

Overview of other NFV Platforms

netmap, BESS, ClickOS

netmap [Rizzo, ATC 12]

Alternative to DPDK library

- Fast I/O to user-space processes

Key idea: have software data structures cleanly map to hardware data structures

- Avoid excess copies and unnecessary encapsulation
- Amortize system calls through batching

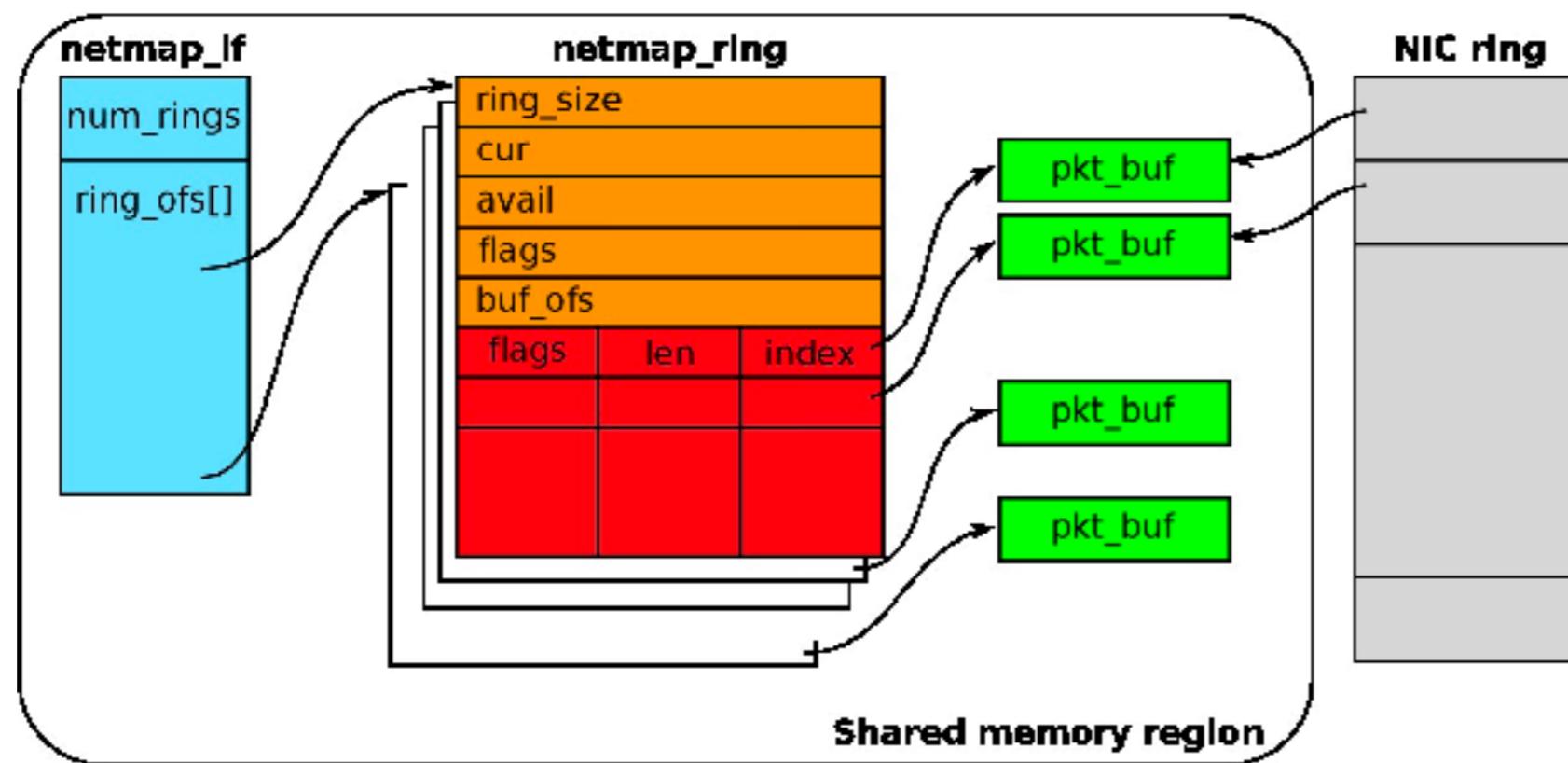


Figure from Luigi
Rizzo netmap talk

netmap [Rizzo, ATC 12]

Initial implementation was in freebsd

- Later ported to Linux

High performance even
on relatively low power
systems

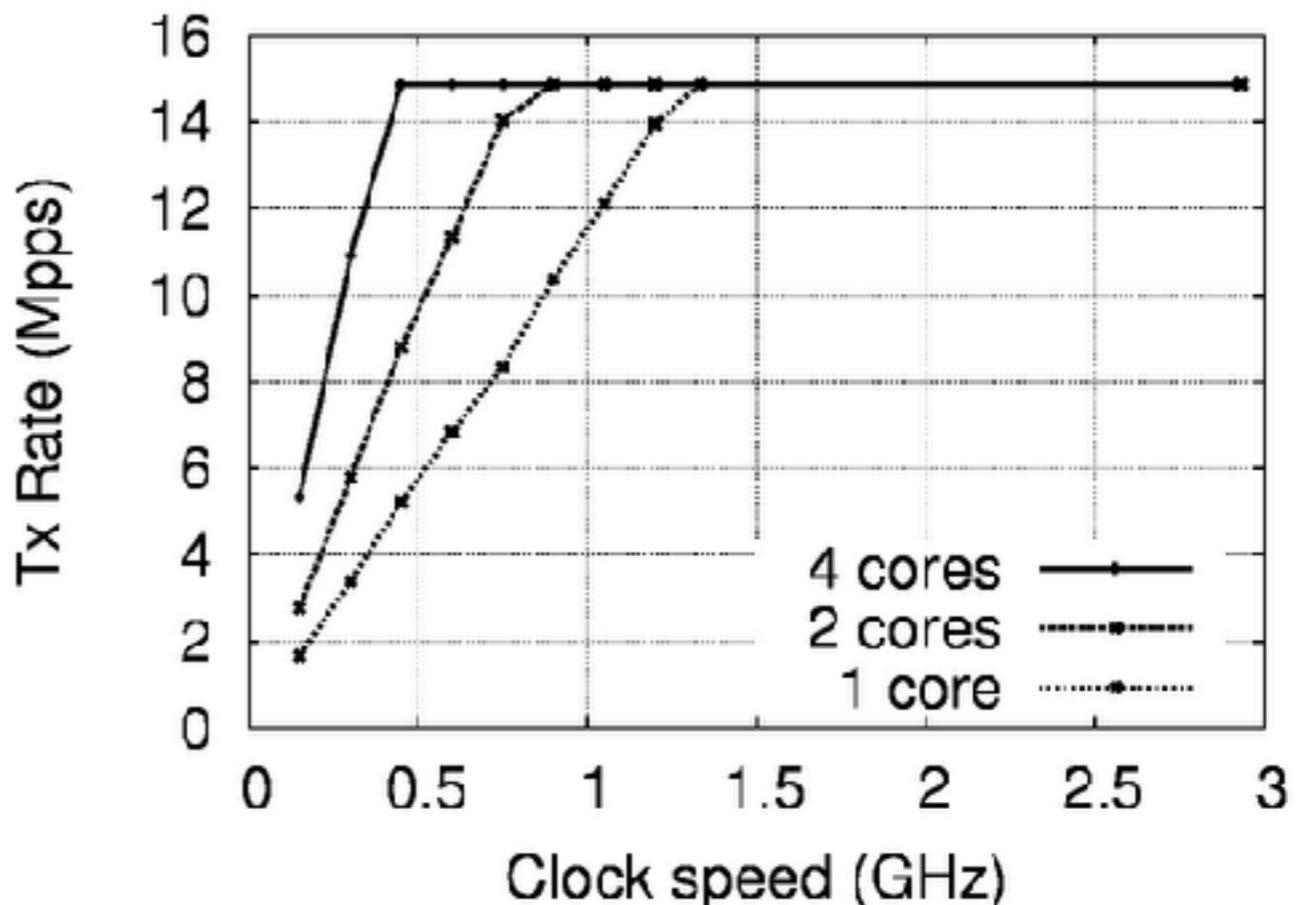


Figure from Luigi
Rizzo netmap talk

BESS [Han, Tech Report '12]

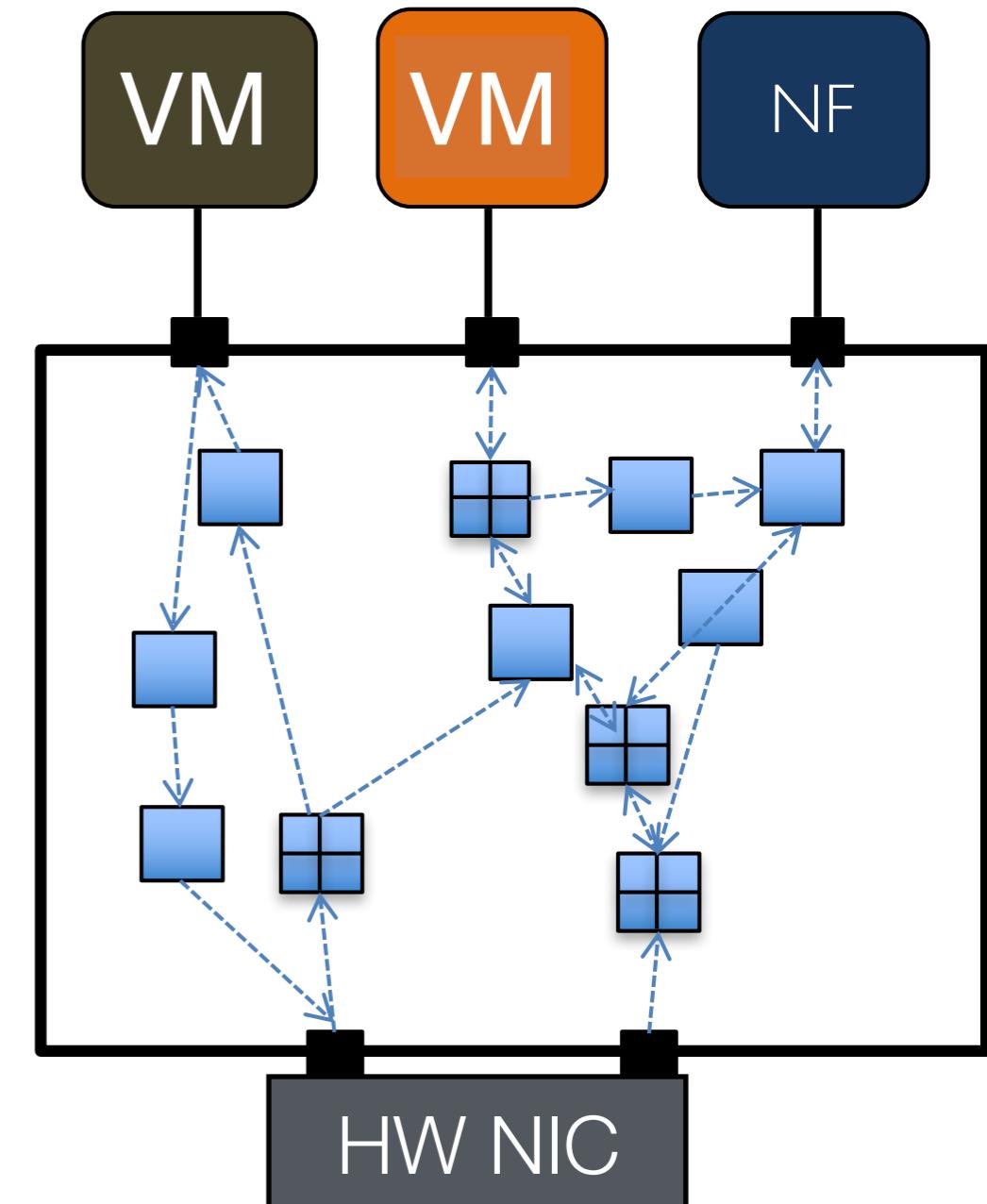
Virtual switch tailored for NFV

- DPDK based

Key Idea: Put programmable functions in switch data plane

Targets light weight functions

All functions run as single process



<https://github.com/netsys/bess>

Figure from BESS talk by Sangjin Han

BESS [Han, Tech Report '12]

User-level resource management

- Customizable scheduling and resource allocation
- Can set priority, bandwidth rates, or CPU limits

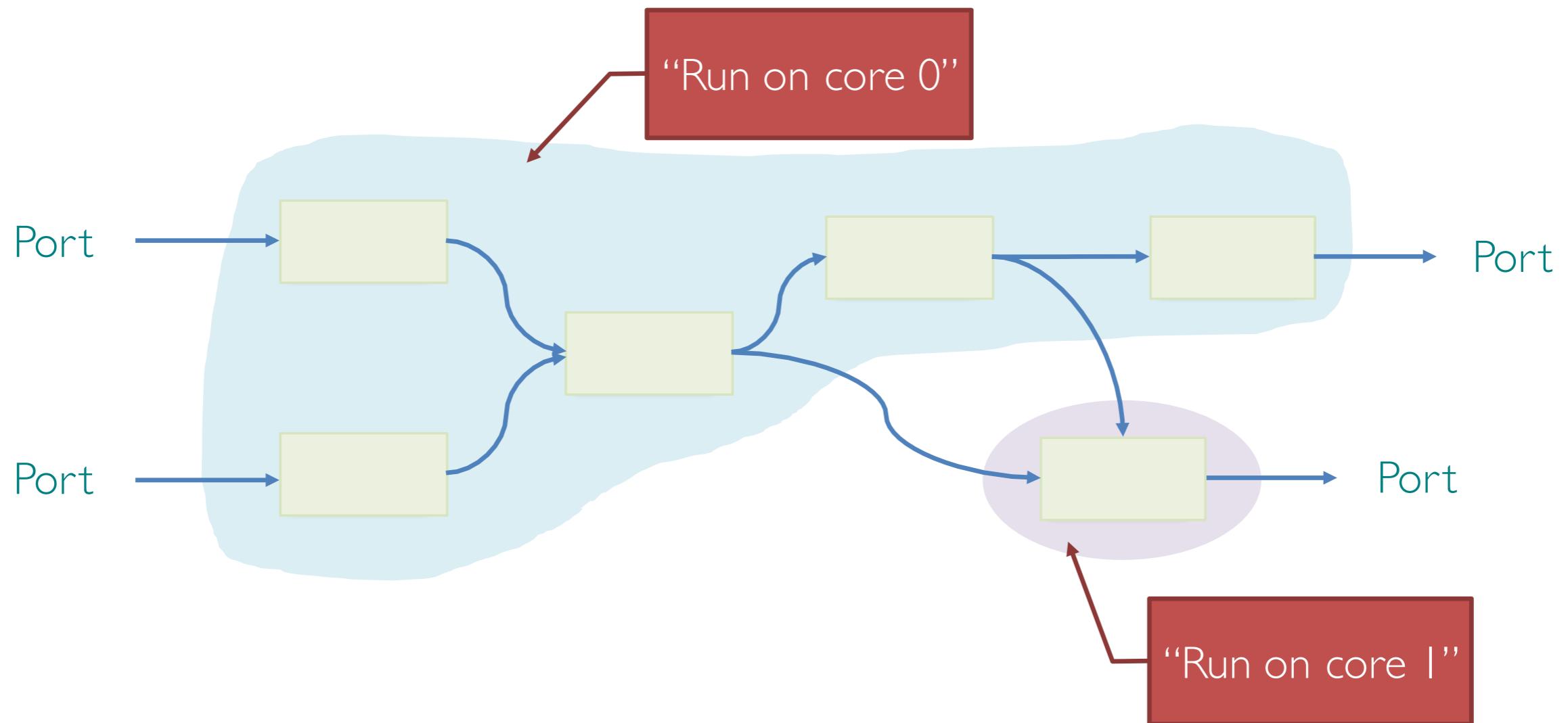
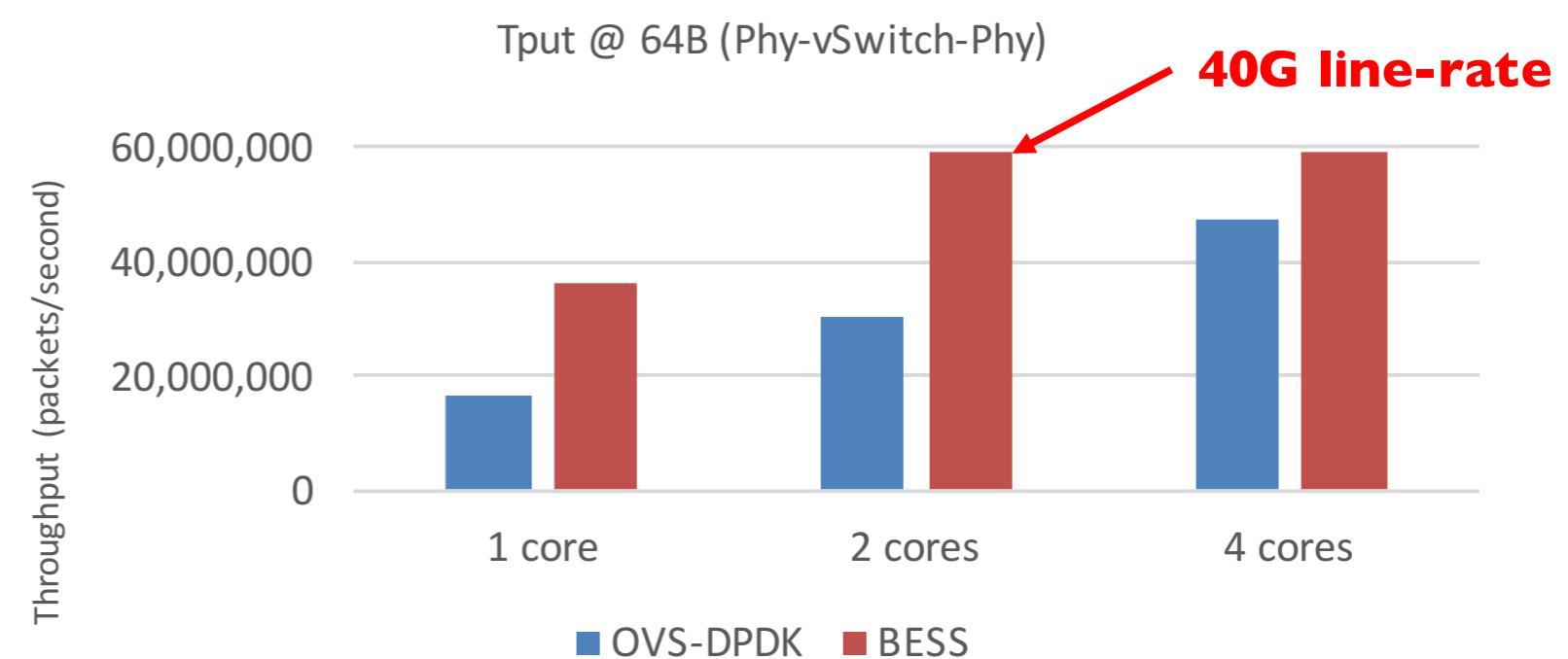
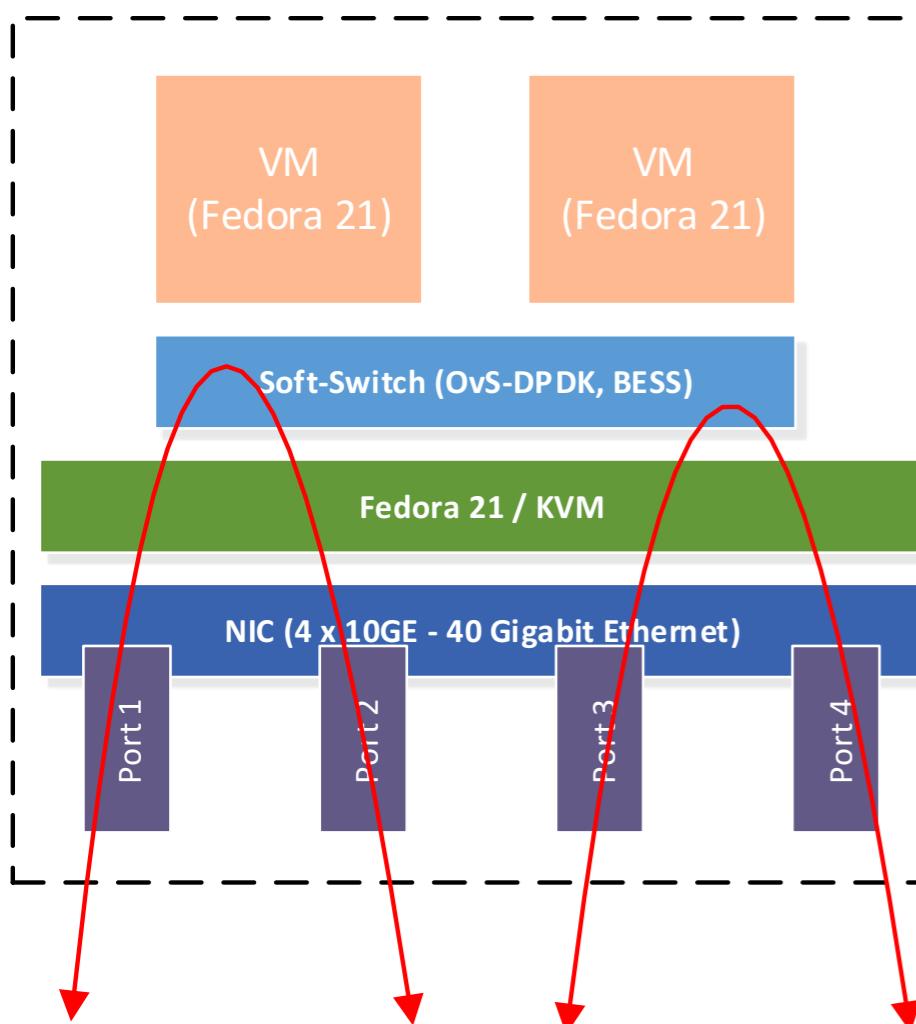


Figure from BESS talk by Sangjin Han

BESS [Han, Tech Report '12]

Provides better performance than OVS-DPDK

- Also good at chains since each NF is a function call

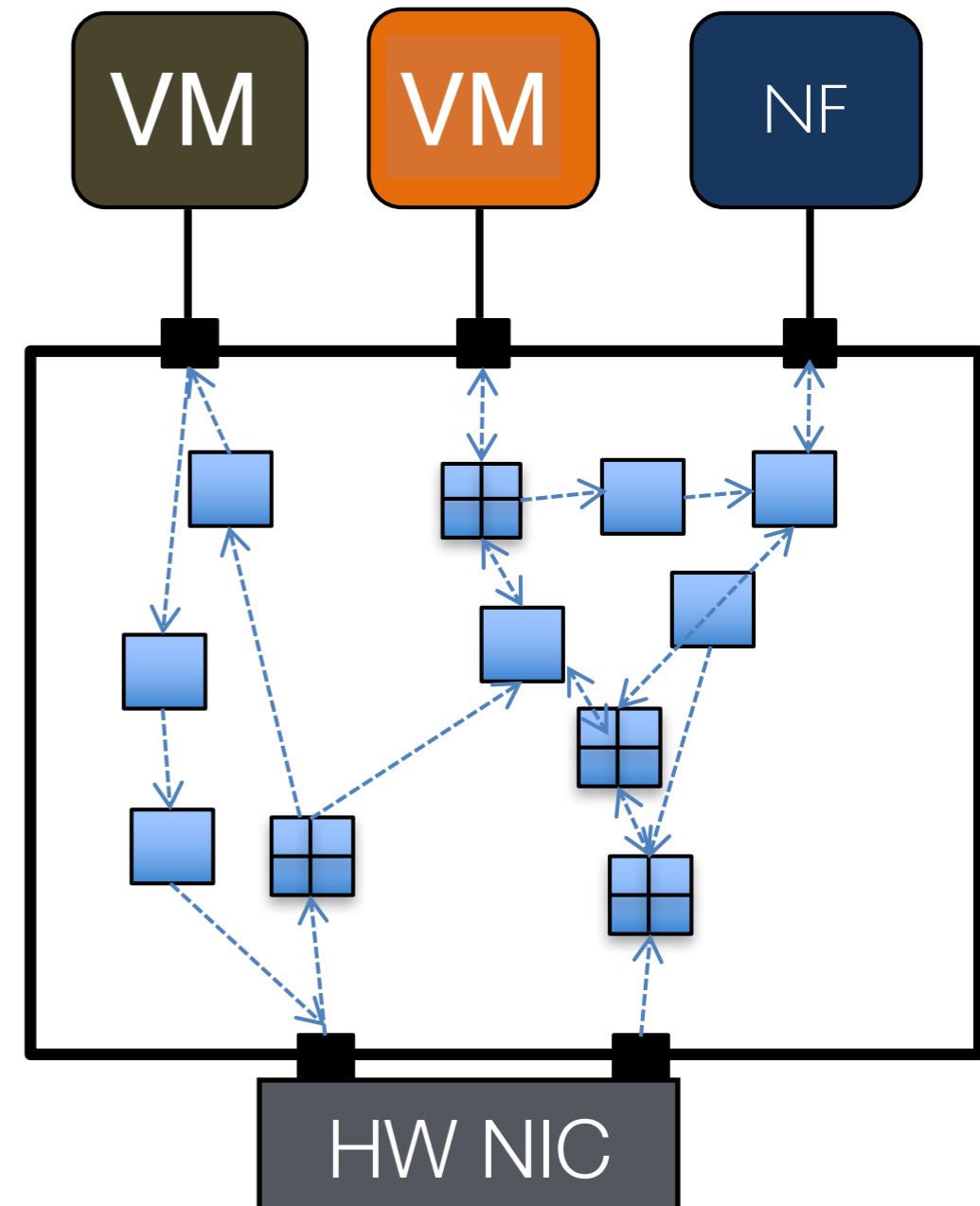


BESS Limitations

Function-call based model
is limited in some scenarios

No security/fault isolation
between functions

Performance isolation may
be compromised if function
is greedy/biggy (no preemption)



E2 [Palkar, SOSP '15]

Control framework for BESS

- Placement, scaling, and migration

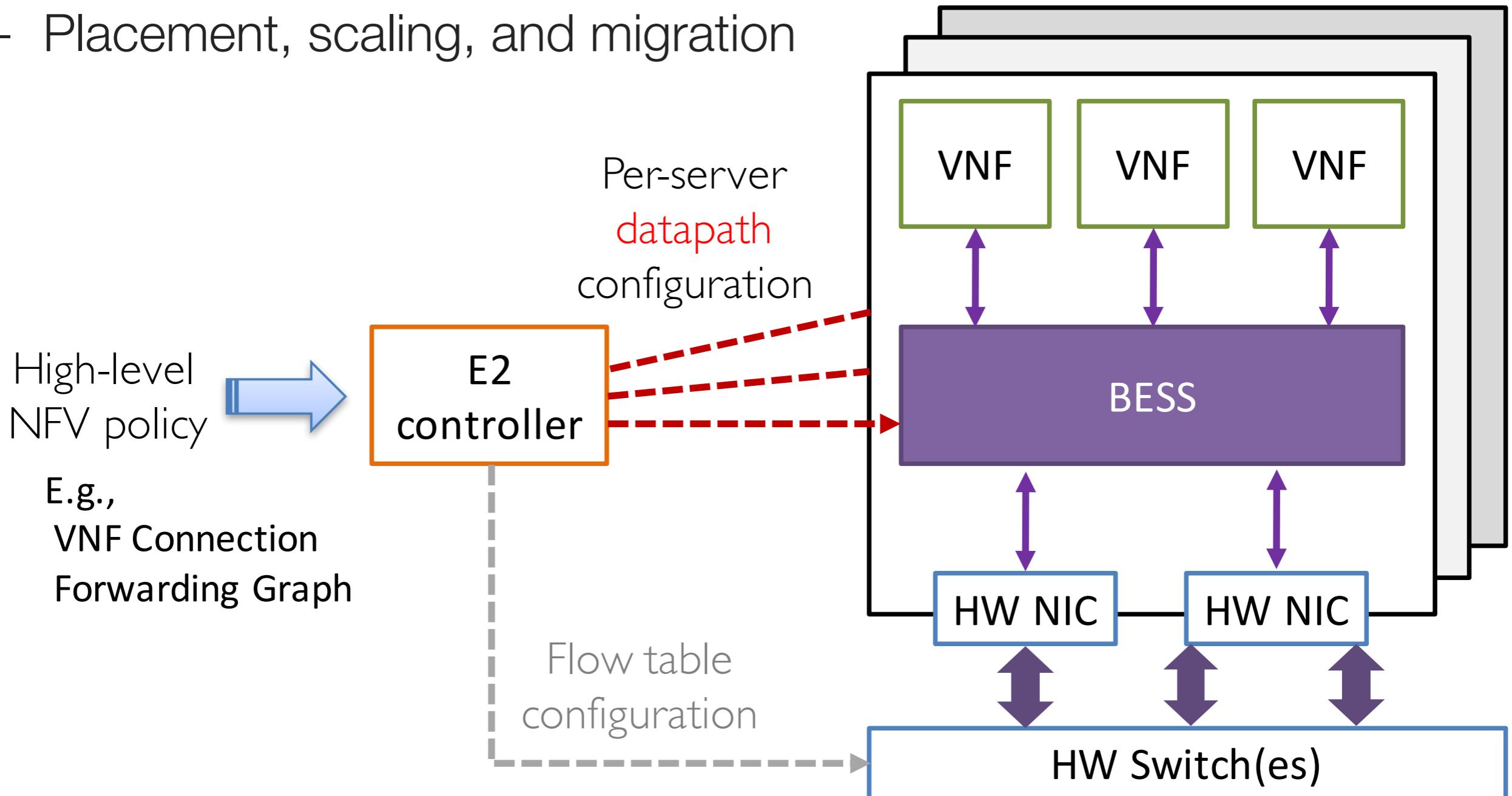


Figure from BESS talk by Sangjin Han

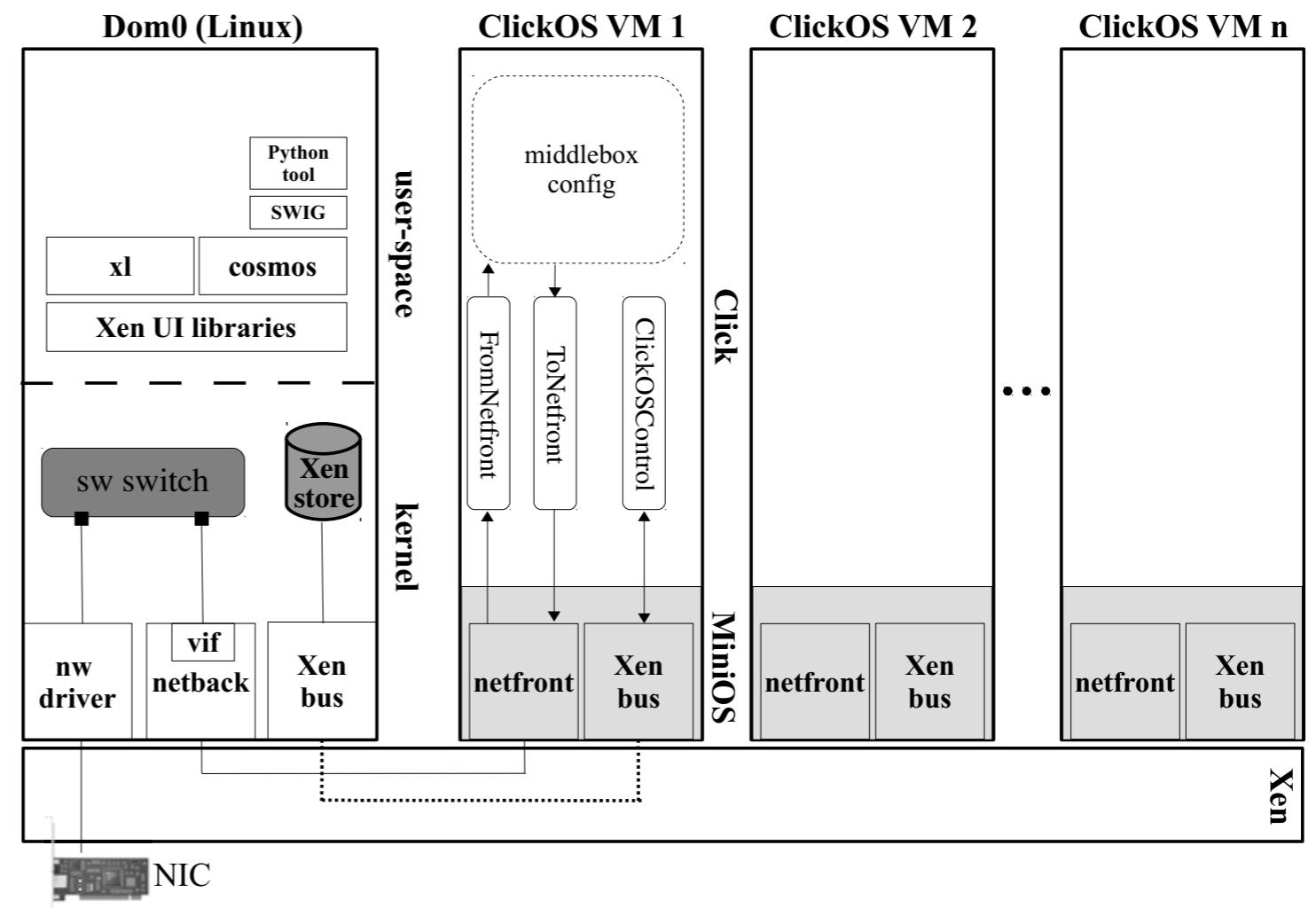
ClickOS [Martins, NSDI '14]

uKernel VM-based NFs

- Strong isolation, fast startup
- Boot in 30 milliseconds, run > 100 per host
- Uses Click framework to program NFs [Kohler XXX]

Key Idea: Customized minimal OS designed only to run network functions

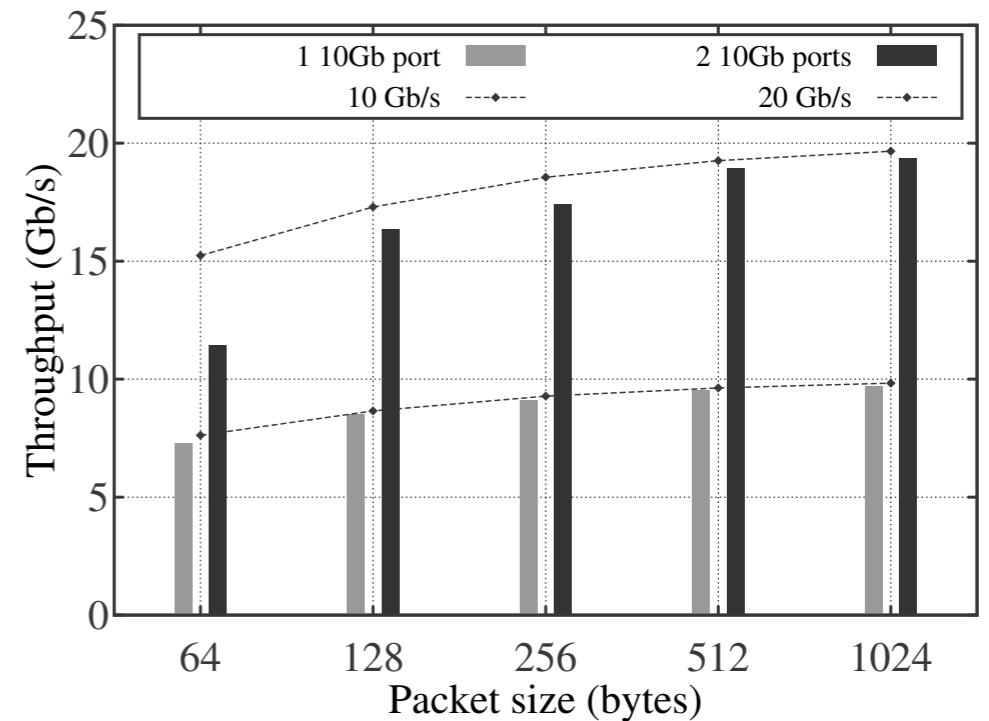
Optimize Xen platform for efficient I/O



ClickOS [Martins, NSDI '14]

Performance

- 10Gbps for medium packets
- Some VM switch overheads



Fast boot

- Optimized Xen boot path
- Lightweight ukernel OS
- <30 ms and scales better than standard VMs

