



# Network Management & Monitoring

## Network and Server Statistics Using Cacti



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# Introduction

## Network Monitoring Tools

- Availability
- Reliability
- Performance

*Cacti monitors the **performance** and usage of devices.*

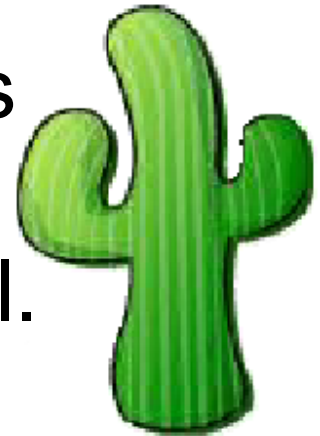
# Introduction

- 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 RRDtool.



*“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 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/>

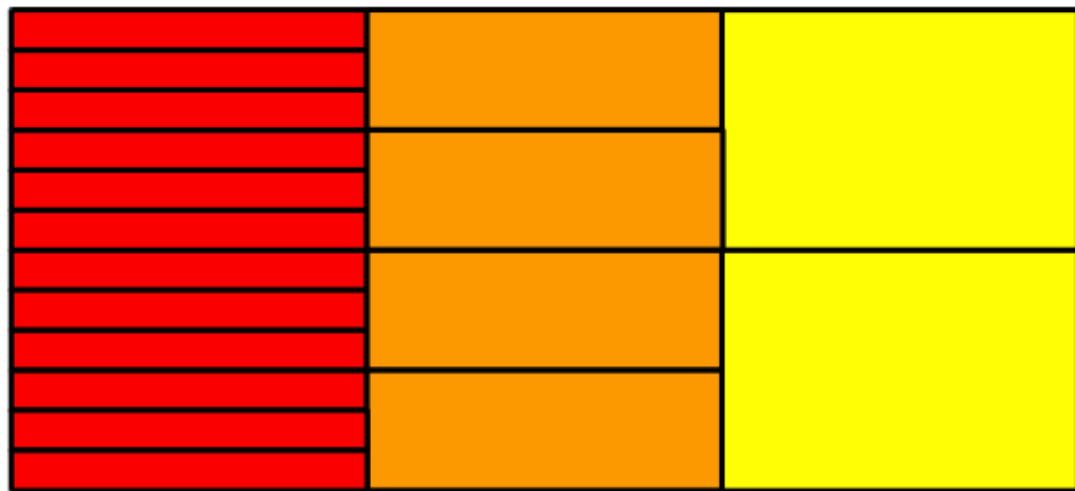


# RRDtool Database Format

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

RRD  
File

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

# 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
```

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 display 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. Part of the default Cacti installation in Ubuntu version 12 and above.

## 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 via the web interface is tedious – use provided command-line scripts instead.
- Upgrading versions can be difficult if installed from Source.

## 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

## PART II

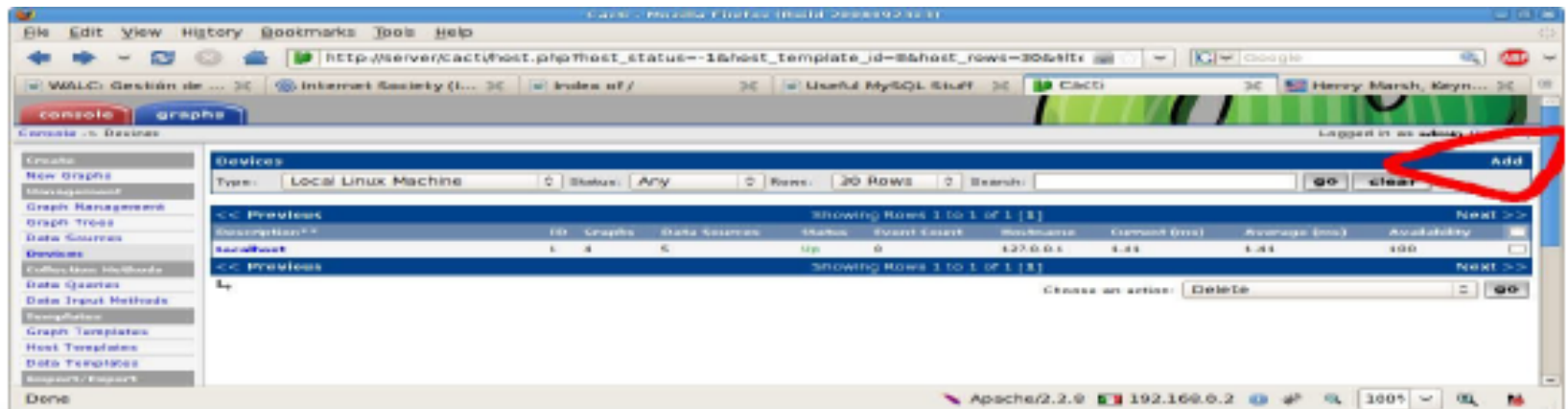
Before we install Cacti we demonstrate how to use the interface to add and monitor some devices...

# Adding a Device via Web Interface

## Management -> Devices -> Add

Specify device attributes

- We'll add an entry for our gateway router,  
[gw.ws.nsrc.org](http://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.

**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.

Gateway Router

gw.ws.nsrc.org

Cisco Router

☐ 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 Method**  
The type of ping packet to sent.  
*NOTE: ICMP on Linux/UNIX requires root privileges.*

**Ping Port**  
TCP or UDP port to attempt connection.

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

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

Ping and SNMP

UDP Ping

23

400

1

Menu changes after you select SNMP version below!

**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.

Version 2

NetManage

161

500

10

**Additional Options**

**Notes**  
Enter notes to this host.

cancel create

# Add Devices: 3

- Host Template: *ucd/net SNMP Host* is recommended for servers to include disk definitions.
- 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 “xxxxxxx” 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.

Associated Data Queries			
Data Query Name	Debugging	Re-Index Method	Status
1) Karlnet - Wireless Bridge Statistics	(Verbose Query)	Uptime Goes Backwards	Success [0 Items, 0 Rows]
2) SNMP - Interface Statistics	(Verbose Query)	Uptime Goes Backwards	Success [59 Items, 7 Rows]
Add Data Query: Netware - Get Available Volumes		Re-Index Method: Uptime Goes Backwards	add

cancel save

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:

- \* [Create Graphs for this Host](#)
- \* [Data Source List](#)
- \* [Graph List](#)

### Ping Results

UDP Ping Success (1.19 ms)

## Devices [edit: Gateway Router]

### 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.

# Create Graphics: 3

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

Host:  Graph Types:

[\\*Edit this Host](#)  
[\\*Create New Host](#)

### Graph Templates

Graph Template Name

Create: Cisco - CPU Usage

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)	1000000000	00:24:97:5C:C0:D2	10.10.0.254	<input checked="" type="checkbox"/>
2	Up	FastEthernet0/1	Fa0/1	connection to LEARN VPLS	ethernetCsmacd(6)	1000000000	00:24:97:5C:C0:D3	192.248.5.1	<input checked="" type="checkbox"/>
3	Up	Null0	Nu0		other(1)	4294967295			<input checked="" type="checkbox"/>
4	Up	Tunnel0	Tu0		tunnel(131)	9000			<input checked="" type="checkbox"/>
5	Up	Tunnel1	Tu1		tunnel(131)	9000			<input checked="" type="checkbox"/>
6	Up	FastEthernet0/0.254	Fa0/0.254		l2vlan(135)	1000000000	00:24:97:5C:C0:D2	10.10.254.254	<input checked="" type="checkbox"/>



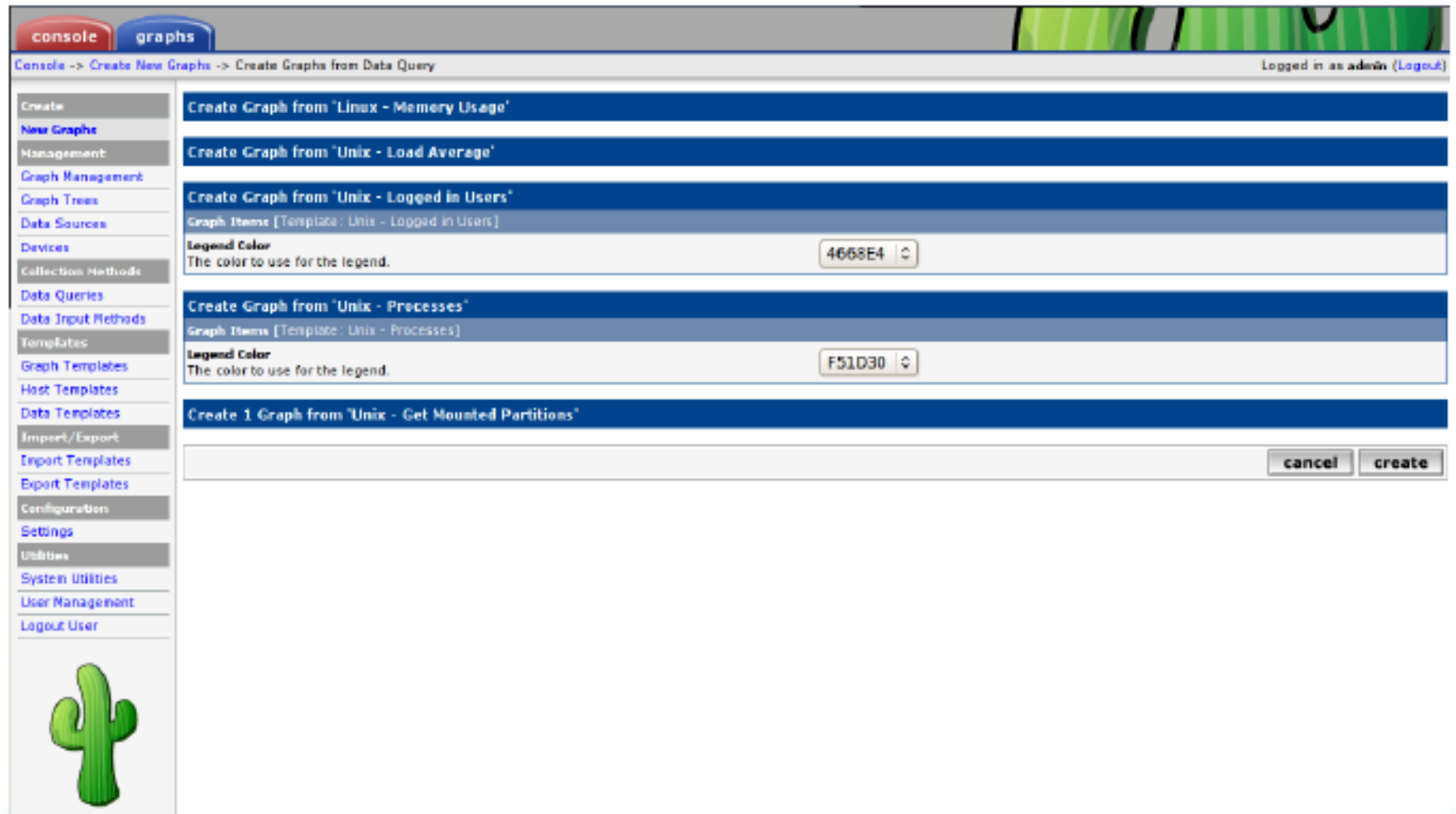
Select a graph type:

Use 64-bit Counters for Gigabit devices

cancel

create

# Create Graphics: 4



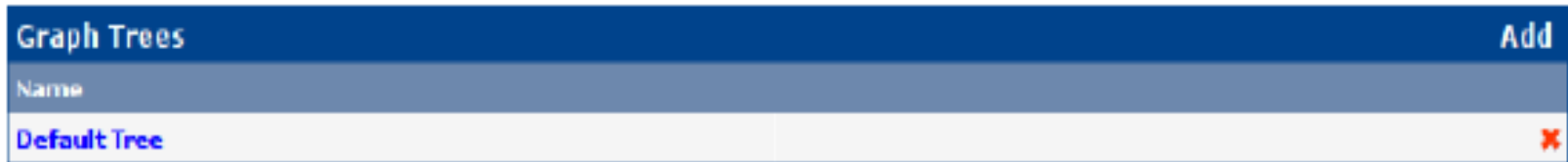
You'll see this screen later when you are creating graphics for hosts vs. routers

# 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).

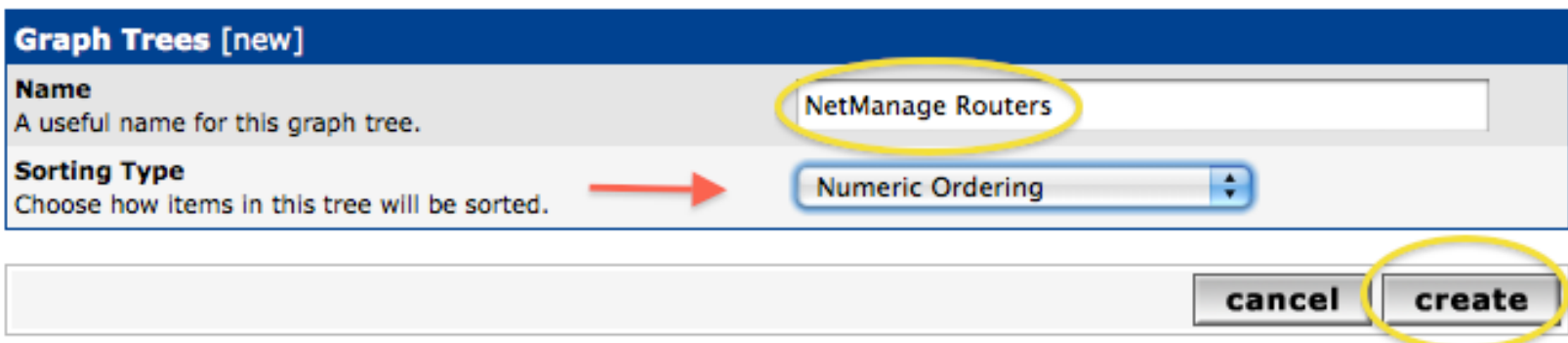
# Graphics Tree

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



The screenshot shows a dialog box titled "Graph Trees" with a blue header bar. In the top right corner of the header bar is an "Add" button. Below the header is a table with a light blue header row containing the text "Name". The first row of the table has the text "Default Tree" in blue, and a red "X" icon is visible in the rightmost column of this row.

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



The screenshot shows a dialog box titled "Graph Trees [new]" with a blue header bar. Below the header, there are two input fields. The first field is labeled "Name" with the subtitle "A useful name for this graph tree." and contains the text "NetManage Routers". The second field is labeled "Sorting Type" with the subtitle "Choose how items in this tree will be sorted." and contains the text "Numeric Ordering". A red arrow points from the "Sorting Type" label to the "Numeric Ordering" field. At the bottom right of the dialog box are two buttons: "cancel" and "create". The "create" button is circled in yellow.

# 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

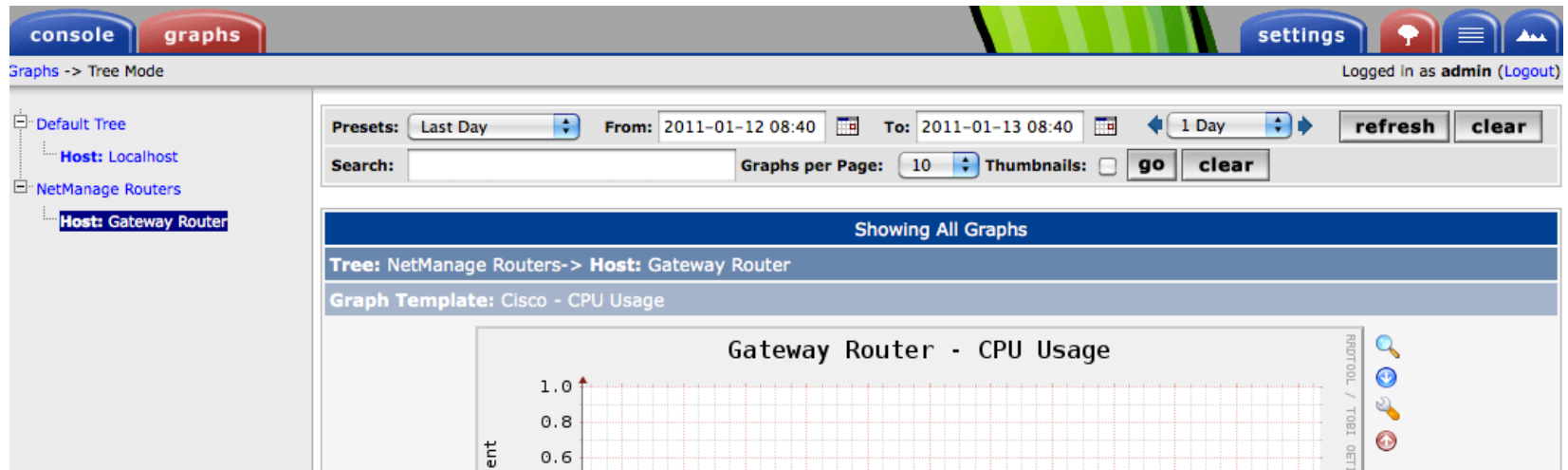
Choose how graphs are grouped when drawn for this particular host on the tree.

Graph Template

cancel

**create**

# Graphics Tree with 2 Devices



- Our graphics tree *just* after the first two devices were added.
- So far, graphics are empty – the first data 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`.

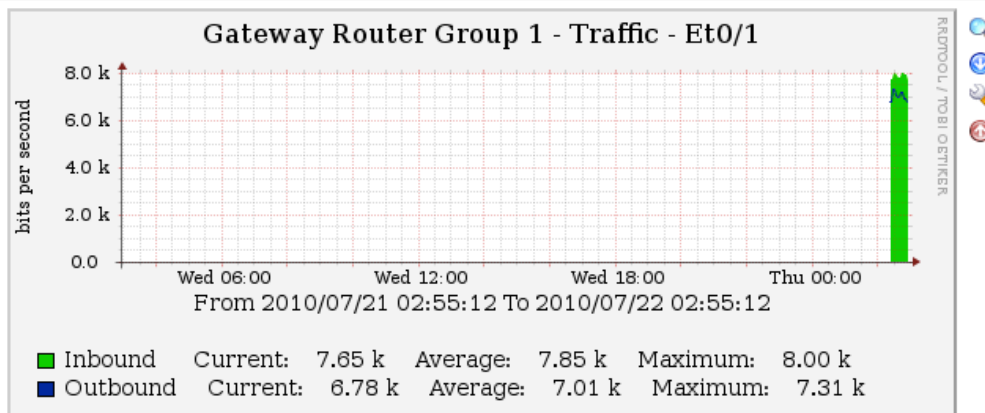
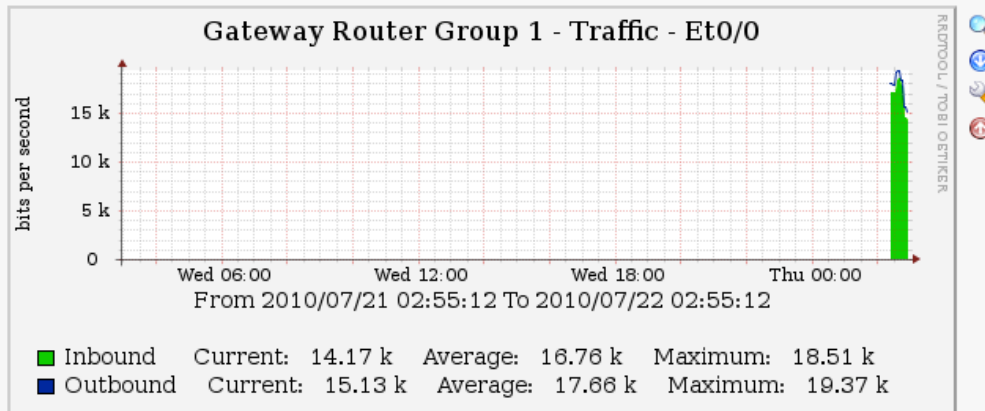
# Initial Graphs

**Presets:** Last Day   
**From:** 2010-07-21 02:55  **To:** 2010-07-22 02:55       
**Search:**  **Graphs per Page:** 10  **Thumbnails:** ☐

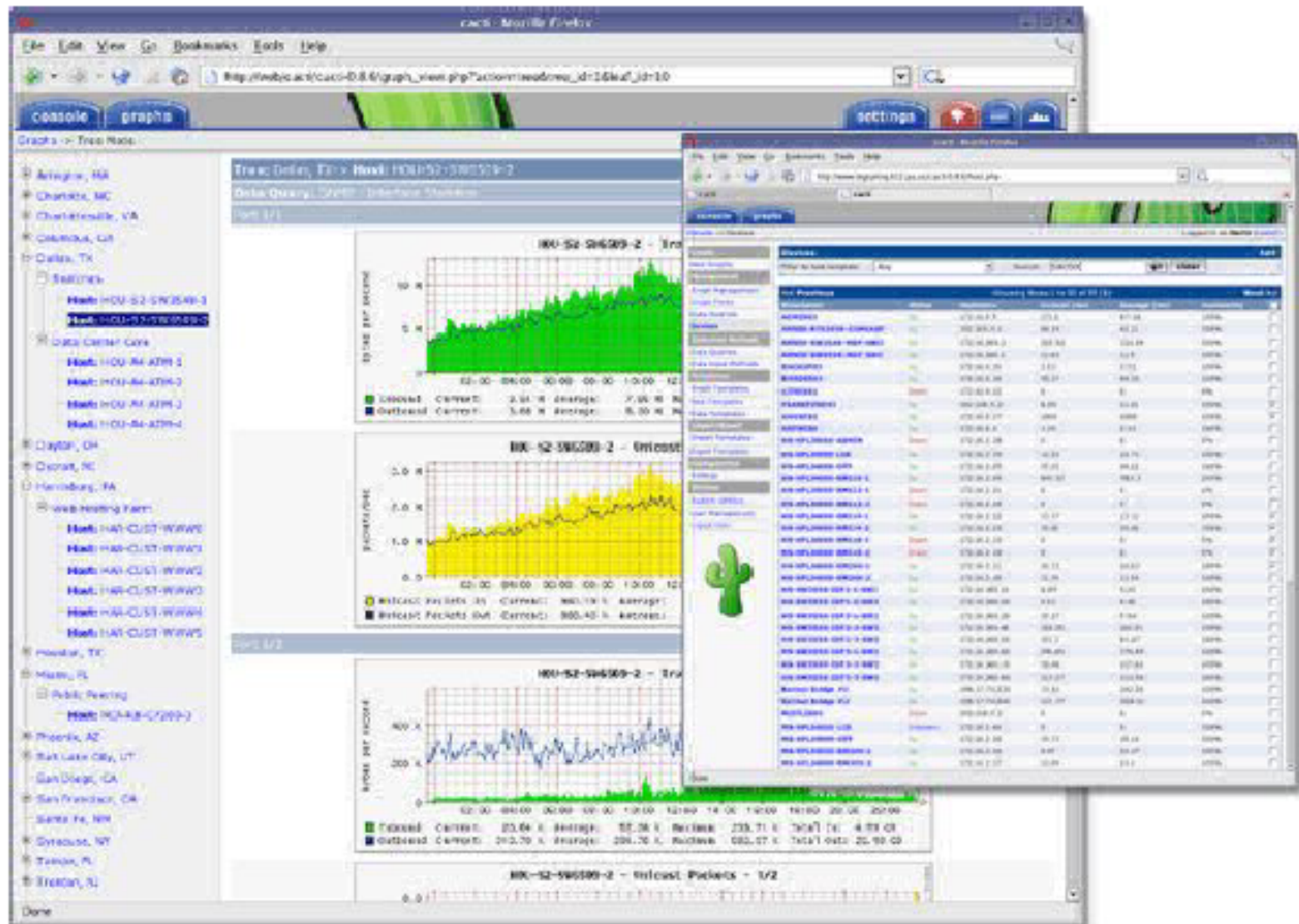
Showing All Graphs

Tree: AROC Routers-> Host: Gateway Router Group 1

Graph Template: Interface - Traffic (bits/sec)



# Over time you'll see tendencies



# Next Steps

- 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>
- Automate device and graph creation using available command-line scripts in `/usr/share/cacti/cli`, such as:
  - `add_devices.php`
  - `add_graphs.php`
  - `add_tree.php`

# 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 locate new devices quickly.
- It is not easy to do a rediscover of devices.
- To add lots of devices requires automation. 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/>
- Plugin Documentation  
<http://docs.cacti.net/plugins>
- Cacti Discussion Group:  
<http://forums.cacti.net/>
- Cacti Users – Plugin Architecture Home  
<http://cactiusers.org/>

# **PART III**

## **Cacti Installation and Configuration**

### **Workshop Labs**