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Alias Resolution with ICMP(v6) Rate Limiting

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Abstract: One of the biggest challenge in Internet cartography is to obtain from an IP level topology a router level topology. The process of grouping different IP addresses into routers is called alias resolution. Because active measurements reveal IP addresses but not the identities of routers, researchers have invented several techniques to discover common signatures shared among IP interfaces that provide evidence that these interfaces might be aliases. In this paper, we propose a new technique, based on ICMP(v6) rate limiting, a feature that is present on all modern routers, and mandatory in IPv6. More often considered as a constraint than an asset in Internet topology discovery, this feature has never been exploited to perform alias resolution. Our contributions are: (1) Limited Ltd., a new technique for alias resolution, which both works in IPv4 and IPv6. (2) A free, open source, and permissively licensed tool that implements the algorithm. (3) A survey of the types of rate limiting behavior that we have found that add new insights to previous survey work. We evaluate Limited Ltd. on Internet2 ground truth and on a larger scale survey by comparing its performance with two existing state-of-the-art techniques for alias resolution, showing that both for IPv4 and IPv6, we find new pairs of aliases that were not findable those techniques against which we compare, while maintaining a low false positive rate. In order to facilitate the reproducibility of our results and the usage of Limited Ltd., our code and the data that we collected are publicly available.

Biography: Kevin Vermeulen is a doctoral student at Sorbonne Université, under the supervision of Olivier Fourmaux and Timur Friedman. His research focuses on Internet topology, and in particular on building new techniques to better capture the dynamics of IP and router level topology.