INF5050 - Protocols and routing in internet

Multiprotocol Label Switching (MPLS) / Generalized Multiprotocol Label Switching (GMPLS)

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Outline

- Background
- MPLS Fundamentals and Terminology
- Control and Forwarding Plane
- Generalized MPLS
- GMPLS Recovery techniques
- Summary
- Resources

Background

- What is MPLS?
  - Mechanism that directs data from one network node to the next based on on path labels rather than network addresses.
  - with such mechanism, we avoid lookups in a routing table
  - MPLS switches packets (IP packets) instead of routing packets to transport the data
- Why MPLS?
  - Provide a highly scalable mechanism that was topology driven rather than flow driven
  - Load balance traffic to utilize network bandwidth efficiently
  - Allow core routers/networking devices to switch packets based on a simplified header
  - Remove the complexity and overhead of network managements (Assemble and reassemble IP packets)

MPLS was conceived, why?

- The shortest path routing protocols like IS-IS and OSPF
  - Did not take capacity characteristics into account while making the routing decisions
  - The outcome is, segmentation over the network which leads to congestion, while others remain under-utilized.
- MPLS reduces the complexity and redundancies by adding new network functionalities.

MPLS Fundamentals and Terminology

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GMPLS

- What is GMPLS?
  - a protocol suite extending MPLS to manage further classes of interfaces and switching technologies other than packet interfaces and switching, such as time division multiplex, layer-2 switch, wavelength switch and fiber-switch.

GMPLS

- GMPLS is an extended form of MPLS and some of these improvements are:
    - RSVP-TE
    - OSPF and IS-IS
    - New link-management protocol
    - Bi-directional LSP setup
        - Reduce latency
        - Less control overhead
        - Route selection is simpler
        - Cleaner interface
    - MPLS emphasizes the seperation of control plane and network plane
    - GMPLS extends this seperation and allows the control plane to be physically diverse from the associated data plane

GMPLS: Hierarchial LSP

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Summary

- MPLS
- GMPLS

Resources

- Generalized Multiprotocol Label Switching: An Overview of Signaling Enhancements and Recovery Techniques IEEE Communication Magazine, July 2001. A. Banerjee et. al.
- Internet Traffic Engineering Using Multi-Protocol Label Switching (MPLS). Computer Networks 40, Elsevier, 2002 D.O. Awduche and B. Jabbari.