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MPLS SD&AI NET WORLD24

The Hardest Simple Thing

Or, Why Are We Still Talking About Service Assurance?

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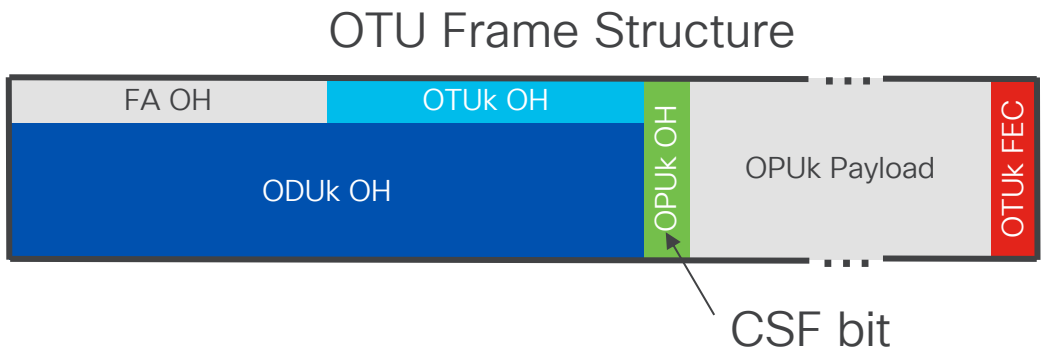
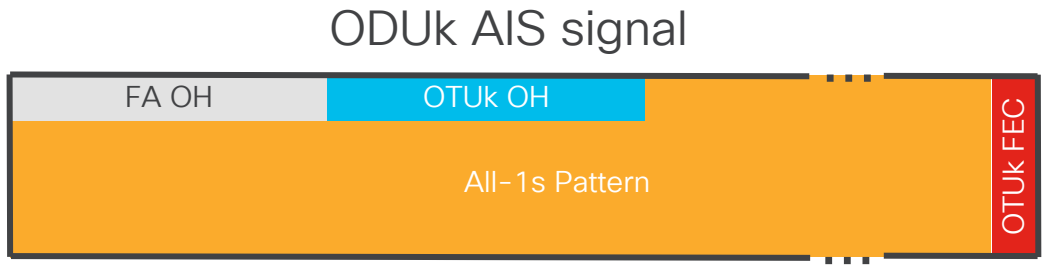
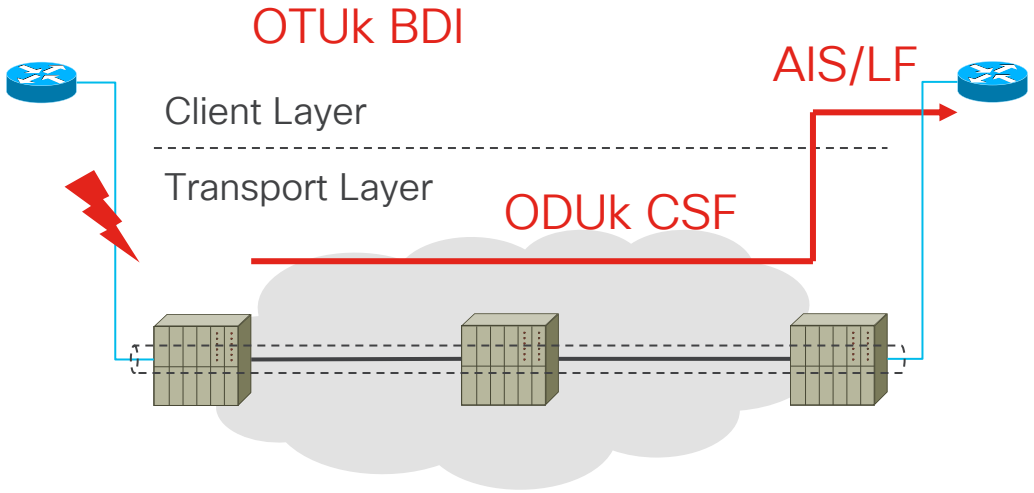
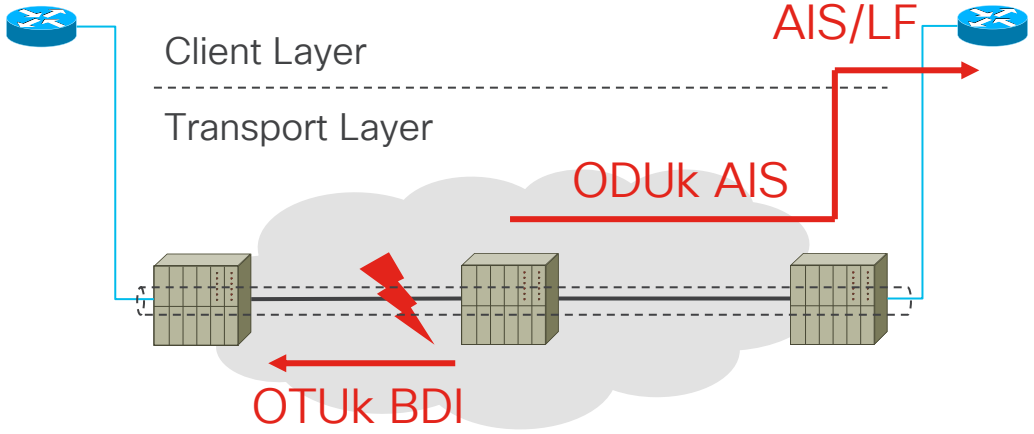
palaisdescongrès deparis

Not That Hard in Optical Networks









Overhead based E2E Connectivity and Performance Monitoring

Internet – Loosely Coupled IP Networks that Scale

"A drawing of the Internet in the style of picasso that includes routers and a globe"

Shelly × DALL·E
Human & AI

Fundamental Design Pattern of IP

Measurement

IP Transport

Are You Actually Measuring What You Think You Are Measuring?

Many Performance Measurement Options

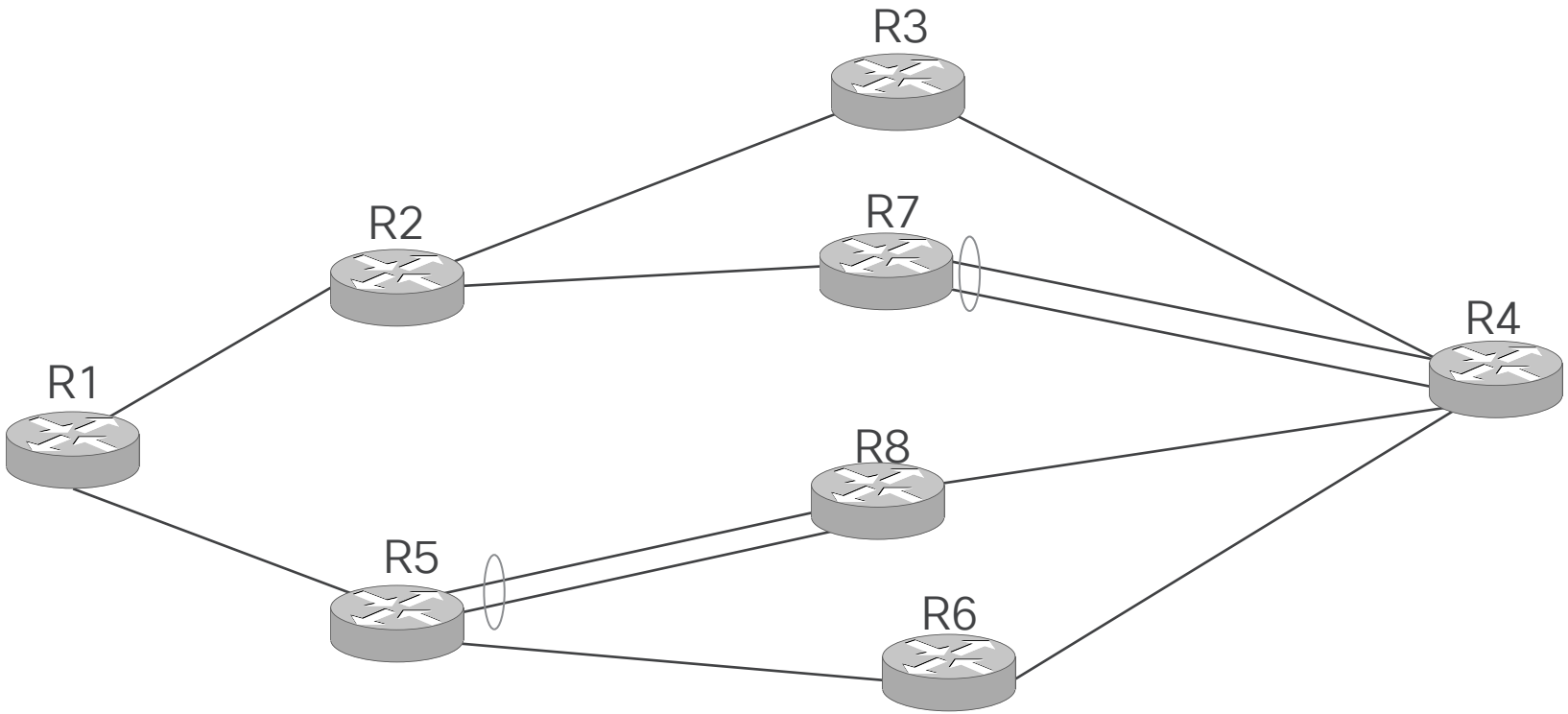
Passive	Active	Hybrid
▪ Monitor live user traffic ▪ Interface counters, queue counters, state…	▪ Dedicated measurement packet ▪ Ping, traceroute, TWAMP, Y.1731, **IPM**, **Swift**…	▪ Piggyback metadata on user traffic ▪ INT, iOAM, SR-PT, DCQCN, **CSIG**…

RFC 7799

Use Case Considerations

- Service or transport focus
- Data model (MIB, YANG) and export type (SNMP, NETCONF, gNMI, IPFIX)
- NID or router based active probing
- Scale
- Timescale

Beware ECMP In Your Assurance Strategy



ECMP, Probability & The Law of Large Numbers

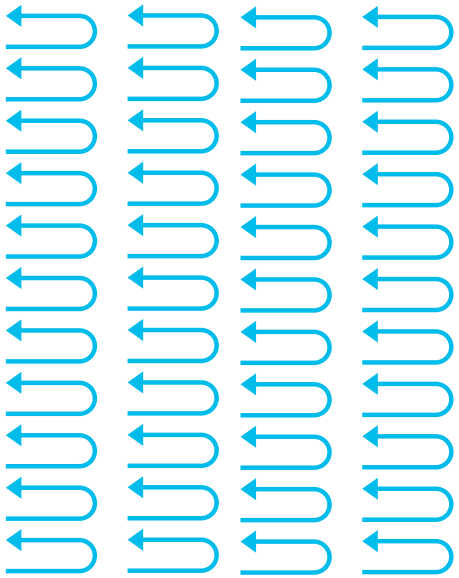
6 Paths

15 Probes for Coverage

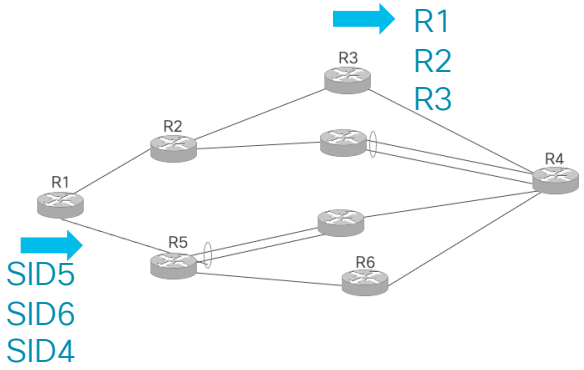
~200 Probes for Average

Random events can become quite predictable **if we test them for long enough.**

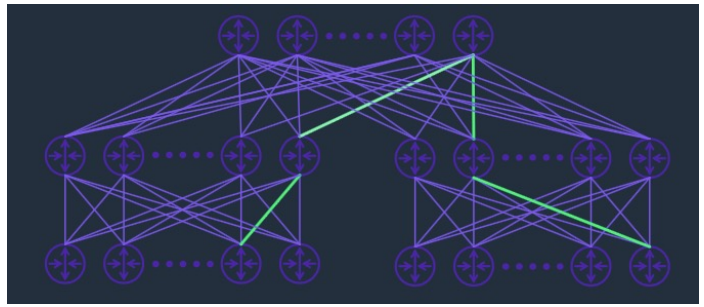
Addressing the ECMP Challenge



Send More Probes



Specify or Trace the Path



Use Passive Metrics Instead
(No Packet Left Behind)

Fundamental Design Pattern #2 of IP Networks

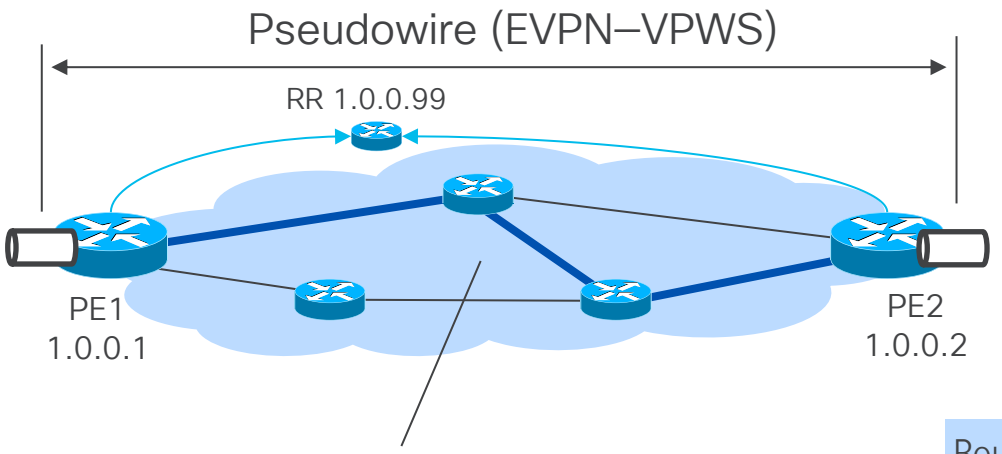
Services and Transport Develop And Scale Independently

Completing the Puzzle …

```
l2vpn
 xconnect group vpws
  p2p service10
   interface TenGig 0/0/0/0
   neighbor evpn evi 10 target 2 source 1
```

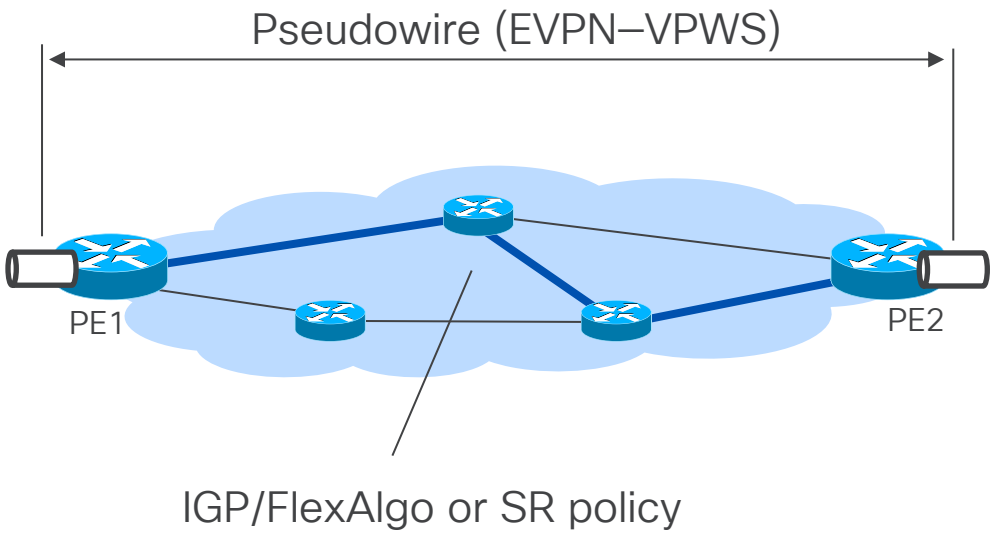
```
router#show bgp l2vpn evpn route-type 1  | b VPWS:10
Network            Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 1.0.0.1:10 (default for vrf VPWS:10)
*> [1][0000.0000.0000.0000.0000][1]/120
                         0.0.0.0                                0 i
*>i[1][0000.0000.0000.0000.0000][2]/120
                         1.0.0.2                  100           0 i
```

```
segment-routing
 traffic-eng
  policy to_PE2
   bandwidth 8000000
   color 1 end-point ipv4 1.0.0.2
   candidate-paths
    preference 100
     dynamic
     ...
   performance-measurement
    liveness-detection
     liveness-profile name detect_fast
```

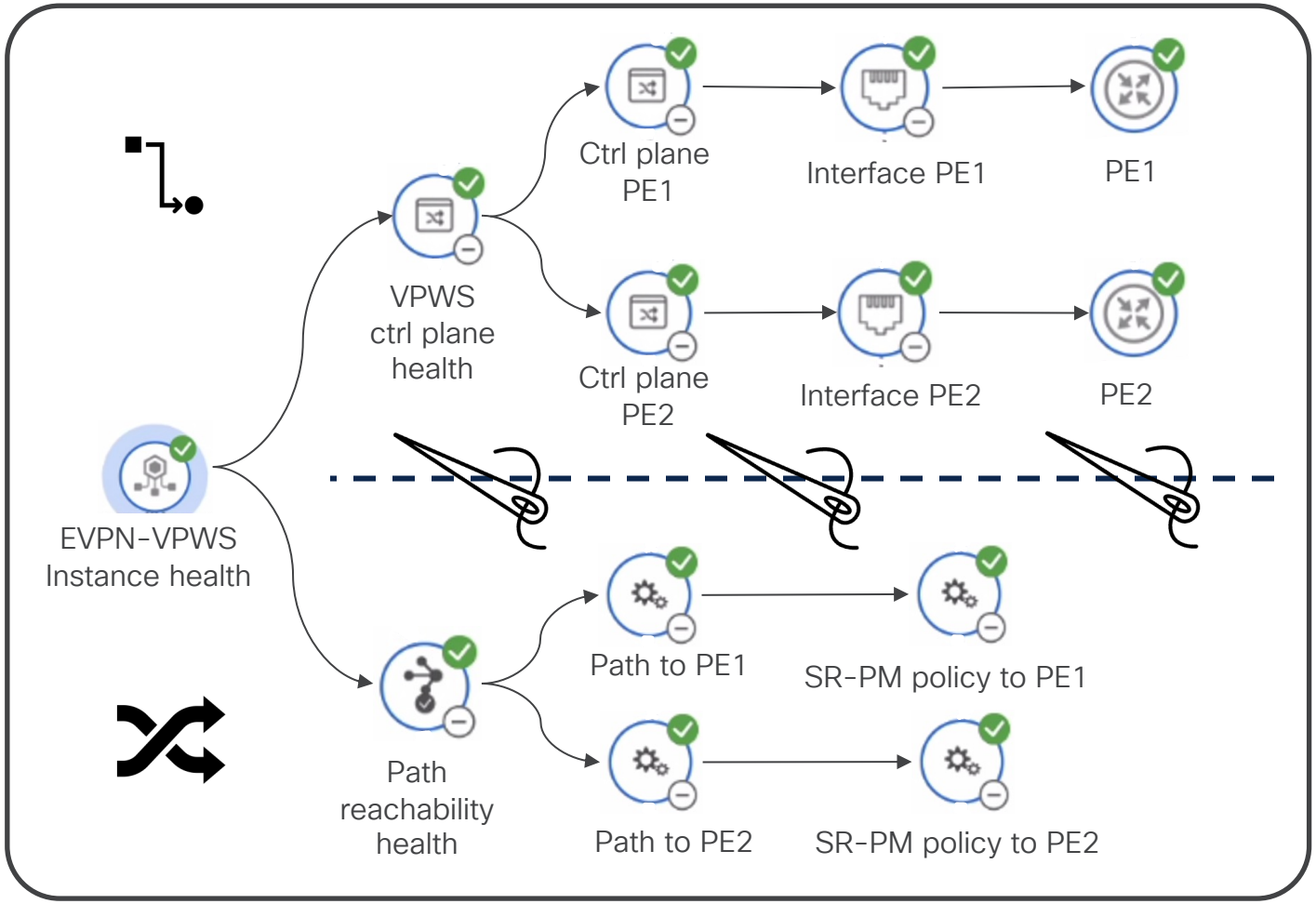



```
Router#show cef 1.0.0.2
1.0.0.2/32
 ...
  next hop srte_c_1_ep_1.0.0.2
```

Intent based Service Assurance

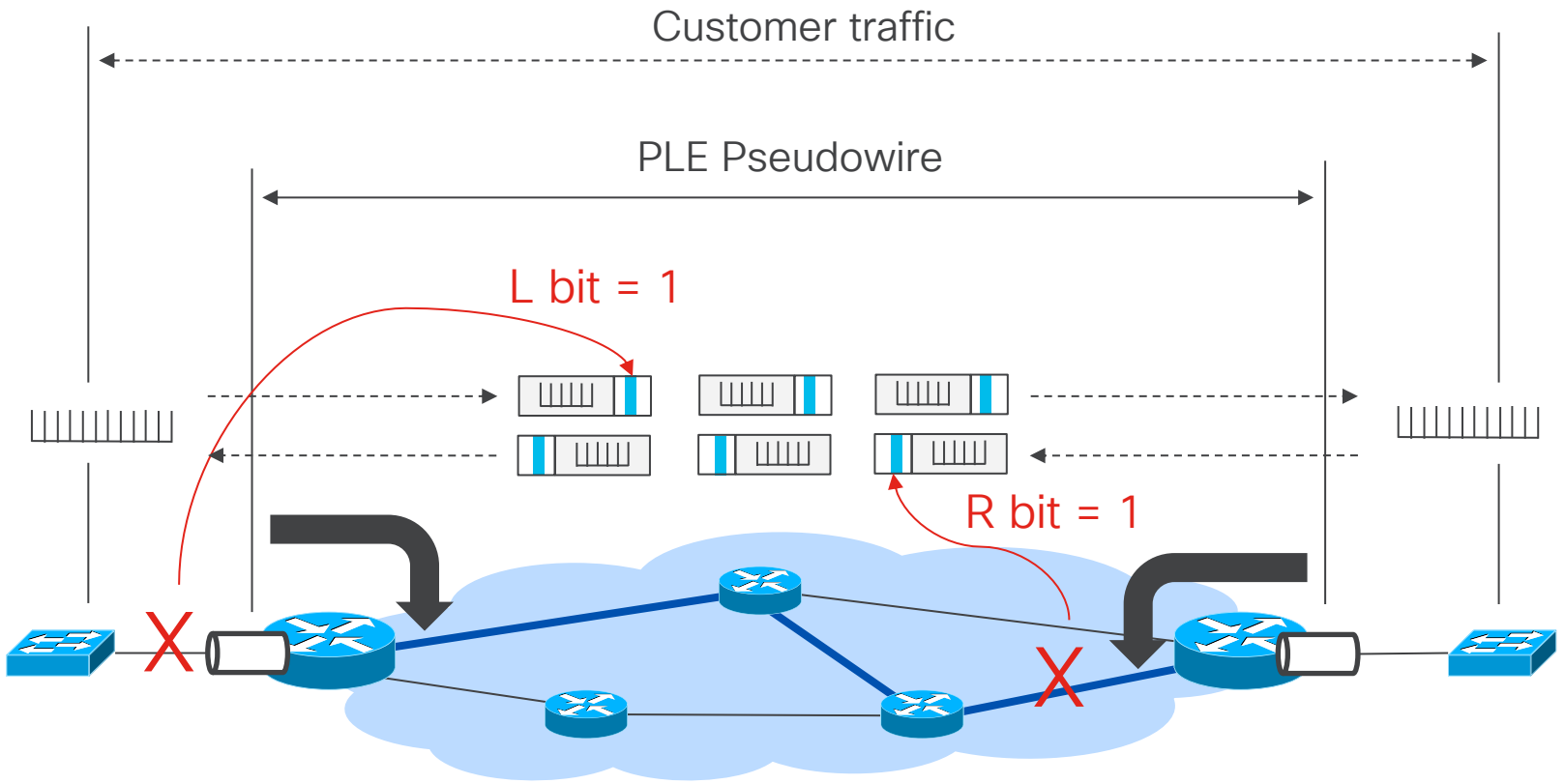


Assurance Graph derived from the Service/Network Model



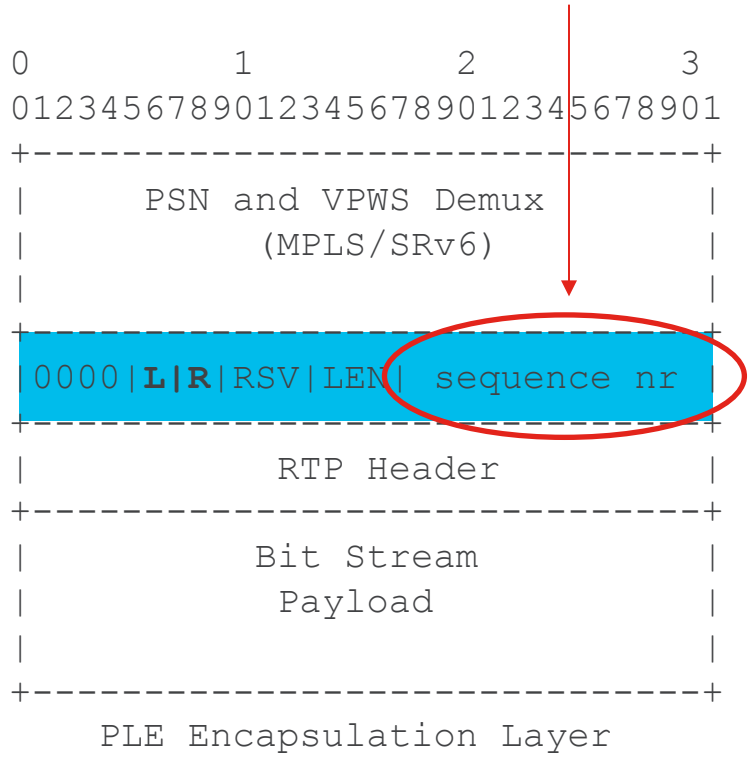
RFC 9417 : Service Assurance for Intend-based Networking Architecture (SAIN)

OAM/PM using Service Dataplane Overhead



Pseudowire 1:1 mapped to tightly engineered transport path
(i.e. Circuit-style SR policy)

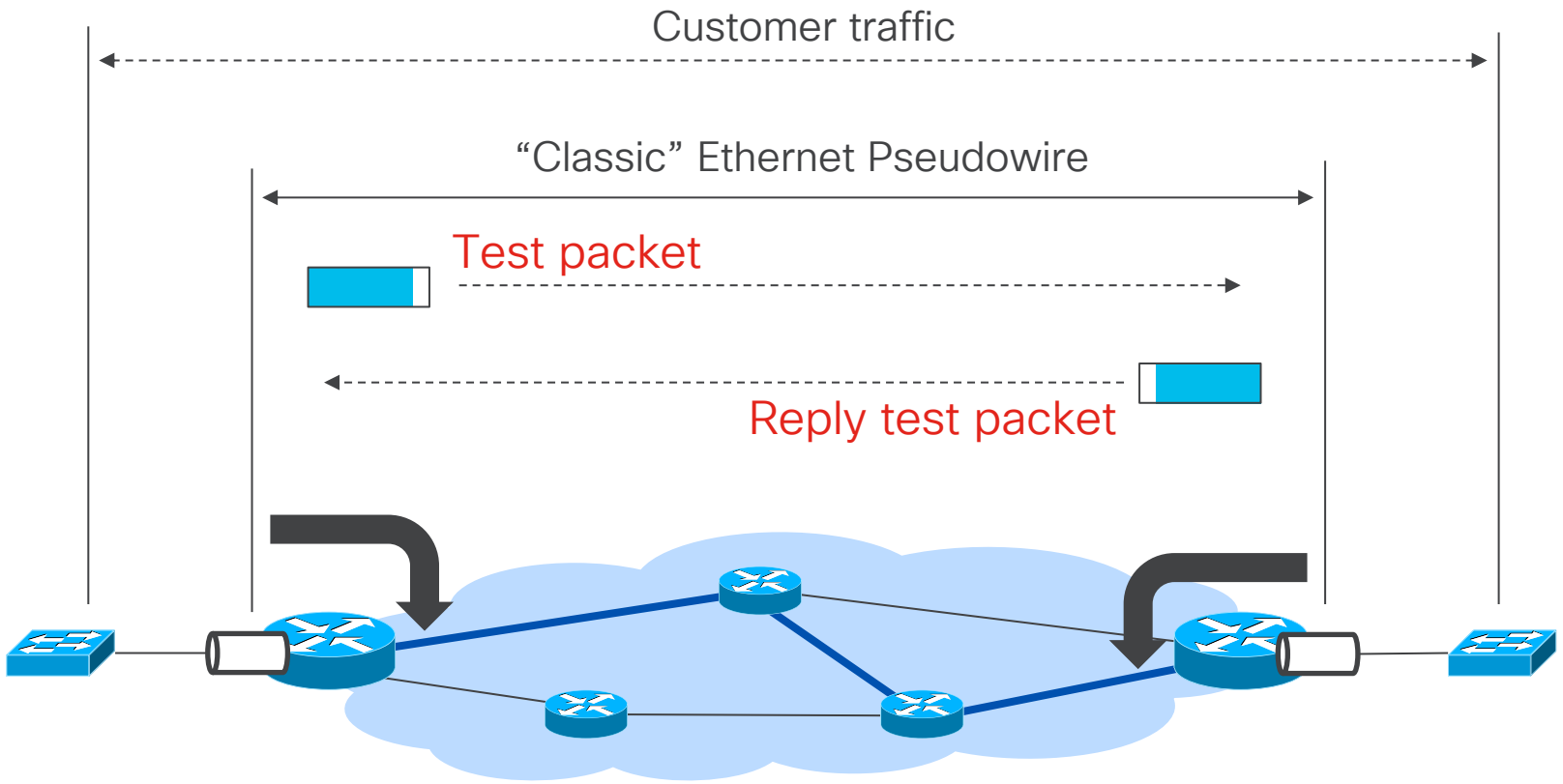
Loss measurement



Source: draft-ietf-pals-ple

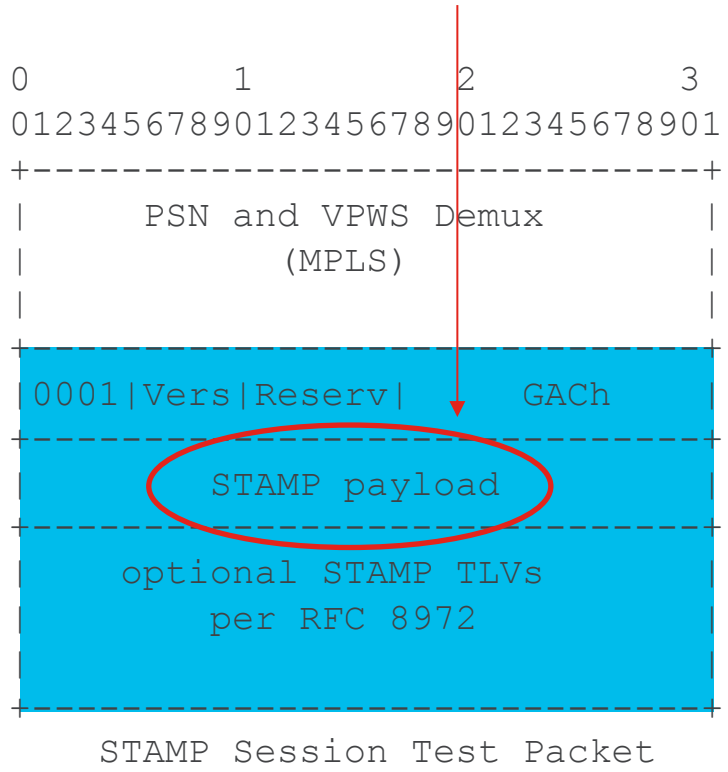
PLE ... Private Line Emulation

OAM/PM using in-band STAMP Packets



Pseudowire 1:1 mapped to tightly engineered transport path
(i.e. Circuit-style SR policy)

Sequence number, timestamp, …

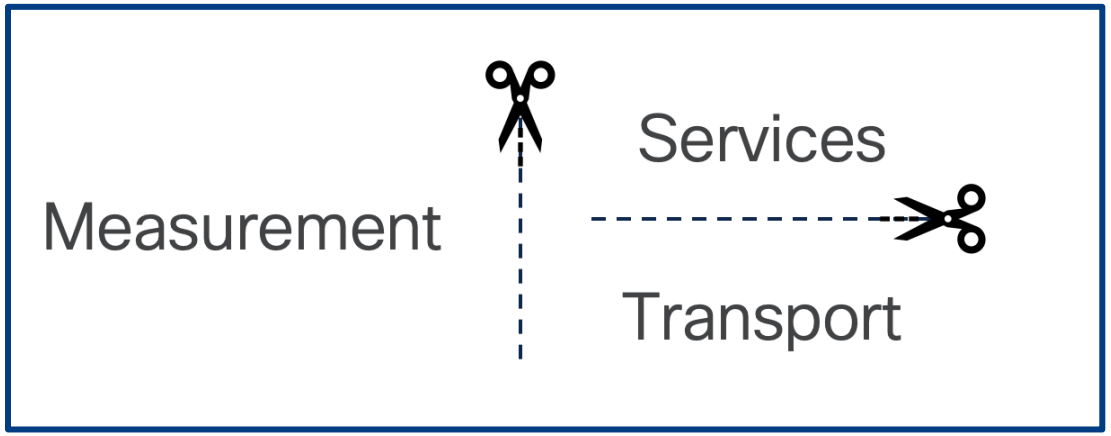


Source: draft-gandhi-mpls-stamp-pw

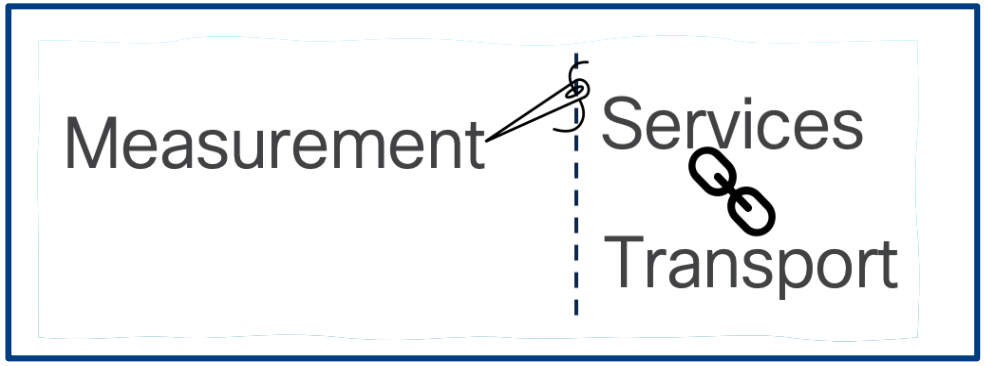
STAMP … Simple Two-way Active Measurement Protocol

Takeaways for Your Service Assurance Strategy

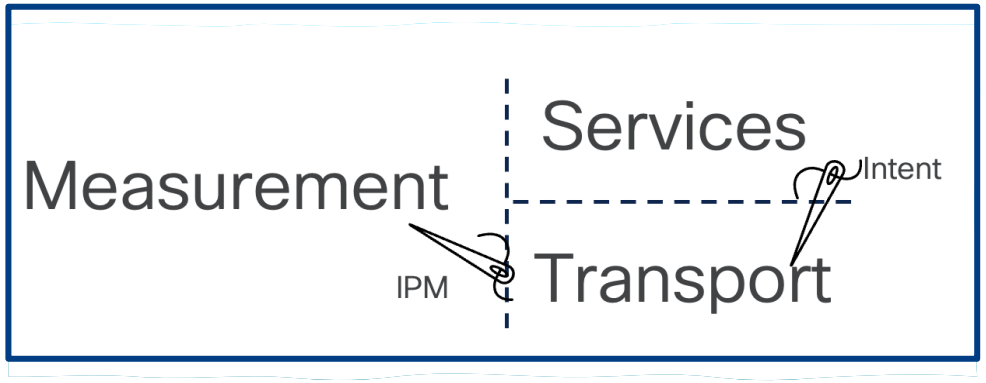
The Grand Tradeoffs



ECMP-Free Services

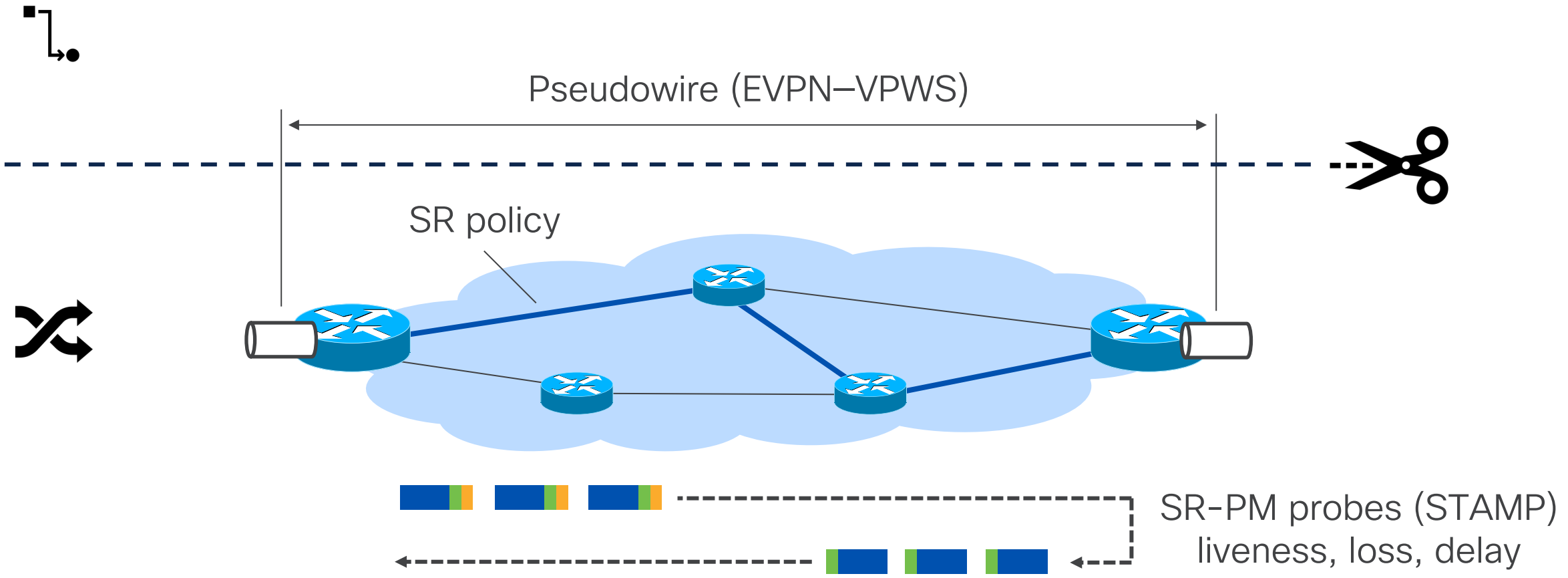


ECMP-Optimized Services

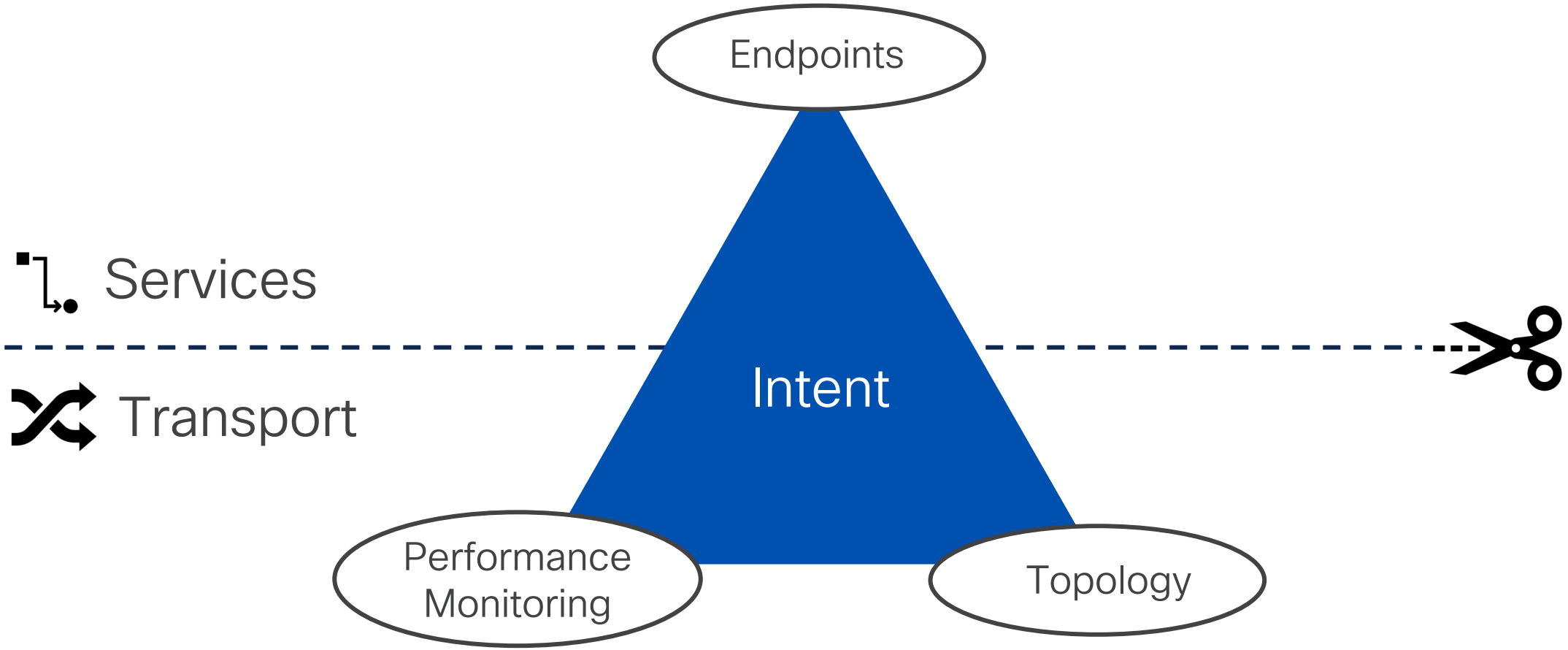


The bridge to possible

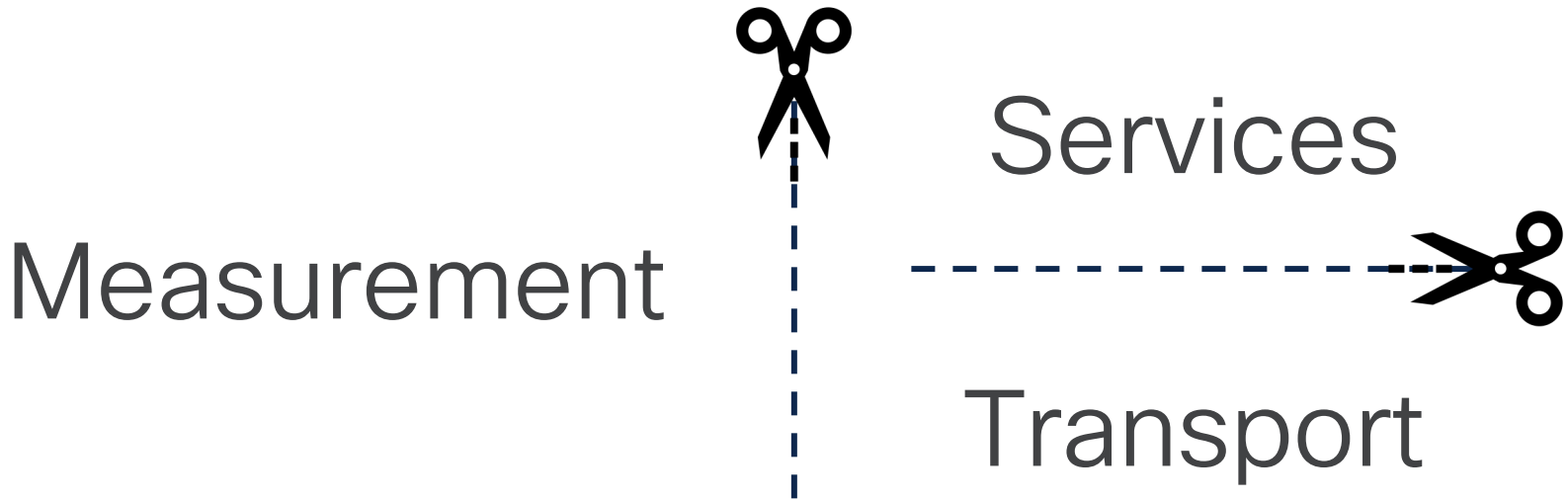
VPWS & Circuit-style Transport – A Closer Look



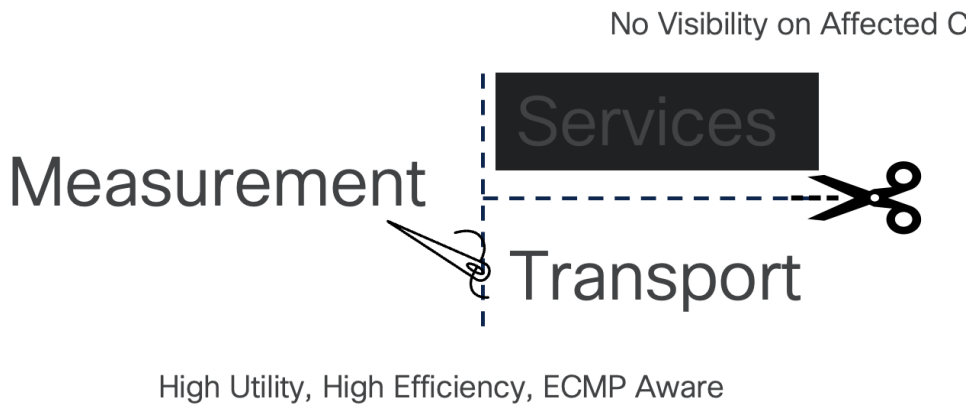
Correlating Transport with Service Elements via Intent



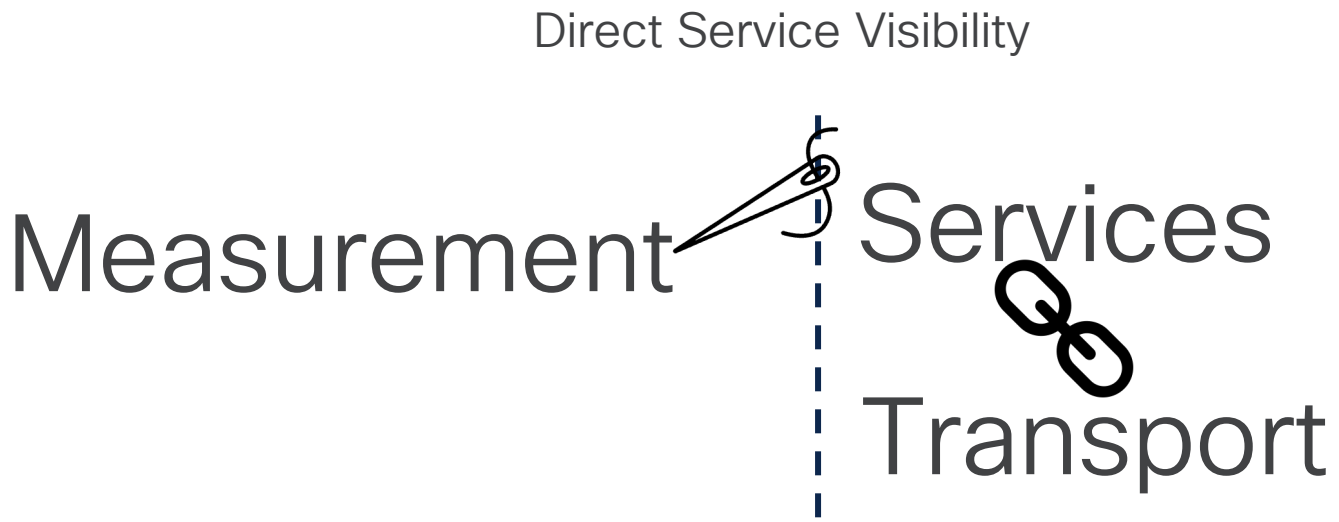
Design Patterns Compound the Problem



How Will You Stitch These Together?



Service Measurement Isn't Inherently Actionable

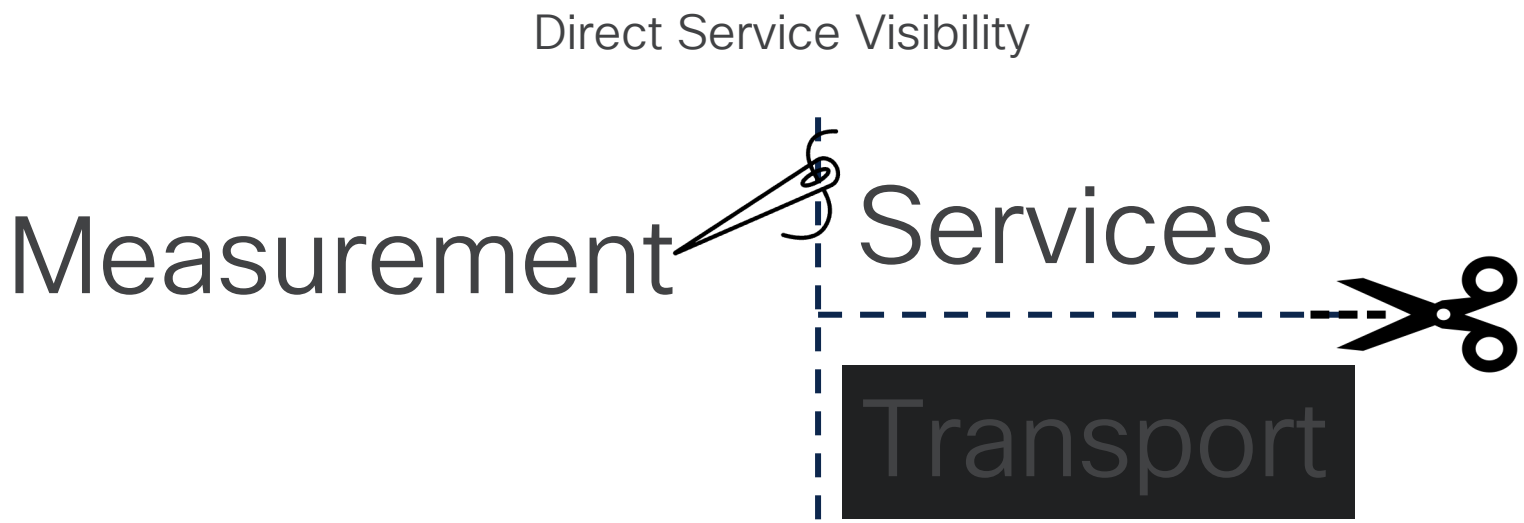


If the Goal is Efficient, Low-Cost Actionable Insight, This Isn't the Answer

Why Are We Still Talking About Service Assurance?

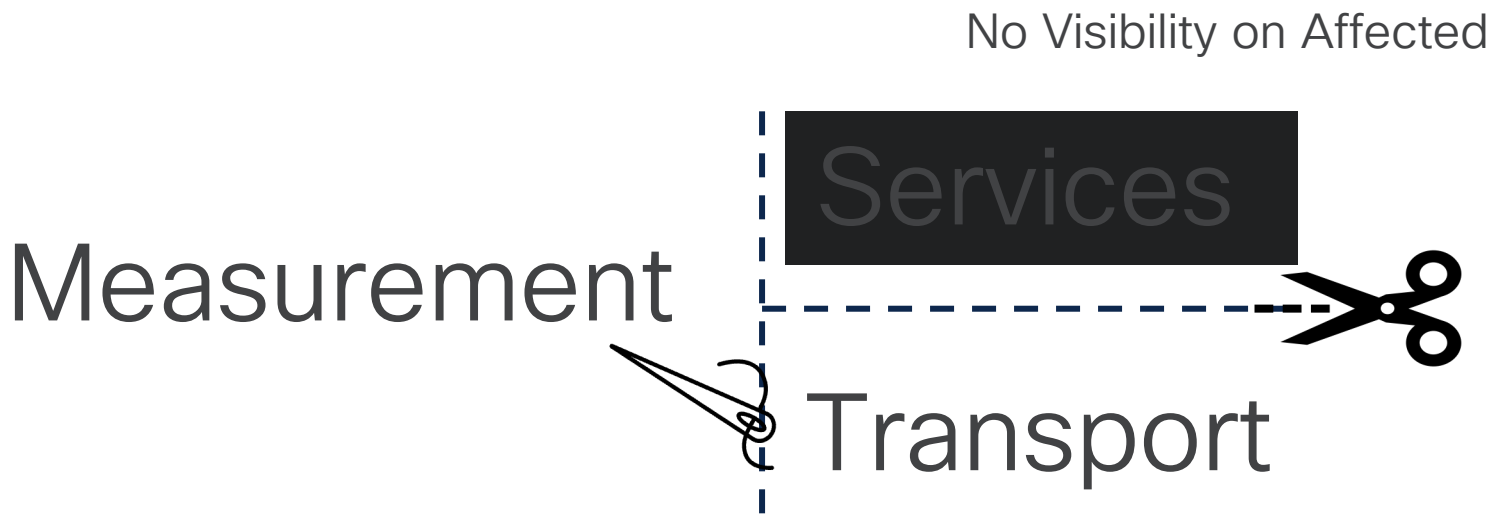
- Because the Problem Isn’t Fully Solvable

Service Measurement Isn't Inherently Actionable



If the Goal is Efficient, Low-Cost Actionable Insight, This Isn't the Answer

Transport Measurement Identifies Fixable Problems



Actionable Insight But Who Does It Impact

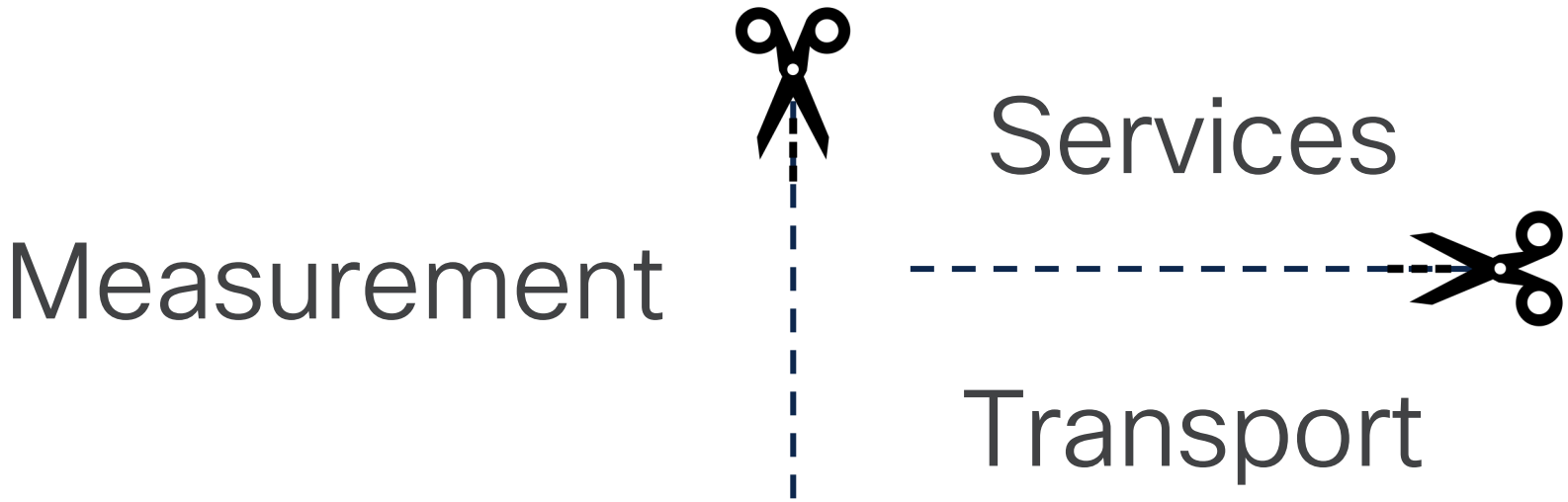
Measure the Transport, Map The Service

Measure the Transport, Map The Service

Key Take Away

- Two design patterns of IP networks
  - Services and Transport are independent
  - IP transport is multi-path oriented
- Remember, Understand and Embrace in your Service Assurance Strategy

Merging Views of Design Patterns



Measurement Is Not Built Into Either Layer