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

Digital transmission systems – Digital networks –
Management of transport network

Computational viewpoint for topology management

ITU-T Recommendation G.854.3

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION G.854.3

COMPUTATIONAL VIEWPOINT FOR TOPOLOGY MANAGEMENT

Summary

The topology management community is used to managing the topology of a layer network domain and the relationships between the resources of the layer network domain being managed. The service provided by the community allows for the creation and deletion of the following resources inside a layer network domain: subnetwork, link, topological link, link end, topological link end and access group. The service also provides a set of reporting actions to advise potential notification receivers of creation and deletion of resources in the community. The service is available between one single caller and one single provider.

The partitioning of subnetworks and links is not addressed in this community.

Enterprise community actions covered by this specification:

- create access group;
- delete access group;
- create link;
- delete link;
- create link end;
- delete link end;
- create subnetwork;
- delete subnetwork;
- create topological link;
- delete topological link;
- create topological link end;
- delete topological link end;
- report access group creation;
- report access group deletion;
- report link creation;
- report link deletion;
- report link end creation;
- report link end deletion;
- report subnetwork creation;
- report subnetwork deletion;
- report topological link creation;
- report topological link deletion;
- report topological link end creation;
- report topological link end deletion.

Source

ITU-T Recommendation G.854.3 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

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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

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Recommendation G.854.3**COMPUTATIONAL VIEWPOINT FOR TOPOLOGY MANAGEMENT***(Geneva, 1999)***1 Scope**

This computational viewpoint specification is related to the topology management enterprise specification defined in Recommendation G.852.3 and the topology management information specification defined in Recommendation G.853.3.

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.852.3 (1999), *Enterprise viewpoint for topology management.*
- [4] ITU-T Recommendation G.853.3 (1999), *Information viewpoint for topology management.*

3 Definitions

None.

4 Abbreviations

This Recommendation uses the following abbreviations:

AG	Access Group
ASN.1	Abstract Syntax Notation One
CTP	Connection Termination Point
Id	Identifier
Ifce	Interface
inv	invariant
ITU	International Telecommunication Union
layerND	layer Network Domain
LE	Link End
LND	Layer Network Domain

**Documents**

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NTTP	Network Trail Termination Point
RM-ODP	Reference Model for Open Distributed Processing
SN	Subnetwork
SNC	Subnetwork Connection
SNTP	Subnetwork Termination Point
TL	Topological Link
TLE	Topological Link End
topman	topology management
TP	Termination Point
TTP	Trail Termination Point

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*.

6 Label references

Full label reference	Local label reference
<"Rec. G.853.1", INFORMATION_OBJECT:linkConnection>	linkConnection
<"Rec. G.853.1", INFORMATION_OBJECT:networkCTP>	networkCTP
<"Rec. G.853.1", INFORMATION_OBJECT:subnetworkConnection>	subnetworkConnection
<"Rec. G.853.3", INFORMATION_OBJECT: topmanAccessGroup>	topmanAccessGroup
<"Rec. G.853.3", INFORMATION_OBJECT: topmanLayerNetworkDomain>	topmanLayerNetworkDomain
<"Rec. G.853.3", INFORMATION_OBJECT: topmanLink>	topmanLink
<"Rec. G.853.3", INFORMATION_OBJECT: topmanLinkEnd>	topmanLinkEnd
<"Rec. G.853.3", INFORMATION_OBJECT: topmanNetworkTTP>	topmanNetworkTTP
<"Rec. G.853.3", INFORMATION_OBJECT: topmanSubnetwork>	topmanSubnetwork
<"Rec. G.853.3", INFORMATION_OBJECT: topmanSubnetworkTP>	topmanSubnetworkTP
<"Rec. G.853.3", INFORMATION_OBJECT: topmanTopologicalLink>	topmanTopologicalLink
<"Rec. G.853.3", INFORMATION_OBJECT: topmanTopologicalLinkEnd>	topmanTopologicalLinkEnd
<"Rec. G.853.1", ATTRIBUTE: linkDirectionality>	linkDirectionality
<"Rec. G.853.1", ATTRIBUTE: pointDirectionality>	pointDirectionality
<"Rec. G.853.1", ATTRIBUTE: resourceId>	resourceId
<"Rec. G.853.1", ATTRIBUTE: signalIdentification>	signalIdentification
<"Rec. G.853.1", ATTRIBUTE: topologicalEndDirection>	topologicalEndDirection
<"Rec. G.853.1", ATTRIBUTE: userLabel>	userLabel
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: accessGroupIsMadeOfNetworkTTPs>	accessGroupIsMadeOfNetworkTTPs

Full label reference	Local label reference
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: layerNetworkDomainIsMadeOf>	layerNetworkDomainIsMadeOf
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: linkBinds>	linkBinds
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: linkConnectionIsTerminatedByTopologicalEntities>	linkConnectionIsTerminatedByTopologicalEntities
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: linkEndHasNetworkCTPs>	linkEndHasNetworkCTPs
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: linkEndIsBoundTo>	linkEndIsBoundTo
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: linkHasLinkConnections>	linkHasLinkConnections
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: subnetworkHasSubnetworkConnections>	subnetworkHasSubnetworkConnections
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: subnetworkIsDelimitedBy>	subnetworkIsDelimitedBy
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: subnetworkTPIsRelatedToExtremity>	subnetworkTPIsRelatedToExtremity
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: topologicalLinkEndIsSupportedByNetworkTTP>	topologicalLinkEndIsSupportedByNetworkTTP
<"Rec. G.853.1", INFORMATION_RELATIONSHIP: topologicalLinkIsSupportedByTrail>	topologicalLinkIsSupportedByTrail

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

7 Interfaces

This specification does not define operations which change the userLabel of the resources or report this change to the notification receiver because they do not change the state of the system. Their exact signature will be developed as part of the engineering viewpoint, with the concerned technology.

7.1 Query interfaces

This specification refers to interfaces that allow get access to identification and properties of resources involved in the "topology 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 the following table with the information they allow access to.

Interface name	Information object	Attributes and relationships
topmanAccessGroupQueryIfce	<topmanAccessGroup>	<resourceId> <signalIdentification> <topologicalEndDirection> <userLabel> <accessGroupIsMadeOfNetworkTTPs, ROLE: elementTTP> <linkBinds, ROLE: transferCapacityLink> <layerNetworkDomainIsMadeOf, ROLE: containerLND>
topmanLayerNetworkDomainQueryIfce	<topmanLayerNetworkDomain>	<resourceId> <signalIdentification> <layerNetworkDomainIsMadeOf, ROLE: element>
topmanLinkEndQueryIfce	<topmanLinkEnd>	<resourceId> <signalIdentification> <topologicalEndDirection> <userLabel> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkEndIsBoundTo, ROLE: topologicalEntity> <linkEndHasNetworkCTPs, ROLE: elementCTP>
topmanLinkQueryIfce	<topmanLink>	<resourceId> <signalIdentification> <linkDirectionality> <userLabel> <linkBinds, ROLE: a_endTopological, ROLE: z_endTopological> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkHasLinkConnections, ROLE: elementLC>
topmanNetworkTTPQueryIfce	<topmanNetworkTTP>	<resourceId> <signalIdentification> <subnetworkTPIsRelatedToExtremity, ROLE: abstractionSNTP> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <accessGroupIsMadeOfNetworkTTPs, ROLE: containerAG>

Interface name	Information object	Attributes and relationships
topmanSubnetworkQueryIfce	<topmanSubnetwork>	<resourceId> <signalIdentification> <userLabel> <linkBinds, ROLE: transferCapacityLink> <subnetworkIsDelimitedBy, ROLE: elementSNTP> <linkEndIsBoundTo, ROLE: transferCapacityLE> <subnetworkHasSubnetworkConnections, ROLE: elementSNC> <linkConnectionIsTerminatedByTopologicalEntities, ROLE: transportEntityLC> <layerNetworkDomainIsMadeOf, ROLE: containerLND>
topmanSubnetworkTPQueryIfce	<topmanSubnetworkTP>	<resourceId> <signalIdentification> <pointDirectionality> <subnetworkIsDelimitedBy, ROLE: containerSN> <subnetworkTPIsRelatedToExtremity, ROLE: extremity> <layerNetworkDomainIsMadeOf, ROLE: containerLND>
topmanTopologicalLinkEndQueryIfce	<topmanTopologicalLinkEnd>	<resourceId> <signalIdentification> <topologicalEndDirection> <userLabel> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <linkEndIsBoundTo, ROLE: topologicalEntity> <topologicalLinkEndIsSupportedByNetworkTTP, ROLE: serverTTP>
topmanTopologicalLinkQueryIfce	<topmanTopologicalLink>	<resourceId> <signalIdentification> <linkDirectionality> <userLabel> <linkBinds, ROLE: a_endTopological, ROLE: z_endTopological> <layerNetworkDomainIsMadeOf, ROLE: containerLND> <topologicalLinkIsSupportedByTrail, ROLE: serverTrail>

7.2 Operational interfaces

7.2.1 Common resource interface

The common resource interface provides functionality for changing the resource identifier of the resources by using the operation "change resource identifier". It satisfies the enterprise requirements stated in <"Rec. G.852.2", COMMUNITY: Transport Network Enterprise Model, General policy>.

COMPUTATIONAL_INTERFACE commonResourceIfce {

OPERATION <changeResourceIdentifier>; }

7.2.1.1 Change resource identifier

<"Rec. G.852.2", COMMUNITY: Transport Network Enterprise Model, General policy>

OPERATION changeResourceId {

INPUT_PARAMETERS

layerND: LayerNetworkDomainId ::= TopmanLayerNetworkDomainQueryIfce;
involvedResource: ResourceChoice
newResourceIdentifier: UserIdentifier ::= SimpleNameType;

OUTPUT_PARAMETERS

agreedResourceIdentifier: UserIdentifier ::= SimpleNameType;

RAISED_EXCEPTIONS

invalidResource: NULL;
newResourceIdentifierNotUnique: newResourceIdentifier;
failureToChangeId: NULL;

BEHAVIOUR

SEMI_FORMAL

PARAMETER_MATCHING

layerND: <INFORMATION OBJECT: topmanLayerNetworkDomain>;
involvedResource: <INFORMATION OBJECT networkInformationTop>;
newResourceIdentifier: <INFORMATION ATTRIBUTE: resourceId>;
agreedResourceIdentifier: <INFORMATION ATTRIBUTE: resourceId>;

PRE_CONDITIONS

inv_existingInvolvedResource

"involvedResource shall refer to *element* in the same <layerNetworkDomainIsMadeOf> relationship where layerND refers to *containerLND*."

inv_uniqueResourceId

"newResourceIdentifier must not be equal to <resourceId> of any *element* in the same <layerNetworkDomainIsMadeOf> relationship where layerND refers to *containerLND*."

POST_CONDITIONS

inv_idChanged

"<resourceId> of the resource referred to by involvedResource has to be equal to newResourceIdentifier and agreedResourceIdentifier.";

EXCEPTIONS

IF PRE_CONDITION inv_existingInvolvedResource NOT_VERIFIED RAISE_EXCEPTION

invalidResource;

IF PRE_CONDITION inv_uniqueResourceId NOT_VERIFIED RAISE_EXCEPTION

newResourceIdentifierNotUnique;

```

        IF POST_CONDITION inv_idChanged NOT_VERIFIED RAISE_EXCEPTION failureToChangeId;
    ;}

```

7.2.2 Topology resources provisioning interface

The Topology Resources Provisioning Interface provides functionality for the provisioning of the resources defined in <"Rec. G.852.2", COMMUNITY: Transport Network Enterprise Model>.

```

COMPUTATIONAL_INTERFACE topologyResourcesProvisioningIfce {
    OPERATION
        <createAccessGroup>;
        <deleteAccessGroup>;
        <createLink>;
        <deleteLink>;
        <createLinkEnd>;
        <deleteLinkEnd>;
        <createSubnetwork>;
        <deleteSubnetwork>;
        <createTopologicalLink>;
        <deleteTopologicalLink>;
        <createTopologicalLinkEnd>;
        <deleteTopologicalLinkEnd>; }

```

7.2.2.1 Create access group

<COMMUNITY: Topology Management, ACTION: create access group>

```

OPERATION createAccessGroup {
    INPUT_PARAMETERS
        layerND: LayerNetworkDomainId;
        suppliedUserIdentifier: UserIdentifier;
            -- zero length string or 0 implies none supplied.
        suppliedUserLabel: GraphicString;
            -- zero length string implies none supplied.
        suppliedDirection: topologicalEndDirection;

```

```

    OUTPUT_PARAMETERS
        accessGroup: AccessGroupId;

```

```

    RAISED_EXCEPTIONS
        userIdentifierNotUnique: suppliedUserIdentifier;
        failureToSetUserIdentifier: NULL;
        failureToSetUserLabel: NULL;
        failureToCreateAccessGroup: NULL;
        failureToSetDirection: NULL;

```

BEHAVIOUR

SEMI_FORMAL

```

    PARAMETER_MATCHING
        layerND: <INFORMATION OBJECT: topmanLayerNetworkDomain>;
        suppliedUserIdentifier: <INFORMATION ATTRIBUTE: resourceId>;
        suppliedUserLabel: <INFORMATION ATTRIBUTE: userLabel>;
        accessGroup: <INFORMATION OBJECT: topmanAccessGroup>;
        suppliedDirection: <INFORMATION ATTRIBUTE: topologicalEndDirection>;

```

PRE_CONDITIONS

inv_uniqueUserIdentifier

"The **suppliedUserIdentifier** value shall not be equal to the <resourceId> value of any *element* in the <layerNetworkDomainIsMadeOf> relationship where the **layerND** refers to *containerLND*."