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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Supplementary services for multimedia

Call signalling transport channel suspension and redirection within H.323 systems

ITU-T Recommendation H.460.15

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.349
Directory services architecture for audiovisual and multimedia services	H.350–H.359
Quality of service architecture for audiovisual and multimedia services	H.360–H.369
Supplementary services for multimedia	**H.450–H.499**
MOBILITY AND COLLABORATION PROCEDURES	
Overview of Mobility and Collaboration, definitions, protocols and procedures	H.500–H.509
Mobility for H-Series multimedia systems and services	H.510–H.519
Mobile multimedia collaboration applications and services	H.520–H.529
Security for mobile multimedia systems and services	H.530–H.539
Security for mobile multimedia collaboration applications and services	H.540–H.549
Mobility interworking procedures	H.550–H.559
Mobile multimedia collaboration inter-working procedures	H.560–H.569
BROADBAND AND TRIPLE-PLAY MULTIMEDIA SERVICES	
Broadband multimedia services over VDSL	H.610–H.619

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

ITU-T Recommendation H.460.15

Call signalling transport channel suspension and redirection within H.323 systems

Summary

This Recommendation specifies a mechanism that allows H.323 entities participating in a stable call to temporarily suspend and later resume the call signalling channel.

Further, using the procedures described in this Recommendation, an intermediate entity (such as a Gatekeeper that routes call signalling messages at the beginning of the call) may remove itself from the call signalling path once the call is stable, and establish the call signalling path directly between the other two entities.

Source

ITU-T Recommendation H.460.15 was approved on 15 March 2004 by ITU-T Study Group 16 (2001-2004) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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 expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, 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

ITU-T Recommendation H.460.15

Call signalling transport channel suspension and redirection within H.323 systems

1 Scope

This Recommendation describes the procedures and the signalling protocol for temporarily suspending the call signalling transport channel between two H.323 entities on a call-by-call basis. This suspension is performed between the entities after the call reaches a stable state and only after mutual agreement. The signalling channel is resumed when a signalling message needs to be sent. For purposes of procedures in this Recommendation, a call is considered to be in a stable state as defined in R.3.5/H.323.

The basic suspension and resumption procedure between two entities is further extended to an intermediate entity, such as a Gatekeeper routing call signalling, that can use it to get out of the signalling path and let the signalling flow directly between two endpoints.

These procedures use the H.323 Generic Extensible Framework (GEF).

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; 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

– ITU-T Recommendation H.225.0 (2003), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems*.

– ITU-T Recommendation H.323 (2003), *Packet-based multimedia communications systems*.

– ITU-T Recommendation H.460.1 (2002), *Guidelines for the Use of the Generic Extensible Framework (GEF)*.

– ITU-T Recommendation H.460.6 (2002), *Extended Fast Connect feature*.

– ITU-T Recommendation X.680 (2002) | ISO/IEC 8824-1:2002, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation*.

– ITU-T Recommendation X.691 (2002) | ISO/IEC 8825-2:2002, *Information technology – ASN.1 encoding rules – Specification of Packed Encoding Rules (PER)*.

3 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

ACF Admission Confirm

ARQ Admission Request

ASN.1 Abstract Syntax Notation No. 1

CRV Call Reference Value

GEF Generic Extensible Framework

LCF Location Confirm

LRQ Location Request

PER Packed Encoding Rules

RAS Registration, Admission and Status

RCF Registration Confirm

RRQ Registration Request

4 Capability advertisement

4.1 RAS messages

Endpoints capable of suspending active call signalling channels may advertise that capability in the **featureSet.supportedFeatures** field of the RRQ messages sent to the Gatekeeper. The capability shall not be advertised in lightweight RRQ messages. If the Gatekeeper routes call signalling messages, and supports this capability, then it shall indicate as such in the **featureSet.supportedFeatures** field of the RCF message.

When initiating a call, an endpoint signals its desire or need for peering with another endpoint that supports this capability by indicating as such in the **featureSet.desiredFeatures** or **featureSet.neededFeature** as appropriate in the ARQ message to its Gatekeeper.

If the originating endpoint's Gatekeeper is a direct mode Gatekeeper and needs to send one or more LRQs in order to resolve the address, it shall propagate this desired or needed information in the **featureSet** field of the LRQ message(s) that it sends to other Gatekeepers. A direct mode remote Gatekeeper shall select the appropriate endpoint(s) based on endpoints' capabilities.

If the originating endpoint's Gatekeeper routes call signalling and needs to send one or more LRQs in order to resolve the address, it shall signal its own desire, or need, for peering with another entity that support this capability in the **featureSet** field of the LRQ message(s). A remote Gatekeeper that routes call signalling shall indicate its own capabilities in the LCF message and shall select, based on local policy, the appropriate terminating endpoint.

An Annex G/H.225.0 Peer Element signals requirement for this capability in the **common.featureSet.desiredFeatures** or **common.featureSet.neededFeatures** fields.

Once the local Gatekeeper identifies the signalling peer for the call (itself, a remote Gatekeeper or an endpoint), it shall indicate support of this feature in the **featureSet.supportedFeatures** of the ACF message it returns.

4.2 Call signalling messages

The originating entity shall indicate its support in **supportedFeatures** of the H.225.0 Setup message. Its signalling neighbour shall indicate its support in **supportedFeatures** of the Connect message.

The capability is indicated with the feature identifier shown in Table 1.

Table 1/H.460.15 – Indication of the ability to suspend and redirect signalling transport channel

Feature name:	Call signalling transport channel suspension and redirection
Feature description:	This feature allows an H.323 entity to temporarily suspend and subsequently resume an active transport channel opened for call signalling.
Feature identifier type:	Standard
Feature identifier value:	15

The following table identifies the parameter contained in the generic data structure.

Table 2/H.460.15 – Signalling channel suspend and redirect parameter

Parameter name:	Signalling channel suspend and redirect
Parameter description:	This is the data sent in H.225.0 RAS and Call Signalling messages to manage suspension, resumption, and redirection of call signalling channel.
Parameter identifier type:	Standard
Parameter identifier value:	1
Parameter type:	Raw
Parameter cardinality:	Once and only once

The ASN.1 structure of this parameter is described in clause 7.

5 Feature description

5.1 Transport channel suspend and resume

Once both the signalling entities recognize the support by the other, either one may invoke the feature by sending a **StatusInquiry** message and including the **genericData** field in its **h323-uu-pdu** containing **ChannelSuspendRequest** information as described in this Recommendation. The **channelResumeAddress** shall be set to the address(es) to which the connection should be re-established, with multiple addresses listed as an ordered set of alternatives. The **ChannelSuspendRequest** message contains an **immediateResume** flag which, when set to TRUE, indicates that the recipient shall immediately re-establish a new connection upon closure of the current connection.

The signalling neighbour should reply with a **Status** message with the **ChannelSuspendResponse** in the genericData field. If it is agreeable to the suspension of the connection, it should indicate that by setting the **okToSuspend** field to TRUE. The entity that wishes to suspend the connection will then confirm with a **ChannelSuspendConfirm** message and proceed to gracefully shutdown the transport connection, taking care to flush any remaining messages in the sent buffer on both sides of the connection. An entity shall not transmit further messages on that transport connection once it has indicated that it is acceptable to suspend the transport connection, unless the suspension is cancelled by the requesting entity by transmitting a **ChannelSuspendCancel** message.

When either entity wishes to send a call-related message to its signalling neighbour, the connection needs to be re-established. To re-establish the signalling channel, the entity opens a transport connection to the transport address sent by the signalling neighbour. If there is more than one transport address, the addresses will be tried in the order sent. After opening the connection the entity shall send a **StatusInquiry** message with **ChannelResumeRequest**. This message contains a random number. In case both the entities open a connection and send the **ChannelResumeRequest** at the same time, the entity that has the numerically lower random number shall close its connection. In case the random numbers are the same, both entities shall transmit a new **StatusInquiry** message over the transport connection with a different random number. Creating a new connection may not be necessary if a signalling channel between the entities already exists and may be reused. The entity that receives an acceptable **ChannelResumeRequest** shall reply with a **ChannelResumeResponse** in a **Status** message before commencing regular call signalling messages on the channel.

A **ChannelSuspendRequest** or a **ChannelResumeRequest** embedded within a **StatusInquiry** that is replied with a **Status** message without the appropriate response (**ChannelSuspendResponse** or **ChannelResumeResponse**) shall be treated as a protocol error and handled as per 8.6/H.323.

It is possible that an entity may not have sufficient resources to initiate or accept a new transport connection especially if the motivation behind suspending connection is to optimize resource usage. To prevent this condition, it is recommended that each entity set aside a percentage of its resources for the resumption of suspended connections.

In case of failure to establish the transport connection for resumption, the initiator shall cycle through the list of **channelResumeAddress** for a number of times determined by the implementation. Complete failure to resume a suspended signalling channel should be treated as network failure and the call ended.

A new CRV for the call that is not in use between the sender and the destination address may need to be selected. This CRV shall be used in the **StatusInquiry** message carrying the **ChannelResumeRequest**. The receiving entity, on receiving the possibly unknown CRV, shall relate it to the call with the **callIdentifier** in the **StatusInquiry-UUIE**.

Example message flows for channel suspend and resume are shown in Figure 1.

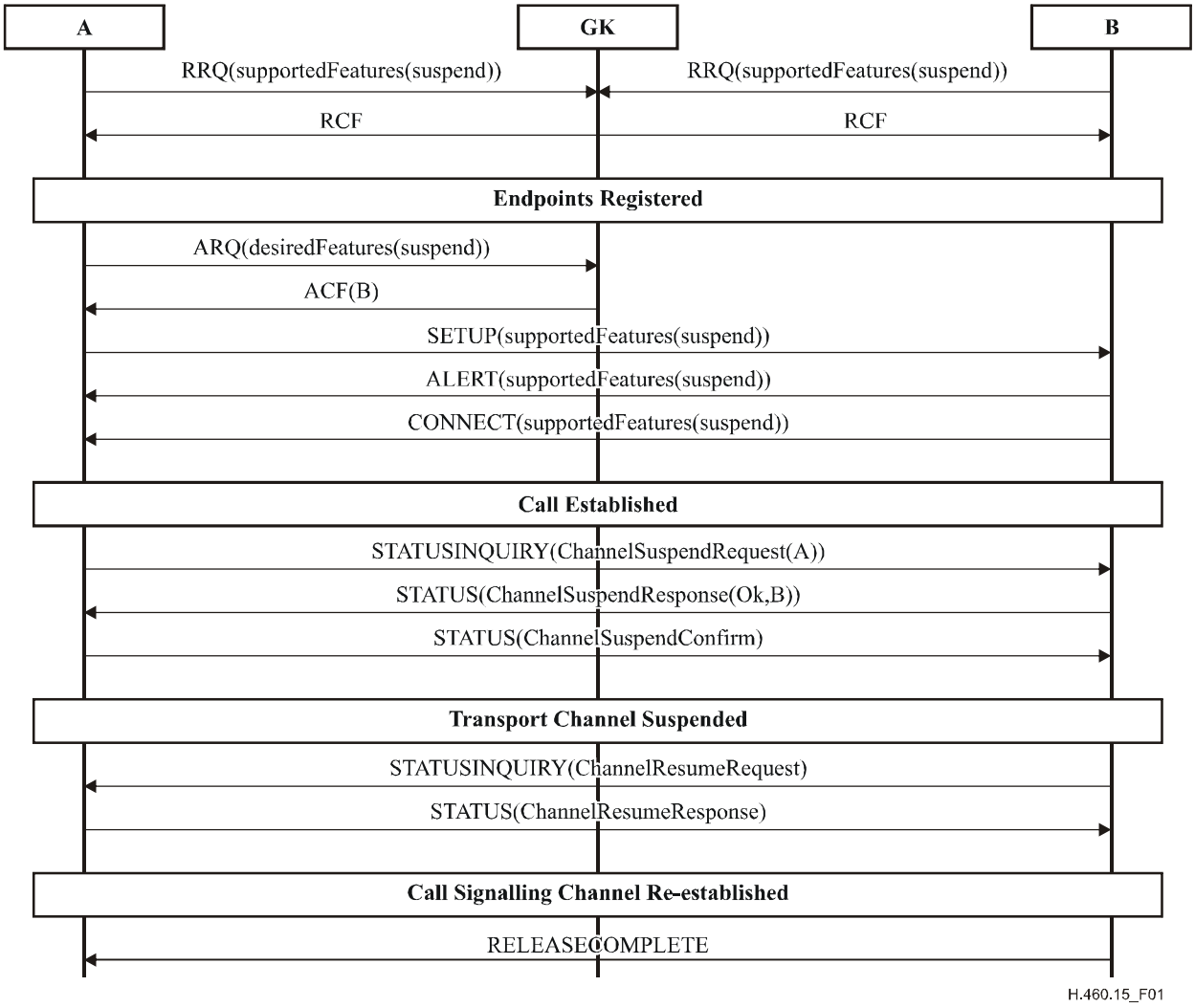

Figure 1/H.460.15 – Example message flows for channel suspend and resume

5.2 Transport channel redirection

A call control entity, such as the Gatekeeper, which may be in the call signalling path (in the "routed" mode) at the beginning of a call, may remove itself from the signalling path (and go to the "direct" mode) by using this procedure. Such a Gatekeeper should send a **ChannelSuspendRequest** message (within the StatusInquiry message) to each of its signalling neighbours with the **channelResumeAddress** set to the other's call signalling address. After receiving positive responses from both, the Gatekeeper should proceed to suspend both the channels. If any of the two entities needs to establish a call signalling path, it has the other's address to which they can open a connection following the procedure as above.

When a call signalling channel is suspended for the purpose of redirecting the call signalling channel to a different device, one device may attempt to resume the connection before the other device receives the **ChannelSuspendConfirm** message and/or closes its current transport connection. This race condition shall be handled by accepting the new connection and by maintaining the old connection solely for receiving the **ChannelSuspendConfirm** message.

If one neighbour does not wish to suspend the channel it has with the Gatekeeper and responds with **ChannelSuspendResponse** with **okToSuspend** set to False, the Gatekeeper should abort the procedure by sending a **ChannelSuspendCancel** to the other endpoint.

Example message flows for channel redirection are shown in Figure 2.

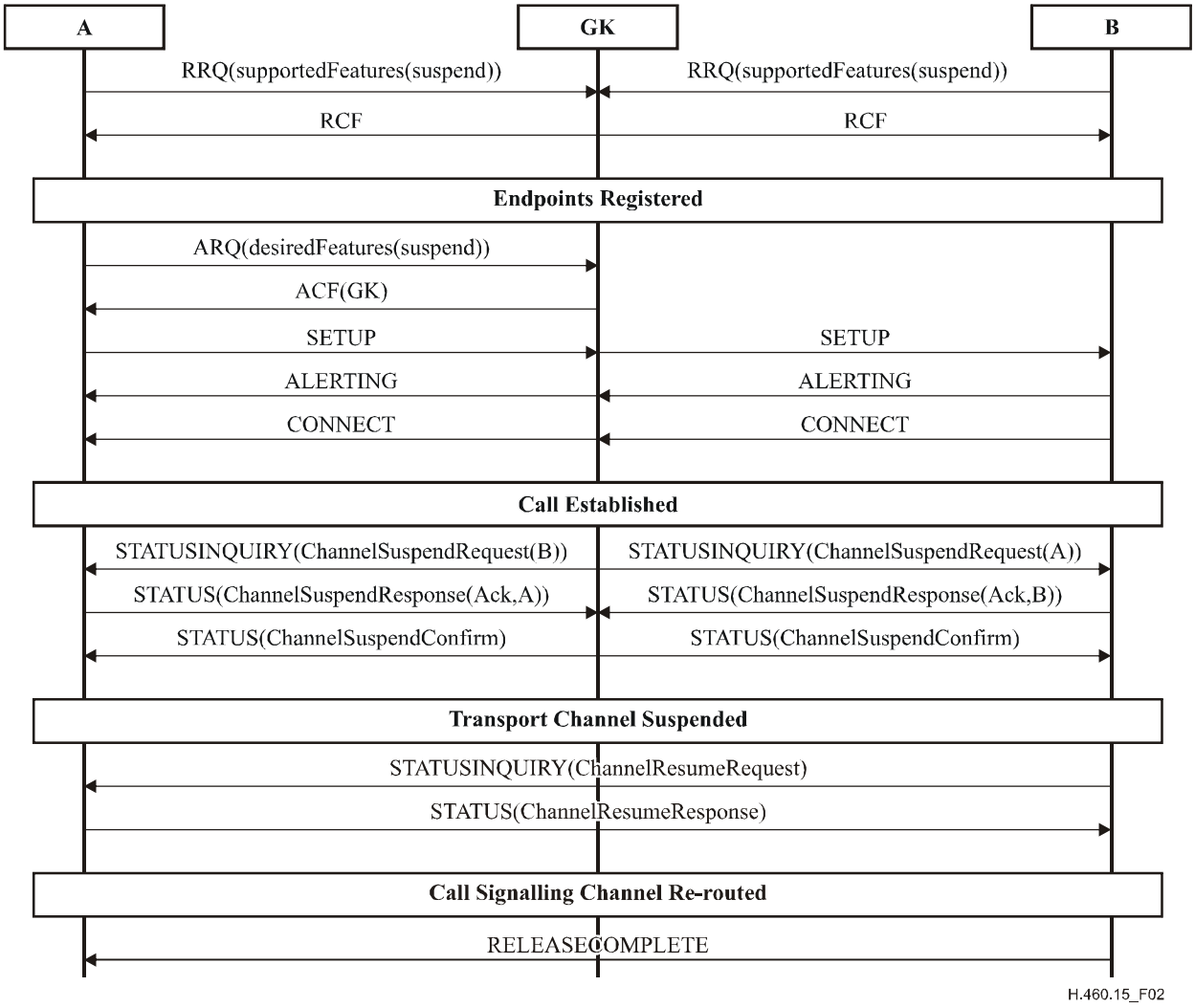

Figure 2/H.460.15 – Example message flows for channel redirection

5.3 Operational considerations

If a separate connection is being used for H.245 Control Channel signalling, it shall also be closed along with the H.225.0 call signalling channel when following the procedures in this Recommendation.

A Gatekeeper that redirects the call signalling channel and does not pass the H.245 messages through transparently should set the **resetH245** flag in the **ChannelSuspendRequest** message indicating that the endpoints shall restart H.245 procedures. In such a case, after the H.225.0 call signalling channel is resumed, the state of the endpoints' H.245 state machines shall be reset without closing any open media channels. If either endpoint elects to establish an H.245 Control Channel after restablishing the H.225.0 call signalling channel, the endpoints shall first transmit a TCS message and negotiate master/slave, as per normal H.245 procedures. It should be noted that if the H.245 Control Channel used a separate connection before the connection was suspended and if tunnelling is supported when the H.225.0 call signalling channel is resumed, H.245 tunnelling should be used as per ITU-T Rec. H.323.

If the Gatekeeper (or other intermediary entity) also routes the media stream and wishes to redirect the call signalling channel, it should first transmit Empty Capability Set messages (as described in 8.4.6/H.323) and allow all media streams to close or follow the procedures in ITU-T Rec. H.460.6 to close all media channels (as described in 4.1.2/H.460.6). It shall then suspend the call signalling channels with the **immediateResume** flag set to TRUE in the

ChannelSuspendRequest message. An endpoint receiving such a suspend request shall immediately re-establish the call signalling channel and open media channels. To avoid a possible unnecessary connection establishment, the intermediate entity may choose to set the **immediateResume** flag on only one of the **ChannelSuspendRequest** messages.

An endpoint that wishes to restart the H.245 state machine on resumption or redirection of a channel should set the **resetH245** flag in the **ChannelResumeRequest** message.

6 Generic Data usage

The entities use **genericData** field in the H323-UU-PDU carried in the **Status** and **StatusInquiry** message to negotiate the capability invocation.

7 Description of ASN.1 Types and Fields

Annex A

ASN.1 definitions

```
SIGNALLING-CHANNEL-SUSPEND-REDIRECT DEFINITIONS AUTOMATIC TAGS ::=
BEGIN

IMPORTS
     TransportAddress FROM H323-MESSAGES;

SignallingChannelData ::= SEQUENCE
{
     signallingChannelData   CHOICE {
          channelSuspendRequest   ChannelSuspendRequest,
          channelSuspendResponse  ChannelSuspendResponse,
          channelSuspendConfirm   ChannelSuspendConfirm,
          channelSuspendCancel    ChannelSuspendCancel,
          channelResumeRequest    ChannelResumeRequest,
          channelResumeResponse   ChannelResumeResponse,
          ...
     },
     ...
}
ChannelSuspendRequest ::= SEQUENCE
{
     channelResumeAddress    SEQUENCE OF TransportAddress,
     immediateResume         BOOLEAN,
     resetH245               NULL OPTIONAL,
     ...
}
ChannelSuspendResponse ::= SEQUENCE
{
     okToSuspend             BOOLEAN,
     channelResumeAddress    SEQUENCE OF TransportAddress,
     ...
}
ChannelSuspendConfirm ::= SEQUENCE
{
     ...
}

ChannelSuspendCancel ::= SEQUENCE
{
```

```
    ...
}

ChannelResumeRequest ::= SEQUENCE
{
    randomNumber        INTEGER(0..4294967295),
    resetH245           NULL OPTIONAL,
    ...
}

ChannelResumeResponse ::= SEQUENCE
{
    ...
}

END       -- of ASN.1
```

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Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	**Audiovisual and multimedia systems**
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
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