WWRF: From 5G Huddle Events to ITU Evaluation Group

Presented by Dr Vinod KUMAR 18th July, 2018 ITU Geneva

Major Contributions from Dr Angeliki Alexiou (University of Piraeus, Greece) and Dr Nigel Jefferies (Huawei, UK) are acknowledged

WWRF

- Founded in 2001
- Formed from EUfunded Wireless
 Strategic Initiative
- Founder members: Nokia, Ericsson, Motorola, Alcatel, Siemens

- Now more global
- Huawei, Nokia, Intel, China
 Mobile are leading
 influences on Steering
 Board
- Many leading universities participate
- Two Forum meetings per year
- 5G Huddle event
- Publications, workshops, etc.



WWRF and ITU

- Liaison with WP5D of ITU
- Presentations to various ITU Workshops
 - A New Generation of e-Health Systems
 - 5G : on the count of three..... paradigm shifts
 - Future of IMT Systems: Wireless World Vision 2020
- ITU-R WP5D, #13 meeting, Workshop on "Research views on IMT Technology Evolution", Geneva, Switzerland, July 2012
- ITU_R WP5A "Requirements and Technologies for The Next Generation of Mobile Communications", Geneva, Switzerland, in May 2013
- ITU-R WP5D, #18 meeting, Workshop on Research Views on IMT Beyond 2020, Ho Chi Minh City, Vietnam, February 2014
- Participating in ITU IMT-2020 Evaluation Process



Most Recent Events 5G Huddle and WWRF 40

- Events held in Durban, South Africa, May 29th to 1st June, 2018
 - WWRF First Venture in Africa
 - Interested Countries:
 - Kenya, Tanzania, Burkina Faso, Zimbabwe
 - WWRF Members:
 - CSIR Meraka Institute
 - The Independent Communications Authority of South Africa (ICASA), South Africa



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Keynote Speakers and Focus of 5G Huddle, South Africa

- Continuing the path to an 'all inclusive' 5G infrastructure
- Preparing for the reality of 5G how ready are regions around the world to start reaping the rewards of 5G?
- Spectrum strategies to meet connectivity needs for ALL 5G Use cases
- The 5G journey in Africa Challenges and Opportunities
- 5G in action: implementation and trials across vertical markets
- Real-world implementation of 5G building the business case through trials and pilots
- Achieving the benefits of 5G in both cities and rural areas

 plans and strategies
- 5G in the health sector transforming health care and wellbeing
- *5G and Smart Water Management
- The role of 5G in delivering a smarter energy and utilities sector
- E-Government The role of 5G in enhancing citizen engagement, efficiency, transparency and accountability







IMT 2020 Evaluation Group WWRF Vision and Differentiators

- Objective> Focus on Perform advanced technologies evaluation studies based on realistic channel and system modelling assumptions
- Leveraging> previous 3G and 4G expertise of members, academic excellence and industrial experience, a global technology perspective and a strategic insight on all factors of the wireless evolution technology chain



WWRF IMT 2020 Evaluation Group Target Scenarios and Critical Requirements (1)

Usage scenarios of IMT for 2020 and beyond

Enhanced mobile broadband



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WWRF IMT 2020 Evaluation Group Target Scenarios and Critical Requirements (2)





eMBB

Capacity scaling

- massive infrastructure deployment density over large geographical areas that is technologically and financially feasible
- new niche and business opportunities
- introduction of new value chain actors.

Crowded Local Access

 massive data local access for dynamic crowds addressed through the interplay of technological and architectural innovations.



WWRF IMT 2020 Evaluation Group Target Scenarios and Critical Requirements (3)



Massively Available Connectivity

5G will accommodate for bursty IoT communications by providing the necessary infrastructure and operations to handle the vastly diversified QoS requirements.

Source: Business Korea, "SK Telecom Develops World's First Global Standard IoT Platform", J.H. Park, Dec 2014



Reliability and Latency or 5G as the 'network of control'

 The realization of Tactile Internet or the Network of Control will open up an "unforeseeable plurality of new applications, products, and services".⁽¹⁾

> (1) Gerhard P. Fettweis, "The Tactile Internet – Applications & Challenges", IEEE Veicular Technology Magazine, Vol. 9, No. 1, pp. 64 – 70, March 2014

WWRF IMT 2020 Evaluation Group Candidate Technologies and Evaluation Methodology (1)

• Large/Massive/Network-MIMO:



(Image Credits : Linkoping Univ, Emil Bjornson)

 Ultra Dense Networks ('Cell-less' wireless)





[A. G. Gotsis, S. Stefanatos, and A. Alexiou, "Optimal User Association for Massive MIMO Empowered Ultra-Dense Wireless Networks," IEEE ICC 2015 -Workshop on Advanced PHY and MAC Techniques for Super Dense Wireless Networks (ICC'15 - Workshops 13), Jun. 2015, London UK]



WWRF IMT 2020 Evaluation Group Candidate Technologies and Evaluation Methodology (2)

 D2D: exploiting intelligence at the edge of the network with Device-to-Device (D2D) connectivity and/or smart caching at the mobile side may offer an excellent network load balancing opportunity.



• **M2M** supporting a massive number of lowrate devices in the future IoT, in a plethora of diverse scenarios, and very-low-latency data transfers.





[5. Stefanatos, A. G. Gotsis, and A. Alexiou, "Operational Region of D2D Communications for Enhancing Cellular Network Performance," IEEE Transactions on Wireless Communications, 2015, to appear (available on arXiv)]



WWRF IMT 2020 Evaluation Group Technical Approach

- **Modelling**: Classification of 5G resources, propagation and channel modelling, node topology (geometry, density, ..)
- Theoretical Tools to formulate and analyze problems: Stochastic geometry, Information theory, Mathematical Programming
- Management models & algorithms: Understanding the fundamental performance levels. Centralized & Distributed approaches for dynamically assigning resources and assessing performance (be means of system level simulations)



WWRF IMT 2020 Evaluation Group Membership and Expertise

- Members > spanning all stakeholders, bringing in a global perspective, and connecting with all 5G regional initiatives, namely
 - industry (Huawei, Intel, ..),
 - operators (China Mobile, ..),
 - academic research (Carleton University, Canada; CTTC Barcelona; Univ. of Piraeus, Greece; CSIR (South Africa),
 - Europe, North America, Asia, Africa
 - 5GPPP, 5G Forum, 5GMF, ..
- Expertise/experience> advanced technologies research and assessment, ITU-R WP5D procedures, system modelling and requirements specifications, large scale system level evaluations



Concluding Remarks

• WWRF & ITU

- An international "networking platform" between industry and academia
- Long experience in collaboration with research, regulatory and vision developers across continents
- Regular and active collaboration with ITU contributions made to several WP 5D and WP 5A events
- Active in 5G space from 2012 onwards through WWRF meetings, international workshops and 5G Huddle events around the globe
- Academic and industry members (of WWRF) actively working in setting-up an ITU Evaluation Group
 - Performance evaluation of PHY and MAC through simulations is aimed at.

