Title: Comparing IPv4 and IPv6 Internets with RIPE Atlas

Contact: Juan-Antonio Cordero, j.a.cordero@gmail.com, École polytechnique

Context: ACN M2 scientific project proposal

Problem statement:

Achieving a complete understanding of the Internet properties, dynamics and behaviour is a highly challenging task. This is due to the huge size of the Internet as a complex system, on one side, and its continuous growth and rapid, decentralised evolution, on the other. A key element of this understanding is the insight about the way how data flows across the Internet, which would be useful, among other purposes, for optimization of routing policies, final user experience, resource allocation and future Internet architecture.

One of the leading forces of Internet evolution is the transition from IPv4 to IPv6. Given its complexity, and although IPv6 is now being adopted at an increasing rate, with a growing part of main networks and devices natively supporting IPv6, for some time IPv4 and IPv6 systems will still coexist in the Internet. In practice, this means that users may experience different performance from the same infrastructure depending on whether they rely on IPv4 or IPv6 to access it.

This project proposes to use RIPE Atlas, a global platform for Internet measurements, to study differences between IPv4 and IPv6 Internets, in particular focusing on topology aspects or path stability, among others. The student's work will include (1) a literature survey on the Internet architecture, measurements and tools, in particular those available in RIPE Atlas, as well as the current state of studies of IPv4 and IPv6 performance, (2) the selection of metrics to be compared via RIPE Atlas and the experimental procedure, (3) the design and implementation of experiments to be performed on RIPE Atlas to compare IPv4 and IPv6 performance, and (4) the analysis of the obtained results.

Students will need to get familiar with the RIPE Atlas platform. Programming knowledge is thus a required skill, as interaction with RIPE Atlas is typically handled in python. Courses addressing the Internet architecture and the operation of the main protocols involved, as well as main statistical tools for data analysis, are highly recommended.