NetDevOps Survey
State of network operations through automation

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Agenda

- Introduction
- State of Network Operations
- Transition to Network Automation
- Industry Trends
- NetDevOps Survey project
Introduction
NetDevOps Survey

The goal of this survey is to collect information to understand how network operators and engineers are using automation to operate their network today.

Vendor Neutral and Community Driven
Where is the data coming from?

1\textsuperscript{st} Survey
Q4 2016
20 Contributors
20 Questions
~300 Participants

2\textsuperscript{nd} Survey
Q4 2019
10 Contributors
26 Questions
~300 Participants
NetDevOps Survey (2019)
Where are you located?

- North America
- Europe
- Asia
- Australia / Oceania
- South America
- Africa
- Middle East
- Everywhere

- North America: 47.5%
- Europe: 37.2%
- Asia: 7.1%
NetDevOps Survey (2019)

What types of environments are you managing?

Stats: 3.09 avg, max 6

- Datacenter
- Campus/User Access
- WAN
- Internet Peering
- Service Provider / Edge
- Public Cloud
NetDevOps Survey
What types of environments are you managing?

- Datacenter
- WAN
- Campus/User Access
- Internet Peering
- Service Provider / Edge
- SP Backbone
- Public Cloud
- Internet Exchange

2016 vs 2019

%
NetDevOps Survey (2019)
Which networking vendor devices are you managing?
Stats: 3.95 avg, max 11

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco IOS/IOS XE</td>
<td></td>
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<tr>
<td>Cisco NX-OS/ACI</td>
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<tr>
<td>Juniper</td>
<td></td>
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<tr>
<td>Cisco IOS XR</td>
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<tr>
<td>Arista</td>
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<tr>
<td>VMware</td>
<td></td>
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<tr>
<td>Amazon AWS</td>
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<tr>
<td>Microsoft Azure</td>
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<tr>
<td>HPE/Aruba</td>
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<tr>
<td>Dell/EMC</td>
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<tr>
<td>Extreme Networks (brocade)</td>
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<tr>
<td>Huawei</td>
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<tr>
<td>Google GCP</td>
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<tr>
<td>Cumulus</td>
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<tr>
<td>Palo Alto</td>
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<tr>
<td>Nokia</td>
<td></td>
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<tr>
<td>Fortinet</td>
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<tr>
<td>F5</td>
<td></td>
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<tr>
<td>Ciena</td>
<td></td>
</tr>
<tr>
<td>Big Switch</td>
<td></td>
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<tr>
<td>Cisco Meraki</td>
<td></td>
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<tr>
<td>Checkpoint</td>
<td></td>
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<tr>
<td>Cisco ASA</td>
<td></td>
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<tr>
<td>Versa Networks</td>
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<tr>
<td>Aerohive</td>
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<tr>
<td>Viptela</td>
<td></td>
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<tr>
<td>Alcatel</td>
<td></td>
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<tr>
<td>Mikrotik</td>
<td></td>
</tr>
</tbody>
</table>

User Provided in “Other”
State of Network Operations through automation
What operations in your network are currently automated?

- Config Generation
- Config Archiving
- Compliance Check
- Troubleshooting
- Anomaly Detection
- Software Upgrade
- Day 0 Provisioning/ZTP
- Config Deployment
- Data collection / reporting
- Pre/Post changes
- Topology Mapping
- Fault Remediation
- Software Qualification
NetDevOps Survey (2019)

What operations in your network are currently automated?

Stats: 4.75 avg, max 13

- Configuration generation
- Configuration deployment
- Configuration archiving
- Data Collection / Reporting
- Compliance Checks
- Pre/Post Change Checks
- Day 0 Provisioning using a vendor solution
- Software upgrade
- Troubleshooting
- Topology Mapping
- Software qualification
- Anomaly detection
- Fault Remediation

%
NetDevOps Survey

What operations in your network are currently automated?

- Configuration generation
- Configuration archiving
- Configuration deployment
- Data Collection / Reporting
- Compliance Checks
- Pre/Post Change Checks
- Day 0 Provisioning using a vendor solution
- Software upgrade
- Topology Mapping
- Troubleshooting
- Anomaly detection
- Fault Remediation
- Software qualification

%
NetDevOps Survey
Number of responses per participant
What operations in your network are currently automated?
Configuration Management

What solution(s) are you using for the generation and/or the deployment of your configurations?
NetDevOps Survey (2019)
Configuration – If you are automating the generation and/or the deployment of your configurations what solution(s) are you using?
Stats: 2.13 avg, max 7

- Ansible
- Custom scripts using common libraries (netmiko/napalm)
- Low level custom scripts (Python paramiko/socket)
- NAPALM
- Normir
- SaltStack
- Network vendor specific tools
- Excel macros
- Controller (ODL/DNAC/NSX/OpenContrail...)
- NSO (Tail-F)
- HPE Network Automation (HP NA)
- Infoblox NetMRI
- Puppet
- Perl
- Chef
- We haven't automated ..
NetDevOps Survey (2019)
Configuration – If you are automating the generation and/or the deployment of your configurations what solution(s) are you using?
Sub Responses for all participants who selected 'Ansible'

- Custom scripts using common libraries (netmiko/napalm)
- Low level custom scripts (Python paramiko/socket)
- NAPALM
- Normir
- Network vendor specific tools
- Controller (ODL/DNAC/NSX/OpenContrail...)
- SaltStack
- Excel macros
- NSO (Tail-F)
- HPE Network Automation (HP NA)
- Infoblox NetMRI
- Puppet
NetDevOps Survey

Configuration – If you are automating the generation and/or the deployment of your configurations what solution(s) are you using?

- Custom scripts (python..)
- Ansible
- Custom scripts using common libraries (netmiko/napalm)
- Low level custom scripts (Python paramiko/socket)
- NAPALM
- Nomir
- Network vendor specific tools
- Excel macros
- SaltStack
- Controller (ODL/DNAC/NSX/OpenContrail...)
- NSO (Tail-F)
- Third Party Software
- Controller
- Tail-F
- HPE Network Automation (HP NA)
- Puppet
- in-house developed tools
- Chef
- Infoblox NetMRI
- Perl
- Excel
- Terraform
- Trigger
- BMC Network Automation
- We haven't automated..

%
Configuration Management

Do you allow configurations to be manually changed via CLI?

Have you automated the decision to deploy a new configuration?
NetDevOps Survey (2019)
Have you automated the decision to deploy a new configuration?
(auto-remediation, auto-change-validation)

- No: 13.5%
- Partially: 32.6%
- Yes: 53.9%
NetDevOps Survey (2019)
Have you automated the decision to deploy a new configuration?
(auto-remediation, auto-change-validation)

Year: 2016
- No: 28.3%
- Partially: 7.2%
- Yes: 64.5%

Year: 2019
- No: 32.6%
- Partially: 13.5%
- Yes: 53.9%
NetDevOps Survey (2019)
Do you allow configurations to be manually changed via CLI in addition to automated deployments?

- Yes: 85.5%
- No: 14.5%
NetDevOps Survey (2016)
Do you allow configurations to be manually changed via CLI in addition to automated deployments?

2016
- Yes: 91.2%
- No: 8.8%

2019
- Yes: 85.5%
- No: 14.5%
Anomaly Detection

What data sources are you using to detect problems in your network?

What mechanism are you using to identify problems in your network?
NetDevOps Survey (2019)

Anomaly detection – what data sources are you using to detect problems in your network?
Stats: 3.77 avg, max 9

- SNMP
- ICMP/PING
- Syslog
- sFlow/Netflow
- Routing Information
- Other active probes (IP SLA/RPM)
- API
- Streaming Telemetry
- External probes (pingmesh)
NetDevOps Survey (2019)
Anomaly detection – What mechanism are you using to identify problems in your network?
Stats: 1.53 avg, max 4

- Up/Down/Threshold alert: 70%
- Events correlation / rule engine: 40%
- Events correlation using AI/ML: 10%
- Proactive monitoring data analysis using AI/ML: 5%
- We haven't automated: 5%
Network telemetry and analytics is the next big transformation.
NetDevOps Survey (2019)
What programmatic language(s) are you using?

- Python
- Shell
- Javascript
- Golang
- Other
- Powershell
- Expect
- Ruby
- C/C++
Transition to Network Automation
Team / Organization Transition

For how long have you been leveraging automation in your network in a significant way?

What actions did your team take to transition to network automation?
NetDevOps Survey (2019)
For how long have you been leveraging automation in your network in a significant way

- Less than 1 year: 25.7%
- 1 to 2 years: 8.2%
- 2 to 5 years: 37.1%
- More than 5 years: 28.9%
NetDevOps Survey (2019)
What actions did your team take to transition to network automation
Stats: 1.7 avg, max 5

- Some of us learned on their own
- Some of us took some network automation / programming training
- We hired dedicated Network Automation Engineer(s)
- We participated in hackathon(s)
- We engaged a consulting firm to help get started

%
Personal Transition

- How long did it take you to make the transition?
- How many hours did you put in training / self-learning?
- How did you manage to find time for this transition?
NetDevOps Survey (2019)
If you (personally) have transitioned from a network engineer role to a network automation role, how long did it take you to make the transition?

- 1 to 2 years: 18.9%
- Less than 1 year: 34.2%
- 2 to 5 years: 44.1%
- More than 5 years: 18.9%
NetDevOps Survey (2019)
If you (personally) have transitioned from a network engineer role to a network automation role, How many hours did you put in training / self-learning?

- 201-1000: 16.1
- 0-200: 53.5
- 1001-4000: 25.8
- More than 4000: 5.6
NetDevOps Survey (2019)
If you (personally) have transitioned from a network engineer role to a network automation role, How did you manage to find time for this transition?

Stats: 1.0 avg, max 1

- Learned on my own time
- Dedicated some time per week at work
- Transitioned into the new role full-time and learned on the job
- Attended formal training
Industry Trends
NetDevOps Survey (2019)

In the following list of topic, which one are you interested about or have currently implemented?

- Network Health Monitoring
- DevOps
- Source of Truth
- Infrastructure As Code
- Continuous Integration/Delivery - CI/CD
- Chatops
- Streaming Telemetry
- Event Driven Automation
- Graph Database
- Intent-based solution / IBN

I don't Know  No Interest  Currently Evaluating  Already In Production  Thinking About It
NetDevOps Survey (2019)

In the following list of tool, which one are you interested about or have currently implemented?

Git
Ansible
ELK
CI
Grafana/Prometheus/Influxdb
Netbox
NAPALM
Saltstack
Puppet
Nomir
NSO
Kentik
Stackstorm
Network Verification Software
Chef
Keyword based testing

- I don’t Know
- No Interest
- Currently Evaluating
- Already In Production
- Thinking About It
Outliers 1/2

Infrastructure as Code

NAPALM
Outliers 2/2

Puppet

Event Driven Automation

NetDevOps Survey

In the following list of tool, which one are you interested about or have currently implemented? Puppet

<table>
<thead>
<tr>
<th>Year</th>
<th>Currently Evaluating It</th>
<th>No Interest</th>
<th>Thinking About It</th>
<th>Already In Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>20%</td>
<td>50%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>2016</td>
<td>15%</td>
<td>55%</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>

NetDevOps Survey

In the following list of topic, which one are you interested about or have currently implemented? Event Driven Automation

<table>
<thead>
<tr>
<th>Year</th>
<th>Currently Evaluating It</th>
<th>No Interest</th>
<th>Thinking About It</th>
<th>Already In Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>30%</td>
<td>30%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>2016</td>
<td>35%</td>
<td>30%</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>
5

NetDevOps Survey Projects
NetDevOps Project : Join the discussion

- GitHub: github.com/dgarros/netdevops-survey
- Slack: Network to Code #netdevops_survey
NetDevOps Project : Results

Results are available in GitHub

- TSV format
- SQLite database
- Graphs in PNG (150+ graphs available)
NetDevOps Project: Process

- Define questionnaire: Aug / Sept
- Collect Responses: Oct
- Cleanup Responses: Nov/Dec
- Publish Results
NetDevOps Project : GitHub

Open an issue or a PR to:

- Ask a question
- Add a vendor for the next edition
- Propose a new question / section
NetDevOps Project: How can you help?

- Spread the word
- Social Media
- Marketing (if working for a vendor)
- Provide feedback, suggestions
THANK YOU