# 2017
# Annual
# Report

Taiwan Association of Information and Communication Standards

# 2017
# Annual Event

**Workshop**

03/10
Wireless Charging and
Smart City Workshop

Wi-Fi and 5G: IEEE's 5G
Planning-Standard Workshop | 03/30

**Seminar**

03/23 — Samsung's view on 5G
Standardization

**MoU**

03/30 — TAICS and IEEE MoU
Signing Ceremony

Huawei's view on
5G Standardization | 05/22

**Seminar**

07/05 — DoCoMo's view on 5G Standardization

Ericssoni's view on
5G Standardization | 06/13

07/06 — Secrets of Autonomous Car Design

Introduction to 5G
New Radio-3GPP NOMA | 09/01

**Forum**

07/27 — Public Meeting:
Draft of Viedo Surreillance
System - IP Camera (I)

09/05
2017 TAICS Standard Forum -
The future of ITS

**Workshop**

09/29 — Public Meeting: Draft of
Viedo Surreillance System -
Industrial Standards of
Informtion Security (II)

TAICS and TTA Mou
Signing Ceremony | 09/05

**MoU**

**Seminar**

Duel-network Integration
Technology of 3GPP/ WLAN and
Development Trend of 5G | 10/13

10/24 — Smart Application- Link Asia and
the World: Smart Identification

10/24 — Smart Application- Link Asia and
the World: Wireless Charging

**Forum**

10/27 — Public Meeting: Draft of Viedo
Surreillance System - Industrial
Standards of Informtion Security (III)

10/31
5G-era Smartphone Application
and Service Workshop

**Workshop**

12/08 — Public Meeting: Draft of Viedo
Surreillance System - Test Results
Presentation (IV)

Launching Rally of IoT
Information Security
Industry Standards | 12/25

**Rally**

# TAICS

## 2017
## Annual
## Report

# A Message from the Chairman

Since its establishment and with the support of hundreds of members, the Taiwan Association of Information and Communication Standards (TAICS) has been dedicated to the promotion of various information and communication technology industry standards. Many of the standards have been adopted by government agencies and incorporated into regulations, implementation subsidies and procurement guidelines.

To strengthen connections with international standards organizations, TAICS hosted the Annual Standards Forum in Taiwan in 2017 and invited representatives from major international standards organizations, including ARIB, TTC, IEEE, TTA, ETSI, and CCSA, to deliver talks on the current state of intelligent transportation systems standards. TAICS also co-hosted the first 5G-era Smartphone Application and Service Workshop with ARIB in Japan to actively promote future 5G mobile applications and services. Additionally, TAICS has signed collaboration MoUs with IEEE in the U.S. and TTA in South Korea to establish frameworks of cooperation for industry standards such as 5G, information security and IoT.

Moving forward, TAICS will strive to learn from the examples set by international standards organizations in testing, certification and operation models. It will also develop a standard verification and certification system for Taiwan in 2018 by working together with domestic laboratories. This effort will reduce the time required for Taiwan's information and communication industries to obtain international standard certifications. As the official channel through which Taiwanese industries connect with international standards organizations, TAICS will continue to participate in the development of new standards and seek closer collaboration with those organizations. We also aspire to lead the next big development in technology by bringing together Taiwan's elite R&D talent and consolidating domain knowledge and business models.

**Chairman, TAICS**
**Jonathan, Tsang**

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# 1 Overview

## 1.1 Mission

The TAICS was established with the objective of developing industry standards as well as the internationalization of local standards to enhance the competitiveness of Taiwan's industry. To achieve such goals, the TAICS will perform the following tasks:

**1** Establish a platform for technical cooperation and development of information and communication standards. Promote the establishment of Taiwanese industry standards in developing information and communication technologies;

**2** Represent and act as an intermediary for Taiwan in international standardization affairs. Strengthen the connections between international and regional standards organizations and establish a communication channel for cooperation;

**3** Promote the industry's adoption of Taiwan industry standards, expand regional influence, and actively facilitate adoption of international standards.

# 1.2 TAICS Organizational Structure

Three units are established under the Board of Directors: the Technical Management Committee (TMC), the Standard Counsel Committee (SCC), and the Office of the Secretariat.

The Technical Management Committee (TMC), chaired by Jung-Chih Kao, is to review the tasks, productivity, personnel appointments, and formation of the technical committees (TC). In addition, the TMC determines horizontal communications among the TCs in the standardization process of the TAICS.

The Standard Counsel Committee (SCC), chaired by Dr. Shyue-Ching Lu, Honorary Professor of National Chiao Tung University, is to provide concrete recommendations for drafts of standards, standardization plans, and the promotion of standard counseling for TAICS.

The Secretary General of the Office of the Secretariat is Sheng-Lin Chou, Deputy Director of the Information and Communications Research Laboratories at the Industrial Technology Research Institute (ITRI). The Office of the Secretariat handles international affairs, partner relations, promotion of achievements, project management, and other administrative tasks. They also provide support for the operation of the TMC and SCC.
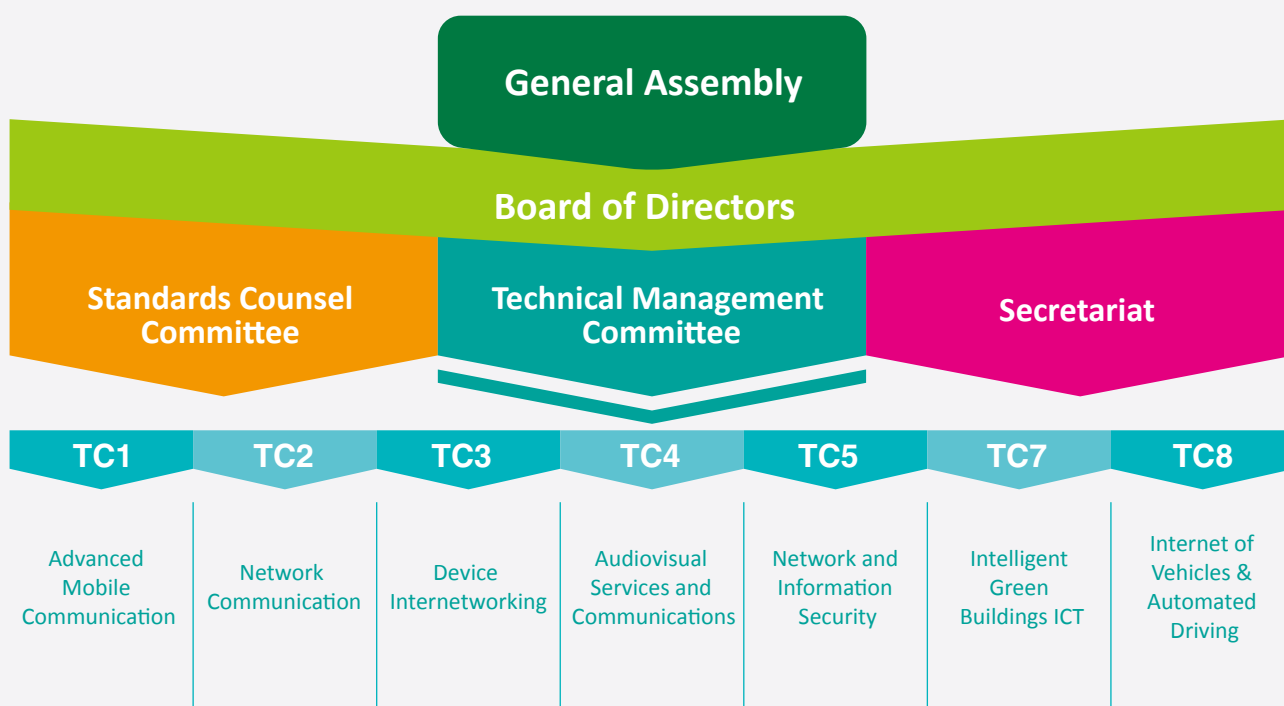


(Note: Due to the needs of the TAICS, TC6 has ceased operations in accordance with the decision of the Board on October 26, 2017. Members of TC6 continue to serve the TAICS as technical staff promoting the testing and certification business.)

Fig. 1   TAICS Organizational structure

In addition, 8 Technical Committees (TCs) have been established under the TMC in certain fields in Taiwan according to the urgency of the need to develop technical standards. TCs are where the industry come together to develop ICT industry standards in technical fields.

### 1.2.1　TC1 Advanced Mobile Communication Technical Committee

The primary focus of TC1 is the new generation of key industry technology in wireless communications, including access technology, network technology, the frequency spectrum of the future, and industry applications. The purpose of this Technical Committee is: The TC1 concentrates the research resources of the domestic industry, academia, and research institutes, and build a consensus, all for the purpose of developing of a new generation of wireless communication technologies. TC1 will become the single channel of communication for Taiwan in related international standard development organizations, e.g. 3GPP, and will thereby promote a connection to related international and regional standards as a precursor to establishing core intellectual properties in the future of international mobile communication standards. The organizational structure of the technical committee is shown in Figure 2:



Chairman
Gabriel Lin,
Senior Director,
Mediatek

TC1
Advanced Mobile
Communication

Vice Chairman
Pang-An Ting,
Division Director,
ICL, ITRI

**Working Group**

Specturm Research
WG1 Chairman
Tzu-Ming Lin,
Technical Manager,
ITRI

Access
technology

Network
Technology

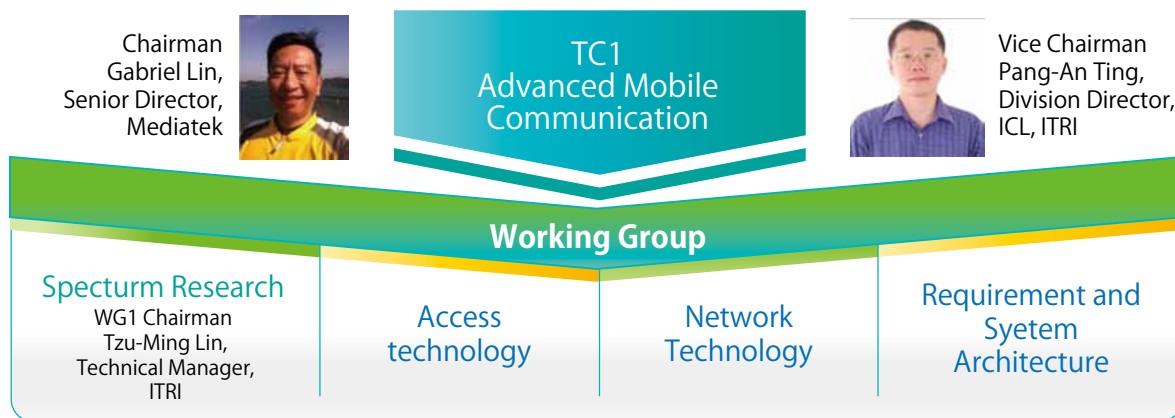Requirement and
Syetem
Architecture

Fig.2 TC1 Organizational Structure

In 2017, TC1 coordinated Taiwanese companies in the 3GPP standards organization to support MediaTek to run for vice chairman of the 3GPP RAN2 group. This was a historical achievement, as it was the first time a Taiwanese company broke through containment by international manufacturers in 3GPP and captured a seat in the office of a 3GPP task group. In addition, in 2017, the TC1 inaugurated the Spectrum Workgin Group (WG) that is performing research on 5G candidate frequency bands in advance to prepare for the specification of the 5G pre-commercial network in the coming year.

Looking forward to 2018, TC1 will begin formulating the feature specs of the 5G pre-commercial network as well as conducting preliminary research into mobile location-based services (LBS). Meanwhile, to conform to the 3GPP process, TC1 will invite members to evaluate NR Rel-16 candidate technologies and recommend items in Rel-16 for development in Taiwan. Through such recommendations, TC1 will form a consensus in Taiwan about how to standardize Rel-16 and eventually exert influence in the development of the international standards for Rel-16.

### 1.2.2 TC2 Network Communications Technical Committee

The primary focus of TC2 is industrial technology for the system integration of the heterogeneous 5G network. This includes the cross-network communications of the next generation heterogeneous networks (5G, 4G, LAN), auto-configuration and performance optimization of network systems, separation of the network control and transmission layers, and network interoperability testing technology. The purpose of this Technical Committee is: To explore heterogeneous 5G network communications technologies, establish technical regulations for cross-network integration, participate in international communication network industry organization activities, and provide technical contributions. The organizational structure of the technical committee is shown in Figure 3:
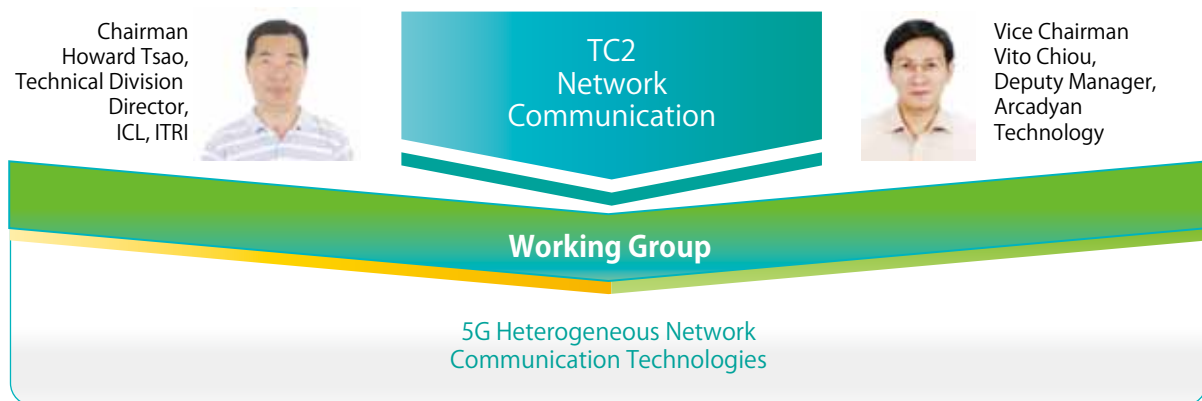


Fig. 3 TC2 Organizational Structure

In 2017, TC2 investigated the testing of transmission performance in a scenario where LWA, LTE-U/LAA terminal devices and Wi-Fi terminal devices coexist in an unlicensed 5GHz spectrum. The results were published in the Technical Report "Performance of Coexisting Heterogeneous Networks in an Unlicensed Spectrum." In connecting to the international community, TC2's main achievements include participating in international organizations such as Small Cell Forum (SCF) and Next Generation Mobile Networks (NGMN). Aside from participating in the Plugfest hosted by SCF where TC2 had technical information exchanges with vendors from across the world, TC2 also

submitted a proposal for the open network functional API (nFAPI) for the physical layer of small cells that was accepted by SCF and published in official documents. In the NGMN Alliance, TC2 turned their attention to the 5G development strategy for major telecom carriers from around the world. TC2 also completed the testing of the interference suppression management functions (Network MIMO, mmWAVE BB) for the NGMN/TTI 5G Ultra-Dense Network and will continue to follow-up with iMEC technology verification.

Looking forward to 2018, TC2 will focus on task proposals relating to the 5G network-building technology. TC2 will discuss with its members the deployment of small cell in enterprise networks, methods for establishing a dedicated network, its possible system architecture, and solutions. The goal is to help companies plan small cell products and network administration specifications more efficiently in the future to meet global market needs and enhance the competitiveness of base station products for better profitability.

### 1.2.3   TC3 Device Internet Working Technical Committee

TC3 has focused on Internet of Things (IoT) applications and selected fields, such as intelligent energy, intelligent environmental protection, intelligent cross-equipment monitoring in manufacturing, wireless charging interface standards, and mobile ticketing terminal equipment to specify industry standards and enhance the competitiveness of Taiwan's industry. The organizational structure of the technical committee is shown in Figure 4:



Chairman Chang-Ping Lin, Senior General Manager, Tatung

TC3 Device Internetworking

Vice Chairman Tony Wan, Board of Directors \BU GM\COO AcBel

Vice Chairman Chun-Sho Lee, Technology & Business Director III

**Working Group**

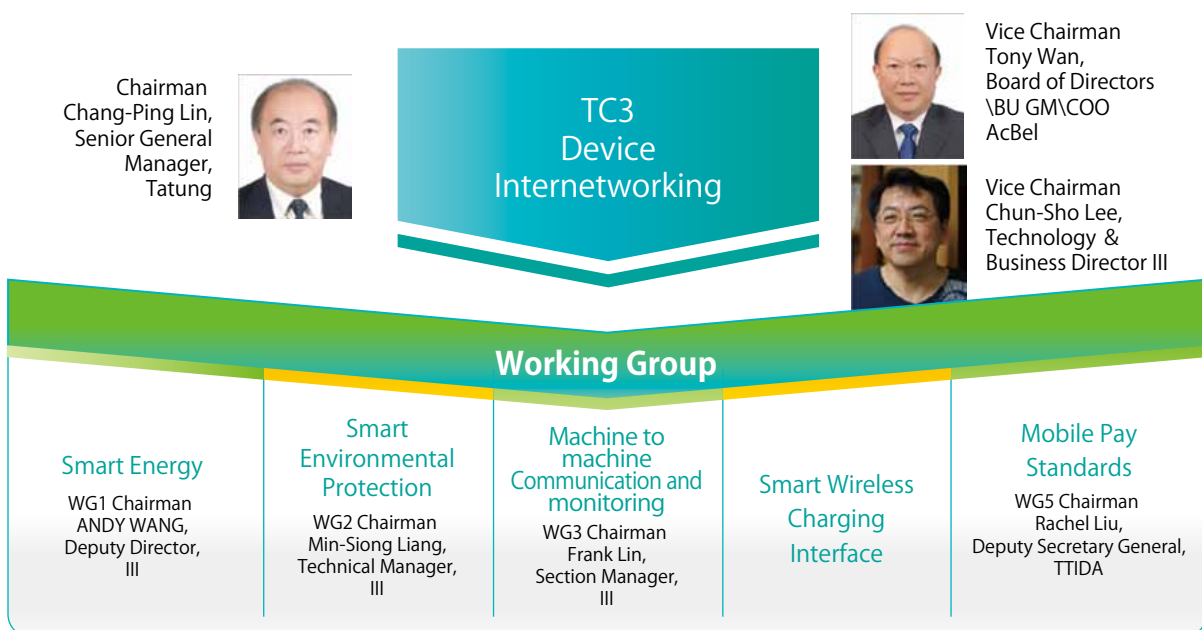| Smart Energy | Smart Environmental Protection | Machine to machine Communication and monitoring | Smart Wireless Charging Interface | Mobile Pay Standards |
|---|---|---|---|---|
| WG1 Chairman ANDY WANG, Deputy Director, III | WG2 Chairman Min-Siong Liang, Technical Manager, III | WG3 Chairman Frank Lin, Section Manager, III | | WG5 Chairman Rachel Liu, Deputy Secretary General, TTIDA |

Fig. 4  TC3 Organizational Structure

Looking forward to 2018, TC3 will focus on standards of mobile ticketing terminal equipment, data format for intelligent building energy management systems and the Taiwan Machine Tool Connect. The goal is to lead and accelerate the development of IoT in Taiwan through the establishment and promotion of standards and regulations.

### 1.2.4    TC4 Audiovisual Services and Communications Technical Committee

The goal of TC4 is to consolidate audiovisual services and communications technologies, establish a content-service integration platform, enrich specialty audiovisual channels and content, facilitate development of innovative value-added audiovisual operating and service modes, and drive the development of Taiwan's digital audiovisual software and hardware industry chain. The organizational structure of the technical committee is shown in Figure 5:



Chairman
C. Stone Shih,
Director General of
Board,
DTVC

TC4
Audiovisual Service and
Communication

Vice Chairman
Tony Do,
Division Director,
ITRI

**Working Group**

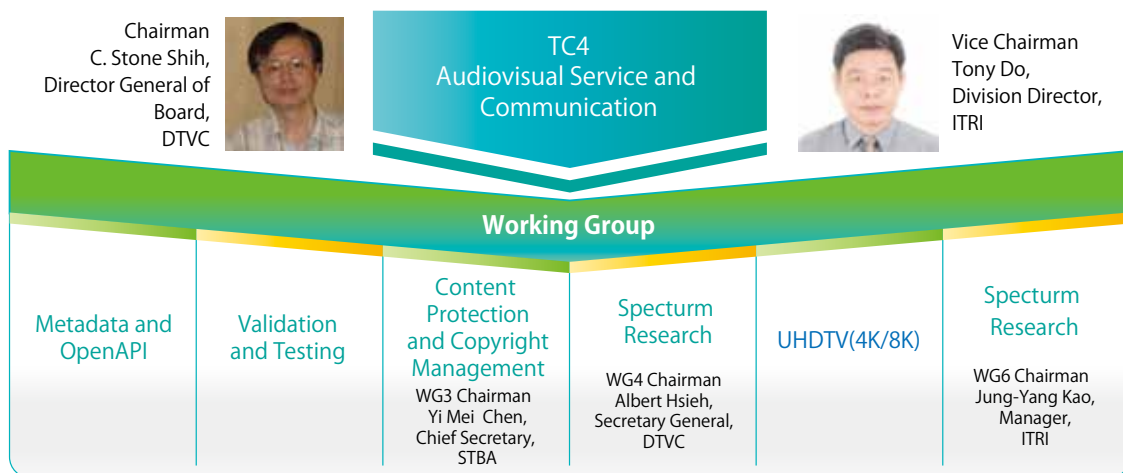| Metadata and OpenAPI | Validation and Testing | Content Protection and Copyright Management WG3 Chairman Yi Mei Chen, Chief Secretary, STBA | Specturm Research WG4 Chairman Albert Hsieh, Secretary General, DTVC | UHDTV(4K/8K) | Specturm Research WG6 Chairman Jung-Yang Kao, Manager, ITRI |

Fig. 5  TC4 Organizational Structure

The main task of TC4 is to specify a common standard format for audiovisual metadata. The drafting of two standard specifications was completed in 2017, which are Audiovisual Open API Standard and Audiovisual Metadata Standard V2.

To promote audiovisual services and communications technologies, TC4 established the MPEG Working Group in 2017 that is responsible for sharing the latest developments in MPEG-related video standards. The group has become Taiwan's channel for obtaining information on the international MPEG video standard.

Looking forward to 2018, to promote audiovisual service and communications technology, TC4 will send the MPEG video technology work group with the backing of the domestic industry to participate in the standards development meetings hosted by the MPEG international standards organization and regularly update the status of the standards development relating to MPEG video.

In addition, they will share latest information on video standards and technical trends as reference for the Taiwanese industry's blueprint for future technical development, which will help Taiwan companies to begin planning its strategy and technical road map, understand market opportunities, and accelerate the time to international market for video-related products.

### 1.2.5 TC5 Network and Information Security Technical Committee

TC5 promotes the development of industry standards according to the security needs of Taiwan's information communication industry. TC5 keeps track of the latest trends in the region and in the world to promote the development of safe and trustworthy products and services, bolster the influence of Taiwan in international organizations, and facilitate the industry's global market strategy. The organizational structure is shown in Figure 6:



Chairman
Morgan Hung,
General Manager,
Onward Security

TC5
Network and
Information Security

Vice Chairman
Cheng Yu Tsai,
Section Manager,
CSTI, III

**Working Group**

IoT Security
WG1 Chairman
Mars Kao,
Senior Engineer,
III

FIDO-PKI Integration
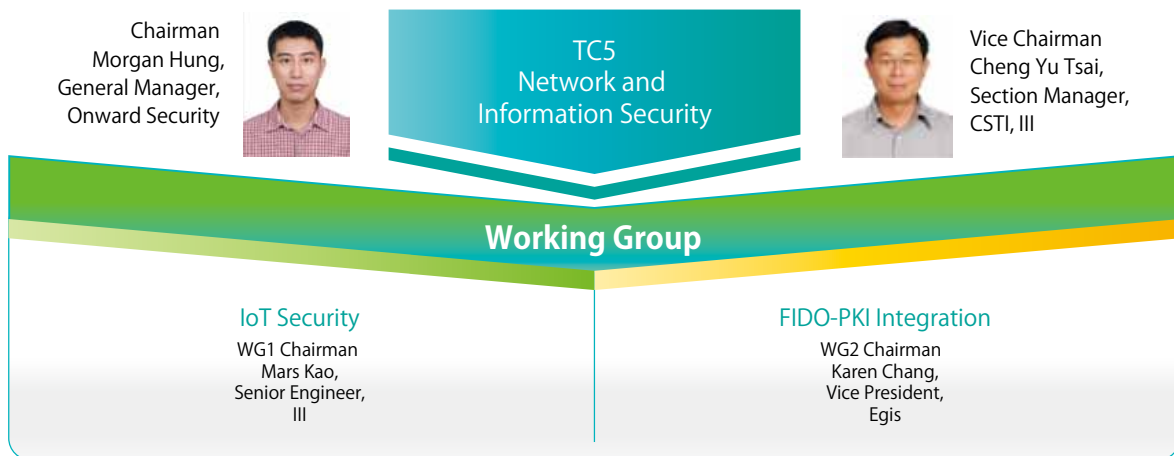WG2 Chairman
Karen Chang,
Vice President,
Egis

Fig. 6  TC5 Organizational Structure

In 2017, to create an environment conforming to IoT information security regulations, the primary mission of TC5 is to complete information security standards for video surveillance system series and continue to develop information security standards for IoT equipment that influence or threaten civilian and national security. Such standards can provide reassurance to consumers on the security of the devices, increase the competitiveness of the exported product on the global market, and enhance the information security quality of the country as a whole, further facilitating the popularization of IoT technologies.

Looking forward to 2018, TC5 will formulate corresponding information security standards for each device on the IoT. Following prior experience with Video Surveillance System Security Standard - IP Camera, TC5 will continue to develop information security standards that suit the needs of the industry. Close cooperation with government agencies will hopefully lead to adoption of the standards by the government as a basis for IoT equipment procurement in the public sector.

### 1.2.6   TC7 Intelligent Green Buildings ICT Technical Committee

The mission of TC7 is to develop and promote information communication standards for intelligent green buildings. Several Working Groups (WGs) are established under the TC7, including data format, communication protocols, system interoperability technologies, storage management, and testing and verification. The organizational structure is shown in Figure 7: The purpose of TC7 is to act as a platform for communication among industry, government, academia, and research institutions, and for developing and promoting standards with consideration of intelligent green buildings information communication standards; to represent Taiwan in activities hosted by the international intelligent green building standards alliance and facilitate the development of the intelligent green building industry in Taiwan.
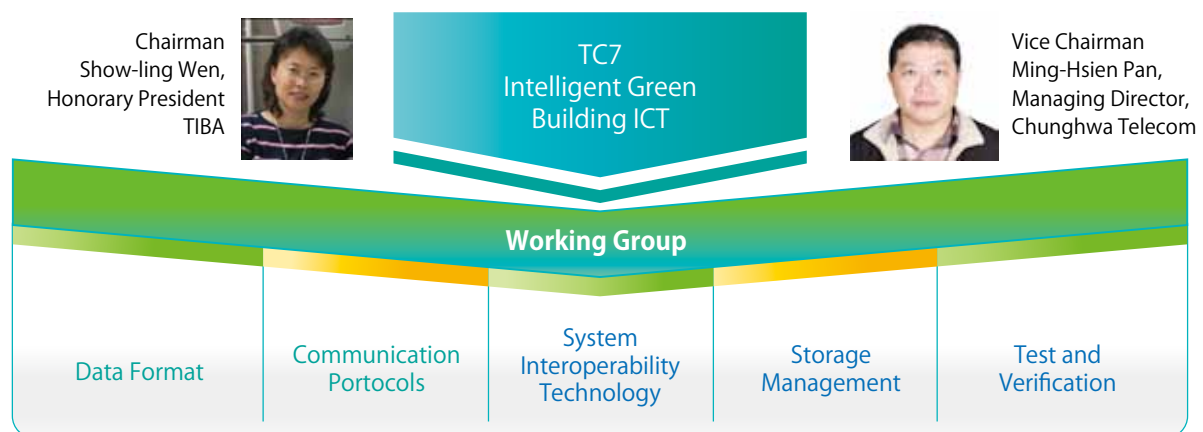


Fig. 7 TC7 Organizational Structure

To make a building intelligent requires the inter-operation of various sub-systems. In the early stage (2014 ~ 2016), the strategy involved introducing mainstream international standards to unify the disparate regulations and develop a common data format to share data in order to inspire new applications. In response to the expansion of the scope of applications within intelligent buildings, we began with the application for which the consumer is the most willing to pay: security and surveillance applications. TC7 has completed development of three standards and specifications, including the TAICS TS-0002 -ONVIF Profile S standard, TAICS TS-0009 Data Format Standards for Safety and Surveillance Systems in Intelligent Buildings, and TAICS TS-0012 Conformance Test Specification of ONVIF Profile S.

Beginning in 2017, TC7 has focused on providing the client and system design vendor reference guideline recommendations to provide a common ground in communication in each stage of the building development, from design and acceptance to maintenance. TC7 also provided the latest specifications as reference for the vendor during the design stage, and for the client to implement

in their project. In 2018, TC7 will develop the Guidelines for adoption of standards in Intelligent Buildings, which will be split into three major aspects: safety, energy, and health. The guidelines will allow intelligent buildings in Taiwan to prosper in an environment that is healthy and beneficial for all. It will also bring the public a friendlier, more convenient and advanced living space.

### 1.2.7 TC8 Internet of Vehicles (IoV) & Automated Driving Technical Committee

TC8 was established with the purpose to improve industry competitiveness by developing a common industry standard that follows the global trend in next generation intelligent transportation and the development of automated driving and V2X initiated by the IoV. By creating specifications that is on par with international standards, TC8 can provide Taiwanese companies a reference specification when manufacturing and marketing products. The committee will also serve to introduce foreign technologies that can serve as a reference for the industry, government, academia, and research sectors as they formulate their strategy for the future. The organizational structure of the technical committee is shown in Figure 8
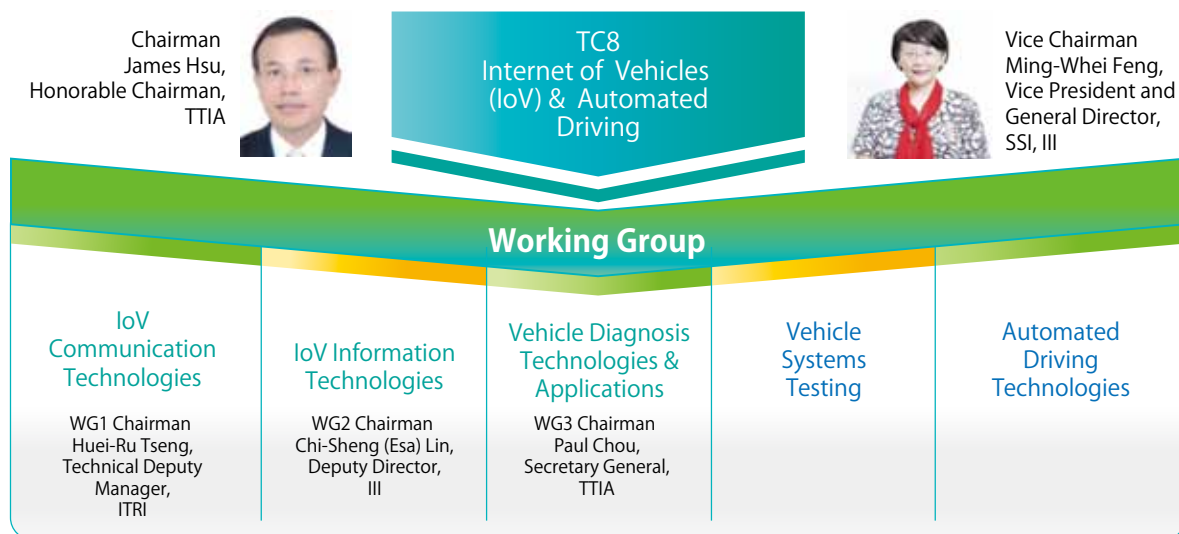


Fig. 8  TC8 Organizational Structure

TC8 was inaugurated in 2016 with the mission of establishing a proposal platform for intelligent transportation and IoV (Internet of Vehicles) equipment communication standards and technology and developing industry standards in Taiwan for the interoperability of intelligent transportation and IoV communication equipment. TC8 will also help set industry standards for in-car sub systems and intelligent transportation communication equipment, enhance the vertical integration of the industry, and promote the adoption of international standards. Several Working Groups have been

established during the initial stage, including the IoV Communication Technology Work Group, the IoV Information Technology Work Group, and the Vehicle Diagnostic Technology and Applications Work Group. New working groups will be established depending on the future development of the industry and government policies.

Looking forward to 2018, TC8 will further explore developments relating to two-wheeled vehicles in addition to paying attention to the development of current IoV-related standards. Since South East Asia is the largest sales market in the world, and Taiwan has the highest density and the most complete industry ecosystem, we have an opportunity to turn Taiwan into a base for new technology of motorcycles. By developing relevant standards and researching related information and communication technologies, the driving environment for motorcyclists in Taiwan can be improved and accident rates lowered. Additionally, TC8 plans to collaborate with major international companies to build testing grounds and expand domestic car electronics potential to other cities in South East Asia and across the globe.

# 2 | Major Achievements



## 2.1 Technical Meetings in Development of Standards

The TAICS hosted 53 technical meetings in 2017, attended by more than 1,000 member experts.

## 2.2 Standards Development

With the avid participation of members in 2017, and through industry consensus formed by each TC, the TAICS has continued to promote the development of industry technical standards in every field. As such, 6 industry technical standards, specifications, and research reports were completed in 2017. What these standards and specifications have achieved has also been adopted by government agencies into regulations, implementation subsidies, and procurement guidelines. The descriptions follow:

### 2.2.1 Technical Report of LTE Small Cell SON –TAICS TR-0004

Self-Organizing Networks (SON) is a technical specification that is desperately needed by telecom operators and actively developed by the telecom standards organization. However, the international organization does not have a unified testing specification or an institution. Telecom operators set their own test items and procedures, costing small cell equipment vendors significant resources as they cater to the different test items and schedules of different operators.

In this research report, standard procedures and methods for testing several SON functions are proposed. The functions include Automatic Neighbor Relation (ANR), Physical Cell ID (PCI), Random Access Channel (RACH) optimization, and Capacity and Coverage Optimization (COO). For each function, multiple test items and the corresponding procedures are provided, including the complete technical testing protocol and testing environment planning. This research report provides domestic companies a recommended testing method of SON functions and plans for implementation in hopes of accelerating the testing of SON products and time to market.
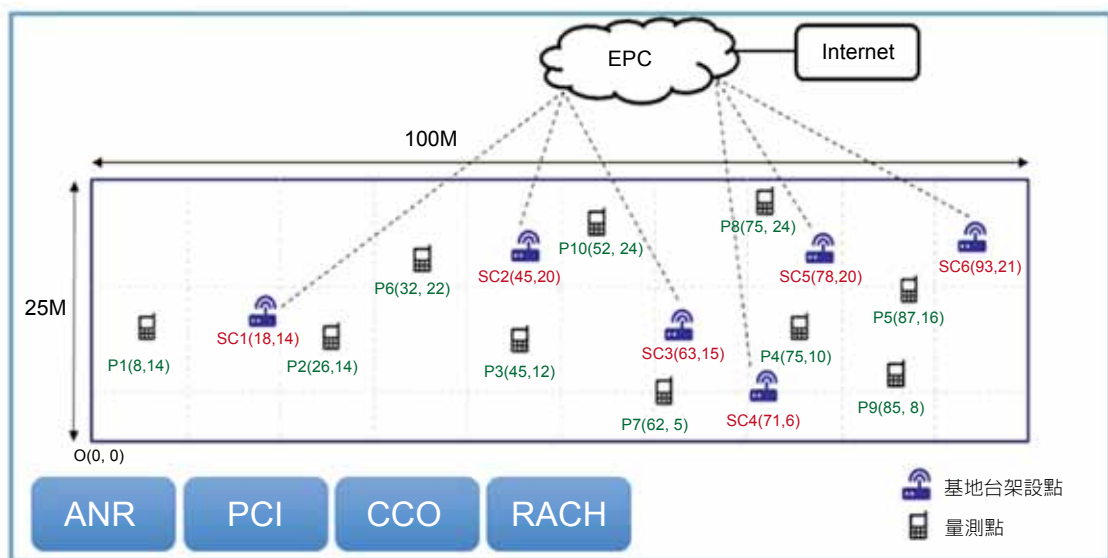


Fig. 9  Diagram of SON Function Testing Environment

### 2.2.2  Test Specification of Wi-Fi Data Offload V2 - TAICS TS-0004

With the rise of popularity of mobile devices, the dependence of the public on the mobile network has increased. Due to the high cost of transmission and poor indoor coverage of the 4G network, telecom operators would like to lower transmission costs and improve coverage by utilizing Wi-Fi offload technology, thereby improving service quality and user satisfaction. TC2 has established the test items and test specifications of Wi-Fi data offload equipment in accordance to 3GPP standards. This is provided to Wi-Fi data offload equipment manufacturers in the country as a basis for testing the shortening of the product development cycle and accelerating production speed. This test case proposal is mainly based on the test cases involving access authentication, smart network selection, and switching between Wi-Fi and 4G for untrusted WLAN as specified in the 3GPP TS 23.402 and TS 24.312 specifications. Since the Wi-Fi AP in an untrusted WLAN is not directly involved in procedures such as access authentication and only acts as a medium for transmitting control commands related to the procedure, LTE-A / Wi-Fi dual-mode UE serve as the main device under testing for the test cases in the proposal. The scope of the test specification in the international standard protocol is shown in figure 10:
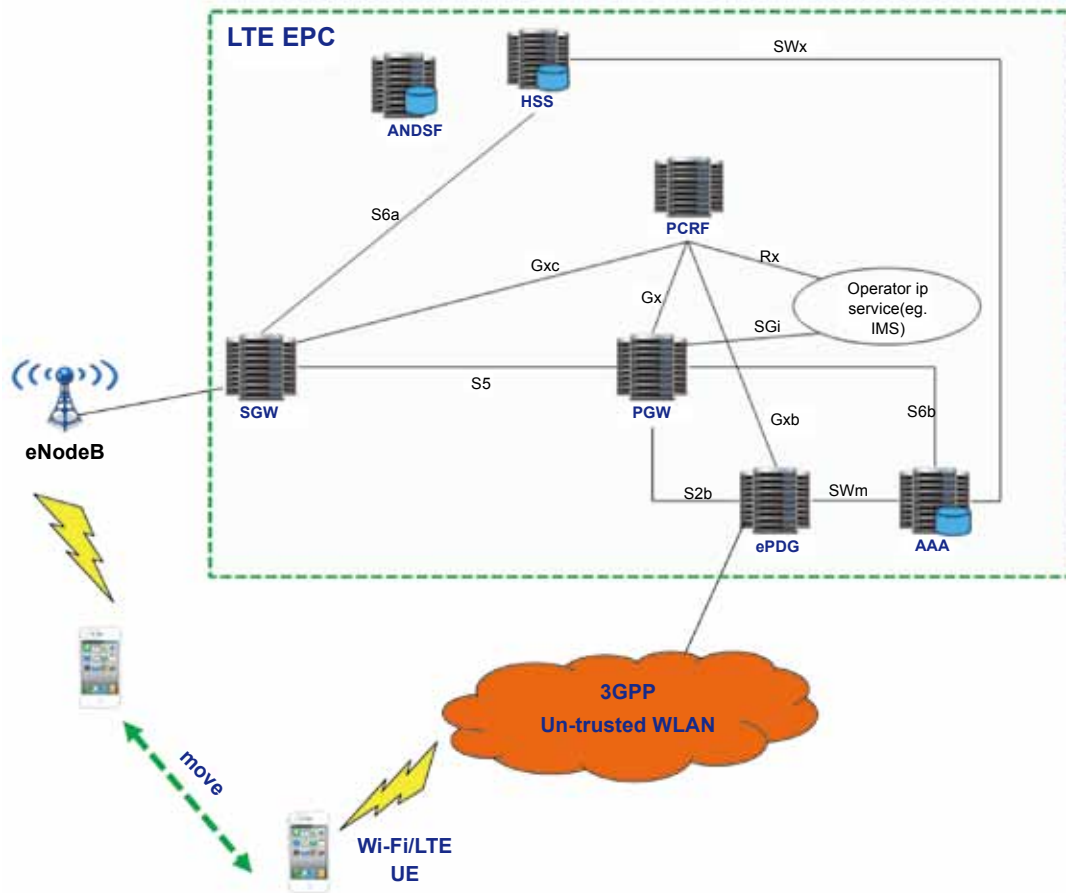
Fig. 10  Scope of the Wi-Fi Offload Test Specifications in International Standard Protocol

### 2.2.3  Automatic Clean Water Monitoring System Compliance Verification - TAICS TS-0011

The issue of environmental monitoring has gained attention with the rise of public awareness in environmental protection. Automatic and continuous environmental monitoring has become the latest blue ocean market in monitoring mainly because while waste water discharge should be reported by enterprises to the relevant authorities, they are only required to do so after the fact with no real-time data to reflect the current state. Water quality reporting in the past has been done by manually collecting single samples at fixed intervals for analysis; no long-term continuous data is available to show that waste water processing is consistent. TAICS completed the development of the Automatic Clean Water Monitoring Standard. To help companies promote the standards, TAICS develop the compliance verification test specification to standardize the certification of automatic clean water monitoring systems, including description of the certification label, principles of awarding certification, and certification method. The hope is to reduce the cost of building and maintaining the system by using a common system interface which would also ensure information security and expandability to help companies and managing authorities create a common environment for system development.

The scope of the specification includes the testing of communication protocols and data formats to ensure compatibility and coordinated operation when using products from different manufacturers in different settings. To achieve this goal, the specification will focus on the verification of the communication interface to ensure stable interoperability. The specification was approved by the Technical Management Committee (TMC) in August, 2017.

### 2.2.4 Taiwan Machine Tool Connect Standard - TAICS TS-0013

In light of the global development industry 4.0 trend, various equipment emphasize connectivity and ability to exchange information. Communications between equipment can provide decision makers with crucial information in real-time. In the machine tool industry, the controller, also known as the brain of the machine tools, plays an essential role. The controller allows for precise control of the operating parameters of the machine tool, the control parameters, and other important elements. However, a survey of the machine tool controllers used in Taiwan reveals a long term reliance on imported systems which form closed communication structures. As such, the Taiwan Machine Tool Connect Standard seeks to provide an exchange layer standard for the machine tool controller and robot arm parameters commonly used on the market by different manufacturers and to specify a common format that lowers switching costs while referencing controller parameters from different companies. The main purpose is to achieve the benefit of equipment monitoring by allowing the upper application service layer to obtain shared data between equipment through this standard. By establishing the infrastructure for equipment connectivity, it is hoped that the integration issue in the industry chain can be solved.
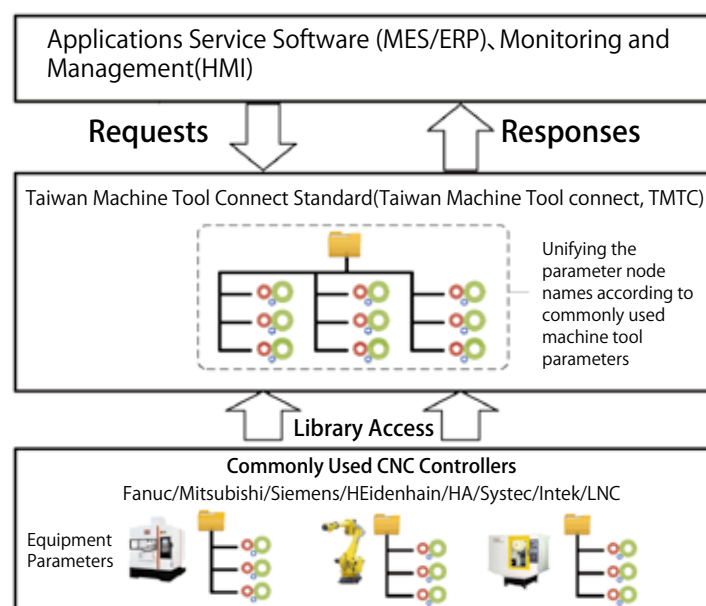


Fig. 11 Diagram of the Application of Taiwan Machine Tool Connect Standard

The TMTC can be used in the machine tool, manufacturing, and other related industries. By using this standard, all equipment from production equipment manufacturers in the machine tool, manufacturing and other industries can pass data to systems in the application service layer. Through two-way passing of parameters, users can control the production on the floor in real-time and obtain the status of the production line, which helps to improve productivity and overall management efficiency. The net result is the improvement in the competitiveness of the companies in the era of industrial IoT and intelligent manufacturing.

### 2.2.5   Conformance Test Specification of ONVIF Profile S - TAICS TS-0012

The test specification describes conformance test specifications and examples of common functions in equipment management and the access of video streaming settings for IP cameras or encoders that uses an IP network to perform video streaming, configuration, or control, citing ONVIF publications. The test specification also references test cases and relevant testing tools in the ONVIF profile, selecting the most relevant parts to describe in detail the testing procedure, testing environment setup, testing tools, and how to use them. As such, manufacturers can quickly gain an understanding of the specifications to be followed, the overall testing procedure, and how to establish the testing environment. By successfully running the conformance test examples, the manufacturer can claim conformance to the interoperability of the ONVIF profile.

After completion of testing, the manufacturer can use the test results to declare and mark the conformance of the product to facilitate distribution and integration.
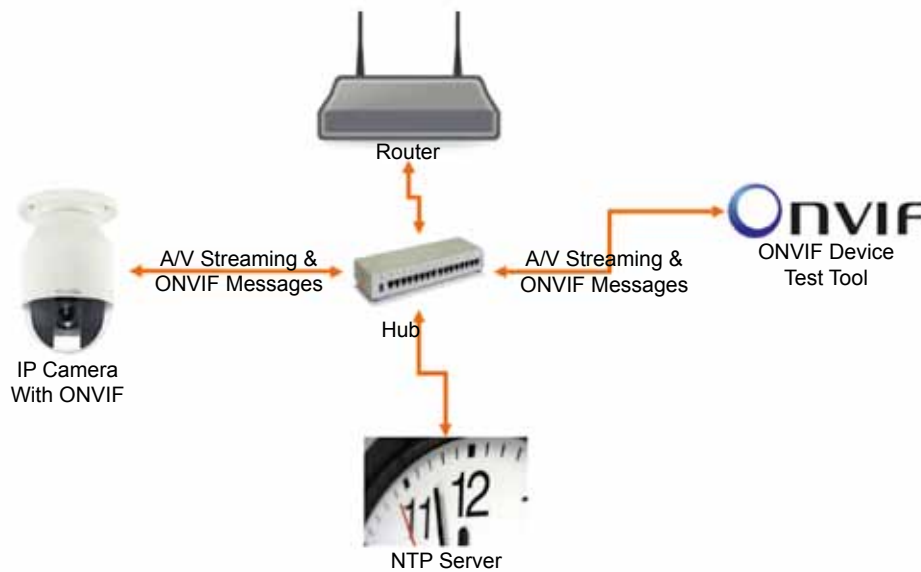


Fig. 12  Testing Environment Setup

## 2.2.6  Video Surveillance System Security Test Specification–IP Camera - TAICS TS-0015-2

Both the government and the public rely on the IP camera. It is ubiquitous in the streets, helping the police monitor and track potential crimes; it is used at home to monitor pets, babies, or the elderly; even in a modern factory, it can be used for machine vision. However, whether the IP camera is imported or domestically manufactured, security features were not considered in the product design phase, leading to a large number of security events. Therefore, government agencies, companies, and even the general public are paying attention to whether a suitable security standard exists that can ensure the security of the products.

Security standards demand security and robustness of a product from five aspects (see Figure 13). Considering the physical security aspect: the standard demands that the product cannot be disassembled easily and that the debug mode of the operation system cannot be accessed through a physical interface. Considering the system security aspect: the standard demands that no known major information security vulnerability exist, that the system must have an information security log, that there is the ability for a system update, and that access sensitive information must be controlled. Considering the communication security aspect: the standard demands that sensitive information must be encoded when transmitted on the Internet and provide a control switch for protocols that allow network status inquiry, such as UPnP. Considering the identification and authorization aspect: the standard demands that identification and authorization must be given before access of product resource is allowed, and that such mechanisms must meet a minimum strength requirement. Finally, considering the privacy aspect: the standard demands that the product must provide a warning when a user logs in, and that a secure channel must be used when transmitting private video information.
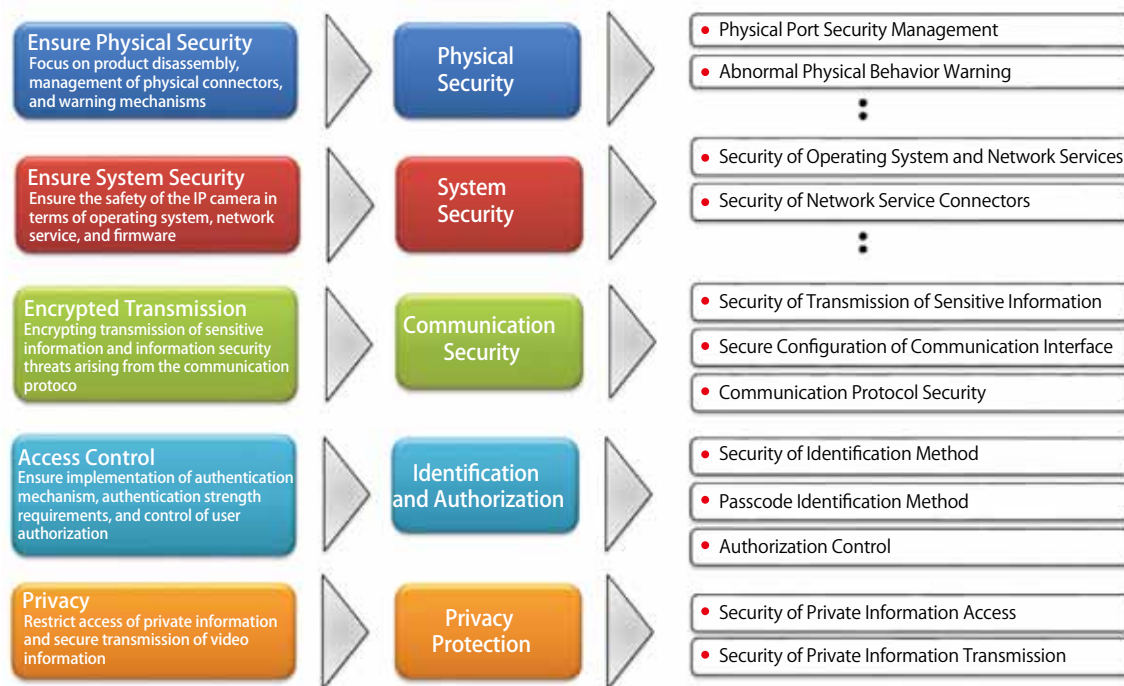
Fig. 13 Framework of Standard

To establish a test system for the information security of IP cameras and develop a test specification for Video Surveillance System Security Standard - IP Camera, the standardized testing procedure, testing purpose, and expected results are set up for every required item in the standard. All test items in the specification have been verified by 3 organizations: Chunghwa Telecom, Onward Security, and Electronics Testing Center, Taiwan. The specification will serve as a reference for the information security standard conformance testing of video surveillance system IP cameras.

The implementation of the specification ensures that IP cameras are protected by information security functions, and additionally ensures: (1)That products can be updated to fix vulnerabilities quickly, and the information security strategies are updated regularly; (2)That a warning mechanism exists for abnormal behavior, so the product is monitored for hacking, containing the scope of damage for connected equipment; (3) That the password authentication is strengthened to reduce the security impact after the equipment connects to the network. Specifically, a compulsory change of the default password upon first login is enforced. In the future, all IoT equipment is expected to follow this guideline to improve the information security quality of connected devices.

# 2.3 TAICS Standards Adoptions

## 2.3.1 Audiovisual Content Metadata Standard - TAICS TS-0001

In 2017, the Ministry of Culture announced on their subsidy website and explicitly stated in the contract that the format of the data submitted by the subsidized companies must conform to the Audiovisual Content Metadata Specifications. These types of grants are reviewed batches, and a total of 60 companies have been subsidized. The description of the grant follows:

▍ 2017 Grant for Documentary Production Details

▍ 2017 Grant for Production of Mobile Broadband Audiovisual Programs Details



Fig. 14   Announcement on the Ministry of Culture Subsidy Information Website

### 2.3.2 Audiovisual Open API Standard - TAICS TS-0016

The Audiovisual Open API standard is supported by the Accelerating Mobile Broadband Service and Industry Development Project of the Ministry of Economic Affairs (MOEA). A technical verification platform has already implemented the live streaming Open API that is part of this standard proposal, which allows vendors to conduct experiments with live streaming applications on the audiovisual service verification platform. A total of 68 vendors (for approximately 75 audiovisual channels) are conducting audiovisual live streaming application experiments in 4 major fields:

**Sports** — Well-known video communities, such as Running Biji and Basketball Biji, which allow users to make personal highlights for activities and events.

**Education** — Such 104 Green Tutor, which provides live video tutoring and online interaction for students in remote areas.

**Competition** — For example, the MOEA's Get Fresh competition and Lion Dance Championships, which have dedicated video channels to collect videos from the events.

**Public Service** — For example, government agencies such as the National Taxation Bureau of Taipei, which has a video channel that promote tax knowledge using live video broadcasts.

TAICS will continue to encourage businesses to use the live streaming open API on their own platforms to develop video applications and services.

### 2.3.3 ONVIF Profile S and Data Format Standards for Safety and Surveillance Systems in Intelligent Buildings - TAICS TS-0009

The Intelligent Green Buildings ICT Technical Committee continues to promote applications for TAICS-0002 ONVIF Profile S Standard and TAICS TS-0009 Data Format Standards for Safety and Surveillance Systems in Intelligent Buildings

In 2016, the technical committee attempted for the first time to introduce the TS-0002 standard in the Taichung Culture and Creative Industries Park sites of the Cultural Heritage Department of the Ministry of Culture (R13 & R14) for the installation of the smart parking management system. The model adopted by the TAICS to promote the standard involved helping the client with construction design through a professional construction management company (PCM), and helping the client adopt appropriate standards into the construction specifications after understanding the needs of the site. This strategy turns the client needs into motivation for introducing the

standards, and is mutually beneficial for the client and the system equipment vendor: the client gains an understanding of the information communication system and products, while the system equipment vendor can better understand the client's needs. The outcome of this case was satisfactory, with the client feeling confident with the standard and its adoption. As a result, in the following year (2017), the client expanded the scope of the smart enhancement project to include the entire park.

In 2017, TC2 completed the development of two standards. To promote the standards, they followed the strategy where the PCM writes the client needs into the construction specifications. In addition to the full adoption of the standards in the Taichung Culture and Creative Industries Park for the Cultural Heritage Department, Ministry of Culture in the second year, discussions began for the smart enhancement of the Taipei Railway Workshop, a national historic site. Currently, both projects have been completed with good results, and discussions for further adoption of the standards are ongoing.



**Project Site 1: Culture and Creative Industries Park, Taichung City**
- Subject: Installation of Smart Parking Management System
- Completed and passed acceptance check at the end of 2016

**Project Site 2: Culture and Creative Industries Park (Second Year)**
- Subject: Pedestrian Sensing Camera for Smart Lights and Integrated Management Platform for the Park
- Completed and passed acceptance check at the end of 2017

**Project Site 3: The National Historic Site Taipei Railway Workshop**
- Subject: Additional Cameras for the Surveillance System Across the Entire Taipei Railway Workshop
- Completed and passed acceptance check at the end of 2017

Fig. 15   Standard Promotion Results

### 2.3.4   Standard for Automatic Clean Water Monitoring System - TAICS TS-0005

The Environmental Protection Administration of the Executive Yuan requires that wastewater treatment plants of each industrial region and companies that discharge 1500 CWD of industrial waste water install a 24-hour automatic water quality monitoring system at the effluent outlet of the factory, in accordance to Article 105 of the Water Pollution Control Measures and Test Reporting Management Regulations. Additionally, the system must be connected to the Continuous Water Monitoring System of the local Environmental Protection Bureau and open for public inspection. Starting at the end of 2013, the list of monitored companies was announced in batches. Currently

over 300 industrial production companies are included in the real-time monitoring system. The EPA announced on April 21, 2017, that public sewage wastewater treatment plants outside of industrial areas must also complete installation of automatic monitoring facilities by July of 2019, and link it with the local authorities. By then, more than 500 wastewater treatment plants in the country will have been included in the real-time water quality monitoring system.

Instability in the function of the water quality monitoring system equipment and the inconsistent quality of system maintenance both may cause data loss. The monitored companies must remedy the situation by manual sampling. Water monitoring system vendors are all small-to-medium enterprises, and as such, the variation in the quality of the companies is significant. Where system vendors do not take responsibility when the system is disconnected or equipment damaged, the system may be orphaned, as there is no guarantee the old system can be repaired even if taken over by a more responsible vendor due to the lack of a national standard. This not only wastes money, but the monitored company is also inconvenienced since it has to explain to the Environmental Protection Bureau the reason for the downtime. To solve the issue of incompatibility between systems made by different water monitoring system vendors, the industry needs a water quality monitoring system standard that serves as a basis for common technical specifications for domestic vendors as they develop systems and products.

To date, the TAICS has completed the Automatic Clean Water Monitoring Standard, and the Automatic Clean Water Monitoring System Compliance Verification. These two documents will be submitted to the Bureau of Standards, Metrology and Inspection along with a national standard recommendation letter to push for the Standard for Automatic Clean Water Monitoring System to become a national standard. Currently, 15 public and private companies have adopted this standard in the water monitoring systems installed in the effluent outlets of plants. These include the YFY Chiutang Plant, YFY Xinwu Plant, YFY Taitung Plant, Wastewater Treatment Plant of Jhongli Industrial Park, West Wastewater Treatment Plant of Changhua Coastal Industrial Park, De Licacy Industrial Co. Ltd., Jin Neng Electroplating Plant, GCE Ltd., Oriental Petrochemical, Advanced Water Purification Plant of Taiwan Water in Kaotan and Weng-Gongyuan, Evonik (German company), Tong Shing Electronic Industries, Wuri Brewery, and Nantou Agricultural Products Marketing Company.
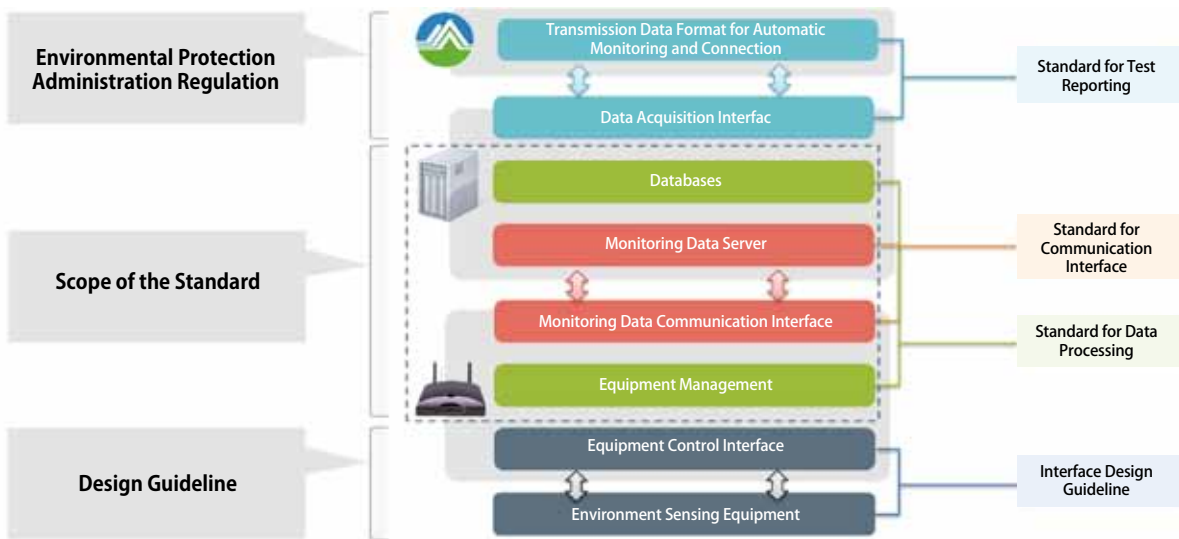
Fig. 16.  Taiwan's First Industrial Wastewater Monitoring Standards and Compliance Verification Specifications.
Source:  TAICS TC3-WG2

### 2.3.5  Taiwan Machine Tool Connect Standard - TAICS TS-0013

The standard passed review in 2017 and has continued to be implemented in products in the industry. To date, it has been implemented in 3,071 pieces of equipment (1,286 in 2017 alone). Through equipment manufacturers such as Victor Taichung Machinery Works, FATEK, and Lien Chieh Machinery, and companies such as Servtech Co., the results have reached 9 countries, including Taiwan, China, Mexico, the US, India, Turkey, the UK, Singapore, and Germany. Sales have continued to rise each year, contributing to the excellent achievements of Taiwan's intelligent manufacturing industry.



Fig. 17 Diagram of Global Distribution of Taiwan Machine Tool Connect Standard

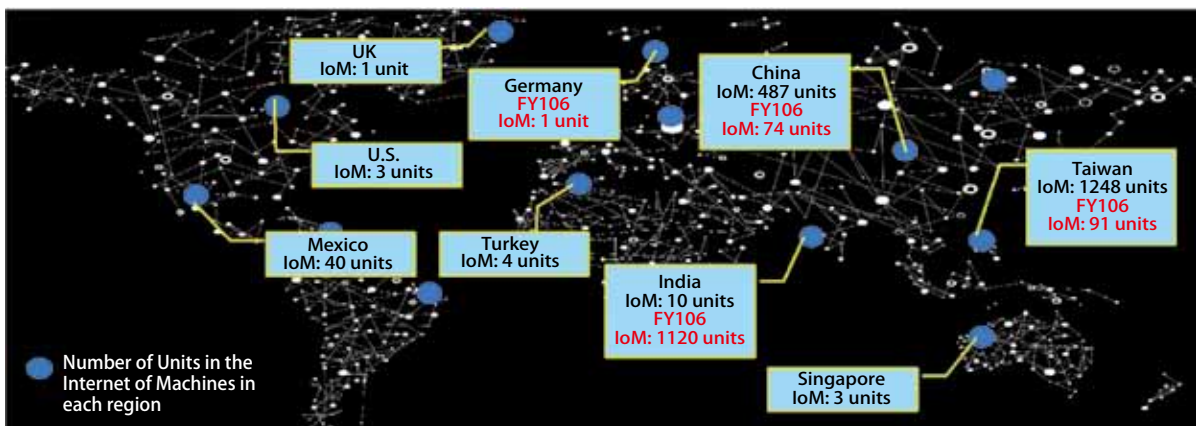## 2.3.6 Video Surveillance System Security Test Specification–IP Camera - TAICS TS-0015-2

The standard was developed by companies in the video monitoring system, information security, test labs, and other industries, and was led by the chairperson of the Network and Information Security Technical Committee (TC5), Kuang-Chun Hung, who is also general manager of Onward Security. The first standard and test specification specifically designed for IP camera security in the world is now the focus of attention by manufacturers around the world. Synology, the leading brand in NAS, and Digicentre, an information security company, both joined TAICS while the standard was being developed, and contributed new information security expertise to the standard.

While promoting the standard, Jonathan Tsang, chairman of the TAICS, was the first to announce the industry standard. The standard is also backed by Wen-Chang Chen, Chairman of Vivotek, Vic Hsu, CEO of Synology, and Qnap general manager Meiji Chang, who represented the industry in declaring their determination to adopt the standard and improve information security. In December of 2017, the Minister of Economic Affairs Sheng Jong-Chin released a joint announcement along with the National Security Council, the National Development Council, the Department of Cyber Security, the Taipei City Government, and the TAICS, that Taiwan is entering the Year of Industry Standards for Information Security. The announcement began a trend of IoT information security standards within the industry.



Fig. 18   Year Actirty of Industry Standards for Information Security

The Department of Cyber Security and the Industrial Development Bureau planned to establish a certification procedure for the information security standards in video surveillance systems. The video surveillance system devices that pass the verification test will be awarded a information

security badge, helping the government agencies and consumers identify IP cameras that have information security functions and serving as a guideline for procurement.

# 2.4 International Affairs

## 2.4.1 Regional Standards Organization and Global Specifications Industry Alliance.

TAICS is actively working with regional standards organizations such as ETSI in Europe, ARIB and TTC of Japan, CCSA in China, and TIA, ATIS, and IEEE of the United States. TAICS is also in talks of collaboration with global specifications industry alliances, such as NGMN, WPC, and AirFuel Alliance. In 2017, TAICS continue to expand its global partners network by signing collaborating memorandums of understanding with IEEE of the US and TTA of Korea. TAICS acts as an intermediary with international information communication industry standards affairs, allowing Taiwan to strengthen its connections with international and regional standards organizations and establish channels for collaboration. At the same time, TAICS worked with ARIB of Japan to conduct a research survey on smart phone consumer behavior and jointly organized a workshop in Taiwan. A summary of related activities follows:

### Signing Collaborating MoU with IEEE

Pictured: IEEE-SA President Don Wright (Left) and TAICS Chairman Jonathan Tsang signed a collaboration MoU to bring opportunities for future collaboration.

### SINOCON Cross-strait 5G Standards Forum

To promote cross-strait collaboration on 5G industries and technical standards, SINOCON, TAICS, CCSA, and TDIA called on members from the communication industry, telecom operators, and research organizations from both sides of the strait to form the 5G mobile communication experts technical committee. The committee is to be jointly chaired by TAICS secretary general Chou Sheng-Lin and TDIA secretary general Hua Yang and will hold formal discussions on topics such as mobile IoT and pre-commercial development of 5G. In the 5G mobile communications experts exchange meeting in Pingyao County, Jinzhong City, Shanxi Province, China held on August 29, 2017, a consensus was reached on topics such as NB-IoT testing technology and planning, the pre-commercial 5G network, millimeter wave channel measurement,

and collaboration on 5G in the 3GPP. A itemized discussion on collaboration was held in the mobile communication sub-forum at the 14th Cross-strait Information Industry and Technical Standards Forum to facilitate the symbiotic collaboration and communication between the two sides of the strait in NB-IoT and 5G communication industries and promote cross-strait industry and technical standards collaboration.

## Signing Collaborating MoU with TTA of Korea

On September 5, 2017, TAICS Chairman Jonathan Tsang and TTA Chairman Park Jae Moon signed a collaboration MoU, witnessed by the Director General of the Department of Industrial Technology (DoIT), MOEA, Ta-Sheng Lo, and Intelligent Transportation Society of Taiwan President Y.C. Chang. The two sides will establish a collaboration framework in 5G, information security, and IoT standards. In the future, besides working together on standards development, TAICS will also learn from the TTA's testing, certification, and operation models. The goal is to establish a system for testing and verifying standards and shorten the time required for the information communication industry in Taiwan to acquire international certification.



## ARIB Visit to Taiwan

Following the signing of a collaborating MoU with ARIB of Japan in the beginning of 2016 that initiated the exchange between Taiwan and Japan in wireless communication standards and the wireless communication industry, the two sides worked together to collect data on mobile phone user behavior at the end of that year. On October 31, 2017, the first TAICS-ARIB 5G-era Smart phone Application and Service Workshop was held in Taipei. Led by Kobashi Yasuyuki of Japan's Ministry of Internal Affairs and Communications, the Japanese delegation consisted of members of ARIB, 5GMF and the industry, and visited the DoIT of MOEA to exchange information on 5G trials and expressed the desire for future discussions and visits.

### ● Visiting India, Jointly Hosting, with TSDSI, Taiwan-India Telecommunication Standard Seminar

TAICS led a Taiwan communications delegation and visited TSDSI and C-DOT, COAI, and India Institute of Technology Delhi in hopes of gaining future collaborating opportunities between Taiwan and India. On November 15, TAICS co-hosted the inaugural Taiwan-India Telecommunication Standard Seminar with TSDSA in New Delhi. Experts from both sides introduced current developments in telecom technologies such as 5G communications, IoT in their respective countries, as well as the development of security technologies for mobile devices and information communication. The two sides plan on signing MoU in 2018 and begin formal collaboration to share information on standards and the industry. The initial work will lead to industry and technical collaboration between Taiwan and India as well as expanding into collaboration of the industry ecosystem and the market.

## 2.4.2   Hosting International Conferences

### ● Wi-Fi & 5G: IEEE 5G Standards Planning Seminar

To help Taiwanese companies follow the trends in international standards, TAICS held the Wi-Fi & 5G: IEEE 5G Standards Planning Seminar at 2pm on March 30, 2017 at the GIS MOTC Convention Center. IEEE-SA representative Bruce Kraemer and speakers from the ITRI were invited to discuss the current status and future development of 3GPP and IEEE 5G standards during the seminar.

Riding on the back of the global commercial success of the IEEE 802.11 series of standards, the IEEE shared its perspective on the 5G system drawing from its experience with Wi-Fi standards. An international 5G standards war is about to begin, so how will Taiwanese network companies respond? The seminar covers topics on IEEE's 5G initiative, the coopetition between IEEE and 3GPP on 5G standards, and the latest in LTE and Wi-Fi aggregation technology. The seminar serves to let companies in Taiwan better understand the current status and future development of 3GPP and IEEE 5G standards, as well as the role that Wi-Fi and unlicensed frequencies play in 5G. On the same day of the TAICS assembly, IEEE-SA President Don Wright paid a visit to sign a collaboration MOU with TAICS and give a talk.

Through this event, Taiwan's industry, government, academia, and research sectors gained an insider's view on the development of international telecommunications standards. The event also focused the capabilities of the four sectors and coopetition with 3GPP in 5G standards to enhance the influence of TAICS in 5G standards development, helping the Taiwanese industry carry more weight in the development of 5G technical standards. A total of 107 people from 43 companies participated in the event, and a total of 38 reports were published in the media.

## TAICS Standards Forum - The Future of ITS

5G and AI are key cornerstones in the development of smart cities and transportation. Self-driving cars involve road condition identification, environmental detection, instant reaction time, as well as numerous safety considerations. Major technology companies and automobile manufacturers are competing fiercely in this area, and people's lives are about to be dramatically changed. On September 5, 2017, The Annual Standards Forum hosted by TAICS with the main theme "The Future of ITS" as the main topic in which several international standardization organizations, including ARIB, CCSA, ETSI, IEEE, TSDSI, TTC and TTA were invited to exchange ideas related to the development of ITS standards and technologies. The goal of the event is to help Taiwan take advantage of global opportunities in automotive information, communication, and intelligent transportation. Chairman Jonathan Tsang stated, "Overcoming the technical barriers to entry is like a high jump competition, 99% effort will not be enough to win. Even though Taiwan may not be the largest, however it certainly plays an integral part in the industry similar to how the smallest instruments in the orchestra can be determinate of a symphony's success to produce a beautiful masterpiece."

During the event, TAICS Chairman Jonathan Tsang signed a memorandum of understanding (MoU) with TTA President Park Jaemoon. A cooperation framework between both sides will be established with a vision to share best practices and identify possible areas for co-operation which may include 5G, information safety, and IoT. TTA was established in 1988, and has formulated over 15,000 standards making it a major contributor to South Korea's ICT development. TTA works with more than 30 accredited international standard laboratories (oneM2M, ITU-T, AirFuel, WPC, ATSC, etc.) to provide various testing and certification services. TAICS will not only work with TTA to develop the international standards, but also learn from TTA's testing, certification and operation models with the goal to establish Taiwan's own verification and certification system using domestic testing labs within one year. This will reduce the time required for Taiwan's information and communication industries to obtain international standard certifications.

As Taiwan's official point of contact for connecting with international standard organizations, TAICS will continue to work closely with others in various areas and participate in the formulation of international standards to guide Taiwan's industrial transformation and pave the way for new industry opportunities.

## ● 5G-era Smartphone Application and Service Workshop

Taiwan Association of Information and Communication Standards (TAICS) and Association of Radio Industries and Businesses (ARIB) organized jointly the "5G-era Smartphone Application and Service Workshop" at International Conference Hall, Chinese Culture University, in Taipei, Taiwan on 31 October 2017. The Workshop was coordinated by The Fifth Generation Mobile Communications Promotion Forum (5GMF) in Japan.

The fifth generation communications system 5G which will be succeeded 4G is the new mobile communication system having main 3 performances such as "ultra-high speed/large capacity", "large numbers of connections", "ultra-low latency" which further developed the existing systems. In recent years, activities related to research and development and international standardization of technologies and functions supporting 5G are accelerating towards the realization of 5G in 2020.

On the workshop, we introduced the hot topics on "User Behavior Survey for Smartphone" and discussed the how to realize the 5G-era in the view point of Service and Applications. It was very useful for all participants to have information sharing and exchange views between both associations for the collaboration on 5G. TAICS and ARIB agreed to continue the study and exchange views on the 5G realization as the series of the 5G event.

# Appendix: Membership

| NO | COMPANY | WEBSITE |
|----|---------|---------|
| 1 | MEDIATEK INC. | http://www.mediatek.com/zh-TW/ |
| 2 | WISTRON NEWEB CORPORATION | http://www.wnc.com.tw/index.php?lang=tw |
| 3 | ACER INCORPORATED | http://www.acer.com.tw/ac/zh/TW/content/home/ |
| 4 | HON HAI PRECISION IND. CO., LTD. | http://www.foxconn.com.tw/ |
| 5 | ARCADYAN TECHNOLOGY CORPORATION | http://www.arcadyan.com/home.aspx |
| 6 | ASUSTEK COMPUTER INC. | https://www.asus.com/tw/ |
| 7 | CHUNGHWA TELECOM CO., LTD. | http://www.cht.com.tw/ |
| 8 | KEYSIGHT TECHNOLOGIES INC. | http://www.keysight.com/main/home.jspx?cc=TW&lc=cht |
| 9 | BUREAU VERITAS CONSUMER PRODUCTS SERVICES (HONG KONG) LIMITED, TAOYUAN BRANCH | http://www.bureauveritas-adt.com/ |
| 10 | WHA YU INDUSTRIAL CO.,LTD. | http://www.whayu.com/index_e.aspx |
| 11 | AUDEN TECHNO CORP. | http://www.auden.com.tw/ |
| 12 | INVENTEC CORPORATION | http://www.inventec.com/ |
| 13 | NATIONAL CHUNG-SHAN INSTITUTE OF SCIENCE AND TECHNOLOGY | http://www.ncsist.org.tw/csistdup/main/Default.aspx |
| 14 | D-LINK CORPORATION | http://www.dlinktw.com.tw/ |
| 15 | ACCTON TECHNOLOGY CORP. | http://www.accton.com.tw/ |

| NO | COMPANY | WEBSITE |
|---|---|---|
| 16 | MITRASTAR TECHNOLOGY CORP. | http://mitrastar.com.tw/index.php |
| 17 | GEMTEK TECHNOLOGY CO., LTD. | http://www.gemtek.com.tw/ |
| 18 | ROHDE&SCHWARZ | http://www.rohde-schwarz.com.tw/PrecompiledWeb/Index.aspx |
| 19 | TATUNG CO. | http://www.tatung.com.tw/b5/index.asp |
| 20 | ACBEL POLYTECH INC. | http://www.acbel.com.tw/index.aspx |
| 21 | UNITECH ELECTRONICS CO., LTD. | http://tw.ute.com/index.php?rbu=2 |
| 22 | HWACOM SYSTEMS INC. | http://www.hwacom.com/ |
| 23 | KBRO CO. LTD. | http://www.kbro.com.tw/mso_index.aspx?B=1 |
| 24 | SATELLITE TELEVISION BROADACSTING ASSOCIATION R.O.C | http://www.stba.org.tw/ |
| 25 | ASUS CLOUD CORPORATION | http://asuscloud.com/ |
| 26 | TAIWAN DIGITAL TELEVISION COMMITTEE | http://www.dtvc.org.tw/index.aspx |
| 27 | TREND MICRO INC. | http://www.trendmicro.tw/tw/index.html |
| 28 | ONWARD SECURITY CORPORATION | http://www.onwardsecurity.com/ |
| 29 | SPORTON INTERNATION INC. | http://www.sporton.com.tw/ |
| 30 | DEKRA | http://www.dekra.com.tw/index.aspx |
| 31 | INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE | https://www.itri.org.tw/ |
| 32 | INSTITUTE FOR INFORMATION INDUSTRY | http://www.iii.org.tw/Default.aspx |
| 33 | TELEVISION BROADCASTS SATELLITE | http://www.tvbs.com.tw/ |
| 34 | TAIWAN MOBILE CO., LTD. | https://www.taiwanmobile.com/index.html |
| 35 | CGC INC. MOBILE COMMUNICATIONS LAB. | http://www.cgctw.com/CGCWebsite/ |
| 36 | YI-SHENG TECHNOLOGY INC. | http://www.es-radar.com/main.html |
| 37 | TONNET INTERNATIONAL TELECOMMUNICATION GROUP | http://www.tonnet.com.tw/index.asp |
| 38 | TAIWAN INTELLIGENT BUILDIN G ASSOCIATION | http://www.tiba.org.tw/ |
| 39 | PEGATRON CORP. | http://cht.pegatroncorp.com/ |
| 40 | ZYXEL COMMUNICATIONS CORP. | http://www.zyxel.com/tw/zh/homepage.shtml |
| 41 | CHENG UEI PRECISION INDUSTRY CO., LTD. | http://www.foxlink.com.tw/index_c.php |
| 42 | HUA YAN MEDIA LTD. | N/A |
| 43 | SERCOMM CORPORATION | http://www.sercomm.com/home.aspx |
| 44 | NATIONAL CHIAO TUNG UNIVERSITY | http://www.nctu.edu.tw/ |
| 45 | TAIWAN SECOM CO. , LTD. | http://www.secom.com.tw/ |
| 46 | HTC CORPORATION | http://www.htc.com/tw/ |
| 47 | NATIONAL CHUNG CHENG UNIVERSITY | http://www.ccu.edu.tw/ |
| 48 | INFORMATION SERVICE INDUSTRY ASSOCIATION OF R.O.C | http://www.cisanet.org.tw/ |
| 49 | ELECTRONICS TESTING CENTER, TAIWAN | http://www.etc.org.tw/default.aspx |

| NO | COMPANY | WEBSITE |
|---|---|---|
| 50 | WEEMA | http://www.weema.com.tw/ |
| 51 | ANRITSU COMPANY INC. | http://www.anritsu.com/zh-TW/Home.aspx |
| 52 | ECS | http://www.ecs.com.tw/ECSWebSite/Index.aspx?MenuID=0&LanID=1 |
| 53 | KCA | http://www.kca.com.tw/tw/ |
| 54 | GCOM | http://www.gcomtw.com/index.php |
| 55 | TAIWAN INSTITUTE OF ECONOMIC RESEARCH | http://www.tier.org.tw/ |
| 56 | FAREASTONE | http://www.fetnet.net/cs/Satellite/Corporate/coHome |
| 57 | TELECOM TECHNOLOGY CENTER | http://www.ttc.org.tw |
| 58 | NATIONAL INSTRUMENTS | http://www.ni.com/zh-tw.html |
| 59 | TAIWAN BROADBAND COMMUNICATIONS | http://www.tbc.net.tw/AboutUs |
| 60 | NATIONAL TAIWAN UNIVERSITY | http://www.ntu.edu.tw/ |
| 61 | NATIONAL CHENG KUNG UNIVERSITY | http://web.ncku.edu.tw/bin/home.php |
| 62 | ASIA PACIFIC TELECOM CO., LTD. | http://www.aptg.com.tw/my/index.htm |
| 63 | TAIWAN TELEMATICS INDUSTRY ASSOCIATION | http://www.ttia-tw.org/ |
| 64 | PANASONIC TAIWAN | http://www.panasonic.com/tw/ |
| 65 | TAIWAN ELECTRICAL AND ELECTRONIC MANUFACTURERS' ASSOCIATION | http://www.teema.org.tw/index.aspx |
| 66 | SENAO NETWORKS, INC. | http://www.senao.com/Taiwan/ |
| 67 | NATIONAL CENTRAL UNIVERSITY | http://www.ncu.edu.tw/ |
| 68 | ALPHA NETWORKS INC. | http://www.alphanetworks.com/ |
| 69 | DIGICENTRE | http://www.digicentre.com.tw/about.html |
| 70 | NAN YA PLASTICS | http://www.npc.com.tw/j2npc/zhtw/company_highlights.jsp |
| 71 | EGIS TECHNOLOGY INC. | https://www.egistec.com/zh-hant/ |
| 72 | TWCA | https://www.twca.com.tw/Portal/Portal.aspx |
| 73 | SYNOLOGY INC. | https://www.synology.com/zh-tw |
| 74 | GAPERTISE INC. | http://www.gapertise.com/ |
| 75 | TAIWAN TELECOM INDUSTRY DEVELOPMENT ASSOCIATION | http://www.ttida.org.tw/ |
| 76 | ICP DAS | http://www.icpdas.com.tw/index_tc.php |
| 77 | TAIPEI COMPUTER ASSOCIATION | http://www.tca.org.tw/ |
| 78 | ARCRAN INFORMATION TECHNOLOGY INC. | http://www.arcran.com/tw/ |
| 79 | NATIONAL TAIPEI UNIVERSITY | https://www.ntpu.edu.tw/chinese/ |
| 80 | ALLION LABS, INC. | http://tw.allion.com/ |
| 81 | NATIONAL DONG HWA UNIVERSITY | https://www.ndhu.edu.tw/bin/home.php |

台灣資通產業標準協會
Taiwan Association of Information and Communication Standards