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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital transmission systems – Digital networks – Management of transport network

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Computational viewpoint for pre-provisioned link management

ITU-T Recommendation G.854.12

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION G.854.12

COMPUTATIONAL VIEWPOINT FOR PRE-PROVISIONED LINK MANAGEMENT

Summary

The pre-provisioned link management service provides functionality to add/remove transport entities (link connections or connection termination points) to/from client linking entities (links/link ends). The client linking entities have to be created using the topology management community (see G.85x.3 series of Recommendations). The transport entities that could be potentially added to the client linking entity have to be provided using either the pre-provisioned adaptation management (see G.85x.8 series of Recommendations) within topological linking entities or using the link management within client linking entities.

Enterprise community actions covered by this Recommendation:

– COMMUNITY plm "pre-provisioned link management";

– "add transport entities to client linking entity";

– "remove transport entities from client linking entity";

– "report client linking entity capacity change".

Source

ITU-T Recommendation G.854.12 was prepared by ITU-T Study Group 4 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 26th of March 1999.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation the term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration, ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

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As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Recommendation G.854.12

COMPUTATIONAL VIEWPOINT FOR PRE-PROVISIONED LINK MANAGEMENT

(Geneva, 1999)

1 Scope

This computational viewpoint specification is related to the pre-provisioned link management enterprise specification defined in Recommendation G.852.12 and to the pre-provisioned link management information specification defined in Recommendation G.853.12.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation G.851.1 (1996), *Management of the transport network – Application of the RM-ODP framework.*

[2] ITU-T Recommendation G.853.1 (1999), *Common elements of the information viewpoint for the management of a transport network.*

[3] ITU-T Recommendation G.852.12 (1999), *Enterprise viewpoint for pre-provisioned link management.*

[4] ITU-T Recommendation G.853.12 (1999), *Information viewpoint for pre-provisioned link management.*

[5] ITU-T Recommendation G.852.8 (1999), *Enterprise viewpoint for pre-provisioned adaptation management.*

[6] ITU-T Recommendation G.853.8 (1999), *Information viewpoint for pre-provisioned adaptation management.*

3 Definitions

None.

4 Abbreviations

This Recommendation uses the following abbreviations:

ASN.1 Abstract Syntax Notation One

CTP Connection Termination Point

Id Identifier

Ifce Interface

layerND Layer Network Domain
LC Link Connection
LE LinkEnd
LND Layer Network Domain
ND Network Domain
pam Pre-provisioned Adaptation Management
plm Pre-provisioned Link Management

5 Conventions

In order to increase the readability of the behaviour in the operations:

– parameters are written in **bold**;

– elements defined in the information specification are written in *italic*.

In this Recommendation, when an interface is used in an ASN.1 production, the same label will be used starting with a capital letter. This complete ASN.1 production for this Query Interface (e.g. use of OBJECT IDENTIFIER, INTEGER, etc.) will be developed as part of the Engineering Viewpoint within the concerned technology.

6 Label references

Table 1/G.854.12 – Label references

Full label reference	Local label reference
<"Rec. G.853.12", INFORMATION_OBJECT:plmClientLink>	plmClientLink
<"Rec. G.853.12", INFORMATION_OBJECT:plmClientLinkEnd>	plmClientLinkEnd
<"Rec. G.853.12", INFORMATION_OBJECT:plmLayerNetworkDomain>	plmLayerNetworkDomain
<"Rec. G.853.12", INFORMATION_OBJECT:plmLinkConnection>	plmLinkConnection
<"Rec. G.853.12", INFORMATION_OBJECT:plmNetworkCTP>	plmNetworkCTP
<"Rec. G.853.12", INFORMATION_OBJECT:plmProviderLink>	plmProviderLink
<"Rec. G.853.12", INFORMATION_OBJECT:plmProviderLinkEnd>	plmProviderLinkEnd
<"Rec. G.853.1", INFORMATION_RELATIONSHIP:linkHasLink Connections>	linkHasLinkConnections
<"Rec. G.853.1", INFORMATION_RELATIONSHIP:linkEndHas NetworkCTPs>	linkEndHasNetworkCTPs
<"Rec. G.853.1", INFORMATION_RELATIONSHIP:representSame ResourceAs>	representSameResourceAs
<"Rec. G.853.8", ATTRIBUTE:pamAvailableLinkCapacity>	pamAvailableLinkCapacity

Full ASN.1 production reference	Local label reference
<"Rec. X.721 : 1992 : Attribute-ASN1Module" : SimpleNameType>	SimpleNameType
<"Rec. X.680 : 1997" : INTEGER>	INTEGER

7 Interfaces

7.1 Query interfaces

This specification refers to interfaces that allow get access identification and properties of resources involved in the "pre-provisioned link management" community. As the invocation of contained operations do not modify any state, there is no interest to develop them explicitly. Their exact signature will be developed as part of the engineering viewpoint, with the concerned technology. These interfaces are listed in Table 2 with the information to which they allow access to.

Table 2/G.854.12 – Correspondence between interface names, information objects, attributes and relationships

Interface name	Information object	Attributes and relationships
plmClientLinkQueryIfce	<plmClientLink>	<resourceId> <signalIdentification> <linkDirectionality> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkHasLinkConnections, ROLE: elementLC>
plmClientLinkEndQueryIfce	<plmClientLinkEnd>	<resourceId> <signalIdentification> <topologicalEndDirection> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkEndHasNetworkCTPs, ROLE: elementCTP>
plmLayerNetworkDomainQueryIfce	<plmLayerNetworkDomain>	<resourceId> <signalIdentification> <layerNetworkDomainIsMadeOf, ROLE: element>
plmLinkConnectionQueryIfce	<plmLinkConnection>	<resourceId> <signalIdentification> <directionality> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkHasLinkConnections, ROLE: containerLink>
plmNetworkCTPQueryIfce	<plmNetworkCTP>	<resourceId> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkEndHasNetworkCTPs, ROLE: containerLE>

Table 2/G.854.12 – Correspondence between interface names, information objects, attributes and relationships *(concluded)*

Interface name	Information object	Attributes and relationships
plmProviderLinkQueryIfce	<plmProviderLink>	<resourceId> <signalIdentification> <linkDirectionality> <pamAvailableLinkCapacity> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkHasLinkConnections, ROLE: elementLC>
plmProviderLinkEndQueryIfce	<plmProviderLinkEnd>	<resourceId> <signalIdentification> <topologicalEndDirection> <pamAvailableLinkCapacity> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkEndHasNetworkCTPs, ROLE: elementCTP>

7.2 Operational interfaces

7.2.1 Pre-provisioned link management interface

The pre-provisioned link management interface provides functionality for adding and removing link connections within links (arc-oriented view). It satisfies the enterprise requirements stated in <"Rec. G.852.12", COMMUNITY: Pre-provisioned Link Management, ACTION: add transport entities to client linking entity and ACTION: remove transport entities from client linking entity>.

```
COMPUTATIONAL_INTERFACE plmLinkManagementIfce {
        OPERATION  <addLinkConnectionToLink>;
        OPERATION  <removeLinkConnectionFromLink>; }
```

7.2.1.1 add linkConnection to link

<COMMUNITY:Pre Provisioned Link Management, ACTION: add transport entities to client linking entity>

```
OPERATION addLinkConnectionToLink {
        INPUT_PARAMETERS
            layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
            involvedClientLink: PlmClientLinkId;
            involvedProviderLink: PlmProviderLinkId;
            requestedLinkConnections: PlmRequestedLinkConnectionChoice;

        OUTPUT_PARAMETERS
            providedLinkConnections: SetOfPLMLinkConnections;

        RAISED_EXCEPTIONS
            clientLinkDoNotExist: plmClientLink;
            providerLinkDoNotExist: plmProviderLink;
            linkAndLinkConnectionNotCompatible: plmLinkConnection;
            notEnoughLinkConnections: number ::= INTEGER;
            noLinkCapacity: NULL;
            failureToAddLinkConnections: NULL;
            failureToIncreaseCapacity: NULL;
```

BEHAVIOUR

SEMI_FORMAL

PARAMETER_MATCHING
layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLink: <INFORMATION OBJECT plmClientLink>;
involvedProviderLink: <INFORMATION OBJECT plmProviderLink>;
setOfPLMLinkConnections ELEMENTS: <INFORMATION OBJECT
plmLinkConnection>;

PRE_CONDITIONS
inv_clientLinkAvailable
"**involvedClientLink** shall refer to *element* of the <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_providerLinkAvailable
"**involvedProviderLink** shall refer to *element* of the <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_linkAndLinkConnectionCompatible
"**requestedLinkConnections** shall refer to *elementLC* of the <*linkHasLinkConnections*> relationship where **involvedProviderLink** refers to *containerLink*."

inv_requestedNumberOfLinkConnectionsAvailable
"the number of available (available means: the requested link connections shall not participate in any <*representSameResourceAs*> relationship) linkConnections in <*pamAvailableLinkCapacity*> of **involvedProviderLink** has to be greater than or equal to the number of requested linkConnections referred to by **requestedLinkConnections**."

inv_linkCapacityNotEmpty
"the number of available link connections in <*pamAvailableLinkCapacity*> of **involvedProviderLink** has to be greater than zero."

POST_CONDITIONS
inv_addLinkConnections
"every link connection of **requestedLinkConnections** is an *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

inv_capacityIncrease
"<*pamAvailableLinkCapacity*> of <*plmLink*> referred to by **involvedClientLink** has been increased by the number of <*plmLinkConnections*> that have been requested to be added in **requestedLinkConnections**.";

EXCEPTIONS
IF PRE_CONDITION inv_clientLinkAvailable NOT_VERIFIED
RAISE_EXCEPTION clientLinkDoNotExist;
IF PRE_CONDITION inv_providerLinkAvailable NOT_VERIFIED
RAISE_EXCEPTION providerLinkDoNotExist;
IF PRE_CONDITION inv_linkAndLinkConnectionCompatible NOT_VERIFIED
RAISE_EXCEPTION linkAndLinkConnectionNotCompatible;
IF PRE_CONDITION inv_requestedNumberOfLinkConnectionsAvailable
NOT_VERIFIED RAISE_EXCEPTION notEnoughLinkConnections;
IF PRE_CONDITION inv_ linkCapacityNotEmpty NOT_VERIFIED
RAISE_EXCEPTION noLinkCapacity;
IF POST_CONDITION inv_addLinkConnections NOT_VERIFIED
RAISE_EXCEPTION failureToAddLinkConnections;
IF POST_CONDITION inv_capacityIncrease NOT_VERIFIED RAISE_EXCEPTION
failureToIncreaseCapacity;
; }

7.2.1.2 remove LinkConnection from Link

<COMMUNITY: Pre Provisioned Link Management, ACTION: remove transport entities from client linking entity>

OPERATION removeLinkConnectionFromLink {

INPUT_PARAMETERS

layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLink: PlmClientLinkId;
involvedLinkConnections: SetOfPlmLinkConnections;

OUTPUT_PARAMETERS

-- *none*

RAISED_EXCEPTIONS

linkDoNotExist: plmClientLink;
invalidLinkConnection: plmLinkConnection;
failureToRemoveLCs: NULL;
failureToDecreaseCapacity: NULL;

BEHAVIOUR

SEMI-FORMAL

PARAMETER_MATCHING

layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLink: <INFORMATION OBJECT plmClientLink>;
involvedLinkConnections ELEMENTS: <INFORMATION OBJECT plmLinkConnection>;

PRE_CONDITIONS

inv_linkAvailable

"**involvedClientLink** shall refer to *element* of the <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_existingLinkConnections

"**involvedLinkConnections** refers to *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

POST_CONDITIONS

inv_LinkConnectionsRemoved

"None of the **involvedLinkConnections** refer to *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

inv_capacityDecrease

"<*pamAvailableLinkCapacity*> of <*plmLink*> referred to by **involvedClientLink** has been decreased by the number of <*plmLinkConnections*> in **involvedLinkConnections** that have been requested to be removed.";

EXCEPTIONS

IF PRE_CONDITION inv_linkAvailable NOT_VERIFIED RAISE_EXCEPTION linkDoNotExist;
IF PRE_CONDITION inv_existingLinkConnections NOT_VERIFIED RAISE_EXCEPTION invalidLinkConnection;
IF POST_CONDITION inv_LinkConnectionsRemoved NOT_VERIFIED RAISE_EXCEPTION failureToRemoveLCs;
IF POST_CONDITION inv_capacityDecrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;

}

7.2.2 Pre-provisioned link end management interface

The pre-provisioned link end management interface provides functionality for adding and removing CTPs within link ends (point-oriented view). It satisfies the enterprise requirements stated in <"Rec. G.852.12", COMMUNITY: Pre-provisioned Link Management, ACTION: add transport entities to client linking entity and ACTION: remove transport entities from client linking entity>.

COMPUTATIONAL_INTERFACE plmLinkEndManagementIfce {

OPERATION <addNetworkCTPToLinkEnd>;
OPERATION <removeNetworkCTPFromLinkEnd>;

7.2.2.1 add NetworkCTP to Link End

<COMMUNITY:Pre Provisioned Link Management, ACTION: add transport entities to client linking entity>

OPERATION addNetworkCTPToLinkEnd {

INPUT_PARAMETERS

layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLinkEnd: PlmClientLinkEndId;
involvedProviderLinkEnd: PlmProviderLinkEndId;
requestedNetworkCTPs: PlmRequestedNetworkCTPChoice;

OUTPUT_PARAMETERS

providedNetworkCTPs: SetOfPLMNetworkCTPs;

RAISED_EXCEPTIONS

clientLinkEndDoNotExist: plmClientLinkEnd;
providerLinkEndDoNotExist: plmProviderLinkEnd;
linkEndAndNetworkCTPNotCompatible: plmNetworkCTP;
notEnoughNetworkCTPs: number ::= INTEGER;
noLinkEndCapacity: NULL;
failureToAddNetworkCTPs: NULL;
failureToIncreaseCapacity: NULL;

BEHAVIOUR

SEMI_FORMAL

PARAMETER_MATCHING

layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLinkEnd: <INFORMATION OBJECT plmClientLinkEnd>;
involvedProviderLinkEnd: <INFORMATION OBJECT plmProviderLinkEnd>;
setOfPLMNetworkCTPs ELEMENTS: <INFORMATION OBJECT plmNetworkCTP>;

PRE_CONDITIONS

inv_clientLinkEndAvailable
"**involvedClientLinkEnd** shall refer to *element* of the <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_providerLinkEndAvailable
"**involvedProviderLinkEnd** shall refer to *element* of the <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_linkEndAndNetworkCTPCompatible
"**requestedNetworkCTPs** shall refer to *elementCTP* of the <*linkEndHasNetworkCTPs*> relationship where **involvedProviderLinkEnd** refers to *containerLE*."

inv_requestedNumberOfNetworkCTPsAvailable
"the number of available (available means: the requested networkCTPs shall not participate in any <*representSameResourceAs*> relationship) networkCTPs in <*pamAvailableLinkCapacity*> of **involvedProviderLinkEnd** has to be greater than or equal to the number of requested networkCTPs referred to by **requestedNetworkCTPs**."

inv_linkEndCapacityNotEmpty
"the number of available networkCTPs in <*pamAvailableLinkCapacity*> of **involvedProviderLinkEnd** has to be greater than zero."

POST_CONDITIONS

inv_addNetworkCTPs
"every networkCTP of **requestedNetworkCTPs** refers to *elementCTP* in a <*linkEndHasNetworkCTPs*> relationship where **involvedClientLinkEnd** refers to *containerLE*."

inv_capacityIncrease
"<*pamAvailableLinkCapacity*> of <*plmLinkEnd*> referred to by **involvedClientLinkEnd** has been increased by the number of <*plmNetworkCTPs*> that have been requested to be added in **requestedNetworkCTPs**.";

EXCEPTIONS
IF PRE_CONDITION inv_clientLinkEndAvailable NOT_VERIFIED RAISE_EXCEPTION
clientLinkEndDoNotExist;
IF PRE_CONDITION inv_providerLinkEndAvailable NOT_VERIFIED RAISE_EXCEPTION
providerLinkEndDoNotExist;
IF PRE_CONDITION inv_linkEndAndNetworkCTPCompatible NOT_VERIFIED RAISE_EXCEPTION
linkEndAndNetworkCTPNotCompatible;
IF PRE_CONDITION inv_requestedNumberOfNetworkCTPsAvailable NOT_VERIFIED
RAISE_EXCEPTION notEnoughNetworkCTPs;
IF PRE_CONDITION inv_ linkEndCapacityNotEmpty NOT_VERIFIED RAISE_EXCEPTION
noLinkEndCapacity;
IF POST_CONDITION inv_addNetworkCTPs NOT_VERIFIED RAISE_EXCEPTION
failureToAddNetworkCTPs;
IF POST_CONDITION inv_capacityIncrease NOT_VERIFIED RAISE_EXCEPTION
failureToIncreaseCapacity;
; }

7.2.2.2 remove NetworkCTP from Link End

<COMMUNITY: Pre Provisioned Link Management, ACTION: remove transport entities from client linking entity>

OPERATION removeNetworkCTPFromLinkEnd {
INPUT_PARAMETERS
layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLinkEnd: PlmClientLinkEndId;
involvedNetworkCTPs: SetOfPlmNetworkCTPs;

OUTPUT_PARAMETERS
-- *none*

RAISED_EXCEPTIONS
linkEndDoNotExist: plmClientLinkEnd;
invalidNetworkCTP: plmNetworkCTP;
failureToRemoveNetworkCTPs: NULL;
failureToDecreaseCapacity: NULL;

BEHAVIOUR

SEMI-FORMAL

PARAMETER_MATCHING
layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLinkEnd: <INFORMATION OBJECT plmClientLinkEnd>;
involvedNetworkCTPs ELEMENTS: <INFORMATION OBJECT plmNetworkCTP>;

PRE_CONDITIONS
inv_linkEndAvailable
"**involvedClientLinkEnd** shall refer to *element* of the <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_existingNetworkCTPs
"**involvedNetworkCTPs** refers to *elementCTP* in a <*linkEndHasNetworkCTPs*> relationship where **involvedLinkEnd** refers to *containerLE*."

POST_CONDITIONS
inv_networkCTPsRemoved
"None of the **involvedNetworkCTPs** shall refer to *elementCTP* in a <*linkEndHasNetworkCTPs*> relationship where **involvedLinkEnd** refers to *containerLE*."

inv_capacityDecrease
"<*pamAvailableLinkCapacity*> of <*plmLinkEnd*> referred to by **involvedLinkEnd** has been decreased by the number of <*plmNetworkCTPs*> in **involvedNetworkCTPs** that have been requested to be removed.";

EXCEPTIONS
IF PRE_CONDITION inv_linkEndAvailable NOT_VERIFIED RAISE_EXCEPTION
linkEndDoNotExist;

IF PRE_CONDITION inv_existingNetworkCTPs NOT_VERIFIED
RAISE_EXCEPTION invalidNetworkCTP;
IF POST_CONDITION inv_networkCTPsRemoved NOT_VERIFIED
RAISE_EXCEPTION failureToRemoveNetworkCTPs;
IF POST_CONDITION inv_capacityDecrease NOT_VERIFIED RAISE_EXCEPTION
failureToDecreaseCapacity;
}

7.3 Report interfaces

7.3.1 Pre-provisioned link management reporting interface

The pre-provisioned link management reporting interface provides functionality for the reporting of the adding/removing of link connections to/from links (arc-oriented view). It satisfies the enterprise requirements stated in <"Rec. G.852.10", COMMUNITY: Pre-provisioned Link Management, ACTION: report client linking entity capacity change>.

COMPUTATIONAL_INTERFACE plmLinkManagementReportingIfce {
OPERATION <reportLinkConnectionAddedToLink>;
OPERATION <reportLinkConnectionRemovedFromLink>; }

7.3.1.1 Report Link Connection Added To Link

<COMMUNITY: Pre Provisioned Link Connection Management, ACTION: report client linking entity capacity change>

OPERATION reportLinkConnectionAddedToLink {
INPUT PARAMETERS
layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLink: PlmClientLinkId;
addedLinkConnections: SetOfPlmLinkConnections;

OUTPUT PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

SEMI-FORMAL

PARAMETER_MATCHING
layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLink: <INFORMATION OBJECT plmClientLink>;
addedLinkConnections ELEMENTS: <INFORMATION OBJECT plmLinkConnection>;

TRIGGERING CONDITIONS

PRE-CONDITIONS
inv_linkAndLinkConnectionExistingAndCompatible
"**involvedClientLink** and **addedLinkConnections** shall refer to *element* of the same <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_notInLink
"None of the link connections in **addedLinkConnections** shall refer to *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

POST_CONDITIONS
inv_inLink
"Every link connection in **addedLinkConnections** shall refer to *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

EXCEPTIONS
-- *none*
;}

7.3.1.2 Report Link Connection Removed From Link

<COMMUNITY: Pre Provisioned Link Connection Management, ACTION: report client linking entity capacity change>

OPERATION reportLinkConnectionRemovedFromLink {

INPUT PARAMETERS

layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLink: PlmClientLinkId;
removedLinkConnections: SetOfPlmLinkConnections;

OUTPUT PARAMETERS

-- *none*

RAISED EXCEPTIONS

-- *none*

BEHAVIOUR

SEMI-FORMAL

PARAMETER_MATCHING

layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLink: <INFORMATION OBJECT plmClientLink>
removedLinkConnections ELEMENTS: <INFORMATION OBJECT plmLinkConnection>

TRIGGERING CONDITIONS

PRE-CONDITIONS

inv_linkAndLinkConnectionExistingAndCompatible

"**involvedClientLink** and **removedLinkConnections** shall refer to *element* of the same <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_inLink

"Every link connection in **removedLinkConnections** shall refer to *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

POST_CONDITIONS

inv_notInLink

"None of the link connections in **removedLinkConnections** shall refer to *elementLC* in a <*linkHasLinkConnections*> relationship where **involvedClientLink** refers to *containerLink*."

EXCEPTIONS

-- *none*

;}

7.3.2 Pre-provisioned link end management reporting interface

The pre-provisioned link end management reporting interface provides functionality for the reporting of the adding/removing of networkCTPs to/from link ends (point-oriented view). It satisfies the enterprise requirements stated in <"Rec. G.852.10", COMMUNITY: Pre-provisioned Link Management, ACTION: report client linking entity capacity change>.

COMPUTATIONAL_INTERFACE plmLinkEndManagementReportingIfce {

OPERATION <reportNetworkCTPAddedToLinkEnd>;
OPERATION <reportNetworkCTPRemovedFromLinkEnd>; }

7.3.2.1 Report NetworkCTP Added To Link End

<COMMUNITY: Pre Provisioned Link Connection Management, ACTION: report client linking entity capacity change>

OPERATION reportNetworkCTPAddedToLinkEnd {

INPUT PARAMETERS

layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLinkEnd: PlmClientLinkEndId;
addedNetworkCTPs: SetOfPlmNetworkCTPs;

OUTPUT PARAMETERS
-- none

RAISED EXCEPTIONS
-- none

BEHAVIOUR

SEMI-FORMAL

PARAMETER_MATCHING
layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLinkEnd: <INFORMATION OBJECT plmClientLinkEnd>;
addedNetworkCTPs ELEMENTS: <INFORMATION OBJECT plmNetworkCTP>;

TRIGGERING CONDITIONS

PRE-CONDITIONS
inv_linkEndAndNetworkCTPExistingAndCompatible
"**involvedClientLinkEnd** and **addedNetworkCTPs** shall refer to *element* of the same <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_notInLinkEnd
"None of the networkCTPs in **addedNetworkCTPs shall** refer to *elementCTP* of a <*linkEndHasNetworkCTPs*> relationship where **involvedClientLinkEnd** refers to *containerLE*."

POST_CONDITIONS

inv_inLinkEnd
"Every networkCTP in **addedNetworkCTPs** shall refer to *elementCTP* in a <*linkEndHasNetworkCTPs*> relationship where **involvedClientLinkEnd** refers to an *containerLE*."

EXCEPTIONS
-- none

;}

7.3.2.2 Report NetworkCTP Removed From Link End

<COMMUNITY: Pre Provisioned Link Connection Management, ACTION: report client linking entity capacity change>

OPERATION reportNetworkCTPRemovedFromLinkEnd {

INPUT PARAMETERS
layerND: layerNetworkDomainIfce ::= PlmLayerNetworkDomainQueryIfce
involvedClientLinkEnd: PlmClientLinkEndId;
removedNetworkCTPs: SetOfPlmNetworkCTPs;

OUTPUT PARAMETERS
-- none

RAISED EXCEPTIONS
-- none

BEHAVIOUR

SEMI-FORMAL

PARAMETER_MATCHING
layerND: <INFORMATION OBJECT plmLayerNetworkDomain>;
involvedClientLinkEnd: <INFORMATION OBJECT plmClientLinkEnd>;
removedNetworkCTPs ELEMENTS: <INFORMATION OBJECT plmNetworkCTP>;

TRIGGERING CONDITIONS

PRE-CONDITIONS
inv_linkEndAndNetworkCTPExistingAndCompatible
"**involvedClientLinkEnd** and **removedNetworkCTPs** shall refer to *element* of the same <*layerNetworkDomainIsMadeOf*> relationship where **layerND** refers to *containerLND*."

inv_inLinkEnd
"Every networkCTP in **removedNetworkCTPs** shall refer to *elementCTP* in a <*linkEndHasNetworkCTPs*> relationship where **involvedClientLinkEnd** refers to *containerLE*."

POST_CONDITIONS
inv_notInLinkEnd
"None of the networkCTPs in **removedNetworkCTPs** refer to *elementCTP* of a <*linkEndHasNetworkCTPs*> relationship where **involvedClientLinkEnd** refers to *containerLE*."

EXCEPTIONS
-- *none*
;}

7.4 ASN.1 supporting productions

This subclause defines the ASN.1 productions which are used within other ASN.1 productions in the operations.

In this Recommendation, when an interface name is used within an ASN.1 production, the same label will be used, starting with a capital letter. The complete ASN.1 type definition for this query interface (e.g. use of ObjectIdentifier, INTEGER, ...) will be developed as part of the engineering viewpoint, with the concerned technology.

```
PlmClientLinkEndId ::= CHOICE {
        clientLinkEndQueryInterface             PlmClientLinkEndQueryInterface,
        userIdentifier                  SimpleNameType }

PlmClientLinkId ::= CHOICE {
        clientLinkQueryInterface                PlmClientLinkQueryInterface,
        userIdentifier                  SimpleNameType }

PlmProviderLinkEndId ::= CHOICE {
        providerLinkEndQueryInterface           PlmProviderLinkEndQueryInterface,
        userIdentifier                  SimpleNameType }

PlmProviderLinkId ::= CHOICE {
        providerLinkQueryInterface              PlmProviderLinkQueryInterface,
        userIdentifier                  SimpleNameType }

PlmRequestedLinkConnectionChoice ::= CHOICE {
        plmLinkConnectionIds        SetOfPlmLinkConnections,
        numberOfLinkConnections     INTEGER,
        allAvailableLinkConnections NULL}

PlmRequestedNetworkCTPChoice  ::= CHOICE {
        plmNetworkCTPIds            SetOfPlmNetworkCTPs,
        numberOfNetworkCTPs         INTEGER,
        allAvailableNetworkCTPs     NULL}

SetOfPlmLinkConnections ::= SET OF CHOICE {
        linkConnectionId            PLMLinkConnectionQueryIfce,
        userIdentifier                  SimpleNameType}

SetOfPlmNetworkCTPs ::= SET OF CHOICE {
        networkCTPIdPlmNetworkCTPQueryIfce,
        userIdentifier              SimpleNameType}
```

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