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NEXT GENERATION • CONVERGED DIGITAL INFRASTRUCTURE

automation architecture

towards an automated testing platform

will fantom | | paul alcock

overview

> challenges

> researcher intros

> automation architecture
  - what is it?
  - why do we need it?
  - then what is **net**dev**ops**?
  - how are we going to get there?
  - what is the big picture?

> sandbox testing
  - what can we do?
  - design overview
  - design overview++
  - what needs to be done?

> some development notes

> a [hopefully functional] proof-of-concept

challenges

the motivation

scaling network testing

> more nuanced errors can occur in heterogenous networks

+> vnfs need to be tested alongside hardware and software-based functions

> µvnf services would likely increase the number of changes per unit of time

+> microservice style deployments change how errors could present themselves

+> testing must look for errors with interconnecting systems

> developers should have the ability to test accurately themselves

intent-based networking

> changes to a configuration could invalidate deployed intents

> changes to vnf software could invalidate deployed intents

> testing should build pass/fail conditions based on the current 'intent state'

researchers

my research will

> good testing needs timely and contextual data!

> are μvnfs suitable for modern network infrastructure?

> are network management toolchains adequately prepared for μvnfs?

> how can the required telemetry be extracted from bespoke μvnfs? (e.g. unikernels)

Lancaster University

my research paul

> research associate
  - mininet/libvirt
  - netdevops
  - automated heterogeneous vnf testing

> phd
  - intent deployments
  - domains/service providers
  - intent manager

Lancaster University

automation architecture

from the top

will

what is it?

| minimize the human input required to make changes to the network |

> mimic aspects of devops as seen in software engineering

> reduce time required to test and deploy configuration changes and software function updates

goals

> give network function developers more autonomy

> provide realistic test suites to developers & configurators

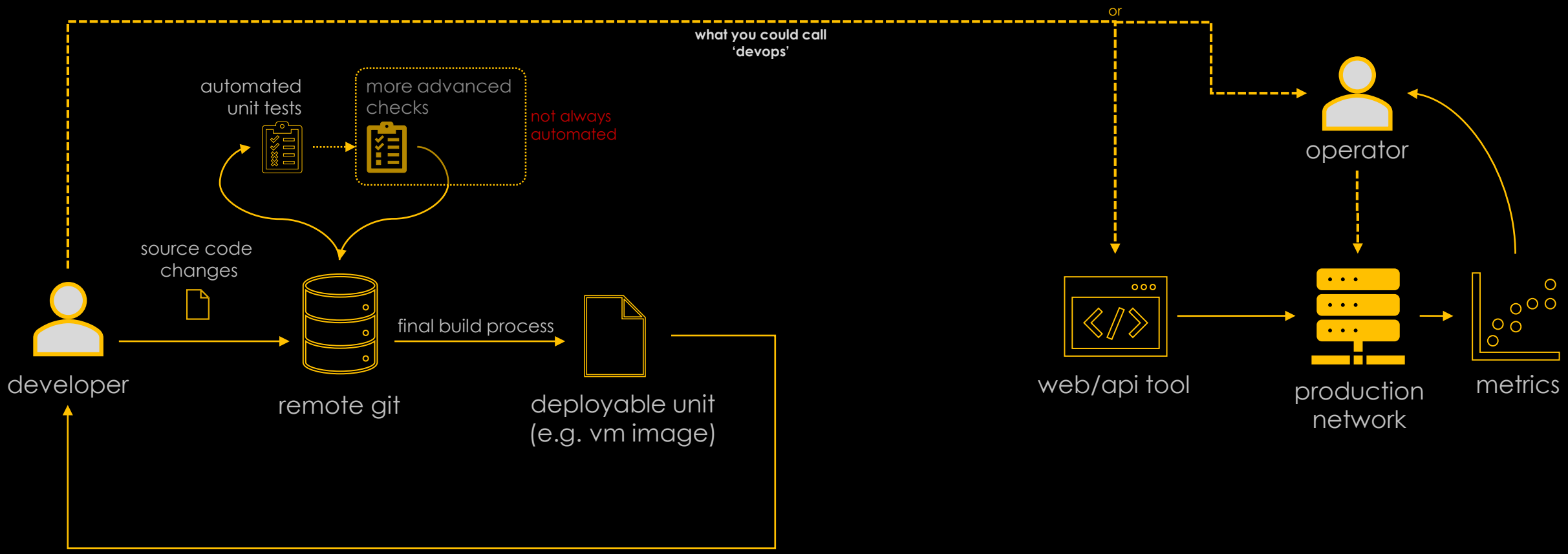
> pass/fail conditions set by operators

> more robust testing prior to any deployment

> separate critical error checks from performance checks

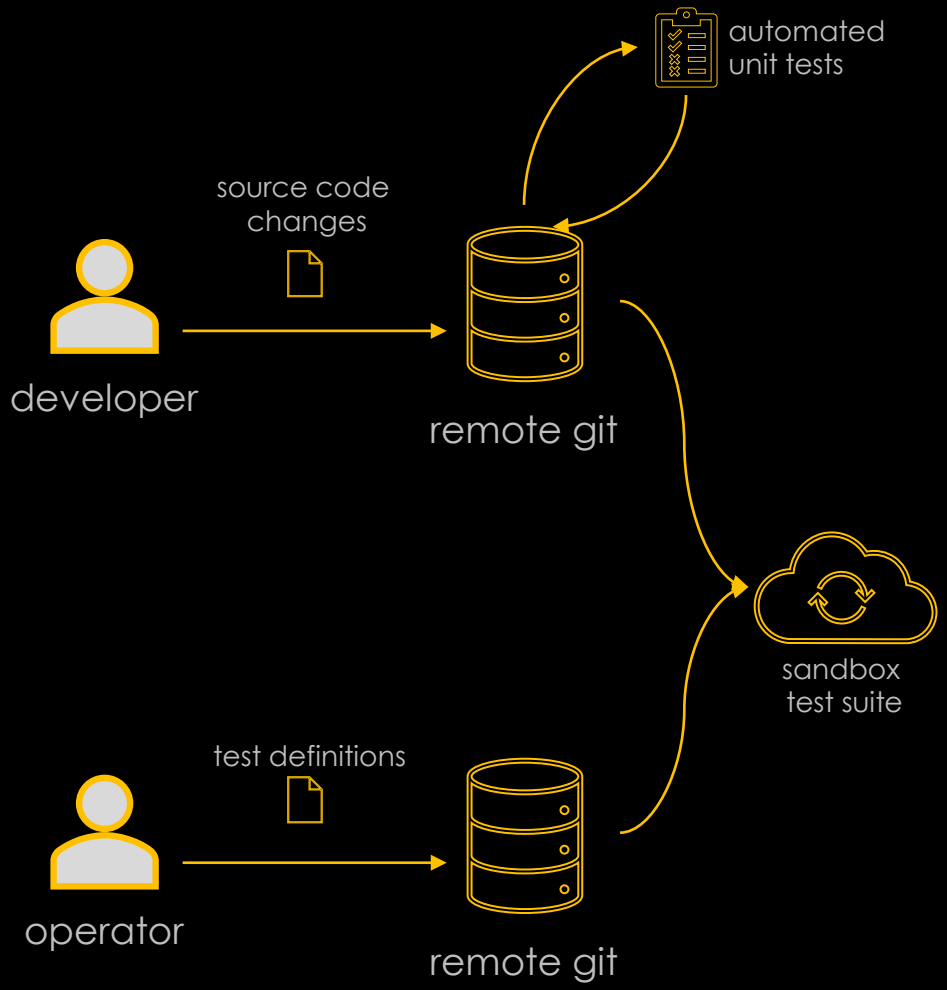
what is it? example

| a current approach |



what is it? example

| vision for updating a virtual network function |



what is it? example

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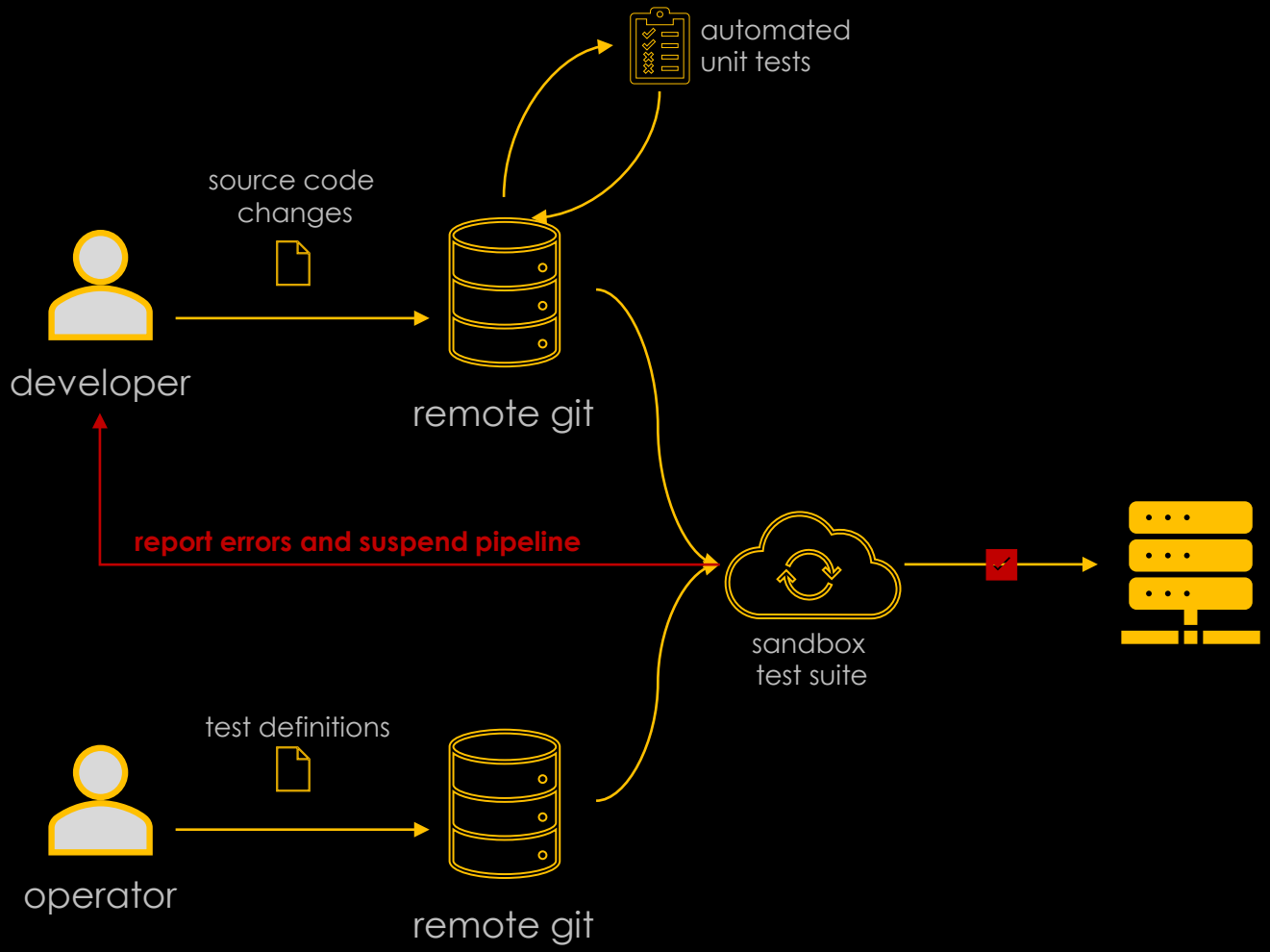

what is it? example

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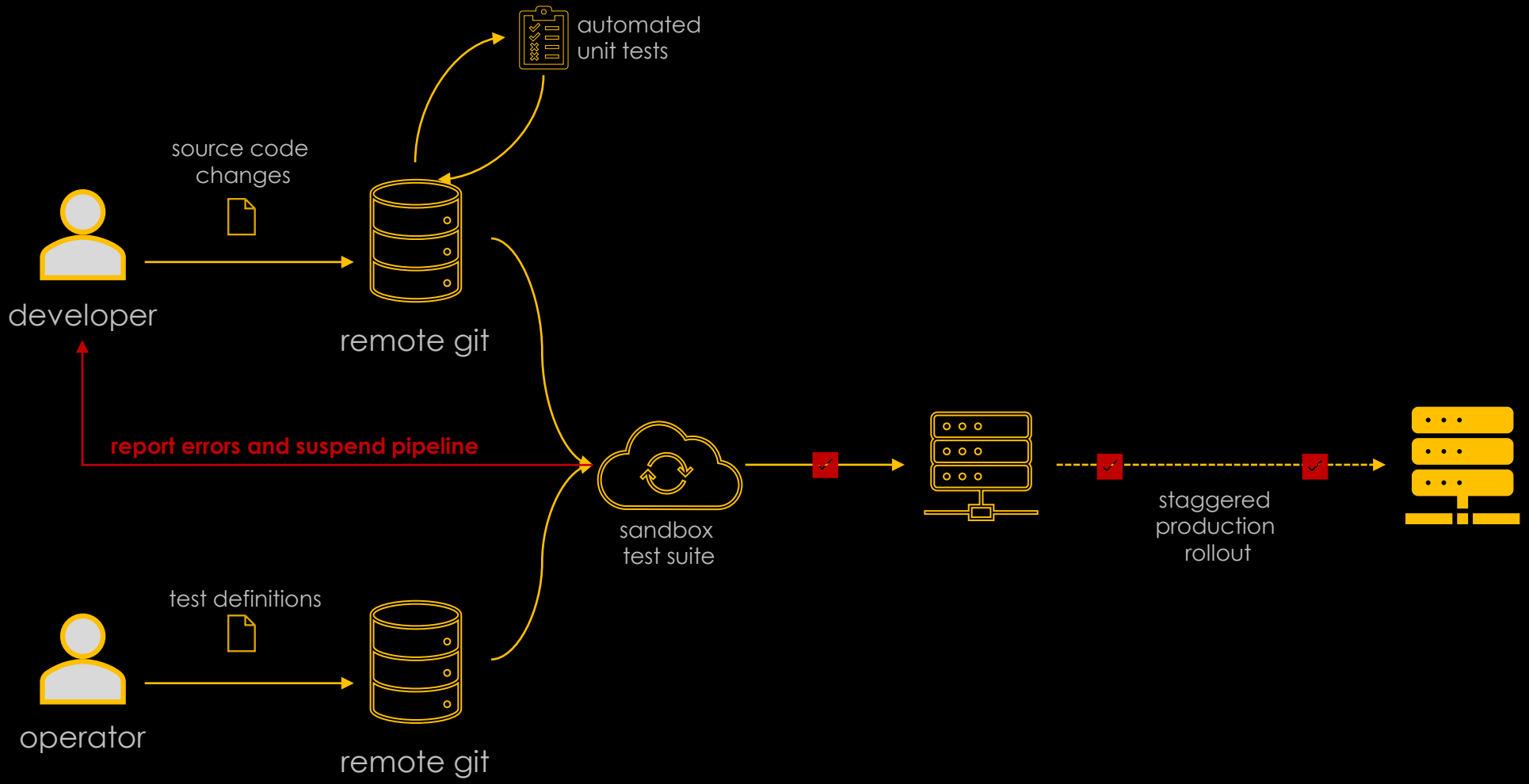
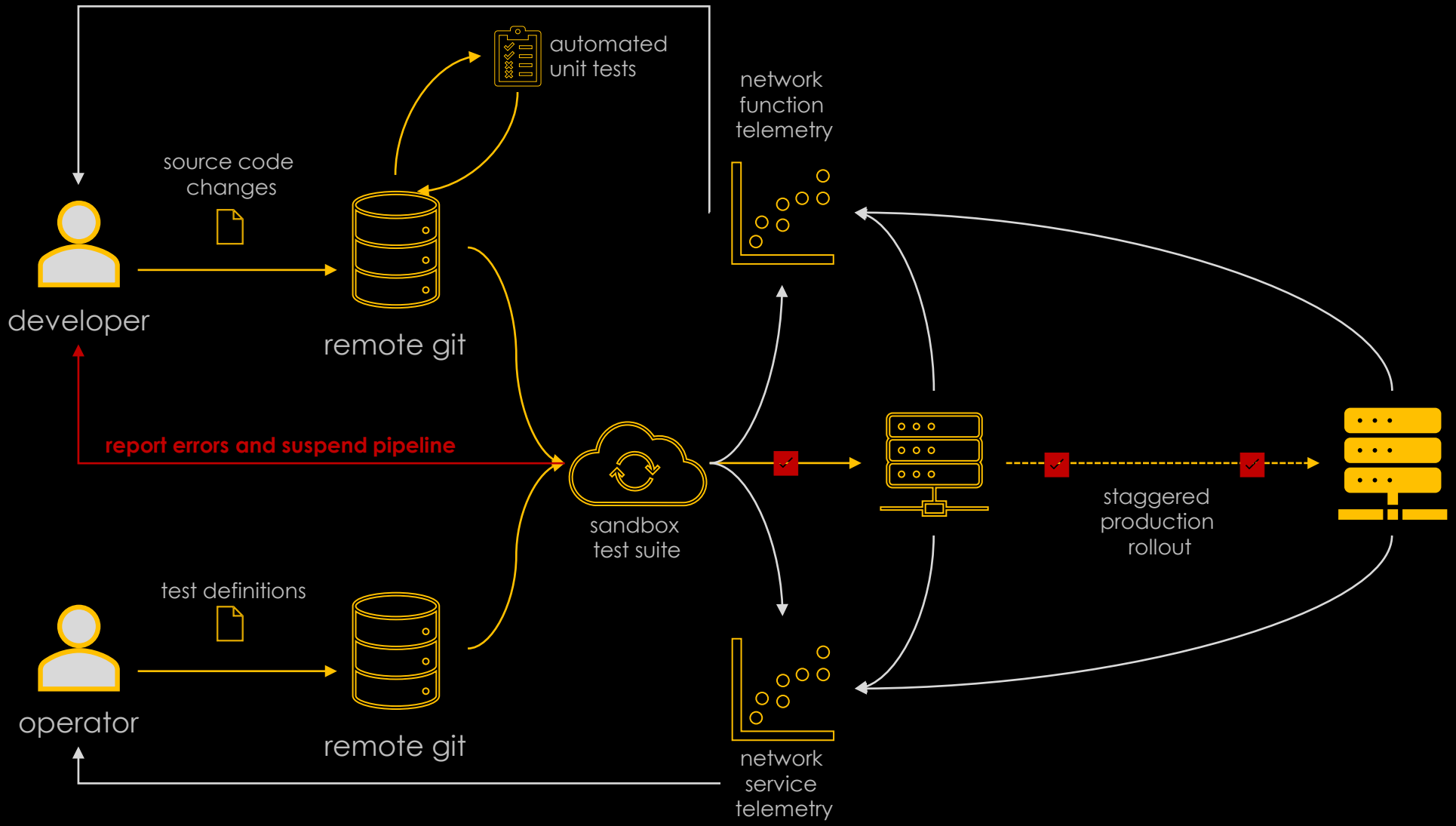


what is it? example

| vision for updating a virtual network function |



what is it? example

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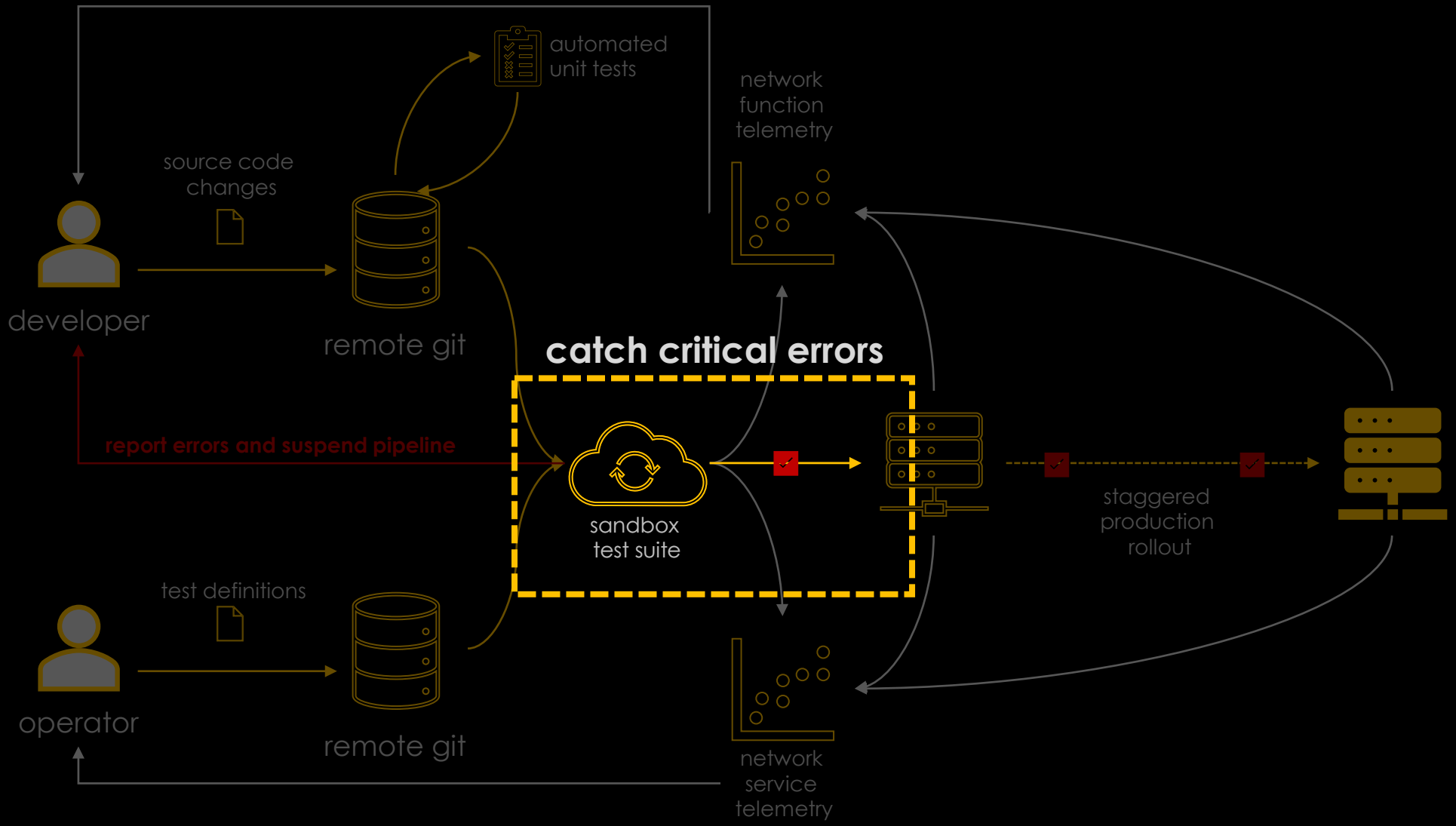
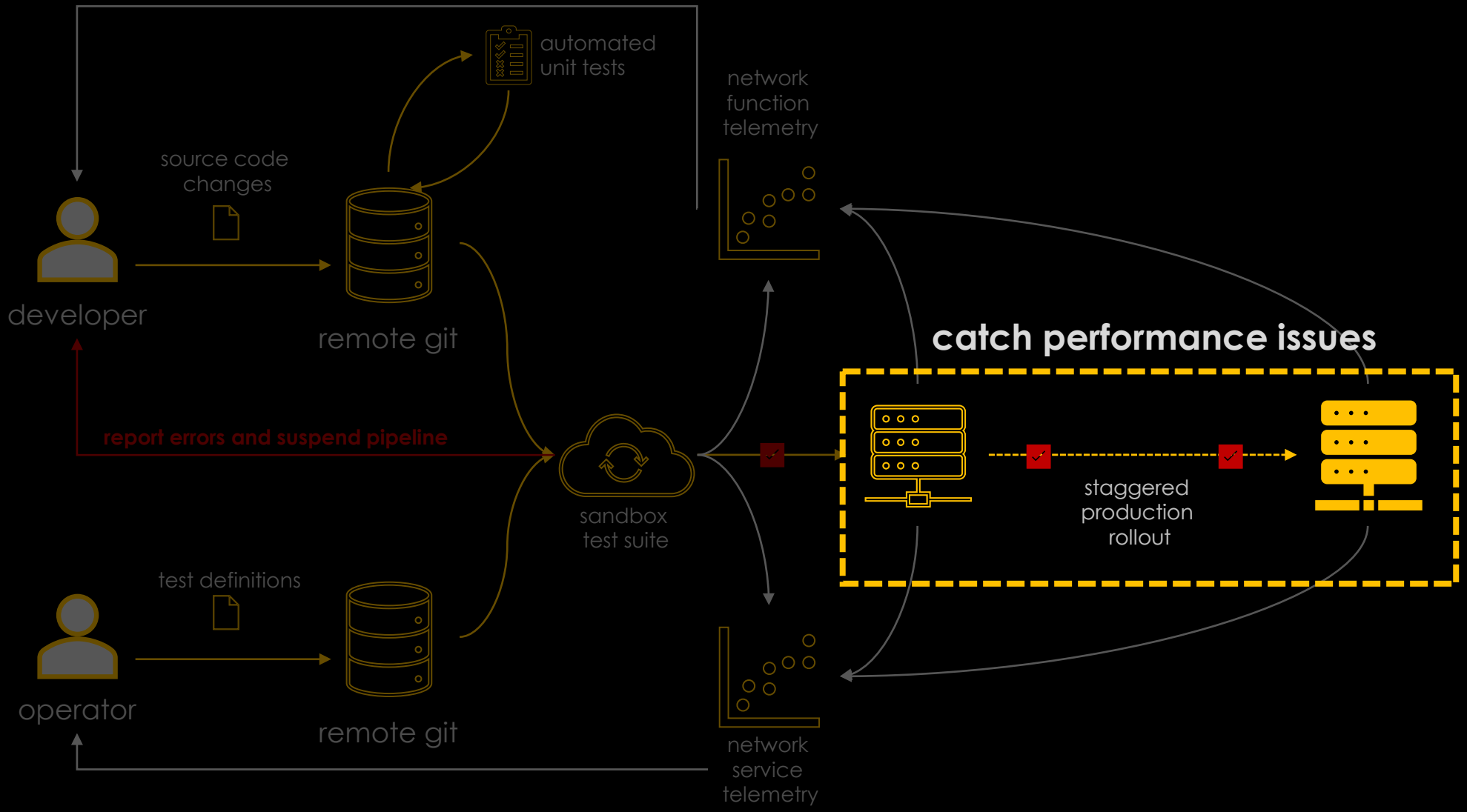


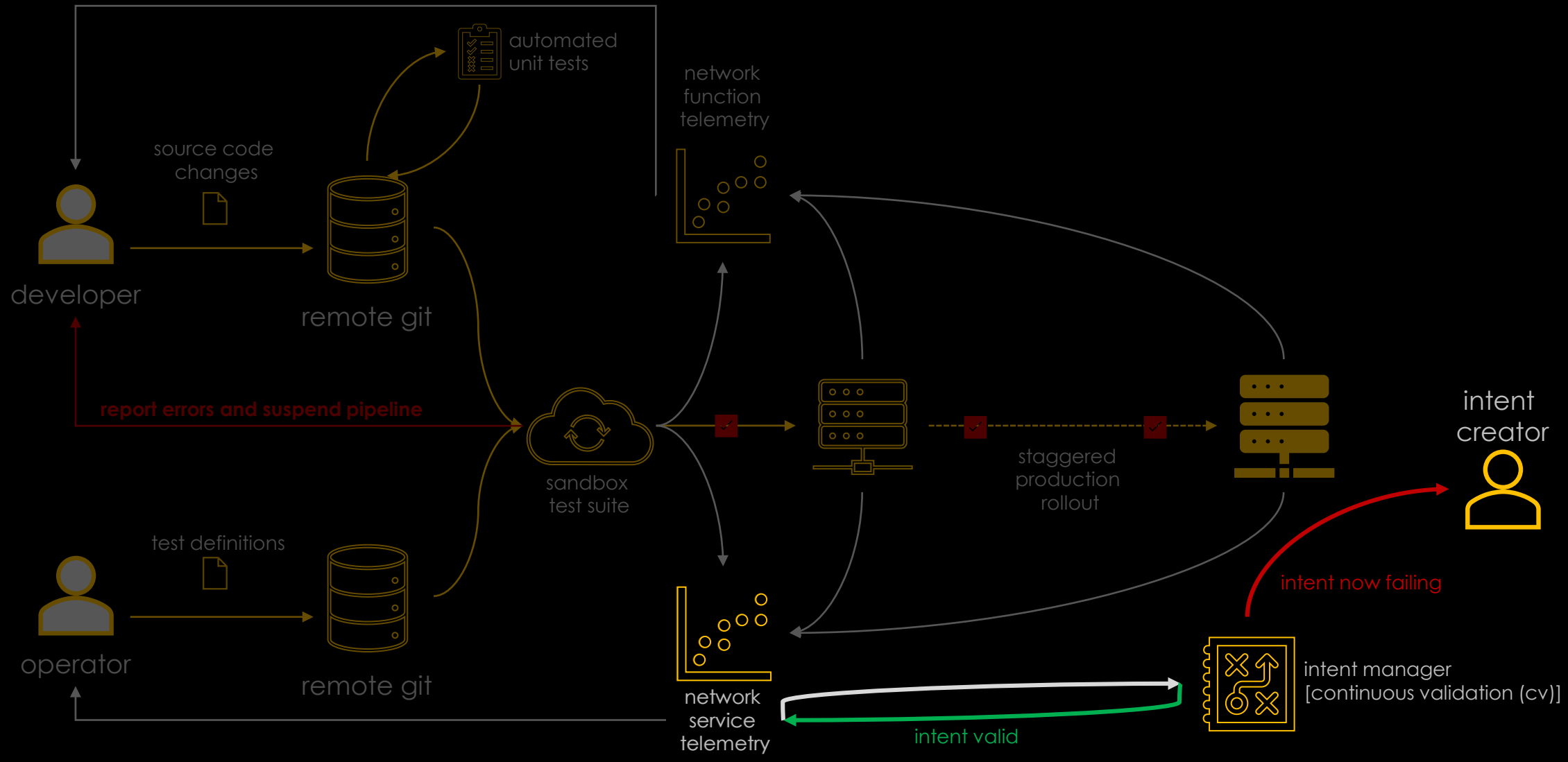
what is it? example

| vision for updating a virtual network function |



what is it? example+

| vision for updating a virtual network function + intents |



netdevops

> encourages collaboration between operators and developers

> operators provide…

+> network testing topologies
+> pass / fail conditions for the ‘sandbox testing’ phase
+> vnf type definitions
+> access to a staggered rollout system

> developers provide…
+> their code/configuration changes

what we need...

> consistent network function telemetry mechanisms

> management api for a staggered rollout

> network function/service telemetry isolation

> well-defined set of network function ‘categories’

> digital counterparts to hardware-based network functions

> testing topologies for each network function ‘category’

> **an environment for the ‘sandbox testing’ phase**…

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sandbox testing

testing in emulation

the idea

> run software vnfs in a sandbox environment before deployment onto a live network

> check configuration changes for hardware network functions in the sandbox using digital twins

> detect for non-performance related errors

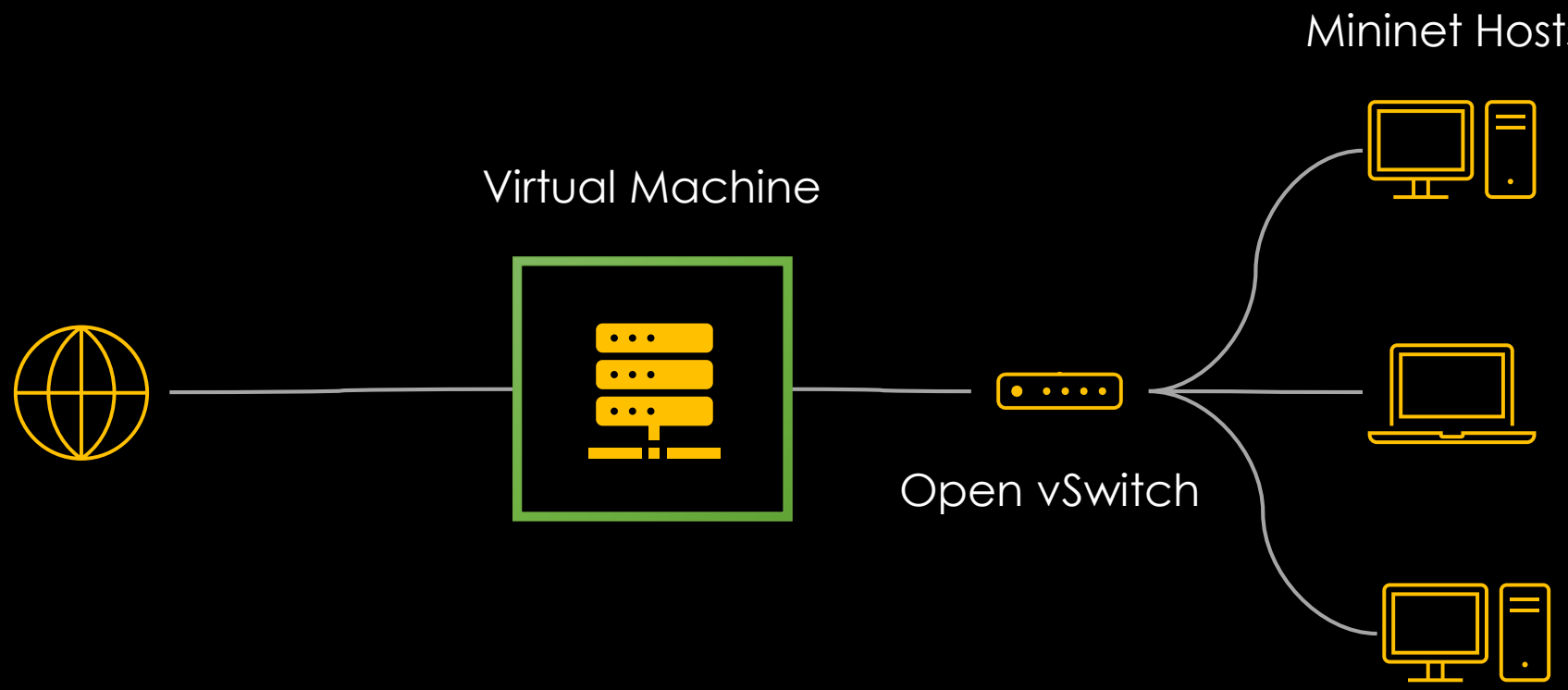
more automation

> testing environment setup (virtual topology) defined by the operators to mirror the real network

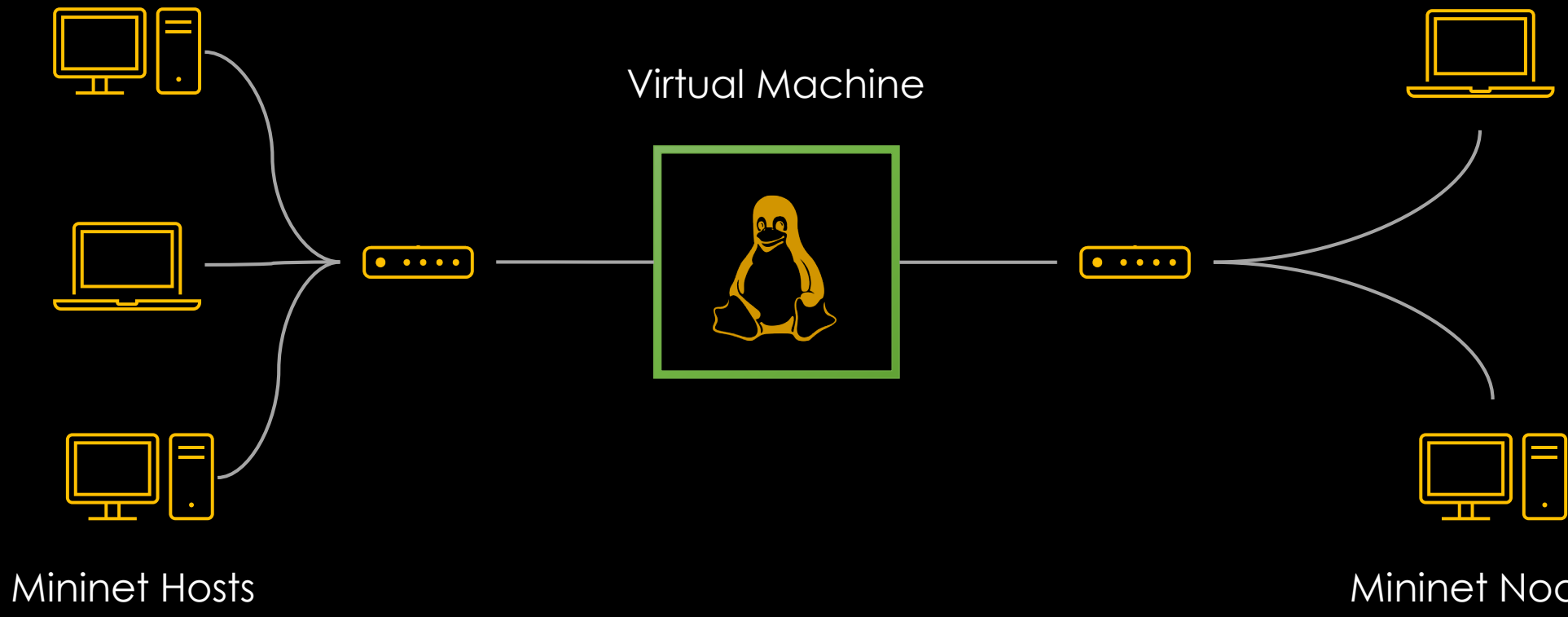
+> operators can set out the requirements for a pass/fail

> vnf developers and network engineers can run their changes with only limited knowledge of the live network's topology

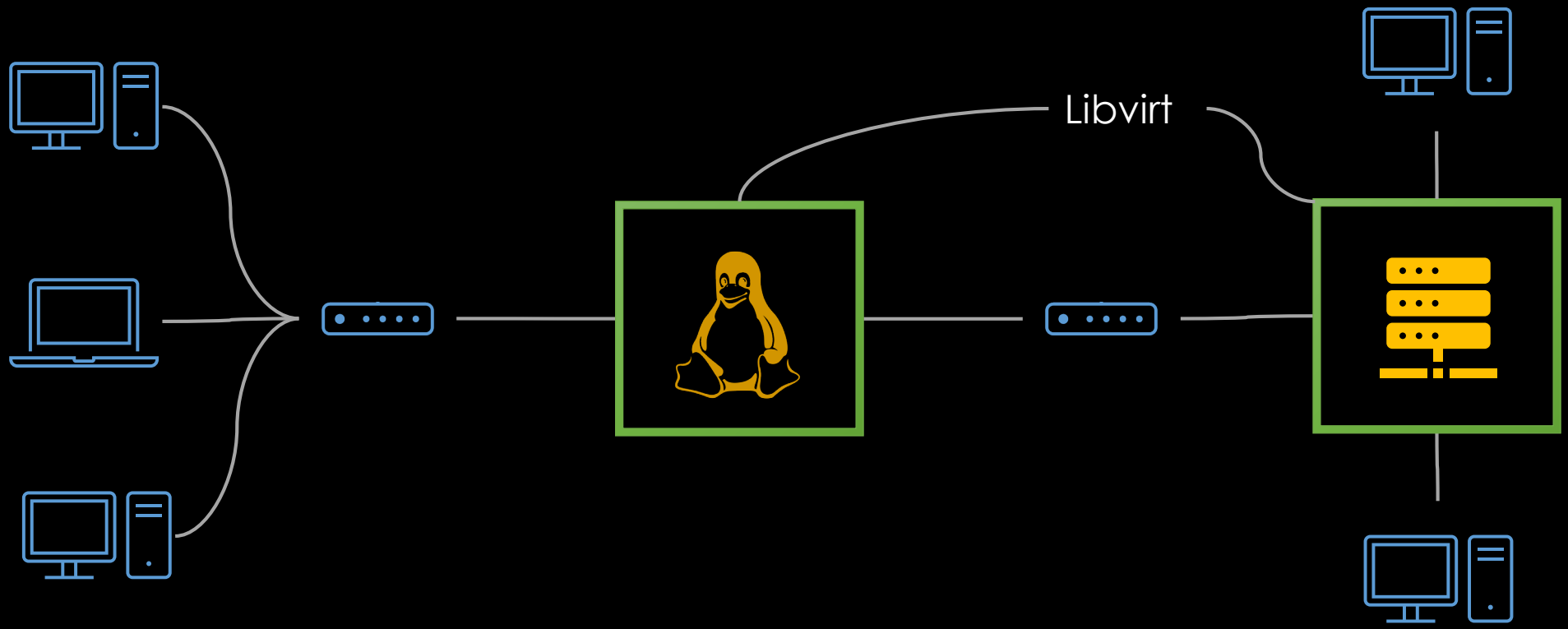
design overview



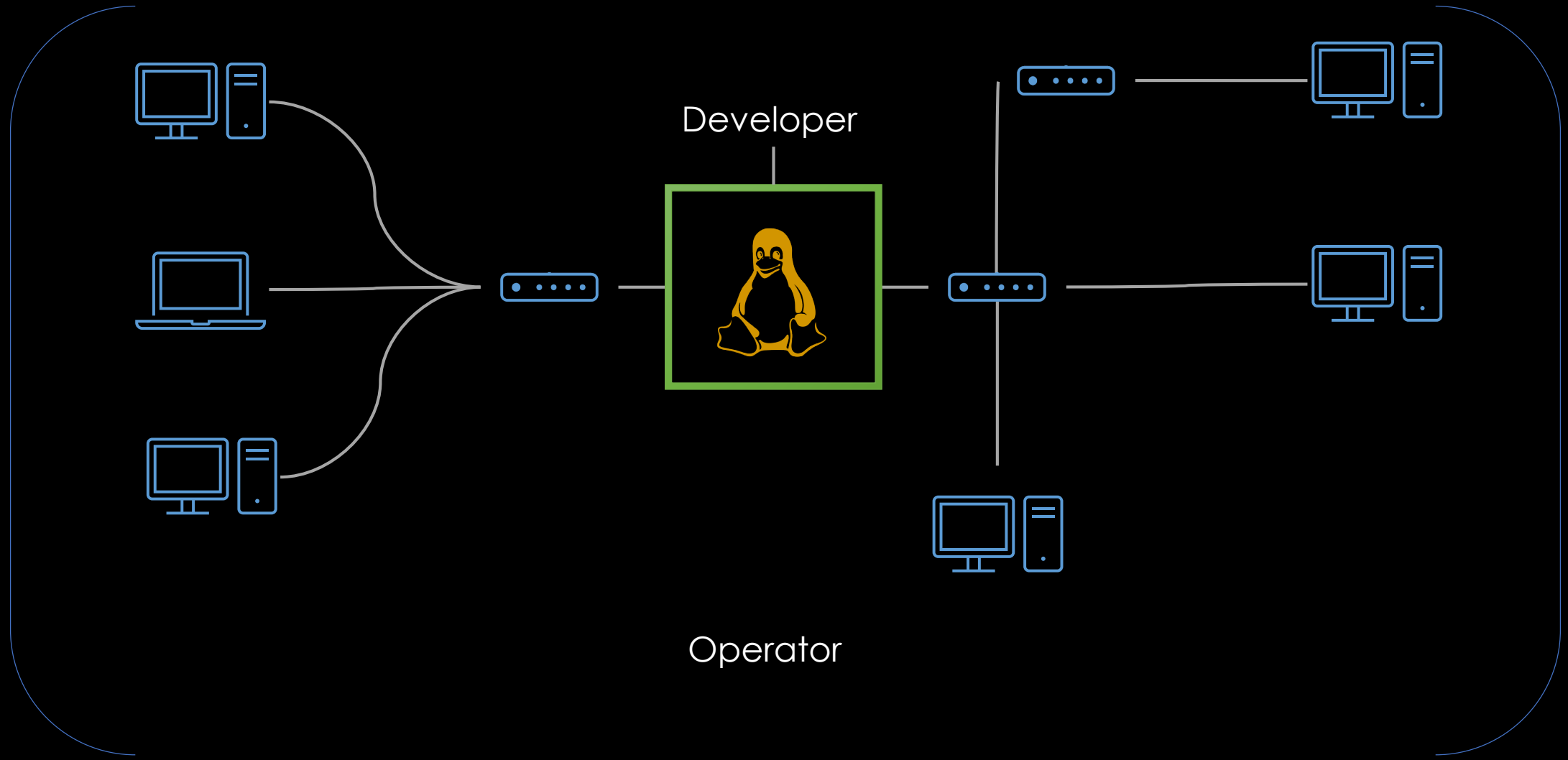
design overview



design overview



design overview



dev notes

open source

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> mininet fork

+> includes the libvirt integration for vm usage

+> includes a rest api

> mininet prometheus exporter

+> golang app to export virtual network metrics to a prometheus tsdb

+> uses the mininet rest api

github organization https://github.com/ng-cdi
technical wiki https://wiki.ng-cdi.com

github & wiki

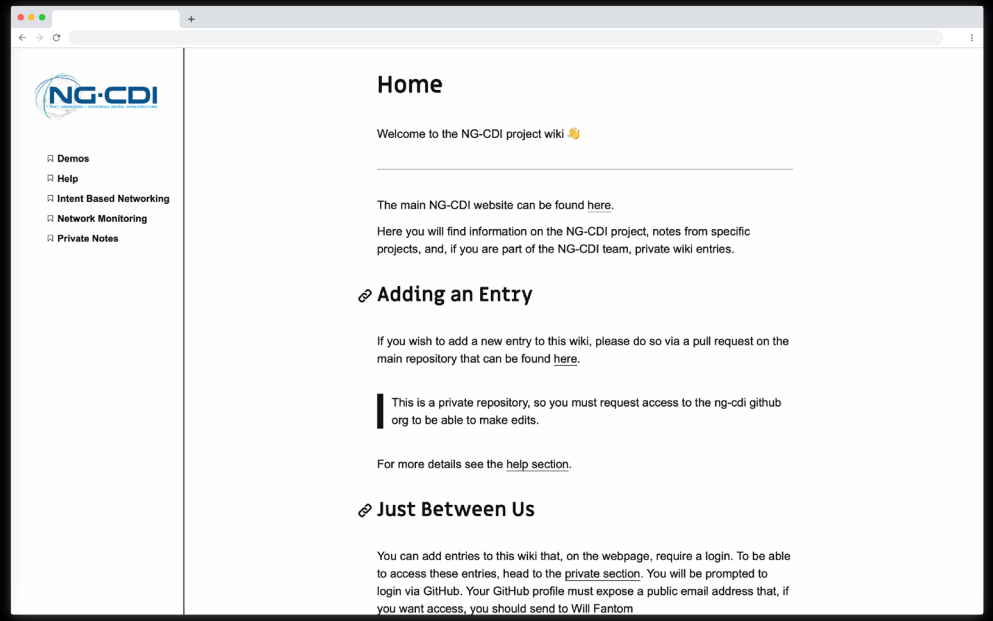
> technical wiki now running

+> contributions are welcome and can be done via markdown files on the repository

> there is a ng-cdi github organization now setup

+> private repos can be created!

+> contact me with your github username for write access



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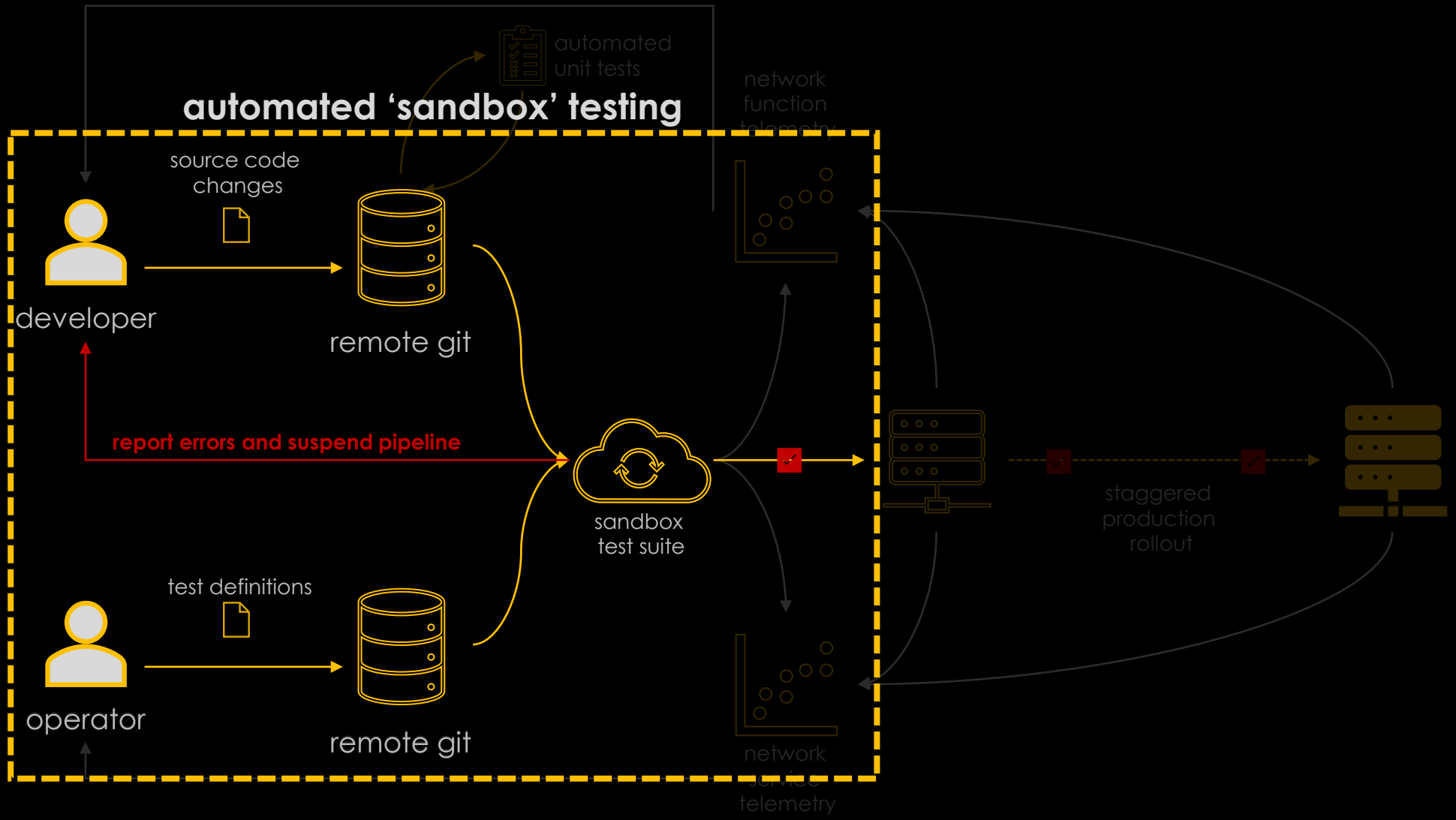
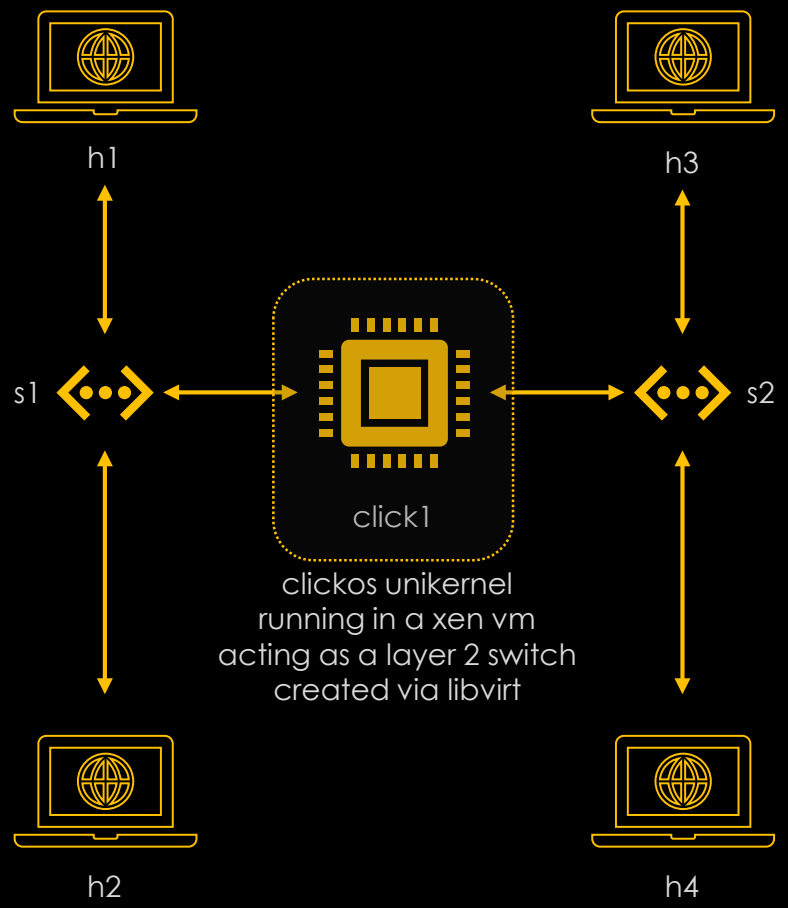
poc

focusing on…


automated unit tests
automated ‘sandbox’ testing
network function telemetry
source code changes
developer
remote git
report errors and suspend pipeline
sandbox test suite
staggered production rollout
test definitions
operator
remote git
network service telemetry

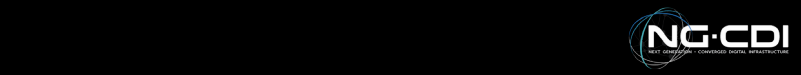
poc test



tests

h1 ping h3
– must not lose any packets
- ping time should be under 0.1ms

h2 ping h4
– must not lose any packets
- ping time should be under 0.05ms



⚠ work in progress ⚠

summary

automated testing

> give network function developers the autonomy to run meaningful tests

+> operators provide useful test scenarios

> scale testing with the increase in vnf microservices

+> separate service/function telemetry

+> feedback data directly to relevant parties

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technical wiki https://wiki.ng-cdi.com

thanks for listening

any questions?

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