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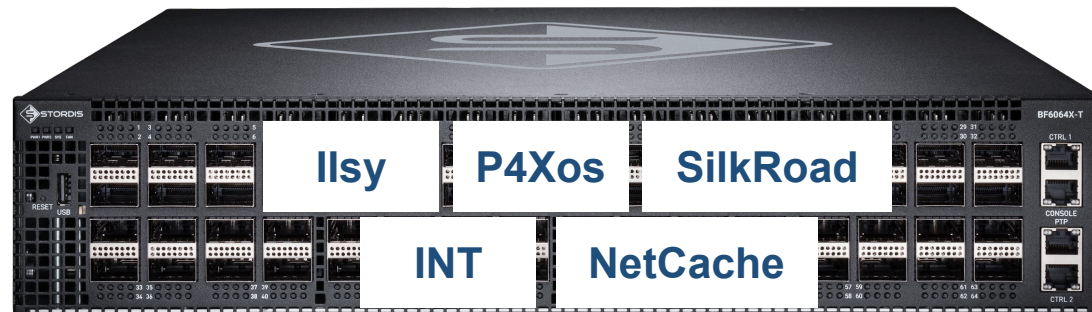
MTPSA: Multi-Tenant Programmable Switches

Radostin Stoyanov and Noa Zilberman

Computing in the Network Research Group (COINRG) - Interim - February 2021

Running User Applications on Programmable Switches

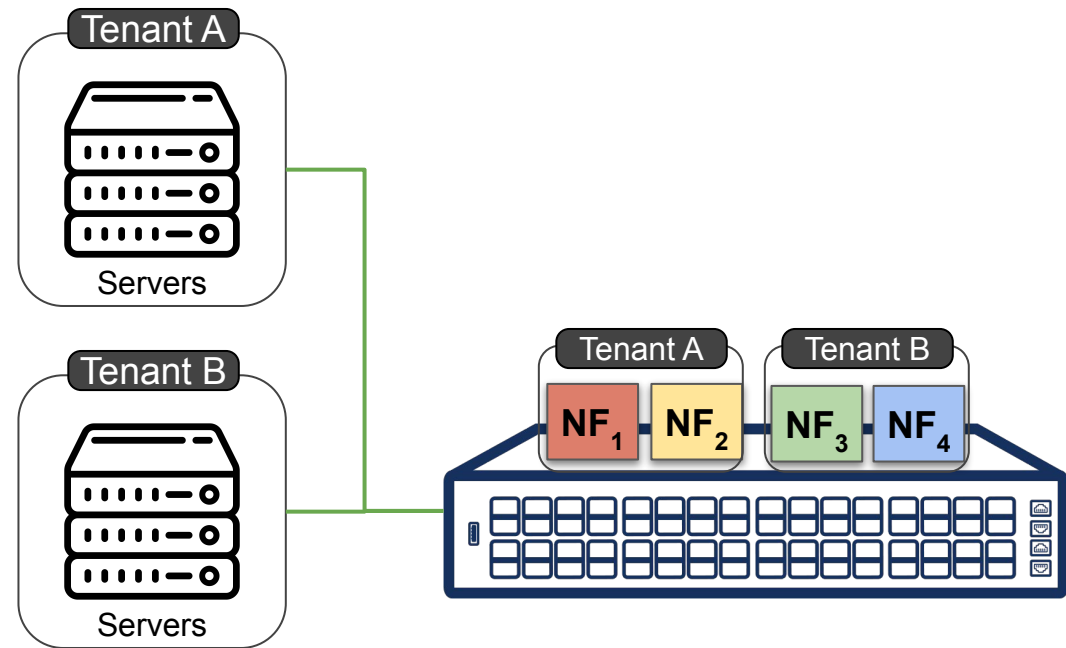
- Users run many types of P4 programs
- But can we support multi-tenancy?



PDP Virtualization and Multi-Tenancy

Requirements:

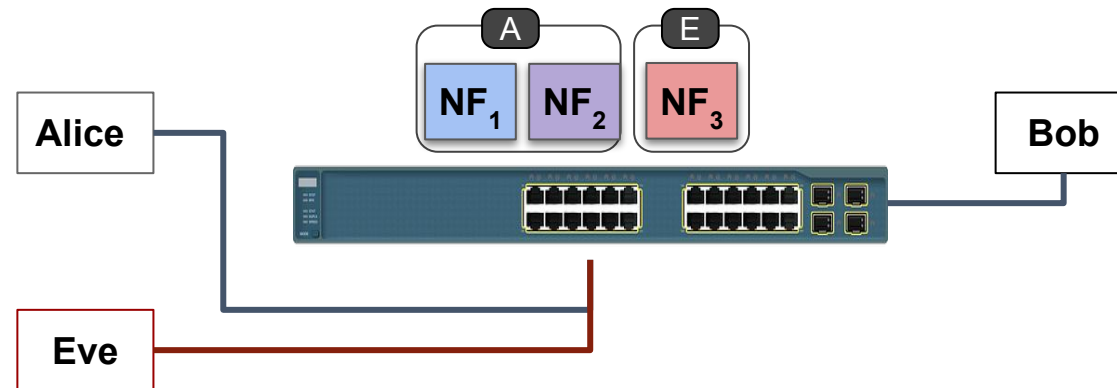
- Security isolation
- Performance isolation
- Resource isolation
- On-the-fly reconfigurability



Can a malicious user take advantage of multi-tenancy?

A malicious programs can:

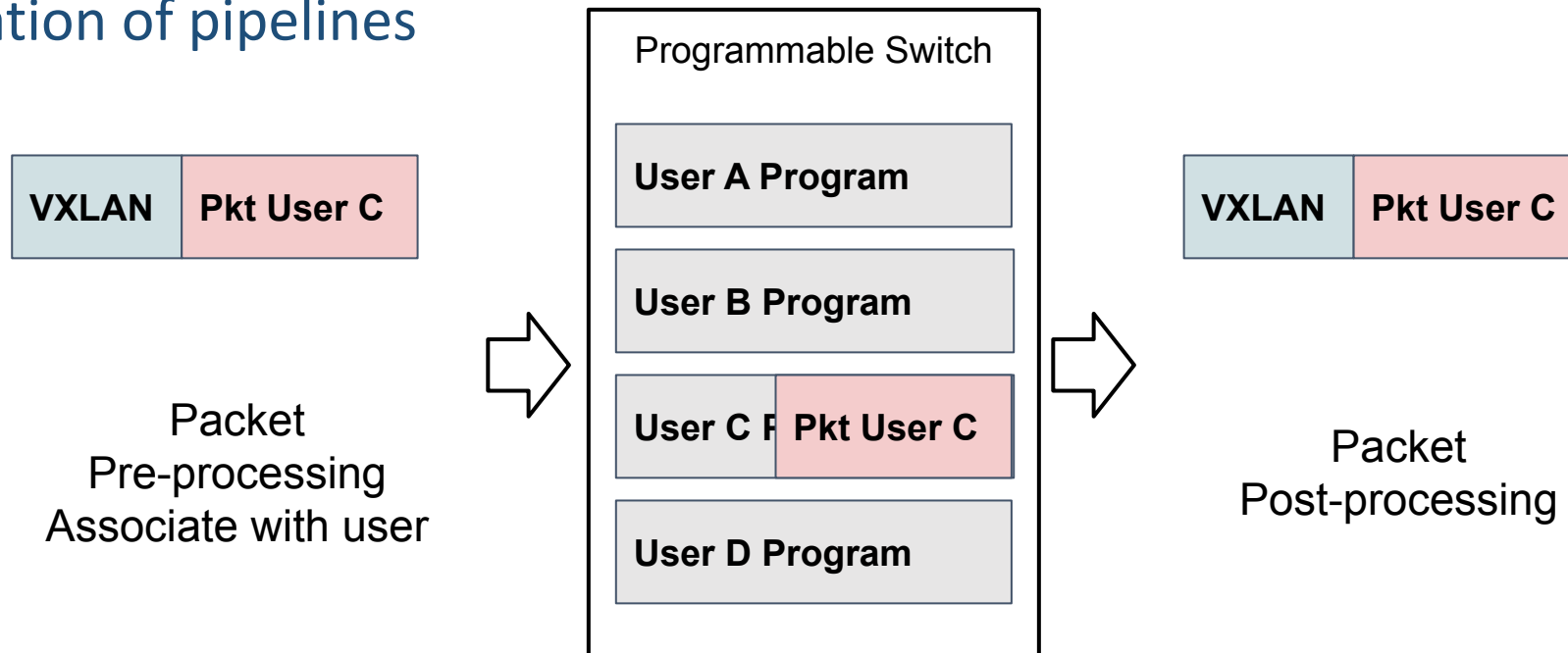
- Affect performance - e.g., recirculate packets in the pipeline
- Affect functionality - e.g., change the headers or metadata of other users' packets
- Violate privacy - e.g., mirror other users' traffic



Operating Model

Packet pre-processing and post-processing:

- Encapsulation (VxLAN)
- Separation of pipelines



Roles & Permissions

Roles - define an authority level

- Users
- Superuser
- Custom roles (M/A rules set by Superuser)

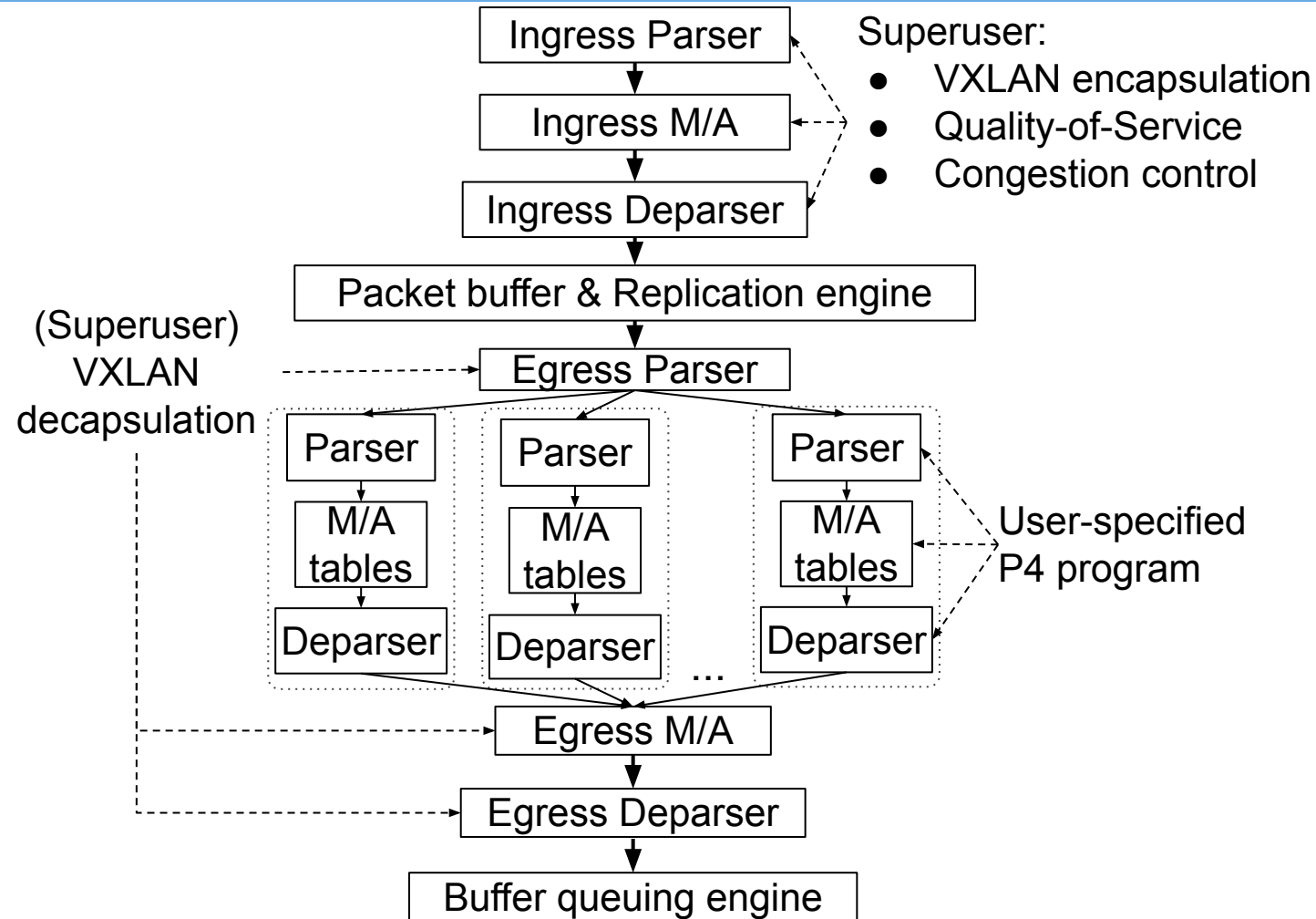
Permissions - an approval of a mode of access to a resource

- Externs (Internet Checksum, Random)
- Packet cloning
- Recirculation
- Multicast
- Registers

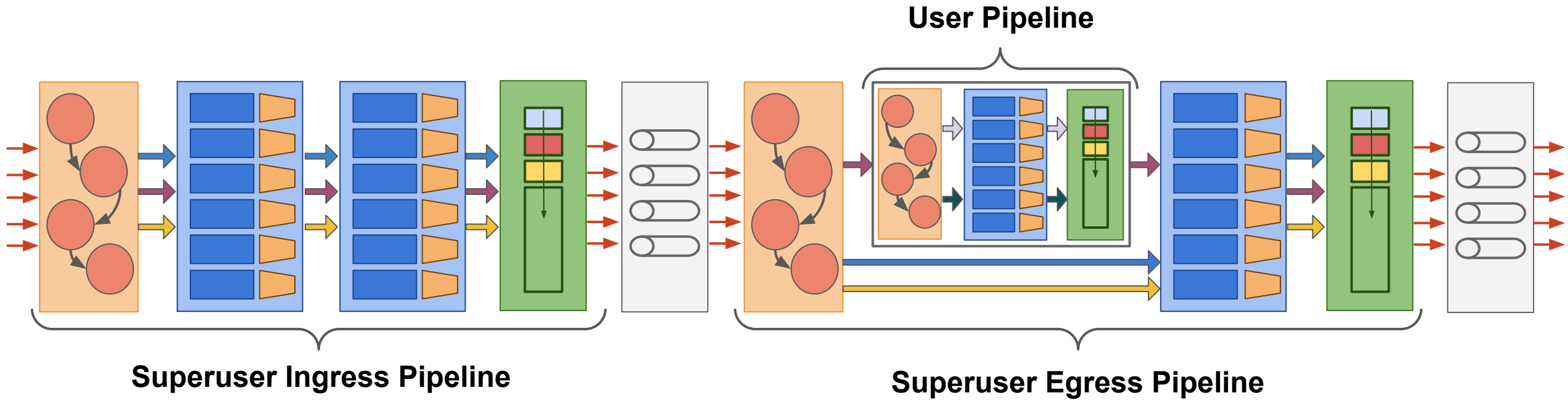


MTPSA

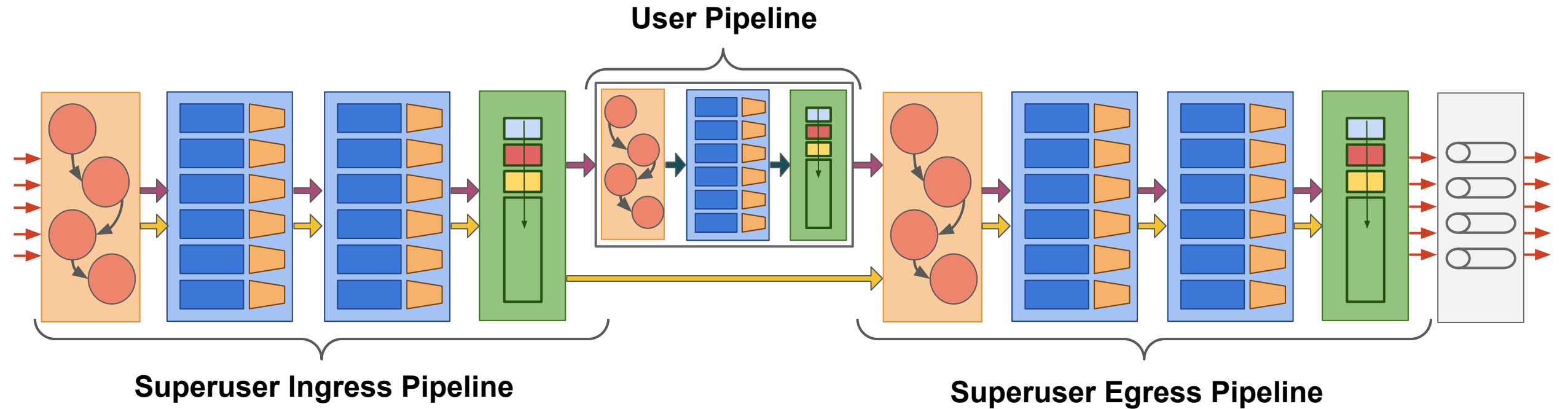
- Superuser vs User architecture
- User isolation:
 - Security (ACL, VxLAN)
 - Performance (QoS)
 - Resource (Switch Context)



BMv2 MTPSA



P4→NetFPGA MTPSA

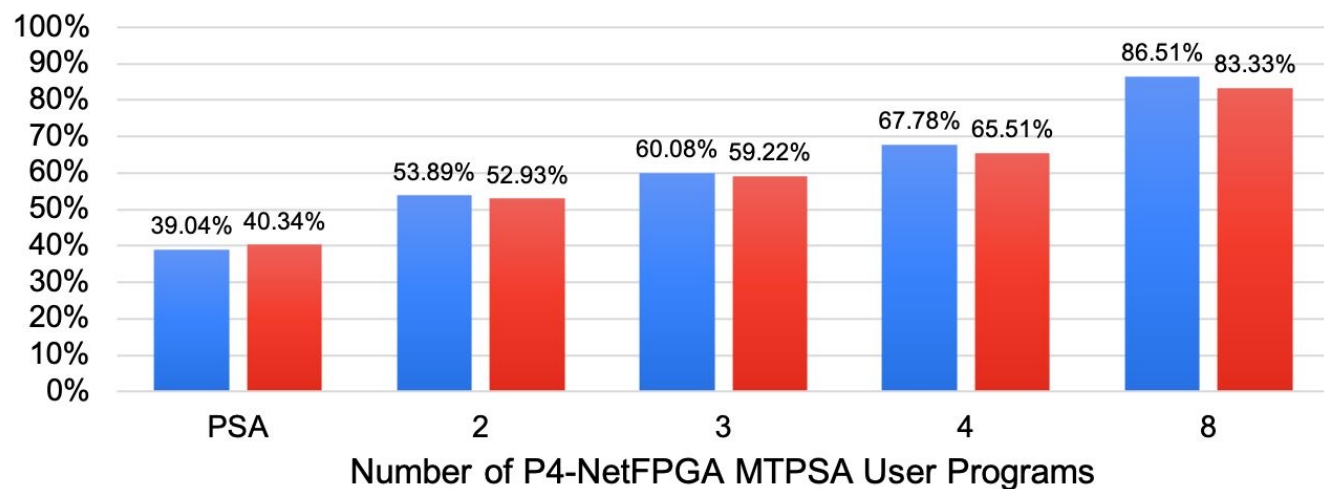


Prototype supporting up to 8 different users and further extendable

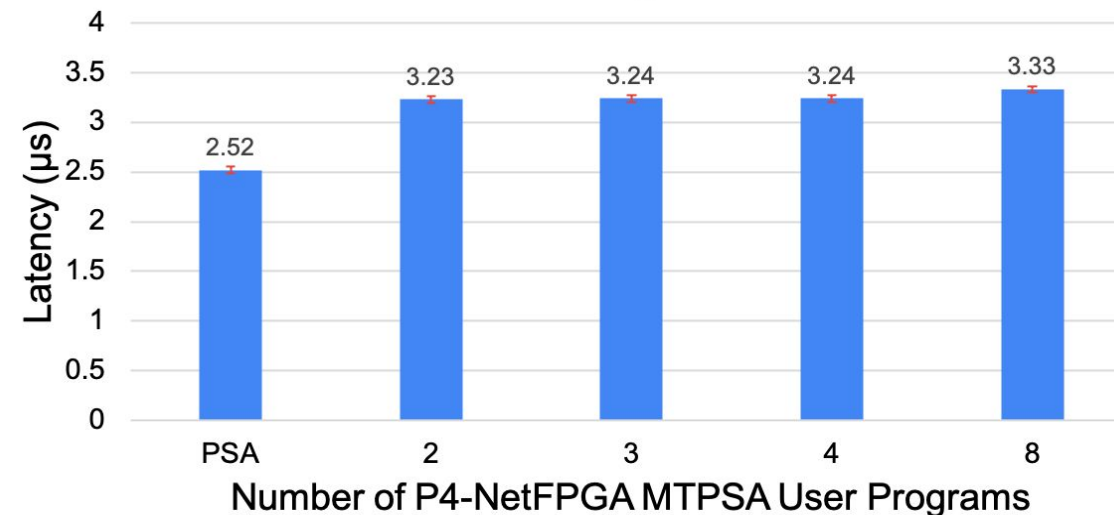
P4→NetFPGA MTPSA Evaluation

Logic & Memory Utilization

■ Slice Logic Distribution Utilization ■ Block RAM Utilization



Latency



Summary

MTPSA offers:

- Performance isolation
- Resource isolation
- Security isolation
- Line rate
- Latency independent of number of users
- SW & HW implementation
- Open!

<https://github.com/mtpsa>

