Dynamic Frequency and Voltage Scaling

DVFS is a technique to reduce power by adjusting the clock frequency and supply voltage to transistors.

- Reduce operating frequency if chip is too hot or otherwise to conserve (especially battery) power.
- Reduce voltage if frequency is reduced.

$$\text{Power} \propto C\, V^2\, f$$

C = dynamic capacitance
$\approx$ roughly area $\times$ activity (how many bits toggle)
V = supply voltage
f = clock frequency

Reducing frequency and voltage results in a cubic reduction in power (and heat).

But it wreaks havoc on performance measurements!

Sources of Variability

- Daemons and background jobs
- Interrupts
- Code and data alignment
- Thread placement
- Runtime scheduler
- Hyperthreading
- Multitenancy
- Dynamic voltage and frequency scaling (DVFS)
- Turbo Boost
- Network traffic