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CustoMac Glossary: Explanations of Common Terms

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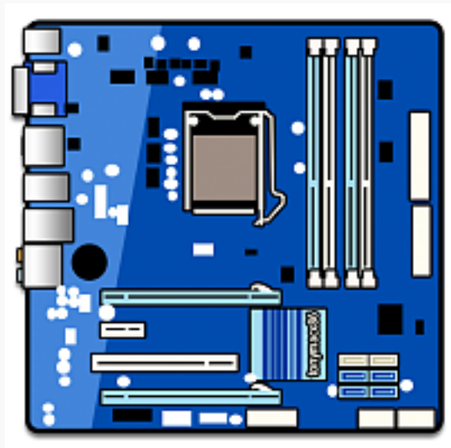
CustoMac Glossary: Explanations of Common Terms

VGA

xHCI

ACPI – The **A**dvanced **C**onfiguration and **P**ower **I**nterface is an open specification used by operating systems for computer hardware discovery, configuration, power management, and system monitoring. ACPI defines a set of tables which provide a platform-independent interface between an ACPI-compliant operating system and the system firmware. The files describing these tables are written in the textual ACPI Source Language (ASL) and stored with a .dsl extension, and then compiled into the binary ACPI Machine Language (AML) format and stored with an .aml extension.

AHCI – The **A**dvanced **H**ost **C**ontroller **I**nterface is an interface specification allowing the SATA controller driver to support advanced features such as Native Command Queuing, Hot Plug, etc. Many SATA controllers can enable AHCI either separately or in conjunction with RAID support; however, Mac OS X does not support Intel hardware RAID. Setting SATA ports to AHCI mode is required for Mac OS X to boot from a hard disk or SSD.

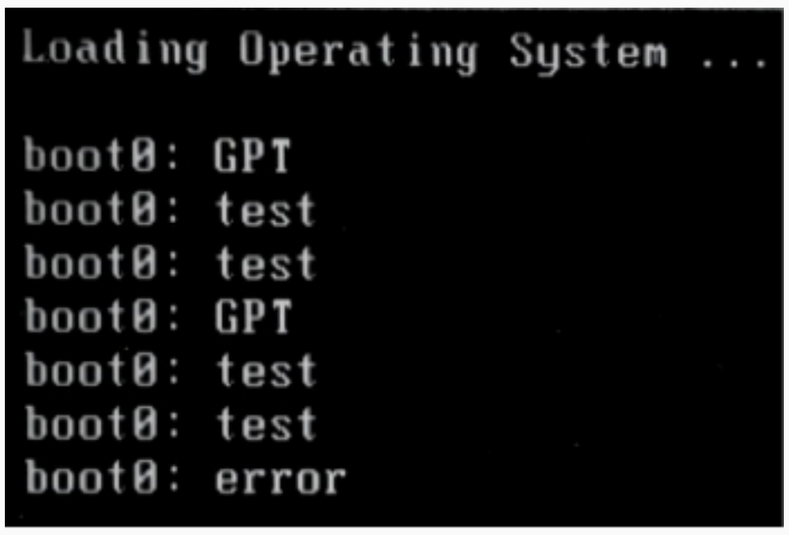


ATX / EATX / MicroATX / Mini-ITX – Motherboard form factors, which include physical dimensions, mounting points, the rear I/O panel, and power and connector interfaces between the case, motherboard, and power supply. Here are the dimensions of the most common form factors:

Form Factor Name	Dimensions
ATX	305mm × 244mm
E-ATX (Extended ATX)	305mm × 330mm
MicroATX	244mm × 244mm
Mini-ITX	170mm × 170mm

BIOS – In IBM PC Compatible computers, the **B**asic **I**nput/**O**utput **S**ystem (BIOS), also referred to as "legacy BIOS", is a de facto standard defining a firmware interface. The BIOS software is built into the PC, and is the first code run by a PC when powered on ('boot firmware'). The primary function of the BIOS is to load and start an operating system. When starting up the PC, it initializes devices such as the graphics card, keyboard and mouse, storage devices, and other hardware. Then it locates software on the storage device designated as the 'boot device' and loads it, handing over control of the PC to the operating system. BIOS software is stored on a non-volatile ROM chip built into the system on the motherboard. The BIOS on most modern motherboards has been replaced with a newer interface called the Unified Extensible Firmware Interface, or UEFI.

boot0 error – This is an error that commonly surfaces with hard drives which have a 4K byte block size (a.k.a. "Advanced Format" drives) instead of the older 512 byte block size. The error is caused by a failure of OS X to write the bootloader code to the 4K drives, and requires a workaround to boot on their own. This error is characterized by the following error appearing on the screen at boot time:



See boot0 Error: The Official Guide for more information on how to install the bootloader manually *(Chimera-only, does not apply to Clover)*.

Chimera – A legacy bootloader commonly used on older CustoMac systems. Chimera works by emulating EFI, acting as middleware between the BIOS and the OS X EFI interface. Chimera is the bootloader installed by UniBeast 5.x and older.

Clover – A UEFI bootloader commonly used on newer CustoMac systems. Though Clover is UEFI-based, it allows for booting Mac OS X (and other operating systems) on UEFI and legacy BIOS systems. Clover is the bootloader installed by UniBeast 6.x and newer.

Codec – The audio codec is a chip that **co**des/**dec**odes the audio stream from digital to analog signals and vice versa. The HDA controller provides the register-level interface to the codec chip, so that software written to the Intel HDA specification can communicate with the codec, no matter who manufactured the chip. Most motherboards in Hackintosh systems use one of several codecs supplied by Realtek.

DisplayPort / MiniDP – **D**isplay**P**ort is a digital graphics interface developed by the Video Electronics Standards Association (VESA). Like HDMI, DisplayPort can carry both digital video and digital audio signals on the same cable. MiniDP is DisplayPort with a miniaturized connector, which is also used by Thunderbolt.

DSDT - The **D**ifferentiated **S**ystem **D**escription **T**able is the main ACPI table. It tells the OS how to interact with the motherboard's hardware. OS X has an incomplete ACPI implementation which supports only a subset of DSDT. By replacing the DSDT file, we can declare essentially the same interface but in the way that OS X will understand it. This potentially can solve nearly any ACPI-related problem as long as OS X does not bypass the ACPI.

DVI – **D**igital **V**isual **I**nterface is a digital/analog graphics interface developed by the Digital Display Working Group (DDWG). There are five variants of DVI: DVI-D (digital only) Single or Dual Link; DVI-A (analog only); and DVI-I (integrated – combines digital and analog in the same connector) Single or Dual Link. A DVI-D source can output HDMI with the proper cable or adapter because both have the same electrical specifications.

ECC memory – **E**rror-**C**orrecting **C**ode memory is a type of RAM that can detect and correct the most common kinds of internal data corruption. It is most often used in computers where data corruption of any kind cannot be tolerated, such as for scientific or financial applications. There is a problem that can arise with Hackintoshes related to ECC memory; a kext called "AppleTyMCEDriver.kext" causes kernel panics if the user selects a system definition that supports ECC RAM but the computer doesn't actually have ECC RAM installed; in this circumstance, "AppleTyMCEDriver.kext" must be deleted.

EFI System Partition (ESP) – the EFI System Partition is a special storage partition, usually on the boot drive, that is used by PCs that boot via UEFI. The UEFI firmware loads boot loaders, device drivers, configuration, and other files stored on the ESP to start the installed operating system. The ESP's format is based on the FAT/FAT32 format).

EHCI – The **E**nhanced **H**ost **C**ontroller **I**nterface defines a low-level description of a host controller for USB 2.0, controlling how the USB 2.0 ports behave, and supports compliant USB 2.0 low-, full-, and high-speed devices.

FakeSMC is an open source **SMC** device driver/emulator developed by netkas. FakeSMC.kext is the only kext file that is absolutely required to boot Mac OS X on non-Apple hardware. FakeSMC, along with a handful of plugins (also open source, released under the name "HWSensors"), emulates much of the functionality of the SMC chip found in "real" Macintosh computers. See also **HWSensors**.

FAT / FAT32 – The **F**ile **A**llocation **T**able (originally 16-bit, now 32-bit) is the original filesystem format used by MS-DOS and later Windows. It is also commonly found on USB memory sticks, SD and MicroSD cards, and other storage devices.

Fusion drive - Apple's implementation of a hybrid drive, combining a hard disk drive with a solid state drive into a single CoreStorage logical volume. The most frequently accessed files, applications, documents, and other data are automatically moved to the SSD for fast access; infrequently used items are moved to the hard drive. The placement of the data is managed by the operating system.

GPT – The **G**UID **P**artition **T**able is the most recent of the HDD/SSD partition table formats supported by OS X. GPT supports greater partition sizes and numbers than MBR, specifically up to 128 partitions of 8 ZiB each (for disks with 512-byte sectors). GPT is the supported partition table format on tonymacx86.com for installing macOS on an Intel-based PC.

HDA driver – **H**igh **D**efinition **A**udio driver refers to an audio driver compliant with Intel's HDA specification. Apple's implementation of this specification is in the AppleHDA.kext which is specifically written for Apple Macintosh hardware. Consequently, for CustoMac systems, a modified HDA kext is required for each motherboard's implementation of the Intel specification and each different codec chip used in the implementation.

HDD (**H**ard **D**isk **D**rive) – Mass storage device with rotational platters. Hard drives are cheaper and come in much larger capacities, but are also much slower than SSDs.

HDMI – **H**igh-**D**efinition **M**ultimedia **I**nterface is a digital audio/video interface. The HDMI standard includes a DRM (Digital Rights Management) implementation called HDCP (High-bandwidth Digital Content Protection), which it uses to encrypt the signal if required by the source device. Signals carried by HDMI are electrically compatible with DVI-D signals, so the two connectors are basically interchangeable with the correct adapter/cable. HDMI has several connector types for use in various applications.

HPET – The **H**igh **P**recision **E**vent **T**imer is a hardware timer used in personal computers. It was developed jointly by Intel and Microsoft and has been incorporated in PC chipsets since circa 2005. The HPET circuit in modern PCs is integrated into the Northbridge chip. HPET must be enabled and in 64-bit mode in most cases for Mac OS X to boot on a PC.

HWSensors – A set of plugins for **FakeSMC** that enable it to supply information such as CPU and drive temperatures, fan speeds, and drive SMART info to hardware monitoring programs.

Hybrid Partition Table – A storage partitioning system where an HDD/SSD will be formatted as GPT first, then formatted with MBR on the remaining free space (as a FAT32 partition). In order to function properly, both the GPT and MBR must be "synchronized", that is they must contain identical entries. This partitioning scheme is most commonly used on PCs that boot into both Microsoft Windows and Mac OS X.

I2C or (**I**nter-**I**ntegrated **C**ircuit) – An interconnection bus typically used for attaching lower-speed peripheral integrated circuits to processors and microcontrollers for short-distance, intra-board communications. **SMBus** is a subset of I2C.

Intel HD Graphics – Many, if not most, Intel Core i3/i5/i7 desktop processors have integrated graphics controllers that are compatible with OS X; Xeon, Pentium, and Celeron processors generally do not. The following is a list of integrated Intel HD Graphics controllers that are supported in Mac OS X *(this list may not be all-inclusive)*:

Graphics Controller	Processor Lines	Processor Models	Notes
HD 3000	Sandy Bridge Core i3/i5/i7	i3: 2105, 2125; i5: 2405S, 2500K; i7: 2600K, 2700K	‘SNB’ framebuffer
HD 2500	Ivy Bridge Core i3/i5	most models	‘Capri’ framebuffer
HD 4000	Ivy Bridge Core i3/i5/i7	i3: 3225, 3245; i5: 3335S, 3475S, 3570K; i7: 3770T, 3770S, 3770, 3770K	‘Capri’ framebuffer
HD 4400	Haswell Core i3	i3: all 41xxx models	‘Azul’ framebuffer
HD 4600	Haswell Core i3/i5/i7	i3: all 43xxx models; i5: most models; i7: most models	‘Azul’ framebuffer
Iris Pro 5200	Haswell Core i5/i7, Xeon E3	i5: 4570R, 4670R; i7: 4770R; Xeon: 1284Lv3	Same as HD 5000 (mobile) with added 128MB cache
Iris Pro 6200	Broadwell Core i5/i7	i5: 5675C; i7: 5775C	Same as HD 6000 (mobile) with added 128MB cache
HD 530	Skylake Core i3/i5/i7	most models	‘SKL’ framebuffer
HD 630	Kaby Lake Core i3/i5/i7	most models	

Intel Processors and Chipsets – In general, any Intel desktop processor with the Intel 64-bit instruction set is capable of running the latest version of Mac OS X. This means the following list of processor lines can run El Capitan *(this list may not be all-inclusive)*:

Sockets	Brand Names	Code Names	Chipset Series
LGA 775	Core 2 Duo, Pentium, Celeron, Xeon	Conroe, Allendale, Wolfdale	9xx, 3-series, 4-series
LGA 775	Core 2 Quad, Core 2 Extreme	Kentsfield, Yorkfield	3-series, 4-series
LGA 1156	Core i3/i5/i7, Pentium, Celeron	Clarkdale, Lynnfield	5-series
LGA 1366	Core i7, Xeon	Bloomfield, Gulftown	5-series
LGA 1155, LGA 2011	Core i3/i5/i7, Pentium, Celeron	Sandy Bridge, Sandy Bridge-E	6-series, 7-series
LGA 1155, LGA 2011	Core i3/i5/i7, Pentium, Celeron	Ivy Bridge, Ivy Bridge-E	6-series, 7-series
LGA 1150, LGA 2011-v3	Core i3/i5/i7, Pentium, Celeron	Haswell, Haswell-E	8-series, 9-series
LGA 1150	Core i5/i7	Broadwell	9-series
LGA 1151	Core i3/i5/i7, Pentium	Skylake	100-series
LGA 1151	Core i3/i5/i7, Pentium, Celeron	Kaby Lake	100-series, 200-series

However, the inverse is not true – newer processors generally cannot run older versions of Mac OS X. See Build Recommendations for Older Versions of OS X Using Older Chipsets for details on which processors can run which OS X versions.

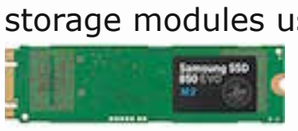
What do the processor number suffixes mean?

C = Desktop processor based on the LGA 1150 package with high-performance graphics
K = Unlocked (overclockable)
M = Mobile
Q = Quad-core
S = Performance-optimized "lifestyle" (i.e. a little lower performance in exchange for lower power draw)
T = Power-optimized "lifestyle" (i.e. much lower performance, but also much lower power draw)
U = Ultra-low power
X = Extreme edition (i.e. the highest-end desktop CPU available from Intel in that particular generation)
Y = Extremely low power

Kernel – The kernel is, in simple terms, the "core" of the operating system. It controls basically all low level operating functions. Kernels exist in all Linux and UNIX based systems, including Mac OS X, as well as Windows operating systems. On Mac OS X 10.9 (Mavericks) and older, the kernel is located in the root of your boot drive (/) and is named "mach_kernel" by default; on Mac OS X 10.10 (Yosemite) and newer, the kernel is located in /System/Library/Kernels, and is named simply "kernel".

Kext – A kext file (actually a folder) is a **k**ernel **ext**ension. Kexts are generally used for device drivers and other types of software that need to modify the system at the lowest level. Kext files are actually folder bundles which can contain various binaries, configuration files, and other resources bundled together. They're not the same as classic Mac OS extensions, as many of the things that classic Mac OS extensions did are done differently in Mac OS X. Since kernel extensions aren't protected by OS X's memory protection, developers are encouraged to stay away from writing them unless they absolutely have to. Whatever needs to run in the kernel environment can be written as an extension and then loaded, even after OS X has finished loading.

M.2 – The M.2 (formerly known as NGFF, or Next Generation Form Factor) specification is the replacement for mSATA for small-footprint SSD storage modules used in notebooks and also increasingly found on desktop motherboards.



MAS - The **M**ac **A**pp **S**tore, i.e. the only place to legally download Mac OS X.

MBR – The **M**aster **B**oot **R**ecord is an older HDD/SSD partition table format, used to boot legacy BIOS-based systems. MBR only supports four partition entries, and each partition is limited to a maximum of 2 TB (on disks with 512-byte sectors).

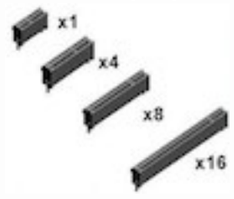
Mobo – The **Mo**ther**bo**ard is the main board that all other devices in your system connect to. Comes in several standard form factors (sizes). See **ATX / EATX / microATX / Mini-ITX**.

mSATA – The mSATA (Mini-SATA) interface is a small-footprint SSD form factor created for use in notebook and netbook computers, but also found on some desktop motherboards. Its connector looks similar to the MiniPCIe connector, but is not electrically compatible. mSATA has been superseded by **M.2**.

MultiBeast – An all-in-one post-installation tool used to enable boot from hard drive and install support for audio, network, and graphics, as well as other configuration options.

NVMe – NVMe (**N**on-**V**olatile **M**emory **E**xpress) is an interface specification for accessing non-volatile storage (such as **SSD**s) attached via the PCIe bus. NVMe was designed to take advantage of the low latency and high parallelism of flash storage, unlike other interfaces such as **AHCI**, which was designed for rotational hard drives.

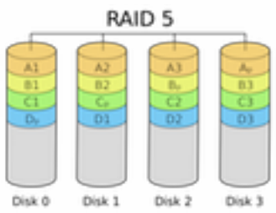
PCIe / MiniPCIe – PCIe stands for **P**eripheral **C**omponent **I**nterconnect **E**xpress, and is the main expansion bus used in modern PCs. PCIe is a high-speed serial bus and comes in several different revisions and variants, all of which are generally cross-compatible. It is used for graphics cards, SATA adapters, USB adapters, and almost any other device that can be added to a PC. MiniPCIe is a smaller version of PCIe (electrically but not physically compatible) used as expansion cards in notebook computers.



.plist Files – Files with the extension .plist in Mac OS X represent configuration files for the system and for various applications. The file format is XML, with configuration options specified as key-value pairs in structured sections.

QE/CI Graphics Acceleration – **QE/CI** is an acronym for **Q**uartz **E**xtreme and **C**ore **I**mage graphics acceleration. Quartz Extreme uses OpenGL and a supported graphics card to offload onscreen calculations that are normally performed by the system CPU to the GPU, to reduce the CPU's workload. Some graphics effects, such as the "rotating cube" effect you see when using Fast User Switching to switch users, are powered by Quartz Extreme. Other graphics effects and optimizations in Mac OS X, such as the ripple effect that appears when you place a widget on Dashboard, are driven by Core Image.

RAID – RAID, an acronym for **R**edundant **A**rray of **I**ndependent **D**isks, is a technology that provides increased storage functions and reliability through redundancy, combining multiple disk drives into a logical unit where the drives in the array are interdependent. There are several RAID architecture designs, distinguished by the amount of redundancy and data replication provided (e.g. RAID 0, RAID 1, RAID 1+0, RAID 5). RAID can be implemented either in software or at the hardware level. Mac OS X's RAID implementation (software) supports RAID 0, RAID 1, and RAID 1+0. Many hardware RAID PCIe cards are supported in OS X, provided their firmware contains OS X drivers, though the firmware RAID on many motherboards is not.



SATA – **S**erial **ATA** is an interface used to connect host bus adapters to mass storage devices such as hard drives and SSDs. It comes in both internal and external ("eSATA") variants.

SIP – **S**ystem **I**ntegrity **P**rotection, also known as "rootless mode", is a system security feature new in OS X El Capitan. It essentially protects all OS X system files and processes from any modification, even by a user with root privileges. Enabled by default, SIP can be partially or completely disabled with system parameters in Clover's config.plist file, and must be disabled to successfully install OS X on a Hackintosh. To disable SIP completely, two system parameters must be set in the Clover config.plist as follows:

Code:

```
<key>RtVariables</key>
<dict>
     <key>CsrActiveConfig</key>
     <string>0x3</string>
     <key>BooterConfig</key>
     <string>0x28</string>
</dict>
```

See Explaining OS X El Capitan Security Changes for more detailed information about SIP.

S.M.A.R.T. – **S**elf-**M**onitoring, **A**nalysis and **R**eporting **T**echnology is a health monitoring system built into most hard drives and SSDs that detects and reports various drive reliability indicators, intended to help predict drive failures. Some of the attributes reported include drive temperatures, read failures, retries, and in the case of SSDs, several attributes related to the wear-leveling technology. S.M.A.R.T. relies on host system software to gather the reported values and make a determination of drive health.

SMC – **S**ystem **M**anagement **C**ontroller – The SMC, found in Intel-based Macintosh computers, controls thermal and power management, battery charging, video mode switching, sleep and wake, hibernation, and LED indicators. It also enables enforcement of the Mac OS X End User License, allowing it to identify when it is running on non-Apple hardware. See also **FakeSMC**.

SMBus – A subset of **I2C**, the **S**ystem **M**anagement **Bus** is a two-wire bus used for simple communications between low-bandwidth devices on the motherboard. It is most commonly used for power-related functions; temperature, fan, and voltage sensors; lid switches on notebooks; and clock chips.

SSD – **S**olid **S**tate **D**rive – Mass storage device with non-volatile flash memory. SSDs are more expensive than HDDs, but can be as much as 4x faster. They come in many different form factors, including the standard laptop drive form factor, mSATA, M.2, and PCIe cards.

SSDT – The **S**econdary **S**ystem **D**escription **T**able is an ACPI table (secondary to the DSDT). The SSDT is usually used to configure system power management parameters, though it can also be used for other purposes. On some systems multiple SSDT files may be present, named SSDT.aml, SSDT-1.aml, SSDT-2.aml, and so on.

Thunderbolt – A hardware interface bearing some similarities to USB that allows connection of external peripherals to a computer. Thunderbolt combines PCIe and DisplayPort into one serial signal and also provides power, all in one cable. Thunderbolt uses the same physical connector as Mini DisplayPort. Examples of Thunderbolt peripherals include storage, displays, network adapters, and docking stations.

UEFI – The **U**nified **E**xtensible **F**irmware **I**nterface (previously EFI, or Extensible Firmware Interface) specifies a standard software interface between the computer's firmware and the operating system. UEFI has largely replaced the legacy BIOS in most modern PCs. UEFI provides many features and services that were unavailable in a simple BIOS, including the storage of data in non-volatile RAM, operating system bootloaders, and device drivers.

UHD (also known as **4K** or **8K**) – **U**ltra **H**igh **D**efinition, a descriptor used for both 4K (3480x2160) and 8K (7680x4320) graphics.

UniBeast – A tool used to create a bootable USB memory stick from the Install Mac OS X application downloaded from the App Store. A bootable UniBeast installer contains the Clover bootloader and its configuration and support files as well as the OS X installation files, and is multipurpose – it can be used to install OS X from scratch or as a rescue boot drive for system recovery.

USB – **U**niversal **S**erial **B**us is a cross-platform industry standard interface used for almost any peripheral device that can be connected to a PC, such as storage, keyboards, pointing devices, printers, network adapters, and audio adapters, to name a few. The USB standard has evolved over time, from USB 1.0 which supported a maximum bandwidth of 12 Mbit/sec, to the current USB 3.1 standard which supports up to 10 Gbit/sec.

VGA – **V**ideo **G**raphics **A**rray is an analog graphics interface that uses a 15-pin D-sub connector. As of OS X Lion 10.7, VGA is no longer supported by Apple.

xHCI – The E**x**tensible **H**ost **C**ontroller **I**nterface defines a low-level description of a host controller for USB 3.0, controlling how the USB 3.0 ports behave, and supports USB 1.x, 2.x, and 3.x devices.

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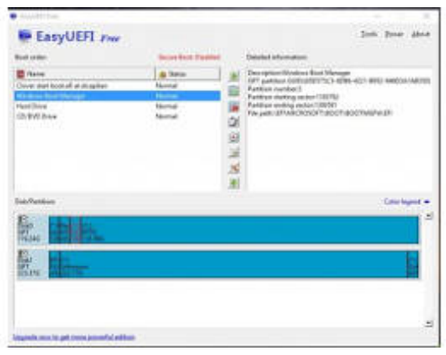

[GUIDE] Remove extra Clover BIOS boot entries & prevent further...

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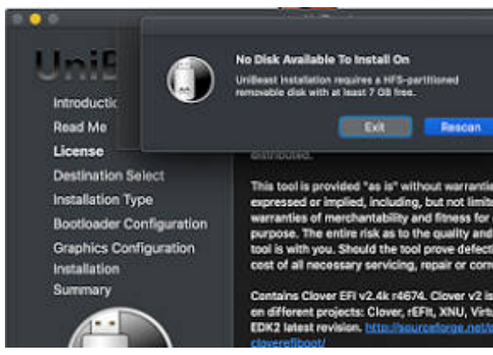

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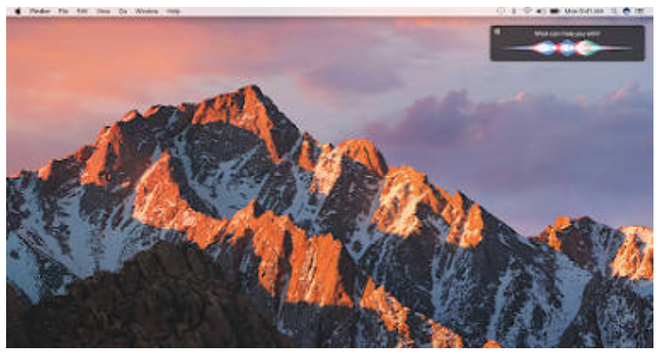

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