CCLRC

Grid Operations Centre

LCG Workshop

CERN 24/3/04

Dave Kant
D.Kant@RL.AC.UK

The Vision

GOC Processes and Activities

- **Coordinating Grid Operations**
- Defining Service Level Parameters
- Monitoring Service Performance Levels
- **First-Level Fault Analysis**
- **Interacting with Local Support Groups**
- Coordinating Security Activities
- **Operations Development**
- **Grid Accounting**

Dave Kant
D.Kant@RL.AC.UK

Grid Operations Centre

- Within the scope of LCG we are responsible for monitoring how the grid is running – who is up, who is down, and why
- Identifying Problems, Contact the Right People, Suggest Actions
- Providing scalable solutions to allow other people to monitor resources
- Manage site Information – definitive source of information
- Accounting – Aggregate Job Throughput (per Site, per VO)
- Established at CLRC (RAL)
- Status of LCG2 Grid here:

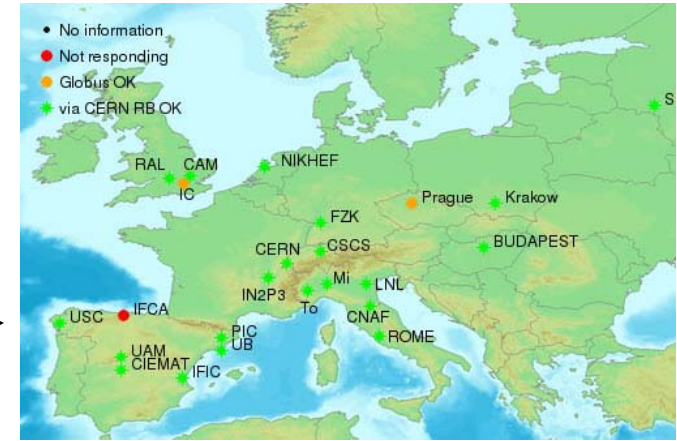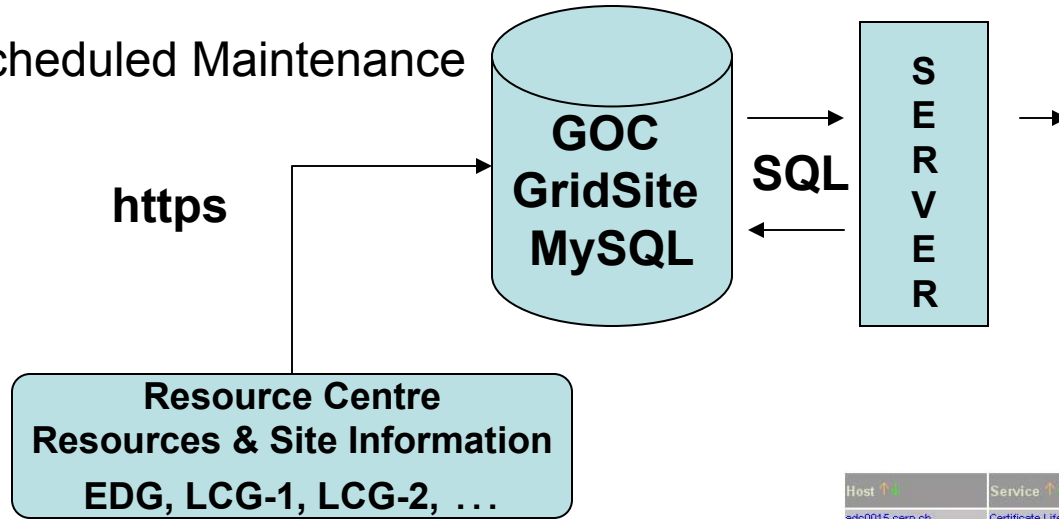- http://goc.grid-support.ac.uk/

Dave Kant
D.Kant@RL.AC.UK

GOC Site Database

- Develop and maintain a database to hold Site Information

- Contact Lists, Nodes, IP, URLs, Scheduled Maintenance

- Each Site has its own Administration Page where Access is Controlled through the use of X509 certificates. (GridSite)

- Monitoring Scripts read information in database and run a set of customised tools to monitor the infrastructure

- To be included in the monitoring a site must register its resources (CE,SE,RB,RC,RLS,MDS,RGMA,BDII,..)
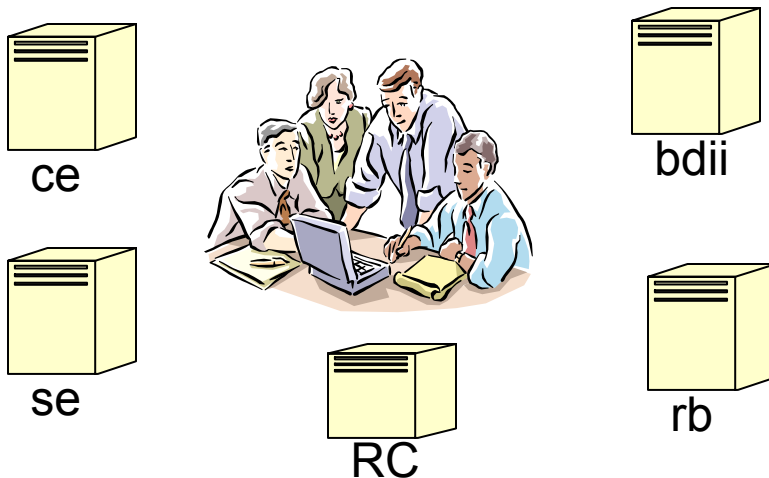
Dave Kant
D.Kant@RL.AC.UK

GOC

CCLRC

Secure Database Management via HTTPS / X.509

People, Contact Information, Resources

Scheduled Maintenance

GOC GridSite MySQL

https

SQL

SERVER

- No information
- Not responding
- Globus OK
- via CERN RB OK

Monitoring

**Resource Centre
Resources & Site Information
EDG, LCG-1, LCG-2, …**

ce

se

RC

bdii

rb

Host ↑↓	Service ↑↓	Status ↑	Last Check ↑↓	Duration ↑	Attempt ↑↓	Status Information
adc0015.cern.ch	Certificate Lifetime	OK	21-01-2004 11:03:21	2d 1h 14m 51s	1/3	Certificate expires: {37}wks,{6}dys,{2}hrs,{46}min,{12}sec
	GIIS attr GlueCEInfoHostName	CRITICAL	21-01-2004 11:28:30	0d 0h 25m 7s	3/3	(Return code of 127 is out of bounds - plugin may be missing)
	GIIS attr siteName	CRITICAL	21-01-2004 11:43:38	0d 0h 9m 57s	3/3	(Return code of 127 is out of bounds - plugin may be missing)
	GateKeeper Authentication Test	OK	21-01-2004 11:48:47	5d 16h 38m 42s	1/3	GRAM Authentication test successful
	GridFTP Service	OK	21-01-2004 11:03:38	5d 16h 18m 34s	1/3	GRIDFTP Test Pass
adc0018.cern.ch	Certificate Lifetime	OK	21-01-2004 11:18:47	5d 16h 58m 25s	1/3	Certificate expires: {37}wks,{6}dys,{2}hrs,{30}min,{49}sec
	GIIS attr GlueCEInfoHostName	CRITICAL	21-01-2004 11:43:55	0d 0h 9m 37s	3/3	(Return code of 127 is out of bounds - plugin may be missing)
	GIIS attr siteName	CRITICAL	21-01-2004 11:49:03	0d 0h 4m 37s	1/3	(Return code of 127 is out of bounds - plugin may be missing)
	GateKeeper Authentication Test	OK	21-01-2004 11:03:55	5d 16h 38m 17s	1/3	GRAM Authentication test successful
	GridFTP Service	OK	21-01-2004 11:19:03	5d 16h 18m 8s	1/3	GRIDFTP Test Pass
atlasgrid04.usatlas.bnl.gov	Certificate Lifetime	OK	21-01-2004 11:34:29	5d 16h 37m 26s	1/3	Certificate expires: {47}wks,{6}dys,{2}hrs,{36}min,{0}sec
	GIIS attr GlueCEInfoHostName	CRITICAL	21-01-2004 11:49:37	0d 0h 3m 57s	1/3	(Return code of 127 is out of bounds - plugin may be missing)
	GIIS attr siteName	CRITICAL	21-01-2004 11:04:29	0d 0h 49m 7s	1/3	(Return code of 127 is out of bounds - plugin may be missing)
	GateKeeper Authentication Test	OK	21-01-2004 11:19:37	5d 16h 17m 18s	1/3	GRAM Authentication test successful

Dave Kant
D.Kant@RL.AC.UK

EXAMPLE: RAL Site

People: Who do we notify when there are problems

Contacts:

Name	Description	Email address	Tel	Hours		
Trevor Daniels	Deployment Team Member	t.daniels@rl.ac.uk	+44 (0)1235 778093	0800 – 1700 (Mon-Wed)	Edit	Delete
Dave Kant	Deployment Team Member	d.kant@rl.ac.uk	+44 (0)1235 778178	0900 – 18.00 (Mon-Fri)	Edit	Delete
Martin Bly	Deployment Team Member	m.j.bly@rl.ac.uk	+44 (0)1235 446981		Edit	Delete
Steve Traylen	Deployment Team Member	s.traylen@rl.ac.uk	+44 (0)1235 446777		Edit	Delete
Andrew Sansum	Deployment Team Member	r.a.sansum@rl.ac.uk	+44 (0)1235 445863		Edit	Delete
John Gordon	Deployment Team Member	j.c.gordon@rl.ac.uk	+44 (0)1235 446574		Edit	Delete
Alistair Mills	–	a.b.mills@rl.ac.uk	+44 (0)1235 446084		Edit	Delete
Matt Thorpe	GOC DB Web Admin	m.s.thorpe@rl.ac.uk	+44 (0)1235 778178	0830 – 1700 (Mon-Fri)	Edit	Delete

[Click to add a new contact]

Dave Kant
D.Kant@RL.AC.UK

CCLRC

Node Information (Type, Hostname, IP Address, Group)

Nodes:

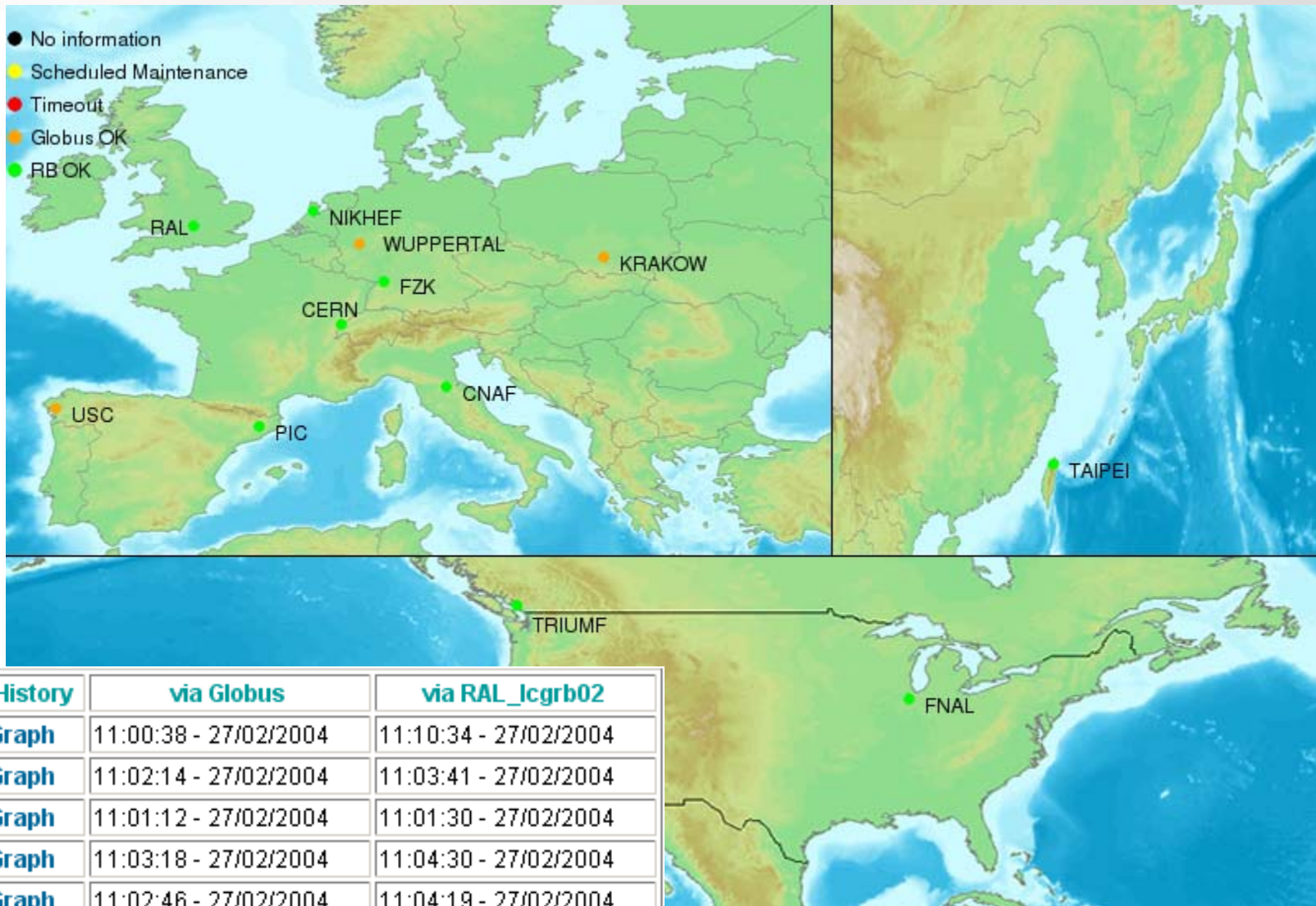| Type	Hostname	IP Address	Group		
LCFG	lcfg	130.246.183.111	LCG-1	Edit	Delete
MDS	lcgcs01	130.246.183.187	LCG-1	Edit	Delete
RB	lcgrb01	130.246.183.184	LCG-1	Edit	Delete
CE	lcgce01	130.246.183.182	LCG-1	Edit	Delete
SE	lcgse01	130.246.183.181	LCG-1	Edit	Delete
UI	lcgui01	130.246.183.183	LCG-1	Edit	Delete
BDII	lcgbdii	130.246.183.185	LCG-1	Edit	Delete
PROX	lcgrbp01	130.246.183.186	LCG-1	Edit	Delete
RB	lcgrb02	130.246.183.189	LCG-2	Edit	Delete
CE	lcgce02	130.246.183.188	LCG-2	Edit	Delete
BDII	lcgbdii02	130.246.183.191	LCG-2	Edit	Delete
UI	lcgui02	130.246.183.194	LCG-2	Edit	Delete
UI	gppui04	130.246.183.172	EDG	Edit	Delete
CE	gppce05	130.246.187.142	EDG	Edit	Delete
RB	gppse05	130.246.187.140	EDG	Edit	Delete
RLS	gpprls05	130.246.187.153	EDG	Edit	Delete
MON	gpprg05	130.246.187.151	EDG	Edit	Delete
NM	gppnm06	130.246.187.145	EDG	Edit	Delete

[Click to add a new node]

Dave Kant

D.Kant@RL.AC.UK

Monitoring Services

- There are many frameworks which can be used to monitor distributed environments
- MAPCENTRE   http://mapcenter.in2p3.fr/
- GPPMON   http://goc.grid-support.ac.uk/
- GRIDICE   http://edt002.cnaf.infn.it:50080/gridice/
- NAGIOS   http://www.nagios.org/
- MONALISA   http://monalisa.cacr.caltech.edu/

- Example: Mapcentre 30 sites ~ 500 lines in config file (static version)
- Example: Nagios   30 sites, 12 individual config files with dependencies

- Developed Tools to Configure these services to make the job easier
  NAGIOS, MAPCENTER and GPPMON

Dave Kant
D.Kant@RL.AC.UK

GOC Features – GPPMon

Status of Grid, based on the success of job submission to resources, displayed as a world map, with sites represented by coloured dots

- SQL Query of Database -> List of Resources (CE , RB)

- Job Submission to each Site in Two Ways:

  Direct to CE   = globus-job-run

  Indirect to CE via Resource Brokers   = edg-job-submit

- Responses Collected and Translated into a Site Status Colour Index

  Success via RB = Green, Globus Only = Orange, Fail = Red

- Geographical View Presented Against World Map

Dave Kant
D.Kant@RL.AC.UK

CCLRC

- ● No information
- ● Scheduled Maintenance
- ● Timeout
- ● Globus OK
- ● RB OK

RAL ● NIKHEF ● WUPPERTAL ● KRAKOW ● FZK ● CERN ● CNAF ● USC ● PIC ● TAIPEI ● TRIUMF ● FNAL ●

Site	History	via Globus	via RAL_lcgrb02
CERN	Graph	11:00:38 - 27/02/2004	11:10:34 - 27/02/2004
CNAF	Graph	11:02:14 - 27/02/2004	11:03:41 - 27/02/2004
FNAL	Graph	11:01:12 - 27/02/2004	11:01:30 - 27/02/2004
FZK	Graph	11:03:18 - 27/02/2004	11:04:30 - 27/02/2004
PIC	Graph	11:02:46 - 27/02/2004	11:04:19 - 27/02/2004
RAL	Graph	11:01:42 - 27/02/2004	11:03:11 - 27/02/2004
Taiwan	Graph	11:03:56 - 27/02/2004	11:05:42 - 27/02/2004

Dave Kant
D.Kant@RL.AC.UK

GOC Features – CERTIFICATE Monitoring

Status of host certificates

• SQL Query of Database -> List of Resources (CE , SE)

• Download Certificate using OPENSSL

• Responses Collected and Translated into a Site Status Colour Index

              Lifetime > 1 Month   OK   - Green

  1 Week < Lifetime < 1 Month   Warning   - Yellow

              Lifetime < 1 Week   Critical   -   Red

• Geographical View Presented Against World Map

Dave Kant
D.Kant@RL.AC.UK

- No information
- Expired
- Critical
- Alert!
- Warning
- OK
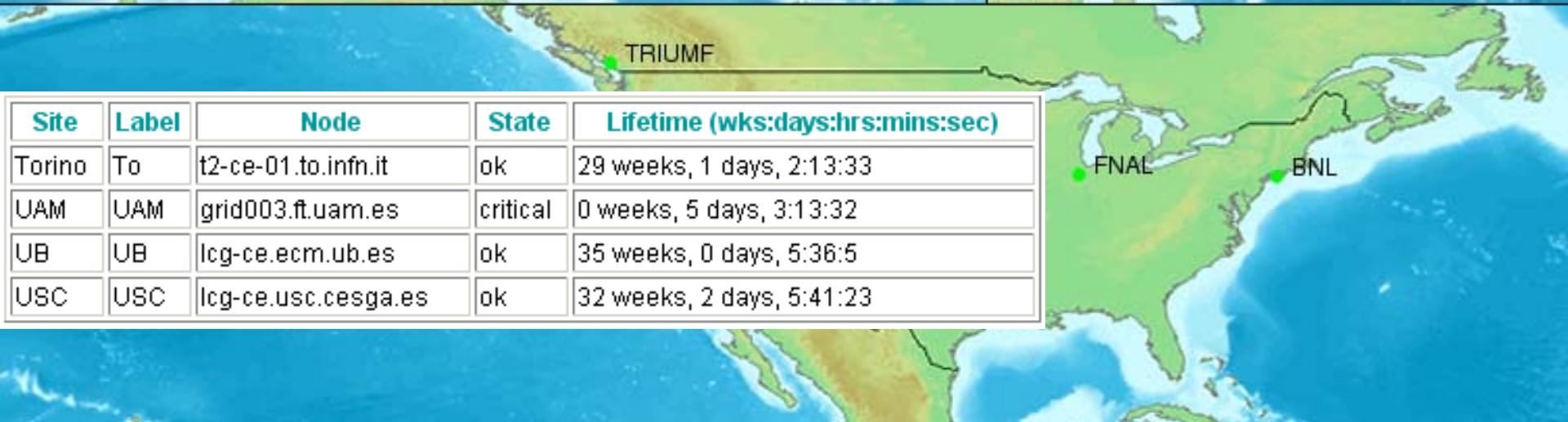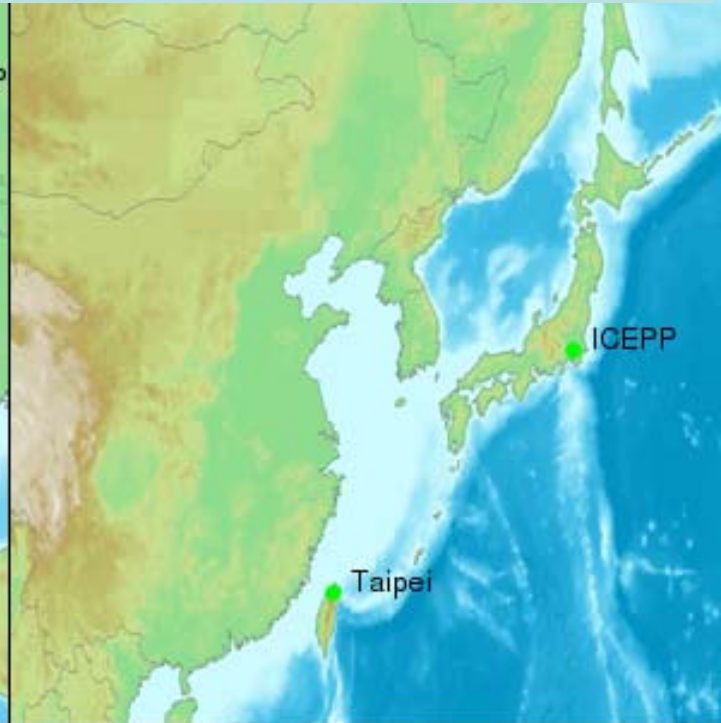
Site	Label	Node	State	Lifetime (wks:days:hrs:mins:sec)
Torino	To	t2-ce-01.to.infn.it	ok	29 weeks, 1 days, 2:13:33
UAM	UAM	grid003.ft.uam.es	critical	0 weeks, 5 days, 3:13:32
UB	UB	lcg-ce.ecm.ub.es	ok	35 weeks, 0 days, 5:36:5
USC	USC	lcg-ce.usc.cesga.es	ok	32 weeks, 2 days, 5:41:23

GOC Features – Nagios Monitoring

Nagios is a powerfull monitoring service that supports notifications, and the execution of remote agents to correct problems when faults are discovered.

- Advantages => proactively monitor grid (NRPE daemon)

- Automatic Configuration of Nagios based on Database

- Developed a set of plugins which focus on service behaviour and data consistency

   Do RBs find resources?
   Does Site GIIS's publish correct hostname?
   Is the site running the latest stable software release?
   Does the Gatekeeper authentication service work?
   Are the host certificates valid   e.g Issued by Trusted CA
   Are essential services running e.g GridFTP

- Further plugins are being developed (e.g certification)

Dave Kant
D.Kant@RL.AC.UK

Nagios Screen Shot

CCLRC

Service Summary for Nodes:

Certificate Lifetime Check , GridFTP , GRAM Authentication

Site Attributes via GIIS (siteName, Tag, …)

HOST	PLUGIN	STATUS				STATUS INFORMATION
Host ↑↓	Service ↑↓	Status ↑↓	Last Check ↑↓	Duration ↑↓	Attempt ↑↓	Status Information
adc0015.cern.ch	Certificate Lifetime	OK	03-02-2004 13:27:59	7d 21h 49m 45s	1/3	Certificate expires: {36}wks,{0}dys,{0}hrs,{21}min,{34}sec
	GIIS attr GlueCEInfoHostName	OK	03-02-2004 12:41:39	7d 21h 11m 39s	1/3	GlueCEInfoHostName attribute is adc0015.cern.ch
	GIIS attr siteName	OK	03-02-2004 12:54:40	7d 20h 58m 7s	1/3	siteName is CERN-LCG1 dataGridVersion is LCG1-1_1_3
	GateKeeper Authentication Test	OK	03-02-2004 13:07:49	7d 21h 49m 29s	1/3	GRAM Authentication test successful
	GridFTP Service	OK	03-02-2004 13:28:00	7d 21h 31m 7s	1/3	GRIDFTP Test Pass
atlasgrid04.usatlas.bnl.gov	Certificate Lifetime	OK	03-02-2004 13:28:00	7d 21h 30m 25s	1/3	Certificate expires: {46}wks,{0}dys,{0}hrs,{42}min,{29}sec
	GIIS attr GlueCEInfoHostName	CRITICAL	03-02-2004 12:43:00	7d 21h 48m 20s	1/3	IO::Socket::INET: connect: Connection refused
	GIIS attr siteName	CRITICAL	03-02-2004 12:55:32	7d 20h 57m 13s	1/3	IO::Socket::INET: connect: Connection refused
	GateKeeper Authentication Test	OK	03-02-2004 13:08:30	7d 20h 43m 43s	1/3	GRAM Authentication test successful
	GridFTP Service	OK	03-02-2004 13:28:20	7d 21h 48m 9s	1/3	GRIDFTP Test Pass
	RRDTool	OK	03-02-2004 13:34:17	7d 21h 9m 3s	1/1	GRAM Authentication test successful

Dave Kant
D.Kant@RL.AC.UK

http://grid-ice.esc.rl.ac.uk/gridice

Site	Slot#	SlotFree	SlotLoad	RunJob	WaitJob	Power	CPU#	CPULoad	Available	Total	%
cern.ch	408	180	55%	0	0	–	–	–	67.5 Gb	69.1 Gb	2%
cnaf.infn.it	–	–	–	–	–	–	–	–	–	–	–
cr.cnaf.infn.it	2154	1086	49%	253	0	762647	387	51%	868.0 Gb	999.7 Gb	13%
fnal.gov	12	12	0%	0	0	–	–	–	–	–	–
fzk.de	–	–	–	–	–	–	–	–	–	–	–
gridka.de	–	–	–	–	–	–	–	–	–	–	–
gridpp.rl.ac.uk	438	273	37%	55	0	–	–	–	59.8 Gb	69.0 Gb	13%
grid.sinica.edu.tw	294	294	0%	0	0	–	–	–	–	–	–
hep.ph.ic.ac.uk	126	126	0%	0	0	–	–	–	9.2 Gb	16.8 Gb	5%
ifae.es	480	480	0%	0	0	433978	160	0%	5.6 Tb	22.4 Tb	25%
nikhef.nl	500	230	54%	137	13	–	–	–	1.4 Tb	1.7 Tb	20%
triumf.ca	4490	30	99%	0	0	–	–	–	729.1 Gb	731.1 Gb	0%
TOTAL	8902	2711	33%	445	13	1196625	547	26%	8.6 Tb	25.9 Tb	17%

Generated: Mon, 22 Mar 2004 15:50:30 +0000

GOC

GridICE
the eyes of the Grid

INFN GRID DataTAG

Select **Site** [▼] and/or **Role** [▼] [Show]   Full View

gridpp.rl.ac.uk

lcgrb02.gridpp.rl.ac.uk RB   UpTime: 1-2:11   Reg.OpenFiles.: 3141   Socket: TCP(29) UDP(17)   FS NA PA Full

	Process			Instances		CPU		Memory		Time	
	Process Name	Status	Inst#	First	Last	1Max	All	1Max	Avg	1Max	All
broker	condorg-scheduler	S	1	1-3:15	1-3:15	0	0	0	0	0-0:0	0-0:0
	condor-master	S	1	1-3:15	1-3:15	0	0	0	0	0-0:0	0-0:0
	fmon-agent	S	1	1-3:16	1-3:16	0	0	0	0	0-0:0	0-0:0
	ftp-server	S	1	1-2:16	1-2:16	0	0	0	0	0-0:0	0-0:0
	job-controller	S	1	1-3:15	1-3:15	0	0	0	0	0-0:2	0-0:2
	local-logger	S	1	1-2:1	1-2:1	0	0	0	0	0-0:0	0-0:0
	local-logger-interlog	S	6	1-4:1	0-3:11	0	0	0	0	0-0:3	0-0:3
	logging-and-bookkeeping	S	11	1-2:55	0-0:7	0	0	0	0	0-0:0	0-0:0
	log-monitor	S	1	1-3:11	1-3:11	0	0	1	1	0-0:2	0-0:2
	network-server	S	21	1-3:13	1-3:13	0	0	1	1	0-0:3	0-0:4
	proxy-renewal	S	4	1-3:16	1-3:14	0	0	0	0	0-0:0	0-0:0
	workload-manager	S	4	1-3:16	1-3:16	0	0	1	1	0-0:4	0-0:8

lcgce02.gridpp.rl.ac.uk CE   UpTime: 7-22:3   Reg.OpenFiles.: 2822   Socket: TCP(38) UDP(18)   FS NA PA Full

lcgse01.gridpp.rl.ac.uk SE   UpTime: 7-22:34   Reg.OpenFiles.: 1287   Socket: TCP(16) UDP(19)   FS NA PA Full
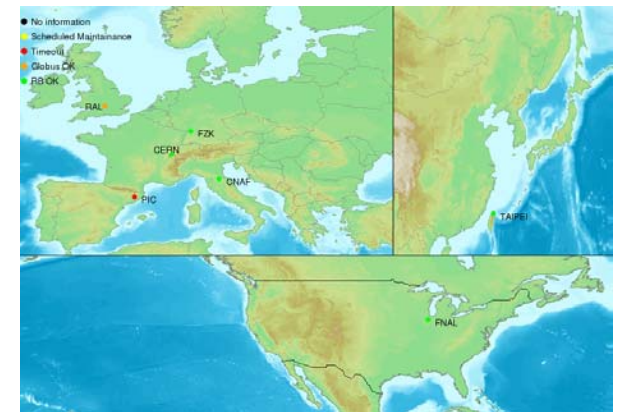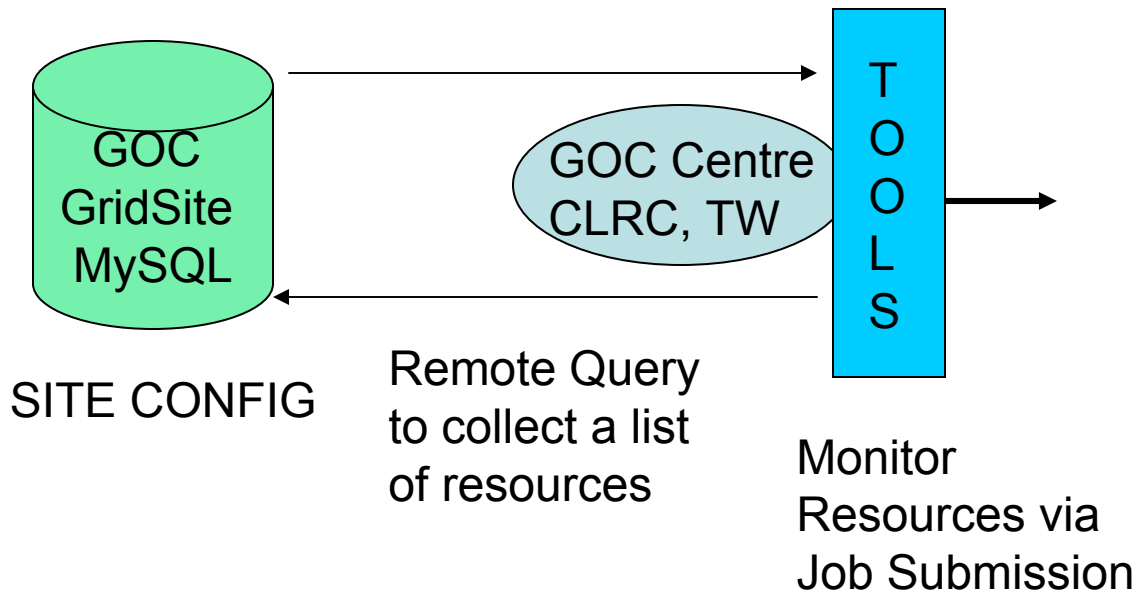
A Second GOC Site

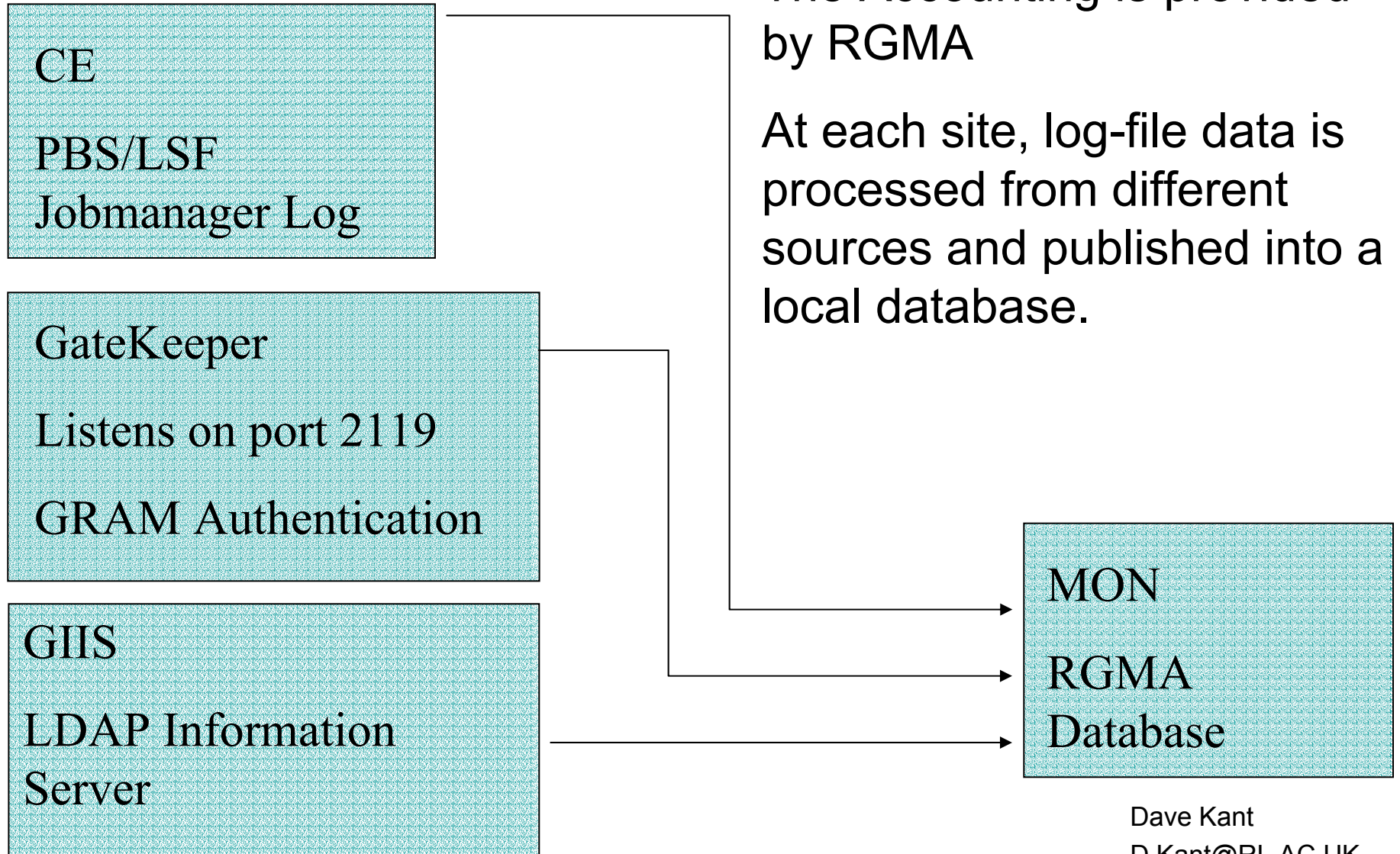Second Centre to Provide Monitoring (Taipei = GMT + 8 hours)

GOC does a remote Database Query to collect a list of resources and monitors those resources

GOC tools packaged for distribution

GOC server is a UI

GOC GridSite MySQL

GOC Centre CLRC, TW

TOOLS

SITE CONFIG

Remote Query to collect a list of resources

Monitor Resources via Job Submission

Dave Kant
D.Kant@RL.AC.UK

CCLRC

CE

PBS/LSF

Jobmanager Log

GateKeeper

Listens on port 2119

GRAM Authentication

GIIS

LDAP Information Server

MON

RGMA Database

The Accounting is provided by RGMA

At each site, log-file data is processed from different sources and published into a local database.

Dave Kant
D.Kant@RL.AC.UK
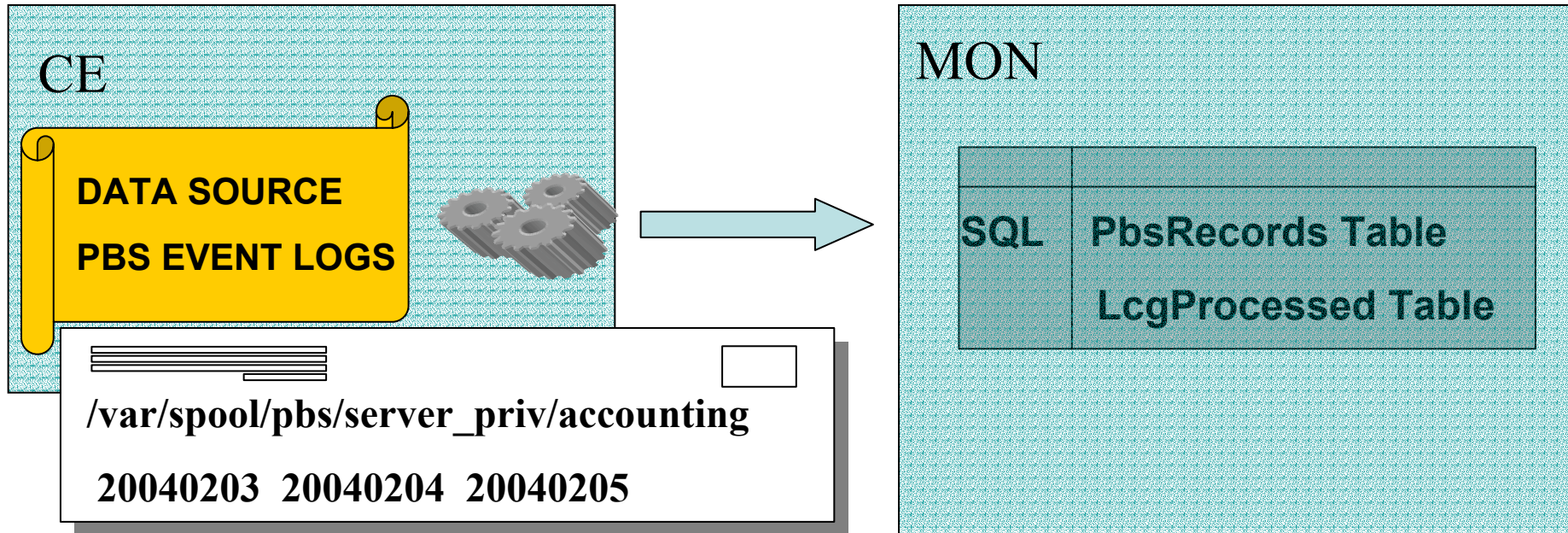
PBS filter to extract data from the event log records.

RGMA-API publishes data to a PbsRecords database table on the MON box and records the names of the processed logs for book-keeping

Dave Kant
D.Kant@RL.AC.UK

CCLRC

"END" EVENT RECORDS CONTAIN THE FOLLOWING INFORMATION

```
+-----------------------+---------------+
| Field                 | Type          |
+-----------------------+---------------+
| RecordIdentityP       | varchar(255)|
| SiteName              |  varchar(50)  |
| JobName               | varchar(100) |
| LocalUserID           | varchar(20)   |
| LocalUserGroup        | varchar(20)   |
| WallDuration          | varchar(30)   |
| CpuDuration           | varchar(30)   |
| WallDurationSeconds   | int(11)       |
| CpuDurationSeconds    | int(11)       |
| StartTime             | varchar(30)   |
| StopTime              | varchar(30)   |
| SubmitHost            | varchar(50)   |
```

MON

| SQL | PbsRecords Table |

The actual table schema contains more information that is shown here.

Dave Kant
D.Kant@RL.AC.UK

CCLRC

GateKeeper

DATA SOURCE

GLOBUS GATEKEEPER LOGS

DATA SOURCE

System Messages LOGS

/var/log:

globus-gatekeeper.log.20040201040203.gz

messages.2.gz   messages.3.gz

MON

SQL | **GKRecords Table**

LcgProcessed Table

JobNames
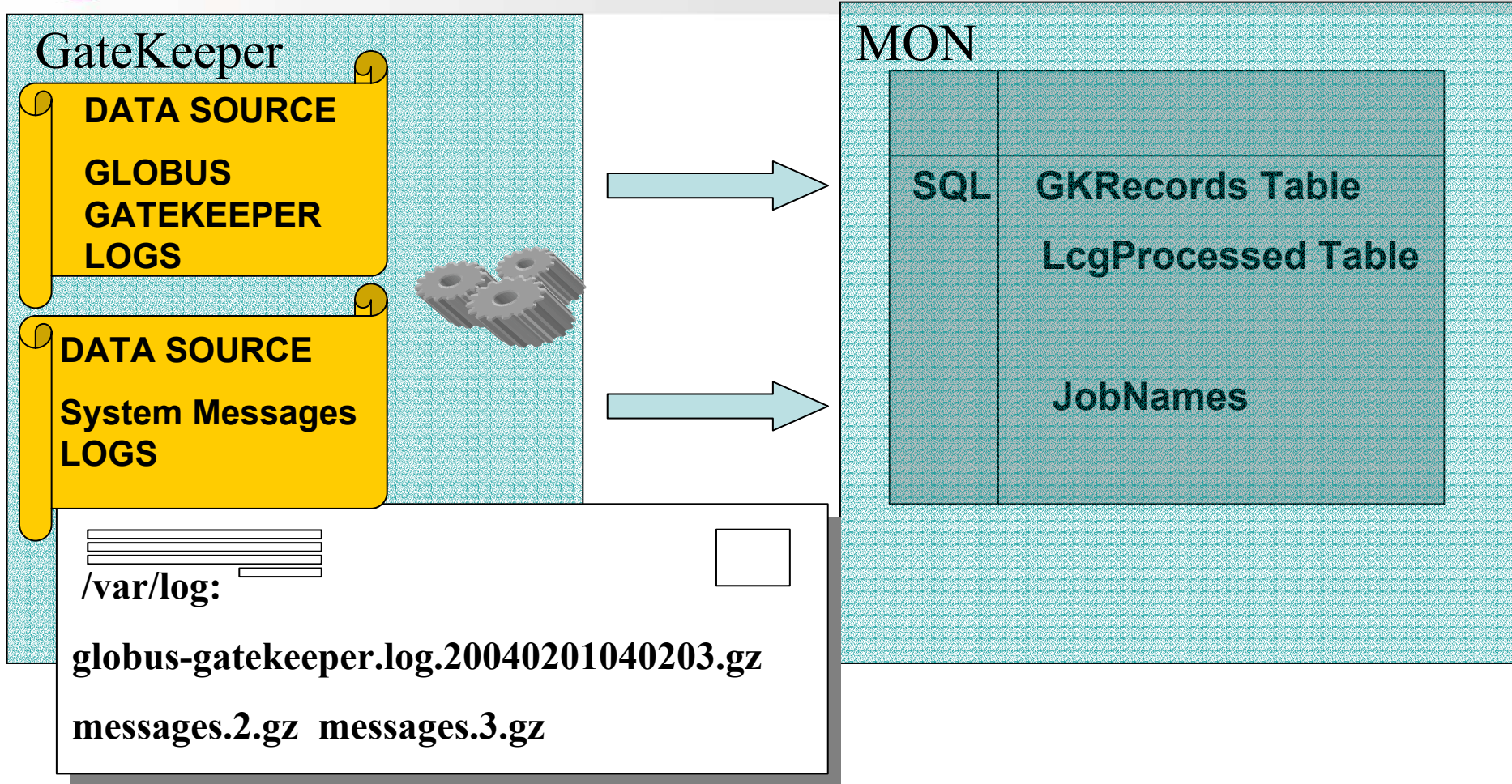
Extract data from globus-gatekeeper and system messages logs

Record a list of files processed to reduce network traffic/load

Dave Kant
D.Kant@RL.AC.UK

```
+--------------------+----------------+
 | Field              | Type
+--------------------+----------------+
| RecordIdentityG    | varchar(255) |
| GramScriptJobID    | varchar(100) |
| LocalJobID         | varchar(50)    |
| GlobalUserName     | varchar(255)  |
| SubmitHost         | varchar(50)    |
| SiteName           | varchar(50)    |
| ValidFrom          | date           |
| ValidUntil         | date           |
+--------------------+----------------+
```

MON

SQL   GKRecords Table

The actual table schema contains more information that is shown here.

Dave Kant
D.Kant@RL.AC.UK

CCLRC

In order to match the authenticated user DN's to the corresponding jobs we need to process the system message logs.

Record ID : [GK]   =/=   Record ID [PBS]

PBSJobNameID
1390.lcgce02.gridpp.rl.ac.uk

1018873411:1220
1761820949:1390
1256023472:1394

GramScriptJobID
1076820949:lcgpbs:internal_1476347454:10033.1076820948

Gatekeeper log   Messages log   PBS Event log

CCLRC

CE

DATA SOURCE

LDAP GIIS Server

MON

SQL SpecRecords Table
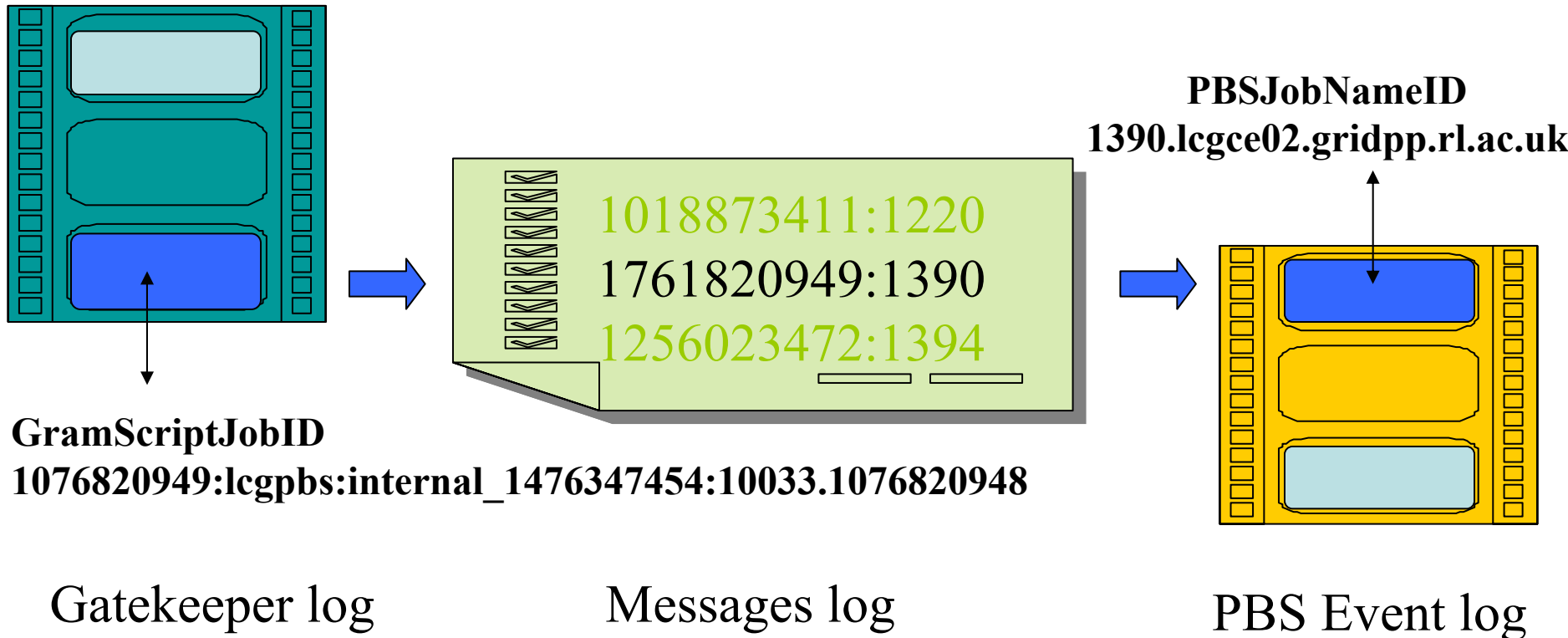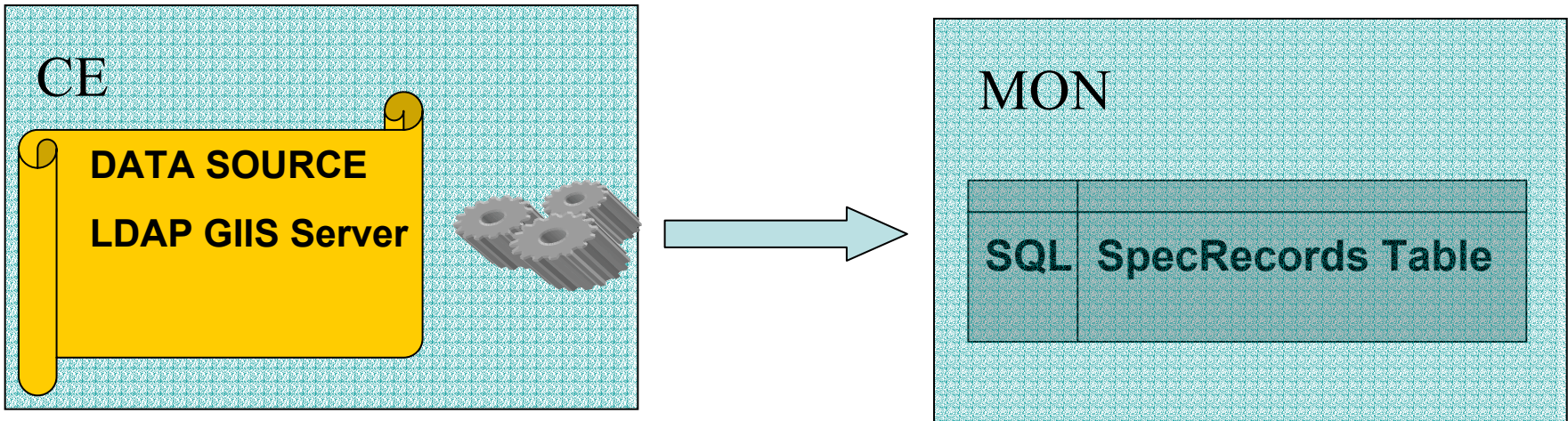
GIIS filter to collect CPU performance benchmarks for the worker nodes from the subclusters attached to the CE.

RGMA-API publishes data to SpecRecords database table on the MON box

Dave Kant
D.Kant@RL.AC.UK

CCLRC

```
+------------------+--------------+
| Field            | Type         |
+------------------+--------------+
| RecordIdentity   | varchar(255) |
| SiteName         | varchar(50)  |
| ClusterID        | varchar(50)  |
| SubClusterID     | varchar(50)  |
| SpecInt2000      | int(11)      |
| SpecFloat2000    | int(11)      |
```

MON

SQL **SpecRecords Table**

CPU Performance benchmarks for the worker nodes in the subclusters attached to the CE

The actual table schema contains more information that is shown here.

Dave Kant
D.Kant@RL.AC.UK

CCLRC

MON

SQL	GKRecords
	PbsRecords
	JobNames
	LcgRecords
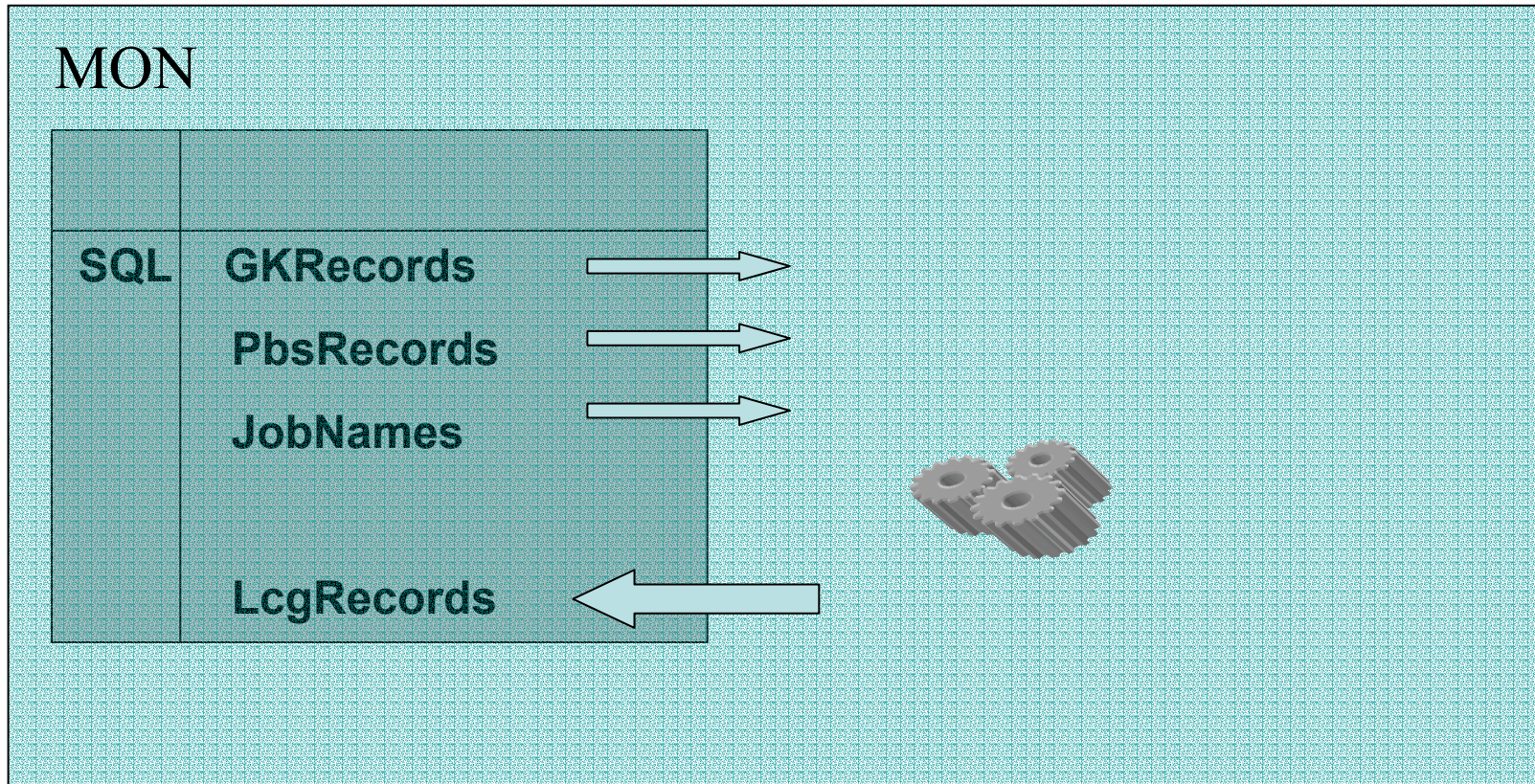
3-Way join matches records and writes them to the LcgRecords Table.

LcgRecords records are unique

Site now has a copy of its own accounting data.

Dave Kant
D.Kant@RL.AC.UK

CCLRC

MON Site 1

LcgRecords

.
.
.
.

MON Site n

LcgRecords

MON GOC

Site	**LcgRecords**
1	
.	
.	
n	
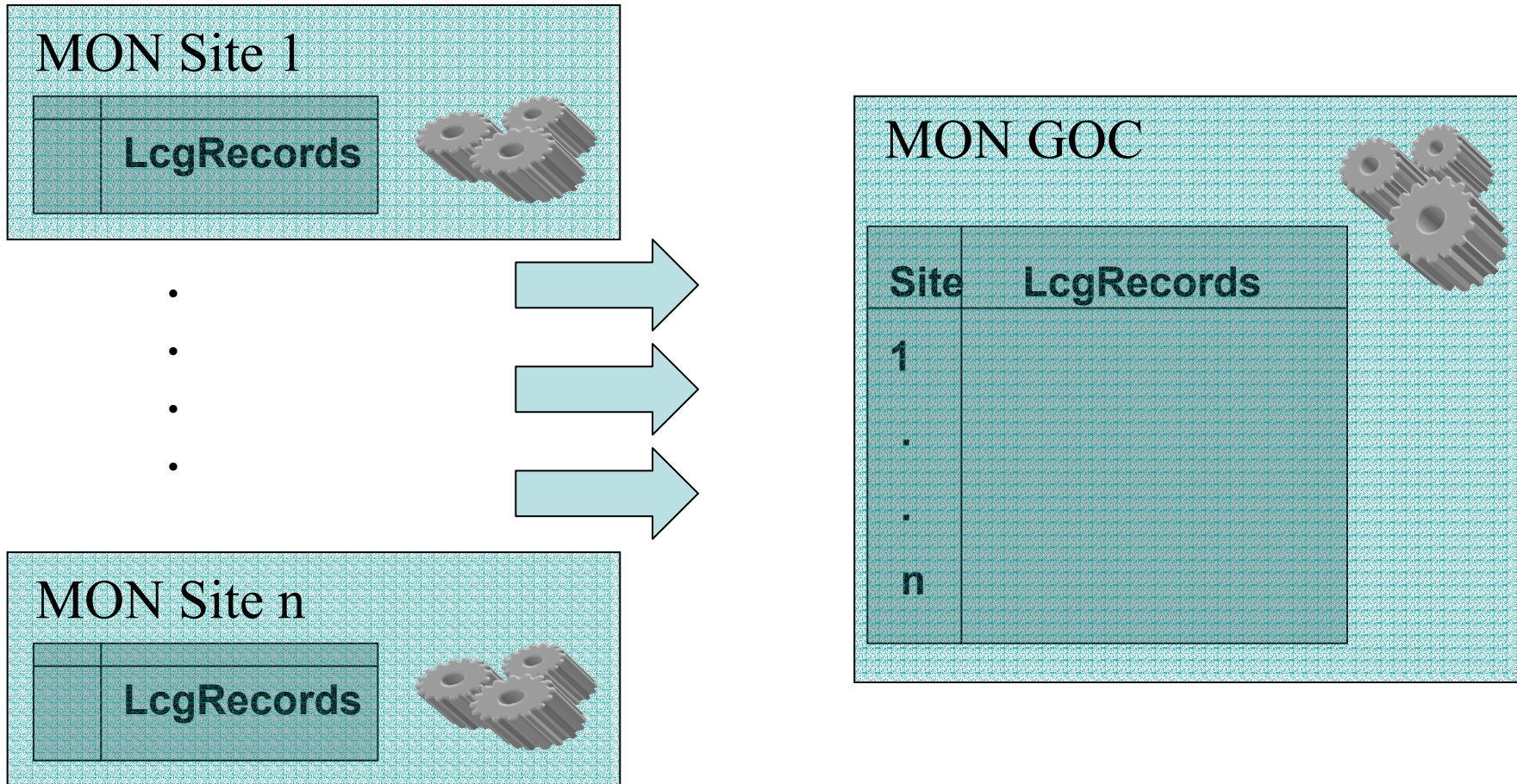
Data processed at each site is streamed to the GOC server

GOC has then aggregated information for all sites

Dave Kant
D.Kant@RL.AC.UK

CCLRC

GOC provides an interface to produce accounting plots "on-demand"

Total Number of Jobs per VO per Site

Total Number of Jobs per VO aggregated over all sites

Tailor plots according to the requirements of the user community
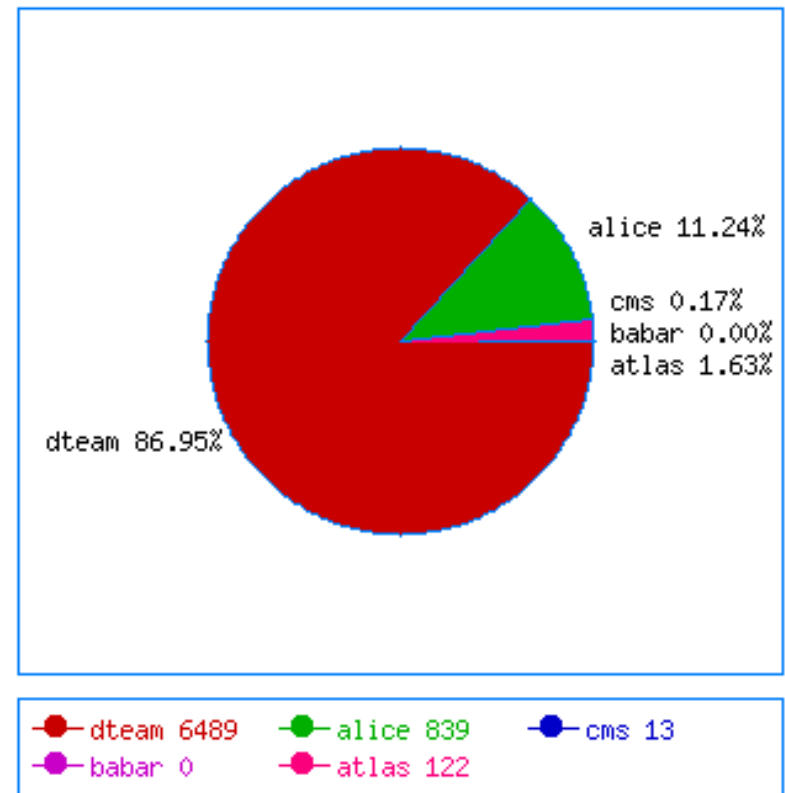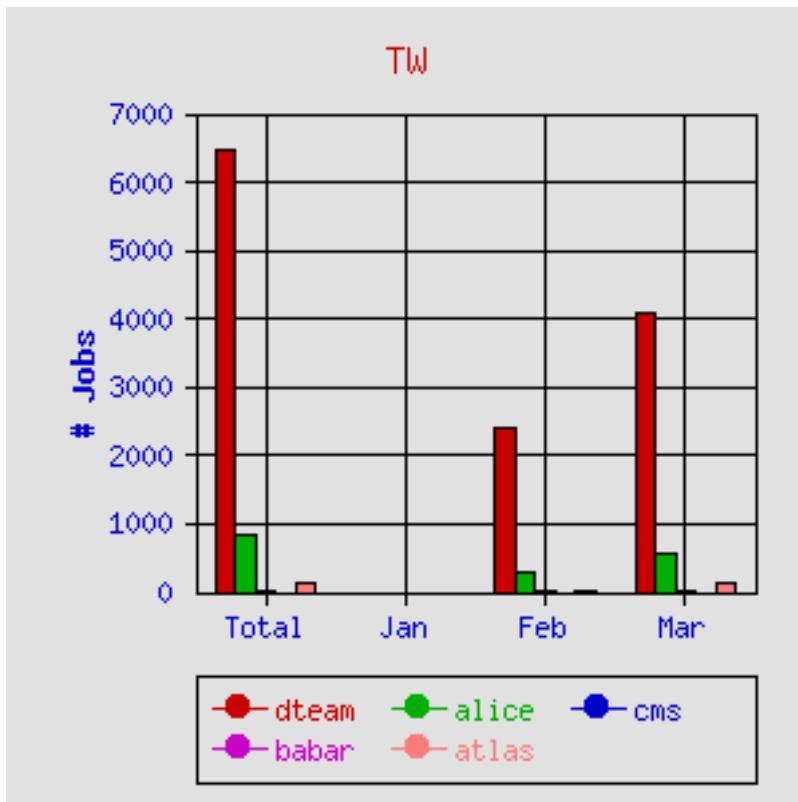
Local Testing Cycle ……………………………………………. [DONE]

RPMS Packaging ……………………………………………… [DONE]

Documentation (Technical / User)………...………………………. [DONE]

Trial Deployment ………… Released last week to two sites

Final Testing Cycle .... Two weeks

LCG2 Release ……………. April 2004

Dave Kant
D.Kant@RL.AC.UK

1. PBS log processed daily on site CE to extract required data, filter acts as R-GMA DBProducer -> PbsRecords table

2. Gatekeeper log processed daily on site CE to extract required data, filter acts as R-GMA DBProducer -> GkRecords table

3. Site GIIS interrogated daily on site CE to obtain SpecInt and SpecFloat values for CE, acts as DBProducer -> SpecRecords table, one dated record per day

4. These three tables joined daily on MON to produce LcgRecords table. As each record is produced program acts as StreamProducer to send the entries to the LcgRecords table on the GOC site.

5. Site now has table containing its own accounting data; GOC has aggregated table over whole of LCG.

6. Interactive and regular reports produced by site or at GOC site as required.

Dave Kant
D.Kant@RL.AC.UK

Accounting Issues

1. There is no R-GMA infrastructure LCG-wide, so most sites are not able to install and run the accounting suite at present. It is expected that R-GMA and the MON boxes will be rolled out in LCG2 soon after the storage problems are resolved. Until this happens the complete batch and gatekeeper logs will have to be copied to the GOC site for processing.

2. The VO associated with a user's DN is not available in the batch or gatekeeper logs. It will be assumed that the group ID used to execute user jobs, which is available, is the same as the VO name. This needs to be acknowledged as an LCG requirement.

3. The global jobID assigned by the Resource Broker is not available in the batch or gatekeeper logs. This global jobID cannot therefore appear in the accounting reports. The RB Events Database contains this, but that is not accessible nor is it designed to be easily processed.

4. At present the logs provide no means of distinguishing sub-clusters of a CE which have nodes of differing processing power. Changes to the information logged by the batch system will be required before such heterogeneous sites can be accounted properly. At present it is believed all sites are homogeneous.

Dave Kant
D.Kant@RL.AC.UK

- Getting site information in database
  - When, who
- Monitor Multiple Grids (LCG1/2 -> Production, Development
  - Should we monitor each VO's RB/BDII?

Dave Kant
D.Kant@RL.AC.UK

Future of GOC

GOC needs to deliver a production quality service to the community round the clock so a third GOC should be setup somewhere in Canada or the US. Build real 24x7 operations support.

Extend the range of monitoring jobs (SRM, Registering Files verifying the information in the RLS,…) further develop the range of nagios plugins.

Automate notifications via nagios; proactively monitor grid.

Interact with experts to develop/implement more through trouble-shooting tools and to monitor/track problems in the deployment. A good place to start would be regular operations meetings – we want to do more than raise problems.

Working towards a site-status and diagnostic page to allow site administrators to change site information, get latest accounting statistics for that site, run a series of tests in real time against the site [viz certification testing on demand] and automatic report generation that is customised to the site.

Tailor GOC database to allow EGEE ROCs to monitor resources in a region.

Dave Kant
D.Kant@RL.AC.UK