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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 adaptation management

ITU-T Recommendation G.854.8

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION G.854.8

COMPUTATIONAL VIEWPOINT FOR PRE-PROVISIONED ADAPTATION MANAGEMENT

Summary

The objective of pre-provisioned adaptation management community is to provide link capacity to client-layer(s) from a server layer. This community should be used in the case where client transport entities can be provisioned inside the link during the adaptation management. This capability of having pre-provisioned client transport entities is available in technologies such as SDH or WDM.

Source

ITU-T Recommendation G.854.8 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.854.8

COMPUTATIONAL VIEWPOINT FOR PRE-PROVISIONED ADAPTATION MANAGEMENT

(Geneva, 1999)

1 Scope

This computational viewpoint specification is related to the pre-provisioned adaptation management enterprise specification defined in Recommendation G.852.8 and the pre-provisioned adaptation management information specification defined in Recommendation G.853.8.

The computational design in clause 2 of this preliminary computational viewpoint specification covers the following enterprise communities and associated actions:

COMMUNITY pam "pre-provisioned adaptation management"
pam "assign server transport entity to client linking entity"
pam "deassign server transport entity from client linking entity"
pam "report assignment of server transport entity"
pam "report deassignment of server transport entity"
pam "provision capacity to client linking entity"
pam "remove capacity from client linking entity"
pam "report client linking entity capacity provisioning"
pam "report client linking entity capacity removal"

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.852.8 (1999), *Enterprise viewpoint for pre-provisioned adaptation management.*

[4] 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
inv	invariant
layerND	layerNetwork Domain
LC	LinkConnection
ND	Network Domain
RM-ODP	Reference Model for Open Distributed Processing

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. The 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 with the concerned technology.

6 Label references

Table 1/G.854.8 – Label references

Full label reference	Local label reference
<"Rec. G.854.3", INTERFACE: commonReportResourceIfce>	commonReportResourceIfce
<"Rec. G.854.3", INTERFACE: commonResourceIfce>	commonResourceIfce
<"Rec. G.853.8", ATTRIBUTE: pamAvailableLinkCapacity>	pamAvailableLinkCapacity
<"Rec. G.853.8", INFORMATION_OBJECT: pamClientLayerNetworkDomain>	pamClientLayerNetworkDomain
<"Rec. G.853.8", INFORMATION_OBJECT: pamLinkConnection>	pamLinkConnection
<"Rec. G.853.8", INFORMATION_OBJECT: pamLinkEnd>	pamLinkEnd
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: PamLinkEndHasNetworkCTPs>	pamLinkEndHasNetworkCTPs
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLinkIsTerminatedByLinkEnd>	pamLinkIsTerminatedByLinkEnd
<"Rec. G.853.8", ATTRIBUTE: pamMaxProvisionableCapacity>	pamMaxProvisionableCapacity
<"Rec. G.853.8", INFORMATION_OBJECT: pamNetworkCTP>	pamNetworkCTP

Table 1/G.854.8 – Label references *(concluded)*

Full label reference	Local label reference
<"Rec. G.853.8", INFORMATION_OBJECT: pamNetworkTTP>	pamNetworkTTP
<"Rec. G.853.8", ATTRIBUTE: pamPotentialLinkCapacity>	pamPotentialLinkCapacity
<"Rec. G.853.8", ATTRIBUTE: pamProvisionedLinkCapacity>	pamProvisionedLinkCapacity
<"Rec. G.853.8-xx", INFORMATION_OBJECT: pamServerLayerNetworkDomain>	pamServerLayerNetworkDomain
<"Rec. G.853.8", INFORMATION_OBJECT: pamSubnetwork>	pamSubnetwork
"Rec. G.853.8", INFORMATION_OBJECT: pamSubnetworkTP	pamSubnetworkTP
<"Rec. G.853.8", INFORMATION_OBJECT: pamTopologicalLink>	pamTopologicalLink
<"Rec. G.853.8", INFORMATION_OBJECT: pamTopologicalLinkEnd>	pamTopologicalLinkEnd
<"Rec. G.853.8", INFORMATION_OBJECT: pamTrail>	pamTrail
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamTopologicalLinkIsSupportedByTrail>	pamTopologicalLinkIsSupportedByTrail
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamTopologicalLinkEndIsSupportedByNetworkTTP>	pamTopologicalLinkEndIsSupportedByNetworkTTP
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLayerNetworkDomainIsMadeOf>	pamLayerNetworkDomainIsMadeOf
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLinkHasLinkConnections>	pamLinkHasLinkConnections
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLinkEndHasNetworkCTPs>	pamLinkEndHasNetworkCTPs
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamNetworkTTPAdaptsNetworkCTP>	pamNetworkTTPAdaptsNetworkCTP
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamSubnetworkIsDelimitedBy>	pamSubnetworkIsDelimitedBy
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamSubnetworkTPIsRelatedToExtremity>	pamSubnetworkTPIsRelatedToExtremity
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLinkConnectionIsSupportedByTrail>	pamLinkConnectionIsSupportedByTrail
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLinkBinds>	pamLinkBinds
<"Rec. G.853.8", INFORMATION_RELATIONSHIP: pamLayerNetworkDomainCanServeLnds>	pamLayerNetworkDomainCanServeLnds

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

7 Interfaces

7.1 Query interfaces

This Recommendation refers to interfaces that allow get access to identification and properties of resources involved in the "pre-provisioned adaptation management community". As the invocation of contained operations does not modify any state, there is no interest to develop them explicitly. There 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 they allow to access.

Table 2/G.854.8 – Correspondence between Interface names, Information objects, Attributes and relationships

Interface name	Information object	Attributes and relationships
pamLayerNetworkDomainQueryIfce	<pamlayerNetworkDomain>	<resourceId> <signalIdentification> <pamLayerNetworkDomainIsMadeOf, ROLE : element> <pamLayerNetworkDomainCanServeLnds, ROLE : Client> <pamLayerNetworkDomainCanServeLnds, ROLE : Server>
pamLinkConnectionQueryIfce	<pamLinkConnection>	<resourceId> <signalIdentification> <pamLayerNetworkDomainIsMadeOf, ROLE : containerND> <linkHasLinkConnections, ROLE : containerLink> <linkConnectionIsSupportedByTrail, ROLE : serverTrail>
pamLinkEndlQueryIfce	<pamLinkEnd>	<resourceId> <signalIdentification> <pamLinkEndHasNetworkCTPs, ROLE : elementCTP> <pamLinkIsTerminatedByLinkEnd, ROLE : transferCapacityLink> <pamTopologicalLinkEndIsSupportedByNetworkTTP, ROLE : server> <pamLayerNetworkDomainIsMadeOf, ROLE : containerND> <pamAvailableLinkCapacity> <pamMaxProvisionableCapacity> <pamPotentialLinkCapacity> <pamProvisionedLinkCapacity>
pamNetworkCTPQueryIfce	<pamNetworkCTP>	<resourceId> <signalIdentification> <pamLinkEndHasNetworkCTPs, ROLE : containerLE> <networkTTPAdaptsNetworkCTP, ROLE : serverTP>
pamNetworkTTPQueryfce	<pamNetworkTTP>	<resourceId> <signalIdentification> <pamTopologicalLinkEndIsSupportedByNetworkTTP, ROLE : client> <pamLayerNetworkDomainIsMadeOf, ROLE : containerND> <networkTTPAdaptsNetworkCTP, ROLE : clientTP >

Table 2/G.854.8 – Correspondence between Interface names, Information objects, Attributes and relationships *(concluded)*

Interface name	Information object	Attributes and relationships
pamSubnetworkQueryIfce	<pamSubnetwork>	<resourceId> <signalIdentification> <pamSubnetworkIsDelimitedBy, ROLE : elementSNTP>
pamSubnetworkTPQueryIfce	<pamSubnetworkTP>	<resourceId> <signalIdentification> <pamSubnetworkIsDelimitedBy, ROLE : containerSN> <subnetworkTPIsRelatedToExtremity, ROLE : extremity>
pamTopologicalLinkQueryIfce	<pamTopologicalLink>	<resourceId> <signalIdentification> <pamTopologicalLinkIsSupportedByTrail, ROLE : serverTrail> <pamLayerNetworkDomainIsMadeOf, ROLE : element> <linkHasLinkConnections, ROLE : elementLC> <linkBinds, ROLE : a_endTopological> <linkBinds, ROLE : z_endTopological> <pamAvailableLinkCapacity> <pamMaxProvisionableCapacity> <pamPotentialLinkCapacity> <pamProvisionedLinkCapacity>
pamTrailQueryIfce	<pamTrail>	<resourceId> <signalIdentification> <pamTopologicalLinkIsSupportedByTrail,ROLE : clientTL> <pamLayerNetworkDomainIsMadeOf, ROLE : element> <linkConnectionIsSupportedByTrail, ROLE : clientLC>

7.2 Operational interfaces

COMPUTATIONAL_INTERFACE <commonResourceIfce>

COMPUTATIONAL_INTERFACE preProvisionedAdaptationManagementArcIfce

OPERATION {
associateTrailWithTopologicalLink;
disassociateTrailFromTopologicalLink;
addCapacityToLink;
removeCapacityFromLink
}

COMPUTATIONAL_INTERFACE preProvisionedAdaptationManagementPointIfce

OPERATION {
associateNetworkTTPWithTopologicalLinkEnd;
disassociateNetworkTTPFromTopologicalLinkEnd;
addCapacityToLinkEnd;
removeCapacityFromLinkEnd
}

7.2.1 Associate trail with topologicalLink

<COMMUNITY: pre-provisioned adaptation management, ACTION: assign server transport entity to client linking entity>

OPERATION associateTrailWithTopologicalLink {

INPUT_PARAMETERS
link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId
trail: TrailId;

OUTPUT_PARAMETERS
potentialCapacity: Capacity;
resultingLinkConnections: LinkConnectionList;
-- *The resultingLinkConnections parameter value is provided when the*
-- *<PERMISSION:returnClientTransportEntities> is supported.*

RAISED_EXCEPTIONS
incorrectLink: LinkId
incorrectTrail: TrailId
linkAndTrailsNotCompatible: NULL;
initialCapacitiesFailure: SEQUENCE {
availableLinkCapacity Capacity;
maxProvisionableCapacity Capacity;
potentialLinkCapacity Capacity;
ProvisionedLinkCapacity Capacity};
trailAlreadyAssociated: NULL;
finalCapacitiesFailure: SEQUENCE {
availableLinkCapacity Capacity;
maxProvisionableCapacity Capacity;
potentialLinkCapacity Capacity;
ProvisionedLinkCapacity Capacity};
consistencyFailure: NULL;
failureToAssociate: NULL;

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:pamTopologicalLink>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
trail: <INFORMATION OBJECT:pamTrail>;
potentialCapacity: <ATTRIBUTE:pamPotentialLinkCapacity>;
resultingLinkConnections ELEMENTS: <INFORMATION OBJECT:pamLinkConnection>
incorrectLink: <INFORMATION OBJECT:pamTopologicalLink>;
incorrectTrail: <INFORMATION OBJECT:pamTrail>;
availableLinkCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkCapacity: <ATTRIBUTE:pamPotentialLinkCapacity>;
ProvisionedLinkCapacity: <ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkExists
"The **link** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv_TrailExists
"The **trail** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is <pamServerLayerNetworkDomain>."

inv_LNDConsistency
"The **trail** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain> relationship. The client of this latter relationship is referred by **Link**."

inv_nullCapacityValues
"The attributes of <*pamTopologicalLink*> referred by **link** have the following values:

- *pamAvailableLinkCapacity* equal to 0;
- *pamMaxProvisionableCapacity* equal to 0;
- *pamPotentialLinkCapacity* equal to 0;
- *pamProvisionedLinkCapacity* equal to 0."

inv_trailNotAssociated
"The **trail** shall not refer to any *server* in any <*pamTopologicalLinkIsSupportedByTrail*> relationship where **link** refers to *client*."

POST_CONDITIONS

inv_finalCapacityValues
"The attributes of <*pamTopologicalLink*> referred by **link** have the following values:

- pamPotentialLinkCapacity is equal to pamMaxProvisionableCapacity of the <pamTopologicalLink> minus pamProvisionedLinkCapacity of each other client in the <pamTopologicalLinkIsSupportedByTrail> relationship where **trail** refers to server;
- pamMaxProvisionableCapacity is updated to its nominal value in accordance to the **trail**;
- pamAvailableLinkCapacity equal to 0;
- pamProvisionedLinkCapacity equal to 0."

inv_potentialCapacity
"The **potentialCapacity** value is equal to the <*pamPotentialLinkCapacity*> attribute value of the <*pamTopologicalLink*> referred by **link**."

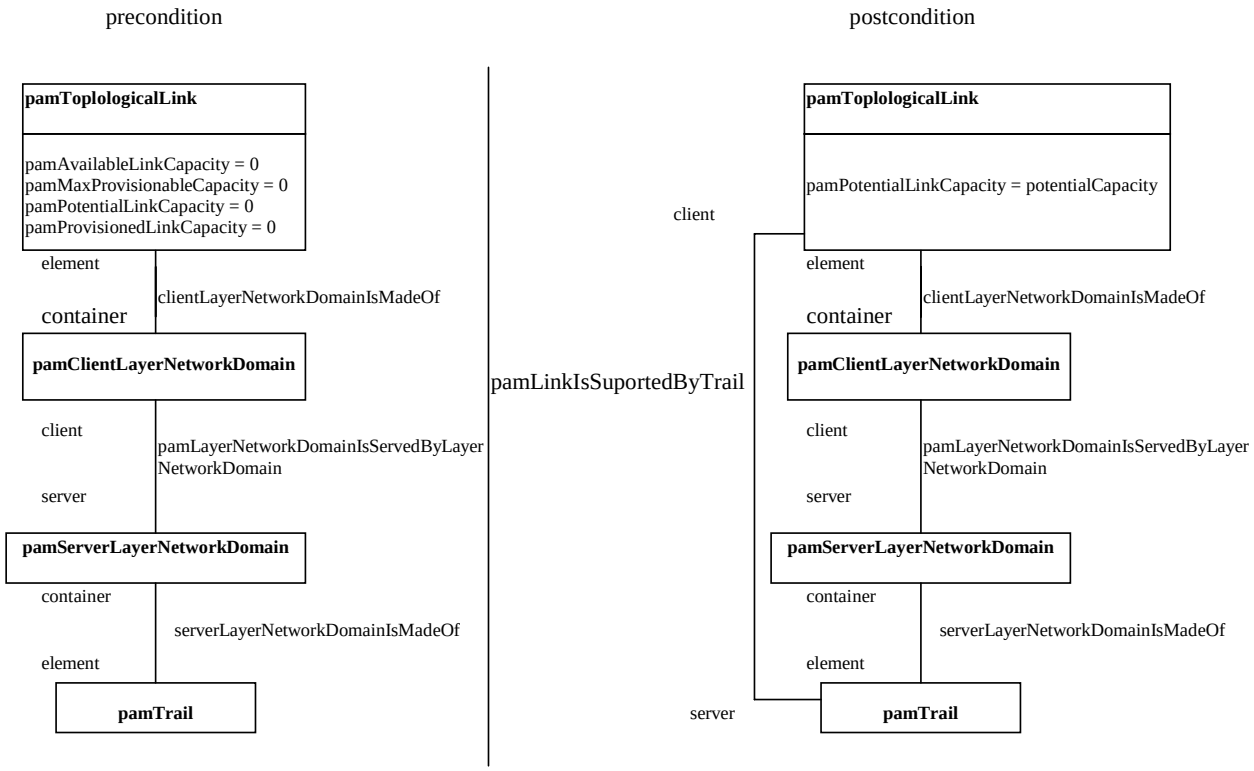
inv_LNDConsistency
"The **trail** refers to *element* of a <*pamServerlayerNetworkDomainIsMadeOf*> where the *container* is *server* regarding a <*layerNetworkDomainIsServedByLayerNetworkDomain*> relationship. The *client* of this latter relationship is also *container* of a <*pamClientlayerNetworkDomainIsMadeOf*> relationship where **link** refers to *element*."

inv_trailAssociated
"The **trail** shall refer to a *server* in a <*pamTopologicalLinkIsSupportedByTrail*> relationship where **link** refers to *client*.";

EXCEPTIONS

IF PRE_CONDITION inv_LinkExists NOT_VERIFIED RAISE_EXCEPTION incorrectLink;
IF PRE_CONDITION inv_TrailExists NOT_VERIFIED RAISE_EXCEPTION incorrectTrail;
IF PRE_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION linkAndTrailsNotCompatible;
IF PRE_CONDITION inv_trailNotAssociated NOT_VERIFIED RAISE_EXCEPTION trailAlreadyAssociated;
IF PRE_CONDITION inv_nullCapacityValues NOT_VERIFIED RAISE_EXCEPTION initialCapacitiesFailure;
IF POST_CONDITION inv_finalCapacityValues NOT_VERIFIED RAISE_EXCEPTION finalCapacitiesFailure;
IF POST_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION consistencyFailure;
IF POST_CONDITION inv_trailAssociated NOT_VERIFIED RAISE_EXCEPTION failureToAssociate;

}



7.2.2 Disassociate trail from topologicalLink

<COMMUNITY: pre-provisioned adaptation management, ACTION: deassign server transport entity from client linking entity>

OPERATION disassociateTrailFromTopologicalLink {

INPUT_PARAMETERS
link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId;
trail: TrailId;

OUTPUT_PARAMETERS
-- *none*

RAISED_EXCEPTIONS
incorrectLink: LinkId
incorrectTrail: TrailId
trailNotAssociated: NULL;
capacityProvisioned: Capacity;
finalCapacitiesFailure: SEQUENCE {
availableLinkCapacity Capacity;
maxProvisionableCapacity Capacity;
potentialLinkCapacity Capacity;
provisionedLinkCapacity Capacity};
failureToDisassociate: NULL;

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:pamTopologicalLink>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
trail: <INFORMATION OBJECT:pamTrail>;
incorrectLink: <INFORMATION OBJECT:pamTopologicalLink>;
incorrectTrail: <INFORMATION OBJECT:pamTrail>;
capacityProvisioned: <ATTRIBUTE:pamProvisionedLinkCapacity>;

availableLinkCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;,
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkCapacity:<ATTRIBUTE:pamPotentialLinkCapacity>;
provisionedLinkCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkExists
"The **link** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv_TrailExists
"The **trail** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is <pamServerLayerNetworkDomain>."

inv_LNDConsistency
"The **trail** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain> relationship. The client of this latter relationship is referred by **Link**."

inv_trailAssociated
"The **trail** shall refer to a *server* in a *<pamTopologicalLinkIsSupportedByTrail>* relationship where **link** refers to *client*."

inv_ pamProvisionedLinkCapacity
"The *pamProvisionedLinkCapacity* attribute value of the *<pamTopologicalLink>* referred by **link** is equal to 0.";

POST_CONDITIONS

inv_nullCapacityValues
The attributes of *<pamTopologicalLink>* referred by **link** have the following values:

- *pamAvailableLinkCapacity* equal to 0;
- *pamMaxProvisionableCapacity* equal to 0;
- *pamPotentialLinkCapacity* equal to 0;
- *pamProvisionedLinkCapacity* equal to 0."

inv_LNDConsistency
"The **trail** shall refer to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain>. The client of this latter relationship is also container of a <pamClientlayerNetworkDomainIsMadeOf> where **link** refers to element."

inv_trailNotAssociated
"The **trail** shall not refer to any *server* in any *<pamTopologicalLinkIsSupportedByTrail>* where **link** refers to ***client***.";

EXCEPTIONS

IF PRE_CONDITION inv_LinkExists NOT_VERIFIED RAISE_EXCEPTION incorrectLink;
IF PRE_CONDITION inv_TrailExists NOT_VERIFIED RAISE_EXCEPTION incorrectTrail;
IF PRE_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION linkAndTrailsNotCompatible;
IF PRE_CONDITION inv_trailAssociated NOT_VERIFIED RAISE_EXCEPTION trailAlreadyAssociated;
IF PRE_CONDITION inv_pamProvisionedLinkCapacity NOT_VERIFIED RAISE_EXCEPTION capacityProvisioned;
IF POST_CONDITION inv_trailNotAssociated NOT_VERIFIED RAISE_EXCEPTION failureToDissociate;
IF POST_CONDITION inv_nullCapacityValues NOT_VERIFIED RAISE_EXCEPTION finalCapacitiesFailure;
IF POST_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION failureToDissociate;

7.2.3 Add capacity to link

<COMMUNITY: pre-provisioned adaptation management, ACTION: provision capacity to client linking entity>

OPERATION addCapacityToLink {

INPUT_PARAMETERS
link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId
capacity: RequestedCapacity::= CHOICE{
requestedChannels SEQUENCE OF {Channel};
requestedNumberOfLinkConnections Capacity}
-- *The requestedChannels sub-parameter value is provided when the*
-- *<PERMISSION: selectClientTransportEntities> is supported.*
-- *Channel indicates the channel number such as timeslot in SDH*

OUTPUT_PARAMETERS
numberOfLinkConnections: Capacity;
resultingLinkConnections: LinkConnectionList;

RAISED_EXCEPTIONS
incorrectLink: LinkId
insufficientCapacity: Capacity;
invalidChannelsNumber: SEQUENCE OF {Channel};
channelsAlreadyProvisioned: SEQUENCE OF {Channel};
failureToCreateLCs: NULL;
failureToAssociateLCs: NULL;
failureToSupportLCs: NULL;
failureToIncreaseCapacity: SEQUENCE {
availableLinkCapacity Capacity;
maxProvisionableCapacity Capacity;
potentialLinkCapacity Capacity;
provisionedLinkCapacity Capacity};

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:pamTopologicalLink>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
numberOfLinkConnections: <ATTRIBUTE:pamProvisionedLinkCapacity>;
resultingLinkConnections ELEMENTS: <INFORMATION OBJECT:pamLinkConnection>;
Channel: <INFORMATION OBJECT:pamLinkConnection>;
incorrectLink: <INFORMATION OBJECT:pamTopologicalLink>;
insufficientCapacity: <ATTRIBUTE:pamPotentialLinkCapacity>;
availableLinkCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkCapacity:<ATTRIBUTE:pamPotentialLinkCapacity>;
provisionedLinkCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkExists
"The **link** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**".

inv ChannelsNumber
"The **Channel** shall refer to a valid value with regard to the *server* of the *client* **link**."

inv_ChannelsDoNotExist
"The **Channel** shall not refer to any *element* in any <*linkHasLinkConnections*> where **link** refers to *container*."

inv_capacityExists
"The *pamPotentialLinkCapacity* attribute value of the <*pamTopologicalLink*> referred by **link** shall be greater or equal to the **requestedNumberOfLinkConnections**."

POST_CONDITIONS

inv_provisionedLinkCapacityIncrease

"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLink*> referred by **link** is increased by the value of **requestedNumberOfLinkConnections.**"

inv_availableLinkCapacityIncrease

"The *pamAvailableLinkCapacity* value of the <*pamTopologicalLink*> referred by **link** is increased by the value of **requestedNumberOfLinkConnections**."

inv_PotentialLinkCapacityDecrease

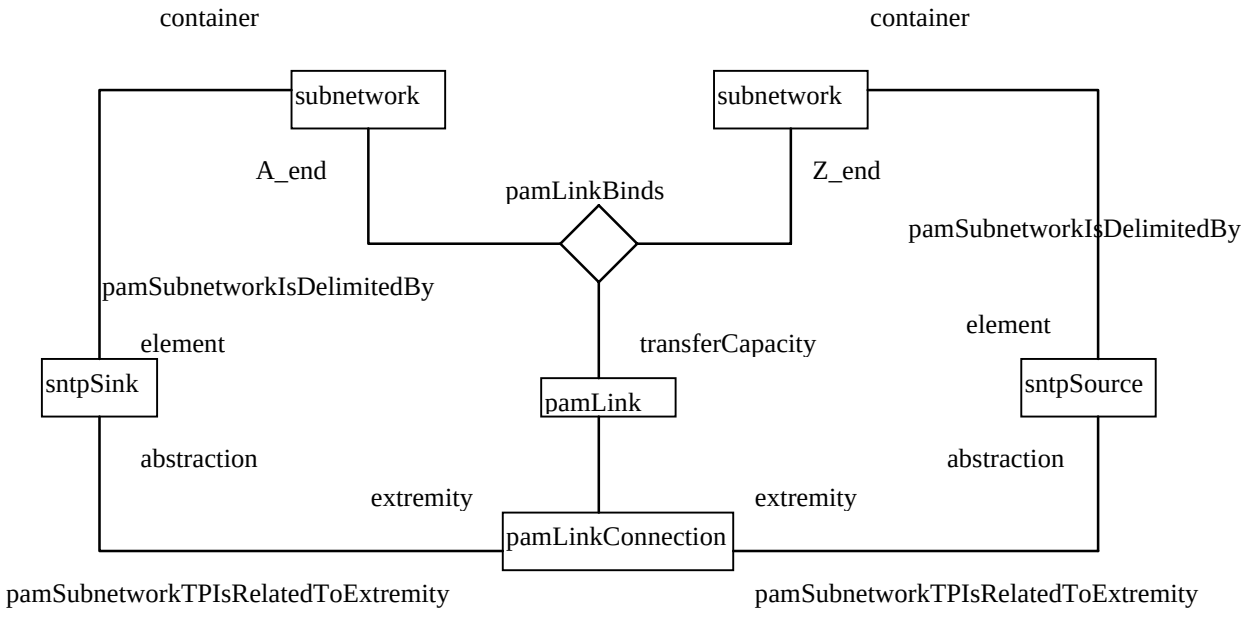
"The *pamPotentialLinkCapacity* value of all <*pamTopologicalLink*> involved in the same <*pamTopologicalLinkIsSupportedByTrail*> as the **link** is decreased by the value of **requestedNumberOfLinkConnections** (down to each associated characteristic information)."

inv_createdLC

"The **resultingLinkConnections** refer to *element* of the <*linkHasLinkConnections*> relationship where **link** refers to *container*."

inv_LCAssociated

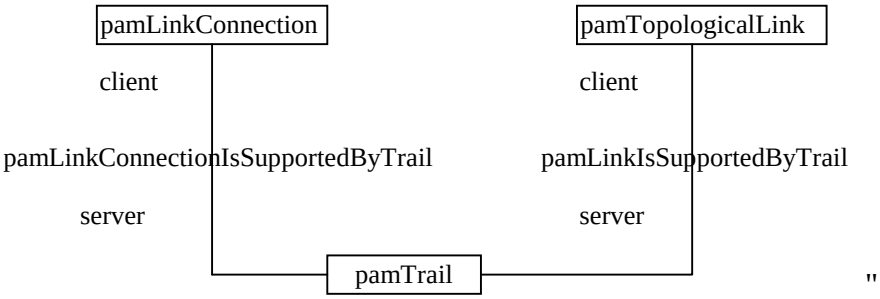
"The **resultingLinkConnections** shall refer to *extremity* in two <*subnetworkTPIsRelatedToExtremity*> relationships. The associated *abstraction* are participating in two <*subnetworkIsDelimitedBy*> relationships where each *container* is the *A_end* and *Z_end* of a <*linkBinds*> relationship for which **link** refers to *transferCapacity*.



"

inv_LCSupported

"The **resultingLinkConnections** refer to *client* in a <*linkConnectionIsSupportedByTrail*> relationship where the **trail** refers to the *server*. This **trail** refers also to a *server* in a <*TopologicalLinkIsSupportedByTrail*> relationship where the **link** refers to *client*.



"

inv_mapping_requestedCapacityToCapacity
"The **numberOfLinkConnections** value is equal to the *pamProvisionedLinkCapacity* value of the <*pamTopologicalLink*> referred by **link**.";

EXCEPTIONS

IF PRE_CONDITION inv_LinkExists NOT_VERIFIED RAISE_EXCEPTION incorrectLink;IF PRE_CONDITION inv_capacityExists NOT_VERIFIED RAISE_EXCEPTION insufficientCapacity;
IF PRE_CONDITION inv ChannelNumber NOT_VERIFIED RAISE_EXCEPTION invalidChannelNumber;
IF PRE_CONDITION inv_ChannelsDoNotExist NOT_VERIFIED RAISE_EXCEPTION channelAlreadyProvisioned;
IF POST_CONDITION inv_createdLC NOT_VERIFIED RAISE_EXCEPTION failureToCreateLCs;
IF POST_CONDITION inv_LCAssociated NOT_VERIFIED RAISE_EXCEPTION failureToAssociateLCs;
IF POST_CONDITION inv_LCSupported NOT_VERIFIED RAISE_EXCEPTION failureToSupportLCs;
IF POST_CONDITION inv_provisonnedLinkCapacityIncrease NOT_VERIFIED RAISE_EXCEPTION failureToIncreaseCapacity;
IF POST_CONDITION inv_availableLinkCapacityIncrease NOT_VERIFIED RAISE_EXCEPTION failureToIncreaseCapacity;
IF POST_CONDITION inv_PotentialLinkCapacityDecrease NOT_VERIFIED RAISE_EXCEPTION failureToIncreaseCapacity;

}

7.2.4 Remove capacity from Link

<COMMUNITY: pre-provisioned adaptation management, ACTION: remove capacity from client linking entity>

OPERATION removeCapacityFromLink {

INPUT_PARAMETERS
link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId
capacity: RequestedCapacity::= CHOICE{
requestedChannels SEQUENCE OF {Channel};requestedNumberOfLinkConnections Capacity}
-- *The requestedChannels sub-parameter value is provided when the*
-- *<PERMISSION: selectClientTransportEntities> is supported.*
-- *Channel indicates the channel number such as timeslot in SDH*

OUTPUT_PARAMETERS
provisionedLinkConnections: Capacity;

RAISED_EXCEPTIONS
incorrectLink: LinkId
insufficientCapacity: Capacity;
invalidChannelsNumber: SEQUENCE OF {channel};

failureToDecreaseCapacity: SEQUENCE {
availableLinkCapacity Capacity,
maxProvisionableCapacity Capacity,
potentialLinkCapacity Capacity,
ProvisionedLinkCapacity Capacity};
failureToRemoveLC: NULL;

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:*pamTopologicalLink*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
Channel: <INFORMATION OBJECT:pamLinkConnection>;
incorrectLink: <INFORMATION OBJECT:pamTopologicalLink>;
provisionedLinkConnections: <ATTRIBUTE:*pamProvisionedLinkCapacity*>;
insufficientCapacity: <ATTRIBUTE:pamProvisionedLinkCapacity>;
availableLinkCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkCapacity:<ATTRIBUTE:pamPotentialLinkCapacity>;
provisionedLinkCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkExists
"The **link** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv_capacityExists
"The *pamAvailableLinkCapacity* attribute value of the <*pamTopologicalLink*> referred by **link** is greater or equal to the **requestedNumberOfLinkConnections** value."

inv_linkConnectionPartOfLink
"Each **Channel** refers to *element* of <*linkHasLinkConnections*> where the *container* is referred by **link**."

POST_CONDITIONS

inv_LCRemoved
"The **Channel** shall not refer to any *element* in a <*linkHasLinkConnections*> relationship where the **link** refers to *container*."

inv_PotentialLinkCapacityIncrease
"The *pamPotentialLinkCapacity* value of all <*pamTopologicalLink*> involved in the same <*pamTopologicalLinkIsSupportedByTrail*> as the **link** are increased by the value of **requestedNumberOfLinkConnections** (down to each associated characteristic information)."

inv_provCapacityDecrease
"The *pamProvisionedLinkCapacity* attribute value of the <*topologicalLink*> referred by **link** has been decreased by the **requestedNumberOfLinkConnections** value."

inv_availCapacityDecrease
"The *pamAvailableLinkCapacity* attribute value of the <*topologicalLink*> referred by **link** has been decreased by the **requestedNumberOfLinkConnections** value."

inv_mappingToReturnedCapacity
"The **provisionedLinkConnections** value is equal to the new *pamProvisionedLinkCapacity* attribute value of the <*topologicalLink*> referred by **link**."

EXCEPTIONS

IF PRE_CONDITION inv_LinkExists NOT_VERIFIED RAISE_EXCEPTION incorrectLink;
IF PRE_CONDITION inv_capacityExists NOT_VERIFIED RAISE_EXCEPTION insufficientCapacity;
IF PRE_CONDITION inv_linkConnectionPartOfLink NOT_VERIFIED RAISE_EXCEPTION invalidChannelsNumber;
IF PRE_CONDITION inv_LCRemoved NOT_VERIFIED RAISE_EXCEPTION failureToRemoveLC;
IF POST_CONDITION inv_PotentialLinkCapacityIncrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;

IF POST_CONDITION inv_provCapacityDecrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;
IF POST_CONDITION inv_availCapacityDecrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;

}

7.2.5 Associate networkTTP with topologicalLinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: assign server transport entity to client linking entity>

OPERATION associatenetworkTTPWithTopologicalLinkEnd {

INPUT_PARAMETERS

link: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId;
networkTTP: NetworkTTPId;

OUTPUT_PARAMETERS
potentialCapacity: Capacity;
resultingNetworkCTPs: networkCTPList;

RAISED_EXCEPTIONS
incorrectLinkEnd: LinkEndId
incorrectNetworkTTP: NetworkTTPId
linkEndAndNetworkTTPsNotCompatible: NULL;
initialCapacitiesFailure: SEQUENCE {
availableLinkEndCapacity Capacity,
maxProvisionableCapacity Capacity,
potentialLinkEndCapacity: Capacity,
provisionedLinkEndCapacity Capacity};
networkTTPAlreadyAssociated: NULL;
finalCapacitiesFailure: SEQUENCE {
availableLinkEndCapacity Capacity,
maxProvisionableCapacity Capacity,
potentialLinkEndCapacity Capacity,
provisionedLinkEndCapacity Capacity};
consistencyFailure: NULL;
failureToAssociate: NULL;

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
networkTTP: <INFORMATION OBJECT:pamNetworkTTP>;
potentialCapacity: <ATTRIBUTE:pamPotentialLinkCapacity>;
resultingNetworkCTPs ELEMENTS: <INFORMATION OBJECT:pamNetworkCTP>
incorrectLinkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
incorrectNetworkTTP: <INFORMATION OBJECT:pamNetworkTTP>;
availableLinkEndCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkEndCapacity: <ATTRIBUTE:pamPotentialLinkCapacity>;
ProvisionedLinkEndCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkEndExists
"The **linkEnd** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv_NetworkTTPExists
"The **networkTTP** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is <pamServerLayerNetworkDomain>."

inv_LNDConsistency
"The **networkTTP** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain> relationship. The client of this latter relationship is referred by **LinkEnd**."

inv_nullCapacityValues
"The attributes of <*pamTopologicalLinkEnd*> referred by **linkEnd** have the following values:

- *pamAvailableLinkCapacity* equal to 0;
- *pamMaxProvisionableCapacity* equal to 0;
- *pamPotentialLinkCapacity* equal to 0;
- *pamProvisionedLinkCapacity* equal to 0."

inv_networkTTPNotAssociated
"The **networkTTP** shall not refer to any *server* in any <*pamTopologicalLinkEndIsSupportedByNetworkTTP*> relationship where **linkEnd** refers to *client*."

POST_CONDITIONS

inv_finalCapacityValues
"The attributes of <*pamTopologicalLinkEnd*> referred by **linkEnd** have the following values:

- *pamPotentialLinkCapacity* is equal to *pamMaxProvisionableCapacity* of the <*pamTopologicalLinkEnd*> minus *pamProvisionedLinkCapacity* of each other *client* in the <*pamTopologicalLinkEndIsSupportedByNetworkTTP*> relationship where **networkTTP** refers to *server*;
- *pamMaxProvisionableCapacity* is updated to its nominal value in accordance to the **networkTTP**;
- *pamAvailableLinkCapacity* equal to 0;
- *pamProvisionedLinkCapacity* equal to 0."

inv_potentialCapacity
"The **potentialCapacity** value is equal to the <*pamPotentialLinkCapacity*> attribute value of the <*pamTopologicalLinkEnd*> referred by **linkEnd**."

inv_LNDConsistency
"The **networkTTP** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain> relationship. The client of this latter relationship is also container of a <pamClientlayerNetworkDomainIsMadeOf> relationship where **linkEnd** refers to element."

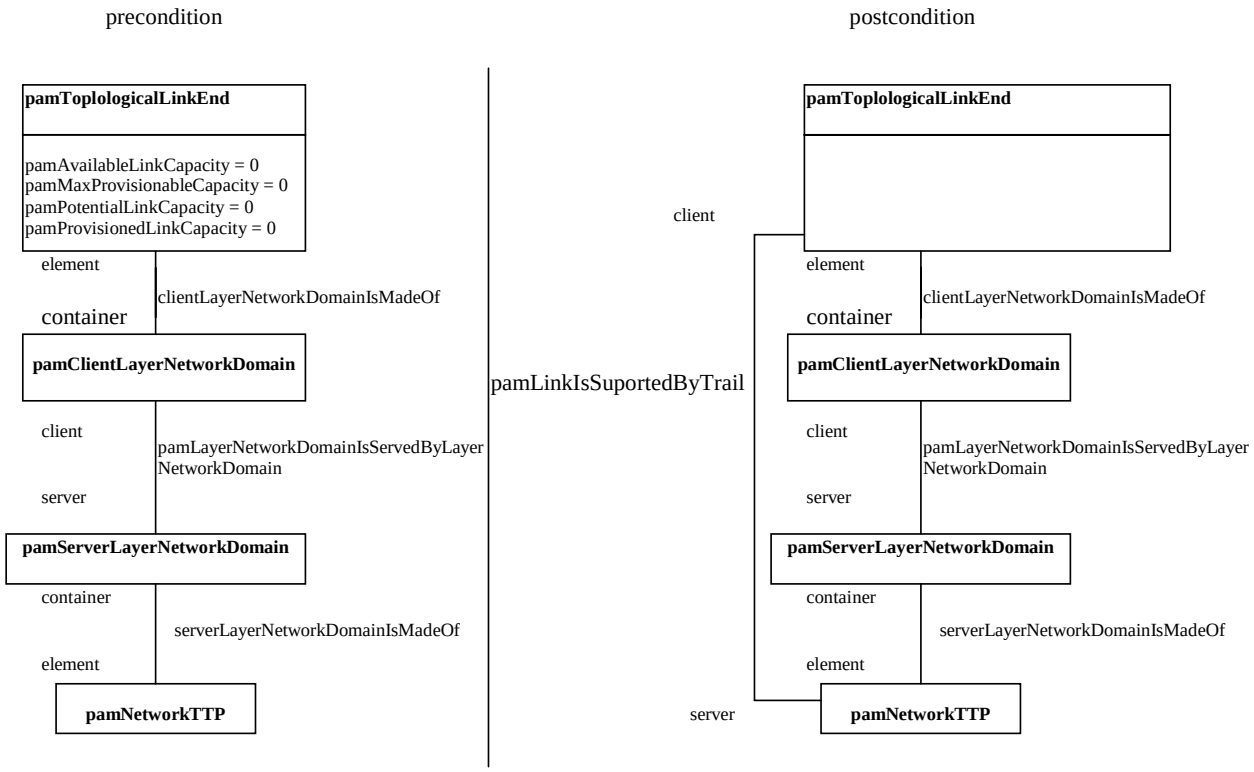
inv_networkTTPAssociated
"The **networkTTP** shall refer to a *server* in a <*pamTopologicalLinkEndIsSupportedByNetworkTTP*> relationship where **linkEnd** refers to *client*."

EXCEPTIONS

IF PRE_CONDITION inv_LinkEndExists NOT_VERIFIED RAISE_EXCEPTION incorrectLinkEnd;
IF PRE_CONDITION inv_NetworkTTPExists NOT_VERIFIED RAISE_EXCEPTION incorrectNetworkTTP;
IF PRE_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION linkAndNetworkTTPsNotCompatible;
IF PRE_CONDITION inv_networkTTPNotAssociated NOT_VERIFIED RAISE_EXCEPTION networkTTPAlreadyAssociated;
IF PRE_CONDITION inv_nullCapacityValues NOT_VERIFIED RAISE_EXCEPTION initialCapacitiesFailure;
IF POST_CONDITION inv_finalCapacityValue> NOT_VERIFIED RAISE_EXCEPTION finalCapacitiesFailure;

IF POST_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION consistencyFailure;
IF POST_CONDITION inv_networkTTPAssociated NOT_VERIFIED RAISE_EXCEPTION failureToAssociate;

}



7.2.6 Disassociate networkTTP from topologicalLinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: deassign server transport entity from client linking entity>

OPERATION disassociateNetworkTTPFromTopologicalLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId;
networkTTP: NetworkTTPId;

OUTPUT_PARAMETERS
-- *none*

RAISED_EXCEPTIONS
incorrectLinkEnd: LinkEndId
incorrectNetworkTTP: NetworkTTPId
networkTTPNotAssociated: NULL;
capacityProvisioned: Capacity;
finalCapacitiesFailure: SEQUENCE {
availableLinkEndCapacity Capacity,
maxProvisionableCapacity Capacity,
potentialLinkEndCapacity Capacity,
provisionedLinkEndCapacity Capacity};
failureToDisassociate: NULL;

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
networkTTP: <INFORMATION OBJECT:pamNetworkTTP>;
incorrectLinkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
incorrectNetworkTTP: <INFORMATION OBJECT:pamNetworkTTP>;
capacityProvisioned: <ATTRIBUTE:pamProvisionedLinkCapacity>;
availableLinkEndCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;,
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkEndCapacity:<ATTRIBUTE:pamPotentialLinkCapacity>;
provisionedLinkEndCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkEndExists
"The **linkEnd** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv_NetworkTTPExists
"The **networkTTP** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is <pamServerLayerNetworkDomain>."

inv_LNDConsistency
"The **networkTTP** refers to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain> relationship. The client of this latter relationship is referred by **LinkEnd**."

inv_networkTTPAssociated
"The **networkTTP** shall refer to a *server* in a <*pamTopologicalLinkEndIsSupportedByNetworkTTP*> relationship where **linkEnd** refers to *client*."

inv_ pamProvisionedLinkCapacity
"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLinkEnd*> referred by **linkEnd** is equal to 0."

POST_CONDITIONS

inv_nullCapacityValues
"The attributes of <*pamTopologicalLinkEnd*> referred by **linkEnd** have the following values:

- *pamAvailableLinkCapacity* equal to 0;
- *pamMaxProvisionableCapacity* equal to 0;
- *pamPotentialLinkCapacity* equal to 0;
- *pamProvisionedLinkCapacity* equal to 0."

inv_LNDConsistency
"The **networkTTP** shall refer to element of a <pamServerlayerNetworkDomainIsMadeOf> where the container is server regarding a <layerNetworkDomainIsServedByLayerNetworkDomain>. The client of this latter relationship is also container of a <pamClientlayerNetworkDomainIsMadeOf> where **linkEnd** refers to element."

inv_networkTTPNotAssociated
"The **networkTTP** shall not refer to any *server* in any <*pamTopologicalLinkEndIsSupportedByNetworkTTP*> where **linkEnd** refers to ***client***.";

EXCEPTIONS

IF PRE_CONDITION inv_LinkEndExists NOT_VERIFIED RAISE_EXCEPTION incorrectLinkEnd;
IF PRE_CONDITION inv_NetworkTTPExists NOT_VERIFIED RAISE_EXCEPTION incorrectNetworkTTP;
IF PRE_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION linkAndNetworkTTPsNotCompatible;
IF PRE_CONDITION inv_networkTTPAssociated NOT_VERIFIED RAISE_EXCEPTION networkTTPAlreadyAssociated;
IF PRE_CONDITION inv_pamProvisionedLinkCapacity NOT_VERIFIED RAISE_EXCEPTION capacityProvisioned;
IF POST_CONDITION inv_networkTTPNotAssociated NOT_VERIFIED RAISE_EXCEPTION failureToDissociate;
IF POST_CONDITION inv_nullCapacityValues NOT_VERIFIED RAISE_EXCEPTION finalCapacitiesFailure;
IF POST_CONDITION inv_LNDConsistency NOT_VERIFIED RAISE_EXCEPTION failureToDissociate;

}

7.2.7 Add capacity to LinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: provision capacity to client linking entity>

OPERATION addCapacityToLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId
capacity: ResquestedCapacity::= CHOICE{
requestedChannels SEQUENCE OF {Channel};
requestedNumberOfNetworkCTPs Capacity}
-- *The requestedChannels sub-parameter value is provided when the*
-- *<PERMISSION: selectClientTransportEntities> is supported.*
-- *Channel indicates the channel number such as timeslot in SDH*

OUTPUT_PARAMETERS
numberOfnetworkCTPs: Capacity;
resultingnetworkCTPs: networkCTPList

RAISED_EXCEPTIONS
incorrectLinkEnd: LinkEndId
insufficientCapacity: Capacity;
invalidChannelsNumber: SEQUENCE OF {Channel};
channelsAlreadyProvisioned: SEQUENCE OF {Channel};
failureToCreateLCs: NULL;
failureToAssociateLCs: NULL;
failureToSupportLCs: NULL;
failureToIncreaseCapacity: SEQUENCE {
availableLinkEndCapacity Capacity,
maxProvisionableCapacity Capacity,
potentialLinkEndCapacity Capacity,
ProvisionedLinkEndCapacity Capacity};

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
numberOfNetworkCTP: <ATTRIBUTE:pamProvisionedLinkCapacity>;
resultingNetworkCTPs ELEMENTS: <INFORMATION OBJECT:pamLinkEndConnection>;
Channel: <INFORMATION OBJECT:pamLinkEndConnection>;
incorrectLinkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
insufficientCapacity: <ATTRIBUTE:pamPotentialLinkCapacity>;

availableLinkEndCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkEndCapacity:<ATTRIBUTE:pamPotentialLinkCapacity>;
provisionedLinkEndCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkEndExists
"The **linkEnd** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv ChannelsNumber
"The **Channel** shall refer to a valid value with regard to the *server* of the *client* **linkEnd**."

inv_ChannelsDoNotExist
"The **Channel** shall not refer to any *element* in any <*linkHasNetworkCTP*> where **linkEnd** refers to *container*."

inv_capacityExists
"The *pamPotentialLinkCapacity* attribute value of the <*pamTopologicalLinkEnd*> referred by **linkEnd** shall be greater or equal to the **requestedNumberOfNetworkCTPs**."

POST_CONDITIONS

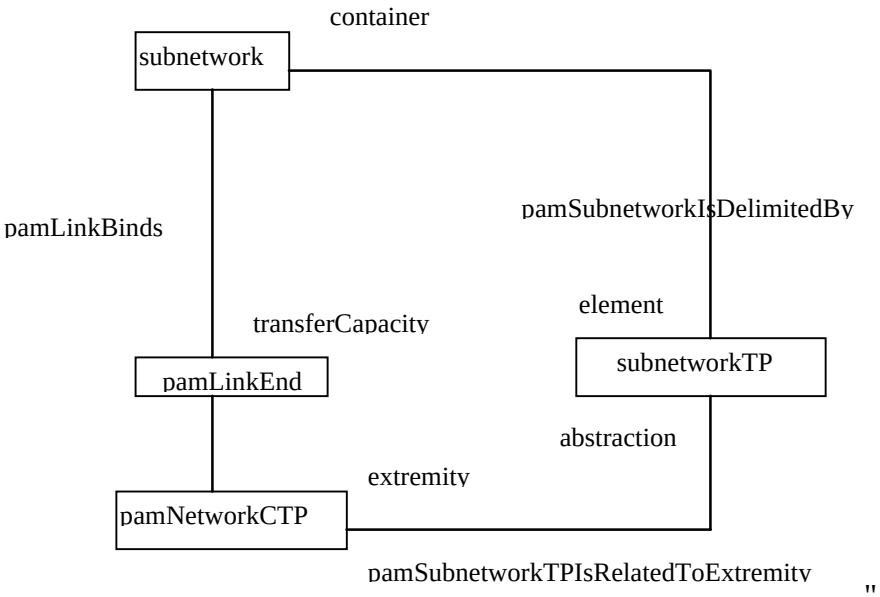
inv_provisionedLinkEndCapacityIncrease
"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLinkEnd*> referred by **linkEnd** is increased by the value of **requestedNumberOfNetworkCTPs.**"

inv_availableLinkEndCapacityIncrease
"The pamAvailableLinkCapacity value of the <pamTopologicalLinkEnd> referred by **linkEnd** is increased by the value of **requestedNumberOfNetworkCTsP.**"

inv_PotentialLinkEndCapacityDecrease
"The *pamPotentialLinkCapacity* value of all <*pamTopologicalLinkEnd*> involved in the same <*pamLinkEndIsSupportedByTrail* > as the **linkEnd** is decreased by the value of **requestedNumberOfNetworkCTPs** (down to each associated characteristic information)."

inv_createdLC
"The **resultingNetworkCTPs** refers to *element* of the <*linkHasNetworkCTP*> relationship where **linkEnd** refers to *container*."

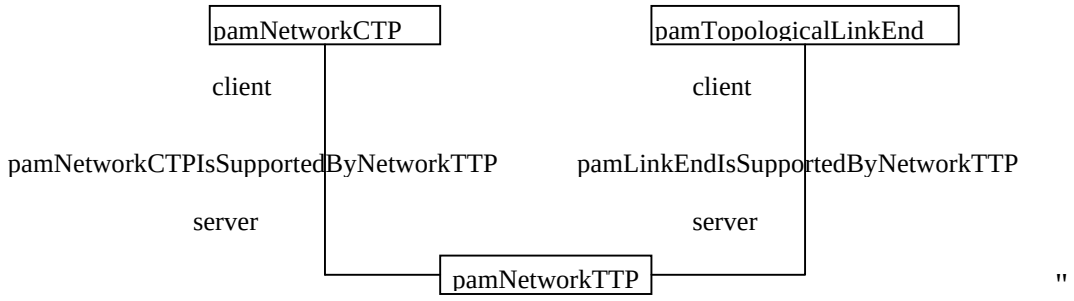
inv_LCAssociated
"The **resultingNetworkCTPs** shall refer to *extremity* in two <*subnetworkTPIsRelatedToExtremity*> relationships. The associated *abstraction* are participating in two <*subnetworkIsDelimitedBy*> relationships where each *container* is the *A_end* and *Z_end* of a <*linkBinds*> relationship for which **linkEnd** refers to *transferCapacity*.



"

inv_LCSupported

"The **resultingNetworkCTPs** refer to *client* in a <*networkCTPIsSupportedByNetworkTTP*> relationship where the **networkTTP** refers to the *server*. This **networkTTP** refers also to a *server* in a <*linkIsSupportedByNetworkTTP*> relationship where the **linkEnd** refers to *client*.



"

inv_mapping_requestedCapacityToCapacity

"The **numberOfNetworkCTP** value is equal to the *pamProvisionedLinkCapacity* value of the <*pamTopologicalLinkEnd*> referred by **linkEnd**."

EXCEPTIONS

IF PRE_CONDITION inv_LinkEndExists NOT_VERIFIED RAISE_EXCEPTION incorrectLinkEnd;
IF PRE_CONDITION inv_capacityExists NOT_VERIFIED RAISE_EXCEPTION insufficientCapacity;
IF PRE_CONDITION inv_ChannelNumber NOT_VERIFIED RAISE_EXCEPTION invalidChannelNumber;
IF PRE_CONDITION inv_ChannelsDoNotExist NOT_VERIFIED RAISE_EXCEPTION channelAlreadyProvisioned;
IF POST_CONDITION inv_createdLC NOT_VERIFIED RAISE_EXCEPTION failureToCreateLCs;
IF POST_CONDITION inv_LCAssociated NOT_VERIFIED RAISE_EXCEPTION failureToAssociateLCs;
IF POST_CONDITION inv_LCSupported NOT_VERIFIED RAISE_EXCEPTION failureToSupportLCs;
IF POST_CONDITION inv_provisonnedLinkEndCapacityIncrease NOT_VERIFIED RAISE_EXCEPTION failureToIncreaseCapacity;
IF POST_CONDITION inv_availableLinkEndCapacityIncrease NOT_VERIFIED RAISE_EXCEPTION failureToIncreaseCapacity;

IF POST_CONDITION inv_PotentialLinkEndCapacityDecrease NOT_VERIFIED
RAISE_EXCEPTION failureToIncreaseCapacity;
}

7.2.8 Remove capacity from LinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: remove capacity from client linking entity>

OPERATION removeCapacityFromLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId
capacity: RequestedCapacity::= CHOICE{
requestedChannels SEQUENCE OF {Channel};
requestedNumberOfNetworkCTP Capacity}
-- *The requestedChannels sub-parameter value is provided when the*
-- *<PERMISSION: selectClientTransportEntities> is supported.*
-- *Channel indicates the channel number such as timeslot in SDH*

OUTPUT_PARAMETERS
provisionedNetworkCTPs: Capacity;

RAISED_EXCEPTIONS
incorrectLinkEnd: LinkEndId
insufficientCapacity: Capacity;
invalidChannelsNumber: SEQUENCE OF {Channel};
failureToDecreaseCapacity: SEQUENCE {
availableLinkEndCapacity Capacity,
maxProvisionableCapacity Capacity,
potentialLinkEndCapacity Capacity,
provisionedLinkEndCapacity Capacity};
failureToRemoveLC: NULL;

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:*pamTopologicalLinkEnd*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
Channel: <INFORMATION OBJECT:pamNetworkCTP>;
provisionedNetworkCTPs: <ATTRIBUTE:*pamProvisionedLinkCapacity*>;
incorrectLinkEnd: <INFORMATION OBJECT:pamTopologicalLinkEnd>;
insufficientCapacity: <ATTRIBUTE:pamProvisionedLinkCapacity>;
availableLinkEndCapacity: <ATTRIBUTE:pamAvailableLinkCapacity>;
maxProvisionableCapacity: <ATTRIBUTE:pamMaxProvisionableCapacity>;
potentialLinkEndCapacity:<ATTRIBUTE:pamPotentialLinkCapacity>;
provisionedLinkEndCapacity:<ATTRIBUTE:pamProvisionedLinkCapacity>;

PRE_CONDITIONS

inv_LinkEndExists
"The **linkEnd** refers to element of a <pamClientlayerNetworkDomainIsMadeOf> where the container refers to **clientLayerNetworkDomain**."

inv_capacityExists
"The *pamAvailableLinkCapacity* attribute value of the <*pamTopologicalLinkEnd*> referred by **linkEnd** is greater or equal to the **requestedNumberOfNetworkCTPs** value."

inv_networkCTPPartOfLinkEnd
"Each **Channel** refers to *element* of <*linkHasNetworkCTP*> where the *container* is referred by **linkEnd**."

POST_CONDITIONS

inv_LCRemoved
"The **Channel** shall not refer to any *element* in a <*linkHasNetworkCTP*> relationship where the **linkEnd** refers to *container*."

inv_PotentialLinkEndCapacityIncrease
"The *pamPotentialLinkCapacity* value of all <*pamTopologicalLinkEnd*> involved in the same <*pamTopologicalLinkEndIsSupportedByNetworkTTP*> as the **linkEnd** is increased by the value of **requestedNumberOfNetworkCTPs** (down to each associated characteristic information)."

inv_provCapacityDecrease
"The *pamProvisionedLinkCapacity* attribute value of the <*topologicalLinkEnd*> referred by **linkEnd** has been decreased by the **requestedNumberOfNetworkCTPs** value."

inv_availCapacityDecrease
"The *pamAvailableLinkCapacity* attribute value of the <*topologicalLinkEnd*> referred by **linkEnd** has been decreased by the **requestedNumberOfNetworkCTPs** value."

inv_mappingToReturnedCapacity
"The **provisionedNetworkCTPs** value is equal to the new *pamProvisionedLinkCapacity* attribute value of the <*topologicalLinkEnd*> referred by **linkEnd**."

EXCEPTIONS

IF PRE_CONDITION inv_LinkEndExists NOT_VERIFIED RAISE_EXCEPTION incorrectLinkEnd;
IF PRE_CONDITION inv_capacityExists NOT_VERIFIED RAISE_EXCEPTION insufficientCapacity;
IF PRE_CONDITION inv_networkCTPPartOfLinkEnd NOT_VERIFIED RAISE_EXCEPTION invalidChannelsNumber;
IF PRE_CONDITION inv_LCRemoved NOT_VERIFIED RAISE_EXCEPTION failureToRemoveLC;
IF POST_CONDITION inv_PotentialLinkEndCapacityIncrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;
IF POST_CONDITION inv_provCapacityDecrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;
IF POST_CONDITION inv_availCapacityDecrease NOT_VERIFIED RAISE_EXCEPTION failureToDecreaseCapacity;

}

7.3 Report interfaces

COMPUTATIONAL_INTERFACE <commonReportResourceIfce>

COMPUTATIONAL_INTERFACE preProvisionedAdaptationManagementArcReportIfce

OPERATION {
ReportAssociateTrailWithTopologicalLink;
reportDisassociateTrailFromTopologicalLink;
reportAddCapacityToLink;
reportRemoveCapacityFromLink
}

COMPUTATIONAL_INTERFACE preProvisionedAdaptationManagementPointReportIfce

OPERATION {
ReportAssociateNetworkTTPWithTopologicalLinkEnd;
ReportDisassociateNetworkTTPFromTopologicalLinkEnd;
ReportAddCapacityToLinkEnd;
reportRemoveCapacityFromLinkEnd
}

7.3.1 Report associate trail with topologicalLink

<COMMUNITY: pre-provisioned adaptation management, ACTION: report assignment of server transport entity>

OPERATION reportAssociateTrailWithTopologicalLink {

INPUT_PARAMETERS

link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId;
trail: TrailId;

OUTPUT_PARAMETERS

-- *none*

RAISED EXCEPTIONS

-- *none*

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:*pamTopologicalLink*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
trail: <INFORMATION OBJECT:*pamTrail*>;

TRIGGER CONDITION

PRE_CONDITIONS

inv_trailNotAssociated
"The **trail** shall not refer to *server* in any <*pamTopologicalLinkIsSupportedByTrail*> where **link** refers to *client*."

POST_CONDITIONS

inv_trailAssociated
"The **trail** refers to *server* in a <*pamTopologicalLinkIsSupportedByTrail*> relationship where **link** refers to *client*."

}

7.3.2 Report disassociate trail with topologicalLink

<COMMUNITY: pre-provisioned adaptation management, ACTION: report deassignment of server transport entity>

OPERATION reportDisassociateTrailWithTopologicalLink {

INPUT_PARAMETERS

link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId;
trail: TrailId;

OUTPUT_PARAMETERS

-- *none*

RAISED EXCEPTIONS

-- *none*

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:*pamTopologicalLink*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
trail: <INFORMATION OBJECT:*pamTrail*>;

TRIGGER CONDITION

PRE_CONDITIONS

inv_trailAssociated
"The **trail** refers a *server* in a <*pamTopologicalLinkIsSupportedByTrail*> relationship where **link** refers to *client*."

POST_CONDITIONS

inv_trailNotAssociated
"The **trail** shall not refer to *server* in any <*pamTopologicalLinkIsSupportedByTrail*> where **link** refers to *client*."

}

7.3.3 Report add capacity to Link

<COMMUNITY: pre-provisioned adaptation management, ACTION: report client linking entity capacity provisioning>

OPERATION reportAddCapacityToLink {

INPUT_PARAMETERS
link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId;
numberOfLinkConnections: Capacity;
resultingLinkConnections: LinkConnectionList;

OUTPUT_PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:*pamTopologicalLink*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
numberOfLinkConnections: <ATTRIBUTE:*pamProvisionedLinkCapacity*>;
resultingLinkConnections ELEMENTS: <INFORMATION OBJECT:pamLinkConnection>;

TRIGGERING CONDITION

PRE_CONDITIONS

inv_provisionedLinkCapacity
"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLink*> referred by **involvedLink** is a valid value>."

POST_CONDITIONS

inv_provisionedLinkCapacityIncrease
"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLink*> referred by **involvedLink** has increased comparing to its value in the PRE_CONDITION>."

}

7.3.4 Report remove capacity from Link

<COMMUNITY: pre-provisioned adaptation management, ACTION: report client linking entity capacity removal>

OPERATION reportRemoveCapacityFromLink {

INPUT_PARAMETERS
link: LinkId;
clientLayerNetworkDomain: LayerNetworkDomainId;
capacity: RequestedCapacity::= CHOICE{
requestedChannels SEQUENCE OF {Channel};
-- *channel indicates the channel number such as timeslot in SDH*
requestedNumberOfLinkConnections Capacity}

OUTPUT_PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

PARAMETER_MATCHING

link: <INFORMATION OBJECT:*pamTopologicalLink*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
requestedChannels ELEMENTS: <INFORMATION OBJECT:pamLinkConnection>;
requestedNumberOfLinkConnections: <ATTRIBUTE:*pamProvisionedLinkCapacity*>;

TRIGGERING CONDITION

PRE_CONDITIONS

-- *none*

POST_CONDITIONS

inv_provisionedLinkCapacityDecrease
"The *pamProvisionedLinkCapacity* attribute value of the *pamTopologicalLink* referred by **link** has decreased."

}

7.3.5 Report associate networkTTP with topologicalLinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: report assignment of server transport entity>

OPERATION reportAssociatenetworkTTPWithTopologicalLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId;
networkTTP: NetworkTTPId;

OUTPUT_PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:*pamTopologicalLinkEnd*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
networkTTP: <INFORMATION OBJECT:*pamNetworkTTP*>;

TRIGGER CONDITION

PRE_CONDITIONS

inv_networkTTPNotAssociated
"The **networkTTP** shall not refer to *server* in any *<pamTopologicalLinkEndIsSupportedByNetworkTTP>* where **linkEnd** refers to *client*."

POST_CONDITIONS

inv_networkTTPAssociated
"The **networkTTP** refers to *server* in a *<pamTopologicalLinkEndIsSupportedByNetworkTTP>* relationship where **linkEnd** refers to *client*."

}

7.3.6 Report disassociate networkTTP with topologicalLinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: report deassignment of server transport entity>

OPERATION reportDisassociatenetworkTTPWithTopologicalLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId;
networkTTP: NetworkTTPId;

OUTPUT_PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:*pamTopologicalLinkEnd*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
networkTTP: <INFORMATION OBJECT:*pamNetworkTTP*>;

TRIGGER CONDITION

PRE_CONDITIONS

inv_networkTTPAssociated
"The **networkTTP** refers a *server* in a *<pamTopologicalLinkEndIsSupportedByNetworkTTP>* relationship where **linkEnd** refers to *client*."

POST_CONDITIONS

inv_networkTTPNotAssociated
"The **networkTTP** shall not refer to *server* in any *<pamTopologicalLinkEndIsSupportedByNetworkTTP>* where **linkEnd** refers to *client*."

}

7.3.7 Report add capacity to LinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: report client linking entity capacity provisioning>

OPERATION reportAddCapacityToLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId
numberOfNetworkCTPs: Capacity;
resultingNetworkCTPs: NetworkCTPsList;

OUTPUT_PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:*pamTopologicalLinkEnd*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
numberOfNetworkCTPs: <ATTRIBUTE:*pamProvisionedLinkCapacity*>;
resultingNetworkCTPs ELEMENTS: <INFORMATION OBJECT:pamNetworkCTP>;

TRIGGERING CONDITION

PRE_CONDITIONS

inv_provisionedLinkEndCapacity
"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLinkEnd*> referred by **involvedLinkEnd** is a valid value>."

POST_CONDITIONS

inv_provisionedLinkEndCapacityIncrease
"The *pamProvisionedLinkCapacity* attribute value of the <*pamTopologicalLinkEnd*> referred by **involvedLinkEnd** has increased comparing to its value in the PRE_CONDITION>."

}

7.3.8 Report remove capacity from LinkEnd

<COMMUNITY: pre-provisioned adaptation management, ACTION: report client linking entity capacity removal>

OPERATION reportRemoveCapacityFromLinkEnd {

INPUT_PARAMETERS
linkEnd: LinkEndId;
clientLayerNetworkDomain: LayerNetworkDomainId
capacity: RequestedCapacity::= CHOICE{
requestedChannels SEQUENCE OF {Channel};
-- *channel indicates the channel number such as timeslot in SDH*
requestedNumberOfNetworkCTPs Capacity}

OUTPUT_PARAMETERS
-- *none*

RAISED EXCEPTIONS
-- *none*

BEHAVIOUR

PARAMETER_MATCHING

linkEnd: <INFORMATION OBJECT:*pamTopologicalLinkEnd*>;
clientLayerNetworkDomain: <INFORMATION OBJECT:pamClientLayerNetworkDomain>;
requestedChannels ELEMENTS: <INFORMATION OBJECT:pamNetworkCTP>;
requestedNumberOfNetworkCTPs: <ATTRIBUTE:*pamProvisionedLinkCapacity*>;

TRIGGERING CONDITION

PRE_CONDITIONS

-- *none*

POST_CONDITIONS

inv_provisionedLinkEndCapacityDecrease
"The *pamProvisionedLinkCapacity* attribute value of the *pamTopologicalLinkEnd* referred by **linkEnd** has decreased>."

}

7.4 ASN.1 supporting productions

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. OBJECT IDENTIFIER, INTEGER, ...) will be developed as part of engineering viewpoint with the concerned technology.

```
Capacity::= INTEGER;
Channel::= SimpleNameType
LayerNetworkDomain::= CHOICE {
        layerNetworkDomainIfce LayerNetworkDomainIfce,
        userIdentifier SimpleNameType };
LinkConnectionList::= CHOICE {
        linkConnectionQueryIfceList          SEQUENCE OF {LinkConnectionQueryIfce},
        channelList                          SEQUENCE OF {Channel}};
LinkEndId::= CHOICE {
        linkEndQueryIfce LinkEndQueryIfce,
        userIdentifier SimpleNameType };
LinkId::= CHOICE {
        linkQueryIfce LinkQueryIfce,
        userIdentifier SimpleNameType };
networkCTPList::= CHOICE {
        networkCTPQueryIfceList      SEQUENCE OF{NetworkCTPQueryIfce};
        channelList                  SEQUENCE OF{Channel}
NetworkTTPId::= CHOICE {
        networkTTPQueryIfce NetworkTTPQueryIfce,
        userIdentifier SimpleNameType };
TrailId::= CHOICE {
        trailQueryIfce TrailQueryIfce,
        userIdentifier SimpleNameType };
```

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