Smart Network. Smart Business.

Leveraging Radware's ADC-VX to Reduce Data Center TCO

An ROI Paper on Radware's Industry-First ADC Hypervisor

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Executive Summary

The purpose of this document is to discuss how businesses can reduce their virtual data center Total Cost of Ownership (TCO) and achieve higher Return on Investment (ROI) by deploying Radware's ADC-VX™, the industry's first Application Delivery Controller (ADC) hypervisor solution.

By enabling seamless ADC consolidation and virtualization while minimizing physical to virtual (P2V) migration risk and ensuring high agility and resilience, Radware ADC-VX enables a reduction in the number of physical ADC units required in the data center by optimizing the ADC processing utilization, and therefore delivers the following cost savings:

Capital expenditures reduction:

- Product cost – by enabling ADC consolidation and increasing the utilization of the ADC solution, less physical ADC units are required to be deployed in the data center. In addition, Radware's on demand scalability enables cost-effective provisioning of new vADC instances and additional throughput capacity to address business growth requirements – with no hardware replacements
- Switch ports cost – as consolidated ADC instances can share the same network connections and ports, fewer network switch ports and less cabling are required to connect fewer physical ADC units
- Disaster recovery cost – enables consolidation of ADCs also in the secondary data center to support disaster recovery plans and SLA

Operational expenditures reduction:

- Data center power and cooling cost – delivers dramatic savings on power and cooling costs due to fewer physical devices resulting in reduced energy consumption. In addition, it also enables avoidance of costly data center upgrades and expansions needed to meet the growing power and cooling requirements
- Data center space cost – since fewer ADC devices are deployed, less data center rack space is required by the solution – resulting in real estate savings
- Service cost – reduced spending on hardware support contracts thanks to ADC CAPEX reduction. In addition, the same service cost can be invested more cost-effectively, for instance, to purchase higher support levels
- Network administration cost – increase network operations efficiency and reduce human error via enabling to shorten ADC provisioning, decommissioning and migration tasks from days or weeks to minutes
- Business administration cost – allows companies to reduce business administration overhead costs by reducing frequent hardware purchases and associated approval and procurement processes

Radware ADC-VX can deliver between $500K to $2M cost reduction for medium-sized businesses and high-scale data centers, respectively, over a 5-year period. This means reducing up to 1/3 of the cost of an equivalent physical solution

Virtual Data Center Trends

Virtualization is a key market driver and a major IT initiative, and can be found in almost any organization's network - from SMBs through large enterprises up to the very large hosting companies, carrier data centers and service providers. While the scope of virtualization may differ between different sizes organizations, the business drivers for the virtual data center are the same - it is all about creating a consolidated, cost-effective, agile, highly available and performing data center.

As part of consolidating and virtualizing the data center, businesses are looking to virtualize not only their servers and applications – but also their network, which includes ADC virtualization. Radware provides the industry's first Virtual Application Delivery Infrastructure (VADI) transforms computing resources, ADC services and virtualization services into an integrated, agile and scalable Application Delivery Virtualization Infrastructure.

Radware VADI enables the consolidation and virtualization of Application Delivery services as an integral part of the virtual data center architecture, its orchestration and provisioning systems - allowing to reduce the risks of consolidation and P2V (Physical to Virtual) ADC migrations, by ensuring application delivery resilience and performance predictability, and dramatically reducing the costs of application delivery deployments.

In the next sections, we will shed more light on the greater cost reduction and faster ROI which Radware ADC-VX provides.

Reducing Data Center TCO with Radware ADC-VX

Radware ADC-VX, the cornerstone of Radware's VADI strategy, is the industry's first ADC Hypervisor that runs multiple virtual ADC instances (vADC) on a dedicated ADC hardware, Radware's OnDemand Switch platforms. ADC-VX is uniquely designed from the ground up for simplicity and ease of integration within existing virtual environments. Its design provides the agility of virtualization without compromising resiliency or performance predictability.

In addition to enabling risk-free path to ADC virtualization and increasing business agility, Radware's ADC-VX delivers significant capital expenditures (CAPEX) and operating expenditures (OPEX) reduction, reducing up to 35% of the TCO, through:

Capital Expenditures

Radware ADC-VX reduces hardware costs as follows:

- **Product costs** – traditionally, a dedicated, physical ADC unit is assigned to each mission-critical application or network service to ensure stability and reliability. In addition, since IT organizations need to address increased network traffic and future capacity growth, the purchased ADC units frequently deliver processing capacity higher than actually required by the application's day-to-day needs. Consequently, most ADC units are not used to their full capacity, on average, utilized only 30%-50%.

  By hosting vADC instances on fewer ADC-VX units, multiple ADC workloads can run on a single physical unit in isolation and independence from each other. Hence, Radware ADC-VX increases the utilization of the overall solution and allows customers to get more out of each ADC hardware device. Therefore, deploying Radware ADC-VX reduces the number of physical ADC units required and their associated product cost.

  In addition, Radware ADC-VX's on demand scalability enables to flexibly increase the number of vADC instances, scale the ADC device total throughput, and add more application-aware services – while continuing to use the same hardware. This approach enables to cost-effectively support future capacity growth and to flexibly provision new ADC instances with no hardware replacements – to ensure undisrupted business continuity while substantially reducing CAPEX.

- **Hardware costs for disaster recovery** - most disaster recovery plans require building an exact duplicate of the production data centers, requiring the purchase and maintenance of additional ADC units that are mostly idle. Similar to enabling ADC consolidation in the primary data center, Radware ADC-VX enables not only to virtualize the ADCs in the secondary data center, but it also removes hassle from such process by allowing seamless duplication of the ADC-VX instances to the disaster recovery environment. This further reduces the number of ADC units (depending on the SLA requirements) and hardware costs.

- **Switch ports costs** – since vADC instances that run on the same ADC-VX units can share network connections, consolidating ADCs reduces the number of network ports required. This brings down the costs of network switches and cables.

Operational Expenditures

By enabling highly-utilized ADC solution consisting of fewer physical devices, Radware ADC-VX also enables to realize IT operational costs reduction as follows:

- **Data center power and cooling costs** – reducing the number of physical ADC units in the data center leads to dramatic savings on power and cooling costs due to reduced energy consumption. It can also make it possible to avoid costly data center upgrades and expansions needed to meet the growing power and cooling requirements for today's data centers.

- **Data center real estate costs** – since fewer ADC devices are deployed, less data center rack space is required by the solution – resulting in real estate savings.

- **Hardware support cost** – reducing the overall ADC solution CAPEX enables organizations to reduce their spending on hardware support contracts. In addition, the same service cost can be invested more cost-effectively, for instance, to purchase higher support levels.

- **ADC operation cost** - Radware ADC-VX enables to centralize, streamline and automate common tasks such as ADC provisioning, decommissioning, configuration, reconfiguration and migration. As a result, the time spent to provision a new ADC can be reduced from days or weeks to minutes.

  In addition, Radware ADC-VX further increases network administration efficiency by reducing human errors and shortening learning curves, allowing central management of a large number of ADCs without requiring equally rapid growth in staffing budgets.

- **Business administration cost** - By enabling to host multiple vADC instances on a single physical ADC unit and thanks to the on demand scalability, Radware ADC-VX allows companies to realize reductions in costs associated with business administration overhead. For example, by reducing the number of physical ADC needed, organizations can reduce the frequency of ADC unit purchases and thus the frequency of time-consuming approval and procurement processes.

Radware ADC-VX ROI Use-Case: Tier-1 Service Provider

In the following ROI use-case, the customer examined is a tier-1 service provider of Internet connectively and hosting services to small & large businesses and residential customers. The customer operates in its data center several network services such as DNS, LDAP and SMTP and deploys 14 redundant pairs of ADCs (total of 28 units, for ADC high-availability) to ensure their high availability and satisfactory performance, where each ADC unit is required to provide up to 2Gbps of throughput capacity.

As the existing ADC units are soon to be retired (after being deployed for an almost 5-year tenure), the customer now considers the following two alternatives:

1. **Upgrade the older ADC units to newer, physical units**
   In the given scenario, selecting a physical ADC solution implies purchasing 28 X 2Gbps ADC units (14 X redundant ADC pairs) delivering total of 56Gbps throughput capacity.

2. **Deploy Radware's ADC-VX solution allowing ADC consolidation**

   In the given scenario, selecting Radware ADC-VX solution implies purchasing 4 ADC-VX units hosting a total of 30 vADC instances and delivering a total of 64Gbpsd[1], as follows:

   - 2 X Alteon 5412 units running ADC-VX, each hosting 10 vADC instances and delivering 20 Gbps throughput capacity. The 2 ADC-VX units run 10 redundant pairs of vADC instances.
   - 2 X Alteon 5412 units running ADC-VX, each hosting 5 vADC instances and delivering 12 Gbps throughput capacity. The 2 ADC-VX units run 4 redundant pairs of vADC instances, leaving a room for growth in case another vADC instance is required to be provisioned.

Radware ADC-VX vs. Physical ADC Cost Analysis

The following table summarizes the 5-year TCO for the physical ADC solution versus Radware ADC-VX, and presents the resulting TCO reduction. To learn more about the cost factors used in the calculation, click the respective links in the table.

Cost Structure	Physical ADC Solution		Radware ADC-VX		TCO reduction
	Cost	Desscription	Cost	Description	
CAPEX					
ADC product cost	$839,860	28 units * $29,995[2]	$497,980	2 * Alteon 5412 units each delivering 20 Gbps throughput capacity + 2 * Alteon 5412 units each delivering 12 Gbps throughput capacity[3]	$233,884 (including licensing costs)
ADC license cost	-		$107,996	2 * ADC-VX and 10 vADC instances license + 2 * ADC-VX and 5 vADC instances license	
Network switch ports cost	$46,667	28 units * 10 ports per device * $166 (cost per switch port)	$10,667	4 units * 10 ports per device * $166 (cost per switch port)	$36,000 (77%)
Total CAPEX	$886,527	Sum of product cost and network switch ports cost	$616,643	Sum of product cost and network switch ports cost	$269,844 (30%)
OPEX					
Electricity cost	$4,170	41,697 kWh consumed * $0.1 (average cost per kWh)	$1,710	17,099 kWh consumed * $0.1 (average cost per kWh)	$2,460 (59%)
Cooling cost	$2,085	Cost required to cool 142.19 MBTU heat dissipation	$855	Cost required to cool 58.31 MBTU heat dissipation	$1,230 (59%)
Rack space cost	$9,800	28 RU (1 RU * 28 devices) * $350 (annual cost per RU space)	$2,800	8 RU (2 RU * 4 devices) * $350 (annual cost per RU space)	
Service cost	$141,844	$839,860 (product cost) * 16% (service margin cost)	$98,663	$605,976 (product & licensing cost) * 16% (service margin cost)	$43,181 (30%)
Total OPEX per year	$157,899	Sum of electricity, cooling, rack space and service costs	$104,028	Sum of electricity, cooling, rack space and service costs	$53,871 (34%)
Total OPEX per 5-year project	$789,495		$520,139		$269,356 (34%)
TCO	$1,676,021		$1,136,781		$539,240 (32%)

[1] ADC-VX can be ordered with on demand scalable throughput license (4Gbps, 8Gbps, 12Gbps, 16Gbps or 20Gbps) and on demand scalable vADC instances license (2, 5, 10, 15, 20 or 28 instances)

[2] Price point refers to 2Gbps ADC industry average list price

[3] Price points refer Radware ADC-VX price list

Radware ADC-VX TCO Reduction

Based on the case presented, the following cost savings are achieved thanks to using Radware ADC-VX:

- Product and licensing cost reduction: $269,844 (30%)
- Network switch ports cost reduction: $36,000 (77%)
- Power, cooling and space cost reduction: $10,690 (67%) – based on the following savings:
- Energy consumption savings: 24,598 kWh (59%)
- Heat dissipation savings: 83.88 MBTUs (59%)
- Data center space savings: 20 RUs (71%)
- Service cost reduction: $43,181 (30%)
- 5-year project TCO reduction: $539,240 (32%)

Conclusions

As discussed in the paper, by enabling seamless ADC consolidation and virtualization while minimizing physical to virtual (P2V) migration risk and ensuring high agility and resilience, Radware ADC-VX reduces the number of physical ADC units required in the data center, optimizes the ADC processing utilization and significantly reduces data center TCO, as illustrated in this customer use-case:

Radware ADC-VX saved the customer nearly $540K over a 5-year project —which is 1/3 of an equivalent, physical solution cost!

Note: To perform additional ROI cost savings calculations, try Radware ADC-VX ROI Calculator which is available online.

References

- Radware ADC-VX ROI Calculator
- Radware ADC-VX Brochure
- Radware ADC-VX White Paper
- Alteon Application Switch Brochure
- Alteon Application Switch Technical Specifications

Appendix: Radware ADC-VX ROI Calculator Model

Radware ADC-VX ROI Calculator enables to calculate the cost savings using ADC-VX for business specific data center scenarios.

The ROI model refers to customer scenarios in which many physical ADC units (dozens and even hundreds) are consolidated into a few virtualized ADC units, like Radware ADC-VX solution. These scenarios take place upon new data center architecture design, new service roll-out, or when existing ADC units are retired (due to insufficient capacity, functionality and lack of service) – requiring the replacement of the existing ADC units with a new ADC solution – either physical or virtual.

At its core, the ADC-VX ROI model examines the two following solution alternatives – where precisely the same application delivery capabilities and business value are delivered to the customer:

- **Alternative #1**: Deploying new – sometimes many – physical ADC units, OR:
- **Alternative #2**: Deploying Radware ADC-VX solution – which virtualizes all ADC instances on significantly fewer physical ADC units.

For each alternative, the ROI calculator provides the physical versus virtual ADC solutions cost structure over a 5-year project[4], while taking into account the following cost elements:

- Product and licensing cost
- Network switch ports cost
- Power consumption cost
- Cooling cost
- Data center space cost
- Service cost

The ROI model then compares the TCO of both alternatives and summarizes the cost savings over a 5-year project. The results – which include an executive summary and detailed cost analysis – can then be exported as a portable document format (PDF) or sent by email.

ROI Model Assumptions

The ADC-VX ROI Calculator is based on the following assumptions:

- Each ADC-VX unit can host up to 28 vADC instances – where each vADC instance provides the full capabilities of a physical ADC
- The two first vADC instances are delivered free of charge, where additional vADC instances can be added on demand by simply applying the respective license according to the number of instances required
- Each ADC-VX unit can be shipped with on demand, scalable 4Gbps, 8Gbps, 12Gbps, 16Gbps or 20Gbps throughput capacity
- Additional application-aware services can be added on demand to the ADC-VX, including global solution, bandwidth management, link optimization and more
- The average ADC project life time is 5 years long (this can be modified per user's requirement)
- ADC units are deployed in redundant pairs – either in active/active or active/passive deployment configurations

ROI Model Inputs

The ADC-VX ROI model inputs consist of standard inputs and advanced parameters that can be entered per customer:

<u>Standard inputs:</u>

The standard inputs allow specifying popularly-entered data, including a list of ADC throughput requirements and whether ADC redundancy is required or not. The standard inputs include the following:

- **# of 0.5Gbps ADC units** – how many 500Mbps ADC units the customer requires
- **# of 1Gbps ADC units** – how many 1Gbps ADC units the customer requires
- **# of 2Gbps ADC units** – how many 2Gbps ADC units the customer requires
- **# of 4Gbps ADC units** – how many 4Gbps ADC units the customer requires
- **Custom ADC throughput** – in many cases, the throughput capacity required for a service or application isn't the full ADC capacity; for instance, a service might require 800Mbps or 1.7Gbps of throughput capacity. This input can be used to specify multiple, accurate throughput capacity requirements
- **ADC redundancy required** - specifies whether the ADC units required need to be redundant pairs (active/active or active/passive) for ADC high-availability. This option is true by default

[4] 5 year is assumed to be the average application delivery project lifetime – however this value can be updated as needed

Advanced parameters:

The advanced parameters allow controlling the ROI model's more-advanced factors and assumptions used by the cost calculation algorithm. These are recommended to be left to their default values, or can be tweaked by advanced users whenever more customization is required. The advanced parameters and their default values include the following:

- **Project lifetime (in years)** – specifies the number of years which the ADC solution is deployed for (default = 5 years)
- **Average ADC power consumption (Watts)** - specifies the average power consumption of a given physical ADC unit (default = 170 Watts, based on average, industry-standard ADC technical specifications)
- **Service cost margin (%)** – specifies the annual service cost which is calculated per the purchased product cost (default = 16%)
- **Annual cost per rack unit (USD)** – specifies the annual cost of a RU in a data center computing closet, and is calculated according to the following formula:

$$\text{Annual cost RU} = \frac{\text{Annual cost per sq. ft.} * \text{square feet required per rack}}{\text{Number of RUs in a rack}}$$

Where:
- o Annual cost per square feet = $1,200, by default
- o Square feet required per rack = 7 square feet, by default
- o Number of RUs in a rack = 24 RUs, by default

- **Cost per kWh (USD)** – specifies the cost per each kWh energy unit consumed (default = $0.1 which is the California rate – US median value)
- **Cost per switch port** – specifies the cost per network switch port in the data center, and is calculated according to the following formula:

$$\text{Cost per switch port} = \frac{\text{Average network switch cost}}{\text{Number of switch ports}}$$

Where:
- o Average network switch cost (USD) = $4,000, by default
- o Number of switch ports – 24, by default

- **Cooling K-Factor** - specific the air conditioning system efficiency; this factor varies between 0 to 1, where 1 means that the air conditioning system consumes 1 BTU to cool 1 BTU of heat (default = 0.5)

Determining Physical ADC & ADC-VX Solution Alternatives

In this stage, the ROI calculator uses a device conversion algorithm which based on the customer's throughput requirements determines the physical and virtual ADC solution alternatives. Following are the outputs for each alternative:

1) Physical ADC solution structure – calculates how many physical ADC units are required to meet requirements and what is their throughput capacity
2) Radware ADC-VX solution structure – calculates how many virtual ADC units are required, what is their throughput capacity and how many vADC instances licenses are required on each

The next paragraphs will explain how this calculation takes place for each alternative.

Determining the physical ADC solution structure

For each required ADC throughput capacity, the model calculates the minimal physical ADC unit (0.5Gbps, 1Gbps, 2Gbps, 4Gbps, 6Gbps or 10Gbps) which will address the required throughput capacity. For example, if 2Gbps is required, then a 2Gbps ADC unit is added to the solution; if a 0.4Gbps is required (using the custom ADC throughput input control), then a 0.5Gbps ADC unit will be added to the solution.

In case the 'ADC Redundancy Required' option is checked, a pair of ADC units will be added per each throughput requirement in order to allow ADC high-availability.

Determining the Virtual ADC Solution Structure

The model iterates each required ADC throughput capacity, and accumulates them as multiple vADC instances on a single ADC-VX unit. To optimize this process, the model first sorts the required throughputs from the smallest to the largest in order to recommend the minimal number of ADC-VX units required (in order to minimize product cost). Based on the number of vADC instances and their total throughputs capacity and required capacity units[5], the required ADC-VX model is selected – including the minimal throughput capacity license that addresses the customer's needs (4Gbps, 8Gbps, 12Gbps, 16Gbps or 20Gbps) and the respective vADC instances license (2, 5, 10, 15, 20 or 28 instances).

In case the vADC instances accumulated throughput capacity – or their number – exceeds the maximal capacity of a single ADC-VX, another ADC-VX is added to the solution – where the same calculation process as described in the former paragraph repeat iteratively, until all throughput requirements are addressed.

Note that the method used to calculate the ADC-VX solution structure is particularly cost-effective in cases where the user has required 'accurate' throughput requirement (such as .4Gbps or 1.7Gbps) – as in these cases the vADC instances to # of ADC-VX units "compression rate" will be optimal, i.e. more ADC units are able to be hosted on fewer ADC-VX units.

In case the 'ADC Redundancy Required' option is checked, a pair of virtual ADC units will be added per each throughput requirement in order to enable ADC high-availability.

Calculating Physical ADC & ADC-VX TCO

Based on the amount and type of ADC units calculated in the determining the physical ADC & ADC-VX solutions alternatives section, the TCO is calculated for both the physical and virtual ADC solutions. The solution's TCO consists of CAPEX and OPEX, where OPEX is multiplied by the number of project years (as indicated by the Project Lifetime parameter). The ADC solution TCO can be presented using the following formula:

ADC solution TCO = CAPEX + # of project years + OPEX

Where:

CAPEX = Production cost + Licensing cost + Network switch ports cost

and

OPEX = Electricity cost + Cooling cost + Space cost + Service cost

[5] Capacity unit basically represents ADC-VX atomic processing capacity including memory, CPU and networking

The cost structure elements are calculated as follows:

- **Product cost** – calculated by summing the number of ADC units list prices (industry average price points are used)
- **Licensing cost** – includes additional software options cost required for the solution, such as vADC instances license
- **Network switch ports cost** – calculated by multiplying the # of ports on each physical device by the cost per switch port parameter
- **Electricity cost** – calculated by multiplying the sum of the devices power consumption by the cost per kWh, where:

$$\text{Device power consumption} = \frac{\text{device power consumption} = \text{number of hours in a year}}{1000}$$

- **Cooling cost** – calculated by multiplying the # of units by each device cooling cost, according to the following formula:

$$\text{Device cooling cost} = \frac{\text{MBTUs generated} * 1000 * \text{cooling K factor} * \text{cost per KWh}}{3.41}$$

Where:

$$\text{MBTUs generated} = \frac{\text{device power consumption} * 3.41 * \text{number of hours per year}}{1{,}000{,}000}$$

- **Rack unit space cost** – calculated by multiplying the sum of all physical units rack unit space by the annual cost per rack unit
- **Service cost** – calculated by multiplied the product cost value by the annual service cost margin parameter

ROI Model Cost Savings

The ADC-VX ROI calculator displays the following results and conclusions:

Physical ADC Solution structure & cost

- Number of physical ADC units required and their throughput capacity
- Rack space required
- 5-year project TCO

Radware ADC-VX Solution structure & cost

- Number of ADC-VX units required and their throughput capacity
- vADC software licenses required
- Rack space required
- n-year project TCO

Cost reduction summary

By comparing the physical ADC and ADC-VX solutions costs, the following cost savings metrics are displayed:

- Physical units reduction – how many fewer physical ADC units are required
- Rack space savings – how much RU space is saved
- Power consumption savings – how many kWh is saved
- Heat dissipation savings – how much less heat the solution dissipates
- 5-year TCO reduction – the overall project TCO reduction