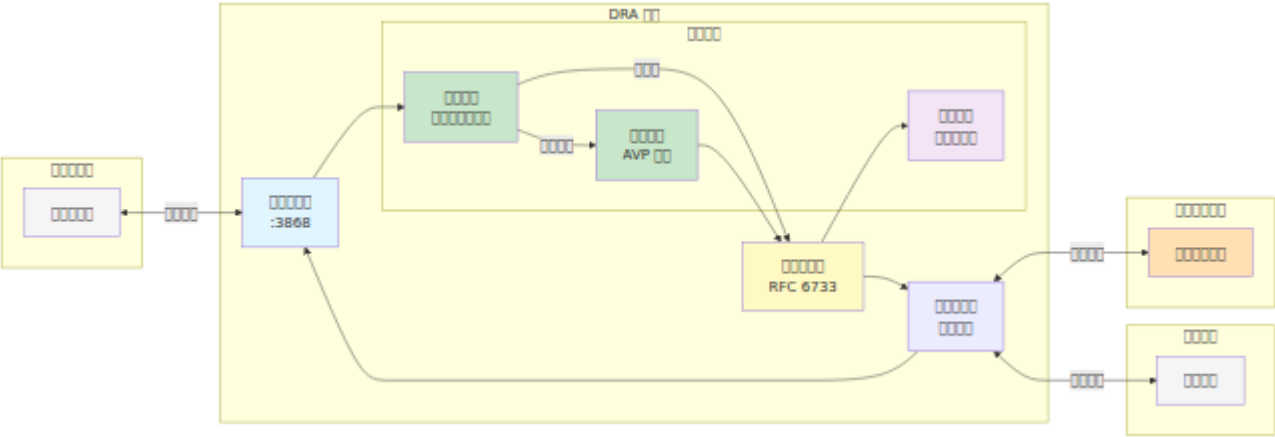


DRA 架构图

图例

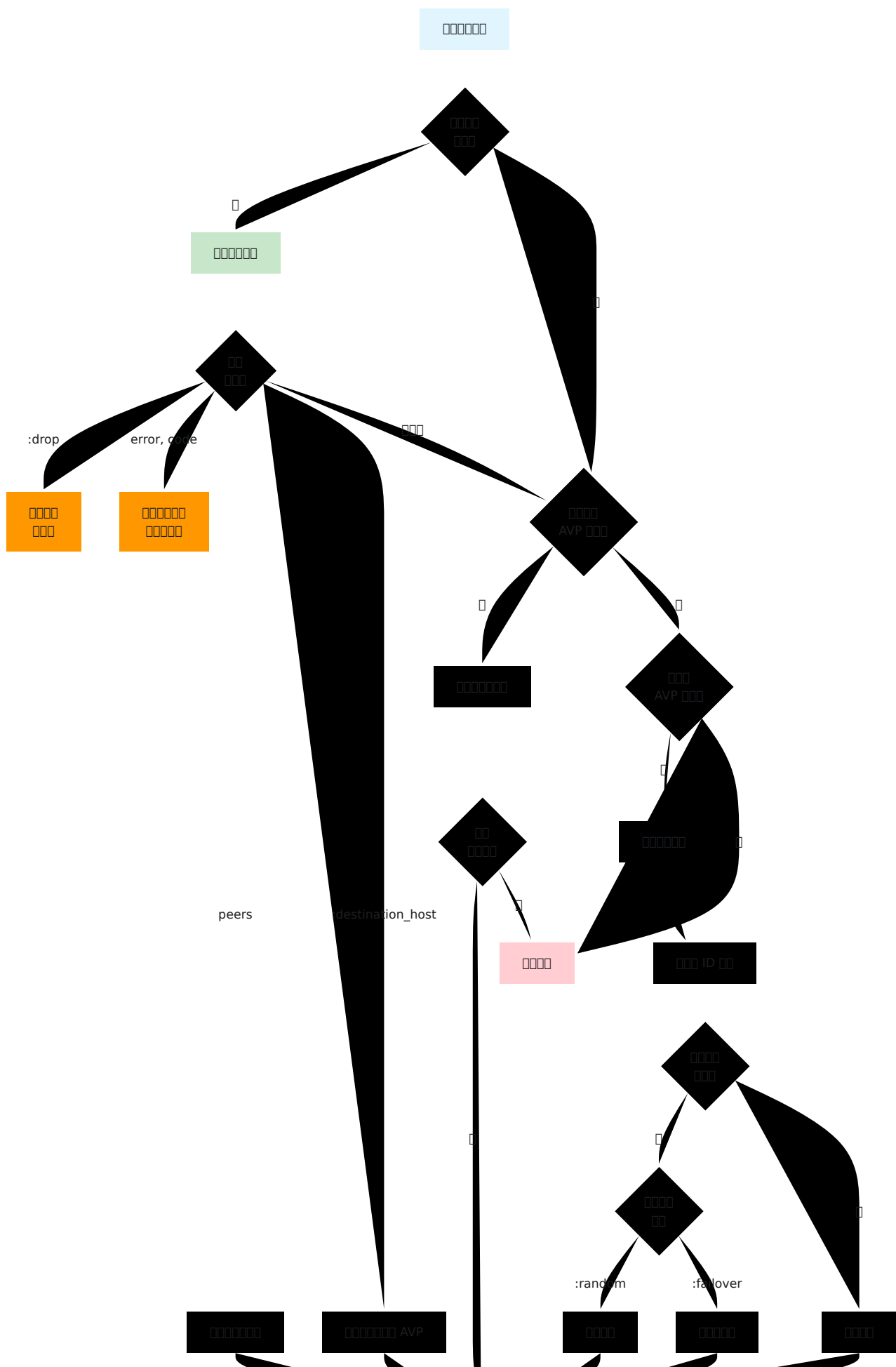
- 1. 网络元素
- 2. 与 DRA 连接
- 3. SCTP 连接
- 4. 接口
 - 与 3GPP 接口 ID
 - 与 AVP 接口
- 5. 网络元素
- 6. 网络元素
- 7. 网络元素
- 8. 网络元素
- 9. Prometheus 接口
 - 网络元素
 - 网络元素
- 10. 网络元素

DRA 架构图



□□□□□□

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





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DRA □□ RFC 6733 □ 6.1 □ □□□□□□□□□□□□□□□□

1. □□□□ **AVP (293)** - □□□□□DRA □□□□□□□□

- □□□□□□□□□□□□
- □□□□□□□□□□□□
- □□□□□□□□□□□□

2. □□□□ **AVP (283)** - □□□□□□□□□□□□□□

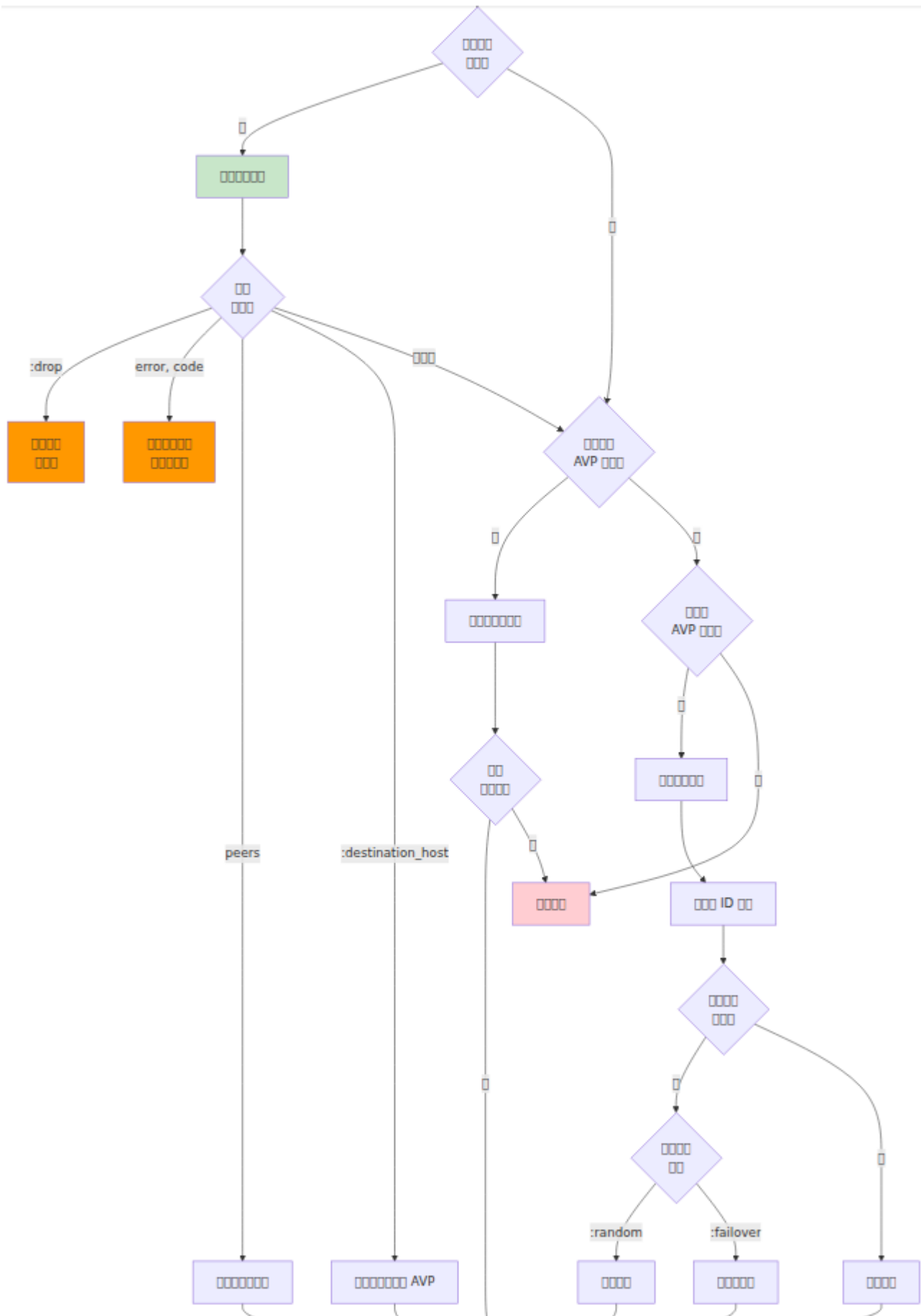
- DRA □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□

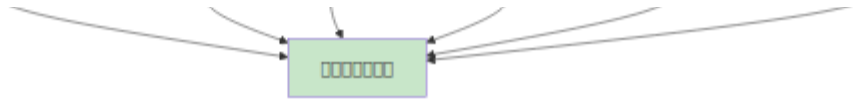
3. □□ **ID** - □□□□□□□□□□□□□□

- □□□□□□□□□□□□ ID □□□□
- □□□□□□□□□□□□□□ (CER/CEA)
- □□ □□ **3GPP** □□ **IDs** □□□□

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- 3GPP TS 23.060 3GPP TS 23.060
- 3GPP ID 3GPP ID
- 3GPP DRA 3GPP DRA
- 3GPP DRA 3GPP AVP
- 3GPP 3GPP

3GPP TS 23.060

- 3GPP TS 23.060
- 3GPP TS 23.060
- 3GPP TS 23.060
- 3GPP TS 23.060

3GPP TS 23.060 RFC 6733 6.2

3GPP

3GPP peer_selection_algorithm

- :random - 3GPP
- :failover - 3GPP
- 3GPP 3GPP
- 3GPP

3GPP

- 3GPP AVP 3GPP IMSI 3GPP
- 3GPP AVP
- 3GPP
- 3GPP

3GPP 3GPP 3GPP

□□ DRA □□

DRA

--	--	--	--

```
%{
  host: "dra01.example.com",
  realm: "example.com",
  listen_ip: "192.168.1.10",
  listen_port: 3868,
  service_name: :example_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: [
    # [][]...
  ]
}
```

DRA ☐ ☐ ☐ ☐

項目	項目	項目
host	項目	DRA 項目 項目項目項目項目項目項目
realm	項目	DRA 項目 項目
product_name	項目	項目 CER/CEA 項目項目項目項目項目
vendor_id	項目	項目 RFC 6733 項目 5.3.3 項目 項目項目項目 ID項目10415 = 3GPP項目

配置

項目	単位	説明
<code>listen_ip</code>	IPv4 アドレス 空	DRA の IP アドレス Sctp の IP アドレス Sctp のポート
<code>listen_port</code>	ポート	TCP/Sctp のポート番号3868
<code>service_name</code>	名前	Erlang の名前
<code>request_timeout</code>	秒	リクエストのタイムアウト時間5000

ピア設定

項目	単位	説明
<code>peer_selection_algorithm</code>	ピア 選択	ピアの選択アルゴリズム random failover ピアの リスト
<code>allow_undefined_peers_to_connect</code>	ピア 接続	ピアの接続を許可するかどうか false
<code>log_unauthorized_peer_connection_attempts</code>	ピア 接続	ピアの接続の失敗をログに記録するかどうか

ピア

`peers` ピアのリスト

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

配置

属性	类型	说明
host	字符串	主机名或 FQDN - 必须为 DNS 可解析
realm	字符串	域名
ip	字符串	主机 IP 地址
ips	列表	SCTP 主机 IP 地址列表 SCTP 支持
port	整数	端口号 3868
transport	枚举	传输协议 :diameter_tcp 或 :diameter_sctp
tls	布尔	是否 TLS 加密 true 则端口为 3869
initiate_connection	布尔	true 则 DRA 主动连接 false 则 DRA 被动连接

配置

配置 (initiate_connection: true)

- DRA 主动连接
- DRA 支持 TCP/SCTP 传输
- 支持 HSS/PCRF 鉴权

- 配置DRA 参数

配置 (`initiate_connection: false`)

- DRA 参数
- DRA 参数
- MME-SGSN-P-GW 参数
- 配置 `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,
```

```

        initiate_connection: true
    }
]
}

```

配置

- 配置 `host` 参数
- 配置 CER/CEA 参数
- 配置 DRA 参数 3GPP 参数 `3GPP IDs`
- 配置 **ID 10415** 3GPP 参数
- 配置 `TTL` + 5
- 配置 `peer_selection_algorithm` 参数

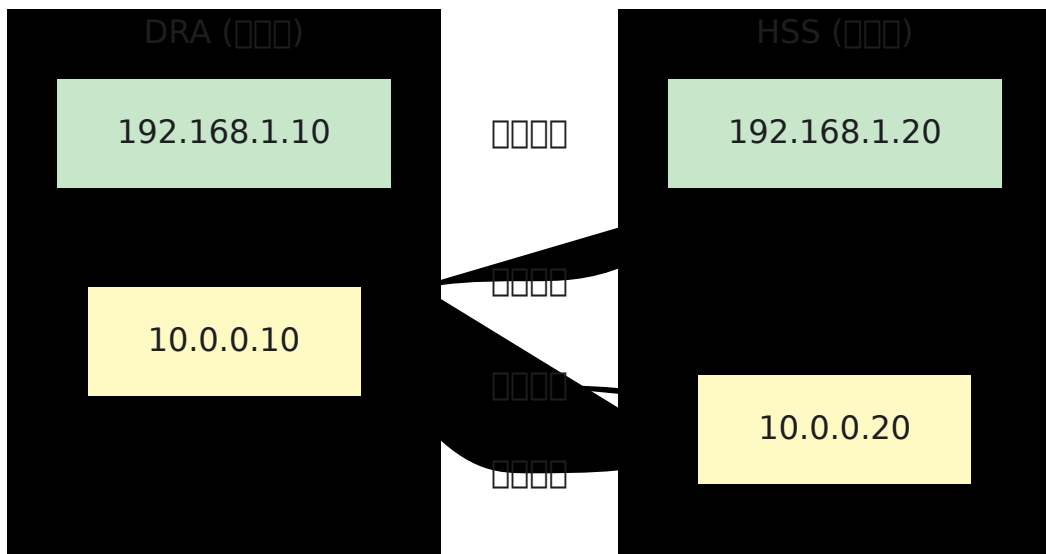
配置

- 配置 `allow_undefined_peers_to_connect: false`
- 配置 `log_unauthorized_peer_connection_attempts: true` 参数
- 配置 `listen_ip` 和 `listen_port` 参数
- 配置 TLS 参数

SCTP 配置

SCTP 配置 IP 地址和 SCTP 配置

□□□□



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

□□

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 连接使用 IP
- SCTP 连接使用 IP
- 每个 IP 连接使用 IP

配置

配置 IP 连接使用 IP

```
peers: [
  %{
    host: "hss01.example.com",
    realm: "example.com",
    ip: "192.168.1.20", # 每个 IP 连接
    additional_ips: ["192.168.1.20", "10.0.0.20"], # 配置 IP
  }
]
```

配置

- `ip` 配置使用 IP
- `ips` 配置使用 IP 连接 `ip`
- 每个 SCTP 连接 `ips` 配置使用 IP
- 每个 TCP 连接 `ip` 配置使用 IP

□□□□

```
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
      }
    ]
  }
}
```

11

- 學習 SCTP 安裝Linux 的 `lksctp-tools`
- 了解 IP 地址範圍/子網
- 瞭解網路設備如何處理 IP 和 SCTP 包
- 瞭解網路設備如何處理多播包

11

- TCP 1000000000000000 IP
- SCTP 1000000000000000 TLS 1000000000000000
- 1000000000000000 SCTP 1000000000000000

□□□

□□ **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 □□□□

00
 AVP
 00

00	AVP 00	00	00
1	000	UTF8String	00000000IMSI 3GPP 00
264	Origin-Host	DiameterIdentity	00000000
268	Result-Code	Unsigned32	00000000
283	Destination-Realm	DiameterIdentity	000
293	Destination-Host	DiameterIdentity	0000000000
296	Origin-Realm	DiameterIdentity	00
297	Experimental-Result	Grouped	000000000000

00000000

000000000000000000000000 AVP


```
dra_module_advanced_routing:
  enabled: True
  rules:
    - rule_name: <rule_name>
      match: <match>
      filters: [<filters>]
      route:
        peers: [<peers>]
```

Table

Field	Description
enabled	Boolean True or False
rule_name	Rule name
match	Match criteria: all AND OR - any OR - none NOR -
filters	Filters
route	Route

Example

```
route: rule_name
```

Example

```
route:
  peers: [peer01.example.com, peer02.example.com]
```

Example

- DRA

- 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

□□□

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

~~~~~

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- **`:to_peer`** - 接收端地址
  - `{:to_peer, "dra01.omnitech.com.au"}`
  - `{:to_peer, ["dra01.omnitech.com.au", "dra02.omnitech.com.au"]}`
- **`:from_peer`** - 发送端地址
  - `{:from_peer, "hss-01.example.com"}`
  - `{:from_peer, ["hss-01.example.com", "hss-02.example.com"]}`
- **`:packet_type`** - 数据包类型
  - `{:packet_type, :request}`
  - `{:packet_type, :answer}`

~~~~~

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

- 配置
 - `:any` - 匹配所有 AVP 类型
 - `{:avp, {264, :any}}` 匹配所有 Origin-Host AVP

配置

配置 1 配置

配置 DRA 配置

```
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]
```

配置 DRA 配置 S6a 配置 HSS 配置

配置 2 配置

配置 IMSI 配置

```
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
```

配置

- 999999 S6a IMSI
-
-
- Prometheus 监控

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}
```

配置

- S6a
- DIAMETER_TOO_BUSY (3004)
-
-
- Prometheus 监控

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```
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

```
dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: <rule_name>
      match: <match>
      filters: [<filters>]
      transform:
        action: <action>
        avps: [<avp rule>]
```

Table

Field	Description
enabled	Boolean True or False
rule_name	Rule name
match	Match criteria: :all AND :any OR :none NOR - :any
filters	Filters
transform.action	Action: :edit :remove :overwrite
transform.avps	AVP list: AVP

Options

Options

- **:edit** - Edit AVP
 - Add AVP
 - AVP
- **:remove** - Remove AVP
- **:overwrite** - Overwrite AVP

- `dictionary` `:diameter_gen_3gpp_s6a`

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

AVP

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

AVP

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

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

1

```
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 operator IMSI destination realm X

2 destination realm

```
dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name:
rewrite_s6a_destination_realm_for_roaming_partner_auie
      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"}}'
```

Operator 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"}}'
```

4 MVNO

4

```
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

- 配置 AVP 1 为 "9999990000000001"
- 配置 Origin-Host 为 AVP 264 配置
- 配置 AVP 2 为 "9999990000000002"
- 配置 AVP 配置

配置 5 个 AVP

配置 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}}' # 配置 AVP
```

配置 S6a 配置 AVP 1 配置

配置 6 个 AVP

配置 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 (000000)
        - ':{packet_type, :answer}'             # 000000
        - ':{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, [], [],
[]}],
[], [], [], [], [], [], [], [], [], [], [], [], [],
[], [], []],
{:"s6a_APN-Configuration", 2, 0, "ims", [],
[{:s6a_EPS-Subscribed-QoS-Profile", 5,
  {:"s6a_Allocation-Retention-Priority", 1, [0],
[1], [], []}],
[0], [], [], [1], ["0800"],
[{:s6a_AMBR, 4200000000, 4200000000, [], [],
[]}],
[], [], [], [], [], [], [], [], [], [], [], [], [],
[], [], []],
{:"s6a_APN-Configuration", 3, 0, "sos", [],
[{:s6a_EPS-Subscribed-QoS-Profile", 5,
  {:"s6a_Allocation-Retention-Priority", 1, [0],
[1], [], []}],
[1], [], [], [1], ["0800"],
[{:s6a_AMBR, 4200000000, 4200000000, [], [],
[]}],
[], [], [], [], [], [], [], [], [], [], [], [], [],

```

```
[], [], []}  
    ], []}  
    }{'
```

□□□□□

- □□□□□ Origin-Realm □ S6a □□□□□ (ULA) □□□
- □□ :overwrite □□□□□ APN □□□□□ AVP
- □□ **dictionary** □□ □□□□□□□□□□ AVP □□
- □□□□ APN □□□ "internet"□□□□ 1□□ "ims"□□□□ 2□□ "sos"□□□□ 3□
- □□ APN □□ QoS □□□□□□□□□□ AMBR□□ PDN □□□□
- □□□□□□□□□□ SOS□ APN □□□□□□□□□□□□□□

□□□□ :overwrite □□□□

- □□□□□□□□□□□□ AVP□□ APN □□□□□□
- □□□□□□□□□□ 3GPP □□□□
- □ :edit □□□□□□□□ AVP □□□□
- □□□□□□□□□□□□ S6a □ :diameter_gen_3gpp_s6a □□

□□□□□

- :overwrite □□□□□ AVP□□□□□□□□□□□□
- AVP □□□□□□□□□□□□□□□□
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- **MVNO** □□□□□□□□□□□□□□□□□□□□
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 - □□□□□□□□□□ IMSI □□□□□□□□□□□□□□□□
-

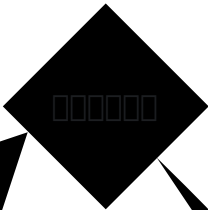
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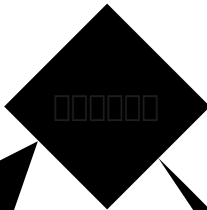
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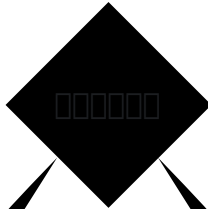
□□ 1



□□ 2



□□ 3

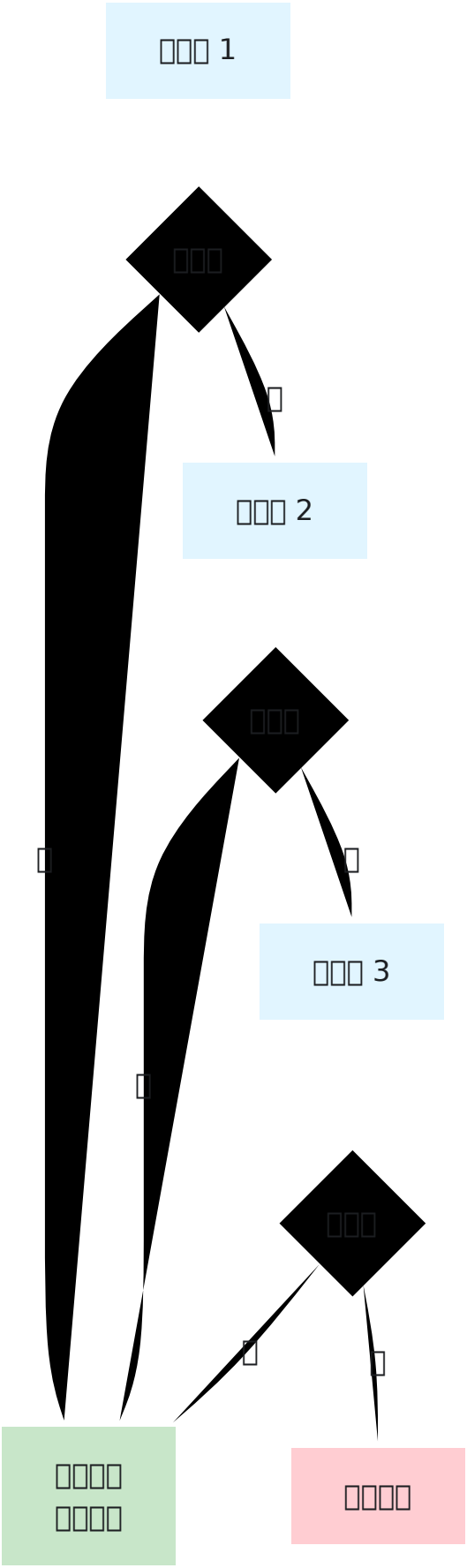


□□□□ 1 □□

□□□□ 2 □□

□□□□ 3 □□

□□□□□□



filter1 OR filter2 OR filter3

match: :none (NOR)

□□□□□□

□□ 1

OmniCharge ▼

OmniRAN ▼

Downloads

⌕ A □□□□ ▼

Omnitouch Website ↗

□□□□□□

□□ 2

□□□□□□

□□ 3

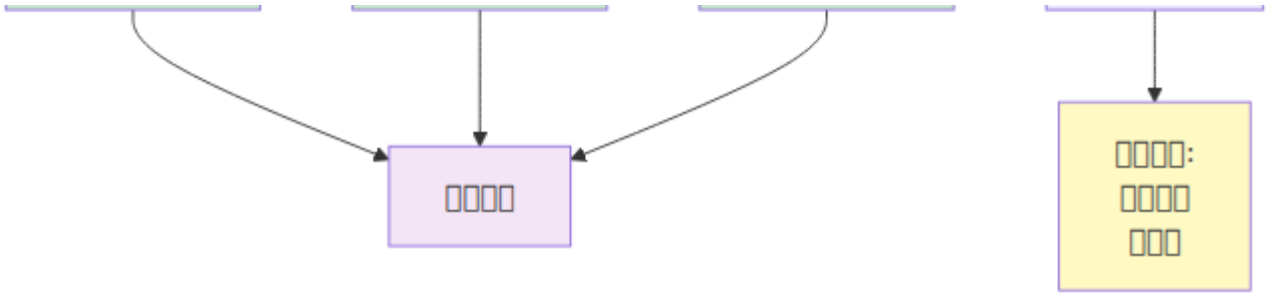
□□□□□□

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filter3 3 filter1 AND NOT filter2 AND NOT filter3

filter1

filter2 {avp, {1, ["value1", "value2"]}} OR filter3

filter4

filter5 ~r"pattern"

- ~r"999001.*" - 999001 IMSI
- ~r"^310[0-9]{3}.*" - MNC IMSI
- ~r".*test\$" - "test"

filter6

- filter6 filter7
- filter8
- filter9
- filter10 rule_name filter11
- filter12

filter13

filter14

00

0000000000000000

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

00

00	00
enabled	000 true 0000000000
attach_attempt_reporting_enabled	00000000 LTE 000000S6a AIR/AIA

0000

000000

000000000000 (AIR) 000 (AIA) 00000000 LTE 000000000

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'

00

000attach_attempt_count

000

- imsi - 000 IMSI00000000 AVP - 00 AVP 000

000

- `origin_host` - 设备IP地址
- `result_code` - HSS 返回结果码

配置

1. 配置 AIR 设备 318 S6a 的 16777251 - 设备 ID
 - 设备/设备 ID
 - IMSI 设备 AVP 的 1
 - Origin-Host AVP 的 264
2. 配置 ETS 的 TTL
3. 配置 AIA 设备
 - 设备 ID
 - 设备 AVP 268 设备 AVP 297
 - 设备 IMSI origin host 的 result code

配置

- 设备 - 设备
- **IMSI** 设备 - 设备
- 设备 - 设备 MME/SGSN
- 设备 - 设备

配置

配置 InfluxDB 设备

```
DRA.Metrics.InfluxDB.write({
  measurement: "attach_attempt_count",
  fields: {imsi: "505057000000001"},
  tags: {origin_host: "mme-01.example.com", result_code: 2001}
})
```

配置

- `2001` - DIAMETER_SUCCESS
- `5001` - DIAMETER_AUTHENTICATION_REJECTED

- 5004 - AVP
- RFC 6733

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

Prometheus

DRA Prometheus /metrics

diameter_peer_status Gauge 10

- origin_host -
- ip - IP

```
#  
diameter_peer_status{origin_host="hss01.example.com"}  
  
#  
count(diameter_peer_status == 0)
```

diameter_peer_message_count_total Counter

- origin_host -

- `received_from` - 送信元
- `application_id` - 送信元 ID 送信元 ID
- `cmd_code` - 送信元コード 送信元コード
- `application_name` - 送信元名前 "3GPP_S6a"
- `cmd_name` - 送信元名前 "AIR"
- `direction` - "request" または "response"

例

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

# 送信元名前
sum by (application_name)
(rate(diameter_peer_message_count_total[5m]))
```

送信元

`diameter_peer_message_result_code_count_total` Counter 送信元コード

- `origin_host` - 送信元
- `routed_to` - 送信元
- `application_id` - 送信元 ID
- `cmd_code` - 送信元コード
- `application_name` - 送信元名前
- `cmd_name` - 送信元名前
- `result_code` - 送信元コード

例

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

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

監視項目

監視項目 `diameter_peer_unanswered_request_count_total` は Counter 型の監視項目
監視項目は以下

- `origin_host` - ホスト名
- `routed_to` - 宛先ホスト名
- `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

監視項目

```
# 監視項目
rate(diameter_peer_unanswered_request_count_total[5m])

# 監視項目
topk(5, sum by (routed_to) (
  rate(diameter_peer_unanswered_request_count_total[5m])
))
```

監視項目

監視項目 `diameter_peer_unauthorized_connection_count_total` は Counter 型の監視項目
監視項目は以下

- `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

- `peer_ip` - 对等端 IP 地址

000

```
# 00000000
rate(diameter_peer_unauthorized_connection_count_total[5m])

# 000000000000
diameter_peer_unauthorized_connection_count_total > 0
```

--	--	--	--	--	--	--	--

5/5

```

diameter_advanced_routing_drop_count_total Counter
:drop

```

- application_id - 应用 ID
- cmd_code - 命令码
- application_name - 应用名
- cmd_name - 命令名

111

```
# 5m 5m
sum by (cmd_name) (
  rate(diameter_advanced_routing_drop_count_total[5m])
)

# 5m
sum(rate(diameter_advanced_routing_drop_count_total[5m]))
```

□ □ □ □ □ □ □

- `route: :drop`
- `route: :delete`
- `route: :get`

- Erlang Diameter :discard
-

□□□□

```

diameter_advanced_routing_error_count_total Counter
{:error, result_code}

```

- `result_code` - 00000000
- `application_id` - 0000 ID
- `cmd_code` - 000000
- `application_name` - 0000
- `cmd_name` - 0000

111

```
# 0000000000
sum by (result_code) (
  rate(diameter_advanced_routing_error_count_total[5m])
)

# DIAMETER_T00_BUSY 00
rate(diameter_advanced_routing_error_count_total{
  result_code="3004"
}[5m])

# 0000000000
diameter_advanced_routing_error_count_total{
  result_code="3004"
} > 100
```

□ □ □ □ □ □ □ □ □

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

- 3000 3001 3002

3000-3002

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

3003

- 3003 /metrics Prometheus
- 3003 S6a 3003 3003
- BEAM/Erlang 3003 3003
- 3003 rate() 3003
- 3003 IMSI 3003

3004

3004

- 3004
- 3004 AVP 3004 [AVP 3004