

Chitchat on BT-like Incentives

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outline

- BT-like incentives
- IPD model
- What are good-scoring strategies like?
- Pitfalls of BT-like Tit-For-Tat
- Robust incentives
- References

BT-like Incentives

- Tit-For-Tat (TFT)
 - An agent using this strategy will initially cooperate, then respond in kind to an opponent's previous action

-wiki



BT-like Incentives

- **Conflict**
 - Eagerness to download
 - unwillingness to upload
- **Incentives**
 - Choking
 - Optimistic unchoking

BT-like Incentives

- **Choking Algorithm**
 - A temporary refusal to upload
 - Strategies for peers disallowing downloading from them
1. **Unchokes a fixed number of other peers (default 4)**
 2. **Based on the current download rate**
 3. **Calculate every 10 seconds**

BT-like Incentives

- **Optimistic Unchoking**
 - Unchoke those peers regardless of the current download rates from them
 - Willingness to cooperate
 - Find better links
1. Select one choked peer to choke
 2. Round-robin
 3. Unchoke for 30 seconds

IPD model

	Cooperate	Defect
Cooperate	R, R	S, T
Defect	T, S	P, P

$$\begin{aligned} R &= d - u, \\ T &= d, \\ S &= -u, \\ P &= 0 \end{aligned}$$

$$\begin{aligned} (1) \quad & T > R > P > S \\ (2) \quad & 2R > S + T \end{aligned}$$



$$d > u$$

It holds

IPD model

- **Cooperation or Not?**
 - Solicits submissions of computer program
 - Two round-robin tournaments with 14 entries and 62 entries

- TFT cannot defeat any single opponent

- TFT is **winner**



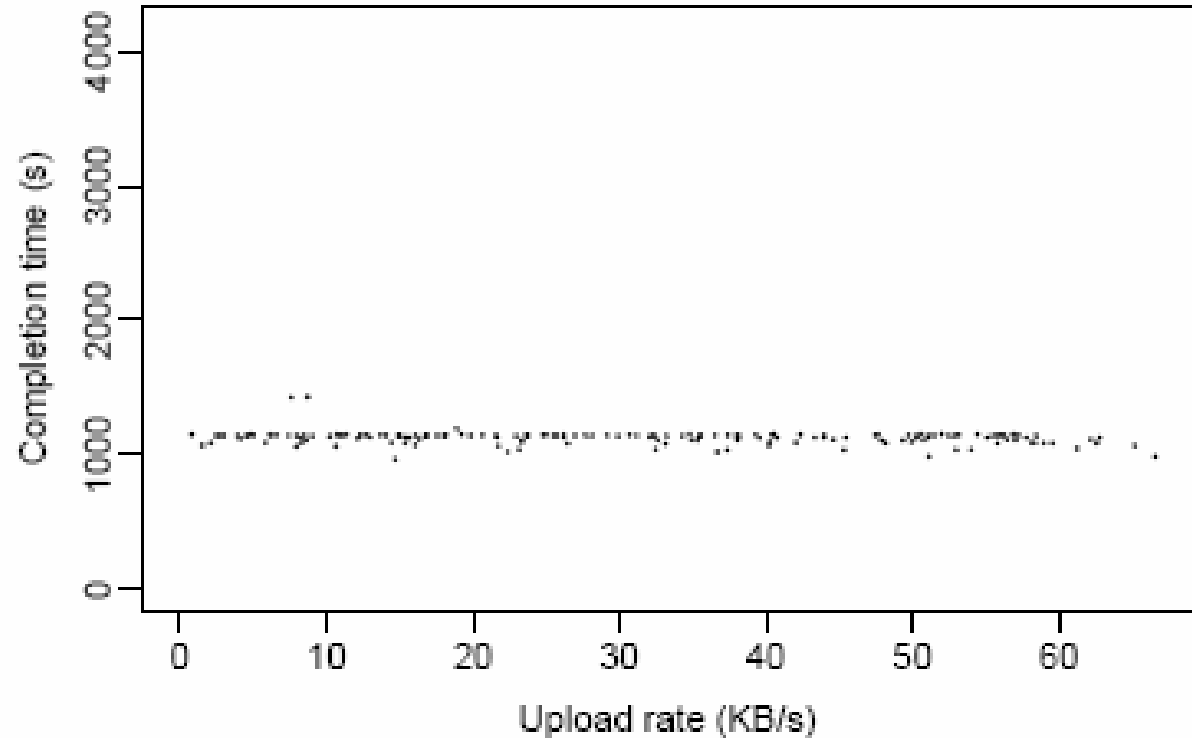
Robert Axelrod
"The Evolution of Cooperation"
Basic Books, 1984

What are good-scoring strategies like?

- Common properties
 - Nice
 - Retaliatory
 - Forgiving
 - Clear behaviors

Pitfalls of BT-like Tit-For-Tat

- Reward
- Punishment
- Seed
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Pitfalls of BT-like Tit-For-Tat

- Fail to meet the “properties”
 - Defects first (not nice)
 - Unchoking (not retaliatory)

1. Nice
2. Retaliatory
3. Forgiving
4. Clear behaviour

Robust incentives

- "Robust"?
 - Selfish clients
 - Malicious clients
- *Design Overview*
 - Credit-based (virtual money)
 - Trade content for credits

Robust incentives

- *Challenges*

- Client cheating
- Keep processing and bandwidth costs low

Cryptographic Fair Exchange Mechanism

Trusted 3rd Party

Robust incentives

Encrypted

A

B



Proof!

A uploads something to B

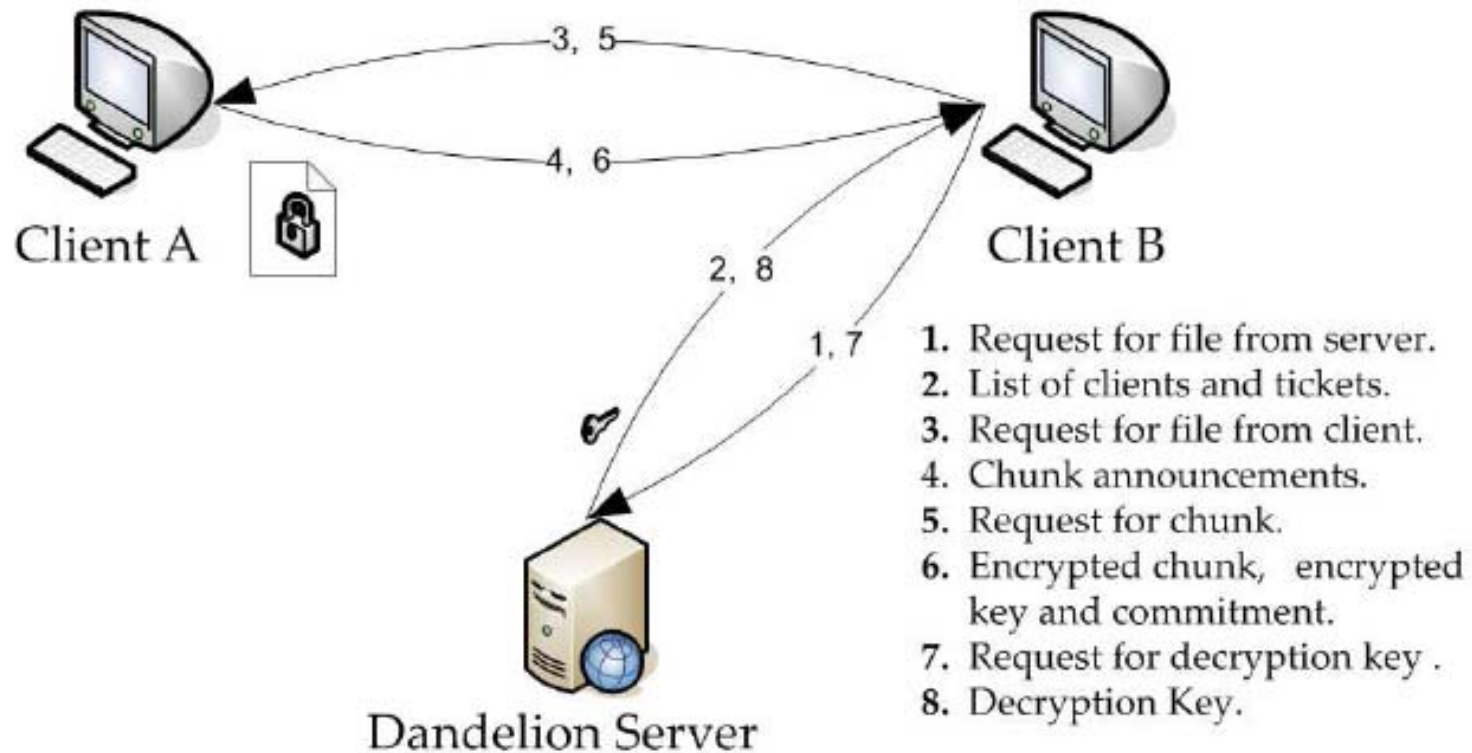


3rd Party

What if A or
B cheats

?

Robust incentives



Robust incentives

- **Strengthens**
 - Robust
 - Discouraging unauthorized sharing
 - Encouraging seeds
- **Weakness**
 - Not scalable than BT
 - Overheads

References

- [1] Seung Jun, Mustaque Ahamad, *Incentives in BitTorrent Induce Free Riding*, SIGCOMM'05 workshops, August 22-26, 2005
- [2] Michael Sirivianos et al., *Dandelion: Cooperative Content Distribution with Robust Incentives*, in Proc. UseNix, Jun. 2007, Article No. 12.
- [3] Michael Sirivianos et al., *Robust and Efficient Incentives for Cooperative Content Distribution*, IEEE/ACM TRANSACTIONS ON NETWORKING, VOL.17, NO.6, DECEMBER 2009.

Thank You!