BES-III distributed computing status

Presented by **Alexander UZHINSKIY**

Authors: Sergey BELOV[1], Igor PELEVANYUK [1], Alexander UZHINSKIY [1], Alexey ZHEMCHUGOV [1], Ziyan DENG [2], Xiaomei ZHANG [2], Weidong LI [2], Xianghu ZHAO [2], Tian YAN [2], Tao LIN [2], Gang ZHANG [2], Xiaofei YAN [2]

1. Joint Institute for Nuclear Research

2. Institute of High Energy Physics , Chinese Academy of Sciences, Beijing, China

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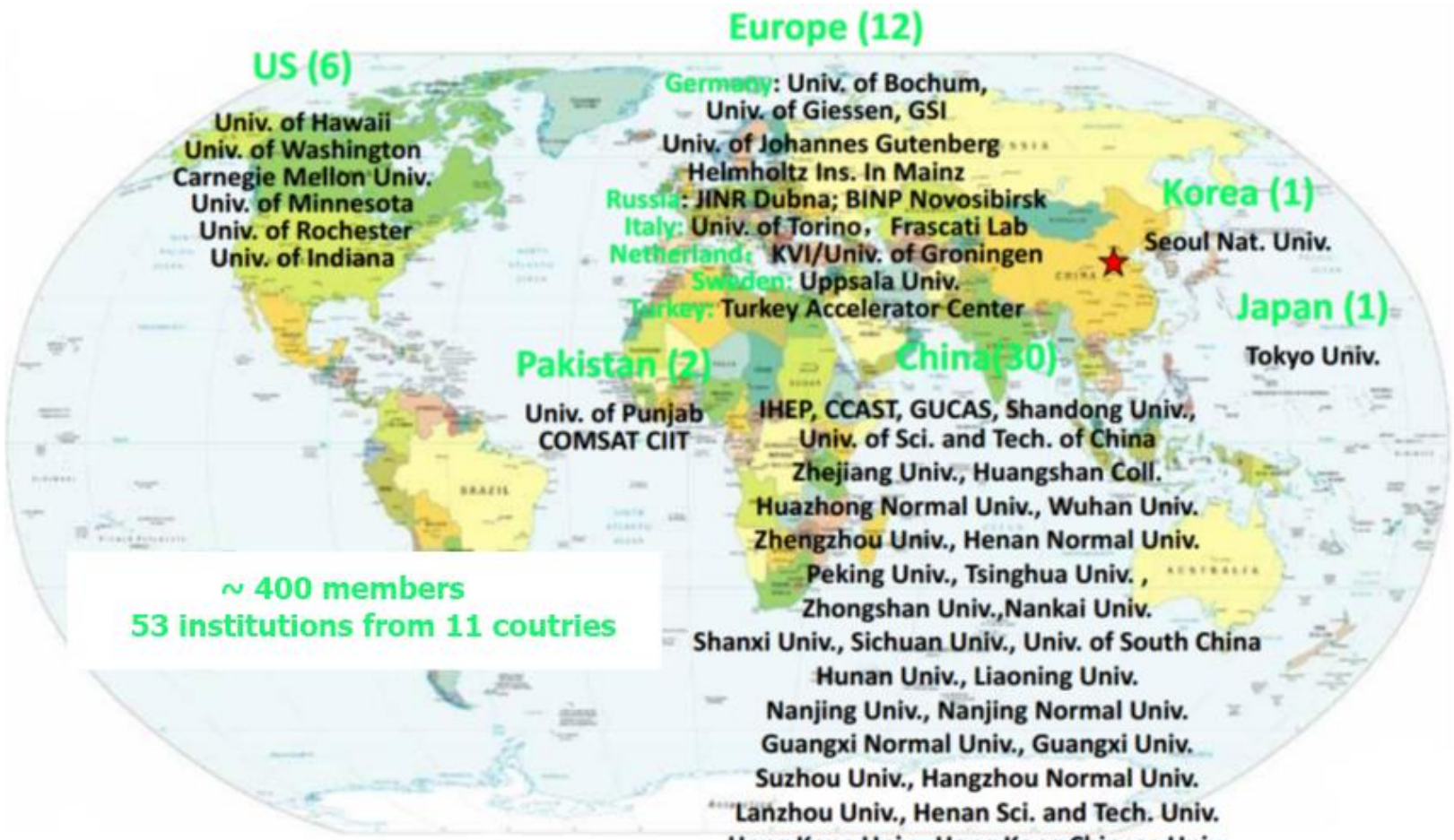
Beijing Electron Positron Collider (BEPC)

2004: started BEPCII upgrade,
BESIII construction

2008: test run

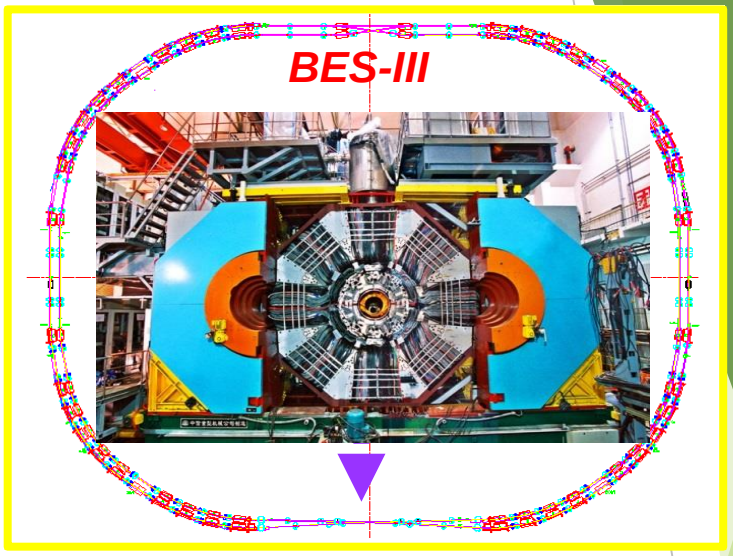
2009 - now: BESIII physics run

The BESIII Collaboration



BES-III Introduction

- The BES-III experiment in Beijing is a world best facility to test Standard Model and QCD with high precision in tau-charm domain
- JINR participates in the experiment since 2005
- BES-III data volume ~0.5 PB/year → 2 PB (2015), 2x109 CPU hours for data processing. Consolidation of resources is necesary so the BES-III Grid is being constructed
- LIT team is a key developer of the BES-III distributed computing system



Status of the project

- A prototype of BES-III Grid has been built (9 sites including IHEP CAS and JINR). Main developments have been done at IHEP and JINR. The Grid is based on DIRAC interware.
- First production (800 million J/ψ events) completed successfully.
  JINR have contributed ~10% of total resources. Current success rate 93%.

- Fully operational system should be setup by 2015
- The infrastructure can be used to process data in other joint JINR-China projects (Daya Bay, NICA (?) ...)

The BES-III data flow

Experimental data are taken from the BES-III detector and stored as raw to the tape storage managed by CASTOR.

The maximum data rate is about 40 MB/s.

DSTs are stored in a disk pool managed by Lustre and dCache and can be accessed only from internal IHEP network.

The total amount of DSTs currently is about 300 TB.

Both inclusive and exclusive Monte-Carlo simulation (MC) is made for each data sample.
The total amount of MC DSTs is more than 50 TB now.

The BES-III offline software is based on the Gaudi framework and runs on Scientific Linux

The BES-III distributed computing system

Remote sites participate only in MC production and physics analysis, while all reconstruction of experimental and simulated data is done at IHEP.

Three operation models are considered, depending on the capabilities and priorities of each site:

a) MC simulation runs at remote sites. The resulting data are copied back to IHEP and then MC reconstruction runs there.

b) MC simulation and reconstruction runs at remote sites. The resulting data are copied back to IHEP;

c) DSTs are copied from IHEP and other sites and analyzed using local resources.

Distributed analysis is postponed for later stage

The BES-III grid solution

DIRAC is BES-III grid solution because:

- DIRAC provides all the necessary components to build ad-hoc distributed computing infrastructures interconnecting resources of different types, allowing interoperability and simplifying interfaces.
- Dirac provide: job management, data management, information system, monitoring, security system
- Dirac is rather easy to install, configure and maintain
- DIRAC Supports grids which based on different middleware (gLite, EGI, VDT, ARC, etc)
- With DIRAC no grid middleware installation needed on site (accessed through an SSH tunnel)

The BES-III Job management

Job submission adopted to BES-III needs

BES-III CE's: 3 gLite-CREAM, 6 SSH-CE

Now main interest is in submitting of BES-III jobs in clouds

The BES-III Data management

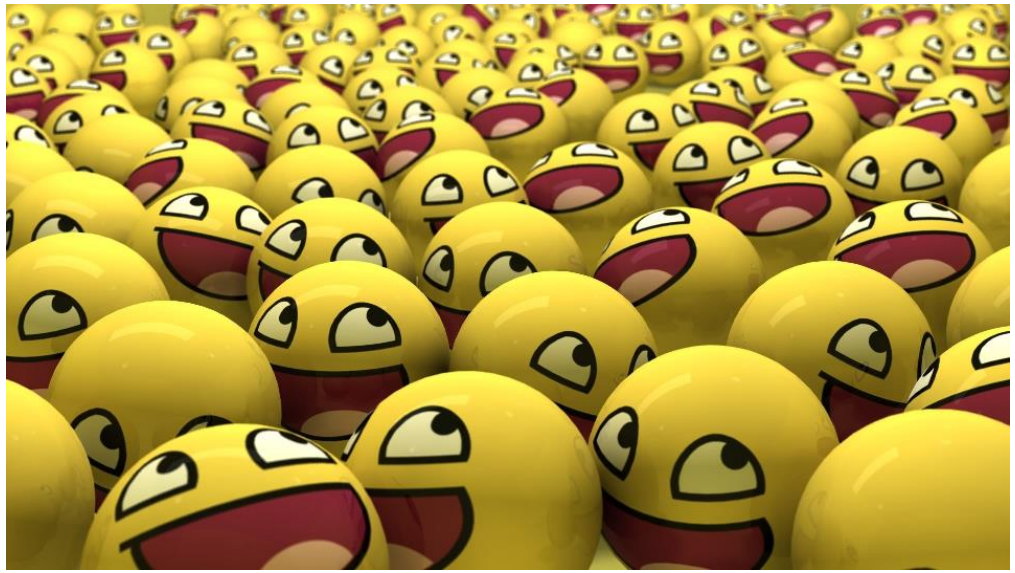
DFC (Dirac file catalog) file operation, dataset operation

SE’s: dCache, Bestman, Storm

Data transfer – BES-III transfer system (FTS)

Solution on dCache-Lustre integration was provided for main data storage in IHEP

The BES-III Monitoring



The main goal of the monitoring to make more users happy:
- to decrease the number of failed jobs
- to understand the failure reasons

Another goal is to lighten the administrator's work
- to show system malfunction before failure occures
- to control overall status of the grid
- to optimize data transfers
- to check storage (=data) availability
- to deploy new sites

First version of the BES-III grid monitoring is operational (http://vm162.jinr.ru)

- Basic site monitoring tools are there to facilitate commissioning of new sites and to improve production reliability
- Storage monitoring becomes a hot issue. Besides that, many more developments are necessary.

The BES-III Monitoring

Available tests

- Network ping test
- WMS test (sending simple job)
- Simple BOSS job (full simulation of 50 events)

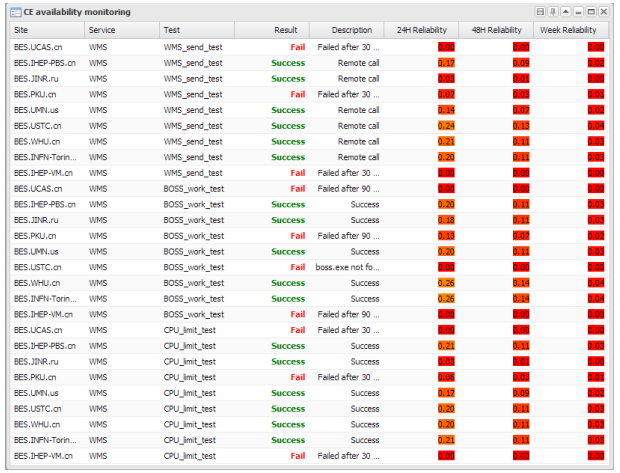
– combined test of CVMFS, environment and resources availability

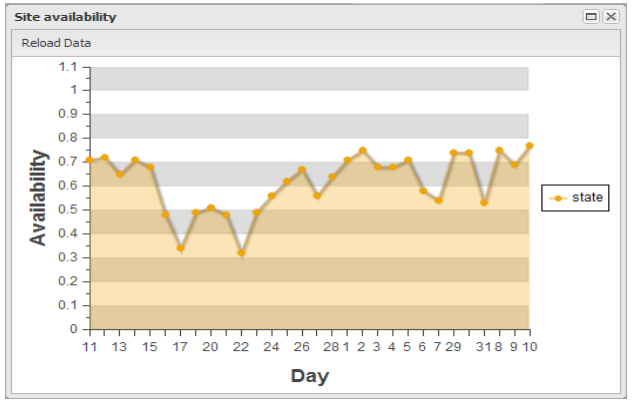
- CPUlimit test

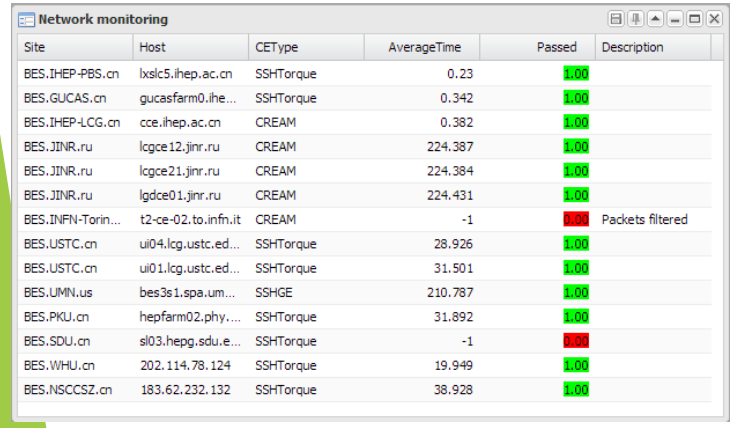
– a number of jobs failed at remote sites because the wrong CPU limit was set ata few WNs

- Host failure accounting

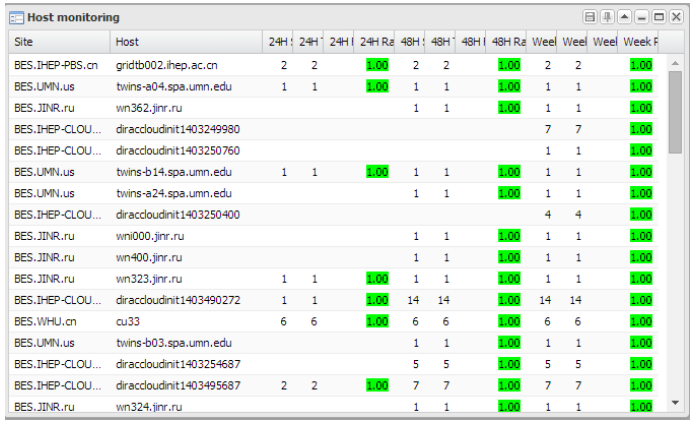
– analyzes failures per individual WN during one week and identifies problematic hosts



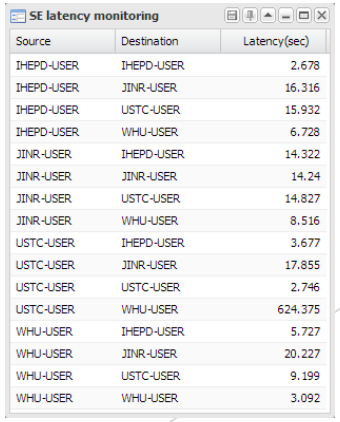




Site	Host	CEType	AverageTime	Passed	Description
BES.IHEP-PBS.cn	lxslc5.ihep.ac.cn	SSHTorque	0.23	1.00	
BES.GUCAS.cn	gucasfarm0.ihe...	SSHTorque	0.342	1.00	
BES.IHEP-LCG.cn	cce.ihep.ac.cn	CREAM	0.382	1.00	
BES.JINR.ru	lcgce12.jinr.ru	CREAM	224.387	1.00	
BES.JINR.ru	lcgce21.jinr.ru	CREAM	224.384	1.00	
BES.JINR.ru	lgdce01.jinr.ru	CREAM	224.431	1.00	
BES.INFN-Torin...	t2-ce-02.to.infn.it	CREAM	-1	0.00	Packets filtered
BES.USTC.cn	ui04.lcg.ustc.ed...	SSHTorque	28.926	1.00	
BES.USTC.cn	ui01.lcg.ustc.ed...	SSHTorque	31.501	1.00	
BES.UMN.us	bes3s1.spa.um...	SSHGE	210.787	1.00	
BES.PKU.cn	hepfarm02.phy....	SSHTorque	31.892	1.00	
BES.SDU.cn	sl03.hepg.sdu.e...	SSHTorque	-1	0.00	
BES.WHU.cn	202.114.78.124	SSHTorque	19.949	1.00	
BES.NSCCSZ.cn	183.62.232.132	SSHTorque	38.928	1.00	



Site	Host	24H	24H	24H	24H Ra	48H	48H	48H	48H Ra	Weel	Weel	Weel	Week
BES.IHEP-PBS.cn	gridtb002.ihep.ac.cn	2	2		1.00	2	2		1.00	2	2		1.00
BES.UMN.us	twins-a04.spa.umn.edu	1	1		1.00	1	1		1.00	1	1		1.00
BES.JINR.ru	wn362.jinr.ru					1	1		1.00	1	1		1.00
BES.IHEP-CLOU...	diraccloudinit1403249980									7	7		1.00
BES.IHEP-CLOU...	diraccloudinit1403250760									1	1		1.00
BES.UMN.us	twins-b14.spa.umn.edu	1	1		1.00	1	1		1.00	1	1		1.00
BES.UMN.us	twins-a24.spa.umn.edu					1	1		1.00	1	1		1.00
BES.IHEP-CLOU...	diraccloudinit1403250400									4	4		1.00
BES.JINR.ru	wn1000.jinr.ru					1	1		1.00	1	1		1.00
BES.JINR.ru	wn400.jinr.ru					1	1		1.00	1	1		1.00
BES.JINR.ru	wn323.jinr.ru	1	1		1.00	1	1		1.00	1	1		1.00
BES.IHEP-CLOU...	diraccloudinit1403490272	1	1		1.00	14	14		1.00	14	14		1.00
BES.WHU.cn	cu33	6	6		1.00	6	6		1.00	6	6		1.00
BES.UMN.us	twins-b03.spa.umn.edu					1	1		1.00	1	1		1.00
BES.IHEP-CLOU...	diraccloudinit1403254687					5	5		1.00	5	5		1.00
BES.IHEP-CLOU...	diraccloudinit1403495687	2	2		1.00	7	7		1.00	7	7		1.00
BES.JINR.ru	wn324.jinr.ru					1	1		1.00	1	1		1.00



Source	Destination	Latency(sec)
IHEPD-USER	IHEPD-USER	2.678
IHEPD-USER	JINR-USER	16.316
IHEPD-USER	USTC-USER	15.932
IHEPD-USER	WHU-USER	6.728
JINR-USER	IHEPD-USER	14.322
JINR-USER	JINR-USER	14.24
JINR-USER	USTC-USER	14.827
JINR-USER	WHU-USER	8.516
USTC-USER	IHEPD-USER	3.677
USTC-USER	JINR-USER	17.855
USTC-USER	USTC-USER	2.746
USTC-USER	WHU-USER	624.375
WHU-USER	IHEPD-USER	5.727
WHU-USER	JINR-USER	20.227
WHU-USER	USTC-USER	9.199
WHU-USER	WHU-USER	3.092

Summary & plans

- The BES-III computing is operational since 2013

  about 350000 jobs executed
  about 250 TB managed disk space

- More development needed at:
  - Data set management
  - Job management and data management integration (random trigger data)
  - Monitoring & accounting
  - FTS migration
  - Clouds integration

- JINR team participates in all tasks of BES-III grid development

Thank you!