Cameron Palmer
CSCE 5450 – September 17, 2007

Timing-sync Protocol for Sensor Networks

In the previous paper we read we about a time sync protocol called Reference Broadcast Synchronization (RBS). In this paper a new time sync protocol is presented called Timing-sync Protocol for Sensor Networks (TPSN). The protocol takes the work done on RBS and delivered a 2x better performance.

TPSN uses a sender-receiver synchronization, whereas the RBS protocol uses receiver-receiver synchronization. RBS introduced the idea of time stamping the packets at the MAC layer upon receipt. The TPSN protocol provides the time stamping at send. Through their proposed system they achieve an average accuracy of about 20 microseconds and a worst case of 50 microseconds.

For extreme power conscious applications they can use TPSN with the post-facto synchronization. This gives TPSN the ability to only synchronize time when an event of interest occurs rather than maintain time constantly. Some applications like those involving TDMA applications require a constant global time and TPSN is suitable for this as well.

TPSN is capable of self configuration which is one of its advantages over protocols like Network Time Protocol (NTP). The TPSN system has two distinct phases: Level Discovery, and Synchronization Phase.

The Level Discovery phase builds a hierarchy of nodes with a root node and then adds layers of nodes. These nodes then create pair-wise links and synchronization where each node most be able to communicate with at least one node below its own level. This method could be characterized as flooding, although I think the level discovery phase is better controlled than a pure flooding scenario.

They then use a method of combining and verifying the Sync pulse, Ack packet to generate a time stamp. This method of time stamping improves the quality of time synchronization over RBS.

To implement their idea they used Berkeley Motes and TinyOS.

It is hard to say too much about this paper because I have already read the Flooding Time Synchronization Protocol (FTSP) paper which further refines this work. This paper is well written, the work seems solid and clearly progresses beyond the previous papers work. I really liked their coverage of the issues about deterministic and non-deterministic portions of the network transmission.

Pros:

- More accurate than RBS
- Well written paper

Cons:

- Unconvinced that the model will behave well in a fluid configuration (moving around)
- Could use more experimental results