A Case for Exogenous Losses

Exogenous Losses

- Produced outside of the transmission control system
- Independent from the source behavior
- Independent from its long-term fair share
- Unavoidable Problematic “Noise”
- Wireless and cross-traffic losses

Level of Impact

Unfairness? 

Why low levels of exogenous losses help?

- Impose an upper limit on TCP throughput
- Randomness in losses prevent monopoly

Model

- Extend a fluid Model
- Quiescent loss rate

\[
\sum_{i=1}^{m} \frac{x_i}{C} = \frac{1}{\sum_{i=1}^{m} \frac{x_i}{C^2}} + 2
\]

Active Tuning of Exogenous Losses

- Exogenous Losses are changing with time
- Ex: Sinusoidal (long and short term behavior)
- Long-Term Adjustments
  Efficiency to efficiency
- Short-Term Compensation
  Smoothness

Leveraging Exogenous Losses

XQM (eXogenous aware Queue Management)

- To be placed at the edges of the Network
- Will maintain state for flows passing through
- Estimated RTTs are measured from the middle
- Estimated throughput is measured every Measurement Period MP
- Control is applied every control period CP
- MP and CP are decoupled

XQM Principles

- Introduce
- Do Nothing
- Hide

\[
q_i(t + CP) = q_i(t) + \delta \times (x_i(t, MP) - x_i) + \alpha(b(t) - b)
\]

Simulations with different number of congested links

Conclusions

- Small level of exogenous losses improve fairness while remain efficient
- Noise should not be filtered out blindly (SNOOP and I TCP)
- XQM can achieve fairness and efficiency through tuning exogenous losses

On Going Work

- Issue of time scale on the measurements and control periods.
- Stability analysis for XQM
- Implementation


BUCS Technical Report

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