Hamilton Institute

Mean-Field Interaction Models for Large TCP Networks

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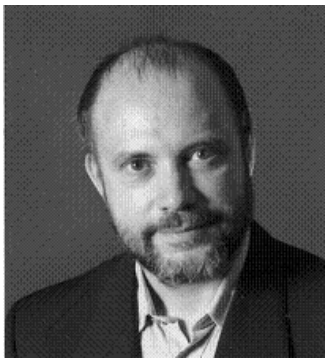


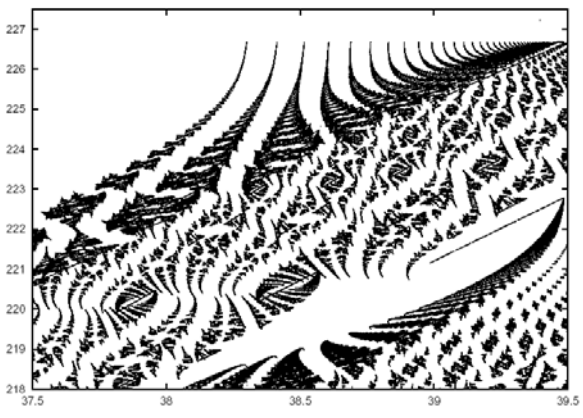
Abstract
This presentation will review various dynamical interaction models allowing one to analyze the throughputs obtained by a large collection of long or short lived TCP flows sharing many links and routers, from the sole knowledge of the network parameters (capacity, buffer sizes, topology) and of the characteristics of each flow (RTT, route, on-off structure etc.).

In the droptail case, the mean-field limit can be described geometrically as a billiards in the Euclidean space. This billiards has as many dimensions as the number of flow classes and as many reflection facets as there are routers and links. This allows one to determine the possible stationary behaviors of the interacting flows and provides new ways of assessing TCP's fairness. The case of on-off flows leads to some turbulence type phenomena even in the one link case.

The RED case can also be investigated by such mean-field techniques and leads to transport type PDEs. In the single link case, this allows one to determine in closed form the stationary distribution of the stationary throughputs obtained by the flows.

When aggregated, the traffic generated by these models exhibits TCP and network-induced fluctuations that will be compared to statistical properties observed on real traces.

A fractal generated by a TCP billiards:



Venue: Seminar Room, Hamilton Institute, Science Building, NUI Maynooth

Time: 1.00 - 2.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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