

## Localization in Wireless Networks

Positioning in radio networks is a well established research area. The dominating approach has been that positioning algorithms are implemented in the higher levels of the communication system based on position related information derived in the lowest (physical) layer. Examples of measurement include received signal strength (RSS), time of arrival (TOA), angle of arrival (AOA), and fusion and filtering is a straightforward task. The technical driver for positioning has been E911 and for commercial driver comes from location based services and logistics management. These demands are fundamental in the development of positioning in future radio networks standards. There is today a trend for accuracy demand that goes beyond what can be achieved with todays measurements. Another trend is that measurements and positioning algorithms are approaching each other, so some parts of the positioning are performed on the chip-sets (lowest layer) and low-level measurements are available to the operating system (highest level). The purpose of this survey is to describe this trend in more detail, with examples of developments in cellular networks as well as WiFi and Bluetooth.