5G Commercial realization: From standards to deployments

5G MENA

28 November 2018

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GCF Programme Manager

Chris Hogg (GCF Programme Manager)

- **18 years mobile industry experience.**
- **Programme and Strategic Management of GCF.**
  - Working with members to define and maintain GCF's Certification Criteria.
  - Liaising with GCF's partner organisations.
  - Advising GCF on how to deal with changes in the market.
  - Previously a standards manager in Nortel (ITU-T, ETSI, 3GPP)
- **MBA, Imperial College, London** (2014)
- **Professional Engineer (UK CEng)**
  - Master of Electrical Engineering, University of Strathclyde, Glasgow (2000)

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Agenda: 5G – 'From standards to deployments'

- What is included in GCF Certification and when?
- What is being deployed in MENA and around the world?
- Key challenges of 5G
- IoT – what is GCF doing?
- The changing market: How is GCF adapting?

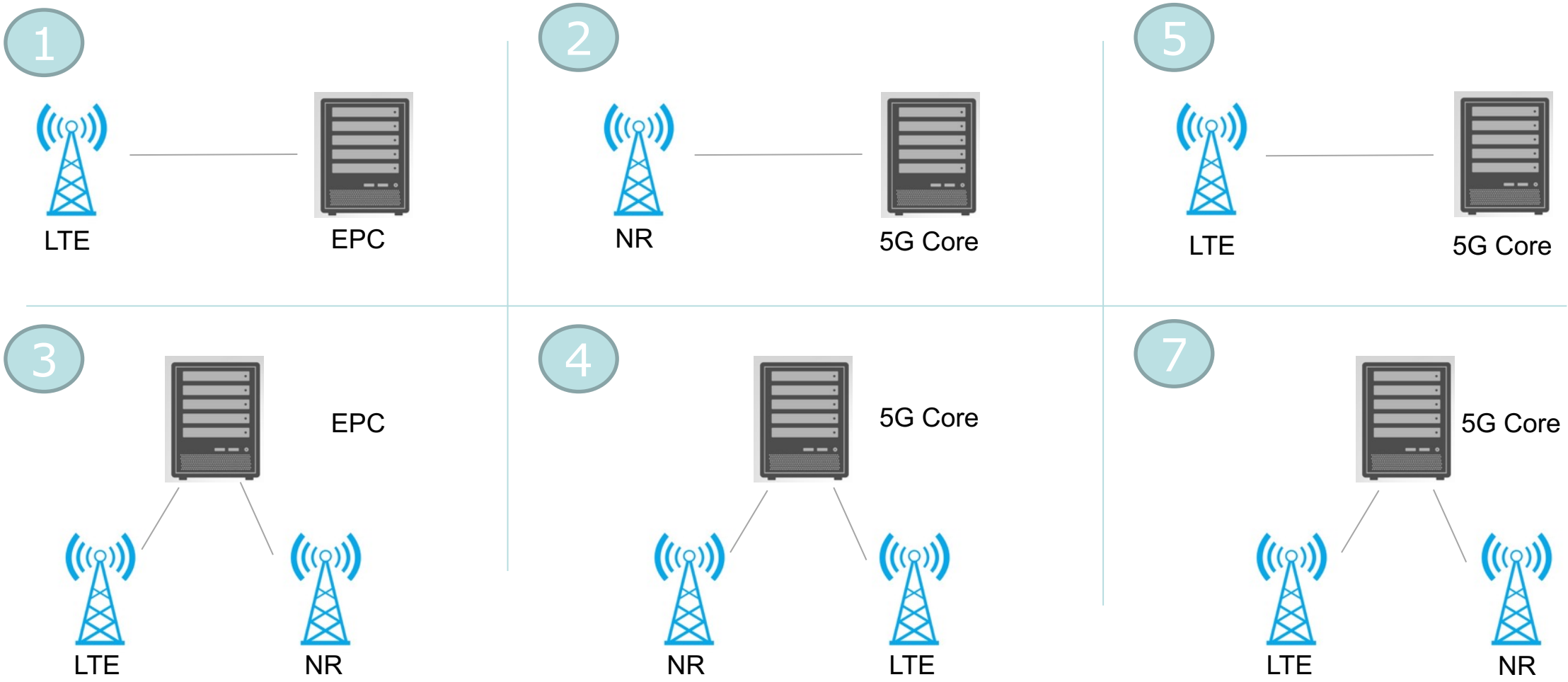
GCF 5G Certification

What is 5G?

- Next-gen mobile technology.
- 'Traditional' and 'new' use cases.
- New radio and new core network – but with flexible deployment options.
- Two frequency bands
  - sub-6Hz and
  - > 6 GHz (mmWave)

There are many options in 5G…

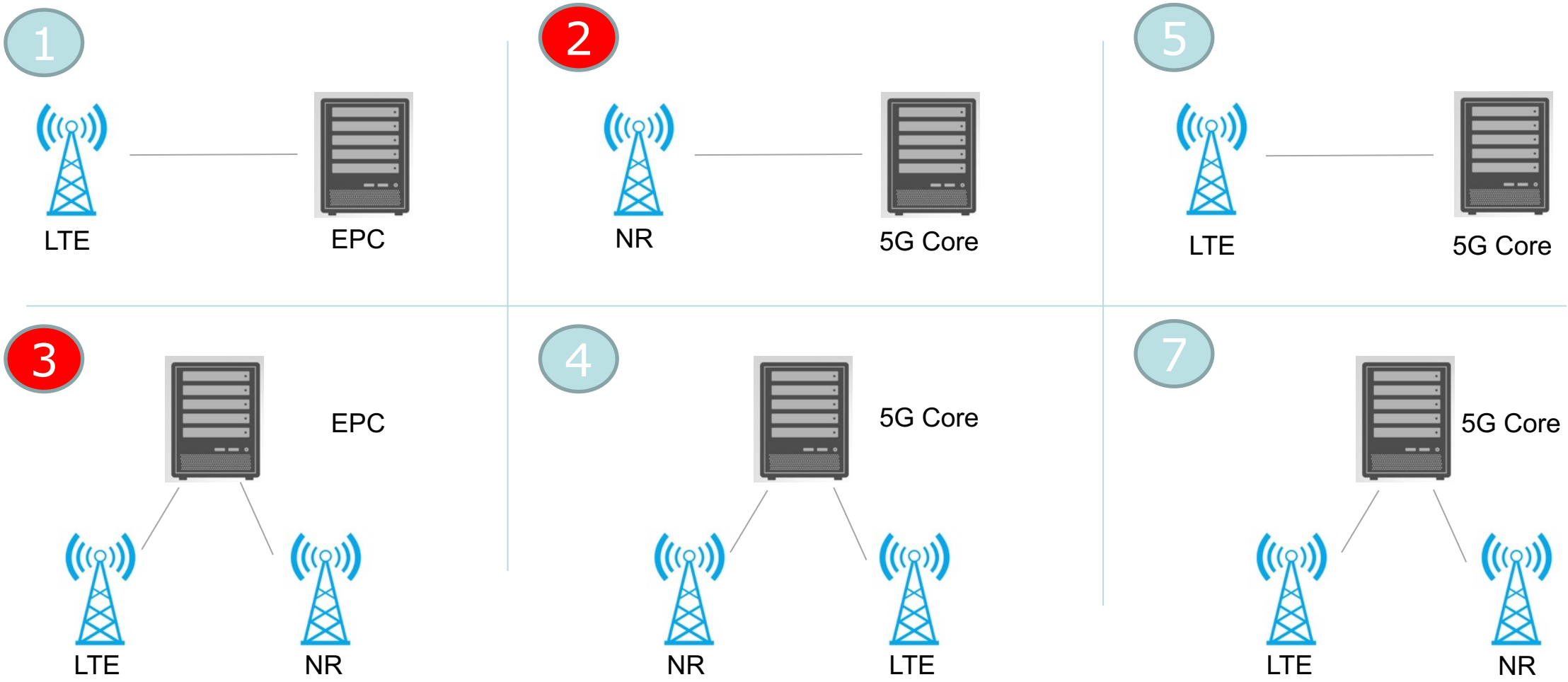
Standalone (SA)



Non-Standalone (NSA)

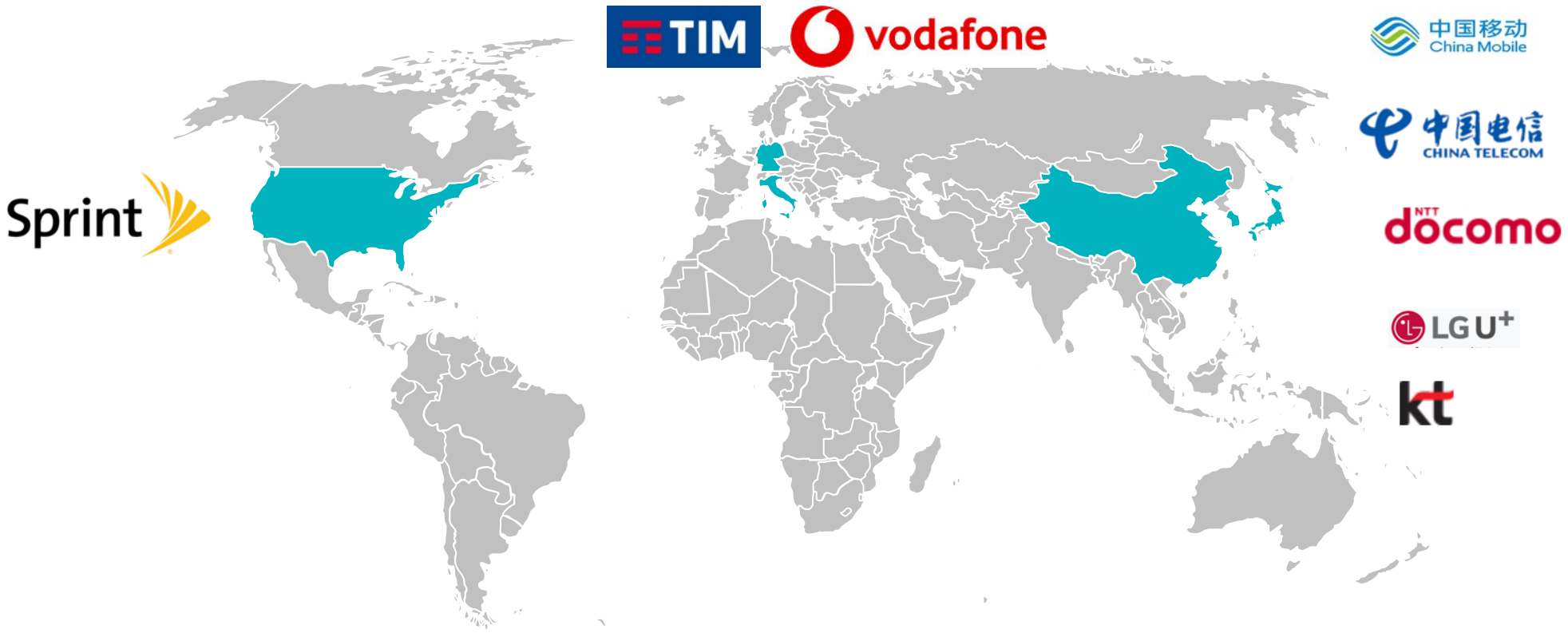
What we presently cover in GCF…

Standalone (SA)



Non-Standalone (NSA) – ‘Dual Connectivity’

GCF 5G Certification by region *



* GCF Operators that have included 5G certification test requirements into GCF's work programme. Expected launch date of certification varies from Q1 – Q3 2019.

5G trials and launches in MENA

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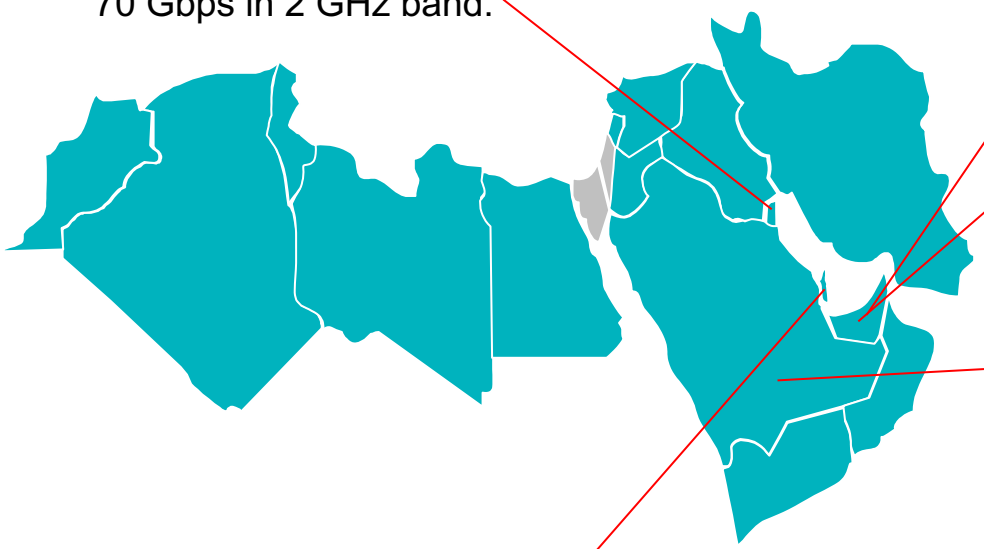
- May 2018 launch in Kuwait.
- Trail in 2017 showed speeds of 70 Gbps in 2 GHz band.



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- August 2018 launch in Doha.
- Fixed broadband.
- 3.5 GHz band.

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GCF Member

- 2019 Planned launch
- Trials in 28 GHz band (2 locations)
- NSA Option 3 to start.
- 700 MHz and 3.6 GHz

etisalat

GCF Member

- Sept 2018 launch in UAE
- 5G Fixed Wireless up to 1.5 Gbps.
- 3.3 – 3.8 GHz band.

STC الاتصالات السعودية

GCF Member

- Live network in eastern region (May 2018)
- Expects first devices in 2019.

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5G launches and trials in the Americas

TELUS

- 5G 'Living Lab' in Vancouver.
- Expects commercial 5G in 2020.

Bell

- 5G Lab and Field Trials.
- LTE-Advanced Fixed Wireless.

ROGERS

- 5G trials late 2018

Sprint

- 5G NR mobile in 1H2019.
- Selected cities.
- 2.5 GHz band.

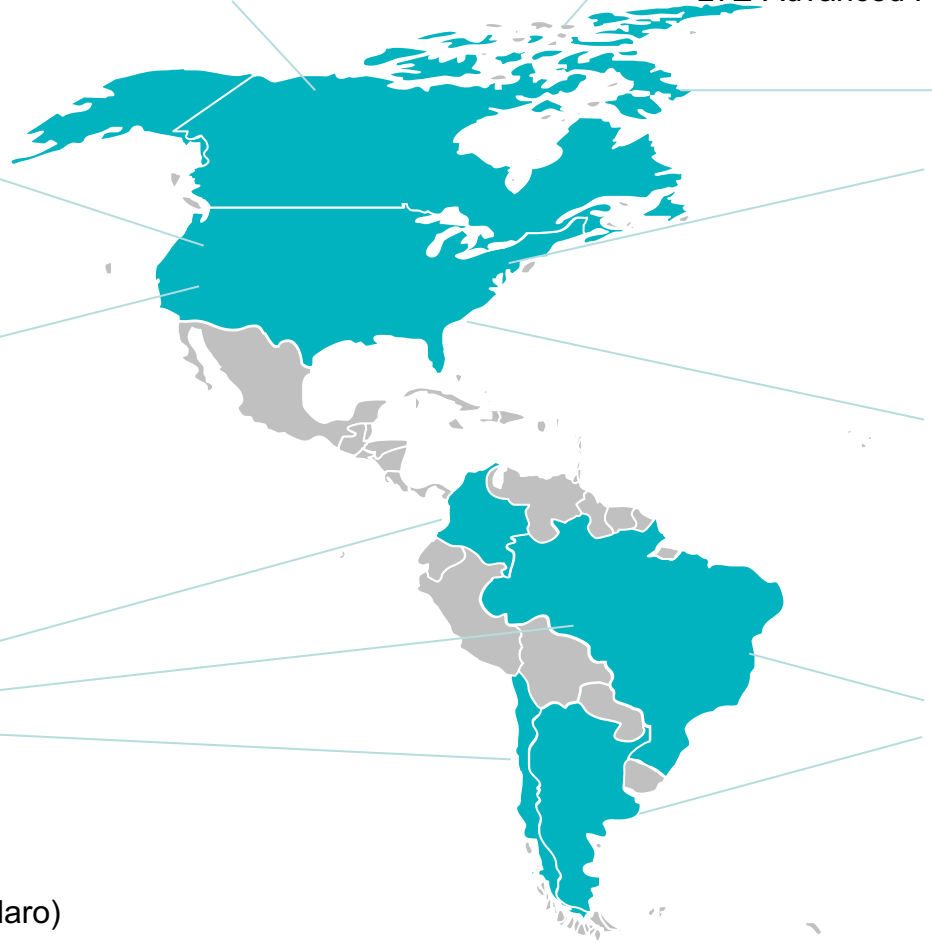
verizon

- 5G NR fixed wireless and mobile in 2018.
- Selected cities.
- 28 GHz band.

- 5G NR mobile in 1H2019.
- Selected cities.
- 600 MHz, 28 GHz, 39 GHz.

AT&T

- 5G NR fixed wireless in 2018.
- Selected cities.
- Not yet confirmed.



América Móvil

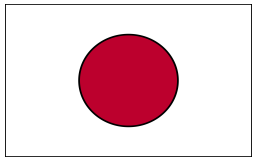
- Columbia: 5G Trial. Jan 2018. 27 GHz.
- Chile: Lab demo, Dec 2017. 28 GHz.
- Brazil: Part of '5G Brazil Project' (via Claro)

Telefónica

- Brazil (Vivo): Part of '5G Brazil Project'
- Argentina (Movistar): 5G Test bed, 28 GHz.

* T-Mobile's parent company (Deutsche Telekom) is a GCF member.

5G trials and launches


中国移动 China Mobile

- Completed development testing with partners.
- Early devices 2019.
- 2020 deployment.

中国电信 CHINA TELECOM

- 2020 deployment.

China unicom 中国联通

- 2020 deployment.

NTT docomo

- Further trials 1H2018.
- 5G NR NSA to begin.
- Launch ‘by 2020’.

Designing The Future KDDI

- Separate trials with Samsung and Ericsson.
- 4.5 and 28 GHz bands.
- 2020 deployment.

SoftBank

- Huawei use cases trial.
- Ericsson 4.5 GHz trial.
- Launch ‘around 2020’.

LG U+

- 5G tests in Gangnam.
- 5G NR NSA
- 3.5 GHz and 28 GHz (trials)

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- ‘Full 5G’ by Q1-2019.
- 5G NR + 5G Core.
- 5G Open Lab.

SK telecom

- Samsung – SK trials of 5G core.
- 5G NR NSA
- Commercial ‘from Oct 2018’.

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5G trials and launches in Europe

- 1000 UK 5G cell sites by 2020.
- 5G trials in 7 UK cities in Oct 2018 (3.4 GHz).
- 5G Lab in Germany.

- 5G test network for autonomous vehicles.
- 5G trials in 2 cities (2018-2019).
- Fixed wireless trials (Orange Romania).

- Around 2020 roll out.
- 5G live demo in San Marino.
- 5G lab with Ericsson in Genoa (focus on IoT and Industry 4.0).

- Planned launch in 2019.
- 5G Trial in East London's 'Tech City'.

- Planned launch in 2020.
- Trials in Dresden (smart energy) and Berlin.

- 5G Living Lab in 2 Spanish cities.
- 5G Public-Private Partnership (Spain).
- NSA then SA.

GCF 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**	**Live network Field Trials**

XX denotes the band information
Bold **Work Items** have test loaded test cases in the DCC and or GCF-CC Field Trials.

GCF 5G RF band coverage (NSA Option 3)

Band configurations		Operator
LTE	**5G New Radio**	
3A, 8A, 39A, 41A	n78A, n79A	China Mobile
3A	n78A, n79A	China Telecom
3A, 19A, 21A	n78A	NTT DOCOMO
19A, 21A	n79A	
19A, 21A	n77A	
5A, 7A	n78A	LG U Plus
3A, 8A	n78A	KT
3A, 7A	n78A	Vodafone
3A, 7A	n78A	TIM
41A	n41A	Sprint

GCF 5G RF band coverage (5G NR / SA Option 2)

5G NR Band	Operators
n41	China Mobile
n78, n79	China Mobile, China Telecom

Frequency bands mapping

LTE Bands

Band	Mode	Frequency (GHz)
3	FDD	1.8
5	FDD	0.85
7	FDD	2.6
8	FDD	0.9
19	FDD	0.85
21	FDD	1.5
41	TDD	2.5

5G NR Bands

Band	Mode	Frequency (GHz)
n41	TDD	2.5
n77	TDD	3.7
n78	TDD	3.5
n79	TDD	4.7

Are MENA frequency bands covered?

3GPP and GCF 5G roadmap…

GCF 5G implementation time plan

3GPP Deliverables	Milestones	Completion date (target)	GCF-CC/Date (target)
NSA Phase 1	**Option 3** Phase 1	RAN#80 (June '18)	CC 3.73 / Q1 2019
NSA Phase 2	**Option 3** Phase 2, Option 7	RAN#82 (Dec '18)	CC 3.75 / Q3 2019
NSA Phase 3	Option 4	FFS	
SA Phase 1	**Option 2**, Option 5 Phase 1	RAN#82 (Dec '18) (Probably)	CC 3.75 / Q3 2019
SA Phase 2	**Option 2**, Option 5 Phase 2	FSS	

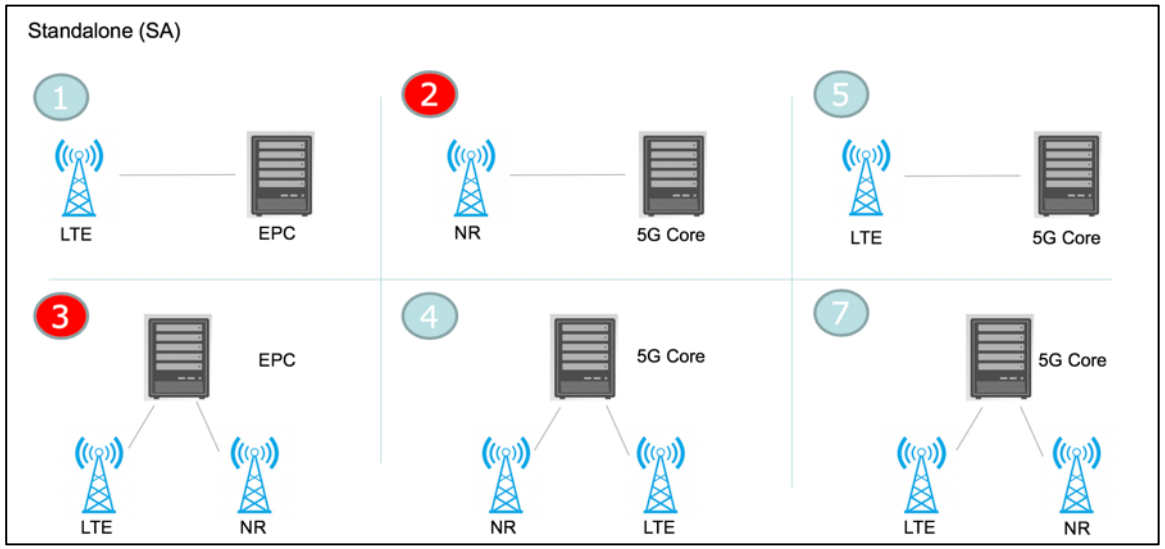
The above targets are based on the expected 3GPP readiness of radio related RF/RRM showing the earliest possible GCF introduction following the scheduled meeting pattern.

GCF investment in 3GPP test cases

- Availability of validated test cases for device certification is driven by the availability of test cases in TTCN
- 3GPP TTCN Development takes place in ETSI TF160
- GCF is working with 3GPP PCG and ETSI TF160 to ensure sufficient funding for 5G TTCN development
  - GCF covers funding of 4 man months of TTCN expert work in 2018
  - Plan is to cover further funding in 2019

Future challenges…

- Inclusion of other 5G options in GCF
  - Depending on market demand.
- Roaming / inter-option / inter-RAT support.
- Support of different options for voice services.

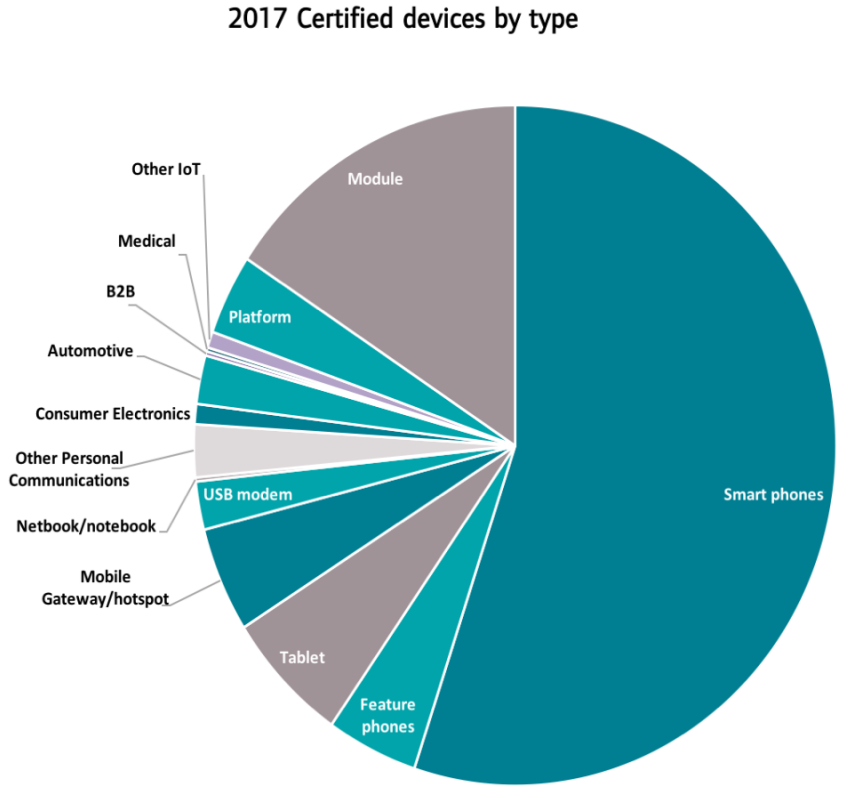


eSIM Certification

- eSIM enables users to securely download a SIM profile to their device.
- For consumer devices implementing GSMA's eSIM (RSP) specifications
  - SGP.21 / SGP.22.
  - SGP.23 (Test specification).
- Two paths to achieve RSP certification
  - Device Certification.
  - Standalone RSP Certification.
- Standalone RSP Certification is open to non-GCF members and is free of charge in 2018.

Expanding into IoT

- IoT is a key 5G use case.
- 25% of GCF Certified Products are for IoT.
- GCF Certification includes LTE-M and NB-IoT.
- For Automotive, GCF Certification includes V2V / V2X LTE features.
- GCF will offer certification for oneM2M from 2019.



LTE-M

Mobile market challenges…and GCF's response

- Competition
- Business beyond smartphones + content.
- It is essential that products and services work.

Mobile market challenges – what is GCF doing?

Change	GCF Response
Industry structure / new players	• New member categories. • Demonstrate direct benefit of GCF Certification to manufacturers. • Engage beyond device acceptance teams in operators. • Further expand geographic footprint.
Outsourced 3GPP development	• Platform / Module Certification. • Certification consultancy services (ACE/RTO).
Rise of IoT	• Ensure all major module/modem manufacturers are members. • Engage other industries and their suppliers to highlight GCF benefits.

Summary

- **5G is happening now with GCF Certification launching in Q1 to Q3 2019**
- **IoT is a key growth area for mobile and GCF is promoting the use of GCF Certification for IoT devices.**
- **GCF is evolving to address changes in the mobile / IoT market.**
- **GCF Certification adds value to 5G and IoT by**
  - **Ensuring proven device-network interoperability.**
  - **Reducing industry testing costs.**
  - **Accelerating time to market.**

Where to find us…

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Backup

oneM2M Application Layer Certification

- GCF is currently engaged in establishing a oneM2M certification program
  - Planned start is **Jan of 2019**
- Focus will be certifying the application and service layer functionality of oneM2M
- Target devices include:
  - Application entities (AE)
  - Common service entities (CSE)
- Products cover both application nodes, middle nodes, and infrastructure nodes covering both HW and SW components