Layer 2 Monitoring in E-CORD
CFM & SOAM

Sean Condon, System & Software Architect, Microsemi
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Layer 2 Monitoring in E-CORD

What is Layer 2 Monitoring?
How is it applied to E-CORD and why?
Relationship to A-CORD
Device support?
Putting E-CORD in context for device vendors
What is Layer 2 Monitoring?

- Connectivity Fault Management (CFM)
  - IEEE 802.1Q-2014 - the IEEE Standard for Local and metropolitan area networks - Bridges and Bridged Networks
  - They run on VLANs (enterprise services/carrier services)
  - Defines several types of test
    - Loopback
    - Linktrace
    - Continuity Check Messages
  - Defines Maintenance Association Endpoint (MEP) as a test node
  - Logically partitioned into
    - Maintenance Domains (MD)
    - Maintenance Associations (MA)
What is Layer 2 Monitoring?

- Maintenance Domain (MD) can span across enterprise, provider or operator
  - Levels 0-7 discern the scope
- MEP at either end of Domain (and MIP in between) provides test scope
  - Multiple MEPs can be involved - not just point to point
- Maintenance Association (MA) relates to a VLAN (service) within an MD, and can contain 1 or more MEPs
What is Layer 2 Monitoring?

- **SOAM (Service Operations Administration and Management)**
  - Metro Ethernet Forum (MEF) has defined MEF-17
- **Adds to MEP with extra tests**
  - Delay Measurement (delay and jitter)
  - Loss Measurements
  - Signal Test
- **Fo Carrier Ethernet services**
  - E-Line, E-Tree and E-Access are supported by a MEP at each end point
  - A Maintenance Association is generally created per EVPL
How is it applied to E-CORD and why?

• E-CORD uses Carrier Ethernet Services through ONOS to provide enterprise connectivity
• CFM and SOAM have been added to ONOS
  – As an API, a REST NBI and driver behaviors
  – In a loosely coupled way (does not depend strictly on carrier ethernet)
• E-CORD acts as an orchestrator
  – Managing CE services
  – Adding monitoring to these
  – Potentially integrating with A-CORD for “programmable observability”
How is it applied to E-CORD and why?

- E-CORD Global orchestrates CE services across sites
- E-CORD Local implements CE services and CFM through ONOS CORD

E-CORD Global

E-CORD Local 1
- ONOS Fabric
- ONOS CORD
How is it applied to E-CORD and why?

- ONOS API - derived from YANG model in MEF 38 and MEF 39
- [Javadoc](#)
- [Wiki](#)
- Swagger (coming soon)
How is it applied to E-CORD and why?

- Within ONOS_CORD
- Service runs and supports REST NBI
- MEPs can be created with devices that support behaviors
- TODO:
  - Persisting MEPs
  - CLI for MEPs
How is it applied to E-CORD and why?
Relationship to A-CORD

A-CORD
“Closed Loop Control”
- is key in making networks Autonomic (Self-managed, Self-protected) and in SLA fulfillment
- Means Continuously observing and analyzing probe data to derive control decisions
- To optimize the state of the system and then executing those control decisions

May dynamically change the level of observability (Broader vs Deeper) during the decision process
Relationship to A-CORD

- A-CORD is currently being ported to 4.0.0
- CFM and SOAM exist independently of A-CORD
  - They are a building block towards this vision
  - Integration work still ongoing
Device Support

• First such CPE device is Microsemi **Edge Assure 1000 SFP-NID**

• **Driver** is created to support behaviors:
  – CFMMEEPProgrammable and
  – SOAMDMPProgrammable
  – FlowRuleProgrammable
  – DeviceDescriptionDiscovery

• Other vendors are free to implement these behaviors in their own devices

• Interface to the EA1000 is only through NETCONF/YANG

• Driver handles all conversion to/from NETCONF /YANG
Putting E-CORD in context for device vendors

• ONF is mainly seen as an operator led consortium
• Reluctant support from traditional box vendors
  – Fear of disaggregation, business case for vendors not clear
• SDN and NFV bring a paradigm shift to the industry however
  – The management plane is now wide open
  – Traditional configuration and EMS model simply can’t catch up
  – Operators require more dynamic services - control more than config
• E-CORD and CORD generally (as well as ONOS):
  – They represent the operator defining the Use Cases
  – Rather than the vendor defining what they think is best for the vendor
  – Expect push back!
Putting E-CORD in context for device vendors

• For Microsemi EA1000 device:
  – Integrating into E-CORD allows it to be relevant to customer use cases
  – No way we could give this much functionality in an EMS

• Vendors generally do not profit from building EMS systems
  – Just enough to pay for development
  – Strategically important though to have a holistic system
  – It’s still an outsider in the customer’s network
  – They take years to develop - same old FCAPS over and over again
Putting E-CORD in context for device vendors

• E-CORD is an insider in the customer’s network
  – Business case is already established
  – If E-CORD/ONOS has native support for a device it becomes a clear and obvious choice to use it

• But it’s not everywhere (yet!) :-(
  – Product managers dilemma - what do we do for customers that don’t use CORD/ONOS?
  – Do we still have to build an EMS for them anyway?

• But wait - CORD/ONOS are completely open source!
  – Can be reused, deployed, distributed
  – Can package up the driver and open source components to rapidly put together a solution for these other customers.
Summary

- Layer 2 Monitoring in E-CORD is a feature that implements CFM and SOAM in VPNs, since CORD 4.0
- The eventual vision is for closed loop programmable observability for A-CORD
- Microsemi EA1000 device supports it today
- E-CORD is a revolutionary game changer in the telecoms industry
- For device vendors these industry supported open source platforms (e.g. CORD, ONOS etc) require a rethink of existing software systems