The Total Economic Impact™ Of A Virtual Cloud Network

Cost Savings And Business Benefits Enabled By VMware NSX Technology

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Capital expenditure avoidance
with NSX Data Center:
$8,074,278

Operational cost avoidance for
decommissioned and avoided
hardware infrastructure:
$1,047,797

Reduced WAN connectivity
costs:
$859,456

*Based on a composite organization
and over a three-year period.

Executive Summary

As organizations prioritize digital transformation initiatives, many are
finding that legacy network architectures are holding them back. To
support new business models, cloud adoption, and an explosion in
connected devices, modern networks must support interoperability across
data centers, multiple clouds, branch locations, and edge devices.
Applications now run at every point on this spectrum, and they are critical
to businesses' ability to win in hyper-competitive marketplaces. Yet, even
as business success has become more dependent on this new
architecture, and the amount of data flowing across connections has
increased, many organizations still lack a unified approach to
management, automation, and security.

With a Virtual Cloud Network delivered on NSX technology, VMware aims
to address these issues, allowing organizations to leverage a software
abstraction to connect, operate, and secure end-to-end architectures that
support applications wherever they may reside. The NSX family of
products includes the following:

› **NSX Data Center:** Network virtualization for the data center.

› **NSX Cloud:** Networking and security for cloud-native applications.

› **NSX SD-WAN by VeloCloud:** Cloud-based, software-defined WAN
  management.

To better understand the benefits, costs, and risks associated with an
investment in a Virtual Cloud Network, Forrester interviewed five
customers using VMware NSX Data Center for network virtualization as
well as three customers using VMware NSX SD-WAN by VeloCloud.

Prior to deploying NSX Data Center, IT organizations at the interviewed
organizations struggled to keep up with rapidly evolving business needs.
An investment in NSX Data Center gave them the tools to meet developer
demands while helping to save on capital expenditures, reduce operational
costs, and ensure network performance, all while maintaining security of
sensitive data flows. Previously, NSX SD-WAN by VeloCloud (NSX SD-
WAN) customers faced high connectivity costs, significant amounts of
downtime, and complex WAN configurations that required too much of
their network engineers' time. With the investment in NSX SD-WAN, they
were able to utilize commodity broadband at lower costs, ensure continuity
of service at branch locations, and simplify the management of the WAN.
"[NSX SD-WAN by] VeloCloud is a key infrastructural capability that allows
organizations to prioritize at the application level," said the chief
information officer of a regional supermarket chain. "There's a level of
guarantee on the availability of uptime and performance on the WAN."

The interviewed organizations also considered the NSX family of
technologies instrumental to the "cloud journey" that they have embarked
on, as one senior network engineer termed it.

Based on the customer interviews, Forrester created a composite
organization to illustrate the benefits and costs associated with an
investment in a Virtual Cloud Network. The analysis revealed that a Virtual
Cloud Network has the following three-year financial impact: $13.2 million
in benefits versus costs of $6.4 million, resulting in a net present value
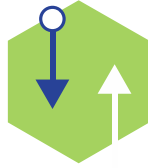(NPV) of $6.8 million and an ROI of 106%.

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ROI
106%

Benefits PV
$13.2 million

NPV
$6.8 million

Payback
<6 months

Key Findings

Quantified benefits. The composite organization experienced the following risk-adjusted present value (PV) benefits totaling $13,224,972 over three years:

› **Capital expenditure avoidance for server and network hardware with NSX Data Center totaling $8,074,278.** By choosing a virtualization strategy, the composite organization forwent an initial capital expenditure of $4.9 million to secure east-west traffic in its data center. Additionally, it avoided purchasing — at a cost of $32,000 each — 19 host servers in Year 1, 21 in Year 2, and 23 in Year 3. In each year, NSX Data Center also allowed the organization to avoid the purchase of switches, load balancers, and additional security appliances to accommodate growth.

› **Operational cost avoidance for decommissioned and avoided hardware totaling $1,047,797.** Operational costs, including maintenance, patching, and support, are calculated as a percentage of server costs. Owing to better utilization, the composite organization was able to retire 37% of its existing servers, which allowed it to avoid the costs associated with upkeep.

› **System administrator time savings from IT and security automation totaling $1,283,724.** By implementing NSX Data Center, the composite organization improved workflows for system administrators, saving over 6,000 hours of administrator time each year over the three-year period covered in this analysis.

› **End user productivity improvements totaling $1,572,469.** Periods of severe underperformance and network unavailability would have cost the composite organization 11,000 hours (at an average cost of $42 per hour) of end user productivity over a three-year period. By enabling administrators to efficiently provision resources, the organization avoided these productivity losses.

› **Reduced WAN connectivity costs totaling $859,456.** The switch to an SD-WAN architecture allowed the composite organization to trade expensive T1 links with a 3G failover for commodity broadband links with a 4G failover, saving $800 per location, per month.

› **Reclaimed losses from WAN downtime totaling $342,440.** Prior to deploying NSX SD-WAN, the composite organization experienced 30 days of downtime across 40 branch locations. Each day cost $8,000 in lost revenue, on which the company earned a 20% gross margin, as well as $1,500 in lost employee productivity and $2,000 in internal effort to restore the network.

› **Time savings in managing the WAN totaling $44,808.** The previous WAN environment required the attention of two IT managers and three network administrators; each committed 10% of his or her time to managing the network. With NSX SD-WAN, managing the WAN required 35% less effort than prior to the deployment, creating significant savings.

Unquantified benefits. The interviewed organizations experienced the following benefits, which are not quantified for this study:

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› Most security breaches can be attributed to internal sources; securing east-west (internal) data flows can limit the impact of an incident. In 2017, the average cost of a security breach was $3.62 million, and organizations faced, on average, a 28% chance of falling victim to a recurring material data breach, according to the Ponemon Institute.[1] The reduction in risk exposure that accompanies any major improvement in internal security has not been factored into the ROI.

Costs. The composite organization experienced the following risk-adjusted PV costs:

› **License and support costs for NSX Data Center of $5,819,461.** Over three years, the composite organization incurred costs of $5.8 million for licensing and support. Licenses are only purchased for the hosts that will serve the virtual network and prices are tied to the number of CPU sockets on a system. Ongoing support is offered at a percentage of the total license costs.

› **Development and training costs for NSX Data Center of $303,177.** For professional services as well as training, which accelerated implementation and production-readiness, the composite organization paid costs of $303,177.

› **Deployment and management of the NSX SD-WAN solution costs of $78,750.** The composite organization contracted with a third-party systems integrator to deploy NSX SD-WAN at each of its branch locations. The modest costs speak to the ease with which NSX SD-WAN was deployed, but owe also from the geographic density of the branch locations.

› **Monthly costs for NSX SD-WAN appliance rental and access to cloud management portal totaling $194,273.** NSX SD-WAN customers incur monthly charges for the rental of SD-WAN appliances and gateways as well as access to the cloud management platform.

Forrester's interviews with eight VMware customers using the NSX family of products and subsequent financial analysis found that an organization based on these interviewed organizations experienced benefits of $13,224,972 over three years versus costs of $6,430,755, adding up to a net present value (NPV) of $6,794,217 and an ROI of 106%.

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The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

TEI Framework And Methodology

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ (TEI) framework for those organizations considering implementing a Virtual Cloud Network.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the impact that a Virtual Cloud Network can have on an organization:

DUE DILIGENCE
Interviewed VMware stakeholders and Forrester analysts to gather data relative to a Virtual Cloud Network deployment.

CUSTOMER INTERVIEWS
Interviewed eight organizations using a Virtual Cloud Network to obtain data with respect to costs, benefits, and risks.

COMPOSITE ORGANIZATION
Designed a composite organization based on characteristics of the interviewed organizations.

FINANCIAL MODEL FRAMEWORK
Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewed organizations.

CASE STUDY
Employed four fundamental elements of TEI in modeling a Virtual Cloud Network's impact: benefits, costs, flexibility, and risks. Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves to provide a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by VMware and delivered by Forrester Consulting. It is not meant to be used as a competitive analysis.

Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the report to determine the appropriateness of an investment in a Virtual Cloud Network.

VMware reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.

VMware provided the customer names for the interviews but did not participate in the interviews.

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A Virtual Cloud Network Customer Journey

BEFORE AND AFTER A VIRTUAL CLOUD NETWORK INVESTMENT

Interviewed Organizations

For this study, Forrester conducted eight interviews with customers using a Virtual Cloud Network and the associated NSX family of products. The interviewed customers include the following:

ORGANIZATION	INTERVIEWEE	SCALE	NSX PRODUCT(S)
Major US university	Information technologist	30,000 end users	NSX Data Center
Business services firm for Fortune 500 clients	Sr. manager, cloud infrastructure	$2 billion annual revenue	NSX Data Center
US graduate-level educational institute	Network architect	4,000 end users	NSX Data Center
US utility company	Sr. cloud administrator	$18 billion annual revenue	NSX Data Center
Global information services provider	Sr. network engineer	$4 billion annual revenue	NSX Data Center
Global mining operations company	Global network operations manager	$16 billion annual revenue	NSX SD-WAN by VeloCloud
Holding company with diverse portfolio businesses	Chief technology officer	$100 million annual revenue	NSX SD-WAN by VeloCloud
Regional supermarket chain	Chief information officer	$1 billion annual revenue	NSX SD-WAN by VeloCloud

Key Challenges

The following key drivers prompted customer organizations to seek out new approaches to network management and security:

› **Risk of a large-scale breach.** Forrester's research indicates that internal actors are the most common source of a data breach, and without a firm policy to regulate east-west traffic in the data center, organizations left themselves exposed to a large-scale incident.[2]

› **Streamlining the development process.** IT operations teams wanted to get out of developers' way and leave them to do what they do best. As one customer put it, the goal was "to have developers build, deploy, and move their environments to different tiers or categories of development with as little intervention as possible."

› **High costs to support the WAN network.** Customers relied on expensive T1 and MPLS links to connect branch locations, and they were looking for easy opportunities for cost savings. However, they were also seeking an easier solution to manage, as the previous WAN management tools were cumbersome and inefficient, according to interviewees.

> "When the product line was being built out, normally that would have been anywhere from a three- to six-month process to allocate all the storage, all the VMs, and all those different components, and they were able to go from concept to deployment of the new part of the application in that private cloud area in about two weeks."
>
> *-Senior network engineer, global information services provider*

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Business disruption at branch locations. With previous WAN configurations, customers experienced frequent periods of downtime, which took business operations to a halt. Customers observed direct losses in revenue and employee productivity but struggled to quantify the impact this had on their brands. What's more, the effort it took to bring networks back online added to costs.

Key Results

The interviewees described the following key results from the investment in a Virtual Cloud Network:

› **Streamlining the development process.** In legacy environments, provisioning infrastructure could take weeks, which impacted developer timelines. With NSX Data Center, what was once a three- to six-month process is now one that takes weeks. "We were able to go from concept to deployment of [a] new part of the application in the private cloud in about two weeks," said one interviewee.

› **A limited attack surface.** NSX Data Center's virtual firewall capabilities allowed customers to protect internal data flows, essentially creating micro-segmentation around each workload. The ability to assign security policy at a granular level (i.e., to individual VMs or containers) offered peace of mind at a time when: (1.) data handling is scrutinized by regulatory bodies and (2.) large-scale breaches can become front-page news.

› **Simplified WAN management.** According to interviewees, NSX SD-WAN's cloud tools create significant time savings for administrators. The chief technology officer of a holding company that manages diverse businesses reported that: "The cloud tools really save a lot of time on the management side of keeping the network running. It requires very little time and effort."

› **Near-zero downtime at branch locations.** Customers using NSX SD-WAN reported that they experience near-zero downtime at branch locations. When minor disruptions do occur, the response is automated, and network administrators rarely intervene. But the biggest benefit is to the business, which is able to ensure continuity of its operations.

Composite Organization

Based on the interviews, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization is representative of the eight companies that Forrester interviewed and is used to present the aggregate financial analysis in the next section. The composite organization that Forrester synthesized from the customer interviews has the following characteristics:

Description of composite. The composite organization is a US-based retail holding company with multiple brands under management and approximately $2 billion in total annual revenue. Many brands have both an online and brick-and-mortar presence. Owing to the nature of its business, the company manages significant amounts of data subject to the payment card industry (PCI) data security standard. In its most recent acquisition, the company purchased a regional chain of retail stores with more than 40 locations and combined revenue of more than $100 million.

> "Because of the built-in NSX [Data Center] firewall and load balancing capabilities, we can really rethink our approach to network design and journey into some areas that would not have been possible before."
>
> *-Senior network engineer, global information services provider*

> "VeloCloud is a key infrastructural capability that allows organizations to prioritize at the application level. There's a level of guarantee on the availability of uptime and performance on the WAN."
>
> *-Chief information officer, regional supermarket chain*

Key assumptions
- $2 billion in total annual revenue
- 3,000 VMs running on 300 hosts
- 40 recently acquired branch locations

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Deployment characteristics. The following description aims to provide context for the deployment of a Virtual Cloud Network with key components of the NSX family of products:

› **Virtual network.** Prior to the deployment of NSX Data Center, the organization relied on 3,000 virtual machines, running across 300 hosts, to support mission-critical applications. Without a centralized approach to network management, it struggled to keep up with the demands of the business. In the absence of automation, it took time and effort to provision secure, segmented networks. Although it used software and hardware protection at the perimeter, its internal security was lacking.

› **WAN network.** Upon the acquisition of the chain of markets, the organization sought to reduce costs associated with managing the WAN across the branch locations. It also wanted to improve uptime and service quality. Prior to deploying NSX SD-WAN, each branch was equipped with two T1 links along with a 3G failover. Despite the high costs of these links, downtime exceeded more than 0.75 operating days at each location.

› **Cloud.** Though its transition to the public cloud is still in early stages, the composite organization does have a presence on major cloud computing platforms, to which it offers developers access alongside the private cloud resources. Additionally, some developers at the organization work with containers, but the organization is seeking a better strategy for managing the security and networking aspects of the container environment prior to offering these capabilities more broadly. It is exploring new capabilities offered by the NSX family of products to meet its evolving needs.

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Analysis Of Benefits

QUANTIFIED BENEFIT DATA AS APPLIED TO THE COMPOSITE

Total Benefits

REF.	BENEFIT	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Atr	Capital expenditure cost avoidance with NSX Data Center (brownfield deployment)	$4,374,000	$1,413,000	$1,517,400	$1,546,200	$8,850,600	$8,074,278
Btr	Operational cost avoidance for decommissioned and avoided hardware	$802,180	$95,486	$98,879	$102,611	$1,099,157	$1,047,797
Ctr	Systems admin time savings from IT and security automation	$0	$470,703	$517,773	$569,535	$1,558,012	$1,283,724
Dtr	End user productivity improvements	$393,120	$432,432	$475,675	$523,228	$1,824,455	$1,572,469
Etr	Reduced WAN connectivity costs	$0	$345,600	$345,600	$345,600	$1,036,800	$859,456
Ftr	Reclaimed losses from WAN downtime	$0	$137,700	$137,700	$137,700	$413,100	$342,440
Gtr	WAN management time savings	$0	$18,018	$18,018	$18,018	$54,054	$44,808
	Total benefits (risk-adjusted)	$5,569,300	$2,912,940	$3,111,046	$3,242,892	$14,836,177	$13,224,972

Capital Expenditure Cost Avoidance For Server And Network Hardware With NSX Data Center

In legacy environments, network resources were significantly underutilized, with an average compute utilization of approximately 15%. With NSX Data Center, customer organizations were able to improve utilization, which in turn allowed them to retire some legacy resources. It also helped customer organizations avoid capital expenditures for multiple categories of networking hardware:

› Owing to NSX Data Center's built-in routing, switching, and load-balancing capabilities, customers were able to avoid purchasing infrastructure components such as switches and load balancers.

› By choosing a microsegmentation strategy to secure internal traffic, customers were also able to avoid making significant investments in security appliances.

> The table above shows the total of all benefits across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to be a PV of more than $13.2 million.

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For the composite organization, Forrester assumes the following:

› The composite organization started out with a base of 300 host servers.

› Without NSX Data Center, the number of servers required to meet end user demand for network resources would grow by 10% each year; with NSX Data Center, the organization will require 37% fewer new servers.

› With NSX Data Center, the organization can utilize commodity servers, which on a per unit basis cost an average of $12,000 less.

› By choosing a virtual firewall strategy, the organization avoided a significant initial purchase of security appliances and avoided further investment in security appliances as demand for network resources grew.

The following risks may affect this benefit category:

› An organization's resource utilization rate prior to the deployment of NSX Data Center.

› The maturity of an organization's approach to internal security prior to the deployment of NSX Data Center.

An organization's resource utilization rate prior to the deployment of NSX Data Center may impact this benefit category. To account for this risk, Forrester applied a 10% risk adjustment to this benefit category, yielding a three-year, risk-adjusted total PV of $8,074,278.
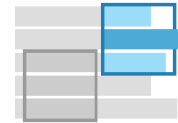
With NSX Data Center, the composite organization required 37% fewer new servers. Those it did purchase were commodity servers, and they were $12,000 cheaper, on average.

Impact risk is the risk that the business or technology needs of the organization may not be met by the investment, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for benefit estimates.

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Capital Expenditure Cost Avoidance With NSX Data Center: Calculation Table						
REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
A1	Total existing host servers with previous solution		300	330	363	399
A2	Host server growth with previous solution	Baseline: 300		30	33	36
A3	Host server growth required with NSX Data Center			19	21	23
A4	Delta in new servers required	A2-A3		11	12	13
A5	Cost per host server			$20,000	$20,000	$20,000
A6	Delta in server unit cost with existing solution versus with commodity servers on NSX Data Center			$12,000	$12,000	$12,000
A7	Host server savings with NSX Data Center	A4*(A5+A6)		$352,000	$384,000	$416,000
A8	Infrastructure purchase cost avoidance - switches, load balancers	Existing research		$570,000	$654,000	$654,000
A9	Security appliance purchase avoidance for east-west traffic	Existing research	$4,860,000	$648,000	$648,000	$648,000
At	Capital expenditure cost avoidance with NSX Data Center (brownfield deployment)	A7+A8+A9	$4,860,000	$1,570,000	$1,686,000	$1,718,000
	Risk adjustment	↓10%				
Atr	Capital expenditure cost avoidance with NSX Data Center (brownfield deployment) (risk-adjusted)		$4,374,000	$1,413,000	$1,517,400	$1,546,200

Operational Cost Avoidance For Decommissioned And Avoided Hardware

By paring down infrastructure and using it more effectively, NSX Data Center customers also avoided significant costs for infrastructure maintenance.

For the composite organization, Forrester assumes the following:

› The cost of maintenance, patching, and support for existing host servers is equal to 10% of the initial purchase price.

› When it began using NSX Data Center, the composite organization decommissioned 37% of its 300 existing servers, which had a purchase of $32,000 each or $3,584,000 in total.

› In years 1, 2, and 3, it decommissioned 11, 12, and 14 servers, respectively.

› The cost of maintenance, patching, and upkeep for the security appliances that the composite organization avoided purchasing by pursuing a virtual firewall strategy is equal to 10% of the security appliance initial purchase price.

$1.0 million

three-year benefit PV
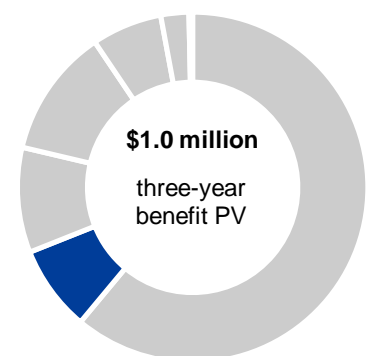
Operational cost avoidance:
8% of total benefits

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- By choosing NSX Data Center, the composite organization initially avoided the purchase of security appliances worth $4,860,000; in each subsequent year, it avoided the purchase of security appliances worth $648,000.

The following risk factors may affect the benefits realized by other organizations that deploy NSX Data Center:

- The efficiency with which organizations carry out maintenance, patching, and security prior to the NSX Data Center deployment.

- The speed with which an organization is able to decommission servers carried over from the pre-NSX Data Center environment.

To account for these risks, Forrester applied a 5% risk adjustment, yielding a three-year, risk-adjusted total PV of $1,047,797.

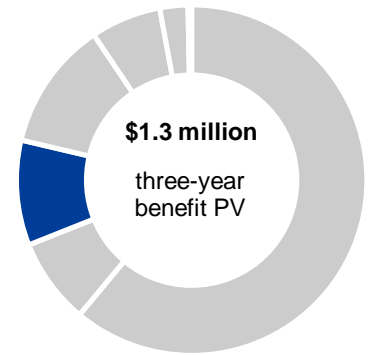| REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
Operational Cost Avoidance For Decommissioned And Avoided Hardware: Calculation Table
B1	Servers decommissionable from previous solution		112	11	12	14
B2	Maintenance, patching, and support of existing hosts	10% of server cost	$358,400	$35,712	$39,283	$43,212
B3	Maintenance, patching, upkeep of infrastructure and security appliances w/o NSX Data Center	10% of infrastructure cost	$486,000	$64,800	$64,800	$64,800
Bt	Operational cost avoidance for decommissioned and avoided hardware	B2+B3	$844,400	$100,512	$104,083	$108,012
	Risk adjustment	↓5%				
Btr	Operational cost avoidance for decommissioned and avoided hardware (risk-adjusted)		$802,180	$95,486	$98,879	$102,611

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Systems Admin Time Savings From IT And Security Automation

NSX Data Center saved administrators time by making workload provisioning, network management, and security assignment processes more efficient. One interviewee said, "We would surely need a lot more people to manage the network if not for NSX [Data Center]."

For the composite organization, Forrester assumes the following:

› In Year 1, system administrators saved a total of 6,117 hours on tasks that include workload provisioning, network management, and security policy administration.

› Time savings increased by 10% in each subsequent year.

› The organization realized this benefit by: 1) being able to avoid hiring additional system administrators at a fully loaded hourly rate of $81 and 2) reallocating existing network administrators to other tasks.

The maturity of an organization's existing network automation and security practices may impact this benefit category. To account for this risk factor, Forrester applied a 5% risk adjustment, yielding a three-year, risk-adjusted total PV of $1,283,724.

$1.3 million

three-year
benefit PV

Systems admin time savings from IT and security automation:
10% of total benefits

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
	Systems Admin Time Savings From IT And Security Automation: Calculation Table					
C1	Workload provisioning automation savings in hours			2,100	2,310	2,541
C2	Network management automation savings in hours			2,520	2,772	3,049
C3	Security posturing/policy automation savings in hours (rounded)			1,497	1,647	1,811
C4	Total hours of administrator time savings	(C1+C2+C3)		6,117	6,729	7,401
C5	Hourly cost of systems admin fully loaded			$81	$81	$81
Ct	Systems admin time savings from IT and security automation	(C1+C2+C3)*C5	$0	$495,477	$545,025	$599,511
	Risk adjustment	↓5%				
Ctr	Systems admin time savings from IT and security automation (risk-adjusted)		$0	$470,703	$517,773	$569,535

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End User Productivity Improvements

Prior to an investment in NSX Data Center, interviewees' IT organizations frequently provisioned resources that underperformed, owing to the inexact, manual process with which they were allocated. Rectifying performance issues took time, forcing end users to work with suboptimal resources and hampering productivity. NSX Data Center enabled administrators to quickly provision resources adequate to support end user workflows.

For the composite organization, Forrester assumes the following:

› Initially, the equivalent of 3,200 VMs was required to meet daily end user demand.

› Each year, end user demand for VMs increased by 10%.

› Over the course of the year (260 working days), 5% of these VMs failed or experienced degraded performance.

› Each period of failure or degraded performance lasted 15 minutes, during which end user productivity was hampered.

The following are potential risks that may affect this benefit category:

› The accuracy with which network administrators can provision resources adequate for end users to perform their jobs.

› The frequency with which end users experience performance degradation and extent to which it impacts their workflows.

To account for these risks, Forrester applied a 10% risk adjustment, yielding a three-year, risk-adjusted total PV of $1,572,469.

$1.6 million

three-year benefit PV
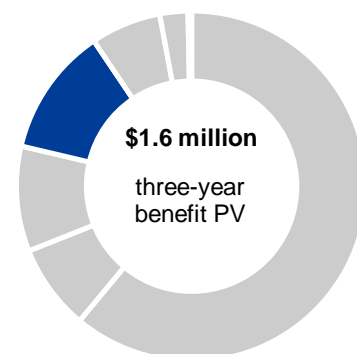
End user productivity improvements:
12% of total benefits

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
	End User Productivity Improvements: Calculation Table					
D1	Active VM user usage across the enterprise, per year	4,000 VMs daily at 80% utilization	832,000	915,200	1,006,720	1,107,392
D2	Frequency of degradation occurrences with prior solution	5% of VM degrade/fail	41,600	45,760	50,336	55,370
D3	Duration of average performance degradation leading to lower end user productivity (hours)	1/4 hour per degrade/fail	10,400	11,440	12,584	13,842
D4	Average hourly wage of end user fully loaded	$42/hour	$42	$42	$42	$42
Dt	End user productivity improvements	D3*D4	$436,800	$480,480	$528,528	$581,364
	Risk adjustment	↓10%				
Dtr	End user productivity improvements (risk-adjusted)		$393,120	$432,432	$475,675	$523,228

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Reduced WAN Connectivity Costs

By switching to an SD-WAN architecture with NSX SD-WAN, the customers were able to reduce the costs associated with connectivity while also improving the quality of service to branch locations. Previously, they relied on expensive T1 and MPLS connections. With NSX SD-WAN, they were able to switch to commodity broadband links, which are available at a much lower cost. The chief information officer of a regional chain of fresh food markets estimated cost savings of more than $130,000 for connectivity, while the global network operations manager for a mining company estimated cost savings at just over $1 million.

For the composite organization, Forrester assumes the following:

› The organization replaced its existing T1 and 3G failover connections with commodity broadband and 4G failover connections at each of its 40 locations.

› For each location, the organization realized $800 in monthly cost savings for connectivity.

The following risk factors may affect the benefits realized by other organizations that deploy NSX SD-WAN:

› The cost of an organization's existing connectivity options.

› The cost of broadband connectivity at branch locations.

To account for these risks, Forrester applied a 10% risk adjustment, yielding a three-year, risk-adjusted total PV of $859,456.

$859,456

three-year benefit PV
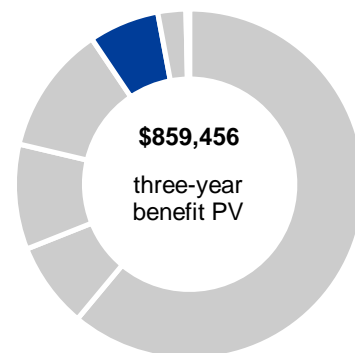
Reduced WAN connectivity costs: 6% of total benefits

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
E1	Per location connectivity costs for T1 connections with 3G failover	Monthly		$1,100	$1,100	$1,100
E2	Per location connectivity costs for broadband with 4G failover	Monthly		$300	$300	$300
E3	Branch locations			40	40	40
Et	Reduced WAN connectivity costs	(E1-E2)*E3*12	$0	$384,000	$384,000	$384,000
	Risk adjustment	↓10%				
Etr	Reduced WAN connectivity costs (risk-adjusted)		$0	$345,600	$345,600	$345,600

Reduced WAN Connectivity Costs: Calculation Table

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Reclaimed Losses From WAN Downtime

Prior to deploying NSX SD-WAN, the customers Forrester spoke with experienced significant amounts of downtime on the WAN. Weather, for example, frequently put T1 connections temporarily out of commission, according to one customer. In some cases, the 3G connection provided an emergency fallback to keep applications up and running, but network administrators had to scramble to set priority levels for network traffic. Despite these efforts, it was typical for each organization that Forrester interviewed to experience downtime in excess of one day for each branch location. When downtime occurred, normal business operations (such as point-of-sale transactions) ground to a halt. With NSX SD-WAN, the customers reduced downtime to near zero.

For the composite organization, Forrester assumes the following:

› Prior to the NSX SD-WAN deployment, the organization experienced 0.75 operational days of annual downtime at each of its 40 locations or a total of 30 days across all locations.

› For each day of downtime, the organization lost an average of $8,000 in revenue, on which it realized a 20% gross margin.

› By reducing downtime and ensuring that branches can continue normal operations, the organization is able to reclaim $48,000 in gross margin.

› Additionally, for each day of downtime, the organization avoids $1,500 in costs associated with lost employee productivity as well as an additional $2,000 in costs associated with network recovery, including overtime pay for network administrators.

The following risk factors may affect the benefits realized by other organizations that deploy NSX SD-WAN:

› The amount of downtime an organization experiences with its current WAN infrastructure.

› The extent to which downtime impacts normal business operations.

To account for these risk factors, Forrester applied a 10% risk adjustment, yielding a three-year, risk-adjusted total PV of $342,440.

With NSX SD-WAN, customers reduced downtime to near zero.

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Reclaimed Losses From WAN Downtime: Calculation Table						
REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
F1	Average number of days of downtime per location for previous WAN configuration			0.75	0.75	0.75
F2	Number of locations			40	40	40
F3	Total days of downtime across all locations (annual)			30	30	30
F4	Estimated daily loss of revenue owing to downtime	Customer interviews		$8,000	$8,000	$8,000
F5	Gross margin on goods sold			20%	20%	20%
F6	Total reclaimed gross margin (annual)	F3*F4*F5		$48,000	$48,000	$48,000
F7	Estimated cost of lost productivity for each day of downtime			$1,500	$1,500	$1,500
F8	Total cost of lost productivity (annual)	F3*F7		$45,000	$45,000	$45,000
F9	Estimated cost of internal effort, including overtime, for network recovery for each day of downtime			$2,000	$2,000	$2,000
F10	Total cost of network recovery efforts (annual)	F3*F9		$60,000	$60,000	$60,000
Ft	Reclaimed losses from WAN downtime	F6+F8+F10	$0	$153,000	$153,000	$153,000
	Risk adjustment	↓10%				
Ftr	Reclaimed losses from WAN downtime (risk-adjusted)		$0	$137,700	$137,700	$137,700

WAN Management Time Savings

Each of the customers using NSX SD-WAN reported significant time savings, owing in large part to how easy the cloud tools make it to manage the network. The chief technology officer for the holding company said that his team spends only one-third of the time managing the WAN that it did prior to the NSX SD-WAN deployment. Among the reasons the network is so much easier to manage, according to the global network operations manager for the mining company, is the availability of centralized controls: "With the [NSX SD-WAN by] VeloCloud model, you don't manage each of the individual [NSX SD-WAN by] VeloCloud routers, you simply change policy in the centralized controller, and the changes get pushed out to all of the sites."

For the composite organization, Forrester assumes the following:

> The team that manages the WAN comprises two IT managers as well as three network administrators.

> With the previous environment, each team member committed 10% of their total time to the task of managing the WAN.

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› With NSX SD-WAN, managing the WAN requires 35% less effort than it did prior to the deployment.

The following are potential risks that may affect this benefit category:

› The complexity of existing tools organizations use for WAN management.

› The efficiency of existing processes organizations employ to manage the WAN environment.

To account for these risks, Forrester applied a 10% risk adjustment, yielding a three-year, risk-adjusted total PV of $34,915.

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
	WAN Management Time Savings: Calculation Table					
G1	IT manager hourly rate fully burdened	US Bureau of Labor Statistics		$70	$70	$70
G2	Number of IT managers dedicated to managing the WAN			2	2	2
G3	Percentage of time dedicated to managing the previous WAN environment			10%	10%	10%
G4	Total IT manager hours dedicated to managing the previous WAN environment	2080 hours*G2*G3		416	416	416
G5	Network administrator hourly rate fully burdened	US Bureau of Labor Statistics		$45	$45	$45
G6	Number of network administrators dedicated to managing the WAN			3	3	3
G7	Percentage of time dedicated to managing the previous WAN environment			10%	10%	10%
G8	Total network administrator time dedicated to managing the previous WAN environment	2080 hours*G6*G7		624	624	624
G9	Reduction in effort to manage WAN environment with NSX SD-WAN			35%	35%	35%
Gt	WAN management time savings	(G1*G4)+(G5*G8)*G9	$0	$20,020	$20,020	$20,020
	Risk adjustment	↓10%				
Gtr	WAN management time savings (risk-adjusted)		$0	$18,018	$18,018	$18,018

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Unquantified Benefits

The benefit of improved security — a direct result of a microsegmentation strategy — has not been factored into this analysis:

› Most security breaches can be attributed to internal sources; securing east-west (internal) data flows can limit the impact of an incident. In 2017, the average cost of a security breach was $3.62 million, and organizations faced, on average, a 28% chance of falling victim to a recurring material data breach, according to the Ponemon Institute.[3] The reduction in risk exposure that accompanies any major improvement in internal security has not been factored into the ROI.

Flexibility

The value of flexibility is clearly unique to each customer, and the measure of its value varies from organization to organization. There are multiple scenarios in which a customer might choose to implement Virtual Cloud Network and later realize additional uses and business opportunities, including the following:

› **Building with the NSX Data Center RESTful API.** The NSX Data Center RESTful API makes NSX extensible, enabling an integrated experience across VMware products and partner solutions. IT organizations retain flexibility and can efficiently provision complex networks, regardless of the underlying topology and components. One customer said that this flexibility was a key reason her organization chose NSX.

› **Supporting digital transformation.** Several interviewed organizations are aggressively pursuing digital transformations. With these initiatives, they expect to see greater demand for cloud resources across the enterprise. This growth has not been factored into the ROI analysis discussed in this study. However, these customers — as well as others pursuing digital transformation initiatives — may see accelerating returns on an investment that allows them to provision network resources securely and efficiently.

› **Growing teams, growing skills.** While efficiency is often associated with lower headcount, interviewees stated that their IT organizations are expanding as demand for their services continues to grow. In turn, this demand creates new jobs and new opportunities. Requests for new features push teams to their limits, expanding their skill sets.

› **Transitioning to containers.** One interviewee reported that while a growing number of its developers are anxious to work with containers, it needs to firm up a strategy for managing the security and networking aspects of the container environment. NSX Data Center will make executing on this strategy easier as it supports automated network provisioning and security for container environments.

› **Scaling up use of the public cloud.** The organizations interviewed for this study leverage both private and public cloud resources. As the latter becomes a bigger part of the infrastructure, they expect to realize efficiencies from being able to manage security across the private and public cloud environments using the NSX management console.

Moving forward, customers expect to realize efficiencies from being able to manage security across the private and public cloud environments using the NSX console.

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for a future additional investment. This provides an organization with the "right" or the ability to engage in future initiatives but not the obligation to do so.

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> › **Ensuring network stability.** NSX SD-WAN customers reported near-zero downtime, helping them to reclaim revenue that would otherwise be lost. The current analysis considers the benefits of deploying NSX SD-WAN across a small part of an organization's footprint; large organizations may benefit from scale, particularly where each hour of downtime is measured in millions of dollars.

> › **Simplifying network architecture.** Prior to adopting NSX SD-WAN, the mining company interviewed for this study maintained about 50 servers around the globe to ensure that business critical data was always available at each of its 60 sites. The company couldn't afford to go without this data if a WAN link went down or if bandwidth was constrained, the global network operations manager said. With the NSX SD-WAN setup, bandwidth isn't ever an issue, and the company was able to create a cloud repository for its data and retire the servers.

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Analysis Of Costs

QUANTIFIED COST DATA AS APPLIED TO THE COMPOSITE

Total Costs

REF.	COST	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Htr	License and support costs for NSX Data Center	$3,287,650	$986,295	$1,019,171	$1,055,336	$6,348,452	$5,819,461
Itr	Deployment and training costs for NSX Data Center	$295,009	$0	$9,884	$0	$304,893	$303,177
Jtr	Cost of deployment and ongoing management of SD-WAN environment	$78,750	$0	$0	$0	$78,750	$78,750
Ktr	Cost of SD-WAN software and hardware	$0	$92,232	$92,232	$92,232	$276,696	$229,367
	Total costs (risk-adjusted)	$3,661,409	$1,078,527	$1,121,287	$1,147,568	$7,008,791	$6,430,755

License And Support Costs For NSX Data Center

Licenses are only purchased for the hosts that will serve the virtual network, and prices are tied to the number of CPU sockets on a system. Ongoing support is offered at a percentage of total license costs.

For the composite organization, Forrester assumes the following:

› Each year, demand for virtual network resources increased by 10%.

› The annual cost of ongoing service and support is equal to 25% of the initial cost of licenses.

License and support cost estimates were supplied by VMware and confirmed by the customers. Therefore, Forrester did not apply a risk adjustment to this cost category. The composite organization incurred three-year license and support costs of $5,819,461 in PV.

> The table above shows the total of all costs across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total costs to be a PV of more than $6.4 million.

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
License And Support Costs For NSX Data Center: Calculation Table						
H1	NSX Data Center license cost		$2,630,120	$263,012	$289,313	$318,245
H2	NSX Data Center service and support		$657,530	$723,283	$729,858	$737,091
Ht	License and support costs for NSX Data Center	H1+H2	$3,287,650	$986,295	$1,019,171	$1,055,336
	Risk adjustment	0%				
Htr	License and support costs for NSX Data Center (risk-adjusted)		$3,287,650	$986,295	$1,019,171	$1,055,336

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Deployment And Training For NSX Data Center

Customers paid for professional services and training for systems administrators, which helped to accelerate implementation and production readiness.

For the composite organization, Forrester assumes the following:

> There is a one-time cost for professional services.

> The organization incurred an initial cost for VMware training; owing to churn, and the need to train new employees, it incurred an additional cost for VMware training in Year 2.

> Each system administrator requires 120 hours of training.

> There is an opportunity cost associated with training system administrators, which is calculated with respect to their fully burdened hourly rate of pay.

> It took two months for system administrators to reach full productivity levels; during the two-month ramp-up period they worked at a 50% rate of productivity.

The following risk factors may affect costs incurred by other organizations:

> The existing skillsets of systems administrators, and the level of training they require.

> The amount of churn, which results in the need to train new employees, among systems administrators.

To account for these risks, Forrester applied a 10% risk adjustment, yielding a risk-adjusted total cost of $303,177 in PV.

> Implementation risk is the risk that a proposed investment may deviate from the original or expected requirements, resulting in higher costs than anticipated. The greater the uncertainty, the wider the potential range of outcomes for cost estimates.

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
I1	VMware design and deployment of professional services		$200,000			
I2	VMware training services program		$8,250		$4,125	
I3	Cost of system admin per hour		$81	$81	$81	$81
I4	Cost of system admin training, initial	120 hours per admin, three admins	$19,440		$4,860	
I5	Cost of system admin ramp-up period	50% productivity for two months, three admins	$40,500			
It	Deployment and training for NSX Data Center	I1+I2+I4+I5	$268,190	$0	$8,985	$0
	Risk adjustment	↑10%				
Itr	Deployment and training for NSX Data Center (risk-adjusted)		$295,009	$0	$9,884	$0

Deployment And Training For NSX Data Center: Calculation Table

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Cost Of Deployment Of The SD-WAN Environment

The customers took different approaches to deploying the NSX SD-WAN solution. One relied entirely on a third-party systems integrator. Others completed the deployment with internal staff. Time devoted to project planning and network architecture design varied, but all interviewees reported actual setup times of 90 minutes or less. (Among the customers interviewed for this study, the maximum amount of time spent on project planning and network architecture design was 400 hours.) The global network operations manager for the mining company also indicated that branch setup can be completed by business personnel and without IT staff on site, which keeps costs for bringing up new locations low.

For the composite organization, Forrester assumes the following:

› The organization relied on a third-party systems integrator to complete the initial deployment.

› To deploy the SD-WAN solution across all branch locations, the systems integrator charged fees of $75,000.

The following risk factors may affect costs incurred by other organizations:

› The efficiency with which an organization's staff can carry out installation procedures.

› The dispersion of branch locations, which may impact third-party systems integrator cost estimates.

To account for these risks, Forrester applied a 5% risk adjustment, yielding a risk-adjusted total cost of $78,750 in PV.

One customer noted that setup of the NSX SD-WAN equipment can be completed by business personnel and without IT staff on site, which keeps branch setup costs low.

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
	Cost Of Deployment Of SD-WAN Environment: Calculation Table					
Jt	Cost of deployment and ongoing management of SD-WAN environment		$75,000	$0	$0	$0
	Risk adjustment	↑5%				
Jtr	Cost of deployment and ongoing management of SD-WAN environment (risk-adjusted)		$78,750	$0	$0	$0

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Cost Of SD-WAN Software And Hardware

The NSX SD-WAN pricing model allows customers to shift from a capex to an opex cost structure; all of the customers interviewed for this study preferred the latter.

The customers incur monthly charges for the rental of gateways and SD-WAN appliances as well as access to cloud-based network management tools. The cost estimates for the composite organization shown in the table below assume that it chose the most common package and price tier along with a bandwidth of 50 Mbps.

License and support cost estimates were supplied by VMware and confirmed by the customers. Therefore, Forrester did not apply a risk adjustment to this cost category. The composite organization incurred three-year SD-WAN software and hardware costs of $229,367 in PV.

**The NSX SD-WAN pricing model allows customers to switch from a CAPEX to an OPEX cost structure.**

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
Cost Of SD-WAN Software And Hardware: Calculation Table						
K1	Monthly per location costs for gateway and SD-WAN appliance rental and cloud portal access (rounded)			$192	$192	$192
K2	Branch locations			40	40	40
Kt	Cost of SD-WAN software and hardware	K1*K2*12	$0	$92,232	$92,232	$92,232
	Risk adjustment	0%				
Ktr	Cost of SD-WAN software and hardware (risk-adjusted)		$0	$92,232	$92,232	$92,232

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Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)

- Total costs
- Total benefits
- Cumulative net benefits
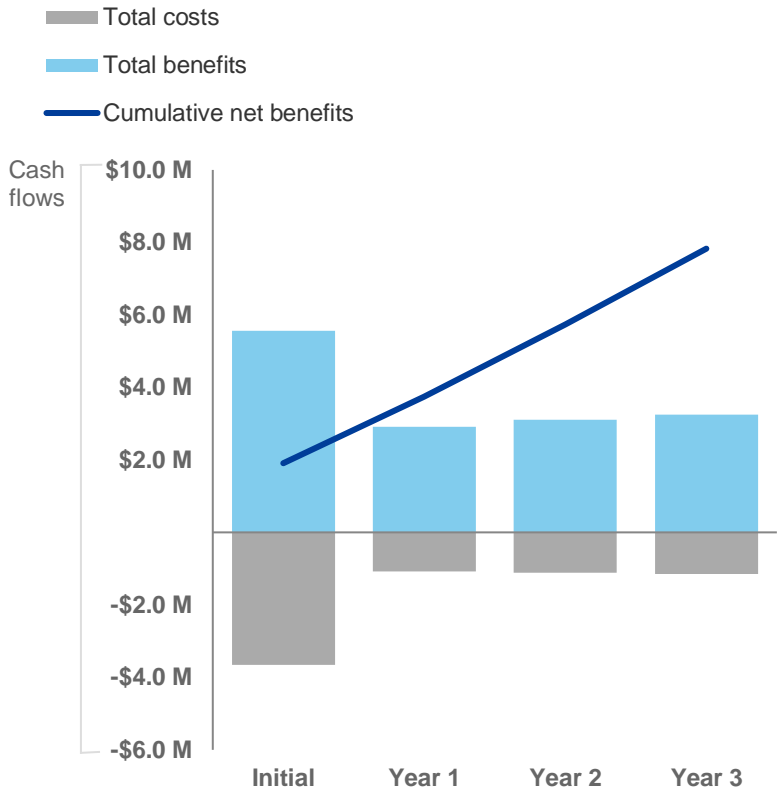
The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

These risk-adjusted ROI, NPV, and payback period values are determined by applying risk-adjustment factors to the unadjusted results in each Benefit and Cost section.

Cash Flow Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Total costs	($3,661,409)	($1,078,527)	($1,121,287)	($1,147,568)	($7,008,791)	($6,430,755)
Total benefits	$5,569,300	$2,912,940	$3,111,046	$3,242,892	$14,836,177	$13,224,972
Net benefits	$1,907,891	$1,834,413	$1,989,759	$2,095,324	$7,827,387	$6,794,217
ROI						106%
Payback period						<6 months

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VMware NSX: Delivering The Virtual Cloud Network

The following information is provided by VMware. Forrester has not validated any claims and does not endorse VMware or its offerings.

The Virtual Cloud Network is a vision for the future of networking to empower customers to connect and secure applications and data, regardless of where they run — from edge to edge. Virtual Cloud Networking is the category of next-generation networking service technology increasingly being adopted across IT organizations to provide a digital fabric that helps unify a hyper-distributed world.

› A Virtual Cloud Network enables organizations to embrace a virtual fabric as the software-defined architecture for connecting everything in a distributed world, representing a significant advancement in enterprise networking.

› Security is architected-in, not bolted on. This is key as the old rule of "perimeter security" evolves from being a perimeter around a data center to one that is application and data-centric — and intrinsic to the entire cloud fabric.

› All of this can only be done in software, consistent networking from end-to-end. A Virtual Cloud Network is a ubiquitous software layer from data center to cloud to edge infrastructure that provides customers with maximum visibility of and context for the interaction among users, applications, and data.

The VMware NSX portfolio delivers on the vision of the Virtual Cloud Network, enabling organizations to connect, secure, and operate an edge-to-edge architecture, and delivers networking and security services to applications and data through a common operating environment.

VMware's approach to delivering the Virtual Cloud Network:

› Enables designing and building the next-generation policy-driven data center that connects, secures, and automates traditional (hypervisor) as well as new microservices-based (container) applications across a range of deployment targets (data center, cloud, branch, etc.).

› Embeds security into the platform, compartmentalizing the network through microsegmentation and automatically detecting and responding to security threats.

› Delivers a WAN solution that provides full visibility, metrics, control, and automation of all endpoints.

› Integrates with VMware's management, analytics, and automation platform to build a full closed loop cycle on defining, deploying, monitoring, and taking business action.
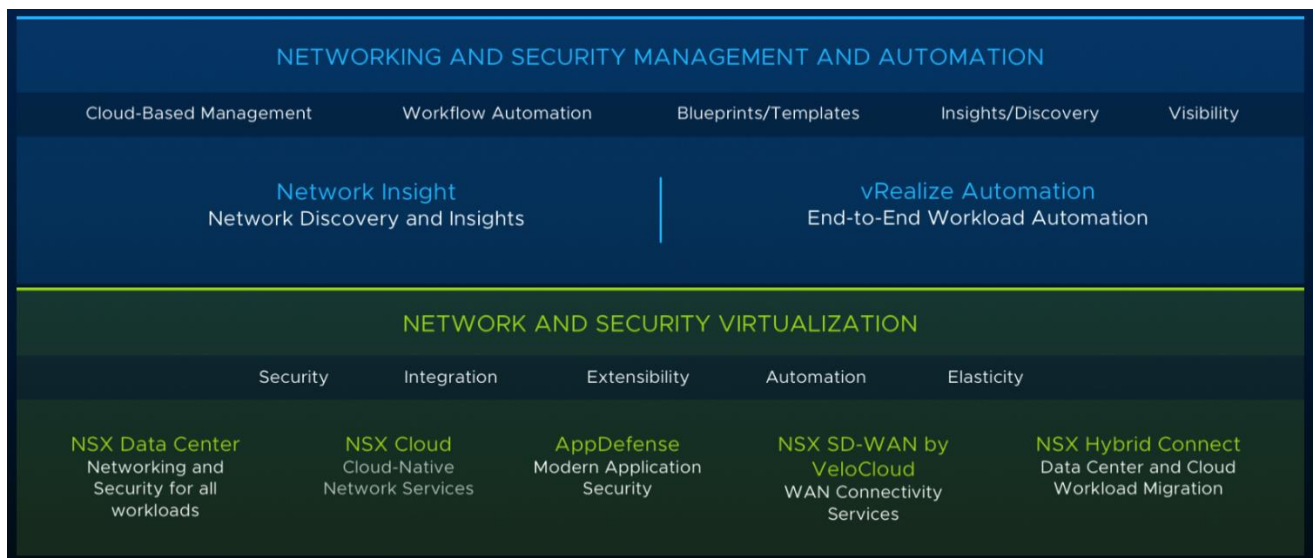
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Appendix A: Total Economic Impact

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

Total Economic Impact Approach

Benefits represent the value delivered to the business by the product. The TEI methodology places equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization.

Costs consider all expenses necessary to deliver the proposed value, or benefits, of the product. The cost category within TEI captures incremental costs over the existing environment for ongoing costs associated with the solution.

Flexibility represents the strategic value that can be obtained for some future additional investment building on top of the initial investment already made. Having the ability to capture that benefit has a PV that can be estimated.

Risks measure the uncertainty of benefit and cost estimates given: 1) the likelihood that estimates will meet original projections and 2) the likelihood that estimates will be tracked over time. TEI risk factors are based on "triangular distribution."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in the summary tables are the sum of the initial investment and the discounted cash flows in each year. Sums and present value calculations of the Total Benefits, Total Costs, and Cash Flow tables may not exactly add up, as some rounding may occur.

Present value (PV)

The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total NPV of cash flows.

Net present value (NPV)

The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.

Return on investment (ROI)

A project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits less costs) by costs.

Discount rate

The interest rate used in cash flow analysis to take into account the time value of money. Organizations typically use discount rates between 8% and 16%.

Payback period

The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

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Endnotes

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[1] Source: "Best Practices: Mitigating Insider Threats," Forrester Research, Inc., November 2, 2017.

[2] Source: "2017 Cost of Data Breach Security: Global Overview," Ponemon Institute, June 13, 2017 (https://www.ponemon.org/library/2017-cost-of-data-breach-study-united-states).

[3] Ibid.

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