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

Internet of things and smart cities and communities –
Requirements and use cases

Accessibility requirements for smart public transport services

Recommendation ITU-T Y.4211

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Recommendation ITU-T Y.4211

Accessibility requirements for smart public transport services

Summary

Recommendation ITU-T Y.4211 specifies accessibility requirements for smart public transport services. The concept of accessibility in public transport services has been mainly concerned with eliminating physical barriers such as adopting accessible trains and buses that allow wheelchair accessibility by mechanical lowering-entrance floors. In smart public transport services, the use of Internet of things (IoT), when properly designed, may increase accessibility of public transport services by providing access of information and physical accessibility. The IoT can be used to create tools for persons with many types of disability and specific needs, including physical, visual, hearing and cognitive disabilities. In order for the smart transport services to appropriately provide accessible services, information about accessibility profiles must be agreed upon in advance. Such accessibility profiles should basically include information on accessibility needs while travelling on public transport services.

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Introduction

Many persons with disabilities (PWDs) have difficulty in using public transport. Transportation issues also apply to persons with age-related disabilities and those with specific needs, which include temporary disabilities as well as literacy difficulties. If the use of public transport is challenging, PWDs and those with specific needs would be socially disconnected and their quality of life would, as a result, be degraded. Thus, mobility rights are an important issue for PWDs. The use of the Internet of things (IoT), when properly designed, may increase accessibility to smart public transport services by providing appropriate information. This information can be used by persons with many types of disability and those with specific needs. In order for smart transport services to appropriately provide accessible services, information on the type of disability profiles must be agreed upon in advance. Such accessibility profiles basically include information about the accessibility needs of PWDs while travelling on public transport services.

Recommendation ITU-T Y.4211

Accessibility requirements for smart public transport services

1 Scope

This Recommendation specifies accessibility requirements for smart public transport services.

This Recommendation includes:

- accessibility requirements for smart public transport services for persons with disabilities (PWDs), persons with age-related disabilities and those with specific needs to utilize the benefits of Internet of things (IoT) applications and services;
- accessibility profile requirements for accessible smart public transport services.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.4204] Recommendation ITU-T Y.4204 (2019), *Accessibility requirements for Internet of things applications and services*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 accessibility [b-ITU-T F.791]: The degree to which a product, device, service or environment (virtual or real) is available to as many people as possible.

3.1.2 accessibility feature [b-ITU-T F.791]: An additional content component that is intended to assist people hindered in their ability to perceive an aspect of the main content.

3.1.3 assistive technology [b-ITU-T F.791]: Piece of equipment, product system, hardware, software or service that is used to enable, maintain or improve functional capabilities of individuals with disabilities.

3.1.4 Internet of things (IoT) [b-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.

3.1.5 person with age-related disabilities [b-ITU-T F.791]: A person with cognitive or physical disabilities caused by the aging process. Examples are impaired eyesight, deafness in varying degrees, reduced mobility or cognitive abilities.

3.1.6 person with specific needs [b-ITU-T F.791]: Includes persons with disabilities (PWDs), persons who are not literate, those with learning disabilities, children, indigenous people, older persons with age-related disabilities, and anyone who has a temporary disability.

3.1.7 platform accessibility feature [b-ITU-T F.791]: Accessibility functionality provided as standard on a particular hardware or software platform.

3.1.8 profile setting [b-ITU-T F.791]: The ability for users to store and retrieve multiple profiles containing sets of user interface preference settings without having to reset them each time, including accessibility settings.

3.1.9 specific needs [b-ITU-T F.791]: This replaces the use of the term 'special needs'. This term refers to a wide range of categories including women, children, youth, indigenous people, older persons with age-related disabilities, persons with illiteracy, as well as persons with disabilities (PWDs), see [b-ITU PP Res.175], [b-WTDC Res.58], and [b-WTDC AP] and clause 6.39 (of [b-ITU-T F.791]).

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 universal design: The design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. "Universal design" shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.

NOTE – Paraphrased from [b-UNCRPD].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAC	Alternative Augmentative Communication
AT	Assistive Technology
GPS	Global Positioning System
ICT	Information and Communication Technology
IoT	Internet of Things
IPTV	Internet Protocol Television
PWD	Person with Disabilities
UI	User Interface

5 Conventions

In this Recommendation:

The expression "**is required to**" indicates a requirement that must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The expression "**is recommended**" indicates a requirement that is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The expression "**can optionally**" and "**may**" indicates an optional requirement that is permissible, without implying any sense of being recommended. This term is not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with this Recommendation.

The expression "**user**" indicates any public transport service customer who is using the service. The user can be any person with or without disabilities.

6 Accessible smart public transport services

In the UN Convention on the Rights of Persons with Disabilities (UNCRPD), Article 20 on personal mobility states

"to ensure personal mobility ... by facilitating access ... to quality mobility aids, devices ... including ... making them available at affordable cost; ... encouraging entities that produce mobility aids, devices and other assistive technologies to take into account all aspects of mobility for persons with disabilities." (p. 12 of [b-UNCRPD])

Also, in Article 26, it further mentions that:

"States Parties shall promote the availability, knowledge and use of assistive devices and technologies, designed for persons with disabilities ..." (p. 17 of [b-UNCRPD])

Therefore, public transport service providers have been working on rectifying lack of accessibility in transportation. The concept of accessibility in transportation has been mainly concerned with eliminating physical barriers such as the adoption of accessible trains and buses that allows wheelchair access by mechanical lowering-entrance floors. Smart services for public transport that make usage of the IoT, when properly designed, may increase accessibility. This can be done by providing information that can be used by persons with various types of disabilities including physical, visual, hearing and cognitive impairments. For example, persons with visual disabilities may purchase a bus ticket by using their smartphone with accessibility features already set up. Persons with physical disabilities may use their computer to search the route and any accessibility information about the train services prior to leaving home. Persons with hearing disabilities could receive an alert message through their smartphones activated by the message as it is broadcast on the speakers of a train station. Such features not only increase the accessibility for PWDs, but also expand usability for everyone, including persons with and without disabilities.

Smart services embedded into the existing public transport system would improve service quality radically. Such smart public transport services will include various passenger services. However, the level of sophistication of different services may vary. The most elementary service may be a simple presentation of information, such as timetables, stop locations and terminal information, route and fare information, and any notice of exceptional conditions. More sophisticated services may include automatic ticket purchasing, finding the best route, arrival and departure information and information on how crowded a vehicle is. There will be many other creative services under development for future introduction.

As anticipated, IoT can be utilized in smart public transport services. IoT is defined in clause 3.1.4. IoT may be used to recognize the information and communicate it to passengers and service providers. It can also assist in the integration of communication, control and information processing across various transport systems.

Each state has its own public transport service systems. A centralized service system might provide different public transport services such as bus, train, metro and tram. Others might have independent providers for each service. Moreover, a provider of smart services may differ from a transport service provider. Thus, in order for smart transport services to appropriately provide accessibility, information on a set of accessibility profiles must be agreed upon in advance, which basically includes information on accessibility while travelling through a public transport system, e.g., wheelchair accessible departures and arrivals at train stations and timetables of low-floor buses on specific routes.

Even though the public transport ecosystem may involve various players, passengers do not need to know whether systems are integrated. A smart public transport system seeks to create seamless services no matter how the underlying operational systems are organized. To achieve this goal, a vast

