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**INTEGRATED SERVICES DIGITAL  
NETWORK (ISDN)**

**OVERALL NETWORK ASPECTS  
AND FUNCTIONS**

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**FRAME RELAYING SERVICE SPECIFIC  
CONVERGENCE SUBLAYER (FR-SSCS)**

**ITU-T Recommendation I.365.1**

(Previously "CCITT Recommendation")

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## FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (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.

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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 (Helsinki, March 1-12, 1993).

ITU-T Recommendation I.365.1 was prepared by ITU-T Study Group 13 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 26th of November 1993.

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## NOTE

In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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## FRAME RELAYING SERVICE SPECIFIC CONVERGENCE SUBLAYER (FR-SSCS)

(Geneva, 1993)

### 1 Introduction

This Recommendation specifies the Frame Relaying Service Specific Convergence Sublayer (FR-SSCS). The FR-SSCS is located in the upper part of the ATM Adaptation Layer on top of the Common Part Convergence Sublayer (CPCS) of AAL type 5, as specified in clause 6/I.363 and shown in Figures 1 and 2. The FR-SSCS is used at the B-ISDN TE to emulate the Frame Relaying Bearer Service (FRBS) in B-ISDN. It is also used for interworking between a B-ISDN and a Frame Relaying Network.

### 2 Service provided by FR-SSCS

At the DL-CORE-SAP the FR-SSCS provides the Core service as described in Annex C/I.233.1. The Core service primitives, exchanged between the Core service user and the Core service provider (FR-SSCS) are summarized in Table 1 according to the table contained in A.4.2.2/Q.922. The primitives and their parameters are described in detail in Annex C/I.233.1 (see Figure 1).

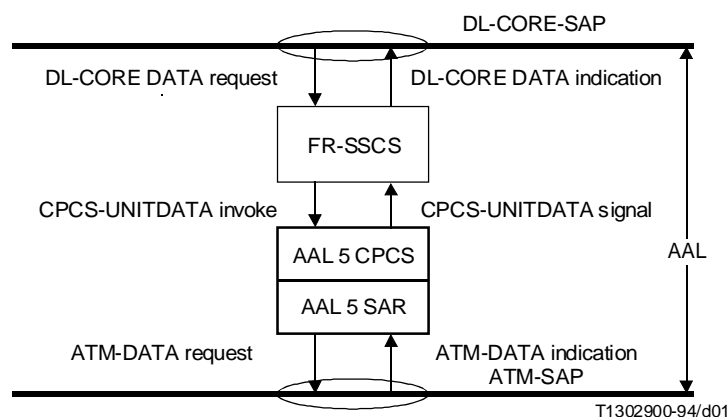


FIGURE 1/I.365.1

Location of the FR-SSCS in the B-ISDN protocol reference model for a B-ISDN TE

The exchange of information at the FR interworking point (FR-IWP) is described by IWF-DATA indication and IWF-DATA request primitives (see Figure 2). The parameters of those primitives are contained in Table 2.

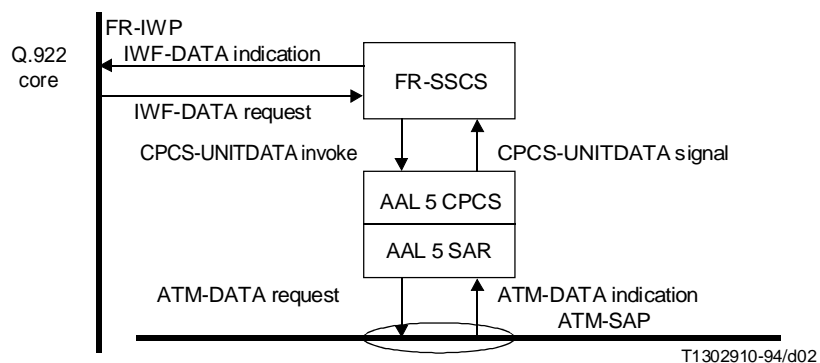


FIGURE 2/I.365.1

**Location of the FR-SSCS in the B-ISDN protocol reference model  
for the IWF between a frame relaying network and a B-ISDN**

The FR-SSCS sublayer preserves the FR-SSCS-SDU sequence integrity. It uses the CPCS message mode service without the corrupted data delivery option.

## 2.1 Primitives

The primitives exchanged across the DL-CORE-SAP are described in Table 1.

TABLE 1/I.365.1

**Core service primitives and parameters at the DL-CORE-SAP**

Parameter (Note)	Primitive		
	DL-CORE DATA request	DL-CORE DATA indication	FR-SSCS-PDU field
DL-CORE user data	X	X	Information field
Discard Eligibility	X		DE
Congestion encountered backward		X	BECN
Congestion encountered forward		X	FECN
DL-CORE-Service-User protocol control information	X	X	C/R bit
X Parameter is present. NOTE – Whether the DL-CORE control parameter and the DLCI or DL-CORE control indicator parameter are included in the DL-CORE DATA primitives is for further study.			

The primitives exchanged across the FR Interworking Point (FR-IWP) are described in Table 2.

TABLE 2/I.365.1

**Primitives and parameters at the FR-IWP**

Parameter	Primitive		
	IWF-DATA request	IWF-DATA indication	FR-SSCS-PDU field
DL-CORE user data	X	X	Information field
Discard Eligibility	X	X	DE
Congestion encountered backward	X	X	BECN
Congestion encountered forward	X	X	FECN
DL-CORE-Service-User protocol control information	X	X	C/R bit
DLCI or DL-CORE control indicator (Note 1)	X	X	D/C
DL-CORE control (Note 2)	X	X	DL-CORE control
<p>X Parameter is present.</p> <p>NOTES</p> <p>1 If this parameter is set = C it indicates the existence of the DL-CORE control parameter.</p> <p>2 This parameter only exists as indicated by the DLCI or DL-CORE control indicator parameter.</p>			

The primitives exchanged across the boundary between the FR-SSCS and the CPCS of AAL type 5 are described in 6.1.2.2.1/I.363.

## 2.2 Description of connections

Multiple FR-SSCS connections may be associated with a single CPCS connection (and with the corresponding ATM connection), allowing multiplexing at the FR-SSCS. Within a CPCS connection the FR-SSCS connections are uniquely identified by the Data Link Connection Identifiers (DLCIs).

## 3 Interaction with the management and control plane

For further study.

## 4 Functions, structure and coding of FR-SSCS

### 4.1 Functions in FR-SSCS

The functions provided by the FR-SSCS include:

a) *Multiplexing/demultiplexing*

This function provides the capability to multiplex multiple FR-SSCS connections into a single CPCS connection.

b) *Inspection of the FR-SSCS-PDU length*

These functions inspect the FR-SSCS-PDU to ensure that it consists of an integral number of octets and to ensure that it is neither too long nor too short as specified in I.233.1.

c) *Congestion control*

These functions provide the means for the network to notify the end user, in forward and backward direction, that congestion avoidance procedures should be initiated, where applicable (congestion control forward and congestion control backward). In addition, the functions provide the means for the end user and/or the network to indicate what frames should be discarded in preference to other frames in a congestion situation (congestion control discard eligibility). Congestion management procedures are described in Recommendation I.370.

## 4.2 FR-SSCS-PDU structure and coding

The peer-to-peer communication between FR-SSCS entities uses FR-SSCS-PDUs. The format of the FR-SSCS-PDU structure is shown in Figure 3.

NOTE – The structure is exactly the same as the Q.922 frame relay frame without the flags, zero bit insertion and FCS.

The details of the formats and the coding of the fields are given in A.3/Q.922.

As every octet of an ATM-PDU is defined to be transmitted from the Most Significant Bit (MSB) to the Least Significant Bit (LSB), the FR-SSCS-PDU in the ATM-PDU is also to be transmitted from MSB to LSB. Though this bit transmission order is different from that of Recommendation Q.922, the user of the FR-SSCS should regard the transmission order of the FR-SSCS to be the same as that of Recommendation Q.922, as the original bit order is restored after receipt.

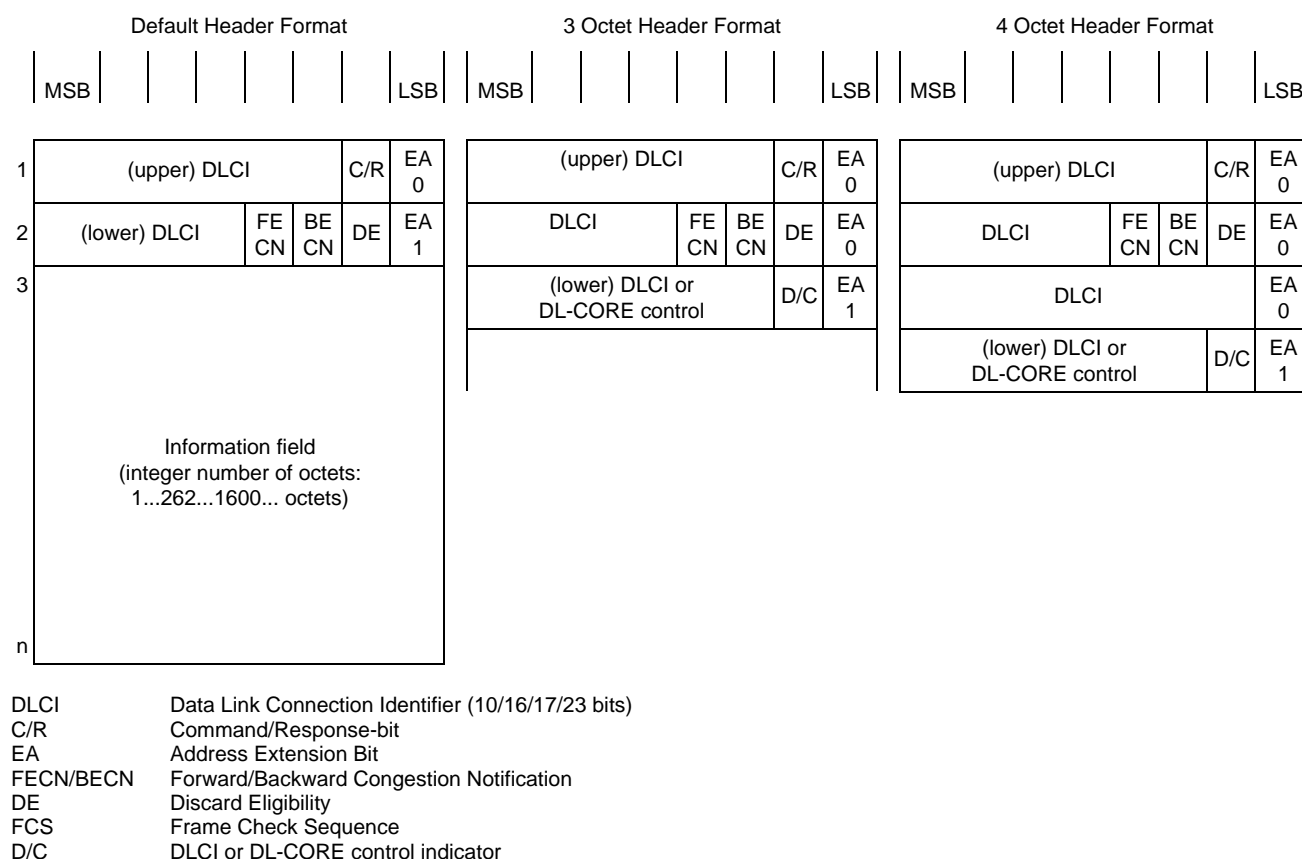


FIGURE 3/I.365.1

Structure of FR-SSCS-PDU with 2, 3 and 4 octet header formats



The support of the default (2 octet) header format is mandatory. The support of 3 and 4 octet header formats is optional.

## 5 Procedures for the FR-SSCS sublayer

### 5.1 State variables

**Most\_recent\_CI\_received:** This variable is initialized to 0. It is used if the FR-SSCS connection is bidirectional. This variable records the value of the CPCS-CI parameter of the most recent CPCS-UNITDATA signal primitive received for this connection in the reverse direction.

### 5.2 Procedures at the sender side

When FR-SSCS receives:

- a DL-CORE DATA request from the core service user in a B-TE, or
- an IWF-DATA request from the Q.922 core in an IWF,

it shall construct the FR-SSCS-PDU as specified in Table 3, according to the format in Figure 3.

TABLE 3/I.365.1

**Values for the FR-SSCS-PDU at the sender side**

FR-SSCS-PDU field	Value set by the FR-SSCS	
	In B-TE	In IWF
DLCI	Is set to the value which is associated to the FR-SSCS connection during the connection set-up or at the subscription	(As in B-TE)
C/R	Is set to the value of the parameter DL-CORE-Service-User protocol control information	(As in B-TE)
FECN	Is set to 0	Is set to the value of the parameter Congestion encountered forward
BECN	Is set to 0 or optionally to the value of the variable Most_recent_CI_received	Is set to logical OR of the values of the variable Most_recent_CI_received and the parameter Congestion encountered backward
DE	Is set to the value of the parameter Discard Eligibility	(As in B-TE)
DL-CORE control	For further study	(As in B-TE)
D/C	Is set to indicate whether the last header octet is negotiated during the connection set-up or at subscription to contain DLCI bits or the DL CORE control field	(As in B-TE)
EA	Is set to 0 at the first octet(s) of the header and to 1 at the last octet of the header	(As in B-TE)
Information field	Is set to the value of the parameter DL-CORE user data	(As in B-TE)

The FR-SSCS-PDU is then forwarded to the CPCS sublayer in the Interface Data (ID) parameter of the CPCS-UNITDATA invoke primitive. Other parameters of that primitive are set as follows:

- The CPCS-Loss Priority (CPCS-LP) parameter is either:
  - a) set to the value of the parameter Discard Eligibility of the DL-CORE DATA request primitive or the IWF-DATA request primitive; or
  - b) always set to zero or to one.

Both a) and b) above shall be supported so that network operators can decide at connection set-up or subscription on a CPCS connection by CPCS connection basis which one is used. The method of selecting between the two cases outlined above is outside the scope of this Recommendation.

- The CPCS-Congestion Indication (CPCS-CI) parameter is always set to zero.
- The CPCS-User-to-User Indication (CPCS-UU) parameter is always set to zero.

### **5.3 Procedures at the receiver side**

Upon reception of a CPCS-UNITDATA signal primitive, the variable `Most_recent_CI_received` is set to the value of the parameter CPCS-Congestion Indication (CPCS-CI) and the FR-SSCS-PDU is extracted from the parameter Interface Data (ID). The FR-SSCS-SDU, contained in the FR-SSCS-PDU information field is then passed:

- to the upper layer, in the case of a B-TE, using the DL-CORE DATA indication primitive, or
- to the Q.922 core, in the case of an IWF, using the IWF-DATA indication primitive.

The parameters of the primitives are defined in Table 4.

TABLE 4/I.365.1

**Values for the parameters of DL-CORE DATA indication and IWF-DATA indication primitives at the receiver side**

Parameters	DL-CORE DATA indication primitive (B-TE)	IWF-DATA indication primitive (IWF)
DL-CORE user data	FR-SSCS-SDU (information field)	(As in B-TE)
Discard Eligibility	(Note 1)	(Note 2)
Congestion encountered backward	Is set to the value of the BECN field in the FR-SSCS-PDU	(As in B-TE)
Congestion encountered forward	Is set to the logical OR of the values of the FECN field in the FR-SSCS-PDU and the parameter CPCS-CI of the CPCS-UNITDATA signal primitive	(As in B-TE)
DL-CORE-Service-User protocol control information	Is set to the value of the C/R field in the FR-SSCS-PDU	(As in B-TE)
DLCI or DL-CORE control indicator	(For further study)	Is set to the value of the D/C field in the FR-SSCS-PDU
DL-CORE control	(For further study)	Is set to the value of the DL-CORE control field in the FR-SSCS-PDU, if present
<p><b>NOTES</b></p> <p>1 At the receiver side of the B-TE the information in the CPCS-Loss Priority (CPCS-LP) parameter at the FR-SSCS may be conveyed to other entities like management.</p> <p>2 At the receiver side of the IWF the Discard Eligibility (DE) parameter shall be set to either:</p> <ul style="list-style-type: none"> <li>a) the value of the DE field in the FR-SSCS-PDU; or</li> <li>b) the logical OR of the values of the DE field in the FR-SSCS-PDU and the parameter CPCS-LP of the CPCS-UNITDATA signal primitive.</li> </ul> <p>Both a) and b) above shall be supported by the IWF so that the network operators can decide at connection set-up or subscription on a CPCS connection by CPCS connection basis which one is used. The method of selecting between the two cases outlined above is outside the scope of this Recommendation.</p>		

## **Annex A**

### **List of acronyms**

(This annex forms an integral part of this Recommendation)

AAL	ATM Adaptation Layer
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
B-TE	B-ISDN Terminal
BECN	Backward Explicit Congestion Notification
C/R	Command/Response bit
CPCS	Common Part Convergence Sublayer
CPCS-CI	CPCS-Congestion Indication
CPCS-LP	CPCS-Loss Priority
CPCS-UU	CPCS-User-to-User Indication
D/C	DLCI or DL-CORE control indicator
DE	Discard Eligibility
DLCI	Data Link Connection Identifier
EA	Address Extension bit
FECN	Forward Explicit Congestion Notification
FR	Frame Relaying
FR-IWP	Frame Relaying Interworking Point
FR-SSCS	Frame Relaying Service Specific Convergence Sublayer
FRBS	Frame Relaying Bearer Service
ID	Interface Data
IWF	Interworking Function
PDU	Protocol Data Unit
SAP	Service Access Point
SAR	Segmentation and Reassembly Sublayer
SDU	Service Data Unit