



# ***Active Measurement for Enterprises on the Cheap***

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# Isn't PerfSonar all I need for Performance Measurement?

- No. While software-based timing is accurate down to milliseconds (mS), fine for wide-area, campus paths are so short that they need hardware-based timing down to microseconds (uS), 1000X faster.
  - In other words, Network Time Protocol (NTP) isn't going to work. You need Precision Time Protocol (PTP).
- "That sounds complex and expensive. I'm already burned up my budget paying for my passive analysis system, all the sniffers and analyzers and netflow licenses. The last thing I need is to double that investment".
  - Passive analysis systems, once you go beyond the manual wireshark level of sniffing, ARE very expensive b/c they need big analyzers and databases to track and infer everything they sniff.
  - The good news is that active measurement doesn't need all that, although vendors will happily sell you bells and whistles if you want.

# What's happening in the world of NIDs?

- Network Interface Devices (NIDs) used to be boring unsexy boxes stuck in networks to do boring unsexy tasks like provider demarc and performance measurement. Useful but nothing to write home about.
  - That was before the Internet of Things happened.
- A very interesting subsection of all the IoT buzz concerns previously dumb things getting smarter. Everyone knows about driverless cars, but hardly anyone knows the same thing applies to commodity stuff like NIDs.
- Pluggable optics ("SFPs") are one of those dumb commodity things that network engineers work with, getting cheaper and cheaper, nothing to get excited about.
  - Other than certain vendors trying to charge 100x the market rate for ones with their code in the eeprom or they lock the switch port, thus giving rise to an industry of "VARs" that just buy Chinese SFPs and program various vendors' codes into them to sell as "compatibles".
  - The community pushed back, but only won the battle not the war, since "service unsupported-transceiver" doesn't work with newer products.

# "Enough politics already, what happened to NIDs?"

- Smart people realized that FPGAs were now so small that NID functionality could be put on the pluggable optics themselves.
  - no klunky separate boxes needed anymore.
  - now can have a measurement point wherever you put an SFP.
  - They still work as dumb pluggable optics, but also can be programmed to reflect the right kind of measurement traffic.
  - In particular twamp, which gives you latency and packet loss.
  - Also can do L2 (Y.1731, ethernet OAM) as well as L3, or both at once
  - As side benefit for vendors, SFPs no longer generic, \$300 vs \$30
  - Also available in copper 1G, but not 10G yet.
- In current generation, still need centralized traffic generators to source.
  - Might think are expensive, actually very cheap: \$3-5k w/o analyzer.
  - They do PTP within box, so no need for nasty clock syncing to uS.
  - Pull results from traffic generator via SNMP OIDs, graph in Cacti.
  - Result is really useful flatline graphs that allow you to definitely triage whether an issue was caused by the network or a service riding on the net.
  - I call ours the "clean pipes initiative" b/c if you aren't measuring prob loss & latency

# "FPGAs? Wake me when they have full CPUs"

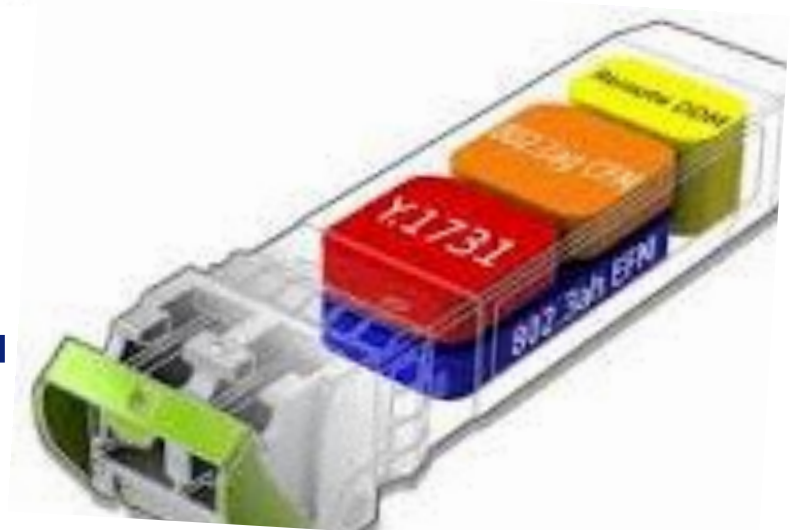
- I didn't say they were that smart, just smarter than they were.
- If you think everything has to have at least the capability of a RPi, then go buy a full cpu on a thumb drive, but doesn't do measurement.
- However, next generation of "Smart SFPs" will be able to source traffic as well as reflect, so won't need central traffic generators
- So can do complex meshes w/o fibering to traffic insertion points. Also will sync PTP, so can do one-way delay (owamp) measurement.
  - Can already do RFC2544 if want to check bandwidth.
- Several vendors of these systems, some more mature than others.
- APL's Trusted Advisor role to government prevents me from discussing vendors w/o public release by Legal.
- This technology has been widely deployed in the wireless backhaul market where crucial to know if tower operators' G.8032 rings perform
- Unknown yet: should we worry they're "phoning home"?

# A taxonomy

- This is an ordinary SFP, and
- This is a "Smart SFP" with NID functionality.
- Notice the larger forebrain.



- Thanks!
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