# *Watt*Stopper®

# Tech Bulletin

## Best Practice Rules Simplify Startup By Limiting Network Scale

**Topic:** DLM Network Design          **Issue:** # TB189.1          **Date:** January 10, 2016

Designing and specifying networks to connect Digital Lighting Management (DLM) rooms adds many powerful capabilities to a project. Whether the job requires scheduled behaviors, energy monitoring, or single-location maintenance and tuning via LMCS software, following design best practices is key to delivering a reliable system that is simple to install.

Segment network wiring termination quality and polarity are critical to network integrity, and are outlined in Technical Bulletin 179.

Constraining the physical scale of the network also enhances system performance, and simplifies installation and maintenance. As an example, limiting the number of terminations on a network makes it easier to troubleshoot, saving time both for the field technicians and installing contractors who must make any needed corrections. Similarly, while a segment network's RS-485 communication protocols allows up to 4,000' (1,220m) of wire, the shorter the network, the less time it will take to identify and correct problems, should any occur.

Logical scale must also be considered for efficient operation. Limiting the quantity of DLM in-room products on a segment network optimizes the flow of network traffic by ensuring that the amount of available data is easily manageable.
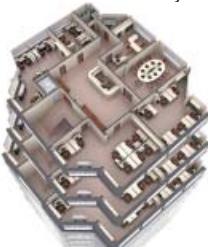
WattStopper has developed the following design rules to help reps, specifiers and installers create robust networks that are easy to start up and fully support the implementation of DLM's advanced functionality.

### New Rules for Basic and Advanced Networks

For the purposes of specification and pricing, DLM network systems are categorized as Basic or Advanced, based on the physical scale of the installation, as well as the complexity of any integration. The two categories were developed to enable clear and consistent communication between WattStopper and the specification community.

**Systems with up to three segment networks, and integration via the Segment Manager export table, are considered Basic.** Specifying Basic scale systems speeds and simplifies bidding, as it does not require input from WattStopper professional services.

**Advanced systems are any projects that are larger or more complex.** All advanced systems require approval from WattStopper professional services prior to bid.

Following the design best practice rules for Basic and Advanced systems will increase serviceability, decrease installation time, and improve service team responsiveness wherever networked DLM is sold.
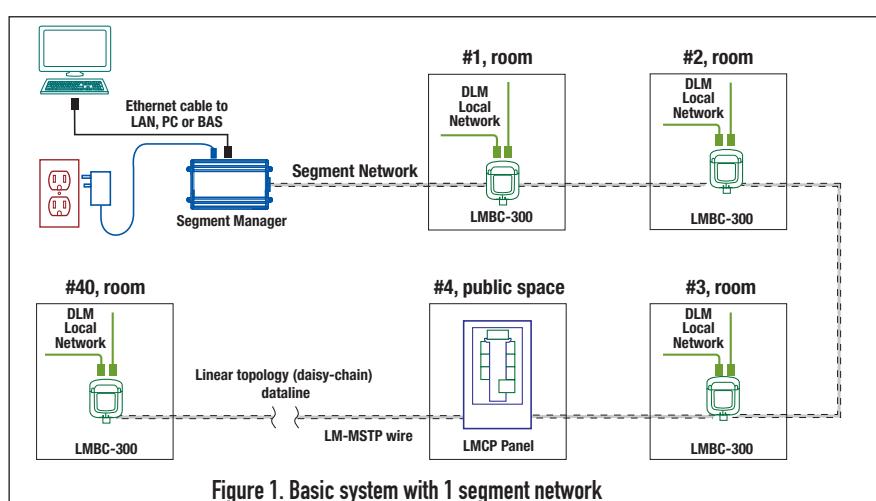


**Figure 1. Basic system with 1 segment network**

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### RULES FOR EACH SEGMENT NETWORK

#### 1. Maximum number of rooms or devices

A segment network may have **no more than 40 network bridges** (DLM rooms) **or 300 digital in-room products** (devices). A dual criteria is necessary because while each DLM room represents one network termination, the logical "footprint" of a given room increases as more in-room products are added. If either the rooms criteria or in-room products criteria is met the segment network is at capacity, and any excess devices must be placed on an additional segment network. **Best practice is to design networks to accommodate future growth or changes**, such as limiting segment networks to 80% of maximum (32 rooms or 240 devices).

#### 2. Comparing LILM and LMCP panels to rooms or devices

Relay panel products supported by the Segment Manager must be treated as large DLM rooms when calculating the segment network device count, as shown in the equivalency chart below. Note that because LMCP relay panels create data objects for connected in-room products, a count of connected products (sensors, switches, etc.) must be added to the device equivalency number to establish the total data footprint for the panel.

| Panel | Room equivalency | Device equivalency | Connected devices |
|-------|------------------|--------------------|-------------------|
| LMCP8 | 3 | 20 | Count connected devices |
| LMCP24 | 5 | 30 | Count connected devices |
| LMCP48 | 7 | 40 | Count connected devices |
| LILM8* | 3 | 20 | Do not count connected devices |
| LILM24* | 5 | 30 | Do not count connected devices |
| LILM48* | 7 | 40 | Do not count connected devices |

* not recommended for new DLM projects

#### 3. Network wire specification

WattStopper LM-MSTP segment network wire is **required** in order to guarantee that installation and serviceability are consistent from project to project.

#### 4. Location of connected rooms or panels

A segment network may only connect to Network Bridges or panels installed on **a single floor, or wing**, though the home run may be to a Segment Manager or router on another floor **(see CAD drawings 90-775 and 90-775-1, available at wattstopper.com/design-tools/cad-drawings.aspx, for examples).** Limiting network terminations to one floor helps ensure consistent EMI exposure, and is easier for technician and installers, preventing the need to move tools and documentation from floor to floor. Home runs up and down a riser can frequently be implemented as a single, unbroken, piece of wire, that present little difficulty for either installation or troubleshooting.

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### RULES FOR BASIC DLM NETWORK SYSTEMS, ILLUSTRATED ON PAGE 4

#### 1. Maximum number of segment networks and DLM rooms or devices

Basic systems are limited to **three segment network**s, and each must comply with the rules outlined above. If all the networks are at full capacity, a Basic system is therefore limted to a maximum of **120 total network bridges** (3 segments x 40 rooms), **or 900 total digital in-room products** (3 segments x 300 devices).

#### 2. Segment Manager specificiation

Basic systems require **one LMSM-3E Segment Manager**, and may not use routers.

#### 3. Segment Manager location

Whenever possible, **the Segment Manager should be located at the beginning of the segment network** (see Figure 2 on page 3) because the network must be grounded at one end, and the best place to ground the network is at the Segment Manager. The network must ONLY be grounded at one location. Locating the Segment Manager at the end of the network also simplifies the task of termination. (Please see Technical Bulletin 179 for additional information.)

#### 4. Integration restriction

BACnet IP integration to BAS is allowed using the **Segment Manager export table** only.

#### 5. Quotation and ordering

As long as **SCOM and SDRAWSYS service part numbers are included**, the rep can develop pricing and place orders for Basic systems using the Quote Tool. There is no need for additional approval by WattStopper.

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**Note: Any DLM network system is categorized as Advanced if the project includes any of the following requirements:**

1. History trending or reporting of any data other than that tracked by the Segment Manager or Supervisor by default.

2. Alarming via network data to a third party

3. BACnet integration that exceeds the capabilities of the Segment Manager export table

4. Niagara integration using LMSM-CONNECT except to a WattStopper Supervisor

5. OpenADR automated demand response

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### BASIC DLM NETWORK TOPOLOGY
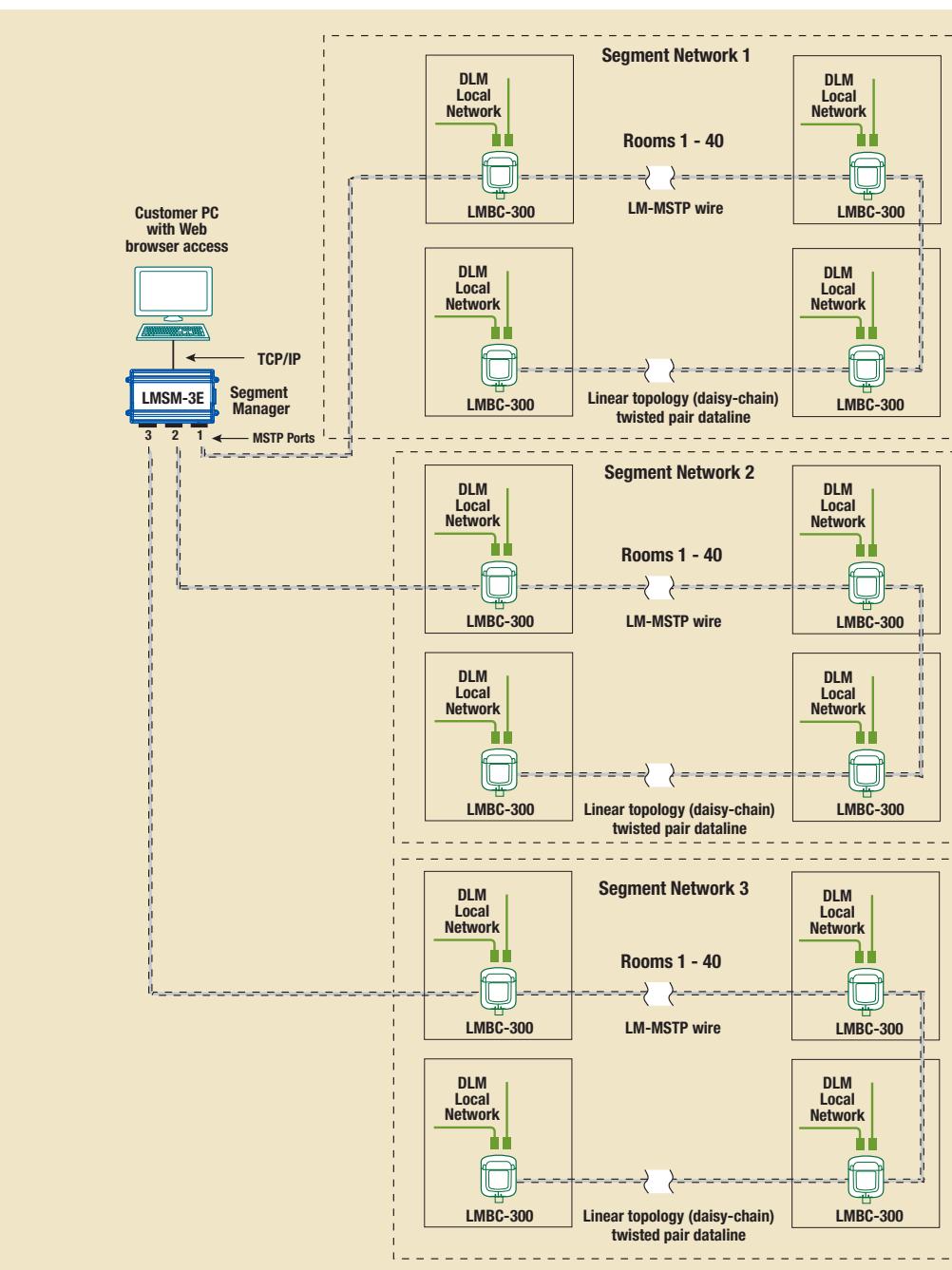


**Figure 2. Basic system with 3 segment networks**

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### RULES FOR ADVANCED DLM NETWORK SYSTEMS, ILLUSTRATED ON PAGE 6

**1. Additional segment network requirement**

Each segment network requires **one NB-ROUTER**. There is no explicit limit on the number of routers. Segment networks must comply with all rules outlined on page 2.

**2. Segment Manager specificiation**

Advanced systems may use **one or more LMSM-6E Segment Manager**. Each LMSM-6E can manage up to 300 network bridges or up to 2,200 digital in-room devices.

**3. Router location**

The router must be at **one end of the segment network**, and should be located as **close as possible to the Segment Manager**, preferably in the same enclosure **(see CAD drawing 90-776, available at wattstopper.com/design-tools/cad-drawings.aspx, for an example)**. Ethernet networking between routers should be minimized.

**4. BACnet integration options**

BACnet IP integration to BAS is allowed using the Segment Manager export table. BACnet IP integration to BAS is allowed via parallel connection to the BACnet/IP network if approved by WattStopper professional services.

**5. Quotation and ordering**

Project management must be involved in the system design and quotation. Note that project management may work with installation and/or design teams to determine whether the project will be better served with less than 40 network bridges or 300 DLM in-room devices per segment network.

Please be aware that the following project requirements that require specialized design and **contact WattStopper professional services for assistance prior to bid.**

**Direct integration** through BACnet routing is not allowed when a Segment Manager is present without prior approval. Coordinating sequences of operation developed by an integration contractor with use cases introduced by allowing the customer to access the Segment Manager interface requires clear communication between parties and an understanding of possible conflicts. Some may be as simple as understanding that the rooms will follow the last command sent to them regardless of the source. Some may be as complicated as understanding that

rooms will follow the highest priority command and ignore requests from other systems.

Similarly, if the project requires using the global scope of segment networks to coordinate **conditional logic behaviors**, please consult WattStopper for prior to bid. Examples of such behaviors include animal lab control lockout to enforce circadian cycles, fixture wear-leveling through tracking last-active ballasts, or OpenADR behaviors whether or not they integrate with an energy utility company.

WattStopper professional services with the Product Line Manager for networked systems products can help you meet the requirements of even the most demanding projects.

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### ADVANCED DLM NETWORK TOPOLOGY
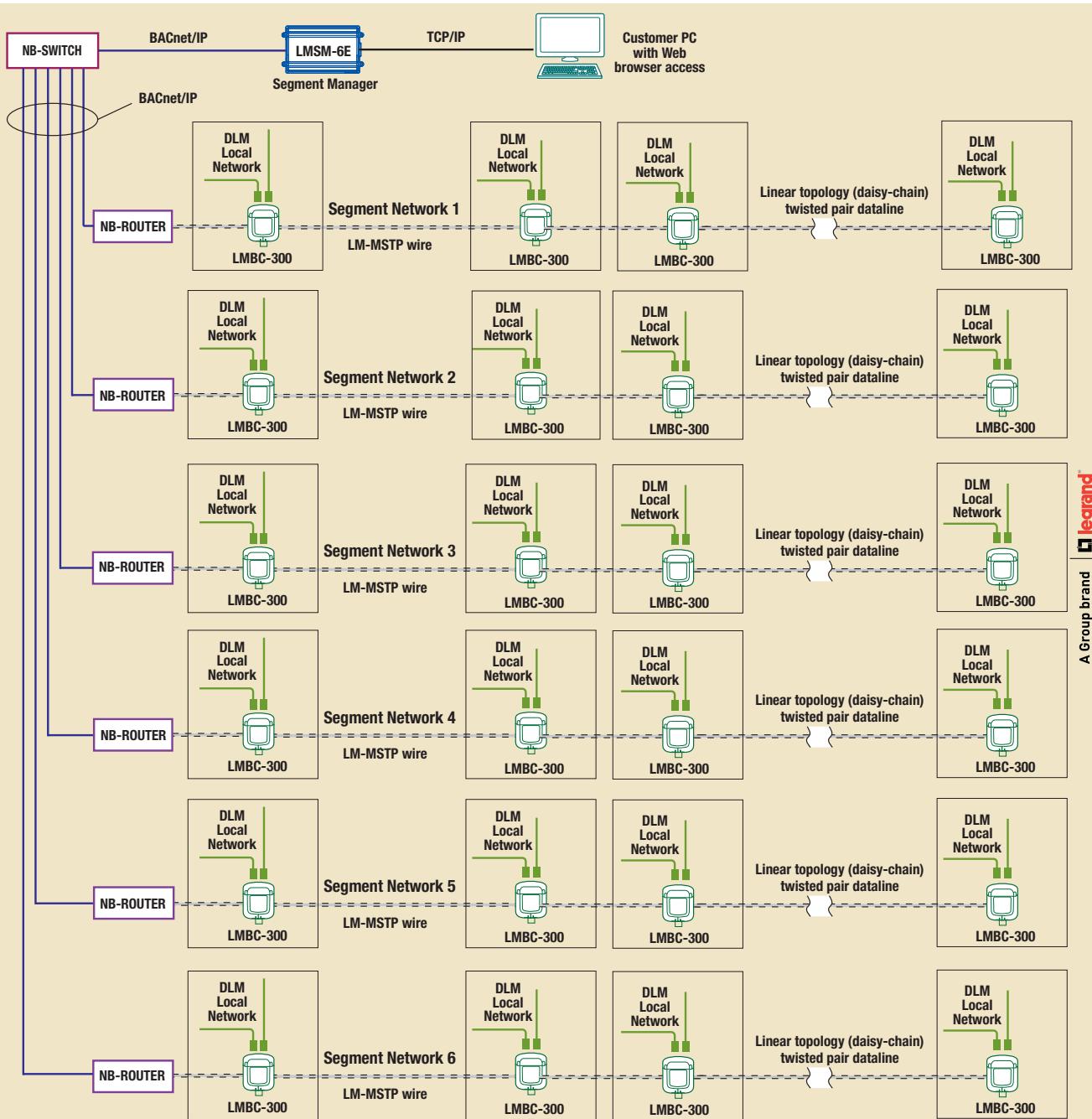


Figure 3. Advanced system with 6 segment networks. See CAD Resource drawings 90-775, 90-775-1 and 90-776 for additional information.