Evaluating Scalability and Performance of a Security Management Solution in Large Virtualized Environments

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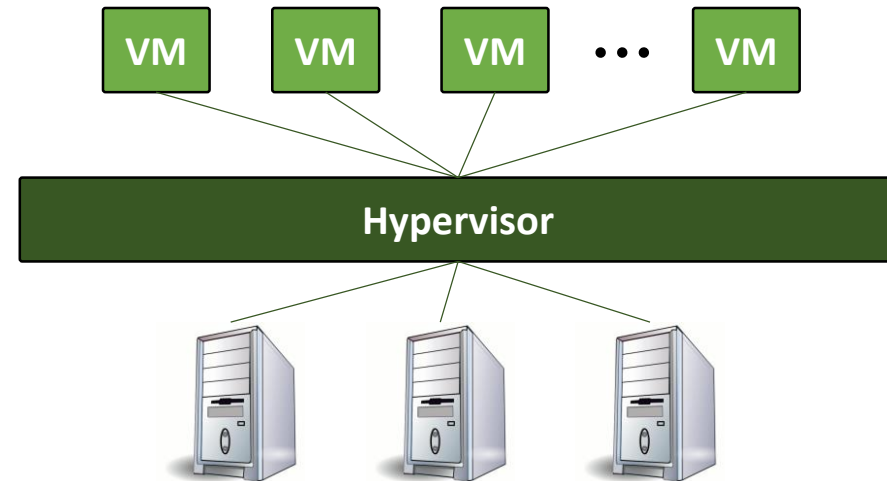Jack Blancaflor , Rahul Konde , Jason Mills , Evgenia Smirni

Motivation
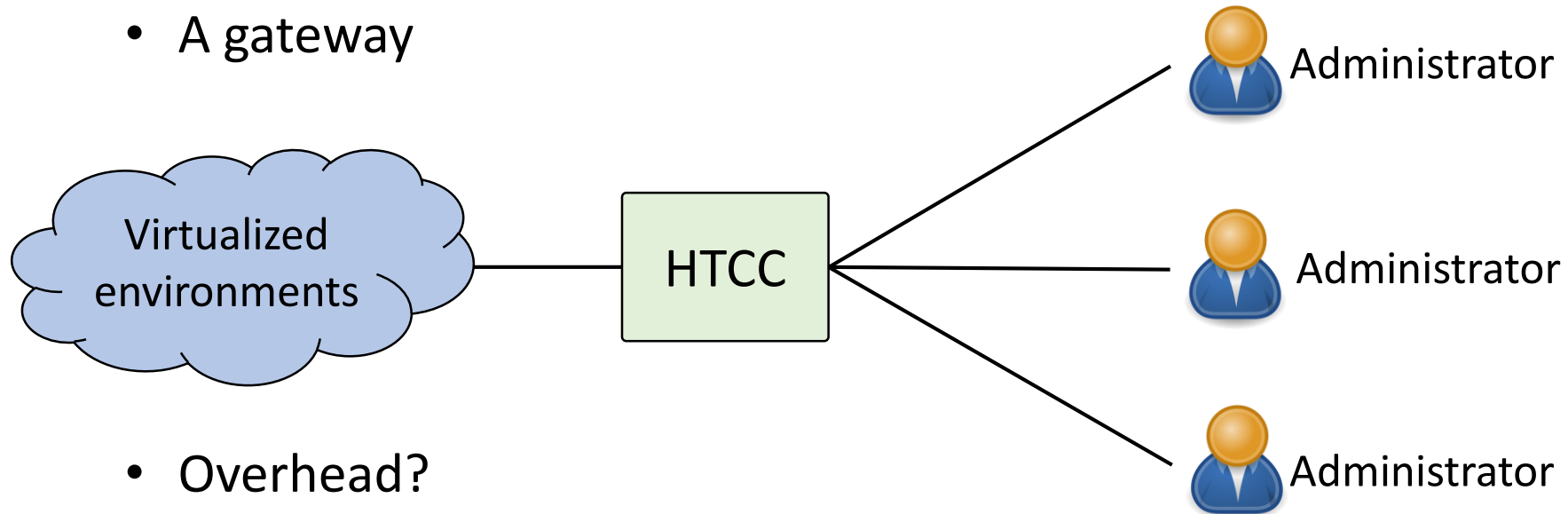
❖Virtualization is important!

- Isolation
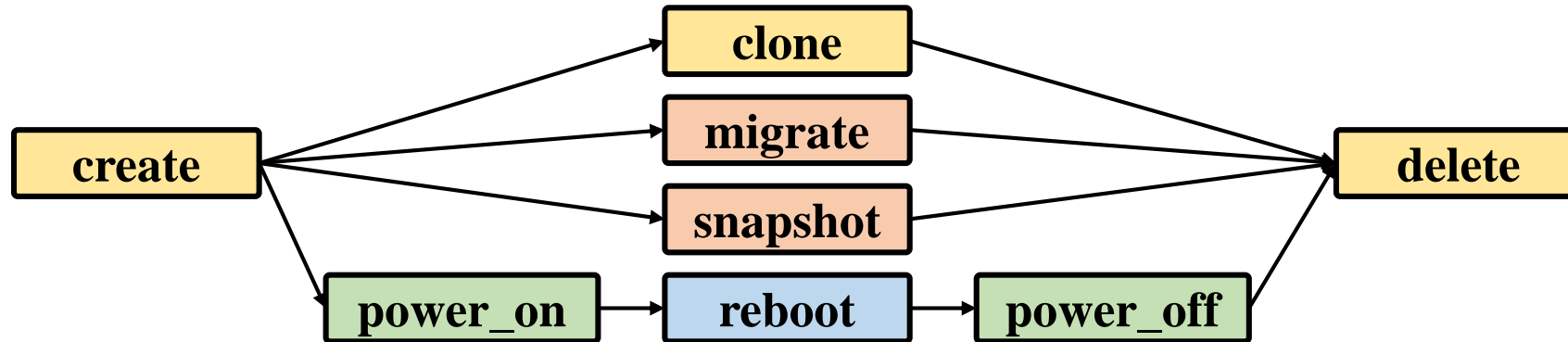

- Resource Sharing

HyTrust Cloud Control (HTCC)
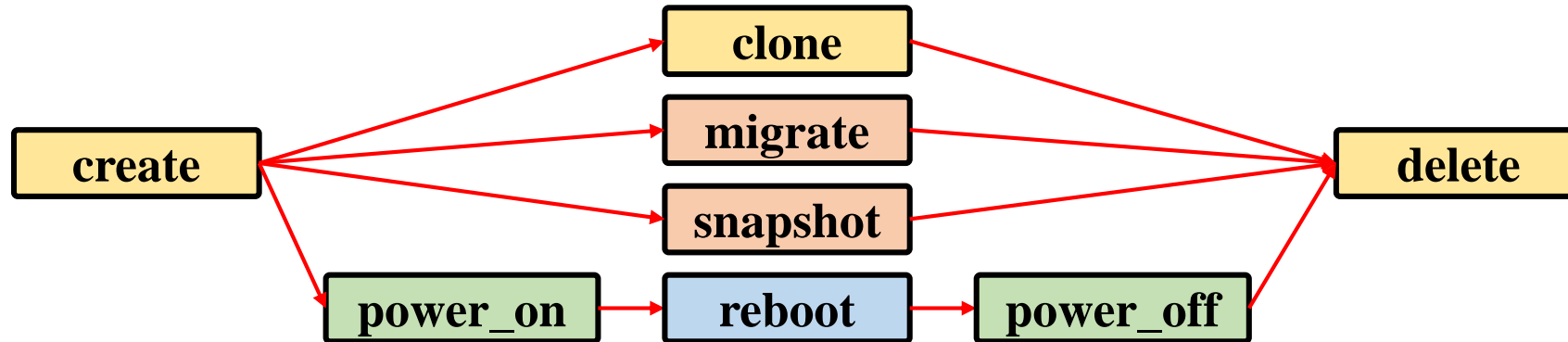
- HTCC
  - A security management solution
  - A gateway

- Overhead?
- Scalability?

VM Operations

VM Operations

*Interdependencies
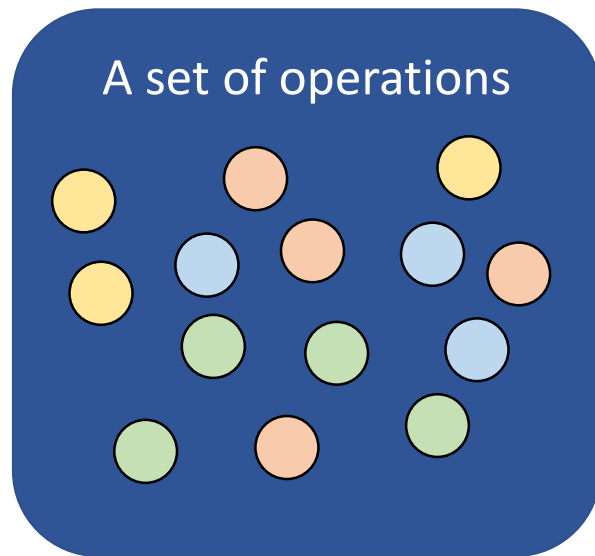
<u>Operation Units</u>

- Paired Operations:
  - (create, delete)
  - (clone, delete)
  - (power_on, power_off)

- Single Operations:
  - migrate
  - snapshot
  - reboot

Design: HT-vmbench

Transaction Mix

User Sessions

A set of operations

Evenly Distribute

User Session 1

User Session 2

User Session 3

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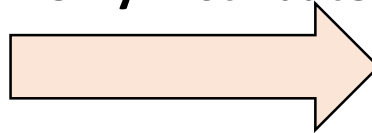
Design: HT-vmbench

Operation Priorities

User Session Creation
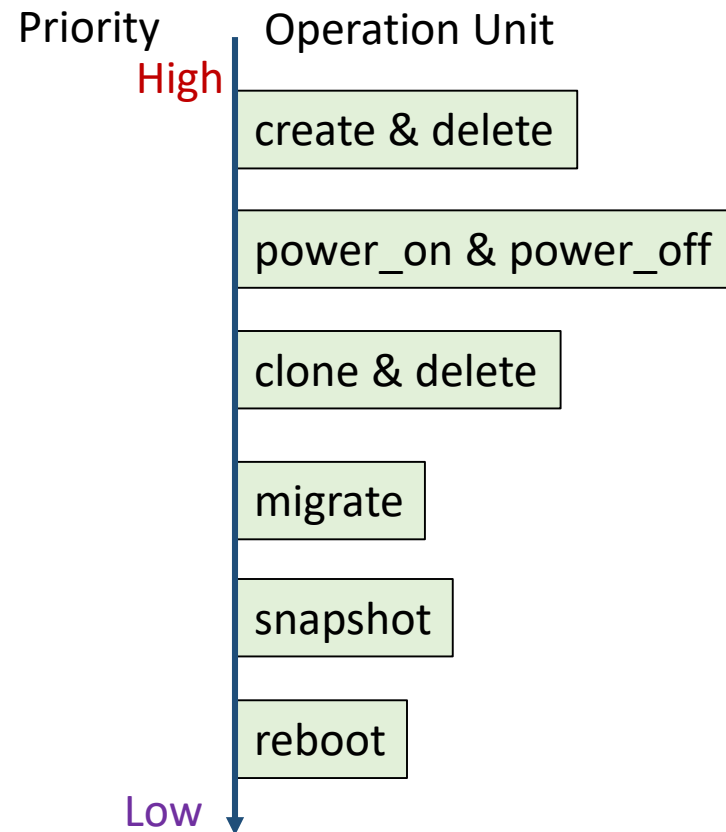
time →

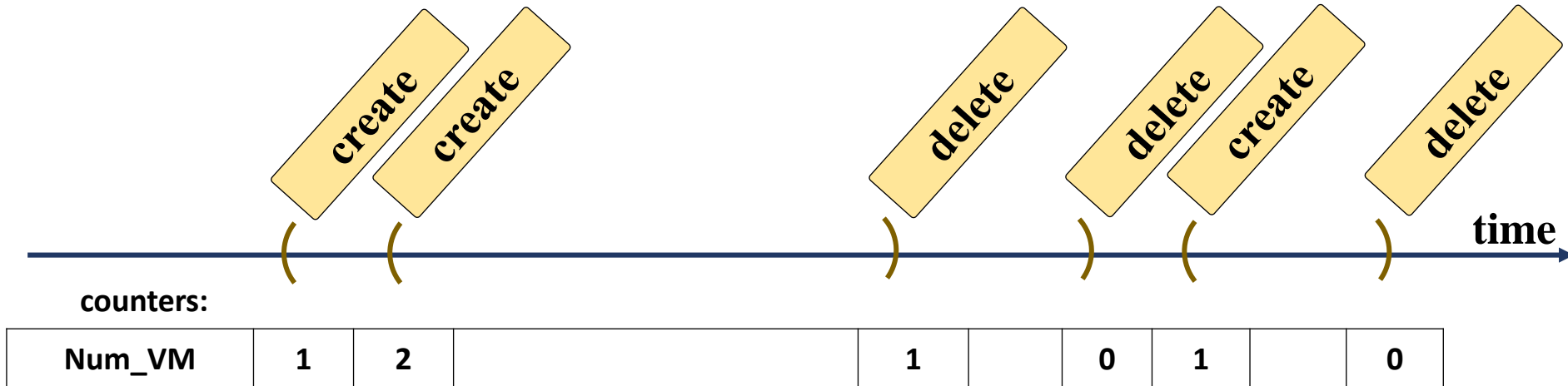# User Session Creation

User Session Creation

counters:								
Num_VM	1	2		1		0	1	0

User Session Creation

counters:

	create	create	power_on		power_off	delete		delete	create		delete
Num_VM	1	2	2		2	1		0	1		0
Num_VM_Powered_On	0	0	1		0	0		0	0		0

User Session Creation

counters:

	create	create	power_on	clone		power_off	delete	delete	delete	create		delete
Num_VM	1	2	2	3		3	2	1	0	1		0
Num_VM_ Powered_On	0	0	1	1		0	0	0	0	0		0

time

User Session Creation

counters:

	create	create	power_on	clone	power_off	delete	delete	delete	create	migrate	delete
Num_VM	1	2	2	3	3	2	1	0	1	1	0
Num_VM_Powered_On	0	0	1	1	0	0	0	0	0	0	0

User Session Creation

counters:

	create	create	power_on	clone	reboot	power_off	delete	delete	delete	create	migrate	delete
Num_VM	1	2	2	3	3	3	2	1	0	1	1	0
Num_VM_ Powered_On	0	0	1	1	1	0	0	0	0	0	0	0

- Closed-loop
- Think time

HT-vmbench Execution

User Session 1

User Session 2

User Session 3

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3 Phases: **warm-up**   **main**   **cool-down**
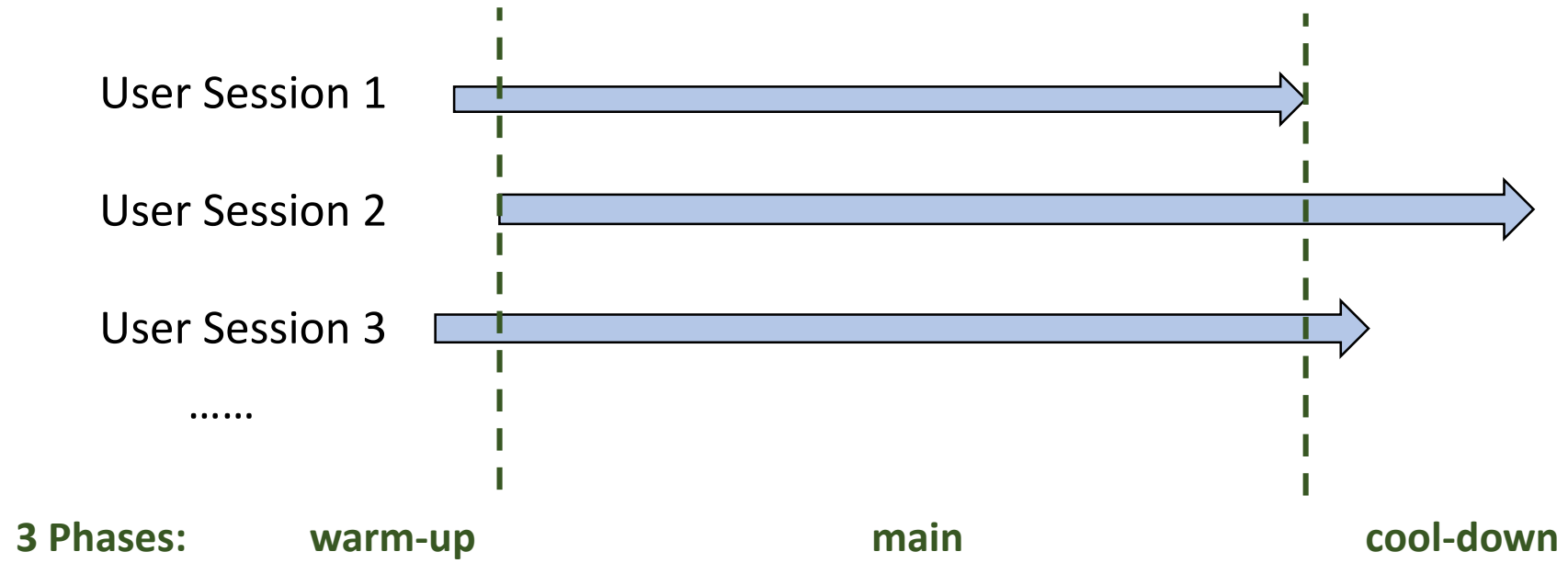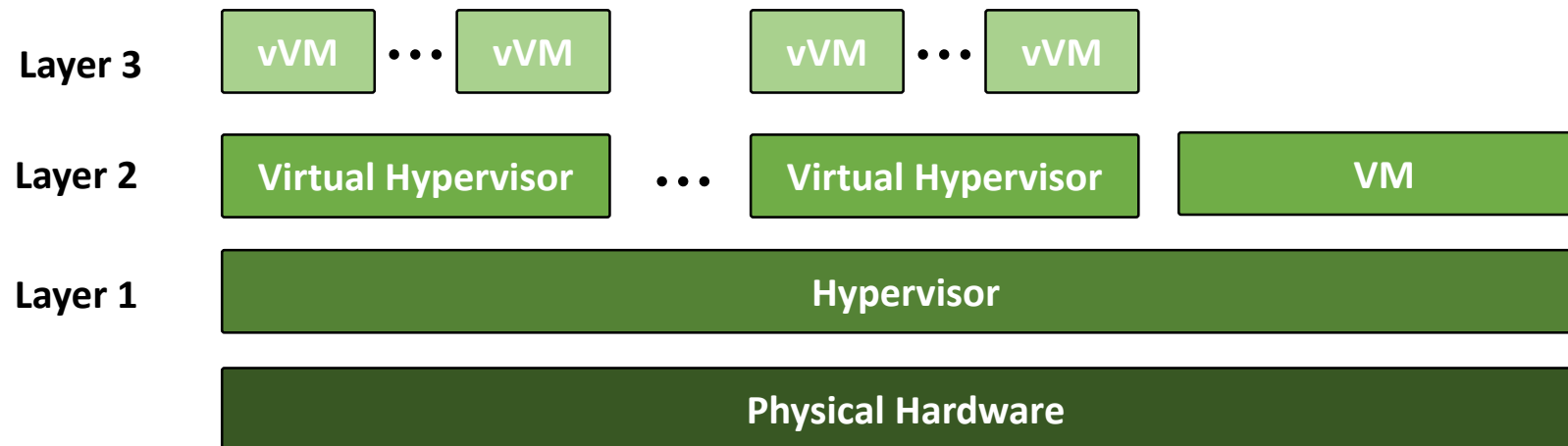
- Metrics:
  - Latency
    - seconds
  - Throughput
    - ops/second

Environment Setup
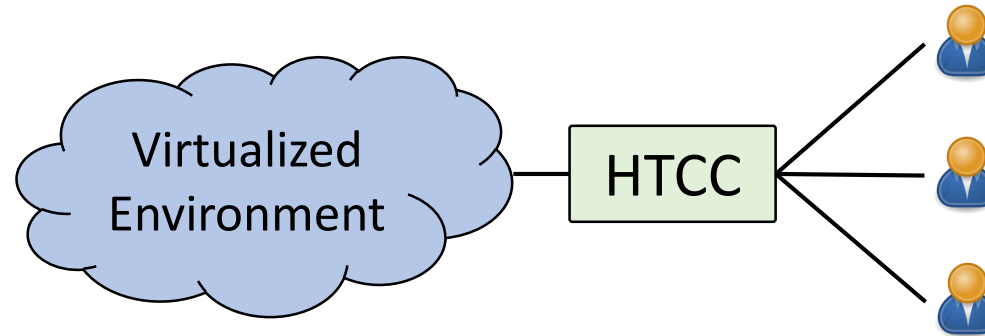
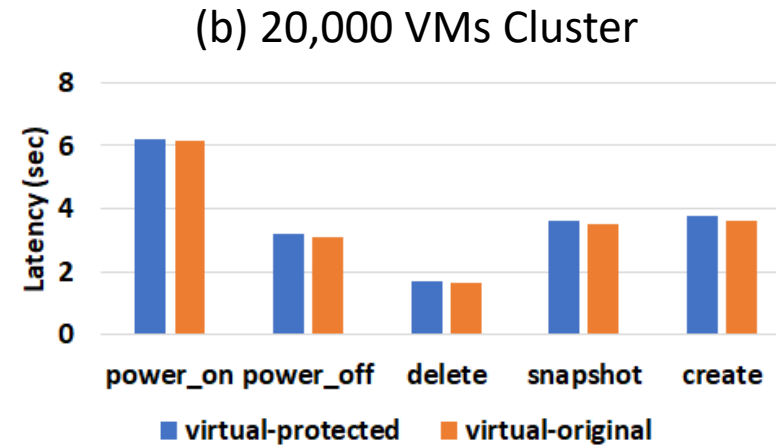- Nested Virtualization
- 4 Physical Machines
- 30,000 VMs

Layer 3	vVM ••• vVM vVM ••• vVM	
Layer 2	Virtual Hypervisor ••• Virtual Hypervisor	VM
Layer 1	Hypervisor	
	Physical Hardware	

Evaluation

- Virtual-original
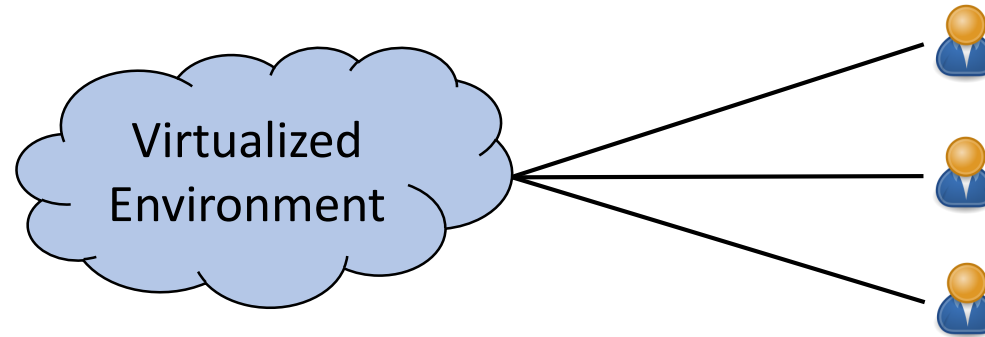
- Virtual-protected

Evaluation
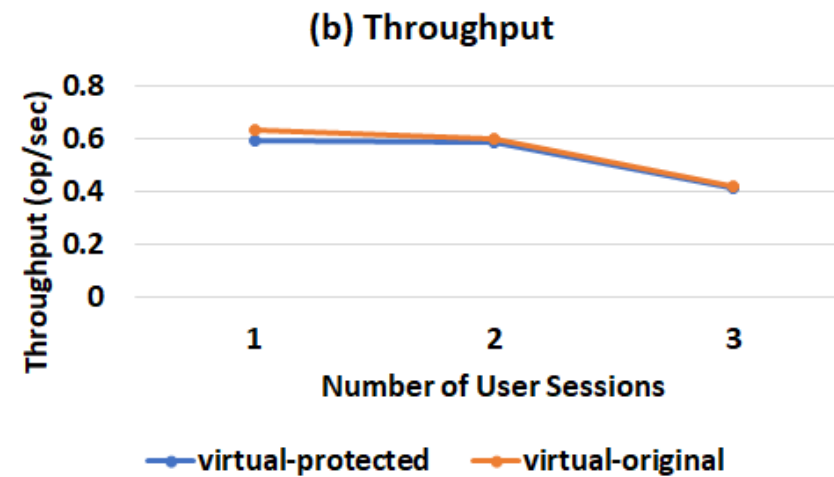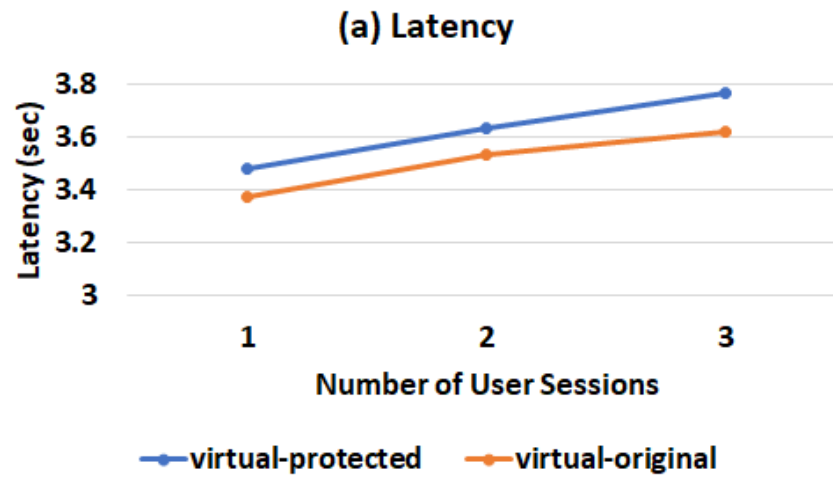
- Latency

(a) 10,000 VMs Cluster

(b) 20,000 VMs Cluster
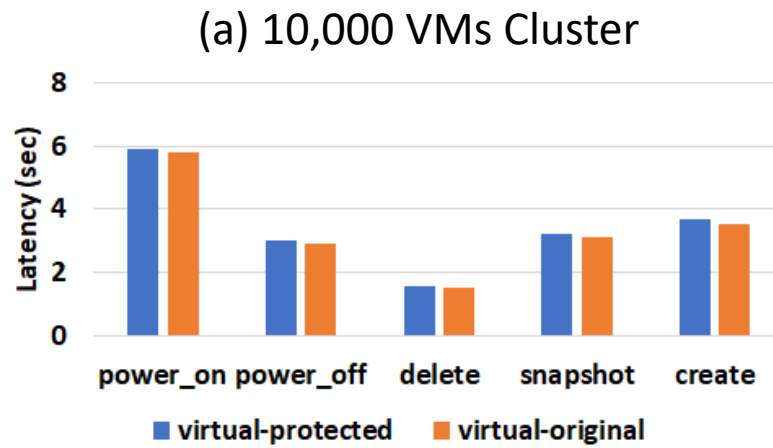
- Good scalability

Evaluation

(a) Latency

(b) Throughput

Conclusion

- HT-vmbench
  - Performance assessment of large virtualized environments

  - User session: simulate session-based activities
  - Metrics: latency & throughput

Thank you.