

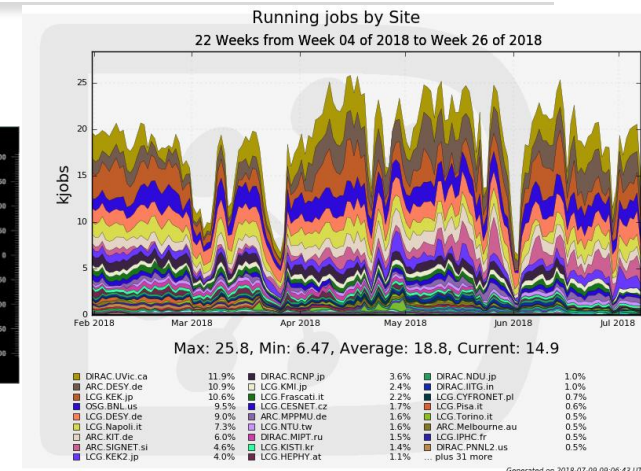
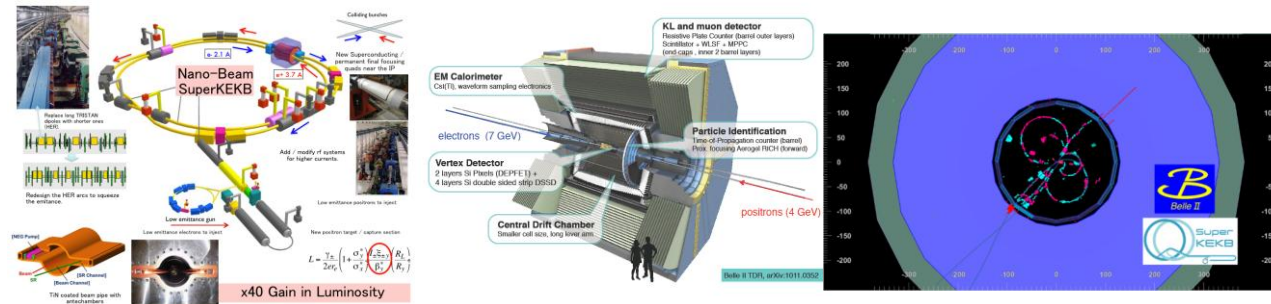
# Monitoring system for the Belle II distributed computing

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# SuperKEKB/Belle II

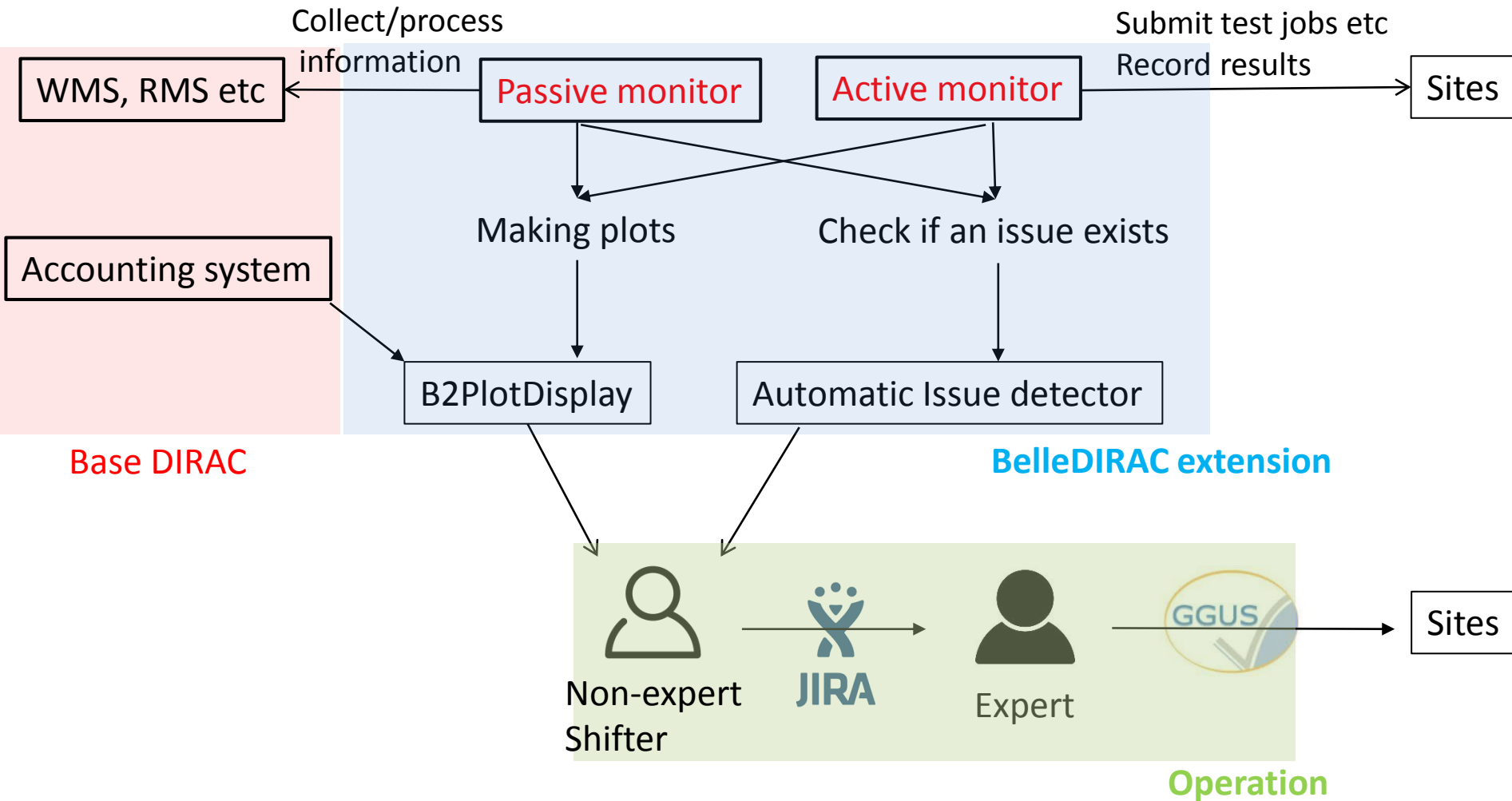
2



- The intensity frontier**  $e^+e^-$  collider B-factory experiment with instantaneous luminosity of  $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$ , which is 40 times of KEKB. Detector also upgraded to improve the performance and to cope with huge beam BG.
- First collision** observed on 26<sup>th</sup>, Apr!
- Computing resource requirements:
  - **O(100 PB) storage**, **O ( $10^5$ ) CPU** cores, analyzed by **~800 collaborators**.
- Distributed computing based on **DIRAC**
  - Around **50 sites** join distributed computing.
  - Efficient monitoring and operation are key for the smooth analysis.

# Monitoring/operation overview

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# Active monitoring

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- Perform **sanity check of worker nodes** by submitting jobs periodically.
  - CPU information, software required by VO card.
  - CVMFS.
  - Connectivity to SEs.
  - Connectivity to the Condition DB.
- Results are summarized in web interface.


## WN basic info

site	worker node	CPU	#core	memory	OS	Kernel	rpm	cvmfs	releases	CPU Norm.	disk free	last update
<a href="#">ARC.DESY.de</a>	<a href="#">batch0315.desy.de</a>	AMD Opteron(tm) Processor 6378	x64	4038MB/cores	Scientific Linux release 6.9 (Carbon)	2.6.32-696.18.7.el6.x86_64	OK	Rev. 438	OK (release-00-09-01)	<a href="#">5.9 HS06</a>	15 GB/cores	2018/03/16 09:21:01
<a href="#">ARC.KIT.de</a>	<a href="#">c01-129-134</a>	Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz	x40	2419MB/cores	Scientific Linux release 6.9 (Carbon)	2.6.32-696.20.1.el6.x86_64	<a href="#">one problem found</a>	Rev. 438	OK (release-00-09-01)	<a href="#">11.0 HS06</a>	60 GB/cores	2018/03/16 09:21:53
<a href="#">ARC.Melbourne.au</a>	<a href="#">agc69.atlas.unimelb.edu.au</a>	AMD Opteron(tm) Processor 6128	x16	2014MB/cores	Scientific Linux release 6.9 (Carbon)	2.6.32-696.18.7.el6.x86_64	OK	Rev. 438	OK (release-00-09-01)	<a href="#">5.5 HS06</a>	42 GB/cores	2018/03/16 09:23:19

## Cond DB connectivity

Site	WN	get URL test	DL CDB test	Check Time
ARC.DESY.de	batch0628.desy....	Succeeded	Succeeded	2018-02-06 05:28:05
CLOfddUD.CC1_Krako...	ip-172-31-22-244	Succeeded	Succeeded	2018-01-12 22:55:04
CLOUD.CC1_Krakov.pl	ip-172-31-22-134	Succeeded	Succeeded	2018-02-06 00:46:42

## SE connectivity

Site	SE	Port Check	List (ls)	Prepare File	Upload	ChkSM (UL)	Download	ChkSM (DL)	RM (File)	RM (Dir)	Exec. Time
DIRAC.IITG.in	KISTI-TMP-SE	OK	OK	OK	OK	OK	OK	OK	OK	OK	2018-03-16 03:19:43
DIRAC.IITG.in	BNL-TMP-SE	OK	OK	OK	OK	OK	OK	OK	OK	OK	2018-03-16 03:18:06
DIRAC.IITG.in	KEK-DISK-TMP-SE	OK	OK	OK	OK	OK	OK	OK	OK	OK	2018-03-16 03:16:06
DIRAC.IITG.in	Napoli-TMP-SE	OK	OK	OK	OK	OK	OK	OK	OK	OK	2018-03-16 03:14:12
LCG.Pisa.it	Pisa-TMP-SE	OK	OK	OK	 Get output file(s)	OK	OK	OK	OK	OK	2018-03-16 03:13:37
LCG.Roma3.it	Roma3-TMP-SE	OK	OK	OK	OK	OK	OK	OK	OK	OK	2018-03-16 03:13:03

```
Pisa-TMP-SE test starts...
Port check: stormfel.pi.infn.it:8444
stormfel.pi.infn.it:8444 is accessible
log-ls test:
$ log-ls -v --connect-timeout 60 --sendreceive-timeout 60 --bdl-timeout 60 --srm-timeout 60 -l -b -D srmv2
--vo belle srm://stormfel.pi.infn.it:8444/srm/manager/v2?SFN=/belle/TMP/belle
SE type: SRMv2
dr-xr-xr-x 1 1 1 0 UNKNOWN /belle/TMP/belle/user
dr-xr-xr-x 1 1 1 0 UNKNOWN /belle/TMP/belle/data
dr-xr-xr-x 1 1 1 0 UNKNOWN /belle/TMP/belle/NC
dr-xr-xr-x 1 1 1 0 UNKNOWN /belle/TMP/belle/group
dr-xr-xr-x 1 1 1 0 UNKNOWN /belle/TMP/belle/test
```

# Active monitoring (2)

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- Test connectivity of CEs from DIRAC servers which submit pilots.
  - 4 types of CEs: ARC, LCG, OSG (not implemented), and local SSH sites (~ 20 sites).
  - Perform arcinfo, glite-ce-service-info, ssh connection.

Site	CE	Test Type	Test Result	Create Time ▾
ARC.SIGNET.si	jost.arnes.si	ARCInfoTest	OK	2018-07-01 08:21:46
DIRAC.SSU.kr	203.230.60.186	SSHConnectio...	OK	2018-07-01 05:16:46
DIRAC.Beihang.cn	202.112.131.140	SSHConnectio...	Password required	2018-06-30 21:17:24
LCG.Pisa.it	gridce0.pi.infn.it	LCGServiceInf...	OK	<div>Show log15</div> <div>Show history27</div> <div>Elapsed time plot28</div> <div>Download log37</div>
LCG.CYFRONET.pl	ce01.grid.cyfro...	LCGServiceInf...	OK	
ARC.MPPMU.de	grid-arcce2.rzg...	ARCInfoTest	in Downtime	
LCG.Napoli.it	atlas-cream01.n...	LCGServiceInf...	OK	
LCG.Napoli.it	t2-recas-ce01.n...	LCGServiceInf...	OK	2018-06-29 14:45:37
LCG.Torino.it	t2-ce-01.to.infn.it	LCGServiceInf...	OK	2018-06-29 14:45:36
LCG.Napoli.it	recas-ce02.na.i...	LCGServiceInf...	OK	2018-06-29 14:45:36
LCG.Napoli.it	atlas-cream02.n...	LCGServiceInf...	OK	2018-06-29 14:45:36
ARC.KIT.de	arc-1-kit.gridka...	ARCInfoTest	in Downtime	2018-06-28 09:20:50
ARC.KIT.de	arc-2-kit.gridka...	ARCInfoTest	in Downtime	2018-06-28 09:20:50

## History

Date Time	Test Result	Software	Elapsed time(s)	Issue Count
2018-07-01 00:17:51	Password required	N/A	1.43827	4
2018-06-30 23:17:23	Password required	N/A	1.30576	3
2018-06-30 22:17:37	Password required	N/A	1.77481	2
2018-06-30 21:17:23	Password required	N/A	1.30033	1
2018-06-30 20:17:26	OK	TORQUE 4.2.10	0.620081	128
2018-06-30 19:17:36	OK	TORQUE 4.2.10	0.732918	127
2018-06-30 18:18:19	OK	TORQUE 4.2.10	0.805503	126
2018-06-30 17:18:11	OK	TORQUE	0.849739	125

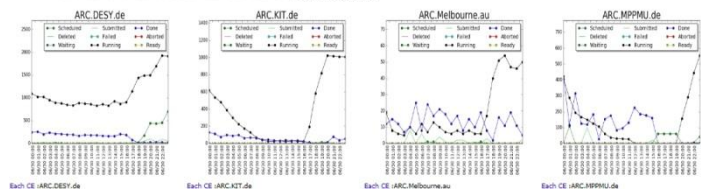
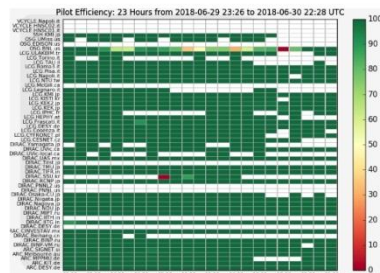
- SE health also tested by performing various operations from DIRAC slaves (not shown in web app).

Pilot Trend | Pilot Submission | Pilot Processing | Pilot Waiting | Job Trend | Job Status | Job Summary | Resubmission Trend | DQM Trend | DQM Task Trend | Storage Accounting | Production

7 day

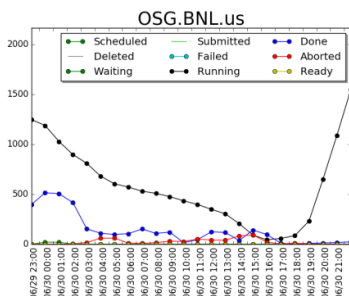
30 day

Figures with a range

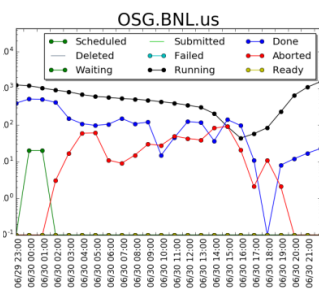


- Collect series of plots in single place.
- Plots are stored in the DIRAC DB periodically and Web App load plots.

## Pilot Trend



Linear

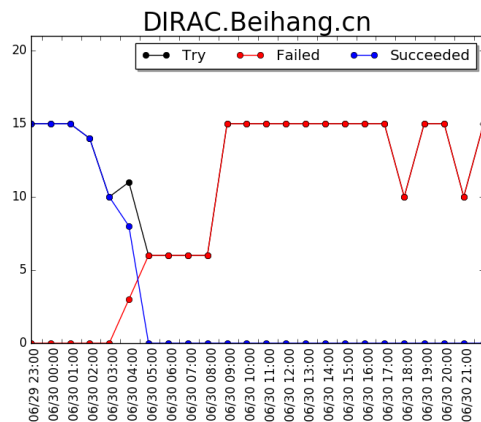


Log

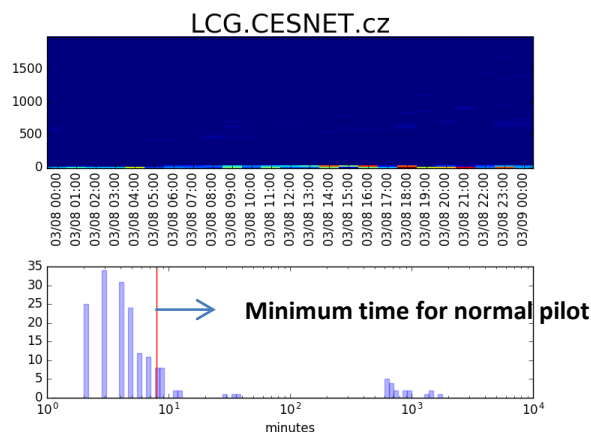
- Trend plots show statistics for terminal statuses (Done, Failed etc) and active statuses (Running, Waiting etc) simultaneously. For terminal statuses, differential numbers are shown.
- This style is useful to grasp the tendency with single plot.
- Log plot can be shown by clicking the plot. (Sometimes, running occupy and hard to see Done or Failed).

# B2PlotDisplay (2)

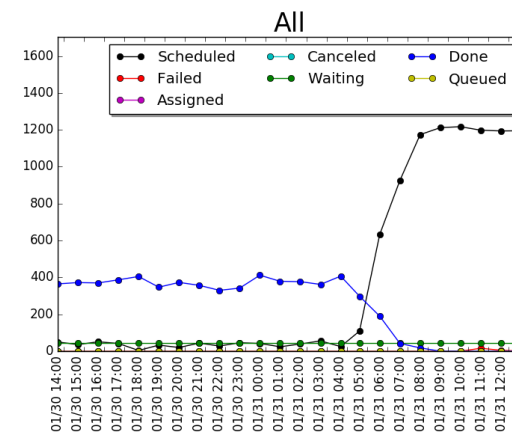
7



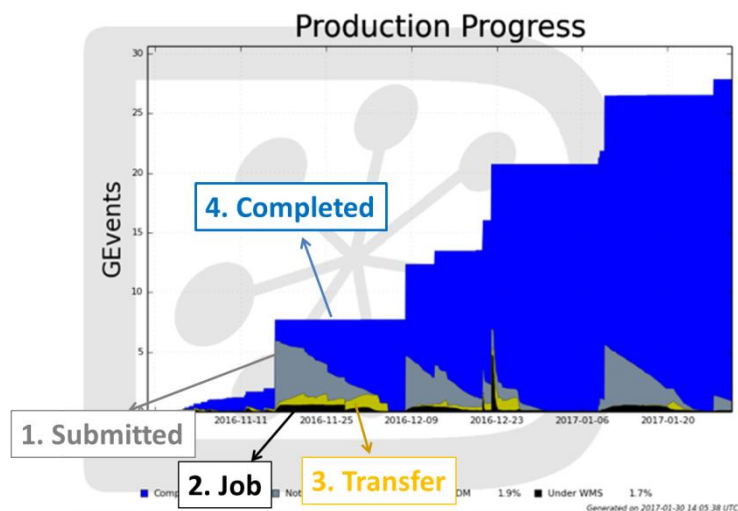
Pilot submission statistics



Pilot wallclock time (min)



Replication Trend



MC production progress

## DownTime for folowing Sites/SEs

Overview ([Link for shift log](#))

### Affected Sites/SE

Site/SE	Name	Down/Total CE (only for sites)
Site	LCG-MCG.ca	1/1
SE	MCG-THP-SE	-
SE	MCG-DATA-SE	-

Overview ([Link for shift log](#))

Start time (UTC)	End time (UTC)	Description	Link
2018-01-11 22:30	2018-04-01 04:02	Decommissioning CA MCG111-CLUMFQ-T2 computing elements (ce02 and ce03) to allow graceful job draining which is a step to decommissioning the site by end of January.	<a href="#">GOCDDB page</a>

### Hosts

Service	Host name	Severity
CREAM CE	ce02.cern.ch	OUTAGE
CREAM CE	ce03.cern.ch	OUTAGE

## DownTime

(GOCDDB information is translated in DIRAC convention)



# Automatic Issue Detector (AID)

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- Issues are summarized in single place after analyzing monitoring information.  
This enable non-expert shifter to report issues.
- Analyze log file to identify the issue automatically.
- Final plan is to put all the issues in single page, but still under development.  
Shifters need to check plots in B2PlotDisplay for some cases.

## Central Services

- DIRAC Servers

## Primary SEs

### • CNAF-TMP-SE

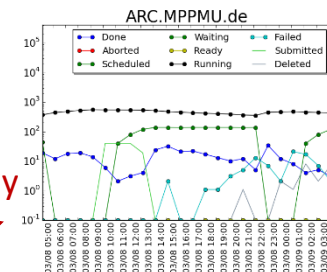
- SE Health check by DDM : checksum, remove file, remove directory, download, upload, Is do not work

## Sites Computing sites

### • ARC.MPPMU.de

- Health checker info. : "Failed pilot jobs" has been found at 01:20:00 UTC on 2018/03/09. ([details](#))

Plots in B2PlotDisplay



What happened? When started?



- Two shifters: normal and expert
- Normal shifter report issues via JIRA. Shift manual defines when to submit ticket. The issue is NOT notified to site admin at this moment.
- Expert investigates the cause of issues. If it is due to the site specific matter, notify to the admin via the GGUS system.

**Site, Issue detected**

Belle II Distrib  
LCG.CYFRONET.pl: Short pilot jobs for 5h+

Edit Comment Assign More Start Review Done Workflow

**Details**

Type:  
Priority:  
Component/s:  
Labels:

**Status:**  
Open->In progress->  
In Review -> Reached

**IN PROGRESS**  
(View Workflow)  
Unresolved

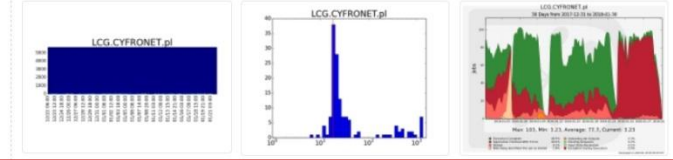
**Description**

Health checker info. : "Short pilot jobs" has been found at 07:20:00 UTC on 2017/11/18.(details)  
Health checker info. : "Short pilot jobs" has been found at 17:20:00 UTC on 2017/11/18.(details)

**From AID**

**Attachments**

Drop files to attach, or browse.



**Plots related to the issue**

**People**  
Assignee:  
Reporter:  
Assign to group:  
Votes:  
Watchers:

**Dates**  
Created:  
Updated:

**Development**  
Create branch

**Agile**  
View on Board

- We had operation experience with series of MC production campaigns.
- Summary of JIRA tickets in half years of MC production campaign (2017 7/1 – 12/31).
- In total **327** (~2 tickets/day)
  - Related to job processing : 167
  - Storage, data transfer: 110
  - Central services: 50  
(DIRAC server, LFC, Condition DB, Monitoring)
- Need some action in large portion of tickets.
  - The workflow of the issue detection, report, tracking are basically working.
- 15% of the JIRA tickets are duplicated..

- Automation of JIRA and GGUS tickets submission.

## Issue DB



- Issue
- Site/SE etc
- When happend
- JIRA ID, status
- GGUS ID, status
- etc..

- Detect the issue automatically.
- If it is not reported by JIRA, store information



## Monitoring DB



- Submit JIRA based on contents on Issue DB.  
Update the status automatically.
- For the GGUS, sentence is made by the system.  
Final submission button is pushed by the expert.



JIRA



- AID shows the issue stored in Issue DB.
- Load of shifters are reduced drastically.  
Duplicated tickets are not submitted.

- Monitoring system for Belle II distributed computing is development as an extension of DIRAC = BelleDIRAC.
- Active/Passive monitoring system collect information. Two components are finally used for normal shifters:
  - B2PlotDisplay
  - Automatic Issue detector
- Confirmed to work properly in the MC production campaign.
- Automatic JIRA/GGUS ticket submission will be developed in the future.
- Plan to implement some of the stuffs on base DIRAC.

