Wireless World Initiative New Radio

WINNER
Outline

- Motivation and vision
- Project phases
- Project goals
- Project structure
- Potential areas of cooperation
Vision of wireless communications beyond 3G
Seamless network of complementary access systems


WWI – WINNER (Wireless World Initiative New Radio)
Layered system structure beyond third generation

- **Distribution Layer**
  - full coverage
  - global access
  - full mobility
  - not necessarily individual links

- **Cellular Layer**
  - full coverage and "hot spots"
  - global roaming
  - full mobility
  - individual links

- **Hot Spot" Layer**
  - local coverage
  - "hot spots"
  - global roaming
  - local mobility
  - individual links

- **Personal Network Layer**
  - short range communication
  - global roaming
  - individual links

- **Fixed (Wired) Layer**
  - personal mobility
  - global access

**Possible return channels**
- horizontal: handover within a system
- vertical: handover between systems

Illustration of capabilities of IMT-2000 and systems beyond IMT-2000

Systems beyond IMT-2000 will encompass the capabilities of previous systems.

- Dark shading indicates existing capabilities, medium shading indicates enhancements to IMT-2000, and the lighter shading indicates new capabilities of systems beyond IMT-2000.

- Dashed line indicates that the exact data rates associated with systems beyond IMT-2000 are not yet determined.

- The degree of mobility as used in this figure is described as follows: Low mobility covers pedestrian speed, and high mobility covers high speed on highways or fast trains (60 km/h to ~250 km/h, or more).

Phases and expected timelines for future development of 3G and beyond

- Approval at ITU-R Radio Assembly, Geneva, June 2 to 6, 2003

The sloped dotted lines indicate that the exact starting point of the particular subject can not yet be fixed.

\(\triangle\) : Expected spectrum identification at WRC07

\(\dagger\) : possible wide deployment around the year 2015 in some countries

Scenarios

Wide Area

Short Range

1Gbps

1-10Mbps

>100km/h, 100Mbps

>1km

<1km

<50km/h

<100m

<5km/h

100Mbps

1-10Mbps

100Mbps

>100km/h, 1000Mbps

>1km

<1km

<50km/h

<100m

<5km/h

WWI – WINNER (Wireless World Initiative New Radio)
Vision: A ubiquitous radio system concept

- Covering the full range of scenarios from short-range to wide-area

- Provides a significant improvement compared to current systems in terms of performance, efficiency, coverage flexibility

- Is based on a common radio interface technology that will adapt to user needs and scenarios by utilising advanced and flexible network topologies, physical layer technologies, frequency sharing methods

- Will make efficient use of the radio spectrum to minimise the cost-per-bit by combining the technologies researched in an efficient way

- Can be realised through cost competitive infrastructure and terminals
Project phases I

- **Phase I**  Requirements analysis, technology analysis and assessment, system concept design
- **Phase II**  Detailed system design and validation by modelling
- **Phase III**  System refinement, realisation of key components and validation of the system concept in key trials
## Project phases II

### Month 1
- Scenario Analysis
- Requirements Capture
- Definition of Assessment Criteria
- Identification of Key Technologies
- Technology Design and Evaluation
- Definition of Ubiquitous System Concept
- Performance Estimation
- Complexity Estimation
- Input Regulation
- Training Activities

### Month 24
- Detailed Definition of Ubiquitous System Concept
- Evaluation of Newly Developed Technologies
- Detailed System Design
- Detailed Performance & Complexity Estimate
- Validation via Modelling
- Contributions to Standardisation & Regulation
- Preparation of Trials
- Training Activities

### Month 48
- Investigation of Implementation Related Issues
- Hardware Validation
- Trials
- Refinement and Optimisation of the Ubiquitous Radio System Concept, Including Feedback from Trials
- Continuous Contributions to Standardisation & Regulation towards a Global Standard
- Training Activities

### Month 72
- Training Activities
Project phases III
Activity and component level

Month 1
- Phase I
  - Supporting Component
    - Scenarios
    - Channel Modelling
    - Spectrum and Coexistence
  - Technology Component
    - Radio Interface
    - Radio Network Deployment Concepts
    - Radio Network Cooperation
  - Integrative Component
    - System Engineering

Month 24
- Phase II
  - Supporting Component
    - Scenarios
    - Channel Modelling
    - Spectrum and Coexistence
  - Technology Component
    - Radio Interface
    - Radio Network Deployment Concepts
    - Radio Network Cooperation
  - Integrative Component
    - System Engineering

Month 48
- Phase III
  - Supporting Component
    - Scenarios
    - Channel Modelling
    - Spectrum and Coexistence
  - Technology Component
    - Radio Interface
    - Radio Network Deployment Concepts
    - Radio Network Cooperation
  - Integrative Component
    - System Engineering

Month 72
- Output
  - Basic concept(s)
  - System Design
  - HW Validation
Project goals I

G1 To identify and analyse challenging user scenarios and corresponding usage scenarios in concordance with all WWI IPs. To derive requirements for the WINNER radio interface and to evaluate and refine the scenarios based on the evaluated radio interface performance.

G2 To define the radio interface technologies needed for the ubiquitous radio system concept, including the following items: adaptive transmission schemes, duplex schemes, multi antenna concepts, and enhanced radio protocols, including Medium Access Control (MAC)/Radio Resource Management (RRM) protocols for multi antenna configurations.
Project goals II

G3 To define radio network topologies and deployment concepts capable of providing a ubiquitous radio coverage area, for example by the use of fixed or mobile relays, feeder systems, ad-hoc networking. The definition includes the functionality and external interfaces of the different network elements, communication protocols for information exchange between them and Radio Resource Management (RRM) algorithms to assign the available radio resources to the corresponding elements.

G4 To define radio level cooperation mechanisms between different Radio Access Networks (RAN). The choice of mechanisms will include, but will not be limited to, handover between new RANs or between new and legacy ones, combined Radio Resource Management (RRM) and concurrent/complementary use of different RANs.
Project goals III

G5 To define a single new ubiquitous radio access system concept whose parameters can be scaled or adapted to the requirements of a comprehensive range of mobile communication scenarios. From a coverage area point of view, the scenarios vary from long-range, or similar to current cellular or Wide-Area Network (WAN), to short-range systems, which correspond to WPAN/WLAN-type scenarios. The radio access systems should be capable of supporting variable bit rates, with peak data rates of up to approximately 100 Mbps for medium to long-range heavy traffic areas with high mobility, and up to approximately 1 Gbps for hot spots and short-range scenarios.

G6 To investigate the propagation conditions and to develop related channel models including path loss, multipath propagation and direction of arrival models in the identified potential target frequency ranges.
Project goals IV

G7 To develop methods for efficient and flexible spectrum use and sharing, to be applied to the WINNER system concept.

G8 To contribute to the development of spectrum demand estimation methods and to produce contributions based on the defined radio interface concepts, which justify the spectrum requirements. The contributions should be available for presentation in the preparatory process towards the World Radiocommunication Conference WRC 2007, in the time frame 2004 to 2006.

G9 To enable training activities by means of workshops.
Project structure

WP8: Project Management

WP1: Scenarios
WP2: Radio Interface

WP3: Radio Network Deployment Concepts
WP4: Co-op of Radio Access Systems

WP5: Channel Modelling
WP6: Spectrum & Coexistence

WP7: System Engineering
Potential areas of cooperation

- Other groups in IST with respect to current clusters
  - Beyond 3G
  - Broadband air interfaces
  - Reconfigurability
  - Smart antennas
  - (UWB)

- Projects in the services and applications area

- International bodies such as ITU-R concerning spectrum issues

- National administrations and CEPT concerning spectrum issues

- Bodies such as IEEE for standardisation purposes and future bodies for standardisation of systems beyond 3G
6. Framework Program of the EU
WWI – Wireless World Initiative