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SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS, NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

ITU-T Y.4000 series – Framework for home environment profiles and levels of IoT systems

ITU-T Y-series Recommendations – Supplement 54

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Supplement 54 to ITU-T Y-series Recommendations

ITU-T Y.4000 series – Framework for home environment profiles and levels of IoT systems

Summary

Supplement 54 to ITU-T Y.-series Recommendations establishes a set of data fields that reflect consumer preferences for IoT-enabled devices in specific environments. These data fields could be incorporated into a consumer device, stored in some fashion, and used by compatible IoT devices in the home and elsewhere to automatically implement those preset user preferences.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Environment, Internet of things, level, profile

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* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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ITU-T Y.4000 series – Framework for home environment profiles and levels of IoT systems

1 Scope

This Supplement describes a set of "Home Environment Profiles" that capture consumer preferences and could be used to direct IoT system performance.

The scope of this Supplement includes:

– requirements of IoT applications

– home environment profiles

– levels.

2 References

[ITU-T Y.4000] Recommendation ITU-T Y.4000/Y.2060 (2012), *Overview of the Internet of things.*

[ITU-T Y.4050] Recommendation ITU-T Y.4050/Y.2069 (2012), *Terms and definitions for the Internet of things.*

[ITU-T Y.4100] Recommendation ITU-T Y.4100/Y.2066 (2014), *Common requirements of the Internet of things.*

[ITU-T Y.4110] Recommendation ITU-T Y.4110/Y.2065 (2014), *Service and capability requirements for e-health monitoring services.*

[ITU-T Y.4252] Recommendation ITU-T Y.4252/Y.2064 (2014), *Energy saving using smart objects in home networks.*

[ITU-T Y.4400] Recommendation ITU-T Y.4400/Y.2063 (2012), *Framework of the web of things.*

[ITU-T Y.4401] Recommendation ITU-T Y.4401/Y.2068 (2015), *Functional framework and capabilities of the Internet of things.*

3 Definitions

3.1 Terms defined elsewhere

This Supplement uses the following terms defined elsewhere:

3.1.1 device [ITU-T Y.4000]: With regard to the Internet of things, this is a piece of equipment with the mandatory capabilities of communication and the optional capabilities of sensing, actuation, data capture, data storage and data processing.

3.1.2 Internet of things (IoT) [ITU-T Y.4000]: A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

NOTE 1 – Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled.

NOTE 2 – From a broader perspective, the IoT can be perceived as a vision with technological and societal implications.

3.1.3 thing [ITU-T Y.4000]: With regard to the Internet of things, this is an object of the physical world (physical things) or the information world (virtual things), which is capable of being identified and integrated into communication networks.

3.2 Terms defined in this Supplement

This Supplement defines the following terms:

3.2.1 home environment profile: A predefined set of parameters for IoT devices to provide the personalised home environment for users.

3.2.2 level: In terms of IoT devices a level is a specified set of constraints imposed on values of the syntax elements in the Supplement. These constraints may be simple limits on values.

4 Abbreviations and acronyms

This Supplement uses the following abbreviations and acronyms:

HEP Home Environment Profile

IoT Internet of Things

IP Internet Protocol

5 Conventions

None.

6 Introduction of home environment profiles and levels

Everyone has their own preferences in any areas of daily life, e.g. preferring a specific air temperature and humidity or illumination intensity. People prefer different levels of TV or music volume. With IoT technologies in mind, we can talk about the artificial environment, provided by some sets of IoT sensors and actuators.

While staying at his/her own place a user can adjust the parameters of IoT devices to provide the most comfortable environment. It may take a lot of time, so it should be done only once. Thus, it is necessary to have the possibility to store the adjusted parameters. It may be the local memory of IoT devices or some kind of cloud storage.

Once we have the full set of stored parameters, which provides the most comfortable environment for the user, we can call this set as the user's home environment profile (HEP). If the user leaves his own place, this HEP may be stored on their device (mobile phone, chip card, etc.) and may be activated at the visiting place in order to provide the most comfortable environment for the user at any place covered by IoT services.

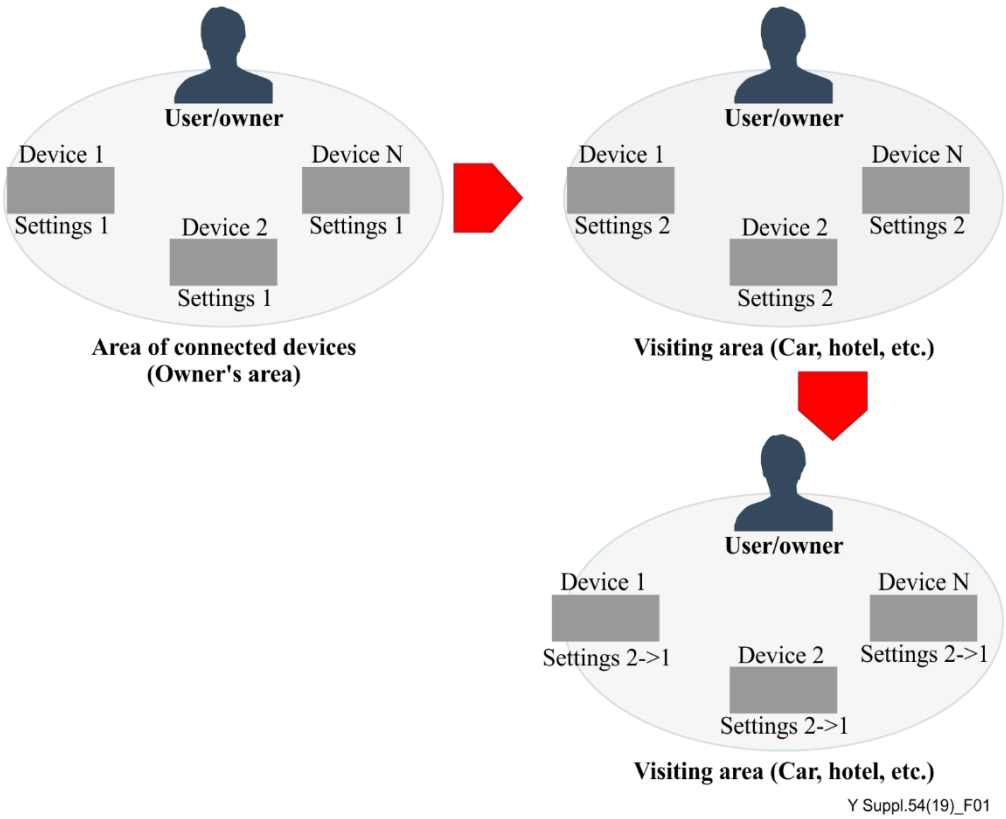

Figure 1 – Operations with the HEP profile

When at home a user adjusts their living environment according to their preferences. This may include settings for climate equipment, multimedia devices, etc. (see clause 6.1). These settings are recorded as a home environment profile, and can be stored, either in cloud storage or locally on the user's smartphone, as configuration files (see Appendix I). When a user changes their location they can use these stored profiles to create their preferred environment automatically. In a car it may be climate settings and multimedia settings (volume level, tone colour, preferred radio stations). In a hotel room there may be some settings to perform professional activities remotely and a remote control of medical devices may be added. Thus, home environment profiles allow users to create the most comfortable environment regardless of their location.

Differentiation by levels

Differentiation by level is introduced to follow the difference in characteristics of different IoT devices. In different environments IoT devices may be involved that are similar in purpose but differ in characteristics and capabilities. To ensure the most effective functioning of the home environment profiles, it is proposed to divide specific profiles into several levels in accordance with the technical capabilities of IoT devices operating within this profile. An example of differentiation by levels within the sound equipment profile is given in Appendix I.

Creation, storage and processing of profiles

The creation of home environment profiles is provided at the user's request and carried out by software developed by the service provider or a third party. At the user's request, the relevant software reads the existing adjustments within the specific profile and generates the corresponding profile file. A possible file format is given in Appendix I.

Profile files can be stored locally, on the user's terminal, or remotely, in cloud storage. The decision on each specific profile is made depending on the scope of the profile and the preferences of the service provider.

Profiles are processed at the user's request by the service provider's software. A "client-server" model is proposed, where the profile file comes from the client side, and the server side processes it and sets up the corresponding environmental parameters. Also, the server part is responsible for selecting the profile level corresponding to the available equipment.

6.1 Home environment profiles categories

There are several categories that can be distinguished as home environment profiles. These categories include, but are not limited to, the multimedia environment, habitation control, climatic environment and energy consumption.

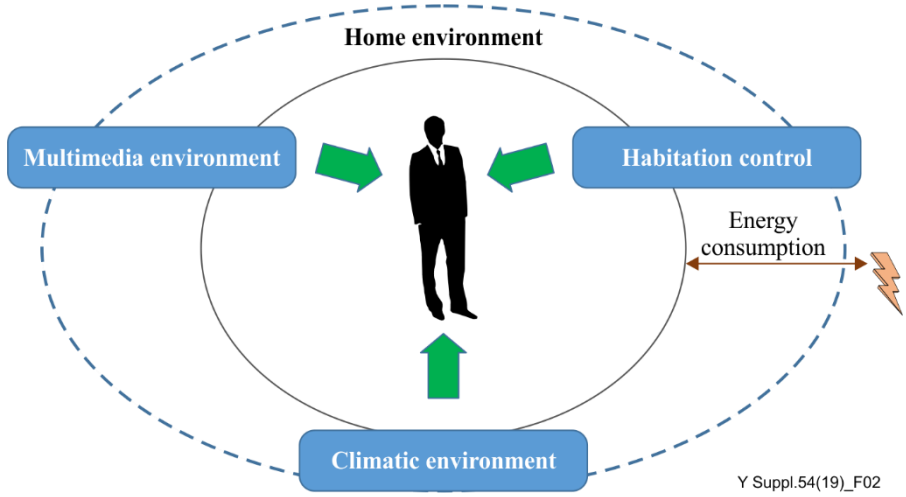

Figure 2 – Home environment profiles categories

Multimedia environment: the category of home environment which stores the user's preferences on different multimedia applications. The example of audio profile is provided in Appendix I.

Habitation control: A set of means for the user to control their smart house features remotely. It may contain a set of features predefined by user (to boil a kettle, to turn on air conditioner, etc.).

Climatic environment: A set of parameters to provide the comfortable climatic environment for the user in some remote locations (air temperature, humidity, etc.).

Energy consumption: A set of preferences related to energy consumption.

Appendix I

Storage and format of profiles

Home environment profiles may be stored in the memory of mobile phones or other devices, or they may be stored in cloud repositories. It may be a service, payable or free. The profiles may be stored in the format of UNIX configuration files. The example of a configuration file for sound equipment is provided below.

This configuration file "sound.conf" consists of two sections. The first section "VolumeLevel" provides the level of volume as a percentage of the maximum value. Such an approach provides quite variable results, but in the where someone will try to estimate the volume level in absolute units (e.g., dBs) complex equipment containing sound sensors with feedback is needed.

The second section "ToneColor" describes the tuning of sound tone colour and provides a good example of what "Levels" means in this very case. There are three different levels in the section. Level 1 is the simplest variant with "Low" and "High" tunes. Level 2 goes about the most common case – graphic equalizer (the whole 20-20 000 Hz frequency range is divided in several frequency bands with a separate tune for each band). Level 3 describes the most sophisticated case of parametric equalizer. In this case, each separate frequency band has got two tunes: one for the specific frequency and the second for its level. This approach allows for the provision of the most precise frequency response curve.

sound.conf

#The VolumeLevelPercentage variable specifies the level of volume in percentage terms

VolumeLevel

– VolumeLevelPercentage = 56

#Next section specifies the different levels of tone colour

ToneColour

Level_1

#Level 1 describes the simple two bands tuning

– LowFreqPercentage = 38
– HighFreqPercentage = 64

Level_2

#Level 2 describes the graphic equaliser

Band_1

– FreqRangeLowHz = 20
– FreqRangeHighHz = 50
– FreqRangeLevelPercentage = 75

Band_2

– FreqRangeLowHz = 50
– FreqRangeHighHz = 100
– FreqRangeLevelPercentage = 70

Band_3

– FreqRangeLowHz = 100
– FreqRangeHighHz = 500
– FreqRangeLevelPercentage = 55

…

Level_3

#Level 3 describes the parametric equalizer

Band_1

– FreqValueHz = 60
– FreqLevelPercentage = 75

Band_2

– FreqValueHz = 1025
– FreqLevelPercentage = 43

Band_3

– FreqValueHz = 5400
– FreqLevelPercentage = 60

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