Chapter 30

Trigger Facility

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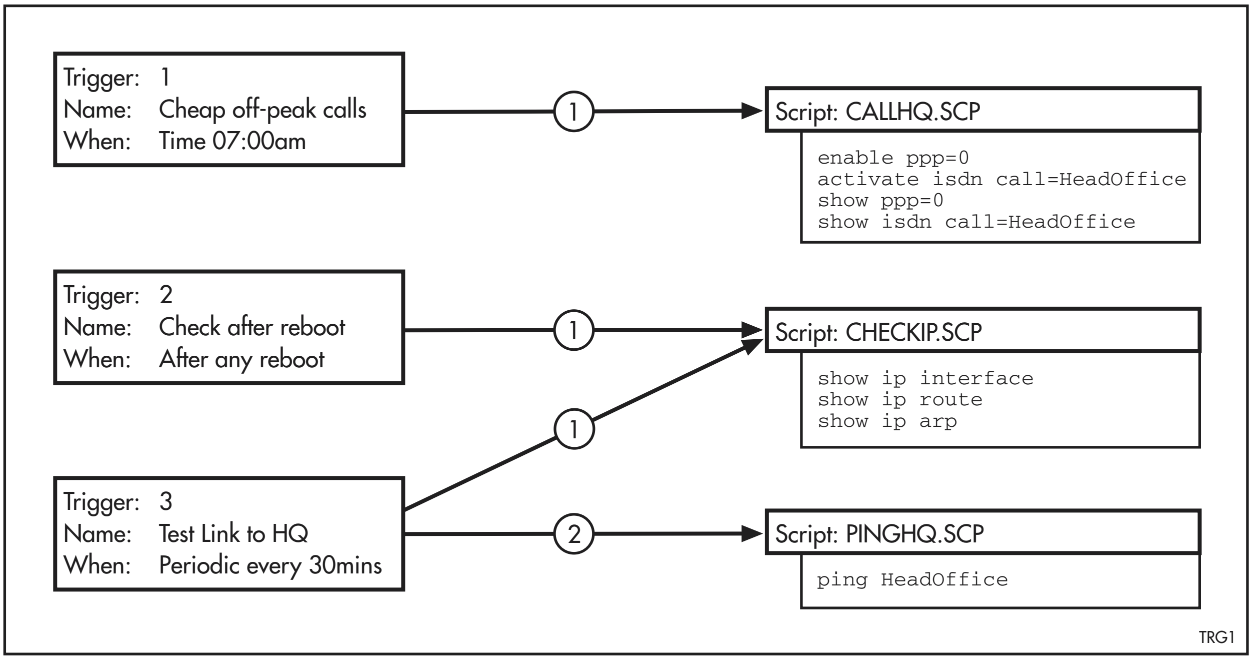
Introduction

The Trigger facility provides a powerful mechanism for automatic and timed management of the router, by automating the execution of router commands in response to certain events. For example, triggers can be configured to activate and deactivate an ISDN call at specified times, or to collect diagnostic information after a router reboots.

Some interface and port types mentioned in this chapter may not be supported on your router. The interface and port types that are available vary depending on your product's model, and whether an expansion unit (PIC, NSM) is installed. For more information, see the Hardware Reference.

A trigger is an ordered sequence of scripts to be executed when a certain event occurs. A script is a sequence of router commands stored as a plaintext file in the router’s file subsystem in flash memory. Each trigger may reference multiple scripts and any script may be used by any trigger. Various types of triggers are supported, each activated in a different way (Figure 30-1 on page 30-2).

Figure 30-1: Triggers respond to events by performing a sequence of predefined scripts



When a trigger is activated, the scripts associated with it are executed in sequence by the router. The trigger passes script parameters to the script that depends on the trigger type, and in the case of module triggers, the event that activates the trigger. The parameters that are passed are available to the script that is executed. Global script parameters that contain date, time, system name, and serial number of the router are also available to scripts. See “Script Parameters” on page 34-4 of Chapter 34, Scripting for more information about passing parameters to scripts. The output from the scripts is passed to the Logging facility, and can be displayed with the **show log** command on page 33-34 of Chapter 33, Logging Facility, or forwarded to another router.

Defining Triggers

Three main groups of parameters define each trigger. Trigger type parameters define the kind of event that activates a trigger. Some modules have their own module type triggers, with additional module-specific defining parameters described in the chapter for the individual module. There are also a group of general trigger parameters that can be used with any trigger type.

A trigger is created by using the **create trigger** command on page 30-7.

A trigger is modified by using the **set trigger** command on page 30-16 command.

Each trigger can be assigned a descriptive name and up to five scripts can be executed. See Chapter 34, Scripting for more information about creating scripts. Add a script to any position in the sequence by using the **add trigger** command on page 30-6.

Scripts can be deleted from a trigger by using the **delete trigger** command on page 30-13.

A trigger can be destroyed by using the **destroy trigger** command on page 30-14.

By default, triggers are enabled when created. A trigger can be disabled by using the **disable trigger** command on page 30-14. Enable a trigger by using the **enable trigger** command on page 30-15.

A trigger can be explicitly activated (triggered) by using the **activate trigger** command on page 30-5 regardless of whether it is currently enabled.

The **show trigger** command on page 30-21displays summary information about all triggers or details about a particular one.

Configuration Example

The following example shows how to initiate ISDN calls during off-peak periods.

Some interface and port types mentioned in this example may not be supported on your router. The interface and port types that are available vary depending on your product's model, and whether an expansion unit (PIC, NSM) is installed. For more information, see the Hardware Reference.

This example assumes that the charging regime for regional ISDN calls is such that calls initiated between 8 a.m. and 8 p.m. are charged at a rate twice that of calls between 8 p.m. and 8 a.m, and that the rate for the entire call is based on the rate at the time the call is initiated, regardless of how long the call lasts. For a network link that is often busy during the working day, it may be cheaper to activate calls before 8 a.m. and keep the link up until 6 p.m. rather than make numerous calls after 8 a.m.

To automatically activate ISDN calls during off-peak charging periods

1. **Create the ISDN call.**

   Create the ISDN call, specifying any required options, using the command:

   ```
   add isdn call=cheap number=42 precedence=out
   ```

2. **Create a PPP interface to use the ISDN call.**

   Create a PPP interface to use the call, and set the idle time to the default of 36000 seconds (the number of seconds between 8am and 6pm). This ensures that the call stays up once it is activated at 8am.

   ```
   create ppp=0 over=isdn-cheap idle=36000
   ```

3. **Create a script to activate the ISDN call.**

   Create a script that explicitly sets the idle time of the PPP interface to 36000 seconds (to keep the call up all day), and activates the ISDN call:

   ```
   add script=acheap.scp text=”set ppp=0 idle=36000”
   add script=acheap.scp text=”activate isdn call=cheap”
   ```

4. **Create a trigger to use the script.**

   Create a time trigger to activate at 7:59am and execute the script:

   ```
   enable trigger
   create trigger=1 time=07:59 days=weekdays
       script=acheap.scp name=”enable off-peak calls”
       repeat=forever
   ```

5. **Create a script to deactivate the ISDN call.**

   Create a script that explicitly sets the idle time of the PPP interface to the default of 60 seconds (to activate the call when there is traffic during the night), and deactivates the ISDN call:

   ```
   add script=dcheap.scp text=”set ppp=0 idle=60”
   ```

   Note that the ISDN call is not explicitly deactivated in case traffic is being transmitted over the link. The call automatically deactivates when there has been no traffic for 60 seconds.

6. **Create a trigger to use the script.**

   Create a time trigger to activate at 6pm and execute the script:

```
create trigger=2 time=18:00 days=weekdays
   script=dcheap.scp name="disable off-peak calls"
   repeat=forever
```

7. **Save the dynamic configuration**

   Save the modified dynamic configuration as the script file `OFFPEAK.CFG` and make `OFFPEAK.CFG` the boot script:

```
create config=offpeak.cfg
set config=offpeak.cfg
```

Command Reference

This section describes the commands to configure and manage the trigger facility in the router. The trigger facility requires that the router's internal clock be set correctly. See Chapter 1, Operation for detailed descriptions of the commands required to configure the router's internal clock.

Some interface and port types mentioned in this chapter may not be supported on your router. The interface and port types that are available vary depending on your product's model, and whether an expansion unit (PIC, NSM) is installed. For more information, see the Hardware Reference.

The shortest valid command is denoted by capital letters in the Syntax section. See "Conventions" on page xcv of Preface in the front of this manual for details of the conventions used to describe command syntax. See Appendix A, Messages for a complete list of messages and their meanings.

activate trigger

Syntax `ACTivate TRIGger=`*`trigger-id`*

where *trigger-id* is a number from 1 to 100

Description This command manually and immediately activates the specified trigger, even if it has been disabled using the **disable trigger** command on page 30-14. The scripts associated with the trigger are executed even if the TEST option is set. Normally, a TEST trigger generates only log entries when it triggers and does not invoke scripts.

The TRIGGER parameter specifies the number of the trigger to activate. The specified trigger must already exist.

Triggers activated manually do not have their repeat counts decremented or their "*last triggered*" time updated, and do not result in updates to the "*time/periodic triggers today*" counters.

Examples To activate trigger number 8, use the command:

```
act trig=8
```

Related Commands

create trigger
disable trigger
enable trigger
show trigger

add trigger

Syntax

```
ADD TRIGger=trigger-id SCript=filename... [NUMber=index]
```

where:

- *trigger-id* is a number from 1 to 100.
- *filename* is a file name in the format `[device]:filename.ext`. The *ext* must be .SCP or .CFG. Valid characters are lowercase and uppercase letters, digits (0–9), and the characters ~ ’ ! @ # $ % ^ & ( ) _ - { }. Invalid characters are * + = “ | \ [ ] ; : ? / , < >. Wildcards are not allowed. The *device* is optional, and specifies the physical memory device on which the file is stored - flash. If *device* is specified, it must be separated from the rest of the file name by a colon (:).
- *index* is a number from 1 to *n*+1, where *n* is the number of scripts already assigned to the trigger.

Description This command adds a script to a trigger so that the script is executed when the trigger is activated.

The TRIGGER parameter specifies the number of the trigger to which the script is to be added. The specified trigger must already exist.

The SCRIPT parameter specifies the name of the script to be added. The SCRIPT parameter may be repeated up to five times in one command in order to add up to five scripts (in the order specified) at once.

The NUMBER parameter specifies the position in the script list where the script is to be added. If NUMBER is specified, the new script occupies this position and all following scripts are pushed down one position. The default position is at the end of the list of scripts.

Examples To add scripts SNAPSHOT.SCP and CALLHQ.SCP to trigger 1 at position 3, use the command:

```
add trig=1 sc=snapshot.scp sc=callhq.scp num=3
```

Related Commands

create trigger
delete trigger
disable trigger
enable trigger
set trigger
show trigger

create trigger

Syntax

```
CREate TRIGger=trigger-id CPU=value [DIrection={UP|DOWN|
   ANY}] [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
   DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
   FORever|count}] [SCript=filename...] [STAte={ENAbled|
   DIsabled}] [TEST={YES|NO|ON|OFF|True|False}]

CREate TRIGger=trigger-id FIREwall={ALL|DOSattack|
   FRAgattack|HOStscan|PORtscan|SMTPATTACK|SMUrfattack|
   SYNattack|TCPattack} [MODE={STArt|END|BOTH}]
   [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
   DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
   FORever|count}] [SCript=filename...] [STAte={ENAbled|
   DIsabled}] [TEST={YES|NO|ON|OFF|True|False}]

CREate TRIGger=trigger-id INTerface=interface EVent={UP|
   DOWN|FAIL|ANY} [CIRCuit=miox-circuit] [CP={APPLE|ATCP|
   BCP|CCP|DCP|DNCP|IPcp|IPXcp|LCP}] [DLCi=dlci]]
   [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
   DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
   FORever|count}] [SCript=filename...] [STAte={ENAbled|
   DIsabled}] [TEST={YES|NO|ON|OFF|True|False}]

CREate TRIGger=trigger-id MEMory=value [DIrection={UP|
   DOWN|ANY}] [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
   DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
   FORever|count}] [SCript=filename...] [STAte={ENAbled|
   DIsabled}] [TEST={YES|NO|ON|OFF|True|False}]

CREate TRIGger=trigger-id MODule=module EVent=event
   [module-parameters...] [AFTer=hh:mm] [BEFore=hh:mm]
   [{DAte=date|DAYs=day-list}] [NAMe=name] [REPeat={Yes|
   No|ONCe|FORever|count}] [SCript=filename...]
   [STAte={ENAbled|DIsabled}] [TEST={YES|NO|ON|OFF|True|
   False}]

CREate TRIGger=trigger-id PERiodic=minutes [AFTer=hh:mm]
   [BEFore=hh:mm] [{DAte=date|DAYs=day-list}] [NAMe=name]
   [REPeat={Yes|No|ONCe|FORever|count}]
   [SCript=filename...] [STAte={ENAbled|DIsabled}]
   [TEST={YES|NO|ON|OFF|True|False}]

CREate TRIGger=trigger-id REBoot={REStart|CRASH|ALL}
   [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
   DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
   FORever|count}] [SCript=filename...] [STAte={ENAbled|
   DIsabled}] [TEST={YES|NO|ON|OFF|True|False}]

CREate TRIGger=trigger-id TIme=hh:mm [{DAte=date|
   DAYs=day-list}] [SCript=filename...] [NAMe=name]
   [REPeat={Yes|No|ONCe|FORever|count}] [STAte={ENAbled|
   DIsabled}] [TEST={YES|NO|ON|OFF|True|False}]
```

where:

- *trigger-id* is a number from 1 to 100.
- *module* is the name of a router module as given in “Module Identifiers, Display Names and Descriptions” on page C-2 of Appendix C, Reference Tables.
- *event* is an event defined in the specified module
- *module-parameters* are one or more other required or optional parameters for the specified module and event, whose syntax is defined in the specified module.
- *value* is a number from 1 to 100.
- *interface* is a valid interface name.
- *miox-circuit* is an alphanumeric string 1 to 15 characters long.
- *dlci* is a Frame Relay Data Link Connection Identifier (DLCI), from 0 to 1023.
- *minutes* is a number from 1 to 1439.
- *hh:mm* is a time in hours and minutes.
- *date* is a date in the format dd-mmm-yyyy, where *mmm* is the first three letters of the month name.
- *day-list* is one or more of the keywords “MON”, “TUE”, “WED”, “THU”, “FRI”, “SAT”, “SUN”, “WEEKDAY”, “WEEKEND” or “ALL”, separated by commas.
- *filename* is a file name in the format `[device]:filename.ext`. The *ext* must be .SCP or .CFG. Valid characters are uppercase and lowercase letters, digits (0–9), and the characters ~ ’ ! @ # $ % ^ & ( ) _ - { }. Invalid characters are * + = “ | \ [ ] ; : ? / , < >. Wildcards are not allowed. The *device* is optional and specifies the physical memory device on which the file is stored - flash. If `device` is specified, it must be separated from the rest of the file name by a colon (:).
- *name* is a character string 1 to 40 characters long. If the string contains spaces, it must be in double quotes.
- *count* is a number from 1 to 4294967294 (2^{32}-2).

Description This command creates a new trigger and defines events and conditions that activate it. Different trigger types are supported – CPU triggers, firewall triggers, link triggers, memory triggers, module triggers, periodic triggers, reboot triggers, and time triggers. Some of these have additional trigger-specific parameters. The EVENT parameter and other parameters for module triggers are described in the chapter for the module that supports them. General trigger parameters can be specified for all trigger types: AFTER, BEFORE, DAYS or DATE, SCRIPT, NAME, REPEAT, STATE and TEST.

When a trigger is activated, it passes parameters to the scripts that it executes. The global script parameters containing the date (%D), time (%T), system name (%N) and serial number (%S) of the router are passed to scripts executed by all triggers. Additional module-specific parameters passed by module-specific triggers are described in the chapters for the given modules.

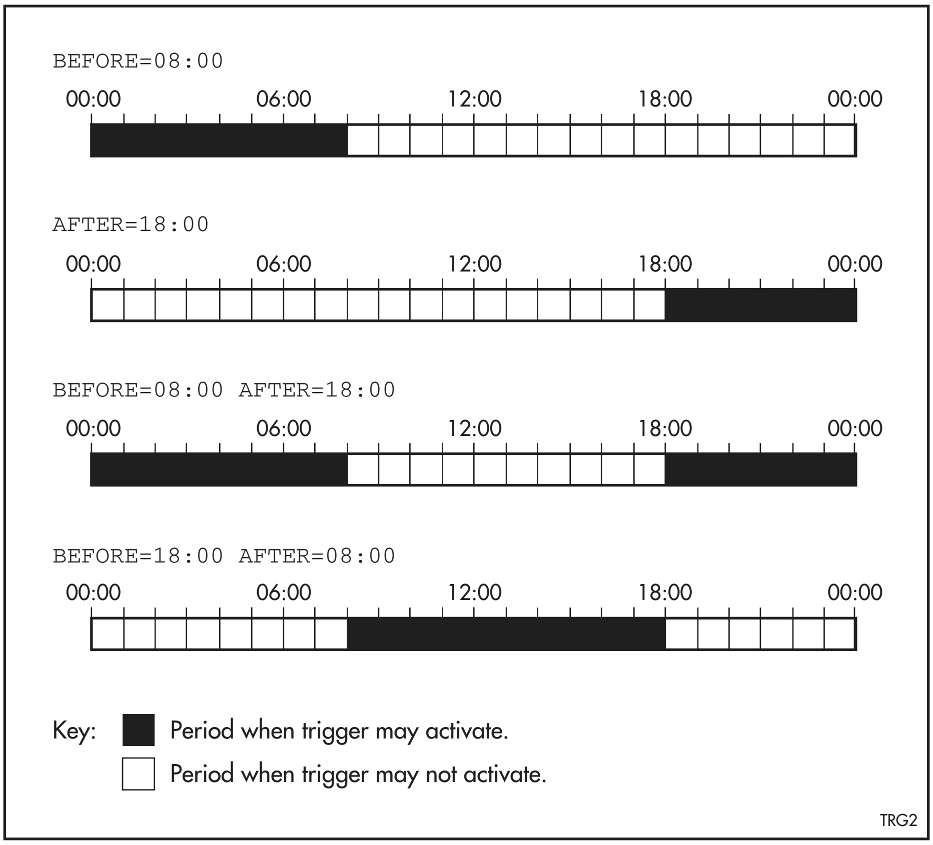
The TRIGGER parameter specifies the number of the trigger to create. The number references the trigger in other commands. The specified trigger must not already exist. The TRIGGER parameter must immediately follow the CREATE keyword, and must be followed immediately by one of the parameters MODULE, CPU, FIREWALL, INTERFACE, MEMORY, PERIODIC, REBOOT, or TIME.

The AFTER parameter is a general trigger parameter that can be used with all trigger types except for TIME triggers. It specifies the earliest time of day in hours and minutes that the trigger is activated. The trigger may be activated any time between the time specified and midnight.

The BEFORE parameter is a general trigger parameter that can be used with all trigger types except for TIME triggers. It specifies the latest time of day in hours and minutes that the trigger is activated. The trigger may be activated any time between midnight and the time specified.

If neither AFTER nor BEFORE are specified, there is no restriction on when the trigger may activate the script. If both AFTER and BEFORE are specified, and the time periods specified overlap, the trigger may activate it any time during the overlap period (Figure 30-2 on page 30-9).

Figure 30-2: The effects of different combinations of the **after** and **before** parameters in the **create trigger** and **set trigger** commands



The CIRCUIT parameter specifies a MIOX circuit to monitor. The trigger is activated when the condition defined by the combination of INTERFACE, CIRCUIT, and EVENT occurs. The CIRCUIT parameter may only follow an INTERFACE parameter that specifies an X25T interface. When activated, the trigger passes three parameters to the trigger scripts – the X.25 instance that caused the trigger, the name of the MIOX circuit, and the event state.

The CP parameter specifies a PPP control protocol to monitor. The trigger is activated when the condition defined by the combination of INTERFACE, CP, and EVENT occurs. The CP parameter may only follow an INTERFACE parameter that specifies a PPP interface. When activated, the trigger passes three parameters to the trigger scripts – the PPP instance that caused the trigger, the control protocol, and the event state.

The CPU parameter defines a CPU utilisation trigger and specifies the CPU utilisation level at which the trigger is to be activated. The DIRECTION parameter, and the general trigger parameters may also be specified.

The DATE parameter is a general trigger parameter that can be used with all trigger types. It specifies a date on which the trigger may activate. The DAYS and DATE parameters are mutually exclusive – use one or the other.

The DAYS parameter is a general trigger parameter that can be used with all trigger types. It specifies a comma-separated list of days when the trigger is activated. The value WEEKDAY is a synonym for the list of values "MON, TUE, WED, THU, FRI" and WEEKEND is a synonym for the list of values "SAT, SUN". Any combination of these and the day names is acceptable. The default is ALL. The DAYS and DATE parameters are mutually exclusive – use one or the other.

The DIRECTION parameter specifies how the CPU or memory utilisation threshold is reached to activate the trigger. If UP is specified, the trigger is activated when CPU or memory utilisation increases to or exceeds the threshold. If DOWN is specified, the trigger is activated when CPU or memory utilisation decreases to or falls below the threshold. If ANY is specified, the trigger is activated when CPU or memory utilisation equals or passes the threshold in either direction. The default is ANY.

The DLCI parameter specifies a Frame Relay DLC (Data Link Connection) to monitor. The trigger is activated when the condition defined by the combination of INTERFACE, DLCI, and EVENT occurs. The DLCI parameter may only follow an INTERFACE parameter that specifies a Frame Relay interface. When activated, the trigger passes three parameters to the trigger scripts – the Frame Relay instance that caused the trigger, the DLCI, and the event state.

The EVENT parameter is valid if the INTERFACE parameter or the MODULE parameter is specified. The EVENT parameter has different meanings in these two contexts. The EVENT parameter is required after the MODULE parameter, and in this context specifies the event for a module specific trigger. Values for the EVENT parameter are described in the chapter for the given module. The EVENT parameter is also required after the INTERFACE parameter, and in this context it specifies a link (interface) status change event. If UP is specified, the trigger is activated when the interface comes up (is operational). If DOWN, it is activated when the interface goes down (closes). If FAIL is specified, the trigger is activated when the interface fails to open at all for any reason. If ANY is specified, it is activated when any of these events occurs. The only valid events are UP and DOWN for the following interfaces:

- Synchronous port (SYN*n*)
- Basic Rate ISDN (BRI*n*)
- Primary Rate ISDN (PRI*n*)

The FIREWALL parameter defines a firewall trigger and specifies the firewall events to monitor. The FIREWALL parameter must be followed by the MODE parameter. The trigger is activated when the condition defined by the combination of the FIREWALL and MODE parameters occurs. The general trigger parameters may also be specified. When activated, the trigger passes two parameters to trigger scripts – the name of the firewall policy and the source IP address of the attack. The following table describes firewall events that are recognised.

Firewall Event	Description
DOSATTACK	Denial of service attack in which a remote user continually sends unwanted traffic
FRAGATTACK	Attack using TCP fragments that are either too large or can never be reassembled
HOSTSCAN	Scan of the hosts of the private network
PORTSCAN	Portscan of the firewall or private network
SMTPATTACK	Attack where email is received that is unwanted either because it is from a source identified as a source of spam, it is attempting to use a mail server as a third party relay, or it has a broadcast reply address
SMURFATTACK	Directed attack on the hosts on the private network hidden by NAT
SYNATTACK	Attack on a host using multiple opening TCP SYN packets to exhaust a host's available sessions or memory
TCPATTACK	Attack on a host using TCP tiny fragments

The INTERFACE parameter defines an interface (link) trigger and specifies the interface to monitor. The EVENT parameter is required for an INTERFACE trigger. The INTERFACE parameter must be followed by the EVENT parameter The CP parameter may be used if INTERFACE specifies a PPP interface; the CIRCUIT parameter may be used if INTERFACE specifies an X.25T interface; the DLCI parameter may be used if INTERFACE specifies a Frame Relay interface. The general trigger parameters may also be specified. Valid interfaces are:

- BRI (e.g. bri0)
- eth (e.g. eth0)
- FR (e.g. fr0)
- PPP (e.g. ppp0)
- PRI (e.g. pri0)
- syn (e.g. syn0)
- VLAN (e.g. vlan1)

The interface must already exist. To see a list of all currently available interfaces, use the **show interface** command on page 7-66 of Chapter 7, Interfaces.

The MEMORY parameter defines a memory utilisation trigger and specifies the amount of free memory at which the trigger is to be activated. The DIRECTION parameter and general trigger parameters may also be specified.

The MODE parameter specifies a firewall status change event and is valid following the FIREWALL parameter. If START is specified, the trigger is activated when the event begins to occur since the last time period measured. If END is specified, the trigger is activated when the event stops after the last time period measured. If BOTH is specified, it is activated when the firewall event begins or ends. The default is BOTH.

The MODULE parameter defines a module-specific trigger and specifies the name of the module to which this trigger applies. The module should be a valid router module as given in "Module Identifiers, Display Names and Descriptions" on page C-2 of Appendix C, Reference Tables, and must be one for which module-specific triggers are defined. The EVENT parameter must be specified, and other module parameters defining the module triggers may be valid or required for the given module. If the MODULE parameter specified is SWITCH, then the PORT parameter must be specified. The general trigger parameters may also be specified.

The NAME parameter is a general trigger parameter that can be used with all trigger types. It specifies a descriptive name for this trigger.

The PERIODIC parameter defines a periodic trigger and specifies the period of the trigger in minutes. The general trigger parameters may also be specified.

The REBOOT parameter defines a reboot trigger and specifies a list of reboot events that activates the trigger. If CRASH is specified, the trigger is activated by a router crash. If RESTART is specified, the trigger is activated by any reboot other than a router crash. If ALL is specified, the trigger is activated by any reboot event. The general trigger parameters may also be specified.

The REPEAT parameter is a general trigger parameter that can be used with all trigger types. It specifies whether the trigger repeats, or a count of how many times the trigger repeated. If YES or FOREVER is specified, the repeat count is set to a value that is effectively infinite. If NO or ONCE is specified, the trigger activate only once. If a numeric value is specified, the trigger repeats the set number of times. The default is FOREVER.

The SCRIPT parameter is a general trigger parameter that can be used with all trigger types. It specifies the name of a script to execute when the trigger is activated. A script is a predefined list of router commands. The specified script must already exist. The SCRIPT parameter may be repeated up to five times in one command, to add up to five scripts (in the order specified) at once. Additional scripts may be added using the **add trigger** command on page 30-6.

The STATE parameter is a general trigger parameter that can be used with all trigger types. It specifies the initial state of the trigger. By default triggers are enabled when created. A trigger is activated automatically only when it is enabled. A trigger can be manually activated with the **activate trigger** command on page 30-5 regardless of whether the trigger is enabled or disabled.

The TEST parameter is a general trigger parameter that can be used with all trigger types. It specifies whether this trigger is in TEST mode. When in test mode, it activates and logs the trigger but does not execute configured scripts. The default is NO.

The TIME parameter defines a time trigger and specifies the time of day in hours and minutes when the trigger is to be activated. Resolutions of up to one minute with an accuracy of five seconds are supported. The trigger is activated at most five seconds after the specified minute. The type parameters DATE or DAYS, and the general parameters SCRIPT, NAME, REPEAT, STATE, and TEST may also be specified. The AFTER and BEFORE parameters are not valid, but all other general trigger parameters may also be specified.

Examples To create trigger 1 that activates at 6am every weekday and initiates script OFFPEAK.SCP, use the command:

```
cre trig=1 ti=06:00 day=weekday sc=offpeak.scp rep=y
```

To create trigger 3 that executes script IPXCALLG.SCP when IPXCP closes on interface ppp3, use the command:

```
cre trig=3 int=ppp3 ev=down cp=ipxcp sc=ipxcallg.scp
```

To create module specific trigger 5 for the Q931 module, which executes script file SPIDOK.SCP when SPID initialisation occurs successfully on interface bri0, use the command:

```
cre trig=5 mod=Q931 ev=spidup int=bri0 sc=spidok.scp
```

Related Commands

activate trigger
add trigger
destroy trigger
disable trigger
enable trigger
set trigger
show trigger

delete trigger

Syntax `DELete TRIGger=`*`trigger-id`*` NUMber=`*`index`*

where:

- *trigger-id* is a number from 1 to 100.
- *index* is a number from 1 to *n*, where *n* is the number of scripts assigned to the trigger.

Description This command removes a script from a trigger. The TRIGGER parameter specifies the number of the trigger from which the script is to be deleted. The specified trigger must already exist.

The NUMBER parameter specifies the position in the script list of the script to be removed. The specified script must already exist in that position.

Examples To remove the third script from trigger 1, use the command:

```
del trig=1 num=3
```

Related Commands

add trigger
destroy trigger
set trigger
show trigger

destroy trigger

Syntax

```
DESTroy TRIGger=trigger-id
```

where *trigger-id* is a number from 1 to 100.

Description

This command destroys a previously-defined trigger. The TRIGGER parameter specifies the number of the trigger to destroy. The specified trigger must already exist.

Examples

To destroy trigger 1, use the command:

```
DESTROY TRIGGER=1
```

Related Commands

add trigger
create trigger
delete trigger
disable trigger
enable trigger
purge trigger
show trigger

disable trigger

Syntax

```
DISable TRIGger[=trigger-id]
```

where *trigger-id* is a number from 1 to 100

Description

This command disables the entire trigger facility, if a trigger is not specified, or the specified trigger. The specified trigger is no longer eligible for activation. The trigger may still be manually activated using the **activate trigger** command on page 30-5.

The TRIGGER parameter specifies the number of the trigger to disable. The specified trigger must already exist.

Examples

To disable trigger 1, use the command:

```
dis trig=1
```

To disable the trigger module, use the command:

```
dis trig
```

Related Commands

activate trigger
delete trigger
destroy trigger
enable trigger
purge trigger
show trigger

enable trigger

Syntax

```
ENAble TRIGger[=trigger-id]
```

where *trigger-id* is a number from 1 to 100

Description

This command enables the entire trigger facility, if a trigger is not specified, or the specified trigger. The specified trigger is eligible for activation. All triggers are enabled by default when they are created. Except for manual activation (using the **activate trigger** command on page 30-5) disabled triggers cannot be activated.

The TRIGGER parameter specifies the number of the trigger to enable. The specified trigger must already exist.

Examples

To enable trigger 1, use the command:

```
ena trig=1
```

To enable the trigger module, use the command:

```
ena trig
```

Related Commands

activate trigger
delete trigger
destroy trigger
disable trigger
purge trigger
set trigger
show trigger

purge trigger

Syntax

```
PURge TRIGger
```

Description

This command erases the trigger facility configuration.

Related Commands

delete trigger
destroy trigger
disable trigger
enable trigger
set trigger
show trigger

set trigger

Syntax

```
SET TRIGger=trigger-id [CPU[=value]] [DIrection={UP|DOWN|
    ANY}] [AFTer=hh:mm] [BEFore=hh:mm] [{DATe=date|
    DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
    FORever|count}] [TEST={YES|NO|ON|OFF|TRUE|FALSE}]

SET TRIGger=trigger-id [FIREwall[={ALL|DOSattack|
    FRAgattack|HOStscan|PORtscan|SMUrfattack|SYNattack|
    TCPattack}]] [MODE={STArt|END|BOTH}] [AFTer=hh:mm]
    [BEFore=hh:mm] [{DAte=date|DAYs=day-list}] [NAMe=name]
    [REPeat={Yes|No|ONCe|FORever|count}] [TEST={YES|NO|ON|
    OFF|True|False}]

SET TRIGGER=trigger-id [INTerface[=interface]] [EVent={UP|
    DOWN|FAIL|ANY}] [CIRCuit=miox-circuit] [CP={APPLE|ATCP|
    BCP|CCP|DCP|DNCP|IPcp|IPXcp|LCP}] [DLCi=dlci]
    [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
    DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
    FORever|count}] [TEST={YES|NO|ON|OFF|True|False}]

SET TRIGger=trigger-id [MEMory[=value]] [DIrection={UP|
    DOWN|ANY}] [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
    DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
    FORever|count}] [TEST={YES|NO|ON|OFF|True|False}]

SET TRIGger=trigger-id [MODule] [module-parameters...]
    [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
    DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
    FORever|count}] [TEST={YES|NO|ON|OFF|True|False}]

SET TRIGger=trigger-id [PERiodic[=minutes]] [AFTer=hh:mm]
    [BEFore=hh:mm] [{DAte=date|DAYs=day-list}] [NAMe=name]
    [REPeat={Yes|No|ONCe|FORever|count}] [TEST={YES|NO|ON|
    OFF|True|False}]

SET TRIGger=trigger-id [REBoot[={REStart|CRASH|ALL}]]
    [AFTer=hh:mm] [BEFore=hh:mm] [{DAte=date|
    DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
    FORever|count}] [TEST={YES|NO|ON|OFF|True|False}]

SET TRIGger=trigger-id [TIme[=hh:mm]] [{DAte=date|
    DAYs=day-list}] [NAMe=name] [REPeat={Yes|No|ONCe|
    FORever|count}] [TEST={YES|NO|ON|OFF|True|False}]
```

where:

- *trigger-id* is a number from 1 to 100.
- *trigger-id* is a number from 1 to 100.
- *module* is the name of a router module as given in "Module Identifiers, Display Names and Descriptions" on page C-2 of Appendix C, Reference Tables.
- *event* is an event defined in the specified module
- *module-parameters* are one or more other required or optional parameters for the specified module and event, whose syntax is defined in the specified module.

- *value* is a number from 1 to 100.
- *interface* is a valid interface name.
- *miox-circuit* is an alphanumeric string 1 to 15 characters long.
- *dlci* is a Frame Relay Data Link Connection Identifier (DLCI) from 0 to 1023.
- *minutes* is a number from 1 to 1439.
- *hh:mm* is a time in hours and minutes.
- *date* is a date in the format dd-mmm-yyyy, where *mmm* is the first three letters of the month name.
- *day-list* is one or more of the keywords “MON”, “TUE”, “WED”, “THU”, “FRI”, “SAT”, “SUN”, “WEEKDAY”, “WEEKEND” or “ALL”, separated by commas.
- *name* is a character string 1 to 40 characters long. If the string contains spaces, it must be in double quotes.
- *count* is a number from 1 to 4294967294 (2^{32}-2).

Description This command modifies the definition of a trigger. Different trigger types are supported – CPU triggers, firewall triggers, link triggers, memory triggers, module triggers, periodic triggers, reboot triggers, and time triggers. Some of these have additional trigger-specific parameters. Any parameters for module triggers are described in the chapter for the module that supports them. General trigger parameters can be specified for all trigger types: AFTER, BEFORE, DAYS or DATE, NAME, REPEAT and TEST. The type of trigger cannot be changed.

The TRIGGER parameter specifies the number of the trigger to create. The number references the trigger in other commands. The specified trigger must not already exist. The TRIGGER parameter must immediately follow the CREATE parameter.

The AFTER parameter is a general trigger parameter that can be used with all trigger types except for TIME triggers. It specifies the earliest time of day in hours and minutes that the trigger is activated. The trigger is activated any time between the time specified and midnight.

The BEFORE parameter is a general trigger parameter that can be used with all trigger types except for TIME triggers. It specifies the latest time of day in hours and minutes that the trigger is activated. The trigger is activated any time between midnight and the time specified.

If neither AFTER nor BEFORE are specified, there is no restriction on when the trigger may activate the script. If both AFTER and BEFORE are specified, and the time periods specified overlap, the trigger may activate it any time during the overlap period (Figure 30-2 on page 30-9).

The CIRCUIT parameter specifies a MIOX circuit to monitor. The trigger is activated when the condition defined by the combination of INTERFACE, CIRCUIT and EVENT occurs. The CIRCUIT parameter may only follow an INTERFACE parameter that specifies an X25T interface. When activated, the trigger passes three parameters to the trigger scripts – the X.25 instance that caused the trigger, the name of the MIOX circuit, and the event state.

The CP parameter specifies a PPP control protocol to monitor. The trigger activate when the condition defined by the combination of INTERFACE, CP, and EVENT occurs. The CP parameter may only follow an INTERFACE parameter that specifies a PPP interface. When activated, the trigger passes three parameters to the trigger scripts – the PPP instance that caused the trigger, the control protocol, and the event state.

The CPU parameter defines a CPU utilisation trigger and specifies the CPU utilisation level at which the trigger is to be activated. The DIRECTION parameter and the general trigger parameters may also be specified.

The DATE parameter is a general trigger parameter that can be used with all trigger types. It specifies a date on which the trigger may activate. The DAYS and DATE parameters are mutually exclusive—use one or the other.

The DAYS parameter is a general trigger parameter that can be used with all trigger types. It specifies a comma-separated list of days when the trigger is activated. The value WEEKDAY is a synonym for the list of values “MON, TUE, WED, THU, FRI” and WEEKEND is a synonym for the list of values “SAT, SUN”. Any combination of these and the day names is acceptable. The default is ALL. The DAYS and DATE parameters are mutually exclusive – use one or the other.

The DIRECTION parameter specifies how the CPU or memory utilisation threshold is reached to activate the trigger. If UP is specified, the trigger is activated when CPU or memory utilisation increases to or exceeds the threshold. If DOWN is specified, the trigger is activated when CPU or memory utilisation decreases to or falls below the threshold. If ANY is specified, the trigger is activated when CPU or memory utilisation equals or passes the threshold in either direction. The default is ANY.

The DLCI parameter specifies a Frame Relay DLC (Data Link Connection) to monitor. The trigger is activated when the condition defined by the combination of INTERFACE, DLCI, and EVENT occurs. The DLCI parameter may only follow an INTERFACE parameter that specifies a Frame Relay interface. When activated, the trigger passes three parameters to the trigger scripts – the Frame Relay instance that caused the trigger, the DLCI, and the event state.

The EVENT parameter after the INTERFACE parameter specifies a link (interface) status change event. If UP is specified, the trigger is activated when the interface comes up (is operational). If DOWN, it is activated when the interface goes down (closes). If FAIL is specified, the trigger is activated when the interface fails to open for any reason. If ANY is specified, it is activated when any of these events occur. The only valid events are UP and DOWN for the following interfaces:

- Synchronous port (SYN*n*)
- Basic Rate ISDN (BRI*n*)
- Primary Rate ISDN (PRI*n*)

The FIREWALL parameter defines a firewall trigger and specifies the firewall event(s) to monitor. The FIREWALL parameter must be followed by the MODE parameter. The trigger is activated when the condition defined by the combination of the FIREWALL and MODE parameters occurs. The general trigger parameters may also be specified. When activated, the trigger passes two parameters to the trigger scripts – the name of the firewall policy and the source IP address of the attack. The following table describes firewall events that are recognised.

Firewall Event	**Description**
DOSATTACK	Denial of service attack in which a remote user continually sends unwanted traffic
FRAGATTACK	Attack using TCP fragments that are either too large or can never be reassembled
HOSTSCAN	Scan of the hosts of the private network
PORTSCAN	Portscan of the firewall or private network
SMTPATTACK	Attack where email is received that is unwanted either because it is from a source identified as a source of spam, it is attempting to use a mail server as a third party relay, or it has a broadcast reply address
SMURFATTACK	Directed attack on the hosts on the private network hidden by NAT
SYNATTACK	Attack on a host using multiple opening TCP SYN packets to exhaust a host's available sessions or memory
TCPATTACK	Attack on a host using TCP tiny fragments

The INTERFACE parameter defines an interface (link) trigger and specifies the interface to monitor. The EVENT parameter specifies a link (interface) status change event. The CIRCUIT parameter may be used if INTERFACE specifies an X.25 T interface. The CP parameter may be used if INTERFACE specifies a PPP interface. The DLCI parameter may be used if INTERFACE specifies a Frame Relay interface. The general trigger parameters may also be specified. The type of trigger cannot be changed. Valid interfaces are:

- BRI (e.g. bri0)
- eth (e.g. eth0)
- FR (e.g. fr0)
- PPP (e.g. ppp0)
- PRI (e.g. pri0)
- syn (e.g. syn0)
- VLAN (e.g. vlan1)

The INTERFACE parameter specifies a valid interface already assigned and configured. To see a list of current valid interfaces, use the **show interface** command on page 7-66 of Chapter 7, Interfaces.

The MEMORY parameter defines a memory utilisation trigger and specifies the amount of free memory at which the trigger is to be activated. The DIRECTION parameter and general trigger parameters may also be specified. The type of trigger cannot be changed.

The MODE parameter specifies a firewall status change event and is only valid following the FIREWALL parameter. If START is specified, the trigger is activated when the event begins to occur since the last time period measured. If END is specified, the trigger is activated when the event stops after the last time period measured. If BOTH is specified, the trigger is activated when the firewall event begins or ends. The default is BOTH.

The MODULE parameter specifies that the trigger to be modified is a module type trigger. The EVENT parameter is not valid, but other module parameters may be specified. The general trigger parameters may also be specified.

The NAME parameter is a general trigger parameter that can be used with all trigger types. It specifies a descriptive name for this trigger.

The PERIODIC parameter defines a periodic trigger and specifies the period of the trigger in minutes. The general trigger parameters may also be specified. The type of trigger cannot be changed.

The REBOOT parameter defines a reboot trigger and specifies a list of reboot events that activates the trigger. If CRASH is specified, the trigger is activated by a router crash. If RESTART is specified, the trigger is activated by any reboot other than a router crash. If ALL is specified, the trigger is activated by any reboot event. The general trigger parameters may also be specified. The type of trigger cannot be changed.

The REPEAT parameter is a general trigger parameter that can be used with all trigger types. It specifies whether the trigger repeats, or a count of how many times the trigger repeated. If YES or FOREVER is specified, the repeat count is set to a value that is effectively infinite. If NO or ONCE is specified, the trigger is activated only once. If a numeric value is specified, the trigger repeats the specified number of times. The default is FOREVER.

The TEST parameter is a general trigger parameter that can be used with all trigger types. It specifies whether this trigger is in TEST mode. When in test mode, it activates and logs the trigger but does not execute configured scripts. The default is NO.

The TIME parameter specifies the time of day in hours and minutes when the time trigger is to be activated. Resolutions of up to one minute with an accuracy of five seconds are supported. The trigger is activated at most five seconds after the specified minute. The AFTER and BEFORE parameters are not valid but other general trigger parameters can be specified. The type of trigger cannot be changed.

Examples

To modify time trigger 1 to activate at 8am every weekday, use the command:

```
set trig=1 ti=08:00 day=weekday rep=y
```

Related Commands

activate trigger
add trigger
create trigger
destroy trigger
disable trigger
enable trigger
show trigger

show trigger

Syntax `SHOW TRIGGER[=`*`trigger-id`*`] [{COUnter|FULl|STAtus|SUMmary}]`

where *trigger-id* is a number from 1 to 100

Description This command displays information about all triggers that have been configured, a specified trigger, or general configuration information for the trigger facility. The TRIGGER parameter specifies the number of the trigger to display. The specified trigger must already exist.

If neither trigger nor parameter is specified, or the SUMMARY parameter is specified, summary information for all or the specified triggers is displayed (Figure 30-3 on page 30-21, Table 30-1 on page 30-21). If FULL is specified, or a trigger is specified without the SUMMARY parameter, detailed information about the specified triggers is displayed (Figure 30-4 on page 30-22, Table 30-2 on page 30-22).

The STATUS parameter displays general configuration information for the trigger facility (Figure 30-5 on page 30-24, Table 30-3 on page 30-24). A trigger identifier may not be specified.

The COUNTER parameter displays counters for the trigger facility (Figure 30-6 on page 30-25, Table 30-4 on page 30-25). A trigger identifier may not be specified.

Figure 30-3: Example output from the **show trigger** command

```
TR# Type & Details                Name           En Te Rept #Scr Days/Date
--------------------------------------------------------------------------------
001 Periodic (3 min)              Test Trigger    Y  Y  Yes   01  -TW-FSS
002 Time (10:00)                  Call home       Y  N  Yes   01  23-Apr-2000
003 Reboot (Crash)                Get Debug Info  Y  N  Yes   01  MTWTFSS
004 Module (VRRP)                 DOWNMASTER      Y  N  No    01  MTWTFSS
--------------------------------------------------------------------------------
```

Table 30-1: Parameters displayed in the output of the **show trigger** command

Parameter	Meaning
TR#	Trigger identifier (ID).
Type & Details	Trigger type and details: Time - trigger time Periodic - period Reboot - either Crash, Reboot, or All Memory CPU Module - module, event
Name	Descriptive name of the trigger.
En	Whether the trigger is enabled.
Te	Whether the trigger is in test mode.
Rept	Whether the trigger repeats or a repeat count.The repeat count is decremented each time the trigger is activated automatically.

Table 30-1: Parameters displayed in the output of the **show trigger** command (continued)

Parameter	Meaning
#Scr	Number of scripts associated with the trigger.
Days/Date	Days or date when the trigger is activated. For the days options, the days are shown as a seven character string representing Monday to Sunday. Days when the trigger is not activated are shown with a hyphen (-).

Figure 30-4: Example output from the **show trigger full** command

```
Trigger Configuration Details
------------------------------------------------------------
Trigger .................... 1
Name ....................... Bring up Wellington link
Type and details ........... Time (13:45)
Days ....................... All
Enabled .................... Enabled
Test ....................... No
Repeat ..................... No
Created/Modified ........... 08-Nov-1996 12:04:33
Number of Activations ...... 1
Last Activation ............ 08-Nov-1996 13:45:07
Number of scripts .......... 2

    callwgtn.scp
    idlewgtn.scp

Trigger .................... 4
Name ....................... VRRP master down action
Type and details ........... Module (VRRP) DOWNMASTER
Other Parameters ........... VRID=1
Days ....................... Daily
Enabled .................... Enabled
Test ....................... No
Repeat ..................... No
Created/Modified ........... 25-Aug-2001 16:37:22
Number of Activations ...... 1
Last Activation ............ 08-Nov-1996 14:40:09
Number of scripts .......... 1

    downmast.scp
```

Table 30-2: Parameters in the output of the **show trigger full** command

Parameter	Meaning
Trigger	Trigger identifier (ID).
Name	Descriptive name of the trigger.

Table 30-2: Parameters in the output of the **show trigger full** command (continued)

Parameter	Meaning
Type and details	Trigger type and details Time - trigger time Periodic - period Reboot - either Crash, Reboot, or All Memory CPU Module - for module-specific triggers, the module name and the event on which the trigger is activated are included
Other parameters	For module specific triggers, the parameters, one per line, which define the trigger.
Days	List of the days when the trigger is activated, or either "Weekdays" (Monday to Friday), "Weekends" (Saturday and Sunday) or "Daily" (every day). Either "Days" or "Date" is displayed.
Date	Date or days when the trigger is activated.
Enabled	Whether the trigger is enabled.
Test	Whether the trigger is in test mode.
Repeat	Whether the trigger repeats.
Created/Modified	Date and time the trigger was created or last modified.
Number of Activations	Number of times the trigger has been activated (triggered) since the last router restart.
Last Activation	Date and time the trigger was last activated (triggered).
Number of scripts	Number of scripts assigned to the trigger, followed by a list of the script file names.

Figure 30-5: Example output from the **show trigger status** command

```
Trigger Module Configuration
------------------------------------------------------------
General
  Trigger Module ........... Enabled
  Triggers configured ...... 4
  Queued Commands .......... 0

Time Triggers
  Configured ............... 2
  Active ................... 2
  Activated today .......... 1

Periodic Triggers
  Configured ............... 1
  Active ................... 1
  Activated today .......... 0

Reboot Triggers
  Configured ............... 0

Interface Triggers
  Configured ............... 0

Resource Triggers
  Configured ............... 1
  Active ................... 1
  Activated today .......... 0

Module Triggers
   Configured ............... 2
   Activated today .......... 3
```

Table 30-3: Parameters in the output of the **show trigger status** command

Parameter	Meaning
General	General information about the Trigger Facility.
Trigger Module	Whether the trigger module is enabled.
Triggers configured	Total number of triggers that have been configured.
Queued commands	Number of commands that are queued for execution.
Time Triggers	Information about time triggers.
Periodic Triggers	Information about periodic triggers.
Reboot Triggers	Information about reboot triggers.
Interface Triggers	Information about interface triggers.
Resource Triggers	Information about CPU and memory resource triggers.
Module Triggers	Information about firewall and module triggers.
Configured	Number of triggers of the associated type that have been configured.
Active	Number of triggers of the associated type that are currently active (enabled).
Activated today	Number of times a trigger of the associated type has been activated (triggered) today.

Figure 30-6: Example output from the **show trigger counter** command

```
Trigger Module Counters
-------------------------------------------
Polls (05 sec timer) .............. 37
 Idle loop entry count ............. 5
 Time trigger checks ............... 2
 Time trigger queue rebuilds ........ 1
 Trigger activations ............... 1
 Time triggers activated today ...... 1
 Periodic triggers activated today .. 0
 Interface triggers activated today . 0
 Resource triggers activated today .. 0
 Module triggers activated today .... 3
```

Table 30-4: Parameters in the output of the **show trigger counter** command

Parameter	Meaning
Polls (05 sec timer)	Number of times the trigger module has polled for a trigger activation event.
Idle loop entry count	Number of times the trigger module has prepared commands for execution.
Time trigger checks	Number of times the trigger module has checked the list of time triggers for a trigger to activate.
Time trigger queue rebuilds	Number of times the time trigger queue has been rebuilt because time triggers have been added, deleted or modified, or because the time/date has been changed.
Trigger activations	Number of times a trigger has been activated.
Time triggers activated today	Number of times a time trigger has been activated today.
Periodic triggers activated today	Number of times a periodic trigger has been activated today.
Interface triggers activated today	Number of times an interface trigger has been activated today.
Resource triggers activated today	Number of times a CPU or memory resource trigger has been activated today.
Module triggers activated today	Number of times a Firewall or Module trigger has been activated today.

Examples To display summary information for trigger 3, use the command:

```
sh trig=3 sum
```

To display summary information for all triggers, use the command:

```
sh trig
```

To display a detailed description of trigger 3, use the command:

```
sh trig=3
```

To display a detailed description of all triggers, use the command:

```
sh trig ful
```

To display general configuration information for the trigger facility, use the command:

```
sh trig sta
```

To display counters for the trigger facility, use the command:

```
sh trig cou
```

Related Commands

activate trigger
add trigger
create trigger
delete trigger
destroy trigger
disable trigger
enable trigger
purge trigger
set trigger