



OmniUDR 開箱

OmniUDR 安裝說明 :omniudr 安裝說明 config/runtime.exs 安裝說明
安裝說明



```
import Config

config :omniudr,
  # HSS API
  hss_api_base_url: System.get_env("HSS_API_BASE_URL",
    "https://127.0.0.1:8443"),

  # SBI
  sbi_scheme: System.get_env("SBI_SCHEME", "http"),
  sbi_addr: System.get_env("SBI_ADDR", "127.0.0.22"),
  sbi_port: String.to_integer(System.get_env("SBI_PORT", "7777")),

  # NRF
  nrf_uri: System.get_env("NRF_URI", "http://127.0.0.1:7777"),

  # PLMN
  mcc: System.get_env("MCC", "999"),
  mnc: System.get_env("MNC", "70"),

  # Prometheus
  prometheus_metrics_port:
    String.to_integer(System.get_env("PROMETHEUS_PORT", "9568")),

  # Heartbeat (ms)
  heartbeat_interval:
    String.to_integer(System.get_env("HEARTBEAT_INTERVAL", "10000")),

  # Test Subscribers - IMSI → {ki, opc, amf} → JSON
  test_subscribers: System.get_env("TEST_SUBSCRIBERS")

config :logger, :default_formatter,
  format: {OmniLogger.JsonFormatter, :format},
  metadata: :all
```

□□□

□□	□□	□ □	□□	
<code>hss_api_base_url</code>	□□□ (URL)	□	<code>https://127.0.0.1:8443</code>	HSS
<code>sbi_scheme</code>	□□□	□	<code>http</code>	SBI
<code>sbi_addr</code>	□□□ (IP)	□	<code>127.0.0.22</code>	SBI
<code>sbi_port</code>	□□	□	<code>7777</code>	SBI
<code>nrf_uri</code>	□□□ (URL)	□	<code>http://127.0.0.1:7777</code>	NRF
<code>mcc</code>	□□□	□	<code>999</code>	MCC
<code>mnc</code>	□□□	□	<code>70</code>	MNC
<code>prometheus_metrics_port</code>	□□	□	<code>9568</code>	PRO

項目	項目	項目	項目	
heartbeat_interval	項目 (項目)	項目	10000	HEA
test_subscribers	項目 (JSON) nil	項目	nil	TES
default_am_nssai	項目	項目	eMBB / URLLC / mMTC 項目 項目項目項目	(項目 -
dnn_snssai_map	項目	項目	%{"iot" => %{"sst" => 3, "sd" => "000003"}}}	(項目 -

項目	項目	単位	項目	
notification_max_attempts	回	回	4	(4 -
notification_backoff_ms	回 (回)	回	500	(4 -

default_am_nssai と dnn_snssai_map は 4G HSS から取得された 5G Nudr から取得された AMF/SMF から NSSAI から AM/SM から eMBB sst 1 URLLC sst 2 / sd 000002 mIoT sst 3 / sd 000003 から取得された

項目 (default_am_nssai, dnn_snssai_map)

項目 S-NSSAI から S-NSSAI

項目	項目	単位	項目
sst	回 (0-255)	回	1 = eMBB 2 = URLLC 3 = mIoT TS 23.501
sd	回 (6 回)	回	sst から sst から AMF/SMF から

default_am_nssai から NSSAI

項目	説明
defaultSingleNssais	UE が最初に受信する S-NSSAI - 初期化時に送信される
singleNssais	初期化時に送信される S-NSSAI のリスト (defaultSingleNssais も含む) SD の S-NSSAI は UE が AMF から 5GMM #62 を受信するまで

```
config :omniudr, :default_am_nssai, %{
  "defaultSingleNssais" => [{"sst" => 1}, {"sst" => 1, "sd" =>
    "000001"}],
  "singleNssais" => [
    {"sst" => 1},
    {"sst" => 1, "sd" => "000001"},
    {"sst" => 2, "sd" => "000002"},
    {"sst" => 3, "sd" => "000003"}
  ]
}
```

dnn_snssai_map は DNN ごとに PDU セッション S-NSSAI を DNN ごとに eMBB ({"sst" => 1, "sd" => "000001"}) を S-NSSAI の default_am_nssai.singleNssais に SMF から受信する

```
config :omniudr, :dnn_snssai_map, %{
  "iot" => {"sst" => 3, "sd" => "000003"},
  "internet" => {"sst" => 1, "sd" => "000001"}
}
```

hss_api_base_url (HSS REST API)

OmniUDR は - OmniUDR から AM SM からの OmniUDR の hss_api_base_url REST API GET /api/subscriber/imsi/{imsi} GET /api/key_set/{id} / SQN / GET /api/hlr/* HSS 3GPP HSS 5 3 Nudr 404/5xx -

test_subscribers

`test_subscribers` 配置测试订阅者 IMSI - 配置 Milenage 配置 - 配置 JSON 配置测试订阅者 AM 及 SM 配置测试 HSS 配置测试 配置测试 配置测试 配置测试 配置测试 HSS 配置测试 Nudr_DR 配置测试 HSS 配置测试 HSS 配置测试 配置测试/配置测试 HSS 配置测试 `nil` 配置 JSON 配置测试

PLMN 配置 NRF 配置

`mcc` 及 `mnc` 配置 NRF NF 配置 PLMN 配置 NRF 及 NF 配置 Omni5G NRF 配置 OAM API 配置 `nf_capacity` `nf_priority`

配置

`notification_max_attempts` 及 `notification_backoff_ms` 配置 OmniUDR 配置 Nudr_DR DataChangeNotify 配置 `subs-to-notify` 配置 TS 29.504 配置 配置 OmniUDR 配置 URI 配置 2xx 配置 OmniUDR 配置 `notification_max_attempts` 配置 `notification_backoff_ms` 配置 配置 SBI 配置 配置 `config` `:omniudr, ...` 配置

配置 OAM API

配置 SBI 配置 OmniUDR 配置 **8443** 配置 HTTPS 配置 API/TLS `enable_tls: true` 配置 Web UI 配置 HTTPS 配置 **7443** 配置

項目	設定	説明
SBI (Nudr_DR)	sbi_port (ポート 7777)	3GPP 標準
Prometheus ポート	prometheus_metrics_port (ポート 9568)	標準
API / OAM API	8443 (HTTPSポート /api ポート)	HSS 標準 OAM ポート
管理 UI	7443 (HTTPS)	標準

API ポート /api HSS 標準 HSS OAM ポート

Method	URI	Description
GET	/api/status/api	API Status
GET	/api/status/nrf	NRF Status
GET	/api/status/nf	NF Status / List
GET	/api/status/license	License Status
GET	/api/health/hss	HSS Health Check HSS GET /api/status/api
GET	/api/subscribers	List HSS subscribers page page_size
GET	/api/subscribers/{imsi}	Get HSS subscriber info
GET	/api/oam/config	Get OAM config
PATCH	/api/oam/config/{id}	Update OAM config hss_api_base_url nrf_uri nf_capacity nf_priority log_level
POST	/api/oam/nrf/reregister	Register NRF
DELETE	/api/oam/subscriber-cache/{id}	Delete AMF/SMF subscriber cache id=all delete all
POST	/api/oam/log_level	Set log level

OAM Configuration PATCH /api/oam/config/{id}

- hss_api_base_url nrf_uri nf_capacity nf_priority log_level (default 400)
- nf_capacity nf_priority log_level emergency alert critical error warning warn notice info debug

- `nf_capacity / nf_priority` 0000000000000000 NRF
 - 000000000000 HSS 000000 `/api/subscribers` 0 `/api/subscribers/{imsi}` 0
00 502 000000000000 404
-

0000

OmniUDR 00 OmniLogger.JsonFormatter 000000 JSON 0000000000000000 OAM
API 0 POST `/api/oam/log_level` 0 PATCH `/api/oam/config/{id}` 0 0000
`log_level` 00000000000000000000 OAM 000000000000000000 `info` 00000000
[OAM] 0000 HSS 000000 `warning/error` 000000

OmniUDR

OmniUDR (prometheus_metrics_port, 9568) Prometheus

UDR / HSS

omni_udr_nrf_registration_status	gauge	nf_type	NRF 0 =
omni_udr_hss_health	gauge	-	OmniHSS [= 0 = /health/h
omni_udr_hss_requests_total	counter	endpoint, result	HSS endpoint result success/
omni_udr_hss_request_duration_ms	distribution	endpoint	HSS REST 5, 50, 100, 2 1000, 250

BEAM VM

메트릭	유형	설명
<code>beam_memory_total</code>	gauge	BEAM 메모리 사용량
<code>beam_memory_processes</code>	gauge	Erlang 프로세스 메모리 사용량
<code>beam_memory_system</code>	gauge	BEAM 시스템 메모리 사용량 (ETS 포함)
<code>beam_processes_count</code>	gauge	Erlang 프로세스 수
<code>beam_vm_uptime</code>	gauge	BEAM VM 실행 시간

PromQL

- HSS 헬스 상태 `omni_udr_hss_health`
- NRF UDR 등록 상태 `omni_udr_nrf_registration_status`
- HSS 5분 평균 실패율
`sum(rate(omni_udr_hss_requests_total{result="failure"}[5m])) / sum(rate(omni_udr_hss_requests_total[5m]))`
- HSS p95 지연 시간 5분 평균
`histogram_quantile(0.95, sum(rate(omni_udr_hss_request_duration_ms_bucket[5m])) by (le, endpoint))`
- 1분 평균 HSS 요청 수
`sum(rate(omni_udr_hss_requests_total[1m])) by (endpoint)`
- BEAM 프로세스 수 `beam_processes_count`

OmniUDR

OmniUDR is Omnitouch 5G Network Data Repository (UDR) Nudr_DataRepository (TS 29.504) SBI UDM PCF

OmniUDR Nudr_DR OmniHSS REST API 3GPP Nudr OmniUDR OmniHSS REST API 5G UDM AUSF Nudr OmniUDR HSS

HSS OmniUDR (ETS) AMF SMF Nudr_DR subs-to-notify Nudr_DR application-data PFD BDT API

3GPP

TS 23.501	5G UDR UDMPCF UDM
TS 29.504	Nudr_DataRepository -
TS 29.505	- SMF
TS 29.519	- AM SM
TS 29.503	Nudm - UDM UEAU/SDM/UECM UDR
TS 29.571	- PatchResultProblemDetailsPLMN S-NSSAI

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項目	設定項目	説明
SBI (Nudr_DR)	<code>{sbi_scheme}://{sbi_addr}:</code> <code>{sbi_port}</code> (例 <code>http://127.0.0.22:7777</code>)	UDM へ PCF へ nudr-dr/v2 接続
HSS REST API	<code>hss_api_base_url</code> (例 <code>https://127.0.0.1:8443</code>)	UDM/HSS/PCF へ REST API OmniHSS
NRF	<code>nrf_uri</code>	NF 接続先
UDM / OAM API	<code>:8443</code> (HTTPS接続先 <code>/api</code> あり)	UDM/HSS/PCF へ OAM API - 接続 確認
Prometheus 接続	<code>prometheus_metrics_port</code> (例 <code>9568</code>)	UDM/HSS/PCF へ - 接続 確認

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OmniUDR 0000 Nudr_DR 0000000000000000 OmniHSS 00000000"HSS 00" 00000000
000 REST 000

UE	Nudr UE	UE	UE	HSS
UE UE	subscription- data/.../authentication- data/authentication- subscription	UE UE /	UDM (Nudm_UEAU)	UE key_set (AMF, SQN) UE key_set_id
UE UE	subscription- data/.../authentication- data/authentication-vectors	UE UE (UE UE)	OmniUDM	HSS generate_authentication_vectors (Milenage + SQN/resync)
UE UE (AM) UE	subscription- data/.../provisioned- data/am-data	UE UE	UDM (Nudm_SDM)	UE EPC UE UE NSSAI
UE UE (SM) UE	subscription- data/.../provisioned- data/sm-data	UE UE	UDM (Nudm_SDM)	EPC APN UE UE AMBR UE UE
SMF UE UE	subscription- data/.../provisioned- data/smf-selection- subscription-data	UE UE	UDM (Nudm_SDM)	EPC APN UE - NSSAI / DNN
AMF UE UE	subscription- data/.../context-data/amf- 3gpp-access	UE UE	UDM (Nudm_UECM)	UE HSS UE UE
SMF UE UE	subscription- data/.../context-data/smf- registrations/{pduSessionId}	UE UE	UDM (Nudm_UECM)	UE

구분	Nudr 데이터	위치	서버	HSS 데이터
AM 데이터 구분	policy-data/ues/{ueId}/am-data	위치 구분	PCF	EPC UE-AM 데이터
SM 데이터 구분	policy-data/ues/{ueId}/sm-data	위치 구분	PCF	EPC APN/QoS PCRF 데이터

| 구분 | application-data/{family}/{id} (위치 pfd, influenceData, bdtData)
| 구분 / 위치 / 위치 / 위치 | PCF, NEF | 위치 - 위치 (ETS) 위치 위치 HSS 위치 |

| 위치 위치 위치 위치 위치 위치 위치 위치 위치 위치 SBI 위치 → 위치 위치

SBI 위치

위치 Nudr_DR 위치 HTTP 위치 위치 {sbi_scheme}://{sbi_addr}:{sbi_port} (위치 http://127.0.0.22:7777) 위치 Content-Type: application/json 위치 위치 TS 29.571 ProblemDetails 위치

{ueId} 위치 imsi-<digits> 위치 SUPI 위치 IMSI 위치 위치 위치
{servingPlmnId} 위치 위치 위치 위치 PLMN 5 6 위치 위치 위치 위치 mcc/mnc 위치 위치
PLMN 위치 위치 위치 위치 400 MANDATORY_IE_INCORRECT 위치 위치 위치 위치 위치

TS 29.504 / 29.505

Method	URI	Response	Status
GET	/nudr-dr/v2/subscription-data/{ueId}/authentication-data/authentication-subscription	Authentication Data (Ki, OPc, AMF, SQN)	200
PATCH	/nudr-dr/v2/subscription-data/{ueId}/authentication-data/authentication-subscription	Authentication Data (SQN)	204 or 200 + PatchResult
POST	/nudr-dr/v2/subscription-data/{ueId}/authentication-vectors	Authentication Vectors (AV)	200

authentication-vectors POST TS 29.504/29.505 SQN/resync UDR HSS OmniUDM

API - (TS 29.505)

Method	URI	Request	Response
GET	/nudr-dr/v2/subscription-data/{ueId}/{servingPlmnId}/provisioned-data/am-data	200 OK 400 MANDATORY_IE_MISSING {servingPlmnId}	
GET	/nudr-dr/v2/subscription-data/{ueId}/{servingPlmnId}/provisioned-data/sm-data	200 OK 400 MANDATORY_IE_MISSING {servingPlmnId}	
GET	/nudr-dr/v2/subscription-data/{ueId}/{servingPlmnId}/provisioned-data/smf-selection-subscription-data	200 OK 400 MANDATORY_IE_MISSING {servingPlmnId}	

API - (TS 29.504)

Method	URI	Request	Response
PUT	/nudr-dr/v2/subscription-data/{ueId}/context-data/amf-3gpp-access	201 AMF 3GPP Access	201 + Location (204)
PUT	/nudr-dr/v2/subscription-data/{ueId}/context-data/smf-registrations/{pduSessionId}	201 SMF	201 + Location (204)

PUT 400 ProblemDetails (cause: MANDATORY_IE_MISSING)

API (TS 29.519)

Method	URI	Response	Status
GET	/nudr-dr/v2/policy-data/ues/{ueId}/am-data	AM Data (subscCats, praInfos)	200
GET	/nudr-dr/v2/policy-data/ues/{ueId}/sm-data	SM Data (smPolicySnssaiData, DNN)	200

API (TS 29.504)

Nudr_DR application-data API provides CRUD for {family} pfd, influenceData, bdtData, {id} ID (appId / influenceId / bdtReferenceId) (ETS) HSS {family} 404

Method	URI	Response	Status
GET	/nudr-dr/v2/application-data/{family}	Application Data (GET)	200 (OK)
GET	/nudr-dr/v2/application-data/{family}/{id}	Application Data	200 OK 404 Not Found
PUT	/nudr-dr/v2/application-data/{family}/{id}	Application Data	201 + Location (OK) 200 (OK)
DELETE	/nudr-dr/v2/application-data/{family}/{id}	Application Data	204 OK 404 Not Found

PUT 400 ProblemDetails (cause: MANDATORY_IE_MISSING)

API (TS 29.504 subscriptions-to-notify)

Method	URI	Request	Response
POST	/nudr-dr/v2/subscription-data/subs-to-notify	SubscriptionData URI URI	201 + Location 400
DELETE	/nudr-dr/v2/subscription-data/subs-to-notify/{subsId}		204 404

API DataChangeNotify

404 ProblemDetails

HSS REST

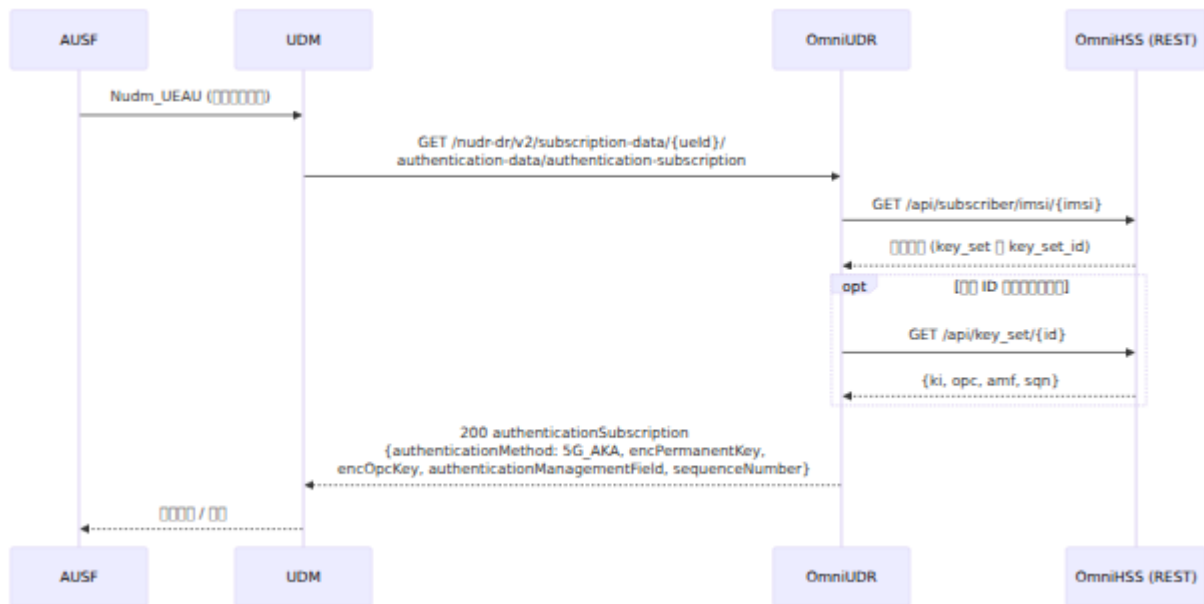
SBI OmniHSS REST hss_api_base_url

Nudr_DR 구분	HSS REST API	설명
구분	GET /api/subscriber/imsi/{imsi} (구분 ID) GET /api/key_set/{id}	구분 정보 조회
구분 생성	POST /api/hlr/generate_auth_vectors	구분 {imsi, auts} 생성 (auts = rand auts) 반환
SQL (PATCH)	POST /api/hlr/update_sqn	구분 {imsi, sqn}
AM / SM / SMF 구분	GET /api/subscriber/imsi/{imsi}	구분 정보 조회
AMF 구분	PUT /api/hlr/circuit_session/{imsi}	구분/회선 세션 정보 반환
SMF 구분	(구분)	구분 ETS 구분
구분 정보 (AM / SM)	GET /api/subscriber/imsi/{imsi}	구분 AM/SM 구분 정보
구분	GET /api/status/api	구분 /health/hss 정보 반환

/api/hlr/* (generate_auth_vectors, update_sqn, circuit_session/{imsi}) HSS OmniUDR 구분 SQL 구분 REST API (/api/subscriber/*, /api/key_set/*) 구분 (/api/status/api) (enabled: false) 구분

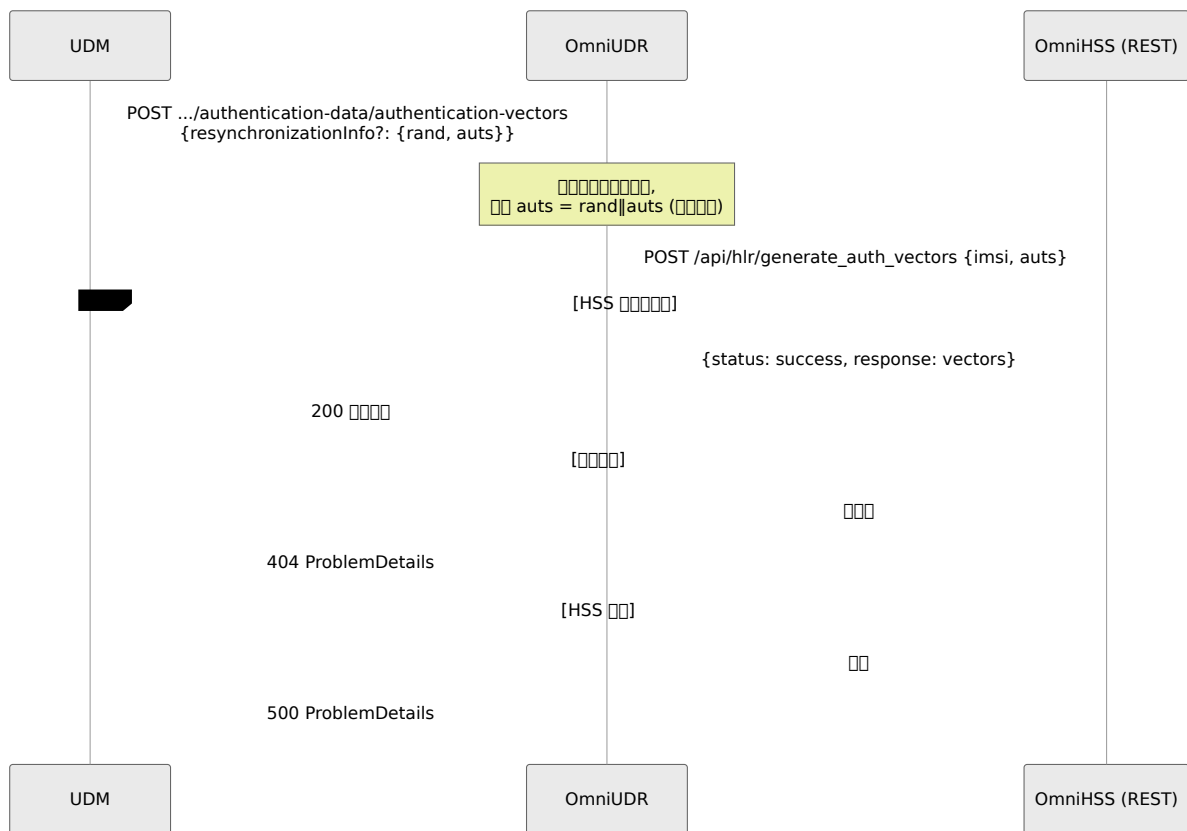
UDM → UDR → HSS

UDR UDM 5G-AKA AUSF OmniUDR OmniUDR HSS Nudr

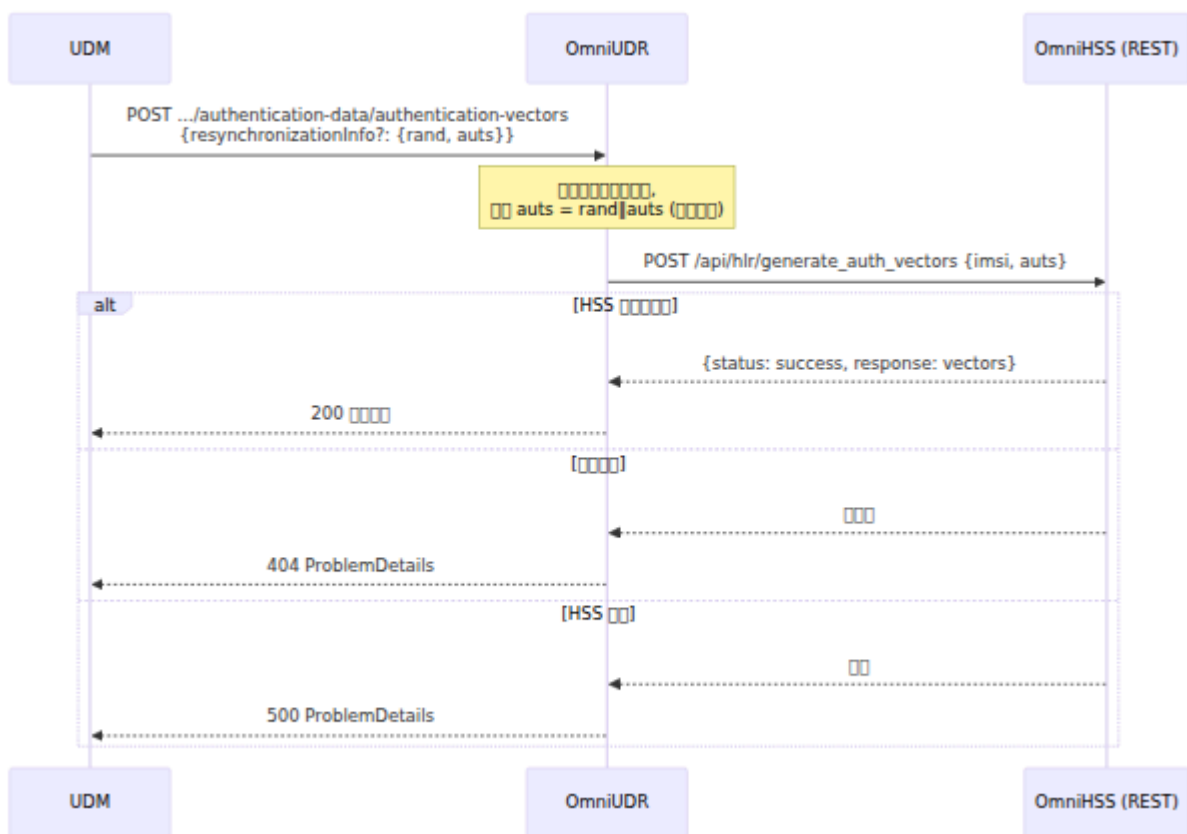


□□□□□□ (□□□□□□□□)

OmniUDM 向 HSS 发送 authentication-vectors POST 消息，消息中包含 Milenage 算法生成的 SQN/计数器值 UDM 返回 resynchronizationInfo (rand + auts) 给 OmniUDR，OmniUDR 再向 HSS 发送 rand||auts。



Authentication (AM / SM / SMF)



4G AM 4G EPC UE-AMBR 4G subscribedUeAmbr 4G NSSAI 4G default_am_nssai 4G SMF 4G APN 4G DNN 4G S-NSSAI

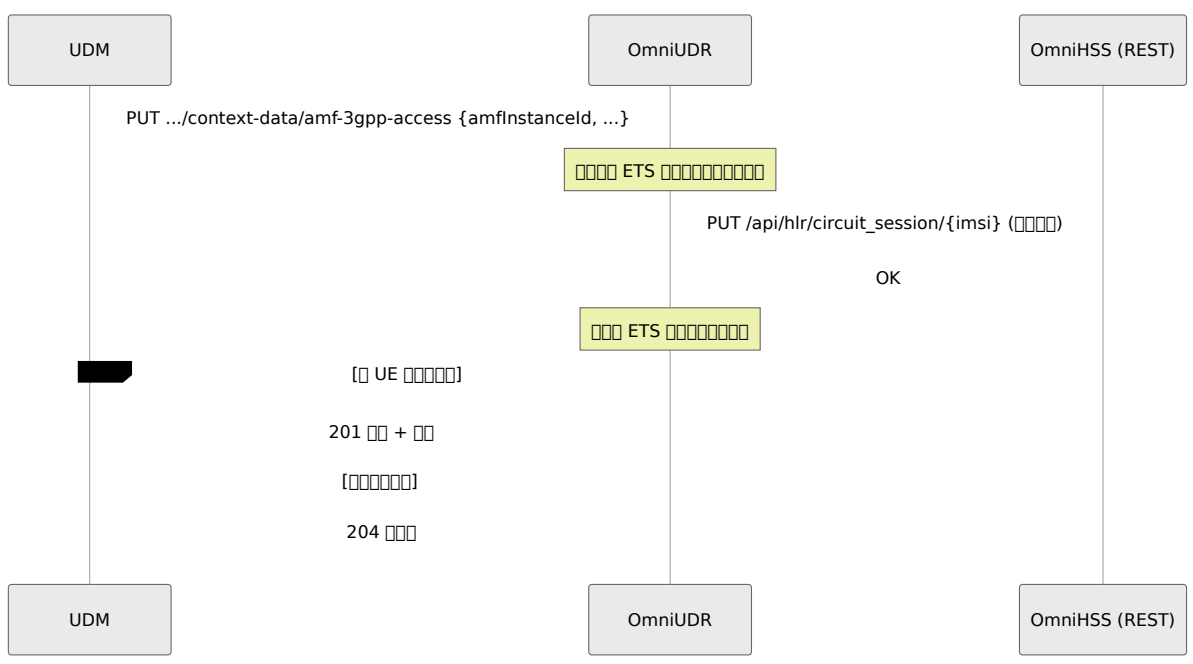
HSS APN 5G SM 5G

4G HSS 4G 5G OmniUDR 4G APN (epc_profile.apn_profiles[]) 4G dnnConfigurations 4G HSS 4G - 4G APN QoS 4G → SM 4G AMBR 4G

5G SM 情報	情報 (HSS 情報) 情報
singleNssai	DNN → S-NSSAI 情報 dnn_snssai_map
DNN 情報 dnnConfigurations 情報	APN 情報 (apn_identifier.apn)
pduSessionTypes	APN apn_identifier.ip_version (IPv4/IPv6)
sscModes	SSC_MODE 1 SSC_MODE 1 + SSC_MODE 2
5gQosProfile.5qi	apn_qos_profile.qci
5gQosProfile.arp.priorityLevel	apn_qos_profile.allocation_retention
5gQosProfile.arp.preemptCap	apn_qos_profile.pre_emption_capability
5gQosProfile.arp.preemptVuln	apn_qos_profile.pre_emption_vulnerability
sessionAmbr.uplink	apn_qos_profile.apn_ambr_ul_kbps
sessionAmbr.downlink	apn_qos_profile.apn_ambr_dl_kbps
chargingRules	APN pcrf_profile.charging_rules[] (5QI/QCI/ARP/GBR/MBR/...

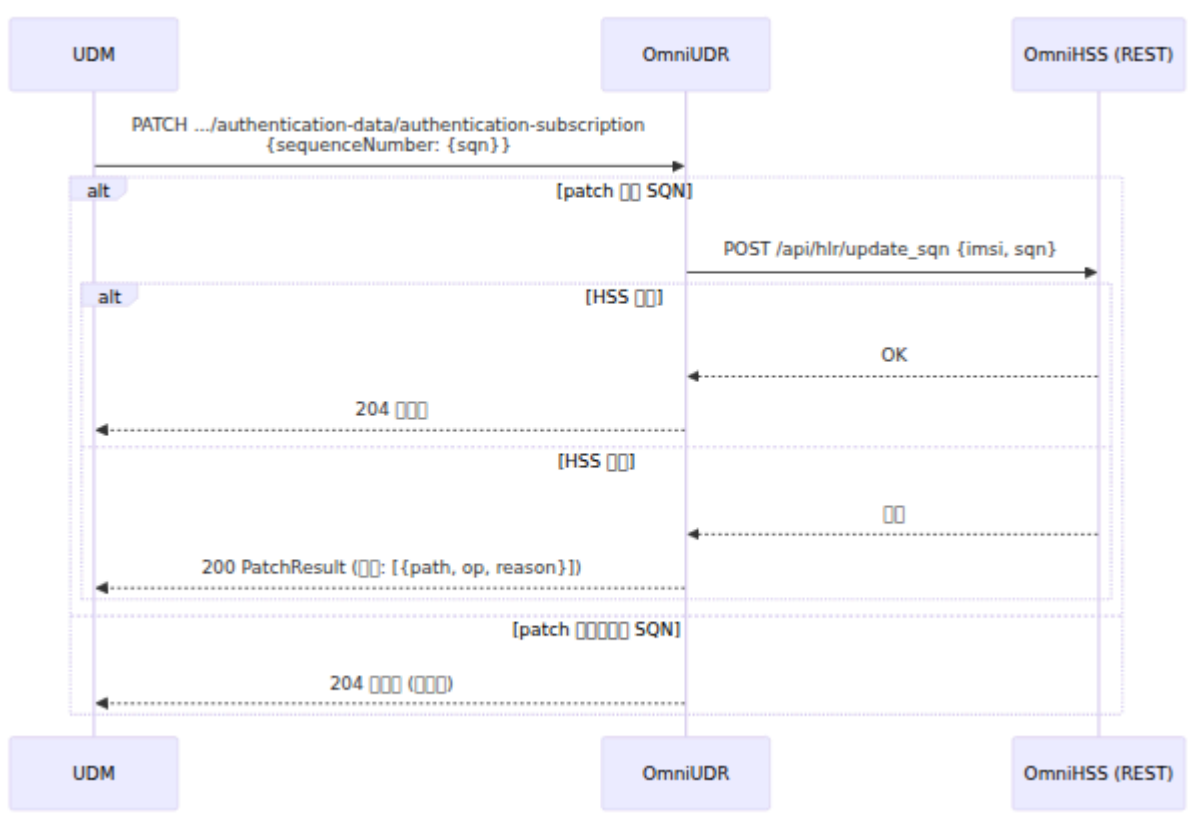
PDU 情報 5G PDU 情報 4G PDN 情報 5G 情報 APN 情報 ip_version 情報 IPv6 情報 APN 情報 IPv6 情報 IPv4 情報 defaultSessionType 情報 SMF 情報 UE 情報

AMF



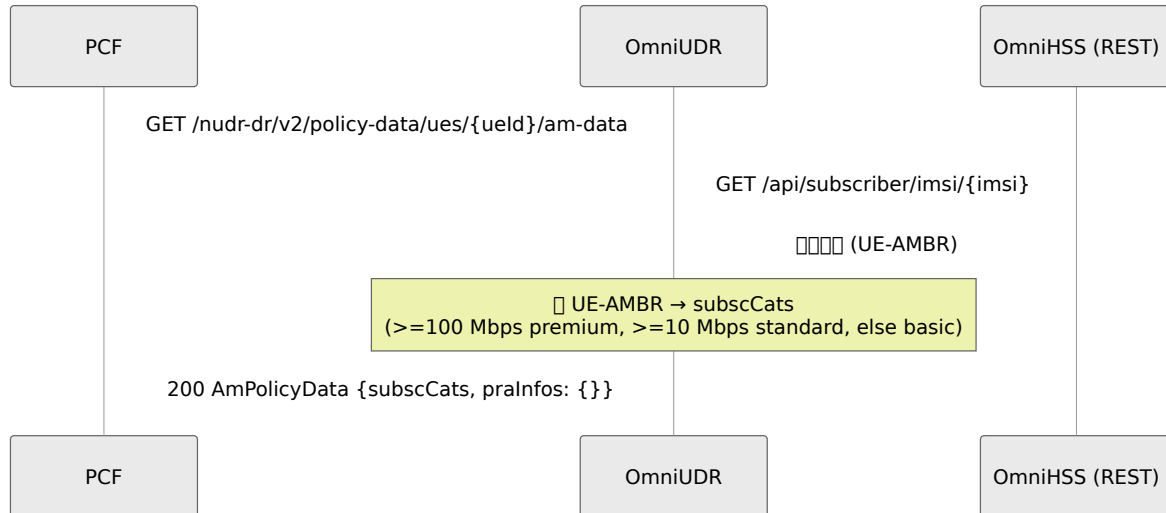
SMF

SMF ETS {ueId}/{pduSessionId} HSS

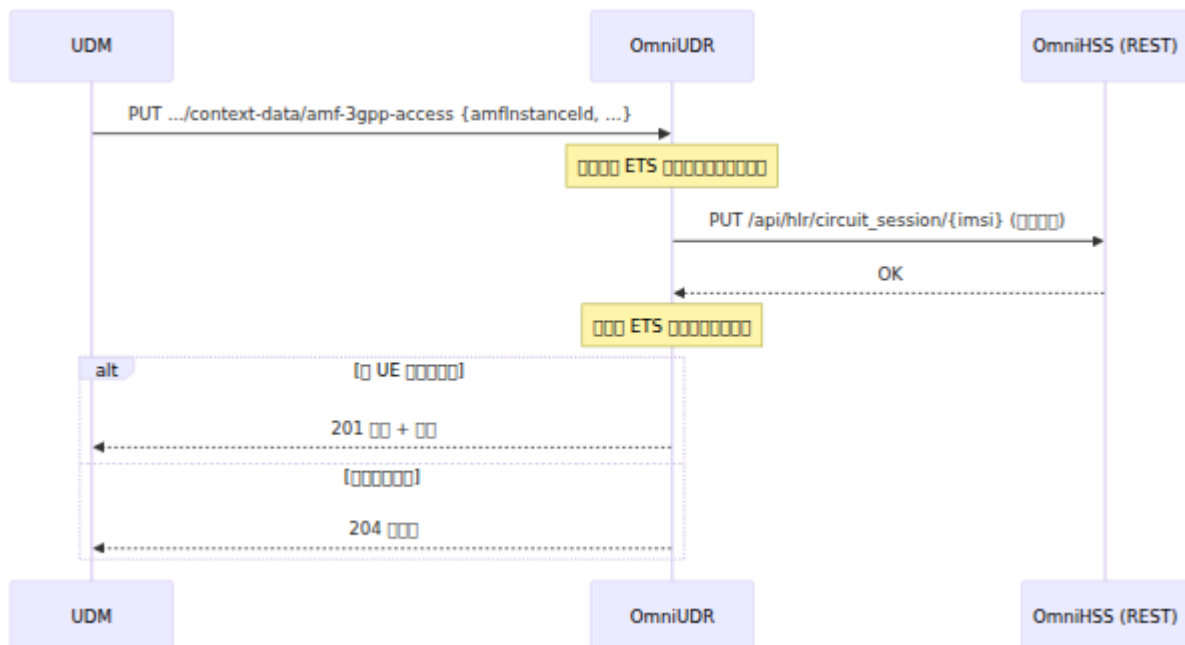


AM 交互流程 (PCF → UDR → HSS)

AM 交互流程涉及 OmniUDR 与 HSS 交互，UE-AMBR 参数值根据 `premium / standard / basic` 取值，`praInfos` 参数值

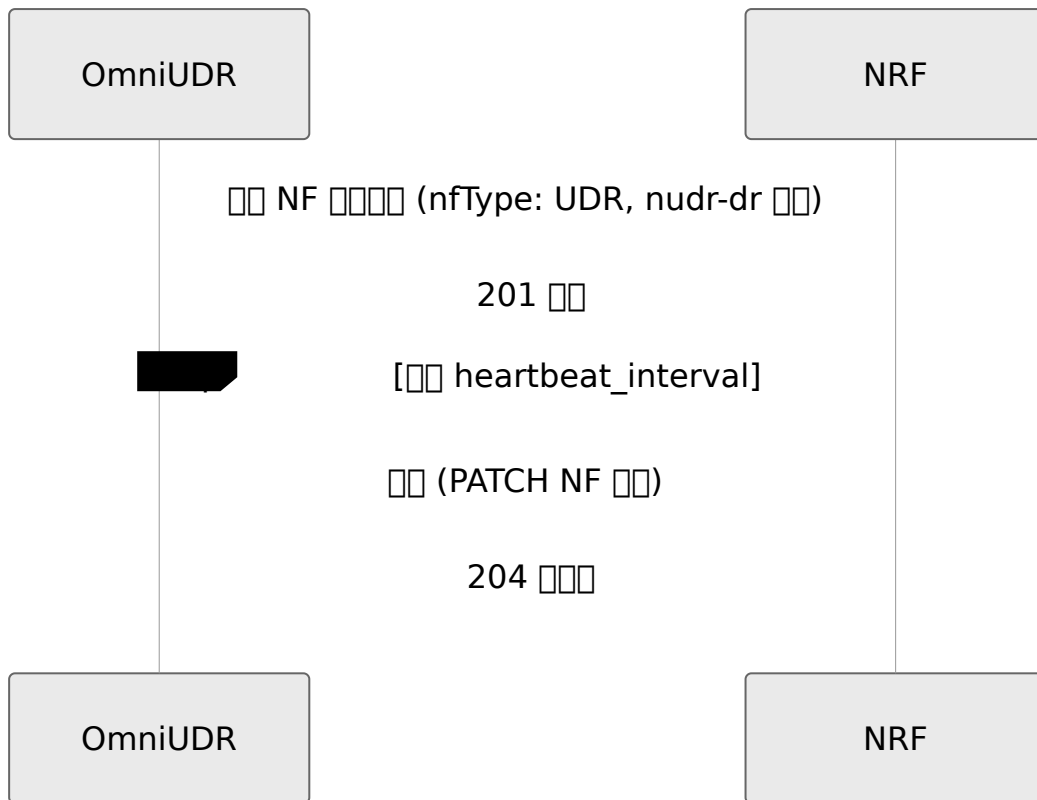


SM 交互流程 (PCF → UDR → HSS)



NRF 交互流程

OmniUDR 与 NF 交互流程 NRF 交互 `heartbeat_interval` 参数值根据 `premium / standard / basic` 取值，`OAM` 参数值



DataChangeNotify

OmniUDR Nudr_DR subscription-data/subs-to-notify TS 29.504 subscriptions-to-notify URI URI (ETS)

OmniUDR URI DataChangeNotify URI ADD REPLACE REMOVE SQN PATCH AMF SMF ADD REPLACE

SBI notification_max_attempts notification_backoff_ms





```
authentication-vectors POST HSS /api/hlr/generate_auth_vectors 404 HSS 500 HSS UDM
```

```
resynchronizationInfo[0] rand[0] auts - OmniUDR[0] HSS[0]
rand||auts[0] OmniUDM[0]
```

AM ــ UE-AMBR ــ subscCats ــــــــ premium ≥ 100 Mbps ــــــــ standard ≥ 10 Mbps ــــــــــــــــ basic ــــــــــــــــ praInfos ــ UE-AMBR ــــــــــــــــ ــــــــــــــــــــــــــــــــ HSS EPC ــــــــــــــــــــــــــــــــ UE-AMBR ــــــــ OmniUDR ــــــــ 1000 Kbps ــ ــ basic - ــ premium/standard ــــــــــــــــ basic ــــــــــــــــ HSS ــــــــ EPC UE-AMBR ــــــــ ue_ambr_ul_kbps / ue_ambr_dl_kbps ــــــــــــــــــــــــــــــــ SM ــ APN/QoS ــــــــ PCRF ــ 5G ــ

AM 0000 (S-NSSAI) 000

4G HSS 5G 5GSS 5GSS AM NSSAI OmniUDR eMBB
URLLC mIoT UE SD S-NSSAI AMF 5GMM #62
default_am_nssai DNN dnn_snssai_map AMF NSSAI

SM □□□□□□□□□□ **AMBR**

```

SM  AMBR / QoS HSS APN QoS 
OmniUDR  OmniHSS  ApnQosProfile 
apn_ambr_dl_kbps apn_ambr_ul_kbps allocation_retention_priority
pre_emption_capability pre_emption_vulnerability qci HSS 

```

HSS

AMF/SMF 201 204
DELETE /api/oam/subscriber-cache/{imsi} .../all

