

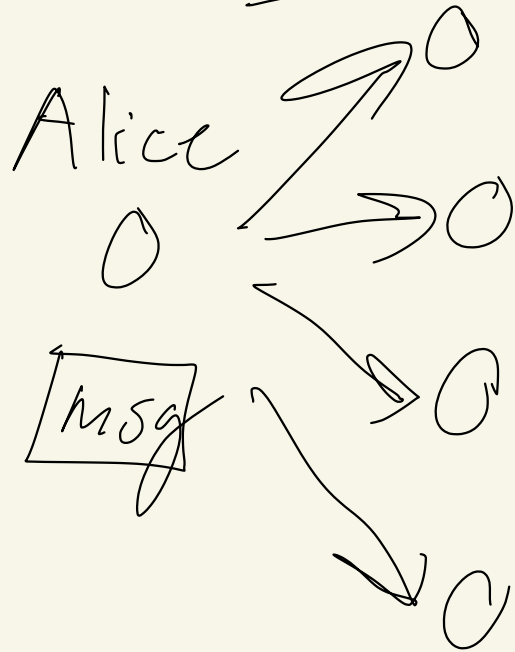
CS-438

Decentralized Systems Engineering

Week 3

Gossip Techniques

Ethernet - "efficient broadcast" $O(1)$
Internet - no efficient broadcast $O(n)$



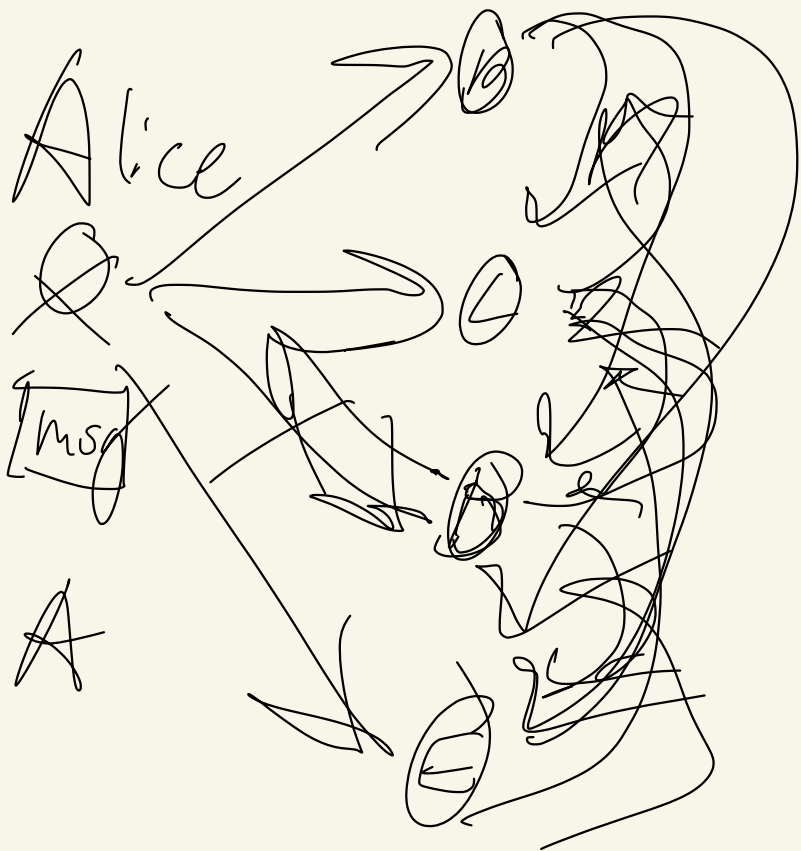
3 problems

- have to have a complete census / map
- reliability
- $O(n)$ comput & bandwidth load on Alice

Baseline:
simple broadcast -
send to all

Reliable broadcast

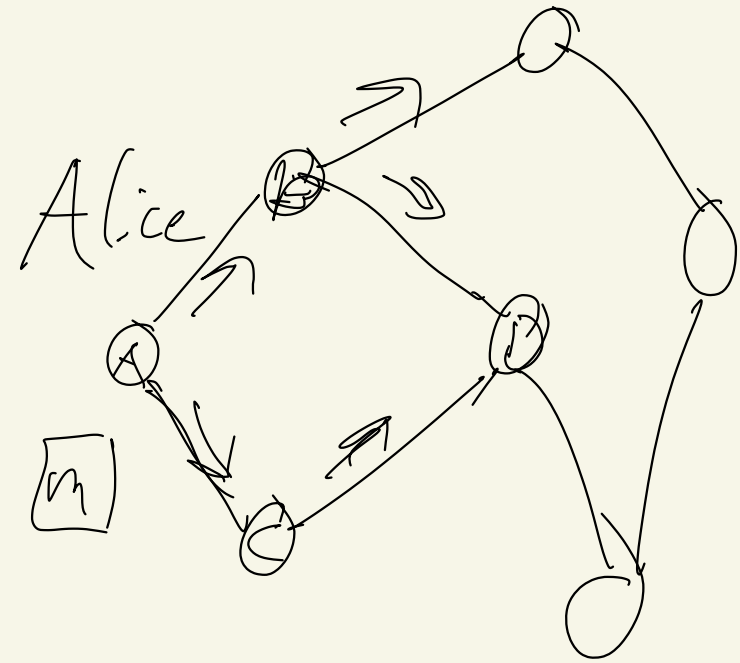
Echo broadcast



$O(n^2)$ total bandwidth
practical for
small groups only

Gossip algorithm (UseNet)

- We want reliability, robustness
("route around failures/censorship")



Naive gossip:

- receive msg M:
send to all other neighbors

Solution:

Unique Message-ID

Remember the Message-IDs seen

- receive msg M
- if not yet received
- save msg ID
- broadcast to neighb.

Randomized gossip - unstructured network, probabilistically "good" efficiency $O(n)$ not $O(n^2)$

- Rumor mongering

- Anti-entropy

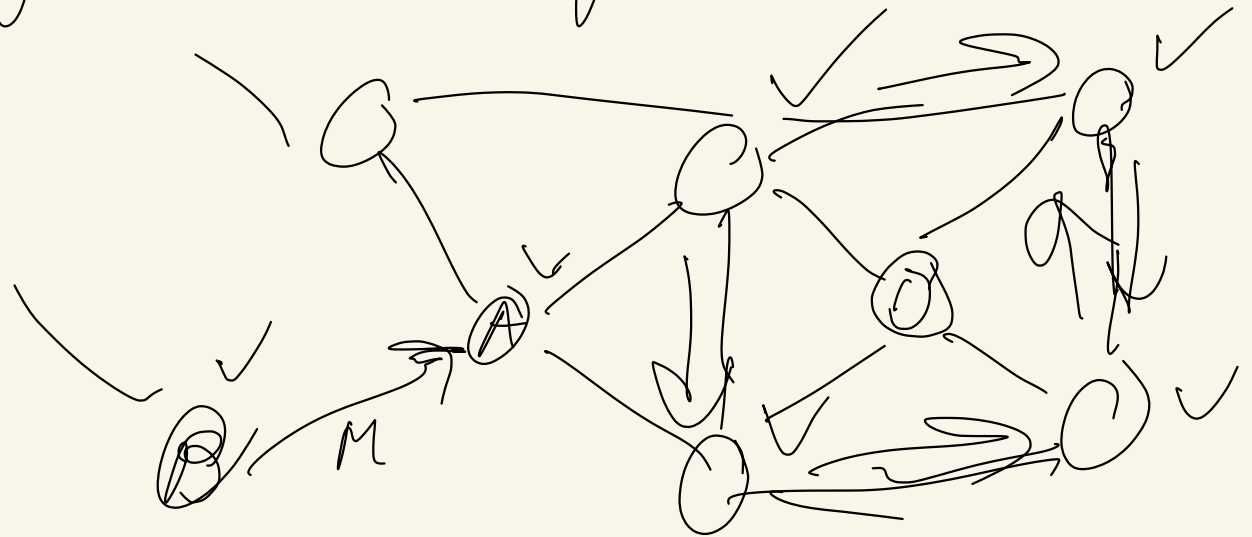
Rumor mongering

on receiving new msg M

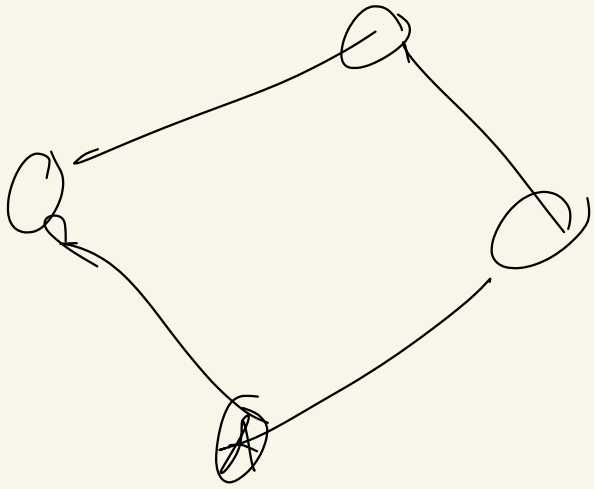
- choose a neighbor to send to uniformly at random

→ - neighbor replies whether already seen
Yes: try again with prob. $\frac{1}{2}$

No: loop



Anti-entropy



On periodic timer:

- picks a random neighbor
- ask if have anything new

No: go back to sleep

Yes: send/recv new msg

Used in combination

Rumormongering effective in early stage

Anti-entropy effective in late stage