RRC User Guide

Version 4.14

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# Introduction

The RRC application is a pure Java RADIUS proxy server with extended features to support interactions with an Arbor Deep Packet Inspection (DPI) platform.

RRC can provide simultaneous support for forwarding of authentication and accounting as a RADIUS proxy, and session lifecycle management within the Arbor DPI platform.

Each functional component of RRC may be enabled or disabled to allow complete deployment flexibility; e.g. dedicated authentication proxy, or dedicated interface to DPI platform.

Version 4 of RRC delivers a complete re-implementation of the configuration mechanism. The previously hard-coded behaviour with a large number of on / off flags has been replaced with an XML based rules engine. The rules engine allows complete flexibility over the handling of requests, and interactions with external systems for data lookup and retrieval.

Multiple external systems may be queried when handling each request, and both LDAP and SQL database (Oracle and MySQL) connections are supported.

The run time behaviour of RRC is controlled by its configuration where rules are defined to determine the handling of each RADIUS packet received. The rules are grouped into four rule-sets:

* authentication request proxy;
* authentication response proxy;
* accounting proxy;
* DPI interface;

The figure below shows the relationship between the RRC and the associated external systems.

IISP

LDAP

Directory

BT

Managed Network Authentication

Wholesale

BRAS

Wholesale

BRAS

Wholesale

BRAS

RTMaN

SLE

Arbor

Subscriber

Manager

Other

Radius

Server

RRC

RTMaN

Radius Server

LDAP

Search

Radius Authentication

And Accounting

Radius

Authentication

And Accounting

Proxied

Radius Authentication

And Accounting

User Session

Profile Changes

Wholesale

Radius

Proxy

Figure 1: RRC Usage Architecture

# Features

The RRC application provides the following features:

* Radius Authentication Proxy;  
    
  The RRC application can provide full authentication proxy capabilities. Decisions about the destination for a proxy request can be made using any of the “standard” attributes present within the Radius authentication request packet. Currently, Vendor specific attributes are not supported for proxy rules.
* Radius Accounting Proxy;  
    
  The RRC application can provide full accounting proxy capabilities. Decisions about the destination for a proxy request can be made using any of the “standard” attributes present within the Radius authentication request packet. Currently, Vendor specific attributes are not supported for proxy rules.
* Radius Accounting Proxied to Multiple Destinations;  
    
  The RRC application can be configured to either proxy an accounting request to the destination associated with the first matching proxy rule, or to the destinations associated with all matching proxy rules.
* Rate limiting of proxied requests;  
    
  RRC can control the rate at which requests are forwarded to remote RADIUS servers and provides some buffering to deal with short term spikes in the request rates. Rate limiting is achieved by controlling the number of outstanding requests to each destination RADIUS server.
* Suppression of Radius Accounting Responses;  
  A Radius access control list can be specified to suppress the sending of an Accounting Response for matching Accounting Request packets.
* Arbor Session Management for Consumer Users;  
    
  The RRC application can use Calling-Station-Id information (the BT Wholesale SID) from incoming Radius Accounting Requests to perform a lookup on the BT IISP system (via LDAP) and subsequently log the user into the Arbor DPI systems with the appropriate product or service profile.
* Arbor Session Management for Business Users;  
    
  A Radius Access Control list may be specified to identify those Radius Accounting Requests that correspond to business users. For these matching requests, the user can be logged into the Arbor systems using the username present in the Accounting Request.
* Validation of IISP Service Packages Against Arbor Service Offers;  
    
  The RRC application will maintain a cached view of the Service Offers available on the Arbor DPI systems. Service Packages returned by the IISP for Consumer broadband lines are validated against this list.
* Detailed Performance Monitoring;  
    
  The RRC application maintains detailed performance statistics on the response times of the external systems it communicates with. The number of requests, minimum, maximum and average response times from those systems will be recorded (e.g. Radius Servers, SLEs, IISP). In addition, for a subset of the systems, response time histograms are maintained allowing 95% percentile response times to be tracked.
* XML based configuration;  
    
  RRC reads a number of XML files at start-up to determine its configuration.
* Integration with Java JMX management framework;  
    
  RRC publishes performance statistics and counters via the Java Management Extensions (JMX) framework allowing remote monitoring by any JMX compliant client (e.g. jconsole or jvisualvm).
* Radius Command Line Client;  
    
  For testing purposes, the RRC application has a command line client . The client can be configured to generate Accounting Start, Stop, and Interim requests a specific rates with the packet contents read from a simple CSV file. The destination Radius Server may be configured, thus the RRC application could be used in some circumstances as a Radius load generator for external systems testing.
* Authenticating Server;  
    
  Although not RRCs primary design goal, sufficient functionality exists to allow RRC to operate as an authenticating RADIUS server if a suitable external repository is available for user information (e.g. LDAP directory or database).

# Installation

## Requirements

The RRC is a pure Java application, and requires J2SE6. It should run on any platform supporting the Java runtime environment.

## Unpacking

The RRC application is delivered as a JAR file. This is in effect a simple ZIP file and the contents may be extracted using either unzip or WinZip as appropriate.

RRC should where possible be executed under a non-privileged user identity. The normal ports used for Radius applications (1812, 1813 or historically 1645 and 1646) do not require root privileges for use.

* Copy the RRC distribution file into a temporary directory on the target host (e.g. /tmp)
* Create the target installation directory (e.g. /opt/rrc);  
    
  mkdir /opt/rrc
* Change to the installation directory;  
    
  cd /opt/rrc
* Extract the files from the JAR archive  
    
  unzip –x /tmp/rrc-x.y.jar

JAR files don’t support the notions of file ownership, or permissions. The files installed will be owned by the user performing the installation, and any executable files will not have the appropriate execute bits set. An installation script is provided that will create an un-privileged user and groups, and set the appropriate file permissions.

* Execute the installation script

**/bin/sh bin/install**  
  
Note that this must be “shell’d” rather than the permissions changed and then executed. This is to overcome the problem of the file being delivered with Microsoft Windows line endings (carriage return and linefeed).

## Starting and Stopping

The RRC application is delivered with a shell script (/opt/rrc/bin/rrc) that can be used to start and stop the application. The script should be invoked with a single command argument

/opt/rrc/bin/rrc <command>

The script supports the following commands:

* start – starts the application
* stop – stops the application
* restart – stops and then immediately starts the application
* status – displays the current running status of the application

## Starting RRC at Boot Time

The RRC application should be started at system boot time. The start and stop script delivered with the RRC will provide the necessary functionality. It simply needs to be called at system boot time.

* Link the start / stop script into the system init directories:  
    
  cd /etc/init.d  
    
  ln –s /opt/rrc/bin/rrc rrc  
    
  cd /etc/rc3.d  
    
  ln –s ../init.d/rrc S99rrc

The installation script will have performed this configuration automatically.

# Overview

The behaviour of RRC version 4 is dependent on the configuration of rules that control the processing of the RADIUS packets.

Almost all aspects of the packet handling are determined by the rules and statement. There is very little functional behaviour hard-coded. Each received RADIUS packet is passed through one of a number of rulesets determined by the packet type:

|  |  |  |  |
| --- | --- | --- | --- |
| RADIUS Packet Type | Ruleset | Ruleset Location | Default Treatment |
| Authentication requests | Authentication proxy request ruleset | <auth-proxy>  <request>  <ruleset> | If the request is not proxied onwards, the default disposition is applied (default to drop). |
| Authentication responses | Authentication proxy response ruleset | <auth-proxy>  <response>  <ruleset> | Forward RADIUS server that originated the authentication request |
| Accounting requests | Accounting proxy rulset | <acct-proxy>  <ruleset> | Drop the request |
| Accounting requests  (DPI enabled) | DPI Ruleset | <dpi>  <ruleset> | Ignore the request |
| Accounting responses | None |  | Handled to acknowledge previously proxied accounting packet. |

## Proxying

The proxying behaviour is determined solely by the rules present in the appropriate ruleset – authentication or accounting as appropriate.

The ruleset must include the logic to select the appropriate destination server group, and a “<proxy>” statement to actually send the request to the destination. The ruleset may modify the RADIUS packet prior to forwarding the request.

Authentication responses are automatically returned to the originating RADIUS client if no rules are present. The authentication response ruleset may be used to either modify the response packet before it is returned, or to drop the packet and prevent the response being passed onwards.

## DPI Processing

If DPI processing is enabled, the received accounting packets are placed into the dpi processing queue to be handled by a DPI worker thread. The worker threads process each queued accounting request in turn, and apply the DPI ruleset to each request. It is up to the ruleset to ensure the appropriate interaction with the DPI platform takes place via the “<dpi-update>” statement. There is no default behaviour with the DPI ruleset. If the ruleset is empty, or not defined, no DPI related processing will take place.

## Authentication Proxy Overview

The diagram below shows a pictorial representation of the authentication proxy logic:

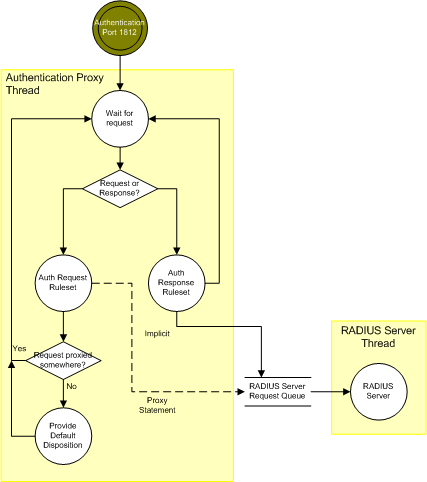


Figure 2: Authentication Processing Overview

## Accounting Proxy Overview

The diagram below shows a pictorial representation of the accounting proxy logic:

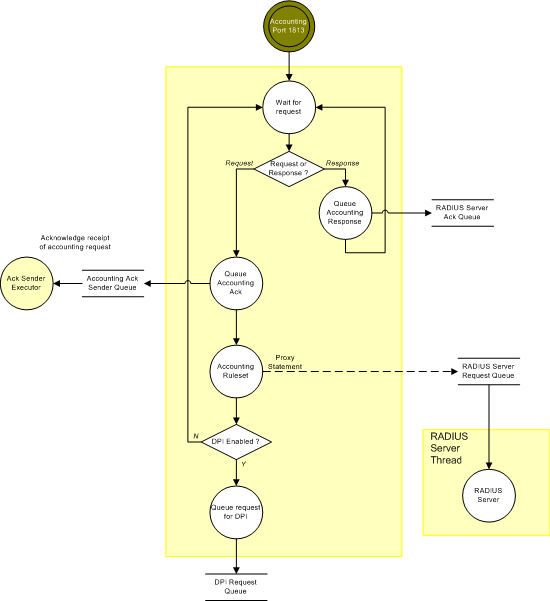


Figure 3: Accounting Processing Overview

# Rules and Rulesets

Rulesets are used to describe the functional behaviour required in the handling of different types of RADIUS packets.

Four rulesets may be defined within RRC:

* Authentication Request Proxy
* Authentication Response Proxy
* Accounting Request
* DPI Accounting Request

All of the rulesets behave and are processed in the same way.

Each ruleset consists of zero or more named rules. Upon execution, each ruleset is executed one rule at a time, in the order they appear in the configuration file.

The ruleset is applied to each RADIUS request received, and the evaluation environment for each ruleset application is limited to the RADIUS request being processed. Changes made by a ruleset are not visible outside of the ruleset itself.

## Rules

Each rule consists of a sequence of statements that dictate the treatment of the RADIUS request.

Rules are executed in sequence until either the end of the rules is reached, an explicit “<end/>” statement is reached, or an error occurs.

### Variables and Expressions

Each RADIUS request being processed has an environment associated with it that contains variables. These variables may be manipulated by the rules as part of the handling of requests.

Variable names are not case sensitive, and can contain any character.

All variables are interpreted as strings, and each variable may be either a single value or a list of values. Values may be added or removed from the list of values using the “<add/>” and “<remove/>” statements. Variables are automatically converted to lists if a second value is added.

Variables are referenced using a simple substitution syntax, similar to Perl or the Bourne Shell

|  |
| --- |
| Given:  <set var=”a” value=”hello”/>  <set var=”b” value=”world”/>  “${a} ${b}” would expand to “hello world” |

## 

Variables that don’t exist are “undefined”, and expand to an empty string if referenced – no error is generated. Logical operators exist to allow testing for a variables existence.

Variable expansion only occurs once during the evaluation of a string so nested references and indirection are not possible.

|  |
| --- |
| Given:  <set var=”a” value=”hello”/>  <set var=”varname” value=”a”/>  ${varname} would expand to “a”  ${${varname}} would evaluate to “${a}” and not be expanded further. |

A variation on the variable expansion syntax allows reference to attributes with the RADIUS request being processed. Adding a prefix of “radius:” to the variable name causes the variable name to be treated as a RADIUS attribute name.

|  |
| --- |
| ${radius:User-Name} would be expanded to the value of the User-Name attribute from the RADIUS request being processed |

Where a variable contains a list of values, its string expansion consists of each of the values separated by a comma ‘,’ character. Similarly, referencing a RADIUS attribute that occurs multiple times within a RADIUS packet results in a list of values and the result is treated as a variable containing a list of values.

Where a RADIUS attribute is known to have multiple instances, a filtering selector may be added to the variable expression to select only those instances where the value starts with the filtering prefix. The returned value has the prefix automatically stripped.

|  |
| --- |
| If the RADIUS packet contains several Class attributes:  Class=RINOffer:Option1a,Class=RINRoute:1.2.3.0/28,Class=Something  ${radius:Class/RINOffer:/} would be expanded to the value “Option1a” |

A few statements expect a list of values as the parameter, and in these cases they process the list internally as a list of values (single values are promoted to a list of one in these cases).

String expression expansion occurs in all instances where a “value” or expression is expected. The “<add>”, “<set>”, “<remove>” and “<delete>” statements perform variable expansion on the variable name parameter:

|  |
| --- |
| <set var=”a” value=”b” />  <set var=”${a}” value=”hello world” />  would set the value of variable “b” to “hello world”  i.e. “${b}” would expand to “hello world” |

Where a reference to another resource is expected, e.g. access list name, or lookup name, no variable expansion is performed.

## Rule and Ruleset Checking

During the startup sequence, RRC will load the configuration from the XML configuration files, and this will be subject to conformance validation with the RRC configuration XML schema.

After the configuration is loaded, RRC will perform a simple static analysis on each riuleset attempting to determine if variables may be used without being set. This process is not infallible so problems identified are logged as warnings. The primary purpose of this feature is to identify typographical errors in variable names. Since RRC doesn’t complain about referencing undefined variable, errors in variable names simply cause the expansion value to be the empty string, and thus make detecting this problem more difficult.

# Configuration Overview

## Configuration Files

RRC is predominantly configured using XML based configuration files. At startup, RRC will load all of the XML files found in the configuration directory – by default this is /opt/rrc/etc/config.d

RRC validates the configuration against the XML schema supplied in /opt/rrc/etc/rrc.xsd.

It is recommended that the configuration be edited with a tool that supports XML schema validation so errors in the configuration are detected during the editing cycle rather than at runtime.

The details of the XML is described in forthcoming sections.

### Referencing Other Configuration Property Values

Within the configuration files, a small number of system variable may be referenced using the variable expansion format ${config:var-name}. This mechanism is only available within the value elements of the XML files.

The following variable names are pre-defined:

|  |
| --- |
| rrc.home – RRC installation directory  rrc.log.dir – configured log file directory from startup script |

## Radius

In order to communicate with Radius servers, the details of the Radius server must be provided in the configuration file. The declaration of RADIUS servers and server groups must be placed within an XML section “<radius>…</radius>”.

### Radius Servers

Radius server entries are required for either:

* Radius servers from which requests are received;  
  In this instance, the server does not need to be associated with a Radius Server Group.
* Radius servers to which requests are proxied;  
  Additionally in this case, one or more Radius Server Groups will be required since Radius requests are proxied to destination server groups rather than individual servers.

The configuration extract below shows the configuration directives required to configure a Radius Server.

### Radius Server Groups

Radius Server Groups are used to specify a group of servers that may be used as the destination for proxying authentication and / or accounting requests.

When proxying a request, the RRC application will select between the servers available within the group and forward the request. If the response from the selected server is timed out, the RRC application will select an alternative server from the group and retry the request.

If the number of successive failures to a particular server exceeds the configured failure threshold, the server will be marked as failed and not tried again until a retry timer has expired. Once the retry timer expires, a single request will be sent to the server to test its functionality. If the response is received, the server will be marked as available and returned to active service within the group.

Each Radius request has a maximum lifetime within the RRC. If the request hasn’t been successfully delivered to a Radius server within this lifetime, it will be discarded, and the event logged.

The selection algorithm for picking a server from the group is by default sequential. The first configured server in the group will be tried. If this fails, the next one in the group will be tried until all servers have been attempted, or the request expires. Alternatively, random selection can be enabled, in which case the destination server is always selected at random from the group.

|  |
| --- |
| <radius>  <radius-server name=”rad1” secret=”testing”>  <ip>1.2.3.4</ip>  </radius-server>  <radius-server name=”rad2” secret=”testing”>  <ip>5.6.7.8</ip>  </radius-server>  <radius-group name=”rad-servers”  selector=”round-robin”  retries=”6”  timeout=”2750”  fire-and-forget=”false”>  <server>rad1</server>  <server>rad2</server>  </radius-group>  </radius> |

The default ports for authentication and accounting are 1812 and 1813 respectively if they are not explicitly specified in the configuration.

## Access Control Lists

Access control lists provide the basic means of matching Radius authentication and accounting packets. Access control lists are used in a number of places to select which requests a particular action will be performed on. These include:

* Matching requests for proxy rules;
* Selecting requests that will have their accounting responses suppressed

Access control lists are named, and consist of a number of clauses that identify a RADIUS attribute, and a regular expression that must match the value of the attribute. In addition to the regular expression matching, RADIUS attributes whose type is an IP address can be matched against an IP subnet access list entry. IP subnet ACL entries are significantly faster than regular expression based clauses.

Each clause may have multiple regular expressions defined, and these may be combined using the logical operators “and”, “or” and “not”.

The following example defines an access control list called “Business User” that will match all RADIUS requests where the User-Name attribute has a realm component that ends with “btclick.com” or “btconnect.com”.

|  |
| --- |
| <access-lists>    <acl name=”Business User”>  <or>  <ends-with string=”${User-Name}” match=”[btclick.com”/](mailto:%5e.*@.*btclick.com$)>  <ends-with string=”${User-Name}” match=”[btconnect.com”/](mailto:%5e.*@.*btclick.com$)>  </or>  </acl>  </access-lists> |

A variation on the previous example that only matches Authentication request packets:

|  |
| --- |
| <access-lists>    <acl name=”Business User Auth”>  <and>  <isAuthentication/>  <or>  <ends-with string=”${User-Name}” match=”[btclick.com”/](mailto:%5e.*@.*btclick.com$)>  <ends-with string=”${User-Name}” match=”[btconnect.com”/](mailto:%5e.*@.*btclick.com$)>  </or>  </and>  </acl>  </access-lists> |

Accounting requests may be matched similarly.

### Regular Expressions

All of the regular expressions used within RRC are required to match against the entire string. Effectively, the patterns are anchored at the start and end regardless of whether the anchoring constructs (“^” and “$”) are explicitly used.

Note that by default all regular expressions are treated as case sensitive. The expression can be prefixed with “(?i)” to make them case insensitive.

See the Regular Expression reference section for details of the regular expression syntax.

## Proxy Configuration

The configuration of RADIUS proxy behaviour is configured using rulesets similarly to the DPI behaviour.

### Authentication Proxy

The authentication proxy behaviour is configured within the “<auth-proxy>…</auth-proxy>” XML element. This declares the port RRC will listen on for authentication requests, and two rulesets. One ruleset is executed for each authentication packet received, and the second for each authentication response received.

To actually proxy an authentication request, the ruleset must include a <proxy /> statement identifying the destination RADIUS group, otherwise the request will be silently discarded.

|  |
| --- |
| <auth-proxy port=”1812” logging=”true”>  <request default-disposition=”drop”>  <ruleset>  <rule name=”All to MNA”>  <proxy destination=”MNA” />  </rule>  </ruleset>  </request>  <response>  <ruleset>  <rule name=”Copy Framed Routes”>  <if>  <is-accept/>  <then>  <copy-framed-routes />  </then>  </if>  </rule>  </ruleset>  </response>  </auth-proxy> |
|  |

The default behaviour for authentication responses is to pass them through the response ruleset, then forward the response to the source of the original request.

### Logging Authentication Requests and Responses

In order to log received authentication requests, and the responses received from down-stream servers, the logging must be enabled using the “logging” attribute of the “<auth-proxy>” configuration element. Setting the value to “true” will cause all received authentication packets to be logged.

The authentication are logged via a logger called “authentication”, allowing the logging behaviour to be tailored individually.

The default behaviour uses a logging configuration that causes a new authentication and accounting log file to be created each day at midnight – i.e. one file per day.

### Example authentication log;

|  |
| --- |
| Fri Jul 15 15:38:48 2005  Identifier = 176  User-Name = A035603@hg28.btclick.com  CHAP-Password = 0x024cbc8c3ebf86b5ab281d18cc53d9ce78  Client-Id = 217.47.197.202  NAS-Port = 220  User-Service-Type = 2  Framed-Protocol = PPP(1)  Proxy-State = 0x42543030326439636131323532  NAS-Port-Type = Virtual(5)  Fri Jul 15 15:38:49 2005  Identifier = 237  User-Name = A416984@hg52.btclick.com  CHAP-Password = 0x01b0d320c36b44d8dc80742ba4e6e8a763  Client-Id = 217.47.48.202  NAS-Port = 1601  User-Service-Type = 2  Framed-Protocol = PPP(1)  Proxy-State = 0x42543030326439636131323532  NAS-Port-Type = Virtual(5) |

### Accounting Proxy

The accounting proxy behaviour is similar, and configured within the <acct-proxy>…</acct-proxy> element.

Again, for accounting packets to be proxied, there must be <proxy /> statements identifying the required destination.

No ruleset is available or required to handle accounting acknowledgements since these carry no attributes.

|  |
| --- |
| <acct-proxy port=”1812” logging=”true”>  <ruleset>  <rule name=”Proxy to MNA”>  <proxy destination=”MNA” />  </rule>  <rule name=”Proxy to DPI”>  <proxy destination=”21c-dpi” />  </rule>  </ruleset>  </acct-proxy> |
|  |

The generation of acknowledgements to RADIUS accounting sources is controlled by an attribute of the <acc-proxy> element, “ack-acl” whose value should be the name of an access list. RADIUS packets matching the access list will be acknowledged.

### Proxy Only Mode

RRC can be configured to act only as a RADIUS proxy with the interface to the deep packet inspection environment disabled. This reduces the overheads in RRC and improves proxy performance. It also removes the need for DPI configuration and prevents errors being logged about absent DPI equipment. The default configuration has DPI processing enabled.

This is enabled by not including the “<dpi>…</dpi>” element on the configuration.

### Fire and Forget Accounting Proxy

RRC can be configured to forward accounting packets to a RADIUS server group without expecting to receive an acknowledgement to the request. This can be configured as an attribute of the RADIUS server group, fire-and-forget=”true”. The same effect can be achieved more selectively by using the same attribute on the <proxy /> statement.

|  |
| --- |
| <proxy destination=”some server” fire-and-forget=”true” /> |

### Logging Accounting Requests

In order to log received accounting requests, the logging must be enabled in the “<acct-proxy>” configuration element. Setting the value to “true” will cause all received packets to be logged.

The accounting packets are logged via a logger called “accounting”, allowing the logging behaviour to be tailored individually.

The default behaviour uses a logging configuration that causes a new authentication and accounting log file to be created each day at midnight – i.e. one file per day.

### Example accounting log

|  |
| --- |
| Fri Jul 15 15:44:48 2005  Identifier = 151  User-Name = voyager205.user@btbroadband.com  Client-Id = 217.47.24.59  NAS-Port = 2148991111  User-Service-Type = 2  Framed-Protocol = PPP(1)  Framed-Address = 81.152.120.103  Proxy-State = 0x42543030326430623435323637  Acct-Status-Type = Alive(3)  Acct-Delay-Time = 0  Acct-Session-Id = 8/0/0/23.135\_00AE492F  Acct-Authentic = RADIUS(1)  Acct-Session-Time = 77270  NAS-Port-Type = Virtual(5)  Fri Jul 15 15:44:48 2005  Identifier = 185  User-Name = A493252@hg40.btclick.com  Client-Id = 217.47.7.73  NAS-Port = 2742  User-Service-Type = 2  Framed-Protocol = PPP(1)  Framed-Address = 81.134.158.204  Proxy-State = 0x42543030326564356133373732  Acct-Status-Type = Stop(2)  Acct-Delay-Time = 0  Acct-Session-Id = 00D6B2BE  Acct-Authentic = RADIUS(1)  Acct-Session-Time = 6811  Acct-Terminate-Cause = Port-Error(8)  NAS-Port-Type = Virtual(5) |

## Arbor Session Management

The interaction with the Arbor management systems is controlled the declaration of a DPI system. This consists of two main elements:

* The declaration of the actual DPI management systems;
* A rule set that controls the logical behaviour of RRC with regard to interacting with the DPI platform.  
    
  Rulesets are explained in the reference section.

The example below shows a simple case where an E100 environment is declared, and a simple ruleset is used to login sessions using the User-Name for business users, and Calling-Station-Id (holds the SID value) for consumer users.

|  |
| --- |
| <dpi name=”21c”  workers=”128”  queue-length=”200”  interim-drop-threshold=”80”  request-expiry=”120000”  >    <e100 enable-optional-products=”false” >  <cm  primary=”10.22.36.155”  secondary=”10.22.37.155”  zone=”Default Zone”  min-profile-age=”300”  max-profile-age=”900”  />  <sm>  primary=”10.22.36.154”  secondary=”10.22.37.154”  />  </e100>  <ruleset>  <rule name=”login”>  <if>  <match-acl acl=”Business User”/>  <then>  <set var=”userid” value=”${radius:User-Name}”/>  </then>  <else>  <set var=”userid” value=”${radius:Calling-Station-Id}”/>  </else>  </if>  <dpi-update id=”21c”  userid=”${userid}”  profile=”Default Profile”  />  </rule>  </ruleset>  </dpi> |

## External Lookups

RRC supports three mechanisms for retrieving external data:

* LDAP directories;
* Local or remote files;
* SQL Databases (Oracle and MySQL)

### LDAP Lookup

RRC implements this using the Java JNDI functionality. This means that the configuration is split into two parts:

* Configuration of LDAP servers and RRCs use of them;
* Configuration of the underlying JNDI LDAP parameters;  
  These are pre-configuured within the RRC distribution, but each lookup can specify its own values for the connect timeout, read timeout, LDAP version and connection pool size.

LDAP servers are declared using a similar format to other servers.

The external lookup is named to provide a reference that is subsequently used with a “lookup” statement to trigger the lookup action.

The “query” element defines the LDAP query language expression that will be passed to the LDAP directory to perform the actual query. This expression should include RRC variable expansion references to substitute the appropriate parameter values.

An arbitrtray number of LDAP lookups may be defined within the enclosing “<lookups>” element.

|  |
| --- |
| <lookups>  <ldap name="iisp-consumer">  <ldap-version>2</ldap-version>  <host>194.73.73.175:389</host>  <username></username>  <password></password>  <base-dn>ou=iisp</base-dn>  <scope>sub</scope>  <query>iispSID=${radius:Calling-Station-Id}</query>  <req-attr>iispProfile</req-attr>  <req-attr>iispDn</req-attr>  <connect-timeout>3000</connect-timeout>  <read-timeout>3000</read-timeout>  <pool-size>25</pool-size>  <probe-query>iispSID=BBEU00000000</probe-query>  </ldap>  </lookups> |

The “<req-attr>” elements define the names of the attributes that are retrieved from the LDAP directory. The attribute value is stored in an RRC variable with the variable name corresponding to the attribute name.

In the example above, these would be “iispProfile” and “iispDn”, and these can be referenced as “${iispProfile}” etc.

#### LDAP Server Status Tracking

RRC tracks the active status of the LDAP server. If RRC believes the server is operating normally, it performs LDAP lookup queries when the appropriate statement is executed.

If RRC detects a failure of the LDAP server (three consecutive communications failure exceptions), it marks the server as failed. Under these conditions, RRC does not perform the LDAP search, and behaves as if the LDAP search had been performed, but details were available. The variables that would normally hopld the retrieved attribute values will be undefined.

Periodically RRC tries a single search on the LDAP server to check if it is available again using the “<probe-query>”. No specific result is required, RRC simply requires that an error is not generated.

### File Lookup

RRC supports the concept of file based lookup tables that can be used lookup arbitrary values.

The mappings must be configured a configuration similar to the example below

|  |
| --- |
| <lookups>  <file name="user override">  <url>file:///opt/rrc/etc/user-mapping.txt</url>  <selector></selector>  <refresh>300</refresh>  <search-key>${radius:Calling-Station-Id}</search-key>  <column>user-product</column>  <column>user-optional-products</column>  <column>...</column>  </file>  </lookups> |

The name attribute specifies the name of this mapping, and is used to refer to the mapping elsewhere in the configuration. The uri property provides the source of the mapping file. This may be a local file, or a remote file obtained via HTTP or FTP. Authentication is supported for FTP and HTTP URLs using the normal URL format.

If a mapping file is successfully loaded, the table is cached in memory. It must be available from the same source each time RRC starts, or when a refresh is required.

The “<search-key>” expression is expanded to form the key value that will be searched for in the lookup mapping.  
  
Each “<column>” declares the name of a column in the comma separated value determined from the lookup. If the column name is “<column>…</column>”, the last named column in the CSV may be repeated to allow multiple values for one attributue (e.g. optional product names).

The mapping file format should adhere to the following rules:

1. A line may contain a ‘#’ character in which case all characters from the ‘#’ to the end of the line are ignored;
2. Blank lines are permitted;
3. The first column in the file must be the key value for the lookup;  
     
   The key value may not contain any whitespace. The first occurrence of whitespace will be interpreted as the separator between the key and the value;
4. The second token must be the string “🡪” to separate the key from the values;  
   This may be surrounded by an arbitrary amount of white space that will be removed.
5. The value is a comma separated list of values;
6. Both the key and value will have leading and trailing whitespace removed.
7. Although the mapping files permit embedded whitespace in the value, it is unlikely that whitespace will be valid within the rest of RRC.
8. The key may be plain text, or a regular expression.  
   Regular expression keys must be enclosed in a matching pair of ‘/’ characters.

Lines within the mapping are processed sequentially. Internally, the implementation has the effect of re-ordering the lines in the mapping file such that all regular expression keys are placed after all plain text keys. The relative ordering of the regular expression keys is maintained. This means that the plain text keys will take precedence over a regular expression match.

RRC monitors configured mapping files for changes and will re-load the mapping if it is updated. This allows the mapping to be changed in-flight without the need to re-start RRC.

|  |
| --- |
| # Example user mapping file  #  # username 🡪 offer  ChrisBurrows 🡪 SuperPlusOffer,NoDNS,BT\_FON\_2M  RobinGriffith 🡪 NoP2POffer  /Test.+/ 🡪 TestOffer  TestUser 🡪 QoSTestOffer |

The example file above, if searched for the key “ChrisBurrows” configured would result the variable “user-product” being set to “SuperPlusOffer”, and the variable “user-optional-products” being set to the list of values “NoDNS”, “BT\_FON\_2M”.

### Database Lookup

External database lookups are configured similarly. The vendor identifies the vendor of the database with “oracle” and “mysql” as the supported systems.

Each “<instance>” identifies a database server instance that may be used by RRC to perform the queries. It identifies the hosts IP address, database name, and the username and password required for access.

|  |
| --- |
| <lookups>  <database name="ora-test" vendor="oracle">    <instance>  <host>dbhost011</host>  <db-name>bbusers</db-name>  <username>rrc</username>  <password>rrc</password>  </instance>    <instance>  <host>dbhost02</host>  <db-name>bbusers</db-name>  <username>rrc</username>  <password>rrc</password>  </instance>    <query>  select profile from users where userid = ?  </query>    <param>${user-id}</param>  <extract-column>profile</extract-column>  </database>  </lookups> |

The “<query>” defines the parameterised query that will be executed. This must be constructed as a parameterised query since RRC will only prepare the statement once, then execute it with different parameter values. Each ‘?’ will be replaced by a parameter defined in the “<param>” element at run time. The order is determined by the order of appearance within the configuration.

The “<extract-column>” element identifies the name of a column from the query result that will be extracted and placed into an RRC variable of the same name.

## Interface to External Load Balancers

The RRC application provides an application specific interface that can be used by an external load balancer to determine if RRC is operating, and thus direct incoming Radius requests to the server.

The interface consists of a listening TCP socket that will accept connections if the RRC is able to process requests. If the RRC is in an operating state where is cannot process requests (e.g. no active SLEs can be found), the TCP socket will be closed and the load balancer will see the server as down.

Similarly, if the RRC application is not running, the operating system will reject the TCP connection attempts, and the load balancer will see the server as down.

The RRC application maintains one status TCP port for authentication proxying, and one for accounting processing. The load balancer can be configured to use the appropriate port if a distinction between authentication and accounting is possible. If it is not, and only a single keep-alive is used, the accounting port should be used.

|  |
| --- |
| <listener>  <monitor  auth="2812"  acct="2813"  check="2000"  sentinal-file="${rrc.log.dir}/shutdown.now"/>  </listener> |

The load balancer interface checks the internal status of the application periodically. This interval may be configured in milliseconds using the “check” attribute.

## Statistics

The RRC application maintains detailed statistics on may aspects of it’s performance, and that of the surrounding systems. Statistics collected include:

* Overall end to end processing
  + Number of requests sent
  + Number of requests received
  + Minimum response time
  + Maximum response time
  + Average response time over all events
  + Average response time measured over the last minute
  + Standard deviation of response time
  + Estimated rate of change measured over the last minute (events / second)
* Radius Server Groups (individual)
  + Number of requests sent
  + Number of requests received
  + Minimum response time
  + Maximum response time
  + Average response time over all events
  + Average response time measured over the last minute
  + Standard deviation of response time
  + Estimated rate of change measured over the last minute (events / second)
  + Histogram distribution of response times
  + 95th percentile response time
* Radius Servers (individual)
  + Number of requests sent
  + Number of requests received
  + Minimum response time
  + Maximum response time
  + Average response time over all events
  + Average response time measured over the last minute
  + Standard deviation of response time
  + Estimated rate of change measured over the last minute (events / second)
* SLEs (collective)
  + Number of requests sent
  + Number of requests received
  + Minimum response time
  + Maximum response time
  + Average response time over all events
  + Average response time measured over the last minute
  + Standard deviation of response time
  + Estimated rate of change measured over the last minute (events / second)
  + Histogram distribution of response times
  + 95th percentile response time
* IISP (collective)
  + Number of requests sent
  + Number of requests received
  + Minimum response time
  + Maximum response time
  + Average response time
  + Average response time measured over the last minute
  + Standard deviation of response time
  + Estimated rate of change measured over the last minute (events / second)
  + Histogram distribution of response times
  + 95th percentile response time
* A count of radius requests that have expired
* A count of radius requests that have been discarded
* Counts of Radius Authentication requests along with counts of Access Accepts, Rejects and Default Accepts generated by RRC.

The preferred mechanism to monitor the statistics is via the Java Management Extensions (JMX), using a suitable JMX client. Within the Phoenix operational environment the JMXAgent application can be used to extract statistical metrics from RRC and make them available via the MIB Statistics file mechanism.

### JConsole (JMX Management)

The RRC application supports access to both JVM performance information and internal statistics via the JMX console.

See reference [4]**Java J2SE JConsole User Guide**http://java.sun.com/j2se/1.5.0/docs/guide/management/jconsole.html for more details on using jconsole.

### MIB Statistics Files

The MIB statistics file support is retained in RRC for legacy reasons. The preferred monitoring approach is to use JMX MBeans and a suitable JMX client like JMXAgent.

These statistics may be obtained through “MIB” statistics files dumped periodically into a statistics directory;

|  |
| --- |
| <statistics  output-dir="/var/log/rrc/snmp"  update-interval="30000">  <scale oid="1.0">1</scale>  <scale oid="2.0">1</scale>  <scale oid="3.0">1</scale>  <scale oid="4.0">100</scale>  <scale oid="5.0">100</scale>  <scale oid="6.0">100</scale>  <scale oid="7.0">1</scale>  <scale oid="8.0">100</scale>  <scale oid="9.0">1</scale>    <metric oid="1">Overall</metric>  <metric oid="2">SLE</metric>  <metric oid="3">IISP</metric>  <metric oid="4">Queue</metric>  <metric oid="5">SLEChangeError</metric>  <metric oid="6">Expired</metric>  </statistics> |

These files contain a single statistic. Each file consists of 3 lines containing the SNMP OID for the metric, the type of the metric (e.g. Gauge), and the metric value.

|  |
| --- |
| 1.3.6.1.4.1.7560.4.10.20.6.1.1  Counter32  104743 |

The metrics that are dumped at MIB statistics files must be configured, along with the directory where the files will be output and the interval between updates to the files. The update interval is specified in milliseconds.

|  |
| --- |
| <statistics  output-dir="/var/log/rrc/snmp"  update-interval="30000">  <scale oid="1.0">1</scale>  <scale oid="2.0">1</scale>  <scale oid="3.0">1</scale>  <scale oid="4.0">100</scale>  <scale oid="5.0">100</scale>  <scale oid="6.0">100</scale>  <scale oid="7.0">1</scale>  <scale oid="8.0">100</scale>  <scale oid="9.0">1</scale>    <metric oid="1">Overall</metric>  <metric oid="2">SLE</metric>  <metric oid="3">IISP</metric>  <metric oid="4">Queue</metric>  <metric oid="5">SLEChangeError</metric>  <metric oid="6">Expired</metric>  </statistics> |

### Mapping OIDs to MIB Statistics

In order to simplify the configuration (especially typing in OIDs), the OID are specified as a “base” and then a per metric OID suffix is used.

|  |
| --- |
| <statistics  output-dir="/var/log/rrc/snmp"  update-interval="30000"  base=”1.3.6.1.4.1.7560.4.10.20.6” >  <scale oid="1.0">1</scale>  <scale oid="2.0">1</scale>  <scale oid="3.0">1</scale>  <scale oid="4.0">100</scale>  <scale oid="5.0">100</scale>  <scale oid="6.0">100</scale>  <scale oid="7.0">1</scale>  <scale oid="8.0">100</scale>  <scale oid="9.0">1</scale>    <metric oid="1">Overall</metric>  <metric oid="2">SLE</metric>  <metric oid="3">IISP</metric>  <metric oid="4">Queue</metric>  <metric oid="5">SLEChangeError</metric>  <metric oid="6">Expired</metric>  </statistics> |

Once the OID base is set, individual metrics can be specified using the “<metric>” element. Each element specifies the OID suffix as an attribute, and the name of the metric object to report as the elements child.

E.g. the example above associates the full OID “1.3.6.1.4.1.7560.4.10.20.6.4” with the metric names “Queue” within RRC.

The names used as the value of the are “names” of the statistics that should be output under the OID value. The available names can be obtained from the telnet statistics (e.g. telnet to the RRC statistics port and the statistics name is the first column of the output).

These correspond to tables where the row in the table is described below. Each row is output as a separate MIB statistics file.

|  |
| --- |
| .0.0 the name of the metric (String)  .1.0 the count (Counter32)  .2.0 the minimum value over all events (Gauge)  .3.0 the maximum value over all events (Gauge)  .4.0 the average value over the last 1 minute (Gauge)  .5.0 the stddev value over all events (Gauge)  .6.0 the rate of occurrence over the last 1 minute (Gauge)  .7.0 the 95th percentile over all events (Gauge)  .8.0 the average value over all events (Gauge) |

### MIB Statistics Scaling

The values output in the MIB statistics files can be scaled arbitrarily. This permits more accuracy to be reflected to the SNMP management system where the values are small “real” numbers. In this case, the value can be scaled by, for example, 100 thus including two decimal points in the value conveyed to the management system.

|  |
| --- |
| <statistics  output-dir="/var/log/rrc/snmp"  update-interval="30000"  base=”1.3.6.1.4.1.7560.4.10.20.6” >  <scale oid="1.0">1</scale>  <scale oid="2.0">1</scale>  <scale oid="3.0">1</scale>  <scale oid="4.0">100</scale>  <scale oid="5.0">100</scale>  <scale oid="6.0">100</scale>  <scale oid="7.0">1</scale>  <scale oid="8.0">100</scale>  <scale oid="9.0">1</scale>    <metric oid="1">Overall</metric>  <metric oid="2">SLE</metric>  <metric oid="3">IISP</metric>  <metric oid="4">Queue</metric>  <metric oid="5">SLEChangeError</metric>  <metric oid="6">Expired</metric>  </statistics> |

The management system must be configured to expect these values to be scaled.

The default scaling values are such that the derived statistics (average, standard deviation and rate) are all scaled by 100.

### Detailed Telnet Statistics

The detailed statistics are dumped in response to a telnet connection to RRC server on port 2823.

All of the available statistics will be output. One line is produced for:

* Each configured Radius Server Group;  
  Histogram data is also collected for Radius Server Groups;
* Each configured Radius server
* Overall Radius Proxy performance;  
  Histogram data is also collected for the overall Radius proxy performance;
* Overall SLE performance;  
  Histogram data is also collected for the overall SLE performance
* Overall IISP performance;  
  Histogram data is also collected for the overall IISP performance
* Internal queue time;
* Expired Radius Requests
* Radius requests discarded due to proxy timeout / retries failing
* Overall end to end performance;  
  Histogram data is also collected for the overall end to end performance

Following these single lines the response time histograms are output;

The telnet output has a line limit applied to ensure that excessive output isn’t generated if there are extremely long response times to report.

## Configuration Validation and Testing

RRC may be started in “configuration check mode” as a means to checking the validity of the configuration and accessibility of the external data lookup systems.

The command line for this is:

**/opt/rrc/bin/rrc check**

This will start RRC in check mode. Normal startup occurs with the configuration file being parsed, and logging messages are generated to the console.

However, RRC will not start the interfaces to the external load balancers, neither will it handle RADIUS packets. This means that RRC will still appear to be down as far as external systems are concerned.

RRC does attempt to create the listening ports, thus RRC cannot be started in check mode on a system where there is a running instance of RRC using the same ports.

RRC will exit immediately after completing the configuration parsing.

RRC also has a “test” mode. This is similar to the check mode in that RRC will appear to be down from the point of view of external load balancers, and it will not handle RADIUS packets. It will however connect to DPI systems and start to “ping” external lookup servers for reachability.

Once started, RRC will operate for around 60 seconds, including the availability probes for external lookup systems, and any configured DPI systems. Errors related to these systems will appear on the console.

After about 60 seconds, RRC will exit normally.

To start RRC in test mode, use the command line:

**/opt/rrc/bin/rrc test**

# Logging

Logging is based on a Simple Logger library that uses a properties file for configuration. The default configuration file is /opt/rrc/etc/simplelogger.properties

This file allows the following elements to be defined:

* appenders;  
  these are the objects that actually write to files, and one should be configured for each physical log file required.
* levels;  
  these associate log levels with appenders. These form the default logging files for given logginging levels. It should be noted that log messages of the specified severity or above will be passed to the appender.
* loggers;  
  these are named logging objects that are used to control log level filtering for specifically named log sources. Each Java file generates log messages sourced from the fully qualified name of the file and package. In addition, there are dedicated loggers associated with specific functions:  
  + Logging authentication packets;
  + Logging accounting packets;

|  |
| --- |
| #  #  # Simple Logger Configuration  #  # Create named appenders - these actually write log messages somewhere  # Appender name should be followed by arguments separated by ';'  # Available appenders include  # Stdout - write to stdout (no arguments)  # Stderr - write to stderr (no arguments)  # RollingFile - write to a file and roll the file periodically.  # Arg 1: filename  # Arg 2: roll interval in seconds  #  # appender.name = Appender[:arg[:arg]...]  appender.stdout = Stdout  appender.rrc = RollingFile:${rrc.log.dir}/rrc.log;86400  appender.debug = RollingFile:${rrc.log.dir}/debug.log;7200  appender.error = RollingFile;${rrc.log.dir}/error.log;86400  appender.auth = RollingFile:${rrc.log.dir}/authentication.log;86400  appender.acct = RollingFile:${rrc.log.dir}/accounting.log;86400  # Configure mapping between log levels and default appenders  # An entry can exist for each available log level, the value  # being the name of an appender defined above  level.debug = debug  level.info = rrc  level.error = error    # Create specific named loggers set set log levels and optionally  # a custom appender.  # This allows specific loggers to be created with a log level  # threshold and associated with a specific appender.  # Note: messages logged against a specifically named logger  # that has an named appender defined will only be logged by  # that logger / appender.  # The log level threshold is required, a specific appender is optional  logger.stdout = info;stdout  logger.Authentication = info:auth  logger.Accounting = info:acct  # Suppress logging levels for some robust(!) classes  logger.net.btretail.rtman.RRC.RadiusAuthenticationProxy = info  logger.net.btretail.rtman.RRC.RadiusAccountingProxy = info  logger.net.btretail.rtman.RRC.LoadBalancerInterface = info  logger.net.btretail.rtman.RRC.ServiceOffers = info  logger.net.btretail.rtman.RRC.WorkSupervisor = info  logger.net.btretail.rtman.RRC.Worker = info  logger.net.btretail.rtman.RRC.LDAP = info  logger.net.btretail.rtman.RRC.process = info  logger.net.btretail.rtman.Ellacoya.SLE = info  logger.net.btretail.rtman.StatsMon = warn  logger.net.btretail.rtman.Radius = warn |

## RRC Log

The RRC log file contains general progress and processing log messages. The granularity of logging is controlled by the log4j.xml configuration file.

The default configuration causes a new rrc.log file to be generated each day at midnight.

## Bad Packet Log

The bad packet log contains a hex dump of any Radius packet received by the RRC that it cannot correctly decode.

Each log entry identifies the time the radius packet was received, and the Radius server from which the packet was received. Following this header line, the packet contents are dumped in hex with an ASCII dump of the printable characters alongside.

The destination file for the bad packets is configured via the log4j.xml configuration file. The bad packets are logged via an *appender* named “badpacket”.

An example is given below.

|  |
| --- |
| Fri Jul 15 14:48:09 2005 Bad accounting packet from: Wholesale31  0000: 04 94 00 9B 26 4E 05 50 30 5A 15 1A D6 FA FE 5D &N P0Z ]  0010: 82 BF F2 F3 01 19 6C 65 73 6C 75 6B 65 40 62 74 lesluke@bt  0020: 62 72 6F 61 64 62 61 6E 64 2E 63 6F 6D 04 06 D9 broadband.com  0030: 2F 57 F8 05 06 D2 55 00 6D 06 06 00 00 00 02 21 /W U m !  0040: 0F 42 54 30 30 32 64 30 62 34 35 32 36 37 28 06 BT002d0b45267(  0050: 00 00 00 02 29 06 00 00 00 00 2C 29 65 72 78 20 ) ,)erx  0060: 61 74 6D 20 31 33 2F 32 2E 31 37 34 30 30 37 31 atm 13/2.1740071  0070: 36 3A 38 35 2E 31 30 39 3A 30 30 31 35 33 31 31 6:85.109:0015311  0080: 39 32 32 2D 06 00 00 00 01 2E 06 00 00 00 00 31 922- . 1  0090: 06 00 00 00 01 3D 06 00 00 00 05  Fri Jul 15 15:29:53 2005 Bad accounting packet from: Wholesale30  0000: 04 65 01 0E A6 0F 50 DA C1 F3 FD 97 09 ED 8C E7 e P  0010: AD 7C 30 F1 01 98 6C 20 20 20 20 20 20 20 20 20 |0 l  0020: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  0030: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  0040: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  0050: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  0060: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  0070: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20  0080: 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 64 d  0090: 73 65 79 2E 6C 65 65 32 40 68 67 32 35 2E 62 74 sey.lee2@hg25.bt  00A0: 69 6E 74 65 72 6E 65 74 2E 63 6F 6D 04 06 D9 2F internet.com /  00B0: 18 B9 05 06 79 44 00 8A 06 06 00 00 00 02 07 06 yD  00C0: 00 00 00 01 08 06 D9 2A C0 BD 21 0F 42 54 30 30 \* ! BT00  00D0: 32 39 61 66 30 63 66 65 35 28 06 00 00 00 03 29 29af0cfe5( )  00E0: 06 00 00 00 00 2C 17 37 2F 31 2F 31 2F 36 38 2E , 7/1/1/68.  00F0: 31 33 38 5F 30 30 32 46 35 30 45 36 2D 06 00 00 138\_002F50E6-  0100: 00 01 2E 06 00 00 18 A0 3D 06 00 00 00 05 |

# Logging Configuration

## Basic Concepts

The simple logging mechanism revolves around 2 concepts:

* Logger  
  Logger is responsible for capturing the log message from the application and passing it to one or more appenders to write the messages. The logger also filters the messages based on levels or severity to determine which messages should be logger.
* Appender  
  Appender is responsible for controlling the output of log operations and actually writing log records to a destination.
* Layout  
  Layout is responsible for formatting the output for Appender.

### Logger

The logger is the core component of the logging process There are 5 normal levels of logger:

* TRACE  
  the TRACE level defines a very granular debugging log level that can be very verbose
* DEBUG   
  The DEBUG Level designates fine-grained informational events that are most useful to debug an application.
* INFO   
  The INFO level designates informational messages that highlight the progress of the application at coarse-grained level.
* WARN  
  The WARN level designates potentially harmful situations.
* ERROR  
  The ERROR level designates error events that might still allow the application to continue running.
* FATAL  
  The FATAL level designates very severe error events that will presumably lead the application to abort.

In addition, there are two special levels of logging available:

* ALL  
  The ALL Level has the lowest possible rank and is intended to turn on all logging.
* OFF  
  The OFF Level has the highest possible rank and is intended to turn off logging.

The behaviour of loggers is hierarchical. The following table illustrates this:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Will Output Messages of Level** | | | | | | |
| **Logger Level** |  | **TRACE** | **DEBUG** | **INFO** | **WARN** | **ERROR** | **FATAL** |
| **TRACE** |  |  |  |  |  |  |
| **DEBUG** |  |  |  |  |  |  |
| **INFO** |  |  |  |  |  |  |
| **WARN** |  |  |  |  |  |  |
| **ERROR** |  |  |  |  |  |  |
| **FATAL** |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ALL** |  |  |  |  |  |  |
| **NONE** |  |  |  |  |  |  |

1. Logger Output Hierarchy

A logger will only output messages that are of a level greater than or equal to it.

### Appender

The Appender controls how the logging is output. Appenders are created in the configuration file with a name, and type. The types of Appender available are:

* Stdout  
  writes log messages to the standard output device;
* Stderr  
  writes log messages to the standard error device;
* RollingFile  
  writes log messages to a file. This appender supports rolling the log file at a configurable interval;

### Stout and Stderr Appenders

These two appenders don’t require and additional parameters for configuration.

|  |
| --- |
| appender.stdout = Stdout  appender.stderr = Stderr |

### Rolling File Appender

The rolling file appender requires two parameters to be provided, the name of the log file and the interval between rotations (in seconds).

The rolling file appender provides buffered output to the file to enhance logging performance. The default behaviour is to flush this log buffer after 5 – 10 seconds of logging inactivity so the messages become visible.

If required, the appender can be configured to log messages synchronously by setting the AutoFlush property on the appender to true. The default is for this to be false.

|  |
| --- |
| appender.debug = RollingFile;/var/log/debug.log;7200  appender.file = RollingFile;/var/log/application.log;86400  appender.file.AutoFlush = false |

## Log Levels

The mapping between the default log levels and which appender is to be used is required for basic logging functionality. If no specific loggers are configured, this will control the disposition of log messages based on the level the message was logged at.

|  |
| --- |
| level.debug = debug  level.info = file |

Logging can be controlled with a much greater level of granularity by configuring Java class specific loggers. The logger allows a filter to be applied to the log message level so messages below the threshold are not logged, and the messages can be directed to a specific appender.

In the example configuration snippet below:

* the logging threshold for the net.btretail.rtman.Radius class and all subclasses is set to warn. This would cause only messages with a level of warn or above to be logged. These messages would be logged according to the default log levels as no specific appender is configured.
* messages generated by the net.btretail.rtman.Arbor class (and subclasses) will be filtered to debug level and above, and written to an appender named “Arbor”. In this case, these log messages are not logged via the default levels as a specific appender has been configured.

|  |
| --- |
| logger.net.btretail.rtman.Radius = warn  logger.net.btretail.rtman.Arbor = debug;Arbor |

## Configuration File

The simple logger requires a configuration file to setup the required appenders, levels and loggers.

The configuration file is similar in format to the other RRC configuration files and uses the same properties file format.

An example configuration is shown below:

|  |
| --- |
| appender.rrc = RollingFile;/var/log/rrc/rrc.log;86400  appender.debug = RollingFile;/var/log/rrc/debug.log;7200  appender.error = RollingFile;/var/log/rrc/error.log;86400  appender.error.AutoFlush = true  level.debug = debug  level.info = rrc  level.error = error    logger.net.btretail.rtman.Radius = warn  logger.net.btretail.Arbor = debug  logger.net.btretail.RRC.LDAP = info |

This specifies several appenders to write log messages to three log files, with the rrc.log and error.log file being rotated daily, and the debug.log file rotated every 2 hours. The error.log file is set to autoflush the log records so that any log watching tools see the error messages immediately.

The default logging is setup via the “level” configuration to send debug and above to the debug log, info messages and above to the rrc appender and errors and above to the error appender (and hence error.log).

Finally, some additional loggers are identified to control the log levels of particular java classes. Note that these are only setting the log levels for these classes, and not and particular appender.

# Command Line Client

RRC includes a simple command line client that may be used to generate RADIUS authentication and accounting packets for testing purposes.

The client is available as **/opt/rrc/bin/client** and accepts the following command line arguments

|  |  |  |
| --- | --- | --- |
| Command Line Flag | Meaning | Required |
| -h | Shows command line help | No |
| -t auth | acct | Selects the creation of an authentication or accounting packet | Yes |
| -d ip:port | set the destination IP address and port to send to | Yes |
| -s *secret* | sets the shared secret | Yes |
| -f *filename* | read packet contents from *filename*. Defaults to **stdin** if not specified. | No |
| -p | print the response packet | No |
| -c *count* | Send *count* packets. Requires the input stream to include at least *count* packets | No |
| -l | Loop the input stream if required to generate the required number of packets | No |
| -r *rate* | Send packets at *rate* requests per second. The client is single threaded so the maximum rate is dependent on the response time from the remove server. | No |
| -T *timeout* | Apply a *timeout* of timeout milliseconds for responses. | No |
| -A | Don’t wait for acknowledgements. Allows very high packet generation rates since the client is single threaded. | No |

The input file containing the packet attributes should have one packet per line, with each attribute value separated by a comma. Each attribute should be specified as “Attribute-Name=value”.

The attribute name must match the an attribute name in the included RADIUS dictionary. The example accounting packet below is broken across lines for readabillty; all the attributes must be listed on the same line.

|  |
| --- |
| Acct-Status-Type=Start,  NAS-IP-Address=217.47.90.1,  NAS-Port=1,  Calling-Station-Id=BBEU12345678,  [User-Name=homehub@btbroadband.com](mailto:User-Name=homehub@btbroadband.com),  Framed-IP-Address=1.2.3.4 |

The client performs no validation on the packet being sent other than to ensure the attributes are valid. There is no checking that that packet sent contains the mandatory attributes, or that attribute cardinality restrictions are met.

# RADIUS Dictionary

The RADIUS dictionary is shipped as in integral component of the RADLIB RADIUS library. If the details of the dictionary are required, the dictionary files may be extracted using the commands below (assuming the default installation location for RRC):

|  |
| --- |
| cd /tmp  mkdir dictionary  cd dictionary  unzip –xj /opt/rrc/lib/radlib-x.y.jar ‘\*/Dictionary/\*’ |

This will extract all of the dictionary files into the current directory.

# Regular Expression Reference

## Summary of regular-expression constructs

|  |  |
| --- | --- |
| **Construct** | **Matches** |
|  |  |
| **Characters** | |
| *x* | The character *x* |
| \\ | The backslash character |
| \0*n* | The character with octal value 0*n* (0 <= *n* <= 7) |
| \0*nn* | The character with octal value 0*nn* (0 <= *n* <= 7) |
| \0*mnn* | The character with octal value 0*mnn* (0 <= *m* <= 3, 0 <= *n* <= 7) |
| \x*hh* | The character with hexadecimal value 0x*hh* |
| \u*hhhh* | The character with hexadecimal value 0x*hhhh* |
| \t | The tab character ('\u0009') |
| \n | The newline (line feed) character ('\u000A') |
| \r | The carriage-return character ('\u000D') |
| \f | The form-feed character ('\u000C') |
| \a | The alert (bell) character ('\u0007') |
| \e | The escape character ('\u001B') |
| \c*x* | The control character corresponding to *x* |
|  |  |
| **Character classes** | |
| [abc] | a, b, or c (simple class) |
| [^abc] | Any character except a, b, or c (negation) |
| [a-zA-Z] | a through z or A through Z, inclusive (range) |
| [a-d[m-p]] | a through d, or m through p: [a-dm-p] (union) |
| [a-z&&[def]] | d, e, or f (intersection) |
| [a-z&&[^bc]] | a through z, except for b and c: [ad-z] (subtraction) |
| [a-z&&[^m-p]] | a through z, and not m through p: [a-lq-z](subtraction) |
|  |  |
| **Predefined character classes** | |
| . | Any character (may or may not match [line terminators](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#lt)) |
| \d | A digit: [0-9] |
| \D | A non-digit: [^0-9] |
| \s | A whitespace character: [ \t\n\x0B\f\r] |
| \S | A non-whitespace character: [^\s] |
| \w | A word character: [a-zA-Z\_0-9] |
| \W | A non-word character: [^\w] |
|  |  |
| **POSIX character classes (US-ASCII only)** | |
| \p{Lower} | A lower-case alphabetic character: [a-z] |
| \p{Upper} | An upper-case alphabetic character:[A-Z] |
| \p{ASCII} | All ASCII:[\x00-\x7F] |
| \p{Alpha} | An alphabetic character:[\p{Lower}\p{Upper}] |
| \p{Digit} | A decimal digit: [0-9] |
| \p{Alnum} | An alphanumeric character:[\p{Alpha}\p{Digit}] |
| \p{Punct} | Punctuation: One of !"#$%&'()\*+,-./:;<=>?@[\]^\_`{|}~ |
| \p{Graph} | A visible character: [\p{Alnum}\p{Punct}] |
| \p{Print} | A printable character: [\p{Graph}\x20] |
| \p{Blank} | A space or a tab: [ \t] |
| \p{Cntrl} | A control character: [\x00-\x1F\x7F] |
| \p{XDigit} | A hexadecimal digit: [0-9a-fA-F] |
| \p{Space} | A whitespace character: [ \t\n\x0B\f\r] |
|  |  |
| **java.lang.Character classes (simple** [**java character type**](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#jcc)**)** | |
| \p{javaLowerCase} | Equivalent to java.lang.Character.isLowerCase() |
| \p{javaUpperCase} | Equivalent to java.lang.Character.isUpperCase() |
| \p{javaWhitespace} | Equivalent to java.lang.Character.isWhitespace() |
| \p{javaMirrored} | Equivalent to java.lang.Character.isMirrored() |
|  |  |
| **Classes for Unicode blocks and categories** | |
| \p{InGreek} | A character in the Greek block (simple [block](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#ubc)) |
| \p{Lu} | An uppercase letter (simple [category](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#ubc)) |
| \p{Sc} | A currency symbol |
| \P{InGreek} | Any character except one in the Greek block (negation) |
| [\p{L}&&[^\p{Lu}]] | Any letter except an uppercase letter (subtraction) |
|  |  |
| **Boundary matchers** | |
| ^ | The beginning of a line |
| $ | The end of a line |
| \b | A word boundary |
| \B | A non-word boundary |
| \A | The beginning of the input |
| \G | The end of the previous match |
| \Z | The end of the input but for the final [terminator](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#lt), if any |
| \z | The end of the input |
|  |  |
| **Greedy quantifiers** | |
| *X*? | *X*, once or not at all |
| *X*\* | *X*, zero or more times |
| *X*+ | *X*, one or more times |
| *X*{*n*} | *X*, exactly *n* times |
| *X*{*n*,} | *X*, at least *n* times |
| *X*{*n*,*m*} | *X*, at least *n* but not more than *m* times |
|  |  |
| **Reluctant quantifiers** | |
| *X*?? | *X*, once or not at all |
| *X*\*? | *X*, zero or more times |
| *X*+? | *X*, one or more times |
| *X*{*n*}? | *X*, exactly *n* times |
| *X*{*n*,}? | *X*, at least *n* times |
| *X*{*n*,*m*}? | *X*, at least *n* but not more than *m* times |
|  |  |
| **Possessive quantifiers** | |
| *X*?+ | *X*, once or not at all |
| *X*\*+ | *X*, zero or more times |
| *X*++ | *X*, one or more times |
| *X*{*n*}+ | *X*, exactly *n* times |
| *X*{*n*,}+ | *X*, at least *n* times |
| *X*{*n*,*m*}+ | *X*, at least *n* but not more than *m* times |
|  |  |
| **Logical operators** | |
| *XY* | *X* followed by *Y* |
| *X*|*Y* | Either *X* or *Y* |
| (*X*) | X, as a [capturing group](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#cg) |
|  |  |
| **Back references** | |
| \*n* | Whatever the *n*th [capturing group](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#cg) matched |
|  |  |
| **Quotation** | |
| \ | Nothing, but quotes the following character |
| \Q | Nothing, but quotes all characters until \E |
| \E | Nothing, but ends quoting started by \Q |
|  |  |
| **Special constructs (non-capturing)** | |
| (?:*X*) | *X*, as a non-capturing group |
| (?idmsux-idmsux) | Nothing, but turns match flags on - off |
| (?idmsux-idmsux:*X*) | *X*, as a [non-capturing group](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#cg) with the given flags on - off |
| (?=*X*) | *X*, via zero-width positive lookahead |
| (?!*X*) | *X*, via zero-width negative lookahead |
| (?<=*X*) | *X*, via zero-width positive lookbehind |
| (?<!*X*) | *X*, via zero-width negative lookbehind |
| (?>*X*) | *X*, as an independent, non-capturing group |

## Backslashes, escapes, and quoting

The backslash character ('\') serves to introduce escaped constructs, as defined in the table above, as well as to quote characters that otherwise would be interpreted as unescaped constructs. Thus the expression \\ matches a single backslash and \{ matches a left brace.

It is an error to use a backslash prior to any alphabetic character that does not denote an escaped construct; these are reserved for future extensions to the regular-expression language. A backslash may be used prior to a non-alphabetic character regardless of whether that character is part of an unescaped construct.

Backslashes within string literals in Java source code are interpreted as required by the [Java Language Specification](http://java.sun.com/docs/books/jls/second_edition/html/) as either [Unicode escapes](http://java.sun.com/docs/books/jls/second_edition/html/lexical.doc.html#100850) or other [character escapes](http://java.sun.com/docs/books/jls/second_edition/html/lexical.doc.html#101089). It is therefore necessary to double backslashes in string literals that represent regular expressions to protect them from interpretation by the Java bytecode compiler. The string literal "\b", for example, matches a single backspace character when interpreted as a regular expression, while "\\b" matches a word boundary. The string literal "\(hello\)" is illegal and leads to a compile-time error; in order to match the string (hello) the string literal "\\(hello\\)" must be used.

## Character Classes

Character classes may appear within other character classes, and may be composed by the union operator (implicit) and the intersection operator (&&). The union operator denotes a class that contains every character that is in at least one of its operand classes. The intersection operator denotes a class that contains every character that is in both of its operand classes.

The precedence of character-class operators is as follows, from highest to lowest:

|  |  |  |
| --- | --- | --- |
| **1** | Literal escape | \x |
| **2** | Grouping | [...] |
| **3** | Range | a-z |
| **4** | Union | [a-e][i-u] |
| **5** | Intersection | [a-z&&[aeiou]] |

Note that a different set of metacharacters are in effect inside a character class than outside a character class. For instance, the regular expression . loses its special meaning inside a character class, while the expression - becomes a range forming metacharacter.

## Line terminators

A *line terminator* is a one- or two-character sequence that marks the end of a line of the input character sequence. The following are recognized as line terminators:

* A newline (line feed) character ('\n'),
* A carriage-return character followed immediately by a newline character ("\r\n"),
* A standalone carriage-return character ('\r'),
* A next-line character ('\u0085'),
* A line-separator character ('\u2028'), or
* A paragraph-separator character ('\u2029).

If [UNIX\_LINES](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html" \l "UNIX_LINES) mode is activated, then the only line terminators recognized are newline characters.

The regular expression . matches any character except a line terminator unless the [DOTALL](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#DOTALL) flag is specified.

By default, the regular expressions ^ and $ ignore line terminators and only match at the beginning and the end, respectively, of the entire input sequence. If [MULTILINE](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#MULTILINE) mode is activated then ^ matches at the beginning of input and after any line terminator except at the end of input. When in [MULTILINE](http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html#MULTILINE) mode $ matches just before a line terminator or the end of the input sequence.

## Groups and capturing

Capturing groups are numbered by counting their opening parentheses from left to right. In the expression ((A)(B(C))), for example, there are four such groups:

|  |  |
| --- | --- |
| 1 | ((A)(B(C))) |
| 2 | (A) |
| 3 | (B(C)) |
| 4 | (C) |

Group zero always stands for the entire expression.

Capturing groups are so named because, during a match, each subsequence of the input sequence that matches such a group is saved. The captured subsequence may be used later in the expression, via a back reference, and may also be retrieved from the matcher once the match operation is complete.

The captured input associated with a group is always the subsequence that the group most recently matched. If a group is evaluated a second time because of quantification then its previously-captured value, if any, will be retained if the second evaluation fails. Matching the string "aba" against the expression (a(b)?)+, for example, leaves group two set to "b". All captured input is discarded at the beginning of each match.

Groups beginning with (? are pure, *non-capturing* groups that do not capture text and do not count towards the group total.

## Unicode support

This class is in conformance with Level 1 of *[Unicode Technical Standard #18: Unicode Regular Expression Guidelines](http://www.unicode.org/reports/tr18/)*, plus RL2.1 Canonical Equivalents.

Unicode escape sequences such as \u2014 in Java source code are processed as described in [§3.3](http://java.sun.com/docs/books/jls/second_edition/html/lexical.doc.html#100850) of the Java Language Specification. Such escape sequences are also implemented directly by the regular-expression parser so that Unicode escapes can be used in expressions that are read from files or from the keyboard. Thus the strings "\u2014" and "\\u2014", while not equal, compile into the same pattern, which matches the character with hexadecimal value 0x2014.

Unicode blocks and categories are written with the \p and \P constructs as in Perl. \p{*prop*} matches if the input has the property *prop*, while \P{*prop*} does not match if the input has that property. Blocks are specified with the prefix In, as in InMongolian. Categories may be specified with the optional prefix Is: Both \p{L} and \p{IsL} denote the category of Unicode letters. Blocks and categories can be used both inside and outside of a character class.

The supported categories are those of *[The Unicode Standard](http://www.unicode.org/unicode/standard/standard.html)* in the version specified by the [Character](http://java.sun.com/j2se/1.5.0/docs/api/java/lang/Character.html) class. The category names are those defined in the Standard, both normative and informative. The block names supported by Pattern are the valid block names accepted and defined by [UnicodeBlock.forName](http://java.sun.com/j2se/1.5.0/docs/api/java/lang/Character.UnicodeBlock.html#forName%28java.lang.String%29).

Categories that behave like the java.lang.Character boolean is*methodname* methods (except for the deprecated ones) are available through the same \p{*prop*} syntax where the specified property has the name java*methodname*.

## Comparison to Perl 5

The Pattern engine performs traditional NFA-based matching with ordered alternation as occurs in Perl 5.

Perl constructs not supported by this class:

* The conditional constructs (?{*X*}) and (?(*condition*)*X*|*Y*),
* The embedded code constructs (?{*code*}) and (??{*code*}),
* The embedded comment syntax (?#comment), and
* The preprocessing operations \l \u, \L, and \U.

Constructs supported by this class but not by Perl:

* Possessive quantifiers, which greedily match as much as they can and do not back off, even when doing so would allow the overall match to succeed.
* Character-class union and intersection as described above

Notable differences from Perl:

* In Perl, \1 through \9 are always interpreted as back references; a backslash-escaped number greater than 9 is treated as a back reference if at least that many subexpressions exist, otherwise it is interpreted, if possible, as an octal escape. In this class octal escapes must always begin with a zero. In this class, \1 through \9 are always interpreted as back references, and a larger number is accepted as a back reference if at least that many subexpressions exist at that point in the regular expression, otherwise the parser will drop digits until the number is smaller or equal to the existing number of groups or it is one digit.
* Perl uses the g flag to request a match that resumes where the last match left off. This functionality is provided implicitly by the Matcher class: Repeated invocations of the find method will resume where the last match left off, unless the matcher is reset.
* In Perl, embedded flags at the top level of an expression affect the whole expression. In this class, embedded flags always take effect at the point at which they appear, whether they are at the top level or within a group; in the latter case, flags are restored at the end of the group just as in Perl.
* Perl is forgiving about malformed matching constructs, as in the expression \*a, as well as dangling brackets, as in the expression abc], and treats them as literals. This class also accepts dangling brackets but is strict about dangling metacharacters like +, ? and \*, and will throw a PatternSyntaxException if it encounters them.

# Monitoring The Java Virtual Machine

The Java Virtual Machine (JVM) used by the RRC application has the SNMP management features enabled by default. This allows details of the current status of the JVM to be monitored remotely via an SNMP capable management system.

The default configuration has the SNMP agent configured on port 2161. Access to the SNMP agent is restricted to the “e0” network interface on the server. Additionally, access to the MIB is controlled via an access control file snmp.acl

## SNMP.ACL

The snmp.acl file contains configuration directives to constrain access to the JVM MIB. Ensure that only the user that will run the RRC application has read and write permissions, since the file contains unencrypted SNMP community strings.  For security reasons, the system checks that only the owner has read and write permissions on the file and exits with an error if not.

An example snmp.acl file is shown below:

|  |
| --- |
| # The communities public and private are allowed access  # from the local host.  acl = {  {  communities = public, private  access = read-only  managers = localhost  }  } # Traps are sent to localhost only trap = {  {  trap-community = public  hosts = localhost  }  } |

## Java Virtual Machine SNMP MIB

The MIB specification for the JVM SNMP management interface is included in the distribution file as etc/examples/JVM-MANAGEMENT-MIB.mib

# References

1. **Log4j API and Documentation**  
   http://logging.apache.org/log4j/docs/
2. **Java J2SE5 Regular Expressions**  
   <http://java.sun.com/j2se/1.5.0/docs/api/java/util/regex/Pattern.html>
3. **Java J2SE SNMP Monitoring and Management**  
   <http://java.sun.com/j2se/1.5.0/docs/guide/management/SNMP.html>
4. **Java J2SE JConsole User Guide**<http://java.sun.com/j2se/1.5.0/docs/guide/management/jconsole.html>

# Change Log

|  |  |  |
| --- | --- | --- |
| Date | Author | Change Description |
| 9 February 2006 | David Woods | Updated to reflect changes in RRC Version 1.6 [Phase I] |
| 14 October 2005 | Chris Burrows | Updated to reflect changes in RRC Version 1.1 |

# Glossary

The list below includes terms in this document that are not ‘standard’ computing terms, or any acronyms that clash with more widely-used definitions.

One useful book on the subject is the ‘Encyclopedia of Networking and Telecommunications’ from McGraw-Hill.

|  |  |
| --- | --- |
| **Term** | **Meaning** |
| ACL | Access Control List |
| ACRI | Assumptions, Constraints, Risks and Issues Log |
| ADQ | Application Driven QOS |
| API | Application Programming Interface |
| ATM | Asynchronous Transfer Mode. |
| BB | Broadband |
| BBSP | Broadband Service Package |
| Broadband  Service Package | This is the name of the BT Retail broadband service that the owner of the line has subscribed to. This defines all of the characteristics of the service the user received, including the headline line speed, and any volume quota associated with the service. Includes the ‘Service Offer’. |
| BT | British Telecommunications Plc |
| BTI | BT Internet |
| DPI | Deep Packet Inspection |
| IISP | Identity and Instant Service Provisioning or Interim Inter-switch Signalling Protocol. In simplest terms, IISP is to ATM as static routing is to IP. IISP creates a routed network by using defined static routes between switches. Generally used in this doc. to refer to the IISP LDAP directory server. |
| J2EE | Java 2 Platform, Enterprise Edition |
| JNI | Java Native Interface |
| JVM | Java Virtual Machine |
| LDAP | Lightweight Directory Access Protocol. An Internet protocol used to look-up information from a server. |
| LDAP  Stub Mode | In some circumstances and configurations there may be a requirement not to use the LDAP search to identify the real service offer to allocate to a user line. The RRC application allows the IISP interface to be configured in a “stub” mode where the responses from IISP are pre-determined. LDAP stub mode is enabled simply via the property setting: rrc.ldap.stub.mode.enable=true |
| Line ID | The Line ID is used to lookup the service profile for the line in the  Consumer ISP database via it’s LDAP directory interface (IISP). |
| Line Identifier | See ‘Line ID’ |
| OSS | Operation Support System |
| PKG | Package |
| QOS | Quality of Service |
| RMI | Remote Method Invocation |
| RRC | RTMAN Rate Controller |
| RTMAN | Retail Traffic Management |
| Service Identifier | See ‘SID’ |
| Service Offer | (Arbor) Service Offer |
| SID | The SID (Service Identifier) is the unique identifier for a BB service Instance and is recognised by the BT Retail OSS systems |
| SLE | (Arbor) Service Logic Engine. |
| SLE Stub Mode | The SLE interface can be configured to operate in a “stub” mode for testing purposes. In this mode, calls to the SLE are always successful,  and the validation of broadband service offers is suppressed. SLE stub mode is enabled simply via the property setting: rrc.sle.stub.mode.enable=true |
| SP | Service Provider |
| TAZZ | TAZZ Networks (a company) |
| TCP | Transmission Control Protocol |
| TBC | To Be Confirmed |
| TBD | To Be Decided |
| UDP | User Datagram Protocol |

# RRC Configuration Schema Reference

Schema **rrc.xsd**

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
| targetNamespace: | **http://rrc.networks.btretail.net** |
|  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Elements | Groups | Complex types | Simple types |
| [**rrc**](#Link1) | [**booleanOp**](#Link2) | [**access-accept**](#Link3) | [**hostAndPort**](#Link4) |
|  | [**logicClause**](#Link5) | [**access-lists**](#Link6) | [**identifier**](#Link7) |
|  | [**statement**](#Link8) | [**access-reject**](#Link9) | [**ipPortType**](#LinkA) |
|  |  | [**acct-proxy**](#LinkB) | [**ipSubnetType**](#LinkC) |
|  |  | [**acl**](#LinkD) | [**ipType**](#LinkE) |
|  |  | [**add**](#LinkF) | [**logLevel**](#Link10) |
|  |  | [**and**](#Link11) | [**oidType**](#Link12) |
|  |  | [**auth-proxy**](#Link13) | [**percent**](#Link14) |
|  |  | [**auth-proxy-request**](#Link15) | [**portType**](#Link16) |
|  |  | [**auth-proxy-response**](#Link17) | [**radiusSelectorType**](#Link18) |
|  |  | [**break**](#Link19) | [**retryType**](#Link1A) |
|  |  | [**call**](#Link1B) | [**timeoutType**](#Link1C) |
|  |  | [**comparison**](#Link1D) |  |
|  |  | [**copy-framed-routes**](#Link1E) |  |
|  |  | [**database**](#Link1F) |  |
|  |  | [**db-instance**](#Link20) |  |
|  |  | [**delete**](#Link21) |  |
|  |  | [**dpi**](#Link22) |  |
|  |  | [**dpi-get-profile**](#Link23) |  |
|  |  | [**dpi-update**](#Link24) |  |
|  |  | [**e100**](#Link25) |  |
|  |  | [**e30**](#Link26) |  |
|  |  | [**else**](#Link27) |  |
|  |  | [**end**](#Link28) |  |
|  |  | [**file**](#Link29) |  |
|  |  | [**foreach**](#Link2A) |  |
|  |  | [**if**](#Link2B) |  |
|  |  | [**is-list**](#Link2C) |  |
|  |  | [**is-valid-password**](#Link2D) |  |
|  |  | [**is-valid-product**](#Link2E) |  |
|  |  | [**isDefined**](#Link2F) |  |
|  |  | [**ldap**](#Link30) |  |
|  |  | [**listener**](#Link31) |  |
|  |  | [**log**](#Link32) |  |
|  |  | [**logging**](#Link33) |  |
|  |  | [**lookup**](#Link34) |  |
|  |  | [**lookups**](#Link35) |  |
|  |  | [**match-acl**](#Link36) |  |
|  |  | [**match-ip**](#Link37) |  |
|  |  | [**match-regex**](#Link38) |  |
|  |  | [**not**](#Link39) |  |
|  |  | [**or**](#Link3A) |  |
|  |  | [**pause**](#Link3B) |  |
|  |  | [**property**](#Link3C) |  |
|  |  | [**proxy**](#Link3D) |  |
|  |  | [**radius**](#Link3E) |  |
|  |  | [**radius-add**](#Link3F) |  |
|  |  | [**radius-delete**](#Link40) |  |
|  |  | [**radius-group**](#Link41) |  |
|  |  | [**radius-log**](#Link42) |  |
|  |  | [**radius-remove**](#Link43) |  |
|  |  | [**radius-server**](#Link44) |  |
|  |  | [**radius-set**](#Link45) |  |
|  |  | [**red-threshold**](#Link46) |  |
|  |  | [**remove**](#Link47) |  |
|  |  | [**rule**](#Link48) |  |
|  |  | [**ruleset**](#Link49) |  |
|  |  | [**set**](#Link4A) |  |
|  |  | [**simple-string-match**](#Link4B) |  |
|  |  | [**statistics**](#Link4C) |  |
|  |  | [**then**](#Link4D) |  |
|  |  | [**variable**](#Link4E) |  |

### element rrc

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | content | complex | |
| children | [**property**](#Link4F)[**listener**](#Link50)[**statistics**](#Link51)[**lookups**](#Link52)[**access-lists**](#Link53)[**radius**](#Link54)[**dpi**](#Link55)[**auth-proxy**](#Link56)[**acct-proxy**](#Link57) |
| annotation | |  | | --- | | documentation | | Top level configuration element. Each of the configuration files must start with this as their root element. | |

### element rrc/property

|  |  |
| --- | --- |
| diagram |  |
| type | [**property**](#Link3C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link58) | **xs:string** | required |  |  |  | | [value](#Link59) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Legacy properties not supported by equivalent XML configuration elements. | |

### element rrc/listener

|  |  |
| --- | --- |
| diagram |  |
| type | [**listener**](#Link31) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**monitor**](#Link5A) |
| annotation | |  | | --- | | documentation | | Listener interfaces for external status monitoring. | |

### element rrc/statistics

|  |  |
| --- | --- |
| diagram |  |
| type | [**statistics**](#Link4C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**scale**](#Link5B)[**metric**](#Link5C) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [port](#Link5D) | **xs:unsignedShort** | optional | 2823 |  | |  | | --- | | documentation | | Port to listen on for simple telnet access to the statistics. | | | [output-dir](#Link5E) | **xs:string** | optional | ${rrc.log.dir}/snmp |  | |  | | --- | | documentation | | Directory where the SNMP MIB files should be written. Directory must already exist. | | | [update-interval](#Link5F) | **xs:positiveInteger** | optional | 30000 |  | |  | | --- | | documentation | | Interval between updates to the SNMP MIB files. | | | [base](#Link60) | [**oidType**](#Link12) | optional | 1.3.6.1.4.1.7560.4.10.20.6 |  | |  | | --- | | documentation | | Base value of the OID used for the SNMP MIB stats. Allows shortening of the OID in each specific MIB statistics declaration. e.g. 1.3.6.1.4.1.7560.4.10.20.6 | | | [histogram-granularity](#Link61) | **xs:positiveInteger** | optional | 10 |  | |  | | --- | | documentation | | Level of granularity to use in generating histogram information on metric values. | | | [rate-estimator-window](#Link62) | **xs:positiveInteger** | optional | 10 |  | |  | | --- | | documentation | | Time interval over which RRC estimates the rate of an event occuring. | | |
| annotation | |  | | --- | | documentation | | Statistics to report via the Phoenix SNMP MIB extension mechanism. | |

### element rrc/lookups

|  |  |
| --- | --- |
| diagram |  |
| type | [**lookups**](#Link35) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**ldap**](#Link63)[**file**](#Link64)[**database**](#Link65) |
| annotation | |  | | --- | | documentation | | External data lookups. | |

### element rrc/access-lists

|  |  |
| --- | --- |
| diagram |  |
| type | [**access-lists**](#Link6) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**acl**](#Link66) |
| annotation | |  | | --- | | documentation | | Access lists for use in packet matching within the rulesets. | |

### element rrc/radius

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius**](#Link3E) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**radius-server**](#Link67)[**radius-group**](#Link68) |
| annotation | |  | | --- | | documentation | | RADIUS servers and RADIUS server groups. | |

### element rrc/dpi

|  |  |
| --- | --- |
| diagram |  |
| type | [**dpi**](#Link22) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**drop-starts-thresholds**](#Link69)[**drop-stops-thresholds**](#Link6A)[**drop-interims-thresholds**](#Link6B)[**e30**](#Link6C)[**e100**](#Link6D)[**ruleset**](#Link6E) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link6F) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI configuration element for reference by DPI statements. | | | [workers](#Link70) | **xs:unsignedShort** | optional | 128 |  | |  | | --- | | documentation | | Specify the number of worker threads to handle DPI activity. | | | [queue-length](#Link71) | **xs:unsignedShort** | optional | 256 |  | |  | | --- | | documentation | | Length of the request queue for each worker thread. RADIUS accounting requests are placed in this queue for processing by a worker thread. The Random Early Drop behaviour is applied to the queue at the point requests are added to the queue. | | | [request-expiry](#Link72) | **xs:positiveInteger** | optional | 120000 |  | |  | | --- | | documentation | | Age in milliseconds after which requests are dropped due to delayed processing. | | | [request-reorder-threshold](#Link73) | **xs:nonNegativeInteger** | optional | 0 |  | |  | | --- | | documentation | | Time window during which RRC will look for potential re-ordering of RADIUS accounting Stop - Start sequences. | | | [lazy-threshold](#Link74) | **xs:nonNegativeInteger** | optional | 0 |  | |  | | --- | | documentation | | RRC has a watch-dog that monitors the behaviour of the worker threads to ensure thay don't hang on accesses to external systems (e.g. LDAP lookups, DPI API calls).  If the worker thread doesn't kick its watch-dog for this amount of time, the worker will be killed and replaced with a new instance. | | | [stub-mode](#Link75) | **xs:boolean** | optional |  |  | |  | | --- | | documentation | | Enable stub-mode operation where all processing takes place as normal, but the final step of communicating with the DPI platform is skipped. | | | [enable](#Link76) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enable DPI processing for ths DPI element. | | |
| annotation | |  | | --- | | documentation | | Interfaces to DPI platforms and the ruleset that should be used to handle interactions with the DPI environment. | |

### element rrc/auth-proxy

|  |  |
| --- | --- |
| diagram |  |
| type | [**auth-proxy**](#Link13) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**request**](#Link77)[**response**](#Link78) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [port](#Link79) | **xs:unsignedShort** | optional | 1812 |  | |  | | --- | | documentation | | UDP port number RRC will listen on for authentication requests. | | | [logging](#Link7A) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable logging of received requests. | | | [enable](#Link7B) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable proxying of authentication requests. | | | [threads](#Link7C) | **xs:positiveInteger** | optional |  |  | |  | | --- | | documentation | | Number of threads to use for authentication proxy functionality. Defaults to 1 per CPU. | | |
| annotation | |  | | --- | | documentation | | Configuration of the authentication handling behavour. | |

### element rrc/acct-proxy

|  |  |
| --- | --- |
| diagram |  |
| type | [**acct-proxy**](#LinkB) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**ruleset**](#Link7D) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [port](#Link7E) | **xs:unsignedShort** | optional | 1813 |  | |  | | --- | | documentation | | UDP port number RRC will listen on for authentication requests. | | | [ack-acl](#Link7F) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of an access list that will be used to determine if a received accounting request will be acknowledged. If this is not defined, all accounting requests will be acknowledged.  If the acl is identified, only packets that match the named ACL will be acknowledged. | | | [logging](#Link80) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable logging of received requests. | | | [enable](#Link81) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable proxying of accounting requests. | | | [threads](#Link82) | **xs:positiveInteger** | optional |  |  | |  | | --- | | documentation | | Number of threads to use for accounting proxy functionality. Defaults to 1 per CPU. | | |
| annotation | |  | | --- | | documentation | | Configuration of the accounting handling behavour. | |

## group booleanOp

|  |  |
| --- | --- |
| diagram |  |
| children | [**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| used by | |  |  | | --- | --- | | group | [**logicClause**](#Link5) | |

### element booleanOp/and

|  |  |
| --- | --- |
| diagram |  |
| type | [**and**](#Link11) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |

### element booleanOp/or

|  |  |
| --- | --- |
| diagram |  |
| type | [**or**](#Link3A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |

### element booleanOp/not

|  |  |
| --- | --- |
| diagram |  |
| type | [**not**](#Link39) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |

## group logicClause

|  |  |
| --- | --- |
| diagram |  |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| used by | |  |  | | --- | --- | | complexTypes | [**acl**](#LinkD)[**and**](#Link11)[**if**](#Link2B)[**not**](#Link39)[**or**](#Link3A) | |

### element logicClause/is-valid-product

|  |  |
| --- | --- |
| diagram |  |
| type | [**is-valid-product**](#Link2E) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [dpi](#Link9F) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI instance to check. | | | [product](#LinkA0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression for the name of the product to test. | | |

### element logicClause/is-valid-password

|  |  |
| --- | --- |
| diagram |  |
| type | [**is-valid-password**](#Link2D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [chap](#LinkA1) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable chap password checking. | | | [pap](#LinkA2) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable PAP password checking. | | | [password](#LinkA3) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions for the plain text password to match. | | |

### element logicClause/variable

|  |  |
| --- | --- |
| diagram |  |
| type | [**variable**](#Link4E) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#LinkA4) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable. | | | [regex](#LinkA5) | **xs:string** | required |  |  | |  | | --- | | documentation | | Literal regular expression to match against. | | |

### element logicClause/is-list

|  |  |
| --- | --- |
| diagram |  |
| type | [**is-list**](#Link2C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkA6) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable. | | |

### element logicClause/starts-with

|  |  |
| --- | --- |
| diagram |  |
| type | [**simple-string-match**](#Link4B) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkA7) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions. | | | [match](#LinkA8) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to match against. | | | [ignore-case](#LinkA9) | **xs:boolean** | optional |  |  | |  | | --- | | documentation | | Enables case insensitive matching. | | |

### element logicClause/ends-with

|  |  |
| --- | --- |
| diagram |  |
| type | [**simple-string-match**](#Link4B) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkA7) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions. | | | [match](#LinkA8) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to match against. | | | [ignore-case](#LinkA9) | **xs:boolean** | optional |  |  | |  | | --- | | documentation | | Enables case insensitive matching. | | |

### element logicClause/contains

|  |  |
| --- | --- |
| diagram |  |
| type | [**simple-string-match**](#Link4B) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkA7) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions. | | | [match](#LinkA8) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to match against. | | | [ignore-case](#LinkA9) | **xs:boolean** | optional |  |  | |  | | --- | | documentation | | Enables case insensitive matching. | | |

### element logicClause/match-regex

|  |  |
| --- | --- |
| diagram |  |
| type | [**match-regex**](#Link38) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAA) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions. | | | [regex](#LinkAB) | **xs:string** | required |  |  |  | |

### element logicClause/match-ip

|  |  |
| --- | --- |
| diagram |  |
| type | [**match-ip**](#Link37) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**subnet**](#LinkAC) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkAD) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | |

### element logicClause/match-acl

|  |  |
| --- | --- |
| diagram |  |
| type | [**match-acl**](#Link36) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [acl](#LinkAE) | **xs:string** |  |  |  | |  | | --- | | documentation | | Name of the access list to match against. | | |

### element logicClause/equals

|  |  |
| --- | --- |
| diagram |  |
| type | [**comparison**](#Link1D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to compare. | | | [match](#LinkB0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Value to match against. | | | [mode](#LinkB1) | **derived by: xs:string** | optional | numeric |  | |  | | --- | | documentation | | The style of comparison, Numeric or String | | |

### element logicClause/less-than

|  |  |
| --- | --- |
| diagram |  |
| type | [**comparison**](#Link1D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to compare. | | | [match](#LinkB0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Value to match against. | | | [mode](#LinkB1) | **derived by: xs:string** | optional | numeric |  | |  | | --- | | documentation | | The style of comparison, Numeric or String | | |

### element logicClause/less-than-equals

|  |  |
| --- | --- |
| diagram |  |
| type | [**comparison**](#Link1D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to compare. | | | [match](#LinkB0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Value to match against. | | | [mode](#LinkB1) | **derived by: xs:string** | optional | numeric |  | |  | | --- | | documentation | | The style of comparison, Numeric or String | | |

### element logicClause/greater-than

|  |  |
| --- | --- |
| diagram |  |
| type | [**comparison**](#Link1D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to compare. | | | [match](#LinkB0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Value to match against. | | | [mode](#LinkB1) | **derived by: xs:string** | optional | numeric |  | |  | | --- | | documentation | | The style of comparison, Numeric or String | | |

### element logicClause/greater-than-equals

|  |  |
| --- | --- |
| diagram |  |
| type | [**comparison**](#Link1D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to compare. | | | [match](#LinkB0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Value to match against. | | | [mode](#LinkB1) | **derived by: xs:string** | optional | numeric |  | |  | | --- | | documentation | | The style of comparison, Numeric or String | | |

### element logicClause/is-defined

|  |  |
| --- | --- |
| diagram |  |
| type | [**isDefined**](#Link2F) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkB2) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to test. | | |

### element logicClause/is-not-defined

|  |  |
| --- | --- |
| diagram |  |
| type | [**isDefined**](#Link2F) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkB2) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to test. | | |

### element logicClause/is-authentication

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-accounting

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-start

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-stop

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-interim

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-accept

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-reject

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

### element logicClause/is-deny

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |

## group statement

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | complexTypes | [**access-accept**](#Link3)[**access-reject**](#Link9)[**else**](#Link27)[**foreach**](#Link2A)[**proxy**](#Link3D)[**rule**](#Link48)[**then**](#Link4D) | |

### element statement/set

|  |  |
| --- | --- |
| diagram |  |
| type | [**set**](#Link4A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkCE) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to set. | | | [value](#LinkCF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD0) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Set the value of a variable/ | |

### element statement/set-if-null

|  |  |
| --- | --- |
| diagram |  |
| type | [**set**](#Link4A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkCE) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to set. | | | [value](#LinkCF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD0) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Conditionally set the value of a variable if the variable is currently null / not defined. | |

### element statement/add

|  |  |
| --- | --- |
| diagram |  |
| type | [**add**](#LinkF) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkD1) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to set. | | | [value](#LinkD2) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD3) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Add a value to a variable, creating or extending a list of values. | |

### element statement/remove

|  |  |
| --- | --- |
| diagram |  |
| type | [**remove**](#Link47) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkD4) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to change. | | | [value](#LinkD5) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD6) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Remove a value from a variables list of values. | |

### element statement/delete

|  |  |
| --- | --- |
| diagram |  |
| type | [**delete**](#Link21) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkD7) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to delete. | | |
| annotation | |  | | --- | | documentation | | Delete a variable. | |

### element statement/lookup

|  |  |
| --- | --- |
| diagram |  |
| type | [**lookup**](#Link34) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#LinkD8) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Perform an external data lookup. | |

### element statement/break

|  |  |
| --- | --- |
| diagram |  |
| type | [**break**](#Link19) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| annotation | |  | | --- | | documentation | | Break out of the enclosing loop (foreach). | |

### element statement/end

|  |  |
| --- | --- |
| diagram |  |
| type | [**end**](#Link28) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| annotation | |  | | --- | | documentation | | End rule execution with a success exit status. | |

### element statement/call

|  |  |
| --- | --- |
| diagram |  |
| type | [**call**](#Link1B) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [rule](#LinkD9) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Call another rule as a subroutine. | |

### element statement/log

|  |  |
| --- | --- |
| diagram |  |
| type | [**log**](#Link32) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [logger](#LinkDA) | **xs:string** | optional | info |  | |  | | --- | | documentation | | Logger to use when writing message. Defaults to the standard log stream. | | | [level](#LinkDB) | [**logLevel**](#Link10) |  | info |  | |  | | --- | | documentation | | Level at which to log the message. | | |
| annotation | |  | | --- | | documentation | | Log a message. | |

### element statement/if

|  |  |
| --- | --- |
| diagram |  |
| type | [**if**](#Link2B) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85)[**then**](#LinkDC)[**else**](#LinkDD) |
| annotation | |  | | --- | | documentation | | Conditional execution; if-then-else. | |

### element statement/foreach

|  |  |
| --- | --- |
| diagram |  |
| type | [**foreach**](#Link2A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkDE) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to hold the list value. | | | [value](#LinkDF) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression to evaluate. e.g. "${optional-products}" | | |
| annotation | |  | | --- | | documentation | | Iterate over a list of values from a variable. | |

### element statement/dump-vars

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Dump the current variables and their values to the debug logging stream. | |

### element statement/pause

|  |  |
| --- | --- |
| diagram |  |
| type | [**pause**](#Link3B) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [time](#LinkE0) | **xs:positiveInteger** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Pause rule execution for a period. | |

### element statement/radius-set

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-set**](#Link45) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkE1) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | | [value](#LinkE2) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkE3) | **xs:string** | optional |  |  |  | | [csv](#LinkE4) | **xs:string** | optional |  |  |  | |
| annotation | |  | | --- | | documentation | | Replace the value of a RADIUS attribute (adds attribute if not already present). | |

### element statement/radius-add

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-add**](#Link3F) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkE5) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | | [value](#LinkE6) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkE7) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | | [csv](#LinkE8) | **xs:string** | optional |  |  |  | |
| annotation | |  | | --- | | documentation | | Add a RADIUS attribute to a RADIUS packet. | |

### element statement/radius-remove

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-remove**](#Link43) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkE9) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | | [value](#LinkEA) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkEB) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Removes an instance of a RADIUS attribute with a given value. | |

### element statement/radius-delete

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-delete**](#Link40) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkEC) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | |
| annotation | |  | | --- | | documentation | | Deletes all instanced of a RADIUS attribute. | |

### element statement/log-radius-packet

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-log**](#Link42) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [logger](#LinkED) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of the logger to use when dumping the packet contents. Defaults to the standard logging stream. | | | [level](#LinkEE) | [**logLevel**](#Link10) | optional |  |  | |  | | --- | | documentation | | Level at which the packet should be logged. Defaults to 'info'. | | |
| annotation | |  | | --- | | documentation | | Logs the contents of a RADIUS packet. | |

### element statement/copy-framed-routes

|  |  |
| --- | --- |
| diagram |  |
| type | [**copy-framed-routes**](#Link1E) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [prefix](#LinkEF) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Specify the prefix to use in the Class attribute value. | | |
| annotation | |  | | --- | | documentation | | Copies the contents of any Framed-Route attributes to a Class attribute. Each Framed-Route will add a Class attribute containing a prefix and the contents of the Framed-Route.  Default prefix is 'RINRoute:'. | |

### element statement/add-session-type

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Adds a Class attribute containing the type of user. Class attribute will have one of the following values:  RINType:DYNAMIC - dynamically allocated IP address RINType:STATIC - statically allocated IP address RINType:NONAT - dynamically allocated IP address with a Framed-Route attribute RINType:TUNNEL - L2TP tunnel initiation  Statement is only useful in the Authentication Response ruleset. | |

### element statement/dpi-get-profile

|  |  |
| --- | --- |
| diagram |  |
| type | [**dpi-get-profile**](#Link23) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [id](#LinkF0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI element to use. | | | [userid](#LinkF1) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression evaluated as the user identifier. | | | [profile-var](#LinkF2) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of the variable into which the retrieved profile is placed. | | | [optional-profiles-var](#LinkF3) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of the variable into which the retrieved optional profiles are placed. | | | [strip-domain](#LinkF4) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enables removal of the domain portion of the user-id before use as the user identifier. | | | [userid-transform](#LinkF5) | **derived by: xs:string** | optional | btretail |  | |  | | --- | | documentation | | Specify a transformation to apply to the user identity.  The "btretail" option applies the legacy BT Retail behaviour where user identities containing a '@' character are coerced to lower case, and the remaining user identities are forced to upper case. | | |
| annotation | |  | | --- | | documentation | | Retrieves the current product / profile applied to a user within the DPI platform. | |

### element statement/dpi-update

|  |  |
| --- | --- |
| diagram |  |
| type | [**dpi-update**](#Link24) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**optional-profile**](#LinkF6)[**ip**](#LinkF7)[**subnet**](#LinkF8) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [id](#LinkF9) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI element to use. | | | [userid](#LinkFA) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression evaluated as the user identifier. | | | [profile](#LinkFB) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Expression evaluated as the product (profile) name. | | | [default-profile](#LinkFC) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Expression evaluated as the default product (profile). This is only used as a last resort if the specified profile is not valid, and the user doesn't already have a profile applied on the DPI platform. | | | [strip-domain](#LinkFD) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enables removal of the domain portion of the user-id before use as the user identifier. | | | [max-ip-count](#LinkFE) | **xs:positiveInteger** | optional | 1025 |  | |  | | --- | | documentation | | Limit the number of IP addresses that will be handled. If the IP address list expanded from the "ip" and "subnet" elements exceeds this limit, no more IP addresses will be handled. | | | [userid-transform](#LinkFF) | **derived by: xs:string** | optional | btretail |  | |  | | --- | | documentation | | Specify a transformation to apply to the user identity.  The "btretail" option applies the legacy BT Retail behaviour where user identities containing a '@' character are coerced to lower case, and the remaining user identities are forced to upper case. | | |
| annotation | |  | | --- | | documentation | | Updates the DPI platform based on the type of accounting request being handled and the specified parameters.  If the accounting packet is a Start or Interim-Update, a start-session API call will be generated. If the accounting packet is a Stop, a stop-session API call will be generated. | |

### element statement/access-accept

|  |  |
| --- | --- |
| diagram |  |
| type | [**access-accept**](#Link3) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [log](#Link100) | **xs:boolean** | optional | false |  |  | |
| annotation | |  | | --- | | documentation | | Generates an Access-Accept response to an authentication request. | |

### element statement/access-reject

|  |  |
| --- | --- |
| diagram |  |
| type | [**access-reject**](#Link9) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [log](#Link101) | **xs:boolean** | optional | false |  |  | |
| annotation | |  | | --- | | documentation | | Generates an Access-Reject response to an authentication request. | |

### element statement/proxy

|  |  |
| --- | --- |
| diagram |  |
| type | [**proxy**](#Link3D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [destination](#Link102) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS group to which the request should be sent. | | | [log](#Link103) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Log the details of the packet in the authentication or accounting log as appropriate.  Care should be excercised with this option. All received requests are logged by default. Loggin all outbound requests will double the rate and size of the logging which could impact performance. | | | [fire-and-forget](#Link104) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Handle the request as fire andf forget regardless of the RADIUS group configuration. RRC will send the request and immediately forget it, and not expect a acknowledgement for accounting packets.  Note: setting this to 'false' will not override a RADIUS group that is configured for fire and forget.  The effective behaviour is fire and forget will be used if either the request or the RADIUS group specifies fire and forget. | | |
| annotation | |  | | --- | | documentation | | Proxies a RADIUS request to another system. | |

### element statement/check-reorder-discard

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Performs some time based checks for re-ordered accounting Stop - Start packet sequences. | |

complexType **access-accept**

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**statement/access-accept**](#LinkCA) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [log](#Link100) | **xs:boolean** | optional | false |  |  | |
| annotation | |  | | --- | | documentation | | Generates an Access-Accept response to an authentication request.  The body may include statments to customise the response packet. Within the body, the statements that manupulate RADIUS packets (radius-add, radius-set, radius-remove and radius-delete) will operate on the Access-Accept packet. Similarly, changes to variables are local to the access-accept statement. | |

attribute **access-accept/@log**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |

## complexType access-lists

|  |  |
| --- | --- |
| diagram |  |
| children | [**acl**](#Link66) |
| used by | |  |  | | --- | --- | | element | [**rrc/access-lists**](#Link53) | |
| annotation | |  | | --- | | documentation | | Declares access lists for reference elsewhere within the configuration. | |

### element access-lists/acl

|  |  |
| --- | --- |
| diagram |  |
| type | [**acl**](#LinkD) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | unbounded | | content | complex | |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link105) | **xs:string** |  |  |  | |  | | --- | | documentation | | Name of the access list for reference elsewhere in the configuration. | | |

## complexType access-reject

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**statement/access-reject**](#LinkCB) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [log](#Link101) | **xs:boolean** | optional | false |  |  | |
| annotation | |  | | --- | | documentation | | Generates an Access-Reject response to an authentication request.  The body may include statments to customise the response packet. Within the body, the statements that manupulate RADIUS packets (radius-add, radius-set, radius-remove and radius-delete) will operate on the Access-Reject packet. Similarly, changes to variables are local to the access-reject statement. | |

attribute **access-reject/@log**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |

## complexType acct-proxy

|  |  |
| --- | --- |
| diagram |  |
| children | [**ruleset**](#Link7D) |
| used by | |  |  | | --- | --- | | element | [**rrc/acct-proxy**](#Link57) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [port](#Link7E) | **xs:unsignedShort** | optional | 1813 |  | |  | | --- | | documentation | | UDP port number RRC will listen on for authentication requests. | | | [ack-acl](#Link7F) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of an access list that will be used to determine if a received accounting request will be acknowledged. If this is not defined, all accounting requests will be acknowledged.  If the acl is identified, only packets that match the named ACL will be acknowledged. | | | [logging](#Link80) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable logging of received requests. | | | [enable](#Link81) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable proxying of accounting requests. | | | [threads](#Link82) | **xs:positiveInteger** | optional |  |  | |  | | --- | | documentation | | Number of threads to use for accounting proxy functionality. Defaults to 1 per CPU. | | |
| annotation | |  | | --- | | documentation | | Configuration of the Accounting Proxy. | |

attribute **acct-proxy/@port**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1813 | | use | optional | |
| annotation | |  | | --- | | documentation | | UDP port number RRC will listen on for authentication requests. | |

attribute **acct-proxy/@ack-acl**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Name of an access list that will be used to determine if a received accounting request will be acknowledged. If this is not defined, all accounting requests will be acknowledged.  If the acl is identified, only packets that match the named ACL will be acknowledged. | |

attribute **acct-proxy/@logging**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | true | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable logging of received requests. | |

attribute **acct-proxy/@enable**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | true | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable proxying of accounting requests. | |

attribute **acct-proxy/@threads**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Number of threads to use for accounting proxy functionality. Defaults to 1 per CPU. | |

### element acct-proxy/ruleset

|  |  |
| --- | --- |
| diagram |  |
| type | [**ruleset**](#Link49) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**rule**](#Link106) |

## complexType acl

|  |  |
| --- | --- |
| diagram |  |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| used by | |  |  | | --- | --- | | element | [**access-lists/acl**](#Link66) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link105) | **xs:string** |  |  |  | |  | | --- | | documentation | | Name of the access list for reference elsewhere in the configuration. | | |
| annotation | |  | | --- | | documentation | | Declares an access list for use in matching against RADIUS packets.  Can contain any logical expression. | |

attribute **acl/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Name of the access list for reference elsewhere in the configuration. | |

## complexType add

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/add**](#LinkB5) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkD1) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to set. | | | [value](#LinkD2) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD3) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Add a value to a variable. If the variable doesn't exist, it will be created.  Will convert a single value variable into a list if necessary. | |

attribute **add/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable to set. | |

attribute **add/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression for the value. | |

attribute **add/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | |

## complexType and

|  |  |
| --- | --- |
| diagram |  |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| used by | |  |  | | --- | --- | | element | [**booleanOp/and**](#Link83) | |
| annotation | |  | | --- | | documentation | | Logical 'and' of the elements. | |

## complexType auth-proxy

|  |  |
| --- | --- |
| diagram |  |
| children | [**request**](#Link77)[**response**](#Link78) |
| used by | |  |  | | --- | --- | | element | [**rrc/auth-proxy**](#Link56) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [port](#Link79) | **xs:unsignedShort** | optional | 1812 |  | |  | | --- | | documentation | | UDP port number RRC will listen on for authentication requests. | | | [logging](#Link7A) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable logging of received requests. | | | [enable](#Link7B) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable proxying of authentication requests. | | | [threads](#Link7C) | **xs:positiveInteger** | optional |  |  | |  | | --- | | documentation | | Number of threads to use for authentication proxy functionality. Defaults to 1 per CPU. | | |
| annotation | |  | | --- | | documentation | | Configuration of the Authentication Proxy. | |

attribute **auth-proxy/@port**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1812 | | use | optional | |
| annotation | |  | | --- | | documentation | | UDP port number RRC will listen on for authentication requests. | |

attribute **auth-proxy/@logging**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | true | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable logging of received requests. | |

attribute **auth-proxy/@enable**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | true | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable proxying of authentication requests. | |

attribute **auth-proxy/@threads**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Number of threads to use for authentication proxy functionality. Defaults to 1 per CPU. | |

### element auth-proxy/request

|  |  |
| --- | --- |
| diagram |  |
| type | [**auth-proxy-request**](#Link15) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**ruleset**](#Link107) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [default-disposition](#Link108) | **derived by: xs:string** | optional | drop |  | |  | | --- | | documentation | | Default disposition to apply to any authentication request that isn't proxied elsewhere. | | |

### element auth-proxy/response

|  |  |
| --- | --- |
| diagram |  |
| type | [**auth-proxy-response**](#Link17) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**ruleset**](#Link109) |

## complexType auth-proxy-request

|  |  |
| --- | --- |
| diagram |  |
| children | [**ruleset**](#Link107) |
| used by | |  |  | | --- | --- | | element | [**auth-proxy/request**](#Link77) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [default-disposition](#Link108) | **derived by: xs:string** | optional | drop |  | |  | | --- | | documentation | | Default disposition to apply to any authentication request that isn't proxied elsewhere. | | |
| annotation | |  | | --- | | documentation | | Configuration of the handling of authentication requests. | |

attribute **auth-proxy-request/@default-disposition**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | drop | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | drop |  | | enumeration | reject |  | | enumeration | accept |  | |
| annotation | |  | | --- | | documentation | | Default disposition to apply to any authentication request that isn't proxied elsewhere. | |

### element auth-proxy-request/ruleset

|  |  |
| --- | --- |
| diagram |  |
| type | [**ruleset**](#Link49) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**rule**](#Link106) |
| annotation | |  | | --- | | documentation | | Ruleset to apply when handling Authentication requests. | |

## complexType auth-proxy-response

|  |  |
| --- | --- |
| diagram |  |
| children | [**ruleset**](#Link109) |
| used by | |  |  | | --- | --- | | element | [**auth-proxy/response**](#Link78) | |
| annotation | |  | | --- | | documentation | | Configuration of the handling of authentication responses. | |

### element auth-proxy-response/ruleset

|  |  |
| --- | --- |
| diagram |  |
| type | [**ruleset**](#Link49) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**rule**](#Link106) |
| annotation | |  | | --- | | documentation | | Ruleset to apply when handling Authentication requests. | |

## complexType break

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/break**](#LinkB9) | |
| annotation | |  | | --- | | documentation | | Breaks out of the innermost containing 'foreach' loop.  If no containing 'foreach' is found, will break out of the rule execution as an error. | |

## complexType call

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/call**](#LinkBB) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [rule](#LinkD9) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Calls a named rule as a subroutine. After the named rule completes, execution continues with the next statement (unless the called rule uses the 'end' statement). | |

attribute **call/@rule**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

## complexType comparison

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | elements | [**logicClause/equals**](#Link90)[**logicClause/greater-than**](#Link93)[**logicClause/greater-than-equals**](#Link94)[**logicClause/less-than**](#Link91)[**logicClause/less-than-equals**](#Link92) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to compare. | | | [match](#LinkB0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Value to match against. | | | [mode](#LinkB1) | **derived by: xs:string** | optional | numeric |  | |  | | --- | | documentation | | The style of comparison, Numeric or String | | |
| annotation | |  | | --- | | documentation | | Basic type for simple comparison operations. | |

attribute **comparison/@string**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression to compare. | |

attribute **comparison/@match**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Value to match against. | |

attribute **comparison/@mode**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | numeric | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | numeric |  | | enumeration | string |  | |
| annotation | |  | | --- | | documentation | | The style of comparison, Numeric or String | |

## complexType copy-framed-routes

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/copy-framed-routes**](#LinkC6) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [prefix](#LinkEF) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Specify the prefix to use in the Class attribute value. | | |
| annotation | |  | | --- | | documentation | | Copies the contents of Framed-Route attributes to a Class attribute with the Class attribute value prefixed with default prefix of "RINRoute:". | |

attribute **copy-framed-routes/@prefix**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Specify the prefix to use in the Class attribute value. | |

## complexType database

|  |  |
| --- | --- |
| diagram |  |
| children | [**instance**](#Link10A)[**query**](#Link10B)[**query-pre-fetch**](#Link10C)[**param**](#Link10D)[**extract-column**](#Link10E)[**selector**](#Link10F)[**up-count**](#Link110)[**down-count**](#Link111)[**down-time**](#Link112)[**probe-interval**](#Link113) |
| used by | |  |  | | --- | --- | | element | [**lookups/database**](#Link65) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link114) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of this lookup for reference by the 'lookup' statement. | | | [one-in-n-mode](#Link115) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Declares this database lookup to only expect one of its instances to be working at any time. RRC limits the error reporting in this environment to only complain if all instances are unavailable.  e.g. a cold standby solution where the second instance isn't normally available | | | [vendor](#Link116) | **derived by: xs:string** | required |  |  | |  | | --- | | documentation | | Declares the vendor of the database, and thus which driver should be used for access. | | |
| annotation | |  | | --- | | documentation | | Declare a database lookup instance. Allows RRC to query SQL databases for information. Declared as one or more instances to allow different usernames, password and pool sizes to be specified for each instance.   Currently supports Oracle and MySQL databases. | |

attribute **database/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of this lookup for reference by the 'lookup' statement. | |

attribute **database/@one-in-n-mode**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Declares this database lookup to only expect one of its instances to be working at any time. RRC limits the error reporting in this environment to only complain if all instances are unavailable.  e.g. a cold standby solution where the second instance isn't normally available | |

attribute **database/@vendor**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | mysql |  | | enumeration | oracle |  | | enumeration | oracle:oci |  | |
| annotation | |  | | --- | | documentation | | Declares the vendor of the database, and thus which driver should be used for access. | |

### element database/instance

|  |  |
| --- | --- |
| diagram |  |
| type | [**db-instance**](#Link20) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | complex | |
| children | [**host**](#Link117)[**db-name**](#Link118)[**username**](#Link119)[**password**](#Link11A)[**pool-size**](#Link11B)[**connect-timeout**](#Link11C)[**query-timeout**](#Link11D) |
| annotation | |  | | --- | | documentation | | Declares instances of the database for access by RRC. | |

### element database/query

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| annotation | |  | | --- | | documentation | | SQL query to use. Should make use if '?' to represent parameters in the 'where' clause of the query.  e.g. select profile from user\_profiles where username = ? | |

### element database/query-pre-fetch

|  |  |
| --- | --- |
| diagram |  |
| type | extension of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [refresh](#Link11E) | **xs:nonNegativeInteger** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | SQL query to use if the entire table should be retrieved and cached internally by RRC. Should only be used for infrequently changing data, and for modest numbers of records.  If this element is defined, RRC will cache the entire data set and only periodically update the cached content. | |

attribute **database/query-pre-fetch/@refresh**

|  |  |
| --- | --- |
| type | **xs:nonNegativeInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

### element database/param

|  |  |
| --- | --- |
| diagram |  |
| type | extension of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [column](#Link11F) | [**identifier**](#Link7) | optional |  |  |  | |
| annotation | |  | | --- | | documentation | | Declares the expression that will be expanded for a parameter substitution value. Multiple 'param' elements should correspond to multiple '?' in the SQL query. | |

attribute **database/param/@column**

|  |  |
| --- | --- |
| type | [**identifier**](#Link7) |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [a-zA-Z0-9\_]+ |  | |

### element database/extract-column

|  |  |
| --- | --- |
| diagram |  |
| type | [**identifier**](#Link7) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [a-zA-Z0-9\_]+ |  | |
| annotation | |  | | --- | | documentation | | Name of a column from the SQL query whose value should be extracted.  Results in a variable being set with the name to contain the value of the query column. | |

### element database/selector

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | roundrobin | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | roundrobin |  | | enumeration | sequential |  | |
| annotation | |  | | --- | | documentation | | Defines the algorithm used to select between instances when deciding which to use for a particular query. | |

### element database/up-count

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3 | |
| annotation | |  | | --- | | documentation | | Number of successful probes required to consider a failed instance as recovered. | |

### element database/down-count

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3 | |
| annotation | |  | | --- | | documentation | | Number of consecutive failed queries for an instance to be considered failed. | |

### element database/down-time

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3000 | |
| annotation | |  | | --- | | documentation | | Time over which no successful queries must occur of the instance to be considered failed. | |

### element database/probe-interval

|  |  |
| --- | --- |
| diagram |  |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3000 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Time interval between attempts to determine if an instance has recovered. | |

## complexType db-instance

|  |  |
| --- | --- |
| diagram |  |
| children | [**host**](#Link117)[**db-name**](#Link118)[**username**](#Link119)[**password**](#Link11A)[**pool-size**](#Link11B)[**connect-timeout**](#Link11C)[**query-timeout**](#Link11D) |
| used by | |  |  | | --- | --- | | element | [**database/instance**](#Link10A) | |

### element db-instance/host

|  |  |
| --- | --- |
| diagram |  |
| type | [**hostAndPort**](#Link4) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [a-zA-Z0-9\-\_+.]+(:[0-9]+)? |  | |
| annotation | |  | | --- | | documentation | | Hostname / IP address of the database with the appropriate port appended. e.g. 10.22.36.138:1521 | |

### element db-instance/db-name

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| annotation | |  | | --- | | documentation | | Name of the database. | |

### element db-instance/username

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| annotation | |  | | --- | | documentation | | Username to authenticate with. | |

### element db-instance/password

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| annotation | |  | | --- | | documentation | | Password to authenticate with. | |

### element db-instance/pool-size

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 1 |  | | maxInclusive | 2000 |  | |

### element db-instance/connect-timeout

|  |  |
| --- | --- |
| diagram |  |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3000 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Timeout in milliseconds for connection establishment to the database. | |

### element db-instance/query-timeout

|  |  |
| --- | --- |
| diagram |  |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 500 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Timeout in milliseconds for a query to complete. | |

## complexType delete

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/delete**](#LinkB7) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkD7) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to delete. | | |
| annotation | |  | | --- | | documentation | | Deletes a variable. If will become undefined. | |

attribute **delete/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable to delete. | |

## complexType dpi

|  |  |
| --- | --- |
| diagram |  |
| children | [**drop-starts-thresholds**](#Link69)[**drop-stops-thresholds**](#Link6A)[**drop-interims-thresholds**](#Link6B)[**e30**](#Link6C)[**e100**](#Link6D)[**ruleset**](#Link6E) |
| used by | |  |  | | --- | --- | | element | [**rrc/dpi**](#Link55) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link6F) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI configuration element for reference by DPI statements. | | | [workers](#Link70) | **xs:unsignedShort** | optional | 128 |  | |  | | --- | | documentation | | Specify the number of worker threads to handle DPI activity. | | | [queue-length](#Link71) | **xs:unsignedShort** | optional | 256 |  | |  | | --- | | documentation | | Length of the request queue for each worker thread. RADIUS accounting requests are placed in this queue for processing by a worker thread. The Random Early Drop behaviour is applied to the queue at the point requests are added to the queue. | | | [request-expiry](#Link72) | **xs:positiveInteger** | optional | 120000 |  | |  | | --- | | documentation | | Age in milliseconds after which requests are dropped due to delayed processing. | | | [request-reorder-threshold](#Link73) | **xs:nonNegativeInteger** | optional | 0 |  | |  | | --- | | documentation | | Time window during which RRC will look for potential re-ordering of RADIUS accounting Stop - Start sequences. | | | [lazy-threshold](#Link74) | **xs:nonNegativeInteger** | optional | 0 |  | |  | | --- | | documentation | | RRC has a watch-dog that monitors the behaviour of the worker threads to ensure thay don't hang on accesses to external systems (e.g. LDAP lookups, DPI API calls).  If the worker thread doesn't kick its watch-dog for this amount of time, the worker will be killed and replaced with a new instance. | | | [stub-mode](#Link75) | **xs:boolean** | optional |  |  | |  | | --- | | documentation | | Enable stub-mode operation where all processing takes place as normal, but the final step of communicating with the DPI platform is skipped. | | | [enable](#Link76) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enable DPI processing for ths DPI element. | | |

attribute **dpi/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the DPI configuration element for reference by DPI statements. | |

attribute **dpi/@workers**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 128 | | use | optional | |
| annotation | |  | | --- | | documentation | | Specify the number of worker threads to handle DPI activity. | |

attribute **dpi/@queue-length**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 256 | | use | optional | |
| annotation | |  | | --- | | documentation | | Length of the request queue for each worker thread. RADIUS accounting requests are placed in this queue for processing by a worker thread. The Random Early Drop behaviour is applied to the queue at the point requests are added to the queue. | |

attribute **dpi/@request-expiry**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 120000 | | use | optional | |
| annotation | |  | | --- | | documentation | | Age in milliseconds after which requests are dropped due to delayed processing. | |

attribute **dpi/@request-reorder-threshold**

|  |  |
| --- | --- |
| type | **xs:nonNegativeInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Time window during which RRC will look for potential re-ordering of RADIUS accounting Stop - Start sequences. | |

attribute **dpi/@lazy-threshold**

|  |  |
| --- | --- |
| type | **xs:nonNegativeInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | RRC has a watch-dog that monitors the behaviour of the worker threads to ensure thay don't hang on accesses to external systems (e.g. LDAP lookups, DPI API calls).  If the worker thread doesn't kick its watch-dog for this amount of time, the worker will be killed and replaced with a new instance. | |

attribute **dpi/@stub-mode**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable stub-mode operation where all processing takes place as normal, but the final step of communicating with the DPI platform is skipped. | |

attribute **dpi/@enable**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable DPI processing for ths DPI element. | |

### element dpi/drop-starts-thresholds

|  |  |
| --- | --- |
| diagram |  |
| type | [**red-threshold**](#Link46) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [min-percent](#Link120) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill depth at which packets start to be dropped. | | | [max-percent](#Link121) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill at which the likelyhood of drop becomes 100%. | | |
| annotation | |  | | --- | | documentation | | RED behaviour for accounting Start packets. | |

### element dpi/drop-stops-thresholds

|  |  |
| --- | --- |
| diagram |  |
| type | [**red-threshold**](#Link46) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [min-percent](#Link120) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill depth at which packets start to be dropped. | | | [max-percent](#Link121) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill at which the likelyhood of drop becomes 100%. | | |
| annotation | |  | | --- | | documentation | | RED behaviour for accounting Stop packets. | |

### element dpi/drop-interims-thresholds

|  |  |
| --- | --- |
| diagram |  |
| type | [**red-threshold**](#Link46) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [min-percent](#Link120) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill depth at which packets start to be dropped. | | | [max-percent](#Link121) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill at which the likelyhood of drop becomes 100%. | | |
| annotation | |  | | --- | | documentation | | RED behaviour for accounting Interim-Update packets. | |

### element dpi/e30

|  |  |
| --- | --- |
| diagram |  |
| type | [**e30**](#Link26) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**sle**](#Link122) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [domain](#Link123) | **xs:string** |  |  |  | |  | | --- | | documentation | | Domain to use for subscriber information. | | | [default-profile](#Link124) | **xs:string** |  | default |  | |  | | --- | | documentation | | Default profile to apply if no specific profile is specified, or the specified profile doesn't exist. | | | [username](#Link125) | **xs:string** |  |  |  | |  | | --- | | documentation | | Username for access to SLE. | | | [password](#Link126) | **xs:string** |  |  |  | |  | | --- | | documentation | | Password for access to SLE. | | | [pool-size](#Link127) | **xs:positiveInteger** | optional | 128 |  | |  | | --- | | documentation | | Size of the connection pool to the SLEs. | | | [connection-limit](#Link128) | **xs:positiveInteger** | optional | 40 |  | |  | | --- | | documentation | | Maximum number of connections to any single SLE. | | | [allocation](#Link129) | **derived by: xs:string** | optional | leastconnections |  | |  | | --- | | documentation | | Algorithm for selecting which SLE instance to use for connections. | | | [rebalance-interval](#Link12A) | **xs:positiveInteger** | optional | 30000 |  | |  | | --- | | documentation | | Time interval between rebalancing activities. Periodically RRC reviews connections to each configured SLE, and will move connections to uniformly distribute the load across the SLEs. | | | [min-profile-age](#Link12B) | **xs:positiveInteger** | optional | 5000 |  | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This sets the minimum interval between refreshes of the cached data. | | | [max-profile-age](#Link12C) | **xs:positiveInteger** | optional | 900000 |  | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This is the maximum interval between refreshes of the cached data. | | |
| annotation | |  | | --- | | documentation | | Associate this DPI configuration with an Arbor e30 environment. | |

### element dpi/e100

|  |  |
| --- | --- |
| diagram |  |
| type | [**e100**](#Link25) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**cm**](#Link12D)[**sm**](#Link12E) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [enable-optional-products](#Link12F) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enables the use of Arbor 9.2 "Optional Products". Must only be enabled on Arbor SLS versions greater than (or equal to) 9.2.0. | | |
| annotation | |  | | --- | | documentation | | Associate this DPI configuration with an Arbor e100 environment. | |

### element dpi/ruleset

|  |  |
| --- | --- |
| diagram |  |
| type | [**ruleset**](#Link49) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**rule**](#Link106) |
| annotation | |  | | --- | | documentation | | Ruleset to be used when processing accounting packets for DPI login / logout activity. | |

## complexType dpi-get-profile

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/dpi-get-profile**](#LinkC8) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [id](#LinkF0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI element to use. | | | [userid](#LinkF1) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression evaluated as the user identifier. | | | [profile-var](#LinkF2) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of the variable into which the retrieved profile is placed. | | | [optional-profiles-var](#LinkF3) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of the variable into which the retrieved optional profiles are placed. | | | [strip-domain](#LinkF4) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enables removal of the domain portion of the user-id before use as the user identifier. | | | [userid-transform](#LinkF5) | **derived by: xs:string** | optional | btretail |  | |  | | --- | | documentation | | Specify a transformation to apply to the user identity.  The "btretail" option applies the legacy BT Retail behaviour where user identities containing a '@' character are coerced to lower case, and the remaining user identities are forced to upper case. | | |
| annotation | |  | | --- | | documentation | | Queries the DPI platform to retrieve the current profile associated with the user. | |

attribute **dpi-get-profile/@id**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the DPI element to use. | |

attribute **dpi-get-profile/@userid**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Expression evaluated as the user identifier. | |

attribute **dpi-get-profile/@profile-var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Name of the variable into which the retrieved profile is placed. | |

attribute **dpi-get-profile/@optional-profiles-var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Name of the variable into which the retrieved optional profiles are placed. | |

attribute **dpi-get-profile/@strip-domain**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Enables removal of the domain portion of the user-id before use as the user identifier. | |

attribute **dpi-get-profile/@userid-transform**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | btretail | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | lowercase |  | | enumeration | uppercase |  | | enumeration | btretail |  | | enumeration | none |  | |
| annotation | |  | | --- | | documentation | | Specify a transformation to apply to the user identity.  The "btretail" option applies the legacy BT Retail behaviour where user identities containing a '@' character are coerced to lower case, and the remaining user identities are forced to upper case. | |

## complexType dpi-update

|  |  |
| --- | --- |
| diagram |  |
| children | [**optional-profile**](#LinkF6)[**ip**](#LinkF7)[**subnet**](#LinkF8) |
| used by | |  |  | | --- | --- | | element | [**statement/dpi-update**](#LinkC9) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [id](#LinkF9) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI element to use. | | | [userid](#LinkFA) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression evaluated as the user identifier. | | | [profile](#LinkFB) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Expression evaluated as the product (profile) name. | | | [default-profile](#LinkFC) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Expression evaluated as the default product (profile). This is only used as a last resort if the specified profile is not valid, and the user doesn't already have a profile applied on the DPI platform. | | | [strip-domain](#LinkFD) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enables removal of the domain portion of the user-id before use as the user identifier. | | | [max-ip-count](#LinkFE) | **xs:positiveInteger** | optional | 1025 |  | |  | | --- | | documentation | | Limit the number of IP addresses that will be handled. If the IP address list expanded from the "ip" and "subnet" elements exceeds this limit, no more IP addresses will be handled. | | | [userid-transform](#LinkFF) | **derived by: xs:string** | optional | btretail |  | |  | | --- | | documentation | | Specify a transformation to apply to the user identity.  The "btretail" option applies the legacy BT Retail behaviour where user identities containing a '@' character are coerced to lower case, and the remaining user identities are forced to upper case. | | |
| annotation | |  | | --- | | documentation | | Updates the DPI platform based on the type of accounting request being handled and the specified parameters.  If the accounting packet is a Start or Interim-Update, a start-session API call will be generated. If the accounting packet is a Stop, a stop-session API call will be generated. | |

attribute **dpi-update/@id**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the DPI element to use. | |

attribute **dpi-update/@userid**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Expression evaluated as the user identifier. | |

attribute **dpi-update/@profile**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Expression evaluated as the product (profile) name. | |

attribute **dpi-update/@default-profile**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Expression evaluated as the default product (profile). This is only used as a last resort if the specified profile is not valid, and the user doesn't already have a profile applied on the DPI platform. | |

attribute **dpi-update/@strip-domain**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Enables removal of the domain portion of the user-id before use as the user identifier. | |

attribute **dpi-update/@max-ip-count**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1025 | | use | optional | |
| annotation | |  | | --- | | documentation | | Limit the number of IP addresses that will be handled. If the IP address list expanded from the "ip" and "subnet" elements exceeds this limit, no more IP addresses will be handled. | |

attribute **dpi-update/@userid-transform**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | btretail | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | lowercase |  | | enumeration | uppercase |  | | enumeration | btretail |  | | enumeration | none |  | |
| annotation | |  | | --- | | documentation | | Specify a transformation to apply to the user identity.  The "btretail" option applies the legacy BT Retail behaviour where user identities containing a '@' character are coerced to lower case, and the remaining user identities are forced to upper case. | |

### element dpi-update/optional-profile

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |

### element dpi-update/ip

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |

### element dpi-update/subnet

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |

## complexType e100

|  |  |
| --- | --- |
| diagram |  |
| children | [**cm**](#Link12D)[**sm**](#Link12E) |
| used by | |  |  | | --- | --- | | element | [**dpi/e100**](#Link6D) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [enable-optional-products](#Link12F) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enables the use of Arbor 9.2 "Optional Products". Must only be enabled on Arbor SLS versions greater than (or equal to) 9.2.0. | | |
| annotation | |  | | --- | | documentation | | Declares an Arbor E100 based DPI platform. | |

attribute **e100/@enable-optional-products**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Enables the use of Arbor 9.2 "Optional Products". Must only be enabled on Arbor SLS versions greater than (or equal to) 9.2.0. | |

### element e100/cm

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**api-version**](#Link130) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [protocol](#Link131) | **derived by: xs:string** | optional | http |  | |  | | --- | | documentation | | Protocol to use for access to the CM. Defaults to 'http'. | | | [primary](#Link132) | **xs:string** |  |  |  | |  | | --- | | documentation | | IP address of the primary server. | | | [secondary](#Link133) | **xs:string** | optional |  |  | |  | | --- | | documentation | | IP address of the secondary server. | | | [default-profile](#Link134) | **xs:string** | optional | Default Profile |  |  | | [username](#Link135) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Username for access to the CM. Not used in current versions of the CM, up to and including 9.2. | | | [password](#Link136) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Password for access to the CM. Not used in current versions of the CM, up to and including 9.2. | | | [zone](#Link137) | **xs:string** | optional | Default Zone |  | |  | | --- | | documentation | | Name of the Zone to use. | | | [pool-size](#Link138) | **xs:positiveInteger** | optional | 32 |  | |  | | --- | | documentation | | Maximum number of concurrent connections to the CM. | | | [fail-threshold](#Link139) | [**retryType**](#Link1A) | optional | 3 |  | |  | | --- | | documentation | | Number of successive API calls that must fail to regard the CM as failed. | | | [fail-time](#Link13A) | [**timeoutType**](#Link1C) | optional | 1500 |  | |  | | --- | | documentation | | Minimum time interval in milliseconds over which API calls must fail for the CM to be regarded as failed. | | | [min-profile-age](#Link13B) | **xs:positiveInteger** | optional | 5000 |  | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This sets the minimum interval between refreshes of the cached data. | | | [max-profile-age](#Link13C) | **xs:positiveInteger** | optional | 900000 |  | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This is the maximum interval between refreshes of the cached data. | | | [api-version](#Link13D) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Fixes the API version in the URL for access to the CM. By default RRC attempts to discover the correct API version by trial and error based on a built-in list of versions.  Doesn't necessarily mean RRC is fully compatible with the version though! | | |
| annotation | |  | | --- | | documentation | | Details for the Configuration Manager. | |

attribute **e100/cm/@protocol**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | http | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | http |  | | enumeration | https |  | |
| annotation | |  | | --- | | documentation | | Protocol to use for access to the CM. Defaults to 'http'. | |

attribute **e100/cm/@primary**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | IP address of the primary server. | |

attribute **e100/cm/@secondary**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | IP address of the secondary server. | |

attribute **e100/cm/@default-profile**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | Default Profile | | use | optional | |

attribute **e100/cm/@username**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Username for access to the CM. Not used in current versions of the CM, up to and including 9.2. | |

attribute **e100/cm/@password**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Password for access to the CM. Not used in current versions of the CM, up to and including 9.2. | |

attribute **e100/cm/@zone**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | Default Zone | | use | optional | |
| annotation | |  | | --- | | documentation | | Name of the Zone to use. | |

attribute **e100/cm/@pool-size**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 32 | | use | optional | |
| annotation | |  | | --- | | documentation | | Maximum number of concurrent connections to the CM. | |

attribute **e100/cm/@fail-threshold**

|  |  |
| --- | --- |
| type | [**retryType**](#Link1A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 3 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 20 |  | |
| annotation | |  | | --- | | documentation | | Number of successive API calls that must fail to regard the CM as failed. | |

attribute **e100/cm/@fail-time**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1500 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Minimum time interval in milliseconds over which API calls must fail for the CM to be regarded as failed. | |

attribute **e100/cm/@min-profile-age**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 5000 | | use | optional | |
| annotation | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This sets the minimum interval between refreshes of the cached data. | |

attribute **e100/cm/@max-profile-age**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 900000 | | use | optional | |
| annotation | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This is the maximum interval between refreshes of the cached data. | |

attribute **e100/cm/@api-version**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Fixes the API version in the URL for access to the CM. By default RRC attempts to discover the correct API version by trial and error based on a built-in list of versions.  Doesn't necessarily mean RRC is fully compatible with the version though! | |

### element e100/cm/api-version

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| annotation | |  | | --- | | documentation | | Identifies an API version string that RRC will try in turn to locate the appropriate API version for the CM.  Doesn't necessarily mean RRC is fully compatible with the version though! | |

### element e100/sm

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [protocol](#Link13E) | **derived by: xs:string** | optional | http |  | |  | | --- | | documentation | | Protocol to use for access to the CM. Defaults to 'http'. | | | [primary](#Link13F) | **xs:string** |  |  |  | |  | | --- | | documentation | | IP address of the primary server. | | | [secondary](#Link140) | **xs:string** | optional |  |  | |  | | --- | | documentation | | IP address of the secondary server. | | | [username](#Link141) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Username for access to the CM. Not used in current versions of the CM, up to and including 9.2. | | | [password](#Link142) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Password for access to the CM. Not used in current versions of the CM, up to and including 9.2. | | | [pool-size](#Link143) | **xs:positiveInteger** | optional | 32 |  | |  | | --- | | documentation | | Maximum number of concurrent connections to the SM. | | | [fail-threshold](#Link144) | [**retryType**](#Link1A) | optional | 3 |  | |  | | --- | | documentation | | Number of successive API calls that must fail to regard the SM as failed. | | | [fail-time](#Link145) | [**timeoutType**](#Link1C) | optional | 1500 |  | |  | | --- | | documentation | | Minimum time interval in milliseconds over which API calls must fail for the SM to be regarded as failed. | | | [busy-timeout](#Link146) | [**timeoutType**](#Link1C) | optional | 1000 |  | |  | | --- | | documentation | | SM can on occaision report 'system busy'. This places a limit on the duration for which the SM can report 'system busy' before an error is triggered. | | |

attribute **e100/sm/@protocol**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | http | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | http |  | | enumeration | https |  | |
| annotation | |  | | --- | | documentation | | Protocol to use for access to the CM. Defaults to 'http'. | |

attribute **e100/sm/@primary**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | IP address of the primary server. | |

attribute **e100/sm/@secondary**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | IP address of the secondary server. | |

attribute **e100/sm/@username**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Username for access to the CM. Not used in current versions of the CM, up to and including 9.2. | |

attribute **e100/sm/@password**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Password for access to the CM. Not used in current versions of the CM, up to and including 9.2. | |

attribute **e100/sm/@pool-size**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 32 | | use | optional | |
| annotation | |  | | --- | | documentation | | Maximum number of concurrent connections to the SM. | |

attribute **e100/sm/@fail-threshold**

|  |  |
| --- | --- |
| type | [**retryType**](#Link1A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 3 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 20 |  | |
| annotation | |  | | --- | | documentation | | Number of successive API calls that must fail to regard the SM as failed. | |

attribute **e100/sm/@fail-time**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1500 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Minimum time interval in milliseconds over which API calls must fail for the SM to be regarded as failed. | |

attribute **e100/sm/@busy-timeout**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1000 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | SM can on occaision report 'system busy'. This places a limit on the duration for which the SM can report 'system busy' before an error is triggered. | |

## complexType e30

|  |  |
| --- | --- |
| diagram |  |
| children | [**sle**](#Link122) |
| used by | |  |  | | --- | --- | | element | [**dpi/e30**](#Link6C) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [domain](#Link123) | **xs:string** |  |  |  | |  | | --- | | documentation | | Domain to use for subscriber information. | | | [default-profile](#Link124) | **xs:string** |  | default |  | |  | | --- | | documentation | | Default profile to apply if no specific profile is specified, or the specified profile doesn't exist. | | | [username](#Link125) | **xs:string** |  |  |  | |  | | --- | | documentation | | Username for access to SLE. | | | [password](#Link126) | **xs:string** |  |  |  | |  | | --- | | documentation | | Password for access to SLE. | | | [pool-size](#Link127) | **xs:positiveInteger** | optional | 128 |  | |  | | --- | | documentation | | Size of the connection pool to the SLEs. | | | [connection-limit](#Link128) | **xs:positiveInteger** | optional | 40 |  | |  | | --- | | documentation | | Maximum number of connections to any single SLE. | | | [allocation](#Link129) | **derived by: xs:string** | optional | leastconnections |  | |  | | --- | | documentation | | Algorithm for selecting which SLE instance to use for connections. | | | [rebalance-interval](#Link12A) | **xs:positiveInteger** | optional | 30000 |  | |  | | --- | | documentation | | Time interval between rebalancing activities. Periodically RRC reviews connections to each configured SLE, and will move connections to uniformly distribute the load across the SLEs. | | | [min-profile-age](#Link12B) | **xs:positiveInteger** | optional | 5000 |  | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This sets the minimum interval between refreshes of the cached data. | | | [max-profile-age](#Link12C) | **xs:positiveInteger** | optional | 900000 |  | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This is the maximum interval between refreshes of the cached data. | | |

attribute **e30/@domain**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Domain to use for subscriber information. | |

attribute **e30/@default-profile**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | default | |
| annotation | |  | | --- | | documentation | | Default profile to apply if no specific profile is specified, or the specified profile doesn't exist. | |

attribute **e30/@username**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Username for access to SLE. | |

attribute **e30/@password**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Password for access to SLE. | |

attribute **e30/@pool-size**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 128 | | use | optional | |
| annotation | |  | | --- | | documentation | | Size of the connection pool to the SLEs. | |

attribute **e30/@connection-limit**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 40 | | use | optional | |
| annotation | |  | | --- | | documentation | | Maximum number of connections to any single SLE. | |

attribute **e30/@allocation**

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | leastconnections | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | leastconnections |  | | enumeration | roundrobin |  | | enumeration | fastest |  | |
| annotation | |  | | --- | | documentation | | Algorithm for selecting which SLE instance to use for connections. | |

attribute **e30/@rebalance-interval**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 30000 | | use | optional | |
| annotation | |  | | --- | | documentation | | Time interval between rebalancing activities. Periodically RRC reviews connections to each configured SLE, and will move connections to uniformly distribute the load across the SLEs. | |

attribute **e30/@min-profile-age**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 5000 | | use | optional | |
| annotation | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This sets the minimum interval between refreshes of the cached data. | |

attribute **e30/@max-profile-age**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 900000 | | use | optional | |
| annotation | |  | | --- | | documentation | | RRC caches the products / profiles retrieved from the CM for validation purposes. This is the maximum interval between refreshes of the cached data. | |

### element e30/sle

|  |  |
| --- | --- |
| diagram |  |
| type | [**ipPortType**](#LinkA) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}:[0-9]+ |  | |
| annotation | |  | | --- | | documentation | | IP address of a SLE for access by RRC. | |

## complexType else

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**if/else**](#LinkDD) | |
| annotation | |  | | --- | | documentation | | Statements executed as part of an 'if' statement, when the logical test returns false. | |

## complexType end

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/end**](#LinkBA) | |
| annotation | |  | | --- | | documentation | | Stops evaluation of more rules and returns success. | |

## complexType file

|  |  |
| --- | --- |
| diagram |  |
| children | [**url**](#Link147)[**selector**](#Link148)[**refresh**](#Link149)[**search-key**](#Link14A)[**column**](#Link14B) |
| used by | |  |  | | --- | --- | | element | [**lookups/file**](#Link64) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link14C) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the file lookup for reference within 'lookup' statements. | | |
| annotation | |  | | --- | | documentation | | Declares a file as a lookup source. File lookups are always fully cached internally so should be of modest size, and slow to change.  File mapping should have a simple key value in the first column, a '-->' separator to the values which should be comma separated.  e.g. BBEU12345678 --> Option1a,NoDNS # Test User | |

attribute **file/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the file lookup for reference within 'lookup' statements. | |

### element file/url

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| annotation | |  | | --- | | documentation | | URL to access the file to use as a lookup.  Can be http or ftp URL as well as a simple local filename. | |

### element file/selector

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | sequential | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | roundrobin |  | | enumeration | sequential |  | |
| annotation | |  | | --- | | documentation | | Algorithm to use to select between URLs when fetching the file mapping.  Only meaningful if the URLs are remote (e.g. http or ftp). | |

### element file/refresh

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| annotation | |  | | --- | | documentation | | Interval in milliseconds between file refreshes. | |

### element file/search-key

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| annotation | |  | | --- | | documentation | | String expression to use as the key value when searching the file. | |

### element file/column

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| annotation | |  | | --- | | documentation | | Declares the name of a column within the file. The columns are matched against the fields within the CSV value of an entry.  The last column may be declared with a name of '...' which means the prevous declared column repeats allowing a multi-valued element to be defined.  The entry can have fewer values than declared columns in which case the additional columns will be unset. | |

## complexType foreach

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**statement/foreach**](#LinkBE) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkDE) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to hold the list value. | | | [value](#LinkDF) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression to evaluate. e.g. "${optional-products}" | | |
| annotation | |  | | --- | | documentation | | Iterate over the values within a variables list of values, and execute the child statements for each value.  Sets a variable to each value in turn. The scope of the variable is the contained block of statements. It will not exists after the foreach statement completes.  If a variable with the same name exists, its value will be hidden within the child statements, and will be restored on exit of the statement. | |

attribute **foreach/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable to hold the list value. | |

attribute **foreach/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Expression to evaluate. e.g. "${optional-products}" | |

## complexType if

|  |  |
| --- | --- |
| diagram |  |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85)[**then**](#LinkDC)[**else**](#LinkDD) |
| used by | |  |  | | --- | --- | | element | [**statement/if**](#LinkBD) | |
| annotation | |  | | --- | | documentation | | Implement a conditional test with statement blocks for true ('then') and false ('else') cases. | |

### element if/then

|  |  |
| --- | --- |
| diagram |  |
| type | [**then**](#Link4D) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| annotation | |  | | --- | | documentation | | Statements executed if the logical test returns true. | |

### element if/else

|  |  |
| --- | --- |
| diagram |  |
| type | [**else**](#Link27) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| annotation | |  | | --- | | documentation | | Statements executed if the logical test returns false. | |

## complexType is-list

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**logicClause/is-list**](#Link89) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkA6) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable. | | |
| annotation | |  | | --- | | documentation | | Tests a variable to see if it contains a list of values (true) or a single value (false). | |

attribute **is-list/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable. | |

## complexType is-valid-password

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**logicClause/is-valid-password**](#Link87) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [chap](#LinkA1) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable chap password checking. | | | [pap](#LinkA2) | **xs:boolean** | optional | true |  | |  | | --- | | documentation | | Enable PAP password checking. | | | [password](#LinkA3) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions for the plain text password to match. | | |
| annotation | |  | | --- | | documentation | | Validate a password. Returns true if the password from the RADIUS packet matches the value of the password attribute. | |

attribute **is-valid-password/@chap**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | true | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable chap password checking. | |

attribute **is-valid-password/@pap**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | true | | use | optional | |
| annotation | |  | | --- | | documentation | | Enable PAP password checking. | |

attribute **is-valid-password/@password**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String containing substition expressions for the plain text password to match. | |

## complexType is-valid-product

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**logicClause/is-valid-product**](#Link86) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [dpi](#Link9F) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the DPI instance to check. | | | [product](#LinkA0) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression for the name of the product to test. | | |
| annotation | |  | | --- | | documentation | | Check to see if the named product is valid on the DPI platform. | |

attribute **is-valid-product/@dpi**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the DPI instance to check. | |

attribute **is-valid-product/@product**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Expression for the name of the product to test. | |

## complexType isDefined

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | elements | [**logicClause/is-defined**](#Link95)[**logicClause/is-not-defined**](#Link96) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkB2) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to test. | | |
| annotation | |  | | --- | | documentation | | True if the variable is defined. | |

attribute **isDefined/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable to test. | |

## complexType ldap

|  |  |
| --- | --- |
| diagram |  |
| children | [**ldap-version**](#Link14D)[**host**](#Link14E)[**username**](#Link14F)[**password**](#Link150)[**base-dn**](#Link151)[**scope**](#Link152)[**query**](#Link153)[**query-pre-fetch**](#Link154)[**req-attr**](#Link155)[**connect-timeout**](#Link156)[**read-timeout**](#Link157)[**pool-size**](#Link158)[**up-count**](#Link159)[**down-count**](#Link15A)[**down-time**](#Link15B)[**probe-interval**](#Link15C)[**probe-query**](#Link15D)[**selector**](#Link15E) |
| used by | |  |  | | --- | --- | | element | [**lookups/ldap**](#Link63) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link15F) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the lookup for reference by 'lookup' statements. | | | [one-in-n-mode](#Link160) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Declares this database lookup to only expect one of its instances to be working at any time. RRC limits the error reporting in this environment to only complain if all instances are unavailable.  e.g. a cold standby solution where the second instance isn't normally available | | |
| annotation | |  | | --- | | documentation | | Declares an external LDAP lookup. | |

attribute **ldap/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the lookup for reference by 'lookup' statements. | |

attribute **ldap/@one-in-n-mode**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Declares this database lookup to only expect one of its instances to be working at any time. RRC limits the error reporting in this environment to only complain if all instances are unavailable.  e.g. a cold standby solution where the second instance isn't normally available | |

### element ldap/ldap-version

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 2 |  | | maxInclusive | 3 |  | |
| annotation | |  | | --- | | documentation | | Specifies which version of LDAP to use for LDAP queries. | |

### element ldap/host

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [a-zA-Z0-9\-\_+.]+(:[0-9]+)? |  | |
| annotation | |  | | --- | | documentation | | Hostname or IP address of the LDAP server. | |

### element ldap/username

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| annotation | |  | | --- | | documentation | | Username for authentication with the LDAP server. If this is not specified, RRC will bind anonymously with the LDAP server. | |

### element ldap/password

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | |
| annotation | |  | | --- | | documentation | | Password for the authentication user. | |

### element ldap/base-dn

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| annotation | |  | | --- | | documentation | | Base DN for the LDAP queries. | |

### element ldap/scope

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | | default | sub | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | sub |  | | enumeration | one |  | | enumeration | none |  | |
| annotation | |  | | --- | | documentation | | Scope of the search. | |

### element ldap/query

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| annotation | |  | | --- | | documentation | | LDAP query expression. Can include substitution expressions to complete the query.  e.g. iispSID=${radius:Calling-Station-Id} | |

### element ldap/query-pre-fetch

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [key-attr](#Link161) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the attribute that is the search key for lookups in the internal cached copy. | | | [key-value](#Link162) | **xs:string** | required |  |  | |  | | --- | | documentation | | Expression to evaluate against the RADIUS request to generate the value for the key attribute. | | | [refresh](#Link163) | **xs:nonNegativeInteger** | required |  |  | |  | | --- | | documentation | | Interval in milliseconds between refreshes of the cached data. | | |
| annotation | |  | | --- | | documentation | | Causes RRC to fetch the entire contents of the LDAP query and cache them internally. Only simple 'tables' can be cached in this way. | |

attribute **ldap/query-pre-fetch/@key-attr**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the attribute that is the search key for lookups in the internal cached copy. | |

attribute **ldap/query-pre-fetch/@key-value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Expression to evaluate against the RADIUS request to generate the value for the key attribute. | |

attribute **ldap/query-pre-fetch/@refresh**

|  |  |
| --- | --- |
| type | **xs:nonNegativeInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Interval in milliseconds between refreshes of the cached data. | |

### element ldap/req-attr

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| annotation | |  | | --- | | documentation | | Name of an attribute whose value should be retrieved. | |

### element ldap/connect-timeout

|  |  |
| --- | --- |
| diagram |  |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3000 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Timeout in milliseconds to establish a connection to the directory. | |

### element ldap/read-timeout

|  |  |
| --- | --- |
| diagram |  |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 500 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Timeout in milliseconds for read timeout, and query execute timeout. | |

### element ldap/pool-size

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 5 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 1 |  | | maxInclusive | 1000 |  | |
| annotation | |  | | --- | | documentation | | Maximum number of concurrent connections permittted to the LDAP directory. | |

### element ldap/up-count

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3 | |
| annotation | |  | | --- | | documentation | | Number of successful probes required to consider a failed directory as recovered. | |

### element ldap/down-count

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3 | |
| annotation | |  | | --- | | documentation | | Number of successive query failures required to consider the directory as failed. | |

### element ldap/down-time

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3000 | |
| annotation | |  | | --- | | documentation | | Time in milliseconds over which no successful queries must occur for the directory to be considered failed. | |

### element ldap/probe-interval

|  |  |
| --- | --- |
| diagram |  |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | 3000 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Interval in milliseconds between availability probes against a failed server. | |

### element ldap/probe-query

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| annotation | |  | | --- | | documentation | | LDAP query to use as a probe to determine if the directory is available.  Note: no RADIUS packet is available, so no substitution expressions should be used. | |

### element ldap/selector

|  |  |
| --- | --- |
| diagram |  |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | 1 | | content | simple | | default | roundrobin | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | roundrobin |  | | enumeration | sequential |  | |
| annotation | |  | | --- | | documentation | | Selection algorithm used to distribute LDAP queries across the available instances. | |

## complexType listener

|  |  |
| --- | --- |
| diagram |  |
| children | [**monitor**](#Link5A) |
| used by | |  |  | | --- | --- | | element | [**rrc/listener**](#Link50) | |
| annotation | |  | | --- | | documentation | | Declaration of listening ports other than those used by the RADIUS authentication and accounting functions. | |

### element listener/monitor

|  |  |
| --- | --- |
| diagram |  |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [auth](#Link164) | **xs:unsignedShort** | optional |  |  |  | | [acct](#Link165) | **xs:unsignedShort** | optional |  |  |  | | [check](#Link166) | **xs:unsignedShort** | optional |  |  |  | | [sentinal-file](#Link167) | **xs:string** | optional | ${rrc.log.dir}/shutdown.now |  |  | |
| annotation | |  | | --- | | documentation | | Listening ports for interfacing with an external load balancer.  RRC publishes it's operational status for handling authentication and accounting packets via TCP listening ports. The load balancer can poll these ports to obtain status for the corresponding service. If RRC is able to handle the authentication or accounting packets, it will accept TCP connections on the monitoring port. These will be closed automatically by RRC shortly after the connection is accepted. Any input received will be discarded. | |

attribute **listener/monitor/@auth**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |

attribute **listener/monitor/@acct**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |

attribute **listener/monitor/@check**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |

attribute **listener/monitor/@sentinal-file**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | ${rrc.log.dir}/shutdown.now | | use | optional | |

## complexType log

|  |  |
| --- | --- |
| diagram |  |
| type | extension of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | element | [**statement/log**](#LinkBC) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [logger](#LinkDA) | **xs:string** | optional | info |  | |  | | --- | | documentation | | Logger to use when writing message. Defaults to the standard log stream. | | | [level](#LinkDB) | [**logLevel**](#Link10) |  | info |  | |  | | --- | | documentation | | Level at which to log the message. | | |
| annotation | |  | | --- | | documentation | | Log a message. | |

attribute **log/@logger**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | info | | use | optional | |
| annotation | |  | | --- | | documentation | | Logger to use when writing message. Defaults to the standard log stream. | |

attribute **log/@level**

|  |  |
| --- | --- |
| type | [**logLevel**](#Link10) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | info | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | trace |  | | enumeration | debug |  | | enumeration | info |  | | enumeration | warn |  | | enumeration | warning |  | | enumeration | error |  | |
| annotation | |  | | --- | | documentation | | Level at which to log the message. | |

## complexType logging

|  |  |
| --- | --- |
| diagram |  |
| annotation | |  | | --- | | documentation | | Configure logging. | |

## complexType lookup

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/lookup**](#LinkB8) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#LinkD8) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Performs an external lookup using the named lookup. | |

attribute **lookup/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

## complexType lookups

|  |  |
| --- | --- |
| diagram |  |
| children | [**ldap**](#Link63)[**file**](#Link64)[**database**](#Link65) |
| used by | |  |  | | --- | --- | | element | [**rrc/lookups**](#Link52) | |
| annotation | |  | | --- | | documentation | | Declares external data lookups for use within the configuration. | |

### element lookups/ldap

|  |  |
| --- | --- |
| diagram |  |
| type | [**ldap**](#Link30) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**ldap-version**](#Link14D)[**host**](#Link14E)[**username**](#Link14F)[**password**](#Link150)[**base-dn**](#Link151)[**scope**](#Link152)[**query**](#Link153)[**query-pre-fetch**](#Link154)[**req-attr**](#Link155)[**connect-timeout**](#Link156)[**read-timeout**](#Link157)[**pool-size**](#Link158)[**up-count**](#Link159)[**down-count**](#Link15A)[**down-time**](#Link15B)[**probe-interval**](#Link15C)[**probe-query**](#Link15D)[**selector**](#Link15E) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link15F) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the lookup for reference by 'lookup' statements. | | | [one-in-n-mode](#Link160) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Declares this database lookup to only expect one of its instances to be working at any time. RRC limits the error reporting in this environment to only complain if all instances are unavailable.  e.g. a cold standby solution where the second instance isn't normally available | | |

### element lookups/file

|  |  |
| --- | --- |
| diagram |  |
| type | [**file**](#Link29) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**url**](#Link147)[**selector**](#Link148)[**refresh**](#Link149)[**search-key**](#Link14A)[**column**](#Link14B) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link14C) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the file lookup for reference within 'lookup' statements. | | |

### element lookups/database

|  |  |
| --- | --- |
| diagram |  |
| type | [**database**](#Link1F) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | complex | |
| children | [**instance**](#Link10A)[**query**](#Link10B)[**query-pre-fetch**](#Link10C)[**param**](#Link10D)[**extract-column**](#Link10E)[**selector**](#Link10F)[**up-count**](#Link110)[**down-count**](#Link111)[**down-time**](#Link112)[**probe-interval**](#Link113) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link114) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of this lookup for reference by the 'lookup' statement. | | | [one-in-n-mode](#Link115) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Declares this database lookup to only expect one of its instances to be working at any time. RRC limits the error reporting in this environment to only complain if all instances are unavailable.  e.g. a cold standby solution where the second instance isn't normally available | | | [vendor](#Link116) | **derived by: xs:string** | required |  |  | |  | | --- | | documentation | | Declares the vendor of the database, and thus which driver should be used for access. | | |

## complexType match-acl

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**logicClause/match-acl**](#Link8F) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [acl](#LinkAE) | **xs:string** |  |  |  | |  | | --- | | documentation | | Name of the access list to match against. | | |
| annotation | |  | | --- | | documentation | | Match against a declared access list. | |

attribute **match-acl/@acl**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Name of the access list to match against. | |

## complexType match-ip

|  |  |
| --- | --- |
| diagram |  |
| children | [**subnet**](#LinkAC) |
| used by | |  |  | | --- | --- | | element | [**logicClause/match-ip**](#Link8E) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkAD) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | |
| annotation | |  | | --- | | documentation | | Matches RADIUS attribute against a subnet. Returns true if the IP in the RADIUS attribute is within the subnet. | |

attribute **match-ip/@attr**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS attribute. | |

### element match-ip/subnet

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| annotation | |  | | --- | | documentation | | Subnet to match e.g. 10.123.22.0/24 | |

## complexType match-regex

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**logicClause/match-regex**](#Link8D) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkAA) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions. | | | [regex](#LinkAB) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Match a string expression against a regular expression. Returns true of the expression matches the regular expression. | |

attribute **match-regex/@string**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String containing substition expressions. | |

attribute **match-regex/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

## complexType not

|  |  |
| --- | --- |
| diagram |  |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| used by | |  |  | | --- | --- | | element | [**booleanOp/not**](#Link85) | |
| annotation | |  | | --- | | documentation | | Logical negation of the single child element. | |

## complexType or

|  |  |
| --- | --- |
| diagram |  |
| children | [**is-valid-product**](#Link86)[**is-valid-password**](#Link87)[**variable**](#Link88)[**is-list**](#Link89)[**starts-with**](#Link8A)[**ends-with**](#Link8B)[**contains**](#Link8C)[**match-regex**](#Link8D)[**match-ip**](#Link8E)[**match-acl**](#Link8F)[**equals**](#Link90)[**less-than**](#Link91)[**less-than-equals**](#Link92)[**greater-than**](#Link93)[**greater-than-equals**](#Link94)[**is-defined**](#Link95)[**is-not-defined**](#Link96)[**is-authentication**](#Link97)[**is-accounting**](#Link98)[**is-start**](#Link99)[**is-stop**](#Link9A)[**is-interim**](#Link9B)[**is-accept**](#Link9C)[**is-reject**](#Link9D)[**is-deny**](#Link9E)[**and**](#Link83)[**or**](#Link84)[**not**](#Link85) |
| used by | |  |  | | --- | --- | | element | [**booleanOp/or**](#Link84) | |
| annotation | |  | | --- | | documentation | | Logical 'or' of the elements. | |

complexType **pause**

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/pause**](#LinkC0) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [time](#LinkE0) | **xs:positiveInteger** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | Pauses rule execution for the specified number of milliseconds. | |

attribute **pause/@time**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

## complexType property

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**rrc/property**](#Link4F) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link58) | **xs:string** | required |  |  |  | | [value](#Link59) | **xs:string** | required |  |  |  | |
| annotation | |  | | --- | | documentation | | XML holder for old properties file entries that aren't yet supported by the XML confguration file. | |

attribute **property/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

attribute **property/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |

## complexType proxy

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**statement/proxy**](#LinkCC) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [destination](#Link102) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS group to which the request should be sent. | | | [log](#Link103) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Log the details of the packet in the authentication or accounting log as appropriate.  Care should be excercised with this option. All received requests are logged by default. Loggin all outbound requests will double the rate and size of the logging which could impact performance. | | | [fire-and-forget](#Link104) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Handle the request as fire andf forget regardless of the RADIUS group configuration. RRC will send the request and immediately forget it, and not expect a acknowledgement for accounting packets.  Note: setting this to 'false' will not override a RADIUS group that is configured for fire and forget.  The effective behaviour is fire and forget will be used if either the request or the RADIUS group specifies fire and forget. | | |
| annotation | |  | | --- | | documentation | | Forwards a RADIUS request to the specified RADIUS group.  The body may include statments to customise the packet before forwarding. Within the body, the statements that manupulate RADIUS packets (radius-add, radius-set, radius-remove and radius-delete) will operate on the packet to be forwarded. Similarly, changes to variables are local to the proxy statement. | |

attribute **proxy/@destination**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS group to which the request should be sent. | |

attribute **proxy/@log**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Log the details of the packet in the authentication or accounting log as appropriate.  Care should be excercised with this option. All received requests are logged by default. Loggin all outbound requests will double the rate and size of the logging which could impact performance. | |

attribute **proxy/@fire-and-forget**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Handle the request as fire andf forget regardless of the RADIUS group configuration. RRC will send the request and immediately forget it, and not expect a acknowledgement for accounting packets.  Note: setting this to 'false' will not override a RADIUS group that is configured for fire and forget.  The effective behaviour is fire and forget will be used if either the request or the RADIUS group specifies fire and forget. | |

## complexType radius

|  |  |
| --- | --- |
| diagram |  |
| children | [**radius-server**](#Link67)[**radius-group**](#Link68) |
| used by | |  |  | | --- | --- | | element | [**rrc/radius**](#Link54) | |

### element radius/radius-server

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-server**](#Link44) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | unbounded | | content | complex | |
| children | [**ip**](#Link168) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link169) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of this RADIUS server. This is a handle by which the RADIUS server can be referenced in RADIUS server group configurations. | | | [secret](#Link16A) | **xs:string** | required |  |  | |  | | --- | | documentation | | Shared secret for communications between RRC and the RADIUS server. | | | [auth-port](#Link16B) | **xs:unsignedShort** | optional | 1812 |  | |  | | --- | | documentation | | UDP port to which authentication packets should be directed. | | | [acct-port](#Link16C) | **xs:unsignedShort** | optional | 1813 |  | |  | | --- | | documentation | | UDP port to which accounting packets should be directed. | | | [timeout](#Link16D) | [**timeoutType**](#Link1C) | optional | 2500 |  | |  | | --- | | documentation | | Timeout in milliseconds to apply to each RADIUS request when  send to this RADIUS server. | | | [max-outstanding-requests](#Link16E) | **xs:integer** | optional | 50 |  | |  | | --- | | documentation | | The maximum number of requests that RRC will allow to be outstanding to this server. This provides a means to limit the rate at which RRC will forward requests to the server. | | | [failure-threshold](#Link16F) | [**retryType**](#Link1A) | optional | 5 |  | |  | | --- | | documentation | | The number of successive timeouts that must occur for the RADIUS server to be considered as down / failed. | | | [failure-time](#Link170) | [**timeoutType**](#Link1C) | optional | 7500 |  | |  | | --- | | documentation | | The minimum time interval (milliseconds) over which the failed responses must occur. Provides a means to de-sensitise RRC to short burts of packet loss so a RADIUS server isn't considered down due a few packets being lost. | | | [retry-probe-interval](#Link171) | [**timeoutType**](#Link1C) | optional | 30000 |  | |  | | --- | | documentation | | Time interval in milliseconds between probes to determine if the RADIUS server has recovered. Real RADIUS packets are used to perform the probe so may be delayed if the server is still down. Probably means this shouldn't be set too short. | | |
| annotation | |  | | --- | | documentation | | Declares a RADIUS server - used to accept received requests. | |

### element radius/radius-group

|  |  |
| --- | --- |
| diagram |  |
| type | [**radius-group**](#Link41) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | unbounded | | content | complex | |
| children | [**server**](#Link172) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link173) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS server group. Used to reference the group in, for example, proxy statements. | | | [selector](#Link174) | [**radiusSelectorType**](#Link18) | optional | sequential |  | |  | | --- | | documentation | | Selection algorithm for determining how RADIUS packets are distributed across the available RADIUS servers. | | | [hash-attribute](#Link175) | **xs:string** | optional | Framed-IP-Address |  | |  | | --- | | documentation | | Name of the RADIUS attribute to use for distributing requests under the 'hash' algorithm. Must be an IP address attribute. | | | [retries](#Link176) | [**retryType**](#Link1A) | optional | 3 |  | |  | | --- | | documentation | | Number of retries to perform when sending to this server group. | | | [timeout](#Link177) | [**timeoutType**](#Link1C) | optional | 5000 |  | |  | | --- | | documentation | | Request timeout time in milliseconds for requests to this group. | | | [fire-and-forget](#Link178) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enabled fire and forget behaviour where RRC is not expecting to receive an acknowledgement to accounting packets. | | |
| annotation | |  | | --- | | documentation | | Declares a RADIUS server group - used as a destination for proxying requests. | |

## complexType radius-add

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/radius-add**](#LinkC2) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkE5) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | | [value](#LinkE6) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkE7) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | | [csv](#LinkE8) | **xs:string** | optional |  |  |  | |
| annotation | |  | | --- | | documentation | | Add a RADIUS attribute. The behaviour is to add an additional attributes to the RADIUS packet. No check is performed for the validity of adding the attribute. This can result in non RFC conformant packets if the RFCs require that only a single instance of the attribute type exists  e.g. CHAP-Password or User-Name | |

attribute **radius-add/@attr**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS attribute. | |

attribute **radius-add/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression for the value. | |

attribute **radius-add/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | |

attribute **radius-add/@csv**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |

## complexType radius-delete

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/radius-delete**](#LinkC4) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkEC) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | |
| annotation | |  | | --- | | documentation | | Delets all instances of a RADIUS attribute from the packet. | |

attribute **radius-delete/@attr**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS attribute. | |

## complexType radius-group

|  |  |
| --- | --- |
| diagram |  |
| children | [**server**](#Link172) |
| used by | |  |  | | --- | --- | | element | [**radius/radius-group**](#Link68) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link173) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS server group. Used to reference the group in, for example, proxy statements. | | | [selector](#Link174) | [**radiusSelectorType**](#Link18) | optional | sequential |  | |  | | --- | | documentation | | Selection algorithm for determining how RADIUS packets are distributed across the available RADIUS servers. | | | [hash-attribute](#Link175) | **xs:string** | optional | Framed-IP-Address |  | |  | | --- | | documentation | | Name of the RADIUS attribute to use for distributing requests under the 'hash' algorithm. Must be an IP address attribute. | | | [retries](#Link176) | [**retryType**](#Link1A) | optional | 3 |  | |  | | --- | | documentation | | Number of retries to perform when sending to this server group. | | | [timeout](#Link177) | [**timeoutType**](#Link1C) | optional | 5000 |  | |  | | --- | | documentation | | Request timeout time in milliseconds for requests to this group. | | | [fire-and-forget](#Link178) | **xs:boolean** | optional | false |  | |  | | --- | | documentation | | Enabled fire and forget behaviour where RRC is not expecting to receive an acknowledgement to accounting packets. | | |
| annotation | |  | | --- | | documentation | | Declaration of a RADIUS server group. These are only required to declare destinations to which RRC will send RADIUS packets. Each groups declares one or more RADIUS servers, and the algorithm used to select between them. | |

attribute **radius-group/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS server group. Used to reference the group in, for example, proxy statements. | |

attribute **radius-group/@selector**

|  |  |
| --- | --- |
| type | [**radiusSelectorType**](#Link18) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | sequential | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | sequential | |  | | --- | | documentation | | For each packet, works through the configured servers from the start if the list until a working server is found. No state is maintained between packets. | | | enumeration | round-robin | |  | | --- | | documentation | | Passes the packet to the next server in sequence. Remembers the last used server between packets. | | | enumeration | roundrobin | |  | | --- | | documentation | | Passes the packet to the next server in sequence. Remembers the last used server between packets. | | | enumeration | hash | |  | | --- | | documentation | | For each packet, generates a hash value from the specified attribute (Framed-IP-Address by default( and distributes the hash values across the configured (and available) servers. Produces a consistent distribution of packets based on the hashed attribute. | | | enumeration | random | |  | | --- | | documentation | | For each packet, picks a random server from the list. If the request times out, a new random selection is made. No state is maintained between packets. | | |
| annotation | |  | | --- | | documentation | | Selection algorithm for determining how RADIUS packets are distributed across the available RADIUS servers. | |

attribute **radius-group/@hash-attribute**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | Framed-IP-Address | | use | optional | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS attribute to use for distributing requests under the 'hash' algorithm. Must be an IP address attribute. | |

attribute **radius-group/@retries**

|  |  |
| --- | --- |
| type | [**retryType**](#Link1A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 3 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 20 |  | |
| annotation | |  | | --- | | documentation | | Number of retries to perform when sending to this server group. | |

attribute **radius-group/@timeout**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 5000 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Request timeout time in milliseconds for requests to this group. | |

attribute **radius-group/@fire-and-forget**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | false | | use | optional | |
| annotation | |  | | --- | | documentation | | Enabled fire and forget behaviour where RRC is not expecting to receive an acknowledgement to accounting packets. | |

### element radius-group/server

|  |  |
| --- | --- |
| diagram |  |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 1 | | maxOcc | unbounded | | content | simple | |
| annotation | |  | | --- | | documentation | | Name of a RADIUS server, or RADIUS group to include in this radius group. The server or group must have been declared before this group. | |

## complexType radius-log

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/log-radius-packet**](#LinkC5) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [logger](#LinkED) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Name of the logger to use when dumping the packet contents. Defaults to the standard logging stream. | | | [level](#LinkEE) | [**logLevel**](#Link10) | optional |  |  | |  | | --- | | documentation | | Level at which the packet should be logged. Defaults to 'info'. | | |
| annotation | |  | | --- | | documentation | | Dumps a RADIUS packet to the specified logger. Default is to log to the default log file. | |

attribute **radius-log/@logger**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Name of the logger to use when dumping the packet contents. Defaults to the standard logging stream. | |

attribute **radius-log/@level**

|  |  |
| --- | --- |
| type | [**logLevel**](#Link10) |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | trace |  | | enumeration | debug |  | | enumeration | info |  | | enumeration | warn |  | | enumeration | warning |  | | enumeration | error |  | |
| annotation | |  | | --- | | documentation | | Level at which the packet should be logged. Defaults to 'info'. | |

## complexType radius-remove

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/radius-remove**](#LinkC3) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkE9) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | | [value](#LinkEA) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkEB) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Remove a RADIUS attribute from the packet.  If an attribute of the specified name exists, and its value matches the regex (if specified), that instance of the attribute will be removed from the packet. | |

attribute **radius-remove/@attr**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS attribute. | |

attribute **radius-remove/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression for the value. | |

attribute **radius-remove/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | |

## complexType radius-server

|  |  |
| --- | --- |
| diagram |  |
| children | [**ip**](#Link168) |
| used by | |  |  | | --- | --- | | element | [**radius/radius-server**](#Link67) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link169) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of this RADIUS server. This is a handle by which the RADIUS server can be referenced in RADIUS server group configurations. | | | [secret](#Link16A) | **xs:string** | required |  |  | |  | | --- | | documentation | | Shared secret for communications between RRC and the RADIUS server. | | | [auth-port](#Link16B) | **xs:unsignedShort** | optional | 1812 |  | |  | | --- | | documentation | | UDP port to which authentication packets should be directed. | | | [acct-port](#Link16C) | **xs:unsignedShort** | optional | 1813 |  | |  | | --- | | documentation | | UDP port to which accounting packets should be directed. | | | [timeout](#Link16D) | [**timeoutType**](#Link1C) | optional | 2500 |  | |  | | --- | | documentation | | Timeout in milliseconds to apply to each RADIUS request when  send to this RADIUS server. | | | [max-outstanding-requests](#Link16E) | **xs:integer** | optional | 50 |  | |  | | --- | | documentation | | The maximum number of requests that RRC will allow to be outstanding to this server. This provides a means to limit the rate at which RRC will forward requests to the server. | | | [failure-threshold](#Link16F) | [**retryType**](#Link1A) | optional | 5 |  | |  | | --- | | documentation | | The number of successive timeouts that must occur for the RADIUS server to be considered as down / failed. | | | [failure-time](#Link170) | [**timeoutType**](#Link1C) | optional | 7500 |  | |  | | --- | | documentation | | The minimum time interval (milliseconds) over which the failed responses must occur. Provides a means to de-sensitise RRC to short burts of packet loss so a RADIUS server isn't considered down due a few packets being lost. | | | [retry-probe-interval](#Link171) | [**timeoutType**](#Link1C) | optional | 30000 |  | |  | | --- | | documentation | | Time interval in milliseconds between probes to determine if the RADIUS server has recovered. Real RADIUS packets are used to perform the probe so may be delayed if the server is still down. Probably means this shouldn't be set too short. | | |
| annotation | |  | | --- | | documentation | | Declaration of a RADIUS server. A declaration is required for all RADIUS servers that RRC will interact with. | |

attribute **radius-server/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of this RADIUS server. This is a handle by which the RADIUS server can be referenced in RADIUS server group configurations. | |

attribute **radius-server/@secret**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Shared secret for communications between RRC and the RADIUS server. | |

attribute **radius-server/@auth-port**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1812 | | use | optional | |
| annotation | |  | | --- | | documentation | | UDP port to which authentication packets should be directed. | |

attribute **radius-server/@acct-port**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1813 | | use | optional | |
| annotation | |  | | --- | | documentation | | UDP port to which accounting packets should be directed. | |

attribute **radius-server/@timeout**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 2500 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Timeout in milliseconds to apply to each RADIUS request when  send to this RADIUS server. | |

attribute **radius-server/@max-outstanding-requests**

|  |  |
| --- | --- |
| type | **xs:integer** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 50 | | use | optional | |
| annotation | |  | | --- | | documentation | | The maximum number of requests that RRC will allow to be outstanding to this server. This provides a means to limit the rate at which RRC will forward requests to the server. | |

attribute **radius-server/@failure-threshold**

|  |  |
| --- | --- |
| type | [**retryType**](#Link1A) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 5 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 20 |  | |
| annotation | |  | | --- | | documentation | | The number of successive timeouts that must occur for the RADIUS server to be considered as down / failed. | |

attribute **radius-server/@failure-time**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 7500 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | The minimum time interval (milliseconds) over which the failed responses must occur. Provides a means to de-sensitise RRC to short burts of packet loss so a RADIUS server isn't considered down due a few packets being lost. | |

attribute **radius-server/@retry-probe-interval**

|  |  |
| --- | --- |
| type | [**timeoutType**](#Link1C) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 30000 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Time interval in milliseconds between probes to determine if the RADIUS server has recovered. Real RADIUS packets are used to perform the probe so may be delayed if the server is still down. Probably means this shouldn't be set too short. | |

### element radius-server/ip

|  |  |
| --- | --- |
| diagram |  |
| type | [**ipType**](#LinkE) |
| properties | |  |  | | --- | --- | | isRef | 0 | | content | simple | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3} |  | |
| annotation | |  | | --- | | documentation | | IP address of the RADIUS server. | |

## complexType radius-set

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/radius-set**](#LinkC1) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [attr](#LinkE1) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the RADIUS attribute. | | | [value](#LinkE2) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkE3) | **xs:string** | optional |  |  |  | | [csv](#LinkE4) | **xs:string** | optional |  |  |  | |
| annotation | |  | | --- | | documentation | | Set the value of a RADIUS attribute. The behaviour is to delete existing attributes and add a new attribute with the specified value. | |

attribute **radius-set/@attr**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the RADIUS attribute. | |

attribute **radius-set/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression for the value. | |

attribute **radius-set/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |

attribute **radius-set/@csv**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |

## complexType red-threshold

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | elements | [**dpi/drop-interims-thresholds**](#Link6B)[**dpi/drop-starts-thresholds**](#Link69)[**dpi/drop-stops-thresholds**](#Link6A) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [min-percent](#Link120) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill depth at which packets start to be dropped. | | | [max-percent](#Link121) | [**percent**](#Link14) | required |  |  | |  | | --- | | documentation | | Queue fill at which the likelyhood of drop becomes 100%. | | |
| annotation | |  | | --- | | documentation | | Simple linear Random Early Drop curve. | |

attribute **red-threshold/@min-percent**

|  |  |
| --- | --- |
| type | [**percent**](#Link14) |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 100 |  | |
| annotation | |  | | --- | | documentation | | Queue fill depth at which packets start to be dropped. | |

attribute **red-threshold/@max-percent**

|  |  |
| --- | --- |
| type | [**percent**](#Link14) |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 100 |  | |
| annotation | |  | | --- | | documentation | | Queue fill at which the likelyhood of drop becomes 100%. | |

## complexType remove

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**statement/remove**](#LinkB6) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkD4) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to change. | | | [value](#LinkD5) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD6) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Remove a value from a list variable. If the variable exists, any values contained that match the regular expression will be removed.  If the removal results in the variable having no value, it will be deleted (become undefined). | |

attribute **remove/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable to change. | |

attribute **remove/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression for the value. | |

attribute **remove/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | |

## complexType rule

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**ruleset/rule**](#Link106) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link179) | **xs:string** |  |  |  | |  | | --- | | documentation | | Name of the rule. | | |
| annotation | |  | | --- | | documentation | | A rule collects together a sequence of statements. | |

attribute **rule/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| annotation | |  | | --- | | documentation | | Name of the rule. | |

## complexType ruleset

|  |  |
| --- | --- |
| diagram |  |
| children | [**rule**](#Link106) |
| used by | |  |  | | --- | --- | | elements | [**dpi/ruleset**](#Link6E)[**auth-proxy-request/ruleset**](#Link107)[**auth-proxy-response/ruleset**](#Link109)[**acct-proxy/ruleset**](#Link7D) | |
| annotation | |  | | --- | | documentation | | A rule set gathers together all of the rules and logic that are applied within RRC.  Rulesets exists for handling requests in the followingg areas:  Authentication Requests Authentication Responses Accounting Requests DPI Processing | |

### element ruleset/rule

|  |  |
| --- | --- |
| diagram |  |
| type | [**rule**](#Link48) |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | unbounded | | content | complex | |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#Link179) | **xs:string** |  |  |  | |  | | --- | | documentation | | Name of the rule. | | |
| annotation | |  | | --- | | documentation | | A rule collects together a sequence of statements. | |

## complexType set

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | elements | [**statement/set**](#LinkB3)[**statement/set-if-null**](#LinkB4) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [var](#LinkCE) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable to set. | | | [value](#LinkCF) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression for the value. | | | [regex](#LinkD0) | **xs:string** | optional |  |  | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | | |
| annotation | |  | | --- | | documentation | | Set the value of a variable. | |

attribute **set/@var**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable to set. | |

attribute **set/@value**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression for the value. | |

attribute **set/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Regular expression applied to the expanded value. If the value matches, and the regular expression contains a capturing group, the value becomes the value of the first capturing group. | |

## complexType simple-string-match

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | elements | [**logicClause/contains**](#Link8C)[**logicClause/ends-with**](#Link8B)[**logicClause/starts-with**](#Link8A) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [string](#LinkA7) | **xs:string** | required |  |  | |  | | --- | | documentation | | String containing substition expressions. | | | [match](#LinkA8) | **xs:string** | required |  |  | |  | | --- | | documentation | | String expression to match against. | | | [ignore-case](#LinkA9) | **xs:boolean** | optional |  |  | |  | | --- | | documentation | | Enables case insensitive matching. | | |

attribute **simple-string-match/@string**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String containing substition expressions. | |

attribute **simple-string-match/@match**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | String expression to match against. | |

attribute **simple-string-match/@ignore-case**

|  |  |
| --- | --- |
| type | **xs:boolean** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | optional | |
| annotation | |  | | --- | | documentation | | Enables case insensitive matching. | |

## complexType statistics

|  |  |
| --- | --- |
| diagram |  |
| children | [**scale**](#Link5B)[**metric**](#Link5C) |
| used by | |  |  | | --- | --- | | element | [**rrc/statistics**](#Link51) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [port](#Link5D) | **xs:unsignedShort** | optional | 2823 |  | |  | | --- | | documentation | | Port to listen on for simple telnet access to the statistics. | | | [output-dir](#Link5E) | **xs:string** | optional | ${rrc.log.dir}/snmp |  | |  | | --- | | documentation | | Directory where the SNMP MIB files should be written. Directory must already exist. | | | [update-interval](#Link5F) | **xs:positiveInteger** | optional | 30000 |  | |  | | --- | | documentation | | Interval between updates to the SNMP MIB files. | | | [base](#Link60) | [**oidType**](#Link12) | optional | 1.3.6.1.4.1.7560.4.10.20.6 |  | |  | | --- | | documentation | | Base value of the OID used for the SNMP MIB stats. Allows shortening of the OID in each specific MIB statistics declaration. e.g. 1.3.6.1.4.1.7560.4.10.20.6 | | | [histogram-granularity](#Link61) | **xs:positiveInteger** | optional | 10 |  | |  | | --- | | documentation | | Level of granularity to use in generating histogram information on metric values. | | | [rate-estimator-window](#Link62) | **xs:positiveInteger** | optional | 10 |  | |  | | --- | | documentation | | Time interval over which RRC estimates the rate of an event occuring. | | |
| annotation | |  | | --- | | documentation | | Statistics that should be reported via the Phoenix SNMP MIB extension mechanism. | |

attribute **statistics/@port**

|  |  |
| --- | --- |
| type | **xs:unsignedShort** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 2823 | | use | optional | |
| annotation | |  | | --- | | documentation | | Port to listen on for simple telnet access to the statistics. | |

attribute **statistics/@output-dir**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | ${rrc.log.dir}/snmp | | use | optional | |
| annotation | |  | | --- | | documentation | | Directory where the SNMP MIB files should be written. Directory must already exist. | |

attribute **statistics/@update-interval**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 30000 | | use | optional | |
| annotation | |  | | --- | | documentation | | Interval between updates to the SNMP MIB files. | |

attribute **statistics/@base**

|  |  |
| --- | --- |
| type | [**oidType**](#Link12) |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 1.3.6.1.4.1.7560.4.10.20.6 | | use | optional | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]+(\.[0-9]+)\* |  | |
| annotation | |  | | --- | | documentation | | Base value of the OID used for the SNMP MIB stats. Allows shortening of the OID in each specific MIB statistics declaration. e.g. 1.3.6.1.4.1.7560.4.10.20.6 | |

attribute **statistics/@histogram-granularity**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 10 | | use | optional | |
| annotation | |  | | --- | | documentation | | Level of granularity to use in generating histogram information on metric values. | |

attribute **statistics/@rate-estimator-window**

|  |  |
| --- | --- |
| type | **xs:positiveInteger** |
| properties | |  |  | | --- | --- | | isRef | 0 | | default | 10 | | use | optional | |
| annotation | |  | | --- | | documentation | | Time interval over which RRC estimates the rate of an event occuring. | |

### element statistics/scale

|  |  |
| --- | --- |
| diagram |  |
| type | extension of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | unbounded | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [oid](#Link17A) | [**oidType**](#Link12) |  |  |  |  | |
| annotation | |  | | --- | | documentation | | Scale factor to apply to the metric value. Allows small floating point values to be reported as scaled integers. | |

attribute **statistics/scale/@oid**

|  |  |
| --- | --- |
| type | [**oidType**](#Link12) |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]+(\.[0-9]+)\* |  | |

### element statistics/metric

|  |  |
| --- | --- |
| diagram |  |
| type | extension of **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | minOcc | 0 | | maxOcc | unbounded | | content | complex | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [oid](#Link17B) | [**oidType**](#Link12) |  |  |  |  | |
| annotation | |  | | --- | | documentation | | Metric to be reported as the specified OID object. | |

attribute **statistics/metric/@oid**

|  |  |
| --- | --- |
| type | [**oidType**](#Link12) |
| properties | |  |  | | --- | --- | | isRef | 0 | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]+(\.[0-9]+)\* |  | |

## complexType then

|  |  |
| --- | --- |
| diagram |  |
| children | [**set**](#LinkB3)[**set-if-null**](#LinkB4)[**add**](#LinkB5)[**remove**](#LinkB6)[**delete**](#LinkB7)[**lookup**](#LinkB8)[**break**](#LinkB9)[**end**](#LinkBA)[**call**](#LinkBB)[**log**](#LinkBC)[**if**](#LinkBD)[**foreach**](#LinkBE)[**dump-vars**](#LinkBF)[**pause**](#LinkC0)[**radius-set**](#LinkC1)[**radius-add**](#LinkC2)[**radius-remove**](#LinkC3)[**radius-delete**](#LinkC4)[**log-radius-packet**](#LinkC5)[**copy-framed-routes**](#LinkC6)[**add-session-type**](#LinkC7)[**dpi-get-profile**](#LinkC8)[**dpi-update**](#LinkC9)[**access-accept**](#LinkCA)[**access-reject**](#LinkCB)[**proxy**](#LinkCC)[**check-reorder-discard**](#LinkCD) |
| used by | |  |  | | --- | --- | | element | [**if/then**](#LinkDC) | |
| annotation | |  | | --- | | documentation | | Statements executed as part of an 'if' statement, when the logical test returns true. | |

## complexType variable

|  |  |
| --- | --- |
| diagram |  |
| used by | |  |  | | --- | --- | | element | [**logicClause/variable**](#Link88) | |
| attributes | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Name | Type | Use | Default | Fixed | annotation | | [name](#LinkA4) | **xs:string** | required |  |  | |  | | --- | | documentation | | Name of the variable. | | | [regex](#LinkA5) | **xs:string** | required |  |  | |  | | --- | | documentation | | Literal regular expression to match against. | | |
| annotation | |  | | --- | | documentation | | Matches the value of a variable against a regular expression. Returns true if the value matches. | |

attribute **variable/@name**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Name of the variable. | |

attribute **variable/@regex**

|  |  |
| --- | --- |
| type | **xs:string** |
| properties | |  |  | | --- | --- | | isRef | 0 | | use | required | |
| annotation | |  | | --- | | documentation | | Literal regular expression to match against. | |

### simpleType hostAndPort

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | element | [**db-instance/host**](#Link117) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [a-zA-Z0-9\-\_+.]+(:[0-9]+)? |  | |
| annotation | |  | | --- | | documentation | | Hostname with an optional port number. | |

### simpleType identifier

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | element | [**database/extract-column**](#Link10E) | | attribute | [**database/param/@column**](#Link11F) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [a-zA-Z0-9\_]+ |  | |
| annotation | |  | | --- | | documentation | | Simple identifier string. | |

### simpleType ipPortType

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | element | [**e30/sle**](#Link122) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}:[0-9]+ |  | |
| annotation | |  | | --- | | documentation | | Simple type representing an IP address and a port number in the format 1.2.3.4:1812. | |

### simpleType ipSubnetType

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}(/[0-9]{1,2})? |  | |
| annotation | |  | | --- | | documentation | | Simple type representing an IP subnet address. Validated based on regular expression so can't fully validate the IP address (e.g. check the value of each octet is between 0 and 255). | |

### simpleType ipType

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | element | [**radius-server/ip**](#Link168) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3}\.[0-9]{1,3} |  | |
| annotation | |  | | --- | | documentation | | Simple type representing an IP address. Validated based on regular expression so can't fully validate the IP address (e.g. check the value of each octet is between 0 and 255). | |

### simpleType logLevel

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | attributes | [**radius-log/@level**](#LinkEE)[**log/@level**](#LinkDB) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | trace |  | | enumeration | debug |  | | enumeration | info |  | | enumeration | warn |  | | enumeration | warning |  | | enumeration | error |  | |
| annotation | |  | | --- | | documentation | | Valid log levels. | |

### simpleType oidType

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | attributes | [**statistics/@base**](#Link60)[**statistics/scale/@oid**](#Link17A)[**statistics/metric/@oid**](#Link17B) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | pattern | [0-9]+(\.[0-9]+)\* |  | |
| annotation | |  | | --- | | documentation | | Simple type representing an SNMP OID. | |

### simpleType percent

|  |  |
| --- | --- |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | base | xs:integer | |
| used by | |  |  | | --- | --- | | attributes | [**red-threshold/@max-percent**](#Link121)[**red-threshold/@min-percent**](#Link120) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 100 |  | |
| annotation | |  | | --- | | documentation | | Simple percentage. | |

### simpleType portType

|  |  |
| --- | --- |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | base | xs:integer | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 1 |  | | maxInclusive | 65535 |  | |
| annotation | |  | | --- | | documentation | | TCP / UDP port type with a sensible range restriction. | |

### simpleType radiusSelectorType

|  |  |
| --- | --- |
| type | restriction of **xs:string** |
| properties | |  |  | | --- | --- | | base | xs:string | |
| used by | |  |  | | --- | --- | | attribute | [**radius-group/@selector**](#Link174) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | enumeration | sequential | |  | | --- | | documentation | | For each packet, works through the configured servers from the start if the list until a working server is found. No state is maintained between packets. | | | enumeration | round-robin | |  | | --- | | documentation | | Passes the packet to the next server in sequence. Remembers the last used server between packets. | | | enumeration | roundrobin | |  | | --- | | documentation | | Passes the packet to the next server in sequence. Remembers the last used server between packets. | | | enumeration | hash | |  | | --- | | documentation | | For each packet, generates a hash value from the specified attribute (Framed-IP-Address by default( and distributes the hash values across the configured (and available) servers. Produces a consistent distribution of packets based on the hashed attribute. | | | enumeration | random | |  | | --- | | documentation | | For each packet, picks a random server from the list. If the request times out, a new random selection is made. No state is maintained between packets. | | |
| annotation | |  | | --- | | documentation | | Defines the different types of load balancing algorithm that may be used to distribute RADIUS packets across the members of a radius-server-group. | |

### simpleType retryType

|  |  |
| --- | --- |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | base | xs:integer | |
| used by | |  |  | | --- | --- | | attributes | [**e100/cm/@fail-threshold**](#Link139)[**e100/sm/@fail-threshold**](#Link144)[**radius-server/@failure-threshold**](#Link16F)[**radius-group/@retries**](#Link176) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 0 |  | | maxInclusive | 20 |  | |
| annotation | |  | | --- | | documentation | | Retry count for a RADIUS retransmission with a sensible range restriction. | |

### simpleType timeoutType

|  |  |
| --- | --- |
| type | restriction of **xs:integer** |
| properties | |  |  | | --- | --- | | base | xs:integer | |
| used by | |  |  | | --- | --- | | elements | [**db-instance/connect-timeout**](#Link11C)[**ldap/connect-timeout**](#Link156)[**database/probe-interval**](#Link113)[**ldap/probe-interval**](#Link15C)[**db-instance/query-timeout**](#Link11D)[**ldap/read-timeout**](#Link157) | | attributes | [**e100/sm/@busy-timeout**](#Link146)[**e100/cm/@fail-time**](#Link13A)[**e100/sm/@fail-time**](#Link145)[**radius-server/@failure-time**](#Link170)[**radius-server/@retry-probe-interval**](#Link171)[**radius-server/@timeout**](#Link16D)[**radius-group/@timeout**](#Link177) | |
| facets | |  |  |  | | --- | --- | --- | | Kind | Value | annotation | | minInclusive | 10 |  | | maxInclusive | 60000 |  | |
| annotation | |  | | --- | | documentation | | Timeout type in milliseconds with a sensible range restriction. | |