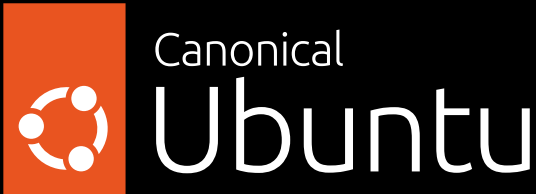# SteamOS™ on the Lenovo Legion™ Go S

Mario Limonciello

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My background

Alienware™ Steam Machine
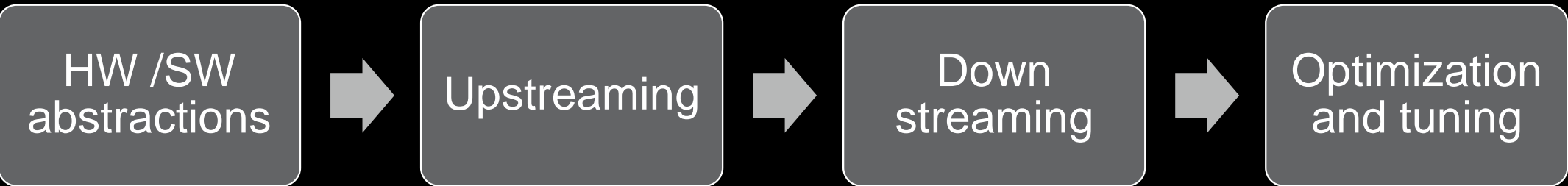
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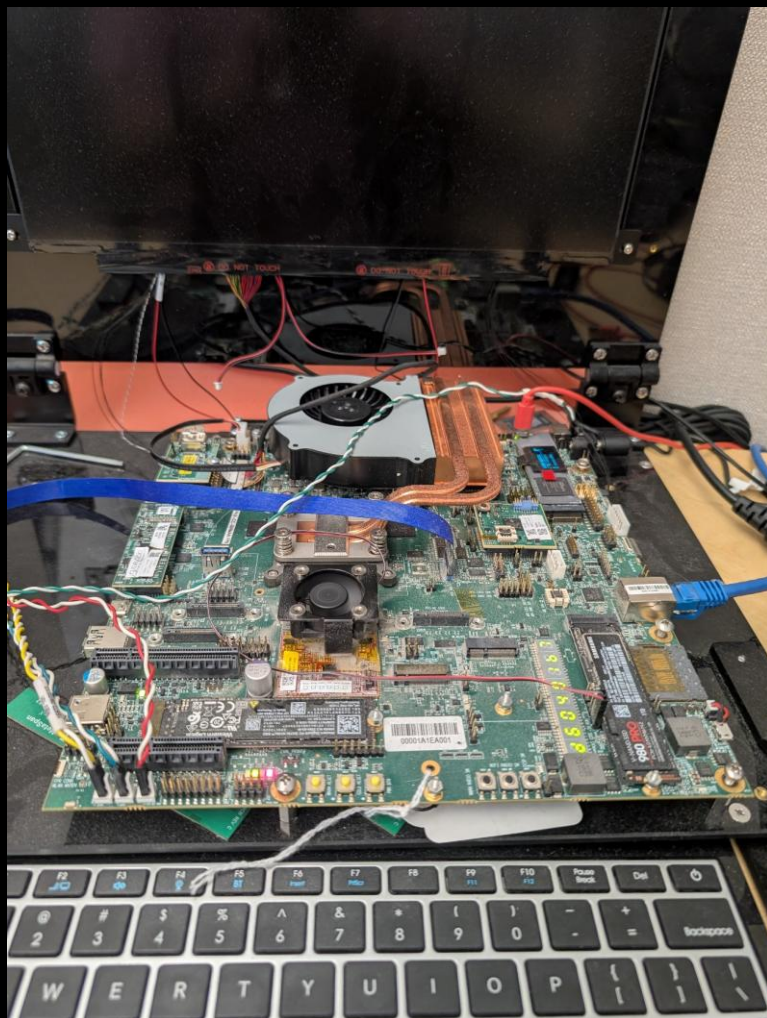
New hardware enablement

- Planning

| Component Selection | → | HW / SW Abstraction Identification | → | Bring Up Reference Hardware |

- Development

| HW /SW abstractions | → | Upstreaming | → | Down streaming | → | Optimization and tuning |

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AMD Reference hardware bring-up

- ☑ System Stability
- 🔋 Power management tuning
- ❗ Log message tuning
- 📶 WLAN enablement
- 🖥 Rotation detection

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Legion Go S Workstreams

- Basic SteamOS bring-up with AMD reference platform

- Firmware updating stack

- Hardware abstractions

- Steam client integrations

- Optimizations
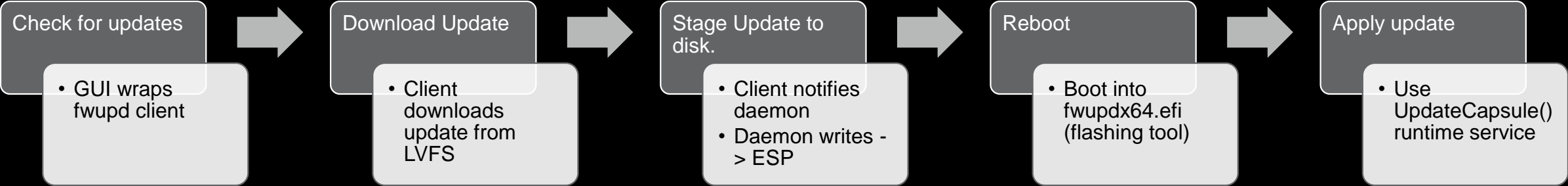
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Firmware updating stack

Steam Deck

- Hardcoded scripts and utilities for firmware update

Legion Go S

- BIOS update through UEFI ESRT
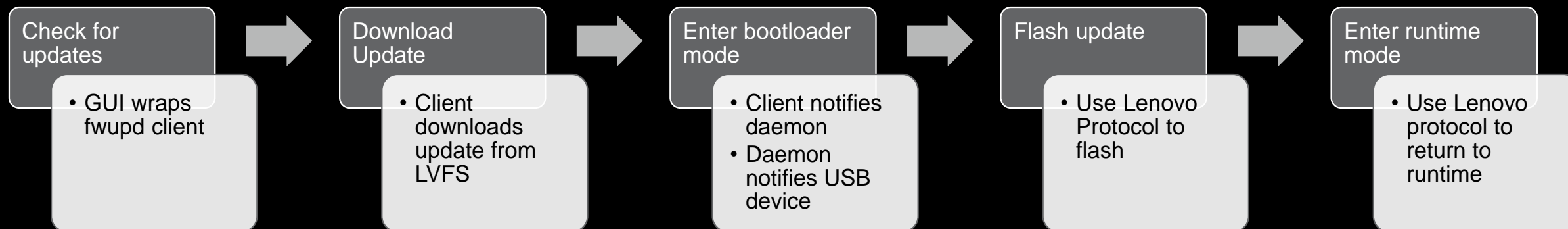- MCU update through USB

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BIOS Update for Legion Go S

Check for updates

- GUI wraps fwupd client

→

Download Update

- Client downloads update from LVFS

→

Stage Update to disk.

- Client notifies daemon
- Daemon writes -> ESP

→

Reboot

- Boot into fwupdx64.efi (flashing tool)

→

Apply update

- Use UpdateCapsule() runtime service

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Microcontroller update for Legion Go S

Check for updates		Download Update		Enter bootloader mode		Flash update		Enter runtime mode
• GUI wraps fwupd client	→	• Client downloads update from LVFS	→	• Client notifies daemon • Daemon notifies USB device	→	• Use Lenovo Protocol to flash	→	• Use Lenovo protocol to return to runtime

- Opening up the update protocol
- Developing / upstreaming fwupd plugin

```
Legion Go S:
    Device ID:         9e7ca05abdfaa9fcb3990af2603eb8194a66d9ed
    Current version:   0.0.3.8
    Vendor:            QinHeng Electronics (HIDRAW:0x1A86)
    Install Duration:  15 seconds
    GUIDs:             96af922c-a4aa-56e9-94cd-cb6797423e70 ← HIDRAW\VEN_1A86&DEV_E310
                       65619675-fec6-5035-801d-7f5e59fd9749 ← USB\VID_1A86&PID_E310
    Device Flags:      • Internal device
                       • Updatable
                       • Signed Payload
                       • Emulated
                       • Can tag for emulation

Touchpad:
    Device ID:         d2dc75dff28c498d71c424b891e01af804d7b2de
    Current version:   9
    Vendor:            SIPO (HIDRAW:0x1A86)
    GUID:              c73a9fb0-1791-5a55-bf51-d84feec977f3 ← USB\VID_1A86&PID_E310&TP_SIPO
    Device Flags:      • Internal device
                       • Unsigned Payload
                       • Emulated
```

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Hardware abstractions
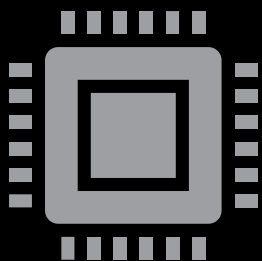
Hardcoded assumptions for how Steam client interacts with Steam Deck

TDP tuning

GPU clock management

Controller / button features / availability

Storage

Dock management

Battery charge level

SteamOS Manager

https://gitlab.steamos.cloud/holo/steamos-manager

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Input Plumber Background

Steam Deck is unusual: All input provided through a single interface

Most devices must aggregate input devices exposed by multiple subsystems (*HIDRAW*, *EVDEV*, *I2C*)

Categorizes and routes input to single virtual controller

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Input Plumber Challenges

Touchpad Firmware

Kernel Configuration

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Optimization

Collaborative Processor Performance Control
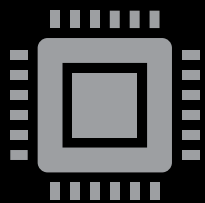
Based on ACPI standard

Processor Configuration and Control
(ACPI Specification 6.5 documentation)

AMD Implementation

amd-pstate CPU Performance Scaling
Driver (The Linux Kernel documentation)

**"Energy Performance
Preference"**

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Static TDP Tuning

ACPI Platform Profile

Platform Profile Selection
(The Linux Kernel documentation)

AMD Power Management Framework (amd_pmf)

1:1 driver to system (before kernel 6.14)

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Platform Experience

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STEAMOS™

Loading SteamOS on Windows hardware doesn't create a *SteamOS experience*.

Platform specific tuning needs to happen

- Correct Key bindings to access features
- Trackpad behavior
- Some platform issues are *only* exposed in Linux.
- Customized Glyphs in Steam Client

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