

# Developer Transition Kit Release Notes

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# Developer

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# Overview

The Developer Transition Kit (DTK) is an Apple development platform built to support early software development for Macs with Apple silicon. It's for development purposes only and will not be made publicly available. Because it's a development platform, the DTK has a number of limitations to be aware of while using the system, as well as developing and testing software on it.

The Developer Transition Kit is provided under the terms of the Universal App Quick Start Program and is considered Apple's Confidential Information under your Developer Agreement. Don't use the DTK for performance or energy benchmarking. Discussing, reviewing and/or posting reaction about your use of the DTK online, in print, or in social media is not permitted.

## About the Developer Transition Kit hardware

The Developer Transition Kit consists of a Mac mini enclosure powered by an Apple A12Z Bionic processor.

System specifications:

- Apple A12Z Bionic
- 16GB of memory
- 512GB SSD
- Two USB-A ports (5Gb/s)
- Two USB-C ports (10Gb/s, DisplayPort alt-mode)
- HDMI 2.0
- Gigabit Ethernet
- Bluetooth 5
- Wi-Fi (802.11ac)

## Booting the DTK

As a development platform, the DTK has some unique behavior when booting the system and accessing macOS Recovery.

- Initial boot may take up to 30 seconds to show the Apple logo.
- Boot progress may not be visible on all external displays (HDMI or USB-C).
- Login Window may take up to 40 seconds before appearing on boot.
- Internet Recovery is not supported.
- Boot "snag keys" are not supported.

- To boot to the local macOS Recovery partition: from a powered-off state, press and hold the power button until the system indicator light turns from white to orange.
- If the system indicator light blinks with an S-O-S sequence (three quick blinks followed by three long blinks, followed by three quick blinks), force shutdown by removing the AC power cord, reconnecting the AC power cord, then pressing and holding the power button to boot the system.
- macOS Recovery does not yet support system restore.
- If the system will not boot after following the above steps, “Revive” the system firmware following these steps:
  - Download the “Revive” image (.ipsw) from the Universal App Quick Start Program resources site and the latest seed build of Apple Configurator 2.
  - Tether the system to another Mac with a USB-C data cable.
  - Boot the DTK into DFU mode by unplugging AC power, press and hold the power button, reconnect AC power, then release the power button.
  - Select the “Revive” option in Apple Configurator 2.

## Hardware Behaviors

There are several known hardware behaviors and limitations unique to the DTK to consider during usage:

- Thunderbolt devices are not supported.
- The DTK supports up to two displays: one on USB-C and one on HDMI 2.0.
  - The USB-C port supports a single display up to a 5K using a compatible DisplayPort alt-mode display or adapter.
  - The HDMI 2.0 ports supports up to a 4K display.
  - Thunderbolt-based displays such as the Apple Thunderbolt Display or LG UltraFine 5K (27MD5KA) are not supported. The LG UltraFine 4K and UltraFine 5K (27MD5KL) support DisplayPort alt-mode and are supported at 4K. The Apple Pro Display XDR is supported at 5K.
- The fans run at a constant speed.
- System does not sleep when USB-C devices are connected.
- The Apple USB SuperDrive is not yet supported on the USB-A ports; connecting it using a USB-C to USB-A adapter is supported.
- Apple Watch unlock is not supported.
- Apple Pay is not supported.
- Audio glitches may occur when unplugging USB devices.
- Force shutdown requires removal of the power cord.

- The coin cell battery in the system will last approximately 6 months, after which the real-time clock will not be preserved on loss of power.
- Installing macOS on another volume on the system or from macOS Recovery is not supported.
- Resetting or erasing a device should be done using a tethered restore with Apple Configurator 2. Wiping the device using the Erase Mac menu option in Recovery OS or using Find My Remote Wipe are not supported.

## Software Behaviors

There are several known software limitations in the DTK to consider during usage:

- HDCP and 4K HDR playback are not supported; protected video content will fail to play.
- 4K memory pages are not supported.
- `Hypervisor.framework` is not supported.
- Floating point features like options for flushing denormals and cumulative exception flags will not completely match the behavior of Intel-based Macs.

## Rosetta 2 Behaviors

There are several known limitations of Rosetta 2 on the DTK to consider when evaluating software:

- Applications that depend on a 4K memory page size will not run.
  - Examples of this may include some web browsers and language runtimes.
- Rosetta uses only the performance cores on the DTK.
- Rosetta will return a CPU ID of `VirtualApple` instead of `GenuineIntel`.
- The Rosetta runtime on the DTK only partially enforces the hardened runtime protections.
  - The system will enforce Library Validation, the dynamic linker environment variable protections, and require mapping of executable code from disk to be properly signed. However, it is possible for the process to make unsigned or invalidly signed code executable at runtime without triggering a violation.

## Graphics Behaviors

The DTK supports the Metal Family Apple 5 feature set, and some but not all of the Mac Family 2 features. When targeting Macs with Apple Silicon, developers can continue to use the full Metal Mac Family 2 feature set, as well as the Metal Family Apple 5 feature set. Where possible, Metal emulates missing features in software to assist with your porting efforts on the DTK. However, this emulation comes with different memory usage and performance than if the features were implemented in hardware.

The following features are not supported, and you'll need to work around them on the development hardware:

- Rendering with MSAA to a texture with a pixel format that has 32-bit floating-point components.
- Resolving an MSAA texture with a pixel format that has 32-bit floating-point components.
- MSAA texture arrays.
- Linear filtering when sampling from a texture with a pixel format that has 32-bit floating-point components.
- Texture LOD query support.
- Using more than 118 texture-bind points.
- SIMD permute or reduction in fragment shaders.

The following feature has a significant performance or memory cost on the DTK:

- BC texture compression is emulated by transcoding those textures to a different format in memory, so you may see larger-than-expected memory usage.

There are some areas where you may see different behavior on the DTK than other Mac family 2 GPUs:

- If you sample a texture using anisotropic filtering in a compute or vertex shader, the results are undefined in Metal. On the DTK, to better match the behavior on Intel-based Macs, Metal disables anisotropic filtering in these cases. However, if you provide the samplers in an argument buffer, Metal can't disable anisotropic filtering, and you may see unexpected artifacts.
- If you sample a non-mipmapped texture using anisotropic filtering under significant magnification, you may see different sampling patterns.
- If you sample a texture using linear filtering when the texture has a pixel format that has 32-bit floating-point components, the development hardware uses nearest sampling instead.
- If you use sampling with mirrored clamp-to-edge, Metal substitutes clamp-to-edge instead.
- If you use sampling with clamp-to-border-color, Metal substitutes clamp-to-zero instead.
- If you sample using linear filtering a texture containing NaN/Inf, the NaN/Inf values are treated as large numbers.
- If you use F16 denormal values, they will be flushed to 0.