

Flexible Relay Wireless OFDM-based networks

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**FlexIble RElay Wireless OFDM-based network RKS
FIREWORKS IST-27675 STP**

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Outline

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

FIREWORKS project

- 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 Catalonia	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 motivation

- 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 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 existing or emerging WMANs and WLANs architectures
-

Objectives (1/2)

- To design innovative flexible Multi Transmit Multi Receive (MTMR) techniques forming an Advanced Antenna System (AAS)
 - Efficient trade-off performance improvement vs. data rate
 - Increase in the number of simultaneous transmitting and receiving users
 - To design flexible Relays focusing on:
 - **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.

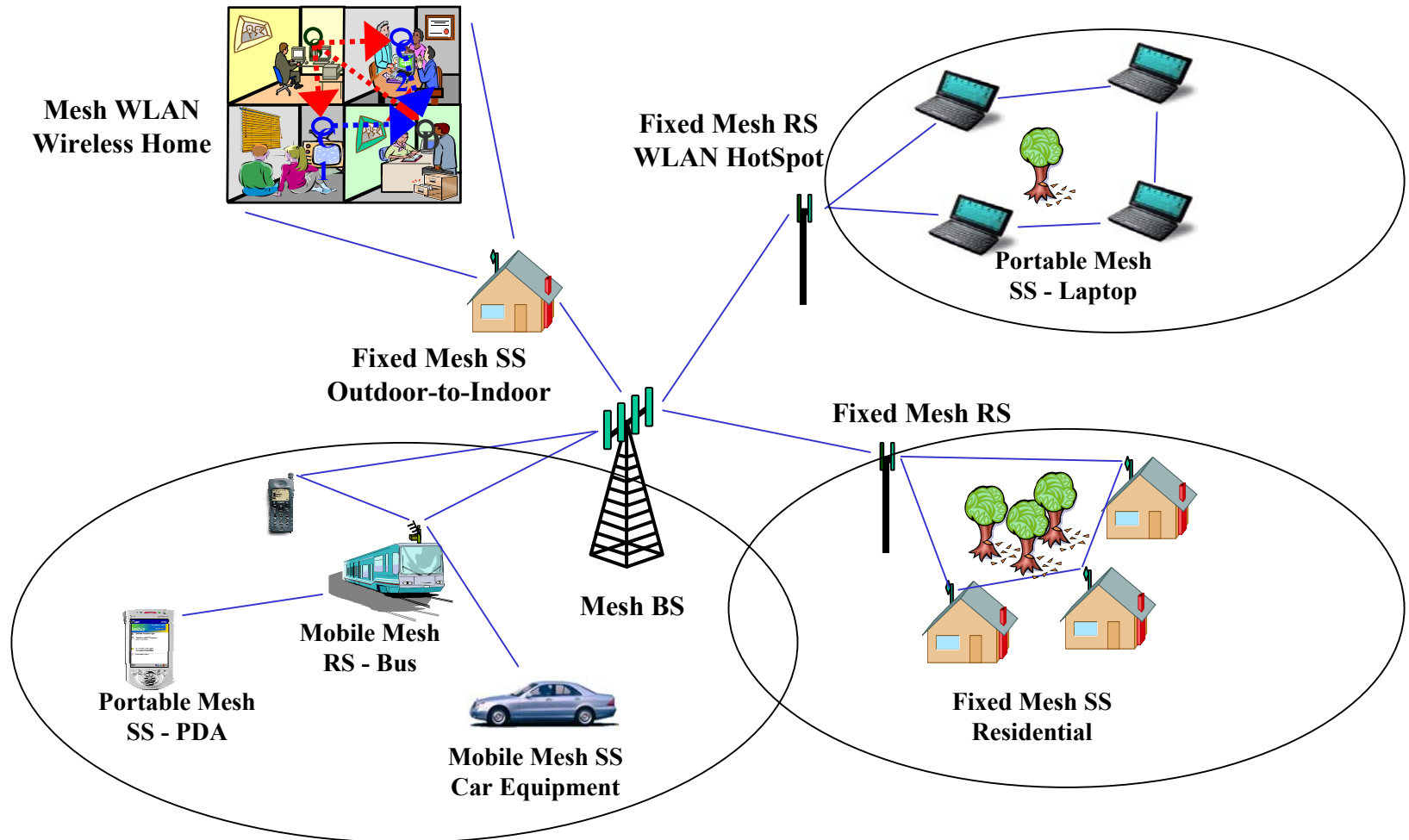
➤ **Outdoor-to-Indoor, Microcell Deployment**

- *Outdoor-to-Indoor* Transmission and vice versa
- Considers *Indoor, Plug&Play Desktop* WMAN Equipment

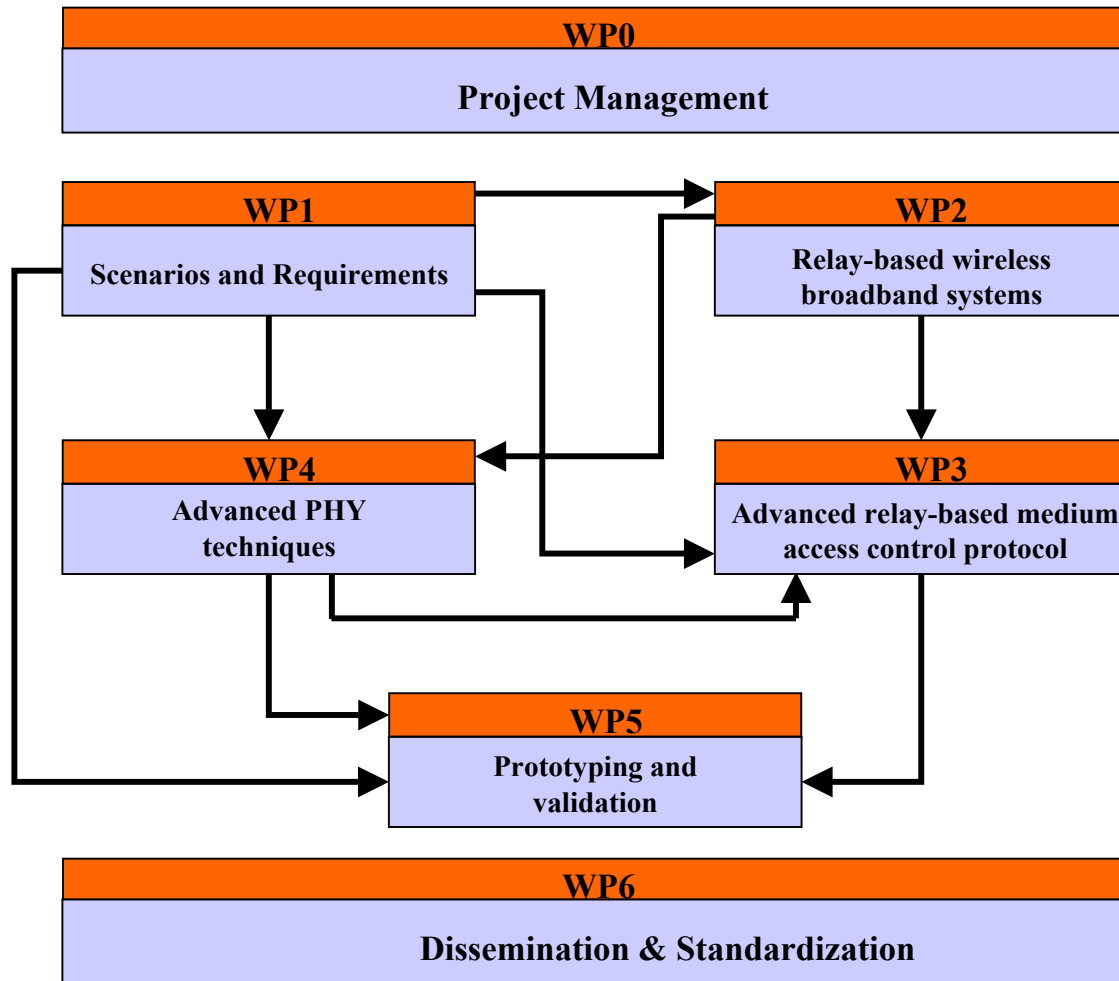
➤ **Indoor Deployment**

- *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)



Project Organization



FIREWORKS Evolution paths

