Exploring and Improving BitTorrent Topologies

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BitTorrent

- Filesharing protocol
- Peers form Ad-Hoc networks (swarm)
- Trackers to join the swarm
- Trading pieces between peers

BitTorrent: handshake

- Peers exchange handshakes before trading
  - Protocol identifier
  - Protocol extensions
  - peer_id
  - Torrent info_hash

Exploring

Exploring Swarm Topologies

Random topology:

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- Traffic log
- Instrumented clients

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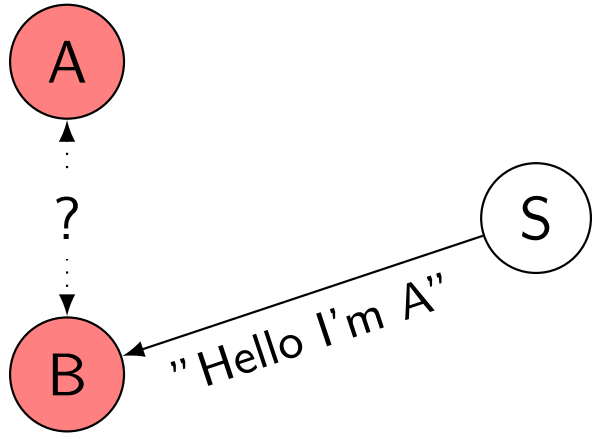
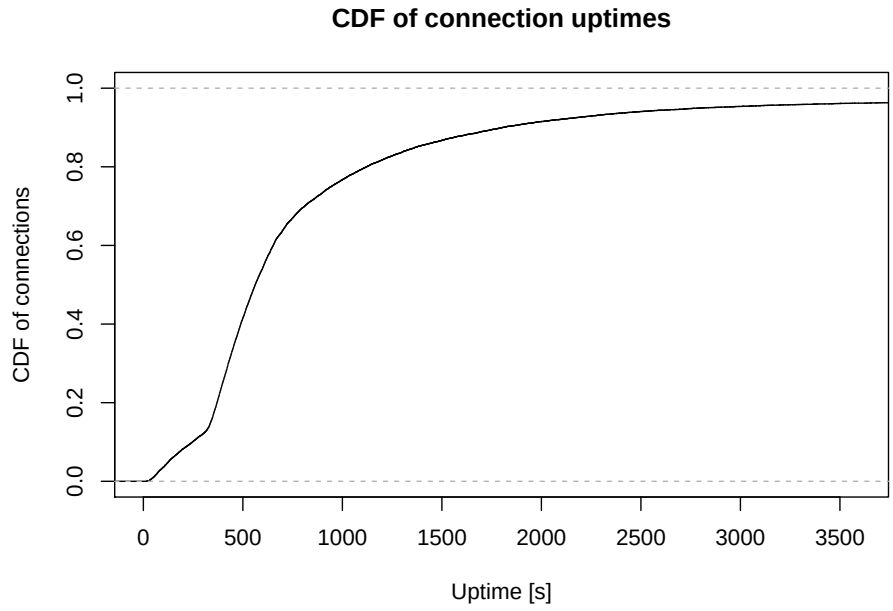
- Experimental setup
- Traffic log
- Instrumented clients
- *Live swarms*

Scanning method



Challenges when moving to real swarms

- Scanning takes time



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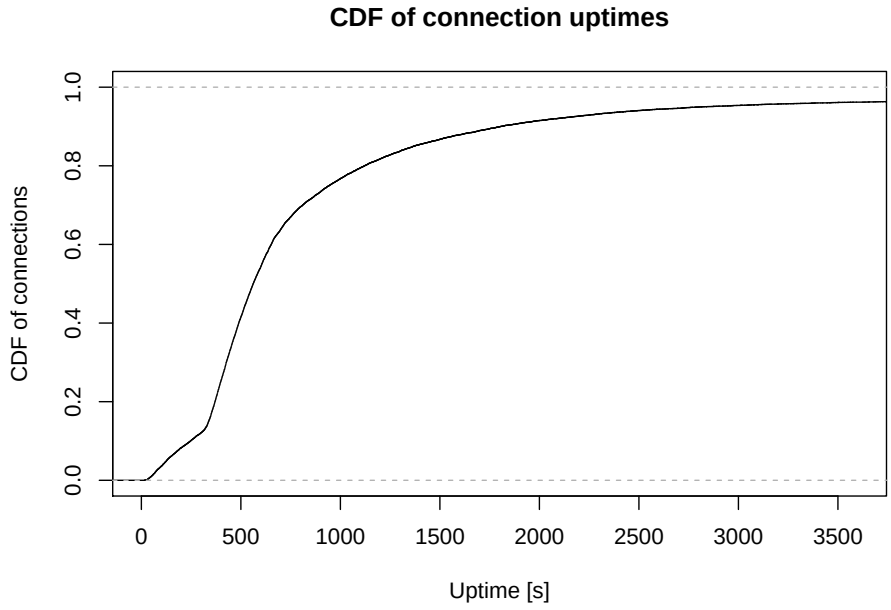
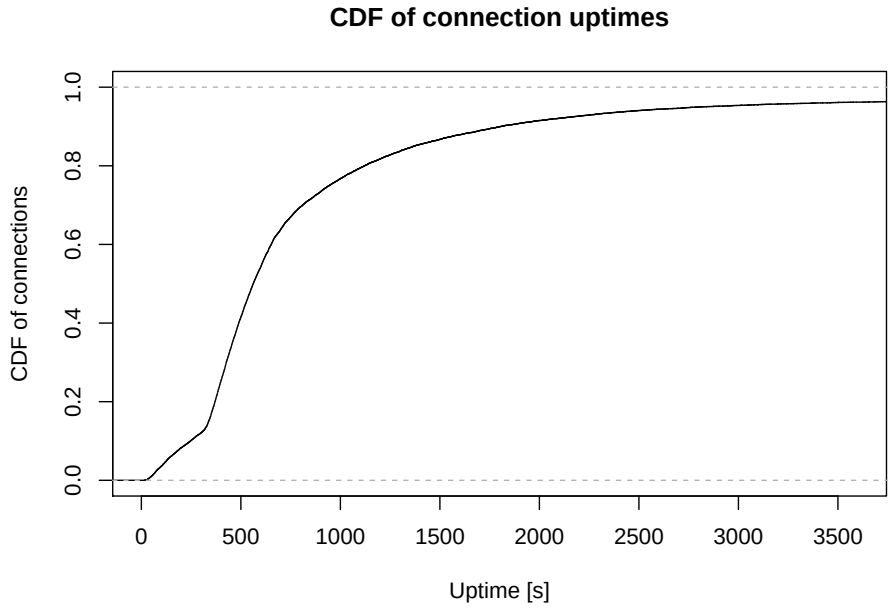
- Invisible part of a swarm



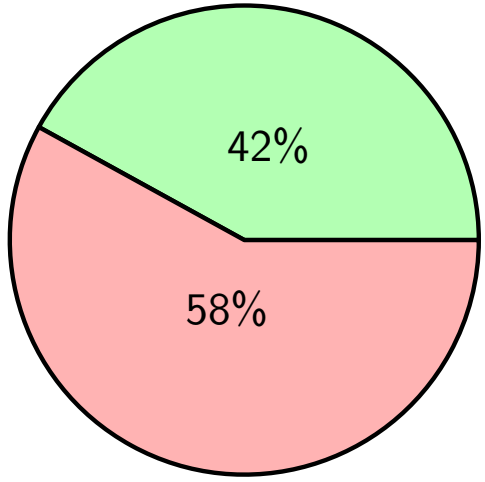
Challenges when moving to real swarms

- Scanning takes time
- Invisible part of a swarm
- Error detection



Evaluation: topology sample size

58% peers cannot be scanned



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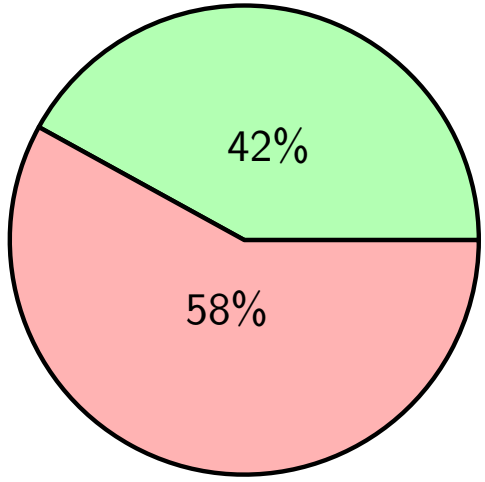
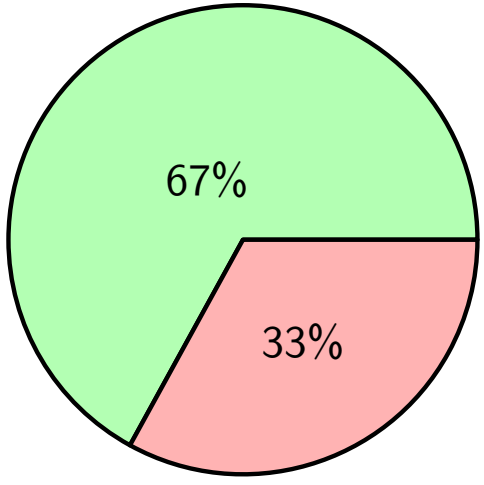
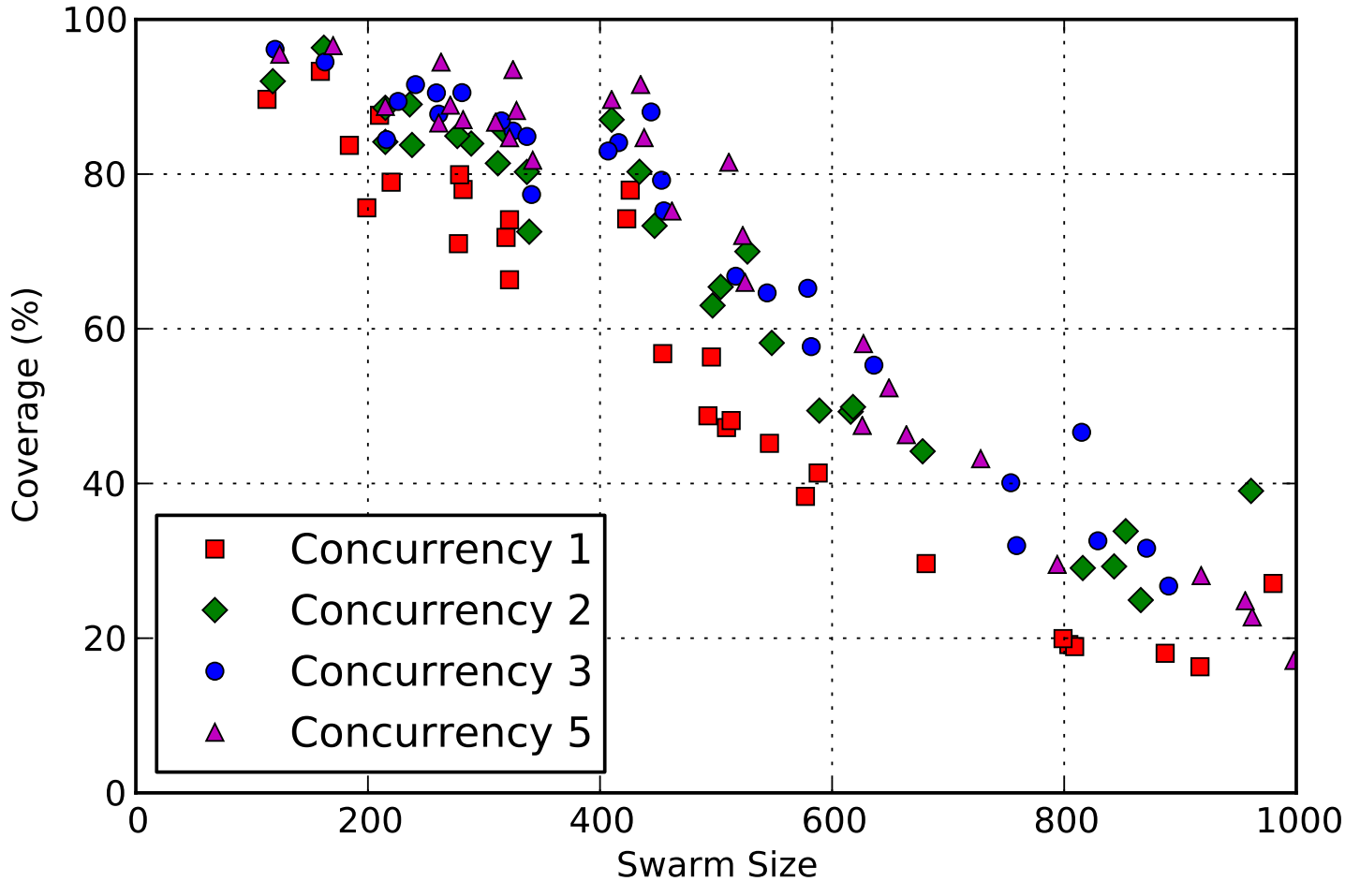


But we can scan either endpoint of a connection:



Evaluation: coverage

How fast can we scan for all possible connections?



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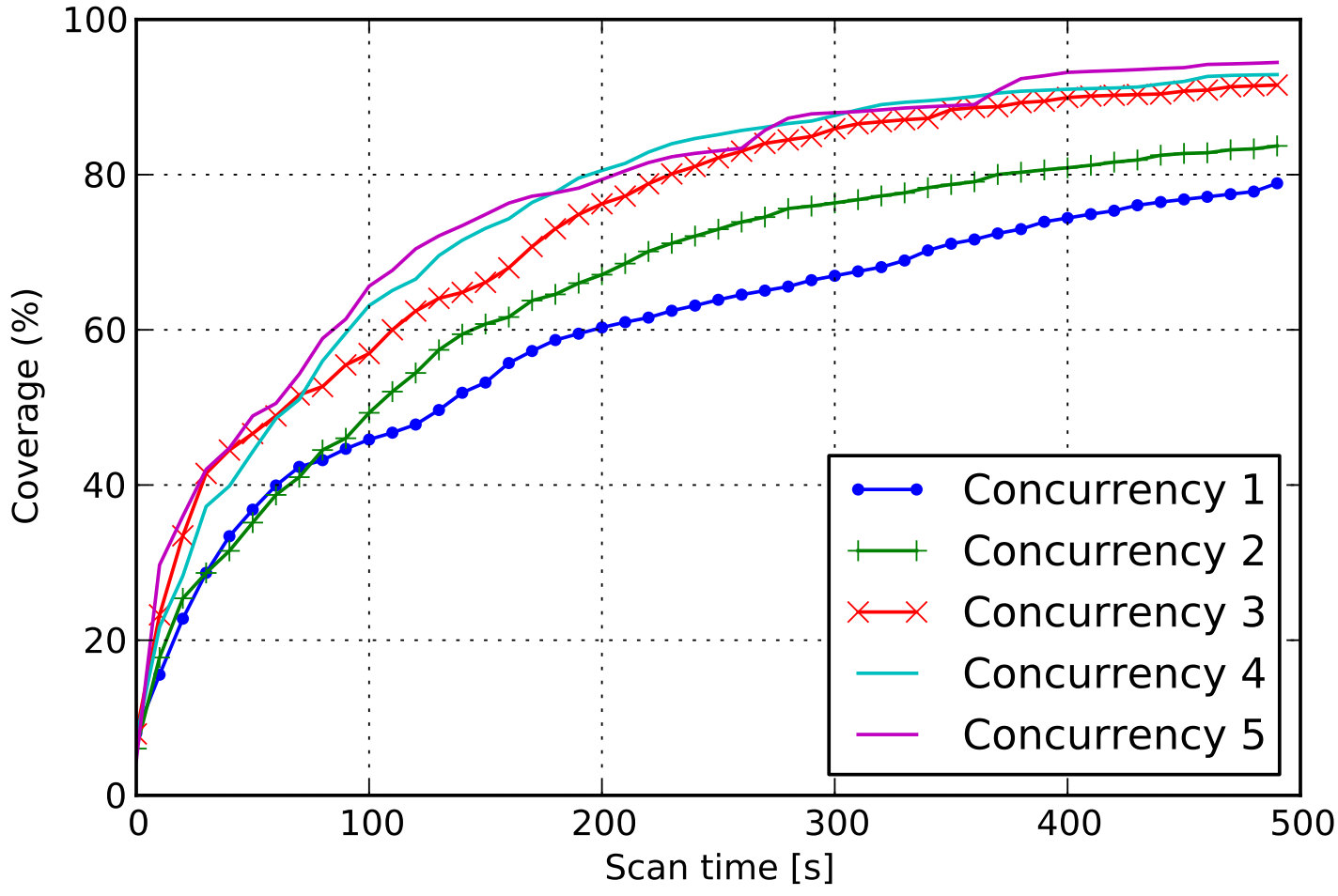

Locality

Trading with random peers, that may be halfway around the globe. Closer peers may be available.

$$\sigma(a, b) = \begin{cases} 1 & a \text{ and } b \text{ are connected} \\ 0 & \text{otherwise} \end{cases}$$

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- $\sigma(a, b)$ provided from scanning method
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BitTorrent is **not** locality aware!

$$\mathcal{L} = 1.062 > 1$$

Improving

Suggesting

Peer Exchange (PEX):

- Reduce tracker load
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- Reduce tracker load
- Increase trading partners
- *Suggest nearby peers*

Suggesting peers with PEX

1. Identify new peers
2. Find nearby peers
3. Connect to new peers
4. Send suggestions as PEX message

Suggesting peers with PEX

+ No special access
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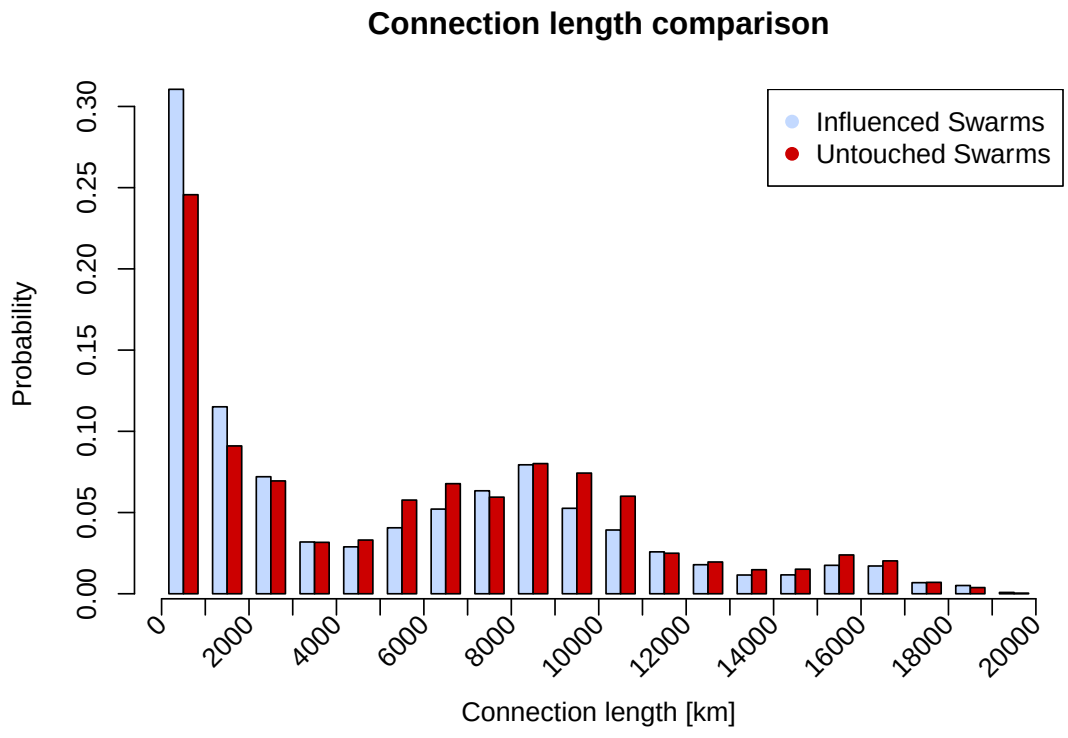
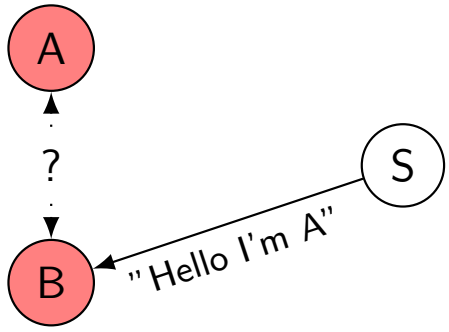
- Limited influence

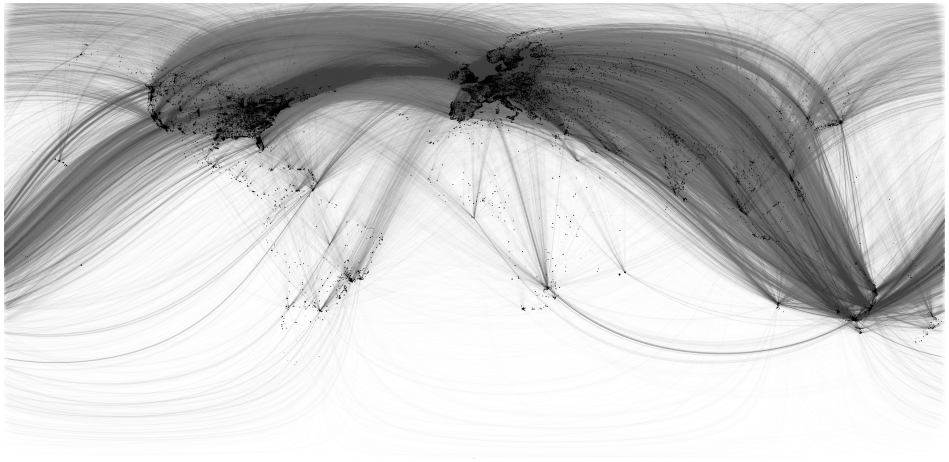
How are we doing?

- $\mathcal{L}$: 1.062 $\rightarrow$ 0.994.
- 6.3% improvement



Conclusion





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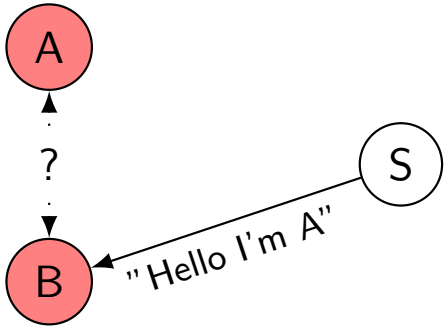
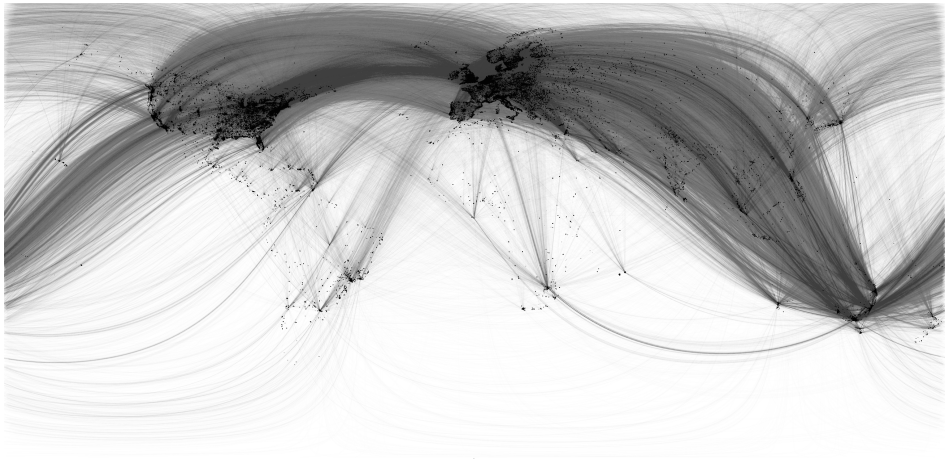
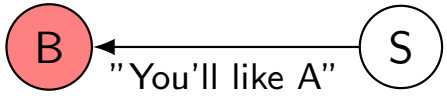
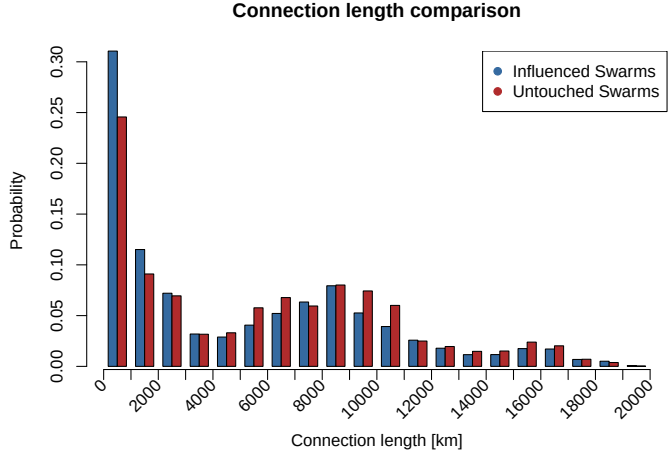

A
?
B
S
"Hello I'm A"




B
S
"You'll like A"


Connection length comparison
Influenced Swarms
Untouched Swarms
Probability
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
Connection length [km]

Thank you, questions?