

Comparing the TCO of Physical PCs, VDI, and NEC's Cloud-hosted Desktops as a Service (DaaS)

A NEC Whitepaper

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Executive Summary

Physical desktop computer infrastructures no longer make sense for the corporate world. Not only are they expensive, insecure and maintenance-heavy, they also cannot effectively support the changing business IT landscape. The groundswell of Windows 7 migration plans, expanding virtual workforce, growing popularity of mobile devices, and tighter IT budgets all point to the need to reevaluate desktop strategies. While virtual desktop infrastructure (VDI) seems like a promising alternative, in reality it is too costly and complex for most companies to implement. Why move the complexities and costs of managing physical desktops to another complex and expensive infrastructure? By moving virtual desktops to the cloud, instead of an internally deployed and managed data center, companies can realize all the promised benefits of virtual desktops—centralized management, improved data security and simplified deployment—without the exorbitant capital costs and management issues.

This white paper will compare the total cost of ownership (TCO) of physical PCs, virtual desktops, and cloud-hosted desktops as a service (DaaS). Cloud-hosted desktops have many benefits outside of TCO as many organizations want the convenience of outsourcing this IT function. The numbers in this study are based upon list prices, when applicable, averages of industry standard solutions, or published analyst numbers including Gartner and IDC.

Desktops: Ripe for Change

Desktop computing has become a millstone for IT departments. While it is essential for delivering must-have applications and services to end users, IT managers are burdened by the tremendous amount of time, complexity and cost inherent in managing and securing physical PCs. And, a progressively tech-savvy user base is becoming increasingly frustrated because their computers lack the flexibility and capabilities that they have come to expect.

Businesses have been aware of these issues for years, but it is only now that the tipping point for change has arrived. The trifecta of Windows 7, increased mobile access devices, and tighter IT budgets has created the perfect storm for desktop computing change.

- **Migration to Windows 7:** With MS dropping support for Windows XP, most companies are looking at a Windows 7 refresh. According to IDC, nearly 90 percent of businesses plan to move forward with Windows 7 by mid-2012.* However, many older PCs are not equipped to run Windows 7—which means that businesses need to purchase new computers in order to migrate workers. In fact, Gartner estimates that many businesses will end up replacing about 25 percent of their PCs before the end of their lifecycle to accommodate Windows 7 migrations.* Organizations that decide to upgrade existing computers instead of replacing them won't save much money because of the new parts and labor needed for memory, hard disks and/or video adapters.
- **Expanding mobile access:** IDC estimates that 1 billion workers will be mobile at least part of the time or remote from their firm's main location by the end of 2011.* Mobile workers will be accessing business applications and services from a variety of devices, including increasingly popular iPads, Android-compatible tablets, and smartphones. Companies need a way to enable anywhere, anytime access.

- **Tighter IT budgets:** PCs can consume 7-10% of IT budgets, yet provide no competitive advantage. With continued economic volatility, businesses are keeping a closer rein on IT expenditures. Wholesale PC refreshments and Windows 7 upgrades are no longer feasible, and the cost of supporting an increasingly dispersed user base needs to be reduced.

Solutions for Comparison

The goal of this paper is to evaluate and compare several different desktop solutions, on a per desktop cost basis. The categories for comparison are PCs, on premises VDI, and DaaS.




	PCs	VDI	DaaS
Benefit			
Genuine, customizable Windows client environments	✓	✓	✓
Centralized desktop management		✓	✓
Walk-off data security		✓	✓
Simplified issue resolution and recovery		✓	✓
Simplified desktop deployment		✓	✓
No upfront CAPEX			✓
Pay as you go			✓
Time to value in weeks, not months			✓
Leverage carrier-class scale			✓
Expand geographic coverage			✓
Reduce complexity and risk			✓

Table 2: Comparison of benefits between solutions

PCs - Standard Desktop

This is the traditional manner in which organizations deploy desktops. Each user, or workstation, receives a physical desktop running a locally installed operating system and applications.

Enterprise Managed VDI

With enterprise managed VDI, organizations must build and maintain a VDI solution running in their data center. The virtual desktop infrastructure, servers – storage – and hypervisors, are all managed by the organization, as are the virtual desktop images and applications.

DaaS: Cloud-hosted Desktops

For organizations utilizing the cloud-hosted desktops, the virtual desktops and relating infrastructure are run as a service in the cloud. The organization is responsible for managing the desktop image and applications, but is able to offload the cost and burden of the virtualized infrastructure.

Key Findings

This table summarizes the costs by model, for a standard Windows 7 desktop.

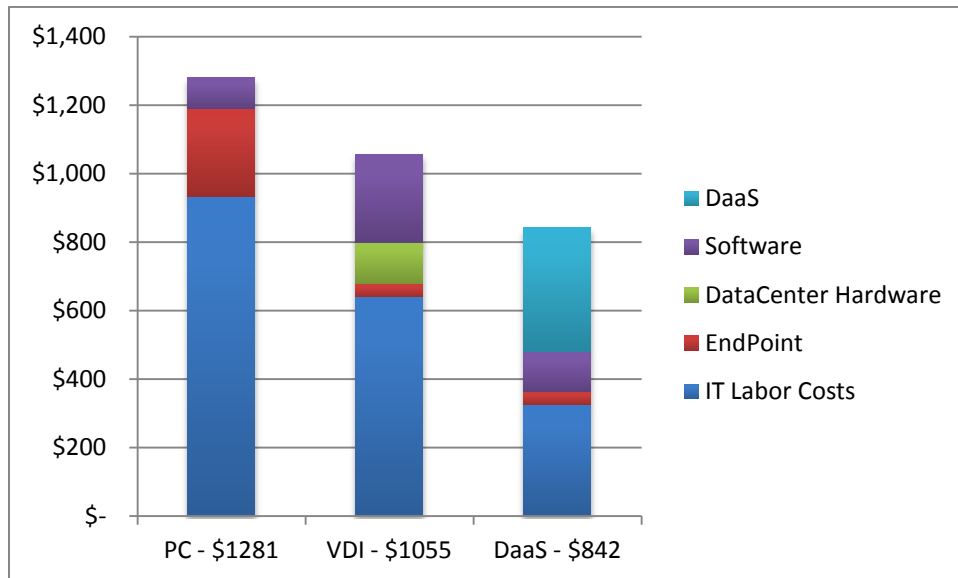


Table 1: Summary annual costs for each solution

There are several significant findings when comparing physical PCs to on premises VDI and Desktops as a Service (DaaS) in the cloud:

- Virtual desktops and specifically cloud-hosted desktops can deliver savings upwards of 36% over average desktop PC costs
- Cloud-hosted desktops can deliver savings of 20% and upwards, for on premises VDI
- The ability to offload end point costs, or simply extend the lifecycle of an existing PC can deliver significant savings of up to \$258 per year per desktop
- On premises VDI delivers savings in terms of IT labor costs, and at the endpoint but many of these savings are offset by significant data center expenses including servers, storage, and labor costs
- The performance requirements of virtual desktops necessitate adoption of external storage systems, which add substantial cost (upwards of \$60 per year) to the desktop cost

Desktop TCO Categories

There are several major line items that define the cost of a “desktop”, be it physical or virtual. The following is a breakdown of these categories by solution and a TCO analysis.

Endpoint Costs

The first category of hardware costs is the end point device; this is the device the end user uses to access their desktop. For standard PCs there is a single choice: Buy a new PC on the given refresh cycle. With VDI or DaaS solutions there is flexibility in terms of the end point device.

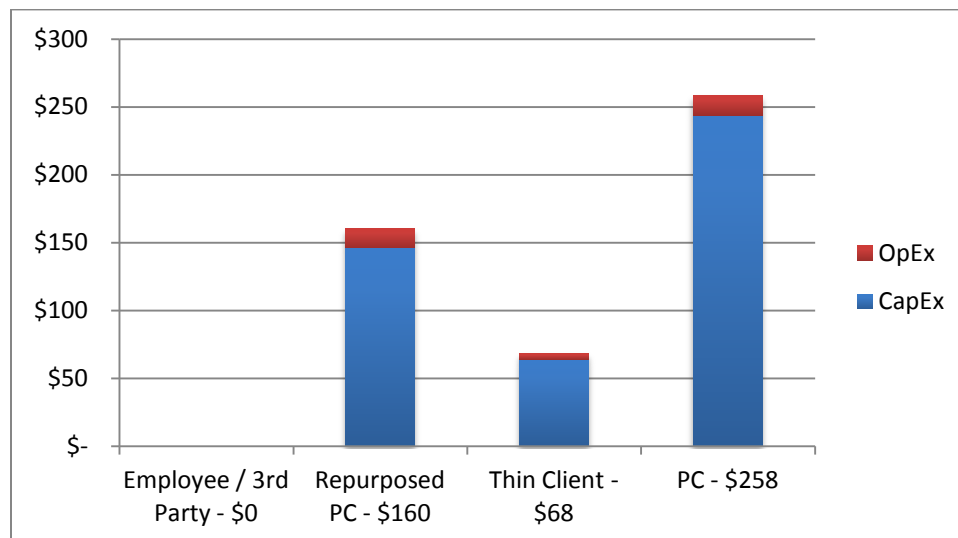


Table 2: Endpoint device annual costs

- PC:** This is a standard average corporate desktop PC with a basic monitor. Annual Cost: \$246 CapEx, \$15 per year in power costs.
- Employee / 3rd Party:** Since the desktop image can now be delivered through a web browser, there may be scenarios where there is no need to deliver a physical asset to end users. Annual Cost: \$0 per year in power costs as this is on 3rd party.
- Repurposed PC:** Organizations can significantly extend the life of existing PCs, utilizing the PC as a “terminal”, and no longer running the desktop OS locally. This is an attractive model for organizations that need to move off existing hardware but do not want the cost or headache of purchasing new PCs. Windows 7 is driving many PC refresh requirements. Annual Costs: \$146 CapEx, \$15 per year in power costs.
- Thin Clients:** Thin clients are an attractive alternative to physical PCs as they have a significantly smaller power footprint, a longer lifecycle, and are easier to manage as a near stateless device. Cost: \$64 CapEx, \$5 per year in power costs.

Cost Assumptions:

- Thin clients with monitor cost of \$450, amortized over 7 years
- PCs average cost of \$738, amortized over 3 years
- Repurposed PCs, average lifecycle extended to 5 years
- PC with monitor average power usage 82 Watts
- Thin Client with monitor average power usage 25 Watts
- 2000 hours of usage per year per end point device
- 9 cents per KWh

Data Center Hardware

There are many areas of up front data center hardware costs needed to run the infrastructure for VDI. These large up front capital investments are impeding adoption of VDI. The two primary cost areas are servers and storage.

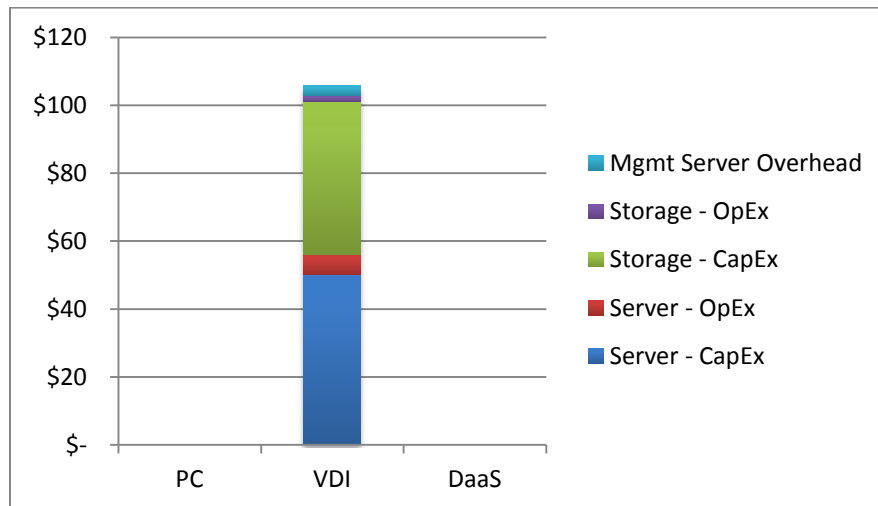


Table 3: Annual data center hardware costs per desktop

Servers

When deploying an internal VDI solution, there is the added cost of servers needed to run virtual machines. When sizing the server for desktop density there are two important considerations: The number of virtual CPUs per core and the amount of RAM per virtual desktop.

vCPU per Core: This is the number of logical virtual CPUs that will share a single core inside of a physical processor. This directly correlates to the processing power of a traditional desktop. For calculation purposes a ratio of 10 vCPUs per core was used, this assumes servers are leveraging Intel Nehalem Xeon or AMD Opteron processors.

RAM: This represented the memory you would see in a normal desktop. In the case of this customer the RAM is not oversubscribed. Since we are assuming Windows 7 desktops, we are using 1.5GB of memory as the average number.

Annual Cost: \$50 per desktop CapEx, \$6 per year in power costs.

Data Center Cost Assumptions:

- Floor space, cooling and racking, \$50 per tile per year
- 50 Desktop server, \$7500 including support, facilities, amortized over 3 years
- Server power consumption, 380 Watts
- 9 cents per KWh

Storage

VDI solutions require storage for the virtual desktops. In planning the storage system there are two primary considerations; IOPS for performance and GB for disk space. Average IOPS inside a Windows 7 desktop can range anywhere from 4 to 50 IOPS per desktop. For the purposes of calculation 15 IOPS per desktop are used as the average number, as this is the average between a task worker and a power user. From a footprint perspective, 25GB was used as the average Windows 7 image. Given the performance requirements of virtual desktops, local disk inside the server is not a recommended option as it cannot deliver a sufficient number of IOPS.

The choice to use SAN or NAS storage depends upon the preference of an organization based upon cost, performance and familiarity. To determine TCO we examine the cost of acquisition per GB, not the specific technology used. Mid-tier enterprise SAN or NAS can be bought for \$7.20 per GB, including power and racking space (using previously stated data center assumptions).

Cost Assumptions:

- Floor space, cooling and racking, \$50 per tile per year
- Mid-tier NAS solution used as average
- \$7.20 per GB, amortized over 3 years
- 25 GB desktop image, \$135 total cost, \$45 annual cost
- Power Costs of \$1.82 per 25GB annually

Management Server Overhead

When deploying a VDI environment in-house, additional hardware overhead is needed to run the VDI platform. Most commercially available VDI platforms are .NET based software products, and run on a Windows Server. This overhead is in the fashion of management servers and storage running the Windows Servers and the associated data store. The deployed infrastructure looks like a pair of Windows Servers, for HA, plus a SQL Server repository. To determine average cost, the management overhead cost was amortized over three years and spread across 1500 users, as that is a fair number to support with a pair of VDI servers acting as the connection broker.

Cost Assumptions:

- Management server to run Windows Server, \$6200
- Power Costs of \$222 per year
- A pair of above supports 1500 desktops, per desktop cost of \$2.83 annually

Software

Software costs account for a large percentage of any desktop solution. In any model the Windows desktop license is needed from Microsoft. Additionally, if a customer is to access their Windows license in a virtual machine, SA (Software Assurance) from Microsoft is also needed. If the virtual desktop is accessed from a non-Windows end point, then an additional Microsoft license, VDA is needed. To deploy and manage a virtual desktop environment a “connection broker” or “VDI platform” is needed. These solutions range in cost but the industry average of \$250 can be used.

The aforementioned VDI management software also requires a Windows Server to run on, as well as external relational databases for the data store. It is a best practice to run a pair of management servers, accounted for in management overhead and a single SQL data store.

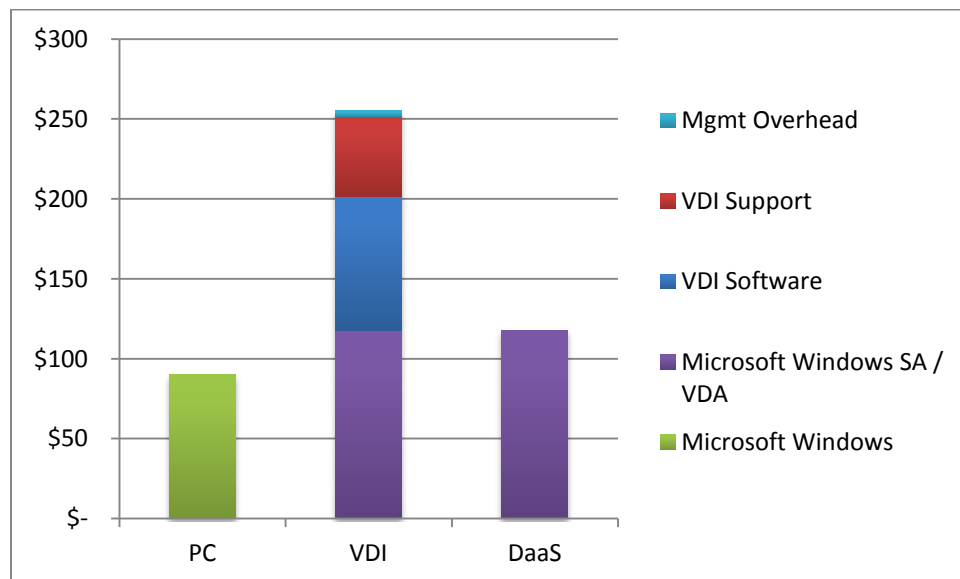


Table 4: Annual software costs per desktop by model

Cost Assumptions:

- Enterprise VDI Software license \$250, amortized over 3 years
- Support for VDI platform costs \$50 annually
- Microsoft Windows 7 Enterprise License with SA, \$90 per year average
- Microsoft Windows SA with VDA is \$118 per year
- Microsoft Windows Server License \$1029
- Microsoft SQL Server License \$7171 per CPU, \$1793 per year Software Assurance

IT Labor Costs

IT labor costs are a large portion of the expense for standard desktops, and an area where virtual desktops deliver significant savings since the desktops are now a centralized and controlled resource. Once the desktop is running inside a virtual machine, it becomes easy to rebuild, reset, and troubleshoot remotely. IT Labor costs include the following areas:

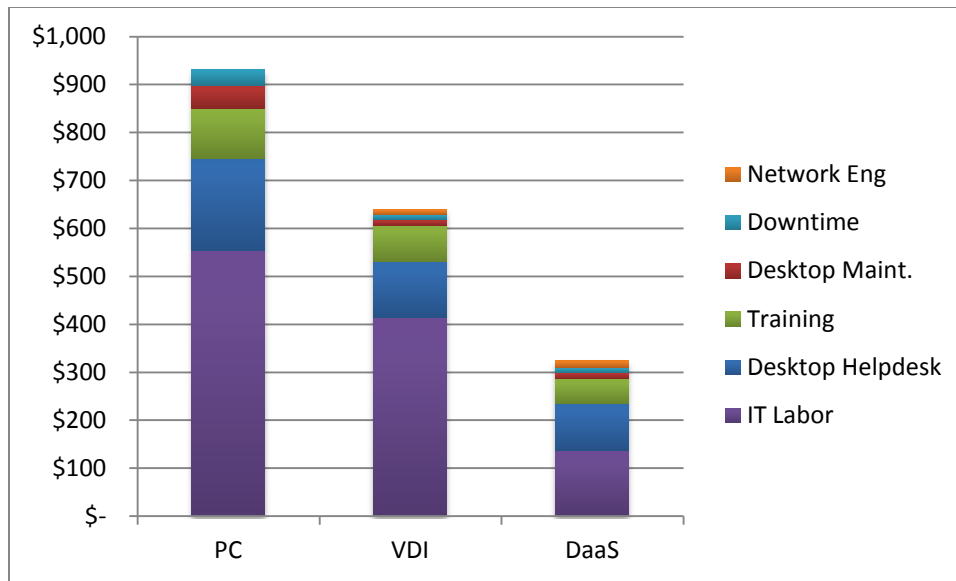


Table 5: Annual IT labor costs by solution per desktop

Helpdesk: The helpdesk cost represents tier one and two desktop support and the first line of response. With virtual desktops this cost is significantly reduced as the user state is no longer associated with the physical device in front of them.

Desktop Maintenance: Desktop maintenance is the cost associated with supporting and managing the physical device in front of the end user. With virtual desktops this cost significantly decreases, as the end point device is a dumb terminal, thin client or a 3rd party device.

Training: Training refers to cost associated with educating the end user on the solution, as well as chosen enterprise applications. Virtual desktops allow organizations to deliver training and updated content without requiring end users to be physically present.

IT Labor: This is a broad category that includes desktop engineering, image engineering, OS patching, maintaining and updating desktop related infrastructure. This also includes the overhead of the IT related functions – administration, finance, and application delivery and maintenance.

Downtime: Downtime refers to lost productivity of end users, associated with an offline device. This is generally recognized as a major point but hard to quantify. Virtual desktops deliver savings here as the desktop is now tied to an SLA.

Network Engineering: Virtual desktops create additional costs in the network engineering category. Virtual desktops, internally or as a service, are a network delivered service and organizations need to invest cycles to maintain and update the network.

Conclusion

The desktop market is ripe for change. Windows 7 migrations, new flexible business models, the need to reduce desktop TCO, and demand for mobile device support are driving organizations to reevaluate their desktop strategy. VDI was supposed to address many of these challenges; instead it created formidable new issues. Because of VDI's inherent complexity and large upfront CAPEX, virtual desktop adoption has stalled and is impossible for many organizations especially those without large data center capacity.

Cloud-hosted desktops as a service eliminate many barriers to adoption, delivering a complete desktop from the cloud, providing all the benefits of VDI without any of the hassles. Businesses can eliminate the cost and complexity of deploying and managing desktops, while enabling the flexibility that users require. Cloud hosted desktops require no upfront infrastructure investments. And, by transforming desktops from the CAPEX outlay inherent in onsite VDI and physical PC refreshes, businesses benefit from a predictable, easy to budget OPEX-based desktop environment.

NEC DaaS powered by Desktone

Desktone pioneered the industry's first virtual desktop hosting platform and is the only product purpose-built for delivering virtual desktops in the cloud. NEC DaaS delivers a simple to deploy and affordable cloud-hosted virtual desktop. Virtualization technology for desktop systems has long held the promise of simplified desktop deployment, centralized management, and improved data security. However, for many businesses the fulfillment of this promise has been out of reach due to complex technology, financial and organizational barriers to start and to scale an internal virtual desktop infrastructure deployment. In contrast, Cloud-based desktops are offered on a pay-as-you-go, subscription service, with no capital investment. Cloud-hosted desktops can be deployed in a matter of hours, not months, with substantially reduced complexity and risk. Desktops as a Service leverages carrier-class scale and geographic coverage that is not available to most organizations.

NEC DaaS provides businesses with a virtual desktop that is accessible from any device, anywhere. It has standard packaging sizes that can be configured to meet end users' performance requirements, with variables including OS, RAM, CPU and disk space. With just three steps required to set up a NEC DaaS implementation, virtual desktops can be up and running in days.

- **Affordable:** Starting at an average \$1/day with no infrastructure investment, businesses only pay for what they need and pricing is consistent to enable predictable IT budgeting.
- **Simple deployment and management:** Managing virtual desktops is simplified through a single, web-based, intuitive interface. Desktops in the NEC Cloud look and act as part of the corporate IT environment, even though they are running at a secure remote data center. This is because the desktops are connected to the corporate IT environment through a private network connection, and access to the desktops is based upon the existing Active Directory. Businesses can quickly add, remove or modify desktops as needed, from any location with a browser.
- **Simple to try and buy:** Because no infrastructure is required you can pilot a virtual desktop immediately with a free trial.
- **Instant 'on' experience:** Users can stop working in one location or on one device and pick up where they left off seamlessly.

- **Any device:** Users can access the NEC Cloud from an iPad, iPhone, iPod Touch and Android-based tablets and smartphones. They can also use thin clients or extend the life of their current PCs for cloud access. The Desktopone mobile client makes this access seamless.
- **Desktop flexibility:** Desktops can be set up for different use cases or groups of users quickly and easily. Options include performance, OS, features and remoting protocol.

*Gartner:

- [Prepare for the Windows 7 Migration Crunch](#), June 24, 2010
- Gartner's calculations assume the average enterprise with 10,000 PCs will need to replace roughly 25% of its machines early. – as quoted in <http://www.zdnet.com/blog/bott/how-much-will-a-windows-7-migration-really-cost/2377>

*IDC: "IDC estimates that 1 billion workers will be mobile at least part of the time or remote from their firm's main location by the end of 2011"

- <http://www.dataprotectioncenter.com/antivirus/symantec/internet-security-predictions-for-2011-the-shape-of-things-to-come/>
- <http://www.symantec.com/connect/blogs/2011-trends-distributed-workforce-drives-security-policies>

*IDC: nearly 90 percent of businesses plan to move forward with Windows 7 by mid-2012.

- ["Deployment Opportunities for Windows 7" June 2010](#)
- <https://partner.microsoft.com/download/global/40148162>

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