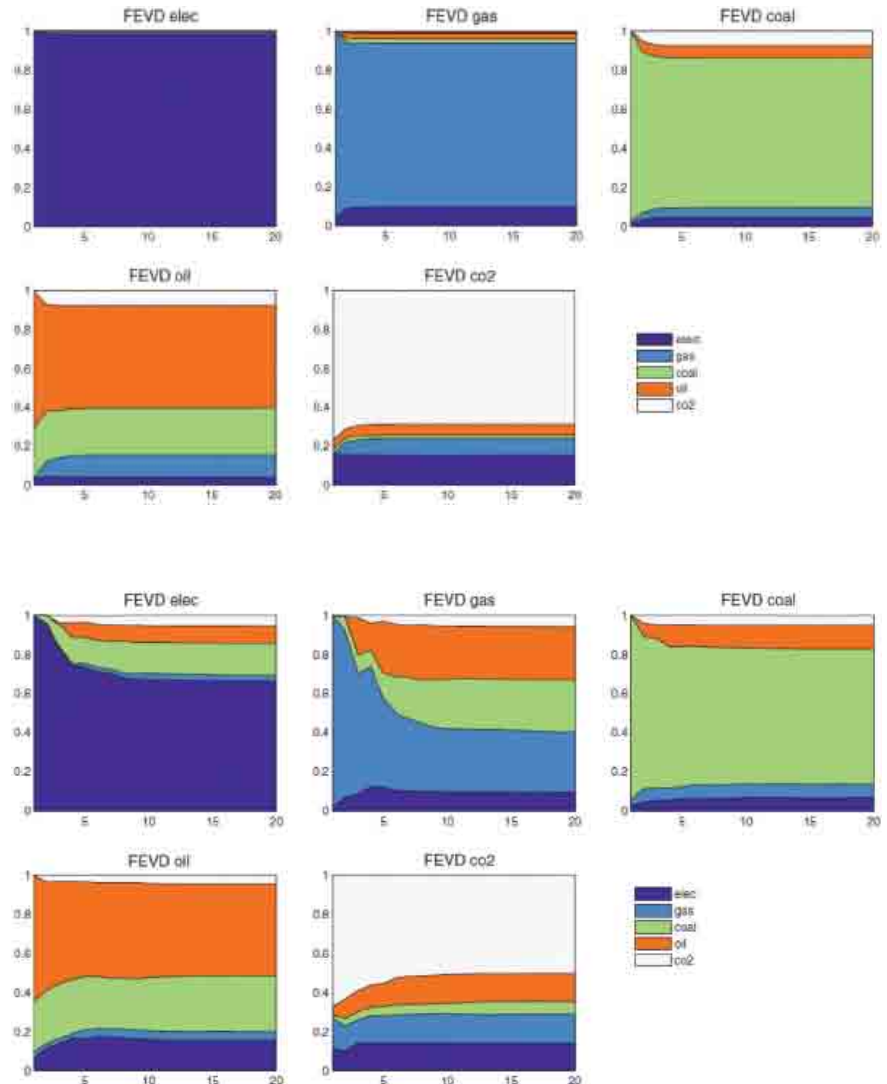


depends on the energy mix and electricity deregulation stage of the country under analysis. It seems that in the European Energy Exchange (EEX) more carbon coercion was undergone and innovations in carbon are stronger in electricity prices. In sum, carbon constraints on the cost of coal and electricity production depend on the country analyzed, which addresses an answer to the impact of the recently created European Union Emission Trading System (EU ETS). Producers in countries using predominantly fossil fuels, big carbon emitters, had undergone more carbon coercion and thus were more likely to include the price of emission permits in their electricity generation and cost functions (EEX). We also found that electricity is the major source of randomness that drives the carbon market for EEX, and vice versa, being the major source of randomness for carbon in France, but not vice versa in this case. In contrast, in the Nord Pool market, the major sources of randomness for carbon are electricity, gas and oil (much lower for coal), gas and oil being used almost in the same percentage in the Nordic countries to generate electricity.

Throughout the period analyzed, the efficiency of the European market for emission allowances had not been able to compel electricity producers to reduce their emissions and invest in cleaner technologies, despite being a good step towards achieving the objectives of the Kyoto Protocol. Desired effects to be produced also depend on politics pursued in distributing allowances.



## mobility between heterogeneous networks

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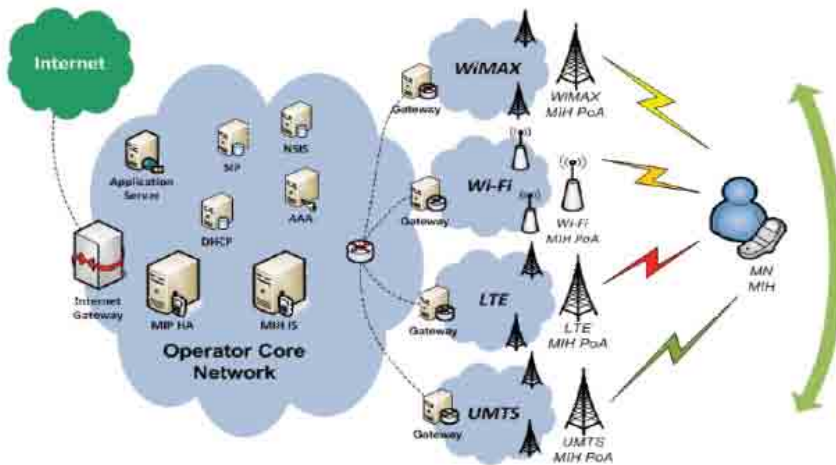
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Ubiquitous Internet access is one of the main challenges for the telecommunications industry in the next decade. The number of users accessing the Internet is growing exponentially and the network access paradigm of “always best connected, anytime, anywhere” is a central requirement for the so-called Next Generation Mobile Networks

(NGMN). WiMAX, together with 3GPP LTE, was recently recognized by ITU as one of the compliant access technologies for 4G. Nevertheless, WiMAX is not yet fully prepared for next generation environments, mainly due to the lack of end-to-end QoS procedures to support real-time multimedia services delivery. Furthermore, besides the 4G compliant

WiMAX and 3GPP LTE radio access technologies, 3GPP UMTS/HSPA and Wi-Fi will also have a significant impact in the mobile communications during the next decade. Therefore, it is fundamental to enable the coexistence of several radio access technologies, thereby providing mobile users with seamless mobility. In this work and related projects, it is



proposed a seamless mobility architecture with QoS support in heterogeneous wireless access environments. The proposed architecture integrates an

extended version of IEEE 802.21 framework with QoS support, as well as an advanced mobility manager integrated with the Mobile IP (MIP) mobility

management protocol. It is also proposed an extension to the handover decision-making processes in heterogeneous access environments through the integration of context information from both the network elements and the end-user. Performance tests are developed in a real testbed to validate the proposed optimizations in an inter-technology handover scenario involving WIMAX, Wi-Fi and 3GPP UMTS/HSPA. This research work has a strong impact in industry, and simpler versions of the developed architecture are being developed towards products, related with heterogeneous wireless access networks coexistence: a connectivity management product ("MyConnect") and a seamless mobility management pre-product ("MyMove").

## SARDANA – first time demo of 1000 clients on a single reconfigurable passive optical access network

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FTTH is nowadays a must have in most developed and even in developing countries. Investments are being made all over to try and minimize the "digital divide". For that, several are the problems being raised among all players in this ecosystem: the users, the operators, the service content providers, the regulators and any newcomer. Portugal, following many countries, is leading the number of homes with fiber already passed to it. It is still gathering traction on the number of connected users, by now only early takers, but fast moving to a massive access to ultra high bandwidth services. Besides the

changes this will bring to the way people act, this will effectively open a set of new opportunities (new services, new ways of working, etc). However, despite the fact that this is a high interest and investment field, the number of barriers that prevents this business of being a full success is high, namely the full availability at a sustainable cost, the deployment strategies, the competition, and others. Contributing to these high level problems the SARDANA project promoted several state of the art technologies which enable to overcome most of these limitations. The project

observed concepts like "colourless ONUs", which allow the same set top box to be used agnostically to the provider assigned band, allowing with this, mobility within operators and openness (a regulatory trend). Also, with the ring architecture inserted in the PON, failures can be worked out very fast minimizing the down time, therefore reducing outage and service prevention, very critical for high priority services or situations. By developing intelligent self-sustained harvesters and low power electro optic mechanisms, the healing and redefinition of the network becomes automatic and self-regenerative, increasing quality of service and flexibility when changing the network. Also, remote amplification, allows full passiveness of the outer plant, and still cover remote areas (100km distant) as well as 1000+ subscribers from a single active central office. This is a big step into reducing the digital divide and allowing seamless evolution of the networks. SARDANA has contributed to standards, won an award, produced more than 100 publications and pushed the directions of deployments (e.g the ARENA Italian project) and future networks.