Regular flow for testing and deployment

Offline testing
- Unit Test
- Integration Test
- Testbed Regression
- Cluster Regression

Production deployment
- Lab Testing
- Pilot Deployment
- Massive Deployment

Software works differently at different scales

Reduce risk through staged deployment and fast iteration
Ideal production testing model:

Realistic production environment based on:

- Real Topology
- Real Hardware (ASIC)
- Real Software
- Real Configuration
- Real Traffic Model

While, to duplicate production environment is **IMPOSSIBLE** and **NOT NECESSARY**
A good example for reference

Relies On …
Purposed practical approach

Network device emulator:

- Virtual Topology
- Virtual HW(ASIC) + Software Runtime Env
- Real Software
- Real Configuration
- Simulated Traffic
SONiC Dataplane Emulation Overview

physical view of virtual topology

management bridge

vsonic vsonic vsonic ... vsonic server VM ... server VM

br-pw ovs bridge

logical view of virtual topology

spine1 ... spineN

leaf1 ... leafN

ToR1 ToR2 ... ToRN-1 ToRN

server VM server VM ... server VM server VM

pod meta-configuration

set up virtual topology

generate and monitor traffic among servers

optional flow configuration

vtopo

meshflow
Virtual Topology

vTopo

- Topology generation
  - Topology generation based on POD meta-configuration (No. of nodes and base IP address), build connection between instances and apply configurations;
  - Virtual links between vSONiC and vServer is connected through OVS based match-action rules;
- Virtual device lifecycle management
  - parse_config,
  - setup_connection, teardown_connection
  - config_vSONiC
  - start_VM, shutdown_VM, destroy_VM
Virtual Hardware (vASIC)

vASIC – ASIC Behavior Model

- P4 source code
- BMv2 ASIC Model
- SAI API adaption layer
- Dataplane Runtime
- Dataplane threads for packet processing
- Emulated Front Panel Ports

- SAI API implementation
- Dataplane SDK
- Dataplane threads for packet processing
- Emulated Front Panel Ports

P4 bmv2 based ASIC model
Vendor specific ASIC model like BCMSIM
Virtual Software Runtime Environment

Enable dataplane emulation with SONiC virtualization.

- BGP container
- Ildp container
- teamd container
- swss container
- syncd
- SAI/SDK
- Behaviour model

- CONFIG_DB/APP_DB/SAI_DB
- Ethernet 1
- Ethernet 2
- Ethernet 3
- Ethernet 4
- Kernel
- fp0
- fp1
- fp2
- fp3
Simulated Traffic

Meshflow

**Data plane** Traffic generator and analyzer;

Generation full mesh traffic across all virtual nodes according to POD meta-configuration info;

Statistical info gathering and monitoring;

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<th>flow</th>
<th>tx_cnt</th>
<th>rx_cnt</th>
<th>drop_rate</th>
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Application Scenario I

Daily Development, Testing and Iteration

Online issue reproducing for trouble shooting offline
Application Scenario II

Full image testbed regression

Physical test bed
Application Scenario III

SAI testing for multi-vendor ASIC

- SAI golden reference
- ASIC behavior model
- LibSAI vendor A
  - Switch ASIC vendor A
- LibSAI vendor B
  - Switch ASIC vendor B
Application Scenario IV

Rehearsal → **Configuration Update** and **Image Upgrade** → Offline

- Configuration Update
  - Human Review
  - Online Execution

- Offline Emulation
  - Online Execution
Case Study

Online Software Upgrade

![Diagram showing network configuration with LEAF1, LEAF2, TOR1, TOR2, and Server nodes connected with active lines.]