When Traceroute Met BGP... How to Reveal Hidden Internet AS-level Connectivity with Portolan and Isolario

Adriano Faggiani†, Pietro G. Giardina†, Enrico Gregori†, Alessandro Improta†, Luciano Lenzini*, Valerio Luconi*, Alessandro Pischedda†, Luca Sani†, Lorenzo Rossi†

Dip. Ingegneria dell’Informazione, University of Pisa, Pisa, Italy
firstname.lastname@iet.unipi.it

IIT-CNR, Pisa, Italy
firstname.lastname@iit.cnr.it

Portolan: mapping the Internet with mobiles

Portolan is a crowdsourcing measurement architecture which exploits smartphones as vantage points to perform regional traceroute campaigns to discover AS-level links. Crowdsourcing gives multiple advantages in AS-level topology discovery: i) a large number of users, especially located at periphery of the Internet; ii) vantage points in any AS without any permission from network administrators; iii) the possibility to split big workload among a large set of users. Finally, thanks to high mobility of users, a single smartphone can visit multiple networks during the day.

Services

Traceroute: an UDP version of Paris Traceroute. It can be run with Multipath Detection Algorithm (MDA).

Ping: an UDP version of classic ping to measure latency.

Max throughput estimator: a tool to measure the bottleneck capacity between the smartphone and Portolan server.

BitTorrent Test: enables users to check if their ISPs shapes BitTorrent traffic.

Fig. 1: Portolan architecture

Isolario: services in change of BGP data

The incompleteness of the Internet AS-level topology extracted from BGP data provided by route collector projects is the most serious pitfall of all the research studies concerning the Internet inter-domain ecosystem. The Isolario project aims at filling this gap by persuading network administrators to provide BGP data in change of services to monitor in real-time the Internet inter-domain routing system, following the do-ut-des principle.

Services

Routing table viewer: enables a network administrator to monitor in real-time the routes that her/his AS is using to reach a set of Internet destinations.

Route flap detector: detects route flapping while it is occurring through real-time analysis of BGP flows provided by the feeder.

My subnet reachability: enables network administrators to check in real-time the routes that other Isolario feeders use to reach her/his own AS networks.

Alerting system: Coming soon.

Fig. 3: Isolario architecture

Portolan and Isolario Interaction

Isolario exploits the geographic distribution of Portolan probes to enhance its services. For example My subnet reachability service enables Isolario users to trigger traceroute and ping measurements from Portolan probing-smartphones to obtain IP-traces and latency between ASes hosting at least one Portolan agent and their own networks.

Fig. 4: Services

1. User requests an IP-level measurement (ping and/or traceroute) through the My subnet reachability service.
2. Isolario forwards the request to Portolan measurement system.
3. The Portolan server selects suitable smartphones and sends a request to Google Cloud Messages (GCM) service to wake them up.
4. GCM notifies smartphones selected by Portolan
5. Each notified smartphone requests a measurement task to the Portolan server and performs it.
6. Smartphones send measurement results back to the Portolan server.
7. The Portolan Server forwards the results to Isolario
8. Isolario parses and send the results to the interested user, which will visualize the results on the browser.

Fig. 5: Demo