

Building Performant Network Infrastructure for Thousands of Snapshotted VMs: eBPF, Geneve, and more

- **Speakers:** Shivendra Srivastava, Prashant Kumar Singh, Kshitij Gupta
- **Room:** HC 204
- **Time:** Sat 9:30 am – 10:00 am
- **Format:** Lecture (30 Min + Q&A)
- **Additional Format:** Panel
- **Difficulty:** Introductory / Some experience required
- **Track:** Networks
- **Presenter Location:** In-person
- **Experience:** several-th time speaking
- **At:** anywhere

Description:

Running thousands of snapshotted VMs presents unique networking challenges that push Linux networking primitives to their limits. This talk explores battle-tested strategies for designing large-scale network topologies that balance performance, isolation, and resource efficiency.

Topics include:

- Modern tunneling with **Geneve** for scalable overlay networks
- **eBPF-accelerated networking** to bypass kernel bottlenecks and reach line-rate performance
- **Stateless NAT** techniques enabling network reuse without connection tracking
- Smart firewall design using **device-prefix-based iptables/nftables** rules that scale to thousands of instances
- **Namespace pooling** strategies to reduce creation/teardown overhead during rapid VM snapshot operations
- Understanding **RTNL lock contention**, its impact on large-scale deployments, and mitigation strategies

Attendees will learn how to architect network stacks that meet the demands of snapshotted workloads—where VMs are frequently cloned, restored, and migrated—while maintaining security boundaries and predictable performance. Real-world examples show how these techniques reduce network initialization time from seconds to milliseconds and support 10K+ concurrent VM instances on commodity hardware.

Target Audience:

- Students
- Engineers
- Architects interested in scaling network performance

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