Network Automation Tools & Technology

Cristian Sîrbu

Agenda

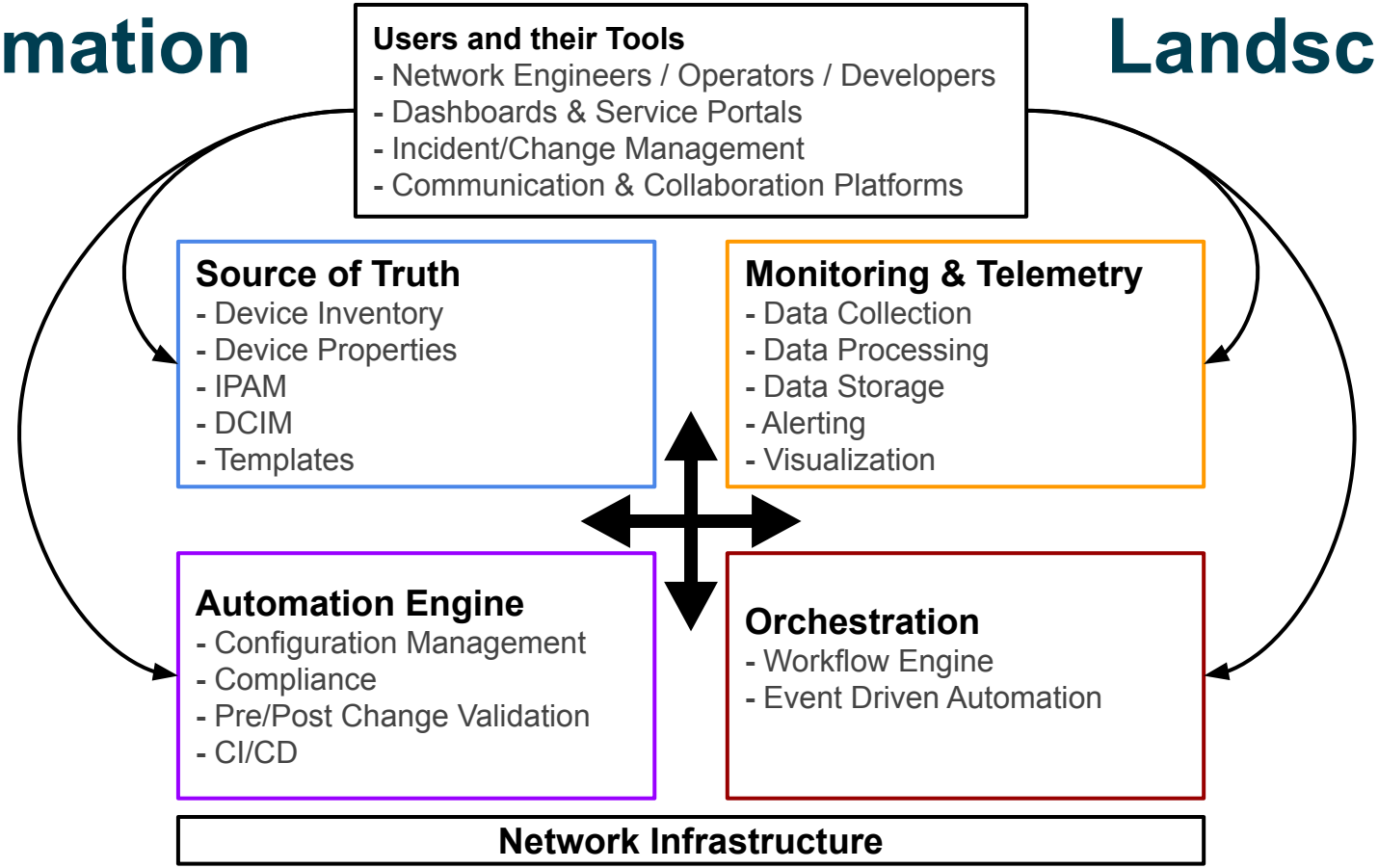
- Who am I?
- Network Automation Landscape
  - The Automation Engine
  - The Source of Truth
  - Monitoring and Telemetry
  - Orchestration
- Wrap-up and Next Steps

I am Cristian Sîrbu.

- **Principal Consultant & Trainer at Redbit Networks**
  - **Helping businesses around the world learn, build and deploy network automation**
  - Close collaboration with Network To Code
- Community builder (co-founder/organizer of the Irish Network Operators Group)
- Network Engineer/Architect for 14+ years, CCIE #43453
- Dabbling in Linux and Programming since high-school
- Blogs at www.trueneutral.eu

- **Get in touch:** @cmsirbu on Twitter/Github and the NetworkToCode Slack

Automation Landscape



Configuration Management

Human driven approach:

- Please configure the **dub01rtr01** interfaces going to **dub01rtr02**, the IPs are in the LLD.
- Good luck!

vs.

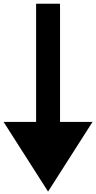
Data driven approach:

```
---

interfaces:
  - name: GigabitEthernet10
    ipv4:
      addr: 192.0.2.1
      mask: 255.255.255.252

  - name: GigabitEthernet11
    ipv4:
      addr: 192.0.2.5
      mask: 255.255.255.252
```

```
{% for intf in interfaces %}
interface {{ intf.name }}
 ip address {{ intf.ipv4.addr }} {{ intf.ipv4.mask }}
{% endfor %}
```

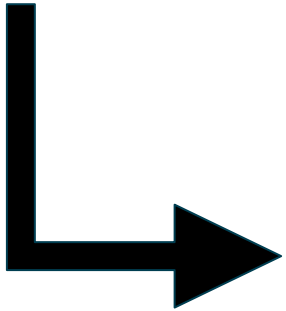


```
interface GigabitEthernet10
 ip address 192.0.2.1 255.255.255.252
interface GigabitEthernet11
 ip address 192.0.2.5 255.255.255.252
```

Configuration Compliance

```
tasks:
  - name: COMPARE BACKUP TO RUNNING CONFIG
    ios_config:
      diff_against: intended
      intended_config: "{{ lookup('file', './backups/{{ inventory_hostname }}.cfg') }}"
```

Using Ansible



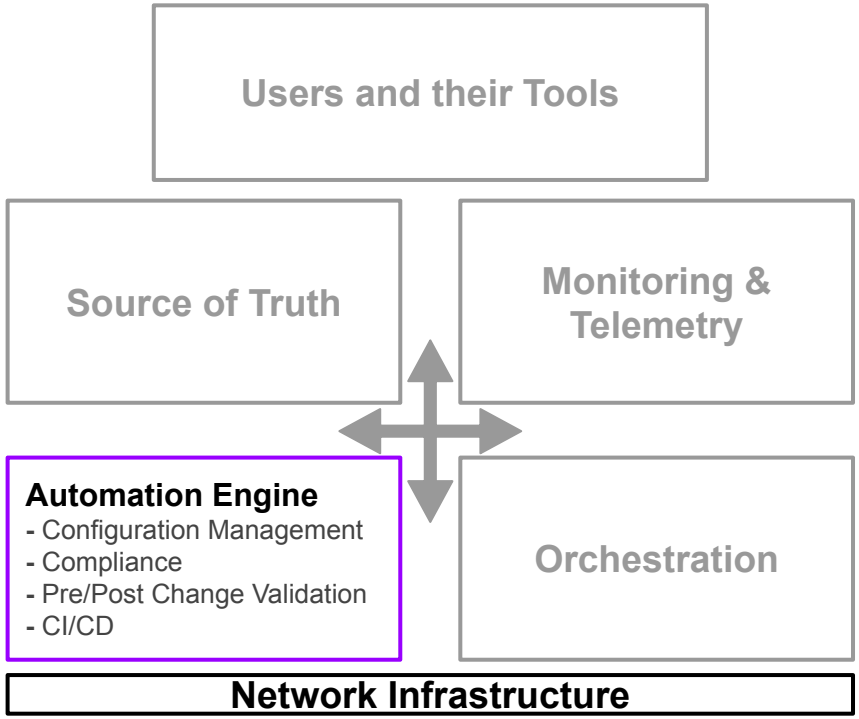
```
TASK [COMPARE BACKUP TO RUNNING CONFIG]
************************************
--- before
+++ after
redundancy
lldp run
cdp run
+interface GigabitEthernet10
+ ip address 192.0.2.1 mask 255.255.255.252
+interface GigabitEthernet11
+ ip address 192.0.2.5 mask 255.255.255.252
interface GigabitEthernet12
vrf forwarding MANAGEMENT
ip address 10.0.0.21 255.255.255.0
```

The Automation Engine

Multipurpose Tools
- Ansible, Salt, Cisco NSO, Rundeck
- Python, Go, JavaScript

Data Analysis, Compliance, Verification
- Batfish, Forward Networks, Cisco pyATS/Genie
- TextFSM with NTC templates, YANG models+tooling

CI/CD
- Jenkins, Gitlab-CI, Travis-CI, Github Actions and many more

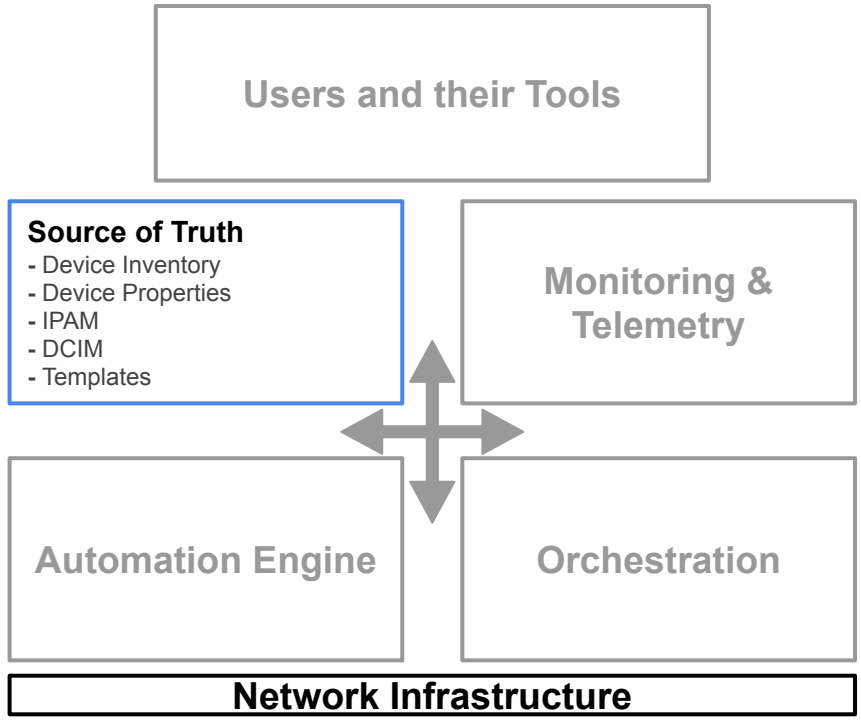


Source of Truth

Source of Truth = Intended State of the Network

- Accurate, Reliable Data
- Up to date through active usage
- Easy to access for people
- Easy to consume programmatically
- Aggregates information from multiple **Systems of Record**

System of Record = Authoritative on one specific type of information.

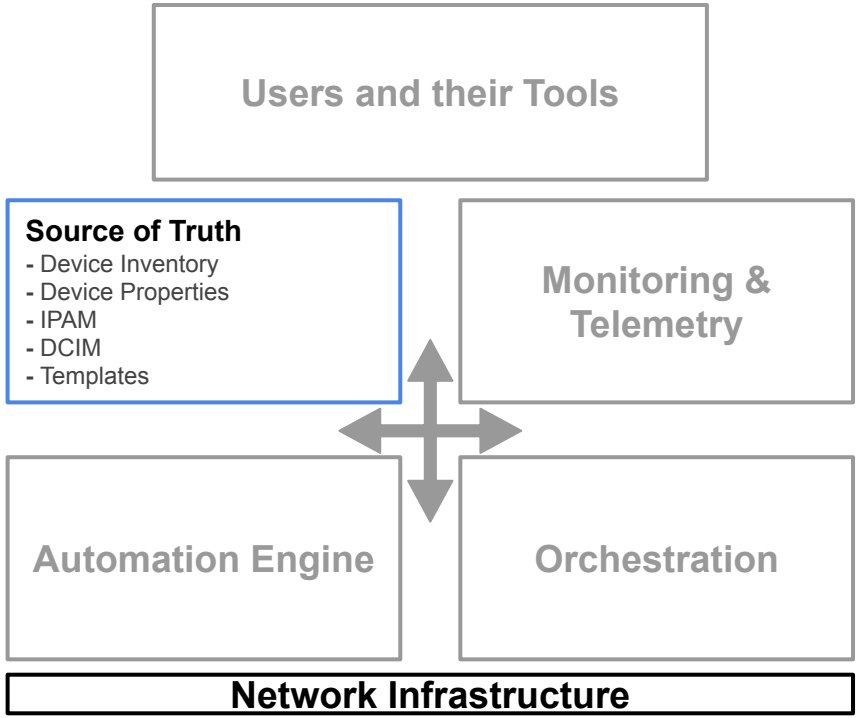


Source of Truth

What are you storing?
- Device Inventory (Location, Role, Model, OS Version, Status)
- Network Device Properties (Interfaces, IPs, Routing, VLANs etc.)

Which format are you storing it in?
- Structured Text - YAML, JSON, Templates
- Applications: IPAM, DCIM
- Custom Databases

How do you keep it up to date?
- Culture & Process changes
- Active use directly and via automation
- Not being stuck in an endless transition



Monitoring and Telemetry

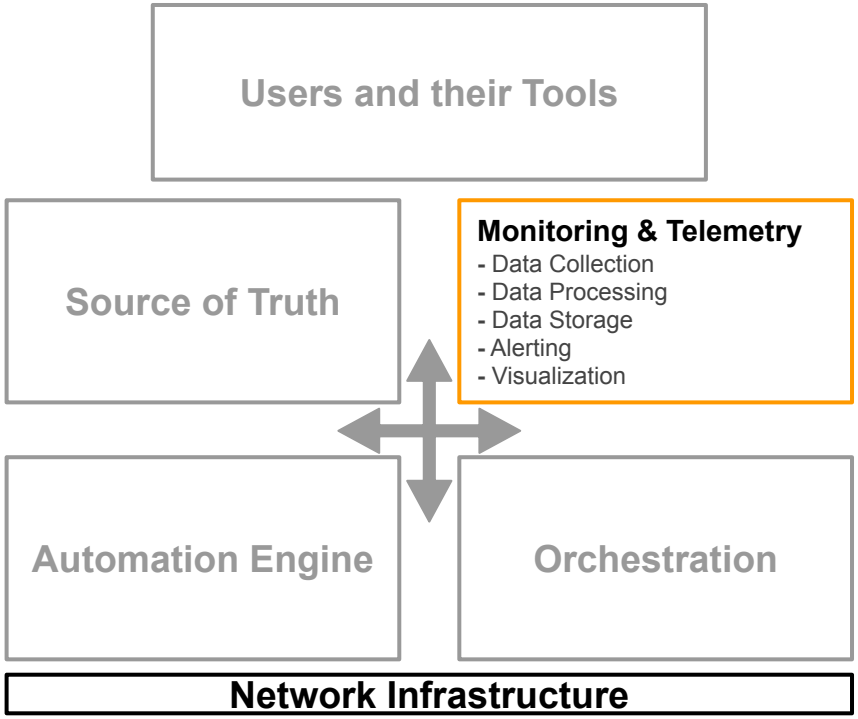
Technology Stacks:

- **ELK** - Elasticsearch, Logstash, Kibana
- **TICK** - Telegraf, InfluxDB, Chronograf, Kapacitor
- **TIG** - Telegraf, InfluxDB, Grafana
- Prometheus, Grafana

Many other solutions:

- Viavi, ThousandEyes
- Cisco AppDynamics, Sensu, Datadog
- Splunk, openNMS, Solarwinds
- Graylog, fluentd

Cloud Native Landscape - Observability & Analysis



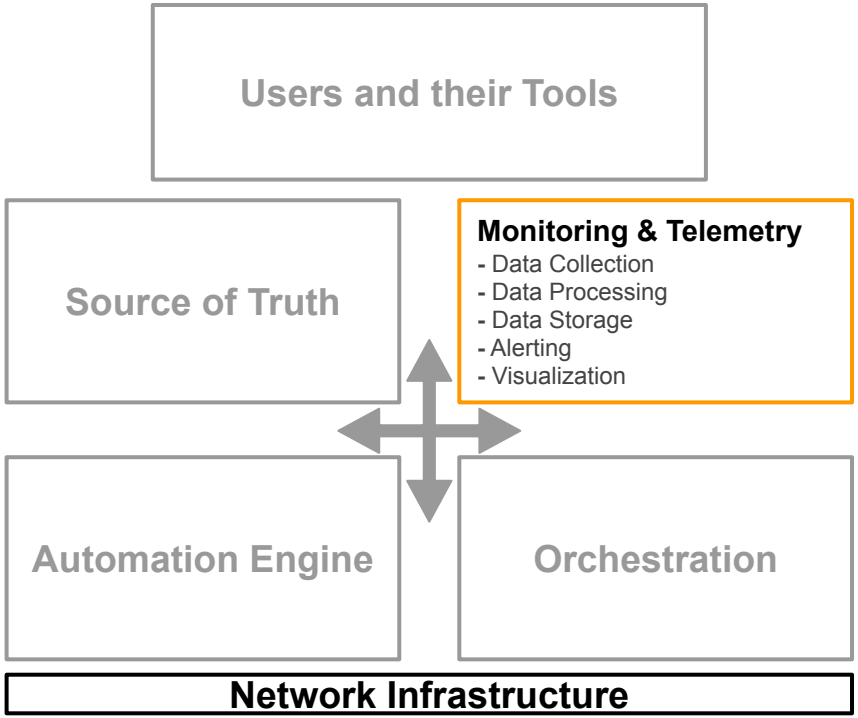
Monitoring and Telemetry

Data Collection
- SNMP, SYSLOG, Flow Exports
- CLI Scraping
- Streaming Telemetry
- gRPC/gNMI, NETCONF/RESTCONF+YANG

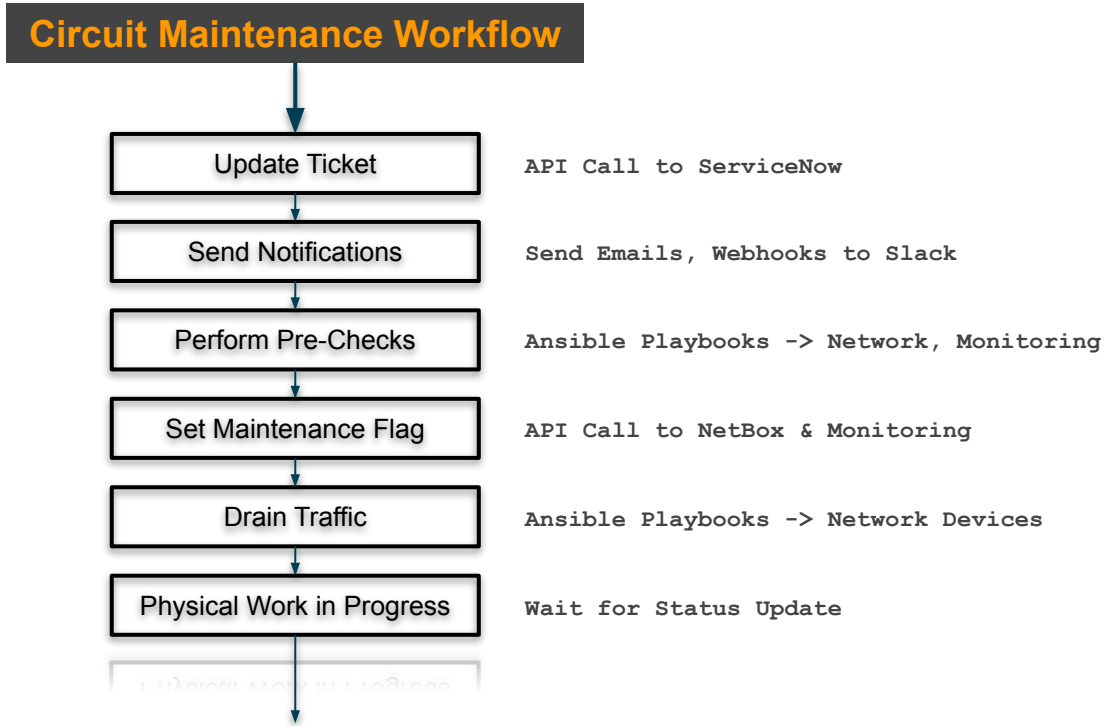
- **What:** Configuration, Metrics, Logs, Alerts

Data Storage:
- Time Series Database - great for numeric values such as interface counters, bandwidth/cpu/memory utilization, prefix stats

- Document and Key/Value Databases - great for structured data, logs, events



Orchestration - Workflows



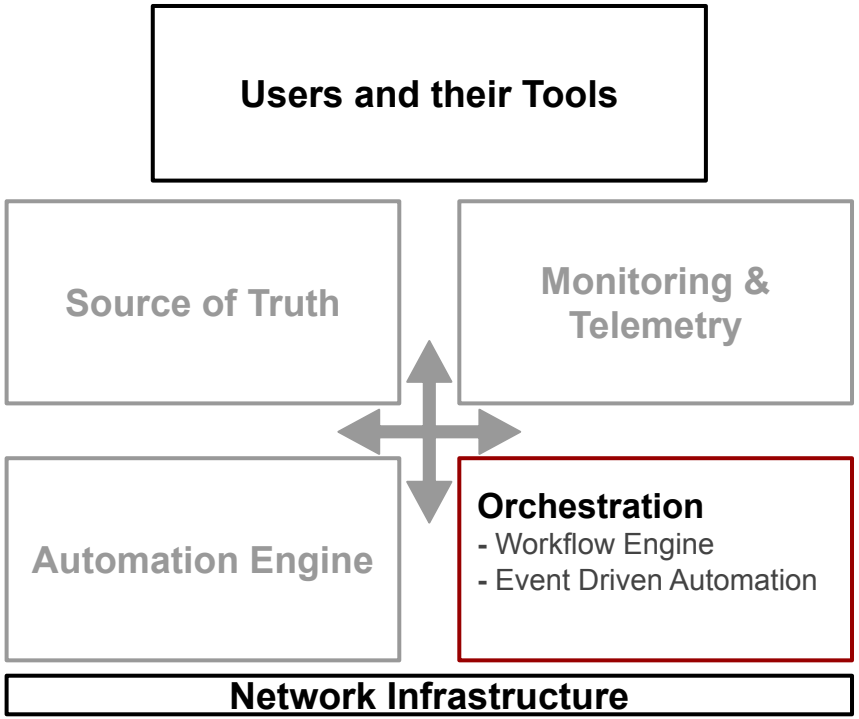
Orchestration - The Final Frontier?

Workflow Engine + Event Driven Automation

- Important step towards Automation maturity
- Building Self-Service Portals for users in different teams / parts of the business

Tooling & Products:

- Ansible Tower, CI/CD Platform (e.g. Jenkins)
- Stackstorm
- Proprietary: Itential, Apstra AOS, Anuta ATOM, Gluware
- Build your own execution engine with help from a third party vendor like NetworkToCode



Thank you for watching!

> Get in touch <

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