



Extending Energy Efficiency From Silicon To The Platform And Beyond

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FORUM

Agenda

- **Defining Terms**
- **Why Platform Energy Efficiency**
- **Value**
- **Intel Research**
- **Call to Action**

Defining Terms



Efficient Power Delivery

Optimizing delivery of power to the platform and through to silicon



Improved Power Management

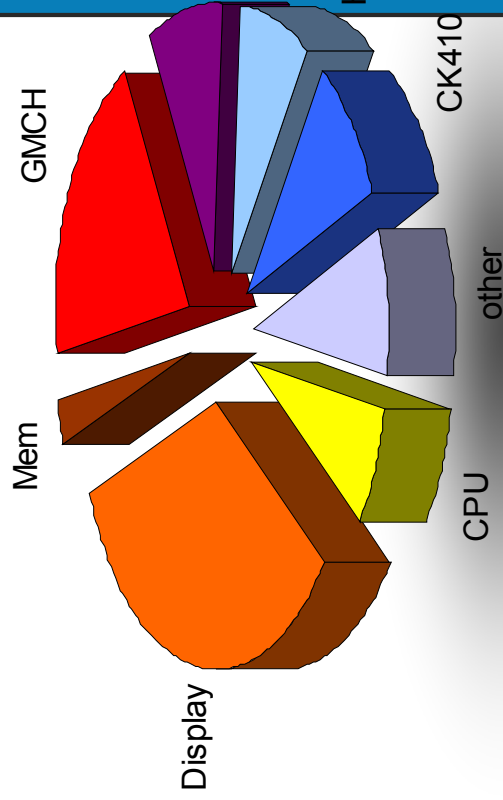
Better managing how and when power is used

Why Platform Efficiency

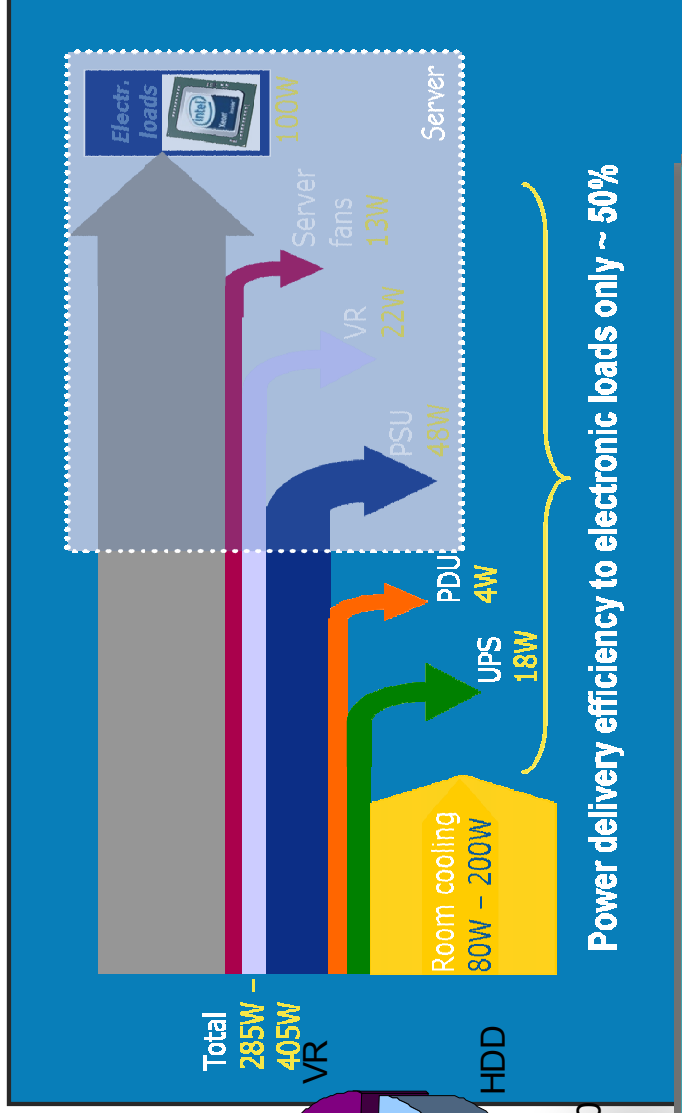
- As perf/watt of silicon improves, efficient operation across the rest of the platform becomes increasingly important
- Mobile example
 - Data Center Example

Laptop Power Utilization

Typical Office Application



Data Center Power Distribution




Future leaps in energy efficiency will come from combined improvements in silicon *and* the platform

Value of Improved Platform Efficiency

Mobile

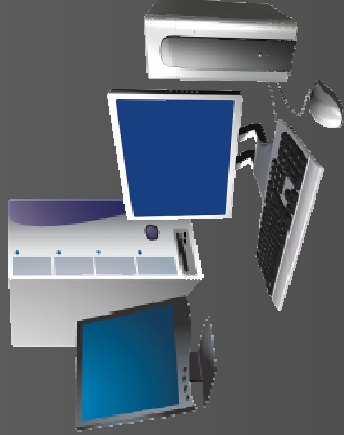
- Smaller
- Cooler
- Easier to design
- Lower cost



Increased Battery Life

Server & Desktop


- Quieter
- Cooler
- Lower utility costs
- Better reliability



Lower TCO

Data Center

- Less cooling
- Lower utility costs
- Better reliability
- Simplified power mgmt



Greater Density

Value Beyond Improved Devices

Environment

- Reduced global carbon footprint for compute devices
- Fewer number of power plants to support expected growth



Regulatory

- Better compliance with emerging regulatory pressures
- Improved flexibility when planning data centers

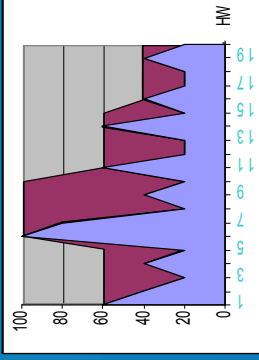


Emerging Markets

- Lessens demand on grid
- Minimizes utility costs in power limited geographies

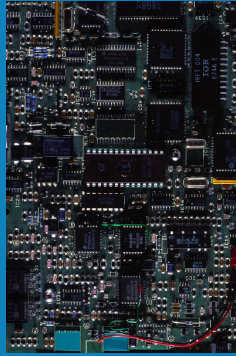


How is Intel Improving Platform Efficiency?



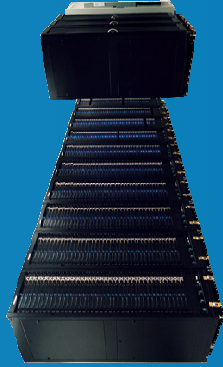
Redefining Power Management

- Moving beyond ACPI
- SW Directed, HW Managed
- Fine Grained Power Management



Innovations in Power Delivery

- Integrated Voltage Regulators
- Load Adaptive
- Fewer Voltage Rails



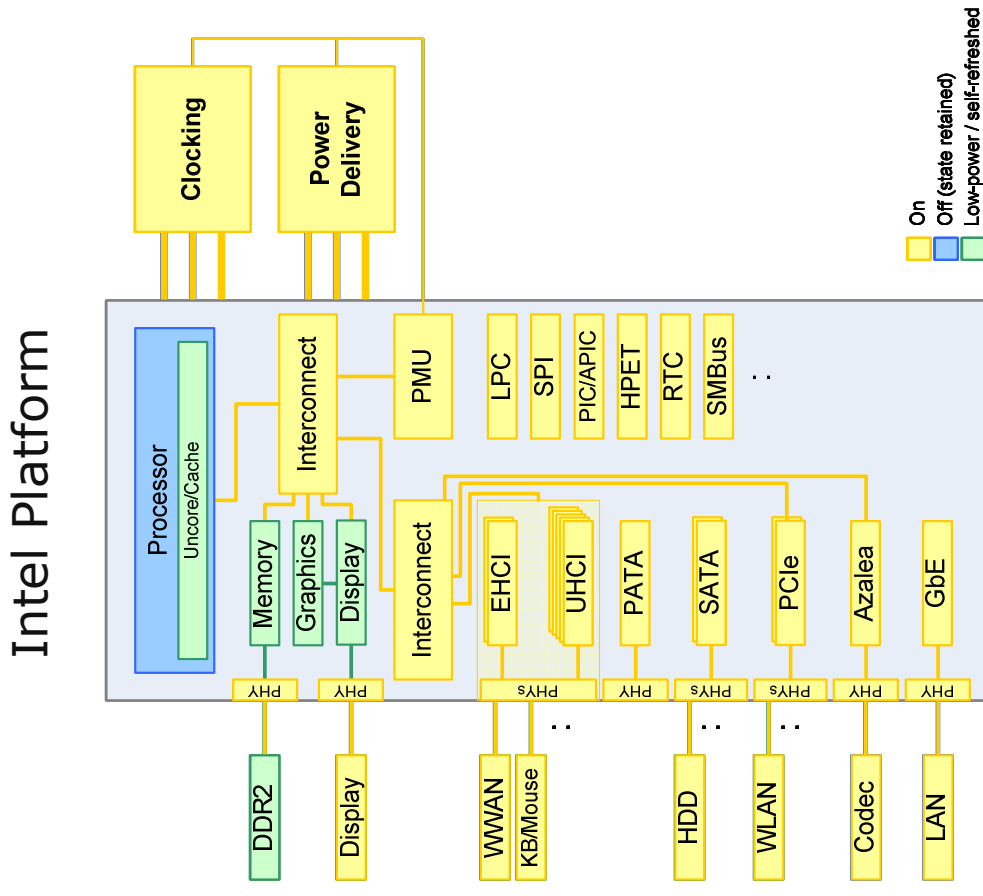
Extending to the Data Center

- Power management across groups of platforms
- Optimizing power delivery within the data center

Innovative Power Management

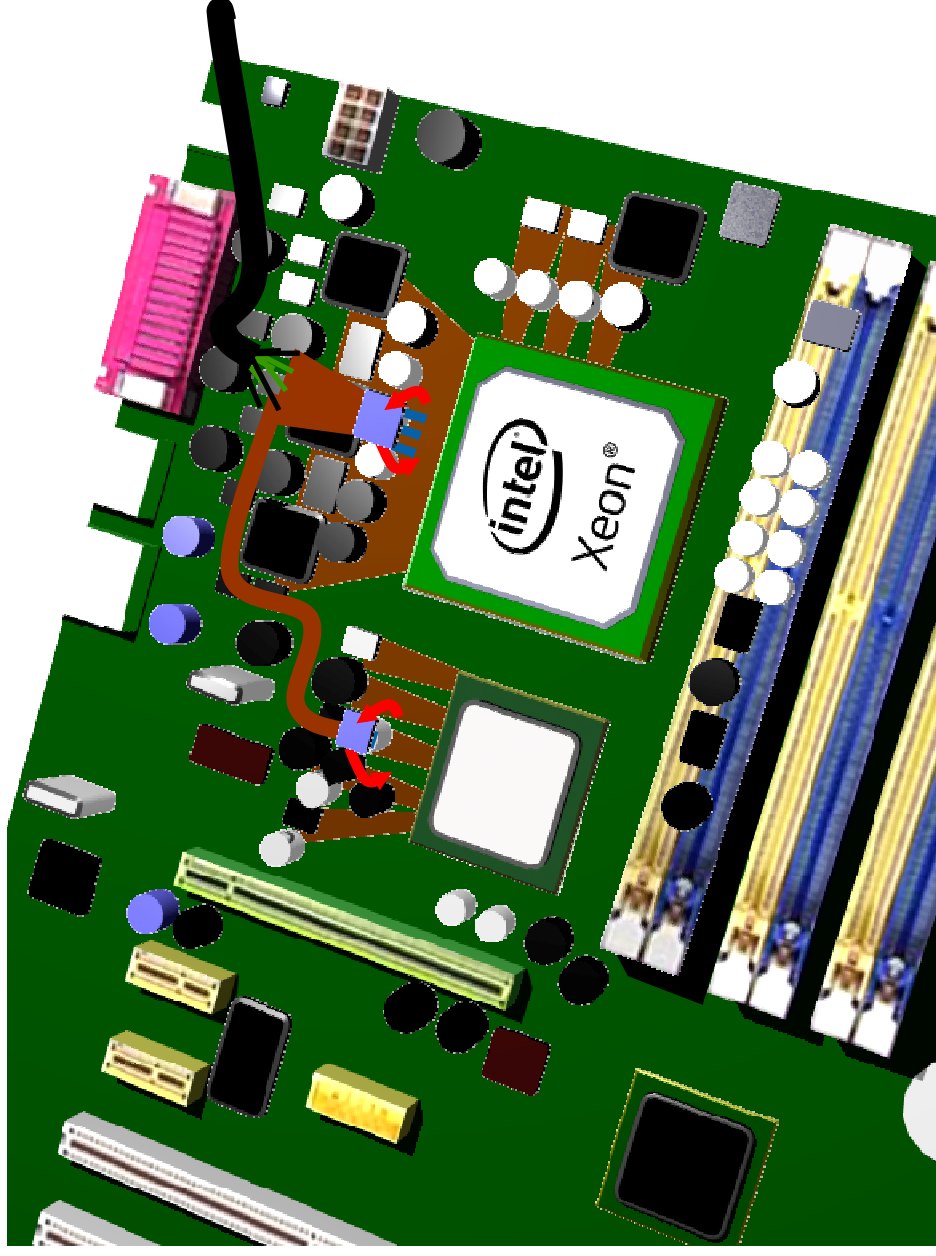
- Shift from OS to HW based power management
- Research underway in multiple areas

1. Today's idle behavior
2. New idle behavior
3. Key press
4. Re-enters idle



Efficient Power Delivery

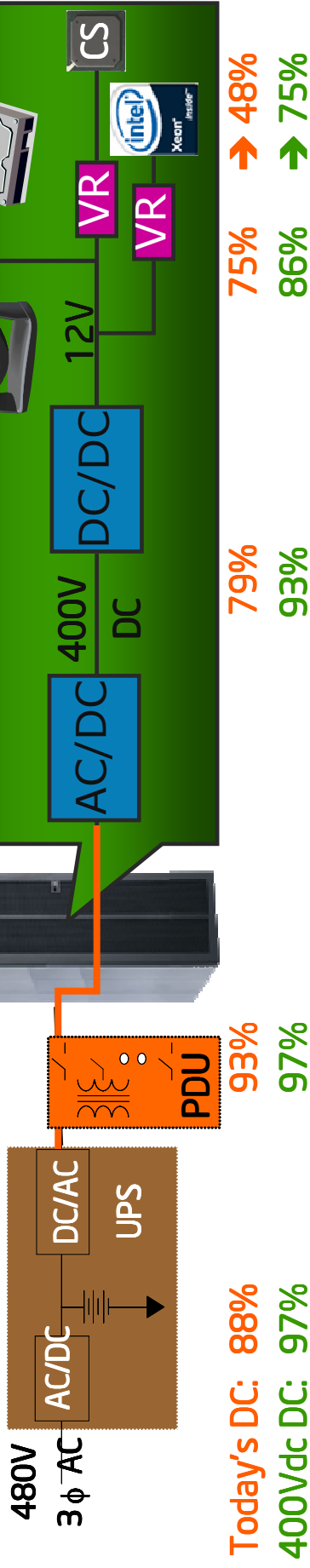
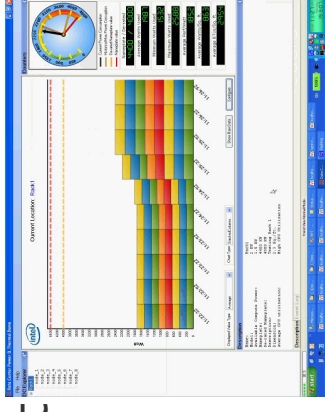
- Several challenges in existing platform power delivery
- Intel researching multiple improvements



30% improvement in power delivery efficiency

Innovations in the Data Center

- Better efficiency through improved group management
- Optimizing data center power delivery



> 25% improvement in data center efficiency

Energy Efficiency – Regulatory View

Focus: Energy Efficient Performance

- Preserving Performance
- While Reducing Energy Impact By 2010
 - Save \$5.5B Collectively in Energy Costs
- Reduce Global CO₂ emissions by 54 Million Tons / Year
 - Without Derailing Moore's Law

Most Performance w/ Least Energy

Harmonizing Energy Efficiency Standards WW

- One Planet, many Regulators
- Working towards Harmonized Standards among all
- Not just Energy, but ROHS, Materials, Packaging



Energy Leads in Holistic Green Strategy

Ecosystem & Industry Partners

- Chips, Boards, Systems, Software, Data Centers, Manufacturers, OEMs
- 4 Year Roadmap of Improved PSU & Motherboard efficiency






We're all in this together

Investing in Start-ups focused on Energy Efficiency

Mobile & Consumer

- Voltage Regulation
 - 
- Displays
 - 
 - 
- Low-power wireless
 - 
 - 
 - 

Server & Desktop

- Virtualization
 - 
- Voltage Regulation
 - 
- Better airflow, lower data error rates
 - 

Note: example only, not an exhaustive list

Call to Action

Advances require industry coordination

	Intel	Industry	Regulatory
Improve Si & Platform	Yes	Yes	
Evolve System Software	Yes	Yes	
Coordinate with Regulatory	Yes	Yes	Yes
Advance 400V DC in data center	Yes	Yes	Yes



Risk Factors

Today's presentation contains forward-looking statements. All statements made that are not historical facts are subject to a number of risks and uncertainties, and actual results may differ materially. Please refer to our most recent Earnings Release and our most recent Form 10-Q or 10-K filing available on our website for more information on the risk factors that could cause actual results to differ.

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