LIME OAM Model Design Team (DT) Discussion

Qin WU (Design Team member)
Gregory Mirsky (Design Team member)
Tom Taylor (Design Team member)
Deepak Kumar (Design Team member)
Carlos Pignataro (Design Team member)
Geoff Huston (Design Team member)
Ronald Bonica (Design Team member)
Santosh P K (Design Team member)
Adrian Farrel

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- Scope and objectives for the Design Team
- Discussion points from Design Team (#1,#2#3) meeting
- Summary of Design Team List Discussions
- Findings, Conclusions and Next Steps

The key questions and objectives for the Design Team (DT)

- Thanks to Ron for helping seed the initial discussion:

1. ***To what degree does the choice of an OAM model influence LIME work?***
2. ***Can the LIME's output be made "model agnostic"?***

- We are **NOT** defining new OAM protocols
- **Our intention** is to work on an OAM data model that is relevant to many, or all (?), IETF technologies
- **Our focus** has been analyzing the suitability of IETF (YANG) technologies to describe OAM information

#1 DT Meeting

- Key Discussion Points
  - What model can be used as basis for LIME OAM model?
  - What mode will the LIME model need to support?
    - Connection Oriented?
    - Connection less?
  - What are common elements for each OAM technology?
  - How does LIME model simplify operation cost?

#2 DT Meeting

OAM, TRILL OAM

- Candidate models
- Terminology
- Common OAM functions

#3 DT Meeting

- Understanding on “IP OAM is under-defined” was discussed
  - MD/MD-Level/MEP/MIP is implicitly supported by IP OAM
    - MD is corresponding to administration domain
    - MEP/MIP is corresponding to IP address of the test point
    - MD-level is corresponding to IP layer or layer 3.
    - MD is corresponding to administration domain
  - Greg claimed he was not aware of IP OAM model to be defined.
  - But draft-tissa-lime-yang-oam-model-03 provide model that is generic enough to support IP OAM
    - Both connection less and connection oriented feature need to be supported
- Greg proposes two options to address this issue
  - Or define IP OAM model first and separate it from LIME OAM model if the current model cannot support IP OAM (Ask WG chairs’ opinion on this)
    - Make sure the LIME model proposed in draft-tissa-lime-yang-oam-model-03 support IP OAM

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OAM, TRILL OAM

Metric	IP	IP/MPLS	MPLS-TP	TRILL
Trail Termination Source Information/MEP ID	Implicit	Implicit	Explicit	Explicit
MIP ID	Implicit	Implicit	Explicit	Explicit
On-demand Continuity Check	Yes	Yes	Yes	Yes
Proactive Continuity Check	Yes	Yes	Yes	Yes
On-demand Connectivity Verification	Yes	Yes	Yes	Yes
Proactive Connectivity Verification	No	No	Yes	Yes
Forward Defect Indication	No	No	Yes	Yes
Backward Defect Indication	No	No	Yes	Yes
Loss Measurement	Yes	Yes	Yes	Yes
Delay Measurement	Yes	Yes	Yes	Yes
Loss of Continuity Defect	Yes	Yes	Yes	Yes
Miss-merge Defect	No	No	Yes	Yes
Miss-connection Defect	No	No	Yes	Yes

Candidate models as basis

- IEEE CFM model
  - CFM is originally designed for Ethernet technology
  - Ethernet technologies support both connection oriented and connection less
- ITU-T Y.1731
- MEF-38 Service OAM Fault Management YANG Modules Technical Specification
  - Use IEEE CFM model as basis
- MEF-39 Service OAM Performance Monitoring YANG Module Technical Specification
  - Use IEEE CFM model as basis
- MPLS-TP OAM model in the section 4 of RFC6371
  - Use ITU-T Y.1731 model as basis

IEEE CFM model vs ITU-T Y.1731

- IEEE CFM defines a complete fault model that include fault domains, Test point, Layering etc.

- ITU-T Y.1731 defines both Fault management mechanisms and Performance Management mechanisms

ITU-T Y.1731 Terminology

Comparison with IEEE 802.1ag

IEEE 802.1ag		ITU-T Y.1731	
ME	Maintenance Entity	**ME**	Maintenance Entity
MA	Maintenance Association	**MEG**	ME Group
MAID	MA Identifier	**MEGID**	MEG Identifier
MD	Maintenance Domain	---	No such construct available
MD Level	MD Level	**MEG Level**	MEG Level
MEP	MA End Point	**MEP**	MEG End Point
MIP	MD Intermediate Point	**MIP**	MEG Intermediate Point

Common OAM functions

See RFC7276 Section5.2 for Common OAM function for IP OAM, IP/MPLS OAM, MPLS-TP OAM, TRILL OAM, BFD

Toolset	Continuity Check	Connectivity Verification	Path Discovery	Perf. Monitoring	Other Functions
IP Ping	Echo				
IP Traceroute			Traceroute		
BFD	BFD Control/ Echo	BFD Control			RDI using BFD Control
MPLS OAM (LSP Ping)		"Ping" mode	"Trace-route" mode		
MPLS-TP OAM	CC	CV/proactive or on demand	Route Tracing	-LM -DM	-Diagnostic Test -Lock -Alarm Reporting -Client Failure Indication -RDI
Pseudowire OAM	BFD	-BFD -ICMP Ping -LSP Ping	LSP Ping		
OWAMP and TWAMP	– control protocol			-DM -LM	
TRILL OAM	CC	CV	Path tracing	-DM -LM	

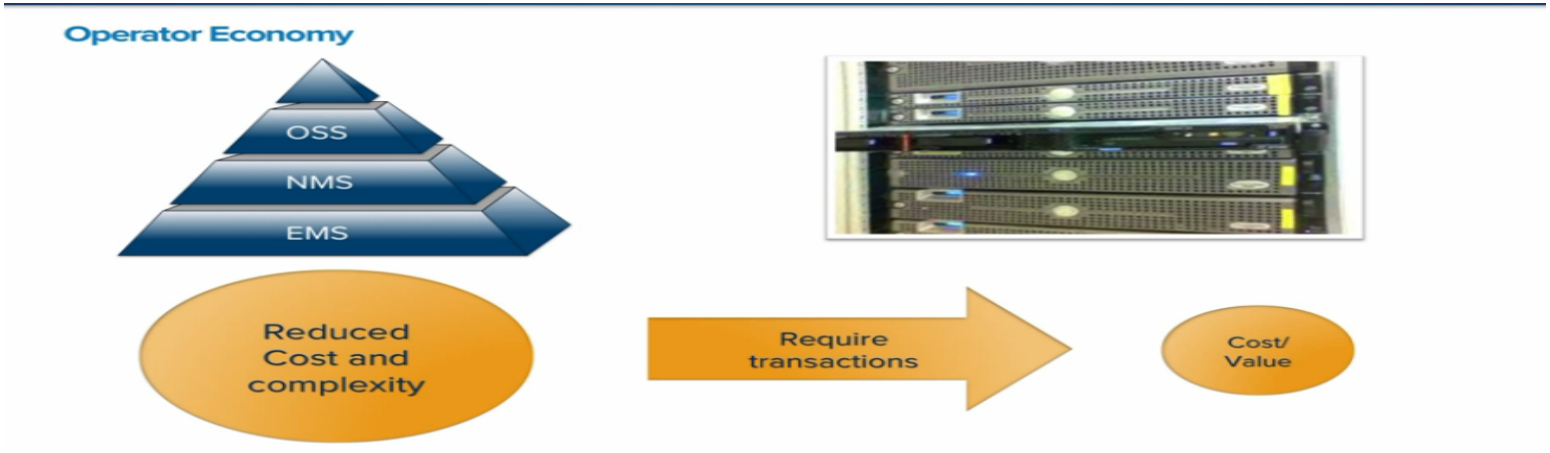
Table 4: Summary of the OAM Functionality in IETF OAM Tools

Common model elements for each OAM technology

- Fault Domain, Test Point, Layering Model
- OAM technology type, addressing, and RPC for various common OAM function
- Other common elements include
  - Connection oriented vs. connection less
  - Proactive vs. on demand
  - Point to point vs. point to multi-point

How does LIME model reduce operation complexity?

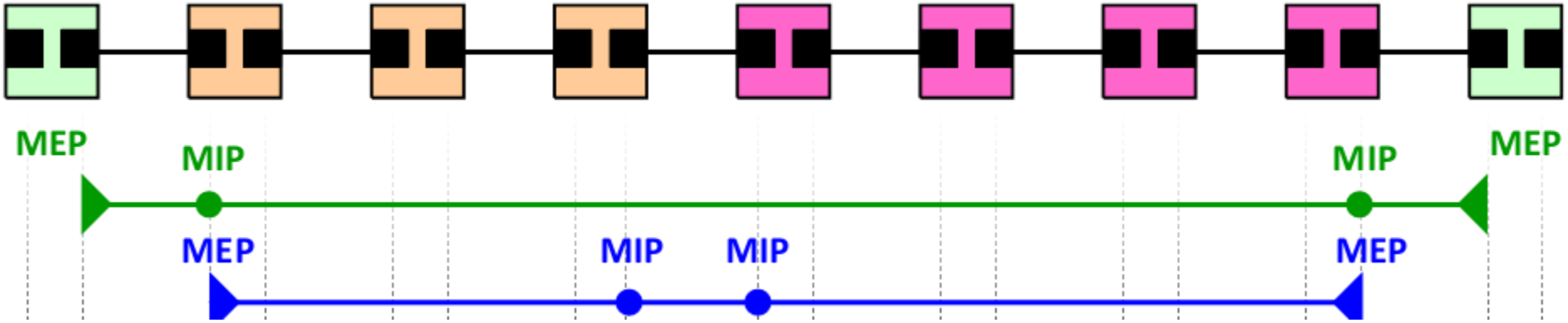
- NETCONF Support network wide transactions management
  - Network and service configuration instead of device configuration
- Using NECONF, adding transaction to the devices, Management complexity are greatly reduced



How does the LIME model reduce operation complexity?

- Operation and management of the network is limited when OAM is required across multiple technologies
  - An end to end path requires multiple network segments, with each segment support the different OAM Technology
  - Ensure that the OAM messaging will not leak outside domain boundaries within a layer

End to End Network Troubleshooting



- Intention of the LIME model
  - Network troubleshooting within each layer, or in each network segment, may be run separately and the test results can be represented and reported in the same way to the management system(e.g., OSS/NMS)
  - The results in each network segment can be stitched together to form end to end network view of troubleshooting results
- Additional requirements
  - A facility to run independent troubleshooting in each layer separately
  - Support for management and control systems to have automated and consistent OAM test results

Summary of All Design Team Discussions

- OAM models analysis table (initially provided by Greg) worked on by all
  - IP OAM, IP/MPLS OAM, MPLS-TP OAM, and TRILL OAM are compared
    - MEP, MIP, CC, CV, loss measurement, delay measurement, loss of continuity ARE common COMPONENTS.
  - OAM requirements are listed, most of requirements are data plane OAM requirements
    - How these requirements are applied to management plane are not discussed yet.
  - LIME model is a superset of the functions in any specific known layer.
- Commonality between IP/IP-based OAM models and CFM/Y.1731/MPLS-TP/TRILL OAM are discussed
  - Most agreed that Testing point, fault domain, technology type, addressing, ECMP, etc are common elements
  - Using MD/MA/MP in the IP and IP/MPLS was discussed
    - The benefit is to provide consistent reporting and representation, Especially in the end to end path diagnose case.
    - MD/MP is not OAM specific information but Management specific information for operator
    - filling this implicit MEP/MIP specific information has no changes to IP OAM protocol
- Is LIME tasked to define new OAM protocol?
    - Get guidance from chairs
    - There were strong agreement that LIME is not targeted to define new OAM protocol
    - Clarification that filling implicit MEP/MIP in the model has no change to OAM protocol.
- P2P,P2MP, etc support in the base model or technology specific model extension
  - Tom Taylor proposed to add technology independent topo type in the base model
  - Deepak and Qin support this and Deepak provide an example to suppor technology independent topo in the base model.

Conclusions

- Ongoing discussion of common objectives, moving away from coded terminology and developing the common OAM model
  - Objects (and corresponding terminology) should be identified, agreed and defined
  - We have OAM technologies that share sufficient commonality to start with

- DT Agreement
  - Whether model A is selected or model B is selected, common features they shared are test point, fault domain, addressing, technology type, rpc, etc.
  - LIME model is manage plane model and orthogonal to any data plane OAM model
    - LIME model can be understood by all the OAM layer or can be parsed by each OAM technology
    - LIME model extension for OAM technology A can only be understood by OAM technology A
  - Commonality between MPLS OAM, MPLS-TP OAM, TRILL OAM are agreed.

Conclusion

- DT Disagreement
  - Debate on commonality between IP OAM and other OAM technologies
    - single hop OAM support
      - Greg believed current model only support single hop OAM
      - BFD model and LIME model are orthogonal to each other. LIME model is used to provide consistent representation and reporting across layer while BFD model is not.
    - Proactive mode support
      - Greg believed Ping/Traceroute only support on demand, proactive mode is supported by LIME model(e.g., BFD Async, TWAMP in IP)?
      - LIME model can support both on demand mode and proactive mode, TRILL PM WG draft provides an example.
    - OWAMP/TWAMP control protocol as CC/CV
      - Greg disagreed OWAMP/TWAMP control protocol played as CC/CV
      - OWAMP/TWAMP uses control protocol to setup session or return results
      - and uses test protocol to exchange sequence no and timestamp
- Therefore, the LIME output **WILL** be "Model Agnostic"
- Next Steps
  - Draft a LIME I-D detailing discussion and conclusions

Slight DT Reorganization

- We lost two members (thank you Nobo and Tissa). We gained one new member (hello