

# PacketCable™ 2.0

## UE Provisioning Data Model Specification

### PKT-SP-UE-DATA-I01-080905

**ISSUED**

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## Document Status Sheet

<b>Document Control Number:</b> PKT-SP-UE-DATA-I01-080905				
<b>Document Title:</b> UE Provisioning Data Model Specification				
<b>Revision History:</b> I01 - Released 09/05/08				
<b>Date:</b> September 5, 2008				
<b>Status:</b>	<del>Work in Progress</del>	<del>Draft</del>	<b>Issued</b>	<del>Closed</del>
<b>Distribution Restrictions:</b>	<del>Author Only</del>	<del>CL/Member</del>	<del>CL/Member/Vendor</del>	<b>Public</b>

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- Work in Progress** An incomplete document, designed to guide discussion and generate feedback that may include several alternative requirements for consideration.
  
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# 1 SCOPE

## 1.1 Introduction and Purpose

This specification presents the data element definitions and associated requirements for use with the PacketCable 2.0 UE Provisioning Framework. Specifically, it defines data to be used for configuration and management of UEs and associated users. For more information on the PacketCable 2.0 UE Provisioning Framework, please refer to [PKT-UE-PROV].

This document does not consider PacketCable 2.0 application specific data within its scope. PacketCable 2.0 application specifications are expected to specify such data.

## 1.2 Document Overview

The document is structured as follows:

- Section 2 - References
- Section 3 - Terms and Definitions
- Section 4 - Abbreviations
- Section 5 - Informative section providing a description of the PacketCable 2.0 E-UE Provisioning Data Model
- Section 6 - Normative section describing the data model requirements for PacketCable 2.0 E-UEs
- Annex A - CLIENT-DEV Management Requirements
- Annex B- UE-USR Management Requirements
- Annex C - UE-BOOT Management Requirements

## 1.3 Requirements

Throughout this document, the words that are used to define the significance of particular requirements are capitalized. These words are:

"MUST"	This word means that the item is an absolute requirement of this specification.
"MUST NOT"	This phrase means that the item is an absolute prohibition of this specification.
"SHOULD"	This word means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighed before choosing a different course.
"SHOULD NOT"	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
"MAY"	This word means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

## 2 REFERENCES

### 2.1 Normative References

In order to claim compliance with this specification, it is necessary to conform to the following standards and other works as indicated, in addition to the other requirements of this specification. Notwithstanding, intellectual property rights may be required to use or implement such normative references.

- |                   |  |
|-------------------|--|
| [PKT-UE-PROV]     | PacketCable UE Provisioning Specification, PKT-SP-UE-PROV-I01-080903, September 3, 2008, Cable Television Laboratories, Inc.   |
| [DOCSIS-OSSIV3.0] | DOCSIS Specification, DOCSIS 3.0 Operations Support System Interface Specification, CM-SP-OSSIV3.0-I07-080522, May 22, 2008, Cable Television Laboratories, Inc.                                 |
| [OMA DMSTDOBJ]    | OMA Device Management Standardized Objects, OMA-TS-DM_StdObj-V1_2-20070209-A, February 9, 2007, Open Mobile Alliance.  |
| [OMA DMTRAPMO]    | DiagMon Trap Management Object, OMA-TS-DiagMonTrapMO-V1_0-20070704-D, Version 1.0, July 4, 2007 Open Mobile Alliance.  |
| [OMA DMFUMO]      | Firmware Update Management Object, OMA-TS-DM-FUMO-V1_0-20070209-A, Version 1.0, February 9, 2007, Open Mobile Alliance.  |
| [OMA DMCONN]      | Standardized Connectivity Management Objects, OMA-DDS-DM_ConnMO-V1_0-20080508-D, Version 1.0, May 8, 2008, Open Mobile Alliance.   |
| [OMA DMCONN_IP]   | Standardized Connectivity Management Objects IP Parameters, OMA-DDS-DM_ConnMO_IP-V1_0-20080509-D, Version 1.0, Open Mobile Alliance  |
| [OMA DMDDFDTD]    | OMA DM Device Description Framework DTD, Version 1.2, Open Mobile Alliance™. OMA-SUP-dtd_dm_ddf-v1_2. URL: <a href="http://www.openmobilealliance.org/">http://www.openmobilealliance.org/</a> . |
| [PKT-PROV1.5]     | PacketCable 1.5 Specification, MTA Device Provisioning, PKT-SP-PROV1.5-I03-070412, April 12, 2007, Cable Television Laboratories, Inc.   |

### 2.2 Informative References

This specification uses the following informative references:

- |                   |  |
|-------------------|--|
| [PKT-ARCH-TR]     | PacketCable Architecture Framework Technical Report, PKT-TR-ARCH-FRM-V05-080425, April 25, 2008, Cable Television Laboratories, Inc. |
| [PKT-RST-UE-PROV] | PacketCable RST UE Provisioning Specification, PKT-SP-RST-UE-PROV-I01-080903, September 3, 2008, Cable Television Laboratories, Inc. |
| [RFC 2578]        | IETF RFC 2578/STD0058, Structure of Management Information Version 2 (SMIV2), April 1999.  |
| [ISO/IEC 19501]   | ISO/IEC 19501:2005 Information technology - Open Distributed Processing - Unified Modeling Language (UML) Version 1.4.2.             |

### 2.3 Reference Acquisition

- Cable Television Laboratories, Inc., 858 Coal Creek Circle, Louisville, CO 80027; Phone +1-303-661-9100; Fax +1-303-661-9199; <http://www.cablelabs.com>.
- Internet Engineering Task Force (IETF) Secretariat, 46000 Center Oak Plaza, Sterling, VA 20166, Phone +1-571-434-3500, Fax +1-571-434-3535, <http://www.ietf.org/>.

- Open Mobile Alliance (OMA), OMA Office, 4275 Executive Square, Suite 240, La Jolla, CA 92037, Fax +1-858-623-0743, Internet: <http://www.openmobilealliance.com/>.

### 3 TERMS AND DEFINITIONS

This specification uses the following terms:

<b>Access Control List</b>	A list of identifiers and access rights associated with each identifier.
<b>Description Framework</b>	A specification for how to describe the management syntax and semantics for a particular device type.
<b>Dynamic node</b>	A node is dynamic if the DDF property Scope is set to Dynamic or if the Scope property is unspecified.
<b>Interior node</b>	A node that may have child nodes, but cannot store any value. The Format property of an interior node is node.
<b>Leaf node</b>	A node that can store a value, but cannot have child nodes. The Format property of a leaf node is not node.
<b>Management client</b>	A software component in a managed device that correctly interprets OMA DM commands, executes appropriate actions in the device, and sends back relevant responses to the issuing management server.
<b>Management object</b>	A management object is a subtree of the management tree, which is intended to be a (possibly singleton) collection of nodes that are related in some way. For example, the ./DevInfo nodes form a management object. A simple management object may consist of one single node.
<b>Management object identifier</b>	The Type property describing the kind of data stored as the management object's value.
<b>Management server</b>	A network-based entity that issues OMA DM commands to devices and correctly interprets responses sent from the devices.
<b>Management tree</b>	The mechanism by which the management client interacts with the device, e.g., by storing and retrieving values from it and by manipulating the properties of it, for example the access control lists.
<b>Node</b>	A node is a single element in a management tree. There can be two kinds of nodes in a management tree: interior nodes and leaf nodes. The Format property of a node provides information about whether a node is a leaf or an interior node.
<b>Permanent node</b>	A node is permanent if the DDF property Scope is set to Permanent. If a node is not permanent, it is dynamic. A permanent node can never be deleted.

## 4 ABBREVIATIONS AND ACRONYMS

This specification uses the following abbreviations:

<b>ACL</b>	Access Control List
<b>CM</b>	DOCSIS Cable Modem - a DOCSIS-compliant device that provides data transport connectivity from RFI to IP networks.
<b>DDF</b>	Device Description Framework
<b>DOCSIS<sup>®</sup></b>	Data-Over-Cable Service Interface Specifications
<b>OMA</b>	Open Mobile Alliance
<b>RFC</b>	Request for Comments. Technical policy documents approved by the IETF, which are available on the World Wide Web at <a href="http://www.ietf.cnri.reston.va.us/rfc.html">http://www.ietf.cnri.reston.va.us/rfc.html</a> .
<b>UML</b>	Unified Modeling Language

## 5 TECHNICAL OVERVIEW

PacketCable 2.0 is a CableLabs specification effort designed to support the convergence of voice, video, data, and mobility technologies. This document is part of the PacketCable 2.0 set of specifications and technical reports that define the base architecture and specifies the data elements required to configure and manage UEs, associated users, and applications, using the PacketCable 2.0 UE Provisioning Framework. For more information about PacketCable 2.0, please refer to the PacketCable 2.0 Architecture Framework Technical Report [PKT-ARCH-TR]. For more information on the PacketCable 2.0 UE Provisioning Framework, please refer to [PKT-UE-PROV].

The PacketCable 2.0 UE Provisioning Framework relies on the Open Mobile Alliance Device Management (OMA DM) protocol suit. In OMA DM, the managed data representation is termed Management Objects (MO) and are represented as Data Description Framework (DDF) as specified in [OMA DMDDFDTD]. This specification defines the UE management requirements in a generic object model and specifies the mapping of those requirements into OMA DM DDFs for use with the PacketCable UE Provisioning Framework. There might be UE data models and provisioning requirements associated with applications that use the PacketCable 2.0 architecture. Those management requirements are not included in this specification and are defined elsewhere, e.g., [PKT-RST-UE-PROV].

In this specification, the term "DOCSIS" is used to refer to DOCSIS version 1.1 or later, unless explicitly specified otherwise. Additionally, all references to PacketCable within this document are assumed to be PacketCable 2.0, unless stated otherwise.

### 5.1 OMA DM

OMA DM defines a list of requirements to provide an interoperable framework for managing devices. The OMA management end points are termed OMA client (user device) and OMA DM Server, (the management application, normally associated with a service provider or a third party organization). See [PKT-UE-PROV] for an OMA DM overview and applicability for the UE.

### 5.2 User Equipment (UE)

PacketCable is based on SIP and IMS, and supports a wide variety of clients with varying characteristics and capabilities, including software and hardware-based, standalone, and embedded devices (with other cable devices, e.g., DOCSIS Cable Modems). Consistent with IMS terminology, all PacketCable clients are called User Equipment (UE). For more information about UEs in PacketCable, please refer to the PacketCable Architecture Technical Report [PKT-ARCH-TR].

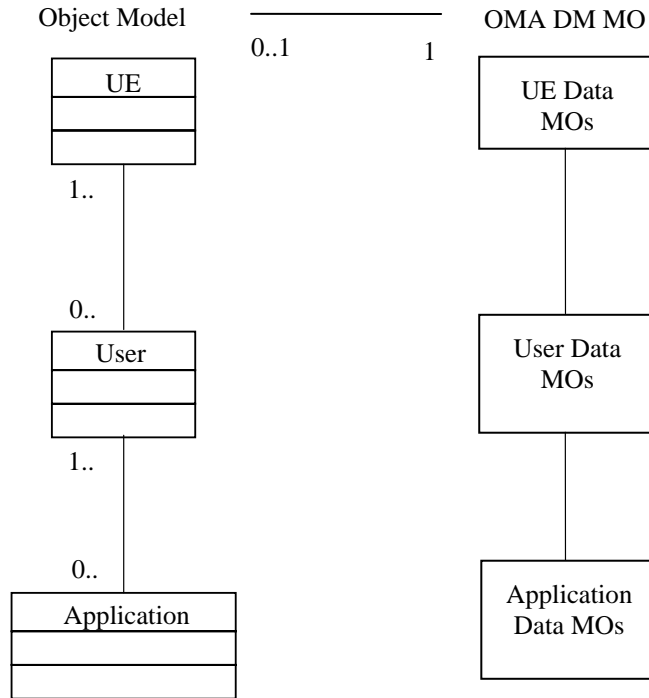
### 5.3 UE Provisioning Framework

The UE Provisioning Framework is a PacketCable 2.0 configuration and management framework based on the PacketCable 2.0 UE Provisioning specification. For more information on the UE Provisioning Framework, please refer to [PKT-UE-PROV].

### 5.4 UE Management Model Components

The UE Provisioning Data Model serves UEs, users, and associated applications as shown in Figure 1. The UE, user, and application data are logically separated and specified in this document. The object models described in this specification are intended to be protocol independent. A Direct mapping to OMA Managed Objects (MOs) is specified in order to support the OMA DM management framework.

The logical representation of the E-UE Provisioning Data Model is specified in Figure 1. The multiplicity relationships presented in Figure 1 indicate that the UE Data represent resources that can be associated to one or more Users; and Application Data can be associated to one or more User. As part of the OMA DM framework, an OMA DEVICE (e.g., UE) can be managed by one or more DM Servers. In addition, each DM Server can be restricted to a particular MO trees as part of the OMA DM Access Control List (ACL). The dependencies between the object model and ACL are defined in [PKT-PROV1.5].



**Figure 1 - E-UE Provisioning Data Model**

Figure 1 also shows the relationship between the Object Model data elements and OMA DM MOs. Object Models fully defined in this specification have correspondent MOs to interface the UE with OMA DM systems as required in [PKT-PROV1.5]. UE MO requirements from OMA DM do not have object models defined in this specification.

The UML (Unified Modeling Language) specification [ISO/IEC 19501] is used to define the Object Models for the UE management features specified in [PKT-PROV1.5] and other UE specifications (e.g., [PKT-RST-UE-PROV]). The object-model approach's main objective is to provide a set of UE management requirements is not tied to a management data structure like OMA DM DDFs for other purposes. For example, the UE object models could be used as the base for additional modeling needs like sequence diagrams for management process outside or in scope of PacketCable specifications. Another option could be to reuse the UE object models in a different data syntax (other than DDFs) in order to support other management protocols for the same set of features.

## 6 UE MANAGEMENT MODEL

### 6.1 UE Data Model

The UE support the OMA DM requirements as specified in UE Provisioning Specification [PKT-UE-PROV]. The UE OMA DM requirements provide an interoperable OMA DM implementation to be used by operators to manage the features defined by the PacketCable specifications in environments other than E-UEs. Even though the network environment and the Management protocols are different for both UEs and E-UEs, the majority of PacketCable features remain the same. This specification provides the data management component of the UE features maintaining a close relationship with the E-UE Data models.

The UE MUST support similar management operations to those supported by the E-UE specifications. In particular, the UE MUST support Creation, Deletion Retrieval, and Update operations over the managed objects. The UE Data specification also needs to balance the convenience of data models implementation shortcuts vs. the convenience of the generality. For example, OMA DM includes additional protocol commands like Exec, Atomic, Sequence, and Copy are not available in other protocols, such as SNMP [RFC 2578]. This could have impact on the final divergences of UE and E-UEs data models. Therefore, this specification looks for generality, and reuses the OMA DM Model Objects (MOs) as much as possible.

The data models presented in this specification and other UE-derived specifications use the DOCSIS 3.0 Management Interface requirements definition model (see [DOCSIS-OSSIV3.0]), where UML object models describe the requirements, and the device management interface defines the syntax and semantics based on the UML definitions. For example, DOCSIS object models are mapped to SNMP MIB modules for the management interface requirement. In this specification the management interface is OMA DM. Therefore, the UE MUST support the dataTypes defined in [DOCSIS-OSSIV3.0] to properly model the UE requirements.

### 6.2 UE Data Requirements

Table 1 represents the list of OMA DM UE data management requirements. The Object Model column indicates if the OMA DM MOs are defined from a UE Object model, or N/A to indicate the MO is a reference to OMA MOs. The UE MUST support the Object Models and MOs DDFs defined in Table 1.

**Table 1 - UE Data Requirements**

Reference	Object Model	MO DDF URN	DDF Path	Description
Annex A	CLIENT-DEV	urn:cablelabs:pktc2:oma:dm:client-dev	./Pktc2	UE Device
Annex B	UE-USR	urn:cablelabs:pktc2:oma:dm:ue-usr	./Pktc2	UE User
Annex C	UE-BOOT	urn:cablelabs:pktc2:oma:dm:ue-boot	<X>/Ext	UE Bootstrap DDF path corresponds to the DMAcc Extension
[OMA DMSTDOBJ]	StdObj	as per [OMA DMSTDOBJ]	as per [OMA DMSTDOBJ]	OMA DM DMAcc, DevInfo, DevDetail MOs
[OMA DMCONN]	ConnMO	as per [OMA DMSTDOBJ]	as per [OMA DMCONN]	OMA DM Connectivity MO
[OMA DMCONN_IP]	ConnMO_IP	as per [OMA DMSTDOBJ]	as per [OMA DMCONN_IP]	OMA DM IP Connectivity MO
[OMA DMFUMO]	FUMO	as per [OMA DMSTDOBJ]	as per [OMA DMFUMO]	OMA DM Firmware Upgrade MO

Reference	Object Model	MO DDF URN	DDF Path	Description
[OMA DMTRAPMO]	DiagMonTrapMO	as per [OMA DMTRAPMO]	as per [OMA DMTRAPMO]	Diagnostic Monitoring Trap MO

## 6.2.1 UE Data Management Requirements

This section includes UE requirements to support UE Object models and MOs, as well as OMA DM MOs.

### 6.2.1.1 UE Object Models Requirements

The UE MUST support the CLIENT-DEV object model and OMA DM MO defined in Annex A.

The UE MUST support the UE-USR object model and OMA DM MO defined in Annex B.

The UE MUST support the UE-BOOT object model and OMA DM MO defined in Annex C.

### 6.2.1.2 UE OMA DM MO Requirements

The UE MUST support the StdObj OMA DM MO defined in [OMA DMSTDOBJ].

The UE MUST support the ConnMO OMA DM MO defined in [OMA DMCONN].

The UE MUST support the ConnMO\_IP OMA DM MO defined in [OMA DMCONN\_IP].

The UE MUST support the FUMO OMA DM MO defined in [OMA DMFUMO].

The UE MUST support the DiagMonTrapMO OMA DM MO defined in [OMA DMTRAPMO].

## Annex A CLIENT-DEV Management Requirements

### A.1 CLIENT-DEV Object Model Overview

This section defines the management model of a Packetcable client device including client and network side provisioning and PacketCable 2.0 protocols configuration and management.

Unless specified, the PacketCable client device MUST NOT persist operator configuration data using the data models herein described. Other documents that reference this object model might change the persistent requirement of the device. This data model is defined after the UE device and may be applicable to other types of PacketCable devices.

### A.2 CLIENT-DEV Object Model Definitions

#### A.2.1 CLIENT-DEV Object Model Data Types

This section defines data types used in the CLIENT-DEV object model.

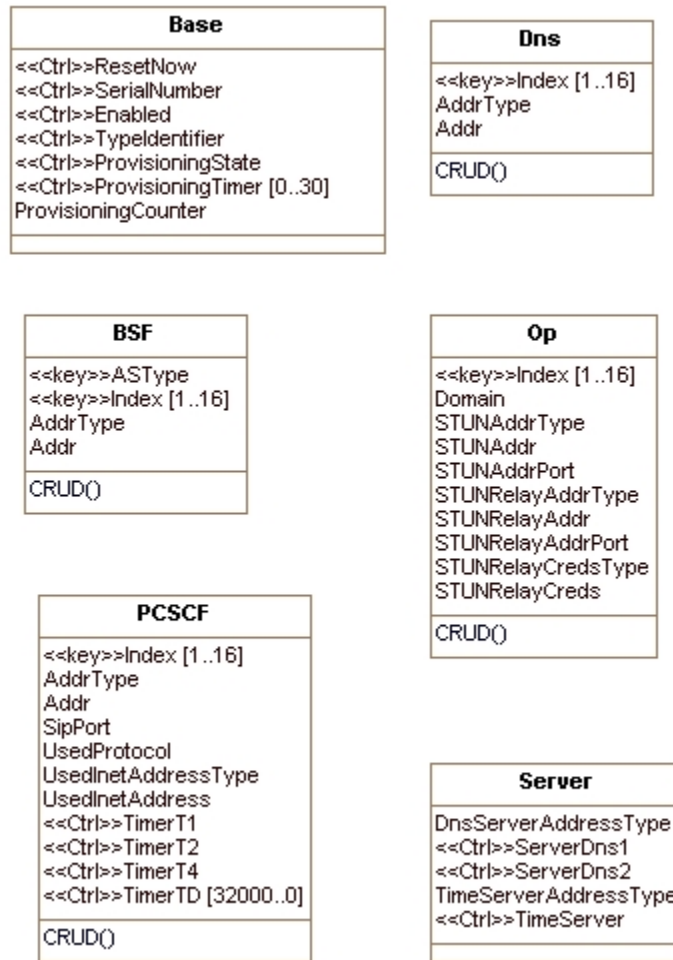
*Table 2- CLIENT-DEV Data Types*

Attribute Name	Type	Permitted Values
PkctEUEDevSipProtID	hexBinary	other(1) udp(2) tcp(3) tls(4)

- PkctEUEDevSipProtID

This data type represents the different transport protocols to carry DOCSIS 2.0 SIP.

**A.2.2 CLIENT-DEV Object Model Class Diagram**



*Figure 2 - CLIENT-DEV Object Model Diagram*

**A.2.3 CLIENT-DEV Object Model Description**

**A.2.3.1 Base Object**

*Table 3 - Base Object*

Attribute Name	Type	Access	Type Constraints	Units	Default
ResetNow	Boolean	RU			
SerialNumber	AdminString	R			
Enabled	Boolean	RU			
TypeIdentifier	AdminString	R			

Attribute Name	Type	Access	Type Constraints	Units	Default
ProvisioningState	Enum	R	pass(1) inProgress(2) failConfigFileError(3) passWithWarnings(4) passWithIncompleteParsing(5) failureInternalError(6) failureOtherReason(7)		
ProvisioningTimer	unsignedInt	RU	0..30	minutes	10
ProvisioningCounter	Counter32	R			

- **ResetNow**

This attribute controls the client device software reset. Reading this attribute always returns 'false'. Setting this attribute to 'true' causes the device to reset immediately and the following actions to occur:

1. All connections (if present) are flushed locally.
2. All current actions immediately terminate.
3. Requests for signaling notifications are flushed.
4. All endpoints are disabled.
5. The provisioning flow is started from the beginning.

- **SerialNumber**

This attribute specifies the manufacturer's serial number of this client device.

- **Enabled**

This object contains the Admin Status of this device. If this object is set to 'true', the client device is administratively enabled, and the client device **MUST** be able to interact with the PacketCable entities. If this object is set to 'false', the client device is administratively disabled, and the client device **MUST** perform the following actions for all endpoints:

1. Shut down all media sessions, if present.
2. Shut down client registrations. For example, a UE **MUST** execute all actions required to enable or disable the telephony services for all endpoints immediately.

- **TypeIdentifier**

This object provides the client device type identifier. The value of this object must be a copy of the DHCP option 60 value exchanged between the client device and the DHCP server. The DHCP option 60 value contains an ASCII-encoded string identifying capabilities of the device as defined for the device provisioning specification.

- **ProvisioningState**

This attribute indicates the completion state of the client device provisioning process.

- **ProvisioningTimer**

This object defines the time interval for the provisioning flow to complete. The client device **MUST** finish all provisioning operations starting from the moment when the client acquires IP connectivity and is ready to initiate its provisioning flow, and ending at the moment when the device completes the retrieval of its configuration within the period of time set by this object. Failure to comply with this condition constitutes a provisioning flow failure. If the object is set to 0, the client device **MUST** ignore the provisioning timer condition. If a value is written into an instance of ProvisioningTimer, the client device **MUST NOT** retain the supplied value across UE re-initializations or reboots.

- ProvisioningCounter

This attribute counts the number of times the provisioning cycle has looped through the first step of the device provisioning.

### A.2.3.2 IPv4Server Object

**Table 4 - Server Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
DnsServerAddressType	InetAddressType	R			
ServerDns1	InetAddress	RU			
ServerDns2	InetAddress	RU			
TimeServerAddressType	InetAddressType	R			
TimeServer	InetAddress	RU			

- DnsServerAddressType

This object contains the Internet address type for the PacketCable DNS servers ServerDNS1, ServerDNS2.

- ServerDns1

This object contains the IP Address of the primary DNS server to be used by the client device. The type of this address is determined by the value of the DnsServerAddressType object. When the latter has the value 'ipv4', this attribute contains the IP address of the primary DNS server. As defined in RFC 2132, PacketCable-compliant client devices receive the IP addresses of the DNS Servers in DHCP option 6 or by other means. The behavior of this object when the value of DnsServerAddressType is other than 'ipv4' is not presently specified, but it may be specified in future versions of this specification. If a value is written into an instance of ServerDns1, the client device MUST NOT retain the supplied value across device re-initializations or reboots.

- ServerDns2

This object contains the IP Address of the secondary DNS server to be used by the client device. The type of this address is determined by the value of the DnsServerAddressType object. When the latter has the value 'ipv4(1)', this attribute contains the IP address of the secondary DNS server. As defined in RFC 2132, PacketCable-compliant devices receive the IP addresses of the DNS Servers in DHCP option 6. The behavior of this object when the value of DnsServerAddressType is other than 'ipv4(1)' is not presently specified, but it may be specified in future versions of this specification. If a value is written into an instance of ServerDns2, the agent MUST NOT retain the supplied value across UE re-initializations or reboots.

- TimeServerAddressType

This object contains the Internet address type for the 'TimeServers' attribute.

- TimeServer

This object contains the Internet Address of the Time Server used by an S-UE for Time Synchronization. The type of this address is determined by the value of the TimeServerAddressType object. When the latter has the value 'ipv4(1)', this object contains the IP address of the Time Server used for Time Synchronization. In the case of an S-UE, this object must be populated with a value other than 0.0.0.0 as obtained from DHCP option 4. The protocol by which the time of day MUST be retrieved is defined in RFC 868. In the case of an E-UE, this object must contain a value of 0.0.0.0 if the address type is 'ipv4(1)' since an E-UE does not use the Time Protocol for time synchronization (an E-UE uses the time retrieved by the DOCSIS cable modem). The behavior of this object when the value of TimeServerAddressType is other than 'ipv4(1)' is not presently

specified, but it may be specified in future versions of this specification. If a value is written into an instance of TimeServer, the agent MUST NOT retain the supplied value across UE re-initializations or reboots.

### A.2.3.3 Op Object

This object contains Operator-specific information associated with the UE.

- Object Operations:

Each entry in this object describes Operator parameters associated with a specific domain name. For each Operator that is associated with a user, the corresponding parameters SHOULD be configured by the Operator. A domain name of '.' indicates any domain name. The UE MUST use the values provided only for sessions established on behalf of the UE identifier (e.g., UE registration, UE configuration, UE Identifier-based sessions). This object defines the row status associated with the particular Operator in the Op object. The value of this object has no effect on whether columnar objects in this row can be modified.

**Table 5 - Op Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
Index	unsignedInt	key	1..16		
Domain	InetAddressDNS	CRUD			
STUNAddrType	InetAddressType	CRUD			unknown
STUNAddr	InetAddress	CRUD			""
STUNAddrPort	InetAddressPort	CRUD			0
STUNRelayAddrType	InetAddressType	CRUD			unknown
STUNRelayAddr	InetAddress	CRUD			""
STUNRelayAddrPort	InetAddressPort	CRUD			0
STUNRelayCredsType	PkctUETCCredsType	CRUD			none
STUNRelayCreds	PkctUETCCreds	CRUD			""

- Index

A unique value used to identify an instance of a set of values pertaining to an Operator domain identified by 'Domain'. The indices SHOULD be contiguous. When multiple entries are specified, the UE MUST give precedence to the values indexed by lower indices.

- Domain

This attribute contains the Operator's Domain or sub-domain name. A value of '.' indicates any domainName.

- STUNAddrType

This data element identifies the data type of the value contained in 'STUNAddr'.

- STUNAddr

This data element contains the STUN server address associated with the domain name identified in 'Domain'.

- STUNAddrPort

This data element contains the STUN server port associated with the server address identified in 'STUNAddr'.

- STUNRelayAddrType

This data element identifies the data type of the value contained in 'STUNRelayAddr'.

- **STUNRelayAddr**  
This data element contains the STUNRelay server (also referred to as TURN Server) address associated with the domain name identified in 'Domain'.
- **STUNRelayAddrPort**  
This data element contains the STUNRelay server port associated with the server address identified in 'STUNRelayAddr'.
- **STUNRelayCredsType**  
This data element contains the creds type associated with the STUN Relay creds identified in 'STUNRelayCreds'. Valid types include other(1), publicIdentity(2), and username(6).
- **STUNRelayCreds**  
This optional data element MAY contain suitable credentials related to STUN Relay access. If read, this data element MUST always return an empty string value.

**A.2.3.4 Dns Object**

This object represents the UE's knowledge of suitable DNS Server information on a per Operator basis. The UE MUST use the values provided only for sessions established on behalf of the UE identifier (e.g., UE P-CSCF Discovery, UE registration, UE configuration, or UE Identifier-based sessions).

- **Object Operations:**  
Each entry in this object contains an instance of a DNS Server entry for a given domain name as indicated by 'Domain'. The information in this table MAY be configured by the Operator. This object defines the row status associated with the particular Operator domain name in the Dns object. The value of the 'AddrType' object MUST not be modified while this object is 'active'. The value of 'Addr' MAY be modified while this object is active if the value is consistent with the type specified by the 'AddrType' object. The UE MUST not allow the row to become 'active' unless the value of 'Addr' is consistent with the value of 'AddrType'.

**Table 6 - Dns Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
Index	unsignedInt	key	1..16		
AddrType	InetAddressType	CRUD			unknown
Addr	InetAddress	CRUD			""

- **Index**  
This key corresponds to an unique value used to identify an instance in this object. The instances should use a continuous sequence. When multiple instances are specified, the UE MUST give precedence to the values indexed by lower indices.
- **AddrType**  
This attribute contains the type of the attribute Addr'. The only valid values are 'ipv4' or 'ipv6'. The value 'unknown' may be used for instance creation where the attribute Addr is not specified.
- **Addr**  
The IP address of a DNS server associated with the domain name indicated by the primary index 'OpIndex', for the instance indicated by the secondary index 'DnsIndex'. If the attribute is empty, the UE MUST use the DNS servers obtained via the DHCP process during provisioning.

### A.2.3.5 PCSCF Object

This object represents the UE's knowledge of suitable P-CSCFs information on a per Operator basis.

- Object Operations:

Each entry in this object contains an instance of a P-CSCF Server entry for a given domain name. The information in this table MAY be configured by the Operator. The UE MUST use the values provided only for sessions established on behalf of the UE identifier (e.g., UE registration, UE configuration, or UE Identifier-based sessions). This object defines the row status associated with the particular P-CSCF Server entry for the particular domain name. The value of the 'AddrType' object MUST not be modified while this object is 'active'. The value of 'PCSCFAddr' MAY be modified while this object is active if the value is consistent with the type specified by the 'PCSCFAddrType' object.

**Table 7 - PCSCF Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
Index	unsignedInt	key	1..16		
AddrType	InetAddressType	CRUD			unknown
Addr	InetAddress	CRUD			""
SipPort	InetPortNumber	CRUD			5060
UsedProtocol	PktcUEDevSipProtID	R			
UsedInetAddressType	InetAddressType	R			
UsedInetAddress	InetAddress	R			
TimerT1	unsignedInt	R		milliseconds	500
TimerT2	unsignedInt	CRUD		milliseconds	4000
TimerT4	unsignedInt	CRUD		milliseconds	5000
TimerTD	unsignedInt	R	32000..0	milliseconds	32000

- Index

A unique value used to identify an instance in this object. The indices SHOULD be contiguous. When multiple entries are specified, the UE MUST give precedence to the values indexed by lower indices.

- AddrType

This data element contains the type of the data element contained in 'PCSCFAddr'.

- Addr

The IP address of a P-CSCF server associated with the domain name indicated by the primary index 'OpIndex', for the instance indicated by the secondary index 'PCSCFIndex'.

- SipPort

This attribute contains a SIP Port to send the SIP requests to (for the P-CSCF indicated by the table entry).

- UsedProtocol

This attribute contains a SIP Protocol, which is used by the UE to communicate with the P-CSCF.

- UsedInetAddressType

This attribute contains the Address Type of the P-CSCF IP address used by the UE in communication with the P-CSCF. Only 'ipv4' and 'ipv6' address types are valid values for this attribute.

- **UsedInetAddress**  
This attribute contains the IP Address of the P-CSCF used by the UE. Only 'ipv4' and 'ipv6' addresses are valid values for this attribute.
- **TimerT1**  
This is the SIP Timer T1, an estimate for the round trip time in the system (UE to P-CSCF). Please refer to the PacketCable IMS Delta Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Stage 3 Specification 3GPP TS 24.229 for more information.
- **TimerT2**  
This is the SIP Timer T2, an estimate for the maximum retransmit interval for non-INVITE requests and INVITE responses. Please refer to the PacketCable IMS Delta Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Stage 3 Specification 3GPP TS 24.229 for more information.
- **TimerT4**  
This is the SIP Timer T4, which indicates the wait time for response retransmits. Please refer to the PacketCable IMS Delta Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Stage 3 Specification 3GPP TS 24.229 for more information.
- **TimerTD**  
This is the SIP Timer TD, an estimate for the maximum duration a message will remain in the network. Please refer to the PacketCable IMS Delta Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Stage 3 Specification 3GPP TS 24.229 for more information. If the protocol used for a SIP Session is UDP, this value is used for SIP Timer D, otherwise it is ignored.

**A.2.3.6 BSF Object**

This object represents the UE's knowledge of suitable BSFs to contact.

- **Object Operations:**  
Each entry in this object contains an instance of a BSF, specific to an AS type, for a given Operator's Domain Name. The entries represent the UE's knowledge of suitable BSFs to contact, as per the IMS GBA architecture to obtain credentials and enabling secure sessions to Application Servers. A list of BSFs for each Operator and application types MAY be configured by the Operator. This object defines the row status associated with this instance of a BSF. The value of the 'BSFAddrType' object MUST not be modified while this object is 'active'. The value of 'BSFAddr' MAY be modified while this object is active if the value is consistent with the type specified by the 'BSFAddrType' object.

**Table 8 - BSF Object**

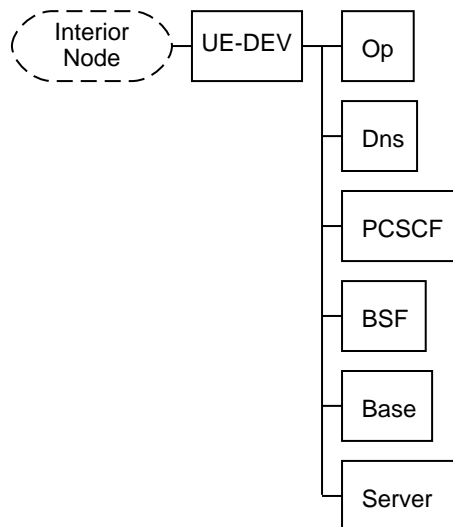
Attribute Name	Type	Access	Type Constraints	Units	Default
ASType	AdminString	key			
Index	unsignedInt	key	1..16		
AddrType	InetAddressType	R			unknown
Addr	InetAddress	R			""

- **ASType**  
A unique value used to indicate the AS type to which the BSFs correspond. Applications using GBA are required to specify such identifiers explicitly.

- **Index**  
A unique value used to identify an instance in this object. The indices SHOULD be contiguous. When multiple entries are specified, the UE MUST give precedence to the values indexed by lower indices.
- **AddrType**  
This data element contains the type of the data element contained in 'BSFAddr'.
- **Addr**  
The address of a BSF server associated with the domain name indicated by the indices 'OpIndex' (Operator Domain), 'BSFASType', and 'BSFIndex'.

### A.3 CLIENT-DEV OMA Management Objects (MO)

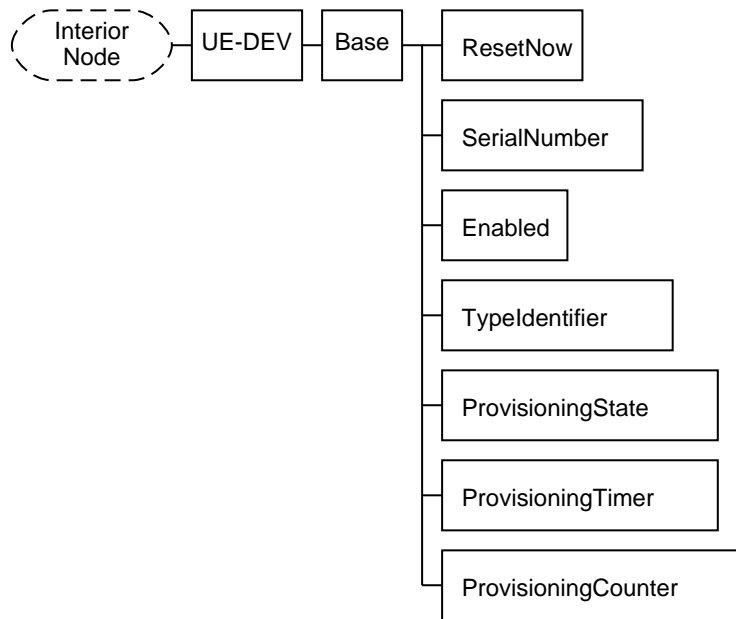
#### A.3.1 CLIENT-DEV High Level MO



**Figure 3 - CLIENT-DEV High Level OMA Management Object**

**A.3.2 CLIENT-DEV Nodes**

**A.3.2.1 CLIENT-DEV Base Node MO tree**

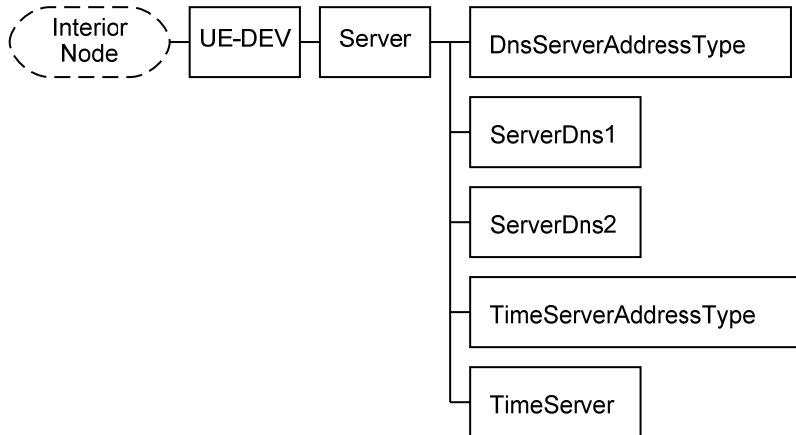


**Figure 4 - Node Base of CLIENT-DEV OMA Management Object**

**A.3.2.2 CLIENT-DEV Base MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/Base	current	One	Node	Get
./CLIENT-DEV/ResetNow/<X>/ResetNow	current	OneOrZero	bool	Get, Replace
./CLIENT-DEV/SerialNumber/<X>/SerialNumber	current	OneOrZero	chr	Get
./CLIENT-DEV/Enabled/<X>/Enabled	current	OneOrZero	bool	Get, Replace
./CLIENT-DEV/TypeIdentifier/<X>/TypeIdentifier	current	OneOrZero	chr	Get
./CLIENT-DEV/ProvisioningState/<X>/ProvisioningState	current	OneOrZero	int	Get
./CLIENT-DEV/ProvisioningTimer/<X>/ProvisioningTimer	current	OneOrZero	int	Get, Replace
./CLIENT-DEV/ProvisioningCounter/<X>/ProvisioningCounter	current	OneOrZero	int	Get

**A.3.2.3 CLIENT-DEV Server Node MO tree**

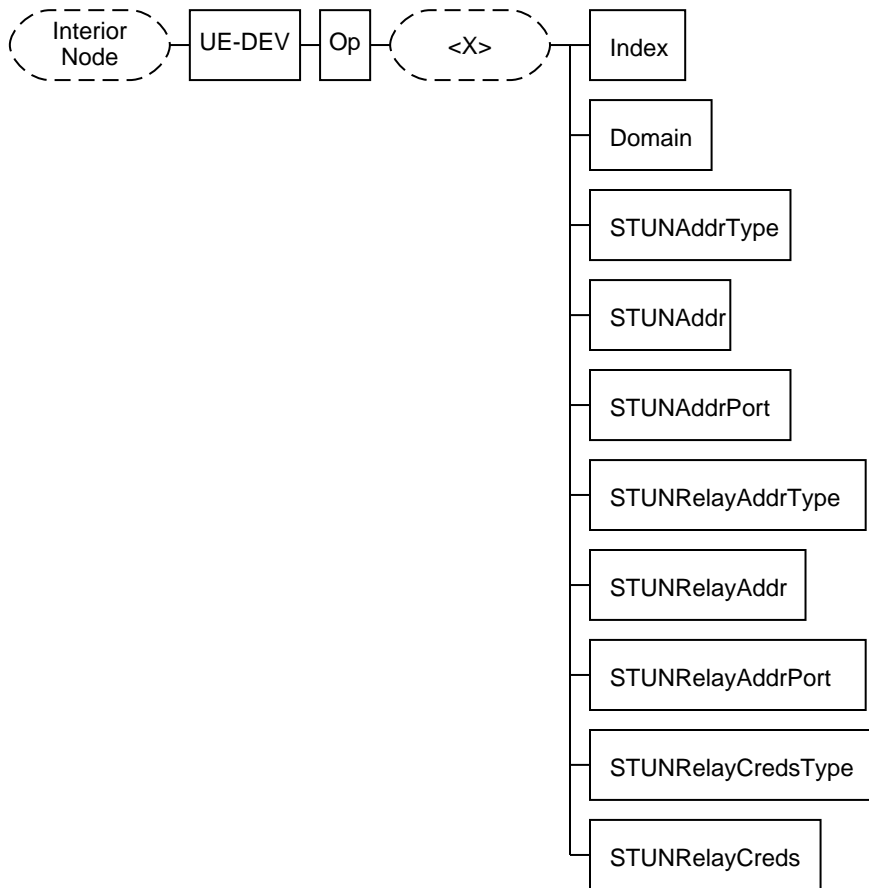


**Figure 5 - Node Server of CLIENT-DEV OMA Management Object**

**A.3.2.4 CLIENT-DEV Server MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/Server	current	One	Node	Get
./CLIENT-DEV/DnsServerAddressType/<X>/DnsServerAddressType	current	OneOrZero	int	Get
./CLIENT-DEV/ServerDns1/<X>/ServerDns1	current	OneOrZero	chr	Get, Replace
./CLIENT-DEV/ServerDns2/<X>/ServerDns2	current	OneOrZero	chr	Get, Replace
./CLIENT-DEV/TimeServerAddressType/<X>/TimeServerAddressType	current	OneOrZero	int	Get
./CLIENT-DEV/TimeServer/<X>/TimeServer	current	OneOrZero	chr	Get, Replace

**A.3.2.5 CLIENT-DEV Op Node MO tree**



**Figure 6 - Node Op of CLIENT-DEV OMA Management Object**

**A.3.2.6 CLIENT-DEV Op MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/Op	current	One	Node	Get
./CLIENT-DEV/Op<X>	current	OneOrMore	Node	Add, Get, Replace
./CLIENT-DEV/Index/<X>/Index	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/Domain/<X>/Domain	current	OneOrZero	chr	Add, Get, Replace
./CLIENT-DEV/STUNAddrType/<X>/STUNAddrType	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/STUNAddr/<X>/STUNAddr	current	OneOrZero	chr	Add, Get, Replace
./CLIENT-DEV/STUNAddrPort/<X>/STUNAddrPort	current	OneOrZero	int	Add, Get, Replace

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/STUNRelayAddrType/<X>/STUNRelayAddrType	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/STUNRelayAddr/<X>/STUNRelayAddr	current	OneOrZero	chr	Add, Get, Replace
./CLIENT-DEV/STUNRelayAddrPort/<X>/STUNRelayAddrPort	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/STUNRelayCredsType/<X>/STUNRelayCredsType	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/STUNRelayCreds/<X>/STUNRelayCreds	current	OneOrZero	chr	Add, Get, Replace

**A.3.2.7 CLIENT-DEV Dns Node MO tree**

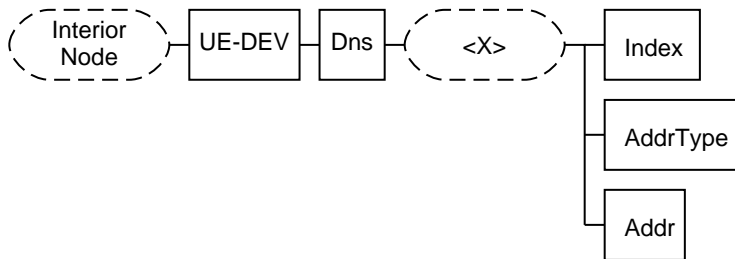
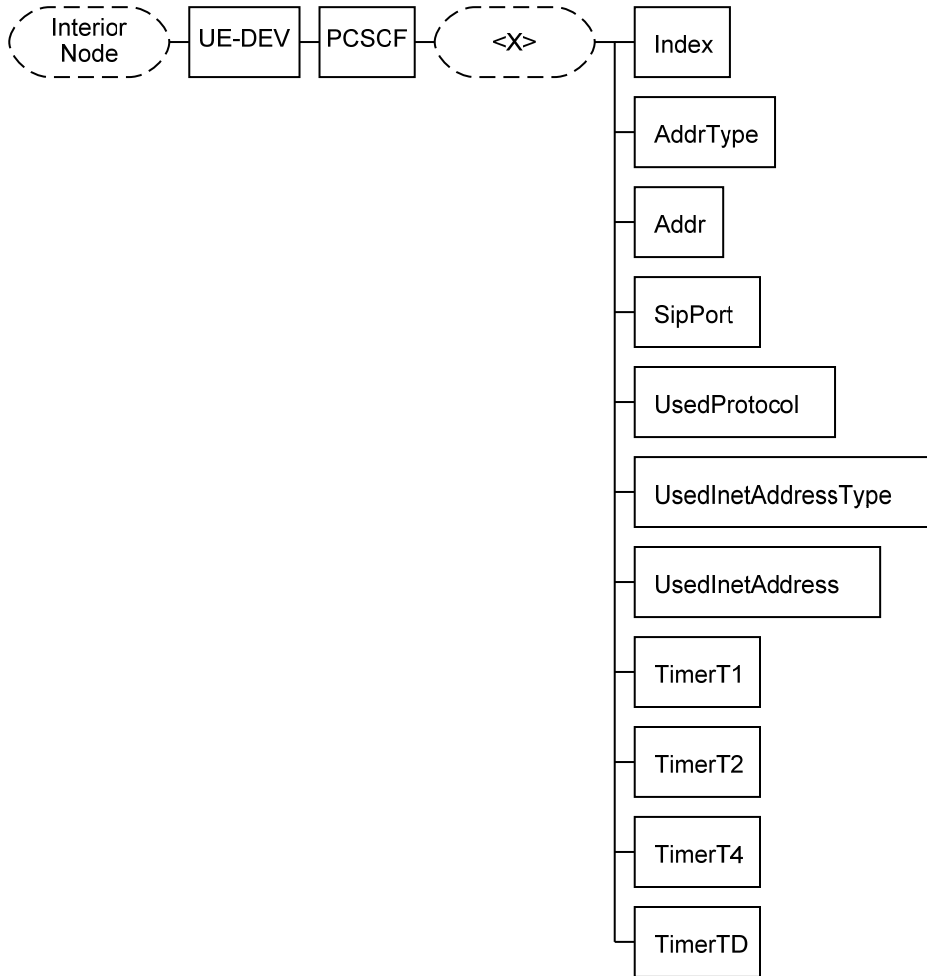


Figure 7 - Node Dns of CLIENT-DEV OMA Management Object

**A.3.2.8 CLIENT-DEV Dns MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/Dns	current	One	Node	Get
./CLIENT-DEV/Dns<X>	current	OneOrMore	Node	Add, Get, Replace
./CLIENT-DEV/Index/<X>/Index	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/AddrType/<X>/AddrType	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/Addr/<X>/Addr	current	OneOrZero	chr	Add, Get, Replace

**A.3.2.9 CLIENT-DEV PCSCF Node MO tree**



**Figure 8 - Node PCSCF of CLIENT-DEV OMA Management Object**

**A.3.2.10 CLIENT-DEV PCSCF MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/PCSCF	current	One	Node	Get
./CLIENT-DEV/PCSCF<X>	current	OneOrMore	Node	Add, Get, Replace
./CLIENT-DEV/Index/<X>/Index	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/AddrType/<X>/AddrType	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/Addr/<X>/Addr	current	OneOrZero	chr	Add, Get, Replace
./CLIENT-DEV/SipPort/<X>/SipPort	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/UsedProtocol/<X>/UsedProtocol	current	OneOrZero	int	Get
./CLIENT-DEV/UsedInetAddressType/<X>/UsedInetAddressType	current	OneOrZero	int	Get
./CLIENT-DEV/UsedInetAddress/<X>/UsedInetAddress	current	OneOrZero	chr	Get

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/TimerT1/<X>/TimerT1	current	OneOrZero	int	Get
./CLIENT-DEV/TimerT2/<X>/TimerT2	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/TimerT4/<X>/TimerT4	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/TimerTD/<X>/TimerTD	current	OneOrZero	intchr	Get

**A.3.2.11 CLIENT-DEV BSF Node MO tree**

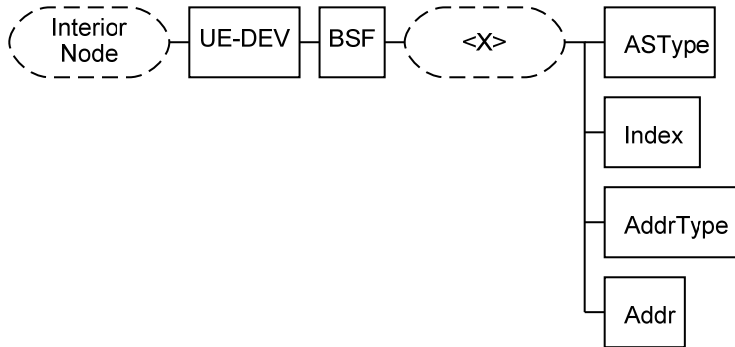


Figure 9 - Node BSF of CLIENT-DEV OMA Management Object.

**A.3.2.12 CLIENT-DEV BSF MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./CLIENT-DEV/BSF	current	One	Node	Get
./CLIENT-DEV/BSF<X>	current	OneOrMore	Node	Add, Get, Replace
./CLIENT-DEV/ASType/<X>/ASType	current	OneOrZero	chr	Add, Get, Replace
./CLIENT-DEV/Index/<X>/Index	current	OneOrZero	int	Add, Get, Replace
./CLIENT-DEV/AddrType/<X>/AddrType	current	OneOrZero	int	Get
./CLIENT-DEV/Addr/<X>/Addr	current	OneOrZero	chr	Get

**A.4 CLIENT-DEV OMA Device Description Framework (DDF)**

```

<?xml version="1.0"?>
<MgmtTree>
  <VerDTD>1.2</VerDTD>
  <Man>PacketCable - Cable Laboratories Inc.</Man>
  <!--This DDF considers as model the UE MO (as defined in the PacketCable
specifications) followed by a colon character (e.g., CLIENT-DEV:) -->
  <Mod>CLIENT-DEV:</Mod>
  <Node>
    <NodeName>CLIENT-DEV</NodeName>
    <Path>./Pktc2</Path>
    <DFProperties>
      <AccessType>
        <Get/>
      </AccessType>
      <DefaultValue/>
      <Description>The node that defines the CLIENT-DEV MO
tree.</Description>
    
```

```

    <DFFormat>
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    </DFFormat>
    <Occurrence>
      <One/>
    </Occurrence>
    <Scope>
      <Permanent/>
    </Scope>
    <DFTitle>The interior node holding all nodes of the PacketCable
CLIENT-DEV MO three</DFTitle>
    <DFType>
      <DDFName>urn:cablelabs:pktc2:oma:dm:client-dev</DDFName>
    </DFType>
    <CaseSense>
      <CIS/>
    </CaseSense>
  </DFProperties>
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      </Scope>
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      </DFType>
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    </DFProperties>
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</Node>
  <Node>
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        </DFType>
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```

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  <DFProperties>
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      <Get/>
    </AccessType>
    <DefaultValue></DefaultValue>
    <Description/>
    <DFFormat>
      <int/>
    </DFFormat>
    <Occurrence>
      <One/>
    </Occurrence>
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      <Permanent/>
    </Scope>
    <DFTitle/>
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      <MIME>text/plain</MIME>
    </DFType>
    <CaseSense/>
  </DFProperties>
  <Value/>
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  <DFProperties>
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    </DFFormat>
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    </DFType>
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  </DFProperties>
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    </AccessType>
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    </DFFormat>
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      <One/>
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    <Scope>
      <Permanent/>
    </Scope>
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```

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        </DFType>
        <CaseSense/>
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    <Value/>
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</Node>
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    <NodeName>Server</NodeName>
    <DFProperties>
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        </Occurrence>
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        </DFType>
    </DFProperties>
    <Node>
        <NodeName>DnsServerAddressType</NodeName>
        <DFProperties>
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                <Get/>
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            <DefaultValue>ipv4</DefaultValue>
            <Description/>
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            </Occurrence>
            <Scope>
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            </Scope>
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            </DFType>
            <CaseSense/>
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</Node>
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    <DFProperties>
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        <DefaultValue></DefaultValue>
        <Description/>
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## Annex B UE-USR Management Requirements

### B.1 UE-USR Object Model Overview

This object provides the configuration of IMPIs with IMPUs and the application mapping to user profiles.

### B.2 UE-USR Object Model Definitions

#### B.2.1 UE-USR Object Model Data Types

There are no data types defined in this section.

#### B.2.2 UE-USR Object Model Class Diagram

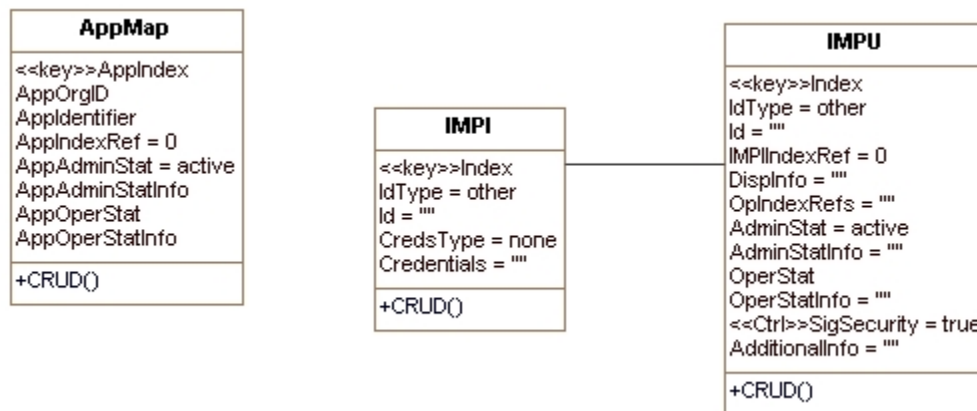


Figure 10 - UE-USR Object Model Diagram

#### B.2.3 UE-USR Object Model Description

##### B.2.3.1 IMPU Object

This object represents Users associated with the eUE. Specifically it provides information related to the IM Public Identity (IMPU) of the User.

- Object Operations:

Each entry in this object describes an association of a user IMPU with the eUE indexed by a IMPU Identifier. The eUE uses the entries in this table to register the user in a PacketCable Network. The credentials for registration are obtained using the association with an IMPI object instance, referenced via the IMPI.IndexRef attribute. If two or more active entries have the same IMPU ID, the eUE uses the entry with the lowest Index. The eUE MAY store pre-configured associations in NVRAM. This Object defines the row status associated with this particular User in the IMPU object. An entry in this table is not qualified for activation until the object instances of all corresponding columns have been initialized, either by default values or via explicit SET operations. Until all object instances in this row are initialized, the status value for this realm must be 'notReady(3)'. In particular, two columnar objects must be SET: the 'IdType' and the 'Id'. Once these two objects have been set, the row status may be SET to 'active(1)'. The eUE MUST not allow these two objects to be changed while the row is 'active'. The value of this object has no effect on whether other columnar objects in this row can be modified.

**Table 9 - IMPU Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
Index	PktcEUETCUsrElementIndexType	key			
IdType	PktcEUETCIDType	CRUD			other
Id	PktcEUETCID	CRUD			""
IMPIIndexRef	PktcEUETCUsrElementIndexType	CRUD			0
DispInfo	AdminString	CRUD			""
OpIndexRefs	AdminString	CRUD			""
AdminStat	PktcEUETCAdminStatus	CRUD			active
AdminStatInfo	PktcEUETCStatusInfo	CRUD			""
OperStat	PktcEUETCOperStatus	R			
OperStatInfo	PktcEUETCStatusInfo	R			""
SigSecurity	boolean	CRUD			true
AdditionalInfo	AdminString	CRUD			""

- **Index**  
This key provides a user IMPU index. When the user IMPU is referenced elsewhere, such as to associate the device and a user IMPU, the Index attribute **MUST** be used as an index reference. A value of '0' **MUST NOT** be used.
- **IdType**  
The IdType attribute indicates the 'Identifier type' of the data value contained in 'Id'. Valid types include other(1), publicIdentity(2), and username(6).
- **Id**  
The Id attribute **MUST** identify the User IMPU being associated with the eUE. The type of Identifier is indicated by the attribute 'IdType'.
- **IMPIIndexRef**  
The IMPIIndexRef attribute **MUST** provide an index reference to a IMPI associated with the corresponding IMPU specified in this table entry. The index reference points to an entry in the 'IMPI' object. If this contains a value of '0', it indicates that the user IMPU is not yet associated with an IMPI and cannot be used in networks requiring authentication.
- **DispInfo**  
This optional attribute **MAY** contain human readable text describing User characteristics. Examples include User Display Name, Subscriber Identifier etc.
- **OpIndexRefs**  
This optional attribute **MAY** contain a list of comma-separated Operator domain entries where the user specified in this entry 'Id' can be used. The entries **MUST** be index references to the operator table associated with the eUE. The eUE **MAY** attempt to use the user entry in a domain or sub-domain specified by the operator table, corresponding to the entries listed here. The eUE **MUST NOT** attempt to use the user entry in a domain that is not specified by this entry. If unspecified, the eUE **MUST** use the domain identified by the IMPU.

- AppAdminStat

This attribute contains the administratively desired activation status of the user IMPU. The eUE MUST allow access to the User identified in 'Id' if the value is set to 'active', unless determined otherwise and reported in 'OperStat'. The eUE SHOULD attempt to register a User identified in 'Id' if the value is set to 'active'. PacketCable Applications can specify additional requirements for registration. If this object is set to 'inactive', all applicable sessions (e.g., SIP registration) are gracefully terminated. The eUE MUST disallow access to the User identified in 'Id' if the value is set to 'inactive'.

- AppAdminStatInfo

This attribute MAY contain information that describes the activation status indicated in 'AppAdminStat'. It indicates administratively-added information associated with administrative status of the User IMPU (e.g., 'User temporarily deactivated for maintenance').

- OperStat

This attribute contains the operational activation status of the user IMPU. This object returns the following values: 'active' When 'AppAdminStat' is 'active' and there are no run-time conditions and/or configuration errors that prohibit the users from communicating with the operator. 'inactive' When 'AppAdminStat' is 'inactive' or When 'AppAdminStat' is 'active' and there are run-time conditions that prohibit the users from communicating with the operator. 'notPresent' This value is not applicable. 'unknown' Other conditions not covered by the previous values. An example of run-time condition that can result in a value of 'inactive' is unsuccessful registration. PacketCable applications can specify additional conditions for how an IMPU is considered 'active', 'inactive', or 'notPresent', and corresponding state machine.

- OperStatInfo

This attribute contains information that describes the activation status indicated in 'OperStat', or the zero-length string if detail information is not available (e.g., 'User deactivated based on user interface input').

- SigSecurity

This element indicates the network requirement for SIP signaling with the P-CSCF. If set to 'true', the UE MUST attempt secure SIP signaling with the P-CSCF. If set to 'false', the UE MUST attempt to communicate without a secure SIP communication channel with the P-CSCF. The P-CSCF is considered to be authoritative and the UE will follow the requirements in PKT 24.229. After the P-CSCF confirms or sets the SIP secure mode, the UE MUST report such state.

Reference: PacketCable IMS Delta Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Stage 3 Specification 3GPP TS 24.229.

- AdditionalInfo

This attribute MAY contain information that describes additional information defined by PacketCable specifications, including those defining PacketCable features. PacketCable specifications are expected to use this data element to obtain additional information. To specify such additional info, the following rules apply: - Each specification planning to use this attribute MUST specify data in the following format: '<Keyword>#<value>', # being the delimiter e.g., FEATURE\_X#ABC FEATURE\_Y#<value of XYZ> - This attribute MUST be a semi-colon separated concatenation of such '<keyword>#<value>' pairs. e.g., FEATURE\_X#ABC;FEATURE\_Z#DEF - Since the '#' and ';' characters are used as delimiters, they SHOULD not be specified in the keyword. If specified, any occurrence of these characters in the value field MUST be preceded by the escape character '\' (e.g., FEATURE\_X#A\C). Occurrences of '\' MUST be preceded by itself (e.g., FEATURE\_X#A\\C\#). The following rules apply on the eUE: - The eUE MUST first separate all the keyword value pairs, using a '#' that is not preceded by '\' as the delimiter - The eUE MUST, For all recognized keywords, decipher the value by interpreting the data after considering the use of '\' as defined in this definition - The eUE MUST ignore and report all unrecognized keywords using PacketCable Management.

**B.2.3.2 IMPI Object**

This object contains the user IMPI information associated with users provisioned on the device.

- Object Operations:

Each entry in this object contains an instance of a user IMPI and associated credentials. Each IMPU provisioned in the eUE SHOULD be associated with an entry in this table. The exception is in networks where certain users are unauthenticated for application access. This object defines the row status associated with this entry. The value of the 'CredsType' object MUST NOT be modified while this object is 'active'. The value of 'Credentials' MAY be modified while this object is active if the value is consistent with the type specified by the 'CredsType' object.

**Table 10 - IMPI Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
Index	PktcEUETCUsrElementIndexType	key			
IdType	PktcEUETCIDType	CRUD			other
Id	PktcEUETCID	CRUD			""
CredsType	PktcEUETCCredsType	CRUD			none
Credentials	PktcEUETCCreds	CRUD			""

- Index

This key provides a user IMPI index. When the user IMPI is referenced elsewhere, such as to associate the IMPU and an IMPI, the Index attribute MUST be used as an index reference. A value of '0' MUST NOT be used.

- IdType

The IdType attribute MUST indicate the 'Identifier type' of the data value contained in 'Id'. Valid types include other(1), privateIdentity(2), and username(6).

- Id

The Id attribute MUST identify a User IMPI being specified in this table. The type of Identifier is indicated by the attribute 'IdType'.

- CredsType

This attribute contains the type of credentials contained in the attribute 'Credentials'. Valid types include other(1), privateIdentity(2), and username(6).

- Credentials

This attribute allows the Operator to configure credentials associated with an IMPI. This value is used with, and must be consistent with, the value of the associated 'CredsType' object. If read, the Credentials attribute MUST always return an empty string value for privacy reasons. An Operator SHOULD provide this attribute only over a secured configuration interface to avoid security threats due to compromised credentials.

**B.2.3.3 AppMap Object**

This object represents Applications associated with a User IMPU.

- Object Operations:

Each entry in this object identifies an application associated with the user, the application profile index reference, administrative status, and the operational status information. This attribute defines the row status

associated with this particular User in the AppMap object. An entry in this table is not qualified for activation until the object instances of all corresponding columns have been initialized, either by default values or via explicit SET operations. Until all object instances in this row are initialized, the status value for this realm must be 'notReady(3)'. In particular, two columnar objects must be SET: the 'OrgID' and 'AppIdentifier'. Once these two objects have been set, the row status may be SET to 'active(1)'. The eUE MUST not allow these two objects to be changed while the row is 'active'. The value of this object has no effect on whether other columnar objects in this row can be modified.

**Table 11 - AppMap Object**

Attribute Name	Type	Access	Type Constraints	Units	Default
AppIndex	PktcEUETCUsrAppIndexType	key			
AppOrgID		CRUD			
AppIdentifier	PktcEUETCAppIdentifier	CRUD			
AppIndexRef	PktcEUETCUsrAppIndexType	CRUD			0
AppAdminStat	PktcEUETCAdminStatus	CRUD			active
AppAdminStatInfo	PktcEUETCStatusInfo	CRUD			
AppOperStat	PktcEUETCOperStatus	R			
AppOperStatInfo	PktcEUETCStatusInfo	R			

- **AppIndex**  
This attribute represents an index to map an application instance associated with the User IMPU.
- **AppOrgID**  
This attribute identifies the Organization specifying the App identifier contained in the attribute 'AppIdentifier'.
- **AppIdentifier**  
This attribute represents the identifier for an application associated with the User. The application identifier MUST represent an application specified by the organization specified in 'OrgID'.
- **AppIndexRef**  
This attribute represents the index reference to an application profile for the application identified by the attribute 'AppIdentifier'. If this value is set to a value of '0', then the following conditions apply: - If the application has no specific configuration data, the network activation status MUST be considered by the eUE. - If the application has configuration data elements, the eUE MUST deactivate the application. The deactivation is reported by 'AppOperStat'.
- **AppAdminStat**  
This attribute contains the administratively desired activation status of this instance. If 'active', the User can use the application. If 'inactive', the user can not use the application.
- **AppAdminStatInfo**  
This attribute represents additional information for the status information represented by 'AppAdminStat'.
- **AppOperStat**  
This attribute represents the current operational status of the user using the application specified in this entry. This object returns the following values: 'active' When 'AppAdminStat' is 'active' and there are no run-time conditions and/or configuration errors that prohibit the IMPU to use this application. 'inactive' When 'AppAdminStat' is 'inactive' or when 'AppAdminStat' is 'active' and there are run-time conditions and/or

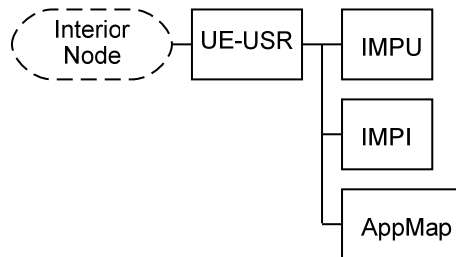
configuration errors that prohibit the IMPU to use this application. 'notPresent' When the application is not available or unknown to the UE. 'unknown' Other conditions not covered by the previous values. An example of a run-time condition that can result in a value of 'inactive' is unsuccessful user registration. PacketCable applications can specify additional conditions for how an application is considered 'active', 'inactive', or 'notPresent' for an IMPU.

- AppOperStatInfo

This attribute represents additional information for the status information represented by 'AppOperStat'. For example, the AppOperStat value 'notPresent' can report in this object the value 'UE does not support this application'.

### B.3 UE-USR OMA Management Objects (MO)

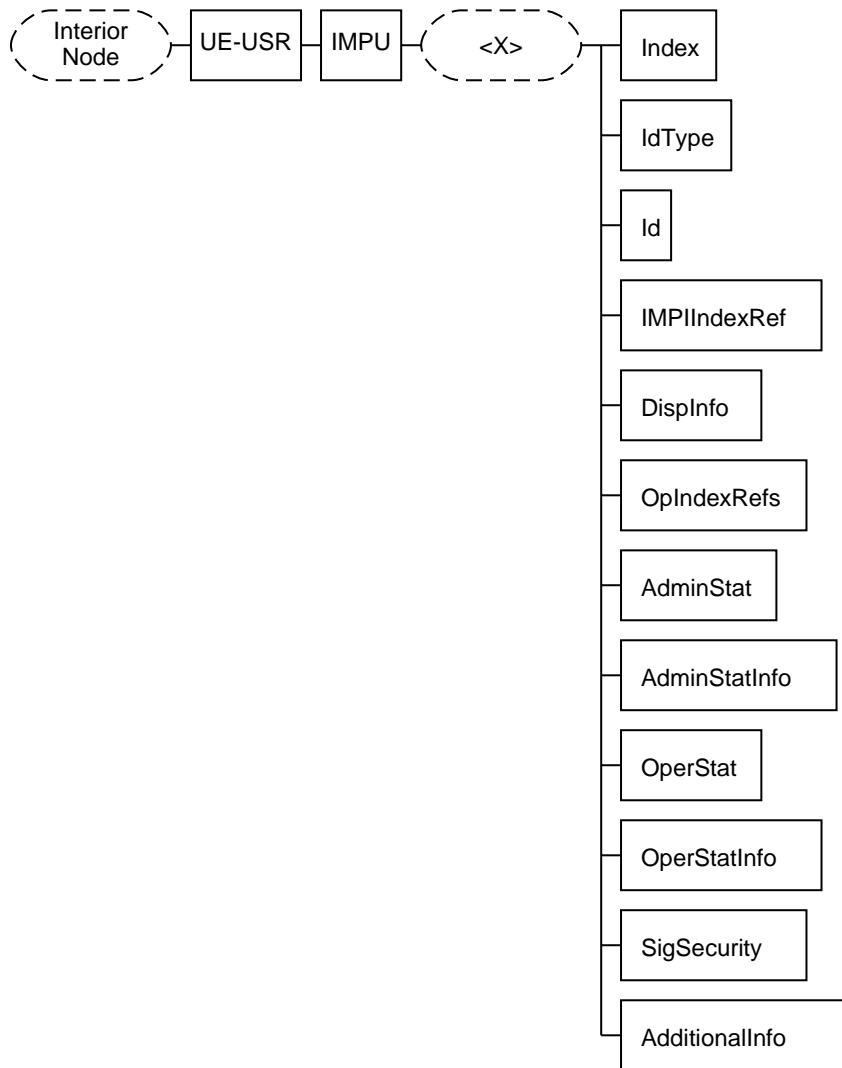
#### B.3.1 UE-USR High Level MO



*Figure 11 - UE-USR High Level OMA Management Object*

**B.3.2 UE-USR Nodes**

**B.3.2.1 UE-USR IMPU Node MO tree**



*Figure 12 - Node IMPU of UE-USR OMA Management Object*

**B.3.2.2 UE-USR IMPU MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./UE-USR/IMPU	current	One	Node	Get
./UE-USR/IMPU<X>	current	OneOrMore	Node	Add, Get, Replace
./UE-USR/Index/<X>/Index	current	OneOrZero	int	Add, Get, Replace
./UE-USR/IdType/<X>/IdType	current	OneOrZero	int	Add, Get, Replace
./UE-USR/Id/<X>/Id	current	OneOrZero	chr	Add, Get, Replace
./UE-USR/IMPIIndexRef/<X>/IMPIIndexRef	current	OneOrZero	int	Add, Get, Replace
./UE-USR/DispInfo/<X>/DispInfo	current	OneOrZero	chr	Add, Get, Replace

MO Element	Status	Occurrence	Format	Access Type
./UE-USR/OpIndexRefs/<X>/OpIndexRefs	current	OneOrZero	chr	Add, Get, Replace
./UE-USR/AdminStat/<X>/AdminStat	current	OneOrZero	int	Add, Get, Replace
./UE-USR/AdminStatInfo/<X>/AdminStatInfo	current	OneOrZero	chr	Add, Get, Replace
./UE-USR/OperStat/<X>/OperStat	current	OneOrZero	int	Get
./UE-USR/OperStatInfo/<X>/OperStatInfo	current	OneOrZero	chr	Get
./UE-USR/SigSecurity/<X>/SigSecurity	current	OneOrZero	bool	Add, Get, Replace
./UE-USR/AdditionalInfo/<X>/AdditionalInfo	current	OneOrZero	chr	Add, Get, Replace

**B.3.2.3 UE-USR IMPI Node MO tree**

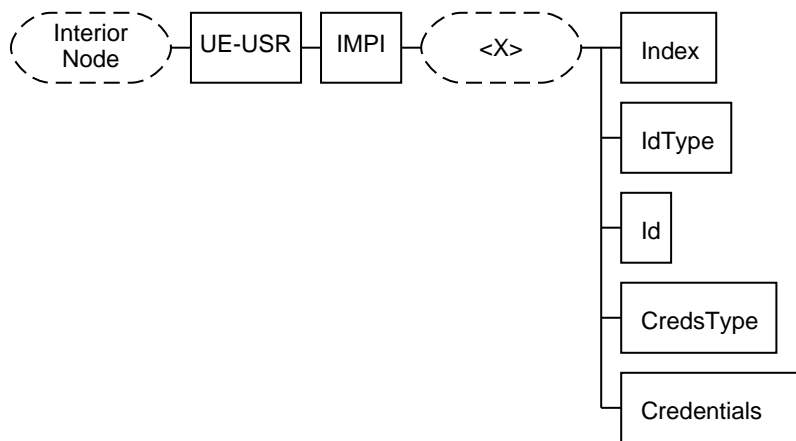


Figure 13 - Node IMPI of UE-USR OMA Management Object

**B.3.2.4 UE-USR IMPI MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./UE-USR/IMPI	current	One	Node	Get
./UE-USR/IMPI<X>	current	OneOrMore	Node	Add, Get, Replace
./UE-USR/Index/<X>/Index	current	OneOrZero	int	Add, Get, Replace
./UE-USR/IdType/<X>/IdType	current	OneOrZero	int	Add, Get, Replace
./UE-USR/Id/<X>/Id	current	OneOrZero	chr	Add, Get, Replace
./UE-USR/CredsType/<X>/CredsType	current	OneOrZero	int	Add, Get, Replace
./UE-USR/Credentials/<X>/Credentials	current	OneOrZero	chr	Add, Get, Replace

**B.3.2.5 UE-USR AppMap Node MO tree**

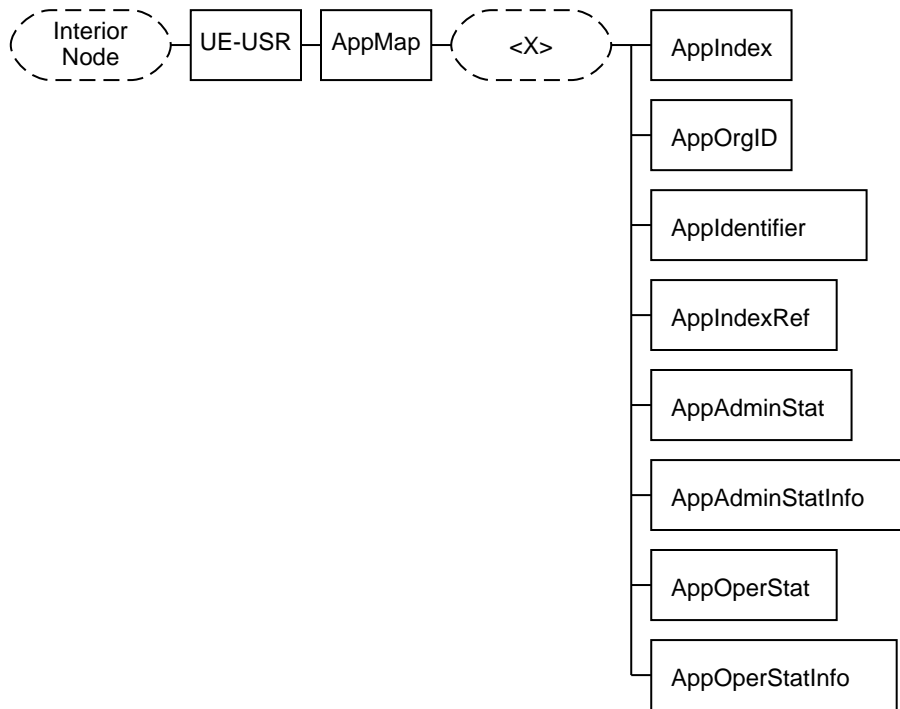


Figure 14 - Node AppMap of UE-USR OMA Management Object.vsd

**B.3.2.6 UE-USR AppMap MO Node Description**

MO Element	Status	Occurrence	Format	Access Type
./UE-USR/AppMap	current	One	Node	Get
./UE-USR/AppMap<X>	current	OneOrMore	Node	Add, Get, Replace
./UE-USR/AppIndex/<X>/AppIndex	current	OneOrZero	int	Add, Get, Replace
./UE-USR/AppOrgID/<X>/AppOrgID	current	OneOrZero	int	Add, Get, Replace
./UE-USR/AppIdentifier/<X>/AppIdentifier	current	OneOrZero	Int	Add, Get, Replace
./UE-USR/AppIndexRef/<X>/AppIndexRef	current	OneOrZero	int	Add, Get, Replace
./UE-USR/AppAdminStat/<X>/AppAdminStat	current	OneOrZero	int	Add, Get, Replace
./UE-USR/AppAdminStatInfo/<X>/AppAdminStatInfo	current	OneOrZero	chr	Add, Get, Replace
./UE-USR/AppOperStat/<X>/AppOperStat	current	OneOrZero	int	Get
./UE-USR/AppOperStatInfo/<X>/AppOperStatInfo	current	OneOrZero	chr	Get

**B.4 UE-USR OMA Device Description Framework (DDF)**

```

<?xml version="1.0"?>
<MgmtTree>
  <VerDTD>1.2</VerDTD>
  <Man>PacketCable - Cable Laboratories Inc.</Man>
  <!--This DDF considers as model the UE MO (as defined in the PacketCable
specifications) followed by a colon character (e.g., UE-USR:) -->
    
```

```

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tree.</Description>
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  </Scope>
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        <AccessType>
            <Get/>
        </AccessType>
        <DFFormat>
            <node/>
        </DFFormat>
        <Occurrence>
            <One/>
        </Occurrence>
        <DFTitle>UE-USR.AppMap</DFTitle>
        <DFType>
            <DDFName/>
        </DFType>
    </DFProperties>
    <Node>
        <NodeName/>
        <DFProperties>
            <AccessType></AccessType>
            <DFFormat>
                <node/>
            </DFFormat>
            <Occurrence>
                <OneOrMore/>
            </Occurrence>
            <DFTitle/>
            <DFType>
                <DDFName/>
            </DFType>
        </DFProperties>
    <Node>
        <NodeName>AppIndex</NodeName>
        <DFProperties>
            <AccessType></AccessType>
            <DefaultValue></DefaultValue>
            <Description/>

```

```

        <DFFormat>
            <int/>
        </DFFormat>
        <Occurrence>
            <One/>
        </Occurrence>
        <Scope>
            <Permanent/>
        </Scope>
        <DFTitle/>
        <DFType>
            <MIME>text/plain</MIME>
        </DFType>
        <CaseSense/>
    </DFProperties>
    <Value/>
</Node>
<Node>
    <NodeName>AppIdentifier</NodeName>
    <DFProperties>
        <AccessType></AccessType>
        <DefaultValue></DefaultValue>
        <Description/>
        <DFFormat>
            <int/>
        </DFFormat>
        <Occurrence>
            <One/>
        </Occurrence>
        <Scope>
            <Permanent/>
        </Scope>
        <DFTitle/>
        <DFType>
            <MIME>text/plain</MIME>
        </DFType>
        <CaseSense/>
    </DFProperties>
    <Value/>
</Node>
<Node>
    <NodeName>AppIndexRef</NodeName>
    <DFProperties>
        <AccessType></AccessType>
        <DefaultValue>0</DefaultValue>
        <Description/>
        <DFFormat>
            <int/>
        </DFFormat>
        <Occurrence>
            <One/>
        </Occurrence>
        <Scope>
            <Permanent/>
        </Scope>
        <DFTitle/>
        <DFType>
            <MIME>text/plain</MIME>
        </DFType>
        <CaseSense/>
    </DFProperties>
    <Value/>
</Node>
<Node>
    <NodeName>AppAdminStat</NodeName>

```

```

    <DFProperties>
      <AccessType></AccessType>
      <DefaultValue>active</DefaultValue>
      <Description/>
      <DFFormat>
        <int/>
      </DFFormat>
      <Occurrence>
        <One/>
      </Occurrence>
      <Scope>
        <Permanent/>
      </Scope>
      <DFTitle/>
      <DFType>
        <MIME>text/plain</MIME>
      </DFType>
      <CaseSense/>
    </DFProperties>
  <Value/>
</Node>
<Node>
  <NodeName>AppAdminStatInfo</NodeName>
  <DFProperties>
    <AccessType></AccessType>
    <DefaultValue></DefaultValue>
    <Description/>
    <DFFormat>
      <chr/>
    </DFFormat>
    <Occurrence>
      <One/>
    </Occurrence>
    <Scope>
      <Permanent/>
    </Scope>
    <DFTitle/>
    <DFType>
      <MIME>text/plain</MIME>
    </DFType>
    <CaseSense/>
  </DFProperties>
  <Value/>
</Node>
<Node>
  <NodeName>AppOperStat</NodeName>
  <DFProperties>
    <AccessType>
      <Get/>
    </AccessType>
    <DefaultValue></DefaultValue>
    <Description/>
    <DFFormat>
      <int/>
    </DFFormat>
    <Occurrence>
      <One/>
    </Occurrence>
    <Scope>
      <Permanent/>
    </Scope>
    <DFTitle/>
    <DFType>
      <MIME>text/plain</MIME>
    </DFType>
    <CaseSense/>
  </DFProperties>
  <Value/>
</Node>

```

```
        </DFProperties>
        <Value/>
    </Node>
    <Node>
        <NodeName>AppOperStatInfo</NodeName>
        <DFProperties>
            <AccessType>
                <Get/>
            </AccessType>
            <DefaultValue></DefaultValue>
            <Description/>
            <DFFormat>
                <chr/>
            </DFFormat>
            <Occurrence>
                <One/>
            </Occurrence>
            <Scope>
                <Permanent/>
            </Scope>
            <DFTitle/>
            <DFType>
                <MIME>text/plain</MIME>
            </DFType>
            <CaseSense/>
        </DFProperties>
        <Value/>
    </Node>
</Node>
</Node>
</Node>
</MgmtTree>
```

## Annex C UE-BOOT Management Requirements

### C.1 UE-BOOT Object Model Overview

This section defines the management model of the UE Bootstrapping configuration and management.

Unless specified. The UE MUST NOT persist operator configuration data using the data models herein described. Other documents that reference this object model might change the persistent requirement of the device.

### C.2 UE-BOOT Object Model Definitions

#### C.2.1 UE-BOOT Object Model Data Types

There are no Data Types defined for the UE-Boot object model.

#### C.2.2 UE-BOOT Object Model Class Diagram

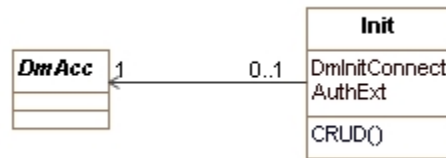


Figure 15 - UE-BOTT Object Model Diagram

#### C.2.3 UE-BOOT Object Model Description

##### C.2.3.1 Init Object

Table 12 - Boot Object

Attribute Name	Type	Access	Type Constraints	Units	Default
DmInitConnect	boot	RU			
AuthExt	char	RU			"

- DmInitConnect**  
 This attribute indicates describes whether the device will immediately initiate an OMA DM HTTP connection (beginning with Pkg #1) on device reset.
- AuthExt**  
 This attribute describes the Authorization extension method used for this DM Server.  
 The zero-length string indicates standard DMAcc authorization mechanisms are used.  
 The value '3GPP-GBA' indicates that GBA Authorization is used. In this case, the OMA DM DMAcc AppAddr list of elements (in the order they are stored) are used to match instances of the BSF object to determine the credentials being used for client authorization.

### C.3 UE-BOOT OMA Management Objects (MO)

#### C.3.1 CLIENT-DEV High Level MO

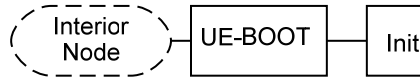


Figure 16 - UE-BOOT High Level OMA Management Object

#### C.3.2 UE-BOOT Nodes

##### C.3.2.1 UE-BOOT Init Node MO tree

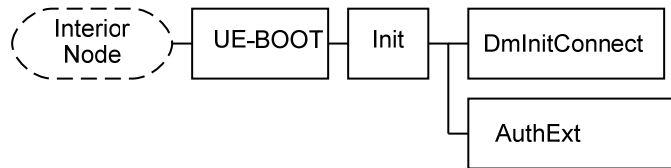


Figure 17 - Node Init of UE-BOOT OMA Management Object

##### C.3.2.2 UE-BOOT Init MO Node Description

MO Element	Status	Occurrence	Format	Access Type
<X>/Ext/Pktc2/Boot	current	One	Node	Add, Get
<X>/Ext/Pktc2/Boot/Init	current	One	Node	Add, Get
<X>/Ext/Pktc2/Boot/Init/DmInitConnect	current	OneOrZero	bool	Add, Get, Replace
<X>/Ext/Pktc2/Boot/Init/AuthExt	current	OneOrZero	chr	Add, Get, Replace

### C.4 UE-BOOT OMA Device Description Framework (DDF)

```

<?xml version="1.0"?>
<MgmtTree>
  <VerDTD>1.2</VerDTD>
  <Man>PacketCable - Cable Laboratories Inc.</Man>
  <!--This DDF considers as model the UE MO (as defined in the PacketCable
specifications) followed by a colon character (e.g., UE-BOOT:) -->
  <Mod>UE-BOOT:</Mod>
  <Node>
    <NodeName>UE-BOOT</NodeName>
    <Path>./Pktc2</Path>
    <DFProperties>
      <AccessType>
        <Get/>
      </AccessType>
      <DefaultValue/>
      <Description>The node that defines the UE-BOOT MO
tree.</Description>
    <DFFormat>
      <node/>
    </DFFormat>
    <Occurrence>
      <One/>
    </Occurrence>
  </Node>
</MgmtTree>
  
```

```

        <Scope>
            <Permanent/>
        </Scope>
        <DFTitle>The interior node holding all nodes of the PacketCable
UE-BOOT MO three</DFTitle>
        <DFType>
            <DDFName>urn:cablelabs:pktc2:oma:dm:ue-boot</DDFName>
        </DFType>
        <CaseSense>
            <CIS/>
        </CaseSense>
    </DFProperties>
    <Node>
        <NodeName>Init</NodeName>
        <DFProperties>
            <AccessType>
                <Get/>
            </AccessType>
            <DFFormat>
                <node/>
            </DFFormat>
            <Occurrence>
                <One/>
            </Occurrence>
            <DFTitle>UE-BOOT.Init</DFTitle>
            <DFType>
                <DDFName/>
            </DFType>
        </DFProperties>
    </Node>
        <NodeName/>
        <DFProperties>
            <AccessType></AccessType>
            <DFFormat>
                <node/>
            </DFFormat>
            <Occurrence>
                <OneOrMore/>
            </Occurrence>
            <DFTitle/>
            <DFType>
                <DDFName/>
            </DFType>
        </DFProperties>
    </Node>
        <NodeName>DmInitConnect</NodeName>
        <DFProperties>
            <AccessType></AccessType>
            <DefaultValue></DefaultValue>
            <Description/>
            <DFFormat>
                <bool/>
            </DFFormat>
            <Occurrence>
                <One/>
            </Occurrence>
            <Scope>
                <Permanent/>
            </Scope>
            <DFTitle/>
            <DFType>
                <MIME>text/plain</MIME>
            </DFType>
            <CaseSense/>
        </DFProperties>
        <Value/>
    </Node>

```

```

        <Node>
          <NodeName>AuthExt</NodeName>
          <DFProperties>
            <AccessType>
              <Get/>
            </AccessType>
            <DefaultValue>' '</DefaultValue>
            <Description/>
            <DFFormat>
              <int/>
            </DFFormat>
            <Occurrence>
              <One/>
            </Occurrence>
            <Scope>
              <Permanent/>
            </Scope>
            <DFTitle/>
            <DFType>
              <MIME>text/plain</MIME>
            </DFType>
            <CaseSense/>
          </DFProperties>
          <Value/>
        </Node>
      </Node>
    </Node>
  <Node>
    <NodeName>DmAcc</NodeName>
    <DFProperties>
      <AccessType>
        <Get/>
      </AccessType>
      <DFFormat>
        <node/>
      </DFFormat>
      <Occurrence>
        <One/>
      </Occurrence>
      <DFTitle>UE-BOOT.DmAcc</DFTitle>
      <DFType>
        <DDFName/>
      </DFType>
    </DFProperties>
  </Node>
</Node>
</MgmtTree>

```

## Acknowledgements

CableLabs wishes to thank the PacketCable Provisioning focus team participants for various contributions and efforts that led to the development of this specification. Specifically, the following individuals are thanked for their direct contributions (alphabetical by company name):

Lakshmi Raman (CableLabs)

Sumanth Channabasappa (CableLabs)

Josh Littlefield (Cisco)

Eugene Nechamkin (Broadcom)

Thomas Clack (Broadcom)

Donald Joong (Ericsson)

Mark Trayer (Samsung)

Special thanks are extended to Eugene Nechamkin and Thomas Clack for their analysis of the UE Management requirements that permitted the development of the object models and OMA DM requirements of this specification.

*Eduardo Cardona and the PacketCable Architects, CableLabs, Inc.*

