Smart meter real-time (H1) interface interoperability

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EMpower Prosumers group (EMP)
ESMIG
Task Force "H1 interoperability"

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About ESMIG

ESMIG is the European industry association that provides solutions and expertise on smart energy measurement and management at a European level. ESMIG's members are the leading companies in the European smart metering market: meter manufacturers, IT companies, data communication and protection solution providers, system integrators, etc.

The activities of ESMIG are organised through various working groups that cover strategic, regulatory, and technical subjects. These groups are reviewing statements and papers issued by European organisations and produce proposals about how to approach the important issues that influence the implementation of smart energy solutions in Europe.

ESMIG's technical working groups focus on functional and technical requirements for all solutions provided by its members. Technological developments are moving fast and the trend in infrastructures is modularity in order to be able to cope with these developments that are different for different components of the Automated Metering Infrastructure. This implies more interfaces and increased complexity of standards that must be able to support the developments in technology still to come.
ESMIG's working group Empower Prosumers (EMP) focusses on consumer engagement and technology that support such engagement. As a follow-up of earlier work in ESMIG on the architecture and Use Cases for the Next Generation Smart Meter, a new task force "H1 Interoperability" was formed to define interoperability requirements for the real-time interface of the Smart Meter, internationally referred to as "H1 interface".

We would like to thank all ESMIG members that contributed to the work to create this report.

Willem Strabbing
Technical Director
ESMIG

TABLE OF CONTENTS – PART I

1 Introduction and reader guidance 4
1.1 Introduction 4
1.2 Reader guidance 4
1.3 Chapters and Annexes ..... **Fout! Bladwijzer niet gedefinieerd.**

2 Task force members and version history 5
2.1 Task Force members 5
2.2 Version history 5
2.3 References 5

3 Architecture developed by ESMIG 6

4 A standard data set for the H1 interface 9

5 Recommendations and follow-up 9

1 INTRODUCTION AND READER GUIDANCE

1.1 Introduction

There are several communication solutions that have been implemented on the real-time data port of the smart meter (H1) throughout Europe. In addition there are also different variants of the same standard (such as the Dutch "P1 port"). These facts are barriers to the interoperability of the metering infrastructure where it concerns the connection with consumer devices in the commercial domain. In particular, this connection is important for enabling consumer involvement as it provides meter data to a consumer or a 3rd party device that either displays this data in consumer-friendly format or manages the energy consumption in a smart home or in home energy management solutions. The (near) real-time[1] data port should provide the data needed for Consumer Energy Management, but an international definition of such a data set is missing.

The Task Force decided to focus on the definition of a standard data set to be provided through the H1 interface. The physical layer has not been considered, but that could still be done in a later stage, for example by defining a (limited) set of physical interfaces (see recommendations).

In order to define such interoperability requirements for the smart meter real-time data port H1 we need

- *use cases* for the exchange of data,
- a definition of the *data set* (eg OBIS codes) to be provided by the meter via this interface and a (limited) list of *communication standards* that are recommended to be used.

The standard should be sufficiently defined, or defined or by companion standards, such that different variants are avoided as much as possible. The scope will cover data exchange for Consumer Energy Management in line with the Use Cases defined by the ESMIG Task Force "Next Generation Smart Metering". Note that ESMIG will not define official standards by itself. The report will be forwarded to the relevant CEN/CLC Technical Committees that officially work on standards for the H1 port,

1.2 Reader guidance

We suggest that readers of these documents consider the following points:

- We started with identifying the infrastructural diagrams created with ESMIG's support and used in the European standardisation, where the H1 interface is included and added the "Next Generation" smart metering architecture developed by ESMIG. These diagrams can be found in chapter 3.
- We have defined the potential use cases to be supported by the smart meter real-time (H1) interface. Since they contain a high level of detail, these use cases are listed in a sperate document Annex I.
- We have analysed the requirements of these use cases in terms of which data from smart meters are needed. A minimum set of mandatory OBIS codes are specified in a separate document Annex II, but also codes that can be included optionally.

[1] "near real time" is defined in the Electricity Directive (EU 2019/944) a short time period, usually down to seconds or up to the imbalance settlement period in the national market;

- As a follow-up of delivering this report, the task force suggests further steps for using the report in chapter 5.

2 TASK FORCE MEMBERS AND VERSION HISTORY

2.1 Task Force members

Horst Toddenrott (chair)	Cuculus
Artemy Voroshilov	Cuculus
Ferry Cserep	Netinium
Andrius Klivečka	Sigmatelas
Tony Field	Itron
Michael Jary	Sense
Jason Humphries	Sense
Willem strabbing	ESMIG

2.2 Version history

Version	Date	Changes
0.1	July 2023	First draft and intro by Willem Strabbing
0.2	July 20th 2023	Added introduction chapter
0.3	November 2023	Created a final draft with all necessary content
0.4	March 2024	Processed all comments and created a clean version
1.0	October 2024	Processed comments by CENELEC TC205 and created final version

2.3 References

[1] – CEN/CENELEC/ETSI Smart Metering Coordination Group - TR 50572 – Functional reference architecture for communications in smart metering systems – December 2011

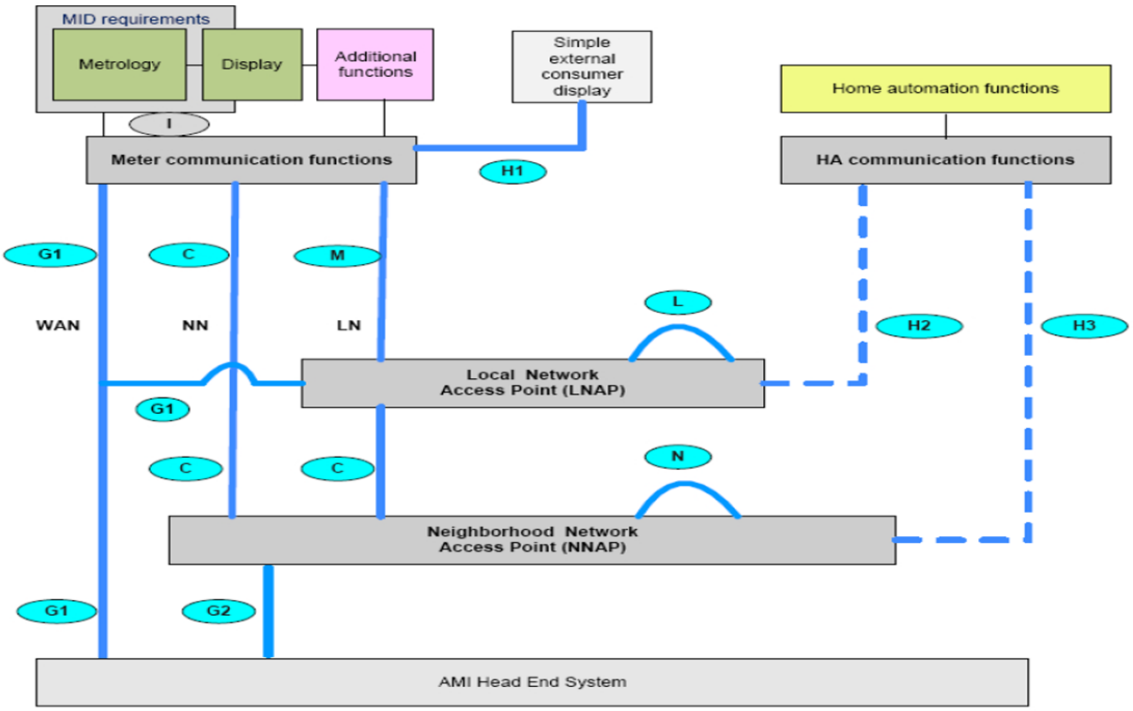
[2] – CEN/CENELEC/ETSI Smart Metering Coordination Group - SM-CG_Sec0060_DC – Smart Metering Use Cases – November 2012

[3]– CEN/CENELEC/ETSI Smart Energy Grid Coordination Group – Overview of the main concepts of flexibility management – November 2014

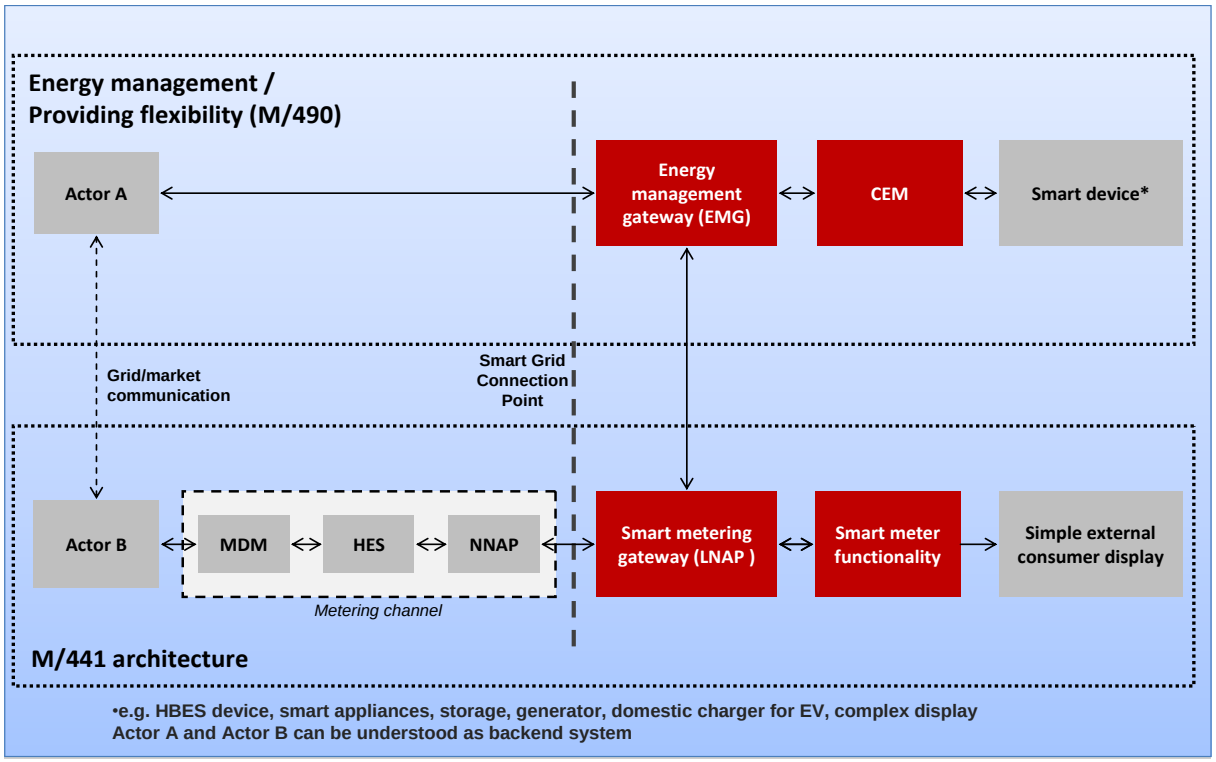
3 ARCHITECTURE DEVELOPED BY ESMIG

The ESMIG Task Force "Next Generation Smart Metering" has used the architectures developed by the CEN/CENELEC/ETSI coordination groups as a basis for the development of a Next Generation Architecture.

The first reference architecture below shows the metering architecture as developed by the Smart Metering Coordination Group (reference [1]) with ESMIG's support. It contains the functional elements of the AMI and the interfaces between them. Some elements, such as the Network Access Points are optional. In current practice examples of the Local Network Access point (LNAP) are the Communications Hub in the UK and the Smart Meter Gateway in Germany. The Neighbourhood Network Access Point (NNAP) is also referred to as "Data Concentrator". The H1 (home) interface is mostly implemented as a one-way interface pushing consumption data out of the meter. H2 can be a more sophisticated two-way interface from the LNAP to home automation / energy management functions. H3 is currently not implemented.



The second diagram below covers a wider functionality: Demand Side management / Flexibility. This reference architecture has been developed by the CEN/CENELEC/ETSI Smart Energy Grid Coordination Group (reference [3]). Actor B in this diagram is the party responsible for operating the metering infrastructure, while actor A offers energy management/flexibility services to consumers. One example of such an implementation is the P1 consumer port as defined in DSMR (Dutch Smart Meter Requirements).



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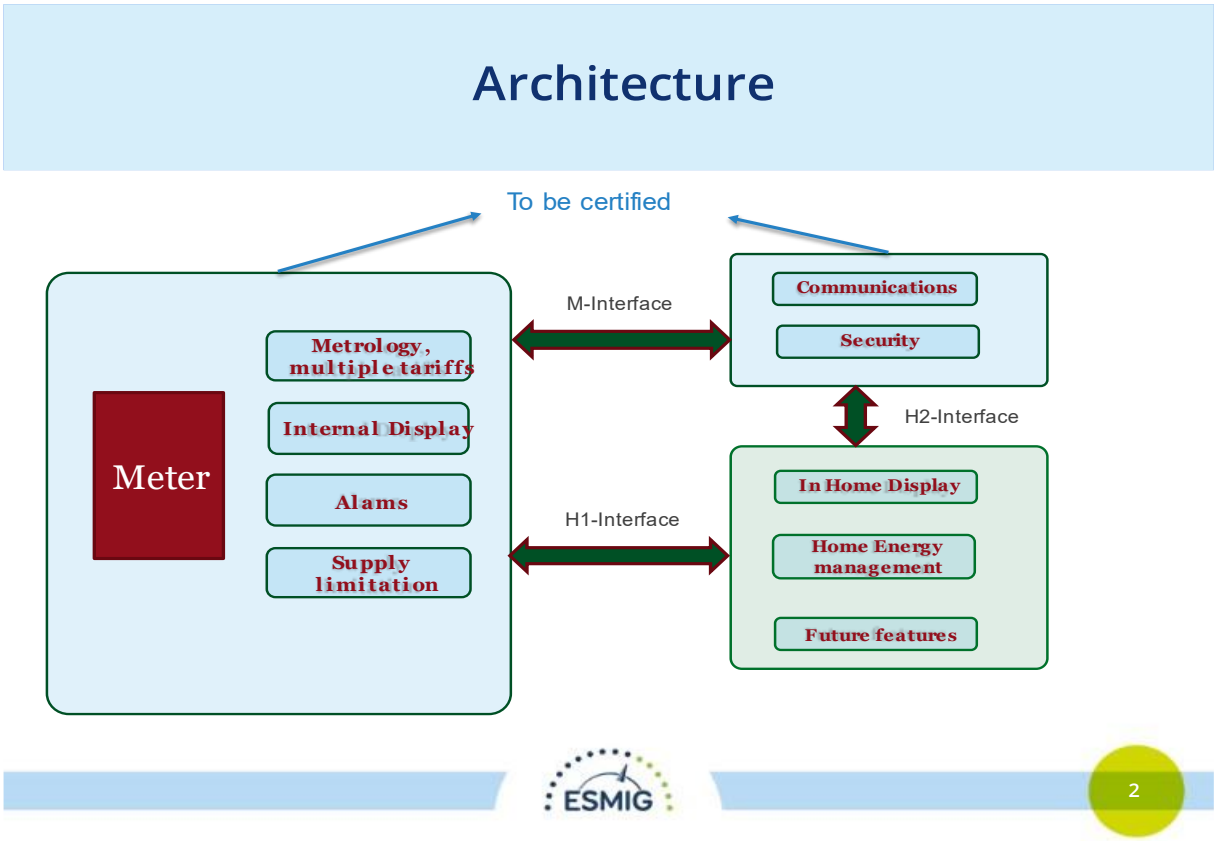
The ESMIG Task Force Next Generation Smart Metering created a new modular architecture as a more simplified version of the above, but also based on current practises and the expectation for the near future. See the diagram below.



As you can see both the H1 and the H2 interface can be used to communicate with Home Energy Management functionality that can be limited to an external display but also extended to full functional flexibility management of household consumption, storage and generation.

The M-Interface connects multiple (multi utility) meters to the communication device or gateway.

As explained in the Introduction, the modules are functional and can be implemented in separate hardware devices or combined. For example, in some European countries the communication device is integrated in the smart electricity meter.

4 A STANDARD DATA SET FOR THE H1 INTERFACE

Annex I contains the repository of Use Cases to be supported by the H1 Interface.
Annex II contains the repository of OBIS codes to be supported by the H1 interface.

5 RECOMMENDATIONS AND FOLLOW-UP

As a follow-up of the work of the task force we suggest sharing the report with relevant external parties and ask for comments. In the first place we think of the DLMS-User Association and DSO associations.

Since CENELEC TC205 is working on a revision of their H1 standard (EN 50491-11) we provided the document to this TC as input for their work and stay available for further support..

The task force has also discussed the physical requirements for such an H1 port. As these were not the scope of this task force, we can start work on such specifications in next steps in the case where there is sufficient interest from relevant stakeholders.

In addition to the specification of the OBIS codes, we believe that the following additional specifications are also important in order to create, an interoperable solution:

a) The physical specification in terms of transmission time for a complete data set.
b) The power supplied via the H1 port to an external device.