ESG Economic Validation

The Economic Benefits of the Pensando Distributed Services Platform

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Executive Summary

Enterprises, carriers, and cloud service providers (CSPs) face similar networking, storage, and security challenges. CSPs, however, may be harder pressed in some areas given their diverse customers, workloads, and security requirements. Traditionally, enterprises operate data centers with "scale-up" IT infrastructure architecture—a complex resource model that is CPU-centric and includes TAP networks, switches, and security appliances. Eventually this approach restricts performance and/or scale, and lack of full network visibility inhibits troubleshooting and optimization. Add to the mix data growth, data security/privacy regulations, and skills shortages, and IT complexity soars. Too often the result is delayed problem resolution, network downtime, low server efficiency, security gaps, and high compliance costs.

Carriers and CSPs have embraced a "scale-out" approach, which enables services to be run on homogeneous, industry-standard server hardware. The challenge is that spinning up network or security functions on the generic servers employed by carriers and CSPs burns CPU resources and is generally less efficient and performant than specialty hardware. Pensando helps offload the CPU and provides an isolated control point for the servers that can be managed by the CSP or carrier, independent of the OS or software running on the server. Enterprises have recognized the value of a simplified, cloud-like approach and are working toward that goal. Pensando allows them to minimize or eliminate appliances and virtual appliance products from multiple vendors and still modernize their data centers into a more cloud-like model.

ESG's analysis found that Pensando's scale-out software-defined services approach enabled organizations to centralize management, simplify administration, and optimize performance. Qualitative and quantitative findings confirmed that the Pensando Distributed Services Platform allowed customers to consolidate network monitoring, eliminate appliances, reduce network downtime, increase server utilization efficiency, and improve security.

While at first glance it might seem expensive to implement Pensando hardware and software into each data center server, ESG's modeled scenarios demonstrate significant savings for both traditional enterprises and cloud service providers, and conversations with real-world customers confirm that. ESG analysis revealed a 64% three-year TCO savings for a cloud services provider with 20,000 servers looking to Pensando to provide network monitoring and management, core network services, security policy management and enforcement, and data encryption. ESG found that an enterprise with 2,000 servers could save 84% over three years by consolidating network monitoring, east-west firewalls, load balancers, and microsegmentation under Pensando.

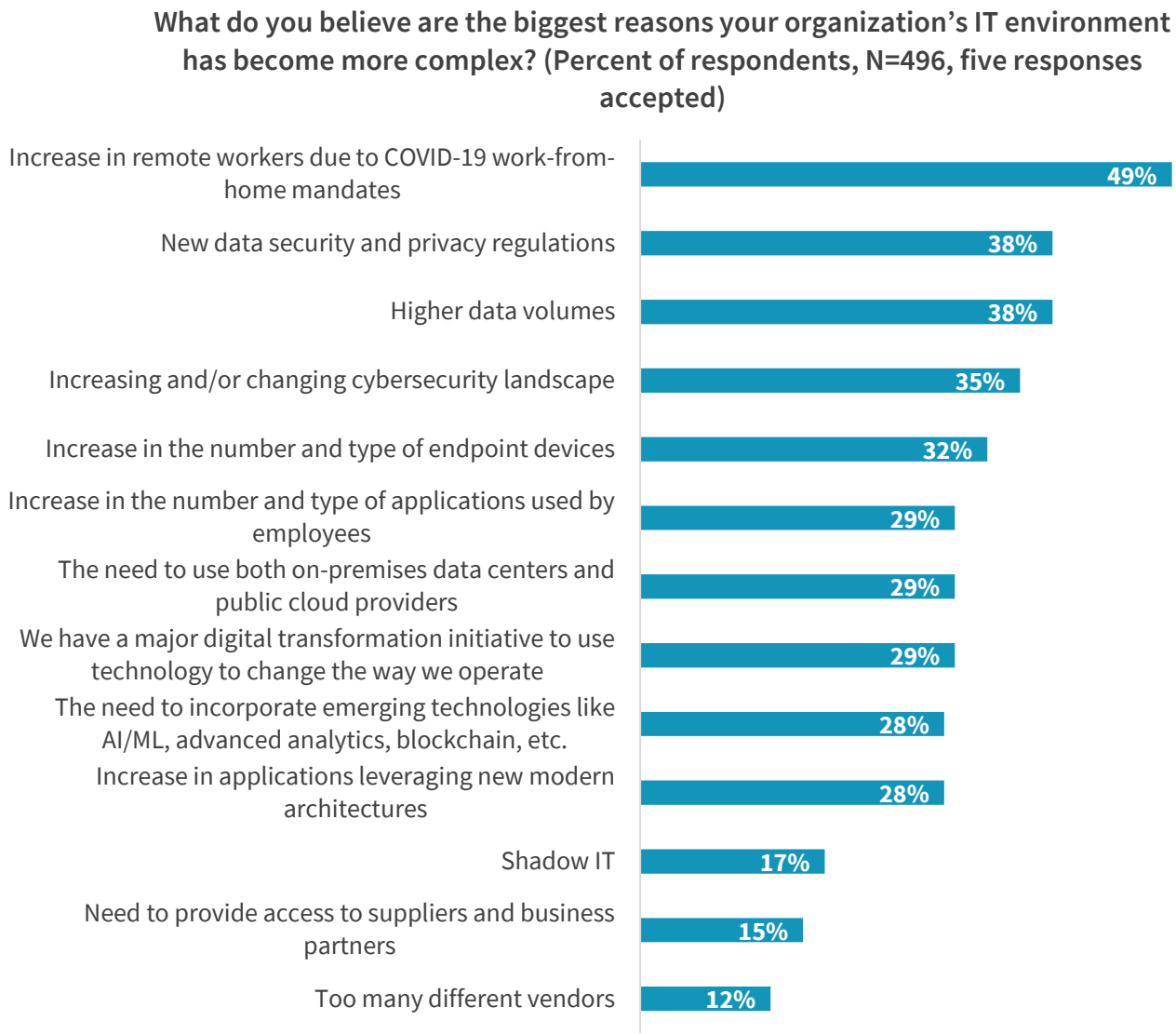
Introduction

This ESG Economic Validation examines the qualitative and quantitative benefits that organizations can expect by scaling out networking, storage, and security at the compute edge using the Pensando Distributed Services Platform. With Pensando, organizations can expect to consolidate network monitoring, reduce network downtime, increase server utilization efficiency, and improve security by reducing risk and regulatory/compliance costs.

Challenges

Multiple factors are making IT more complex as organizations cope with changing networking, storage, and security requirements. It becomes increasingly difficult to deliver expected service level agreements, sustain end-user satisfaction, and contain costs. In ESG's 2021 technology spending intentions survey, respondents identified work-from-home mandates as one of the top drivers of complexity (49%), followed by new data security and privacy regulations (38%) and data growth (38%) (see Figure 1).[1]

Figure 1. Drivers of IT Complexity



Source: Enterprise Strategy Group

[1]Source: ESG Research Report, *2021 Technology Spending Intentions Survey*, January 2021. All research in this Economic Validation was taken from this Research Report unless otherwise specified.

The shift to a work-from-home model adds an additional burden to already-stretched IT teams: the need to ensure secure remote access and protect a greatly expanded attack surface. The ongoing cybersecurity skills shortage (identified by 48% of organizations surveyed by ESG) can compromise monitoring, investigation, response, and remediation. Gaps increase risk. Some businesses turn to third parties for help to offset both network and cybersecurity skills shortages. In 2020, ESG research found that 73% of surveyed organizations expected to increase their usage of third parties for managed security services and 59% for network administration services.[2]

As regulations evolve and emerge, organizations have to manage and protect data to demonstrate compliance in a timely manner, which isn't always easy, given varying levels of integration and automation. In addition to General Data Protection Regulation (GDPR) requirements, new data privacy laws are appearing in the US at the state level, with the California Consumer Privacy Act (CCPA) leading the way.

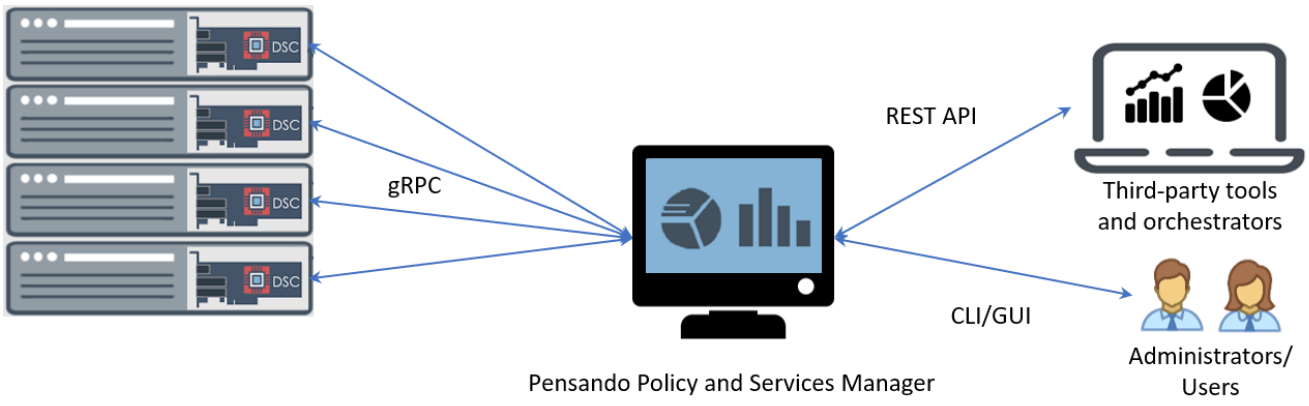
As data volumes increase, they stress legacy storage and management systems, and organizations may find it difficult to retrieve and share data efficiently and securely, thereby limiting the value they can extract from the data. This, in turn, may thwart digital transformation and innovation.

In this context, traditional CPU-centric, scale-up IT infrastructure architecture, in which networking services are embedded in top-of-rack switches or appliances, is pushed to its limits—often with adverse effects on performance and scalability. CPU cycles are overconsumed, and lack of full network visibility complicates troubleshooting, driving up mean time to repair (MTTR) and network downtime. Components such as network TAPs, switches, legacy firewalls, micro-segmentation solutions, and support requirements further increase cost and support requirements. Sometimes data centers have to make compromises that can inhibit operational flexibility and security.

The Solution: The Pensando Distributed Services Platform

The Pensando Distributed Services Platform is built on domain-specific hardware—the Pensando Distributed Services Card (DSC)—based on Pensando's P4 programmable processor designed to support a software stack delivering cloud, compute, network, storage, and security services. The platform is designed to deliver services at cloud scale with minimal latency, jitter, and exceptionally low power requirements (~35W at 100Gbps). Pensando DSCs, also known as smart network interface cards (SmartNICs), can be installed easily in standard servers to provide high-speed I/O ports and deliver software-defined services to workloads. In hyperconverged infrastructure solutions, DSCs replace legacy NICs. All server traffic traverses the DSC, where zero-trust policy enforcement and encryption can be applied consistently. Secure host isolation protects a DSC from being compromised in case of an attack on the server on which it is hosted.

Figure 2. The Pensando Distributed Services Platform



Source: Enterprise Strategy Group

[2] Source: ESG Research Report, 2020 Technology Spending Intentions Survey, February 2020.

The Pensando Policy and Services Manager (PSM) is microservices-based and designed for high availability and fault tolerance. The PSM controls the DSCs and delivers enterprise-grade security and visibility at every level of the software stack. The PSM integrates with existing infrastructures via APIs, and it enables IT to provision resources automatically and deploy software-defined services from a single point. The unified management approach ensures that security and network policies are consistent throughout enterprises and multi-tenant domains. Communications between the PSM and DSCs are encrypted and authenticated. The PSM also collects events, logs, and metrics from DSCs to speed troubleshooting.

The platform supports virtualized computing, bare metal, and container environments. Infrastructure services such as security, encryption, flow-based packet telemetry, and fabric storage services are deployed at every server, simplifying network operations. A "flatter" network architecture with services deployed at each server not only lowers latency but also makes it easier for users to reconfigure and manage services centrally compared to traditional approaches involving multi-vendor appliances. The network and services layers are decoupled, allowing IT to make network decisions independent of the security architecture and security policies.

Notable features and functions of the platform include:

- Centralized management for deployment, configuration, monitoring, and provisioning, with comprehensive visibility enabled with bi-directional flow streaming and traffic mirroring.
- Inclusion of data plane and control plane, eliminating host agents and allowing customization of each layer.
- Non-volatile memory express (NVMe) storage virtualization with NVMe over fabric (NVME-oF).
- Advanced security provided by line-speed IPsec encryption and an optional stateful L4 firewall with application-level gateways, URL filtering, micro-segmentation, with future planned support for TLS/DTLS encryption and TLS proxy.
- Platform protection against rogue hardware or software components with cryptography hardware and capabilities such as hardware attestation, secure boot, software validation, and connection validation.
- Scalability to hundreds of thousands of flows and more than 1 million routes.

ESG Economic Validation

ESG's Economic Validation process is a proven method for understanding, validating, quantifying, and modeling the economic value propositions of a product or solution. The process leverages ESG's core competencies in market and industry analysis, forward-looking research, and technical/economic validation. ESG evaluated Pensando's TCO calculator, conducted in-depth interviews with end-users, and reviewed case studies to better understand and quantify the positive outcomes experienced by organizations using Pensando.

Pensando Economic Overview

ESG reviewed the Pensando Distributed Services Platform and conducted a series of interviews with Pensando enterprise and service provider customers. We uncovered economic benefit in the following categories for organizations using Pensando services:

Consolidated Network Monitoring

The Pensando platform is designed to enable customers to consolidate network monitoring, firewalls, load balancing, micro-segmentation, and VPN encryption systems to eliminate services appliances. A banking and securities organization confirmed they "absolutely see savings" after reducing the number of firewalls and load balancers along with the time required to manage related policies. Customers also eliminated network TAPs and aggregation switches and their related maintenance and support. The flatter network and unified policies accelerated new application and workload deployment by up to 30%, freeing IT to accomplish other tasks. A data center services provider was able to bypass top-of-rack switch challenges, including monitoring/TAP in the switch and implementing overlay and policy functions. They said that without Pensando, they would have to deploy more TAP network resources. The same customer noted the "highly desirable ability to apply consistent policy" versus internally automating policies in a self-service model. ESG confirmed that the ability to monitor networks at every network port with granular source filtering reduced cost and complexity because TAP traffic could be managed more efficiently compared to traditional network TAP approaches.

"Pensando replaced our leaf layer (switches), eliminating one entire layer of hardware devices and lowering cost."

--Large distributed enterprise

Reduced Network Downtime

With Pensando, customers achieved greater network visibility compared to host-based tools. Telemetry at the edge provided customers with real-time observability and insights into network and storage that accelerated troubleshooting and problem reporting, with no adverse effects on performance. The distributed monitoring capability, along with automated problem detection, remediation, and report delivery, enabled administrators to resolve issues before they became problems for end-users. Instances of automatic remediation and earlier identification of potential bottlenecks translated into higher network uptime. For one cloud service provider, having a single standardized way to get data from network cards was a "real advantage." Customers also mentioned the ease with which they could monitor and manage overall system health. The cloud services provider told ESG the Pensando platform reduced mean time to repair (MTTR) by more than half, an improvement that helped decrease downtime significantly.

"Pensando enabled us to achieve shorter MTTR and lower downtime which translated directly to a reputational advantage."

--Global hosting provider

Increased Server Utilization Efficiency

A global technology manufacturer said Pensando's distributed host-based services helped them offload network, security, and storage functions from the server CPU to domain-specific hardware. As a result, server utilization increased by about 20%, power and cooling costs were reduced, and CapEx spending for server purchases was projected to decrease in the next buying cycle. A financial services customer said they were seeing better overall performance as a result of less packet forwarding done by the host CPU. A colocation provider was able to maintain an isolated footprint at the server with the ability to "apply network policy and do other things that otherwise would be more difficult to do in the network." This is especially important considering that colocation providers running bare metal servers have no ability to run a software agent on the server.

Improved Security via Reduction of Risk and Regulatory/Compliance Costs

Pensando's distributed approach to east-west security enhanced customers' security postures; eliminated costly firewall appliances, legacy micro-segmentation licenses, and other virtual security solutions; and simplified compliance. As one customer pointed out, "…trying to convince people that I need to add dozens upon dozens of security enforcement points into an internal network at many tens of thousands of dollars per node is almost a non-starter."

ESG validated that organizations could lower risk through Pensando capabilities such as in-line 100Gbps encryption with no load on server resources and host isolation that protects DSCs from compromise. ESG also found that Pensando provides PCIe-layer secure hardware isolation between software running on a server and the DSC enforcement engine, ensuring that tenants cannot gain access to a cloud provider's infrastructure. A colocation provider commented that multi-tenant isolated networking allows customers to bring their own address base and delivers full control from a single tenant's perspective. Another customer praised the ability to terminate IPsec tunnels at the server or virtual private edge versus termination elsewhere in the environment that led to additional tunneling. In addition, this customer described the benefit of being able to "deploy deny lists into the environment to block traffic that we know shouldn't be there." With the insights into application and user behavior provided by Pensando, customers were better able to implement segmentation policy, a core aspect of a zero-trust approach.

The PSM bolstered security with role-based access control following a whitelist model that prevents users from accessing resources outside their own tenant. ESG also confirmed that the PSM enables local, LDAP, and RADIUS authentication methods in conjunction with hashed, encrypted passwords. Read-only audit logs helped customers streamline regulatory reporting.

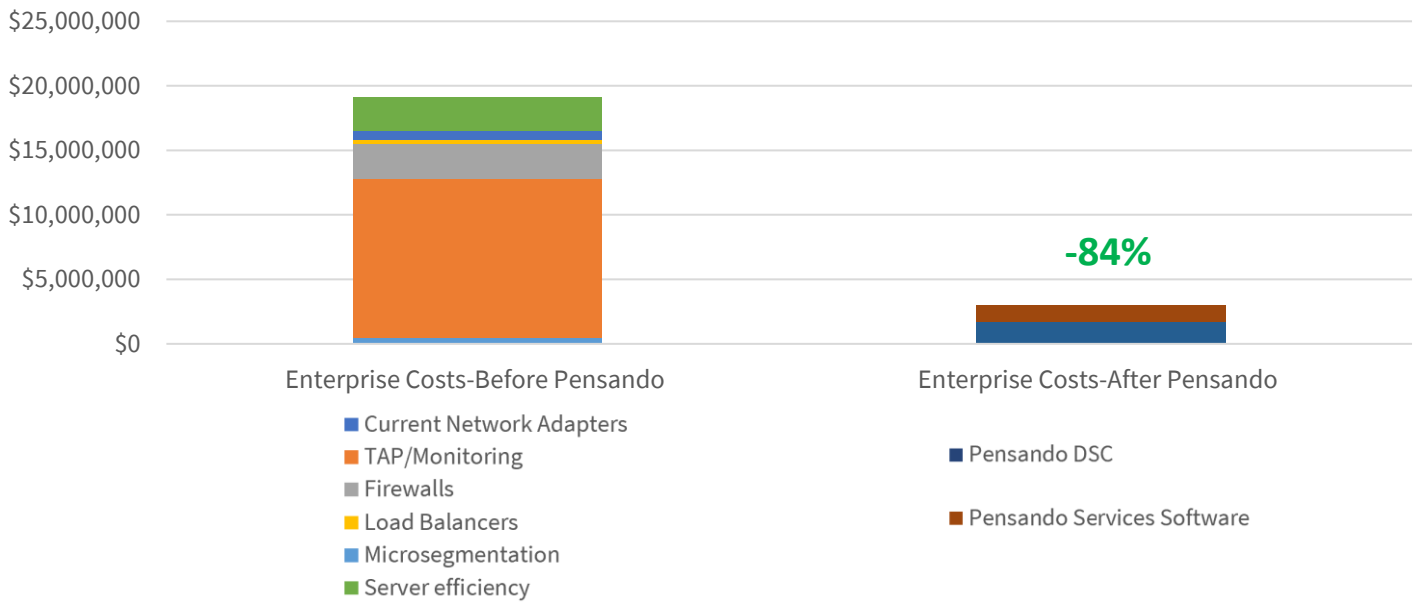
ESG Modeled Analysis

ESG leveraged the information collected through vendor-provided material, public and industry knowledge of economics and technologies, and the results of customer interviews to validate an economic benefit model that compares the costs and benefits of implementing the Pensando Distributed Services Platform with continuing to operate without Pensando's technology. ESG's interviews with Pensando's customers, combined with experience and expertise in economic modeling and technical validation of Pensando's products helped to form the basis for the modeled scenario.

ESG modeled two organizations: one, an enterprise with a few data centers and 2,000 on-premises servers, and the other, a cloud services provider with 20,000 servers deployed in many data centers around the globe. The reason we chose to model these two types of organizations is to highlight the differences in the use cases and the different costs that Pensando can reduce or eliminate in each case. Both modeled organizations are using network TAPs for traffic monitoring, a common area of savings.

In the enterprise model, Pensando reduced and/or eliminated network TAPs, monitoring appliances, east-west firewalls, load balancers, microsegmentation nodes, and their associated license fees and operational expenditures (OpEx). Over three years, ESG's model predicts a total three-year savings of $16,180,092, or 84% (see Figure 3).

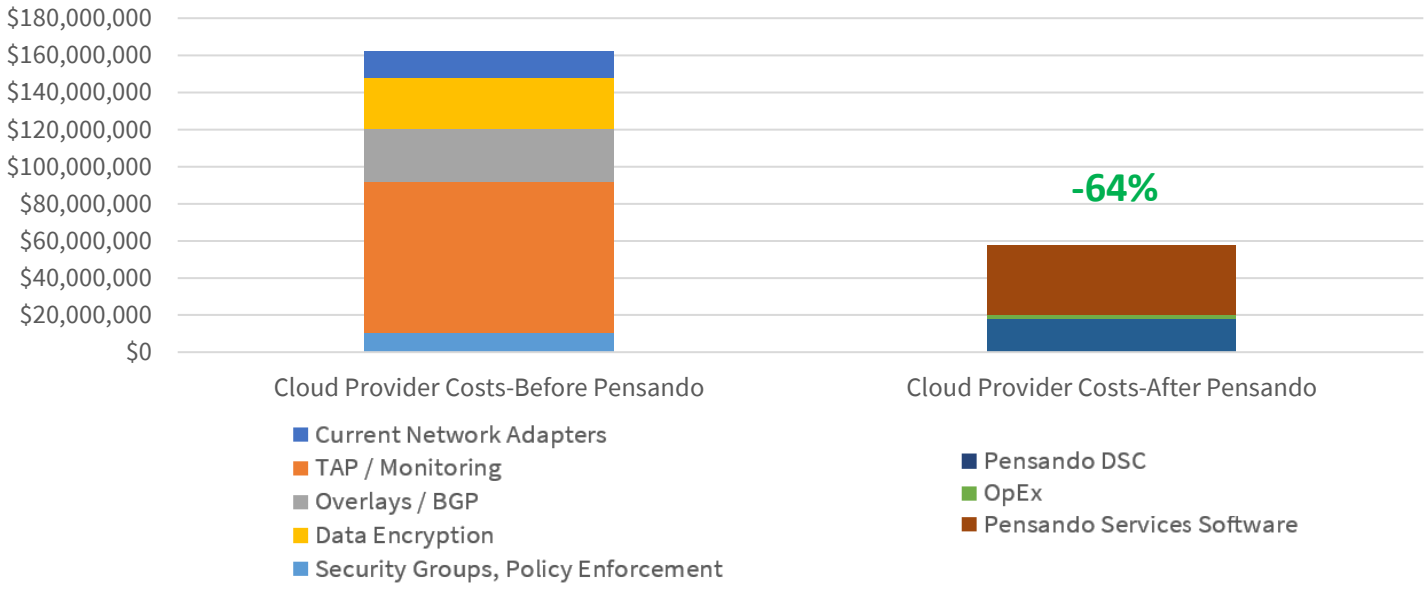
Figure 3. Three-year TCO Benefits Provided by Pensando—Enterprise



Source: Enterprise Strategy Group

In the cloud services provider model, Pensando reduced and/or eliminated network TAPs, monitoring appliances, underlay/overlay networks, bridging, BGP processing, and data encryption appliances and their associated license fees and OpEx. In addition, the capital expenditures (CapEx) and OpEx costs associated with security groups and policy enforcement were likewise reduced. Over three years, ESG's model predicts a total three-year savings of $104,456,894, or 64% (see Figure 4).

Figure 4. Three-year TCO Benefits Provided by Pensando—Cloud Services Provider



Source: Enterprise Strategy Group

The Bigger Truth

Three-quarters of organizations reported that IT is more complex (54%) or significantly more complex (21%) compared with two years ago, according to a recent ESG research survey. Data growth, regulations, and skills shortages are persistent complicating factors, in addition to the inherent limitations of scale-up infrastructures. The more time IT staff spends managing complexity and infrastructure, the more costs go up while digital transformation suffers.

With Pensando, enterprises and CSPs can take a big step toward reducing complexity. Less complexity means better use of resources, time, and money, which in turn enables innovation and the development of new applications and revenue-generating services. Consider the implications of a simpler, flatter data center architecture that integrates with existing environments, provides comprehensive telemetry and visibility, centralizes security policy management, ensures compliance for all traffic, and scales as needed. Fast time to value is a compelling rationale, and Pensando delivers it in multiple ways, not the least of which is centralized management for deployment, configuration, monitoring, and provisioning.

Because cybersecurity presents an especially daunting challenge, the fact that organizations can easily tap into zero-trust principles represents a large advantage and larger savings. As one customer said, "as folks move to more zero-trust architectures from an application point of view…the need for smartness at the edge goes up…."

ESG's modeled scenarios demonstrate significant savings for both traditional enterprises and cloud service providers, and conversations with real-world customers confirm that. ESG analysis revealed a 64% three-year TCO savings for a cloud services provider with 20,000 servers looking to Pensando to provide network monitoring and management, core network services, security policy management and enforcement, and data encryption. ESG found that an enterprise with 2,000 servers could save 84% over three years by consolidating network monitoring, east-west firewalls, load balancers, and microsegmentation under Pensando.

Pensando's scale-out, software-defined services approach to networking, storage, and security is designed to reduce IT complexity significantly by providing significant operational benefits and savings, but enterprise decision makers and CSPs should understand all of the costs and benefits associated with choosing a distributed services platform provider.

ESG has carefully studied the impact that adopting the Pensando Distributed Services Platform has on companies and found that businesses are more likely to achieve their goals when utilizing the cost efficiency, manageability, security, and flexibility that Pensando provides. ESG customer interviews and conversations with industry analysts have consistently shown that the Pensando Distributed Services Platform is a critical tool for success in today's digital age.

ESG is impressed with Pensando's vision and by the benefits Pensando delivers to their customers. We strongly recommend enterprises and cloud services providers alike—really any organization that manages large networks with hundreds or thousands of servers—consider the Pensando Distributed Services Platform for their network management and security needs.

Enterprise Strategy Group is an IT analyst, research, validation, and strategy firm that provides market intelligence and actionable insight to the global IT community.