Model Based Metrics

IPPM Working Group
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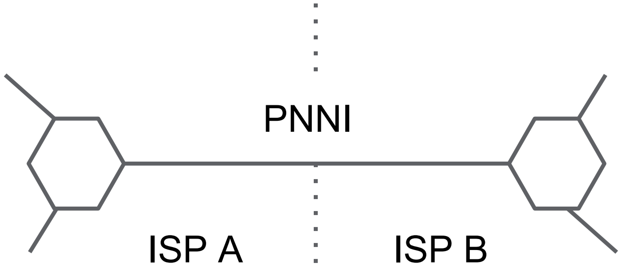
Outline

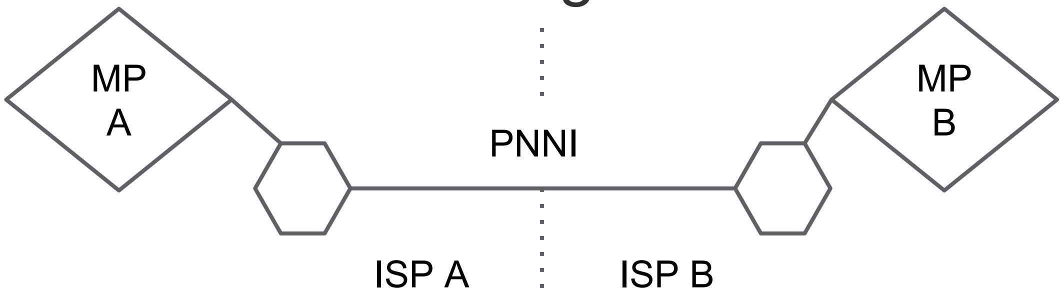
- Usage example (motivation)
- Next steps

Problem: Capacity planning at interconnects



- Want to understand the performance of a busy interconnect
  - Does it have sufficient headroom?
  - Is there a problem with the link?
- Vague/experience based approaches
  - Use a rule of thumb for maximum utilization (e.g. 80%)
    - Theory comes from "effective bottleneck capacity"
    - Useless for non-load related problems
  - Look for "flat tops" in the traffic data
    - But for 5 minutes averages, this is way too late

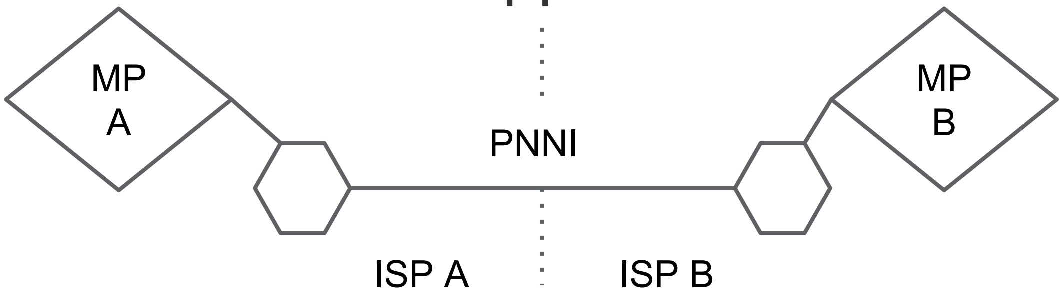
Wrong answer #3: TCP testing across the interconnect



- Easy measurement
  - MP to MP TCP tests: netperf, iperf, nettest, etc
  - RTT is tiny, TCP grabs as much BW as it can
  - Measured performance is too good and irrelevant
  - Loss rate reflects self inflicted congestion (See BTC framework)
  - Furthermore the test itself adversely impacts users

It is common knowledge that this is a bad idea....

The Model Based Metrics approach



- Generate test traffic that mimics TCP and application behavior
  - Primarily determined by the presumed rest of the path and app
    - Presumed rest of path determines the target RTT
  - Open loop
    - insensitive to the behavior of path under test
  - Test path length doesn't change the traffic
    - Except by diffusion/reclocking
- Gather delivery statistics (loss, jitter)
  - Evaluate against a performance model
  - Success criteria depends on target performance
    - Not the details of the test path

Streaming HD Video example (Follows from the draft)

- Target end-to-end parameters
  - target_rate = 2.5 Mb/s
  - target_RTT = 50 mS
  - target_MTU = 1500 Bytes
  - Header_overhead = 64 Bytes
- Computed end-to-end parameters (from model)
  - target_pipe_size = 11 packets
  - target_run_length = 363 packets
    - e.g. one loss every 33 round trips
- Apportionment assumptions
  - For smooth traffic, the IXC contributes at most 10% of the loss
  - For bursty traffic, the IXC contributes at most 50% of the loss

HD Video tests

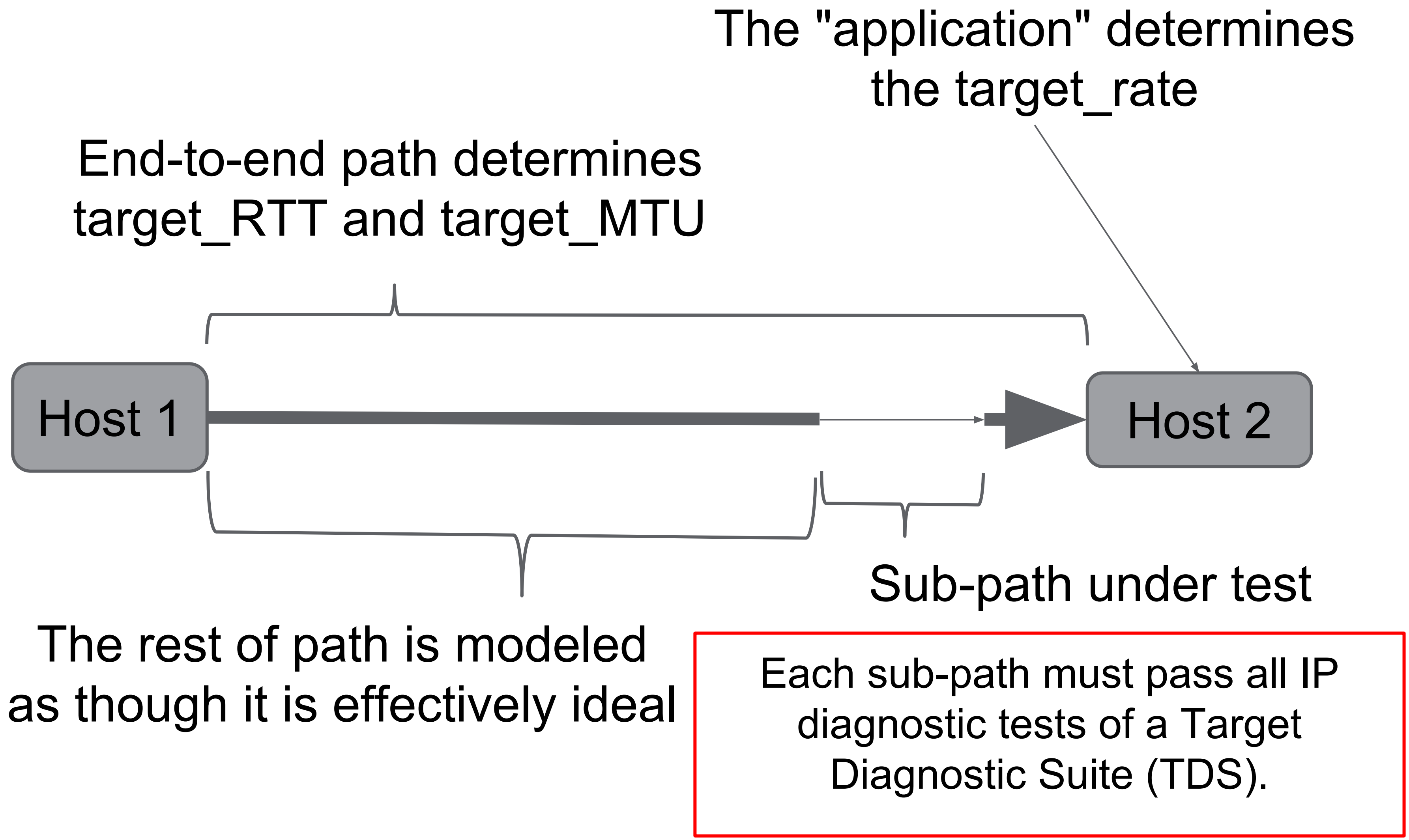
- Smooth
  - One 1500 byte packet every 4.5 mS
  - Loss rate must be below 1 in 3630 packets
- Bursts
  - (11) 1500 byte packets, every 50 mS
  - Loss rate must be below 1 in 66 packets (1 in 6 busts)
- Engineering (bench) tests
  - Onset of congestion must not cause loss of TCP self clock
  - e.g. AQM like progressive onset of losses

Next Steps

- New draft: MBM forStreaming HD video
  - Fully specified - As concrete as possible
  - Built on existing metrics
    - E.g. OWAMP, etc
  - Field tests
    - Measurement Lab and elsewhere
- Research paper
  - Move some of the background from the current draft
  - Measurement results and other non-RFC material
- Hold current draft, pending input from above
  - Scope changes
  - Clarifications

Questions?

Overview


The "application" determines
the target_rate
End-to-end path determines
target_RTT and target_MTU
Host 1
Host 2
Sub-path under test
The rest of path is modeled
as though it is effectively ideal
Each sub-path must pass all IP
diagnostic tests of a Target
Diagnostic Suite (TDS).