

# Expanding OpenFlow Capabilities with Virtualized Reconfigurable Hardware

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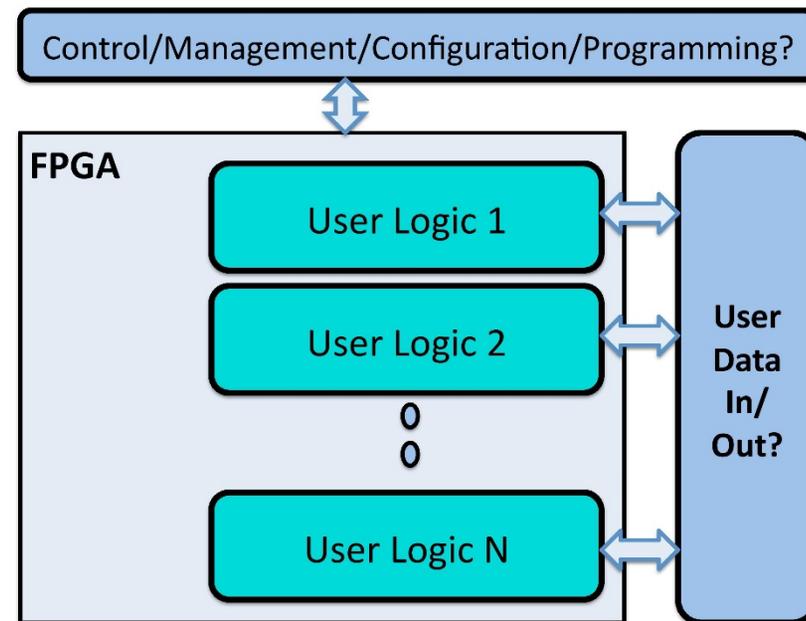


# Goal

- Software Defined Networking
  - Divides control plane and data plane
- OpenFlow is an open source SDN standard
- OpenFlow functionality limited
- Goal: Expand OpenFlow with versatility of software and performance of reconfigurable hardware

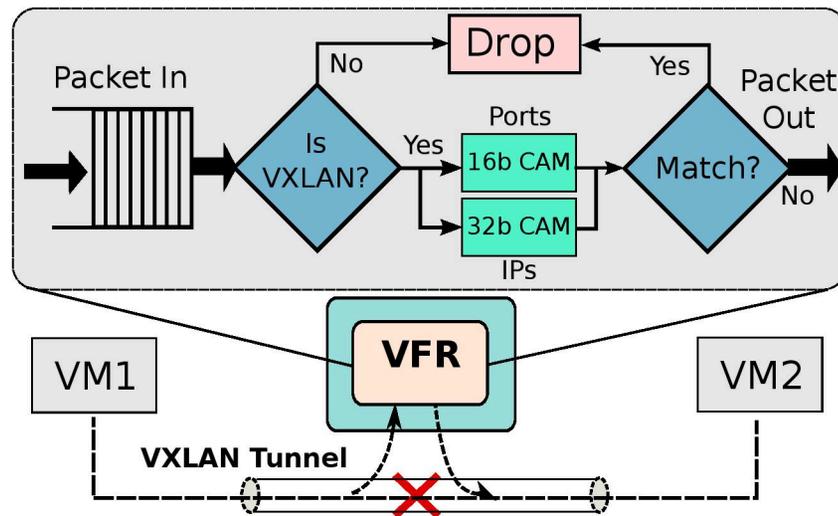
# Virtualized Reconfigurable Hardware

- Infrastructure in place virtualizing physical FPGAs into multiple user Virtualized FPGA Resources (VFRs)
- Managed by Openstack
- Partial reconfiguration is used to program user applications



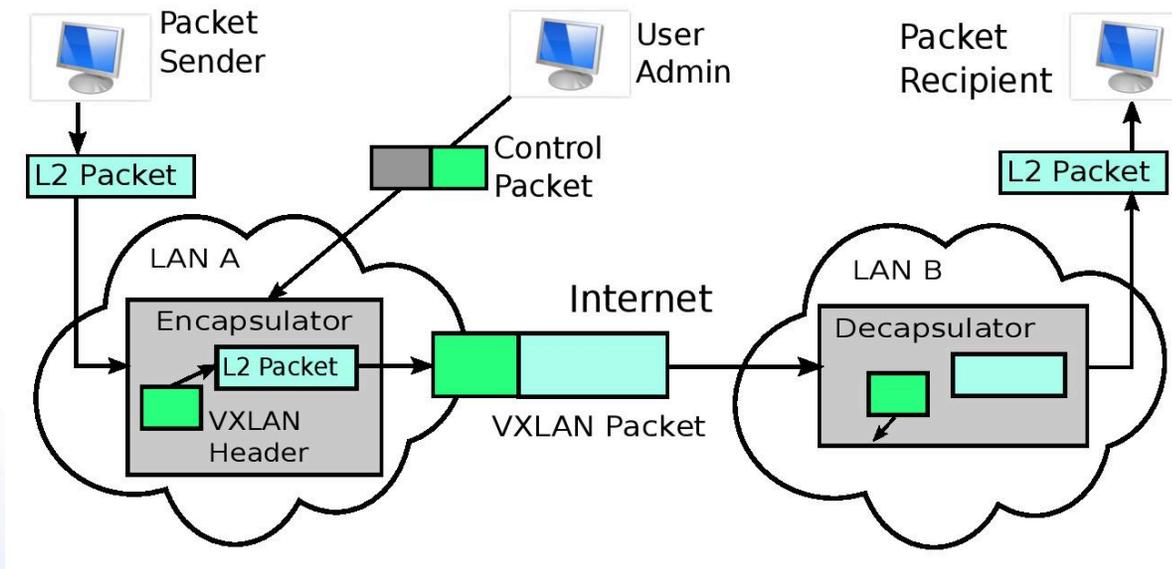
# Application: VxLAN Firewall

- Firewall drops non VxLAN packets and blacklisted packets
- Blacklisted headers stored in Content Addressable Memory
- Processed in Line-Rate



# Application: VxLAN Implementation

- Packets encapsulated by VFR and decapsulated by VFR
- Processed in Line-Rate



# Conclusion

- Network applications developed in hardware
- Extra hop through hardware engine
  - Slight increase in latency
  - Throughput stays the same
- Virtualized Hardware Infrastructure simplifies new application implementation
- These applications are just the tip of the iceberg!

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