

Mininet-HiFi: Rapid, High Fidelity SDN Prototyping

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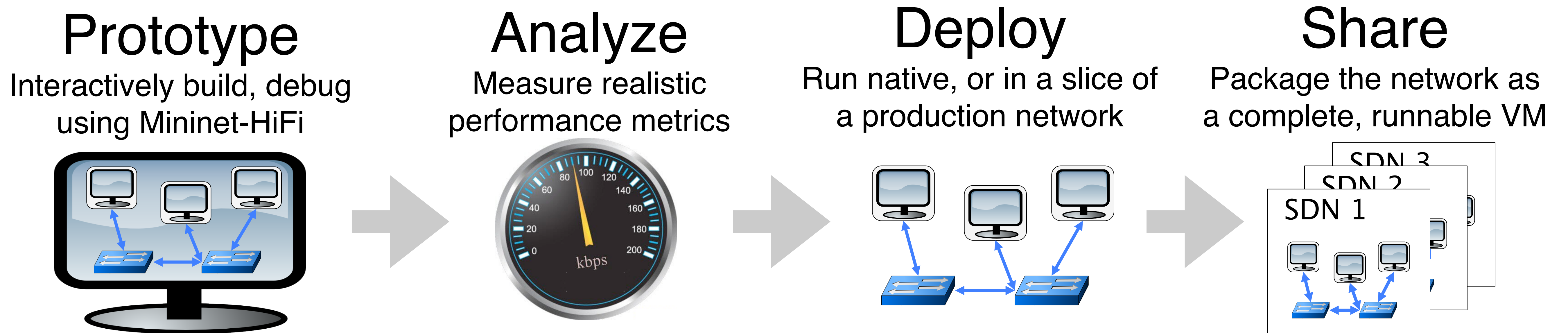
Problem

Software-Defined Networks (SDNs) create complex interactions between hosts, switches, and controllers. Testbeds may lack sufficient visibility for debugging; simulators may lack the desired code realism.

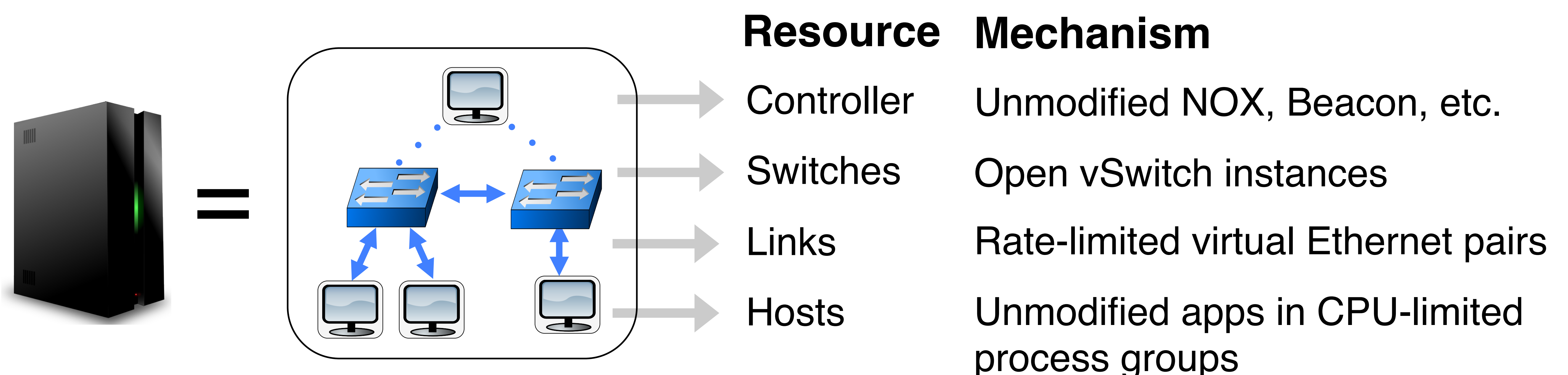
Solution

Mininet-HiFi is a *container-based emulator* that runs a complete network of hosts, switches, and controllers on a single PC. It provides performance fidelity by adding resource-isolation mechanisms.

Mininet-HiFi enables a rapid-prototyping workflow for building SDNs:



Mininet-HiFi runs networks on a single PC, using lightweight OS virtualization:

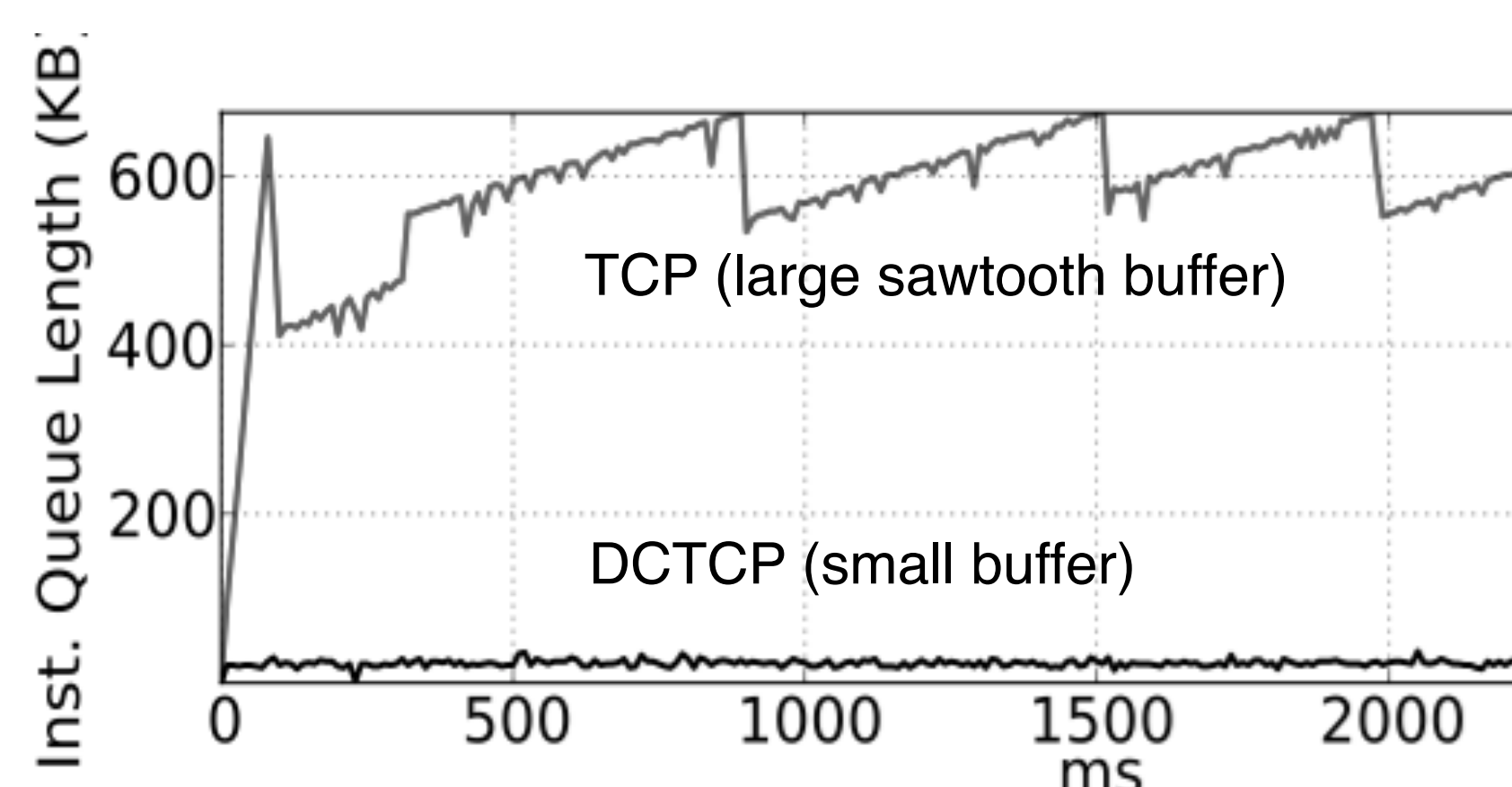


To the controller, each virtual resource appears identical to its corresponding physical one.

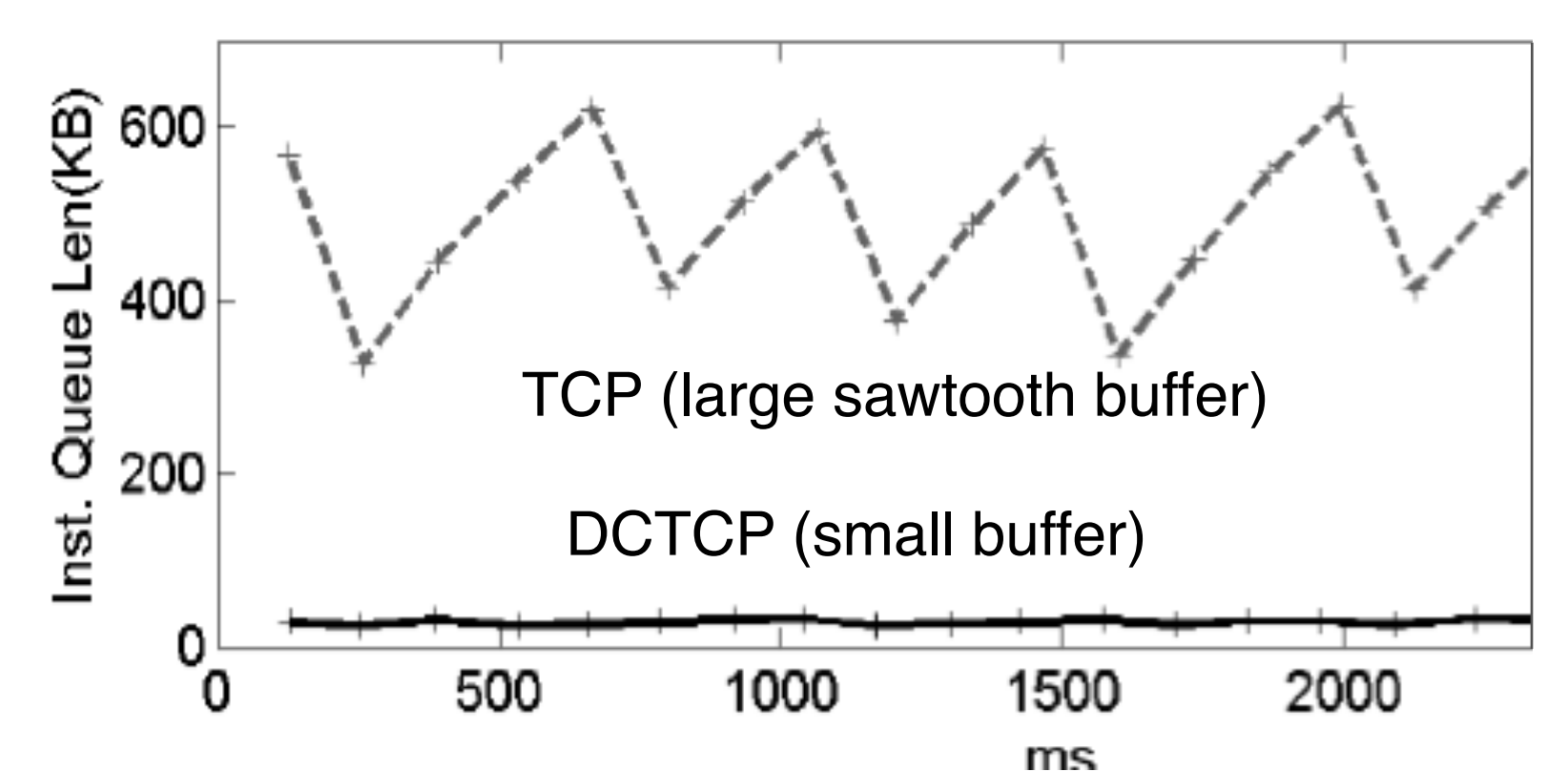
Mininet-HiFi provides the realism to reproduce published results:

Test 1: DCTCP

Data-Center TCP, or DCTCP, modifies TCP's congestion control algorithm to reduce latency and buffer usage. The topology is a simple 2-into-1 fork, and we measure buffer sizes.



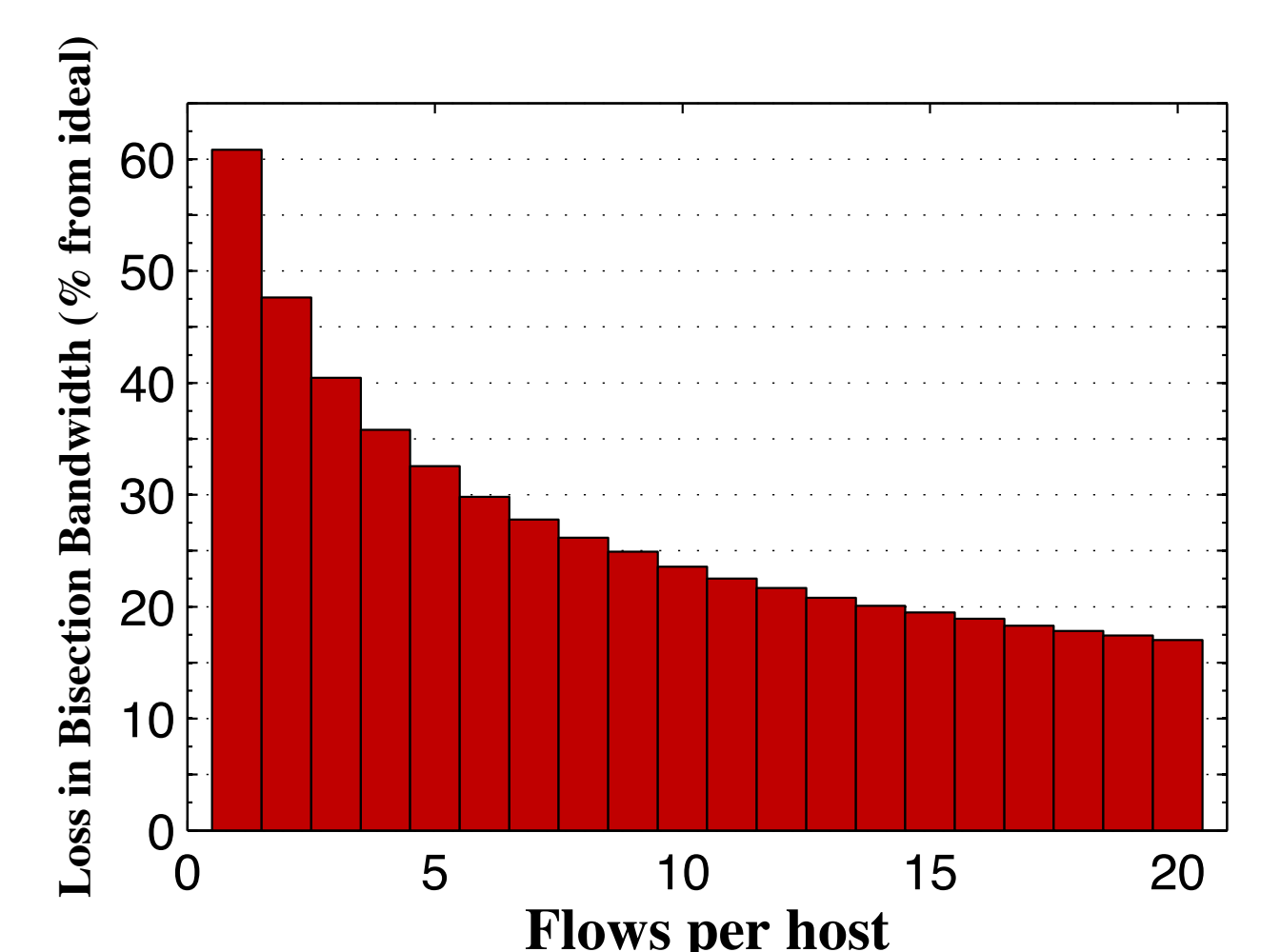
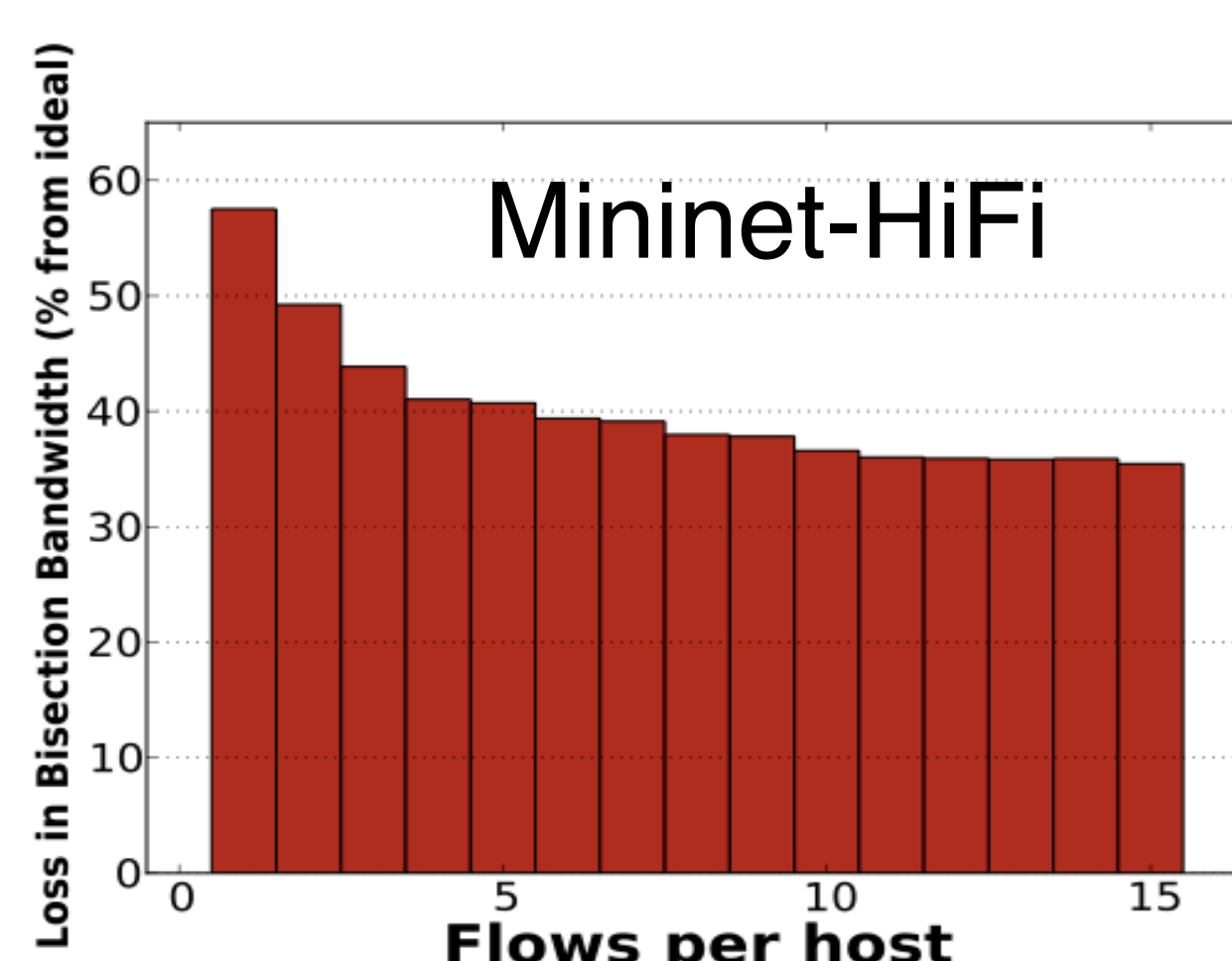
Mininet-HiFi



from DCTCP paper [SIGCOMM 2010]

Test 2: Multipath Routing

Flows are commonly spread across paths in a data center using ECMP, but in Fat Trees, hash collisions reduce the effective bandwidth. This test shows the bisection bandwidth loss for varying traffic dispersions.



from Hedera paper [NSDI 2010]