

INVENTION DISCLOSURE

1. **Invention Title.**

DOCSIS Deep Sleep Mode

2. **Invention Summary.**

A new operational mode for DOCSIS which is aimed at significantly reducing power consumption of cable modems during periods where continuous network connectivity is not expected.

3. **Invention Description.**

a. Describe the invention in detail.

When it is determined that the CM can go into a deep sleep, the CMTS instructs the CM to sleep via a DOCSIS MAC Management Message (for example, via a CM-CTRL message exchange) for a defined period of time (could be on order of minutes) or until kicked on by local process (for example, if the modem needs to transmit data upstream). The CMTS maintains Registration state of the CM while it is hibernating, but does not queue packets and does not schedule station maintenance.

When the CM wakes up it performs initial maintenance (including acquiring SYNC and ranging) then resumes normal operation – it does not need to re-perform the registration process (meaning that it does not need to perform DHCP, acquire a configuration file via TFTP, etc.). If the wakeup was due to the defined period expiring, the CM might immediately be told by the CMTS to go back to sleep.

If the defined period expires and the CM doesn't wake up and range, (i.e. it was switched off during hibernation) then the CMTS clears out the Registration state for the CM.

In deep sleep, the CM doesn't need a real-time clock, so it can shut off that functionality. It might even be able to write contents of memory to flash and then power down fairly completely.

This sleep mode would be more applicable to a DSG modem in a STB than a modem being used for internet connectivity or phone service due to the timing and process involved in waking the modem. However, if customers are willing to accept the operational impacts – such as through a customer choice – there could be some application for data modems. Those modems providing phone service would likely not be candidates for this in any scenario.

b. Why was the invention developed? What problem(s) does the invention solve? How is it better?

Energy consumption is a growing concern. Both operators and customers have an increased interest in minimizing energy consumption while in the process maintaining functionality.

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Standby losses of consumer equipment have been an especially attractive target for improvement in energy efficiency. In particular there has been significant press regarding the inefficiency of the standby mode currently employed by cable STBs.

This invention is intended primarily for embedded cable modems in devices that have a distinct "standby" state (e.g. a STB), but could be used in other situations as well.

The invention allows the CM to draw very little average power when in deep sleep. The idea is that the CM is essentially powered off, but upon waking doesn't have to re-register, which can reduce the amount of time that it takes to resume operation. Additionally, the operator has some indication that the CM is still connected to the network, so the DSG STB doesn't look like a non-responder.

c. Briefly outline the potential commercial value and customers of the invention.

This invention could become mandatory for all DSG cable modems, or conceivably for all cable modems providing data services if the operational impacts are considered acceptable, or if customers are willing to accept the impact in order to reduce power consumption (for example, through customer choice).

4. HOW is this invention different from existing products, processes, systems?

Recent solutions for improved STB standby behavior involve shutting the CM off completely. This invention defines a new operational mode for the CM that results in a reduction in the time required for the CM to resume operation, and further provides fairly continuous state in the CMTS that the CM has not simply gone offline, while providing similar power savings.