Understanding the traffic evolution process after an unexpected network disruption is of great significance to traffic engineers who are responsible for traffic restoration. In this talk, we will discuss our recent findings on the day-to-day traffic equilibration process following the unexpected collapse and eventual reopening of the I-35W Bridge over the Mississippi River in Minneapolis. Following the I-35W Bridge collapse, drivers were observed to drastically avoid areas near the disruption site until the perceived congestion in that area gradually diminished. After the reopening of the disrupted link, despite a complete restoration of network topology, it was found that total demand restoration on that link did not occur, implying that a different traffic equilibrium was reached. Due to the rare occurrence of the network disruption event, such behaviour has not been reported in the literature and none of the existing day-to-day traffic assignment models are capable of explaining the empirical evidences. To fill in this gap, we have developed a nonlinear dynamic system that is capable of describing the transient states of a disrupted network, answering questions related to the traffic evolution trajectory from a disequilibrium (due to a network disruption) toward an equilibrium. Our models are calibrated and validated using the data collected from the Twin Cities network after the bridge collapse and reopening. To the best of our knowledge, this is the first time that day-to-day traffic equilibration models have been constructed and compared against real world observations.

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