# Guide for choosing between Azure Lab Services and Windows Virtual Desktop for your educational scenarios

**Azure Lab Services** and **Windows Virtual Desktop** are two separate product offerings that make it easy for educational institutions to set up and manage cloud hosted virtual machines (VMs) for student usage. The goal of this guide is to help both IT administrators and educators understand the differences between these two offerings and the scenarios each offering is best suited for. Before we dive into the differences, let’s first get an overview.

What is Azure Lab Services?

Azure Lab Services (AzLabs) enables institutions to quickly set up and manage classroom labs in Azure. Inside a lab, an educator can easily set up Windows or Linux VM learning environments, assign VMs to students, manage the student roster, and control students’ VM usage. Students see all of their lab resources in a single view and connect to lab VMs for their projects, assignments, and classroom exercises. AzLabs is a managed service that simplifies the experience of using Azure resources for teaching\learning. This means that AzLabs fully manages the cloud infrastructure running behind classroom labs on behalf of the institution. For more information, refer to the [AzLabs documentation](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/classroom-labs-overview).

## What is Windows Virtual Desktop?

Windows Virtual Desktop (WVD) is Azure’s platform desktop and app virtualization service. WVD is not necessarily education-specific and addresses a wide range of virtualization scenarios across industries. WVD enables organizations to provide users with a full desktop experience for Windows 10, Windows Server, or Windows 7. In addition, WVD enables remote application access, which can be used to provide users with direct access to individual Windows applications, such as Office 365’s Excel or Word applications. WVD is also a *managed service* since it manages the connections to VMs; however, organizations have greater responsibility when it comes to configuring and managing the involved AAD tenant and infrastructure. For more information, refer to the [Virtual Desktop documentation](https://docs.microsoft.com/en-ca/azure/virtual-desktop/).

## Which Do I Use?

Here is a general guide on when to use Azure Lab Services and Windows Virtual Desktop.

#### **Azure Lab Services**

AzLabs is optimized to manage classroom labs’ underlying cloud infrastructure on behalf of institutions. With AzLab’s easy to use experience, institutions can quickly set up customized teaching/learning environments for time-boxed events, such as a course running for a semester or a hackathon running for a weekend. AzLabs is lightweight in the sense that labs are created only when you need them and cleaned up when you don’t.

AzLabs is best suited to:

* Enable *both* IT and educators to quickly set up and manage VMs without technical expertise.
* Provide VM learning environments that can be deleted and easily recreated as needed.
* Control and minimize the costs by managing students’ usage hours on the VMs.
* Estimate costs using a simplified pricing model.
* Provide students with admin access to their own individually assigned VM environment.
* Use multiple applications and tools in conjunction with each other.
* Create both Windows and Linux VMs.

The following list includes example types of classes that institutions have run that showcase where AzLabs is ideal to use:

* **Computer programming class –** A computer programming class typically requires a development environment, such as Visual Studio, and involves various debugging tools\emulators that must be used in conjunction with one another. This type of class may also require students to make configuration changes to the VM environment itself.
* **Data science class –** Data science classes are similar to computer programming classes because student workloads involve a variety of deep learning frameworks and tools. Since the process to train machine learning models is often GPU\CPU intensive, students may need their own VM for optimal performance.
* **Cybersecurity class –** In a cybersecurity class, students need access to several VM environments so that they can practice scenarios where one VM demonstrates a vulnerability and another is used to exploit the vulnerability. For this class, each student is provided a Windows Server host VM that has several nested VMs.

For further information on how to use AzLabs to set up various class types, refer to the [class types overview](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/class-types).

#### **Windows Virtual Desktop**

WVD is optimized to minimize costs by sharing and scaling a pool of VMs across users within an organization. WVD is not education-specific, nor is it focused on the teaching/learning experience. WVD offers highly configurable Windows virtualization experiences, but with this flexibility comes complexity. WVD requires your organization’s IT to be involved in its setup and management of the backing AAD tenant and infrastructure.

WVD is best suited to:

* Give access to individual Windows line-of business or Office 365 apps.
* Provide users with continuous, 24-hour access to apps or desktop environments.
* Minimize costs by sharing and scaling pooled VMs across users.

Here are some educational use cases where WVD is ideal to use:

* **Virtual computers for libraries or offices –** Institutions looking to replace general-use Windows computers, such as library computers, with a cloud-based offering can use a virtualized environment for this purpose. For example, library computers usually provide students with access to basic applications such as Office and a browser.
* **Accounting class that only needs Excel –** WVD’sremote app virtualization is ideal for classes that only need to provide students with access to a single application. For example, an accounting class where the students need to learn and have access to Excel.

There are additional factors that should be considered when choosing between these two offerings. The following table summarizes key comparison points based on the *current* functionality for each offering.

Later in this guide we cover these points in detail and provide a roadmap of upcoming features that will impact these comparison points in the future.

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|  |  | **Azure Lab Services** | **Windows Virtual Desktop** |
| **1.** | **Setup and management** | Educators are provided a simplified experience (that requires no technical expertise) to easily set up and manage labs within the policies set by their IT department. | IT is solely responsible for setting up and managing the pool of VMs and related resources since technical expertise and access to the institution’s Azure subscription is required. |
| **2.** | **Windows\Linux support** | VMs are provisioned with the flexibility of choosing from a variety of base images, including Linux, various versions of Windows, and custom images. | VMs can be provisioned specifically with **Windows 10, Windows Server 2016\2019, or Windows 7 based images (noLinux). Custom images are supported for the previously mentioned Windows versions.** |
| **3.** | **Student account\**  **domain access** | Students connect using an Office 365 account, Azure Active Directory email account or personal Microsoft accounts. | Users connect using an Office 365 account that is synchronized with an on-premise Active Directory. |
| **4.** | **Persistent student workspace** | Students’ work and data on the VM is persistent across sessions until a lab’s template VM is republished or the lab is deleted. | With FSLogix profile containers, users have persistent access to their user settings and their user profile folder which includes subfolders such as Desktop, Documents, Music, Pictures, etc. User profiles are maintained across VMs and when VMs are reimaged.  Like Lab Services, users may also be assigned their own dedicated VM so that their work and data is persistent across sessions for the lifetime of the VM. |
| **5.** | **Device connection** | Students may connect from any device that has a native remote desktop client installed; this includes Windows, Android, MacOS or iOS device.  Also, supports connecting from a modern browser. | Same as AzLabs.  In addition, supports IGEL (linux-based) thin clients, with more thin clients coming soon. |
| **6.** | **Cost control** | IT and educators can limit exactly how many hours that students can use a lab’s VMs by setting user schedules and quotas – this ensures the budget is never exceeded. | Provides cost savings by sharing VMs across users and scaling VMs to automatically start\stop during specified hours – scaling drops costs by 30% on top of the savings from sharing VMs.  There is no ability to set user quotas. |
| **7.** | **Pricing model** | The pricing model is simplified to bundle the cost of storage, networking, and VMs into a single price point. | The pricing model is based on the cost of storage, the type of VM used, and networking; institutions are responsible for factoring in these costs. |

## Additional details

Here are comparison points in more detail.

### **Setup and Management**

**A key decision point to consider is how an institution plans to divide the responsibility of setup and management across their IT department and educators. AzLabs enables educators to self-sufficiently manage their own lab of VMs within the boundaries set by their IT department. WVD is managed entirely by an institution’s IT department.**

#### **Azure Lab Services**

**AzLabs only requires that a lab account and its policies be set up and managed by their IT department; the lab account serves as a management container for one or more classroom labs. Once the lab account is created, educators are granted permission to create and self-manage their classroom labs. Specifically, educators can independently perform the following tasks using AzLabs’s simplified user experience:**

* **Create, update, and delete VMs.**
* **Select the base image and install additional software\tooling on VMs.**
* **Save and share custom images for reuse.**
* **Set a schedule for VMs so that they are automatically started\stopped.**
* **Set a quota for students that limits the number of hours that a VM can be used for.**
* **Invite students to register for a VM using their email addresses.**

#### **Windows Virtual Desktop**

**WVD supports many of the same tasks mentioned above, but the key difference is that an institution’s IT department must perform these tasks because administrative access to Azure computing, networking, and security resources is required. Also, setup and management of these resources requires technical expertise since this involves using the** [Azure Portal](https://login.microsoftonline.com/common/oauth2/authorize?resource=https%3a%2f%2fmanagement.core.windows.net%2f&response_mode=form_post&response_type=code+id_token&scope=user_impersonation+openid&state=OpenIdConnect.AuthenticationProperties%3dFp7OFgIhUcjTtCbkoHICHsk0YTiSVPGncjE295CQXDPW5N0rCUIvnawlMsleU94SEHJsNBfhlFZ3CT-l7LGqf2lHdfMG8-VG0cJ9cjmRNvhEY6JzhSJponCPm9GzAMsT6wF1x_-0-gzgMk023BqjpmFJKWjCPZsxgaX2EwggbI41XNQGQ0hpqNPUAL_w5ov7dWpHhlkFjgap4OwGLOgtyDW9hiHiiDbI1ouwOje7aoo3-eH4hJYzFuiW5qZFe4rHpb4NAeBIdSzQuCY4im7LH21V_hKlo0se6lNk7yM5YSK7LCkL0whEaana5VybZODAT9MBYFPa5muIKBEkeI4-ZpkKikLxmIbI2Y940MtYtOE&nonce=637080695212828599.MGVjNDEwMGUtNGQyYy00M2UwLThjNzQtMDI1MTA1YmIxYTJjMmUwZWIyM2YtN2Q2Yy00Yjg3LWEwMWEtNmY4YTQ2ZGFhMDVi&client_id=c44b4083-3bb0-49c1-b47d-974e53cbdf3c&redirect_uri=https%3a%2f%2fportal.azure.com%2fsignin%2findex%2f%3ffeature.refreshtokenbinding%3dtrue&site_id=501430&client-request-id=0224feaf-fc51-41cd-bd46-b5a36c26a926&x-client-SKU=ID_NET&x-client-ver=1.0.40306.1554&sso_nonce=AQABAAAAAACQN9QBRU3jT6bcBQLZNUj7VRDYflGjRO45gLJOlJa7tzlVcf7jslhJtenMSapSPM3eUSRtcJRaxl1jLIUlyjqW9eGFXFpuOQsGgCfo8pvqtSAA&mscrid=0224feaf-fc51-41cd-bd46-b5a36c26a926)**,** [PowerShell](https://docs.microsoft.com/en-us/powershell/scripting/overview?view=powershell-6)**, and REST programming interfaces.**

### **Windows\Linux Support**

**With both WVD and AzLabs, you can choose from custom images or images from the public gallery to provision VMs.**

#### **Azure Lab Services**

**AzLabs supports the ability to use a wide variety of Linux and Windows images based on the unique needs of a class.**

#### **Windows Virtual Desktop**

**As the name suggests, WVD is intended only be used with specific versions of Windows – specifically, Windows 10, Windows Server 2016\2019, and Windows 7. Here’s why:**

* **A key benefit of using WVD is to efficiently share pooled VM resources across users; multisession capabilities are supported only for Windows 10 and Server.**
* [Windows 7 is reaching end-of-life support](https://www.microsoft.com/en-us/windows/windows-7-end-of-life-support-information)**, so for customers that still need to use this version, they can opt to use WVD to create a Windows 7 environment while continuing to receive security updates. If you** specifically need to use Windows 7, WVD is the preferred option.

### **Student Account\Domain Access**

**An educational institution may require students to use a specific type of account for accessing VM resources. As a result, it’s important to note the differences between the two offerings.**

#### **Azure Labs Services**

With AzLabs, students have the flexibility of using the following types of accounts:

* A student email account that is provided by a university’s Office 365 or Azure Active Directory (AAD).
* A Microsoft email account, such as @outlook.com, @hotmail.com, @msn.com, or @live.com.
* A non-Microsoft email account, such as one provided by Yahoo or Google; however, these types of accounts must be linked with a Microsoft account.
* A GitHub account; again, this account must be linked with a Microsoft account.

#### **Windows Virtual Desktop**

For a student to access a virtualized app or desktop using WVD, they must connect with a domain account from an institution’s Azure Active Directory (AAD).

***Note:*** AzLabs’s VMs are currently *not* joined to a domain; however, functionality to make it possible to join to a domain is coming soon. WVD’s VMs are joined to the domain.

### **Persistent Student Workspace**

Another aspect to consider is how students persist their work and data.

#### **Azure Lab Services**

For classes that require students to have dedicated access to a VM, AzLabsis designed so that each student is permanently assigned their own VM to use throughout the lifetime of the class’s lab. This means students can save their work and data directly on the VM; and their work and data are persistent across sessions. Their work and data remain persistent unless the educator chooses to republish the lab’s image from the template VM which reimages the labs’ VMs.

#### **Windows Virtual Desktop**

WVD can be configured to share pooled VMs across users. With this configuration, each time that a user connects to a virtualized app or desktop, they may be accessing a different VM. In this case, we recommend setting up an FSLogix [profile containers](https://docs.microsoft.com/en-us/azure/virtual-desktop/create-host-pools-user-profile) so that a student’s profile follows them no matter which VM that they connect to in the pool. This allows them to save their work and data within their user profile folder which includes subfolders such as Desktop, Documents, Music, Pictures, etc.

It is also possible with WVD to virtualize an entire Windows desktop and assign the underlying VM to a single user – this essentially gives a user access to their own permanently assigned Windows VM where any work and data that is saved remains persisted for the lifetime of the VM. This configuration is commonly used for Windows 7 since it [requires a full desktop](https://docs.microsoft.com/en-ca/azure/virtual-desktop/troubleshoot-windows-7-vm) and does *not* support multiuser sessions.

### **Device Connection**

AzLabs and WVD both support connecting to VM resources using Windows, Android, macOS, and iOS devices. This requires that you install the appropriate remote desktop client on the device that you are connecting from. If you want to avoid installing this on your device, both AzLabs and WVD support the ability to connect using a modern web client.

#### **Azure Lab Services**

Refer to the following articles on how to connect to an AzLabs VM:

* [Connect to the VM](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/how-to-use-classroom-lab#connect-to-the-vm)
* [Connect to a VM using RDP on a Mac](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/how-to-use-classroom-lab#connect-to-a-vm-using-rdp-on-a-mac)
* [Use remote desktop connection for Linux VMs](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/how-to-use-remote-desktop-linux-student)

#### **Windows Virtual Desktop**

For further information on how to connect to a WVD resource, refer to the below articles. In addition, WVD is currently working with partners to enable thin clients. The first Linux-based thin client supported by WVD is IGEL.

* [Connect with the Windows Desktop client](https://docs.microsoft.com/en-us/azure/virtual-desktop/connect-windows-7-and-10)
* [Connect with the Android client](https://docs.microsoft.com/en-us/azure/virtual-desktop/connect-android)
* [Connect with the macOS client](https://docs.microsoft.com/en-us/azure/virtual-desktop/connect-macos)
* [Connect with the iOS client](https://docs.microsoft.com/en-us/azure/virtual-desktop/connect-ios)
* [Connect with the web client](https://docs.microsoft.com/en-us/azure/virtual-desktop/connect-web)

### **Cost Control**

With AzLabs, you have explicit control over costs to ensure the expected budget is never exceeded. WVD offers cost-minimizing scaling options.

#### **Azure Lab Services**

AzLabs provides three key features that allows both IT and educators to easily and precisely control costs:

* **Lab schedule** – You can define a one-time schedule or a recurring schedule so that VMs in the lab automatically start and shutdown at a specified time. Keep in mind that *no* costs are incurred when the VMs are shutdown. For more details, refer to the guide on how to [create and manage schedules](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/how-to-create-schedules).
* **Hourly student quota –** Setting an hourly student quota allows you to specify the number of hours you want to give each student (outside the scheduled lab time) to use their VM. Once the student has reached this quota, the VM is automatically shut down and the student no longer has access. You can also set additional quotas for individual students as needed. For more details, refer to guides on how to [set quotas for users](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/how-to-configure-student-usage#set-quotas-for-users) and [set additional quota for a specific user](https://docs.microsoft.com/en-us/azure/lab-services/classroom-labs/how-to-configure-student-usage#set-additional-quota-for-a-specific-user).
* **Automatic shutdown of VMs –** Each lab comes with a setting to auto-shutdown students’ VMs when students disconnect from the VM (e.g. RDP session ends). This feature is enabled for Windows VMs, and the Linux version is currently being worked on. To learn more, see how to [enable automatic shutdown of VMs on disconnect](https://docs.microsoft.com/azure/lab-services/classroom-labs/how-to-enable-shutdown-disconnect).

#### **Windows Virtual Desktop**

**WVD has the following features that provide substantial cost savings:**

* **Load balancing –** WVD provides a depth-first load-balancing method to use for cost control. This cost control method gives granular control over the number of VMs that are allocated when students connect to resources in the host pool. For more details, refer to [host pool load-balancing methods](https://docs.microsoft.com/en-us/azure/virtual-desktop/host-pool-load-balancing).
* **Dynamic scaling –** To reduce costs further, dynamic scaling is used to shut down and deallocate VMs during off-peak usage hours, then restart them during peak usage hours. For more details, refer to the guide on how to [scale session hosts dynamically](https://docs.microsoft.com/en-us/azure/virtual-desktop/set-up-scaling-script).

### **Pricing Model**

Both AzLabs and WVD pricing models are based on paying for the storage and type of VMs that you use. However, AzLabs’s pricing model is further simplified by bundling these costs into a single price point, called a Lab Unit.

#### **Azure Lab Services**

For AzLabs, the pricing is calculated using similar cost factors as described below for WVD; refer to specific details in the [Azure Lab Services pricing guide](https://azure.microsoft.com/en-us/pricing/details/lab-services/). The key difference is that the compute size, disk type, and networking costs are bundled together as a Lab Unit. A Lab Unit is the cost unit that determines the price for each VM instance within a lab.

#### **Windows Virtual Desktop**

Key cost factors associated with WVD are:

* [Compute size](https://azure.microsoft.com/en-us/pricing/details/virtual-machines/series/) of VM instances
* [Disk type](https://docs.microsoft.com/en-us/azure/virtual-machines/windows/disks-types) of VM instances (Premium SSD, Standard SSD, or Standard HDD)
* Number of VM instances
* Usage hours (charges are *not* incurred when a VM is shutdown)

Refer to details in the [Windows Virtual Desktop pricing guide](https://azure.microsoft.com/en-us/pricing/details/virtual-desktop/).