Emulating Amiibos in Software

tales from
reverse engineering
Nintendo’s controller protocol

Paul Weiß – 13.12.2023

What this talk is not

Amiibo = NTAG215 + data

9ct/pc

Way cheaper, easier and less interesting

Where I stole most of this

https://github.com/dekuNukem/Nintendo_Switch_Reverse_Engineering

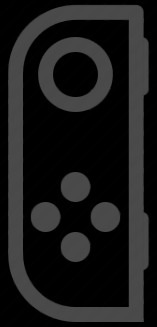
https://github.com/mart1nro/joycontrol

https://github.com/CTCaer/jc_toolkit

https://github.com/Brikwerk/nxbt

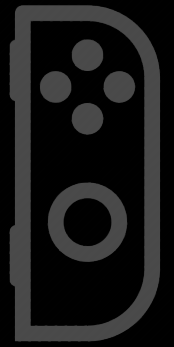
Kinds of Controllers

Joycon (L)



Procon

Joycon (R)



Protocol identical for all of them

No clue what happens when you request
IR or NFC from a left Joycon

Input “Modes”

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Human Interface Device

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MicroController[Unit]

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NFC + IR

Input “Modes”

0x2F
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Input “Modes”

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0x30
Nintendo HID

More buttons,
Gyro, fixed rate

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Human Interface
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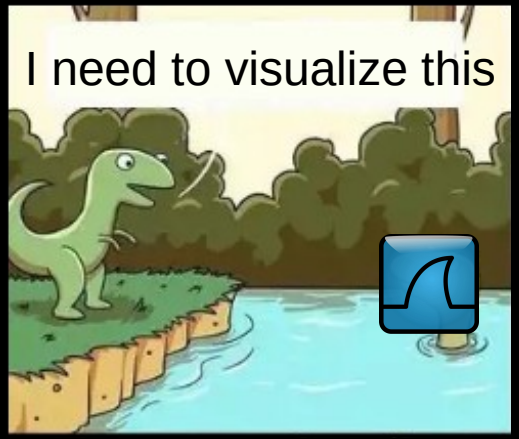
0x21
Commands and
replies

NFC + IR

Visualizing this Bit-Mess



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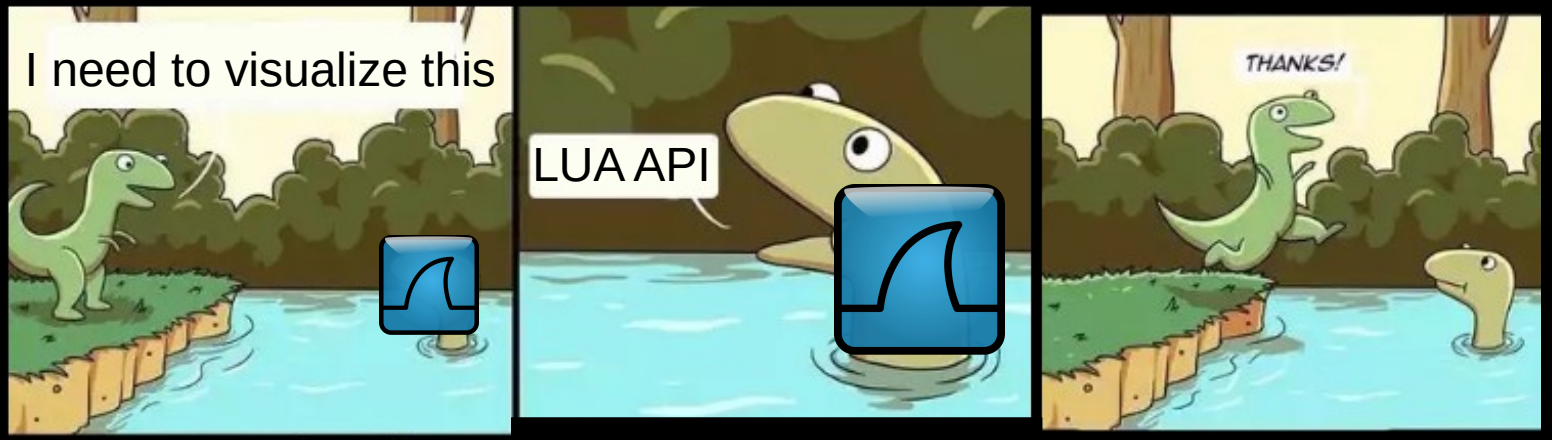

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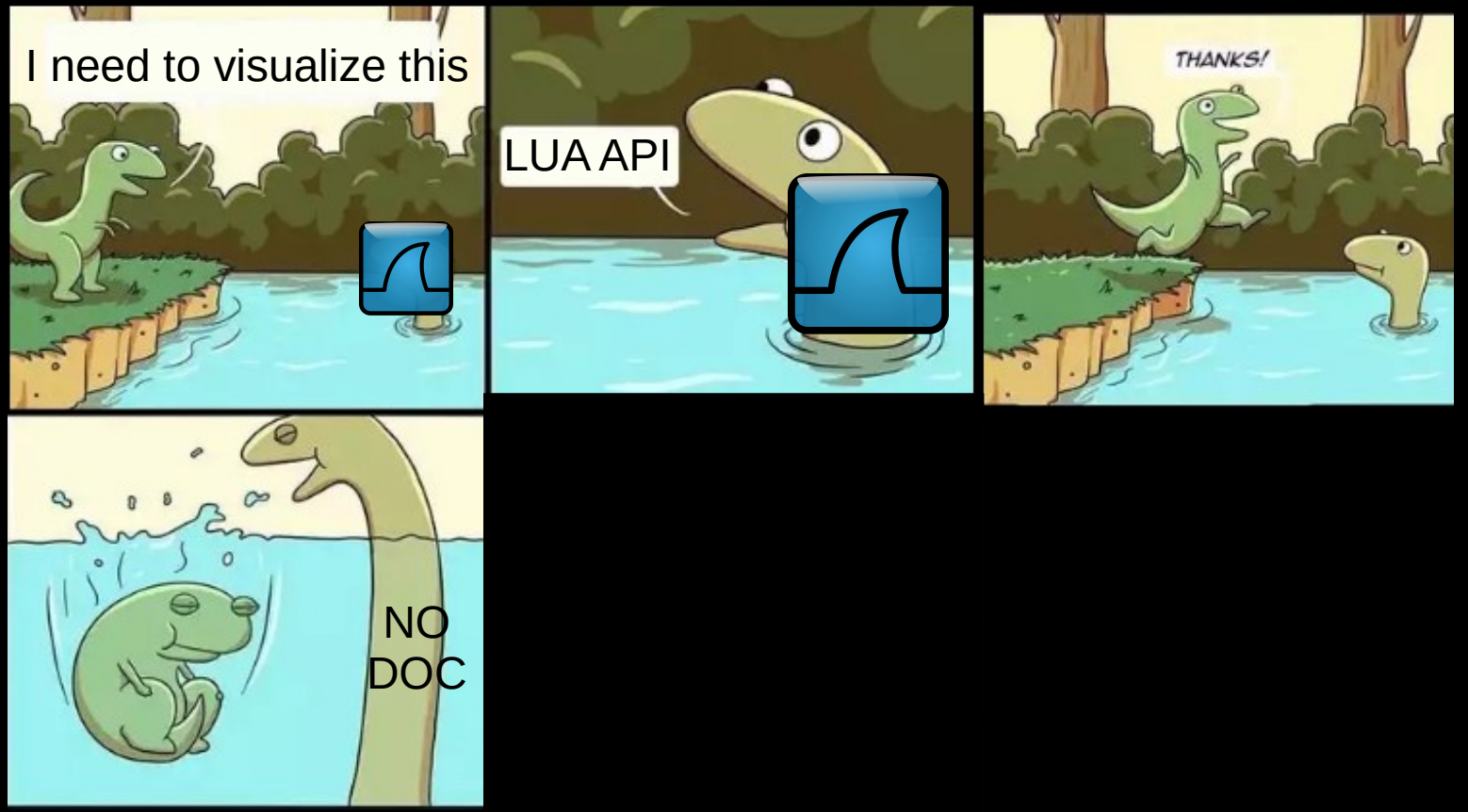

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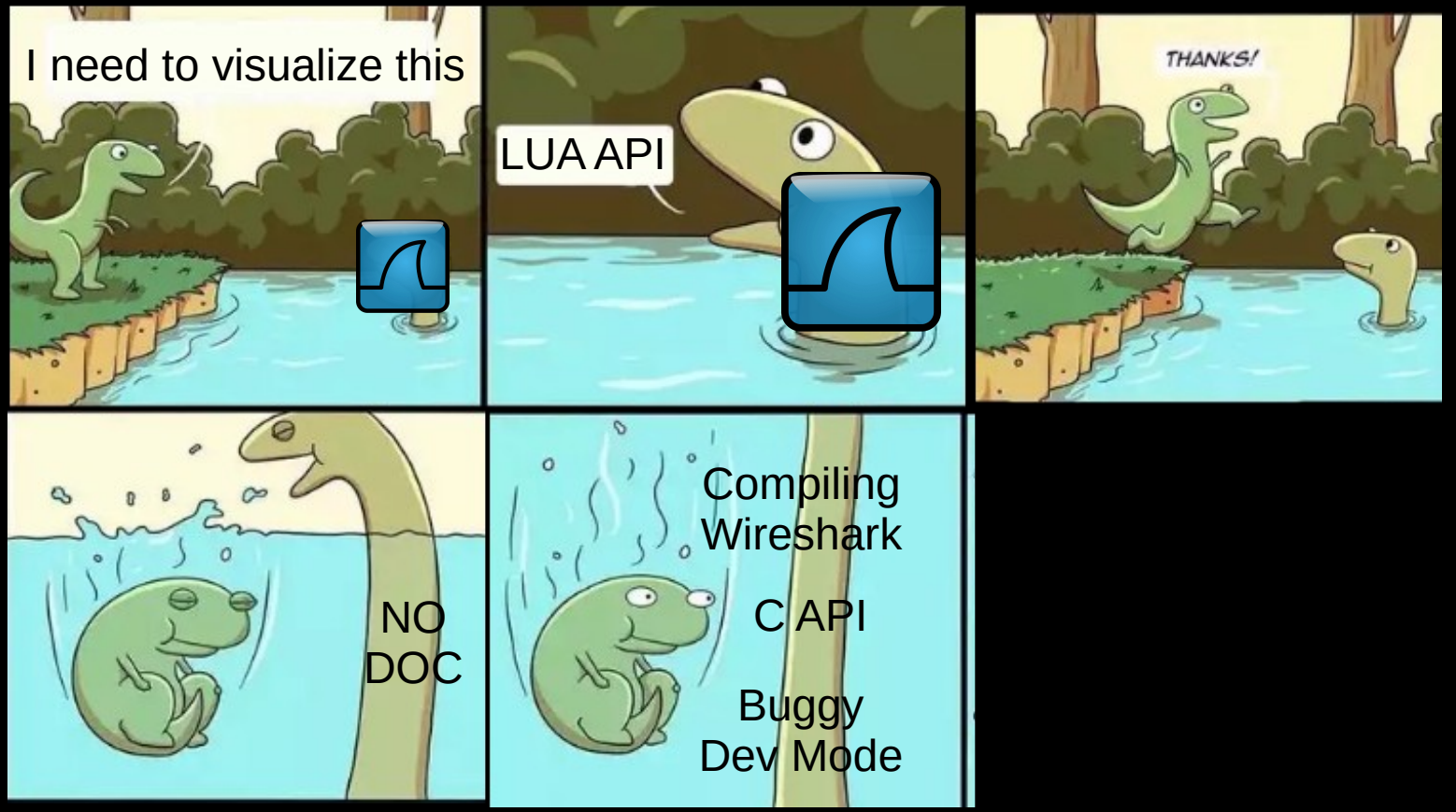

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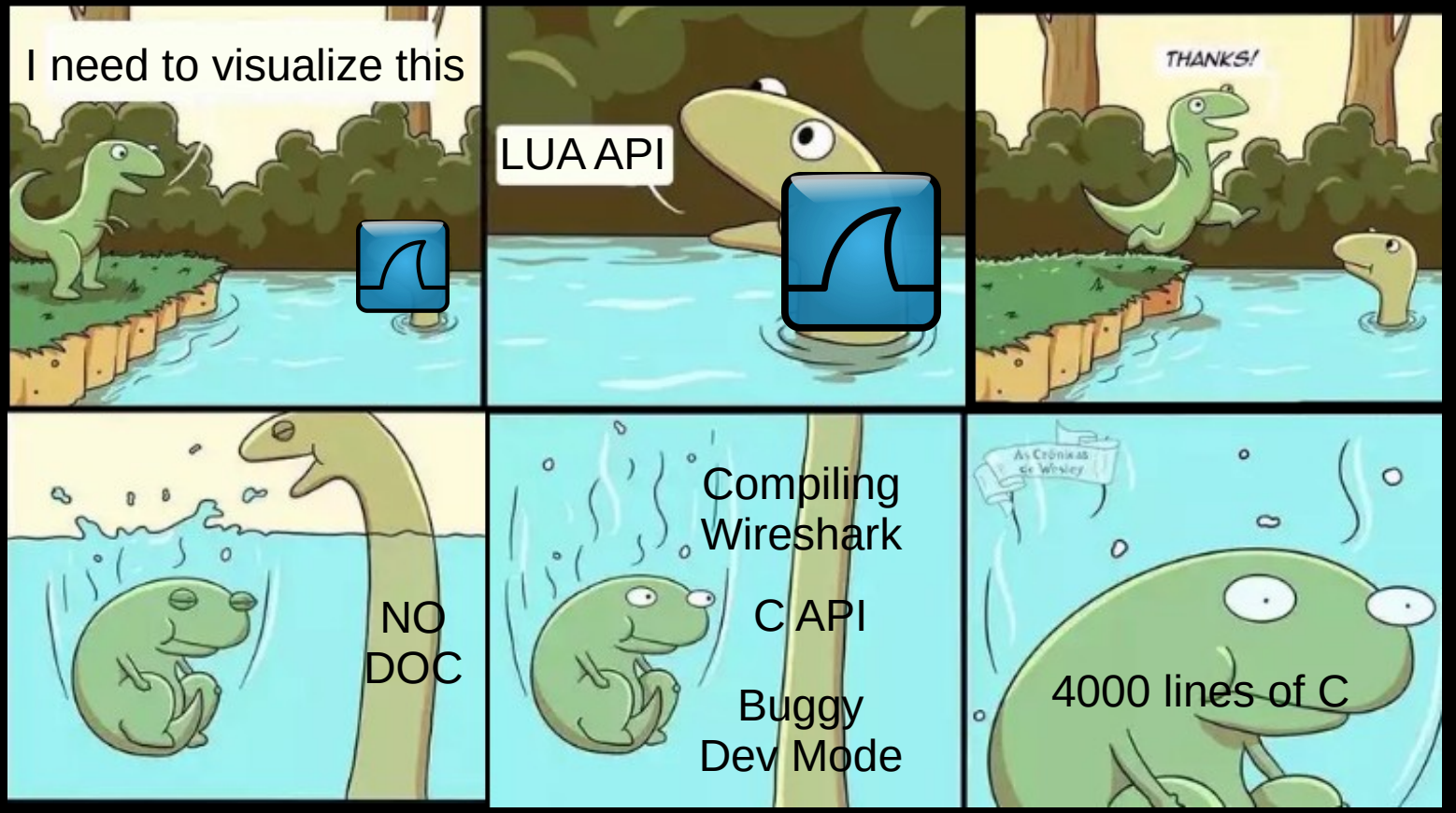
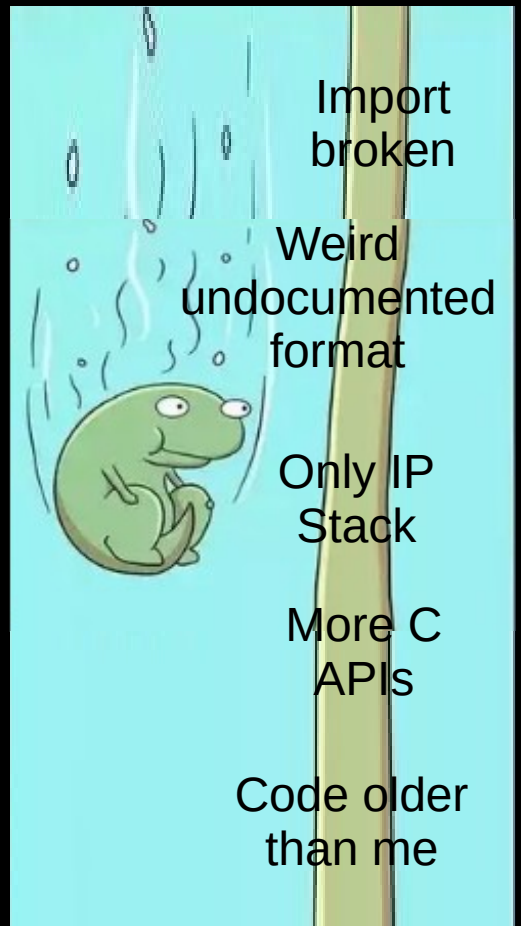


Importing Bluetooth logs



People send you terminal logs

Log EVERYTHING (and into file)

< 0.0014 0500608cb100608cb1
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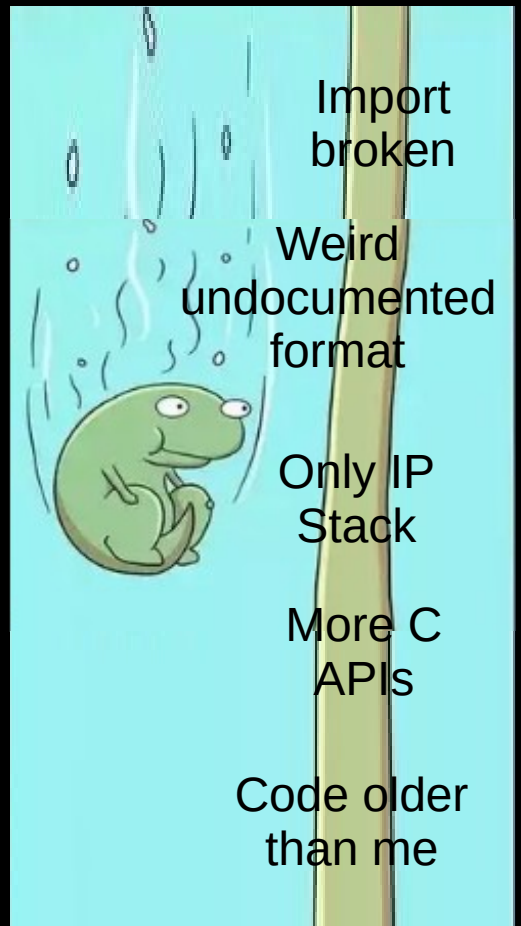

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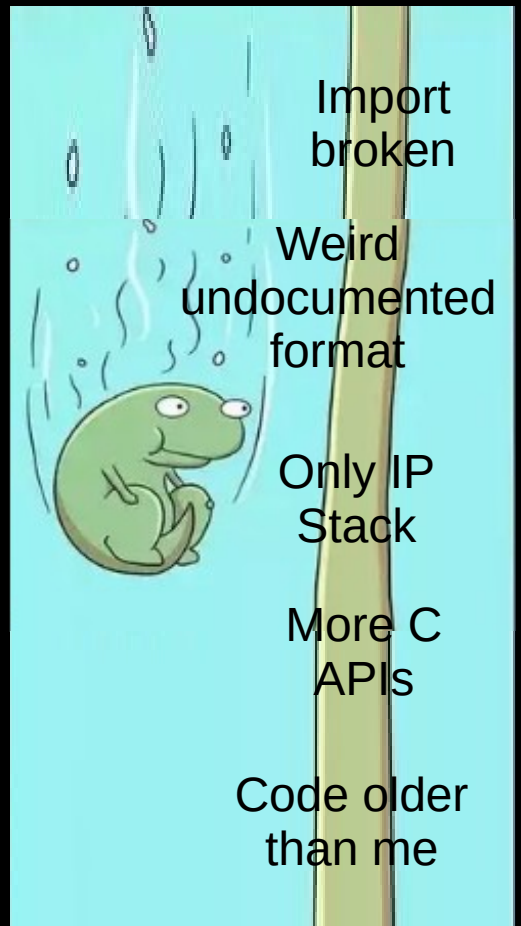

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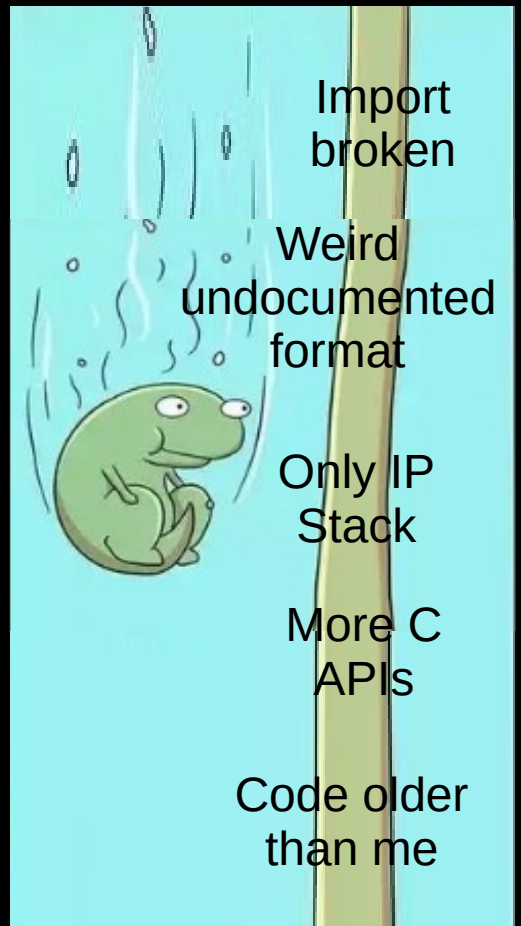

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Also bugs in python’s Bluetooth sockets, I didn’t want to compile that too

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- Yes, you have to restart the entire thing after writing an amiibo
- Yes, you can use this to crash the switch, linux kernel 6.?+ and btstack
- Yes, this breaks your bluetooth stack in ways you haven’t seen before

Thanks for your Attention

The parts I didn’t steal

https://github.com/Poohl/joycontrol

https://gist.github.com/Poohl/e0f254b3e02051b18c7e9f4f032883be

https://github.com/Poohl/joycontrol-pico