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Networking: Software

Large-scale operations for our next-gen Fabric and Fabric Hardware

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Agenda

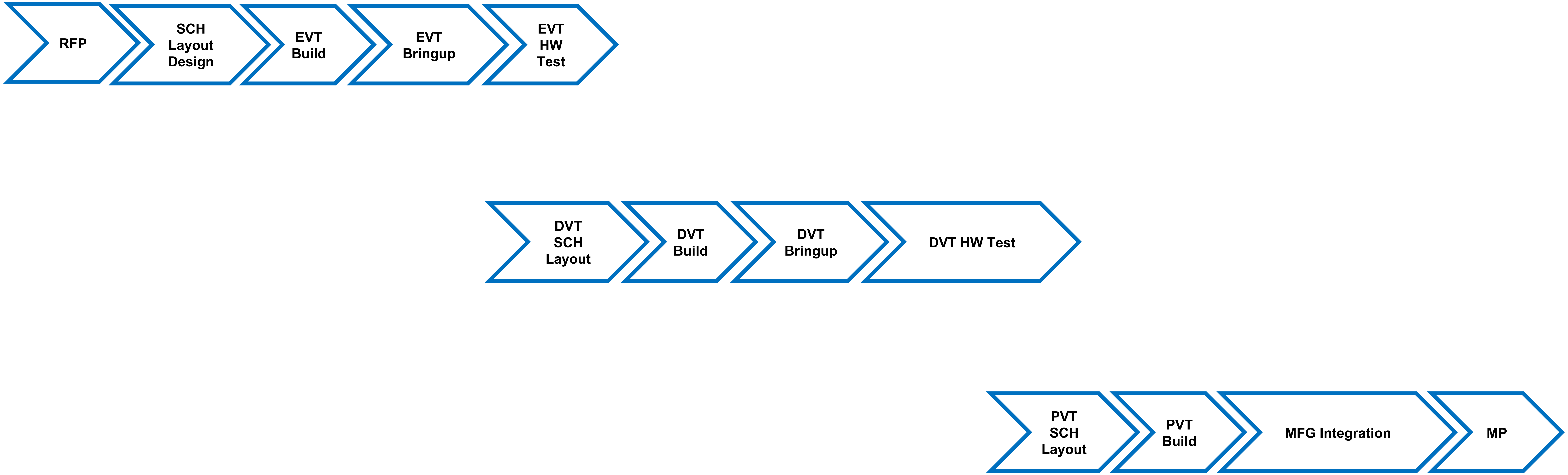
- Hardware Testing – New Platforms
- FBOSS Deployment Infra

Hardware Testing - New Platforms

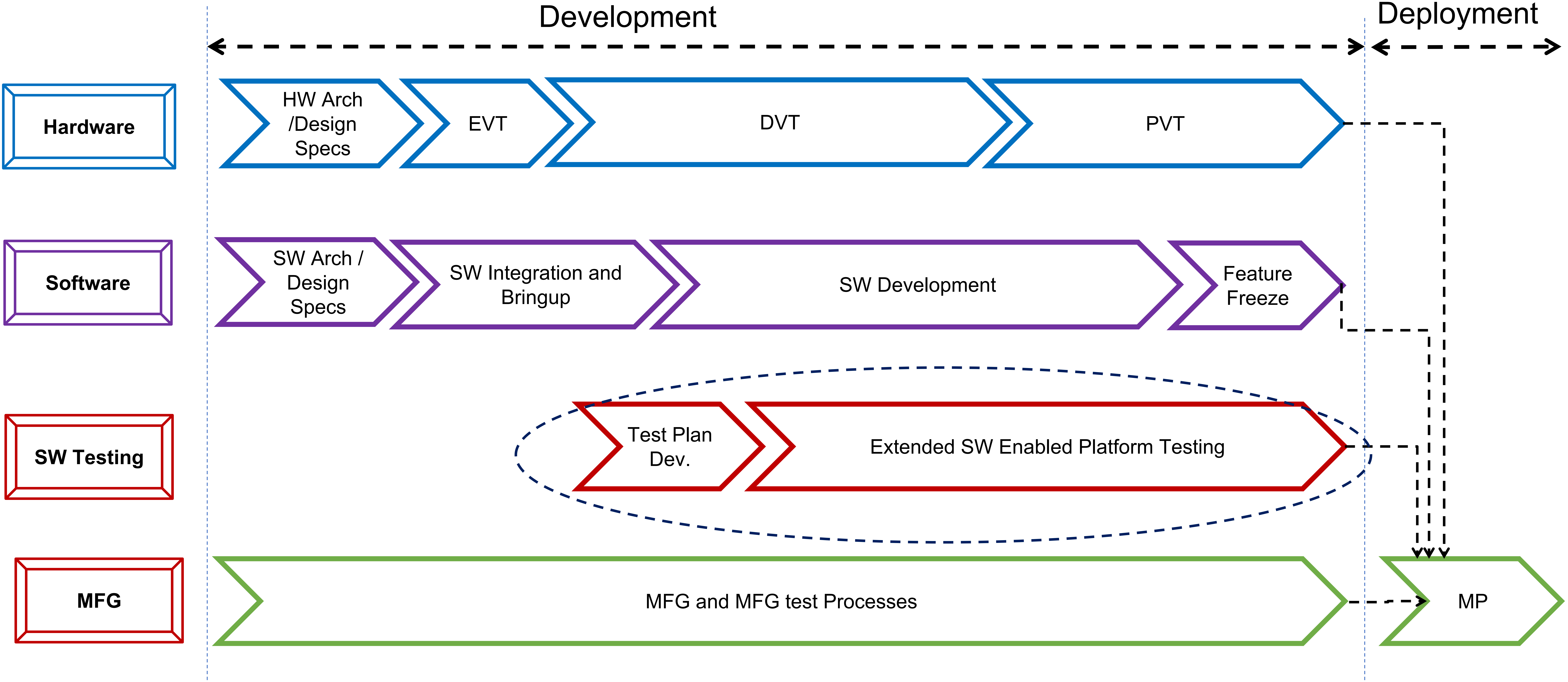
- Validate new HW platforms with high confidence

- Provide reliable readouts in ever compressing time schedules

HW Design Cycle



Revisit processes

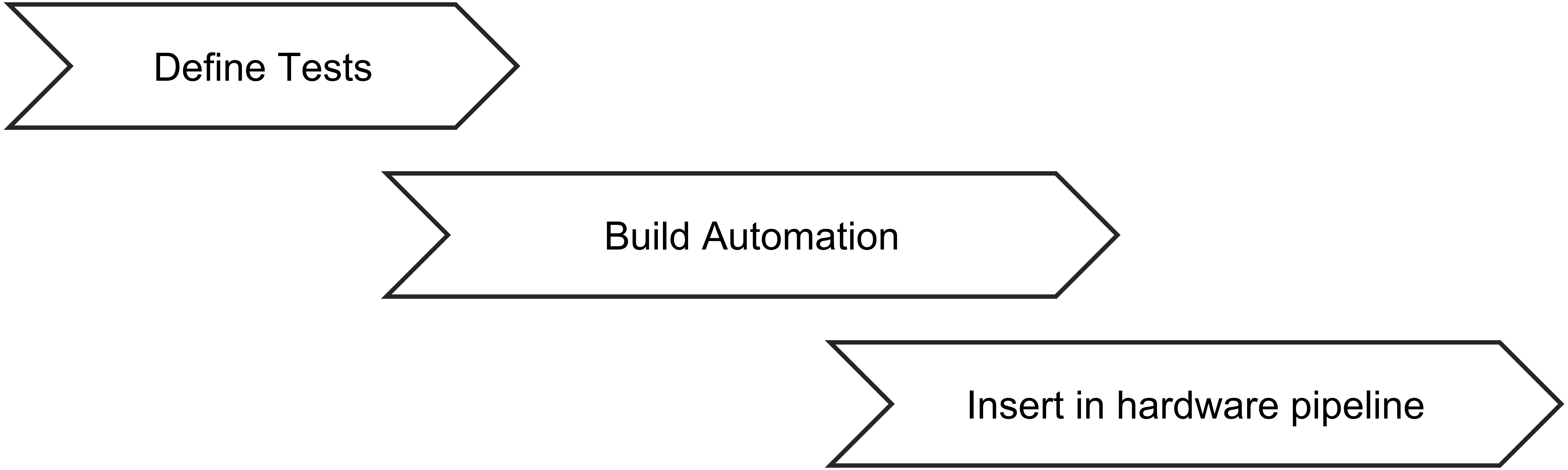


Maintaining Quality w/ Speed

Build HW Validation pipeline where tests

- **Leverage partner ODMs experience**
- **De-risk new designs**/newer **deployment use-cases** with minimal extension on timelines
- are **repeatable/ re-usable** across phases and platforms
- generate **reliable results**

Hacking Hardware Tests



Define Tests

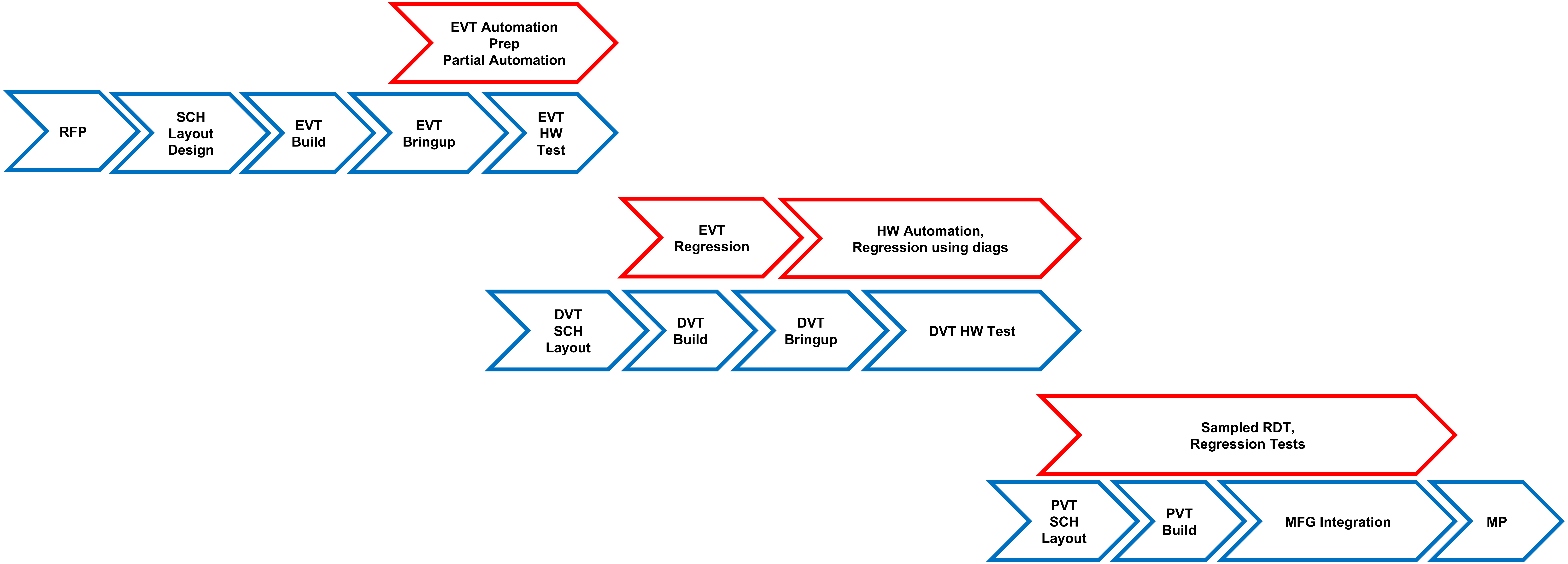
Build Automation

Insert in hardware pipeline

Automatable HW Tests

- **Characterization Tests** (tracked for data sets throughout the program)
  - Link stability tracked against SERDES configuration parameters, Jitter –Phase Noise measurements as function of traffic/load, fan speed calibration
- **Functional Tests (**Common Tests Across Platforms**)**
  - EEPROM read/write tests, BMC functions
- **Stress Tests** (repeated stress in single iteration**)**
  - Sensors, fan speed variation, low level cpld functions
- **Regression Tests (**repeated over different hardware test phases**)**
  - Reboots, Resets, Sensors
- **Integration Tests (**multiple validations at same time**)**
  - Temperature, Fan, and power measurement with traffic load variation, Non disruptive upgrade or monitoring functions provided by BMC, link flap, loopback tests

Extending HW Test Cycle



Results and Key Gains

- 2x reduction in manual review of logs
  - Clear failure signature in tests
- Improvement in tools that help HW Debugging
  - Enhanced debug tools in diags
- Efficiency gains through Automation
  - Gaining 2x execution time using automated scripts

In Conclusion

- View **automation as a resource that assists execution** and **analysis**
- **Define tests from deployment perspective**
- View test unit at bench as a **remote DUT**
- Explore methods to extend **automation** deeper into **conventional EE validation** /test cycles

FBOSS Deployment Infra

What is FBOSS?

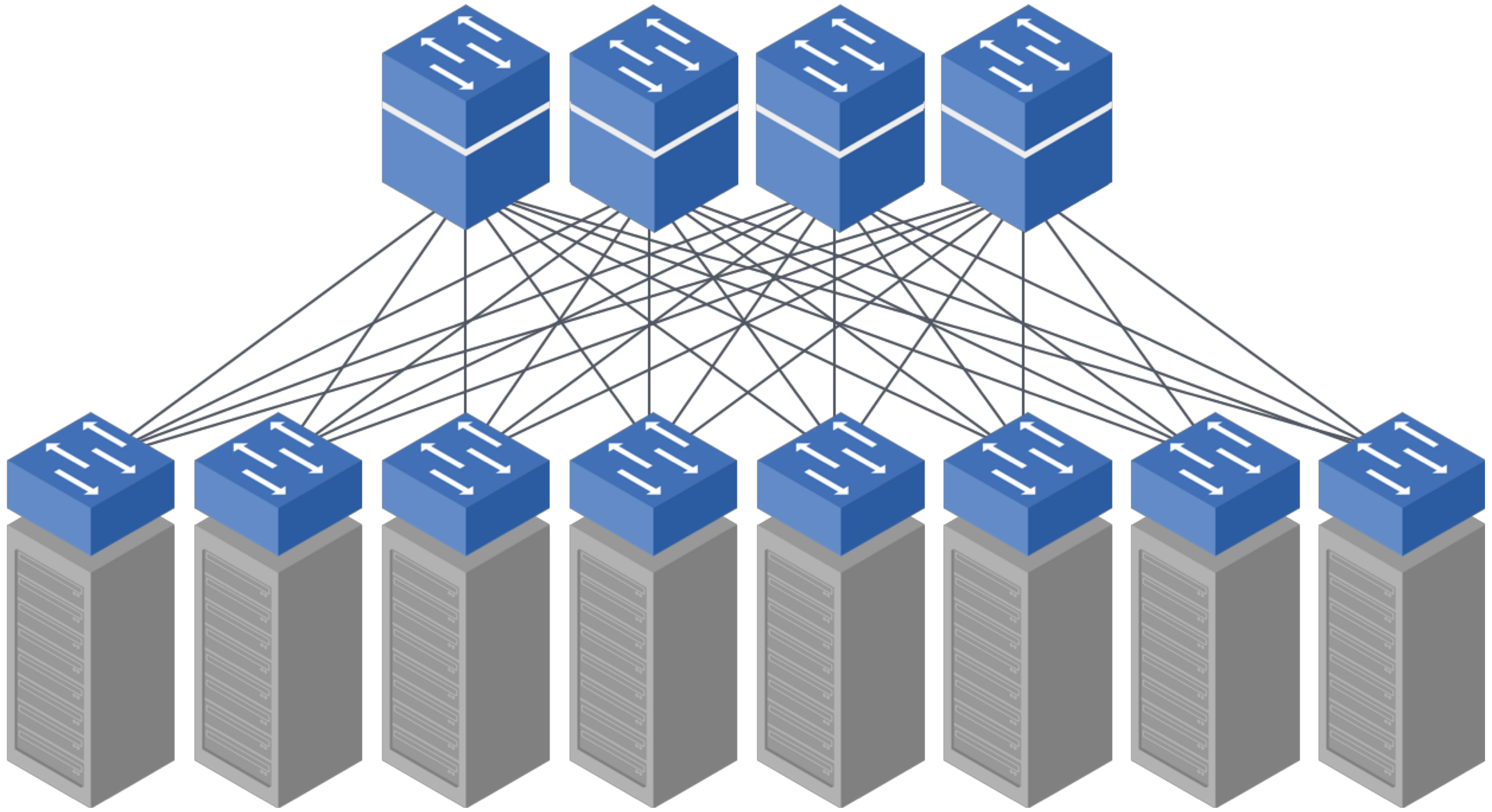
- FBOSS stands for “Facebook Open Switching System”
  - It’s a software stack used for controlling and managing network switches
  - FBOSS Agent Daemon manages the forwarding tables in the ASIC

Facebook’s Philosophy

- In 2016, Facebook moved from weekly release branch to a continuous push model for its web releases
    - Push **code trunk automatically, directly, and regularly to production**
    - Benefits
        - Quicker turn around on rolling out bug fixes
        - Engineering effectiveness
        - Less changes → Less issues → Less time

Risks

- FBOSS is a Tier-0 service
  - Taking down a rack switch would disrupt multiple servers



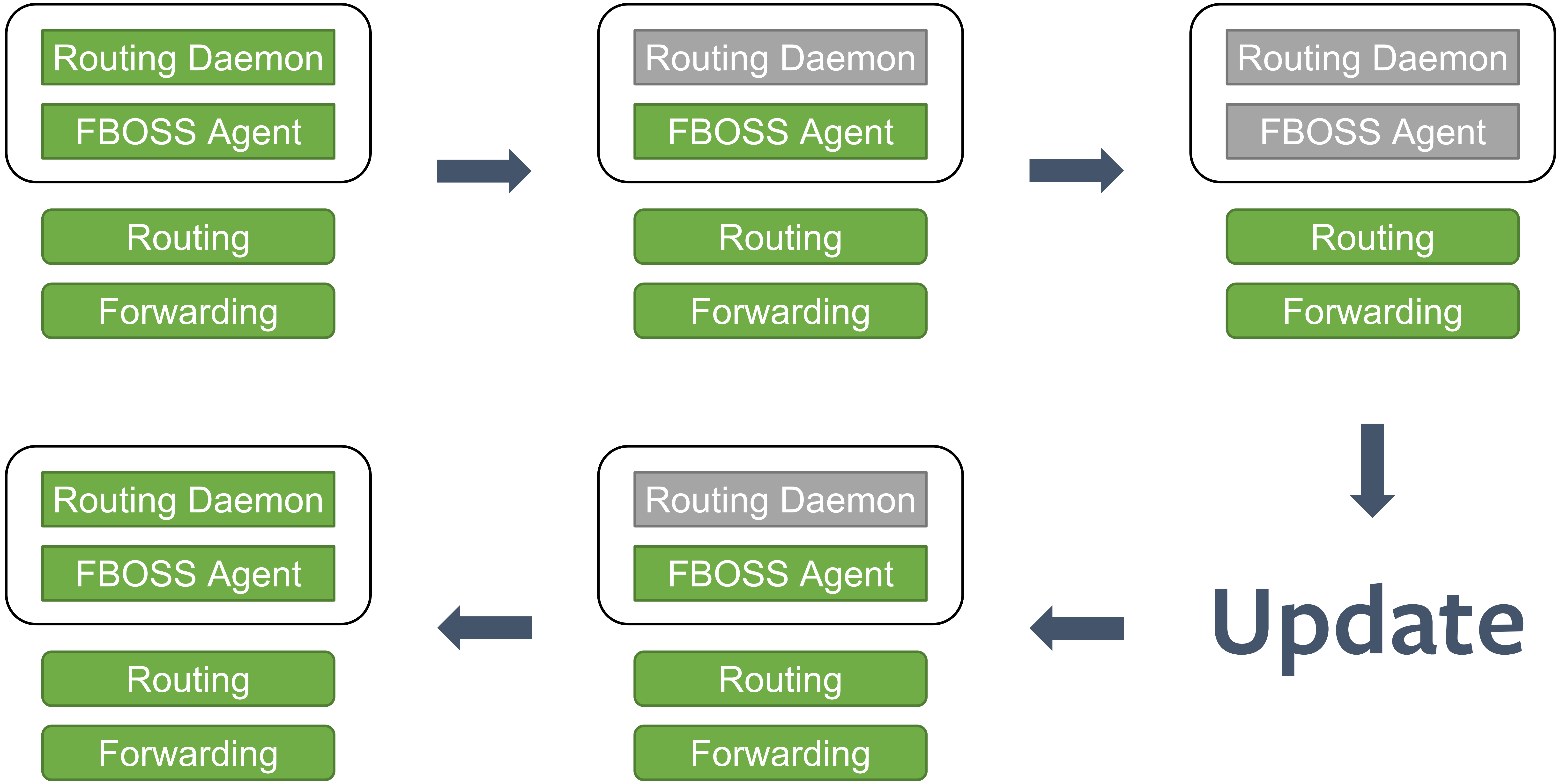
Fabric Layer

Rack Layer

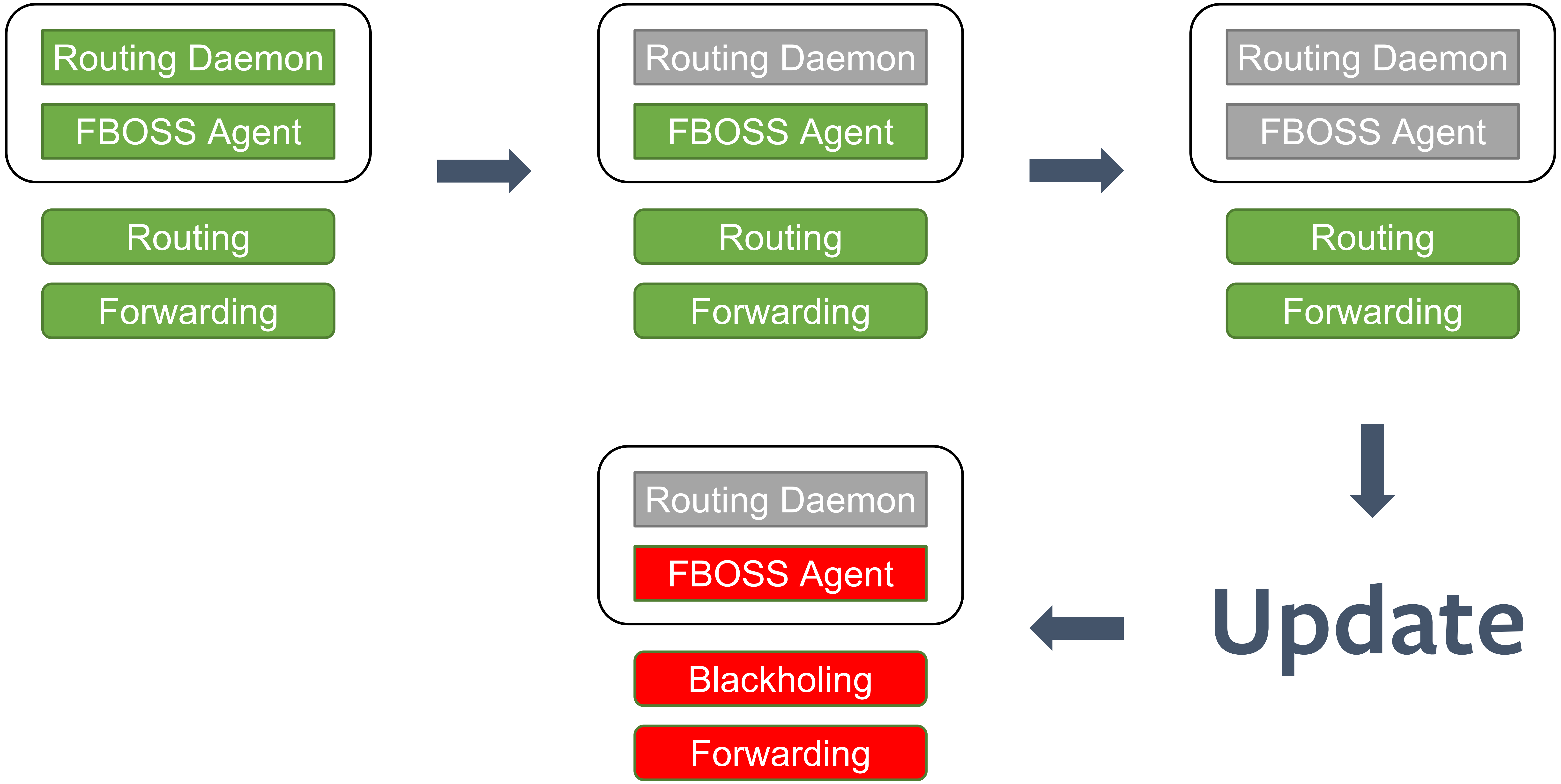
Risks

- Update itself is a complicated workflow
  - FBOSS Agent uses “Warmboot”
    - Restart without interfering the data plane
    - Subject to time limits
  - Control plane disruption is expected
    - Routing daemons need to initiate a graceful restart

Update Workflow (Good Case)



Update Workflow (Bad Case)



Routing Daemon

FBOSS Agent

Routing

Forwarding

Routing Daemon

FBOSS Agent

Routing

Forwarding

Routing Daemon

FBOSS Agent

Routing

Forwarding

Update

Routing Daemon

FBOSS Agent

Blackholing

Forwarding

Mitigating Risks

- Stay “trunk-stable” with high confidence
- Limit disruption below a fixed threshold

How to be “trunk-stable”?

Testing, testing, testing

- Unit tests to validate FBOSS Agent
- Integration tests to validate SDK behavior
  - Run on all platforms
- Test on every code commit, and continuously on trunk

How to be “trunk-stable”?

Canarying (Test in prod)

- Test common operations on production switches
  - Update, restart and roll-back
- Canary switches selected from a pool of ”Non-Critical” production switches
- Tests are run hourly and daily

Limiting disruption

Monitoring, monitoring, monitoring

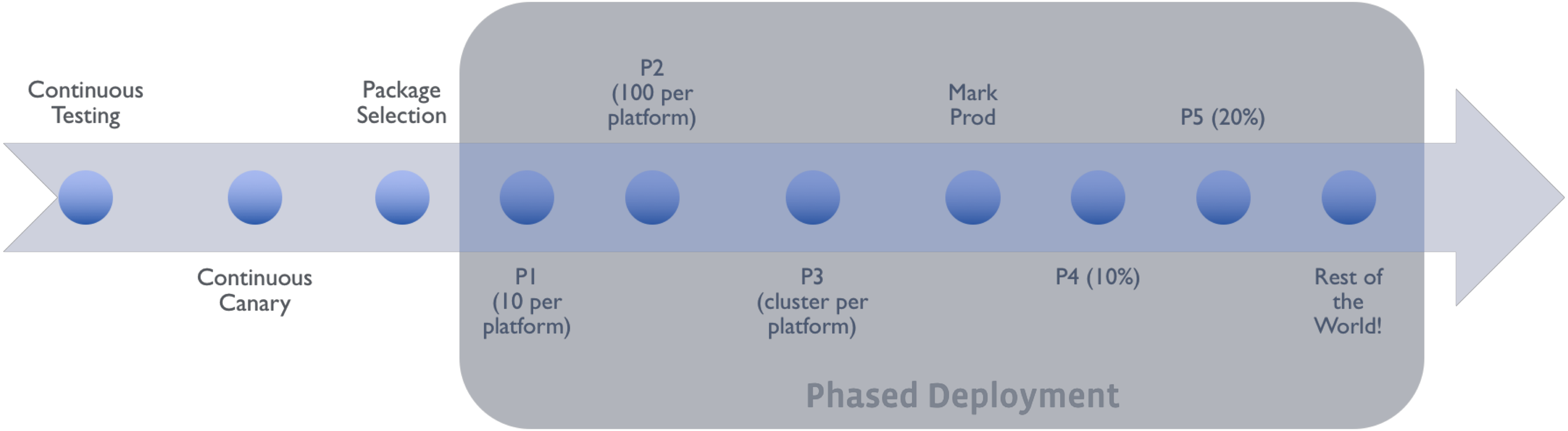
- Monitoring is built-in to our deployment infra
- Things we monitor:
  - Server reachability
  - Neighbor route updates
  - Switch State – ports, routes, peerings, etc.
- Automatically detect and stop if disruption exceeds our thresholds

Limiting disruption

Phased Roll-out

- Release broken up into multiple phases
  - Phase 1 - 10 devices per h/w platform
  - Phase 2 – 100 devices per h/w platform
  - Phase 3 – 1 cluster per h/w platform
  - Phase 4 – 10% of the fleet
  - Phase 5 – 20% of the fleet
  - Rest of the world!

Release Pipeline



Results

- Every traffic impacting service running on a FBOSS switch is supported
- Services are updated every 2-4 weeks as opposed to ~3-6 months
- Traffic disruption limited to <0.1% of the updates

Questions?

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