ITU-T Workshop on
"Control plane of IMT-2020 and emerging networks. Current issues and the way forward"
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5G Network Control in ITU-T SG13: perspective and challenges

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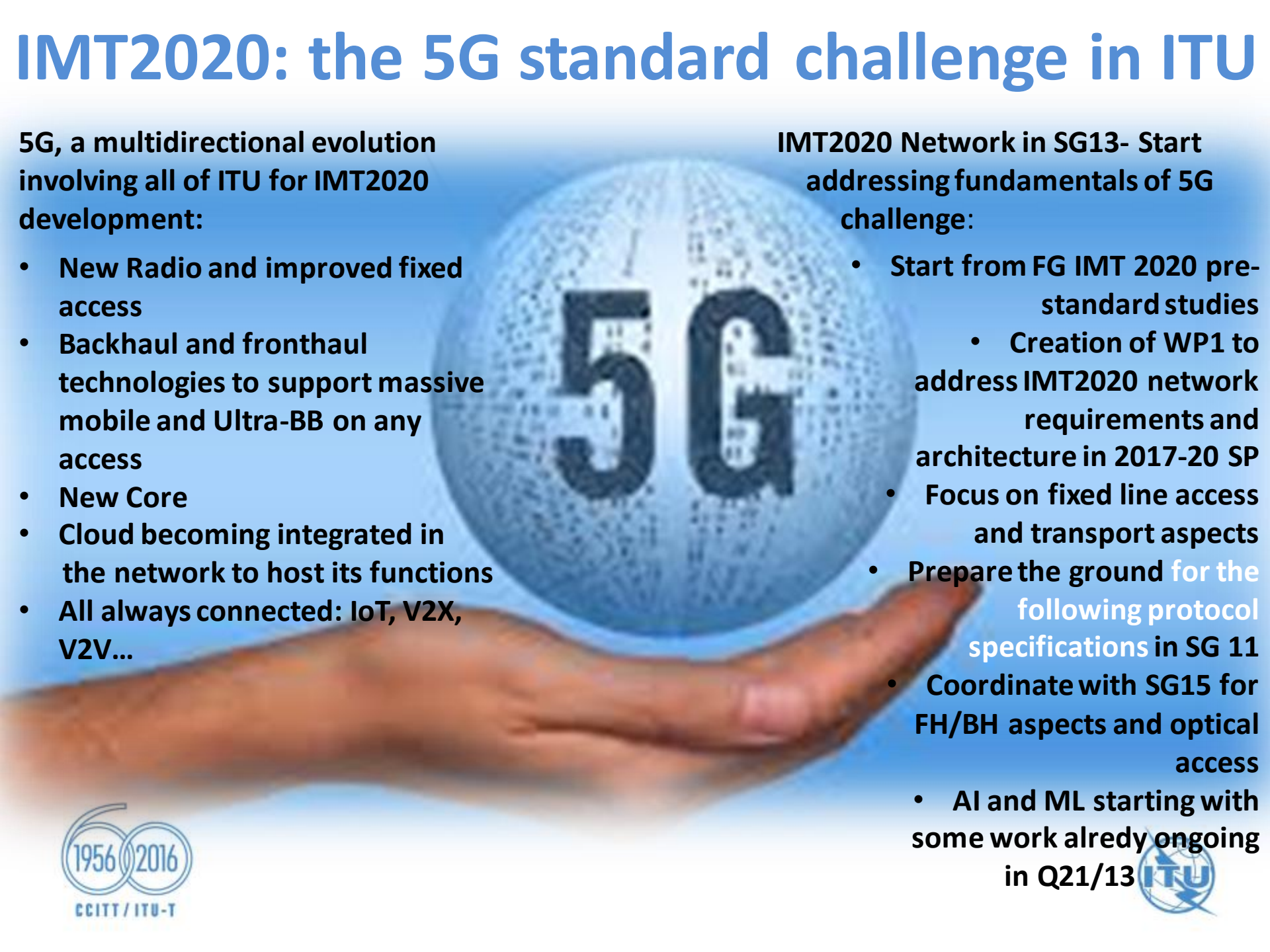
Content

- ITU-T/SG13 and 5G activities
- General context of IMT2020: std development and deployment
  - Focus on control protocol aspects
- IMT2020 control architecture and protocols development: SG13 perspective
- Conclusions

IMT2020: the 5G standard challenge in ITU

5G, a multidirectional evolution involving all of ITU for IMT2020 development:

- New Radio and improved fixed access
- Backhaul and fronthaul technologies to support massive mobile and Ultra-BB on any access
- New Core
- Cloud becoming integrated in the network to host its functions
- All always connected: IoT, V2X, V2V…



IMT2020 Network in SG13- Start addressing fundamentals of 5G challenge:

- Start from FG IMT 2020 pre-standard studies
- Creation of WP1 to address IMT2020 network requirements and architecture in 2017-20 SP
- Focus on fixed line access and transport aspects
- Prepare the ground for the following protocol specifications in SG 11
- Coordinate with SG15 for FH/BH aspects and optical access
- AI and ML starting with some work alredy ongoing in Q21/13

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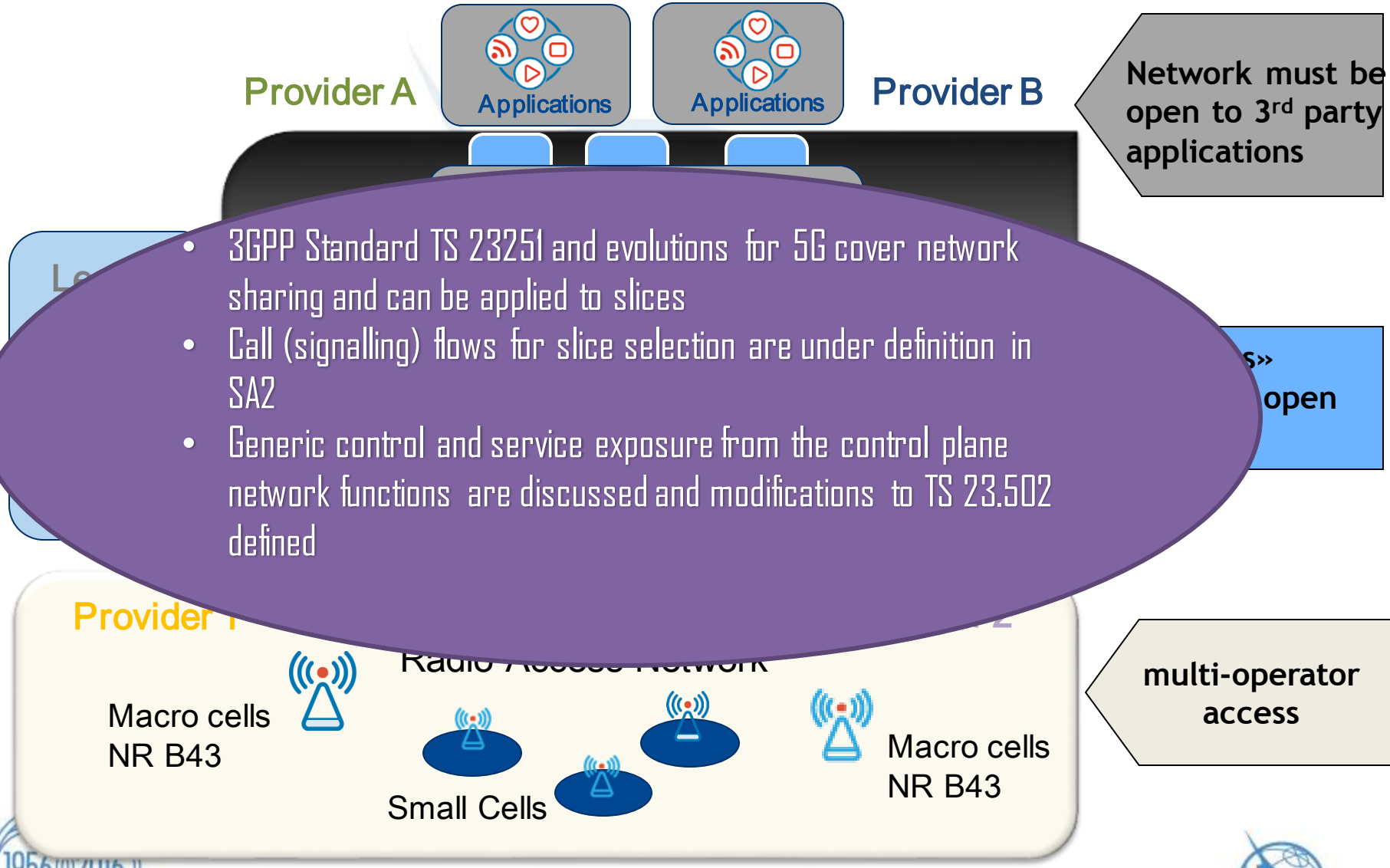
WP1/13 Structure

Who does what on IMT2020

Question	Title
Q6	Quality of service (QoS) aspects including IMT-2020 networks
	Continuation of Q.6/13 from the last study period
Q20	IMT-2020: Network requirements and functional architecture
	Transformation from Architecture WG of FG IMT-2020
Q21	Network softwarization including software-defined networking, network slicing and orchestration
	Continuation of Q. 14/13 and 12/13 from the last study period Transformation from Softwarization WG and Network Management WG of FG IMT-2020
Q22	Upcoming network technologies for IMT-2020 and Future Networks
	Continuation of Q. 13/13 and 15/13 from the last study period Transformation from ICN WG of FG IMT-2020
Q23	Fixed-Mobile Convergence including IMT-2020
	Continuation of Q. 4/13, 9/13 and 10/13 from the last study period Transformation from FMC WG of FG IMT-2020

Softwarisation and multi-slice network



Why 5G makes life more complicated for network control?

The most evident aspects impacting control emerging from WP1/13 work so far and from FG IMT-2020 before

The new vision of the network indicates we need to consider that :

In a virtualised scenario control becomes more complex

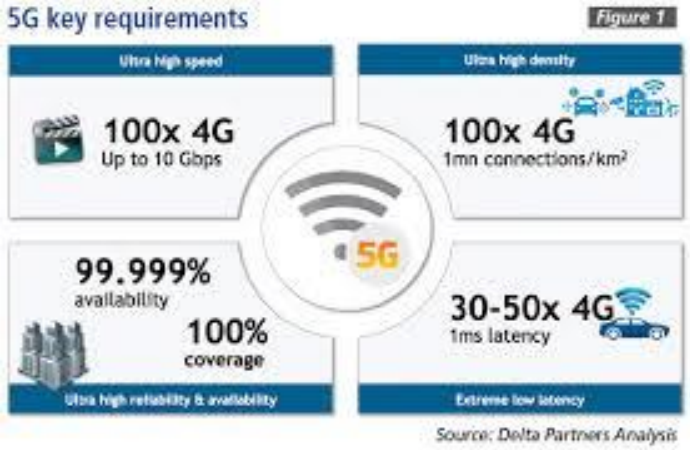
Definition of interfaces (and protocols)

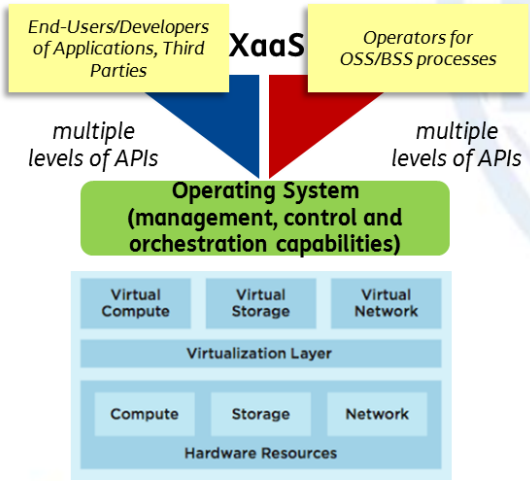
- between virtualised functions
- between VNFs, VIMs and orchestrators, and
- between orchestrators of different rank and in different domains

Multiple networks of heterogeneous nature need to communicate and to adapt to particular needs (dynamic configuration vs semi-permanent)

.....but not only:

- Extreme performance requirements impact not only on physical layer technologies as radio and fibre
- They put requirements on control and the way protocols support service implementation and delivery





- The extreme consequences of softwarisation will be a single 'Network OS':
  - integrating management, control and orchestration
  - generalised APIs allowing interaction at each vertical stage.
- Access to control functions could be extended to users
- The new control paradigm will need to face this innovation

Q6/13: QoS in 5G

- Not only high bandwidth and better terminals, QoS is tightly bond to control !
- Diferentiated QoS in 5G scenarios requires adaptive behaviour of the network

- Y.IMT-2020.qos-mon (IMT-2020 network QoS monitoring architectural framework)
- Y.qos-ml (Requirements of machine learning based QoS assurance for IMT-2020)

Q20/13 work and its impact on control

Expected for consent this meeting,
Requirements are the beginning
of everything...

As well as it is the establishing a common language :

Y.3100

“Terms and definitions for IMT-2020 network”

Q21: softwarisation

A true revolution in networks

Status of activities **before** this meeting

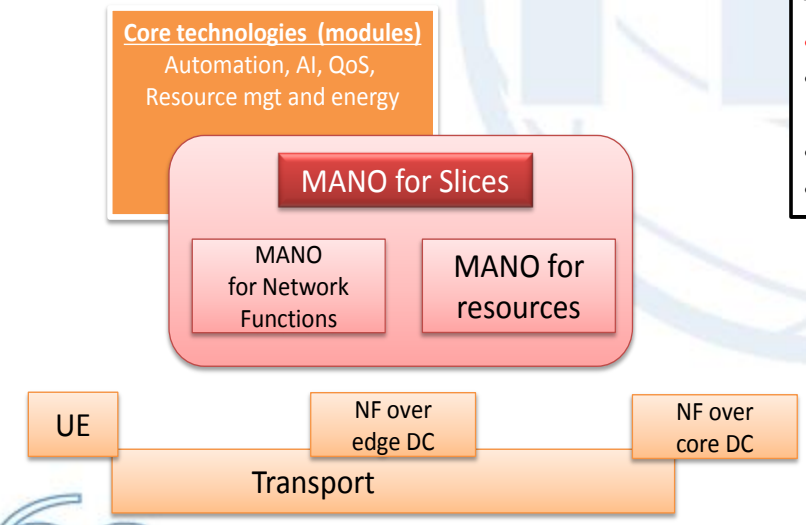
Work items (Recs and drafts) under Q21 and their target

Rec. Y.3110: MANO Reqts. (general, descriptive)

Rec. Y.3111: MANO Framework
- Two-tier model; LCM level and per-instance level
- Focusing on MANO for **slices**

Draft Y.IMT2020-Netsoft:
Title: High level technical characteristic of network softwarization
- Leading document in high level
- Slice and other netsoft technologies
- Vertical aspects: **top to bottom (e.g., slice, NF and resource)**
- Horizontal aspects: end-to-end

Draft Y.NSOM
Title: Mobile network slicing orchestration and management
- **Detailed** requirements (and behaviors)
- Focus on the **end to end** slice (RAN, CORE, TRANSPORT and DC), **guar antee of service quality** for slice customer, **automatic** processing, etc.
- With **assumptions** of **specific** networks
- Focusing on **mobile** networks, especially IMT-2020 network



Draft Y.3MO
Title: Requirements and Architectural Framework of 3MO for SDN
- SDN and **transport-oriented**
- multiple layers: packet layer and transport layer
- multiple domains: NWs for cloud, access, and core domains
- multiple technologies: wireless & wireline access, x-haul, mobile/fixed core technologies

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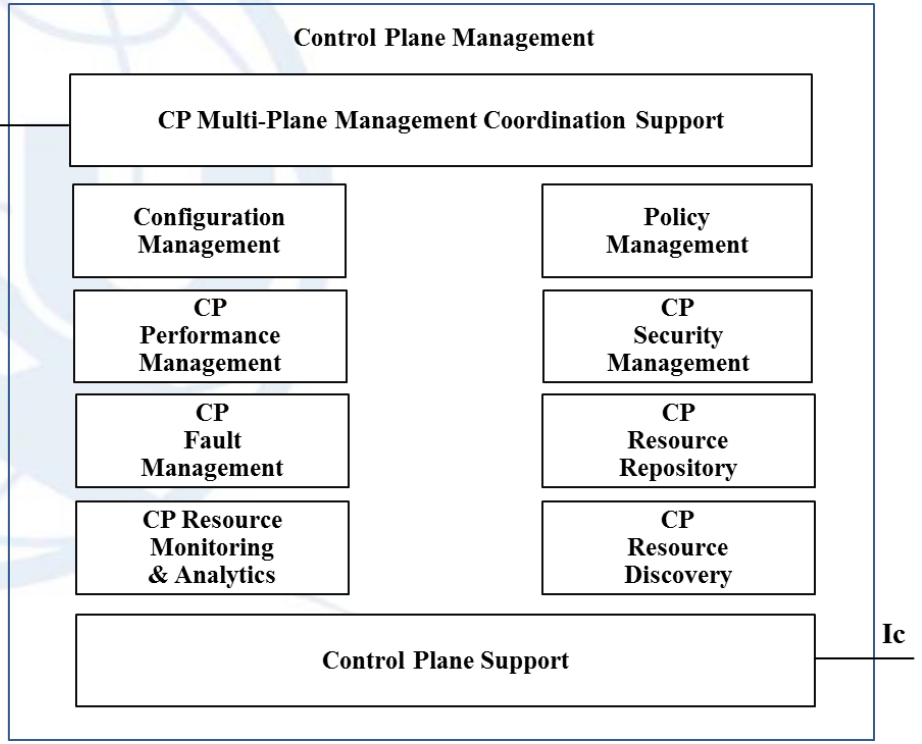
Q21/13 recommendations with relevant impact on control

- Y.3110 Management and Orchestration Requirements - ten requirements addressing control
- Y.3111 - IMT-2020 Network Management and Orchestration Framework: the whole document is relevant for control aspects

Before the ongoing meeting



Q22/13 new networking technologies: Network Control revolution?

New WI proposal on requirements on ICN message content and ICN naming for edge computing and service chaining

New WI proposal and draft recommendation on a framework for directory service

- to satisfy ultra-low latency requirements

Eg **Gap 3** in Supplement (from FG IMT2020 work):

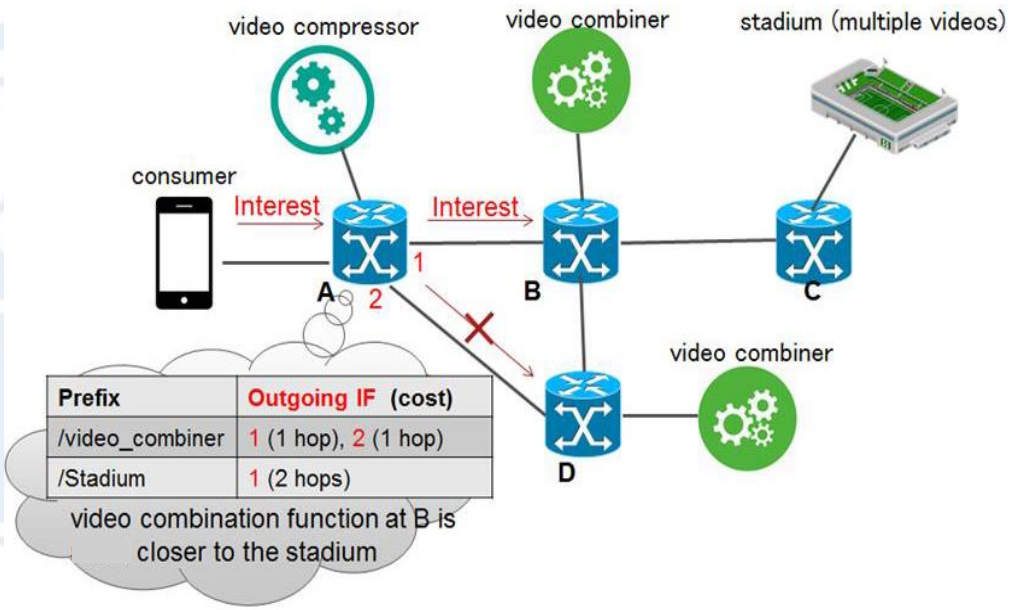
- ICN – It is necessary to modify and develop Mobility anchoring (ICN aware S-GW), call flows for ICN based device attachment, authentication and registration with content providers. Different approaches to be considered
  - Similar to current single anchor like S-GW and P-GW
  - Using the closest ICN router(s) as a single anchor
  - Distributing anchors among points of attachment

  →for ICN, multiple simultaneous gateways would be required

Some examples from FG IMT2020 demos on ICN developments

e.g.

- Wireless Loss Detection and Recovery (WLDR):
  - ICN application from Demos last year
  - Signalling on eNodeB to manage media flow

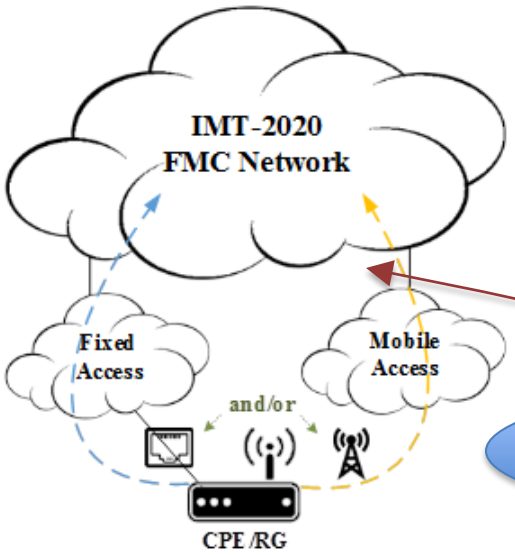


- In-Network caching for content in ICN neworks:
  - Signalling is used to discover the nearest copy of the content
  - Signalling is used to redirect traffic towards the most convenient cash

Q23 cloud solutions for FMC

New WI proposals
Y.FMC-SS (service scheduling for supporting FMC in IMT-2020 network)

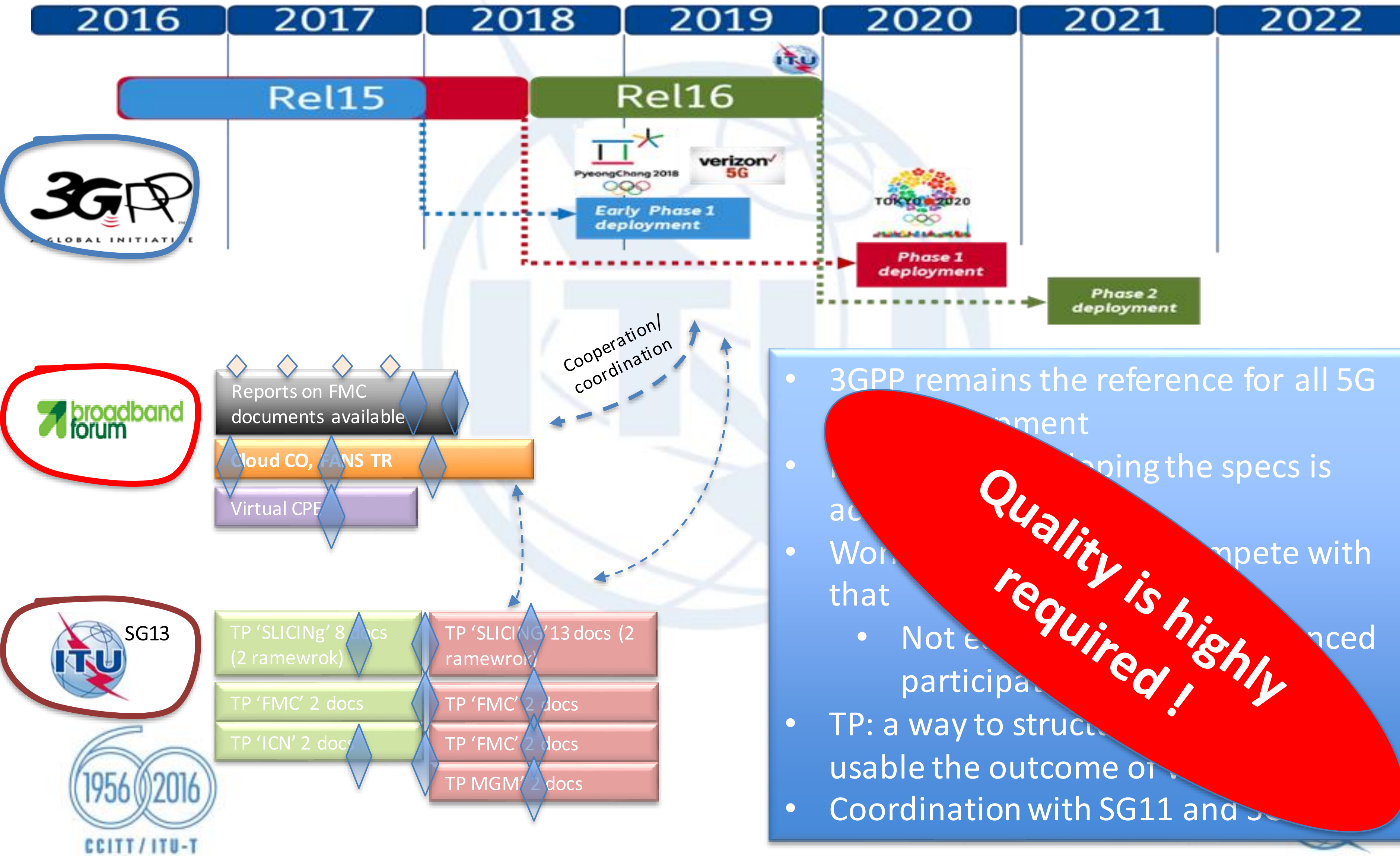
Y.FMC-CE (capability exposure enhancement for supporting FMC in IMT-2020 network)



Y.FMC-ARCH	Q23/13	Functional architecture for supporting fixed mobile convergence in IMT-2020 networks	2018-04
Y.FMC-MM	Q23/13	Mobility management for fixed mobile convergence in IMT-2020 networks	2018-10
Y.FMC-REQ	Q23/13	Requirements of IMT-2020 fixed- mobile convergence	2017-11
Y.FMC-ReqMO	Q23/13	IMT-2020 FMC functional requirements for management and orchestration	2018-10
Y.MM-RN	Q23/13	Mobility management framework over reconfigurable networks	2017-11

We would like to have this, not that!

One concern: TIME!!!



- 3GPP remains the reference for all 5G ... ment
- ... ping the specs is ac...
- Wor... mpete with that
  - Not e... nced participa...
- TP: a way to struct... usable the outcome of ...
- Coordination with SG11 and S...

Quality is highly required !

Conclusions

- IMT 2020 standard… …been in SG13 (and ITU-T in general) focu… …years
- The first doc… …nd architecture for IMT202… …nd SG13 Technical …
- From the… …ig effort on protocols… …rtant involmen…
- Collaborati… …t SGs is essential
- In 5G standardis… …P is the reference group, need to align to its pace to play a role !

YES, WE COULD ALWAYS DECIDE TO GO FASTER!!!!

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Thank you!

QUESTIONS?