Shaping the Global Wireless Future

- Influencing decision makers’ views of the Wireless World
- Enabling powerful R&D collaborations
- Advancing wireless frontiers to serve our customers
Outline

- WWRF objectives and workplan
- WWRF membership and structure
- WWRF vision and approach
- Conclusions
WWRF - Objectives and scope

- **Major objectives**
  - develop a consistent vision of the future Wireless World
  - generate, identify, and promote research and trends
  - identify and assess the potential of new technologies and trends
  - contribute to the definition of research programs
  - ease future standardization by harmonizing and disseminating views

- **Scope**
  - concentrate on the definition of research items
  - open to all actors
Motivators to join WWRF

- Influence
- Understand
- Get consensus prior to standardization
- Open exchange of ideas
- Reduce risk for investment in research
- Networking
- Facilitate funding
- Publications
Deliverables

- Input: Contributions to meetings and working groups

- Output deliverables:
  - White Papers on different topics
  - Book of Visions, new edition submitted for publication
  - IEEE Communication Magazine theme issue
  - Book publications together with e.g. IEEE Press
Global context towards the Wireless World

**WWRF Milestones & Activities**

- **2001**
  - Preparation of the Book of Visions 2001
- **2002**
  - Set of initial white papers and work on reference models
- **2003**
  - Next Book of Visions ready for publication with current versions of the Vision, White Papers, and Reference Model
- **2004**
  - High level view for future services and applications
- **2005**
  - First Book of Visions published
- **2006**
  - Defined concept for future services and applications
- **2007**
  - System concept with high-level architecture
- **2008**
  - Consensus document defining the concept for future Wireless World
- **2009**
  - Review of the Wireless World
- **2010**
  - Vision for 2020

**ITU-R**

Global Research activities towards a Wireless World

- WWRF Milestones & Activities
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**Close interworking with other organisations**

- High level requirements for the Wireless World
  - Prototypes / Concept Integration
  - Close interworking with other organisations

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**WRC03**

- Spectrum Estimation
- Identification
- Specifications referenced

**WRC07**

- Requirements & Radio Framework

**Framework**

- Services View / Market Analysis

**Research towards WW started**

- International Research Programs

**Close interworking with other organisations**

- High level requirements for the Wireless World

= Milestone

- Prototypes / Concept Integration

- Close interworking with other organisations
WWRF meeting schedule for 2004

**WWRF 8th bis Meeting**  February 26-27  
Beijing, China  
MOST/HTRDC  
Future project  

300+ participants, key people from China and rest of the world

**WWRF 11th Meeting**  June 10-11  
Oslo, Norway  
Telenor Research  

theme: services and applications roadmaps in different areas, like automotive

**WWRF 12th Meeting**  November 4-5  
Toronto, Canada  
Bell Canada,  
Nortel Networks  

theme: convergence of digital industries

See most recent info on WWRF web site
International relations

- Formal liaison agreements with
  - UMTS Forum, signed on January 30, 2003
  - mITF, Japan, signed on May 30, 2003
  - IEEE ComSoc, signed October 29, 2003

- Many informal relationships with several organisations at the overall and working group levels
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WWRF membership

More than 150 members

- They belong to the
  - manufacturer domain
  - network operator domain
  - R&D centers
  - academic domain
  - one regulator

- They come from the four continents
  - America
  - Asia
  - Australia
  - Europe
## Sponsor members

- Alcatel
- Bell Canada
- Ericsson
- EURESCOM
- France Telecom
- IBM
- Intel
- LGE
- Lucent
- Motorola
- NEC
- Nokia
- Nortel
- Philips
- Raytheon
- Samsung
- Siemens
- Sony
- Vodafone
WWRF executives

- Chair: Mikko A. Uusitalo, Nokia, Finland
- Vice Chair Americas: Miguel Pellon, Motorola, US
- Vice Chair Asia: Young Kyun Kim, Samsung, Korea
- Vice Chair Europe: Brigitte Cardinael, France Telecom, France
- Treasurer: Fiona Williams, Ericsson, Germany
Working Group and SIG Chairs

- WG1: Angela Sasse, University College London, UK
- WG2: Stefan Arbanowski, Fraunhofer Fokus, Germany
- WG3: Petri Mähönen, RWTH Aachen, Germany
- WG4: David Falconer, Carleton University, Canada
- WG5: Gerhard Fettweis, University of Dresden, Germany
- WG6: Panagiotis Demestichas, University of Piraeus, Greece

- SIG1: Pekka Ojanen, Nokia, Finland
- SIG2: Nigel Jefferies, Vodafone, UK
- SIG3: Amardeo Sarma, NEC, Germany
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The major trends at a glance

- **Advance of the Internet**
  The Internet has become a mass medium and IP the leading network protocol.

- **Advance of mobile communication**
  Communication via mobile radio networks is still increasing enormously.

- **Bandwidth evolution**
  The available bandwidth is exploding and the prices for bandwidth decrease dramatically.

- **Convergence of digital industries**
  The converging digital industry brings together parts of the consumer electronics, communication, information technology, media and entertainment industries.

- **Advance of e-commerce**
  E-commerce changes and amends business processes tremendously.

- **Deregulation and globalization**
  The I&C markets move fast.
  Competition and differentiation are driven by deregulation and globalization.

- **Services and applications are key**
  The end user is interested in services and applications only, the underlying technology is not relevant to her or him.

- **Reduced cost/bit**
Cycles of innovation

- **Shorter cycles – up to ~1 a year**
  - Dynamic evolution of services
  - Regular updates of targets required

- **Short cycles – up to ~2 years**
  - Moore’s Law, Hardware changes, new peripherals and innovative form factors

- **Medium cycles – ~7 years**
  - for IP based functions (e.g. for mobility)
  - Introduction of IPv6 will last longer

- **Long cycles – up to ~ a decade**
  - Investigation and test of new radio technology
  - Regulation and allocation of spectrum
  - Development of new generation radio products
MultiSphere Level Concept
Future Wireless World will cover different communication relations

① The PAN
② The Immediate Environment
③ Instant Partners
④ Radio Accesses
⑤ Interconnectivity
⑥ CyberWorld

Source: IST WSI Project
Key principles for WWRF vision

- **Users** are in control through intuitive interactions with applications, services and devices
- Services and applications are **personalized, ambient-aware, and adaptive** (I-centric) - ubiquitous from the point of view of the user
- **Seamless services to users, groups** of users, communities and **machines** (autonomously communicating devices) irrespective of place and network and with agreed quality of service
- Users, application developers, service and content providers, network operators and manufacturers can **create efficiently and flexibly new services and business models** based on the component-based open architecture of the wireless world
Some challenges for the future wireless world 1/2

Starting point in addition to the key principles of vision: Humans

- Interest in sematics
- Need to control and communicate as a prolongation of their human senses

This leads to the following challenges:

I-, user- and group-centric challenges

- Exceed user expectations in terms of simplicity and functionality
- Enhance user experience through effortless, intuitive communication and information browsing and retrieval applications, featuring:
  - Natural interfaces, using all appropriate senses
  - Intelligence, context awareness and adaptiveness
  - High degree of personalization
- Manage conflict between diversity (of needs) and simplicity (of appropriation)
- Experienced added value exceeds cost

Device-centric challenges

- Creation and trial of many innovative devices (communicating objects)
- Autonomously communicating devices
- Nuts and bolts: weight, size, battery life, displays and audio quality....
Some challenges for the future wireless world 2/2

Service-centric challenges
- Seamless services irrespective of place and network and with agreed quality of service
- Support innovative applications (e.g., mobile multimedia, communicating objects)
- Efficient and flexible service and business model creation -> component-based open architecture and platform, generic service elements

System-centric challenges
- Independent evolution of different layers, e.g., services and networks
- E2E security, scalability, reconfigurability and manageability
- Requirements from convergence of digital industries
- IPv6 and beyond

Access Network-centric challenges
- Transparent, seamless and secure access across any access networks (short or long range, relayed, multiple hops, ad hoc)
- Connect a trillion devices, including machine-to-machine and sensor networks
- More efficient air interfaces and spectrum use, much higher bit rates, ubiquitous coverage
- All-IP architecture and beyond
- Flexibility, cognitive radio, self-managed systems
Current White Papers

- WG1
  - Scenarios and Analysis
  - Reference Model
  - UI technologies and Techniques
  - UCD process
  - Future Services

- WG2
  - Terminology (basic terms for WG2)
  - Business Model
  - Personalization
  - Ambient Awareness
  - Adaptability
  - Generic Service Elements
  - Enabling Technologies
  - Service Architecture

- WG3
  - Vision and Roadmap (cooperative networks)
  - Research Challenges and Priorities
  - Architectural Principles
  - Network Component Technologies for Cooperative Networks
  - Ad Hoc Networking

- SIG1
  - Spectrum for Future Mobile & Wireless Communications

- WG4
  - New Air Interface Techs: Requirements and Tech
  - Broadband Frequency Domain Based Air Interface
  - Relay-based Deployment Concepts
  - Smart Antennas
  - Channel Measurement and Modelling

- WG5
  - Short Range Communications
  - Optical Communications
  - Ultra Wideband
  - MIMO-OFDM TDD PHY
  - WBAN/WSN
  - High Throughput
  - Implementation

- WG6 (R = reconfigurability)
  - Scenarios, requirements and roadmaps for R
  - Network architectures and support services for R
  - Cognitive radio, spectrum and RRM in R context
  - Element management, flexible air-interfaces, SDR

- SIG3
  - Self-Organization Overview
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Conclusions on WWRF

- Global platform to initiate global cooperation towards future wireless world
- Vision from user perspective → requirements for the enabling technologies
- Unique way of active cooperation within and between industry and academia
- Reduce risk for investment in research
- Ease future standardization by globally harmonizing views
- Proven history of creating large scale research cooperation and facilitating funding
- Open to all actors

www.wireless-world-research.org