OAM Interworking

Dave Allan
dallan@nortelnetworks.com

Dave Allan
dallan@nortelnetworks.com

MPLS
2004

NORTEL
NETWORKS™

What is Being Interworked & Why?

- OAM interworking is primarily about how fault notifications are propagated both to peers and client layers

- Motivations for fault interworking
  1. Alarm management/notification
     - "we know, we know…."
  2. Fault isolation between technology partitions
     - "wasn't on my watch…."
  3. Control of metric collection for SLAs
  4. Allow client layers to react promptly
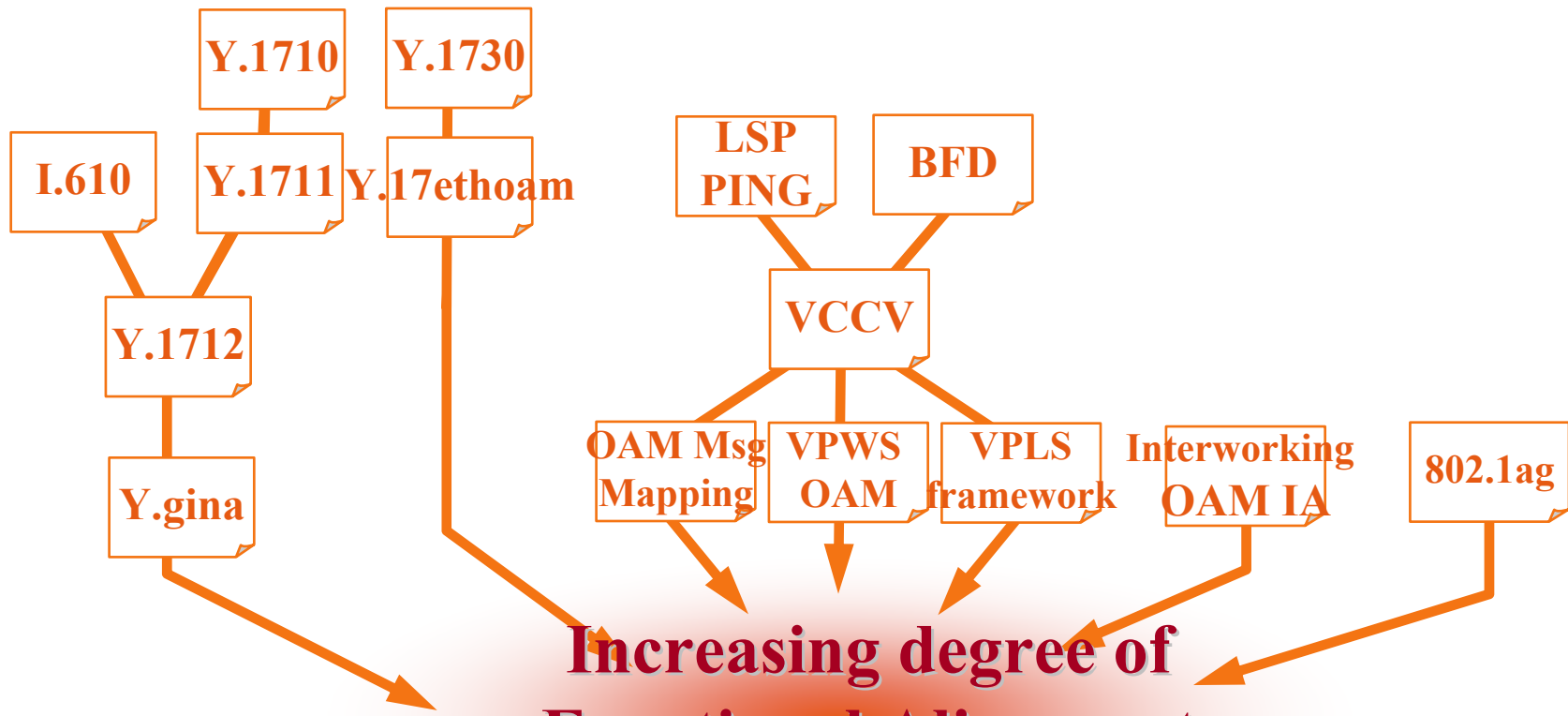   - Data plane notification can trigger higher layer responses
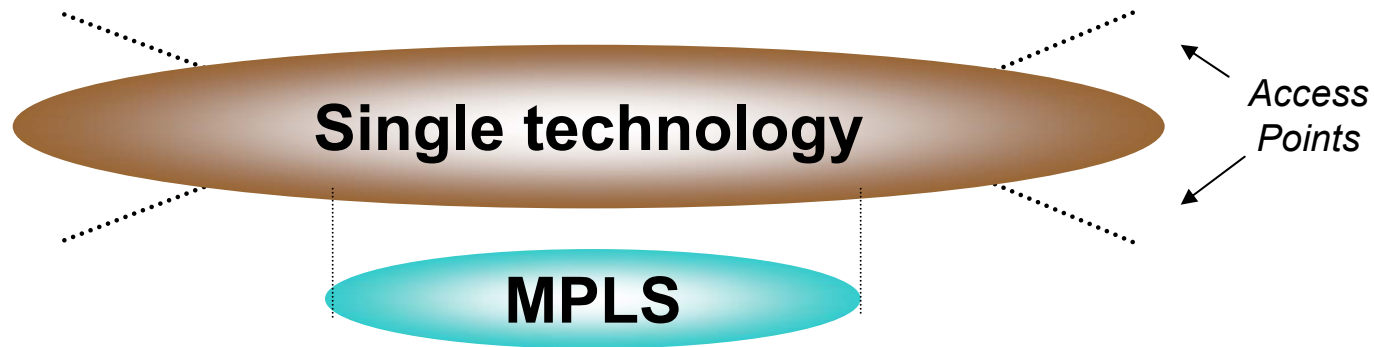
Everyone is Doing OAM!

ITU-T SG13 **IETF** **MPLSF** **IEEE**

Y.1710 Y.1730

I.610 Y.1711 Y.17ethoam

LSP PING BFD

Y.1712

VCCV

Y.gina

OAM Msg Mapping VPWS OAM VPLS framework Interworking OAM IA 802.1ag

time

Increasing degree of Functional Alignment across the Industry

MPLS 2004

N✪RTEL NETWORKS™

Scenarios – Network Interworking

Single technology
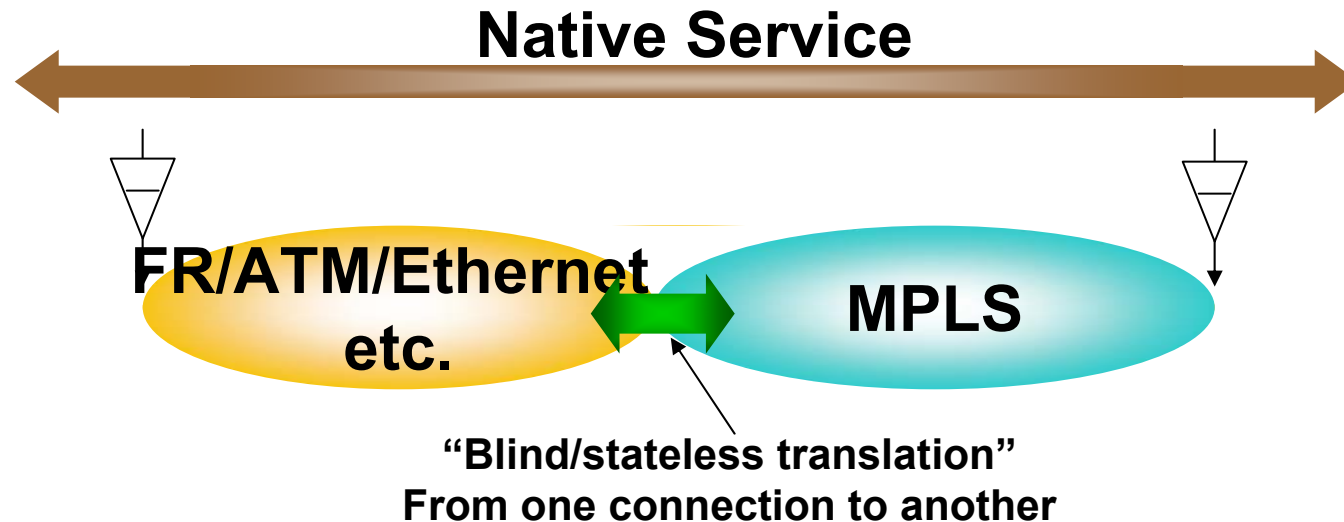
MPLS

Access Points

Also known as like-to-like or homogeneous

Each layer has own OAM

OAM interworking is fairly trivial
MPLS stunt doubles as a PHY link

Scenarios – Service Interworking

Native Service

FR/ATM/Ethernet etc. ⟷ **MPLS**

"Blind/stateless translation"
From one connection to another

Service Interworking is somewhat more subtle

- *Peer networks terminate own OAM functions*
- *Interwork defect states between peers, not protocols*

Scenarios – Putting Them Together

Native Service

FR ⟷ MPLS PW ⟷ Ethernet
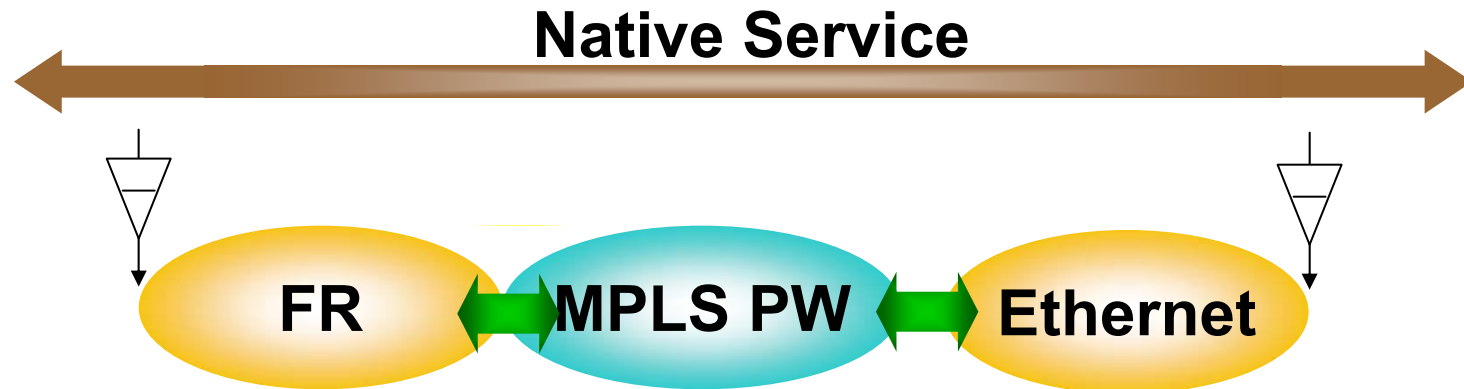
Common scenario of interest is using MPLS to tie disparate technologies together
Current focus is on Frame, ATM and Ethernet

May combine both styles of interworking
PW can be ATM, FR, Ethernet, AAL5

MPLS 2004

NORTEL NETWORKS™

What Must be Achieved?

- Preservation of necessary operational semantics
  - e.g. Consistency at the client layers
- Common behavior of interworking functions
  - How it acts does not depend on any peer IWFs
- Minimal messaging to convey all requisite information
- Consistent behavior even under multiple fault scenarios
  - Faults notified promptly and clear properly
    - No unrecoverable states requiring manual intervention
- Consistent behavior no matter what the chain of interworking is
  - Not limited to Attachment Circuit <->PW<->Attachment Circuit
- Works for all interworking scenarios and mixes of technologies

Styles of Fault Notification

- Directional notifications
  - e.g. AIS, RDI

- "Down" indications
  - e.g. FR LMI
  - Down is bi-directional fault or escalation of uni-directional fault

- Challenge is mixing and matching notification styles while achieving goals
  - Key observation is "escalation" loses information
   - Translating back to AIS/RDI problematic

The Models

- **Partitioned loop**
  - Local escalation to "down"
    - Information is lost
  - "down" conveyed between technology partitions
    - Translated back into AIS where required
 - Vulnerable either to lock downs OR multiple failure scenarios
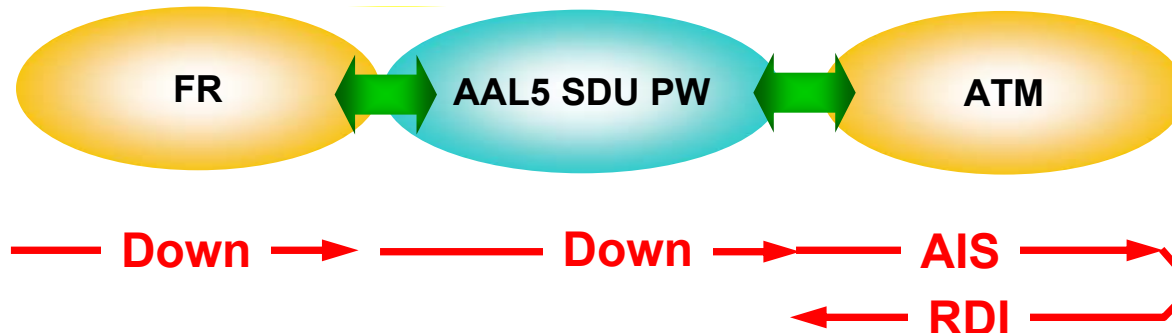
The Models

- Emulated loop
  - Directional notifications flow end to end and reflected end to end
    - Information preserved, even when not required
  - Results in redundant messaging in some scenarios
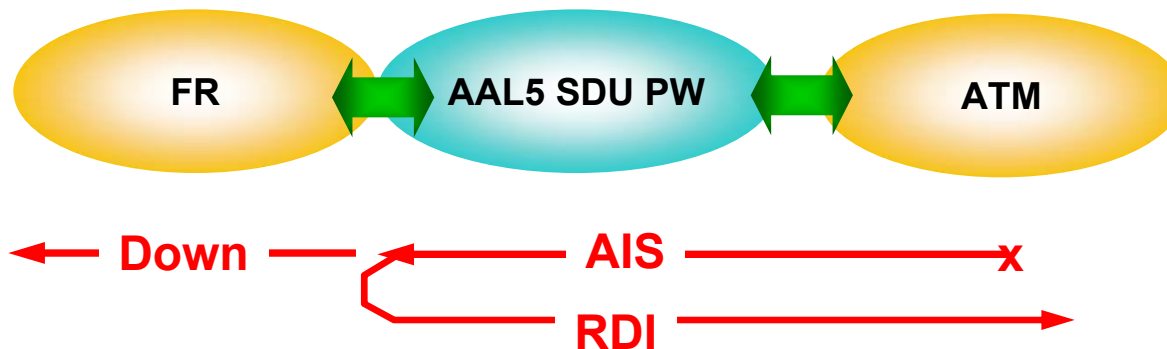
The Models

- "Modified" Emulated loop
  - Directional information flows end to end AND looped back at intermediate nodes only as required
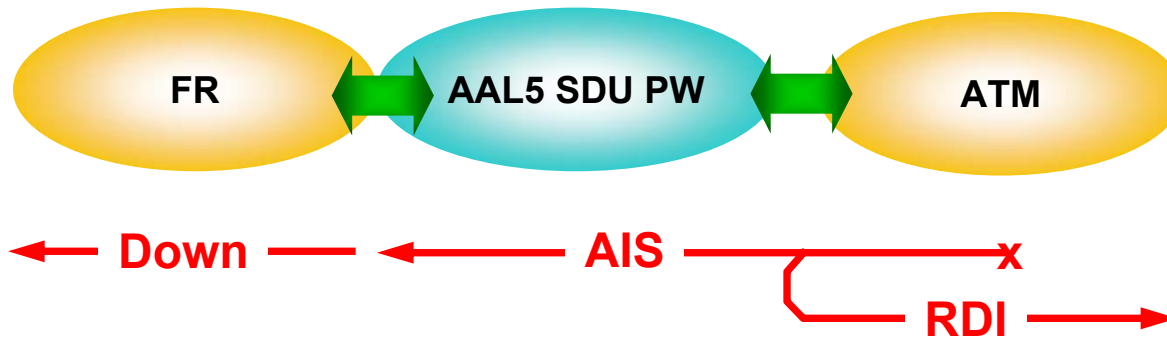
  - Eliminates redundant messaging (e.g. reflecting RDI across the PW)

The Mechanisms

- Control plane
  - Label withdraw
    - Confuses provisioning and fault notification
  - Status TLV
    - Default mechanism
- Data plane
  - *Optional* optimization
    - Y.1711/BFD diagnostic codes
    - *Some folks would like LSP-PING to do this as well...*

Why Data Plane as an Option?

- Offloads control plane
  - Failure of large number of ACs will seriously stress the network
- Notifications will flow faster if not serialized through the control plane
- Data plane notifications delegates implementation to PW IWF
  - Direct association of notification PDU with incoming PW or use of discriminator means simpler protocol, simpler implementation
- Control plane optimizations (e.g. Group ID) have limited applicability
- Provides inter-domain mechanism
- There may not always be a control plane, or may be multiple/different control plane protocols or tandem/"stitching" points

MPLS 2004

NORTEL NETWORKS

Conclusions

- OAM convergence is happening across SDOs
    - Significant progress made in the past year!
- We're working to models that will preserve key attributes while minimizing complexity
- Data plane notification option addresses a number of issues as the PW architecture "grows"

For Further Reading

- ITU-T Draft Recommendation Y.gina (June 2004) "General Interworking Architecture"
- BFD Extensions for PW Exchange of Fault Notifications
  - draft-radoaca-l2vpn-bfd-inband-oam-00.txt
- Fault Management for Multi-service Interworking
  - MPLS Forum Draft Implementation Agreement
- MPSL OAM Framework
  - draft-an-mpls-oam-frmwk-00.txt