Performance Analysis of Snabbswitch

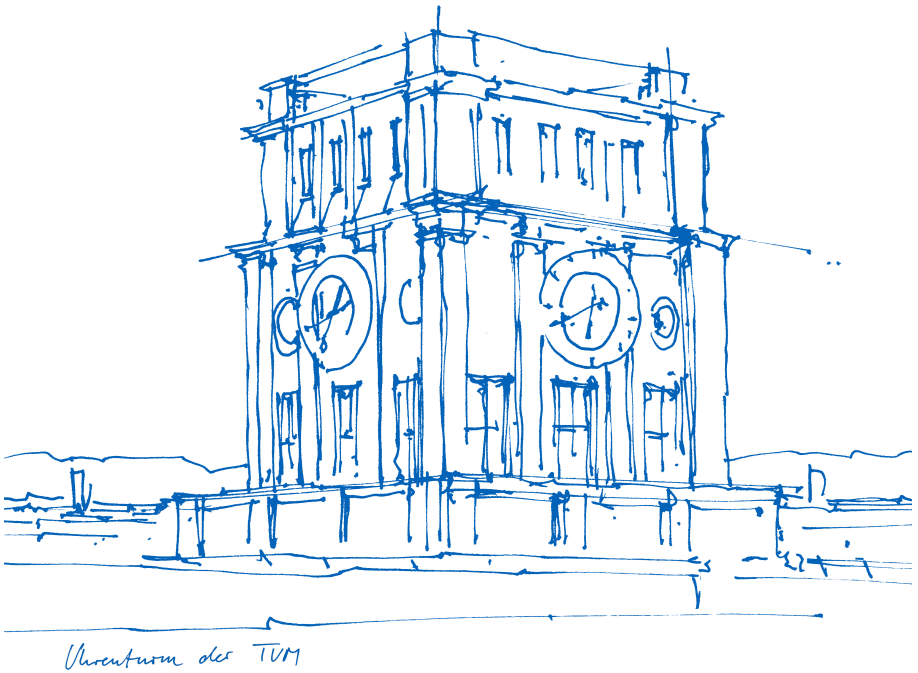
Karthik Mathiazhagan

Chair of Network Architecture and Services

Department Of Informatics

Technical University Of Munich

Munich, 7. Nov 2016



Snabbswitch

- So Far
  - Analysed the basic architecture of Snabbswitch.
  - Simple forwarder Snabbswitch app to forward packets between two interfaces.
  - Analysed the performance characteristic such as throughput, latency and cache events of the forwarder app.
  - Profiling using LuaJIT profiler.

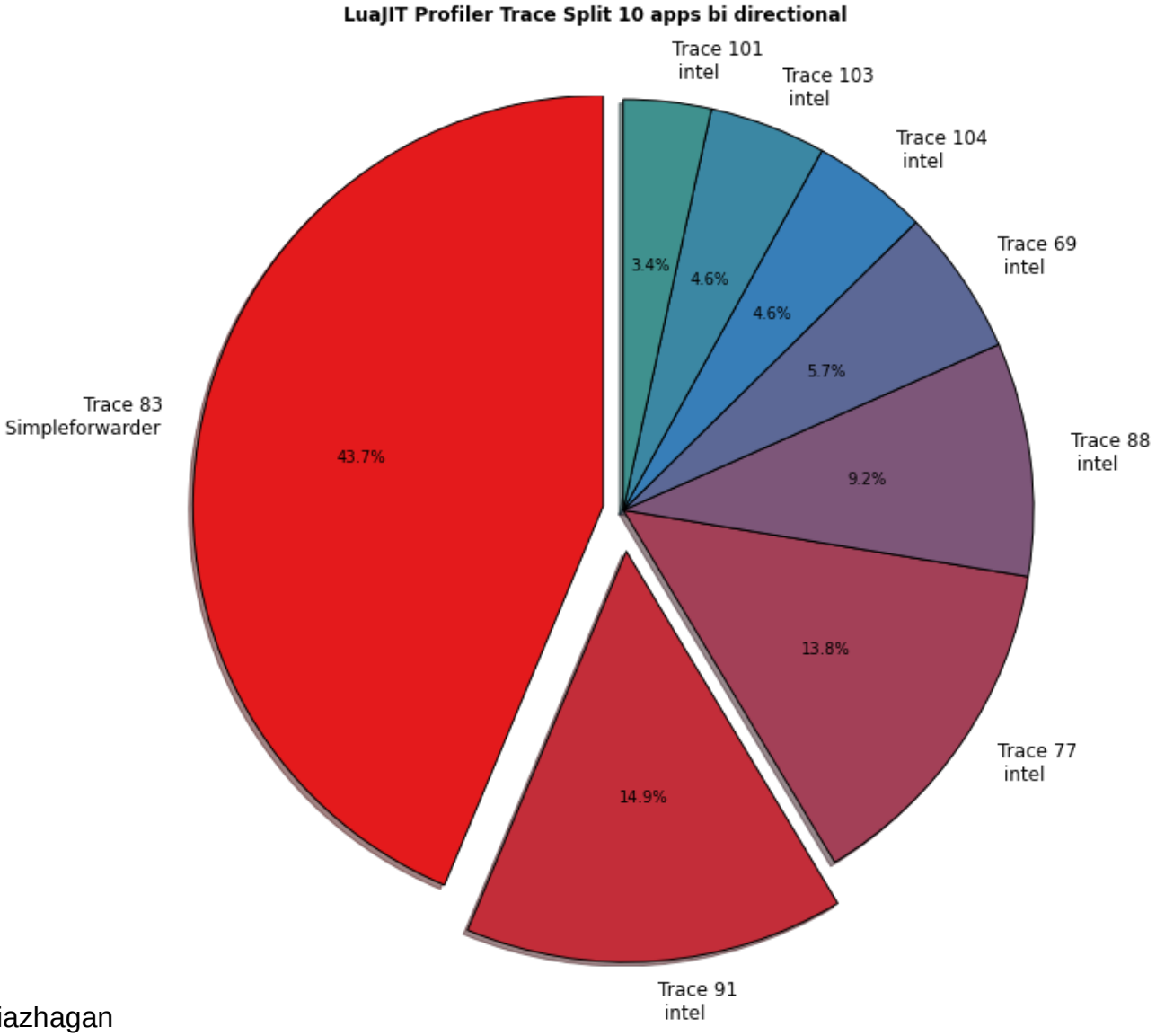
- Overview
  - Tracing LuaJIT profiler for Forwarder app.
  - Lightweight 4over6.
  - Influence of batch pull size.
  - Snabb Network Function Virtualization.
  - VhostUser for QEMU Virtual Machines.

Tracing LuaJIT

- Just-in-time Compilers
  - Just-in-time compilation increases program execution by compiling parts of the program to machine code during run time.
  - Method based JIT compilers.
    - Methods as scope of compilation.
  - Trace based JIT compilers.
    - Sequence of frequently executed instructions (loops) as scope of compilation.

- LuaJIT is a trace based just-in-time compiler for Lua Programming Language.
  - Works on assumption that program execution spends more time on loops.
  - Subsequent execution of loops take the same path.
  - Initially records the frequently executed program sequence. Recording phase.
  - Generates IR machine code which is optimized for the recorded unit of execution.
  - Single loop with no branches.
  - All function call inlined.

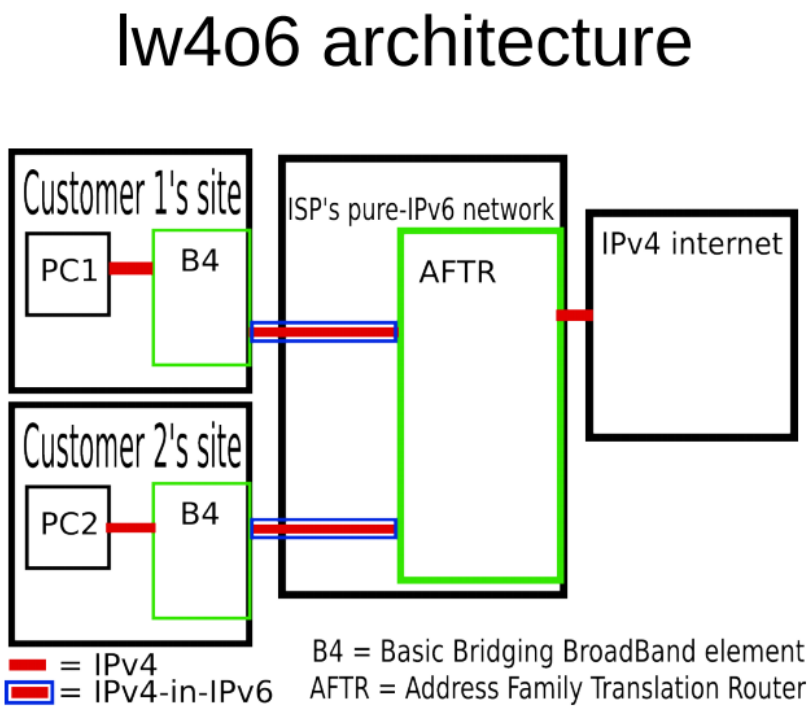
LuaJIT Trace for Forwarder App



Lightweight 4-over-6

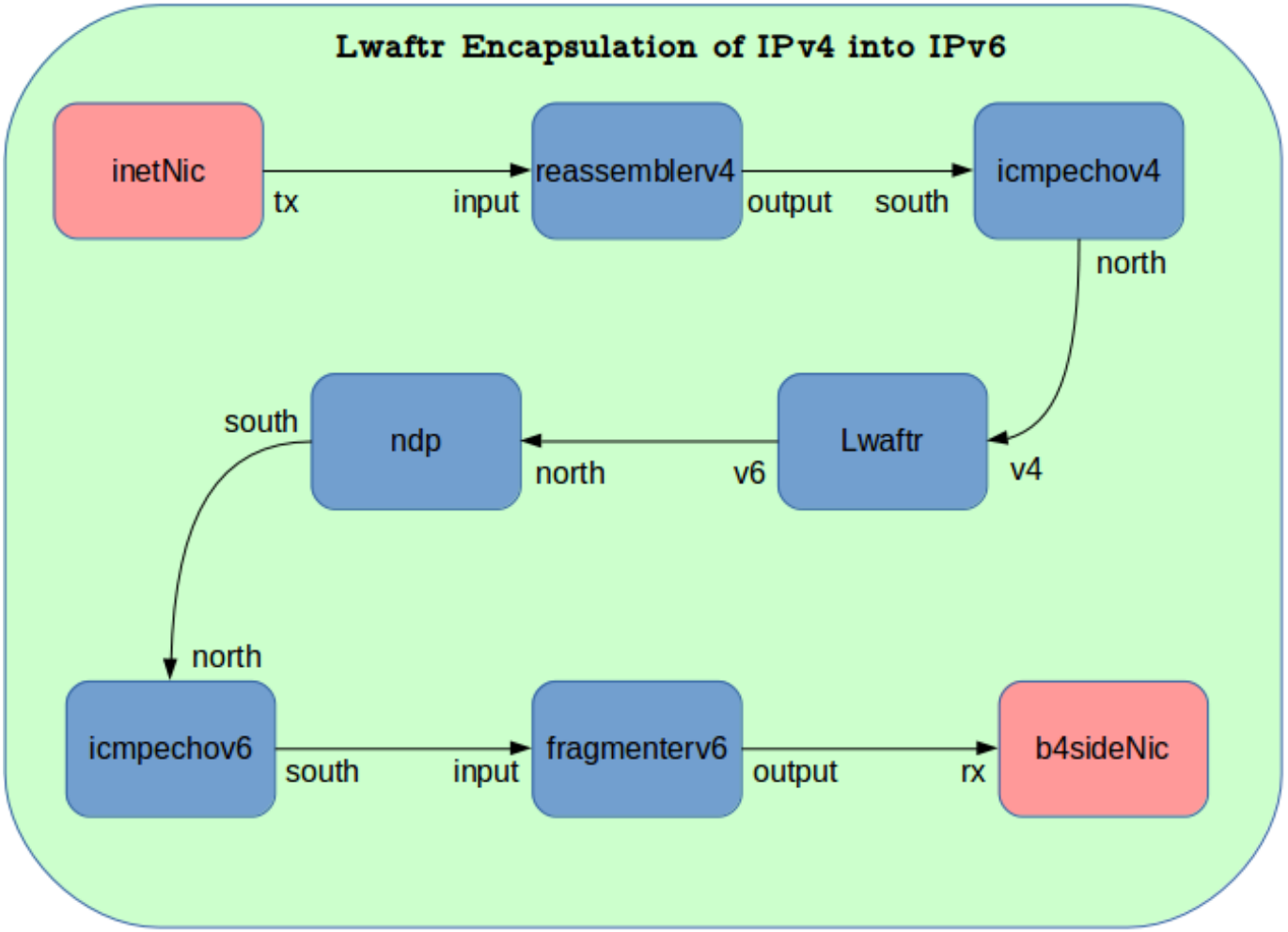
- Lw406 is an Ipv6 transition mechanism.
- Allows network provides to maintain pure Ipv6 network with Ipv4 interoperability.
- Consist of two components.
- LwAFTR
  - Internet facing component.
- LwB4
  - Customer facing component.

- Mapping is done per subscriber instead of per flow basis.
- Each Ipv4 address share a port range.
- Lwaftr maintains a binding table of Ipv4 address, port range and b4 Ipv6 address.



Katerina Barone-Adesi, Andy Wingo, FOSDEM 2016

Encapsulation of Ipv4 into Ipv6



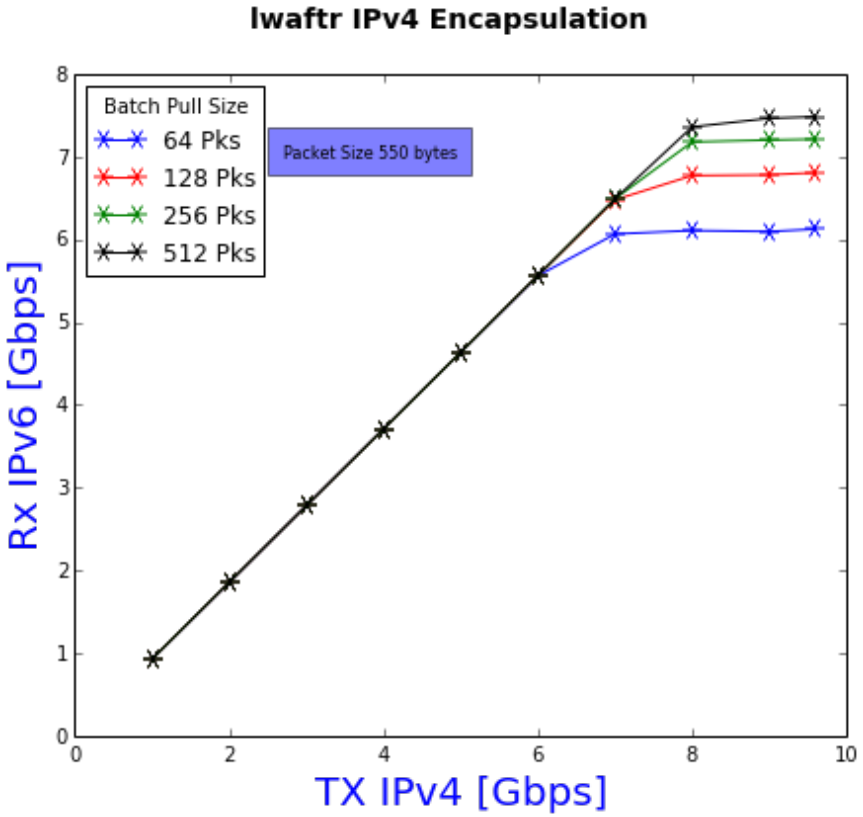
Influence of Batch Size

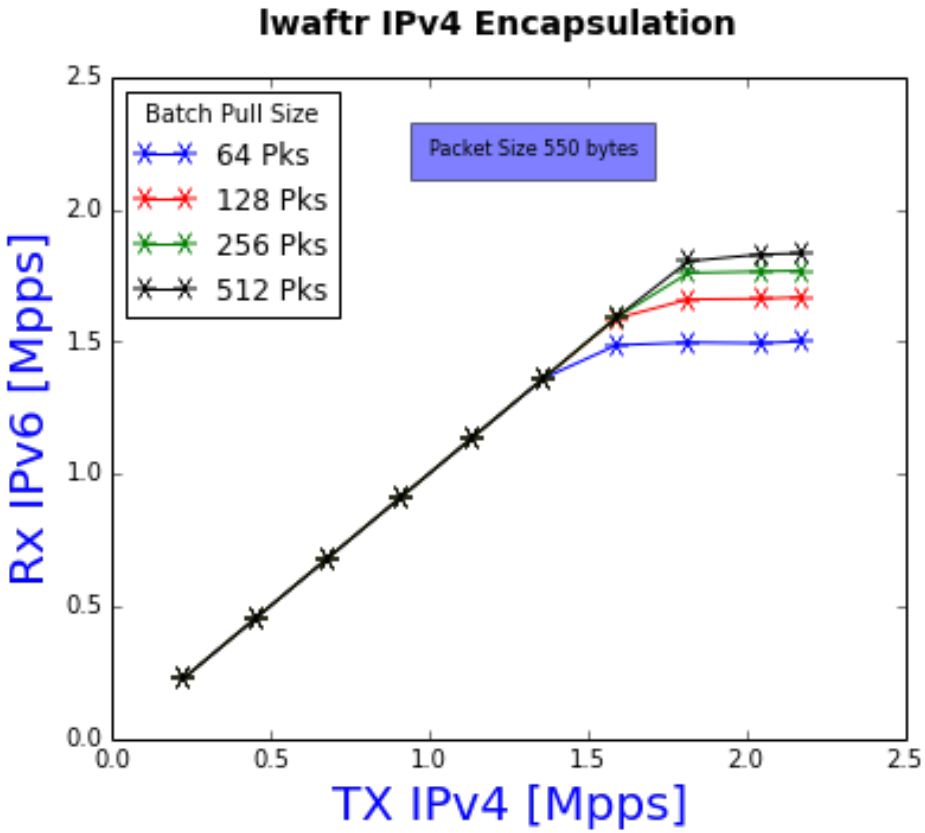
- Breath Cycle of Snabbswitch apps consist of push and pull routines.
  - Pull routines pulls the packet into app network.
  - Push routines pushs the packet from the app network.

- Intel app has fixed batch pull size of 128 packets.
  - Modified Pull routine of Intel app with variable batch size.
  - Could be configure before starting the app engine.
  - Should be less than the link buffer size present between the app network.

```
90  -- Pull in packets from the network and queue them on our 'tx' link.
91  function Intel82599:pull ()
92     local l = self.output.tx
93     if l == nil then return end
94     self.dev:sync_receive()
95     for i=1,pull_size do
96        if full(l) or not self.dev:can_receive() then break end
97        transmit(l, self.dev:receive())
98     end
99     self:add_receive_buffers()
100 end
```

Influence of Batch Size

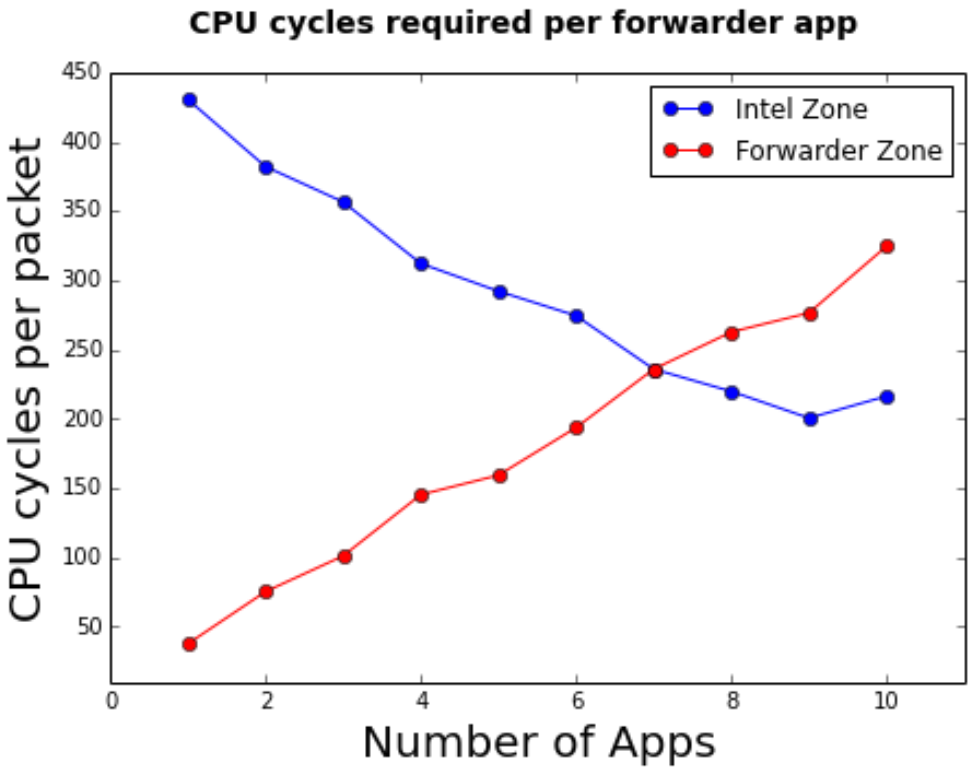




CPU Cycles per packet

- Calculated CPU cycles required for forwarding a single packet.
- Could be useful in determining number of forwarders required in the app chain.
- Multiple forwarders could be combined to a single app.

$$\text{CPU cycle/pkt} = \frac{\text{Observed Throughput}}{\text{CPU cycles per second}}$$

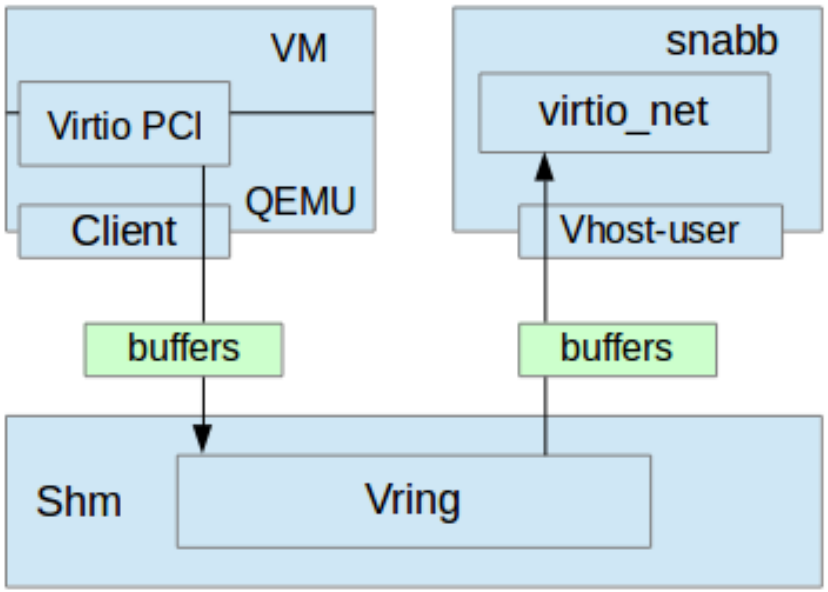


Snabb NFV using vhost-user

- Implements Network Function Virtualization module for Snabb.
- Suitable for QEMU/KVM virtual machines.
- Takes NFV configuration file, PCI address of NIC and socket path and constructs a app network.

```
return {
{ mac_address = "52:54:00:00:00:01",
  port_id = "id1",
},
}
```

- Vhost-User
  - QEMU 2.1 release supports vhost-user.
  - Enables sharing of virtio queues of virtio pci directly with another userspace process.
  - Vhost-user app of Snabb implements the virtio backend drivers.
  - Shared memory enables sharing of file descriptors with Snabb vhost-user.



Thank you

Questions ?