

Network Automation: The Hype vs. Reality

You aren't behind



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- Over 20 years in IT
- Over 15 years working with Infrastructure and Operations enterprises and startups
- Security - CISSP, CISA, PCI
- Infra/Ops - Data Center, Cloud, CDN
- Head of global monitoring at Thomson Reuters
- Head of IT Operations at MFG.com (Bezos Expeditions)
- Gartner Research VP 4 years
- Product + Strategy AppDynamics/Cisco 4 years
- Kentik CTO 10 months

Ground Rules

Spoke on the phone and in person to over 500 companies a year running networks for 4 years (as all analysts do).

Most people struggle with the same fundamental problems, how to keep the lights on and improve incrementally. Technical Debt is a problem everywhere.

This talk is focused on automation which is not what Kentik does, nor what Kentik will do. However we are an input into an automation strategy and work with customers regularly on their approach.

Agenda

- Network complexity continues to increase
- Automation strategies fragment between custom tools, NCCM, and DevOps automation tools
- State of the union survey data on automation and telemetry and where people are going with their strategies
- Common approaches in the modern toolset for state of the network and pushing changes
- Closed loop automation and validation via CI/CD
- AIOps platforms

Infrastructure is changing, fast

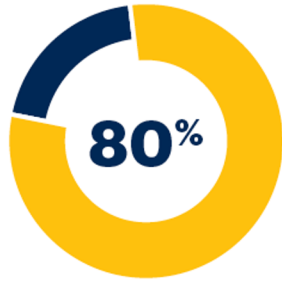
In 5 years it will be fundamentally different

Enterprises That Will Close Their Traditional Data Centers

Percentages of Respondents



Today

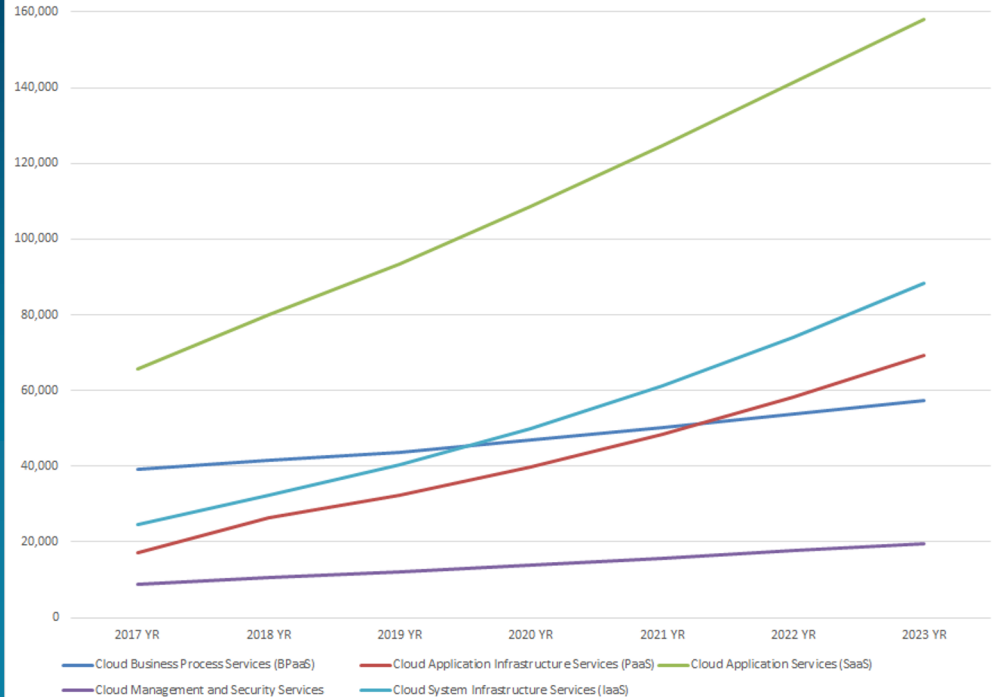


2025

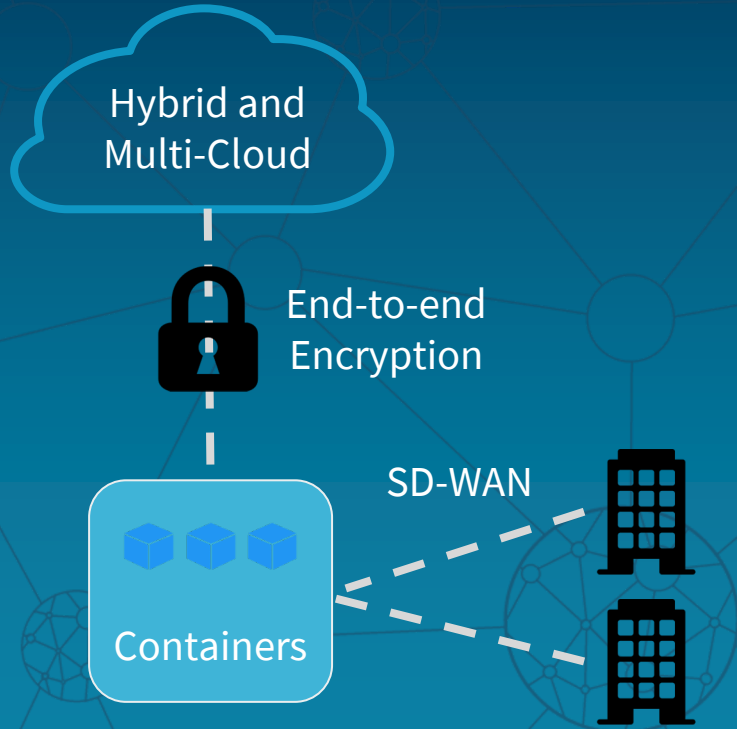
Source: Gartner (February 2019)
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Gartner

Gartner Cloud Spending Forecast Globally
August 2019 (Millions)



Running today's networks is dramatically harder



Tasks that are impacted:

- End to end automation
- Quickly detecting problems
- Root cause determination
- Allocating network costs

Automation is Fragmented



Gartner predicts that, through 2022, 80% of I&O organizations will use more than 10 different tools to automate their operations environments, which is an increase from an estimated 6 to 8 in 2017

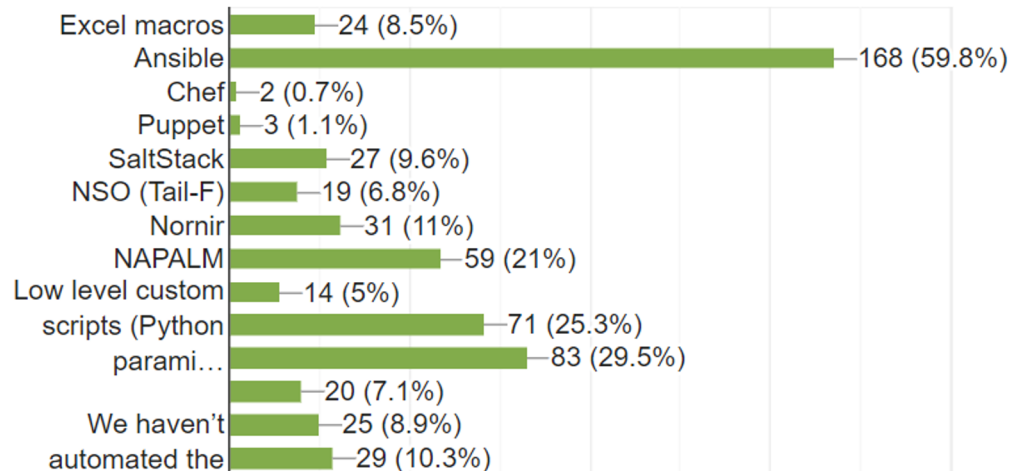
4 Distinct Types of Automation Systems:

1. Network Configuration and Change Management (NCCM)
Patching, compliance, rollout
1. Network Orchestration
Programmatic device access (CLI/API) often DevOps
1. Policy-Based Automation
Abstraction of devices into policy control
1. Intent-Based Networking Systems (IBNS)
Business intent and network config are unified

NetDevOps Survey 2019: current state of automation

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

281 responses



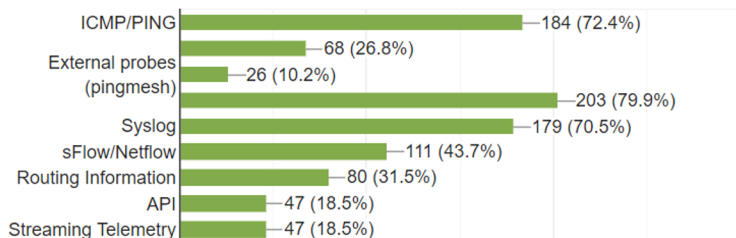
Open community driven project.

Network To Code is our partner and they kicked this initiative off.

NetDevOps Survey: Wow is monitoring broken

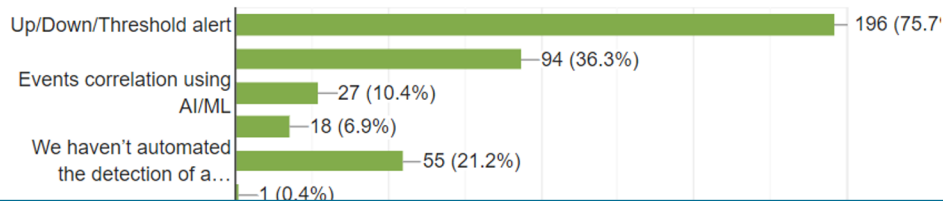
Anomaly detection – what data sources are you using to detect problems in your network ?

254 responses



Anomaly detection – What mechanism are you using to identify problems in your network ?

259 responses



If you told me 10 yrs ago most people were using ping and thresholds to monitor their networks I would have called you crazy.

Ansible wins for the future

Not a single solution for the network user, requires building a toolkit of many packages typically in Python

Commonly used Python toolkits:

- Napalm
- Nornir
- Netmiko

Lack of standard implementation

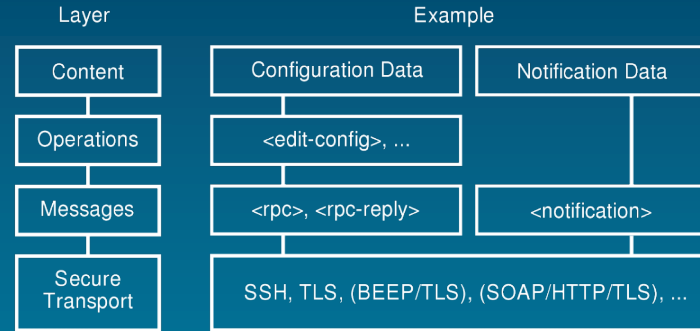
Doesn't handle support / import of existing automation



Result: More complexity, but better scale

Network Modeling and State

Netconf protocol implemented on most devices, but older style XML implementation



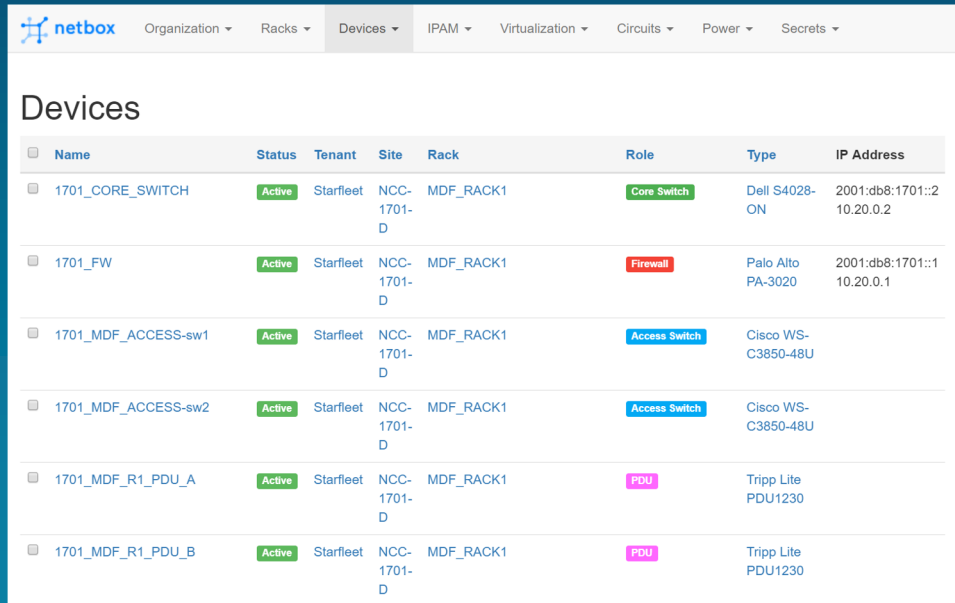
Still need other discovery to get device status and details.

- Config download (legacy), SNMP, or proprietary APIs
- Limited usefulness of Streaming Telemetry due to lack of standards and most networks being diverse vendors/versions.



Netbox

NetBox allows for the state of the network to be managed, but not populated easily.



The screenshot shows the NetBox web interface with the 'Devices' tab selected. The interface includes a navigation bar with the NetBox logo and several dropdown menus: Organization, Racks, Devices, IPAM, Virtualization, Circuits, Power, and Secrets. Below the navigation bar, the 'Devices' section is displayed as a table with the following columns: Name, Status, Tenant, Site, Rack, Role, Type, and IP Address. The table contains seven rows of device information.

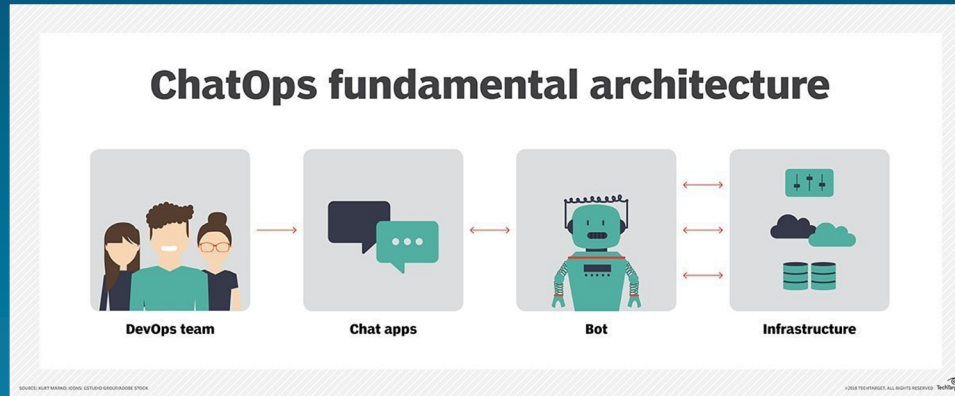
Name	Status	Tenant	Site	Rack	Role	Type	IP Address
1701_CORE_SWITCH	Active	Starfleet	NCC-1701-D	MDF_RACK1	Core Switch	Dell S4028-ON	2001:db8:1701::2 10.20.0.2
1701_FW	Active	Starfleet	NCC-1701-D	MDF_RACK1	Firewall	Palo Alto PA-3020	2001:db8:1701::1 10.20.0.1
1701_MDF_ACCESS-sw1	Active	Starfleet	NCC-1701-D	MDF_RACK1	Access Switch	Cisco WS-C3850-48U	
1701_MDF_ACCESS-sw2	Active	Starfleet	NCC-1701-D	MDF_RACK1	Access Switch	Cisco WS-C3850-48U	
1701_MDF_R1_PDU_A	Active	Starfleet	NCC-1701-D	MDF_RACK1	PDU	Tripp Lite PDU1230	
1701_MDF_R1_PDU_B	Active	Starfleet	NCC-1701-D	MDF_RACK1	PDU	Tripp Lite PDU1230	

Another DIY project

ChatOps and Demo

Integrate various OSS tools as an interactive chat bots

More collaborative during a change or troubleshooting event



Open Source chatbot in development which includes NetBox, Ansible, and Kentik. We have more work going into this as well.

Demo Video: <https://youtu.be/6wl2suubMIQ?t=691>

Demo: Chatbot Netbox Site Details

The screenshot displays the Netbox web interface in a browser window. The browser's address bar shows the URL `netbox.networktocode.com`. The page header includes the Netbox logo and navigation menus for Organization, Racks, Devices, IPAM, Virtualization, Circuits, Power, and Secrets. A search bar and a 'Log in' button are also present.

The main content area is titled 'Network To Code' and features a search bar and a dropdown menu set to 'All Objects'. Below this, the interface is organized into several columns of object categories, each with a count of items:

- Organization** (11 items):
 - Sites (11): Geographic locations
 - Tenants (3): Customers or departments
- DCIM** (7 items):
 - Racks (7): Equipment racks, optionally organized by group
 - Device Types (9): Physical hardware models by manufacturer
 - Devices (50): Rack-mounted network equipment, servers, and other devices
 - Connections (22 items):
 - Cables (22)
 - Interfaces (22)
 - Console (0)
 - Power (0)
- IPAM** (125 items):
 - VRFs (0): Virtual routing and forwarding tables
 - Aggregates (3): Top-level IP allocations
 - Prefixes (6): IPv4 and IPv6 network assignments
 - IP Addresses (125): Individual IPv4 and IPv6 addresses
 - VLANS (25): Layer two domains, identified by VLAN ID
- Circuits** (0 items):
 - Providers (0): Organizations which provide circuit connectivity
 - Circuits (0): Communication links for Internet transit, peering, and other services
- Virtualization** (3 items):
 - Clusters (3)
- Global Topology Maps**: None found
- Reports**: None found
- Changelog**:
 - Interface GigabitEthernet0/0/0 (ntc - 2020-01-31 16:01)
 - IP Address 10.0.120.1/24 (ntc - 2020-01-31 15:28)
 - IP Address 10.0.120.4/24 (ntc - 2020-01-31 15:28)
 - IP Address 10.0.120.4/24 (ntc - 2020-01-31 15:27)
 - Interface ManagementEthernet0/RP0/CPU0/0 (ntc - 2020-01-31 15:25)
 - IP Address 10.0.0.21/30 (ntc - 2020-01-31 15:25)

Demo: Chatbot Kentik Top Sources Chart

telegraf/plugins/inputs/cisco_tel... eos-spine1 - NetBox Slack | cu-kentik-demo | network... Network Explorer - Kentik v4

app.slack.com/client/T101A77MM/CSTK91AG

Kentik Mail ClickUp Asana Cal Hoot MFP Drive Keep FB Li News ExpertFlyer Music

networktocode... Jonah Kowall

cu-kentik-demo


Search

Today

Site kentiksp.SFO1

Source	Destination	Avg (bits/s)	95th % (bits/s)	Max (bits/s)
141.193.38.41/32	198.247.0.117/32	93874196.144	123356228.267	136341094.400
141.193.38.41/32	198.247.0.119/32	91828917.858	119521280.000	133863833.600
141.193.38.41/32	63.145.0.50/32	83758016.210	84485734.400	123148697.600
141.193.38.41/32	198.247.0.111/32	70748941.150	78665045.333	104079906.133
141.193.38.41/32	198.247.0.118/32	66202282.667	66202282.667	98162805.333
141.193.38.41/32	198.247.0.113/32	62404184.970	63605964.800	75464704.000
141.193.38.41/32	198.247.0.116/32	59491539.515	78197555.200	86428876.800
141.193.38.41/32	63.145.0.52/32	55158589.272	61081190.400	79547596.800
141.193.38.41/32	198.247.0.112/32	41902017.329	57224396.800	60463513.600
141.193.38.41/32	63.145.0.51/32	27480713.093	27621239.467	40003174.400

Hey @Jonah Kowall, here is that Kentik data

Quick view Top Internal IP Conversations  kentik

Site kentiksp.SFO1

Source	Destination	Avg (bits/s)	95th % (bits/s)	Max (bits/s)
141.193.38.41/32	198.247.0.117/32	93874196.144	123356228.267	136341094.400
141.193.38.41/32	198.247.0.119/32	91828917.858	119521280.000	133863833.600
141.193.38.41/32	63.145.0.50/32	83758016.210	84485734.400	123148697.600
141.193.38.41/32	198.247.0.111/32	70748941.150	78665045.333	104079906.133
141.193.38.41/32	198.247.0.118/32	66202282.667	66202282.667	98162805.333
141.193.38.41/32	198.247.0.113/32	62404184.970	63605964.800	75464704.000
141.193.38.41/32	198.247.0.116/32	59491539.515	78197555.200	86428876.800
141.193.38.41/32	63.145.0.52/32	55158589.272	61081190.400	79547596.800
141.193.38.41/32	198.247.0.112/32	41902017.329	57224396.800	60463513.600
141.193.38.41/32	63.145.0.51/32	27472906.072	27621239.467	40003174.400

Message #cu-kentik-demo

Message formatting icons: @, B, I, S, /, code, list, link, image, emoji, etc.

CI for Networks

Store all configs in git



Most build custom pipeline in Python



Run through Jenkins, Gitlab



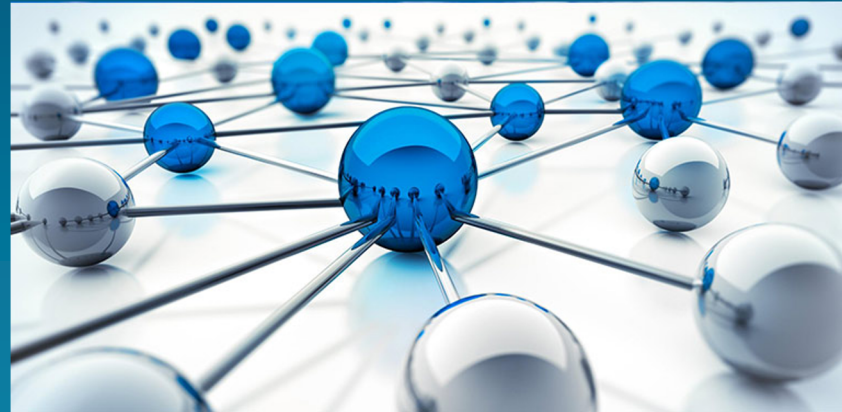
GitLab

Verification using Batfish



CD For Networks

Deploy with Ansible

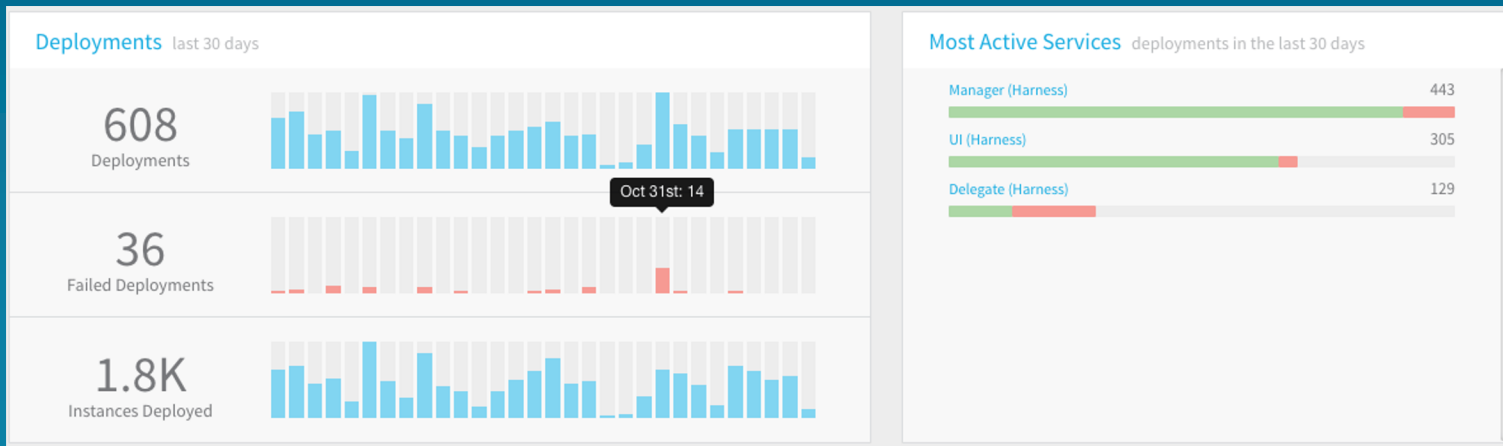


Hard if not starting from scratch many need to change operating modes

Advanced Pipelines

- Incorporate verification of device
 - Monitoring data compare pre/post + synthetic tests
- Using APIs for config replace versus modification
- Some doing this today, but only the most advanced

Failure is part of CD



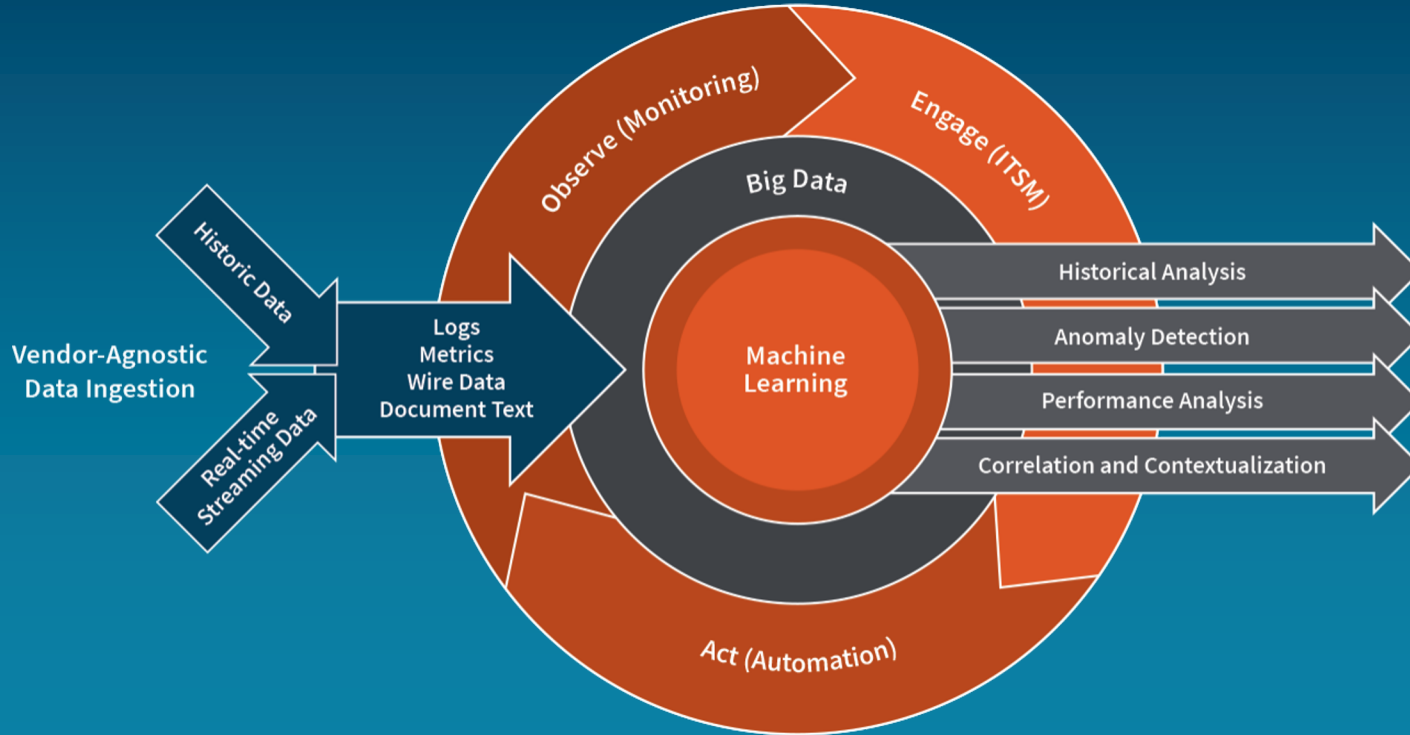


What to buy and how to build?

Network operations have exceeded human scale

AIOps techniques can restore manageability

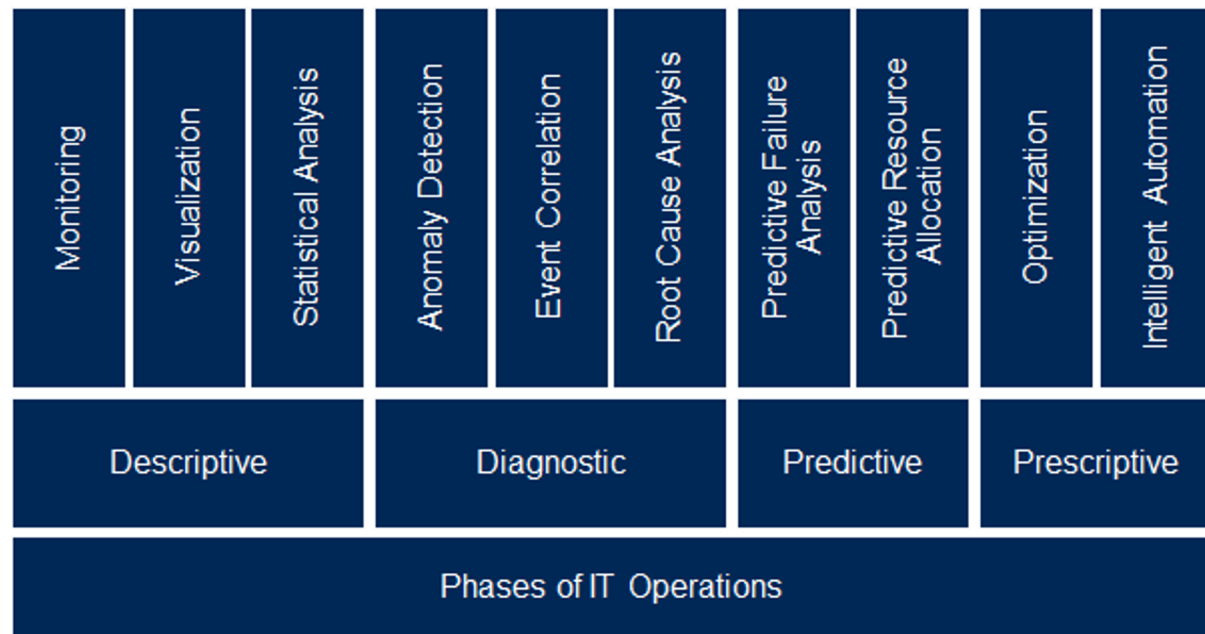
“By 2023, 40% of DevOps teams will augment application and infrastructure monitoring tools with AIOps platform capabilities.”



“By 2024, 60% of NPMD buyers will require improved AIOps capabilities, up from 30% in 2018.”

Industry Trends: AI for IT Operations (AIOps)

AIOps Across Phases of IT Operations



Source: Gartner
ID: 377716

AI Ops: **AI Ops for Efficient Operations**



The what

Detect and
Identify
Sooner



Prioritize



Scale People
with
Automation



The how

- Data normalization
- Data collection and aggregation
- Data enrichment

AI Ops drives significant business value for increasingly complex and distributed infrastructure



Not yet reality, but coming together



Questions?