

Core network protocols and architectures

Multi-Protocol Label Switching

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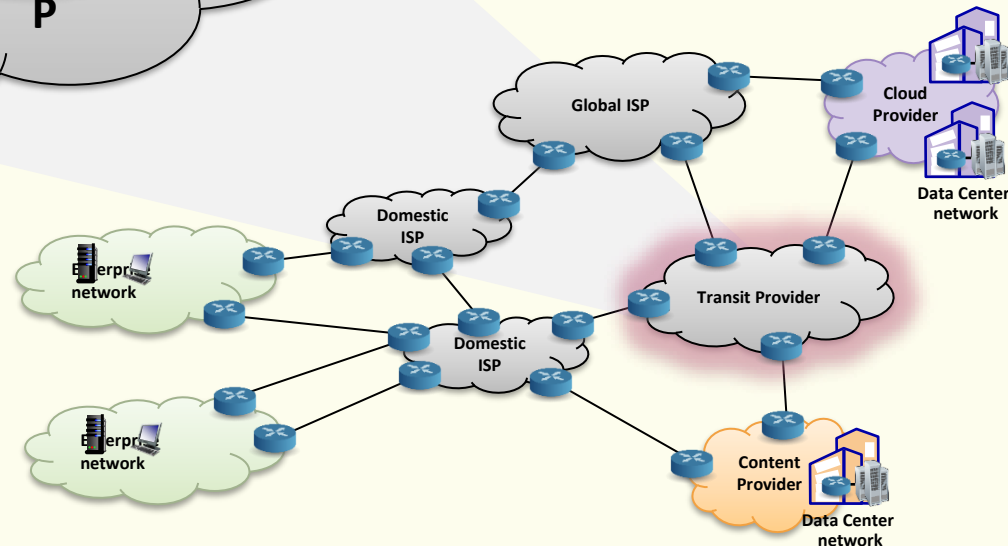
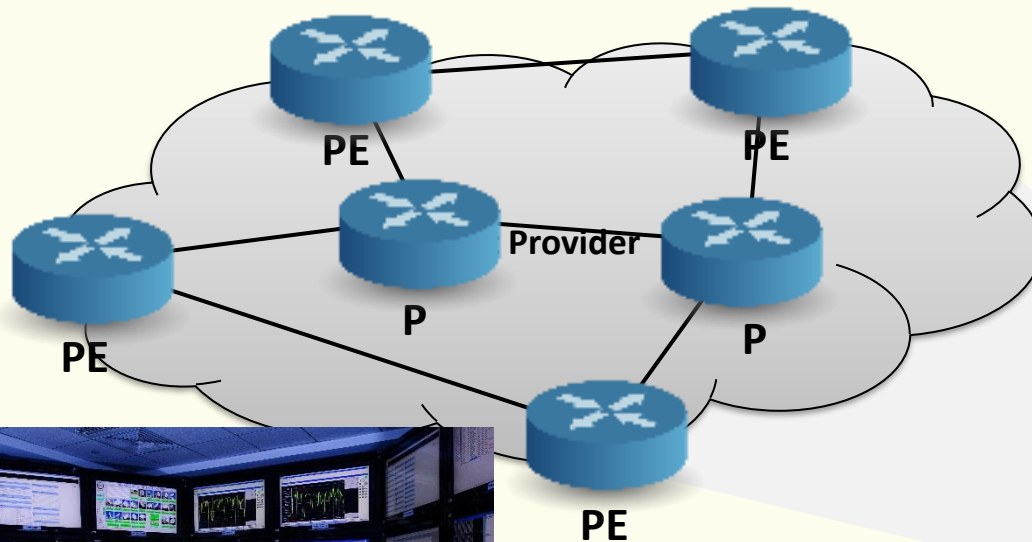
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Multi-Protocol Label Switching



- Routing scalability

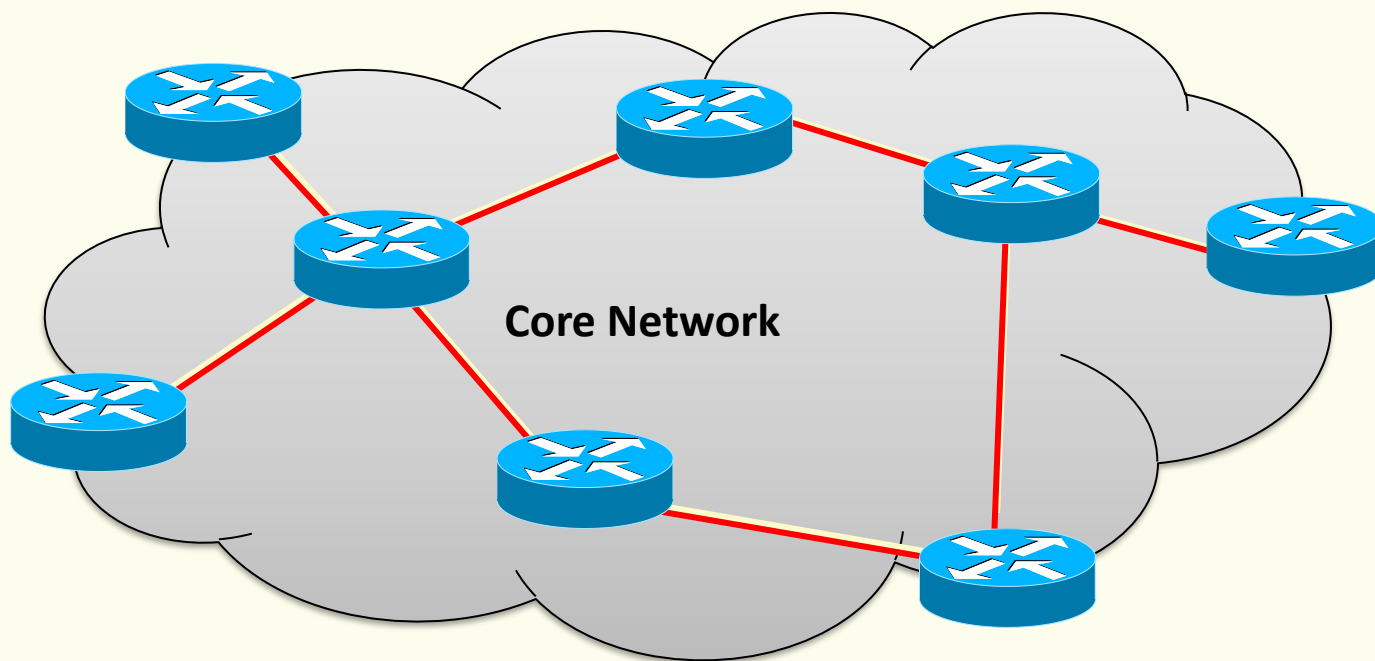


MPLS problem statement

- **Scalability** of network layer routing
- Greater **flexibility** in delivering routing services
- Optimize network **performance**
- Simplify **integration** of routers with cell-switching based technologies

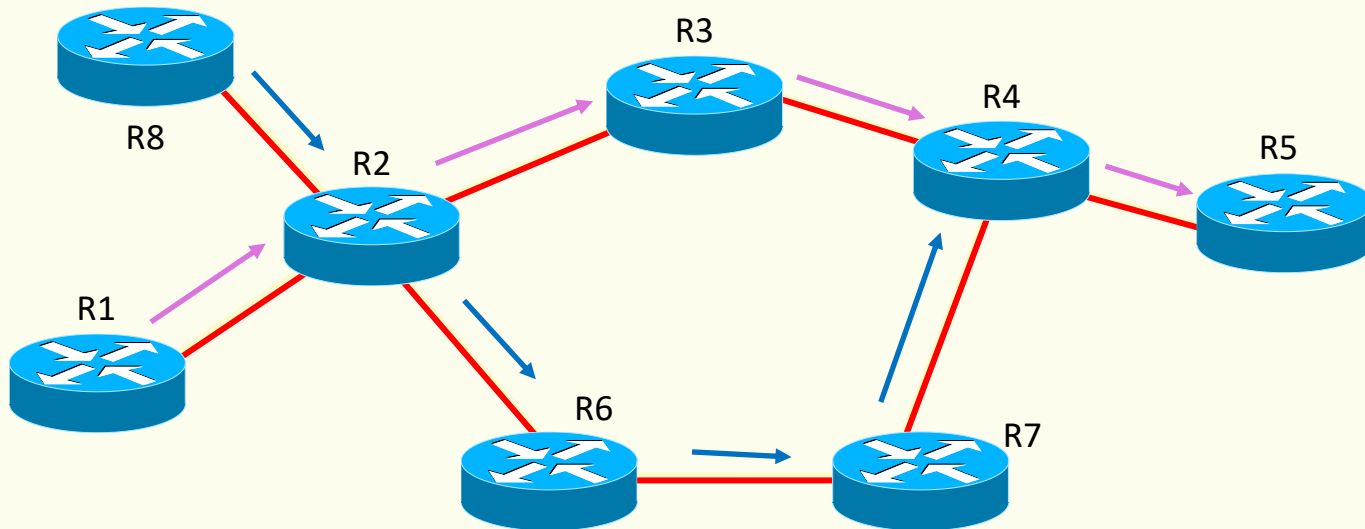
MPLS problem statement

- **Scalability** of network layer routing



MPLS problem statement

- Greater **flexibility** in delivering routing services





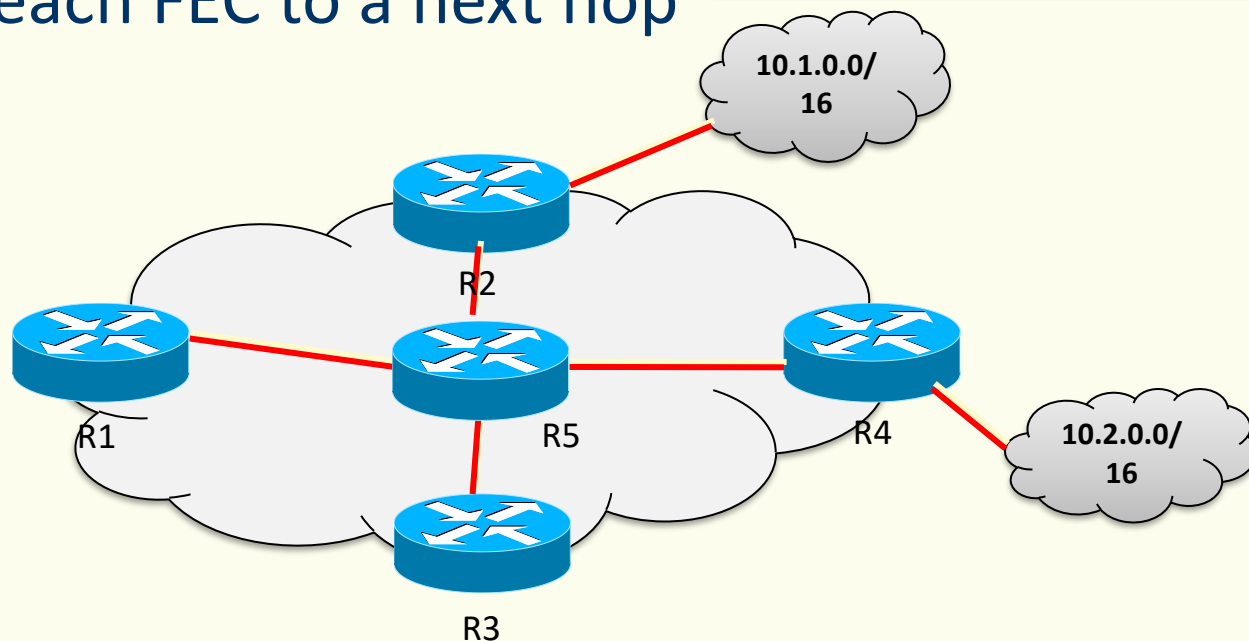
MPLS problem statement

- Optimize network **performance**

Label switching concept

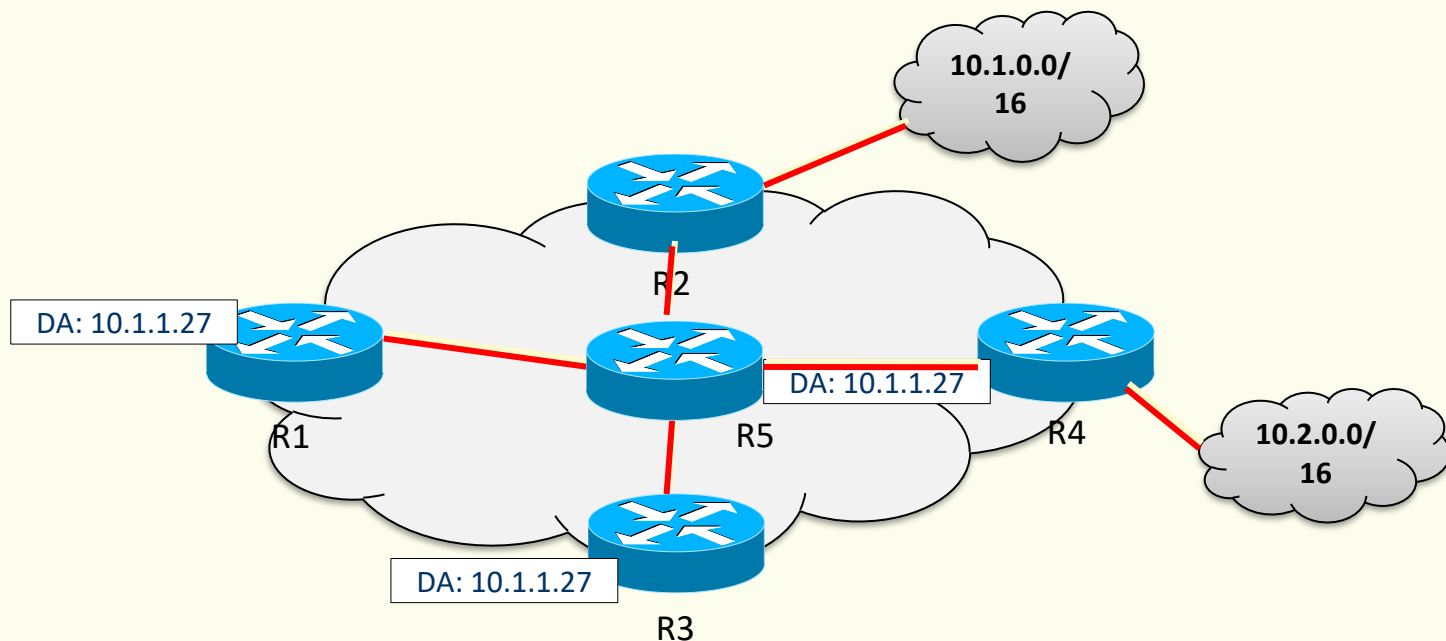
- Conventional IP forwarding (reformulated)
 1. **Partition** packets into a set of Forwarding Equivalent Classes (FECs)
 2. **Map** each FEC to a next hop

FEC: a group of IP packets which are forwarded in the same manner



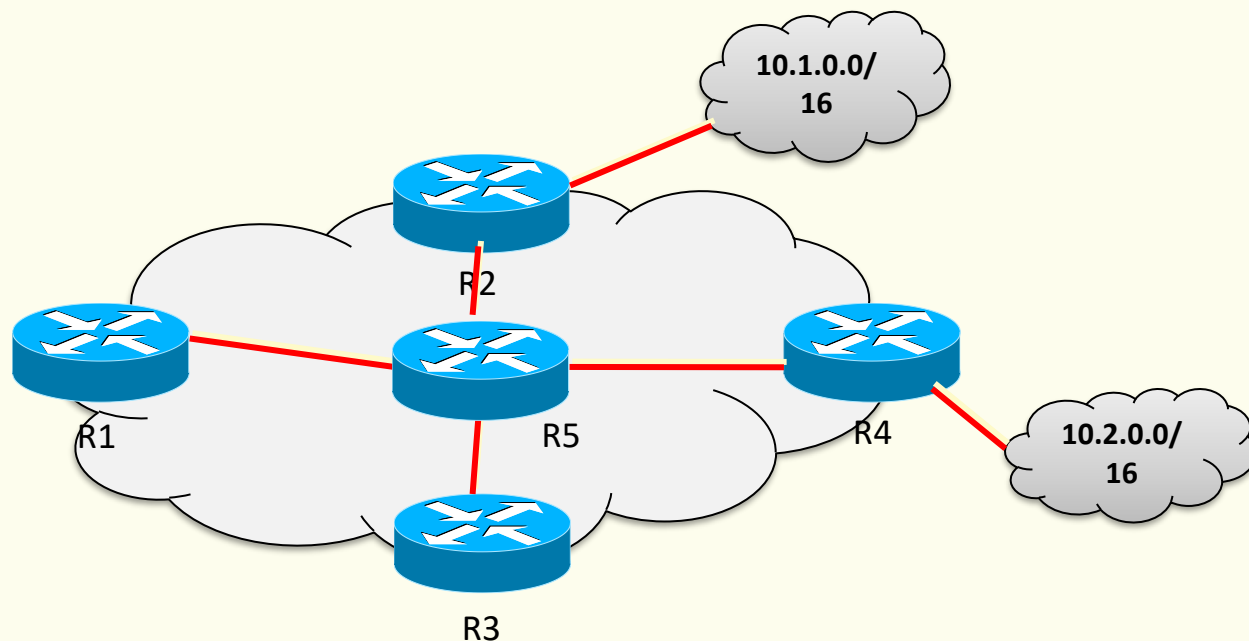
Label switching concept

- Conventional IP forwarding (reformulated)
 - Partitioning and mapping is done **at each hop**



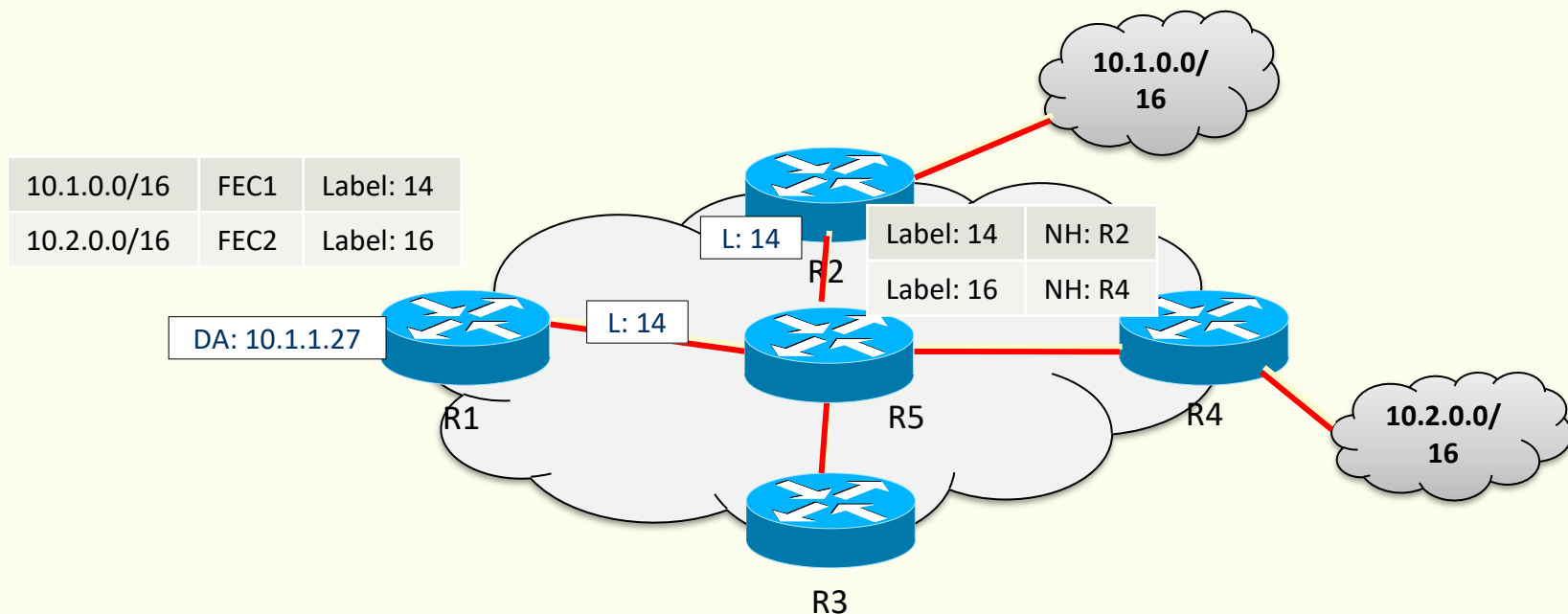
Label switching concept

- Can we decouple partitioning from mapping?
 - Partitioning into FECs at **edge routers**
 - Only mapping at each hop (**edge + core routers**)



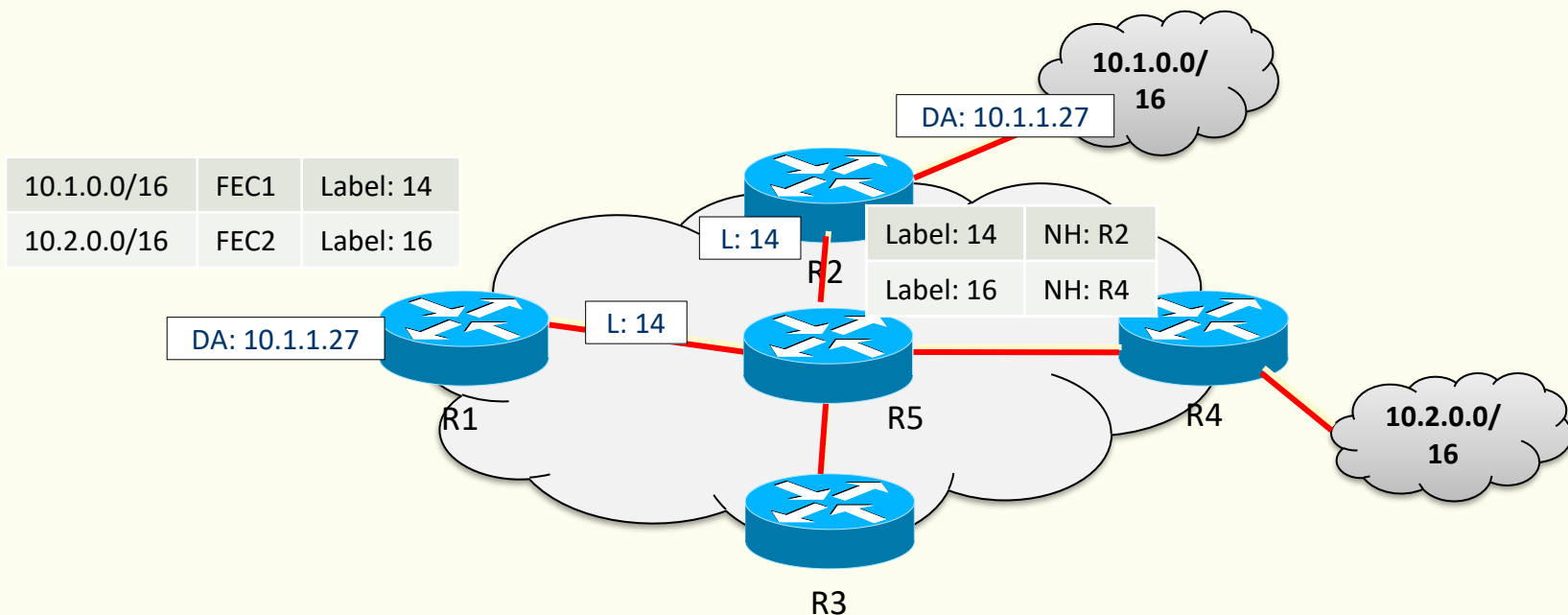
Label switching concept

- Yes, by introducing **labels into packets**
 - Partitioning into FECs at **edge routers**
 - Only mapping at each hop (**edge + core routers**)



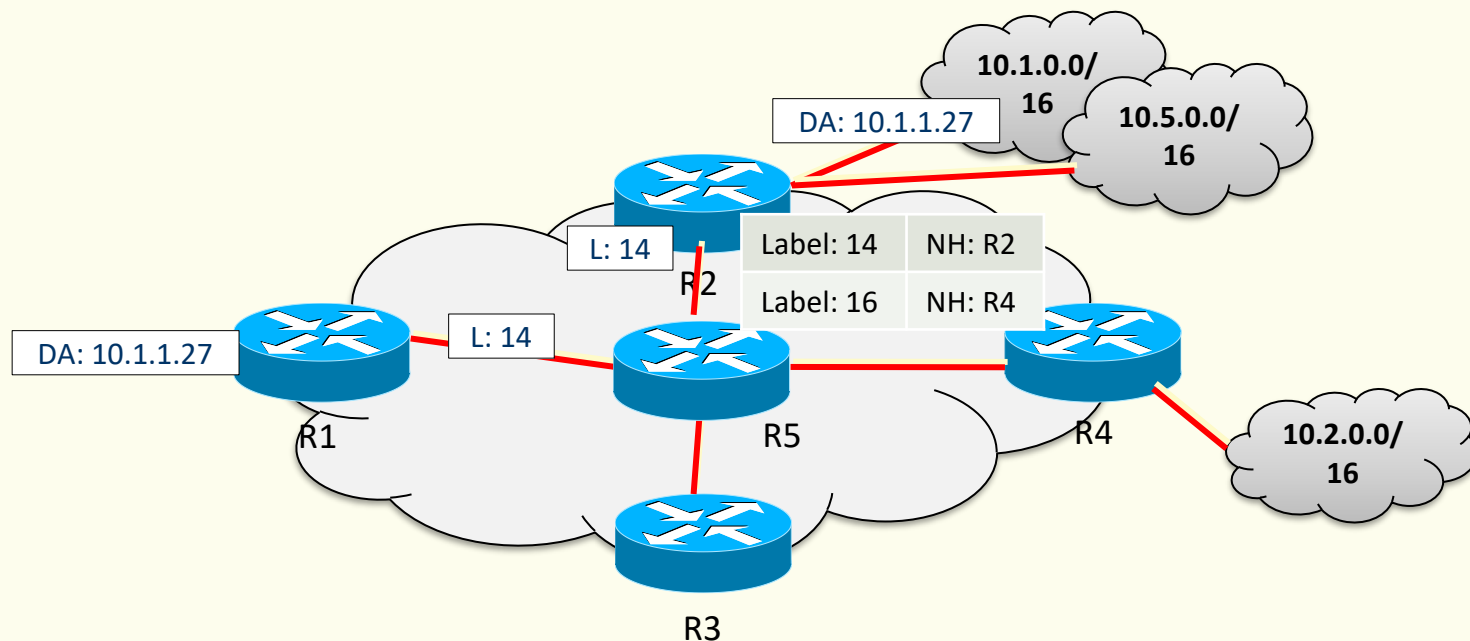
Label switching concept

- Advantages? **Yes!**
 - Easily allows for FEC partitioning other than the destination address based one



Label switching concept

Address prefix matching 10.1.0.0/16 && DSCP=101110	FEC1	Label: 14
Address prefix matching 10.1.0.0/16 10.5.0.0/16	FEC2	Label: 16
Address prefix matching 10.1.0.0/16 && TCP protocol	FEC3	Label: 23
Address prefix matching 10.1.0.0/16 && INport=Se0/0/0	FEC4	Label: 15



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- Diagram illustrating a network topology for LSP setup. The network consists of five routers (R1, R2, R3, R4, R5) connected in a mesh topology. A source cloud (10.1.0.0/16) is connected to R2. A destination cloud (10.2.0.0/16) is connected to R4. A table on the left shows the mapping of FECs to labels:
- | FEC | Label |
|--------------------|-------|
| 10.1.0.0/16 (FEC1) | 14 |
| 10.2.0.0/16 (FEC2) | 16 |
- The diagram also shows a box labeled "DA: 10.1.1.27" connected to R1, and a box labeled "L: 14" connected to R2. A box labeled "Label: 14, NH: R2" is connected to R2, and a box labeled "Label: 16, NH: R4" is connected to R4.

Label switching concept

- **Local-scope** is better, yielding the basis for a distributed solution

