Surface transportation systems continue to be plagued by concerns regarding safety, excessive delays, and pollution. These problems will only become progressively worse in the future, particularly in developing nations as they modernize and become more mobile. The widespread deployment of smart vehicles that include unprecedented computation, wireless communication, and sensing capabilities will revolutionize the transportation industry, offering new approaches to alleviating these problems. For example, systems soon to be launched under the Vehicle-Infrastructure Integration (VII) initiative by government agencies and private companies will deploy a variety of roadside and mobile sensing platforms. Such systems can also offer a rich variety of new computation and communication services to travelers.

Due to their highly mobile and dynamic nature, distributed systems composed of networked in-vehicle computers and roadside infrastructure present new challenges to manage the flood of data that will be created as well as to provide effective information services. Suitable system evaluation tools are essential to understand these systems and evaluate alternate design approaches. Such tools must be able to capture both realistic vehicle movements as well as communication and computer system behaviors. This presentation will describe challenges and our experiences in experimenting with and evaluating vehicular networks through analysis, simulation, and experimentation. We will describe a distributed simulation testbed that has been developed that federates transportation and wireless network simulators, and has been populated with data corresponding to the Atlanta metropolitan area.