BT Internal

ISP Networks

RRC Release Statement 4.18

Chris Burrows
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1 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 forwrding of authentictation and accounting as a RADIUS proxy, and session lifecycle managemt 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;

2 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 startup to determine its configuration.

- Integration with Java JMX management framework
  RRC publishes performance statistics and counters via the Java Managament Extensions (JMX) framework allowing remote monitoring by any JMX compliant client (e.g. jconsole or jvisualvm).

- Export of internal metrics via the GRAPHITE statistics protocol to en external server.

- 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.

3 Release Details

3.1 Release Number

Release Version Number	**RRC-4.18**
Included E100 WSDL	**V2.2.1**
RADIUS Library Version	**1.16**
Simple Logger Library Version	**1.13**
RADIUS Rules Library Version	**1.5**
Statistics Monitor Library Version	**1.7**
Lib RTMAN	**1.11**
Distribution File	**RRC-4.18.jar**

3.2 Build Environment

Development Operating System	**Linux**
Java Development Kit	**Sun J2SE7.0 (Jdk 1.7.0_75)**
Development Tools	**NetBeans 8.2**

3.3 Installation Dependencies

Java environment	The RRC application should run on any version of Sun Java 2 later than J2SE7.0 (jre1.7.0).
Ellacoya SLE	**Not Supported**
Ellacoya E100 Compatibility	**8.3.8 or later Solaris** **9.0 Appliance** **9.1 Appliance** **9.2 Appliance**

3.4 Installation Instructions

Installation of version 4 requires a compete new set of configuration files to be installed. No automatic migration of the existing configuration is possible.

Version 4 should be installed into a new empty directory, and not installed over the top of a version earlier than 4.0. If installation over the top of a previous 4.x release, the “lib” and “net” subdirectories should be removed prior to unpacking the new version.

1. Stop any running version of RRC
   ```
   sh /etc/init.d/rrc stop
   ```
2. Create a new installation directory:
   ```
   mkdir /opt/rrc4
   ```
3. Install the new version
   ```
   cd /opt/rrc4
   unzip –x RRC-4.17.jar
   sh bin/install
   ```
4. Install configuration files and edit to suit. Example configuration files are included in the etc/example directory.
5. Start the new version
   ```
   sh /etc/init.d/rrc start
   ```

3.5 Upgrade Notes

Version 4.17 introduces the requirement for an additional configuration file that defines some variable
describing the deployment environment. These are required to configure the correct server address f
performance metrics to be exported, and also the prefix to be applied to the generated metric names.

The file must be created as "…/etc/environment.sh" and example files are distributed under "…/etc/examples/environment-*.sh". Example contents are also shown below; the value for **GRAPHITE_HOST** must be adjusted to suit the deployment environment. Deployments other than with
BT Retail RAN/RSN environment will also require the **GRAPHITE_PREFIX** value to be set appropriately.

RRC will not start unless this file is in place.

```
#
# Environment settings file for RRC
#
# Assumes the script will be included into a /bin/bash script.

# set our HOSTNAME
HOSTNAME=$(uname -n | awk -F. '{print $1}' | tr A-Z a-z)

# Graphite metrics collection
GRAPHITE_HOST="217.32.108.178"
GRAPHITE_PORT=2003
GRAPHITE_PREFIX="tso.tso.apa.${HOSTNAME}.server.linux.stats.rrc"
GRAPHITE_TIMEOUT="5000"
```

4 New Features

4.1 New Features in Release 4.18

Number	Description
N/A	None

4.2 New Features in Release 4.17

Number	Description
Mantis #0000506	Increased the size of the UDP input buffer to better accommodate packets received during garbage collection pauses.
Mantis #0000529	Some aspects of RRC run-time configuration should be setup via a separate "environment" settings file

4.3 New Features in Release 4.16

Number	Description
Mantis #0000484	A number of RADIUS attributes seen in live are not understood by RRC. RRC updated to latest available dictionary.
Mantis #0000486	Framed-Routes in accounting packets are received without a next hop

4.4 New Features in Release 4.15

Number	Description
Mantis #0000445	Add support for logging RADIUS packet in binary format
Mantis #0000473	RRC doesn't allow the size of the destination RADIUS server request queue to be configured
Mantis #0000474	RRC can implement outstanding request limiting in proxy mode but doesn't record any statistics
Mantis #0000475	RRC default has no limit on the outstanding proxy request count

4.5 New Features in Release 4.14

Number	Description
Mantis #0000434	Added support for packing / unpacking multiple Class attributes into a single Class attribute to support non RFC compliant BRAS
Mantis #0000421	Removed support for Ellacoya e30 platform

4.6 New Features in Release 4.13

Number	Description
Mantis #0000333	Add support for read / write tables to give access to persistent data that may be modified
Mantis #0000337	Add support for external lookups to a RESTful web service

Number	Description
Mantis #0000330	RRC would benefit from having a file based IP-subnet lookup map to do fast IP lookups

4.7 New Features in Release 4.12

Number	Description
Mantis #0000310	RRC's single queue request queue counts "deferred" requests, but doesn't actually publish the value via JMX

4.8 New Features in Release 4.11

Number	Description
Mantis #0000303	RRC should add to Acct-Delay-Time for time spent on queue. This feature can be enabled on a per-server basis by setting the “update-acct-delay-time” attribute on a <proxy-server> element to “true”; the default behaviour is to not update the Acct-Delay-Time.

4.9 New Features in Release 4.10

Number	Description
Mantis #0000299	The command line client allows the timeout to be specified, but is limited to whole seconds

4.10 New Features in Release 4.9

Number	Description
	None

4.11 New Features in Release 4.8

Number	Description
	None

4.12 New Features in Release 4.7

Number	Description
	None

4.13 New Features in Release 4.6

Number	Description
	None

4.14 New Features in Release 4.5

Number	Description
Mantis #0000272	RRC now publishes statistics for file based lookups.

Number	Description
Mantis #0000276	Impact of SM pauses is very high due to the way RRC schedules requests across worker threadsDescriptionRRC currently maintains a fixed size pool of worker threads to handle DPI processing. Incoming accounting requests are distributed to the worker threads by hashing the Framed-IP-Address attribute. This produces a model with 'n' sequential queues (when 'n' is the configured number of worker threads). If a worker thread is delayed by a slow SM response, all requests in the same queue will be delayed similarly - this delay can accumulate if multiple delays occur. RRC could schedule request more intelligently across worker threads while maintaining the deisgn goal of handling requests for the same Framed-IP-Address sequentially.

4.15 New Features in Release 4.4

Number	Description
	None

4.16 New Features in Release 4.3

Number	Description
	None

4.17 New Features in Release 4.2

Number	Description
Mantis #0000073	RRC configuration checker / test mode

4.18 New Features in Release 4.1

Number	Description
Mantis #0000251	Addition of an equals logical operation.
Mantis #0000253	Addition of logical operations to allow numeric comparisons including less-than, less-than-equals, greater-then and greater-than-equals

4.19 New Features in Release 4.0

Number	Description
Mantis #0000247	Support for auto-detection of the Arbor SOAP endpint – version auto-detection.
Mantis #0000233	Enhanced rules engine to control the configuration
Mantis #0000232	XML based configuration
Mantis #0000245	Support for Arbor 9.2 interface and WSDL
Mantis #0000231	Support for Arbor 9.2 optional products

5 Problems Resolved

5.1 Problems Resolved in Release 4.18

Number	Description
Mantis #0000577	Access-Reject statement doesn't work in the auth-response ruleset.

5.2 Problems Resolved in Release 4.17

Number	Description
Mantis #0000515	The deleted state of a RADIUS request property is lost when request properties are copied for <proxy> statement
Mantis #0000523	Thread Pool Listener convenience class should support random dropping for packets to control load
Mantis #0000528	RADIUS variable expansion for VSA matches wrong Vendor ID

5.3 Problems Resolved in Release 4.16.2

Number	Description
Mantis #0000488	Client hangs / fails to exit

5.4 Problems Resolved in Release 4.16.1

Number	Description
Mantis #0000487	The generic catch all exception handler in RRC doesn't log the type of exception

5.5 Problems Resolved in Release 4.16

Number	Description
	None

5.6 Problems Resolved in Release 4.15

Number	Description
Mantis #0000469	RRC suffers from long garbage collection pauses

5.7 Problems Resolved in Release 4.14

Number	Description
Mantis #0000442	RRC suffers from long garbage collection pauses
Mantis #0000439	Auth thread dies logging an array index out of bounds error
Mantis #0000426	RRC thrashes under overload conditions
Mantis #0000422	Access accept response sent from the ruleset is sent from the wrong port when running in multi-port mode.

5.8 Problems Resolved in Release 4.13

Number	Description
Mantis #0000328	RRC ignores accounting packets with Acct-Status-Type values 7-15
Mantis #0000329	RRC can be made to run out of memory
Mantis #0000337	RRC thrashes under overload conditions

5.9 Problems Resolved in Release 4.12

Number	Description
Mantis #0000306	RRC reports an Exception: null
Mantis #0000307	RRC shows entries in the log files that indicate accounting packets being received but not processed
Mantis #0000308	When the standard products are updated in optional product mode, RRC always logs the change as the deletion of all products
Mantis #0000309	RRC logs an error during installation from the install script

5.10 Problems Resolved in Release 4.11

Number	Description
Mantis #0000304	rrc stop fails on Solaris 11. Note: although this problem has been resolved, RRC has not been fully tested on Solaris 11.

5.11 Problems Resolved in Release 4.10

Number	Description
Mantis #0000296	RRC load balancer interface spins when there is a monitored thread failure
Mantis #0000297	A Null Pointer exception is generated if an authentication response is received after the corresponding proxy state has expired

5.12 Problems Resolved in Release 4.9

Number	Description
Mantis #0000292	RRC logs authentication responses before decrypting the packet
Mantis #0000293	RRC has a race condition involving logging a packet and decrypting the attributes
Mantis #0000294	RRC executes the proxy authentication response ruleset twice for each packet received
Mantis #0000295	RRC classifies an Auth Response packet as bad if it contains more than one Tunnel-Type attribute
Mantis #0000264	Library fails to sensibly handle parsing a CSV packet string where the attribute has no value
Mantis #0000289	RADLIB fails to handle non-printing characters in StringAttributes when printing / logging their value
Mantis #0000290	RADLIB can generate a thread crash when decrypting encrypted attributes if the wrong shared secret is being used.
Mantis #0000291	RADLIB doesn't correctly implement deep copy on String attributes if the string contains non-printing characters

5.13 Problems Resolved in Release 4.8

Number	Description
Mantis #0000284	Configuration logicals <and> and <or> are broken.
Mantis #0000285	RRC maintains status of CM and SM within each connection object.
Mantis #0000286	RRC should include a retry against the second CM when fetching profile information
Mantis #0000287	RRC applies fire-and-forget functionality to authentication requests as well as accounting requests
Mantis #0000288	In check mode, RRC still starts the MIB stats server

5.14 Problems Resolved in Release 4.7

Number	Description
Mantis #0000275	RRC doesn't allow the SOAP connection and read timeout to be specified in the XML configuration. RRC currently requires the startup shell script to be modified if the connect and read timeout associated with the DPI SOAP interface need to be changed. This should be part of the XML configuration.
Mantis #0000281	RRC marks the CM and SM as failed when they're actually functioning OK. The RRC seems quite sensitive to the response times from the CM and SM and marks the CM & SM failed quite readily.
Mantis #0000282	The profile min and max age settings don't make much sense. In reality, the min / max profile age settings for caching the profile names don't make much sense. It would be better to just have a nominal refresh interval.
Mantis #0000283	RRC only ever tries to use a single SM for a given session management API call Currently, RRC will make multiple retries to complete a session management API call to the SM. The selection of SM to use is controlled entirely by the availability status of the SM. In most cases, all of the retries will be directed at the same SM. RRC could apply a last-ditch effort to the retries and for the last retry, it could direct the request to the other SM regardless of state (assuming the other SM is configured). This would help to reduce the number of events discarded due to SM problems / failures.

5.15 Problems Resolved in Release 4.6

Number	Description
Mantis #0000280	RRC attempts to use 3000 connections to secondary CM. During startup, RRC logs attempt to use 3,000 connections to secondary CM, and fails to bring up connection to secondary CM. Connectivity to the primary CM is correct and working.

5.16 Problems Resolved in Release 4.5

Number	Description
Mantis #0000271	RRC doesn't publish the 'not found' count for external LDAP queries. RRC doesn't make available via the MIB stats interface the 'not found' count for LDAP queries. The query count, cumulative lookup time and failure counts are available.
Mantis #0000273	RRC doesn't use all of the woker threads for DPI If the RRC server handling DPI activity receives it's accounting traffic from an upstream RRC server that is using HASH load balancing on the Framed-IP-Address attribute, only half the configured worker threads will be used. This is a consequence of applying the same hash function to the attribute twice.
Mantis #0000274	RRC hammers external LDAP lookup with queries if the Subscriber Managers are unavailable. RRC's current behaviour of re-queuing requests and fully re-processing them if they fail due to DPI errors causes all of the external LDAP queries to be performed again. RRC will spin the request rapidly under these conditions placing a considerable load on external systems like IISP.
Mantis #0000277	RRC doesn't setup the java endorsed mechanism correctly to override the JAX-WS versionDescriptionRRC is currently built using the JAX-WS version 2.2.1 that ships with Netbeans 6.9.1. This version is more recent than the JAX-WS version shipped at standard with the J2SE 6 environment (JAX-WS 2.0). In order for RRC to work correctly with JAX-WS 2.2.1, the java endorsed mechanism must be used to override the JAX-WS libraries from J2SE6 with the later versions.

5.17 Problems Resolved in Release 4.4

Number	Description
Mantis #0000266	RRC generates LDAP v3 queries when configured for LDAP v2
Mantis #0000268	During the API detection behaviour, the SOAP interfaces can generate un-caught exceptions due to unexpected SOAP / HTTP / TCP traffic caused by interface version mis-matches.
Mantis #0000269	RRC reports CM connection pool corruption If both CMs are unavailable, RRC starts to report an internal consistency problem with it's CM connection pool management.
Mantis #0000270	RRC can fail to start if both CMs are unavailable at startup. If neither CM is available at startup, RRC will fail to start since it waits forever attempting to get a connection pool to the CM.

5.18 Problems Resolved in Release 4.3

Number	Description
Mantis #0000263	RRC generated NullPointer exceptions in live deployment. Caused by RADIUS packets with no Framed-IP-Address attribute present.
Mantis #0000265	The LDAP connection pooling that is used to reduce TCP connection overheads and limit the load on the remote LDAP server is not working. RRC implements a limit on concurrent LDAP queries, but each query creates a new LDAP connection leading to a large number of connections.

5.19 Problems Resolved in Release 4.2

Number	Description
Mantis #0000256	RRC fails to start if <lookups> is missing
Mantis #0000258	RRC has a warning level log message left over from debg / development
Mantis #0000259	RRC allocates a Proxy-State value to each received packet that it will forward to another RADIUS server. When replicating packets and forwarding to multiple destinations, RRC is using the same value for the Proxy-State attribute in each of the forwarded requests. This leads to problems when handling the responses received from the downstream RADIUS servers.
Mantis #0000260	RRC needs to be able to coerce the upper/lower case nature of search keys for external lookups
Mantis #0000261	RRC 4.x doesn't support the notion of "current" override profile
Mantis #0000262	The <set-if-null/> statement should regard the variable being assigned as a read-write variable for reference tracing

5.20 Problems Resolved in Release 4.1

Number	Description
Mantis #0000250	If two RADIUS servers are configured with different names, the same IP addresses but different ports RRC will reject the configuratio complaining that the servers have the same IP and port numbers.
Mantis #0000252	he logical operators starts-with, ends-with and contains require the match string to be in lowercase for a case-insensitive match (the default) to work. Would probably be more appropriate if the case of the match string doesn't matter for insensitive matching. Change behaviour to make the case of the match string flexible.
Mantis #0000257	RRC allows the configuration of the LDAP protocol version to be specified in the configuration, but doesn't appear to actually set this for the LDAP transactions. Default is always version 3.

5.21 Problems Resolved in Release 4.0

Number	Description
None	

6 FreeRADIUS Dictionary

The RRC application includes the RADIUS dictionary from the FreeRADIUS distribution. This version of RRC includes the dictionary from FreeRADIUS 3.0.3.

FreeRADIUS is licensed under the GNU GENERAL PUBLIC LICENSE Version 2, June 1991, and thus the RADIUS Dictionary is covered by this license.

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