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Public data networks – Transmission, signalling and
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Support of frame relay services over MPLS core networks

ITU-T Recommendation X.84

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Support of frame relay services over MPLS core networks

Summary

MPLS has the potential to consolidate core networks and services, for example frame relay services, over a single common core infrastructure. This Recommendation defines frame relay over MPLS core network architecture, the transfer of frame relay control and user data information over the core MPLS network and the user plane protocol stack used at the edges of the MPLS core network. Two mapping modes for frame relay over MPLS are defined: the "one-to-one" mapping mode and the "many-to-one" mapping mode. The signalling and management planes are outside of the scope of this Recommendation.

Source

ITU-T Recommendation X.84 was approved on 19 March 2004 by ITU-T Study Group 17 (2001-2004) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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Support of frame relay services over MPLS core networks

1 Scope

MPLS has the potential to consolidate core networks and services, for example frame relay services, over a single common core infrastructure. This Recommendation defines the architecture for frame relay over MPLS core network, the transfer of frame relay control and user-data information and the user plane protocol stack used at the edges of the MPLS core network.

This Recommendation defines two mapping modes for the provision of Frame Relay service over MPLS. One-to-one mode characterized by a one-to-one relation between a frame relay VC and a pair of unidirectional MPLS LSPs. The other mode is known as many-to-one mode. In this mode all FR VCs between a pair of frame relay devices (CEs) controlled by a single frame relay signalling channel may be transparently transported in one pair of MPLS LSPs.

NOTE – This Recommendation does not cover Switch Virtual Connection and Soft PVC signalling between PEs. The control protocol for PVC status monitoring is for further study. The signalling and management planes are outside of the scope of this Recommendation.

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 X.36 (2003), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for public data networks providing frame relay data transmission service by dedicated circuit.*
- ITU-T Recommendation X.76 (2003), *Network-to-network interface between public networks providing PVC and/or SVC frame relay data transmission service.*
- ITU-T Recommendation X.146 (2000), *Performance objectives and quality of service classes applicable to frame relay.*
- IETF RFC 3031 (2001), *Multiprotocol Label Switching Architecture.*
- IETF RFC 3032 (2001), *MPLS Label Stack Encoding.*
- IETF RFC 3270 (2002), *Multi-Protocol Label Switching (MPLS) Support of Differentiated Services.*

3 Definitions

This Recommendation defines the following terms:

- 3.1 customer edge (CE):** The customer device connected to a provider edge device. Also known as frame relay DTE.
- 3.2 egress provider edge:** The Provider Edge device that is the receiver of FR-MPLS packets.
- 3.3 FR-MPLS packet:** Packets exchanged between an ingress provider edge and an egress provider edge.

- 3.4 ingress provider edge:** The Provider Edge that transmits FR-MPLS packets.
- 3.5 provider edge (PE):** A network edge device that provides a frame relay service over an MPLS network.
- 3.6 label switched path (LSP):** The path through one or more MPLS nodes at one level of the hierarchy over which packets in a particular forwarding equivalence class are transmitted.
- 3.7 MPLS node:** A device that is aware of MPLS control protocols, operates one or more layer three routing protocols and is capable of forwarding packets based on MPLS LSP labels.
- 3.8 penultimate hop popping:** In MPLS architecture, penultimate hop popping is the mechanism by which the penultimate node (the node immediately before the egress node) pops the top label of the label stack prior to forwarding the packet to the egress node. Performing label popping by the penultimate node provides the egress node with the possibility to process optimally the packets.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

B _c	Committed Burst size
B _e	Excess Burst size
BECN	Backward Explicit Congestion Notification
C/R	Command/Response indicator
CE	Customer Edge
CIR	Committed Information Rate
DCE	Data Communication Equipment
DE	Discard Eligibility
DLCI	Data Link Connection Identifier
DTE	Data Terminal Equipment
FCS	Frame Check Sequence
FECN	Forward Explicit Congestion Notification
FR	Frame Relay
FRS	Frame Relay Service
HDLC	High-level Data Link Control
IETF	Internet Engineering Task Force
LSP	Label Switched Path
MPLS	Multi-Protocol Label Switching
MTU	Maximum Transmission Unit
NNI	Network-to-Network Interface
PDU	Protocol Data Unit
PE	Provider Edge
PHB	Per Hop Behaviour
PHP	Penultimate Hop Popping

PVC	Permanent Virtual Connection
QoS	Quality of Service
RFC	Request For Comments
SVC	Switched Virtual Connection
UNI	User-to-Network Interface
VC	Virtual Circuit/Virtual Connection

5 Conventions

PDU formats: In this Recommendation, PDU headers are structured as a group of four octets or words numbered from the left from 0 to 31.

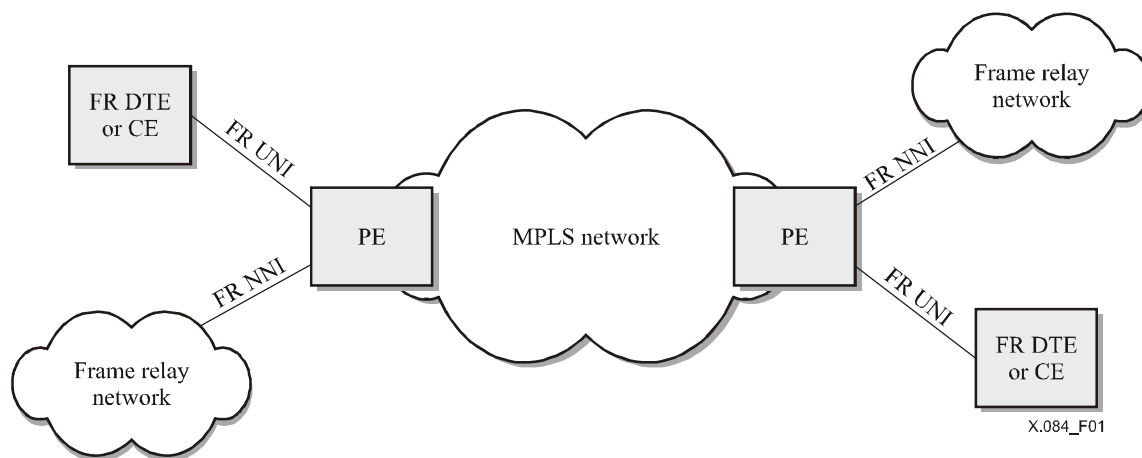
Bit order within single octet and multiple octets fields: In a single octet field, the left most bit of an octet is the high order or most significant bit. Similarly, in a multi-octet field, the left most bit of the whole field is the most significant bit.

6 Architecture

6.1 General

The reference model for frame relay services over MPLS core networks is shown in Figure 1. It consists of the following elements:

- an MPLS core network;
- Provider Edge (PE) devices providing interworking functions between frame relay and MPLS. PEs can support frame relay UNIs and/or NNIs;
- frame relay devices (DTEs/CEs) and FR networks (DCEs) connected to PEs with frame relay UNIs and/or NNIs.



NOTE – PE includes FR-MPLS interworking functions.

Figure 1/X.84 – Frame relay over MPLS core network reference model

Frame relay over MPLS core network architecture allows the interconnection of frame relay networks (DCEs) and/or frame relay devices (DTEs) over an MPLS network. In this architecture, frame relay networks and DTEs act as CE devices attached to PEs of the MPLS network as shown in Figure 1. The frame relay service is first provisioned between each frame relay DTE or DCE and