

Integrating DLM with Building Automation System Networks

Set fixed MAC addresses for network bridges and panels to accommodate third party devices

Topic: DLM Network Addressing

Issue: # TB180

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A key feature of Digital Lighting Management (DLM) is its ease of setup, including automatic configuration of not only each local network, but also WattStopper devices on an open protocol BACnet MS/TP segment network. In fact, WattStopper's development of an "Auto MAC" addressing algorithm for its DLM network bridges and LILM panels is leading the market, and a working group has proposed incorporating this technology into the BACnet standard (see sidebar on page 2).

However, there may be third party devices on the MS/TP network that are not compatible with this technology and rely on fixed MAC addresses. This bulletin explains:

- Why every BACnet MS/TP device requires two addresses: a high level Device ID and a low level MAC address
- How DLM automatic MAC addressing works
- How and when to manually set network addresses

BACnet Device ID

Each DLM network bridge and LILM panel uses a high-level address known as the Device Instance Number, or Device ID, for system-wide communication with large controllers. This address is a number between 0 and 4,194,302, which is the decimal expression of a 22-bit digital address. The Device ID range includes a very large number of possible addresses because each interconnected device in every system must use a unique number. Imagine a campus with dozens of buildings, each with hundreds of devices, where every device must be identified on the network by a unique address.

The default Device ID for DLM network bridges is the last six digits of the product's serial number. Since each Device ID will almost always be unique on a given project, it is seldom necessary to change these numbers. However, it

is sometimes advantageous to assign more meaningful addresses prior to configuring the segment network. One addressing technique is to preface each Device ID number with the floor number on which the device is installed.

LILM panels do not have a serial number but are shipped with a default ID number that is easy to change during panel setup for projects with multiple panels.

BACnet MAC address

While larger controllers are typically interconnected using high-speed Ethernet, communicating via BACnet IP (a form of TCP/IP), the majority of the "bus level" devices on a BACnet system such as thermostats, VAV controllers, and DLM network devices, reside on one of many small RS-485-based BACnet MS/TP segment networks. These MS/TP segments rely on each device's low-level address, known as the Media Access Control, or MAC address. For DLM devices, this address is a number from 0 to 127. The

LMCT-100 Wireless Configuration Tool



LILM Panel Setup Screen



The easiest way to change Device IDs and set fixed MAC addresses on network bridges is to follow the prompts on an LMCT-100. Set LILM panel addresses with each panel's built-in user interface.

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number must be unique only within the individual segment network.

The factory default setting for all DLM MAC addresses is 255. This special number, outside the required address range, prompts the device to perform WattStopper's Auto MAC addressing algorithm upon power up and automatically choose a MAC address that is not being used by any other MS/TP device.

Upon power up, each network bridge and LILM panel in Auto MAC mode listens to network traffic to find unused MAC addresses. In turn, each device chooses one of these addresses and asks if any other DLM device is using this number. If no other device responds, "yes" the asking device takes the number. If another device responds, "yes" the asking device waits until its next turn to talk and tries again. The process continues until each device has a unique MAC address. This unique algorithm is what makes the DLM segment network so easy to commission compared to most other products that require manual addressing using DIP switches or similar means.

Auto MAC assigns a maximum of 96 addresses in the range of 32 to 127. This is to reserve address numbers 0 to 31 for third party devices with fixed MAC addresses. This is why WattStopper recommends a limit of 96 network bridges and/or LILM panels per segment network even though the BACnet-defined limit is 127.

After their initial setup, DLM devices again negotiate for

Proposed BACnet Addressing Extension

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) owns and maintains the BACnet standard, ANSI/ASHRAE Standard 135-2010. The MS/TP Working Group is currently proposing an extension of the standard titled "Zero-Config MAC Address for MS/TP" that is based largely on WattStopper's automatic addressing algorithm.

addresses every time the system is powered up. The Auto MAC process is typically faster on subsequent power cycles, as each DLM device will try to use the same address it used previously, but it may result in different MAC addresses. Since the segment manager uses the Device ID to identify each DLM network device, a new MAC address is of little consequence to DLM, and the process allows new DLM devices to be seamlessly integrated into the system, but it can affect some other devices in a building automation system (BAS) network.

Auto MAC and the BAS

Each BAS is unique and each will have differing dependencies on the MS/TP MAC address. Some systems are like DLM and are unaffected as long as the numbers are unique on the segment. Others use the MAC address in some proprietary way where allowing addresses to change will have undesirable effects on the operation of the system. **To ensure the most harmonious integration of DLM in any installation using a BAS, the best practice is to set fixed MS/TP MAC addresses for all network bridges and LILM panels.**

To support this practice, WattStopper project management will work with the BAS system integrator to coordinate DLM addressing. When specified, the DLM Device ID and MS/TP MAC addresses will be noted on submittal documents, and the commissioning technician should manually address each network bridge and LILM panel.

In Conclusion

The exclusive DLM Auto MAC addressing algorithm ensures that the DLM segment network will start up and communicate without the complexity of manually addressing the devices. However, if there is any chance that DLM will be integrated with a BAS at a later date, we recommend setting fixed MS/TP MAC addresses.