

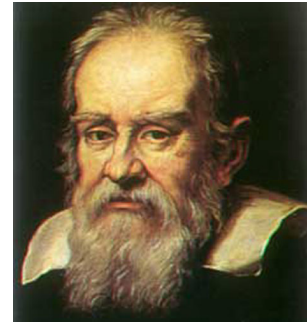
Measurement enhanced SDN

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Network measurement

“Measure what is measurable, and make measurable what is not so”. [Galileo]

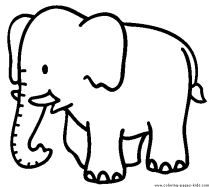


Where did all those packets come from?

Why do I keep seeing bursts?

Is it worth forwarding this traffic?

Which flows are mice, which are elephants?



Can I turn off any interfaces?

What size should I make the buffer?

Software Defined Networking

SDN abstracts forwarding and network state so acts as enabler for new protocols

Currently OpenFlow is the main contender:

Simple – uses flow look up tables

Extensible – allows new protocols

Fast – operates at line-rate (usually...)

Controlled – separates control and forwarding



Measuring flows

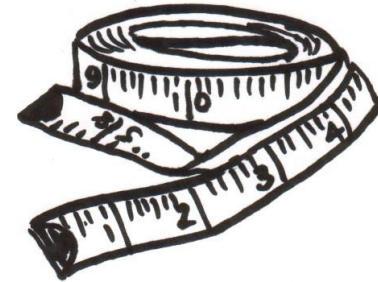
How many flows?

How big is this flow?

What is the flow rate?

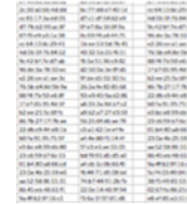
Identify flow start

Have these flows stopped yet?



Measuring switches

How big is the flow table?



What is the latency in the switch?

How big are my buffers?

Congestion (or pre-congestion)

Information about ARP cache

Energy use in the switch

State of each port

q



Improving throughput

Differentiate mice from elephants by measuring flow characteristics

More efficient use of buffer space:

- Mice see small buffers = less delay
- Elephants get most buffer space
- Might alleviate TCP incast



Saving energy

Identify underutilised links by measuring rate on each output port

Then control the flow rates to save energy:

- Identify flows that can be re-routed
- Reduce the flow rate for other flows
- If link is energy proportional, reduce rate
- Once link is idle it can be turned off

OpenFlow as a platform

Easy(?) to do all this in OpenFlow:

Simple – already understands flows so easy to add flow-based measurement

Extensible – understands cross-layer information so gives intelligent measurements

Fast – measurements can be done at line-rate

Controlled – can control buffers, markers, etc.

Questions?



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