LPC Android MC - Thermal core usage challenges in Android

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Android MC

Linux Plumbers Conference 2021
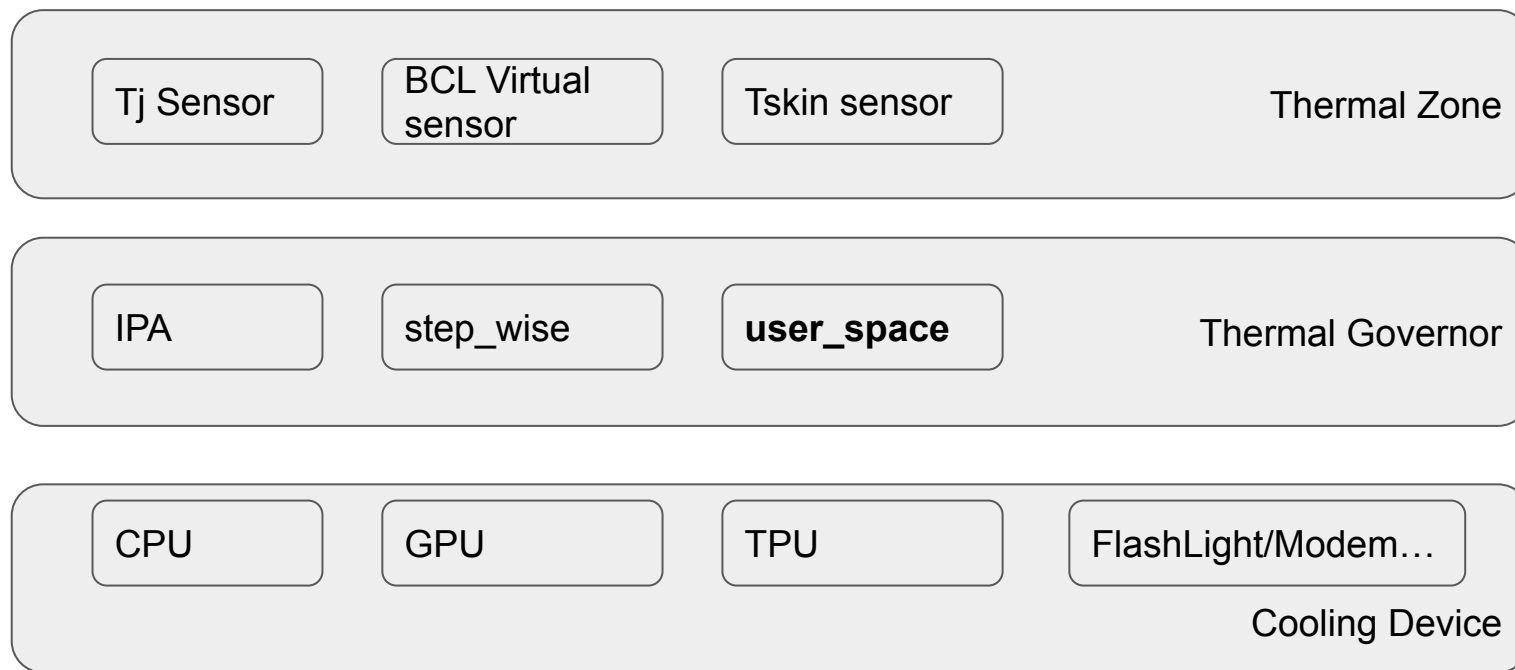
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This talk is about

- Productize thermal core on Android

- Issues, pain points

- Thoughts, possible solutions

Thermal core usage in Android

- Thermal core used for both Tj and Tskin solutions.

Tj Sensor	BCL Virtual sensor	Tskin sensor	Thermal Zone

IPA	step_wise	**user_space**	Thermal Governor

CPU	GPU	TPU	FlashLight/Modem…	Cooling Device

Problem: interaction between user_space governor and other governors

Sysfs interface for userspace governor

- Thermal daemon in userspace usually uses cooling device sysfs node

  `cur_state` for voting

- Same cooling device can be used by multiple thermal zones (Tj, Tskin, BCL)

- Aggregation exists between in-kernel thermal zones, but not through

  `cur_state` sysfs.

- `temp` sysfs in thermal zone doesn't trigger trip update.

Proposal

- Add a dedicated vote for userspace governor to aggregate votes between userspace governor and other governors.

Problem: thermal netlink configuration

Thermal netlink usage

- All thermal zones generate messages

- Userspace thermal daemon is mostly interested in those slow changing thermal zones (e.g. Tskin)

- Updates from some thermal zones (e.g. Tj) could be very spammy

Proposal

- filter or configuration on messages?

Problem: loadable governor module

Custom thermal governor

- Thermal governors are part of GKI

- No module support - all in one image -- larger code

- Things are not perfect in product

  - complex rules on different thresholds

  - combination of multiple governors

  - product workaround

  - customization is sometimes inevitable

Product workaround

- Implement thermal governor insides thermal sensor driver

    - Complex lock usage

    - Separate trip setting

    - In general, bad and inefficient code

Problem: virtual sensor support

Virtual sensor support

- Many usage of sensor fusion

    - Tskin: sensor fusion of multiple places for better correlation

    - BCL: complex rules for battery temperature, PMIC current, and other thermal zone inputs.

Thanks!