

Diameter Stack Configuration Guide

USER GUIDE

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Contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 1 |
| 1.1 | Prerequisites | 1 |
| 2 | Diameter Stack Initial Configuration | 3 |
| 2.1 | Diameter Stack Initial Configuration Procedure | 3 |
| 2.2 | Configuration Examples for Diameter Connection Scenarios | 8 |
| 3 | Use Cases of Diameter Stack Update Configuration | 21 |
| 3.1 | Change HSS Deployment | 21 |
| 3.2 | Change EIR Deployment | 26 |
| 3.3 | Change DRA Deployment | 26 |
| 3.4 | Change the Port Which IPWorks AAA Listens On | 31 |
| 4 | Diameter Stack Management Tools | 35 |
| 4.1 | How to Use Diameter Server Identification Tool | 35 |
| 4.2 | How to Use Diameter Transport Tool | 37 |
| 4.3 | How to Use Diameter Route Tool | 40 |
| | Reference List | 45 |





1 Introduction

This document describes how to configure Diameter stack initially and how to update the configuration when IPWorks AAA is already in service. Besides, some configuration examples are provided for reference.

Diameter stack supports both IPv4 and IPv6 addresses. All the examples in this document use only IPv4 addresses. The operator determines to use IPv4 or IPv6, or both addresses according to site requirement.

For general concepts about the Diameter Stack, refer to the *Diameter Stack* section in *IPWorks Configuration Management*.

1.1 Prerequisites

For Diameter Stack initial configuration, stop the IPWorks EPC AAA process if it is running:

1. Log on to the SC node.

```
# ssh <username>@<OAM IP Address>
```

2. Stop all the running IPWorks EPC AAA processes, for example, EPC AAA services are deployed in both PL-3 and PL-4.

```
SC-X # ipw-ctr stop aaa_diameter PL-3
```

```
SC-X # ipw-ctr stop aaa_diameter PL-4
```

3. If SCTP transport is used, configure SS7 stack to create SCTP FE, refer to section **Configuring SS7 for Diameter over SCTP** in *Configure SS7 for AAA* or according to different IPWorks deployment scenario.

Figure 1 illustrates the protocol stack for IPWorks AAA:

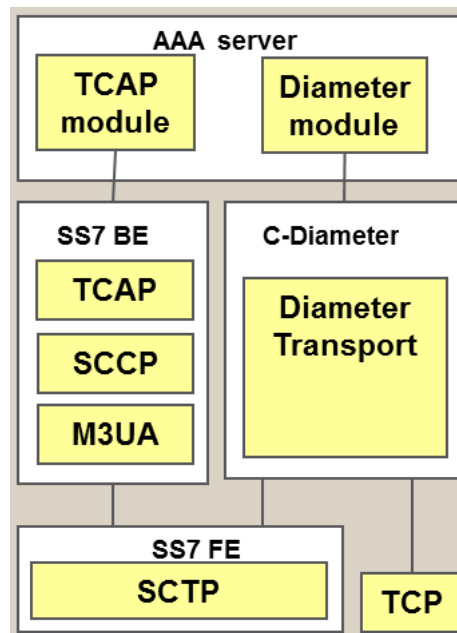


Figure 1 IPWorks AAA Protocol Stack Overview

Personal Prerequisites

The personal must have good knowledge in:

- Concepts in Diameter skills.
- Concepts, terminologies, and telecommunication abbreviations, such as TCP/IP, PDN (Public Data Network).
- Linux
- CBA Architecture



2 Diameter Stack Initial Configuration

This section provides the following topics:

- Section 2.1 Diameter Stack Initial Configuration Procedure on page 3, it describes how to use the Diameter Stack management tools to perform initial configuration for the Diameter Stack.
- Section 2.2 Configuration Examples for Diameter Connection Scenarios on page 8, it provides examples for typical Diameter connection scenarios.

2.1 Diameter Stack Initial Configuration Procedure

This section describes how to configure the Diameter Stack initially, which includes:

- Section 2.1.1 Configure Diameter Server Identification on page 3
- Section 2.1.2 Configure Diameter Transport on page 4
- Section 2.1.3 Configure Diameter Route on page 5

The Diameter Stack management tools are used on SC node. For details about these tools, see Section 4 on page 35.

2.1.1 Configure Diameter Server Identification

The Diameter server identification consists of origin host, origin realm, host IP address, and product name that are used for Diameter Capabilities Exchange messages (CER/CEA messages).

1. Initialize the Diameter Stack configuration.

```
# dia-identity-ctr --cmd initial
```

Prompt information is shown as below:

```
"Do you want to cleanup all the information of diameter identity
Please type 'Yes' or 'No' to continue: Yes"
```

2. Configure Diameter server identification.

```
# dia-identity-ctr --cmd add --origin-host "<AAA Host>"
--origin-realm "<AAA Realm>" --host-ip-address "[<AAA
Traffic Address>]" --product-name "<AAA Product Name>"
```



For more information about the command, see Section 4.1 How to Use Diameter Server Identification Tool on page 35.

For example:

```
# dia-identity-ctr --cmd add --origin-host "PL-3.ipworks.com" --origin-realm "ipworks.com"
--host-ip-address "[192.168.20.13]" --product-name
"IPWorksAAADiameterServer"
```

When SCTP multi-homing is used, more than one Host IP addresses need to be configured:

```
# dia-identity-ctr --cmd add --origin-host "PL-3.ipworks.com" --origin-realm "ipworks.com" --host-ip-address
"[192.168.20.13, 192.168.20.15]" --product-name
"IPWorksAAADiameterServer"
```

2.1.2 Configure Diameter Transport

IPWorks AAA supports TCP or SCTP transport. When IPWorks AAA plays the Diameter server role, the transport is configured to accept connections from HSGW, ePDG, PGW, and DRA. When IPWorks AAA plays the Diameter client role, the transport is configured to connect to HSS.

- To configure a transport to accept connections from HSGW, ePDG, PGW, and DRA:

```
# dia-transport-ctr --cmd add --local "[<AAA Traffic IP>]:<AAA Listening Port>" --mode <TCP/SCTP>
```

For more information about the command, see Section 4.2 How to Use Diameter Transport Tool on page 37.

For example:

- To configure a TCP transport:

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:3868" --mode TCP
```

- To configure an SCTP transport:

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:3868" --mode SCTP
```

When SCTP multi-homing is used, more than one *<AAA traffic IP>* need to be configured:

```
# dia-transport-ctr --cmd add --local "[192.168.20.13, 192.168.20.15]:3868" --mode SCTP
```


**Note:**

- It is recommended that multi-connections to AAA server can be established by the remote nodes (HSGW, ePDG, PGW, or DRA).
- It is recommended that the connection number equals to the multiples of the number of Pay Load which deployed with EPC AAA. So, the traffic can be load share between each Pay Load.
- EPC AAA supports TCP or SCTP transport. If SCTP transport is selected, it supports two multi-homing IP address for EPC AAA and remote nodes.
- To configure a transport to connect to remote peer, such as HSS:

```
# dia-transport-ctr --cmd add --local "[<AAA Traffic
IP>]:0" --remote "[<Peer Traffic IP>]:<Peer Listening
Port>" --mode <TCP/SCTP>
```

For example:

- To configure a TCP transport:

```
# dia-transport-ctr --cmd add --local "[192.168.20.1
3]:0" --remote "[192.168.20.1]:3869" --mode TCP
```

- To configure an SCTP transport:

```
# dia-transport-ctr --cmd add --local "[192.168.20.1
3]:0" --remote "[192.168.20.1]:3869" --mode SCTP
```

When SCTP multi-homing is used, more than one *<AAA traffic IP>* and *<HSS Traffic IP>* need to be configured:

```
# dia-transport-ctr --cmd add --local "[192.168.2
0.13, 192.168.20.15]:0" --remote "[192.168.20.1,
192.168.20.2]:3869" --mode SCTP
```

- To configure more transport to remote peer for other feature, such as EIR in case of **IMEI CHECK** feature is enabled:

This configuration steps are the same as the steps for HSS and HSS IP. Only the ports must be modified according to EIR IP and port.

2.1.3 Configure Diameter Route

Note: The Diameter route configuration is required only when DRA is used or IPWorks AAA is direct connection with multiple HSS and EIR.

The Diameter route table contains Application ID, Destination information (Destination Host and Realm), and Diameter peer. Application ID and Destination information are used as the match condition.



Configure Diameter Route with One Peer

Table 1 is an example of a Diameter route table that one peer is selected for the match condition.

Table 1 Route Table Example 1

| Match Condition | | | Selected Peer | |
|-----------------|------------------|-------------------|---------------|------------|
| Application ID | Destination Host | Destination Realm | Peer Host | Peer Realm |
| SWx (16777 265) | * | hss.com | hss1.hss.com | hss.com |
| SWm (16777 264) | * | * | dra1.dra.com | dra.com |
| S13 (167772 52) | * | eir.com | eir1.eir.com | eir.com |

As Table 1 shows, when IPWorks AAA sends out a Diameter request message:

- The message with Application ID (SWx) and Destination-Realm (hss.com) are sent to the peer with host (hss1.hss.com) and realm (hss.com).
- The message with Application ID (SWm) is sent to the peer with host (dra1.dra.com) and realm (dra.com).
- The message with Application ID (S13) and Destination-Realm (eir.com) are sent to the peer with host (eir1.eir.com) and realm (eir.com).

To configure Diameter route based on Table 1, do the following:

```
# dia-route-ctr --cmd add --app "SWx" --dest "[*],hss.com"
--peer "[hss1.hss.com], hss.com"
```

```
# dia-route-ctr --cmd add --app "SWm" --dest "*" --peer
"[dra1.dra.com], dra.com"
```

The following configuration is applicable for **IMEI Check** feature:

```
# dia-route-ctr --cmd add --app "S13" --dest "[*],eir.com"
--peer "[eir1.eir.com], eir.com"
```

For more information about the command, see Section 4.3 How to Use Diameter Route Tool on page 40.

Configure Diameter Route with Two or More Peers

If two or more peers are selected for the match condition, the operator needs to decide which redundancy mode is used for the selected peers.



Table 2 is an example of a Diameter route table that two peers are selected for the match condition.

Table 2 Route Table Example 2

| Match Condition | | | Selected Peer | | |
|-----------------|------------------|-------------------|---------------|------------|-----------------|
| Application ID | Destination Host | Destination Realm | Peer Host | Peer Realm | Redundancy Mode |
| SWx (16777265) | * | hss.com | hss1.hss.com | hss.com | Failover |
| SWx (16777265) | * | hss.com | hss2.hss.com | hss.com | |
| S13 (1677252) | * | eir.com | eir1.eir.com | eir.com | Failover |
| S13 (1677252) | * | eir.com | eir2.eir.com | eir.com | |
| SWm (16777264) | * | * | dra1.dra.com | dra.com | Load sharing |
| SWm (16777264) | * | * | dra2.dra.com | dra.com | |

As Table 2 shows, when IPWorks AAA sends out a Diameter request message:

- For the message with Application ID (SWx) and Destination-Realm (hss.com), there are two selected peers (hss1.hss.com and hss2.hss.com).
- For the message with Application ID (S13) and Destination-Realm (eir.com), there are two selected peers (eir1.eir.com and eir2.eir.com). These two pairs of peers work in failover mode separately.
- For the message with Application ID (SWm), there are two selected peers (dra1.dra.com and dra2.dra.com). These two peers work in load sharing mode.

To configure Diameter route based on Table 2 , do the following:

- Two selected peers work in failover mode:

```
# dia-route-ctr --cmd add --app "SWx" --dest "[*], hss.com" --peer "[hss1.hss.com], hss.com"
```

```
# dia-route-ctr --cmd add --app "SWx" --dest "[*], hss.com" --peer "[hss2.hss.com], hss.com"
```

S13 is only applicable in **IMEI Check** feature:

```
# dia-route-ctr --cmd add --app "S13" --dest "[*], eir.com" --peer "[eir1.eir.com], eir.com"
```



```
# dia-route-ctr --cmd add --app "S13" --dest "[*],  
eir.com" --peer "[eir2.eir.com], eir.com"
```

List the route table:

```
# dia-route-ctr --cmd list  
  
-----  
id:          1  
app:         SWx  
dest:        host = *, realm = hss.com  
peer:        host = ['hss1.hss.com'], realm = hss.com  
priority:    1  
-----  
id:          2  
app:         SWx  
dest:        host = *, realm = hss.com  
peer:        host = ['hss2.hss.com'], realm = hss.com  
priority:    2
```

Note: The former configured route has a higher priority. In this example, the route to peer (hss1.hss.com) is configured before peer (hss2.hss.com), so the route to peer (hss1.hss.com) has a higher priority.

- Two selected peers work in load sharing mode:

```
# dia-route-ctr --cmd add --app "SWm" --dest "*" --peer  
"[dra1.dra.com, dra2.dra.com], dra.com"
```

```
# dia-route-ctr --cmd list
```

```
-----  
id:          1  
app:         SWm  
dest:        *  
peer:        host = ['dra1.dra.com', 'dra2.dra.com'], realm = dra.co  
priority:    1
```

2.2 Configuration Examples for Diameter Connection Scenarios

Table 3 lists the configuration examples for typical Diameter connection scenarios.



Table 3 Diameter Connection Scenarios

| Scenario | Transport Layer Type | Redundancy Mode | Procedures |
|----------------|---|-----------------|---|
| Single HSS | <ul style="list-style-type: none"> • TCP • SCTP Multi-homing is used. | - | Section 2.2.1 HSS on page 9 |
| Single EIR | <ul style="list-style-type: none"> • TCP • SCTP Multi-homing is used. | - | Section 2.2.2.1 Single EIR on page 13 |
| HSS Redundancy | TCP | failover | Section 2.2.1.2 HSS Redundancy on page 11 |
| EIR Redundancy | EIR Redundancy | failover | Section 2.2.2.2 EIR Redundancy on page 14 |
| DRA | SCTP | load sharing | Section 2.2.3 Diameter Routing Agent on page 15 |

2.2.1 HSS

2.2.1.1 Single HSS

In this scenario (shown in Figure 2), IPWorks AAA opens a listen port and accepts TCP or SCTP connections from HSGW, ePDG, and PGW. IPWorks AAA connects to HSS via TCP or SCTP transport. And SCTP multi-homing is used.

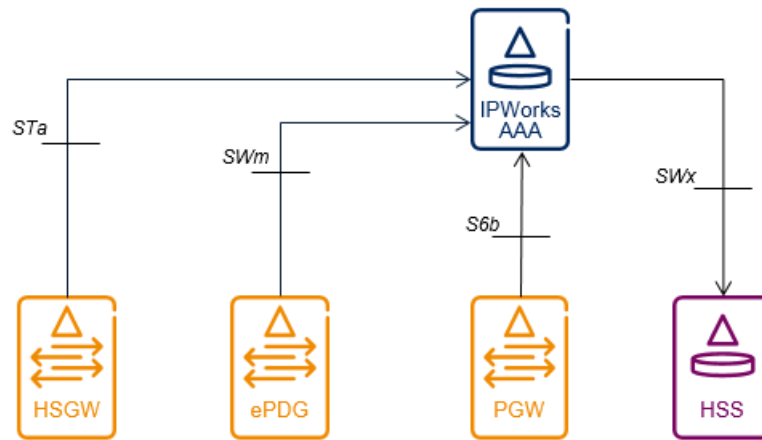


Figure 2 Single HSS

Table 4 lists the presupposition values for the example:

Table 4 Presupposition Values for Single HSS

| Attribute | IPWorks AAA | HSS |
|----------------|--------------------------------|------------------------------|
| Host | aaa1.aaa.com | hss1.hss.com |
| Realm | aaa.com | hss.com |
| Traffic IP | 192.168.20.13 192.168.20.14 | 192.168.20.1 192.168.20.2 |
| Listening Port | 3868 | 3869 |
| Product Name | IPWorksAAADiameterServer | * |

To configure Diameter stack in this scenario, do the following:

1. Configure Diameter server identification.

```
# dia-identity-ctr --cmd initial
```

Prompt information is shown as below:

```
Do you want to cleanup all the information of diameter
identity, transport and route? Please type 'Yes' or
'No' to continue: Yes
```

```
# dia-identity-ctr --cmd add --origin-host "aaa1.a
aa.com" --origin-realm "aaa.com" --host-ip-address
"[192.168.20.13,192.168.20.14]" --product-name
"IPWorksAAADiameterServer"
```

2. Configure Diameter transport.



- a. Configure TCP or SCTP transport to accept connections from HSGW, ePDG, or PGW.

```
# dia-transport-ctr --cmd add --local
" [192.168.20.13]:3868" --mode TCP
```

```
# dia-transport-ctr --cmd add --local
" [192.168.20.13, 192.168.20.14]:3868" --mode SCTP
```

- b. Configure TCP or SCTP transport to connect with HSS.

```
# dia-transport-ctr --cmd add --local "[192.168.
20.13]:0" --remote "[192.168.20.1]:3869" --mode
TCP
```

```
# dia-transport-ctr --cmd add --local
" [192.168.20.13, 192.168.20.14]:0" --remote
" [192.168.20.1, 192.168.20.2]:3869" --mode SCTP
```

3. Configure SS7 stack to create SCTP FE, refer to the section **Configuring SS7 for Diameter over SCTP** in *Configure SS7 for AAA*.

2.2.1.2

HSS Redundancy

In this scenario (as shown in Section 2.2.1.2 HSS Redundancy on page 11), IPWorks AAA opens a listen port and accepts connections from HSGW, ePDG, and PGW. There are two HSS servers connected by IPWorks AAA with failover mode.

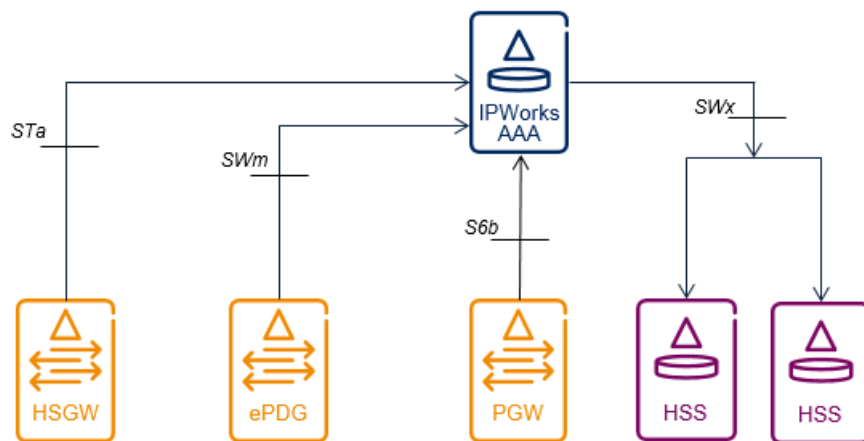


Figure 3 HSS Redundancy

Table 5 lists the presupposition values for the example:

Table 5 Presupposition Values for HSS Redundancy

| Attribute | IPWorks AAA | HSS1 | HSS2 |
|-----------|--------------|--------------|--------------|
| Host | aaa1.aaa.com | hss1.hss.com | hss2.hss.com |



| Attribute | IPWorks AAA | HSS1 | HSS2 |
|----------------|--------------------------|--------------|--------------|
| Realm | aaa.com | hss.com | hss.com |
| Traffic IP | 192.168.20.13 | 192.168.20.1 | 192.168.20.2 |
| Listening Port | 3868 | 3869 | 3869 |
| Product Name | IPWorksAAADiameterServer | * | * |

To configure Diameter stack in this scenario, do the following:

1. Configure Diameter server identification.

```
# dia-identity-ctr --cmd initial
```

Prompt information is shown as below:

```
Do you want to cleanup all the information of diameter
identity, transport and route? Please type 'Yes' or
'No' to continue: Yes
```

```
# dia-identity-ctr --cmd add --origin-host "aaa1.aaa.co
m" --origin-realm "aaa.com" --host-ip-address "[192.168
.20.13]" --product-name "IPWorksAAADiameterServer"
```

2. Configure Diameter transport.

- a. Configure one TCP transport which is used to accept connections from HSGW, ePDG, or PGW.

```
# dia-transport-ctr --cmd add --local
"[192.168.20.13]:3868" --mode TCP
```

- b. Configure one TCP transport which is used to connect to HSS1.

```
# dia-transport-ctr --cmd add --local "[192.168.
20.13]:0" --remote "[192.168.20.1]:3869" --mode
TCP
```

- c. Configure one TCP transport which is used to connect to HSS2.

```
# dia-transport-ctr --cmd add --local "[192.168.
20.13]:0" --remote "[192.168.20.2]:3869" --mode
TCP
```

3. Configure Diameter route. In this scenario, IPWorks connects to two HSS via failover mode.

```
# dia-route-ctr --cmd add --app "SWx" --dest
"[*],hss.com" --peer "[hss1.hss.com],hss.com"
```




```
# dia-route-ctr --cmd add --app "SWx" --dest
"[*],hss.com" --peer "[hss2.hss.com],hss.com"
```

Note: The former configured route has a higher priority. In this example, the route to HSS1 is configured before HSS2, so the route to HSS1 has a higher priority.

2.2.2 EIR

The configuration example is only available for **IMEI Check** feature.

2.2.2.1 Single EIR

In this scenario (shown in Figure 4), IPWorks AAA opens a listen port and accepts TCP or SCTP connections from HSGW, ePDG, and PGW. IPWorks AAA connects to EIR by TCP or SCTP transport. And SCTP multi-homing is used.

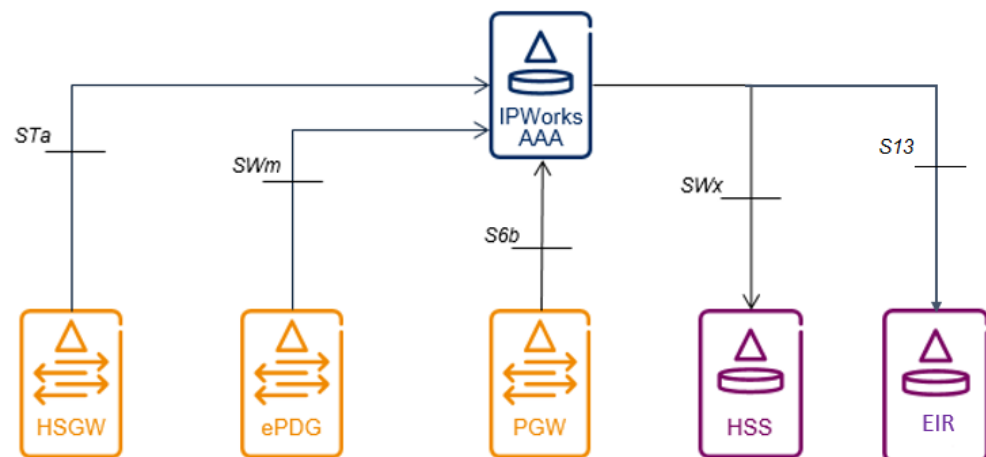


Figure 4 Single EIR

Table 6 Presupposition Values for Single EIR

| Attribute | EIR |
|----------------|------------------------------|
| Host | eir1.eir.com |
| Realm | eir.com |
| Traffic IP | 192.168.20.3 192.168.20.4 |
| Listening Port | 3870 |
| Product Name | * |

This configuration steps are only needed in **IMEI Check** feature and the configuration are same as the steps in Section 2.2.1 HSS on page 9. The extra step is configuring TCP or SCTP transport to connect with EIR:

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0"
--remote "[192.168.20.3]:3870" --mode TCP

# dia-transport-ctr --cmd add --local "[192.168.20.13,
192.168.20.14]:0" --remote "[192.168.20.3, 192.168.20.4]:3
870" --mode SCTP
```

2.2.2.2 EIR Redundancy

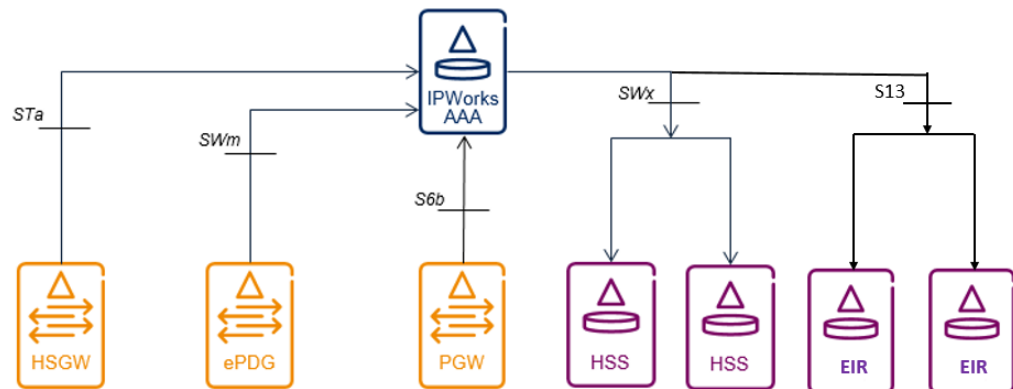


Figure 5 EIR Redundancy

Table 7 Presupposition Values for EIR Redundancy

| Attribute | EIR1 | EIR2 |
|----------------|--------------|--------------|
| Host | eir1.eir.com | eir2.eir.com |
| Realm | eir.com | eir.com |
| Traffic IP | 192.168.20.3 | 192.168.20.4 |
| Listening Port | 3870 | 3870 |
| Product Name | * | * |

To configure Diameter stack in this scenario, do the following:

1. Configure Diameter transport.
 - a. Configure one TCP transport which is used to connect to EIR1.

```
#dia-transport-ctr --cmd add --local "[192.168.20
.13]:0" --remote "[192.168.20.3]:3870" --mode TCP
```
 - b. Configure one TCP transport which is used to connect to EIR2.



```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.4]:3870" --mode TCP
```

2. Configure Diameter route. In this scenario, IPWorks connects to two EIRs via failover mode.

```
# dia-route-ctr --cmd add --app "S13" --dest "[*],eir.com" --peer "[eir1.eir.com],eir.com"
```

```
#dia-route-ctr --cmd add --app "S13" --dest "[*],eir.com" --peer "[eir2.eir.com],eir.com"
```

Note: The former configured route has a higher priority. In this example, the route to EIR1 is configured before EIR2, so the route to EIR1 has a higher priority.

2.2.3

Diameter Routing Agent

In this scenario (shown in Figure 6), IPWorks AAA opens a listen port and accepts SCTP connection from DRA. IPWorks AAA is not directly connected with HSS HSGW, ePDG, and PGW, DRA is working as a proxy.



Figure 6 DRA

Table 8 lists the presupposition values for the example:

Table 8 Presupposition Values for DRA

| Attribute | IPWorks AAA | DRA1 | DRA2 |
|----------------|--------------------------|--------------|--------------|
| Host | aaa1.aaa.com | dra1.dra.com | dra2.dra.com |
| Realm | aaa.com | dra.com | dra.com |
| Traffic IP | 192.168.20.13 | 192.168.20.1 | 192.168.20.2 |
| Listening Port | 3868 | - | - |
| Product Name | IPWorksAAADiameterServer | - | - |

To configure Diameter stack in this scenario, do the following:

1. Configure Diameter server identification.

```
# dia-identity-ctr --cmd initial
```



Prompt information is shown as below:

Do you want to cleanup all the information of diameter identity, t
Please type 'Yes' or 'No' to continue: Yes

```
# dia-identity-ctr --cmd add --origin-host "aaa1.aaa.co  
m" --origin-realm "aaa.com" --host-ip-address "[192.168  
.20.13]" --product-name "IPWorksAAADiameterServer"
```

2. Configure Diameter transport.

Configure one SCTP transport that is used to accept connections from DRA.

```
# dia-transport-ctr --cmd add --local "[192.168.20.13  
]:3868" --mode SCTP
```

3. Configure Diameter route. In this scenario, IPWorks connects with two DRA via load sharing mode.

```
# dia-route-ctr --cmd add --app "*" --dest "*" --peer  
"[dra1.dra.com, dra2.dra.com], dra.com"
```

2.2.4 Hybrid Deployment with DRA

In this scenario (shown in Figure 7), IPWorks AAA opens a port to accept TCP connection from DRA. IPWorks AAA directly connects with two groups of HSS. HSS1 and HSS2 are in Group 1, and HSS3 and HSS4 are in Group 2. Inside the HSS Group, the HSS works in load sharing mode. Between Group1 and Group2, the HSS works in failover mode. Group 1 has a higher priority. If **IMEI Check** feature is enabled, EIR configuration and deployment is the same as HSS.

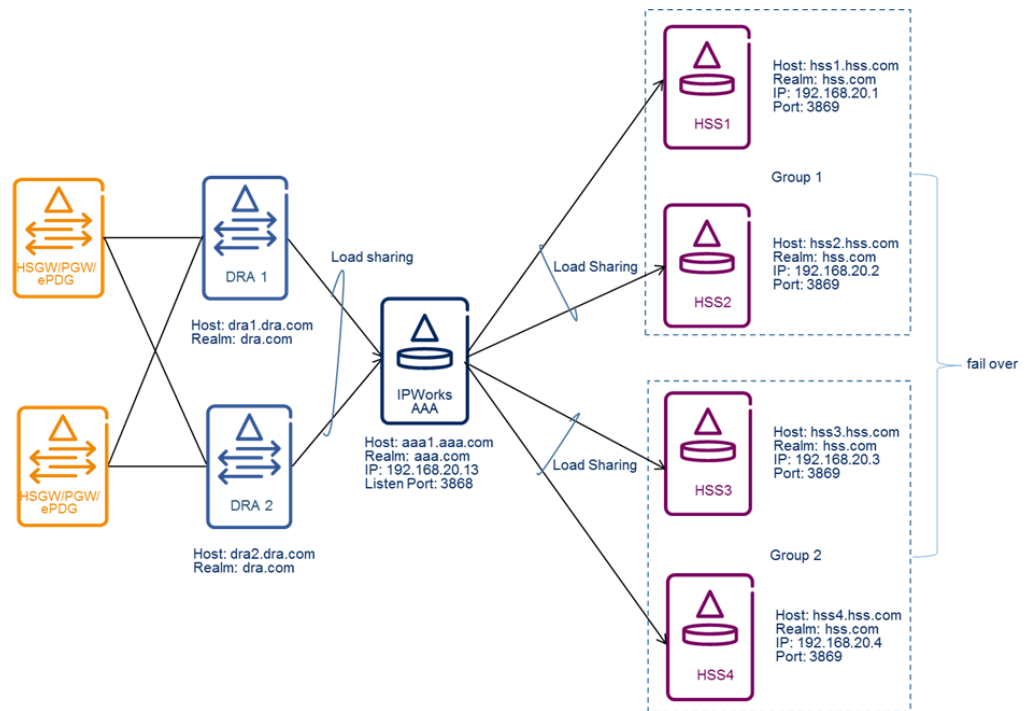


Figure 7 Hybrid Deployment with DRA

To configure Diameter stack in this scenario, do the following:

1. Configure Diameter server identification.

```
# dia-identity-ctr --cmd initial

# dia-identity-ctr --cmd add --origin-host "aaa1.aaa.com" --origin-realm "aaa.com" --host-ip-address "[192.168.20.13]" --product-name "IPWorksAAADiameterServer"
```

2. Configure Diameter transport.

- a. Configure one TCP transport that is used to accept connections from DRA.

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:3868" --mode TCP
```

- b. Configure one TCP transport for each HSS.

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.1]:3869" --mode TCP
```

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.2]:3869" --mode TCP
```



```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.3]:3869" --mode TCP
```

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.4]:3869" --mode TCP
```

- c. Configure one TCP transport for each EIR if **IMEI Check** feature is enabled.

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.5]:3870" --mode TCP
```

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.6]:3870" --mode TCP
```

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.7]:3870" --mode TCP
```

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.8]:3870" --mode TCP
```

3. Configure Diameter route.

- Inside the HSS Group, the HSS works in load sharing mode. Between Group1 and Group2, the HSS works in failover mode. Group 1 has a higher priority.

```
# dia-route-ctr --cmd add --app "SWx" --dest "[*], hss.com" --peer "[hss1.hss.com, hss2.hss.com], hss.com"
```

```
# dia-route-ctr --cmd add --app "SWx" --dest "[*], hss.com" --peer "[hss3.hss.com, hss4.hss.com], hss.com"
```

- Inside the EIR Group, the EIR works in load sharing mode. Between Group1 and Group2, the EIR works in failover mode. Group 1 has a higher priority. This step is only available in **IMEI Check** feature.

```
# dia-route-ctr --cmd add --app "S13" --dest "[*], eir.com" --peer "[eir1.eir.com, eir2.eir.com], eir.com"
```

```
# dia-route-ctr --cmd add --app "S13" --dest "[*], eir.com" --peer "[eir3.eir.com, eir4.eir.com], eir.com"
```



- Two DRA works in load sharing mode:

```
# dia-route-ctr --cmd add --app "SWm" --dest "*"
--peer "[dra1.dra.com, dra2.dra.com], dra.com"

# dia-route-ctr --cmd add --app "S6b" --dest "*"
--peer "[dra1.dra.com, dra2.dra.com], dra.com"

# dia-route-ctr --cmd add --app "STa" --dest "*"
--peer "[dra1.dra.com, dra2.dra.com], dra.com"
```





3 Use Cases of Diameter Stack Update Configuration

In some case, customer needs to update the diameter stack configuration, such as adding an HSS or DRA. Here are some common use cases for updating diameter stack configurations:

- Change HSS Deployment, see Section 3.1 on page 21.
- Change DRA Deployment, see Section 3.3 on page 26.
- Change the Port which IPWorks AAA listens on, see Section 3.4 on page 31.

Most of these use cases involve combinations of adding, modifying, or removing diameter server identification, transport, and route. The diameter stack configuration updates take effect in runtime.

The Diameter Stack management tools are used to operate the diameter server identification, transport, and route. For details about these tools, see Section 4 on page 35.

3.1 Change HSS Deployment

This use case is about IPWorks AAA directly connecting with HSS. When an HSS is added or removed, the diameter transport and diameter route need to be updated.

- Section 3.1.1 Add an HSS on page 21, it describes an example about how to update diameter stack configuration because of adding an HSS.
- Section 3.1.2 Remove an HSS on page 23, it describes an example about how to update diameter stack configuration because of removing an HSS.

3.1.1 Add an HSS

The current deployment is that IPWorks AAA directly connects to two HSS (HSS1, HSS 2) with load sharing mode. The diameter transport is TCP. This example is to add an HSS (HSS 3) based on current deployment.

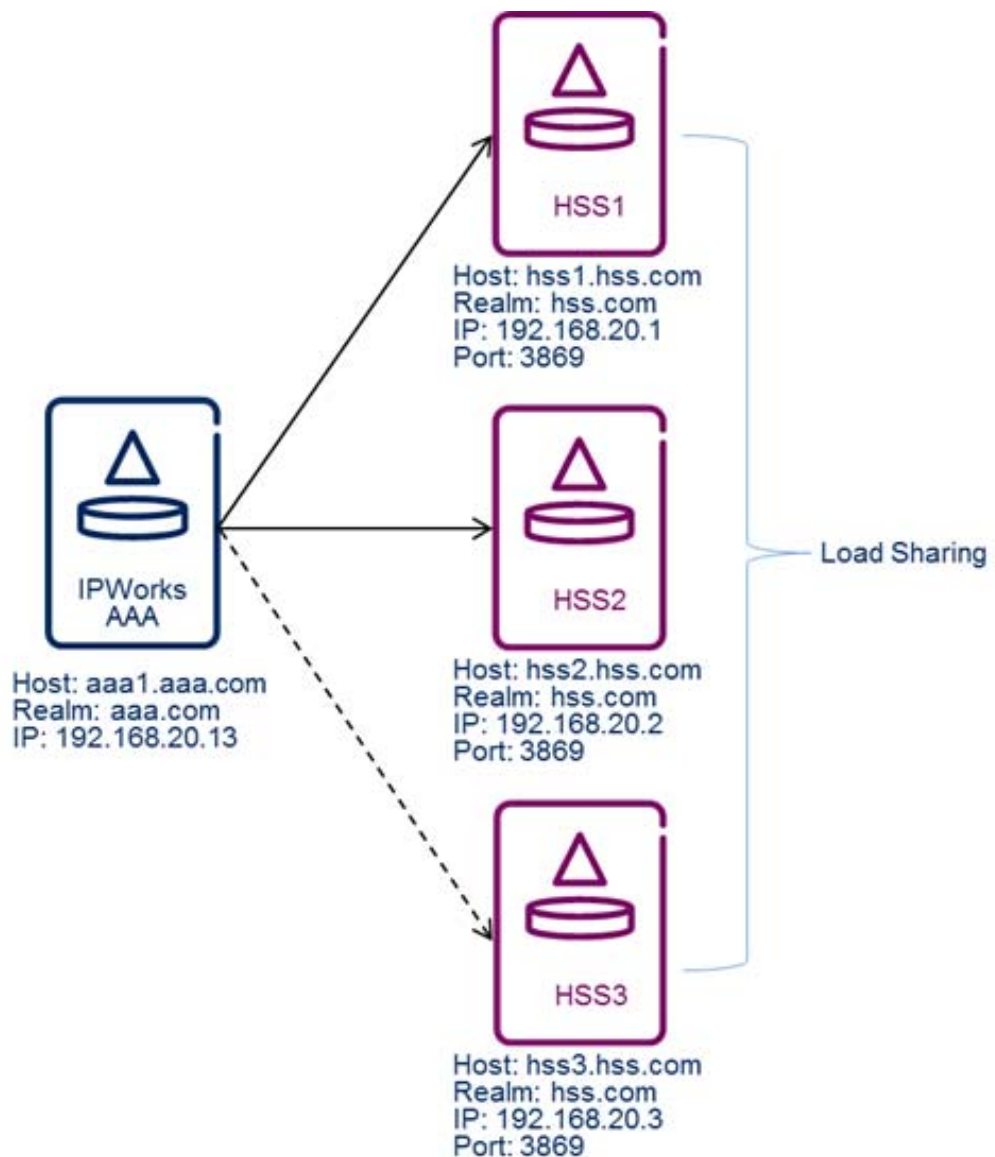


Figure 8 Add an HSS

To add the HSS3:

1. Add a diameter transport which is used to connect to HSS3:

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:0" --remote "[192.168.20.3]:3869" --mode TCP
```

2. Change the diameter route:

- a. List the current diameter route. Two HSS work in load sharing mode.

```
# dia-route-ctr --cmd list
```



```
RouteTable:
```

```
-----
```

```
id:          1
app:         SWx
dest:        host = *,   realm = hss.com
peer:        host = ['hss1.hss.com', 'hss2.hss.com'], realm =
priority: 1
```

- b. Change the diameter route, and make that three HSS work in load sharing mode.

```
#dia-route-ctr --cmd modify --id 1 --peer
"[hss1.hss.com, hss2.hss.com, hss3.hss.com],
hss.com"
```

- c. List the modified diameter route:

```
# dia-route-ctr --cmd list
```

```
RouteTable:
```

```
-----
```

```
id:          1
app:         SWx
dest:        host = *,   realm = hss.com
peer:        host = ['hss1.hss.com', 'hss2.hss.com', 'hss3.h
priority: 1
```

3.1.2 Remove an HSS

The current deployment is that IPWorks AAA connects to three HSS (HSS1, HSS2, HSS3) with load sharing mode. The diameter transport is TCP. This example is to remove an HSS (HSS3) based on current deployment.

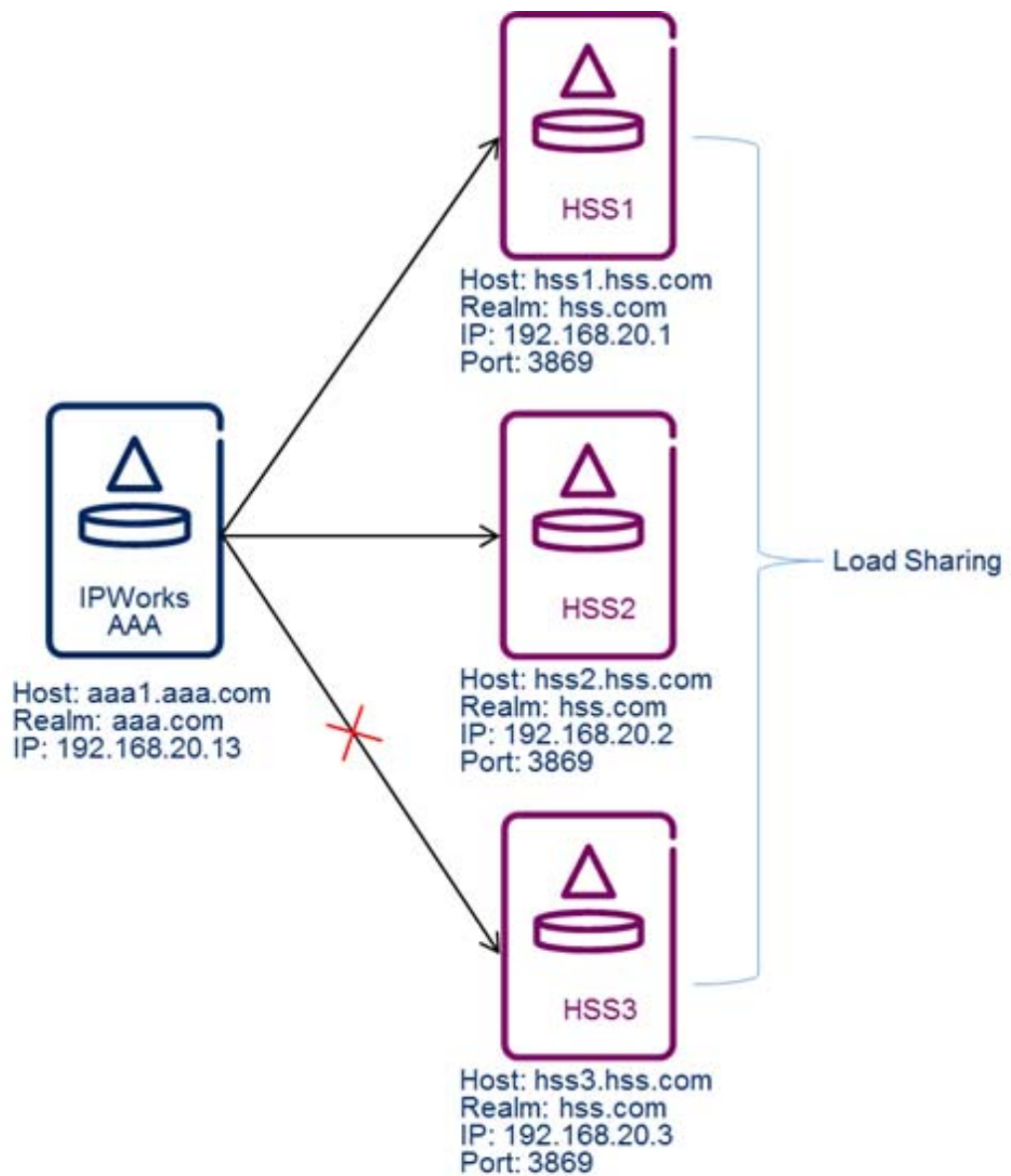


Figure 9 Remove an HSS

To remove the HSS3:

1. Change the diameter route:
 - a. List the current diameter route, three HSS works in load sharing mode.

```
# dia-route-ctr --cmd list
```

```
RouteTable:
```

```
-----
id:          1
```



```
app:      SWx
dest:     host = *, realm = hss.com
peer:     host = ['hss1.hss.com', 'hss2.hss.com', 'hss3.hss.com']
priority: 1
```

- b. Change the diameter route, and make that the left two HSS work in load sharing mode.

```
#dia-route-ctr --cmd modify --id 1 --peer
"[hss1.hss.com, hss2.hss.com], hss.com"
```

- c. List the modified diameter route:

```
# dia-route-ctr --cmd list
```

```
SC-1:~ # dia-route-ctr --cmd list
RouteTable:
```

```
-----
```

```
id:      1
app:      SWx
dest:     host = *, realm = hss.com
peer:     host = ['hss1.hss.com', 'hss2.hss.com'], realm = hss.com
priority: 1
```

2. Delete the diameter transport HSS3 related.

- a. List the current diameter transport, and find that the `id` of diameter transport HSS3 related is 1.

```
# dia-transport-ctr --cmd list
```

```
TransportTable:
```

| id | local | remote |
|----|------------------------|-----------------------|
| 1 | ['192.168.20.13']:0 | ['192.168.20.3']:3869 |
| 2 | ['192.168.20.13']:0 | ['192.168.20.2']:3869 |
| 3 | ['192.168.20.13']:0 | ['192.168.20.1']:3869 |
| 4 | ['192.168.20.13']:3868 | |

- b. Remove the transport which `id` is 1:

```
# dia-transport-ctr --cmd rm --id 1
```



3.2 Change EIR Deployment

For changing EIR deployment, refer to Section 3.1 on page 21.

3.3 Change DRA Deployment

When a DRA is added or removed, or the priority of DRA is changed, diameter route needs to be updated. If IPWorks AAA plays the diameter client role and connects to DRA, the diameter transport also needs to be updated.

- Section 3.3.1 Add a DRA on page 26, it describes an example about how to update diameter stack configuration because of adding a DRA.
- Section 3.3.2 Remove a DRA on page 28, it describes an example about how to update diameter stack configuration because of removing a DRA.
- Section 3.3.3 Change Priority of DRA on page 30, it describes an example how to update diameter stack configuration because of changing the priority of DRA.

3.3.1 Add a DRA

The current deployment is that IPWorks AAA listens on port 3868, and two DRA (DRA1, DRA2) connect to IPWorks AAA. The two DRA work in failover mode. This example is to add a DRA (DRA3) based on current deployment.

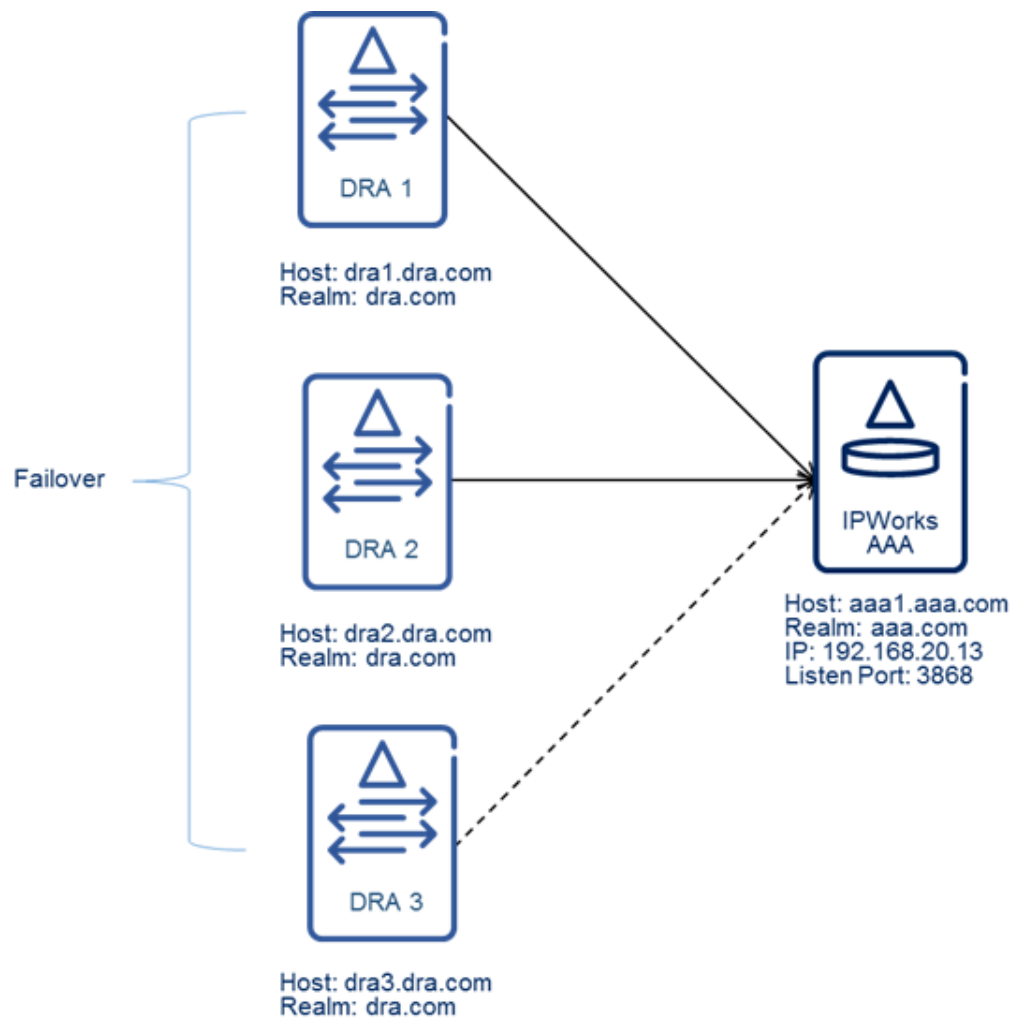


Figure 10 Add a DRA

As IPWorks AAA already has a transport to accept connections from DRA, it is not necessary to create an additional transport, you only need to add a diameter route.

To add a DRA3:

1. List current Diameter route, two DRA work in failover mode.

```
# dia-route-ctr --cmd list
```

```
RouteTable:
```

```
-----
id:      1
app:     *
dest:    *
peer:    host = ['dra1.dra.com'], realm = dra.com
priority: 1
```



```
-----  
id:          2  
app:         *  
dest:        *  
peer:        host = ['dra2.dra.com'], realm = dra.com  
priority:    2
```

2. Add a diameter route for DRA3.

```
# dia-route-ctr --cmd add --app "*" --dest "*" --peer  
"[dra3.dra.com], dra.com"
```

3. List the modified Diameter route, three DRA works in failover mode.

```
# dia-route-ctr --cmd list
```

```
RouteTable:  
-----  
id:          1  
app:         *  
dest:        *  
peer:        host = ['dra1.dra.com'], realm = dra.com  
priority:    1
```

```
-----  
id:          2  
app:         *  
dest:        *  
peer:        host = ['dra2.dra.com'], realm = dra.com  
priority:    2
```

```
-----  
id:          3  
app:         *  
dest:        *  
peer:        host = ['dra3.dra.com'], realm = dra.com  
priority:    3
```

3.3.2 Remove a DRA

The current deployment is that IPWorks AAA listens on port 3868, and three DRA (DRA1, DRA2, and DRA3) connect to IPWorks AAA. The three DRA work in failover mode. This example is to remove a DRA (DRA3) based on current deployment.

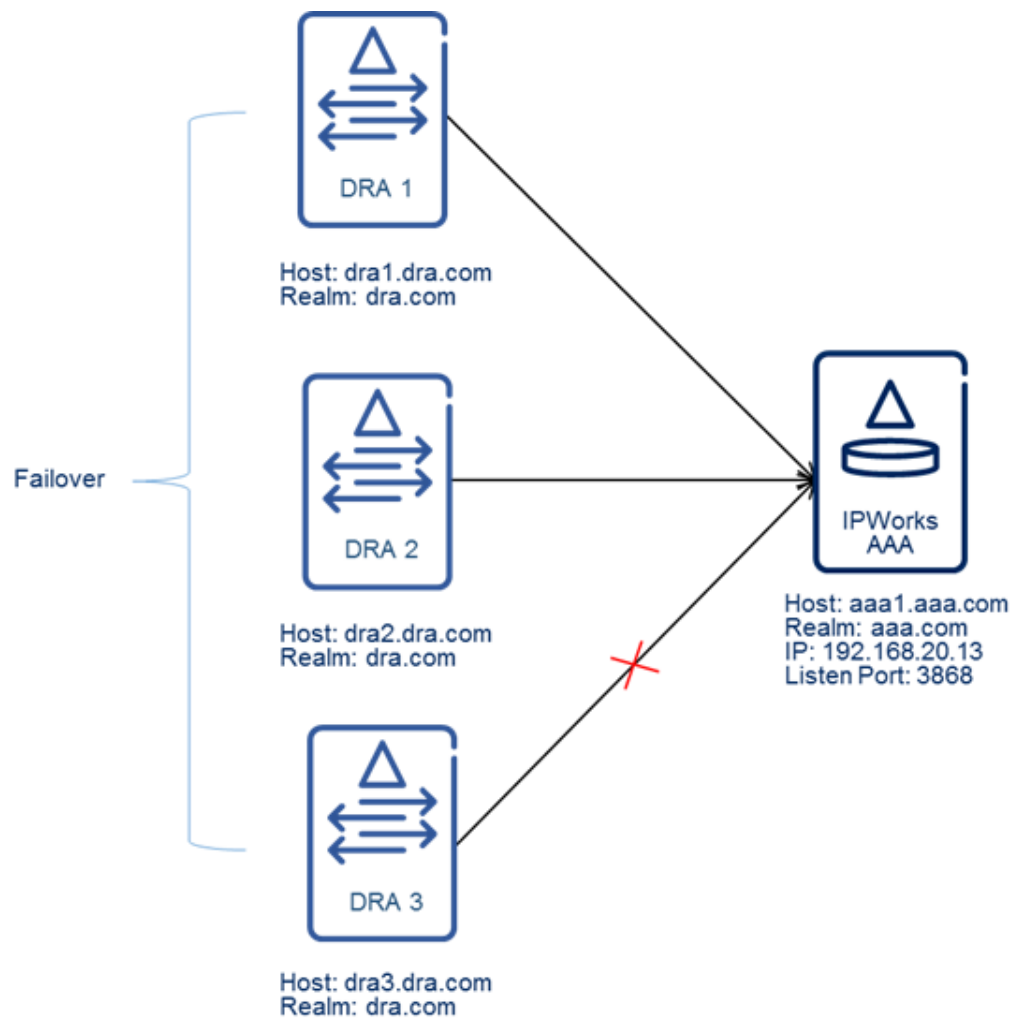


Figure 11 Remove a DRA

To remove the DRA3:

1. List the current Diameter route, three DRA work in failover mode.

```
# dia-route-ctr --cmd list
```

```
RouteTable:
```

```
-----
id:      1
app:     *
dest:    *
peer:    host = ['dra1.dra.com'], realm = dra.com
priority: 1
-----
```

```
id:      2
```



```
app:      *
dest:     *
peer:     host = ['dra2.dra.com'], realm = dra.com
priority: 2
-----
id:       3
app:      *
dest:     *
peer:     host = ['dra3.dra.com'], realm = dra.com
priority: 3
```

2. Remove the diameter route DRA3 related. The `id` of the route DRA3 is 3.

```
# dia-route-ctr --cmd rm --id 3
```

3. List the modified Diameter route, two DRA work in failover mode.

```
# dia-route-ctr --cmd list
```

```
SC-1:~ # dia-route-ctr --cmd list
RouteTable:
```

```
-----
id:       1
app:      *
dest:     *
peer:     host = ['dra1.dra.com'], realm = dra.com
priority: 1
```

```
-----
id:       2
app:      *
dest:     *
peer:     host = ['dra2.dra.com'], realm = dra.com
priority: 2
```

3.3.3

Change Priority of DRA

The current deployment is that IPWorks AAA listens on port 3868, and two DRA (DRA1, DRA2) connect to IPWorks AAA. The two DRA work in failover mode and DRA1 has a higher priority. This example is to change the priority of DRA.

To change the priority:

1. List the Diameter route, two DRA work in failover mode, and DRA1 has a higher priority.

```
# dia-route-ctr --cmd list
```

```
RouteTable:
```



```
-----
id:      1
app:     *
dest:    *
peer:    host = ['dra1.dra.com'], realm = dra.com
priority: 1
```

```
-----
id:      2
app:     *
dest:    *
peer:    host = ['dra2.dra.com'], realm = dra.com
priority: 2
```

2. Change the DRA priority.

```
# dia-route-ctr --cmd modify --id 2 --peer "[dra1.dra
.com], dra.com"

# dia-route-ctr --cmd modify --id 1 --peer "[dra2.dra
.com], dra.com"
```

3. List the modified Diameter route. The priority of DRA1 and DRA2 changes.

```
# dia-route-ctr --cmd list

RouteTable:
-----
id:      1
app:     *
dest:    *
peer:    host = ['dra2.dra.com'], realm = dra.com
priority: 1

-----
id:      2
app:     *
dest:    *
peer:    host = ['dra1.dra.com'], realm = dra.com
priority: 2
```

3.4 Change the Port Which IPWorks AAA Listens On

When IPWorks AAA plays the Diameter server role, it listens on a port to accept connections from the remote peers. IPWorks AAA supports to change the listening port in runtime.



Here is an example to change the original listening port (3868) to the new one (3870). In this example, the IPWorks AAA traffic IP is 192.168.20.13.

1. Add a new transport with the new listening port to accept connections from remote peers.

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:  
3870" --mode TCP
```

2. Configure the eVIP policy for the new port 3870, and remove the old one.

Log on to the ECLI interface:

```
# ssh <username>@<MIP_OAM_IP> -t -s cli

>dn ManagedElement=<Node Name>,Transport=1,Evip=1,EvipAl  
bs=1,EvipAlb=ipw_sig_sp,EvipFlowPolicies=1

(EvipFlowPolicies=1)>configure
(config-EvipFlowPolicies=1)>EvipFlowPolicy=diameter_port_3870
(config-EvipFlowPolicy=diameter_port_3870)>addressFamily="ipv4"
(config-EvipFlowPolicy=diameter_port_3870)>dest="192.168.20.13"
(config-EvipFlowPolicy=diameter_port_3870)>destPort="3870"
(config-EvipFlowPolicy=diameter_port_3870)>protocol="tcp"
(config-EvipFlowPolicy=diameter_port_3870)>targetPool="DIA_pools"
(config-EvipFlowPolicy=diameter_port_3870)>commit
(EvipFlowPolicy=diameter_port_3870)>show
EvipFlowPolicy=diameter_port_3870
  addressFamily="ipv4"
  dest="192.168.20.13"
  destPort="3870"
  protocol="tcp"
  targetPool="DIA_pools"
(EvipFlowPolicy=diameter_port)>up
(EvipFlowPolicies=1)>show
EvipFlowPolicies=1
  EvipFlowPolicy=sip_alb_tcp_fe_ipv4_port_53
  EvipFlowPolicy=sip_alb_udp_fe_ipv4_port_53
  EvipFlowPolicy=sctp_1
  EvipFlowPolicy=sctp_2
  EvipFlowPolicy=sctp_3
  EvipFlowPolicy=sctp_4
  EvipFlowPolicy=diameter_port_3868
  EvipFlowPolicy=diameter_port_3870
(config-EvipFlowPolicies=1)>no EvipFlowPolicy=diameter_port_3868
(config-EvipFlowPolicies=1)>commit
```

3. After remote peer has already connected to IPWorks AAA with the new transport, remove the original transport.

In this example, the record is of original transport is 2.



```
# dia-transport-ctr --cmd list
```

```
TransportTable:
```

| id | local | remote | mode |
|----|------------------------|--------|------|
| 1 | ['192.168.20.13']:3870 | | TCP |
| 2 | ['192.168.20.13']:3868 | | TCP |

```
# dia-transport-ctr --cmd rm --id 2
```

```
# dia-transport-ctr --cmd list
```

```
TransportTable:
```

| id | local | remote | mode |
|----|------------------------|--------|------|
| 1 | ['192.168.20.13']:3870 | | TCP |





4 Diameter Stack Management Tools

This section provides user guides of Diameter Stack management tools to configure Diameter Stack. It includes the following topics:

- Section 4.1 How to Use Diameter Server Identification Tool on page 35
- Section 4.2 How to Use Diameter Transport Tool on page 37
- Section 4.3 How to Use Diameter Route Tool on page 40

4.1 How to Use Diameter Server Identification Tool

The tool `dia-identity-ctr` is used to initialize the Diameter basic configuration. Also, it can list, add, and modify the following identity attributes:

Table 9 Diameter Server Identification Attributes

| Attribute Name | Attribute Value | Comment |
|----------------|--------------------|--|
| originHost | <AAA Host> | Encode it as Origin-Host AVP in CER/CEA message. |
| originRealm | <AAA Realm> | Encode it as Origin-Realm AVP in CER/CEA message. |
| hostIpAddress | <AAA Traffic IP> | Encode it as Host-IP-Address AVP in CER/CEA message. |
| productName | <AAA Product Name> | Encode it as Product-Name AVP in CER/CEA message, it represents the product name of IPWorks Diameter AAA server. |

Initialize Diameter Server Identification

The initial command cleans up all the information of identity, transport, and route for Diameter Stack.

```
# dia-identity-ctr --cmd initial
```

Prompt information is shown as below:

```
Do you want to cleanup all the information of diameter identity, tr
```



Please type 'Yes' or 'No' to continue:

Type Yes to continue or type No to cancel this operation.

List Diameter Server Identification

```
# dia-identity-ctr --cmd list
```

Add Diameter Server Identification

Syntax:

```
# dia-identity-ctr --cmd add --product-name "<AAA Product
Name>" --origin-host "<AAA Host>" --origin-realm "<AAA
Realm>" --host-ip-address "[<AAA Traffic IP>,..]"
```

Example:

```
# dia-identity-ctr --cmd add --product-name "IPWorksA
AADiameterServer" --origin-host "PL-3" --origin-realm
"aaa.ericsson.com" --host-ip-address "[192.168.10.13,
192.168.10.14]"
```

Table 10 *dia-identity-ctr Add Command Options*

| Option | Mandatory/Optional | Default Value |
|-----------------|--------------------|---------------|
| product-name | Mandatory | - |
| origin-host | Mandatory | - |
| origin-realm | Mandatory | - |
| host-ip-address | Mandatory | - |

Modify Diameter Server Identification

Syntax:

```
# dia-identity-ctr --cmd modify --product-name "<AAA Product
Name>" --origin-host "<AAA Host>" --origin-realm "<AAA
Realm>" --host-ip-address "[<AAA Traffic IP>,..]"
```

Example:

```
# dia-identity-ctr --cmd modify --product-name
"IPWorksAADiameterServer" --origin-host "PL-3"
--origin-realm "aaa.ericsson.com" --host-ip-address
"[192.168.10.13, 192.168.10.14]"
```


Table 11 *dia-identity-ctr Add Command Options*

| Option | Mandatory/Optional | Default Value |
|-----------------|--------------------|---------------|
| product-name | Optional | - |
| origin-host | Optional | - |
| origin-realm | Optional | - |
| host-ip-address | Optional | - |

4.2 How to Use Diameter Transport Tool

IPWorks AAA can accept connection request from Diameter Peer Node(s) by supporting Diameter connection over TCP or SCTP.

The tool `dia-transport-ctr` is used to list, add, modify, and remove the following transport related attributes:

Table 12 *Diameter Transport Attributes*

| Node | Attribute Name | Attribute Value | Comment |
|---------------------|----------------|-----------------------|---|
| IPWorks AAA (local) | address | <AAA Traffic IP> | IPWorks AAA can use separate IPs for SCTP and TCP traffic. |
| | port | <AAA Listening Port> | Defaults to 3868 for listening transport, 0 for connecting port |
| Peer node (remote) | address | <Peer Traffic IP> | Traffic IP for peer node, such as HSS |
| | port | <Peer Listening Port> | - |

List Diameter Transport

```
# dia-transport-ctr --cmd list
```

Add Diameter Transport

Syntax:

```
# dia-transport-ctr --cmd add --local "[<AAA Traffic IP>]:<AAA Listening Port>" --remote "[<Peer Traffic IP>]:<Peer Listening Port>" --mode <TCP/SCTP>
```



Example:

```
# dia-transport-ctr --cmd add --local "[192.168.20.13]:3868" --mode TCP

# dia-transport-ctr --cmd add --local "[192.168.20.13]:0"
--remote "[192.168.20.1]:3869" --mode TCP

# dia-transport-ctr --cmd add --local "[192.168.20.13,192.168.20.14]:0" --remote "[192.168.20.1,192.168.20.2]:3869"
--mode SCTP
```

Table 13 dia-transport-ctr Add Command Options

| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|---|
| local | Mandatory | - | The address and port of IPWorks AAA should be as its value. Multiple value can be specified for the address. |
| remote | Optional | - | The address and port of peer node should be as its value if needed. Multiple value can be specified for the address. |
| mode | Mandatory | - | Only two choices: "TCP" or "SCTP". For example, SCTP should be set if SCTP transport is used. |

Remove Diameter Transport

Note: Use list command to show all the records before remove operation.

Syntax:

```
# dia-transport-ctr --cmd rm --id <Record_Id>
```

Example:



```
# dia-transport-ctr --cmd list
```

```
# dia-transport-ctr --cmd rm --id 1
```

Table 14 *dia-transport-ctr rm Command Option*

| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|---|
| id | Mandatory | - | The value is set to the record id that will be deleted. The record id can be shown by list command. |

Modify Diameter Transport

Note: Use list command to show all the records before modify operation.

Syntax:

```
# dia-transport-ctr --cmd modify --id <Record_Id> --local
" [<AAA Traffic IP>]:<AAA Listening Port>" --remote " [<Peer
Traffic IP>]:<Peer Listening Port>"
```

Example:

```
# dia-transport-ctr --cmd list
```

```
# dia-transport-ctr --cmd modify --id 4 --local
"[192.168.20.13]:3868"
```

```
# dia-transport-ctr --cmd modify --id 4 --local
"[192.168.20.13]:0" --remote "[192.168.20.1]:3869"
```

```
# dia-transport-ctr --cmd modify --id 4 --remote
"[192.168.20.1]:3870"
```

```
# dia-transport-ctr --cmd modify --id 4 --local "[192.
168.20.13, 192.168.20.14]:0" --remote "[192.168.20.1,
192.168.20.2]:3869"
```

Table 15 *dia-transport-ctr Modify Command Options*

| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|---|
| id | Mandatory | - | The value is set to the record id that will be modified. The record id can be shown by list command. |
| local | Optional | - | The address and port of IPWorks AAA should be as its value. Multiple value can be specified for the address. |
| remote | Optional | - | The address and port of peer node should be as its value if needed. Multiple value can be specified for the address. |

4.3 How to Use Diameter Route Tool

The tool `dia-route-ctr` is used to list, add, modify, and remove the following route related attributes:

Table 16 *Diameter Route Attributes*

| Node | Attribute Name | Attribute Value | Comment |
|------|----------------|---------------------|---|
| dest | host | <Destination Host> | Only single value can be specified. If all hosts are in one realm, use "*" here. |
| | realm | <Destination Realm> | - |



| Node | Attribute Name | Attribute Value | Comment |
|------|----------------|-----------------|---|
| peer | host | <Peer Host> | Multiple value can be specified. If all hosts are in one realm, use "*" here. |
| | realm | <Peer Realm> | - |

List Diameter Route

```
# dia-route-ctr --cmd list
```

Add Diameter Route

Syntax:

```
# dia-route-ctr --cmd add --app "<App Name>" --dest
" [<Destination Host>] ,<Destination Realm>" --peer " [<Peer
Host>] ,<Peer Realm>"
```

Example:

```
# dia-route-ctr --cmd add --app "SWx" --dest " [*] ,hss.com"
--peer " [hss1] ,hss.com"
```

```
# dia-route-ctr --cmd add --app "SWx" --dest " [hss1] ,hss.c
om" --peer " [hss1,hss2] ,hss.com"
```

```
# dia-route-ctr --cmd add --app "SWx" --dest "*" --peer
" [hss1,hss2] ,hss.com9"
```

Table 17 *dia-route-ctr Add Command Options*

| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|--|
| app | Mandatory | - | The app is configured to one of these values: SWx, STa, S6b, or SWm, use "*" for all apps. |



| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|---|
| dest | Mandatory | - | The host and realm of destination node should be configured as its value. If all the destination are in one realm, use "*" as the host name. |
| peer | Mandatory | - | The host and realm of peer node should be configured as its value. If more than one peer are in one realm, multiple hosts are configured. |

Remove Diameter Route

Note: Use list command to show all the records before the remove operation,

Syntax:

```
# dia_route_ctr --cmd rm --id <RECORD_ID>
```

Example:

```
# dia_route_ctr --cmd list
```

```
# dia_route_ctr --cmd rm --id 1
```

Table 18 dia-route-ctr rm Command Option

| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|---|
| id | Mandatory | - | The value is set to the record id that will be deleted. |



Modify Diameter Route

Note: Use list command to show all the records before the modify operation.

Syntax:

```
# dia-route-ctr --cmd modify --id <Record Id> --peer "[<Peer Host>], <Peer Realm>"
```

Example:

```
# dia-route-ctr --cmd list
```

```
# dia-route-ctr --cmd modify --id 4 --peer "[hss1,hss2],hss.com"
```

Table 19 dia-route-ctr Modify Command Options

| Option | Mandatory/Optional | Default Value | Comments |
|--------|--------------------|---------------|---|
| id | Mandatory | - | The value is set to the record id that will be modified. |
| peer | Optional | - | The host and realm of peer node should be configured as its value. If more than one peers are in one realm, multiple hosts are configured. |





Reference List

- [1] *C-diameter Programmer's Guide*, 198 17-APR 901 0488/2
- [2] *Configure SS7 for AAA*