

Do we need additional standards for energy consumption measurement?

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based on work done in the
Energy Efficient Internet Project
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http://www.csee.usf.edu/~christen/energy/lcn08_2_proceedings.pdf

What is going on?

- reducing power consumption has become an important issue
 - ◆ buildings, transportation, datacenters ...
 - ◆ ... and also in the Internet
- global warming
 - ◆ goal: reduce carbon emissions
- significant increase in energy cost
 - ◆ goal: reduce operational cost

What is needed for a green Internet?

- low power electronics
- energy-saving protocols
 - ◆ e.g. energy efficient Ethernet (802.3az)
- energy-efficient device design
 - ◆ low-power and stand-by modes for each module in a device
- active power management
 - ◆ power down or switch off modules of devices that are not under heavy/any load
- **monitoring power states and consumption**

Why is monitoring desirable?

- monitoring does not directly save energy
 - ◆ it rather consumes additional energy
- however ...
 - ◆ it helps identifying possible savings
 - ◆ it is needed to evaluate effectiveness of saving measures
 - ◆ it can be used to quantify equipment's total cost of ownership (TCO)
 - ◆ it can be useful for dynamic power management

What needs to be monitored? (1)

Wish list for power state monitoring

- actual power state
 - ◆ e.g. full power, low-power, stand-by, off
 - ◆ times spent in each state
 - ◆ duration of last time period in each state
 - ◆ number of transitions to each state
 - ◆ cause for last transition
- current power source (AC/battery)
 - ◆ times spent on each source
 - ◆ duration of last time period on each source

What needs to be monitored? (2)

Wish list for energy consumption monitoring

- power (current energy consumption rate)
- energy consumption (accumulated)
 - ◆ in total and per power state
 - ◆ for which time intervals?
- it's easy to extend the list much more
 - ◆ ACPI states
 - ◆ Wake on LAN / 802.3az statistics, ...

What do we have already?

- RFC 4268 (Entity State MIB)
 - ◆ standby status (hot, cold, providing service)
- RFC 3621 (Power Ethernet MIB)
 - ◆ good information on small devices powered with PoE
 - ◆ accessible at power sourcing equipment
- RFC 1628 (UPS MIB)
 - ◆ good information for UPS protected devices
- RFC 3433 (Entity Sensor MIB)
 - ◆ generic, can be used for power monitoring
- DMTF power state management profile
 - ◆ targeted at hosts, using Common Information Model (CIM)
 - ◆ rather device profile than actual monitoring
- ACPI (advanced configuration and power interface)
 - ◆ low-level interface to PCs

What seems to be missing?

- we have standards for collecting basic information on power state and source
- we don't have them for statistics and accumulated values

What can we do?

- guideline for power monitoring
- Power MIB as extension of existing RFCs
 - ◆ mainly providing statistics
- are these really needed?
- would the IETF be the right place for this?
 - ◆ more relevant for hosts than for network equipment
- would people be interested in this work?