UDM简单功能说明

描述UDM功能的3GPP协议文档为TS29503， UDM的功能主要是用于存储订阅信息（subscription data），UE信息（ue context），认证信息，并对这些信息进行管理，UDM总共有五个服务：Nudm_SubscriberDataManagement Service （sdm），Nudm_UEContextManagement Service （uecm），Nudm_UEAuthentication Service (ueau)， Nudm_EventExposure Service (ee)，Nudm_ParameterProvision Service (pp).UDM一般自带数据库，如果UDM没有带数据库，那么UDM会需要结合UDR来存储数据，相当于UDR是UDM的数据库。

注：以下curl 命令都为1.R15.1.0版本的命令

一. Nudm_SubscriberDataManagement Service（SDM）

SDM主要用于管理Subscription data， 总共有五个功能：Get， Subscribe， Unsubscribe，Notification， Info。

1.1. Get

Get是UDM向外提供检索Subscription data的接口，主要用于其他NF instance向UDM获取Subscription data信息，每个设备会有自己的一套Subscription data，有点类似ue的属性， 这些Subscription data和不同的nf有关联，并且会指明一些和nf有关的信息和限制条件，比如跟amf关联的Subscription data就有该ue的限制上线区域，支持的核心网类型等等，ue向amf注册时，amf需要到udm上获取这些信息来判定ue是否合法，能不能在这里注册。ue上线时，AMF不止需要获取跟AMF相关联的Subscription data，也会需要获取与SMF,SMS有关联的Subscription data。

SDM总共有以下这些服务：

Slice Selection Subscription Data Retrieval

Access and Mobility Subscription Data Retrieval

SMS Subscription Data Retrieval

SMS Management Subscription Data Retrieval

UE Context in SMF Data Retrieval

Retrieval Of Multiple Data Sets

Identifier Translation

Shared Subscription Data Retrieval

但目前UDM并没有提供保存或者注册Subscription data的接口，换言之，其他NF Instance如AMF, SMF, SMSF等没有办法向UDM保存自己的Subscription Data，而这个Subscription Data必须一开始就存在于UDM之中。目前我们的UDM实现了一个私有接口（协议29503中并未规定的东西），用于手动向UDM中写入Subscription data。curl测试命令如下：

curl --verbose -X PUT -H "Content-Type: application/json" http://localhost:80/udm-configure/sdm/v1/{supi} -d '{"gpsi": "msisdn-54321","supi": "imsi-12345", "subscriptionDataSets": {"amData": {"supportedFeatures":"support","gpsis": ["gpsi1234","gpsi5678"],"internalGroupIds":["internalGroupId0","internalGroupId1"],"subscribedUeAmbr":{"uplink":"120 Mbps","downlink":"110 Mbps"},"nssai":{"supportedFeatures":"support1","defaultSingleNssais": [{"sst":1,"sd":"sd2345"}],"singleNssais":[{"sst":2,"sd":"sd2345"}]},"ratRestrictions":["WLAN","VIRTUAL","NR"],"forbiddenAreas": [{"tacs":["tac1"],"areaCodes":["areaCodes1"]},{"tacs":["tac3","tac4"],"areaCodes": ["areaCodes3","areaCodes4"]}],"serviceAreaRestrictions":{"restrictionType":"ALLOWED_AREAS","areas":[{"tacs": ["svcAreaTac1","svcAreaTac2"],"areaCodes":["svcAreaCodes1","svcAreaCodes2"]},{"tacs": ["svcAreaTac3","svcAreaTac4"],"areaCodes": ["svcAreaCodes3","svcAreaCodes4"]}],"maxNumOfTAs":123},"coreNetworkTypeRestrictions":["5GC", "EPC"],"rfspIndex":12,"subsRegTimer":13,"ueUsageType":14,"mpsPriority":true,"activeTime":15,"dlPacketCount":16,"sorInfo": {"steeringInfoList":[{"plmnId":{"mcc":"901","mnc":"31"},"accessTechList":["NR"]},{"plmnId": {"mcc":"902","mnc":"32"},"accessTechList": ["NR","UTRAN"]}],"ackInd":true,"sorMacIausf":"sorMacIausf.val","countersor":"countersor.val"},"micoAllowed":true,"sharedDataId ["sharedDataId1","sharedDataId2"]},"smfSelData":{"supportedFeatures":"SUPPORT","subscribedSnssaiInfos":[{"dnnInfos": [{"dnn":"DNN","defaultDnnIndicator":true,"lboRoamingAllowed":true,"iwkEpsInd":true,"ladnIndicator":true}],"singleNssai": {"sst":1,"sd":"sd2345"}}]},"uecSmfData":{"pduSessions":[{"pduSessionId":1,"dnn":"dnn1","smfInstanceId":"smfId1","plmnId": {"mcc":"48","mnc":"902"}},{"pduSessionId":2,"dnn":"dnn2","smfInstanceId":"smfId2","plmnId": {"mcc":"49","mnc":"902"}}],"pgwInfo":[{"dnn":"dnn1","pgwFqdn":"pgw1","plmnId":{"mcc":"50","mnc":"903"}}, {"dnn":"dnn2","pgwFqdn":"pgw2","plmnId":{"mcc":"51","mnc":"903"}}]},"uecSmsfData":{"smsfInfo3GppAccess": {"smsfInstanceId":"smsfInstanceId.val","plmnId":{"mcc":"51","mnc":"901"}},"smsfInfoNon3GppAccess": {"smsfInstanceId":"smsfInstanceId.val","plmnId":{"mcc":"52","mnc":"902"}}},"smsSubsData": {"smsSubscribed":true,"sharedDataIds":["sharedDataId1","sharedDataId2"]},"smData":[{"singleNssai":

{"sst":1,"sd":"sd2123"},"dnnConfiguration":[{"dnn":"DNN1","pduSessionTypes":
{"defaultSessionType":"IPV4","allowedSessionTypes":["IPV6","IPV4V6"]},"sscModes":
{"defaultSscMode":"SSC_MODE_1","allowedSscModes":
["SSC_MODE_2","SSC_MODE_3"]},"iwkEpsInd":true,"ladnIndicator":true,"_5gQosProfile":{"_5qi":171,"nonDynamic5Qi":
{"priorityLevel":2,"averWindow":100,"maxDataBurstVol":200},"dynamic5Qi":{"resourceType":"NON_GBR","priorityLevel":50,
"packetDelayBudget":100, "packetErrRate":20, "averWindow":50, "maxDataBurstVol":1000},"arp":
{"priorityLevel":1,"preemptCap":"MAY_PREEMPT","preemptVuln":"NOT_PREEMPTABLE"}},"sessionAmbr":{"uplink":"101
Mbps","downlink":"102 Mbps"},"_3gppChargingCharacteristics":"TERISTICS","staticIpAddress":
[{"ipv4Addr":"1.2.3.4","ipv6Addr":"1.2.3.4::","ipv6Prefix":"5.6.7.8::"}],"upSecurity":
{"upIntegr":"REQUIRED","upConfid":"NOT_NEEDED"}},{"dnn":"DNN2","pduSessionTypes":
{"defaultSessionType":"IPV4","allowedSessionTypes":["IPV6","IPV4V6"]},"sscModes":
{"defaultSscMode":"SSC_MODE_1","allowedSscModes":
["SSC_MODE_2","SSC_MODE_3"]},"iwkEpsInd":true,"ladnIndicator":true,"_5gQosProfile":{"_5qi":171,"nonDynamic5Qi":
{"priorityLevel":2,"averWindow":100,"maxDataBurstVol":200},"dynamic5Qi":{"resourceType":"NON_GBR","priorityLevel":50,
"packetDelayBudget":100, "packetErrRate":20, "averWindow":50, "maxDataBurstVol":1000},"arp":
{"priorityLevel":1,"preemptCap":"MAY_PREEMPT","preemptVuln":"NOT_PREEMPTABLE"}},"sessionAmbr":{"uplink":"101
Mbps","downlink":"102 Mbps"},"_3gppChargingCharacteristics":"TERISTICS","staticIpAddress":
[{"ipv4Addr":"1.2.3.4","ipv6Addr":"1.2.3.4::","ipv6Prefix":"5.6.7.8::"}],"upSecurity":
{"upIntegr":"REQUIRED","upConfid":"NOT_NEEDED"}}]}],"traceData":
{"traceRef":"traceRefVal","traceDepth":"MEDIUM","neTypeList":"EEAA","eventList":"22","collectionEntityIpv4Addr":"1.2.3.4","colle
{"supportedFeatures":"supported","mtSmsSubscribed":true,"mtSmsBarringAll":true,"mtSmsBarringRoaming":true,"moSmsSubscr
["sharedDataId1","sharedDataId2"]}},"idTranslationResult":{"supportedFeatures":"option","supi":"imsi-12345","gpsi":"msisdn-
54321"}, "sharedData":[{"sharedDataId":"12345", "sharedAmData":{"supportedFeatures":"support","gpsis":
["gpsi1234","gpsi5678"],"internalGroupIds":["internalGroupId0","internalGroupId1"],"subscribedUeAmbr":{"uplink":"120
Mbps","downlink":"110 Mbps"},"nssai":{"supportedFeatures":"support1","defaultSingleNssais":
[{"sst":1,"sd":"sd2345"}],"singleNssais":[{"sst":2,"sd":"sd2345"}]},"ratRestrictions":["WLAN","VIRTUAL","NR"],"forbiddenAreas":
[{"tacs":["tac1"],"areaCodes":["areaCodes1"]},{"tacs":["tac3","tac4"],"areaCodes":
["areaCodes3","areaCodes4"]}],"serviceAreaRestrictions":{"restrictionType":"ALLOWED_AREAS","areas":[{"tacs":
["svcAreaTac1","svcAreaTac2"],"areaCodes":["svcAreaCodes1","svcAreaCodes2"]},{"tacs":
["svcAreaTac3","svcAreaTac4"],"areaCodes":
["svcAreaCodes3","svcAreaCodes4"]}],"maxNumOfTAs":123},"coreNetworkTypeRestrictions":["5GC",
"EPC"],"rfspIndex":12,"subsRegTimer":13,"ueUsageType":14,"mpsPriority":true,"activeTime":15,"dlPacketCount":16,"sorInfo":
{"steeringInfoList":[{"plmnId":{"mcc":"901","mnc":"31"},"accessTechList":["NR"]},{"plmnId":
{"mcc":"902","mnc":"32"},"accessTechList":
["NR","UTRAN"]}],"ackInd":true,"sorMacIausf":"sorMacIausf.val","countersor":"countersor.val"},"micoAllowed":true,"sharedDataId
["sharedDataId1","sharedDataId2"]},"sharedSmsSubsData":{"smsSubscribed":true,"sharedDataIds":
["sharedDataId1","sharedDataId2"]},"sharedSmsMngSubsData":
{"supportedFeatures":"supported","mtSmsSubscribed":true,"mtSmsBarringAll":true,"mtSmsBarringRoaming":true,"moSmsSubscr
["sharedDataId1","sharedDataId2"]}}]}'
成功返回204, 如果json不符合协议，返回400

配进去UDM的subscription data可以用以下命令查看：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/udm-configure/sdm/v1/{supi}

成功则返回200和之前配进UDM的数据。

我们公司的UDM支持两种形式的subscription data，一种是用上面这个命令手动把必须把subscription data配进UDM，另一种是在你没配置的时候启用默认数据，而这种方法，必须把sim-udm/src/sdm_lib/Nudm_SubscriberDataManagement_1_PreR15_0_0.rs中这一行改为false

```
static mut DEMO: bool = false;
```

这样用get方法检索时如果UDM找不到ue对应的subscription data，就会启用默认的subscription data返回出来。

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实际部署的UDM的Subscription Data又是哪来的呢？总不会又是手动配置进去的

1.1.1. Slice Selection Subscription Data Retrieval

用于其他NF（比如AMF）向UDM获取ue的NSSAI， NSSAI是跟NSSF有关的属性

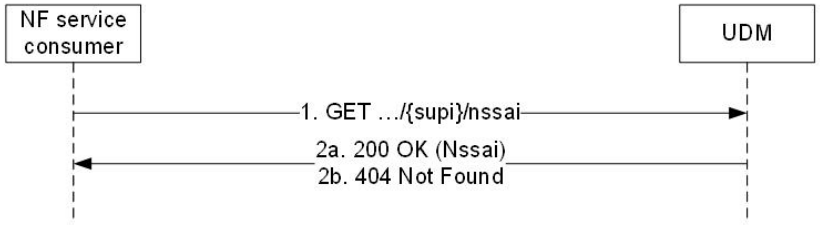

Figure 5.2.2.2.2-1: Requesting a UE's NSSAI

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/nssai

成功返回200，找不到supi对应的nssai返回404。

如果用的是手动配进UDM的subscription data，nssai用的是AccessAndMobilitySubscriptionData中的nssai这个成员

6.1.6.2.4 Type: AccessAndMobilitySubscriptionData

Table 6.1.6.2.4-1: Definition of type AccessAndMobilitySubscriptionData

Attribute name	Data type	P	Cardinality	Description
supportedFeatures	SupportedFeatures	O	0..1	See subclause 6.1.8
gpsis	array(Gpsi)	O	0..N	List of Generic Public Subscription Identifier; see 3GPP TS 29.571 [7]
internalGroupIds	array(GroupId)	O	1..N	List of internal group identifier; see 3GPP TS 23.501 [2] subclause 5.9.7
subscribedUeAmbr	AmbrRm	O	0..1	
nssai	Nssai	O	0..1	Network Slice Selection Assistance Information
ratRestrictions	array(RatType)	O	0..N	List of RAT Types that are restricted; see 3GPP TS 29.571 [7]
forbiddenAreas	array(Area)	O	0..N	List of forbidden areas
serviceAreaRestriction	ServiceAreaRestriction	O	0..1	Subscribed Service Area Restriction
coreNetworkTypeRestrictions	array(CoreNetworkType)	O	0..N	List of Core Network Types that are restricted
rfspIndex	RfspIndexRm	O	0..1	Index to RAT/Frequency Selection Priority;
subsRegTimer	DurationSecRm	O	0..1	Subscribed periodic registration timer; see 3GPP TS 29.571 [7]
ueUsageType	UeUsageType	O	0..1	
mpsPriority	MpsPriorityIndicator	O	0..1	
mcsPriority	McsPriorityIndicator	O	0..1	
activeTime	DurationSecRm	O	0..1	subscribed active time for PSM UEs
dlPacketCount	DlPacketCount	O	0..1	DL Buffering Suggested Packet Count indicates whether extended buffering of downlink packets for High Latency Communication is requested.
sorInfo	SorInfo	O	0..1	On Nudm, this IE shall be present if the UDM shall send the information for Steering of Roaming during registration or the subscription data update to the UE. The UDM may detect the need to send sorInfo by retrieving context information from the UDR.
upuInfo	UpuInfo	O	0..1	This IE shall be present if the UDM shall send the information for UE Parameters Update after the UE has been successfully authenticated and registered to the 5G system.
micoAllowed	MicoAllowed	O	0..1	Indicates whether the UE subscription allows MICO mode.
sharedAmDataIds	array(SharedDataId)	O	0..N	Identifier of shared Access And Mobility Subscription data
odbPacketServices	OdbPacketServices	O	0..1	Operator Determined Barring for Packet Oriented Services
subscribedDnnList	array(Dnn)	O	0..N	List of the subscribed DNNs for the UE. Used to determine the list of LADN available to the UE as defined in clause 5.6.5 of TS 23.501 [2].
NOTE: AccessAndMobilitySubscriptionData can be UE-individual data or shared data. UE-individual data take precedence over shared data. E.g.: When an attribute of type array is present but empty within UE-Individual data and present (with any cardinality) in shared data, the empty array takes precedence. Similarly, when a nullable attribute is present with value null within the individual data and present (with any value) in shared data, the null value takes precedence (i.e. for the concerned UE the attribute is considered absent).				

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①关于UDM的get其实应该支持两个query parmeter，一个是supported-features， 另一个是plmn-id，但目前公司的UDM没有做支持

②UDM返回4xx/5xx之后，需要提供具体的失败原因，即所谓的“ProblemDetail”，协议第6节里有对每个API规定详细的ProblemDetail，但目前公司的UDM没有做支持

1.1.2. Access and Mobility Subscription Data Retrieval

这个服务用于获取与AMF相关的subscription data

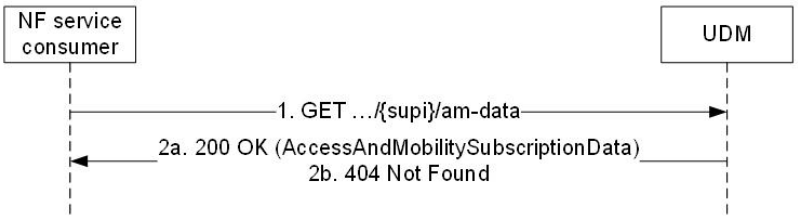

Figure 5.2.2.2.3-1: Requesting a UE's Access and Mobility Subscription Data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/am-data

成功返回200，找不到supi对应的AMF相关的subscription data返回404。

1.1.3. SMF Selection Subscription Data Retrieval

这个服务用于获取和SMF相关联的Subscription Data，用于SMF的挑选

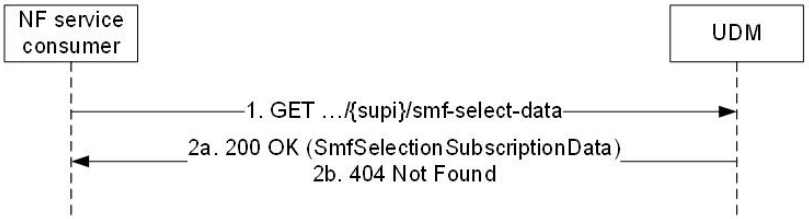

Figure 5.2.2.2.4-1: Requesting a UE's SMF Selection Subscription Data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/smf-select-data

成功返回200，找不到supi对应的SMF相关联的Subscription Data返回404。

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什么时候需要挑选SMF？

1.1.4. Session Management Subscription Data Retrieval

这个服务用于获取和SMFSM（SMF Session Management）相关联的Subscription Data，即和会话管理有关

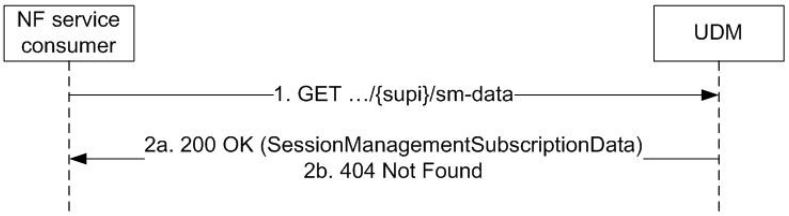

Figure 5.2.2.2.5-1: Requesting a UE's Session Management Subscription Data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/sm-data

成功返回200，找不到supi对应的SMFSM相关联的Subscription Data返回404。

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使用此接口的NF和场景？

1.1.5. SMS Subscription Data Retrieval

用于获取和SMSF相关联的Subscription Data，应用场景不明

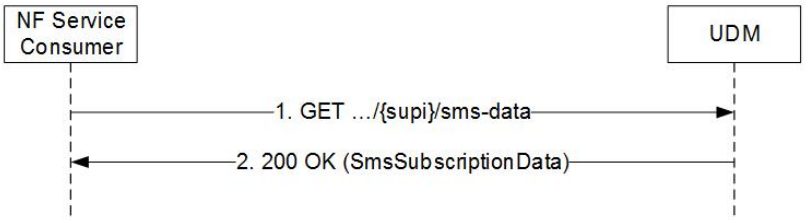

Figure 5.2.2.2.6-1: Requesting UE's SMS Subscription Data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/sms-data

成功返回200，协议中并未提及失败的情形

1.1.6. SMS Management Subscription Data Retrieval

用于获取和SMSFSMSM相关联的Subscription Data，应用场景不明

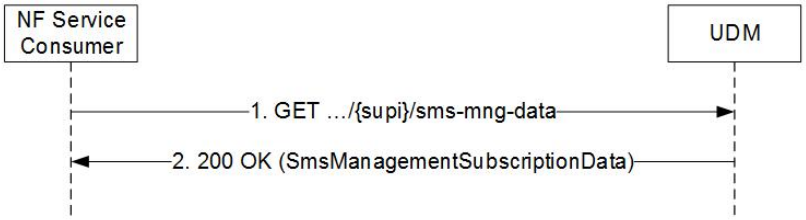

Figure 5.2.2.2.7-1: Requesting UE's SMS Management Subscription Data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/sms-mng-data

成功返回200，协议中并未提及失败的情形

1.1.7. UE Context in SMF Data Retrieval

这个是用于获取SMF相关的UE Context（其实这个服务属于SDM非常奇怪，他获取的subscription data实际上就是UE Context，按理应该属于UECM，下文的UECM里SMF 的UE Context也没有GET的接口，应该就是用这个接口去获取UE Context然后转化的）

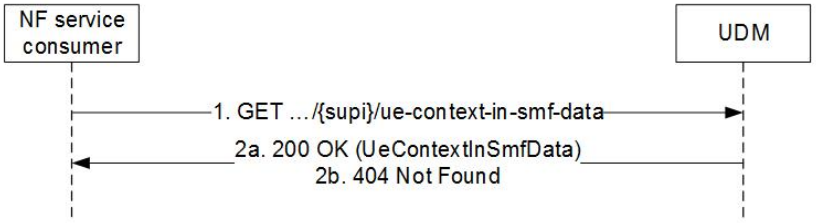

Figure 5.2.2.2.8-1: Requesting a UE's Context in SMF Data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}/ue-context-in-smf-data

成功返回200，找不到SMF相关联的ue context返回404

1.1.8. Retrieval Of Multiple Data Sets

这个接口实际上就是通过调整query parameter dataset-names的值来获取多种Subscription data，dataset-names的取值可以是AM,SMF_SEL,UEC_SMF,UEC_SMSF,SMS_SUB,SM,TRACE,SMS_MNG中的一种或者多种

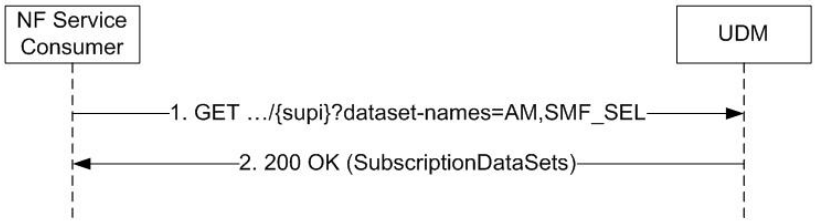

Figure 5.2.2.2.9-1: Retrieval of Multiple Data Sets

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{supi}?dataset-names=AM,SMF_SEL,UEC_SMF,UEC_SMSF,SMS_SUB,SM,TRACE,SMS_MNG

成功返回200，协议中并未提及失败的情形

1.1.9. Identifier Translation

用于把ue的gpsi转化为supi，UDM应该事先存好gpsi和supi的转化列表，但是UDM并没有提供注册转化列表的接口，我们公司是在上面配全部的subscription data的时候一并手动配进去，使用情景不明

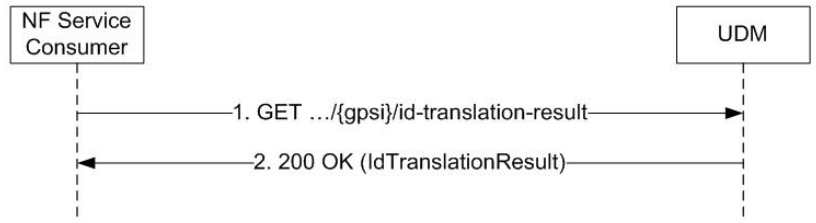

Figure 5.2.2.2.10-1: Identifier Translation

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/{gpsi}/id-translation-result

成功返回200，协议中并未提及失败的情形

1.1.10. Shared Subscription Data Retrieval

用于获取shared data，shared data与ue的id无关，几个ue共用一套shared data，但每一套shared data有自己的一个shared data id，可以通过query parameter加上shared data id来查询对应的shared data，具体应用场景不明

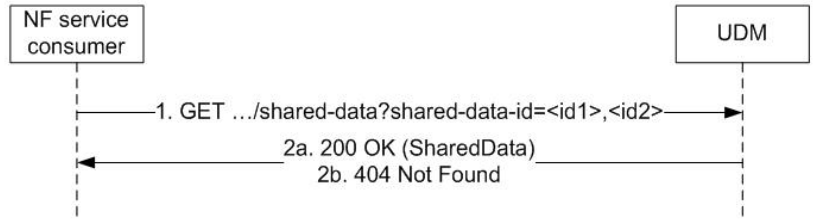

Figure 5.2.2.2.11-1: Requesting shared data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-sdm/v1/shared-data

成功返回200，找不到对应的shared data返回404

****

目前公司的UDM不支持任何query parameter，包括shared-data-id

1.2. Subscribe

用于其他NF Instance对UDM上的subscription data进行订阅，类似于关注，所关注的subscription data后面有任何变动都会发notification到NF Instance所提供的uri作为通知。NF Instance用POST方法向UDM订阅时必须提供一个uri用于收notification

1.2.1. Subscription to notifications of data change

用于订阅普通的subscription data，nf instance在用get获取了subscription data之后必须对该subscription data进行订阅以关注其状况

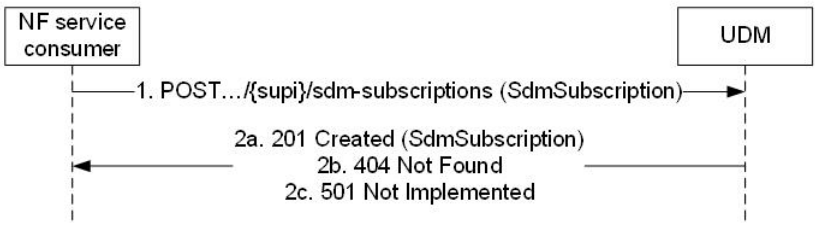

Figure 5.2.2.3.2-1: NF service consumer subscribes to notifications

curl命令如下：

curl --verbose -d '{"nfInstanceId":"smf-1", "callbackReference": "string","monitoredResourceUris": ["monitoredResourceUris"]}' -H "Content-Type: application/json" -X POST http://localhost:80/nudm-sdm/v1/{supi}/sdm-subscriptions

成功返回201，所订阅的subscription data不存在返回404，如果request时提供的触发条件有格式错误之类的会返回501

UDM的subscribe可以手动unsubscribe，也可以设置自动消亡时间，时间到了该subscription就自动失效了。SdmSubscription中的expires设置上了就属于自动消亡式，如果把implicitUnsubscribe设置为true，则为手动注销模式，如果设置了手动注销，则expires不能填

6.1.6.2.3 Type: SdmSubscription

Table 6.1.6.2.3-1: SdmSubscription

Attribute name	Data type	P	Cardinality	Description
nfInstanceId	NfInstanceId	M	1	Identity of the NF Instance creating the subscription.
implicitUnsubscribe	boolean	O	0..1	If present with value true indicates that the subscription expires when the subscribing NF (AMF, SMF, SMSF) identified by the nfInstanceId ceases to be registered at the UDM.
expires	DateTime	C	0..1	If present, indicates the point in time at which the subscription expires. Shall be present if implicitUnsubscribe is absent or false. Within a POST request the proposed expiry time is conveyed whereas in a POST response the confirmed expiry time is returned.
callbackReference	Uri	M	1	URI provided by the NF service consumer to receive notifications
monitoredResourceUris	array(Uri)	M	1..N	A set of URIs that identify the resources for which a change triggers a notification
singleNssai	Snssai	O	0..1	This IE may be present if the consumer is SMF. See NOTE.
dnn	Dnn	O	0..1	This IE may be present if the consumer is SMF. See NOTE.

NOTE: If "singleNssai" is not included, and "dnn" is not included, the UDM shall notify the data change of all DNN configurations and network slice(s).
If "singleNssai" is included, and "dnn" is not included, the UDM shall notify the data change of network slice identified by "singleNssai" and all DNN configurations for the requested network slice identified by "singleNssai".
If "singleNssai" is not included, and "dnn" is included, the UDM shall notify the data change of all network slices where such DNN is available and all DNN configurations identified by "dnn".
If "singleNssai" is included, and "dnn" is included, the UDM shall notify the data change of network slice identified by "singleNssai" where such DNN is available and the DNN configuration identified by "dnn", if such DNN is available in the network slice identified by "singleNssai".

****

①公司的UDM目前没有做判断，不支持回复404，501

②目前UDM的subscription data没有提供改动的接口，也就是说subscription data不会发生变动，即永远都不会有notification

③公司的UDM目前不支持subscription的自动消亡式

④SdmSubscription中的monitoredResource不知道是干嘛用的，可能和改变subscription data的方法有关

1.2.2. Subscription to notifications of shared data change

用于订阅shared data

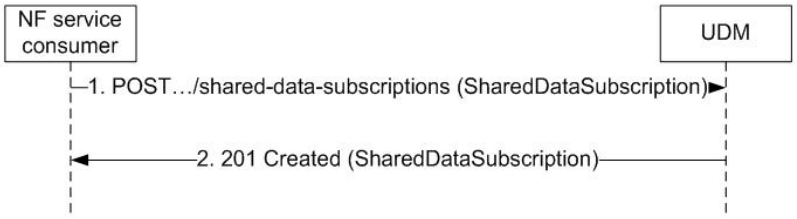

Figure 5.2.2.3.3-1: NF service consumer subscribes to notifications of shared data change

curl命令如下：

curl --verbose -d '{"nfInstanceId":"smf-1", "callbackReference": "string","monitoredResourceUris": ["monitoredResourceUris"]}' -H "Content-Type: application/json" -X POST http://localhost:80/nudm-sdm/v1/shared-data-subscriptions

成功返回201，协议并未提及失败情形

需要注意的是虽然这里写的ShareDataSubscription，但其实ShareDataSubscription就是SdmSubscription

6.1.3.16.2 Resource Definition

Resource URI: {apiRoot}/nudm-sdm/v1/shared-data-subscriptions

This resource shall support the resource URI variables defined in table 6.1.3.16.2-1.

Table 6.1.3.16.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	See subclause 6.1.1

6.1.3.16.3 Resource Standard Methods

6.1.3.16.3.1 POST

This method shall support the URI query parameters specified in table 6.1.3.16.3.1-1.

Table 6.1.3.16.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 6.1.3.16.3.1-2 and the response data structures and response codes specified in table 6.1.3.16.3.1-3.

Table 6.1.3.16.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
SdmSubscription	M	1	The subscription that is to be created.

Table 6.1.3.16.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
SdmSubscription	M	1	201 Created	Upon success, a response body containing a representation of the created Individual subscription resource shall be returned. The HTTP response shall include a "Location" HTTP header that contains the resource URI of the created resource. When stateless UDM is deployed, the stateless UDM shall use the FQDN identifying the UDM set to which the UDM belongs as the host part of the resource URI.
NOTE: In addition common data structures as listed in table 6.1.7-1 are supported.				

NOTE: In the scenario of stateless UDM deployment, it is assumed that stateless UDMs are organized into several UDM sets, and each UDM set is allocated an FQDN.

1.3. Unsubscribe

1.3.1. Unsubscribe to notifications of data change

用于取消对subscription data的订阅

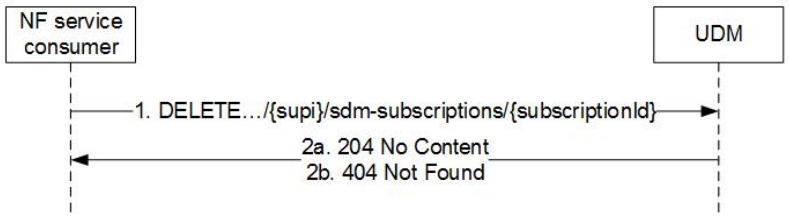

Figure 5.2.2.4.2-1: NF service consumer unsubscribes to notifications

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/nudm-sdm/v1/{supi}/sdm-subscriptions/1

成功返回204，找不到subscription Id对应的subscription则返回404

关于subscription Id在29509-f00和29503-f10没有找到任何描述，不知道从哪里来的，但在29503-f30里就有了，其实这个id应该是在subscrbe成功的同时由UDM分配，并填入SdmSubscription中

6.1.6.2.3 Type: SdmSubscription

Table 6.1.6.2.3-1: SdmSubscription

Attribute name	Data type	P	Cardinality	Description
nfInstanceId	NfInstanceId	M	1	Identity of the NF Instance creating the subscription.
implicitUnsubscribe	boolean	O	0..1	If present with value true indicates that the subscription expires when the subscribing NF (AMF, SMF, SMSF) identified by the nfInstanceId ceases to be registered at the UDM.
expires	DateTime	C	0..1	If present, indicates the point in time at which the subscription expires. Shall be present if implicitUnsubscribe is absent or false. Within a POST request the proposed expiry time is conveyed whereas in a POST response or PATCH response the confirmed expiry time is returned.
callbackReference	Uri	M	1	URI provided by the NF service consumer to receive notifications
amfServiceNameDataChange	ServiceName	O	0..1	When present, this IE shall contain the name of the AMF service to which Data Change Notifications are to be sent (see subclause 6.5.2.2 of 3GPP TS 29.500 [4]). This IE may be included if the NF service consumer is an AMF.
monitoredResourceUris	array(Uri)	M	1..N	A set of URIs that identify the resources for which a change triggers a notification
singleNssai	Snssai	O	0..1	This IE may be present if the consumer is SMF. See NOTE.
dnn	Dnn	O	0..1	This IE may be present if the consumer is SMF. See NOTE.
subscriptionId	string	C	0..1	This attribute shall be present if the SdmSubscription is sent in a GET response message on Nudr. It identifies the individual sdmSubscription stored in the UDR and may be used by the UDM to delete an expired or implicitly unsubscribed sdmSubscription.
plmnId	PlmnId	C	0..1	If present, it indicates the PLMN of the NF Instance creating the subscription (i.e., the PLMN serving the UE). It shall be present if the NF Instance is located in a different PLMN than the UDM. If absent, the Home PLMN ID is used as default.

1.3.2. Unsubscribe to notifications of shared data change

用于对shared data取消订阅

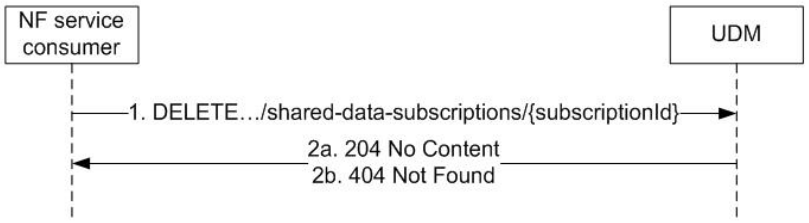

Figure 5.2.2.4.3-1: NF service consumer unsubscribes to notifications for shared data

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/nudm-sdm/v1/shared-data-subscriptions/1

成功返回204，找不到subscription Id对应的subscription则返回404

1.4. Notification

当NF Consumer关注的subscription data发生变化时，UDM需要发notification到subscribe时注册的callbackReference uri中

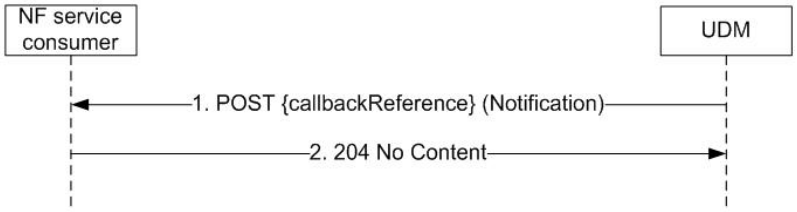

Figure 5.2.2.5.2-1: Subscription Data Change Notification

**********目前公司的UDM不支持这个功能

1.5. Info

这个功能是当ue已经成功在AMF上完成了注册之后，AMF用来通知UDM ue已经完成了注册，同时传递一些ue的漫游信息，sor是指steering of roaming

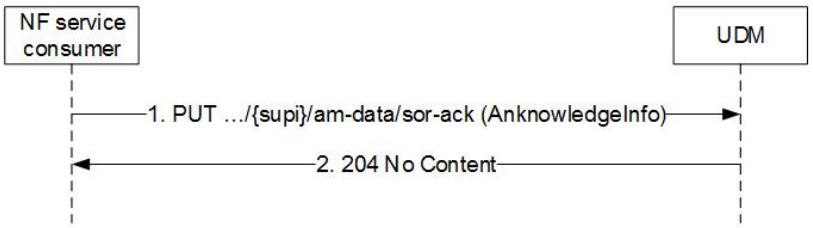

Figure 5.2.2.6.2-1: Providing acknowledgement of Steering of Roaming

curl --verbose -d '{"sorMacIue": "string"}' -H "Content-Type: application/json" -X PUT http://localhost:80/nudm-sdm/v1/{supi}/am-data/sor-ack

成功返回204，协议并未提及失败情形

二. Nudm_UEContextManagement Service（UECM）

这个功能是用来管理UE Context的，总共有6个服务：

- Registration
- DeregistrationNotification
- Deregistration
- Get
- Update
- P-CSCF-RestorationNotification

UEContext是UE自带的一些信息，ue上线是会向各个nf instance注册自己的信息，同时nf instance会把ue的这些信息与nf instance本身的一些信息（比如nf instance id）结合在一起，然后保存在UDM之中

2.1. Registration

这个功能用于nf nstance（AMF,SMF,SMSF）向UDM注册UE Context

2.1.1. AMF registration for 3GPP access

用于AMF向UDM注册UE Context，适用于UE是用3GPP接入的类型

Figure 5.3.2.2.2-1: AMF registering for 3GPP access

curl命令如下：

curl --verbose -d '{"amfInstanceId": "string", "supportedFeatures": "string","pei": "string", "imsVoPS": "HOMOGENEOUS_SUPPORT", "deregCallbackUri": "string"}' -H "Content-Type: application/json" -X PUT http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-3gpp-access

如果amf已经注册过了，那么返回204，如果amf是第一次注册，返回201，UDM可根据subscriptiondata判定该ue是否可以注册，如果不允许注册，将返回403

****

公司的UDM目前不支持返回403，下文的也全部不支持

2.1.2. AMF registration for non 3GPP access

用于AMF向UDM注册UE Context，适用于UE是用非3GPP接入的类型

Figure 5.3.2.2.3-1: AMF registering for non 3GPP access

curl命令如下：

curl --verbose -d '{"amfInstanceId": "string", "supportedFeatures": "string", "pei": "string", "imsVoPS": "HOMOGENEOUS_SUPPORT", "deregCallbackUri": "string"}' -H "Content-Type: application/json" -X PUT http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-non-3gpp-access

如果amf已经注册过了，那么返回204，如果amf是第一次注册，返回201，UDM可根据subscriptiondata判定该ue是否可以注册，如果不允许注册，将返回403

2.1.3. SMF registration

用于SMF向UDM注册UE Context

Figure 5.3.2.2.4-1: SMF registration

curl命令如下：

curl --verbose -d '{"smfInstanceId": "string","supportedFeatures": "string","pduSessionId": 0,"dnn": "string","pcscfRestorationCallbackUri": "string", "plmnId":{"mnc": "mnc1", "mcc":"mcc1"}, "pgwFqdn":"string"}' -H "Content-Type: application/json" -X PUT http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smf-registrations/pduSessionId:1

成功返回201，不允许注册返回403，并未提及注册失败的情形

2.1.4. SMSF Registration for 3GPP Access

用于SMSF向UDM注册UE Context，适用于UE是用3GPP接入的类型

Figure 5.3.2.2.5-1: SMSF registering for 3GPP Access

curl命令如下：

curl --verbose -d '{"smsfInstanceId": "string","supportedFeatures": "string", "plmnId":{"mcc":"mcc1","mnc":"mnc1"}}' -H "Content-Type: application/json" -X PUT http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smsf-3gpp-access

如果smsf已经注册过了，那么返回200，如果smsf是第一次注册，返回201，如果不允许注册，将返回403

2.1.5. SMSF Registration for Non 3GPP Access

用于SMSF向UDM注册UE Context，适用于UE是用非3GPP接入的类型

Figure 5.3.2.2.6-1: SMSF registering for Non 3GPP Access

curl命令如下：

curl --verbose -d '{"smsfInstanceId": "string","supportedFeatures": "string", "plmnId":{"mcc":"mcc1","mnc":"mnc1"}}' -H "Content-Type: application/json" -X PUT http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smsf-non-3gpp-access

如果smsf已经注册过了，那么返回200，如果smsf是第一次注册，返回201，如果不允许注册，将返回403

2.2.DeregistrationNotification

这个功能是提供给AMF的，一般一个UE从一个AMF移动到另一个AMF，UE需要到新AMF上进行注册，新的AMF也需要到UDM上进行UE Context的注册，注册成功之后UDM就需要用这个DeregistrationNotification的服务来通知旧的AMF UE已经成功发生移动。旧的AMF收到UDM的通知之后就会做一些处理，比如删除UE的信息（也可能不删除，看情况，总之会做处理）

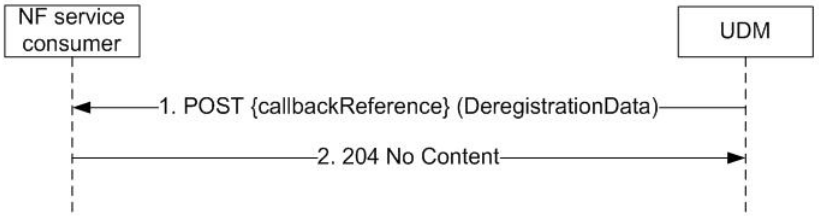

Figure 5.3.2.3.2-1: UDM initiated NF Deregistration

****

这个功能目前UDM并不支持

2.3.Deregistration

用于注销nf instance（AMF， SMF，SMSF）的UE Context

2.3.1. AMF deregistration for 3GPP access

用于ue是3GPP接入类型的AMF的注销

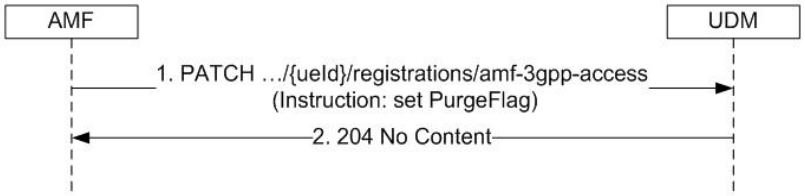

Figure 5.3.2.4.2-1: AMF deregistering for 3GPP access

AMF的注销有点特别，不是用DELETE方法，而是用PATCH，AMF注册UE Context时不应包含Amf3GppAccessRegistration中的purgeFlag这个字段，注销的时候通过把purgeFlag设为true来作为注销标志

6.2.6.2.2 Type: Amf3GppAccessRegistration

Table 6.2.6.2.2-1: Definition of type Amf3GppAccessRegistration

Attribute name	Data type	P	Cardinality	Description
amfInstanceId	NfInstanceId	M	1	The identity the AMF uses to register in the NRF.
supportedFeatures	SupportedFeatures	O	0..1	See subclause 6.2.8
purgeFlag	PurgeFlag	O	0..1	This flag indicates whether or not the AMF has deregistered. It shall not be included in the Registration service operation.
pei	Pei	O	0..1	Permanent Equipment Identifier.
imsVoPS	ImsVoPS	O	0..1	Indicates per UE if "IMS Voice over PS Sessions" is homogeneously supported in all TAs in the serving AMF, or homogeneously not supported, or if support is non-homogeneous/unknown. Absence of this attribute shall be interpreted as "non homogenous or unknown" support.
deregCallbackUri	Uri	M	1	A URI provided by the AMF to receive (implicitly subscribed) notifications on deregistration.
pcscfRestorationCallbackUri	Uri	O	0..1	A URI provided by the AMF to receive (implicitly subscribed) notifications on the need for P-CSCF Restoration.
guami	Guami	C	0..1	This IE shall contain the serving AMF's GUAMI. It shall be included if the NF service consumer is an AMF.
backupAmfInfo	array(BackupAmfInfo)	C	0..N	This IE shall be included if the NF service consumer is an AMF and the AMF supports the AMF management without UDSF for the first interaction with UDM. The UDM uses this attribute to do an NRF query in order to invoke later services in a backup AMF, e.g. Namf_EventExposure.
Optional attributes of this type that are also attributes of the derived type Amf3GppAccessRegistrationModification (see clause 6.2.6.2.7) shall not be marked with "nullable : true" in the OpenAPI file.				

curl命令如下：

curl --verbose -d '{"purgeFlag": true, "pei": "my string", "imsVoPS": "NON_HOMOGENEOUS_OR_UNKNOWN"}' -H "Content-Type: application/json" -X PATCH http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-3gpp-access

注销成功返回204，并未提及失败情形

2.3.2. AMF deregistration for non-3GPP access

用于ue是非3GPP接入类型的AMF的注销，同上，也是用PATCH设置purgeFlag的方法来注销

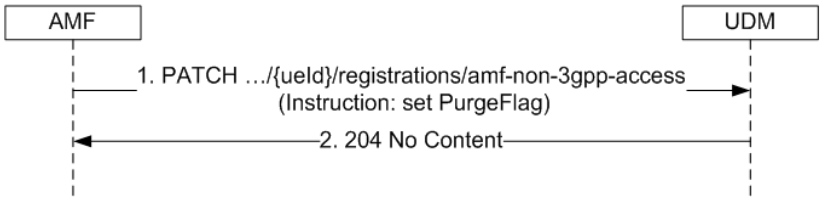

Figure 5.3.2.4.3-1: AMF deregistering for non-3GPP access

curl命令如下：

curl --verbose -d '{"purgeFlag": true, "pei": "my string", "imsVoPS": "NON_HOMOGENEOUS_OR_UNKNOWN"}' -H "Content-Type: application/json" -X PATCH http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-non-3gpp-access

注销成功返回204，并未提及失败情形

2.3.3. SMF deregistration

用于注销SMF UE Context

Figure 5.3.2.4.4-1: SMF deregistration

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smf-registrations/pduSessionId:1

注销成功返回204，并未提及失败情形

2.3.4. SMSF Deregistration for 3GPP Access

用于注销ue是3GPP接入类型SMSF UE Context

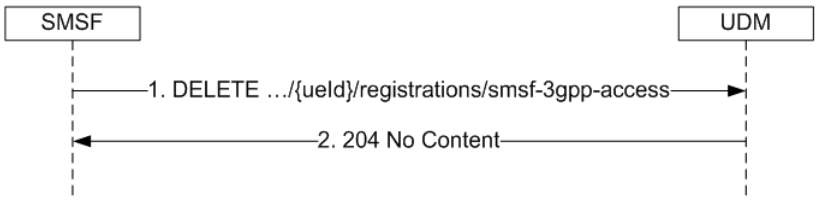

Figure 5.3.2.4.5-1: SMSF Deregistering for 3GPP Access

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smsf-3gpp-access

注销成功返回204，并未提及失败情形

2.3.5. SMSF Deregistration for Non 3GPP Access

用于注销ue是非3GPP接入类型SMSF UE Context

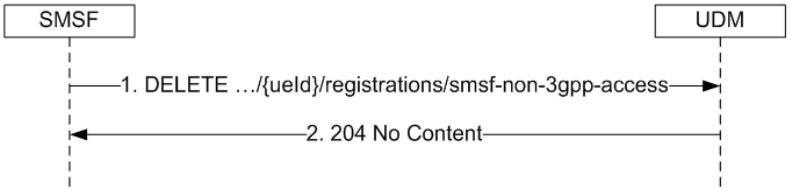

Figure 5.3.2.4.6-1: SMSF Deregistering for Non 3GPP Access

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smsf-non-3gpp-access

注销成功返回204，并未提及失败情形

2.4. Get

这个服务用于获取nf instance（比如NEF）获取AMF,SMF或者SMSF的UE Context

2.4.1. Amf3GppAccessRegistration Information Retrieval

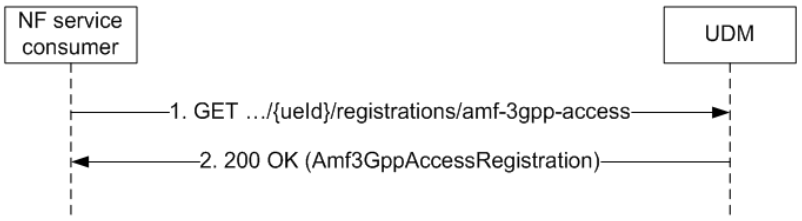

Figure 5.3.2.5.2-1: Requesting a UE's AMF Registration Information for 3GPP Access

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-3gpp-access

成功返回200，并未提及失败情形

2.4.2. AmfNon3GppAccessRegistration Information Retrieval：

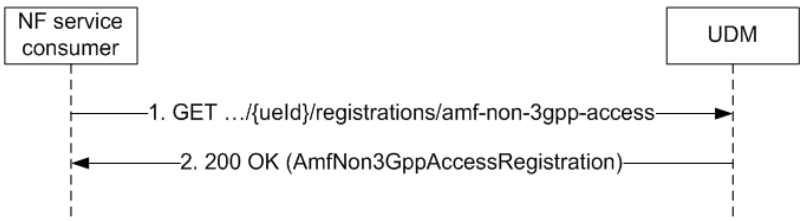

Figure 5.3.2.5.3-1: Requesting a UE's AMF Registration Information for non-3GPP Access

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-non-3gpp-access
成功返回200，并未提及失败情形

2.4.3. SmfRegistrations Information Retrieval

这个协议里没有写，有点奇怪，但是应该调用的是SDM的UE Context in SMF Data Retrieval

2.4.4. SmsfRegistration Information Retrieval for 3GPP Access

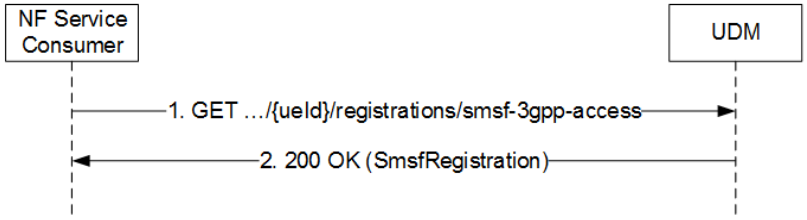

Figure 5.3.2.5.5-1: Requesting a UE's SMSF Registration Information for 3GPP Access

curl命令如下：
curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smsf-3gpp-access
成功返回200，并未提及失败情形

2.4.5. SmsfRegistration Information Retrieval for Non-3GPP Access

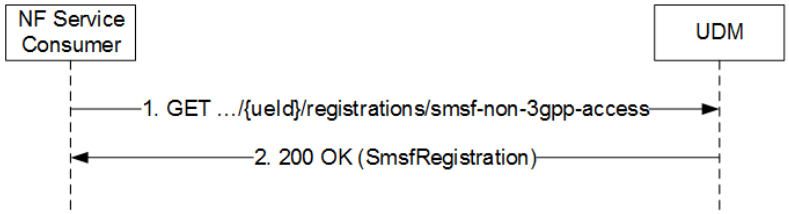

Figure 5.3.2.5.6-1: Requesting a UE's SMSF Registration Information for Non-3GPP Access

curl命令如下：
curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/nudm-uecm/v1/{ueId}/registrations/smsf-non-3gpp-access
成功返回200，并未提及失败情形

2.5. Update

这个服务用于AMF更新UE Context

2.5.1. Update A Parameter (e.g. PEI) in the AMF Registration For 3GPP Access

更新用的结构体和注册用的结构体其实长得很像，只是少了id这些固定不可变更的字段，此外，purgeFlag如果有出现必须设置为false

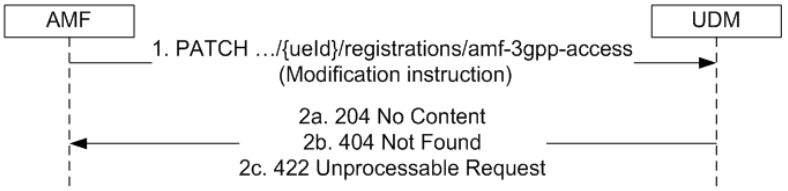

Figure 5.3.2.6.2-1: AMF registration parameter update for 3GPP access

curl命令如下：
curl --verbose -d '{"purgeFlag": false, "pei": "my string", "imsVoPS": "NON_HOMOGENEOUS_OR_UNKNOWN"}' -H "Content-Type: application/json" -X PATCH http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-3gpp-access
如果更改成功返回204，找不到ue ID对应的UE context则返回404，如果发现当前的AMF不是UE注册的AMF，则返回422
**********目前不支持返回422的功能，下面也一样，并且不清楚他是如何判断当前的AMF不是UE注册的AMF

2.5.2. Update A Parameter (e.g. PEI) in the AMF Registration For Non 3GPP Access

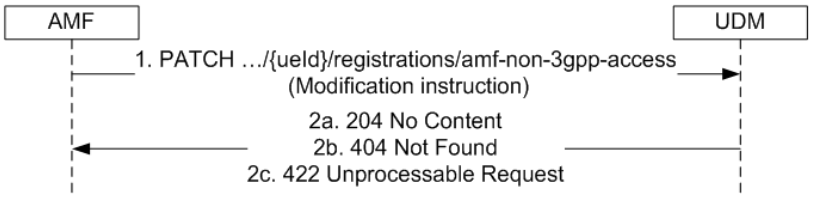

Figure 5.3.2.6.3-1: AMF registration parameter update for non-3GPP access

curl命令如下：

curl --verbose -d '{"purgeFlag": false, "pei": "my string", "imsVoPS": "NON_HOMOGENEOUS_OR_UNKNOWN"}' -H "Content-Type: application/json" -X PATCH http://localhost:80/nudm-uecm/v1/"123456"/registrations/amf-non-3gpp-access

如果更改成功返回204，找不到ue ID对应的UE context则返回404，如果发现当前的AMF不是UE注册的AMF，则返回422

2.6. P-CSCF-RestorationNotification

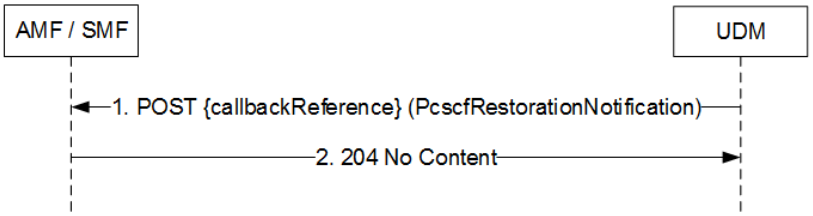

Figure 5.3.2.7.2-1: UDM initiated P-CSCF Restoration

****

这个功能目前不支持而且不知道有什么用

三. Nudm_UEAuthentication Service（UEAU）

3.1. Get

3.1.1. Authentication Information Retrieval

这个用于AUSF向UDM获取认证所使用的方法，当ue上线注册之时需要去AUSF做认证以获得授权，但是认证的方法有很多，支持以下几种：

6.3.6.3.3 Enumeration: AuthType

Table 6.3.6.3.3-1: Enumeration AuthType

Enumeration value	Description
"EAP_AKA_PRIME"	EAP-AKA'
"5G_AKA"	5G AKA
"EAP_TLS"	EAP-TLS. See NOTE
NOTE: EAP-TLS is described in the Informative Annex B of 3GPP TS 33.501 [6] and is not mandatory to support.	

AUSF需要到UDM获取ue所规定支持的认证方法有哪些以及用这些认证时所需要的一些参数和属性，所以UDM上要事先保存好这些认证用的信息

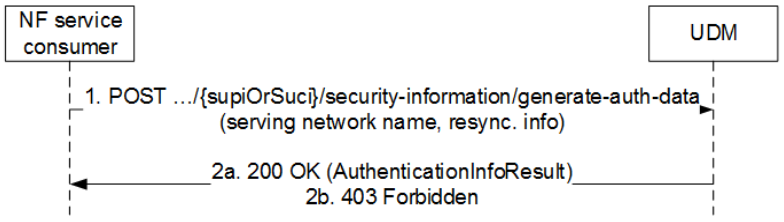

Figure 5.4.2.2.2-1: NF service consumer requesting authentication information

curl命令如下：

curl --verbose -d '{"supportedFeatures": "supportedFeatures","servingNetworkName": "5G:mnc123.mcc456.3gppnetwork.org","ausfInstanceId":"ausf-1"}' -H "Content-Type: application/json" -X POST http://localhost:80/nudm-ueau/v1/{supiOrSuci}/security-information/generate-auth-data

成功返回200，如果因为获取不到ue对应的subscription data或者是有一些限制没有通过（比如区域限制），就会返回403

****

协议里并没有提供保存认证信息的接口，也就是说一开始UDM中跟认证相关的信息不知道从哪来的，目前公司的UDM也没有任何手段可以往UDM里配置这些信息，而是直接回复固定的一套配置，后面可能会像SDM一样加私有接口

3.2. ResultConfirmationInform

3.2.1. Authentication Confirmation

AUSF对ue认证之后的结果是成功还是失败以及一些附属信息要通过这个服务返回给UDM，保存在UDM上

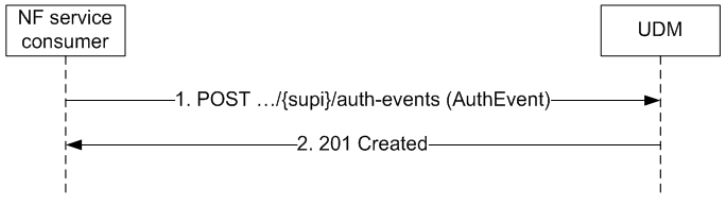

Figure 5.4.2.3.2-1: NF service consumer confirms UE authentication

AuthEvent这个结构体很关键，其中nfInatanceId就是指AUSF的id，success就是标志成功与否，同时还有认证时所使用的方法和时间戳

6.3.6.2.7 Type: AuthEvent

Table 6.3.6.2.7-1: Definition of type AuthEvent

Attribute name	Data type	P	Cardinality	Description
nfInstanceId	NfInstanceId	M	1	Identifier of the NF instance where the authentication occurred
success	Success	M	1	true indicates success; false indicates no success
timeStamp	DateTime	M	1	time stamp of the authentication
authType	AuthType	M	1	string Authentication Type ("EAP_AKA_PRIME" or "5G_AKA")

curl命令如下：

curl --verbose -d '{"nfInstanceId": "string", "success": true, "timeStamp": "2018-07-09:04:56 pm", "authType": "5G_HE_AKA"}' -H "Content-Type: application/json" -X POST http://localhost:80/nudm-ueau/v1/{supi}/auth-events

成功返回201，并未提及失败情形

四. Nudm_EventExposure Service（EE）

总共有以下三个服务：

- Subscribe
- Unsubscribe
- Notify

这个功能是用于其他NF（比如NEF）向UDM获取一些特别的事件用的，事件包括以下这些：

6.4.6.3.3 Enumeration: EventType

Table 6.4.6.3.3-1: Enumeration EventType

Enumeration value	Description
"LOSS_OF_CONNECTIVITY"	Loss of connectivity
"UE_REACHABILITY_FOR_DATA"	UE reachability for data
"UE_REACHABILITY_FOR_SMS"	UE reachability for SMS
"LOCATION_REPORTING"	Location Reporting
"CHANGE_OF_SUPI_PEI_ASSOCIATION"	Change of SUPI-PEI association
"ROAMING_STATUS"	Roaming Status
"COMMUNICATION_FAILURE"	Communication Failure
"AVAILABILITY_AFTER_DNN_FAILURE"	Availability after DNN failure

其他NF（比如NEF） subscribe 这些事件，如果有这些事件发生，则UDM会发notification去通知这个NF。

实际上UDM本身并没有直接监测这些事件的能力，所以UDM是通过subscribe关注其他NF来获取这些事件的，比如Location reporting，UDM通过subscribe AMF来获取这个事件的发生，AMF有提供event exposure的功能（Namf_EventExposure service），也有监测Location reporting这个事件，UDM通过subscribe关注这个事件，并给定一个用来获取资源的callbackReference URI，然后收来自AMF的notification，如果收到了notification则用UDM自己Nudm_EventExposure Service的notify功能通知subscribe的NF（比如NEF）。

4.1. Subscribe

用于其他NF订阅关注UDM一些特定的事件

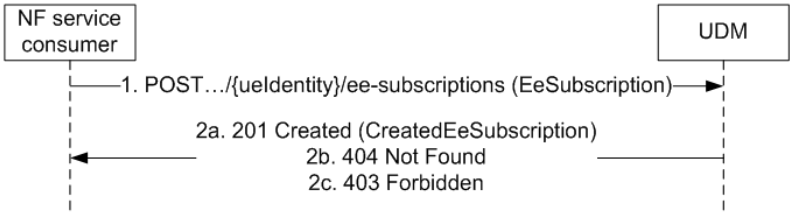

Figure 5.5.2.2.2-1: NF service consumer subscribes to notifications

给定的EeSubscription的callbackReference必须是真实有效的，否则将收不到notification

curl命令如下：

curl --verbose -d '{"callbackReference": "http://pytest-server:43767/ee-subscribe-notify/1","monitoringConfiguration": [{"referenceId": 100, "eventType": "LOSS_OF_CONNECTIVITY","reportingOptions": {"maxNumOfReports": 5, "monitoringDuration": "5 days"}},{"referenceId": 101, "eventType": "UE_REACHABILITY_FOR_DATA", "reportingOptions": {"maxNumOfReports": 2,"monitoringDuration": "2 days"}},{"referenceId": 102, "eventType": "UE_REACHABILITY_FOR_SMS", "reportingOptions": {"maxNumOfReports": 1, "monitoringDuration": "1 days"}}],"supportedFeatures": "9012acdf"}' -H "Content-Type: application/json" -X POST http://localhost:80/nudm-ee/v1/msisdn-23333/ee-subscriptions

成功返回201，如果所关注的ueId所代表的ue不存在（UDM subscribe 其他NF的时候收到了404），则返回404，如果ueId对应的subscription data不存在，或者触发条件和事件类型是UDM不支持的，就返回403

4.2. Unsubscribe

用于NF注销对UDM上事件的订阅

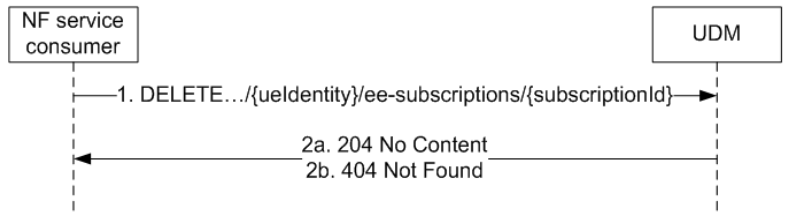

Figure 5.2.2.3.2-1: NF service consumer unsubscribes to notifications

curl命令如下：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/nudm-ee/v1/msisdn-23333/ee-subscriptions/1

成功返回204，找不到对应的订阅内容返回404

****

这里的subscription id也不知道哪来的，不过推测应该和SDM是一样的

4.3. Notify

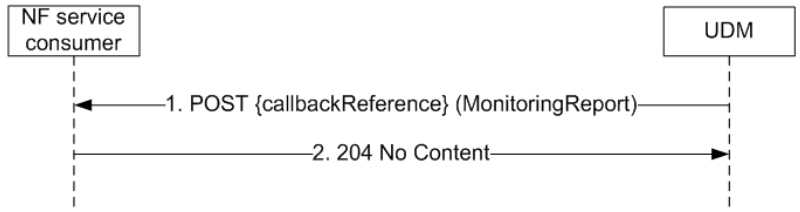

Figure 5.5.2.4.2-1: Event Occurrence Notification

虽然公司的UDM目前支持notify这个功能，但是做的很不完善，存在较大问题，有待改进

4.4.Private Api

由于目前公司的UDM不支持向其他NF发送订阅的功能，所以另外做了一些私有接口，用于把事件配进UDM模拟事件的发生

用于查看配进去的事件：

curl --verbose -H "Content-Type: application/json" -X GET http://localhost:80/test-ee-callback/v1/{gpsi}/ee-subscriptions/1

用于删除配进去的事件：

curl --verbose -H "Content-Type: application/json" -X DELETE http://localhost:80/test-ee-callback/v1/{gpsi}/ee-subscriptions/1

用于向UDM配置事件，相当于发生了该事件：

curl --verbose -d '{"referenceId": 100, "eventType": "LOSS_OF_CONNECTIVITY"}' -H "Content-Type: application/json" -X PUT http://localhost:80/test-ee-callback/v1/msisdn-23333/ee-subscriptions/1

五. Nudm_ParameterProvison Service（PP）

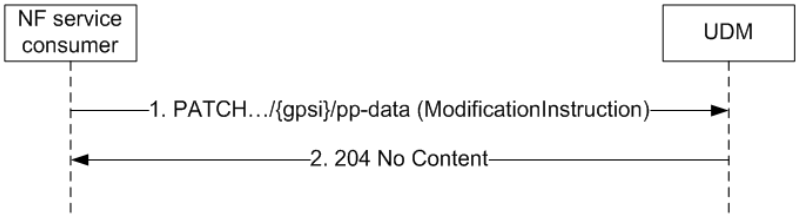

Figure 5.6.2.2.2-1: NF service consumer updates subscription data

curl命令如下：

curl --verbose -d '{"communicationCharacteristics": {"ppSubsRegTimer": {"subsRegTimer": 0,"afId": "string","referenceId": 0},"ppActiveTime": {"activeTime": 0, "afId": "string", "referenceId": 0},"ppDlPacketCount": 0},"supportedFeatures": "string"}' -H "Content-Type: application/json" -X PATCH http://localhost:80/nudm-pp/v1/{gpsi}/pp-data

成功返回204，并未提及失败情形

****

这个功能不知道有什么用，协议写的也不清不楚，和保存在UDM上的subscription data有关，推测可能是用来设置subscription data的有效时间和自动消亡一类的属性

关于全文 “未提及失败的情形” 可能需要参考yaml文件提供的API，但依然无法得出具体的错误码的使用场景