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.”
MRTG: Multi Router Traffic Grapher

- Tool to monitor traffic load on network links
- Generates HTML pages with PNG images
- Almost live visual representation of traffic

MRTG is ubiquitous...

- Uses simple SNMP queries on a regular interval to generate graphs.
General RRDtool

- Round Robin Database for time series data storage
- Command line based
- From the author of MRTG
- Made to be faster and more flexible
- Includes CGI and Graphing tools, plus APIs
- Solves the Historical Trends and Simple Interface problems as well as storage issues

Find RRDtool here: http://oss.oetiker.ch/rrdtool/
RRDtool Database Format

Recent data stored once every 5 minutes for the past 2 hours (1:24)

Old data averaged to one entry per day for the last 365 days (288:365)

--step 300 (5 minute input step size)

RRA 1:24
RRA 6:10
RRA 288:365

Medium length data averaged to one entry per half hour for the last 5 hours (6:10)
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:
   
   ```bash
   MAILTO=root
   */5 * * * * www-data php /usr/share/cacti/site/poller.php >/dev/null 2>/var/log/cacti/poller-error.log
   ```
4. 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.
5. The RRD files are located in /var/lib/cacti/rra when cacti is installed from packages.
Advantages

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

– Cacti can 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.

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
- Configuration of Plugin Architecture is non-trivial
- Upgrading versions can be complex

Advice:

For continuous use or large installations it is likely that you will be using scripts and tools to automate the configuration of Cacti.
Steps to add and monitor devices

Before we install Cacti we demonstrate how to use the interface to add and monitor some devices…
Adding a Device

Management -> Devices -> Add

Specify device attributes

– We’ll add an entry for our gateway router, 
gw.ws.nsrec.org*

*Actual device name may be different.
Choose SNMP version 2 for this workshop.
For “Downed Device Detection” we recommend either using Ping and SNMP, or just Ping.
Use “NetManage” for the “SNMP Community” string.

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 “xxxxxxxx” with your local public r/o string
Add Devices: 4

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

<table>
<thead>
<tr>
<th>Data Query Name</th>
<th>Debugging</th>
<th>Re-Index Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Kismet - Wireless Bridge Statistics</td>
<td>(Verbose Query)</td>
<td>Uptime Goes Backwards</td>
<td>Success [0 Items, 0 Rows]</td>
</tr>
<tr>
<td>2) SNMP - Interface Statistics</td>
<td>(Verbose Query)</td>
<td>Uptime Goes Backwards</td>
<td>Success [59 Items, 7 Rows]</td>
</tr>
</tbody>
</table>

Your decision is to create graphs for all of these or 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.nsrec.org)**

**SNMP Information**
- System: Cisco IOS Software, 1841 Software (C1841-ADVIPSERVICESK9-M), Version 12.4(9)8X1+15865, Copyright (c) 1986-2004 by Cisco Systems, Inc. Compiled Tue 28-Feb-06 21:03 by alnguyen
- Uptime: 24891862 (2 days, 21 hours, 6 minutes)
- Hostname: sancgi7-2.learn.ac.uk
- Location:
- Contact:

**Ping Results**
- UDP Ping Success (1.19 ms)

**Devices [edit: Gateway Router]**

<table>
<thead>
<tr>
<th>General Host Options</th>
<th>Gateway Router</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Give this host a meaningful description.</td>
</tr>
<tr>
<td><strong>Hostname</strong></td>
<td>Fully qualified hostname or IP address for this device.</td>
</tr>
<tr>
<td><strong>Host Template</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

*Create Graphs for this Host*
*Data Source List*
*Graph List*
You’ll see this screen later when you are creating graphics for hosts vs. routers
• 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).
First, press “Add” if you want a new graphing tree:

Second, name your tree, choose the sorting order (the author likes Natural Sorting and press “create”):
Third, add devices to your new tree:

Once you click “Add” you can add “Headers” (separators), graphs or hosts. Now we'll add Hosts to our newly created graph tree:
• 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 RRDTtool via the poller.php script, which, by default, is run every five minutes using *cron*. 
Initial Graphs

Gateway Router Group 1 - Traffic - Et0/0

- Inbound: Current 14.17 k, Average 18.78 k, Maximum 18.51 k
- Outbound: Current 15.13 k, Average 17.66 k, Maximum 18.37 k

Gateway Router Group 1 - Traffic - Et0/1

- Inbound: Current 7.85 k, Average 7.85 k, Maximum 8.00 k
- Outbound: Current 6.78 k, Average 7.01 k, Maximum 7.31 k
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

• 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.
References

- Cacti Web Site: http://www.cacti.net/
- Cacti Discussion Group: http://forums.cacti.net/
- Cacti Users – Plugin Architecture Home http://cactiusers.org/
- Instructions to Install Cacti from Source and configure the thold and settings plugins are available on the class wiki
Before we install Cacti we are going to do a live demonstration of how to use the Cacti interface to add and monitor a few devices.
Cacti Installation and Configuration
Exercises

Your Mission...

– Install Cacti
– Create device entry for your local router
– Create device entries for your local servers
– Create graphs for each item
– Place PCs, Routers, Switches in a tree hierarchy of your design.

If you have time…

– Create device entries for any additional network equipment in the classroom. Use SNMP for all items.

Use the Network Diagram on the class wiki as a reference.
– 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:)

```bash
# 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…

Use the workshop password for your sysadm user
Again, use the workshop password
Installation: 4

Informational message. Is not normally an issue.
We are using Apache2. Be sure this is chosen then highlight <Ok> and press <ENTER> to continue.
Choose <Yes>
Use our workshop password.

Do no use a different password. You can break later exercises.
Again, use the workshop password.
Finally, one last time, use the workshop password.
Now use a web browser and open the following address:

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

You will see the following...
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.

Press “Next >>”
Choose “New Install” and press “Next >>” again.
Your screen should look like this. If it does not ask your instructor for help.

Press “Finish”

Note!
Be sure that “RRDTool 1.3.x” (or higher) is chosen and not “1.0.x”.
First time login use:
  User Name: admin
  Password: admin
Now you must change the admin password. Please use the workshop password.