ISO/IEC JTC 1/SC 25/WG 1 **N 859A**
Date: Aug. 3, 1999

ISO/IEC JTC 1/SC 25/WG 1
Interconnection of Information Technology Equipment
Home Electronic System

Title: DTR 14543-1: Information technology
Home Electronic System (HES) architecture
Part 1: Introduction

Source: ISO/IEC JTC 1/SC 25/WG 1

Project: Project: 25.01.04.01-03: HES Architecture, Part 1

Status: Draft Technical Report Type 2

Requested Action: Approval as a Technical Report Type 2

Distribution: SC 25

ISO/IEC DTR 14543-1

JTC 1/SC 25 WG 1 **N 859A**
Project: 25.01.04.01-03

Draft Technical Report, Type 2

DTR 14543-1: Information technology Home Electronic System (HES) Architecture - Part 1: Introduction

Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75% of the national bodies casting a vote.

Technical Report 14543-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 25, Interconnection of Information Technology Equipment.

Introduction

Various electrically controlled devices are used in homes and similar environments for many different applications. Examples of such applications are: lighting, heating, food preparation, washing, energy management, water control, fire alarms, blinds control, different forms of security control and entertainment (audio and video). An overview of such applications is given in "Catalogue of Applications of the HES" (see Informative reference).

When several such devices are able to interwork via a common internal network (in this document called a home network), the resulting total system is called a home control system. When a home control system follows all the specifications in the ISO/IEC *HES Standards*, it is called a Home Electronic System (HES).

Three different classes of HES are defined. Class 1 has transport capabilities for telecontrol applications only. Class 2 includes Class 1, but also supports switched medium bandwidth data channels. Class 3 includes Classes 1 and 2 and in addition supports high bandwidth switched data channels.

A home network may be based on one or more different media (for example power line, twisted pair, infrared or radio) and may also be connected to outside networks (for example telephone, cable television, power and alarm networks).

An implementation of the Home Electronic System will typically be assembled by a consumer one application at a time, starting from single applications like lighting control, security control or audio and video control, to develop eventually into an integrated multi-application system. The cost of adding an application depends on whether rewiring of the house is needed or whether existing cables and prefitted ducts can be used. Hence the HES standards and supplementary technical reports will also give guidance to architects and builders as well as to users on how to share such resources.

Lifetime and innovation cycles vary between one device and another and between devices and networks. To make it possible to add and to change existing devices as well as to enlarge and to upgrade the home network keeping the existing devices, several stable interfaces, the Universal

Interface (UI) and the Process Interfaces (PIs) are defined between the home network and the devices. The PIs are meant for simple devices not requiring the full implementation of the HES application protocol. By using these interfaces a manufacturer can design a device both to meet his specific marketing objectives and to give the option to integrate that special device into a multi-application Home Electronic System. This added value allows the user to take advantage of synergy between different applications.

To allow manufacturers to implement cheaper devices/network combinations, an HES conformance type B is defined. In this case a device connects directly to the medium without showing the UI or a PI. These devices will however be medium dependent and do not have the advantages of devices with full HES conformance (type A conformance where the devices include the Universal Interface).

Home Electronic System, HES
Architecture
Part 1: Introduction

1 Scope

This document gives an introductory description of the Home Electronic System, a home control system standardised by ISO/IEC.

2 References

ISO/IEC 2382-26:1993, Information technology - Vocabulary - Part 26: Open Systems Interconnection

ISO/IEC TR 15044: Information technology - Terminology for Home Electronic System (HES)

3 Definitions

3.1 Definitions from ISO/IEC 2382-26

This document makes use of the following terms defined in ISO/IEC 2382-26:

application layer
layer
network layer
open systems interconnection reference model (OSI reference model)
protocol
service

3.2 Definitions from ISO/IEC HES Terminology

This Technical Report makes use of terms defined in ISO/IEC TR 15044: Information technology - Terminology for Home Electronic System (HES).

4 Standardisation strategy for the Home Electronic System

The primary objective of the HES standards is to specify rules to guarantee, in a multivendor - multiapplication context, free implementation and configuration of the system and interoperations between the devices in the system.

The basic principle used in the standards is to separate the devices and the network and to have stable interfaces, the UI and the PIs, between them. The standards do not cover the medium and the associated access units, but gives the specifications for the services delivered through these interfaces and for the local implementations of them.

In addition, a reduced level of conformance to the standard, type B conformance, is defined without the UI or PIs. Type A conformance is the primary strategy, including the UI or a PI. Type B conformance does not include either the UI or a PI.

With type B conformance, devices are connected directly to the network medium (although type B conformant devices may be implemented in more than one physical unit). Type B conformant devices can be connected only to a specific (proprietary) home network medium. However these devices will still implement the HES Network Service and Application Service and Protocol , allowing routers (gateways that do not interpret protocols above the network layer) to be implemented between different implementations of the Home Electronic System.

This strategy is described in the following subsections.

4.1 Free choice of implementation

The main strategy for the HES standardization is to have stable interfaces (the UI and the PIs) between devices and networks (see figures 1 and 2), and thus to make the devices network independent (type A conformance). However the standard allows devices to be connected directly to the medium (see figure 4) although this makes the devices network dependent (type B conformance). To be type B conformant a device must be in conformance with the HES Network Service and the HES Application Service and Application Protocol.

Note that the UI is universal in the sense that it allows the interconnection of any device implementing the UI to any home network also implementing UIs (within an HES).

It is not universal in the sense that it makes it possible to connect non HES devices to an HES, or HES devices to a non HES network.

A manufacturer of a type B conformant device may offer an adaptor allowing interworking between his device and type A conformant devices via a UI and an HES network (see figure 6). If this combination of a type B conformant device and an adaptor is in conformance with the necessary HES standards, this combination can be claimed to be in type A conformance with the Home Electronic System.

If a manufacturer claims conformance with the HES, the type of conformance (type A or B) must be clearly stated in the same place.

4.2 Medium- and device-independent interface

The main strategy for the HES standardization is to split the system into two parts:

- the home network
- the devices connected to it

With a stable interface between the two parts, home networks which are **medium dependent**, and devices which are **application dependent** can be developed separately (see figure 1).

In addition to specifying the stable interfaces, HES standards specify the rules for information exchange between devices (via the interfaces and the home network). These rules are specified in the HES Application Protocol.

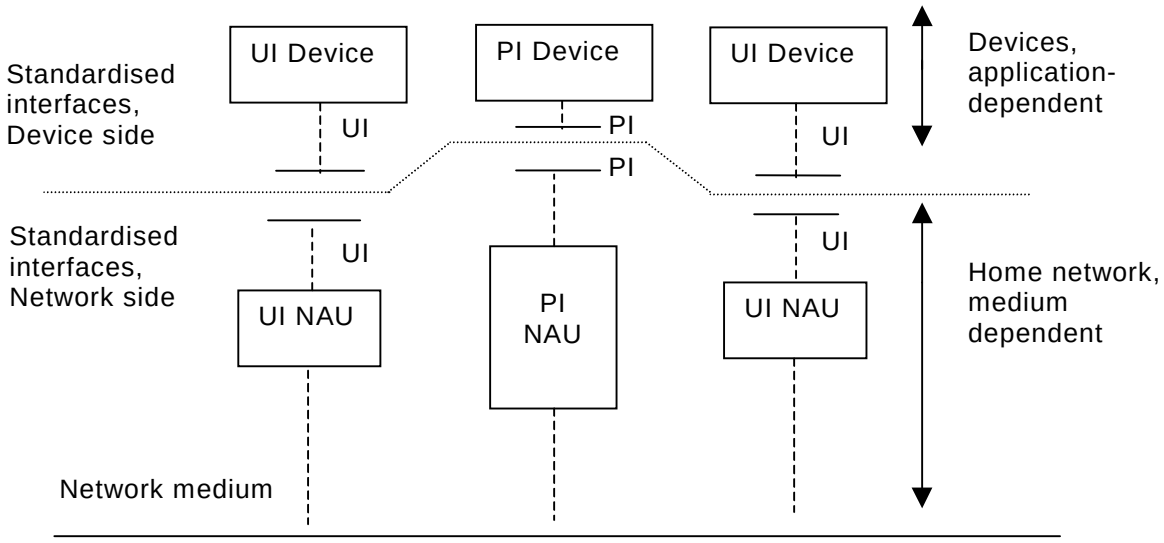


Figure 1 - Application- and medium-dependent parts of the HES

Figure 1 represents the home network as a bus; this is however just an example of topology. The HES places no restriction on home network topology.

The standardized interface is either the Universal Interface (UI) or one of the Process Interfaces (PIs). Note that the UI and the PIs need different sets of functions in the NAU. Figure 2 shows the concepts of the UI and the PIs.

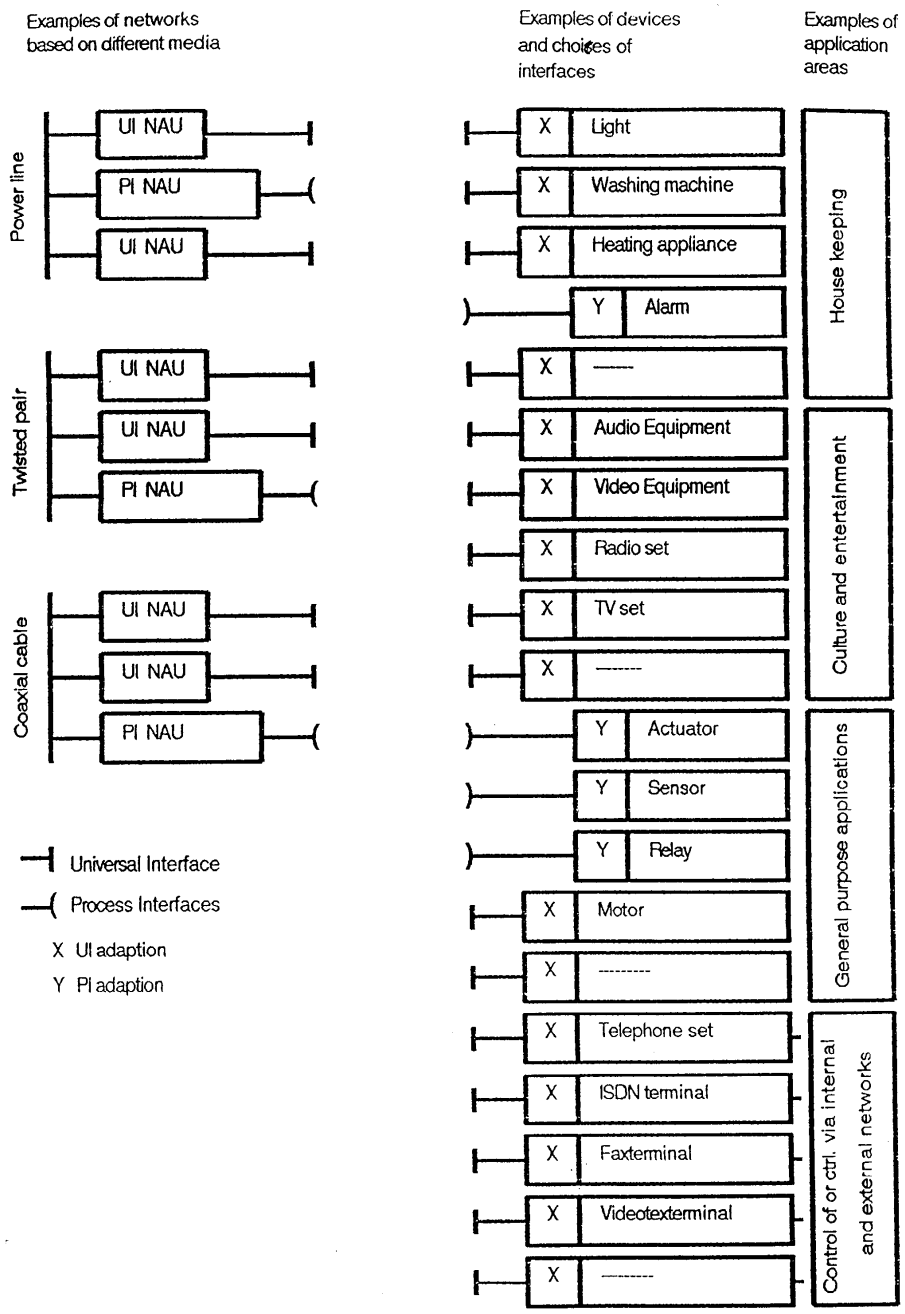
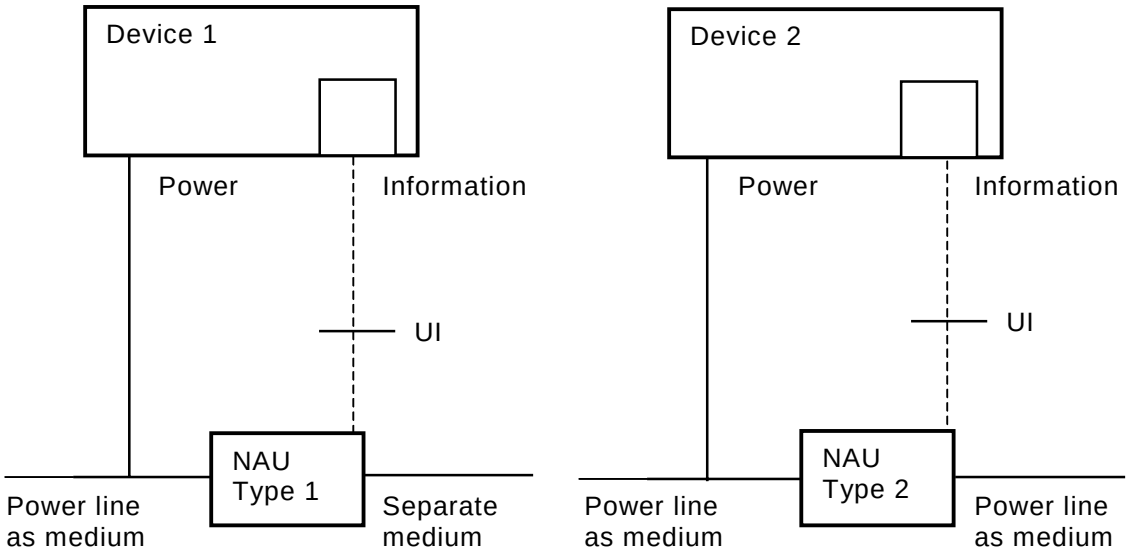


Figure 2 - Examples of Universal Interfaces and Process Interfaces as stable interfaces between devices and home networks (Class 1)

In Figure 2 any network UI may be connected to any device UI, and any network PI to any corresponding device PI.

Note that Figure 2 gives only an indication of some possible implementations. The HES does not preclude other combinations of devices and UIs and PIs.

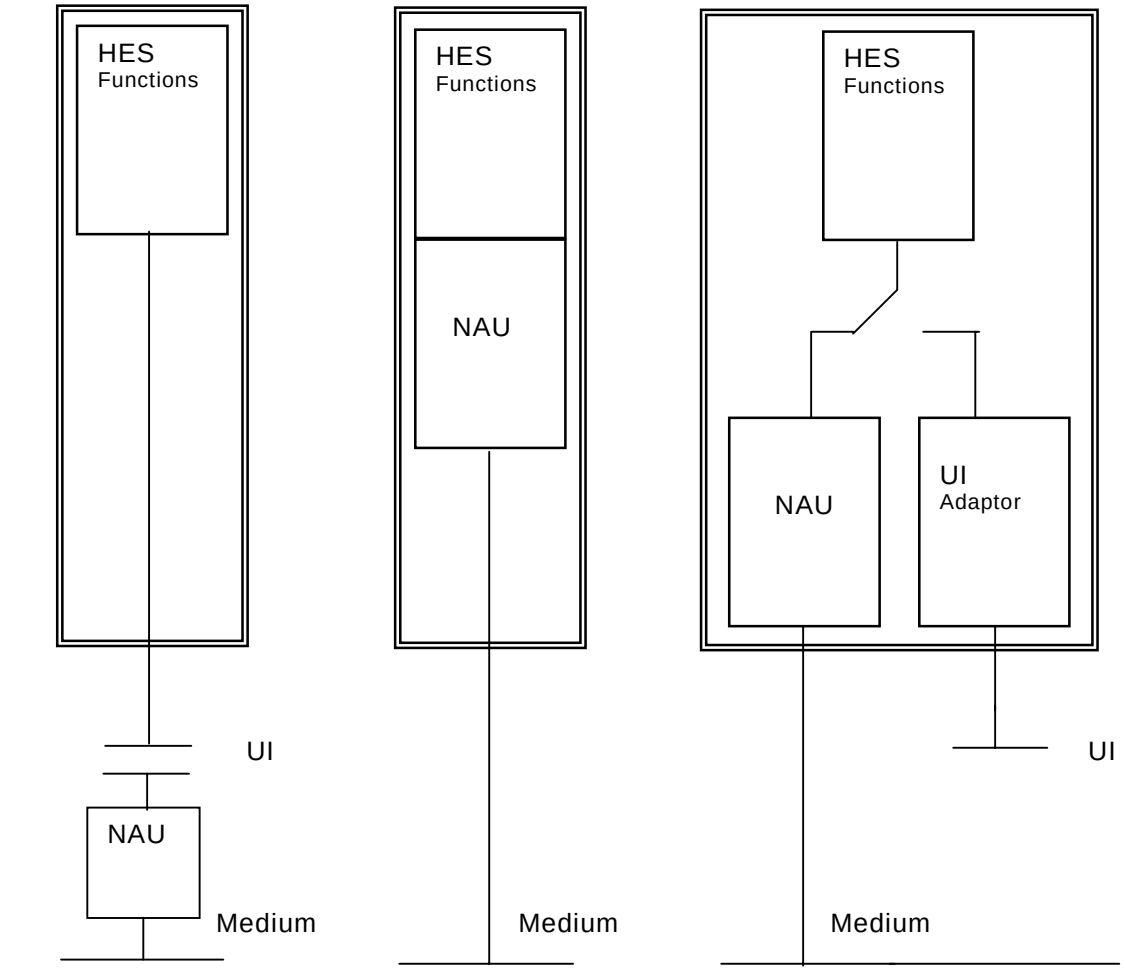
Figure 3 shows how a device using the UI can be integrated into implementations of the HES based on different media.



a) Device connected to mains wiring as power source and to a separate home network medium.

b) Device connected to mains wiring as power source and as home network medium.
Note that the NAU is external to the device.

Figure 3 - Example of the use of the same device in different environments



a) Type A Conformance b) Type B Conformance c) Type A Conformance

Figure 4 - Device configurations with different types of HES conformance

4.3 Multimedia and multi-vendor home control system

Traditionally, realisations of home control systems have been based on one specific transmission medium, for instance twisted pairs or mains power wiring. The devices designed for these systems can be connected only to the medium they are designed for. Furthermore different proprietary implementations do not normally communicate with each other and might even interfere with each other when installed on the same transmission medium.

The UI and the PIs introduced in the HES allow connection of devices from different sources to home networks implemented in different technologies. This provides portability of devices from one medium and network to another thus allowing a large variety of devices from different sources to be used within one HES. Also devices for a variety of applications can share the same network.

The architecture, using a UI or PI is called “Type A Conformance”. A reduced level of conformance to the standard “Type B Conformance” is defined with the UI or PIs. Type A Conformance is the primary strategy and includes the UI or a PI. Type B Conformance does not include either the UI or a PI.

With Type B Conformance, devices are connected directly to the network medium (although Type B conformant devices may be implemented in more than one physical unit). Type B conformant devices can be connected only to a specific home network medium. However, these devices will still implement the HES Network Services and Application Services and Protocol (Command Language) allowing routers to be implemented between different home networks. In this way proprietary home networks may be interconnected with each other, and with home networks implementing UIs or PIs in an integrated Home Electronic System.

Figure 4 illustrates the differences between Type A and Type B conformance. Note that Type B conformant devices are network dependant. If a manufacturer claims conformance with ISO/IEC 10192, the type of Conformance (Type A or Type B) must be clearly stated.

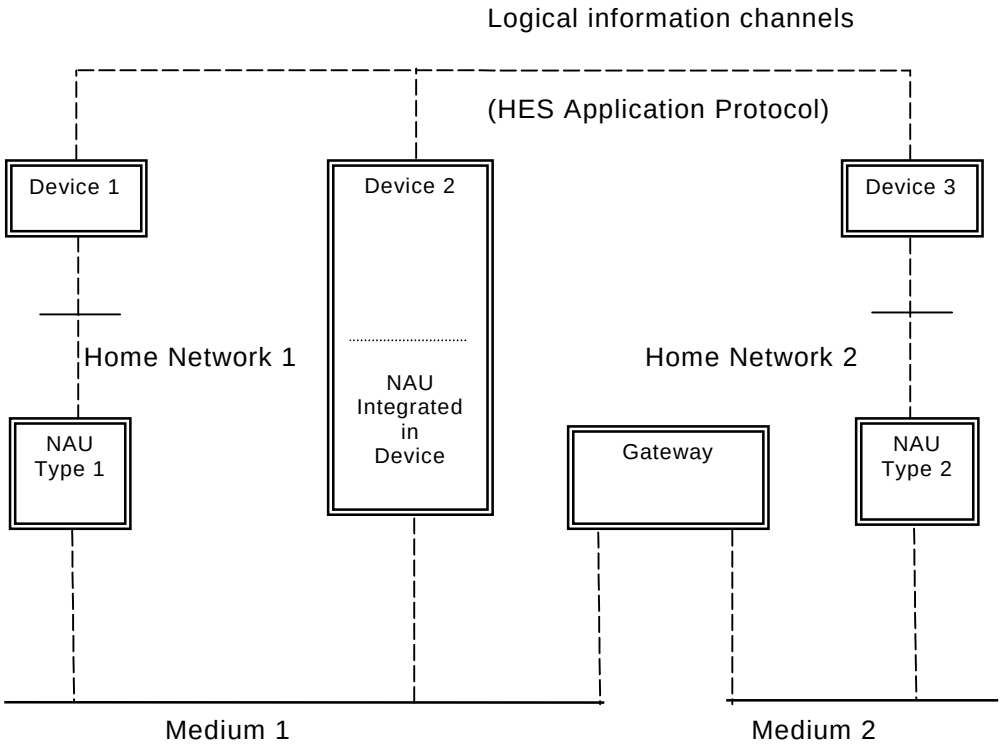


Figure 5 - Multimedia Home Electronic System

In Figure 5 two different media are connected by a low level gateway. For type A conformant devices it makes no difference to which medium they are connected. Type B conformant devices can only be connected to a compatible medium. All devices can communicate with each other.

Other internal or external networks such as ISDN may be interconnected with implementations of the HES via appropriate higher level gateways.

Full interworking can be achieved only when the application processes in the devices share a common application protocol. The HES contains such a standardised common application protocol flexible enough to support:

- single vendor products
- multi-vendor products for single applications
- multi-vendor, multi-application products

A manufacturer of a Type B conformant device may offer an adapter allowing interworking between this device and Type A conformant devices via a UI and an HES network as shown in Figure 6.

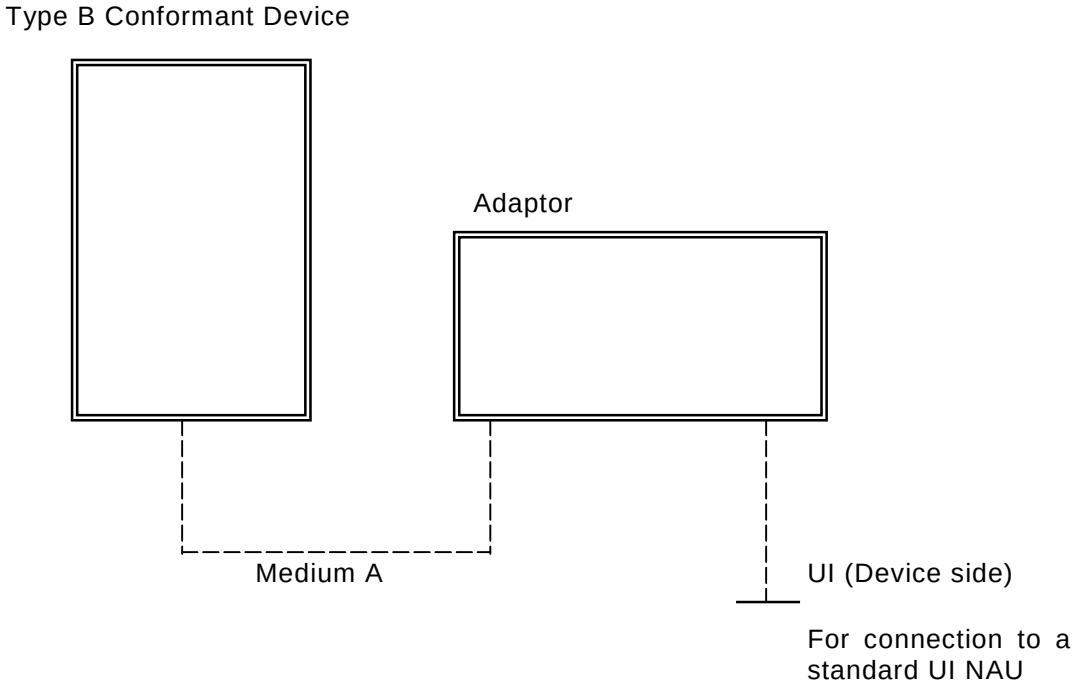


Figure 6 - Type A conformant combination of a type B conformant device and an adaptor