

TECHNICAL REPORT



Connectivity for lighting systems

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CONNECTIVITY FOR LIGHTING SYSTEMS

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IEC TR 63425 has been prepared by IEC technical committee 34: Lighting. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
34/896/DTR	34/913A/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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INTRODUCTION

Lighting systems are used in various applications such as indoor lighting (both residential and non-residential), outdoor lighting and emergency lighting. These lighting systems can include functionalities such as lighting monitoring and control, lighting energy management and data collection. There are many communication protocols in the global market. It is important for system designers and integrators to have an understanding of the variety of communication protocols used in lighting systems. By taking into account knowledge and information of other industries, designers can create appropriate systems that integrate lighting and non-lighting performances. Standards and reports referencing communication protocols such as the ISO/IEC 14543 series, the IEC 62386 series and ANSI/IES TM-23-17 exist, but a need for a comprehensive international technical report has been identified.

Technologies of lighting systems are rapidly developing as a result of evolving customer needs and new connectivity technologies. Examples of such systems are smart homes/buildings, smart cities, adaptive roadways and horticultural lighting. The internet of things (IoT) enables the interconnecting of lighting systems. This document provides information and guidance on how lighting systems operate and interconnect with other systems.

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CONNECTIVITY FOR LIGHTING SYSTEMS

1 Scope

This document provides information and guidance on the connectivity aspects of lighting systems to operate and to interconnect with other systems.

This document provides an overview of various connectivity solutions used within lighting systems, including topologies, communication protocols and related embedded functionalities.

This document does not express preference for any specific topology or protocol.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

NOTE Terms and definitions for lighting systems and related equipment are given in IEC TS 63105.

3.1

communication protocol

set of rules for data transmission in a system interlinking several system components

[SOURCE: IEC 60050-351:2013, 351-56-14, modified – The term "protocol" has been replaced by "communication protocol", in the definition "participants" has been replaced by "system components" and the notes to entry have been deleted.]

3.2

open protocol

communication protocol which is publicly available and developed in an open consensus process under the auspices of a recognized organization

[SOURCE: ANSI/IES TM-23-17, 2.14.1, modified – "open protocols are standards that are" has been replaced by "protocol which is" and "typically not-for-profit" has been deleted.]

3.3

proprietary protocol

communication protocol that is not an open protocol

3.4

connectivity

capability of a system or device to communicate to other systems or devices without modification

[SOURCE: ISO/IEC 13066-1:2011, 2.9, modified – "be attached" has been replaced by "communicate".]

4 Topologies, OSI model, physical layers and communication protocols¹

4.1 Topologies

4.1.1 Point-to-point topology

Point-to-point topology is a type of topology where two fixed nodes are connected directly to a single line. This topology is the basic form of a network. See Figure 1.

- Features:
 - This topology is the simplest topology which connects two nodes in the network.
- Examples of use in lighting systems and other systems which can control lighting:
 - Bluetooth®, ECHONET Lite™ (ISO/IEC 14543-4-3) and Ethernet (IEEE 802.3).

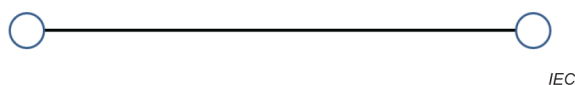


Figure 1 – Point-to-point topology illustration

4.1.2 Bus topology

Bus topology is a type of topology where each node is connected to a single line. This topology is one of the basic forms of a network. See Figure 2.

- Features:
 - A new connection on the bus topology is possible simply by attaching a new node.
 - Small to even relatively large systems can be configured in a relatively economical way.
 - Faults on each node have no effect on other parts of the network. However, failure of the main line will affect the whole network.
- Examples of use in lighting systems and other systems which can control lighting:
 - DALI® (IEC 62386 series), 0-10 VDC, PWM (IEC 60929), KNX® (ISO/IEC 14543-3-10 and ISO/IEC 14543-3-11), BACnet® (ISO 16484-5), LonWorks® (ISO/IEC 14908 series) and ECHONET Lite™ (ISO/IEC 14543-4-3).

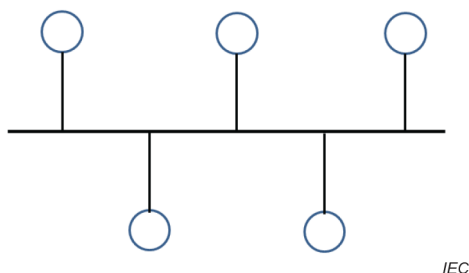


Figure 2 – Bus topology illustration

4.1.3 Daisy chain topology

Daisy chain topology is a type of topology where one node is connected to the next node in the chain. For example, node A is connected to node B and node B connected to node C, and so on. See Figure 3.

¹ The trademarks and trade names mentioned in this document are given for the convenience of users of this document. This information does not constitute an endorsement by IEC of the products named.

- Features:
 - This topology is one of the simplest topologies to add more nodes in the network.
- Examples of use in lighting systems and other systems which can control lighting:
 - DALI® (IEC 62386 series), DMX, BACnet (ISO 16484-5), LonWorks (ISO/IEC 14908 series) and ECHONET Lite (ISO/IEC 14543-4-3) .

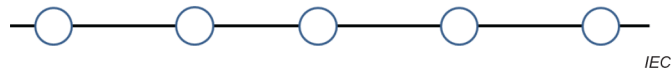


Figure 3 – Daisy chain topology illustration

4.1.4 Ring topology

Ring topology is a type of topology where each node is connected to two adjacent nodes, forming a closed loop or ring shape. See Figure 4.

- Features:
 - This topology, compared to the bus topology, has a longer configuration line. And in the case of a one-way connection, faults on each node will affect the whole network.
- Examples of use in lighting systems and other systems which can control lighting:
 - BACnet (ISO 16484-5), LonWorks (ISO/IEC 14908 series) and ECHONET Lite (ISO/IEC 14543-4-3).

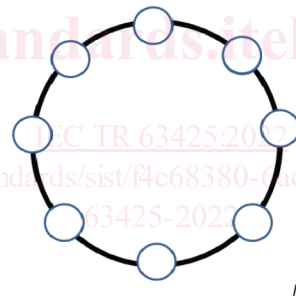


Figure 4 – Ring topology illustration

4.1.5 Star topology

Star topology is a type of topology where each node is connected to one central node and where the central node has the responsibility of managing the whole network. A star topology can be used for wired and wireless connections. See Figure 5.

- Features:
 - This topology is one of the most popular topologies for a local area network. In the event of a fault on a specific node, the remaining nodes in the network will function normally. However, a fault on the central node can affect the whole network.
- Examples of use in lighting systems and other systems which can control lighting:
 - DALI® (IEC 62386 series), KNX (ISO/IEC 14543-3-10 and ISO/IEC 14543-3-11), BACnet (ISO 16484-5), ECHONET Lite (ISO/IEC 14543-4-3), LonWorks (ISO/IEC 14908 series), Ethernet (IEEE 802.3) and Wi-Fi™.