

GTI

5G+AI

GO INTELLIGENT AND CONNECTED

GTI SUMMIT 2018

27th June 2018, Shanghai



<http://www.gtigroup.org>



GTI APP



GTI 1.0

2011-2015

Objective

- Construct a robust ecosystem of TD-LTE
- Speed up the commercialization of TD-LTE
- Promote the converged development of LTE TDD and FDD

GTI 2.0

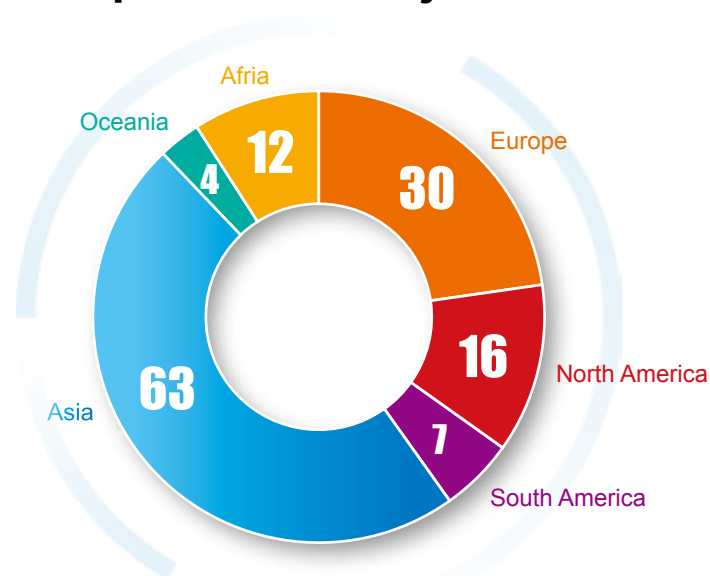
2016-

Objective

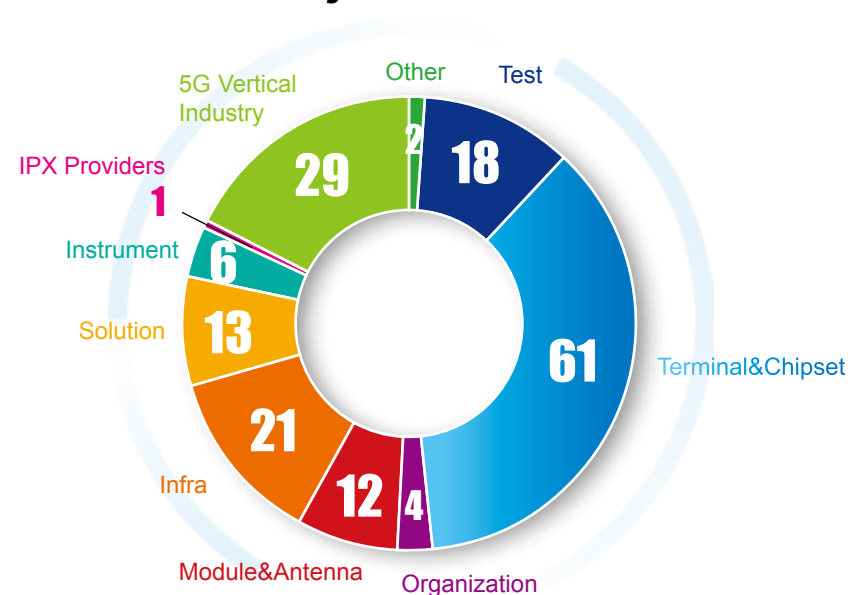
- Further promote 4G evolution and expand global market
- Promote 5G development and cross-industry innovation

GTI Has Become One of the Most Important Platforms for Industrial Collaboration

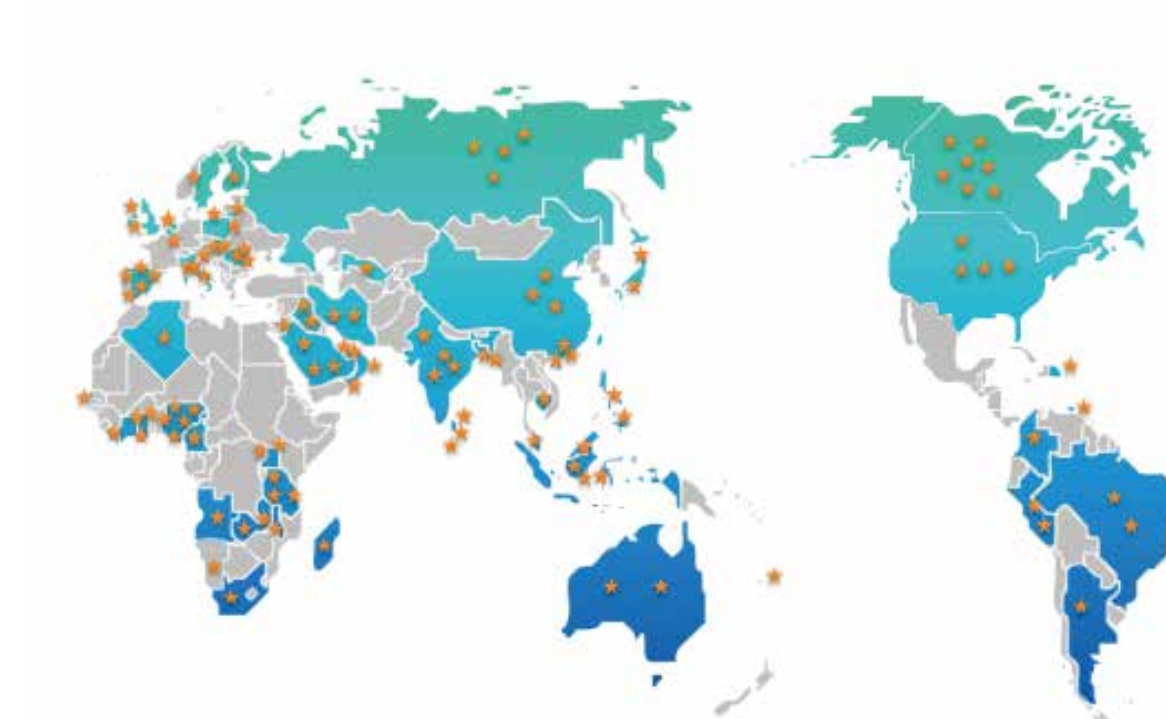
132 operators have joined GTI



167 vendors have joined GTI Partner Forum



Successful Global Commercialization of TD-LTE



122 TD-LTE commercial networks in **61** countries, and

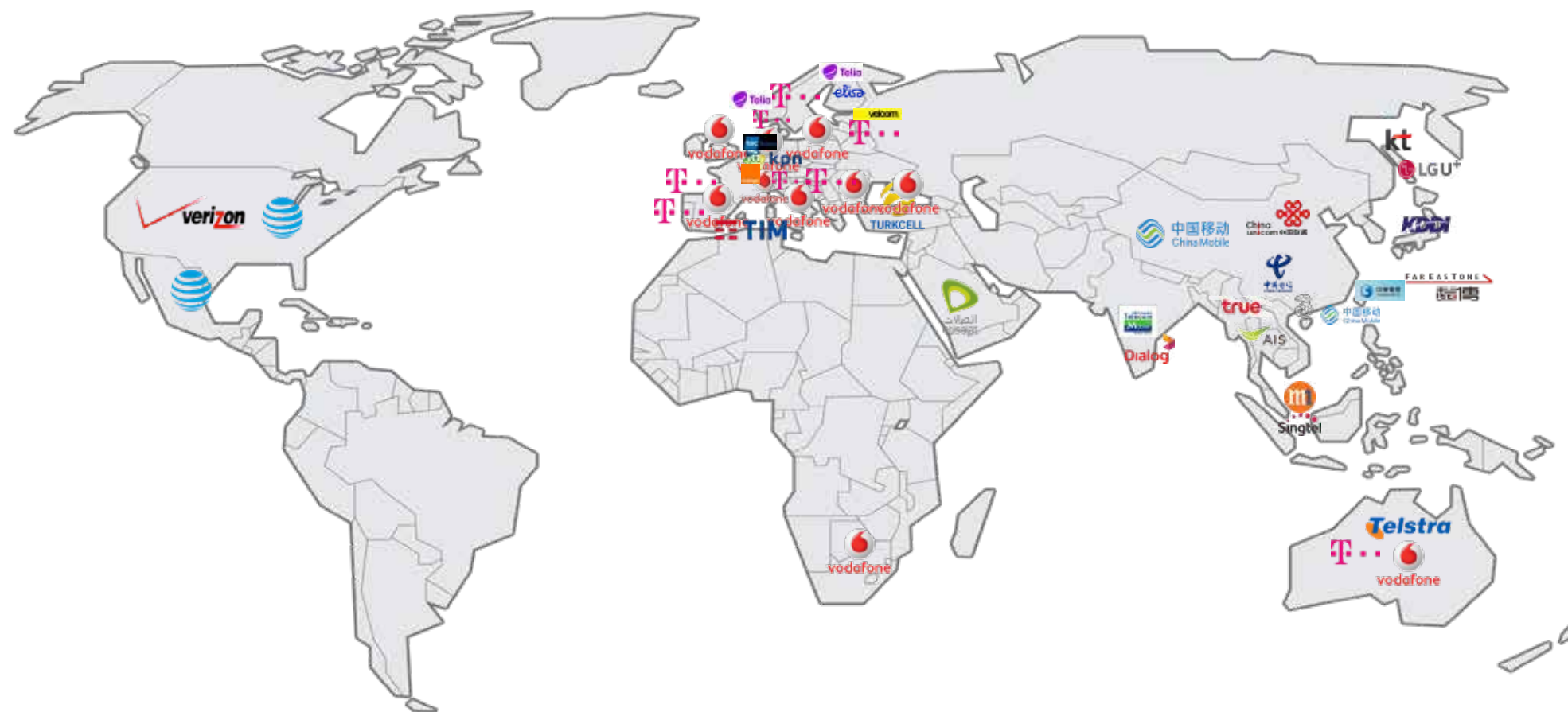
152 TD-LTE commercial networks in progress

2.96 million TD-LTE base stations (Q4,2017)

1.4 billion TD-LTE subscribers

8014 TD-LTE terminals, **66.8%** supporting TDD/FDD

Maturing MloT Industry Facilitates MloT Commercial Launches on a Global Scale



Commercial Launches

52 NB-IoT
11 eMTC

Industrial Maturity

* Source from GSMA

RAN / CN



Chipset



Module



Test Platform



Latest Breakthroughs and Accomplishments



New Released Whitepapers



GTI IoT Service Layer Architecture Whitepaper

The underlying mobile network is an existing large-scale platform for bearing the IoT services. Getting the underlying transport network capability to be exposed to the IoT applications in a simple way while offering additional and commonly needed functions and guaranteeing a robust protection of the network from inefficient usage will provide differentiated competition for mobile operators' IoT platforms versus other over-the-top offerings.



GTI IoT Security Technical Implementation Guide

The IoT terminal security is the entrance to all data of IoT. At present, the security of IoT presents a top-heavy security posture, and there is no guide to security technology development for IoT terminals in the industry. This whitepaper is devoted to releasing GTI IoT terminal security technical guide to enhance the safety awareness of manufacturers, improve the safety of existing IoT terminals, and promote the safe, stable and healthy development of IoT industry.



GTI IoT Wireless Solution Whitepaper

This whitepaper introduces the development of Cellular IoT technology and the evolution of standards, and focuses on the analysis of NB-IoT and eMTC's experiences in network deployment strategies, network planning and optimization. In the meantime, the whitepaper also makes a detailed comparison between Cellular IoT technologies and other LPWA technologies.



GTI IoT Core Network Architecture Whitepaper

This whitepaper gives a description on IoT use case analysis, core architectural requirement and EPC optimized architecture to support NB-IoT or enhanced MTC devices. This whitepaper also investigates how to leverage NFV and other emerging network technologies to realize optimization of Cellular IoT core network architecture, deployment strategy and service capability exposure architecture.



GTI IoT Small-sized eSIM UICC Whitepaper

With the development of miniaturization of Cellular IoT modules, the module size can be 16x18mm, but the minimum size of eSIM card defined in current international standards is 5x6mm, which cannot meet the demand for module miniaturization. This whitepaper intends to solve such problems and defines smaller eSIM Card Size (2x2mm) to promote the development of Cellular IoT Business.



GTI Guideline for Device Certification V2.0.0

This document is the guideline for GTI Device Certification, which contains GTI certification architecture, definition of certification objects, certification procedure and criteria as well as procedure of test platform validation and test lab accreditation. In addition, the test certification requirements for NB-IoT module are also included in the guideline.

Latest Breakthroughs and Accomplishments

13

Whitepapers and Technical Reports

have been released in GTI Summit 2018 Barcelona

GTI Sub-6GHz 5G Device White Paper

GTI Sub-6GHz 5G Device White Paper

This White Paper is necessary to facilitate the development of 5G chipset/ device and the corresponding test instruments. It targets enhanced Mobile Broadband (eMBB) scenario for Sub-6GHz 5G pre-commercial and commercial products, which is conducted to be the technical references for the development of chipset/ device and the basis for the 5G pre-commercial and commercial products specs.

GTI Massive MIMO Whitepaper

GTI Massive MIMO Whitepaper

As a massive-antenna technology in the 4G era, Massive MIMO has been widely regarded as an ever energizing technology since 4G rollout. It takes the unrivaled advantages of LTE TDD spectrum to achieve revolutionary breakthroughs in network performance for operators. This revolutionary technology is a great prelude to the future-oriented network.

GTI NB-IoT Interoperability Test Specification

GTI NB-IoT Interoperability Test Specification

This document defines the Inter-Operability test cases for NB-IoT chipsets, modules and devices.

GTI 5G Sub-6GHz Spectrum and Refarming Whitepaper

GTI Sub-6GHz 5G Deployment Whitepaper

GTI Proof of Concept of 5G System Whitepaper

GTI Sub-6GHz 5G Radio Access Network Whitepaper

GTI Sub-6GHz 5G Core Network Whitepaper

GTI 5G Network Architecture Whitepaper

GTI 5G Network Slicing Whitepaper

GTI Sub-6GHz 5G Device Whitepaper

GTI 5G New Device Type Research Report

GTI 5G Device RF Component Research Report

GTI NB-IoT Module Test Specification

GTI Enabling AI Vision with 5G Networks Whitepaper

GTI 5G Cloud Robotics Whitepaper

To get the full version of GTI Whitepapers,
- View on the GTI website <http://gtigroup.org/Resources/rep/>
- Scan the QR code on the cover to download GTI APP to view

Latest Breakthroughs and Accomplishments

Commercial Products and Prototypes

5G System Prototype

In 2017, GTI took the lead in releasing **5G System Prototype** and **Trial Guideline** which puts forward the basic index requirements of the low frequency equipment.

These two 5G system prototypes by Huawei and ZTE are the first product matched with the Trial Guideline, which have been used in the field trial. In 2018, there will be more related products.



3.5GHz, 64TxRU, 100MHz BW, 200w Tx Power

Sub-6GHz 5G FPGA Prototype Device

GTI successfully promoted the maturity of the world's first batch of sub-6GHz 5G FPGA prototype device by Qualcomm, Intel, Spreadtrum and MediaTek :

- Support 100MHz bandwidth in 3.5GHz
- Compliant with the NR Layer1 architecture in 3GPP R15
- Support PDSCH/PUSCH CP-OFDM
- Support 256QAM and 4x4 MIMO



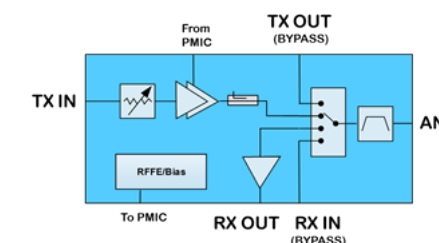
Promoted 5G RF Components Commercialization

World's 1st Sub-6GHz 5G Device RF FEM Prototype

- High-integration: power amplifier, filter, switch, LNA
- Optimize the matching within RF FEM
- Reduce RF front-end insertion loss
- Optimize the RF performance of device



Qorvo
(3.5mm x 6mm)

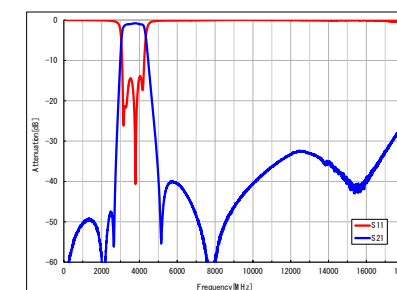


World's 1st Sub-6GHz 5G Device High Power Multilayer Ceramic Filter Prototype

- High power capacity: +33dBm, 10000h (Passband)
- Insertion Loss (typical value): 1.29dB
- Support HPUE to improve network coverage and user experience



Taiyo Yuden
2.0mm x 1.25mm x 0.65mm Max



Test Result

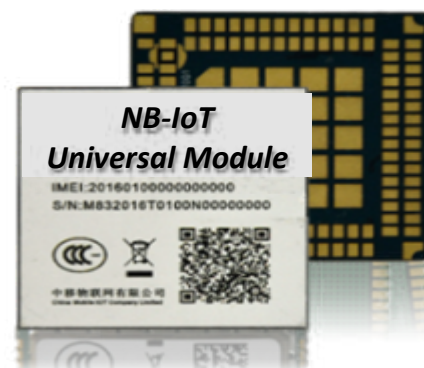
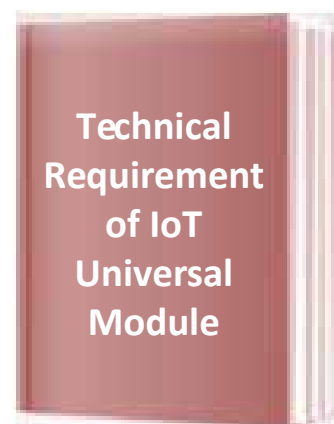
Latest Breakthroughs and Accomplishments

Commercial Products and Prototypes

Promoted Maturity of IoT Universal Module

In 2017, GTI promoted the maturity of **IoT Universal Module** which is the bridge of communication capability and service capability.

- The **Technical Requirement of IoT Universal Module** is published for the very first time giving specific guidance to the whole industry
- Jointly developed the world's smallest **NB-IoT Universal Module** (16mm*18mm)



Why Universal Module?

- Break the fragmentation of IoT industry to further expand IoT market
- Make the integration of C-IoT technology and terminal more convenient and ease the application in vertical industry
- Lower the cost of terminals

Prototype Device of Cloud Robot

With joint efforts, GTI has developed the Cloud Robot prototype device with Softbank, **Mr. CUBE** and **Mr. WOODEN BOX**, which are autonomous robots based on the ROS (Robot Operating System) and COTS (Commercial Off-the-shelf) components, intended to become new office automation equipment, universal like air and water. Simple yet practical configuration and sufficient payload makes Mr. CUBE Mr. WOODEN BOX are ideal platform to explore possibilities of Cloud Robotics in 5G era



Mr. CUBE



Mr. Wooden Box

Commercialization of High Power UE

High Power UE on Band 41 can significantly improve coverage and user experience at cell edge, meanwhile saving 15%-30% investment for operators.

In 2017, GTI promoted the **4 types of B41 HPUE** to be released. In the future, more is coming.



Samsung GS8



Samsung GS8+



LG G6



ZTE-MAX

※To meet in deferent requirements in deferent market, **Band 40 HPUE** is under Standardization

GTI 2.0 Technical Work Refinement: A Significant Shift to Foster Joint Innovation towards 5G

Objective

Focus on key technical issues, provide solutions and guidance to the whole industry and ensure commercial success

Goal-Oriented

To stay goal-oriented with clearly defined objectives and plans to ensure efficient operation and collaboration

Concrete Deliverables

With concrete deliverables to ensure substantial progress of the industry

Win-win Cooperation

To encourage more active participation and contribution from all partners to unleash synergy and benefit the industry as a whole

Programs with Concrete Deliverables to Continuously Promote 4G Evolution and 5G Development

PROGRAMS

4G & Evolution

Program Coordinators

Guangyi Liu, CMCC Carlson Chu, PCCW
Kathleen Leach, Sprint Chengke Tang, Huawei
Qi Guo, ZTE

Objective

Facing the rapid development of data requirements on new service & applications, efficient utilizing LTE to enhance performance and service capability

Projects

Massive-MIMO
Uplink Enhancement
VoLTE
Smooth Evolution
Roaming
Innovative Business & Service
Small Cell
eMBMS

5G eMBB

Program Coordinators

Prakash Bhat, Vodafone Guangyi Liu, CMCC
Junjiang Peng, Ericsson Gao Quanzhong, Huawei

Objective

Defining 5G eMBB requirements/use case, validating system solution, defining product requirement and promoting commercial deployment among GTI partners and with wider industry partners

Projects

Sub 6GHz
Above 6GHz
New Device
Architecture
Test Equipment
...

IoT

Program Coordinators

Herkole Sava & Kathleen Leach, Sprint Shanpeng Xiao, CMCC Xiaowu Zhao, ZTE

Objective

Promoting development of cellular IoT technology and its commercialization

Projects

Pilot and Trial
Wireless Solution
Network Architecture
Device Solution
Device Certification
eSIM
Open Platform
Business & Service
Security
...

IoV

Program Coordinators

Prakash Bhat, Vodafone Guang Yang, CMCC
Dayong Zhang, Nokia Yan Li, Qualcomm

Cooperation with 5GAA and industry partners to better promote the development of V2X

Cloud Robot

Program Coordinators

Tomohiko Furutani, Softbank
Sen Wang, CloudMind Xi Chen, Huawei

Objective

Enabling the development of Cloud Robot and jointly exploring the market

Projects

Whitepaper
Prototype demo
5G integration
Pre-5G demo
...

DELIVERABLES

Requirement
Whitepaper

Test/Technical/Business &
Service Report

Prototype/
Product

Trial/
Showcase

Leadership of GTI 2.0

Leaders Committee

Strategy Guidance



Sunil Bharti Mittal
Founder and Chairman
Bharti Enterprises



Shang Bing
Chairman
China Mobile



Chang-Gyu Hwang
Chairman & CEO
KT



Masayoshi Son
Chairman & CEO
SoftBank Group Corp



Vittorio Colao
Chief Executive
Vodafone

Steering Committee

Management



Mr. Craig Ehrlich
Chairman of SC
GTI



Mr. Abhay Savargaonkar
CTO
Bharti Airtel



Mr. Li Zhengmao
Executive Vice President
China Mobile



Dr. John Saw
Chief Network Officer
Sprint



Mr. Seong-Mok Oh
Head of Network Group
KT



Dr. PS Tang
Managing Director
Arete M



Mr. Ted Matsumoto
Special Advisor
SoftBank



Mr. Andy Macleod
Director of VF Network
Vodafone



Mr. Natee Sumethason
Assistant Vice President
AT&T/DRVLA



Mr. Paul Berriman
Group Chief Technology Officer
PCCW

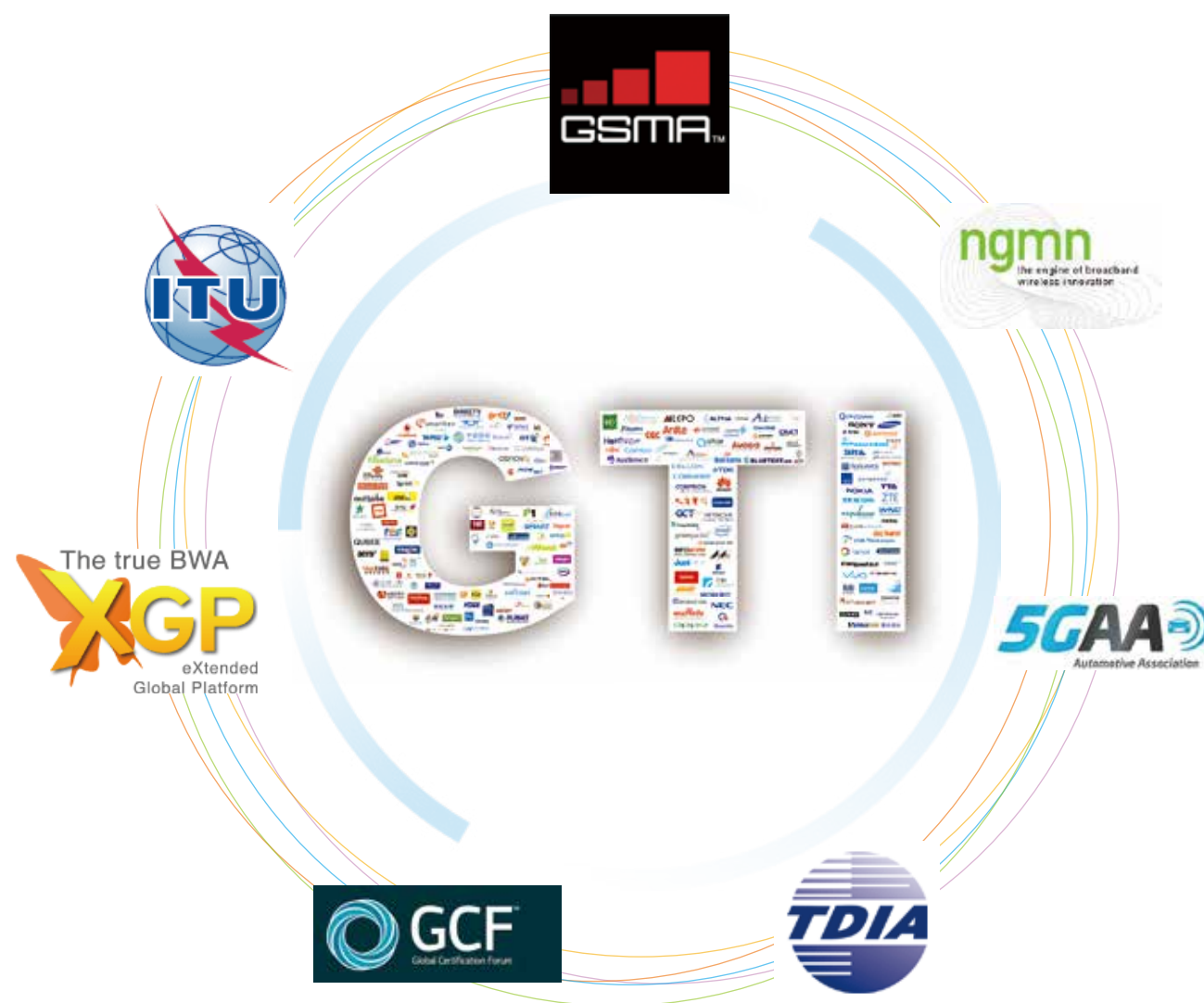


Mr. Mathew Oommen
President Network,
Global Strategy, and
Service Development
RJIL



Mr. Hajime Nakamura Deputy General
Manager of Technology Planning Division,
KDDI
Executive Vice President, KDDI Research, Inc.
KDDI

Global Collaboration, Bright Future!



Welcome to join

GTI 2.0

<http://www.gtigroup.org>

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Blank lined paper with a faint 'GTA' watermark.