Ganglia Roll: Users Guide

Version 5.2 Edition

Ganglia Roll: Users Guide :

Version 5.2 Edition
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Preface

This Roll installs and configures the Ganglia[1] cluster monitoring system.

Notes

1. http://ganglia.info/

Chapter 1. Overview

Table 1-1. Summary

Name	ganglia
Version	5.2
Maintained By	Rocks Group
Architecture	i386, x86_64
Compatible with Rocks™	5.2

Table 1-2. Roll Compatibility

Roll	Requires [a]	Optional [b]	Conflicts
alpha		X	
area51		X	
base	X		
bio		X	
condor		X	
ganglia	X		
grid		X	
hpc		X	
java		X	
kernel	X		
os (disk 1)	X		
os (disk 2)	X		
os (disk 3)		X	
os (disk 4)		X	
os (disk 5)		X	
os (disk 6)		X	
os (disk 7)		X	
pbs		X	
service-pack		X	
sge		X	
viz		X	
web-server	X		
xen		X	

Roll	**Requires** [a]	**Optional** [b]	**Conflicts**

Notes:

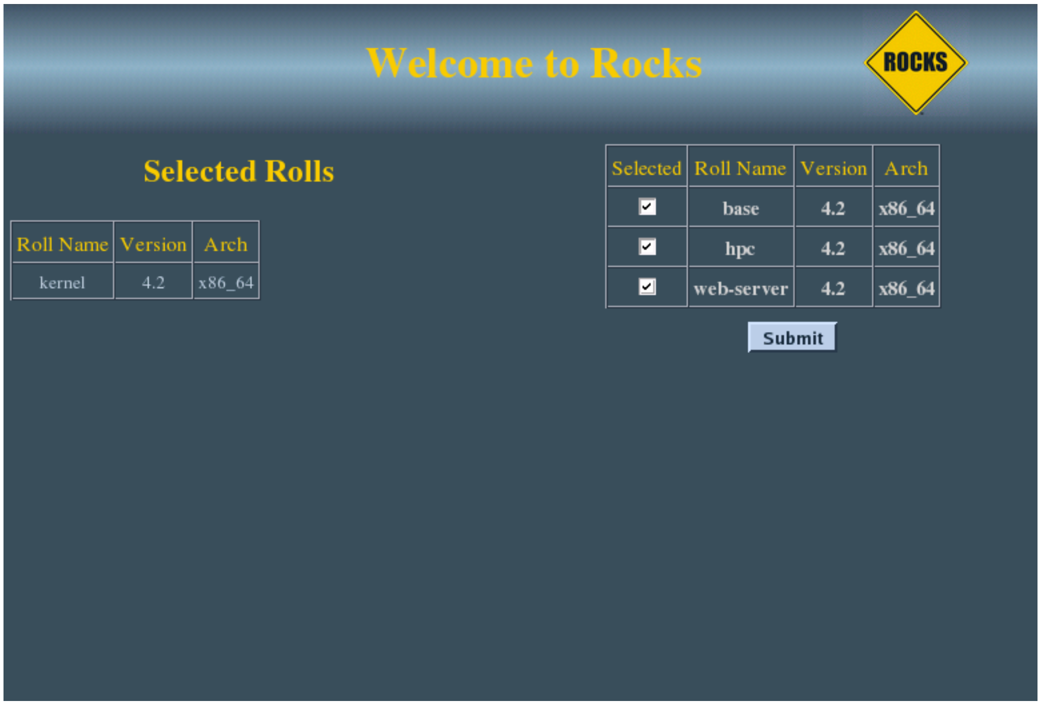
a. You may also substitute your own OS CDs for the Rocks™ OS Roll CDs. In this case you must use all the CDs from your distribution and not use any of the Rocks™ OS Roll CDs.

b. Only Rolls that have been verified as compatible with this Roll are listed. Other Rolls will likely work, but have not been tested by the maintainer of this Roll.

Chapter 2. Installing

2.1. On a New Server

The ganglia Roll should be installed during the initial installation of your server (or cluster). This procedure is documented in section 1.2 of the Rocks™ usersguide. You should select the ganglia Roll from the list of available rolls when you see a screen that is similar to the one below.



Roll Name	Version	Arch
kernel	4.2	x86_64

Selected	Roll Name	Version	Arch
☑	base	4.2	x86_64
☑	hpc	4.2	x86_64
☑	web-server	4.2	x86_64

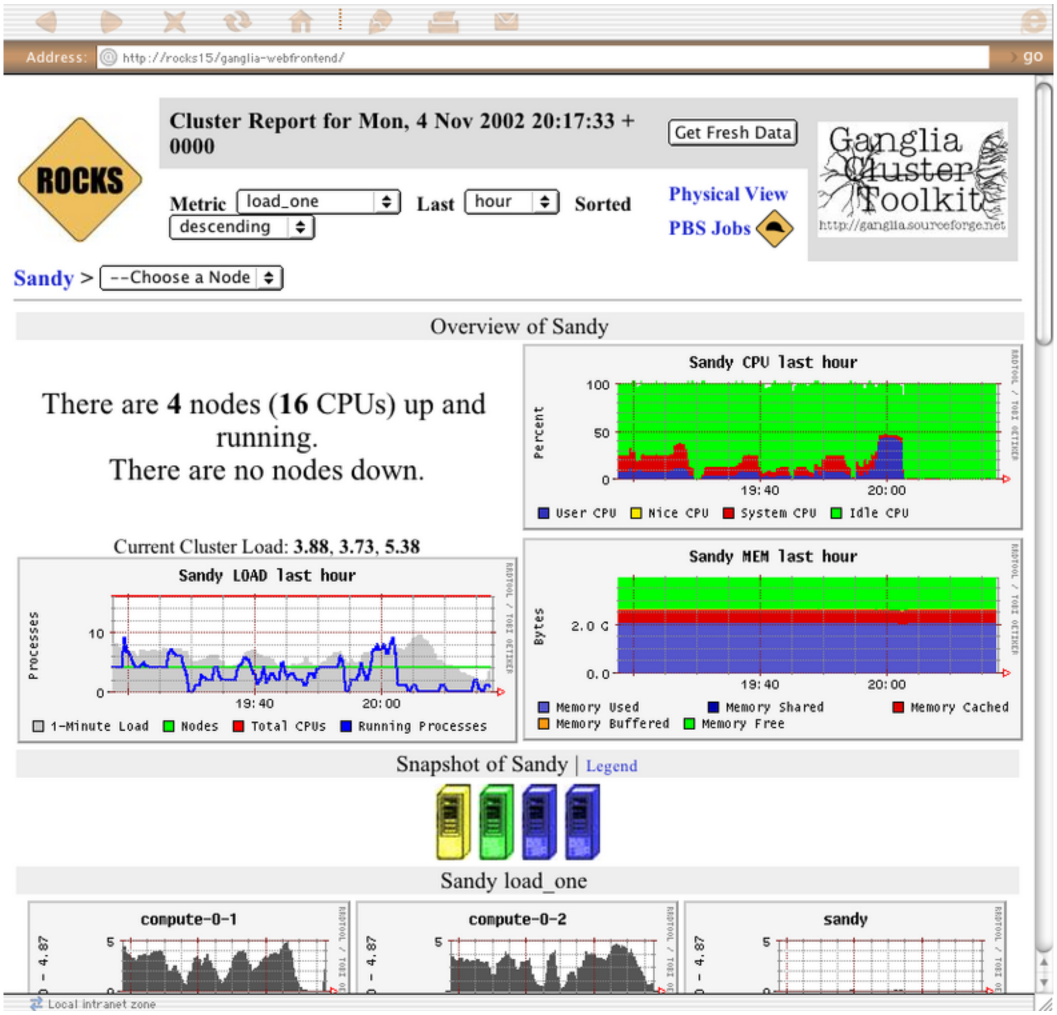
Chapter 3. Using the ganglia Roll

3.1. Using the Ganglia Roll

3.1.1. Cluster Status

The webpages available from this link provide a graphical interface to live cluster information provided by Ganglia monitors[1] running on each cluster node. The monitors gather values for various metrics such as CPU load, free memory, disk usage, network I/O, operating system version, etc. These metrics are sent through the private cluster network and are used by the frontend node to generate the historical graphs.

In addition to metric parameters, a heartbeat message from each node is collected by the Ganglia monitors. When a number of heartbeats from any node are missed, this web page will declare it "dead". These dead nodes often have problems which require additional attention, and are marked with the Skull-and-Crossbones icon, or a red background.



Address: http://rocks15/ganglia-webfrontend/

Cluster Report for Mon, 4 Nov 2002 20:17:33 +0000

Metric load_one **Last** hour **Sorted** descending

Sandy > --Choose a Node

Overview of Sandy

There are **4** nodes (**16** CPUs) up and running.
There are no nodes down.

Current Cluster Load: **3.88**, **3.73**, **5.38**

Snapshot of Sandy | Legend

Sandy load_one

The Rocks Cluster Group maintains a similar web page called *Meta* that collects Ganglia information from many clusters built with Rocks software. It may give you a glimpse of the power and scalability of the Ganglia monitors. The meta page is available at http://meta.rocksclusters.org/.

Ganglia[3] was designed at Berkeley by Matt Massie (massie@cs.berkeley.edu) in 2000, and is currently developed by an open source partnership between Berkeley, SDSC, and others. It is distributed through Sourceforge.net under the GPL software liscence.

3.1.2. Cluster Top

This page is a version of the standard "top" command for your cluster. This page presents process information from each node in the cluster. This page is useful for monitoring the precise activity of your nodes.

The Cluster Top differs from standard top in several respects. Most importantly, each row has a "HOST" designation and a "TN" attribute that specifies its age. Since taking a process measurement itself requires resources, compute nodes report process data only once every 60 seconds on average. A process row with TN=30 means the host reported information about that process 30 seconds ago.

For brevity and minimal performance impact, each node only reports as many processes as it has CPUs. The processes shown had the highest %CPU utilization on the node at the time of reporting. Unfortunately the number of processes per node is not currently adjustable. The restriction lies in the structure of the Ganglia monitoring system, which only delivers information and has no faculty for accepting parameters on the fly. However, showing the most CPU intensive processes should give you a good idea of how the CPUs are being utilized.

The process data is gathered by raw processing of the /proc filesystem on each node. Memory statistics differ slightly from standard "ps" output, and are calculated from the /proc/[pid]/statm virtual file.

Process Columns

TN

> The age of the information in this row, in seconds.

HOST

> The node in the cluster on which this process is running.

PID

> The Process ID. A non-negative integer, unique among all processes on this node.

USER

> The username of this processes.

CMD

> The command name of this process, without arguments.

%CPU

The percentage of available CPU cycles occupied by this process. This is always an approximate figure, which is more accurate for longer running processes.

%MEM

The percentage of available physical memory occupied by this process.

SIZE

The size of the "text" memory segment of this process, in kilobytes. This approximately relates the size of the executable itself (depending on the BSS segment).

DATA

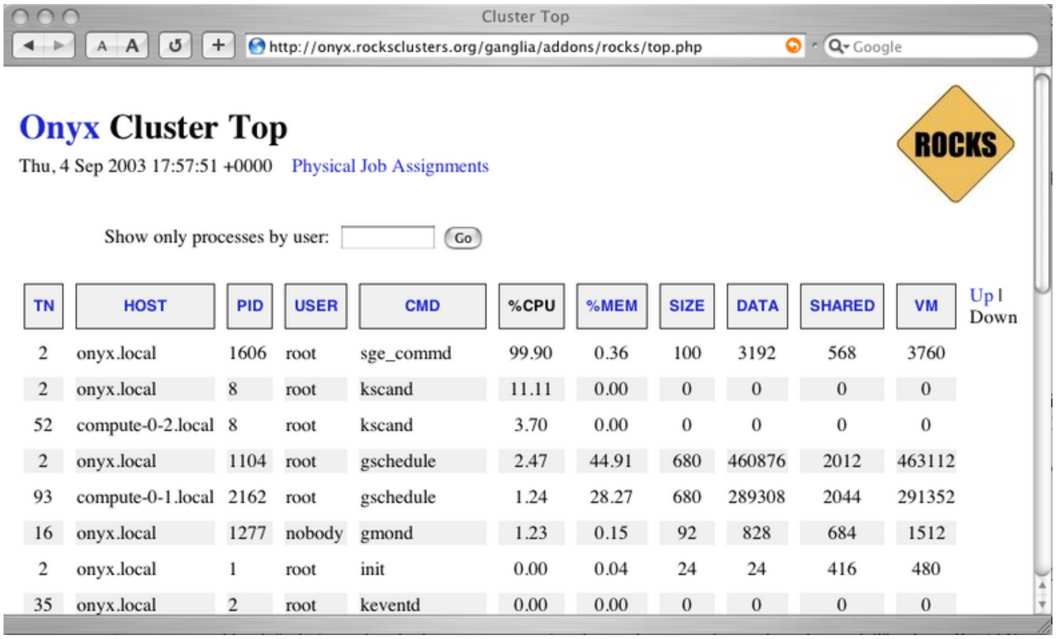
Approximately the size of all dynamically allocated memory of this process, in kilobytes. Includes the Heap and Stack of the process. Defined as the "resident" - "shared" size, where resident is the total amount of physical memory used, and shared is defined below. Includes the the text segment as well if this process has no children.

SHARED

The size of the shared memory belonging to this process, in kilobytes. Defined as any page of this process' physical memory that is referenced by another process. Includes shared libraries such as the standard libc and loader.

VM

The total virtual memory size used by this process, in kilobytes.



Onyx Cluster Top

Thu, 4 Sep 2003 17:57:51 +0000   Physical Job Assignments

Show only processes by user:

TN	HOST	PID	USER	CMD	%CPU	%MEM	SIZE	DATA	SHARED	VM
2	onyx.local	1606	root	sge_commd	99.90	0.36	100	3192	568	3760
2	onyx.local	8	root	kscand	11.11	0.00	0	0	0	0
52	compute-0-2.local	8	root	kscand	3.70	0.00	0	0	0	0
2	onyx.local	1104	root	gschedule	2.47	44.91	680	460876	2012	463112
93	compute-0-1.local	2162	root	gschedule	1.24	28.27	680	289308	2044	291352
16	onyx.local	1277	nobody	gmond	1.23	0.15	92	828	684	1512
2	onyx.local	1	root	init	0.00	0.04	24	24	416	480
35	onyx.local	2	root	keventd	0.00	0.00	0	0	0	0

Notes

1. http://ganglia.info/
2. http://meta.rocksclusters.org/
3. http://ganglia.info/

Chapter 4. Customizing the Ganglia Roll

4.1. Customizing Ganglia Monitors

4.1.1. Enabling fully aware Ganglia daemons

For maximum performance and scalability, the Ganglia *gmond* daemons on compute nodes in the cluster are run in "deaf" mode. While compute nodes report their own Ganglia data to the frontend, they do not listen for information from their peers. This reduces the resource footprint of compute nodes.

Running the compute node monitors in deaf mode means they cannot be queried for cluster state. This may be a problem if your parallel jobs use Ganglia data for performance analysis or fault tolerance purposes. If you would like to re-enable Ganglia's full functionality on your compute nodes, follow the instructions below.

Ganglia daemons were switched to the deaf mode by default starting in the Matterhorn Rocks release 3.1.0.

- Add a new XML node file called `replace-ganglia-client.xml` (see section "3.2. Customizing Configuration of Compute Nodes" in the Base Roll Documentation for details on how to create a replacement XML node file).

  Put the following contents in the new file:

  ```
  <?xml version="1.0" standalone="no"?>

  <kickstart>

    <description>
    UCB’s Ganglia Monitor system for client nodes in the
    cluster.
    </description>

  <post>

  /sbin/chkconfig --add gmetad

  </post>

  </kickstart>
  ```

- Reinstall your compute nodes. They will now have access to the full monitoring tree. This procedure places the compute nodes on the same level monitoring level as the frontend.

4.2. Monitoring Multiple Clusters with Ganglia

Ganglia has the ability to track and present monitoring data from multiple clusters. A collection of monitored clusters is called a *Grid* in Ganglia's nomenclature. This section describes the steps required to setup a multi-cluster monitoring grid.

The essential idea is to instruct the gmetad daemon on one of your frontend nodes to track the second cluster in addition to its own. This procedure can be repeated to monitor a large set clusters from one location.

For this discussion, your two clusters are named "A" and "B". We will choose the frontend on cluster "A" to be the top-level monitor.

1. On "A" frontend, add the line to /etc/gmetad.conf:

   ```
   data_source "Cluster B" B.frontend.domain.name
   ```

   Then restart the gmetad server on "A" frontend.

2. On "B" frontend, get the IP address of "A.frontend.domain.name" and edit /etc/ganglia/gmond.conf and change the section from:

   ```
   tcp_accept_channel {
    port = 8649
    acl {
     default = "deny"
                   access {
                           ip = 127.0.0.1
                           mask = 32
                           action = "allow"
                   }
     access {
      ip = 10.0.0.0
      mask = 8
      action = "allow"
     }
    }
   }
   ```

   to:

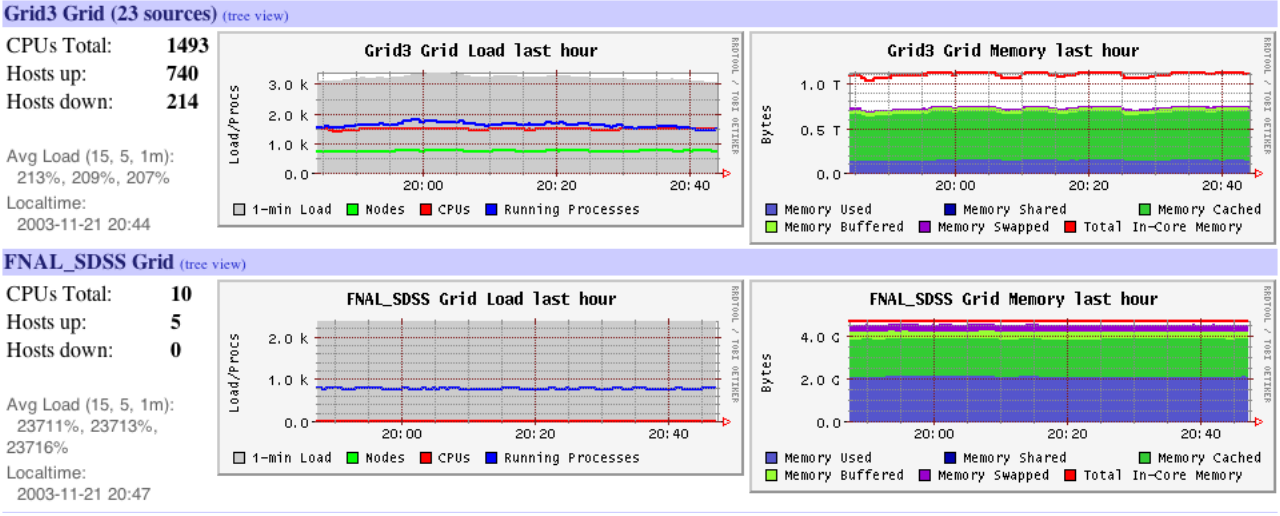
   ```
   tcp_accept_channel {
    port = 8649
    acl {
     default = "deny"
                   access {
                           ip = 127.0.0.1
                           mask = 32
                           action = "allow"
                   }
     access {
      ip = 10.0.0.0
      mask = 8
      action = "allow"
     }
     access {
   ```

```
   ip = ip-address-of-A.frontend
   mask = 32
   action = "allow"
  }
 }
}
```

Then restart gmond server on "B" frontend.

3. Take a look at the Ganglia page on "A". It should include statistics for B, and a summary or "roll-up" view of both clusters.

This screenshot is from the iVDGL Physics Grid3 project. It is a very large grid monitored by Ganglia in a similar manner as specified here.



Grid3 Grid (23 sources) (tree view)

CPUs Total: **1493**
Hosts up: **740**
Hosts down: **214**

Avg Load (15, 5, 1m):
213%, 209%, 207%
Localtime:
2003-11-21 20:44

FNAL_SDSS Grid (tree view)

CPUs Total: **10**
Hosts up: **5**
Hosts down: **0**

Avg Load (15, 5, 1m):
23711%, 23713%, 23716%
Localtime:
2003-11-21 20:47

Appendix A. Frequently Asked Questions

1. I see IP addresses not names in my Ganglia graphs. Why is this?

The DNS system in the cluster sometimes causes Ganglia to record bogus node names (usually their IP addresses). To clear this situation, restart the "gmond" and "gmetad" services on the frontend. This action may be useful later, as it will flush any dead nodes from the Ganglia output.

```
# service gmond restart
# service gmetad restart
```

This method is also useful when replacing or renaming nodes in your cluster.

2. When looking at the Ganglia page, I dont see graphs, just the error:

```
There was an error collecting ganglia data (127.0.0.1:8652): XML error: not
well-formed (invalid token) at xxx
```

This indicates a parse error in the Ganglia gmond XML output. It is generally caused by non-XML characters (& especially) in the cluster name or cluster owner fields, although any ganglia field (including node names) with these characters will cause this problem.

We hope future versions of Ganglia will correctly escape all names to make them XML safe. If you have a bad name, to edit `/etc/ganglia/gmond.conf` on the frontend node, remove the offending characters, then restart gmond.

Appendix B. Rocks Copyright

Rocks(r)
www.rocksclusters.org
version 5.2 (Chimichanga)

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C.1. Ganglia

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C.2. phpsysinfo

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Version 2, June 1991

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[This is the first released version of the library GPL. It is numbered 2 because it goes with version 2 of the ordinary GPL.]

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uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

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That’s all there is to it!

C.3. rrdtool

```
RRDTOOL - Round Robin Database Tool
A tool for fast logging of numerical data graphical display
of this data.

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