

# Amazon WorkSpaces at Cornell

## Overview

[Amazon WorkSpaces](#) is a fully managed VDI service from AWS that allows admins to assign remote Amazon Linux WorkSpaces built on Amazon Linux 2 LTS, or Windows 10 desktop experience instances to individual users.

Users can connect to the WorkSpace from their own device whether they are using Windows, Mac, Chromebook, Tablets or even a supported web browser.

The WorkSpaces are persistent computing environments; each user will see the same personal files and settings every time they log into the WorkSpace assigned to them.

Admins create an image using the Amazon Linux WorkSpaces built on Amazon Linux 2 LTS, or Windows 10 desktop experience base image provided by AWS with the software and updates they desire and then deploy to users. Traditional desktop management tools can be installed like any other computer TSPs are administering.


Amazon also offers the WorkSpaces Application Manager, which allows admins to manage and update applications separately from the base OS image and assign them to users based on AD group membership.


Like most AWS offerings, there is [extensive documentation](#) offered through the AWS website.

## Cornell Network & Active Directory

To get started with Amazon WorkSpaces, the first step is to have the IT@Cornell Cloud Team create an AWS account for your team. If you don't already have an AWS account under the Cornell Master Contract, please send your request to [cloud-support@cornell.edu](mailto:cloud-support@cornell.edu) and we will begin the Account On-Boarding process.


Your AWS account will need a Cornell Standard VPC configured with [Direct Connect](#). You will also need a VPC peer to the Cornell Core VPC for access to [Cornell Active Directory DC's](#) in AWS.

 All of the above will be configured for you by the IT@Cornell Cloud Team. Once these items are set up, you are ready to start administering Amazon WorkSpaces!


 WorkSpaces can be used without integration to Cornell resources, but we encourage admins at Cornell to follow these guidelines for better support and the best experience for users.

## Creating WorkSpaces Directories

Amazon WorkSpaces requires an Active Directory domain as a base for assigning WorkSpaces to individual users. [AWS Directory Service](#) allows admins to create an [AD Connector](#) in order to integrate with CornellAD. The AD Connector acts as a proxy to CornellAD and has a Cornell HoldingID assigned to it. This special HoldingID is given permission to look up users and groups as well as create Computer Objects in a specific OU. If you are ready to create your AD Connector, send your request to [cloud-support@cornell.edu](mailto:cloud-support@cornell.edu) and the IT@Cornell Cloud Team will create your OrganizationalUnit (OU). You will be given the ability to manage your OU and apply Group Policy Objects (GPOs) as desired; WorkSpaces respect GPOs the same as any other computer would.

 We recommend creating a minimum of two WorkSpaces Directories. One for admins to create images, and a second for users. You can create as many directories as you like but be sure to create sub-OU's under your top-level OU in order to organize computer objects by each directory. (You will not be charged for any small AD Connector that has at least one WorkSpace assigned).

To create your AD Connector, log into your [Cornell AWS Account](#), navigate to the [WorkSpaces Directories Console](#), click the "Set up Directory" button and choose AD Connector as the directory type. The settings for the AD Connector are straightforward and an example configuration is outlined in the screenshot below. Be sure to place your AD Connector within your Cornell Standard VPC and your **private** subnets. All WorkSpaces you create within this directory will be created within the same subnets as the AD Connector. You will need to plan network space according to the number of users you plan to support.

 There are very few cases where you would want your WorkSpaces to be assigned public IP addresses. We recommend always placing them in private subnets so that they are protected by a NAT Gateway.

## Directory details

AD Connector is a directory gateway to your on-premises Microsoft Active Directory. Learn more about [setting up AD Connector](#) or [setting up a VPN Network](#) for more information.

Directory type	AD Connector	
Organization name*	<input type="text" value="my-cornell-workspaces-organization"/>	
Connected directory DNS*	<input type="text" value="cornell.edu"/>	
Connected directory NetBIOS name	<input type="text" value="CORNELL"/>	
Connector account username*	<input type="text" value="HoldingID"/>	
Connector account password*	<input type="password" value="....."/>	
Confirm password*	<input type="password" value="....."/>	
DNS address*	<input type="text" value="169.254.169.253"/> <input type="text" value=""/>	
Description	<input type="text" value="My Description"/>	
Size	<input checked="" type="radio"/> Small <input type="radio"/> Large <small>Large directories cost more. <a href="#">Learn more.</a></small>	

## VPC Details

To set up AD Connector you need to select a VPC and two subnets, each in a different Availability Zone. This ensures your directory is isolated and reachable only by your instances.

VPC*	<input type="text" value="cu-cs-vpc   vpc-71070114 (10.92.76.0/24)"/>	
<a href="#">Create a new VPC</a>		
Subnets*	<input type="text" value="1c-private   10.92.77.0/24 (us-east-1c)"/> <input type="text" value="1d-private   10.92.78.0/24 (us-east-1d)"/>	
<a href="#">Create a new Subnet</a>		

\* Required

[Cancel](#)

[Next Step](#)

## Configuring a WorkSpaces Directory

Once your WorkSpaces Directory has been successfully created, there is a bit more configuration to do. Navigate back to the [WorkSpaces Directories Console](#) and select the directory. If your AD Connector reports it is not "Registered," select it and choose "Register" under the "Actions" dropdown. Once your directory is Registered for WorkSpaces, select the directory and choose "Update Details." We recommend the following configuration for your WorkSpaces Directory.

- **Target Domain and Organizational Unit**
  - Place the Distinguished Name for the OU assigned to you by the IT@Cornell Cloud Team
  - Only the OU that is assigned to you will work, if you place any other OU here, your computer objects will fail to create. This is because they are named by AWS and will not conform to your object naming restrictions.
  - You can create sub-OUs under the OU assigned to you. As long as the OU you designate here is underneath your assigned WorkSpaces OU, it will work fine.
- **Security Group**
  - Assigning a Security Group to your WorkSpaces is optional.
  - This would come in handy if you need to restrict WorkSpaces network access to other resources in your VPC. For example, an RDS database, file share or EC2 Instance.
- **Access to Internet**
  - Although it seems counterintuitive, in almost all cases you want to disable this setting.

- Enabling this setting simply assigns each WorkSpace a public IP address. In the previous section, we recommended to place your WorkSpaces Directory within private subnets, so public IP addresses are not required.
  - The advantage here is that all WorkSpaces will be behind a NAT Gateway and all traffic will come from a single public IP, that of the NAT Gateway itself. This benefits security and also makes it easier to open firewall rules to allow WorkSpaces to connect to publicly routed resources.
  - There may be edge cases where your WorkSpaces need to be placed in public subnets and assigned public IP addresses. This is up to the discretion of the admins.
- **Web Access**
    - Enable this setting unless you want to disable access to WorkSpaces via Web Browser.
  - **Local Administrator Setting**
    - We recommend setting this to disabled for user directories and enabled for admin directories. However, this is up to the discretion of the admins.
    - This setting controls user write privileges to the OS drive on the WorkSpaces. Users always have write privileges to their persistent User Profile.
    - Keep in mind that if a WorkSpace is rebuilt, any changes to the OS drive will be overwritten by the new WorkSpaces Image. Only the User Profile persists between rebuilds.
    - Admins can also control local administrator access on WorkSpaces via GPO instead of enabling this setting.
  - **Update AD Connector Account**
    - If you ever need to update the password on your assigned HoldingID, here is where you do it.
  - **Multi-Factor Authentication**
    - This allows you to configure MFA for your WorkSpaces via RADIUS.
    - Please work with IdM to setup a RADIUS integration as they will need to provide a shared secret, IP addresses and any custom ports. [Reference doc.](#)
      - Setup an AD Connector Directory within the Workspaces console.
      - Provide IdM with the Directory IP addresses for firewall allows.
      - Enter RADIUS server IP addresses to the security group attached to the Directory.

**RADIUS status** Completed

**Enable Multi-Factor Authentication** ☒

**RADIUS server IP address(es)**  ⓘ

**Port**

**Shared secret code**

**Confirm shared secret code**  ⓘ

**Protocol**

**Server timeout (in seconds)**

**Max retries**

- In MFA field in the Workspaces application, enter DUO code, 'push,' 'phone' or 'sms' for MFA authentication.

- **Maintenance Mode**
  - We recommend always enabling this setting.
  - This ensures that Auto-Stop WorkSpaces start up at least once per month to apply updates.

## Creating WorkSpaces

The above setup concludes any Cornell specific configuration. From this point, you should be able to create NetID assigned WorkSpaces that have a Computer Object in CornellAD. Please refer to the [WorkSpaces Documentation](#) for instructions on how to create images and bundles for WorkSpaces, as well as managed applications using WorkSpaces Application Manager (WAM). Feel free to contact the IT@Cornell Cloud Team if you have any specific questions, but we will outline some best practices below:

- **WorkSpaces Images**
  - The first step to creating WorkSpaces for your users is to create a WorkSpaces Image.
  - This should have the latest Windows Updates and any management software and applications you want to maintain within the base image.
  - We recommend creating a "Golden Image" as your base and using existing management tools to manage WorkSpaces like any other Desktop / Laptop on campus.
  - WorkSpaces, and the images and applications that make them up, should adhere to [CU Policy 5.10](#).
- **WorkSpaces Bundles**
  - A bundle decides the OS Version, CPU, RAM, SSD and GPU resources available to a set of WorkSpaces.
  - One Image is assigned to a Bundle, but the Image can be updated / swapped out with any other Image you create, at any time.
  - Once a WorkSpace is created, its bundle cannot change, but you can update the Image within the Bundle and then Rebuild the WorkSpace to apply the updated Image.
  - Rebuilding a WorkSpace with a new Image has a few caveats and is analogous to "re-imaging" a physical computer. Technically, the User Profile will persist, but file integrity is only guaranteed if a Rebuild is performed within a certain maintenance window. For this reason, we recommend using traditional management tools to administer WorkSpaces as if they were a physical computer.
- **WorkSpace**
  - A WorkSpace is a single VM assigned to a single user.
  - WorkSpaces have a "Registration Code" that is unique to each directory. Users will need this Registration Code to configure their client to connect to their assigned WorkSpace.
  - When WorkSpaces are set up to use CornellAD, as outlined in this wiki, the user logs in with their Cornell NetID & Password.
  - Only one WorkSpace can be assigned per user, per directory.
  - You cannot change the user assigned to a WorkSpace, it is forever assigned to that user.
  - WorkSpaces can be set to Always-On or Auto-Stop. We recommend using Auto-Stop in the majority of cases. The cost savings are significant and it only adds a minimal amount of time to resume a WorkSpace when a user connects.
  - WorkSpaces can optionally have the OS Drive and / or User Profile encrypted at rest (full disk encryption). We recommend enabling full disk encryption, as it is a requirement for [CU Policy 5.10](#).



WorkSpaces, and the images and applications that make them up, should adhere to [CU Policy 5.10](#).

## WorkSpaces Application Manager (WAM)

WAM allows you to manage and update your applications separately from the WorkSpaces Image. You can assign applications to user WorkSpaces based on AD group membership. This makes license management as simple as assigning a user to a group. You can choose to make application installs required or optional in the WAM console. For example, you might want to require that Identity Finder be installed and kept up to date, but give the user the option to install Adobe Photoshop at their discretion. You can also keep track of and limit the total number of installs for any one Application.

To use WAM, you first create a WAM Package using the tools outlined in the AWS WAM documentation. Then you create a WAM Application with that Package assigned; the Application is configured with a version and AD group. You can update an Application with a new Package version any time you want. The model is very much analogous to the Image / Bundle concept for the WorkSpaces themselves.



Each WAM Application must be less than 5 GB. Using WAM also adds \$5/mo to the price of every WorkSpace you create. If you can work within those constraints, WAM will work well for you.

## Bring Your Own License (BYOL)

There is a BYOL concept in WorkSpaces that allows an organization to shave \$4/mo off the cost of each WorkSpace by implementing our Microsoft Windows Site License. However, a commitment of 200 WorkSpaces is required and a long administrative process is involved with AWS. If you are interested in BYOL for WorkSpaces, please get in touch with the IT@Cornell Cloud Team. We may also be able to negotiate WorkSpaces BYOL for all Cornell AWS accounts in the future.

