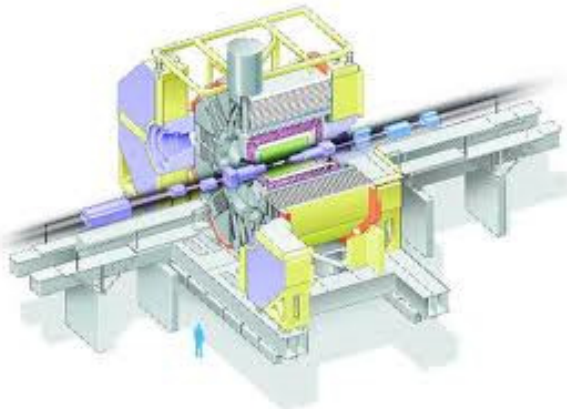


Korean Belle II General Meeting
Chonnam National U., Gwangju, Korea



The Use of AMGA for Belle II Data Handling System

2020. 11. 20

Kihyeon Cho (UST/KISTI)

Contents

- Belle/Belle @KISTI
- KISTI HEP Group
- Belle II Data Handling System
- New KEKCC Transition
- AMGA
- Plan

Belle/Belle II @KISTI

- Belle II Collaboration

- KISTI HEP Group

- Prof. Kihyeon Cho (IR)
- Mr. Kihong Park (Master Student at UST/KISTI)
- Dr. Insung Yeo (Left KISTI for Seoyeong U. on March 15, 2020)

- Belle II Computing Group (Not Belle II Collaboration)

- AMGA Team

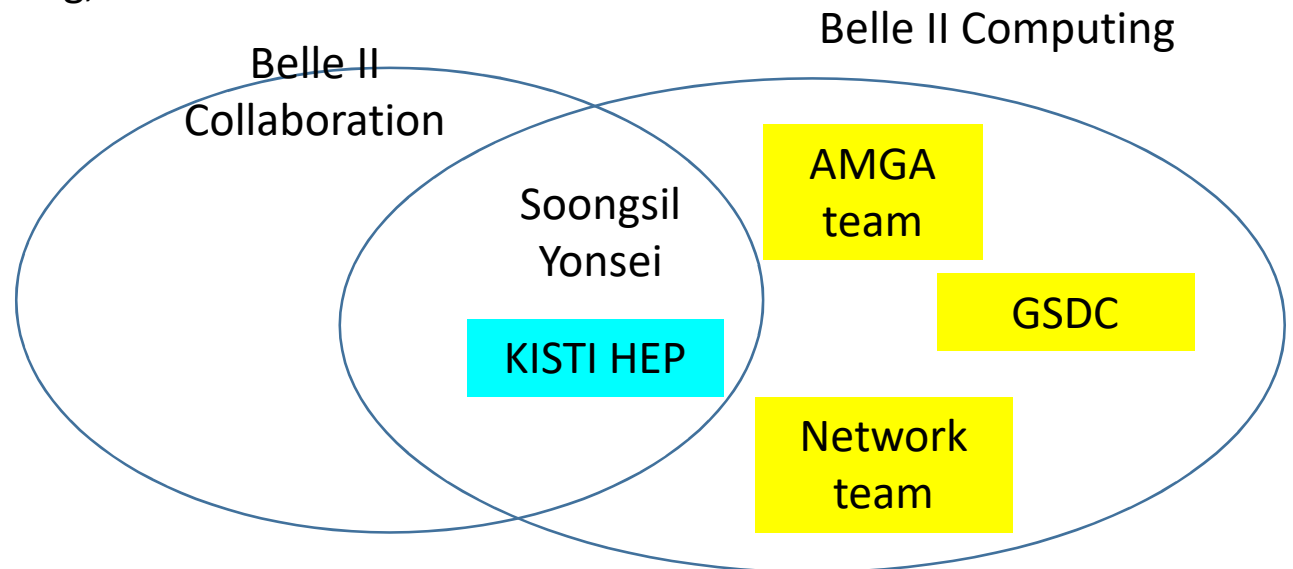
- Prof. Soonwook Hwang, Director General
- Mr. Geunchul Park

- GSDC

- Mr. Ilyeon Yeo

- Network Team

- Prof. Buseong Cho



Contact Persons and Mailing list

	Responsible person	Belle II Contact Person
KISTI	Kihyeon Cho	Kihyeon Cho
AMGA	Soonwook Hwang	Geunchul Park
GSDC	Soonwook Hwang	Ilyeon Yeo
Network	Buseong Cho	Buseong Cho

Mailing list	Who
hep@kisti.re.kr	KISTI HEP Group
amga@edison.re.kr	AMGA Team + Kihyeon, Miyake, Hara
belle2_comuting@kisti.re.kr	GSDC + Kihyeon
belle2@kisti.re.kr	All KISTI persons related with Belle II

KISTI HEP Group

- (Service) AMGA 활용 Belle II Data Handling System
 - Working Group Chair: K. Cho (2009~2014)
 - To use AMGA component for metadata catalogue
 - MC Production now \Rightarrow works well
- (Shift) Belle II Remote Control Room
 - Data production shift to monitor Belle II Data Handling system
 - Remote Control shift for Belle II collaboration
- (Physics) Dark Sector
 - \Rightarrow Kihong Park's talk

Belle II Data Handling System

머니투데이

2020년 2월 25일 화요일 017면 IT 미디어 과학

과학기술정보연구개발 '연구용 SW' 대형 국제물리학 프로젝트서 채택

데이터관리 'AMGA'... 유럽 우수 연구소 제처

우리나라의 연구용 소프트웨어가 프랑스 핵입자물리연구소(IN2P3), 스페인 바르셀로나대학교, 유럽입자물리연구소(CERN) 컨소시엄을 제치고 대형 국제 물리학 연구프로젝트의 데이터처리용 SW(소프트웨어)로 채택됐다.

한국과학기술정보연구원(KISTI)은 자체 개발한 메타데이터 관리 SW AMGA(ARDA Metadata Grid Application)가 다음달부터 본격 가동될 벨 II(Belle II) 검출기 실험의 데이터처리용 SW로 사용될 예정이라고 24일 밝혔다. 2008년 노벨물리학상 수상에 기여한 벨의 후속실험인 벨 II는 물리학 표준모형을 넘어선 새로운 입자 및 물리현상의 존재 여부를 찾는 일본 고에너지입자연구소(KEK)의 가속기 실험이다. 현재 전세계 약 26개국,

1000여명의 연구자가 참여하고 있다. 한국에서도 9개 기관, 50여명이 참여한다.

KISTI가 개발한 AMGA는 2011년 프랑스 IN2P3, 바르셀로나대학교, CERN 등의 컨소시엄이 개발한 미들웨어 메타데이터 시스템을 제치고 벨 II 실험에 채택되는 성과를 거뒀다. AMGA는 여러 저장소에 분산된 실험데이터의 요약 정보를 관리하는 SW로서 연구자들이 보다 쉽게 실험데이터를 활용할 수 있도록 돕는다. 벨 실험장비를 전면적으로 업그레이드한 벨 II 실험은 이전 벨 실험보다 50배나 더 많은 데이터를 생성하기 때문에 새로운 데이터처리 시스템이 필요하다.

KISTI 조기팀(고에너지물리연구팀장) 박사팀은 2009년부터 벨 II 분산데이터처리 시



벨 II 검출기 내부 형상. /자료 제공=벨 II

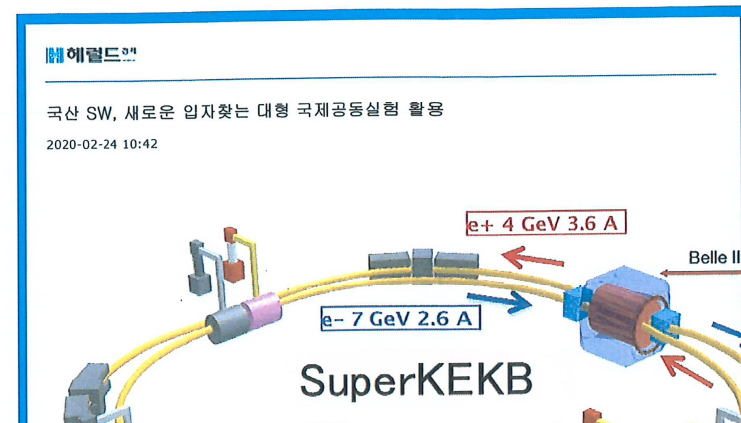
스템 개발에 참여해왔다. 벨 II 실험 시뮬레이션 워킹그룹 리더인 김양수 숭실대 물리학과 교수는 "KISTI가 개발한 AMGA SW가 지난 10년간 벨 II와 같은 대형 국제공동실험에 활용된다는 사실에 한국 연구자로서 자긍심을 느낀다"고 말했다. 황순숙 KISTI 국가슈퍼컴퓨팅본부장은 "이제부터 10년간 본격 가동 예정인 벨 II 실험에서 생산되는 대용량 실험데이터 처리에 AMGA가 잘 활용될 수 있도록 계속 지원하겠다"고 말했다.

류준영 기자 joon@

언론보도(2020.02.25)

국산 SW, 새로운 입자찾는 대형 국제공동실험 활용-프린트화면

1의 2페이지



돈이 보이는 리얼타임 뉴스 '머니투데이'

1의 3페이지

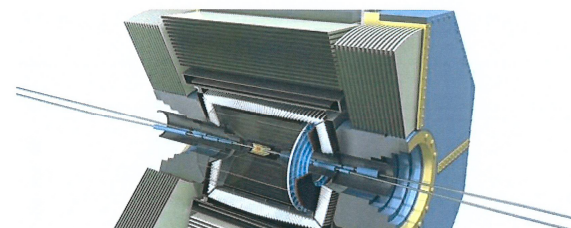
韓 연구SW, 국제 '벨II' 프로젝트에 공급...佛 핵입자물리연구소·CERN 연합 제겼다

머니투데이 | 류준영 기자

2020.02.24 10:43

<https://news.mt.co.kr/mtview.php?no=2020022409551994358&type=1>

기사주소 복사

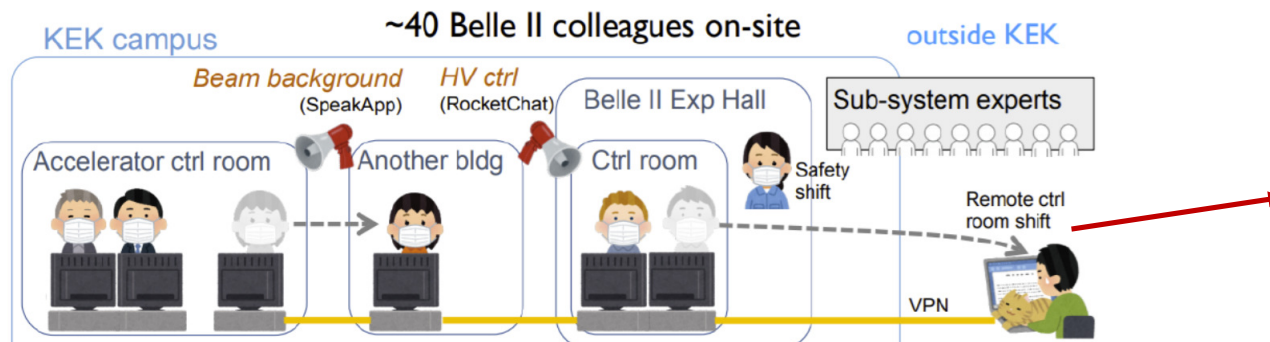
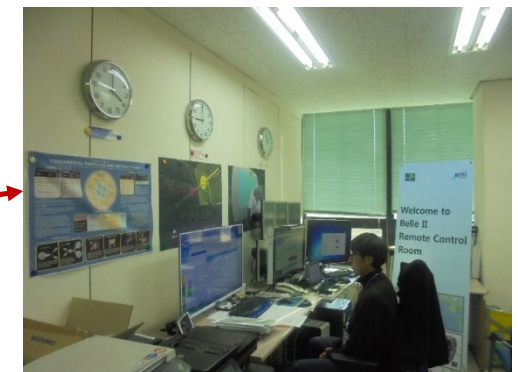


History

- 2009.02: Belle II Data Handling Group 구축
(Chair: Kihyeon Cho)
- 2010.10: Belle II 컴퓨팅, Metadata Catalog로 AMGA 채택
- 2014.02: Belle II Data Handling Group
⇒ Distributed Computing과 통합 (Chair: I. Ueda)
- 2014.07: Hideki 상, KISTI 방문
⇒ AMGA 문제해결, SL6.0 업그레이드
- 2020.02: AMGA, CentOS7.0 업그레이드 ⇒ 언론보도
- 2020.09: KEKCC migration
⇒ AMGA shutdown: 8/21-24, 9/28

Data Production shifts

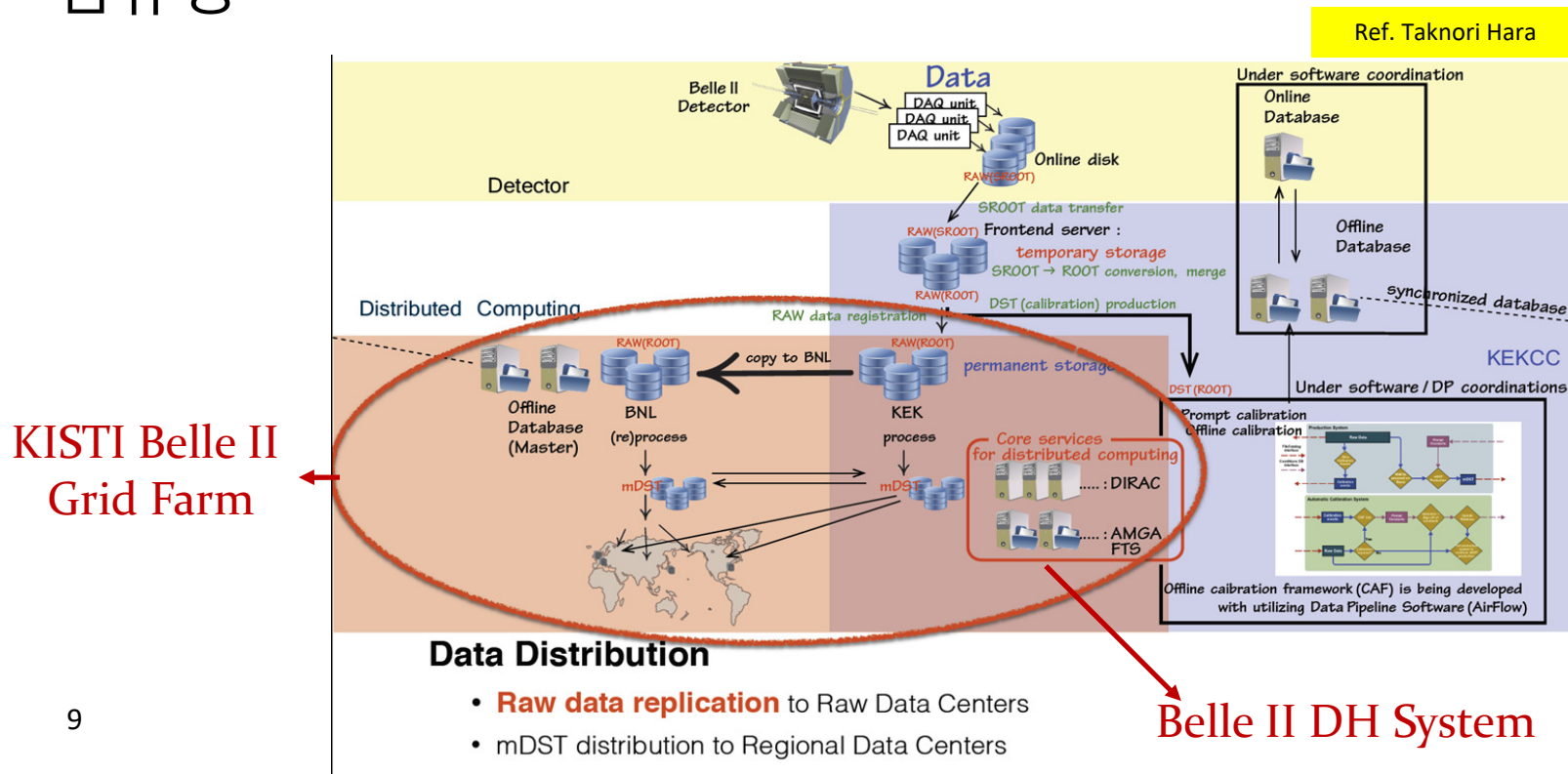
- To monitor DH system
- Data Production shifts - 5 Terms
 - Dec. 16~19, 2019 (K.Cho)
 - Jan. 2~4, 2020 (K. Park)
 - Jan. 27~30, 2020 (I. Yeo)
 - Feb.24~27, 2020 (K. Cho)
 - Feb.3~6, 2020 (K. Park)
- Remote Control Room
 - Remote Control Room Shift



from ICHEP2020 talk by K. Matsuoka

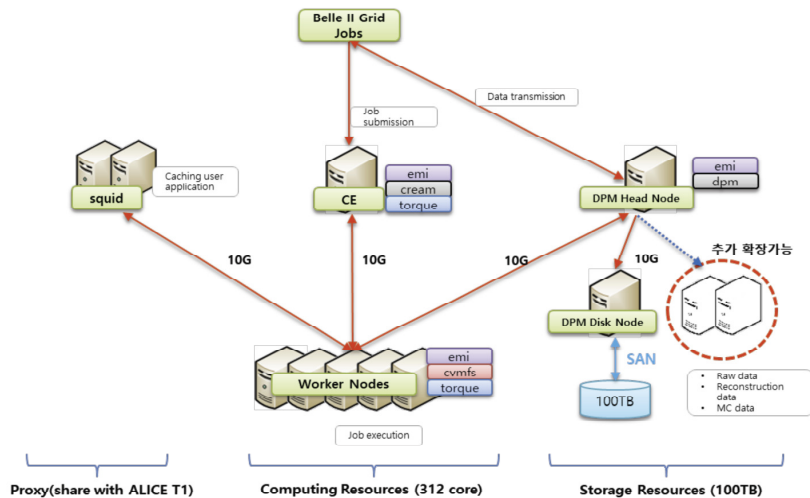
Belle II Computing

- 필요한 전산자원
 - 130 PB Raw data (2 copies) + MC
- 컴퓨팅



KISTI Belle II Grid Farm

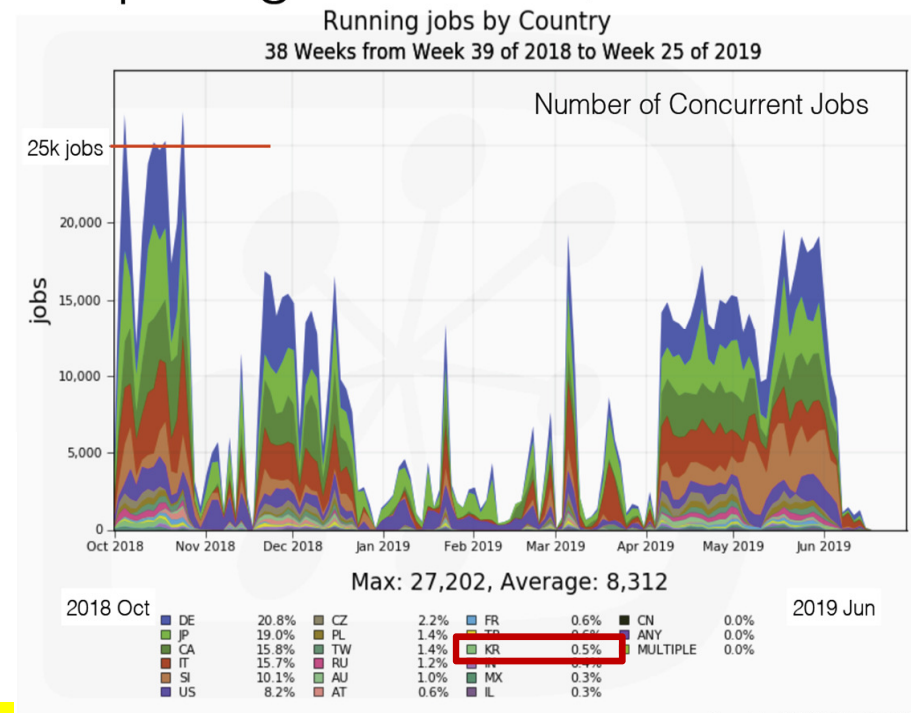
- Tier2 level
- 2016.11 Computing General MoU for Belle II
- 312 core (2.7 kHS06), 107 TB
- SE protocol: DPM/GridFTP



	Hostname	HW	Middleware	Resource
CE	ce07.sdffarm.kr	• Dell R610	EMI 3(Cream-CE)	
WN	wn[3038~3050].sdffarm.kr	• 2cpu, 6core/cpu, 72GB mem	EMI 3(torque)	312 core
UI	ui07.sdffarm.kr		EMI 3	
SE	belle-se-head		EMI 3(DPM)	100TB
	belle-se-disk01			

Ref. Ilyeon Yeo

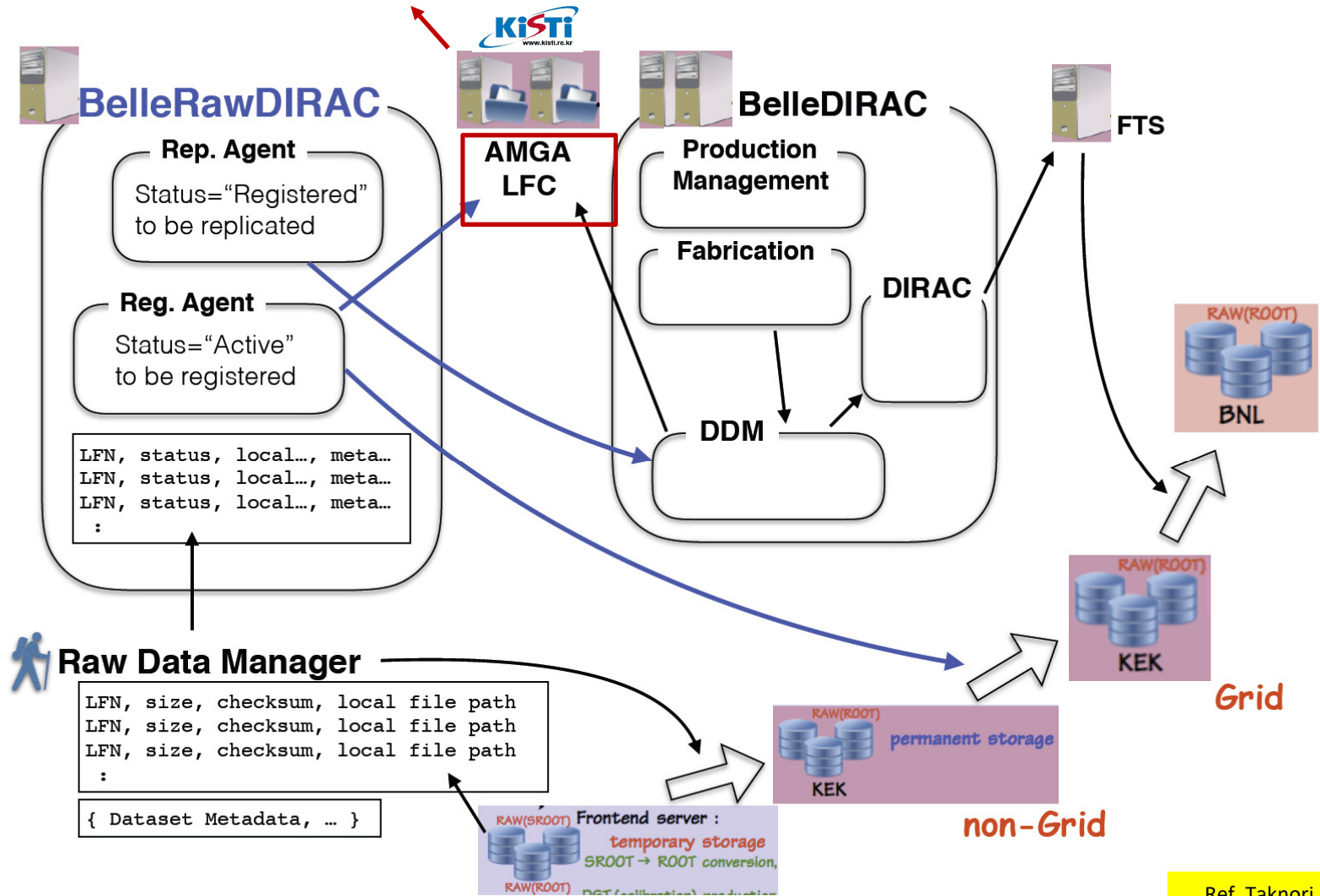
Computing Activities (2018 Oct - 2019 Jun)



Generated on 2019-06-17 01:47:52 UTC

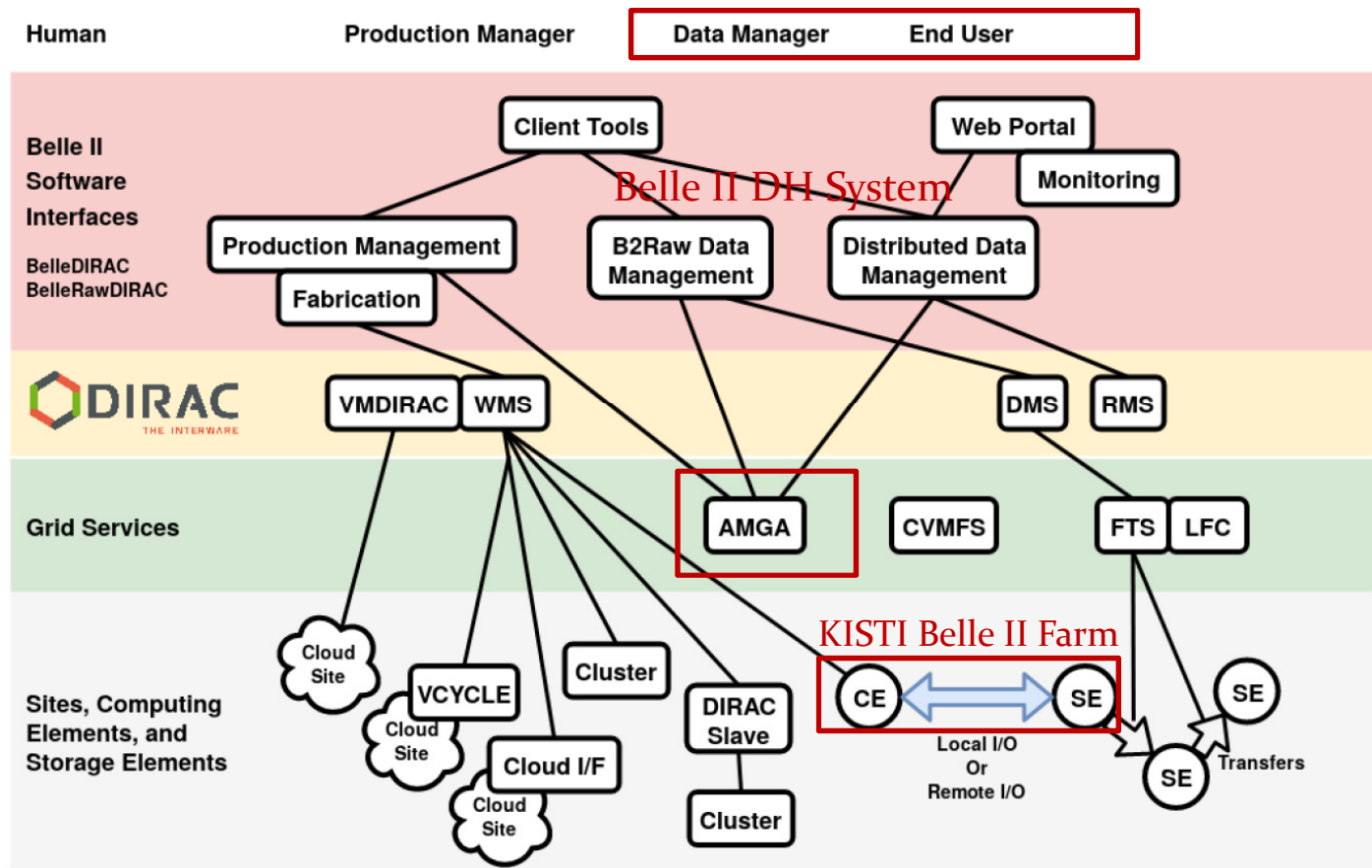
Belle II Data Flow

Belle II DH System



Layers - Grid Services: AMGA

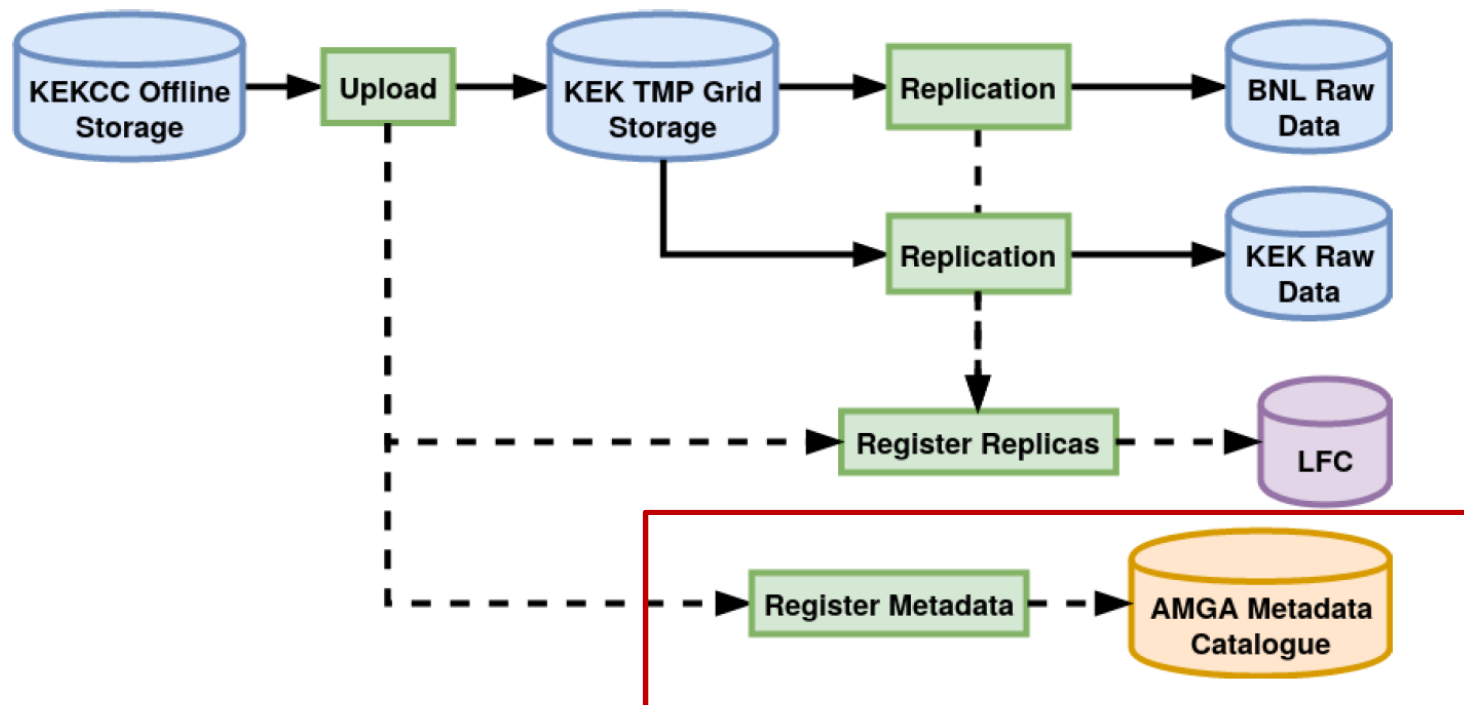
Distributed Components



Offline → Register Metadata

Offline → Grid: BelleRawDIRAC

Poster - Raw Data Management System



KEKCC migration

to be launched on Sep. 1st

	2016	2020	Upgrade Factor
CPU	Xeon E5-2697v3 <small>Haswell</small> (2.6GHz, 14cores)	Xeon Gold 6230 <small>Cascade Lake</small> (2.1 GHz, 20 cores)	
CPU cores	10,024	15,200	x1.5
HS06	236k	480k (est.)	x2
OS	SL 6.10	CentOS 7.X (??)	
Disk Capacity	10 + 3 PB (HSM)	17 + 8.5 PB (HSM)	x2
Tape Drive	IBM TS1150 x54	IBM TS1160 x72	
Tape Media	7 TB/vol (JC) 10 TB/vol (JD), 360 MB/s	7 TB /vol (JC) 15 TB/vol (JD-Gen6) 20 TB/vol (JE), 400 MB/s	
Tape max capacity	70 PB	100 PB	x1.4

<https://indico.belle2.org/event/1391/contributions/7519/>

Koichi Murakami

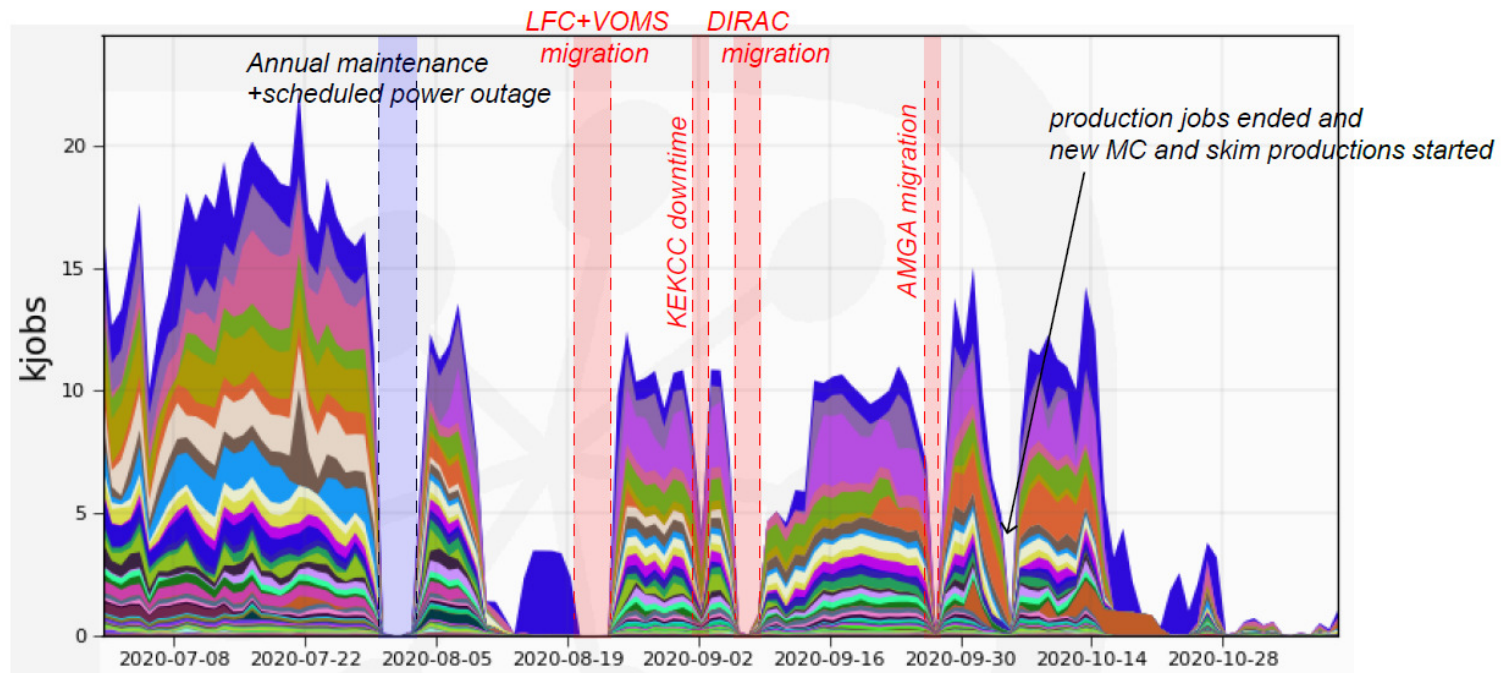
- SL6 → CentOS7 Upgrade
 - ✓ The AMGA packages for CentOS7 had been developed on Feb. 2020.
 - ✓ AMGA Team (Geunchul Park) has been worked on it.

Distributed computing

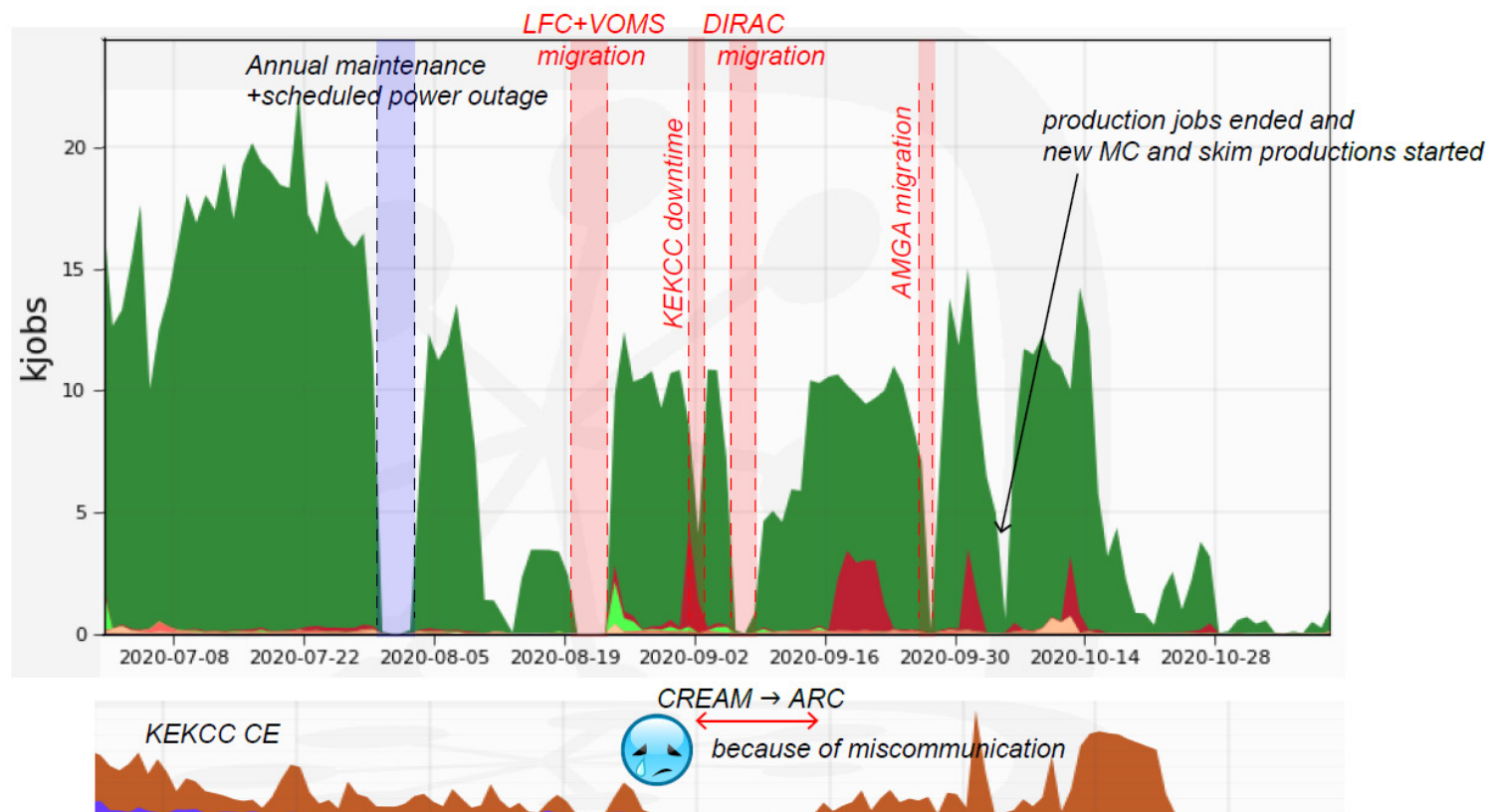


- **Belle II dedicated servers**, so-called peripheral servers for the analysis system, were available by the end of July. However, there were many misconfigurations mainly originating from the network, e.g. IPv6 and DNS, etc. Almost things seem to be fixed by the end of Aug., but additional time might have been needed to migrate the functionality by the Belle II group e.g. DIRAC and so on.
- **Grid instances** have been migrated with one or two days delays from the original plan by the end of Aug. except for AMGA. But there are still a lot of things to be fixed.
 - VOMS: downtime on Aug. 21
 - CVMFS-st0, CVMFS-update, FTS, LFC-RW: downtime Aug. 21 to Aug. 24
 - StoRM: limited access Aug. 24 to Aug. 28, downtime Aug. 31 to Sep. 1
 - AMGA: Downtime was scheduled from Aug. 21st to Aug. 24th.
 - But the upgrade of the PostgreSQL version was not completed within the scheduled downtime period due to the huge DB size (more than 300GB). Then, we turned back to the old servers and restarted the service again. We investigated some effective ways to minimize downtime. However, we have not been able to find the way even at this moment. So actually, we are running the old version at the new servers by using the cold DB backup. We took an additional downtime on Sep. 28th for this work.

Distributed computing



Distributed computing



Although there were many issues, we managed to keep Belle II Grid activities finally...

AMGA

AMGA - Overview
2.2.0

Introduction

The ARDA project is studying the needs on metadata catalogues in a grid environment and what the solutions offered by the HEP experiments so far. In order to investigate how an implementation of a highly performant and possibly distributed (including distributed updates) metadata server could look like, ARDA has written a prototype implementation. For the rationales of the design see [here](#).

This prototype is also used to understand the design of the protocol interface of the server. Currently, the protocol of the metadata server is not yet final but already somewhat stable: [Definition of the Client Server Protocol](#). It corresponds to the interface design for a web-service which is developed by ARDA together with the gLite team.

Development

The AMGA implementation uses streaming to communicate between client and server which shows a very promising performance. To meet the EGEE requirements, we have also implemented an alternative SOAP-based frontend. We have made a RPM including:

- A streaming and a SOAP front-end
- An interactive client for the streaming front-end
- Client APIs for the streaming client (C++, Java and Python)

In the [download directory](#) you can find RPMs for installation on CERN Scientific Linux 3. Along with a source tarball and the latest Java client. Available is the [WSDL](#) definition describing the SOAP frontend and several examples.

The AMGA server comes with client APIs for C++ ([Using the C++ Client API](#)), Python ([Using the Python Client API](#)), Java ([Using the Java Client API](#)) and Perl. The client APIs apart from the C++ one are distributed separately from C++ server. They only need to be unpacked and work without much of an installation. The Java style documentation for the Java Client API can be found [here](#). Both the Java API and the C++ client RPM include a command line interface.

Installation and First Steps

Installing the rpm on a machine will automatically install and set up postgresql including creation of an arda user. This last step might produce some error messages if the database metadata and the user arda already exist. This is a common situation if the server package has been previously installed. Please ignore these message. In a future release the installation process will be updated to deal with this situation gracefully. Detailed installation instruction for the RPM can be found in [Installation](#).

After installation each user interested in using the client must define its own client configuration file. The client looks for its configuration in two places:

- `mdclient.config` in the current directory
- `mdclient.config` in the user's home directory

The easiest way for creating a configuration file is copying the sample configuration in `etc/mdclient.config`. When security is not used, there should be no need to customize this sample configuration. Detailed instructions on the configuration of the client are in [Configuration of the C++ and Java command line clients](#).

Configuring and Starting the Servers

The metadata server includes two frontends:

- `amgad` - A frontend implementing the streaming protocol.
- `mdsoapserver` - A SOAP based frontend.

Each frontend has its own configuration file: `amgad.config` and `mdsoapserver.config`, respectively. During installation these files are created on the `/etc` directory. The default values should work fine in most situations, but if you want, you can fine-tune the behaviour of the servers by editing those files. To make this easy, all the settings are documented on the configuration files, but there is also a more detailed documentation at [Configuring the AMGA Server and the Replicatn Daemon](#).

To start the server either execute `amgad` or `mdsoapserver`.

- CERN의 AMGA 홈페이지에 Belle II 실험을 위한 새로운 AMGA 패키지를 업로드 예정

- Scientific Linux7과 RedHat Linux 7을 위한 새로운 AMGA 패키지를 아래 디렉토리에 업로드 예정

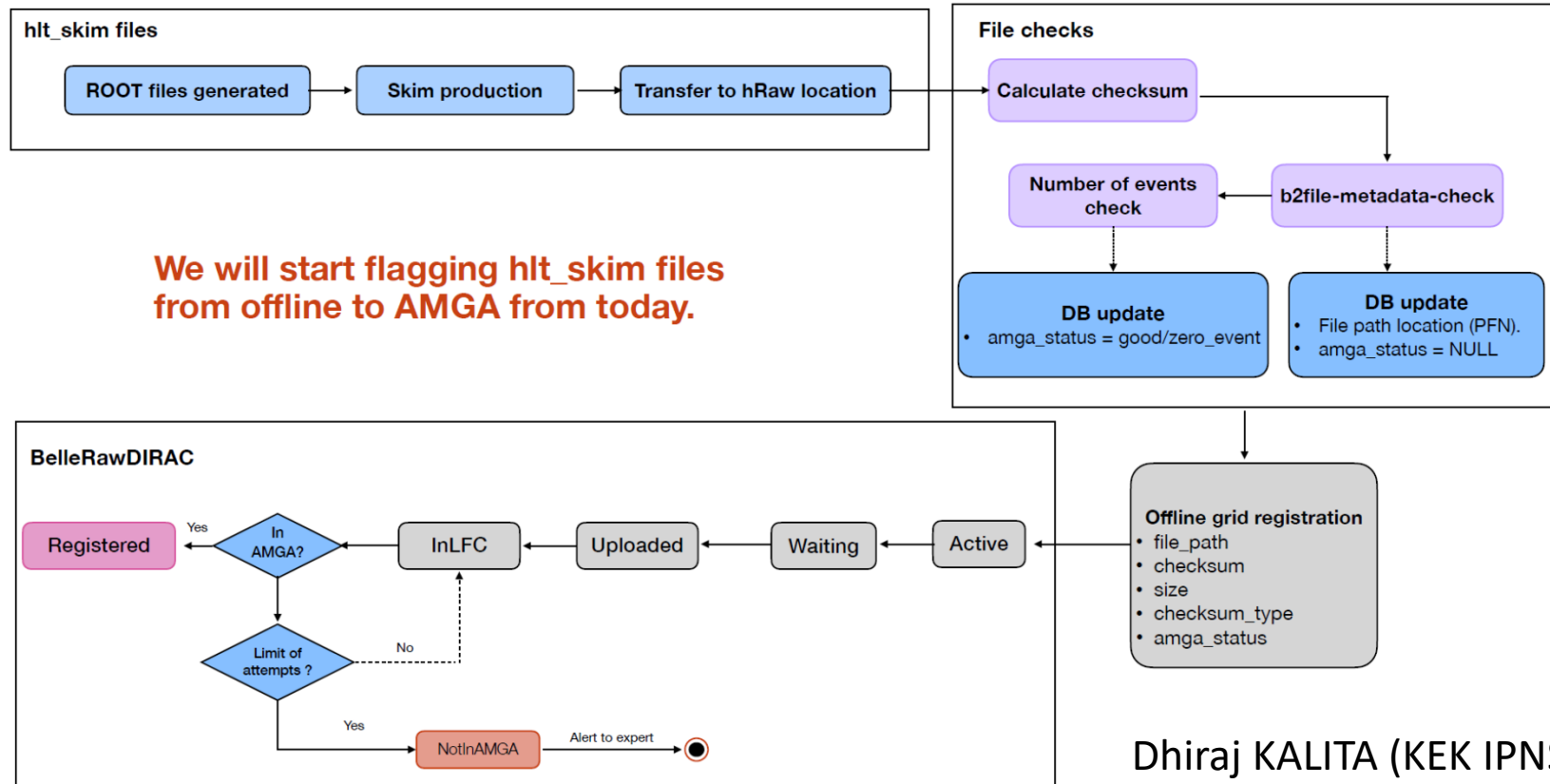
`/eos/web/arda/amga/downloads/2.5.1`

- CERN AMGA management (amga2020) 계정 생성
 - Soonwook Hwang, Geunchul Park

<http://amga.web.cern.ch/amga/>

AMGA의 활용

- AMGA tagging RAW 데이터와 HLT skim 파일에도 활용 (2020.06)

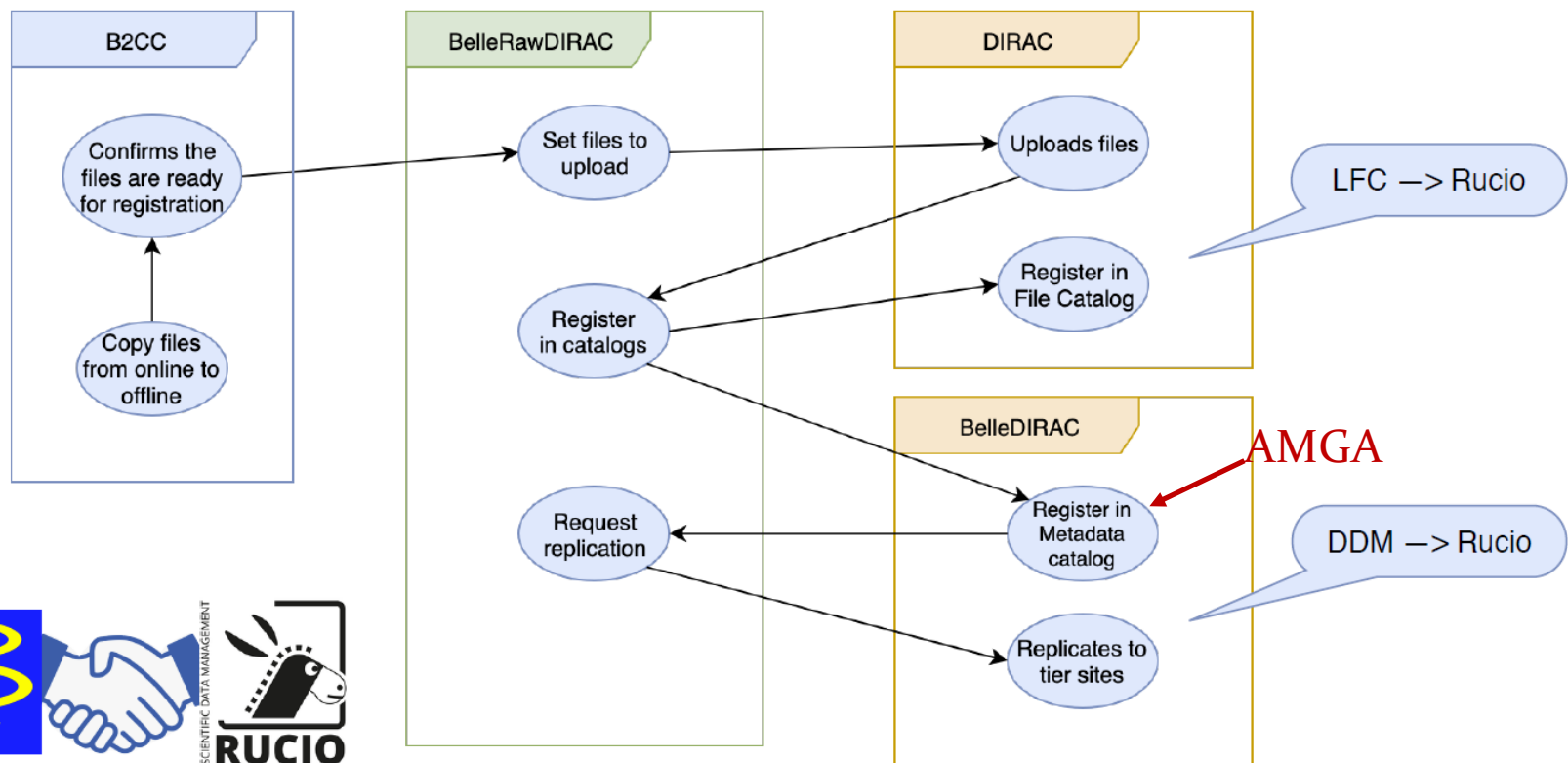


Dhiraj KALITA (KEK IPNS)

AMGA의 도전

- 2020.02.26, 03.13 AMGA stuck ⇒ All Grid site stop
 - KEK CC ⇒ AMGA server restart (Go 상)
 - Scalability problem ⇒ Solution: Tight cut (Miyake 상)
- 2020.07.21 AMGA connection error
 - ⇒ Italia local problem
- Rucio
 - CERN 주도로 만든 Scientific Data Management SW
 - ATLAS 실험에서 활용 중
 - BNL에서 Belle II 실험에 사용 시도 중
 - ⇒ Stand-alone에서 작동
 - ⇒ LFC와 DDM 대체 예정 (BPAC 2020 미팅 보고)
 - ⇒ AMGA?

BelleRawDIRAC and Rucio



Plan

- KISTI HEP그룹은 AMGA 팀과 함께,
 - AMGA 활용 Belle II Data Handling System 구축
 - 지난 10년간 유지 보수 및 향후 5년간 운영 예정
- 2021년도 KISTI 슈퍼컴퓨팅 기본사업에 Belle II 포함
⇒ 국가연구개발 우수성과 100선 목표

Acknowledgement

- AMGA team (Soonwook Hwang and Geunchul Park)

Thank you.

(cho@kisti.re.kr)