



Arm Solutions at Lightspeed

ARM Linux Laptops - Status Report

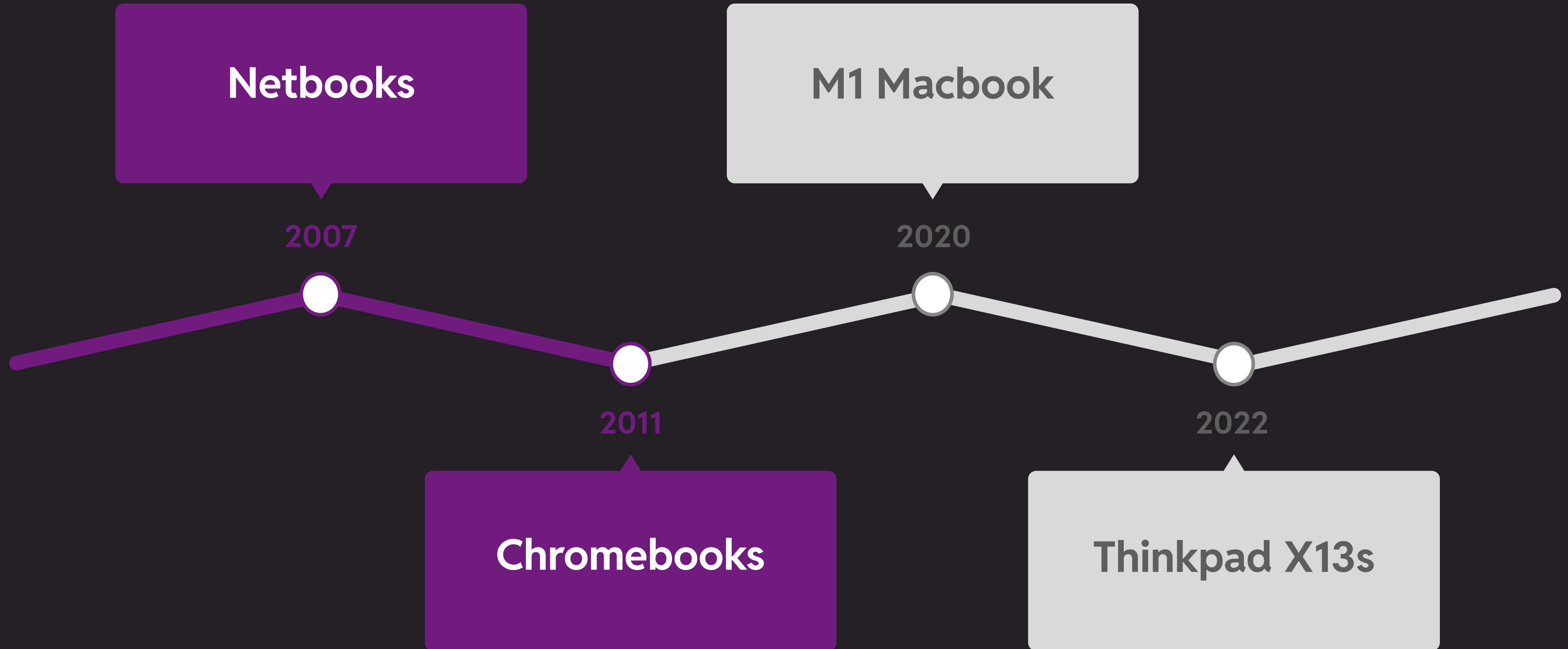
SFSCON 2024, Bolzano

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Agenda

- History
- 2024 New Kids on the Block
- Nine Circles of Installation Hell
- Linux Support Overview
- Daily Usage

History

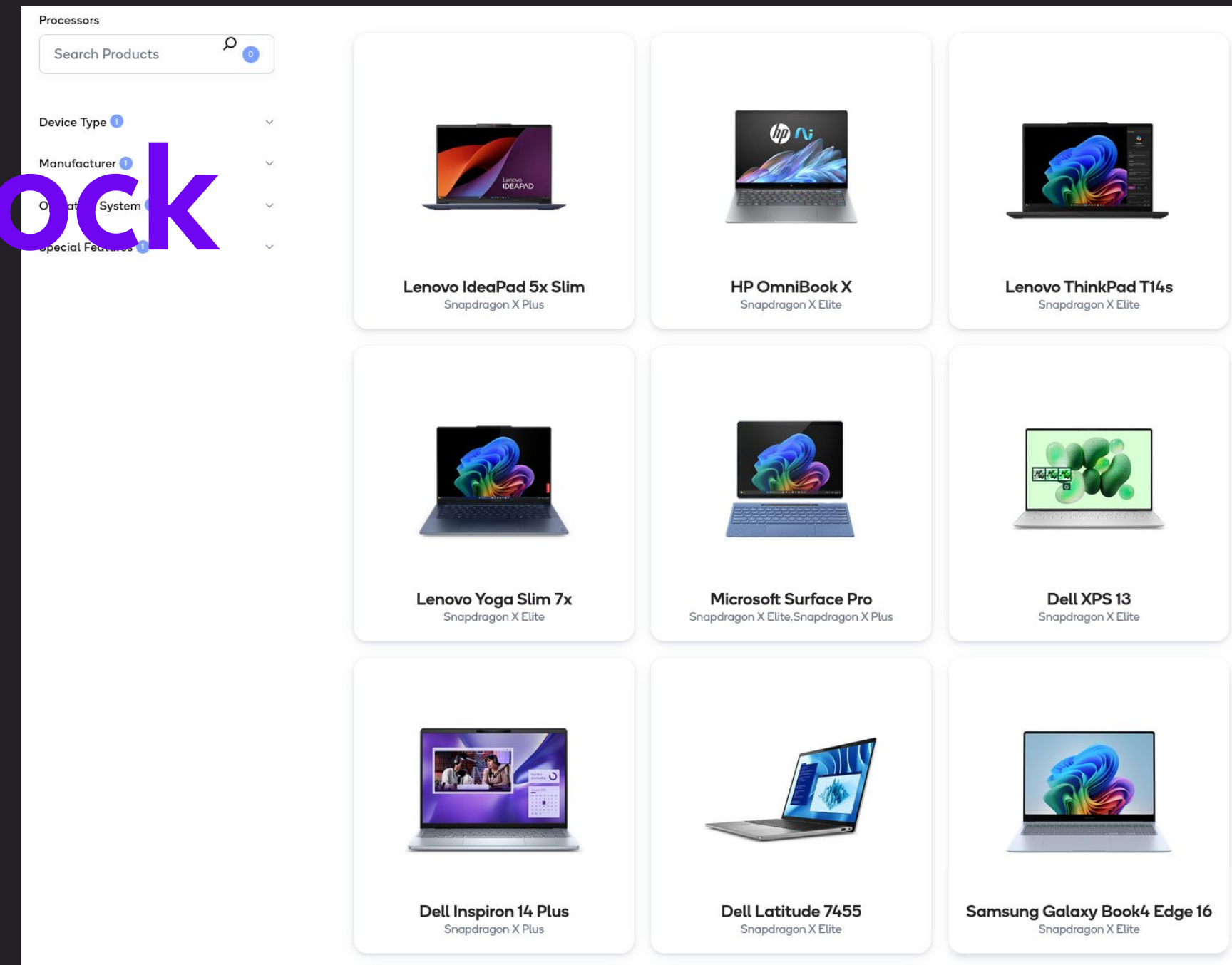


2024 New Kids on the Block

- Snapdragon X Elite launched in June 2024
- Devices from Lenovo, Dell, Asus, Acer, HP, Microsoft, Samsung, Medion, Honor, etc.
- Currently 118 devices listed by 8 manufacturers (heise.de/preisvergleich)
- Snapdragon X Plus rolled out for mid price range
- Overall a good price, aesthetics and manufacturer range, freedom of choice

<https://www.qualcomm.com/products/mobile/snapdragon/laptops-and-tablets/snapdragon-x-elite>

<https://www.qualcomm.com/products/mobile/snapdragon/laptops-and-tablets/laptop-device-finder>



Processor	Qualcomm Oryon CPU				Qualcomm Adreno GPU TFLOPS	Qualcomm Hexagon NPU NPU TOPS	Memory	
	Cores	Total cache	Max Multi-Core Frequency	Boost Frequency			Memory Type	Transfer Rate
Snapdragon X Elite								
X1E-00-1DE	12	42 MB	3.8 GHz	4.3 GHz (Dual-Core)	4.6	45	LPDDR5x	8448 MT/s
X1E-84-100	12	42 MB	3.8 GHz	4.2 GHz (Dual-Core)	4.6	45	LPDDR5x	8448 MT/s
X1E-80-100	12	42 MB	3.4 GHz	4.0 GHz (Dual-Core)	3.8	45	LPDDR5x	8448 MT/s
X1E-78-100	12	42 MB	3.4 GHz	None	3.8	45	LPDDR5x	8448 MT/s
Snapdragon X Plus								
X1P-66-100	10	42 MB	3.4 GHz	4.0 GHz (Single-core)	3.8	45	LPDDR5x	8448 MT/s
X1P-64-100	10	42 MB	3.4 GHz	None	3.8	45	LPDDR5x	8448 MT/s
X1P-46-100	8	30 MB	3.4 GHz	4.0 GHz (Single-core)	2.1	45	LPDDR5x	8448 MT/s
X1P-42-100	8	30 MB	3.2 GHz	3.4 GHz (Single-core)	1.7	45	LPDDR5x	8448 MT/s

Nine Circles of Installation Hell

1. Windows-on-ARM
2. UEFI booting + ACPI device description and discovery
3. ACPI implementation not compatible with Linux
4. No device-tree in UEFI firmware, but Linux needs one
5. Grub running out of stamina for 64GB of memory
6. Bring Your Own Installer artifacts (kernel, modules, firmware, initrd & DTB)
7. Distro needs to provide bleeding edge kernels
8. Keep non-bitlocker Windows partition
9. Linux installation pain like in the old days...

Thank you for the journey, Dante.



Linux Support Overview

Basics: clocks, pinctrl, interconnects	SPI, I2C, UART, SPMI, SMMU	PCIe
NVMe	Wi-Fi	Bluetooth
UEFI variables	Touchpad	Keyboard
Battery / charging	Audio: Analog Codec, DMIC, Soundwire, ADSP	Video Processing Unit
Display: DSI, HDMI, DisplayPort	GPU (mesa & freedreno)	USB-C
Camera	Suspend	Watchdog

More detailed version at: <https://linaro.github.io/msm/>, improvement patches are going in constantly

Latest linux-firmware is also expected for GPU, Wi-Fi, Bluetooth, ADSP and CDSP firmwares

pd-mapper userspace service or in kernel version

Regular Daily Usage

Pros

- After installation the pain mostly stops
- Comparable performance to current Intel
- Working GPU acceleration with mesa 24.2 and freedreno
- Most needed firmwares are available in linux-firmware
- Distro's have aarch64 package repositories
- FEX-EMU for x86_64 binaries and gaming
- Linaro eat-your-own-dogfood ARM64 usage

Cons

- Installation
- No distro kernel packages for now
- WIP power collapse and suspend savings
- WIP camera, video de/encoder
- Not tested x86_64 binary-only applications
- No use for the NPU so far :-)



Developer Daily Usage

- **Kernel build time: 2 min**
- **Chromium Debian package build time: 5h**
- **Full work day battery usage**
- **Full breadth of Debian Trixie packages available**
- **Continuing effort from Qualcomm, Linaro and the community on upstream support**

Tips, Tricks & Hopes

- Keep your Windows installation for firmware files and UEFI updates
- Disable bitlocker disk encryption on Windows
- Be comfortable to build your own kernel
- Be comfortable to create initrds, Grub configs, etc
- Try both orientations with USB-C connections
- Johan Hovold's git tree with patches tracking mainline:
<https://github.com/jhovold/linux-wip/x1e80100>* branches
- IRC OFTC #aarch64-laptops channel
- Choice of Linux as OS, as Dell and Lenovo do on x86 (Tuxedo?)

Summary

- Finally a good range of capable ARM64 laptops suitable for developers
- The initial installation is currently painful
- Distro kernels are not fully ready yet for daily use (getting there)
- Hardware support has some WIP, but solid state and ongoing work on the remaining
- Works for tech savvy early adaptors, not so much for normal users
- Hope: choice of Linux as OS by manufacturers

Thank You!

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