Evolve the Network into a Security Sensor and Enforcer to Improve Business Security

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Prepared by:

Zeus Kerravala

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ZK Research
A Division of Kerravala Consulting

zeus@zkresearch.com

Cell: 301-775-7447
Office: 978-252-5314

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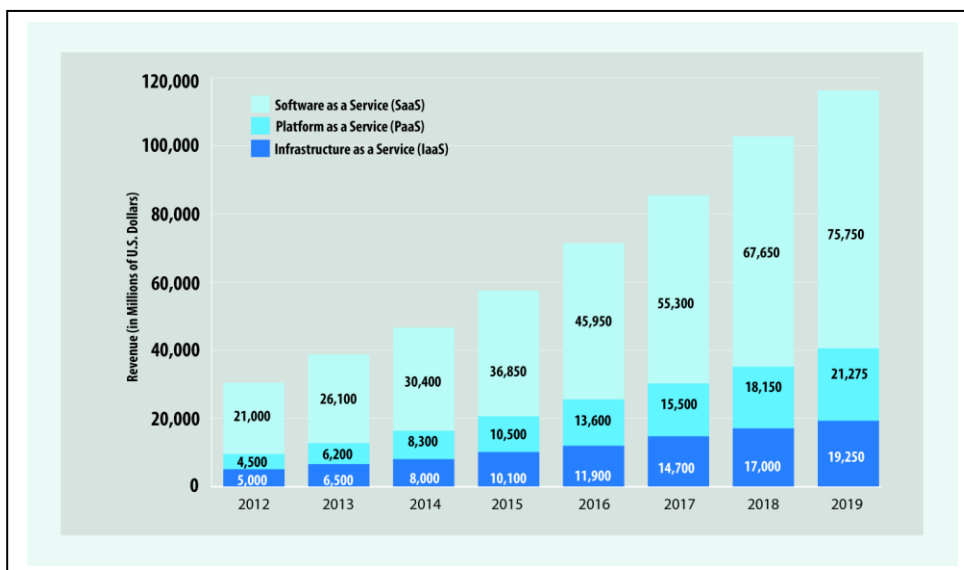## Introduction: Digital Evolution Is Driving the Need for Security Everywhere

The world is rapidly becoming digitized, and the IT landscape is evolving to meet the needs of the new business environment. Client/server has given way to the cloud, mobile computing and the Internet of Things (IoT), shifting industries from server centric to network centric. All of our business systems are tied together on a common network. Although the shift to network-centric computing has shrunk the world and enabled businesses to take advantage of the digital economy, it has also created a number of new security challenges, including the following:

- **The well-defined enterprise perimeter has disappeared.** Historically, protecting the enterprise perimeter was a straightforward task involving just a single point of entry. Today, the rise of the cloud has forced organizations to open up more connections to the Internet to improve the cloud's performance. Given the continued strong growth of the cloud (Exhibit 1), the perimeter will continue to become more fragmented and exposed.

Exhibit 1: The Growth of the Cloud Makes IT Security More Challenging

Source: ZK Research 2015 Global Cloud Forecast
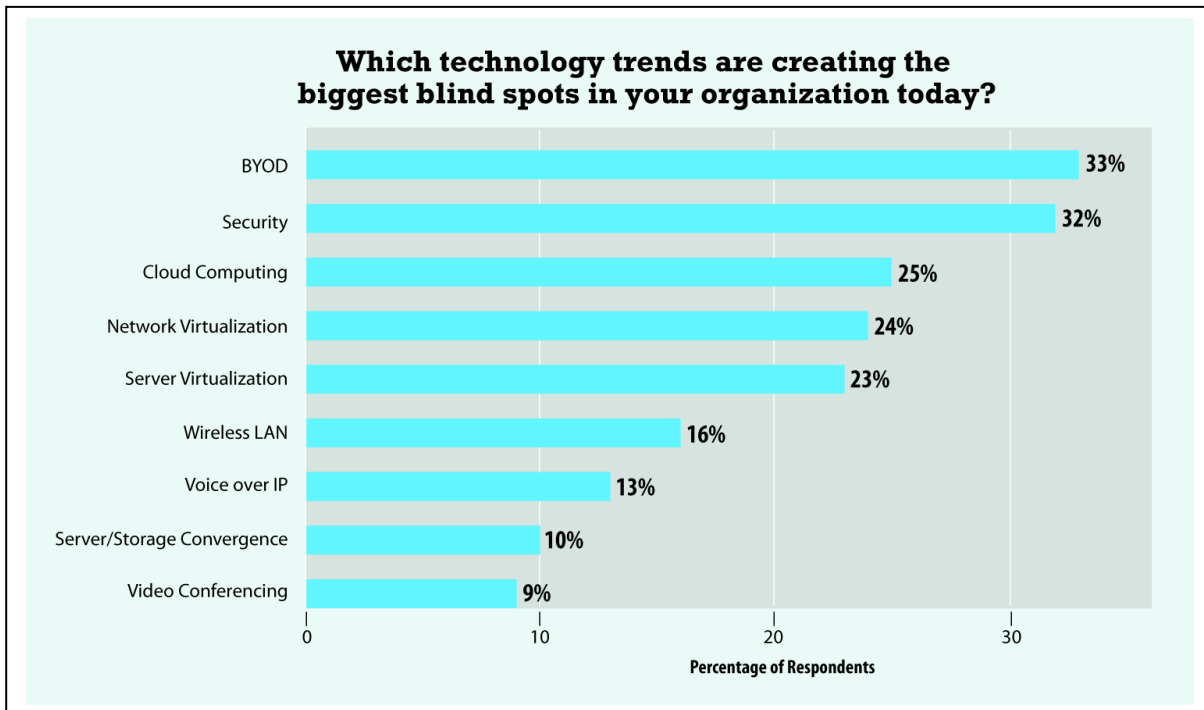
Influence and insight through social media

- **Traditional endpoint security strategies are now ineffective.** Endpoint security has been a core component of almost every business's security strategy for decades. This type of security worked when IT had tight control over every desktop, laptop and mobile device. However, the ZK Research 2015 Network Purchase Intention Study indicates that almost 90% of organizations now have a bring your own device (BYOD) policy that permits workers to bring personal devices into the workplace. This loss of control over the endpoint has made it increasingly difficult for enterprises to have a consistent endpoint solution.

- **Shadow IT has created many IT "blind spots."** The pervasiveness and ease of procurement of software as a service (SaaS)–based applications has enabled lines of business to purchase applications without IT or security involvement. In some large enterprises, the number of applications purchased directly by a line of business can range in the hundreds. Because IT has no knowledge of these applications, securing any information that is sent to or from the business is extremely difficult.

Business networks are no longer defined by four secure walls. The enterprise network extends to people's homes, partner organizations, coffee shops, hotels or wherever an employee happens to be when requiring access to corporate data. In the digital era, competitive advantage is based on speed—and that means workers need access to data and other resources wherever they are, regardless of the time of day, and on any device.

As the concept of BYOD becomes the norm rather than the exception, it creates a significant "blind spot" for enterprises. In fact, in the ZK Research 2015 Network Purchase Intention Study, BYOD ranked as the biggest blind spot for organizations today (Exhibit 2).

BYOD and IoT add another level of complexity as well—the explosion of connected devices. ZK Research predicts that the number of connected devices will increase by 500% by the year 2020. This means that even if organizations do not expand their headcount, IT will be tasked with supporting five times the number of connected endpoints compared to today.

Exhibit 2: BYOD Is IT's Number-One Blind Spot

Which technology trends are creating the biggest blind spots in your organization today?

Category	Percentage
BYOD	33%
Security	32%
Cloud Computing	25%
Network Virtualization	24%
Server Virtualization	23%
Wireless LAN	16%
Voice over IP	13%
Server/Storage Convergence	10%
Video Conferencing	9%

Percentage of Respondents

Source: ZK Research 2015 Network Purchase Intention Study

This explosion in connected endpoints combined with the opening up of business networks has increased the number of attack surfaces, with many attacks being aimed directly at mobile devices. The ZK Research 2015 Network Spending Survey revealed that 74% of organizations claim to have dealt with mobile-specific malware in the last 12 months alone.

As much as the digital economy and the Internet of Everything (IoE) create new opportunities for businesses and consumers, they also create new opportunities for hackers and cybercriminals. The existence of more and more devices creates even more attack surfaces that can be exploited. Any security breach could cost an organization millions of dollars, significant brand damage and even potential legal action. Given that a growing amount of IT infrastructure is being connected to the network, businesses need to take a threat-centric approach to security. By placing security at the heart of their infrastructure, organizations can embrace the changing nature of computing, which is invigorated by this digital transformation.
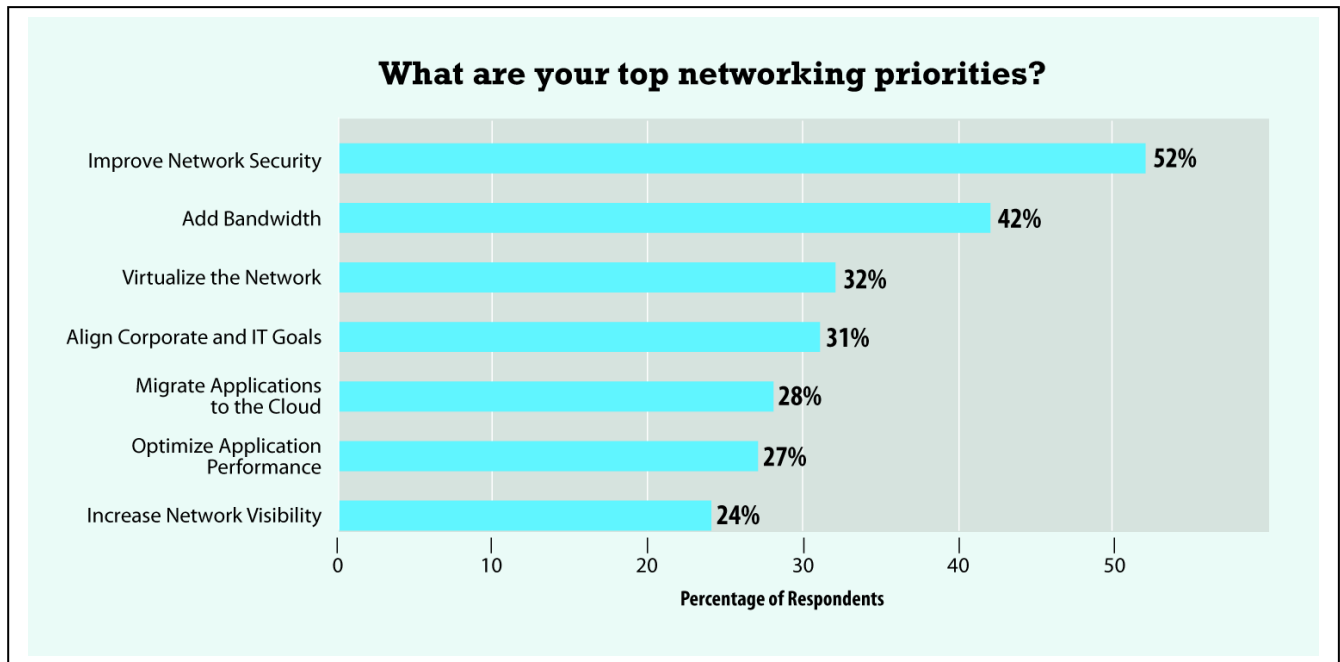
Digitization is causing the IT environment to become more complex, making it more difficult to secure the organization. Traditional security methods are no longer effective because the perimeter has eroded.

Security professionals must focus on securing the network and using it as a way to identify and remediate breaches as fast as possible. This paper highlights how the threat landscape is changing and details how Cisco can transform the network into a security sensor and enforcer to improve network security.

Section II: Evolving Threats and Expanded Attack Surface

The task of securing a business has become increasingly complicated. Consequently, the need to improve IT security is now the number-one network challenge according to the ZK Research 2015 Network Purchase Intention Study (Exhibit 3). With the existence of cloud computing, virtualization, mobile devices and the Internet of Things, the attack surface has expanded greatly. Consider this: ZK Research estimates that the number of devices per user has grown from 1 per user 10 years ago to 3.5 in 2015, meaning there has been a 350% increase in the size of the attack surface purely from device growth. Now, add in the impact of cloud applications and the Internet of Things, and it's easy to see why ZK Research estimates the number of attack surfaces is up to 10 times bigger today compared to 10 years ago.

Exhibit 3: Improving Network Security Is a Top Priority

What are your top networking priorities?

Priority	Percentage
Improve Network Security	52%
Add Bandwidth	42%
Virtualize the Network	32%
Align Corporate and IT Goals	31%
Migrate Applications to the Cloud	28%
Optimize Application Performance	27%
Increase Network Visibility	24%

Percentage of Respondents

Source: ZK Research 2015 Network Purchase Intention Study

Also, threats are becoming increasingly more difficult to detect. Based on continuing research, ZK Research estimates that 80% of breaches originate inside the business and not through the perimeter, resulting from malware on consumer devices, propagated through email or even from users clicking on phishing sites. Sometimes the malware can remain dormant for months and gain intelligence before an attack is launched.

To combat the threat-centric landscape, businesses often deploy security products from 12 to 30 different security providers, according to the ZK Research 2015 Network Purchase Intention Study. Correlating the information from multiple security products is extremely difficult to do and can lead to many blind spots in the environment. This is the primary reason why discovering breaches can be a lengthy process today. The long delays in discovering security breaches enable attackers to spend more time on the network to steal information or cause harm without disruption.

Despite the fact that businesses have thrown literally billions of dollars at protecting the organization, traditional security products focused solely on prevention or a "silver bullet" approach do not work. ZK Research estimates that 85% of organizations have suffered an attack in the past five years—and these breaches can be very expensive. The ZK
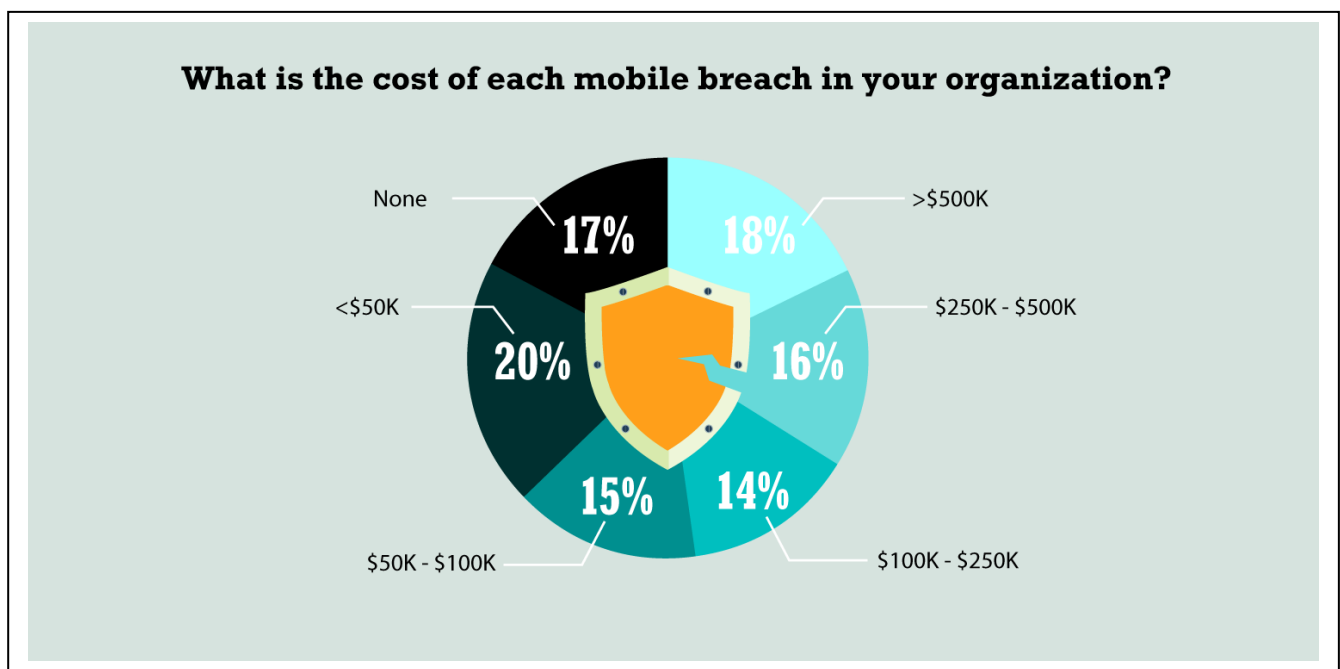
Research 2015 Security Study shows that 48% of organizations claim that a single mobile incident costs their company at least $100,000 (Exhibit 4).

It's time for technology and business leaders to shed their conventional thinking regarding traditional endpoint or network security and shift to a more threat-centric strategy. This requires looking at security across the network—from the enterprise network infrastructure to the data center, IoT, the cloud and endpoints—and offering protection from a wider array of attack vectors while acting as a growth engine to enable companies to seize new business opportunities.

Section III: Cisco's Threat-Centric Approach Offers Protection Across the Full Attack Continuum

It's impossible to protect a business from threats without first understanding who and what are connecting to the network. Fully visualizing the users, devices and activity in the network is paramount to securing it. By gaining visibility into all network devices and understanding network traffic flows, the following can more easily be detected: anomalous traffic, violation of user access policies and discovery of unknown network-attached endpoints, such as rogue access points.

Exhibit 4: Mobile Incidents Cost Big Bucks

What is the cost of each mobile breach in your organization?

None — 17%
>$500K — 18%
<$50K — 20%
$250K - $500K — 16%
$50K - $100K — 15%
$100K - $250K — 14%

Source: ZK Research 2015 Security Study

Cisco has a broad and diverse network portfolio that includes the data center, campus and branch switches, routers, wireless access points and other infrastructure required to build a secure network for businesses. It also has an extremely comprehensive portfolio of security solutions that help enterprises take a more threat-centric approach to security and target the entire attack continuum. As a market leader in both networking and security, Cisco is uniquely positioned to deliver unparalleled levels of visibility—turning the network into a sensor to quickly identify breaches and an enforcer to isolate them quickly and limit the resulting damage.

Transform Your Network into a Security Sensor

No amount of user training and security technology can prevent attacks from occurring. The key is to find threats quickly before they spread across the extended network. However, it's impossible to protect an environment without having visibility everywhere.

End-to-end visibility is becoming even more difficult because traffic patterns are chaotic and not predictable as data travels among tens of thousands of devices to people both inside and outside the organization. Nevertheless, when securing a network, it's imperative to have the ability to detect suspicious traffic flows, policy violations and compromised devices in the environment. Fortunately, Cisco customers likely already have the technology to turn their network into a sensor; they just need to turn it on.

Cisco offers a feature in IOS called Flexible NetFlow, which is a powerful, rich information source that "sees" every network conversation. NetFlow monitors and records all traffic passing through supported routers and switches. It can characterize IP traffic and identify the source and destination of network flows as well as provide information that maps time to application traffic. NetFlow acts as a recorder for the network and can show an organization who accessed what system and for how long.

A good analogy for NetFlow is the data contained in a mobile phone bill. It tells you who (or what) was called, when the call took place and the duration of the call. It is metadata about the calls that were made but does not include the content of those discussions.

Cisco IOS Flexible NetFlow can be used as a tool to identify security threats in real time by identifying

anomalous activities and providing forensic information that can be analyzed to identify the origin of an intrusion. The data from NetFlow can be used at a later time for compliance purposes, network automation or analysis.

Exhibit 5 shows how NetFlow can transform the network into a sensor to quickly identify suspicious activity.

NetFlow can also add value to third-party security tools. For example, the Lancope® StealthWatch® System can use NetFlow information to provide threat alerting. By analyzing NetFlow and other types of network telemetry, Lancope's StealthWatch System delivers context-aware security analytics to quickly detect a wide range of attacks from advanced persistent threats (APTs) and distributed denial-of-service (DDoS) attacks to zero-day malware and insider threats.

Also, NetFlow data paired with the Cisco Identity Services Engine provides even more context to the flow information, enabling the administrator to work with contextual data instead of only network information. For example, Lancope StealthWatch can now identify that there is suspicious traffic coming from "Tom's Computer" instead of a device with the IP address 192.168.1.2.

NetFlow is generated by switches and NetFlow Generation Appliances but can be extended into the data center from the Nexus 1000V and virtual network interface card (NIC) running on a Unified Computing System (UCS) server. This capability provides visibility all the way down to the virtual machines in the data center and captures east–west virtual-machine-to-virtual-machine communications.

By analyzing Cisco IOS Flexible NetFlow with Lancope StealthWatch, administrators can gain visibility into what their network activity baseline (aka "normal") might be as well as the presence of suspicious activity that deviates from that baseline and triggers an alert. The dilemma then becomes one of time-to-attribution and time-to-resolution, because the alerts only provide IP address information. With more and more devices connecting to networks, identifying attacks by IP address could take too long. In that time, who knows how much damage the potential breach could cause?

That's where the Cisco Identity Services Engine (ISE) can help.

Exhibit 5: NetFlow in Action

BREACH STAGE

> Vulnerability exploration: Attacker scans IP addresses and ports to find holes

> Installation of malware

> Connection to command and control systems

> Spreading of malware

> Data exfiltration to outside host

NETFLOW ACTION

> Detects scans across every IP address and IP port

> Detects inbound administrator action from an unexpected location

> Detects outbound communications to known command and control systems

> Detects scans on IP addresses and ports by internal hosts

> Detects extended traffic flows and data transfers

Source: ZK Research, 2016

Cisco ISE is designed to help businesses control and secure network access. It does this by collecting contextual data from the network (e.g., device type, user identity) to more accurately identify and classify the user and then assign the appropriate level of access for network users. For example, an organization could use ISE to set up the following security policies:

- A **guest access** policy for any visitor on the company network
- A **BYOD access** policy for workers who use personal devices such as iPads and smartphones
- **Zero access** to the network for any device that is deemed to be noncompliant with corporate policies or has been compromised
- **Business-class access** for corporate workers using IT assigned devices
- **High-level access** to confidential information for C-level executives using a company workstation

By leveraging all the contextual data it collects from the network, Cisco ISE ensures that the *right* level of access is provided to the *right* users at *every* moment in time, while limiting the potential attack surface by preventing noncompliant or compromised devices from ever accessing the network in the first place.

This same contextual data can be shared with Lancope StealthWatch to provide more information about the IP address that triggered the alert. Through their integration, Lancope can ask ISE for more information regarding an IP address. Now, in Lancope's dashboard, administrators automatically gain the deep visibility they need to triage and analyze potential network threats or malicious activity. This additional data enables a faster time to insight from the NetFlow data provided by the network.

Set the Rules and Leverage the Network as an Enforcer

When the entire network is transformed into a security sensor, organizations gain very deep visibility and insight into who and what are connecting to the network and what they're doing on the network. In the event of a malicious attack, organizations may not like what they see. Fortunately, once again, Cisco customers may already have the technology needed to take action and resolve these security threats; they just need to enable it.

One way that Cisco ISE can protect the organization is by leveraging Cisco TrustSec software-defined segmentation technology. For readers who are not familiar with TrustSec software-defined segmentation, this section introduces the feature and explains its relationship to ISE.

Cisco TrustSec software-defined segmentation is embedded technology in existing Cisco infrastructure that uses software-defined segmentation to reduce the risk of malware propagation, prevent lateral movement across a network and contain threats. Traffic classification is based on the user/device role, not the IP address. Using Cisco ISE to create policy that utilizes TrustSec software-defined segmentation can simplify the provisioning and management of network access, make security operations more efficient and help to enforce segmentation policy consistently, anywhere in the network. As explained earlier, Cisco ISE gathers advanced contextual data about who and what are accessing the network. It then defines role-based access using Security Group Tags to segment the network. This centralized software-defined segmentation policy is pushed by ISE to TrustSec software-defined segmentation–enabled network devices to enforce policy decisions across the network.

Bringing the Solutions Together

The combination of Cisco IOS Flexible NetFlow, Cisco ISE, Lancope StealthWatch and Cisco TrustSec software-defined segmentation ultimately enables customers to maximize their existing infrastructure investment to better secure the network.

For example, when a device comes onto the network, its traffic is constantly monitored and analyzed through the integration of NetFlow and Lancope StealthWatch. When anomalous activity is detected, the administrator can quickly associate the event with the user, device and location by integrating ISE.

Should the determination then be made that something suspicious is taking place, the offending device or user can be rapidly placed into network isolation with TrustSec software-defined segmentation and ISE. Consequently, the quarantined device is isolated on the network for IT to identify and mitigate; the effective "blast radius" of the infection is minimized, and further harm is prevented.

When these solutions come together, the network administrator gains visibility into and control over the environment through the network's role as a sensor and an enforcer.

Section IV: Conclusion

Given the digital economy, changing business models and the dynamic threat landscape, an organization's approach to reducing the time from breach to recovery needs to be integrated, pervasive, continuous and open.

IT's challenge is the insufficiency of traditional endpoint- and perimeter-focused security. Those security technologies are dedicated almost exclusively to preventing breaches from occurring. Although this is still critically important, IT must place more emphasis on finding security incidents when they occur and then remediating them before they spread laterally or data is exfiltrated.

The network can be used as both a sensor and an enforcer to protect businesses while bringing unparalleled levels of visibility to the security environment. Because of the breadth and depth of Cisco's security and network portfolios as well as its market leadership in these areas, it is uniquely positioned to deliver on the vision of turning the network into both a sensor and an enforcer.

Most Cisco customers can make this shift today by using the technology that they already have because the features are embedded components of Cisco's network portfolio or routers and switches.

Having access to deep visibility and contextual information will yield actionable insights that can be automated to help businesses fight modern-day cybercriminals. Cisco can deliver these benefits today, and all Cisco customers should consider leveraging the network for security purposes.