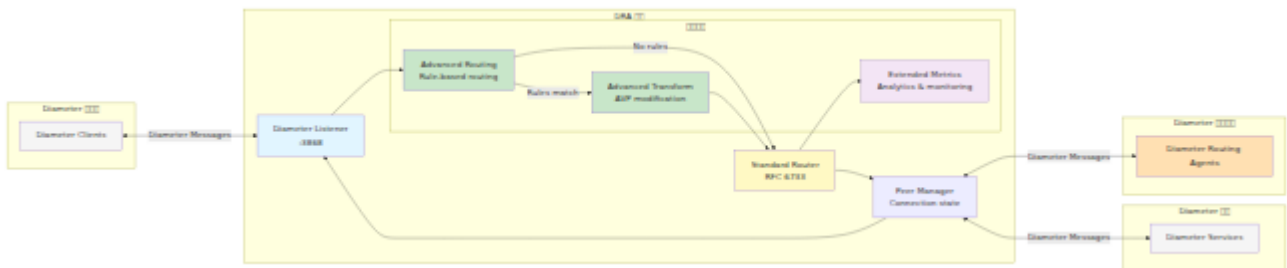


# DRA 11111

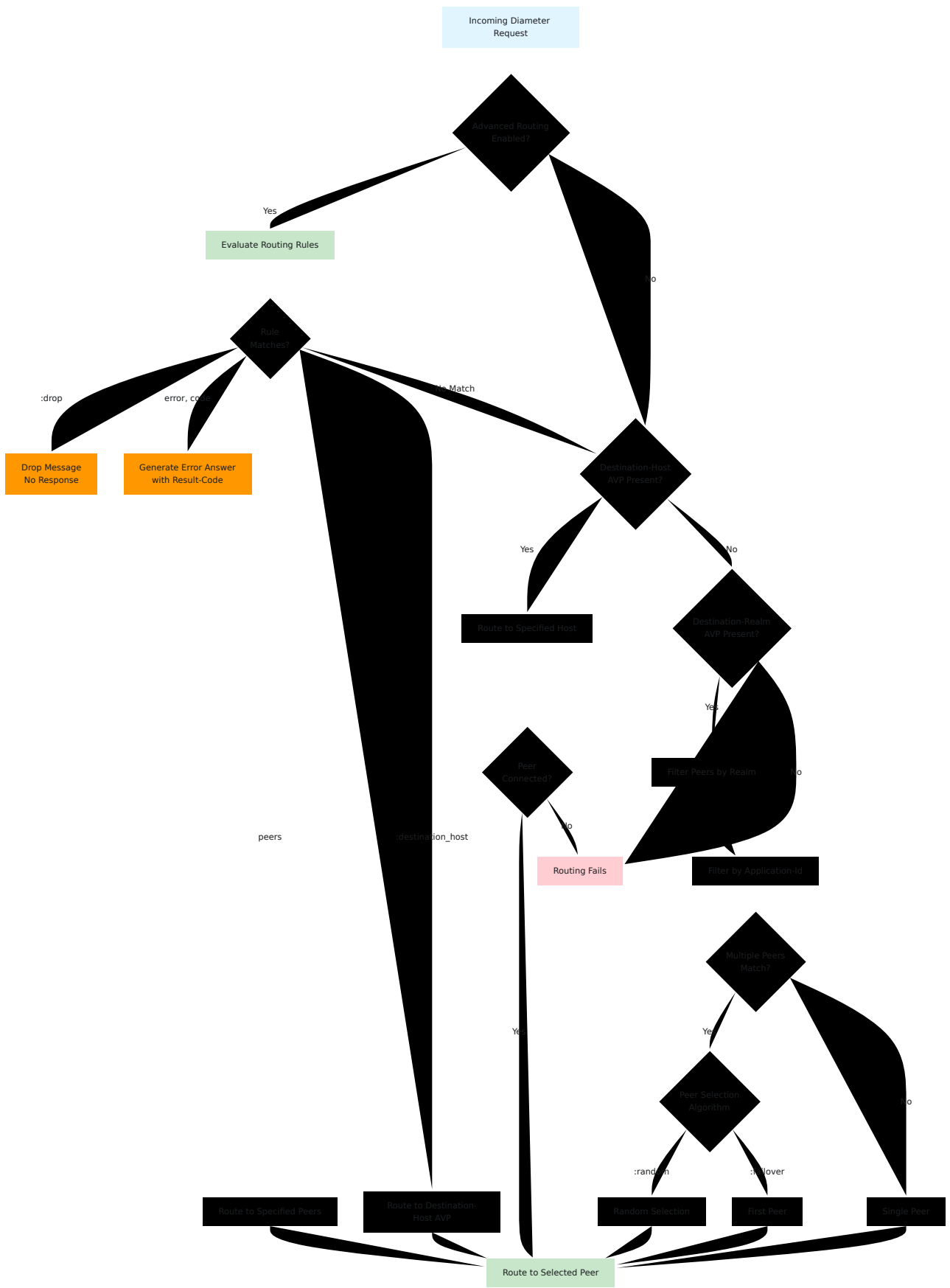
## 11

1. 11 Diameter 11
2. 11 DRA 11
3. SCTP 111
4. 111
  - o 11 3GPP 11 ID
  - o 11 AVP 11
5. 1111111
6. 1111111
7. 1111
8. 1111111
9. 11111111
10. Prometheus 11
  - o 11 Diameter 11
  - o 111111111
11. 1111

# DRA 11111











- 3GPP TS 29.273 DRA 3GPP TS 29.273 AVP 3GPP TS 29.273
- 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273

3GPP TS 29.273

- 3GPP TS 29.273 3GPP TS 29.273
- Diameter 3GPP TS 29.273 3GPP TS 29.273
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3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273

3GPP TS 29.273

3GPP TS 29.273 peer\_selection\_algorithm 3GPP TS 29.273

- :random - 3GPP TS 29.273 3GPP TS 29.273
- :failover - 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273
- 3GPP TS 29.273 3GPP TS 29.273
- 3GPP TS 29.273 3GPP TS 29.273

3GPP TS 29.273

- 3GPP TS 29.273 AVP 3GPP TS 29.273 IMSI 3GPP TS 29.273
- 3GPP TS 29.273 AVP 3GPP TS 29.273
- 3GPP TS 29.273 3GPP TS 29.273
- 3GPP TS 29.273 3GPP TS 29.273

3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273

## 3GPP TS 29.273 DRA 3GPP TS 29.273

DRA 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273 3GPP TS 29.273

□□□□

```
%{
  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 □□□□

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



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

□□□□

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

□□□□

□□□□ (**initiate\_connection: true**)

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

- DRA

(`initiate_connection: false`)

- DRA Diameter
- DRA
- MME SGSN P-GW
- `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 with 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 配置 `3GPP IDs`
- 配置 **ID 10415** 3GPP 参数
- 配置 `TTL` + 5
- 配置 `peer_selection_algorithm` 参数

## 配置

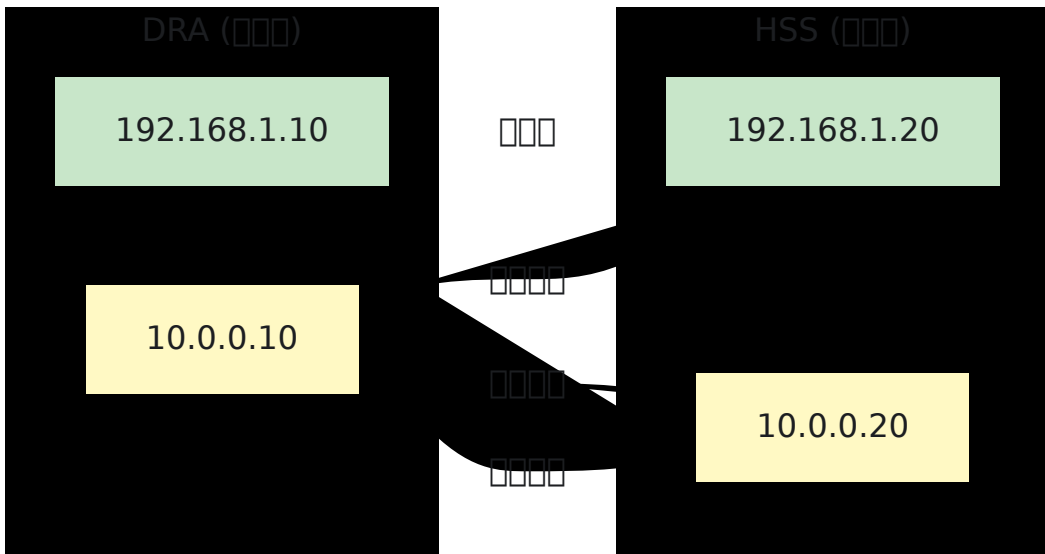
- 配置 `allow_undefined_peers_to_connect: false`
- 配置 `log_unauthorized_peer_connection_attempts: true`
- 配置 `listen_ip` 和 `listen_port`
- 配置 TLS 参数

---

## SCTP 配置

SCTP 配置 IP 地址和 SCTP 配置 Diameter 配置

□□□□



- SCTP □□□□□□□□□□
- □□□□□□□□□□□□□□□□
- □□□□□□□□□□ Diameter □□
- □□□□□□□□□□

□□

### 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
- 多 IP 配置

配置

配置 IP 配置

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




配置

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

□□□□

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

Diameter AVP



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

□□

□□	□□
enabled	□□□ True □□□□□
rule_name	□□□□□□□□□□
match	□□□□□□□□ :all □□□□ - □□□□□□□□□□□□ :any □□□□ - □□□□□□□□□□ □□□□ :none □□□□ - □□□□□□□□□□
filters	□□□□□□□□□ □□□□□□
route	□□□□□□□□ □□□□□

□□□□

route □□□□□□□□□□

□□□□□□

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

□□□□□□□□□□□□□□□□□□□□

- DRA □ Diameter □□□□□□□□□□

- 3002 - DIAMETER\_UNABLE\_TO\_DELIVER
- 3003 - DIAMETER\_REALM\_NOT\_SERVED

## Destination-Host AVP

```
route: :destination_host
```

Destination-Host AVP (293) Diameter Destination-Host AVP

Drop

```
route: :drop
```

Drop

- 3002 - DIAMETER\_UNABLE\_TO\_DELIVER
- 3003 - DIAMETER\_REALM\_NOT\_SERVED
- 3004 - DIAMETER\_TOO\_BUSY

Drop

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

Drop

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

Diameter

- 3002 - DIAMETER\_UNABLE\_TO\_DELIVER
- 3003 - DIAMETER\_REALM\_NOT\_SERVED
- 3004 - DIAMETER\_TOO\_BUSY

- 5012 - DIAMETER\_UNABLE\_TO\_COMPLY

000

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

00000

00000

0 0000 0 0000 00000

- `:application_id` - Diameter ID ID

  - `{:application_id, 16777251}` S6a/S6d
  - `{:application_id, [16777251, 16777252]}` S6a S6b

- `:command_code` - Diameter

  - `{: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}}`

0000000

00 0000 0000

- **:via\_peer** - 指定するピアの名前
  - `{: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}`

例

例 `peer` の定義

- **:to\_peer** - 送信先ピアの名前
  - `{:to_peer, "dra01.omnitouch.com.au"}`
  - `{:to_peer, ["dra01.omnitouch.com.au", "dra02.omnitouch.com.au"]}`
- **:from\_peer** - 送信元ピアの名前
  - `{:from_peer, "hss-01.example.com"}`
  - `{:from_peer, ["hss-01.example.com", "hss-02.example.com"]}`
- **:packet\_type** - パケットの種類
  - `{:packet_type, :request}`
  - `{:packet_type, :answer}`

例

- **AVP** AVP `User-Name` `Origin-Host` `Destination-Realm`
  - AVP の定義
  - AVP の値
  - `{:avp, {code, value}}`
- AVP の種類 `:packet_type`
  - AVP の種類

- `{:command_code, [317, 318]}` `317` `318`
- `AVP`
  - `:any` - `AVP`
  - `{:avp, {264, :any}}` `Origin-Host AVP`

## Configuration

### 1. DRA Configuration

#### DRA Configuration

```
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 Configuration S6a Configuration HSS

### 2. HSS Configuration

#### HSS Configuration

```
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**

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
```

- Destination-Host AVP (293)
- Destination-Host 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
```

□□□□□

- IMSI 999999 S6a
- □□□□□□□□□□□□□□□□
- □□□□□□□□□□□□□□□□
- 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}
```

□□□□□

- □□□□□□□□□□□□□□□□ 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 (Purge-UE-Request)  
      route: {:error, 5012}
```

- S6a UE
- DIAMETER\_UNABLE\_TO\_COMPLY (5012)
- 
- Diameter

Diameter AVP

```

dra_module_advanced_transform:
  enabled: True
  rules:
    - rule_name: <rule_identifier>
      match: <match_scope>
      filters: [<filter_list>]
      transform:
        action: <transform_action>
        avps: [<avp_modifications>]

```

□□

□□	□□
enabled	□□□ True □□□□□
rule_name	□□□□□□□□□□
match	□□□□□□□□ :all □□□□□□□□ :any □□□□□□□□ :none □□□□□□ - □□ □□ □□□
filters	□□□□□□□□□ □□□□□□□
transform.action	□□□□□□ :edit □□ :remove □□ :overwrite □□
transform.avps	□□□□ AVP □□□□□□□□ AVP □□□□□□

□□□□□

□□□□□□ **Diameter** □□□

- **:edit** - □□□□ AVP □
  - □□□□□□□□□ AVP
  - □□ AVP □□□□□□□□□□
- **:remove** - □□□□□□ AVP
- **:overwrite** - □□□□ AVP □□

- Diameter dictionary :diameter\_gen\_3gpp\_s6a

## Diameter

- **: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**

Destination-Realm

```

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 X S6a Destination-Realm

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"}}'

```

Operator IMSI IMSI

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}}}'

```

Destination-Realm

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

- User-Name AVP 1 "9999990000000001"
- Origin-Host AVP 264
- User-Name "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}}' # User-Name
```

S6a User-Name 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 (Update
Location Answer)
        - ':{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, [], [],
[]]},
                [], [], [], [], [], [], [], [], [], [], [], [],
[1], [], []}},
                {:"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, [], [],
[]]},
                [], [], [], [], [], [], [], [], [], [], [], [],
[1], [], []}},
                {:"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, [], [],
[]]},

```

```

    [], [], [], [], [], [], [], [], [], [], [], [], [],
  [], [], []
    ], []}
  }}'

```

## 구분

- Origin-Realm 이 S6a 구분 (ULA) 이
- `:overwrite` 구분 APN-Configuration-Profile 이 AVP
- `dictionary` 이 구분 AVP 이
- APN 이 "internet" 이 1 "ims" 이 2 "sos" 이 3
- APN 이 QoS 구분 AMBR 이 PDN 이
- 구분 SOS 이 APN

## 구분 `:overwrite`

- 구분 AVP 이 APN-Configuration-Profile 이
- 구분 3GPP 이
- `:edit` 구분 AVP 이
- 구분 Diameter 이 S6a 이 `:diameter_gen_3gpp_s6a` 이

## 구분

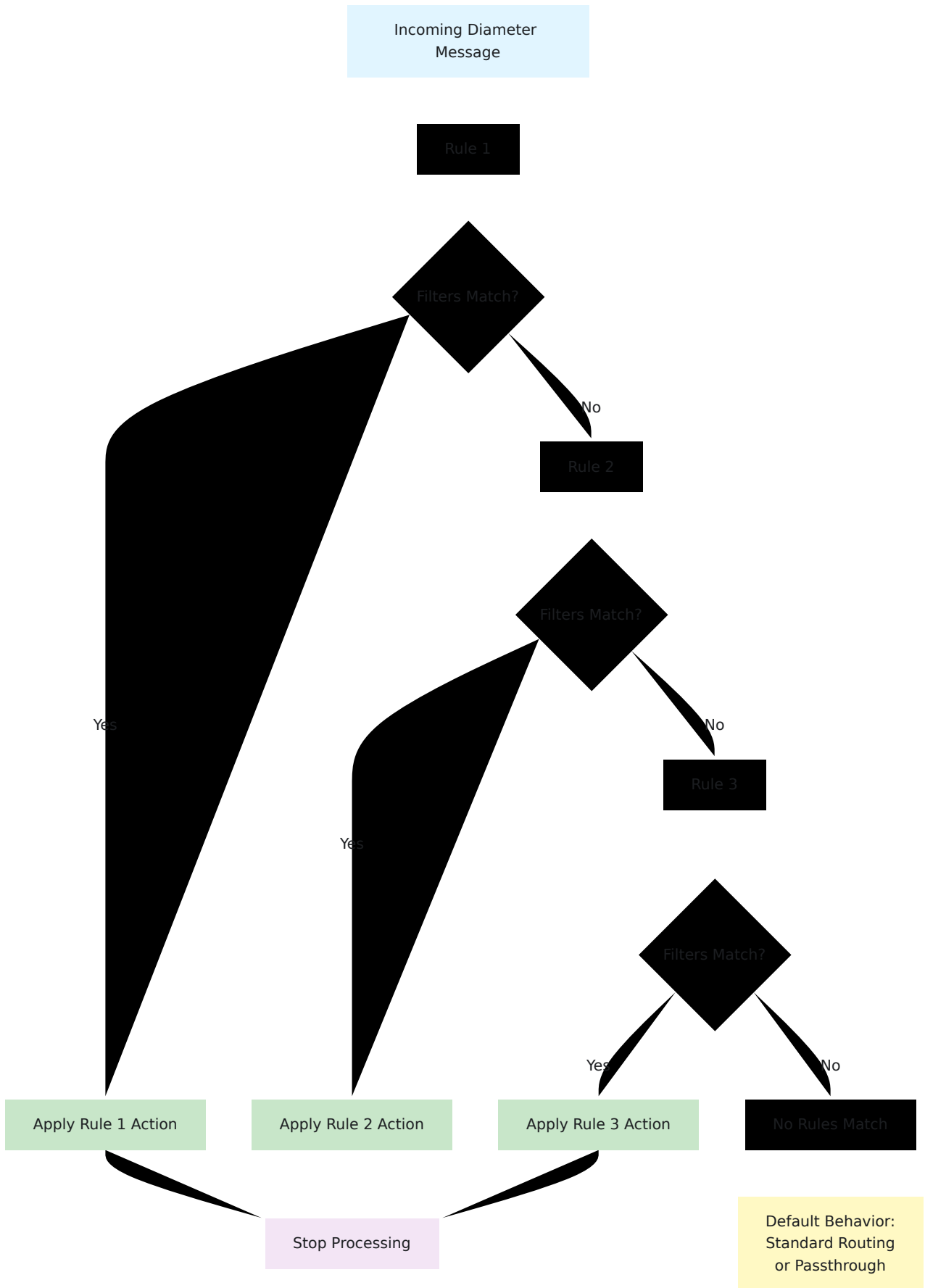
- `:overwrite` 이 AVP 이
- AVP 이
- 이
- 이 - 이

## 이

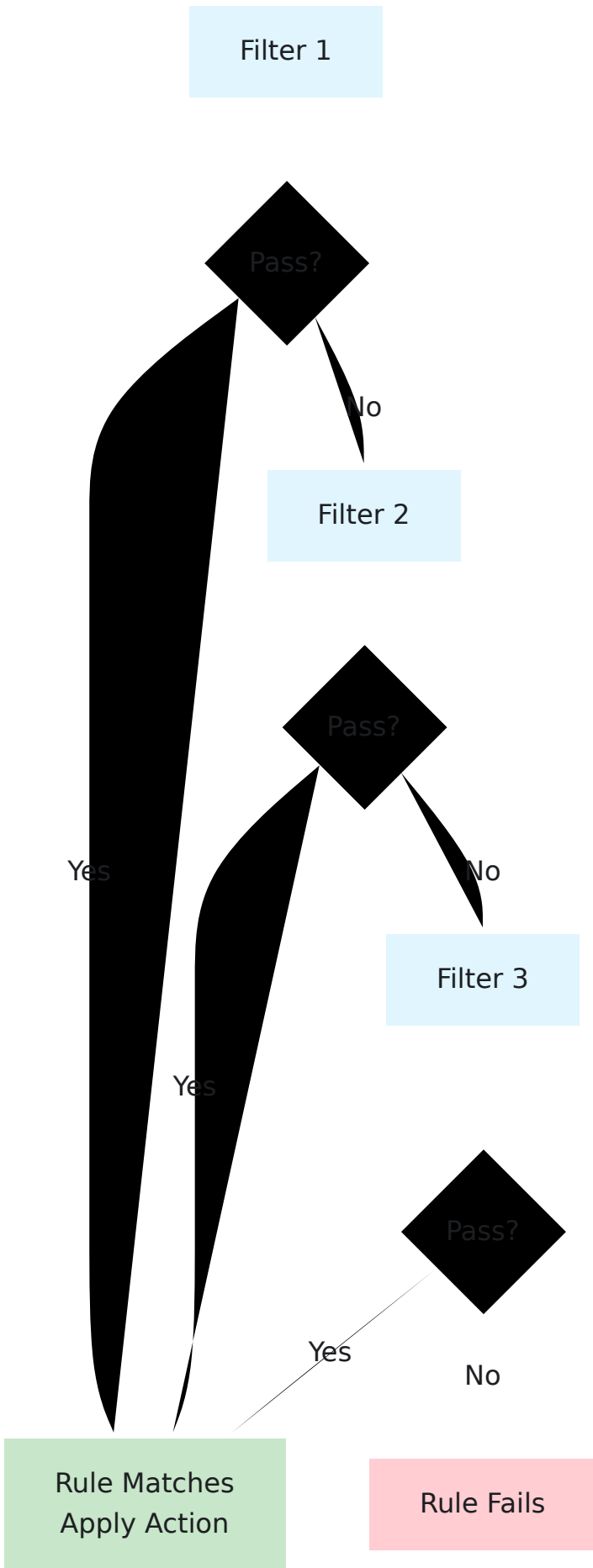
- **MVNO** 이
- 이
- 이
- 이
- 이 IMSI 이

□□□□

□□□ □□□□ □ □□□□ □□□



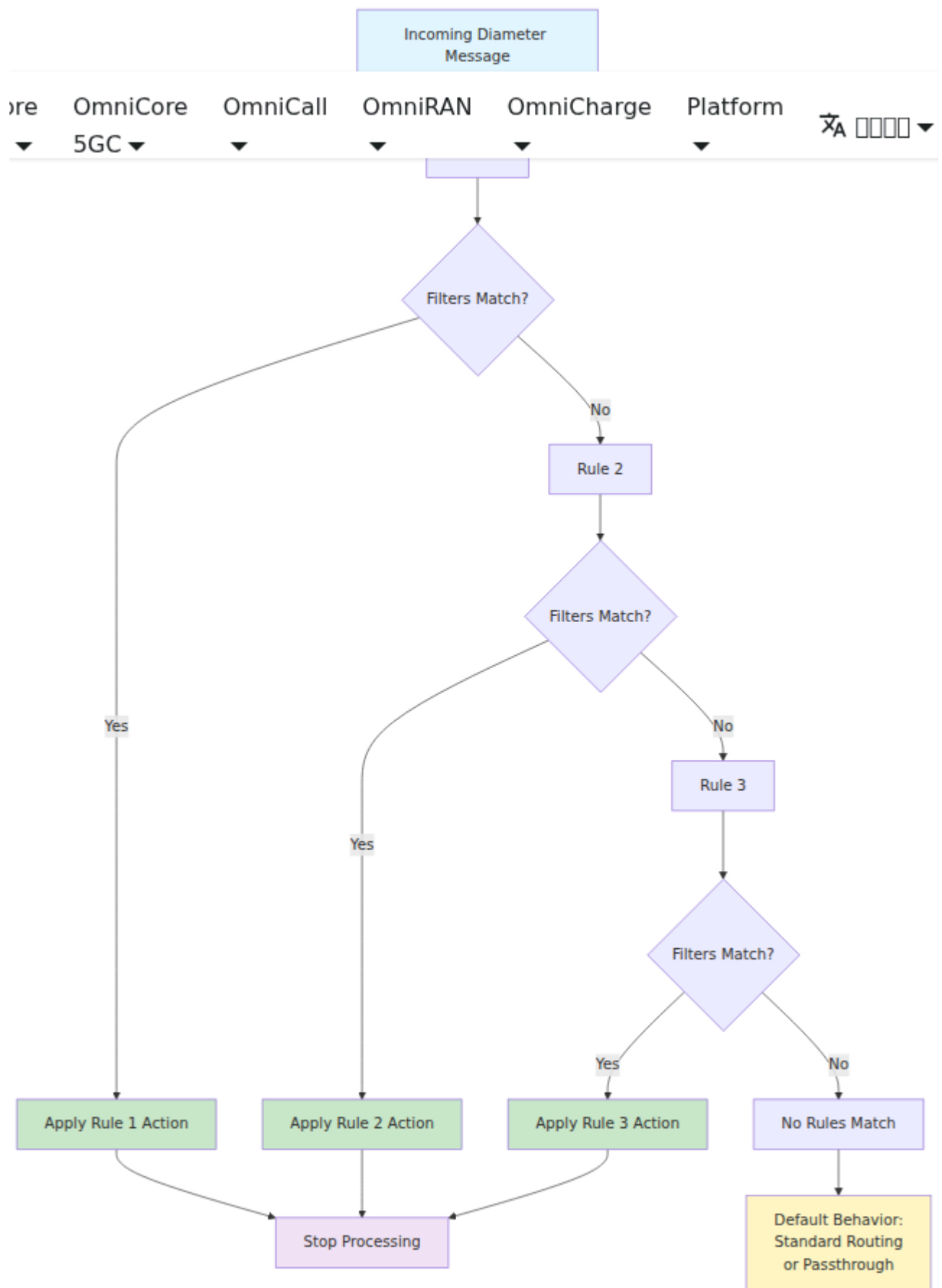




□□□□ 3 □□□□ filter1 OR filter2 OR filter3 □□□□□□□□

**match: :none**□□□□

□□□□□□□□□□□□□□□□□□□□



□□□□ 3 □□□□ NOT filter1 AND NOT filter2 AND NOT filter3 □□□□□□□□



□□

□□	□□
<code>enabled</code>	□□ <code>true</code> □□□□□□□□□□
<code>attach_attempt_reporting_enabled</code>	□□ 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□□□□ User-Name AVP - □□ AVP □□□

□□□

- `origin_host` - □□□□□□□□□□□□
- `result_code` - HSS □□□□ Diameter □□□□

□□□□□□

1. □□□□ AIR□□□□□□ 318□S6a □□ 16777251 - □□ □□ IDs□□□□□□□□□□
  - □□□□/□□□□□□□□□□ ID
  - IMSI□User-Name AVP □□ 1□

- Origin-Host AVP 264
2. ETS TTL
  3. AIA
    - ID
    - AVP 268 AVP 297
    - IMSI origin host

## □□

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

## □□

InfluxDB

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

Diameter

- 2001 - DIAMETER\_SUCCESS
- 5001 - DIAMETER\_AUTHENTICATION\_REJECTED
- 5004 - Diameter AVP
- RFC 6733

## □□□□

- S6a AIR/AIA ID 16777251 318
- + 5

- 认证鉴权
- 计费

## 鉴权

DRA 鉴权流程

- **Diameter** 协议 — 基于 GSM A FS.19/FS.21 定义的 Diameter 协议
- **SoR (Service Based)** — 基于 VPLMN 的鉴权
- **SLF (Service Location Function)** — Diameter 协议的 SLg/SLh 接口

## Prometheus 鉴权

DRA 鉴权 Prometheus 鉴权接口 `/metrics`

### 鉴权 Diameter 鉴权

鉴权

鉴权 `diameter_peer_status` 鉴权 Gauge 鉴权 1 鉴权 0

- `origin_host` - 鉴权 Diameter 鉴权
- `ip` - 鉴权 IP 鉴权

鉴权

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

□□□□

□□□ `diameter_peer_message_count_total` □□□ Counter □□□□□□□□□□ Diameter □□  
□□ □□□

- `origin_host` - □□□□ Diameter □□
- `received_from` - □□□□□□□□□□
- `application_id` - Diameter □□ ID□□□□ □□ ID □□□
- `cmd_code` - Diameter □□□□□□□□ □□□□□□□□
- `application_name` - □□□□□□□□□□□□ "3GPP\_S6a"□
- `cmd_name` - □□□□□□□□□□□□ "AIR"□
- `direction` - "request" □ "response"

□□□□

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

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

□□□□□□

□□□ `diameter_peer_message_result_code_count_total` □□□ Counter □□□□□□□□□□  
□□ Diameter □□□□ □□□

- `origin_host` - □□□□□□
- `routed_to` - □□□□□□□□□□
- `application_id` - Diameter □□ ID
- `cmd_code` - Diameter □□◆◆◆◆□
- `application_name` - □□□□□
- `cmd_name` - □□□□□
- `result_code` - Diameter □□□□□□□□□□□□



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

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

Counter

`diameter_peer_unanswered_request_count_total` Counter

- `origin_host` -
- `routed_to` -
- `application_id` - Diameter ID
- `cmd_code` - Diameter
- `application_name` -
- `cmd_name` -

Counter

```
#
rate(diameter_peer_unanswered_request_count_total[5m])

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

Counter

`diameter_peer_unauthorized_connection_count_total` Counter

- `origin_host` -
- `supported_applications` -

- `peer_ip` - IP 地址

配置

```
# 配置速率限制
rate(diameter_peer_unauthorized_connection_count_total[5m])

# 配置告警
diameter_peer_unauthorized_connection_count_total > 0
```

配置告警

配置

配置 `diameter_advanced_routing_drop_count_total` Counter 告警

```
:drop 配置告警
```

- `application_id` - Diameter 应用 ID
- `cmd_code` - Diameter 命令
- `application_name` - 应用名称
- `cmd_name` - 命令名称

配置

```
# 配置速率限制
sum by (cmd_name) (
  rate(diameter_advanced_routing_drop_count_total[5m])
)

# 配置告警
sum(rate(diameter_advanced_routing_drop_count_total[5m]))
```

配置告警

- 配置告警 `route: :drop`
- 配置告警
- 配置告警

- Erlang Diameter :discard
- 报警

报警

diameter\_advanced\_routing\_error\_count\_total Counter 报警

{:error, result\_code} 报警

- result\_code - Diameter
- application\_id - Diameter ID
- cmd\_code - Diameter
- application\_name -
- cmd\_name -

报警

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

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

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

\*\*

# SoR (SoR)

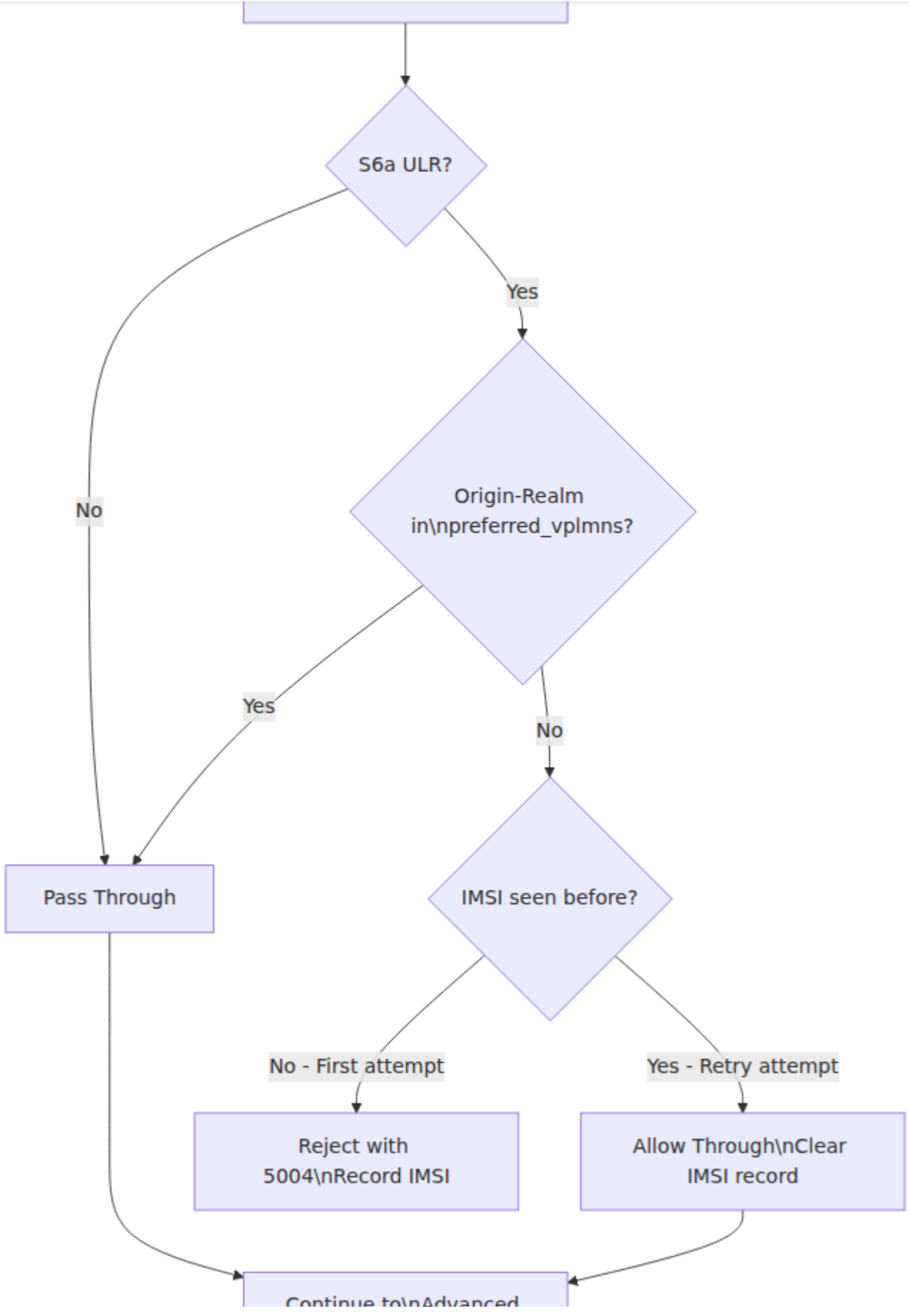
SoR (SoR) HPLMN VPLMN VPLMN DRA S6a (ULR) **DIAMETER\_ERROR\_ROAMING\_NOT\_ALLOWED (5004)** UE VPLMN

VPLMN

SoR 3GPP TS 29.272 5.2.1.1 3GPP TS 23.122

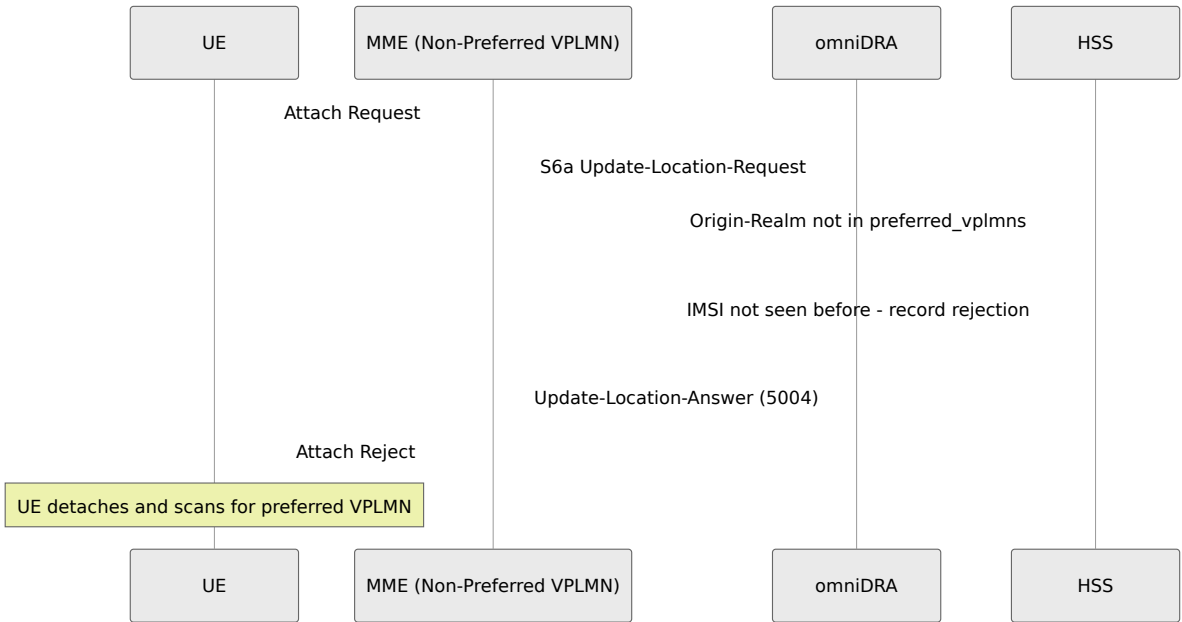
## SoR

DRA S6a (ID 16777251 316)

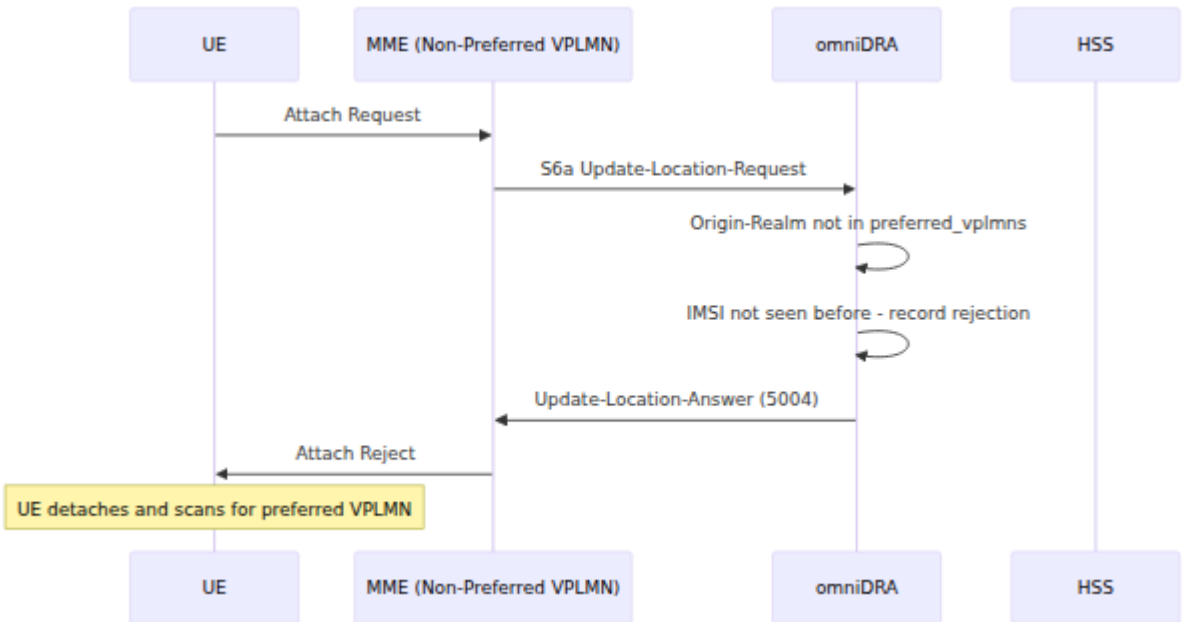


# Continued to Advanced Routing

□□□□□□□□□□□□□□



□□□□□□□□□□□□□□



□□□□

□□□□□□□□□□□□□□□□ SoR □□□□□□□□□□□□□□□□□□□□





```
module_roaming_steering: %{
  enabled: true,
  max_rejections: 1,
  rejection_ttl_seconds: 300,
  rejection_result_code: 5004,
  preferred_vplmns: [
    "epc.mnc001.mcc310.3gppnetwork.org",
    "epc.mnc002.mcc310.3gppnetwork.org"
  ]
}
```

UE が epc.mnc003.mcc310.3gppnetwork.org を MME から ULR として  
拒絶 (5004) された後、300 秒の VPLMN 拒絶 (ULR) 期間が

経過する。

その後、

UE は VPLMN を再接続しようと試みます。

```
module_roaming_steering: %{
  enabled: true,
  max_rejections: 3,
  rejection_ttl_seconds: 600,
  rejection_result_code: 5004,
  preferred_vplmns: [
    "epc.mnc001.mcc310.3gppnetwork.org"
  ]
}
```

拒絶 (5004) された後、TTL が 600 秒の VPLMN 拒絶期間が

経過する。

□□

□□

□□: `diameter.roaming_steering.reject.count`

□□: □□□

□□: □□ SoR □□□□ ULR □□□□

□□:

- `origin_realm` - □□□ VPLMN □ Origin-Realm
- `result_code` - □□□□□□□□□□□□
- `imsi` - □□□□□□ IMSI

## □□□□□ **VPLMN**□

□□: `diameter.roaming_steering.allow.count`

□□: □□□

□□: □ ULR □□□□□□□□□□

□□:

- `origin_realm` - □□ VPLMN □ Origin-Realm
- `reason` - □□□□□□□□□□ `preferred_vplmn` □ `max_rejections_reached`
- `imsi` - □□□ IMSI□□□□□□□□ `max_rejections_reached` □□□□

□□□□

□□: `diameter.roaming_steering.error.count`

□□: □□□

□□: □□□□□ SoR □□□□□□□□□□□□□□□□

□□:

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

## □□□□

### □□□□□□□□□□□□□□□□

□□: □□ VPLMN □□□□□□□□□□□□□□□□

□□□□:

- rejection\_ttl\_seconds □□□□□□□□□□□□□□□□
- max\_rejections □□□□ UE □□□□□□□□□□□□

□□□□:

1. □□ rejection\_ttl\_seconds □□□□ UE □□□□□
2. □□ max\_rejections □□□□ UE □□□□□□□□□□□□□□□□

## □□ **VPLMN** □□□□□□□□

□□: □□□□□□□□□□ ULR □□□□□□□□ 5004□

□□□□:

- □□ VPLMN □ Origin-Realm □□□ preferred\_vplmns
- Origin-Realm □□□□□□□□□□□□□□□□

□□□□:

1. □ DRA □□□□□□□□□□ Origin-Realm □□□
2. □□□□□□ Origin-Realm □□□□□□□ preferred\_vplmns □□□

## □□□□□□

□□: □□□□□ VPLMN □ ULR □□□□□□□□□□

□□□□:

- enabled □□□ false
- □□□□□□□□□□□□□□□□

□□□□:

1. □□□□□□  enabled: true
2. □□□□□□□□□□□□□□□□ DRA

□□

□□□□

□□	□□	□□	□□
5004	DIAMETER_ERROR_ROAMING_NOT_ALLOWED	□□□□□□ □ VPLMN □□	3GPP TS 29.272 □ 7.4.4 □

## S6a □□

□□□ □	□□	□□	□□
316	□□□□□□/□□ (ULR/ULA)	MME □□□□□□□□ HSS □□□ □□□□□□□□	3GPP TS 29.272 □ 7.2.3 □

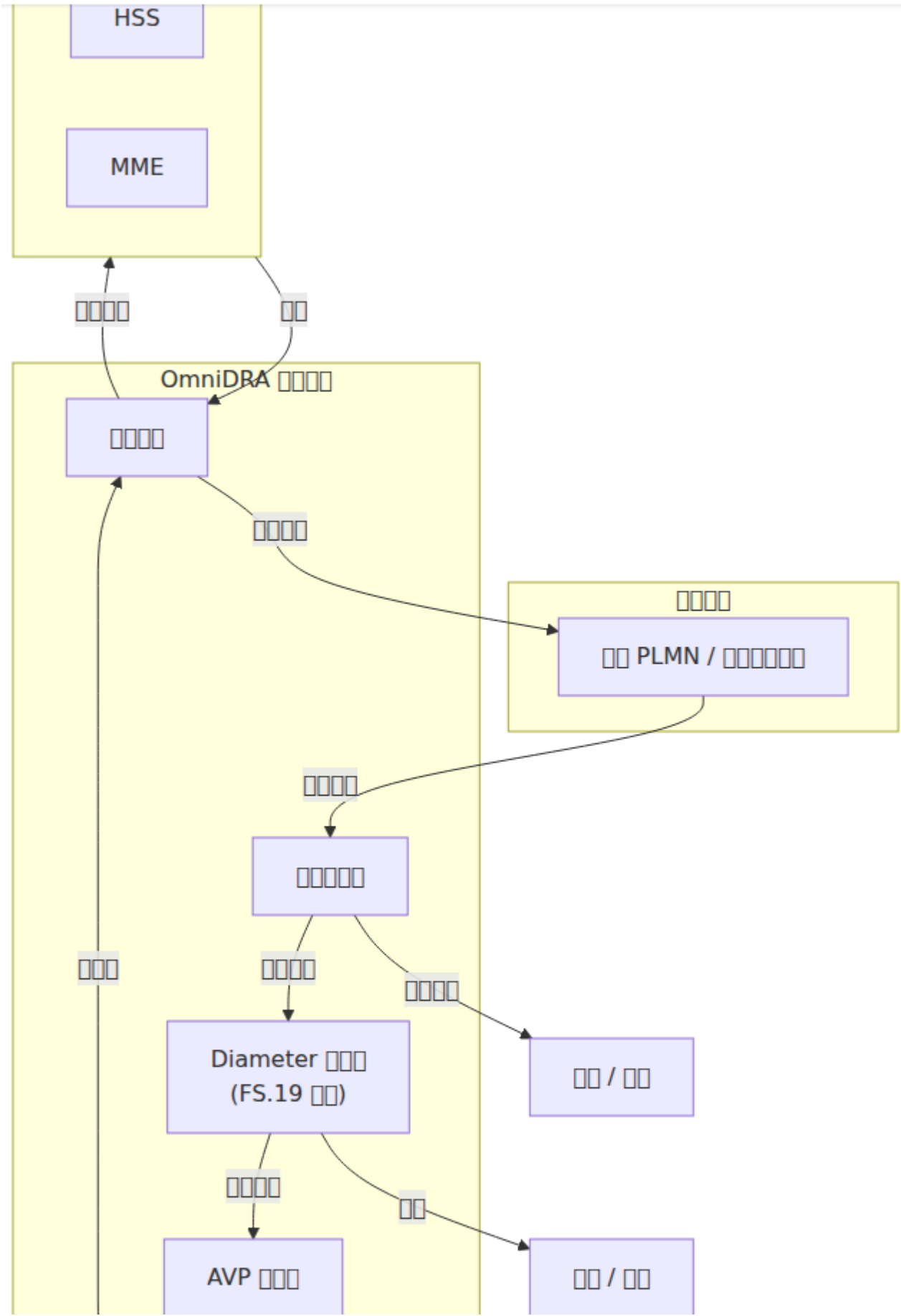
## □□ ID

ID	□□	□□	□□
16777251	S6a/S6d	MME/SGSN □ HSS □□□□□□□□□□	3GPP TS 29.272

# Diameter

OmniDRA Diameter **GSMA FS.19** Diameter v10.0  
**GSMA FS.21** v12.0 Diameter









□□□□□:

□□	FS.19 □□	□□
AVP □□	□ 3.3.4 □, 4.8.1	□□□□□□□□□□ AVP □□□□□□□□ Origin-Host, Origin-Realm□□□□ AVP □□□□□□□□
Session-Id □□	□ 3.3.4 □	□□ Session-Id□AVP 263□□□□□□□□□□ AVP□□□□ RFC 6733 □ 8.8 □□
□□□□ Destination-Host	□ 3.3.4 □	□□□□ Destination-Host AVP □□□□□□□□□□□□□□□□□□□□□□□□
□□ AVP □□	□ 3.3.5 □	□□□□□□□□□□ AVP □□□□□□□□ ULR □□□□ User-Name □ Visited-PLMN-Id□□□□ 3GPP TS 29.272 □ 7.2.3 □□□□

```
low_layer: %{
  enabled: true,
  action: {:error, 3002},
  # AVP □□□□□□□□□□□□□□□□ (FS.19 □ 3.3.4 □)
  # 264 = Origin-Host, 296 = Origin-Realm, 283 = Destination-
  Realm, 293 = Destination-Host
  single_instance_avps: [264, 296, 283, 293],
  # Session-Id □□□□□□ AVP (RFC 6733 □ 8.8 □)
  enforce_session_id_first: true,
  # □□□□□□□□□□ Destination-Host (FS.19 □ 3.3.4 □)
  reject_destination_host_in_answers: true,
  # □□□□□□□□□□ AVP (3GPP TS 29.272)
  # 1 = User-Name (IMSI), 1407 = Visited-PLMN-Id, 264 = Origin-
  Host, 296 = Origin-Realm
  mandatory_avps: %{
    316 => [1, 1407, 264, 296],
    318 => [1, 1407, 264, 296]
  }
}
```



Sequence	Direction	Interface	Reference
316	UE → MME	MME → HSS	3GPP TS 29.272 §7.2.3
317	MME → UE	HSS → MME	3GPP TS 29.272 §7.2.7
318	UE → MME	MME → HSS	3GPP TS 29.272 §7.2.5
319	MME → UE	HSS → MME	3GPP TS 29.272 §7.2.9
320	UE → MME	HSS → MME	3GPP TS 29.272 §7.2.11
321	MME → UE	MME → HSS	3GPP TS 29.272 §7.2.13
323	UE → MME	MME → HSS	3GPP TS 29.272 §7.2.15

Sequence 316: ID FS.19 § 3.3.5

Sequence ID	Direction	Reference
16777251	S6a/S6d	3GPP TS 29.272
16777252	S13	3GPP TS 29.272
16777312	S6c	3GPP TS 29.338
16777313	SGd	3GPP TS 29.338
16777255	SLg	3GPP TS 29.172
16777267	S9	3GPP TS 29.215

Sequence 2 – Sequence 316

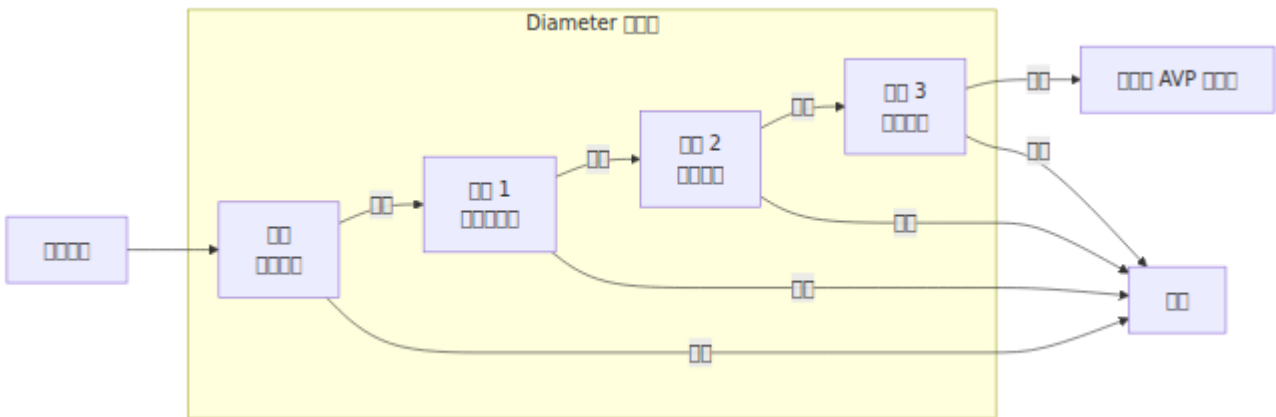
GSMA: FS.19 § 3.3.6, FS.21 § 7.2.2

Step 2: The Diameter client sends a Diameter message containing IMSI, User-Name AVP, MSISDN, and AVP 701 to the Diameter server — The Diameter server processes the message.

The Diameter server returns a Diameter message to the Diameter client.

```
# Diameter server configuration
home_imsi_prefixes: ["31338", "31339"],
home_msisdn_prefixes: ["+1313"],

category_2: %{
  enabled: true,
  action: {:error, 3002},
  # S6a Diameter server (FS.19 § 3.3.6 §, § 12)
  protected_command_codes: [316, 317, 318, 319, 320, 321, 323]
}
```



### Step 3 — Diameter server

**GSMA** §: FS.19 § 3.3.7 §, FS.21 § 7.2.3 §

Step 3: The Diameter server sends a Diameter message containing IMSI, Update-Location-Request to the Diameter client. The Diameter client processes the message.

The Diameter server returns a Diameter message to the Diameter client.

The Diameter server:

項目	FS.19 項目	説明
ULR 送信 Origin-Realm	3.3.7.1	ULR の Origin-Realm に IMSI を追加して Origin-Realm を送信
速度制限 km/h	3.3.7.2	速度制限を設定

```
category_3: %{
  enabled: true,
  # log_only を有効にする (FS.19 3.3.7)
  action: :log_only,
  # km/h (FS.19 3.3.7.2)
  max_velocity_kmh: 1200,
  # IMSI を含む ULR を送信
  min_time_between_updates_seconds: 2
}
```

## 設定

Diameter 設定を有効にするには、以下の設定を行います。

`module_diameter_firewall` を有効にする

```
config :dra,
  module_diameter_firewall: %{
    enabled: true,
    home_imsi_prefixes: ["31338", "31339"],
    home_msisdn_prefixes: ["+1313"],
    low_layer: %{ ... }, # ...
    category_1: %{ ... }, # ... 1
    category_2: %{ ... }, # ... 2
    category_3: %{ ... } # ... 3
  }
```

□□□□

□□	□ □	□ □	□□	□□
enabled	□ □ □	□	false	□□□□□□ Diameter □□□□□□ false □□□□□□□□□□□□
home_imsi_prefixes	□ □	□	[]	□□□□□□ IMSI □□□□□□□□□□ 2 □ □□□□□□ ["31338", "31339"] □
home_msisdn_prefixes	□ □	□	[]	□□□□□□ MSISDN □□□□ □□□□ 2 □□□□□□□ □ ["+1313"] □

□□□□

□□	□ □	□ □	□□	□□
enabled	□ □ □	□	true	□□□□□□□□□□ □□
action	□ □	□	{:error, 3002}	□□□□□□□□□□ □□□□
single_instance_avps	□ □	□	[264, 296, 283, 293]	□□□□□□□□□□ □□ AVP □□□□ □□□ Origin- Host (264)□ Origin-Realm (296)□ Destination- Realm (283) □ Destination- Host (293)□
enforce_session_id_first	□ □ □	□	true	□□ Session- Id □□□□□ AVP □□□□
reject_destination_host_in_answers	□ □ □	□	true	□□□□ Destination- Host AVP □□ □□□□
mandatory_avps	□ □	□	%{}	□□□□□□□ AVP □□□□□□□□□□ □□ %{316 => [1, 1407,

Item	Key	Value	Description
			264, 296]} ULR User-Name Visited-PLMN-Id Origin-Host Origin-Realm

### 1

Item	Key	Value	Description
enabled		true	1
action		{:error, 3007}	1 DIAMETER_APPLICATION_UNSUPPORTED
whitelists		-	:all ID / all

## Table 2

Field	Type	Default	Value	Description
<code>enabled</code>	Boolean	True	<code>true</code>	Whether the feature is enabled. Default is 2 weeks.
<code>action</code>	String	None	<code>{:error, 3002}</code>	Action to take when the feature is disabled.
<code>protected_command_codes</code>	List	None	<code>[]</code>	List of command codes that are protected. Default is S6a and others.

### Table 3

Property	Type	Default	Value	Description
<code>enabled</code>	Boolean	Boolean	<code>false</code>	Whether the LocationTracker is enabled. Default is false.
<code>action</code>	String	String	<code>:log_only</code>	Action to take when the location is updated. Default is <code>:log_only</code> .
<code>max_velocity_kmh</code>	Integer	Integer	<code>1200</code>	Maximum velocity in km/h. Default is 1200.
<code>min_time_between_updates_seconds</code>	Integer	Integer	<code>2</code>	Minimum time between updates in seconds. Default is 2.

## 配置

配置	说明
<code>[:diameter, :firewall, :low_layer, :block]</code>	低层防火墙
<code>[:diameter, :firewall, :category_1, :block]</code>	类别 1 防火墙
<code>[:diameter, :firewall, :category_2, :block]</code>	类别 2 防火墙
<code>[:diameter, :firewall, :category_3, :block]</code>	类别 3 防火墙
<code>[:diameter, :firewall, :pass, :count]</code>	防火墙通过次数

配置项：`origin_host`、`application_id`、`command_code`、`application_name`、`command_name`、`reason`

---

## 配置

**GSMA** 配置：FS.19 配置 2.4 节，配置 3.4 节；FS.21 配置 3.6 节

配置项：`Diameter`、`Route-Record AVP`、`Origin-Host/Origin-Realm`

配置项：`reason` — 配置项



```

module_topology_hiding: %{
  enabled: true,
  # Route-Record AVP (FS.19 § 2.4 §)
  strip_route_records: true,
  # Origin-Host § (FS.19 § 3.4 §)
  rewrite_origin_host: %{enabled: true, replacement: :self},
  # §
  rewrite_origin_realm: %{enabled: false, replacement: :self},
  # §
  external_peers: :all
}

```

§§

§§	§§	§ §	§§	§§
<code>enabled</code>	§§§	§	<code>false</code>	§§§§§§§§§§§§§§
<code>strip_route_records</code>	§§§	§	<code>true</code>	§§§§§§§§§§§§§§§§§§§§ Route-Record AVP§§§ 282§§
<code>rewrite_origin_host</code>	§§	§	§§§	§§§§§§§§§§ Origin-Host §§§
<code>rewrite_origin_realm</code>	§§	§	§§§	§§§§§§§§§§ Origin-Realm § §§
<code>external_peers</code>	<code>:all</code> § §§	§	<code>:all</code>	§§§§§§§§§§§§§§§§§§§§ §§§§§§§§§§§§§§§§§§§§ <code>:all</code> §§ §§§§§§§§§§§§§§§§§§§§

§§§§§§§§§§ `rewrite_origin_host` § `rewrite_origin_realm`§:

名前	値	タイプ	デフォルト	説明
enabled	boolean	boolean	false	この AVP を有効にするかどうか。Origin-Host が true、Origin-Realm が false。
replacement	string	string	:self	この AVP が DRA から返された場合に、:self で置き換えるかどうか。host.realm を含む。

## フィルタ

名前	説明
[:diameter, :topology_hiding, :route_record, :stripped]	Route-Record AVP を含む AVP の count
[:diameter, :topology_hiding, :origin_host, :rewritten]	Origin-Host AVP
[:diameter, :topology_hiding, :origin_realm, :rewritten]	Origin-Realm AVP

## 参照

**GSMA** 規格: FS.19 の 3.4 節 / DoS 対策

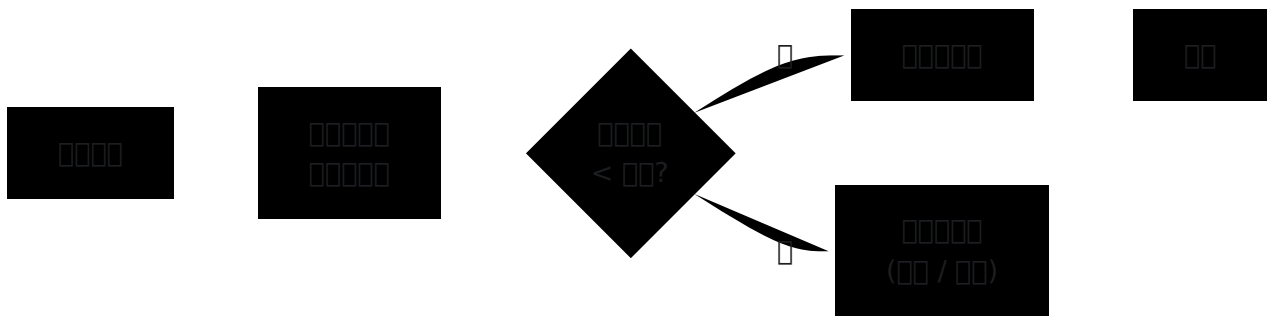
このドキュメントは、Cisco の製品に関する情報を含みます。このドキュメントは、Cisco の製品に関する情報を含みます。このドキュメントは、Cisco の製品に関する情報を含みます。

このドキュメントは、Cisco の製品に関する情報を含みます。

```

module_rate_limiter: %{
  enabled: true,
  # 限制速率 (FS.19 3.4)
  default_max_requests_per_second: 1000,
  default_action: {:error, 3004},
  # 限制速率
  peer_limits: %{
    "high-volume-partner.roaming.com" => %
  {max_requests_per_second: 5000, action: {:error, 3004}},
    "restricted-peer.roaming.com" => %{max_requests_per_second:
  100, action: :drop}
  }
}

```



□□

□□	□	□	□□	□□
<code>enabled</code>	□ □ □	□	<code>false</code>	□□□□□□□□□□□□□□
<code>default_max_requests_per_second</code>	□ □	□	<code>1000</code>	□□□□□□□□□□□□□□□□ □□
<code>default_action</code>	□ □	□	<code>{:error, 3004}</code>	□□□□□□□□□□□□□□□□ <code>{:error, 3004}</code> □ DIAMETER_TOO_BI
<code>peer_limits</code>	□ □	□	<code>%{}</code>	□□□□□□□□□□□□□□□□ □□□□□□□□□□

□□□□□□□□□□:

□□	□□	□□	□□	□□
<code>max_requests_per_second</code>	□□	□	□□□□□□	□□□□□□□□□□□□□□
<code>action</code>	□□	□	□□□□□□	□□□□□□□□□□□□□□□□





## Vendor ID:

Vendor ID	Vendor	Description
0	IETF	RFC 4801 Diameter AVP
10415	3GPP	3GPP AVP S6a Gx Rx
13019	ETSI	ETSI AVP
5535	3GPP2	3GPP2 AVP CDMA

## Filter

Filter	Match
<code>[:diameter, :avp_sanitizer, :unknown_vendor, :stripped]</code>	AVP
<code>[:diameter, :avp_sanitizer, :nesting_depth, :violation]</code>	AVP
<code>[:diameter, :avp_sanitizer, :pass, :count]</code>	

## Filter

## Filter

Filter

- Filter —
- AVP** —
- Diameter** **1** — ID /

- 4. **Diameter** 00000000 — 000000000000
- 5. **Diameter** 0000000 20 — 0000 IMSI/MSISDN 0000
- 6. 0000 — 0000 Route-Record 00000000 Origin-Host0
- 7. **Diameter** 0000000 30 — 00 :log\_only 0000000000000000000000

00000

00000000 FS.19 0 3.4 000000 00000 0000000000000000000000

00000	00000	00000
00 DoS	000000	Diameter 000000000000
00000	0000 1	AVP 0000
00000000	00 2	00 100000000
00000	00 3	00 200000000000
00000	00000	-
AVP 00	AVP 000	00000
000000AVP 000	00000	AVP 000

# GSMA 000000

00 / 00	FS.19 v10.0	FS.21 v12.0
000000	0 3.3.4 0	0 7.3.1 0
00 1 00	0 3.3.5 0, 00 B.3.3	0 7.2.1 0
00 2 00	0 3.3.6 0, 00 B.3.4	0 7.2.2 0, 0 16 0
00 3 00	0 3.3.7 0, 00 B.3.5	0 7.2.3 0
0000	0 2.4 0, 0 3.4 0	0 3.6 0
0000	0 3.4 0	-
AVP 00	0 4.8.1 0, 4.8.2 0	0 3.6 0
0000	0 3.4 0	0 3.15 0
0000000000	00 A	0 7 0

# SLF (Serving-Layer Function)

SLF (Serving-Layer Function) は、DRA (Diameter Routing Agent) と Diameter プロトコルを使用して、MME (Mobility Management Entity) と MME を接続する役割を担います。

SLF (Serving-Layer Function) は、GMLC (Gateway Mobile Location Center) と MME (Mobility Management Entity) と MME を接続する役割を担います。

SLF は、3GPP TS 29.172 と 3GPP TS 29.173 で定義され、3GPP TS 29.272 で規定されています。

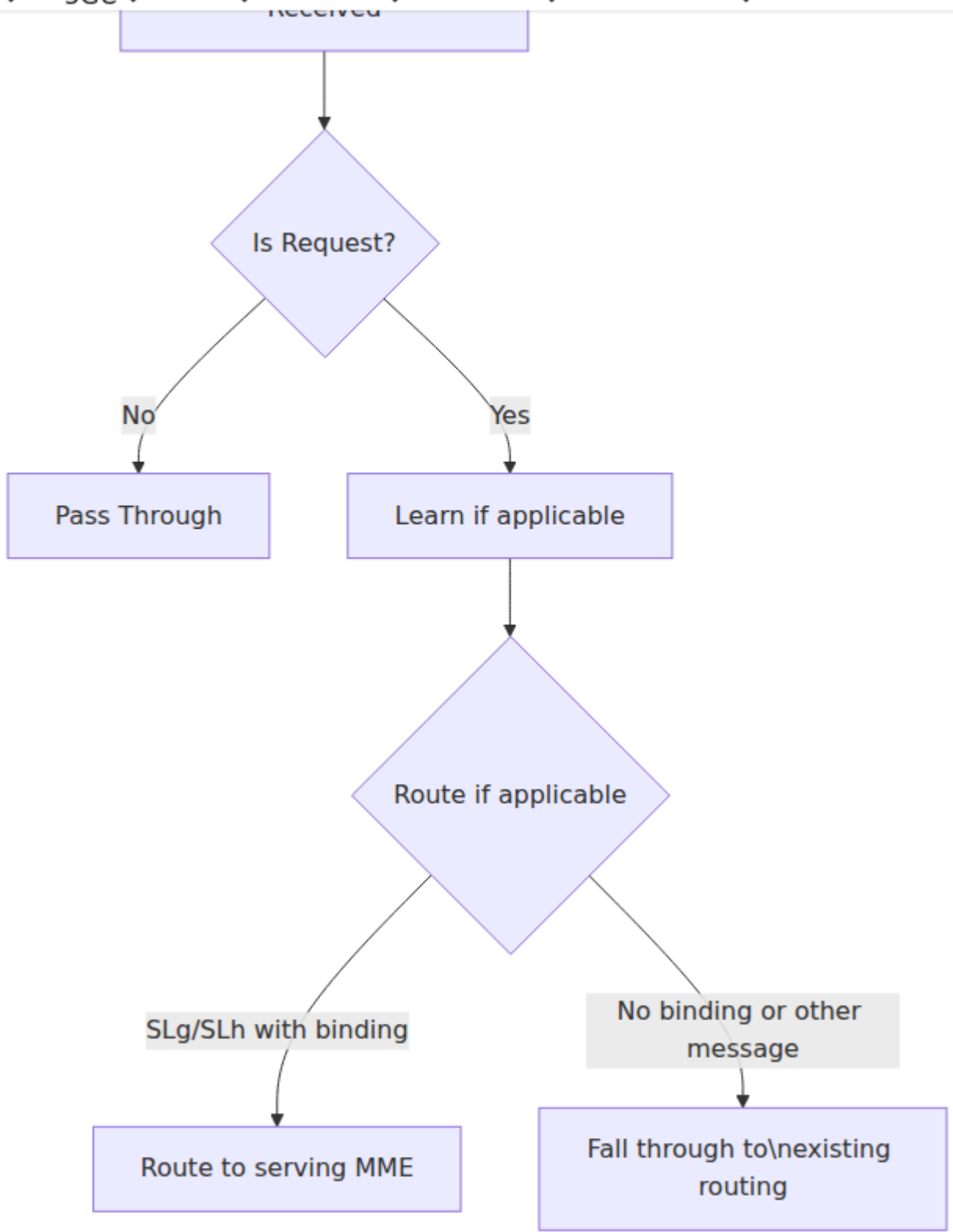
## 機能

SLF は、MME と MME を接続する役割を担います。

SLF は、DRA (Diameter Routing Agent) と S6a (S6a) を接続する役割を担います。

SLF は、SLg (Serving-Layer Gateway) と MME (Mobility Management Entity) と MME を接続する役割を担います。

SLF は、MME と MME を接続する役割を担います。



□□□□□□



Subscriber unknown

NoBinding

Registration message  
observed

Deregistration message  
observed

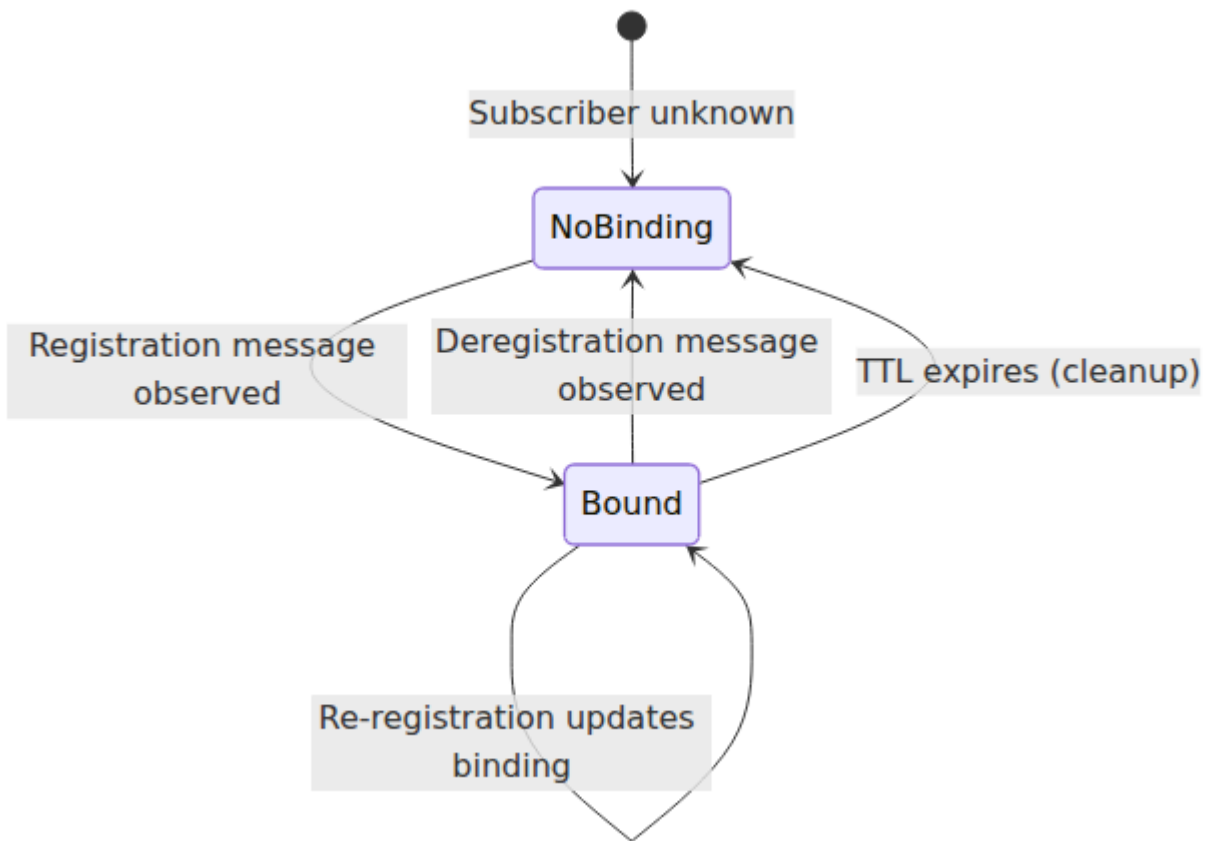
TTL expires (cleanup)

Bound

Re-registration updates  
binding

□□□□□□□□

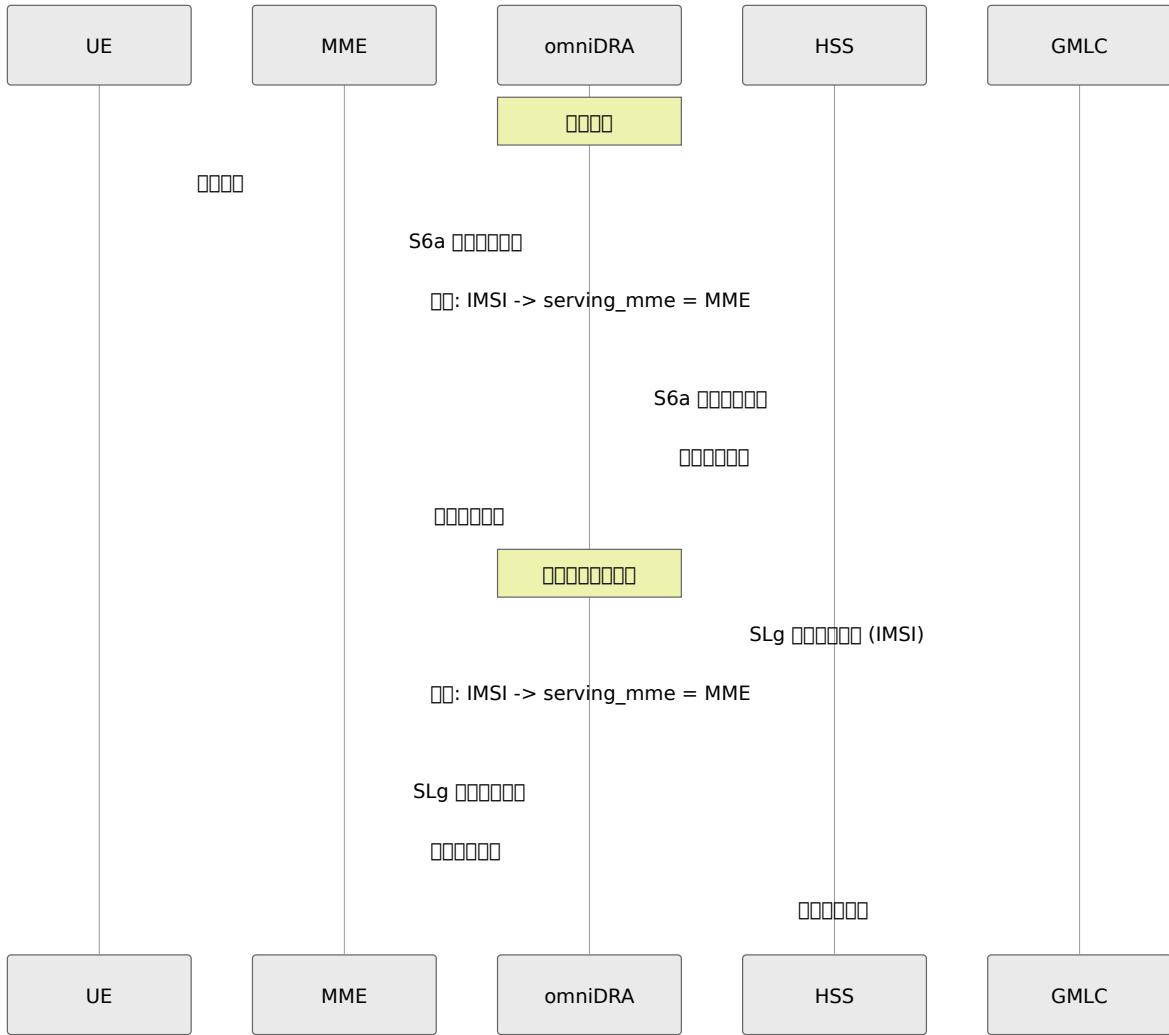
□□□□□ Diameter □□□□□□□□□□□□□□□□



□□	□□	□□□	□□□□□	<b>IMSI</b> □□
S6a	□□□□□□ (ULR)	316	servicing_mme	□□□ AVP (1)
Gx	□□□□□□□□ (CCR-I)	272 (CC-Request- Type=1)	servicing_pgw	□□ ID AVP (443)
Cx	□□□□□□□□ (SAR)	301 (Server- Assignment-Type=1)	servicing_cscf	□□□□ AVP (601)



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Incoming Request

Subscriber Lookup

Advanced Routing

Peer Selection / Relay

□□

□□□□ config/runtime.exs □□ module\_subscriber\_lookup □□□□□□





## 配置

配置: `diameter.subscriber_lookup.route.count` 配置: 配置 配置: 配置配置配置配置配置配置  
SLg/SLh 配置配置 配置:

- `imsi` - 配置 IMSI
- `binding_type` - 配置配置配置配置配置配置 `serving_mme`
- `serving_host` - 配置配置配置配置配置 Origin-Host

## 配置

### 配置配置配置配置配置 **MME**

配置: SLg 配置配置配置 SLh LCS-配置配置配置配置配置配置 MME配置配置配置配置配置配置

配置:

- 配置配置配置 DRA 配置配置配置配置配置
- 配置配置配置TTL 配置
- 配置 MME 配置配置配置配置 DRA
- `enabled` 配置 `false`

配置:

1. 配置配置配置配置配置
2. 配置配置配置 S6a ULR 配置配置配置 DRA配置配置配置配置配置配置配置配置
3. 配置 `binding_ttl_seconds` 配置配置配置配置配置配置配置配置配置配置配置
4. 配置配置 MME 配置配置配置配置

## 配置配置配置

配置: 配置 S6a/Gx/Cx 配置配置 DRA配置配置配置配置配置配置

配置:

- 配置配置

- IMSI AVP
- IMSI AVP

Steps:

1. `enabled: true`
2. DRA
3. DRA `SubscriberLookup: Learned`

Steps:

Step: MME

Steps:

- (CLR) (PUR) DRA
- `binding_ttl_seconds`

Steps:

1. `binding_ttl_seconds`
2. S6a DRA

□□

□□□□ ID

ID	□□	□□	□□
16777251	S6a/S6d	MME/SGSN □ HSS □□□◆◆◆□□□□ □□	3GPP TS 29.272
16777238	Gx	PCEF □ PCRF □□□□□□□□	3GPP TS 29.212
16777216	Cx	I-CSCF/S-CSCF □ HSS □ IMS □□	3GPP TS 29.229
16777255	SLg	GMLC □ MME □□□□□	3GPP TS 29.172
16777291	SLh	GMLC □ HSS/DRA □ LCS □□□□	3GPP TS 29.173

□□□

□□	□□	□□	□□
272	□□□□□□/□□ (CCR/CCA)	Gx	□□□□□□□□□□□□
301	□□□□□□□□/□□ (SAR/SAA)	Cx	IMS □□□□□□
316	□□□□□□□□/□□ (ULR/ULA)	S6a	□ MME □□□□□□□□
317	□□□□□□□□/□□ (CLR/CLA)	S6a	HSS □□□□□□□□
321	□□□□□□□□/□□ (PUR/PUA)	S6a	MME □□□□□□□□
8388620	□□□□□□□□/□□ (PLR/PLA)	SLg	□□□ MME □□□□□□□□
8388622	LCS-□□□□□□□□/□□ (RIR/RIA)	SLh	LCS □□□□□□□□

□□□□

□□□□	□□	□□	□□
servicing_mme	S6a ULR	SLg PLR, SLh RIR	□□□□□□□□□□□□ MME
servicing_pgw	Gx CCR-I	—	□□□□□□□□□□ PGW□□□□□□□□□□□□
servicing_cscf	Cx SAR (□ □)	—	□□□□□□ IMS □□□□□□□□□□ S-CSCF□□ □□□□□□□□□□