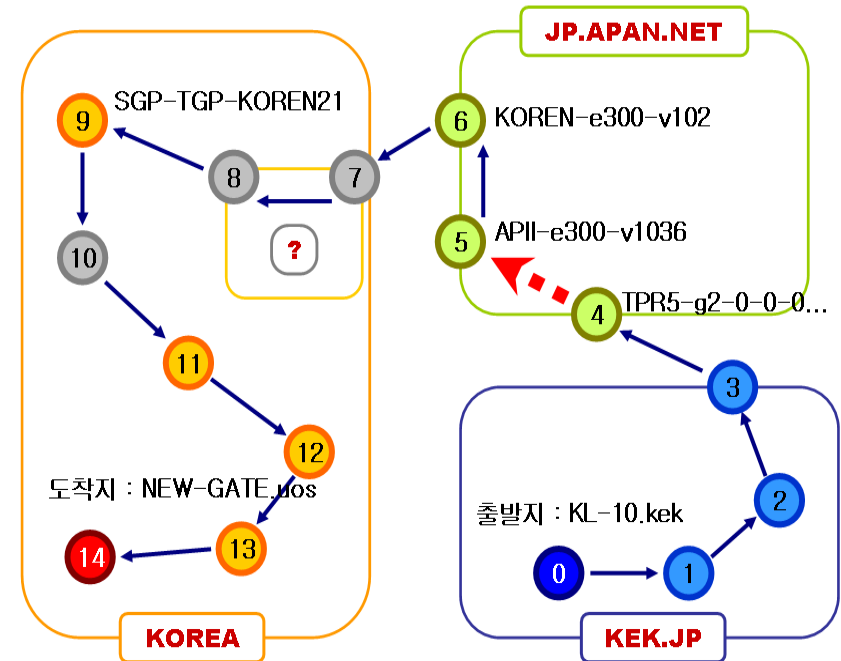
Route Table

1	210.219.52.1	2	203.241.173.46	3	134.75.120.1	4	134.75.1.9	5	134.75.20.70	6	64.57.28.13	7	134.75.108.210	8	18.168.0.25
					kreonet.net				kreonet.net					.edu	
														nit.edu	
														18.7.24.65	

Traceroute KL-10.kek to OLD-GATE.uos



Traceroute KL-10.kek to NEW-GATE.uos



Existing: KEK→AD.JP→KDDNET→UoS

– 20 hops: hop between 9 and 10 takes 40ms.

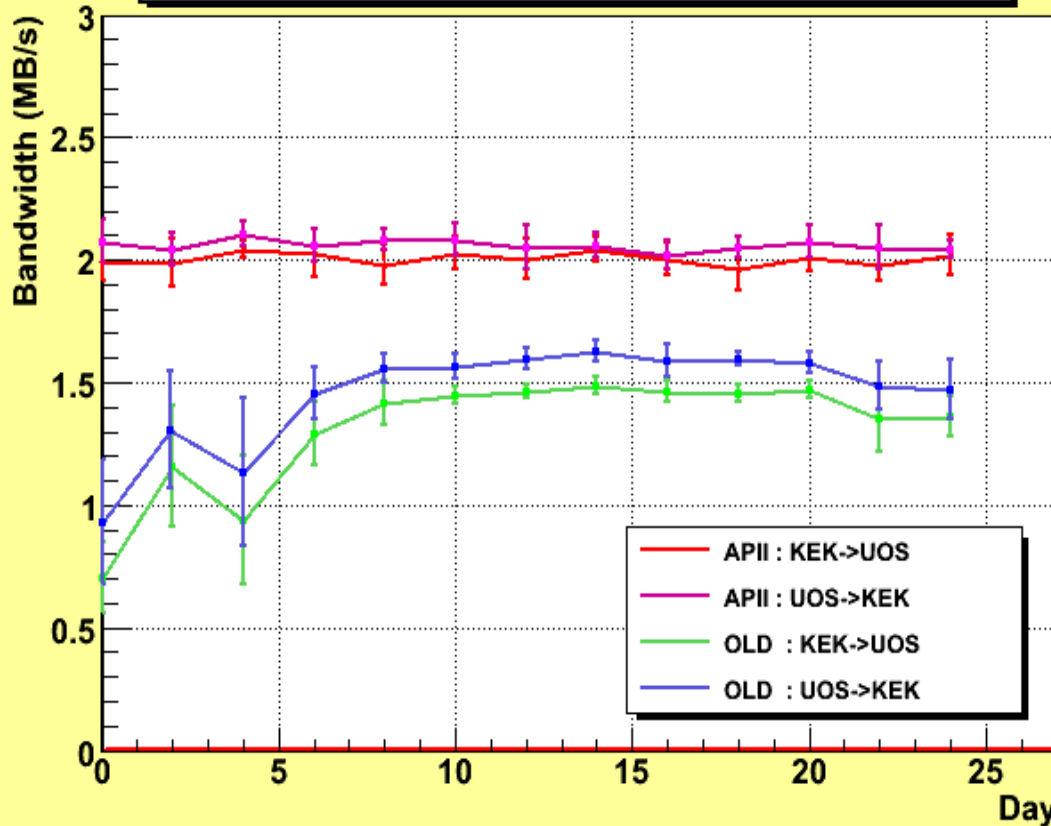


KEK→APII→KOREN→UoS

– 14 hops : hop between 4 and 5 takes 30ms, which is 90% of total delay time

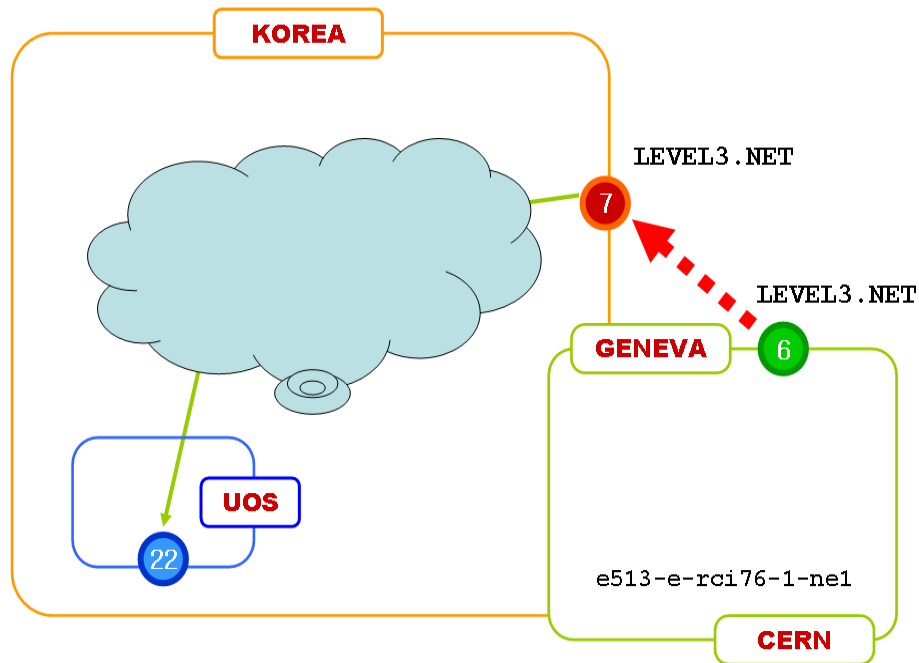
Bandwidth test between UoS and KEK

Univ. of Seoul - KEK Bandwidth

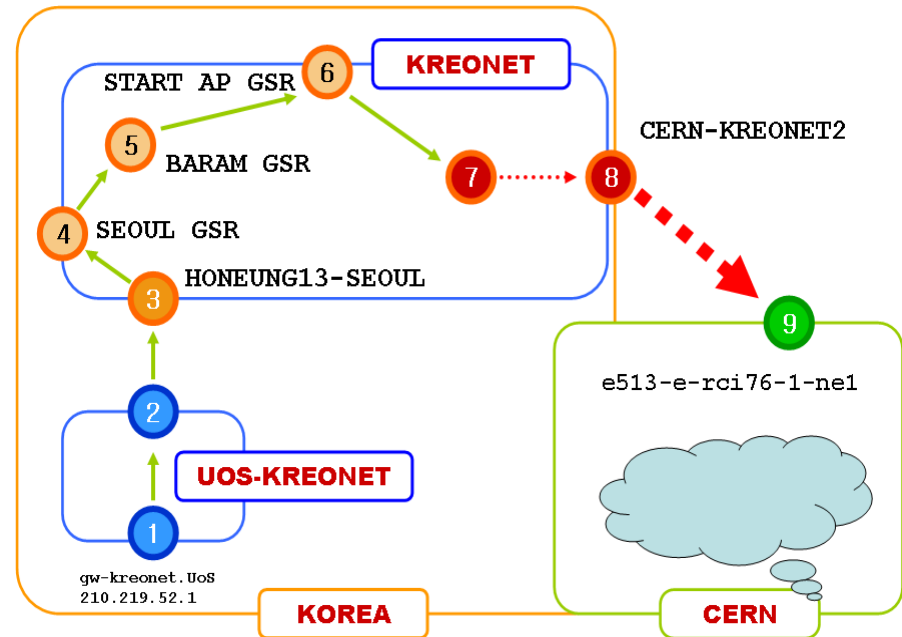


- 100Mbps at KEK, while 1G in UoS
- About a gain of 1.3, but need a correct KOREN usage
- Need more info and works

Route Between LXPLUS.cern & OLD-GATE.uos



Route Between LXPLUS.cern & NEW-GATE.uos

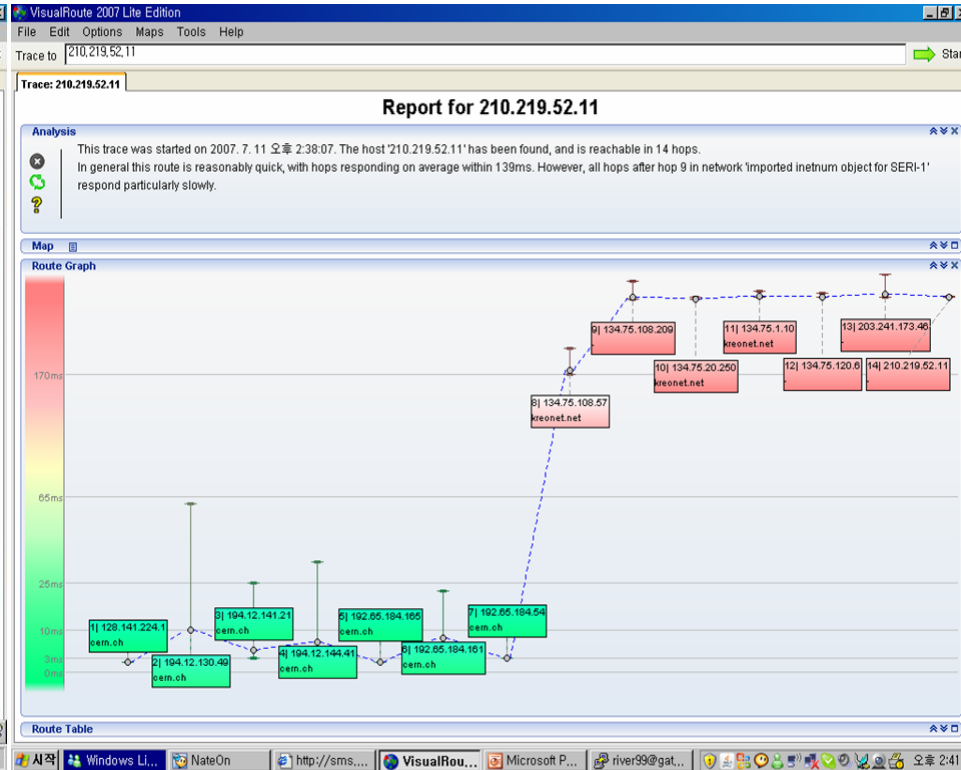
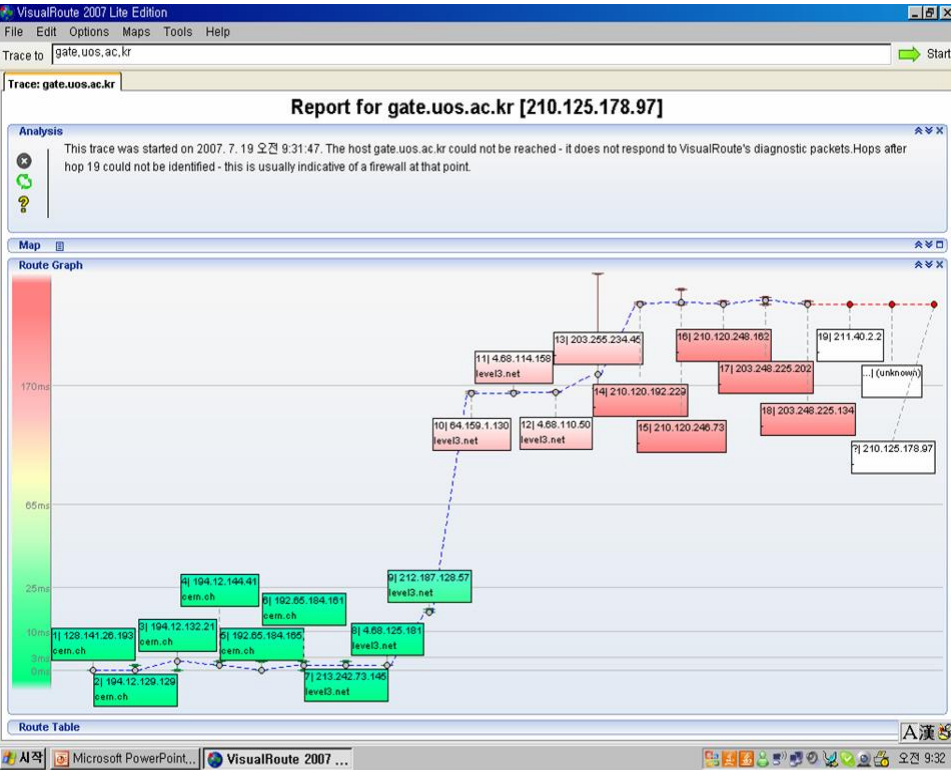


💡 170ms delay in both

- *We didn't have time to correct this problem by the time of this review.*



Between UoS and CERN



Still unclear status

– Somehow we couldn't see TEIN2

- 💡 **Bandwidth between SSCC and KNU**
- 💡 **Bandwidth between SSCC and KU**
- 💡 **Bandwidth between SSCC and SKKU**
- 💡 **Iperf was used for the check of TCP/UDP performance**

Network 벤치마크 기관	KOREN 연동 속도
서울시립대-고려대학교	99Mbps
서울시립대-경북대학교	520Mbps
서울시립대-성균관대학교	100Mbps



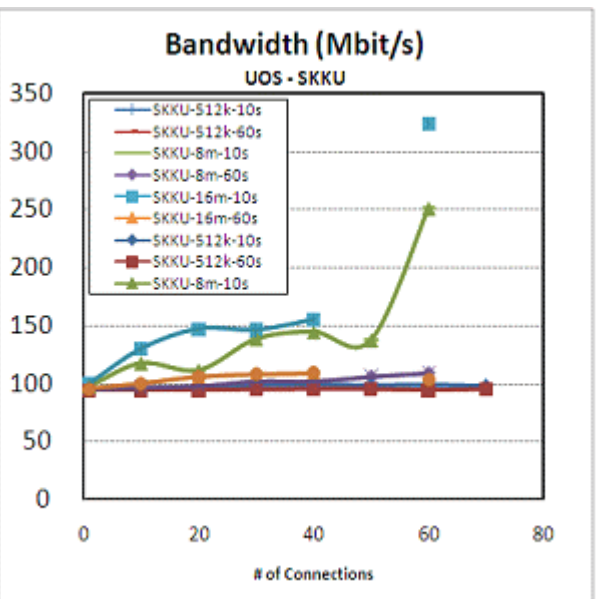
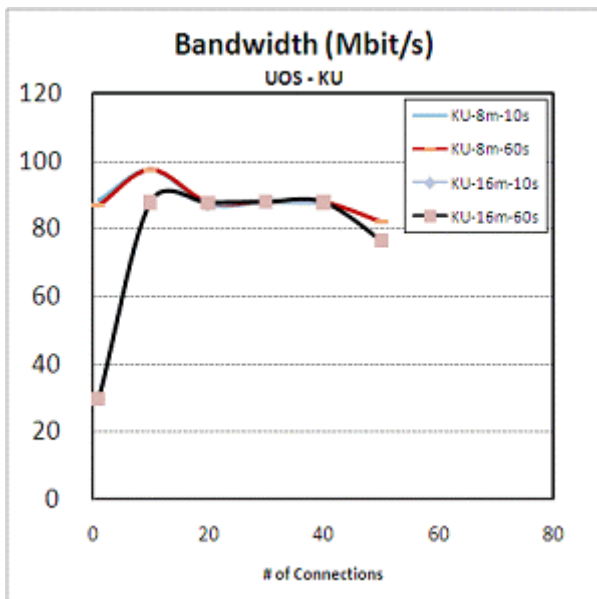
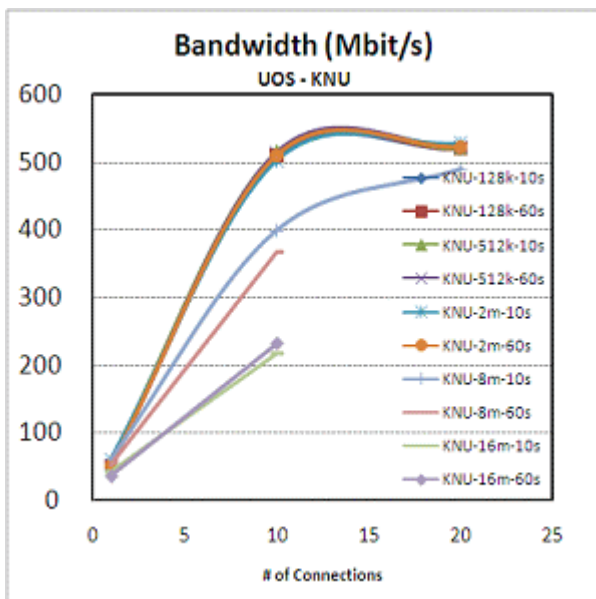
National KOREN Bandwidth



NAME	Number of connections(threads) at the same time								UNIV_NAME	W_SIZE	TIME
	1	10	20	30	40	50	60	70			
KNU-128k-10s	53.9	506.0	520.0						KNU	128k	10
KNU-128k-60s	51.8	510.0	520.0						KNU	128k	60
KNU-512k-10s	58.6	515.0	521.0						KNU	512k	10
KNU-512k-60s	52.3	514.0	522.0						KNU	512k	60
KNU-2m-10s	60.4	503.0	528.0						KNU	2m	10
KNU-2m-60s	52.4	511.0	523.0						KNU	2m	60
KNU-8m-10s	59.9	399.0	490.0						KNU	8m	10
KNU-8m-60s	53.6	367.0							KNU	8m	60
KNU-16m-10s	42.6	218.0							KNU	16m	10
KNU-16m-60s	36.4	232.0							KNU	16m	60
KU-8m-10s	88.5	97.4	87.4	88.0	87.7				KU	8m	10
KU-8m-60s	87.0	97.4	87.9	88.1	88.0	82.2			KU	8m	60
KU-16m-10s	29.7	87.8	87.2	88.0	87.7				KU	16m	10
KU-16m-60s	29.7	88.0	87.8	88.1	88.0	76.6			KU	16m	60
SKKU-512k-10s	94.1	95.6	96.1	98.3	98.9	98.1	98.7	97.6	SKKU	512k	10
SKKU-512k-60s	94.1	94.3	94.3	94.7	94.9	94.9	94.1	94.9	SKKU	512k	60
SKKU-8m-10s	97.3	117.0	111.0	138.0	144.0	137.0	251.0		SKKU	8m	10
SKKU-8m-60s	94.7	96.5	97.9	102.0	102.0	106.0	109.0		SKKU	8m	60
SKKU-16m-10s	100.0	130.0	147.0	146.0	155.0		324.0		SKKU	16m	10
SKKU-16m-60s	95.2	100.0	106.0	108.0	109.0		103.0		SKKU	16m	60



Bandwidth results



- 💡 **SSCC-KNU shows 500Mbps connection**
- 💡 **500Mbps is our test machine maximum**



Optimized APlI and TEIN2



💡 Maximun TEIN2 connection is 622Mbps

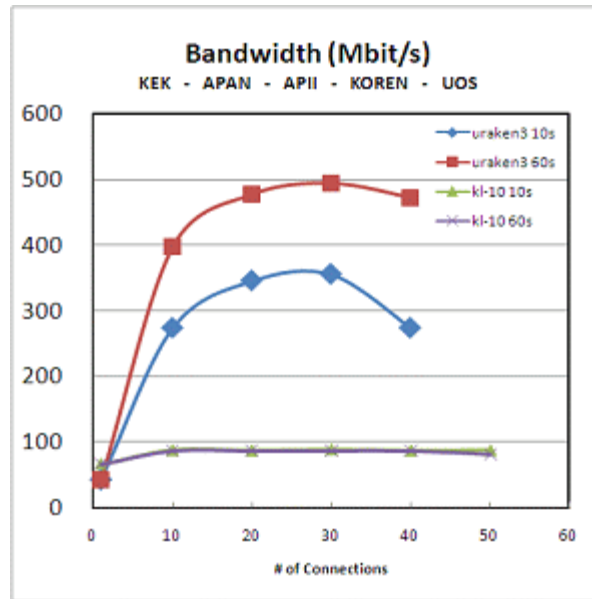
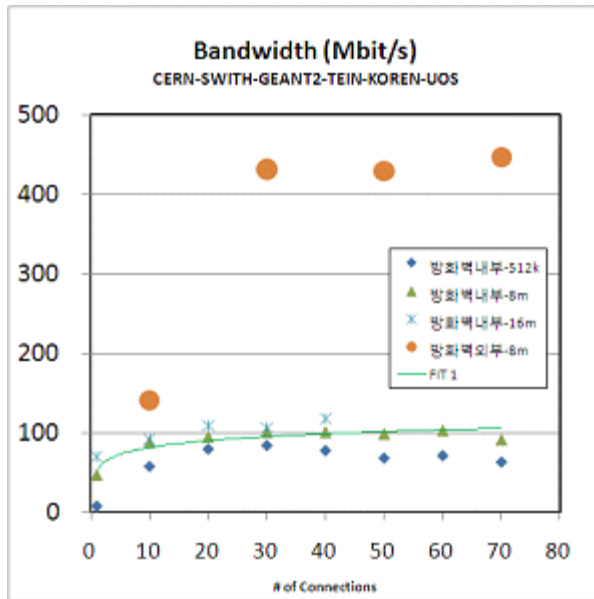
- AS559 - SWITCH Swiss Education and Research Network
- AS20965 - GEANT IP Service
- AS24490 - TEIN2 Trans-Eurasia Information Network
- AS9270 - Asia Pacific Advanced Network Korea (APAN-KR)

💡 APlI connection is 10Gbps (uraken3.kek.jp = 1G)

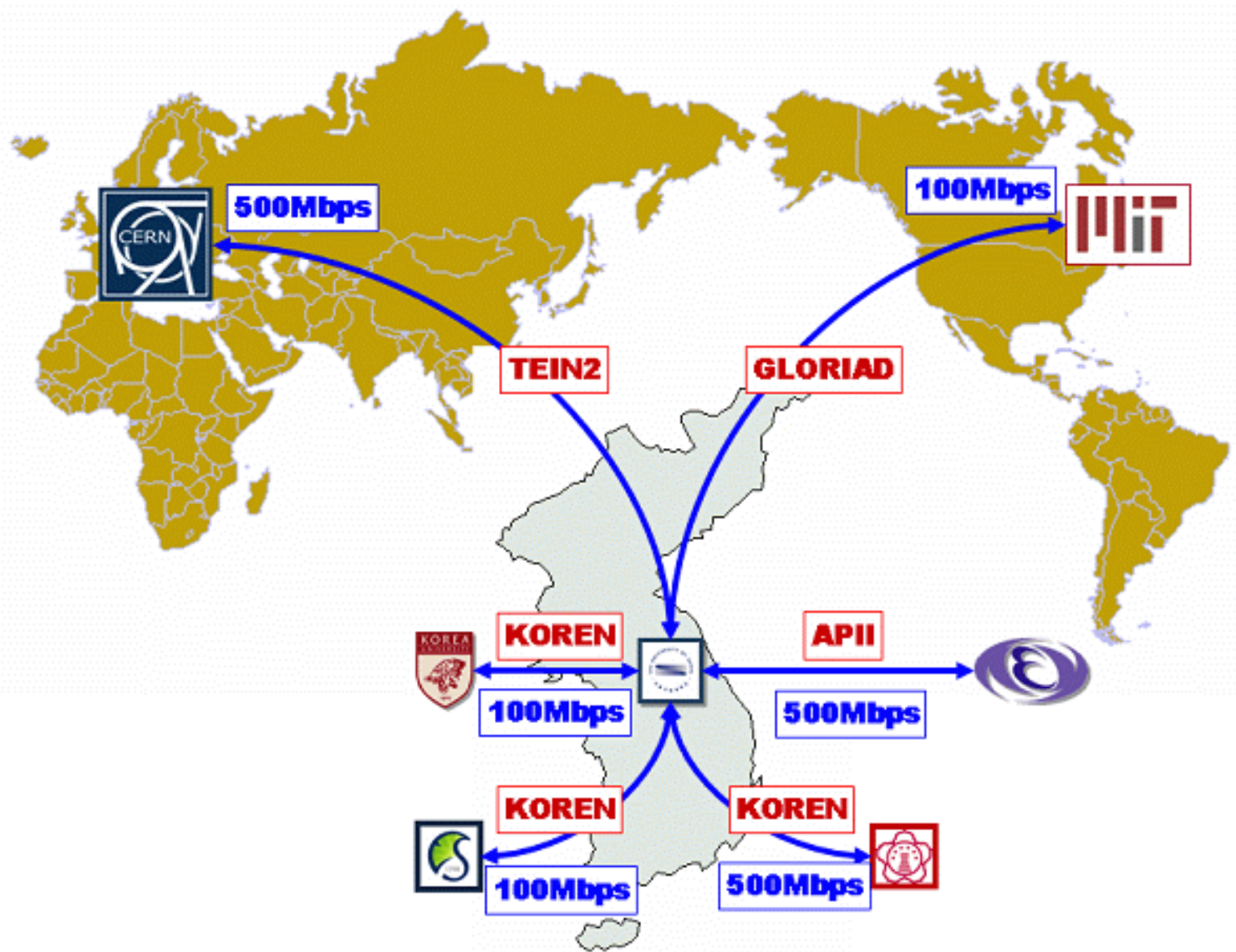
NAME-W_SIZE-S	Number of threads(connections) at the same time								NAME	SIZE	TIME
	1	10	20	30	40	50	60	70			
CERN-512k-10s	7.9	30.0	32.2	39.9					CERN	512k	10
CERN-512k-60s	7.7	57.4	79.1	83.6	77.2	67.8	70.8	62.8	CERN	512k	60
CERN-8m-10s	5.9	78.8	112.0	119.0	92.5				CERN	8m	10
CERN-8m-60s	47.5	88.2	95.0	101.0	101.0	98.8	103.0	91.4	CERN	8m	60
CERN-16m-10s	20.0	96.9	130.0	112.0					CERN	16m	10
CERN-16m-60s	69.8	92.0	109.0	106.0	118.0				CERN	16m	60
CERNNF-8m-Hs		141.0		431.0		429.0		446.0	CERNNF	8m	H
CERNNF-512k-Hs		113.0		193.0		340.0		442.0	CERNNF	512k	H
KEK-512k-10s	42.6	274.0	346.0	356.0	274.0				KEK	512k	10
KEK-512k-60s	43.6	398.0	478.0	495.0	473.0				KEK	512k	60
KEK-512k-10s	42.6	274.0	346.0	356.0	274.0				KEK	512k	10
KEK-512k-60s	43.6	398.0	478.0	495.0	473.0				KEK	512k	60



Network to both institutions has been optimized, and shows 500Gbps



Final network map



Remarks & Summary



Brief history so far, now, and tomorrow



- 💡 **2006 summer:** visit CERN, work with CMSSW.0.7.0 to 0.8.0, implement libraries.
 - Work with HIROOT too
- 💡 **2006 fall:** CMS-KR Heavy-Ion team was formed
 - Mainly work in reconstruction software (Jet, muon)
- 💡 **2007 winter:** Our team visited MIT. OSG installed, dCache tested, Monitoring system tested.
- 💡 **2007 spring:** Upgrade for SSCC, ~\$0.2M
 - Not enough to be a standard CMS Tier2, but good for a physics program, CMS-HI
- 💡 **2007 summer:** Tier2 in test operation, visit CERN
 - 1 graduate student will stay at CERN
- 💡 **2007 winter:** Full size CMS-HI tier2 are being built
 - Starting from 2008, MOST will support a Tier2 center



Remarks



- 💡 ***The only solution for **LHC/CMS Computing is Grid.*****
- 💡 ***HEP again leads the next computing technology, as it did in WWW.***
- 💡 ***LCG(EGEE) and OSG will be the ones!***
- 💡 ***Expect lots of industrial by-products***
- 💡 ***SSCC at Univ. of Seoul starts **CMS-Tier2** based on **OSG*****
 - ***Due to its limited resource, we only run CMS-HI Tier2 for now.***
 - ***Plugged in to US-CMS TIER1 for now.***
- 💡 ***We should not loose this opportunity if we want to lead IT & Science.***
 - ***We need to do Korea Tier2 or Tier1, now.***



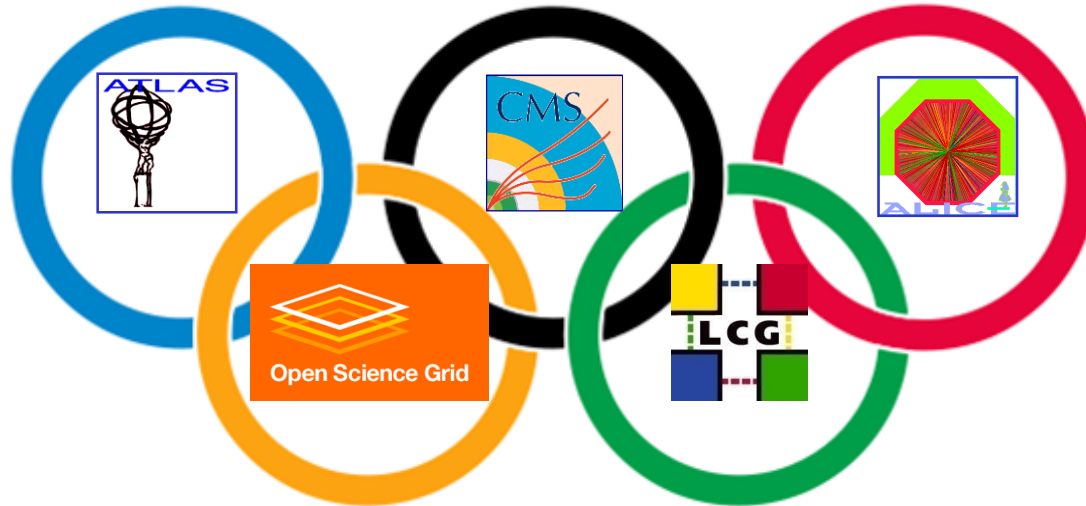
Summary



- ❗ ***Seoul SuperComputing Centre (SSCC) becomes an OSG based CMS Tier2 centre***
 - ***CE :102 CPUs → 200CPUs***
 - ***SE: 12 TB → 140TB***
- ❗ ***Network to CERN and KEK via APII and TEIN2 has been optimized***
 - ***UoS-KEK : 500Mbps***
 - ***UoS-CERN: 500Mbps***
- ❗ ***Everything went smoothly. Further upgraded needed soon.***
 - ***OSG, LCG Tier2 center needs a connection of 2Gbps – 10Gbps***
 - ***Further KOREN /KREONET support is important***
- ❗ ***An official launching of CMS Tier2 are coming***
 - ***MOST will launch a program to support a CMS Tier2 center***
 - ***Many thanks to our HEP and HIP communities.***



Finale!



OLYMPIC 2008

Supplementary Slides

- ① **Korea CMS-HI uses the Open Science Grid (OSG) to provide a shared infrastructure in Korea to contribute to the WLCG.**
 - **Mostly US Tier-1 and all US Tier-2s are part of the OSG.**
- ① **Integration with and interfacing to the WLCG is achieved through participation in many management, operational and technical activities.**
- ① **In 2006 OSG has effectively contributed to CSA06 and CMS simulation production.**
- ① **In 2007 OSG plans are to improve the reliability and scalability of the infrastructure to meet LHC needs, as well as add and support needed additional services, sites and users.**

Web-Based Monitoring



Web-Based Monitoring: home



CMS Web Based Monitoring - Windows Internet Explorer

http://cmsmon.cern.ch/

CMS WEB-BASED MONITORING

CMS Web Based Monitoring

<p>LHC</p> <ul style="list-style-type: none"> Customized Slides Beam Status - HF Luminosity by LumiSection or HF Luminosity - Fast from Forward Hadron Calorimeter 	<p>CMS</p> <ul style="list-style-type: none"> CMS Page 1 RunSummary (global, in development) TriggerRates <i>new!</i> - Online DQM GUI Display (live during data taking or online-playback or online-test or gui-test systems) [SM] - SnapShotService S³ <i>new!</i> - HCalChannelQuality <i>new!</i> - RunSummary MTCC Phase I (frozen) RunSummary MTCC Phase II (frozen) RunSummary TIF - DcsLastValue HCalibViewer PixelConfigViewer MagnetHistory MTCC Files Magnet MTCC Shift eLog MTCC DAQ Expert Summary EventProxy EventProxyTIF Trigger Rate DAQ Status Shifts Fills ConditionsBrowser DatabaseBrowser devdb10 cms_hcl cms_hcl_int2r_lb cms_pvss_tk ecalh4db int2r_lb ConfigureDescriptors cms_hcl cms_pvss_tk cmscald ecalh4db CustomizedSlides cms_hcl cms_pvss_tk ecalh4db int2r_lb 	<p>code</p> <ul style="list-style-type: none"> How to Construct a Command Line RunSummary Query - How to Construct a Command Line RunSummary TIF Query - How to Construct a Database Query Plot URL - Using the RunNotification Service <i>new!</i> for asynchronous begin and end run messages - Documentation for CustomizedSlides <i>new!</i> for multi-channel plot - Meta Data - Tomcat Java Root PL/SQL
--	---	--

- tools for remote status display
- easy to use, flexible, interactive
- work with firewall and with security
-



Web-Based Monitoring : page1



Page refreshed at: 2007/12/12 16:23:51 CET 15:23:51 UTC
All other times given in UTC

CMS Page 1

Web-Based Monitoring

Run Information	DCS Environment
Booking time 2007/12/07 16:33:34	DAQ cluster dew point 8.4 C
Run number 30635	DAQ cluster relative humidity 39.6 %
Start time 2007/12/07 16:35:54	DAQ cluster temperature 18.7 C

Trigger	DSS
Configuration TSC_GREN07_GTmuon_GMTdt_DTTfb_LMS	DAQ room temperature 24.8 C
Event number 211756	Magnet room temperature 20.8 C
Rate in Hz 46.8	FED room temperature 21.8 C
Run number 30635	SX5 temperature 16.6 C
Trigger state Halted	

RC States	CVS Repository
DAQ Ready	Run information
DQM Running	Trigger
DT Running	RC States
RC Stopping	DCS Environment
TRG Ready	DSS

WBM: Zongru Wan, William Badgett & Steven Murray
Comments: Steven.Murray@cern.ch

Run info and overall detector status can be seen

Web-Based Monitoring : Run summary

CMS RunSummary Information
All times are in UTC

RunSummary for Specific Runs
Enter a RunNumber or LHC Fill and press **return**; [All LHC Fills](#) | [Range of LHC Fills](#) | [SlowControl by Date](#)

CMS RunNumber: LHC Fill:

or Search over a range of runs
All times are in UTC
Enter range of RunNumbers or range of dates and press or click here for the last 24 hours

Begin RunNumber:	<input type="text"/>	End RunNumber:	<input type="text"/>
Begin date YYYY.MM.DD:	<input type="text"/>	End date YYYY.MM.DD:	<input type="text"/>
Minimum Triggers:	<input type="text"/>	Minimum Events:	<input type="text"/>
Run Duration, minutes:	<input type="text"/>	Magnet Current, amps:	<input type="text"/>
Sequence:	<input type="text"/>		

Components Online Status:
 EFED TRG TRACKER ECAL HCAL DT RPC CSC

LTC Trigger MTCC Selection:
Exclusive Trigger: (no other triggers enabled than the ones selected)

Query

- simple query
- sophisticate query



Web-Based Monitoring



CMS RunSummary - Netscape Browser

http://cmsdaq.cern.ch/cmsmon/cmsdb/servlet/RunSummary

Rows: 1 Data: [root](#) | [text](#) | [xml](#) | [query](#)

RUNNUMBER	USERNAME	SEQUENCE	BOOKINGTIME	RUN_MODE	START_TIME	STOP_TIME	TRIGGERS	EVENTS
2241	toppro	CESSY_DAQ	2006.08.10 13:40:46	null	2006.08.10 15:40:46	2006.08.10 16:25:15	50222	50222

Rows: 3 Data: [root](#) | [text](#) | [xml](#) | [query](#)

COMPONENT	AVERAGE_RATE_HZ	AVERAGE_SIZE	AVERAGE_SIZE_RMS	N
BU_PERFORMANCE	8.559	262492.814		127.999 96
EVM_PERFORMANCE	19.201	72.000		OED 43
RU_PERFORMANCE	18.756	87469.880		31.728 129

LTC_CONTROL Configuration			LTC_CONTROL Rates, n=44		MagnetStatus	
Trigger	Name	Enable	AVERAGEDEFFICIENCY	1.000	Temperature, °K	5.034 n=243 2006.08.10 16:25:13
0	DT	1	AVERAGEDL1ARATE	19.131	Current, A	566.056 n=178 2006.08.10 16:25:13
1	CSC	0	AVERAGEDRAWL1ARATE	19.131	MAGNET_CURRENT, A	588.172 n=100 2006.08.10 16:25:14
2	RBC1	0	BLOCKEDTRIGGERS	0E0	VACCUUM, bar	1.665118E-6 n=0 * 2006.08.10 15:09:09
3	RBC2	0	EFFICIENCY	0.977	* no values during run; last value before run is shown	
4	RPCTB	0	L1ARATE	18.523		
5	na	0	RAWL1ARATE	18.523		

FED Enable Masks

Component	Id	Status	OK?
ECAL	818	0x1b	Good
HCAL	700	0x3	Good
HCAL	701	0x3	Good
HCAL	702	0x3	Good

Done Spyware Protection Not Effective

CMS RunSummary - Netscape Browser

http://cmsdaq.cern.ch/cmsmon/cmsdb/servlet/RunSummary

Column	min	max	clear
CHANGE_DATE	2006.08.10_15:40:46	2006.08.10_16:25:15	<input type="checkbox"/>
MAGNET_CURRENT	178.6	1251.6	<input type="checkbox"/>

Submit

DCS_ENVIRONMENT.CMSFWMAGNET2DCS Entries: 290

[eps]

Rows: 290 Data: [root](#) | [text](#) | [xml](#) | [query](#)

CHANGE_DATE	MAGNET_CURRENT
2006.08.10 15:40:49	196.000
2006.08.10 15:40:52	202.000

http://cmsdaq.cern.ch/cmsmon/cmsdb/servlet/GenericQu... Spyware Protection Not Effective








By clicking a specific link, you can access more elaborated info



CMS computing bottom line



-  **Fast reconstruction codes**
-  **Streamed Primary Datasets**
-  **Distribution of Raw and Reconstructed data**
-  **Compact data formats**
-  **Effective and efficient production reprocessing and bookkeeping systems**



① The event display and data quality monitoring visualisation systems are especially crucial for commissioning CMS in the imminent CMS physics run at the LHC. They have already proved invaluable for the CMS magnet test and cosmic challenge. We describe how these systems are used to navigate and filter the immense amounts of complex event data from the CMS detector and prepare clear and flexible views of the salient features to the shift crews and offline users. These allow shift staff and experts to navigate from a top-level general view to very specific monitoring elements in real time to help validate data quality and ascertain causes of problems. We describe how events may be accessed in the higher level trigger filter farm, at the CERN Tier-0 centre, and in offsite centres to help ensure good data quality at all points in the data processing workflow. Emphasis has been placed on deployment issues in order to ensure that experts and general users may use the visualisation systems at CERN, in remote operations and monitoring centers offsite, and from their own desktops.



- ❶ **CMS offline software suite uses a layered approach to provide several different environments suitable for a wide range of analysis styles.**
- ❷ **At the heart of all the environments is the ROOT-based event data model file format.**
- ❸ **The simplest environment uses "bare" ROOT to read files directly, without the use of any CMS-specific supporting libraries. This is useful for performing simple checks on a file or plotting simple distributions (such as the momentum distribution of tracks). The second environment supports use of the CMS framework's smart pointers that read data on demand, as well as automatic loading of the libraries holding the object interfaces. This environment fully supports interactive ROOT sessions in either CINT or PyROOT. The third environment combines ROOT's TSelector with the data access API of the full CMS framework, facilitating sharing of code between the ROOT environment and the full framework. The final environment is the full CMS framework that is used for all data production activities as well as full access to all data available on the Grid. By providing a layered approach to analysis environments, physicists can choose the environment that most closely matches their individual work style.**