



1. AVP (293) - DRA

 -
 -
 -
2. AVP (283) -

 - DRA
 -
 -
3. ID -

- `uint32_t ID`
- `uint32_t (CER/CEA)`
- `uint32_t 3GPP IDs`

`uint32_t`

`uint32_t peer_selection_algorithm`

- `uint32_t: uint32_t`
- `uint32_t ID: uint32_t`
- `uint32_t: DRA uint32_t (uint32_t)`
- `uint32_t: DRA uint32_t AVP`
- `uint32_t: uint32_t`

`uint32_t:`

- `uint32_t: uint32_t`
- `uint32_t: uint32_t`
- `uint32_t: uint32_t`
- `uint32_t: uint32_t`

`uint32_t RFC 6733 6.2`

`uint32_t`

`uint32_t peer_selection_algorithm`

- `:random - uint32_t (uint32_t)`
- `:failover - uint32_t (uint32_t)`
- `uint32_t: uint32_t`
- `uint32_t: uint32_t`

`uint32_t`

- `uint32_t AVP (uint32_t IMSI)`
- `uint32_t AVP`
- `uint32_t: uint32_t`
- `uint32_t: uint32_t`

`uint32_t uint32_t`

`DRA`

`DRA uint32_t`

```
%{
  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: [
    # ? ? ? ? ...
  ]
}
```

	??	??		??		??
host	???	DRA	?	<u>???</u>	(	?????)
realm	???	DRA	?	<u>???</u>		
product_name	????	CER/CEA	??????			
vendor_id	??	??	RFC 6733	<u>5.3.3</u>	?????	ID (10415 = 3GPP)

```
listen_ip          1.2.3.4 DRA 1.2.3.4.5.6.7.8 IP 1.2.3.4
listen_port        1.2.3.4 1.2.3.4.5.6.7.8 TCP/SCTP 1.2.3.4 (1.2.3.4: 3868)
service_name        1.2.3.4 Erlang 1.2.3.4.5.6.7.8
request_timeout     1.2.3.4 1.2.3.4/1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.18.19.20: 5000.1
```

```

peer_selection_algorithm
allow_undefined_peers_to_connect
log_unauthorized_peer_connection_attempts

```



```

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
  }
]
}

```

- : host
- : CER/CEA
- : DRA 3GPP (3GPP IDs)
- ID 10415: 3GPP

- 0000: 00 0000 TTL (00 + 5 0)
- 0000: 0000000000000000peer_selection_algorithm 000000

000000

- 00000000 allow_undefined_peers_to_connect: false
- 00 log_unauthorized_peer_connection_attempts: true 000000
- 00000000 listen_ip 0 listen_port 0000
- 00 TLS 00000000

000

00 3GPP 00 IDs

00 ID	00	00
16777251 S6a/S6d	MME/SGSN	0 HSS 0000000000
16777252 S13/S13'	MME	0 EIR 000000
16777238 Gx	PCEF	0 PCRF 00000000
16777267 S9	0 PCRF	000 PCRF 0000
16777272 Sy	PCRF	0 OCS 0000
16777216 Cx	I-CSCF/S-CSCF	0 HSS IMS 00
16777217 Sh	AS	0 HSS IMS 0000
16777236 SLg	MME/SGSN	0 GMLC 0000
16777291 SLh	GMLC	0 HSS 00000000
16777302 S6m	MTC-IWF	0 HSS/HLR 0 M2M 00
16777308 S6c	SMS-SC/IP-SM-GW	0 HSS SMS 00
16777343 S6t	SCEF	0 HSS 0000
16777334 Rx	AF	0 PCRF 0000

00 AVP 00

00	AVP 00	00	00
1	000	UTF8String	0000000 (IMSI 0 3GPP 0)
264	Origin-Host	DiameterIdentity	00000000
268	Result-Code	Unsigned32	00000000
283	Destination-Realm	DiameterIdentity	000
293	Destination-Host	DiameterIdentity	00000 (00)
296	Origin-Realm	DiameterIdentity	00
297	Experimental-Result Grouped		000000000000

0000000

000000000000000000000000 AVP0

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

```

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

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

enabled rule_name match filters route.peers

257 CER/CEA 258 RAR/RAA 274 ASR/ASA 275 STR/STA 280 DWR/DWA 282 DPR/DPA 316 ULR/ULA 317 CLR/CLA 318 AIR/AIA 321 PUR/PUA

- DRA
-
-

- **: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} }

- **: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 }

- **:to_peer** -
 - :to_peer, "dra01.omnitouch.com.au" }
 - :to_peer, ["dra01.omnitouch.com.au",

"dra02.omnitouch.com.au"]}]}

- **:from_peer** - 16 octets
 - 4 octets: { :from_peer, "hss-01.example.com" }
 - 4 octets: { :from_peer, ["hss-01.example.com", "hss-02.example.com"] }
- **:packet_type** - 8 octets
 - 2 octets: { :packet_type, :request }
 - 2 octets: { :packet_type, :answer }

16 octets

- **AVP 1 octet**: 1 octet AVP (1 octet Origin-Host 1 octet Destination-Realm 1 octet)
 - 1 octet AVP 1 octet
 - 1 octet 1 octet
 - 2 octets: { :avp, {code, value} }
- 4 octets: 1 octet 1 octet 1 octet 1 octet :packet_type 4 octets
 - 1 octet 1 octet 1 octet 1 octet **OR** 1 octet 1 octet 1 octet
 - 2 octets: { :command_code, [317, 318] } 1 octet 1 octet 1 octet 1 octet 317 1 octet 318
- 3 octets:
 - :any - 1 octet 1 octet 1 octet AVP 1 octet
 - 2 octets: { :avp, {264, :any} } 1 octet 1 octet Origin-Host AVP 1 octet 1 octet 1 octet 1 octet

4 octets

2 octets **1**: 1 octet 1 octet 1 octet 1 octet

1 octet 1 octet 1 octet 1 octet DRA 1 octet 1 octet 1 octet

```
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"}'}
```


???

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 (AND ?), :any (OR ?), :none (NOR ?)
filters      ? ? ? ? ? ( ? ? ? ? ? )
transform.action ? ? ? ? (:edit, :remove, ? :overwrite)
transform.avps ? ? ? ? AVP ? ? ? ? ( ? ? AVP ? ? ? ? )
```

???

?? (???)

- **:edit** - ? AVP ?
 - ? ? ? ? ? ? ? ? AVP
 - ? AVP ? ? ? ? ? ? ? ?
- **:remove** - ? ? ? ? ? AVP
- **: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"}}'
```

?: ? S6a ? ? ? ? ? ? ? ? DRA ? ? ? ? ? IMSI ? ? ? ? ? Operator X ? ? ? ? ?
??

2: IMSI

```
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"}]'
```

4: 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"}]'
```

4: MVNO

4: Tutorial_Rule_AIR

```
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) ◆◆◆◆◆◆◆◆◆◆
- ◆◆◆◆◆◆◆◆ "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, [], [], []}],
          [], [], [], [], [], [], [], [], [], [], [], [],
[], [],
          {"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-Configuration-Profile ?? AVP
- ?? **dictionary** ?? ??? AVP
- ??? APN ??: "internet" (?? 1) ? "ims" (?? 2) ? "sos" (?? 3)
- ?? APN ?? QoS ??? (AMBR) ? PDN ???
- ??? (SOS) APN ???

??? :overwrite ??:

```

?? : ?? 3 ?? ?? ?? filter1 OR filter2 OR filter3 (?? ?? ?? ??) ?

```


attach_attempt_reporting_enabled (LTE (S6a AIR/AIA))

(AIR) (AIA) LTE

attach_attempt_count

:

- imsi - IMSI (AVP - AVP)

:

- origin_host -
- result_code - HSS

:

- AIR (318S6a 16777251 - IDs)
 - / ID
 - IMSI (AVP 1)
 - Origin-Host (AVP 264)
- ETS TTL
- AIA
 - ID
 - (AVP 268 AVP 297)
 - IMSIorigin 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}
})
```

?? ? ? ? ? ? ? ? ? ? ?

- 2001 - ?? (DIAMETER_SUCCESS)
- 5001 - ? ? ? ? ? ? (DIAMETER_AUTHENTICATION_REJECTED)
- 5004 - ?? AVP ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? RFC 6733

?? ? ?

- ? ? ? ? ? ? ? ? ? S6a AIR/AIA ? (?? ID 16777251 ? ? ? ? ? 318)
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? + 5 ? ? ?
- ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?

?? ? ? ?

?? ? ? ? ?

- ? ? ? ? ? ? ? ? ? ? ? ? ?
- ?? AVP ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? AVP ? ? ? ? ?
- ?
- ? ? ? ? ? ? ? ? match ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ?? ?

?? ? ? ?

- ? ? ? ? ? ? ? - ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ?

?? ? ? ? ?

- ?? AVP ? ? ? ? ? ? ? ? ? ? ? ? ? AVP ? ? ? ? ?
- ?? :edit ?? : ?? AVP ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? AVP ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? :request ? :answer ?
- ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? :edit ? ? ? ? ? ? - ?? ? ? ? ? ? ?
- ?? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?