NEXT GENERATION WIRELESS FOR A COGNITIVE & ENERGY-EFFICIENT FUTURE

Presented by Dr Nigel Jefferies
WWRF’s role and mode of operation

- Develop future vision of the wireless world
- Inform and educate on trends and developments
- Enable and facilitate the translation of the vision into reality
- Bring a wide range of parties together to identify and overcome significant roadblocks to the vision

- Global
- Open to all
- Not
  - standards body
  - research funding body
  - A typical research conference
- Based on membership
- All can attend meetings and make contributions
Current Working Groups

A User Needs & Requirements in a Secure Environment in different Socio-Economic settings

B Services, devices and service architectures

C Communication architectures and technologies

D Radio Communication Technologies
Next-generation wireless at WWRF

- Updated WWRF charter to include next-generation 5G research challenges
- 5G workshops in major regions
  - Americas – IEEE VTC, Quebec, July 2012
  - Europe – WWRF29, Berlin, October 2012
  - Asia – GISFI, Pune, March 2013
  - Africa – Applications of Mobile Communications in Africa, Accra, May 2013
- Publications
  - White paper on workshop outcomes
  - Further white papers on 5G technologies and network architectures
- Links with regional activities in China, Korea, Japan and Europe
WWRF Vision in a nutshell

- 7 trillion wireless devices
- serving 7 billion people

» All people will be served with wireless devices
» Affordable to purchase and operate
» Calm computing: technology invisible to users
» Machine to machine communications
» All devices are part of the (mobile) internet
Radio Communications in 2020s become pervasive

Pervasive Communication Systems
- very large number of devices
- often small size and/or embedded in the environment

These devices
- interact with each other and with mobile users
  - *dynamically form networks*
  - *probe the environment* to *adapt and optimize*, in a context-aware fashion, network performance, user experience and QoS
Wireless connectivity beyond IoT - “Thingbook”

Traffic Control

Smart Grid

Logistics

Automotive & Secure Mobility

Healthcare: Mobile Monitoring

Networking Objects / Things 2.0
Technology trend - the Internet of Things or the hidden technology – creating a new dimension
System concept evolution trend No. 1

Cell-less architecture

Distributed-Input-Distributed-Output (DIDO) wireless technology allows each user to use the full data rate of shared spectrum simultaneously with all other users, by eliminating interference.

System concept evolution trend No. 2
M2M over wireless infrastructure

Capillary parts of the network collect data and aggregate info through the gateways towards the wireless infrastructure

[source: ICT-EXALTED fp7 project, 2011]
System concept evolution trend No. 3

RAN Virtualization

All baseband functions/intelligence is moved to the virtual substrate (cloud), making use of shared virtual resources.
New technology challenges.. may require a little revolutionary radio-communications thinking

New technology challenges:
• Manage huge number of nodes: interference management, resources allocation, aggregation
• Latency, tactile response time and large dynamic range of delay constraints
• Energy efficiency, often too stringent constraints
• Backhaul and over the air signaling design

..may require a whole new approach to:
• physical layer, air interface and spectrum usage
• resources management
• optimization
Potential ways forward

• Ultra dense user-centric deployments: new cell-less system concept
• DIDO: the new PHY
• Scheduled+random: the new Multiple Access scheme
• Universal Resources Management: the new MAC
• Cloud empowered centralization: new virtualized RAN
• Large & complex systems optimization: new radio engineering approach

Synergy of research and business units should be sought
Addressing of business aspects and related scenarios and use cases
Decrease in the temporal distance between research and products and shorter time-to-market

Design – Specifications – Development – Prototyping of appropriate functionality
Validation – Proof of Concept – Experiments – Pilots – Trials
Standards
Next WWRF Meetings

WWRF32  Marrakech, Morocco
20-22 May 2014
Hosted by Kings College London

WWRF33  Guildford, UK
23-25 September 2014
Hosted by University of Surrey