FlexVPN Dynamic Configuration with Local AAA Attribute Lists

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Introduction

This configuration example demonstrates how to use local Authentication, Authorization, and Accounting (AAA) attribute list in order to perform dynamic and potentially advanced configuration without the use of external Remote Authentication Dial−In User Service (RADIUS) server.

This is desired in certain scenarios, especially when rapid deployment or test is required. Such deployments are typically proof−of−concept labs, new deployment testing, or troubleshooting.

Dynamic configuration is important on the concentrator/hub side where different policies or attributes should be applied on a per−user, per−customer, per−session basis.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on, but not limited to, these software and hardware versions. This list does not outline the minimum requirements, but reflects the state of the device throughout the test phase of this feature.

Hardware

- Aggregation Services Routers (ASR) − ASR 1001 − called "bsns−asr1001−4"
- Integrated Services Routers Generation 2 (ISR G2) − 3925e − called "bsns−3925e−1"
- Integrated Services Routers Generation 2 (ISR G2) − 3945e − called "bsns−3945e−1"

Software

- Cisco IOS XE Release 3.8 − 15.3(1)S
- Cisco IOS® Software Release 15.2(4)M1 and 15.2(4)M2

Licenses

- ASR routers have the **adventerprise** and **ipsec** feature licenses enabled.
- ISR G2 routers have the **ipbasek9**, **securityk9**, and **hseck9** feature licenses enabled.

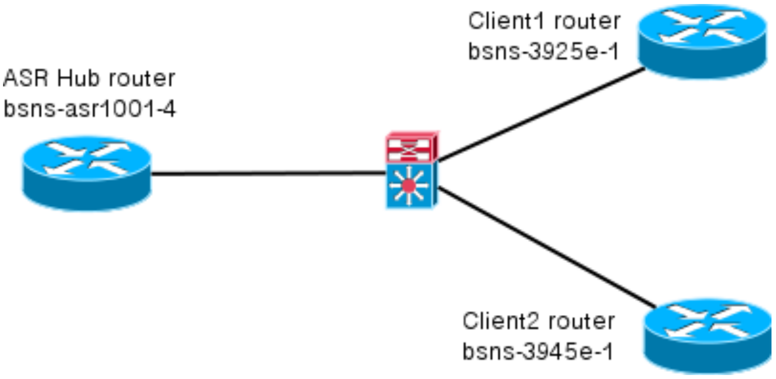
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Topology

The topology used in this exercise is basic. A hub router (ASR) and two spoke routers (ISR) are utilized, which simulate clients.



Configurations

The configurations in this document are intended to show a basic setup, with smart defaults as much as possible. For Cisco recommendations on cryptography, visit the Next Generation Encryption page on cisco.com.

Spoke Configuration

As mentioned previously, most of the actions in this documentation are performed on the hub. Spoke configuration is here for reference. In this configuration, notice that only change is identity between Client1 and Client2 (displayed in bold).

```
aaa new−model
aaa authorization network default local
aaa session−id common

crypto ikev2 keyring Flex_key
 peer Spokes
 address 0.0.0.0 0.0.0.0
 pre−shared−key local cisco
 pre−shared−key remote cisco
 !!
crypto ikev2 profile Flex_IKEv2
 match identity remote address 0.0.0.0
 identity local email Client1@cisco.com
 authentication remote pre−share
 authentication local pre−share
 keyring local Flex_key
 aaa authorization group psk list default default
 virtual−template 1

crypto logging session

crypto ipsec profile default
 set ikev2−profile Flex_IKEv2

interface Tunnel1
 ip address negotiated
 ip mtu 1400
 ip nhrp network−id 2
 ip nhrp shortcut virtual−template 1
 ip nhrp redirect
 ip tcp adjust−mss 1360
 tunnel source GigabitEthernet0/0
 tunnel destination 172.25.1.1
 tunnel path−mtu−discovery
 tunnel protection ipsec profile default

interface Virtual−Template1 type tunnel
 ip unnumbered Tunnel1
 ip mtu 1400
 ip nhrp network−id 2
 ip nhrp shortcut virtual−template 1
 ip nhrp redirect
 ip tcp adjust−mss 1360
 tunnel path−mtu−discovery
 tunnel protection ipsec profile default
```

Hub Configuration

The hub configuration is divided into two parts:

1. **Basic connectivity configuration**, which outlines the configuration needed for basic connectivity.
2. **Extended configuration**, which outlines the configuration changes needed in order to demonstrate how an administrator can use the AAA attribute list to perform per−user or per−session configuration changes.

Basic Connectivity Configuration

This configuration is for reference only and is not meant to be optimal, only functional.

The greatest limitation of this configuration is usage of pre−shared key (PSK) as the authentication method. Cisco recommends the use of certificates whenever applicable.

```
aaa new−model
aaa authorization network default local

aaa session−id common
crypto ikev2 authorization policy default
 pool FlexSpokes
 route set interface

crypto ikev2 keyring Flex_key
 peer Spokes
 address 0.0.0.0 0.0.0.0
 pre−shared−key local cisco
 pre−shared−key remote cisco
 !!
 peer Client1
 identity email Client1@cisco.com
 pre−shared−key cisco
 !!
 peer Client2
 identity email Client2@cisco.com
 pre−shared−key cisco

crypto ikev2 profile Flex_IKEv2
 match fvrf any
 match identity remote address 0.0.0.0
 match identity remote email domain cisco.com
 authentication remote pre−share
 authentication local pre−share
 keyring local Flex_key
 aaa authorization group psk list default default
 virtual−template 1

no crypto ikev2 http−url cert

crypto logging session

crypto ipsec profile default
 set ikev2−profile Flex_IKEv2

interface Virtual−Template1 type tunnel
 vrf forwarding IVRF
 ip unnumbered Loopback100
 ip mtu 1400
 ip nhrp network−id 2
 ip nhrp redirect
 ip tcp adjust−mss 1360
 tunnel path−mtu−discovery
 tunnel vrf INTERNET
 tunnel protection ipsec profile default
```

Extended Configuration

There are a few things needed to assign AAA attributes to a particular session. This example shows complete work for client1; then it shows how to add another client/user.

Extended Hub Configuration for Client1

1. Define a AAA attribute list.

   ```
   aaa attribute list Client1
    attribute type interface−config "ip mtu 1300" protocol ip
    attribute type interface−config "service−policy output TEST" protocol ip
   ```

   Note: Remember that the entity assigned via attributes must exist locally. In this case, **policy−map** was previously configured.

   ```
   policy−map TEST
    class class−default
    shape average 60000
   ```
2. Assign AAA attribute list to an **authorization policy.**

   ```
   crypto ikev2 authorization policy Client1
    pool FlexSpokes
    aaa attribute list Client1
    route set interface
   ```
3. Ensure that this new policy used by the clients that connect. In this case, extract the **username** portion of the identity sent by the clients. The clients should use an email address of ClientX@cisco.com (X is 1 or 2, dependent on the client). The **mangler** splits the email address into username and domain portion and uses only one of them (username in this case) to choose the name of authorization policy.

   ```
   crypto ikev2 name−mangler GET_NAME
    email username

   crypto ikev2 profile Flex_IKEv2
    aaa authorization group psk list default name−mangler GET_NAME
   ```

   When client1 is operational, client2 can be added relatively easy.

Extended Hub Configuration for Client2

Ensure a policy and a separate set of attributes, if needed, exist.

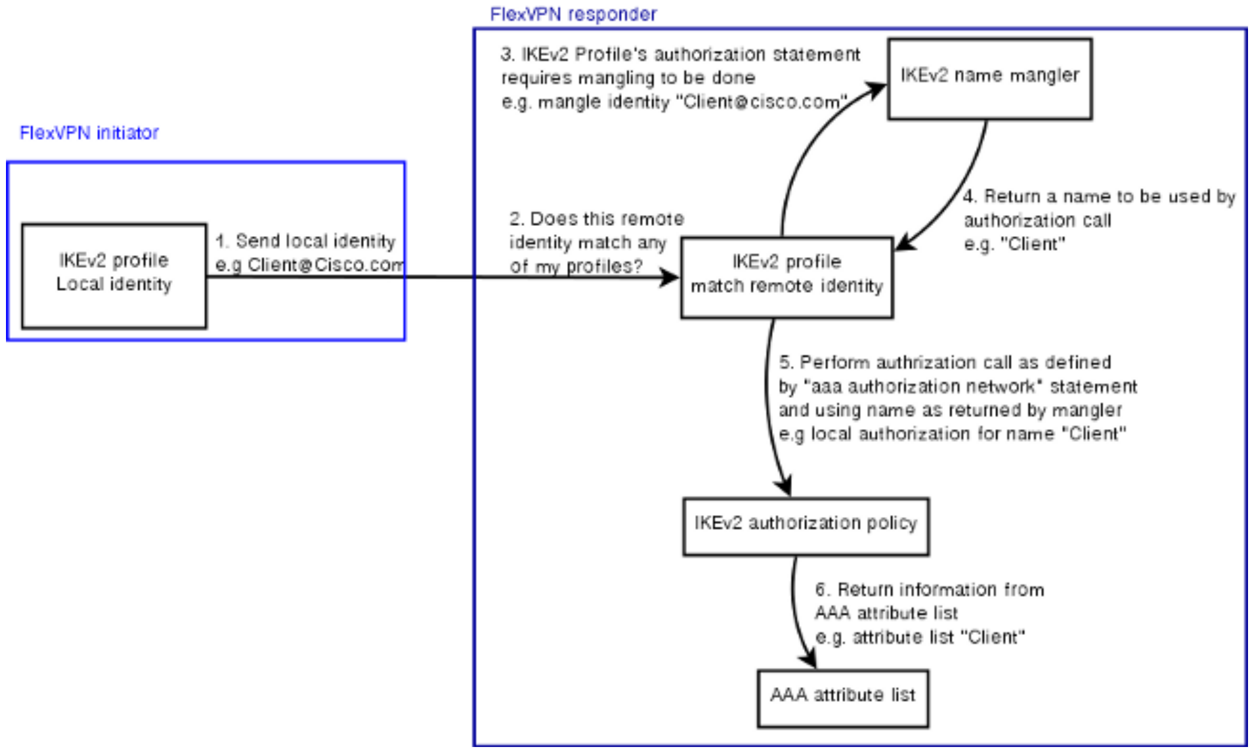
```
aaa attribute list Client2
 attribute type interface−config "ip tcp adjust−mss 1200" protocol ip
 attribute type interface−config "ip access−group 133 in" protocol ip

crypto ikev2 authorization policy Client2
 pool FlexSpokes
 aaa attribute list Client2
 route set interface
```

In this example, an updated maximum segment size (MSS) setting and an inbound access−list to operate for this client is applied. Other settings can be easily chosen. A typical setting is to assign different virtual routing and forwarding (VRF) for different clients. As mentioned earlier, any entity assigned to the attribute list, such as access−list 133 in this scenario, must already exist in the configuration.

Process Overview

This figure outlines the order of operation when AAA authorization is processed via the Internet Key Exchange version 2 (IKEv2) profile and contains information specific to this configuration example.


FlexVPN responder
3. IKEv2 Profile's authorization statement
requires mangling to be done
e.g. mangle identity "Client@cisco.com"
IKEv2 name mangler
FlexVPN initiator
4. Return a name to be used by
authorization call
e.g. "Client"
2. Does this remote
identity match any
of my profiles?
IKEv2 profile
Local identity
1. Send local identity
e.g Client@Cisco.com
IKEv2 profile
match remote identity
5. Perform authrization call as defined
by "aaa authorization network" statement
and using name as returned by mangler
e.g local authorization for name "Client"
IKEv2 authorization policy
6. Return information from
AAA attribute list
e.g. attribute list "Client"
AAA attribute list

Verification

This section shows how to verify that the settings previously assigned have been applied to the clients.

Client1

Here are the commands that verify that the maximum transmission units (MTU) settings, as well as the service policy have been applied.

```
bsns-asr1001-4#show cef int virtual-access 1
(...)
 Hardware idb is Virtual-Access1
 Fast switching type 14, interface type 21
 IP CEF switching enabled
 IP CEF switching turbo vector
 IP Null turbo vector
 VPN Forwarding table "IVRF"
 IP prefix lookup IPv4 mtrie 8-8-8-8 optimized
 Tunnel VPN Forwarding table "INTERNET" (tableid 2)
 Input fast flags 0x0, Output fast flags 0x4000
 ifindex 16(16)
 Slot unknown (4294967295) Slot unit 1 VC -1
 IP MTU 1300
 Real output interface is GigabitEthernet0/0/0

bsns-asr1001-4#show policy-map interface virtual-access1
 Virtual-Access1

Service-policy output: TEST

Class-map: class-default (match-any)
 5 packets, 620 bytes
 5 minute offered rate 0000 bps, drop rate 0000 bps
 Match: any
 Queueing
 queue limit 64 packets
 (queue depth/total drops/no−buffer drops) 0/0/0
 (pkts output/bytes output) 5/910
 shape (average) cir 60000, bc 240, be 240
 target shape rate 60000
```

Client2

Here are the commands that verify that the MSS settings have been pushed and that the access−list 133 has also been applied as an inbound filter on the equivalent virtual access interface.

```
bsns−asr1001−4#show cef int virtual−access 2
Virtual−Access2 is up (if_number 18)
 Corresponding hwidb fast_if_number 18
 Corresponding hwidb firstsw−>if_number 18
 Internet address is 0.0.0.0/0
 Unnumbered interface. Using address of Loopback100 (192.168.1.1)
 ICMP redirects are never sent
 Per packet load−sharing is disabled
 IP unicast RPF check is disabled
 Input features: Access List, TCP Adjust MSS
 (...)

bsns−asr1001−4#show ip interface virtual−access2
Virtual−Access2 is up, line protocol is up
 Interface is unnumbered. Using address of Loopback100 (192.168.1.1)
 Broadcast address is 255.255.255.255
 MTU is 1400 bytes
 Helper address is not set
 Directed broadcast forwarding is disabled
 Outgoing access list is not set
 Inbound access list is 133, default is not set
(...)
```

Debug

There are two major blocks to debug. This is useful when you need to open a TAC case and get things on track quicker.

Debug IKEv2

Begin with this major debug command:

```
debug crypto ikev2 [internal|packet]
```

Then enter these commands:

```
show crypto ikev2 sa
show crypto ipsec sa peer a.b.c.d
```

Debug AAA Attribute Assignment

If you would like to debug AAA assignment of attributes, these debugs can be helpful.

```
debug aaa authorization
debug aaa attr
debug aaa proto local
```

Conclusion

This document demonstrates how to use the AAA attribute list in order to allow added flexibility in FlexVPN deployments where the RADIUS server might not be available or is not desired. The AAA attribute list offers added configuration options on a per−session, per−group basis, if it is required.

Related Information

- **FlexVPN and Internet Key Exchange Version 2 Configuration Guide, Cisco IOS Release 15M&T**
- **Remote Authentication Dial−In User Services (RADIUS)**
- **Requests for Comments (RFCs)**
- **IPsec Negotiation/IKE Protocols**
- **Technical Support & Documentation − Cisco Systems**