

CISCO *Live!*



#CiscoLive



The bridge to possible

Automation gone wrong

Lessons learned from screwing up your network
automation

Marcel Neidinger,

Software Solutions Engineer

@squ4rks

DEVNET-1439



#CiscoLive

Cisco Webex app

Questions?

Use Cisco Webex App to chat with the speaker after the session

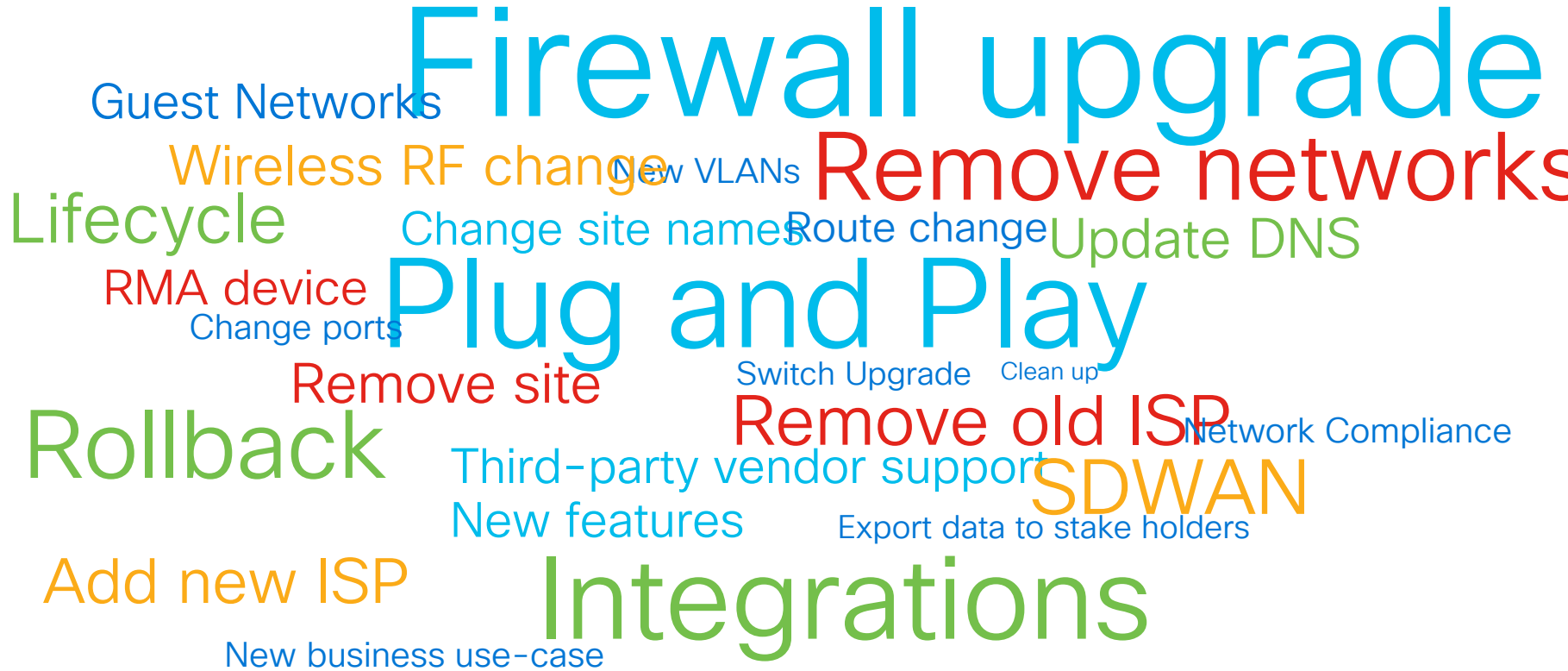
How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until June 17, 2022.



<https://ciscolive.ciscoevents.com/ciscolivebot/#DEVNET-1439>



A word cloud of network-related terms. The words are arranged in a circular pattern, with some words being larger and more prominent than others. The colors of the words are: blue, red, green, orange, and yellow. The words include: Firewall upgrade, Remove networks, Plug and Play, Rollback, Integrations, Add new ISP, New business use-case, New features, Third-party vendor support, Remove old ISP, SDWAN, Network Compliance, Export data to stake holders, Clean up, Switch Upgrade, Remove site, Change ports, RMA device, Lifecycle, Wireless RF change, New VLANs, Change site names, Route change, Update DNS, Guest Networks, and RMA device.

Firewall upgrade

Remove networks

Plug and Play

Rollback

Integrations

Add new ISP

New business use-case

New features

Third-party vendor support

Remove old ISP

SDWAN

Network Compliance

Export data to stake holders

Clean up

Switch Upgrade

Remove site

Change ports

RMA device

Lifecycle

Wireless RF change

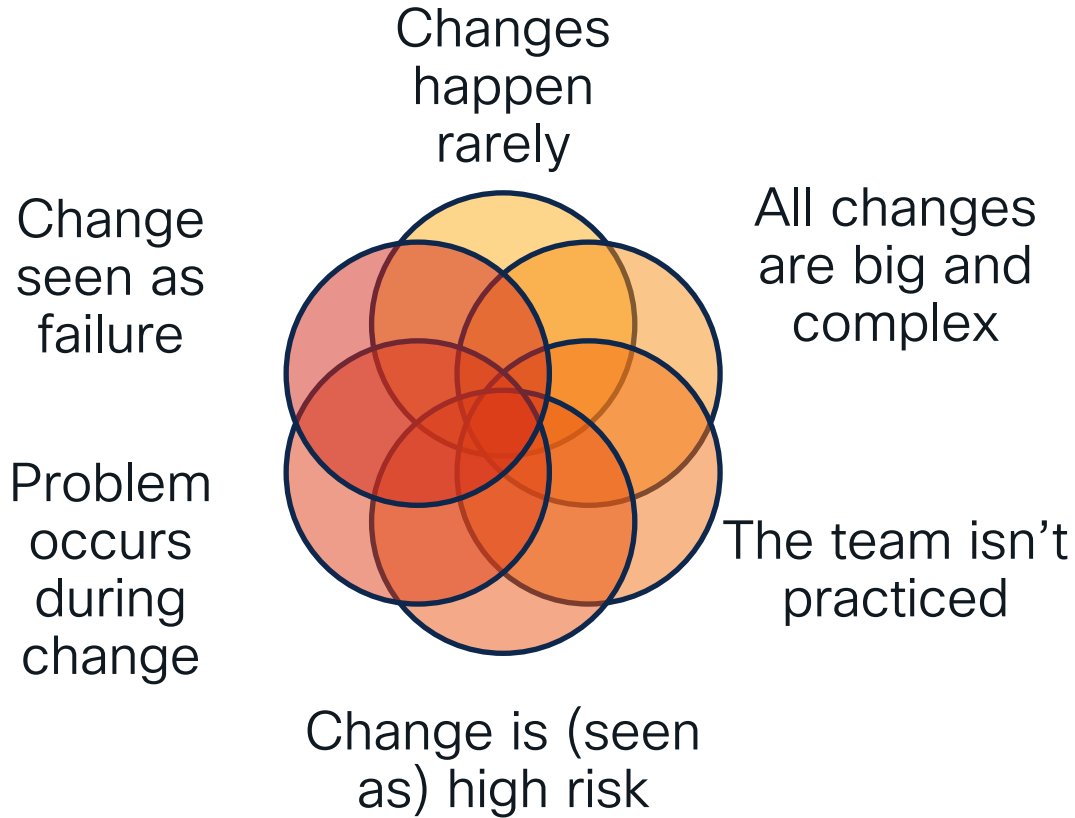
New VLANs

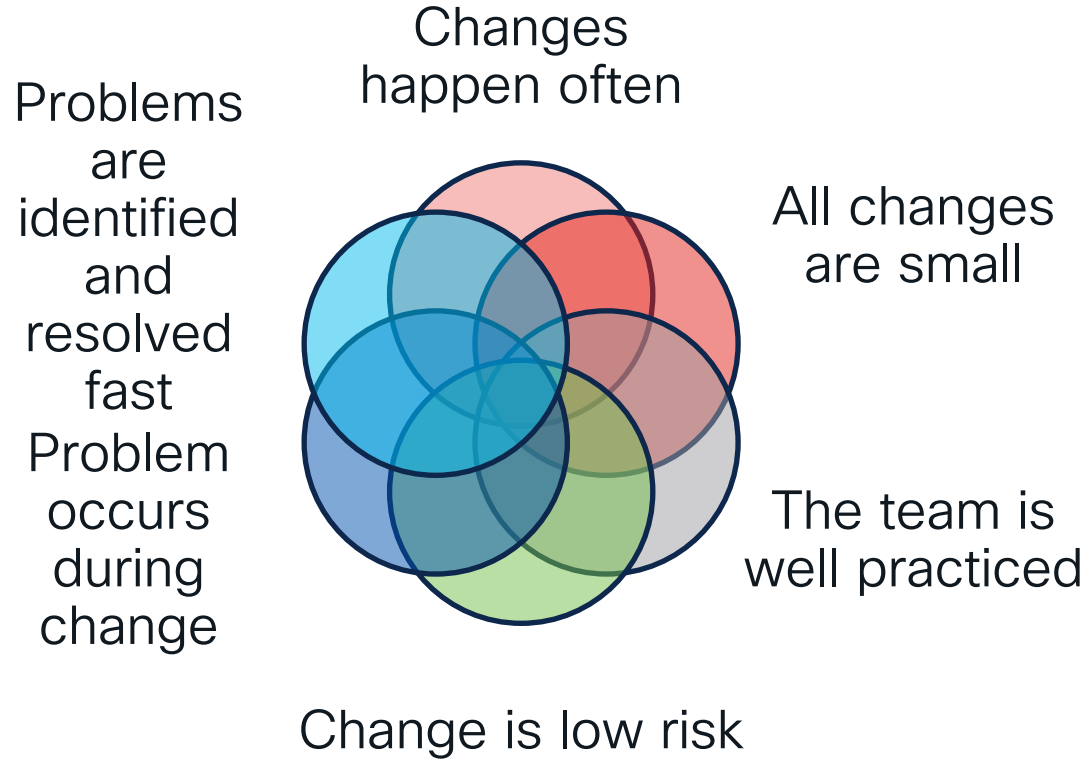
Change site names

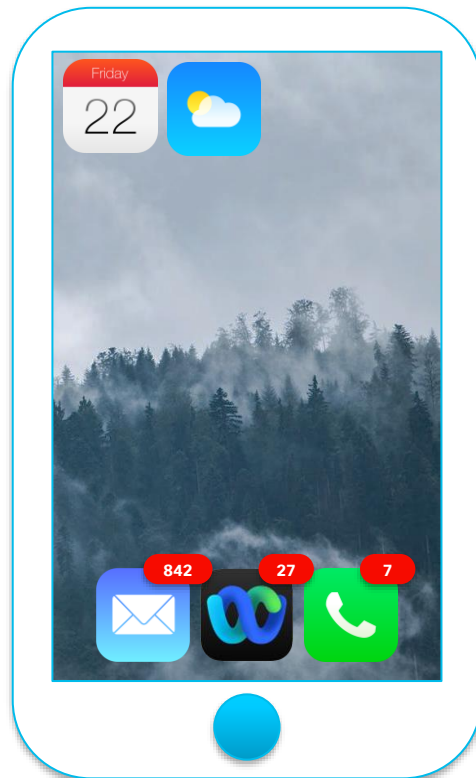
Route change


Update DNS

Guest Networks










*The **first** rule of technology used in a business is that **automation** applied to an **efficient** operation will **magnify the efficiency** ...*



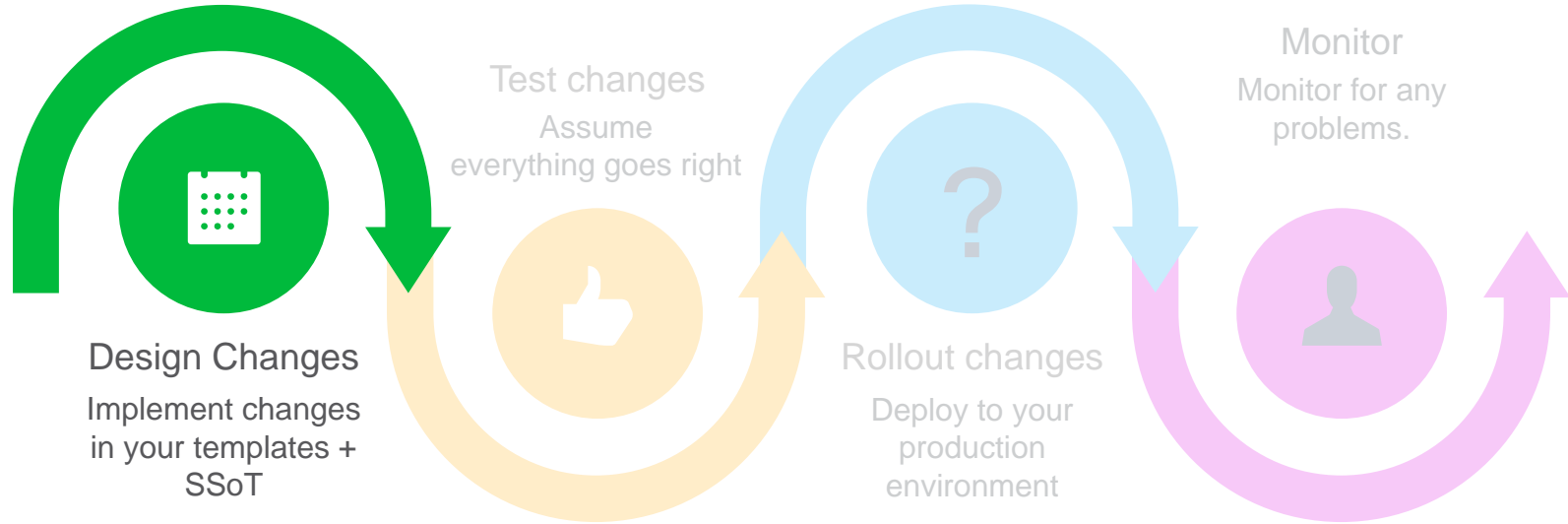
... The *second* is that *automation*
applied to an *inefficient operation*
will *magnify the inefficiency*.

– Bill Gates



*A **difference in scale** becomes a
difference in kind.*

Steps of a NetDevOps pipeline



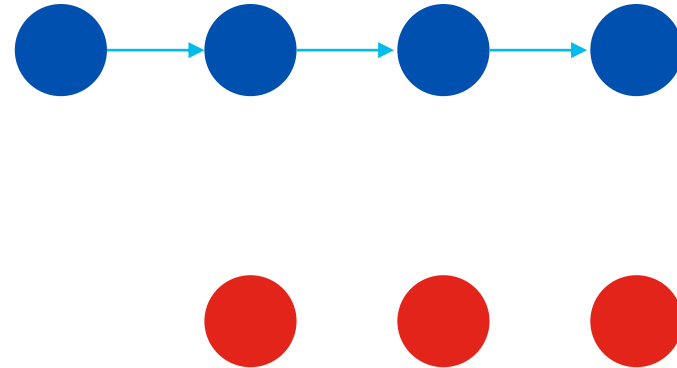
Yes – You need a
single source of truth
(SSoT)

Demo: SSoT using GitLab, Templates and NetBox

Design changes with
rollback in mind

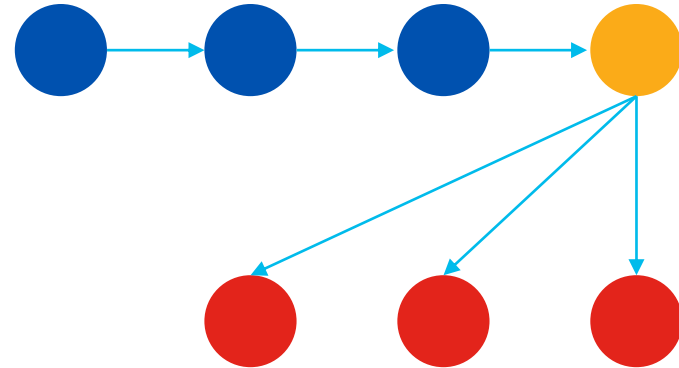
Build-in rollbacks

- Each workflow (or Saga) consists of requests.
- Each request has a compensation request that undoes the changes.
- If any of the requests fail all compensation requests are send

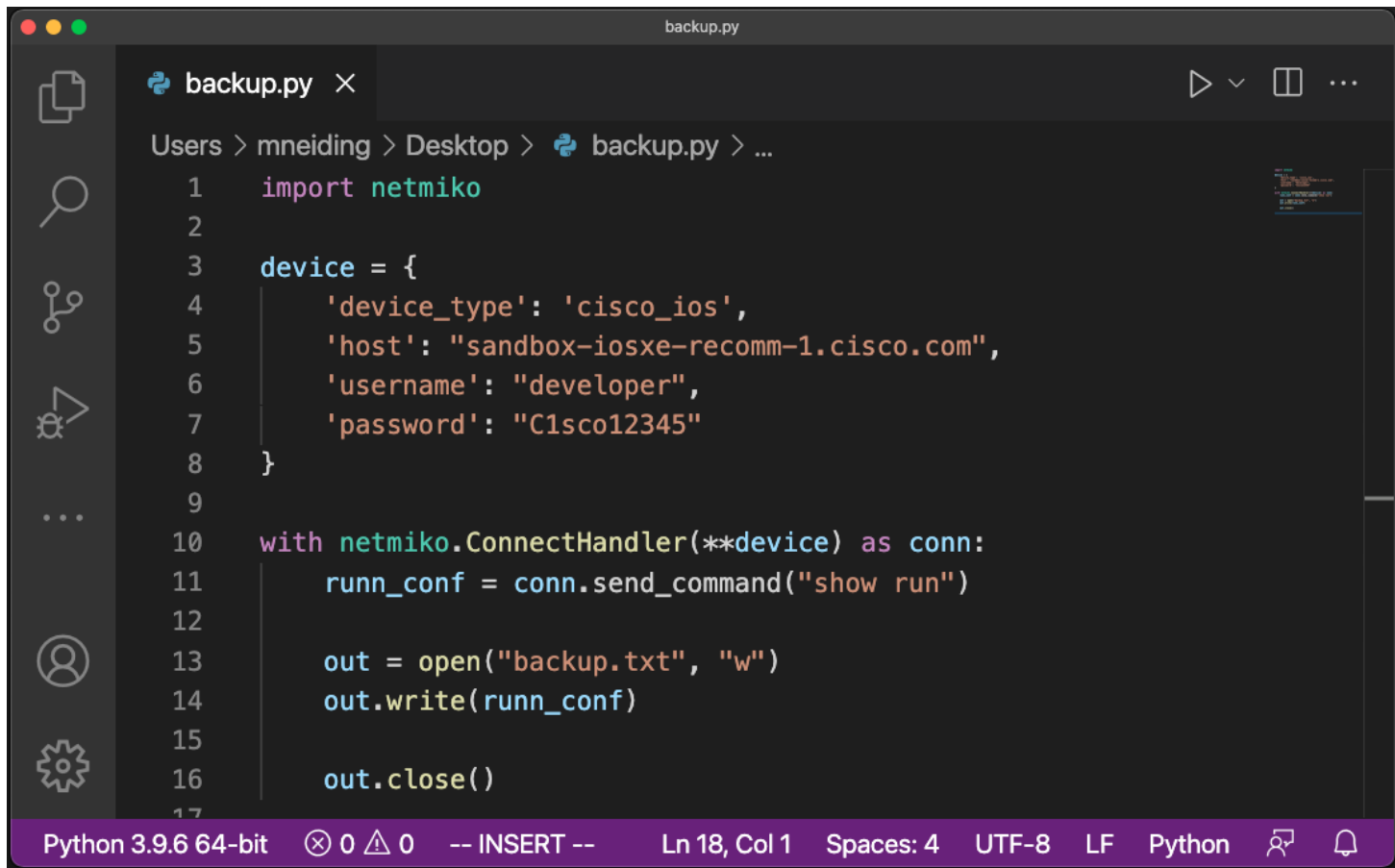


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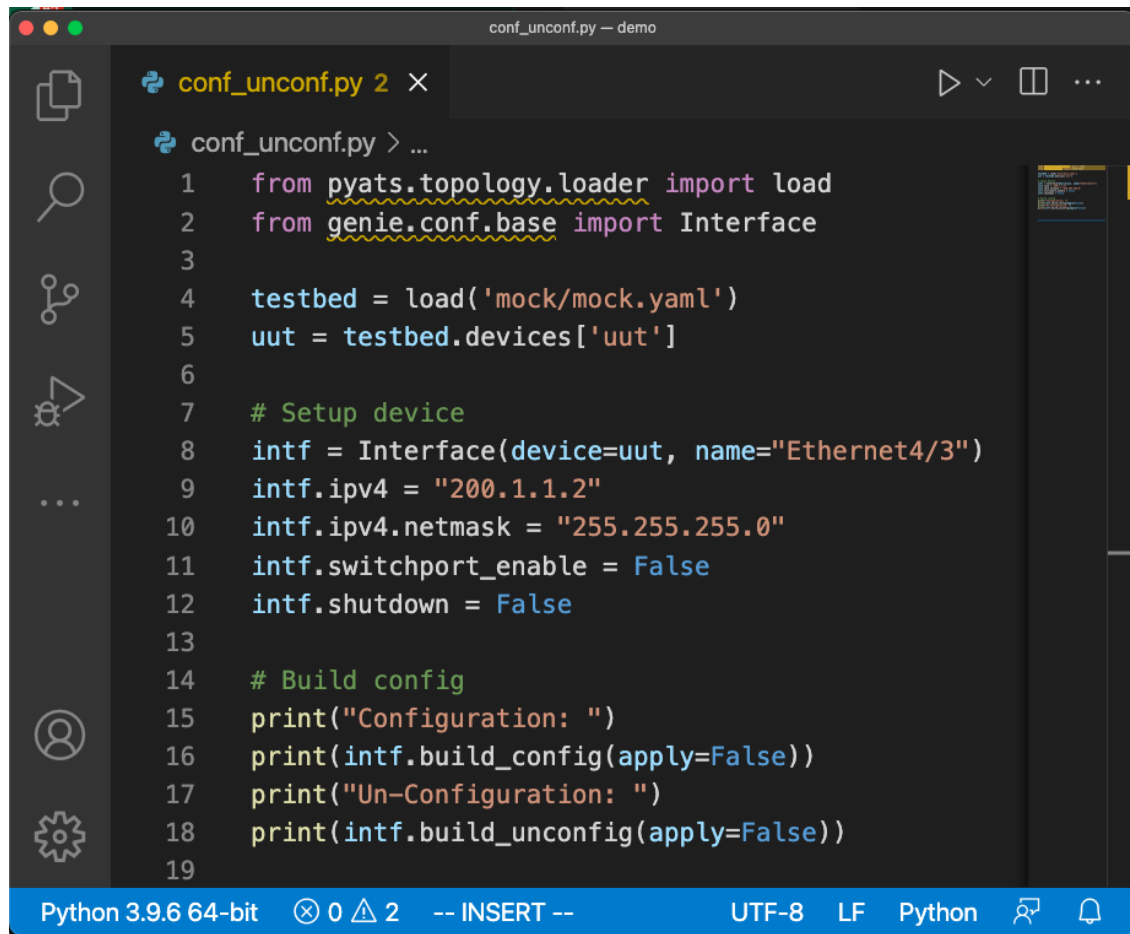
Demo: Automatic config and unconfig creation with pyATS



```
backup.py ×
Users > mneiding > Desktop > backup.py > ...
1  import netmiko
2
3  device = {
4      'device_type': 'cisco_ios',
5      'host': "sandbox-iosxe-recomm-1.cisco.com",
6      'username': "developer",
7      'password': "C1sco12345"
8  }
9
10 with netmiko.ConnectHandler(**device) as conn:
11     runn_conf = conn.send_command("show run")
12
13     out = open("backup.txt", "w")
14     out.write(runn_conf)
15
16     out.close()
17
```

Python 3.9.6 64-bit 0 0 -- INSERT -- Ln 18, Col 1 Spaces: 4 UTF-8 LF Python

Source code available under: <https://github.com/squ4rks/DEVNET-1439>

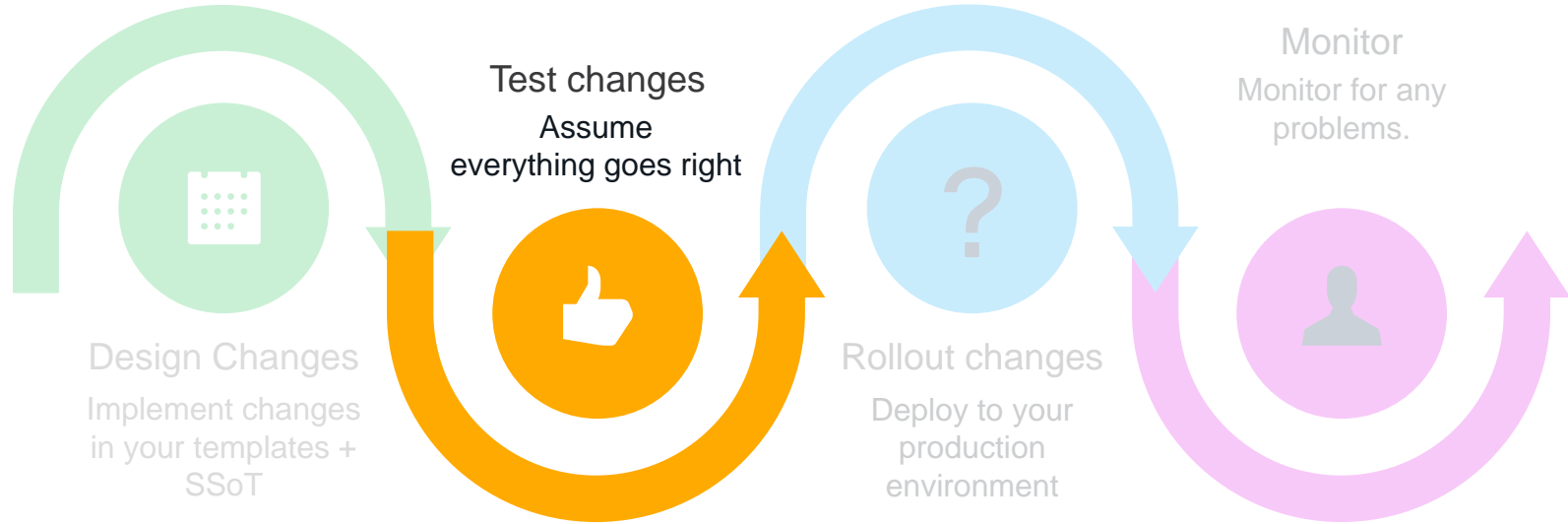


```
conf_unconf.py 2 x
conf_unconf.py > ...
1  from pyats.topology.loader import load
2  from genie.conf.base import Interface
3
4  testbed = load('mock/mock.yaml')
5  uut = testbed.devices['uut']
6
7  # Setup device
8  intf = Interface(device=uut, name="Ethernet4/3")
9  intf.ipv4 = "200.1.1.2"
10  intf.ipv4.netmask = "255.255.255.0"
11  intf.switchport_enable = False
12  intf.shutdown = False
13
14  # Build config
15  print("Configuration: ")
16  print(intf.build_config(apply=False))
17  print("Un-Configuration: ")
18  print(intf.build_unconfig(apply=False))
19
```


Python 3.9.6 64-bit 0 2 -- INSERT -- UTF-8 LF Python

Source code available under: <https://github.com/squ4rks/DEVNET-1439>

Steps of a NetDevOps pipeline



Make sure you are
actually testing



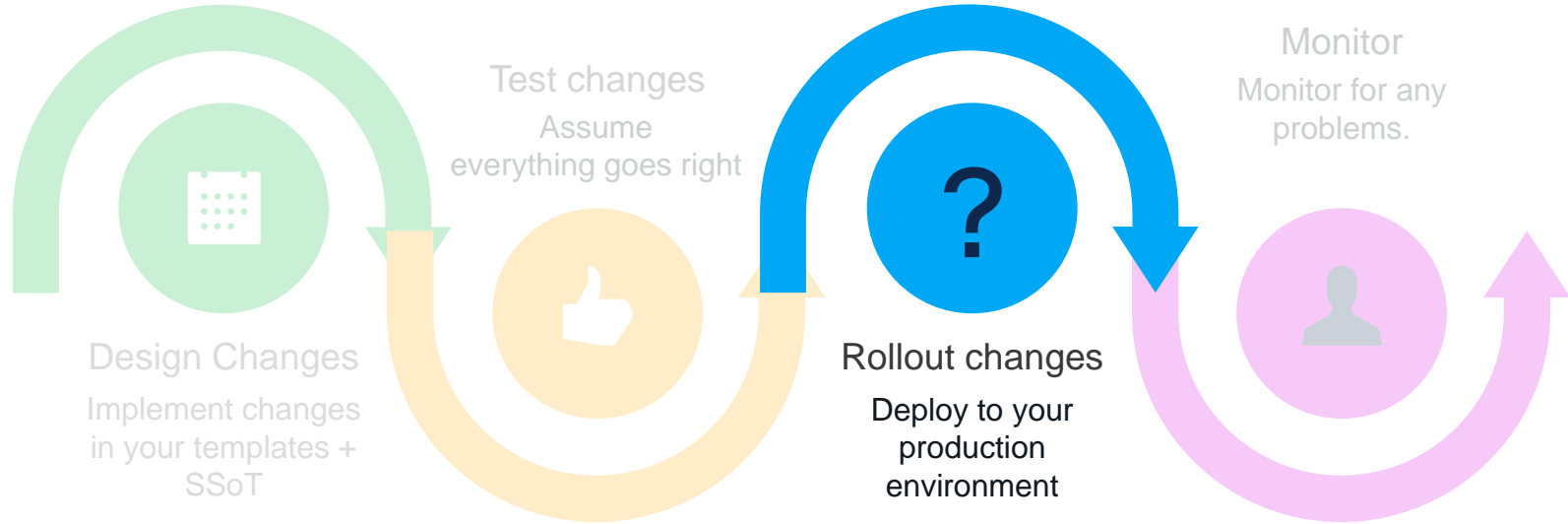
*We can make **good tests run faster**
but we can't **make fast tests be**
good.*

– Ryan Tomayko

Think what you *do* –
then write it as a test
case

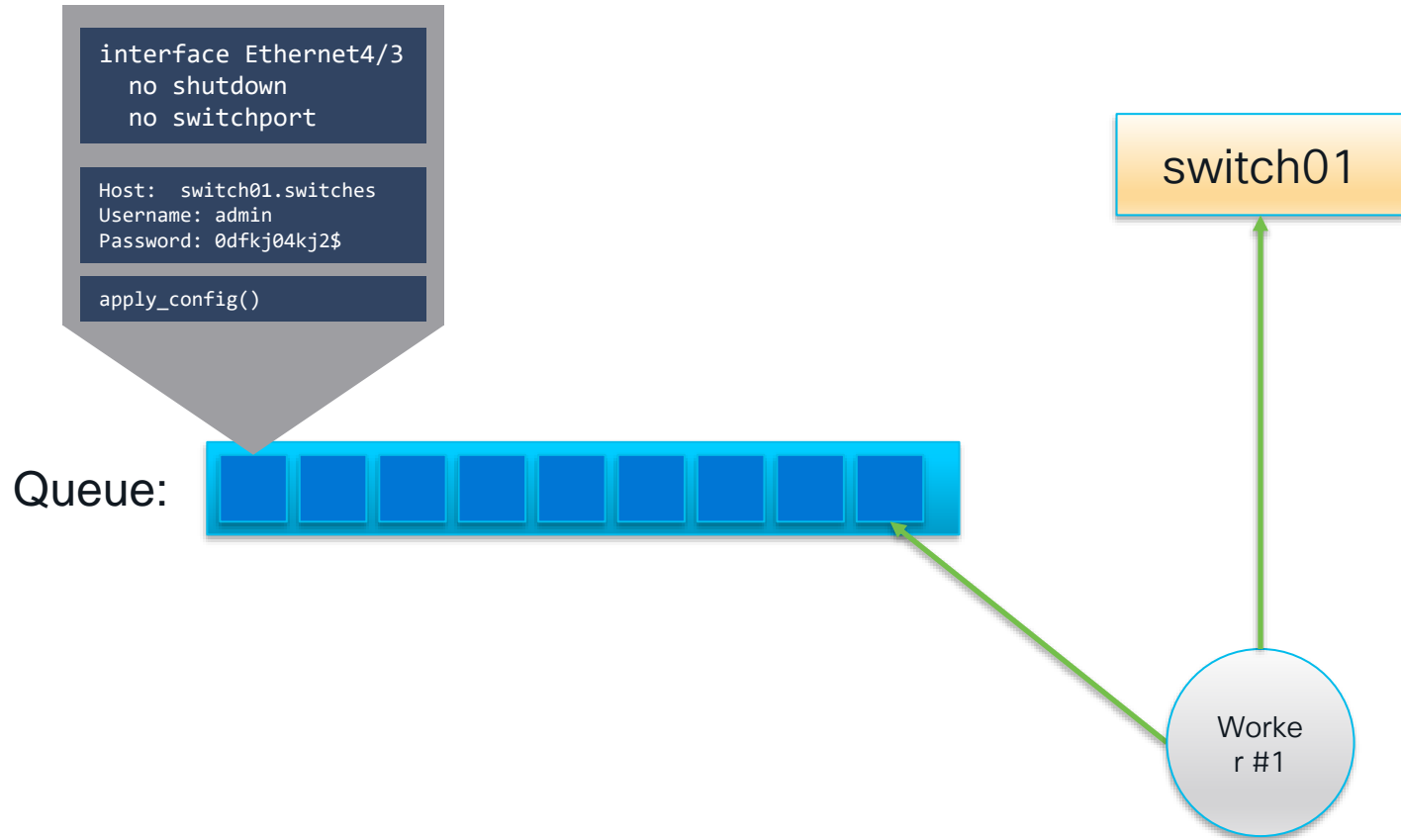
Demo: Automated testing using pyATS

Steps of a NetDevOps pipeline

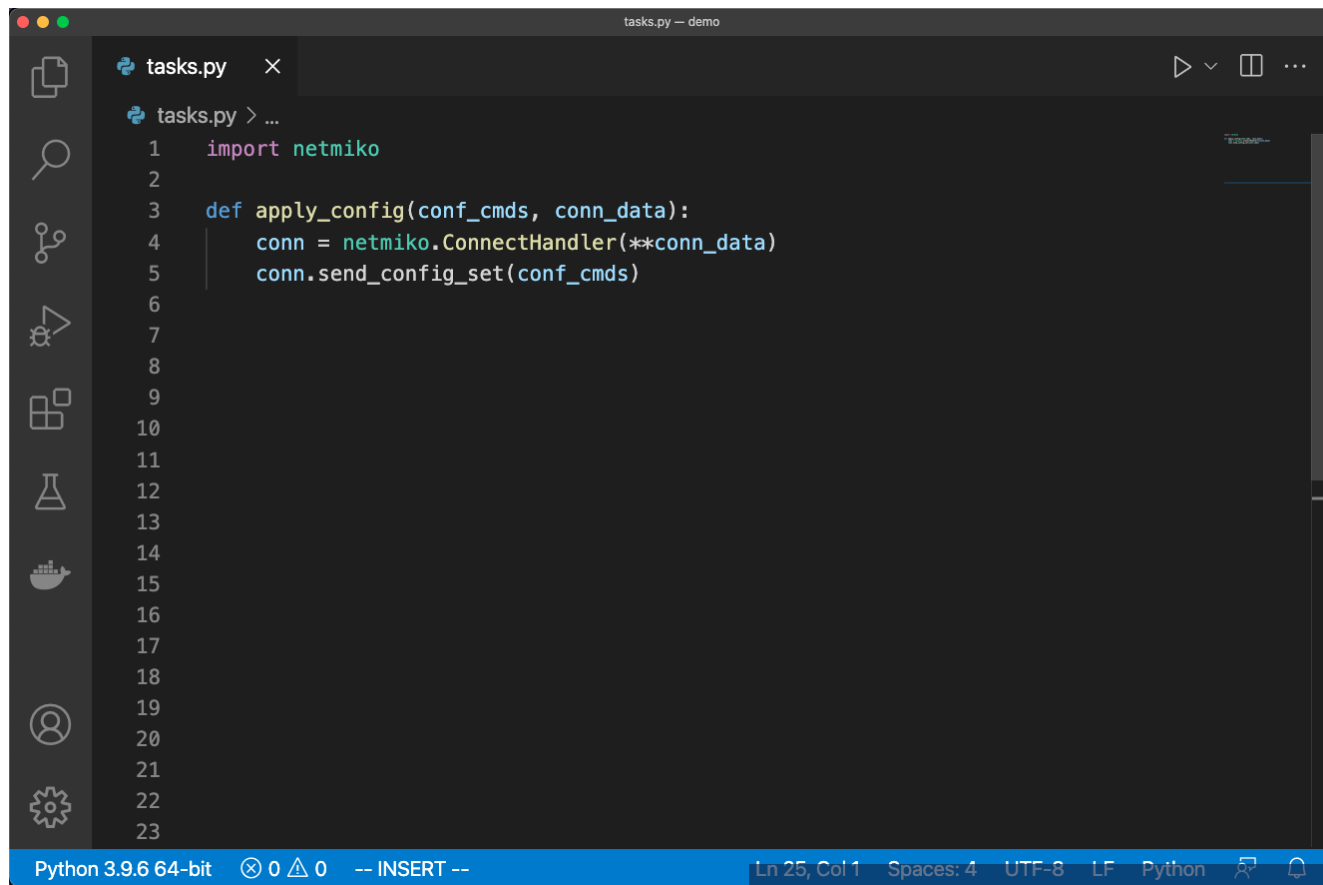


A decorative graphic in the top right corner of the slide, consisting of a dense cluster of circles in various sizes and colors, including shades of blue, green, orange, and red. The circles are arranged in a way that suggests a network or a dynamic system. The text "Optimize for speed" is positioned to the left of this graphic.

Optimize for speed



Demo: Parallelized change rollout using RQ and pyATS

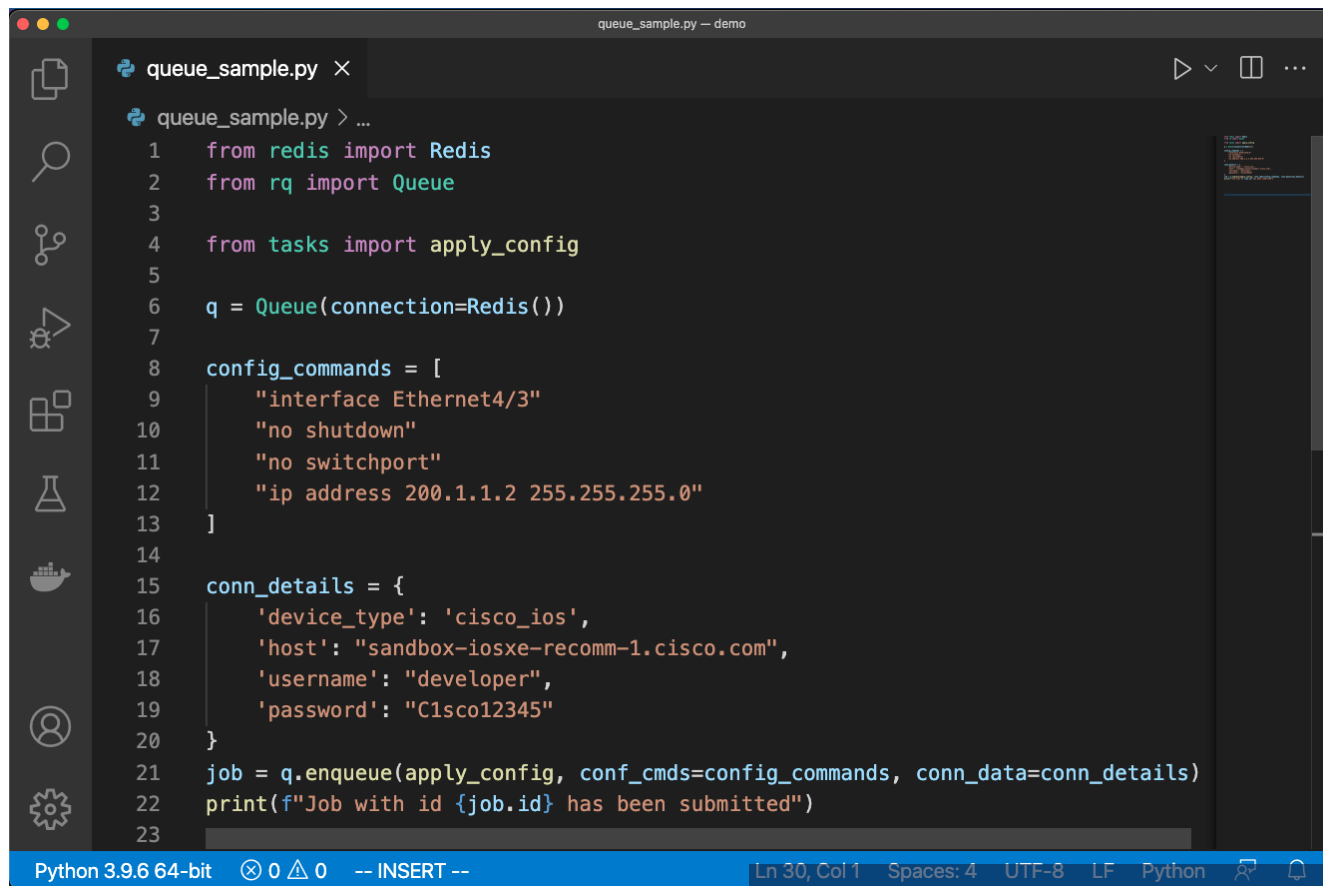


```
tasks.py  x  [play] [dropdown] [toggle] [menu]

tasks.py > ...
1  import netmiko
2
3  def apply_config(conf_cmds, conn_data):
4      conn = netmiko.ConnectHandler(**conn_data)
5      conn.send_config_set(conf_cmds)
6
7
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21
22
23

Python 3.9.6 64-bit  0 0  -- INSERT --  Ln 25, Col 1  Spaces: 4  UTF-8  LF  Python  [search] [refresh]
```

Source code available under: <https://github.com/squ4rks/DEVNET-1439>



```
queue_sample.py > ...
1  from redis import Redis
2  from rq import Queue
3
4  from tasks import apply_config
5
6  q = Queue(connection=Redis())
7
8  config_commands = [
9      "interface Ethernet4/3"
10     "no shutdown"
11     "no switchport"
12     "ip address 200.1.1.2 255.255.255.0"
13 ]
14
15 conn_details = {
16     'device_type': 'cisco_ios',
17     'host': "sandbox-iosxe-recomm-1.cisco.com",
18     'username': "developer",
19     'password': "C1sco12345"
20 }
21 job = q.enqueue(apply_config, conf_cmds=config_commands, conn_data=conn_details)
22 print(f"Job with id {job.id} has been submitted")
23
```

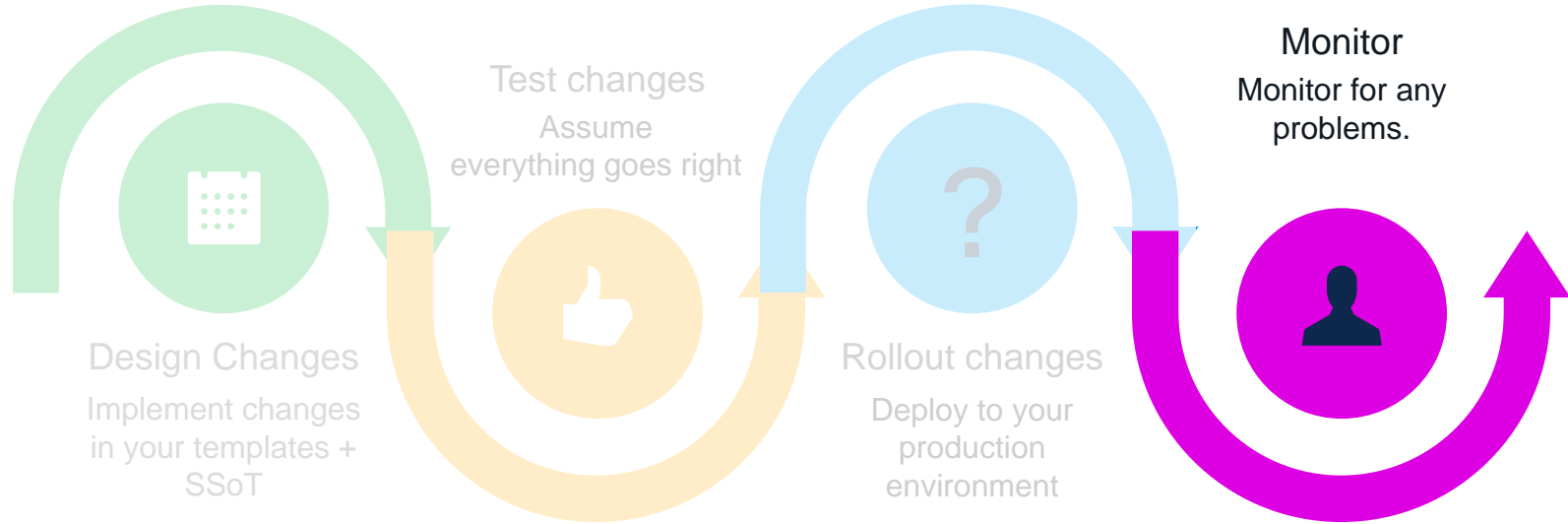
Python 3.9.6 64-bit 0 0 -- INSERT -- Ln 30, Col 1 Spaces: 4 UTF-8 LF Python

Source code available under: <https://github.com/squ4rks/DEVNET-1439>

Keep those rollbacks
in mind – they are all
about speed



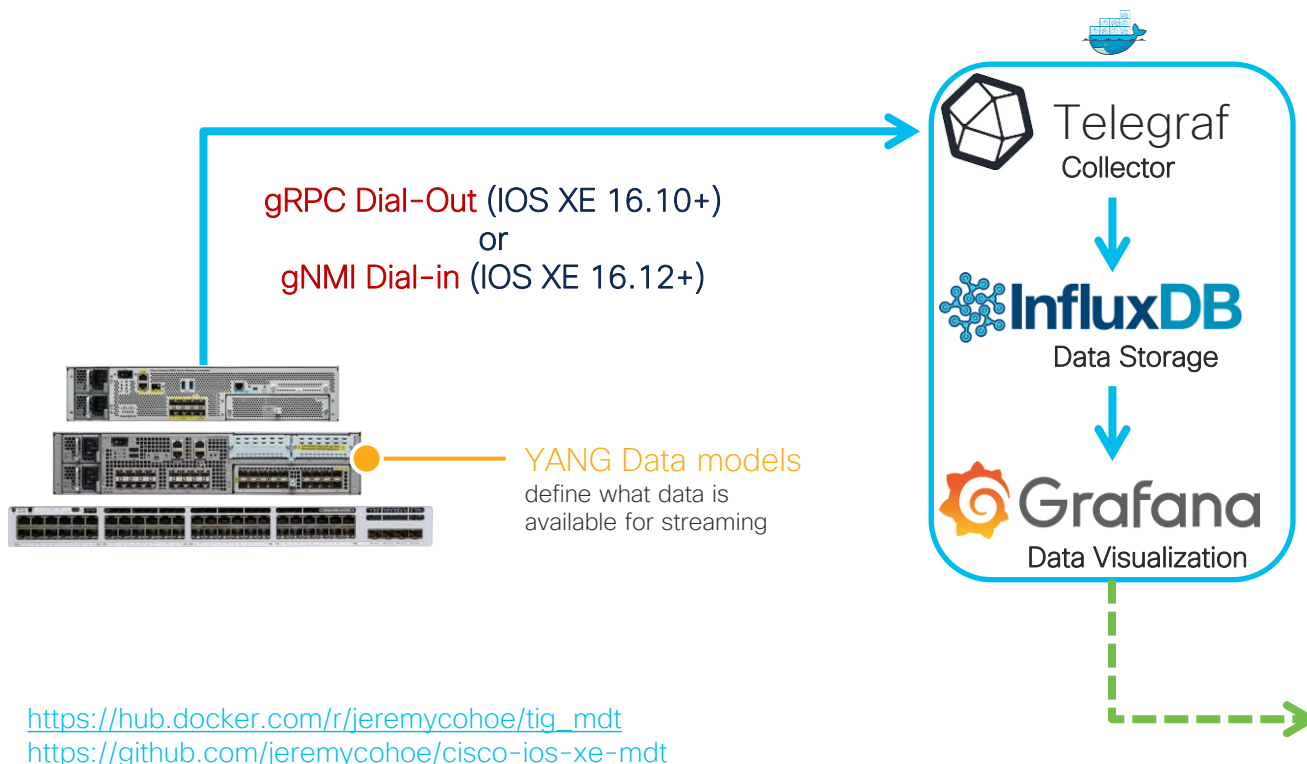
Steps of a NetDevOps pipeline



Swivel chair looks cool
– but it really isn't

Monitoring goes beyond
your core devices

Example: Custom monitoring solution



Customized Dashboard

Choose **what** to stream
Choose **how often**
Choose **where** to stream to

Choose **time span**

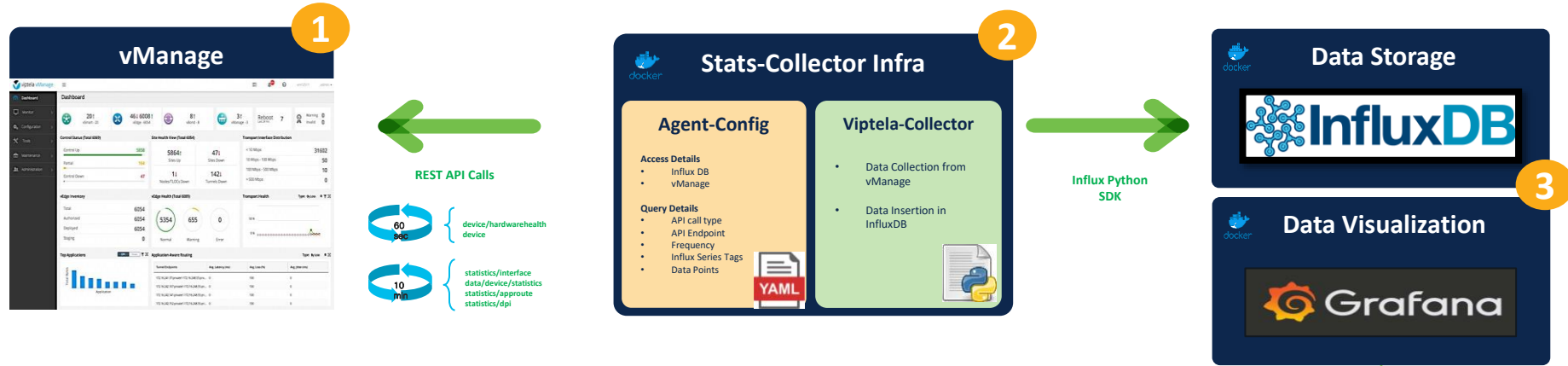
Add as many
panels as you like

Choose **which
data** you want to
visualize

Choose **how** you
want to visualize
it

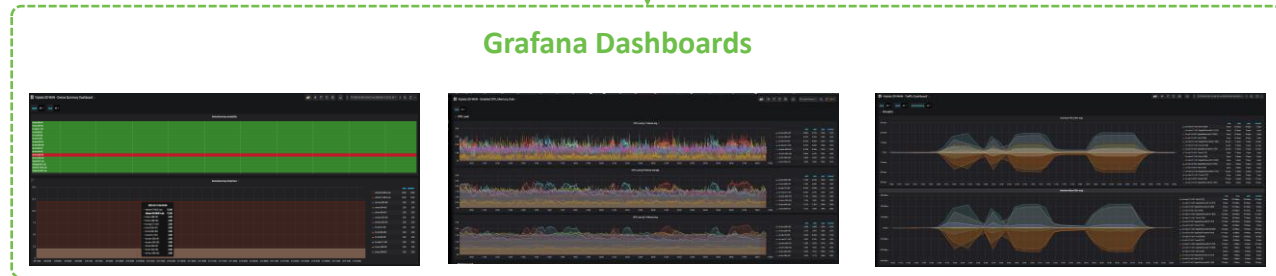


vManage monitoring with Grafana & InfluxDB

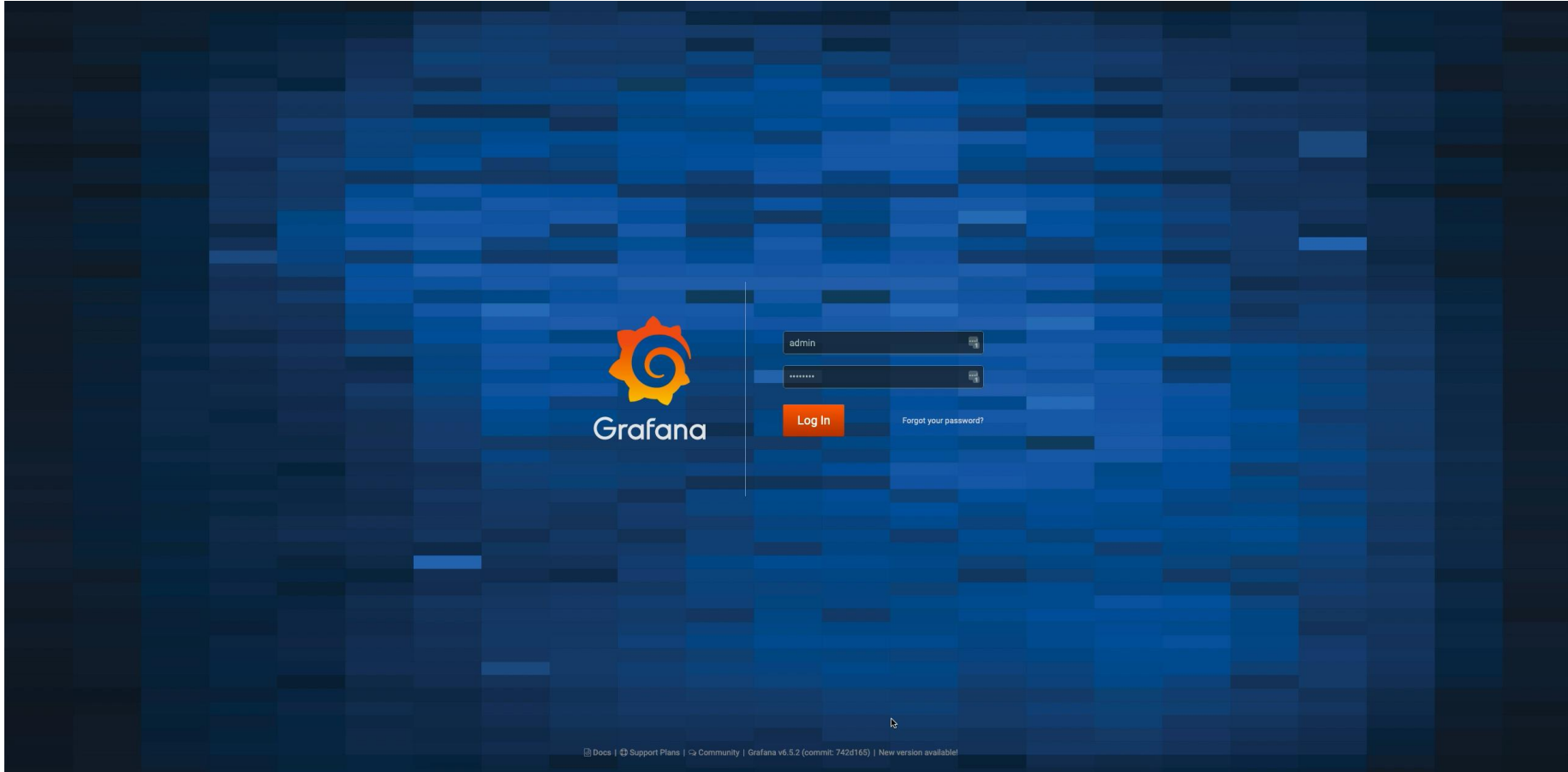


- ❖ Dashboards can be created based on any vManage API type Bulk, Aggregated, Real-Time.
- ❖ API Query frequency is user definable.
- ❖ Grafana variables can be used to narrow down graphs to only interesting devices.

<https://github.com/schornig/viptela-sdwan-stats-collector>



vManage monitoring with Grafana & InfluxDB



Your tests *verify*
functionality – use that

Demo: Continuous monitoring using pyATS test cases

Monitor your
humans too

Demo: Continuous change monitoring

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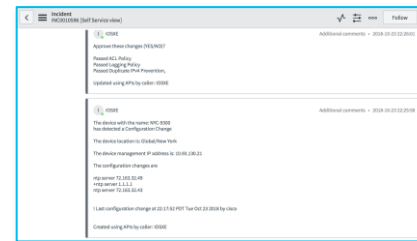
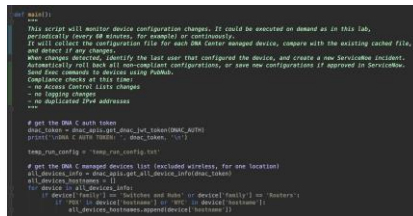
Demo courtesy of Gabi Zapodeanu (gzapodea@cisco.com)

ServiceNow

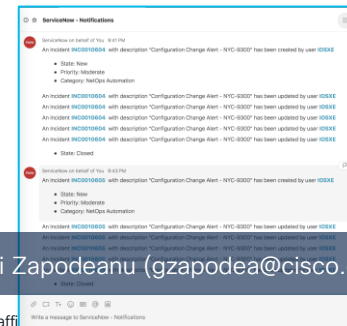


Guest Shell

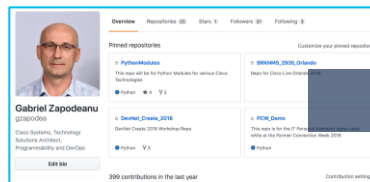
Open IOS XE, Guest Shell



Webex Teams



GitHub



```
NetOpsBot [~/pythonCode/NetOpsBot] - .../ccm_dnac.py [NetOpsBot]
ccm_dnac.py
main() while True: for device in all_devices_justus...

Run: ccm_dnac
/Users/gzapodea/PythonCode/BlitzAdvanced/venv/bin/python /Users/gzapodea/PythonCode/NetOpsBot/ccm_dnac.py

DNA C AUTH TOKEN: X-JWT-ACCESS-TOKEN=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJzdWIiOiI1YmVmNDg1NzNjNTg0YjAwODg0OTFhODYiLCJhbnR...

Device: NYC-9300 - No configuration changes detected
Device: NYC-R0 - No configuration changes detected
Device: PDX-3850 - No configuration changes detected
Device: PDX-3850-CAMPUS - No configuration changes detected
Device: PDX-9300 - No configuration changes detected
Device: PDX-RN - No configuration changes detected
Device: PDX-R0 - No configuration changes detected
Wait for 10 seconds and start again

DNA C AUTH TOKEN: X-JWT-ACCESS-TOKEN=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJzdWIiOiI1YmVmNDg1NzNjNTg0YjAwODg0OTFhODYiLCJhbnR...

Device: NYC-9300 - No configuration changes detected
Device: NYC-R0 - No configuration changes detected
Device: PDX-3850 - No configuration changes detected
Device: PDX-3850-CAMPUS - No configuration changes detected
Device: PDX-9300 - No configuration changes detected
Device: PDX-RN - No configuration changes detected
Device: PDX-R0 - No configuration changes detected
Wait for 10 seconds and start again

DNA C AUTH TOKEN: X-JWT-ACCESS-TOKEN=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJzdWIiOiI1YmVmNDg1NzNjNTg0YjAwODg0OTFhODYiLCJhbnR...

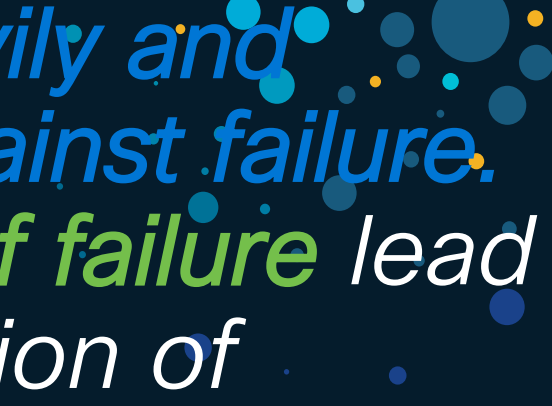
Device: NYC-9300 - No configuration changes detected
Device: NYC-R0 - No configuration changes detected
```

```
GZAPODEA-M-26NT1:~ gzapodea$
```



*Complex systems are **intrinsically hazardous systems.***

– Richard I. Cook, "How Complex Systems Fail"



Complex systems are *heavily and successfully defended against failure.*
The *high consequences of failure* lead over time to the construction of *multiple layers of defense against failure.*

– Richard I. Cook, "How Complex Systems Fail"

Technical session surveys

- Attendees who fill out a minimum of four session surveys and the overall event survey will get Cisco Live branded socks!
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Thank you

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