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SERIES Q: SWITCHING AND SIGNALLING

Technical report TRQ.2401: Transport control signalling requirements – Signalling requirements for AAL type 2 link control capability set 2

ITU-T Q-series Recommendations – Supplement 33

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

For further details, please refer to the list of ITU-T Recommendations.

Supplement 33 to ITU-T Q-series Recommendations

Technical report TRQ.2401: Transport control signalling requirements – Signalling requirements for AAL type 2 link control capability set 2

Summary

This Supplement to the Q series of ITU-T Recommendations specifies the general aspects of AAL type 2 signalling requirements for the development of AAL type 2 signalling Capability Set 2 (CS–2). It should be read in conjunction with ITU-T Q-Series Supplement 8 realise the full set of requirements.

This Supplement identifies what can be viewed as the capabilities for AAL type 2 Signalling. In addition, it describes the essential features and models useful for the development of functional entity actions in support of AAL type 2 Signalling.

FOREWORD

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1 Scope

This Supplement contains the signalling requirements for the AAL type 2 connection signalling for the capability set 2 (CS–2) to extend the CS–1 signalling requirements specified in ITU-T Q-series Supplement 8 [1]. Only additional or changed requirements to those described in ITU-T Q-series Supplement 8 [1] are shown.

The main new features introduced in this capability set are:

– Support of the latest version of AAL type 2 SSCS for Narrowband Services,

– Connection Resource Modification,

– AAL type 2 Path Type Selection, and

– AAL type 2 Path Redirection Request.

2 References

[1] ITU-T Q-series Supplement 8 (1999), *Technical report TRQ.2400: Transport control signalling requirements – Signalling requirements for AAL Type 2 link control capability set 1*.

[2] ITU-T I.366.2 (2000), *AAL type 2 service specific convergence sublayer for narrow–band services*.

[3] ITU-T I.356 (2000), *B–ISDN ATM layer cell transfer performance*.

3 Definitions

For the purpose of this Supplement the definitions in clause 3 of ITU-T Q-Series Supplement 8 [1] apply, with the addition of :

3.1 AAL type 2 Connection Resource: Describes the attributes of the AAL type 2 links making up the connection, and the Service Specific Convergence Sublayer resources used at the AAL type 2 end points.

3.2 AAL type 2 Path Characteristics: Describes the AAL type 2 path type.

3.3 AAL type 2 Preferred Link Characteristics: Link Characteristics to be used at connection establishment for nodes supporting connection resource modification capabilities.

3.4 modified SSI attributes: SSI profile or multiplier n, for $n \times 64$ kbit/s. Preferred SSI attributes. SSI attributes to be used at connection establishment for nodes supporting connection resource modification capabilities.

4 Abbreviations

For the purpose of this Supplement the abbreviations in clause 4 of ITU-T Q-series Supplement 8 [1] apply, with the addition of:

M_SSI   Modified SSI attributes

P_SSI   Preferred SSI attributes

SSI   Service Specific Convergence Sublayer Information

5 Requirements

The additional / modified AAL type 2 signalling requirements for capability set 2 (CS–2) are provided in this clause to extend those in clause 5 of ITU-T Q-series Supplement 8 [1].

5.1 General

The AAL type 2 Signalling Endpoint shall include mechanisms for the establishment and clearing of AAL type 2 links.

In support of general signalling requirements for the establishment of AAL type 2 links, the AAL type 2 Signalling Endpoint shall provide:

- the transparent transfer of the AAL type 2 served user generated reference to the AAL type 2 served user in the forward direction in the establishment phase;

  NOTE – the AAL type 2 served user generated reference may include, for example, a reference to an access channel or radio link.

- the Service Specific Convergence Sublayer type and any relevant Service Specific Convergence Sublayer parameters;

- the AAL type 2 link characteristics; and

- the AAL type 2 path types.

5.2 Routing

The AAL type 2 Signalling shall support hop-by-hop routing.

Routing typically is based on addressing information (in the switched case); path and link characteristics/SSCS (at a AAL type 2 endpoint) reflecting the resources required, eg. bandwidth; path type and other information. The information used for describing the link characteristics shall be defined in such a way to allow efficient routing with minimal delay and processing burden. Routing algorithms are implementation specific.

Rerouting at an AAL type 2 node may be based on information received from an AAL type 2 terminating endpoint.

5.2.1 Support of AAL type 2 Service Specific Convergence Sublayer for Narrow–band Services [2]

The AAL type 2 Signalling Endpoint shall provide the Service Specific Convergence Sublayer type and any relevant Service Specific Convergence Sublayer parameters

5.2.2 Connection Resource Modification

Either AAL type 2 Served User shall be able to modify the resources associated with an active AAL type 2 connection, represented by the information contained in the AAL type 2 Link Characteristic or the Service Specific Convergence Sublayer information, Profile or Multiplier n for $n \times 64$ kbit/s.

NOTE – This modification of AAL type 2 connection resources only involves Connection Admission Control (CAC).

Collision of connection resource modification requests shall be avoided by the AAL type 2 Served User.

Modification shall be performed with no loss of CPS-SDU information.

Use of inband procedures are not excluded.

The use of the preferred AAL type 2 Link Characteristics and preferred AAL type 2 SSCS are to avoid the need of a subsequent modification of the connection resources immediately after the connection establishment.

The capability to modify AAL type 2 SSCS or AAL type 2 Link Characteristics, for an AAL type 2 connection must be indicated by the originating AAL type 2 endpoint. Each AAL type 2 node must support the modification capability of AAL type 2 Link Characteristics. Only the terminating AAL type 2 endpoint need support the modification capability of the AAL type 2 SSCS.

This capability uses the following objects:

–   SSI Modification Support Request,

–   AAL type 2 Link Characteristics Modification Support Request,

–   SSI Modification Support Response, and

–   AAL type 2 Link Characteristics Modification Support Response.

5.2.3   AAL type 2 Path Types

AAL type 2 path types shall include:

•   Path Type, tolerant.

•   Path Type, stringent.

The above information is only used for AAL type 2 path selection.

The attributes of stringent and tolerant shall be those as defined in ITU-T I.356 [3].

5.2.4   CS–2 to CS–1 Interworking

AAL type 2 path type Selection

It is assumed that a CS–1 node operates in a stringent mode, therefore the information shall be passed on transparently through an AAL type 2 switch.

AAL type 2 Path Redirection

A CS–1 node receiving an AAL type 2 path redirection request, shall ignore the request.

Connection Resource Modification

CS–1 nodes receiving the AAL type 2 Link Characteristics Modification Support Request information relating to connection resource modification, shall discard that information.

CS–1 switches receiving the SSI Modification Support Request information relating to connection resource modification, shall pass on transparently this information.

AAL type 2 Service Specific Convergence Sublayer for Narrow–band Services

The information shall be passed on transparently through an AAL type 2 switch (both CS–1 and CS–2).

6   Architecture of AAL type 2 Signalling

For the purpose of this Supplement the architecture in clause 6 of ITU-T Q-series Supplement 8 [1] apply.

7 AAL type 2 Signalling Flows

The following diagrams illustrate the modification of AAL type 2 connection resource (successful and unsuccessful).

7.1 Successful AAL type 2 Connection Establishment Information Flows
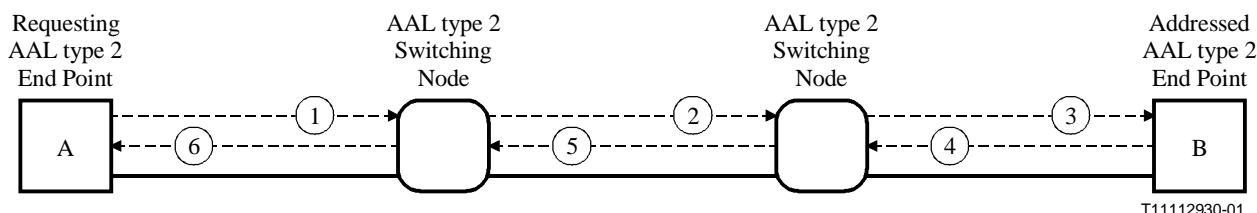
**Figure 1 – Successful AAL type 2 Connection
Establishment Information Flows**

The flows illustrated in Figure 1 are as follows:

1	**AAL type 2 Setup-Request.ready**	**Requesting End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1	End Pt. Address = B,	CID = 15,
	Served User Transport Information	AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 27
	P_SSI (optional)	AAL type 2 Preferred Link Characteristics (optional)	
	SSI Modification Support Request	AAL type 2 Link Characteristics Modification Support Request	
	SSI	AAL type 2 Path Type	

Initiation of information flow: The requesting end point starts to establish an AAL type 2 network connection.

Pocessing upon receipt: The switching node selects a route towards the addressed end point that can provide enough resources to carry the AAL type 2 network connection to be established. It then issues Information Flow 2.

2	**AAL type 2 Setup-Request.ready**	**Switching Node to Switching Node**	
	User information	**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1	End Pt. Address = B,	CID = 25,
	Served User Transport Information	AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 18
	P_SSI (optional)SSI Modification Support Request	AAL type 2 Preferred Link Characteristics (optional)	
	SSI	AAL type 2 Link Characteristics Modification Support Request	
		AAL type 2 Path Type	

Processing upon receipt: The switching node selects a route towards the addressed end point that can provide enough resources to carry the AAL type 2 network connection to be established. It then issues Information Flow 3.

3	**AAL type 2 Setup-Request.ready**	**Switching Node to Addressed End Point**	
	User information	**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1	End Pt. Address = B,	CID = 10,
	Served User Transport Information	AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 55
	P_SSI (optional)	AAL type 2 Preferred Link Characteristics (optional)	
	SSI Modification Support Request	AAL type 2 Link Characteristics Modification Support Request	
	SSI	AAL type 2 Path Type	

Processing upon receipt: The addressed end point assures that enough resources in the end point remain for the new AAL type 2 network connection. It then issues Information Flow 4 to confirm the establishment. Finally, the AAL type 2 signalling served user is informed about the establishment of the new AAL type 2 network connection.

4	**AAL type 2 Setup-Request.commit**	**Addressed End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	SSI Modification Support Response	AAL type 2 Link Characteristics Modification Support Response	CID = 10,
			AAL type 2 Path Identifier = 55

Processing upon receipt: The switching node propagates the confirmation of the AAL type 2 network connection establishment as Information Flow 5.

5	**AAL type 2 Setup-Request.commit**		**Switching Node to Switching Node**	
	User information		**Connection information**	**Link information**
	SSI Modification Support Response		AAL type 2 Link Characteristics Modification Support Response	CID = 25, AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node propagates the confirmation of the AAL type 2 network connection establishment as Information Flow 6.
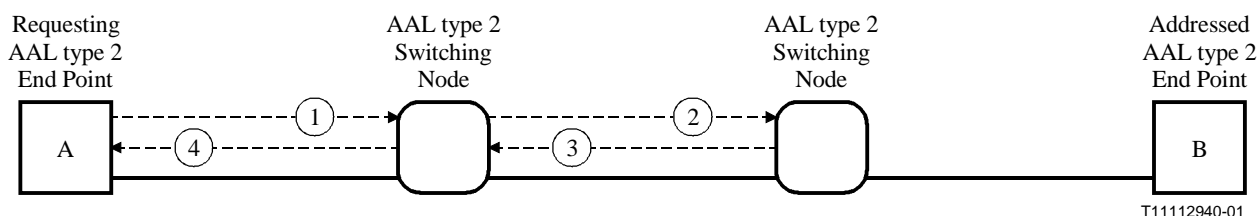
6	**AAL type 2 Setup-Request.commit**		**Switching Node to Requesting End Point**	
	User information		**Connection information**	**Link information**
	SSI Modification Support Response		AAL type 2 Link Characteristics Modification Support Response	CID = 15, AAL type 2 Path Identifier = 27

Processing upon receipt: The requesting end point informs the AAL type 2 signalling served user about the completion of the requested AAL type 2 network connection establishment.

NOTE 1 – The CID values, the AAL type 2 Path Identifier values and the AAL type 2 Connection Identifier values are chosen for illustrative purposes only.

NOTE 2 – The combination of CID value and AAL type 2 Path Identifier value identifies the AAL type 2 link controlled by the AAL type 2 signalling peer entities.

7.2 Unsuccessful AAL type 2 Connection Establishment Information Flows

Figure 2 – Unsuccessful AAL type 2 Connection Establishment Information Flows

The flows illustrated in Figure 2 are as follows:

1	**AAL type 2 Setup-Request.ready**		**Requesting End Point to Switching Node**	
	User information		**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1		End Pt. Address = B,	CID = 15,
	Served User Transport Information		AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 27
	P_SSI (optional)		AAL type 2 Preferred Link Characteristics (optional)	
	SSI Modification Support Request			
	SSI		AAL type 2 Link Characteristics Modification Support Request	
			AAL type 2 Path Type	

Initiation of information flow: The requesting end point starts to establish an AAL type 2 network connection.

Processing upon receipt: The switching node selects a route towards the addressed end point that can provide enough resources to carry the AAL type 2 network connection to be established. It then issues Information Flow 2.

2	AAL type 2 Setup-Request.ready	Switching Node to Switching Node	
	User information	**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1	End Pt. Address = B,	CID = 25,
	Served User Transport Information	AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 18
	P_SSI (optional)	AAL type 2 Preferred Link Characteristics (optional)	
	SSI Modification Support Request	AAL type 2 Link Characteristics Modification Support Request	
	SSI	AAL type 2 Path Type	

Processing upon receipt: The switching node attempts to select a route towards the addressed end point; however, no route is available that can provide enough resources to carry the AAL type 2 network connection to be established – the establishment has to be canceled. The switching node then releases all resources already committed to the new AAL type 2 network connection and issues Information Flow 3.

3	AAL type 2 Setup-Request.cancel	Switching Node to Switching Node	
	User information	**Connection information**	**Link information**
	(none)	(none)	CID = 25,
			AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node releases all resources already committed to the new AAL type 2 network connection and propagates the cancellation of the AAL type 2 network connection establishment as Information Flow 4.

4	AAL type 2 Setup-Request.cancel	Switching Node to Requesting End Point	
	User information	**Connection information**	**Link information**
	(none)	(none)	CID = 15,
			AAL type 2 Path Identifier = 27

Processing upon receipt: The requesting end point releases all resources already committed to the new AAL type 2 network connection and informs the AAL type 2 signalling served user about the cancellation of the requested AAL type 2 network connection establishment.

NOTE 1 – The CID values, the AAL type 2 Path Identifier values and the AAL type 2 Connection Identifier values are chosen for illustrative purposes only.

NOTE 2 – The combination of CID value and AAL type 2 Path Identifier value identifies the AAL type 2 link controlled by the AAL type 2 signalling peer entities.

7.3 Successful AAL type 2 Connection Resource Modification Information Flows
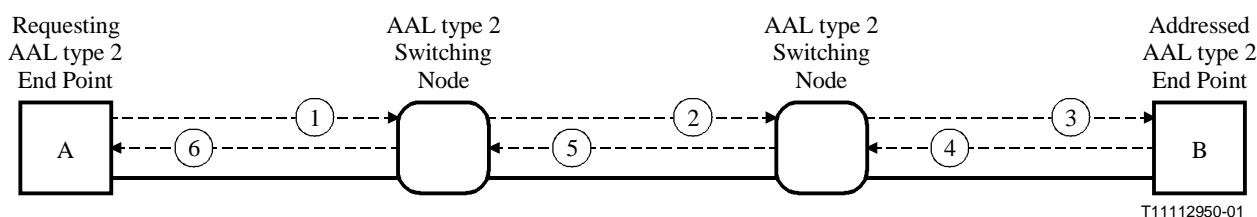
**Figure 3 – Successful AAL type 2 Connection
Resource Modification Information Flows**

The flows illustrated in Figure 3 are as follows:

1	**AAL type 2 Modification-Request.ready**	**Requesting End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	M_SSI	AAL type 2 Link Characteristics	CID = 15,
	Served User Correlation ID		AAL type 2 Path Identifier = 27

Initiation of information flow: The requesting end point starts to modify the AAL type 2 link characteristics / M_SSI information.

Processing upon receipt: The switching node assures that enough resources are available for the modified AAL type 2 connection resources and reserves the resources. It then issues Information Flow 2.

2	**AAL type 2 Modification-Request.ready**	**Switching Node to Switching Node**	
	User information	**Connection information**	**Link information**
	M_SSI	AAL type 2 Link Characteristics	CID = 25,
	Served User Correlation ID		AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node assures that enough resources remain for the modified AAL type 2 link characteristics and reserves the resources. It then issues Information Flow 3.

3	**AAL type 2 Modification-Request.ready**	**Switching Node to Addressed End Point**	
	User information	**Connection information**	**Link information**
	M_SSI	AAL type 2 Link Characteristics	CID = 25,
	Served User Correlation ID		AAL type 2 Path Identifier = 18

Processing upon receipt: The addressed end point assures that the resources for the modified AAL type 2 link characteristics and M_SSI are available, and allocate the resources. It then issues Information Flow 4 to confirm the modification. Finally, the AAL type 2 signalling served user is informed about the modification of the AAL type 2 link characteristics / M_SSI information.

4	**AAL type 2 Modify-Request.commit**	**Addressed End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	Served User Correlation ID	(none)	CID = 25,
			AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node allocates the reserved resources to the AAL type 2 connection and propagates the confirmation of the AAL type 2 connection resource modification as Information Flow 5.

5	**AAL type 2 Modify-Request.commit**	**Switching Node to Switching Node**	
	User information	**Connection information**	**Link information**
	Served User Correlation ID	(none)	CID = 25, AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node allocates the reserved resources to the AAL type 2 connection and propagates the confirmation of the AAL type 2 connection resource modification as Information Flow 6.
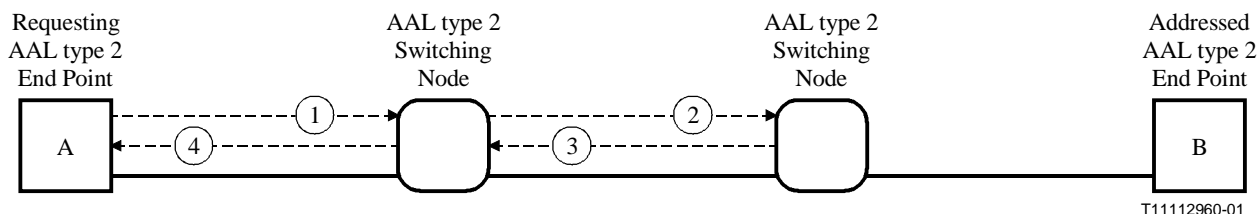
6	**AAL type 2 Modify-Request.commit**	**Switching Node to Requesting End Point**	
	User information	**Connection information**	**Link information**
	Served User Correlation ID	(none)	CID = 15, AAL type 2 Path Identifier = 27

Processing upon receipt: The requesting end point allocates the reserved resources and then informs the AAL type 2 signalling served user about the completion of the requested AAL type 2 connection resource modification.

7.3 Unsuccessful AAL type 2 Connection Resource Modification Information Flows

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Figure 4 – Unsuccessful AAL type 2 Connection Resource Modification Information Flows

The flows illustrated in Figure 4 are as follows:

1	**AAL type 2 Modify-Request.ready**	**Requesting End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	M_SSI	AAL type 2 Link Characteristics	CID = 15, AAL type 2 Path Identifier = 27
	Served User Correlation ID		

Initiation of information flow: The requesting end point starts to modify the AAL type 2 link characteristics / M_SSI information.

Processing upon receipt: The switching node assures that enough resources are available for the modified AAL type 2 connection resources and reserves the resources. It then issues Information Flow 2.

2	**AAL type 2 Modify-Request.ready**	**Switching Node to Switching Node**	
	User information	**Connection information**	**Link information**
	M_SSI	AAL type 2 Link Characteristics	CID = 25,
	Served User Correlation ID		AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node attempts to reserve enough resources for the modified AAL type 2 link characteristics; however, enough resources to carry the modified AAL type 2 connection is not available – the modification has to be canceled. The switching node then remains the AAL type 2 connection as it was and issues Information Flow 3.

3	**AAL type 2 Modify-Request.cancel**	**Switching Node to Switching Node**	
	User information	**Connection information**	**Link information**
	(none)	(none)	CID = 25,
			AAL type 2 Path Identifier = 18

Processing upon receipt: The switching node cancels all resources reserved for the modification request, remains the AAL type 2 connection as it was, and propagates the cancellation of the AAL type 2 connection resource modification as Information Flow 4.

4	**AAL type 2 Modify-Request.cancel**	**Switching Node to Requesting End Point**	
	User information	**Connection information**	**Link information**
	(none)	(none)	CID = 15,
			AAL type 2 Path Identifier = 27

Processing upon receipt: The requesting end point cancels all resources reserved for the modification request, retains the AAL type 2 connection as it was, and informs the AAL type 2 signalling served user about the unsuccessful requested AAL type connection resource modification.

7.5   Successful AAL type 2 Path Redirection Information Flows
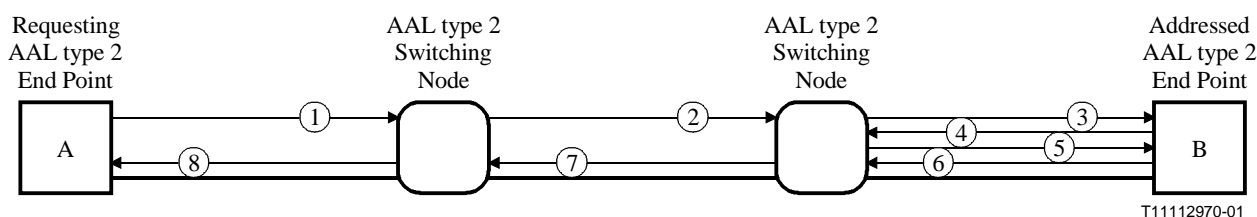
**Figure 5 – Successful AAL type 2 Path Redirection Information Flows between
an AAL type 2 Switching Node and the Terminating AAL type 2 End Point**

Flows 1 and 2 illustrated in Figure 5 are identical to the Flows 1 and 2 described in Figure 1 "Successful AAL type 2 Connection Establishment Information Flows" and Flows 6, 7, and 8 in Figure 5 above equate to Flows 4, 5 and 6 described in Figure 1 respectively. Flows 3, 4 and 5 are as follows:

3	**AAL type 2 Setup-Request.ready**	**Addressed End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1	End Pt. Address = B,	CID = 5,
	Served User Transport Information	AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 27
	P_SSI (optional)	AAL type 2 Preferred Link Characteristics (optional)	
	SSI Modification Support Request	AAL type 2 Link Characteristics Modification Support Request	
	SSI	AAL type 2 Path Type	

Processing Upon receipt: Upon receipt, the addressed end point decides that the selected path is not acceptable and that the connection establishment can only progress if an alternative AAL type 2 Path Identifier is selected. It therefore proposes alternative AAL type 2 Path Identifier in the AAL type 2 Setup-Request.cancel Information Flow 4 returned to the preceding AAL type 2 node.

4	**AAL type 2 Setup-Request.cancel**	**Addressed End Point to Switching Node**	
	User information	**Connection information**	**Link information**
	SSI Modification Support Response	AAL type 2 Link Characteristics Modification Support Response	CID = 5,
			AAL type 2 Path Identifier = 27,
			Alternative AAL type 2 Path Identifier = 32

Processing upon receipt: Upon receipt of this information flow containing a proposed alternative AAL type 2 Path Identifier from the Addressed AAL type 2 end point, the AAL type 2 node re-attempts establishment of the connection as information Flow 5.

5	**AAL type 2 Setup-Request.ready**	**Switching Node to AAL type 2 End Point**	
	User information	**Connection information**	**Link information**
	AAL type 2 served user generated reference = 1	End Pt. Address = B,	CID = 25,
	Served User Transport Information	AAL type 2 Link Characteristics	AAL type 2 Path Identifier = 32
	P_SSI (optional)	AAL type 2 Preferred Link Characteristics (optional)	
	SSI Modification Support Request	AAL type 2 Link Characteristics Modification Support Request	
	SSI	AAL type 2 Path Type	

Processing upon receipt: The addressed end point assures that enough resources in the end point remain available for the new AAL type 2 network connection. It then issues Information Flow 6 to

confirm the successful establishment. Finally, the AAL type 2 signalling served now is informed about the establishment of the new AAL type 2 network connection.

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