

Multi-Tenant Data Center Experiment on PRAGMA-ENT

Kyuho Jeong (UF)
Kohei Ichikawa (NAIST)
Renato Figueiredo (UF)

Introduction

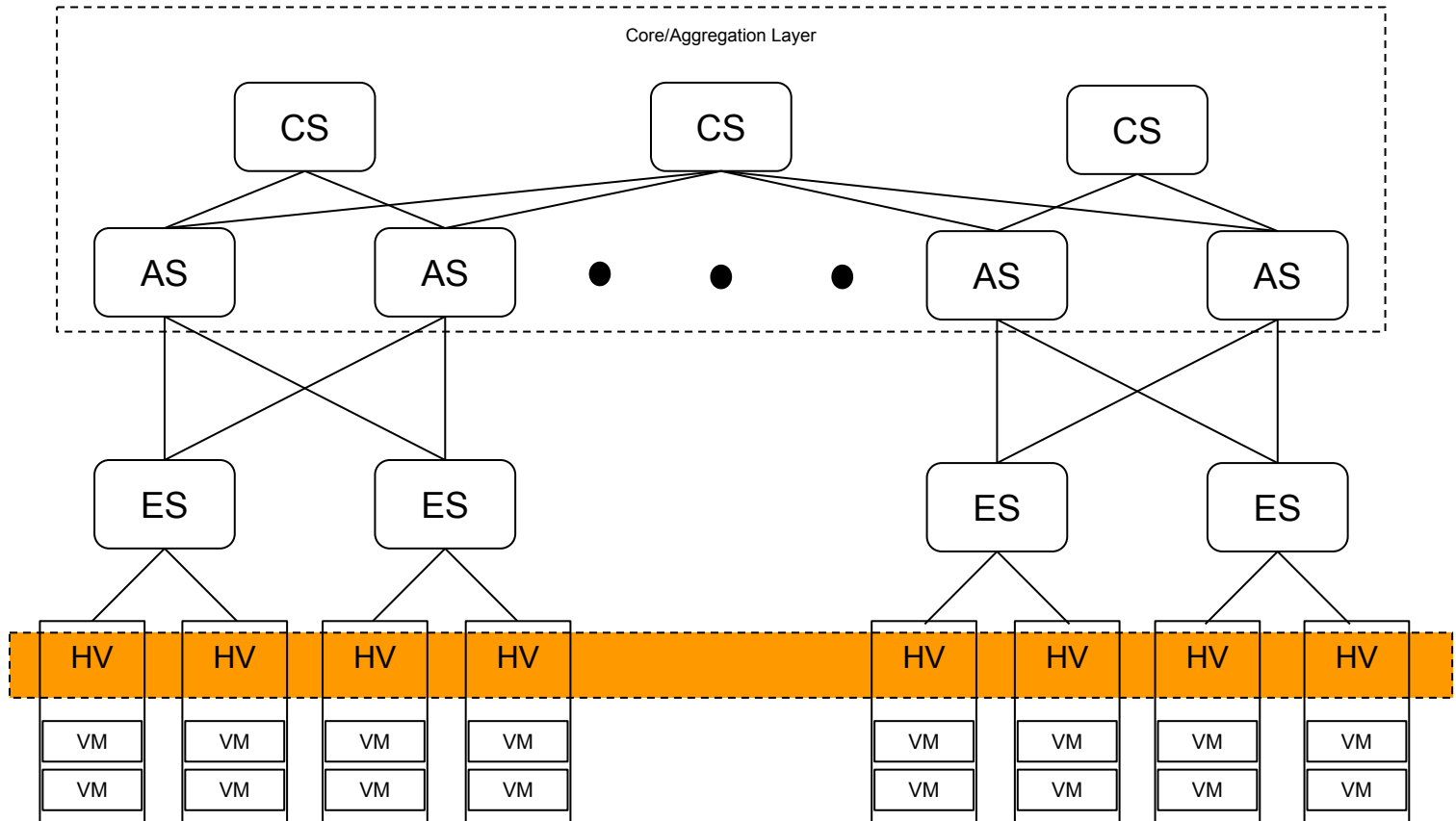
Software Defined Network (SDN)

- Programmable Network Layer 2-4 (Data plane) through Controller (Control plane)
- Enable federation of multiple switches through control plane
- Allow packet rewriting of MAC or IP address

Multi-Tenant Data Center (MTDC) Architecture for Cloud

- Virtual connection between separated virtual machines (VM)
- Multiple isolated address spaces, managed by tenants
- Managing and isolating overlapping address spaces
- Support for VM migration for flexible provisioning
- Decoupling of large number of virtual network topologies from physical network topology

Multi-Tenant Data Center Architecture (MTDC)



CS = Core Switch, AS = Aggregate Switch, ES = Edge Switch, HV = Hypervisor, VM = Virtual Machines

Location of typical MTDC network virtualization process

Typical Multi-Tenancy Data Center

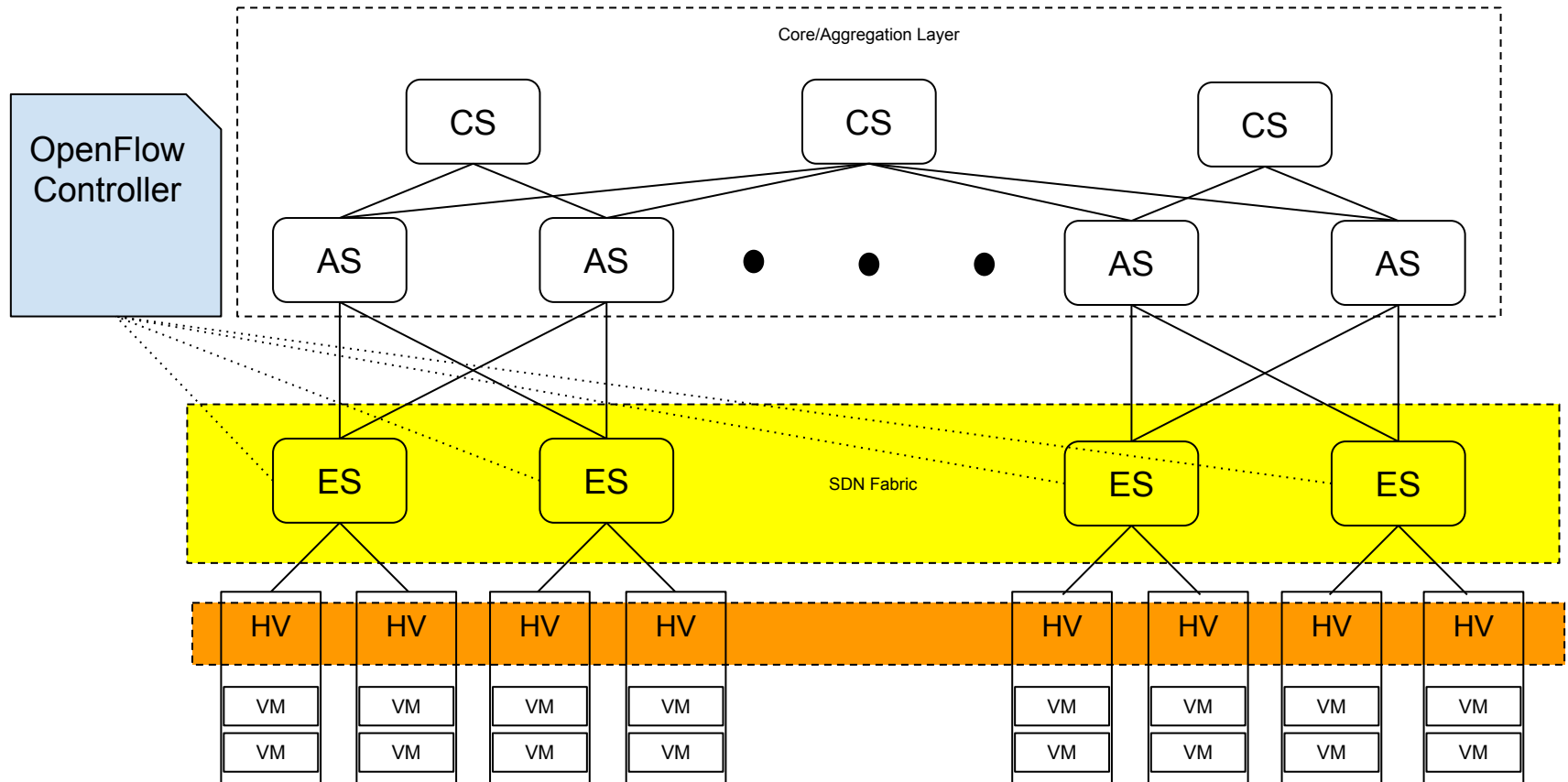
Run a proxy at hypervisor, Top of Rack or inside O/S network stack

Use one of Encapsulating (Tunneling) protocols

- GRE, VXLAN, NVGRE or IPinIP ...

→ Current MTDC architectures incur computation overhead (due to encapsulation) at edge hypervisors

PACket REwriting on SDN (PARES)



CS = Core Switch, AS = Aggregate Switch, ES = Edge Switch, HV = Hypervisor, VM = Virtual Machines

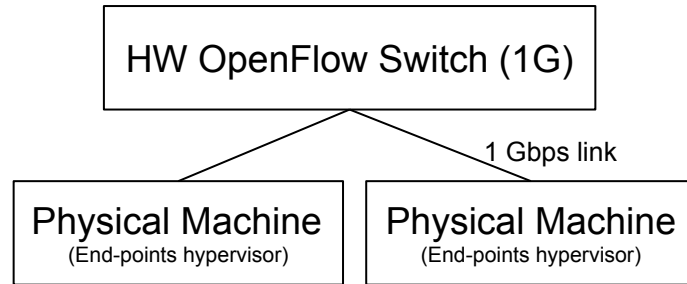
Location of PARES network virtualization process

Location of typical MTDC network virtualization process

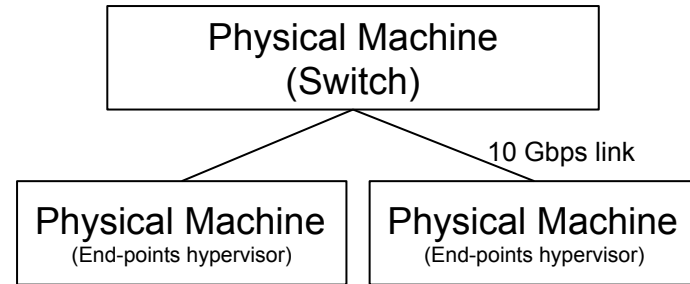
PACket REwriting on SDN (PARES)

- MTDC Architecture with SDN edge switches
- SDN controller implementation for multi-tenancy
- Offloads these encapsulation overheads from edge servers (hypervisors, O/Ss) to the “edge” SDN devices using SDN features such as packet rewriting

Testbed



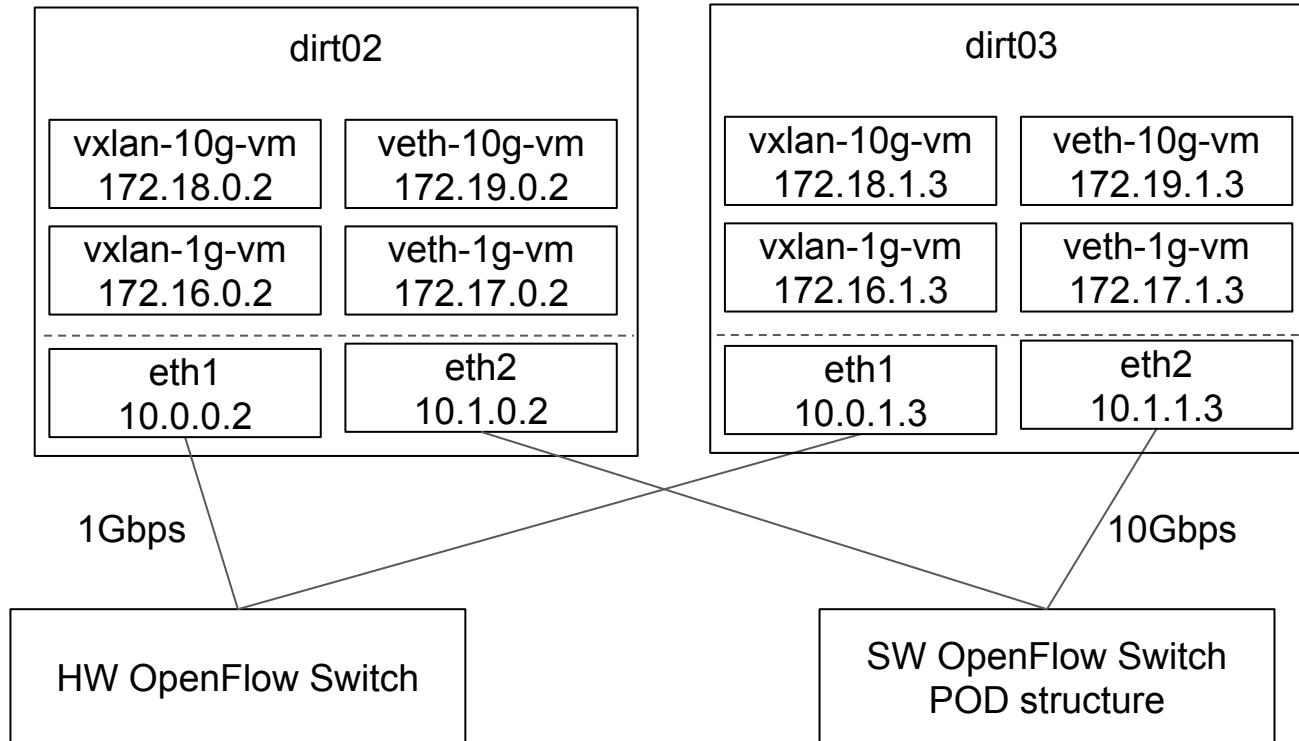
(a) Hardware OpenFlow Test



(b) 10 Gbps Line Test

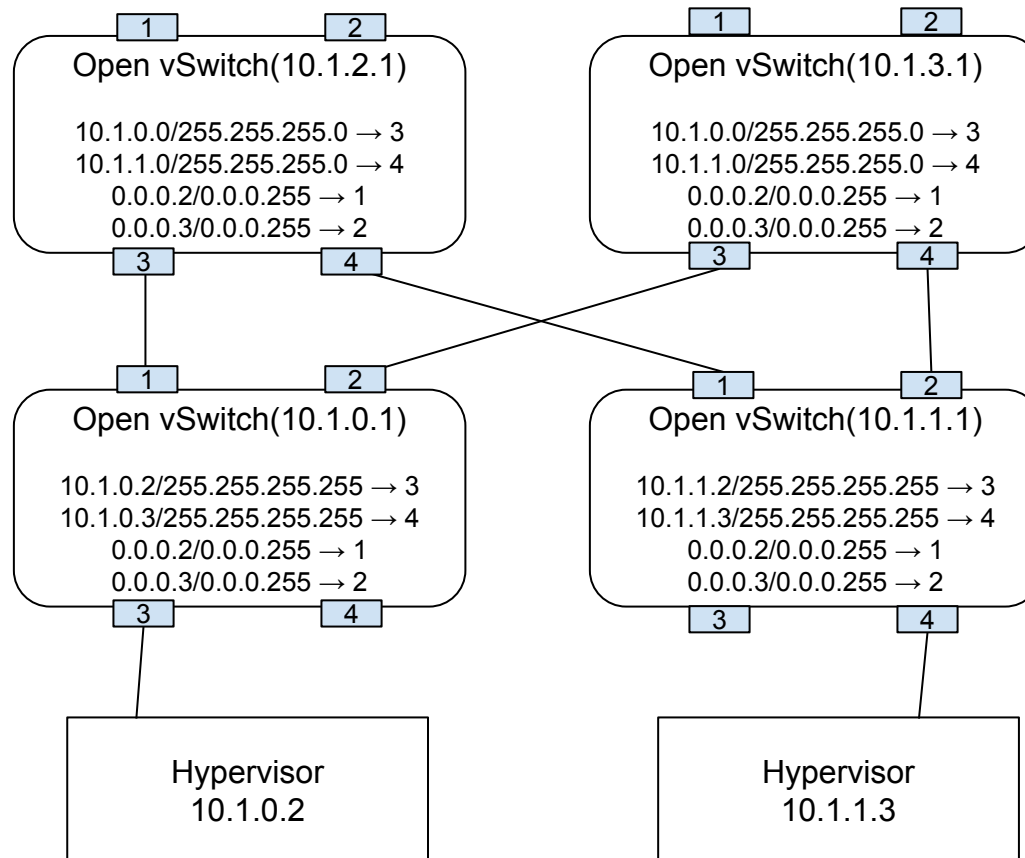
- PRAMA-ENT as testbed
- VXLAN as reference comparison to PARES
 - Encapsulation at hypervisor
 - VXLAN protocol designed specifically for Multi-tenancy

Demo



Comparison of throughput and CPU profile between VXLAN and PARES

10 Gbps SDN Testbed



Conclusion

Achieved line rate network virtualization of multi-tenancy

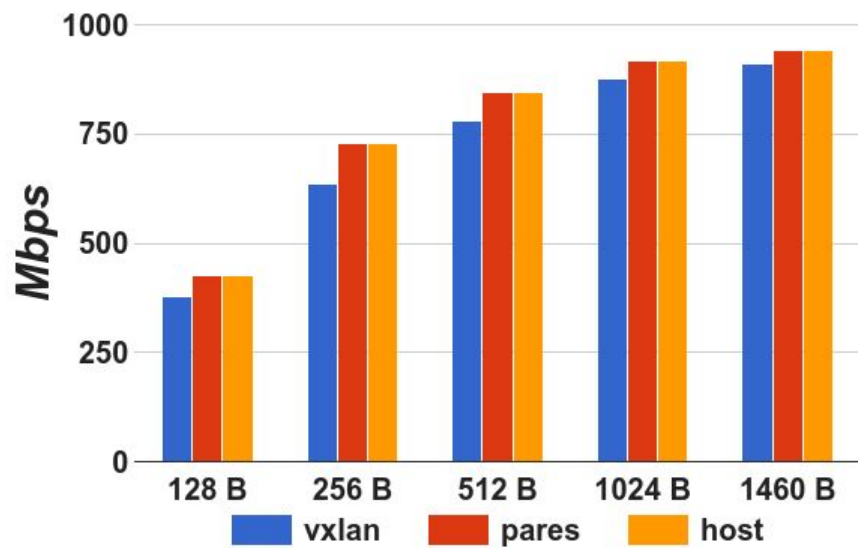
Reduced computation overhead from hypervisor

Future Work

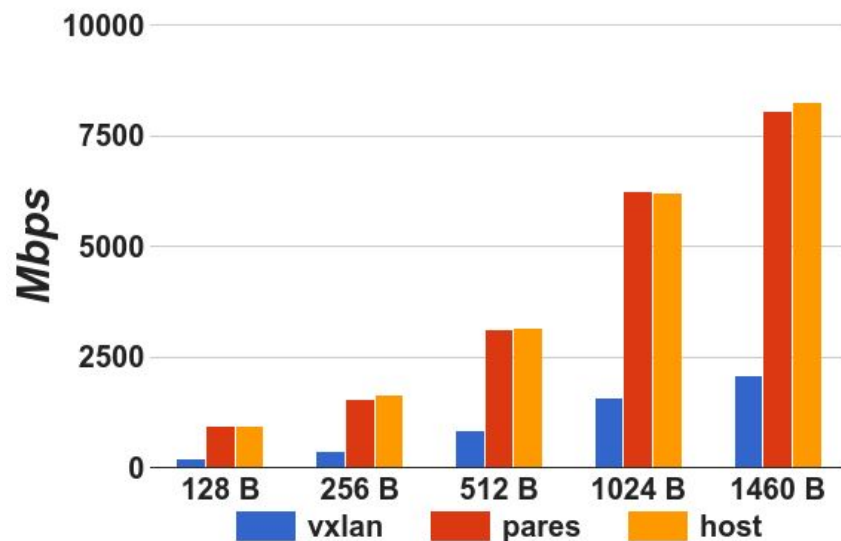
Scalability test

Full-fledged data center solution

TCP Throughput



testbed 1



testbed 2

CPU Profile

