

# A Packet Generator on the NetFPGA Platform

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Presented by

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# Outline

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- Motivation
- Related work
- Background
- Approach
- Methodology
- Results
- Conclusions

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# Motivation

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- Software generators running on PCs cannot guarantee when packets are transmitted and don't allow full line rate testing.
- Proprietary traffic generators are expensive.
- Traffic generators are highly used in network measurement and testing.

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# Related work

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- **Hardware systems** such as *Ixia* generates traffic in synthetic traces that can be rerun in the future. Ixia does not allow the replay of PCAP traces.
- **Software programs** such as *tcpreplay* and *TCPivo* allow the replay of saved network traffic.
  - In *Tcpreplay* the time between packets is affected by OS context switching.
  - *TCPivo* attempts to minimize these problems by employing a low latency kernel, and implementing network trace prefetching along with low latency counters.

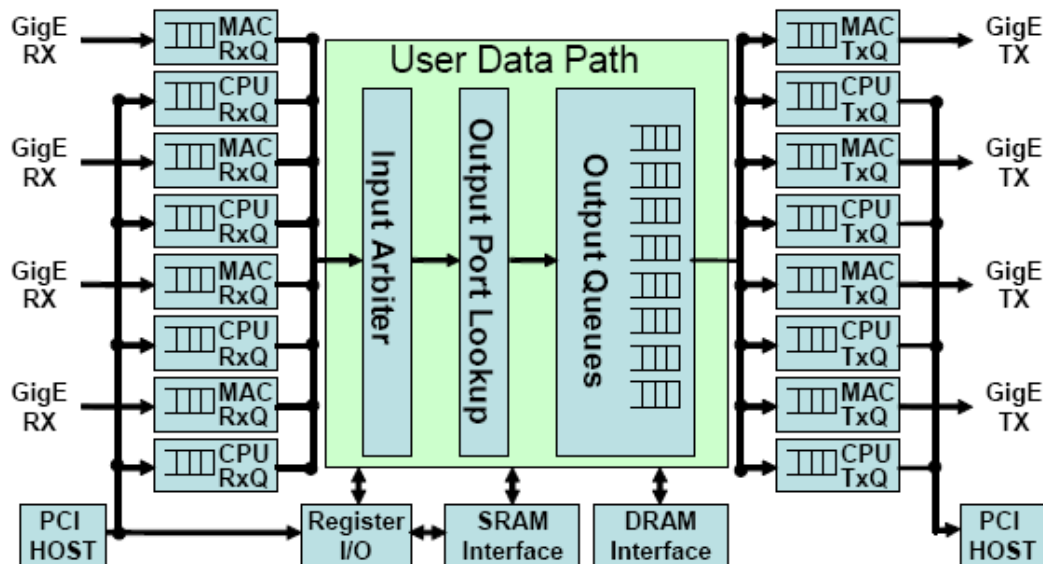
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# Background

- NetFPGA Infrastructure
  - The NetFPGA is a network hardware accelerator.
  - The NetFPGA has three major components:
    - The kernel module communicates with the NetFPGA hardware.
    - Open source utilities used to communicate with the card.
    - The reference Pipeline
- NetFPGA Reference Pipeline



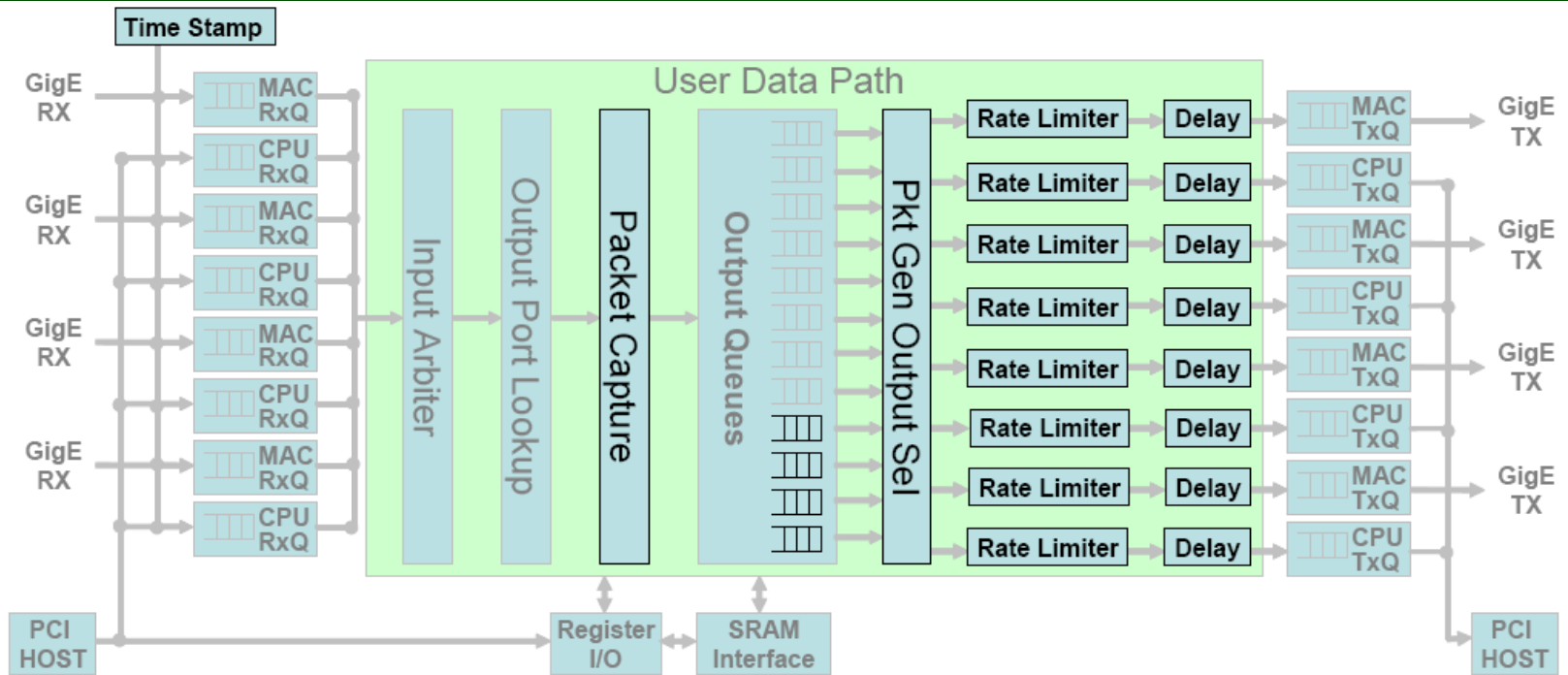


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# Approach



## Packet generator architecture:

- Timestamp module
- Input Arbiter/Output Port Lookup
- Packet Capture
- Output Queues
- Pkt Gen Output Select
- Rate Limiter and Delay
- Registers
- Pkt Gen Software

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# Methodology

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- Experimentation infrastructure:
  - AMD dual core PC with a dual port e1000 PCI-express x4 NIC.
  - A PCAP file with 430 packets and 25383 bytes.
- Tools evaluated:
  - Tcpreplay
  - NetFPGA packet generator
- Experimental setup:
  - Experiment 1: play the PCAP trace on one port.
  - Experiment 2: play the PCAP trace on one ports simultaneously.
  - Each experiment was performed ten times and the average rate achieved was measured.

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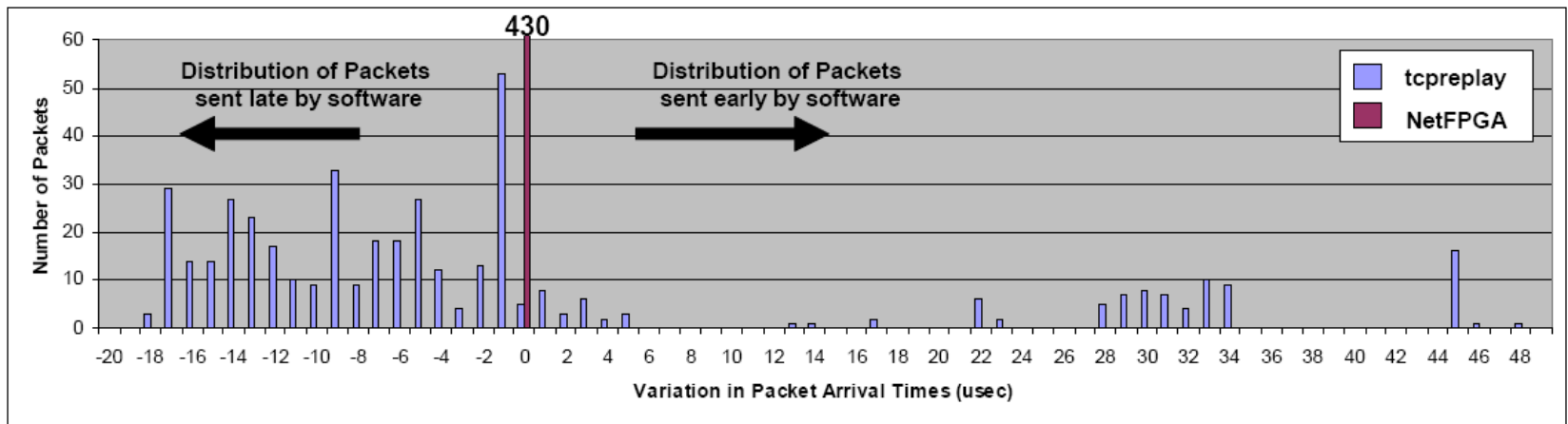
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# Results (1/2)

- Average line rate

Number of Ports	TCPreplay Rate	NetFPGA Rate
One	901.31 Mbps	1000 Mbps
Two	896.23 Mbps	1000 Mbps

- Variation of packet arrival time



## Results (2/2)

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- Device utilization for the NetFPGA packet generator

Resources	XC2VP50 Utilization	Utilization Percentage
Slices	19674 out of 23616	83%
4-input LUTs	30049 out of 47232	63%
Flip Flops	22570 out of 47232	47%
Block RAMs	140 out of 232	60%
External IOBs	356 out of 692	51%

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# Conclusions

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- Because the NetFPGA hardware runs at line rate, it can play traffic at full line rate.
- The NetFPGA packet generator can reliably replay time sensitive traffic while giving users the ability to change the rate of the queues, the delay between packets, and the number of iterations that the PCAP files are cycled through.

# References

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