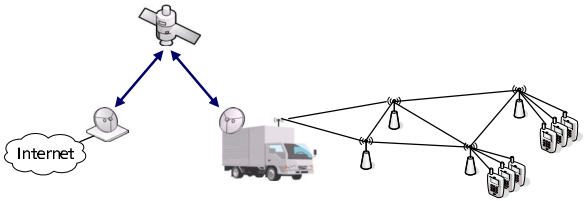
CARMEN's Vision

Wireless mesh networks offer important advantages when compared with traditional backhaul solutions based on wired or point-to-point radio links: lower costs and greater flexibility. **CARMEN** aims at providing a complete solution for setting up and maintaining a cost-effective carrier grade wireless mesh network including access capabilities. Exemplary applications and challenges addressed by CARMEN are:

Emergency Response Support

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



London Olympic Games 2012

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

CARMEN Project Facts

Industrial Partners

British Telecom ■ Deutsche Telekom AG ■ NEC Europe Limited ■ Alcatel-Lucent Deutschland AG

Academic Partners

Universidad Carlos III de Madrid ■ Fraunhofer Institute for Open Communication Systems ■ National University of Ireland, Dublin ■ AGH University of Science and Technology

Duration: January, 2008 – December, 2010

Total Cost: €6.248m

EC Contribution: €3.987m

Contract Number: INFSO-ICT-214994

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CARMEN
CARrier grade MEsh Networks

http://www.ict-carmen.eu

SEVENTH FRAMEWORK PROGRAMME

CARMEN's Main Objectives

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

The goal of CARMEN (*CARrier grade MEsh Networks*) is to design and develop a wireless mesh network supporting carrier grade triple-play services for mobile/fixed network operators. Future operator networks are comprised of a common core network and several access networks. CARMEN technology provides a low cost and fast-to-deploy mesh access network. The project proposes the integration of heterogeneous wireless technologies in a multi-hop fashion to provide scalable and efficient ubiquitous carrier services.

To achieve this vision, CARMEN addresses the following objectives:

1. **Create a cost-effective mesh network that supports carrier grade services**

To provide efficient wireless mesh access networks, CARMEN designs mechanisms for carrier grade support and techniques for self-configuration and monitoring to reduce capex and opex costs.

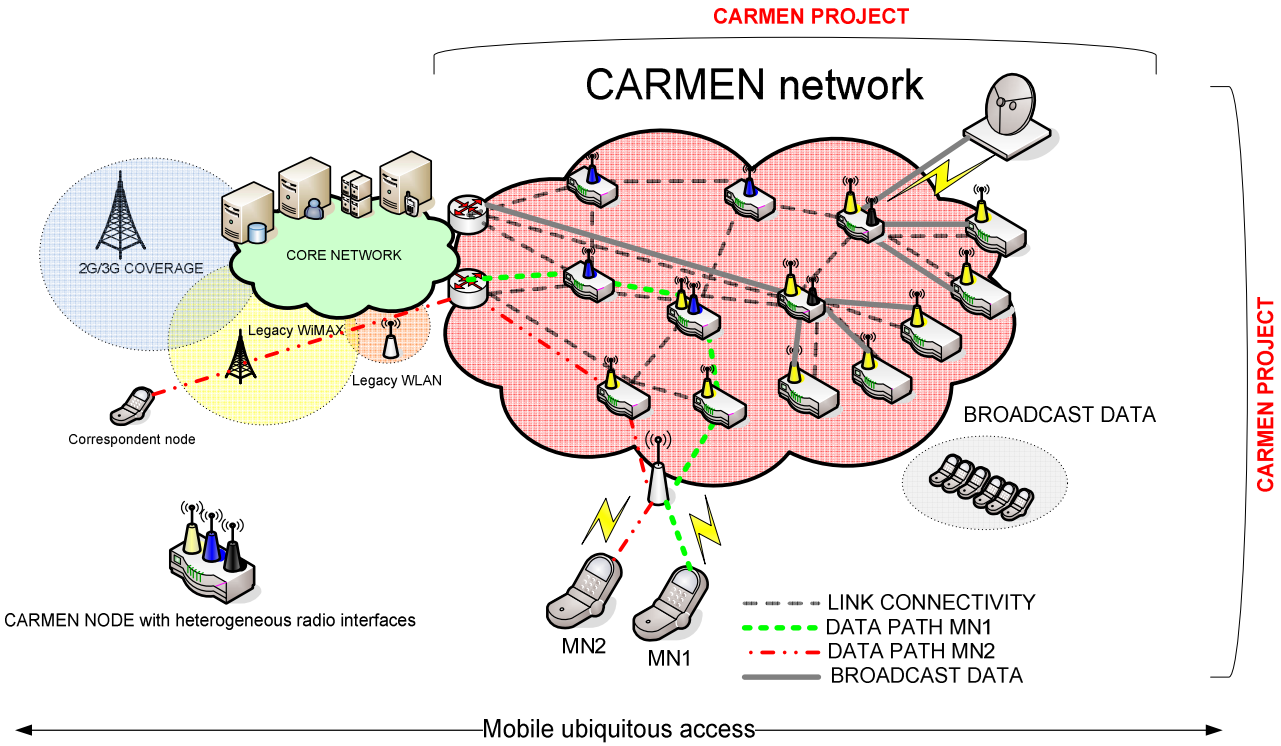
> CARMEN designs backhaul mesh networks to deliver carrier grade services to mobile users

2. **Support for mobile unicast and broadcast services within a meshed network environment**

Routing and mobility schemes are designed and validated to support the provision of unicast and multicast services. Efficiency is improved by using techniques such as multipath or integration of DVB receivers in certain mesh nodes to save multicast traffic load in the backbone mesh.

3. **Multi-technology support by designing an interface that provides an abstraction of radio based MAC layers for mesh networks**

CARMEN supports multiple technologies, providing the necessary changes in the underlying technologies in order to adapt to wireless multi-hop environments, and introducing elements to simplify the integration of them.



Major 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 link capacities in a technology-independent way. Capacity inter-dependencies of links (links operating with the same spectrum, time and code such as typically with P2MP interfaces) can be modeled.

- 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.

- Pipe Concept and Capacity Handling

Label switched paths with associated resource requirements that bundle multiple user flows. Algorithmic studies are done to determine optimal pipe sizes and conditions for pipe size changes.

- 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.

- IEEE 802.21 Study Group

The media-independent link interface concept was proposed as an extension to the existing IEEE 802.21 link interface. CARMEN chairs a Study Group within IEEE 802.21 on this subject.