

Title: New network architectures

Introduction

The increasing access to the network via mobile networks increases the pressure to go beyond the Internet's assumption of continuous connectivity and static attachment points, and to fully address and profit from the specifics of wireless transmissions.

Unlike the multitude we had in the past, where different incompatible technologies were competing with each other, the new trend is to create a framework that will allow these many networks to bloom as a family of interoperable networks coexisting and complementing each other. Different networks will be able to address individual requirements such as mobility, QoS, security, resilience, wireless transport and energy-awareness. It is required to develop a design process for combining existing, or specifying and generating new networks with customized architectures, enabling the run of virtual networks on top of a shared underlying network infrastructure, enabling the path abstraction to the links being traversed and supporting sets of information to be sent through different paths, and enabling the support of inherent mobile environments.

However, to address all these concepts, new Internet architectures need to be designed, following the GENI initiatives in the US of Clean Slate design approaches to re-build the Internet.

Objectives

The aim of this PhD Thesis is to study these challenges, evaluate these new concepts and propose new mechanisms for the support of virtualization and coexistence of different networks, coexistence of generic paths for multipath transport of information, and mobility of users, services and flows/sub-flows. For this purpose, the following areas of work are of main importance:

- Evaluation of the effects and tradeoffs of the support of flows in different paths (how to organize them, what paths to use, how to use generic paths as they are available) and different networks in the same paths and links.
- Enable the reliable communication and interworking between different virtual networks, considering issues such as resource and dynamic bandwidth management, and development of bandwidth on demand concepts, for "on demand" provisioning of bandwidth or even whole networks for applications that require short-term bandwidth assignments at large scale, addressing fairness and networks requirements issues. This concept will then be extended for generic paths concept, where each link contains portions of flows of different networks.
- Seamless integration of wireless resource management into a next generation Internet (both for "end-user" access and meshed networks) by means of innovative generic cross-layer techniques which try to hide specific wireless characteristics from the overall transport system.
- Support of mobility and multihoming in these environments, using the concepts of virtualization and generic paths to abstract the connection to specific physical interfaces and the links being traversed.

Advisory

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Research Institution

The work will be integrated in the Institute of Telecommunications – Aveiro.

Financial sources

If required, it may be possible to provide a scholarship funded mainly from European projects.