Applications and Development of a Plug Load Management System That Automatically Identifies the Type and Location of Connected Devices

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Abstract : Plug and process loads (PPLs) account for 47% of U.S. commercial building energy use. There is a huge potential to reduce whole building consumption by targeting PPLs for energy savings measures or implementing some form of plug load management (PLM). Despite this potential, there has yet to be a widely adopted commercial PLM technology. This paper describes the Automatic Type and Location Identification System (ATLIS), a PLM system framework with automatic and dynamic load detection (ADLD). ADLD gives PLM systems the ability to automatically identify devices as they are plugged into the outlets of a building. The ATLIS framework takes advantage of smart, connected devices to identify device locations in a building, meter and control their power, and communicate this information to a central database. ATLIS includes five primary capabilities: location identification, communication, control, energy metering and data storage. A laboratory proof of concept (PoC) demonstrated all but the data storage capabilities and these capabilities were validated using an office building scenario. The PoC can identify when a device is plugged into an outlet and the location of the device in the building. When a device is moved, the PoC's dashboard and database are automatically updated with the new location. The PoC implements controls to devices from the system dashboard so that devices maintain correct schedules regardless of where they are plugged in within a building. ATLIS's primary technology application is improved PLM, but other applications include asset management, energy audits, and interoperability for grid-interactive efficient buildings. A system like ATLIS could also be used to direct power to critical devices, such as ventilators, during a brownout or blackout. Such a framework is an opportunity to make PLM more widespread and reduce the amount of energy consumed by PPLs in current and future commercial buildings.