Techniques for Constructing Dependable Distributed Systems

Constructing dependable distributed systems is a long-standing area of research due to the inherent complexity of design, implementation, and maintenance of such systems. In this talk, I will discuss a set of orthogonal techniques that attempt to provide different levels of assurance and optimality in constructing distributed systems from various perspectives. These techniques range over deeply theoretical to highly practical approaches.

Specifically, I will present our results on optimal coordination and fault-tolerant runtime monitoring of distributed and autonomous fleet of unmanned aerial vehicles (UAVs). These algorithms essentially solve the vehicle routing problem (VRP) in a distributed fashion, enabling a fleet of UAVs to jointly carry out a mission while minimizing a set of costs. I will also present our recent work on runtime monitoring of security and privacy policies that enable us to inspect the health of complex policies across multiple executions of a system (e.g., information flow and against sophisticated side-channel timing attacks).