

A journey to SDN

Ulf Fischer

Me

My name is Ulf Fischer.

I'm Network Engineer since more than 20 years.

Worked at different ISP's in Hamburg.

POP - (now Pop Interactive),

Hansenet - (now Telefonica),

broadnet mediascape - (now QSC),

Easynet - (now GTT),

Nexinto - (now Plusserver),

IPHH - (still IPHH),

and did consulting for several other Companies.

Now working at Kuehne+Nagel and responsible for the
Global Datacenter Networks.

Agenda

- How did this all start?
- The vendor game
- The Challenge
- Eve-ng / Ansible / DEV Network
- Pipeline
- DEMO
- Networkers toolset changed
- Q&A

How did this all start?

Split SDN into two parts

1. Underlay – Hardware Routers / Switches including OS
2. Overlay – Software on top of the Underlay – the real SDN

The vendor game

Underlay	Overlay
Cisco / Nexus 9k	ACI
Nokia	Nuage
Juniper	Contrail
Mellanox / Cumulus	NSX-T

*There was a preselection
regarding Hardware
Vendors*

What we choose:

- VMware NSX-T (Overlay)
- Mellanox – 2700 spine, 2100 leaf, 2400 low speed leaf
- EdgeCore for Management
- Mellanox and EdgeCore run on Cumulus Linux (Underlay)

The challenge

- 4 Weeks to get the Underlay up and running incl. config
- Challenge accepted

Ansible, GIT, DEV Network

- Revision and audit save – Code in Git (bitbucket)
- Infrastructure as Code (IaC)
- Ansible
- Cumulus VX, DEV Network

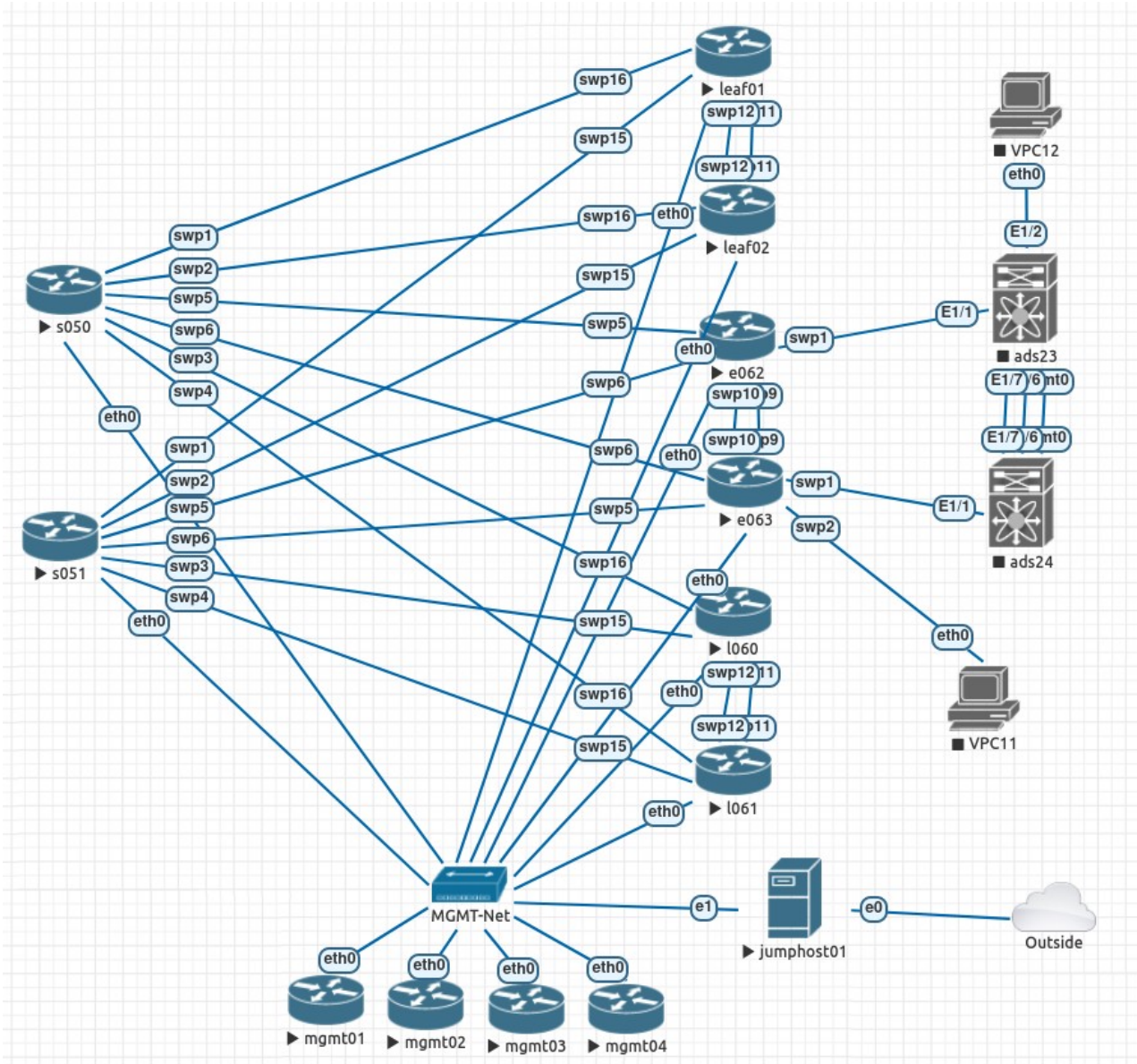
EVE - The Emulated Virtual Environment For Network, Security and DevOps Professionals

Just choose your version and download

[Download Now](#)



DEV Network



Ansible roles

```
[ufischer@localhost cumulus-conf (master)]$ ls -l roles
total 92
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 acl
drwxr-xr-x. 3 ufischer ufischer 4096 18. Jun 15:36 ansible_state
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 apps
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 apps_configs
drwxr-xr-x. 3 ufischer ufischer 4096 18. Jun 15:36 backup
drwxr-xr-x. 3 ufischer ufischer 4096 18. Jun 15:36 common
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 dns
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 frr
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 hostname
drwxr-xr-x. 3 ufischer ufischer 4096 18. Jun 15:36 hosts
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 interfaces
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 kn_proxy
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 license
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 motd
drwxr-xr-x. 4 ufischer ufischer 4096 18. Jun 15:36 netd
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 netdata
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 ports
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 ptm
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 snmp
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 ssh
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 syslog
drwxr-xr-x. 5 ufischer ufischer 4096 18. Jun 15:36 time
drwxr-xr-x. 3 ufischer ufischer 4096 18. Jun 15:36 users
[ufischer@localhost cumulus-conf (master)]$
```

Manual ansible run

```
[ufischer@jumphost01 cumulus-demo (master X)]$ ansible-playbook -i inventories/demo playbooks/initial_setup.yml -t interfaces
```

```
PLAY [everything] *****
```

TASK [Gathering Facts] *****

```
ok: [1060]
```

```
ok: [leaf02]
```

```
ok: [s051]
```

```
ok: [s050]
```

```
ok: [mgmt01]
```

```
ok: [leaf01]
```

```
ok: [1061]
```

What is a pipeline?

- With automation you get cool stuff.
- Automatic configuration changes on a bunch of devices in short time.
- With automation you get drawbacks.
- Automatic configuration changes on a bunch of devices in short time.

Stages

- DEV (or TEST) - Syntax checks, if the change works
- QA (or Staging) - Load or stress tests, quality tests
- LIVE (or Prod) - Now it's Live.

Pipeline / Jenkins



Jenkins

Build great things at any scale

The leading open source automation server, Jenkins provides hundreds of plugins to support building, deploying and automating any project.

[Documentation](#) [Download](#)

Jenkins is the Way!

We are looking for experiences of Jenkins users from around the world showcasing how they are building, deploying, and automating great software with Jenkins. Check out their user stories and share yours

[More info](#)



Continuous Integration and Continuous Delivery

As an extensible automation server, Jenkins can be used as a simple CI server or turned into the continuous delivery hub for any project.



Easy installation

Jenkins is a self-contained Java-based program, ready to run out-of-the-box, with packages for Windows, Mac OS X and other Unix-like operating systems.



Easy configuration

Jenkins can be easily set up and configured via its web interface, which includes on-the-fly error checks and built-in help.



Plugins

With hundreds of plugins in the Update Center, Jenkins integrates with practically every tool in the continuous integration and continuous delivery toolchain.



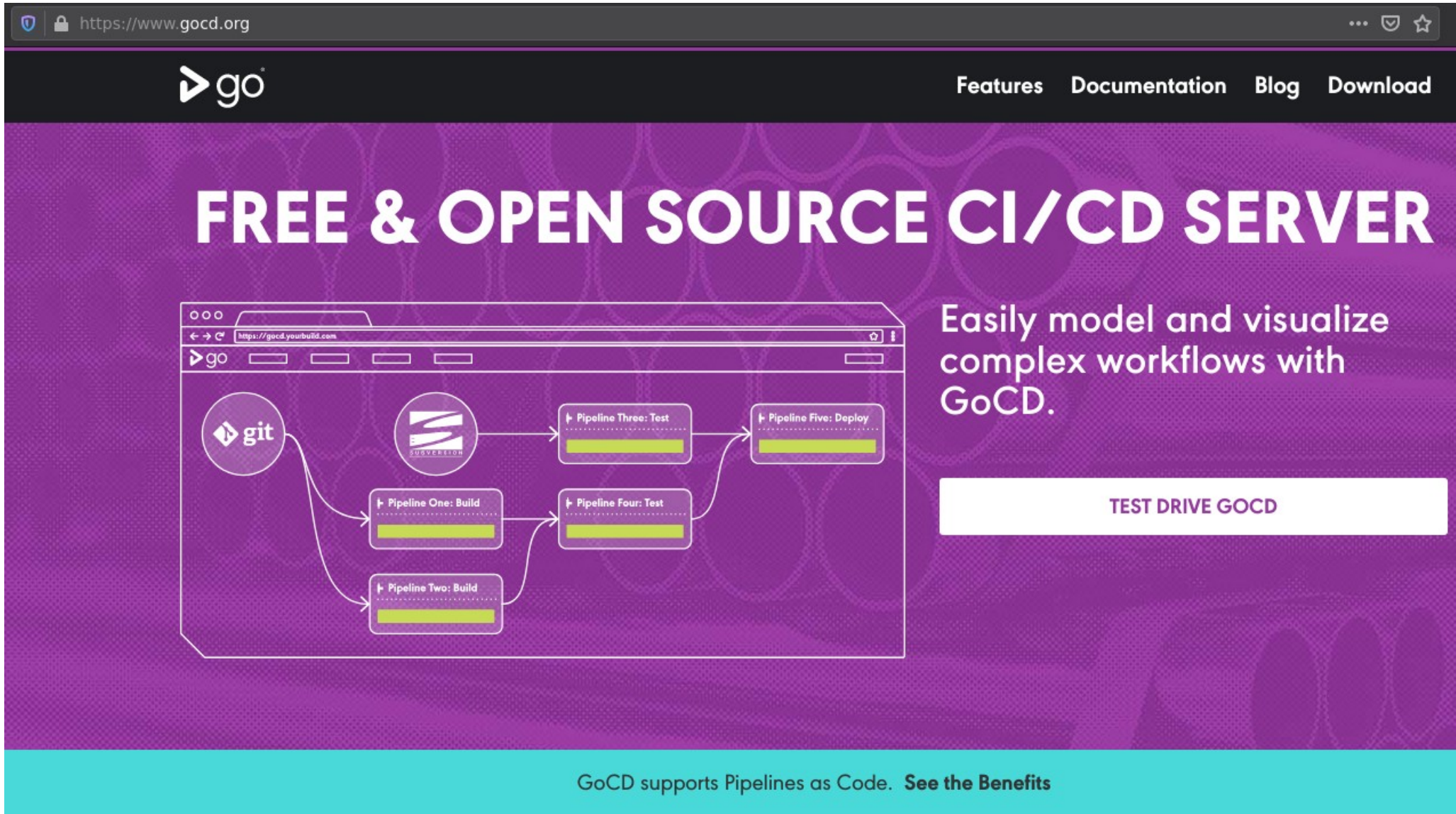
Extensible

Jenkins can be extended via its plugin architecture, providing nearly infinite possibilities for what Jenkins can do.



Distributed

Jenkins can easily distribute work across multiple machines, helping drive builds, tests and deployments across multiple platforms faster.



The screenshot shows the GoCD website with a purple background. The main heading is "FREE & OPEN SOURCE CI/CD SERVER". Below it, a diagram illustrates a CI/CD pipeline. The pipeline starts with a "git" icon, which branches into "Pipeline One: Build" and "Pipeline Two: Build". Both build pipelines lead to "Pipeline Four: Test". From "Pipeline Four: Test", the flow goes to "Pipeline Three: Test", then to "Pipeline Five: Deploy". The diagram is enclosed in a browser window frame with the URL "https://gocd.yourbuild.com". To the right of the diagram, the text reads "Easily model and visualize complex workflows with GoCD." Below this text is a white button with the text "TEST DRIVE GOCD". At the bottom of the page, a teal banner contains the text "GoCD supports Pipelines as Code. See the Benefits".

https://www.gocd.org

go

Features Documentation Blog Download

FREE & OPEN SOURCE CI/CD SERVER

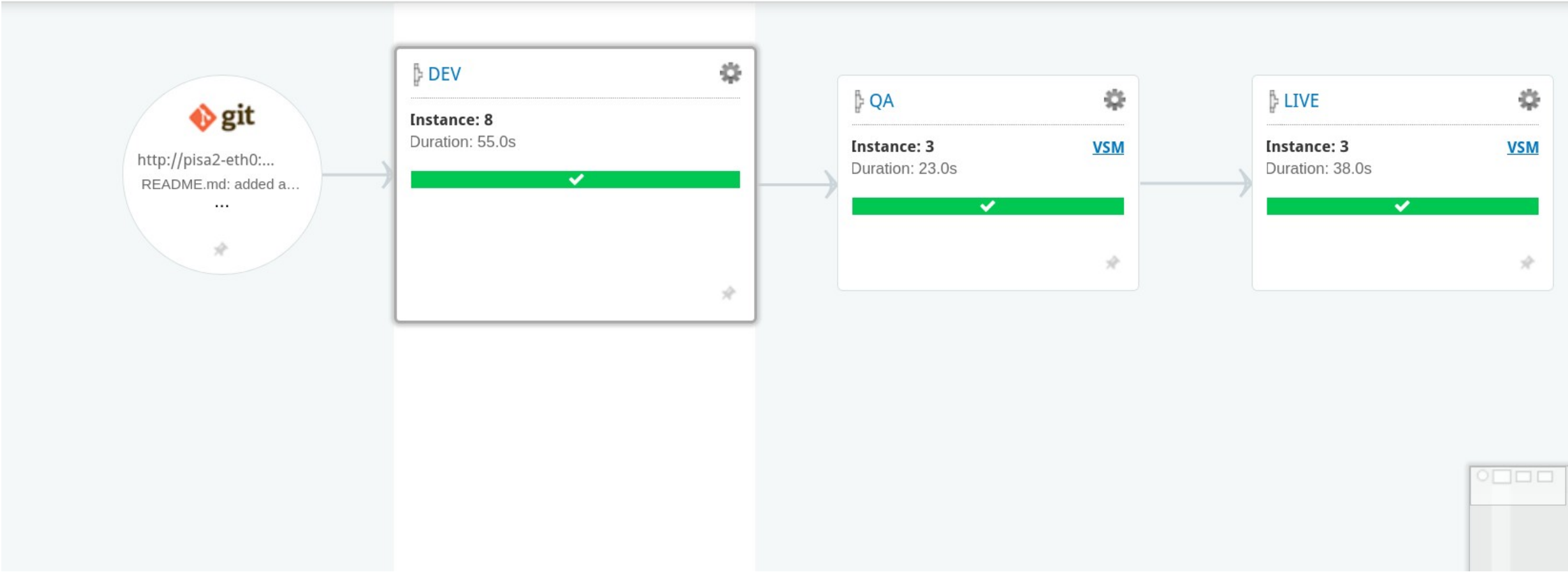
Easily model and visualize complex workflows with GoCD.

TEST DRIVE GOCD

GoCD supports Pipelines as Code. **See the Benefits**

Pipeline / Value Stream Map

Value Stream Map | Pipeline **DEV** » Instance 8



How do we do configuration changes?

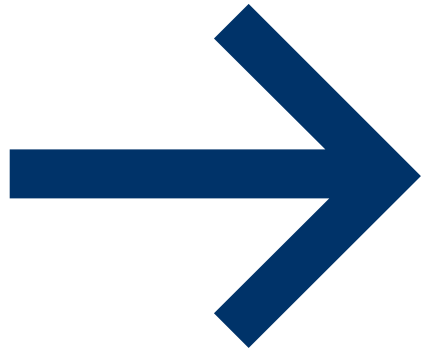
No ssh / putty – config anymore.

Not edit any script and run it.

Clone the repository (or pull if you have it already).

Edit the code / configuration.

Commit and push the change back to the repository. Done.



DEMO

Evolution of Networkers toolset

PROBLEM: NETWORK AGILITY

Not Much has Changed in the Last 20 Years

1994

```
Router> enable
Router# configure terminal
Router(config)# enable secret cisco
Router(config)# ip route 0.0.0.0 0.0.0.0 20.2.2.3
Router(config)# interface ethernet0
Router(config-if)# ip address 10.1.1.1 255.0.0.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# interface serial0
Router(config-if)# ip address 20.2.2.2 255.0.0.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# router rip
Router(config-router)# network 10.0.0.0
Router(config-router)# network 20.0.0.0
Router(config-router)# exit
Router(config)# exit
Router# copy running-config startup-config
Router# disable
Router>
```

Terminal Protocol: **Telnet**

2014

```
Router> enable
Router# configure terminal
Router(config)# enable secret cisco
Router(config)# ip route 0.0.0.0 0.0.0.0 20.2.2.3
Router(config)# interface ethernet0
Router(config-if)# ip address 10.1.1.1 255.0.0.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# interface serial0
Router(config-if)# ip address 20.2.2.2 255.0.0.0
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)# router rip
Router(config-router)# network 10.0.0.0
Router(config-router)# network 20.0.0.0
Router(config-router)# exit
Router(config)# exit
Router# copy running-config startup-config
Router# disable
Router>
```

Terminal Protocol: **SSH**

2020

vi configfile
git add / git commit
git push

Figure 1-2. What's changed? From Telnet to SSH (source: Big Switch Networks)

Networkers toolset changed

- Shell / Commandline – vi and git
- „Git for Windows“ – <https://git-scm.com>
- Atom – <https://atom.io> (shortcut „Ctrl-Shift P“)
- Visual Studio Code (VSCode)

Networkers toolset changed / Atom Editor

Git — C:\Users\ulf.fischer\Documents\git\cumulus-conf — Atom

File Edit View Selection Find Packages Help

Project

- roles
 - acl
 - ansible_state
 - apps
 - apps_configs
 - backup
 - common
 - dns
 - frr
 - hostname
 - hosts
 - interfaces
 - handlers
 - tasks
 - templates
 - edge_2100_interfaces.j2
 - edge_2410_interfaces.j2**
 - leaf_interfaces.j2
 - mgmt_ham_interfaces.j2
 - mgmt_interfaces.j2-poc
 - mgmt_not_interfaces.j2
 - spine_interfaces.j2
 - kn_proxy
 - license
 - motd
 - netd
 - netdata

edge_2410_interfaces.j2

```
1  {{ ansible_managed }}
2  # This file describes the network interfaces available on your system
3  # and how to activate them. For more information, see interfaces(5).
4
5  source /etc/network/interfaces.d/*.intf
6
7  # The loopback network interface
8  auto lo
9  iface lo inet loopback
10 # The primary network interface
11     address {{ devices[inventory_hostname].loopback|ipaddr('address') }}
12     clagd-vxlan-anycast-ip {{ devices[inventory_hostname].clagd_vxlan_anycast_ip }}
13
14 # The primary network interface
15 auto eth0
16 iface eth0
17     address {{ hostvars[inventory_hostname]['ansible_eth0']['ipv4']['address'] }}/24
18     gateway {{ devices[inventory_hostname].eth0_gateway }}
19     vrf mgmt
20
21 auto swp1
22 iface swp1
23     alias demo
24     link-autoneg on
25
26 auto swp2
27 iface swp2
28     link-autoneg on
29
30 auto swp3
```

Git

cumulus-conf

Unstaged Changes Stage All

No changes

Staged Changes Unstage All

roles\interfaces\templates\edge_2410_interfaces.j2

See All Staged Changes

Commit message

Commit to master 72

roles/snmp/templates/mgmt_ham_snmpd.conf.j2: ... Undo 5d

roles/snmp/tasks/main.yml: fixed syntax error 5d

roles/snmp/templates/mgmt_ham_snmpd.conf.j2 and roles... 5d

roles\interfaces\templates\edge_2410_interfaces.j2 21:10

CRLF 1 deprecation UTF-8 Plain Text master Fetch GitHub Git (1)

Finally

- We won the challenge
- SDN Underlay was ready in time
- NSX-T (Overlay) installation was successful

Q&A



Inspire. Empower. Deliver.

