



OmniUDM

OmniUDM `config/runtime.exs` `:omniudm` `SBI` `NRF` `UDR` `PLMN` `hnet_key_dir`

```
config :omniudm,
  udr_uri: "http://127.0.0.22:7777",
  sbi_scheme: "http",
  sbi_addr: "127.0.0.12",
  sbi_port: 7777,
  nrf_uri: "http://127.0.0.1:7777",
  mcc: "999",
  mnc: "70",
  prometheus_metrics_port: 9568,
  heartbeat_interval: 10_000,
  hnet_key_dir: "/etc/omniudm/hnet"

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

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□□	□□	□ □	□□	
udr_uri	string (URI)	□	http://127.0.0.22:7777	UDR_I
sbi_scheme	string	□	http	SBI_S
sbi_addr	string (IP)	□	127.0.0.12	SBI_I
sbi_port	integer	□	7777	SBI_I
nrf_uri	string (URI)	□	http://127.0.0.1:7777	NRF_I
mcc	string	□	999	MCC

配置名	数据类型	是否必填	默认值	说明
mnc	string	否	70	MNC
prometheus_metrics_port	integer	否	9568	PROMETHEUS
heartbeat_interval	integer (ms)	否	10000	HEARTBEAT
hnet_key_dir	string (path)	否	/etc/omniudm/hnet	HNET

配置示例

配置示例：在 `runtime.exs` 文件中添加以下配置

이름	타입	대상	설명
default_nssai	map	eMBB / URLLC / mMTC / mMTC	UDR am-data에 저장된 nssai 값. 이 값은 NSSAI를 나타내며, SD 및 S-NSSAIs를 포함합니다.
nf_capacity	integer (0-65535)	모든	NF가 NRF에서 NF를 검색할 수 있는 능력. OAM에 PATCH 메서드를 사용하여 /api/oam/config/{id}에 PATCH를 수행할 수 있습니다.
nf_priority	integer (0-65535)	모든	NF가 NRF에서 NF를 검색할 수 있는 능력. OAM에 PATCH 메서드를 사용하여 /api/oam/config/{id}에 PATCH를 수행할 수 있습니다.

default_nssai는 defaultSingleNssais의 sst 1과 sst 1 / sd 000001, sst 1 / sst 1 / sd 000001, sst 2 / sd 000002, URLLC의 sst 3 / sd 000003, mMTC의 singleNssais를 포함하며, AMF는 5GMM #62를 사용하여 이 값을 설정합니다.

Nssai는 TS 29.503 / TS 29.571에 정의된 값입니다.

이름	타입	설명
defaultSingleNssais	list of S-NSSAI	UE가 AMF에 전달하는 S-NSSAI 목록. singleNssais를 포함합니다.
singleNssais	list of S-NSSAI	UE가 PLMN에 전달하는 S-NSSAI 목록.

S-NSSAI는 S-NSSAI를 나타냅니다.

Field	Type	Value
sst	integer (0-255)	1 = eMBB, 2 = URLLC, 3 = mMTC
sd	string (6 hex digits)	SD associated with SST, SD associated with SST, SD associated with SST

defaultSingleNssais, singleNssais, S-NSSAI, AMF, 5GMM, #62, UE

hnet_key_dir

hnet_key_dir, ECIES Profile A/B, SUCI, SIM, home_network_public_key_id, OmniUDM

ECIES, Null, SUCI

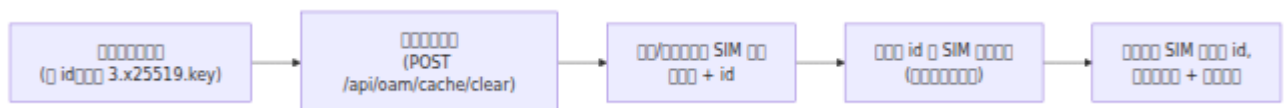
	Profile A (Curve25519)	Profile B (P-256)
<id>.<curve>.key	1.x25519.key	2.secp256r1.key
<curve>-<id>.key	curve25519-1.key, x25519-1.key	secp256r1-2.key

<id>, SIM, home_network_public_key_id, .key

- **PEM** - PKCS#8 -----BEGIN PRIVATE KEY----- SEC1 -----BEGIN EC PRIVATE KEY-----
- **Hex** -
- **Raw** -

SIM SUCI SIM SUPI `suci-0-<mcc>-<mnc>-<routing-ind>-<scheme>-<home_nw_pub_key_id>-<scheme_output>` OmniUDM
 SUCI `<home_nw_pub_key_id>` `<id>` -
 SIM - SUCI `unknown_home_network_key_id`

/



SIM MAC SIM
 SIM

- `hnet_key_dir` - SUCI OmniUDM
- SIM MAC
- OAM `POST /api/oam/cache/clear`

/ OAM API

HTTPS /OAM API 8443 TLS SBI

Method	URI	Description
GET	/api/status/api	API status
GET	/api/status/license	License status
GET	/api/status/nrf	NRF status
GET	/api/status/nf	NF status
GET	/api/ue	UE list
GET	/api/ue/{supi}	UE by SUPI
GET	/api/statistics	Statistics
GET	/api/oam/config	OAM configuration
PATCH	/api/oam/config/{id}	Update OAM configuration
DELETE	/api/oam/ue_cache/{id}	Delete UE from cache
POST	/api/oam/ue/sdm-notify	Notify SDM about UE status change
DELETE	/api/oam/ue/amf-registration/{id}	Remove UE from AMF registration
POST	/api/oam/cache/clear	Clear OAM cache
POST	/api/oam/log_level	Set log level

Method	URI	Description
GET	/api/oam/resources	Get resources
GET	/api/oam/diagnostics	Get diagnostics
POST	/api/oam/nrf/reregister	Post NRF registration

Configuration

Parameter	Value	Description
format	{OmniLogger.JsonFormatter, :format}	Configure JSON format for OmniLogger. The format is defined in the OmniLogger module.
metadata	:all	Configure metadata for OmniLogger. The metadata is defined in the OmniLogger module.

Configure OAM API log level with POST /api/oam/log_level. The log level is defined in the CK/IK/KAUSF/SQN@AK module. The SUPI is defined in the SUPI module.



OmniUDM

Prometheus prometheus_metrics_port 9568 /metrics

UDM 表结构

表名	数据类型	字段名	说明
omni_udm_auth_requests_count	counter	supi, result	认证请求次数统计 成功失败 统计
omni_udm_auth_vector_generations_total	counter	result	认证向量生成总次数 统计
omni_udm_auth_result_count	counter	supi, result	认证结果统计 成功失败 统计 成功失败 统计
omni_udm_uecm_registrations_total	counter	access_type	UECM注册总次数 UECM注册 3GPP 3GPP 统计 统计 统计 统计 统计
omni_udm_sdm_queries_total	counter	data_type	SDM查询总次数 SDM查询 data data select data ue-c

項目	タイプ	単位	説明
			in-s data sets
omni_udm_active_ue_contexts_count	gauge	none	UUUU UUUU UUUU
omni_udm_nrf_registration_status	gauge	nf_type	NRF = UU UUU

UUUUUU

```
# 5UUUUUUUUUU
sum(rate(omni_udm_auth_requests_count{result="failure"}[5m]))
  / sum(rate(omni_udm_auth_requests_count[5m]))

# UUUUUU SDM UUU
sum by (data_type) (rate(omni_udm_sdm_queries_total[5m]))

# UUUUUU3gpp / non_3gppUUUU UECM UUU
sum by (access_type) (rate(omni_udm_uecm_registrations_total[5m]))

# UUUUUUUUUU
sum(rate(omni_udm_auth_vector_generations_total{result="failure"}
[5m]))
  / sum(rate(omni_udm_auth_vector_generations_total[5m]))

# UU UDM UUUU NRFUUUUUU
min(omni_udm_nrf_registration_status) < 1
```

omni_udm_active_ue_contexts_count UUUUUUUU UE UUUUUUUUUUUUU UE UUUUUUUU
UUUUUUOAM U /api/statistics U /api/status/nf UUUUUUUUUUUUU

BEAM VM 指标

指标	类型	描述
beam_memory_total	gauge	BEAM 总内存
beam_memory_processes	gauge	Erlang 进程内存
beam_memory_processes_used	gauge	进程内存使用量
beam_memory_system	gauge	ETS 系统内存
beam_memory_atom	gauge	原子内存
beam_memory_atom_used	gauge	原子内存使用量
beam_memory_binary	gauge	二进制内存
beam_memory_code	gauge	代码内存
beam_memory_ets	gauge	ETS 内存
beam_processes_count	gauge	Erlang 进程数
beam_ports_count	gauge	Erlang 端口数
beam_atom_count	gauge	原子数
beam_vm_uptime	gauge	VM 运行时间



OmniUDM

OmniUDM is Omnitouch 5G UDM (UDM) Nudm (Nudm) (OmniUDR) nudr-dr

3GPP

5GC UDM	TS 23.501
Nudm (SDM / UEAU / UECM)	TS 29.503
Nudr_DataRepository (NDR)	TS 29.504
SUCI / SUPI	TS 33.501 §6.12 C
SUCI / SUPI	TS 23.003 §2.2B
5G-AKA	TS 33.501 §6.1.3, A
Milenage	TS 35.206
(SUCI/MSIN BCD)	TS 24.501

SBI

OmniUDM NRF SBI (sbi_scheme://sbi_addr:sbi_port)

API	Version	Description
nudm-sdm	v2	Subscription Data
nudm-ueau	v1	UE Authentication
nudm-uecm	v1	UE Context Management (AMF/SMF) API

Subscription Data API (nudr-dr/v2) is part of the OmniUDR API. The endpoint is `.../nudr-dr/v2/subscription-data/{ueId}/...`. The response is in JSON format with the content type `application/problem+json`. The response body is a `ProblemDetails` object.

Nudm_UEAuthentication (nudm-ueau/v1)

Method	Endpoint	Description
POST	<code>/supiOrSuci/security-information/generate-auth-data</code>	Generate 5G-AKA authentication data for SUPI or SUCI. The response includes <code>servingNetworkName</code> and <code>ausfInstanceId</code> .
POST	<code>/supi/auth-events</code>	Report authentication events. The response includes <code>nfInstanceId</code> , <code>success</code> , <code>timestamp</code> , <code>authType</code> , and <code>servingNetworkName</code> .
PUT	<code>/supi/auth-events/{authEventId}</code>	Update authentication event details. The response includes <code>authRemovalInd=true</code> if the event is removed.

Nudm_UECM (nudm-uecm/v1)

Method	URI	Description
PUT	/n1-api/uecm/registrations/amf-3gpp-access	AMF to UE 3GPP
PATCH	/n1-api/uecm/registrations/amf-3gpp-access	AMF to UE 3GPP (update)
GET	/n1-api/uecm/registrations/amf-3gpp-access	AMF to UE 3GPP
PUT	/n1-api/uecm/registrations/amf-non-3gpp-access	AMF to UE non-3GPP
GET	/n1-api/uecm/registrations/amf-non-3gpp-access	AMF to UE non-3GPP
PUT	/n1-api/uecm/registrations/smf-registrations/{pduSessionId}	SMF to PDU session
DELETE	/n1-api/uecm/registrations/smf-registrations/{pduSessionId}	SMF to PDU session

Nudm_SDM (nudm-sdm/v2)

HTTP Method	URI	Description
GET	/nssai/{supi}	GetDataSets - Retrieve the DataSets for the given supi. The response contains the dataset-names and the corresponding AM and SMF data (AM and SMF data are returned as separate resources). The response also contains the SMF data (UEC_SMF).
GET	/nssai/{supi}/am-data	Retrieve the AM data for the given supi (plmn-id is optional).
GET	/nssai/{supi}/sm-data	Retrieve the SM data for the given supi (plmn-id is optional).
GET	/nssai/{supi}/smf-select-data	SMF data (plmn-id is optional).
GET	/nssai/{supi}/nssai	Retrieve the NSSAI for the given supi.
GET	/nssai/{supi}/ue-context-in-smf-data	UE context in SMF data (PDU session ID is optional).
POST	/nssai/{supi}/sdm-subscriptions	Subscribe to the SDM data for the given supi. The request contains the nfInstanceId, callbackReference, and monitoredResourceUris.
GET	/nssai/{supi}/sdm-subscriptions/{subscriptionId}	Retrieve the SDM data for the given supi and subscriptionId.
PATCH	/nssai/{supi}/sdm-subscriptions/{subscriptionId}	Update the SDM data for the given supi and subscriptionId.
DELETE	/nssai/{supi}/sdm-subscriptions/{subscriptionId}	Delete the SDM data for the given supi and subscriptionId.

SUCI / SUPI

UE 向 **SUCI** () 向 **SUPI** (imsi-<IMSI>) 向 AUSF 向 OmniUDM 向 SUCI 向 OmniUDM 向 **UDR** 向 **SUCI** 向 **SUPI**

OmniUDM 向 TS 33.501 §6.12 / C

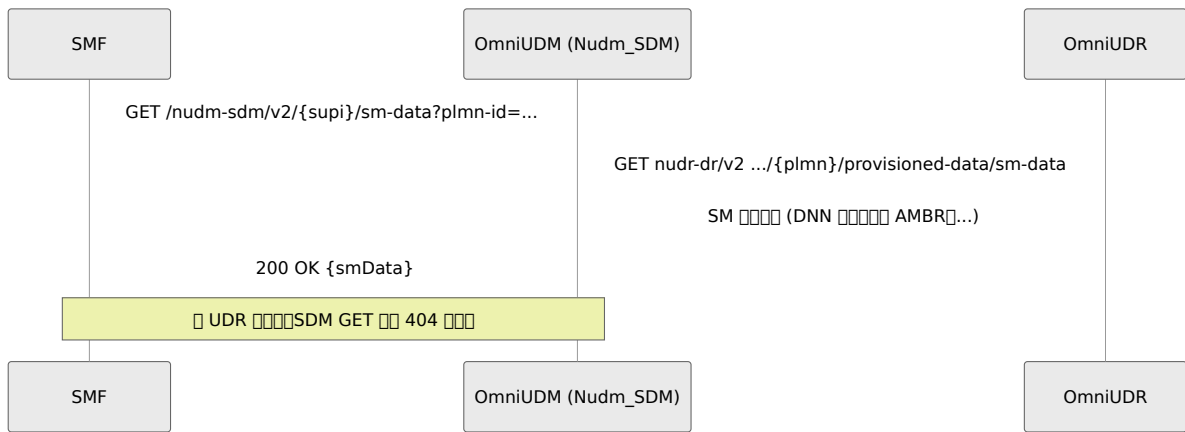
/		/	HNET
0		- MSIN	
1	ECIES A	Curve25519 (X25519) + AES-128-CTR + HMAC-SHA-256	
2	ECIES B	secp256r1 / P-256 + AES-128-CTR + HMAC-SHA-256	

向 MSIN 向 **BCD** 向 IMSI (TS 24.501 - MSIN BCD) 向 **A** 向 **B** 向 ECDH/MAC (ANSI-X9.63-KDF SHA-256) 向 MAC 向 MSIN 向 BCD 向 IMSI

向 A/B 向 hnet_key_dir 向 向 (hnet_key_dir) 向

SUCI

AUSF 向 OmniUDM 向 (SUCI) 向 HSS 向 UDR 向 5G 向 AUTN 向 **SQN** 向 **HSS** 向 **UDR** 向 - OmniUDM 向 5G AUTN (XRES* 向 KAUSF 向 AUSF 向 resynchronizationInfo 向 UDR 向 HSS

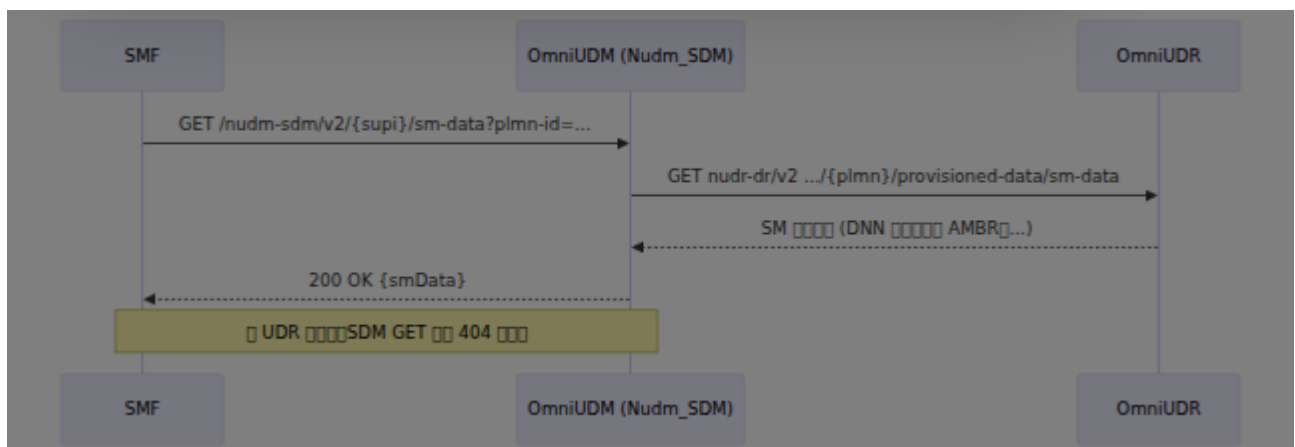


am-data → smf-select-data → GetDataSets (GET /{supi}) → UDR
 GetDataSets → nssai → UDR am-data →

UE-context-in-SMF → PDU → GET /{supi}/ue-context-in-smf-data → GetDataSets → UEC_SMF → SMF → Nudm_UECM SMF → UE PDU → TS 29.503 → pduSessions → PDU → ID → UE → SMF ({"pduSessions": {}})

NSSAI

GET /{supi}/nssai → UDR → am-data → nssai → UDR → am-data → nssai → UDR → OmniUDM → default_nssai → AMF



default_nssai - AMF → 5GMM → #62 →

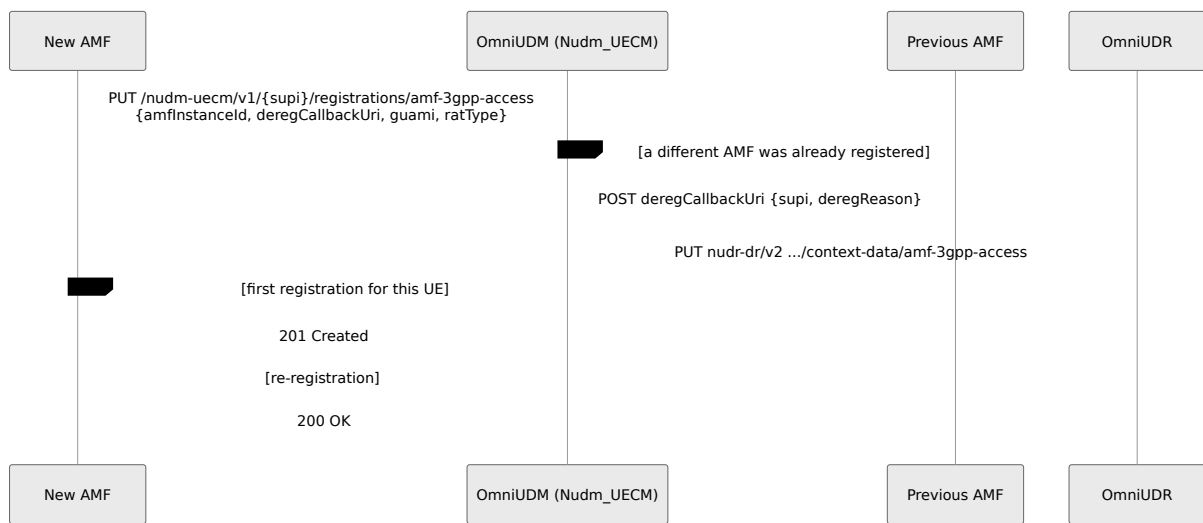
SDM ☐ ☐ ☐ ☐

SDM OmniUDM POST

ModificationNotification callbackReference /OAM API

UECM AMF

UE 向 AMF 注册 OmniUDM 向 UE 注册 AMF 向 OmniUDM 注册 AMF 向 deregCallbackUri 向 UE 注册 UDR



```

IEs TS 29.503 AMF 3GPP amfInstanceId deregCallbackUri
guami ratType SMF smfInstanceId pduSessionId singleNssai
plmnId pduSessionId MANDATORY_IE_INCORRECT
IEs HTTP 400

```



OmniUDM

□□□□□□ **404** □□□□□

OmniUDM 向 UDR 请求 `udr_uri` 的 OmniUDR 地址
 向 IMSI 请求 SUCI 的 IMSI 和“SUCI 列表”

403 SUCI

OmniUDM SUCI

- `unknown_home_network_key_id` - 未知 SUCI 暗号化ディレクトリ `hnet_key_dir` 内の `home_network_public_key_id` 暗号化ディレクトリが見つかりません
- `ecies_mac_verification_failed` - 暗号化 SIM 暗号化ディレクトリ内の SUCI 暗号化 SIM 暗号化ディレクトリが見つかりません
- `ecies_profile_a_scheme_output_too_short` / `ecies_profile_b_scheme_output_too_short` - SUCI 暗号化ディレクトリ / 暗号化ディレクトリ
- `invalid_suci_format` - SUCI 暗号化ディレクトリ

□□□□□□**501** □□□□□□□□

□□□ SUCI □□□□□□ 0□□□□1□□□ A□□ 2□□□ B□□□□□□□□□□

□□□□□□ **500** □□□□

UDR encPermanentKey/encOpK HSS
 rand/ck/ik/authn HSS UDR
 Ki/OPc OmniUDR HSS

am-data / sm-data / smf-select-data

404

UDR `plmn-id` `mcc/mnc` `udr_uri` PLMN UDR

UE AMF 5GMM #62

AMF NSSAI AMF UDR `am-data` `nssai` OmniUDM `default_nssai` - `default_nssai` UDR `nssai` SD S-NSSAIs

UE

UE AMF/SMF SDM OmniUDM AMF/SMF PDU UE NF

SDM

`callbackReference` URI OmniUDM "SDM ..."/OAM API SUPI `POST /api/oam/ue/sdm-notify`

`hnet_key_dir` OAM `POST /api/oam/hnet/reload` ID

UDM 注册 NF 注册

设置 omni_udm_nrf_registration_status 为 0 设置 nrf_uri 为 OAM 注册 API 调用 NRF 注册 POST /api/oam/nrf/reregister

