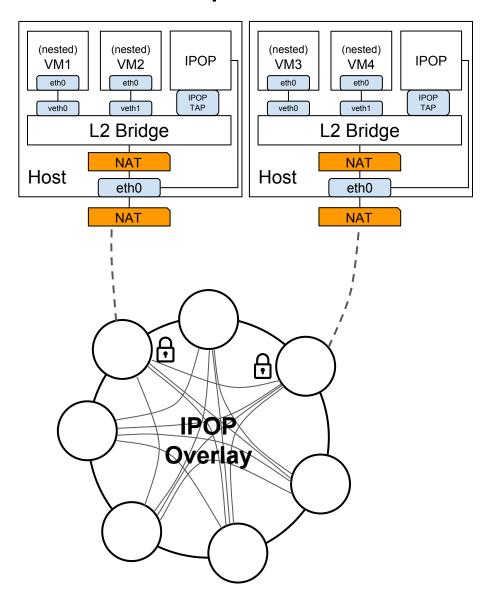
Overlay and SDN Hybrid for Seamless High Performance Virtual Network

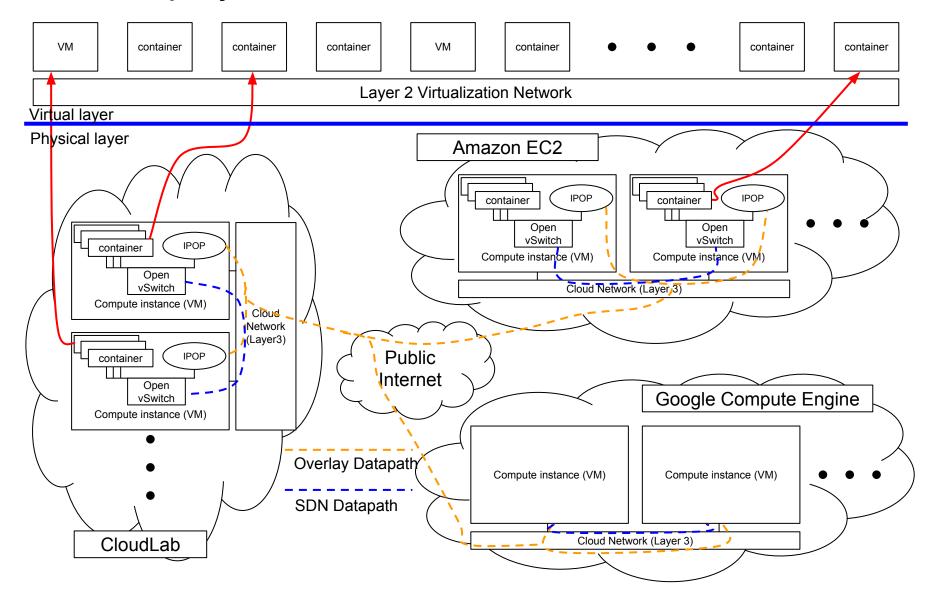
Kyuho Jeong (UF) Kohei Ichikawa (NAIST) Renato Figueiredo (UF)

IPOP Recap



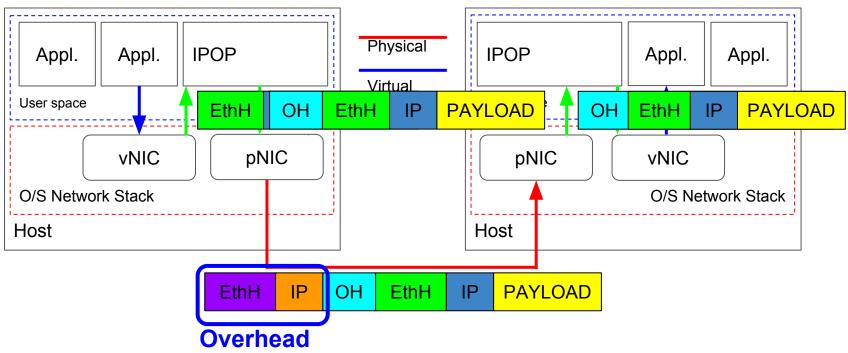
- Create direct P2P virtual tunnel across multiple NAT/Firewall using ICE protocol
- Each virtual tunnel is mapped to either MAC or IP address
- Tap device to interface with O/S network stack
- Packets are encapsulated by IP/UDP header.
- Runs in application layer
- N2N Encryption (DTLS)

IPOP Deployment across Internet



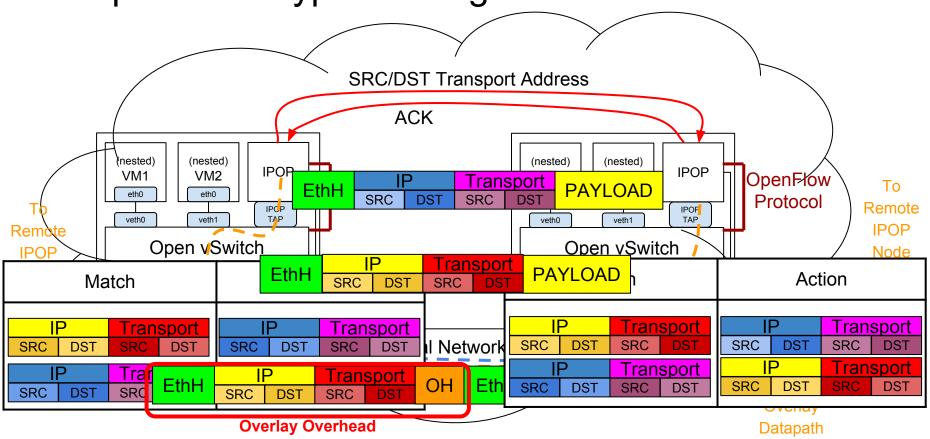
Conventional IPOP (Encapsulation)

From the end-point encapsulation in application/kernel (Overlay Network)



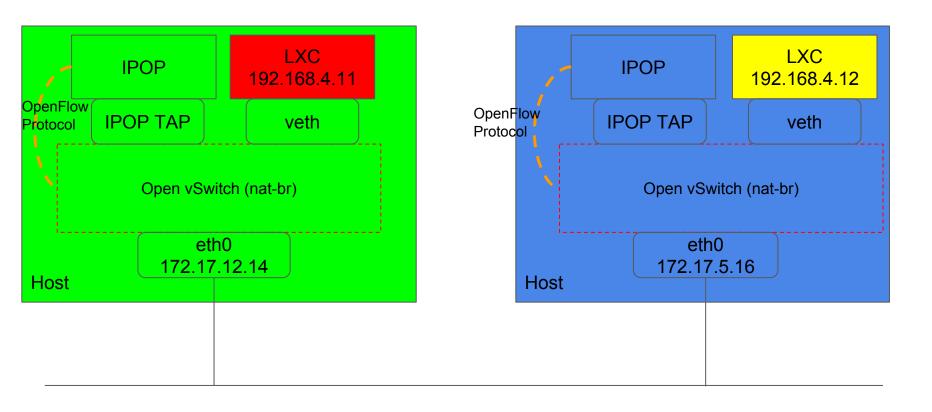
- Overheads
 - Increased header → Reduced MTU and payload
 - Encapsulation process
 - Possible Context Switching between kernel/userspace

Encapsulation bypass using SDN



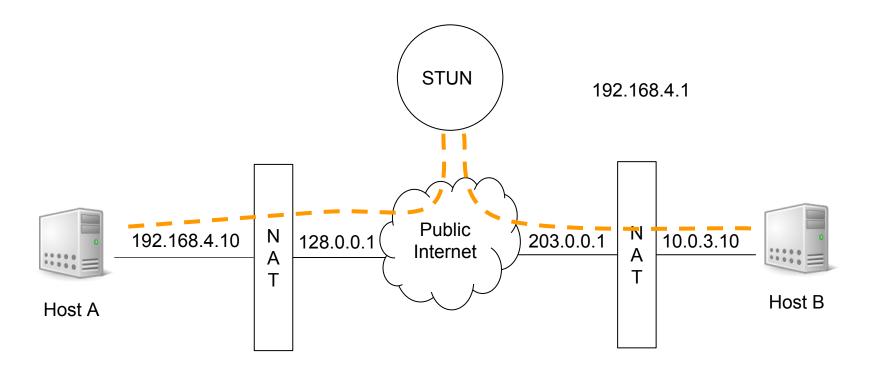
- VIAS detects traffic intensive traffic (TCP/UDP) on overlay datapath
- VIAS coordinates with remote node and program SDN devices
- ARP, ICMP, IP Multicast virtualizes on overlay datapath

Demonstration



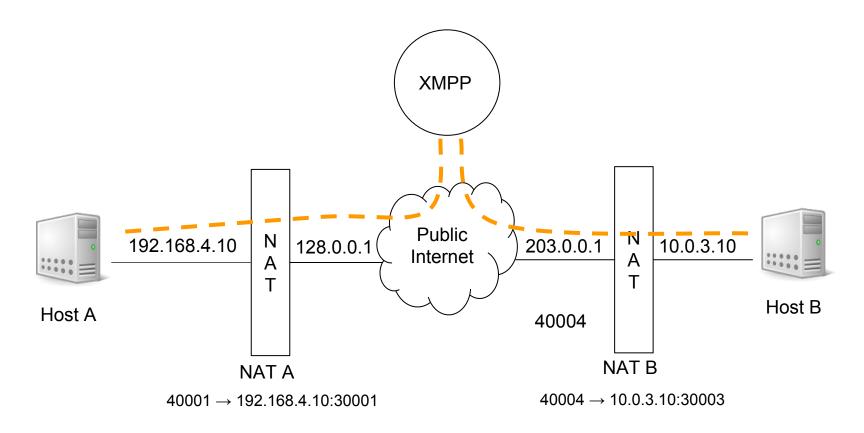
Backup Slides

ICE(Interactive Connectivity Establishment) Protocol



Candidate strings of Host A 192.168.4.10:30001 128.0.0.1:40001 Candidate strings of Host B 10.0.3.10:30003 203.0.0.1:40004

ICE(Interactive Connectivity Establishment) Protocol



Exchange each other's candidate string through XMPP. Create direct P2P link between Host A and Host B.

IPOP Overlay Network

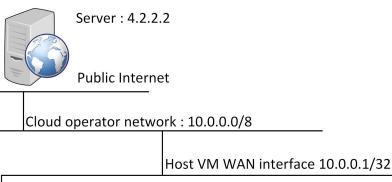
Use ICE protocol to create direct P2P link

Create overlay network topology upon direct P2P link

Encapsulate whole ethernet frame with IPOP and UDP header

	Bit 0	
Public Network Header	IP Header	4 bytes
	UDP Header	2 bytes
	Source IPOP UID	20 bytes
	Destination IPOP UID	20 bytes
Overlay Network Header	Ethernet Frame	14 bytes
	IP Header	May 1200 by tac
	Payload	Max 1280 bytes

Implementation of SDN NAT featured switch



- Full-cone NAT
- NAT has higher priority than switching
- ICMP packets not implementable

i.e.) nVM(192.168.1.2) starts TCP session with server with port number X.

VIAS picks up port number Y from available port number

Gateway	
MAC 00:00:00:11:22:33	
IP 192.168.1.1	
NAT rules	
Match	Action
	. Outgoing flow entry
src_network_addr == 192.168.1.2/32	set_dl_src = 00:00:00:11:22:33
dst_network_addr == 4.2.2.2/32	set_nw_src = 10.0.0.1
tp_src = X	set_tp_src = Y
	Incoming flow entry
src_network_addr == 4.2.2.2/32	set_dl_src = 00:00:00:11:22:33
dst_network_addr == 10.0.0.1/32	set_nw_dst = 192.168.1.2
tp_src = Y	set_tp_src = X

nested VM LAN interface 192.168.1.0/24

nVM

192.168.1.3

192.168.1.4

nVM

192.168.1.5

nVM

192.168.1.2

nVM