Framework 13 (Intel 13th gen) - Hardware notes

Notes about the Framework laptop I'm currently waiting on

Embedded Controller - MEC1521H

The EC is a Microchip MEC1521H in a WFBGA-144 package.

It has the following features:

- Vendor ID 0023h, Product ID 34##h, JTAG ID 02232445h
- 256KB SRAM
- 224KB code storage, 32kb data storage
- 4K one-time programmable bits
- 64B battery-backed storage
- A multitude of interfaces, controllers, ports and etc.
- ARM M4 core

Interesting features to investigate

The datasheet for the EC notes that it has:

- 1x dual-port PS/2 and 1x single-port PS/2 controller
- 2x “Port 80” BIOS Debug ports
- 3x LED controllers
- 9x PWM channels, 8x ADC channels
- 5x SMBus controllers, 3x I2C controllers, 16x SMBus/I2C ports
- 3x UARTs, all of which can operate in 2, 4 or 8 pin mode, one of which can also operate in 1-pin mode (?)
- 128x GPIOs with configurable drive strength of 2, 4, 8 and 12mA

Other interesting things in the datasheet

- Memory location 400f2000h (logical device 8h) is “Port 92 - Legacy”, which some searching suggests is related to keyboards and the ISA bus, but there are also mentions of it being involved in the ICH9, PIIX and so on..

Reference links for potential future futzing

- https://unix.stackexchange.com/questions/453486/writing-cpu-temperature-to-port-0x80-bios-debug-card-with-bash-script - Writing to Port 80h (from linux)
- https://ww1.microchip.com/downloads/aemDocuments/documents/CPG/ProductDocuments/DataSheets/MEC152x-Data-Sheet-DS00003427E.pdf - MEC152x datasheet

- https://github.com/FrameworkComputer/EmbeddedController - Source code for the EC firmware (Intel 11th gen is identified as board hx20, 12th gen is hx30, unknown what 13th gen will be but presumed hx40, unless the 13th gen uses a new EC)
- https://github.com/FrameworkComputer/Framework-Laptop-13/tree/main/Mainboard - Schematics for the mainboard, which will indicate what pins on the EC are actually routed on the mainboard

Driver packaging

The Framework 13 (Intel 13th Gen) driver bundle is an approximately 1GB executable containing all current drivers (as of 28th March, which is the newest version of the driver bundle). It is listed as being for Windows 11, but I'm intending to run Windows 10, so I will be fucking around and finding out.

The installer runs a batch script which does the following:

- Retrieves the machine's serial number and stores it in TEMP\frameworkinstall.txt
- Retrieves the machine's baseboard product ID, and fails out if it does not contain “FRANMCCP”
- Installs the Intel Wireless Adapter drivers version 22.190.0.4G
- Sets WmiWiFiModeNotify → NotifyWiFiModeStatus to 0,0 and then 1,1
- Installs the Intel Serial IO driver version 30.100.2237.26 v2 for “touchpad and hotkey support”
- Installs the Goodix fingerprint reader drivers version 3.12804.0.180 (20221201)
- Installs the Intel Dynamic Tuning Technology drivers, versions 2.0.10301.5 (Innovation Platform Framework) and 9.0.11202.31222 (IPF DTT)
- Installs the Intel “Gaussian and Neural Accelerator” drivers version 03.00.00.1457
- Installs the Intel Chipset 600 and 700 series drivers version 10.1.19376.8374
- Installs the Intel Management Engine drivers version 2304.4.5.0, which contains a bunch of driver packages inside it
- Installs the Intel Bluetooth Adapter drivers version 22.190.0.2G
- Installs the Realtek USB Ethernet Adapter drivers version 11.9.0823.2022_20_10262022 for Windows 11
- Installs the Intel Graphics driver version 101.4146 (16416368)
- Installs the Intel Trusted Execution drivers, versions 1.18.13 (Authenticated Code Module), 1.18.11 v2 (SINIT ACM) and 1.18.11 (ADL PW)
- Installs the Intel Graphics Control Centre version 1.100.4478.0 in AppX format
- Sets a Registry key HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\AppKey\16 to open Framework.url, which in turn opens https://frame.work?src=startmenu, whenever the Framework hotkey is pressed
- Uninstalls any Intel Smart Sound Technology drivers that are present on the system

Other than the Realtek USB Ethernet drivers, all of this appears to be Windows 10 compatible, and not all of them appear to be necessary. I think once I receive my laptop, I'll be installing these drivers manually and skipping the management engine and trusted execution drivers. I sort of wish I'd ordered the AMD version, but I'm too impatient to wait for Q3, and the AMD version doesn't have the improved sound (afaik). I assume that I can switch out the Intel motherboard for the AMD one at a later date should I feel the need to.

Remaining questions

- Why does the AMD version of the Framework not use the Intel AX210?
- Why does the AMD version of the Framework not have the same audio controller?
- Can the Intel motherboard be replaced with an AMD one?

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