



Enabling Grids for E-science

Monitoring Systems and Tricks of the Trade

Antun Balaz

Scientific Computing Laboratory

Institute of Physics Belgrade

<http://www.scl.rs/>



SEE-GRID-SCI
SEE-GRID infrastructure for regional eScience



Information Society



21 Jan – 01 Feb 2009

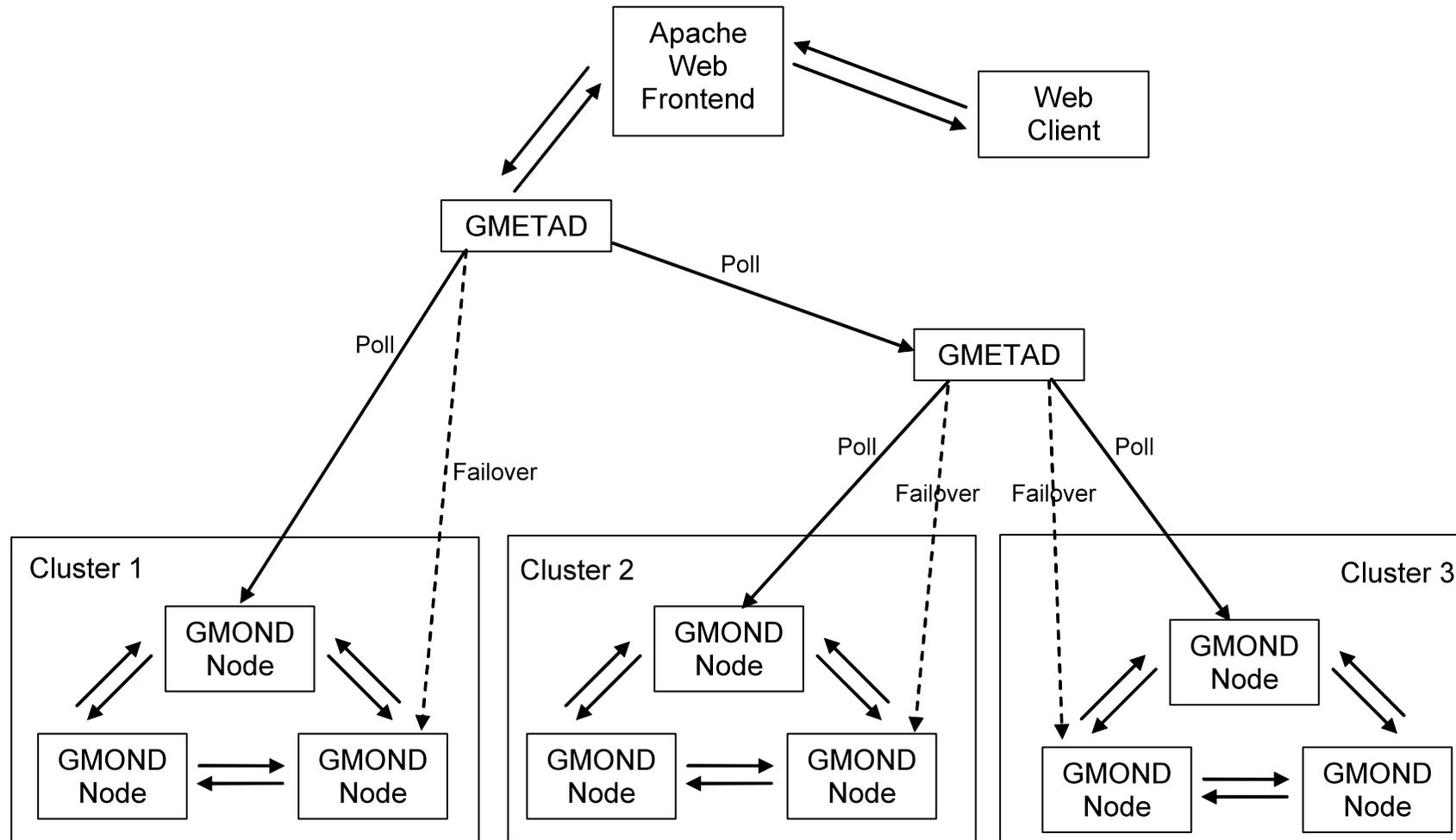
www.eu-egEE.org

- **Ganglia (fabric monitoring)**
- **Nagios (fabric + network monitoring)**
- **Yumit/Pakiti (security)**
- **CGMT (integration + hardware sensors)**
- **WMSMON (custom service monitoring)**
- **BBmSAM (mobile interface)**
- **CLI scripts**
- **Summary**

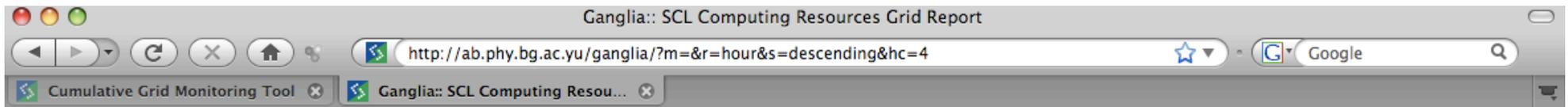
- Introduction
- Ganglia Architecture
- Apache Web Frontend
- Gmond & Gmetad
- Extending Ganglia
 - GMetrics
 - Gmond Module Development

- Scalable Distributed Monitoring System
- Targeted at monitoring clusters and grids
- Multicast-based Listen/Announce protocol
- Depends on open standards
 - XML
 - XDR compact portable data transport
 - RRDTool - Round Robin Database
 - APR – Apache Portable Runtime
 - Apache HTTPD Server
 - PHP based web interface
- <http://ganglia.sourceforge.net> or <http://www.ganglia.info>

- **Gmond – Metric gathering agent installed on individual servers**
- **Gmetad – Metric aggregation agent installed on one or more specific task oriented servers**
- **Apache Web Frontend – Metric presentation and analysis server**
- **Attributes**
 - Multicast – All gmond nodes are capable of listening to and reporting on the status of the entire cluster
 - Failover – Gmetad has the ability to switch which cluster node it polls for metric data
 - Lightweight and low overhead metric gathering and transport
- **Ported to various different platforms (Linux, FreeBSD, Solaris, others)**



- Built around Apache HTTPD server using mod_php
- Uses presentation templates so that the web site “look and feel” can be easily customized
- Presents an overview of all nodes within a grid vs all nodes in a cluster
- Ability to drill down into individual nodes
- Presents both textual and graphical views



SCL Computing Resources Grid Report for Sat, 31 Jan 2009 21:45:11 +0100

Get Fresh Data

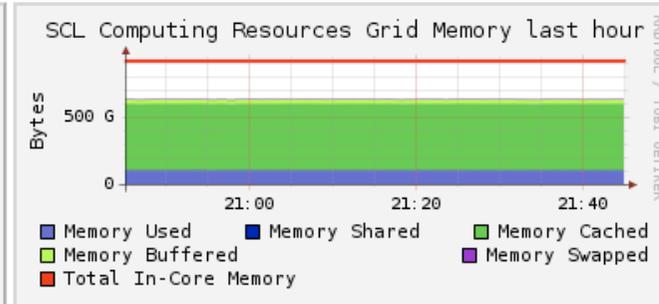
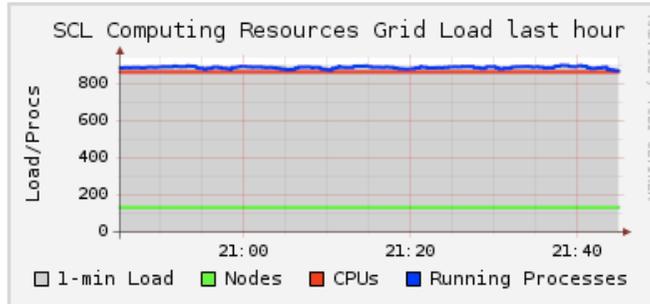
Last Sorted

SCL Computing Resources Grid >

SCL Computing Resources Grid (4 sources) (tree view)

CPU's Total: **864**
 Hosts up: **133**
 Hosts down: **0**

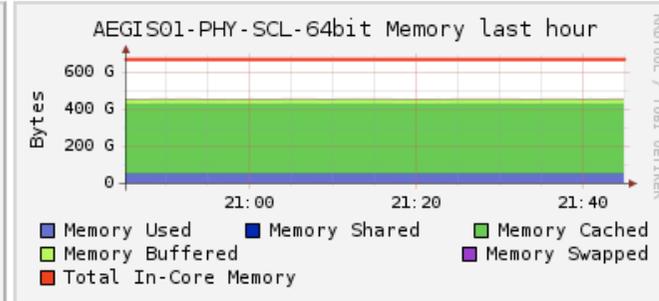
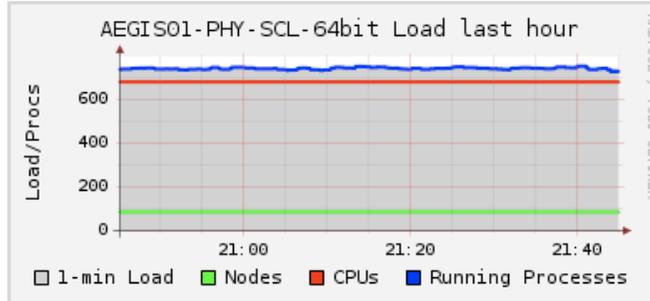
Avg Load (15, 5, 1m):
 102%, 102%, 102%
 Localtime:
 2009-01-31 21:45



AEGIS01-PHY-SCL-64bit (physical view)

CPU's Total: **680**
 Hosts up: **85**
 Hosts down: **0**

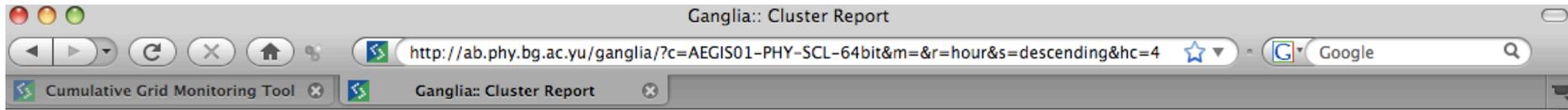
Avg Load (15, 5, 1m):
 108%, 108%, 108%
 Localtime:
 2009-01-31 21:45



AEGIS01-PHY-SCL-32bit (physical view)

CPU's Total: **128**
 Hosts up: **32**





Cluster Report for Sat, 31 Jan 2009 21:45:26 +0100

Get Fresh Data

Metric Last Sorted

[Physical View](#)

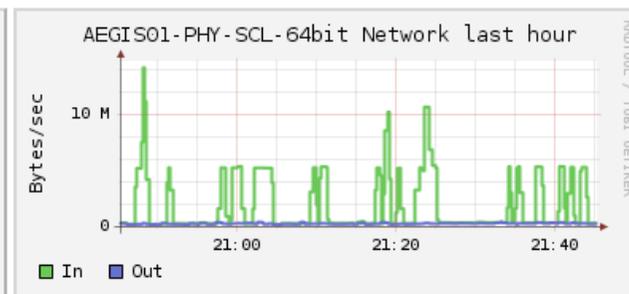
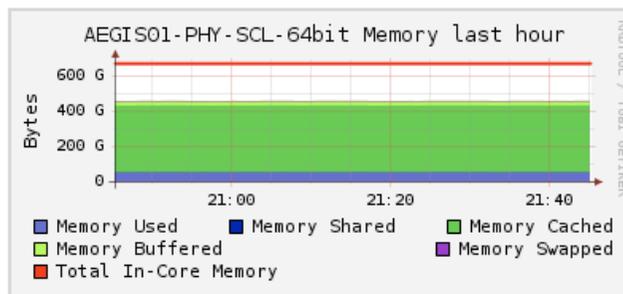
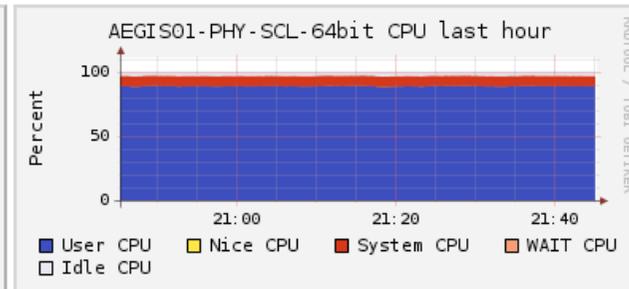
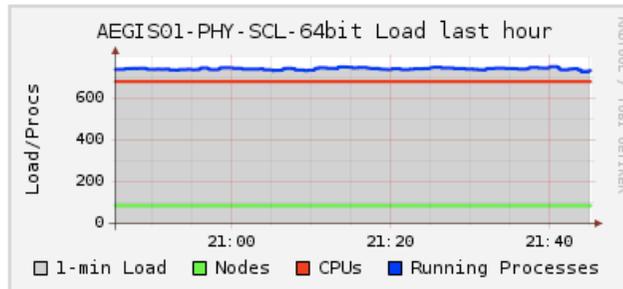
SCL Computing Resources Grid > AEGIS01-PHY-SCL-64bit >

Overview of AEGIS01-PHY-SCL-64bit

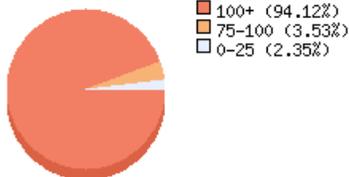
CPU's Total: **680**
 Hosts up: **85**
 Hosts down: **0**

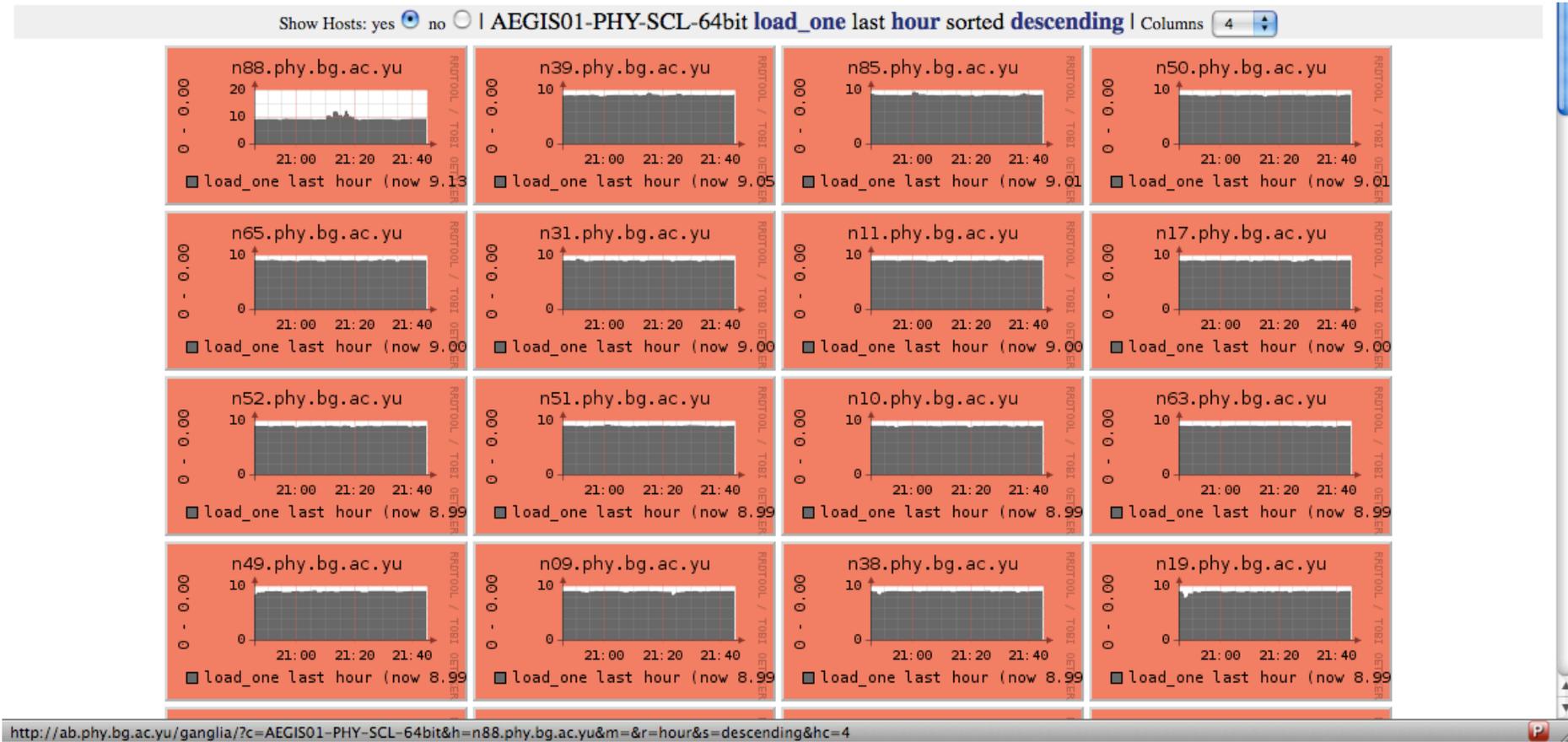
Avg Load (15, 5, 1m):
108%, 108%, 108%

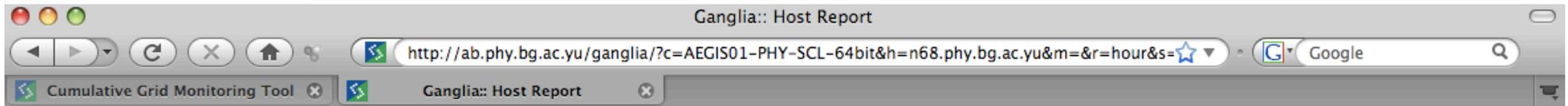
Localtime:
2009-01-31 21:45



Cluster Load Percentages







Host Report for Sat, 31 Jan 2009 21:44:55 +0100

Get Fresh Data

Last

[Node View](#)

[SCL Computing Resources Grid](#) > [AEGIS01-PHY-SCL-64bit](#) > [n68.phy.bg.ac.yu](#)

n68.phy.bg.ac.yu Overview



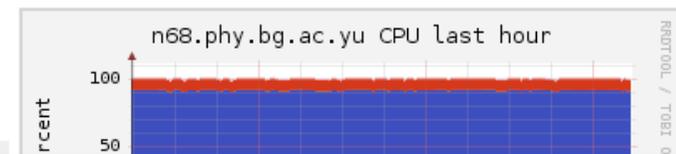
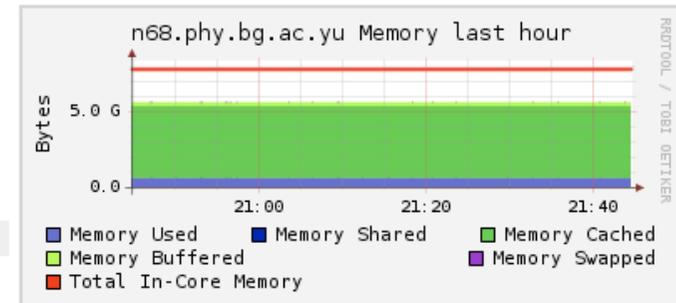
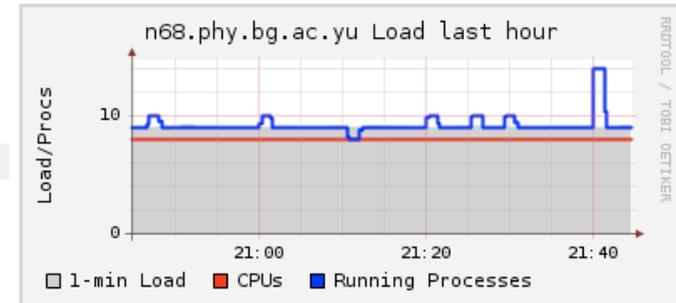
This host is up and running.

Time and String Metrics

boottime	Mon, 12 Jan 2009 16:59:54 +0100
gexec	OFF
gmond_started	Sat, 24 Jan 2009 17:38:46 +0100
last_reported	0 days, 0:00:15
machine_type	x86_64
os_name	Linux
os_release	2.6.9-78.0.1.ELsmp
uptime	19 days, 4:44:42

Constant Metrics

cpu_num	8 CPUs
cpu_speed	2333 MHz
mem_total	8177812 KB
swap_total	8385920 KB



http://ab.phy.bg.ac.yu/ganglia/?m=&r=hour&s=descending&hc=4

- See <http://ganglia.sourceforge.net/docs/ganglia.html>
- **Install Gmond on all monitored nodes**
 - Edit the configuration file
 - Add cluster and host information
 - Configure network `udp_send_channel`, `udp_rcv_channel`, `tcp_accept_channel`
 - Start gmond
- **Installing Gmetad on an aggregation node**
 - Edit the configuration file
 - Add data and failover sources
 - Add grid name
 - Start gmetad
- **Installing the web frontend**
 - Install Apache httpd server with `mod_php`
 - Copy Ganglia web pages and PHP code to appropriate location
 - Add appropriate authentication configuration for access control

- **Built-in metrics**
 - Various CPU, Network I/O, Disk I/O and Memory
- **Extensible**
 - Gmetric – Out-of-process utility capable of invoking command line based metric gathering scripts
 - Loadable modules capable of gathering multiple metrics or using advanced metric gathering APIs
- **Built on the Apache Portable Runtime**
 - Supports Linux, FreeBSD, Solaris and more...

- **Automatic discovery of nodes**
 - Adding a node does not require configuration file changes
 - Each node is configured independently
 - Each node has the ability to listen to and/or talk on the multicast channel
 - Can be configured for unicast connections if desired
 - Heartbeat metric determines the up/down status
- **Thread pools**
 - Collection threads – Capable of running specialized functions for gathering metric data
 - Multicast listeners – Listen for metric data from other nodes in the same cluster
 - Data export listeners – Listen for client requests for cluster metric data

- **daemonize** - When “yes”, gmond will daemonize
- **setuid** - When “yes”, gmond will set its effective UID to the uid of the user specified by the user attribute
- **debug_level** - When set to zero (0), gmond will run normally. Greater than zero, gmond runs in the foreground and outputs debugging information
- **mute** - When “yes”, gmond will not send data
- **deaf** - When “yes”, gmond will not receive data
- **host_dmax** - When set to zero (0), gmond will not delete a host from its list. If set to a positive number, gmond will flush a host after it has not heard from it for N seconds
- **cleanup_threshold** - Minimum amount of time before gmond will cleanup expired data
- **gexec** - Specify whether gmond will announce the hosts availability to run gexec jobs

- **name** - Specifies the name of the cluster of machines
- **owner** - Specifies the administrators of the cluster
- **latlong** - Latitude and longitude GPS coordinates of this cluster on earth
- **url** - Additional information about the cluster

- **Udp_send_channel**
 - mcast_join, mcast_if – Multicast address and interface
 - host – Unicast host
 - port – Multicast or Unicast port
- **Udp_rcv_channel**
 - mcast_join, mcast_if, port – Multicast address, interface and port
 - Bind – Bind a particular local address
 - family – Protocol family
- **Tcp_accept_channel**
 - Bind, port, interface – Bind a particular local address, listen port and interface
 - Family – Protocol family
 - timeout – Request timeout

```
globals {
  daemonize = yes
  setuid = yes
  user = nobody
  debug_level = 0
  max_udp_msg_len = 1472
  mute = no
  deaf = no
  host_dmax = 0 /*secs */
  cleanup_threshold = 300 /*secs */
  gexec = no
}
cluster {
  name = "AEGIS01-PHY-SCL"
  owner = "Administrator"
  latlong = "N44.8552 E20.3910"
  url = "http://www.scl.rs/"
}
```

```
udp_send_channel {
  mcast_join = 192.168.1.21
  port = 8649
  ttl = 1
}
udp_rcv_channel {
  mcast_join = 192.168.2.71
  port = 8649
  bind = 192.168.2.71
}
tcp_accept_channel {
  port = 8649
}
```

- Specify as many collection groups as you like
- Each collection group must contain at least one metric section
- List available metrics by invoking “gmond -m”
- **Collection_group section:**
 - collect_once – Specifies that the group of static metrics
 - collect_every – Collection interval (only valid for non-static)
 - time_threshold – Max data send interval
- **Metric section:**
 - Name – Metric name (see “gmond -m”)
 - Value_threshold – Metric variance threshold (send if exceeded)

```
collection_group {
  collect_once = yes
  time_threshold = 20
  metric {
    name = "heartbeat"
  }
}
collection_group {
  collect_once = yes
  time_threshold = 1200
  metric {
    name = "cpu_num"
  }
  metric {
    name = "cpu_speed"
  }
  metric {
    name = "mem_total"
  }
  metric {
    name = "swap_total"
  }
  ...
}
```

```
collection_group {
  collect_every = 20
  time_threshold = 90
  metric {
    name = "load_one"
    value_threshold = "1.0"
  }
  metric {
    name = "load_five"
    value_threshold = "1.0"
  }
  ...
}
collection_group {
  collect_every = 80
  time_threshold = 950
  metric {
    name = "proc_run"
    value_threshold = "1.0"
  }
  metric {
    name = "proc_total"
    value_threshold = "1.0"
  }
}
```

- **Polls a designated cluster node for the status of the entire cluster**
 - Data collection thread per cluster
 - Ability to poll gmond or another gmetad for metric data
- **Failover capability**
- **RRDTool – Storage and trend graphing tool**
 - Defines fixed size databases that hold data of various granularity
 - Capable of rendering trending graphs from the smallest granularity to the largest (eg. Last hour vs last year)
 - Never grows larger than the predetermined fixed size
 - Database granularity is configurable through gmetad.conf

- **Data source and and failover designations**
 - **data_source** "my cluster" [polling interval] address1:port addreses2:port ...
- **RRD database storage definition**
 - **RRAs** "RRA:AVERAGE:0.5:1:244" "RRA:AVERAGE:0.5:24:244" "RRA:AVERAGE:0.5:168:244" "RRA:AVERAGE:0.5:672:244" "RRA:AVERAGE:0.5:5760:374"
- **Access control**
 - **trusted_hosts** address1 address2 ... DN1 DN2 ...
 - **all_trusted** OFF/on
- **RRD files location**
 - **rrd_rootdir** "/var/lib/ganglia/rrds"
- **Network**
 - **xml_port** 8651
 - **interactive_port** 8652

```
data_source "mycluster" 10 localhost my.machine.ac.ir:8649 1.2.3.5:8655
data_source "mygrid" 50 1.3.4.7:8655 grid.ir:8651 grid-backup.ir:8651
data_source "another source" 1.3.4.7:8655 1.3.4.8

trusted_hosts 127.0.0.1 192.168.2.71 ganglia.ipm.ac.ir
xml_port 8651
interactive_port 8652

rrd_rootdir "/var/lib/ganglia/rrds"
```

- **High performance data logging and graphing system for time series data**
- **Automatic data consolidation over time**
 - Define various Round-Robin Archives (RRA) which hold data points at decreasing levels of granularity
 - Multiple data points from a more granular RRA are automatically consolidated and added to a courser RRA
- **Constant and predictable data storage size**
 - Old data is eliminated as new data is added to the RRD file
 - Amount of storage required is defined at the time the RRD file is created
- **RRDTool Web site: <http://oss.oetiker.ch/rrdtool/>**

- **Definition of the Round-Robin Database format is determined at database creation time**
- **Default Ganglia RRA definitions:**
 - RRA #1 – 15 second average for 61 minutes
 - RRA #2 – 6 minute average for 24.4 hours
 - RRA #3 – 42 minute average for 7.1 days
 - RRA #4 – 2.8 hour average for 28.5 days
 - RRA #5 – 24 hour average for 374 days
- **Default largest retrievable time series, ~1 year**
- **Configurable to whatever you want**

- **RRDFetch** – Retrieve time series data from an RRD file for a specific time period
- **RRDInfo** – Print header data from an RRD file in a parsing friendly format
- **RRDGraph** – Creates a graphical representation of the specified time series data
- **RRDUpdate** – Feed new data values into an RRD file
- **Other APIs** – RRDCreate, RRDDump, RRDFirst, RRDLast, RRDLastupdate, RRDResize, ...

- Extends the available metrics that can be produced through Gmond
- Ability to run specialized metric gathering scripts
- Pushes metric data back through Gmond
- Must be scheduled through cron rather than Gmond
- Gmetric repository on Ganglia project site
 - <http://ganglia.sourceforge.net/gmetric/>

- Extends the available metrics that can be gathered by Gmond
- Provided as dynamically loadable modules
- Configured through the `gmond.conf`
- Scheduled through Gmond rather than an external scheduler
- Module development is similar to an Apache module
- Able to produce multiple metrics from a single module

- Extends the available metrics that can be gathered by Gmond
- Configured through the Gmond configuration file
- Python module interface is similar to the C module interface
- Ability to save state within the script vs. a persistent data store
- Larger footprint but easier to implement new metrics

- **Introduction**
- **Building blocks**
 - Hosts, Commands, Services, Timeperiods and Contacts
 - Remote Checks with NRPE
 - Hostgroups and Servicegroups
 - Templates
 - Config File(s)
 - Active vs. Passive checks
- **Customizations**
 - Writing you own Checks
 - NSCA
 - Service Hierarchies
 - Eventhandlers
 - Modifying the Web Pages

- “Nagios is an enterprise-class monitoring solutions for hosts, services, and networks released under an Open Source license.”

<http://www.nagios.org/>

- “Nagios is a popular open source computer system and network monitoring application software. It watches hosts and services that you specify, alerting you when things go bad and again when they get better.”

<http://www.wikipedia.org/>

- **Open source monitoring framework**
 - widely used & actively developed
- **Host and service problems detection and recovery**
- **Provides wide set of basic sensors**
 - easy to develop custom sensors
- **Centralized vs. distributed deployment**
- **High configurability**
 - service dependencies, fine-grained notification options
- **Web interface**
 - status view, administration

- **Nagios RPMs for RHEL (and so SL/SLC) available from the DAG repository**
- **4 Main component RPMS**
 - nagios – the main server software and web scripts
 - nagios-plugins – the common set of check scripts used to query services
 - nagios-nrpe – Nagios Remote Plugin Executor
 - nagios-nasca – Nagios Service Check Acceptor
- **Setup is simply a matter of installing RPMs, configuring your web server and editing the config files to suit your setup**

- Simplest setup has central server running Nagios daemon that runs local check scripts to monitor the status of services on local and remote hosts
- A host is a computer running on the network which runs one or more services to be checked
- A service is anything on the host that you want checked. Its state can be one of: OK, Warning, Critical or Unknown
- A check is a script run on the server whose exit status determines the state of the service: 0, 1, 2 or -1

```
define host{
    host_name      my-host
    alias          my-host.ipm.ac.ir
    address        192.168.0.1
    check_command  check-host-alive
    max_check_attempts 10
    check_period   24x7
    notification_interval 120
    notification_period 24x7
    notification_options d,r
    contact_groups  unix-admins
    register        1
}
```

```
define service{
    name                ping-service
    service_description PING
    is_volatile         0
    check_period        24x7
    max_check_attempts 4
    normal_check_interval 5
    retry_check_interval 1
    contact_groups      unix-admins
    notification_options w,u,c,r
    notification_interval 960
    notification_period 24x7
    check_command       check_ping!100.0,20%!500.0,60%
    hosts               my-host
    register            1
}
```

- **Commands wrap the check scripts**

```
define command{
    command_name      check-host-alive
    command_line      $USER1$/check_ping -H      $HOSTADDRESS$
                    -w 99,99% -c 100,100% -p 1
}
```

- **and the alerts**

```
define command{
    command_name      notify-by-email
    command_line      /usr/bin/printf "%b" "***** Nagios *****
\n\nNotification Type: $NOTIFICATIONTYPE$\n\nService:
$SERVICEDESC$\nHost: $HOSTALIAS$\nAddress: $HOSTADDRESS$
\nState: $SERVICESTATE$\n\nDate/Time: $LONGDATETIME$\n
\nAdditional Info:\n\n$SERVICEOUTPUT$" | /bin/mail -s "***
$NOTIFICATIONTYPE$ alert - $HOSTALIAS$/$SERVICEDESC$ is
$SERVICESTATE$ **" $CONTACTEMAIL$
}
```

- The standard nagios-plugins rpm provides over 130 different check scripts, ranging from `check_load` to `check_oracle_instance.p` via `check_procs`, `check_mysql`, `check_mssql`, `check_real` and `check_disk`
- Writing your own check scripts is easy, can be in any language.
 - Active scripts just need to set the exit status and output a single line of text
 - Passive checks just write a single line to the server's command file

- **Contacts are the people who receive the alerts:**

```
define contact{
    contact_name             happy_admin
    alias                    Happy Admin
    service_notification_period 24x7
    host_notification_period  24x7
    service_notification_options w,u,c,r
    host_notification_options  d,r
    service_notification_commands notify-by-email
    host_notification_commands host-notify-by-email
    email                   happyadmin@ipm.ac.ir
}
```

- **Contactgroups group contacts:**

```
define contactgroup{
    contactgroup_name       unix-admins
    alias                   Unix Administrators
    members                 happy_admin
}
```

- **Time periods define when things, checks or alerts, happen:**

```
define timeperiod{
    timeperiod_name 24x7
    alias            24 Hours A Day, 7 Days A Week
    sunday           00:00-24:00
    monday           00:00-24:00
    tuesday          00:00-24:00
    wednesday        00:00-24:00
    thursday         00:00-24:00
    friday           00:00-24:00
    saturday         00:00-24:00
}
```

- NRPE is a daemon that runs on a remote host to be checked and a corresponding check script on the Master Nagios server
- Nagios Daemon runs the `check_nrpe` script which contacts the daemon which runs the check script locally and returns the output:

Nrpe.cfg (on a remote host):

```
command[check_load]=/usr/lib/nagios/plugins/check_load -w 15,10,5 -c  
30,25,20
```

Nagios.cfg (on Master server):

```
define command{  
    command_name      check_nrpe_load  
    command_line      $USER1$/check_nrpe -H $HOSTADDRESS$ -c  
    check_load  
}
```

- **Host and service groups let you group together similar hosts and services:**

```
define hostgroup{
    hostgroup_name  4-ServiceNodes
    alias           IranGrid Service Nodes
}

define servicegroup{
    servicegroup_name  topgrid
    alias              Top Grid Services
}
```

- **Plus a hostgroups or a servicegroups line in the host or service definition**

- You can define templates to make specifying hosts and services easier:

```
define host{
    name                generic-unix-host
    use                 generic-host
    check_command       check-host-alive
    max_check_attempts 10
    check_period        24x7
    notification_interval 120
    notification_period 24x7
    notification_options d,r
    contact_groups      unix-admins
    register            0
}
```

- Reduces a host definition to:

```
define host{
    use                 generic-grid-frontend-host
    host_name          mymachine
    alias              mymachine.ipm.ac.ir
    address            192.168.1.21
}
```

- Main nagios.cfg file can have include statements to pull other setting files or directories of files
- Usual setup has config spread over multiple files and directories.
 - One set of top level files defining global settings, commands, contact, hostgroups, servicegroups, host-templates, service-templates, time-periods, resources (user variables)
 - One directory for each host group containing one file defining the services and one defining the hosts

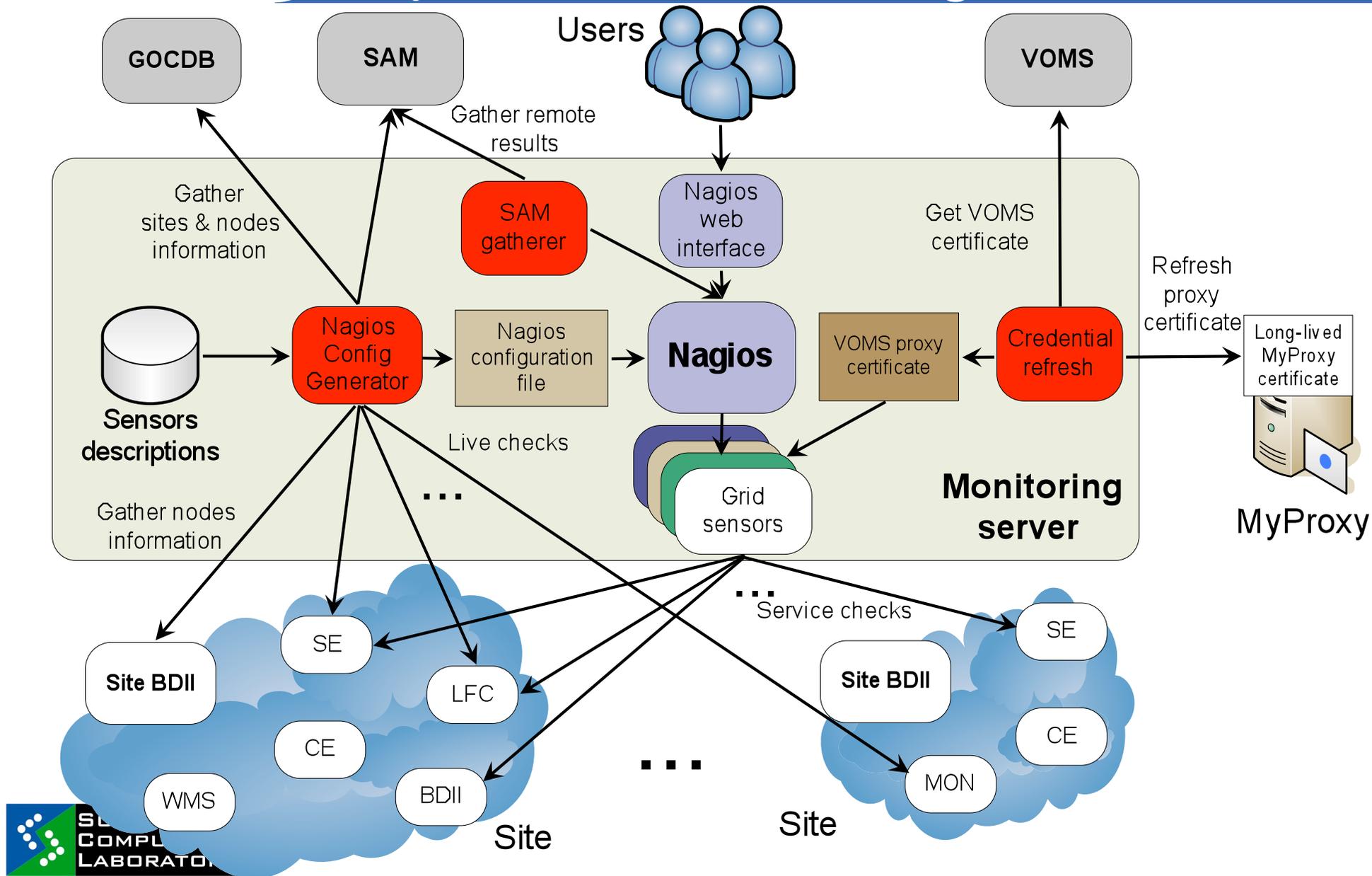
- **For some services running a script to check their state every few minutes (active checking) is not the best way.**
 - Service has its own internal monitoring
 - One script can efficiently check the status of multiple related services
- **The nagios service can be set to read “commands” from a named pipe**
 - Any process can then write in a line updating the status of a service (passive check)
 - Web frontend’s cgi script can also write commands to the file to disable checks or notifications for e.g. host or service.

- **NSCA is a script/daemon pair that allow remote hosts to run passive checks and write the results into that nagios servers command file.**
 - Checking operation on remote host calls send_nsca script which forwards the result to the nsca daemon on the server which writes the result into the command file
 - Can be used with eventhandlers to produce a hierarchy of Nagios servers
- **Service Hierarchies, services and hosts can depend on other services or hosts so for instance:**
 - If the web server is down don't tell me the web is unreachable
 - If the switch is down don't send alerts for the hosts behind it

- **Event Handlers:** instead of just telling you a service is down, Nagios can attempt to rectify the fault by running an eventhandler
- The cgi scripts, templates and style sheets that build the web pages can be edited to add extra information
- Nagios has a myriad of other features not mentioned here, from state stalking to flap detection, from notification escalations to scheduling network, host or service downtimes

- **Nagios is a very useful tool, but can be very daunting at the first sight and use**
- **Advices:**
 - Install it on a test node
 - Run a few check scripts by hand
 - Setup a simple config file that runs a few checks on the local host
 - Install nrpe on the host and nrpe and nagios-plugins on a remote host
 - Run check_nrpe by hand to get it working, then add a couple of simple checks on the remote host
 - NOW THINK ABOUT HOW YOU WANT TO ORGANISE YOUR CONFIG FILES
 - Now add hosts and services, then include further checks until the setup is satisfactory

- **Monitoring of EGEE resources in Central Europe**
 - core services since mid 2006
 - <http://nagios.ce-egee.org>



- **Grid sensors**

- Security facilities & services
 - CA distribution, Certificate lifetime, MyProxy, VOMS, VOMS Admin
- Monitoring & information services
 - R-GMA, BDII, MDS, GridICE
- Job management services
 - Globus Gatekeeper, RB, WMS, WMPProxy, Job matching
- File management services
 - GridFTP, SRM, DPNS, LFC

Home

Monitoring

- Tactical Overview
- Service Detail
- Host Detail
- hostname
- Host Group
 - Summary
 - Grid
- Service Group
 - Summary
 - Grid
- Status Map
- Problems
- Comments
- Downtime

Reporting

- Trends
- Availability
- Alerts
 - Histogram
 - History
 - Summary
- Notifications
- Event Log

Configuration

Tactical Monitoring Overview

Last Updated: Tue Jan 23 16:15:21 CET 2007
 Updated every 90 seconds
 Nagios® - www.nagios.org
 Logged in as /C=HR/O=edu/OU=srce/CN=Emir Imamagic

Network Outages

0 Outages

Monitoring Performance

Service Check Execution Time: 0.02 / 2066.35 / 44.042 sec
 Service Check Latency: 0.00 / 3.21 / 0.150 sec
 Host Check Execution Time: 0.01 / 10.01 / 0.671 sec
 Host Check Latency: 0.00 / 0.00 / 0.000 sec
 # Active Host / Service Checks: 65 / 480
 # Passive Host / Service Checks: 0 / 0

Network Health

Host Health:
 Service Health:

Hosts

4 Down	0 Unreachable	61 Up	0 Pending
1 Unhandled Problems			
3 Scheduled			

Services

28 Critical	1 Warning	1 Unknown	450 Ok	0 Pending
6 Unhandled Problems		1 Unhandled Problems	1 Unhandled Problems	
17 on Problem Hosts				
6 Acknowledged				

Monitoring Features

	Flap Detection	Notifications	Event Handlers	Active Checks	Passive Checks
Disabled	N/A	43 Services Disabled 4 Hosts Disabled	All Services Enabled All Hosts Enabled	All Services Enabled All Hosts Enabled	All Services Enabled All Hosts Enabled
Enabled			All Services Enabled All Hosts Enabled	All Services Enabled All Hosts Enabled	All Services Enabled All Hosts Enabled

Home

Monitoring

- Tactical Overview
- Service Detail
- Host Detail
- hostname
- Host Group
 - Summary
 - Grid
- Service Group
 - Summary
 - Grid
- Status Map
- Problems
- Comments
- Downtime

Reporting

- Trends
- Availability
- Alerts
 - Histogram
 - History
 - Summary
- Notifications
- Event Log

Configuration

Service Information

Last Updated: Tue Jan 23 13:56:53 CET 2007
 Updated every 90 seconds
 Nagios® - www.nagios.org
 Logged in as /C=HR/O=edu/OU=srce/CN=Emir Imamagic

View Information For This Host
 View Status Detail For This Host
 View Alert History For This Service
 View Trends For This Service
 View Alert Histogram For This Service
 View Availability Report For This Service
 View Notifications For This Service

Service

WMS

On Host

CYFRONET-LCG2 WMS
 (wms1.cyf-kr.edu.pl)

Member of

wms

149.156.9.27

Service State Information

Current Status: OK

Status Information: GLITE-SUBMIT SUCCESS: job https://wms1.cyf-kr.edu.pl:9000/20o7YUZirst-iNm5nv5LZA submitted. GLITE-STATUS SUCCESS: Done (Success). GLITE-OUTPUT SUCCESS: job output retrieved. SUCCESS: Output contains string "TESTING".

Performance Data:

Current Attempt: 1/4
State Type: HARD
Last Check Type: ACTIVE
Last Check Time: 01-23-2007 12:58:04
Status Data Age: 0d 0h 58m 49s
Next Scheduled Active Check: 01-23-2007 13:58:04
Latency: 0.075 seconds
Check Duration: 438.309 seconds
Last State Change: 01-23-2007 11:58:04
Current State Duration: 0d 1h 58m 49s
Last Service Notification: N/A
Current Notification Number: 0
Is This Service Flapping? N/A
Percent State Change: N/A
In Scheduled Downtime? NO
Last Update: 01-23-2007 13:56:48

Active Checks: ENABLED
Passive Checks: ENABLED
Obsessing: ENABLED
Notifications: ENABLED
Event Handler: ENABLED
Flap Detection: ENABLED

Service Commands

- Disable active checks of this service
- Re-schedule the next check of this service
- Submit passive check result for this service
- Stop accepting passive checks for this service
- Stop obsessing over this service
- Disable notifications for this service
- Schedule downtime for this service
- Disable event handler for this service
- Disable flap detection for this service

Home

Monitoring

- Tactical Overview
- Service Detail
- Host Detail
-
- Host Group
 - Summary
 - Grid
- Service Group
 - Summary
 - Grid
- Status Map
- Problems
- Comments
- Downtime

Reporting

- Trends
- Availability
- Alerts
 - Histogram
 - History
 - Summary
- Notifications
- Event Log

Configuration

Service 'MyProxy' On Host 'se1-egge.srce.hr'

Service Availability Report

Last Updated: Tue Jan 23 14:01:04 CET 2007
 Nagios® - www.nagios.org
 Logged in as /C=HR/O=edu/OU=srce/CN=Emir Imamagic

View Availability Report For This Host
 View Availability Report For All Services
 View Trends For This Service
 View Alert Histogram For This Service
 View Alert History This Service
 View Notifications For This Service

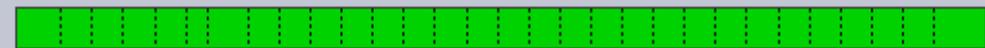
12-23-2006 14:01:04 to 01-23-2007 14:01:04
 Duration: 31d 0h 0m 0s

First assumed service state:

Report period: Backtracked archives:

[Availability report completed in 0 min 0 sec]

Service State Breakdowns:



State	Type / Reason	Time	% Total Time	% Known Time
OK	Unscheduled	30d 20h 0m 0s	99.462%	99.462%
	Scheduled	0d 3h 52m 33s	0.521%	0.521%
	Total	30d 23h 52m 33s	99.983%	99.983%
WARNING	Unscheduled	0d 0h 0m 0s	0.000%	0.000%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	0d 0h 0m 0s	0.000%	0.000%
UNKNOWN	Unscheduled	0d 0h 0m 0s	0.000%	0.000%
	Scheduled	0d 0h 0m 0s	0.000%	0.000%
	Total	0d 0h 0m 0s	0.000%	0.000%
CRITICAL	Unscheduled	0d 0h 0m 0s	0.000%	0.000%
	Scheduled	0d 0h 7m 27s	0.017%	0.017%
	Total	0d 0h 7m 27s	0.017%	0.017%
Undetermined	Nagios Not Running	0d 0h 0m 0s	0.000%	0.000%
	Insufficient Data	0d 0h 0m 0s	0.000%	0.000%
	Total	0d 0h 0m 0s	0.000%	0.000%
All	Total	31d 0h 0m 0s	100.000%	100.000%

Service Log Entries:
[\[View full log entries \]](#)

Current Network Status
 Last Updated: Sat Jan 31 22:48:38 EET 2009
 Updated every 90 seconds
 Nagios@ 3.0.3 - www.nagios.org
 Logged in as Antun Balaz
 Logged in as c9ee8003e840a4bf11bbe3855ebd076a

Host Status Totals

Up	Down	Unreachable	Pending
105	2	0	0
All Problems		All Types	
2		107	

Service Status Totals

Ok	Warning	Unknown	Critical	Pending
218	1	2	31	92
All Problems		All Types		
34		344		

Service Status Details For All Hosts

Host	Service	Status	Last Check	Duration	Attempt	Status Information
bdii.phy.bg.ac.yu	EGEE_BDII	OK	01-31-2009 21:58:08	0d 12h 50m 30s	1/1	ldap bdii connection ok
	sam_check_BDII	OK	01-31-2009 21:58:34	3d 19h 50m 4s	1/6	ldap bdii connection ok
bdii.seegrid.grid.pub.ro	sam_check_BDII	OK	01-31-2009 21:59:00	2d 14h 49m 38s	1/6	ldap bdii connection ok
	EGEE_BDII	OK	01-31-2009 22:47:08	5d 15h 1m 30s	1/1	ldap bdii connection ok
bdii.ulakbim.gov.tr	EGEE_BDII	OK	01-31-2009 22:47:08	5d 15h 1m 30s	1/1	ldap bdii connection ok
	sam_check_BDII	OK	01-31-2009 22:47:33	5d 15h 1m 5s	1/6	ldap bdii connection ok
bdii01.afroditi.hellasgrid.gr	EGEE_BDII	OK	01-31-2009 22:00:18	0d 3h 48m 20s	1/1	ldap bdii connection ok
	sam_check_BDII	OK	01-31-2009 22:00:44	0d 3h 47m 54s	1/6	ldap bdii connection ok
c01.grid.etfbl.net	history_check_CE	OK	01-30-2009 23:40:04	1d 11h 39m 31s	1/1	OK: sam_check_CE success is 100% at Fri Jan 30 21:41:15 2009 GMT. See history at https://c01.grid.etfbl.net/index.php?c=history&f_nodeid=118&f_date_type=3&f_service_id=1
	sam_check_CE	OK	01-30-2009 23:33:03	1d 17h 15m 26s	1/6	sam_check_CE checked OK at Fri Jan 30 21:34:31 2009 GMT. History: https://c01.grid.etfbl.net/index.php?c=history&f_nodeid=118&f_date_type=3&f_service_id=1
c02.grid.etfbl.net	history_check_SE	OK	01-30-2009 23:40:04	1d 11h 39m 31s	1/1	OK: sam_check_SE success is 100% at Fri Jan 30 21:41:17 2009 GMT. See history at https://c01.grid.etfbl.net/index.php?c=history&f_nodeid=166&f_date_type=3&f_service_id=2
	sam_check_SE	OK	01-30-2009 23:33:03	1d 17h 15m 26s	1/6	sam_check_SE checked OK at Fri Jan 30 21:34:33 2009 GMT. History: https://c01.grid.etfbl.net/index.php?c=history&f_nodeid=166&f_date_type=3&f_service_id=2
	sam_check_SRM	OK	01-30-2009 23:33:03	1d 17h 15m 26s	1/6	sam_check_SRM checked OK at Fri Jan 30 21:34:34 2009 GMT.

Current Network Status
 Last Updated: Sat Jan 31 22:49:23 EET 2009
 Updated every 90 seconds
 Nagios® 3.0.3 - www.nagios.org
 Logged in as Antun Balaz
 Logged in as c9ee8003e840a4bf11bbe3855ebd076a

Host Status Totals

Up	Down	Unreachable	Pending
105	2	0	0
All Problems		All Types	
2		107	

Service Status Totals

Ok	Warning	Unknown	Critical	Pending
218	1	2	31	92
All Problems		All Types		
34		344		

Service Overview For All Service Groups

Critical Tests (Critical Tests)

Host	Status	Services	Actions
c01.grid.etfbl.net	UP	1 OK	
c02.grid.etfbl.net	UP	1 OK	
ce.fit.upt.al	UP	1 OK	
ce.grid.pmf.unsa.ba	UP	1 CRITICAL	
ce.iiap-cluster.sci.am	UP	1 OK	
ce.ngcc.acad.bg	UP	2 OK	
ce.sq.grena.ge	UP	1 CRITICAL	

LDAP (LDAP)

Host	Status	Services	Actions
bdii.phy.bq.ac.yu	UP	2 OK	
bdii.seegrid.grid.pub.ro	UP	1 OK	
bdii.ulakbim.gov.tr	UP	2 OK	
bdii01.afroditi.hellasgrid.gr	UP	2 OK	
c14.grid.etfbl.net	UP	1 CRITICAL	
ce.fit.upt.al	UP	1 OK	
ce.grid.pmf.unsa.ba	UP	1 OK	

RGMA (RGMA)

Host	Status	Services	Actions
c03.grid.etfbl.net	UP	1 OK	
ce.grid.pmf.unsa.ba	UP	1 OK	
cluster2.csk.kq.ac.yu	UP	1 OK	
eymir.grid.metu.edu.tr	UP	1 OK	
grid-ce.ii.edu.mk	UP	1 OK	
grid01.efak.ni.ac.yu	UP	1 CRITICAL	
grid01.rcub.bg.ac.yu	UP	1 OK	

Current Network Status
 Last Updated: Sat Jan 31 22:49:50 EET 2009
 Updated every 90 seconds
 Nagios® 3.0.3 - www.nagios.org
 Logged in as Antun Balaz
 Logged in as c9ee8003e840a4bf11bbe3855ebd076a

Host Status Totals

Up	Down	Unreachable	Pending
105	2	0	0

Service Status Totals

Ok	Warning	Unknown	Critical	Pending
218	1	2	31	92

Display Filters:
 Host Status Types: All
 Host Properties: Any
 Service Status Types: All Problems
 Service Properties: Any

Service Status Details For All Hosts

Host	Service	Status	Last Check	Duration	Attempt	Status Information
c14.grid.etfbt.net	sam_check_BDI	CRITICAL	01-31-2009 22:47:33	1d 17h 2m 17s	6/6	CRITICAL: ldapsearch output not available or does not contain expected expression
ce.grid.pmf.unsa.ba	history_check_CE	CRITICAL	01-30-2009 23:40:04	8d 11h 40m 46s	1/1	Error: sam_check_CE success is 0% at Fri Jan 30 21:41:26 2009 GMT. See history at https://c01.grid.etfbt.net/index.php?c=history&f_nodeid=652&f_date_type=3&f_service_id=1
	sam_check_CE	CRITICAL	01-30-2009 23:33:03	9d 10h 57m 26s	6/6	sam_check_CE Error at Fri Jan 30 21:34:55 2009 GMTHelp: http://qoc.grid.sinica.edu.tw/qocwiki/Brokerhelper%3A_Cannot_plan_No_compatible_resources
ce.sg.grena.ge	history_check_CE	CRITICAL	01-30-2009 23:40:04	3d 11h 40m 26s	1/1	Error: sam_check_CE success is 0% at Fri Jan 30 21:43:28 2009 GMT. See history at https://c01.grid.etfbt.net/index.php?c=history&f_nodeid=989&f_date_type=3&f_service_id=1
	sam_check_CE	CRITICAL	01-30-2009 23:33:03	3d 16h 16m 41s	6/6	sam_check_CE Error at Fri Jan 30 21:36:46 2009 GMTHelp: http://qoc.grid.sinica.edu.tw/qocwiki/Brokerhelper%3A_Cannot_plan_No_compatible_resources
ce01.grid.renam.md	history_check_CE	CRITICAL	01-30-2009 23:40:04	10d 11h 40m 46s	1/1	Error: sam_check_CE success is 0% at Fri Jan 30 21:44:14 2009 GMT. See history at https://c01.grid.etfbt.net/index.php?c=history&f_nodeid=562&f_date_type=3&f_service_id=1
	sam_check_CE	CRITICAL	01-30-2009 23:33:03	112d 13h 16m 45s	6/6	sam_check_CE Error at Fri Jan 30 21:37:34 2009 GMTHelp: http://qoc.grid.sinica.edu.tw/qocwiki/Brokerhelper%3A_Cannot_plan_No_compatible_resources
	sam_check_Site-BDI	CRITICAL	01-31-2009 22:06:49	112d 13h 2m 49s	6/6	CRITICAL: ldapsearch output not available or does not contain expected expression

- **Pakiti Client**
 - Installed on all nodes
 - Checks software versions against configured repositories
 - Sends report once per day to pakiti server
- **Pakiti Server**
 - Main Components:
 - Feed
 - *Daily reports from clients*
 - Site Administrator's front-end
 - *Detailed view of the rpm package status at each node*
 - *Access is permitted only to each the administrator's of each site via TLS Authentication using X.509v3 Certificates*
 - Addon Components
 - ROC Manager's front-end
 - *Aggregated view of the status of all the sites in the ROC*
 - *Developed by the AUTH GOC*
- **Developed initially by CERN/Steve Traylen, and later by Aristotle University of Thessaloniki, Greece**

Pakiti Results for AEGIS01-PHY-SCL

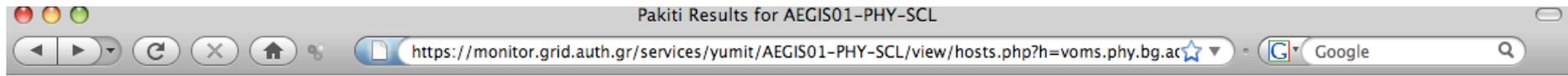
Order by: Display hosts: all vulnerable unpatched not reporting

Section: AEGIS01-PHY-SCL Admin

Scientific Linux SL release 4.7 (Beryllium)

Security	Others	hostname	current kernel	last report	Connection
??	29	bdii.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:05	X
		ce64.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:17	X
		cyclops.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:03	X
??	1	mon.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:12	X
??	4	n04.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:08	X
??	1	n05.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:14	X
??	1	n06.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:04	X
??	1	n07.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:04	X
??	1	n08.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:17	X
??	1	n09.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:11	X
??	1	n10.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:04	X
??	1	n11.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:13	X
??	1	n12.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:10	X
??	1	n13.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:06	X
??	1	n14.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:02	X
??	1	n15.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:17	X
??	2	n16.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:14	X
??	1	n17.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:17	X
??	1	n18.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:09	X
??	1	n19.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:09	X
??	1	n20.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:17	X
??	1	n21.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:16	X
??	1	n22.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:17	X
??	1	n23.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:12	X
??	1	n24.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:13	X
??	1	n25.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:10	X
??	1	n26.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:10	X
??	1	n27.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:11	X
??	1	n28.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:12	X
??	1	n29.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:02	X
??	1	n30.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:11	X
??	1	n31.phy.bg.ac.yu	2.6.9-78.0.1.ELsmp	31 January 2009 05:11	X

Done



Pakiti Package Results for AEGIS01-PHY-SCL: 31 January 2009 22:36

Host: voms.phy.bg.ac.yu

Hostname: <input type="text" value="voms.phy.bg.ac.yu"/>	Package: <input type="text" value="All"/>	Admin: <input type="text" value="All"/>
--	---	---

Scientific Linux SL release 4.7 (Beryllium)

- voms.phy.bg.ac.yu
- bouncycastle.noarch - scl-jpackage5-ge
 - glite-info-provider-service.noarch - scl-glite-LFC_my
 - glite-LFC_mysql.i386 - scl-glite-LFC_my
 - glite-PX.i386 - scl-glite-LFC_my
 - glite-security-trustmanager.noarch - scl-glite-LFC_my
 - glite-VOMS_mysql.i386 - scl-glite-LFC_my
 - glite-yaim-myproxy.noarch - scl-glite-LFC_my
 - glue-schema.noarch - scl-glite-LFC_my
 - log-vomscerts.noarch - scl-glite-LFC_my
 - log4j.noarch - scl-jpackage5-ge
 - myproxy-config.noarch - scl-glite-LFC_my
 - tomcat5-common-lib.noarch - scl-jpackage5-ge
 - tomcat5-jasper.noarch - scl-jpackage5-ge
 - tomcat5-jsp-2.0-api.noarch - scl-jpackage5-ge
 - tomcat5-server-lib.noarch - scl-jpackage5-ge
 - tomcat5-servlet-2.4-api.noarch - scl-jpackage5-ge
 - tomcat5.noarch - scl-jpackage5-ge

[Display all hosts](#)

All pages are optimized for  and compatible with Internet Explorer.



- **Cumulative Grid Monitoring Tool developed by the Scientific Computing Laboratory of the Institute of Physics Belgrade**
- **Collects information from other monitoring tools**
- **Provides also information on temperatures of hosts (CPU and MB)**
- **Soon to be replaced by the Cyclops tool, which is currently being developed**

Cumulative Grid Monitoring Tool

http://ab.phy.bg.ac.yu/cgmt/index.html

Mon Mar 24 17:32:01 CET 2008 : GStat: **OK** | BDII on bdii: **OK** | CE on ce64: **OK** | sBDII on ce: **OK** | CE on ce: **OK** | LFC on lfc: **OK** | RGMA on mon: **OK** | PX on myproxy: **OK** | RB on rb: **OK** | SE on se: **OK** | SRM on se: **OK** | VOMS on voms: **OK** | gRB on wms: **OK** |

AEGIS01-PHY-SCL-32bit Load last hour

Load/Procs

21:00 21:20 21:40

1-min Load Nodes CPUs Running Processes

AEGIS01-PHY-SCL-32bit Memory last hour

Bytes

21:00 21:20 21:40

Memory Used Memory Shared Memory Cached Memory Buffered Memory Swapped Total In-Core Memory

AEGIS01-PHY-SCL Core Services Network last hour

Bytes/sec

21:00 21:20 21:40

In Out

AEGIS01-PHY-SCL Entries

Entries

21:00 21:20 21:40

WN	Load	RAM Used	Swap Cached	Temp CPU	Temp MB
wn01	4.00	1253MB	0kB	+49°C	+43°C
wn02	4.00	1386MB	0kB	+53°C	+44°C
wn03	4.06	929MB	0kB	+56°C	+45°C
wn04	4.08	1223MB	200kB	+54°C	+47°C
wn05	4.04	1044MB	0kB	+54°C	+46°C
wn06	4.11	1390MB	0kB	+59°C	+44°C
wn07	4.00	1515MB	0kB	+55°C	+46°C
wn08	4.00	888MB	0kB	+59°C	+46°C
wn09	4.00	1370MB	0kB	+57°C	+48°C
wn10	4.00	1103MB	0kB	+50°C	+46°C
wn11	3.99	1127MB	192kB	+57°C	+47°C
wn12	4.00	1778MB	0kB	+59°C	+49°C
wn13	4.01	1334MB	232kB	+52°C	+46°C
wn14	4.02	1446MB	244kB	+61°C	+48°C
wn15	4.00	1371MB	204kB	+55°C	+45°C
wn16	4.00	1783MB	340kB	+51°C	+49°C
wn17	4.00	1109MB	0kB	+52°C	+47°C
wn18	4.00	1569MB	0kB	+54°C	+44°C
wn19	3.99	1885MB	0kB	+48°C	+47°C
wn20	4.00	1360MB	0kB	+54°C	+48°C
wn21	4.24	1071MB	0kB	+54°C	+46°C
wn22	4.00	2082MB	0kB	+51°C	+43°C
wn23	4.00	768MB	0kB	+53°C	+47°C

- **Computing resources discovery and management in the gLite environment is done by the WMS**
- **Current implementation of Grid Service Availability Monitoring framework does not include direct probes of WMS**
- **WMSSMON - newly developed gLite WMS monitoring tool by the Scientific Computing Laboratory of the Institute of Physics Belgrade**
 - site independent gLite WMS monitoring
 - centralized gLite WMS monitoring
 - uniform gLite WMS monitoring

- **WMSMON is based on the server-client architecture**
 - aggregated status view of all monitored WMS services
 - detailed status page for each WMS service
 - links to the appropriate troubleshooting guides

wmsmon

wmsmon						
WMS Hostname	Timestamp	Load	Jobs	File system	Log files	gLite daemons
wms.phy.bq.ac.yu	Thu, 15 Jan 2009 22:25:02 +0100	●	●●●	●●●●●●●●	●●	●●●●●●●●●●
wms-aegis.phy.bq.ac.yu	Thu, 15 Jan 2009 22:20:01 +0100	●	●●●	●●●●●●●●	●●	●●●●●●●●●●
c16.grid.etfbl.net	Thu, 15 Jan 2009 22:20:01 +0100	●	●●●	●●●●●●●●	●●	●●●●●●●●●●

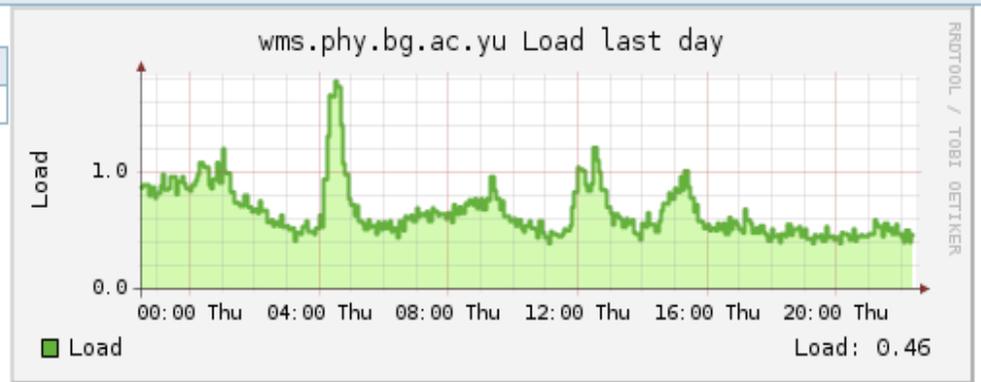
wmsmon

wmsmon :: wms.phy.bg.ac.yu

[week](#) :: [month](#) :: [year](#)

Load

Property	Value
Load fifteen	0.46



Jobs

Property	Value
Number of Running Jobs	452
Total Number of Jobs	4059



- **BBmSAM portal**

- Created for SLA monitoring
 - Generating site availability statistics according to several criteria
 - Overview (HTML) and full dump (CSV) of data possible
- Extended into full SAM portal
 - Availability for last 24h period for all sites/services
 - Latest results per service
 - History for nodes/services

- **BBmobileSAM**

- Optimized for small-screen devices and low bandwidth
- Possible filtering of sites
- Possible three levels of details

- **Developed by the University of Banjaluka, Bosnia and Herzegovina**

BBmobileSAM @ 20:46:27

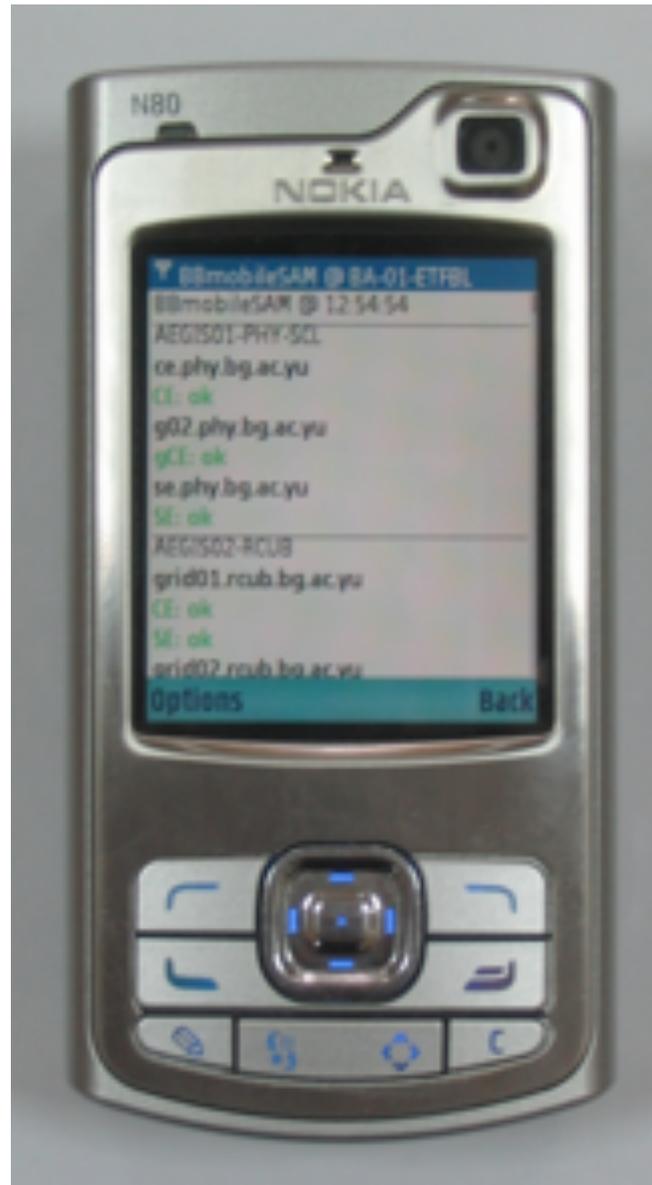
AEGIS01-PHY-SCL
ce64.phy.bg.ac.yu
CE: ok 100%
lfc.phy.bg.ac.yu
LFC: ok 100%
LFC_C: ok 100%
LFC_L: ok 100%
se.phy.bg.ac.yu
SE: ok 100%
SRM: ok 96%

AEGIS02-RCUB
grid01.rcub.bg.ac.yu
CE: ok 100%
grid02.rcub.bg.ac.yu
LFC: ok 100%
LFC_C: ok 100%
grid15.rcub.bg.ac.yu
SE: ok 100%
SRM: ok 96%

AEGIS03-ELEF-LEDA
grid01.elfak.ni.ac.yu
CE: ok 18%
grid02.elfak.ni.ac.yu
SE: ok 87%

AEGIS04-KG
cluster1.csk.kg.ac.yu
CE: ok 86%
se.csk.kg.ac.yu

Done



- Shell scripts are very powerful tools
- Monitoring of queue systems and other services
- Direct active and passive probes
- Many Ganglia and Nagios probes/checks Initially developed as shell scripts by sys admins

- **Monitoring of computing resources is essential**
 - Ensures availability and quality of service
 - Prevents (or provides early diagnosis of) problems
 - Gives insights into infrastructure bottlenecks and helps in improving and customizing cluster design
- **A vast set of monitoring tools exist**
 - Deployment of at least one tool is necessary if you have more than a few nodes
 - Integration of interfaces of various tools is difficult task
 - Messaging systems could provide major simplification for monitoring integration frameworks
- **Development efforts should be shared / coordinated**
 - New developments more useful if they fit to existing tools