



**New opportunities
in smart metering
with the KNX Standard,
the European standard
for Home & Building
Control (EN 50090)**





The KNX M-Bus interface



Define a model to make information from M-Bus (RF) metering devices accessible on a KNX network

- **for usage within that KNX network, and**
- **to make it available to external networks.**

KNX M-Bus Interface

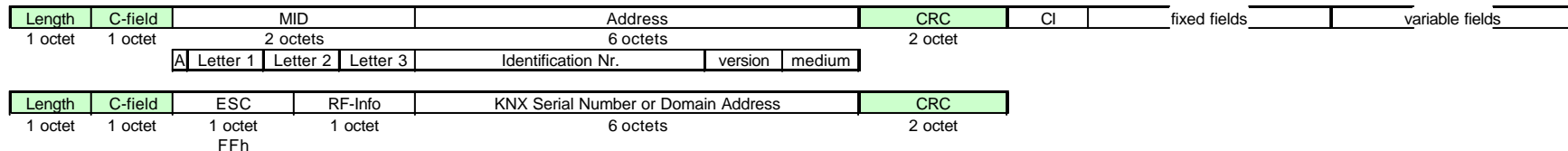
The challenge

M-Bus

KNX

- Typically multiple data records in one transmission.
- The frame may contain manufacturer specific parts.
- The same information can be encoded in various ways. This is indicated **in** the frame by:
 - DIF integer, real, BCD + length
 - VIF unit (Wh, J ...) + resolution (decimal factor)

- Typically only one piece of information in a transmission.
- Manufacturer specific information is handled in manufacturer specific DPs.
- The same information is always encoded in the same way. It is not necessary to transmit indications on this.



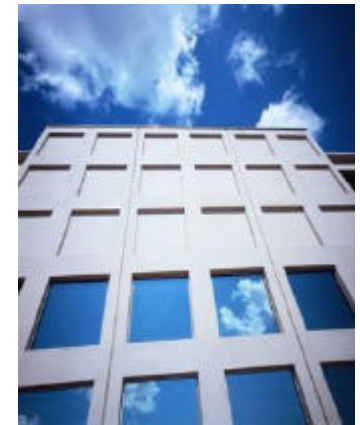
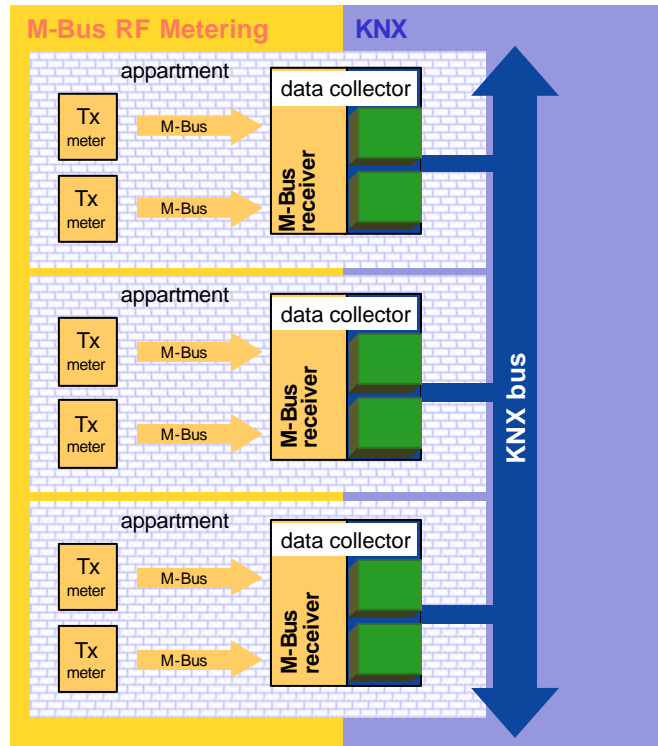
The solution encompasses:

1. the KNX application model for M-Bus
2. the KNX support of the M-Bus RF protocol
3. the KNX Data Collector for M-Bus
4. the KNX M-Bus Repeater

KNX M-Bus Interface

The solution

The KNX application model for M-Bus (1)



The KNX application model for M-Bus (1)

❖ The Data Collector supports

- EN 13757-4 Wireless meter readout (Data Link Layer)
- EN 13757-3 Dedicated Application Layer (M-Bus)

❖ Constraints (1)

- Only the following physical media (MID-field in M-Bus frame) are supported so far:
 - Heat (outlet) (code 4)
 - Warm Water (code 6)
 - Water (code 7)
 - Heat Cost Allocator (code 8)
 - Cooling Load meter (inlet) (code A)
 - Cooling Load meter (outlet) (code B)
 - Heat (inlet) (code C)
 - Heat and Cool (code D)

The KNX application model for M-Bus (3)

❖ Constraints (2)

- Encrypted data will be skipped.
- Only tariff 00b and 01b are accepted.
 - Tariff information allows differentiating data with the same storage number, typically, but not exclusively used for monetary information.
- Only subunit 0 is supported.
- Most primary VIFs are accepted, but only 8 VIFE with VIF = FBh and none with 7Dh, 7Fh, FDh, FEh and FFh.

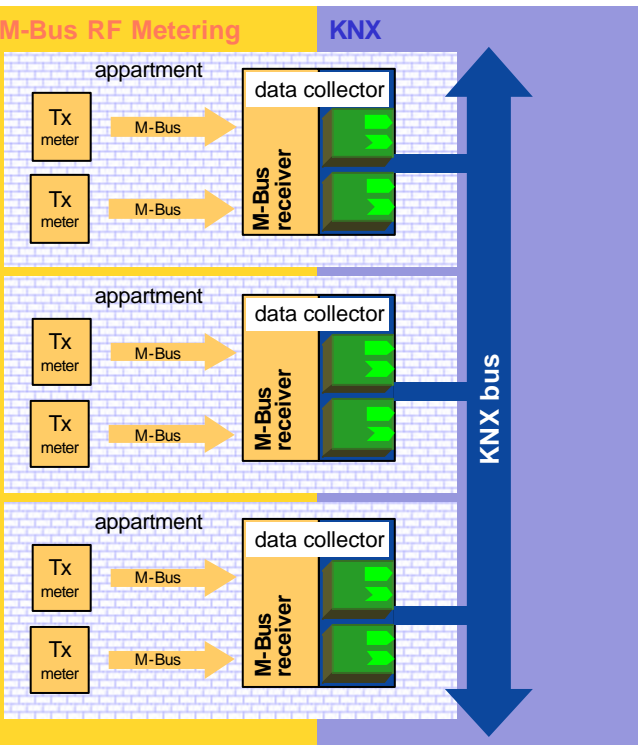
The Data Collector - General ()

❖ M-Bus Data is by the Data Collector


- received
- filtered, and
- interpreted

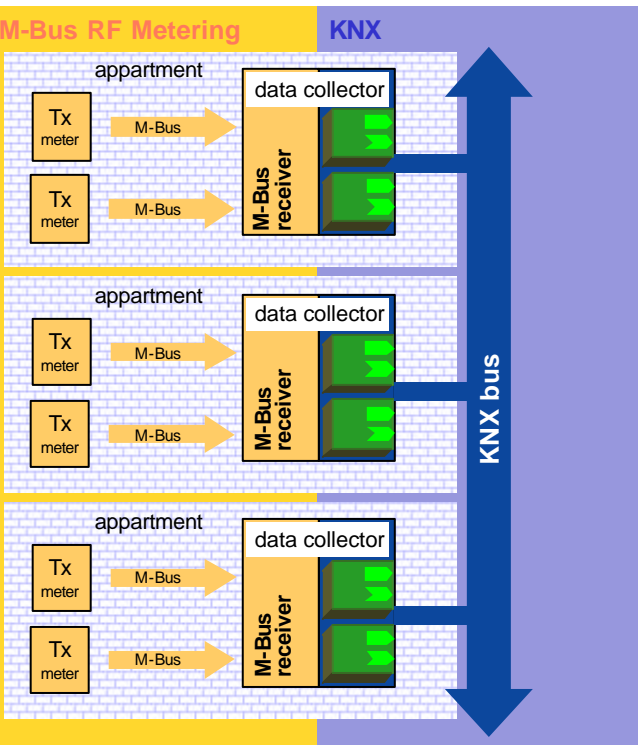
❖ Configuration

- On M-Bus side:
 - Each metering device is linked to the Data Collector using the M-Bus “push button mode”
 - The Data collector stores for each connected metering sensor:
 - Identification No
 - Manufacturer
 - Version
 - Medium
 - Fabrication number
 - The meter quits installation mode after 5 min.
 - The Data Collector’s Installation Mode is quit manually, or after a 1 hour time-out.
- On KNX-side, S-Mode (ETS) is used.



The Data Collector - General ()

- ❖ It maps and stores the data
 - For each connected metering sensor, it shall create one dedicated Interface Object .
 - It shall allow connecting at least 8 metering sensors (= 8 Interface Objects).
- ❖ Further functions
 - Support for meter replacement

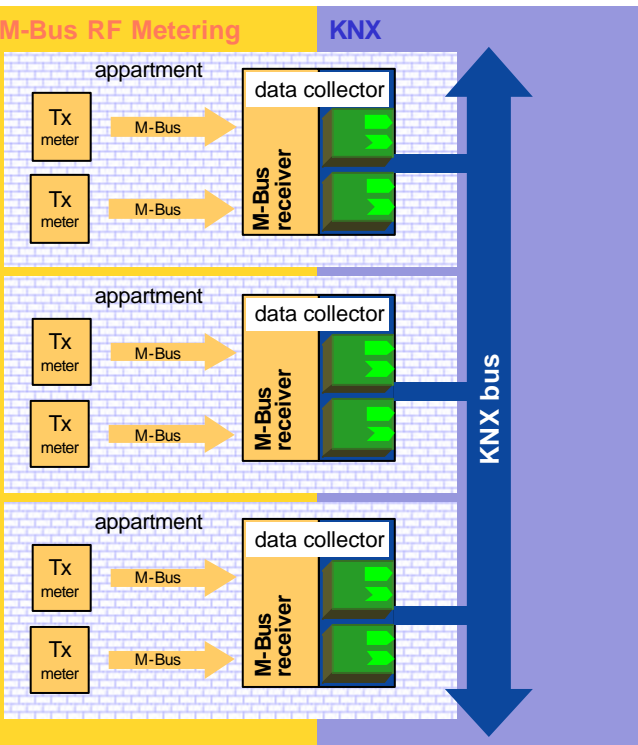


KNX M-Bus Interface

The solution

The Data Collector – Interface Objects (IO)

- All accepted and filtered metering data from a connected metering sensor shall be stored as Properties ➔ of the related Interface Object.
- A Property Value is an array:
one array element is used per *storage number*.



KNX M-Bus Interface

The solution

The Data Collector – Interface Objects (I/O)

Field	Value from example	Data Type	Memory type
RX-Sequence counter ¹	02 (by receiver)	Octet	volatile
RX-Reception Time ¹	22.09.04 12:03 (by receiver)	DPT_DateTime	volatile
Manufacturer ²	CEN	2 octets	non volatile
identification number ²	12345678	8 digits BCD	non volatile
Version ²	01	octet	non volatile
Medium ²	04	octet	non volatile
Fabrication number ²	98765432	8 digits BCD (like ident. no)	non volatile
access number	09	octet	volatile
Status	08	octet	volatile
operating time	--	DPT_LongDeltaTimeSec	volatile
on time	--	DPT_LongDeltaTimeSec	volatile
current date	22.09.04 12:00	DPT_DateTime	volatile
current consumption	187 kWh	DPT_MeteringValue	volatile
current consumption (Tarif1)	1875 x 0,1 m ³	DPT_MeteringValue	volatile
current power		DPT_MeteringValue	volatile
max. date	15.06.04	DPT_DateTime	volatile
max. power	112 W	DPT_MeteringValue	volatile
min. date		DPT_DateTime	volatile
min. power		DPT_MeteringValue	volatile
error date	01.07.04	DPT_DateTime	volatile
error consumption		DPT_MeteringValue	volatile
averaging duration	1 h	DPT_LongDeltaTimeSec	volatile
raw data of telegram (starting from CI) ³	72 78 56 34 12 AE 0C 01 04...	String of octet (min.. 127 octets)	volatile

KNX M-Bus Interface

The solution

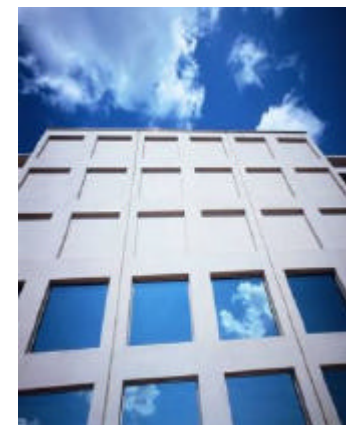
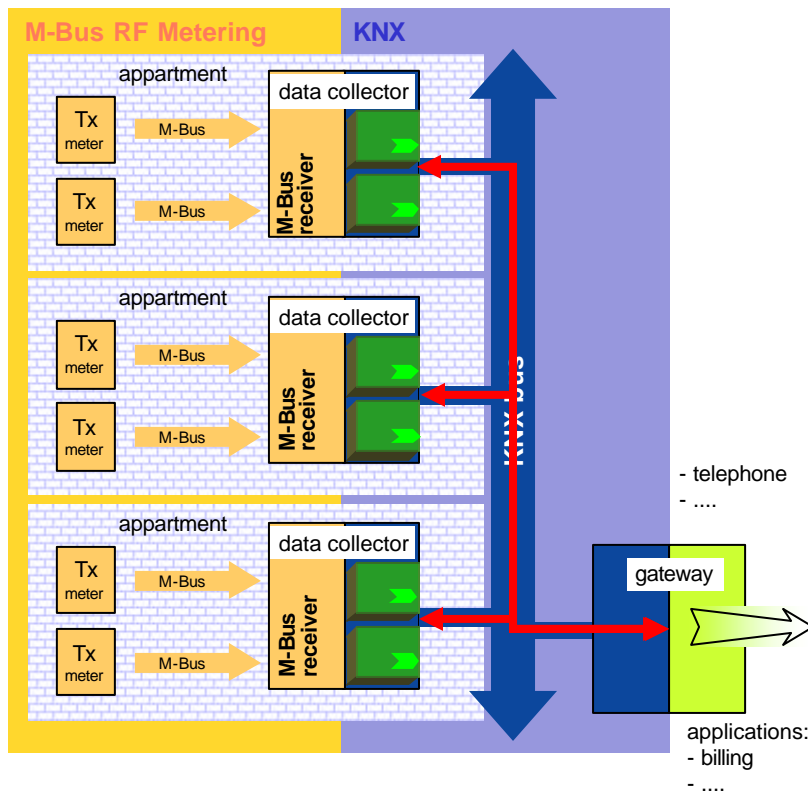
The Data Collector – Interface Objects ()

Property Array index	Property							
	Storage Number (>0) DPT_Value_1_Ucount	HistoryDate DPT_DateTime	HistoryEnergyConsumption DPT_MeteringValue	HistoryEnergyConsumption_T1 DPT_MeteringValue	HistoryVolumeMaxFlow DPT_MeteringValue	HistoryVolumeMinFlow DPT_MeteringValue	HistoryMaxPower DPT_MeteringValue	HistoryMinPower DPT_MeteringValue
1	1 (fixed) (billing period)	31.12.2003	100 kWh	void	void	void	void	void
2	3 (monthly value)	30.06.2004	160 kWh	void	16 x 0,1 m ³ /h	void	350 W	void
3	3 (monthly value)	31.07.2004	170 kWh	void	17 x 0,1 m ³ /h	void	180 W	void
4	3 (monthly value)	31.08.2004	180 kWh	void	18 x 0,1 m ³ /h	void	200 W	void
...
n	void	void	void	void	void	void	void	void

KNX M-Bus Interface

The solution

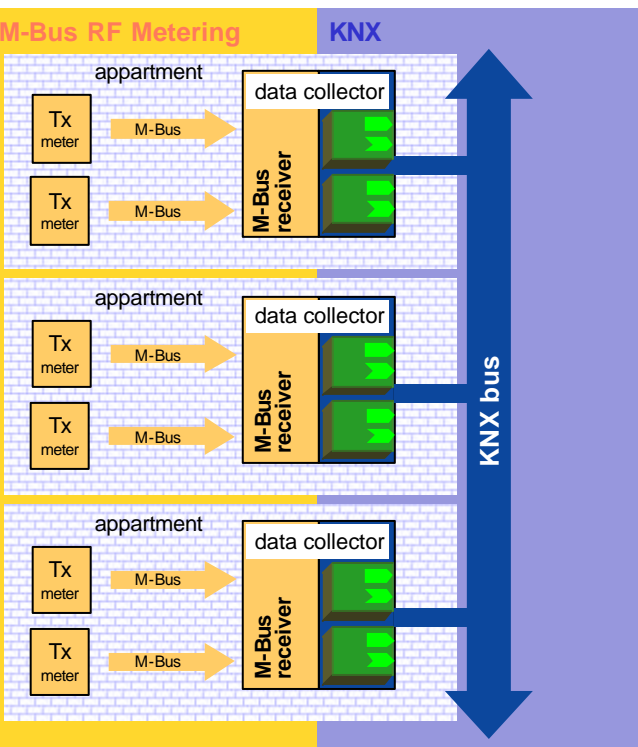
Use case 1 : remote meter reading



The Data Collector – Group Objects ()

- Certain accepted and filtered metering data from a connected metering sensor is additionally accessible as a Group Object ➡ .
- Currently, this concerns:
 - current consumption data
 - metering sensor status information

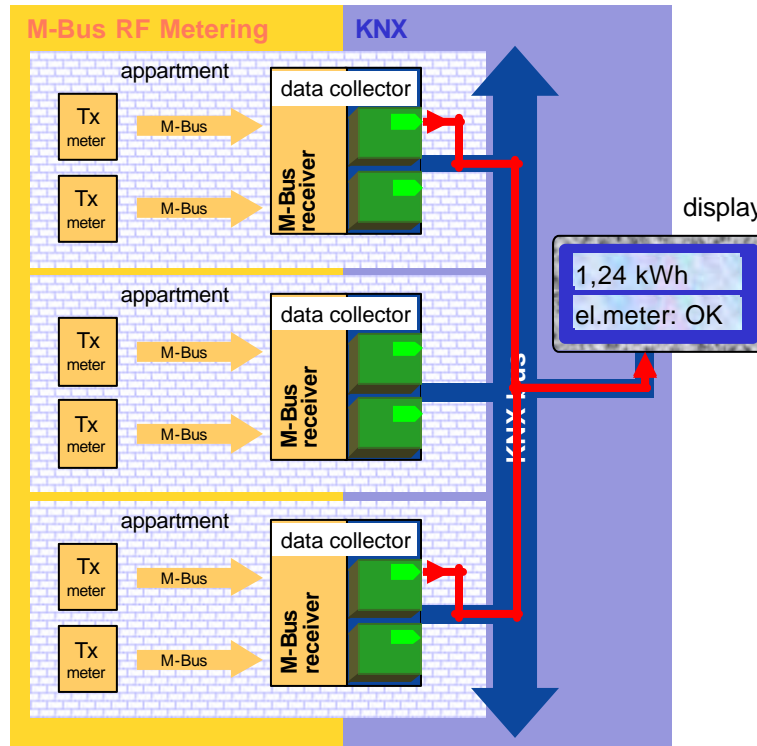
Other values can be considered.
- In the future, this may be used for:
 - Load shedding and load management



KNX M-Bus Interface

The solution

Use case 2 : link with home control
(display)



The KNX M-Bus repeater

Receives frames from a sender and repeat them for the receiver if the communication between both is unreliable.

❖ Needless retransmissions and frame avalanches are prevented by:

■ A history list

By storing unique features of a retransmitted frame (sender address, CRC...) in a short circular buffer frames that are received again can be recognised and will not be repeated.

The list is cleared automatically after 3 s of silence.

■ Filtering – Filter Table

This table contains the M-Bus address information (manufacturer + hard or soft address). Only frames received from addresses contained in this table may be repeated.

This table can be programmed by a service tool or teached-in via push button mode.

❖ Up to three repeaters in sequence are possible.



New opportunities



New opportunities

Possible business

❖ End user

KNX already provides control and sensor data for heating and cooling applications. This metering data completes this picture, in view of energy saving.

❖ Installer: KNX installer / M-Bus installer

- An available KNX network can be reused. This simplifies the installation.
- Install and configure the Data Collectors and possible repeaters.
- Link possibly with displays in the KNX installation.
- Teach in the metering devices.
- Install and configure the gateway.
- Forward the installation documentation to the the billing company.


❖ Wholesaler

KNX and M-Bus are EN standards. Both compatible domains are now linked, meaning one technical solution may be offered.

New opportunities

Possible business

❖ Manufacturers

- The Data Collector and the gateway may complete the existing product palette allowing to offer a complete, standard solution from one hand.
-  is established as a label for quality and compliance. This increases the product market acceptance in certain segments.
- Existing KNX displays may visualise new information.
- The link with M-Bus creates and additional value for the use of KNX in a building.

❖ Service companies

- The interface from the gateway to the outside world is not covered, but neither changed by this proposal. Only the way the data is retrieved from the Data Collectors is specified.



Thank you for
your attention.

