

INVENTION DISCLOSURE

Invention Title: Heuristic / Adaptive Learning Energy Reduction

Invention Summary: Mechanism to allow Customer Premise Equipment to achieve the lowest possible power modes while still providing an acceptable user experience.

Invention Description: The primary issue with energy reduction in connected devices (such as set-top boxes, cable modems and VoIP equipment) is putting them into low energy states and the time it takes to recover from that low energy state so that it doesn't impact the user experience and user safety.

Typically, televisions take 10 seconds or less to power on. If a connected device takes more than that to turn on, the user experience may be affected. If the connected device is in such a lower power state that it is not connected to the network then many functions may need to be performed before it is ready for use (possible functions include – booting, acquiring access permissions to content, downloading updates, downloading program data, etc.). This could take several minutes, however if the device has knowledge of when the user may be expected to use it then it can go to a higher energy state prior to that time, connect to the network and begin performing the activities to prepare it for use. In this way it may “turn on” in an acceptable time.

This describes mechanisms using learned knowledge of behaviors, usage patterns, other sensors, and predicted future activities to put connected devices into the lowest energy states practical while still providing acceptable recovery times.

For example, a set-top box can learn from the usage patterns during the day, day of the week, weekend, holiday, etc. such that it can go into very low and long recovery energy states when it is unlikely to be used based on historic usage patterns. The set-top box can go into a higher power and quick recovery state when approaching times of likely usage. The set-top box can also use information about programmed events, such as scheduled recordings, to go to higher power states as these events approach.

Other devices in the home such as thermostats, security equipment, light controls, motion detectors, etc. could inform the connected devices of times when it is unlikely that end users are home and thus no usage of the connected devices are expected. Or the same in-home devices could inform the connected devices that potential users are in the home and active or inactive.

The end user could also supplement and improve the usage knowledge by specifying times of likely and unlikely usage. This could speed up the time that the “learning” solution is acceptable.

The intelligence for these learned patterns can be contained in the devices itself or also come from other networked devices such as server equipment that isn't contained in the home.

As part of the Cable Power Reduction effort this was seen as a possible mechanism to achieve lower power usage.

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Invention Commercial value/customers: The value is seen by cable subscribers, cable operators and power companies. Cable subscribers will see lower power bills, cable operators will meet their obligation to provide more efficient CPE and power companies will reduce their need for new power plants.

Invention differences: There is known research on using adaptive learning techniques to manage HVAC systems in buildings. In addition, a consumer thermostat by NEST (<http://www.nest.com/>) claims to learn consumer behavior and automatically adjust after taking in consumer inputs for a while (the consumer modifies the temperature on the thermostat during the first period of usage while the thermostat is learning usage patterns). However, we are not aware of any application of usage learning to support energy management of STBs, or other CPE devices with similar startup challenges.