Applicable platform:

All chipsets which meta build kernel version is upgraded to v4.9

Issue Description:

1. KTM is not founded.
2. Thermal-engine has no default config file anymore.
3. "thermal-engine -o" command doesn't output anything.
4. How to add customized policy and tune the parameters?
5. How to verify the thermal mitigation policy is working?

Issue Analysis:

All the issues are because the thermal architecture changed in kernel-v4.9. They'll be clarified one by one.

1. KTM is deprecated and the original function is implemented in thermal core framework. Please refer to DCN 80-p9301-113 for the details.
2. All the default thermal mitigation policy is configured in device tree. The thermal zone definition format and parameters details can be found in DCN 80-p9301-113.

dtsi file	type of entry	comments
sdmxxx.dtsi (soc dtsi file)	CPU Tj rules GPU Tj rules pop-mem Tj rules vdd restriction rules	has default config
OEM's platform dtsi	PCB or Tskin sensor rules: LCD Charging Modem	to be added by OEM
pmixxxx.dtsi (pmic dtsi file)	BCL sensors BCL rules	has default confi

3. Yes, in the new thermal arch, the "thermal-engine -o" command is useless. Please check thermal engine logs to confirm the user-space thermal mitigation policy.

4. Although thermal-engine has no default config file, the customer still can create own config file, the format is the same as before. For example, if want to add battery charging mitigation, the policy is defined as below, remember to change the sensor to the customized thermal name, and do not add "#" in the algo_type segment.

[BATTERY_CHARGING_CTL]

algo_type monitor

sampling 10000

sensor case_therm

thresholds 41000 45000

thresholds_clr 39000 41000

actions battery battery

action_info 1 2

The supported device is as below, the "cluster" keyword is not used and replaced by cpuX.

Mitigation device	Description
cpuX	Adjustment of maximum allowed operating frequency per cluster. For cluster0 mitigation use cpu0 and for cluster1 mitigation use cpu4.
gpu	Adjustment of maximum allowed operating frequency
hotplug_X	Take specific core offline
modem	Adjustment of peak data rates, maximum Tx power, and data call termination
lcd	Adjustment of maximum backlight intensity
battery	Adjustment of maximum allowable charge rate

5. To verify the thermal zone functionality, you should check the thermal zone mapped cooling device. E.g. as below thermal zone named "cpu0-silver-step"

cpu0-silver-step {

polling-delay-passive = <100>;

polling-delay = <0>;

thermal-sensors = <&tsens0 1>;

thermal-governor = "step_wise";

trips {

emerg_config0: emerg-config0 {

```
temperature = <75000>;

hysteresis = <10000>;

type = "passive";

};

};

cooling-maps {

emerg_cdev0 {

trip = <&emerg_config0>;

cooling-device =

<&CPU0 3 10>;

};

};

};
```

Then find the /sys/class/thermal_zone/thermal_zoneX/type, which one is cpu0-silver-step. Supposing it's thermal_zone29, then the corresponding cooling device is at /sys/class/thermal/thermal_zone29/cdev0/

cur_state is the cpu current perf level(frequency),

min_state/max_state is the cpu perf_ceiling/perf_floor defined in device tree.

You may also use ftrace to get the events for thermal by /d/tracing/events/thermal/*

Ftrace Event	Description
thermal_zone_trip	Trip event marker
thermal_device_update	The governor polling loop start marker
thermal_temperature	The temperature read by a zone
cdev_update_start	Cooling device mitigation update start marker
cdev_update	Cooling device mitigation update exit marker
thermal_handle_trip	Governor polling loop end marker
thermal_set_trip	Thermal set trip temperatures

Here is the sample ftrace logs when the mitigation is triggered and released.

For example, set silver cluster temperature threshold range from 30C to 35C

Thermal mitigation triggering

thermal_zone type and id

```
irq/122-tsens-u-98   [000] ....  7266.585744: thermal_device_update: thermal_zone=cpu0-silver-step id=25 received even
irq/122-tsens-u-98   [000] ....  7266.585747: thermal_query_temp: thermal_zone=cpu0-silver-step id=25 temp=35000
irq/122-tsens-u-98   [000] ....  7266.585748: thermal_temperature: thermal_zone=cpu0-silver-step id=25 temp_prev=282
irq/122-tsens-u-98   [000] ....  7266.585756: thermal_set_trip: thermal_zone=cpu0-silver-step id=25 low trip 30000 high t
irq/122-tsens-u-98   [000] ....  7266.585762: thermal_zone_trip: thermal_zone=cpu0-silver-step id=25 trip=0 trip_type=PA
irq/122-tsens-u-98   [000] ....  7266.585767: cdev_update_start: type=thermal-cpufreq-0 update start
irq/122-tsens-u-98   [000] ....  7266.585964: cdev_update: type=thermal-cpufreq-0 target=3 min_target=18446744073705
```

Target state

Thermal mitigation releasing

```
kworker/u17:1-418   [003] ....  7355.478937: thermal_device_update: thermal_zone=cpu0-silver-step id=25 received even
kworker/u17:1-418   [003] ....  7355.478991: thermal_query_temp: thermal_zone=cpu0-silver-step id=25 temp=29500
kworker/u17:1-418   [003] ....  7355.478999: thermal_temperature: thermal_zone=cpu0-silver-step id=25 temp_prev=298
kworker/u17:1-418   [003] ....  7355.479056: thermal_set_trip: thermal_zone=cpu0-silver-step id=25 low trip=-214748364
kworker/u17:1-418   [003] ....  7355.479079: thermal_zone_trip: thermal_zone=cpu0-silver-step id=25 hyst=0 trip_type=P.
kworker/u17:1-418   [003] ....  7355.479106: cdev_update_start: type=thermal-cpufreq-0 update start
kworker/u17:1-418   [003] ....  7355.479477: cdev_update: type=thermal-cpufreq-0 target=0 min_target=18446744073705
kworker/u17:1-418   [003] ....  7355.479486: thermal_handle_trip: thermal_zone=cpu0-silver-step id=25 handle trip=0
```