

June 16~18, 2010

Belle II Computing workshop, Krakow, Poland

# Report on Belle II Data Handling Group

Kihyeon Cho

High Energy Physics Team

KISTI (Korea Institute of Science and Technology Information)

- Prologue
- Who?
- Belle II time schedule
- Data Handling Outline
- Status and plan
- To do list
- Discussion
- Epilogue

# Prologue

What has been discussed on Dec. 15, 2009

## ● KISTI

- To maintain the central AMGA server and take care of the metadata replication.
- To work on the replication of **metadata**.

## ● Krakow

- is responsible for the job submission tool and the assignment of files to jobs based on the file-level metadata.
- To take care of the recovery mechanism for failed jobs.

● We agreed to continue with the parallel development of AMGA clients for the moment and evaluate them when we do the large scale data handling test.

● We will merge the systems:

- command script -> c++
- portal tool -> python

# Who?



## ● KISTI Group

- HEP Team – JungHyun Kim(JK), Kihyeon Cho(KC),  
YoungJin Kim, ...
- AMGA Team – Soonwook Hwang, Sunil Ahn(SA), HanGi Kim,  
Tae-sang Huh, ...
- NSDC Team – Beob Kyun Kim(BK), Seoyoung Roh,  
Jonghu Lee, Haengjin Jang,...

## ● Melbourne Group

- Tom Fifiield, Martin Sevier, ...

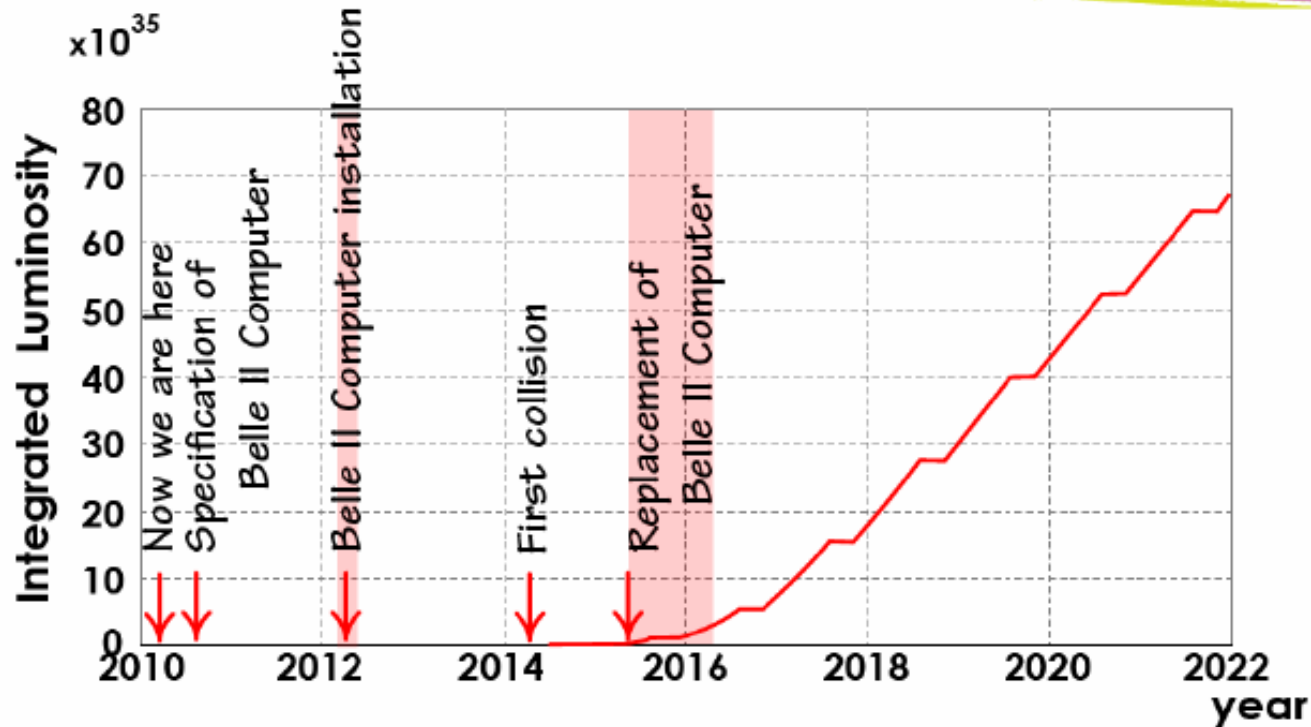
## ● Krokow Group

- Maciej Sitarz, Mitosz Zdybat, Rafat Grzymkowski, Henryk  
Polka, ...

## ● KEK, Karlsruhe, etc...

# Belle II Time schedule

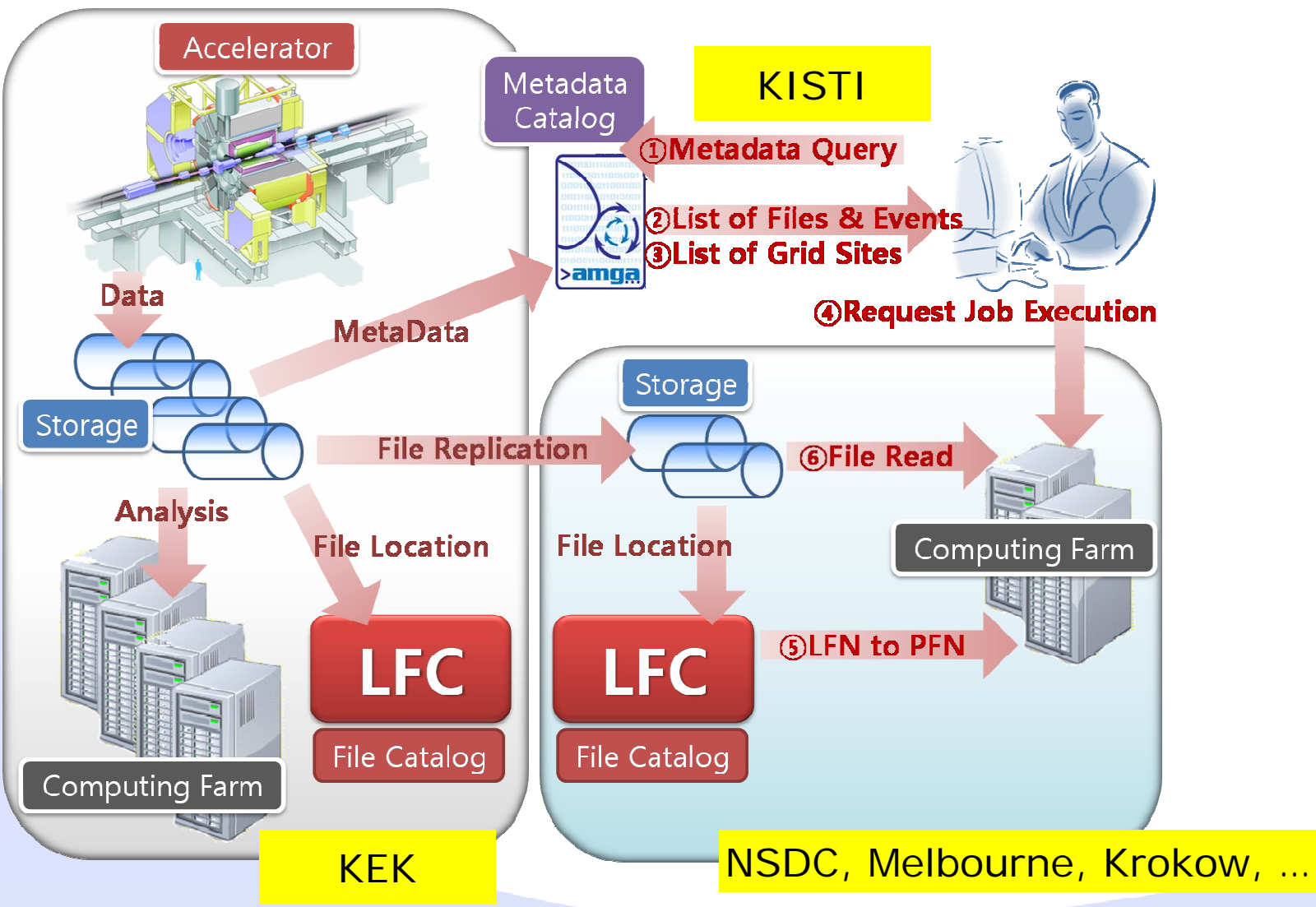
## Schedule for computing



Hara San

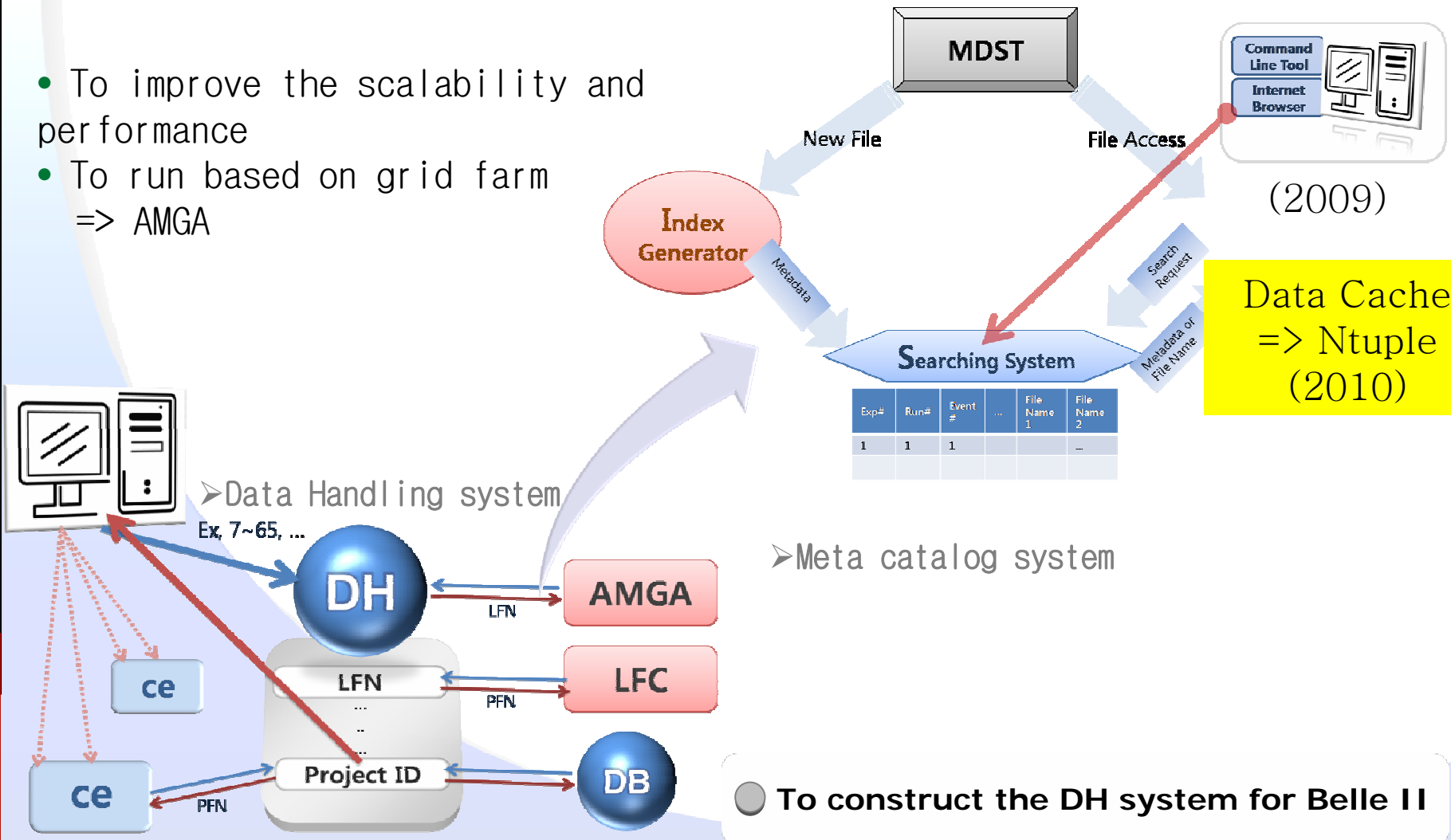
- 2014 April – Collider turn on
- 2012 February – Ready for Computing
- 2011 Summer – Rough final system
- 2010 Summer – Prototype system
  - Spec & Test
- 2010.5 PAC – Answers for questions
  - Computing & Pixel

# Data Handling Outlines



# Goal of Data Handling System

- To improve the scalability and performance
- To run based on grid farm  
=> AMGA





# Status and plan

- To construct Belle II Data Handling System ☹️
- To test Large Scale Data Handling
  - Belle Data at NSDC farm at KISTI ☹️
  - Belle II Data (Random data) => doing
  - Belle Data at KEK => will do
- Data Handling and Job Management for Belle II Grid ☹️
  - Interactive Grid Console
  - Data Handling -> FTS

## Abstract

- Information module
- Job submission module
- Job bookkeeping module
- Metadata searching module
- Data handling module
- Interactive Grid Console and future ideas for scripting
  - Done for today
  - Plans for next months
  - Plans for further future

BuGM, KEK, 03.04.2009

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# Status and plan of KISTI group



<http://b2comp.kek.jp/~twiki/bin/view/Computing/ProjectPlanning>

- Data/Job handling prototype => done
  - JA, SA, March 2010
- Large Scale Data Testing => done
  - JK, BK, KC March 2010
  - Depending on NSDC
- Data Caching R&D => done
  - JK, June 2010
- Configuration for AMGA system in DH system (Optimization of large scale data) => doing
  - SA, JK, Dec 2010
- RB & DH system based on Grid system => doing
  - JK, SA, Dec 2010

# Status and plan of NSDC @ KISTI

## Belle LSDH Test & NSDC/KISTI

Belle Data Transfer	<ul style="list-style-type: none"> <li>• KEK → KISTI</li> <li>• Currently, 142TB data are archived</li> </ul>	<ul style="list-style-type: none"> <li>• 90% of planned done</li> </ul>
Metadata Extraction		
Scalability Test		
Metadata Replication		
Grid-awaring of Belle data	<ul style="list-style-type: none"> <li>• SRMDoor &amp; Disk Pool (SEDPM)</li> <li>• File registration to SE without copy</li> <li>• Registration to LFC</li> <li>• Co-test with SE &amp; LFC</li> </ul>	<ul style="list-style-type: none"> <li>• SRM Door &amp; Disk Pool → Done</li> <li>• File Registration to SE → Done</li> <li>• Registration to LFC → in progress</li> <li>• Test with SE &amp; LFC → partially done</li> </ul>
Test on Grid Env.	<ul style="list-style-type: none"> <li>• Job submission to Grid ( with access to AMGA, SE, LFC )</li> </ul>	<ul style="list-style-type: none"> <li>• Every Testers should have grid cert. and Belle VO membership</li> </ul>
What Next ?	<ul style="list-style-type: none"> <li>• ???</li> </ul>	

=> See Dr. Jonghu Lee' s talk

# Plan and Status of Krokow Group

## Data handling

- working prototype using lcg\_utils
  - multi-threaded
- plans to use FTS
  - may be faster - needs tests
  - but we need working FTS installation
  - no Python API - web services available

B2GM, KEK, 01.04.2010

=> See Milosz Zdybal's talk

# Large Scale Data Handling Test

## ● The whole process:

KISTI

Melbourne

- Data Transfer => Extraction => Scalability => Replication => LFC => Grid farm
- KISTI takes care for up to LFC. Then, Melbourne gets LFC file and does Grid test.
- JungHyun is rebuilding from metadata attributes to logical files. Therefore, Junghyun gave logical file name to Tom.

## ● The procedure for metadata is as follows:

KISTI

Melbourne / NSDC

- Metadata => LFC => SE => Physical Data
- For this processing, we have installed Grid SE

=> See Dr. JungHyun Kim' s talk

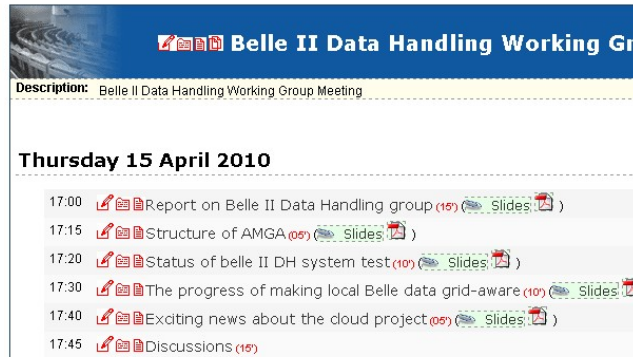
# Belle II DH group activities

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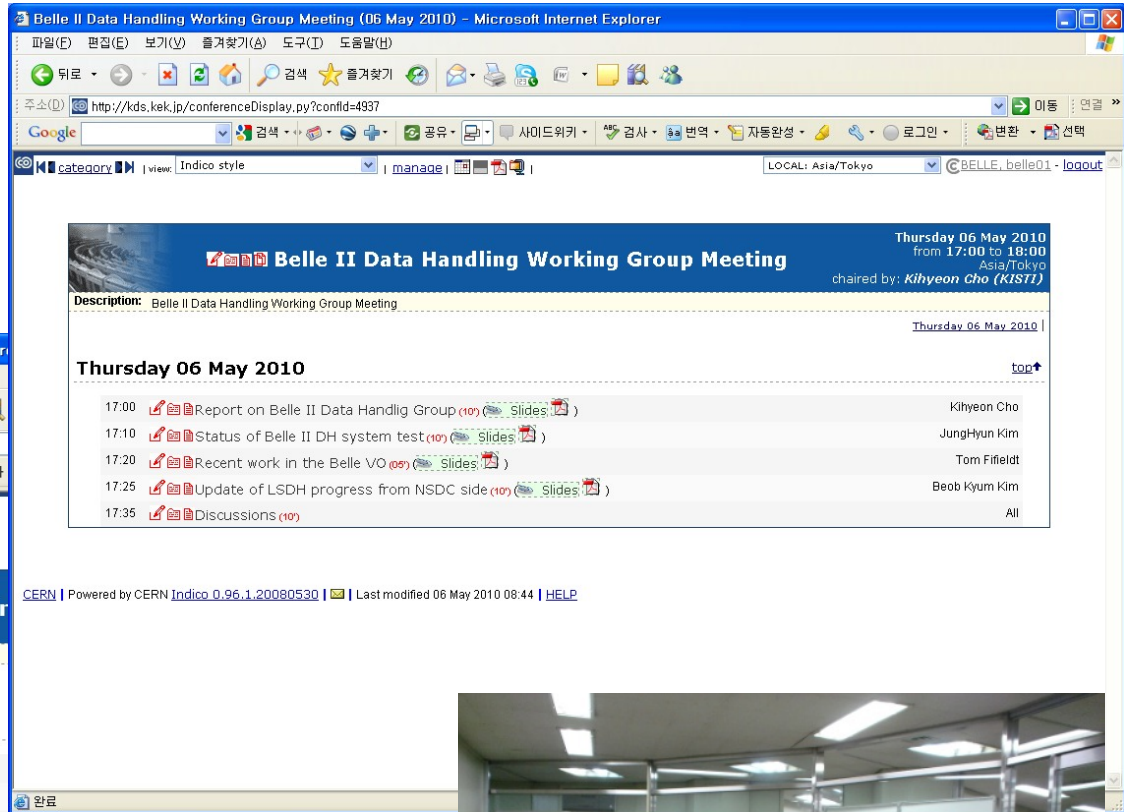
- Host Belle II DH group meeting
  - April 27, 2010
  - May 16, 2010
  - KISTI internal DH group meeting – April 8, 2010
  
- Report to Belle computing meeting
  - January 19, 2010
  - March 02, 2010
  - April 27, 2010
  - June 3, 2010

# Belle II Data Handling Group meeting

First and Third  
Thursday 5:00 PM (KEK  
Time)



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- Belle II DH KISTI meeting
- Date: April 8, 2010 1:30-3:30 PM
- Participant:
  - Kihyeon Cho ([cho@kisti.re.kr](mailto:cho@kisti.re.kr)) – HEP team
  - Junghyun Kim ([hyun@kisti.re.kr](mailto:hyun@kisti.re.kr)) – HEP team
  - Soonwook Hwang ([hwang@kisti.re.kr](mailto:hwang@kisti.re.kr)) – AMGA team
  - Tae-Sang Huh ([tshuh@kisti.re.kr](mailto:tshuh@kisti.re.kr)) – AMGA team
  - Sunil Ahn ([siahn@kisti.re.kr](mailto:siahn@kisti.re.kr)) – AMGA team
  - Beob Kyun Kim ([kyun@kisti.re.kr](mailto:kyun@kisti.re.kr)) – NSDC team
  - Jinseung Yu ([jsu@kisti.re.kr](mailto:jsu@kisti.re.kr)) – NSDC team
  - Seoyoung Roh ([rsyoung@kisti.re.kr](mailto:rsyoung@kisti.re.kr)) – NSDC team
- Minutes of meeting
  - The role of HEP team, AMGA team and NSDC team



## ● Conference talks

1. *The Advanced Data Searching System with AMGA at the Belle II Experiment*
  - CCP2009, Gaushung, Taiwan, Dec., 2009
  - Submitted to CPC (Computational Physics Communication)
2. *Data Cache System at Belle II experiment*
  - CCP2010, Trondheim, Norway, June 2010
3. *Belle II Data Management system*
  - CHEP 2010, Taipei, Taiwan, Nov. 2010

## ● Draft

1. *Design of the advanced metadata service system with AMGA for the Belle II experiment*
  - To be submitted to JKPS (Journal of the Korean Physical Society)

# The advanced data searching system with AMGA at the Belle II Experiment

J. H. Kim<sup>g</sup>, S. Ahn<sup>g</sup>, K. Cho<sup>g</sup>, M. Bračko<sup>f</sup>, Z. Drasal<sup>a</sup>, T. Fifield<sup>k</sup>, R. Frühwirth<sup>c</sup>, R. Grzymkowski<sup>d</sup>, T. Hara<sup>b</sup>, M. Heck<sup>e</sup>, S. Hwang<sup>g</sup>, Y. Iida<sup>b</sup>, R. Itoh<sup>b</sup>, G. Iwai<sup>b</sup>, H. Jang<sup>g</sup>, N. Katayama<sup>b</sup>, Y. Kawai<sup>b</sup>, C. Kiesling<sup>i</sup>, B. K. Kim<sup>g</sup>, T. Kuhr<sup>e</sup>, S. Lee<sup>h</sup>, W. Mitaroff<sup>c</sup>, A. Moll<sup>i</sup>, H. Nakazawa<sup>j</sup>, S. Nishida<sup>b</sup>, H. Palka<sup>d</sup>, K. Prothmann<sup>i</sup>, M. Röhrken<sup>e</sup>, T. Sasaki<sup>b</sup>, M. E. Sevier<sup>k</sup>, M. Sitarz<sup>d</sup>, S. Stanić<sup>l</sup>, Y. Watase<sup>b</sup>, H. Yoon<sup>g</sup>, J. Yu<sup>g</sup>, M. Zdybal<sup>d</sup>

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<sup>k</sup>University of Melbourne, School of Physics

<sup>l</sup>University of Nova Gorica, Nova Gorica

## Design of the Advanced Metadata Service System with AMGA for the Belle II Experiment

S. Ahn, J.H. Kim, K.H. Cho, S.W. Hwang

(on behalf of the Belle-II computing group)

Korea Institute of Science and Technology Information, Daejeon, Korea

### Abstract

We use a metadata service at the Belle experiment which provides a metadata service. However, at the Belle II experiment, we will have 50 ~ 60 times more data than the existing Belle experiment. It is expected that the existing metadata service has problems with performance for event-level metadata searching. To deal with this issue, we have designed a new metadata service system which significantly reduces disk space for metadata, and proposed a new metadata service system based on Arda Metadata catalog for Grid Application. The new metadata service system scheme of processing such as events with many tracks.

**Keywords:** High energy physics, Belle II, Large data handling, Metadata

The Belle II experiment is expected to produce 60 times more data than the existing Belle experiment. Such huge data production requires not only scalability with respect to the storage service but also scalability regarding to metadata service. There is already a metadata service at the Belle experiment but it is not proper for Belle II because it has scalability problems and it is not intended to be used in a distributed grid environment. To deal with these issues, we designed an advanced metadata service system based on AMGA, which significantly reduces disk space and response time required for event-level metadata searching. Moreover, it provides efficient and scalable metadata searching through replicating metadata into multiple sites. We have built testbed sites to test correctness, performance and scalability of the advanced metadata service system and it is proved to be able to provide efficient metadata searching for events, for example with many tracks.

# Belle II DH Group – Daeduk net (2010.4.6)

대덕넷 기사 프린트하기

페이지 1 / 4

대덕넷 기사 프린트하기

페이지 2 / 4

대덕넷 기사 프린트하기

페이지 4 / 4

대덕넷 뉴스 프린트

소인쇄하기 | 정렬하기

## KOREA 우주가원 밝히는 '국제거대실험' 주도

한국과학기술, 세계 3대 가속기 이용 실험 "그랜드 실험" 특별  
조기형 KISTI 박사, Belle II 데이터 핸들링 그룹장 취임



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한국의 연구그룹이 세계 3대 가속기를 이용한 국제 거대과학실험에서 주도적인 역할을 펼치고 있어 과학기술계에 장찬한 교감을 일으키고 있다.

향후의 국제 거대실험 프로젝트명은 Belle II.

세계 3대 가속기 중 하나인 일본 KEK(고에너지연구소) 가속기를 이용해 우주의 기원을 밝히기 위해 새로운 물리(New physics)를 찾는 거대 과학실험이다. 1999년부터 10년간 약 수백억원이 투입된 Belle 프로젝트의 후속 사업으로 기존 보다 더 정밀한 측정과 통계적 오류를 줄이는 목표를 갖고 있다. 일본 KEK 고바야시와 마스카와 박사가 지난 2008년 Belle 프로젝트를 통해 우주의 비대칭 기원을 규명, 노벨상을 거머쥔 바 있다.

Belle II 프로젝트는 2014년부터 2020년까지 기존 Belle 프로젝트 데이터 보다 50배 많은 데이터를 생산하게 된다.

지금까지 인류가 다뤄보지 못한 엄청난 양의 데이터를 처리하는 데 실험에서 우리나라의 조기형 KISTI(한국과학기술정보연구원) 고에너지물리연구팀장이 데이터 핸들링(Data Handling) 그룹장을 맡아 일본·호주·폴란드·독일 등 국제공동연구팀을 전두지휘하고 있다.

[http://www.hellodd.com/Kr/DD\\_News/Article\\_Print.asp?Mark=30692](http://www.hellodd.com/Kr/DD_News/Article_Print.asp?Mark=30692)

2010-04-07

적어도 이번 Belle II 프로젝트의 경우 그동안 국제공동연구에 수동적으로 참여해 왔던 한국 과학기술계의 이미지는 다른 세상 이야기다.

사실 조 박사가 Belle II 프로젝트의 데이터 핸들링 그룹장을 맡은 지 1년이 넘었다. 2009년 3월부터 그룹장을 맡았다. 중책을 맡고 연구가 시작된 이후 그동안 언론이나 외부에 공개된 적이 없다. 그룹장 선임 자체가 뉴스거리였지만, 조 박사는 "아무것도 해놓은 것이 없어 글이 알리지 않았다"며 겸연쩍어 했다.

◆ KISTI 개발 소프트웨어 'AMGA', Belle II 데이터 핸들링 시스템에 격응



▲ "한국이 국제공동연구의 주류가 됐습니다" 조기형 그룹장.  
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우리나라가 Belle II와 같은 국제 거대과학실험에서 주도적 위치를 차지한 핵심비결은 사람과 SW 개발 기술력이다. 고에너지물리 데이터 핸들링 분야에서 10년 넘게 뚝자 굶은 조 박사가 국제적 교류 역량을 높여 왔으며, 같은 연구실의 김정현 박사도 데이터 그리드 응용-활용 연구 경력이 10년 넘었다.

특히 KISTI 기반기술개발실의 황순목 박사가 개발한 데이터 핸들링 소프트웨어 'AMGA'를 응용, 안전일 박사(기반기술개발실)와 김정현 박사(고에너지물리연구팀)가 공동으로 Belle II에 적용될 새로운 개념의 데이터 핸들링 소프트웨어를 개발 중이다. 지속적으로 성능을 향상할 경우 큰 우리 없이 600페타바이트(Petabyte) 데이터 용량을 다루는 Belle II 실험에 제력을 예견된다. 연구진이 따르면 600페타바이트는 슈퍼컴퓨터를 건물로 수백층 쌓아도 처리할까 말까한 수준이다. 10페타바이트가 CD를 2만km 쌓아올린 데이터 크기니, 600페타바이트는 120만km의 CD를 쌓아올린 용량과 맞먹는다.

이러한 엄청난 양의 데이터를 취급할 수 있는 대안으로 KISTI가 개발중인 Belle II 데이터 핸들링 시스템을 주목하고 있는 것이다. 이 소프트웨어는 기존 데이터베이스 환경을 뛰어 넘는다. 물리적으로 글로벌 네트워크 환경에서는 데이터 핸들링의 한계가 있는데, 국제공동연구팀 사이에서 가장 저비용으로 안정

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2010-04-07



▲ 일본 쓰쿠바시에 있는 KEK 가속기 내부 Belle 실험의 제어실 앞에서 "질라".  
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<대덕넷 필요성 기사> joesmy@hellodd.com  
2010년 04월 06일

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2010-04-07

<http://www.hellodd.com>

# To do list

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- Configuration for AMGA system in DH system (Optimization of large scale data) => doing
  - Dec 2010
- RB & DH system based on Grid system => doing
  - Dec 2010
- To test Large Scale Data Handling
  - Belle II Data (Random data) => doing
  - Belle Data at KEK => will do
- Data Handling and Job Management for Belle II Grid
  - Interactive Grid Console
  - Data Handling -> FTS

# Discussions (suggestions)

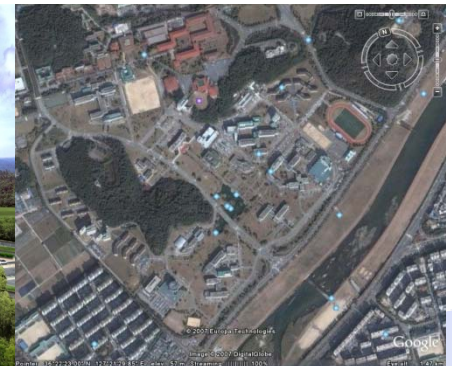


## 1. Belle II DH Group meeting

- 1<sup>st</sup> and 3<sup>rd</sup> Thursday at 5:00 PM

## 2. The 3<sup>rd</sup> Belle II Computing Workshop (?)

- Date: December 2010
- Place: KISTI, Daejeon, Korea
- Hosted by HEP team @ KISTI



- For more in detail, please see **today's** talks
  1. Test of Belle II Data Handling System (JungHyun Kim)– EVO
  2. Technical aspect of AMGA system (Soonwook Hwang) – EVO
  3. The Data Cache System at the Belle II Experiment (Kihyeon Cho)
    - CCP2010 practice talk
  4. Introduction to Ganga (HanGi Kim) – EVO



Belle II Computing Workshop (16-18 June 2010) - Windows Internet Explorer

http://indico.ifj.edu.pl/MaKaC/sessionDisplay.py?sessionId=2&slotId=0&confId=22#2010-06-17

파일(F) 편집(E) 보기(V) 즐겨찾기(A) 도구(T) 도움말(H)

Belle II Computing Workshop (16-18 June 2010)

Accommodation  
Travel  
Social events

Room: 5301  
Dates: Thursday 17 June 2010 09:00

**Contribution List** **Time Table**

**Thursday, 17 June 2010**

09:00	[12] <b>Report on Belle II Data Handling Group</b> by Kihyeon CHO (KISTI) (5301: 09:00 - 09:30)
	[13] <b>Test of Belle II Data Handling System</b> by Junghyun KIM (KISTI) (5301: 09:30 - 10:00)
10:00	[15] <b>Technical aspects of AMGA</b> by Soonwook HWANG (KISTI) (5301: 10:00 - 10:20)
	coffee break (10:20 - 10:40)
11:00	[14] <b>Grid-waring and LFC registration of Local Belle Data for Belle2 LSDH Test</b> by Dr. Beob Kyun KIM (NSDC of Korea Institute of Science and Technology Information) (5301: 10:40 - 11:10)
	[16] <b>The Data Cache System at the Belle II Experiment</b> by Kihyeon Cho CHO (KISTI) (5301: 11:10 - 11:40)
	[33] <b>Introduction to Ganga</b> by Mr. HanGi KIM (5301: 11:40 - 12:00)
12:00	[17] <b>Reconsideration of development needs</b> by Prof. Martin SEVIOR (Melbourne) (5301: 12:00 - 12:20)
13:00	lunch (12:20 - 14:00)

시작 3 Microsoft Of... ComputingSu... access.pdf - A... 3 Internet Expl... Capsun5.0 오후 11:1

# Thank you.

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