

# The ROI of a Network Digital Twin

The financial return on aligning your team,  
simplifying troubleshooting, and avoiding outages





# The Real Value of Forward Networks

“

*We started our journey with Forward Networks defining success as lower operational costs. Once we began using it, we discovered so many other use cases. Embracing Forward Networks has enabled us to support business growth and new product offerings – things we wouldn't have been able to do using our previous technology.*

”

**Managing Director, Technology**  
**Multinational Investment Bank & Financial Services Company**

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# Increased Network Complexity Creates Business Case for Digital Twin Technology

THE CURRENT STATE OF  
NETWORK OPERATIONS:

DOZENS  
of vendors

THOUSANDS  
of devices

MILLIONS  
of rules

A FORTUNE 500  
ENTERPRISE  
COMPANY HAS, ON  
AVERAGE,

>12,750  
devices on their network

>3 BILLION  
lines of code

>500  
model and firmware  
combinations

100s  
of changes each week



# What Is a Network Digital Twin?

A network digital twin is a digital model of the network that makes network data accessible and actionable to ensure the network behaves as expected and is secure.

Interest in digital twin technology continues to trend upwards, as more enterprise shops realize the need for software to monitor, verify, and understand network behavior. Most large enterprises have networks that have grown over the past two or three decades; they are a complex system of devices from dozens of vendors, using multiple operating systems that run on billions of lines of configuration code that is constantly being updated. An additional complication, the majority of enterprises operate in multiple clouds.

With this increased sophistication comes increased fragility; a single typo during an update has led to major outages. Imagine trying to manually track down the errant code while your company is making the headlines nobody wants. Not only is money being lost during the outage, but the company's reputation is being damaged.

Based on a mathematical model, the Forward Enterprise network digital twin is a virtual representation of the entire network capable of computing every possible path a packet could take. By securely collecting data from network devices, Forward Enterprise makes the entire network searchable, unlocking previously obfuscated, yet valuable data.

Forward Enterprise is designed for the reality of multi-vendor, hybrid, multi-cloud enterprise networks, providing support for all major networking and security vendors, AWS, Azure, and Google Cloud Platform. Data is collected, parsed, and normalized, providing actionable insights that doesn't require specific vendor or technology expertise to interpret.

NetOps, SecOps, and CloudOps teams use this data to drastically reduce time spent diagnosing problems, leading to a more agile, reliable, and secure network.

Gartner believes that digital twin technology is transformational for enterprises, noting that the technology can improve delivery times for requests by 20% across the network. To learn more, [read the 2023 Gartner Hype Cycle for Enterprise Networking report.](#)



*Learn how a digital twin delivers instant value [6:43]*



*Learn how a digital twin works from co-founder, Brandon Heller [4:11]*



# Outages Are Expensive and Preventable



**OVER 80%**

of network problems are due to improper configuration and change management



**39 MILLION  
USERS and  
CRITICAL  
SERVICES  
DISRUPTED**

Due to configuration error at KDDI, Q3 2022



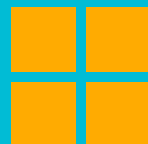
**IMPROPER  
CONFIGURATION  
AND CHANGE  
MANAGEMENT**

Cause 80% of Network Problems



**THOUSANDS OF  
U.S. FLIGHTS  
GROUNDED**

Due to software configuration error Q1 2023



**MICROSOFT  
TEAMS,  
OUTLOOK AND  
SHAREPOINT  
OFFLINE FOR 90  
MINUTES**

Due to BGP misconfiguration in Q1 2023



According to a Spring 2023 survey by IDC, the average cost of downtime for large enterprises (5,000+ employees)

**\$691K PER HOUR**

1 in 4 of these large enterprises report their cost of downtime is over

**\$1M PER HOUR**



**12 MILLION  
PEOPLE WITHOUT  
PHONE AND  
INTERNET FOR >1  
DAY**

Due to botched maintenance update at Rogers Communications Q3 2022

"When we evaluated 8 P1 outages, we realized Forward Networks would have prevented or assisted in 7 of them; those savings would have immediately paid for the platform."

Managing Director of Technology,  
Global Investment Firm



# A Network Digital Twin Saves Time and Money

## DIGITAL TWIN USE CASES

USERS	Network Security	Cloud/Multi-cloud	NetOps/NetEng
VERTICAL UC	Incident Response	Continuous Security Audit	Path Verification/Analysis
	Vulnerability Management	Service Assurance	Outage Prevention
	Sec Posture - Zero Trust	End-to-End Visibility	Troubleshooting
GENERAL UC	Change Control		
	Compliance Audit		
	Inventory Management		
	Workflow Automation/Integration		
	FORWARD NETWORKS PLATFORM		



# Time is Money

	Before Forward Enterprise	With Forward Enterprise
Route validation across 500 routers	9 Hours	16 Seconds
Identify incorrect prefix list across 17,000 devices	3 Months	6 Minutes
Extract SSLPROFILE in AVI LB across 7,100 profiles	11 Hours	6 Seconds
Route table consistency across 2,000 devices	Impractical	2 Minutes

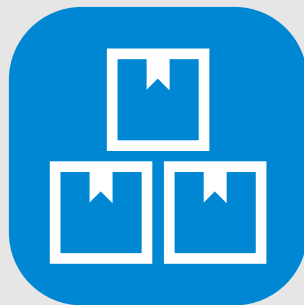
Actual numbers from a 45,600-device deployment.

# General Use Cases

One of the prime benefits of democratizing network data is increasing collaboration amongst the various IT teams. A single-source-of-truth enables teams to work more efficiently, reduce OpEx, and ensure compliance throughout the hybrid multi-cloud network.



**Workflow  
Automation**



**Inventory  
Management**



**Automated  
Compliance/  
Audit**



**Change  
Management**

*To learn how democratizing network data helped the IT leader of a large government network secure budget and improve efficiency, view this webinar.*

*[48 minutes]*





# Workflow Automation

“

*During a major outage, we no longer have to host calls with 100 engineers who then have to manually log into devices to collect information to diagnose the problem. Now an engineer performs a path search in Forward Enterprise, and all the configuration information is at their fingertips in the application. We can solve the problem much faster than before.*

**Network Operator, Global  
Entertainment Company**

”

## Improve workflow efficiency with ServiceNow integrations

Opening tickets is a tedious task prone to human error. Once a ticket is open and routed, the engineer on the receiving end often spends hours or days researching the issue. Through an API integration with ServiceNow, Forward Enterprise streamlines that process. NetOps teams can choose to automatically open tickets when specific verification checks fail; that information is then routed with a link to Forward Enterprise that contains the details of the issue such as device configuration. Operators opening manual tickets can include links to Forward Enterprise, so the recipient has all the necessary information at their fingertips.

# Inventory Management

**Know exactly what's in your network for accurate support contracts and EOL management**

For most operations teams, the network inventory is a series of outdated .CSV files and the “communal knowledge” held sacred by the organization’s most seasoned IT staff. That puts the entire team at a disadvantage, slowing ticket resolution, increasing the opportunity for errors, and creating potential security and compliance issues.

Forward Enterprise provides a very accurate device discovery process that delivers an exportable, always-current inventory of your network available at the click of a mouse. According to an IT leader at a global financial services company, knowing his inventory is accurate has saved his company “seven figures” by preventing them from paying maintenance on devices no longer in use, and integration with his CMDB had improved lifecycle management and helped his team make better use of new devices. [Learn more by watching the webinar.](#)

Learn how an accurate inventory saved a large Federal organization \$6 million during a refresh by preventing them from purchasing unnecessary equipment.

READ THE BLOG



# Automated Compliance/Audit

**Custom verification checks alert anytime the network is out of compliance; snapshots provide proof of compliance over time**

Ensuring network compliance in a hybrid multi-cloud environment is nearly impossible without a digital twin. With teams of engineers making changes and updates to tens of thousands of devices, mistakes are inevitable.

Using custom verification checks in Forward Enterprise, administrators can regularly scan the network to search for misconfigurations, lack of connectivity, or lack of redundancy to proactively identify and remediate non-compliant configurations before they cause an incident.

For a global entertainment company, 4 simple checks saved over 700 work hours and prevented two possible outages.

[READ THE CASE STUDY](#)



*Our company has gone through many FBA (Federal Banking Administration) audits. We successfully demonstrate that we have standards, but struggle to demonstrate which devices are in compliance and don't have an easy way to remediate the devices which are non-compliant. Forward Networks is automating this process for us, saving countless hours of work.*

**IT Manager at leading Fortune 250 Financial Services Company**



**A \$9 billion  
banking company  
reduced audit  
time by 80%  
and proactively  
detected  
over 1,500  
vulnerabilities in a  
two-year period.**

## GENERAL USE CASES

# Change Management

### Expedite change maintenance windows while preventing business disruption

Change maintenance windows are one of the most stressful aspects of NetOps. No matter how meticulous the planning, verifying that the changes are affecting the desired behavior and that there were no unintended side effects is the hardest part of the project. Forward Enterprise enables IT teams to verify behavior before, during, and after the change window to prevent business disruption.

***“Using Forward Networks, we were able to change data centers over the weekend with zero business disruption.” – Fortune 25 Global Investment Company***

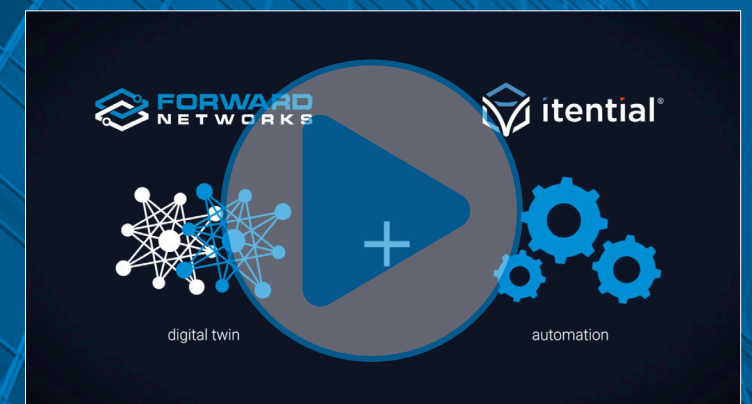
***“The value Forward Networks delivers for pre- and post-change window checks is justification enough for purchasing the platform. I can’t wait to learn more ways to use it.” Senior NetDevOps Engineer for Fortune 150 Telecommunications Company***

A misconfiguration entered into automation software by the chief IT infrastructure engineer for a health care organization caused all of the production servers across the U.S. to fail. **It took his team eight hours to rebuild all DNS servers from scratch.**

**Investment bank relies on Forward Enterprise to verify automation software**

[READ THE BLOG](#)

*Learn how to prevent expensive mistakes with closed loop automation*





# Network Security Use Cases

## Proactively identify non-compliance and vulnerabilities before a breach occurs

Forward Enterprise enables SecOps teams to find misconfigurations and vulnerabilities on hosts and devices before a breach occurs. Using data collected from the network, integration with the NIST database, and integrations with vulnerability scanning and assessment tools, the platform identifies risks and helps prioritize how to remediate them to keep your network safe.



**Security  
Posture  
Verification**



**Incident  
Response**



**Vulnerability  
Management**

## Expensive security breaches are on the rise

Almost **60% of enterprises** said they had experienced some kind of **cybersecurity incident in the last 12 months**.

The incidents cost **71% of organizations affected at least US\$100,000**, with 41% saying the overall cost was US\$500,000 or more.

*Source: March 2023 Cybersecurity readiness index report*

# Security Posture Verification for Hybrid Multi-Cloud Environments

## Always current, at-a-glance micro-segmentation verification

Without a current and comprehensive visual representation of network policies and configurations, it's exceptionally challenging for teams to know with certainty whether a specific area (e.g. subnet, firewall zone, or cloud security group) in the network has intended connectivity or isolation between areas.

This lack of visibility undermines the very foundation of network security.

Most enterprises are incapable of proving their end-to-end security posture across the entire environment, this leaves them open to attacks. Forward Enterprise provides this information in an always current, fully customizable, and easy to read table.

[READ THE USE CASE](#)

In 2023,

## THE AVERAGE COST OF A DATA BREACH

has reached a record high of

**US\$ 4.45 MILLION,**

an increase of 2% compared to 2022 (US\$ 4.35 million).

Source: [2023 cost of a data breach report by IBM and the Ponemon Institute](#)



# Incident Response

94 percent of enterprise IT teams admit they are not aware of every device in their network. **59 percent of IT Teams can find less than 75 percent of their network assets.** (SANS' report [Device Visibility and Control: Streamlining IT and OT Security](#))

**48 percent of devices are at risk because they are no longer detected** by the organization's IT department or the endpoints' operating systems have become outdated. ([Ponemon Institute](#))

**A global enterprise spent \$1 million and 3 months to outsource the analysis of its attack surface.**

## **Know your attack surface and device “blast radius” in an instant to speed remediation**

It's impossible to secure devices you cannot see. In the event of a breach, teams of people are often dedicated to locating compromised devices for days or weeks, while the risk continues. The blast radius feature instantly assesses and reports the reach of a compromised host providing teams detailed understanding of the exposure post-attack. Using data already collected by the platform, calculating an exportable blast radius report is as simple as inputting the IP address and clicking a button; the information is also exportable as a .CSV file.

[READ THE USE CASE](#)

# 1,678,890

Total number of **vulnerabilities identified** in scan reports in 2018

# 269,605 (16%)

Total number of **vulnerability occurrences** that have associated public exploits

# 2,579

Total number of **distinct vulnerabilities** found in scan reports. These vulnerabilities are the unique IDs reported by scanners.

# 590 (23%)

Total number of **distinct vulnerability findings** that have associated public exploits

Source: IBM Security Services

## NETWORK SECURITY USE CASES

# Vulnerability Management

### Prove your network is vulnerability free with mathematical certainty

In 2022, vendors issued over 25,000 Critical Vulnerability Exposure alerts. Each one specific not just to a device, but often to the network OS, specific configuration, and features enabled on the device.

One CSO we spoke to said that the volume of advisories was too high for his team to analyze, and they were now ignoring them while reporting that they are in compliance. If this is your situation, you may be comforted to know that you are not alone, but that doesn't make your network any safer.

Attackers are weaponizing these vulnerabilities at an alarming rate to gain access to and control of businesses' infrastructure.

Forward Enterprise offers Vulnerability Analysis for network devices using collected data and integration with NIST. Additionally, through integration with Rapid 7 and Tenable, the platform delivers exposure analysis for hosts delivered in an easy to read at-a-glance table and delivers a prioritized remediation plan.

[READ THE USE CASE](#)



# Multi-Cloud Use Cases

Visibility in a multi-cloud environment is one of the toughest challenges for IT teams to overcome. Each cloud provider has their own management solution which does not “talk” to their competitor’s products, leaving engineers to try to “stitch” together information from disparate tools and platforms.

The lack of visibility leads to unnecessary spend in shadow IT, underutilization of circuits, lack of compliance, and inefficient routing.

Forward Enterprise provides visibility across AWS, GCP, and Azure in a single screen. Information is normalized, allowing even a cloud novice to expertly troubleshoot and resolve issues.



Continuous  
Multi-Cloud  
Security Audit



Service  
Assurance



End-to-End  
Visibility

According to *Omdia Group*, by the end of 2023, **39% of the IT budget will be spent in the cloud**. The report went on to say that 45% of the respondents to the survey indicated that end users in their organization purchase cloud services that **are not procured or supported by the central IT team**. That’s a lot of unaccounted for spend.

# Continuous Multi-Cloud Security Audit

## Ensure your multi-cloud environment is in compliance

According to the [Cisco State of Hybrid Cloud Report](#), 92 percent of enterprises rely on multi-cloud environments because they provide many benefits. At the same time, managing several clouds is incredibly difficult. Instead of using proprietary applications from AWS, Azure, and Google Cloud Platform, Forward Enterprise provides single console visibility and management.

Forward Enterprise enables IT teams to enforce their on-premises security throughout their multi-cloud environment using verification checks.

READ THE USE CASE

According to a report from 451 Group, two of the top cloud security concerns enterprises have are compliance and auditability.

READ THE REPORT

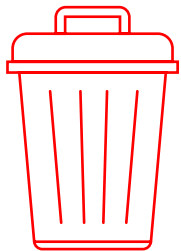


# Service Assurance

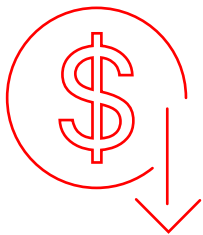
## Know your multi-cloud environment is behaving as intended

Forward Enterprise lets you visualize your entire cloud estate alongside your on-premises environment in a single normalized view. The verification check feature in the platform helps you confirm that the traffic to, from, and between your cloud environments is taking the desired path. If there's a routing change that violates policy, the appropriate team is immediately alerted, so they can fix it before the problem grows.

[READ THE USE CASE](#)

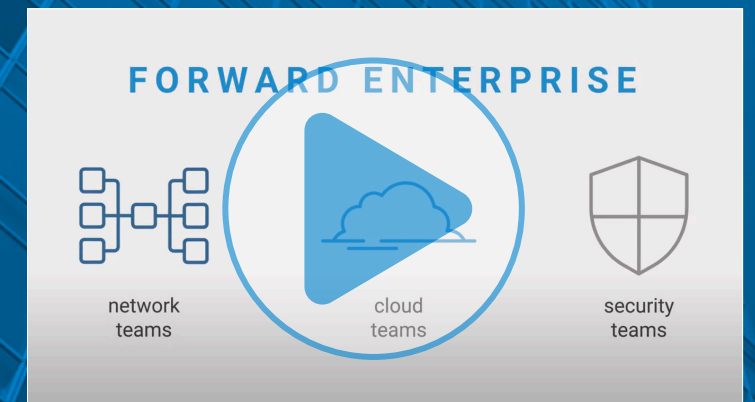


**30% of cloud budget is wasted**



**A single configuration mistake increased a company's AWS bill by 525,000x**

*View a demo of Forward Enterprise Cloud [5:03]*



Gaining end-to-end visibility into network performance and security as more traffic originates or terminates beyond the boundaries of the corporate network is the second biggest challenge for enterprises (37%).

Source: [Cisco Global Networking 2023](#)

## MULTI-CLOUD USE CASES

# End-to-End Visibility

### Analyze multi-cloud behavior in a single console

Troubleshooting behavior in a multi-cloud environment is an expensive endeavor requiring several highly trained (and expensive) engineers to stitch together information from multiple applications. Troubleshooting performance issues can take days or weeks for the team at a cost of \$300 per hour per person.

Using Forward Enterprise, entry level engineers can perform a hop-by-hop path trace in seconds to identify issues.

READ THE USE CASE

“

*Before Forward Enterprise, our cloud visibility was a cloud icon. Now we can perform full path traces from the point of origin through the multi-cloud environment.*

**Senior SecOps Leader  
Federal Security Agency**

”



# Network Operations Use Cases

The network is the backbone of business. When it goes down, productivity grinds to a halt, customer satisfaction and trust take a hit, and worst of all, revenue recognition is compromised. At the same time, the complexity of the network means it's more fragile than ever before, and the people charged with keeping it running need the support of an advanced software platform to ensure it behaves as expected.

[A survey by 451 Group](#) found that 89% of enterprises believe they are digitally ahead of their peers, yet only 25% of enterprises reported their average problem resolution time as being under 4 hours. The group concluded this indicates they are not using the best technology to support them.



**Path  
Verification /  
Analysis**



**Outage  
Prevention**



**Troubleshooting**

## GigaOm

Forward Networks is a leader in the  
GigaOm Radar for Network Validation

[READ THE REPORT](#)

# Path Verification/Analysis

## Know every possible path a packet can take

Path searches are the foundation for understanding the network. To diagnose network behavior, it's imperative to model exactly how traffic is (and can) move through the network. Additionally, you need the detailed behavior of each device handling packets. Trying to manually analyze why traffic isn't getting through can take a team of people weeks.

Forward Enterprise can [scale to support 10<sup>30</sup> network](#) flows and supports networks with >60,000 network and security devices, giving NetOps teams a detailed understanding of the exact behavior of each device in handling different packets delivered in a normalized (vendor agnostic) manner.

[READ THE WHITE PAPER](#)

“

*Forward Enterprise helped me diagnose and resolve a host accessibility issue in minutes. Without the platform and given my full workload, this would have taken 3 – 4 weeks.*

**Network Operations and Security  
Center Lead, Federal Government**

”



# Outage Prevention

## Forward Networks intent checks prevent outages before they happen

Outages disrupt business, damage brand equity, and diminish customer satisfaction. Unfortunately, they can be caused by a simple typo. According to Uptime Institute, human error was the cause for 74% of the most severe network outages. That's why we've built intent checks into the Forward Networks Platform. Engineers can use our platform to pinpoint issues before they impact the business.

For a global entertainment company, intent checks within Forward Enterprise prevented two potential headline-worthy outages.

[READ THE CASE STUDY](#)

# Troubleshooting

## Give your most junior engineers troubleshooting superpower

Troubleshooting network issues often requires multiple teams and senior device or cloud experts to decipher the causes of malfunctions. The Forward Networks platform collects, parses, and displays network configuration and state information in an actionable, vendor agnostic format that allows a Tier 1 engineer to diagnose most issues and route them to the appropriate teams. Reducing escalations means reducing costs. It also frees senior network architects to focus on projects that deliver business value.



*The amount of information available in the Forward Networks Platform means our Tier 1 and Tier 2 staff can troubleshoot faster without escalation.*

Senior IT Leader, U.S. Government



*We've reduced MTTR by 80% using Forward Networks search functionality.*

Fortune 50  
Media and Entertainment  
Company



*By reducing the number of P1 tickets, we've saved \$600,000 in two years.*

Head of Network Operations,  
Global Internet Provider





# Deployable and Enterprise-Ready Today

**Scales beyond 50K network devices**

**Supports SSO, LDAP, and TACACS auth support**

**Secures data encryption at rest and in transit**

**Integrates easily**



## YOUR CHOICE

SaaS or

On-Prem



## NO RISK

No write-credentials needed

No configuration changes

No required firmware updates



## NO PAIN

No agents

No rack of servers

No Windows needed

No hardware appliances  
needed

No additional software to  
maintain

# How Can Forward Networks Impact Your Business?

**We all agree that saving money and time helps a business, but generalities aren't compelling.**

That's why we've developed an ROI calculator that uses your data to estimate the financial impact of incorporating the Forward Networks platform into your Network Operations Center (NOC). Try it now:

[TRY OUR ROI CALCULATOR >](#)

## Getting Started With Forward Networks

Are you ready to deliver new capabilities through the network, reduce outages, enhance security, and save time?

[Request a personal demo >](#)



[www.forwardnetworks.com](http://www.forwardnetworks.com)