Traffic Shaping: an introduction

Tim Clark (eclipse)

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What is Traffic Shaping?

- A networking feature
- Sometimes referred to as throttling
- Used to control data speeds
- Used to control data priorities

Who and Why

- ISP
  - To slow down heavy network users e.g. Virgin
  - To slow down torrents and large downloads
- Home users
  - Stop one person using all the internet bandwidth
  - Try and prevent upstream traffic shaping
- Network admins
  - To stop prioritise interactive traffic e.g. SSH
  - To stop high volume data choking other services e.g. torrents
  - QOS e.g. VoIP

Basics

- Selectively drops outbound packets
- Can't shape incoming traffic (like you can't stop incoming texts)
- Internet doesn't know how fast a connection is
- Internet is mostly TCP
- TCP auto detects speed
- We can mislead TCP on our speed (more on this in a moment)

TCP

- Starts sending slow
- Speeds up transmission till packets start going missing (not getting ACKed)
- Slows down till it gets reliable responses
- If we selectively drop packets (or thir ACKs) TCP will slow down its transmission rate
- Selectively drop packets going out to the local subnet on a router to control incoming speed of connections from the outside.
- "This is the equivalent of not reading half of your mail, and hoping that people will stop sending it to you. With the difference that it works for the Internet" - lirc.org

Queueing

- Data is shaped by queueing it
- Most basic is all data goes into one queue
- More complex is queues in queues (more on this later)
- Different types of queueing disciplines (qdiscs)
- Different qdiscs are useful for different things

pfifo_fast

- Puts all traffic into one of three queues
- Empties queues in order i.e. wont start emptying 2 until 1 is emptying
- Selects queues by the QOS/TOS bit in the packet

Token Bucket Filter (TBF)

- A bucket if filled with tokens at a specific rate
- When the bucket is full tokens are no longer added
- When a packet arrives, a token is taken from the bucket and the packet allowed through
- If the bucket is empty the packet is dropped
- Best way to slow down your interface

Stochastic Fairness Queueing (SFQ)

- Queues each packets for each connection separately
- Does a round robin on the queues when data slots are available
- Fair algorithm

Complicated QDiscs

Classfull QDiscs

- Classify packets and pass them to child qdiscs
- Filters get called by qdisc when packet arrives
- Qdisc then passes it to the approprite child
- When kernel can send packet, it asks the root qdisk that then queries its children
- The qdisks are then queried recursively
- Different types of classful qdisc

PRIO

- Clasifies packets like pfifo_fast
- Does not queue internally
- Passes packets to its child qdiscs

CBQ

- Very Complicated
- Passes packets to appropriate childern based on filters
- Deques them based on weighted round robin
- Each queue has a weight, and a bandwidth which determines how often it can be dequeued
- Queus can be allowed to borrow a certain amount of unused bandwidth from other queues
- Requires you to know the upstream speed, otherwise it gets a little pointless

Complicated QDiscs

Hierarchical Token Bucket

- Works like a bit like CBQ
- Uses token buckets instead of weird timing stuff to decide which queue to use
- Allows bandwidth borrowing
- Easier to configure than CBQ

Filters

- Filters are used to classify packets in classful qdiscs
- Can filter on lots of packet propeties
    - source and desntination ip or subnet
    - source and destination port
    - QOS/TOS marks
- Can use marks that are set by iptables to do more complex matching
- Desisions can also be made dependsing on the routeing desision

tc

- tc is the command for confuguring traffic shapeing under linux
- Not partically intuative syntax
- GUIs and Configuration tools exsist to write the tc rules for you
- Linux Advanced Routing & Traffic Control(LARTC) is a good linux traffic shapeing and tc reference

The Internet

Slides Available at `http://sucs.org/~eclipse`
LARTC: `http://lartc.org/`

Questions?

Any Questions?