LPC Android MC - Thermal core usage challenges in Android

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Android MC

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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 $T_j$ and $T_{skin}$ solutions.

Thermal Zone:
- $T_j$ Sensor
- BCL Virtual sensor
- $T_{skin}$ sensor

Thermal Governor:
- IPA
- step_wise
- user_space

Cooling Device:
- CPU
- GPU
- TPU
- FlashLight/Modem…
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 inside the 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!