0. Introduction

The DFI (Data Flow Interface) standardization initiative

This document is a first outline for an amendment to the IEC 62056-21 standard describing how to establish a standard for a digital output device for delivering abounding real-time measurements to home and building automation systems. The document is based on the standard IEC 62056-21 mode D.

The described interface incorporates measurements for electricity, heat, gas, water and cooling.

In the document the physical interface is based on the Toslink socket. In the coming work this selection will be discussed and finalized.

With the described output interface the need for real-time values for the end consumer's future need is solved in the light of coming Smart Grid and demand respond solutions. Streaming of real time information enabling the next generation of smart home and building services

1. Scope

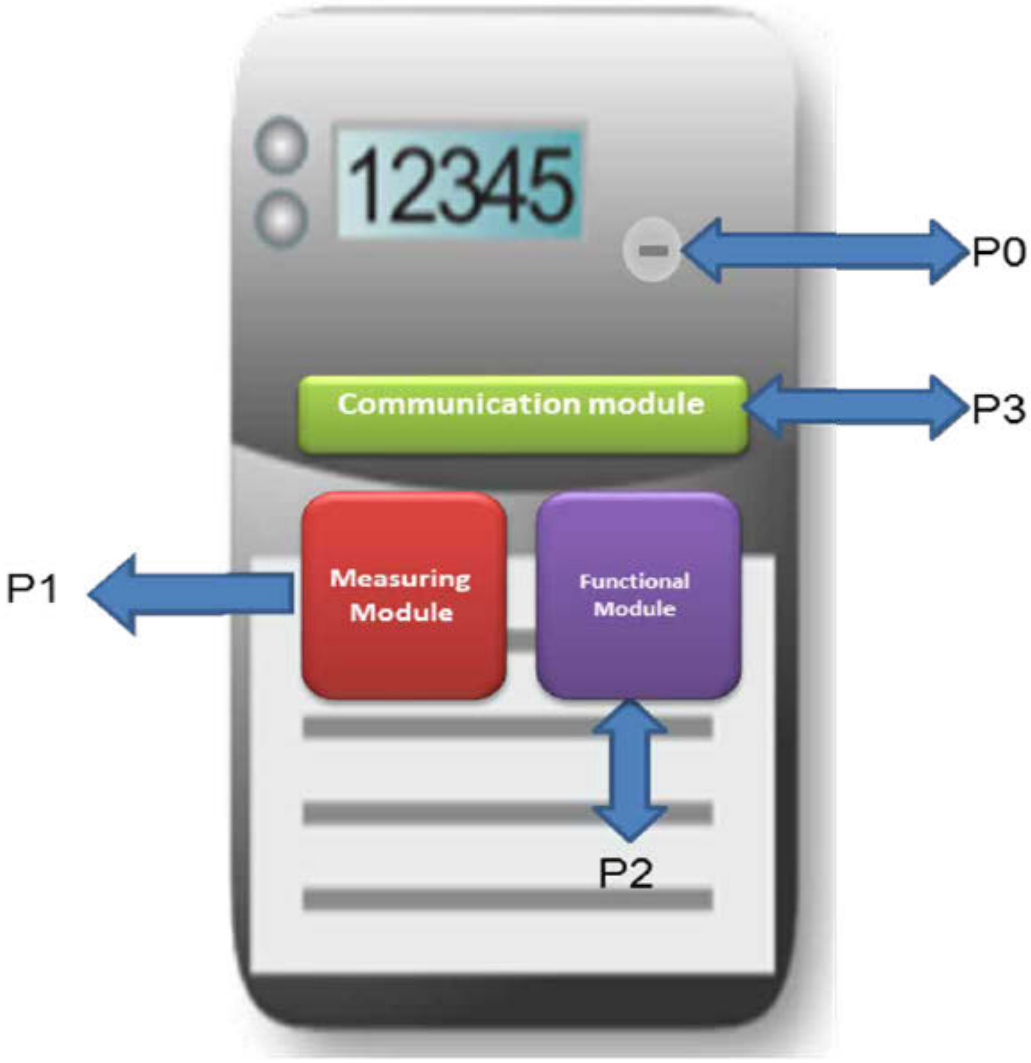
This part of IEC 62056-21 describes the technical, physical and logical specifications of an interface for local data exchange in one-way direction between the electricity meter and a PAN/HAN system.

Note: The interface will not include tariffs and load controlling information just real time values. Tariff and load controlling Information will be supported to the system owner by the energy supplier, a service provider or the costumer .The communication between the described interface and the PAN/HAN system will be selected and maintained by the PAN/HAN system owner.

2. Normative references

To be completed.

”OUT-line”
Specification interface HAN/P1



3. Block diagram installation

The picture below describes the installation of a meter in a household with the different interfaces used.

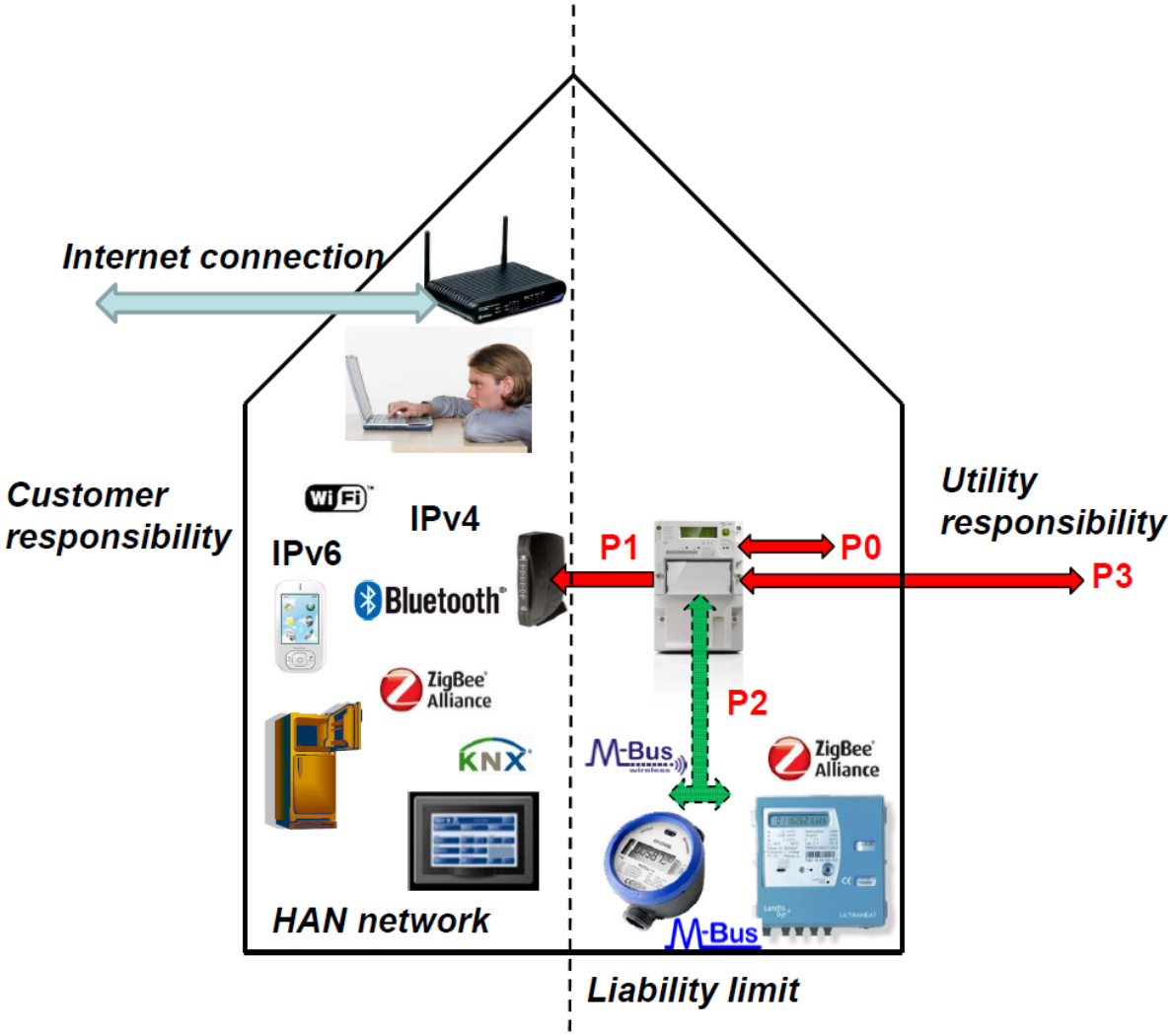


Figure 1: Block diagram installation

There are four different connections towards the metering unit:

P0: Interface for local communication for utility use
P1: Interface against HAN, ”Home Area Network”
P2: Interface for local meter and other utility related equipment.
P3: Interface towards the central system.

The household and other actors serving the end customer shall use P1 if they need information from the metering unit. On top of that connection any other communication media, like the end customers IP connection, can be used to deliver the services the end customer asks for. The other interfaces, P0, P2 and P3 shall be used for are for utility and related functionality. This creates clear limits of liability between different actors.

Port P1 shall be provided free of charge from the utility, everything connected to it is the responsibility of the end customer. The interface will provide enough information to enable all possible needs for the end customer or by him selected service provider. The access of the port is the responsibility of the end customer since it is a physical connector that has to be connected to the metering unit.

4. P1 interface

The port P1 connected to other communication channels, such as broadband and telecommunications, provides the opportunity for all stakeholders to create and deliver services that are fully decoupled energy company / network installation company, and therefore competitively neutral. It creates no law requiring prioritization / bandwidth or functionality from external actors against the utility installation. Here it is important that one, and only one, interface is standardized to achieve competitive neutrality, that is, a service provider should be able to use the same equipment for all end users. The interface to be unidirectional, that it is not possible to influence the measuring unit in any way, it should also be galvanically separated so that connected equipment can't damage the measuring unit electrically.
The idea is that the P1 port should not cause any increase in costs for the product, but provide good access to all measurement data in real time.

5. HAN "Home Area Network" module

From P1, the standardized interface, it must be possible to connect external devices to retrieve the raw data available from all "utility equipment connected to the metering unit. The end-user that wants to use a service that requires data from the metering unit, have to purchase and install an interface module or control module. Interface module provides a gateway between the metering unit and the end users HAN solution. HAN solutions may be e.g. WLAN, ZigBee, KNX. P1 can also be connected directly to a controller, such as energy optimization controller, and possibly from there distributed in a HAN network.
For data that can't be delivered from the metering unit the end user and service providers have to resolve the communication with another solution, such as the customer's Internet connection, it should not be sent via P3 the utility communication channel.

6. P1, Interface towards PAN/HAN gateway

Protocol	Physical interface
IEC 62056-21 Mode D, activated by a timer Update time 1 second	Optical according to: EIAJ standard CP-1201 for Digital Audio Interfaces

IEC 62056-21 Mode D defines a one way communication with fixed baud rate, it is defined as follows:

Activation: Timer, update every second.
Baud rate: 115kbit, to give enough of performance to deliver all available data in a 1 second update time. It will provide space for approximately 10 000 characters, if data is maximum 78 characters long it will provide space for approximately 1000 values every second.

/	X	X	X	3?	Identity	CR	LF	CR	LF	Data	!	CR	LF

XXX: Manufacturer identity, three capital characters
Identity: Manufacturer specific identity, 16 writable characters except ”/”,”!”.
Data: Data block with measuring data, all writable characters except ”/”,”!”.

Data consist of one or more lines ended with CR+LF, Data lines
Every line consist of one or several datasets

One dataset looks as follows:

Obis code	(	Value	*	Unit	)

The Obis codes are according to IEC 62056-61, a simplified summary is reported below

The OBIS codes are defined as follows

A	-	B	:	C	.	D	.	E	.	F

A: Type of measurement data
- 0: Abstract data
- 1: Data related to Electricity
- 5: Data related to Cooling
- 6: Data related to Heat
- 7: Data related to Gas
- 8: Data related to Cold Water
- 9: Data related to Hot Water

B: Channel (We assume one channel only)
- 0: No channel defined

C: Defines abstract or physical quantities, depending on what have been set in field A. The code could have different meaning if it is electricity or heat.
A=1 ; Electricity
- 0: Abstract data
- 1: Active energy import

2: Active energy export
3: Reactive energy import
.

A=6 ; Heat
0: Abstract data
1: Energy
2: Flow
.

D: Type of value, like meter reading, instantaneous value, the code depends on the code I field A. It means that a code can have different meaning depending on field A
A=1 ; Electricity and A=6 Heat
8: Meter reading
7: Instantaneous value
.

E: Tariff.
A=1 ; Electricity and A=6 Heat
0: Total
1: Tariff 1
.

F: Defines values related to tariff periods, in Sweden that could be hourly values, 15 minutes values in other countries.
The question is if these values should be transferred through P1 ? To be discussed in the project.

Example on data line:

1-1:1.8.0(123456.789*kWh)(2011-11-12-12:34)	Active energy meter reading at 12:34 2011-11-12

Electricity	**Identity (OBIS code)**	**Unit**	**Number of digits / decimals**
Meter reading Active Energy import (A+)	1-1:1.8.0	kWh	6/2
Meter reading Active Energy export (A-)	1-1:2.8.0	kWh	6/2
Meter reading Reactive Energy import (R+)	1-1:3.8.0	kVARh	6/2
Meter reading Reactive Energy export (R-)	1-1:4.8.0	kVARh	6/2
Active total power		kW	3/3
Reaktiv total power		kVAR	3/3
Active power L1		kW	3/3
Active power L2		kW	3/3
Active power L3		kW	3/3
Voltage L1		V	3/1
Voltage L2		V	3/1
Voltage L3		V	3/1
Current L1		A	2/2
Current L2		A	2/2
Current L3		A	2/2
Alarm		Event	NA/NA

Heat	**Identity (OBIS code)**	**Unit**	**Number of digits / decimals**
Meter reading Energy		kWh	6/2
Meter reading Volume		m3	6/3
Temperature incoming		C	3/1
Temperature outgoing		C	3/1
Difference temperature		C	3/2
Power		kW	3/2
Flow		l/h	3/0
Error code/Status		-	-
Alarm		Event	NA/NA

Cold Water	**Identity (OBIS code)**	**Unit**	**Number of digits / decimals**
Meter reading Volume		m3	6/3
Flow		l/h	3/0
Temperature		C	3/1
Error code/Status		-	-
Alarm		Event	NA/NA

Hot Water	**Identity (OBIS code)**	**Unit**	**Number of digits / decimals**
Meter reading Volume		m3	6/3
Flow		l/h	3/0
Temperature		C	3/1
Error code/Status		-	-
Alarm		Event	NA/NA

Gas	**Identity (OBIS code)**	**Unit**	**Number of digits / decimals**
Meter reading Volume		m3	6/3
Meter reading Volume, temperature compensated		m3	6/3
Flow		m3/h	3/0
Temperature		C	3/1
Pressure		Pa	3/1
Error code/Status		-	-
Alarm		Event	NA/NA