Notes from Problem Solving Presentations

May 5, 2005

The three teams proposed solutions to the problem. All solutions were made with three switches.

1 Presentation by Marc

Three bits that represent Intention, Intention Change, and Counting.

The algorithm involves on "leader cardinal" that manages the voting process. The algorithm iterates over N phases. Each phase corresponds to one of the cardinals, and in phase i each cardinal shows his intention to vote for cardinal i. Each vote is viewed by everyone, hence at the end of the phase, all cardinals know the number of votes received by each cardinal.

This point was later observed by Tom as a good security measure in order to prevent the leader from cheating.

2 Presentation by Alex

Also three bits: two bits used for synchronization, third bit used for sending a message. Implements a message passing primitive with synchronization. The algorithm also involves a "leader cardinal"

Expected runtime on bounded scheduler for this algorithm: $O(2nb\ lg\ n)$. An alternitive is offered that uses $n\ lg\ n + 2n + 2$ and uses $4b$ steps. Questions: is there a better solution in between?

3 Presentation by Wojciech

Again three bits. Main idea is to implement a four state message passing interface with two bits. The third bit is used to announce the end of first

phase (in which intentions are declared). This algorithm also involves a "leader cardinal"

Expected runtime on bounded scheduler for this algorithm: $O(2nb\ lg\ n)$. Also an alternative is offered that uses $2(1 + lg\ n)$ with runtime of $2nb$.

4 Tom's Remarks

In addition to formalizing what is required for this project, Tom made the following remarks:

- Can we prove that the problem cannot be solved in 2 bits?
- Can we formalize a "cheat-resistant" property for the protocol?
- How can we implement "cheat-resistance"?
- Can we do without a "leader cardinal"?