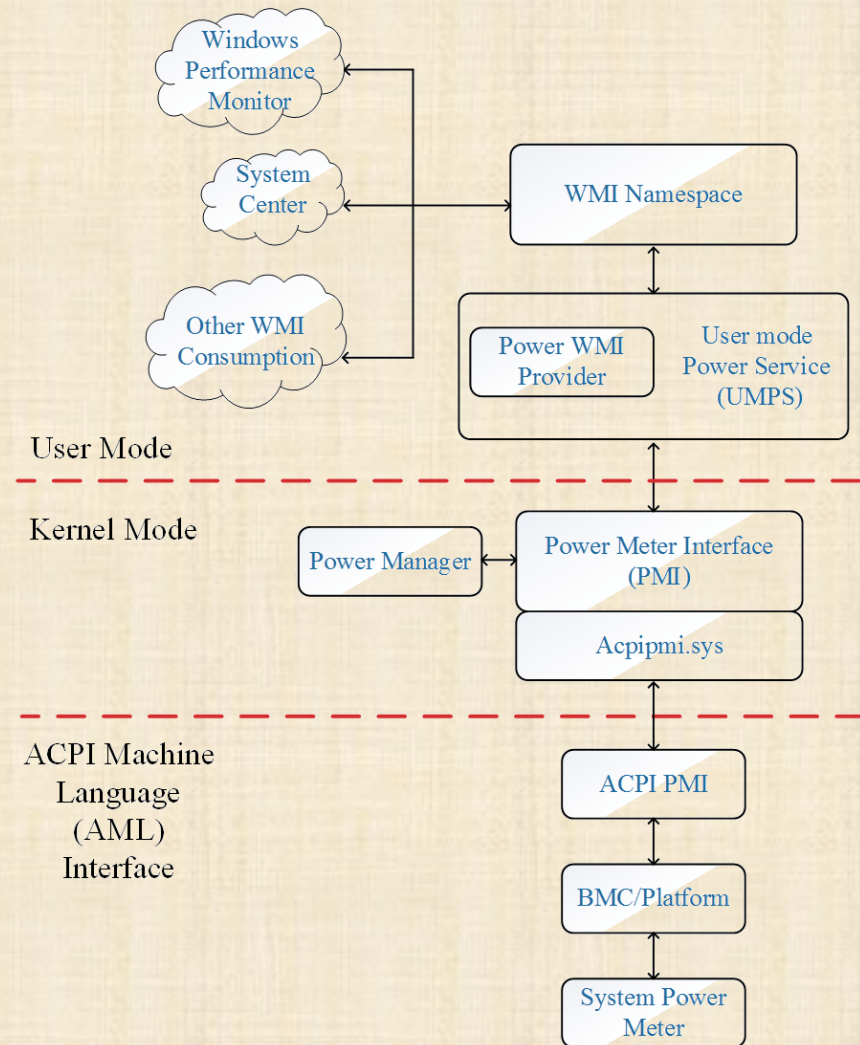# ENERGY OPTIMIZATION AT <u>ALL</u> LEVELS
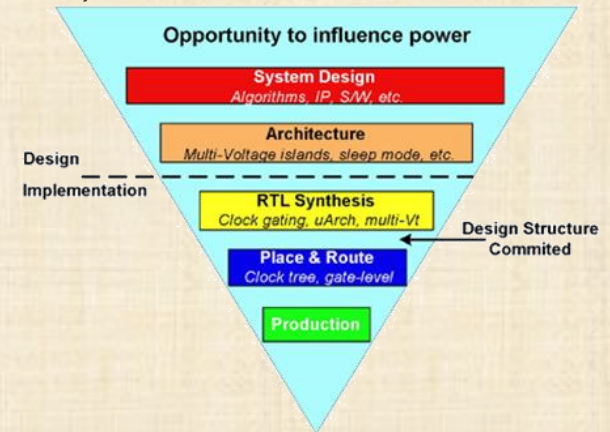
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EVERY LITTLE BIT COUNTS

- **Under the Hood** (chip/component levels)
  - Clock gating
  - Voltage and frequency scaling
  - Power modes
  - VLSI techniques (multi Vt, 3D ICs, etc.)

- **System** (motherboard or platform management levels)
  - Embedded Real-Time Power Monitoring (ERPoM)
    - Power metering PSU
    - Baseboard Management Controller (BMC); used by power management SW through ACPI PMI to manage subcomponents.

POWER MANAGEMENT OPPORTUNITIES

- **✖ Smart Metering**
  - **+** Producer led (privacy issues)
  - **+** User led (limited resources, e.g. algorithms, rates)
- **✖ Smart Appliances**
  - **+** Cost and interoperability standards
- **✖ HW/SW Cooperation**
  - **+** Industry cooperation
  - **+** Economical incentives for new add on features