

# radsecproxy Configuration for the OpenRoaming

Rev. 20240907

## 1. Introduction

This document explains the minimum configuration of radsecproxy for setting up a RadSec endpoint of the WBA OpenRoaming. This document aims to help operators obtain the first working environment but is not intended for providing official recommendations.

The following configuration examples assume to use v1.11.0 which is the latest as of this writing. The source package is available at <https://radsecproxy.github.io/>. radsecproxy 1.9.x and older must not be used since they suffer from some critical connection issues (please see <https://github.com/radsecproxy/radsecproxy/blob/master/ChangeLog>). Please make sure that you link radsecproxy with OpenSSL 1.1.1 or newer because TLS 1.3 is required. OpenSSL 3.x is recommended.

The Open Source Software (OSS) version of radsecproxy can be used to add RadSec transport and Dynamic Peer Discovery (DPD) features to existing RADIUS IdP/proxy software. In this document, we assume the network configuration shown in Fig.1. For simplicity, we assume that both radsecproxy and the RADIUS server are running on the same host.

Throughout the document, the locations of the configuration files are relative to the configuration directory of radsecproxy unless otherwise mentioned. It would be convenient to put all configuration files in /etc/radsecproxy or create a symbolic link to the ./etc directory at the radsecproxy installation path.

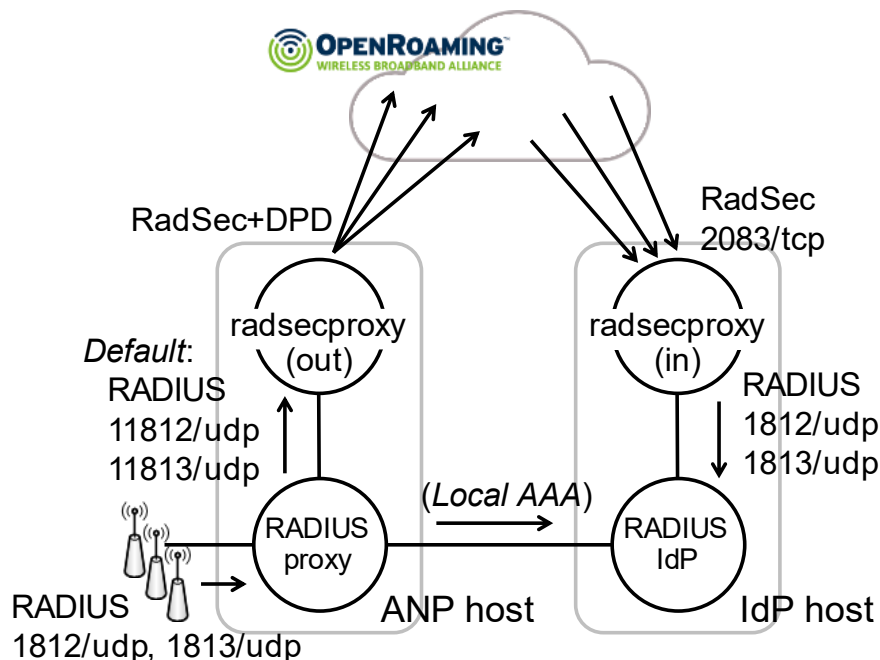


Fig.1 Using radsecproxy as a RadSec gateway for existing RADIUS IdP/proxy.

**See also:** [1] "PKI RadSec End Entity Deployment Guidelines" (WBA Members Only)

## 2. Obtaining an OpenRoaming endpoint certificate and CA/I-CA certificates

Each operator directly connecting to the OpenRoaming network needs to receive an endpoint certificate package from a certificate issuer, i.e., a WBA agent or a broker. The package contains the following certificates.

- (1) A server (IdP) certificate, a client (ANP) certificate, or a combined (IdP+ANP) certificate.
- (2) Root CA certificate, normally named as wba-root0.pem  
(was WBA\_OpenRoaming\_Root.pem).  
Root CA certificates can be found at <https://wballiance.com/openroaming/pki-repository/>
- (3) All I-CA (Intermediate CA) certificates, normally the issuer's I-CA certificate and the policy certificate named as WBA\_Policy\_CA.pem .

These certificates should be in text format. In addition, the operator should retain the key file which was generated during the CSR creation [1] and its passphrase.

Suppose an operator "example.com" receives a certificate named as example.com.cer, which is a text file. The contents can be seen by a command line as follows.

```
$ openssl x509 -noout -text -in example.com.cer
```

A new certificate chain file can be created by simply concatenating the operator's certificate and the I-CA certificates.

```
$ cat example.com.cer Issuing_CA.pem WBA_Policy_CA.pem > cert-chain.pem
```

The content of the file looks like:

```
-----BEGIN CERTIFICATE-----
<operator's certificate>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<I-CA certificate Issuing_CA.pem>
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
<I-CA certificate WBA_Policy_CA.pem>
-----END CERTIFICATE-----
```

We assume that all certificate files and the key file are stored in the radsecproxy configuration directory, e.g., /etc/radsecproxy .

Note, if the certificate and chain have been issued using WBA's Agent API, the responses may have been delivered to you using a JSON format. This means that the certificate and chain need to be reformatted back to a multi-line text format. Assuming your json certificate is in a file named "cert-json.pem", this can be achieved using the awk command:

```
$ awk '{gsub(/\n/, "\n")}' cert-json.pem > cert-text.pem
```

During the Root CA transition period, all operators should use a CA file containing both the legacy and new CA certificates. Please see section 6 for details. You may use the following command to create a combined CA file.

```
$ cat wba-root0.pem wba-root1.pem > wba-root.pem
```

### 3. Configuring radsecproxy as OpenRoaming IdP (server) gateway

The only configuration file to be edited is radsecproxy.conf. By using the following configuration example, all requests from external OpenRoaming clients (ANPs) will be forwarded to the local RADIUS server which is listening on the standard ports 1812/udp (auth) and 1813/udp (acct).

```
ListenTLS *:2083
ListenUDP *:11812          # This UDP port is for local testing purposes only.
LogThreadId on
LogLevel 3

tls OR-certs {
    CACertificateFile /etc/radsecproxy/wba-root.pem
    CertificateFile /etc/radsecproxy/cert-chain.pem
    CertificateKeyFile /etc/radsecproxy/<keyfile.key>
    CertificateKeyPassword <passphrase>
    TLSVersion TLS1_2:      # Don't miss the last colon (:).
}

client 0.0.0.0/0 {
    type tls
    tls OR-certs
    secret radsec
    CertificateNameCheck off
}
client [::]/0 {
    type tls
    tls OR-certs
    secret radsec
    CertificateNameCheck off
}

# This client block is for local testing only and may be removed on a production system.
client 127.0.0.1/32 {
    type udp
    secret testing123 # Adjust it to the local RADIUS server setting.
}

server localproxy {
    type udp
    host localhost
    secret testing123 # Adjust it to the local RADIUS server setting.
    statusServer on  # Turn it on if RADIUS server supports it.
}

server localproxy-acct {
    type udp
    host localhost
    port 1813
    secret testing123 # Adjust it to the local RADIUS server setting.
    statusServer on  # Turn it on if RADIUS server supports it.
}

realm /@.*\example\com$/ { # Fix the regex accordingly to catch all your realms here.
    server localproxy
    accountingServer localproxy-acct
    accountingResponse on
}
```

CertificateKeyPassword line can be omitted if the key file was generated without passphrase.

To test the functionality locally, try the following on the same host, using a test ID/PW pair.

```
$ radtest testID@example.com testPW localhost:11812 1 testing123
```

In addition, check that the TLS is configured correctly by using the openssl s\_client command as follows from an external host.

```
$ openssl s_client -showcerts <IP address of RadSec server>:2083
```

Once the above tests have been successful, i.e., you have received Access-Accept, you may ask an ANP outside your own network to test the authentication over the RadSec transport. Alternatively, you may set up your own ANP on an external network for testing.

Note: Some RadSec products, e.g., Cisco Spaces Connector, require EAP and may block non-EAP communication. Please see also eaopl\_test command for tests using EAP.

#### 4. Configuring radsecproxy as OpenRoaming ANP (client) gateway

The only configuration files to be edited are radsecproxy.conf and a new file naptr-openroaming.sh. By using the following configuration example, all requests from the local RADIUS proxy will be forwarded to external OpenRoaming servers (IdPs). Since the local RADIUS server is using the standard ports 1812/udp (auth) and 1813/udp (acct), shifted ports 11812/udp and 11813/udp are used in this example. The local RADIUS server needs to be configured accordingly.

[radsecproxy.conf]

```
ListenUDP *:11812
ListenUDP *:11813
LogThreadID on
LogLevel 3

tls OR-certs {
    CACertificateFile /etc/radsecproxy/wba-root.pem
    CertificateFile /etc/radsecproxy/cert-chain.pem
    CertificateKeyFile /etc/radsecproxy/<keyfile.key>
    CertificateKeyPassword <passphrase>
    TLSVersion TLS1_2:      # Don't miss the last colon (:).
}

client 127.0.0.1/32 {
    type udp
    secret testing123 # Adjust it to the local RADIUS server setting.
}

server OR-dynamic {
    type tls
    tls OR-certs
    secret radsec
```

```

certificateNameCheck off
dynamicLookupCommand /etc/radsecproxy/naptr-openroaming.sh
}

server OR-dynamic-acct {
    type tls
    tls OR-certs
    secret radsec
    certificateNameCheck off
    dynamicLookupCommand /etc/radsecproxy/naptr-openroaming.sh aaa+acct:radius.tls.tcp
}

# You may add a bypass route here for local account processing.
# (See Local AAA in Fig.1.)

realm /@.\.+\$/ { # This realm block must be placed at the end of the file.
    server OR-dynamic
    # accountingServer OR-dynamic-acct # (experimental, so far)
    accountingResponse on
    ReplyMessage "Realm not found in OpenRoaming."
}

```

CertificateKeyPassword line can be omitted if the key file was generated without passphrase.

New script file for the dynamic lookup, named `naptr-openroaming.sh`, can be created based on the example script for eduroam, `tools/naptr-eduroam.sh`, included in the `radsecproxy` source tree. The easiest way is to replace all “`x-eduroam:radius.tls`” with “`aaa+auth:radius.tls.tcp`”. However, it is recommended that you use the NAPTR lookup script provided by the WBA as it contains some extensions including 3GPP support.

Please see <https://github.com/wireless-broadband-alliance/openroaming-config> and also “Pull requests”.

Finally, it is necessary to insert RADIUS Operator-Name attribute containing your WBAID. The RADIUS proxy in Fig.1 is probably in charge of this operation. It should be like `Operator-Name=“4EXAMPLE:US”`. Please refer to the WRIX Standards documents and the OpenRoaming Standard document.

## 5. Consideration on separating the IdP and ANP radsecproxy

Some operators may adopt the OpenRoaming settled model or work as an ANP for non-OpenRoaming operators. If this is the case, care must be taken in the proxy configurations.

It is recommended to separate inbound and outbound proxies by running two `radsecproxy` instances. If the proxies were combined, inbound requests would be transferred to other operators, allowing another operator to gain false authorization without a bilateral roaming agreement, intentionally or by mistake.

For example, an inbound-only `radsecproxy` can be run by the following where `radsec-in.conf` file contains the IdP configuration only.

```
# radsecproxy -c /etc/radsecproxy/radsec-in.conf -i /var/run/radsec-in.pid
```

## 6. Transition from the legacy Root CA to new Root

WBA OpenRoaming is going to introduce a new Root CA replacing the legacy CA. All certificates will be issued based on the new trust anchor in the future. The transition commences in 2024.

During the transition period, all operators (IdPs, ANPs, and hubs) need to set both the legacy CA certificate, wba-root0 with “O=Cisco Systems, Inc.”, and the new CA certificate, wba-root1 with “O=Wireless Broadband Alliance, Inc.”, on every RadSec endpoint.

These CA certificates can be found at <https://wballiance.com/openroaming/pki-repository/>

**It is strongly recommended for all operators to install both old and new CA certificates even before new client/server certificates will be issued based on the new trust anchor.**

By adding the new CA certificate, IdPs will be able to accept connections from all peers having a new client certificate with the new trust anchor.

There may be some periods in which an ANP is still using an old client certificate while an IdP (or hub) is using a new server certificate. The ANP needs to have the new CA certificate to verify the new server certificate presented by the peer.

## 7. Firewall configuration (informational)

Because there are many RadSec clients doing the DPD on the OpenRoaming network, the source addresses of these clients cannot be determined beforehand.

The RadSec endpoint of the OpenRoaming ANP needs to have port 2083/tcp open to any hosts.

For your information, if firewalld is used on a Linux distribution, the configuration file /etc/firewalld/zones/public.xml would need an additional rule:

```
<rule family="ipv4">
  <source address="0.0.0.0/0"/>
  <port port="2083" protocol="tcp"/>
  <accept/>
</rule>
```

On Ubuntu use the command:

```
$ sudo ufw allow 2083
```

Rev. 20200817 Hideaki Goto, Cityroam/eduroam

Rev. 20200910 Hideaki Goto, Cityroam/eduroam

Rev. 20210108 Hideaki Goto, Cityroam/eduroam RadSec secret updated.

Rev. 20210409 Hideaki Goto, Cityroam/eduroam Removed ambiguities in client certificate handling.

Rev. 20210719 Hideaki Goto, Cityroam/eduroam Fixed accounting configuration. Updated firewalld rule example.

Rev. 20220107 Hideaki Goto, Cityroam/eduroam Revised for clarity. Added an explicit TLS version setting. Described a risk in IdP/ANP combined deployment.

Rev. 20220220 Hideaki Goto, Cityroam/eduroam Added some testing stuff.

Rev. 20230304 Hideaki Goto, Cityroam/eduroam	Fixed a typo.
Rev. 20230421 Hideaki Goto, Cityroam/eduroam	Fixed the issuer's name.
Rev. 20230517 Mark Grayson, Cisco	Added JSON to TEXT format command and openSSL test command.
Rev. 20230520 Hideaki Goto, Cityroam/eduroam	(merge & clean-up)
Rev. 20230714 Hideaki Goto, Cityroam/eduroam	Added WBAID. Updated radsecproxy version.
Rev. 20230810 Hideaki Goto, Cityroam/eduroam	Separated ANP / IdP in Fig.1.
Rev. 20230814 Hideaki Goto, Cityroam/eduroam	Added a bypass route to Fig.1. Added aaa+acct.
Rev. 20230908 Hideaki Goto, Cityroam/eduroam	Suppress protocol errors of "proxy failure."
Rev. 20240519 Hideaki Goto, Cityroam/eduroam	(clean-up)
Rev. 20240907 Hideaki Goto, Cityroam/eduroam	Add new trust anchor, preparing for the Root CA transition.