Path to Disaggregation

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Agenda

- Introduction
- What is Disaggregation?
- Background on Disaggregation
- Advantages / Disadvantages
- Disaggregation at the Transport Layer
- Interoperability
- Standards Work
- Summary





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On-Demand

Personalized

Real-time Delivery

SDN / NFV and Disaggregated Infrastructures will enable Service Providers and Enterprises to deliver these Services

Disaggregated Infrastructures or white boxes (both packet and optical), open source software defined networking (SDN) platforms, and a set of network control and management applications



What is Disaggregation?

Disaggregation by definition means "separation into components"



The Disaggregated Network Element





Advantages of Disaggregation



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Challenges of Disaggregation



Disaggregation of the Optical Network Element

Current Model

Physical Hardware Integration with proprietary EMS/NMS

Network Management System







Disggregation Model

Logical hardware integration with centralized control



Vendor Interoperability



Challenges with Optical Disaggregation



DWDM Interoperability

- Interop at the interface level of the DWDM optics will provide for greater competition as well as drive down the cost of 100G DWDM optics
- Interop will also help set the stage for achieving pluggable optics that will not only reduce cost but also increase face plate density
- Via the OIF forum industry has agreed on a Modulation Standard
 - Dual Polarization-Quadrature Phase Shift Keying (DP-QPSK) that leverages Coherent technology
- Modulation does not provide the full mechanism to allow for interop
 - Transmit, Line and Receive parameters need to be defined and standardized
 - ITU SG15 Q.6 has taken on this challenge at both 2.5G and 10G and successfully completed the effort and is defined in G.698.2



Standards are being worked

OTU-X Interoperability

- OIF and ITU G.709 is the main OTN Spec
- Non-standard Transponder Specs
 - Open Line System (OLS) is based on 10G interfaces, and the standard is called "Black Link"
 - Standardization of the optical parameters at the interface to the transponder, captured in an ITU spec G.698.2

Connectivity between Devices

- Open Transport Working Group (OTWG) neighbor discovery
- No physical channel protocol has been standardized
- Interface to the Device
 - OTWG working on OpenFlow extensions for Layer 0/1
 - ONF T-API, OpenConfig



Virtualizing the Transport Network Resources



- Virtualize the transport network resources
- VTNS provides a transport network as a service to a user within which the user controls the connection services.
- Leveraging T-API work from ONF, MEF, ITU (ASON, GMPLS).
- Leveraging "Intent" NBI (Boulder group).

What's Next?

- SDN has been focused on data and control plane
- Frequency of changes (operations) in the network determine the best SDN implementation:
 - Microseconds: embedded layer changes. E.g. packet discards, FEC error corrections. For this type of change, the round trip delay to the controller is too high.
 - Milliseconds: flow programming, at the packet level. E.g. Update to a FIB.
 Need to reconfigure your routing (protection switching) to react to a change in the network. Google does this at layer 2.5 or layer 3. some may do it at L1 or L0.
 - Seconds/minutes: Configuration and Provisioning. Could use flow programming, but configuration programming is better because more complex operations can be implemented. Enter: OpenConfig

OpenConfig



OPENCONFIG

Vendor-neutral, model-driven network management designed by users

What is OpenConfig?

OpenConfig is an informal working group of network operators sharing the goal of moving our networks toward a more dynamic, programmable infrastructure by adopting software-defined networking principles such as declarative configuration and model-driven management and operations.

Common data models

OpenConfig's initial focus is on compiling a consistent set of vendor-neutral data models (written in YANG) based on actual operational needs from use cases and requirements from multiple network operators.

Streaming Telemetry

Streaming telemetry is a new paradigm for network monitoring in which data is streamed from devices continuously with efficient, incremental updates. Operators can subscribe to the specific data items they need, using OpenConfig data models as the common interface.

Summary

- Disaggregation allows for rapid deployment of features and functions when needed and in the amount that is needed
- Disaggregation is mature in the Server world
- Networking world is work in progress
 - Routers/Switches
 - Optical Transport
- Key to this value proposition is the separation of the hardware development cycle (which is typically annual and fixed) from the software cycle (which, as Web scale companies have shown the world, is very fast)
- Disaggregation is very dependent on standards work









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100G Coherent DWDM Interop and Pluggable Technology Review

 Walid Wakim, Theodor Kupfer, Peter Lothberg, Hojjat Salemi, Matthias Berger, Roberto Marcoccia, Steven Keck, Xie Changsong

