

There are two main approaches for estimating a cooperative target location using signal propagation time between base stations at known positions and the target. In one approach, the base stations are synchronized and the location is obtained by one-way transmission from the target to the base stations, or by synchronized transmissions from the base stations to the target. In a second approach, the base stations are unsynchronized and the location is based on two-way transmissions between the target and the base stations. In this paper, we consider a third approach, in which two-way transmissions are used together with synchronized base stations. We develop a novel localization algorithm and analyze its performance. Obviously, base stations synchronization requires system resources, and two-way transmissions require additional resources with respect to one-way transmissions. This higher complexity may be justified by improved performance. Our analysis and simulations give insight into the performance advantage of two-way transmissions with synchronized base stations with respect to the other two approaches. It is shown that the performance advantage is significant only when the signal-to-noise ratio in the uplink and downlink differ, and also depends on the spatial topology of the target and the base stations as well as the uplink and downlink channels correlation.