





Standardization and Interoperability of IoT

Dr. Yuming GE @ CAICT and All and IMT-2020 geyuming@caict.ac.cn

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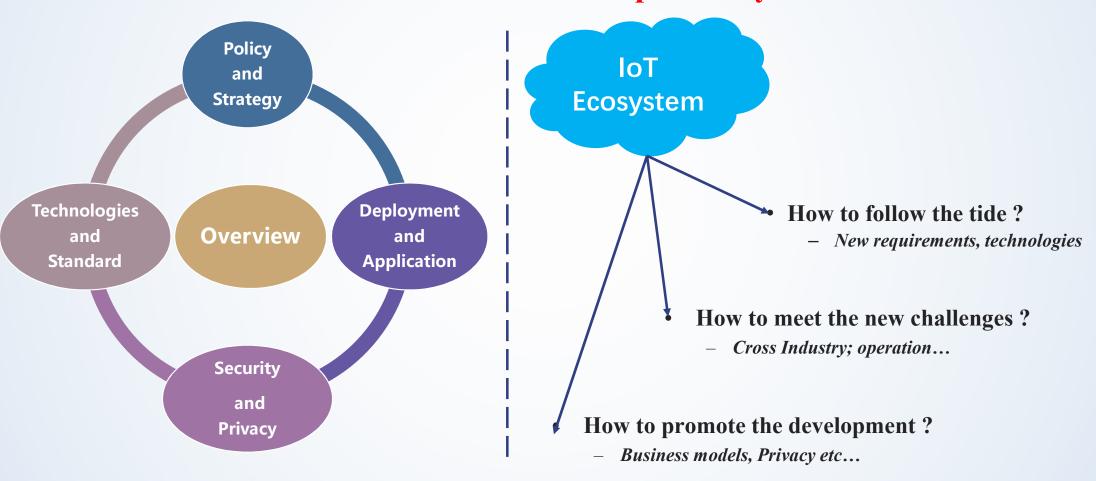
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Standardization and Interoperability



Horizontal Vertical Application API Cloud computing **IOT Platform Data** /Big data open Device KP1 IOT terminal (OS/Gateway) open MiCO Development environment, tools terminal "Application" as the core "Platform + AI + Big data" as the core



Industrial Internet (Industrial IoT)

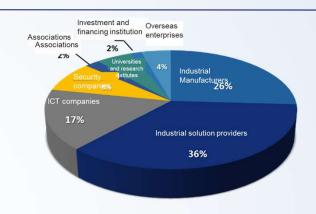
Internet of Vehicles (Connected Vehicles)

All Overview

1,214 members:

- **Chairman: CAICT**
- 20 vice-president members
- 58 council members





Vice-president

Membership Makeup

Council Members: (%)



MOXA

ahah CISCO

Members:









NATIONAL INSTRUMENTS



NOKIA ŁÀSK



















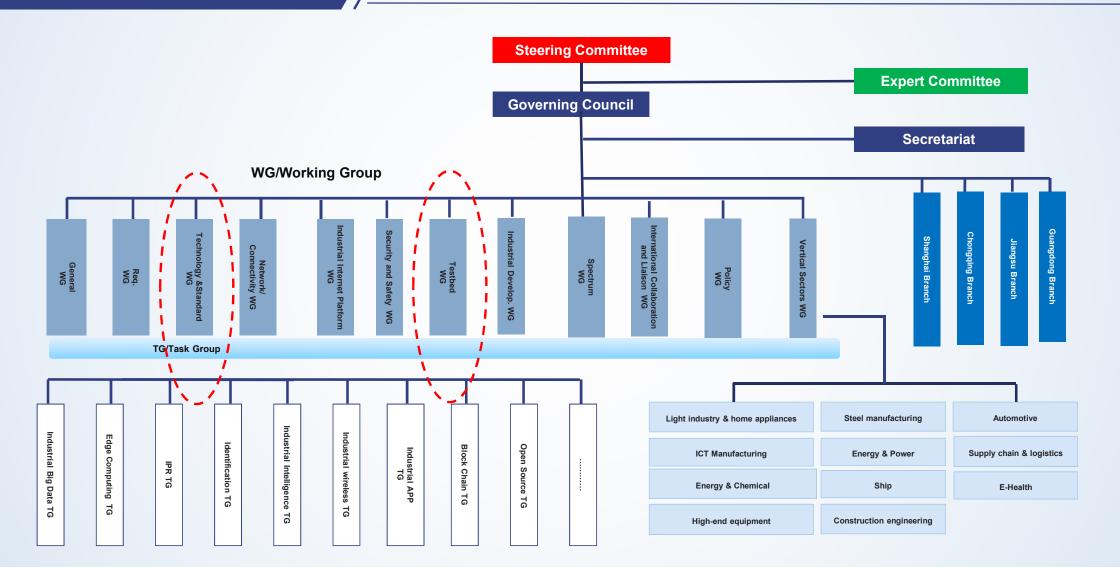












Technical Reports

(33 Reports PUBLISHED)

High-Level

Application

- 1. Industrial Internet Architecture v1.0
- 2. Industrial Internet Standard System Framework v1.0
- 3. Industrial Internet Technology System v1.0
- Industrial Internet Standard System v2.0
- 5. Industrial Internet Key Technology Patenting Trend Research White Paper
- Industrial Internet Key Technology Patenting Trend Analysis White Paper (2019)
- 7. Industrial Internet Terms and Definitions
- 8. Implementation Architecture of Vertical Industry Industrial Internet White Paper(Draft for Discussion)
- 9. Industrial Internet Vertical Industry Application Report
- 10. 2016 Industrial Internet Case Compilation
- 11. 2017 Industrial Internet Case Compilation
- 12. 2018 Industrial Internet Case Compilation
- 13. Industrial Internet Maturity Assessment White Paper V1.0
- Industrial Internet Application Maturity Assessment White Paper(Draft for Discussion)
- 15. Industrial Intelligence White Paper(Draft for Discussion)
- 16. SMEs Cloud and Platform Application Scenario White Paper
- 17. Industrial Blockchain Application White Paper (Draft for Comment)

- 18. Industrial Internet Network Connectivity White Paper
- 19. Guide for Device Intelligentization
- 20. Industrial Data Collection Research Report
- Factory Internal Network, Technical Requirements of Industrial EPON
- 22. Industrial Wireless Electromagnetic White Paper
- 23. Wireless Application Scenario —Automobile Manufacturing
- 24. Industrial Internet Network Excellent Solution Compilation
- Industrial Internet Identification—Product Traceability White Paper (2017)
- 26. Industrial Internet Identification Analysis System Architecture White Paper (Draft for Discussion)
- 27. Edge Computing White Paper v2.0 (with ECC)
- 28. Industrial Internet Platform White Paper(2017)
- 29. Industrial Internet Platform White Paper(2019,Draft for Discussion)
- 30. Industrial Internet Platform Standard System Framework
- 31. Industrial Internet Platform General Requirements
- 32. Interface Model for Industrial Internet Platform
- 33. Application Management Interface Requirements for Industrial Internet Platform
- 34. Trustworthy Service Assessment Requirements of Industrial Internet Platform
- 35. Industrial Big Data Technology and Application White Paper
- 36. Technical Architecture of Industrial Big Data White Paper

Security and Safety

 General Security Requirements for Industrial Internet

Network

- 41. Industrial Internet Security Architecture White Paper
- 42. Industrial Cloud Security Reference Solution
- 43. Security Protection Requirements for Industrial Internet Platform
- 44. Industrial Internet Typical Security Solution Case Collection
- 45. China Industrial Internet Security Situation Report (2016)
- 37. Industrial Big Data Analysis White Paper
- 2018 Industrial Enterprise Data Asset Management Status Survey Report
- Industrial Big Data Innovation Contest White Paper(2017)- Wind Power Icing Failure Analysis Guide

Platform &Data

Selected Industrial Internet Test Beds, Network and Industry Application Cases and Security Solutions, and Conducted Platform Evaluation

48 test beds

- 11 industrial Internet platform test beds
- 11 industrial Internet new network and application test beds (TSN, industrial PON, NB-IOT, etc.)
- 8 industrial Internet new technology test beds (AI, edge computing, big data, blockchain, etc.)
- 7 industrial Internet-driven smart factory/service test beds

30 excellent network solutions

- 16 network technology transformation solutions
- ----Factory extranet transformation, factory intranet transformation
- 13 network industry application solutions
- ---- Intelligent production, equipment monitoring and maintenance
- 1 network security solution

25 Industrial Internet platform evaluation

- 17 industrial Internet platform trustworthiness evaluation
- 8 industrial Internet platform function performance evaluation

star test beds

- Software-defined reconfigurable manufacturing platform -Shenyang Institute of Automation
- Industrial monitoring test bed based on cellular technology-Huawei
- Cloud Manufacturing Service Platform -CASIC

60 excellent application cases

- 22 intelligent production application cases
- 16 industrial Internet platforms and networked collaborative application cases
- 8 service extension application cases
- 8 industrial big data application cases
- 2 personalized application cases
- 2 industrial Internet security application cases

13 typical security solutions

- Rail
- Industrial data
- Electricity, petrochemical oil and gas, oil fields, gas, wind power
- Automobile manufacturing, engine manufacturing
- Urban sewage treatment

Industrial Internet Standardization Overview

C应用

Application

CA 典型应用

Typical

Application

CB 垂直行业应用

Vertical Industry

Application

工业互联网标准体系框架

Industrial Internet Standard System Framework

B总体性

General

BA网络与连接

Network &

Connectivity

BB 标识解析

Identifier &

Resolution

BC 边缘计算

Edge

Computing

BD平台与数据 Platform & Data

BE 工业APP Industry APP

BF安全

Security

A基础共性

Basic

AA术语和定义

Terms &

Definitions

AB 通用需求

Requirements

AC 架构

Architecture

AD 测试与评估 Testing & Evaluation

AE 管理

Administration

Industrial Internet Standard Framework (V2.0)
Industrial Internet Technology Architecture 1.0 (Draft for Comment)
Industrial Internet Platform Standard Architecture, Industrial Internet
Identification architecture, etc.



Refined technical system Industrial Internet Technology System 1.0 (Draft for Review), etc. documentation Industrial Internet System Architecture, Industrial Internet Identification Analysis System Architecture, Industrial Internet: Edge Computing Overall Architecture and Requirements, Industrial Internet Platform: Interface Model, Industrial Internet Platform: Fundamental standards Enterprise Performance Capability Assessment Requirements, Industrial Internet Platform: Operational Security Management, ndustrial Internet Platform Service Quality, etc. Industrial Internet Benchmark Network: Technical Requirements for Factory Extranet, Industrial Internet Identification Analysis and Identification Code Specification, Industrial Internet Identification Analysis: Aerospace Identification Code Specification, Industrial General standards Internet Platform: Industrial Equipment Access Requirements, Industrial Internet Platform: Data Management Requirements Industrial APP Application Requirements, Industrial Internet Security Monitoring and Management System Requirements, etc. ndustrial Internet: General Requirements for Intelligent Production, Industrial Internet: General Requirements for Networking Application standards Collaboration, Industrial Internet: General Requirements for Personalized Customization, etc.



Training and promotion



transformation of
higher-level
standards
(national standards,
industry standards)



Application and test
verification
(Exploring best standard
practice cases)



International
standardization exchange
(Promoting the
development of
international standards)

Industrial Internet Test Bed to Accelerate the Innovative Application of New Technologies

Smart factory based on safe and reliable industrial Internet platform Intelligent service platform

ProMACE——Process Industry Industrial Internet

EDM machine cloud life guarantee and process sharing intelligent service platform

Industrial robot fault detection based on industrial Internet platform

Collaborative manufacturing platform for medium, small and micro enterprises

Remote health management of wind turbines based on XSOM industrial Internet platform

Centrifuge equipment industry Internet

Software-defined reconfigurable manufacturing platform

Urban smart water supply

Industrial APP platform test bed based on intelligent numerical control system Intelligent collaborative manufacturing of home appliances Information physics system common key technology and application promotion

Electronic system product industry Internet

Predictive maintenance test bed

Energy-saving control system test bed based on airconditioning cloud platform

Digital factory test bed based on industrial network connection

Factory intranet interconnection and data collection

Product lifecycle management based on tag identification technology

NB-IoT Smart Street Light

Intelligent product lifecycle management based on heterogeneous identification analysis technology

Industrial Internet private network test bed based on SDN and SDP

Industrial Internet network architecture level

Smart Grid 5G Network and Slice Application

NB-iot smart water meter test bed

Industrial Internet **Platform** (14)Industrial Industrial Internet-**Internet New** Driven **Technology** Smart Factory/Ser Al, edge computing, big vice (8) data, blockchain, etc.

Equipment remote monitoring and diagnosis test bed based on industrial Internet platform Flat panel display electronic glass industry Internet verification

application platform Manufacturing service based on industrial

Internet platform

Intelligent Machine Tool Industrial

Internet Platform NB-IoT-based workshop energy

management platform

Factory efficiency improvement platform based on wide and

narrow integrated network

Port wireless automation

platform

Edge computing and AI combined to achieve air conditioning quality intelligent detection MQM **Industrial Internet Artificial Intelligence**

Open Engine

Intelligent Manufacturing Safety Monitoring AlBeD pension monitoring and Operation Management Platform

Industrial Internet Data Connection Based

on Blockchain

Blockchain-based production process and product

quality credibility Intelligent secure real-time network system based on

hyper-edge computing Flexible inspection scheme based on visual intelligent

industrial appearance Application of Industrial Internet Big Data Technology in Air

Compressor Energy Saving

Industrial **Internet Future Networking and** Application (15)

TSN, industrial PON, NB-IOT, etc.

Real-time detection and optimization of product quality

based on 5G and Al

TSN network for OT/IT integration and

interoperability

Communication equipment manufacturing system based on

industrial Internet

WAN innovation for industrial Internet large

bandwidth services

Industrial monitoring based on cellular technology

NB-IoT shared washing machine

ROS robot wireless universal

platform test bed

Excellent User Cases Facilitated the Adoption and Promotion of Industrial Internet Technology

Wearable Products Smart Factory for Reconfigurable and Microservices

Hebei Wuwei Aero & Power digital management upgrade Constructing Zoomlion's intelligent O&M service system Industrial APP Innovation Service Platform

Xiamen Qiaoxing's practice based on UAP Smart Platform

Huaneng Group Production Control System Safety Supervision and Early Warning Platform Crane smart management platform

> Industrial robot intelligent service system based on data interconnection HollySys Electronics Intelligent Manufacturing Digital Workshop

Construction of intelligent production workshop for color TV based on industrial interconnection

Intelligent Stereo Library Based on Robot and IoT Technology

Cisco-Guangzhou BIKE Smart Connect Factory Flexible Manufacturing Demonstration Project

Haier COSMOPLAT RV industry intelligent manufacturing solution

Medical equipment IoT solution

Cellular wireless releases AGV potential, achieving smarter warehouse logistics

Pen point processing data acquisition and industrial micro-application project

Omron Smart Factory Case

Digital to Intelligent Empowering Precision Assembly Stacking Data Value Design Creation and

Portable electronic product intelligent manufacturing - "7" integration, to achieve the lights-off production

Data Driven Smart Manufacturing-Smart Factory No.18

Establishing an industrial Internet system with Foxconn characteristics

Smart Manufacturing Practice Case Based on UAP Smart Industrial Internet Platform

Haier Industrial Internet Ecological Security Case Industry Matching Provincial-National Industrial Internet Security Platform

BYD "Eternal Blue" virus emergency disposal and security solution

Rail transit enterprise intelligent control center project

Traditional garment enterprises transform and upgrade with Internet

Zhongshan Telecom Heytz Industrial Internet Public Service Platform

The smart factory coordinating the whole process of smart stores

Industrial Internet Service Intelligent extension production Industrial **Industrial Internet** Internet Platform and security Networking Collaboration Personalized Industrial big

Complete value creation loop of Industrial Internet + Big Data + Insurance

"Seven Stars" intelligent service system

Urban Rail Intelligent Integrated Automation and Operation System Based on

Remote data collection and predictive maintenance of smart water supply

Sewing equipment interconnection innovation platform project

Haier Central Air Conditioning Industry Internet Cloud Service Platform

Collaborative design and manufacturing based on cloud platform

Manufacturing mobile machinery intelligent dispatch management platform

Haier COSMOPlat platform

"Root Cloud" industrial Internet platform and application

SINOGRAIN Smart Granary Project

Construction and Application of Equipment Intelligent Diagnosis System Based on Sinochem Industrial Internet Platform

Foxconn Industrial Internet

Platform (BEACON)

Transfer Industrial Internet

(Service) Platform

Intelligent manufacturing operation management platform for the non-ferrous industry

Foxconn Industrial Internet Platform - FiiBEACON

Application Technology Innovation

MIZUDA environmental protection industry intelligent operation and control platform

Process Industry Aldustry Industrial Internet

Project

Smart water platform under the support of industrial Internet

Gas-fired and coal-fired unit fleets monitoring and diagnosis private cloud platform based on emerging information technology

Hengyue Group Digital Cloud Factory Project

Warp Knitting industry cloud platform

Power Equipment Industry Big Data Application Technology Platform

Precision Mechanism Intelligent Cloud Network Manufacturing System

Big data application in ironmaking industry

Application Warp Knitting industry cloud platform

Shaqang Energy Management Big Data Application

Shaanxi Blower intelligent O&M

Datang Group Industrial Big Data

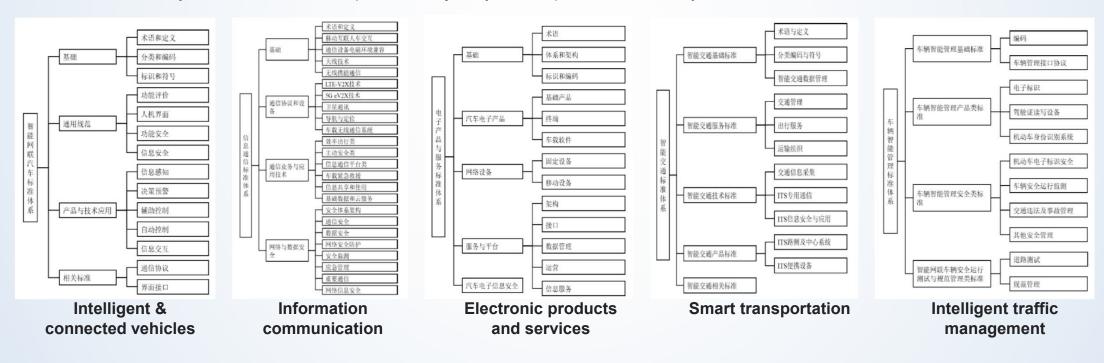
Digital upgrade of wind power equipment

Shaanxi Blower intelligent O&M big data

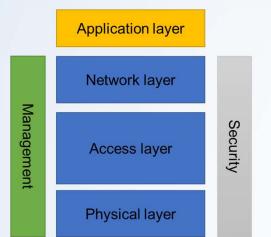
Instrument display industrial big data application **BONC Big Data Promotes Unilever** Transformation and Upgrade

IoV Standard Architecture

The MIIT and the Standardization Administration jointly issued the **Guide to the Construction of the National IoV Industry Standard Architecture**, which included general requirements, intelligent & connected vehicles, information and communication Technology, electronic products and services, smart transportation, and intelligent traffic management. **The MIIT, Ministry of Transport, and Ministry of Public Security**, together with standardization organizations, research institutes, industry alliances, and enterprises, will jointly develop the IoV industry standards.



C-V2X standards



C-V2X standard protocol architecture in China



MoU on strengthening Cooperation in C-V2X
Standards for Automobile, Intelligent Transportation,
Communication and Traffic Management

Category	Standards Name	Standards Type	Standards Organization
Overview	Overall technical requirements of LTE-based Vehicular communications	Industry standards, National standards	CCSA
Access layer	The air interface technical requirements of LTE-based Vehicular Communication	Industry standards, National standards	CCSA
Network layer	Technical requirements of Network layer of LTE-based vehicular communication	Alliance standards, Industry standards, National standards	C-ITS、CCSA
Application layer	Technical requirements of Message layer of LTE-based vehicular communication	Alliance standards, Industry standards, National standards	C-ITS 、 SAE-C 、 CCSA
Security	General technical requirements of Security for Vehicular Communication based on LTE	Industry standards, National standards	CCSA
Application(System)	Technical requirements of System of LTE-based vehicular communication	Alliance standards, Industry standards, National standards	SAE-C、C-ITS、 Automobile/Communication/Transportation/ Public Security
Functional application	Functional Applications such as Intersection collision warning and platooning	Industry standards, National standards	Automobile/Traffic/Pu blic Security

Note: Red means the part of plan.

IMT-2020(5G) PG C-V2X WG

Founded in 2017.6, **IMT-2020(5G)PG C-V2X WG** has consisted of **132 members** so far with an manufacturer-college-institute-operator collaboration in vehicle, information and communication, and transportation fields





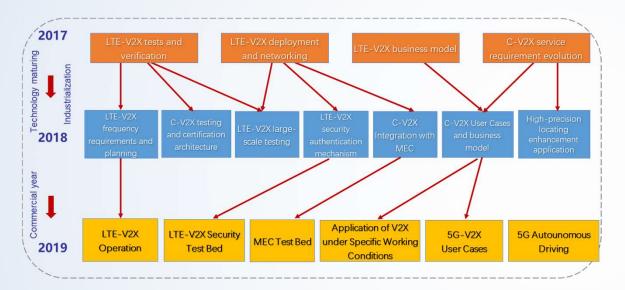
- Published *C-V2X*, *MEC* integration with *C-V2X* White paper
- Released a series of test specifications for *interoperability and conformance*
- Promoted LTE-V2X Network layer, Message layer, security and system level standardization



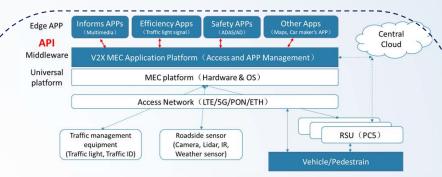
Organized the worldwide first *LTE-V2X three layer"chipset, terminals, OMEs" interoperability demonstration*, November 2018, Shanghai

C-V2X Working Progress

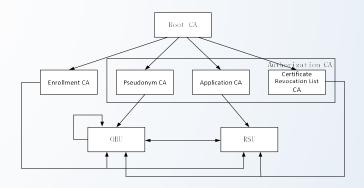
C-V2X technology innovation, testing and demonstrations



- Continue the Research on LTE-V2X Large-scale testing, Security and Operation, in order to promote the LTE-V2X Commercialization
- Carrying out the Research on for 5G-V2X Use Cases and 5G
 Autounomous Driving, for *C-V2X Evolution*



1. MEC Test Bed, MEC support LTE-V2X scenarios, Ability to open and APIs definition



2. *LTE-V2X security Test Bed*, E2E LTE-V2X Demonstration with security solution, planned October 22-24, 2019, Shanghai

Integration · Cooperation · Win-Win

