

1 Introduction

A topology is a (pictorial) description of the structure and hierarchy of a network, including the devices and communication paths.

The *Logical Topology* describes the configuration of an installation from the point of view of the communication flow. The *Physical Topology* gives a, mostly simplified, description of the physical layout of the communication media and the physical location of the KNX Devices.

2 Logical Topology, medium independent

The logical topology of a KNX installation is structured in a Backbone Line, Main Lines and

Lines. This structure is reflected in the Individual Address of KNX devices.

There is only one single **Backbone Line**.

Main Lines are hierarchically subordinate to the Backbone Line. Up to 15 Main Lines may be defined in an installation. Main Lines may be numbered from 1 to 15. The Backbone Line has Main Line number 0. No Main Line may have Main Line number 0.

Main Lines may be connected to Backbone Lines by means of an optional **Backbone Coupler**. There may at maximum be one Backbone Coupler in a Main Line. The Backbone Coupler belongs to the Main Line, not to the Backbone Line. A Backbone Coupler always has Device number 0 and Line number 0.

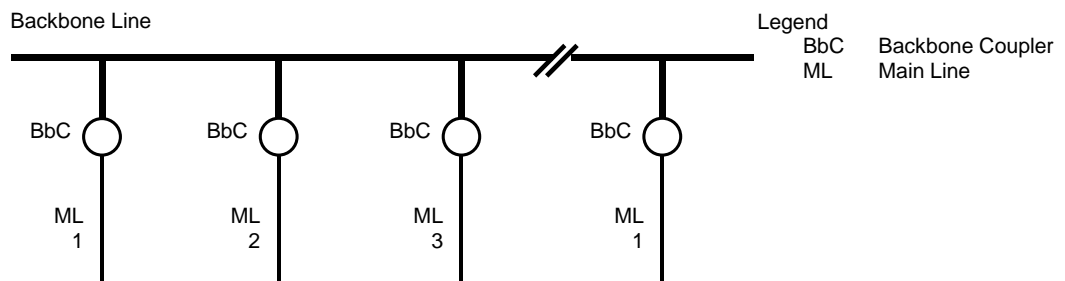


Figure 1 - Backbone Line & Main Lines

Lines are hierarchically subordinate to the Main Lines. Up to 15 Lines may be defined per Main Line in an installation. Lines may be numbered from 1 to 15. A Main Line must always have Line Number 0. No Line may have Line Number 0. Line Numbers are written preceded by the number of the Main Line the Line is connected to.

Lines may be connected to Main Lines by means of a **Line Coupler**. There may at maximum be one Line Coupler in a Line. The Line Coupler belongs to the Line, not to the Main Line. The Line Coupler always has the Device number 0. No other device may have the device number 0.

Examples:

“4.9” may be the notation for the Line 9 connected to Main Line 4.

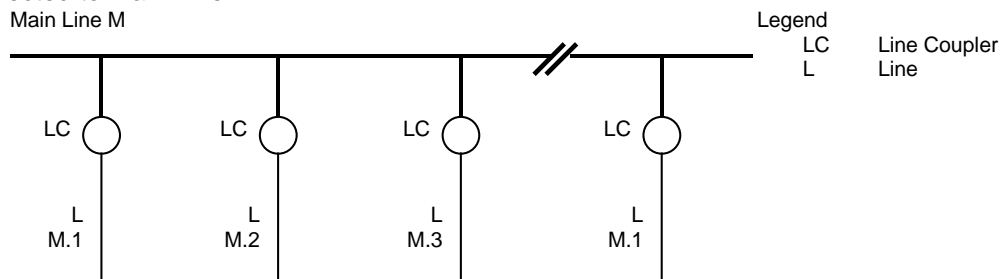


Figure 2 - Main Line & Lines

An **Area** consists of the whole of a Main Line with subordinate Lines and all connected devices. A KNX installation may therefore count up to 15 Areas. The Area number is the number of the Main Line it contains. The

Backbone Line with the devices attached to it is not seen as an Area.

A **Subnetwork** is any part of this topology with the same Main Line number and the same

Line number. The Backbone Line, any Main Line and any Line are Subnetworks.

Devices can be addressed in any Subnetwork. KNX End Devices may be numbered from 1 to 255. No KNX End Device may have Device number 0.

The KNX End Devices may be connected anywhere in this topology. Up to 255 KNX End

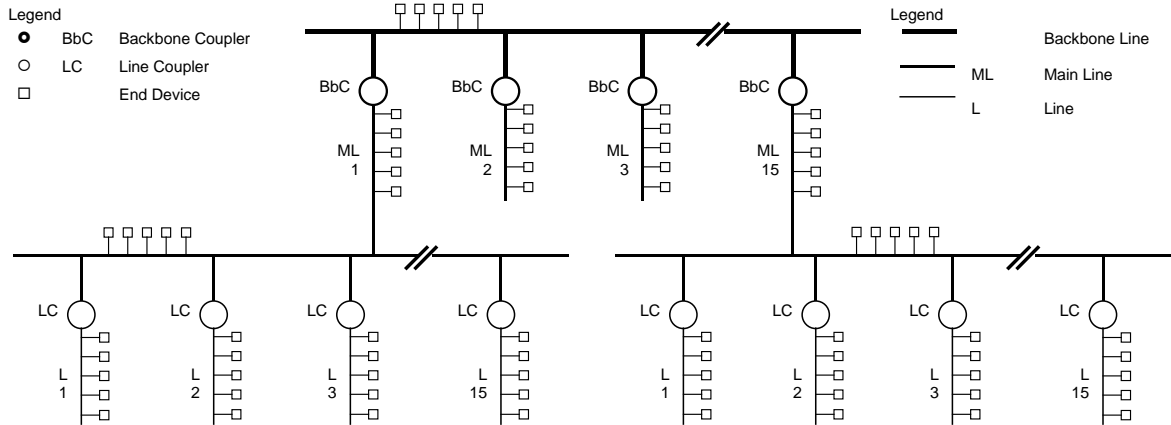
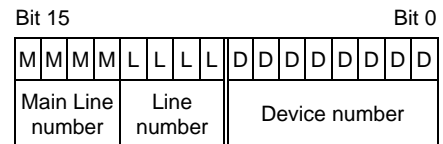


Figure 3 - Backbone Line, Main Lines and Lines

2.1 Hierarchical Structure

The Logical Topology defines a hierarchical organisation of the KNX Network: messages may only pass from one Subnetwork to another following a path in the Logical Topology.



This Individual Address is written as M.L.D

2.2 Individual Address

Every KNX Device (Backbone Coupler, Line Coupler, KNX End Device, ...) must have an Individual Address. This Individual Address is unique throughout the complete topology. The Individual Address of any device is composed as follows:

Reserved Individual Addresses:

Device number "0" is reserved for Backbone Couplers and Line Couplers.

NOTE AS A BACKBONE COUPLER IS INSTALLED IN A MAIN LINE, ALSO ITS LINE NUMBER IS "0".

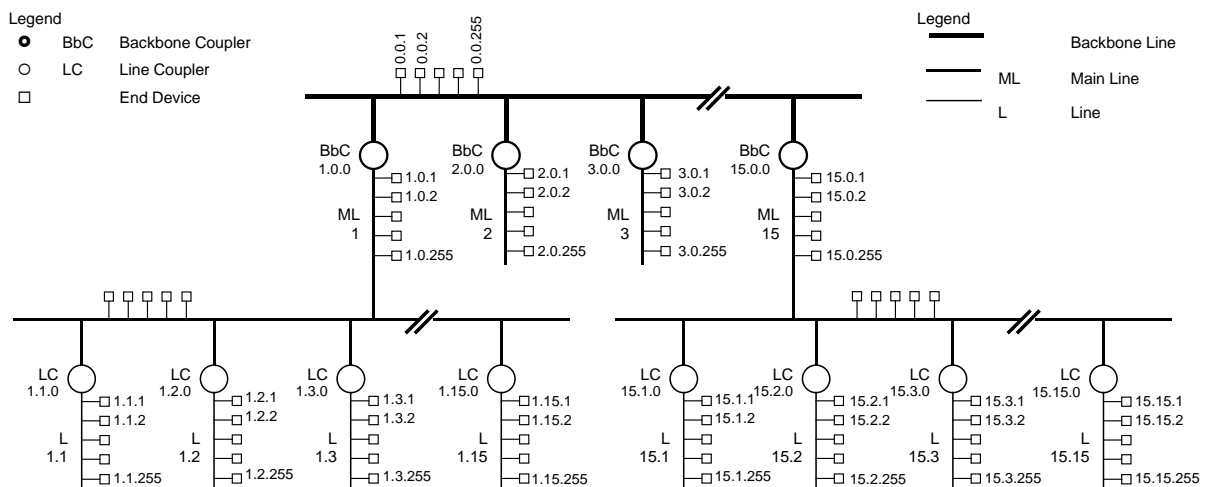


Figure 4: Logical Topology reflected in the Individual Addresses

Examples:

- “4.9.12” may be the Individual Address for any KNX End Device.
- “4.9.0” is the Individual Address of the Line Coupler that couples Line 4.9 to Main Line 4.
- “7.0.0” is the Individual Address of the Backbone Coupler coupling Main Line 7 to the Backbone Line.

3 Media in the Logical Topology

The Subnetwork is the smallest part of the Logical Topology that shall be implemented with one single Physical Layer type. It is not allowed to split up a Subnetwork into different Physical Layer types.

A **Domain** is that part of the Logical Topology over which the data signals of one Physical Layer type propagate, possibly with resending with identical characteristics but without changing the message contents and with respect of the Logical Topology.

The smallest possible Domain therefore is a Subnetwork. A larger Domain may enclose one or more united Subnetworks.

Closed Media are these Physical Layer Types on which the message signals propagate along the medium in a controllable way.

EXAMPLE TWISTED PAIR

Open Media are these Physical Layer Types on which the message signals do not follow a wirelike physical medium

EXAMPLE POWERLINE, RADIO FREQUENCY

In open media, it may be impossible to physically separate:

a) Subnetworks

In this case, the Backbone Couplers and Line Couplers are optional. Lines may then be connected to Main Lines without a Line Coupler and Main Lines may be connected to the Backbone Line without a Backbone Coupler.

b) Domains

If in 2 Domains identical transmission characteristics are used, messages pass undetected from one Domain to another.

To allow separating Subnetworks and Domains and thus respect the Logical Topology, the Link Layers of open media limit their communication by using a **Domain Address**. This Domain Address separates between Domains in one KNX Network and between different KNX Networks. The Domain Address is an unstructured 16-bit number. Every Domain has an own unique Domain Address within an installation.

Domain Address 0000h is reserved for cross-media broadcast communication.

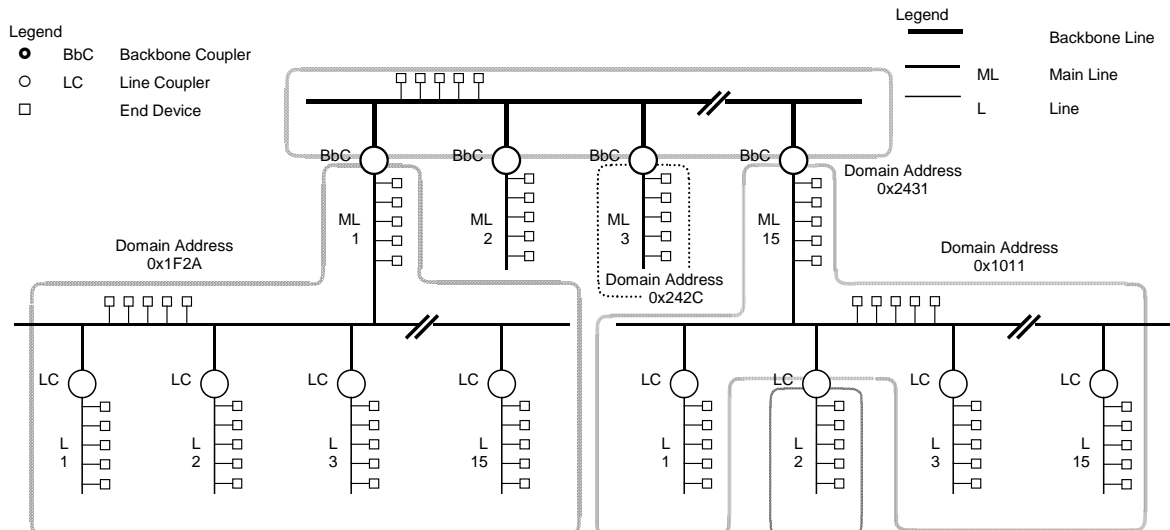


Figure 5 - Examples of Domains and Domain Addresses

3.1 Message Routing

To allow in principle for connection oriented communication between any two devices in a KNX installation, possibly connected to different media with none or more, possibly different media in-between, the Individual Address must be unique throughout all used media.

If neighbouring Subnetworks are connected to each other via a Line- or Backbone-Coupler - this is mandatory a Media Coupler in case of coupling different media - this coupler shall filter the messages in both directions. This routing is a functionality of the Network Layer in the Coupler.

The filtering is based on the destination address field and for open media additionally on the Domain Address-field in the message.

The following cases are possible:

1. Destination Address = Group Address

The routing is in this case based on a routing table containing information which group addressed messages shall be passed.

2. Destination Address = Individual Address

The routing is in this case based on a comparison between the coupler's own Individual Address and the destination address.

3. Destination Address = Broadcast

- Closed media: messages are always passed in both directions
- Open media: messages are passed or not based on the Domain Address

a) Domain Address \neq 0x0000

The Media Coupler does not pass the message to the other medium.

b) Domain Address = 0x0000

The Media Coupler passes the message to the other medium.

4 Notes

- Lines may also be connected directly to the Backbone Line. This is however not recommended.

4.1 Twisted Pair

- For KNX Twisted Pair media, Electrical Segments are defined. An Electrical Segment is a part of a Subnetwork that is electrically uninterrupted. If in an Electrical Segment the Twisted Pair is short-circuited, no communication is possible in that Electrical Segment.

NOTE FOR POWERLINE, IF WE TAKE THE SAME DEFINITION OF ELECTRICAL SEGMENT AS "PART OF THE PHYSICAL MEDIUM THAT IS ELECTRICALLY UNINTERRUPTED", AN ELECTRICAL SEGMENT MAY AS WELL ENCOMPASS MORE THAN ONE LINE.

- The Electrical Segment is part of the Physical Topology of the KNX Network, not of the Logical Topology. In KNX TP1, up to 4 Electrical Segments may be connected using 3 Repeaters.

NOTE REPEATERS CAN EXTEND THE RANGE OF A SUBNETWORK IN KNX TP1-64. IN KNX TP1-256 THEY ARE NOT NECESSARY.

- A Subnetwork may exist of at least one, to up to four electrical segments. Every electrical segment may be powered by one or two Power Supply Units.

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