22C: 196: 001 Peer-to-peer Networks
Spring 2009, Assignment 3
50 points

Assigned April 21, 2009, Due April 28, 2009, in class

Please submit the answers in a typewritten form. Good documentation is essential.

Question 1. (25 points)

The Background

(BitTorrent News Release) You can now use a trackerless version of BitTorrent. This is important because if you own a website and you publish your latest video on it, you will pay for your popularity in bandwidth charges. But with BitTorrent, you can save on transfer fees. The earliest versions of BitTorrent required operators to follow a three-step process:

1. Create a ".torrent" file -- a summary of your file which you put on your website.
2. Create a "tracker" on your webserver so that your downloaders can find each other.
3. Create a "seed" so that your first downloader has a place to download from.

Now you can omit step 2. This means that anyone with a website and an Internet connection can host a BitTorrent download.

While it is called trackerless, in practice it makes every client a lightweight tracker. A clever protocol, allows clients to efficiently store and retrieve contact information for peers in a torrent. When generating a torrent, you can choose to utilize the trackerless system or a traditional dedicated tracker. A dedicated tracker allows you to collect statistics about downloads and gives you a measure of control over the reliability of downloads. The trackerless system makes no guarantees about reliability, but requires no resources of the publisher. The trackerless system is not consulted when downloading a traditionally tracked torrent.

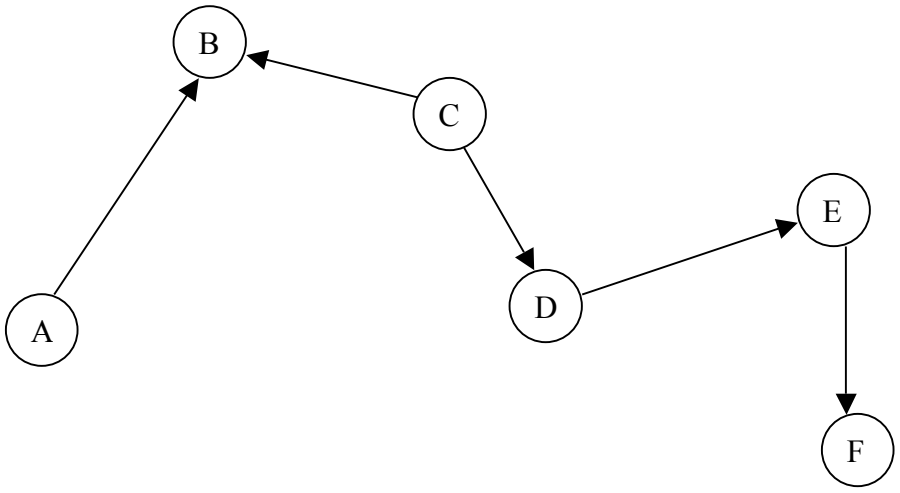
The Question

How can BitTorrent work without a designated tracker? Explore how this can be (or has been) implemented. This is an open-ended question – the more you can dig into it, the better will be the answer.

Question 2. (25 points)

Part 1. Recall the paper on Network Creation Game. Given that the cost of establishing a link = 3, which topology will reflect the *social optimum* for a system of six nodes?

Draw it, and compute the *social cost* (i.e. the total cost of all the nodes when the system is in the social optimum configuration). (Hint: You will find the answer within the first two pages of the paper).



Part 2. Starting from the designated configuration (here an edge from A to B implies that A paid for that link to B), describe a sequence of possible moves to reach Nash equilibrium. What is the Price of Anarchy for this system of six nodes? (You will need some trials and errors to figure this out).

Part 3. What lesson should we take home from this paper?