

Building an Automation Culture

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GlobalNOC
Global Research Network Operations Center

How can we leverage our:

People
Tools
Processes

to **enable automation** across our organization

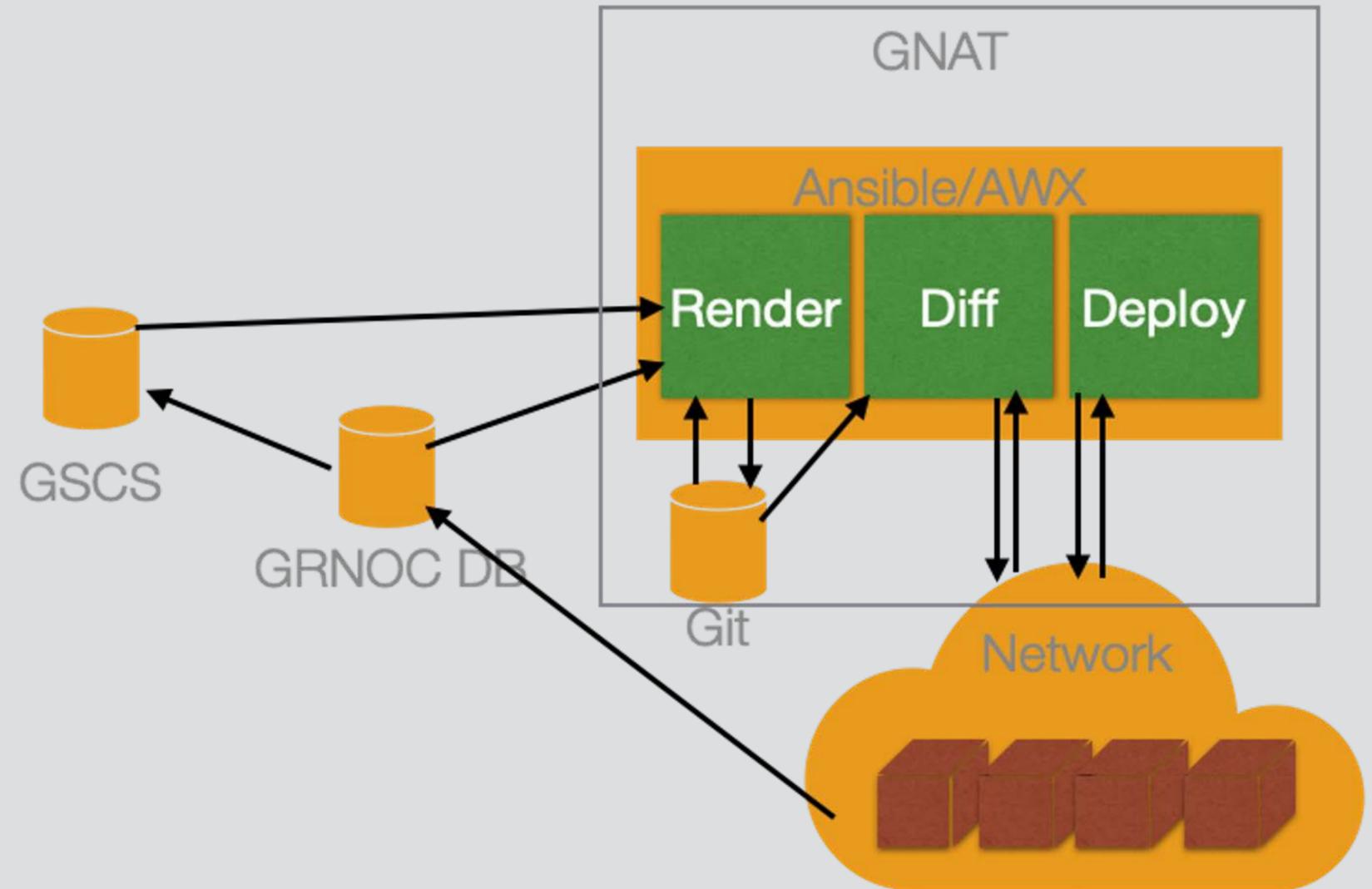
across every service delivery team

Network Config Automation

(you may have heard about this???)

⦿ Integrated toolkit built on top of:

- Ansible / AWX
- Git / Github
- GlobalNOC Database
- UIs for baseline automation and service configuration



Service

[View History](#)

Name

VPN-S01503

Nodes



Name

rtr3.ictc.vpn.grnoc.iu.edu

Outside Interface

GigabitEthernet0/0

Type

local

Use No Monitor Flag Use Pending Flag

View config for node:

rtr3.ictc.vpn.grnoc.iu.edu

Language:

junos

```
groups {
  VPN-S01503 {
    security {
      zones {
        security-zone INSIDE {
          interfaces {
            st0.11;
          }
        }
      }
    }
  }
}

ike {
  policy IKE_POLICY_PennREN_ {
    mode main;
    proposals IKE_PROPOSAL;
    pre-shared-key ascii-text 11;
  }

  gateway GATEWAY-PennREN- {
    ike-policy IKE_POLICY_
    address 1.1.1.1;
    local-identity inet 1.1.1.1;

    external-interface GigabitEthernet0/0;
  }
}
```

Service Details

Telemetry & Measurement

SNAPP

SIMP

TSDS

Grafana

Atlas

PerfSONAR

Netflow

Syslog

AAA

RADIUS

LDAP

Kerberos

OTP

Shibboleth

ITSM

ServiceNow

Notification Tool

Ticketing Tools

Request Forms

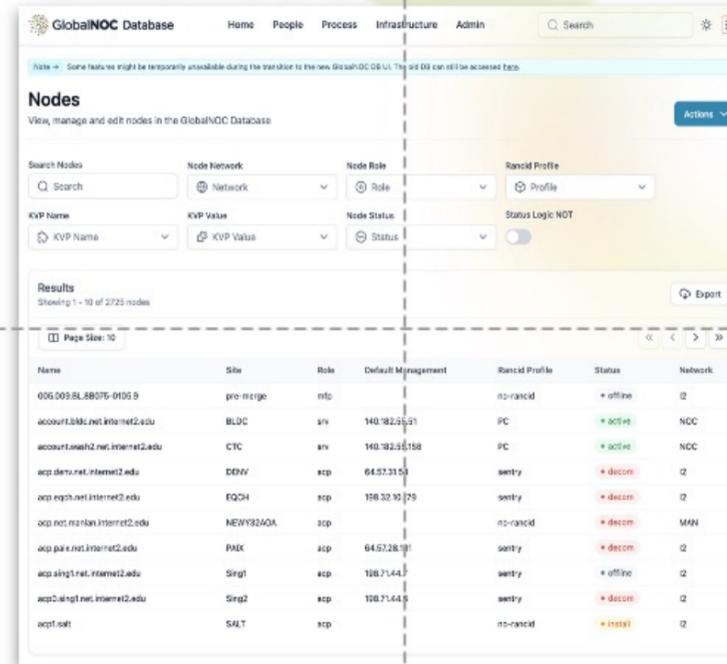
Configuration

RANCID

SVN

Populators

GlobalNOC Database



Name	Site	Role	Default Management	Rancid Profile	Status	Network
006.009.BL.88076-0105.9	pro-ncige	info		no-rancid	offline	Q
account338c.net.internet2.edu	BLDC	srv	140.192.35.51	PC	active	NCC
account338c2.net.internet2.edu	CTC	srv	140.192.35.158	PC	active	NCC
acp.dens.net.internet2.edu	EDHV	exp	64.57.31.5	seentry	decom	Q
acp.eqch.net.internet2.edu	EQCH	exp	198.32.10.79	seentry	decom	Q
acp.nci.mnaban.internet2.edu	NEWY92AOK	exp		no-rancid	decom	MAN
acp.pak.net.internet2.edu	PAK	exp	64.57.28.10	seentry	decom	Q
acp.sing1.net.internet2.edu	Sing1	exp	108.7.144.7	seentry	offline	Q
acp.sing1.net.internet2.edu	Sing2	exp	108.7.144.8	seentry	decom	Q
acpt.oak	SALT	exp		no-rancid	install	Q

Automation

Network Troubleshooter

RouterProxy

GNAT

GSCS

DNS AutoGen

OESS

Monitoring

Nagios

Alertmon

Custom Agents

Network Impact Tool

Infrastructure

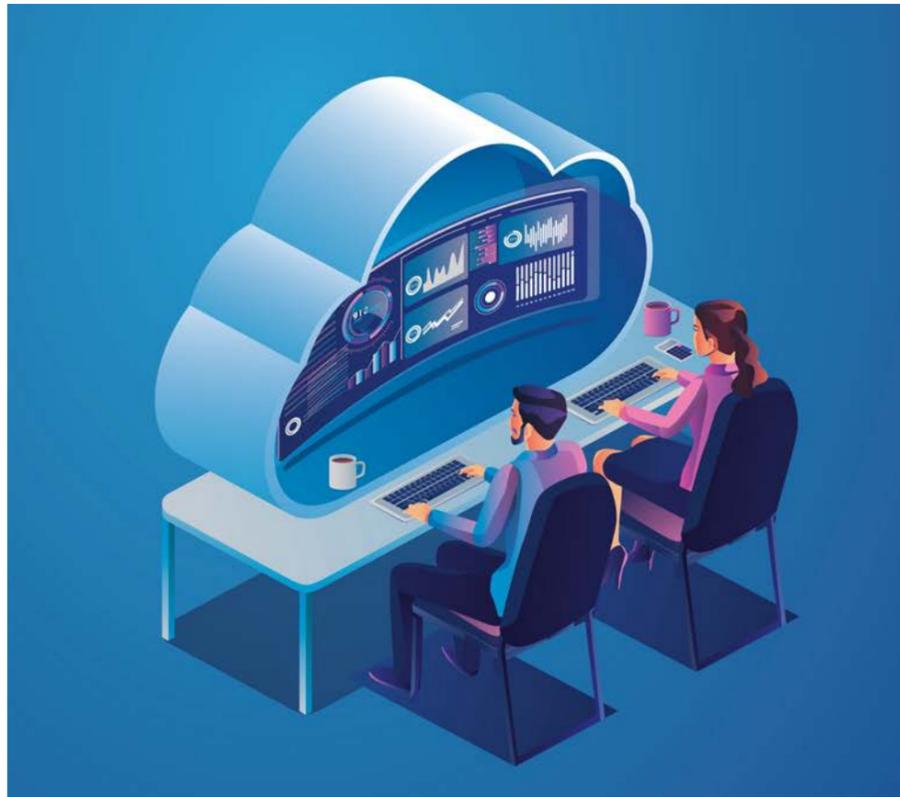
Ansible/AWX

GitHub

Jenkins

Puppet

Cobbler



Service Desk



Network Engineering



Software & Systems Engineering

Get the whole organization involved!

We launched an “idea challenge” across
GlobalNOC

How could you be more effective...
What parts of your job could be easier...

With the aid of automation

Broadening the scope...

- ⦿ Automated alert triage and routing
- ⦿ Automated communication when outages are detected
- ⦿ Automated tools to assist diagnose and remediate outages
- ⦿ Automated tools to verify changes
- ⦿ Automated systems to facilitate fine grained control of event notifications from our NOC to our users.
- ⦿ Automated software testing and deployment for our network management systems
- ⦿ And more...



Service Desk

- **Automated Alarm Handling**

- Process for high-volume peer outage alarms used to have a manual “hold timer” before Service Desk engaged Network Engineering
- These alarms now get automatic ticket creation to record the event. If peer restores before timer expires, no action is required, ticket is auto-closed.
- If timer expires, Service Desk is notified and engages engineering.

- **Automated “Inquiry” e-mails**

- Automate the process of sending e-mail to the remote side when we detect an outage inquiring about cause

- **Automated gathering of event up/down times**



Network Engineering

- **Automated pre/post maintenance condition comparison**
 - Tools to assist engineers during maintenance events to verify status of network after maintenance matches expectations.
- **Automate verifying light levels following fiber outage/maintenance**
 - Enable Service Desk to complete a task that used to require engineering engagement with enhanced tools and processes
- **Auto-remediation of network problem events**



Software & Systems Engineering

• **Automated Alarm Routing and Grouping**

- Certain classes of high-volume / routine systems alarms were taking up significant time at our Service Desk to triage and route to the proper team.
- Enabled a system to automatically classify, acknowledge, group and route these alarms to the correct systems engineering team.

• **Automated Software Release Packaging & Deployment**

- Enhancements to our software build & deployment processes
- Go from “code changes completed” to “tested and deployed” automatically

“Network Troubleshooter”

AJ Ragusa
Tomorrow – 2:40pm

Automated Incident
Troubleshooting
Dashboards
&
Automated Change Support



GlobalNOC Network Troubleshooter

(now supports both **incident** and **change** events)

GlobalNOC Troubleshooter Home

INC0127736 Alarm core1.newy32aoa.net.internet2.edu - BGP - 144.206.2...

Critical since Sun Dec 04 16:22:07 MST 2022

core1.newy32aoa.net.internet2.edu
BGP to [LHCONE] KIAE via MANLAN ~ AS57484 | I2-S190801 is down (State: Active).

Ping Results

Ping test with set sizes to verify MTU and to verify layer1 and layer2 connectivity to peer

Command	Results
ping vrf LHCONE 144.206.255.148 count 10	Success rate is 100 percent (10/10), round-trip min/avg/max = 132/133/134 ms
ping vrf LHCONE 144.206.255.148 count 10 size 1478	Success rate is 100 percent (10/10), round-trip min/avg/max = 132/133/134 ms
ping vrf LHCONE 144.206.255.148 count 10 size 8975	Success rate is 100 percent (10/10), round-trip min/avg/max = 134/135/139 ms

BGP Route

Display the route to the BGP neighbor
Command: show route vrf LHCONE 144.206.255.148 detail

```

Routing entry for 144.206.255.148/31
Known via "connected", distance 0, metric 0 (connected)
Installed Sep 12 04:10:23.020 for 12w0d
Routing Descriptor Blocks
  directly connected, via HundredGigE0/0/0/22.533
  Route metric is 0
  Label: None
  Tunnel ID: None
  Binding Label: None
  Extended communities count: 0
  NHID:0x0(Ref:0)
  MPLS eid:0xfffffffffffffd
  Route version is 0x1 (1)
  No local label
  IP Precedence: Not Set
  QoS Group ID: Not Set
  Flow-tag: Not Set
  Fwd-class: Not Set
  Route Priority: RIB_PRIORITY_CONNECTED (4) SVD Type RIB_SVD_TYPE_LOCAL
  Download Priority 0, Download Version 4
  Route eid: 0xfffffffffffffd
  No advertising protos.
    
```

Commit History

Show commit history to determine if any recent changes affected the BGP status
Command: show configuration history last 15

Sno.	Event Info	Time Stamp
1	backup.Periodic ASCII backup	Fri Dec 2 17:20:53 2022

Changes

CHG000001 Start Maintenance End Maintenance View Ticket

Maintenance Information

Description: Maintenance (NSA) - I2 OESS VRF Alarm Capture

Planned Start: 2023-09-17 16:30:00 UTC

Planned End: 2023-09-18 18:00:00 UTC

Time Remaining: 1 day 23 hours 49 minutes

Affected Nodes

- core1.hart2.net.internet2.edu
- core2.hart2.net.internet2.edu
- core3.hart2.net.internet2.edu
- core4.hart2.net.internet2.edu
- core5.hart2.net.internet2.edu

Active Alarms

View Alarms in Troubleshooter

Network	Node	Device	Service	Description	Duration	Severity
I2	core1.hart2.net.internet2.edu	10.66.255.102	BGP - 10.66.255.102	BGP to [OESS-VRF-4000] Performance Assuranc ~ AS65123 is down (State: Active).	2d 3h	Critical
I2	core2.hart2.net.internet2.edu	10.66.255.106	BGP - 10.66.255.106	BGP to [OESS-VRF-4005] Performance Assuranc ~ AS65123 is down (State: Active).	2d 3h	Critical

Change Management

3 Total Hosts 1 Success 2 Failed

failed - core2.hart2.net.internet2.edu

Name	Pre	Post	Status
Up Interfaces	5	7	success
BGP Peers	12	9	failed

failed - core3.hart2.net.internet2.edu

Name	Pre	Post	Status
Up Interfaces	5	7	success
BGP Peers	12	9	failed

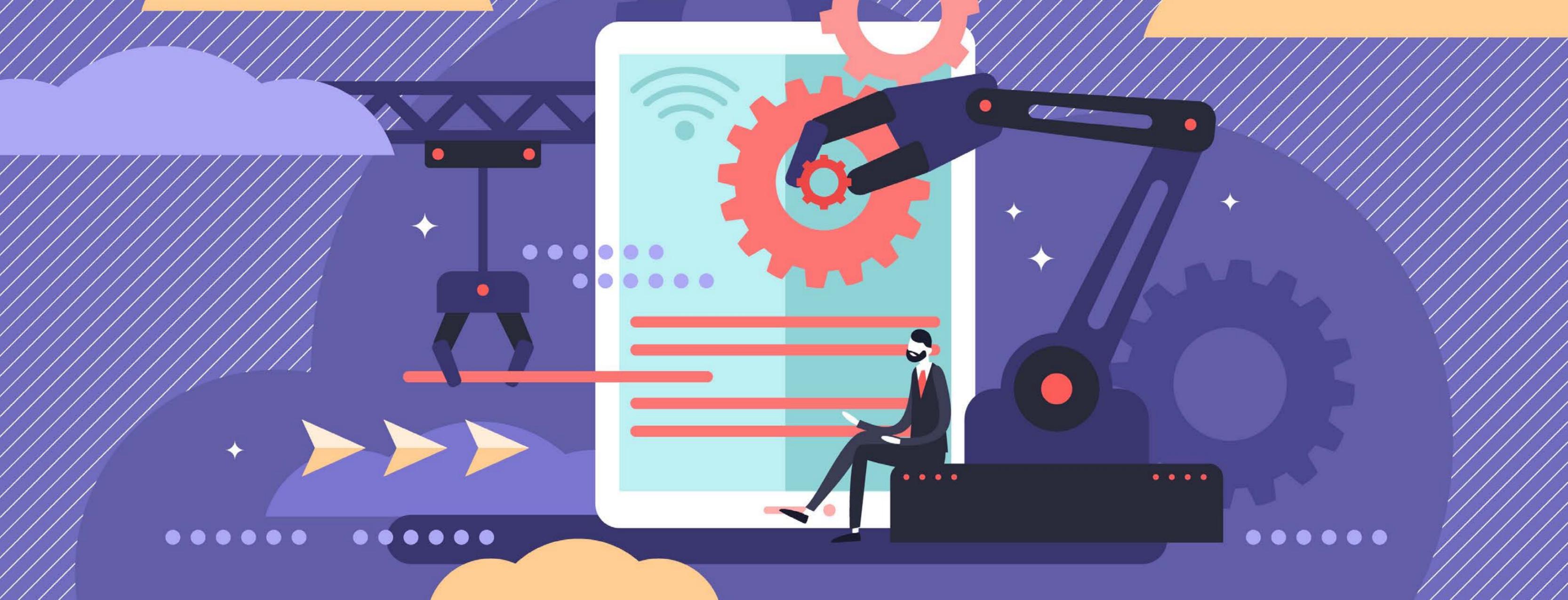
success - core1.hart2.net.internet2.edu

Lots of little automation projects promoting an automation culture across your organization...



Can lead to a transformative impact over time





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