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Powercap energy model based

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An ever-increasing number of embedded devices need fine grain control on their performance in order to limit the power consumption. There are three primary reasons for this: to increase the battery life, to protect the components and to control the temperature.

Due to the increasing complexity of SoCs, we're now seeing lots of thermal sensors on the die to quickly detect hot spots and allow the OS to take steps to mitigate these events - either through better scheduling, frequency throttling, idle injection or other similar techniques.

Mobile devices are even more interested in managing power consumption because, depending upon the situation or the workload, the performance places higher or lower priority on certain components in regards to others. One example is virtual reality where a hotspot on the graphics can lead to a performance throttling on the GPU resulting in frame drops and a dizziness feeling for the user. Another example is the ratio between the cost in energy for a specific performance state vs a benefit not noticeable for the user, like saving milliseconds when rendering a web page. And last but not least, a battery low situation where we want to guarantee a longer duration before shutdown can create a unique prioritization scheme.

This non-exhaustive list of examples shows there is a need to act dynamically on the devices'power from the userspace who has full knowledge of the running application. In order to catch unique scenarios and tune the system at runtime, the solution today leverages a thermal daemon monitoring the temperature of different devices and trying to anticipate where to reduce the power consumption, given the application is running. The thermal daemon turns the different "knobs"here and there, in every place where it is possible to act on the power. One of these places is the thermal framework which exports an API via sysfs to manually set the level of the performance state for a given device declared as a passive cooling device.

The powercap provides all the infrastructure to export the power consumption and set the power limit. The combination of the energy model and the powercap framework will offer an unified access to the power management of the different devices.

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