Broadwell-E

Support	Version
Initial macOS Support	OS X 10.11, El Capitan

Starting Point

So making a config.plist may seem hard, it's not. It just takes some time but this guide will tell you how to configure everything, you won't be left in the cold. This also means if you have issues, review your config settings to make sure they're correct. Main things to note with OpenCore:

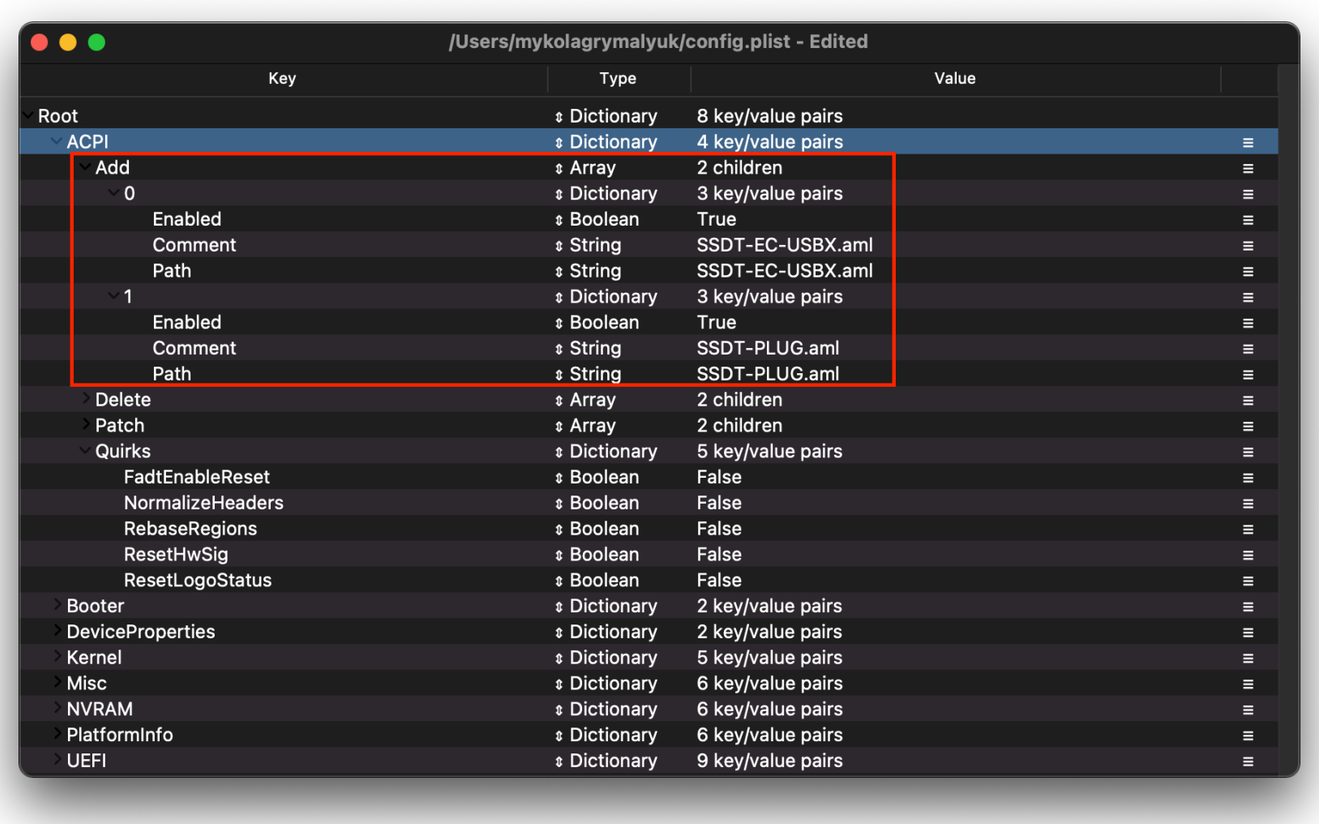
- **All properties must be defined**, there are no default OpenCore will fall back on so **do not delete sections unless told explicitly so**. If the guide doesn't mention the option, leave it at default.
- **The Sample.plist cannot be used As-Is**, you must configure it to your system
- **DO NOT USE CONFIGURATORS**, these rarely respect OpenCore's configuration and even some like Mackie's will add Clover properties and corrupt plists!

Now with all that, a quick reminder of the tools we need

- ProperTree
  - Universal plist editor
- GenSMBIOS
  - For generating our SMBIOS data
- Sample/config.plist
  - See previous section on how to obtain: config.plist Setup

> **WARNING**
>
> Read this guide more than once before setting up OpenCore and make sure you have it set up correctly. Do note that images will not always be the most up-to-date so please read the text below them, if nothing's mentioned then leave as default.

ACPI



Add

Info

This is where you'll add SSDTs for your system, these are very important to **booting macOS** and have many uses like USB maps , disabling unsupported GPUs and such. And with our system, **it's even required to boot**. Guide on making them found here: **Getting started with ACPI**

For us we'll need a couple of SSDTs to bring back functionality that Clover provided:

Required SSDTs	Description
SSDT-PLUG	Allows for native CPU power management on Haswell and newer, see Getting Started With ACPI Guide for more details.
SSDT-EC-USBX	Fixes both the embedded controller and USB power, see Getting Started With ACPI Guide for more details.
SSDT-RTC0-RANGE	Required for all Big Sur users to ensure their RTC device is compatible, see Getting Started With ACPI Guide for more details.
SSDT-UNC	Required for all Big Sur users to ensure their UNC devices are compatible, see Getting

Started With ACPI Guide for more details.

Note that you **should not** add your generated `DSDT.aml` here, it is already in your firmware. So if present, remove the entry for it in your `config.plist` and under EFI/OC/ACPI.

For those wanting a deeper dive into dumping your DSDT, how to make these SSDTs, and compiling them, please see the **Getting started with ACPI page.** Compiled SSDTs have a **.aml** extension(Assembled) and will go into the `EFI/OC/ACPI` folder and **must** be specified in your config under `ACPI -> Add` as well.

Delete

This blocks certain ACPI tables from loading, for us we can ignore this.

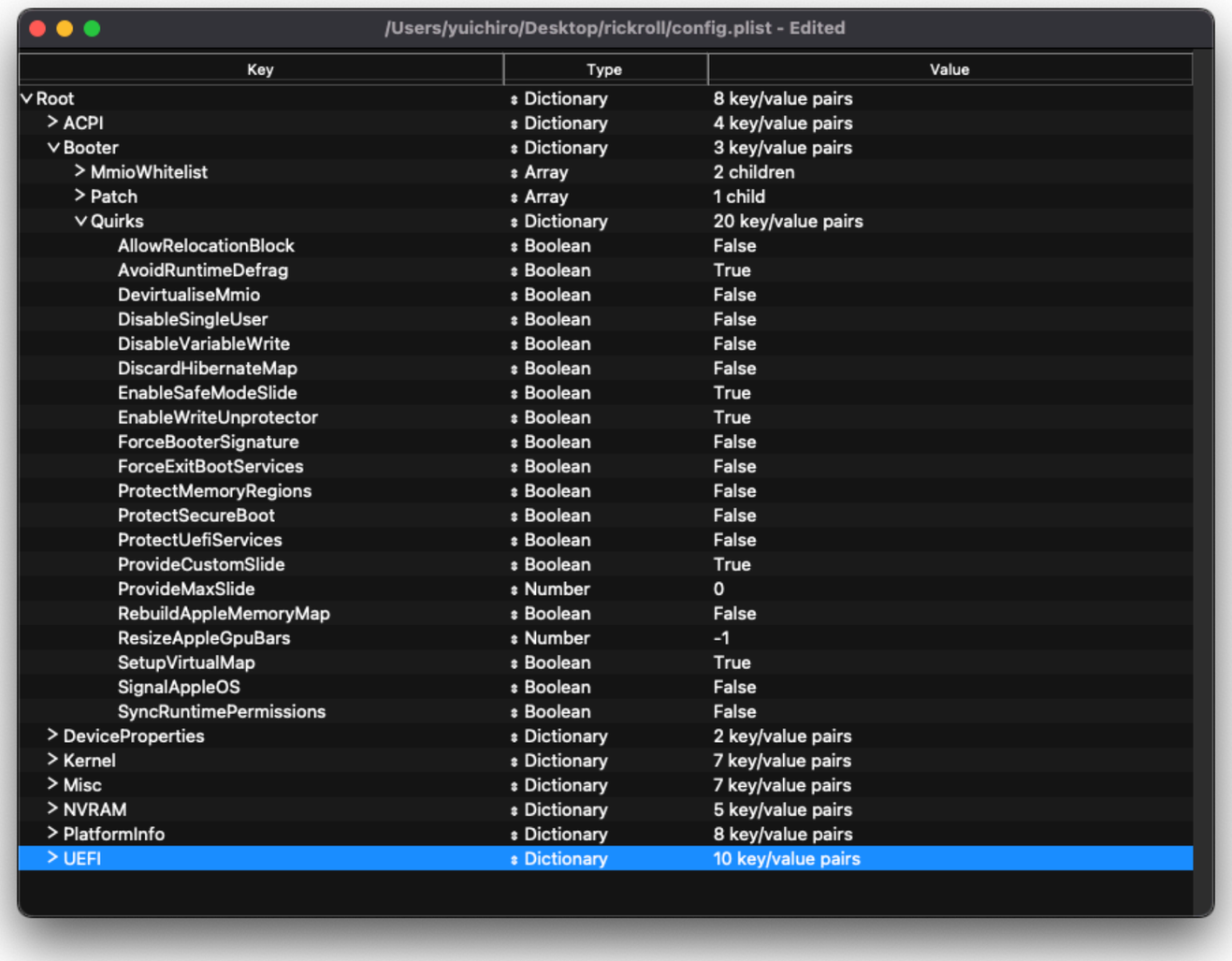
Patch

This section allows us to dynamically modify parts of the ACPI (DSDT, SSDT, etc.) via OpenCore. For us, our patches are handled by our SSDTs. This is a much cleaner solution as this will allow us to boot Windows and other OSes with OpenCore

Quirks

Settings relating to ACPI, leave everything here as default as we have no use for these quirks.

Booter



This section is dedicated to quirks relating to boot.efi patching with OpenRuntime, the replacement for AptioMemoryFix.efi

MmioWhitelist

This section is allowing spaces to be passthrough to macOS that are generally ignored, useful when paired with `DevirtualiseMmio`

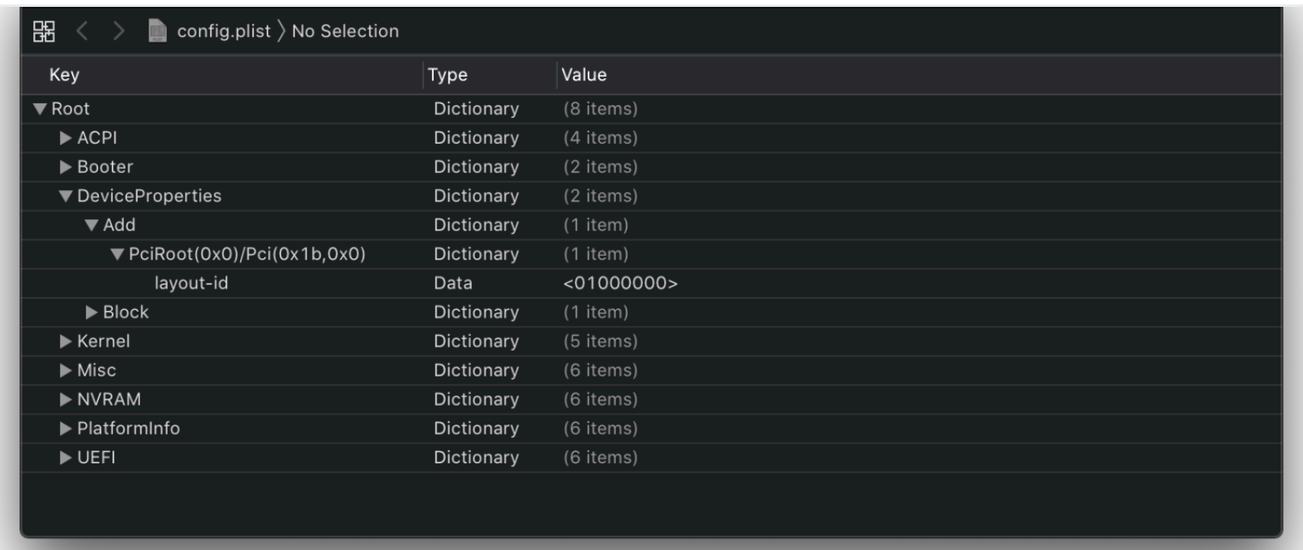
Quirks

Info

Settings relating to boot.efi patching and firmware fixes, for us, we leave it as default

▶ More in-depth Info

DeviceProperties



Add

Sets device properties from a map.

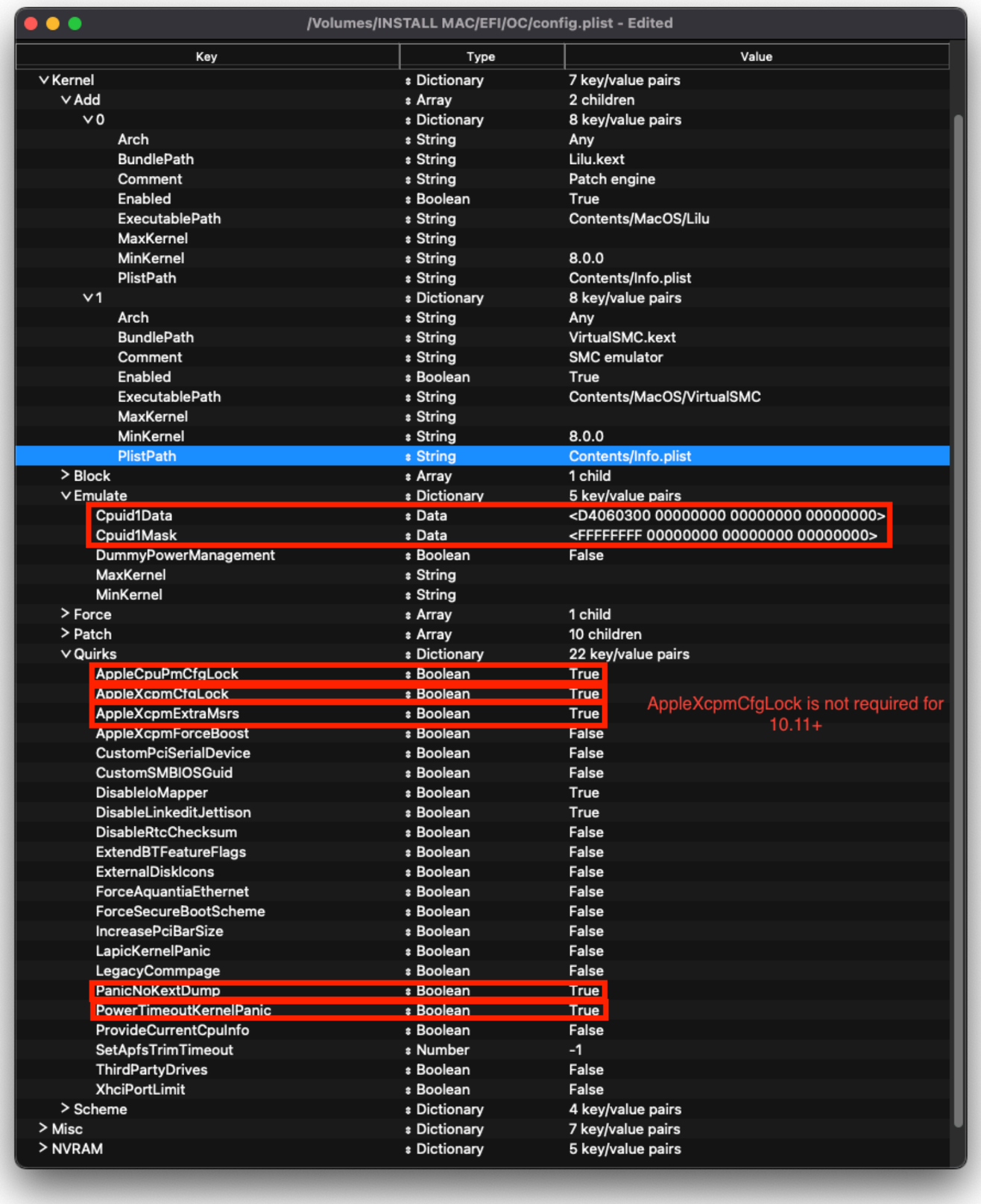
By default, the Sample.plist has this section set for audio which we'll be setting up by setting the layout ID in the boot-args section, so removal of `PciRoot(0x0)/Pci(0x1b,0x0)` is also recommended from the `Add` section.

TL;DR, delete all the PciRoot's here as we won't be using this section.

Delete

Removes device properties from the map, for us we can ignore this

Kernel



Add

Here's where we specify which kexts to load, in what specific order to load, and what architectures each kext is meant for. By default we recommend leaving what ProperTree has done, however for 32-bit CPUs please see below:

▶ More in-depth Info

Emulate

Info

Needed for spoofing unsupported CPUs and enabling power management on Haswell-E and Broadwell-E

- **Broadwell E:**
  - Cpuid1Data: `D4060300 00000000 00000000 00000000`
  - Cpuid1Mask: `FFFFFFFF 00000000 00000000 00000000`

▶ More in-depth Info

Force

Used for loading kexts off system volume, only relevant for older operating systems where certain kexts are not present in the cache(ie. IONetworkingFamily in 10.6).

For us, we can ignore.

Block

Blocks certain kexts from loading. Not relevant for us.

Patch

Patches both the kernel and kexts.

Quirks

Info

Settings relating to the kernel, for us we'll be enabling the following:

Quirk	Enabled	Comment
AppleCpuPmCfgLock	NO	Need if running 10.10 or older and cannot disable `CFG-Lock` in the BIOS
AppleXcpmCfgLock	YES	Not needed if `CFG-Lock` is disabled in the BIOS
AppleXcpmExtraMsrs	YES	
DisableIoMapper	YES	Not needed if `VT-D` is disabled in the BIOS
LapicKernelPanic	NO	HP Machines will require this quirk
PanicNoKextDump	YES	
PowerTimeoutKernelPanic	YES	
XhciPortLimit	YES	Disable if running macOS 11.3+

▶ More in-depth Info

Scheme

Settings related to legacy booting(ie. 10.4-10.6), for majority you can skip however for those planning to boot legacy OSes you can see below:

▶ More in-depth Info

Misc

Boot

Info

Quirk	Enabled	Comment
HideAuxiliary	YES	Press space to show macOS recovery and other auxiliary entries

▶ More in-depth Info

Debug

Info

Helpful for debugging OpenCore boot issues(We'll be changing everything *but* `DisplayDelay`):

Quirk	Enabled
AppleDebug	YES
ApplePanic	YES
DisableWatchDog	YES
Target	67

▶ More in-depth Info

Security

Info

Security is pretty self-explanatory, **do not skip**. We'll be changing the following:

Quirk	Enabled	Comment
AllowSetDefault	YES	
BlacklistAppleUpdate	YES	

ScanPolicy	0	
SecureBootModel	Default	Leave this as `Default` for OpenCore to automatically set the correct value corresponding to your SMBIOS. The next page goes into more detail about this setting.
Vault	Optional	This is a word, it is not optional to omit this setting. You will regret it if you don't set it to Optional, note that it is case-sensitive

▶ More in-depth Info

Serial

Used for serial debugging (Leave everything as default).

Tools

Used for running OC debugging tools like the shell, ProperTree's snapshot function will add these for you.

Entries

Used for specifying irregular boot paths that can't be found naturally with OpenCore.

Won't be covered here, see 8.6 of Configuration.pdf for more info

NVRAM

Add

4D1EDE05-38C7-4A6A-9CC6-4BCCA8B38C14

Used for OpenCore's UI scaling, default will work for us. See in-depth section for more info

▶ More in-depth Info

4D1FDA02-38C7-4A6A-9CC6-4BCCA8B30102

▶ More in-depth Info

7C436110-AB2A-4BBB-A880-FE41995C9F82

System Integrity Protection bitmask

- **General Purpose boot-args**:

boot-args	Description
-v	This enables verbose mode, which shows all the behind-the-scenes text that scrolls by as you're booting instead of the Apple logo and progress bar. It's invaluable to any Hackintosher, as it gives you an inside look at the boot process, and can help you identify issues, problem kexts, etc.
debug=0x100	This disables macOS's watchdog which helps prevents a reboot on a kernel panic. That way you can *hopefully* glean some useful info and follow the breadcrumbs to get past the issues.
keepsyms=1	This is a companion setting to debug=0x100 that tells the OS to also print the symbols on a kernel panic. That can give some more helpful insight as to what's causing the panic itself.
npci=0x2000	This disables some PCI debugging related to `kIOPCIConfiguratorPFM64`, alternative is `npci=0x3000` which disables debugging related to `gIOPCITunnelledKey` in addition. Required for when getting stuck on `PCI Start Configuration` as there are IRQ conflicts relating to your PCI lanes. Source
alcid=1	Used for setting layout-id for AppleALC, see supported codecs to figure out which layout to use for your specific system. More info on this is covered in the Post-Install Page

- **GPU-Specific boot-args**:

boot-args	Description
agdpmod=pikera	Used for disabling board ID checks on some Navi GPUs (RX 5000 & 6000 series), without this you'll get a black screen. **Don't use if you don't have Navi** (ie. Polaris and Vega cards shouldn't use this)
-radcodec	Used for allowing officially unsupported AMD GPUs (spoofed) to use the Hardware Video Encoder
radpg=15	Used for disabling some power-gating modes, helpful for properly initializing AMD Cape Verde based GPUs
unfairgva=1	Used for fixing hardware DRM support on supported AMD GPUs
nvda_drv_vrl=1	Used for enabling NVIDIA's Web Drivers on Maxwell and Pascal cards in macOS Sierra and High Sierra

- **csr-active-config**: `00000000`
  - Settings for 'System Integrity Protection' (SIP). It is generally recommended to change this with `csrutil` via the recovery partition.
  - csr-active-config by default is set to `00000000` which enables System Integrity Protection. You can choose a number of different values but overall we recommend keeping this enabled for best security practices. More info can be found in our troubleshooting page: Disabling SIP
- **run-efi-updater**: `No`
  - This is used to prevent Apple's firmware update packages from installing and breaking boot order; this is important as these firmware updates (meant for Macs) will not work.
- **prev-lang:kbd**: <>
  - Needed for non-latin keyboards in the format of `lang-COUNTRY:keyboard`, recommended to keep blank though you can specify it(**Default in Sample config is Russian**):
  - American: `en-US:0` (`656e2d55533a30` in HEX)
  - Full list can be found in AppleKeyboardLayouts.txt
  - Hint: `prev-lang:kbd` can be changed into a String so you can input `en-US:0` directly instead of converting to HEX
  - Hint 2: `prev-lang:kbd` can be set to a blank variable (eg. `<>`) which will force the Language Picker to appear instead at first boot up.

Key	Type	Value
prev-lang:kbd	String	en-US:0

Delete

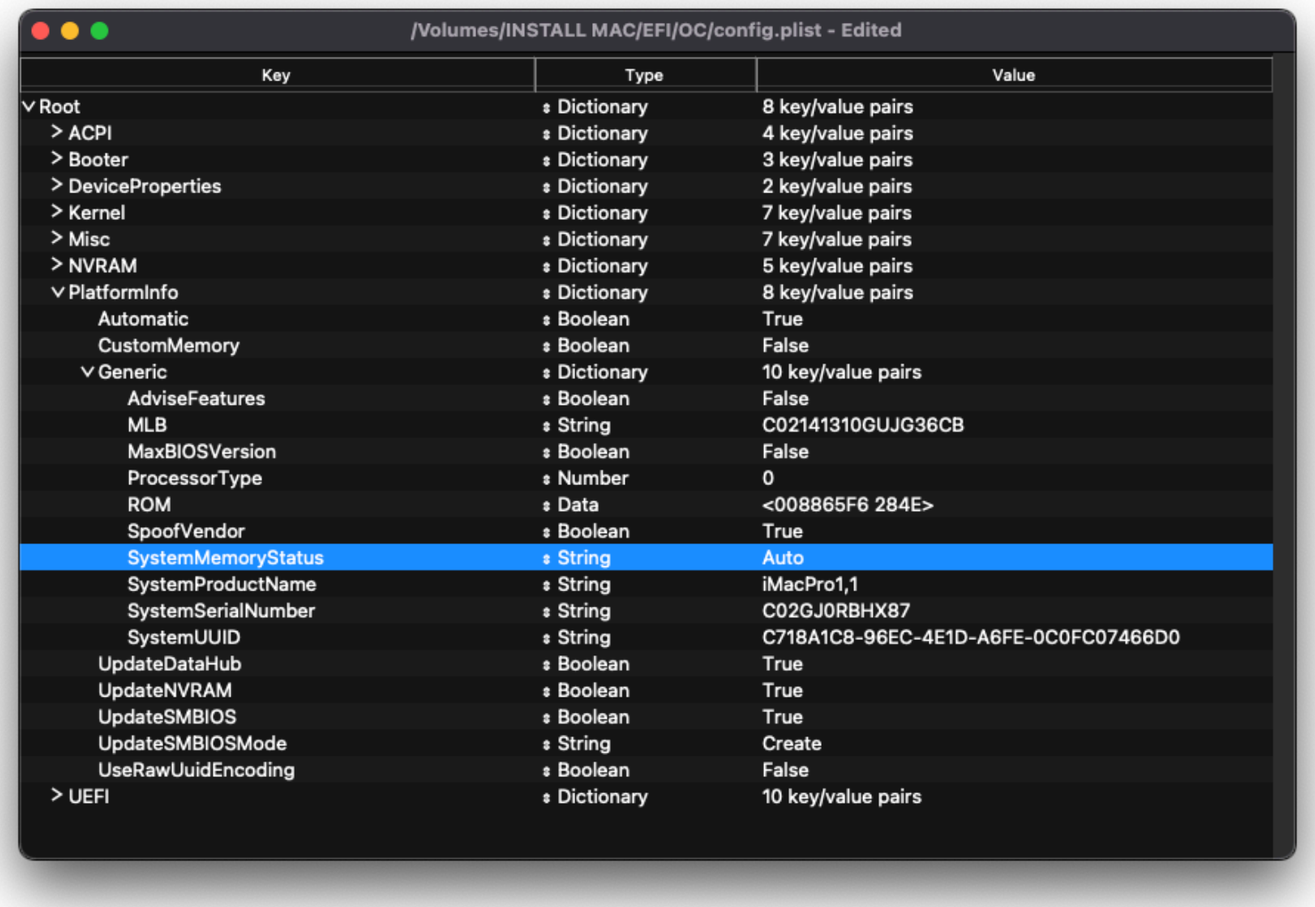
Info

Forcibly rewrites NVRAM variables, do note that `Add` **will not overwrite** values already present in NVRAM so values like `boot-args` should be left alone. Due to NVRAM issues on X99, we'll be changing the following:

LegacyOverwrite	YES
WriteFlash	NO

▶ More in-depth Info

PlatformInfo



Info

For setting up the SMBIOS info, we'll use CorpNewt's GenSMBIOS application.

For this Broadwell-E example, we'll choose the iMacPro1,1 SMBIOS.

Run GenSMBIOS, pick option 1 for downloading MacSerial and Option 3 for selecting out SMBIOS. This will give us an output similar to the following:

```sh
  ###################################################
 #             iMacPro1,1 SMBIOS Info              #
###################################################

Type:          iMacPro1,1
Serial:        C02YX0TZHX87
Board Serial: C029269024NJG36CB
SmUUID:        DEA17B2D-2F9F-4955-B266-A74C47678AD3
```

The `Type` part gets copied to Generic -> SystemProductName.

The `Serial` part gets copied to Generic -> SystemSerialNumber.

The `Board Serial` part gets copied to Generic -> MLB.

The `SmUUID` part gets copied to Generic -> SystemUUID.

We set Generic -> ROM to either an Apple ROM (dumped from a real Mac), your NIC MAC address, or any random MAC address (could be just 6 random bytes, for this guide we'll use `11223300 0000` . After install follow the Fixing iServices page on how to find your real MAC Address)

Reminder that you need an invalid serial! When inputting your serial number in Apple's Check Coverage Page , you should get a message such as "Unable to check coverage for this serial number."

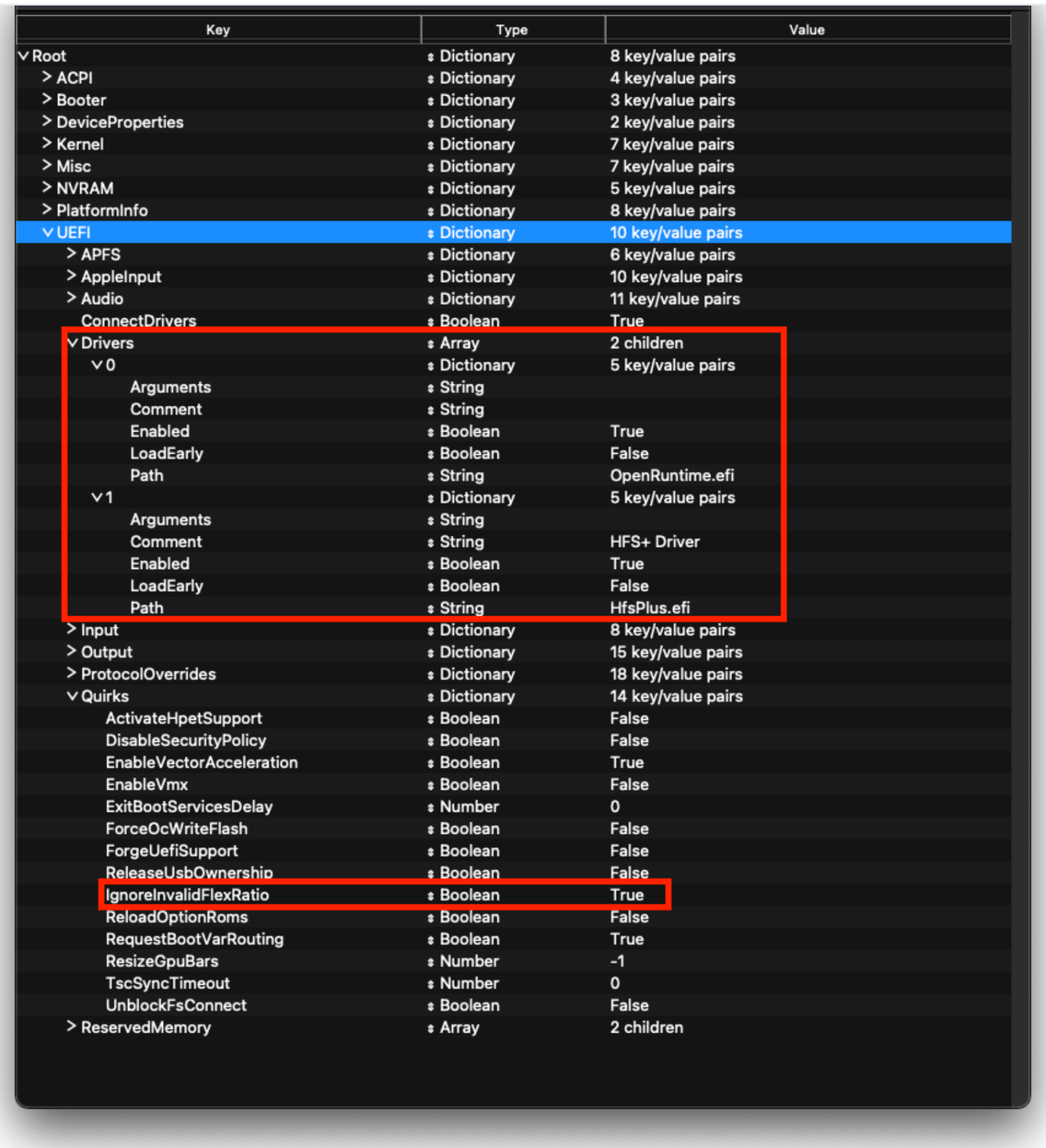
Automatic: YES

- Generates PlatformInfo based on Generic section instead of DataHub, NVRAM, and SMBIOS sections

Generic

▶ More in-depth Info

UEFI



ConnectDrivers: YES

- Forces .efi drivers, change to NO will automatically connect added UEFI drivers. This can make booting slightly faster, but not all drivers connect themselves. E.g. certain file system drivers may not load.

Drivers

Add your .efi drivers here.

Only drivers present here should be:

- HfsPlus.efi
- OpenRuntime.efi

▶ More in-depth Info

APFS

By default, OpenCore only loads APFS drivers from macOS Big Sur and newer. If you are booting macOS Catalina or earlier, you may need to set a new minimum version/date. Not setting this can result in OpenCore not finding your macOS partition!

macOS Sierra and earlier use HFS instead of APFS. You can skip this section if booting older versions of macOS.

APFS Versions

Both MinVersion and MinDate need to be set if changing the minimum version.

macOS Version	Min Version	Min Date
High Sierra (`10.13.6`)	`748077008000000`	`20180621`
Mojave (`10.14.6`)	`945275007000000`	`20190820`
Catalina (`10.15.4`)	`1412101001000000`	`20200306`
No restriction	`-1`	`-1`

Audio

Related to AudioDxe settings, for us we'll be ignoring(leave as default). This is unrelated to audio support in macOS.

- For further use of AudioDxe and the Audio section, please see the Post Install page: Add GUI and Boot-chime

Input

Output

Relating to OpenCore's visual output, leave everything here as default as we have no use for these quirks.

▶ More in-depth Info

ProtocolOverrides

Mainly relevant for Virtual machines, legacy macs and FileVault users. See here for more details: Security and FileVault

Quirks

Info

Relating to quirks with the UEFI environment, for us we'll be changing the following:

Quirk	Enabled	Comment
IgnoreInvalidFlexRatio	YES	
UnblockFsConnect	NO	Needed mainly by HP motherboards

▶ More in-depth Info

ReservedMemory

Used for exempting certain memory regions from OSes to use, mainly relevant for Sandy Bridge iGPUs or systems with faulty memory. Use of this quirk is not covered in this guide

Cleaning up

And now you're ready to save and place it into your EFI under EFI/OC.

For those having booting issues, please make sure to read the Troubleshooting section first and if your questions are still unanswered we have plenty of resources at your disposal:

- r/Hackintosh Subreddit
- r/Hackintosh Discord

Intel BIOS settings

- Note: Most of these options may not be present in your firmware, we recommend matching up as closely as possible but don't be too concerned if many of these options are not available in your BIOS

Disable

- Fast Boot
- Secure Boot
- Serial/COM Port
- Parallel Port
- VT-d (can be enabled if you set `DisableIoMapper` to YES)
- Compatibility Support Module (CSM) (**Must be off in most cases, GPU errors/stalls like `gIO` are common when this option is enabled**)
- Thunderbolt(For initial install, as Thunderbolt can cause issues if not setup correctly)
- Intel SGX
- Intel Platform Trust
- CFG Lock (MSR 0xE2 write protection)(**This must be off, if you can't find the option then enable `AppleXcpmCfgLock` under Kernel -> Quirks. Your hack will not boot with CFG-Lock enabled**)
  - For 10.10 and older, you'll need to enable AppleCpuPmCfgLock as well

Enable

- VT-x
- Above 4G Decoding
  - If experiencing issues, ensure "MMIOH Base" is set to 12 TB or lower
- Hyper-Threading
- Execute Disable Bit
- EHCI/XHCI Hand-off
- OS type: Windows 8.1/10 UEFI Mode (some motherboards may require "Other OS" instead)
- SATA Mode: AHCI

Once done here, we need to edit a couple extra values. Head to the Apple Secure Boot Page

← Haswell-E
Skylake-X/W and Cascade Lake-X/W →