

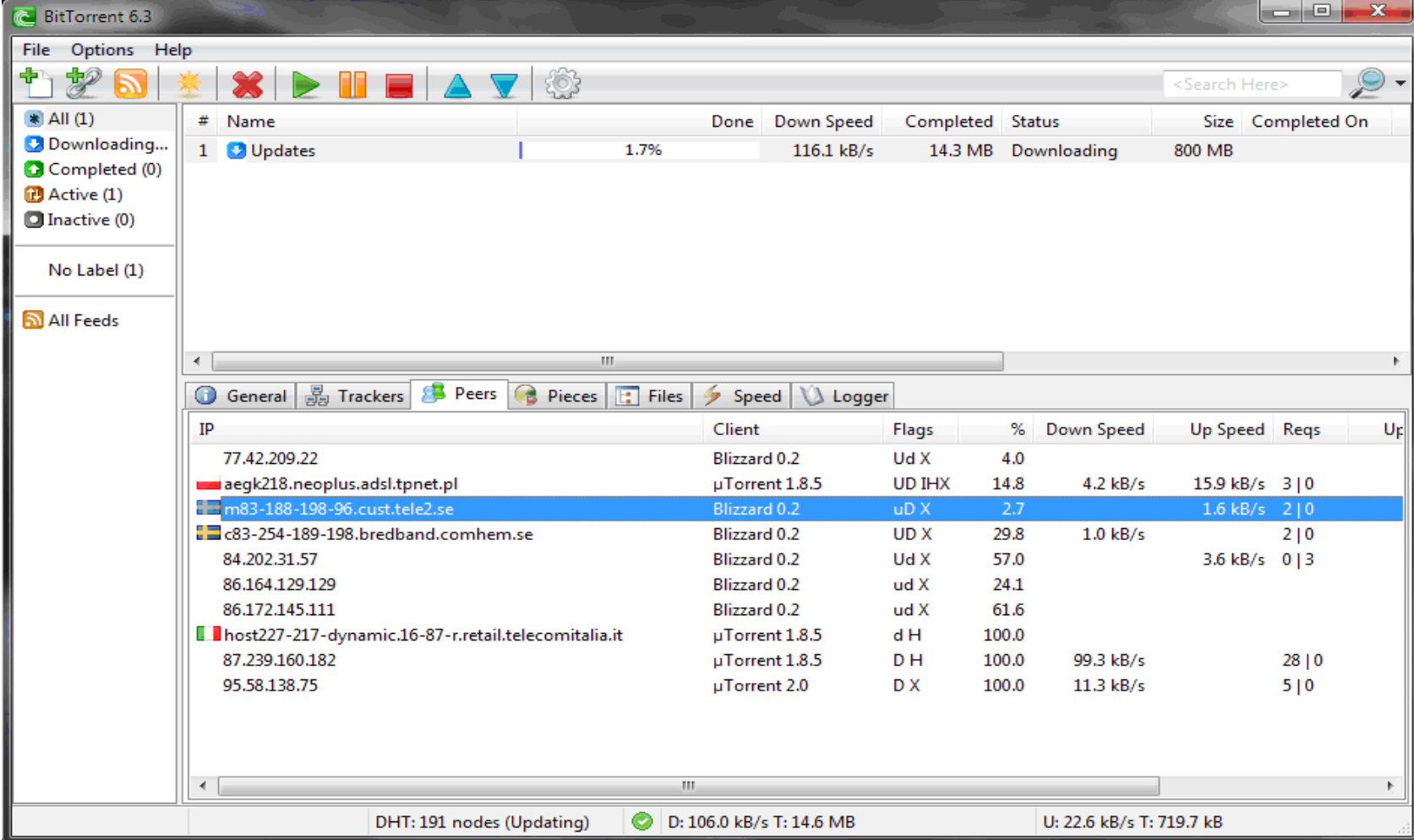
Auction-based Model of BitTorrent

Seminar in Distributed Computing 2010

ETH Zurich

Yu Li

What is BitTorrent




The screenshot displays the BitTorrent 6.3 application window. The main interface shows a download progress bar for a file named "Updates" which is 1.7% complete, with a download speed of 116.1 kB/s and a total size of 800 MB. The status is "Downloading".

Below the progress bar, the "Peers" tab is selected, showing a list of active peers. The table below contains the data from this tab:

IP	Client	Flags	%	Down Speed	Up Speed	Reqs	Up
77.42.209.22	Blizzard 0.2	Ud X	4.0				
aegk218.neoplus.adsl.tpnet.pl	µTorrent 1.8.5	UD IHX	14.8	4.2 kB/s	15.9 kB/s	3 0	
m83-188-198-96.cust.tele2.se	Blizzard 0.2	uD X	2.7		1.6 kB/s	2 0	
c83-254-189-198.bredband.comhem.se	Blizzard 0.2	UD X	29.8	1.0 kB/s		2 0	
84.202.31.57	Blizzard 0.2	Ud X	57.0		3.6 kB/s	0 3	
86.164.129.129	Blizzard 0.2	ud X	24.1				
86.172.145.111	Blizzard 0.2	ud X	61.6				
host227-217-dynamic.16-87-r.retail.telecomitalia.it	µTorrent 1.8.5	d H	100.0				
87.239.160.182	µTorrent 1.8.5	D H	100.0	99.3 kB/s		28 0	
95.58.138.75	µTorrent 2.0	D X	100.0	11.3 kB/s		5 0	

At the bottom of the window, the status bar shows: DHT: 191 nodes (Updating), D: 106.0 kB/s T: 14.6 MB, U: 22.6 kB/s T: 719.7 kB.

How to download using BitTorrent

 AVATAR


AVATAR Torrents Search Results

AVATAR RSS

Name	Category	Size	C	S	L
Avatar (2010 Movie) DVDRip XviD-JUMANJI	Movies	714.1 MB	0	58423	56586
Avatar (2009 Movie) DVDRip XviD-UNIVERS	Movies		0	6538	35432
Avatar 2009 DVDRip MAXSPEED	Movies		0	379	145
Avatar (2009) PROPER DVDSR XviD-MAXSPEED	Movies	1.4 GB	4	4430	2100
Avatar CamRipXviD	Movies	713.7 MB	0	3310	73
Avatar 2009 DVDSr H264 AAC-SecretMyth (Kingdom-Release)	Movies	2.1 GB	0	3288	2720
Avatar DVDRipXviD	Movies	718.7 MB	0	3269	164
Avatar (2009(Eng)DVDRip XviD)	Movies	1.3 GB	0	3211	123
Avatar DVDRip XviD	Movies	710.7 MB	0	3156	113

Avatar (2010 Movie) DVDRip [Full Movie] XviD-JUMANJI

Size	714.1 MB in files
Added	14-03-2010
Status	58423 seeds ↑ 56586 leechers ↓

 **Download Torrent**
Avatar (2010 Movie) DVDRip [Full Movie] XviD-JUMANJI.torrent

STEP 1: Select Torrent File

STEP 2: Download Torrent

How to download using BitTorrent

The image shows two overlapping windows from the BitTorrent 6.4 application. The top window is the 'Save As' dialog for a torrent file. The file name is 'Avatar (2010 Movie) DVDRip [Full Movie] XviD-JUMANJI'. The save location is 'Downloads\Avatar (2010 Movie) DVDRip [Full Movie] XviD-JUMANJI'. The 'Start torrent' checkbox is checked. The 'Torrent Contents' section shows the file 'Avatar (2010) DVDRip XviD-JUMANJI.rar' with a size of 714 MB. A yellow box with the text 'STEP 3: Configuration' is overlaid on this window, with a red arrow pointing to the 'Start torrent' checkbox.

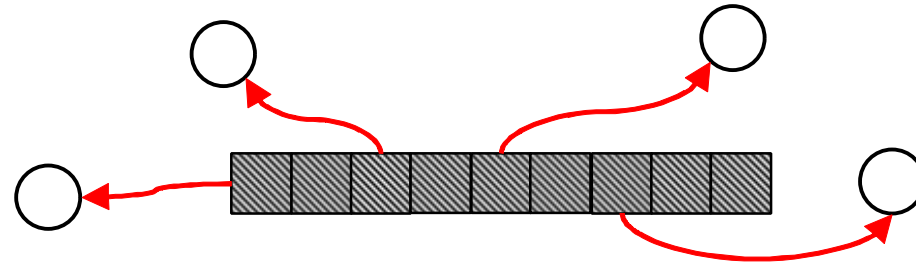
The bottom window is the main BitTorrent 6.4 interface. The 'Name' column of the torrent list shows 'Avatar (2010 Movie) DVDRip [Full Movie] XviD-JUMANJI' with a download icon. The 'Size' column shows '714 MB' and the 'Done' column shows '0.6%'. A yellow box with the text 'STEP 4: Download File' is overlaid on this window, with a red arrow pointing to the download icon in the torrent list.

Name	#	Size	Done
Avatar (2010 Movie) DVDRip [Full Movie] XviD-JUMANJI	1	714 MB	0.6%

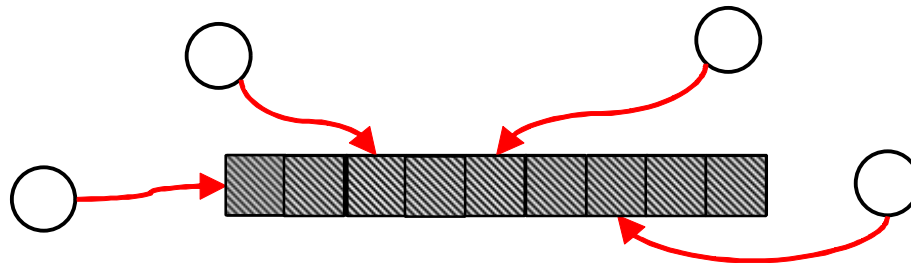
Downloading procedure

- Individuals View

- Seed



- Leecher

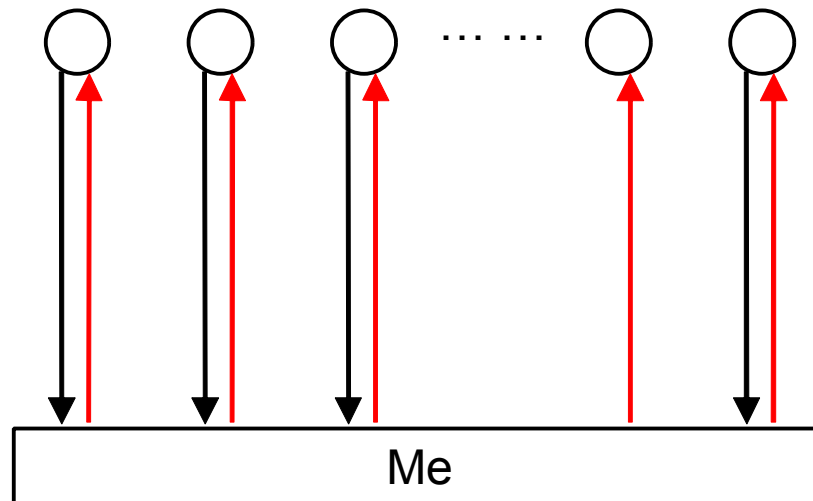


A screenshot of a BitTorrent client interface. The top menu bar includes 'General', 'Trackers', 'Peers', 'Pieces', 'Files', 'Speed', and 'Logger'. Below the menu, there are two progress bars: 'Downloaded:' (highlighted with a red box) and 'Availability:'. The 'Downloaded:' bar shows a blue progress bar that is nearly full. Below the progress bars, there is a 'Transfer' section with the following statistics:

Transfer			
Time Elapsed:	1h 10m	Remaining:	∞
Downloaded:	179 MB	Uploaded:	115 MB
Download Speed:	0.0 kB/s (avg. 43.6 kB/s)	Upload Speed:	0.0 kB/s (avg. 28.0 kB/s)

Downloading procedure

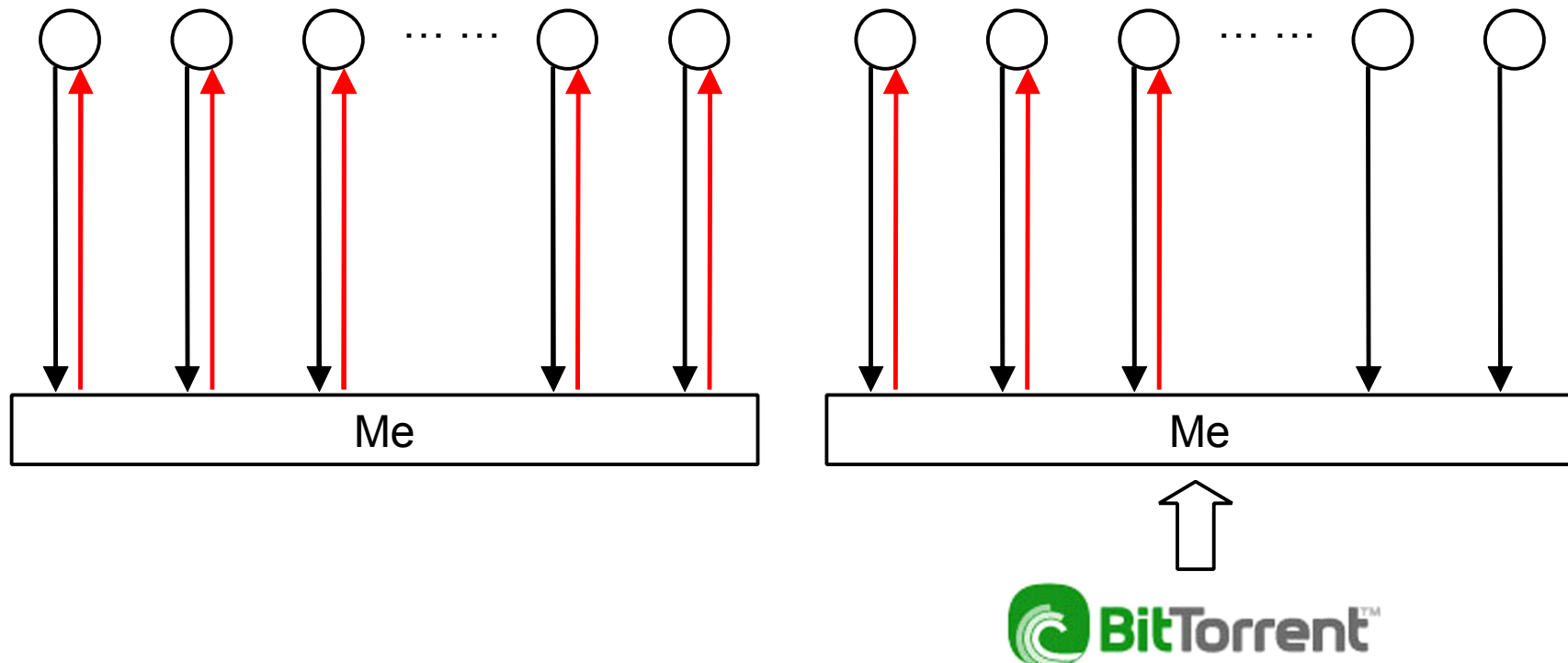
- System View
 - I upload and download at the same time



Auction-based Model

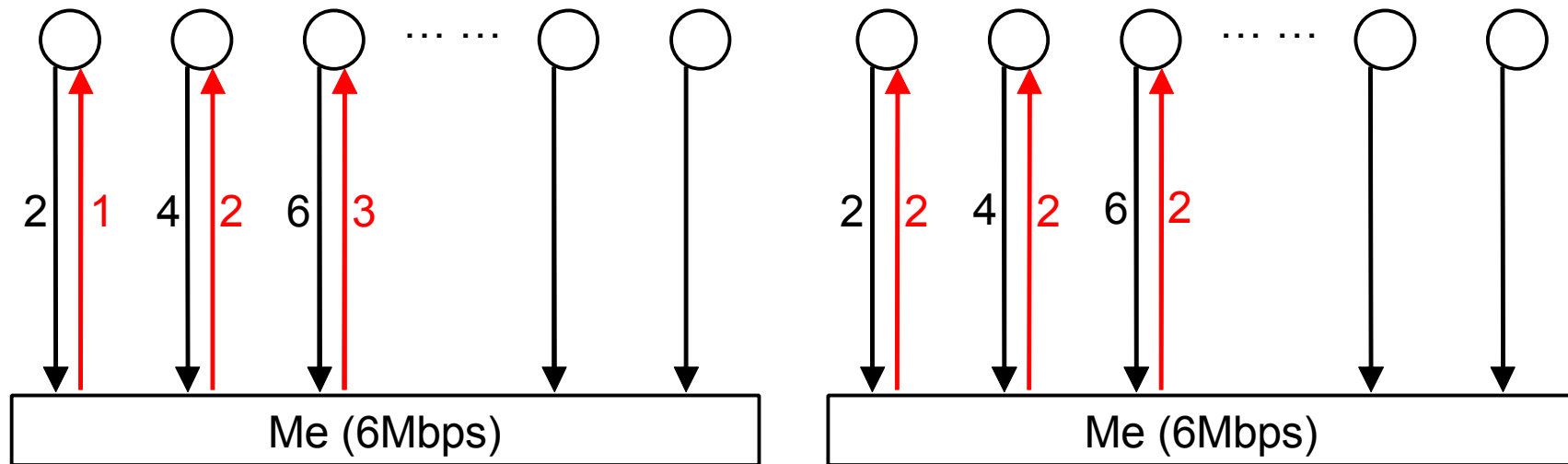
[D. Levin, K. LaCurts, 2008] "BitTorrent is an Auction:
Analyzing and Improving BitTorrent's Incentives"

(Q1) Do I upload to everyone?



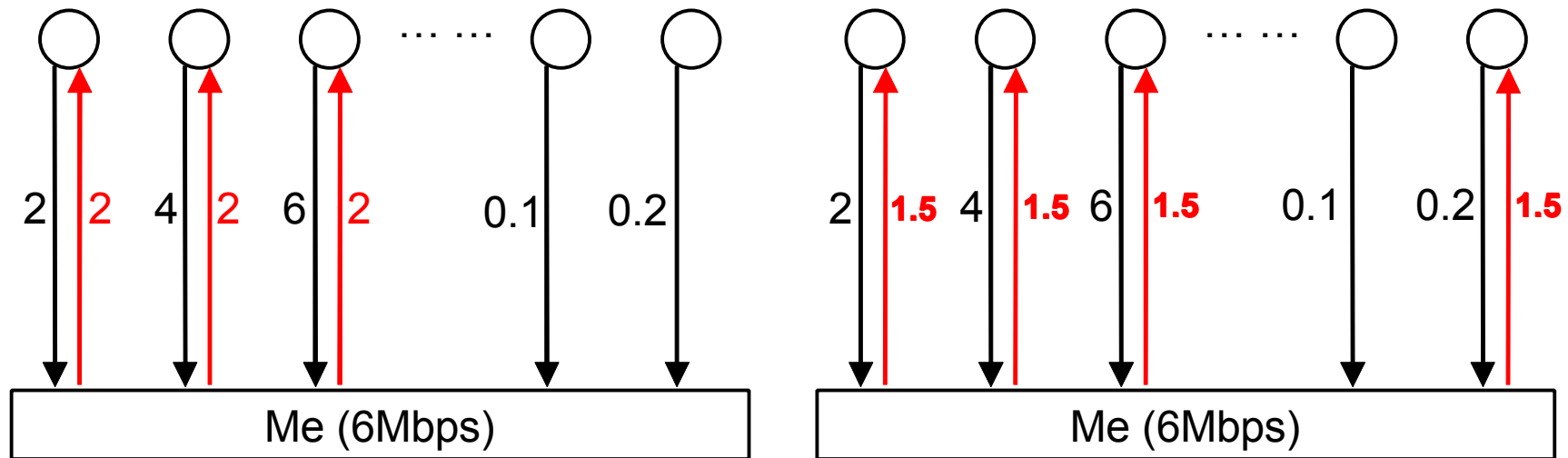
Auction-based Model

(Q2) Do I treat every peer equally?



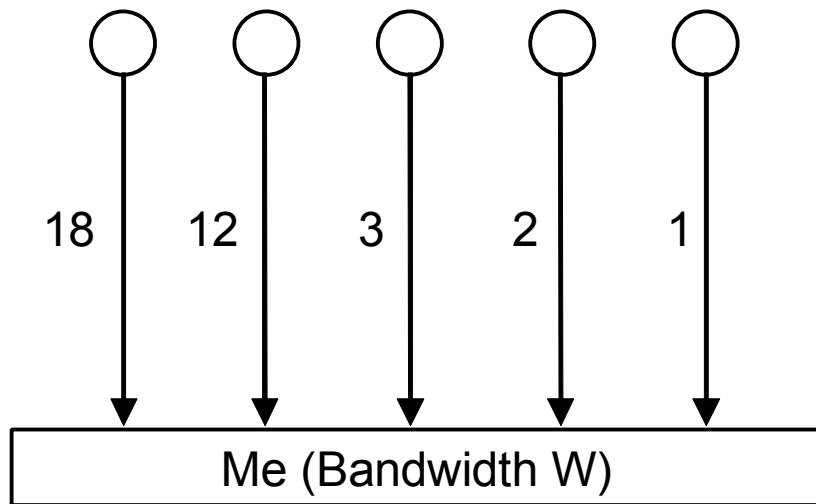
Auction-based Model

(Q3) Do I ignore others?

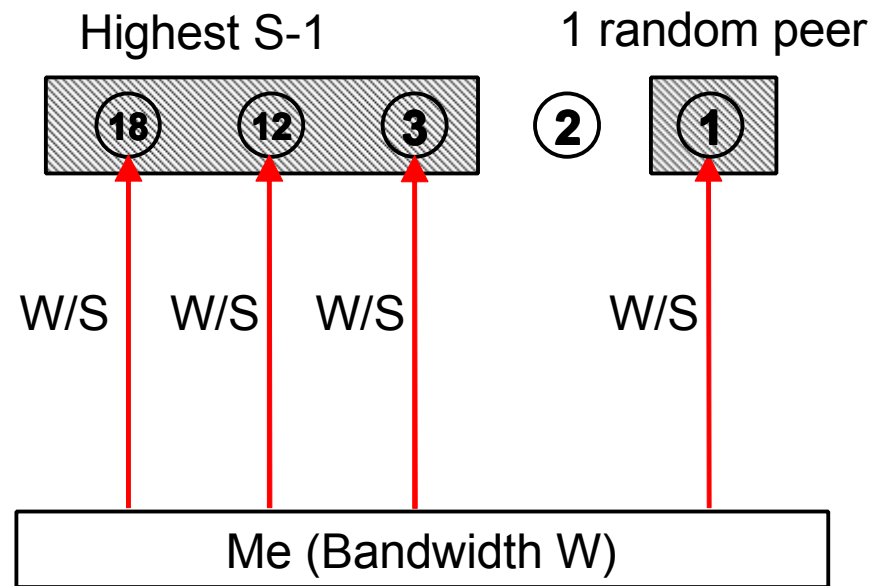


Auction-based Model

- Bids are uploads of round $n-1$
- Auction clearing



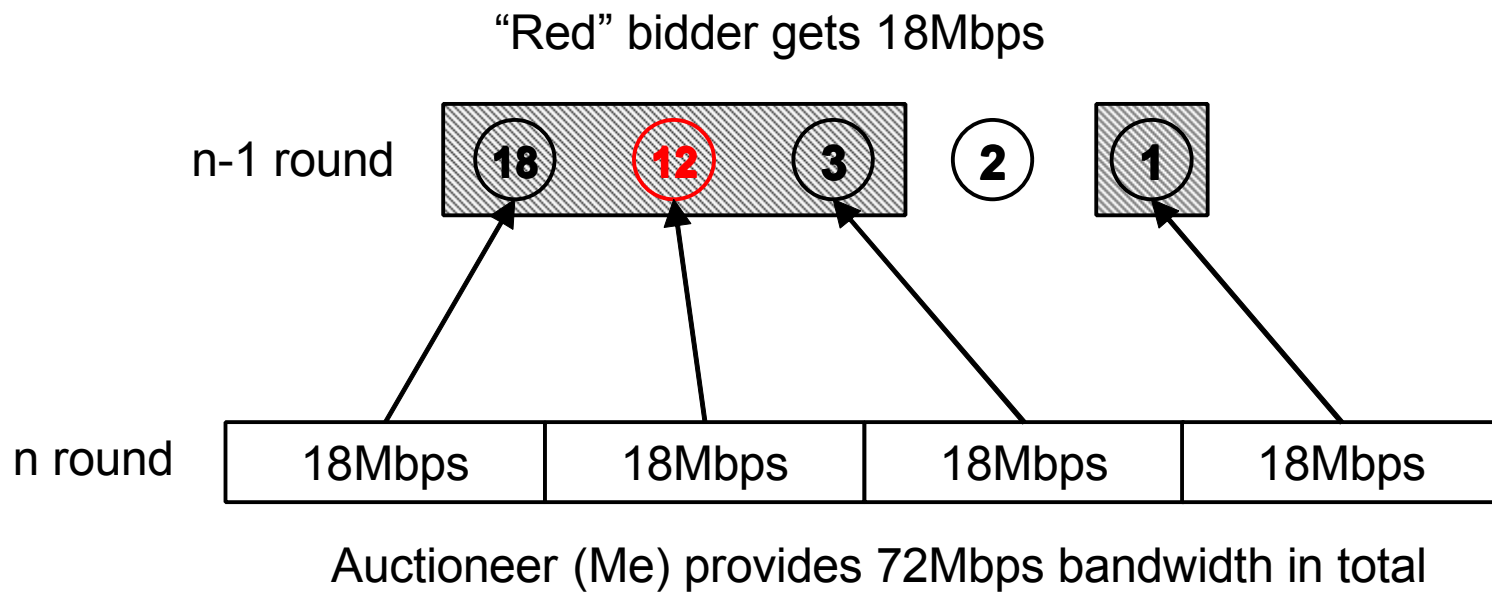
Round $n-1$



Round n
Select S peers ($S=4$)

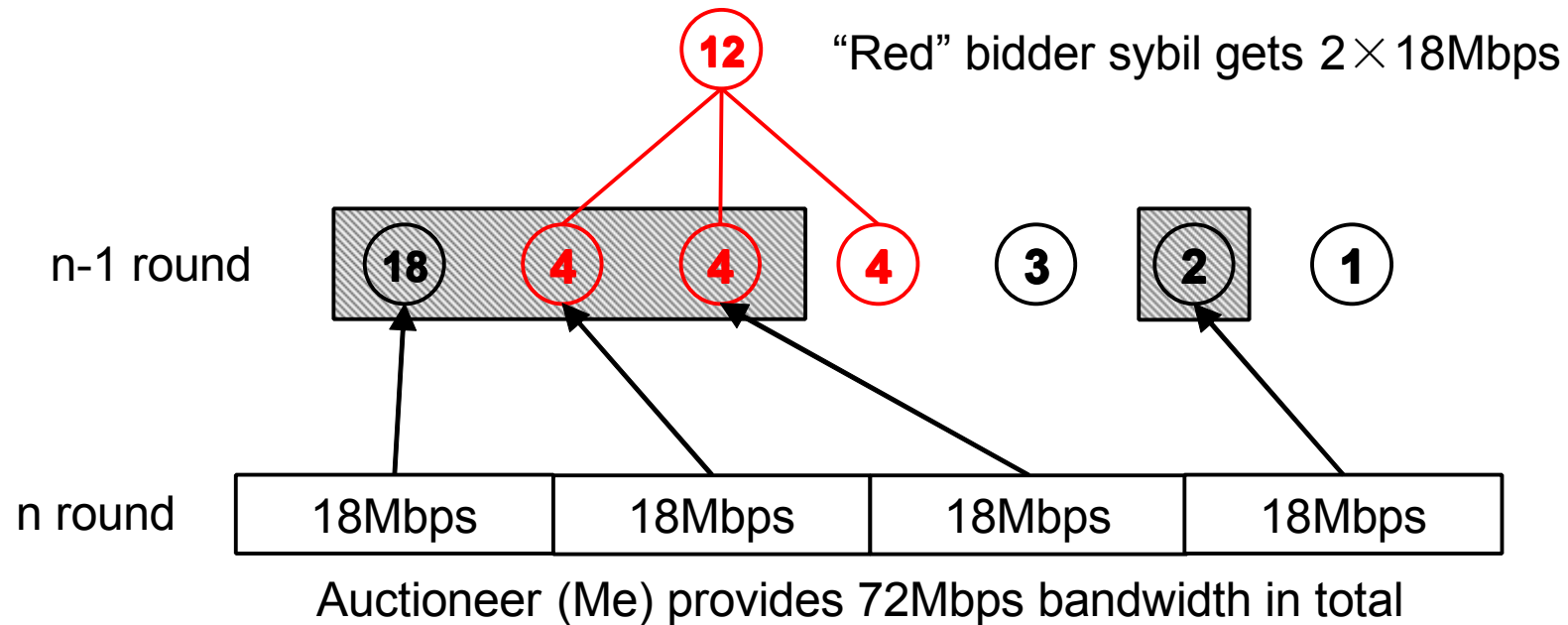
Sybil Attack

- Normal Bidder



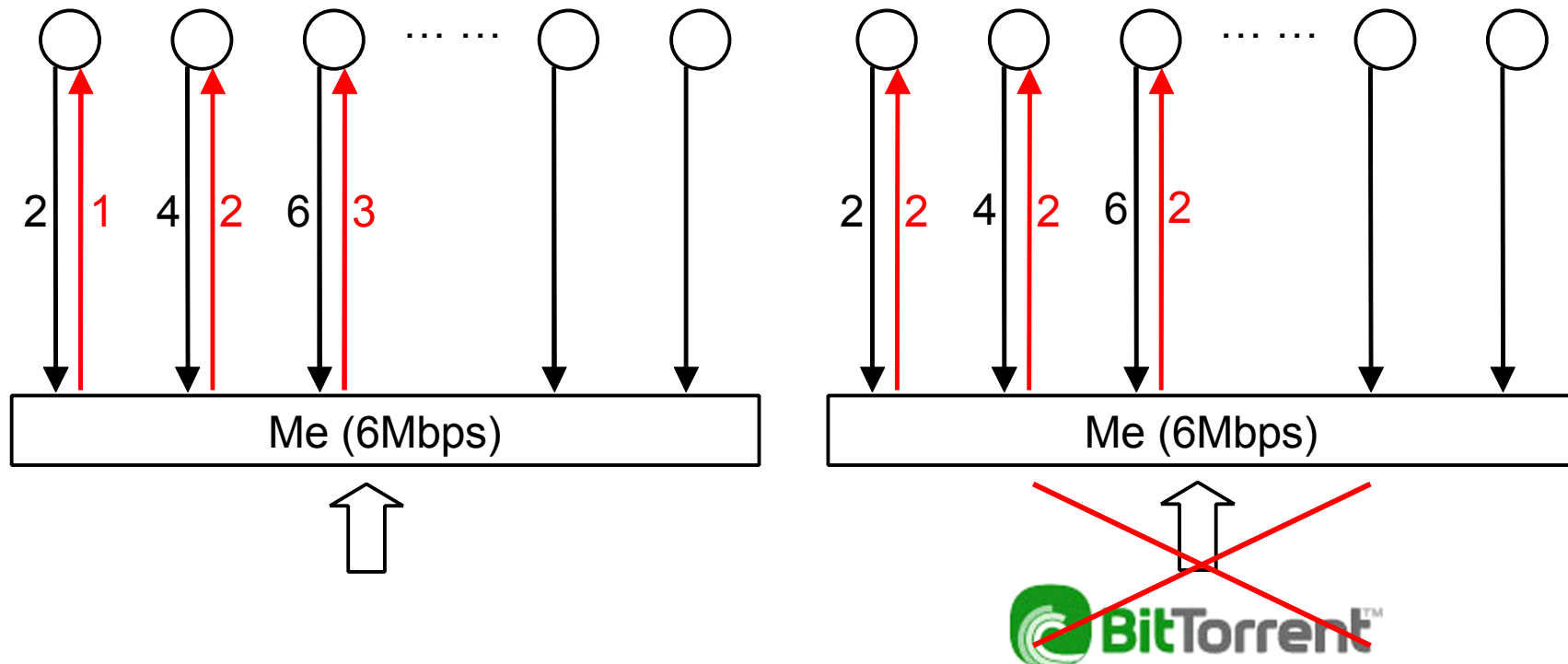
Sybil Attack

- Selfish Bidder



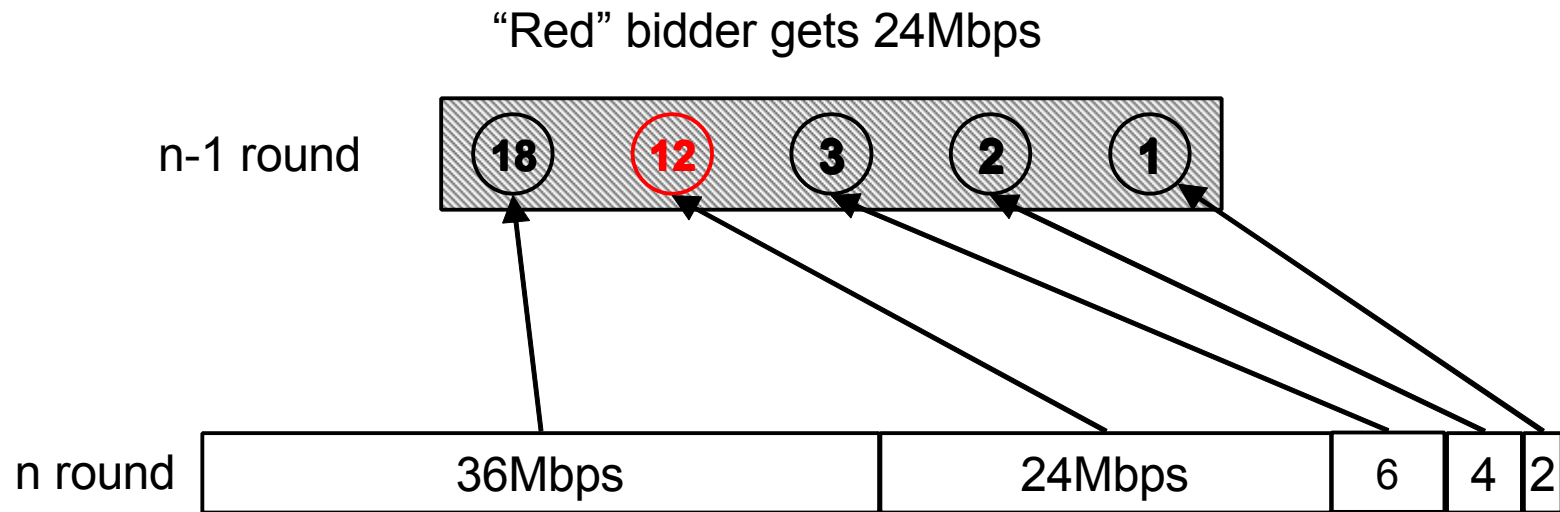
Review of Question 2

- (Q2) Do I treat every peer equally?



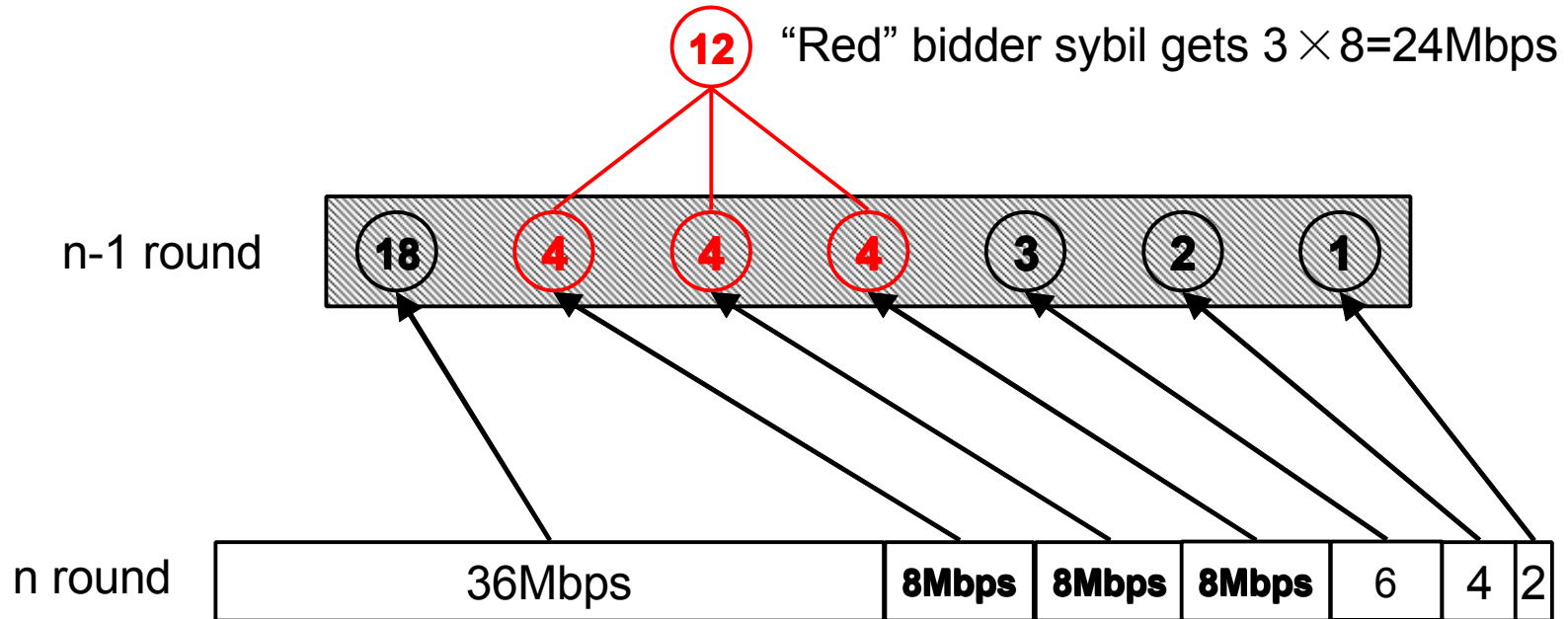
Countermeasure: Proportional share auction

- Proportional share



Countermeasure: Proportional share auction

- Sybil attack resilient



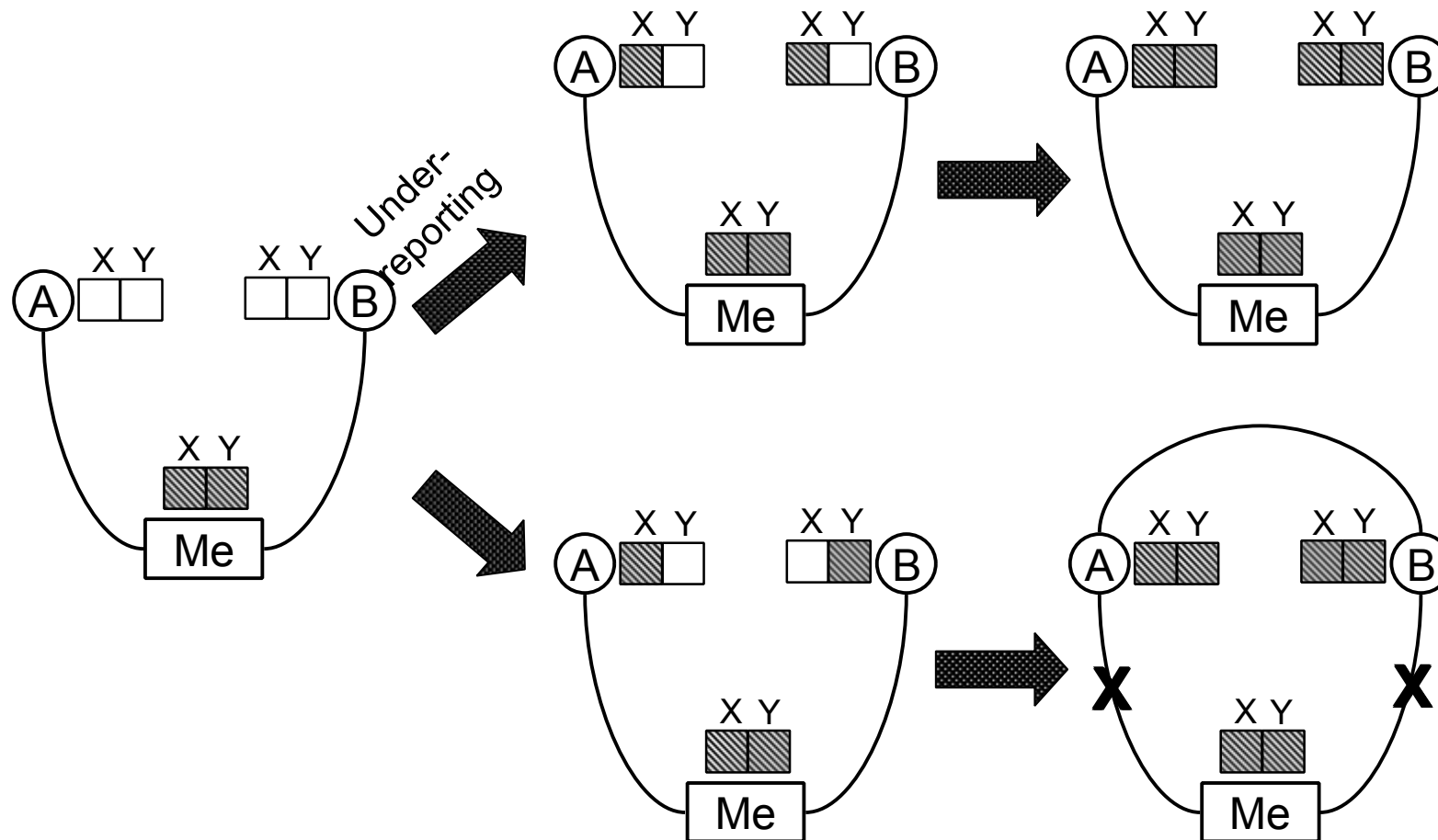
Comparison of Auction-based & Propshare

- Propshare is Sybil proof

	Normal client	Selfish client (using sybil)
Standard Bittorrent	18 Mbps	2×18 Mbps
Propshare	24 Mbps	24 Mbps

Under-reporting

- Which one is better for me?

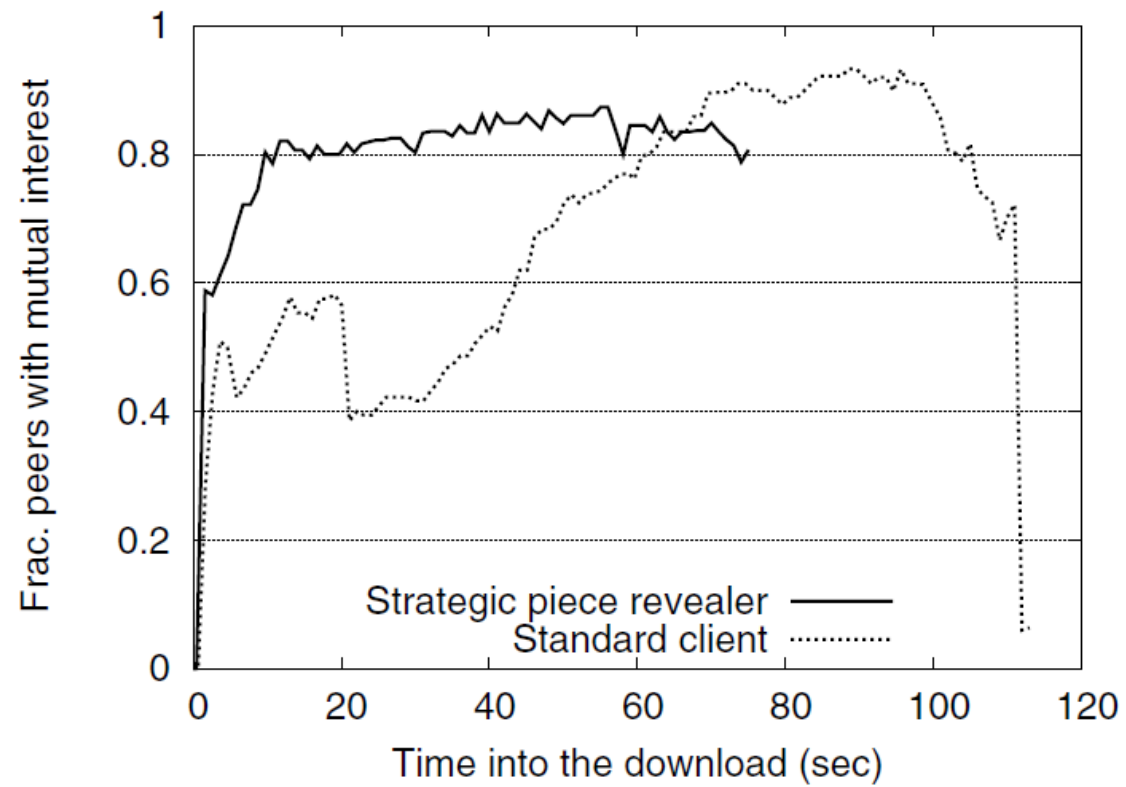


Under-reporting

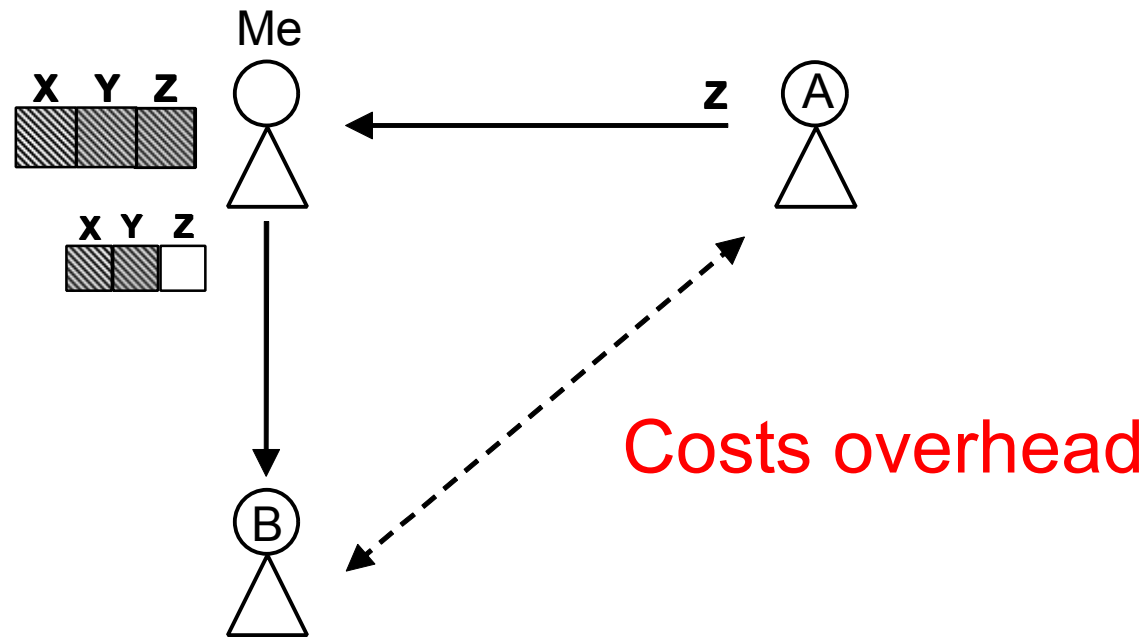
- Under-reporting algorithm
 - Run algr. when peer is about to lose interest.
 - Determine the most common piece among available



Under-reporting



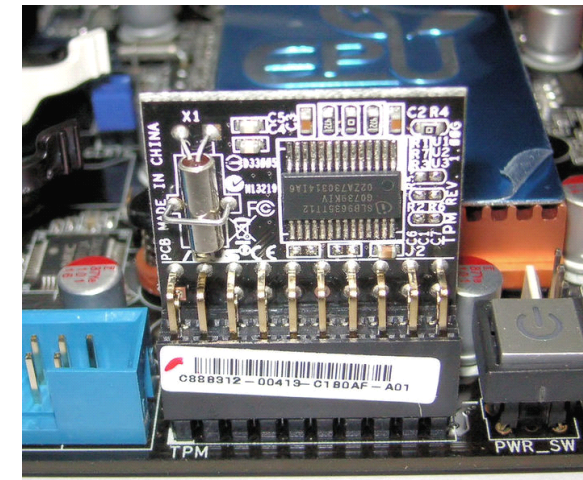
Countermeasure: Gossiping



Countermeasure: TrInc

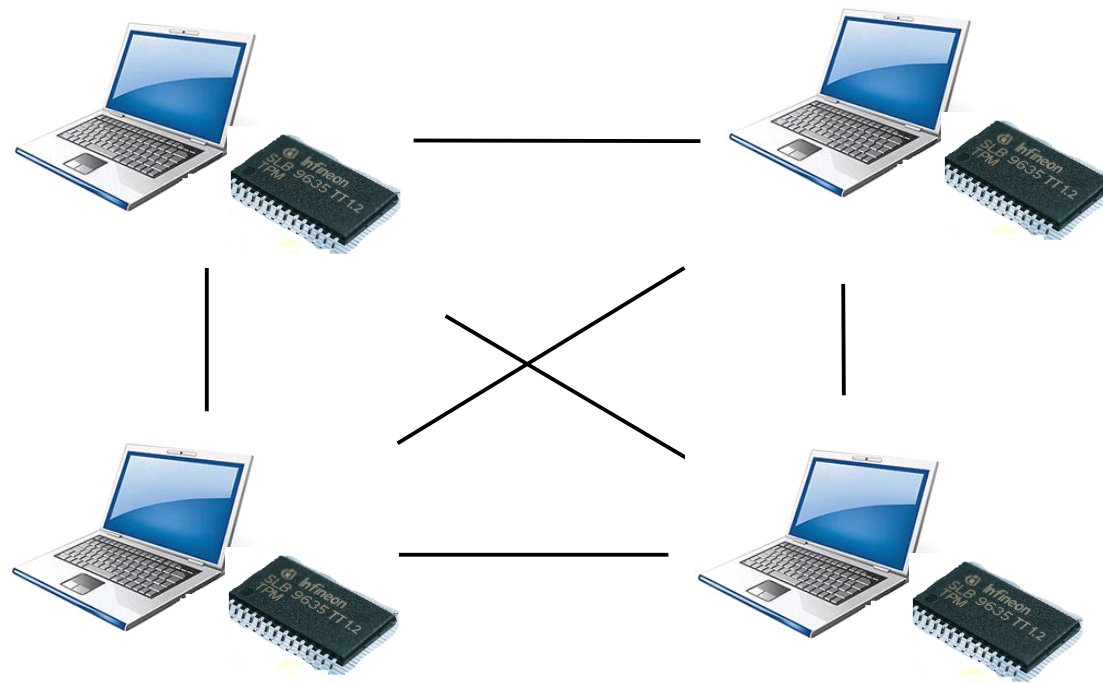
[D.Levin, J.R. Douceur 2009] "TrInc: Small Trusted Hardware for Large Distributed Systems"

- TrInc (Trusted Incrementer)
 - Prevents lying
 - Decreases overhead
- TPM (Trusted Platform Module) by Intel



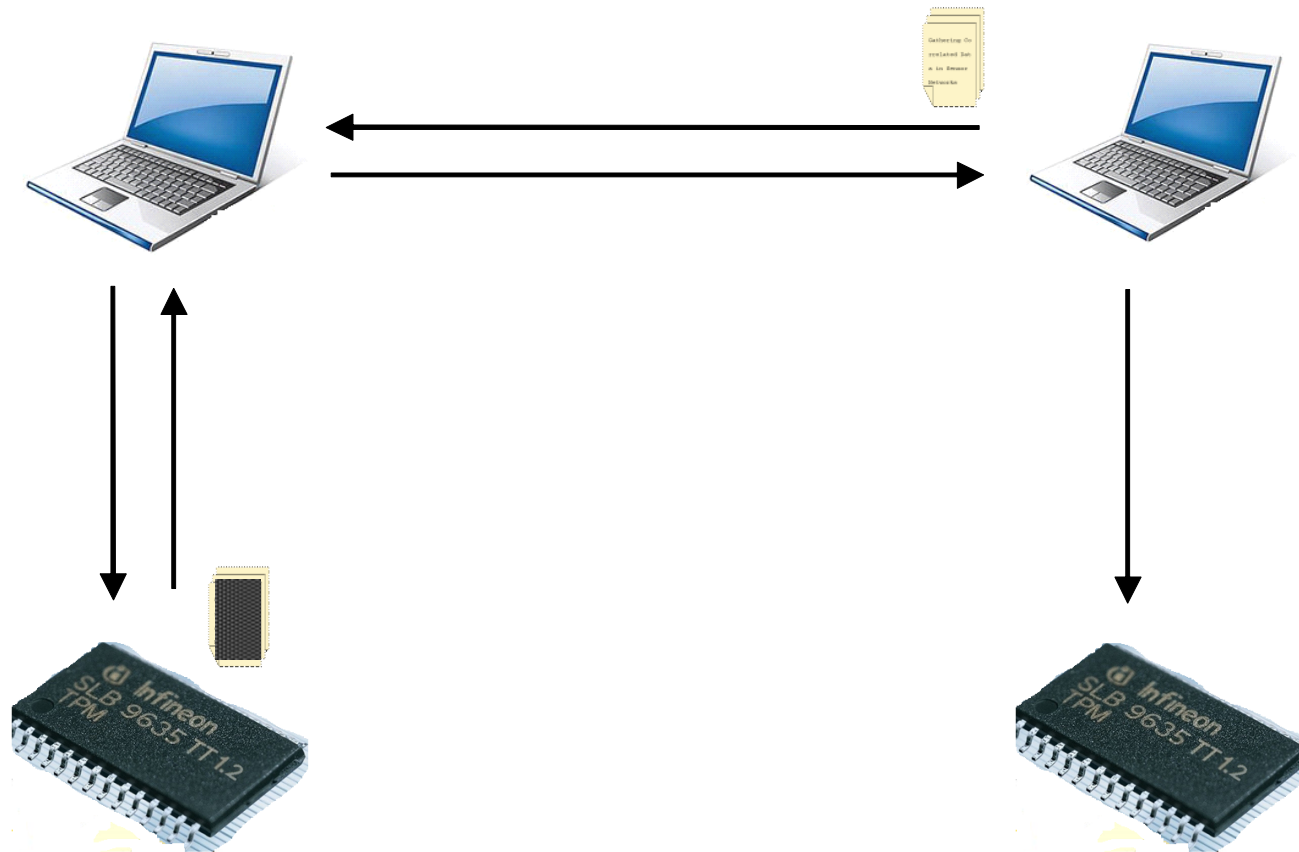
Countermeasure: TrInc

- System equipped with TrInc



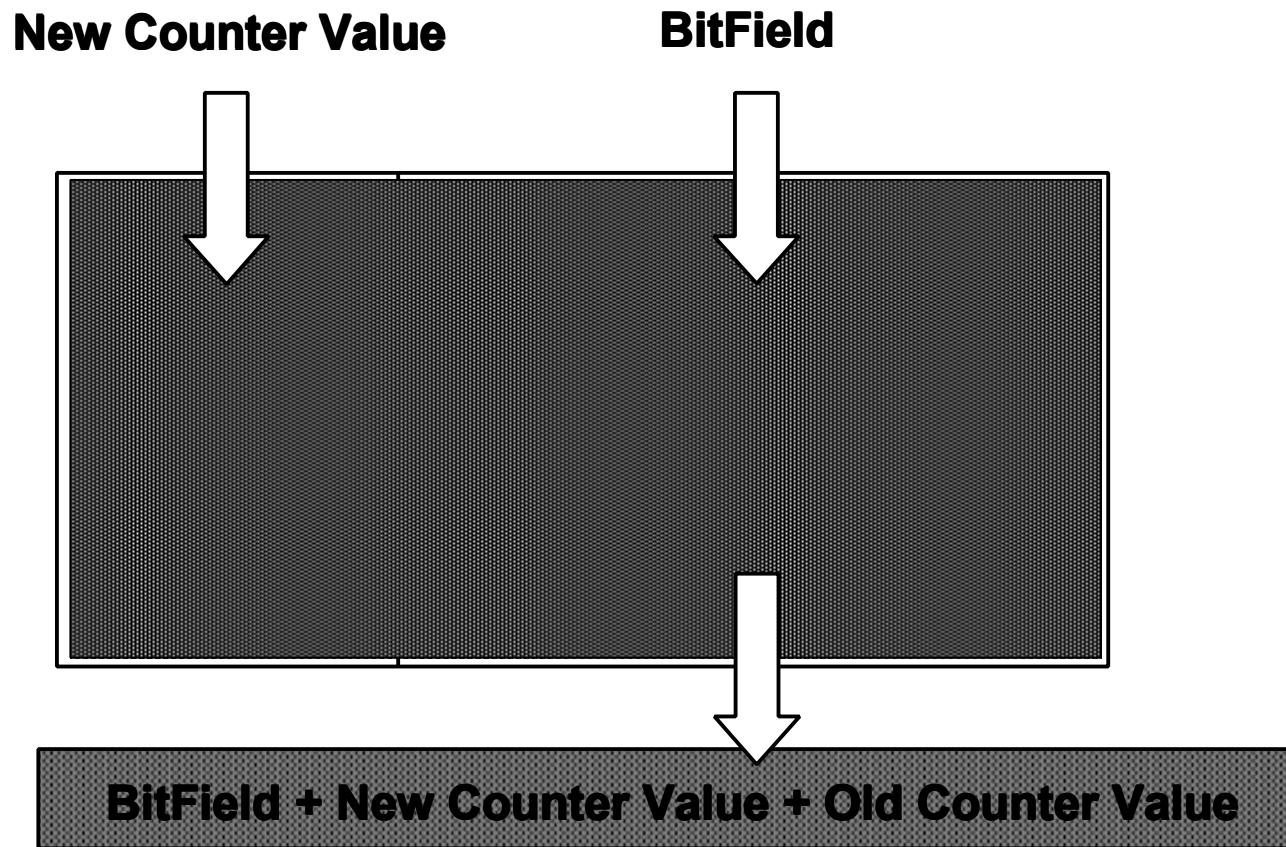
Countermeasure: TrInc

- Individual equipped with TrInc



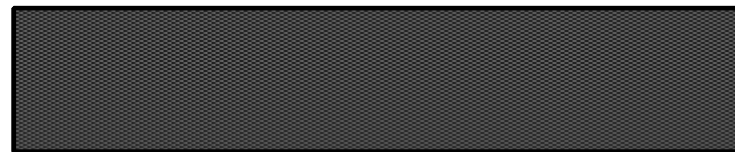
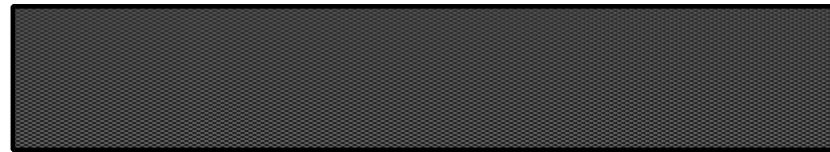
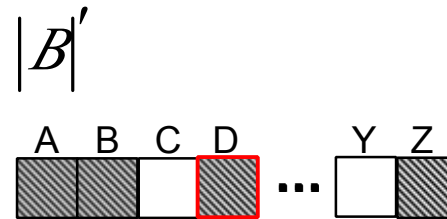
Countermeasure: TrInc

- How does TrInc work?

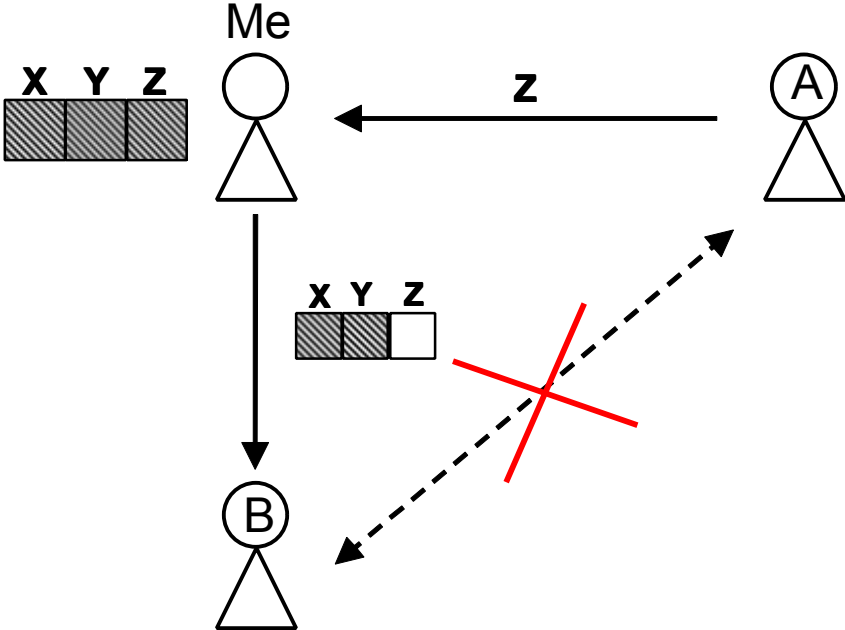


Countermeasure: TrInc

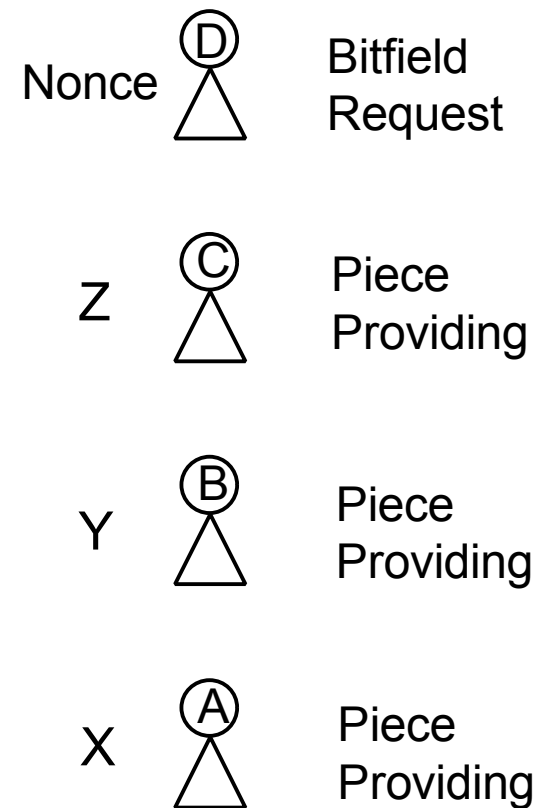
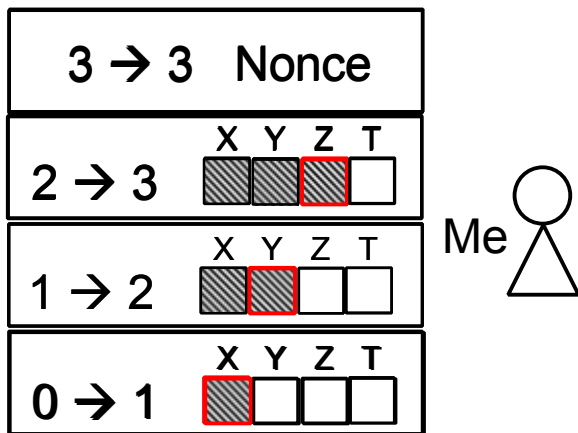
- Input
 - New Counter Value
 - BitField
- Output
 - Attestation
- Sample Output



Countermeasure

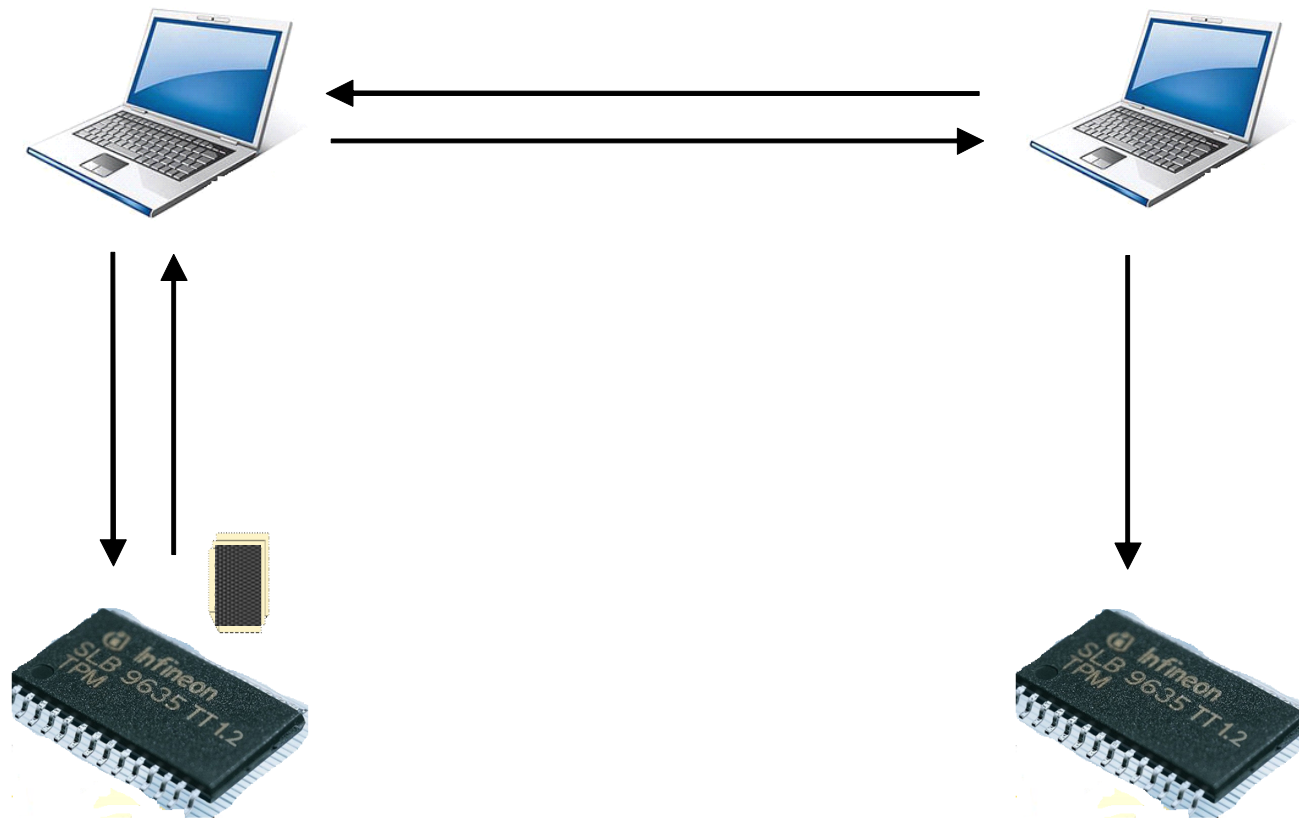


Countermeasure: TrInc



Countermeasure: TrInc

- Individual equipped with TrInc



- Auction-based Model
- TrInc
- Q & A