Haswell

We'll go through the config.plist sections, one at a time for a Haswell desktop setup.

Starting Points

I like to start with either the stock *config.plist* that Clover gives you, or with just a blank canvas. In the next examples, I'll show you how I set things up from scratch; if you start from somewhere else, you may have more things checked/set than I do - but you'll want to follow along with what I do.

I'll also include the raw xml examples too in order to show those that work with a text editor (as I prefer to).

ACPI

The default Clover settings are pretty overdone and can cause some issues. We'll keep this section fairly minimal, and I'll go through a bit of *why we do that* for each part as well.

Raw XML

```
1       <key>ACPI</key>
2       <dict>
3           <key>DSDT</key>
4           <dict>
5               <key>Fixes</key>
6               <dict>
7                   <key>AddMCHC</key>
8                   <true/>
9                   <key>FixHPET</key>
10                  <true/>
11                  <key>FixIPIC</key>
```

```xml
                    <true/>
                <key>FixRTC</key>
                <true/>
                <key>FixShutdown</key>
                <true/>
                <key>FixTMR</key>
                <true/>
            </dict>
            <key>Patches</key>
            <array>
                <dict>
                    <key>Comment</key>
                    <string>change EHC1 to EH01</string>
                    <key>Disabled</key>
                    <false/>
                    <key>Find</key>
                    <data>
                    RUhDMQ==
                    </data>
                    <key>Replace</key>
                    <data>
                    RUgwMQ==
                    </data>
                </dict>
                <dict>
                    <key>Comment</key>
                    <string>change EHC2 to EH02</string>
                    <key>Disabled</key>
                    <false/>
                    <key>Find</key>
                    <data>
                    RUhDMg==
                    </data>
                    <key>Replace</key>
                    <data>
                    RUgwMg==
                    </data>
                </dict>
                <dict>
                    <key>Comment</key>
                    <string>change XHCI to XHC</string>
                    <key>Disabled</key>
```

```
                                    <false/>
                                    <key>Find</key>
                                    <data>
                                    WEhDSQ==
                                    </data>
                                    <key>Replace</key>
                                    <data>
                                    WEhDXw==
                                    </data>
                            </dict>
                            <dict>
                                    <key>Comment</key>
                                    <string>change XHC1 to XHC</string>
                                    <key>Disabled</key>
                                    <false/>
                                    <key>Find</key>
                                    <data>
                                    WEhDMQ==
                                    </data>
                                    <key>Replace</key>
                                    <data>
                                    WEhDXw==
                                    </data>
                            </dict>
                            <dict>
                                    <key>Comment</key>
                                    <string>change SAT0 to SATA</string>
                                    <key>Disabled</key>
                                    <false/>
                                    <key>Find</key>
                                    <data>
                                    U0FUMA==
                                    </data>
                                    <key>Replace</key>
                                    <data>
                                    U0FUQQ==
                                    </data>
                            </dict>
                    </array>
            </dict>
            <key>DropTables</key>
            <array>
```

```
 96                <dict>
 97                    <key>Signature</key>
 98                    <string>DMAR</string>
 99                </dict>
100                <dict>
101                    <key>Signature</key>
102                    <string>MATS</string>
103                </dict>
104            </array>
105            <key>FixHeaders</key>
106            <true/>
107            <key>SSDT</key>
108            <dict>
109                <key>Generate</key>
110                <dict>
111                    <key>PluginType</key>
112                    <true/>
113                </dict>
114            </dict>
115        </dict>
```

Clover Configurator Screenshots

Haswell Acpi CC Section 1

Haswell Acpi CC Section 2

Explanation

Patches:

The first thing we'll go over is the *Patches* section. This section allows us to dynamically rename parts of the DSDT via Clover. Since we're not running a real mac, and macOS is pretty particular with how things are named, we can make non-destructive changes to keep things mac-friendly. We have three entries here:

- *change EHC1 to EH01* - helps avoid a conflict with built-in USB injectors

- *change EHC2 to EH02* - helps avoid a conflict with built-in USB injectors
- *change XHC1 to XHC* - helps avoid a conflict with built-in USB injectors
- *change XHCI to XHC* - helps avoid a conflict with built-in USB injectors
- *change SAT0 to SATA* - for potential SATA compatibility

Fixes:

If we look then at the *Fixes* section, we'll see that we have a few things checked (there are 2 pages, so I included 2 screenshots):

- *FixShutdown* - this can help with some boards that prefer to restart instead of shutdown. Sometimes it can cause shutdown issues on other boards (ironic, right?), so if you have issues shutting down with this enabled, look at disabling it.
- The remaining fixes help avoid IRQ conflicts and etc, and are not known to cause issues. They may not be necessary for all hardware, but do not negatively impact anything if applied.

Drop Tables:

We touched in gently on DSDT with our *Patches* section - and this is a a bit of an extension of that. SSDT is like a sub-section of DSDT. The *Drop Tables* section allows us to omit certain SSDT tables from loading (as I mentioned before, mac and PC DSDT is different, and macOS can be rather picky). The two that I've added are as follows:

- *DMAR* - this prevents some issues with Vt-d; which is PCI passthrough for VMs, and not very functional (if at all?) on Hackintoshes.
- *MATS* - with High Sierra on up this table is parsed, and can sometimes contain unprintable characters that can lead to a kernel panic.

FixHeaders and PluginType:

The only other things we've done on this page are enable these two checkboxes.

- *FixHeaders* - this is just a double-up of our *MATS* table dropping. This checkbox tells Clover to sanitize headers to avoid kernel panics related to unprintable characters.
- *PluginType* - this injects some DSDT data to get *X86PlatformPlugin* to load - giving us a leg-up on native CPU power management. This setting only works on Haswell and newer CPUs though.

Boot

We don't need to do *too much* here, but we'll tweak a few things.

Raw XML

```
1        <key>Boot</key>
2        <dict>
3            <key>Arguments</key>
4            <string>keepsyms=1 dart=0 debug=0x100 shikigva=40 -v</string>
5            <key>DefaultVolume</key>
6            <string>LastBootedVolume</string>
7            <key>Timeout</key>
8            <integer>5</integer>
9        </dict>
```

Clover Configurator Screenshots

Haswell Boot CC Section

Explanation

Arguments:

We have a few boot args set here:

- `-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.
- `dart=0` - this is just an extra layer of protection against Vt-d issues.
- `debug=0x100` - this 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.

- `shikigva=40` - this flag is specific to the iGPU. It enables a few *Shiki* settings that do the following (found *here*):
  - `8 – AddExecutableWhitelist` - ensures that processes in the whitelist are patched.
  - `32 – ReplaceBoardID` - replaces board-id used by AppleGVA by a different board-id.

DefaultBootVolume and Timeout:

These are the only other settings I've updated in this section.

- *DefaultBootVolume* - this uses NVRAM to remember which volume was last booted by Clover, and auto-select that at the next boot.
- *Timeout* - this is the number of seconds before the *DefaultBootVolume* auto-boots. You can set this to `-1` to avoid all timeout, or to `0` to skip the GUI entirely. If set to `0`, you can press any keys at boot to get the GUI to show back up in case of issues.

Boot Graphics

Nothing here - just the stock settings. You could adjust this if Clover's scaling needs changes, but I don't mess with it.

Cpu

Again, nothing here gets changed in most setups I've worked with.

Devices

We'll handle some slick property injection for *WhateverGreen* here, and do some basic audio setup.

Raw XML

```xml
<key>Devices</key>
<dict>
    <key>Audio</key>
    <dict>
        <key>Inject</key>
        <integer>1</integer>
        <key>ResetHDA</key>
        <true/>
    </dict>
    <key>Properties</key>
    <dict>
        <key>PciRoot(0x0)/Pci(0x2,0x0)</key>
        <dict>
            <key>AAPL,ig-platform-id</key>
            <data>
            AwAiDQ==
            </data>
        </dict>
    </dict>
    <key>USB</key>
    <dict>
        <key>FixOwnership</key>
        <true/>
    </dict>
</dict>
```

Clover Configurator Screenshots

Haswell Devices CC Section - iGPU

Haswell Devices CC Section - iGPU (Connectorless) + dGPU

Device-Id fake for HD 4400 --> HD 4600

Explanation

Fake ID:

This section remains empty for our example setup. In the past, almost-supported iGPUs (like the HD 4400) would get faked to a supported iGPU here, but we'll be using the cleaner Properties section for this.

USB:

Under this section, we ensure that *Inject* and *FixOwnership* are selected to avoid issues with hanging at a half-printed line somewhere around the `Enabling Legacy Matching` verbose line. You can also get past that by enabling *XHCI Hand Off* in BIOS.

Audio:

Here we set our audio to inject *Layout 1* - this may or may not be compatible with your codec, but you can check on *AppleALC's Supported Codec Page*.

We also enabled *ResetHDA* which puts the codec back in a neutral state between OS reboots. This prevents some issues with no audio after booting to another OS and then back.

Properties:

This section is setup via Headkaze's *Intel Framebuffer Patching Guide* and applies only one actual property to begin, which is the *ig-platform-id*. The way we get the proper value for this is to look at the ig-platform-id we intend to use, then swap the pairs of hex bytes.

If we think of our ig-plat as `0xAABBCCDD`, our swapped version would look like `0xDDCCBBAA`.

The two ig-platform-id's we use are as follows:

- `0x0D220003` - this is used when the iGPU is used to drive a display
  - `0300220D` when hex-swapped
  - `AwAiDQ==` when the hex-swapped version is converted to base64
- `0x04120004` - this is used when the iGPU is only used for compute tasks, and doesn't drive a display
  - `04001204` when hex-swapped

- `BAASBA==` when the hex-swapped version is converted to base64

I added another screenshot as well that shows a `device-id` fake in case you have an HD 4400 which is unsupported in macOS.

For this - we follow a similar procedure as our above ig-platform-id hex swapping - but this time, we only work with the first two pairs of hex bytes. If we think of our device id as `0xAABB0000`, our swapped version would look like `0xBBAA0000`. We don't do anything with the last 2 pairs of hex bytes.

The device-id fake is setup like so:

- `0x04120000` - this is the device id for HD 4600 which *does* have support in macOS
  - `12040000` when hex swapped
  - `EgQAAA==` when the hex-swapped version is converted to base64

If using the raw xml, your Properties would look like this (make sure to still use the appropriate ig-platform-id for your setup):

```xml
<key>Properties</key>
<dict>
    <key>PciRoot(0x0)/Pci(0x2,0x0)</key>
    <dict>
        <key>device-id</key>
        <data>
        EgQAAA==
        </data>
        <key>AAPL,ig-platform-id</key>
        <data>
        AwAiDQ==
        </data>
    </dict>
</dict>
```

Disable Drivers

We have nothing to do here.

Gui

Raw XML

```
1      <key>GUI</key>
2      <dict>
3          <key>Scan</key>
4          <dict>
5              <key>Entries</key>
6              <true/>
7              <key>Tool</key>
8              <true/>
9          </dict>
10     </dict>
```

Clover Configurator Screenshots

Haswell Gui CC Section

Explanation

Scan:

The only settings I've tweaked on this page are the *Scan* settings. I've selected *Custom*, then checked everything except *Legacy* and *Kernel*. This just omits some of the unbootable entries in Clover to clean up the menu.

Hide Volumes:

I haven't added anything here, but you *can* hide unwanted volumes here. You can do so by either adding the volume's name, or UUID.

To hide extra APFS entries, add the following to this list:

- `Preboot`
- `VM`

To hide all Recovery partitions, add `Recovery` to the list.

To get the UUID of a drive to hide, you can use the following terminal command:

```
diskutil info diskXsY | grep -i "Partition UUID" | rev | cut -d' ' -f 1 | re
```

Make sure to replace `diskXsY` with the actual disk number of the volume you'd like to hide.

Theme:

If you want to test out a new theme (and I suggest you look at *clover-next-black*), you can add the unzipped theme folder to the */Volumes/EFI/EFI/CLOVER/themes* directory, then type the name of the folder in the *Theme* text field to apply it.

Graphics

In the past, we'd setup the iGPU here, but since we already did that via Properties in the *Devices* section, we have nothing to really configure here. **NOTE**: When Clover detects an Intel iGPU, it *automatically* enables Intel Injection if the Graphics section doesn't exist in the config.plist. To bypass this, you can explicitly disable injection using the raw XML below, or by clicking the "Inject Intel" button once to check it, and once to uncheck it in CC.

Raw XML

```
1    <key>Graphics</key>
2    <dict>
3        <key>Inject</key>
4        <false/>
5    </dict>
```

Kernel And Kext Patches

Raw XML

```
1       <key>KernelAndKextPatches</key>
2       <dict>
3           <key>KernelPm</key>
4           <true/>
5           <key>KextsToPatch</key>
6           <array>
7               <dict>
8                   <key>Comment</key>
9                   <string>Port limit increase</string>
10                  <key>Disabled</key>
11                  <false/>
12                  <key>Find</key>
13                  <data>
14                  g710////EA==
15                  </data>
16                  <key>InfoPlistPatch</key>
17                  <false/>
18                  <key>MatchOS</key>
19                  <string>10.12.x</string>
20                  <key>Name</key>
21                  <string>com.apple.driver.usb.AppleUSBXHCI</string>
22                  <key>Replace</key>
23                  <data>
24                  g710////Gw==
25                  </data>
26              </dict>
27              <dict>
28                  <key>Comment</key>
29                  <string>Port limit increase (RehabMan)</string>
30                  <key>Disabled</key>
31                  <false/>
32                  <key>Find</key>
33                  <data>
34                  g32IDw+DpwQAAA==
35                  </data>
36                  <key>InfoPlistPatch</key>
```

```xml
            <false/>
            <key>MatchOS</key>
            <string>10.13.x</string>
            <key>Name</key>
            <string>com.apple.driver.usb.AppleUSBXHCI</string>
            <key>Replace</key>
            <data>
            g32ID5CQkJCQkA==
            </data>
        </dict>
        <dict>
            <key>Comment</key>
            <string>Port limit increase (PMHeart)</string>
            <key>Disabled</key>
            <true/>
            <key>Find</key>
            <data>
            g/sPD4MDBQAA
            </data>
            <key>InfoPlistPatch</key>
            <false/>
            <key>MatchOS</key>
            <string>10.14.0</string>
            <key>Name</key>
            <string>com.apple.driver.usb.AppleUSBXHCI</string>
            <key>Replace</key>
            <data>
            g/sPkJCQkJCQ
            </data>
        </dict>
        <dict>
            <key>Comment</key>
            <string>Port limit increase (Ricky)</string>
            <key>Disabled</key>
            <false/>
            <key>Find</key>
            <data>
            g/sPD4OPBAAA
            </data>
            <key>InfoPlistPatch</key>
            <false/>
            <key>MatchOS</key>
```

```
 79                      <string>10.14.x</string>
 80                      <key>Name</key>
 81                      <string>com.apple.driver.usb.AppleUSBXHCI</string>
 82                      <key>Replace</key>
 83                      <data>
 84                      g/sPkJCQkJCQ
 85                      </data>
 86                  </dict>
 87                  <dict>
 88                      <key>Comment</key>
 89                      <string>External Icons Patch</string>
 90                      <key>Disabled</key>
 91                      <false/>
 92                      <key>Find</key>
 93                      <data>
 94                      RXh0ZXJuYWw=
 95                      </data>
 96                      <key>InfoPlistPatch</key>
 97                      <false/>
 98                      <key>Name</key>
 99                      <string>AppleAHCIPort</string>
100                      <key>Replace</key>
101                      <data>
102                      SW50ZXJuYWw=
103                      </data>
104                  </dict>
105              </array>
106          </dict>
```

Clover Configurator Screenshots

Haswell KernelAndKextPatches CC Section

Explanation

In this section, we've enabled a few settings and added some kext patches.

Checkboxes:

We have a couple checkboxes selected here:

- *Apple RTC* - this ensures that we don't have a BIOS reset on reboot.
- *KernelPM* - this setting prevents writing to MSR 0xe2 which can prevent a kernel panic at boot.

KextsToPatch:

We added 4 different kexts to patch here. Three of them are for USB port limit increases, and the last acts as an *orange icons fix* - when internal drives are hotpluggable, and treated as external drives.

You'll notice that there are MatchOS values set for each of the USB port limit patches. You can remove any of the entries for OS versions you don't intend to run. They won't do any harm being there, but if you want a clean, minimal plist, there's no sense in having them.

RtVariables And SMBIOS

Raw XML

```
1    <key>RtVariables</key>
2    <dict>
3        <key>BooterConfig</key>
4        <string>0x28</string>
5        <key>CsrActiveConfig</key>
6        <string>0x3E7</string>
7        <key>MLB</key>
8        <string>C02532300QXG2Y7AD</string>
9        <key>ROM</key>
10       <string>UseMacAddr0</string>
11   </dict>
12   <key>SMBIOS</key>
13   <dict>
14       <key>BoardSerialNumber</key>
15       <string>C02532300QXG2Y7AD</string>
16       <key>ProductName</key>
17       <string>iMac15,1</string>
```

```
18          <key>SerialNumber</key>
19          <string>C02Q6FYUFY10</string>
20          <key>SmUUID</key>
21          <string>C495EE18-C8EA-4100-8CAD-3099AC27772F</string>
22      </dict>
```

Clover Configurator Screenshots

Haswell Rt Variables CC Section

Haswell SMBIOS CC Section

Explanation

For setting up the SMBIOS info, I use acidanthera's *macserial* application. I wrote a *python script* that can leverage it as well (and auto-saves to the config.plist when selected). There's plenty of info that's left blank to allow Clover to fill in the blanks; this means that updating Clover will update the info passed, and not require you to also update your config.plist.

For this Haswell example, I chose the *iMac15,1* SMBIOS. The typical breakdown is as follows:

- Haswell with only iGPU - *iMac14,1*
- Haswell with dGPU - *iMac14,2*
- Haswell Refresh - *iMac15,1*

To get the SMBIOS info generated with *macserial*, you can run it with the `-a` argument (which generates serials and board serials for all supported platforms). You can also parse it with `grep` to limit your search to one SMBIOS type.

With our *iMac15,1* example, we would run *macserial* like so via the terminal:

```
macserial -a | grep -i iMac15,1
```

Which would give us output similar to the following:

```
1          iMac15,1 | C02NFZZYFY10 | C02438207QXG2Y7FB
2          iMac15,1 | C02P32YJFY10 | C02502303GUG2Y78C
3          iMac15,1 | C02P2VZ7FY10 | C02501306QXG2Y7AD
4          iMac15,1 | C02NM0EDFY10 | C02444701CDG2Y71H
5          iMac15,1 | C02NVHZCFY10 | C02451303CDG2Y7JA
6          iMac15,1 | C02QLRZ4FY10 | C02543300GUG2Y7JC
7          iMac15,1 | C02QJ0UPFY10 | C02541902GUG2Y7JA
8          iMac15,1 | C02QG0NGFY10 | C02539700J9G2Y71M
9          iMac15,1 | C02N3XYEFY10 | C02429104J9G2Y7UE
10         iMac15,1 | C02QW0M3FY10 | C02552700GUG2Y7JA
```

The order is `Product | Serial | Board Serial (MLB)`

The `iMac15,1` part gets copied to *SMBIOS -> Product Name*.

The `Serial` part gets copied to *SMBIOS -> Serial Number.*

The `Board Serial` part gets copied to *SMBIOS -> Board Serial Number* as well as *Rt Variables -> MLB.*

We can create an SmUUID by running `uuidgen` in the terminal (or it's auto-generated via my *GenSMBIOS* script) - and that gets copied to *SMBIOS -> SmUUID.*

We set *Rt Variables -> ROM* to `UseMacAddr0` which just utilizes our onboard Mac address - this should be unique enough to not conflict with any others.

BooterConfig gets set to `0x28`, and *CsrActiveConfig* is set to `0x3e7` which effectively disables SIP. You can choose a number of other options to enable/disable sections of SIP. Some common ones are as follows:

- `0x0` - SIP completely enabled
- `0x3` - Allow unsigned kexts and writing to protected fs locations
- `0x3e7` - SIP completely disabled

System Parameters

Raw XML

```
1        <key>SystemParameters</key>
2        <dict>
3            <key>InjectKexts</key>
4            <string>Yes</string>
5            <key>InjectSystemID</key>
6            <true/>
7        </dict>
```

Clover Configurator Screenshots

System Parameters CC Section

Explanation

Inject Kexts:

This setting has 3 modes:

- `Yes` - this tells Clover to inject kexts from the EFI regardless.
- `No` - this tells Clover not to inject kexts from the EFI.
- `Detect` - this has Clover inject kexts only if *FakeSMC.kext* is not in the kext cache.

We set it to `Yes` to make sure that all the kexts we added before get injected properly.

InjectSystemID

This setting tells clover to set the SmUUID as the `system-id` at boot - which is important for iMessage and such.

Saving

At this point, you can do *File -> Save* to save the config.plist. If you have issues saving directly to the EFI, you can save it on the Desktop, then just copy it over. I'll leave the sample config.plist here too.