Network Management & Monitoring

Network and Server Statistics Using Cacti

Introduction

Network Monitoring Tools

➢Availability

➢Reliability

➢Performance

*Cacti monitors the performance and usage of devices.*

Introduction

- A tool to monitor, store and present network and system/server statistics

- Designed around RRDTool with a special emphasis on the graphical interface

- Almost all of Cacti's functionality can be configured via the Web.

- You can find Cacti here:
    http://www.cacti.net/

Introduction

Cacti: Uses RRDtool, PHP and stores data in MySQL. It supports the use of SNMP and graphics with MRTG.
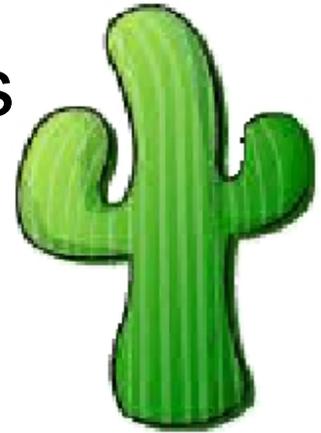
"Cacti is a complete frontend to RRDTool, it stores all of the necessary information to create graphs and populate them with data in a MySQL database. The frontend is completely PHP driven. Along with being able to maintain Graphs, Data Sources, and Round Robin Archives in a database, cacti handles the data gathering. There is also SNMP support for those used to creating traffic graphs with MRTG."

General Description

1. Cacti is written as a group of PHP scripts.
2. The key script is "poller.php", which runs every 5 minutes (by default). It resides in /usr/share/cacti/site.
3. To work poller.php needs to be in /etc/cron.d/cacti like this:

```
MAILTO=root

*/5 * * * * www-data php /usr/share/cacti/site/poller.php >/dev/null 2>/var/log/cacti/poller-error.log
```

1. Cacti uses RRDtool to create graphs for each device and data that is collected about that device. You can adjust all of this from within the Cacti web interface.
2. The RRD data is stored in a MySQL database along with descriptions of each device that is monitored.
3. The RRD files are located in /var/lib/cacti/rra.

Advantages

You can measure Availability, Load, Errors and more all with history.

– Cacti con view your router and switch interfaces and their traffic, including all error traffic as well.

– Cacti can measure drive capacity, CPU load (network h/w and servers) and much more. It can react to conditions and send notifications based on specified ranges.

Graphics

– Allows you to use all the functionality of rrdgraph to define graphics and automate how they are displayed.

– Allows you to organize information in hierarchical tree structures.

Data Sources

– Permits you to utilize all the functions of rrdcreate and rrdupdate including defining several sources of information for each RRD file.

Advantages cont.

Data Collection

- Supports SNMP including the use of *php-snmp* or *net-snmp*
- Data sources can be updated via SNMP or by defining scripts to capture required data.
- An optional component, *cactid*, implements SNMP routines in C with multi-threading. Critical for very large installations.

Templates

- You can create templates to reutilize graphics definitions, data and device sources

Cacti Plugin Architecture

- Extends Cacti functionality. Many, many plugins are available.

User Management

- You can manage users locally or via LDAP and you can assign granular levels of authorization by user or groups of users.

Disadvantages

Configuration of Interfaces is Tedious

- The first time you add an interfaces, add graphics for each interface and place these graphics correctly on a hierarchical menu requires considerable time and effort.

- It's very important that you keep your Cacti configuration up-to-date with your network. You must either assign someone to do this, or create appropriate scripts and data shares for this purpose.

- If you make a configuration error it can be tedious to correct it.

Configuration of Plugin Architecture is non-trivial

- Plugin Architecture (PA) versions are released based on specific Cacti versions.

- Installing the PA with packaged Cacti versions can be hard.

- Upgrading Cacti if you have installed the PA can be hard.

For continuous use or large installations it is likely that you will be using scripts and tools to automate the configuration of Cacti.
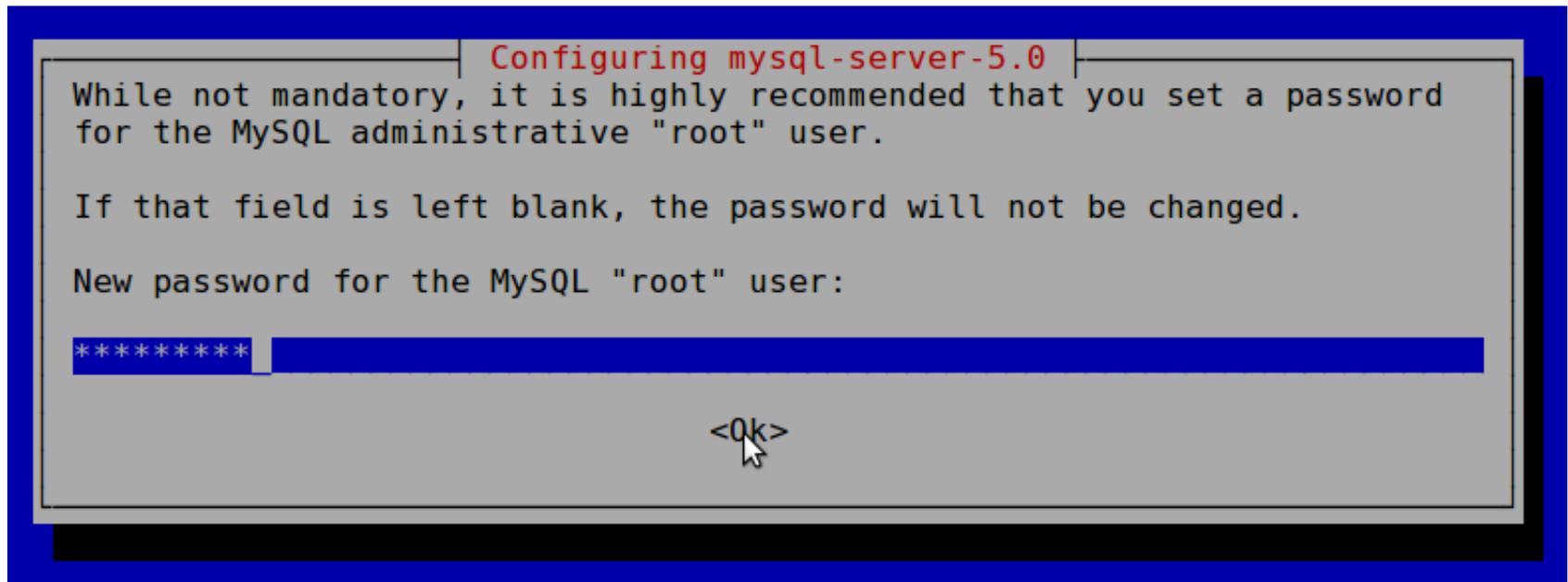
Installation: Ubuntu Server 10.04

- Available in RPM form and packages for Gentoo, Red Hat, Fedora, SuSE, FreeBSD, etc.

- It is necessary to install *cactid* separately if you wish to use this for larger installations. This is the *cacti-spine* package in Ubuntu.

- In Ubuntu/Debian… (we'd do this on our local machines:)

```
# apt-get install cacti
```

Installation: 2

We may have already done this for you. If so, you can use these slides for informational purposes. Skip to the Cacti *Web* installation steps to continue…
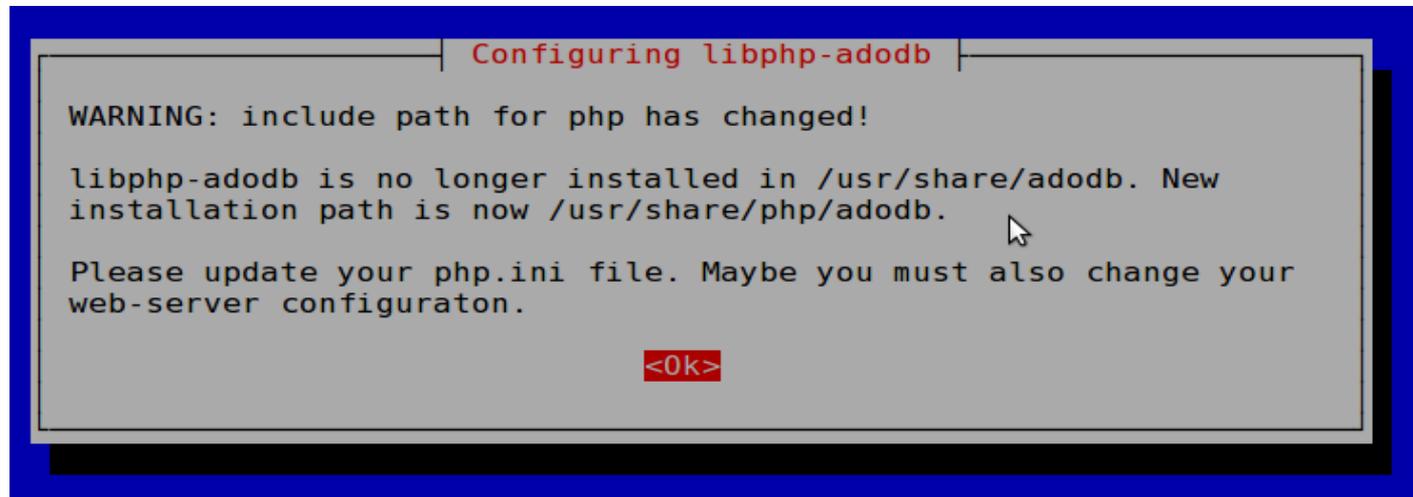


```
┌──────────────────┤ Configuring mysql-server-5.0 ├──────────────────┐
│ While not mandatory, it is highly recommended that you set a password │
│ for the MySQL administrative "root" user.                            │
│                                                                      │
│ If that field is left blank, the password will not be changed.       │
│                                                                      │
│ New password for the MySQL "root" user:                              │
│                                                                      │
│ ********                                                             │
│                                                                      │
│                            <Ok>                                      │
│                                                                      │
└──────────────────────────────────────────────────────────────────┘
```

Use the workshop password for your sysadm user

Installation: 3
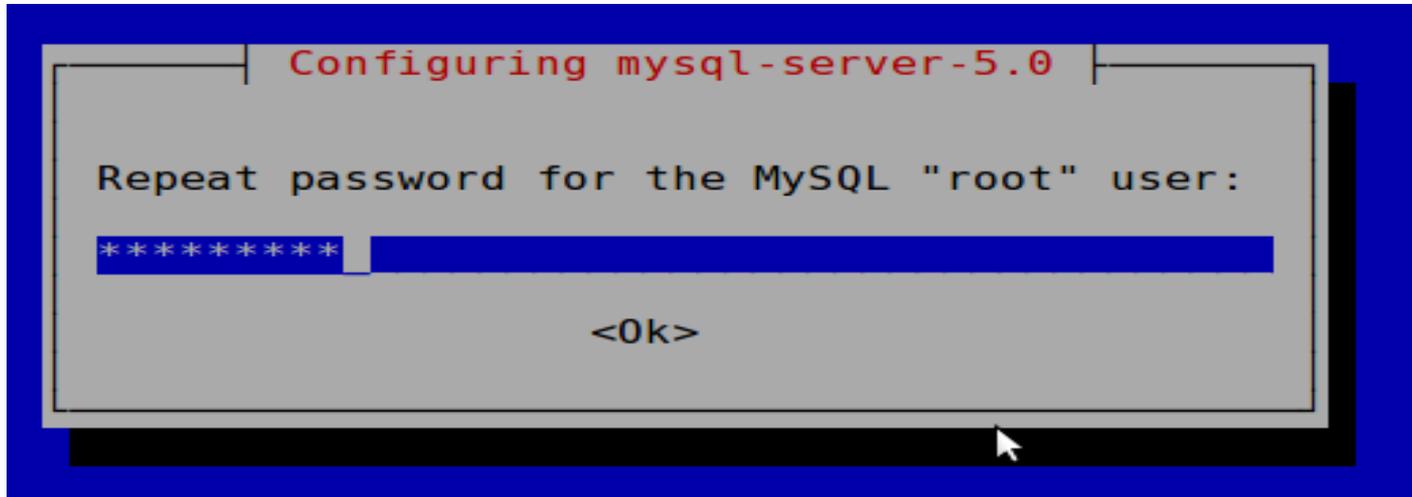
Again, use the workshop password

Installation: 4

Informational message. Is not normally an issue.

Installation: 5
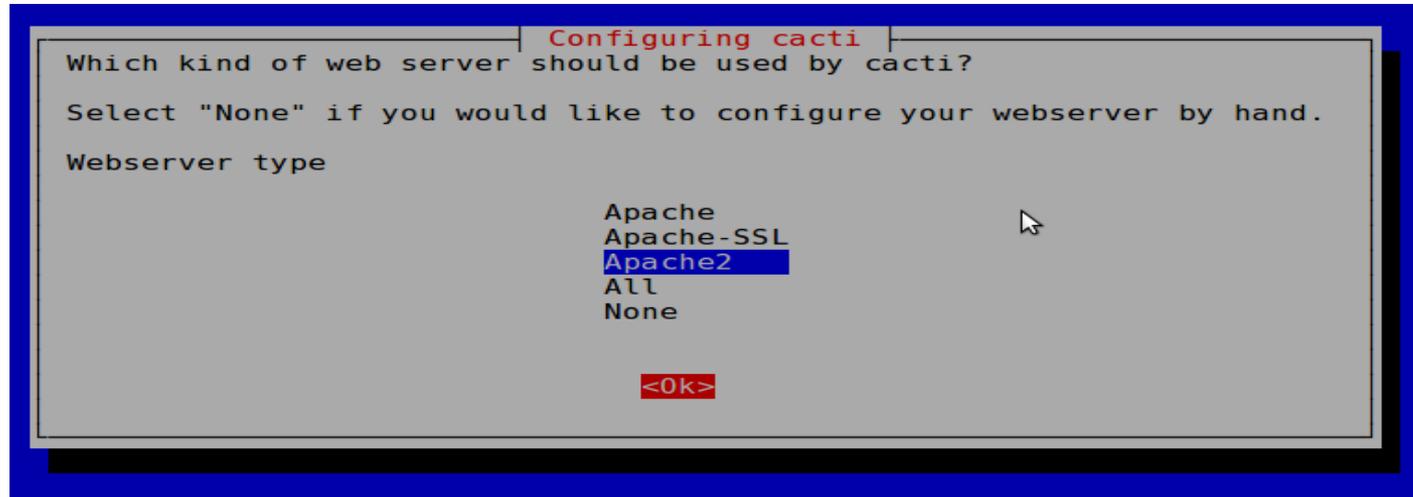
We are using Apache2. Be sure this is chosen, then highlight <Ok> and press <ENTER> to continue.
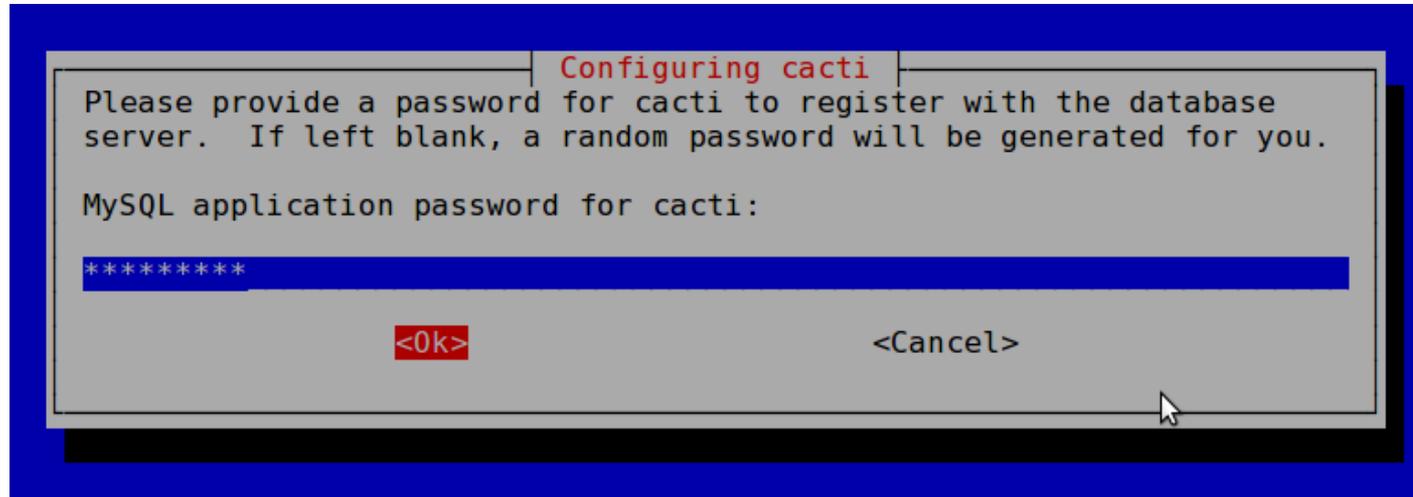
Installation: 6

Choose <Yes>. If you choose <No> you will have to manually configure your database at a later time.
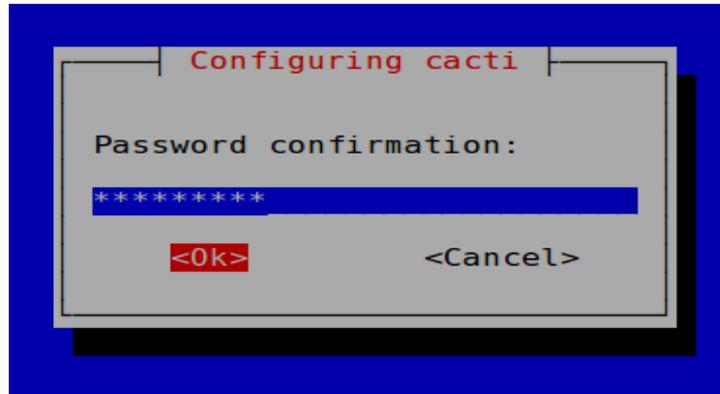
Installation: 7
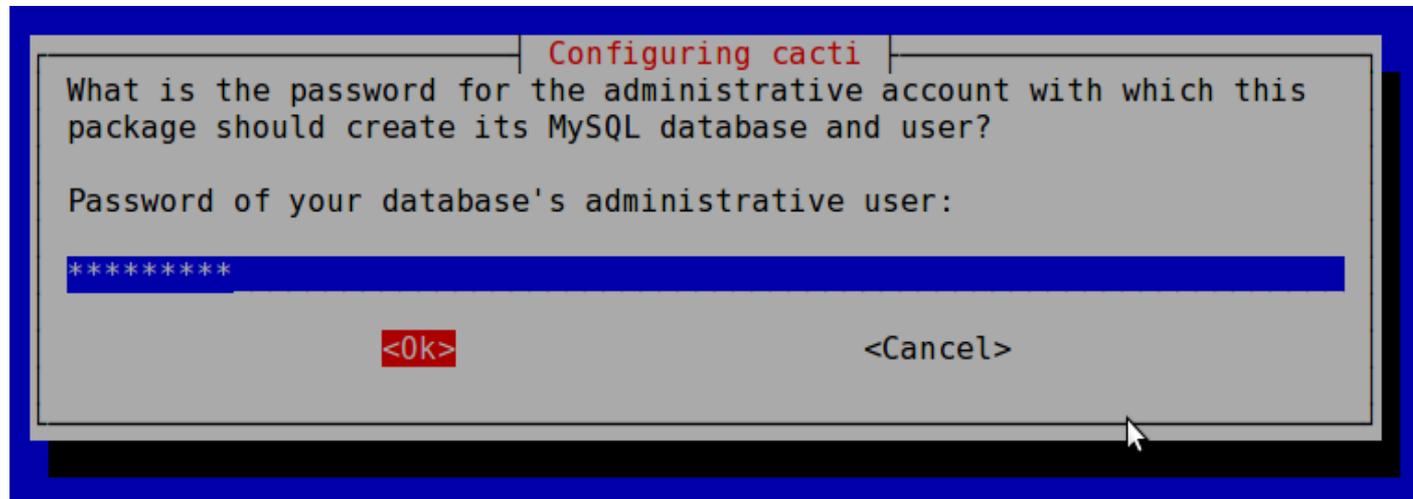
Use our workshop password.

Installation: 8

Again, use the workshop password.

Installation: 9

Finally, one last time, use the workshop password.

Cacti: Installation - Web

Now use a web browser and open the following address:

http://pcN.ws.nsrc.org/cacti

You will see the following...

Cacti: Installation - Web

Cacti Installation Guide

Thanks for taking the time to download and install cacti, the complete graphing solution for your network. Before you can start making cool graphs, there are a few pieces of data that cacti needs to know.

Make sure you have read and followed the required steps needed to install cacti before continuing. Install information can be found for Unix and Win32-based operating systems.

Also, if this is an upgrade, be sure to reading the Upgrade information file.

Cacti is licensed under the GNU General Public License, you must agree to its provisions before continuing:

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

Next >>

Press "Next >>"

Cacti: Installation - Web

Cacti Installation Guide

Please select the type of installation

New Install ▼

The following information has been determined from Cacti's configuration file. If it is not correct, please edit 'include/config.php' before continuing.

```
Database User: cacti
Database Hostname:
Database: cacti
Server Operating System Type: unix
```

Next >>

Choose "New Install" and press "Next >>" again.

Cacti: Installation - Web

Cacti Installation Guide

Make sure all of these values are correct before continuing.

[FOUND] RRDTool Binary Path: The path to the rrdtool binary.

`/usr/bin/rrdtool`

[FOUND] PHP Binary Path: The path to your PHP binary file (may require a php recompile to get this file).

`/usr/bin/php`

[FOUND] snmpwalk Binary Path: The path to your snmpwalk binary.

`/usr/bin/snmpwalk`

[FOUND] snmpget Binary Path: The path to your snmpget binary.

`/usr/bin/snmpget`

[FOUND] snmpbulkwalk Binary Path: The path to your snmpbulkwalk binary.

`/usr/bin/snmpbulkwalk`

[FOUND] snmpgetnext Binary Path: The path to your snmpgetnext binary.

`/usr/bin/snmpgetnext`

[FOUND] Cacti Log File Path: The path to your Cacti log file.

`/usr/share/cacti/site/log/cacti.log`

SNMP Utility Version: The type of SNMP you have installed. Required if you are using SNMP v2c or don't have embedded SNMP support in PHP.

`NET-SNMP 5.x`

RRDTool Utility Version: The version of RRDTool that you have installed.

`RRDTool 1.2.x`

NOTE: Once you click "Finish", all of your settings will be saved and your database will be upgraded if this is an upgrade. You can change any of the settings on this screen at a later time by going to "Cacti Settings" from within Cacti.

Finish

Your screen should look like this. If it does not ask your instructor for help.

Press "Finish"

Note!
Be sure that "RRDTool 1.2.x" (or higher) is chosen and *not* "1.0.x".
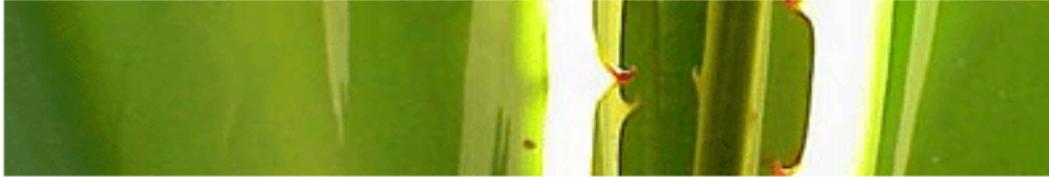
Cacti: First Time Login

First time login use:
   User Name: *admin*
   Password: *admin*

Cacti: Change Default Password

User Login

*** Forced Password Change ***

Please enter a new password for cacti:
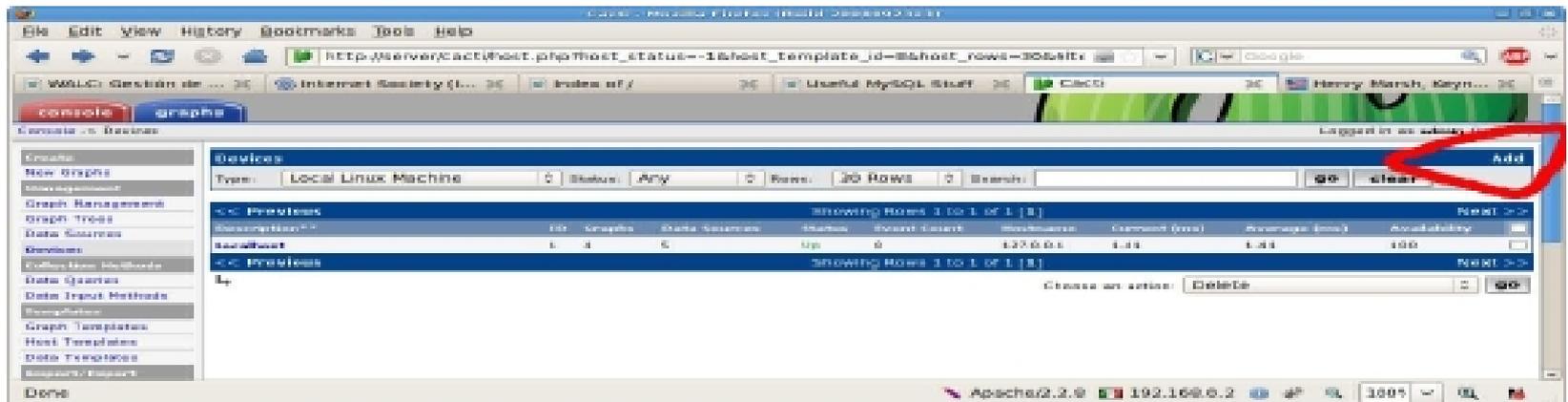
Password: [●●●●●●●●]

Confirm: [●●●●●●●●]

Save

Now you must change the *admin* password. Please use the workshop password.

Adding a Device

Management -> Devices -> Add

Specify device attributes

- – Choose a device template and this will ask you for additional information about the device.
- – You can add additional templates when, or if, you want.
- – We'll add an entry for our gateway router, gw.ws.nsrc.org*

Actual device name may be different.

Add Devices: 2

Devices [edit: Gateway Router]

General Host Options

Description
Give this host a meaningful description.
`Gateway Router`

Hostname
Fully qualified hostname or IP address for this device.
`gw.ws.nsrc.org`

Host Template
Choose what type of host, host template this is. The host template will govern what kinds of data should be gathered from this type of host.
`Cisco Router`

Disable Host
Check this box to disable all checks for this host.
☐ Disable Host

Availability/Reachability Options

Downed Device Detection
The method Cacti will use to determine if a host is available for polling.
NOTE: It is recommended that, at a minimum, SNMP always be selected.
`Ping and SNMP`
← **Menu changes after you select SNMP version below!**

Ping Method
The type of ping packet to sent.
NOTE: ICMP on Linux/UNIX requires root privileges.
`UDP Ping`

Ping Port
TCP or UDP port to attempt connection.
`23`

Ping Timeout Value
The timeout value to use for host ICMP and UDP pinging. This host SNMP timeout value applies for SNMP pings.
`400`

Ping Retry Count
After an initial failure, the number of ping retries Cacti will attempt before failing.
`1`

SNMP Options

SNMP Version
Choose the SNMP version for this device.
`Version 2`

SNMP Community
SNMP read community for this device.
`NetManage`

SNMP Port
Enter the UDP port number to use for SNMP (default is 161).
`161`

SNMP Timeout
The maximum number of milliseconds Cacti will wait for an SNMP response (does not work with php-snmp support).
`500`

Maximum OID's Per Get Request
Specified the number of OID's that can be obtained in a single SNMP Get request.
`10`

Additional Options

Notes
Enter notes to this host.

cancel   create

Add Devices: 3

- Choose SNMP version 2 for this workshop.

- For "Downed Device Detection" we recommend either using *Ping and SNMP*, or just *Ping*.

- At your own location you can use SNMP version 3 if your devices support this.

- SNMP access is a security issue:

  - Version 2 is not encrypted

  - Watch out for globally readable "public" communities

  - Be careful about who can access r/w communities.

  - Replace "xxxxxxx" with your local public r/o string

Add Devices: 5

For a router you may see *a lot* of potential network interfaces that are detected by SNMP.

Your decision is to create graphs for all of these are not. Generally the answer is, "Yes" – Why?

Create Graphics

- Chose the "Create graphs for this host"
- Under Graph Templates generally check the top box that chooses *all* the available graphs to be displayed.
- Press Create.
- You can change the default colors, but the predefined definitions generally work well.

Create Graphics: 2

Save Successful.

Gateway Router (gw.ws.nsrc.org)

SNMP Information
System: Cisco IOS Software, 1841 Software (C1841-ADVIPSERVICESK9-M), Version
www.cisco.com/techsupport Copyright (c) 1986-2006 by Cisco Systems,
Inc. Compiled Tue 28-Feb-06 21:03 by alnguyen
Uptime: 24881862 (2 days, 21 hours, 6 minutes)
Hostname: sanog17-2.learn.ac.lk
Location:
Contact:

Ping Results
UDP Ping Success (1.19 ms)

* **Create Graphs for this Host**
* **Data Source List**
* **Graph List**

Devices [edit: Gateway Router]	
General Host Options	
Description Give this host a meaningful description.	Gateway Router
Hostname Fully qualified hostname or IP address for this device.	gw.ws.nsrc.org
Host Template Choose what type of host, host template this is. The host template will govern what kinds of data should be gathered from this type of host.	Cisco Router ▲▼

Create Graphics: 3

Gateway Router (gw.ws.nsrc.org) Cisco Router

Host: Gateway Router (gw.ws.nsrc.org) | Graph Types: All

Graph Templates

Graph Template Name	☑
Create: Cisco - CPU Usage	☑

Create: (Select a graph type to create)

Data Query [SNMP - Interface Statistics]

Index	Status	Description	Name (IF-MIB)	Alias (IF-MIB)	Type	Speed	Hardware Address	IP Address	☑
1	Up	FastEthernet0/0	Fa0/0		ethernetCsmacd(6)	100000000	00:24:97:5C:C0:D2	10.10.0.254	☑
2	Up	FastEthernet0/1	Fa0/1	connection to LEARN VPLS	ethernetCsmacd(6)	100000000	00:24:97:5C:C0:D3	192.248.5.1	☑
3	Up	Null0	Nu0		other(1)	4294967295			☑
4	Up	Tunnel0	Tu0		tunnel(131)	9000			☑
5	Up	Tunnel1	Tu1		tunnel(131)	9000			☑
6	Up	FastEthernet0/0.254	Fa0/0.254		l2vlan(135)	100000000	00:24:97:5C:C0:D2	10.10.254.254	☑

↳ Select a graph type: In/Out Bits

cancel create

Create Graphics: 4

You'll see this screen later when you are creating graphics for hosts vs. routers

View the Graphics

- Place the new device in its proper location in your tree hierarchy.

- Building your display hierarchy is your decision. It might make sense to try drawing this out on paper first.

  - Under Management → Graph Trees select the Default Tree hierarchy (or, create one of your own).

Graphics Tree

First, press "Add" if you want a new graphing tree:

Graph Trees	Add
Name	
Default Tree	✖

Second, name your tree, choose the sorting order (the author likes Natural Sorting and press "create":

Graph Trees [new]

Name A useful name for this graph tree.	NetManage Routers
Sorting Type Choose how items in this tree will be sorted.	Numeric Ordering

cancel   create

Graphics Tree

Third, add devices to your new tree:

Save Successful.

Graph Trees [edit: NetManage Routers]

Name A useful name for this graph tree.	NetManage Routers
Sorting Type Choose how items in this tree will be sorted.	Natural Ordering ▲▼

Tree Items   Add

`++` `--`

Item	Value
No Graph Tree Items	

cancel   save

Once you click "Add" you can add "Headers" (separators), graphs or hosts. Now we'll add Hosts to our newly created graph tree:

Tree Items

Parent Item Choose the parent for this header/graph.	[root] ▲▼
Tree Item Type Choose what type of tree item this is.	Host ▲▼

Tree Item Value

Host Choose a host here to add it to the tree.	Gateway Router (gw.ws.nsrc.org) ▲▼
Graph Grouping Style Choose how graphs are grouped when drawn for this particular host on the tree.	Graph Template ▲▼

cancel   create

Graphics Tree with 2 Devices
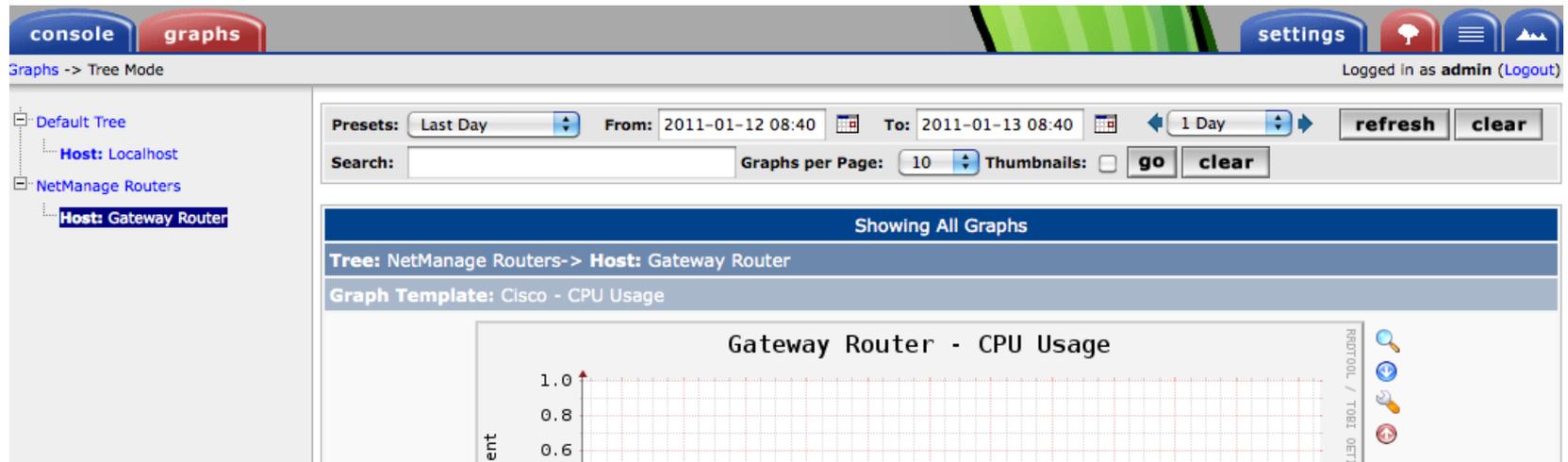
- Our graphics tree *just* after the first two devices were added.
- So far, no graphics are displayed – the first graphics can take up to 5 minutes to display.
- Cacti graphs are stored on disk and updated using RRDTool via the poller.php script, which, by default, is run every five minutes using `cron`.
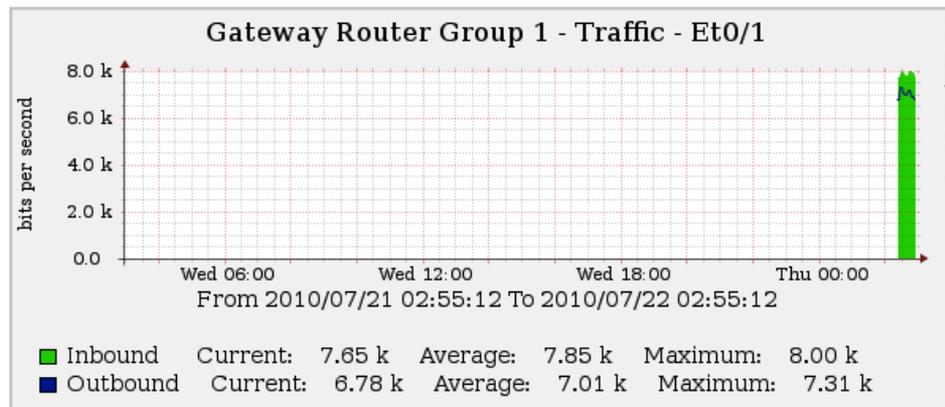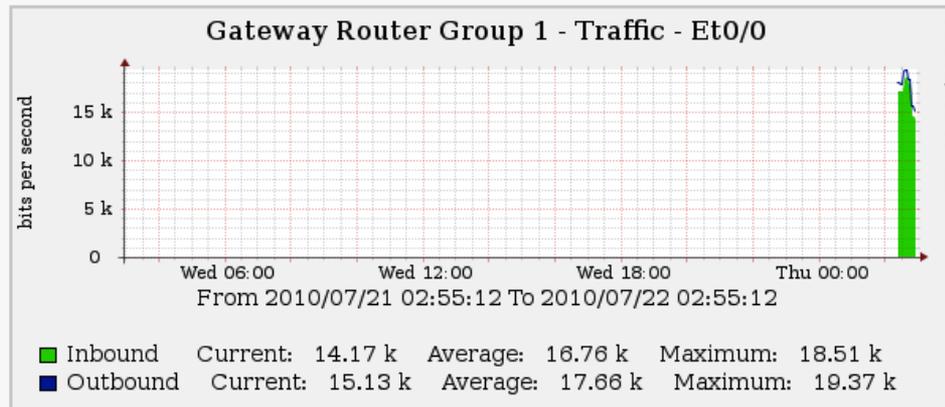
Initial Graphs

Over time you'll see tendencies

Next Steps

- You can extend cacti by installing the Cacti Plugin Architecture:

  http://cactiusers.org/wiki/PluginArchitectureInstall

- There are a number of popular Cacti plugins, such as:
  - Settings
  - thold
  - PHP Weathermap
  - Syslog-NG

- A good place to start is http://cactiusers.net/ and Google.

- To send email to RT from Cacti via rt-mailgate you can use the Cacti "settings" plugin:

  http://docs.cacti.net/plugin:settings

Conclusions

- Cacti is very flexible due to its use of templates.

- Once you understand the concepts behind RRDTool, then how Cacti works should be (more or less) intuitive.

- The visualization hierarchy of devices helps to organize and discover new devices quickly.

- It is not easy to do a rediscover of devices.

- To add lots of devices requires lots of time and effort. Software such as Netdot, Netdisco, IPPlan, TIPP can help – as well as local scripts that update the Cacti back-end MySQL database directly.

Exercises

Your Mission...

- Create device entries in Cacti for every router
- Create device entries in Cacti for each server
- Create device entries for any additional network equipment in the classroom. Use SNMP for all items.
- Create graphs for each item.
- Place PCs, Routers, Switches in a tree hierarchy of your design.

This is tedious and you may wish to only create entries for a subset of items in the classroom. Use the Network Diagram on the class wiki as a reference.

References

- Cacti Web Site:
  http://www.cacti.net/
- Cacti Discussion Group:
  http://forums.cacti.net/