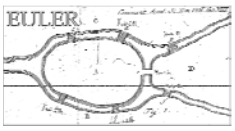
EULER

Experimental UpdateLess Evolutive Routing

http://www.euler-fire-project.eu/



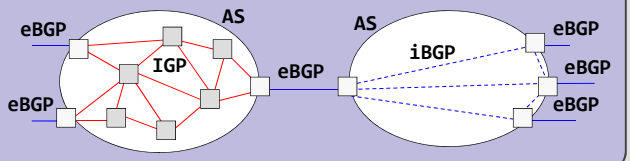
FIRE

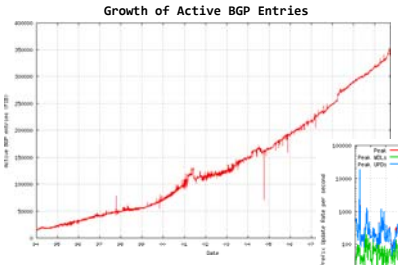
Project Description

The main objective of the EULER exploratory research project is to investigate new routing paradigms so as to design, develop and validate experimentally a distributed and dynamic routing scheme for the Internet. The resulting routing scheme(s) is/are intended to address the fundamental limits of current stretch-1 shortest-path routing in terms of routing table scalability but also in terms of topology and policy dynamics (perform efficiently under dynamic network conditions).

Problem Description

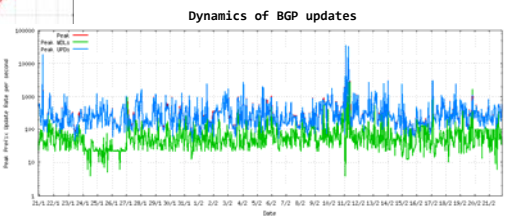
It has been long recognized by the scientific and technical community that the most fundamental problems faced by the Internet architecture are the scalability, convergence and stability properties of its inter-domain routing system based on the Border Gateway Protocol (BGP).





Growth and Dynamics of BGP

→300k prefix entries (growth 20-25% /year)
→30k ASs (growth 15-20% /year)
→2-3 BGP updates per second (peak O(1000))



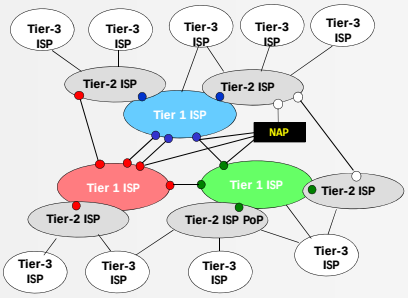
Desired Properties of the new Routing Paradigm

1. **Scalability**: RT size scaling better than n log(n) - at most O(n) and at best O(log(n))
2. **Quality** (stretch): bound length increase of paths as produced by routing scheme compared to shortest path (does not grow with network size)
3. **Reliability**: fast convergence upon topology changes while minimizing communication costs to maintain coherent non-local knowledge about network topology
4. **Name-independent routing**: accommodate node addresses/labels assigned independently of the topology (*otherwise* need to split locator and ID parts in addressing architecture)
5. **Specialization**: Taking benefit of Internet topology properties (scale-free graph)
6. **Policy**: Enable each network admistrative partition to apply its own routing policy without requiring explicit exchange of these policies neither mandate homogeneous rules for the routing scheme to properly operate.

Internet Topology Modelling

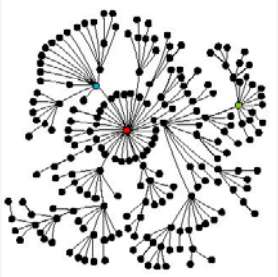
The driving idea of this research project is to make use of the structural and statistical properties of the Internet topology (some of which are hidden) in order to specialize the design of a distributed routing scheme known to perform efficiently under network dynamic conditions when these topological properties are met.

Organization of the Internet



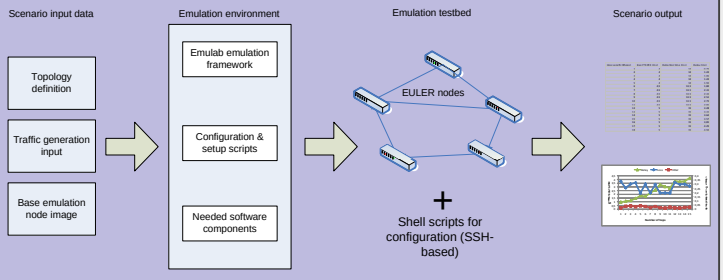
Model of the Internet

Graph generation
Complex Networks



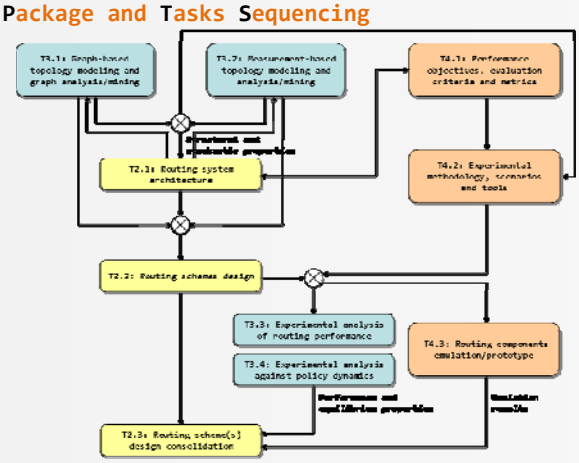
Routing Schemes Experimentation

Experimentation through emulation and prototyping for functional validation and performance evaluation.



Use of FIRE (Future Internet Research & Experimentation) facilities for experimentation.
http://cordis.europa.eu/fp7/ict/fire/home_en.html

Work Package and Tasks Sequencing



WP2 → Routing system architecture and Routing schemes design
WP3 → Topology modelling and Routing schemes experimental analysis
WP4 → Routing schemes experimentation

Technical Information

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INRIA - Institut National de Recherche en Informatique et en Automatique (France)
IBBT - Interdisciplinary Institute for Broadband Technology (Belgium)
UPMC – Université Pierre Marie Curie (France)
UCL - Université Catholique de Louvain (Belgium)
RACTI - Research Academic Computer Technology Institute (Greece)
UPC – Universitat Politècnica de Catalunya / Universitat de Girona (Spain)