



Introduction to Terrestrial Network Technologies

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Geographical Coverage





Network Topologies

Determined by the communications requirements of all nodes

- Mesh
- Star
- Ring
- Hybrid



Transmission Media

Technical and economics factors as well as the management criterion determine the medium to employ:

- Satellite
- Terrestrial
- Mix



Terrestrial Technologies



Terrestrial Technologies

Most common media employed in terrestrial networks:

- Copper wires or twisted pairs (DSL)
- Coaxial cable (CATV)
- Microwave (P-P, LMDS, WiMax)
- Fiber cable (Broadband Trunk)



Terrestrial Technologies

The first three media are mainly employed for local access, also named as 'last mile' connection. In some cases, fiber cable is also employed for the 'last mile'.

Fiber cable is commonly used as a transmission medium for very high capacity and serves to build the 'backbone' of a telecom network.



Terrestrial Technologies

Establishing a regional terrestrial network implies the use of fiber cable as the 'backbone' to connect all the network nodes.

Leasing or buying 'dark fiber' (no modulation over fiber) from global telecom operators is not feasible due to the hardware investment versus the required capacity or network bandwidth.

Leasing of 'clear channel' (protocol free) circuits over fiber are not being offered by international telecom operators.



Terrestrial Technologies

On the other hand, in the last years, access rates (Kbps) to Internet are increasing in bandwidth while their associated access costs to Internet are decreasing.

Parameters to be considered when evaluating the access to Internet:

- Latency
- Minimum rates for upload/download
- Oversubscription rate (1:N)



Terrestrial Technologies

Private Networks

Implementation of a regional terrestrial private network should be based on the technologies and service offerings of a regional public service provider.

Technologies most employed by public service providers:

- MPLS (MultiProtocol Label Switching)
- VPN (Virtual Private Network)



Terrestrial Technologies

MPLS

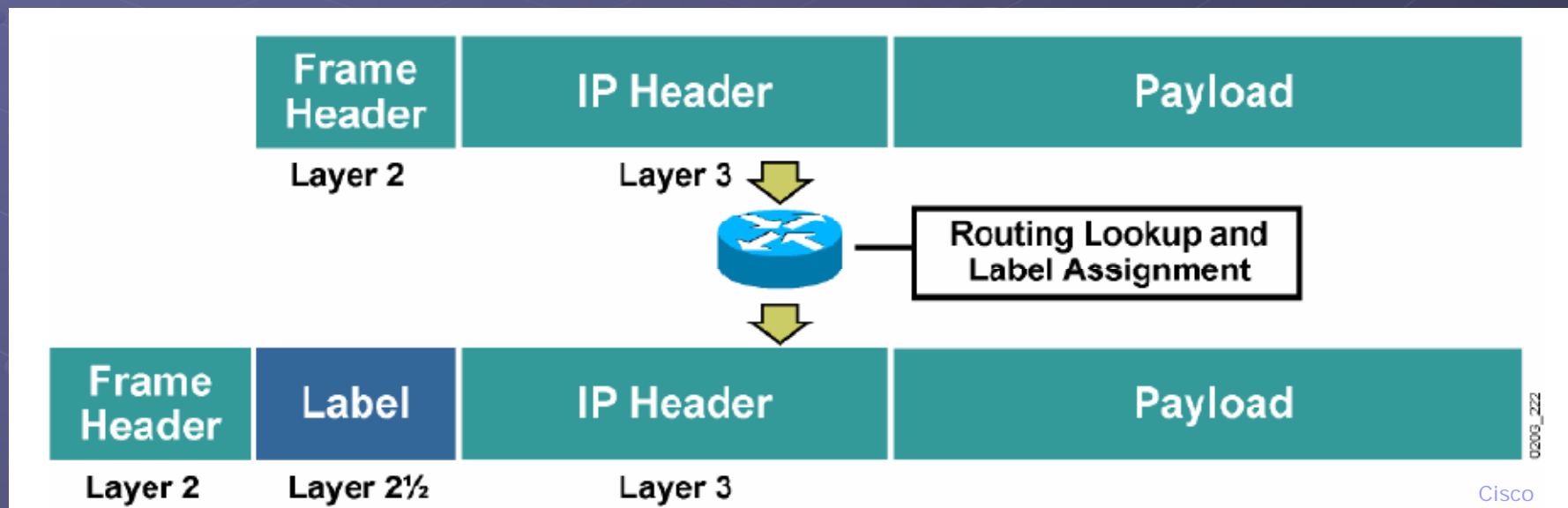
- Integrates routing, switching and transport of packets through the “labeling” of data packets.
- Designed to support encapsulation of different network protocols.
- Forwarding of packets is based on the “label” which contains the destination address as well as the respective CoS and QoS.
- No examination of packet content.



Terrestrial Technologies

MPLS

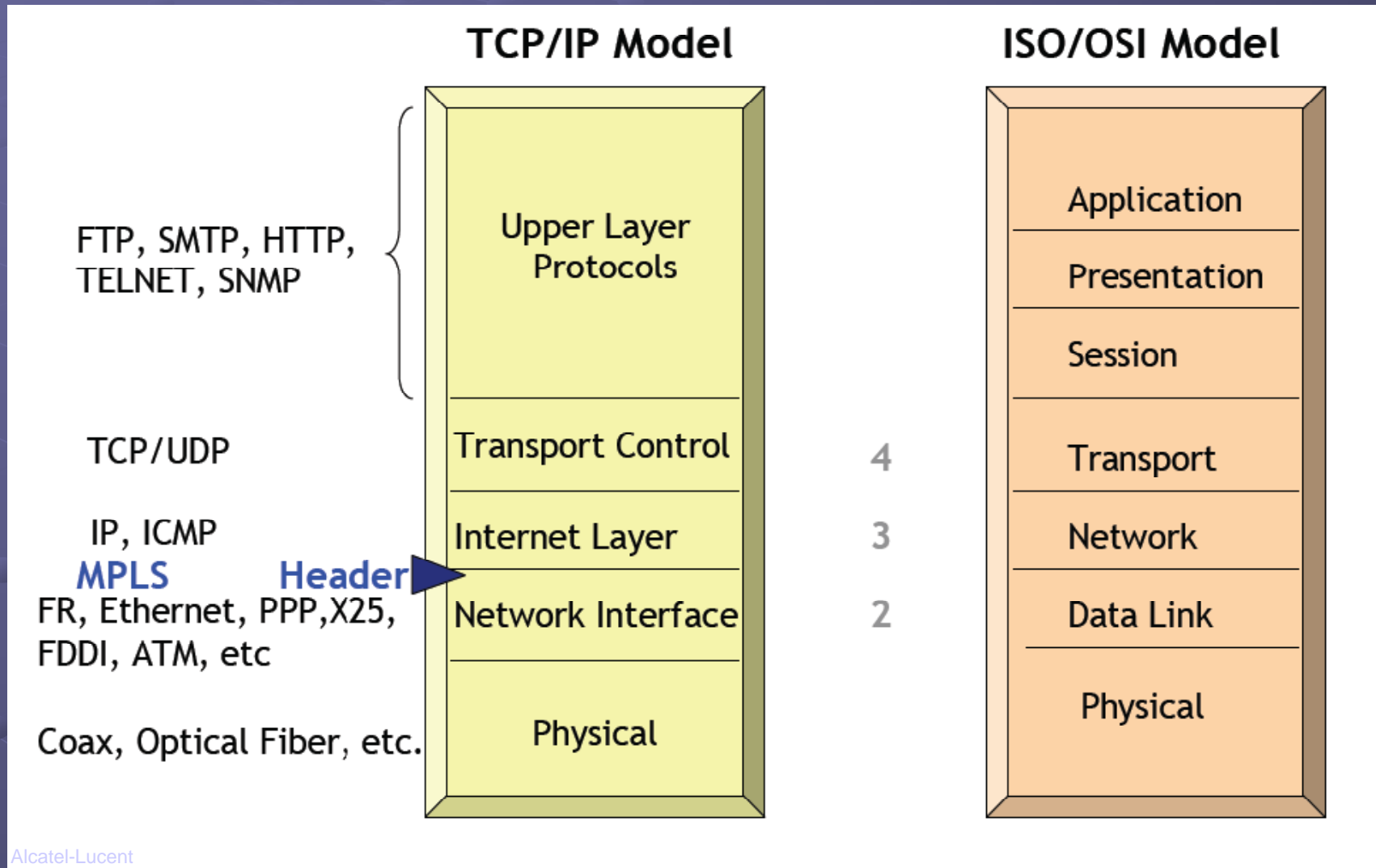
➤ Layer 2 ½





Terrestrial Technologies

MPLS





Terrestrial Technologies

MPLS

Main applications:

- Unicast/Multicast IP Routing
- Traffic Engineering (TE) for traffic analysis
- Quality of Service (QoS)
- **VPN (Virtual Private Network)**
- Tunneling for Layer 2: FR, HDLC/PPP, Ethernet



Terrestrial Technologies

VPN

- Based on the establishment of 'tunnels' to create virtual channels crossing a public network.
- Protected with encryption techniques and security protocols such as IPSec (Internet Protocol Security) or SSL (Secure Sockets Layer)
- Can be implemented on top of public networks:
 - MPLS
 - Internet