CalIT Plug-Load Initiative: Set Top Box Workshop

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Energy Efficient Technology Adoption Challenges

- Consumer usage define opportunities and acceptance of the technology
  - ➢ Study behavior for energy savings- DVR, video download, multi-room/multi-user environment
  - ➢ Avoiding annoyance modes – e.g. 2minute restart, missed programming, dropped signal/poor video, interrupted recording
- Market transformation is driven by consumer preference
  - ➢ Economic impact to consumers, manufacturers, and service providers- increased costs drives slow adoption
  - ➢ No consumer demand to change- replacing the box doesn't improve the user experience
- Unintended consequences slows technology adoption and increase energy consumption
  - ➢ Power reductions can actually increase energy consumption

Consumer usage and expectations outline the opportunities and limitations to energy efficient technology adoption

Considerations

- Holistic household approach not single box

- Existing operations and energy demand are driven by consumer use expectations- deliver the same or better.

- Market transition timing and cost limitations
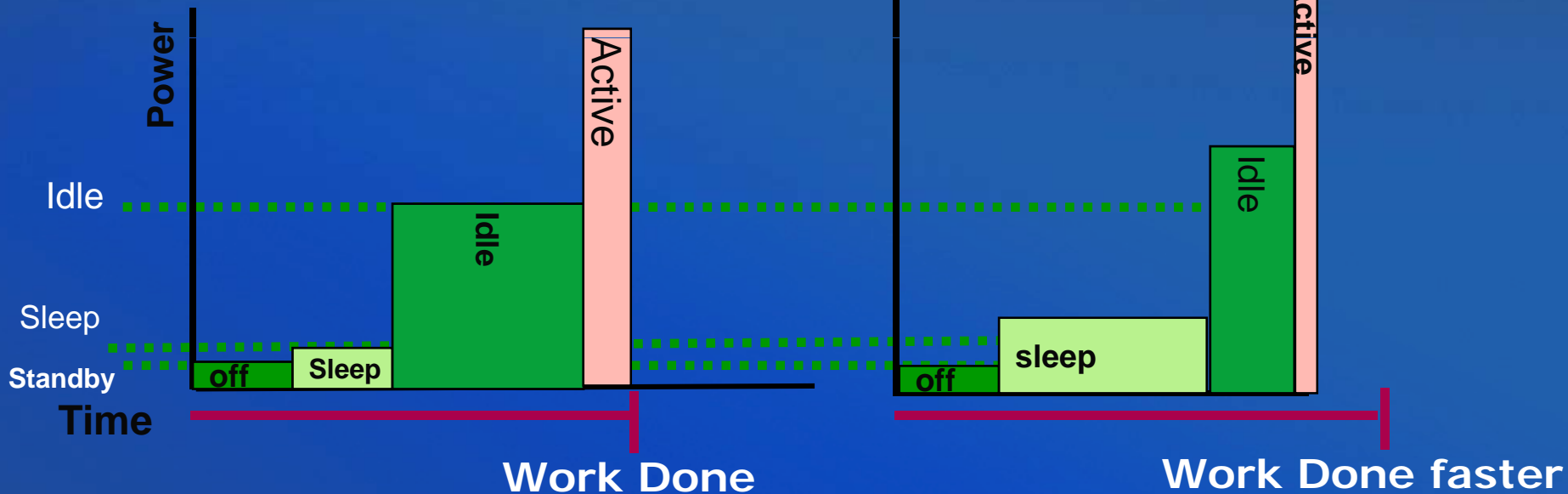
Backup- 2006, 2008 concepts
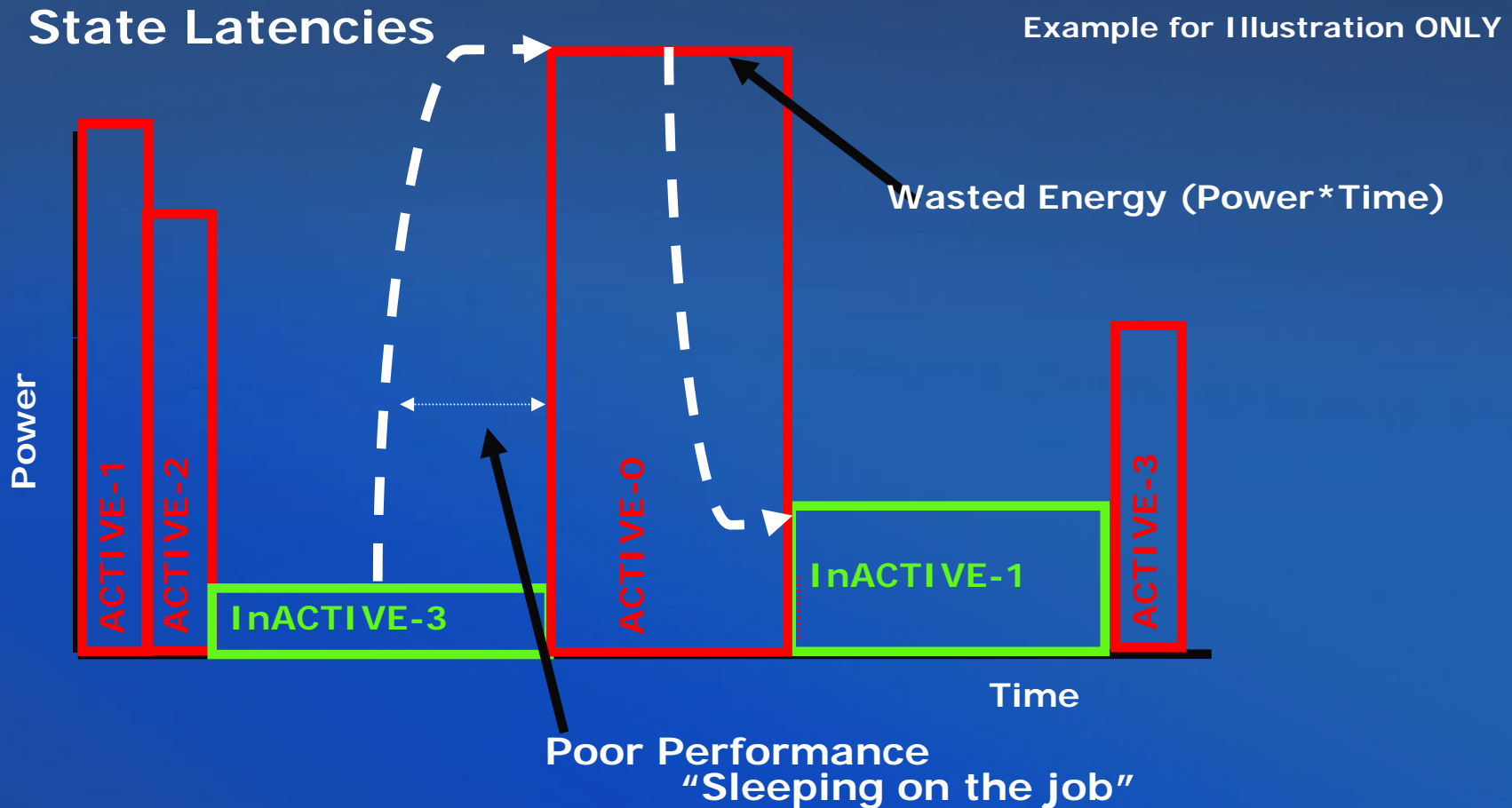
Efficiency Comparisons

Energy profiles

WAS "Efficient"
Low Power (Idle, Sleep)

True efficiency
Less energy to complete the work

Power

Idle

Sleep

Standby

Time

off | Sleep | Idle | Active

off | sleep | Idle | Active

Work Done

Work Done faster

Efficiency Needs to Comprehend Time to Complete the Work

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Power Management: Efficient Transitions

State Latencies

Example for Illustration ONLY

Wasted Energy (Power*Time)

Power

ACTIVE-1
ACTIVE-2
InACTIVE-3
ACTIVE-0
InACTIVE-1
ACTIVE-3

Time

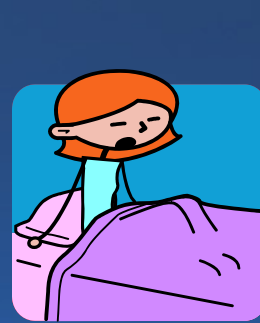Poor Performance
"Sleeping on the job"

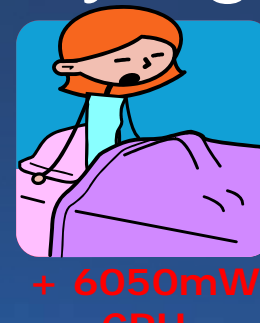**Efficiency Needs to Comprehend Power Management**
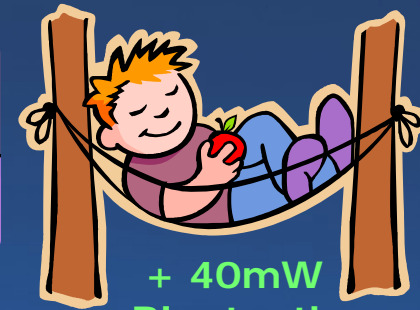
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Analogy: Idle Devices & Crying Babies

- Idle devices should excel at *"Doing Nothing"*

- Crying Babies
  - Babies are small, don't consume much energy
  - Baby sleeps at night everyone sleeps
  - A crying baby prevents everyone from resting

+ 590mW
GMCH

+ 6050mW
CPU

+ 40mW
Bluetooth

+ 170mW
Memory

USB Bus
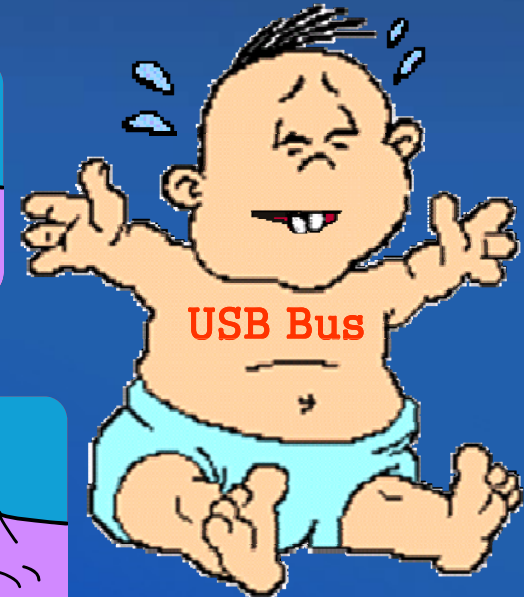
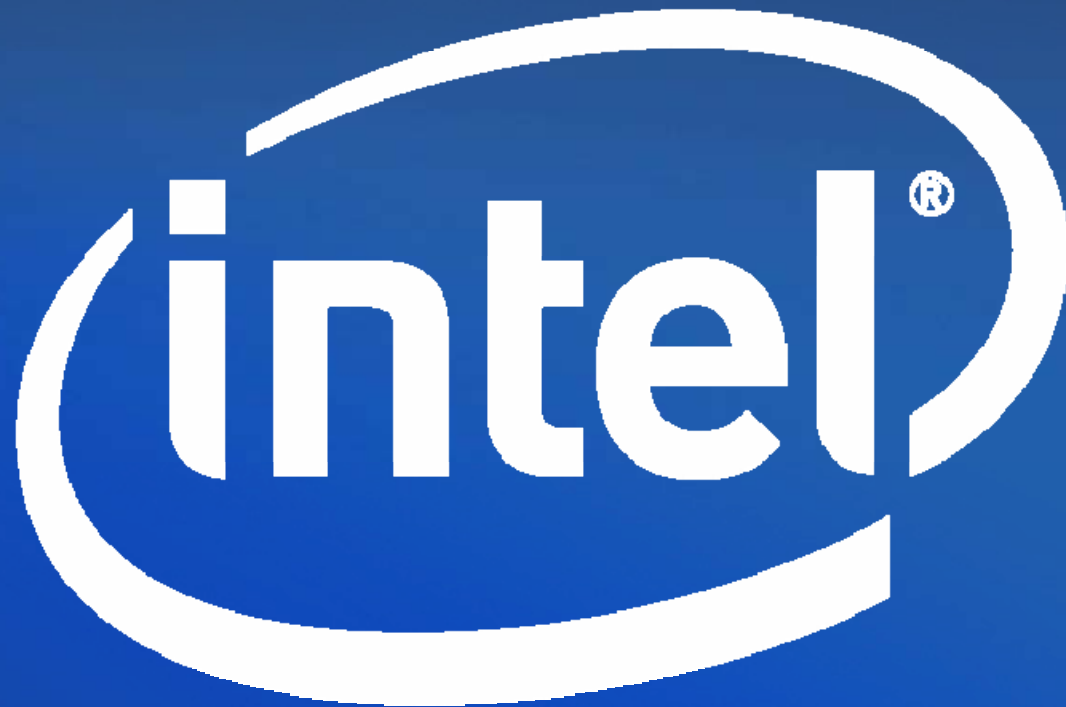**"USB2 Crying" increases idle platform power by 7W!**

+ 60mW
Clock Chip

+ 0mW EHCI
+ 310mW EHCI

Need to focus on the platform (household), not just the feature (baby)!

** Any similarities to real or imagined technologies is purely coincidental

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