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The Total Economic Impact™ Of Juniper Networks' JUNOS Network Operating System

Multicompany Analysis

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Executive Summary

In February 2009, Juniper Networks commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by deploying JUNOS in an enterprise network environment. JUNOS is the network operating system software that is used to provision and operate Juniper Network's switches and routers. This study illustrates the financial impact of JUNOS on an organization's network operations and business.

In conducting in-depth interviews with 10 existing customers, Forrester found that these companies, through the use of JUNOS and Juniper switches and routers, achieved a 40% reduction in operations costs for certain network operations tasks including planning and provision, deployment, and planned and unplanned network events.

Purpose

The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of JUNOS on their organizations. Forrester's aim is to clearly show all calculations and assumptions used in the analysis. Readers should use this study to better understand and communicate a business case for investing in JUNOS.

Methodology

Juniper Networks selected Forrester for this project because of its industry expertise in enterprise networking technology and Forrester's Total Economic Impact™ (TEI) methodology. TEI not only measures costs and cost reduction (areas that are typically accounted for within IT); it also weighs the enabling value of a technology in increasing the effectiveness of overall business processes.

For this study, Forrester employed four fundamental elements of TEI in modeling JUNOS:

1. Costs and cost reduction.
2. Benefits to the entire organization.
3. Flexibility.
4. Risk.

Given the increasing sophistication that enterprises have regarding cost analyses related to IT investments, Forrester's TEI methodology serves an extremely useful purpose by providing a complete picture of the total economic impact of purchase decisions. Please see Appendix B for additional information on the TEI methodology.

Approach

Forrester used a five-step approach for this study:

1. Forrester gathered data from existing Forrester research relative to network operating systems and the networking market in general.
2. Forrester interviewed Juniper Networks marketing and sales personnel to fully understand the potential (or intended) value proposition of the JUNOS network operating system.
3. Forrester conducted a series of in-depth interviews with 10 organizations currently using Juniper's routers, switches, and JUNOS software.

4. Forrester constructed a financial model representative of the interviews. This model can be found in the TEI Framework section, below.

5. Forrester created a composite organization based on the interviews and populated the framework using data from the interviews as applied to the composite organization.

Key Findings

Forrester's study yielded three key findings:

- **ROI.** Based on the interviews with the 10 existing customers, Forrester constructed a TEI framework for a composite organization (see Appendix A) and the associated ROI analysis illustrating the financial impact areas. A risk-adjusted ROI takes into account the variability of original cost and benefit estimates. The payback period is the time taken for the accrued benefits to exceed the accrued costs. Key highlights include:
    - Three-year risk adjust ROI of 63%.
    - Positive financial payback within 0.8 years or nine months.
- **Benefits.** Benefits identified by the interviewed organizations include cost savings across a spectrum of network operations management tasks and cost avoidance associated with not hiring additional network operations support staff. The composite organization assumes these specific benefits:
    - **Reduction in network downtime costs: 27%.** This reflects savings associated with a reduction in the frequency and duration of unplanned network events.
    - **Reduction in maintenance and support costs: 54%.** This reflects savings associated with a reduced effort needed to perform planned network events or tasks.
    - **Reduction in deployment time costs: 25%.** This reflects savings associated with a reduced effort needed to perform tasks that add infrastructure to the network.
    - **Cost savings associated with increased network stability and reliability: 41%.** This reflects the combined savings associated with reduced effort needed to perform planned and unplanned events.
    - **Reduction in overall network operations costs: 41%.** This reflects the combined total savings associated with planned, unplanned, planning and provisioning, and adding infrastructure tasks.
    - **Cost savings associated with decreased resolution times: 40%.** This reflects savings associated with the reduced time needed to resolve unplanned network events.
    - **Avoiding hiring additional network administrators to support JUNOS.** Organizations noted that the ease of use associated with JUNOS and the reduced effort required to perform planned and unplanned network operations tasks allowed them to avoid hiring additional staff to maintain their Juniper environment. The composite organization assumes a $297,697 savings over the three-year period of this analysis.

- **Costs.** Costs to deploy and maintain JUNOS include network administrator training, software maintenance and support costs, and professional services fees. This amounts to $238,065 over the three-year analysis period.

Table 1 illustrates the risk-adjusted cash flow for the composite organization, based on data and characteristics obtained during the interview process. Forrester risk-adjusts these values to take into account the potential uncertainty that exists in estimating the costs and benefits of a technology investment. The risk-adjusted value is meant to provide a conservative estimation, incorporating any potential risk factors that may later affect the original cost and benefit estimates. For a more in-depth explanation of risk and risk adjustments used in this study, please see the "Risk" section.

Table 1: Summary Financial Metrics, Composite Organization

Summary financial results	Original estimate	Risk-adjusted
ROI	75%	63%
Payback period (years)	0.7	0.8
Total costs (PV)	($220,082)	($238,065)
Total benefits (PV)	$384,747	$387,011
Total (NPV)	$164,665	$148,946

Source: Forrester Research, Inc.

Disclosures

The reader should be aware of the following:

- The study is commissioned by Juniper Networks and delivered by the Forrester Consulting group.
- Juniper Networks 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.
- The customer names for the interviews were provided by Juniper Networks.
- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers should use their own estimates within the framework provided in the report to determine the appropriateness of an investment in JUNOS.
- This study is not meant to be used as a competitive product analysis.

Juniper Networks JUNOS: Overview

According to Juniper Networks, JUNOS software is Juniper Networks' network operating system running on Juniper's routing, switching and security platforms.

Key features of the software include:

- A single operating system across all platforms which makes planning easier, day-to-day operations more intuitive and implementation faster. Network administrators can configure and manage functionality from the chassis to routing using the same tools and to monitor, manage, and update the entire network.

- One release train for the software which provides stable delivery of new features in a steady cadence. Each new version builds upon the prior, so features remain consistent and new versions are released concurrently for all devices run by JUNOS software.

- A modular software architecture where the separation of the control and forwarding functions of the operating system provide offer predictable performance and scalability from small to very large platforms across product lines.

Analysis

As stated in the Executive Summary, Forrester took a multistep approach to evaluate the impact that implementing JUNOS can have on an organization:

- Interviews with Juniper Networks' marketing and sales personnel to fully understand the potential (or intended) value proposition of JUNOS.

- In-depth interviews of 10 organizations currently using JUNOS.

- Construction of a composite organization based on characteristics of the interviewed organizations.

- Construction of a common financial framework for the implementation and operations of JUNOS.

Interview Highlights

> *"If I lost my job today and started for some new company and was building a brand-new building, would I put in 100% Juniper? Absolutely."* Director, Network Operations

A total of 10 interviews were conducted for this study, involving representatives from the following companies and organizations (Juniper Networks customers based in the United States, Europe and Australia):

1. A defense contractor that uses its network to support its research and development functions, to provide real-time proof-of-concept tests in sales events, and to support everyday business applications.

2. A subsidiary of a financial services company with six data centers and 50 locations globally. The subsidiary provides network services for its employees and all the companies that are owned by the parent firm.

3. A high-tech manufacturer whose R&D and global sales team require a network that can support high-performance voice and video applications.

4. A manufacturer of consumer and industrial energy control products, with manufacturing and distribution facilities in Europe, Asia, North America, and Latin America.

5. An international financial services firm that is headquartered in Europe.

6. A governmental organization with locations in more than 130 countries.

7. A state university that provides services for 5,700 users, as well as nine local counties and 30 school districts.

8. A private school serving grades 5 through 12 with student body of 1,000 and staff of 160.

9. An online movie ticketing service that represents more than 10,000 theatres in the US.

10. A major domain name registrar that serves more than 3 million domain names.

The composite organization created from these interviews represents a company that serves 4,000 users in 30 locations in various parts of the globe. The network is supported by seven full-time administrators and engineers. The organization uses network hardware from multiple providers.

The 10 in-depth interviews found that the organizations faced a common set of challenges with their existing infrastructure that drove them to seek solutions from alternate vendors. The firms wished to:

- **Lower network operations costs and simplify overall network operations.** The organizations found that the effort required to introduce new gear into the network, perform upgrades, and roll out software patches had become too burdensome, and that the problem was exacerbated by having to support multiple disparate network operating systems.

- **Support high performance applications and services like video and voice.** The organizations were struggling to reliably support voice, video, and proprietary high-performance applications. Network instability when running these applications was having a negative impact on mission-critical business functions.

- **Establish a network infrastructure that could scale simply in line with anticipated growth in network traffic.** The current infrastructure couldn't keep pace with network traffic growth and required significant upgrading.

Our interviews with these organizations yielded the following insights:

- The single release train for JUNOS allowed them to reduce the task time needed to test and deploy software upgrades and patches. Also, the frequency of software upgrade events decreased. The organizations like the predictability of the JUNOS software release schedule. According to a director of network operations: "It's not only the reliability of having a single chain, but also the way they release their software — you can then plan ahead when you can introduce new features."

- The organizations experienced an overall more stable network environment that they attributed to the (modular) design of JUNOS and the underlying hardware. As one director of network operations remarked: "I can't think of a single instance where we've put a new

router, switch, whatever in place, that's running a later version of JUNOS that we've had a situation where it wouldn't communicate or interoperate with what was already there." Interviewees reported reductions in downtime occurrences ranging from 10% to 500%.

- Networks that used Juniper hardware scaled smoothly when running high-performance applications under high traffic loads. One network operations manager said: "Our previous vendor could not accommodate (micro-bursts) with their current set of hardware. So we were faced with customer demos going bad . . . every time we put in a Juniper piece of equipment where we had issues, those issues go away. It was exactly the right platform for exactly our needs."

- The organizations experienced reduced network operations costs, especially in those tasks associated with testing new software, planned network upgrades, maintenance, and troubleshooting. For planned events, companies reported reduction in task times ranging from 50% to 66%. For adding infrastructure tasks, interviewees reported reduction in task times ranging from 30% to 50%. According to a network operations manager, "The operational guys have had less load due to the reliability that we've seen."

TEI Framework

Introduction

From the information provided in the in-depth interviews, Forrester has constructed a TEI framework for those organizations considering implementation of JUNOS. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that impact the investment decision.

Composite Organization

Based on the interviews with the 10 existing customers provided by Juniper Networks, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas impacted financially. The composite organization that Forrester synthesized from these results represents a company with 4,000 employees in 30 locations. See Appendix A for more details on the composite organization.

Framework Assumptions

Table 2 lists the discount rate used in the PV and NPV calculations and time horizon used for the financial modeling.

Table 2: General Assumptions

Ref.	General assumptions	Value
	Discount rate	10%
	Length of analysis	Three years

Source: Forrester Research, Inc.

Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with Finance to determine the most appropriate discount rate to use within their own organizations.

In addition to the financial assumptions used to construct the cash flow analysis, Table 3 provides salary assumptions used within this analysis.

Table 3: Salary Assumptions

Ref.	Metric	Calculation	Value
A1	Hours per week		40
A2	Weeks per year		52
A3	Hours per year (M-F, 9-5)		2,080
A4	Hours per year (24x7)		8,736
A5	Network administrator fully loaded salary		$110,500
A6	Hourly	(A5/A3)	$53

Source: Forrester Research, Inc.

Costs

The costs of deploying, maintaining, and operating the JUNOS software include training costs for network administrators and engineers, professional services costs incurred when initially deploying Juniper hardware, and ongoing software maintenance costs.

Excluded from the cost analysis are network hardware acquisition costs and network administrator salaries. Our interviews found that there were insignificant differences in hardware costs between Juniper and alternate vendors and these costs would have been born irrespective of which network hardware vendor was chosen. Similarly, network administrator and engineers' salaries were already incurred to support their current networks.

Training For Network Administrators And Engineers

To adequately provision, operate, and maintain the Juniper hardware, Forrester assumes that network administrators and engineers will undergo relevant training to become proficient at all the necessary task required to support Juniper hardware and switches. We assume that seven administrators will take training classes for routers and switches during the initial deployment period, and one administrator will undergo training during the subsequent years. Using a list price of $2,700 per class, the initial training costs are $37,800 and the ongoing training costs are $5,400 (see Table 3). Forrester recognize that Juniper Networks offers JUNOS Fast Track training, which is a self-paced, online training option that allows customers to obtain JUNOS certification for free.

Table 3: Network Administrator Training Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
A1	Number of administrators		7			
A2	Cost per administrator		$5,400			
At	Network administrator JUNOS training costs	A1 * A2	$37,800	$5,400	$5,400	$5,400

Source: Forrester Research, Inc.

Professional Services Fees

During the course of a major network upgrade or when a company introduces a new vendor's gear into its network, we assume that the composite organization uses third-party professional services to accelerate the design and implementation process. The professional services fill any skill gap shortages that the customer may have. For the composite company, we assume a professional services fee of $30,000 (see Table 4).

Table 4: Professional Services Fees For Initial Network Architecture and Configuration

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
B1	Professional services fees		$30,000			
Bt	Professional services fees (total)		$30,000			

Source: Forrester Research, Inc.

Software And Hardware Maintenance Costs

Annual hardware and software maintenance charges are based on the type and configuration of the network equipment. The maintenance costs are base on Juniper's service-level description, which provides customers 12x5 next business day parts delivery, 24x7 technical support, software updates and upgrades, and access to customer support center Web services. This cost is shown in Table 5.

The annual maintenance costs are based on the generic network configuration of the composite organization, and are shown in Table 5.

Table 5: Annual Maintenance

Ref.	Metric	Calculation	Per Period
C1	Annual maintenance costs		$55,835
Ct	Hardware/software support and maintenance	C1	$55,835

Source: Forrester Research, Inc.

Total Costs

The total incremental cost for the composite organization for deploying and maintaining JUNOS is shown in Table 6.

Table 6: Total Costs, Non-Risk-Adjusted

Cash flow analysis (original estimates)						
Costs	**Initial**	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present value**
Network administrator JUNOS training	(37,800)	(5,400)	(5,400)	(5,400)	(54,000)	(51,229)
Hardware/software support and maintenance		(55,835)	(55,835)	(55,835)	(167,505)	(138,853)
Professional services fees	(30,000)				(30,000)	(30,000)
Total	($67,800)	($61,235)	($61,235)	($61,235)	($251,505)	($220,082)

Source: Forrester Research, Inc.

Benefits

Among the Juniper customers interviewed, benefits included reduction in operations support costs, resulting in a reduction in the frequency and/or duration of provisioning, deployment, and planned maintenance events. The interviewed customers also experienced reductions in frequency and duration of unplanned events that cause network downtime and were able to avoid hiring additional network support staff.

Costs Avoided By Not Hiring Network Administrators

Organizations we interviewed had planned to hire new additional network administrators or engineers to support the Juniper hardware. This was done in anticipation of introducing new and unfamiliar hardware and software into the network environment which would require new skill sets to support. The organizations found the that the rapid learning curve for JUNOS, the overall simplicity and ease of supporting JUNOS, and the reliability of the underlying software allowed them to forestall hiring additional network support staff. We assumed that the composite organization could avoid hiring one additional full-time network administrator. This yields an annual savings of $110,500, which is the fully burdened cost of a network administrator (see Table 7)

Table 7: Cost Avoidance Of Not Hiring Additional Network Administrators

Ref.	Metric	Calculation	Per period
D1	Number of workers (saved)		1.0
D2	Network administrator fully loaded salary		$110,500
Dt	Cost avoidance (hiring additional network administrators)	D1 * D2	$110,500

Source: Forrester Research, Inc.

Reduced "Planning And Provisioning" Task Duration

Planning and provisioning involves the creation of installation scripts and batch processes for deploying new network hardware or software modules. Typically, new scripts are created when new gear is put into production or when software updates are rolled out. Companies we interviewed

noted that the complexity of the task increased with the number of network operating systems involved, which resulted in increased task time. JUNOS users found that planning and provisioning task times were reduced by up to 50% in comparison to other vendors.

For the composite organization, we assumed that planning and provision occurred six times per year. The composite organization saved 1 hour in task time in the JUNOS environment. Assuming that one network administrator/engineer performs the planning and provisioning tasks, this results in cost savings of $638 (see Table 8).

Table 8: Planning And Provisioning Task Effort Reduction

Ref.	Metric	Calculation	Per period
E1	Task frequency (annual)		12
E2	Reduction in task time (hours)		1
E3	Administrator cost ($/hour)		$53*
E4	Number of network administrators		1
Et	Task effort reduction: planning and provisioning	E1*E2*E3*E4	$638

*Numbers have been rounded

Source: Forrester Research, Inc.

Reduced "Adding New Infrastructure" Task Duration

Adding new infrastructure involves feature/function configuration and software setup for the network devices. Similar to the reduced effort for planning and provisioning, the companies we interviewed noted that equipment deployment times for the network hardware that ran JUNOS was reduced. One interviewee noted that Juniper's *Virtual Chassis* software allowed them to deploy new a rack of 10 switches in less than 10 minutes — a task that would have taken 20 minutes per switch, had it been done manually with other vendors' equipment.

To calculate the value of this benefit, we assumed that adding new infrastructure was done quarterly and that about one-quarter of the installed equipment was affected. With an average task time reduction of 1.0 hours per device, this results in a saving of $4,888 as shown in Table 9.

Table 9: Deploying Infrastructure Task Effort Reduction

Ref.	Metric	Calculation	Per period
F1	Task frequency (annual)		4
F2	Task time reduction (hours)		1.00
F3	Task cost (hourly)		$53
F4	Number of devices		23
Ft	Task effort reduction: adding Infrastructure	F1*F2*F3*F4	$4,888*

*Numbers have been rounded

Source: Forrester Research, Inc.

Reduced "Planned Events" Task Duration

Planned downtime is used to perform equipment upgrades, updates, applying software patches, and other maintenance tasks. All companies we interviewed conducted planned downtime events during non-working hours like weekends and or nights, so there was no material impact to the business. Interviewees noted that applying software patches was more complex and time consuming in environments that had multiple operating system release streams, and in some instance reported time saving for 50% to 60% for JUNOS.

For the composite organization that is running JUNOS in all of its routers and switches, we assume a 1-hour task time saving per device. Assuming that two administrators are involved in planned network events, this results in total savings of $28,688 (see Table 10)

Table 10: Planned Network Event Task Effort Reduction

Ref.	Metric	Calculation	Per period
G1	Task frequency (annual)		4
G2	Task time reduction (hours)		1.50
G3	Task cost (hourly)		$53
G4	Number of network administrators		2
G5	Number of devices		45
Gt	Task effort reduction: planned events	G1*G2*G3*G4*G5	$28,688*

*Numbers have been rounded

Source: Forrester Research, Inc.

Reduction In Unplanned Events

The companies we interviewed noted that their JUNOS environments had fewer unplanned events that resulted in downtime, and the time required to recover was shorter. It should be noted that some interviewees had implemented fully redundant networks, which meant that unplanned events went unnoticed by users, and these events had no impact on the business irrespective of the network equipment vendor. Companies we interviewed that ran applications that stressed the performance of their Juniper networks observed a greater reduction in unplanned events compared

with their non-Juniper environments when running the same applications. Overall, the interviewed companies noted a 10% to 50% reduction in unplanned network events.

For the composite organization, we calculate two benefits associated with unplanned events: benefits associated with a reduction in the number of events, and benefits associated with faster recovery times. In each case, we assume the cost of downtime to business is $10,000 per hour. Assuming that the number of events drops from four to two per year and it takes 1 hour to recover, the savings to the business is $5,000. Similarly, using a reduction in recovery time of 1 hour and an average of two unplanned events per year, the savings to the business is $5,000 (see Tables 11 and 12)

Table 11: Reduction In Number Of Unplanned Events

Ref.	Metric	Calculation	Per period
H1	Cost of downtime ($/hour)		$10,000
H2	Decrease in number of unplanned network events (annual)		1
H3	Average downtime event duration (hours)		1.0
H4	Percent captured		50%
Ht	Reduction in frequency of unplanned network events	H1*H2*H3*H4	$5,000

Source: Forrester Research, Inc.

Table 12: Reduction In Duration Of Unplanned Events

Ref.	Metric	Calculation	Per period
I1	Cost of downtime ($/hour)		$10,000
I2	Average number of unplanned network events		2
I3	Reduction in time to recover from unplanned event (hours)		0.5
I4	Percent captured		50%
It	Reduction in duration of unplanned events	I1*I2*I3*I4	$5,000

Source: Forrester Research, Inc.

Total Benefits

The total benefits for operating and maintaining JUNOS is shown in Table 13.

Table 13: Total Benefits - Non-Risk-Adjusted

Cash flow analysis (original estimates)						
Benefits	**Initial**	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present value**
Cost avoidance (hiring additional network administrators)		110,500	110,500	110,500	331,500	274,797
Task effort reduction: planning and provisioning		638	638	638	1,913	1,585
Task effort reduction: adding infrastructure		4,888	4,888	4,888	14,663	12,154
Task effort reduction: planned events		28,688	28,688	28,688	86,063	71,342
Reduction in frequency of unplanned network events		5,000	5,000	5,000	15,000	12,434
Reduction in duration of unplanned events		5,000	5,000	5,000	15,000	12,434
Total		$154,713	$154,713	$154,713	$464,138	$384,747

Source: Forrester Research, Inc.

Risk

Forrester defines two types of investment risk associated with this analysis: implementation and impact risk. **Implementation risk** is the risk that a proposed technology investment may deviate from the original resource requirements needed to implement and integrate the investment, resulting in higher costs than anticipated. **Impact risk** refers to the risk that the business or technology needs of the organization may not be met by the technology investment, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates. Quantitatively capturing investment risk, by directly adjusting the financial estimates, results in more meaningful and accurate estimates and a more accurate projection of the return on an investment. The risk-adjusted numbers should be taken as "realistic" expectations, since they represent the expected values considering risk. In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates.

The following implementation risks are identified as part of this analysis:

- Professional services expenses may vary, depending on each firm's needs and the abilities of its internal network engineering resources.
- Annual maintenance costs, which vary with the level of the support that the customer purchases from Juniper. Maintenance costs will also depend on the configuration of specific network devices.

The following impact risks are identified as part of the analysis:

- Cost savings associated with reduction in network operations task times may vary, depending on each firms' network support and engineering skills.
- Reduction in time will depend on the network architecture, especially if there is redundancy in the network.

For the purpose of this analysis, Forrester risk-adjusts cost and benefit estimates to better reflect the level of uncertainty that exists for each estimate. The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first

estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points.

The following tables show the values used to adjust for uncertainty in cost and benefit estimates. Different cost and benefits estimates have different levels of risk adjustments. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Table 14: Cost Category Risk Adjustments

Costs	Low	Original	High	Mean
Professional services fees	$0	$30,000	$50,000	$26,666
Annual maintenance	$42,465	$55,835	$94,920	$64,407

Source: Forrester Research, Inc.

Table 15: Benefit Category Risk Adjustments

Benefits	Low	Original	High	Mean
Cost avoidance – not hiring additional network administrators	0.5	1.0	1.0	0.83
Task time reduction for planning and provisioning events	0	1.0	1.5	0.83
Task time reduction for adding infrastructure events	0.5	1.0	2.0	1.16
Task time reduction for planned events (hours)	0.25	1.50	2.0	1.25
Decrease in number of unplanned network events	0	1	2	1
Decrease in duration of unplanned network events (hours)	0.3	0.5	1	0.6

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for some future additional investment at some additional cost. Flexibility benefits typically increase with the scalability of the technology investment. This provides an organization with the "right" or the ability to engage in future initiatives but not the obligation to do so. In the case of this investment, customers who choose to employ features of JUNOS like Virtual Chassis and its quality of service (QoS) mechanisms may achieve some additional operations savings or be able to run new applications over their networks.

While Forrester believes organizations that adopt JUNOS can take advantage of these flexibility options, quantification (using the financial industry standard Black-Scholes or the binomial option pricing models) of the additional value associated with these options for this customer would require scenario development and forward-looking analysis that is not available at this time. The value of flexibility is unique to each organization, and the willingness to measure its value varies from company to company.

TEI Framework: Summary

Considering the financial framework constructed above, the results of the costs, benefits, risk, and flexibility sections using the representative numbers can be used to determine a return on investment, net present value, and payback period. Table 16 shows the consolidation of the numbers for the composite organization.

Table 17 below shows the risk-adjusted values, applying the risk adjustment method indicated in the "Risks" section and the values from Tables 14 and 15 to the numbers in Tables 6 and 13.

It's important to note that values used throughout the TEI Framework are based on in-depth interviews with 10 organizations and the resulting composite organization built by Forrester. Forrester makes no assumptions as to the potential return that other organizations will receive within their own environment. Forrester strongly advises that readers use their own estimates within the framework provided in this study to determine the expected financial impact of implementing JUNOS.

Table 16: Cash Flow Summary, Non-Risk-Adjusted

Cash flow analysis (non-risk-adjusted)						
Benefits	**Initial**	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present value**
Total costs	($67,800)	($61,235)	($61,235)	($61,235)	($251,505)	($220,082)
Total benefits		$154,713	$154,713	$154,713	$464,138	$384,747
Net savings	($67,800)	$93,478	$93,478	$93,478	$212,633	$164,665
RIO	75%					
Payback period (years)	0.7					

Source: Forrester Research, Inc.

Table 17: Cash Flow Summary – Risk-Adjusted

Cash flow analysis (risk-adjusted)						
Benefits	**Initial**	**Year 1**	**Year 2**	**Year 3**	**Total**	**Present value**
Total costs	($64,467))	($69,807)	($69,807)	($69,807)	($273,888)	($238,065)
Total benefits		$155,623	$155,623	$155,623	$466,869	$387,011
Net savings	($64,467)	$85,816	$85,816	$85,816	$192,981	$148,946
RIO	63%					
Payback period (years)	0.8					

Source: Forrester Research, Inc.

Study Conclusions

Forrester's in-depth interviews with Juniper's customers yielded several important observations:

- Based on information collected in interviews with current JUNOS customers, Forrester found that organizations can realize benefits in the form of lower operation costs, improved network scalability, and a reduction in network downtime.

- Of the customers interviewed, several factors contributed to the difference in ROIs. Forrester found higher ROIs in customers that had greater percentage of Juniper gear in their networks and with those that took advantage of the Virtual Chassis technology.

The financial analysis provided in this study illustrates the potential way an organization can evaluate the value proposition of JUNOS. Based on information collected in 10 in-depth customer interviews, Forrester calculated a three-year risk-adjusted ROI of 63% for the composite organization with a payback period of 0.8 years. All final estimates are risk-adjusted to incorporate potential uncertainty in the calculation of costs and benefits.

Based on these findings, companies looking to implement JUNOS can realize savings in their network operations costs. Using the TEI framework, many companies may find the potential for a compelling business case to make such an investment.

Appendix A: Composite Organization Description

In this TEI study, Forrester has created a composite organization to illustrate the quantifiable costs and benefits of JUNOS network operating system software. The composite company is intended to represent a firm with 4,000 employees and is based on characteristics of the interviewed customers.

The composite company has the following characteristics:

- **Revenues:** $800 million
- **Employees:** 4,000
- **Locations:** 30 locations spread across North America, Latin America, Europe and Asia

For the purpose of the analysis, the composite company has the following objectives:

- To rebuild its network and potentially simplify its architecture by taking advantage of advances in networking technology; current network hardware is approaching end of life and is unable to support the company's future vision.
- To support new applications that have stringent jitter and delay requirements like voice and video. They also require a network that will scale efficiently with minimal performance degradation when new high-performance applications are placed on the network.
- To simplify network operations and to lower network operations costs.

The company replaced or upgraded more than 95% of its existing switches and routers with Juniper Networks switches and routers. The following Juniper Networks device count was assumed for this study:

- Network device count:
    - 6x M7i series multiservice edge routers
    - 30x J2320 series branch routers
    - 2x EX8208 Ethernet switches
    - 55x EX4200 Ethernet switches

Network administrators and engineers headcount: 7

Appendix B: Total Economic Impact™ Overview

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.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility. For the purpose of this analysis, the impact of flexibility was not quantified.

Benefits

Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization. The TEI methodology and the resulting financial model place 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. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created. In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

Costs

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the forms of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

Risk

Risk measures the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: the likelihood that the cost and benefit estimates will meet the original projections and the likelihood that the estimates will be measured and tracked over time. TEI applies a probability density function known as "triangular distribution" to the values entered. At a minimum, three values are calculated to estimate the underlying range around each cost and benefit.

Flexibility

Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment. Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made. For instance, an investment in an enterprisewide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated. The collaboration can only be used with additional investment in training at some future point in time. However, having the ability to capture that benefit has a present value that can be estimated. The flexibility component of TEI captures that value.

Appendix C: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Although the Federal Reserve Bank sets a discount rate, companies often set a discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 10% for this analysis. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult their organization to determine the most appropriate discount rate to use in their own environment.

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.

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 net present value of cash flows.

Payback period: The breakeven point for an investment. The point in time at which net benefits (benefits minus costs) equal initial investment or cost.

Return on investment (ROI): A measure of a project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits minus costs) by costs.

A Note On Cash Flow Tables

The following is a note on the cash flow tables used in this study (see the Example Table below). The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1. Those costs are not discounted. All other cash flows in Years 1 through 3 are discounted using the discount rate shown in Table 2 at the end of the year. Present value (PV) calculations are calculated for each total cost and benefit estimate. Net present value (NPV) calculations are not calculated until the summary tables and are the sum of the initial investment and the discounted cash flows in each year.

Example Table

Ref.	Category	Calculation	Initial cost	Year 1	Year 2	Year 3	Total

Source: Forrester Research, Inc.