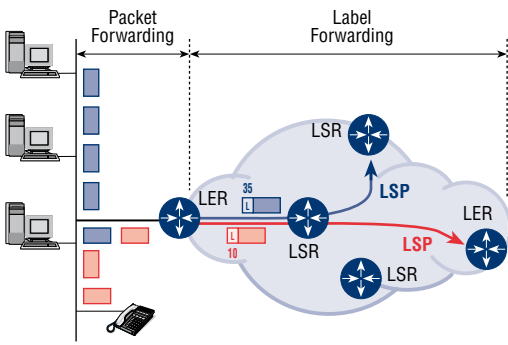


MPLS reference card

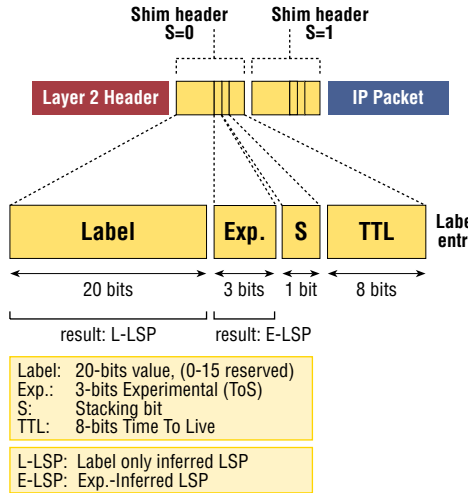
MPLS NETWORK

MPLS Components



LER = Label Edge Router
 LSR = Label Switching Router
 LSP = Label Switched Path

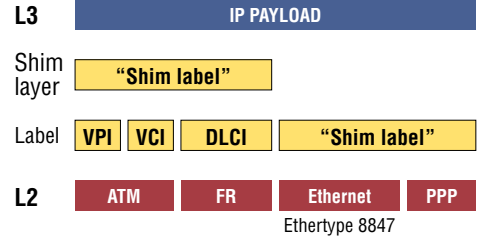
MPLS SHIM HEADER STRUCTURE



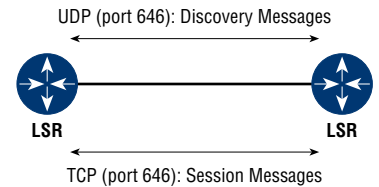
Label: 20-bits value, (0-15 reserved)
 Exp.: 3-bits Experimental (ToS)
 S: Stacking bit
 TTL: 8-bits Time To Live

L-LSP: Label only inferred LSP
 E-LSP: Exp.-Inferred LSP

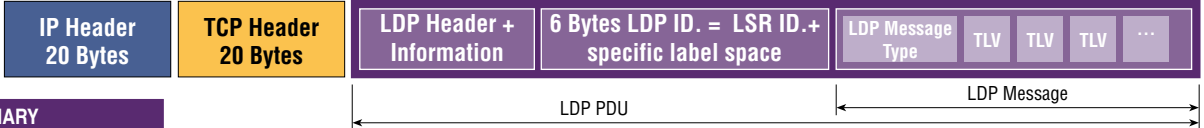
LABEL ENCAPSULATIONS



LDP MESSAGES



LDP - LABEL DISTRIBUTION PROTOCOL IMPLEMENTATION ON IP



MESSAGE SUMMARY

Message Name	Type
Notification	0x0001
Hello	0x0100
Initialization	0x0200
KeepAlive	0x0201
Address	0x0300
Address Withdraw	0x0301
Label Mapping	0x0400
Label Request	0x0401
Label Withdraw	0x0402
Label Release	0x0403
Label Abort Request	0x0404
Vendor-Private	0x3E00 - 0x3EFF
Experimental	0x3F00 - 0x3FFF

ERROR SUBCODES

Status Code	Type
Bad Explicit Routing TLV Error	0x44000001
Bad Strict Node Error	0x44000002
Bad Loose Node Error	0x44000003
Bad Initial ER-Hop Error	0x44000004
Resource Unavailable	0x44000005
Traffic Parameters Unavailable	0x44000006
Setup Abort (Label request Aborted in 1)	0x44000015
Modify Request Not Supported	0x44000008

TYPE LENGTH VALUES (TLV) SUMMARY

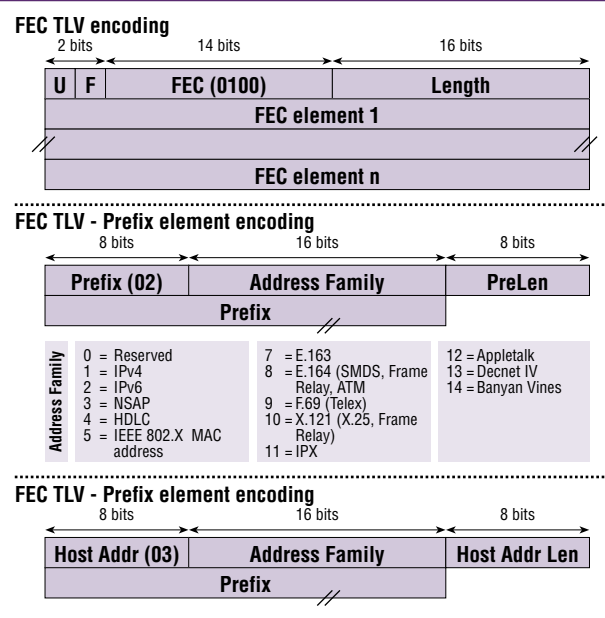
TLV	Type
Forwarding Equivalence Class (FEC)	0x0100
Address List	0x0101
Hop Count	0x0103
Path Vector	0x0104
Aggreg. capability	0x0105
Generic Label	0x0200
ATM Label	0x0201
Frame Relay Label	0x0202
Status	0x0300
Extended Status	0x0301
Returned PDU	0x0302
Returned Message	0x0303
Common Hello Parameters	0x0400
IP v4 Transport Address	0x0401
Configuration Sequence Number	0x0402

TLV	Type
IPv6 Transport Address	0x0403
MAC TLV	0x0404
Common Session Parameters	0x0500
ATM Session Parameters	0x0501
Frame Relay Session	0x0502
Parameters Label Request	0x0600
Explicit Route IPv4 TLV	0x0800
ER-HOP: IP v4 prefix	0x0801
ER-HOP: IPv6 Address	0x0802
ER-HOP: Autonomous System Number	0x0803
Preemption TLV	0x0820
LSPID-TLV	0x0821
Resource Class TLV	0x0822
Route Pinning TLV	0x0823
Diffserv TLV	0x0901
Message ID Vendor-Private	0x3E00 - 0x3EFF
Experimental	0x3F00 - 0x3FFF

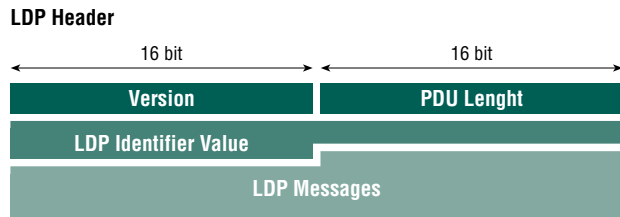
STATUS TLV - STATUS ELEMENT CODING

Status Code	E-bit	Status Data	Section Title
Success	0	0x00000000	"Status TLV"
Bad LDP Identifier	1	0x00000001	"Events Signaled by ..."
Bad Protocol Version	1	0x00000002	"Events Signaled by ..."
Bad PDU Length	1	0x00000003	"Events Signaled by ..."
Unknown Message Type	0	0x00000004	"Events Signaled by ..."
Bad Message Length	1	0x00000005	"Events Signaled by ..."
Unknown TLV	0	0x00000006	"Events Signaled by ..."
Bad TLV Length	1	0x00000007	"Events Signaled by ..."
Malformed TLV Value	1	0x00000008	"Events Signaled by ..."
Hold Timer Expired	1	0x00000009	"Events Signaled by ..."
Shutdown	1	0x0000000A	"Events Signaled by ..."
Loop Detected	0	0x0000000B	"Loop Detection"
Unknown FEC	0	0x0000000C	"FEC Procedures"
No Route	0	0x0000000D	"Label Request Mess ..."
No Label Resources	0	0x0000000E	"Label Request Mess ..."
Label Resources Available	0	0x0000000F	"Label Request Mess ..."
Session Rejected No Hello	1	0x00000010	"Session Initialization"
Session Rejected/ Parameters Advertisement Mode	1	0x00000011	"Session Initialization"
Session Rejected/ Parameters Max PDU Length	1	0x00000012	"Session Initialization"
Session Rejected/ Parameters Label Range	1	0x00000013	"Session Initialization"
KeepAlive Timer Expired	1	0x00000014	"Events Signaled by ..."
Label Request Aborted	0	0x00000015	"Label Request Abort ..."
Missing Message Parameters	0	0x00000016	"Events Signaled by ..."
Unsupported Address Family	0	0x00000017	"FEC Procedures" "Address Message Proc ..."
Session Rejected/ Bad KeepAlive Time	1	0x00000018	"Session Initialization"
Internal Error	1	0x00000019	"Events Signaled by ..."

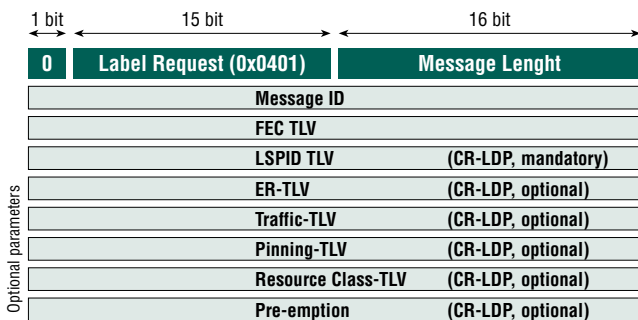
TLV ENCODING EXAMPLE



LDP PROTOCOL DATA UNITS (PDU)

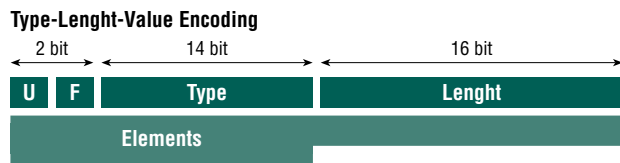


Label Request Message (Example)

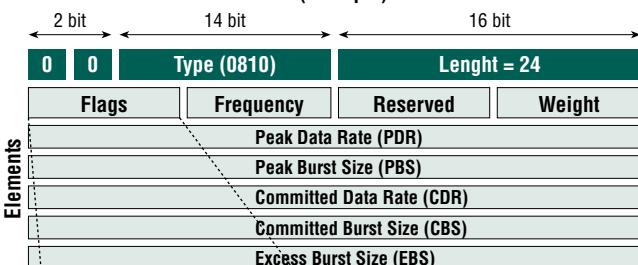


Encoding for the Label Request Message 0x0401

TYPE-LENGTH-VALUE ENCODING



Traffic Parameters TLV 0x0810 (Example)



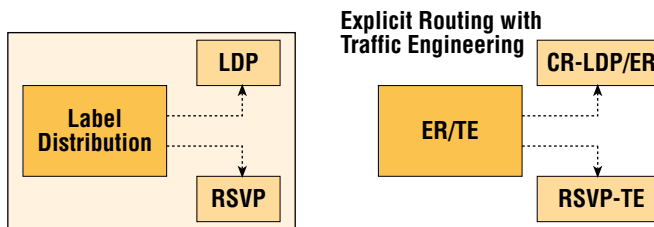
Elements

Res F6 F5 F4 F3 F2 F1

Res: These bits are reserved. Zero on transmission. Ignored on receipt.
 F1: Corresponds to the PDR
 F2: Corresponds to the PBS
 F3: Corresponds to the CDR
 F4: Corresponds to the CBS
 F5: Corresponds to the EBS
 F6: Corresponds to the Weight

Negotiation flags

TRAFFIC ENGINEERING



LDP: Label Distribution Protocol
 RSVP: ReSource reSerVation Protocol
 ER/TE: Expl. Routing/Traffic Engineering
 CR-LDP/ER: Constraint-Based Routing-Label Distribution Protocol /Explicit Routing

Mapping for CoS to CR-LDP to the ATM service category

UBR	nrt-VBR	rt-VBR	CBR
CDR = 0 CBS = 0 frequency = unspecified	PDR CDR PBS CBS frequency = unspecified	PDR CDR PBS CBS frequency = frequent	PDR = CDR PBS = CBS frequency = very frequent

PDR: Peak Data Rate
 PBS: Peak Burst Size
 CDR: Committed Data Rate
 CBS: Committed Burst Size

DIFFERENTIATED SERVICES

Differentiated services field: RFC 2474, 2597, 2598

Differentiated services codepoint (DSCP)					Currently unused		
0	1	2	3	4	5	6	7
Precedence			Delay	Throughput	Reliability	Reserved	

IP ToS bit assignment RFC 791

Expedited Forwarding (EF): **101110** **46**
 Binary Decimal

Assured Forwarding (AF) - Differentiated Service Code Point (DSCP)

	Class 1	Class 2	Class 3	Class 4
Low Drop Prec	001010 10	010010 18	011010 26	100010 34
Med Drop Prec	001100 12	010100 20	011100 28	100100 36
High Drop Prec	001110 14	010110 22	011110 30	100110 38

Binary Decimal

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MPLS

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