AKiPS™

Network Monitoring Software

API reference guide

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Publisher

AKIPS, PO Box 3422, Shailer Park, Queensland, 4128, Australia

Email: info@akips.com

Website: https://www.akips.com

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Contents

Chapter 1

About this guide

The AKIPS *API reference guide* assists users of API code in AKIPS Network Monitoring Software.

The following **Abbreviations** (see 1.1), **Text conventions** (see 1.2) and **Syntax** (see 1.3) are used throughout AKIPS's guides.

1.1 Abbreviations

3DES	triple data encryption standard
ADB	AKIPS database
AES	advanced encryption standard
AKIPS	Always Keep It Purely Simple :)
API	application programming interface
ARP	address resolution protocol
AS	autonomous system
BFD	bidirectional forwarding detection
BGP	border gateway protocol
CA	certificate authority
CBQoS	class-based quality of service
CDP	Cisco discovery protocol
CGI	computer gateway interface
CIDR	classless inter-domain routing
CLI	command line interface
CPU	central processing unit
CSR	certificate signing request
CSV	comma-separated values
cURL	client url
DHCP	dynamic host configuration protocol
DN	distinguished name
DNS	domain name system
FQDN	fully qualified domain name
GB	gigabyte
GRE	generic routing encapsulation
GUI	graphical user interface
HTTP	hypertext transfer protocol
HTTPS	hypertext transfer protocol secure
IF-MIB	interface MIB
IP	internet protocol
IPFIX	internet protocol flow information export
IPSLA	internet protocol service level agreement
IS-IS	intermediate system to intermediate system

LAN	local area network
LDAP	lightweight directory access protocol
LLDP	link layer discovery protocol
MAC	media access control
MIB	management information base
NAS	network-attached storage
NDP	neighbour discovery protocol
NIC	network interface card
NMS	network-monitoring software
NTP	network time protocol
OID	object identifier
OS	operating system
PCRE	Perl-compatible regular expressions
PEM	privacy-enhanced mail
PFX	personal information exchange format
PKCS	public key cryptography standards
png	portable network graphics
POSIX	portable operating system interface
PSSH	parallel secure shell
QoS	quality of service
RADIUS	remote authentication dial-in user service
RAID	redundant array of independent disks
RAM	random-access memory
RTT	round-trip time
SAN	storage area network
SCSI	small computer system interface
SHA	secure hash algorithm
SMI	structure of management information
SMTP	simple mail transfer protocol
SNMP	simple network management protocol
SSH	secure shell
SSL	secure sockets layer
STARTTLS	start transport layer security
stderr	standard error
sysadmin	system administrator

TACACS+	terminal access controller access-control system plus
TCP	transmission control protocol
TLS	transport layer security
TOS	type of service
UID	user identifier
UDP	user datagram protocol
UTC	coordinated universal time
VLAN	virtual local area network
VM	virtual machine
WAN	wide area network

1.2 Text conventions

Menu options are in **bold**.

E.g. **Go to Admin > System > System Settings**

Bold is also used for emphasis or clarity.

E.g. The **backup server** must have double the disk space of the **production server**.

Links to other parts of this guide are shown as red boxes.

E.g. The following **Abbreviations** (see 1.1), **Text conventions** (see 1.2) and **Syntax** (see 1.3) are used throughout AKIPS's guides.

Websites and email addresses are in blue.

If they are also hyperlinks, they are shown as cyan boxes.

E.g. https://www.akips.com

Code is in `monospace`.

Further:

Command syntax is in `red monospace`.

E.g. `{ddd} {hh:mm} to {hh:mm}`

Input (by the user) is in `blue monospace`.

E.g. `tf dump last7d`

Output (by AKIPS) is in `cyan monospace`.

E.g. `cisco-74-1-1 sys ip4addr = 10.74.1.1`

1.3 Syntax

Syntax may be presented in this guide across multiple lines due to layout constraints. When using AKIPS, you will need to run commands in a single line.

Parameters (fields expecting a substituted value) are contained within { } (braces).

E.g. `{type} {value}`

Optional parameters are contained within [ ] (square brackets).

E.g. `[index,{description}]`

Optional parameters may be nested.

E.g.

```
mlist {type} [{parent regex} [{child regex} [{attribute regex}]]]
```

For values separated by a | (pipe), choose one option only.

E.g. `[any|all|not group {group name} ...]`

Multiple parameters will have an ... (ellipsis).

E.g. `not group {group name} ...`

Chapter 2

AKIPS API

2.1 Test environment

AKIPS recommends that you test all API code in a test environment.

Email keys@akips.com to request a licence.

Refer to the 'AKIPS licence' chapter in the AKIPS *Install & upgrade guide*.

To view the video *AKIPS licence*,
visit https://vimeo.com/manage/videos/514080623

Before you execute code in your production environment, ensure that you have a current backup.

Refer to the AKIPS *Backup & restore guide*.

2.2 Command console

Warning: for expert use only.

Only admin users may access the command console.

To use the command console:

Go to **Admin** > **API** > **Command Console**.

To run commands:

In the text field, enter your command/s.

Click **Run Commands**.

To view your command history:

Click **History**.

2.3 Regex

Regex syntax depends on its underlying language (C, Perl, Java, JavaScript, Python, etc), which is responsible for compiling and executing the expression.

AKIPS is written in C and Perl, with a small amount of JavaScript.

All of our C programs are compatible with the PCRE library.

AKIPS API requires that:

- all regex strings be enclosed within / / (forward slashes)
- regex that contains spaces also be enclosed within " " (double quotation marks).

To negate regex, use the following syntax:

```
/!{regex}/
```

Be precise with your syntax so that it performs quickly and efficiently.

E.g. `/^NewYork-Router/` is faster than `/NewYork-Router/` because it specifies that the start of the match *must* begin with NewYork-Router.

For more information on regex, refer to *Regular Expressions Cookbook* (Goyvaerts & Levithan, 2012).

2.4 Time filters

AKIPS uses syntax for time filters in:

- reports and graphs
- threshold, alerting and availability rules.

AKIPS defines a week as 00:00:00 on Sunday to 23:59:59 on Saturday.

Syntax	Description	Example
`m`	minute	`7m`
`h`	hour	`2h`
`d`	day	`5d`
`w`	week	`6w`
`M`	month	`3M`
`y` / `yyyy`	year	`1y` / `2021`
`yyyy q[1-4]`	year and quarter	`2021 q2`
`yyyy-MM`	year and month	`2021-04`
`yyyy-MM-dd`	year, month and day	`2021-04-17`
`yyyy-MM-dd hh:mm`	year, month, day and time	`2021-04-17 15:30`

Use the following syntax:

```
{positive integer}{m h d w M y}

{ddd} {hh:mm} to {hh:mm}

{ddd} {hh:mm} to {ddd} {hh:mm}

{ddd} to {ddd} {hh:mm} to {hh:mm}

not {ddd} {hh:mm} to {hh:mm}

not {ddd} {hh:mm} to {ddd} {hh:mm}

not {ddd} to {ddd} {hh:mm} to {hh:mm}

thishour

lasthour

today

yesterday

thisweek

lastweek

thismonth

lastmonth

thisyear

lastyear

last{duration}

from yyyy to yyyy

from yyyy-mm to yyyy-mm

from yyyy-mm-dd to yyyy-mm-dd

from yyyy-mm-dd hh:mm to yyyy-mm-dd hh:mm
```

```
from yyyy for {duration}

from yyyy-mm for {duration}

from yyyy-mm-dd for {duration}

from yyyy-mm-dd hh:mm for {duration}

from {timestamp} to {timestamp}

from {point in time} to {point in time}

from {point in time} to {point in time} [+- duration]

from {point in time} [+- duration] to
{point in time} [+- duration]

now

startoflastminute

endoflastminute

startofthisminute

endofthisminute

startoflasthour

endoflasthour

startofthishour

endofthishour

startofyesterday

endofyesterday

startoftoday

endoftoday

startoflastweek

endoflastweek
```

```
startofthisweek

endofthisweek

startoflastmonth

endoflastmonth

startofthismonth

endofthismonth

startoflastyear

endoflastyear

startofthisyear

endofthisyear
```

2.4.1 tf pairs and tf span

The `tf pairs` command will display a series of start,end pairs which indicate valid time ranges within the time filter.

The human readable form of this is shown in the `tf dump` command.

E.g.

```
tf dump "lastweek; mon to fri 8:00 to 17:00"

tf pairs "lastweek; mon to fri 8:00 to 17:00"
```

The `tf span` command displays the total span of the time filter.

E.g.

```
tf dump "lastweek; mon to fri 8:00 to 17:00"

tf span "lastweek; mon to fri 8:00 to 17:00"
```

Examples

The past 30 minutes:

```
tf dump last30m

span 2021-03-06 09:20:50 to 2021-03-06 09:50:50
```

The past 24 hours:

```
tf dump last24h

span 2021-03-05 10:05:56 to 2021-03-06 10:05:56
```

The previous day (until midnight this morning):

```
tf dump last1d

span 2021-03-06 00:00:00 to 2021-03-06 23:59:59
```

The previous seven days (until midnight this morning):

```
tf dump last7d

span 2021-02-28 00:00:00 to 2021-03-06 23:59:59
```

During business hours for the past week:

```
tf dump "lastweek; mon to fri 8:00 to 17:00"

span 2021-02-24 00:00:00 to 2021-03-02 23:59:59
include 2021-02-25 08:00:00 to 2021-02-25 17:00:00
include 2021-02-26 08:00:00 to 2021-02-26 17:00:00
include 2021-02-27 08:00:00 to 2021-02-27 17:00:00
include 2021-02-28 08:00:00 to 2021-02-28 17:00:00
include 2021-03-01 08:00:00 to 2021-03-01 17:00:00
```

During trading hours (with Thursday-evening trading) for the past week:

```
tf dump "lastweek; mon to fri 8:00 to 17:00; thu 8:00 to 21:00"

span 2021-02-24 00:00:00 to 2021-03-02 23:59:59
include 2021-02-25 08:00:00 to 2021-02-25 17:00:00
include 2021-02-26 08:00:00 to 2021-02-26 17:00:00
include 2021-02-27 08:00:00 to 2021-02-27 17:00:00
include 2021-02-28 08:00:00 to 2021-02-28 21:00:00
include 2021-03-01 08:00:00 to 2021-03-01 17:00:00
```

Outside trading hours (with Saturday-morning trading) for the past week:

```
tf dump "lastweek; not mon to fri 8:00 to 17:00; not sat 8:00 to
12:00"

span 2021-02-24 00:00:00 to 2021-03-02 23:59:59
include 2021-02-24 00:00:00 to 2021-02-25 08:00:00
include 2021-02-25 17:00:00 to 2021-02-26 08:00:00
include 2021-02-26 17:00:00 to 2021-02-27 08:00:00
include 2021-02-27 17:00:00 to 2021-02-28 08:00:00
include 2021-02-28 17:00:00 to 2021-03-01 08:00:00
include 2021-03-01 17:00:00 to 2021-03-02 08:00:00
include 2021-03-02 12:00:00 to 2021-03-02 23:59:59
```

During business hours in the first quarter of 2021:

```
tf dump "2021 q1; mon to fri 8:00 to 17:00"

span 2021-01-01 00:00:00 to 2021-03-31 23:59:59
include 2021-01-01 08:00:00 to 2021-01-01 17:00:00
include 2021-01-02 08:00:00 to 2021-01-02 17:00:00
include 2021-01-03 08:00:00 to 2021-01-03 17:00:00
...
include 2021-03-28 08:00:00 to 2021-03-28 17:00:00
include 2021-03-29 08:00:00 to 2021-03-29 17:00:00
```

The past 30 minutes:

```
tf dump "from now - 1h to now - 30m"

span 2021-03-06 09:30:58 to 2021-03-06 10:00:58
```

Today until now:

```
tf dump "from startoftoday to now"

span 2021-03-06 00:00:00 to 2021-03-06 10:33:13
```

Business hours on 1 February 2021:

```
tf dump "2021-02-01 8:00 to 17:00"

span 2021-02-01 08:00:00 to 2021-02-01 17:00:00
```

After business hours on 1 February 2021:

```
tf dump "from 2021-02-01 18:00 to 2021-02-02 06:00"

span 2021-02-01 18:00:00 to 2021-02-02 06:00:00
```

The first two months of 2021:

```
tf dump "from 2021 for 2M"

span 2021-01-01 00:00:00 to 2021-03-01 00:00:00
```

Yesterday from midday for three hours:

```
tf dump "from startofyesterday + 12h to startofyesterday + 15h"

span 2021-03-05 12:00:00 to 2021-03-05 15:00:00
```

2.4.2 tf check

The **tf check** command will display either 1 (true) or 0 (false) depending on whether the given point in time (Unix epoch time) is within the time filter.

Use the following syntax:

```
tf check {point in time} "{time filter}"
```

Examples

```
tf check 1594771234 "from 2020-07-05 to 2020-07-11"

0
ok:  tf check 1594771234 "from 2020-07-05 to 2020-07-11"


tf check 1594771234 "from 2020-07-12 to 2020-07-18"

1
ok:  tf check 1594771234 "from 2020-07-12 to 2020-07-18"
```

2.5 IP address filters

You can use IP address filters throughout AKIPS.

Use the following syntax:

```
{address}/{mask}

{address}.*

{address}[{range}]

{address}[{range}]/{mask}

{address}[{range}].*
```

Examples

A single IPv4 address:

```
10.1.1.50

10.1.1.50
```

All addresses in a single logical network (i.e. with a specified 24-bit prefix):

```
10.0.0.0/24

10.0.0.*

10.0.0.0
10.0.0.1
...
10.0.0.254
10.0.0.255
```

A host ID in a range of 256 logical networks (within a specified range of 256 concurrent 24-bit blocks):

```
10.0.0-255.1
```

```
10.0.*.1
```

```
10.0.0.1
10.0.1.1
10.0.2.1
...
10.0.255.1
```

A single IPv6 address:

```
fd00:10:1:1::1
```

```
fd00:10:1:1::1
```

Two hundred and fifty-six IPv6 addresses in a single logical network:

```
fd00:10:1:1::0-ff
```

```
fd00:10:1:1::0
fd00:10:1:1::1
...
fd00:10:1:1::fe
fd00:10:1:1::ff
```

A host ID in a range of 50 logical networks:

```
fd00:10:1:1-50:1
```

```
fd00:10:1:1::1
fd00:10:1:2::1
...
fd00:10:1:50::1
```

Chapter 3

Database overview

3.1 Entities

The ADB architecture defines three levels of entities:

- parents (see 3.1.1)
- childs (see 3.1.2)
- attributes (see 3.1.3).

You must create entities in the following order:

- create the **parent** before you add a **child**
- create the **child** before you add an **attribute**.

Each entity must have a type, which you cannot change once created.

Level	Entity	Type	Value	Notes
1	parent	Y	N	a parent is an independent item
2	child	Y	optional	a child is a component of its parent entity
3	attribute	Y	Y	an attribute is a component of its parent and child entities

Example

To measure the flow of traffic (by counting the number of incoming bytes, or InOctets) for a particular router:

- the parent is a device
- the child is an interface
- the attribute is a counter.

You could define it as:

Level	Entity	Type	Value	Name
1	parent	device router01		
2	child	interface	`1,Test network`	Sel1/1
3	attribute	counter	`1`	IF-MIB.ifHC InOctets

3.1.1 Level 1: parent

Parent types:

- parent (generic)
- device
- user
- report.

3.1.2 Level 2: child

Child types:

- child (generic)
- interface
- ipsla
- memory
- processor
- storage
- system
- temperature.

A child may optionally have a value in the format of index,[description]

E.g. a child, Fa0/1, may be assigned a value of 1,Link to server:

- **1** is the ifIndex of the interface in ifTable
- **Link to server** is the ifAlias.

3.1.3 Level 3: attribute

Attribute types:

Type	Value	Example
counter	must be 1	`1`
enum	positive integer,text (enumerated list)	`1,up` `2,down`
gauge	scale: integer (positive to multiply, negative to divide)	`-2`
integer	positive or negative whole number or 0	`100287`
RTT	positive integer (microseconds)	`430`
text	up to 2000 characters	`the quick` `brown fox`
timestamp	seconds since start of Unix epoch	`1406787487`
uptime	seconds since status change	`13095`

3.1.4 Virtual attributes

AKIPS doesn't poll virtual attributes but instead meaningfully interprets the data. E.g. ifutil is the in-rate divided by the interface speed.

Virtual attribute types:

Type	Description
ifutil	interface utilisation
ifrate	interface bps
vutil	utilisation
vnutil	calculate used from free
vdiff	difference x = a-b
temp_f	convert C to F

3.2 Groups

When you create a group, specify the group type. You can assign an entity only to a group with the same type.

A child inherits group assignments from its parent.

An attribute inherits group assignments from both its child and parent.

3.2.1 Super groups

Use super groups (groups of groups) to create a hierarchy of your network.

You cannot assign an entity directly to a super group. You can assign only a group to a super group.

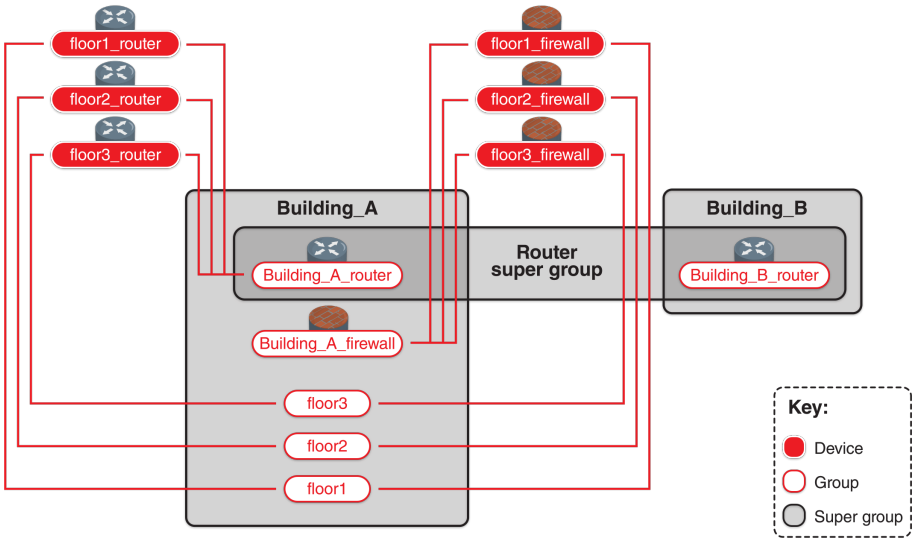
Example

Assign a **router** on **floor 1** of **building A** to both:

- **floor 1** group
- **building A router** group.

Further assign the **building A router** group to both:

- **building A** super group
- **router** super group.



Graphic 1: mapping a hierarchy of groups and super groups

To edit a super group:

Go to **Admin** > **Grouping** > **Manual Grouping**.

Click **Super Groups**.

Select the relevant super group.

To change the super group's name:

Overtype the name.

Click **Rename**.

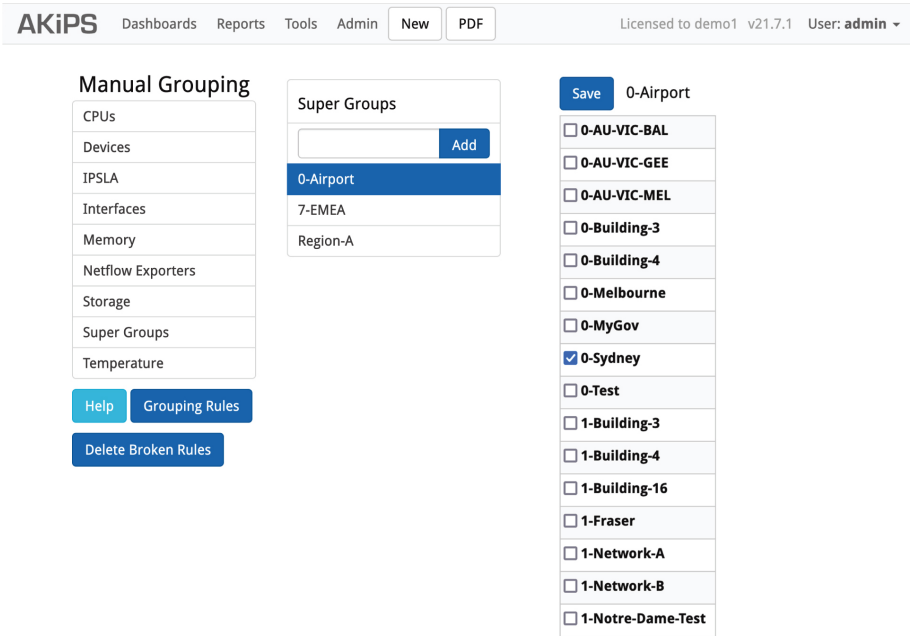
To edit the super group's configuration:

Click **Edit**.

Select or deselect the relevant checkboxes

To delete the super group:

Click **Delete**.



Graphic 2: editing a super group's configuration

3.2.2 Configuring groups

Use the web API to manually:

- add or delete a group or super group
- assign an entity to a group
- assign a group to a super group
- remove an entity from a group
- remove a group from a super group.

Examples

CPU

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=processor;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=processor;group={group_name};
mode=assign;device={device_name};child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=processor;group={group_name};
mode=clear;device={device_name};child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=processor;group={group_name};
mode=delete"
```

Device

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=device;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=device;group={group_name};
mode=assign;device={device_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=device;group={group_name};
mode=clear;device={device_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=device;group={group_name};
mode=delete"
```

IPSLA

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=ipsla;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=ipsla;group={group_name};
mode=assign;device={device_name};child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=ipsla;group={group_name};
mode=clear;device={device_name};child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=ipsla;group={group_name};
mode=delete"
```

Interface

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=interface;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=interface;group={group_name};
mode=assign;device={device_name};child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=interface;group={group_name};
mode=clear;device={device_name};child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=interface;group={group_name};
mode=delete"
```

Memory

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=memory;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=memory;group={group_name};
mode=assign;device={device_name};child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=memory;group={group_name};
mode=clear;device={device_name};child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=memory;group={group_name};
mode=delete"
```

NetFlow

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=flow;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=flow;group={group_name};
mode=assign;device={device_name};child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=flow;group={group_name};
mode=clear;device={device_name};child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=flow;group={group_name};
mode=delete"
```

Storage

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=storage;group={group_name};
mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=storage;group={group_name};
mode=assign;device={device_name};child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=storage;group={group_name};
mode=clear;device={device_name};child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=storage;group={group_name};
mode=delete"
```

Super group

Add a super group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=super;
group={super_group_name};mode=add"
```

Assign a group to a super group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=group;group={group_name};
mode=assign;device={group_name}"
```

Remove a group from a super group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=group;group={group_name};
mode=clear;device={group_name}"
```

Delete a super group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=super;
group={super_group_name};mode=delete"
```

Temperature

Add a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=temperature;
group={group_name};mode=add"
```

Assign an entity to a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=temperature;
group={group_name};mode=assign;device={device_name};
child={child_name}"
```

Remove an entity from a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=temperature;
group={group_name};mode=clear;device={device_name};
child={child_name}"
```

Delete a group:

```
curl -s "http://{server}/api-script?password={pwd};
function=web_manual_grouping;type=temperature;
group={group_name};mode=delete"
```

3.3 Events records

AKIPS stores events records in chronologically ordered blocks.

After 72 hours, AKIPS compresses and archives events records. You will not be able to edit or delete these.

Events records may include:

- enumeration changes
- uptime resets
- threshold events.

Each record in the events database includes:

- event time (epoch timestamp)
- entity (parent, child or attribute)
- flags (critical, enum, threshold and uptime)
- value.

To view enumeration and uptime attributes:

Go to **Admin** > **Alerting** > **Status Alerts**.

Scroll down the right-hand side of the page to find the table of **Status Attributes**.

To view threshold attributes:

Go to **Admin** > **Alerting** > **Threshold Alerts**.

Scroll down the right-hand side of the page to find the table of **Threshold Attributes**.

3.4 Time series

The features for time series include:

- three years of historical data
- 60-second values (no rollups or averages of stored data)
- 30-day blocks.

Rolling averages are available for the past five minutes to 30 days.

Time-series data types are:

- counters
- gauges
- RTT (microseconds).

Chapter 4

Config and events

4.1 Entity commands

4.1.1 add

Use the `add` command to create a new entity.

If the entity already exists, AKIPS will update it.

You cannot change an entity's type once created.

Use the following syntax:

```
add {type} {parent name}

add {type} {parent name} {child name} = [{index,[description]}]

add {type} {parent name} {child name} {attribute name}
[= {value}]
```

Examples

Add a router with an interface:

```
add device Router1

add system Router1 sys = 0

add text Router1 sys SNMPv2-MIB.sysName = "Router1.akips.com"

add text Router1 sys SNMPv2-MIB.sysLocation = "Test Rack"

add text Router1 sys SNMPv2-MIB.sysDesc = "Cisco IOS 7200
Version 12.4(9) T RELEASE (fc1)"

add text Router1 sys SNMPv2-MIB.sysContact = "AKIPS developers"

add uptime Router1 sys SNMPv2-MIB.sysUpTime = 1432703430

add text Router1 sys ip4addr = 10.1.8.250

add text Router1 sys ip6addr = fd00:10:1:8::250

add system Router1 ping4 = "4,10.1.8.4"

add rtt Router1 ping4 PING.icmpRtt

add counter Router1 ping4 PING.icmpDup

add counter Router1 ping4 PING.icmpLost

add enum Router1 ping4 PING.icmpState = 2,up

add system Router1 ping6 = "6,fd00:10:1:8::250"

add rtt Router1 ping6 PING.icmpRtt

add counter Router1 ping6 PING.icmpDup

add counter Router1 ping6 PING.icmpLost

add enum Router1 ping6 PING.icmpState

add interface Router1 Fa0/0 = "1,Link to remote site"

add integer Router1 Fa0/0 IF-MIB.ifSpeed = 1000000000
```

```
add text Router1 Fa0/0 IF-MIB.ifAlias = "Link to remote site"

add counter Router1 Fa0/0 IF-MIB.ifHCInOctets = 1

add counter Router1 Fa0/0 IF-MIB.ifHCOutOctets = 1

add enum Router1 Fa0/0 IF-MIB.ifAdminStatus = 1,up

add enum Router1 Fa0/0 IF-MIB.ifOperStatus = 1,up

add counter Router1 Fa0/0 IF-MIB.ifHCInBroadcastPkts = 1

add counter Router1 Fa0/0 IF-MIB.ifHCOutBroadcast Pkts = 1

add counter Router1 Fa0/0 IF-MIB.ifHCInMulticastPkts = 1

add counter Router1 Fa0/0 IF-MIB.ifHCOutMulticast Pkts = 1
```

Add some custom entries for asset information:

```
add child Router1 asset

add text Router1 asset serial_number = 123456789

add text Router1 asset purchase_date = 2017/05/02

add integer Router1 asset purchase_cost = 12013
```

4.1.2 delete

Use the `delete` command to remove a single entity, including all of its childs and attributes.

Use the following syntax:

```
delete {type} {parent name} [[{child name}] {attribute name}]
```

Examples

Delete a device:

```
delete device CoreRouter12
```

Delete a child:

```
delete interface CoreRouter1 Fa0/03
```

Delete an attribute:

```
delete integer CoreRouter1 Fa0/0 IF-MIB.ifSpeed
```

4.1.3 get

Use the `get` command to return the value assigned to a child or attribute.

Use the following syntax:

```
get {parent name} {child name} [{attribute name}]
```

Examples

Get the value for an interface:

```
get swt250 Fa0/1
```

```
10001,Link to swt2512
```

Get the value for an attribute:

```
get swt250 sys SNMPv2-MIB.sysLocation
```

```
Test room
```

The `get` command for an attribute with a type of uptime returns two values separated by a comma:

1. when the value was reset to zero (epoch timestamp)
2. when the attribute value was last updated (epoch timestamp).

Example

```
get swt250 sys SNMPv2-MIB.sysUpTime
```

```
1427283250,1433815768
```

The `get` command for an attribute with a type of enum returns five values separated by commas:

1. list number (from MIB)
2. text value (from MIB)
3. time created (epoch timestamp)
4. time modified (epoch timestamp)
5. child description.

Example

```
get swt250 Fa0/1 IF-MIB.ifOperStatus
```

```
1,up,1431579447,1431579447,link to swt251
```

4.1.4 mdelete

Use the `mdelete` command to remove several entities at once. You can test your selection first with `mget` (see 4.1.5).

You can use regex to precisely target the entities.

Use the following syntax:

```
mdelete {type} {parent regex} [{child regex}
[{attribute regex}]]
```

Examples

Delete all devices (We do not recommend this!):

```
mdelete device *
```

Delete all devices in a group:

```
mdelete device * any group testlab
```

Delete all IF-MIB attributes:

```
mdelete * CoreRouter1 Fa0/0 /IF-MIB/
```

Delete all ipsla entities for a device:

```
mdelete * Corerouter1 /ipsla/
```

4.1.5 mget

Use the `mget` command to retrieve large amounts of configuration information.

Use the following syntax:

```
mget {type}
```

Examples

```
mget device

mget user

mget interface

mget processor

mget system
```

You can also add regex.

Use the following syntax:

```
[{parent regex} [{child regex} [{attribute regex}]]]
[value {text|/regex/|integer|ipaddr}] [profile {profile name}]
[any|all|not group {group name} ...
```

The format of the return values depends on which entity (parent, child or attribute) you request.

If you request a parent then the type must be a parent or a wildcard, e.g.

```
mget * /^nyc-.*-rtr/

mget device *

mget user *
```

If you request a child then the type must be a child or a wildcard, e.g.

```
mget * swt250 /^Fa/

mget system swt250 *

mget interface * *

mget interface * /^Fa0/1/
```

If you request an attribute then the type must be an attribute or a wildcard, e.g.

```
mget * swt250 * *

mget counter swt250 Fa0/1 /IF-MIB/
```

Examples

Retrieve the entire configuration for a single device:

```
mget * swt250 * *
```

Retrieve the sysName for each device:

```
mget text * * SNMPv2-MIB.sysName

Atlanta-ro sys SNMPv2-MIB.sysName = Atlanta-ro.akips.com
Baltimore-ro sys SNMPv2-MIB.sysName = Baltimore-ro.akips.com
Boston-ro sys SNMPv2-MIB.sysName = Boston-ro.akips.com
Charlotte-ro sys SNMPv2-MIB.sysName = Charlotte-ro.akips.com
cisco-74-1-1 sys SNMPv2-MIB.sysName = cisco-74-1-1
```

Retrieve all IF-MIB objects for a single interface:

```
mget * swt250 Fa0/1 /^IF-MIB.*/

swt250 Fa0/1 IF-MIB.ifAdminStatus = 1,up,1434416774,1434416774
swt250 Fa0/1 IF-MIB.ifAlias = Link to swt251
swt250 Fa0/1 IF-MIB.ifDescr = FastEthernet0/1
swt250 Fa0/1 IF-MIB.ifDuplex = 3,fullDuplex,1434416774,1434416774
swt250 Fa0/1 IF-MIB.ifHCInBroadcastPkts = 1
```

Retrieve the IPv4/6 addresses for each device:

```
mget text * sys /ip.addr/

Atlanta-ro sys ip4addr = 10.4.26.1
Atlanta-ro sys ip6addr = fd00:10:4:26::1
Baltimore-ro sys ip4addr = 10.4.22.1
Baltimore-ro sys ip6addr = fd00:10:4:22::1
Boston-ro sys ip4addr = 10.4.23.1
Boston-ro sys ip6addr = fd00:10:4:23::1
...
```

Case study

A customer used the `mget` command to obtain the serial numbers of all devices on his network, including their access points:

```
mget * * * /serial/
```

4.1.6 mlist

Use the `mlist` command to retrieve a list of matching entities.

Unlike the `mget` command, the output does not contain any entity values.

Use the following syntax:

```
mlist {type} [{parent regex} [{child regex} [{attribute regex}]]]
[value {text|/regex/|integer|ipaddr}] [profile {profile name}]
[any|all|not group {group name} ...
```

Examples

Retrieve a list of all interfaces on a device:

```
mlist interface swt250 *

swt250 Fa0/1
swt250 Fa0/10
swt250 Fa0/11
swt250 Fa0/12
swt250 Fa0/16
...
```

Retrieve a list of interface attributes on a device with the type counter:

```
mlist counter

swt250 * /^IF-MIB./
swt250 Fa0/1 IF-MIB.ifHCInBroadcastPkts
swt250 Fa0/1 IF-MIB.ifHCInMulticastPkts
swt250 Fa0/1 IF-MIB.ifHCInOctets
swt250 Fa0/1 IF-MIB.ifHCInUcastPkts
swt250 Fa0/1 IF-MIB.ifHCOutBroadcastPkts
swt250 Fa0/1 IF-MIB.ifHCOutMulticastPkts
swt250 Fa0/1 IF-MIB.ifHCOutOctets
swt250 Fa0/1 IF-MIB.ifHCOutUcastPkts
swt250 Fa0/1 IF-MIB.ifInDiscards
swt250 Fa0/1 IF-MIB.ifInErrors
...
```

Retrieve a list of enumerated attribute types configured for a device:

```
mlist enum swt250 * *

swt250 cstack.1 CISCO-STACK-MIB.moduleStandbyStatus
swt250 cstack.1 CISCO-STACK-MIB.moduleStatus
swt250 Fa0/1 IF-MIB.ifAdminStatus
swt250 Fa0/1 IF-MIB.ifDuplex
swt250 Fa0/1 IF-MIB.ifOperStatus
swt250 Fa0/1 IF-MIB.ifType
swt250 Fa0/10 IF-MIB.ifAdminStatus
...
```

4.1.7 mtype

Use the `mtype` command to retrieve a list of matching entities.

Unlike the `mget` command, the output contains entity types, not values.

Use the following syntax:

```
mtype {type} [{parent regex} [{child regex} [{attribute regex}]]]
[value {text|/regex/|integer|ipaddr}] [profile {profile name}]
[any|all|not group {group name} ...]
```

Examples

Retrieve a list of childs for a device:

```
mtype * swt250 *

swt250 cpu.1 processor
swt250 cstack.1 child
swt250 Fa0/1 interface
...
swt250 Gi0/1 interface
swt250 Gi0/2 interface
swt250 ipsla.1 ipsla
swt250 ipsla.2 ipsla
swt250 ping6 system
swt250 psu.1003 system
swt250 ram.1 memory
swt250 ram.2 memory
swt250 sys system
```

Retrieve a list of attributes for a device:

```
mtype * swt250 * *

swt250 cpu.1 CISCO-PROCESS-MIB.cpmCPUTotal1minRev gauge
swt250 cstack.1 CISCO-STACK-MIB.moduleModel text
swt250 cstack.1 CISCO-STACK-MIB.moduleStandbyStatus enum
swt250 cstack.1 CISCO-STACK-MIB.moduleStatus enum
swt250 Fa0/1 IF-MIB.ifAdminStatus enum
swt250 Fa0/1 IF-MIB.ifAlias text
swt250 Fa0/1 IF-MIB.ifDescr text
swt250 Fa0/1 IF-MIB.ifDuplex enum
swt250 Fa0/1 IF-MIB.ifHCInBroadcastPkts counter
swt250 Fa0/1 IF-MIB.ifHCInMulticastPkts counter
...
```

4.1.8 rename

Use the **rename** command to rename a parent or child.

Use the following syntax:

```
rename {type} {existing parent name} {new parent name}

rename {type} {existing parent name} {existing child name}
{new parent name} {new child name}
```

Examples

Rename a device:

```
rename device nyc-rtr usa-nyc-rtr12
```

Move an interface from one device to another:

```
rename interface nyc-rtr1 Se0/1 nyc-rtr2 Se0/1
```

4.1.9 set

Use the `set` command to update an entity's value.

Use the following syntax:

```
set {parent name} {child name} [{attribute name}] = {value}
```

Examples

```
set swt250 sys SNMPv2-MIB.sysLocation = "AKIPS Test Lab"

set swt250 sys SNMPv2-MIB.sysContact = "AKIPS developers"

set swt250 sys ip4addr = 10.1.8.250
```

4.2 Group commands

4.2.1 add

Use the **add** command to create a new group.

If the group already exists, AKIPS will not update it.

You cannot change a group's type once created.

Use the following syntax:

```
add {type} group {group name}
```

Examples

Add a group:

```
add device group core-routers
```

Add an interface group:

```
add interface group uplinks
```

Add an ipsla group:

```
add ipsla group Jitter-tests
```

Add device and super groups:

```
add device group SFO-BuildingA-Fl01
add device group SFO-BuildingA-Fl02
add device group SFO-BuildingA-Fl03
...
add device group SFO-BuildingB-Fl01
add device group SFO-BuildingB-Fl02
add device group SFO-BuildingB-Fl03
...
add super group SFO-BuildingA
add super group SFO-BuildingB
add super group SFO-Campus
```

Add interface and super groups:

```
add interface group SFO-BuildingA-switch-uplinks
...
add super group SFO-Campus-switch-uplinks
```

You can also use the `add` command to create a new profile group.

Use the following syntax:

```
add profile group {group name}
```

Example

```
add profile group WAN-Tech-Support
```

4.2.2 assign

Use the `assign` command to assign groups.

Use the following syntax:

```
assign group {group name} = {super group name}

assign {type} {parent regex} [{child regex} [{attribute regex}]]
[value {text|integer|/regex/|ipaddr}] [profile {profile name}]
[any|all|not group {group name} ...]  = {target group} ...
```

Examples

Create vendor groups and assign devices to them based on attribute values:

```
add device group Cisco

add device group Extreme

assign * * sys SNMPv2-MIB.sysDescr value /Cisco/ = Cisco

assign * * sys SNMPv2-MIB.sysDescr value /Cabletron/ = Extreme

assign * * sys SNMPv2-MIB.sysDescr value /Enterasys/ = Extreme

assign * * sys SNMPv2-MIB.sysDescr value /Extreme/ = Extreme
```

Put different models into groups using sysDescr:

```
add device group Cisco-3600

add device group Cisco-3700

add device group Cisco-7200

assign * * sys SNMPv2-MIB.sysDescr value "/Cisco IOS 3600/" =
Cisco-3600

assign * * sys SNMPv2-MIB.sysDescr value "/Cisco IOS 3700/" =
Cisco-3700

assign * * sys SNMPv2-MIB.sysDescr value "/Cisco IOS 7200/" =
Cisco-7200
```

Put different models into groups using sysObjectID:

```
add device group Cisco-3600

add device group Cisco-3700

add device group Cisco-7200

assign * * sys SNMPv2-MIB.sysObjectID value
/CISCO-PRODUCTS-MIB.cisco36/ = Cisco-3600

assign * * sys SNMPv2-MIB.sysObjectID value
/CISCO-PRODUCTS-MIB.catalyst37xxStack/ = Cisco-3700

assign * * sys SNMPv2-MIB.sysObjectID value
/CISCO-PRODUCTS-MIB.cisco72/ = Cisco-7200
```

Create some device groups:

```
add device group routers

add device group switches

add device group core-routers

add device group regional-routers

add device group core-switches

add device group regional-switches
```

Create some interface groups:

```
add interface group core-links

add interface group core-switch-uplinks

add interface group regional-links

add interface group servers
```

Assign interfaces to a group:

```
add interface group serial-links

assign interface * /^Se/ = serial-links27
```

Assign all links with a specific ifAlias to a group:

```
add interface group Switch-Uplinks

assign interface * * IF-MIB.ifAlias value /uplink/ =
Switch-Uplinks
```

Create a group hierarchy:

```
add device group central-office-fl01

assign device /central-office-fl01-.*/ = central-office-fl01

add device group central-office-fl02

assign device /central-office-fl02-.*/ = central-office-fl02

add super group central-office

assign group central-office-fl01 = central-office

assign group central-office-fl02 = central-office

add super group Brisbane

assign group central-office = Brisbane

add super group Queensland

assign group Brisbane = Queensland

add super group Australia

assign group Queensland = Australia
```

You can also use the **assign** command to assign a user or group to a profile group.

Use the following syntax:

```
assign user {user name} = {profile name}

assign {type} group {group regex} = {profile name}

assign group {group regex} = {profile name}
```

Examples

Allow a profile to access a device group:

```
assign device group Alcatel = Support
```

Allow a profile to access an interface group:

```
assign interface group ifspeed_10G = Support
```

Assign a user to a location profile:

```
assign user a.jager = Building02
```

Create a profile group and allow it to access specific devices:

```
add profile group WAN-Tech-Support

add device group WAN-Devices

assign * * sys SNMPv2-MIB.sysDescr value /Cisco/ = WAN-Devices

add report group WAN-Reports

assign * * config vendor value /Cisco/ = WAN-Reports

assign group WAN-Devices = WAN-Tech-Support

assign group WAN-Reports = WAN-Tech-Support
```

Create a profile group, assign a user and allow access to devices with a specific sysName:

```
add profile group Helpdesk-Profile

assign user fred = Helpdesk-Profile

add device group Helpdesk-Devices

assign * /-swt|-rtr/ = Helpdesk-Devices

assign group helpdesk-devices = Helpdesk-Profile
```

4.2.3 clear

Use the `clear` command to remove group assignments.

Use the following syntax:

```
clear group {group name} = {super group name} clear {type}
{parent regex} [{child regex} [{attribute regex}]]
[value {text|/regex/|integer|ipaddr}] [profile {profile name}]
[any|all|not group {group name} ...]  = {target group} ...
```

Example

Assign devices to a group and then clear switches:

```
assign * * sys SNMPv2-MIB.sysDescr value /Cisco/ = Cisco

clear * * sys SNMPv2-MIB.sysDescr value "/Cisco IOS C3560/"
= Cisco
```

You can also use the `clear` command to remove entities from a profile group.

Use the following syntax:

```
clear user {user name} = {profile name}

clear group {group name} = {profile name}

clear group {group regex} = {profile name}

clear {type} group {group regex} = {profile name}
```

Examples

Remove a user from a profile group:

```
clear user a.jager = Cisco-Only
```

Remove a profile group's access to a device group:

```
clear group WAN-Device = WAN-Tech-Support
```

4.2.4 count

Use the `count` command to return the number of entities in a group.

Use the following syntax:

```
count {type} group {group regex}
```

Example

Count the number of interfaces in a group:

```
count interface group uplinks
```

4.2.5 delete

Use the `delete` command to remove a single group.

Use the following syntax:

```
delete {type} group {group name}
```

Examples

Delete a device group:

```
delete device group core-routers
```

Delete an interface group:

```
delete interface group uplinks
```

Delete a super group:

```
delete super group SFO-Campus
```

4.2.6 get

Use the `get` command to check if a group exists.

Use the following syntax:

```
get group {group name}
```

Example

```
get group Cisco
```

```
device
```

You can also use the `get` command to check if a profile group exists.

Use the following syntax:

```
get profile user {user name}
```

Example

Show the profile allocated to a user:

```
get profile user a.jager
```

```
Support
```

4.2.7 list

Use the `list` command to see the groups in a specific type.

Use the following syntax:

```
list {type} group [{parent name} [{child name}
[{attribute name}]]] [profile {profile name}]
[super {super group name}]
```

Examples

```
list profile group
```

```
list device group
```

```
list * group
```

You can also use the `list` command to find the profile groups associated with an entity.

Use the following syntax:

```
list profile {type} {parent name} [[{child name}]
{attribute name}]
```

Examples

Find the groups associated with a profile group:

```
list * group profile Support

super,Australia
super,Brisbane
super,central-office
device,Cisco
device,Dell
interface,ifspeed_1
interface,ifspeed_1.4G
interface,ifspeed_1.5M
interface,ifspeed_1.8
```

Find the devices associated with a profile group:

```
list device group profile Support

Cisco
Dell
```

Find the interfaces associated with a profile group:

```
list interface group profile Support

ifspeed_1
ifspeed_1.4G
ifspeed_1.8G
ifspeed_100G
...
```

Find all of the super groups that a profile group can access:

```
list device super group profile Support

Australia
Brisbane
central-office
```

4.2.8 mget

Use the `mget` command to retrieve large amounts of configuration information for a profile group.

Use the following syntax:

```
mget {type} [{parent regex} [{child regex} [{attribute regex}]]]
[value {text|integer|/regex/|ipaddr}] [profile {profile name}]
[any|all|not group {group name} ...]
```

Example

Show every device that a profile group can access:

```
mget device profile Cisco-Only

cisco-132-0-1
cisco-132-0-10
```

4.2.9 mlist

Use the `mlist` command to find entities associated with a profile group.

Use the following syntax:

```
mlist {type} [profile {profile name}]
```

Example

Show which devices a profile group can access:

```
mlist device profile fred
```

4.2.10 mtype

Use the `mtype` command to return an entity type for a profile group.

Use the following syntax:

```
mtype {type} [profile {profile name}]
```

Example

Show which entity types a profile group can access:

```
mtype * profile Fred
```

4.2.11 prune

Use the `prune` command to remove empty groups.

Use the following syntax:

```
prune {type} group [{group regex}]
```

Examples

Remove all empty device groups:

```
prune device group
```

Remove all empty interface groups:

```
prune interface group
```

4.2.12 rename

Use the `rename` command to rename a group. This will retain all of its associations.

Use the following syntax:

```
rename {type} group {existing group name} {new group name}
```

Examples

Rename a profile group:

```
rename profile group Support Network-Support
```

Rename a device group:

```
rename device group core-routers USA-Core-Routers
```

Rename an interface group:

```
rename interface group uplinks Switch-Uplinks
```

4.3 Event commands

Event flags include:

- **ack**
- **critical**. AKIPS automatically adds a critical event flag to entities which match crit_event
- **suppress**
- **warning.** AKIPS automatically adds a warning event flag to entities which match warn_event
- **above**
- **below**.

4.3.1 add

Use the `add` command to add an entity before creating an event.

You can use only the critical event flag with `add`.

Use the following syntax:

```
add event {time} {parent name} {child name} {attribute name}
[{event flags}] = {value}
```

Examples

Add ifOperStatus down and up events:

```
add event 0 swt250 Se0/1 IF-MIB.ifOperStatus = down

add event 0 swt250 Se0/1 IF-MIB.ifOperStatus = up
```

Add ping-down and SNMP-down events:

```
add event 0 swt250 ping4 PING.icmpState = down

add event 0 swt250 ping6 PING.icmpState = down

add event 0 swt250 sys snmp.snmpState = down
```

Create a site-specific admin state for a device which may be set by another system:

```
add enum swt250 sys admin_state

add event 0 swt250 sys admin_state = maintenance

add event 0 swt250 sys admin_state = online
```

4.3.2 clear

Use the `clear` command to clear a flag from an event.

Use the following syntax:

```
clear event {time} {parent name} {child name} {attribute name} =
{event flags}
```

Example

Clear the critical flag on a ping-down event:

```
clear event 1435822220 swt250 ping4 ping.icmpState = critical
```

4.3.3 delete

Use the `delete` command to delete an event.

Use the following syntax:

```
delete event {time} {parent name} {child name} {attribute name}
```

Example

Delete a down event:

```
delete event 1435822225 swt250 ping4 PING.icmpState
```

4.3.4 mdelete

Use the `mdelete` command to delete all events for an attribute within a specific time range.

You can test your selection first with `mget` (see 4.3.5).

Use the following syntax:

```
mdelete event time {time filter} [{parent regex}
[{child regex} [{attribute regex}]]] [profile {profile name}]
[any|all|not group {group name} ...]
```

Example

Delete all IF-MIB.ifOperStatus events for devices in a group for yesterday:

```
mdelete event time yesterday * * IF-MIB.ifOperStatus any group
Edge-Switches
```

4.3.5 mget

Use the `mget` command to retrieve events records in chronological order.

The child description will display only if you include one in its configuration.

Use the following syntax:

```
mget event {all,critical,enum,threshold,uptime}
time {time filter} [{parent regex} {child regex}
{attribute regex}] [profile {profile name}]
[any|all|not group {group name} ...]
```

Enumerated events

Use the following syntax:

```
{epoch} {parent} {child} {attribute} enum {flags} {value}
[{child description}]
```

Uptime events

Use the following syntax:

```
{epoch} {parent} {child} {attribute} uptime {flags}
{last uptime in seconds} [{child description}]
```

Threshold events

Use the following syntax:

```
{epoch} {parent} {child} {attribute} threshold {flags}
{rule exceeded} [{child description}]
```

Examples

Retrieve all ping-outage events for a router for the past hour:

```
mget event enum time last1h Columbus-ro /ping/ *

1435894798 Columbus-ro ping4 PING.icmpState enum none down
10.4.1.22
1435894799 Columbus-ro ping6 PING.icmpState enum none down
fd00:10:4:1::22
1435895128 Columbus-ro ping4 PING.icmpState enum none up
10.4.1.22
1435895129 Columbus-ro ping6 PING.icmpState enum none up
fd00:10:4:1::22
```

Retrieve all ifOperStatus events for the past day:

```
mget event enum time last1d * * IF-MIB.ifOperStatus

1435846269 NewYork-ro Se2/2 IF-MIB.ifOperStatus enum none down
Link to San Francisco
1435846509 NewYork-ro Se2/2 IF-MIB.ifOperStatus enum none up
Link to San Francisco
1435848305 Chicago-ro Se1/4 IF-MIB.ifOperStatus enum none down
Link to Dallas
1435848365 Chicago-ro Se1/4 IF-MIB.ifOperStatus enum none up Link
to Dallas
```

Retrieve all sysUpTime resets:

```
mget event uptime time last1d

1435846486 Toronto-ro sys SNMPv2-MIB.sysUpTime uptime none 19044
1435848309 Columbus-ro sys SNMPv2-MIB.sysUpTime uptime none 7863
1435849250 Detroit-ro sys SNMPv2-MIB.sysUpTime uptime none 10363
1435849830 Cleveland-ro sys SNMPv2-MIB.sysUpTime uptime none
25704
```

Retrieve all threshold events for the past hour:

```
mget event threshold time last1h
```

```
1436104800 cisco-74-1-19 cpu.2 CISCO-PROCESS-MIB.cpm CPUTotal
1minRev threshold critical,above last5m,avg,60
1436104800 Chicago-ro ping4 PING.icmpRtt threshold critical,below
last30m,avg,40000
1436104800 cisco-74-1-38 cpu.26 CISCO-PROCESS-MIB.cpm CPUTotal
1minRev threshold critical,above last5m,avg,60
1436105101 SanFrancisco-ro ping4 PING.icmpRtt threshold
critical,above last30m,avg,40000
1436105101 cisco-74-1-17 cpu.4 CISCO-PROCESS-MIB.cpm CPUTotal
1minRev threshold critical,below last5m,avg,60
1436105101 cisco-74-1-29 cpu.2 CISCO-PROCESS-MIB.cpm CPUTotal1min
threshold critical,above last5m,avg,60
1436105101 cisco-74-1-30 cpu.2 CISCO-PROCESS-MIB.cpm CPUTotal1min
threshold critical,above last5m,avg,60
1436105101 NewYork-ro ping6 PING.icmpRtt threshold critical,above
last30m,avg,40000
1436105101 NewYork-ro ping4 PING.icmpRtt threshold critical,above
last30m,avg,40000
1436105101 Chicago-ro ping4 PING.icmpRtt threshold critical,above
last30m,avg,40000
```

4.3.6 set

Use the **set** command to set event flags.

Use the following syntax:

```
set event {time} {parent name} {child name} {attribute name} =
{event flags}
```

Example

Set a critical flag on an existing ping-down event:

```
set event 1435822220 swt250 ping4 ping.icmpState = critical
```

4.3.7 tget

Use the `tget` command to return time-series values for a number of events per interval.

Use the following syntax:

```
tget event {all,critical,enum,threshold,uptime} {interval secs}
time {time filter} [{parent regex} [{child regex}
[{attribute regex}]]] [profile {profile name}]
[any|all|not group {group name} ...]
```

Example

Retrieve time-series values for all ping events for yesterday in 24 one-hour intervals:

```
tget event all 3600 time yesterday * /ping/

506,426,460,458,440,760,315,301,232,421,332,288,196,299,380,381,
495,448,497,570,386,430,362,530
```

4.4 Time-series commands

4.4.1 calc

Use the `calc` command to calculate a total, average or median value.

Use the following syntax:

```
calc total|avg|{median NN} time {time filter}
{type} {parent name} {child name} {attribute regex}
[profile {profile name}] [any|all|not group {group name} ...]
```

Examples

Calculate the total InOctets for a switch interface for yesterday:

```
calc total time yesterday counter swt250 Fa0/1 /InOctets/
```

Calculate the average InOctets for a switch interface for yesterday:

```
calc avg time yesterday counter swt250 Fa0/1 /InOctets/
```

4.4.2 mcalc

Use the `mcalc` command to calculate multiple total, average or median values.

Use the following syntax:

```
mcalc total|avg|{median NN} time {time filter}
{type} {parent regex} {child regex} {attribute regex}
[profile {profile name}] [any|all|not group {group name} ...]
```

Example

Calculate the In/OutOctets for all interfaces in a group:

```
mcalc total time yesterday counter * * /^IF-MIB.*InOctets|
^IF-MIB.*OutOctets/ any group wan-links mcalc avg time last1m
ifutil swt5 Gi2/0/1 *

Chicago-ro Se1/0 IF-MIB.ifInOctets = 90922240
Chicago-ro Se1/0 IF-MIB.ifOutOctets = 112385280
Chicago-ro Se1/1 IF-MIB.ifInOctets = 0
Chicago-ro Se1/1 IF-MIB.ifOutOctets = 0
Chicago-ro Se1/2 IF-MIB.ifInOctets = 11374963
Chicago-ro Se1/2 IF-MIB.ifOutOctets = 10454049
Chicago-ro Se1/3 IF-MIB.ifInOctets = 11409152
```

Case study

A customer used the `mcalc` command to export the utilisation data (bits in or out) from groups of interfaces for specific device groups, for the previous five minutes as an average:

```
mcalc avg time last5m ifrate * * /IF-MIB.if.*BitRate/
any group Circuit
```

4.4.3 mget

Use the `mget` command to test if an average has crossed a defined threshold.

For threshold examples, see **Admin** > **Alerting** > **Threshold Alerts**.

Use the following syntax:

```
mget last{duration} total|avg|nonzero
[above|below {value}[%]] [time {time filter}]
{type} {parent regex} {child regex} {attribute regex}
[profile {profile name}] [any|all|not group {group name} ...]
```

Examples

Retrieve a list of devices in a group whose average ping RTTs have exceeded a specific value in a specific timeframe:

```
mget last1h avg above 10000 rtt * /ping/ * any group data-center2
```

Retrieve a list of interfaces in a group whose usage have exceeded a specific percentage in a specific timeframe:

```
mget last5m avg above 80% * * * /ifInUtil|ifOutUtil/
any group wan-links3
```

Retrieve a list of devices whose CPU usage have exceeded a specific percentage in a specific timeframe:

```
mget last5m avg above 60 * * * /CISCO-PROCESS-MIB.cpmCPU
Total1min/
```

4.4.4 series

Use the **series** command to return time-series values for a selected time range.

Use the following syntax:

```
series [interval total|avg {secs}] time {time filter}
{type} {parent regex} {child regex} {attribute regex}
[profile {profile name}] [any|all|not group {group name} ...]
```

Example

Retrieve the total In/OutOctet values for an interface:

```
series interval total 3600 time yesterday counter swt250
Fa0/1/InOctets|OutOctets/

swt250 Fa0/1 IF-MIB.ifHCInOctets = 2524672,2463360,2449920,
2447488,2486656,2488064,2457856,...
swt250 Fa0/1 IF-MIB.ifHCOutOctets = 975552,806976,803392,
822016,802496,894144,820480,820608,...
```

4.4.5 top

Use the `top` command to retrieve information on the highest number of events of a particular type within a selected time range.

Use the following syntax:

```
top {N} [reverse] [interval avg {secs}]
total|max|avg|median {NN} time {time filter}
{type} {parent regex} {child regex} {attribute regex}
[profile {profile name}] [any|all|not group {group name} ...]
```

Example

Retrieve the interfaces with the highest In/OutOctets for yesterday:

```
top 20 total time yesterday counter * * /IF-MIB.if.*Octets/

cisco-74-1-12 Te1/1 IF-MIB.ifHCInOctets = 134374989234176
cisco-74-1-16 Te1/1/1 IF-MIB.ifHCOutOctets = 92564298924032
juniper-74-2-7 xe-0/0/10.0 IF-MIB.ifHCInOctets = 92329710977024
juniper-74-2-12 ae47.0 IF-MIB.ifHCOutOctets = 92308460535808
cisco-74-1-24 Ethernet1/23 IF-MIB.ifHCOutOctets = 89412016799744
cisco-74-1-24 Ethernet1/24 IF-MIB.ifHCOutOctets = 88919019356160
juniper-74-2-10 reth0.2213 IF-MIB.ifHCOutOctets = 88832066191360
arista-74-0-40 Ethernet5/6 IF-MIB.ifHCInOctets = 88685106167808
cisco-74-1-17 Po55.152 IF-MIB.ifHCOutOctets = 88431959736320
...
```

4.5 Web API

Instead of using the command console (see 2.2) or SSH, you can transport commands via HTTP.

Use the following syntax:

```
http://{server}/api-db?password={pw};cmds={query}
```

The `api-rw` user can run any API command.

The `api-ro` user can use any of the following commands:

`aggregate`

`calc`

`check`

`count`

`cseries`

`get` (url encode the query, e.g. replace each space with +)

`list`

`mcalc`

`mget`

`mgroup`

`mlist`

`mtime`

`mtype`

`netmask`

`rget`

`series`

`tf`

`tget`

`top`

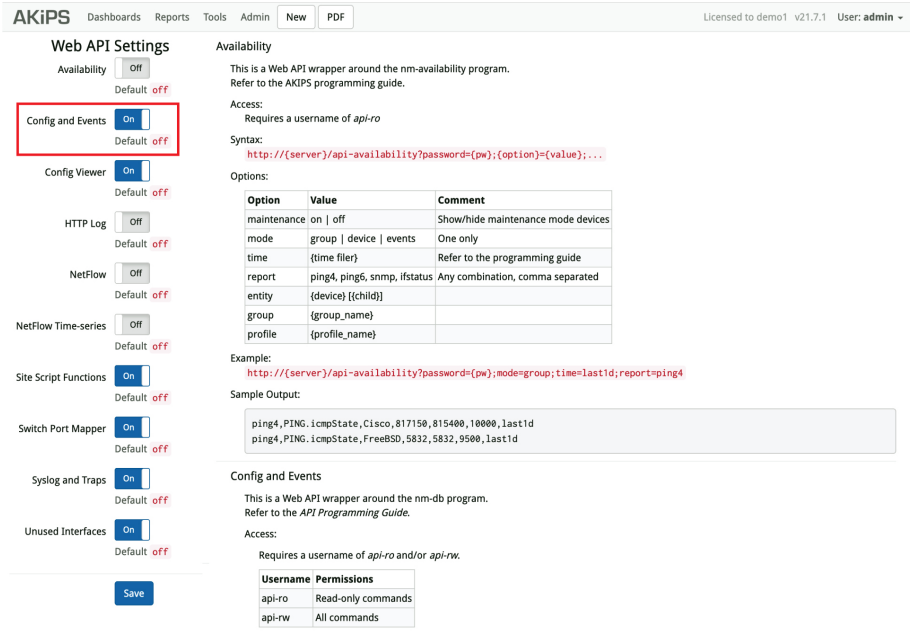
`tz`

To activate the config and events web API:

Go to **Admin** > **API** > **Web API Settings**.

Click the **Config and Events** option **On**.

Click **Save**.



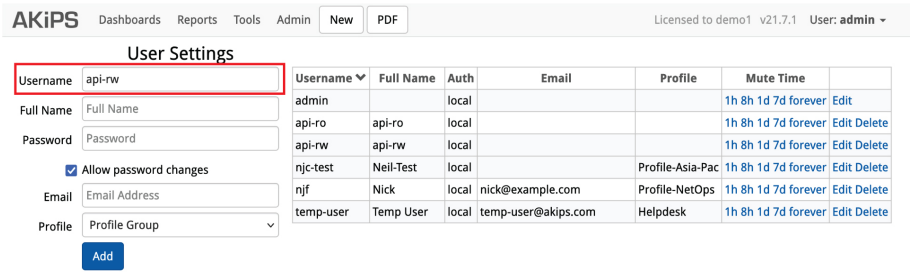
Graphic 3: activating the config and events web API

Go to **Admin** > **Users** / **Profiles** > **User Settings**.

In the **Username** text field, type `api-rw`

Complete the remaining text fields.

Click **Add**.



Graphic 4: configuring user settings for the config and events web API

Case study

A customer wanted to return data from the web API config and events endpoint in JSON. He used site scripting to loop through a list of devices and push the output to an array:

```
push(@deviceoutput, {devicename => $dev, ip4addr =>
$ip4addr, model => $model});
```

He then used the JSON library to convert the array to JSON format:

```
use JSON; my $jsonoutput = to_json(\@deviceoutput,
{utf8 => 1, pretty => 1, canonical => 1});
```

4.5.1 cURL

You can use cURL to access AKIPS data through the web API.

Command line options include:

Command line	Description
`-k`	insecure mode; suppresses SSC error messages
`-d, --data`	sends POST data
`--compressed`	notifies the HTTP server to compress output
`--data-binary`	sends POST data in binary form: does not strip new line characters (e.g. gzip)
`@{filename}`	reads POST data from {filename}. You must first use `-d, --data`
`@-`	reads POST data from standard input. You must first use `-d, --data`

Examples

Retrieve a list of devices:

```
curl "http://{server}/api-db?password={pw};cmds=mget+device+*"
```

Retrieve a list of unreachable IPv4 ping devices:

```
curl "http://{server}/api-db?password={pw};
cmds=mget+*+*+ping4+PING.icmpState+value+/down/"
```

4.5.2 data

Use the `data` command to send data, including multiple commands at a time.

You can run several commands from a file, e.g.

```
curl --data-binary @commands
"http://{server}/api-db?password={pw}"
```

You can run several commands from the standard input stream, e.g.

```
cat commands | curl --data-binary @-
"http://{server}/api-db?password={pw}"
```

Examples

Retrieve a list of devices:

```
curl -d "cmds=mget device *"
"http://{server}/api-db?password={pw}"
```

Retrieve a list of unreachable IPv4 ping devices:

```
curl -d "cmds=mget * * ping4 PING.icmpState value /down/"
"http://{server}/api-db?password={pw}"
```

Chapter 5

Syslog and traps reporter

AKIPS stores all syslog and SNMP traps in a single database.

Use the `nm-msg-reporter` command line tool to extract and filter messages.

Use the following syntax:

```
time {filter}

[type {syslog|trap}]

[addr {filter}]

[limit {num}]

[regex {filter}]

[mute {file}]

[trim {file}]

[opt stats]

[interval {sec}]
```

5.1 CSV output

Each syslog or trap message contains:

- header line: `{system timestamp} {type} {IP version} {IP Address}`
- message text
- blank terminating line.

Examples

Retrieve all syslog messages for the past hour:

```
time last1h type syslog

1436229532 syslog 4 10.4.2.130
error local7 67:  *Mar 3 09:22:52.269:  SYS-3-CPUHOG: Task is
running for (3180)msecs, more ...

1436229532 syslog 4 10.4.2.130
error local7 68:  -Traceback= 0x60C35A94 0x60C35C84 0x60C34688
0x60C34B84 0x60C38BC8 0x60C2950C ...

1436229532 syslog 4 10.4.2.130
error local7 69:  *Mar 3 09:22:53.109:  SYS-3-CPUHOG: Task is
running for (4024)msecs, more ...

1436229532 syslog 4 10.4.2.130
error local7 70:  -Traceback= 0x60C35A98 0x60C35C84 0x60C34688
0x60C34B84 0x60C38BC8 0x60C2950C ...
```

Retrieve all trap messages for the past day which contain specific text:

```
type trap time last1d regex OSPF

1436232075 trap 4 10.4.2.26
SNMPv2-MIB sysUpTime 0 TimeTicks 53803
SNMPv2-MIB snmpTrapOID 0 ObjectIdentifier
CISCO-SYSLOG-MIB.clog MessageGenerated
CISCO-SYSLOG-MIB clogHistFacility 122 DisplayString OSPFv3
CISCO-SYSLOG-MIB clogHistSeverity 122 ENUM 6,notice
CISCO-SYSLOG-MIB clogHistMsgName 122 DisplayString ADJCHG
CISCO-SYSLOG-MIB clogHistMsgText 122 DisplayString Process 1, Nbr
10.4.45.1 on Serial1/6 from ...
CISCO-SYSLOG-MIB clogHistTimestamp 122 TimeTicks 53803

1436232075trap 4 10.4.2.26
SNMPv2-MIB sysUpTime 0 TimeTicks 53803
SNMPv2-MIB snmpTrapOID 0 ObjectIdentifier
OSPF-TRAP-MIB.ospf NbrStateChange
OSPF-MIB ospfRouterId 10.4.2.20 IPAddress 10.4.40.1
OSPF-MIB ospfNbrIpAddr 10.4.2.20 IPAddress 10.4.2.166
OSPF-MIB ospfNbrAddressLessIndex 10.4.2.20 Integer 0
OSPF-MIB ospfNbrRtrId 10.4.2.20 IPAddress 10.4.45.1
OSPF-MIB ospfNbrState 10.4.2.20 ENUM 1,down
```

Retrieve all syslog and trap messages for today from a specific IP address:

```
time today addr 10.4.2.26

1436232275 syslog 4 10.4.2.26
notice local7 149:Jul 7 11:24:34.476:  LINEPROTO-5-UPDOWN: Line
protocol on Interface Serial1/6, changed...

1436232275 syslog 4 10.4.2.26
notice local7 150:Jul 7 11:24:34.572:  OSPF-5-ADJCHG: Process 1,
Nbr 10.4.45.1 onSerial1/6 from LOADING...

1436232275 trap 4 10.4.2.26
SNMPv2-MIB sysUpTime 0 TimeTicks 54003
SNMPv2-MIB snmpTrapOID 0 ObjectIdentifier
OSPF-TRAP-MIB.ospf Nbr StateChange
OSPF-MIB ospfRouterId 10.4.2.20 IPAddress 10.4.40.1
OSPF-MIB ospfNbrIpAddr 10.4.2.20 IPAddress 10.4.2.166
OSPF-MIB ospfNbrAddressLessIndex 10.4.2.20 Integer 0
OSPF-MIB ospfNbrRtrId 10.4.2.20 IPAddress 10.4.45.1
OSPF-MIB ospfNbrState 10.4.2.20 ENUM 8,full

1436232276 trap 4 10.4.2.26
SNMPv2-MIB sysUpTime 0 TimeTicks 54004
SNMPv2-MIB snmpTrapOID 0 ObjectIdentifier
OSPF-TRAP-MIB. ospf OriginateLsa
OSPF-MIB ospfRouterId 10.4.2.20 IPAddress 10.4.40.1
OSPF-MIB ospfLsdbAreaId 10.4.2.20 IPAddress 0.0.0.0
OSPF-MIB ospfLsdbType 10.4.2.20 ENUM 1,routerLink
```

5.2 Web API

You can use a web API wrapper for `nm-msg-reporter`

Use the following syntax:

```
https://{server}/api-msg?password={pw};time={time filter};
[addr={ip filter}];[type=syslog|trap];[device={name}|{regex}];
[regex={regex filter}];[limit={qty messages}]
```

Examples

Retrieve all syslog messages for the past 30 minutes for devices with specific text:

```
http://{server}/api-msg?password={pw};time=last30m;type=syslog;
device=/^swt/;
```

Retrieve up to a specific number of syslog messages for the past hour for a specific IP address:

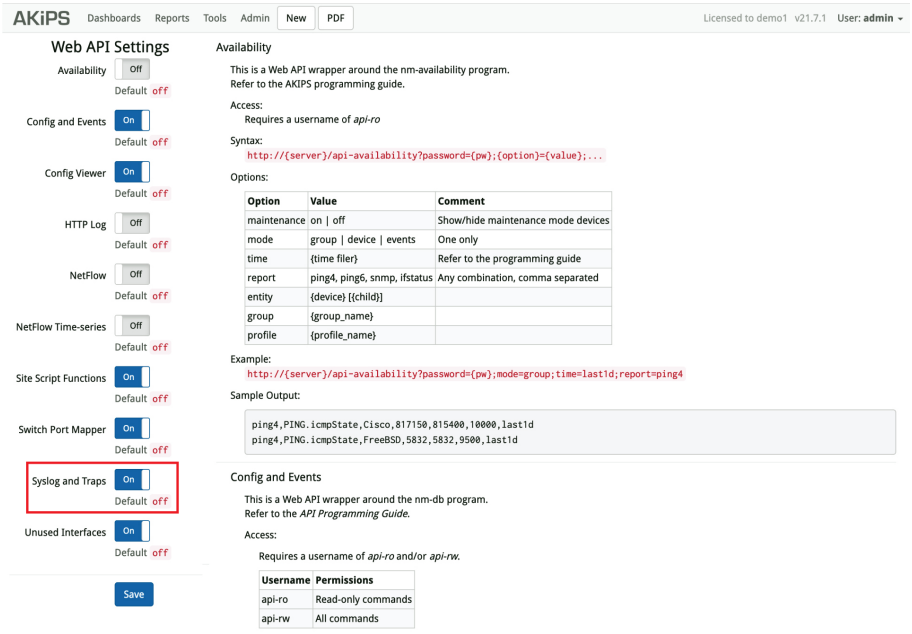
```
http://{server}/api-msg?password={pw};time=last1h;addr=0.1.9.6;
type=syslog;regex=down;limit=5;
```

To activate the syslog and traps web API:

Go to **Admin** > **API** > **Web API Settings**.

Click the **Syslog and Traps** option **On**.

Click **Save**.



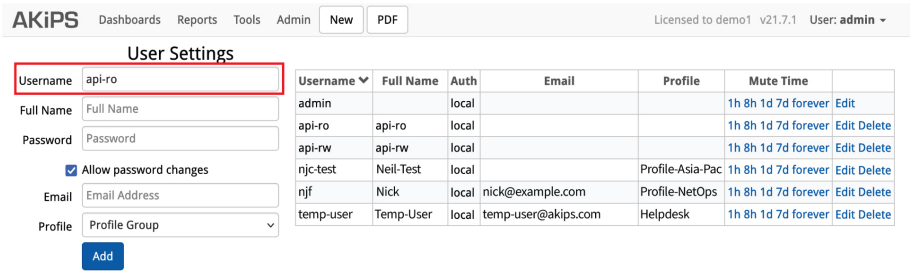
Graphic 5: activating the syslog and traps web API

Go to **Admin** > **Users / Profiles** > **User Settings**.

In the **Username** text field, type `api-ro`

Complete the remaining text fields.

Click **Add**.



Graphic 6: configuring user settings for the syslog and traps web API

Chapter 6

Availability

Use the `nm-availability` command line tool to retrieve availability statistics.

Use the following syntax:

`[-m]` *(include maintenance mode)*

`mode { group | device | events }`

`time { time filter }`

`report { ping4,ping6,snmp,ifstatus }`

`[entity { device } [{ interface }]]`

`[group { name }]`

`[profile { name }]`

6.1 Group

This will retrieve a summary of device and interface groups.

The output will be in the following format:

```
{child},{attr},{group name},{total time},{match time},
{group target},{tf}[;{group tf}]
```

Example

```
nm-availability mode group time last1w report ping4
```

```
ping4,PING.icmpState,1-Building-4,11688115,11687711,9990,last1w
ping4,PING.icmpState,1-Fraser,8213270,8213190,9990,last1w
ping4,PING.icmpState,1-Building-16,44541195,44540002,9990,last1w
ping4,PING.icmpState,Accedian,1766635,1766635,9890,last1w;
mon to sat 6:00 to 20:00
ping4,PING.icmpState,Aerohive,589475,589475,9999,last1w;
mon to fri 7:00 to 19:00; sat 8:00 to 18:00
```

6.2 Device

This will retrieve a summary of devices.

The output will be in the following format:

```
{parent},{child},{attr},{total time},{match time},{group target}
```

Example

```
nm-availability mode device time last1w report snmp,ping4
group Accedian

accedian-131-2-7,ping4,PING.icmpState,136020,136020,9890
accedian-131-2-7,sys,SNMP.snmpState,136020,136020,9890
accedian-131-2-8,ping4,PING.icmpState,136020,136020,9890
accedian-131-2-8,sys,SNMP.snmpState,136020,136020,9890
accedian-131-2-9,ping4,PING.icmpState,136020,136020,9890
accedian-131-2-9,sys,SNMP.snmpState,136020,136020,9890
```

6.3 Events

This will retrieve pairs of up/down events.

The output will be in the following format:

```
{parent},{child},{down},{up},{total time},{match_time}
```

Example

```
nm-availability mode events time last1M report ping4
entity cisco-131-16-1

cisco-131-16-1,ping4,1603822871,1603822916,2389764,2388341
cisco-131-16-1,ping4,1603088563,1603089823,2389764,2388341
cisco-131-16-1,ping4,1603060380,1603060498,2389764,2388341
```

Chapter 7

NetFlow reporter

AKIPS stores NetFlow records in a dedicated database.

Use the `nm-flow-reporter` command line tool to query the database.

Use the following syntax:

```
nm-flow-reporter [optional parameters] time {time filter}
exporter {exporter IP address}
```

Optional parameters:

```
[src_ip | dst_ip | any_ip | both_ip {IP filter}]

[src_as | dst_as | any_as | both_as {AS Number|Name|Regex}]

[src_idx | dst_idx | any_idx | both_idx {ifIndex}]

[show src_ip,dst_ip,src_host,dst_host,src_idx,dst_idx,src_as,
dst_as,geo,tos,proto,pkt,oct,flow,conv,tsf,url]

[sort src_ip | dst_ip | src_idx | dst_idx | src_as | dst_as |
pkt | oct | flow | conv]

[proto {protocol.service}]

[limit {num}]

[sort_dir {f | r}]
```

Parameter	Description
src_ip	source IPv4/6 address
dst_ip	destination IPv4/6 address
src_idx	SNMP index of source (input) interface
dst_idx	SNMP index of destination (output) interface
src_host	source hostname
dst_host	destination hostname
src_as	source AS number
dst_as	destination AS number
geo	location (country code) of IP addresses
tos	IP type of service
proto	IP protocol type
pkt	number of packets
oct	octets (bytes)
flow	flows

(continued)

Parameter	Description
conv	number of conversations
tsf	filter that can be passed to `nm-flow-timeseries`

Example

Retrieve TopN protocol data for packets/octets, sorted by octets:

```
http://{server}/api-flow?password={pw};exporter=10.0.0.254;
time=last10m;show=proto,pkt,oct;sort=oct
```

7.1 CSV output

The first line of output contains 24 fields which describe the data.
Each following line contains data which match the parameters.
Empty fields represent an unreported value.

```
source IP,destination IP,source index,destination index,
source hostname,destination hostname,source AS number,
destination AS number,source AS name,destination AS name,
source location,destination location,type of service,protocol,
packets,octets,flows,conversations,timeseries filter,url,
milliseconds to process,records processed,records matched,
records included in result
```

Example

```
nm-flow-reporter exporter 10.117.0.35 time last30m limit 10show
src_ip,dst_ip,proto,geo,tos,pkt,oct,flow sort pktsort_dir f
src_ip 188.24.60.104 #Src IP,Dst IP,,,,,,,Src Location,Dst
Location,TOS Number,Protocol,
Packets,Bytes,Flows,,,3,44346,221,213

188.24.60.104,213.138.70.62,,,,,,,RO,RU,0,tcp.re-mail-ck,124,
74576,3,,,
188.24.60.104,203.45.91.4,,,,,,,RO,AU,0,icmp.echoreply,73,38921,2,,,
188.24.60.104,65.60.39.90,,,,,,,RO,US,0,udp.epmap,64,38303,2,,,
188.24.60.104,65.60.39.90,,,,,,,RO,US,0,udp.unknown,63,33321,2,,,
188.24.60.104,58.167.215.31,,,,,,,RO,AU,0,tcp.http,49,35703,1,,,
188.24.60.104,202.159.32.2,,,,,,,RO,ID,200,udp.domain,49,29878,1,,,
188.24.60.104,203.45.91.4,,,,,,,RO,AU,0,udp.z3950,49,35131,1,,,
188.24.60.104,123.100.150.72,,,,,,,RO,AU,0,tcp.timeserver,49,
31455,1,,,
188.24.60.104,81.205.200.183,,,,,,,RO,NL,0,tcp.snpp,48,20521,1,,,
188.24.60.104,65.60.39.90,,,,,,,RO,US,0,tcp.netbios-ns,48,12403,1,,,
```

7.2 Web API

You can use a web API wrapper for `nm-flow-reporter`

Use the following syntax:

```
http://{server}/api-flow?password={pw};{option}={value};...
```

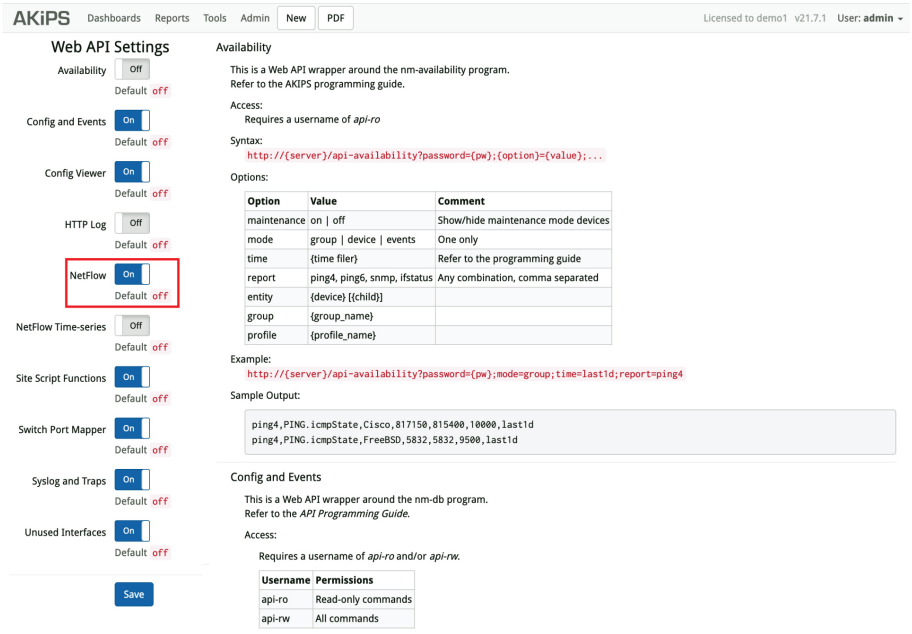
Option	Value
exporter	{exporter IP}
time	{increments of 5 minutes}
show	src_ip,dst_ip,src_host,dst_host,src_idx, dst_idx,src_as,dst_as,geo,tos,proto,pkt, oct,flow,conv
sort	src_ip | dst_ip | src_idx | dst_idx | src_as | dst_as | pkt | oct | flow | conv
proto	{protocol}.{service}
src_ip | dst_ip | any_ip | both_ip	{ip filter}
src_as | dst_as | any_as | both_as	{Autonomous System Filter}
src_idx | dst_idx | any_idx | both_idx	{Index Filter Number}
sort_dir	f | r

To activate the NetFlow web API:

Go to **Admin** > **API** > **Web API Settings**.

Click the **NetFlow** option **On**.

Click **Save**.



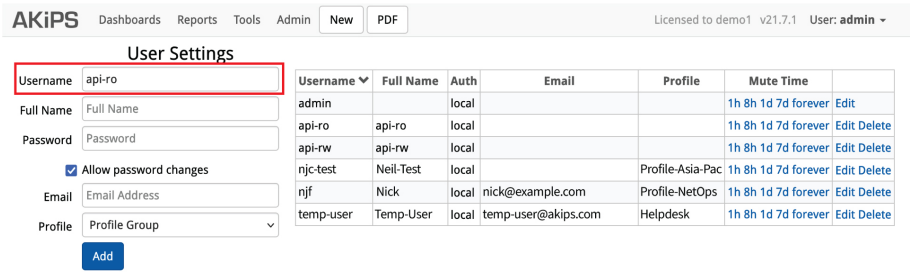
Graphic 7: activating the NetFlow web API

Go to **Admin** > **Users** / **Profiles** > **User Settings**.

In the **Username** text field, type `api-ro`

Complete the remaining text fields.

Click **Add**.



Graphic 8: configuring user settings for the NetFlow web API

Chapter 8

NetFlow time series

Use the `nm-flow-timeseries` command line tool to extract time-series values for:

- packets
- bytes (octets)
- bits per second
- flows.

Use the following syntax:

```
nm-flow-timeseries [optional parameters] time {time filter}
exporter {exporter IP address} interval {minutes}
```

Optional parameters:

```
[src_ip | dst_ip | any_ip | both_ip {IP filter}]
[src_as | dst_as | any_as | both_as {AS Number|Name|Regex}]
[src_idx | dst_idx | any_idx | both_idx {ifIndex}]
tos {number} [proto {protocol.service}]
```

8.1 CSV output

Each query delivers four lines of CSV output that may contain the following:

- **source/destination IP**
- **protocol**
- **start time** (POSIX timestamp)
- **interval in seconds**
- **time-series values**. AKIPS calculates these by dividing the time span by the interval. E.g. today divided by 60 minutes produces 24 time-series values.

Examples

```
time last1h src_ip 157.187.62.203 interval 10 exporter
172.16.1.17

157.187.62.203,,,,Pkts,1436243100,600,69970,1236,44698,45,38252,
33,21
157.187.62.203,,,,Bytes,1436243100,600,98279249,134122,62765460,
4296,53683296,3352,2009
157.187.62.203,,,,Bits 1436243100,600,786233992,1072976,502123680,
34368,429466368,26816,16072
157.187.62.203,,,,Flows,1436243100,600,32,41,30,45,38,31,21


time last1h src_ip 10.1.8.62 proto udp.snmp interval 5 exporter
10.4.2.22

10.1.8.62,,,udp.snmp,Pkts,1436244300,300,126,114,125,128,495,125,
128,106,131,128,121,0,52
10.1.8.62,,,udp.snmp,Bytes,1436244300,300,76605,68846,75615,77655,
120197,75738,77745,64000,79708,...
10.1.8.62,,,udp.snmp,Bits,1436244300,300,612840,550768,604920,
621240,961576,605904,621960,512000,...
10.1.8.62,,,udp.snmp,Flows,1436244300,300,49,51,50,50,140,50,50,
48,52,50,22,0,16
```

8.2 Web API

You can use a web API wrapper for `nm-flow-timeseries`

Use the following syntax:

```
http://{server}/api-flow-timeseries?password={pw};
{option}={value};...
```

Option	Value
exporter	{exporter IP}
time	{time filter}
interval	{increments of 5 minutes}
proto	{protocol}.{service}
src_ip | dst_ip | any_ip | both_ip	{ip filter}
src_as | dst_as | any_as | both_as	{AS Number|Name|Regex}
src_idx | dst_idx | any_idx | both_idx	{ifIndex}
tos	{number}

Example

Retrieve five-minute time-series values for all flow records on a specific exporter:

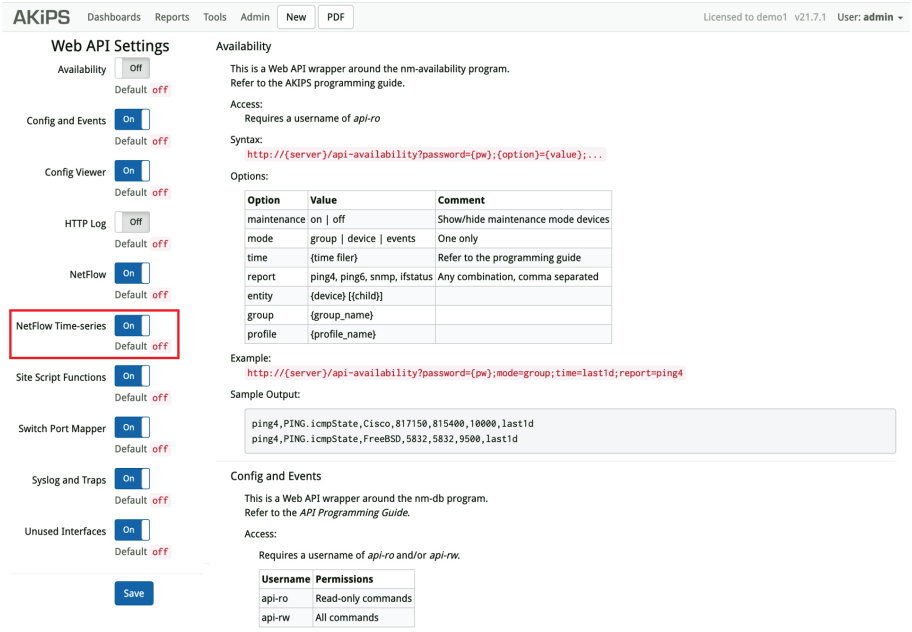
```
http://{server}/api-flow-timeseries?password={pw};
exporter=10.0.0.254;time=last4h;interval=5
```

To activate the NetFlow time-series web API:

Go to **Admin** > **API** > **Web API Settings**.

Click the **NetFlow Time-series** option **On**.

Click **Save**.



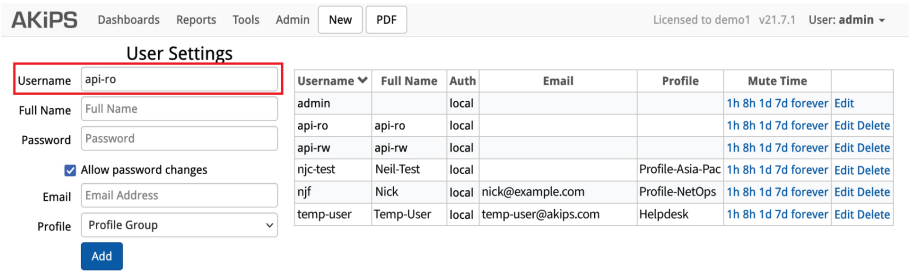
Graphic 9: activating the NetFlow time series web API

Go to **Admin** > **Users** / **Profiles** > **User Settings**.

In the **Username** text field, type `api-ro`

Complete the remaining text fields.

Click **Add**.



Graphic 10: configuring user settings for the NetFlow time series web API

Chapter 9

Switch port mapper

Switch port mapper data is stored in CSV format.

You can access it via:

- the command console (see 2.2)
- system log viewer (Go to **Admin > System > System Log Viewer)**
- web API (see 9.2).

9.1 CSV output

Filename	Description	Output format (CSV)
arp	ARP tables	`epoch,ipaddress,mac`
ip2mac	IP to MAC mapping	`epoch,mac,ipaddress`
mac2ip	MAC to IP mapping	`epoch,mac,ipaddress`
mac2sp	MAC to switch interface mapping	`epoch,mac,` `switch,port`
mac2vspa	MAC to vendor, switch, interface, IP address	`mac,vendor,switch,` `port,ipaddress`
sp2mac	switch interface to MAC	`switch,port,mac`
sp2vlan	switch interface to VLAN	`epoch,switch,` `port,vlan`
vlan2sp	VLAN to switch interface	`epoch,vlan,` `switch,port`
vlans	list of all VLANs	`vlan`

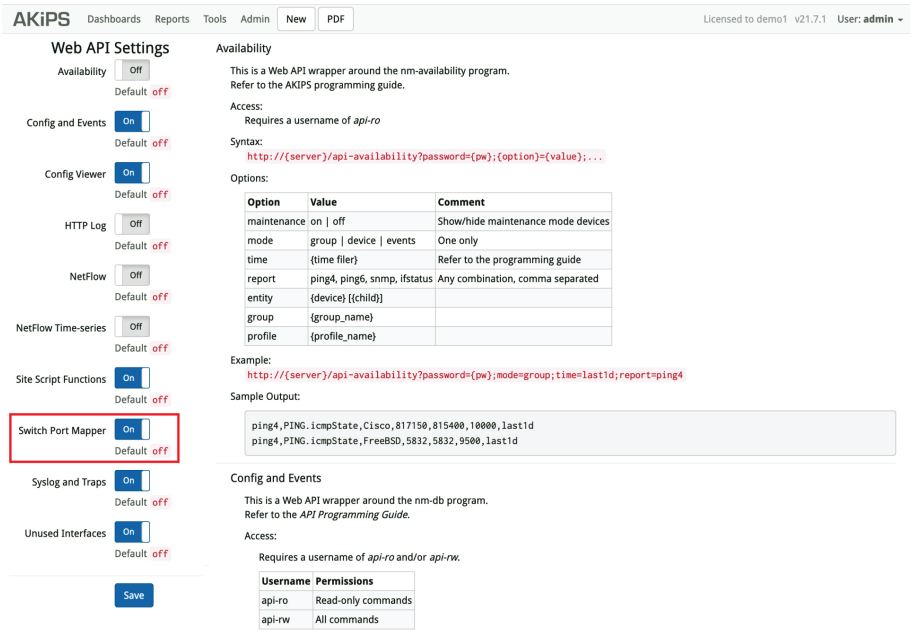
9.2 Web API

To activate the switch port mapper web API:

Go to **Admin** > **API** > **Web API Settings**.

Click the **Switch Port Mapper** option **On**.

Click **Save**.



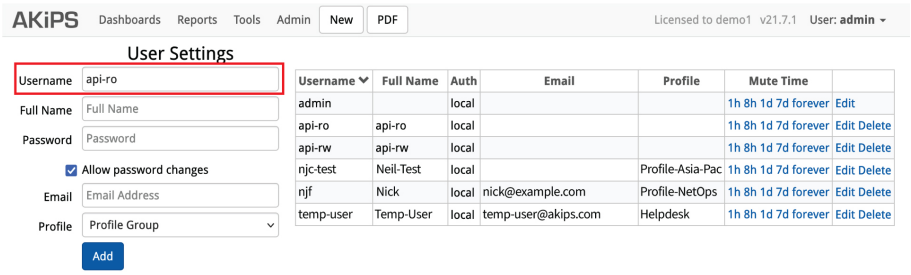
Graphic 11: activating the switch port mapper web API

Go to **Admin** > **Users / Profiles** > **User Settings**.

In the **Username** text field, type `api-ro`

Complete the remaining text fields.

Click **Add**.



Graphic 12: configuring user settings for the switch port mapper web API

Chapter 10

Unused interfaces

10.1 CSV output

Field	Description
1	device name
2	interface name
3	interface speed
4	used/free
5	current IF-MIB.ifOperStatus
6	last change time (epoch timestamp (seconds))
7	IF-MIB.ifAlias
8	VLAN name

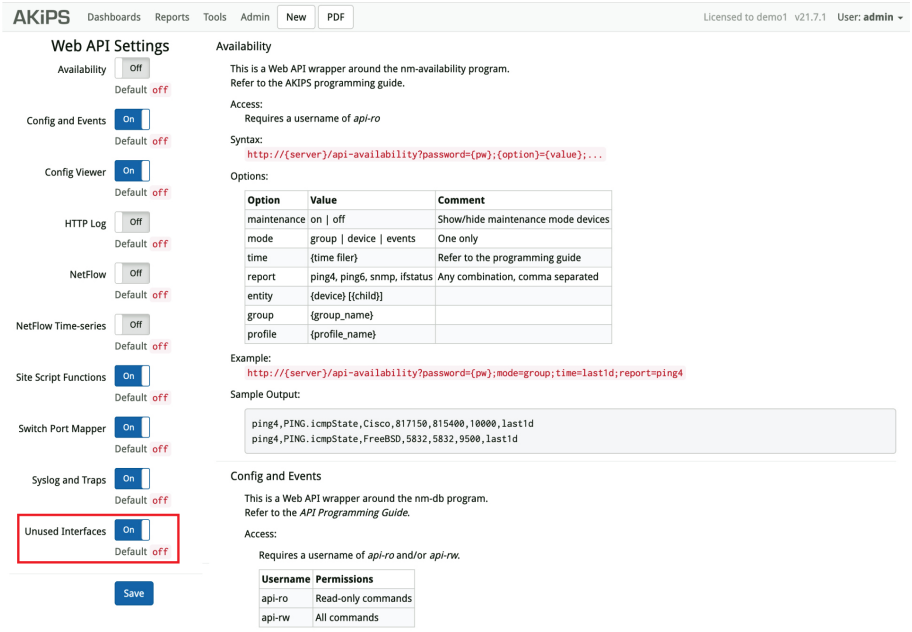
10.2 Web API

To activate the unused interfaces web API:

Go to **Admin** > **API** > **Web API Settings**.

Click the **Unused Interfaces** option **On**.

Click **Save**.



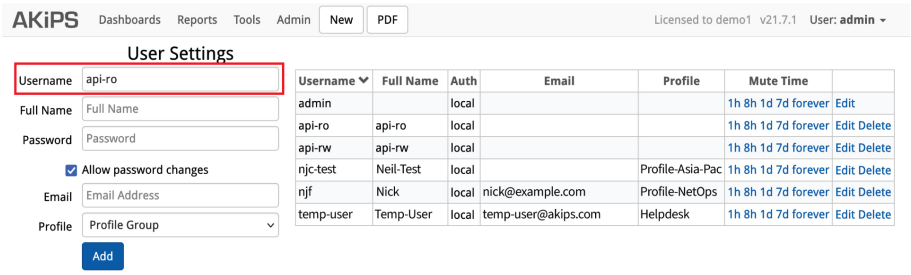
Graphic 13: activating the unused interfaces web API

Go to **Admin** > **Users** / **Profiles** > **User Settings**.

In the **Username** text field, type `api-ro`

Complete the remaining text fields.

Click **Add**.



Graphic 14: configuring user settings for the unused interfaces web API

Chapter 11

TCP socket

You can use the TCP socket daemon to remotely access `nm-db` and `nm-msg-reporter`

It does not perform authentication, so use it only in a secure environment.

Use the following syntax:

```
{program} {socket number} [{Restrict IP Address}]
```

Examples

Start an `nm-db` process listening on a port:

```
nm-db 3000
```

Start an `nm-db` process listening on a port and allow connections from a specific IP address:

```
nm-db 3001 10.0.0.50
```

Start an `nm-msg-reporter` process listening on a port and allow connections from a specific IP address:

```
nm-msg-reporter 3002 10.0.0.51
```

Chapter 12

Perl modules

12.1 Common

This module is located in /usr/local/akips/pm/Akips/Common.pm

Review the module for available definitions and externally visible functions.

12.1.1 Useful arrays

```
@weekday_names_short = (
   "Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"
);


@weekday_names_long = (
   "Sunday", "Monday", "Tuesday", "Wednesday", "Thursday",
   "Friday", "Saturday", "Sunday"
);


@month_names_short = (
   "Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug",
   "Sep", "Oct", "Nov", "Dec"
);


@month_names_long = (
   "January", "February", "March", "April", "May", "June",
   "July", "August", "September", "October",
   "November", "December"
);


@days_of_month = (
   "1st", "2nd", "3rd", "4th", "5th", "6th", "7th", "8th", "9th",
   "10th", "11th", "12th", "13th", "14th", "15th", "16th",
   "17th", "18th", "19th", "20th", "21st", "22nd", "23rd",
   "24th", "25th", "26th", "27th", "28th", "29th", "30th", "31st"
);


@days_in_month = (
   31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31
);


@metric_prefix = (
   'p', 'n', 'u', 'm', '', 'K', 'M', 'G', 'T', 'P', 'E'
);
```

12.1.2 PRINT_LINE

`PRINT_LINE` is useful when debugging.

It prints the following on a single line to stderr:

- date/time
- process name
- function name
- filename
- line number
- error message.

Example

```
Jan 6 13:20:51.583957 0 ms nm-site-script-alert_uplink 44232
Akips::Site::alert_uplink Site.pm:48
Service returned:  "401 Unauthorized"
```

12.1.3 trim

`trim` strips white space (spaces, line breaks, etc) from a string.

Example

```
my $str = " Hello World !  ";
$str = trim ($str);
print ($str); # "Hello World!"
```

12.1.4 errlog

AKIPS uses its own error log.

Use the following syntax:

```
errlog ({LOG_LEVEL}, {log message});
```

Available log levels:

```
$ERR_FATAL

$ERR_ERROR

$ERR_WARNING

$ERR_INFO

$ERR_USER

$ERR_DEBUG

$ERR_CGI
```

Example

```
my $error_msg = "it broke";
errlog ($ERR_FATAL, "something went wrong - %s",
$error_msg);
```

To view error messages:

Go to **Admin** > **System** > **System Log Viewer**.

12.1.5 get_localtime()

`get_localtime()` (epoch timestamp) is a wrapper around the standard `localtime()`

Element	Description
`$hash{sec}`	seconds: 00 to 59
`$hash{min}`	minutes: 00 to 59
`$hash{hour}`	hours: 00 to 23
`$hash{wday}`	day of the week: 0 = Sunday to 6 = Saturday
`$hash{mday}`	day of the month: 1 to 31
`$hash{mon}`	month: 0 = January to 11 = December
`$hash{year}`	year, e.g. 2020
`$hash{yday}`	day of the year: 0 to 364 (0 to 365 in leap years)
`$hash{isdst}`	daylight saving time: 0 = No, 1 = Yes

Example

```
my $h_ref = get_localtime ();

printf STDOUT "%s %s %s",
  $days_of_month[$h_ref->{mday} - 1],
  $month_names_long[$h_ref->{mon}],
  $h_ref->{year};
```

12.1.6 mail()

`mail()` takes a hash reference containing:

- to
- subject
- body.

Example

```
my @body = (
   "Hello,",
   "Greetings from AKIPS!",
   "Sincerely,",
   "Bob"
);


@files = ("/path/to/graph1.png", "/path/to/report1.pdf",
"/path/to/report2.pdf");


mail ({
   to      = > 'admin@example.com',
   subject = > 'Greetings',
   body    = > \@body,
   attach  = > \@files, #(optional)
});
```

12.1.7 syslog()

Element	Description	Options
ipaddr	destination IP address	
priority	default: notice	emergency | alert | critical | error | warning | notice | info | debug
facility	default: user	auth | authpriv | console | cron | daemon | ftp | kern | lpr | mail | news | ntp | security | syslog | user | uucp | local0 | local1 | local2 | local3 | local4 | local5 | local6 | local7
message	message body	

Example

```
syslog ({
          ipaddr   = > "10.50.1.100",
          priority = > "error",
          facility = > "local3",
          message  = > "The quick brown fox has jumped",
});
```

12.1.8 http_send() and http_result()

These HTTP functions are a wrapper around the `nm-http` command line tool.

`http_send()` sends an HTTP request.

`http_result()` sends an HTTP request and returns response data.

Element	Value	Comment
`url`	http://www.example.com	HTTP
`method`	GET, HEAD, POST, PUT, DELETE, CONNECT, OPTIONS, TRACE, PATCH	case insensitive
`content_type`	text/html	application/x-www-form-urlencoded = default
`headers`		send custom HTTP headers
`proxy`	host:port	send request through the specified proxy
`secure`	0 or 1	0 = allow SSC 1 = default
`show_headers`	0 or 1	0 = default 1 = show headers
`data`	POST data	

12.2 AKIPS database

The command line tool for the ADB is `nm-db`.

The ADB module simplifies interacting with `nm-db` by automatically opening and closing a bidirectional pipe when loading and exiting.

12.2.1 adb_send()

Use `adb_send()` to write the specified command to `nm-db`.

Example

```
adb_send ("add device group CoreRouters");

adb_send ("add device group CoreSwitches"); adb_flush ();
```

12.2.2 adb_flush()

Use `adb_flush()` to flush all buffered output to `nm-db`.

You must do this after calling `adb_send()`

12.2.3 adb_result()

Use `adb_result()` to write to `nm-db` and return the results in either a scalar or array.

You do not need to call `adb_flush()`

12.3 Discover

12.3.1 discover_scan()

`discover_scan()` performs the first stage of the device discover and creates the intermediate files for `discover_config()`

`ping.scan` lists the IPv4/6 addresses that responded to a ping scan.

`snmp.scan` lists the SNMP walk of the SNMPv2-MIB.system for each device.

`devices` lists the IPv4/6 address, SNMPv2-MIB.sysName, SNMP credentials, SNMPv2-MIB.sysObjectID and SNMPv2-MIB.sysDescr.

Use the following syntax:

```
discover_scan ( {SNMP Parameters}, {IP Address Range}, ...  );
```

Examples

Scan three IP ranges using existing discover SNMP credentials:

```
discover_scan (undef, "10.0.0.0/16", "10.3.0.0/24",
"10.5.0.0/24");
```

Scan multiple IP ranges using specified SNMPv2 credentials:

```
discover_scan ("version 2 community loofah", "10.3.0.0/24",
"10.5.0.0/24");
```

Scan one IP address using specified SNMPv3 credentials:

```
discover_scan ("version 3 sha passwd1 aes256 passwd1",
"10.2.0.1");
```

12.3.2 discover_config()

`discover_config()` performs SNMP walks of each device which `discover_scan()` locates, then processes the data to configure each device.

12.3.3 discover_device_rewalk()

`discover_device_rewalk()` performs an SNMP walk for a specified device and then processes the data to configure the device.

It returns:

0 = failure

1 = success

Use the following syntax:

```
discover_device_rewalk (\%hash_ref);
```

Example

```
discover_device_rewalk ({
  ipaddr = > "10.1.2.3",
  device = > "atlanta-ro",
})
```

Chapter 13

Site scripts

You can use site scripts to:

- configure AKIPS after discover
- configure AKIPS after auto grouping
- schedule periodic scripting.

Case study

A customer built a custom report in AKIPS by using fields in existing reports.

He used site scripting to load up arrays as `mget` outputs, added the necessary logic to align the data into hashes or whatever nested structure by whatever key fields, and then within a loop did a printf to produce a csv output.

He used smaller scripts with the `custom_ script` prefix to break them into more digestible and reusable subroutines, e.g. a function that only made DB calls.

13.1 Using site scripts

To use site scripts:

Go to the AKIPS website (https://www.akips.com).

Go to **Support** > **Site Scripts**.

To use an existing site script:

Copy the relevant script.

Open AKIPS and go to **Admin** > **API** > **Site Scripting**.

Paste the script into the text field.

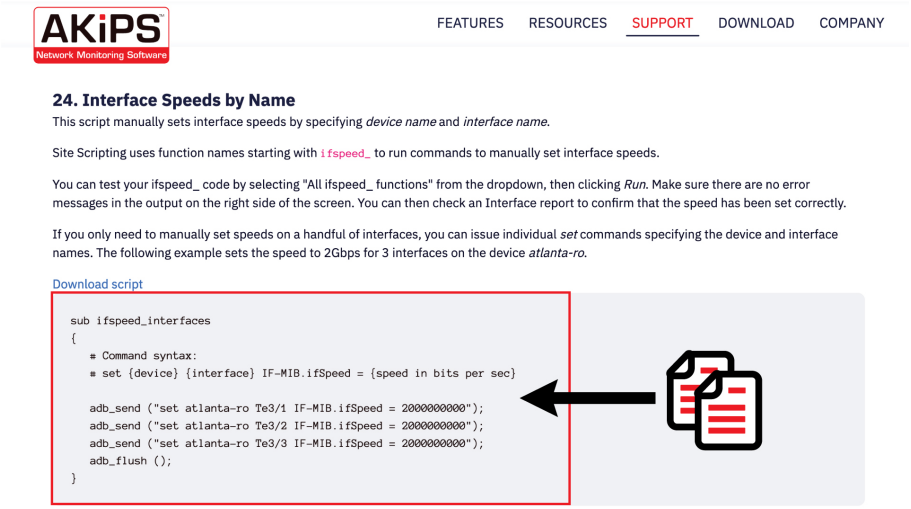
To create a new site script:

Copy an existing AKIPS script which is similar to what you need.

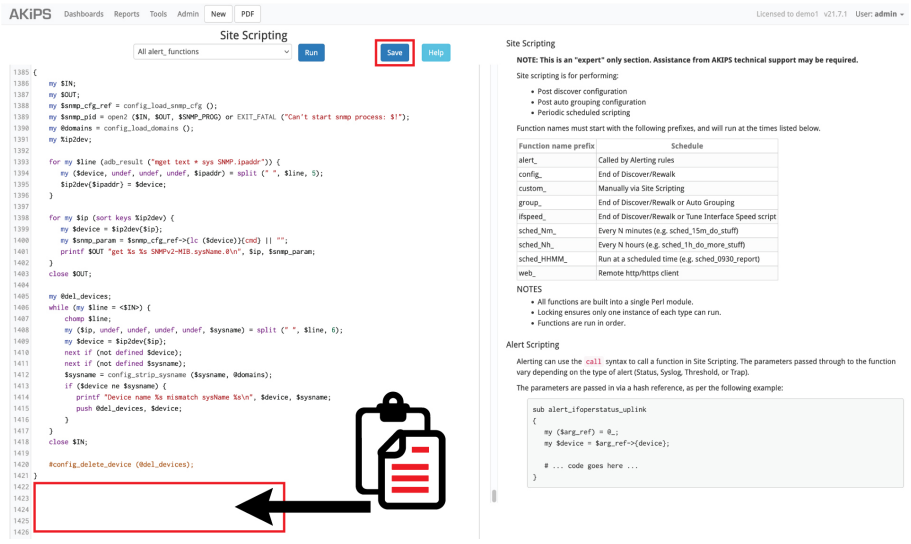
Open AKIPS and go to **Admin** > **API** > **Site Scripting**.

Paste the script into the text field.

Modify the script.



Graphic 15: selecting and copying a site script



Graphic 16: pasting a site script into AKIPS

Click **Save**. AKIPS will kill the script if it runs for longer than two minutes.

Refresh the page.

The drop-down list will display functions which you can manually run from this page.

13.2 Naming a site script

When naming a script, use one of the following prefixes:

Prefix	Schedule
admin_	called by alerting rules
config_	end of discover/rewalk
custom_	manual execution
group_	end of discover/rewalk or auto grouping
ifspeed_	end of discover/rewalk or interface speed update
sched_1m_	every minute
sched_5m_	every five minutes
sched_1h_	every hour
sched_HHMM_	every day at a specific time
web_	triggered by remote HTTP client

After you save the script, AKIPS will check the syntax and notify you of any errors.

13.3 Alerting site scripts

Alerting site scripts supports the following alerts:

- status
- scheduled
- syslog
- threshold
- trap.

To test an alerting site script:

Go to **Admin** > **API** > **Site Scripting**.

Enter a hash table of test data for the subroutine you wish to test.

Note the following rules:

Name

The name of the hash table must be identical to the subroutine.

Key-value pairs

Each alert type requires specific key-value pairs.

Each pair must appear on a single line.

AKIPS will interpret undefined pairs as an empty string.

Pairs are delimited by = >

Arrays

Arrays must open and close with [ ] (square brackets).

Arrays can be either single- or multi-line.

Multi-line arrays must have one value per line.

Values

Values can be either scalar or array.

Closing punctuation

The closing); (parenthesis and semicolon) must be on their own line.

Click **Save**.

From the drop-down menu, select **All alert_ functions**.

Click **Run**.

Examples

Status_

```
our %alert_{foo}_status = (
  device => "device_value",
  child  => "child_value",
  attr   => "attr_value",
  state  => "state_value",
);

our %alert_mail_status = (
  device => "CISCO-82-1-109",
  child  => "gil1/1",
  attr   => "IF-MIB.ifOperStatus",
  state  => "down",
);
```

Syslog_

```
our %alert_{foo}_syslog = (
  device => "device_value",
  ipaddr => "ipaddr_value",
  msg    => "msg_value",
);

our %alert_mail_syslog = (
  device => "eaton-123-1-190",
  ipaddr => "10.82.0.109",
  msg    => "161 20 1",
);
```

Trap_

```
our %alert_{foo}_trap = (
  device   => "device_value",
  ipaddr   => "ipaddr_value",
  trap_oid => "trap_oid_value",
  uptime   => "uptime_value",
  oids     => [ "oid_1",
                "oid_x",
                "oid_n-1",
                "oid_n" ],
);

our %alert_mail_trap = (
  device   => "cisco-82-0-109",
  ipaddr   => "10.82.0.109",
  trap_oid => "EdgeSwitch-SWITCHING-MIB.
  fastPathSwitchingTraps.29",
  uptime   => "1541842604",
  oids     => [ "EdgeSwitch-SWITCHING-MIB.agentLoginSession
                 Index:  ,"
               "EdgeSwitch-SWITCHING-MIB.agentLoginSession
                UserName:  akips, ",
               "EdgeSwitch-SWITCHING-MIB.agentLoginSession
                ConnectionType:  3,ssh",
               "EdgeSwitch-SWITCHING-MIB.agentLoginSessionInet
                Address:  10.0.19.2",
               "EdgeSwitch-SWITCHING-MIB.
               agentLoginSessionStatus:1,active" ],
);
```

Index