# Wireless Mesh Networks as an Alternative to Conventional Wired Backhaul Deployments

Paul Patras
Institute IMDEA Networks / University Carlos III of Madrid

## Introduction

Wireless mesh networks (WMN) offer important advantages as compared to traditional backhaul solutions based on wired or point-to-point radio links: lower costs and greater flexibility. We aim to design a complete WMN architecture that enables efficient resource management, abstraction of multiple heterogeneous wireless technologies, self-configuration capabilities and user mobility.

This architecture is currently being developed within the CARMEN (CARrier grade MEsh Networks) research project, partially funded by the European Commission under the 7th Framework Programme.

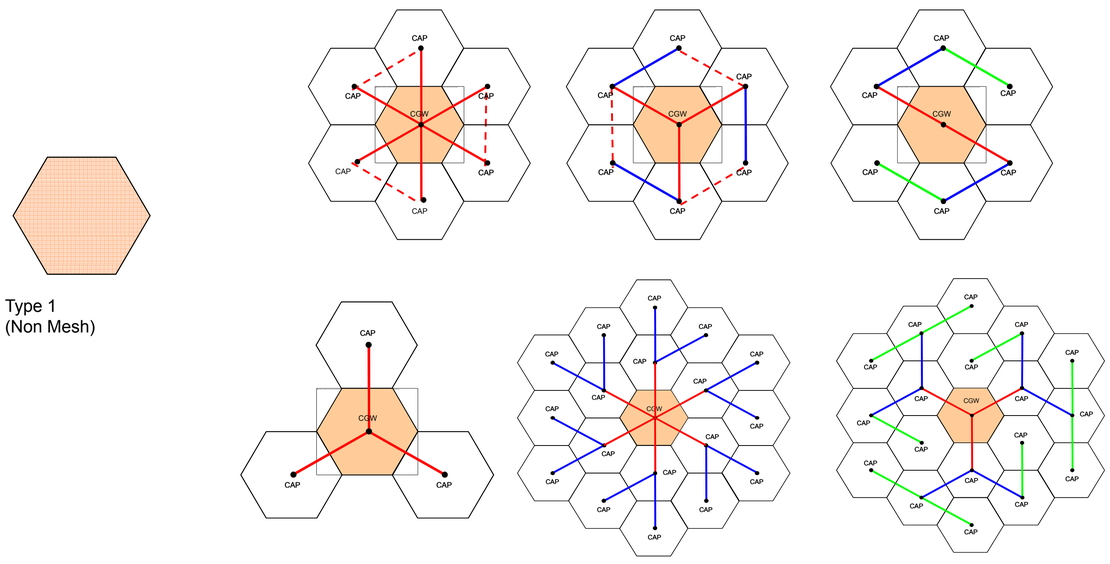
http://www.ict-carmen.eu/

CARMEN
CARrier grade MEsh Networks

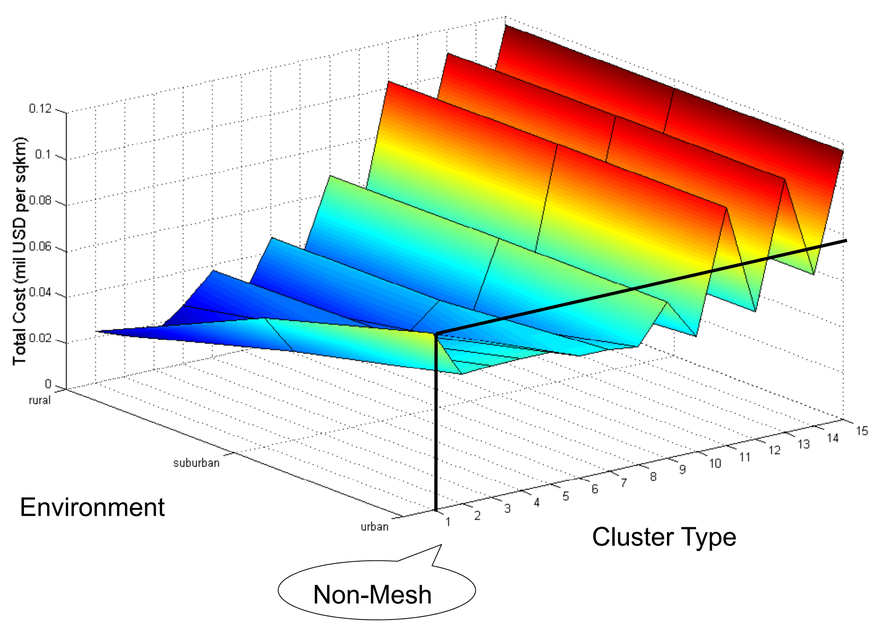
## Economical Analysis

We analyze the sensitivity of total deployment cost towards various key input parameters, e.g. network design options, environment conditions, equipment costs. We identify scenarios where mesh deployments outperform non-mesh backhauls.

### Cluster Designs Examples:




### Cost/km² vs. environment

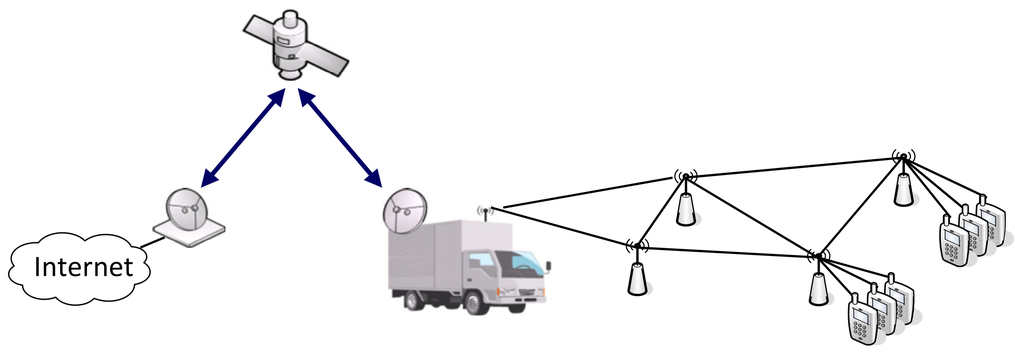



The specific case studies show that WiMAX mesh deployments in urban and suburban environments offer a promising business case since they are able to generate payback within a 5 year timeframe. Results show that WiFi mesh deployment are feasible in urban region considering the timeframe of 5 years, but also in suburban and rural region after 5 years. These studies were leaded by the CARMEN project members from British Telecom and T-Systems, a division of Deutsche Telekom.

## Use Cases

### 1. Emergency Response Support

Severe capacity constraints, intermitted connectivity to core network, sub-optimal node placement, focus on group-communication.




### 2. London Olympic Games 2012

Low-cost & short-term provisioning of additional wireless access capacity with triple-play QoS requirements.

## Achievements

### Media-independent Link Interface

An API which allows network bootstrapping, radio configuration, link state monitoring and QoS management using technology-independent commands and events.

### Capacity Model

This model allows capturing effective capacities of the links operating with the same spectrum, time and code in a technology-independent way.

### Capacity-aware Routing

A centralized solution based on complete link state. It considers capacity constraints and is able to accommodate significantly more flows than other routing schemes.

### Flow Mobility

The mobility solution for the access network side is based on an extended version of IEEE 802.21, where per-flow information is communicated during handover decisions.

### Topology Analysis

Given the number and geographical distribution of mesh points, studies were made to determine cost-optimal topologies.