

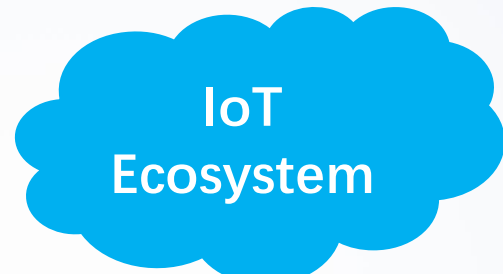
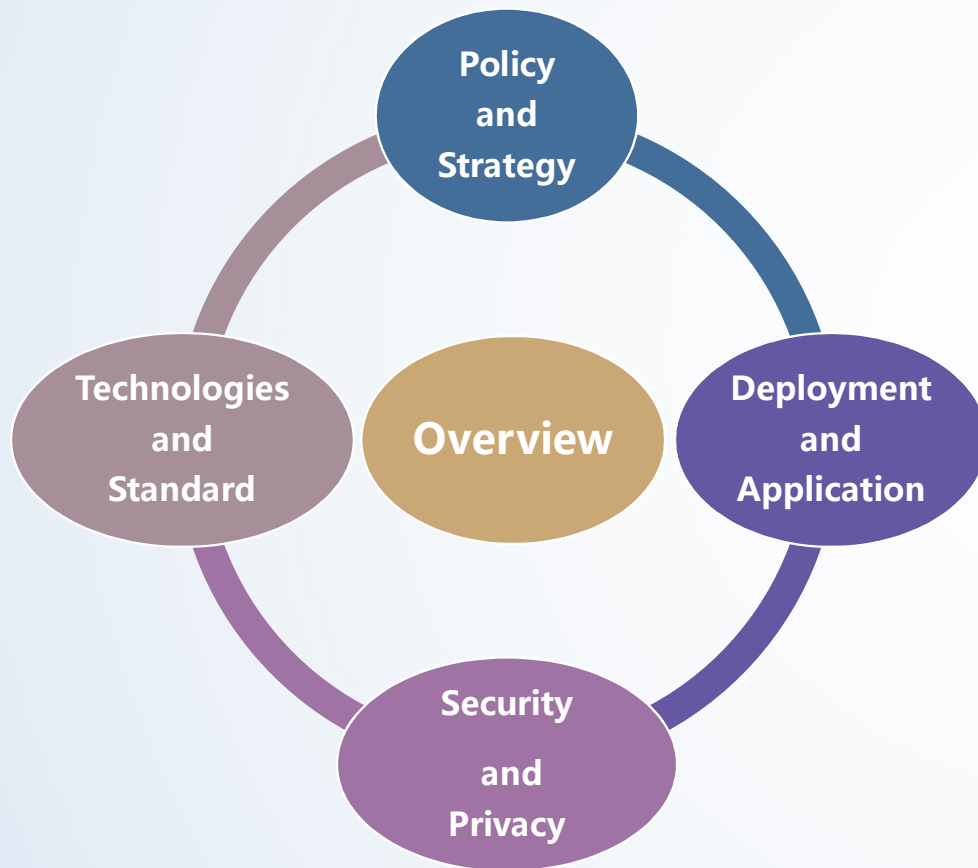
Standardization and Interoperability of IoT

Dr. Yuming GE @ CAICT and All and IMT-2020

geyuming@caict.ac.cn

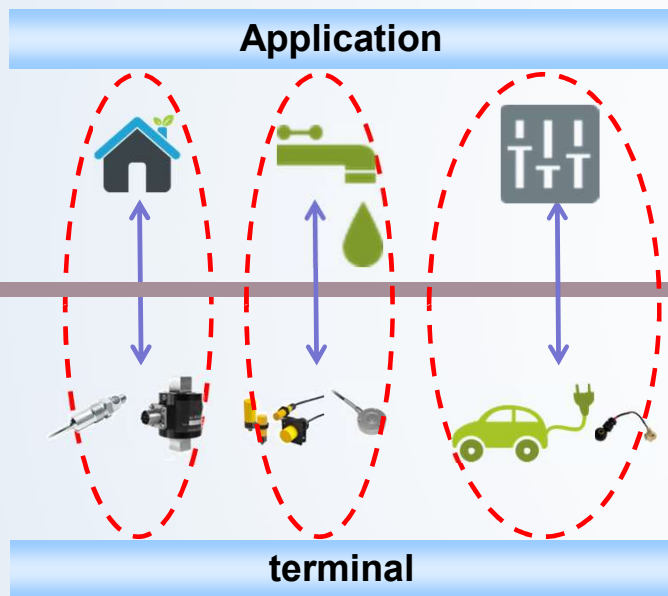
17-21, June, 2019, Aarhus, Denmark

Standardization and Interoperability



- **How to follow the tide ?**
 - *New requirements, technologies*
- **How to meet the new challenges ?**
 - *Cross Industry; operation...*
- **How to promote the development ?**
 - *Business models, Privacy etc...*

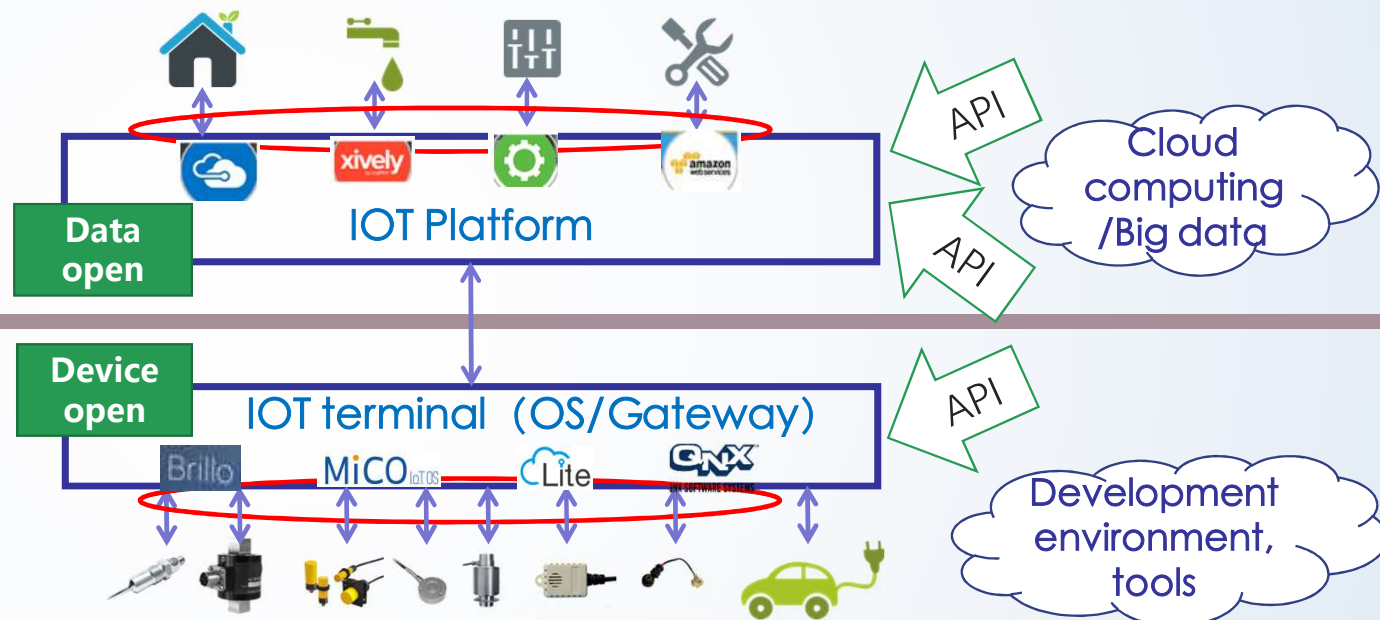
Vertical



“Application” as the core

&

Horizontal



“Platform + AI + Big data” as the core



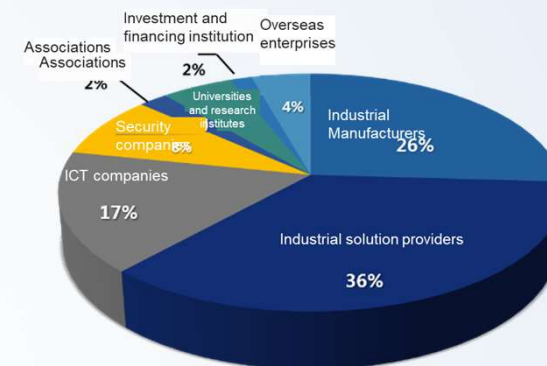
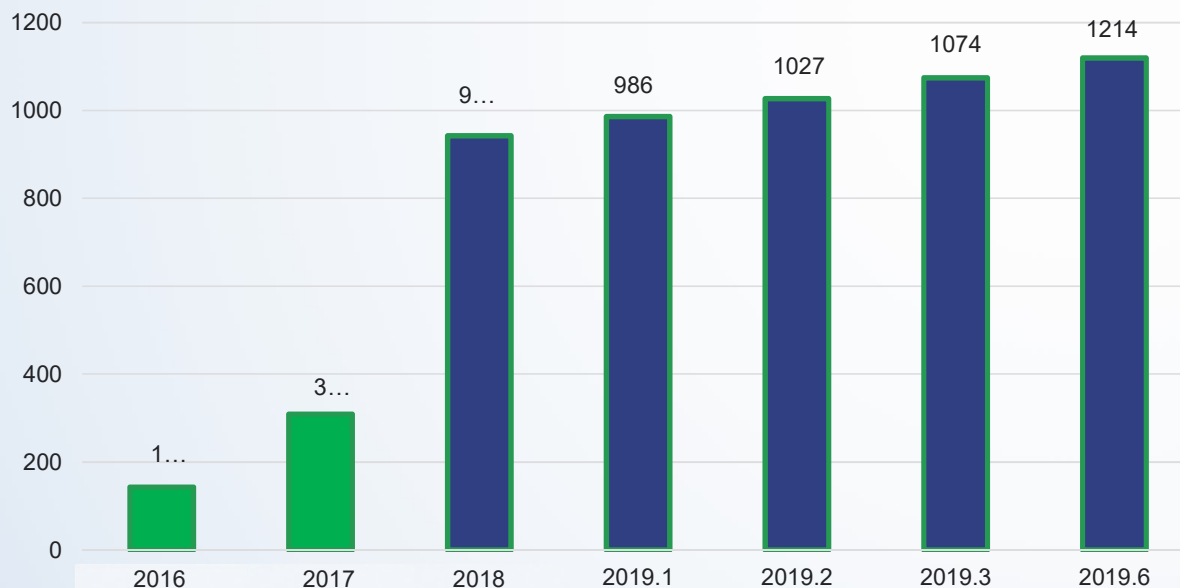
Industrial Internet (Industrial IoT)

Internet of Vehicles (Connected Vehicles)

1,214 members:

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

Membership Growth



Vice-president



Membership Makeup

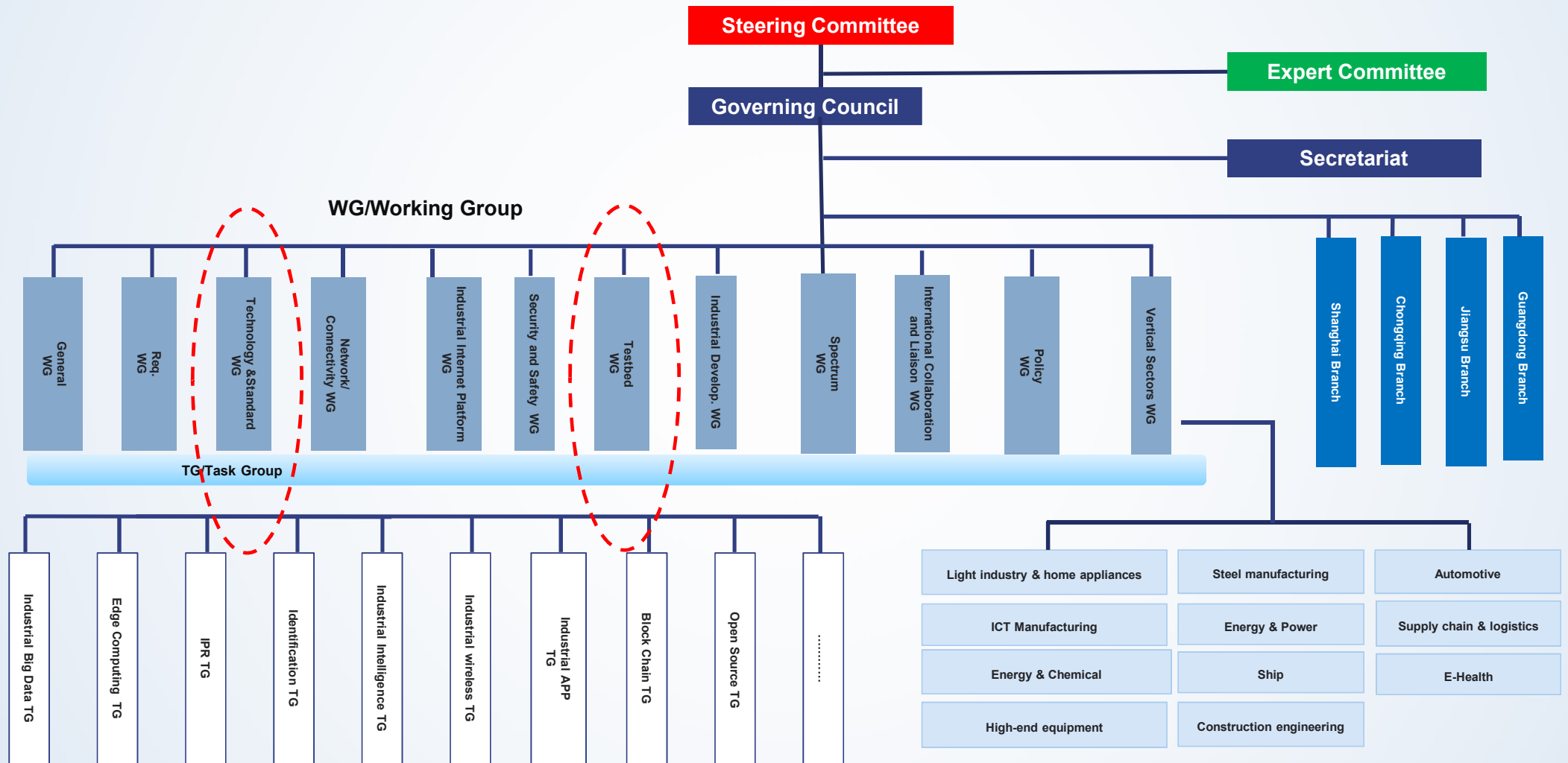
Council Members:



Members:



All "12+9+X" Structure



Technical Reports

(33 Reports PUBLISHED)

1. Industrial Internet Architecture v1.0
2. Industrial Internet Standard System Framework v1.0
3. Industrial Internet Technology System v1.0
4. **Industrial Internet Standard System v2.0**
5. Industrial Internet Key Technology Patenting Trend Research White Paper
6. **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
14. **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)**

High-Level

Application

18. Industrial Internet Network Connectivity White Paper
19. Guide for Device Intelligentization
20. Industrial Data Collection Research Report
21. 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
25. 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

Network

Security and Safety

40. General Security Requirements for Industrial Internet
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**
38. 2018 Industrial Enterprise Data Asset Management Status Survey Report
39. 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

3

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

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

60 excellent application cases

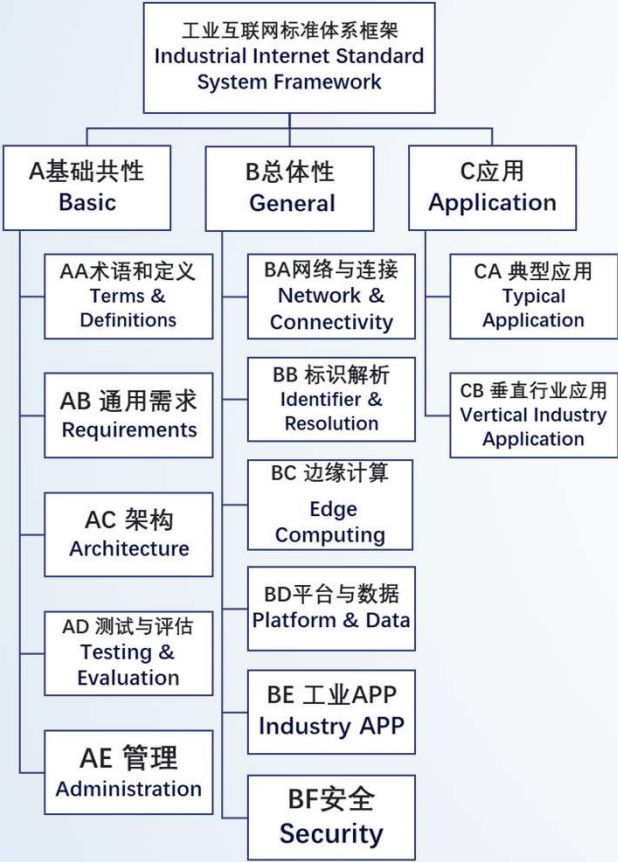
- 22 intelligent production application cases
- 16 industrial Internet platforms and networked collaborative application cases
- 8 service extension application cases
- 8 industrial big data application cases
- 2 personalized application cases
- 2 industrial Internet security application cases

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

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 documentation	Industrial Internet Technology System 1.0 (Draft for Review), etc.
Fundamental standards	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: Enterprise Performance Capability Assessment Requirements, Industrial Internet Platform: Operational Security Management, Industrial Internet Platform Service Quality, etc.
General standards	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 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.
Application standards	Industrial Internet: General Requirements for Intelligent Production, Industrial Internet: General Requirements for Networking Collaboration, Industrial Internet: General Requirements for Personalized Customization, etc.

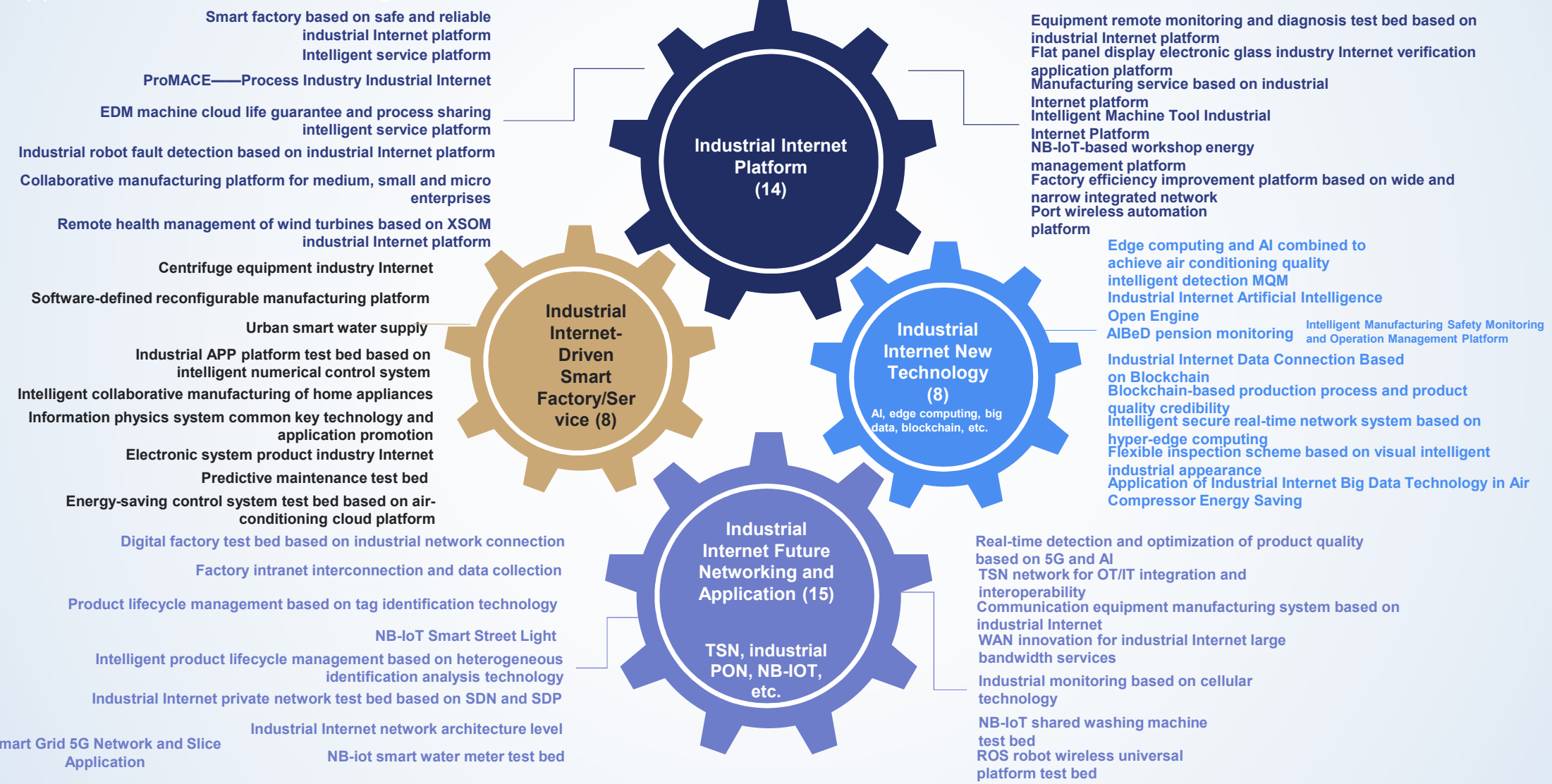
Training and promotion

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

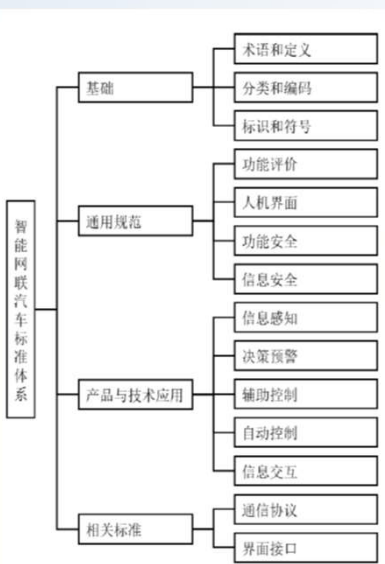


Excellent User Cases Facilitated the Adoption and Promotion of Industrial Internet Technology

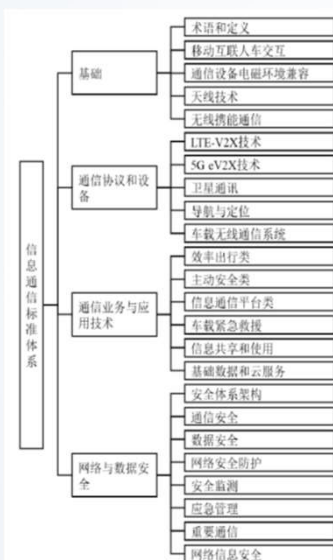


IoV Standard Architecture

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.



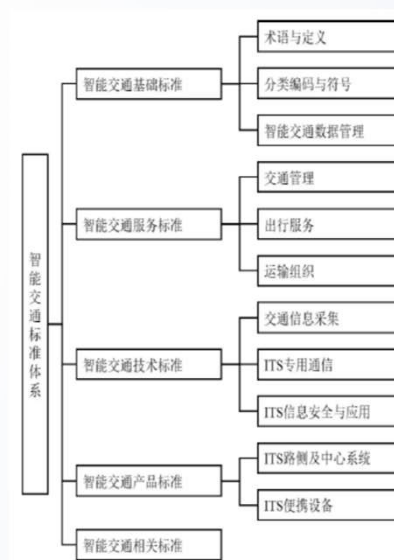
Intelligent & connected vehicles



Information communication



Electronic products and services

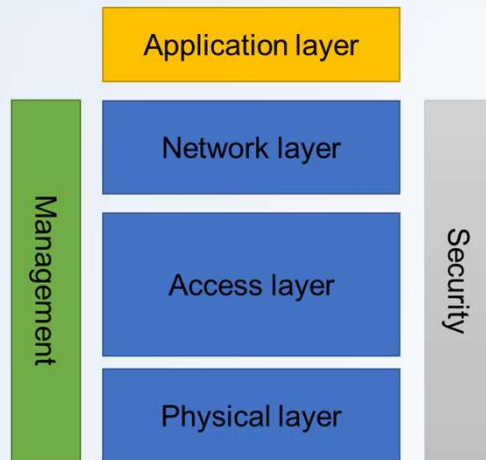


Smart transportation



Intelligent traffic management

C-V2X standards



C-V2X standard protocol architecture in China



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/ Public Security

Note: Red means the part of plan.

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

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



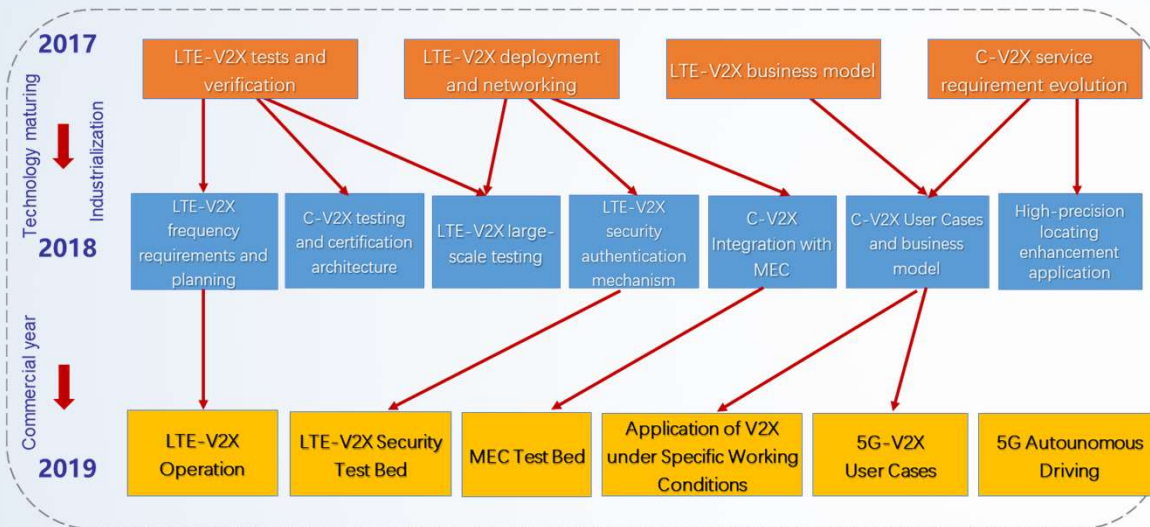
- Published **C-V2X**, **MEC integration with C-V2X** White paper
- Released a series of test specifications for **interoperability and conformance**
- Promoted LTE-V2X **Network layer, Message layer, security and system level** standardization



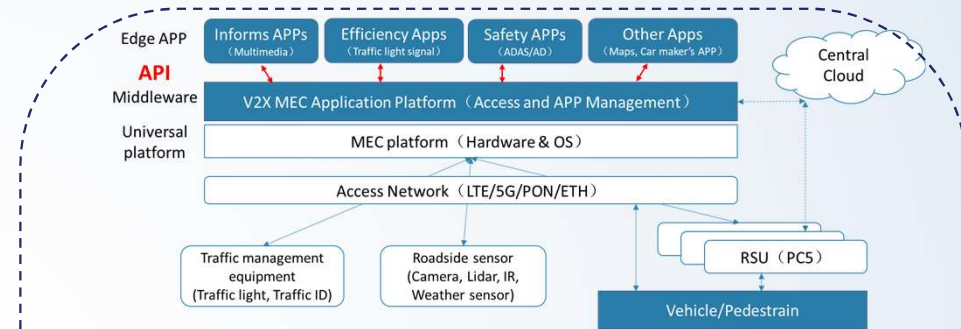
Organized the worldwide first **LTE-V2X three layer “chipset, terminals, OMEs” interoperability demonstration**, November 2018, Shanghai

C-V2X Working Progress

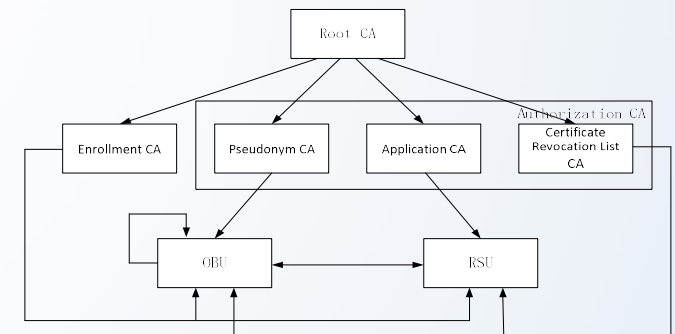
C-V2X technology innovation, testing and demonstrations



- 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 Autonomous 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

