

Geant4 17<sup>th</sup> Collaboration Meeting

10<sup>th</sup>-14<sup>th</sup> September 2012, Chartres, France

---

# KISTI Resources for Geant4 Collaboration

**Soonwook Hwang and Kihyeon Cho**

**September 13, 2012**

**Korea Institute of  
Science and Technology Information**

# Outline

---

- **KISTI Supercomputing Center**
- **Geant4 Activities**
  - Geant4 MT
  - Geant4 AIX Porting
  - Geant4 Grid Resources
- **Geant4 User Support in Korea**

# Korea Institute of Science and Technology Information

---



- **Organization**
  - 3 Centers
  - 5 Branch offices
- **Personnel**
  - About 380 regular staffs
  - 200 part-time workers
- **Annual Revenue**
  - About 100M USD mostly funded by a government

# KISTI Supercomputing Center

---

- **Departments**

- Computing and Network Resources      Staff > 200
- Application and Support                      Budget > \$40M
- Cyberenvironment Development
- Infrastructure Technology Development

- **Teams**

- HPC System Team
- Advanced Research Team
- Application Service Development Team
- Science and Technology Security Center
- Global Science Experimental Data Hub Center

# History of KISTI Supercomputers

**[KISTI-1]**  
Cray 2S  
2 GFlops



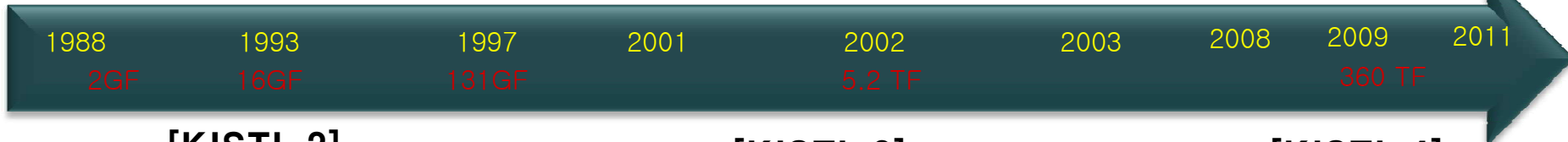
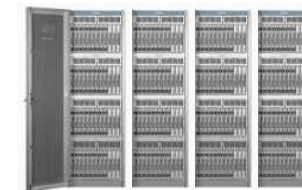
**[KISTI-2.5]** Cray T3E  
115 GFlops



**[KISTI-3]**  
NEC SX-5/6  
320 GFlops



**[KISTI-4]**  
SUN Blade 6048  
324 TFlops



**[KISTI-2]**  
Cray C90  
16 GFlops



**[KISTI-3]**  
IBM p690  
4.4 TFlops



**[KISTI-4]**  
IBM p595  
36 TFlops



# GAlA running AIX

- ❖ Cluster of SMPs
- ❖ Memory intensive Computing System for Massive Parallel Jobs
- ❖ Ranked at 393<sup>th</sup> in top500 in Nov. 2009



	Gaia(IBM)	
	Phase 1	Phase 2
Manufacture	IBM p595	IBM p595
Architecture	SMP	
Process model	POWER5+	POWER6
# of Nodes	10 nodes	24 nodes
# of CPU cores	640 (64 per node)	1,536 (64 per node)
Rpeak (Tflops)	5.9TFlops	30.7TFlops
	36.6TFlops	
Total Memory	2.6TB	9.2TB
Disk Storage	63TB	273TB
Interconnection Network	HPS	IB 4X DDR

# Tachyon running Linux

- ❖ Cluster system
- ❖ Ranked at 14<sup>th</sup> in top500 in Nov. 2009



[SUN Blade 6048]

	Tachyon(SUN)	
	Phase 1	Phase 2
Manufacture	SUN Blade 6048	
Architecture	cluster	
Process model	AMD(Barcelona)	Intel (Nehalem)
# of Nodes	188 nodes	3,200 nodes
# of CPU cores	3,008 (16 per node)	25,600 (8 per node)
Rpeak (Tflops)	24	300
	324	
Total Memory	6TB	76TB
Disk Storage	207TB	1.2PB
Tape Storage	422TB	2PB
Interconnection Network	IB 4X DDR	IB 4X QDR

# Geant4 Activities in KISTI

---

- **KISTI's proposal to contribute to Geant4 Collaboration**
  - Support for AIX machine
  - Support for Geant4 MT activities
  - Contribution to Grid Infrastructure for Geant4 Testing and Validation



# Geant4 Porting to AIX

---

- **Done successfully on the AIX 6.1 with the xIC/C++ compiler**
  - [The patch on the 9.6-beta is ready !!](#)
  - The patched source works fine with the Linux
- **To Do**
  - more verification tests
  - check-in to Geant4 svn code repository
  - Integrate AIX into the geant4 regular testing using cmake/cdash
- **Geant4\_MT porting to AIX**
  - xIC compiler is tried, but it produces a seg fault at runtime
  - It only supports the GNU compiler, higher than 4.3 version to provide the thread local storage feature.
  - Upgrading the GNU compiler is going on.....

# Geant4 MT Benchmarking

---

- **The Goal**
  - Test its stability, validity, performance and scalability
- **Applications to be used**
  - N03
  - SimplifiedCalo: adapted from A. Dotti
    - <http://oink.fnal.gov/perfanalysis/g4p/admin/task.html>
  - ...
- **H/W platforms**
  - Current: KISTI Tachyon supercomputer (Linux, 16 cores, 188 nodes)
  - Future: KISTI GAIA supercomputer (AIX, 64 cores, 10 node)

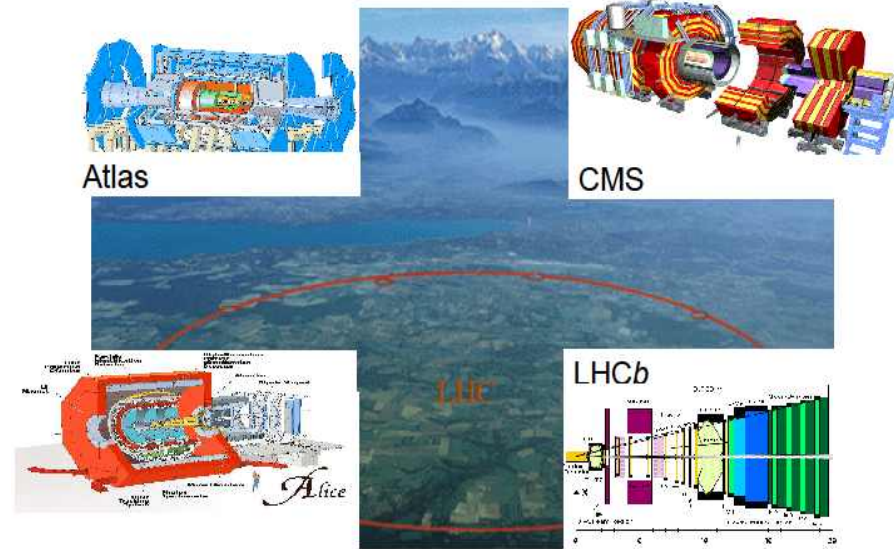
# Geant4 MT Benchmarking

---

- **Estimate of the number of benchmarking "runs"**
  - # Apps : 2
  - Threads : 1, 2, 4, 8, 16, single process
    - There will be more tests with 32, 64 threads in AIX
  - # Inputs : 37
    - Refer <http://oink.fnal.gov/perfanalysis/g4p/admin/task.html>
  - # runs : 100
  - Total Runs =  $2 * 6 * 37 * 100 = 44,400$  runs
- **Reports**
  - maintain a web page containing summaries/plots and detailed benchmarking results
- **Status**
  - Porting the applications to MT to AIX : ongoing
  - Development of Test scripts : ongoing

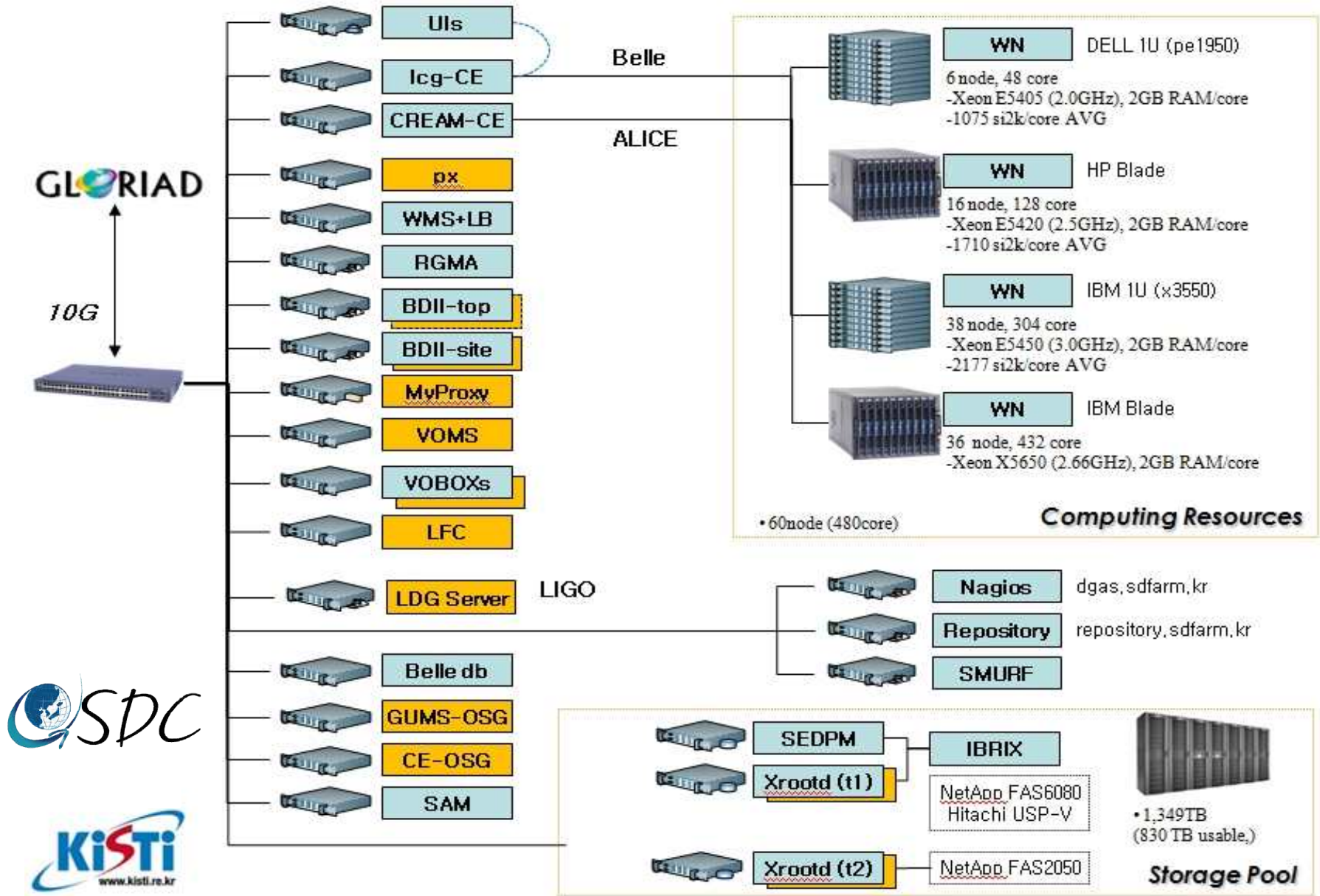
# KISTI ALICE Tier-2 Center

- Signing of WLCG MoU for the ALICE Tier-2 center ('07.10.23)
- Has been part of ALICE distributed computing grid as an official T2
- Providing a reliable and stable node in the ALICE Grid
- Funded by MEST
  - ~200,000 US dollars/year



Korea, KISTI, Daejeon	Pledged	Planned to be pledged					Comments
	2007	2008	2009	2010	2011	2012	
CPU (kSI2K)	50	100	150	150	150	150	
Disk (Tbyte)	15	30	50	50	50	50	
Nominal WAN (M bits/sec)	10000	10000	10000	10000	10000	10000	

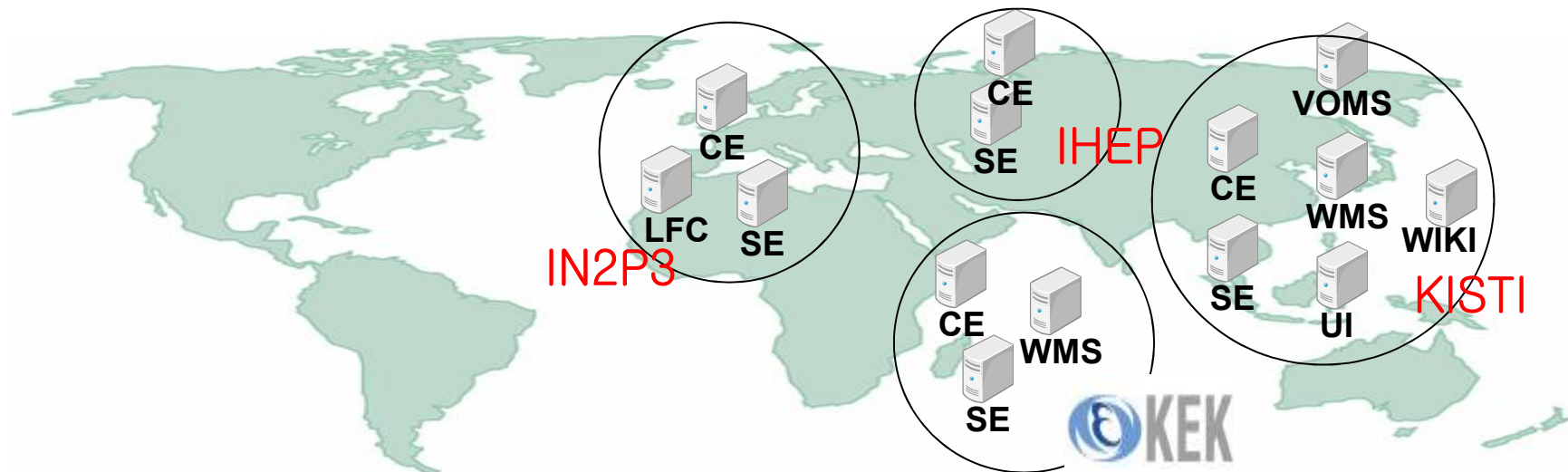
# KISTI ALICE Tier2 Based on gLite Middleware



# France-Asia VO Grid

---

- **Successfully deployed in 2011 and now fully functional at four sites**
  - KISTI (Korea), KEK (Japan), IHEP(China), CC-IN2P3 (France)
  - ~25000 CPU cores, ~8 TB of Disk
- **As of now, 106 users have joined the France-Asia VO membership**





# Applications on the France-Asia VO

---

- ***In-Silico* Drug Discovery**

- A large-scale deployment of docking simulations, with hundreds of thousands of potential chemical compounds against
- In collaboration with Prof. Doman Kim from Chonnam National University

- **Geant4 Applications**

- Used extensively by the National Cancer Center in Korea to carry out compute-intensive simulations relevant to cancer treatment planning
- In collaboration with Dr. Se-Byeong Lee from National Cancer Center in Korea

- **Two-color QCD (Quantum ChromoDynamics) simulation in theoretical Physics**

- Several hundreds or thousands of QCD jobs are required to be run on the Grid, with each jobs taking about 10 days.
- In collaboration with Prof. Seyong Kim from Sejong University

---

# Geant4 User Support in Korea



# Geant4 User Support in Korea

- Home page
  - <https://hep.kisti.re.kr/geant4>
  - <https://hep.kisti.re.kr/indico>
- Geant4 Workshops held in April
- User support email account:
  - [hep@kisti.re.kr](mailto:hep@kisti.re.kr)
- Tutorials co-organized with NCC
  - 1<sup>st</sup> Geant4 Tutorial (6.30, KISTI, Daejeon)
  - 2<sup>nd</sup> Geant4 Tutorial (9.20-21, KAIST, Daejeon)
  - 3<sup>rd</sup> International Geant4 Tutorial (10.28-11.2, KISTI, Seoul)

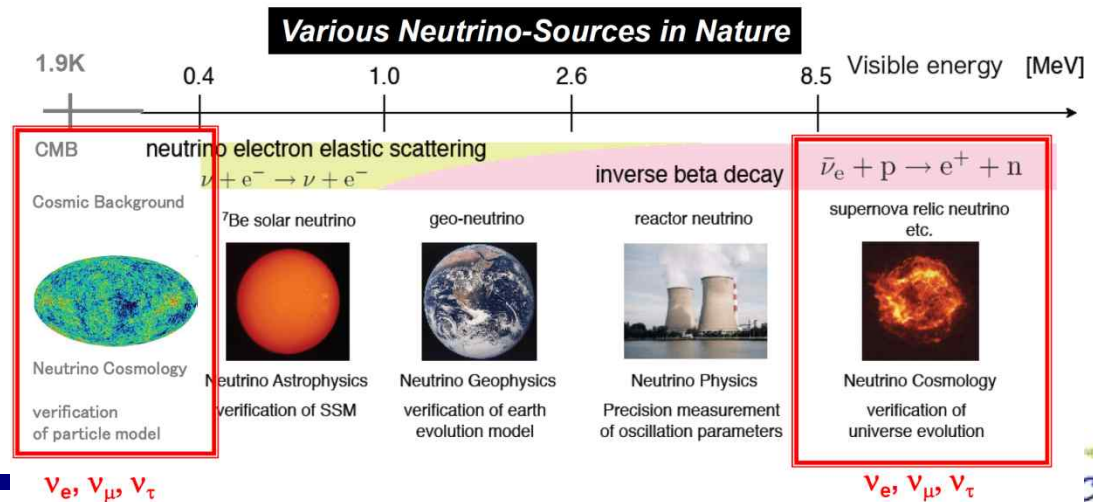
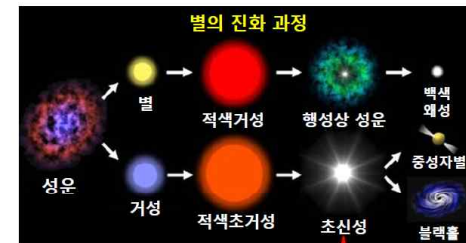
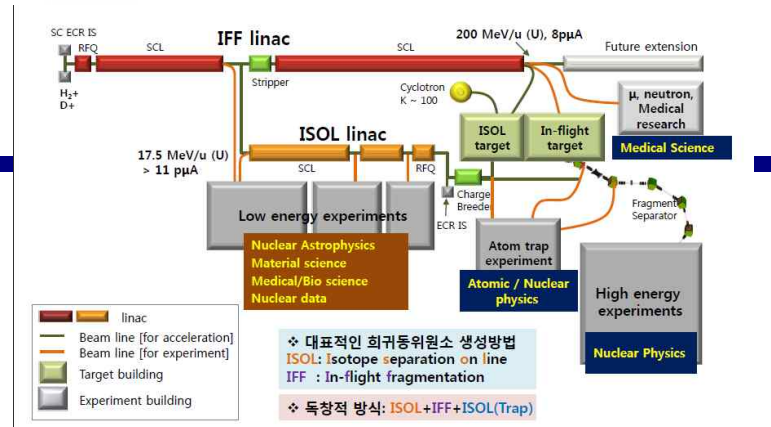


# User Request

- User requests by
  - Medical Physics
  - RISP (Rare Isotope Science Project)
    - Accelerator group
    - Astro-nuclear theory group

## ■ Contents

- Hope to include Neutrino interactions at Geant4 code
- To port library with Geant4
  - MCNP
  - IMSL



---

**Thank you for your attention!**

**hwang@kisti.re.kr**