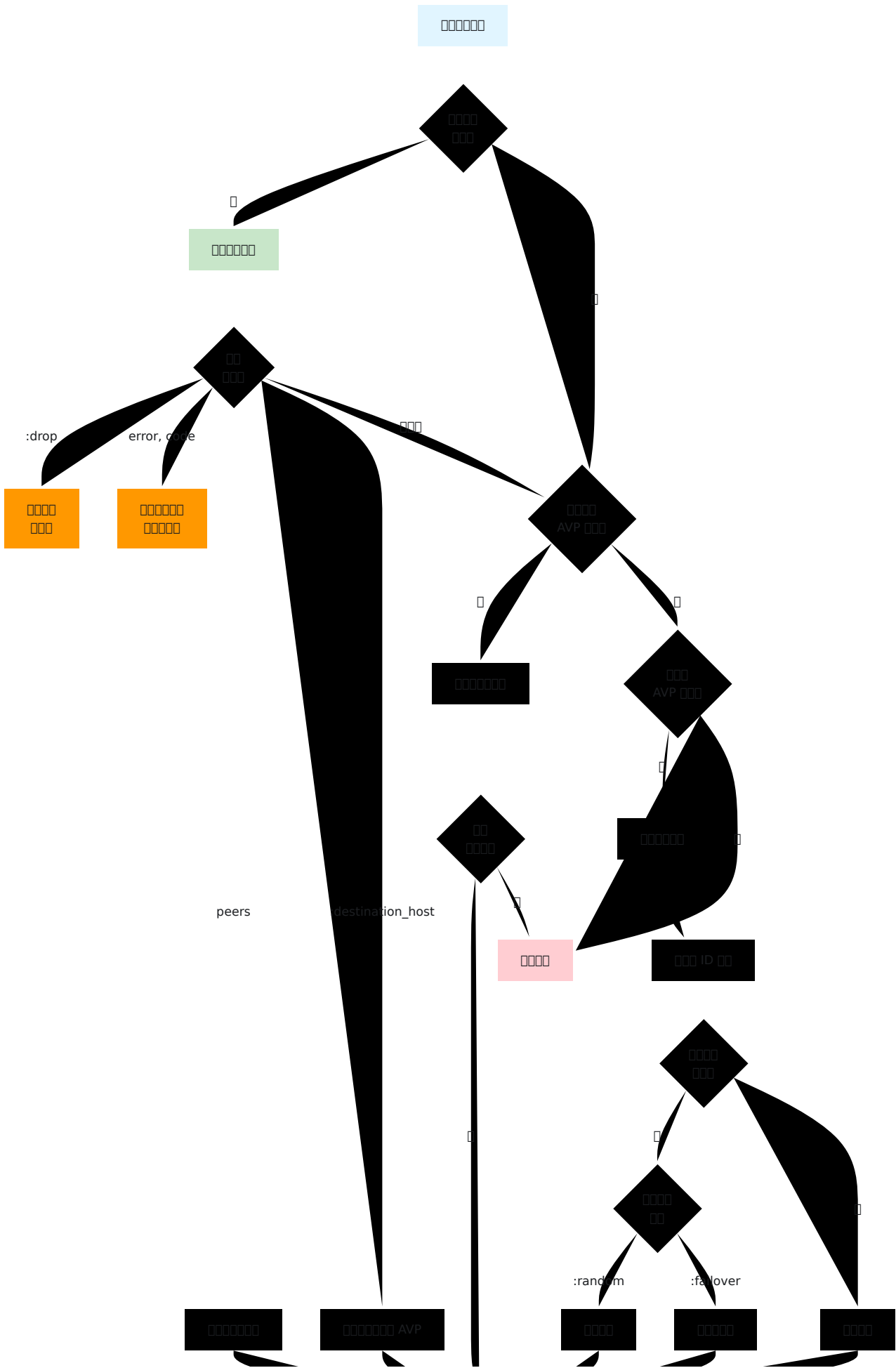


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□□□ □□□□ □ □□□□ □□□□□□DRA □□ □□□□□ (RFC 6733) □□□□□□□□





0000

DRA 00 RFC 6733 0 6.1 0 0000000000000000000000

1. 0000 AVP (293) - 000000DRA 0000000000

- 0 00000000000000
- 0 00000000000000
- 0 00000000000000

2. 000 AVP (283) - 0000000000000000

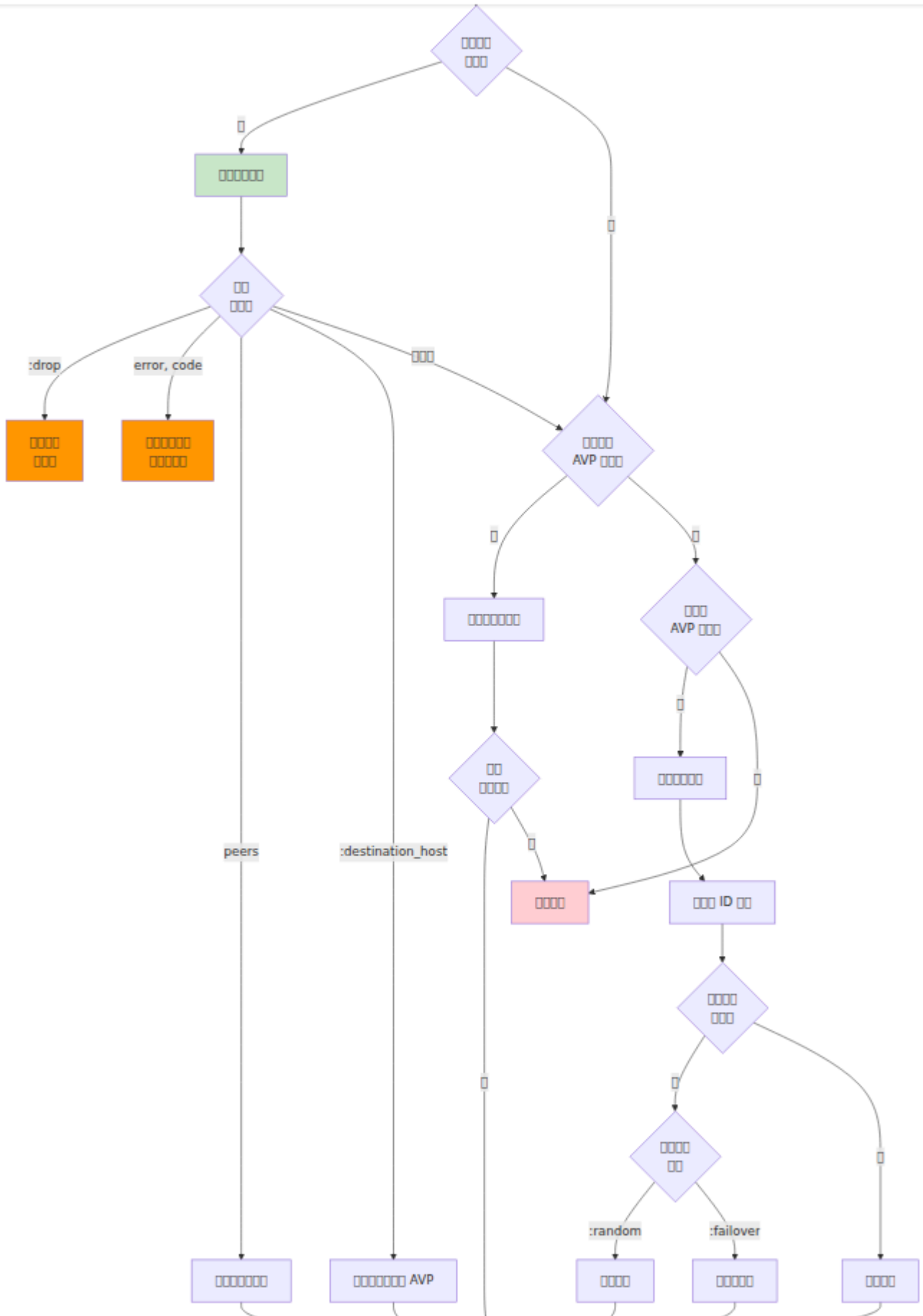
- 0 DRA 0000000000000000000000
- 0 0000000000000000
- 0 0000000000000000000000

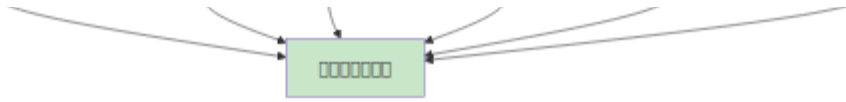
3. 00 ID - 0000000000000000

- 0 000000000000 ID 000
- 0 0000000000000000 (CER/CEA)
- 0 00 00 3GPP 00 IDs 0000

0000

0000000000000000000000





- 認證與授權的交互過程
- 認證 ID 的分配與使用
- 認證與 DRA 的交互過程
- 認證與 DRA 的交互過程 AVP 的
- 認證與授權的交互過程

認證與授權的交互過程

- 認證與授權的交互過程
- 認證與授權的交互過程
- 認證與授權的交互過程
- 認證與授權的交互過程

認證與授權的交互過程 RFC 6733 的 6.2 節

認證與授權

認證與授權的交互過程 `peer_selection_algorithm` 的交互過程

- `:random` - 認證與授權的交互過程
- `:failover` - 認證與授權的交互過程
- 認證與授權的交互過程
- 認證與授權的交互過程

認證與授權的交互過程

- 認證與 AVP 的交互過程 IMSI 的交互過程
- 認證與 AVP 的交互過程
- 認證與授權的交互過程
- 認證與授權的交互過程

認證與授權的交互過程 認證與授權的交互過程

□□□□

□□	□□	□◀▶
<code>listen_ip</code>	□□□□□ □	DRA □□□ IP □□□□□ SCTP □□□□□ IP □□□□□□□□ SCTP □□□□
<code>listen_port</code>	□□	□□□□□ TCP/SCTP □□□□□□3868□
<code>service_name</code>	□□	□□ Erlang □□□□□
<code>request_timeout</code>	□□	□□/□□□□□□□□□□□□□□□□5000□

□□□□□□

□□	□ □	□□
<code>peer_selection_algorithm</code>	□ □	□□□□□□□□ : <code>random</code> □□□□ □□□□ : <code>failover</code> □□□□ □□□□□□
<code>allow_undefined_peers_to_connect</code>	□ □	□□□□□□□□□□□□□□□□□□ □□ <code>false</code> □
<code>log_unauthorized_peer_connection_attempts</code>	□ □	□□□□□□□□□□□□□□□□

□□□□

`peers` □□□□□□□□□□□□□□□□□□

```
%{
  host: "mme01.operator.com",
  realm: "operator.com",
  ip: "192.168.1.20",
  port: 3868,
  transport: :diameter_tcp,
  tls: false,
  initiate_connection: false
}
```

□□□□

□□	□□	□□
host	□□□	□□□ □□□□□ FQDN - □□□□□□□□□□□□□□□□
realm	□□□	□□□□□□□□
ip	□□□	□□□□□ IP □□□□□□□
ips	□□	SCTP □□□□ IP □□□□□□□□□□□□ SCTP □□□□
port	□□	□□□□□□□□□□□□ 3868
transport	□□	□□□□□ :diameter_tcp □ :diameter_sctp
tls	□□	□□ TLS □□□□□□□ true □□□□□□□□ 3869
initiate_connection	□□	true □DRA □□□□□□□ false □DRA □□□□□□□

□□□□

□□□□ (**initiate_connection: true**)

- DRA □□□□□□□□
- DRA □□□□□□ TCP/SCTP □□
- □□□□ HSS □PCRF □□□□□□□□

- `allow_undefined_peers_to_connect: true`

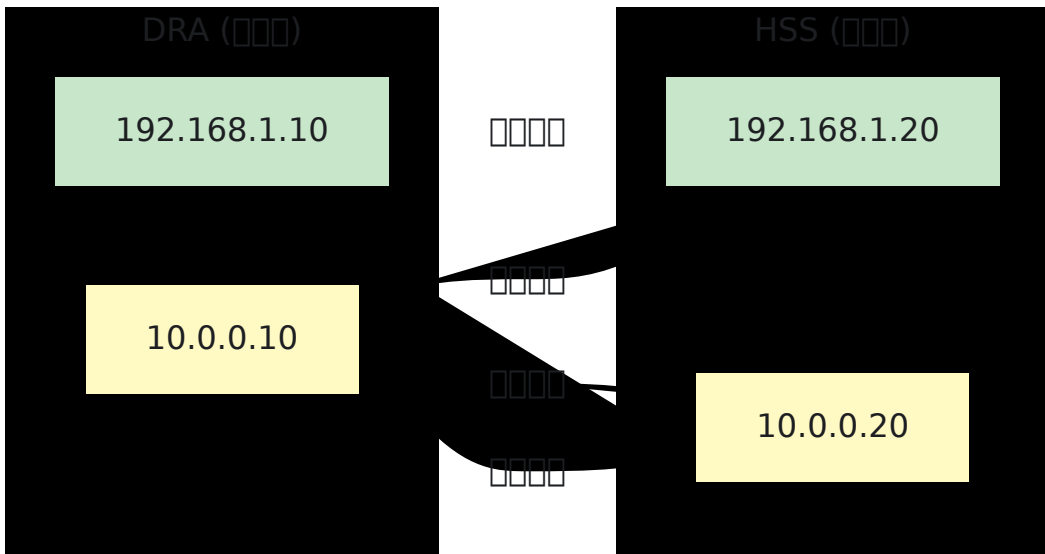
`initiate_connection: false`

- DRA `allow_undefined_peers_to_connect: true`
- DRA `allow_undefined_peers_to_connect: true`
- `MME` `SGSN` `P-GW` `allow_undefined_peers_to_connect: true`
- `allow_undefined_peers_to_connect: true`

□□□□

```
%{
  host: "dra01.mvno.example.com",
  realm: "mvno.example.com",
  listen_ip: "10.100.1.10",
  listen_port: 3868,
  service_name: :mvno_dra,
  product_name: "OmniDRA",
  vendor_id: 10415,
  request_timeout: 5000,
  peer_selection_algorithm: :random,
  allow_undefined_peers_to_connect: false,
  log_unauthorized_peer_connection_attempts: true,
  peers: [
    # MME - □□ MME □□
    %{
      host: "mme01.operator.example.com",
      realm: "operator.example.com",
      ip: "10.100.2.15",
      port: 3868,
      transport: :diameter_sctp,
      tls: false,
      initiate_connection: false
    },
    # HSS - DRA □□□□
    %{
      host: "hss01.mvno.example.com",
      realm: "mvno.example.com",
      ip: "10.100.3.141",
      port: 3868,
      transport: :diameter_tcp,
      tls: false,
      initiate_connection: true
    },
    # PCRF □ TLS - DRA □□□□□□
    %{
      host: "pcrf01.mvno.example.com",
      realm: "mvno.example.com",
      ip: "10.100.3.22",
      port: 3869,
      transport: :diameter_tcp,
      tls: true,
```


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- SCTP □□□□□□□□□□
- □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□
- □□□□□□□□□□

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DRA □□□□

□□□□□□ IP □□□□ DRA □□□□

```
%{  
  # □□ IP□□□□□□□□  
  listen_ip: "192.168.1.10",  
  
  # SCTP □□□□□□□□ IP  
  listen_ip: ["192.168.1.10", "10.0.0.10"],  
  
  listen_port: 3868,  
  ...  
}
```

□□□□

- TCP 配置 IP
- SCTP 配置 IP
- 配置 IP 地址

配置

配置 IP 地址

```
peers: [
  %{
    host: "hss01.example.com",
    realm: "example.com",
    ip: "192.168.1.20", # IP 地址
    additional_ips: ["192.168.1.20", "10.0.0.20"], # 配置 IP
  }
  IP
  port: 3868,
  transport: :diameter_sctp,
  tls: false,
  initiate_connection: true
]
```

配置

- ip 配置
- ips 配置 ip
- 配置 SCTP ips IP
- 配置 TCP ip TCP 配置

□□□□

```
config :dra,  
  diameter: %{  
    service_name: :omnitouch_dra,  
    listen_ip: ["192.168.1.10", "10.0.0.10"], # □□□ DRA  
    listen_port: 3868,  
    host: "dra01",  
    realm: "example.com",  
    product_name: "OmniDRA",  
    vendor_id: 10415,  
    request_timeout: 5000,  
    peer_selection_algorithm: :random,  
    allow_undefined_peers_to_connect: false,  
    peers: [  
      # □□□ HSS □□  
      %{  
        host: "hss01.example.com",  
        realm: "example.com",  
        ip: "192.168.1.20",  
        additional_ips: ["192.168.1.20", "10.0.0.20"],  
        port: 3868,  
        transport: :diameter_sctp,  
        tls: false,  
        initiate_connection: true  
      },  
      # □□□ MME□□□□□□  
      %{  
        host: "mme01.example.com",  
        realm: "example.com",  
        ip: "192.168.1.30",  
        port: 3868,  
        transport: :diameter_sctp,  
        tls: false,  
        initiate_connection: false  
      }  
    ]  
  }  
}
```

□□

- □□□□ SCTP □□□□□Linux □□ `lksctp-tools` □□
- □□ IP □□□□□□□□/□□□□
- □□□□□□□□□□□□□□ IP □□ SCTP □□
- □□□□□□□□□□□□□□□□□□

□□

- TCP □□□□□□□□□□□□□□ IP□
 - SCTP □□□□□ TLS □□□□□□□□□□
 - □□□□□□□□□□□□□□ SCTP □□
-

□□□

□□ 3GPP □□ IDs

□□ ID	□□	□□
16777251	S6a/S6d	MME/SGSN □ HSS □□□□□□□□
16777252	S13/S13'	MME □ EIR □□□□□□
16777238	Gx	PCEF □ PCRF □□□□□□□□
16777267	S9	□ PCRF □□□ PCRF □□□□
16777272	Sy	PCRF □ OCS □□□□
16777216	Cx	I-CSCF/S-CSCF □ HSS IMS □□
16777217	Sh	AS □ HSS IMS □□□□
16777236	SLg	MME/SGSN □ GMLC □□□□
16777291	SLh	GMLC □ HSS □□□□□□
16777302	S6m	MTC-IWF □ HSS/HLR □□ M2M □□
16777308	S6c	SMS-SC/IP-SM-GW □ HSS SMS □□
16777343	S6t	SCEF □ HSS □□□□
16777334	Rx	AF □ PCRF □□□□

AVP

AVP	AVP		
1		UTF8String	IMSI 3GPP
264	Origin-Host	DiameterIdentity	
268	Result-Code	Unsigned32	
283	Destination-Realm	DiameterIdentity	
293	Destination-Host	DiameterIdentity	
296	Origin-Realm	DiameterIdentity	
297	Experimental-Result	Grouped	

AVP

- 3002 - DIAMETER_UNABLE_TO_DELIVER
- 3003 - DIAMETER_REALM_NOT_SERVED

AVP

```
route: :destination_host
```

AVP (293) AVP

drop

```
route: :drop
```

drop

- 3002 - DIAMETER_UNABLE_TO_DELIVER
- 3003 - DIAMETER_REALM_NOT_SERVED
- 3004 - DIAMETER_TOO_BUSY

drop

- DRA
- Erlang Diameter :discard
- `diameter_advanced_routing_drop_count_total` Prometheus

drop

```
route: {:error, 3004}
```

drop

- 3002 - DIAMETER_UNABLE_TO_DELIVER
- 3003 - DIAMETER_REALM_NOT_SERVED
- 3004 - DIAMETER_TOO_BUSY
- 5012 - DIAMETER_UNABLE_TO_COMPLY

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- DRA □□□□□□□□□□□□□□□□
- □□□□ Origin-Host□Origin-Realm□Session-Id□□□□□□□□□□
- □□□□□□□□□□□□
- □□ Erlang Diameter `{:protocol_error, code}` □□□□ `{:answer_message, code}` □
- □□□ `diameter_advanced_routing_error_count_total` □□□ Prometheus □□□

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- `:application_id` - □□□□□□ ID□□□□ □□ ID □□□□
 - □□□□ `{:application_id, 16777251}` □S6a/S6d□
 - □□□□ `{:application_id, [16777251, 16777252]}` □S6a □ S6b□
- `:command_code` - □□□□□□□□□□
 - □□□□ `{:command_code, 318}` □AIR □□□□
 - `{:command_code, [317, 318]}` □ULR □ AIR□
- `:avp` - □□ AVP □□□□ AVP □□□□□□
 - □□□□□□ `{:avp, {296, "epc.mnc001.mcc001.3gppnetwork.org"}}`
 - □□□□□□ `{:avp, {1, ~r"999001.*"}}`
 - □□□□□□ `{:avp, {1, ["505057001313606", ~r"999001.*", ~r"505057.*"]}}`
 - □□□□□□□□□□□□□□ `{:avp, {264, :any}}`

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- `:via_peer` - □□□□□□□□□□□□

- `{:via_peer, "omnitouch-lab-dra01.epc.mnc001.mcc001.3gppnetwork.org"}`
- `{:via_peer, ["omnitouch-lab-dra01.epc.mnc001.mcc001.3gppnetwork.org", "omnitouch-lab-dra02.epc.mnc001.mcc001.3gppnetwork.org"]}`
- `{:via_peer, :any}`

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- **`:to_peer`** - □□□□□□□□□□□□□□□□
 - `{:to_peer, "dra01.omnitouch.com.au"}`
 - `{:to_peer, ["dra01.omnitouch.com.au", "dra02.omnitouch.com.au"]}`
- **`:from_peer`** - □□□□□□□□□□□□□□□□
 - `{:from_peer, "hss-01.example.com"}`
 - `{:from_peer, ["hss-01.example.com", "hss-02.example.com"]}`
- **`:packet_type`** - □□□□□□□□
 - `{:packet_type, :request}`
 - `{:packet_type, :answer}`

□□□□□□□□

- **AVP** □□□□□□□□□□ AVP□□□□□□□□□□Origin-Host□Destination-Realm □□
 - □□ AVP □□□□□□□□□□
 - □□□□□□□□ □□□□
 - `{:avp, {code, value}}`
- □□□□□□□□□□□□□□□□□□□□ `:packet_type`□□□□
 - □□□□□□□□□□ **OR** □□ □□□□
 - `{:command_code, [317, 318]}` □□□□□□□□ 317 □ 318

- `any`
 - `:any` - AVP `any`
 - `{:avp, {264, :any}}` Origin-Host AVP

1

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DRA

```
dra_module_advanced_routing:
  enabled: True
  rules:
    - rule_name: temporary_until_cutover_s6a_via_to_local_hss
      match: ":all"
      filters:
        - '{:application_id, 16777251}'
        - '{:via_peer, ["omnitouch-lab-
dra01.epc.mnc001.mcc001.3gppnetwork.org", "omnitouch-lab-
dra02.epc.mnc001.mcc001.3gppnetwork.org"]}'
        - '{:avp, {296, "epc.mnc001.mcc001.3gppnetwork.org}}}'
      route:
        peers: [omnitouch-lab-
hss01.epc.mnc001.mcc001.3gppnetwork.org, omnitouch-lab-
hss02.epc.mnc001.mcc001.3gppnetwork.org]
```

DRA S6a HSS

2

IMSI

```
dra_module_advanced_routing:
  enabled: True
  rules:
    - rule_name: inbound_s6a_roaming_to_dcc
      match: ":all"
      filters:
        - '{:application_id, 16777251}'
        - '{:avp, {296, "epc.mnc001.mcc001.3gppnetwork.org}}}'
        - '{:avp, {1, ["505571234567", ~r"999001.*"]}}}'
      route:
        peers: [dra01.omnitouch.com.au, dra02.omnitouch.com.au]
```

Origin-Realm S6a IMSI DRA

3 **:destination_host**

AVP

```
dra_module_advanced_routing:
  enabled: True
  rules:
    - rule_name: route_to_specified_destination_host
      match: ":all"
      filters:
        - '{:avp, {1, [~r"90199.*"]}}}' # IMSI
      route: :destination_host
```

- AVP (293)
- AVP
-

4

IMSI

```
dra_module_advanced_routing:
  enabled: True
  rules:
    - rule_name: drop_test_subscribers
      match: ":all"
      filters:
        - '{:application_id, 16777251}' # S6a
        - '{:avp, {1, [~r"999999.*"]}}' # IMSI
      route: :drop
```

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- 999999 S6a IMSI
- □□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□
- Prometheus □□ □□□□□□□□

□□ 5□□□□□□□□□□□□□□

□□□□□□□□□□ DIAMETER_TOO_BUSY□

```
dra_module_advanced_routing:
  enabled: True
  rules:
    - rule_name: rate_limit_high_volume_peer
      match: ":all"
      filters:
        - '{:via_peer, "mme-overloaded-01.example.com"}'
        - '{:application_id, 16777251}'
      route: {:error, 3004}
```

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- □□□□□□□□□□ S6a □□
- □□ DIAMETER_TOO_BUSY (3004) □□□□
- □□□□□□□□□□□□□□
- □□□□□□□□□□□□□□
- □□ Prometheus □□ □□□□□□□□

❖❖❖ 6

```
dra_module_advanced_routing:  
  enabled: True  
  rules:  
    - rule_name: block_purge_requests  
      match: ":all"  
      filters:  
        - '{:application_id, 16777251}' # S6a  
        - '{:command_code, 321}' # PUR ( UE )  
      route: {:error, 5012}
```

- S6a UE
- DIAMETER_UNABLE_TO_COMPLY (5012)
-
-

AVP

- `dictionary` `:diameter_gen_3gpp_s6a`

AVP

- `:remove` - AVP
- `:overwrite` - AVP
 - `dictionary`

AVP

AVP

AVP

- `{:avp, {<code>, <new_value>}}` - AVP

AVP

- `{:avp, {<code>, :any}}` - ID AVP
- `avp_id` AVP

AVP

```
transform: %{
  action: :overwrite,
  dictionary: :diameter_gen_3gpp_s6a,
  avps: [{:avp, {"s6a_Supported-Features", {"s6a_Supported-Features", 10415, 1, 3221225470, []}}}]
}
```

AVP

AVP 1

AVP

```
dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: rewrite_s6a_destination_realm_for_operator_X
      match: ":all"
      filters:
        - '{:to_peer, ["dra01.omnitouch.com.au",
"dra02.omnitouch.com.au"]}'
        - '{:avp, {296, "epc.mnc001.mcc001.3gppnetwork.org"}}'
        - '{:avp, {1, [~r"9999999.*"]}}'
      transform:
        action: ":edit"
        avps:
          - '{:avp, {283, "epc.mnc999.mcc999.3gppnetwork.org"}}'
```

Operator S6a destination realm DRA IMSI destination realm X

2

```
dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name:
rewrite_s6a_destination_realm_for_roaming_partner_ausie
      match: ":all"
      filters:
        - '{:to_peer, ["dra01.omnitouch.com.au",
"dra02.omnitouch.com.au"]}'
        - '{:avp, {296, "epc.mnc057.mcc505.3gppnetwork.org"}}'
        - '{:avp, {1, [~r"50557.*"]}}'
      transform:
        action: ":edit"
        avps:
          - '{:avp, {283, "epc.mnc030.mcc310.3gppnetwork.org"}}'
```

IMSI destination realm IMSI destination realm

3 MVNO

```

dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: rewrite_s6a_destination_realm_for_single_sub
      match: ":all"
      filters:
        - '{:to_peer, ["dra01.omnitouch.com.au",
"dra02.omnitouch.com.au"]}'
        - '{:avp, {296, "epc.mnc001.mcc001.3gppnetwork.org}}}'
        - '{:avp, {1, ["505057000003606"]}}}' # IMSI
      transform:
        action: ":edit"
        avps:
          - '{:avp, {283, "epc.mnc001.mcc001.3gppnetwork.org}}}'

```

□□□□□□□□ MVNO □□□□□□□□□□□□□□□□

□□ **4**□□□□□□□□□□□□□□□□

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```

dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: Tutorial_Rule_AIR
      match: ":all"
      filters:
        - '{:application_id, 16777251}'
        - '{:command_code, 318}'
        - '{:packet_type, :request}'
        - '{:avp, {1, "9999990000000001}}}'
        - '{:avp, {264, :any}}}' # Origin-Host □□□□□□□□□□
      transform:
        action: ":edit"
        avps:
          - '{:avp, {1, "9999990000000002}}}'

```

□□□□□

- □□□ S6a AIR □□ □□□□□□□□□□□□

- AVP 1 "9999990000000001"
- Origin-Host AVP 264
- AVP "9999990000000002"
- AVP

5 AVP

AVP

```
dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: remove_user_name_avp
      match: ":all"
      filters:
        - '{:application_id, 16777251}'
      transform:
        action: ":remove"
        avps:
          - '{:avp, {1, :any}}' #
```

S6a AVP 1

6 AVP

AVP

```

dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: add_sos_apn_to_ula
      match: ":all"
      filters:
        - ':{application_id, 16777251}'          # S6a/S6d
        - ':{command_code, 316}'                # ULA (□□□□□□)
        - ':{packet_type, :answer}'             # □□□□□□
        - ':{avp, {296, "epc.mnc001.mcc001.3gppnetwork.org"}}' #

```

Origin-Realm

```

  transform:
    action: ":overwrite"
    dictionary: ":diameter_gen_3gpp_s6a"
    avps:
      - ':{avp, {"s6a_APN-Configuration-Profile",
        {"s6a_APN-Configuration-Profile", 1, 0, [
          {"s6a_APN-Configuration", 1, 0, "internet", [],
            [{"s6a_EPS-Subscribed-QoS-Profile", 9,
              {"s6a_Allocation-Retention-Priority", 1, [0],
[0], [], []]},
[1], [], [], [1], ["0800"],
[{:s6a_AMBR, 4200000000, 4200000000, [], [],
[]]},
[], [], [], [], [], [], [], [], [], [], [], [], [],
[1], [], [1]},
{"s6a_APN-Configuration", 2, 0, "ims", [],
[{:s6a_EPS-Subscribed-QoS-Profile", 5,
  {"s6a_Allocation-Retention-Priority", 1, [0],
[1], [], [1]},
[0], [], [], [1], ["0800"],
[{:s6a_AMBR, 4200000000, 4200000000, [], [],
[]]},
[], [], [], [], [], [], [], [], [], [], [], [], [],
[1], [], [1]},
{"s6a_APN-Configuration", 3, 0, "sos", [],
[{:s6a_EPS-Subscribed-QoS-Profile", 5,
  {"s6a_Allocation-Retention-Priority", 1, [0],
[1], [], [1]},
[1], [], [], [1], ["0800"],
[{:s6a_AMBR, 4200000000, 4200000000, [], [],
[]]},
[], [], [], [], [], [], [], [], [], [], [], [], [],

```


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□□ 1

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□□ 2

□□□□□□

□□ 3

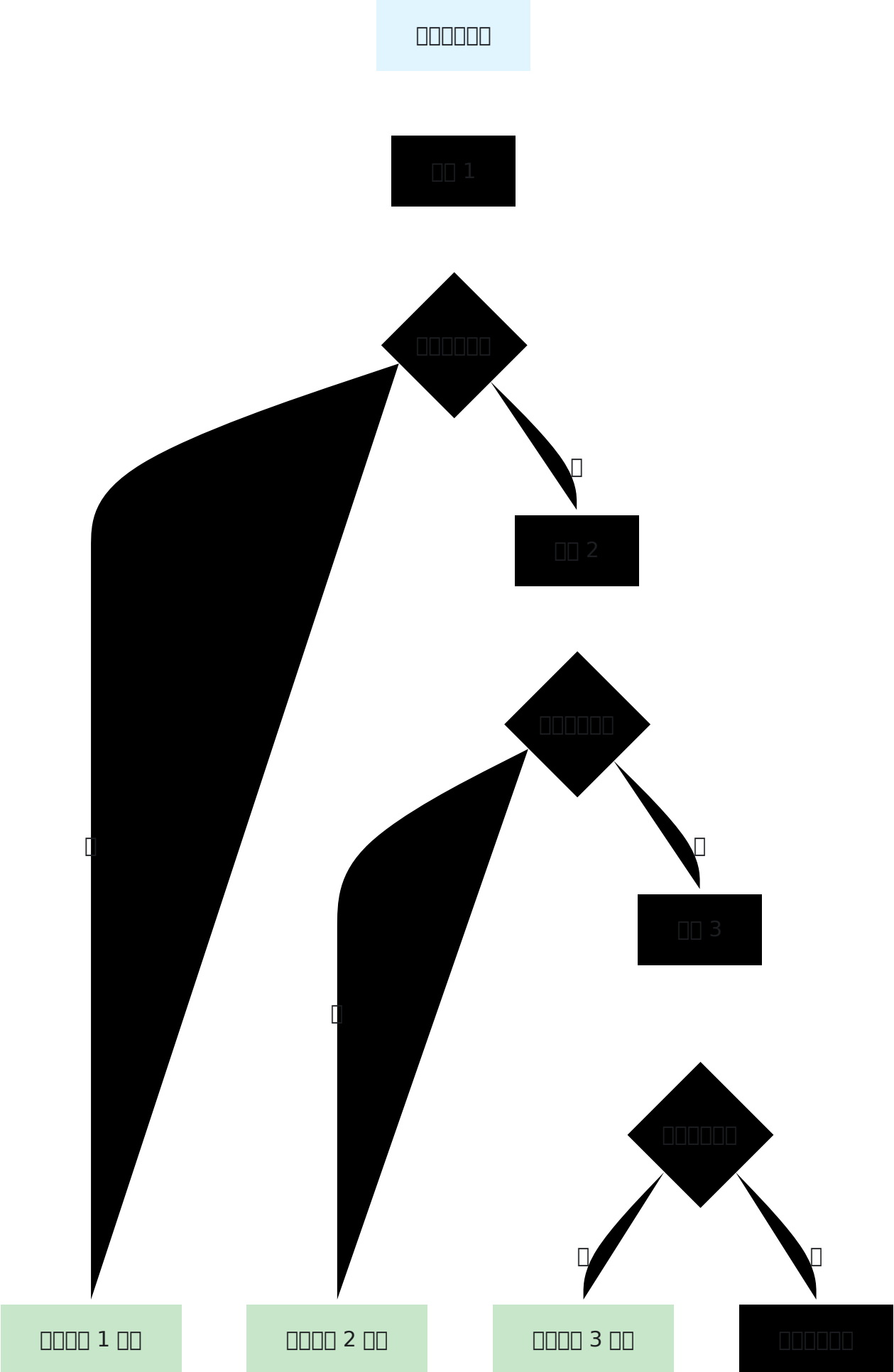
□□□□□□

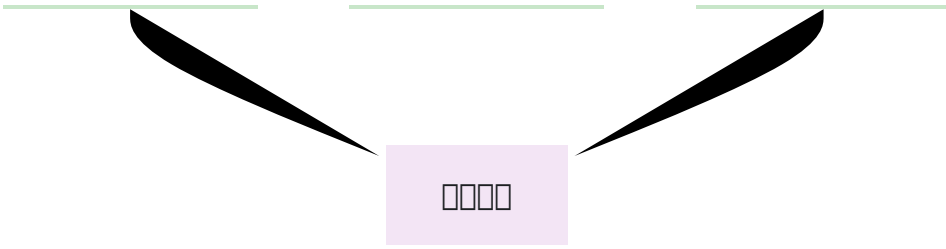
□□□□ 1 □□

□□□□ 2 □□

□□□□ 3 □□

□□□□□□





IPsec:
IPsec
IPsec

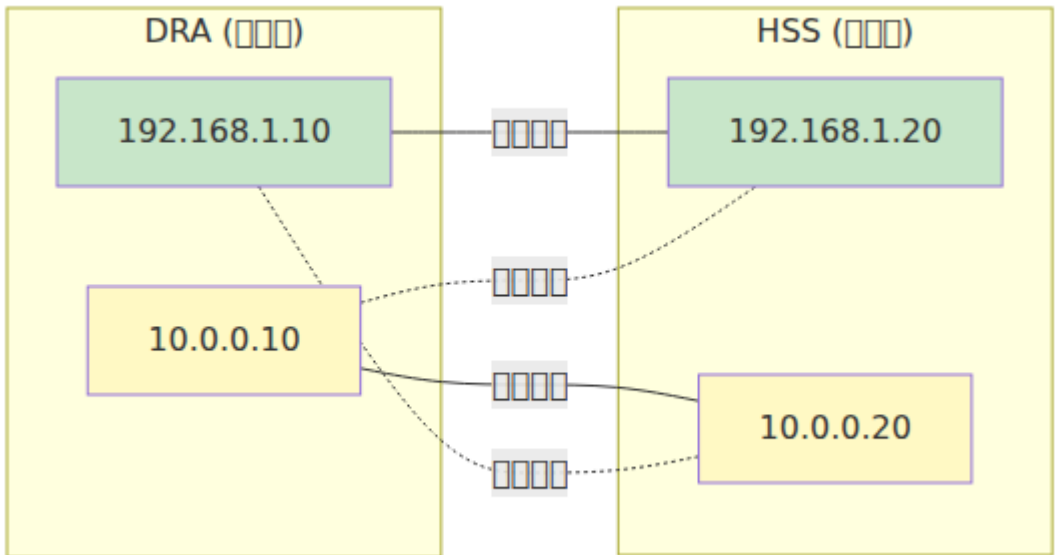
1. IPsec configuration IPsec IPsec
2. IPsec configuration match IPsec :all IP :any IP :none IP
3. IPsec configuration - IPsec configuration
4. IPsec configuration IPsec configuration/IPsec

IPsec

match IPsec configuration

match: :all (AND IP)

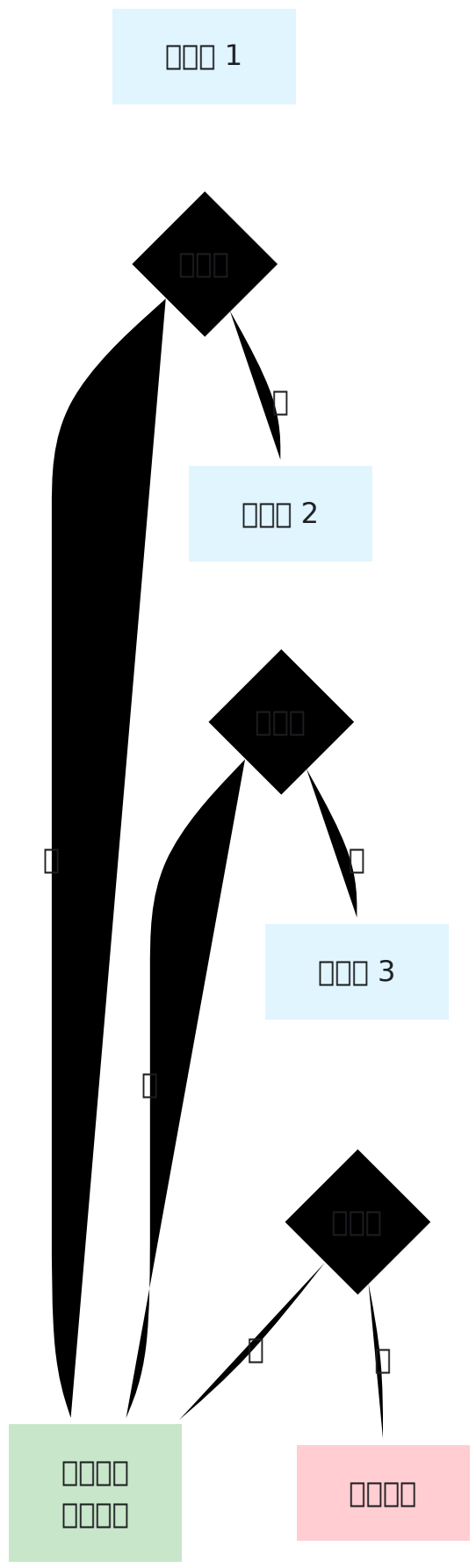
IPsec configuration



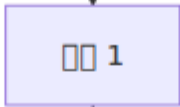
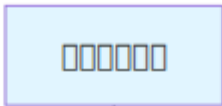
IPsec 3 IPsec filter1 AND filter2 AND filter3 IPsec

match: :any (OR IP)

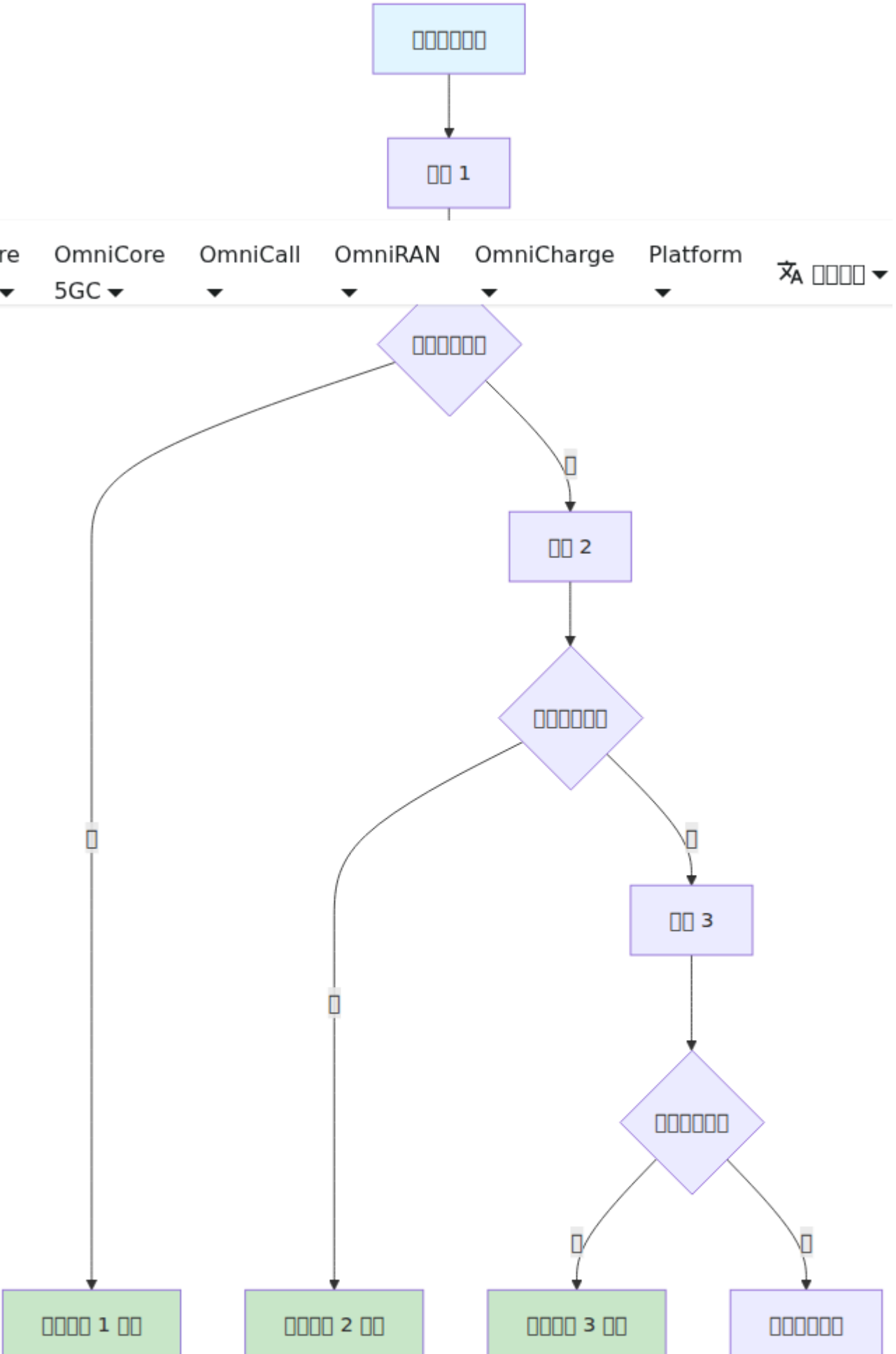
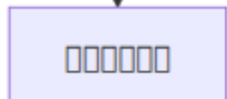
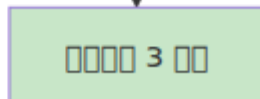
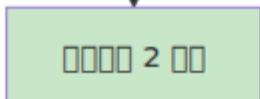
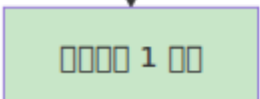
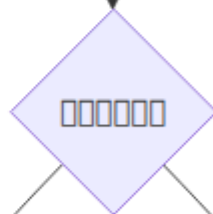
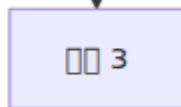
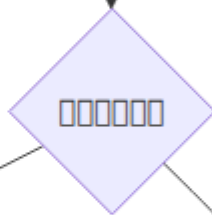
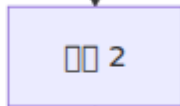
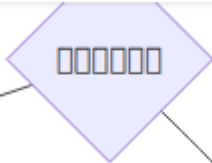
IPsec configuration



filter1 OR filter2 OR filter3



Core OmniCore OmniCall OmniRAN OmniCharge Platform AA AAAA ▼



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```
module_extended_metrics:
  enabled: true
  attach_attempt_reporting_enabled: true
```

□□

□□	□□
enabled	□□ true □□□□□□□□
attach_attempt_reporting_enabled	□□□□□□ LTE □□□□□□S6a AIR/AIA□

□□□□

□□□□□□

□□□□□□□□□□ (AIR) □□□ (AIA) □□□□□□ LTE □□□□□□□□

Parse error on line 36: ... style Metrics fill:#f3e5f5 style E -----^
Expecting 'SOLID_OPEN_ARROW', 'DOTTED_OPEN_ARROW', 'SOLID_ARROW',
'BIDIRECTIONAL_SOLID_ARROW', 'DOTTED_ARROW',
'BIDIRECTIONAL_DOTTED_ARROW', 'SOLID_CROSS', 'DOTTED_CROSS',
'SOLID_POINT', 'DOTTED_POINT', got 'TXT'

□□

□□□ attach_attempt_count

□□□

- imsi - □□□ IMSI□□□□□□ AVP - □□ AVP □□□

□□□

- 5004 - AVP
- RFC 6733

Configuration

- S6a AIR/AIA ID 16777251 318
- + 5
-
-

Prometheus

DRA Prometheus `/metrics`

Configuration

Example

`diameter_peer_status` Gauge 1 0

- `origin_host` -
- `ip` - IP

Example

```
#
diameter_peer_status{origin_host="hss01.example.com"}

#
count(diameter_peer_status == 0)
```

Example

`diameter_peer_message_count_total` Counter

- `origin_host` -

- `received_from` - 00000000
- `application_id` - 0000 ID0000 00 ID 0000
- `cmd_code` - 0000000000 0000???
- `application_name` - 000000000000"3GPP_S6a"
- `cmd_name` - 000000000000"AIR"
- `direction` - "request" 0 "response"

000

```
# 0000 MME 0 S6a AIR 0000
rate(diameter_peer_message_count_total{
  cmd_code="318",
  direction="request",
  origin_host="mme01.example.com"
}[5m])

# 0000000000
sum by (application_name)
(rate(diameter_peer_message_count_total[5m]))
```

000000

000 `diameter_peer_message_result_code_count_total` 000Counter 0000000000
000000000 000

- `origin_host` - 000000
- `routed_to` - 00000000
- `application_id` - 0000 ID
- `cmd_code` - 00000000
- `application_name` - 00000
- `cmd_name` - 00000
- `result_code` - 0000000000000000

000

```

# S6a AIR
rate(diameter_peer_message_result_code_count_total{
  cmd_code="318",
  result_code="2001"
}[5m])

#
sum by (result_code) (
  rate(diameter_peer_message_result_code_count_total{
    result_code!="2001"
  }[5m])
)

```

2001-5012

- 2001 - DIAMETER_SUCCESS
- 3002 - DIAMETER_UNABLE_TO_DELIVER
- 3003 - DIAMETER_REALM_NOT_SERVED
- 3004 - DIAMETER_TOO_BUSY
- 5001 - DIAMETER_AUTHENTICATION_REJECTED
- 5004 - DIAMETER_INVALID_AVP_VALUE
- 5012 - DIAMETER_UNABLE_TO_COMPLY

318

diameter_peer_last_response_delay Gauge DRA →
 → DRA

- origin_host -
- routed_to -
- application_name -
- cmd_name -

318

```
# HSS 平均遅延
avg(diameter_peer_last_response_delay{routed_to="hss01.example.com"})

# S6a の P95 遅延
histogram_quantile(0.95,
  rate(diameter_peer_last_response_delay{application_name="3GPP_S6a"}
    [5m])
)
```

フィルタ

メトリック `diameter_peer_unanswered_request_count_total` Counter のラベル

- `origin_host` - ホスト名
- `routed_to` - 宛先ホスト
- `application_id` - アプリケーション ID
- `cmd_code` - コマンドコード
- `application_name` - アプリケーション名
- `cmd_name` - コマンド名

クエリ

```
# 平均遅延
rate(diameter_peer_unanswered_request_count_total[5m])

# 遅延が長いものを上位5つ取得
topk(5, sum by (routed_to) (
  rate(diameter_peer_unanswered_request_count_total[5m])
))
```

フィルタ

メトリック `diameter_peer_unauthorized_connection_count_total` Counter のラベル

- `origin_host` - ホスト名
- `supported_applications` - サポートされているアプリケーション

- Erlang Diameter `:discard`
- `ignore`

Counter

`diameter_advanced_routing_error_count_total` Counter `Counter`
`{:error, result_code}`

- `result_code` -
- `application_id` - ID
- `cmd_code` -
- `application_name` -
- `cmd_name` -

Code

```
# Counter
sum by (result_code) (
  rate(diameter_advanced_routing_error_count_total[5m])
)

# DIAMETER_T00_BUSY
rate(diameter_advanced_routing_error_count_total{
  result_code="3004"
}[5m])

# Counter
diameter_advanced_routing_error_count_total{
  result_code="3004"
} > 100
```

Code

- `route: {:error, result_code}`
- DRA
-
- Erlang Diameter `{:protocol_error, code}` `{:answer_message, code}`

- `3000` - DIAMETER_UNABLE_TO_DELIVER

3000

- `3002` - DIAMETER_UNABLE_TO_DELIVER
- `3003` - DIAMETER_REALM_NOT_SERVED
- `3004` - DIAMETER_TOO_BUSY
- `5012` - DIAMETER_UNABLE_TO_COMPLY

3000

- `/metrics` Prometheus
 - S6a `3000`
 - **BEAM/Erlang** `rate()`
 - IMSI
-

3000

3000

- `AVP`
- `AVP`