Improved algorithms for capturing the dynamics of Internet maps

Mots clés :

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Résumé du projet de recherche (Langue 1)

A network administrator in principle has a clear view of his or her own network: what are the routers that are deployed, where are they located, how are they interconnected, what is the content of the routing tables that govern how packets pass from one router to the other as they traverse the network. However, anyone outside of that network has a very limited view of what happens within, restricted to data from the BGP inter-domain routing protocol that is used between networks, and information that can be gleaned from sending probe packets into and through the network, guided by tools such as "ping" and "traceroute". This limited view into the tens of thousands of networks that make up the Internet presents a challenge for efforts to construct a map of the Internet as a whole. Well known measurement systems such as Archipelago and RIPE Atlas have been constructed over the years to collect raw data, and algorithms have been devised to interpret this data into Internet maps. These systems consist of distributed probing agents that systematically explore the network. Current probing approaches arrive, at best, in refreshing the map of the Internet once every three days. However, the Internet is dynamic, and the map changes every hour and every minute, and current methods miss this dynamics. The value of better capturing the dynamics is inestimable, in terms of an improved scientific understanding of the Internet and also in terms of the augmented security of the Internet that would come from being able to track potentially disruptive changes in real time. This thesis subject is aimed at improving the capture of Internet map dynamics.

Résumé du projet de recherche (Langue 2)

The main challenge will be to significantly speed up the capture of Internet map dynamics. A goal will be to do so by an order of magnitude: refreshing the Internet map once every several hours instead of once every three days. There is already a small scientific literature on improved dynamics capture, so it will be important to come up with novel ways that can be distinguished from the existing state of the art.

Informations complémentaires (Langue 1)

There are considerable opportunities to collaborate with teams that are working on Internet mapping around the world. Most notably, there is the possibility to interact with the Archipelago team at the CAIDA institute at the University of California San Diego.