Outline

- TEACUP
- TCP stack information loggers
- Web10g logger
- ttprobe v0.1
- Linux Jprobe/Kprobe mechanism
- Comparing ttprobe v0.1 and Web10g
TCP/IP performance testing

- Bandwidth utilisation (Highest throughput)
- Network Congestion (Avoid/reduce congestion)
- Link sharing (Fairness)
- Latency (Smallest Latency)

TEACUP: TCP Experiment Automation

Example of a TEACUP testbed topology
TEACUP (cont.)

- Running and analysing TCP/UDP experiments.

![Graph showing CWND vs Time for different bottleneck buffer sizes](image)

**TEACUP experiment to compare three different scenarios**

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TCP stack data loggers

- Capture state variables from inside TCP/IP stack.

- TEACUP uses (FreeBSD-> SIFTR), (Linux->Web10g)
Web10g TCP state logger

- Implements many TCP Extended Statistics MIB (RFC4898).
- Using regular polling per fixed time interval (>=1ms).
- Includes user-land and kernel patch codes.
- Latest Linux kernel officially support is 3.17

Challenges of using Web10g

CWND plot of a TCP experiment captured using Web10g
ttprobe v0.1: TEACUP TCP Probe

- Event-driven (per incoming and/or outgoing packet)
- Based on TCP probe, utilises JProbes/KProbes architecture
- Output format: ttprobe, binary and web10g formats
- Capture TCP states in both directions
- Hooks \texttt{tcp\_v4\_do\_rcv}, \texttt{tcp\_v6\_do\_rcv} and \texttt{tcp\_transmit\_skb}
- Implements buffer flushing and reader termination

Kprobes mechanism in Linux

- Kprobes = Kernel Probes
- Used for kernel debugging and information collection
- Dynamically break into any kernel instruction/routine

\textbf{Execution of a KProbe}

Image copyright Sudhanshu Goswami 2005
ttprobe v0.1 Design

Comparing Web10g with ttprobe
Sampling: ttprobe vs. web10g

- TCP flow (iperf), 100Mbps Up/Down, 6ms RTT, TCP CUBIC
- 1ms Web10g poll interval

CWND of the first 30ms of the experiment
CPU usage: ttprobe vs. web10g (cont.)

- Five individual experiments with ten runs each
- Each run lasted 60 seconds

![CDF of CPU usage of iperf TCP traffic over 1Gbps link](image)

Summary

- Event-driven TCP loggers produce more accurate data than TCP loggers that use polling approach.
- CPU overhead of event-driven loggers depends on the traffic.
- ttprobe v0.1 captures more samples with reasonable CPU overhead than Web10g.
- Code and technical report
Questions

Thank you for listening