Firmware ABI stability

Marek Vasut

December 11th, 2025

Problem

Contemporary embedded Linux systems depend on services provided by firmware

- Firmware provides services with ABI – PSCI, SCMI, ...
- ABI misuse 1 – changes to protocol itself
  (e.g. new SCMI protocol commands)
- ABI misuse 2 – changes to ID allocation
  (e.g. changed SCMI IDs)
  - SCMI IDs are sometimes encoded in DTs, does this mean SCMI IDs are part of HW description or SCMI server SW policy ?

Implications

Upstreaming is impeded by unstable firmware ABI

- DT changes are not being upstreamed until firmware ABI stabilizes
- Driver development is slowed down due to unclear DT description

Possible solutions

- Incremental development
  - Add new SCMI IDs when they are tested with at least two clients U-Boot, Linux, RTOS, ...
  - Append-only strategy
  - Downside is, that older broken entries cannot be fixed
- Boot everything together
  - Start U-Boot SPL and U-Boot first, then use fitImage to start the firmware, Linux, RTOS together
  - Bundle the ABI-server firmware and ABI-client Linux/RTOS/... into single container, booted together
  - Mitigates possible firmware ABI breakage problems, improves updateability, but does not solve unstable firmware ABI

Discussion ?

Thank you for your attention

Marek Vasut <marek.vasut+lpc25@mailbox.org>