



How my first Network Automation project failed (and is still in production)

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```
>>> qr = QRCode()  
>>> qr.add_data("https://www.linkedin.com/in/ubaumannch")  
>>> qr.print_ascii()
```



How it begun ...



You have automated CCIE Lab deployments.
Could you build a "Staging Robot"?

Customer A (2015)

Software Engineer

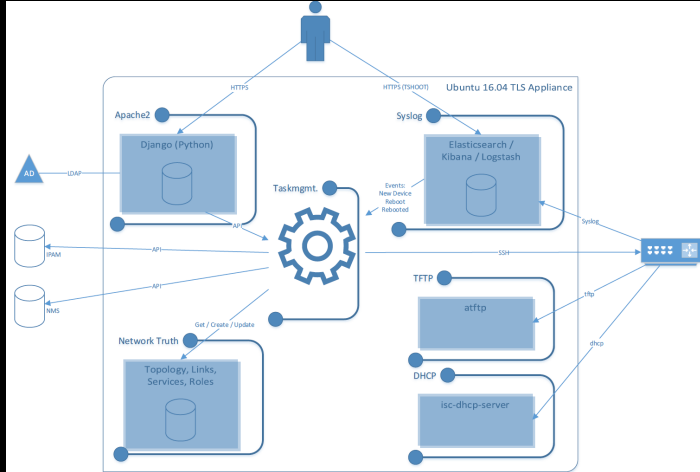
- System Engineering background
- "Hardcore code reviewer"

Network Engineer

- Basic programming skills
- "It is working, isn't it?"

¹System Engineer (BSc Student) with a flair for UI joined for UI

First Architecture



Source: SwiNOG #31 Network Automation – Road trip to an automated Network

- No need to know in advance:
 - Serial Number
 - MAC Address
 - Model ID
- Support for different staging areas
- Staging directly at the destination

Disclaimer: Needed support for IOS 12 (no Python, no PnP)

- The First idea was to use EEM
- EEM is not supported on L2 devices
- TCL works on all platforms
- TCL has slightly different versions and different libraries

- More than 900 lines of code
- Around 100 "if" statements
- Aproxamitly 50 cold showers

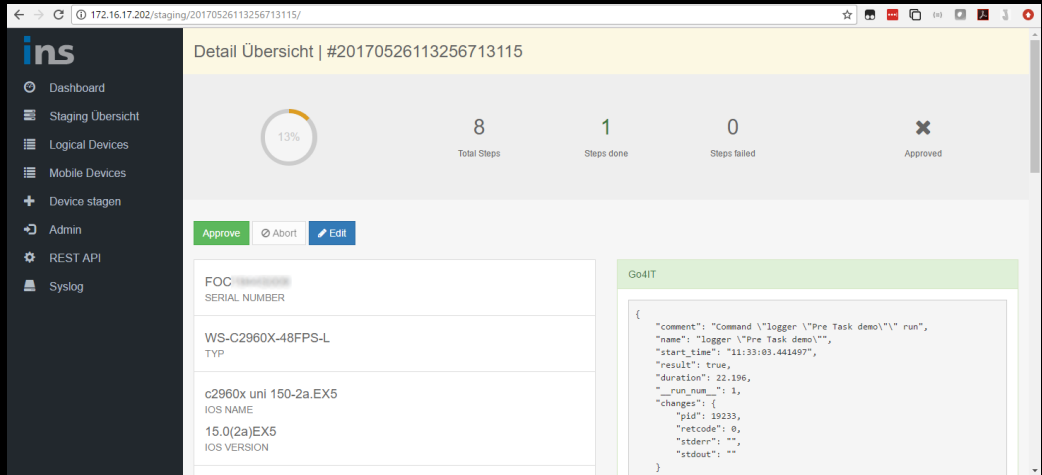
How it looked - Job Overview



Start ▾	Job ID ⇅	Physical Device ⇅	Progress ⇅	Status ⇅	
26.05.2017 15:15:32 +0200	20170526151532393023	SN:FOC - Type:WS-C2960X-48FPS-L	63%	Error	<input type="checkbox"/>
26.05.2017 11:32:56 +0200	20170526113256713115	SN:FOC - Type:WS-C2960X-48FPS-L	13%	Aborted	<input type="checkbox"/>
02.05.2017 15:18:31 +0200	20170502151831476525	SN:FOC - Type:WS-C2960G-8TC-L	25%	Error	<input type="checkbox"/>
21.04.2017 15:54:59 +0200	20170421155459614297	SN:FOC - Type:WS-C2960CG-8TC-L	50%	Error	<input type="checkbox"/>

Source: SwiNOG #31 Network Automation – Road trip to an automated Network

How it looked - Job Details



Source: SwiNOG #31 Network Automation – Road trip to an automated Network

- Using event bus
- Provides API
- Over time way too many workarounds

```
{% set printlabel = salt['pillar.get']('printlabel') %}  
{% if printlabel in ['8 mm', '18 mm', '16 mm'] %}  
label_print:  
  cmd.run:  
    - description: Print label  
    - name: print_label.py {{ printer_ip }} 1 "{{ salt['pillar.get']('hostname','') }}"  
{% endif %}
```

- Hierarchical Network-Domain variables
- Generate WebForm from Template variables
- Prepare Device Management with SaltStack
- Templates and template snippets

Generate Form from Template

■ Parameter

```
hostname: testname
ntp:
  - time0.ins.hsr.ch
  - 152.96.120.53
```

hostname

domain_name

lab

ntp

server

+ Add

■ Template

```
!
hostname {{ hostname }}
domain-name {{ domain_name|default('lab') }}
!{% for server in ntp %}
ntp server {{ server }}
!{% endfor %}
end
```

```
!
hostname testname
domain-name lab
!
ntp server time0.ins.hsr.ch
ntp server 152.96.120.53
!
end
```

Source: SwiNOG #31 Network Automation – Road trip to an automated Network

"Emergency" OS upgrade



We hit a dot1x bug and need to upgrade 5000 switches ASAP.
Could the "Staging Robot" do that?

Customer A (2017)

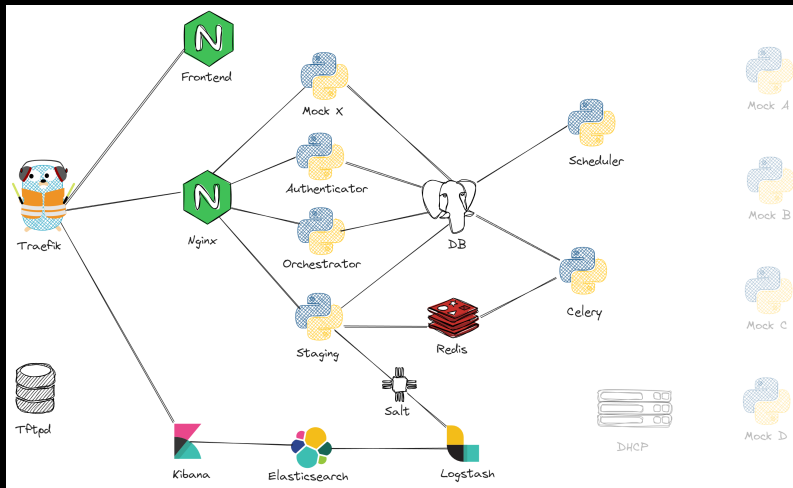
- Own implementation of Plug&Play
- UI with CSV export/import to select a time window
- Slow start

- Use synergies from other internally developed tools
- SinglePage with react
- Integrate multiple backends in the same UI

We have a huge rollout upcoming. Could your tool be adapted?

Customer B (2019)

Architecture



- 1:1 Replace Device
- Replacement with a new device
- Replace with Stack
- Interface rearrangement
- Provision/Deprovision Access port (API triggered from ordering system)

NetTowel					admin
Orchestration	Overview				
Overview					
Device Lifecycle					
Approval Report					
	Filter table				
	Start	Description	Status	Ack.	<input type="checkbox"/>
	2024-04-17 14:46	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-738	Finished		<input type="checkbox"/>
	2024-04-17 14:42	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-737	Finished		<input type="checkbox"/>
	2024-04-17 14:39	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-736	Finished		<input type="checkbox"/>
	2024-04-17 14:35	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-735	Finished		<input type="checkbox"/>
	2024-04-17 14:31	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-734	Finished		<input type="checkbox"/>
	2024-04-17 14:27	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-733	Finished		<input type="checkbox"/>
	2024-04-17 14:23	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-732	Finished		<input type="checkbox"/>
	2024-04-17 12:50	Enabling LAN port on 192.16712-02-0000-0-0-0-0012-wd000-807-730	Error		<input type="checkbox"/>
	2024-04-17 12:49	Enabling LAN port on 192.16712-02-0000-0-0-0-0012-wd000-807-729	Error		<input type="checkbox"/>
	2024-04-16 15:14	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-008	Finished		<input type="checkbox"/>
	2024-04-16 15:11	Enabling LAN port on 192.168.8028-02-0001-0-0-0-0028-wd071-493-008	Finished		<input type="checkbox"/>

NetTowel

admin

Orchestration

Overview

Device Lifecycle

Approval Report

Orchestration Task Details for Staging new device

ABORT

RESTART

STAGING TASK

Start

2024-04-11 17:03

Status

FINISHED

Submitted by

system

Last updated

2024-04-12T09:57:10.463753Z

Acknowledged

☐

Data

100%

9

9

0

Total

Done

Failed

VERIFY_DISTRIBUTION_INTERFACE_AND_PORTCHANNEL

UPDATE_DISTRIBUTION_INTERFACE_WITHOUT_PORTCHANNEL

REGISTER_DNS_ENTRY

CREATE_STAGING_TASK

CHECK_STAGING_TASK

ADD_ISE_HOST_RECORD

UPDATE_DISTRIBUTION_INTERFACE_WITH_PORTCHANNEL

WAIT_FOR_REBOOT

ADD_PRIME_HOST_RECORD

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Page 20/28

- Exactly what you need vs general
- Resource-intensive vs locking
- Dependencies
- Integration

Configuration Task

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Configuration

Overview

Create Configuration Task

Create Configuration Task

Step 1: General Parameters

Name

Select Task

Execution Timeframe

Start

End

napalm_get

napalm_update

restconf_delete

restconf_get

restconf_update

NEXT

Step 2: Hosts

Step 3: Arguments

NetTowel

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Staging

Overview

Stage Device

IOS

Physical Devices

Logical Devices

Device Types

Network Domains

Templates

Template Snippets

Syslog

Stage Device

Step 1: Select Devices and Template

Select devices to stage

LOAD ALL DEVICES

☐ One to One Replacement

Select Network Domain

NEXT

Step 2: Device Configuration

Step 3: Staging Extensions

Step 4: Select ios Version for the devices

Customer A

- Used the Staging Robot until mid-2023
- Staged around 9'000 L2/L3 devices
- Around 5'000 PnP OS Upgrades

Customer B

- In production
- Staged around 700 L3 Access Switches
- Around 1'500 workflows executed

- Be prepared to debug the code
- Avoid basing on forks
- Try to be up to date
- Be prepared to overtake small projects
- Version pinning and testing is key

- Don't be afraid of failing
- Do not over-engineer
- Who can maintain this in 5 years?
- Does the customer need this feature or do you want it?
- No shortcuts
- "Just" maintaining needs time
- Engineer fluctuation

Why do I say the project has failed?



- No direct vendor locking but engineer locking
- No or outdated documentation
- SaltStack is a central component and hard to replace/update
- Settings are in many different locations (because of quick wins)
- Project had multiple contributors but only one has the global view

Questions?