ITU-T Workshop on "Control plane of IMT-2020 and emerging networks. Current issues and the way forward"
Geneva, Switzerland, 15 November 2017

5G Network Control in ITU-T SG13: perspective and challenges
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SG13/WP1 Co-Chairman
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 already ongoing in Q21/13
## WP1/13 Structure

**Who does what on IMT2020**

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

- 3GPP Standard TS 23251 and evolutions for 5G cover network sharing and can be applied to slices
- Call (signalling) flows for slice selection are under definition in SA2
- Generic control and service exposure from the control plane network functions are discussed and modifications to TS 23.502 defined

Network must be open to 3rd party applications

multi-operator access
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!
- Differentiated QoS in 5G scenarios requires adaptive behaviour of the network

- 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 Reqs.
(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), guarantee 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

Core technologies (modules)
Automation, AI, QoS, Resource mgt and energy

Transport

MANO for Slices

MANO for Network Functions

MANO for resources

NF over edge DC

NF over core DC

UE
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
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

- 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 networks:
  - Signalling is used to discover the nearest copy of the content
  - Signalling is used to redirect traffic towards the most convenient cache
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)

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<tr>
<th>WI Code</th>
<th>Q23/13</th>
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<tr>
<td>Y.FMC-ARCH</td>
<td>Q23/13</td>
<td>Functional architecture for supporting fixed mobile convergence in IMT-2020 networks</td>
<td>2018-04</td>
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<tr>
<td>Y.FMC-MM</td>
<td>Q23/13</td>
<td>Mobility management for fixed mobile convergence in IMT-2020 networks</td>
<td>2018-10</td>
</tr>
<tr>
<td>Y.FMC-REQ</td>
<td>Q23/13</td>
<td>Requirements of IMT-2020 fixed-mobile convergence</td>
<td>2017-11</td>
</tr>
<tr>
<td>Y.FMC-ReqMO</td>
<td>Q23/13</td>
<td>IMT-2020 FMC functional requirements for management and orchestration</td>
<td>2018-10</td>
</tr>
<tr>
<td>Y.MM-RN</td>
<td>Q23/13</td>
<td>Mobility management framework over reconfigurable networks</td>
<td>2017-11</td>
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We would like to have this, not that!
One concern: TIME!!!

- 3GPP remains the reference for all 5G development
- Progress in developing the specs is accelerating
- Work in ITU-T needs to compete with that
- Not easy with highly unbalanced participation
- TP: a way to structure and make more usable the outcome of WP1 work
- Coordination with SG11 and SG15

Quality is highly required!
Conclusions

• IMT 2020 standards have now been in SG13 (and ITU-T in general) focus for more than two years.

• The first documents on requirements and architecture for IMT2020 have now been published and SG13 Technical Packages are progressing well.

• From these first documents, a big effort on protocols is evident, with important involvement of SG11 and other SGs.

• Collaboration and sync between different SGs is essential.

• In 5G standardisation, 3GPP is the reference group, need to align to its pace to play a role!!!
Thank you!

QUESTIONS?