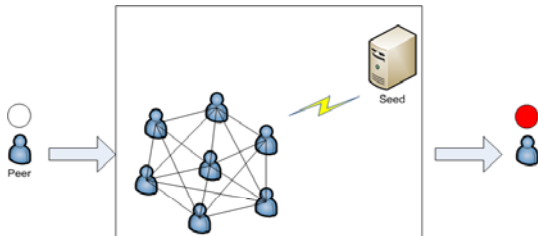


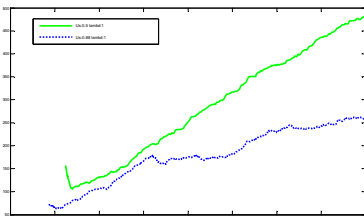
Problems



What is the affect of peer arrival and peer departure to the system behavior?

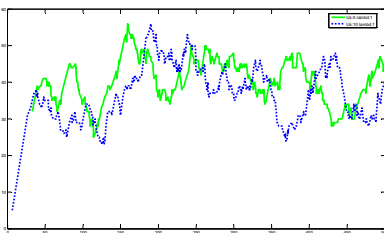
Stability Condition 1

seed rate (U_s) < arrival rate (λ): system is transient.

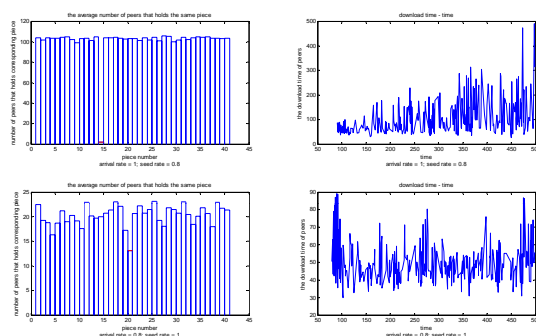


Stability Condition 2 (conjecture)

seed rate (U_s) > arrival rate (λ), system is positive recurrent.



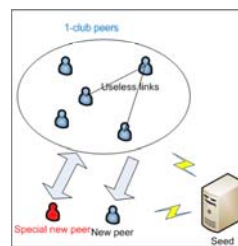
Simulation result



Model

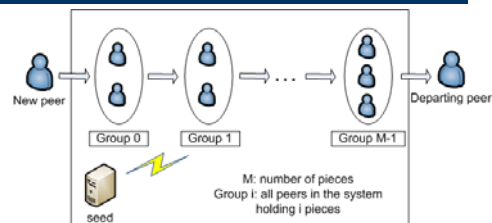
- File distribute: mesh-push
- There is one seed staying in the system
- New peer arrival: Poisson
- Peer departure: ASAP
- Seed and peer fan-out: 1
- Selection strategy: random peer, random useful piece
- Piece transmitting: independent exponential distribution

Piece distribution of condition 1



- Most of the peers are just missing one particular piece, say piece 1 (1-club)
- peers in 1-club:
 1. Departure rate $\approx U_s$
 2. Arrival rate $\approx \lambda$
 3. the number of 1-club peers will go to infinity with probability 1.

Piece distribution of condition 2 (conjecture)



- Group M-1 will eventually become the largest group in finite time
- Transmission rate between group M-1 and other groups will be eventually larger than $M\lambda$.

Conclusions

- A P2P file transferring system can be modeled as a Markov queue.
- The values of seed rate and arrival rate determines the stability of the Markov queue
- There is great relevance on piece distribution among different peers
- When seed rate < arrival rate, peers is likely to form "1-club group"