Certification Ecosystem for 5G and beyond

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Global Certification Forum (GCF) - who are we?

- **The mobile industry's 3GPP device certification scheme**
  - 300+ members from across the globe and growing
    - 38 new members so far in 2019
  - Major brands participate (Operators, Device Manufacturers and Test Industry)
    - Global presence through major operators
    - 100+ manufacturers including top 10 smart phone manufacturers
  - > 600 products certified per year
    - 2019 had first certified 5G devices
- **A GCF certified product has an assured level of interoperability**

Industry Partners

GCF supports all 3GPP mobile technologies

Year of first certification:

2019 - 5G

2017 – NB-IoT & LTE-M

2016 – CA certification

2011 – LTE certification

2008 – HSD/UPA

2006 – WCDMA
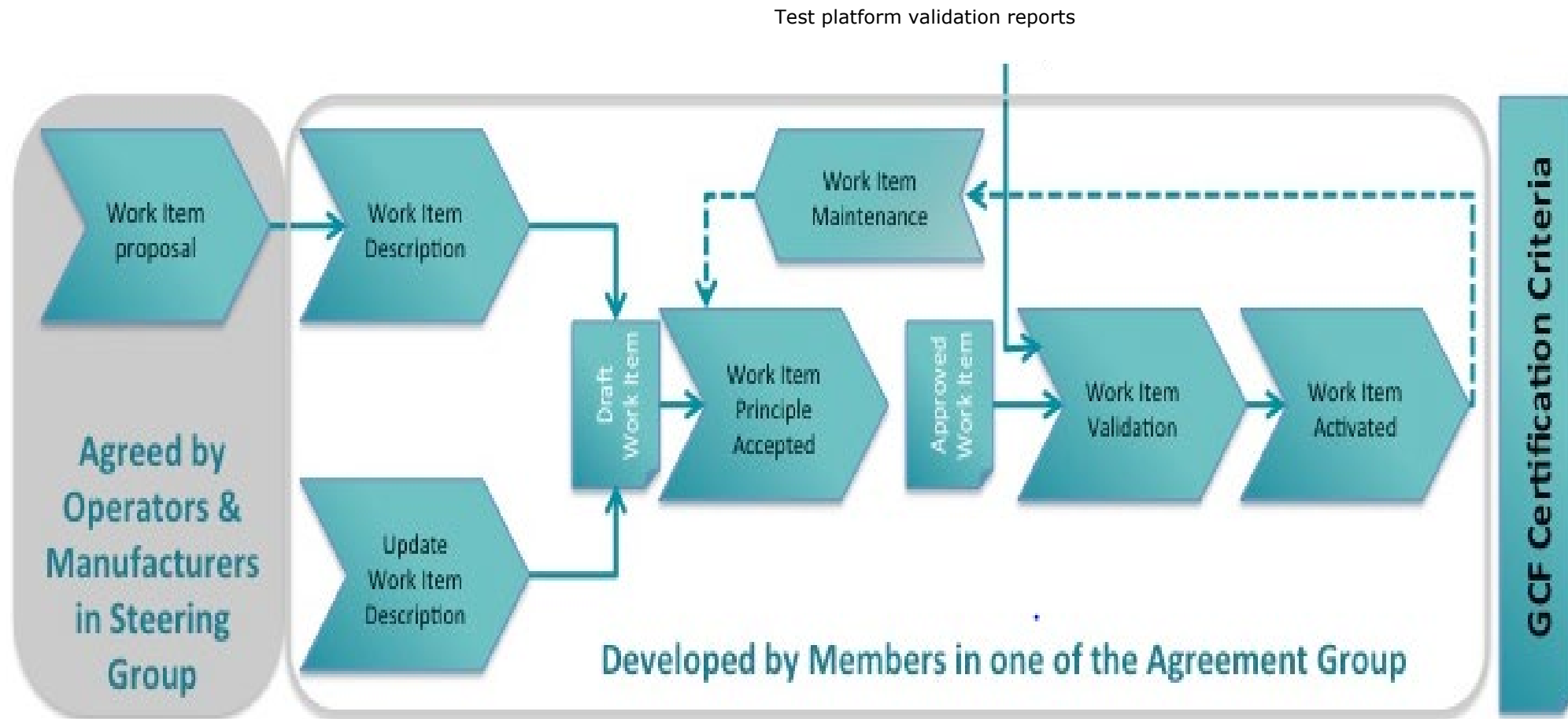
2000 – GSM
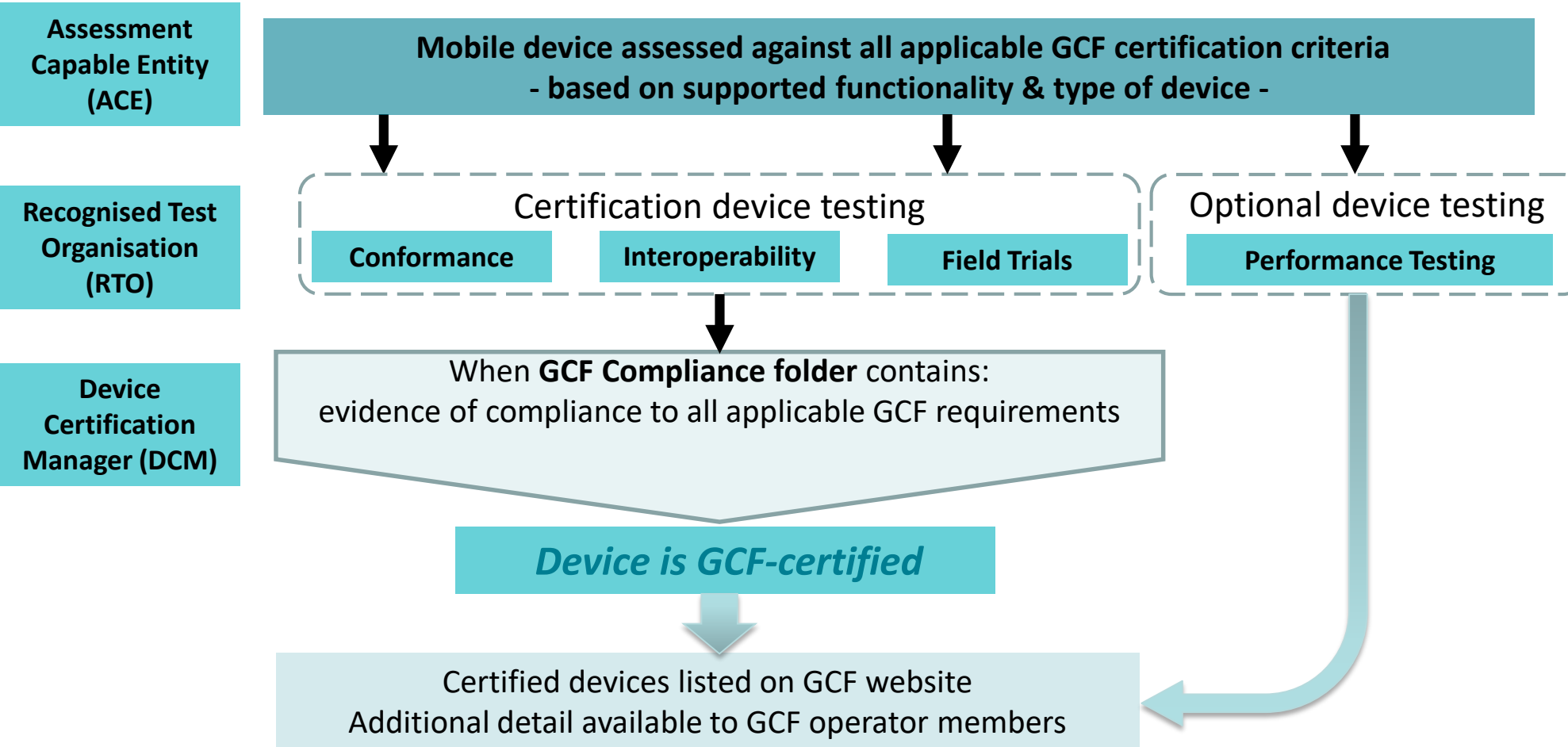
GCF's Certification scope

Services and Applications
oneM2M

Radio Technologies
(2G, 3G, 4G, 5G)

Related Technologies
(e.g. NFC, SIM, eSIM/RSP etc)

Introduction of new work items

Test platform validation reports

The GCF certification process

Assessment Capable Entity (ACE)

Recognised Test Organisation (RTO)

Device Certification Manager (DCM)

Mobile device assessed against all applicable GCF certification criteria
- based on supported functionality & type of device -

Certification device testing

Conformance

Interoperability

Field Trials

Optional device testing

Performance Testing

When **GCF Compliance folder** contains:
evidence of compliance to all applicable GCF requirements

Device is GCF-certified

Certified devices listed on GCF website
Additional detail available to GCF operator members

Conformance testing
(Based upon standards & validated test cases/platforms)

Interoperability testing

Field trials
(GSMA TS.11)

Field trials

Execute field trials as per GCF CC and GCF FTP on FTQ network

②

Field trial qualified Network 1

④

Field Trial Officer provide support in testing

Certifying organisation

③

Repeat on #2 and #3 on mandated number of FTQ networks

Upload field trial results to compliance folder

①

Upload declaration to become field trial qualified

Field trial qualified Network 2

Field trial qualified Network N

Development of certification ecosystem /1

- Development of a robust ecosystem for mobile device certification requires:

Requirements	GCF
Relationship with SDO	3GPP MRP
Core specifications	3GPP RAN
Device test specifications	3GPP RAN5 + TF160
Test equipment	20+ TE suppliers
Testing laboratories	66 labs recognised
Agreed test case validation	GCF-CV
Verification in live networks	FTQ programme
Sync with SDO	Quarterly drumbeat
Tools for test case management	DCC database
Engagement with SMEs	~3,500 accounts
Funding of ecosystem	Membership fees

Development of certification ecosystem /2

- Timeline for development
  - GCF has refined its eco system since 1999
  - Starting from scratch: estimated minimum 3 years

- Investment & maintenance cost
  - IT tools development ~2-3 M€ with two years development time
  - Yearly Maintenance cost of 25%
  - Organisation to host the ecosystem – cost ?

- Other considerations
  - High complexity of standards -> How to engage experts
  - Proficiency of test equipment –> high cost of test system solutions

Certification ecosystem changes

- 5G will drive usage of wireless connections into everything
  - Certification will have additional stakeholders
  - Operators and device manufacturers will be complemented by non-telecom stakeholders
  - Interoperability on application layers may have same importance as modem layer

- Impact on drivers for certification
  - Operators may not be the main driver for certification
  - New stakeholders may not recognise the value of certification
  - Risk of more un-certified devices in networks with resulting harm and reduced QoS?

- What is GCF doing
  - Engaging with new industries through their associations
  - Increasing coverage for application layer certifications
    - Started with oneM2M certification in July 2019
  - Joint certification solutions for specific industries
  - Promoting usage of certified devices
    - Launched IoT Solutions website

What we presently cover in GCF for 5G …

Standalone (SA)

1 LTE ——— EPC

2 NR ——— 5G Core

5 LTE ——— 5G Core

3 EPC / LTE, NR

4 5G Core / NR, LTE

7 5G Core / LTE, NR

Non-Standalone (NSA) – 'Dual Connectivity'
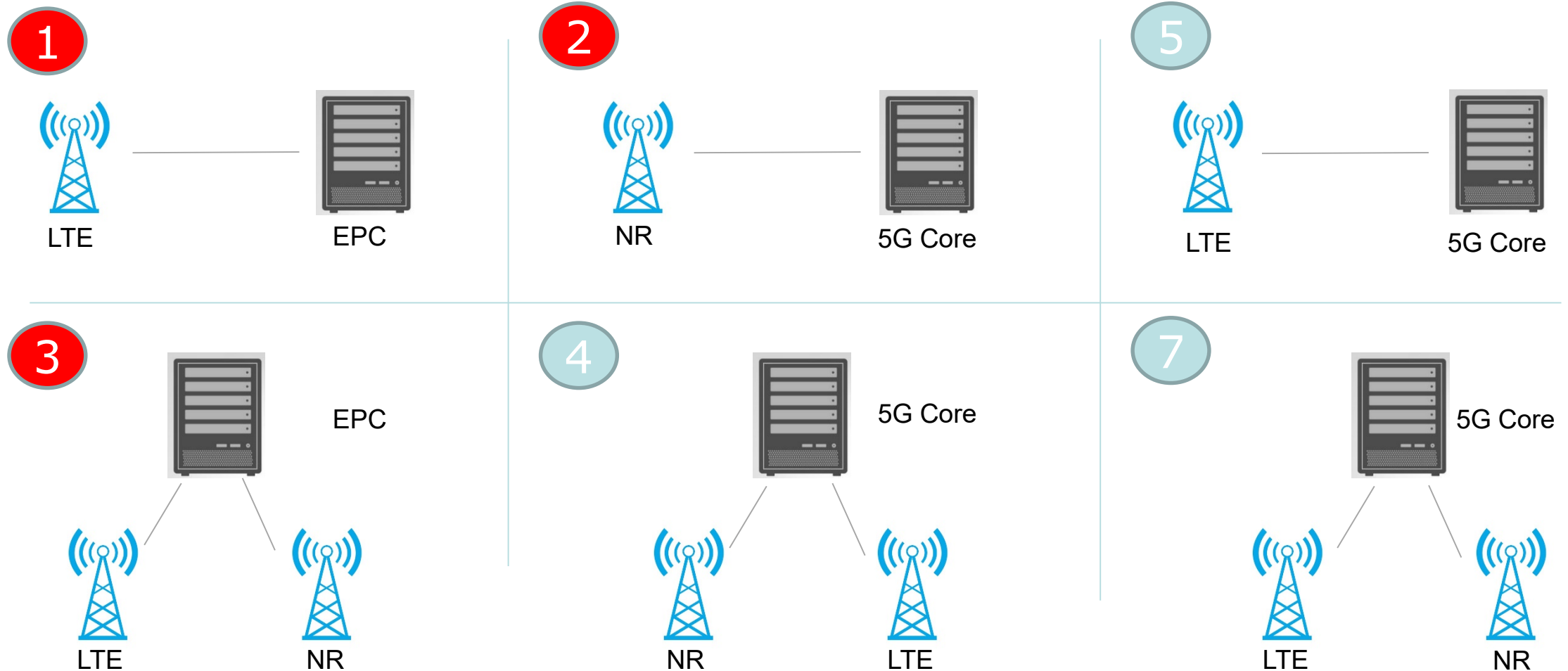
GCF 5G Certification covers 11 operators now
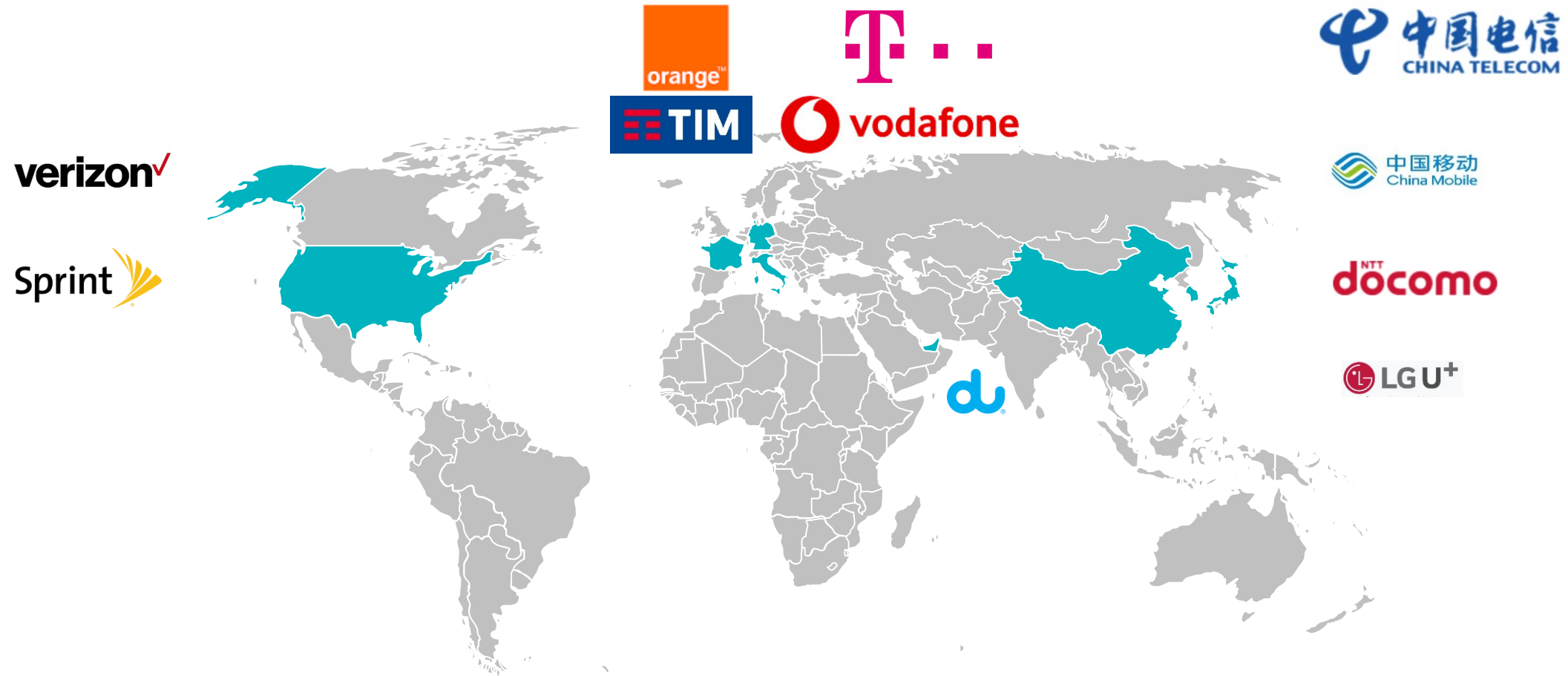
* Shown GCF Operators that have included 5G certification test requirements into GCF's work program..

GCF 5G Band Coverage

Band Coverage SA Option 2			
n1	n41	n78	n79

Band Coverage NSA Option 3			
(n)41AA	4A_n260A	18A_n78A	28A_n78A
1A_n77A	4A_n261A	18A_n79A	39A_n41A
1A_n78A	5A_n78A	18A_n257A	39A_n78A
1A_n79A	5A_n260A	19A_n77A	39A_n79A
1A_n257A	5A_n261A	19A_n78A	40A_n41A
2A_n260A	7A_n28A	19A_n79A	41A_n41A
2A_n261A	7A_n78A	19A_n257A	41A_n78A
3A_n28A	8A_n41A	20A_n78A	41A_n79A
3A_n41A	8A_n78A	21A_n77A	66A_n260A
3A_n77A	8A_n79A	21A_n78A	66A_n261A
3A_n78A	13A_n260A	21A_n79A	
3A_n79A	13A_n261A	21A_n257A	
3A_n257A	18A_n77A	25A_n41A	

Current 5G Work Items

Number	Area	Type
WI-500-XX	**5G RF**	**Conformance**
WI-501-XX	**5G RRM**	**Conformance**
WI-502-XX	**5G De-Mod / CSI**	**Conformance**
WI-503-XX	**5G AS Protocol**	**Conformance**
WI-504-XX	**5G NAS Protocol**	**Conformance**
WI-505-XX	5G IMS	Conformance
WI-506-XX	**5G Positioning**	**Conformance**
WI-507-XX	**5G Field Trials**	**Field Trials**
WI-508-NR	**USIM/USAT Interworking**	**Conformance**

XX denotes the band information
Bold **Work Items** have test loaded test cases in the DCC.

	Priority	Test cases	Validated
Overall 5G	1	5001	529
Overall 5G	2	3620	6
Overall 5G	**Total**	**8621**	**535**
RF	1	722	193
RF	2	831	6
RF	**Total**	**1553**	**199**
RRM	1	170	6
RRM	2	615	0
RRM	**Total**	**785**	**6**
Demod/CSI	1	187	2
Demod/CSI	2	241	0
Demod/CSI	**Total**	**428**	**2**
AS Protocol	1	3447	280
AS Protocol	2	1553	0
AS Protocol	**Total**	**5000**	**280**
NAS Protocol	1	259	48
NAS Protocol	2	96	0
NAS Protocol	**Total**	**355**	**48**
IMS Protocol	1		
IMS Protocol	2		
IMS Protocol	**Total**	**0**	**0**
Positioning	1	19	0
Positioning	2	1	0
Positioning	**Total**	**20**	**0**
USIM/USAT Interworking	1	12	0
USIM/USAT Interworking	2	17	0
USIM/SAT Interworking	**Total**	**29**	**0**
IRAT NR-LTE	1	185	0
IRAT NR-LTE	2	266	0
IRAT NR - LTE	**Total**	**451**	**0**

GCF 5G Field Trials

FT Test Case count

Field Trials	5G option	Test cases
NR	2	27
EN-DC	3	36

FTQ Operators

Operator	5G Option	Declaration Date
TIM	**3**	**25 June 2019**
Deutsche Telekom	**3**	**13 September**

5G Test Platforms and labs

TEST PLATFORMS

Test equipment vendors have declared 10 test platforms:

- 6 different vendors
- 5 Test Platform have validated tests
- 3 Test Platforms have activated Work Items

TEST LABORATORIES

Seven 3rd Party labs have submitted 5G C-RTO declarations

- 5 x China
- 1 x US
- 1 x South Korea

What is the 5G short term priorities

- Increase the number of validated test cases

- Accelerate the activation of work items

- Increase number of FTQ operators

- Include bands for more operators

- Support additional connectivity options (4,5 &7)

What are the challenges for 2020 and beyond

- 3GPP additional bands & Rel-16 features
  - Growth in number of Work Items and Test Cases
- Increase coverage of operators
  - Band complexity may increase significantly
- Testing of FR2
  - All testing will be radiated

- New applications
  - Critical communication & closed networks
  - Automotive & connected vehicles
  - Industrial
  - IoT
  - Artificial Intelligence

GCF can handle 5G complexity...

- GCF's Device Certification Criteria (DCC) database is industry leading.

- DCC has successfully managed increasing complexity from 2G through to 5G

- Significant continued investments
  - Upgraded, faster DCC database to be released end of 2020 to cover future needs
  - GCF's online certification database to include supported as well as certified features Submission to become smarter

GCF tools are ready for 5G!

Wrap-up

- 5G is significant more complex than 4G which makes certification even more critical and needed
- GCF is ready to support certification of the next generation 5G devices
  - However we miss requirements & priorities from India
- 5G will enable new businesses for operators and industries

GCF is working with members and
  - **TCCA** on certification of critical communication devices
  - **5GAA** on certification of connected cars
  - **5GACIA** on certification of industry & automation
  - **GSMA** on certification of IOT devices
  - **oneM2M** on certification of M2M applications

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