Idle injection and cpu power topology description
Status of development

● Idle injection mechanism merged upstream => v4.19
  ○ Provides the API to create threads playing idle
  ○ Based on smpboot threads (uses hotplug generic code)
  ○ Set idle and run durations

● Became a component of the drivers/powercap
  ○ Not usable alone
  ○ Needs another component to use the framework
  ○ Can be re-used by the ‘intel_powerclamp’ as requested by Rafael J. Wysocki
Usage

● All idle threads are created at boot time on each CPU
  ○ idle-inject/N

● Simple API
  1. idle_inject_register(struct cpumask *cpumask) => ii_dev
  2. idle_inject_set_duration(ii_dev, run_ms, idle_ms)
  3. idle_inject_start(ii_dev)
  4. idle_inject_stop(ii_dev)

Up to the caller to manage concurrency
Cooling device

● Different use cases
  ○ Boards without cpufreq can use idle injection as an alternative
  ○ When the cpufreq cooling fails to mitigate the idle injection can be an alternative
  ○ Combining freq changes and idle injection can improve the performances (needs proof)

● Prototype shows:
  ○ Idle injection cooling device allows to drop the static leakage
  ○ Mixing idle injection and frequency changes allows to smooth temperature changes
  ○ Idle injections increase the latency but also the throughput
Problems to solve

● Idle injection, OPP changes:
  ○ Same cooling device with different policies?
    ■ Governor?
    ■ Cooling device itself?
    ■ What about DT?
  ○ Different cooling device?
    ■ How to specify which one to use?

● Description of the cooling device in the DT:
  ○ Back compatibility?
  ○ Switching the cooling strategy?
  ○ Latest Viresh’s changes allow to specify the CPUs acting as cooling device
Problems to solve

- Based on capacity equivalence we should be able to combine OPP+idle and OPP decreasing

- Do the proof combining idle injection and OPP changes is worth to
  - Deepest idle states are expensive (cache flush, exit latency, timings, ...)
  - Gap between OPPs tend to be smaller and number of OPP are higher
  - Proof can be done mathematically (February - Internship)