

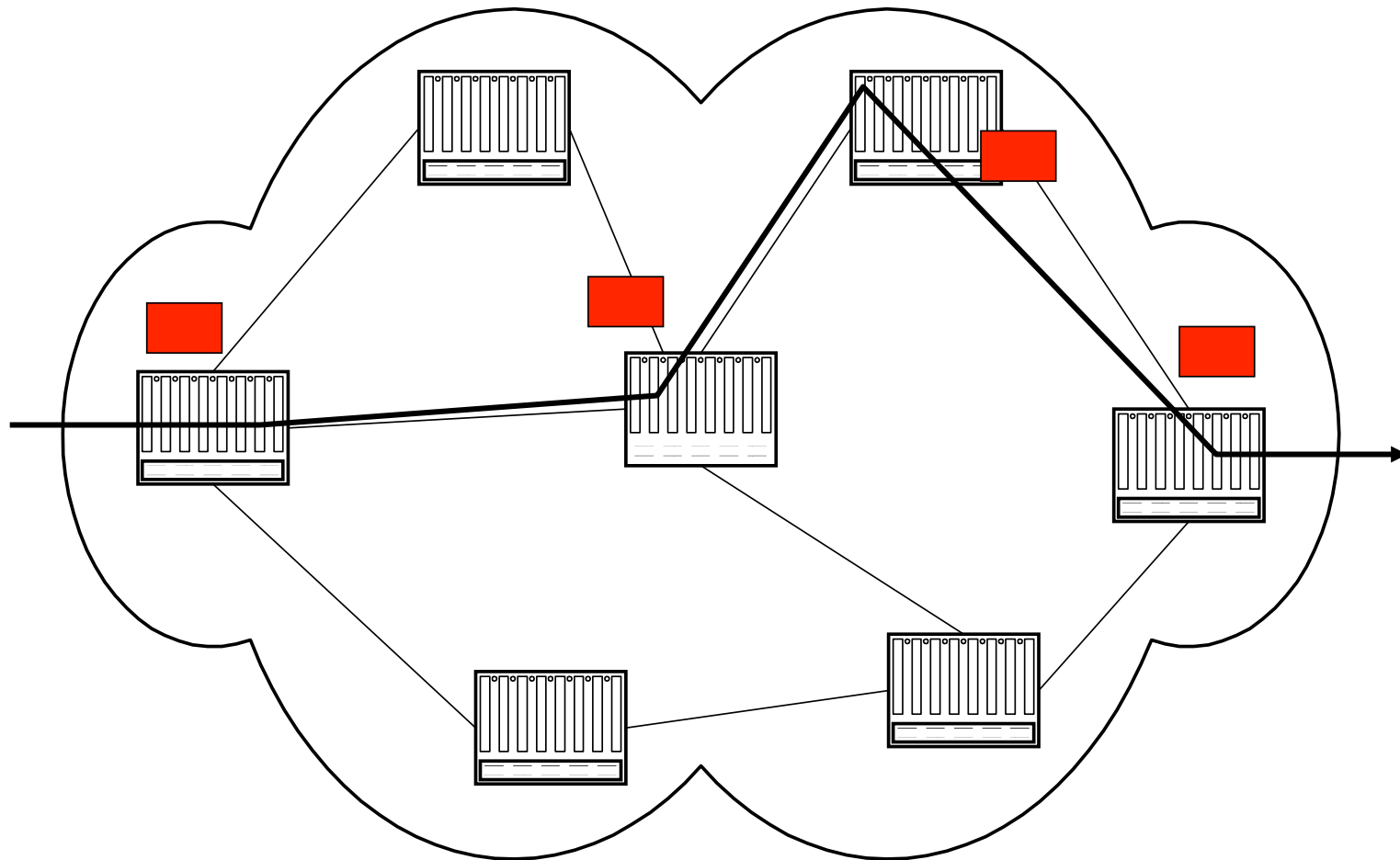
# ***Introduction to MPLS***

**Guy Pujolle**

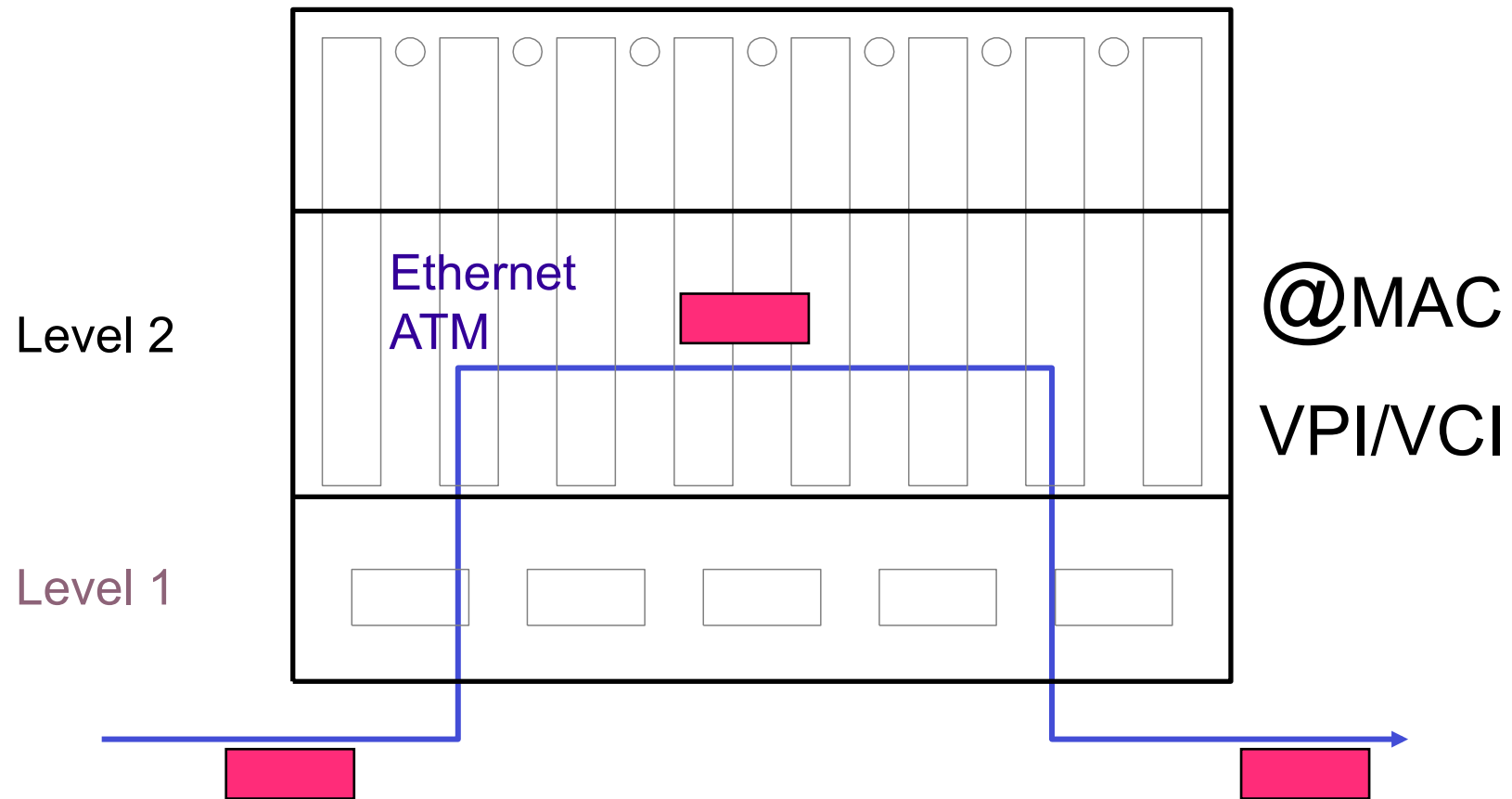
# How to use IP environment

- **IP on the periphery**
- **Problem: how to transport IP packets**
  - Routing?
  - Switching?
  - A mixed of routing and switching?
- **IP within the network**
  - IP is too slow
  - Need of gigabits per second

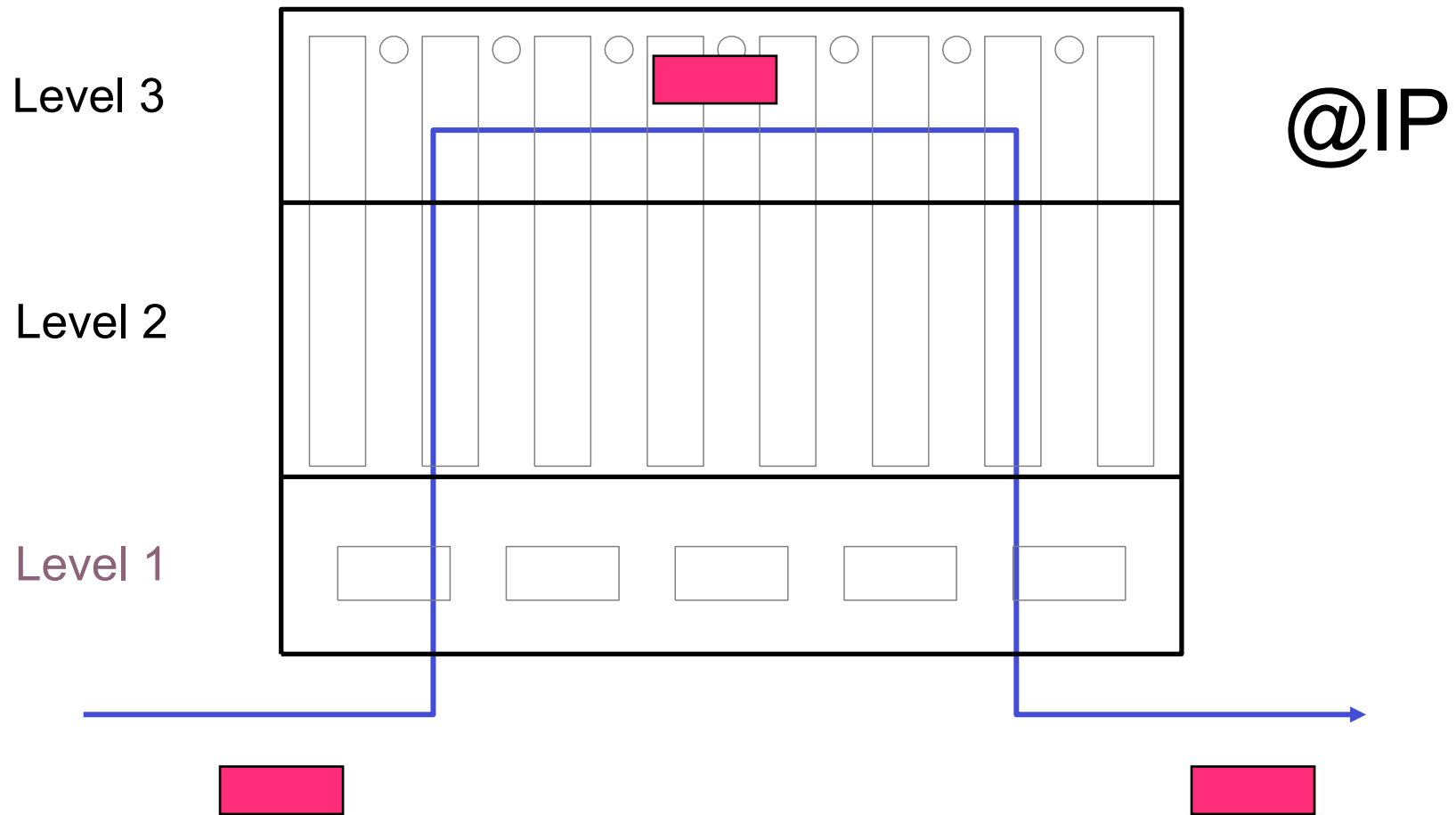
# Core networks



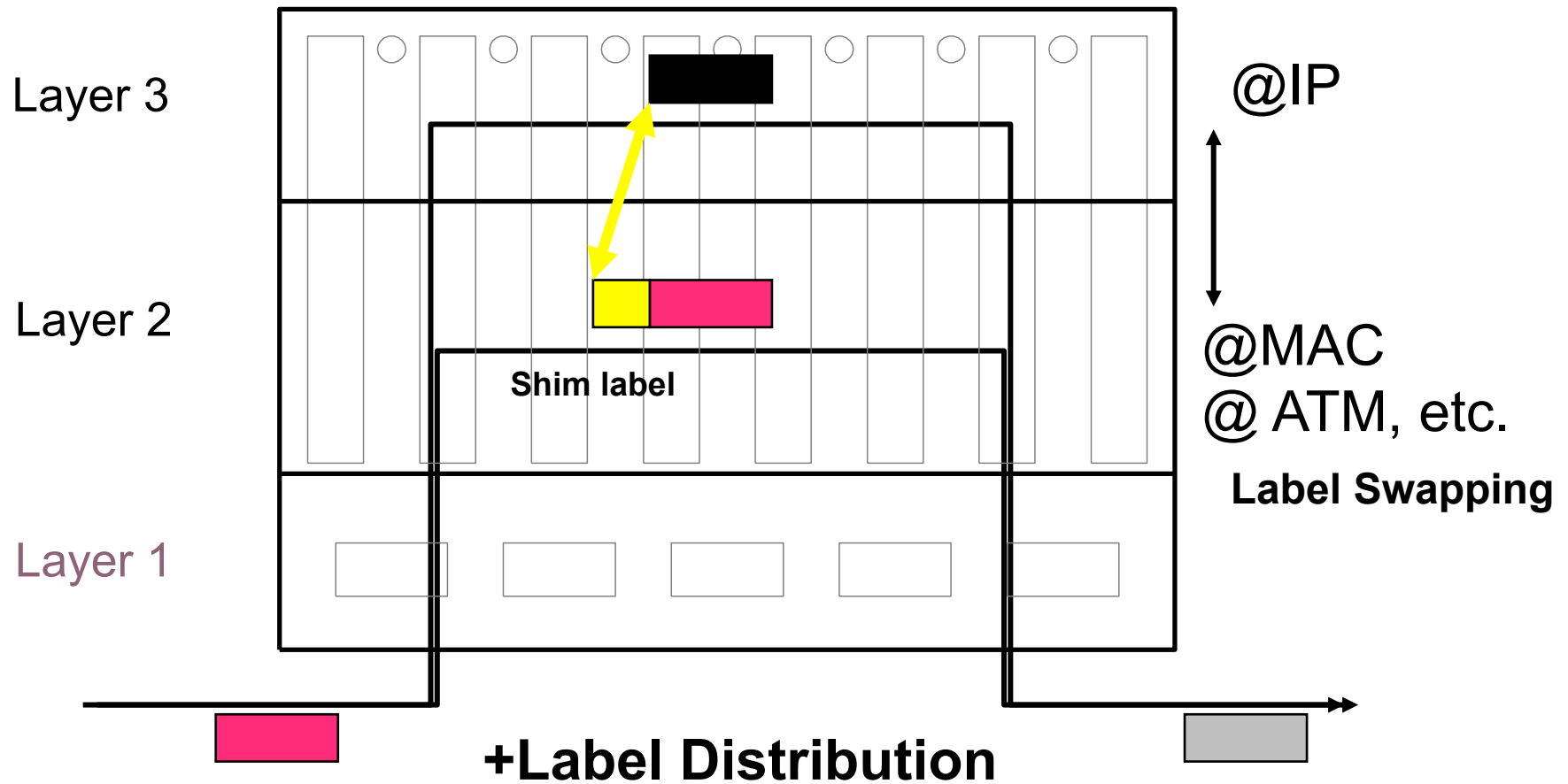
# Frame switching



# Pure routing



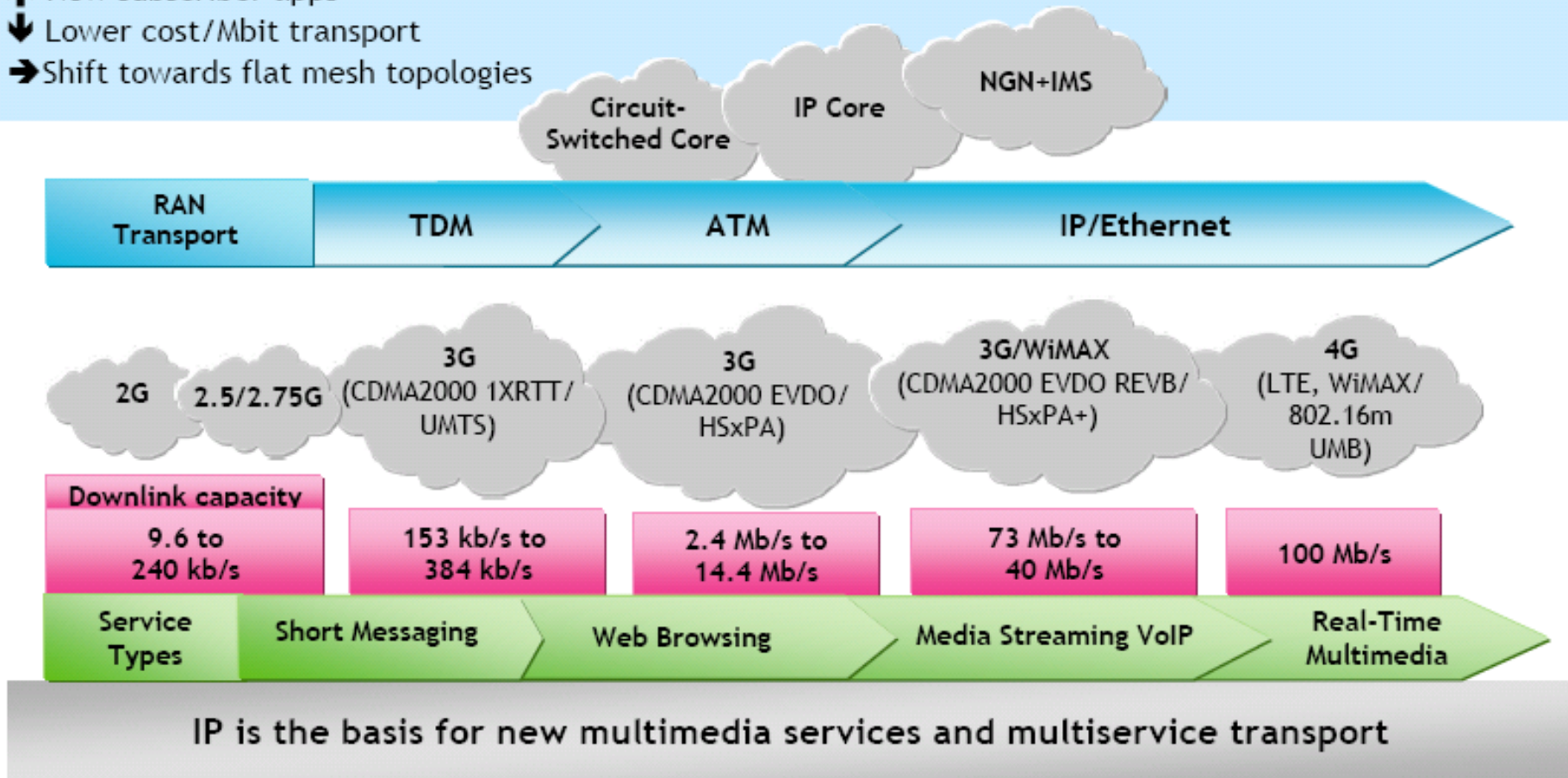
# Label Switch Router (LSR)



***MPLS***

# Core network technologies

- ↑ Higher access bandwidth
- ↑ New subscriber apps
- ↓ Lower cost/Mbit transport
- Shift towards flat mesh topologies



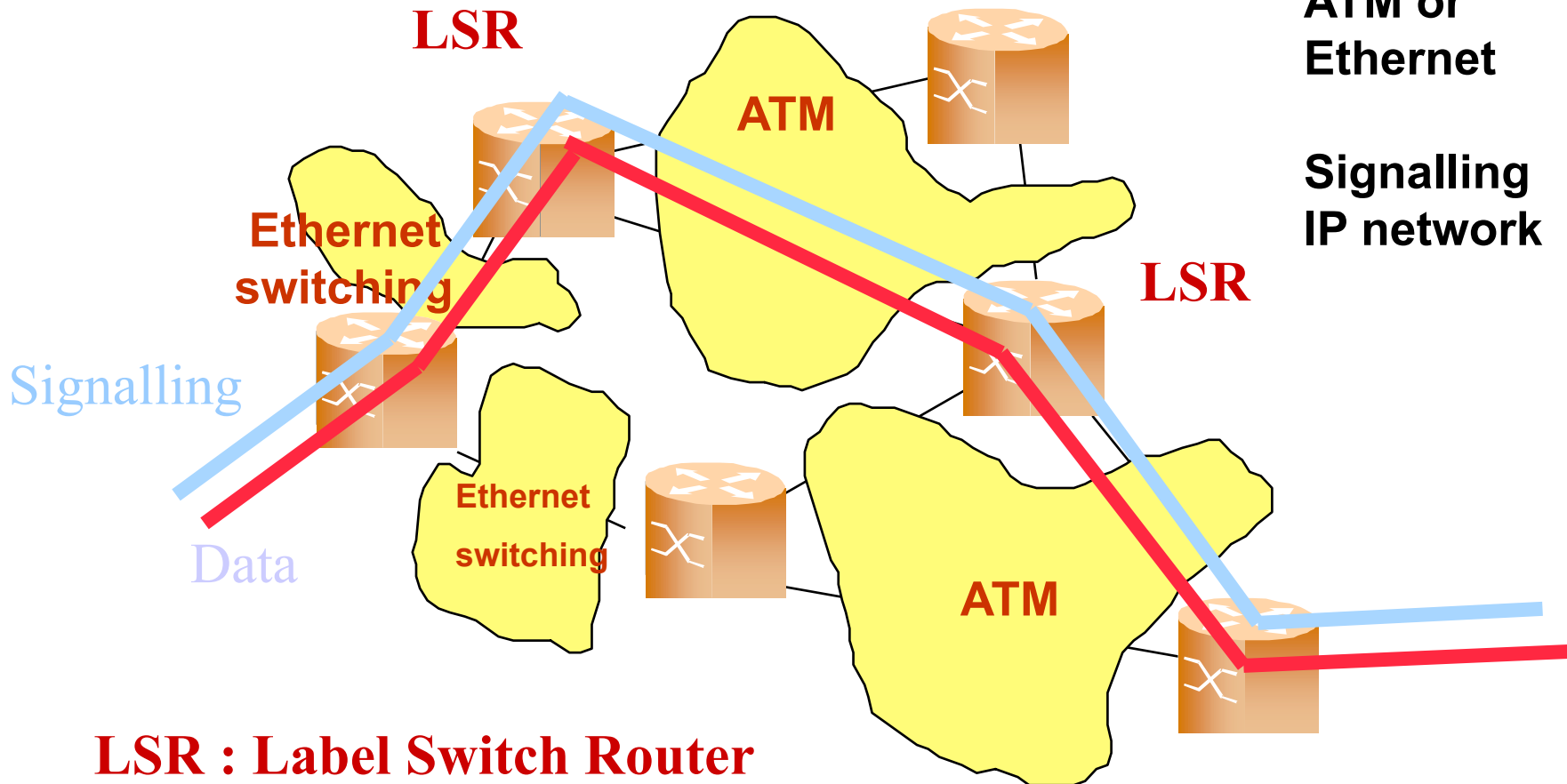


# Signalling and QoS (MPLS)

Internet = signalling network

IP over  
ATM or  
Ethernet

Signalling  
IP network

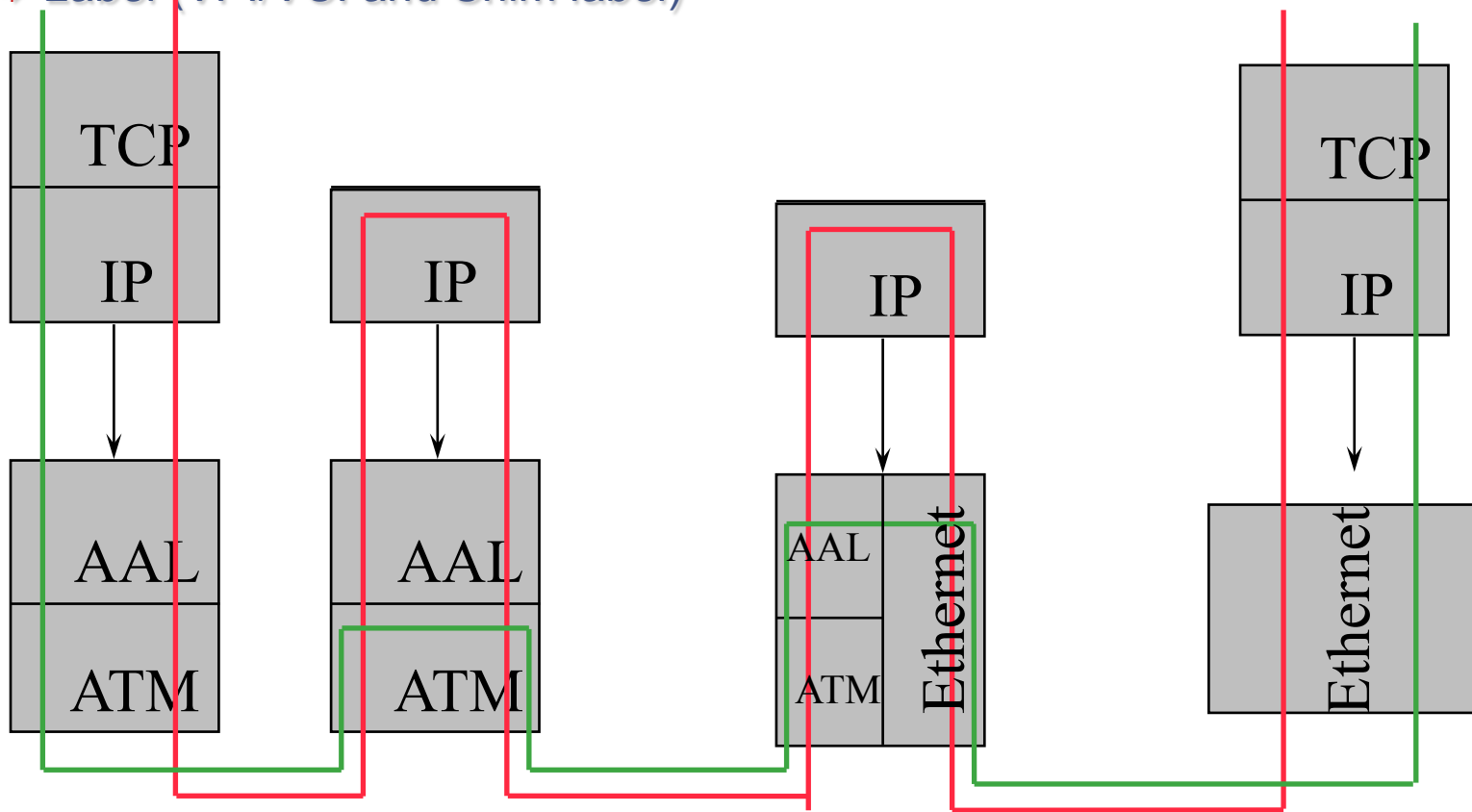


# MPLS

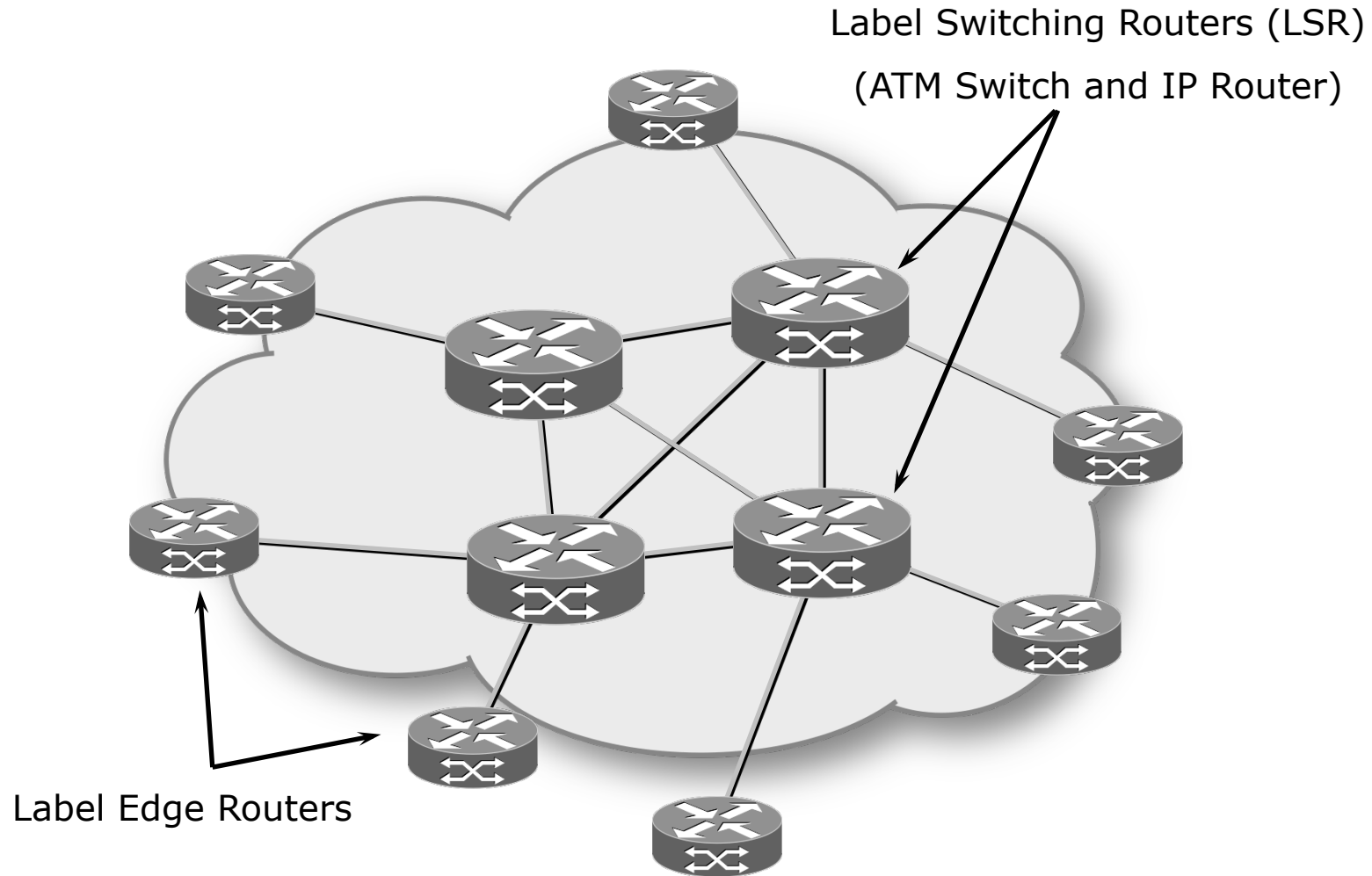
## ◆ Multiprotocol Label Switching

- Association IP, ATM, Ethernet, Frame relay, PPP, etc.

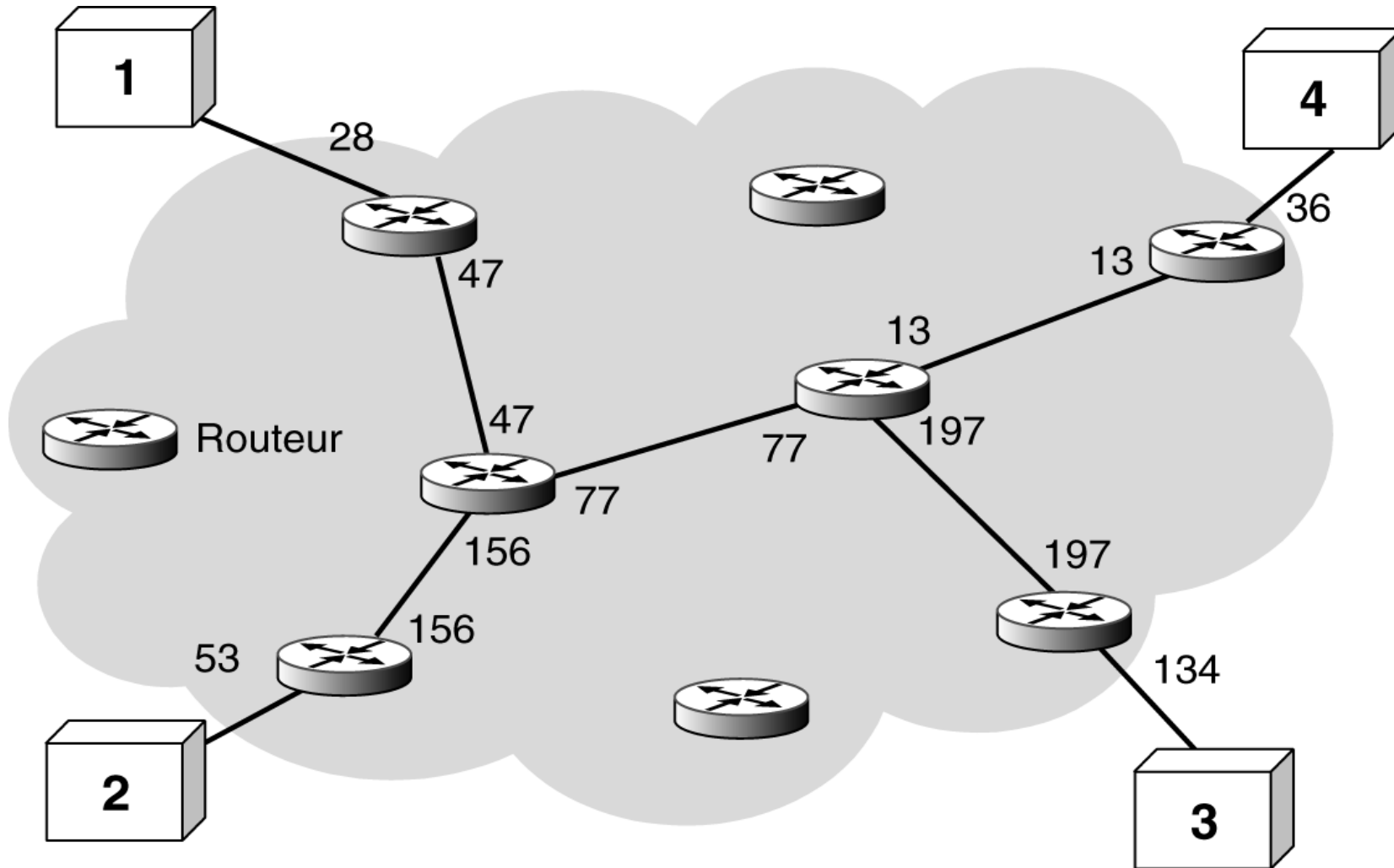
▶ Label (VPI/VCI and Shim label)



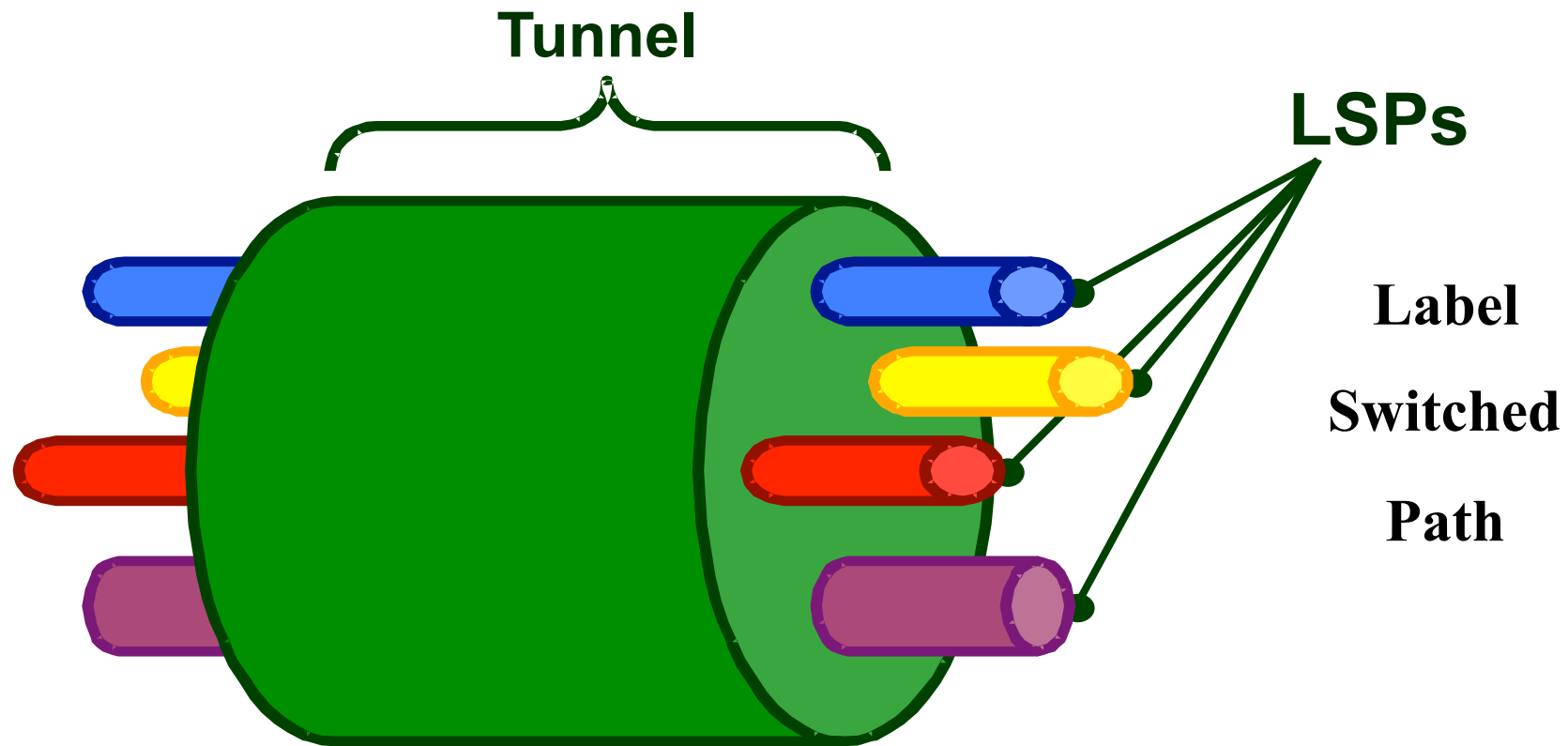
# MPLS (*MultiProtocol Label Switching*)



# MPLS

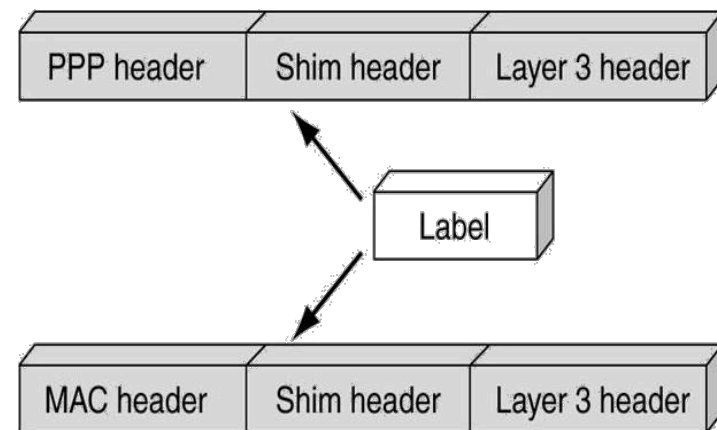
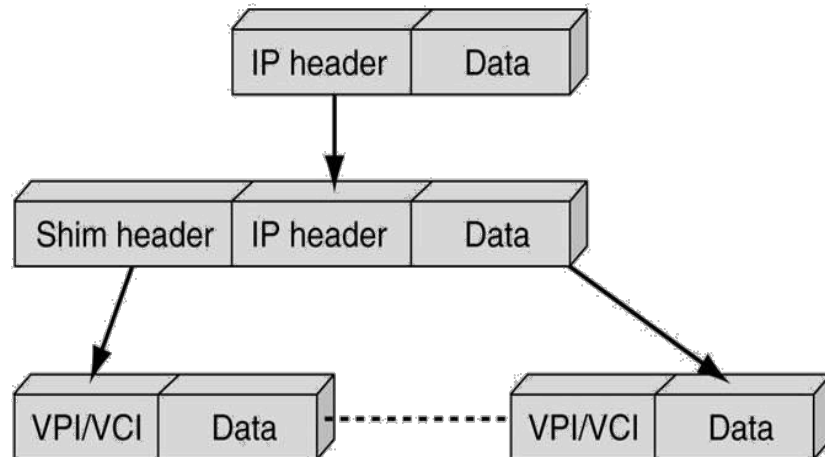
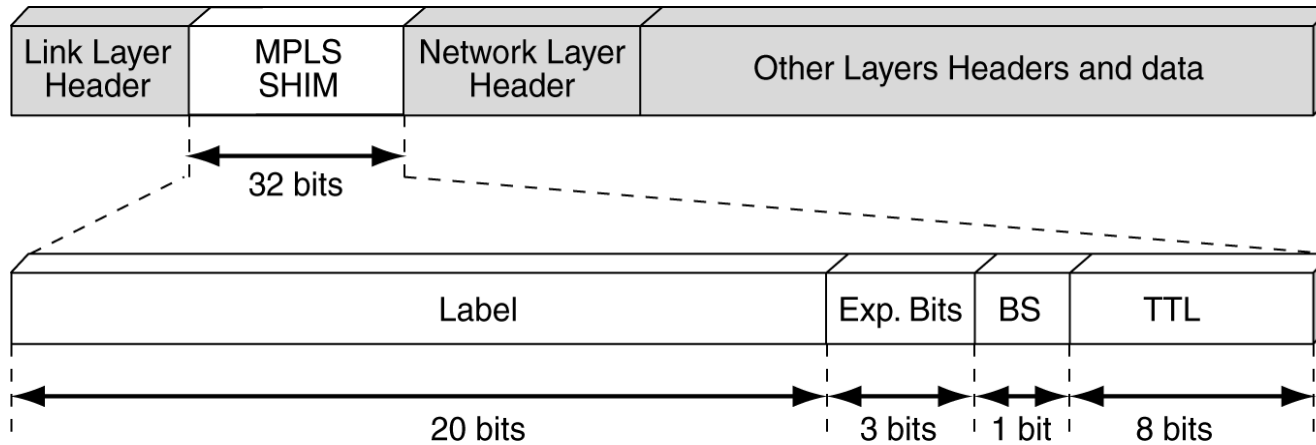


# MPLS : conceptual view



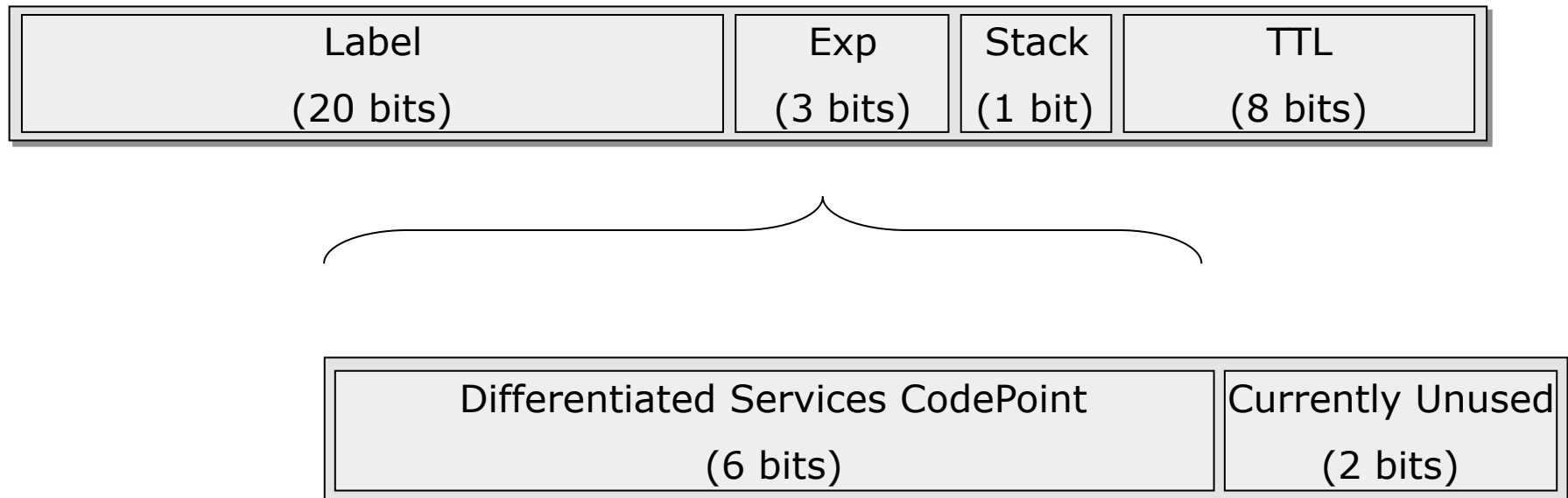
FEC (Forwarding Equivalence Class)

# Label MPLS



# MPLS - DiffServ

## MPLS Shim



## DiffServ field

# Set-up of the LSPs

- **LSP: Label Switch Path**
- **LDP: Label Distribution Protocol**
- **Between LERs**
- **Different modes**
  - Requested by LSRs (downstream)
  - Through the management plan (static)
  - Explicit routes
    - ➔ IP routing (Shortest Path)
    - ➔ Management of the traffic and QoS
    - ➔ Protocols
      - RSVP
      - CR-LDP (Constraint-Based Routing)



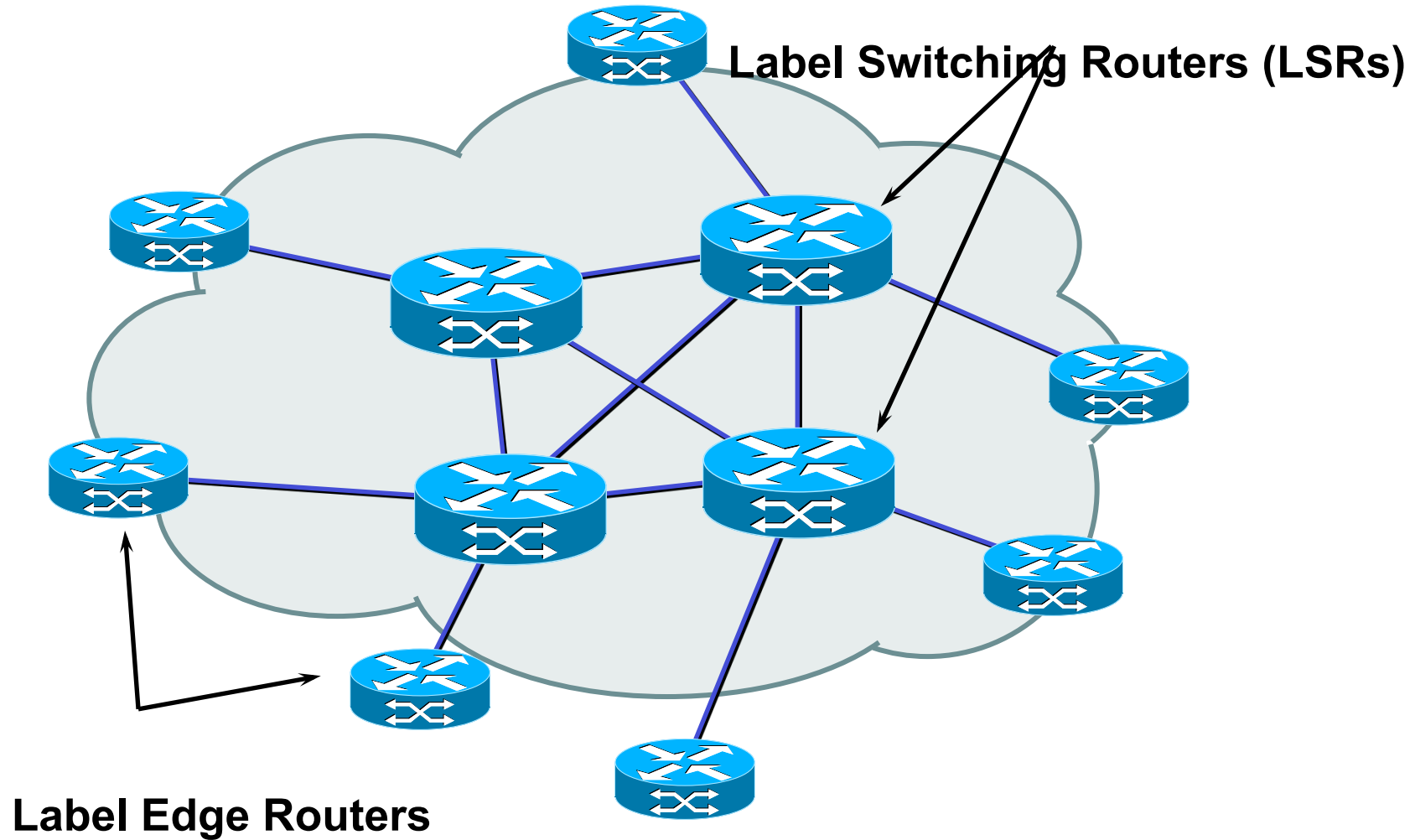
# MPLS : signalling

- Founded on the topology (Topology-based)
  - OSPF, BGP
  - LDP (Label Distribution Protocol)
- Founded on the requests (Request-based)
  - RSVP-TE
  - CR-LDP (Constraint-based Routing LDP)
- Founded on the traffic (Traffic-based)
  - IP-switching

# MPLS

- **Multi Protocol Label Switching**
- **Reduce the complexity of the network**
- **LER: Label Edge Router**
  - Classification of entering packets
  - Apply the label on the appropriate output
- **LSR: Label Switch Router**
  - Look-up table (label)
  - Label swapping
  - Forward the packet

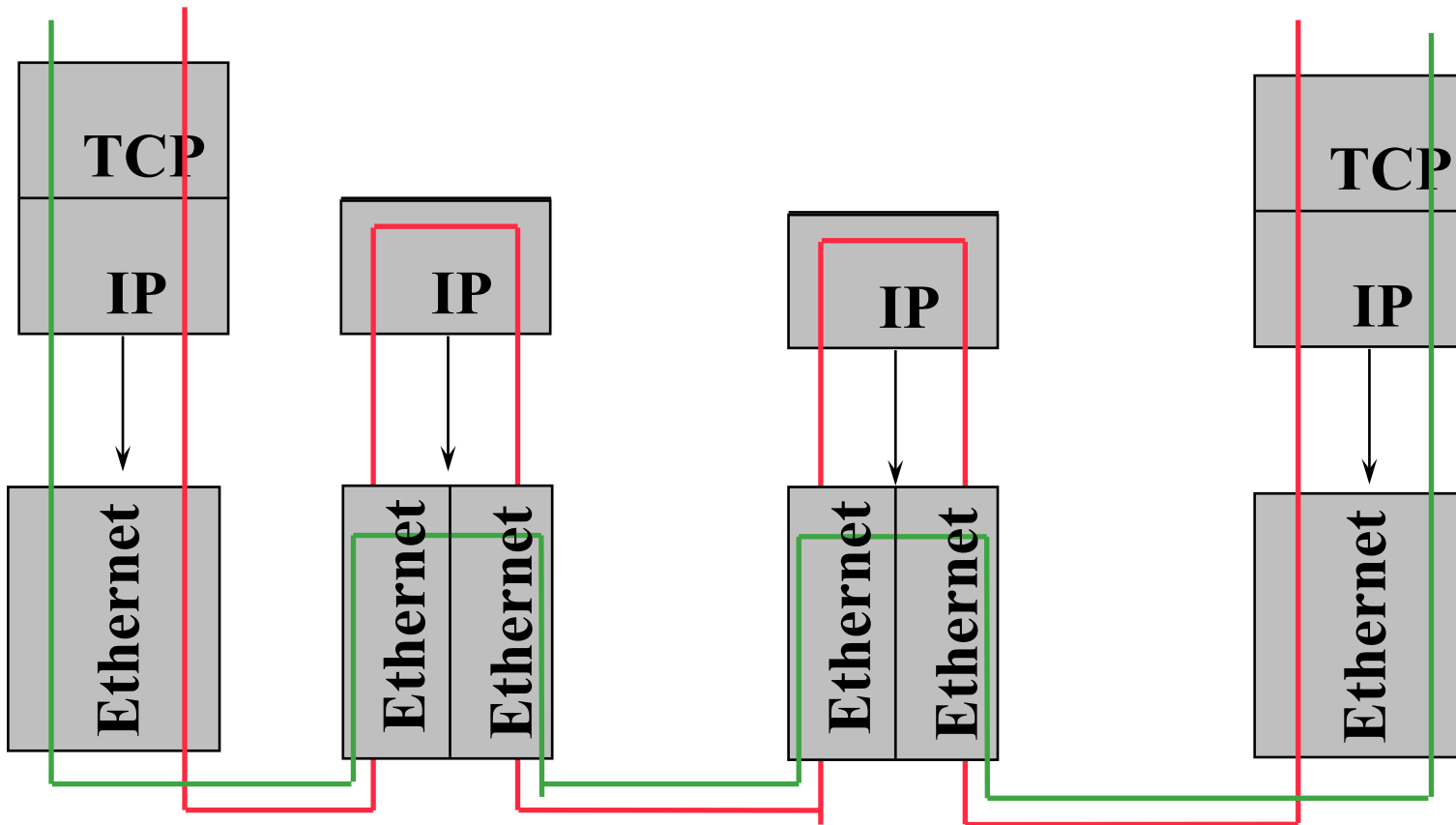
# Label switching equipment



# MPLS

## ● MultiProtocol Label Switching

### ■ Ethernet forwarding



# MPLS Summary

- **Defined by IETF**
- **Principle from IP switching**
- **Utilization of labels**
- **Forwarding Equivalence Class (FEC)**
- **LDP Protocol (Label Distribution Protocol)**
- **RSVP, OSPF, BGP, ...**
- **A solution to control the traffic**