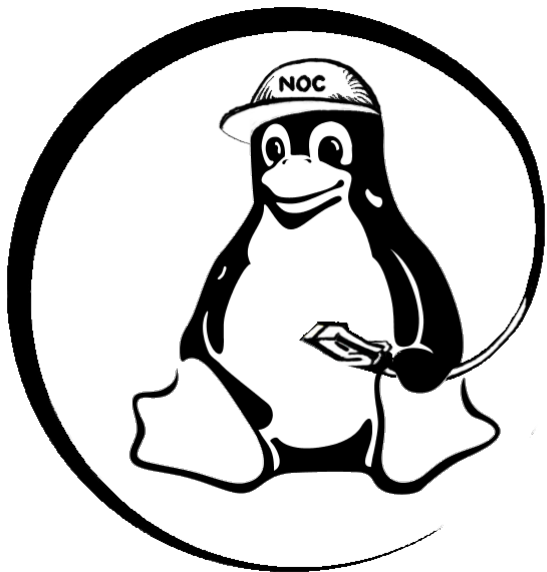


# Building ScaLE's OpenWrt Conference WiFi

Yes...The very network you're connected to right now

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Robert Hernandez  
CTO @ Nebulaworks  
@sarcasticadmin  
July 2022



Conference attendees need WiFi



- Jan 2017 - "Does anyone know how to build OpenWrt?"



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- March 2017 - SCaLE 15x

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- July 2022 - SCaLE 19x

## ~120 consumer "routers"

Model	WiFi Chipsets	2.4 GHz	5 GHz	RAM
Netgear 3700v2	Ath AR9220 + AR9223	b/g/n	a/n	64MB
Netgear 3800[CH]	Ath AR9220 + AR9223	b/g/n	a/n	64MB



<https://github.com/socallinuxexpo/scale-network>

## SCaLE's OpenWrt image

### 16MB max

Kernel: Linux 5.10.89 2022 mips GNU/Linux

Pkgs: Bash, Python, OpenSSH, lldp, tcpdump, rsyslog, apinger, zabbix

Files: Openwrt Configs, ssh keys, etc.

Removed: luci, dropbear, dnsmasq, logd

\_\_\_\_\_ OpenWrt Flash

Traditional

OpenWrt Flash



# Flash



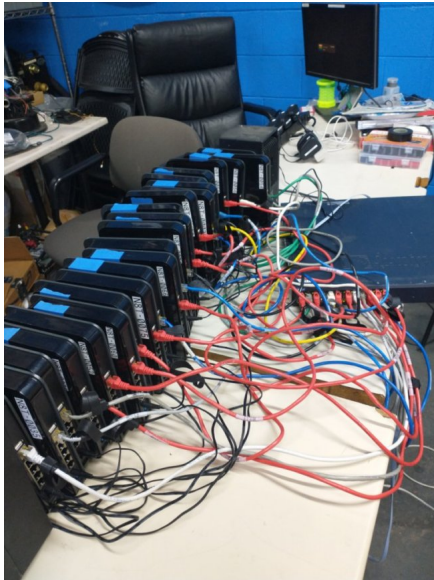
Solo OpenWrt Flash

Mass OpenWrt Flash

# Flash



# Flash



# Flash



Autoflash OpenWrt Flash

## SCaLE's OpenWrt management

- Custom DHCP options: WiFi Channels and Network Config
- Re-flash APs for any major system updates
- SSH
- Rsyslog and zabbix for observability












### Golden Tests

```
gen_templates $TMPLOC
```

```
diff -u -r "golden/$TARGET" $TMPLOC/
```

**Weekly Image Build**

## Weekly Image Build

84 workflow runs	Event ▾	Status ▾	Branch ▾	Actor ▾
This workflow has a <code>workflow_dispatch</code> event trigger.				<a href="#">Run workflow ▾</a>
 <b>openwrt-build</b> openwrt-build #84: Scheduled			4 days ago 2h 0m 10s	...
 <b>openwrt-build</b> openwrt-build #83: Scheduled			11 days ago 1h 32m 4s	...
 <b>openwrt-build</b> openwrt-build #82: Scheduled			18 days ago 1h 50m 9s	...
 <b>openwrt-build</b> openwrt-build #81: Scheduled			25 days ago 1h 29m 5s	...
 <b>openwrt-build</b> openwrt-build #80: Scheduled			last month 1h 50m 8s	...
 <b>openwrt-build</b> openwrt-build #79: Scheduled			last month 1h 31m 3s	...
 <b>openwrt-build</b> openwrt-build #78: Scheduled			2 months ago 1h 28m 27s	...
 <b>openwrt-build</b> openwrt-build #77: Scheduled			2 months ago 1h 50m 11s	...
 <b>openwrt-build</b> openwrt-build #76: Scheduled			2 months ago 1h 50m 10s	...

## Weekly Image Build

✔ **openwrt-build** openwrt-build #84

### Summary

Jobs

- ✔ Building openwrt img (ar71xx)
- ✔ Building openwrt img (ipq806x)

Triggered via schedule 4 days ago      Status      Total duration      Artifacts  
👤 owendelong → 0824da0      **Success**      **2h 0m 10s**      **4**

### openwrt-build.yml

on: schedule

Matrix: Building openwrt img

✔ 2 jobs completed  
[Show all jobs](#)

### Artifacts

Produced during runtime

Name	Size
📦 ar71xx-openwrt-build-artifacts	102 MB
📦 ar71xx-openwrt-buildlog	45.8 MB
📦 ipq806x-openwrt-build-artifacts	37.9 MB
📦 ipq806x-openwrt-buildlog	47.4 MB

### Serverspec

```
describe file('/etc/config/network') do
  it { should exist }
  it { should be_symlink }
  it { should be_owned_by 'root' }
  it { should be_grouped_into 'root' }
end
```

**Autoflash**

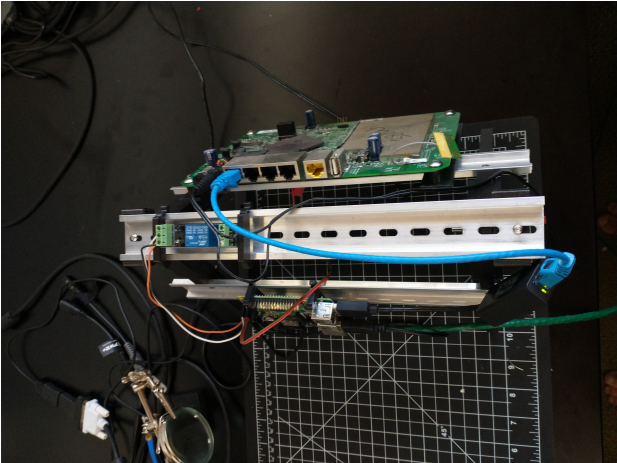
## Autoflash

### Configuration

Hardware: Raspberry Pi 4, Relay, USB Ethernet Adapter, AP Board

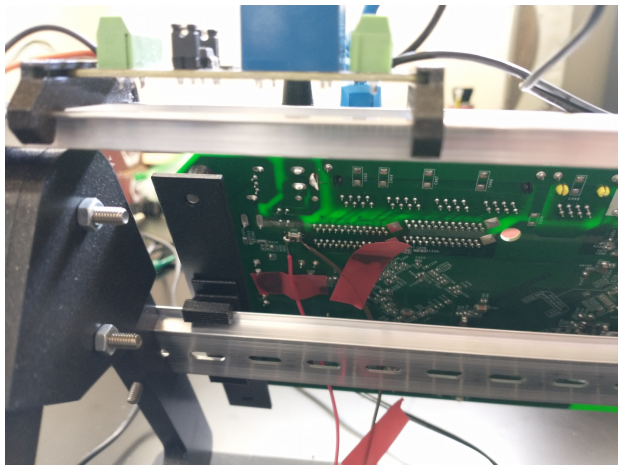
Software: FreeBSD 13, GitLab runner, magic wormhole, and expect

# Automated Testing

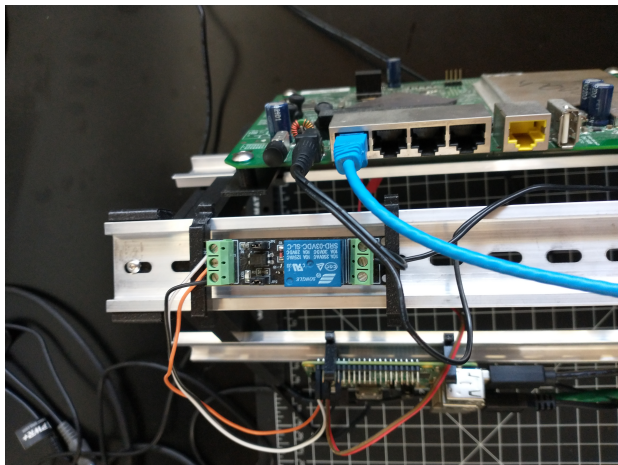




## Automated Testing



# Automated Testing



1. iperf
2. Dogfooding
3. Surveying

- Stable platform for the conference
- Saves an entire day during show prep
- Autoflash decreased feedback loops from 20+min to 5 min per test
- 52 serverspec tests being checked on all images
- Enables expanding AP hardware to support more than 1 model with limited overhead

- WiFi radios remaining up if initial boot had no connectivity
- DHCP reservations mismatches and range overlap
- DNS ACL assumptions for Pasadena Convention Center

- Belkin RT3200: WiFi 6
- DAWN: <https://github.com/berlin-open-wireless-lab/DAWN>
- Automated client WiFi testing in CI
- Advanced surveying process

<https://github.com/socallinuxexpo/scale-network>

<https://github.com/sarcasticadmin/talks>



**End**

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**Thank you**