NJIT

IEEE North Jersey Communications Chapter

Tomo-Gravity

(or: How to compute large-scale IP traffic matrices from link loads in seconds?)

by Yin Zhang, AT&T Research Lab

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About the Speaker

Yin Zhang is a senior technical staff member of the Networking Research Department at AT&T Labs Research. He earned his B.S. from Peking University in July 1997, and Ph.D. from Cornell University in August 2001, both in Computer Science. His research interests lie in computer networks, with emphasis on network management, traffic engineering, performance measurement, and anomaly detection. He is a member of ACM and IEEE.

About the Talk

Traffic matrices, which specify the amount of traffic between origin and destination in a network, have tremendous potential utility for many IP network engineering applications, such as capacity planning, traffic engineering, and network reliability analysis. However, it is often difficult to directly measure traffic matrices in large operational IP networks. So there has been a surge of interest in inferring traffic matrices from link loads and other more easily measured data. Unfortunately, this is a non-trivial task. The challenge lies in the ill-posed nature of the problem: the number of constraints (i.e., the link measurements) is typically much smaller than the number of unknowns (i.e., the matrix elements to be estimated). So the problem is massively under-constrained for large networks.
In this talk, I present a new method for practical and rapid inference of traffic matrices in IP networks from link load measurements, augmented by readily available network and routing configuration information. The method, "tomo-gravity", combines the advantages of transportation modeling (gravity models) with tomo-graphic methods such as those applied in medical imaging (CAT scans) and seismology. It has a firm theoretical foundation in information theory, and we have shown that it is remarkably fast, accurate, flexible and robust on test data from AT&T's North American backbone network.

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