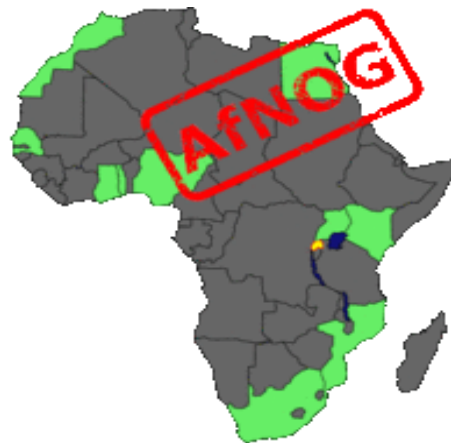


Graphing and statistics with Cacti

AfNOG 11, Kigali/Rwanda



A little bit of history

- **MRTG**: Monitor interfaces on routers/switches and generate graphs for interfaces/load/etc. Anything discoverable by SNMP. Makes daily/weekly/monthly/yearly graphs and simple HTML files. Not very scalable and simple
- **RRDtool**: new database format which is much more scalable, "Round Robin Database", graphing on demand. However no more direct integration with SNMP or building webpages included. Need your own toolset - harder to administrate
- **Cacti**: complete frontend to RRDtool, manage data sources and graphs, gather data (SNMP etc.)
-

What is cacti / Features

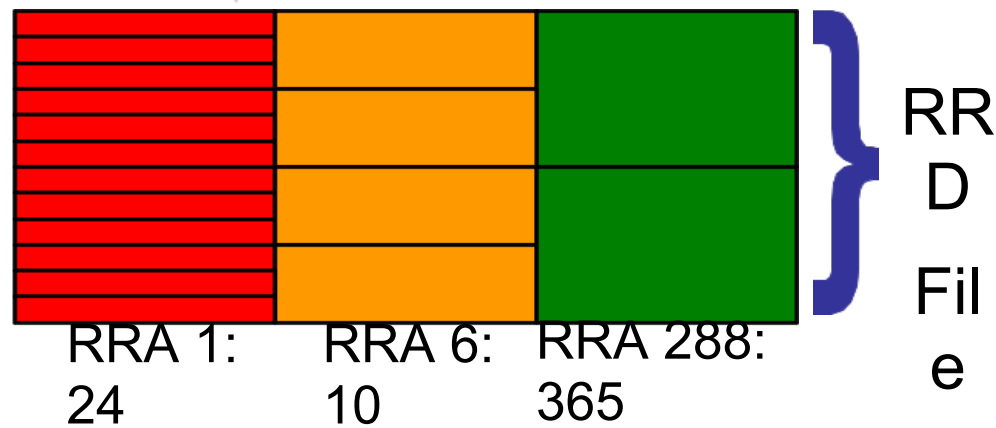
- You can **manage data sources** - can be routers (interface/load/memory/etc.), PCs (disk space etc.) or anything which you can get using a script. Cacti puts the data in RRD files, and the administrative data in a MySQL database
- You can **graph** these data sources in several ways - select colors and graphing styles as well as consolidation options using the GUI and arrange them in different pages. You can also generate custom graphs on the fly (e.g. what was my traffic on Thursday 3 weeks ago)
- You can give different **user rights** and scale data sources using **templates**
- Extendable using **plugins**

Round Robin Databases

- Data is kept detailed for the short term, but aggregated longer term.
- Details are definable (e.g. you might want to keep a few weeks of very detailed history if you have the space) and sums should always match up (accounting)

Recent data stored once every 5 minutes for the past 2 hours

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



--step 300
(5 minute input step size)

Medium length data averaged to one entry per half hour for the last 5 hours (6:10)

How does cacti work

- Group of PHP scripts connected to a MySQL database
- poller.php script runs every 5 minutes (or more often) and collects data
- Uses RRDtool to store data and build graphs
- Use the web interface to select which data to pull and which graphs to generate (make trees of graphs)
- Data which devices are monitored in which RRD files, which graphs are selected is stored via MySQL
- Mostly used to measure traffic/errors/packets/CPU
- Populate database using scripts to scale

Practice

- We'll get started right away - feel free to follow along, or just watch and take your time for the exercises later
- Installation of the package is done on the workstation - however it's easy:
apt-get install cacti
Then follow the instructions. If you install MySQL now, you need to choose a password for it, and a password for the cacti db.
- To start now go to *http://localhost/cacti* - you should see something like this:

Cacti - Installation

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 >>

- Click Next >>

Cacti - Installation

Cacti Installation Guide

Please select the type of installation

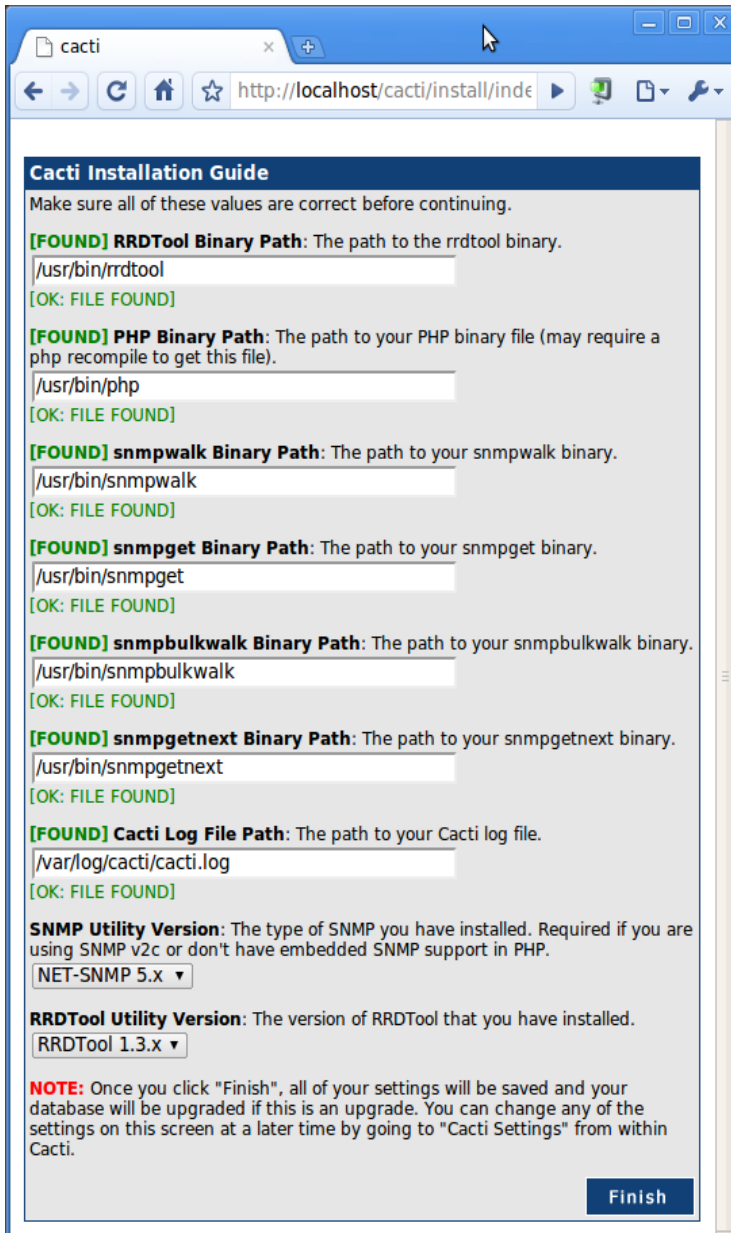
The following information has been determined from Cacti's configuration file. If it is not correct, please edit 'include/config.php' before continuing.

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

[Next >>](#)

Select New Install and click Next >> again

Cacti - Installation



The screenshot shows a web browser window with the address bar displaying "http://localhost/cacti/install/index.php". The page content is titled "Cacti Installation Guide" and includes the following sections:

- RRDTool Binary Path:** The path to the rrdtool binary. Value: `/usr/bin/rrdtool`. Status: [OK: FILE FOUND]
- PHP Binary Path:** The path to your PHP binary file (may require a php recompile to get this file). Value: `/usr/bin/php`. Status: [OK: FILE FOUND]
- snmpwalk Binary Path:** The path to your snmpwalk binary. Value: `/usr/bin/snmpwalk`. Status: [OK: FILE FOUND]
- snmpget Binary Path:** The path to your snmpget binary. Value: `/usr/bin/snmpget`. Status: [OK: FILE FOUND]
- snmpbulkwalk Binary Path:** The path to your snmpbulkwalk binary. Value: `/usr/bin/snmpbulkwalk`. Status: [OK: FILE FOUND]
- snmpgetnext Binary Path:** The path to your snmpgetnext binary. Value: `/usr/bin/snmpgetnext`. Status: [OK: FILE FOUND]
- Cacti Log File Path:** The path to your Cacti log file. Value: `/var/log/cacti/cacti.log`. Status: [OK: FILE FOUND]
- 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. Value: `NET-SNMP 5.x`
- RRDTool Utility Version:** The version of RRDTool that you have installed. Value: `RRDTool 1.3.x`

A **NOTE** at the bottom states: "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." A "Finish" button is located at the bottom right of the form.

- Your screen should look like this (all required packages have been automatically found) - if not ask us for help
- Make sure RRDTool 1.3.x is selected
- Click Finish

Cacti: first logon



User Login

Please enter your Cacti user name and password below:

User Name:

Password:

Login

Login with:

User Name: admin

Password: admin

You will be asked to change these

Cacti: password change



User Login

***** Forced Password Change *****

Please enter a new password for cacti:

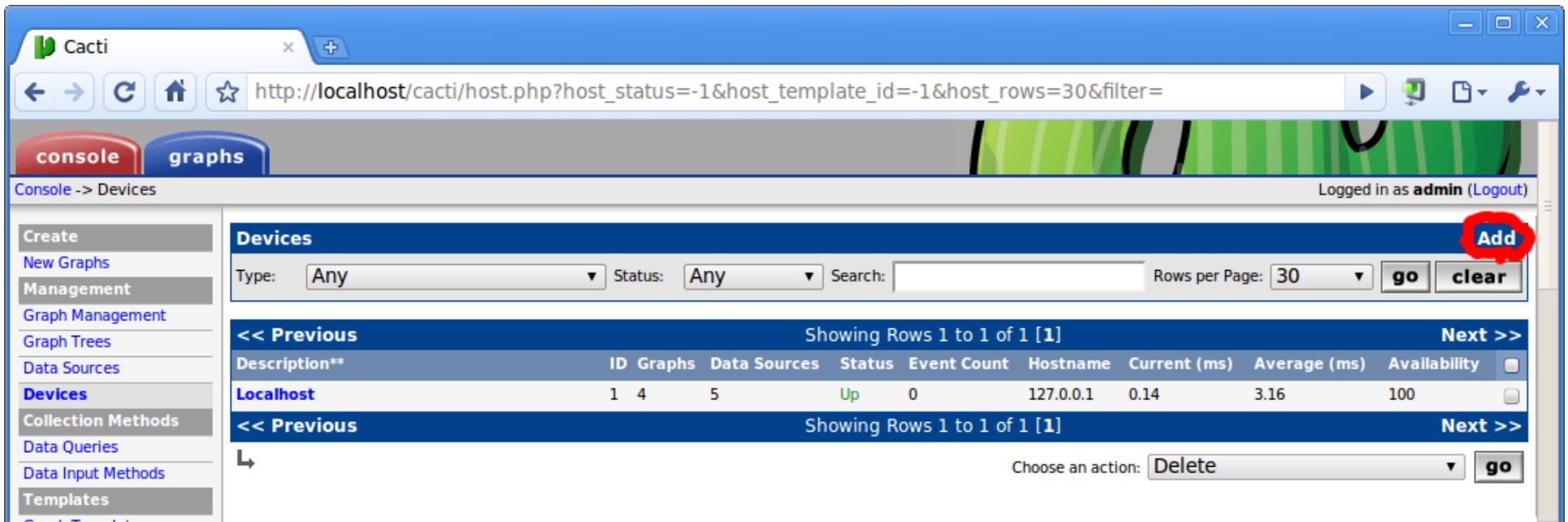
Password:

Confirm:

Please use the workshop password as the new password

Add first router

- Click **Management >> Devices >> Add**
- Select "**Cisco router**" as a Host template
- Add the Gateway to the Internet with IP 196.200.218.254
- Select SNMP version 2 and input password as community
- Click Create



The screenshot shows the Cacti web interface. The browser address bar displays the URL: `http://localhost/cacti/host.php?host_status=-1&host_template_id=-1&host_rows=30&filter=`. The interface includes a navigation menu on the left with options like 'Create', 'Management', 'Devices', and 'Templates'. The main content area is titled 'Devices' and features a search bar with filters for 'Type: Any' and 'Status: Any'. A table lists the existing device 'localhost' with details such as ID, Graphs, Data Sources, Status (Up), Event Count, Hostname (127.0.0.1), Current (ms) (0.14), Average (ms) (3.16), and Availability (100). A red circle highlights the 'Add' button in the top right corner of the 'Devices' section. Below the table, there is an action dropdown menu set to 'Delete'.

Description**	ID	Graphs	Data Sources	Status	Event Count	Hostname	Current (ms)	Average (ms)	Availability
localhost	1	4	5	Up	0	127.0.0.1	0.14	3.16	100

Add first router - 2

Cacti

http://localhost/cacti/host.php?action=edit&host_template_id=-1&host_status=-1

console graphs

Console -> Devices -> (Edit) Logged in as admin (Logout)

Devices [new]

General Host Options

Description
Give this host a meaningful description.

Hostname
Fully qualified hostname or IP address for this device.

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.

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

Ping Retry Count
The number of times Cacti will attempt to ping a host before failing.

SNMP Options

SNMP Version
Choose the SNMP version for this device.

SNMP Community
SNMP read community for this device.

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

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

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

Additional Options

Notes
Enter notes to this host.

Add first router - 3

- You should get a success and see some basic system information at the top
- On the bottom it should have added "**SNMP interface statistics**" as an associated graph templates
- Click "Create Graphs for this Host"

Add first router - 4

Save Successful.

backbone-gw (196.200.218.1)

SNMP Information
System: Cisco Internetwork Operating System Software IOS (tm) 3600 Software (C3640-15-M), Version 12.2(7a), RELEASE SOFTWARE (fc2) Copyright (c) 1986-2002 by Cisco Systems, Inc. Compiled Wed 20-Feb-02 21:58 by pwade
Uptime: 4270058 (0 days, 11 hours, 51 minutes)
Hostname: afnog1
Location:
Contact:

Devices [edit: backbone-gw]

General Host Options

Description
Give this host a meaningful description. backbone-gw

Hostname
Fully qualified hostname or IP address for this device. 196.200.218.1

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. SNMP
NOTE: It is recommended that, at a minimum, SNMP always be selected.

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

Ping Retry Count
The number of times Cacti will attempt to ping a host before failing. 1

SNMP Options

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

SNMP Community
SNMP read community for this device. afnog

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.

Associated Graph Templates

Graph Template Name	Status
1) Cisco - CPU Usage	Not Being Graphed

Add Graph Template: Cisco - CPU Usage

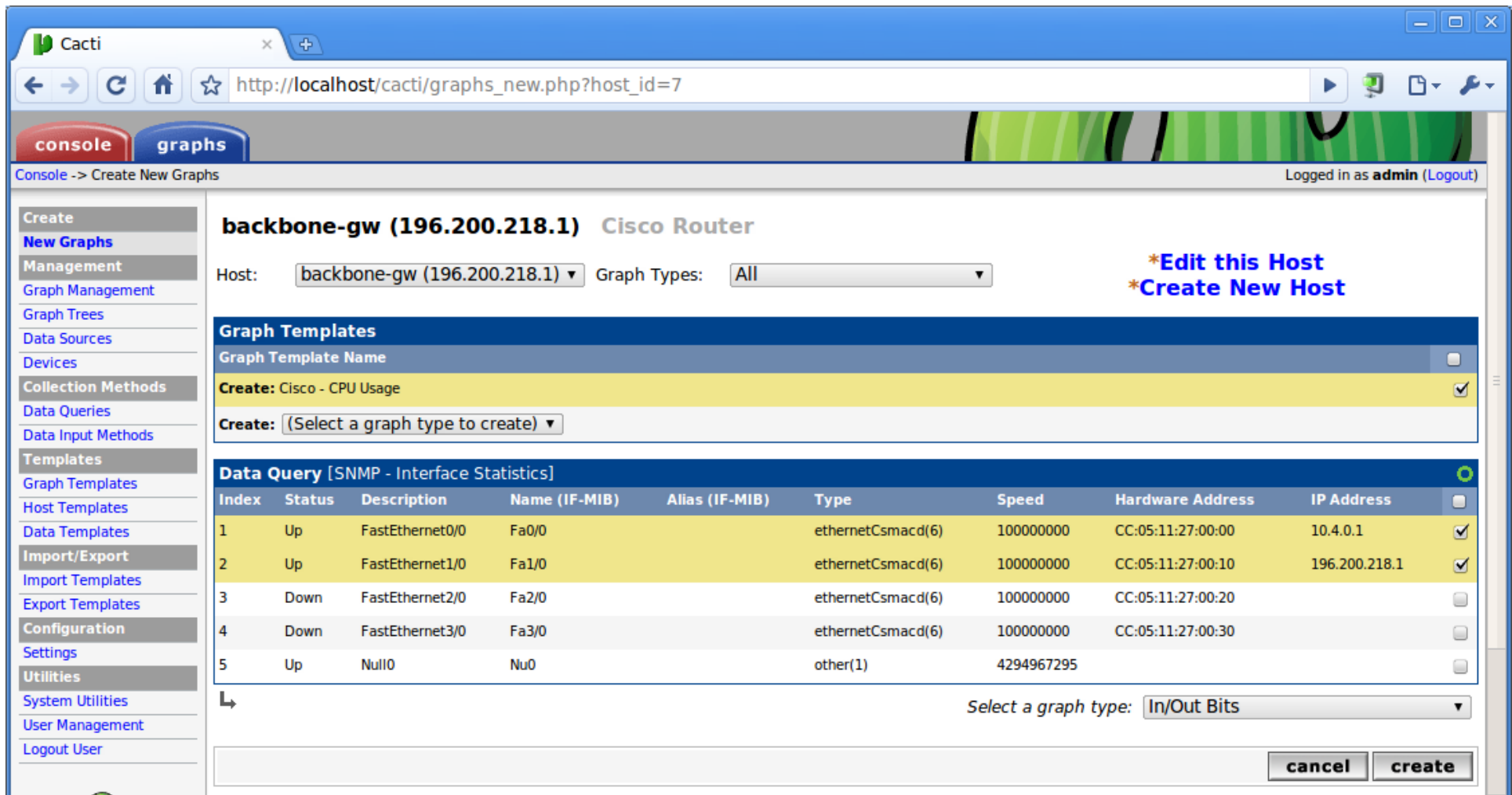
Associated Data Queries

Data Query Name	Debugging	Re-Index Method	Status
1) SNMP - Interface Statistics	(Verbose Query)	Uptime Goes Backwards	Success [42 Items, 5 Rows]

Add Data Query: Karlnet - Wireless Bridge Statistics

Add graphs

- Select CPU usage and all "Up" interfaces, select In/Out bits and click create. Click create again on the next page



The screenshot shows the Cacti web interface for creating a new graph. The browser address bar shows `http://localhost/cacti/graphs_new.php?host_id=7`. The page title is "Console -> Create New Graphs" and the user is logged in as "admin".

The main content area is titled "backbone-gw (196.200.218.1) Cisco Router". It includes a "Host" dropdown menu set to "backbone-gw (196.200.218.1)" and a "Graph Types" dropdown menu set to "All". There are links for "*Edit this Host" and "*Create New Host".

The "Graph Templates" section shows a table with the following data:

Graph Template Name	
Create: Cisco - CPU Usage	<input checked="" type="checkbox"/>
Create: (Select a graph type to create)	

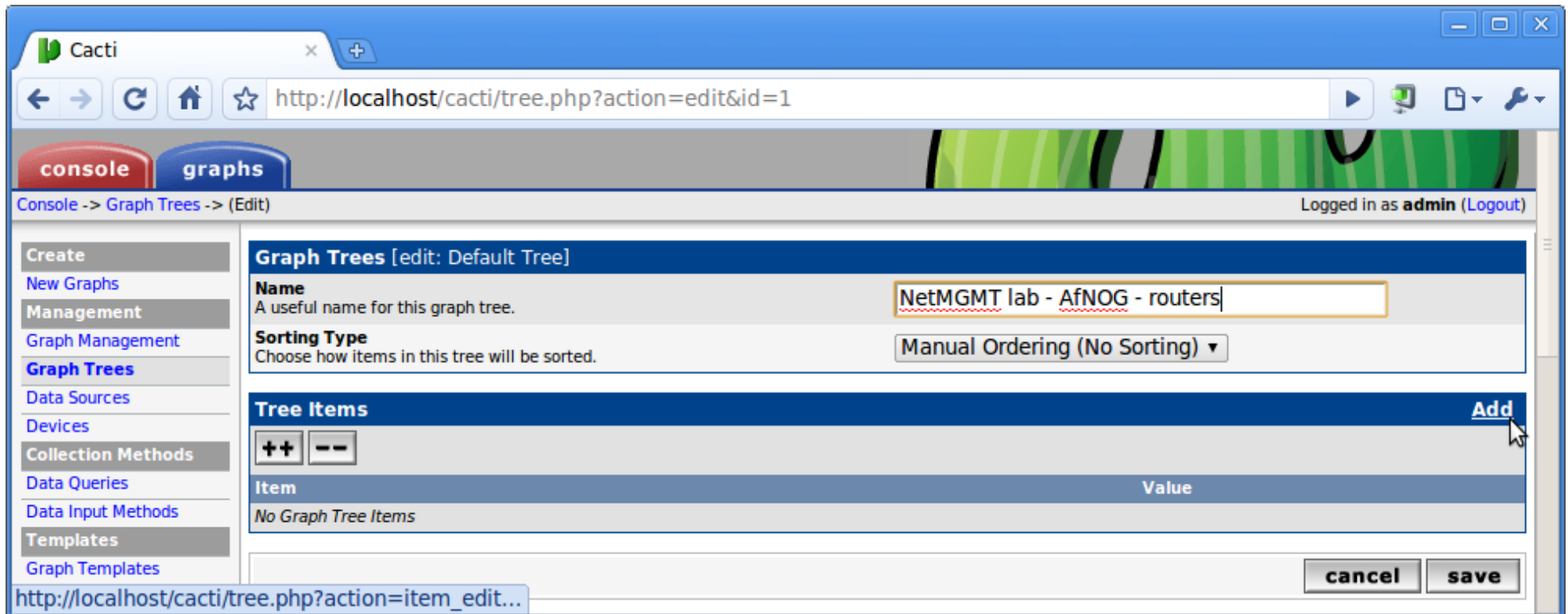
The "Data Query [SNMP - Interface Statistics]" section shows a table with the following data:

Index	Status	Description	Name (IF-MIB)	Alias (IF-MIB)	Type	Speed	Hardware Address	IP Address	
1	Up	FastEthernet0/0	Fa0/0		ethernetCsmacd(6)	100000000	CC:05:11:27:00:00	10.4.0.1	<input checked="" type="checkbox"/>
2	Up	FastEthernet1/0	Fa1/0		ethernetCsmacd(6)	100000000	CC:05:11:27:00:10	196.200.218.1	<input checked="" type="checkbox"/>
3	Down	FastEthernet2/0	Fa2/0		ethernetCsmacd(6)	100000000	CC:05:11:27:00:20		<input type="checkbox"/>
4	Down	FastEthernet3/0	Fa3/0		ethernetCsmacd(6)	100000000	CC:05:11:27:00:30		<input type="checkbox"/>
5	Up	Null0	Nu0		other(1)	4294967295			<input type="checkbox"/>

At the bottom, there is a "Select a graph type:" dropdown menu set to "In/Out Bits" and "cancel" and "create" buttons.

Add graphs to trees

- You need to add the graphs to a "tree" to be visible.
- Click **Management -> Graph Trees** and then Default Tree.
- Rename the default tree, save. Open it again and click **Add** next to Tree Items

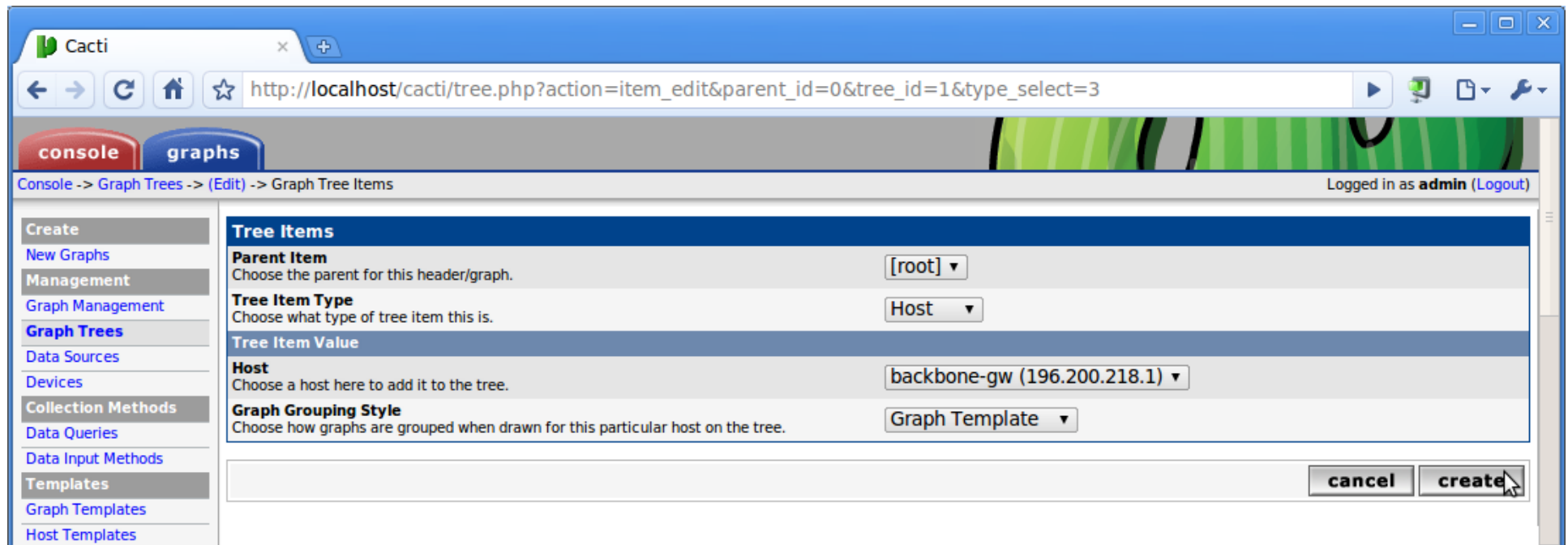


The screenshot shows the Cacti web interface. The browser address bar displays `http://localhost/cacti/tree.php?action=edit&id=1`. The page title is "Graph Trees [edit: Default Tree]". The "Name" field is filled with "NetMGMT lab - AfNOG - routers". The "Sorting Type" dropdown is set to "Manual Ordering (No Sorting)". Below the form, there is a section for "Tree Items" with an "Add" button. The "Item" column is empty, and the "Value" column is also empty. The "cancel" and "save" buttons are at the bottom right.

Item	Value
No Graph Tree Items	

Add graphs to trees - 2

- Select Host to graph all graphs from the newly created router in one group
- (or select graph to select a single graph to make nice overview pages)



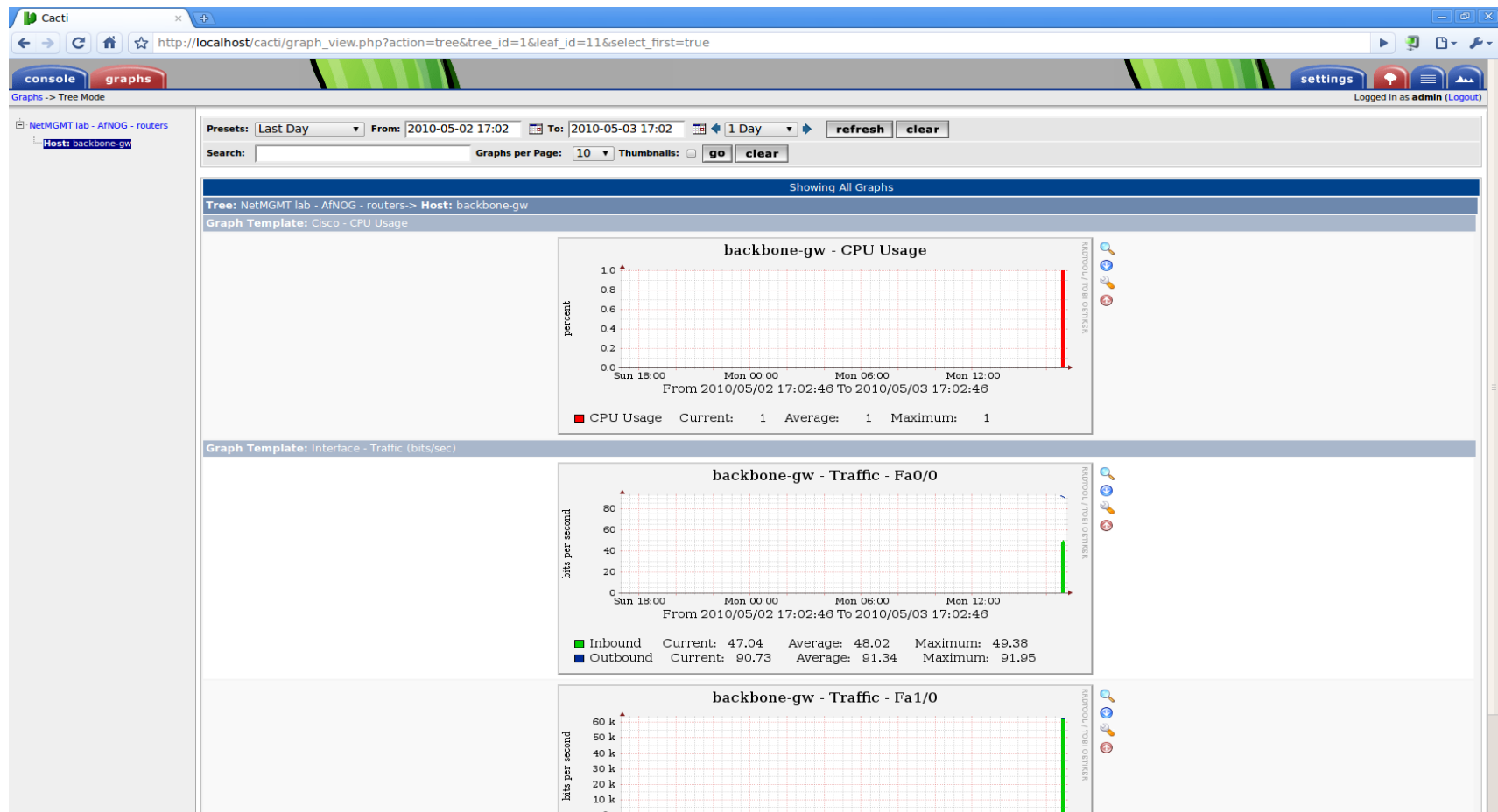
The screenshot shows the Cacti web interface in a browser window. The address bar displays the URL: `http://localhost/cacti/tree.php?action=item_edit&parent_id=0&tree_id=1&type_select=3`. The interface has a navigation bar with 'console' and 'graphs' tabs. Below the navigation bar, the breadcrumb path is 'Console -> Graph Trees -> (Edit) -> Graph Tree Items' and the user is logged in as 'admin'. A left sidebar contains a menu with options like 'New Graphs', 'Graph Management', 'Graph Trees', 'Data Sources', 'Devices', 'Collection Methods', 'Data Queries', 'Data Input Methods', 'Templates', 'Graph Templates', and 'Host Templates'. The main content area is titled 'Tree Items' and contains the following configuration fields:

- Parent Item:** Choose the parent for this header/graph. Value: [root]
- Tree Item Type:** Choose what type of tree item this is. Value: Host
- Tree Item Value:**
 - Host:** Choose a host here to add it to the tree. Value: backbone-gw (196.200.218.1)
 - Graph Grouping Style:** Choose how graphs are grouped when drawn for this particular host on the tree. Value: Graph Template

At the bottom right of the form, there are 'cancel' and 'create' buttons.

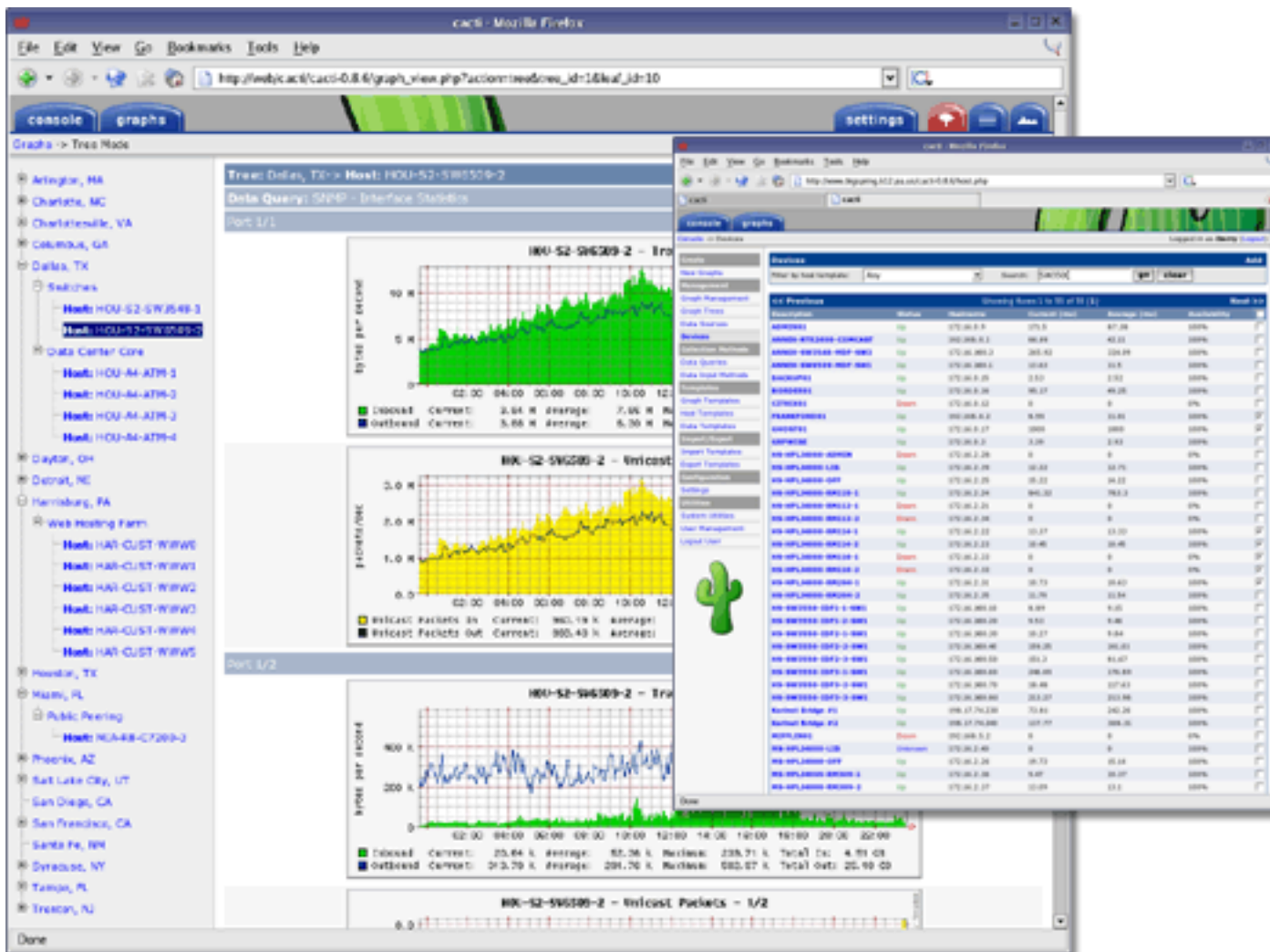
View graphs

- Click graphs on top - see the graphs. You might have to wait at least 10 mins to see anything useful.



When it all comes together

- You can have complete graphing of your network



Next steps

- You can extend Cacti using the plugin architecture (PA)
<http://cactiusers.org/wiki/PluginArchitectureInstall>
- There are a number of popular plugins
 - Nagios
 - NTOP
 - PHP Weathermap
 - Smokeping
 - Syslog-NG
- A good place to start is <http://cactiusers.net> and your favourite search engine
- Good things to start are the settings plugin (for RT/Mailgate) and the threshold plugin

Conclusions

- Cacti is very flexible because of templates and plugins
- Once you understand how RRDTool and it's file format works, cacti is relatively easy to configure
- You can add graphs in hierarchies to make neat and useful websites of graphs
- There are lots of resources, extensions, plugins - it gets more complicated then. Also a faster, but untested SNMP poller is available (cactid)
- Once you grow you need to use scripts/helpers to maintain cacti database. E.g. Netdot, Netdisco, IPPlan etc.

Exercises



- Try it out more
- Feel free to play around - the exercises are just ideas - not constraints.
- If you create some traffic graphs will be much more interesting after a while

References

- Cacti web site: <http://www.cacti.net>
- Cacti documentation: <http://docs.cacti.net>
- Cacti forums: <http://forums.cacti.net>
- Netdot: <http://netdot.uoregon.edu>