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A Statistical Approach to Improving Activepacket Loss Measurement

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Abstract: Measurement and estimation of packet loss characteristics are challenging due to the relatively rare occurrence and typically short duration of packet loss episodes. While active probe tools are commonly used to measure packet loss on end-to-end paths, there has been little analysis of the accuracy of these tools or their impact on the network. The objective of our study is to understand how to measure packet loss episodes accurately with end-to-end probes. We begin by testing the capability of standard Poisson-modulated end-to-end measurements of loss in a controlled laboratory environment using IP routers and commodity end hosts. Our tests show that loss characteristics reported from such Poisson-modulated probe tools can be quite inaccurate over a range of traffic conditions.

Key words: Packet loss characteristics · Commonly used to measure · Accuracy of these tools · Understand how to measure packet loss

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INTRODUCTION

Motivated by these observations, we introduce a new algorithm for packet loss measurement that is designed to overcome the deficiencies in standard Poisson-based tools. Specifically, our method entails probe experiments that follow a geometric distribution to 1) enable an explicit trade-off between accuracy and impact on the network and 2) enable more accurate measurements than standard Poisson probing at the same rate [1-9]. We evaluate the capabilities of our methodology experimentally by developing and implementing a prototype tool, called BADABING. The experiments demonstrate the trade-offs between impact on the network and measurement accuracy. We show that BADABING reports loss characteristics far more accurately than traditional loss measurement tools.

Obtainable System: We begin by testing the capability of standard Poisson-modulated end-to-end measurements of loss in a controlled laboratory environment using IP routers and commodity end hosts. Our tests show that loss characteristics reported from such Poisson-modulated probe tools can be quite inaccurate over a range of traffic conditions [10].

Future System: We developed a one-way active measurement tool called BADABING. BADABING sends fixed-size probes at specified intervals from one measurement host to a collaborating target host. The target system collects the probe packets and reports the loss characteristics after a specified period of time. We also compare BADABING with a standard tool for loss measurement those emits probe packets at Poisson intervals. The results show that our tool reports loss episode estimates much more accurately for the same number of probes. We also show that BADABING estimates converge to the underlying loss episode frequency and duration characteristics.

Advantages:

- The most important implication of these results is that there is now a methodology and tool available for wide-area studies of packet loss characteristics that enables researchers to understand and specify the trade-offs between accuracy and impact.
- Furthermore, the tool is self-calibrating in the sense that it can report when estimates are poor.

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Disadvantages:

- Individual probes often incorrectly report the absence of a loss episode (i.e., they are successfully transferred when a loss episode is underway).
- Second, they are not well suited to measure loss episode duration over limited measurement periods.

"A Geometric Approach to Improving Active Packet Loss Measurement" is specially developed to monitor host and service and designed to inform you of network incidents before your clients, end-users or managers do. The Active Packet Loss Measurement System mainly consists of four modules:

- Creating Packets Module
- Transmitting Packet From Sender Module
- Receiving Packets In Receiver Module
- Checking packet Loss Using Header Information Module

Creating Packets Module: This Module to This configuration was created in order to accommodate our measurement system, described below Probe and background traffic was then multiplexed onto a single OC3 (155 Mb/s) link (hop C in the figure) which formed the bottleneck where loss episodes took place. We used a hardware-based propagation delay emulator on the OC3 link to add 50 milliseconds delay in each direction for all experiments [11] and configured the bottleneck queue to hold approximately 100 milliseconds of packets.

Transmitting Packet from Sender Module: Loss is inferred by the sender if the response packets expected from the target host are not received within a specified time period. When the aggregate sending rate of the *N* flows exceeds the capacity of the shared output link, the output buffer begins to fill. This effect is seen as a positive slope in the queue length graph. The rate of increase of the queue length depends both on the number *N* and on sending rate of each source. The ZING sender emits UDP probe packets at Poisson-modulated intervals with timestamps and unique sequence numbers and the receiver logs the probe packet arrivals. Users specify the mean probe rate l , the probe packet size and the number of packets in a "flight."

Receiving Packets in Receiver Module: The most commonly used tools for probing end-to-end paths to measure packet loss resemble the ubiquitous PING utility. PING-like tools send probe packets (*e.g.,* ICMP echo packets) to a target host at fixed intervals. Loss is inferred by the sender if the response packets expected from the target host are not received within a specified time period. Both probe and background traffic were generated and received by the end hosts. Traffic flowed from the sending hosts on separate paths via Gigabit Ethernet to separate Cisco GSRs (hop B in the figure) where it transitioned to OC12 (622 Mb/s) links. The first experiment used 40 infinite TCP sources with receive windows set to 256 full size (1500 bytes) packets. Figure 3a shows the time series of the queue occupancy for a portion of the experiment; the expected synchronization behavior of TCP sources in congestion avoidance is clear. The experiment was run for a period of 15 minutes which should have enabled ZING to measure loss rate with standard deviation within 10% of the mean [10].

Checking Packet Loss Using Header Information Module: By comparing packet header information, we were able to identify exactly which packets were lost at the congested output queue during experiments. Furthermore, the fact that the measurements of packets entering and leaving hop C were time-synchronized on the order of a single microsecond enabled us to easily infer the queue length and how the queue was affected by probe traffic during all tests [12]. We consider this environment ideally suited to understanding and calibrating end-to-end loss measurement tools. We address the important issue of testing the tool under "representative" traffic conditions by using a combination of the Harpoon IP traffic generator [13] and Iperf to evaluate the tool over a range of cross traffic and loss conditions.

System Investigation

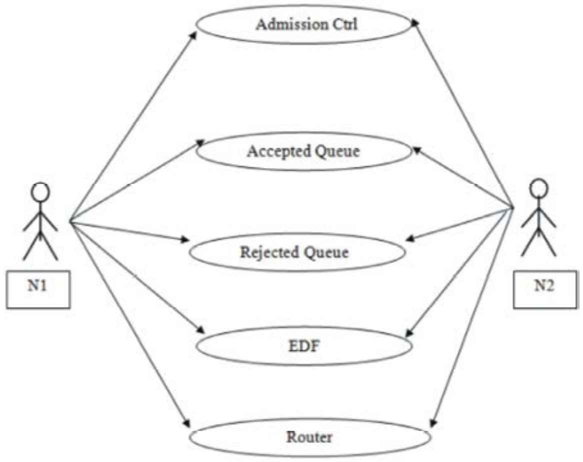
Time Delay: Loss is inferred by the sender if the response packets expected from the target host are not received within a specified time period. The target system collects the probe packets and reports the loss characteristics after a specified period of time.

Accuracy: While active probe tools are commonly used to measure packet loss on end-to-end paths, there has been little analysis of the accuracy of these tools or their impact on the network.

The accuracy of the resulting measurements depends both on the characteristics and interpretation of the sampling process as well as the characteristics of the underlying loss process.

Information Retrieval: As the information is stored in the particular format, it can only be retrieved in the same format. But if it is to be retrieve in different format, it is not possible.

Dataflow Di Agram: The main actor identified are the user who monitors .This modules include following details when u monitor the details like services, time period, commands, contact, contact group, service group, host group.

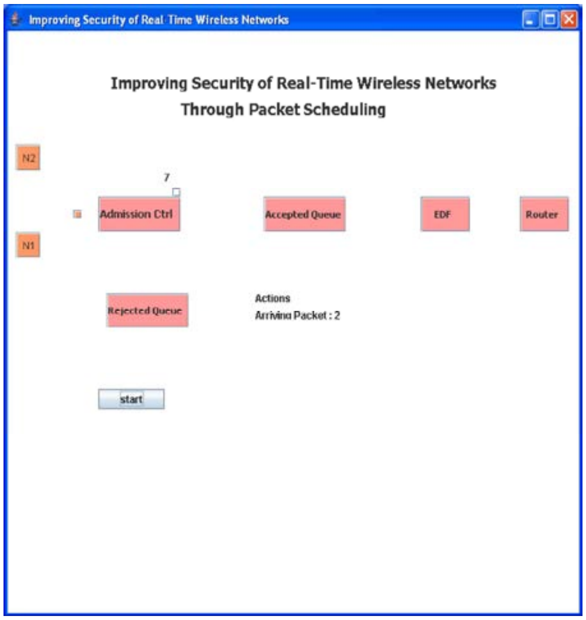


Dataflow Diagram

System Implementation: In this project, we concentrate on packet loss, measuring and analyzing network traffic dynamics between end hosts has provided the foundation for the development of many different network protocols and systems. Of particular importance understands packet loss behavior since loss can have a significant impact on the performance of both TCP- and UDP-based applications.

Despite efforts of network engineers and operators to limit loss, it will probably never be eliminated due to the intrinsic dynamics and scaling properties of traffic in packet switched network [1]. Network operators have the ability to passively monitor nodes within their network for packet loss on routers using SNMP. End-to-end active measurements using probes provide an equally valuable perspective since they indicate the conditions that application traffic is experiencing on those paths.

The result is that during a period where the router-centric loss rate is non-zero, there may be flows that do not lose any packets and therefore have end-to end loss rates of zero [13]. This observation is central to our study and bears directly on the design and implementation of active emeasurement methods for packet loss.


Improving Security of Real-Time Wireless Networks Through Packet Scheduling

Actions
Arriving Packet : 2

Arriving Packet

CONCLUSION

The purpose of our study was to understand how to measure end-to-end packet loss characteristics accurately with probes and in a way that enables us to specify the impact on the bottleneck queue. We began by evaluating the capabilities of simple Poisson-modulated probing in a controlled laboratory environment consisting of commodity end hosts and IP routers. We consider this tested ideal for loss measurement tool evaluation since it enables repeatability, establishment of ground truth and a range of traffic conditions under which to subject the tool. Our initial tests indicate that simple Poisson probing is relatively ineffective at measuring loss episode frequency or measuring loss episode duration, especially when subjected to TCP (reactive) cross traffic.

While BADABING enables superior accuracy and a better understanding of link impact versus timeliness of measurement, there is still room for improvement. First, we intend to investigate why p=0.1 does not appear to work well even as N increases. Second, we plan to examine the issue of appropriate parameterization of BADABING, including packet sizes and the a and t parameters, over a range of realistic operational settings including more complex multichip paths.

Future Enhancements: Finally, we have considered adding adaptively to our probe process model in a limited sense. We are also considering alternative, parametric methods for inferring loss characteristics from our probe process. Another task is to estimate the variability of the estimates of congestion frequency and duration themselves directly from the measured data, under a minimal set of statistical assumptions on the congestion process. However the future enhancements would includes, Data Integrity, Data Authentication, Data Confidentiality.

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