NetOps Meets DevOps

The State of Network Automation

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Executive Summary

Digital transformation anchors the majority of today's enterprise IT investments.

Modern agile development practices, microservices, containers and cloud infrastructure have combined to empower application developers to innovate faster and update applications more frequently than ever before. This adoption of agile development and operational strategies requires more scalable and flexible infrastructure teams and processes, ensuring that production network, Layer 4-7 application services and applications can scale as needed. Therefore, development and test resources are ready whenever requested.

A new discipline, DevOps, has emerged to address these needs. DevOps represents the integration of application development and IT operations at many levels including culture, process workflows, and infrastructure management, as well as application creation, test, deployment, and delivery. Among enterprise IT teams, 72% expect they will have adopted DevOps methodologies for at least some of their development activities within the next 12 months.

Early DevOps initiatives have focused on the integration of development, testing and computing infrastructure provisioning to increase developer productivity and speed applications to market. As more and more organizations move towards using DevOps-driven workflows to support production applications, the impact on network operations is significant. Specifically, network operations teams need to rapidly configure, scale, secure and integrate network infrastructure and Layer 4-7 application services. They must anticipate and respond to dynamic, ever-

changing workload requirements for flexible capacity, application security, load balancing and multi-cloud integrations. In short, the network team needs to be as agile and flexible as the applications team and be fully empowered to drive network agility.
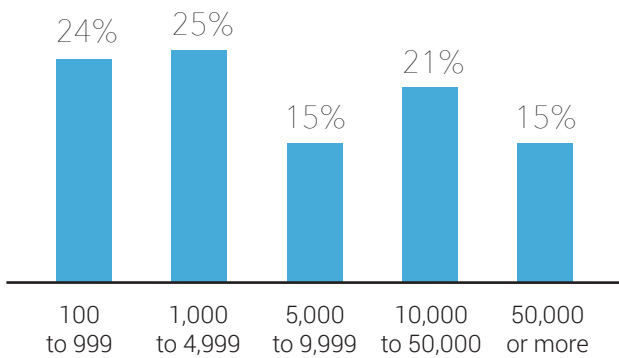
72%
of enterprises will have implemented DevOps methodologies within the next 12 months

Network operations teams need the same level of reusable, scalable and software-defined automation to control network resources as systems and cloud administrators have over computing and storage assets. Modern, open-source-driven automation-as-code solutions provide proven technology to accelerate the transformation of network operations using automation to support digital initiatives and DevOps priorities.
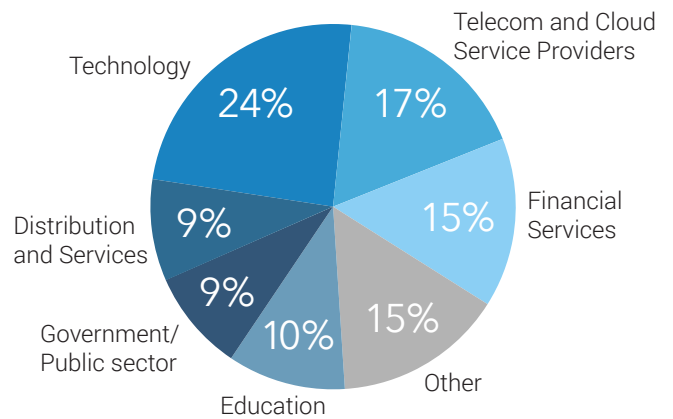
At F5 and Red Hat, we were curious about the state of network automation and co-sponsored a survey of more than 400 IT DevOps and NetOps professionals to explore the topic. Our findings identify opportunities where NetOps teams can learn from DevOps best practices, integrate with continuous deployment toolchains and take advantage of modern, open-source-driven automation technologies to create a more agile, business-centric value for tomorrow's networks.
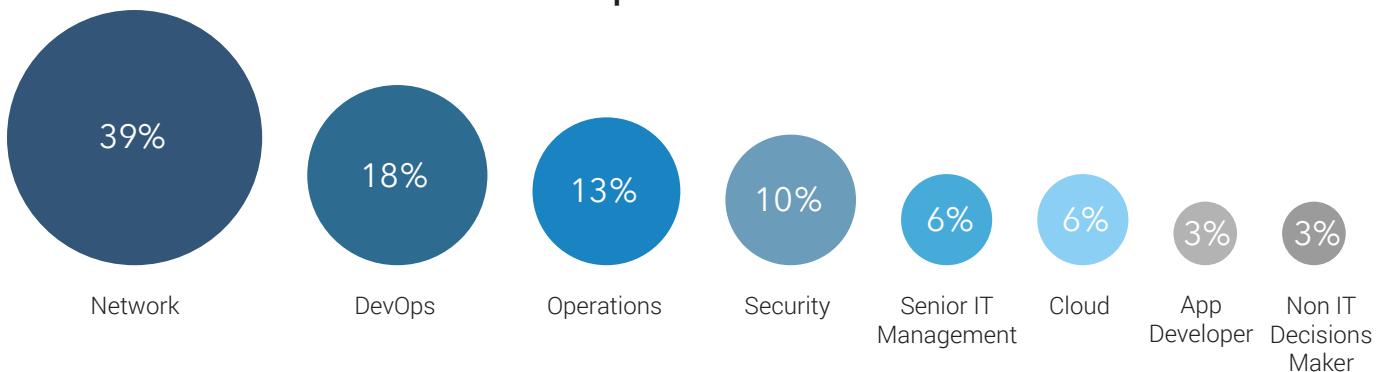
Methodology & Survey Demographics

Respondent Company Size

Company Size	Percentage
100 to 999	24%
1,000 to 4,999	25%
5,000 to 9,999	15%
10,000 to 50,000	21%
50,000 or more	15%

Respondent Industry

- Technology: 24%
- Telecom and Cloud Service Providers: 17%
- Financial Services: 15%
- Other: 15%
- Education: 10%
- Government/Public sector: 9%
- Distribution and Services: 9%

Respondent Role

- Network: 39%
- DevOps: 18%
- Operations: 13%
- Security: 10%
- Senior IT Management: 6%
- Cloud: 6%
- App Developer: 3%
- Non IT Decisions Maker: 3%

The survey analysis is based on 400+ respondents who answered a web-based survey in English. Questions focused on the Business and IT Benefits of embracing automation, current challenges and bottlenecks, adoption of automation tools and required skills to take advantage of automation. The survey was administered and analyzed by an independent research company on behalf of F5 and Red Hat®. Answers are kept strictly confidential and individual feedback was combined with the feedback from all other respondents worldwide.

The Benefits of Automation In DevOps Environments

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An organization adhering to DevOps principles embraces a collaborative, business-centric approach to development that values tight links between business decision makers, application development staff, IT operations and infrastructure managers.

It also relies heavily on automation to provide a number of important benefits (see Figure 1) including:

- Minimizing human errors
- Increasing IT productivity
- Shortening application deployment and update timelines
- Improving application performance success
- Reducing the cost of infrastructure

When paired with adequate training and use of collaborative cross-team operational processes, modern, open-source-driven automation technologies such as Ansible® have proven critical to the success of many organizations' digital transformation initiatives. IDC reports that 85% of enterprises believe automation is very important to the success of their DevOps programs[†].

Automation technologies offer enterprise teams the opportunity to move away from device, vendor-specific scripts and tooling by taking advantage of infrastructure as code.

This may included the following:

- Documentation shifts from static runbook PDFs to human readable code.
- Automation becomes accessible, and managed under source control, such as GitHub.
- Adhoc interventions become scheduled, documented and auditable.

75%
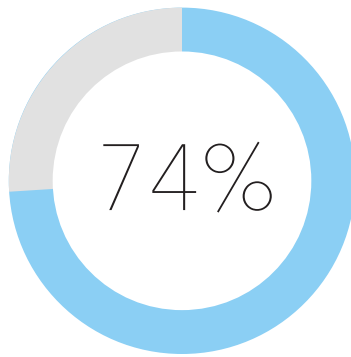believe automation will minimize human errors

The result is greater operational reliability, better infrastructure uptime and on demand availability, improved staff productivity and fewer unplanned outages and maintenance windows.
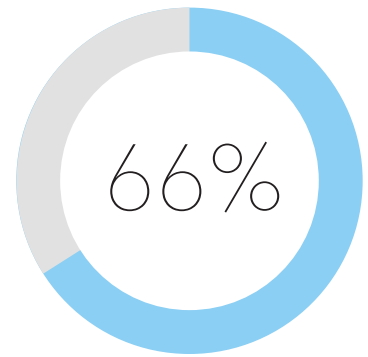
Figure 1

Top Operational Benefits of DevOps Automation

75%
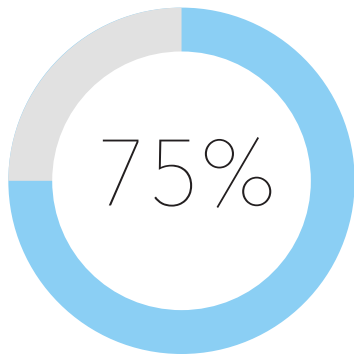
**Reduces the chance
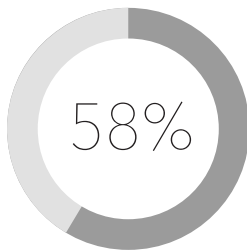of human error**

74%

**Improves IT
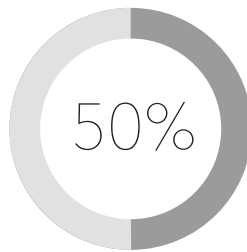staff productivity**

66%

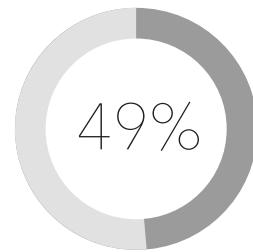**Enables speed into
production environments**

Other Responses:

58%

Enables greater frequency
of delivery of applications

50%

Improves overall success
rate of applications

49%

Reduces costs for
IT infrastructure

Innovation Opens Up New Opportunities for NetOps Automation

Most of the early work done to automate the provisioning and lifecycle management aspects of DevOps has focused on automating and integrating dev and test tool chains and the provisioning of systems and cloud infrastructure.

However, the growing use of DevOps-driven applications in production environments is exerting significant pressure on network operations teams to maintain security, scale and availability. DevOps workloads change more frequently than traditional applications, resulting in more dynamic network response to assess risk, scale and performance requirements.

Traditional approaches to network configuration and updating are too slow, manual and error-prone to effectively support the needs of today's rapidly shifting applications and data transfer requirements. To keep their organizations' digital strategies on track, network operations teams are embracing DevOps style approaches to automation using programmable, open source, agentless technologies. By embracing software-based, reusable automation technologies and best practices, network operations teams are able to more effectively support their organization's digital transformation priorities.

NetOps teams have historically trailed DevOps teams in the use of automation for important operations activities including configuration management and upgrades (see Figure 2). This gap represents an opportunity for NetOps teams to rapidly improve operations by adopting proven best practices for

workflows and collaboration using modern, open, programmable approaches to automation that have been optimized for network operations and configuration.

46% of NetOps teams have implemented DevOps methodologies

Historically, it has been difficult for NetOps teams to take advantage of the same levels of automation as DevOps teams. Traditional device-specific tools required specialized expertise and were difficult to integrate. Additionally, NetOps project management skills were more targeted at network integration than software driven automation. Many NetOps professionals felt unprepared to take advantage of first generation programmable automation technologies which lacked specific network integrations. Requirements for advanced policy-driven network configurations on managed nodes often made it impossible to effectively use many multi-vendor options. As is seen in Figure 3, these challenges have previously slowed adoption of automation in the NetOps space.

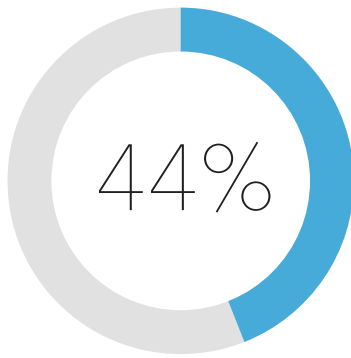Figure 2

Current Adoption of Automation Across DevOps and NetOps Teams
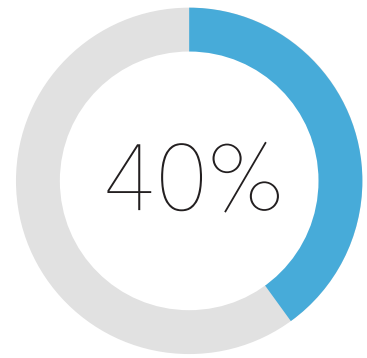
Figure 3
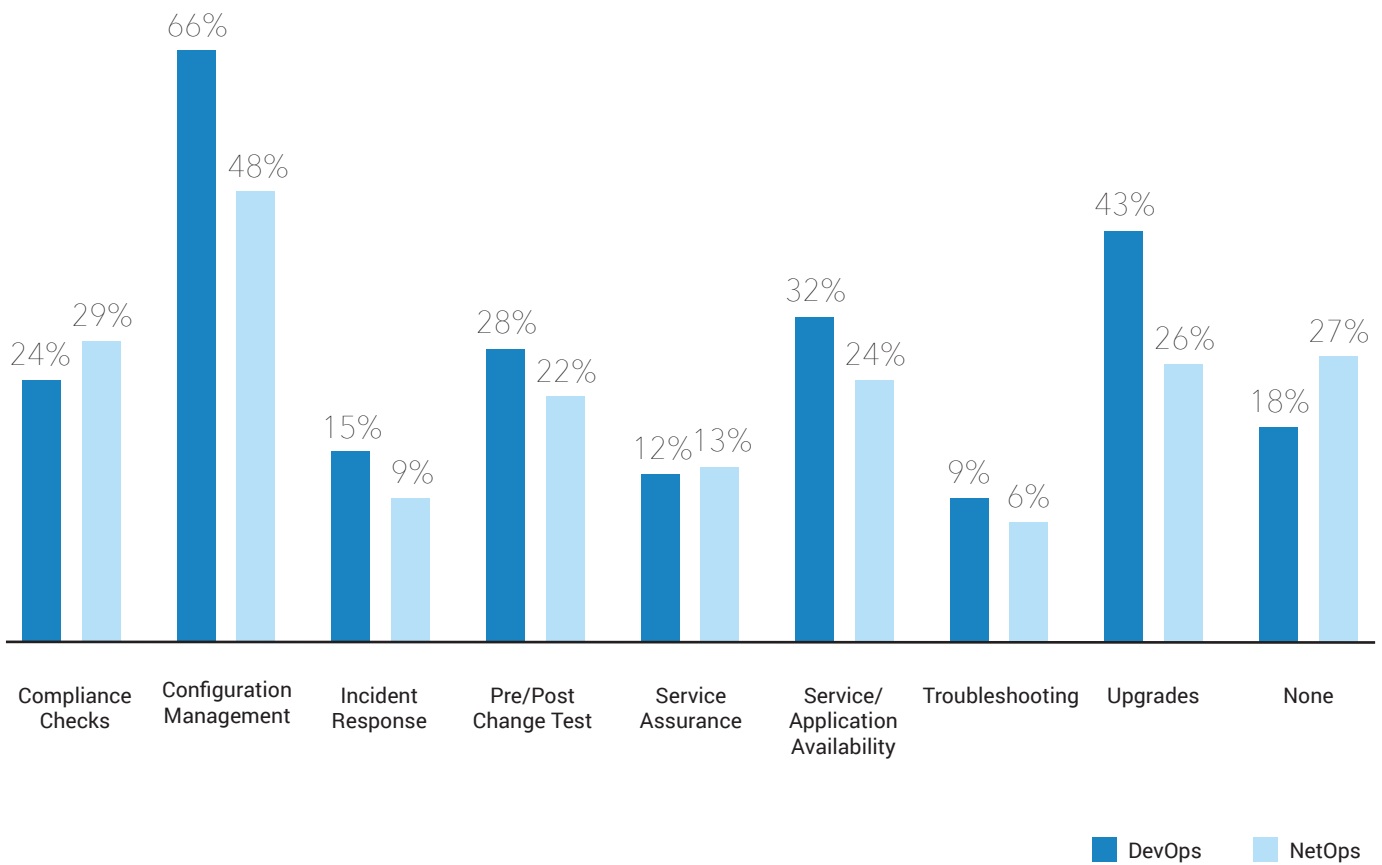
Challenges to Network Automation

48%
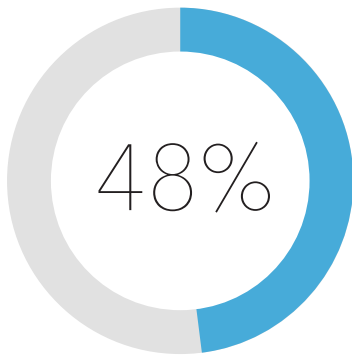
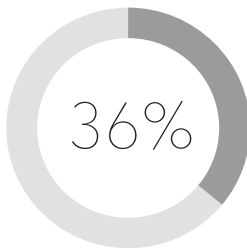**Lack of skilled professionals
to manage projects**

44%

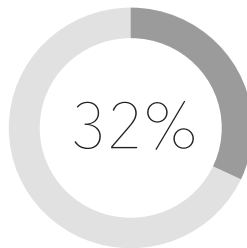**Integration of toolsets
across vendors/devices**

40%

**Political or cultural
resistance to change**
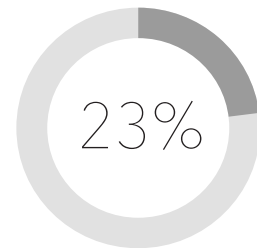
Other Responses:

36%

Creating policies
and governance

32%

Budget for new tools

23%

Limited offering of
solutions from the vendors

Recent innovation in the open source community has focused on agentless NetOps automation. Orchestration is changing the market landscape and opening up many new opportunities for NetOps teams to implement broad-based network automation strategies paired with collaborative workflows. These workflows can align with business-led digital transformation initiatives.

Additionally, NetOps are increasingly using pre-built open industry standard automation platforms and open, reusable automation code as launch pads for introducing and deploying programmatic, software-based automation across their network environments. Organizations making investments in network automation typically set goals to improve staff productivity, improve compliance and security, enhance network performance and lower operating expenses (see Figure 4).

Figure 4

Top Goals for Network Automation

55%

Improving productivity

47%
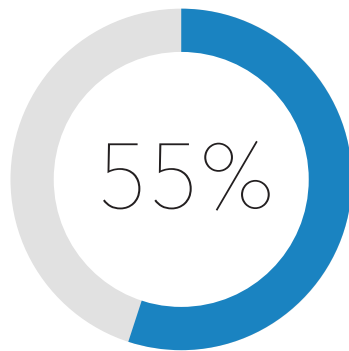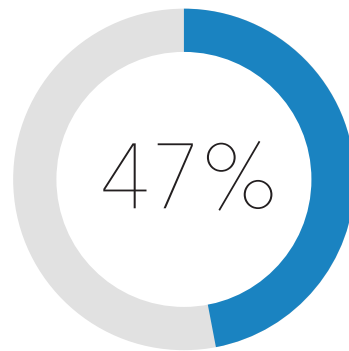
Ease implementation of compliance requirements

43%

Enhance security

43%

Enhance network availability

Strategies for Successful Introduction of NetOps Automation

Successful adoption of modern automation strategies for DevOps and NetOps requires new approaches to defining workflows, operational policies, and collaboration strategies across diverse functional teams while taking advantage of modern automation technologies.

In the network automation arena, our research shows that a number of important opportunities exist where NetOps teams currently rely on hi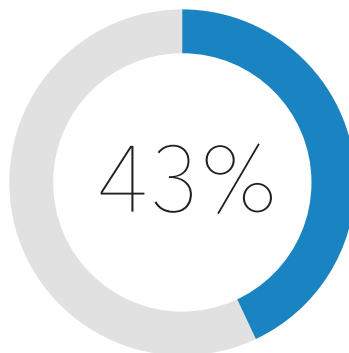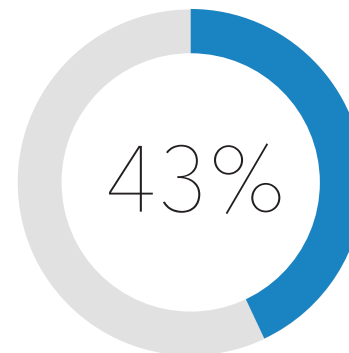ghly manual strategies to address capabilities that can be effectively standardized and streamlined using modern automation technologies (see Figure 5). These include:
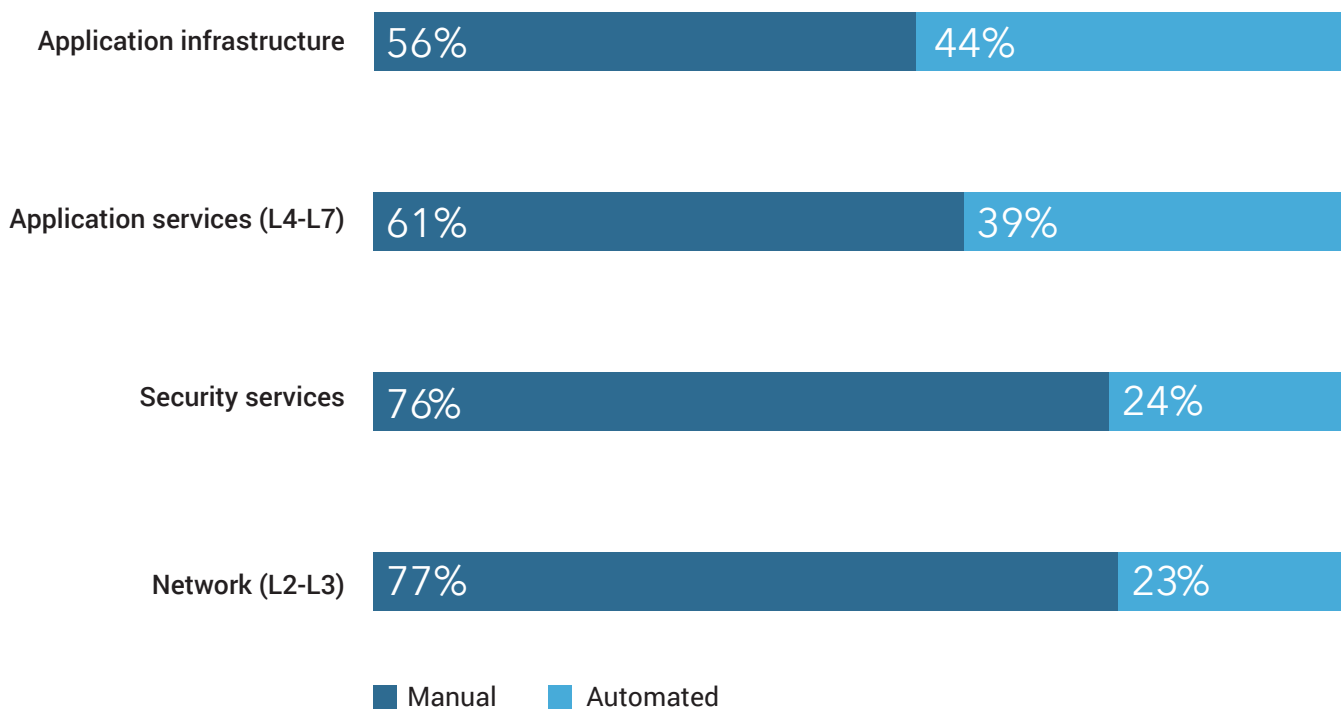
- Network (L2-L3): More than three-quarters of organizations report using manual methods to manage configuration of VLANs, routers and network access controllers. Use of automation can reduce the risk and scale of errors introduced by manual methods. Automation further frees NetOps from repetitive tasks to focus on innovation.
- Security services: Currently over three-quarters of organization rely on manual methods to configure firewalls, WAFs, and DLPs. Use of automation can improve the speed with which these services are deployed. Each service automated represents a significant boost in productivity and offers opportunities to increase the frequency of deployments.
- Network L4-L7 application services: More than half of organizations rely on manual approaches to configure the services that scale and secure applications. Application services often have

the biggest impact on application performance and scale and are more dependent on application behavior than network services. Automation is critical to deliver these services faster and earlier in the development lifecycle, enabling collaboration to eliminate conflicts that can occur post-deployment and delay delivery to the market.

- Application infrastructure: Just under half of all application infrastructure deployments are currently automated. App infrastructure is the closest to the application, comprising the servers, middleware, web, and app platforms applications are dependent on. The scope of app infrastructure is such that automation of these components is considered as critical to success as delivering the application itself. Automation of this process - particularly when begun in the development and test phases of an application lifecycle - can produce greater success rates when the application is released to production.

By adopting programmatic methods to provision, integrate, and configure network and application services, NetOps teams can reduce friction that arises from the use of slower, manual methods of network management and reduce delays in both speed and frequency of app deployments.

Figure 5

Current Levels of Manual or Automated Components within the Continuous Deployment Pipeline

Application infrastructure | 56% | 44%

Application services (L4-L7) | 61% | 39%

Security services | 76% | 24%

Network (L2-L3) | 77% | 23%

■ Manual   ■ Automated

Moving from Manual Methods to Modern Tools

Embracing modern, open, software driven automation tools enables NetOps teams to standardize, scale and reduce configuration errors related to a number of network operations tasks.

Some of the most important transitions include:

- Shifting from command line to declarative, API driven interfaces
- Replacement of traditional, proprietary, centralized vendor specific tools to inclusive, multi-vendor orchestration systems
- Adoption of declarative, intent-driven automation and industry best practices instead of highly customized, brittle scripts and runbooks
- Use of policy driven automation vs hard coding rules into network systems

These types of changes allow NetOps staff to more easily interact with programmatic, software driven automation technologies and to scale use of automation routines more consistently and broadly across the enterprise.

As is shown in Figure 6, the majority of NetOps teams currently rely on device specific and centralized vendor specific management tools.

The adoption of API-enabled, multi vendor network and application services automation solutions positions NetOps teams to support the rapidly changing workload and networking requirements created by DevOps and digital transformation initiatives. It also allows network automation workflows, reporting and compliance activities to be more easily integrated with DevOps workflows and operational metrics including full stack application performance SLAs.

Figure 6

Current Methods for Implementing Network Changes

30%
Multi-vendor automation

70%
Vendor or device specific

Multi-vendor orchestration engine across multiple vendors and multiple layers of networking devices

18%

8%

API or templates approach on each individual device in the network

12%

18%

Multi-vendor traditional central network and security management

Per vendor traditional central network and security management

43%

CLI on individual devices and/or on device script

Align and Encourage Collaboration and Culture Through Shared Metrics

By shifting to modern, collaborative tools and methodologies that span network, security, and application services, NetOps can promote a culture in which the successful delivery and deployment of an application is a shared goal that aligns operational activities across DevOps and NetOps teams and their business stakeholder. This type of alignment is critical to the success of agile digital transformation efforts and relies on operational teams thinking differently about how they measure success.
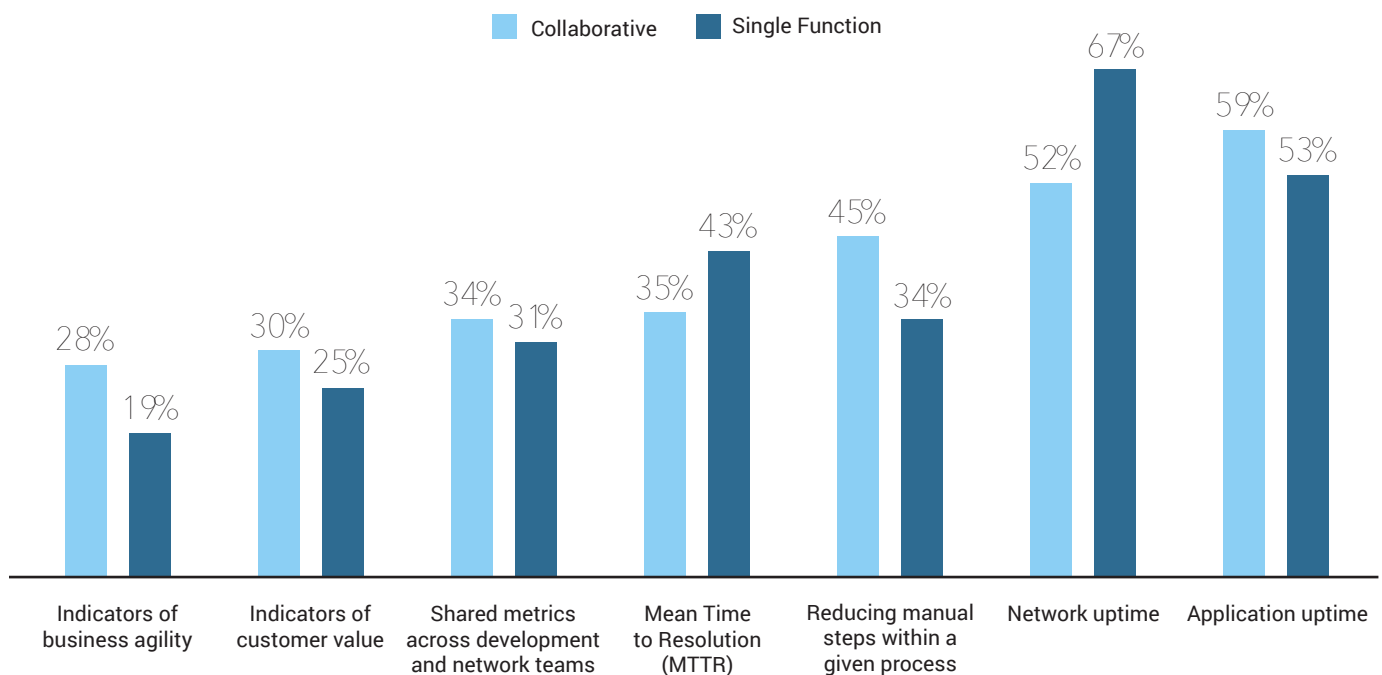
For example, in traditional single function team environments, operations admins focus on network

or device specific uptime success metrics rather than end-to-end application performance and staff productivity (see Figure 7).

By comparison, in highly agile, collaborative environments, the top priority metrics more often focus on application uptime and reducing manual steps as a way of improving productivity. In an agile world, it may be more important to focus on reduction in repeated errors and failed code integrations than on MTTR for individual device failures.

Metrics for Measuring Success

Collaborative | Single Function

Metric	Collaborative	Single Function
Indicators of business agility	28%	19%
Indicators of customer value	30%	25%
Shared metrics across development and network teams	34%	31%
Mean Time to Resolution (MTTR)	35%	43%
Reducing manual steps within a given process	45%	34%
Network uptime	52%	67%
Application uptime	59%	53%

NetOps Are Charting a Path to Agile Automation

Network operations expertise is more important than ever.

Digital transformation is driving exponential growth in applications, along with the requirements that these applications are secure and always available. It is imperative that NetOps build on their decades of experience deploying, managing, maintaining, and securing applications, and equip themselves to deliver the automation and agility needed by the business.
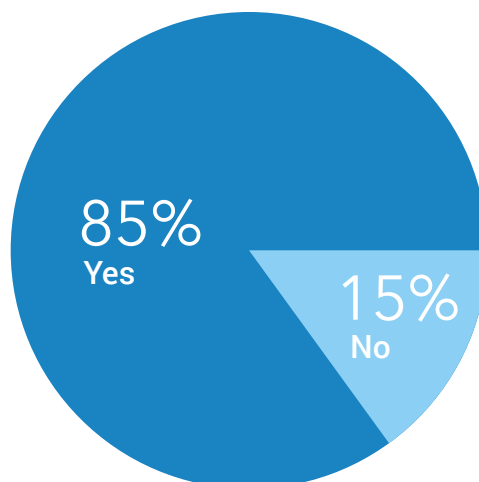
Just as DevOps teams introduce automation by starting small and expanding over time, NetOps teams need to create revolutionary automation strategies that will allow them to begin to learn and benefit from using modern, open automation technologies while aligning processes and metrics to better reflect business priorities and support integrated, collaborative workflows.

74%
are employing automation and orchestration to support digital transformation initiatives

For more information on how you can create revolutionary automation strategies for your network:

- Visit F5 Super-NetOps free training for operations professionals
- Automate BIG-IP and BIG-IQ with Ansible

Respondents with Digital Transformation Projects in Place

85%
Yes

15%
No

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