

Peer-to-Peer (p2p) Networks

- Overview
- BitTorrent
- Skype (separate slide set)

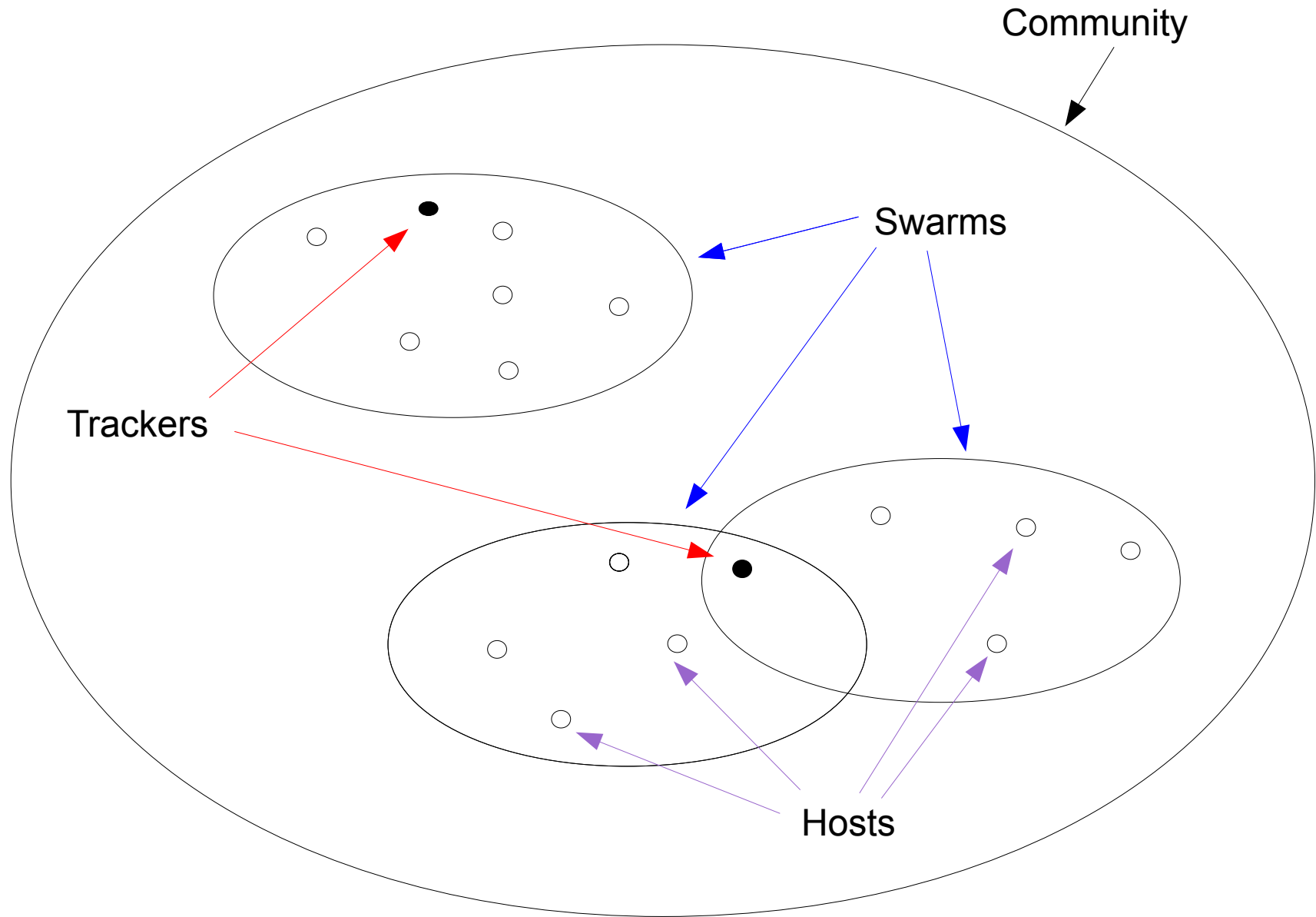
P2P Basics

- Peers cooperate to form an overlay network
 - At the *Application* layer
 - Using IP protocols to communicate (*network* layer)
- Their goal is to *share resources* between peers, e.g.
 - Storage (files or sets of files)
 - Transmission paths ('phone calls)
- They may have a shared directory system, e.g. using *distributed hash tables*
- We look at two examples
 - BitTorrent: file sharing
 - Skype: audio and video telephony

BitTorrent

- Shares files amongst *peers* that run implementations of the BitTorrent protocol (i.e. BitTorrent clients)
 - Files are broken into small pieces for transmission
 - The pieces can be downloaded in parallel from many peers
 - A peer that has the whole file is a *seed* peer
 - A *tracker* is a host that keeps track of other peers have that have pieces of one or more files
 - The peers a tracker is watching is called a *swarm*
 - *Communities* are based at sites that provide portals to one or more swarms

BitTorrent Universe



Sharing: 'tit-for-tat' principle

- A peer must share files with others so that it can go on downloading
 - Peers that don't are called leechers
 - Many client implementations try to enforce tit-for-tat, e.g. ranking peers by the amount they share
 - Ranking can be unfair to new users. Clients can be given some credit to get them started. That's called *opportunistic unchoking*

To share a file or set of files ...

- A user creates a *.torrent file* and makes it public
- A .torrent file contains
 - A unique identifier
 - Names and sizes of files to be shared
 - Piece hashing information
 - Each piece carries a cryptographic hash to protect its integrity
 - Address of one or more trackers
- The torrent is advertised on a community – usually via a web site

BitTorrent Summary

- Very widely used, e.g. for distributing software releases
- Many different clients available
 - Many use TCP
 - μ Torrent uses UDP, and does its own congestion management
- Allows users to download large files faster than would be possible from a single server
- Should help ISPs by reducing the size of servers and amount of download bandwidth, but ..
- Means that ISPs need to provide symmetric link capacities