LINUX KERNEL: THERMAL WARMING

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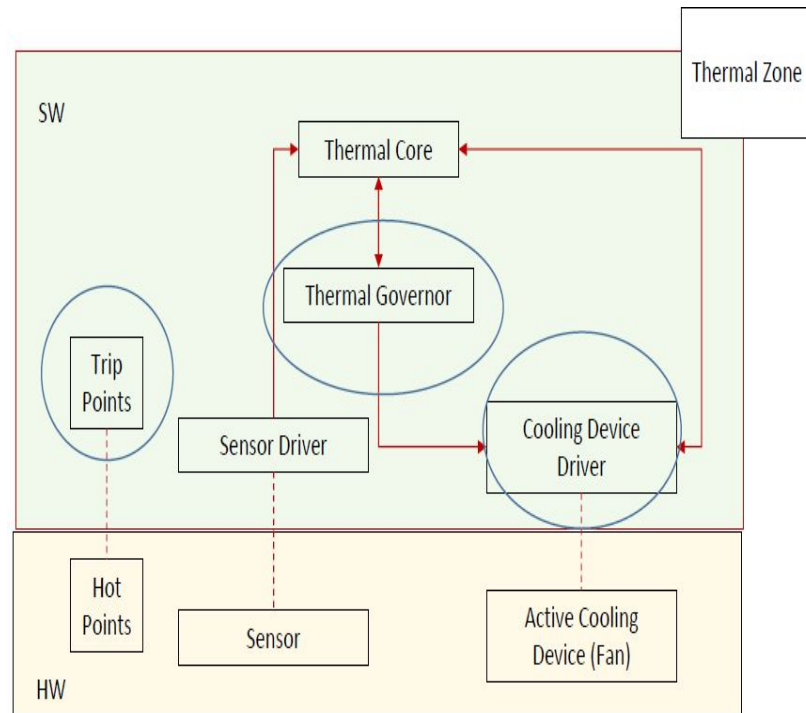
Problem Statement

➢ Delay in propagating signals from input elements to output elements in a circuit path cannot exceed the time period between synchronizing clock pulses.

➢ If the delay is greater than a clock cycle, the circuit will not function as expected.

➢ SoCs are characterized for timing closure in a temperature range.

➢ At lower temperatures, certain voltage and frequency combination CANNOT meet timing closure.

➢ Leads to non-functional system under extremely cold temperatures (< 0 degree Celsius)

➢ To close timing, the operating voltage must be increased.

➢ Opposite of what is required to cool down the system.

My tails froze, and my nose is froze, and my ears are froze, and my toes are froze

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Proposed Solution

➢ Linux Kernel Thermal Management Framework already has provision to monitor and handle out of bounds temperature.

➢ Extend the framework to monitor and handle falling temperature.

➢ Two requirements
  ○ Thermal framework should monitor and handle descending temperature.
  ○ Thermal framework should support warming devices

Proposed Solution Cont..

TRIP POINTS	THERMAL GOVERNOR	WARMING DEVICES
- Support for cold trip points. - New trip type: THERMAL_TRIP_COLD - "cold": trip point property in dt - Enable notification mechanism via netlink interface. 1. https://lkml.org/lkml/2020/7/10/63	- Support for monitoring and mitigating falling temperature (triggering warming action) - New range governor vs extending existing governors ?	- Software based warming mechanisms.(genpd based warming mechanism[2], disabling lower operating points of devices) - Resource specific warming mechanisms[3] 2. https://lkml.org/lkml/2020/6/3/1112 3. https://github.com/torvalds/linux/blob/master/drivers/soc/qcom/qcom_aoss.c

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Thank you