Flexible Relay Wireless OFDM-based networks

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Information

FlexIble RElay Wireless OFDM-based netwoRKS
FIREWORKS IST-27675 STP

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Outline

- Consortium Presentation
- FIREWORKS environment
- Problem statement and drivers
- FIREWORKS target system
- Objectives
- Deployment scenarios

FIREWORKS Environment

- FIREWORKS is
  - A European Commission (EC) Project in terms of 6th Framework Programme – Priority 2 "Information Society Technologies"
  - 50% budget is funded by EC
  - Submitted in March 2005
  - Approved in July 2005
  - Potential kick-off date → Dec. 2005

- **Duration 27 months**

FIREWORKS Consortium

INTRACOM S.A. (Principal Contractor)	**INT**	**Greece**
MOTOROLA Labs	**MOT**	**France**
Commissariat A L'Energie Atomique – LETI (CEA/LETI)	**CEA**	**France**
RWTH Aachen University	**RWTH**	**Germany**
University of Surrey	**UniS**	**United Kingdom**
Technical University of Catalunia	**UPC**	**Spain**
Czech Technical University	**CTU**	**Czech Republic**
Hellenic Telecommunication Organization	**OTE**	**Greece**

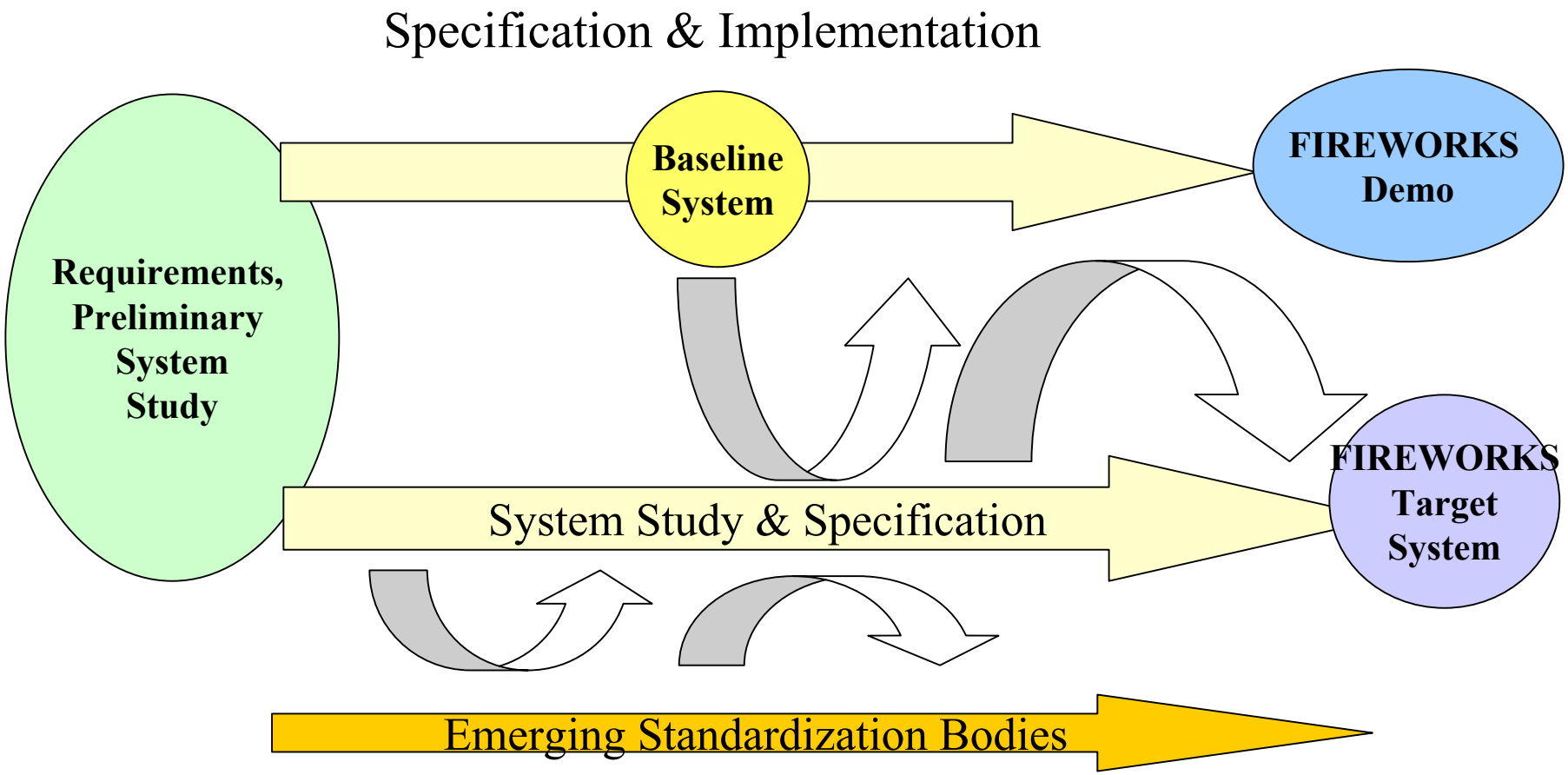
Problem Statement

- Problem Statement
  - Emerging and future BWA systems require:
    - **Ubiquitous** provision of **Broadband** services
    - Even in hostile environment and propagation conditions:
      - **NLOs** reception
      - Areas with **terrain** and **cost** difficulties(e.g., in underdeveloped areas)
      - supporting **mobility**
    - Fulfilling specific **QoS** requirements

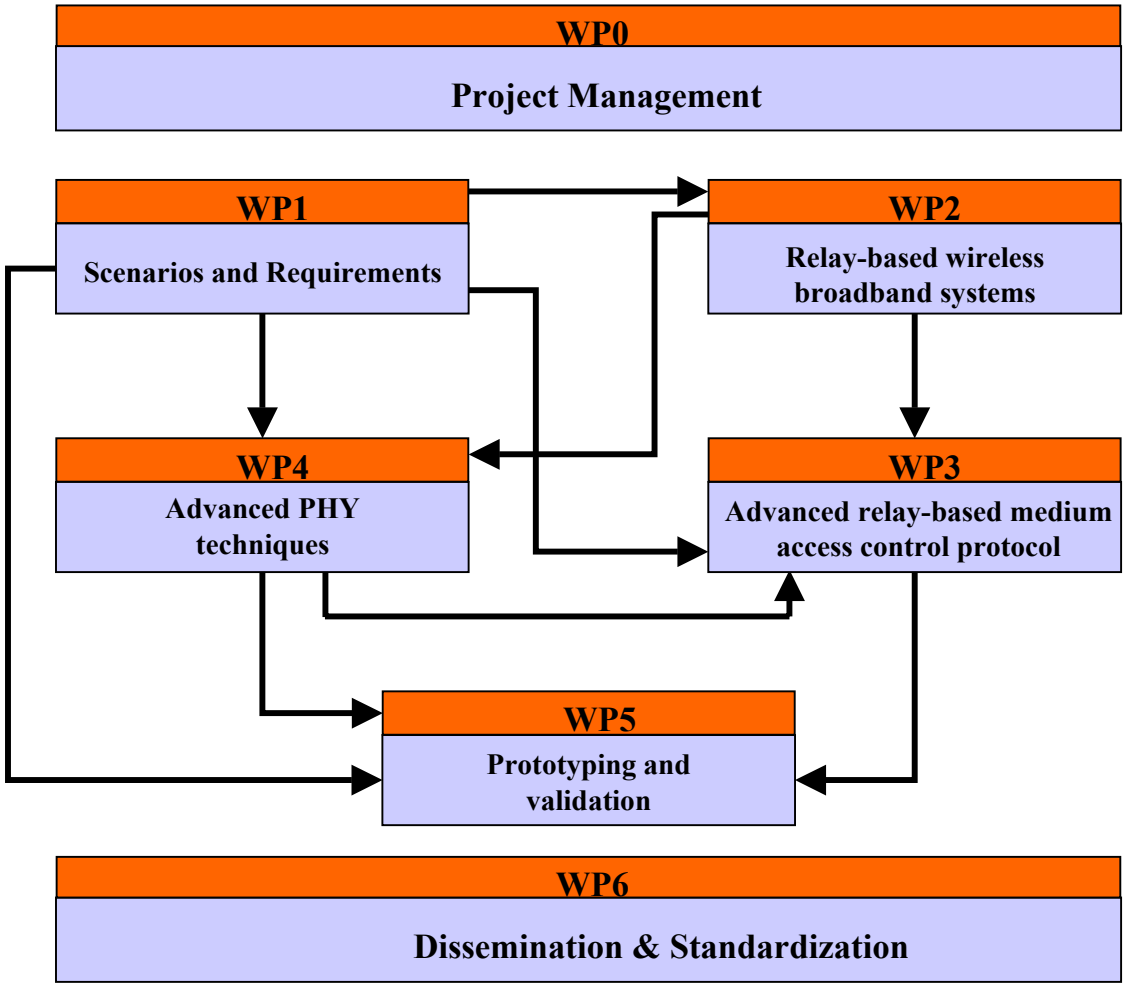
FIREWORKS drivers

- Lack of BWA solutions to cover the high throughput and coverage requirements in costly efficient manner
- Need of flexible nodes adapting to the changing characteristics of the surroundings, power restrictions & services required at a specific moment
- Non existence of WMANs and WLANs standards specifying a sufficient **set of functionalities** to operate a **Flexible Mesh network**
  - Need of functions that efficiently manage the signaling or feedback information between nodes

FIREWORKS Evolution paths



Project Organization



FIREWORKS Target System

- Mesh OFDM-based Broadband Wireless Access (BWA) system based on flexible Relay Stations that provides solution for
  - Extended and ubiquitous coverage with QoS, in adverse environments
  - Scalable deployment that can easily adapt to terrain changes (i.e. in under-development areas).
  - Overcoming limited capacity at the cell edges, NLOS, heavy shadowing from obstacles, penetration loss in an outdoor-to-indoor link, mobility and their combination
  - Joint capacity optimization between FIREWORKS and existing or emerging WMANs and WLANs architectures

Objectives (1/2)

- To design innovative flexible Advanced Antenna System (AAS) concept
  - Efficient trade-off performance improvement vs. data rate
  - Increase in the number of simultaneous transmitting and receiving users
- Flexible Relays in PHY and MAC
  - **PHY** layer:
    - MIMO, Spatial Diversity Coding, Spatial Multiplexing, Beam-Forming and Cooperative MTMR
  - **MAC** layer
    - Advanced Radio Resource Management schemes and distributed MAC protocols for Mesh

Objectives (2/2)

- To optimize the network capacity as a result of relaying functionality
- To design innovative cross-layer optimization techniques for cooperative relays
- To specify operational deployment scenarios, service provisioning and system requirements as well as techno-economics assessments
- To establish a liaison and contribute to the emerging standards in
  - IEEE 802.16 SG “Mobile Multi-hop Relay Study Group”
  - IEEE 802.11s

Deployment Scenarios (1/2)

- **Outdoor, Wide Area, Cellular Deployment**
  - Involves *Outdoor-to-Outdoor* Transmission and *Fixed*, *Mobile* or *Portable* Radio Equipment. Based on WMAN technologies, enhanced for *Mesh Operation* and *Relay-based* Deployment.
  - Provides Access to *Residential*, *Industrial*, *Corporate* and *Individual* Users.
- **Outdoor-to-Indoor, Microcell Deployment**
  - *Outdoor-to-Indoor* Transmission and vice versa
  - Considers *Indoor, Plug&Play Desktop* WMAN Equipment
- **Indoor Deployment**
  - *Indoor* Wireless Connectivity based on Enhanced WLAN Technology
  - Interconnects *Home Appliances, Entertainment* and *Communication* Devices and provides *Bridge* to the external WMAN 'Backhaul' Network

Deployment Scenarios (2/2)