

Cacti

„Autom8“ Plug-in

Usage Guide

Brought to you by
Reinhard Scheck alias gandalf@forums.cacti.net
The Cacti Group



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Purpose of this Plug-in

Maintaining a quite decent Cacti installation with lots of devices, graphs and tree items may result in quite a huge amount of administrative work.

Using the cli scripts allows you to write your own scripts to e.g. create Cacti device entries, graphs, tree items and more. This helps e.g. interfacing a CMDB or some other repository that holds information about devices that shall be monitored.

Create “Meaningful” Graphs

Of course, when creating a new device you will at least want to create all graphs related to “Associated Graph Templates”. But when it comes to Data Queries, it is not always desired to create graphs for all indexes; e.g. you will not want to graph each and every interface, e.g. if it's ifOperStatus is “down”. So you will make up your mind to restrict graph creation to “meaningful” indexes.

In case you are able to define “meaningful” as a (set of) rule(s), you've just caught the goal of this plug-in!

In most cases, those rules depend on some device properties, e.g. a “64 bit Traffic Graph” makes no sense if the SNMP Version of the device is 1.

Trigger Graph Creation on Multiple Events

Cli scripts mostly are used when a new device is created. This plug-in will be invoked each time a new device is created, be it via cli or via browser.

But this plug-in uses hooks that are triggered not only when a new device is created. It features graph creation each time a new re-index occurs. This way, if you add a new specific data query that matches a given rule, all graphs will be created in about no time. This virtually eliminates visiting the page “Create Graphs for this Host”.

And more, you may call the rule execution from device management as a new dropdown action with a selected list of devices. This is of special use when testing your rules.

Create Tree Items

Using the Graph Tree is a very flexible means of grouping what you desire to be grouped. In many cases it turns out that your trees will apply to some algorithm; let's again call it a rule.

You may e.g. want to create a tree that holds all host entries. But perhaps you do not want them crowded up as a flat list of items. Instead, you may find it useful to group them by Host Template. Of course, more sophisticated and nested rule will come up to your mind.

Autom8 now turns out to be able to catch virtually any property (column) related to your device of graph to build rule based trees for you. To extend this flexibility, use of regular expressions allows it to parse virtually any string out of those properties for use in new tree headers.

These Tree Rules take respect of already created trees, sub-trees and tree items. It won't change any existing tree item but only add new ones as you define those.

Installing the Plug-in

As a prerequisite, the **Plug-in Architecture** is required; this plug-in requires at least Plug-in Architecture version 2.4 or higher. Installation of Plug-in Architecture is not described here, please see <http://cactiusers.org/> for help regarding this topic. Then, please download this plug-in to the <path_cacti>/plugin directory. Next, unpack the .tgz file. All files will now reside in the <path_cacti>/plugin/autom8 directory.

You will notice several *.patch files. They mainly contain new hooks required for this plug-in. And there is a code change for api_tree.php that will be part of upcoming Cacti releases but is required for the proper operation of this plug-in.

Please install **all** those *.patch files from main cacti directory using e.g.

```
patch -p1 -N -dry-run < plugins/autom8/cli.patch
```

and then, if successful

```
patch -p1 -N < plugins/autom8/cli.patch
```

CAVEAT: Please make sure **not** to leave old „autom8“, e.g. <path_cacti>/plugin/autom8_old!

Assuming, you already have provided authorization to **Plug-in Management**, please go to that menu item and find:

autom8	
Directory:	autom8
Version:	0.30
Author:	Reinhard Scheck
Home Page:	
Status:	Not Installed
	Install Uninstall Enable Disable Check

Illustration 1: Install Autom8, Step 1

Hit „Install“:

Automate Cacti Tasks	
Directory:	autom8
Version:	0.30
Author:	Reinhard Scheck
Home Page:	
Status:	Installed
	Install Uninstall Enable Disable Check

Illustration 2: Install Autom8, Step 2

Hit „Enable“:

Automate Cacti Tasks	
Directory:	autom8
Version:	0.30
Author:	Reinhard Scheck
Home Page:	
Status:	Active
	Install Uninstall Enable Disable Check

Illustration 3: Install Autom8, Final Step

Providing Authorization to Users

As this Plug-in has high impact on Cacti operation, it is secured by a realm. For each user that is granted access to define an enable new rules, you will have to see the **User Management** page and check the appropriate check-box

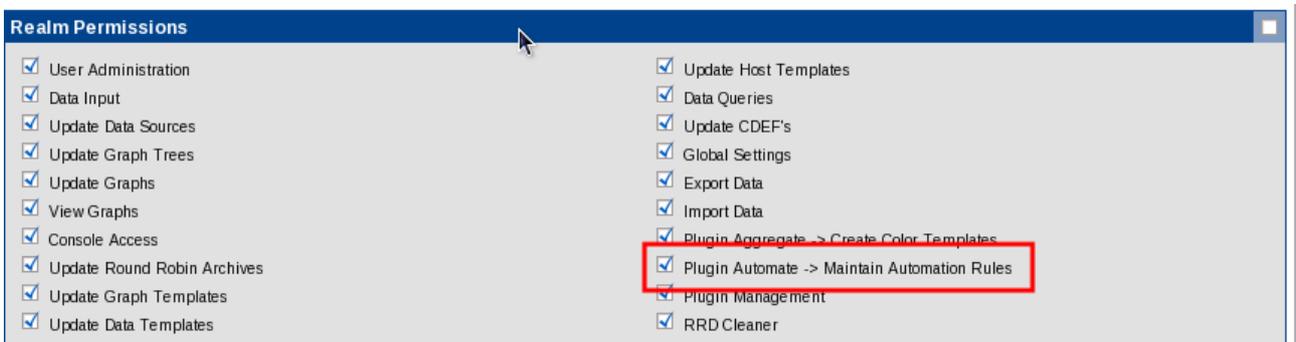


Illustration 4: Realm Permission for Autom8 Rules

This will then result in two new management options appearing on the menu bar:

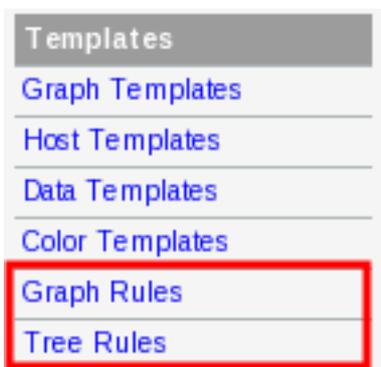


Illustration 5: New Menu Options for Rule Management

Basic Usage

The current concept of this plug-in allows to create two different types of objects

- a graph
- a tree entry (along with all “parent tree items”)

In other words: the host has to be in place already; it will not be created by this plug-in. You may create the host using any of the standard cacti features, be it via browser or via cli script.

The necessary hooks are in place to operate this plug-in instantaneously. There are several occasions, when you may want this plug-in to interfere:

- each time a new host is created, you will want this plug-in to create all “relevant” graphs
- each time a data query is re-indexed and new indexes are discovered, you will want this plug-in to create new graphs for those interfaces “if desired”
- each time a new host is added, you “may want” to automatically create the appropriate host entry for a specific tree
- each time a new graph is created, even if created by this plug-in, you “may want” to add an entry to a tree

Matching Rules

You will have to define **Rules** to make this plug-in take control. To avoid mayhem, it won't do anything without explicit request.

E.g. you may want to restrict automatic graph creation to specific hosts or host related to specific host templates. Same holds for tree item creation. This is the first step of autom8 processing.

Action Rules

Now, that the plug-in knows that it is involved by means of the first step, you will want to define the action that has to be taken. This is called an “**action rule**”. It comes in two flavors

- action rules for graph creation
- action rules for tree item creation

Test Support

For ease of testing, all rules allow for displaying the list of matching objects. This is shown in detail later in this manual.

And for triggering this plug-in, you may not want to wait until a rule matches. This is why new “actions” were defined for **Device** and **Graph Management**.

Please notice, that this plug-in does not change any permissions on graphs nor does it allow to create new permissions automatically.

Graph Rules

The hooks provided for this plug-in will create **all** “simple” Graph Template graphs that are associated with the host in question. It is recommended, that those Graph Templates are defined by the Host Template and no superfluous Graph Templates are listed.

It makes virtually no sense to defined rules (filters) for the Graph Templates that should be used automatically, because this is usually done by defining the Host Template appropriately. So, basically, the Graph creation covers **Data Queries**.

But how to make a specific host eligible for automatic graph creation? Or, changing the point of view, how to prevent the “wrong” hosts from being treated by this plug-in?

After a pristine installation of this plug-in, you will find two **Graph Rules** that we shall discuss now:

The screenshot shows the 'Graph Rules' management interface. At the top, there is a search bar with 'go' and 'clear' buttons. Below it is a table of rules with columns: Rule Title**, Rule Id, Data Query, Graph Type, and Enabled. Two rules are listed: 'Disk Space' (Rule Id 2, Data Query: SNMP - Get Mounted Partitions, Graph Type: Available Disk Space, Enabled: Disabled) and 'Traffic 64 bit' (Rule Id 1, Data Query: SNMP - Interface Statistics, Graph Type: In/Out Bits (64-bit Counters), Enabled: Disabled). Navigation buttons '<< Previous' and 'Next >>' are present. At the bottom, there is a 'Choose an action:' dropdown set to 'Delete' and a 'go' button.

Illustration 6: Default Graph Rules

For an explanation of features, let's turn to the rule named “Traffic 64 bit”. The most important properties of this rule are listed here. Please notice, that all rules are “disabled” by default to prevent accidental and unwanted actions.

The screenshot shows the configuration page for the 'Traffic 64 bit' rule. It includes a 'Name' field with the value 'Traffic 64 bit', a 'REQUIRED: Data Query' dropdown set to 'SNMP - Interface Statistics', and a 'REQUIRED: Graph Type' dropdown set to 'In/Out Bits (64-bit Counters)'. There is an 'Enable Rule' checkbox which is currently unchecked. Below these fields are two tables for 'Rule Items => Eligible Hosts' and 'Rule Items => Create Graph'. The 'Eligible Hosts' table has two items: Item#1 (Sequence 1, Operation, Field: host.description, Operator: is not unknown) and Item#2 (Sequence 2, Operation: AND, Field: host.snmp_version, Operator: is greater than or equal, Pattern: 2). The 'Create Graph' table has three items: Item#1 (Sequence 1, Operation, Field: ifOperStatus, Operator: matches, Pattern: Up), Item#2 (Sequence 2, Operation: AND, Field: ifIP, Operator: is not empty), and Item#3 (Sequence 3, Operation: AND, Field: ifHwAddr, Operator: is not empty). At the bottom, there are 'cancel' and 'save' buttons.

Illustration 7: “Traffic 64 bit” Graph Rule

The properties are defined as shown below

Property	Description
Name	To be defined freely
Data Query	The Data Query this rule shall act upon
Graph Type	The type of graph that shall be created
Enable Rule	Unless the Rule is complete, you will not want it to be executed. It is a good practice to go through several steps of rule verification, see below.
Rule Items => Eligible Hosts	Define properties of hosts that shall match this rule. This is called a “matching rule”
Rule Items => Create Graphs	Define the properties related to the Data Query on how to create new graphs. This is called an “action rule”

Table 1: Properties of Graph Rules

Graph Rules: Matching Rule Items

Let's have a look at some rule items:

Rule Item [edit rule item for Host Match Rule: Traffic 64 bit]

Operation Logical operation to combine rules.	<input type="text" value=""/>
Field Name The Field Name that shall be used for this Rule Item.	<input type="text" value="HOST: description - varchar(150)"/>
Operator Operator.	<input type="text" value="is not unknown"/>
Matching Pattern The Pattern to be matched against.	<input type="text" value=""/>
Sequence Sequence.	1

Illustration 8: Graph Rule Item 1

The properties are defined as shown below

Property	Values	Description
Operation	“empty” AND OR ()	Allows definition of SQL logic
Field Name	<table>: <field> - <type>	Select any field presented here. <table>: HOST, HOST TEMPLATE <field>: any field of the above tables <type>: data type for your help
Operator	contains does not contain begins with does not begin with ends with does not end with matches does not match with is less than is less than or equal is greater than is greater than or equal is unknown is not unknown is empty is not empty matches regular expression	List of SQL operators
Matching Pattern	<string> or <number>	The pattern to match against
Sequence	<number>	Sequence Number of this rule item

Table 2: Properties of Matching Rule Items

This rule item defines, that the description of the host must “not be unknown”. In other words, this

rule matches all hosts as no host has an empty host description. This rule is of particular use when starting a new rule, because the list of matching hosts simply equals “all available hosts”. You may then add further restrictive rules to narrow the selection down. Such is the second rule item:

Rule Item [edit rule item for Host Match Rule: Traffic 64 bit]

Operation
Logical operation to combine rules.

Field Name
The Field Name that shall be used for this Rule Item.

Operator
Operator.

Matching Pattern
The Pattern to be matched against.

Sequence
Sequence.

Illustration 9: Graph Rule Item 2

The operation is AND, the field operated upon is the host's SNMP version. As you may know, 64 bit traffic counters are supported only with hosts running at least SNMP V2c (or SNMP = 2 in Cacti terms). The field name is build up in three parts:

- table, printed in uppercase: *HOST*
- table field: *snmp_version*
- database field properties: *tinyint(1) unsigned*

The test itself is a “>=”, the matching pattern a “2”. All in all, this rule requires a host to have at least SNMP version 2 defined in its host properties to match.

You will want to test this rule. Does it match all hosts you expected? Click “Show Matching Hosts” to see:

Eligible Hosts

Type: Status:

Search: Rows per Page:

Description**	Hostname	Host Template Name	ID	Graphs	Data Sources	Status
gandalf	gandalf	ucd/net SNMP Host	11	0	0	Up
gandalf wlan	wlan	ucd/net SNMP Host	16	4	4	Down
Localhost at Home	127.0.0.1	Local Linux Machine	1	20	21	Up

Showing Rows 1 to 3 of 3 [1]

Illustration 10: Eligible Hosts

You may now check, whether all desired hosts show up in the list along with some important properties. The hosts are directly linked in the first column. So may quickly check all host's properties if in doubt.

In most cases, your list will be huge. This is where you may enter some filter conditions, *Type*, *Status* or free *Search*, to find specific hosts. The filters are NOT applied as a new rule item; if you want to do so, you will have to add the rule explicitly.

Graph Rules: Create Graphs Items

This example illustrates how to create SNMP V2c traffic graphs using 64 bit counters. But you may want to restrict automatic graph creation not only to certain hosts. You may want to narrow new graphs down to “meaningful interfaces”. But how to tell Cacti about a “meaningful interface”?

That's what “action rules” are for. In this specific case, Illustration 7: “Traffic 64 bit” Graph Rule shows three parameters, that will be checked prior to creating a new traffic graph. Those parameters differ between Data Queries, e.g. there is no ifAlias when using a Disk Space Data Query. Let's see the first one:

Rule Item [edit rule item for Create Graph Rule: Traffic 64 bit]

Operation
Logical operation to combine rules.

Field Name
The Field Name that shall be used for this Rule Item.

Operator
Operator.

Matching Pattern
The Pattern to be matched against.

Sequence
Sequence.

Illustration 11: Create Graph Rule Item

This very item will filter for all interfaces with ifOperStatus of “Up”. The next two rule items of this example make sure, that both ifIP and ifHwAddr are not empty (This perfectly makes sense for servers but makes no sense e.g. for switches).

The properties of those rule items are the same as defined in Table 2, Properties of Matching Rule Items.

Again, there's an option “Show Matching Graphs” to see which graphs are related:

Data Query [SNMP - Interface Statistics]									
Hostname	Index	Status	Description	Name (IF-MIB)	Alias (IF-MIB)	Type	Speed	Hardware Address	IP Address
127.0.0.1	3	Up	eth0	eth0		ethernetCsmacd(6)	100000000	00:09:6B:86:FE:89	10.71.0.117
gandalf	4	Up	wlan0	wlan0		ethernetCsmacd(6)	100000000	00:02:72:61:04:CB	192.168.1.55
wlan	4	Up	wlan0	wlan0		ethernetCsmacd(6)	100000000	00:02:72:61:04:CB	192.168.1.55

Illustration 12: Show Matching Graphs

This list looks very much like the one presented when “Create Graphs for this Host” is selected; only the first column for the associated host has been added. A grayed-out line marks a graph that already is present.

This allows you to precisely verify, that this rule matches exactly those graphs you want to create.

Create a New Graph Rule

Now that you understand how a Graph Rule works in general, let's create a new graph rule. Do so by clicking “Add” in the Graph Rule menu:

The screenshot shows the 'Graph Rules' interface. At the top right, there is a red 'Add' button. Below it is a search bar with 'go' and 'clear' buttons. A table lists two rules:

Rule Title**	Rule Id	Data Query	Graph Type	Enabled
Disk Space	2	SNMP - Get Mounted Partitions	Available Disk Space	Disabled <input type="checkbox"/>
Traffic 64 bit	1	SNMP - Interface Statistics	In/Out Bits (64-bit Counters)	Disabled <input type="checkbox"/>

Below the table, there is a 'Choose an action:' dropdown menu with 'Delete' selected and a 'go' button.

Illustration 13: Add a New Graph Rule

Now fill in the name of the new rule and select the related Data Query:

The screenshot shows the 'Rule Selection [new]' form. The 'Name' field contains 'Traffic 32 bit'. The 'REQUIRED: Data Query' dropdown menu is set to 'SNMP - Interface Statistics'. At the bottom right, there are 'cancel' and 'create' buttons.

Illustration 14: Graph Rule – Select Data Query

Then “Create” and select the type of graph that shall be created, “save”:

The screenshot shows the 'Rule Selection [edit: Traffic 32 bit]' form. The 'Name' field is 'Traffic 32 bit'. The 'REQUIRED: Data Query' dropdown is 'SNMP - Interface Statistics'. The 'REQUIRED: Graph Type' dropdown is 'In/Out Bits'. There is an 'Enable Rule' checkbox which is unchecked. To the right, there are two blue links: '*Show Matching Hosts.' and '*Show Matching Graphs.'. Below the form are two empty tables: 'Rule Items => Eligible Hosts' and 'Rule Items => Create Graph', both with 'Add' buttons. At the bottom right, there are 'cancel' and 'save' buttons.

Illustration 15: Graph Rule defined

New Graph Rule: Define Matching Rule Items

Now the raw rule properties are defined. But currently it will never match, because no “Matching Rule” has been defined. So let's start to do so:

Rule Item [new rule item for Host Match Rule: Traffic 32 bit]

Operation
Logical operation to combine rules. [] [v]

Field Name
The Field Name that shall be used for this Rule Item. HOST: description - varchar(150) [v]

Operator
Operator. is not unknown [v]

Matching Pattern
The Pattern to be matched against. []

Sequence
Sequence. 1

cancel save

Illustration 16: Define a “Matching Rule Item”

This rule item virtually makes no sense. It's goal is simply to show the principles of operation. “Save” to see:

Save Successful.

[*Show Matching Hosts.](#)
[*Show Matching Graphs.](#)

Rule Selection [edit: Traffic 32 bit]

Name
A useful name for this Rule. Traffic 32 bit

REQUIRED: Data Query
Choose a Data Query to apply to this rule. SNMP - Interface Statistics [v]

REQUIRED: Graph Type
Choose any of the available Graph Types to apply to this rule. In/Out Bits [v]

Enable Rule
Check this box to enable this rule. Enable Rule

Rule Items => Eligible Hosts Add

Item	Sequence	Operation	Field	Operator	Pattern	
Item#1	1		host.description	is not unknown		[v] [^] [x]

Rule Items => Create Graph Add

Item	Sequence	Operation	Field	Operator	Pattern
No Rule Items					

cancel save

Illustration 17: Rule with a single matching rule item

Click “Show Matching Hosts” to find the list of hosts that match this rule:

Eligible Hosts

Type: Any [v] Status: Any [v] go clear

Search: Rows per Page: 30 [v]

Showing Rows 1 to 4 of 4 [1] Next >>

Description**	Hostname	Host Template Name	ID	Graphs	Data Sources	Status
Fabian	fabian	Local Linux Machine	15	0	0	Unknown
gandalf	gandalf	ucd/net SNMP Host	11	0	0	Up
gandalf wlan	wlan	ucd/net SNMP Host	16	4	4	Down
Localhost at Home	127.0.0.1	Local Linux Machine	1	20	21	Up

Showing Rows 1 to 4 of 4 [1] Next >>

Illustration 18: Show all matching hosts

This are all hosts currently defined to my test box. Now we add a new rule to narrow down to all hosts running SNMP Version 1:

Save Successful.

*Don't Show Matching Hosts.
*Show Matching Graphs.

Rule Selection [edit: Traffic 32 bit]

Name
A useful name for this Rule.

REQUIRED: Data Query
Choose a Data Query to apply to this rule.

REQUIRED: Graph Type
Choose any of the available Graph Types to apply to this rule.

Enable Rule
Check this box to enable this rule. Enable Rule

Rule Items => Eligible Hosts Add

Item	Sequence	Operation	Field	Operator	Pattern	
Item#1	1		host.description	not unknown		⬇️⬆️
Item#2	2	AND	hostsnmplib_version	matches	1	⬇️⬆️

Rule Items => Create Graph Add

Item	Sequence	Operation	Field	Operator	Pattern
No Rule Items					

Illustration 19: Second matching rule item added

This now results in

Eligible Hosts

Type: Status:

Search: Rows per Page:

Showing Rows 1 to 1 of 1 [1]

Description**	Hostname	Host Template Name	ID	Graphs	Data Sources	Status
gandalf wlan	wlan	ucd/net SNMP Host	16	4	4	Down

Showing Rows 1 to 1 of 1 [1]

Illustration 20: Matching Host list narrowed down

This is how you want to develop host matching rules step-by-step. Still, this rule is **not** enabled.

New Graph Rule: Define Action Rule Items

Let's now defined the rule items that govern graph creation. It works quite the same way as already described for the "Traffic 64 bit" rule.

Testing a Graph Rule

Now that we have a valid Graph Rule in place, it's time to see it in action. For purpose of not breaking your installation, a two step process is recommended.

- 1st Step
Run your new rule on dedicated and selected hosts
- 2nd Step
Activate the rule for standard processing

At this time, you will want to know about two new “Settings -> Misc”, that are introduced by AUTOM8. These settings are “off” by default and this makes sense at this point in time:

The screenshot shows the 'Cacti Settings (Misc)' interface. Under the 'Autom8' section, two settings are visible: 'Enable Autom8 Graph Creation' and 'Enable Autom8 Tree Item Creation'. Both settings have a description and an unchecked checkbox. The 'Backup directory' and 'Archive directory' fields are also visible above, both containing paths and marked as 'OK: DIR FOUND'.

Illustration 21: Misc Settings for Autom8

Make sure that these settings are “off” unless you have finished testing for your new rule. Now turn to **Devices** and select any single host, or a list of hosts. Now choose the new action introduced by autom8, called “Apply Autom8 Rules”:

The screenshot shows the 'Devices' page in Cacti. It features a table with columns for Description, ID, Graphs, Data Sources, Status, Event Count, Hostname, Current (ms), Average (ms), and Availability. The 'Localhost at Home' row is highlighted in yellow. Below the table, a context menu is open, showing various actions. The 'Apply Autom8 Rules' option is highlighted in blue.

Description**	ID	Graphs	Data Sources	Status	Event Count	Hostname	Current (ms)	Average (ms)	Availability
Fabian	15	0	0	Unknown	0	fabian	0	0	100
gandalf	11	0	0	Up	0	gandalf	6.25	5.56	100
gandalf wlan	16	4	4	Down	934	wlan	4.08	4.86	16.7
Localhost at Home	1	20	21	Up	0	127.0.0.1	3.78	3.4	100

Illustration 22: Apply Autom8 Rules to specific hosts

You will be prompted by a confirmation page like:

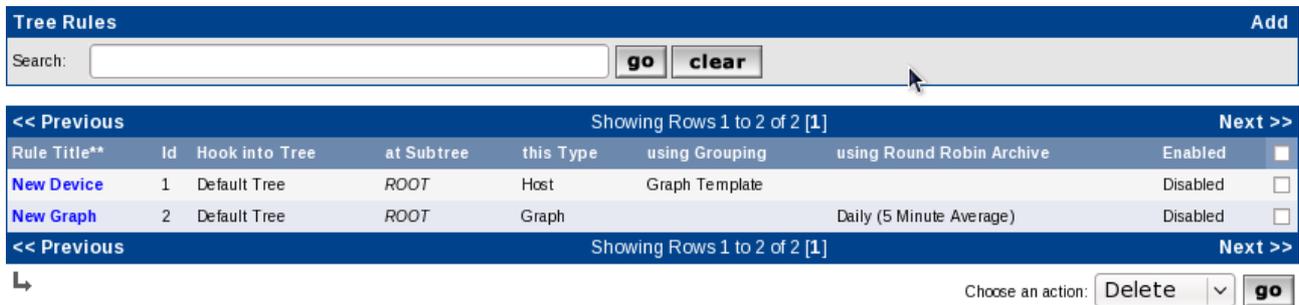


Illustration 23: Confirmation for applying Graph Rules

At time of writing, you will find lots of information in the cacti.log file. Grep for “AUTOM8” to find them.

Tree Rules

Most of the concepts explained for Graph Rules even hold for Tree Rules as well. For sake of better understanding, let's walk through both examples provided by the default installation.



Tree Rules								Add	
Search:								go	clear
<< Previous		Showing Rows 1 to 2 of 2 [1]					Next >>		
Rule Title**	Id	Hook into Tree	at Subtree	this Type	using Grouping	using Round Robin Archive	Enabled		
New Device	1	Default Tree	ROOT	Host	Graph Template		Disabled <input type="checkbox"/>		
New Graph	2	Default Tree	ROOT	Graph		Daily (5 Minute Average)	Disabled <input type="checkbox"/>		
<< Previous		Showing Rows 1 to 2 of 2 [1]					Next >>		
Choose an action: Delete <input type="button" value="v"/> <input type="button" value="go"/>									

Illustration 24: Default Tree Rules provided with Autom8

The first basic issue to understand is which types of objects may be added to a tree. Currently, Cacti only knows two different types of leaf objects of a tree

- a host
- a graph

The third object, the “header”, does not make much sense as a leaf object. But you will use it to create sub-trees to group leaf items or other sub-trees. So there is one example for automatic creation of a “host leaf tree item” along with some headers. And there is another example that creates “graph leaf tree items” along with different headers.

Tree Rule: Host Leaf Item

There's a default Tree Rule named “New Device”. It looks like this:

[*Show Eligible Objects.](#)

Tree Rule Selection [edit: New Device]

Name
A useful name for this Rule.

REQUIRED: Tree
Choose a Tree for the new Tree Items.

REQUIRED: Leaf Item Type
The Item Type that shall be dynamically added to the tree.

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

Round Robin Archive
Choose a round robin archive to control how this graph is displayed.

Optional: Sub-Tree Item
Choose a Sub-Tree Item to hook in.
Make sure, that it is still there when this rule is executed!

Enable Rule
Check this box to enable this rule. Enable Rule

Rule Items => Eligible Objects Add

Item	Sequence	Operation	Field	Operator	Pattern	
Item#1	1		host_template.name	contains	Linux	⬇️⬆️ ❌

Rule Items => Create Tree Add

Item	Sequence	Field Name	Sorting Type	Propagate Changes	Search Pattern	Replace Pattern	
Item#1	1	host_template.name	Manual Ordering (No Sorting)	No	^(.*)s*Linux\s*(.*)\$	\$(1)\n\$(2)	⬇️⬆️ ❌
Item#2	2	host.hostname	Manual Ordering (No Sorting)	No	^(w*)\s*(w*)\s*(w*)\s*\$	\$(1)\n\$(2)\n\$(3)	⬇️⬆️ ❌

Illustration 25: Tree Rule for a Host Tree Item

Property	Values	Description
Name	<string>	To be defined freely
Tree	<dropdown>	The tree that shall take the new Host Tree Item. This tree has to be pre-defined, all available trees will be listed in this dropdown. Autom8 does not create new trees, it only creates tree items
Leaf Item Type	Host Graph	In this example, we want to create a “Host” tree item.
Graph Grouping Style	Graph Template Data Query Index	For a host tree item type only! All available graph grouping options are offered. These are the same as Cacti offers itself when editing the tree manually.
Round Robin Archive	<dropdown>	For graph tree item type only! All available RRA definitions are offered.
Sub-Tree Item	<sub tree item>	You may not want to hook the new tree items directly underneath the tree's root. When defining a sub-tree here, make sure that it still exists at the time this rule is executed!
Enable Rule	<checkbox>	Again, you may want to disable this rule until you've entered all rule items.

Table 3: Properties of Tree Rules

Tree Rules (Host): Matching Rule Items

Like the Graph Rules, you will have to define a “Matching Rule” first. This restricts the use of this Rule to specific hosts. Here's how it works:

Illustration 26: Matching Rule for “New Device”

The properties have been listed in Table 2, Properties of Matching Rule Items.

This rule reads in clear text:

1. Get the table HOST_TEMPLATE
2. Use the field “name”, which is a “varchar(100)”

3. check, whether a string “Linux” is part of the host template name

Again, this equals exactly the way that a Graph Rule Match is done. Like Graph Rules, you may list all matching hosts from the Tree Rule edit page, when choosing “Show Eligible Objects”:

The screenshot shows the 'Eligible Hosts' interface. At the top, there are filters for 'Type' (set to 'Any'), 'Status' (set to 'Any'), and a 'Search' field. Below the filters, there are navigation buttons '<< Previous' and 'Next >>'. The main content is a table with the following data:

Description**	Hostname	Host Template Name	ID	Graphs	Data Sources	Status
Fabian	fabian	Local Linux Machine	15	0	0	Unknown
Localhost at Home	127.0.0.1	Local Linux Machine	1	19	20	Up

At the bottom of the table, there are navigation buttons '<< Previous' and 'Next >>'. The text 'Showing Rows 1 to 2 of 2 [1]' is displayed above and below the table.

Illustration 27: Eligible Objects for Tree Rule

For sake of convenience, the target hosts are directly linked in the first column of this list. If the list is huge, you may use the opportunity to filter it by type, status or a versatile “Search” filter that matches host description, host name or host template name.

Once you've verified, that this matching rule ends up with exactly those hosts you want to act upon, you will turn to the action rules.

Tree Rules (Host): Action Rule Items

This part of Autom8 is really powerful and perhaps hard to understand on the first run. See it in action:

[*Show Created Trees.](#)

Rule Item [edit rule item for Create Tree Rule (Host): New Device]

Header Type Choose an Object to build a new Subheader.	HOST_TEMPLATE: name - varchar(100) ▼
Sorting Type Choose how items in this tree will be sorted.	Manual Ordering (No Sorting) ▼
Propagate Changes Propagate all options on this form (except for 'Title') to all child 'Header' items.	<input type="checkbox"/> Propagate Changes
Matching Pattern The String Pattern (Regular Expression) to match against. Enclosing '/' must NOT be provided!	^(.*)\s*Linux\s*(.*)\$
Replacement Pattern The Replacement String Pattern for use as a Tree Header. Refer to a Match by e.g. \${1} for the first match!	\${1}\n\${2}
Sequence Sequence.	1

cancel
save

Illustration 28: Tree Rule Action

Property	Description
Header Type	You may choose any object of the drop-down list to act upon. You will be able to apply regexp magic to derive strings from any of those objects. Those strings will be used to form a new header entry. There's a special entry "Fixed String". When used, it allows you to enter a specific string as a header.
Sorting Type	All standard Cacti sorting types are supported
Propagate Changes	Propagate sorting type to lower header levels
Matching Pattern	Define a regexp pattern for matching the given value of the variable defined by "Header Type"
Replacement Pattern	preg_replace pattern You may enter fixed strings here. Reference to variables defined by the matching pattern are done via e.g. "\${1}" to denote the first variable. It is possible to split the result into multiple headers by using "\n" as a delimiter.
Sequence	Sequence number of this rule item
Enable Rule	Again, you may want to disable this rule until you've entered all rule items.

Table 4: Properties of Tree Rule Action Items

Let's explain the above example:

1. Use the table HOST_TEMPLATE, field “name” as a basis for this rule item.
2. The header derived from this rule item shall have “manual sorting” as it's sorting type
3. Sorting will not be propagated to lower levels
4. Try to find the string “Linux” in the host templates name. Put everything before that string (except for white-space) into a first variable and everything behind that string into a second variable (again skipping white-space)
5. Print the first variable as a header; then create a second header that holds the second variable

If applied to a host template name of “Local Linux Machine”, this will yield

- Local
 - Machine

as the resulting header structure. While this virtually does not make any sense, it shows how to use regexp for header definitions.

Let me explain a specific use case for this. Assume, you have a lot of different switches. You may decide to create a host template for each different manufacturer and/or model of switch. E.g.

- Switch – Cisco ...
- Switch – Enterasys N7
- Switch – Enterasys C3
- Switch – Extreme ...
- ...

are your host template names. With a matching pattern of “`^(.*)\s*-\s*(.*)\s*(.*)$`” and a replacement pattern of “`${1}\n${2}\n${3}`”, this will yield following tree structure

- Switch
 - Cisco
 - ...
 - ...
 - Enterasys
 - N7
 - C3
 - Extreme
 - ...

which may make perfect sense for a structured host tree. The second rule item works quite the same way, but it uses the HOST table, field “hostname” as a basis for generating sub-headers. The sub-headers of the second rule are placed underneath those of the first rule and so on.

But how to verify the results? You may have noticed the “Show Created Trees” option at top of each rule item. When clicking it, you will receive the following result for the first rule item:

Matching Items					
Type:	Any	Status:	Any	<input type="button" value="go"/>	<input type="button" value="clear"/>
Search:	<input type="text"/>	Rows per Page:	30		
<< Previous		Showing Rows 1 to 2 of 2 [1]			Next >>
Description**	Hostname	Host Template Name	Status	host_template.name	Result
Fabian	fabian	Local Linux Machine	Unknown	Local Linux Machine	Local -- Machine
Localhost at Home	127.0.0.1	Local Linux Machine	Up	Local Linux Machine	Local -- Machine
<< Previous		Showing Rows 1 to 2 of 2 [1]			Next >>

Illustration 29: Show Created Trees

The second to last column shows the variable that is used, the value printed as a table field. The last column shows which tree elements are created from that variable.

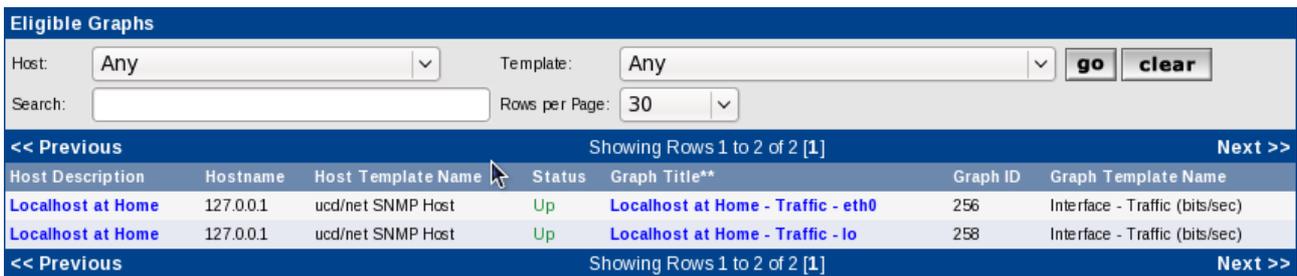
This way you again have the opportunity to verify the results of your rules before any damage may occur to your tree structure.

Tree Rules (Graph): Matching Rule Items

Again, you will have to define a “Matching Rule” first. Using graphs as the object to add upon, there are some new tables that may be of use when defining a “match”:

- host_template: as above
- host: as above
- graph_template is new
- graph_template_graph is also available

This way, you may restrict the “match” to certain graph templates or graphs. For testing, you may want again to “Show Eligible Objects”. In this case, the resulting table will not show hosts but graphs:



The screenshot shows a web interface titled "Eligible Graphs". At the top, there are search filters: "Host:" with a dropdown menu set to "Any", "Template:" with a dropdown menu set to "Any", and buttons for "go" and "clear". Below these is a "Search:" input field and a "Rows per Page:" dropdown set to "30". The main content is a table with the following columns: "Host Description", "Hostname", "Host Template Name", "Status", "Graph Title**", "Graph ID", and "Graph Template Name". The table contains two rows, both for "Localhost at Home" with hostname "127.0.0.1" and template "ucd/net SNMP Host". The first row has status "Up" and title "Localhost at Home - Traffic - eth0" with Graph ID 256. The second row has status "Up" and title "Localhost at Home - Traffic - lo" with Graph ID 258. Navigation links "<< Previous" and "Next >>" are visible at the top and bottom of the table, along with the text "Showing Rows 1 to 2 of 2 [1]".

Host Description	Hostname	Host Template Name	Status	Graph Title**	Graph ID	Graph Template Name
Localhost at Home	127.0.0.1	ucd/net SNMP Host	Up	Localhost at Home - Traffic - eth0	256	Interface - Traffic (bits/sec)
Localhost at Home	127.0.0.1	ucd/net SNMP Host	Up	Localhost at Home - Traffic - lo	258	Interface - Traffic (bits/sec)

Illustration 31: Matching Objects for a Graph Type Tree Rule

Tree Rules (Graph): Action Rule Items

Here's an example for use of “Fixed String”:

Rule Item [edit rule item for Create Tree Rule (Graph): New Graph]

Header Type
Choose an Object to build a new Subheader. Fixed String

Sorting Type
Choose how items in this tree will be sorted. Alphabetic Ordering

Propagate Changes
Propagate all options on this form (except for 'Title') to all child 'Header' items. Propagate Changes

Matching Pattern
The String Pattern (Regular Expression) to match against. Enclosing '/' must NOT be provided! Traffic

Replacement Pattern
The Replacement String Pattern for use as a Tree Header. Refer to a Match by e.g. **#{1}** for the first match!

Sequence
Sequence. 1

cancel save

Illustration 32: Fixed String as a header type

As it makes less sense to “test” this rule item, the test link entry is suppressed. Let's turn to the second item:

[*Show Created Trees.](#)

Rule Item [edit rule item for Create Tree Rule (Graph): New Graph]

Header Type
Choose an Object to build a new Subheader. GRAPH_TEMPLATES_GRAPH: title_cache - varchar(255)

Sorting Type
Choose how items in this tree will be sorted. Manual Ordering (No Sorting)

Propagate Changes
Propagate all options on this form (except for 'Title') to all child 'Header' items. Propagate Changes

Matching Pattern
The String Pattern (Regular Expression) to match against. Enclosing '/' must NOT be provided! ^(.*)s*-\s*Traffic -\s*(.*)\$

Replacement Pattern
The Replacement String Pattern for use as a Tree Header. Refer to a Match by e.g. **#{1}** for the first match! **#{1}\n#{2}**

Sequence
Sequence. 2

cancel save

Illustration 33: Derive sub-tree header items from graph title

In this case, the graph title is searched for a match against the string “Traffic”. Again, the resulting chunks are used to form two new header entries. The result is perfectly shown when using “Show Created Trees”:

Matching Items

Type: Any Status: Any go clear

Search: Rows per Page: 30

<< Previous Showing Rows 1 to 2 of 2 [1] Next >>

Description**	Hostname	Host Template Name	Status	graph_templates_graph.title_cache	Result
Localhost at Home	127.0.0.1	ucd/net SNMP Host	Up	Localhost at Home - Traffic - eth0	Localhost at Home --- eth0
Localhost at Home	127.0.0.1	ucd/net SNMP Host	Up	Localhost at Home - Traffic - lo	Localhost at Home --- lo

<< Previous Showing Rows 1 to 2 of 2 [1] Next >>

Illustration 34: Derive sub-tree header items from graph title – the results

Testing a Tree Rule

The principles of testing are just the same as above. In this case, you will start at the “Graph Management” page and again use the drop-down action “Apply Autom8 Rules”.

Best Practices

It is perfectly possible to create e.g. a set of Graph Rules that apply to one and the same host. In fact, this will be the most usual case to cope with all different data queries. So, as a rule of thumb, it is very likely that you end up with a Graph Rule for at least each different Data Query.

In most cases, you may face the need to indeed define multiple rules for the same Data Query but for e.g. different host templates. E.g. when using SNMP V2c 64bit traffic graphs, you may want to create those graphs for servers only in case the ifIP and ifHwAddr are set. But for switches, you may want to create different graphs.

This will end up not only in different “Matching Rules” related to different host templates but to different “Action Rules” as well. There's a dropdown action that allows you to duplicate a rule and modify it later. For sake of security, the “enabled” bit is reset when a rule is duplicated.

It is worth paying attention not to apply those different rules to one and the same host (which is perfectly possible from the view of this plug-in).

The functions called by this plug-in make sure, that if a graph is already in place, no duplicate will be created.

The same discussion holds for Tree Rules. But in fact, the most likely way to handle this will end up in e.g. creating rules to place hosts into trees. You may even drop each or only selected hosts into multiple trees by defining multiple Tree Rules matching the same set of hosts.

And additionally, you may want to drop the graphs, e.g. grouped by graph template, underneath a different tree. This way it is easily possible, to functionally join all graphs of same type (same graph template” underneath a common sub-header.

And you may define virtually any sub-header structure to further group those graphs in a meaningful way.

Again, duplicates are suppressed.

Beneath this automatism, you may perfectly keep your own, hand-grown tree structure without any impact.

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