MPLS Network Management: MIBs, Tools and Techniques From an Implementer's Perspective

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Agenda

- Introduction
- Challenges and Hurdles
- Obstacle Avoidance
- Observations/Conclusions

Introduction

This presentation we will cover a variety of tools and techniques available for the management of various MPLS services including L2 and L3 VPNs. The discussion will cover both standards-based as well as proprietary options. The presenter will take the perspective of one implementing these tools by highlighting potential pitfalls often encountered when building them. Suggested ways around those pitfalls as well as suggestions for approaches that may tend to be more interoperable will also be presented.

Introduction
Goals of Presentation

- Describe interaction between vendors with 3rd party NMS vendors and ISP customers who wish to build NM applications to manage the MPLS MIBs and OAM tools.
- Describe Challenges and Hurdles
- Present ideas for how to Overcome these Challenges

Introduction
Set the Stage -- What is MPLS NM/OAM?

Fault-management
Configuration
Accounting
Performance
Security

MPLS *MIBs*
Summary – Lots of MIBs!

- **MPLS**

  LSR, LDP, FTN, TE, TE-FRR, LC-IF, TE-LINK, PPVPN-MPLS-VPN, IF-MIB, DSTE

  CISCO-VPN, CISCO-TE, CISCO-MPLS-SSO, etc…

- **GMPLS**

  LSR, TE, LMP

- **PWE3**

  PW, PW-MPLS, PW-ENET, PW-CEM, PW-ATM, PW-FR

MPLS OAM Summary

- LSP ping, path trace/tree trace
- Virtual Circuit Connectivity Verification (VCCV)
  - BFD, LSP ping Mode
- VRF-aware MPLS ICMP-based ping
- Service Assurance Agent (SAA)
- MPLS-aware NetFlow
- MPLS OAM NM Applications
- LSR Self-Test

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MPLS MIBs
Hurdles: Standards

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- **Drafty drafts**
  - **Multi-vendor interop with drafts.**
    - **SNMP issues.**
    - **Different interpretations.**
  - **Many tables to support different aspects of implementations; some not applicable to some implementations.**

MPLS MIBs
Hurdles: Standards (cont)

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- **Standards organizations are inherently *slow*.**
- **Some standards authored by those not close to an implementation.**
  - **Sometimes propose things not efficient for implementations.**
- **Customers request new things after draft is published.**
  - **Changing the draft is the easiest part.**

MPLS MIBs
Hurdles: Implementation

- **Multiple code branch support**
- **Multiple hardware support**

  Some hardware may not support some aspects required by the MIB.

- **New features added to original feature.**

  If MIB is not RFC, can be changed, otherwise proprietary extensions needed.

- **Multiple Development Models Possible**

MPLS OAM Challenges/Hurdles Standards

- Long History.
- Two Standards Bodies Working on MPLS OAM
  - ITU, IETF
- Requests for new things after draft is published.
  - Changing the draft is the easiest part.
- Problems Discovered in Drafts Needed to Be Fixed.
- In short, MPLS OAM is a hard problem.

MPLS OAM Challenges/Hurdles Implementation

- Multiple code branch support
- Multiple hardware support

  Some hardware may not support some aspects required by the standard.

- New features added to original feature.

  If is not RFC, can be changed, otherwise proprietary extensions needed.

- Multiple Development Models Possible
- Building the plane as it takes off!

MPLS MIBs
Two Development Models

- **Develop as you go model.**

  Build NM applications along with the MIBs and the features at the same time.

  Pros: tightly coupled, better collaboration, better standards. Cheaper in the long run.

  Cons: expensive to develop/coordinate (more expensive initially).

- **Develop after the fact model.**

  Build NM applications and/or MIBs *later*.

  Pros: cheaper initial cost (develop as you go)

  Cons: sometimes prone to errors/omissions resulting in requirement for proprietary extensions/re-spin of standard: potential higher cost later.

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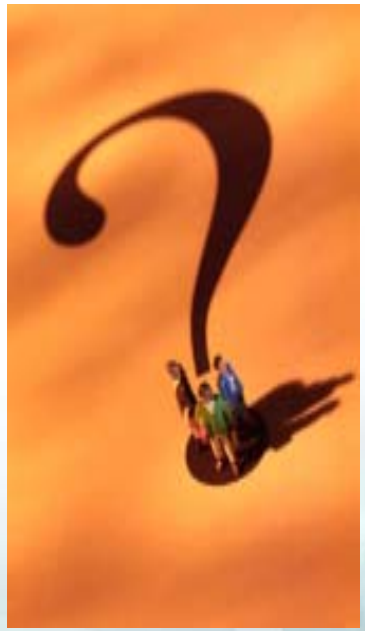
MPLS OAM/NM
Making The Process Better

- **Participate in standards**
  - **Drive Requirements**
  - **Contribute to or review IETF drafts and ITU recommendations.**
  - **If standards are not satisfying your needs, work directly with vendors; standards will follow.**
  - **Let your requirements be heard.**
    - **This is the only way they can be *satisfied*!**

MPLS OAM/NM
Making The Process Better

- Customers and vendors need to be as engaged as possible.
  - As early in the process as possible!
- Provide feedback through EFTs
- Provide feedback, in general either directly or through account contacts.
- Interoperability Events
  - –sponsor/coordinate/encourage
- Closer cooperation with your vendors when they implement MIBs.
  - –SDKs, partnerships, etc...

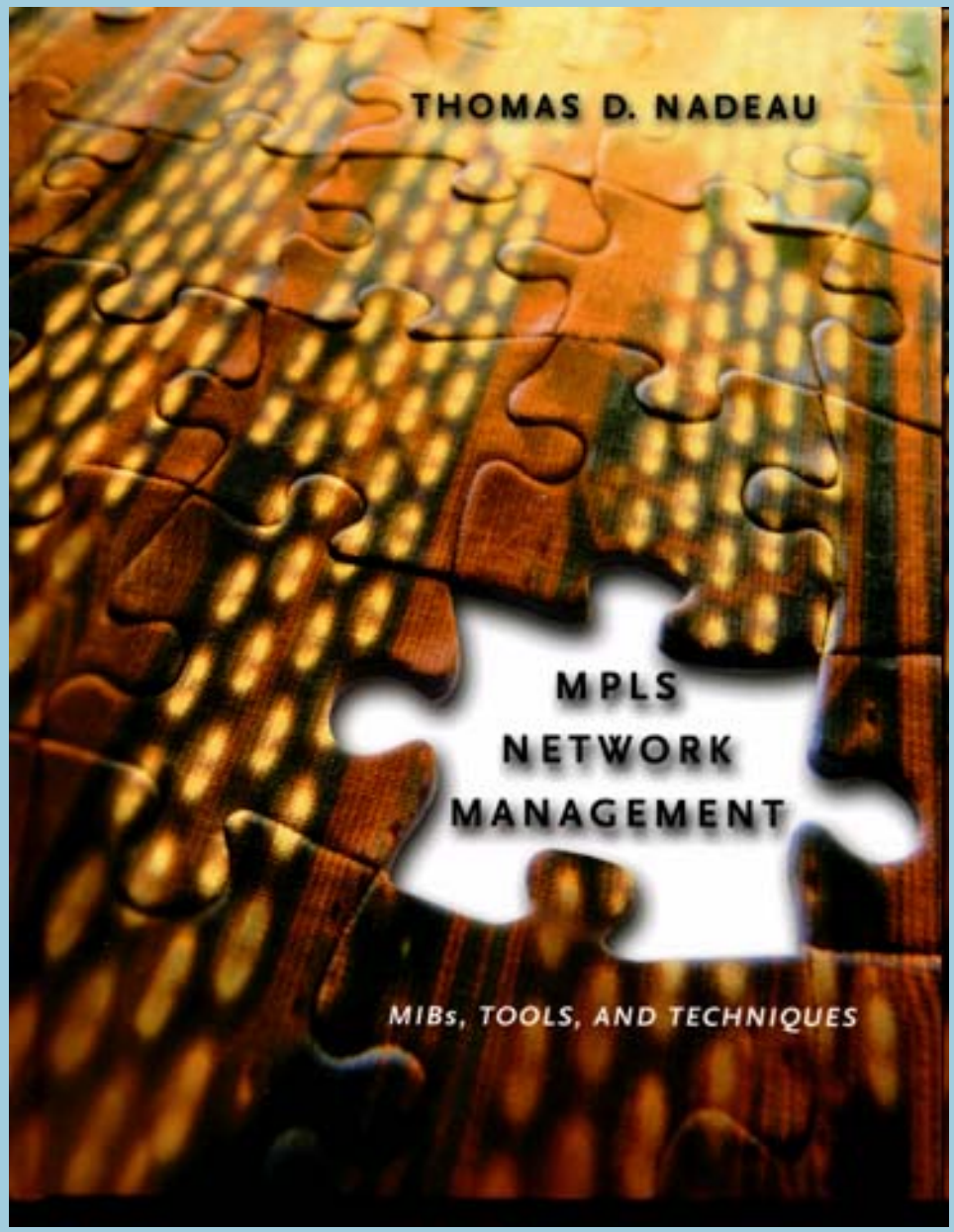
Questions?



Observations/Conclusions

- There are hurdles in the process to successful NM application development.
- There are definite ways of avoiding them.

Thank You



MPLS Network Management: MIBs, Tools, and Techniques is the first and only book that will help you master MPLS management technologies and techniques, as they apply to classic MPLS networks, traffic-engineered networks, and VPNs. Written by the co-author of most current MPLS management standards, it provides detailed, authoritative coverage of official MIBs, examining key topics ranging from syntax to access levels to object interaction. It also offers extensive consideration of third-party management interfaces, including tools for metering traffic and predicting traffic growth and behavior. If you're a network operator, network device engineer, or MPLS application developer, you need this book to get all you can out of all of MPLS's many capabilities.

http://www.elsevier-international.com/catalogue/title.cfm?ISBN=155860751X

Biography

Tom works at Cisco Systems where he is the technical leader of MPLS network management and OAM development. He leads a team of that design and develops MIBs and other management tools for Cisco's routing and switching platforms. He also works on other network management-related activities at Cisco such as OAM, GMPLS, L2/L3 VPNs, Traffic Engineering, Pseudo-wire Emulation, and SNMP in general. He is co-author of all but one of the MPLS and GMPLS-related IETF MIBs, as well as numerous other IETF protocol and architecture documents.

Tom has filed several patents for network management technology. He received his BSCS from The University of New Hampshire, and an MSc from The University of Massachusetts in Lowell, where he has been an Adjunct Professor of Computer Science since 2000. He teaches courses in the topic of data communications. He is the technical editor of Enabling VPN Aware Network With MPLS (Prentice-Hall Publishers, 2001), and author of MPLS Network Management: Tools and Techniques (Morgan-Kaufman, 2002). The anticipated publication date of Tom's second book entitled, "MPLS Operations and Management" is the first quarter of 2004.