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ucode Tag Architecture

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Update history

Version	Date of update	Content
00.00.01	2006.02.01	Started writing
00.00.02	2006.10.12	Modified words
00.01.00	2009.07.28	Modified the Basic Policy regarding Certification
01.A0.00	2009.07.31	Added the chapters of Cancellation of Certification and Review of Certification Criteria
01.A0.01	2010.10.15	Added the description of Category4: Acoustic tag
01.A0.02	2011.01.24	Added the description of Category5: Visible light tag

ucode Tag Architecture

Introduction

Scope

This document specifies ucode tag category and security class.

Position of this Document

This document specifies ucode tag category and security class. The details of each category are set forth individually.

References

[1] Ubiquitous ID Center, "Standard of ucode Tag Interface (Category 0)," UID-00018.

[2] Ubiquitous ID Center, "Standard of ucode Tag Interface (Category 1)," UID-00019.

[3] Ubiquitous ID Center, "Standard of ucode Tag Interface (Category 2)," UID-00020.

[4] Ubiquitous ID Center, "Standard of ucode Tag Interface (Category 3)," UID-00021.

[5] Ubiquitous ID Center, "Standard of ucode Tag Interface (Category 4)," UID-00043.

[6] Ubiquitous ID Center, "Standard of ucode Tag Interface (Category 5)," UID-00044.

Definition of Terms

- ucode Tag

  A ucode tag is a device to which ucode is assigned. A tag here means a device with which information can be obtained from outside via a certain communication method. Examples of such devices include RFID tags, infra-red tags, wireless communication devices, and bar codes for which we can obtain information by certain pre-defined means.

- Ubiquitous Communicator

  A user terminal that communicates with ucode tags and offers a function to receive information services based on ucodes.

- Ubiquitous ID Center（uID Center）

  An internal unit/department in T-Engine Forum which handles matters related to ubiquitous ID technology.

1. ucode Tag System

1.1. Summary

In ubiquitous ID technology, a unique ID (identifier) that is provided to identify objects is called ucode. ucode is assigned to various objects that comprise ubiquitous computing environment so that these objects will be automatically identified. The device to which ucode is assigned is a ucode tag. Ubiquitous ID Center handles bar codes, RFIDs, smart cards, active chips, etc. as ucode tags comprehensively. The center classifies these tags in terms of interface category and security class, sets the certification criteria for the standard ID tag in each classification, and certifies tags that meet the criteria as the standard ID tags. The following sections describe the interface category and the security class.

1.2. Interface Category

The interface category is determined according to the ucode tag communication method. There are 6 types of categories that are classified as below.

Table 1: Interface Category

Category	Content
Category 0	Print tag (bar codes, two-dimensional bar codes)
Category 1	RF tag (RFIDs or non-contact ID cards that have non-contact interface)
Category 2	Active RF tag (RFID tags or sensor nodes that have its own power source, e.g. a battery, and communicate via RF)
Category 3	Active infrared tag (ID tags or sensor nodes that have its own power source, e.g. a battery, and communicate via infrared light)
Category 4	Acoustic tag (ID tags that communicate via audio data communication technology)
Category 5	Visible light tag (ID tags that communicate via visible light communication)

Category 0 is a category of tags from which we can obtain ucode by reading symbols represented by means of printing, etc. Category 1 is a category of tags from which we can obtain ucode via RFID. Category 2 is a category of tags from which we can obtain ucode via wireless communication. Category 3 is a category of tags that is equipped with active infrared tags. Category 4 is a category of acoustic tags. It's a

system that modulates digital information into audio signal to send. Category 5 is a category of visible light tags. It's a system that modulates digital information into visible light to send.

1.3. Security Class

The security class is classified into 7 kinds in accordance with the tag system.

Table 2: Security Class

Class	Content
Class 0	Function to detect data error or data loss
Class 1	Anti physical duplication/forgery
Class 2	Function to prevent identification
Class 3	Tamper-resistant function (physical and logical)/function to control access for resources
Class 4	Secure communication with unfamiliar nodes
Class 5	Resource management function using timer
Class 6	Update function of internal programs/security information

Tags that have a function to detect data error or data loss are classified in Class 0. Data error or data loss means partial damage in data due to interference when the tag and the reader communicate, or physical data loss of optical tags.

Also, tags that have a function of anti physical duplication/forgery as well as the mechanism in Class 0, are classified in Class 1. Anti physical duplication/forgery means creating identical or similar data is physically difficult.

Tags that have a mechanism to prevent identification as well as the function in Class 1 are classified in Class 2. A mechanism to prevent identification means a system that prevents identification of the communication status, content and method.

Tags that have a tamper-resistant function and a function to control access for resources as well as the function in Class 2 are classified in Class 3. A tamper-resistant function means a function to prevent information stored in the tag from being read without authorization. There are two types of tamper-resistance: physical tamper resistance and logical tamper resistance. Physical tamper resistance does not allow readout of data by physical analysis (for example, reading electric signals in the memory physically). With logical tamper resistance, unauthorized access is not possible by any logical processing. A function to control access for resources means a function that performs access control for resources according to the

privilege class of the user to access a particular resource.

Tags that have a function to build secure communication channels with unfamiliar nodes as well as the tag function in Class 3 are classified in Class 4. A function to build secure communications channels with unfamiliar nodes means a function that enables the establishment of secure data communication channels even with unknown nodes with which the secret key is not shared in advance when data in the tag is transmitted through the network.

Tags that have a resource management function using the internal secure clock as well as the tag function in Class 4 are classified in Class 5. A resource management function using the internal secure clock means a time-dependant management function of carrier data, security information and tag operations. Examples include a function to set the expiration date for data, and another to suspend operations after a set period of time.

Tags that have a secure update function of internal programs/security information as well as the tag function in Class 5 are classified in Class 6. A secure update function of internal programs/security information means a maintenance function that allows the optimal security state to continue according to the usage patterns by updating firmware, applying security patches, etc., in a secure fashion.

2. Certification Criteria

2.1. Basic Policy regarding Certification

The purpose of promoting the standardization of ucode tags at Ubiquitous ID Center is to realize integrated ubiquitous computing environment, where users do not have to be aware of the difference of types of tags. For that to happen, it must be guaranteed that ucode can be read from all the certified tags. Therefore, the major pre-condition for tag certification by Ubiquitous ID Center is that certain means to read ucode is provided.

As for the policy of certification, there are alternatives. There would be one that limits the type of a tag itself and another that does not limit tag types. Each tag has its advantages and disadvantages depending on the used communication method, and it is not favorable to limit the tag type to only one type for realizing ubiquitous computing environment.

For that reason, we have adopted the policy in which the type of a tag is not limited to only one.

To prevent problems that could be caused by diverse tag types, when certifying a ucode tag, its reader and writer are also certified. By doing so, even when the physical communication method or data storage is different, we can offer a way to read a ucode. Therefore, as long as the tag is certified, it can be used as a ucode tag.

Though the certification layer depends on the information to offer outside the tag, in any cases, how the tag performs communication needs to be specified when applying for a tag certification. This is to determine the validity of the application.

2.2. How to Handle Disclosed Information

The Nondisclosure Agreement, which is specified separately, is concluded between Ubiquitous ID Center and the applicant for certification as necessary prior to the certification process. The information disclosed based on this agreement is used only for the ucode tag certification process. In principle, Ubiquitous ID Center does not disclose this disclosed information to third parties, but there are cases where the information will be disclosed. One example is when Ubiquitous ID Center starts to develop a ucode tag interface device such as Ubiquitous Communicator (UC). In such cases, the two parties conclude a separate agreement and Ubiquitous ID Center may use information provided for the certification.

2.3. Examination for Certification

- ucode tag and its reader/writer are examined together. Therefore, the information of both ucode tag and reader/writer must be provided when making an application. And also, it must be verified that ucode can be read from the reader/writer applied.

- ucode tag is a tag that ensures reading of a ucode. So it's necessary to define that tags applied must allow reading of the stored ucode in some way. When certifying tags, how a ucode is read must be checked.

- The applicant should provide Ubiquitous ID Center the information such as physical protocol, logical protocol, or data format that is necessary to examine whether ucode can be acquired regardless of the requested certified layer above. Ubiquitous ID Center examines the application using the information.

- Examination should be made according to the guideline set separately.

3. Cancellation of Certification

The ucode tags certified will be reviewed as needed and if found to be inappropriate, their certification may be cancelled. The review will be started at the initiative of T-Engine Forum A members who are eligible to attend at committees or by board members.

The certification will be cancelled in the following cases.

- When the uniqueness of ucode is not guaranteed.
- When the ucode tag is used being indistinguishable from non-ucode tags.
- When the existence of ucode tag fails to be clearly identified.

The procedure for cancellation is described below.

1. Review ucode tags at WG
2. Get approval from T-Engine Forum Committee for cancellation of the ineligible ucode tags.
3. Report the cancellation at board meeting.

4. Review of Certification Criteria

The certification criteria can be reviewed annually as needed.