

Complexity and SP Core networks: Can a "Simple" architecture save money

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Outline

- Service Model
- MPLS
- Complexity and network design
- Lunch!

Network Access Service Model

- The more complex the service model, the more costly it is to maintain.
 - Ex: Point-To-Point circuit vs L3VPN
- Areas of complexity:
 - Customer interface.
 - Network reachability. (# of routes)
 - OAM model and support.
 - Protocol Design.

Service model and Support

- Clear defined boundary between the Service provider , and the customer.
 - Ex. PW, TDM circuit | Counter example: VPLS
- Keep the MPLS implementation simple, PW is the access , L3VPN in the edge/core for services.
- Run ~~CLNS~~ everywhere 



80% of unplanned Network outages caused by people and process failures

Network Management

- Protect as much as possible against human error (80%)
 - Simple access network architecture with simple circuit construct.
 - Limit user provisioning complexity in the access.
 - Complex under the hood if necessary.
- Scale by using aggregation.
 - Ex: monitor PE,P neighbors not end to end PWs
 - People overload much faster then routers Alarm Aggregations is a must!

MPLS flexibility

- Separation of control plane and forwarding paradigm.
 - MPLS label is interpreted using control plane or provisioning system.
- Many protocols reinvented the same thing over and over again: GRE, ATM, Frame-relay, 802.1 ah
 - They all encode the forwarding information in the packet format.
 - Eventually they get superseded by something new.
 - Ex. 802.1q -> 802.1 ah
- MPLS is going to be around for a very long time.

MPLS Simple and Efficient!

- MPLS label is 20 bits, with Penultimate-Hop-Popping lookups are 20 bits , but scales to a million PW per PE.
- An MPLS PW scales 3 to 6 times better then 802.1ah.
- Throwing bits at the problem does not make for good engineering.
- A statically Provisioned PW is very simple.
- There is no need for IP , however IP is the simplest most understood method for network management.

MPLS and Implementations

- Some Say: “MPLS is expensive”
 - MPLS is not expensive, many routers that implement it are!
 - Complicated PE devices intended for service instantiation , not simple transport.
- Some interesting hardware general cost facts:
 - Large FIBs are expensive.
 - Features, and buffers are expensive.
 - It takes a lot of power to go fast.
 - Complex features used in “Walled Gardens” are really expensive.

Network Complexity

- Complex MPLS cores require the least amount of support.
 - Complexity Is hidden by the technology == less support cost.
 - Ex: BGP free Internet MPLS core.
 - RSVP-TE Automesh/auto bandwidth features.

Simple Network

- Minimize regular intervention.
 - Provisioning at the edges.
 - Automatic path selection
 - Self-healing.
- Static path provisioning is a really bad idea.
- Reproduce SONET/TDM technology using Ethernet does not scale.
 - Why doesn't everybody have a permanent SONET link to their house ?

Conclusions

- MPLS is not expensive.
- Simple Access network.
- Automate as much as possible.
- Reproducing a TDM architecture with Ethernet is a waste of money.
- Resolve scaling problem by localization of information.
 - MPLS LABEL vs global addresses at the transport layer.
 - Multiple domains vs Flat single domain.