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Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document analyses and evaluates the definition of a Reference Data Model (RDM) for Ud interface between Front-Ends (FEs) for the HSS application and the User Data Repository (UDR).

The stage 3 of the Ud interface in the User Data Convergence (UDC architecture) is defined in 3GPP TS 29.335 [2].

The Reference Data Model (RDM) shall comply with the Common Baseline Information Model for UDC as defined in 3GPP TS 32.182 [3] and it shall follow the concepts of the Framework for Model Handling and Management as defined in 3GPP TS 32.181 [4].

The analysis will comprise the general considerations impacting the RDM for HSS.

The analysis will comprise the following topics:

- The general considerations impacting the RDM for HSS;
- Attributes definition: names, syntax, semantics;
- Object classes & Directory Information Tree: object classes names, attributes grouping, LDAP entries, Distinguished Names and Relative Distinguished Names.

Directory information trees, object classes and attributes in this report should be considered informative since they are subject to additions and/or modification depending on the specific implementation as illustrated in the presented alternatives in this technical report. Even the assignment of attributes to object classes may be redistributed, for example,because the normalization of object classes across different domains may result in attributes being moved to a superclass. Naming is provisional. Diagrams used and naming convention are not standardized.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications"

[2] 3GPP TS 29.335: "User Data Convergence (UDC);User Data Repository Access Protocol over the Ud interface"

[3] 3GPP TS 32.182: "Telecommunication management; User Data Convergence (UDC); Common Baseline Information Model"

[4] 3GPP TS 32.181: "User Data Convergence; Framework for Model Handling and Management"

[5] 3GPP TS 23.008: "Organization of subscriber data"

[6] IETF RFC 4517: "Syntaxes and Matching Rules"

[7] 3GPP TS 23.003: "Numbering, addressing and identification"

[8] IETF RFC 4291: "IP Version 6 Addressing Architecture"

[9] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point"

[10] 3GPP TS 32.251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging"

[11] 3GPP TS 32.298: "Telecommunication management; Charging management; Charging Data Record (CDR) parameter description"

[12] 3GPP TS 29.272: "Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol"

[13] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access"

[14] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2"

[15] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)"

[16] 3GPP TS 29.212: "Policy and Charging Control over Gx reference point"

[17] IETF RFC 1035: "DOMAIN NAMES - IMPLEMENTATION AND SPECIFICATION"

[18] 3GPP TS 23.015: "Technical realization of Operator Determined Barring (ODB)"

[19] 3GPP TS 29.364: "IP Multimedia Subsystem (IMS) Application Server (AS) service data descriptions for AS interoperability"

[20] IETF RFC 3261 "SIP: Session Initiation Protocol"

[21] IETF RFC 2396: "Uniform Resource Identifiers (URI): generic syntax"

[22] IETF RFC 3966 "The tel URI for Telephone Numbers"

[23] IETF RFC 4282: "The Network Access Identifier"

[24] 3GPP TS 29.228: "IP Multimedia (IM) Subsystem Cx and Dx interface; signalling flows and message contents"

[25] 3GPP TS 23.845: "Study on User Data Convergence (UDC) evolution"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Reference Data Model for HSS: Reference Data Model for HSS is an Application Data Model that operations on Ud interfaces supporting HSS applications shall comply to.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

CB	Call Barring
CDIV	Call Diversion
LDAP	Lightweight Directory Access Protocol
MMTEL	Multimedia Telephony
RDM	Reference Data Model
TAS	Telephony Application Server

UDC User Data Convergence

4 General considerations

4.1 General syntax definitions

The LDAP attributes in this document are defined as having a syntax specified in IETF RFC 4517 [6] or a derived syntax that will be specified in this section. The description of a derived syntax will contain the name of the IETF RFC 4517 [6] syntax from which it was derived as well as any additional structure and value constraints. Syntax names should follow the rules set by IETF RFC 4517 [6] (mixed case with first letter of word capitalized), e.g. NumericString.

Derived Syntax name	Description
UInt8	This syntax is derived from the Integer syntax [6]. The structure is further constrained to a maximum length of 1 and the values are further constrained from 0 to 255.
UInt16	This syntax is derived from the Integer syntax syntax [6]. The structure is further constrained to a maximum length of 2 and the values are further constrained from 0 to 65535.
UInt32	This syntax is derived from the Integer syntax syntax [6]. The structure is further constrained to a maximum length of 4 and the values are further constrained from 0 to 4294967295.
HexString	This syntax is derived from the PrintableString syntax [6]. The values are further constrained to the decimal digits (0 through 9), characters 'a' to 'f' or characters 'A' to 'F'.
HexString32	This syntax is derived from the HexString syntax. The structure is further constrained to a maximum length of 32 characters.
FQDN	This syntax is used to represent an Fully Qualified Domain Name (FQDN) (see IETF RFC1035 [17]) and is derived from the PrintableString syntax [6]. The structure is further constrained to a maximum length of 255 and the values are further constrained to one or more labels separated by the period (".") character. Each label consists of the decimal digits (0 through 9), characters "a" to "z", characters "A" to "Z", the hyphen ("-) character and has a maximum length of 63 characters. CaseIgnore
IPv4Address	This syntax is derived from the PrintableString syntax [6] and is used to represent IPv4 addresses formatted in dot-decimal notation without leading zeros. The structure is further constrained to a maximum length of 15 and values are further constrained to the decimal digits (0 through 9) and the period (.) character.
IPv6Address	This syntax is derived from the PrintableString syntax [6] and is used to represent IPv6 addresses formatted in hexadecimal colon-separated notation without leading zeros in each group and with the largest run of consecutive zero groups collapsed into a single empty group (see IETF RFC 4291 [8]). The structure is further constrained to a maximum length of 39 and the values are further constrained to the decimal digits (0 through 9), characters 'a' to 'f' or characters 'A' to 'F' and the colon (:) character.
IPv6Prefix	This syntax is derived from the PrintableString syntax [6] and is used to represent an IPv6 prefix formatted in CIDR (Classless Inter-domain Routing) notation, i.e. an IPv6 address (formatted in IPv6Address syntax), a slash (/) character and a decimal value indicating the size in bits of the address prefix (see IETF RFC 4291 [8]). The structure is further constrained to a maximum length of 43 and the values are further constrained to the decimal digits (0 through 9), characters 'a' to 'f' or characters 'A' to 'F', the colon (:) character and the slash (/) character.
Name10	This syntax is derived from the PrintableString syntax [6]. The structure is further constrained to a maximum length of 10 characters. CaseIgnore.
String	This syntax corresponds to Printable String syntax according to IETF RFC 4517 [6].
Enumerated	This syntax corresponds to Numeric String syntax according to IETF RFC 4517 [6], where the maximum length is defined by the number of included numerals.

Table 4.1-1

4.2 MMTEL data

4.2.1 Introduction

The specification of the MMTEL data in the Reference Data Model over Ud has to define for which Application FEs it will be applied. Two cases are identified.

- MMTEL data specification over Ud applies to the Ud interface between a Telephony Application Server Front-end (TAS-FE) and the UDR.

- MMTEL data specification over Ud applies to the Ud interface between a HSS-FE (supporting IMS) and the UDR.

4.2.2 MMTEL data with a TAS-FE

The Ud interface supported by a TAS is an alternative way to store its MMTEL data in a UDR instead of using the Sh interface and an HSS-FE. For this purpose another protocol (i.e. reusing Ud protocol) to centrally store MMTEL Data in addition to Sh has to be assessed and confirmed. This is out of the scope in the present release of the specifications.

4.2.3 MMTEL data with an HSS-FE

With a HSS-FE, MMTEL data are transported over a Sh interface as transparent data within repository data. Then, regarding to the storage on the UDR by the HSS-FE, two sub-cases are identified:

- It is normally stored as transparent data in the UDR in the same way as any other transparent data coming from an AS over Sh, so not requiring a data modelling of the MMTEL data over the Ud between a HSS-FE and the UDR.

- The transparent data is analysed by the HSS-FE application logic and translated into data complying with the MMTEL RDM over Ud. In the other way, the HSS-FE application logic builds a Sh transparent data from the MMTEL data retrieved from the UDR and complying with the MMTEL RDM over Ud. It is to be noted that the concept of transparent data that still applies to Sh is no more applied on the transparent storage in the HSS in this sub-case.

To address the second sub-case, the HSS-FE will rely on the standardisation of MMTEL Data over Sh in 3GPP TS 29.364 [19]. Two coding options are defined, a binary one and a XML one. An objective is that the same MMTEL RDM over Ud can be mapped with both options. The same MMTEL RDM should also be applicable to the case described in 4.2.2. This is out of the scope in the present release of the specifications.

With the XML option, the data configuring each of the CDIV and CB MMTEL Services is structured in a set of multiple rules, each rule may contain multiple conditions and an action, structure that was not retained for the binary option aimed to handle the subset of MMTEL services corresponding to PSTN/ISDN and CS supplementary services.

How the MMTEL RDM over Ud can address the configuration data for CDIV and CB services for both the XML and the binary option is out of the scope in the present release of the specifications.

4.2.4 MMTEL Data and CS Supplementary Services data

In some cases, the supplementary services execution and/or their configuration when user is in the CS domain may have to rely on the CS supplementary services and not MMTEL ones. It may drive to maintain the consistency between the MMTEL services and the CS supplementary services. Two approaches that impact RDM for Ud may be considered:

- MMTEL Data and CS supplementary Service data are considered as separate data in the RDM for Ud, considering that their consistency will be handled by the concerned application logics. This approach may be more in line with current 3GPP specifications where CS supplementary Services and MMTEL services are defined in different 3GPP specifications.

- A subset of MMTEL data and CS supplementary service data are merged in the RDM over Ud and describe a supplementary service independently of the access (CS or PS). This approach may impact stage 1 and stage 2 specifications on supplementary services.

Which one of the two approaches is the most relevant and if it impacts existing specifications on supplementary services (CS and MMTEL) is out of the scope in the present release of the specifications.

4.2.5 Supplementary Services RDM principle

It should be possible to define the Supplementary Services that are common to MMTEL and CS only once and not separately in the Reference Data Model. Using this approach the synchronization of common MMTEL and CS Supplementary Services is implicitly reached. At the same time, it should be possible to have separate Supplementary Services data for MMTEL and CS in order that the operators could provide differentiated services. The operator has to choose between these alternatives. The RDM specification for MMTEL and CS Supplementary services should allow these two approaches.

Only a subset of MMTEL Supplementary Services defined in [19] is shared with the Circuit domain.

Here are described three possible structures of the RDM.

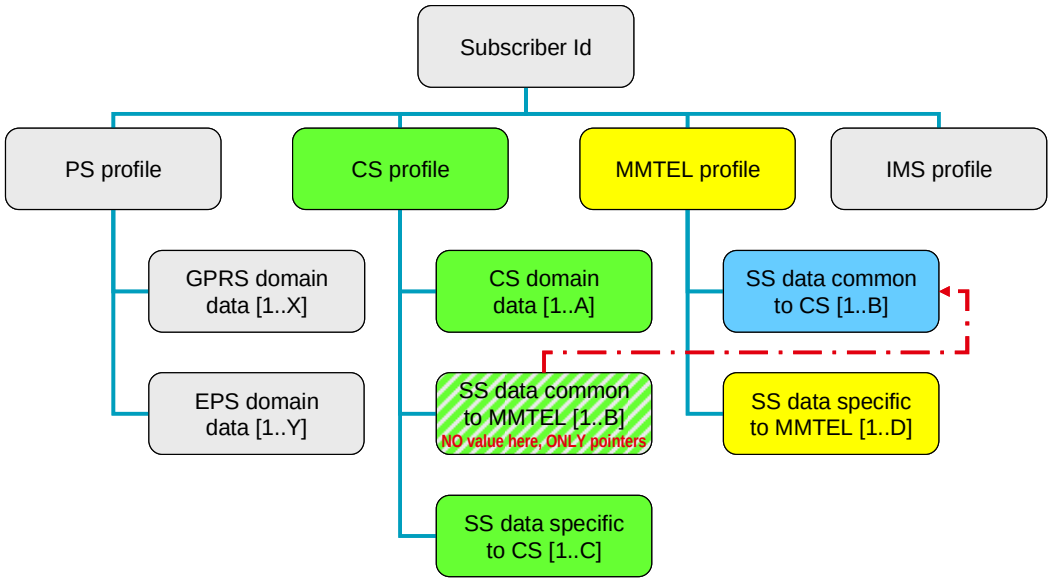

Figure 4.2.5-1: Reference Data Model referring to MMTEL services

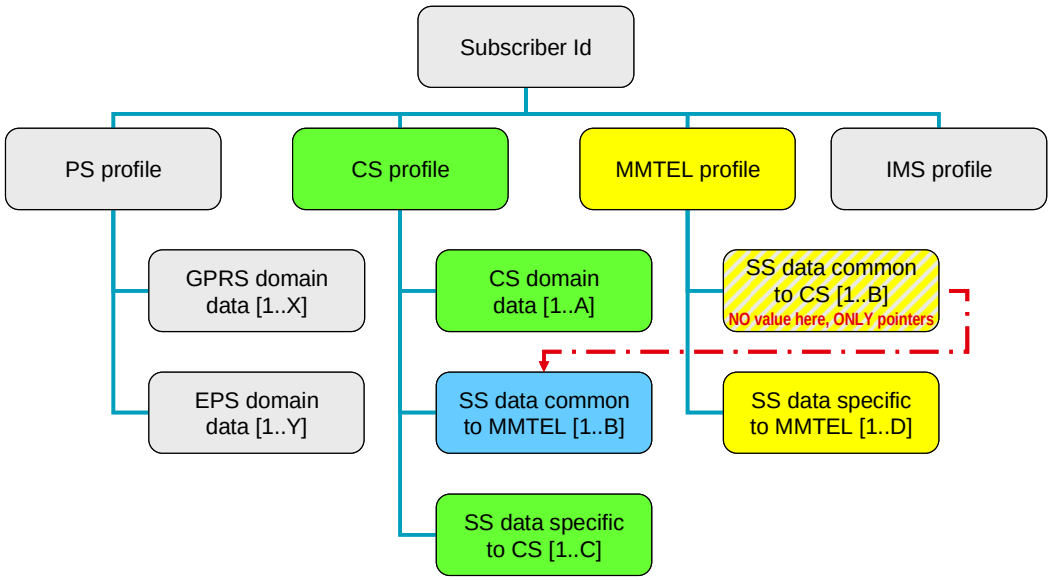

Figure 4.2.5-2: Reference Data Model referring to CS services

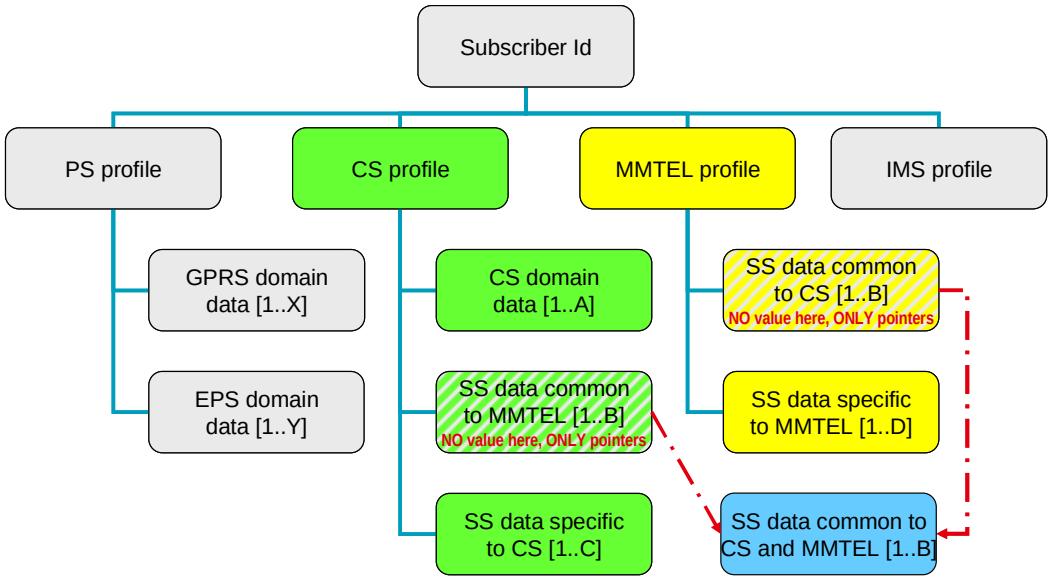

Figure 4.2.5-3: Reference Data Model referring to the common services

Depending on the implementation any of the above data structures for MMTEL and CS SS or a combination of them can be selected for the RDM.

5 Identifier

5.1 Object classes and their attributes

Table 5.1-1

Derived Syntax name	Description
IMSI	This syntax is used to represent international mobile subscriber identity (IMSI) [7] and is derived from the NumericString syntax [6]. The structure is further constrained to a maximum length of 15 and the values are further constrained to decimal digits (0 through 9) only.
PublicIdentity	This syntax is used to represent the public identity of a user in the IMS and is derived from the PrintableString syntax [6]. The structure is further constrained to a SIP URI (with the format defined in IETF RFC 3261 [20] and IETF RFC 2396 [21]) or a TEL URI (with the format defined in IETF RFC 3966 [22]). Both SIP URI and TEL URI shall be in canonical form, as described in 3GPP TS 23.003 [7].
PrivateIdentity	This syntax is used to represent the private identity of a user in the IMS and is derived from the PrintableString syntax [6]. The structure is further constrained to a NAI with the form username@realm as specified in IETF RFC 4282 [23].
E164Number	This syntax is used to represent an E.164 Number and is derived from the NumericString syntax [6]. The structure is further constrained to a maximum length of 15 and the values are further constrained to decimal digits (0 through 9) only.

6 UDC Service Profile

6.1 Object classes and their attributes

Object classes and attributes for UDC Service Profile are out of scope of the present release.

6.2 Directory Information Tree

6.2.1 Alternative A

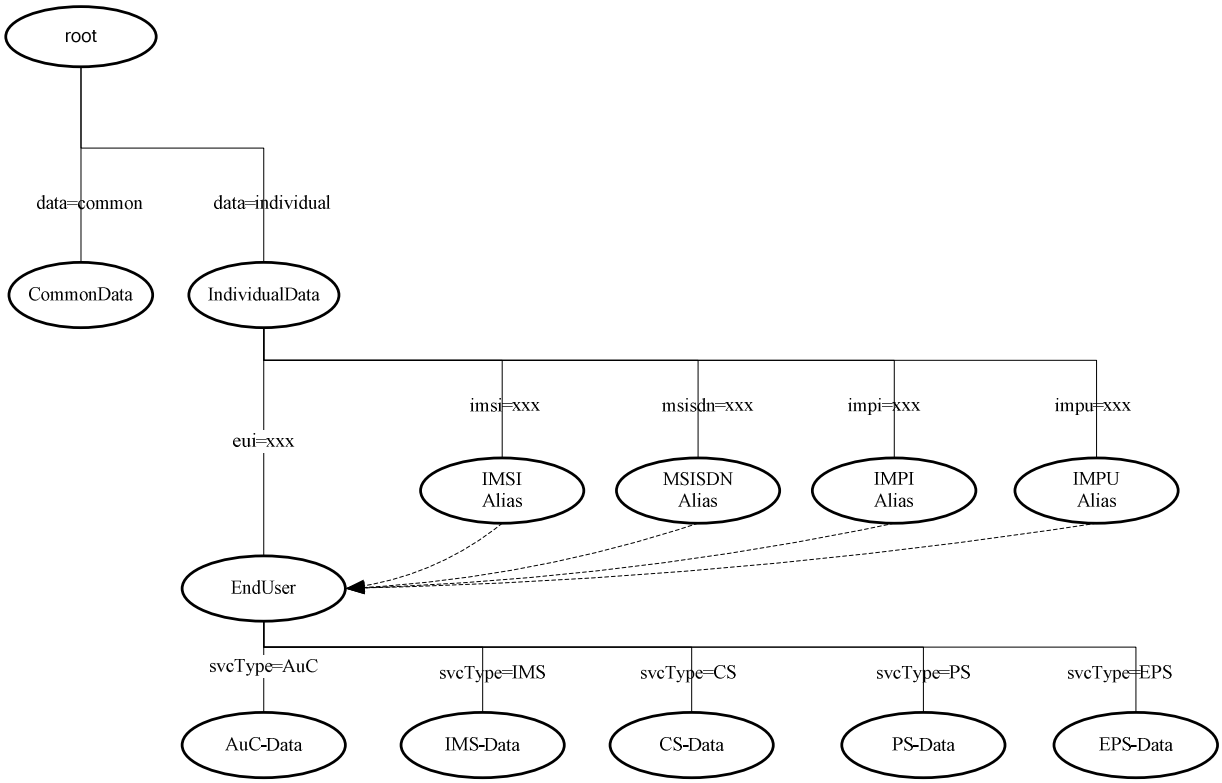

Figure 6.2.1-1: DIT Structure for UDC with alternative A

For definition of End User see 3GPP TS 32.182 [3].

6.2.2 Alternative B

In this alternative, the parent of the different domain data entities is a Subscription entity. This Subscription entity may be not limited to one user, for example, IMS data belongs to a IMS subscription that, according to TS 23.228, may be multiuser. How to support subscription with several IMS users is not described in the present clause.

It introduces privateIdentityAlias and publicIdentityAlias entities that cover Private and Public Service Identities as well as Private and Public User Identities.

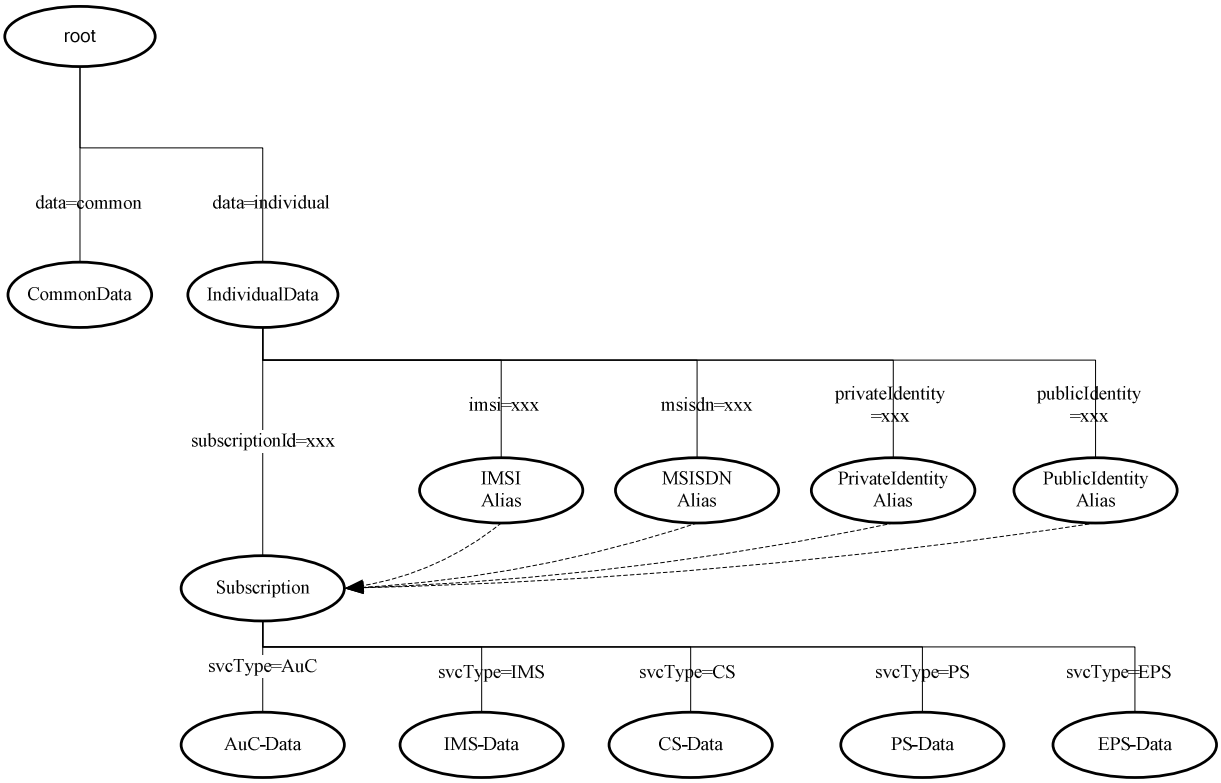

Figure 6.2.2-1: DIT Structure for UDC with alternative B

6.2.3 Alternative C

In alternative C, as for alternative B, the diagram contains Subscription, privateIdentityAlias and publicIdentityAlias entities. How to support subscription with several IMS users is not described in the present clause.

The different domains for data are organised differently. This alternative allows attributes that are applicable to several domains to be defined once. For example:

- an attribute that is the same in the GPRS and EPS domains should be defined in the entity PS-Data
- an attribute that is the same in the CS and PS domains should be defined in the entity Access-Data.

The compatibility with new 3GPP releases extending the use of data defined for a domain to other domains is out of the scope of the present document.

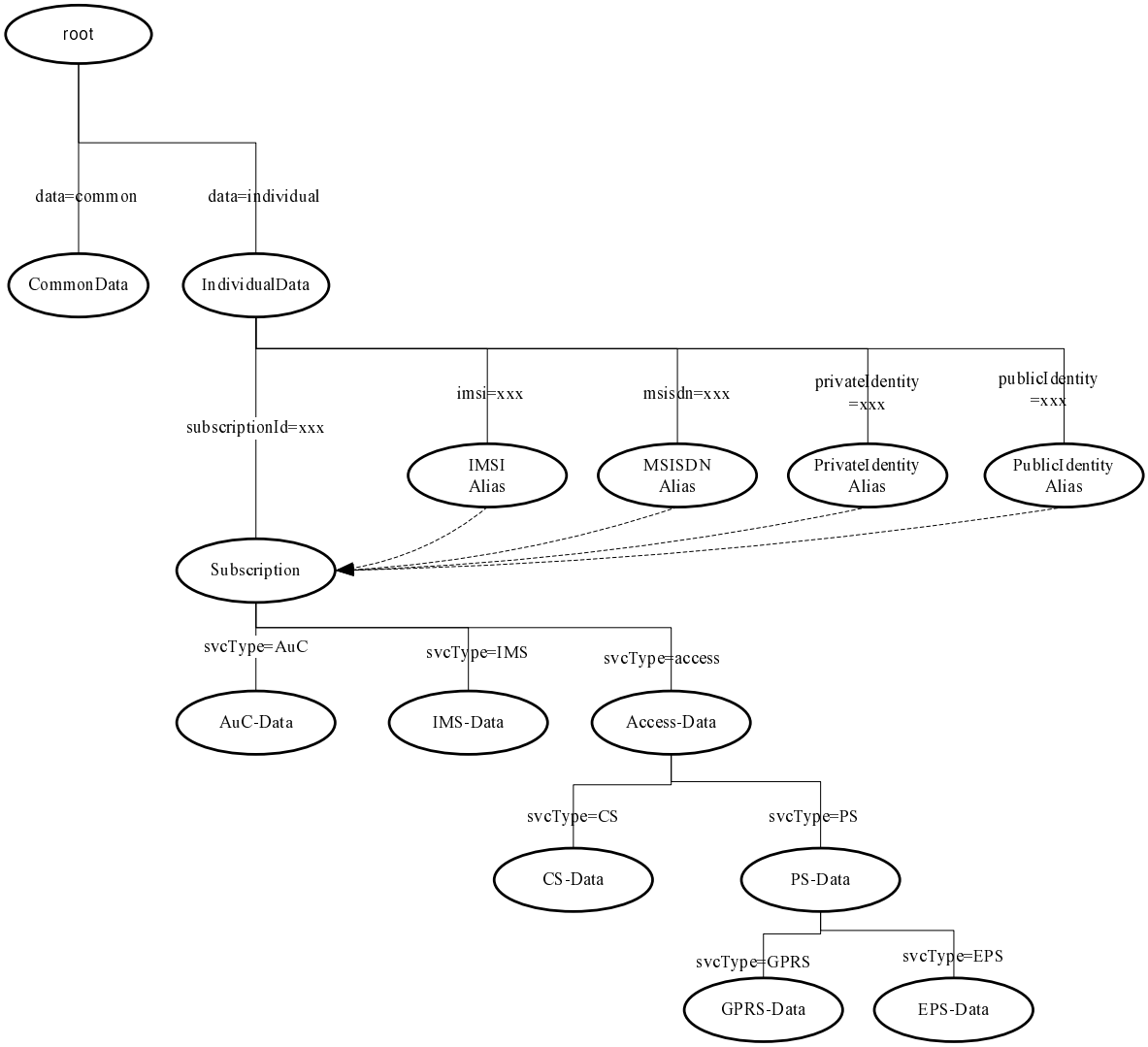

Figure 6.2.3-1: DIT Structure for UDC with alternative C

6.2.4 Alternative D

In this alternative, the parent of the different domain data entities is a Subscription entity. This Subscription entity may not limited to one user, for example, IMS data belongs to a IMS subscription that, according to 3GPP TS 23.228, may be multiuser.

The RDN of the Individual user data classes AuC-Data, CS-Data, PS-Data and EPS-Data is defined with the IMSI + svcType in order to allow for multiuser.

The Alias MSISDN class, in addition to providing a reference to the Subscription object, also contain an IMSI attribute. This is done to assist in MSISDN based message processing, such as MAP Send Routing Info. i.e., such a request would have to search for the Alias MSISDN object to obtain the subscriber's IMSI prior to obtaining the specific SvcType class associated with the IMSI.

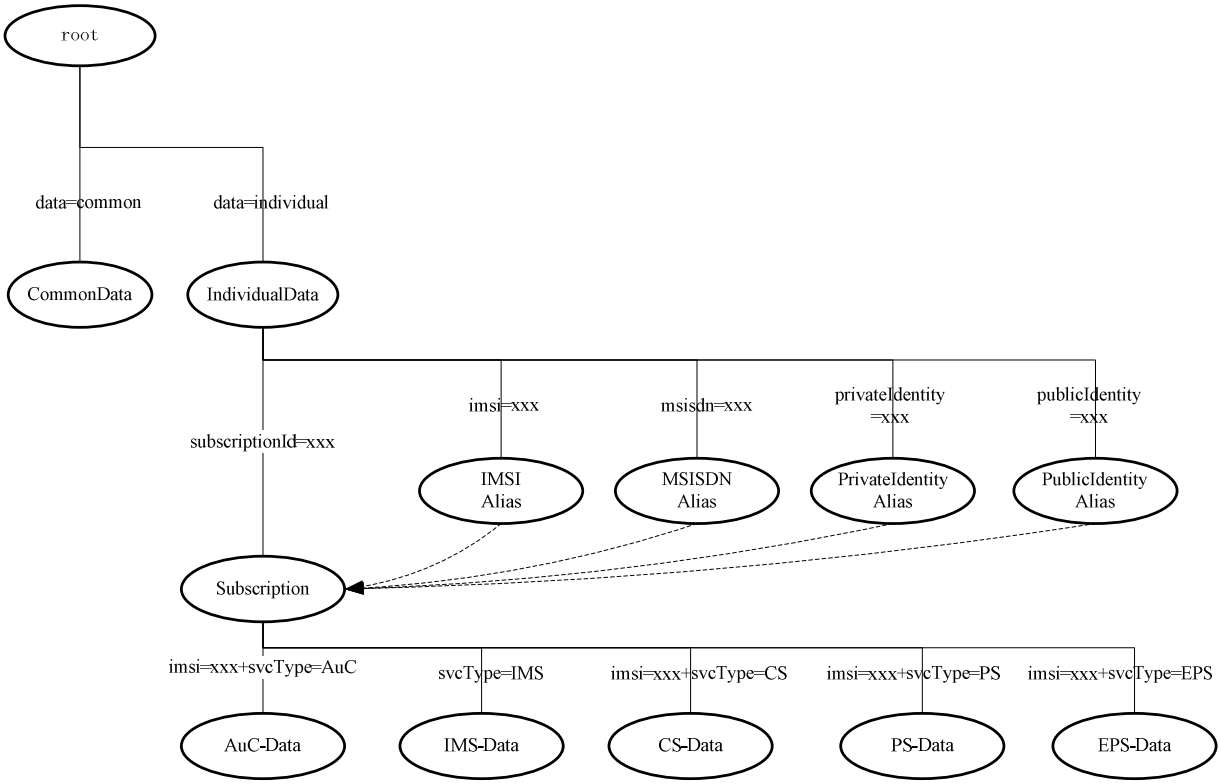

Figure 6.2.4-1: DIT Structure for UDC with alternative D

7 UDC Service Data shared by several domains

The data defined in this section are examples of data shared by several domains.

Data sharing among multiple domains may impact data model and is out of the scope of the present document.

7.1 Object classes and their attributes

7.1.1 AuC Subscriber Data

Table 7.1.1-1

Object Class	ACSUBDATA			
Type of Obect Class	tbd			
Description	This class represents the Data Container for all Subscriber Data relevant to the AuC			
Superior OCL	tbd			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
imsi	IMSI	read	Naming Attribute mandatory single-valued	International Mobile Subscriber Identity. See 3GPP TS 23.003.
acSubscrType	UInt8	read	optional single-valued	Type of Subscriber. Possible values: 0 - GSM 1 - UMTS
acEncKey	HexString32	read	optional single-valued	The subscriber's encrypted long term secret key. This is a hexadecimal string with fixed length of 32 bytes. For definition of a UMTS subscriber's long term secret key K see 3GPP TS 33.102. For definition of a GSM subscriber's long term secret key Ki see 3GPP TS 43.020.
acSeqNum	HexString32	read, write	optional single-valued	Sequence Number for UMTS subscriber. This is a hexadecimal string with fixed length of 12 bytes. For definition of a UMTS subscriber's Sequence Number SQN_{HE} see 3GPP TS 33.102.
acAMF	HexString32	read	optional single-valued	Authentication Management Field for UMTS subscriber. This is a hexadecimal string with fixed length of 4 bytes For definition of a UMTS subscriber's Authentication Management Field AMF see 3GPP TS 33.102.
acKdbId	Uint16	read	optional single-valued	The reference to the key used to encrypt the subscriber's long term secret key. tbc.
acAlgorithId	Uint16	read	optional single-valued	AC Algorithm Identifier. Specifies the algorithm used for the generation of authentication vectors. tbc.

8 UDC CS Service Data

Object classes, attributes and Directory Information Tree for CS Service Data are out of scope of the present release.

9 UDC GPRS Service Data

Object classes, attributes and Directory Information Tree for GPRS Service Data are out of scope of the present release.

10 UDC EPS Service Data

Object classes, attributes and Directory Information Tree for EPS Service Data are out of scope of the present release.

11 UDC IMS Service Data

11.1 Object classes and their attributes

11.1.1 General

The application of the common data concept described in 3GPP TR 23.845 [25] may bring a significant optimisation and may impact the structure of the object classes described in the presented hereafter alternatives.

In the following sub-sections more attributes of some object class may be needed and are left to implementations. Different alternatives are described in order to show how different implementations may differ.

11.1.2 Alternative A

11.1.2.1 IMS Data

Table 11.1.2.1-1

Object Class	**ImsData**			
Description	**This class represents the Data Container for subscriber-specific IMS Data**			
Superior OCL	**tbd**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**tbd**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
imsDataId	Unt8	read	Naming Attribute mandatory single-valued	Fixed '1'
mdtrCap	UInt32	read	optional multi-valued	Mandatory capabilities of S-CSCF
optCap	UInt32	read	optional multi-valued	Optional capabilities of S-CSCF
authorizedCscf	String	read	optional multi-valued	S-CSCF names that may be delivered to the I-CSCF
scscfName	String	read, write	optional single-valued	S-CSCF Name assigned
primaryChargeId	UInt16	read	optional single-valued	Identification of the primary charging server
secondaryChargeId	UInt16	read	optional single-valued	Identification of the primary charging server
primaryEventId	UInt16	read	optional single-valued	Identification of the primary event server
SecondaryEventId	UInt16	read	optional single-valued	Identification of the primary event server

11.1.2.2 Service Profile Data

11.1.2.2.1 Service Profile

Table 11.1.2.2.1-1

Object Class	ServiceProfile			
Description	This class represents the Data Container for a Service Profile			
Superior OCL	ImsData			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
serviceProfileId	UInt32	read	Naming Attribute mandatory single-valued	The service profile identification associated with the public user identity
subscribedMediaProfiled	String	read	optional single-valued	Subscribed media profile identification
serviceIdList	UInt32	read	optional multi-valued	List of service identifications
sharedIfcList	UInt16	read	optional multi-valued	List of shared IFC identifications

11.1.2.2.2 Initial Filter Criteria

Table 11.1.2.2.2-1

Object Class	IFC			
Description	This class represents the Data Container for an Initial Filter Criteria			
Superior OCL	ServiceProfile			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
ifcId	UInt16	read	Naming Attribute mandatory single-valued	IFC identification
asServerNameId	tbd	read	mandatory single-valued	AS identification
ifcPriority	UInt32	read	mandatory single-valued	Priority of the IFC
profilePartIndicator	UInt8	read	optional single-valued	Indicator of the Profile Type with 3 values according if applicable to Registered or Unregistered or both
tpParams	String	read	optional single-valued	Trigger Points description
defaultHandling	UInt8	read	optional single-valued	Default Handling
svcInfo	String	read	optional single-valued	Transparent information related to the trigger points only used by the application server

11.1.2.3 Implicit Registration Set

Table 11.1.2.3-1

Object Class	IRSET			
Description	This class represents the Data Container for Implicit Registration Set			
Superior OCL	ImsData			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
irSetId	UInt32	read	Naming Attribute mandatory single-valued	Implicit registration set identification
irsPuidList	tbd	read	mandatory multi-valued	List of identifications of public identities sharing the implicit registration set
registrationStatus	Uint8	read, write	mandatory single-valued	Registration status of the implicit registration set

11.1.2.4 Public Identity

Table 11.1.2.4-1

Object Class	PublicIdentity			
Description	This class represents the Data Container for Public Identity			
Superior OCL	ImsData			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
puidId	tbd	read	Naming Attribute mandatory single-valued	Identification of the public identity
puidUsername	String	read	mandatory single-valued	User name part of the public identity
puidDomainname	String	read	optional Single-valued	Domain name part of the public identity
irSetId	UInt32	read	optional Single-valued	Identification of the implicit registration set
puidType	UInt8	read	mandatory single-valued	Type of the public identity. Possible values: 0: IMPU 1: PSI 2: wildcard PSI 3: wildcard IMPU
serviceProfileId	Uint32	read	mandatory single-valued	Identification of the service profile associated to the public identity
pridList	tbd	read	mandatory multi-valued	List of the identifications of the private identities the public identity is associated with
barringIndication	boolean	read	optional single-valued	The barring indication of the public user identity
unregSvcInd	Boolean			Indicates whether the public user identity has in unregistered state
aliasGroupId	UInt8	read	optional single-valued	Identification of the Alias Group associated to the public user identity

11.1.2.5 Private Identity

Table 11.1.2.5-1

Object Class	PrivateIdentity			
Description	This class represents the Data Container for Private Identity			
Superior OCL	ImsData			
Attribute Name	Type	FE access rights	Properties	Description
pridId	tbd	read	Naming Attribute mandatory single-valued	Identification of the private identity
pridUsername	String	read	mandatory single-valued	User name part of the private identity
pridDomainname	String	read	optional Single-valued	Domain name part of the private identity
puidList	tbd	read	mandatory multi-valued	List of the identification s of the public identities the private identity is associated with
puidRegistrationStatusList	tbd	read, write	optional multi-valued	Registration status of a Prid Puid pair
authSchema	Uint8	read	mandatory single-valued	Authentication scheme associated to the private identity

11.1.3 Alternative B

11.1.3.1 IMS Data

Table 11.1.3.1-1

Object Class	ImsData			
Description	This class represents the Data Container for subscriber-specific IMS Data			
Superior OCL	tbd			
Class Type	STRUCTURAL			
Direct Superclass(es)	tbd			
Attribute Name	Type	HSS-FE access rights	Properties	Description
svcType	Name10	read	Naming Attribute mandatory single-valued	Fixed 'IMS'.
mandatoryCapabilities	UInt32	read	optional multi-valued	Mandatory capabilities of S-CSCF used by I-CSCF to select a S-CSCF.
optionalCapabilities	UInt32	read	optional multi-valued	Optional capabilities of S-CSCF used by I-CSCF to select a S-CSCF.
serverNames	String	read	optional multi-valued	Statically configured S-CSCF names to be selected by the I-CSCF.
assignedSCSCF	String	read. write	optional single-valued	Assigned S-CSCF for a user.
primaryECFName	FQDN	read	optional single-valued	Address of the Primary Online Charging Function.
secondaryECFName	FQDN	read	optional single-valued	Address of the Secondary Online Charging Function.
PrimaryCCFName	FQDN	read	optional single-valued	Address of the Primary Charging Data Function.
secondaryCCFName	FQDN	read	optional single-valued	Address of the Primary Charging Data Function.

11.1.3.2 Service Profile Data

11.1.3.2.1 Service Profile

Table 11.1.3.2.1-1

Object Class	ServiceProfile			
Description	This class represents the Data Container for a Service Profile			
Superior OCL	tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
serviceProfileID	UInt32	read	Naming Attribute mandatory single-valued	The service profile Identification associated with the public user identity.
coreNet-SubscribedMediaProfileId	UInt32	read	optional Single-valued	Subscribed media profile Identification which identifies a media profile in the S-CSCF for the authorization of media parameters.
coreNet-ServiceIdList	String	read	optional multi-valued	List of Service Ids which identify the IMS Communication Service Identifiers that the subscriber is authorized to use.
sharedFilterCriteriaSets	UInt32	read	optional mandatory multi-valued	The Shared iFC Set ID ist.

11.1.3.2.2 Initial Filter Criteria

Table 11.1.3.2.2-1

Object Class	InitialFilterCriteria			
Description	This class represents the Data Container for an Initial Filter Criteria			
Superior OCL	tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
initialFilterCriteriaId	UInt32	read	Naming Attribute mandatory single-valued	The Identification of the associated initial filter criteria.
applicationServerName	String	read	mandatory single-valued	SIP URI of the application server to contact if the corresponding trigger points are met.
priority	UInt32	read	mandatory single-valued	Priority of the IFC.
profilePartIndicator	UInt8	read	optional single-valued	Indicator of the Profile Type as defined in the 3GPP TS 29.228 [24], i.e. whether the iFC is part of the registered or unregistered user profile. Possible values: 0 - UNREGISTERED 1 - REGISTERED
triggerPoints	String	read	optional single-valued	Trigger Points as defined in the 3GPP TS 29.228 [24].
defaultHandling	UInt8	read	optional single-valued	Default Handling as defined in the 3GPP TS 29.228 [24]. Possible values: 0 - SESSION_CONTINUED 1 - SESSION_TERMINATED
serviceInfo	String	read	optional single-valued	Transparent information related to the trigger points only used by the application server.

11.1.3.3 Implicit Registration Set Data

11.1.3.3.1 Implicit Registration Set

Table 11.1.3.2.2-1

Object Class	ImplicitRegistrationSet			
Description	This class represents the Data Container for Implicit Registration Set			
Superior OCL	Tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
implicitRegistrationSetID	UInt32	read	Naming Attribute mandatory single-valued	Indentification of the corresponding Implicit Registration Set.
publicIdList	PublicIdentity	read	mandatory multi-valued	Public User Identities belonging to the implicit registration set.

11.1.3.3.2 Alias Group

Table 11.1.3.3.2-1

Object Class	AliasGroup			
Description	This class represents the Data Container for Alias Group			
Superior OCL	Tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
aliasGroupID	UInt32	read	Naming Attribute mandatory single-valued	Indentification of the corresponding Alias Group.
publicIdList	PublicIdentity	read	mandatory multi-valued	Public User Identities belonging to the alias group.

11.1.3.3 Public Identity

Table 11.1.3.3.3-1

Object Class	PublicIdentity			
Description	This class represents the Data Container for Public Identity			
Superior OCL	tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
publicId	PublicIdentity	read	Naming Attribute mandatory single-valued	Public Identity of the subscriber.
idType	UInt8	read	mandatory single-valued	Type of Public Identity. Possible values: 0 - IMPU 1 - PSI
barringIndication	UInt8	read	optional single-valued	The Barring Indicator of the IMPU. Possible values: 0 - NOT BARRED 1 - BARRED
implicitRegistritionSetID	UInt32	read	optional single-valued	Identification of the Implicit Registration Set the Public User Identity belongs to. This attribute only applies to the Public User Identity.
serviceProfileID	UInt32	read	mandatory single-valued	Identification of the Service Profile the Public Identity is associated with.
privateIdList	PrivateIdentity	read	mandatory multi-valued	Private Identities the Public Identity is associated with.

registrationStatus	UInt8	read, write	mandatory multi-valued	The registration status related to the Public Identity. Possible values: 0 - NOT REGISTERED 1 - UNREGISTERED 2 - REGISTERED
registeredPrivateIdList	PrivateIdentity	read, write	optional multi-valued	Private Identities the Public Identity is registered with.
aliasGroupID	UInt32	read	optional single-valued	Identification of the Alias Group the public user identity belongs to. It only applies to the Public User Identity.

11.1.3.4 Repository Data

Table 11.1.3.3.4-1

Object Class	**RepositoryData**			
Description	**This class represents the Data Container for Repository Data**			
Superior OCL	**tbd**			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
serviceIndication	String	read, write	Naming Attribute mandatory single-valued	Identifier of one set of service related transparent data.
sequenceNumber	UInt32	read, write	optional single-valued	Sequence number of the Repository data updated.
serviceData	OctetString	read, write	optional single-valued	The corresponding service data.

11.1.3.5 Private Identity

Table 11.1.3.3.5-1

Object Class	PrivateIdentity			
Description	This class represents the Data Container for Private Identity			
Superior OCL	tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
privateId	PrivateIdentity	read	Naming Attribute mandatory single-valued	Private Identity of the subscriber.
idType	UInt8	read	mandatory single-valued	Type of Public Identity. Possible values: 0 - IMPI 1 - PSI
publicIdList	PublicIdentity	read	mandatory multi-valued	Public Identities the Private Identity is associated with.
pendingStatus	UInt8	read, write	Optional single-valued	The authentication pending flag. Possible values: 0 - NOT PENDING 1 - PENGDING
lineIdentifier	OctetString	read	optional multi-valued	Fixed broadband access line identifiers associated to the user.
userName	String	read	optional single-valued	The user name related to the IMPI, which is used to calculate HA1
password	String	read	optional single-valued	The password related to the IMPI, which is used to calculate HA1
Realm	String	read	optional single-valued	The password related to the IMPI, which is used to calculate HA1
ipv4Addr	IPv4Address	read	optional single-valued	IPv4 address related to the IMPI for GIBA.
ipv6Prefix	IPv6Prefix	read	optional single-valued	IPv6 prefix related to the IMPI for GIBA.
iPv6Addr	IPv6Address	read	optional single-valued	IPv6 address related to the IMPI for GIBA.

11.1.3.6 Reference Location Information

Table 11.1.3.3.6-1

Object Class	ReferenceLocationInfor			
Description	This class represents the Data Container for Reference Location Information			
Superior OCL	tbd			
Attribute Name	**Type**	**FE access rights**	**Properties**	**Description**
referenceLocationInforId	UInt8	read	Naming Attribute mandatory single-valued	Identifier of one set of reference location information.
accessType	String	read	optional single-valued	The type of access (e.g. ADSL).
accessInfo	String	read	optional single-valued	The type of the access information (e.g. dsl-location).
accessValue	String	read	optional single-valued	The location information (e.g. line identifier in fixed access networks).

11.1.4 Alternative C

11.1.4.1 IMS Subscription

Table 11.1.4.1-1

Object Class	**IMS-Subscription**			
Description	**This class represents the root node for IMS subscription specific data**			
Superior OCL	**IMS-Data**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**top**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
subscriptionId	tbd	read	Naming Attribute mandatory single-valued	UDR-Internal identification of an IMS-Subscription.
sharedIFCsupport	Boolean	read, write	optional single-valued	Indicates whether the assigned S-CSCF (if any) supports shared iFCs.
scscfMandCap	tbd	read	optional multi-valued	Mandatory Capabilities an S-CSCF must support to serve the subscription
scscfOptCap	tbd	read	optional multi-valued	Optional Capabilities an S-CSCF may support to serve the subscription
scscfHost	FQDN	read, write	optional single valued	Diameter Identity of the assigned S-CSCF
scscfRealm	FQDN	read, write	optional single valued	Diameter Identity of the assigned S-CSCF
ccfPrim	FQDN	read	mandatory single valued	Diameter Identity of the Primary Charging Collection Function
ccfSec	FQDN	read	mandatory single valued	Diameter Identity of the Secondary Charging Collection Function
ecfPrim	FQDN	read	mandatory single valued	Diameter Identity of the Primary Event Charging Function
ecfSec	FQDN	read	mandatory single valued	Diameter Identity of the Secondary Event Charging Function

11.1.4.2 Service Profile

Table 11.1.4.2-1

Object Class	**ServiceProfile**			
Description	**This class represents service profiles**			
Superior OCL	**IMS-Subscription**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**top**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
serviceProfileId	tbd	read	Naming Attribute mandatory single-valued	UDR-Internal identification of a Service Profile.
sharedFilterIDs	tbd	read	optional multi-valued	List of pointers to shared IFCs within CommonData
subMediaProfId	tbd	read	optional single-valued	Core Network Service Authorization: Subscribed Media Profile Id
serviceId	tbd	read	optional multi-valued	Core Network Service Authorization: List of Service Ids

11.1.4.3 Initial Filter Criteria

Table 11.1.4.3-1

Object Class	**Filter**			
Description	**This class represents user specific filter**			
Superior OCL	**ServiceProfile**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**top**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
initialFilterCriteriaId	tbd	read	Naming Attribute mandatory single-valued	UDR-Internal identification of a Filter.
profilePartInd	tbd	read	optional single-valued	Profile Part Indicator
priority	tbd	read	optional single-valued	Priority
applicationServer	tbd	read	optional single-valued	SIP URL of the Applicatio Server
serviceInfo	tbd	read	optional single-valued	Service Information
triggerPoint	tbd	read	optional single-valued	The Filter's trigger point

11.1.4.4 Implicit Registration Set

Table 11.1.4.4-1

Object Class	**ImplicitRegistrationSet**			
Description	**This class represents Implicit Registration Sets**			
Superior OCL	**IMS-Subscription**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**top**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
implicitRegistrationSetId	tbd	read	Naming Attribute mandatory single-valued	UDR-Internal identification of an Implicit Registration Set.
authenticationPending	Boolean	read, write	mandatory single-valued	Authentication-Pending flag
registrationStatus	tbd	read, write	mandatory single-valued	Registration Status
privateIdentity	tbd	read	mandatory multi-valued	List of Private User Identities
forbiddenPLMNsId	tbd	read	optional single-valued	pointer to a list of forbidden PLMNs within CommonData

11.1.4.5 Public Identity

Table 11.1.4.5-1

Object Class	**PublicIdentity**			
Description	**This class represents IMS Public Identities**			
Superior OCL	**ImplicitRegistrationSet**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**top**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
publicIdentity	tbd	read	Naming Attribute mandatory single-valued	Public User Identity or Public Service Identity
barredIndicator	Boolean	read	mandatory single-valued	Indicates whether the PublicIdentity is barred
defaultIndicator	Boolean	read	mandatory single-valued	Indicates whether the public identity is the default public identity within the implicit registrationset
serviceProfileId	tbd	read	optional single-valued	Name of the service profile associated to the public identity
displayName	tbd	read	optional single-valued	
aliasId	tbd	read	optional single-valued	Identifies the alias group to which the public identity belongs
psiIndicator	Boolean	read	mandatory single-valued	Indicates whether the public identity is a PSI

11.1.4.6 Repository Data

Table 11.1.4.6-1

Object Class	**RepositoryData**			
Description	**This class represents Repository Data**			
Superior OCL	**PublicIdentity**			
Class Type	**STRUCTURAL**			
Direct Superclass(es)	**top**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
serviceIndication	tbd	create, delete	Naming Attribute mandatory single-valued	Identifies the Transparent Data
version	tbd	read, write	mandatory single-valued	Version of the Transparent Data
data	tbd	read, write	optional single-valued	Transparent Data

11.1.4.7 Alias Group

Table 11.1.4.7-1

Object Class	AliasGroup			
Description	This class represents Alias Groups			
Superior OCL	ImplicitRegistrationSet			
Class Type	STRUCTURAL			
Direct Superclass(es)	top			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
aliasGroupId	tbd	read	Naming Attribute mandatory single-valued	Identifies the Alias Group
serviceProfileId	tbd	read	mandatory single-valued	Name of the service profile associated to the alias group

11.1.4.8 Private Identity

Table 11.1.4.8-1

Object Class	PrivateIdentity			
Description	This class represents Private Identities			
Superior OCL	IMS-Subscription			
Class Type	STRUCTURAL			
Direct Superclass(es)	top			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
privateIdentity	tbd	read	Naming Attribute mandatory single-valued	Identifies the Private Identity
authScheme	tbd	read	mandatory single-valued	
imsi	tbd	read	optional single-valued	
digestHa1	tbd	read	optional single-valued	

11.1.5 Alternative D

11.1.5.1 IMS Private Identity

Table 11.1.5.1-1

Object Class	**ImsImpi**			
Description	**This class represents the Data Container for IMS Private Identity**			
Superior OCL	**IMS-Data**			
Class Type	**tbd**			
Direct Superclass(es)	**tbd**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
ImsImpiId	tbd	Read	Naming Attribute Mandatory Single-valued	This attribute identifies this Object Class.
ImsPassw	String	Read	Optional Single-valued	This attribute contains the password to be used for SIP Digest authentication
ImsAuthSchMask	Enumerated	Read	Mandatory	This attribute indicates IMS supported authentication mechanisms.
ImsRoamAllow	Boolean	Read	Mandatory Single-valued	This attribute indicates whether the user is allowed to roam. Possible values are: TRUE – The user is allowed to roam FALSE – The user is not allowed to roam

11.1.5.2 IMS Public Identity

Table 11.1.5.2-1

Object Class	**ImsImpu**			
Description	**This class represents the Data Container for IMS Public Identity**			
Superior OCL	**IMS-Data**			
Class Type	**tbd**			
Direct Superclass(es)	**tbd**			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
IMPU	tbd	Read	Naming Attribute Mandatory Single-valued	This attribute identifies this Object Class
ImsAssocImpi	tbd	Read	Optional Single-valued	This attribute indicates the Private Identity associated to this Public Identity
ImsServProfId	String	Read	Optional Single-valued	This attribute indicates the Service Profile associated to this IMS Public Identity.
AliasGroupId	String	Read	Optional Single-valued	This attribute identifies corresponding Alias Group, if any.
ImsIrs	UInt16	Read	Mandatory Single-valued	This attribute indicates to which implicit registration set (IRS) the IMS Public Identity belongs to. See 3GPP TS 23.008 [5], section 3.1.6. If the Public Identity does not belong to an IRS, the value of this attribute shall be 0.
ImsSessBarrInd	Boolean	Read	Mandatory Single-valued	This attribute indicates whether the IMPU is barred for session establishment. See 3GPP TS 23.008 [5], section 3.1.3. Possible values are: TRUE – Identity is barred FALSE – Identity is not barred
ImsIsDefault	Boolean	Read	Mandatory Single-valued	This attribute indicates whether this Public Identity is the default one within the IRS. See 3GPP TS 23.008 [5], section 3.1.7. Possible values are: TRUE – The identity is the default within the IRS FALSE – The identity is not the default within the IRS

11.1.5.3 IMS Service Profile

Table 11.1.5.3-1

Object Class	IMS ServiceProfile			
Description	This class represents the Data Container for Service Profile			
Superior OCL	IMS-Data			
Class Type	tbd			
Direct Superclass(es)	tbd			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
ImsServProfId	String	Read	Naming Attribute Mandatory single-valued	This attribute identifies this Object Class
AliasGroupId	String	Read	Optional Single-valued	This attribute identifies corresponding Alias Group, if any.

11.1.5.4 Alias Group

Table 11.1.5.4-1

Object Class	AliasGroup			
Description	This class represents the Data Container for Alias Group			
Superior OCL	IMS-Data			
Class Type	tbd			
Direct Superclass(es)	tbd			
Attribute Name	**Type**	**HSS-FE access rights**	**Properties**	**Description**
AliasGroupId	String	Read	Naming Attribute Mandatory Single-valued	This attribute identifies this Object Class
ImsServProfId	String	read	Mandatory single-valued	This attribute indicates the Service Profile associated to this Alias Group.

11.2 Directory Information Tree

11.2.0 General

In the following sub-sections more object classes may be needed and are left to implementations. Different alternatives are described in order to show how different implementations may differ.

11.2.1 Alternative A

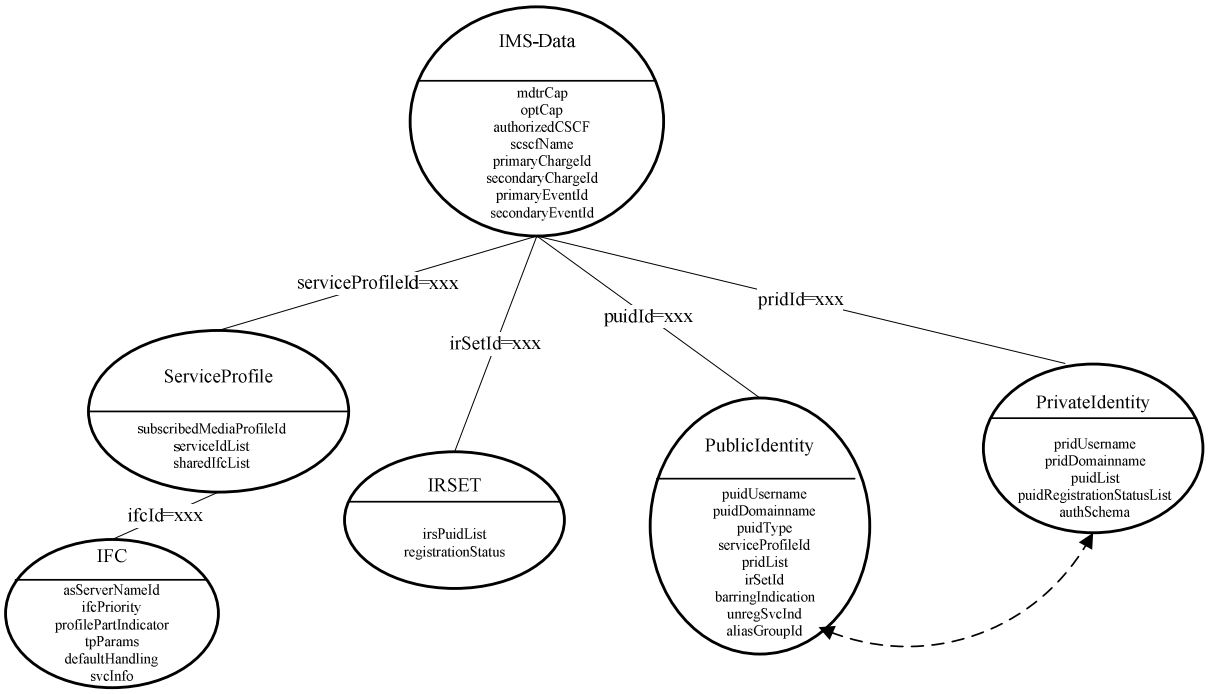

Figure 11.2.1-1: DIT Structure for IMS-Data with Alternative A

The dotted arrow indicates the relationship between PublicIdentity and PrivateIdentity which is expressed by the attributes PrivateIdList and PublicIdList.

The superior OCL description of the ImsData object class and some more detailed description of object classes and attributes are FFS.

11.2.2 Alternative B

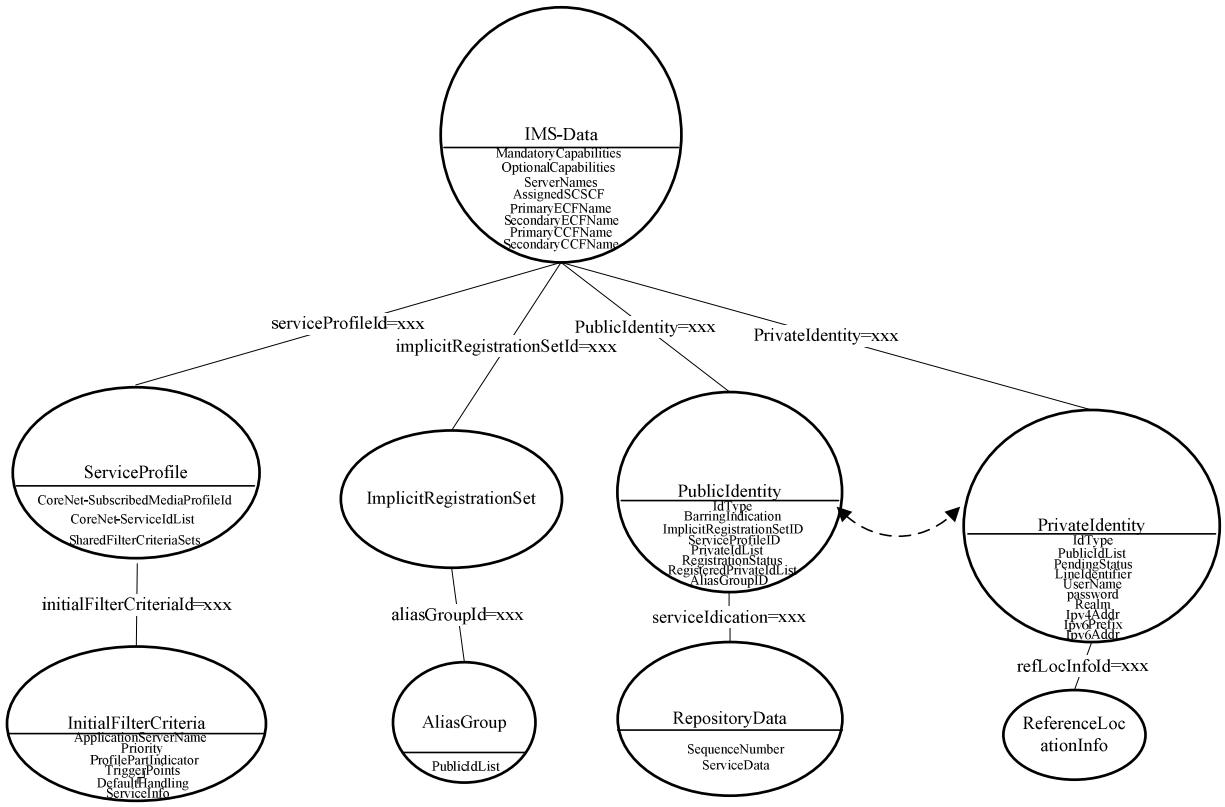

Figure 11.2.2-1: DIT Structure for IMS-Data with Alternative B

CoreNet-SubscribedMediaProfileId, CoreNet-ServiceIdList and SharedFilterCriteriaSets are optional attributes in Service Profile entry.

The dotted arrow indicates the relationship between PublicIdentity and PrivateIdentity which is expressed by the attributes PrivateIdList and PublicIdList.

Multiple instances of ReferenceLocInfo (refLocInfo=xxx) is for future releases.

11.2.3 Alternative C

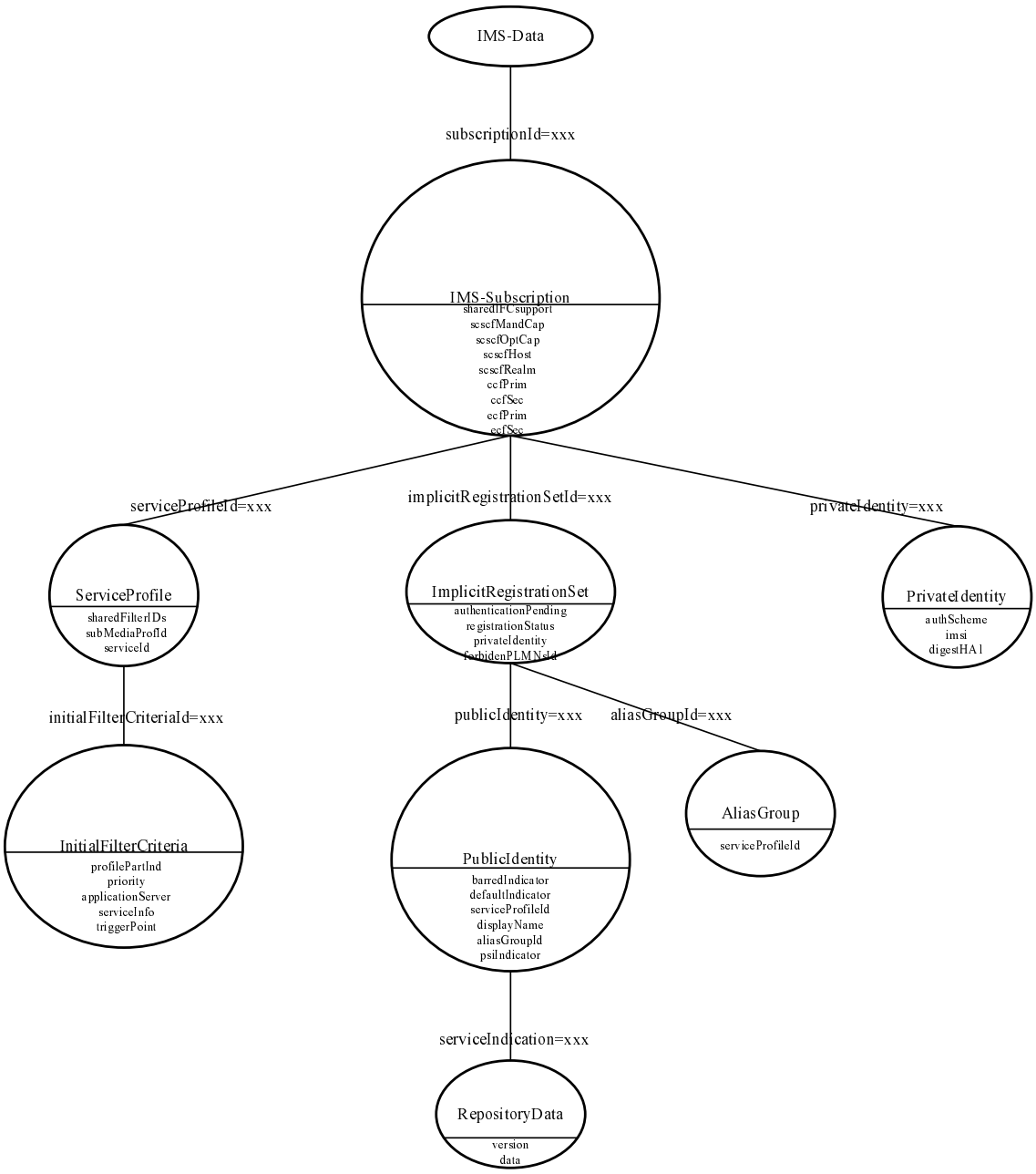

Figure 11.2.3-1: DIT Structure for IMS-Data with Alternative C

If an ImplicitRegistrationSet contains a PublicIdentity which is a PSI then it shall not contain any other PublicIdentity.

If an ImplicitRegistrationSet contains a single PublicIdentity, this Public Identity is not implicitly registered with any other Public Identity and therefore in stage 2 terms is not considered to belong to an Implicit Registration Set.

The concept of multiple IMS-Subscriptions within IMS-Data is not described in the present document.

11.2.4 Alternative D

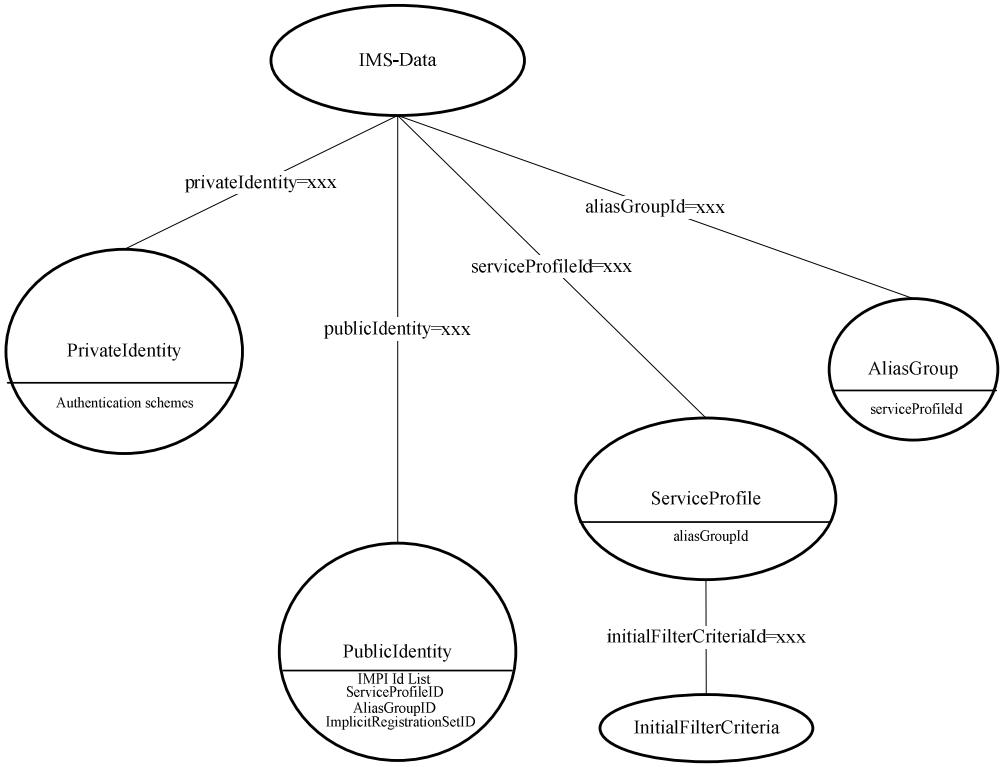

Figure 11.2.4-1: DIT Structure for IMS-Data with Alternative D

11.3 UML model

This section covers the information model for IMS Data and all its permanent data entities. The term IMS Data may also include temporary data as shown in the corresponding DITs.

Some data entities are already defined in 3GPP TS 32.182 [3].

Figure 11.3-1 covers some basic IMS entities with two possible approaches:

- Approach A: where IMPU and PSI are considered as different basic entities;
- Approach B: where a Public Identity basic IMS entity may identify a Public User Identity or a Public Service Identity and a Private Identity basic IMS entity may identify a Private User Identity or a Private Service Identity. The rational of Approach B is that Public User Identity and Public Service Identity have many common points. They have the same inheritance diagram with SIP URI or Tel URI. Public User Identity or Public Service Identity have compatible associations with other entities such as IMS Data or IMS Service profile. This modelling reduces the number of IMS basic entities and associations. Then, the differentiation between a Public User Identity and a Public Service Identity may be done by an attribute within the Public identity.

It is left to implementation to identify the most suited approach according to the further model inputs.

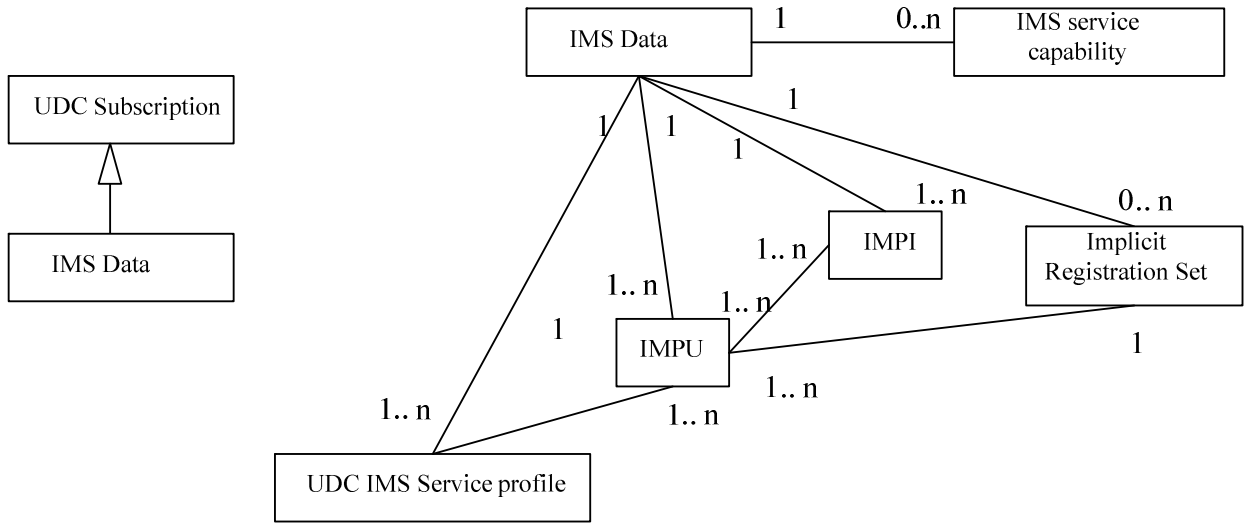

Figure 11.3-1A Information model for some IMS entities with approach A

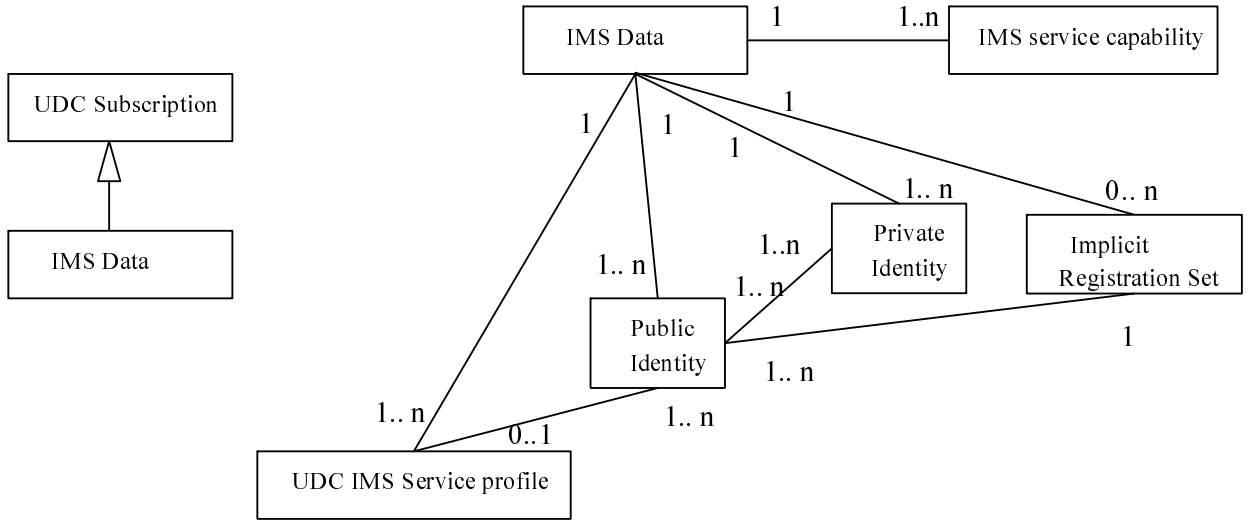

Figure 11.3-1B Information model for some IMS entities with approach B

Figure 11.3-2 covers IMS Public User Identity and its relationship with other IMS data entities.

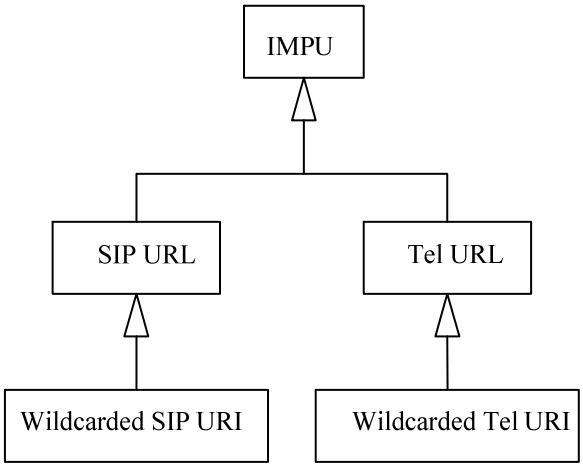

Figure 11.3-2 Information model for IMS Public User Identity and some surrounding entities

Figure 11.3-3 covers IMS Public Service Identity and its relationship with other IMS data entities.

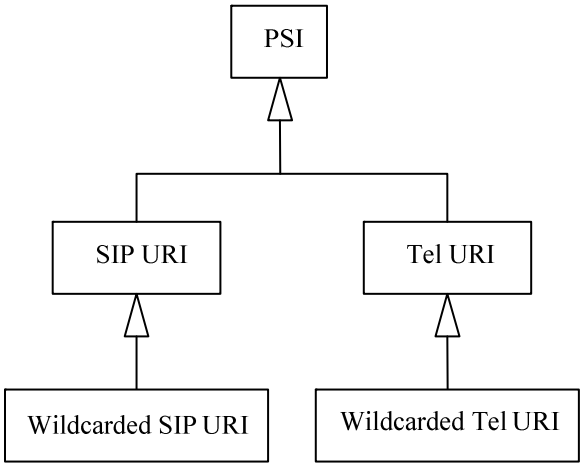

Figure 11.3-3 Information model for IMS Public Service Identity and some surrounding entities

Figure 11.3-4 covers IMS Public User Identity Implicit Registration Set and its relationship with Alias Group, and IMS Public User Identity.

NOTE: Alias Group is used as a simplification of the 3GPP TS 23.228 defined term Alias Public User Identities. In 3GPP TS 23.228 this is referred sometimes as well as Alias Public User Identity Group or Alias Public User Identity Set.

Following constrains apply:

- All Public User Identities of an Implicit Registration set must be associated to the same Private User Identities.
- Each IMPU can only be included in one Alias Group

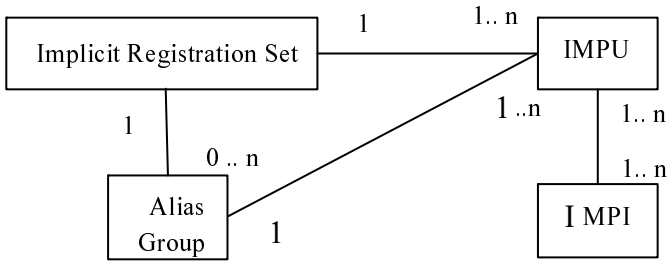

Figure 11.3-4 Information model for IMS Public User Identity Implicit Registration Set and its relationship with IMS Public User Identity and Alias Group

Figure 11.3-5 covers IMS Data and its relationship with Public Identity that provides coherence between approach A and approach B, since IMPU and PSI are derived entities from the more generic Public Identity

The figure implies that a Public Identity can not exist without IMS Data. On the other hand, IMS Data is defined for IMPU(s) or PSI(s), but not for both at the same time.

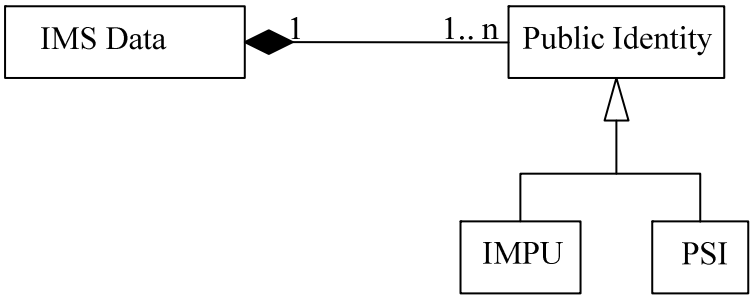

Figure 11.3-5 Information model for Public Identity

Figure 11.3-6 covers IMS Alias Group information model.

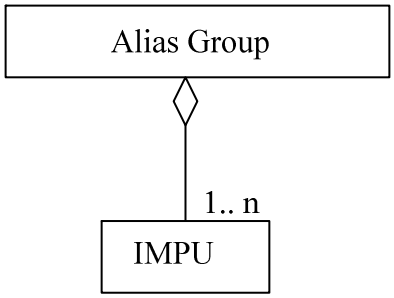

Figure 11.3-6 Information model for Alias Group

12 Conclusion and Recommendation

The present study, although focused on IMS data model and not fully completed, has shown that different alternatives for UDC Service Profile (section 7) and UDC IMS Service Data (section 12) are supported in current deployments and implementations and that a common base could not be found. This is mainly due to the fact that existing FE application logics may be impacted when changing the data model and this has been evaluated as not acceptable during the work.

For the above reasons a standardized Reference Data Model (RDM) for the Ud interface between Front-Ends for the HSS application (HSS-FEs) and the User Data Repository (UDR) is not agreeable.

It is therefore recommended not to start normative specification work on the definition of a Reference Data Model.

It is further recommended to add text to 3GPP TS 29.335 indicating that specifying a standardized RDM is out of scope of 3GPP specifications and hence Ud data model is proprietary.

For multivendor interoperability between FEs and UDR specific integration projects are needed in order to accommodate data required by different vendors FEs into UDR. To this end the present document may represent a valid example of data models implementation in operator's network.

Annex A:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2012-09	CT#57	CP-120484			Presented for approval	2.0.0	11.0.0
2014-09	-	-	-	-	Update to Rel-12 version (MCC)	11.0.0	12.0.0
2015-12	-	-	-	-	Update to Rel-13 version (MCC)	12.0.0	13.0.0

History

Document history		
V13.0.0	January 2016	Publication