

# Tips and Techniques for the Fusion 22H2 Tech Preview for Apple Silicon

Revision 10 (25-October-2022)

Compiled by @Technogeezer (a.k.a. Paul Rockwell, just another Fusion user...)

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# 1 Introduction

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This document is an unofficial supplement to the Fusion 22H2 Tech Preview Testing Guide. It contains tips and techniques originally posted in the Tech Preview Discussions board. This document will be updated as new issues are uncovered.

This document only contains tips and techniques for the Fusion 22H2 Tech Preview running on Apple Silicon. If you are still running the 21H1 version of the Tech Preview, it is recommended to upgrade to the 22H2 version.

This document contains hyperlinks to external web sites. It is best viewed in Adobe Reader or any other PDF viewer. It can be printed for reference if desired (URLs to external web sites are visible in their entirety).

## 1.1 Some administrative skills are required to use this document

This document assumes basic Windows and Linux administration skills, such as how to gain administrative access to the virtual machine's operating system and use both graphical and command line utilities to make changes to configurations.

If you are unsure about how to perform these basic administrative tasks, you are encouraged to search the web for documentation and tutorials on your operating system environment.

## 1.2 The Tech Preview Testing Guide is mandatory reading

It is essential that you download and read the Fusion 22H2 Tech Preview Testing Guide before attempting to use the Tech Preview. The Tech Preview Testing Guide can be found here: <https://communities.vmware.com/t5/Fusion-22H2-Tech-Preview/Fusion-22H2-Tech-Preview-Testing-Guide/ta-p/2867908>

The Tech Preview is just that – a preview of an upcoming Fusion release. The Testing Guide is essentially the release notes for the Tech Preview. It contains what's included in the preview, what's not, what's known not to work, and other information valuable for virtual machine creation and operation.

The Testing Guide has been updated as of September 2022 with important new information. Please download this new version and review it.

This document does not duplicate information that is found in the Tech Preview Testing Guide.

## 1.3 Acknowledgements

The content of this document is the work of the many Fusion community members that have contributed these valuable tips to the Tech Preview Discussions board. Many thanks go out to those whose efforts made this document possible. Apologies to anyone that I may have missed.

Special thanks go out to:

- @Mikero (Michael Roy, VMware Fusion/Workstation product manager) – for providing the Tech Preview, its documentation, and for keeping watch over the Discussions forum.
- @dlhotka – For comments and experiences on using prior versions of the Tech Preview, as well as for the heads-up on running multiple hypervisors at the same time, as well as suggestions leading to the return of the uupdump.net instructions for building on macOS.
- @k\_ronny – For inspiration on how to modify RHEL 9 configurations to increase the default graphics resolution until Red Hat fixes it.
- @ZigaD – for detailed instructions on how to create Windows 11 ISO media from uupdump.net
- @palter – for independently confirming how to get CentOS 9 Stream working on the Tech Preview
- @mssblinq – for reporting sound device errors in Windows VMs
- @JamesRule – for reporting issues with resizing Kali Linux windows
- @adf43r3rfe – for reporting issues in booting a newly installed Kali Linux VM
- @mannyman – for offering a streamlined Ubuntu 20.04 -> 22.04 upgrade process
- @shildebrandt (VMware employee) – for noting that the Windows 11 IoT ISO will work on the Tech Preview.
- @bzilli – for a workaround to audio issues
- @mvreijn – for pointing out an omission of instructions for installing openSUSE Leap
- @toce – for pointing out an error in the commands used to install a Debian backport kernel that results in installation failures.
- @tonyarnold – for discovering that enabling 3D on Ubuntu 22.10 will crash the Tech Preview.
- Burke Azbill (Twitter: @TechnicalValues) – for discovering issues with Fedora 36 upgrading and providing information for a solution.
- @jnauer – for verifying that Fedora 37 beta works on the Tech Preview.
- @btechit – for providing feedback on upgrading Windows 11 versions via Windows update, leading to the re-introduction of the uupdump.net build instructions for macOS.
- @kaz219 – for corrections to the Homebrew commands used to create Windows 11 ARM ISO media on macOS

## 2 General Notes

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### 2.1 22H2 Tech Preview allows Linux kernels with security updates to boot

In early March 2022, the Linux kernel maintainers introduced changes to the Linux kernel to address SPECTRE-like security vulnerabilities that were discovered in various CPU chipsets. These changes were made to Linux kernels that run on many CPU architectures, including ARM (arm64/aarch64). As the changes were incorporated as security updates to most Linux distributions, VMs that received these updates would no longer boot on the 21H1 Tech Preview.

#### **Technical details**

The specific kernel change that caused the most problems is the addition of a check of the ARM architecture CPU capability register ID\_AA64ISAR2\_EL1. This register is being checked for the existence of an ARM CPU instruction that helps mitigate SPECTRE-like vulnerabilities.

Accessing this register in a virtual machine causes a trap back to hypervisors on Apple Silicon. This register had not been accessed in prior versions of the Linux kernel, and almost all Apple Silicon virtualization products did not implement handling of the trap.

The 21H1 Tech Preview did not recognize the trap. As a result, it failed to boot the kernels containing the change.

This issue has been addressed in the 22H2 Tech Preview.

However, read on. There are other instances of kernels failing to boot on the 22H2 Tech Preview which are discussed in other topics of this document.

### 2.2 Linux kernels do not boot on the 22H2 Tech Preview

Some ISO installation media and Linux VMs that worked under the 21H1 Tech Preview will not boot on the 22H2 Tech Preview. They will display a blank screen with either no cursor or a static non-blinking cursor.

A common cause of this problem appears to be due to changes made in the 22H2 Tech Preview. Some 5.14 and later kernels containing the VMware Linux SVGA driver (vmwgfx) look to have difficulties with the driver under the 22H2 Tech Preview.

If you are running or wish to run Ubuntu, please see the Ubuntu topics in this document. The short version:

- Daily development builds of Ubuntu Desktop and Server 22.04.1 LTS (Jammy Jellyfish) dated 20-Sep-2022 or later will boot and install on the Tech Preview
- Daily development builds of Ubuntu 22.10 Desktop and Server (Kinetic Kudu) dated 08-Sep-2022 or later will boot and install on the Tech Preview.
- 20.04.4 LTS installers will boot and install a working VM.
- Ubuntu builds other than these will not work.

For distributions other than Ubuntu, try blacklisting the vmwgfx driver at boot time so that the kernel will not load it. In most cases this will allow the installer or VM to boot using the default Linux framebuffer graphics driver.

**IMPORTANT:**

Before attempting the following procedure, take a snapshot of the offending VM or copy it to another disk to preserve it.

This procedure will NOT work for Ubuntu virtual machines.

To boot VMs that exhibit the “blank screen” problem	
1.	<p>Boot the VM to the GRUB boot loader menu,</p> <ul style="list-style-type: none"> <li>• Use the arrow keys to highlight the previously working kernel.</li> <li>• Do not press ‘Enter’. Instead, press ‘e’.</li> </ul> <p>This will display the details of the GRUB booting commands for that kernel.</p>
2.	<p>See the documentation for GRUB and your distribution for complete instructions on how to block kernel drivers from loading.</p> <p>For most non-Debian Linux distributions, adding the following to the kernel arguments will prevent the vmwgfx driver from loading:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre>modprobe.blacklist=vmwgfx</pre> </div> <p>For Debian-derived releases (including Kali Linux), add the following instead:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre>module_blacklist=vmwgfx</pre> </div>

3.	Press Ctrl-x to boot the kernel with the updated arguments. The kernel should now boot to the graphical login screen or installer. If it doesn't, the vmwgfx driver most likely isn't your problem and you should perform additional troubleshooting.
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### 2.3 Existing Linux VMs will not boot under 22H2 Tech Preview

It is likely that you are encountering the issue described in the topic [Linux kernels do not boot on the 22H2 Tech Preview](#). In most cases using the procedure in that topic will allow your kernel to boot.

Many distributions have an updated kernel package containing a working vmwgfx driver. This can be installed via software updates after the VM is able to boot.

The following distributions are known to have updated kernels that will be installed via software updates after a VM is booted. These updated versions allow the vmwgfx driver to work properly.

- OpenSUSE Tumbleweed – 5.18.11 or later
- Fedora 35 – 5.18.13-100 or later
- Fedora 36 – 5.18.13-200 or later
- CentOS 9 Stream – 5.14.0-134 or later
- Kali Linux – 5.18.5 or later

Follow this procedure to fix an existing VM does not boot.

#### **Important:**

Before attempting the following procedure, please take a snapshot of the offending VM or copy it to another disk to preserve it.

This procedure will NOT work for Ubuntu virtual machines.

To fix existing Linux VMs that do not boot with the 22H2 Tech Preview	
1.	Follow the procedure in the topic <a href="#">Linux kernels do not boot on the 22H2 Tech Preview</a> to get your VM to boot. If it does not boot properly, stop, and perform additional troubleshooting.
2.	Log into your virtual machine, open a Terminal/Konsole session, and sudo to root. Note that since the vmwgfx driver is not loaded, the screen resolution is fixed (typically at 1024x768) and unable to be changed.
5.	If you have modified your VM to block the installation of kernel updates (because of the issues encountered in the 22H1 Tech Preview with Linux security updates) undo those changes.
6.	Upgrade your Linux virtual machine using your distribution's package management utilities. In most cases, an updated kernel that will boot with the 22H2 Tech Preview will be installed.
7.	Reboot the VM and log back in again. Graphics resolution should now be able to be changed.

## 2.4 No VMware Tools packages for ARM Linux

Use open-vm-tools packages that are provided by the distribution. open-vm-tools are the in-guest hypervisor integration tools recommended by VMware for Linux operating systems. See the Tech Preview Testing Guide for more information.

VMware Tools for Linux packages (distributed for VMware Fusion, Workstation or ESXi) will not work on ARM architecture Linux distributions. They are compiled for older Linux distributions running on Intel architecture CPUs.

## 2.5 Dynamically changing the display resolution of a Linux VM doesn't work

Changing the resolution of the VM display requires a Linux kernel that contains the VMware SVGA (vmwgfx) driver. VMware delivered the vmwgfx driver to the Linux kernel maintainers, and it should be included in most vendor distributions with a 5.14 kernel or later.

This issue will be seen most often in Debian 11 releases. The kernel that is released with these distributions is a 5.10 version which does not contain the vmwgfx driver.

## 2.6 Unable to change screen resolution in a KDE Plasma session

This is a bug in releases of KDE Plasma prior to 5.24.2 running on Linux kernels that contain the VMware SVGA (vmwgfx) graphics driver. Any change in screen resolution in the VM switches briefly to the new value, then snaps back immediately to the defaults.

This bug is fixed in KDE Plasma 5.24.2.

In KDE Plasma releases before 5.24.2, this issue can be worked around as follows:

<b>To enable screen resolution change in KDE Plasma releases prior to 5.24.2</b>	
1.	In the guest OS, open the System Settings app.
2.	Under the "Workspace" category, select "Startup and Shutdown".
3.	Select "Background Services" on the left-hand side of the screen.
4.	Scroll down the list of "Background Services" until you see "KScreen 2" under the "Startup Services" category.
5.	Uncheck "KScreen 2" to disable it and stop the service using the pause button on the right if you see it running.
6.	Log out and log back in again.

The screen resolution can now be changed using the appropriate KDE Plasma control panels.

Note that when using the work-around, the updated resolution will not persist across login sessions. The resolution must be reset to the desired values after session logout or reboot. When using KDE Plasma 5.24.2, the resolution change will persist for sessions across logout and reboot.

## 2.7 Shared folders do not automatically mount in a Linux VM at boot

This is a known issue that impacts Linux guests when the shared folder client in the guest is implemented using the FUSE user-space file system framework. This issue exists on both Intel and ARM architectures, and when using either using open-vm-tools or VMware Tools. See the following VMware KB article for more information: <https://kb.vmware.com/s/article/60262>

The standard documented workaround is to disable and enable the Shared Folders feature of the VM from the Fusion GUI while the guest operating system is running. However, this work-around is not persistent, and must be repeated after each reboot of the VM.

A persistent solution is to edit `/etc/fstab` and add an entry to mount the shared folders automatically on boot. As an example,

1.	Make sure the mount point <code>/mnt/hgfs</code> exists. If it doesn't, <code>sudo</code> to root and create the empty directory.
2.	Add the following line to <code>/etc/fstab</code> : <pre>vmhgfs-fuse /mnt/hgfs fuse defaults,allow_other 0 0</pre>

Shared folders configured for the VM will now be mounted at boot time.

Another persistent solution for distributions using `systemd` can be found in the following VMware Knowledge Base article: <https://kb.vmware.com/s/article/74650>

## 2.8 Audio problems

(Thanks to `@mssblinq` for finding this, and `@bzilli` for a workaround)

The 22H2 Tech Preview has a known issue with the sound device on Windows systems and may throw errors on Linux VMs audio devices. VMware acknowledges that they have more work to do on the sound device.

`@bzilli` reports that configuring the sampling rate of the virtual audio device in the VM to 44,100 Hz (44.1 kHz) instead of the default 48,000 Hz may solve some of the issues. This workaround is reported to work for both Linux and Windows.

## 2.9 Erratic behavior when multiple hypervisors are in use

(Thanks to `@dlhotka` for finding this)

Erratic behavior has been observed when running VMs with the 22H2 Tech Preview at the same time as running VMs with another virtualization product (in the reported case, Parallels). The issue reported is that hard host crashes have occurred when under heavy load.

It is not clear if it is a macOS resource contention issue, or a virtualization software issue (personal opinion - because virtualization software doesn't use kernel extensions right now, I suspect there's something up in macOS and its virtualization frameworks).

For now, a prudent best practice would be to avoid running multiple virtualization products at the same time.

See this post for more details: <https://communities.vmware.com/t5/Fusion-22H2-Tech-Preview/Warning-about-running-multiple-hypervisors-at-once/td-p/2921430>.

## 2.10 Fixed: TPM does not work unless Rosetta 2 is installed

(Thanks to @Mikero for the heads-up on this)

A bug with the TPM implementation in the 22H2 Tech Preview build 20191287 causes TPM initialization failures when Rosetta 2 is not present on the Mac.

This issue has been fixed with the updated build 20486664 of the 22H2 Tech Preview which was released in September 2022. This build no longer requires Rosetta 2 to be installed. Please upgrade to this build to obtain the fix.

## 3 CentOS Stream

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**Note:** This topic discusses CentOS Stream releases that are “upstream” from Red Hat Enterprise Linux. See the section [Red Hat Enterprise Linux and compatible/downstream distros](#) for discussion of CentOS versions that are re-spins of Red Hat Enterprise Linux (“downstream versions”).

### 3.1 Text mode installation hangs at boot

When booting into the text mode installer at the GRUB boot menu using “Troubleshooting --> Install CentOS Stream 9 in text mode”, the installer OS appears to boot but the console screen remains blank.

To work around this, edit the GRUB boot entry for text mode installation and add “console=tty0” to the kernel boot parameters.

### 3.2 CentOS 8 Stream will not work on the Tech Preview

Like RHEL 8, CentOS 8 Stream kernels on ARM architectures are compiled with a 64KB page size. This is incompatible with the Apple Silicon hardware. These distributions cannot be made to boot on the Tech Preview.

Use CentOS 9 Stream instead.

## 4 Debian

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### 4.1 Fixed: Debian 11.3 and 11.4 installation ISOs do not boot with 21H1 Tech Preview

Issues that prevented these ISOs from booting in the 21H1 Tech Preview have been fixed. These ISOs will boot without issue on the 22H2 Tech Preview.

### 4.2 Obtaining newer kernel versions for Debian 11

The Debian 11 releases for ARM ship with a 5.10 version of the Linux kernel. While this kernel will work with the Tech Preview, it will not allow resizing of screen resolution.

To change the screen resolution, install a kernel from the “bullseye-backports” repo that contains the VMware virtual graphics adapter driver (vmwgfx). To access this repo, it must be added to the list of available repos for installation. Full instructions on how to do this can be found at <https://backports.debian.org/Instructions>.

Short version of installing a bullseye-backports kernel	
1.	Add the following line to /etc/apt/sources.list: <pre>deb http://deb.debian.org/debian bullseye-backports main contrib non-free</pre>
2.	Run one of the following to update the available package information: <pre>apt update apt-get update</pre>
3.	Run the following to list kernels available for installation. Anything with “/bullseye-backports” attached to the name is available from the backports repo. <pre>apt list 'linux-image*'</pre>

4.	<p>Install a 5.18 kernel from the bullseye-backports repo. Example:</p> <pre style="border: 1px solid black; padding: 5px; margin: 5px 0;">apt-get install linux-image-5.18.0-0.bpo.1-arm64/bullseye-backports</pre> <p><b>Note:</b> be sure to specify the exact, full name of the package. A command such as</p> <pre style="border: 1px solid black; padding: 5px; margin: 5px 0;">apt-get install linux-image-5.18.0-0.bpo.1/bullseye-backports</pre> <p>will attempt to install all variants of the given kernel and will result in an installation failure.</p>
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Backport kernels that are known to install and work:

- linux-image-5.18.0-0.bpo.1-arm64/bullseye-backports
- linux-image-5.18.0-0.deb11.4-4-arm64/bullseye-backports (newer 5.18 kernel, dated 8/12/2022).

### 4.3 open-vm-tools are now available in Debian repos

As of 17-Feb-2022, Debian has made open-vm-tools and open-vm-tools desktop packages available for Debian 11 in their “bullseye-backports” repo. To install them, first add the “bullseye-backports” repo to /etc/apt/sources.list as noted in the topic ["Obtaining newer kernel versions for Debian 11"](#). Then install the packages from the backport repo – here’s an example:

```
apt-get install -t bullseye-backports open-vm-tools open-vm-tools-desktop
```

If open-vm-tools and open-vm-tools-desktop were installed from packages provided by VMware (via the link in the previous Tech Preview Testing Guide), there is no need to uninstall them. They can be upgraded to the version found in the Debian “bullseye-backports” repo.

### 4.4 Switching to text-based console from graphical console works out of the box

A previously reported issue of the inability to switch to a text console from a graphical console using Fn+Alt+Ctrl+<F1 through F7> has been addressed. The default kernel and the 5.18 backport kernel work properly.

## 5 Fedora

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### 5.1 General Notes

Fedora 35 and 36 will work with the 22H2 Tech Preview, but the installers may hang at boot. See the topic [Installing Fedora 35/36 from ISO](#).

Fedora 37 beta (available 2022-09-13) boots and installs with no issues. The installed kernel is 5.19.7-300.fc37.aarch64 (or later). The VMware SVGA driver that supports 3D acceleration is installed in this kernel. Mesa 22.2 is installed.

Fedora Rawhide boots and installs with no issues. Latest updates install a 6.0 kernel. The VMware SVGA driver that supports 3D acceleration is installed in these kernels.

### 5.2 Installing Fedora 35/36 from ISO

Installation from Fedora 35 and 36 ISOs may hang at the boot screen. This is due to the same vmwgfx driver issues noted in the topic [Linux kernels do not boot on the 22H2 Tech Preview](#). Follow this procedure to install both releases from ISO if this occurs.

Installing Fedora 35 and 36 from ISO	
1.	Create the VM as you normally would from ISO installation media.
2.	Power on the VM and follow the procedure in the topic <a href="#">Linux kernels do not boot on the 22H2 Tech Preview</a> to boot the Fedora installer ISO.
4.	The Fedora live environment will now become active. Install Fedora to the virtual hard drive from this environment.
5.	When the installation finishes, shut down the live environment and take a snapshot. This snapshot will be useful if something does not work properly during the execution of steps 6 through 9.  Restart the virtual machine. The VM's graphics will be set to a fixed 1024x768 and cannot be changed at this time.
6.	Log in, execute Terminal, and sudo to a root shell.

7.	<p>Issue the following command:</p> <pre>dnf list 'grubby*'</pre> <p>Fedora 36 installation from ISO installs both the “grubby” and “grubby-deprecated” packages. When this occurs, software updates that contain an update to either of these packages will report a file conflict and software updates will fail to install. This has been observed when performing Fedora 36 installs from Fedora-Workstation-Live-aarch64-36-1.5.iso and updating the software after installation. (thanks Burke Azbill - Twitter: @TechnicalValues)</p> <p>If the above command shows that both “grubby” and “grubby-deprecated” are installed, one of the two conflicting packages must be removed. Choose one (and only one) of the following:</p> <ul style="list-style-type: none"><li>• Option 1: Use the following command remove the “grubby” package:</li></ul> <pre>dnf remove grubby</pre> <ul style="list-style-type: none"><li>• Option 2: Use the following two commands to remove the “grubby-deprecated” package (<b>preferred</b>: this is how Fedora 36 on Intel and Fedora 37 are configured):</li></ul> <pre>dnf remove grubby-deprecated grub2-switch-to-blscfg</pre>
8.	<p>Perform a software update to obtain the latest Fedora packages. Since a root shell is already active, use the command line version:</p> <pre>dnf upgrade</pre> <p>This process should install an upgraded kernel:</p> <ul style="list-style-type: none"><li>• Fedora 35 – 5.18.13.100 or later</li><li>• Fedora 36 – 5.18.12-200 or later</li></ul> <p>These kernels will work and allow changing of the screen resolution.</p> <p>Do not reboot yet.</p>

9.	<p>The Fedora installer persists blacklisting of the vmwgfx driver into the VM's hard drive during installation. Remove the blacklisting by commenting out the entry</p> <pre data-bbox="375 298 1295 388">blacklist vmwgfx</pre> <p>in the file <code>/etc/modprobe.d/anaconda-denylist.conf</code>.</p>
10.	<p>Reboot the VM. The graphics resolution should now be able to be changed from within the VM and by resizing the VM's window.</p> <p>If the reboot is successful, then delete the snapshot taken in step 5.</p>

## 6 Kali Linux

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### 6.1 General notes

Kali Linux can be run on the Tech Preview with media obtained from the Kali web site. Use Bare Metal media to install Kali onto the VM's hard disk, or Live Boot media for a Live CD/DVD that does not require installation. Ensure that you download media for "Apple M1". Media labelled "32-bit" or "64-bit" are for Intel CPUs.

Do not use any pre-packaged virtual machines, even if they are labelled for use under VMware. They are for Intel architecture CPUs.

### 6.2 Kali 2022.2 VM fails to boot after initial installation

After a fresh installation of Kali from the 2022.2 ISO, the VM displays a blank screen after what appears to be a successful installation. The kernel that was installed by the Kali Linux 2022.2 ISO appears to be a 5.16 version that exhibits the issues with the vmwgfx VMware graphics driver described in the topic [Linux VMs built on 21H1 Tech Preview no longer boot on the 22H2 Tech Preview](#)

The installed kernel can be booted by blacklisting the vmwgfx driver temporarily. At that point, Kali must be updated to obtain a newer kernel that works properly.

Fixing Kali 2022.2 initial installations from ISO media	
1.	<p>Power on the VM and use the procedure in the topic <a href="#">Linux kernels do not boot on the 22H2 Tech Preview</a> to boot the installed VM.</p> <p>The kernel argument you need to add is the Debian-style blacklist argument</p> <pre>module_blacklist=vmwgfx</pre>
2.	<p>The VM should now boot, and the graphical session login will appear.</p> <p>Log into the VM, open the Terminal application, and sudo to root.</p>
3.	<p>From the Terminal session, update the Kali Linux installation.</p> <pre>apt update apt full-upgrade -y</pre> <p>The package updates will include an update to the kernel to version 5.18.5 or later. This kernel will successfully boot without blacklisting vmwgfx, and the display resolution can be resized from within the VM.</p>

4.	After the updates have finished installing, reboot the VM. The VM should start normally
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### 6.3 Screen resolution fails to change when resizing the VM's display window

(Thanks to @JamesRule and @Mikero for reporting and explaining this)

Resizing the window of a Kali Linux VM will not change the graphics resolution. The graphics resolution can be changed within the VM, which will then change the window size. This works on other Linux distributions.

According to @Mikero, this is an issue with the default XFCE window manager that Kali uses. Screen resizing will work for KDE, GNOME, and Cinnamon, but not XFCE.

This issue also occurs on Intel (x64) architecture Kali virtual machines.

## 7 OpenSUSE Leap

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### 7.1 Installing OpenSUSE Leap 15.4

OpenSUSE Leap 15.4 will boot and install on the Tech Preview. It ships with a more recent 5.14 kernel and updated packages that work better with the Tech Preview than the Leap 15.3 version.

Note that during installation you must create a custom virtual machine. Do not drag/drop the ISO on the “New Virtual Machine” dialog. See the topic ["Installing from ISO error - the VM needs x86 architecture"](#).

### 7.2 OpenSUSE Leap 15.4 installer hangs at “Starting udev”

(thanks to @mvreijn for reporting this)

When installing from the OpenSUSE Leap 15.4 ISO media, the VM will hang at “Starting udev”.

To work around this, blacklist the vmwgfx driver as follows:

1.	Boot the ISO installation media
2.	Select “Installation”, but do not press return. Instead, press ‘e’ to edit the GRUB command line.
3.	Add the following to the kernel boot argument (the line starting with “linux /boot/aarch”: <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"><code>modprobe.blacklist=vmwgfx</code></div>
4.	Press ctrl-x to boot the installer.

Note that the blacklisting of vmwgfx will persist into the installed VM. The installer retains the kernel argument to blacklist in the GRUB boot commands.

After installation and application of upgrades, the kernel in the installed VM will be a 5.14.21-150400.24.18-default version or later. This version will support the use of the vmwgfx driver, and the blacklisting should be removed if you wish to resize the console window. Use the Boot Loader module of YaST to remove the blacklisting from the kernel boot arguments.

### 7.3 Installing from ISO error - the VM needs x86 architecture

When creating a new virtual machine by dragging and dropping the OpenSUSE Leap installation ISO on the Fusion "Select the Installation Method" dialog, an error message will appear that states that the virtual machine needs an x86 machine architecture. This appears even though the installation media is an arm64 architecture version.

The virtual machine operating system type will also be set to "OpenSUSE", which is not one of the available choices in the GUI for a Fusion Tech Preview virtual machine.

This behavior is a bug in the Tech Preview. It is creating an improper and incompatible .vmx file when using the "drag/drop" method of creating a new VM with an OpenSUSE Leap arm64 installation ISO. To work around this issue, use the following procedure to create and install a virtual machine for OpenSUSE Leap:

<b>Installing OpenSUSE Leap from ISO installation media (tested on 15.3 and 15.4)</b>	
1.	Create a new virtual machine.
2.	In the "Select the Installation Method" dialog: <ul style="list-style-type: none"><li>• Click on "Create a custom virtual machine".</li><li>• Click "Continue".</li></ul>
3.	In the "Choose Operating System" dialog: <ul style="list-style-type: none"><li>• Select a Linux operating system with "Other Linux 5.x kernel 64-bit Arm".</li></ul> <p><i>Note the lack of a "OpenSUSE" option here.</i></p> <ul style="list-style-type: none"><li>• Click "Continue".</li></ul>
4.	In the "Choose a Virtual Disk" dialog: <ul style="list-style-type: none"><li>• Accept the default answer to create a new virtual disk.</li><li>• Click "Continue".</li></ul>
5.	In the "Finish" dialog: <ul style="list-style-type: none"><li>• Click "Customize Settings".</li></ul> <p><i>Do not click "Finish".</i></p>
6.	Select a name for the new virtual machine and save it.
7.	The Settings dialog for the new virtual machine will appear.

8.	<p>Make the following changes to the virtual machine configuration:</p> <ul style="list-style-type: none"><li>• <b>Processors and Memory:</b> Change the number of CPUs and memory for the virtual machine. 2 virtual processors and 2048MB of memory are a good start.</li><li>• <b>Hard Disk (NVMe):</b> Increase the disk size. 20 GB is a good start.</li><li>• <b>CD/DVD (SATA):</b> Configure the virtual CD/DVD device to use the OpenSUSE Leap installation ISO.</li></ul>
----	--

The virtual machine will now start and OpenSUSE Leap will install.

## 8 OpenSUSE Tumbleweed

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There are no known issues with the current snapshot of OpenSUSE Tumbleweed.

## 9 Red Hat Enterprise Linux and compatible/downstream distros

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### 9.1 General notes

References to Red Hat Enterprise Linux (RHEL) in this section also apply to “compatible” or “downstream” distributions based on Red Hat Enterprise Linux such as:

- Rocky Linux
- CentOS 8 and earlier (before the switch to CentOS Stream)
- Oracle Linux

### 9.2 Red Hat Enterprise Linux 8 and earlier fail to boot

Red Hat Enterprise Linux 8 or earlier on ARM architectures will fail to boot on the Tech Preview. The CentOS 8 Stream upstream release has this same behavior. The most visible symptom of this issue is that the installation media will get into a “boot loop”. A kernel selected in the GRUB boot menu will fail to boot, and the GRUB boot menu will reappear.

The happens because Red Hat compiled the RHEL 8.x and earlier ARM kernels with a 64 KB page size. Apple Silicon’s hardware memory management unit supports only 4 KB or 16 KB page sizes. This makes these RHEL releases unable to run on Apple Silicon and the Tech Preview. No workaround is available to make these kernels boot.

Starting with RHEL 9, Red Hat compiles their ARM kernels with a 4 KB page size. Use the following releases instead of RHEL 8.x: to address this issue:

- Red Hat Enterprise Linux 9 (or compatible downstream release)
- CentOS 9 Stream
- Fedora 35 or 36

### 9.3 RHEL 9.0 installation ISOs will not boot

The RHEL 9.0 installation ISO is impacted by the issue described in the topic [Linux kernels do not boot on the 22H2 Tech Preview](#)

To boot these installers, follow the procedure in the topic above to blacklist the vmwgfx driver using the following kernel argument:

```
modprobe.blacklist=vmwgfx
```

The resulting GRUB command should look something like this:

```
setparams 'Install Rocky Linux 9.0'

linux /images/pxeboot/vmlinuz inst.stage2=hd:LABEL=Rocky-9-0-aarch64-d\
vd ro modprobe.blacklist=vmwgfx_
initrd /images/pxeboot/initrd.img

Press Ctrl-x to start, Ctrl-c for a command prompt or Escape to
discard edits and return to the menu. Pressing Tab lists possible
completions.
```

### 9.4 Unable to change graphics resolution in a RHEL 9 VM

(Thanks to @k\_ronny for the inspiration for this work-around).

The installer for RHEL 9.0 persists any module blacklisting present for the installer’s kernel into the installed virtual machine. Since the procedure described in the section [RHEL 9.0 installation ISOs will not boot](#) blacklists the vmwgfx driver at installation time, the same blacklisting is present in the installed virtual machine. This results in a graphical display whose resolution is fixed (usually at 1024x768).

The blacklisting of vmwgfx cannot be removed at this time because even though the kernels contain the vmwgfx driver, Red Hat has not released a kernel for RHEL 9 that allows proper operation of the vmwgfx driver.

Until Red Hat delivers an updated kernel for RHEL 9, a workaround exists that can provide a larger screen resolution. While the screen resolution is larger with this workaround, it is static and cannot be dynamically changed.

To change the static graphics resolution of a RHEL 9 VM	
1.	Boot the VM, log in, open a Terminal session and sudo to root.
2.	Open /etc/default/grub in your favorite text editor.
3.	Add the following line to the top of the file to set the graphics resolution to 1920x1200.

	<pre>GRUB_GFXMODE=1920x1200</pre>
4.	<p>Find the following line in the file</p> <pre>GRUB_TERMINAL_OUTPUT="console"</pre> <p>and change it to:</p> <pre>GRUB_TERMINAL_OUTPUT="gfxterm"</pre> <p>(Using gfxterm instead of console here allows GRUB to change the virtual display's resolution during boot, which remains available to the operating system).</p>
5.	Save the changes and exit the editor.
6.	<p>Upgrade the GRUB menus by executing the following:</p> <pre># grub2-mkconfig --output /boot/grub2/grub.cfg Generating grub configuration file ... Adding boot menu entry for UEFI Firmware Settings ... done</pre>
7.	Log out and log back in again. Graphics resolution will now be set to 1920x1200.

## 9.5 Blank screen when text mode installation is selected

When booting into the text mode installer, the installer OS appears to boot but the console screen remains blank.

To work around this, edit the GRUB boot entry for text mode installation and add “console=tty0” to the kernel boot parameters.

## 10 Ubuntu

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### 10.1 General notes

Ubuntu releases known to work on the 22H2 Tech Preview are:

- 20.04.4 LTS. See the topic [Installing Ubuntu 20.04.4 LTS](#).
- 22.04.1 LTS daily development builds dated 20-Sep-2022 or later. Ubuntu has included the Linux kernel fixes that allow booting of the 22.04.1 installer and operating system. See the September 2022 update to the Tech Preview Testing guide for download URLs.
- 22.10 daily builds dated 08-Sep-2022 or later. See the September 2022 update to the Tech Preview Testing guide for download URLs.

Other releases/builds will not work.

See the following sections for more information.

### 10.2 Updated: Ubuntu 22.04 LTS installers do not boot

The official released versions of Ubuntu 22.04 and 22.04.1 LTS will not boot on the Tech Preview. Ubuntu has fixed this starting with the daily development builds of 22.04.1 LTS Server and Desktop versions starting 20-Sep-2022.

Please use the daily development builds for Ubuntu 22.04.1 to install a Ubuntu 22.04 virtual machine. The download URLs can be found in the updated (September 2022) Tech Preview Testing Guide.

### 10.3 Making Ubuntu show the GRUB boot prompt

Ubuntu has an annoying “feature” of not displaying the GRUB boot prompt. While there is Ubuntu documentation for accessing the GRUB menu during boot, these instructions are inconvenient and rely a bit on manual dexterity and timing to get it right.

The boot process can be changed to give more time to select either the default kernel or an alternate kernel for booting.

Modifying Ubuntu boot defaults to show the GRUB menu	
1.	Log into the VM and sudo to a root shell.
2.	Edit /etc/default/grub:

	<ul style="list-style-type: none"> <li>• Comment out the “GRUB_TIMEOUT_STYLE=hidden” line. This will allow GRUB to always display the boot menu instead of having to press “Esc” at the “right time” during boot.</li> <li>• Change the value of GRUB_TIMEOUT to something other than zero. A good starting value is 10 (10 seconds) that allows an alternate boot selection if necessary.</li> </ul>
3.	Save the changes.
4.	Update the grub configuration: <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre>update-grub</pre> </div>

At the next reboot, the GRUB boot menu will appear for 10 seconds, allowing changes to be made to the default boot commands.

## 10.4 Installing Ubuntu 20.04.4 LTS

Ubuntu Server 20.04.4 LTS will install on the 22H2 Tech Preview without issues. No blacklisting of drivers is necessary, as this release ships with a 5.4 kernel version that does not contain the vmwgfx graphics driver.

It is recommended to create the VM with 4GB of memory, a 40GB or larger hard drive, and without the sound device due to issues with sound on the 22H2 Tech Preview.

Canonical has not made it easy to find the Ubuntu Server 20.04.4 LTS ISO for arm64. Here is a direct link to the download: <https://cdimage.ubuntu.com/ubuntu/releases/20.04.4/release/ubuntu-20.04.4-live-server-arm64.iso>

### **Important!:**

Do not install a 5.19.x mainline kernel on 20.04 LTS. 5.19 kernels have dependencies on updated libraries that are not met by 20.04 LTS.

## 10.5 Deprecated: Upgrading a 20.04.4 LTS VM to 22.04.1 LTS

The procedure to upgrade Ubuntu 20.04.4 LTS to 22.04.1 LTS that appeared in earlier versions of this document is no longer necessary. The documented Ubuntu upgrade procedures now install a 5.15.0-48-generic kernel version that works with the 22H2 Tech Preview.

Installing Ubuntu 20.04.4 LTS and performing an upgrade to 22.04.1 is no longer necessary to obtain a working 22.04.1 virtual machine. Ubuntu 22.04.1 LTS daily builds dated 20-Sep-2022 or later will install on the Tech Preview without issue. See the September 2022 update to the Tech Preview Testing guide for the URLs where these daily builds can be found.

## 10.6 Existing Ubuntu VMs on the 21H1 Tech Preview? Read this before upgrading.

Do not upgrade to the 22H2 Tech Preview if you have running Ubuntu VMs before reading this section. Otherwise, you will lose the ability to boot your VMs.

If you are still running the 21H1 version of the Tech Preview, you may be able to install a newer “mainline” kernel into an Ubuntu VM **before upgrading to the 22H2 version**. Your VM will continue to run after upgrade.

**Note:** *Taking a snapshot of your VM is highly recommended before doing this procedure!*

This procedure was tested on Ubuntu 22.04. It may or may not work on earlier versions due to package dependencies for the updated mainline kernels.

1.	While still running the 21H1 Tech Preview, start the Ubuntu VM, and log in.
2.	Download and build the “mainline” open-source utility. See the topic <a href="#">How to find additional “Mainline” kernel versions</a>
3.	Use the command line “mainline” or GUI “mainline-gtk” to browse, select and install a 5.19 mainline kernel. Help for using the command line “mainline” utility can be found by executing “mainline –help”
4.	Shut down your VM.

At this point your VM will no longer boot on the 21H1 Tech Preview. You may now upgrade to the 22H2 Tech Preview. Your VM should boot under the 22H2 Tech Preview.

## 10.7 How to find and install “mainline” kernel versions

(thanks to @Mikero for the tip about the “mainline” utility)

### Notes:

Do not install a 5.19 mainline kernel on Ubuntu 20.04 LTS. 5.19 kernels have package dependencies that are *not met by 20.04 LTS*.

It is recommended to install a version 5.19 or later mainline kernel if choosing to use these updated kernels. These kernels provide the *best results with the 22H2 Tech Preview*.

Ubuntu has alternative kernel builds that they refer to as “mainline” kernels. These kernels are unofficial builds of kernels from the Linux source code that are newer than those they officially release for their products. In most cases one of these kernels can be used instead of the standard Ubuntu kernel, and in most cases work much better with the Tech Preview.

Mainline kernels can be found by browsing to <https://kernel.ubuntu.com/~kernel-ppa/mainline>. They are organized by kernel versions.

Instead of downloading the packages and installing them manually, the open source “mainline” utility makes the process much easier. “mainline” provides a more streamlined front-end to the process of listing, installing, and uninstalling these mainline kernels.

Browse to <https://github.com/bkw777/mainline> and follow the instructions on how to download, build, and install this utility. There is no pre-built package available for arm64 Linux, so you’ll need to build it yourself. Fortunately, the instructions are understandable, and the build process is straightforward.

The utility has two versions:

- A command line version “mainline”
- A GUI version “mainline-gtk”

## 10.8 Ubuntu 22.10 and 20.04.1 daily builds now boot on the 22H2 Tech Preview

(Thanks to @Mikero for the heads-up on this).

Ubuntu is indeed making steps forward.

As of 08-Sep-2022, Ubuntu 22.10 (Kinetic Kudu) arm64 daily development ISO builds boot and install on the 22H2 Tech Preview on Apple Silicon. These builds include a 5.19 kernel.

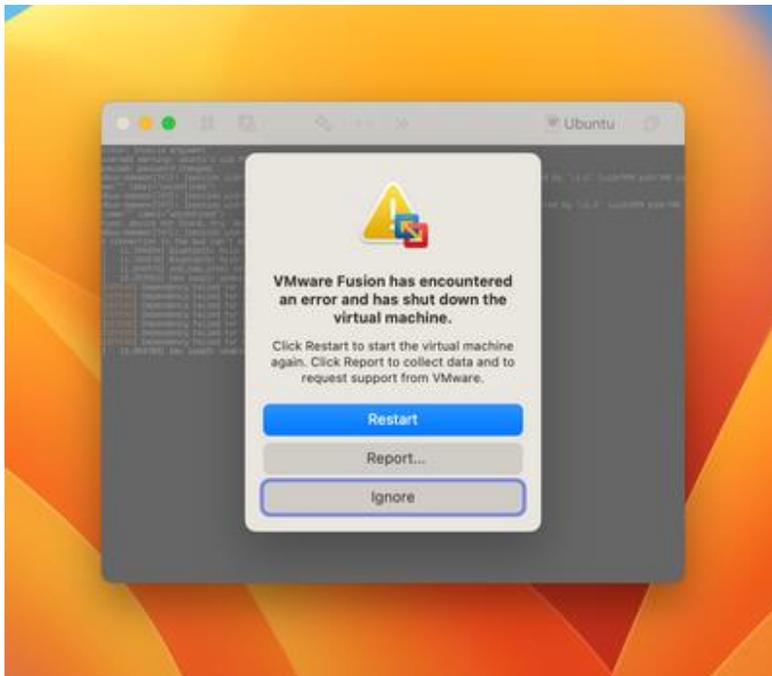
As of 20-Sep-2022, Ubuntu 22.04.1 (Jammy Jellyfish) arm64 daily development workstation and server ISO builds boot and install on the 22H2 Tech Preview.

URLs for all of these daily development builds can be found in the September 2022 update of the Tech Preview Testing Guide.

**Important:**

(Thanks to both @tonyarnold for uncovering this and @Mikero for the explanation)

These Ubuntu builds use kernels that do not contain 3D support. Do not enable 3D support for the virtual machine. Enabling 3D support will crash Fusion when trying to boot the VM with this error:



## 11 Windows 11 on ARM

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### 11.1 General comments

Windows 11 will install and run on the Tech Preview. With the 22H2 Tech Preview, VMware is providing virtual hardware features required by Windows 11 (both UEFI Secure Boot and Trusted Platform Module) as well as virtual device drivers for 2D graphics and networking.

Don't waste time on Windows 10 for ARM.

- VMware does not support Windows 10 for ARM on the 22H2 Tech Preview.
- Microsoft is encouraging upgrades to Windows 11 on all architectures.
- Microsoft no longer offers Windows 10 for ARM as an Insider Preview.
- Windows 11 on ARM is more feature complete to its Intel counterpart than Windows 10 was.
- Windows 11 on ARM includes Microsoft's x86\_64 translator capabilities (useful for running Windows applications compiled on Intel versions of Windows). This functionality is not available on Windows 10.

The writing is on the wall. Use Windows 11.

Instructions for installing Windows 11 can be found in the 22H2 Tech Preview Testing Guide.

#### **Important:**

**Please read the Testing Guide before starting.** If you have difficulties, please check that you've followed the instructions in the guide, and then look in this section to see if your problem may have been seen before. Then post any questions to the Tech Preview Discussion Forum.

#### **Recommendation (for what it's worth...):**

Please try to use a Retail (a.k.a. "officially released") ISO build of Windows 11 22H2 (currently 22621.521) obtained from uupdump.net to install Windows 11. The Insider Preview VHDX builds may seem easier to obtain and install but they are pre-release builds designed for IT professionals or experienced users. It is easier for less technical users to keep Retail builds of Windows 11 up to date through Windows Update than to deal with updating the Insider Preview VHDX builds.

## 11.2 “Start pxe over ipv4” message displayed during VM power up

If his message appears, check to see if one of the following has occurred:

- You did not respond to the “Press any key to start from CD or DVD” prompt before it timed out. You must click in the VM window before you press any key. If you fail to do this, the prompt will time out and the boot process will attempt a PXE boot over the network.
- You have a corrupt or invalid ISO file. Verify that you have valid installation media as a bootable operating system was not found. Please see the topic [Obtaining Windows 11 ARM ISO installation media](#).
- You are trying to use a Windows 11 on ARM Insider Preview VHDX file as a virtual CD-ROM drive. Please see the topic [Installing Windows 11 from Windows 11 on ARM Insider Preview VHDX file](#)
- You have x86\_64/x64 Windows 11 installation media. Only Windows 11 on ARM (arm64) media will boot on Apple Silicon processors. Please see the topic [Obtaining Windows 11 ARM ISO installation media](#).

## 11.3 Obtaining Windows 11 ARM ISO installation media

Windows 11 on ARM can be installed from ISO media using the procedures found in the 22H2 Tech Preview Testing Guide. However, the guide does not explain how to obtain the ISO media required.

Microsoft does not make it easy to find ISO installation media for Windows 11 ARM (or if they do, they have done a very good job hiding it from us mere mortals). Any ISOs built or downloaded via <https://www.microsoft.com/software-download/windows11> are for Intel (x86\_64) architectures only.

Some Enterprise Partner programs or MSDN subscriptions may provide the required ISOs. For example, @shildebrandt (VMware employee) has reported success with the Windows 11 IoT Enterprise ISO included with an MSDN subscription. It is a full version of Windows 11 on ARM.

If you have no access to these Microsoft Partner or MSDN sources, UUP dump is a commonly recommended source for obtaining Windows 11 on ARM ISO installation media from Microsoft’s repositories.

As of 20-Sep-2022, Microsoft has made Windows 11 22H2 build 22621.521(also known as a Retail build) available from uupdump.net and is recommended for the installation of a new virtual machine. Unfortunately, this build's ISO media can only be created on Windows system. As an alternative, Windows 11 21H2 build 22000.978 (also a retail build) can be used for installation.

This build's ISO media can be created on macOS, Linux, and Windows. Once this build is installed, the virtual machine can be upgraded to Windows 11 22H2 through Windows Update.

Once the desired Windows 11 ISO build is obtained, install Windows 11 in the virtual machine using either the installation procedure in the Tech Preview Testing Guide or the alternate installation procedure found in the topic [Alternative method of installing tools when using ISO installation media](#).

### 11.3.1 Obtaining Windows 11 for ARM 22H2 installation ISOs

**Note:**

Use this procedure only if you have access to a Windows 10, version 2004 system or later. If you do not have access, use the procedure in the topic [Obtaining Windows 11 for ARM 21H2 installation ISOs on macOS](#)

#### Obtaining Windows for ARM 22H1 media on macOS

1. Navigate to <https://uupdump.net> using any web browser. Note that this can be done on any platform.
2. On the uupdump.net home page, type '22621.521' into the search field and click the magnifying glass to search:



3. From the list of builds displayed, click on 'Windows 11 (22621.521) (2) arm64' build:

The screenshot shows the UUP dump website interface. At the top, there are navigation links for Home, Downloads, and FAQ, along with language and theme settings. A search bar contains the text '22621.521'. Below the search bar, a message states '6 builds were found for your query.' A table lists the search results:

Build	Architecture	Date added
Cumulative Update for Windows 11 Version 22H2 (22621.521) amd64	x64	2022-09-13 17:00:39 UTC
Windows 11, version 22H2 (22621.521) (2) amd64	x64	2022-09-21 19:30:42 UTC
Windows 11, version 22H2 (22621.521) amd64	x64	2022-09-13 17:00:51 UTC
Cumulative Update for Windows 11 Version 22H2 (22621.521) arm64	arm64	2022-09-13 17:00:37 UTC
Windows 11, version 22H2 (22621.521) (2) arm64	arm64	2022-09-21 19:30:24 UTC
Windows 11, version 22H2 (22621.521) arm64	arm64	2022-09-13 17:07:17 UTC

The row for 'Windows 11, version 22H2 (22621.521) (2) arm64' is highlighted with a red border. Below the table, there are 'Previous' and 'Next' navigation buttons and a 'Page 1 of 1' indicator.

Make sure you select the arm64 architecture, not the amd64 architecture.

3. The Choose Language page for the selected build will be displayed.

The screenshot shows the 'Choose Language' page for the selected build. At the top, the page title is 'Windows 11, version 22H2 (22621.521) (2) arm64'. A warning box states: 'This is an ARM64 build. This build is only compatible with: Surface Pro X, Raspberry Pi, Apple Mac M1, other glorified mobile phones. UUP dump authors don't have a single one of these and therefore will provide absolutely no support.' Below the warning, there are two main sections: 'Choose language' and 'Browse files'. The 'Choose language' section has a dropdown menu set to 'English (United States)' and a 'Next' button highlighted in red. The 'Browse files' section has a search bar and a list of files. At the bottom, there is an 'INFORMATION' section with three items: 'Build 22621.521', 'Channel Retail', and 'Date added 2022-09-21 19:30:24 UTC'.

Select the desired language, then click the Next button to proceed

4.

The 'Choose Edition' page will be displayed:

UUP dump

Windows 11, version 22H2 (22H2.1521) (2) arm64

This is an ARM64 build  
This build is only compatible with:

- Surface Pro X
- Raspberry Pi
- Apple Mac M1
- other specified mobile phones

UUP dump authors don't have a single one of those products, so we provide absolutely no support.

Choose edition  
Choose your desired edition

Language  
English (United States)

Edition  
 Windows Home  
 Windows Pro

If you need additional editions from the table on the right, select their Required edition above and proceed by clicking Next.  
On the summary page select the Create additional editions option.

Next

Click the Next button to open the summary page of your selection.

Additional edition	Required edition
Windows Home Single Language	Windows Home
Windows Pro for Workstations	Windows Pro
Windows Pro Education	Windows Pro
Windows Education	Windows Pro
Windows Enterprise	Windows Pro
Windows Enterprise multi-session / Virtual Desktops	Windows Pro
Windows IoT Enterprise	Windows Pro
Windows Pro for Workstations N	Windows Pro N
Windows Pro Education N	Windows Pro N
Windows Education N	Windows Pro N
Windows Enterprise N	Windows Pro N

Choose language  
Choose your desired language

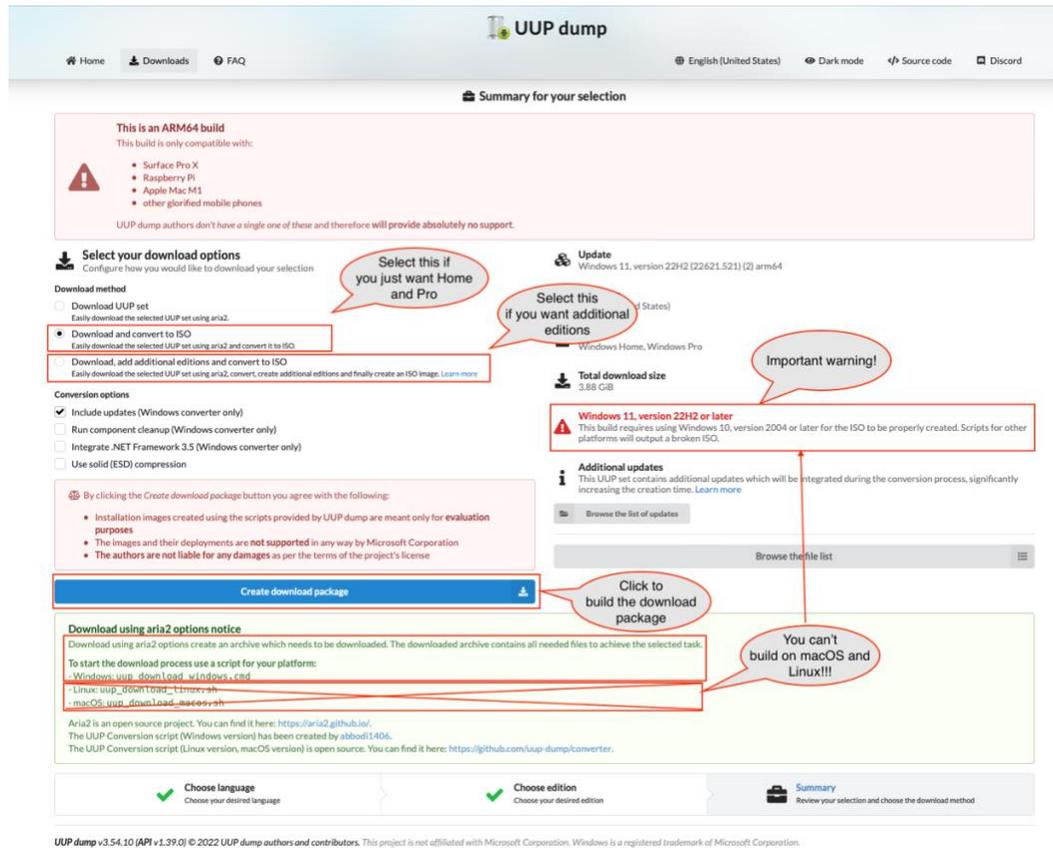
Choose edition  
Choose your desired edition

Summary  
Review your selection and choose the download method

UUP dump v1.54.10 (API v1.39.0) © 2022 UUP dump authors and contributors. This project is not affiliated with Microsoft Corporation. Windows is a registered trademark of Microsoft Corporation.

Select your desired Windows editions, then click Next.

5. The 'Summary' page will be displayed:



Additional additions may be included by selecting the 'Download, add additional editions, and convert to ISO' radio button, if desired.

Click 'Create download package' to continue.

6. A .zip file will be created and will download to your Downloads folder. This .zip file that contains information and shell scripts which will download and create the ISO installation media.

7. Transfer this .zip file to a system running Windows 10, version 2004 or later (or Windows 11). The system can be physical or virtual, and either Intel or ARM. Have about 20 GB of free storage available to download and build the ISO.

8. Extract the zip file, and a folder will be created containing the ISO creation scripts and necessary support files. The folder where the scripts reside will be used as a working folder for download and creation of the ISO media.

9. Open a Windows command prompt, and 'cd' to the folder where the extracted files reside.

10.	Run the script to start the ISO creation process. <pre data-bbox="367 260 1308 348">.\uup_download_windows.cmd</pre>
-----	---

Take a break and get a cup/glass of your favorite beverage while the file download and ISO creation process is in progress. The ISO will be found in the working folder at the end of the process. Transfer the file back to the Mac to use it for Windows 11 installation.

The zip file and working folder can be deleted once the ISO is confirmed to install.

### 11.3.2 Obtaining Windows 11 for ARM 21H2 installation ISOs on macOS

**Important:**

This procedure assumes you have installed Homebrew on your macOS system.

Instructions for installing Homebrew are outside the scope of this document. Please reference the Homebrew web page at <https://brew.sh> and other web resources for instructions on how to install Homebrew.

Use the following checklist (thanks to @ZigaD) to obtain an ISO distribution of Windows 11 for ARM from uupdump.net on macOS.

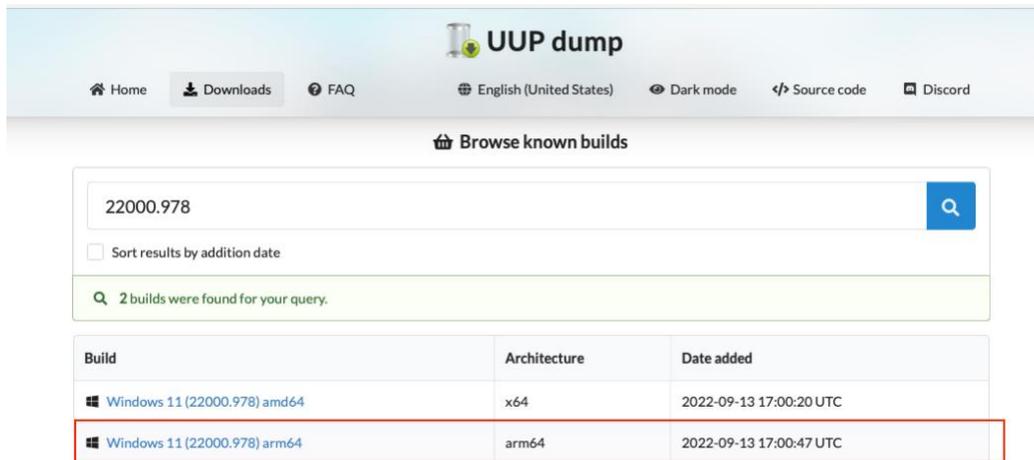
## Obtaining Windows for ARM 22H1 media on macOS

1. Navigate to <https://uupdump.net> using Safari or any other web browser of your choice.

2. On the uupdump.net home page, type '22000.978' into the search field and click the magnifying glass to search:



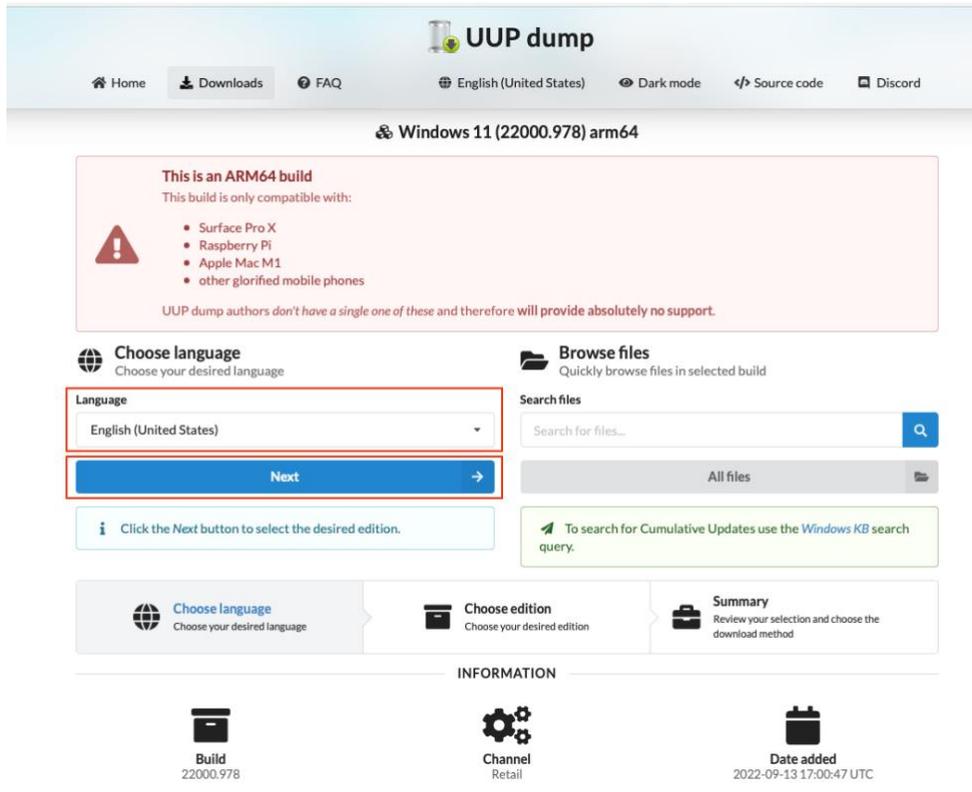
3. From the list of builds displayed, click on 'Windows 11 (22000.978) arm64':



Make sure you select the arm64 architecture.

4.

The Choose Language page for your selected build will be displayed.



The screenshot shows the UUP dump website interface. At the top, there is a navigation bar with links for Home, Downloads, FAQ, English (United States), Dark mode, Source code, and Discord. Below the navigation bar, the page title is "Windows 11 (22000.978) arm64". A prominent warning box states "This is an ARM64 build" and lists compatible devices: Surface Pro X, Raspberry Pi, Apple Mac M1, and other glorified mobile phones. It also notes that the authors do not provide support for these devices. The main content area is divided into two sections: "Choose language" and "Browse files". The "Choose language" section features a dropdown menu currently set to "English (United States)" and a blue "Next" button. A tooltip below the "Next" button instructs the user to "Click the Next button to select the desired edition." The "Browse files" section includes a search bar and a button labeled "All files". Below these sections, there is a "Summary" section with a brief overview of the selection process. At the bottom, an "INFORMATION" section provides details about the build: Build (22000.978), Channel (Retail), and Date added (2022-09-13 17:00:47 UTC).

Select the desired language, then click the Next button to proceed

5. The 'Choose Edition' page will be displayed:

**UUP dump**

Home Downloads FAQ English (United States) Dark mode Source code Discord UUP dump v3.54.11

Windows 11 (22000.978) arm64

**This is an ARM64 build**  
This build is only compatible with:

- Surface Pro X
- Raspberry Pi
- Apple Mac M1
- other glorified mobile phones

UUP dump authors don't have a single one of these and therefore will provide absolutely no support.

**Choose edition**  
Choose your desired edition

Language  
English (United States)

**Edition**

- Windows Home
- Windows Pro

If you need **additional editions** from the table on the right, select their **Required edition** above and proceed by clicking Next.  
On the summary page select the **Create additional editions** option.

**Next** →

Click the Next button to open the summary page of your selection.

Additional edition	Required edition
Windows Home Single Language	Windows Home
Windows Pro for Workstations	Windows Pro
Windows Pro Education	Windows Pro
Windows Education	Windows Pro
Windows Enterprise	Windows Pro
Windows Enterprise multi-session / Virtual Desktops	Windows Pro
Windows IoT Enterprise	Windows Pro
Windows Pro for Workstations N	Windows Pro N
Windows Pro Education N	Windows Pro N
Windows Education N	Windows Pro N
Windows Enterprise N	Windows Pro N

**Choose language**  
Choose your desired language

**Choose edition**  
Choose your desired edition

**Summary**  
Review your selection and choose the download method

Select your desired editions, then click Next.

6.

The 'Summary' page will be displayed:

The screenshot shows the 'UUP dump' website interface. At the top, there is a navigation bar with links for Home, Downloads, FAQ, English (United States), Dark mode, Source code, and Discord. Below the navigation bar, the page title is 'Summary for your selection'. A prominent red warning box states: 'This is an ARM64 build. This build is only compatible with: Surface Pro X, Raspberry Pi, Apple Mac M1, other glorified mobile phones. UUP dump authors don't have a single one of these and therefore will provide absolutely no support.' Below this, the 'Select your download options' section is visible. It includes 'Download method' with radio buttons for 'Download UUP set', 'Download and convert to ISO' (selected), and 'Download, add additional editions and convert to ISO'. 'Conversion options' include checkboxes for 'Include updates (Windows converter only)', 'Run component cleanup (Windows converter only)', 'Integrate .NET Framework 3.5 (Windows converter only)', and 'Use solid (ESD) compression'. A red box highlights a disclaimer: 'By clicking the Create download package button you agree with the following: Installation images created using the scripts provided by UUP dump are meant only for evaluation purposes. The images and their deployments are not supported in any way by Microsoft Corporation. The authors are not liable for any damages as per the terms of the project's license.' Below this is a blue 'Create download package' button with a download icon, which is highlighted with a red box. To the right, there are sections for 'Update' (Windows 11 (22000.978) arm64), 'Language' (English (United States)), 'Edition' (Windows Home, Windows Pro), and 'Total download size' (4.13 GiB). There are also buttons for 'Browse the list of updates' and 'Browse the file list'. At the bottom, a progress bar shows three steps: 'Choose language' (checked), 'Choose edition' (checked), and 'Summary' (active, highlighted with a blue box).

Do not change any options on this page. Click 'Create download package' to continue.

7.

A .zip file will be created and will download to your Downloads folder. This .zip file that contains information and shell scripts which will download and create the ISO installation media.

Copy this .zip file from the Downloads folder into into an empty folder.

8.	<p>Execute a Terminal session and install the required utilities from Homebrew.</p> <pre data-bbox="370 260 1308 426">brew tap sidneys/homebrew brew install aria2 cabextract wimlib imagex brew install cdrtools sidneys/homebrew/chntpw</pre>
9.	<p>Extract the .zip file obtained from step 7 and change the working directory to the folder that was created during the unzip process.</p>
10.	<p>Modify the permissions of the macOS shell script to allow execution.</p> <pre data-bbox="370 613 1308 703">chmod +x uup_download_macos.sh</pre>
11.	<p>Run the script to start the download process.</p> <pre data-bbox="370 789 1308 879">./uup_download_macos.sh</pre>

Go have a cup of your favorite beverage while the Windows components are being downloaded and the ISO is being built. At the end of the process, a copy of the ISO file will be found in the directory where the script was run.

#### 11.4 Installing Windows 11 from Windows 11 on ARM Insider Preview VHDX file

**Note:**

The procedure in the Tech Preview Testing Guide for downloading and converting the Windows 11 on ARM Insider Preview VHDX (Hyper-V virtual disk) to a VMware-compatible vmdk file assumes Homebrew is already installed on the Mac before starting the procedure.

Instructions for installing Homebrew are outside the scope of this document. Please reference the Homebrew web page at <https://brew.sh> and other web resources for instructions on how to install Homebrew.

Insider Preview VHDX files Several users have reported difficulties in the installation of a Windows 11 VM using the Windows 11 on ARM Insider Preview VHDX file. Many of these difficulties are due to improper conversion of the VHDX file to .vmdk format. The conversion command in the Tech Preview Guide can lead to situations where the conversion is not done

properly. You may get the "Start pxe over ipv4" message at VM boot time should you try to use the incorrectly converted file.

If the original and converted files are in the same directory, and you use a command like this one (implied by using the information in the Guide):

```
qemu-img convert -p -O vmdk Windows11.VHDX Windows11.vhdx
```

***the conversion will not be done properly. You will end up with a corrupted file that will not boot.***

In addition, this incorrect conversion command line will destroy the originally downloaded file. You will have to re-download the VHDX file and start over.

To reliably get a proper conversion,

- ***ensure your destination file name is different than the source file name, and***
- ***ensure that the destination file name has a .vmdk extension.***

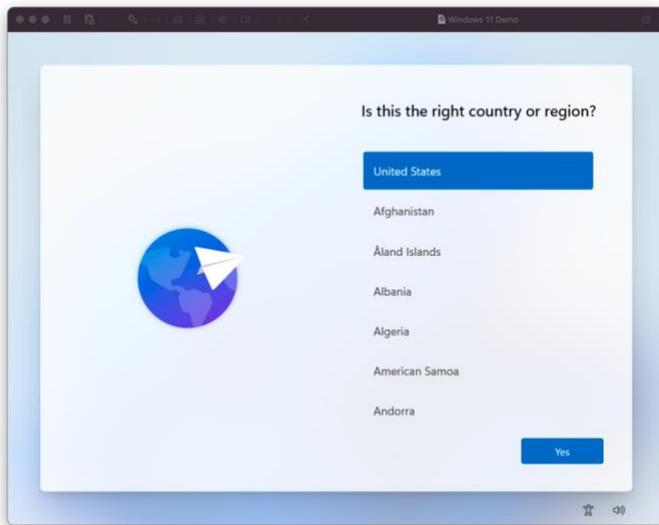
Examples of commands that result in a proper conversion are:

```
qemu-img convert -p -O vmdk Windows11.VHDX Windows11.vmdk  
qemu-img convert -p -O vmdk Windows11.VHDX NewWindows11.vmdk
```

After downloading and converting the VHDX file, use the following procedure to complete the creation of the VM:

<b>Installing Windows 11 from Windows Insider Preview VHDX file</b>	
1.	<p>Using the converted file, follow the procedure to create a VM using the Windows Insider Preview download found on page 22 in the 22H2 Tech Preview Testing Guide after the paragraph “This .vmdk can now be used to create a Custom VM”. Perform steps 1 through 8.</p> <p>Make sure virtual machine encryption is set during the VM creation process. This is required to enable the virtual TPM device required by Windows 11. It’s recommended to select the “Fast” option to obtain best performance for the virtual machine.</p>

2. After completing the VM creation process and powering on the VM, you will see the start of the Windows setup process.



Do not answer the questions in this dialog.  
Instead, press Shift-fn-F10 to open a command line prompt.

3. In the command line prompt, execute PowerShell

```
powershell
```

The Windows command line prompt will be replaced by a PowerShell prompt.

4. From the Fusion menu bar, select Virtual Machine > Install VMware Tools.  
Click “Install” on the dialog when prompted. The VMware Tools ISO will be mounted to your VM as the D: drive.

Wait a few moments while the VMware Tools ISO is being mounted to the VM.

5. In the PowerShell window, install the VMware Tools by executing the following commands:

```
D:  
Set-ExecutionPolicy RemoteSigned  
.\setup.ps1
```

The script will install both the VMware graphics driver and the VMware network driver for Windows 11. The screen may blank briefly while this happens.

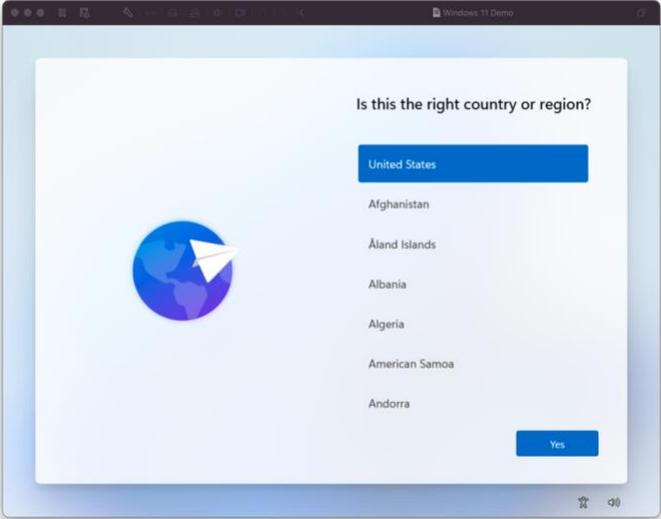
6.	<p>When the tools installation finishes, reboot your VM via command line.:</p> <pre style="border: 1px solid black; padding: 5px; display: inline-block;">shutdown /r /t 0</pre>
7.	<p>The VM will reboot, and the Windows setup will restart. Continue with the setup.</p> <p>You will not be prompted for a network connection because the network should now be discovered and operational with the new VMware driver.</p> <p>Answer additional Windows Setup prompts as directed.</p> <p>Note that since the VM now has a network connection Windows may update itself “to the latest version” during initial setup.</p>
8.	<p>Skip the section found starting on page 17 in the Testing Guide for installing VMware Tools after Windows installation. You do not have to do this as the drivers are already installed.</p>

### 11.5 Alternative method of installing tools when using ISO installation media

The 22H2 Tech Preview Testing Guide procedure for installing Windows 11 from ISO media requires you to disable checks for a network connection (page 13, step 16), and then install the VMware Tools after the initial setup has completed (page 17).

There is an alternate procedure that will allow you to install the VMware Tools earlier in the Windows setup process and eliminate the need to disable the network connectivity checks.

<b>Alternate Windows 11 Installation procedure from ISO</b>	
1.	Starting at the topic “To install Windows on Apple Silicon from ISO” (page 7 in the 22H2 Tech Preview Testing Guide), perform steps 1 through 13. Stop before step 14.

2.	<p>When you see this screen</p>  <p>Do not answer any of the questions. Instead, press Shift-fn-F10 to open a command line prompt.</p>
3.	<p>In the command line prompt, execute PowerShell</p> <pre>powershell</pre> <p>The Windows command line prompt will be replaced by a PowerShell prompt.</p>
4.	<p>From the Fusion menu bar, select Virtual Machine &gt; Install VMware Tools. Click “Install” on the dialog when prompted. The VMware Tools ISO will be mounted to your VM as the D: drive.</p> <p>Wait a few moments while the VMware Tools ISO is being mounted to the VM.</p>
5.	<p>In the PowerShell window, install VMware Tools by executing the following commands:</p> <pre>D: Set-ExecutionPolicy RemoteSigned .\setup.ps1</pre> <p>The setup.ps1 script will install both the VMware graphics driver and the VMware network driver for Windows 11. The screen may blank out briefly while this happens.</p>

6.	<p>When the tools installation finishes, reboot your VM via command line.:</p> <pre style="border: 1px solid black; padding: 5px; margin: 10px 0;">shutdown /r /t 0</pre>
7.	<p>After reboot, the Windows setup will restart at the point noted in step 14 of the Testing Guide procedure. Continue with the setup.</p> <p>You will not be prompted for a network connection because the network should now be discovered and operational with the new VMware driver.</p> <p>Answer additional Windows Setup prompts as directed.</p> <p>Note that since the VM now has a network connection Windows may update itself “to the latest version” during initial setup.</p>
8.	<p>Skip the section found starting on page 17 in the Testing Guide for installing VMware Tools after Windows installation. You do not have to do this as the Tools are already installed.</p>

## 11.6 Upgrading existing Windows 11 VMs to use 22H2 Tech Preview features

Windows 11 VMs created under the previous Tech Preview release can be updated to utilize the new device support present in the 22H2 Tech Preview.

<b>Upgrading existing Windows 11 VMs for the 22H2 Tech Preview</b>	
1.	<p>At first power-on to the VM on the 22H2 Tech Preview, a dialog will appear prompting you to upgrade the virtual machine. Accept this upgrade as it will change the virtual hardware version to the latest version.</p>
2.	<p>Log into the VM and execute the Terminal program as administrator.</p> <p>A PowerShell prompt will appear.</p>
3.	<p>Disable kernel debugging with the following command.</p> <pre style="border: 1px solid black; padding: 5px; margin: 10px 0;">bcdedit /debug off</pre> <p>This will also disable the kernel debugging network adapter, and you will find that the network is no longer connected</p>
4.	<p>Shut down your VM.</p>

5.	<p>In the VM's settings,</p> <ul style="list-style-type: none"> <li>• Delete the existing network adapter, then</li> <li>• Add a new network adapter</li> </ul> <p>The existing network adapter was configured to the virtual machine as an Intel e1000 NIC. The VMware Tools driver requires the network adapter to be a vmxnet3 type. Re-creating the network adapter satisfies this requirement.</p>
5.	<p>Reboot the VM, and install VMware Tools per the instructions on page 17 of the 22H2 Tech Preview Testing Guide</p>
6.	<p>(Optional) Use the Windows Device Manager to remove the Kernel Debugging Network Adapter if it's still present. In Device Manager:</p> <ul style="list-style-type: none"> <li>• Enable display of hidden devices (View &gt; Show Hidden Devices...)</li> <li>• Look under Network adapters.</li> <li>• Right click on the adapter if it's still there, then select Uninstall Device</li> </ul>
7.	<p>Shut down the VM</p>
8.	<p>In the VM's properties:</p> <ul style="list-style-type: none"> <li>• <b>Encryption:</b> The VM will be listed as unencrypted. Choose to encrypt only the files needed to support a TPM. Choose a password and don't forget it. Also choose to have the password remembered (it's stored in the macOS Keychain).</li> <li>• <b>Advanced:</b> Check the box to enable UEFI Secure Boot.</li> <li>• <b>Add Device... button:</b> Add the Trusted Platform Module device to the VM if it does not already exist.</li> </ul>
9.	<p>Reboot your VM. A setup-like process will occur at first login – it looks like that's being done because you added the TPM device.</p>

## 11.7 Fixed: Changing the resolution of the VM console

This is no longer an issue with the 22H2 Tech Preview and the included VMware Tools release. See the 22H2 Tech Preview Testing Guide.

### **Important:**

The console resolution must be changed from within the virtual machine. Resizing the virtual machine's console window will not change the console resolution.

## 11.8 Sharing folders with the Mac host in the 22H2 Tech Preview

The VMware Tools included with the 22H2 Tech Preview do not support Fusion's Shared Folders functionality. Use one of the following workarounds to share folders between the Mac host and a Windows VM:

- Configure macOS Windows file sharing for the Mac folder you want the VM to access. Consult macOS Help (found in the Finder's Help menu bar) or Internet resources for instructions on how to do this. This will allow the Windows VM to access the file system via Windows SMB file sharing.
- Access the VM that is running Windows 11 Pro or Enterprise via a Remote Desktop client (such as Microsoft Remote Desktop on the Mac) and utilize its folder redirection capabilities. Consult documentation on how to enable RDP in Windows VM, and your RDP client on how to enable folder redirection.

Alternatively, a network file transfer utility such as WinSCP can be used to transfer files between the Windows VM and the Mac host.