

CS 510 Mobile Computing

Fall 2020

Instructor: Gruia-Catalin Roman
Credit: 3 units
Prerequisites: senior or graduate standing
Time: Tu. and Th. 2:00 - 3:15 pm
Location: remote class

Internet and wireless communication are two technologies that share the common goal of providing ubiquitous access to distant resources. Their impact on the social fabric is immediately observable today. This course is concerned with methods and principles for the development of systems whose components exhibit some form of mobility across networks or within some physical space and require some knowledge about the domain within which the movement takes place. The course material will cluster around several dominant themes: the delivery of connectivity to mobile nodes, languages that provide facilities for code migration, computational models that include the notion of locality, and design methods that support the development of new kinds of network applications.

Since much of the work on mobility has its roots in the networking tradition the class will include topics concerned with communication protocols, application support software, the unique characteristics of the wireless communication medium, security, location aware applications, algorithms for implementing basic system services. Language-related issues will be concerned with constructs, abstractions and software architectures that facilitate the movement of code mostly across existing wired networks. New models of concurrency and proof techniques will be discussed to better understand fundamental differences between distributed computing across a fixed graph structure and new paradigms in which components have a location attribute and may travel across a logical or physical space.

Syllabus

1. Introduction (1 week)

Class overview
Physical and logical mobility
Societal impact
Architectural styles: nomadic, ad hoc, sensor nets

2. Network Architecture (3 weeks)

Wireless technology
Localization
Routing protocols in ad hoc networks

3. Mobile Algorithms (3 weeks)

Message delivery
Termination detection
Group communication
Transactions

4. Middleware (6 weeks)

Logical mobility
Disconnected operation
Coordination
Service provision
Publish/subscribe
Sensor network middleware

5. Formal Models (1 week)

Mobile UNITY
Other models: Pi-calculus, Mobile Ambients, Join Calculus

6. Mobile Apps (1 week)

Software engineering perspective
Commercialization perspective