

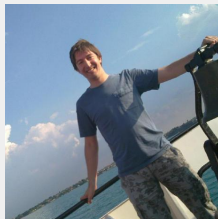
Testing applications with traffic control

In containers

Alban Crequy

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- Worked on rkt the last 1.5 years
- Currently tech lead on rkt
- In 2014, worked on traffic control for multimedia applications in cars (tcmmd)

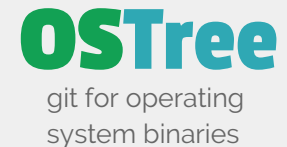
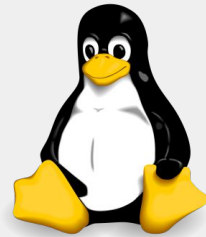


<https://github.com/alban>



Berlin-based software company building
foundational Linux technologies

Some examples of what we work on...





Find out more about us...

Blog: <http://kinvolk.io/blog>

Github: <https://github.com/kinvolk>

Twitter: <https://twitter.com/kinvolkio>

Email: hello@kinvolk.io

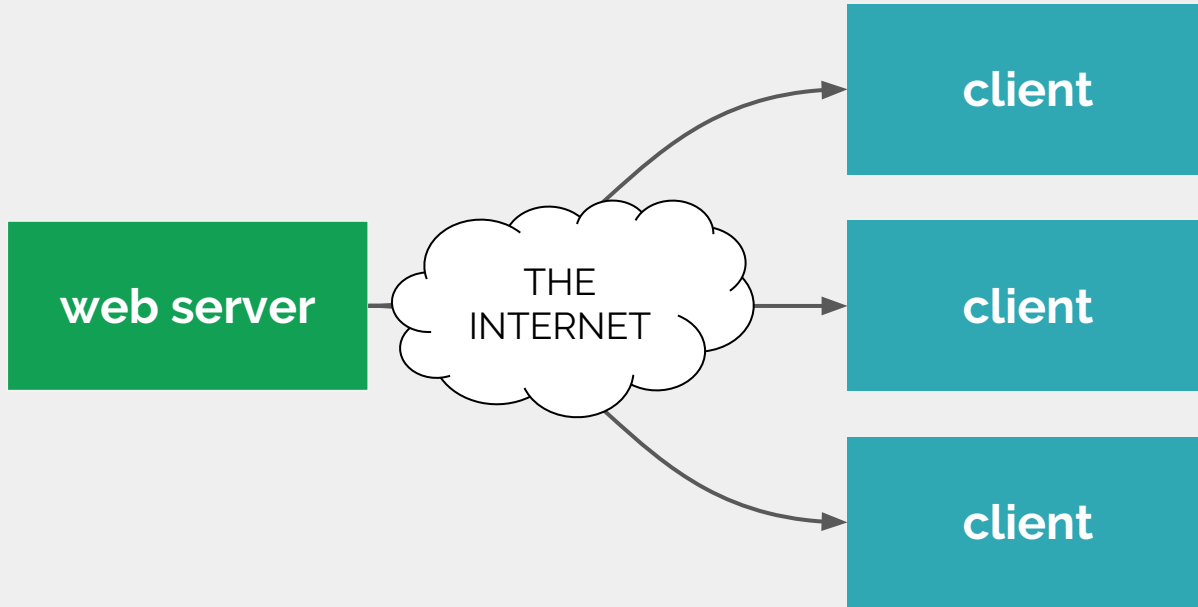
Plan

- What is traffic control and how does it work on Linux
- How it can be used for testing a microservices application
- Demo
 - With CoreOS Linux, Kubernetes, Weave Scope

What is traffic control?

How does it work on Linux?

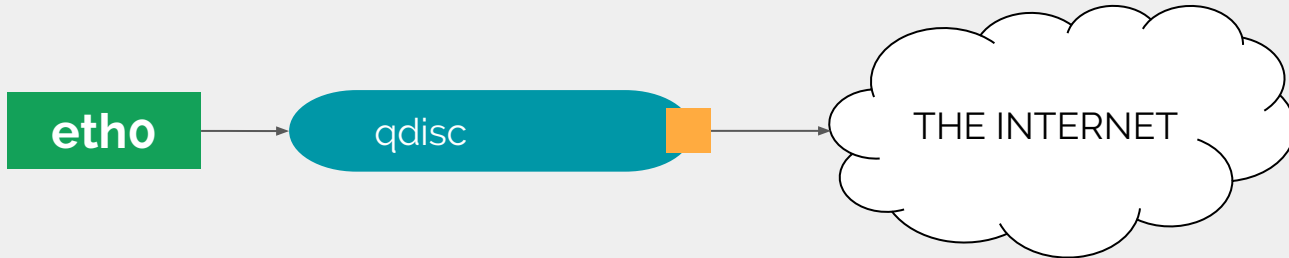
Traffic control, why?



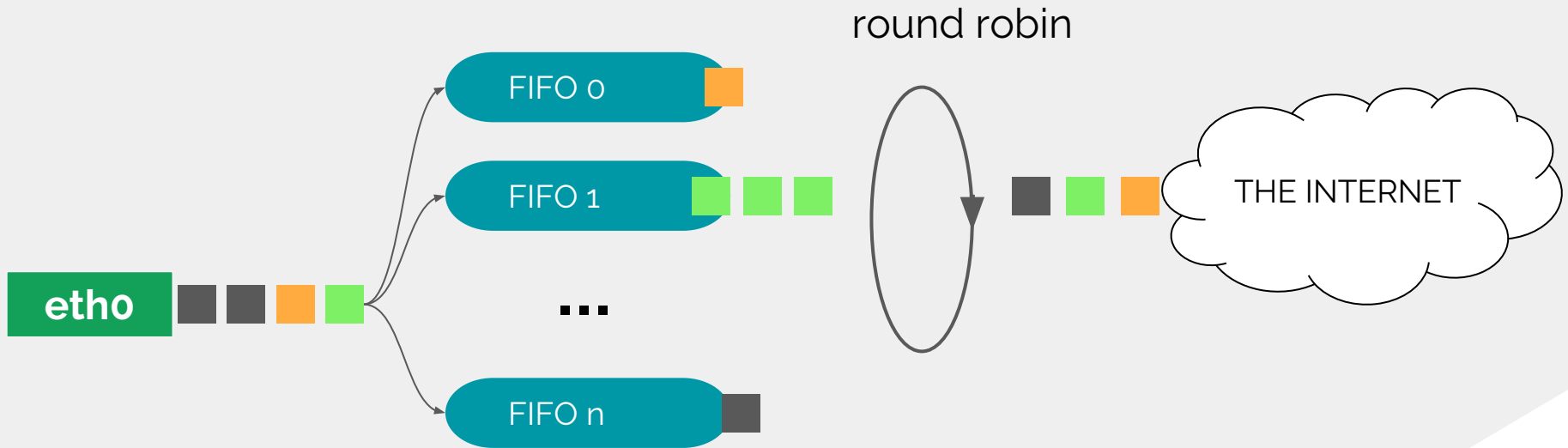
- fair distribution of bandwidth
- reserve bandwidth to specific applications
- avoid bufferbloat

Queuing disciplines (qdisc)

- Network scheduling algorithm
 - which packet to emit next?
 - when?
- Configurable at run-time:
 - `/sbin/tc`
 - Netlink
- Default on new network interfaces: `sysctl net.core.default_qdisc`

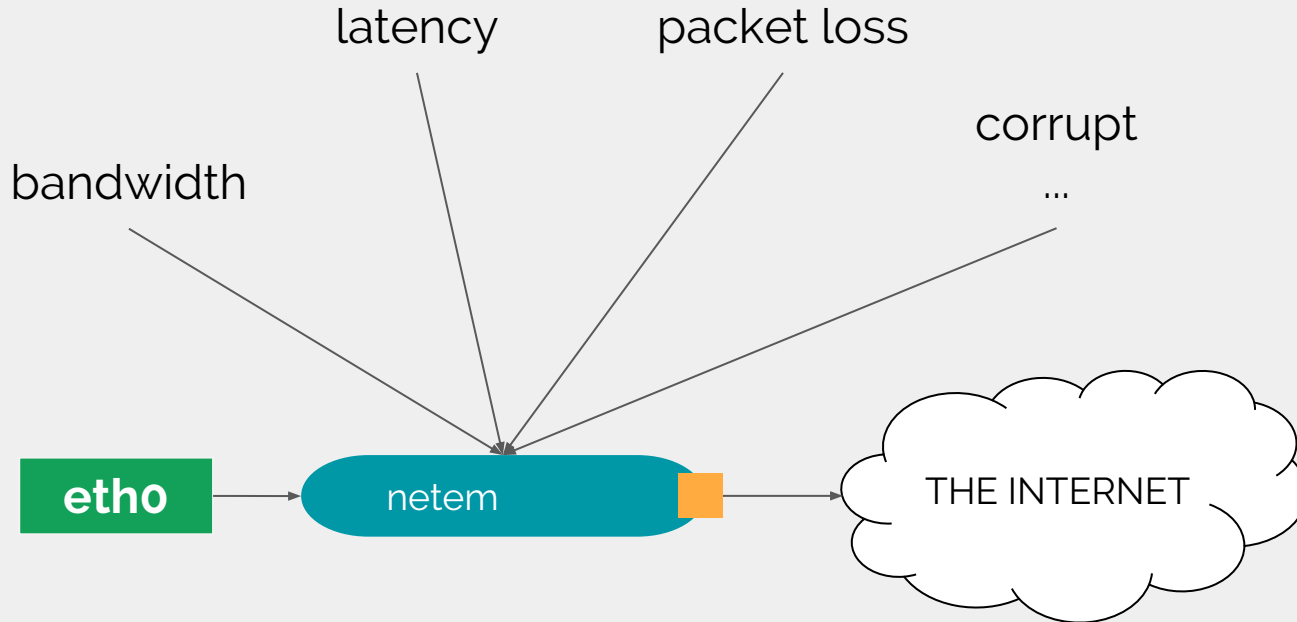


Stochastic Fairness Queueing (sfq)

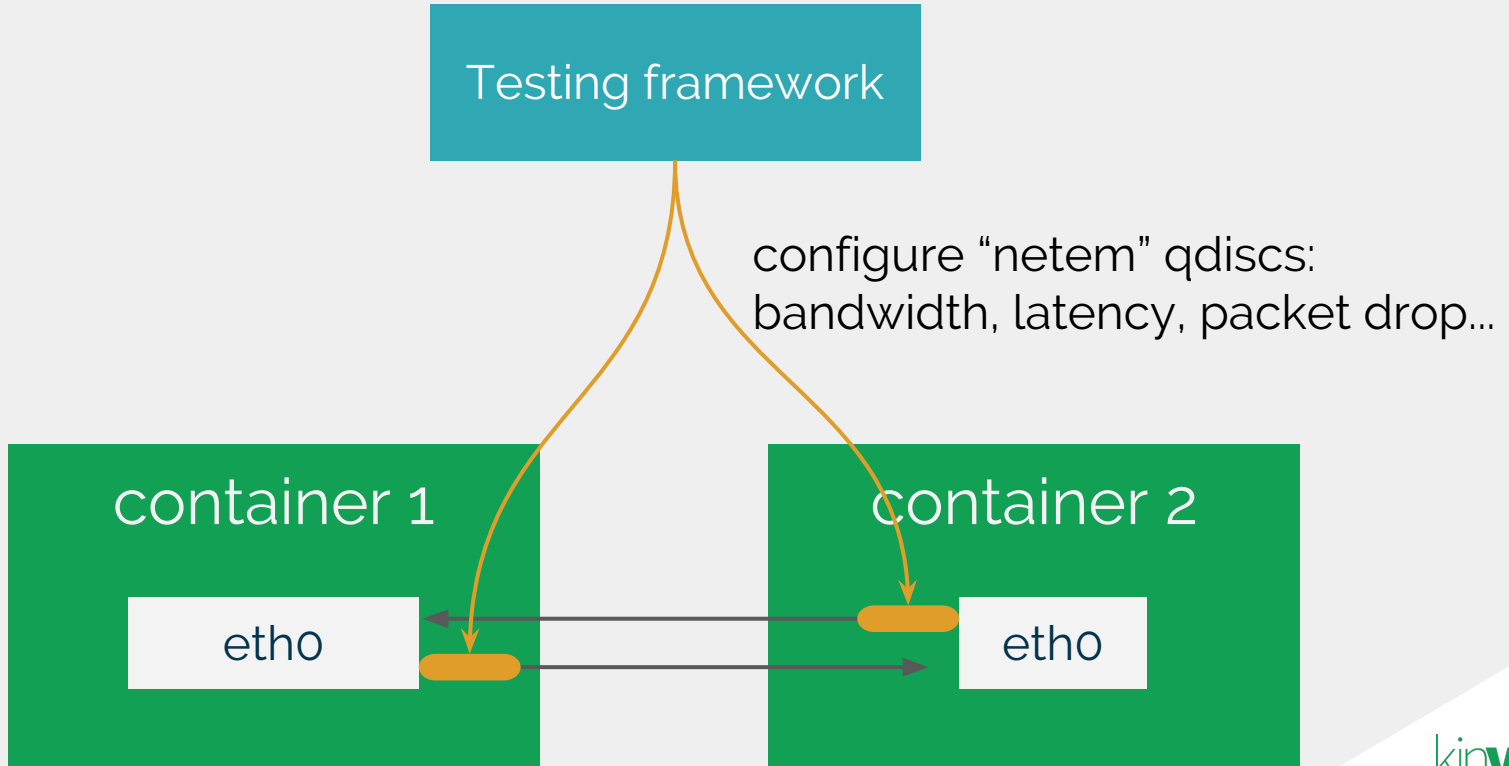


Traffic control for testing?

Network emulator (netem)




Testing with containers









The demo application

microservices-demo

HOME CATALOGUE ▾ ACCOUNT 4 item(s) in cart

[Home](#) > Shopping cart

Shopping cart

Product	Quantity	Unit price	Discount	Total	
 Cat socks	<input type="text" value="2"/>	\$15.00	\$0.00	\$30.00	
 Colourful	<input type="text" value="1"/>	\$18.00	\$0.00	\$18.00	
 Holy	<input type="text" value="1"/>	\$99.99	\$0.00	\$99.99	
Total				\$147.99	

[← Continue shopping](#) [↻ Update basket](#) [Proceed to checkout >](#)

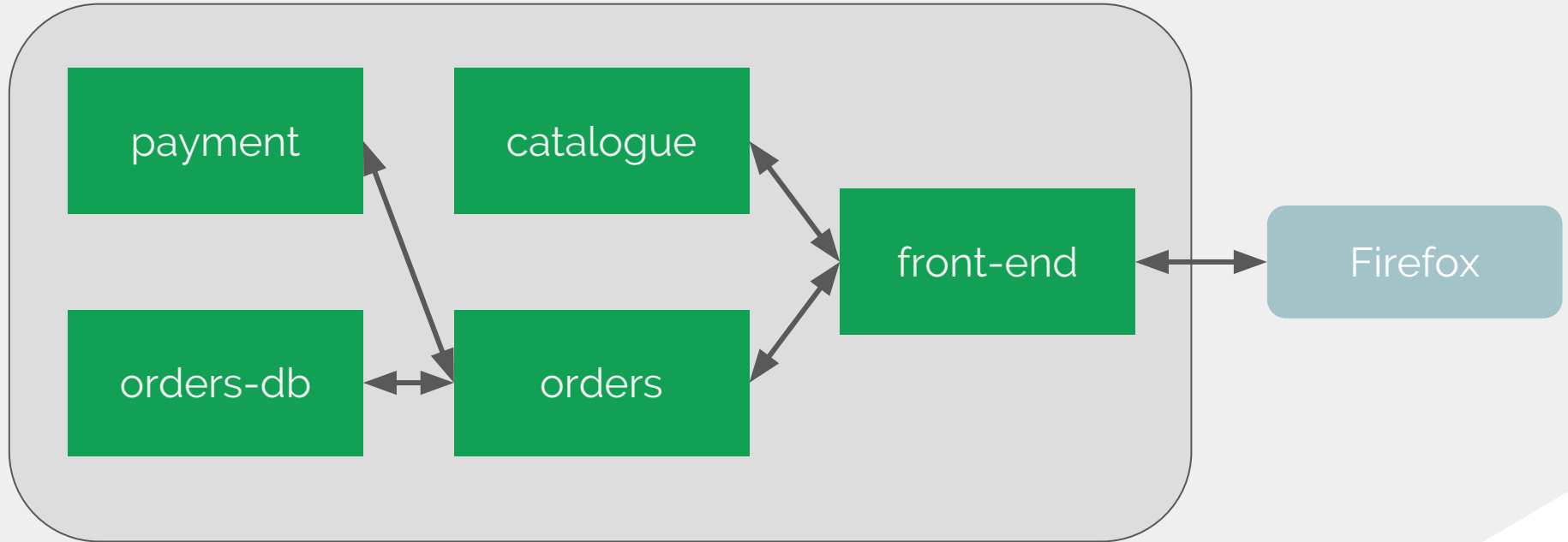
Order summary

Shipping and additional costs are calculated based on the values you have entered.

Order subtotal	\$147.99
Shipping and handling	\$4.99
Tax	\$0.00
Total	\$152.98

<https://github.com/microservices-demo/microservices-demo>

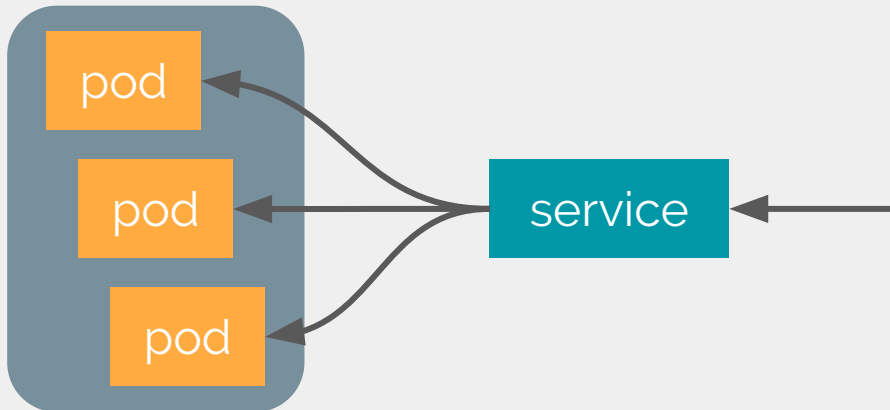
Some micro-services



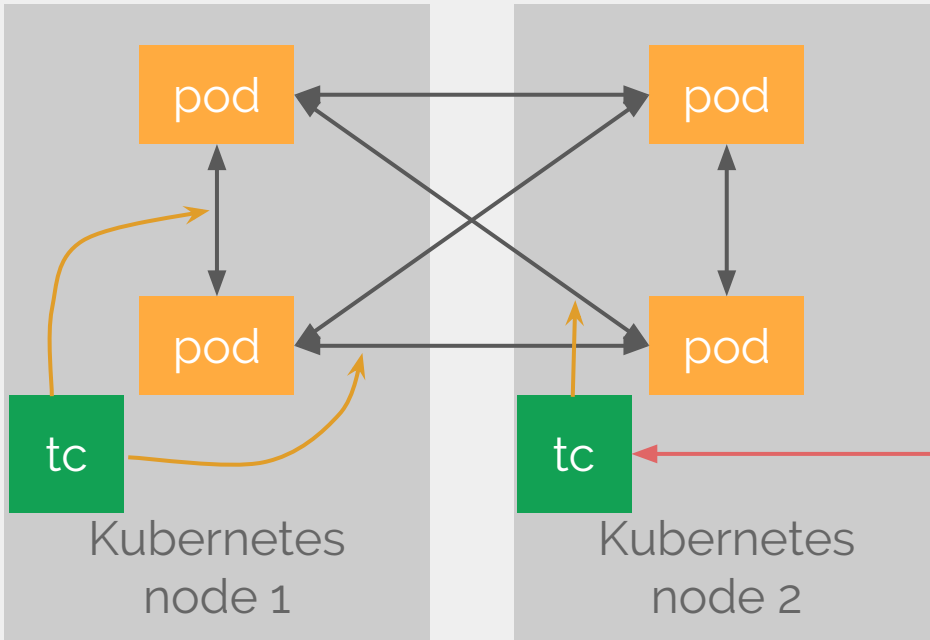
Kubernetes

Kubernetes objects

- **Kubernetes “Pods”**
 - Group of container(s) running together
- **Kubernetes “Replication Sets”**
 - Control the number of “Pods” replicas running
- **Kubernetes “Service”**
 - Directing the traffic to “Pods”



Testing with traffic control in Kubernetes



- configure network simulator
- play scenarios

controls

- Latency
- Bandwidth
- Packet drop

Weave Scope

Weave Scope

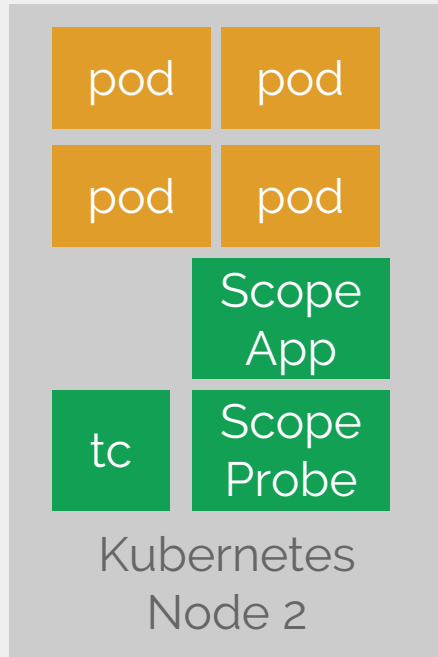
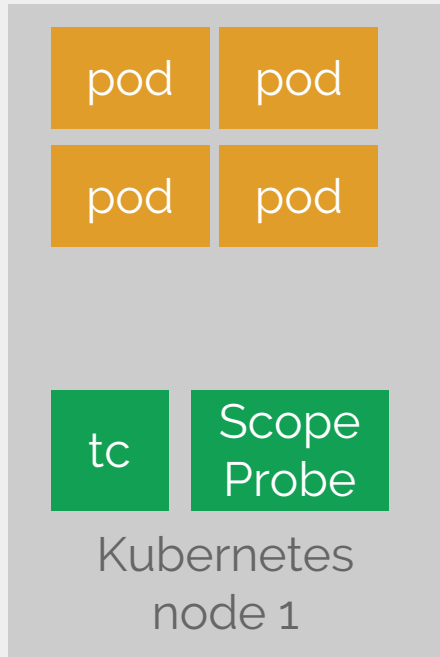
The screenshot displays the Weave Scope web interface. At the top left is the Weave logo and the text "weavescope". To the right is a search bar labeled "SEARCH". Below the search bar are three tabs: "PROCESSES", "CONTAINERS" (which is selected), and "HOSTS". Under the "CONTAINERS" tab, there are three sub-tabs: "BY NAME", "BY DNS NAME", and "BY IMAGE".

The main area shows a network diagram with nodes represented by hexagons. At the top, "The Internet" is connected to "consul swarm-keystone" and "weavedemo_edge-rou... swarm-master". These connect to "weavedemo_front-end... swarm-node-0". This node then branches into "weavedemo_orders_1 swarm-node-1" and "weavedemo_login_1 swarm-master". "weavedemo_orders_1" further branches into "weavedemo_orders-d... swarm-node-0", "weavedemo_cart_1 swarm-node-0", "kickass_poincare swarm-node-1", "happy_wilson swarm-node-1", "condescending_kalam swarm-node-1", "weavedemo_payment swarm-master", "weavedemo_queue-in... swarm-node-1", "weavedemo_shipping swarm-node-1", "weavedemo_account... swarm-node-1", and "weavedemo_rabbitmq... swarm-node-0". "weavedemo_login_1" connects to "weavedemo_catalog... swarm-master". "weavedemo_account... swarm-node-1" connects to "weavedemo_account... swarm-node-0".

At the bottom left, there are filter controls: "24 NODES (9 FILTERED)", "CPU" (with a dropdown arrow) and "Memory", "Networks", "System containers", "Application containers" (selected), "Both", "Stopped containers", "Running containers" (selected), "Both", "Show Uncontained", and "Hide Uncontained".

At the bottom right, there is a status bar: "VERSION 2219266 ON service PLUGINS: n/a" followed by a "PAUSED" button and several icons for refresh, download, code, help, and search.

Testing with Weave Scope



catalogue

[weaveworksdemos/catal...](#) localhost
[catalogue-3448421813-...](#)

INFO

ID: 09105146772a
STATE: Up 14 minutes
COMMAND: /app -port=80







PROCESSES	PID	CPU	MEMORY
/app	4642	0.00 %	2.7 MB

ENVIRONMENT VARIABLES

ACCOUNTS_DB_PORT_27017_TC... 10.30.42
CART_DB_PORT_27017_TCP... tcp://10.30.44:27017
CART_DB_PORT_27017_TCP_POR... 27017
CART_DB_SERVICE_PORT: 27017
CART_SERVICE_HOST: 10.30.43

Demo

The screenshot shows a shopping cart page for 'weaveworks SOCKS'. The navigation bar includes 'HOME', 'CATALOGUE', and 'ACCOUNT', along with a cart icon indicating '4 item(s) in cart'. The breadcrumb trail is 'Home > Shopping cart'. The main content area is titled 'Shopping cart' and contains a table with the following items:

Product	Quantity	Unit price	Discount	Total	
 Cat socks	<input type="text" value="2"/>	\$15.00	\$0.00	\$30.00	
 Colourful	<input type="text" value="1"/>	\$18.00	\$0.00	\$18.00	
 Holy	<input type="text" value="1"/>	\$99.99	\$0.00	\$99.99	
Total				\$147.99	

At the bottom of the cart area are three buttons: 'Continue shopping', 'Update basket', and 'Proceed to checkout'. To the right, the 'Order summary' section provides a breakdown of costs:

Shipping and additional costs are calculated based on the values you have entered.	
Order subtotal	\$147.99
Shipping and handling	\$4.99
Tax	\$0.00
Total	\$152.98

Reproduce the demo yourself: <https://github.com/kinvolk/demo>

Plugins in Scope

- Unix socket in `/var/run/scope/plugins/`
- Protocols: report and control
- Write your own plugins for your testing needs



Testing framework for web apps



Selenium



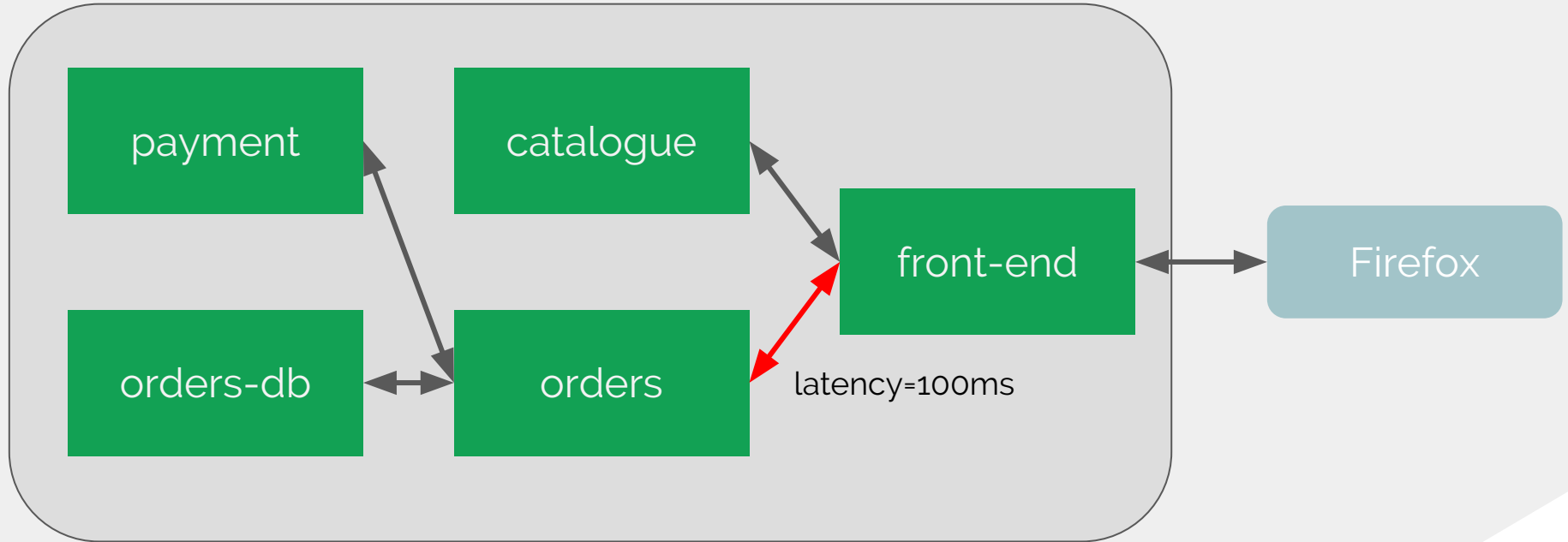
A Golang BDD Testing Framework



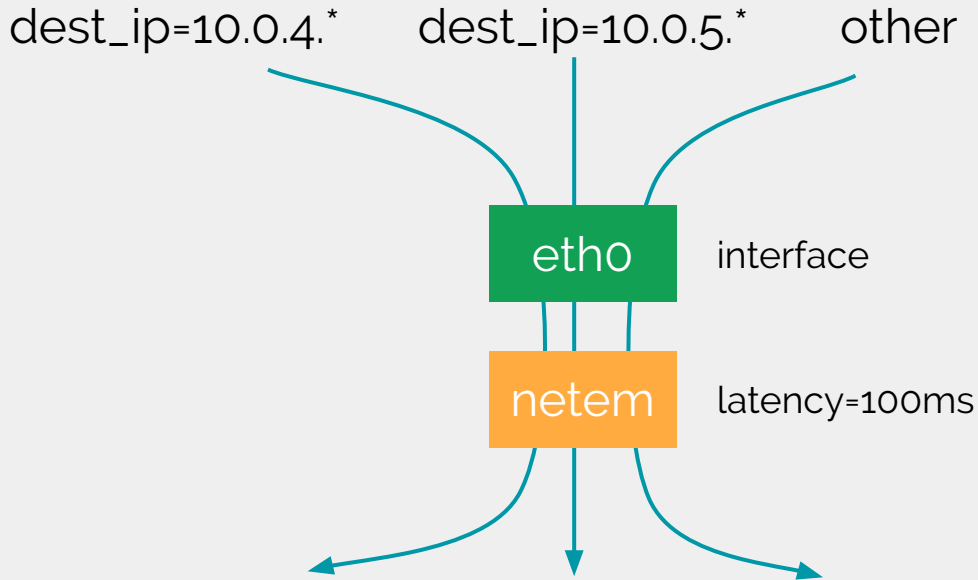
Ginkgo's Preferred Matcher Library

Testing more complex scenarios (my “wishlist”)

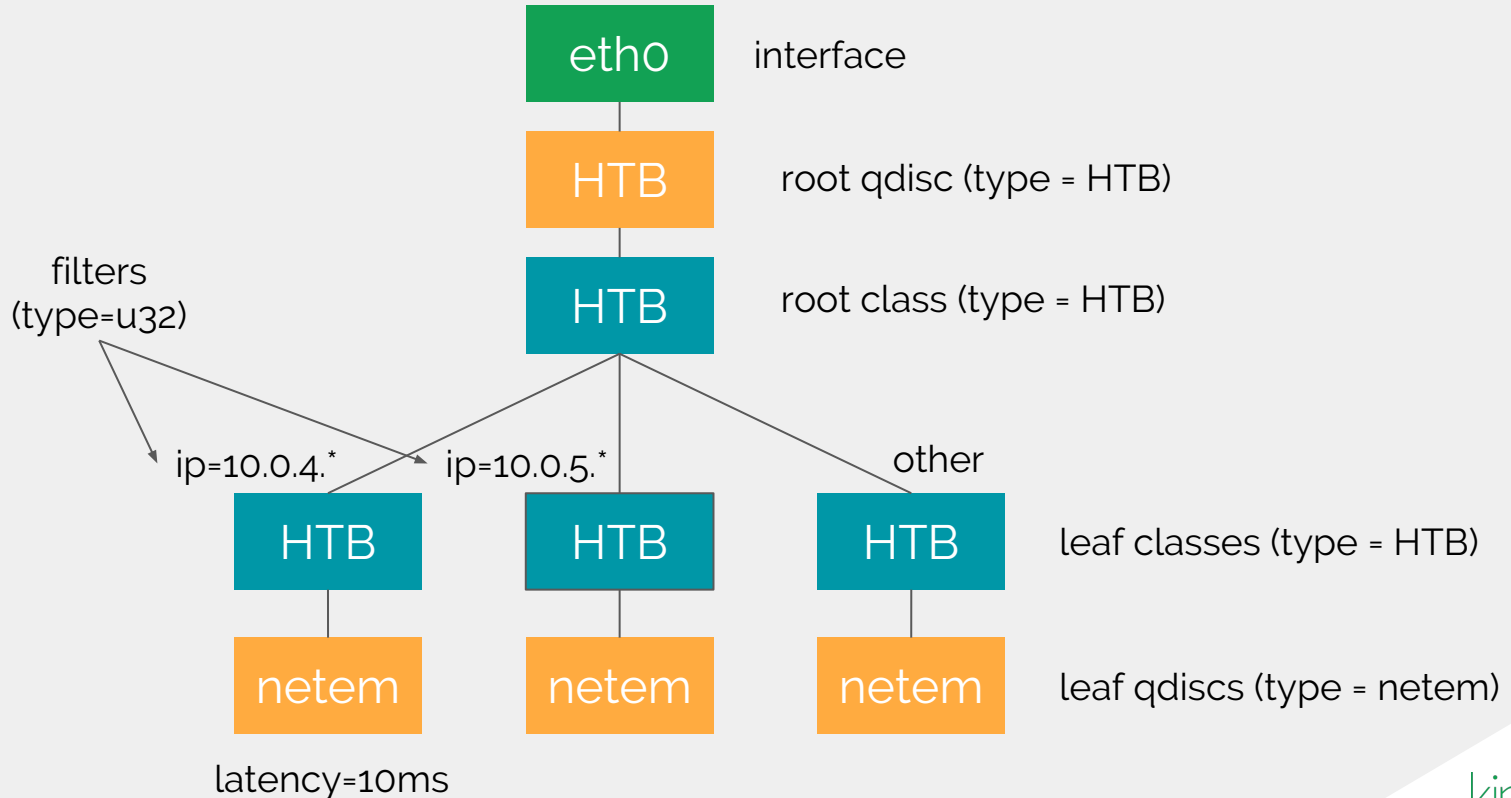
Add latency on a specific connection



How to define classes of traffic



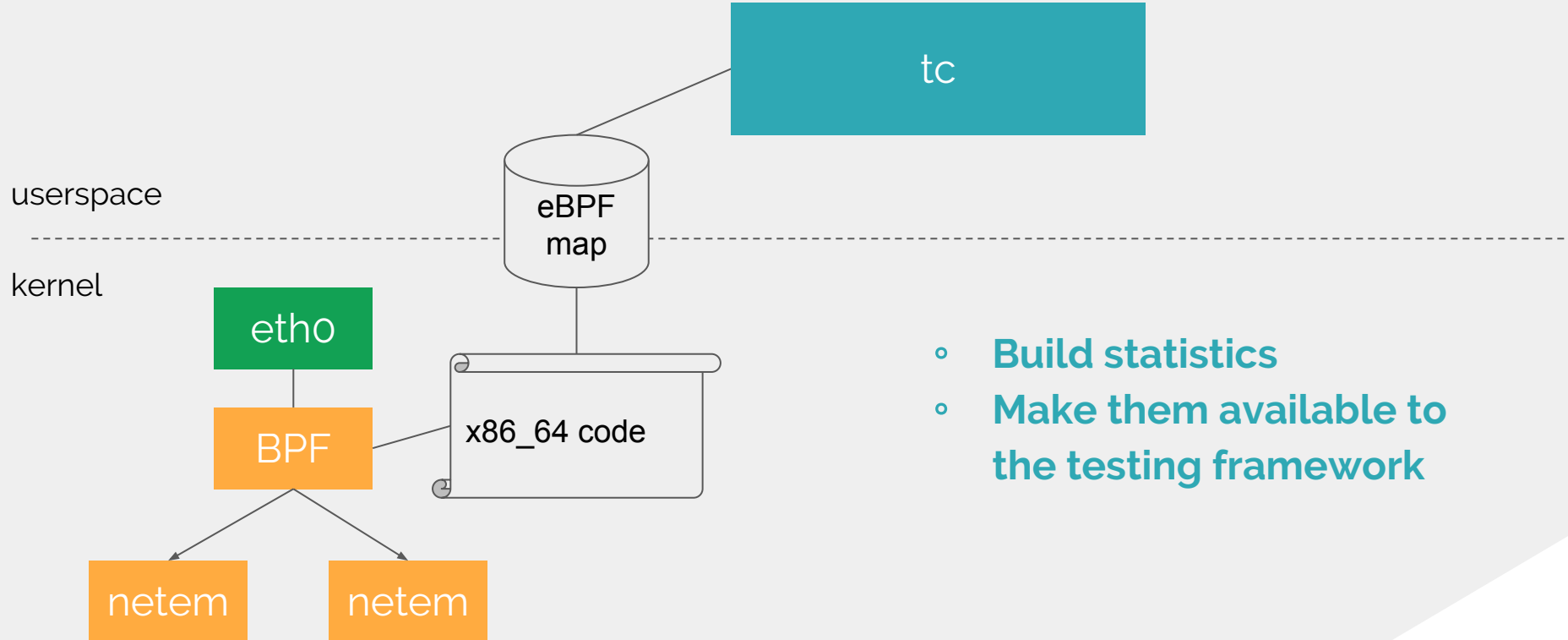
u32: filter on content



Filtering with cBPF/eBPF



eBPF maps



- **Build statistics**
- **Make them available to the testing framework**

The End

Try the demos yourself: <https://github.com/kinvolk/demo>

Read more: <https://kinvolk.io/blog/>

The slides: <https://goo.gl/ZLLlv3>

Questions?