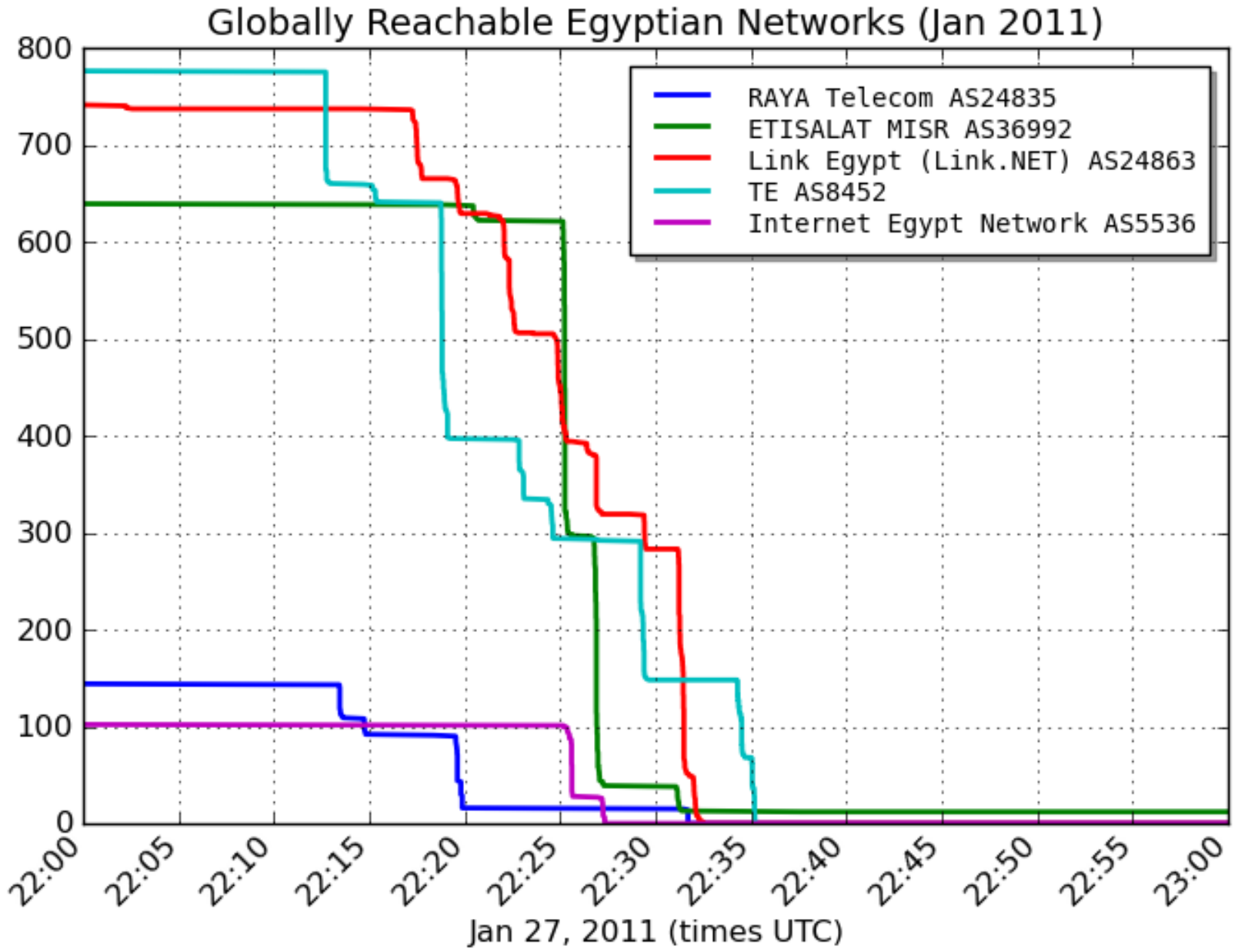
Building Dissent Networks

Towards Effective Countermeasures Against Large-Scale Communications Blackouts

Shaddi Hasan, Yahel Ben-David, Giulia Fanti,
Eric Brewer, Scott Shenker





Credit: Renesys

In-Country Dissident Infrastructure

THESE	NOT THESE
Commotion	Tor
Serval	Ultrasurf
Freedom Tower	Freegate
FabFi	VPNs
Hyperboria	Proxies

Your government just shut off your country's Internet access.

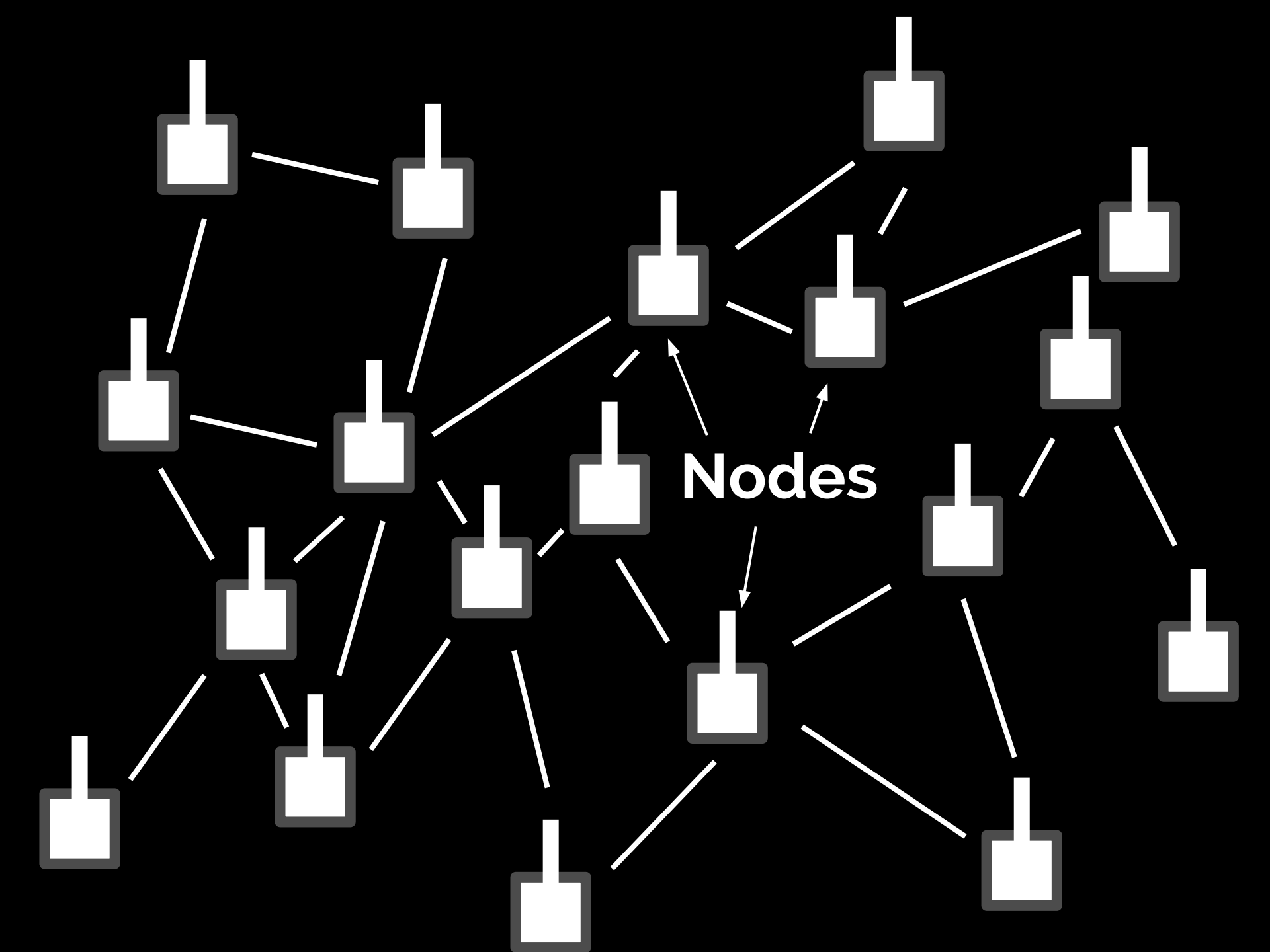
Now what?

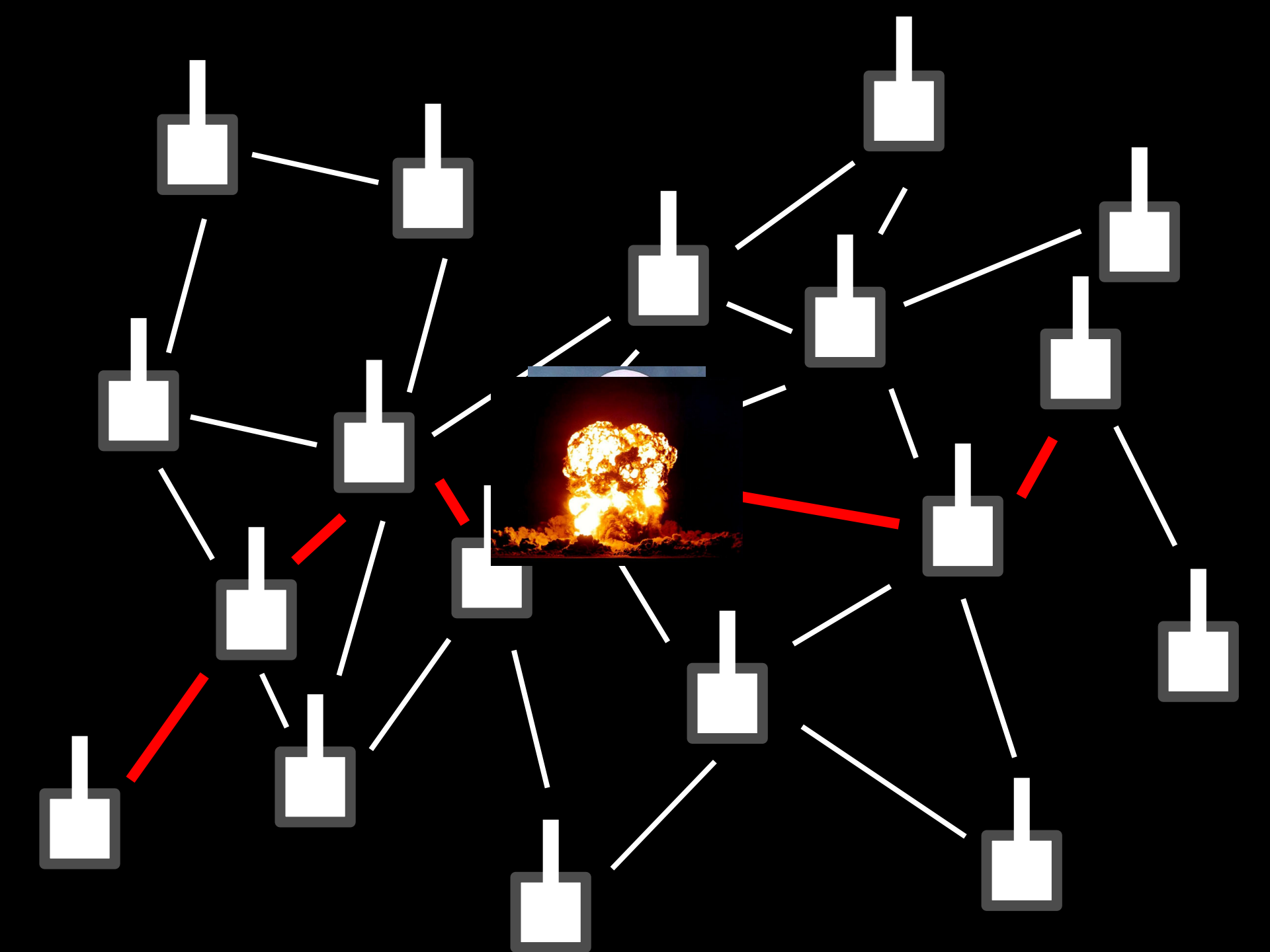
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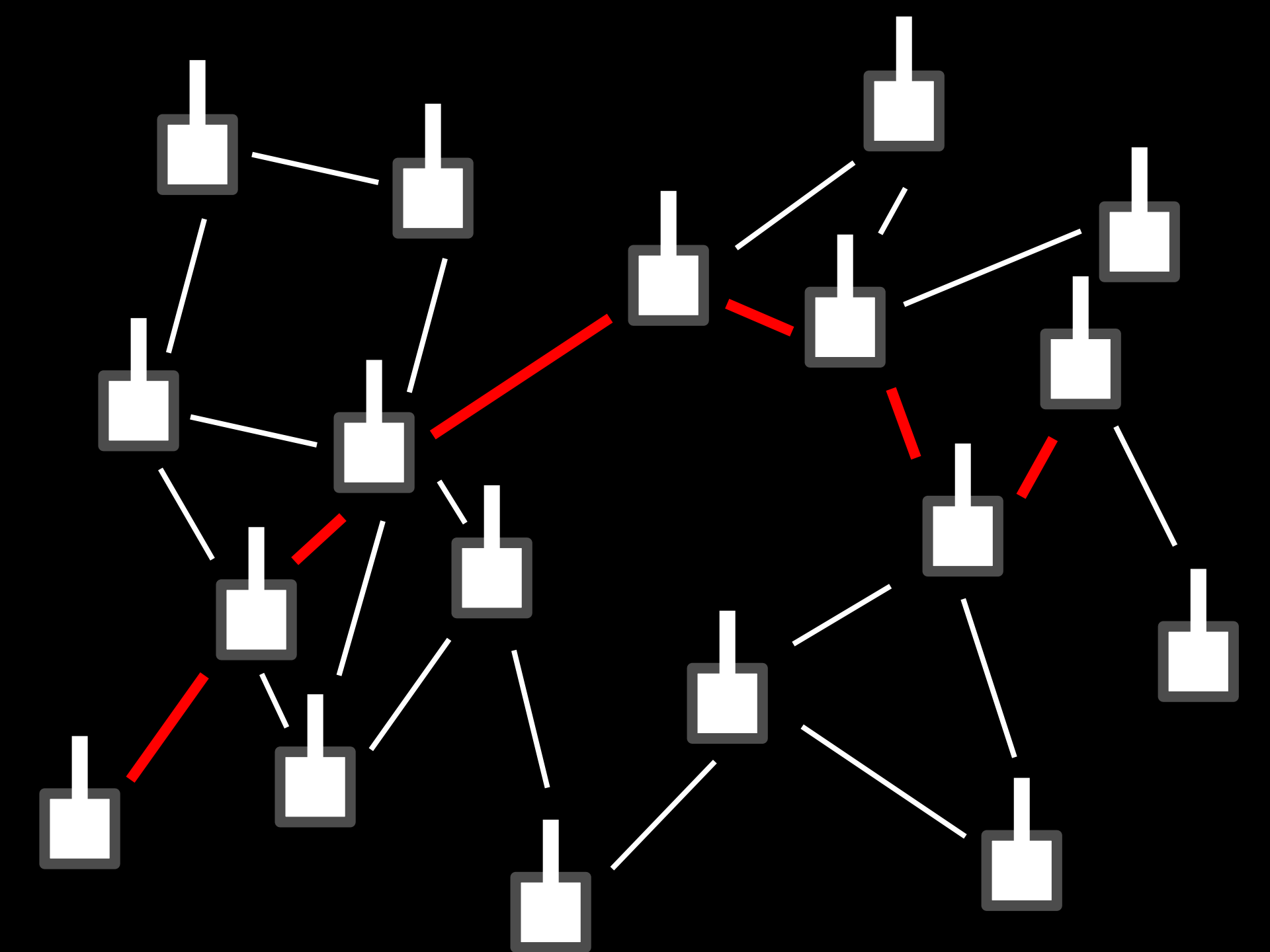
"Let's build a mesh network."

Still a thing...




Nodes





How will it grow?

Planned vs. Organic?

How will it be managed?

Centralized vs. Decentralized?

What is the topology?

Stationary vs. Mobile?





Organic
Decentralized
Mobile

Planned
Centralized
Stationary

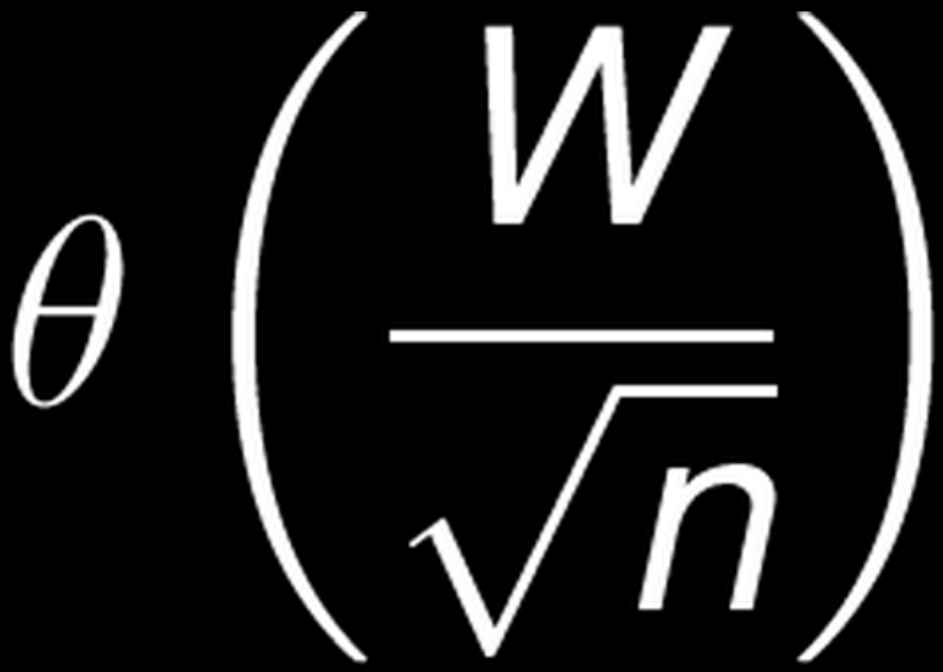
Dissent Networks

Resilient to disruption

Meaningful scalability

Innocuous components

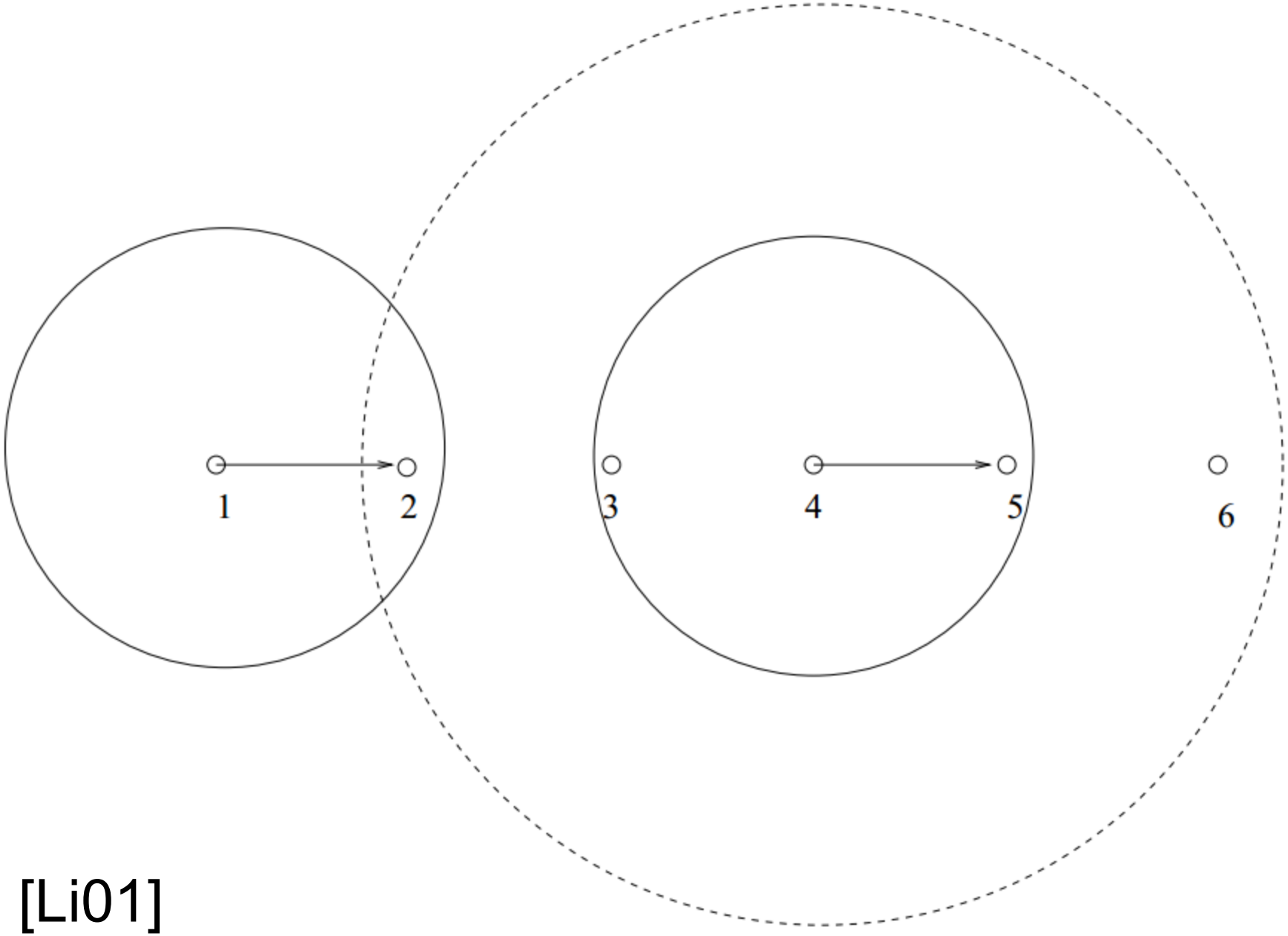
Resistant to tracking



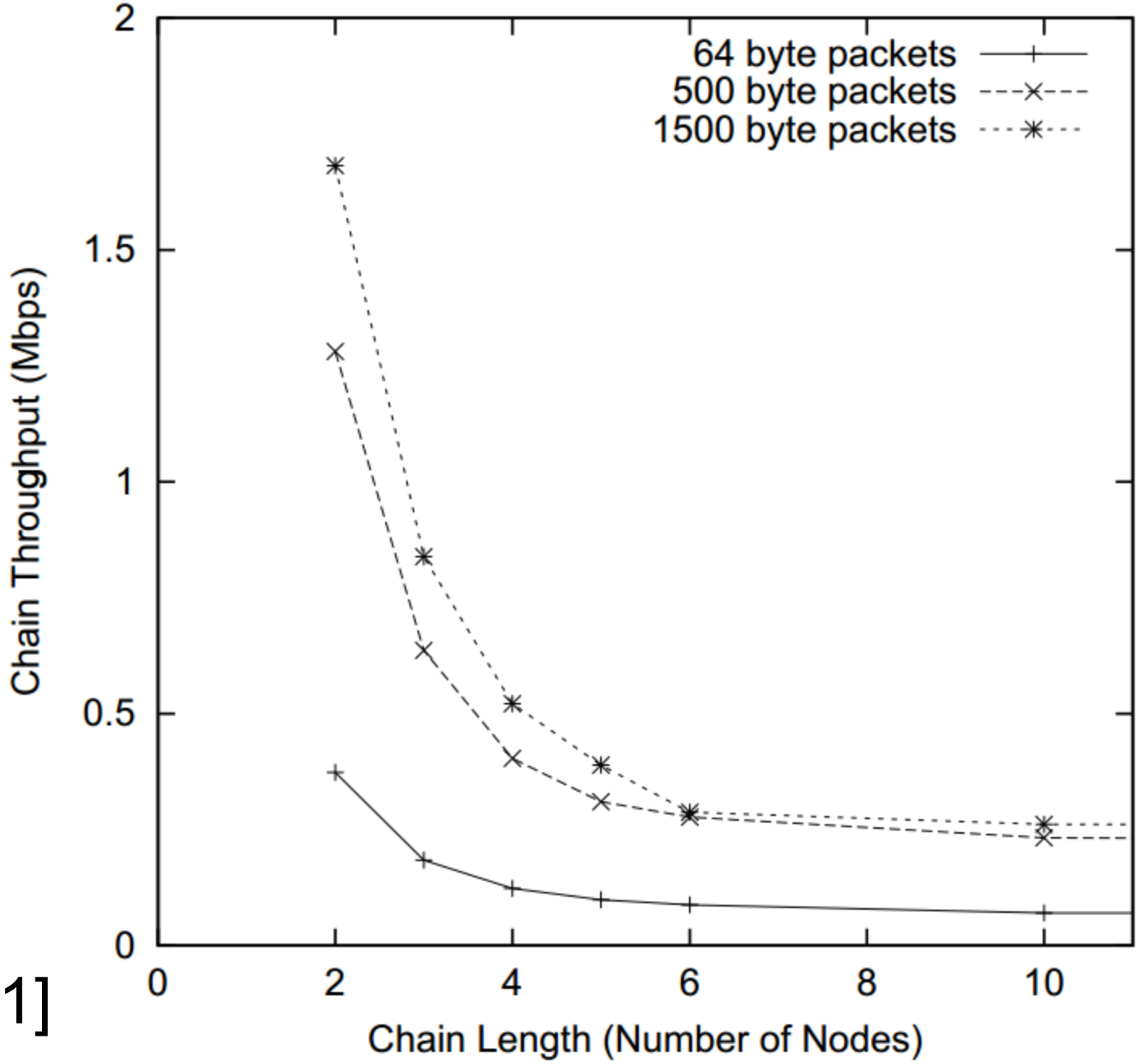
W = Bits/second
n = # nodes

"These results have some implications that designers may want to consider. **Perhaps efforts should be targeted at designing networks with small numbers of nodes**."

[Gupta00]

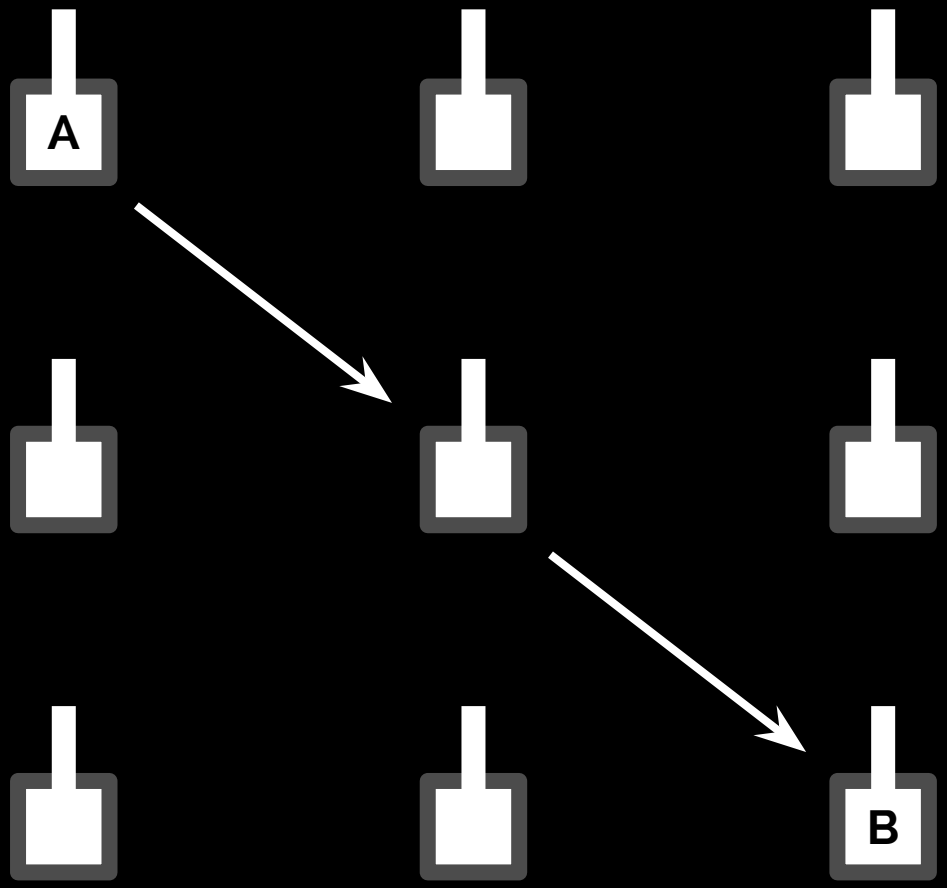


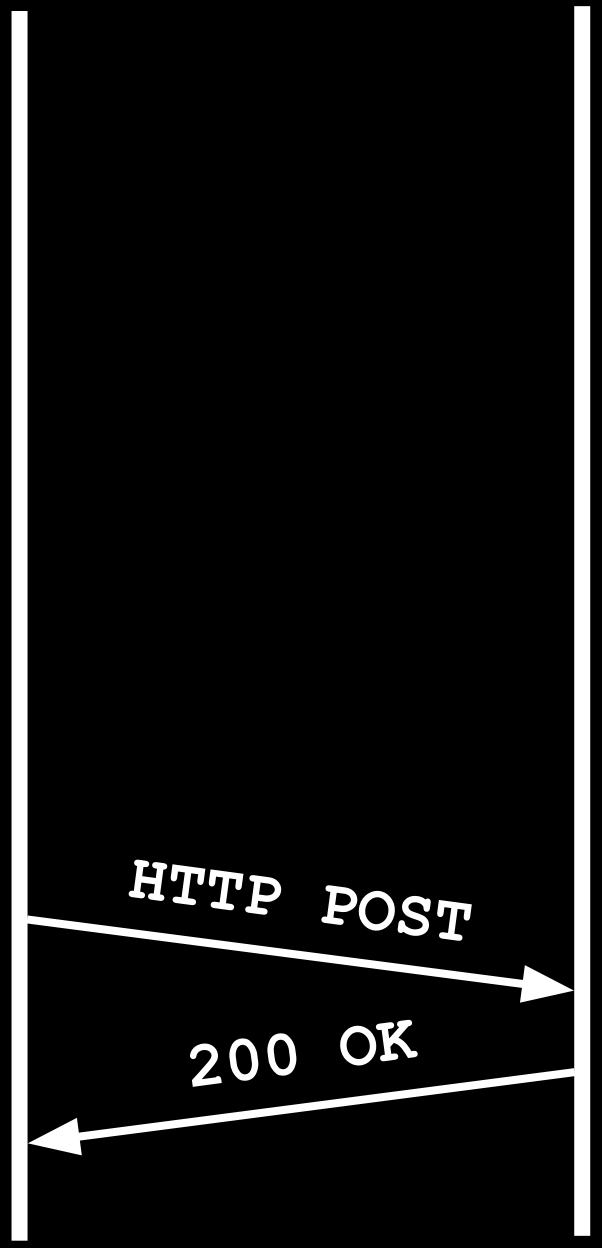
[Li01]

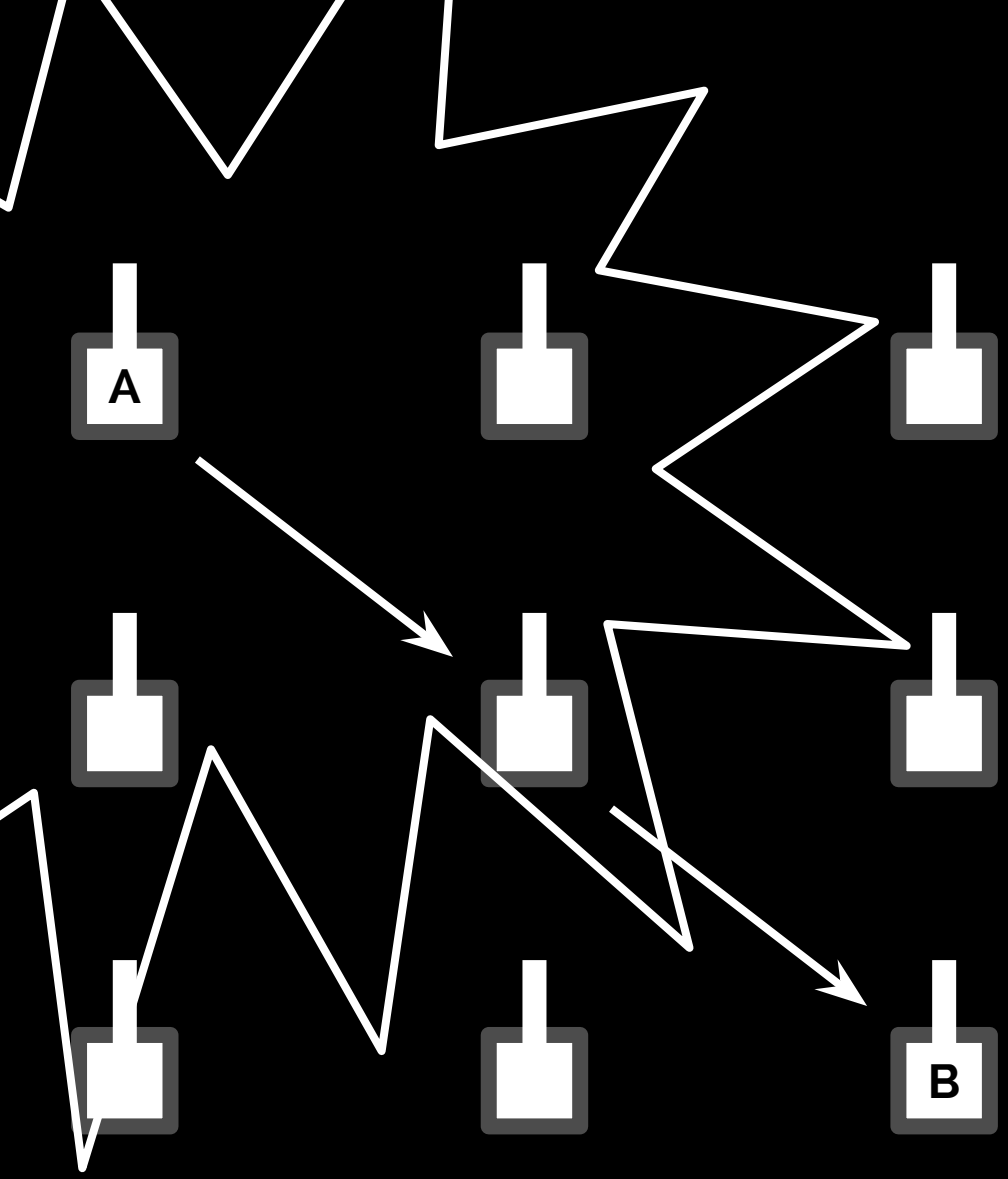

64 byte packets
500 byte packets
1500 byte packets
Chain Throughput (Mbps)
Chain Length (Number of Nodes)
0
0.5
1
1.5
2
0
2
4
6
8
10

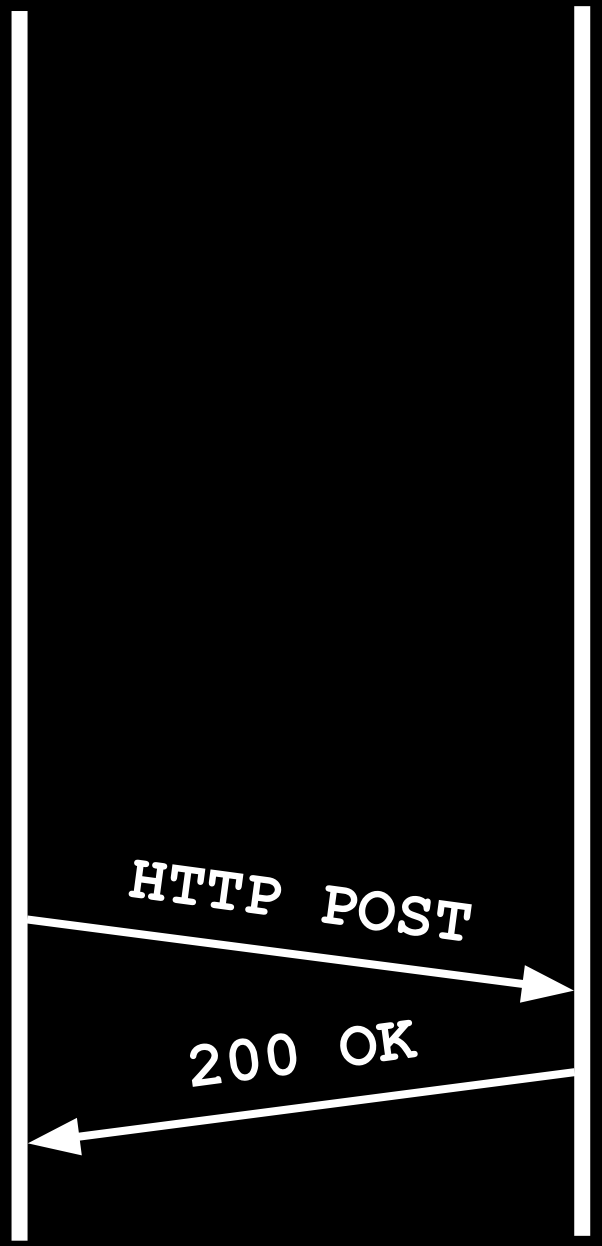
[Li01]

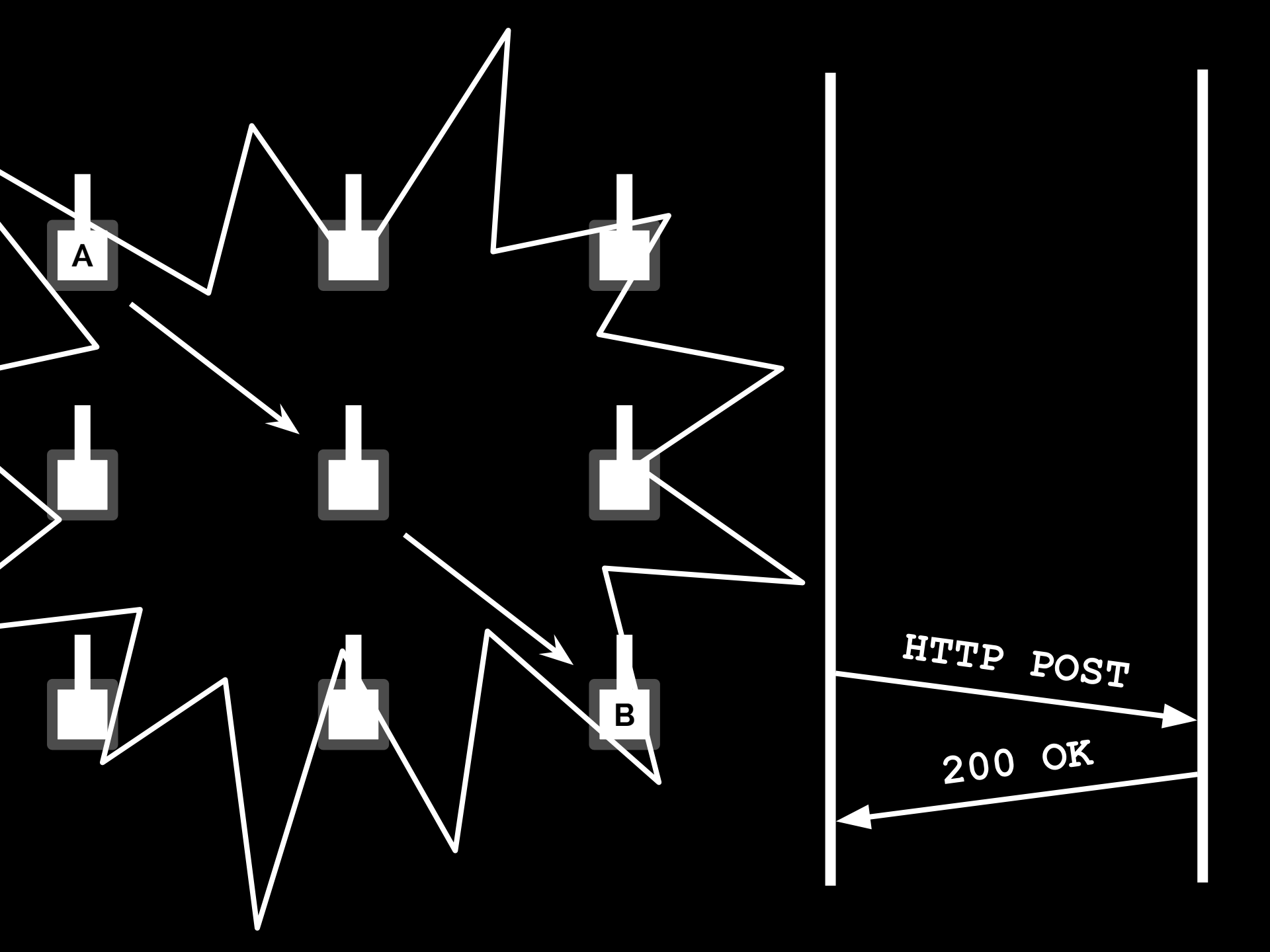

IF YOU SEND VIDEOS ACROSS A WIRELESS MESH NETWORK
INSTRUCTOR
YOU'RE GONNA HAVE A BAD TIME
quickmeme.com

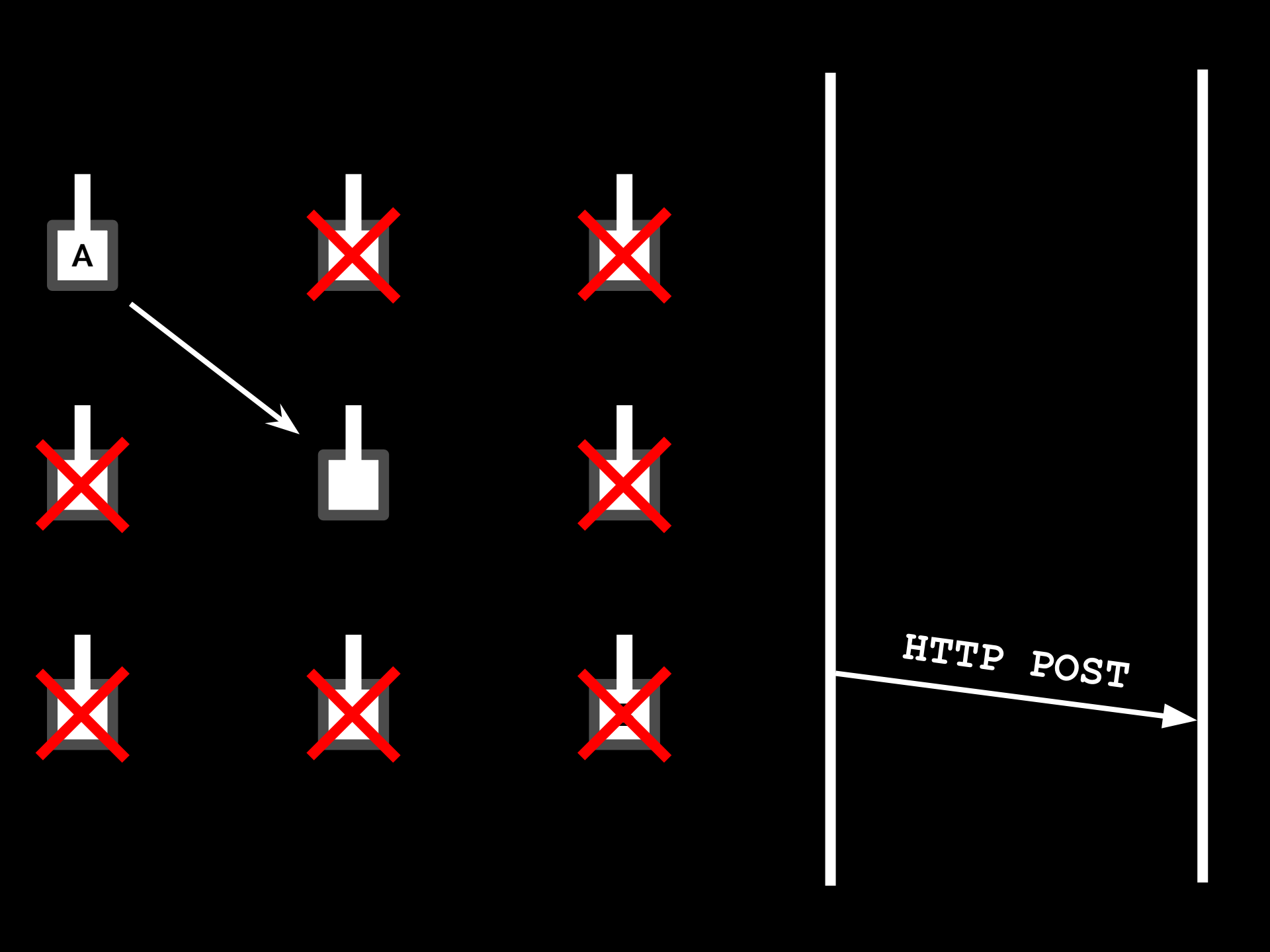

A
B

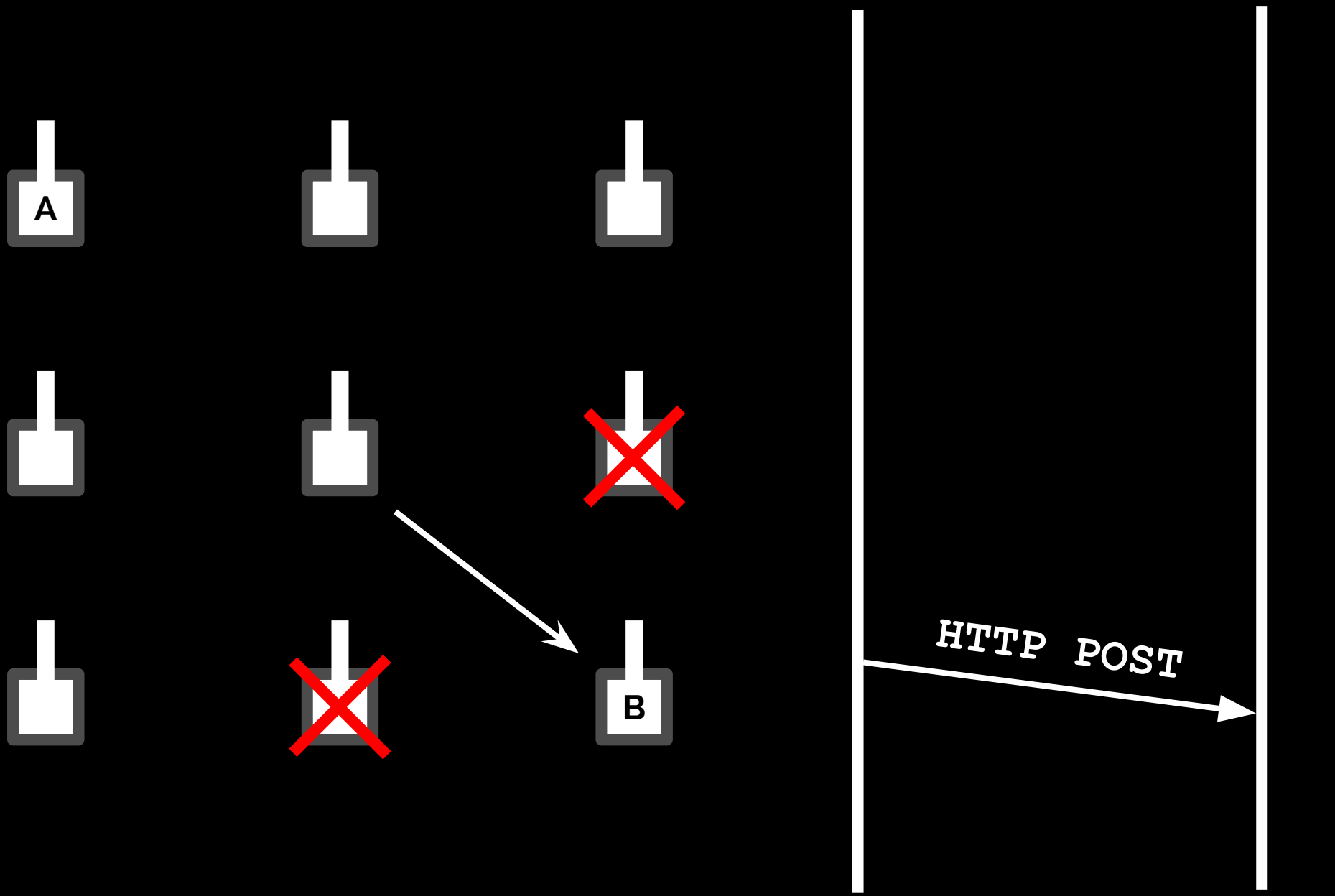

HTTP POST
200 OK

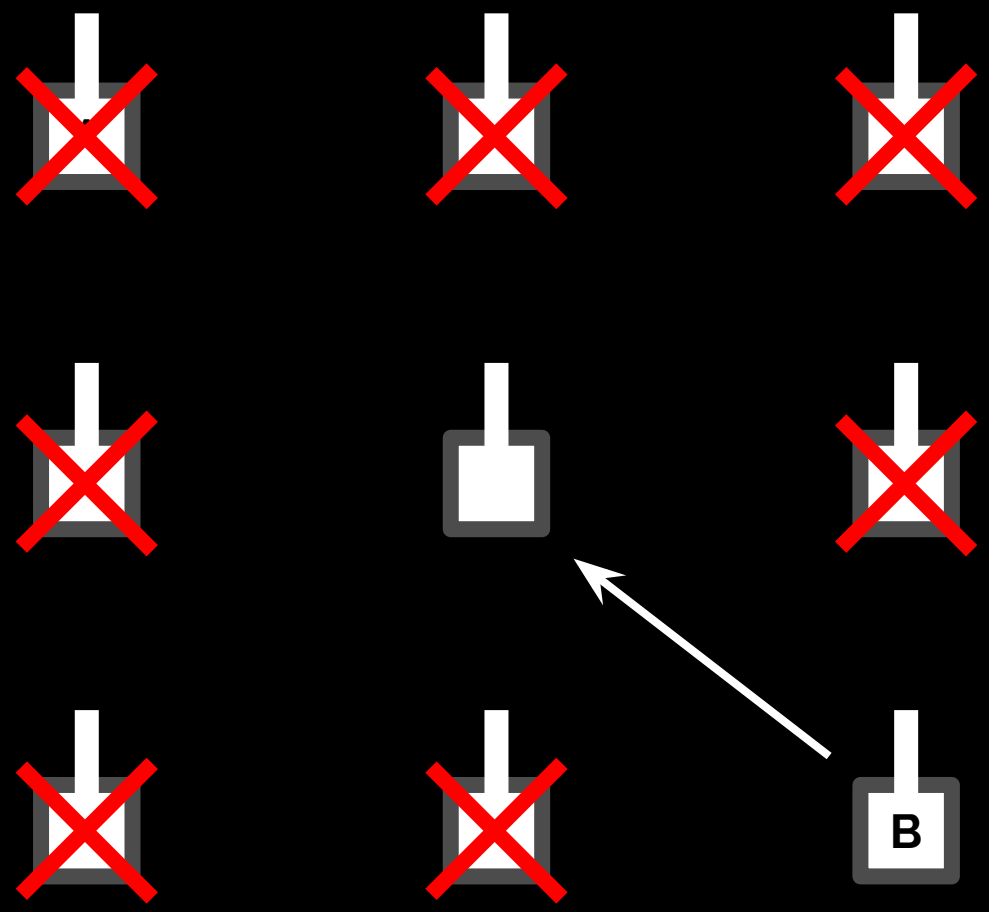

A
B

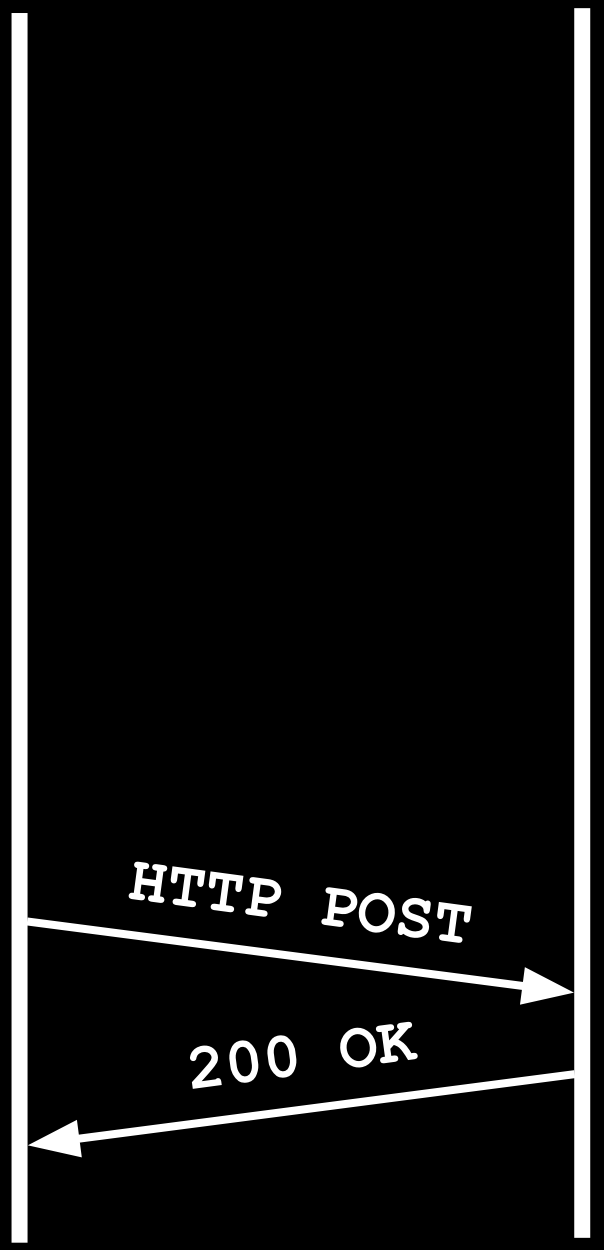

HTTP POST
200 OK

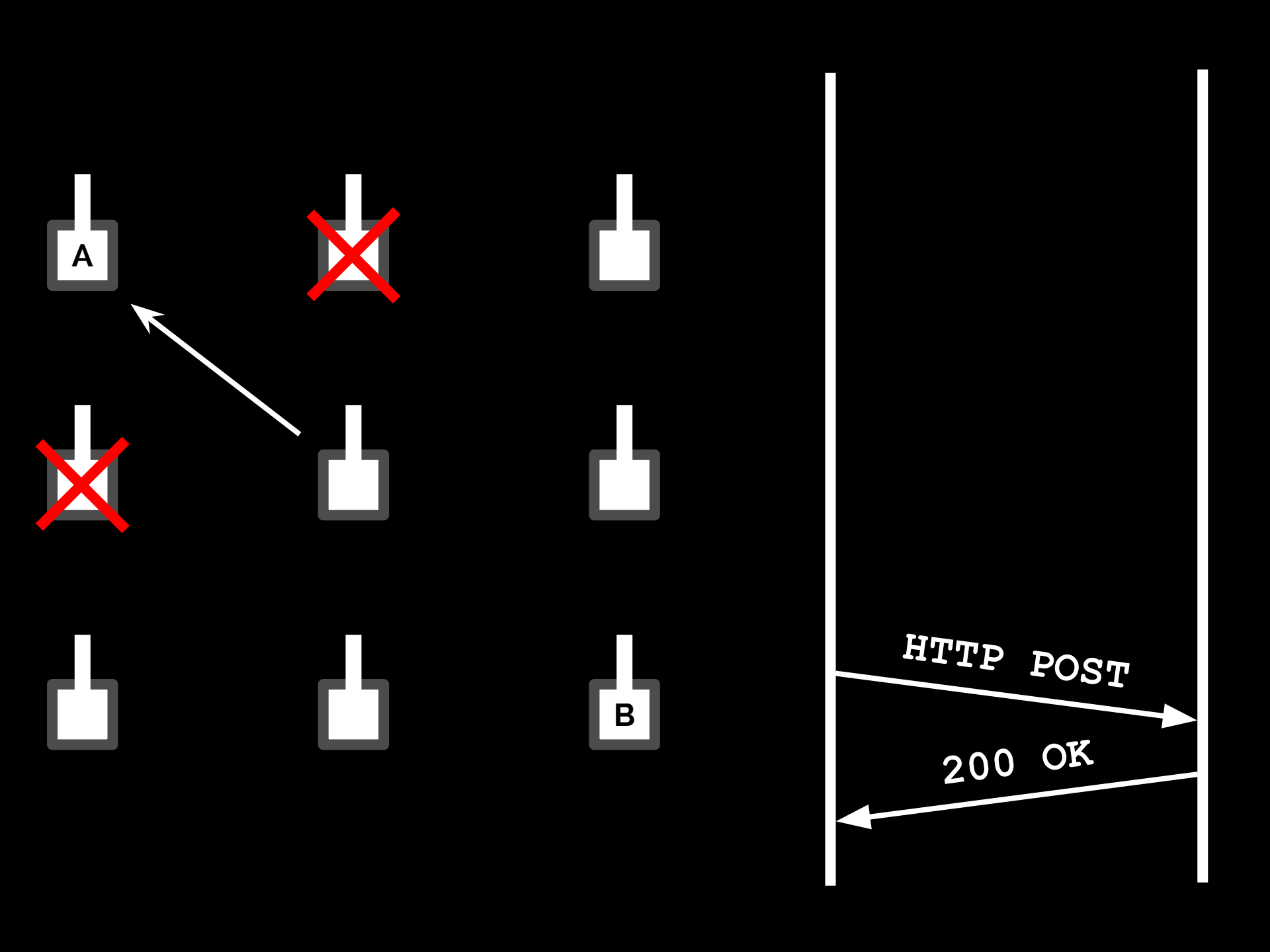

A
B
HTTP POST
200 OK

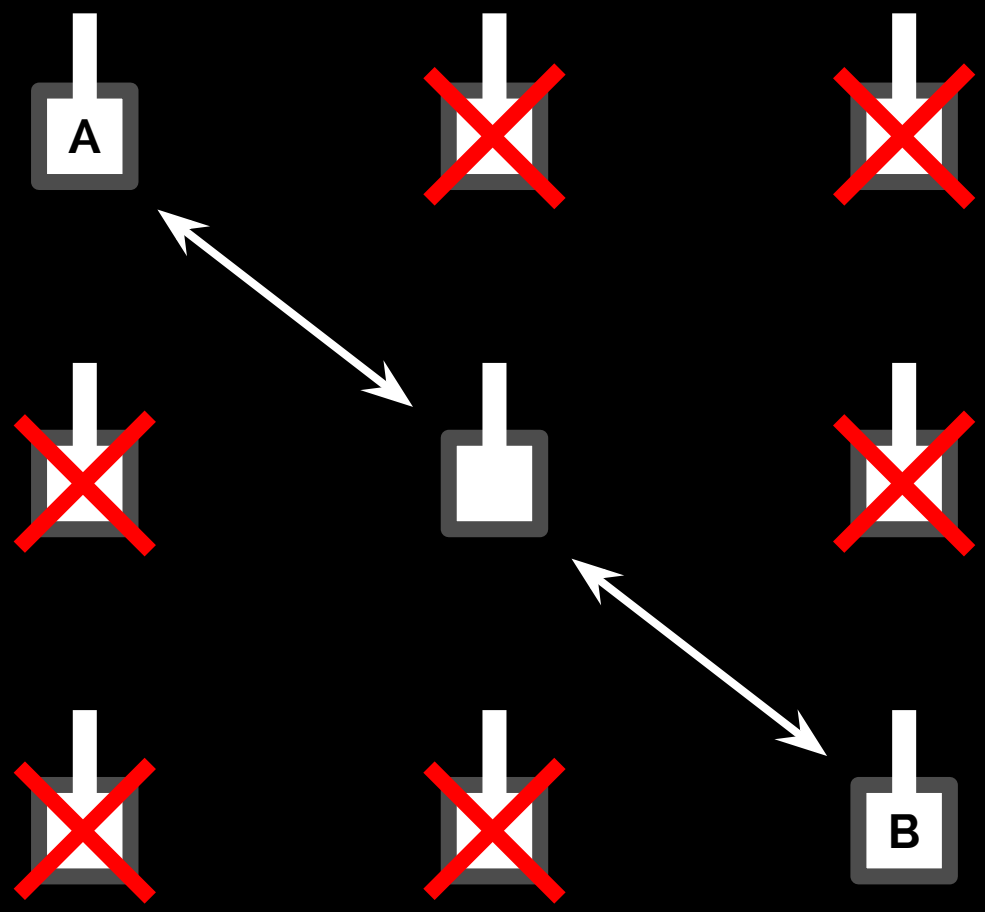

A
HTTP POST

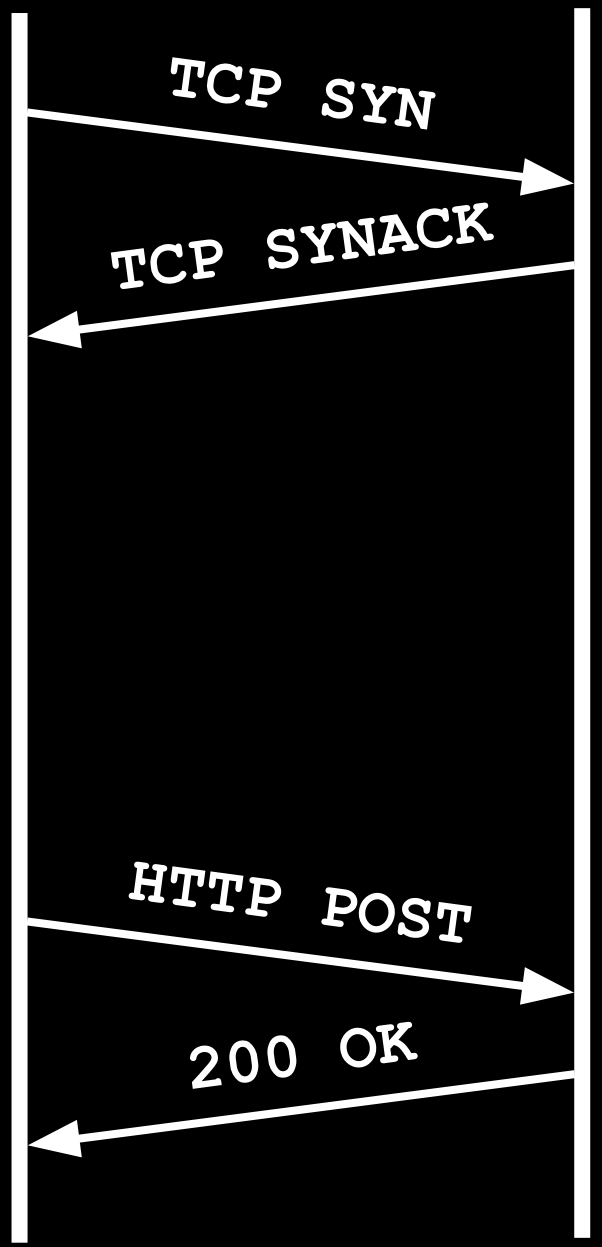

A
B
HTTP POST


B

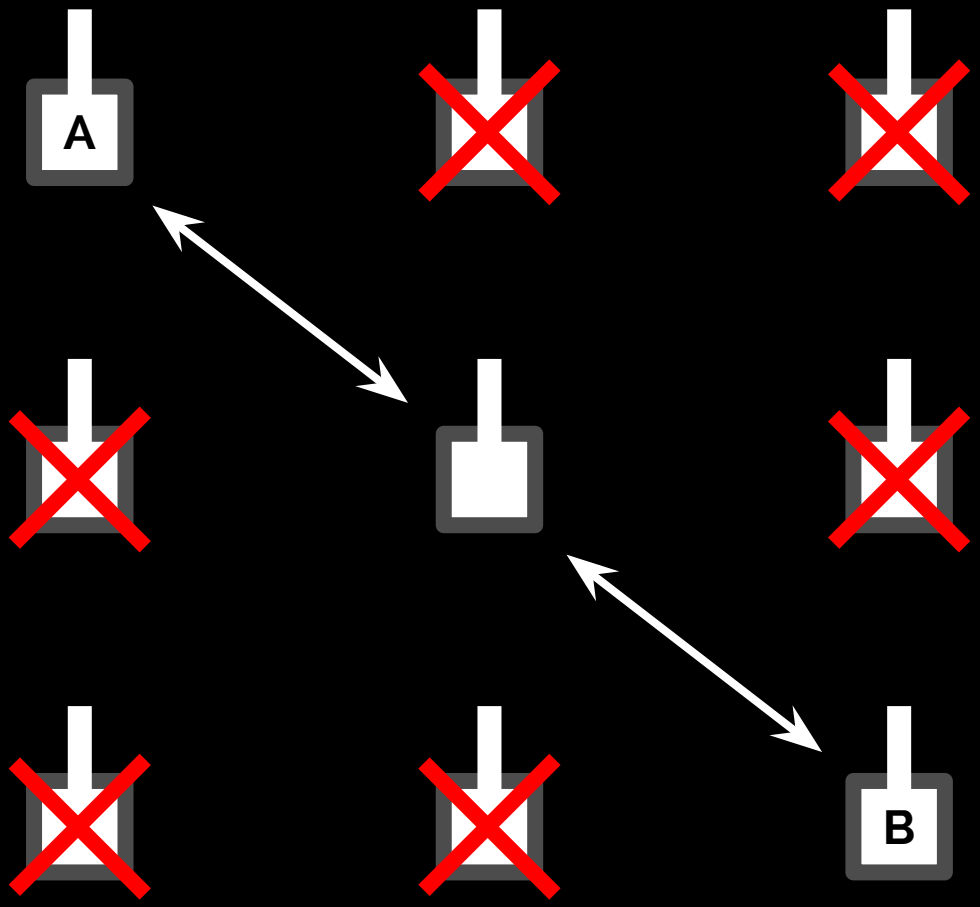

HTTP POST
200 OK

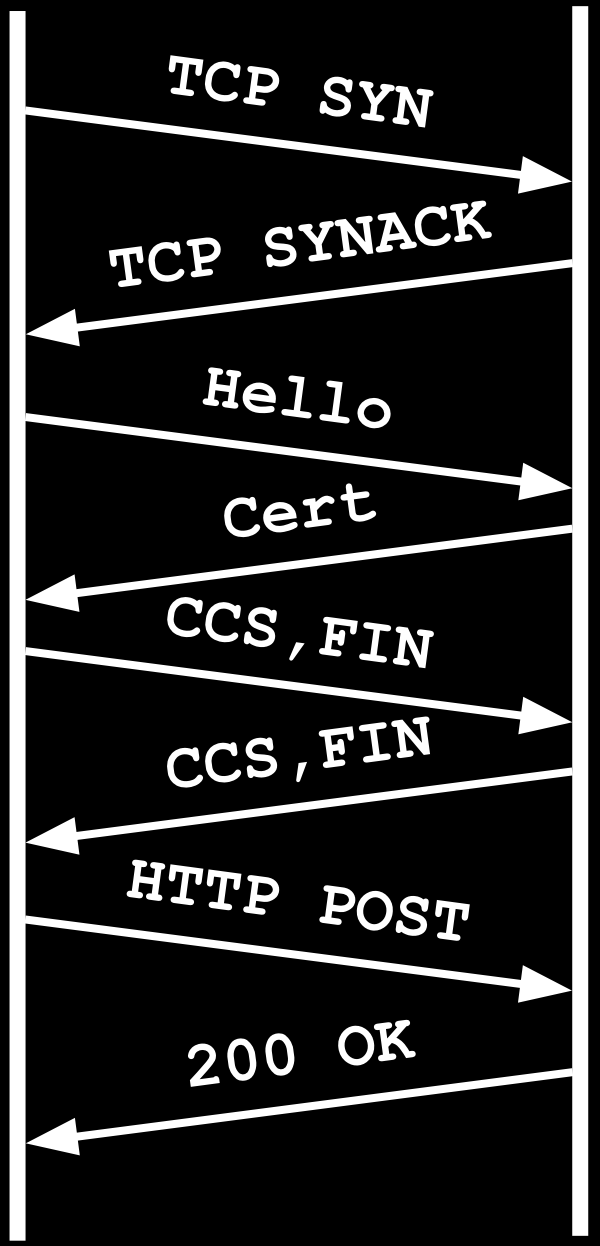

A
B
HTTP POST
200 OK


A
B

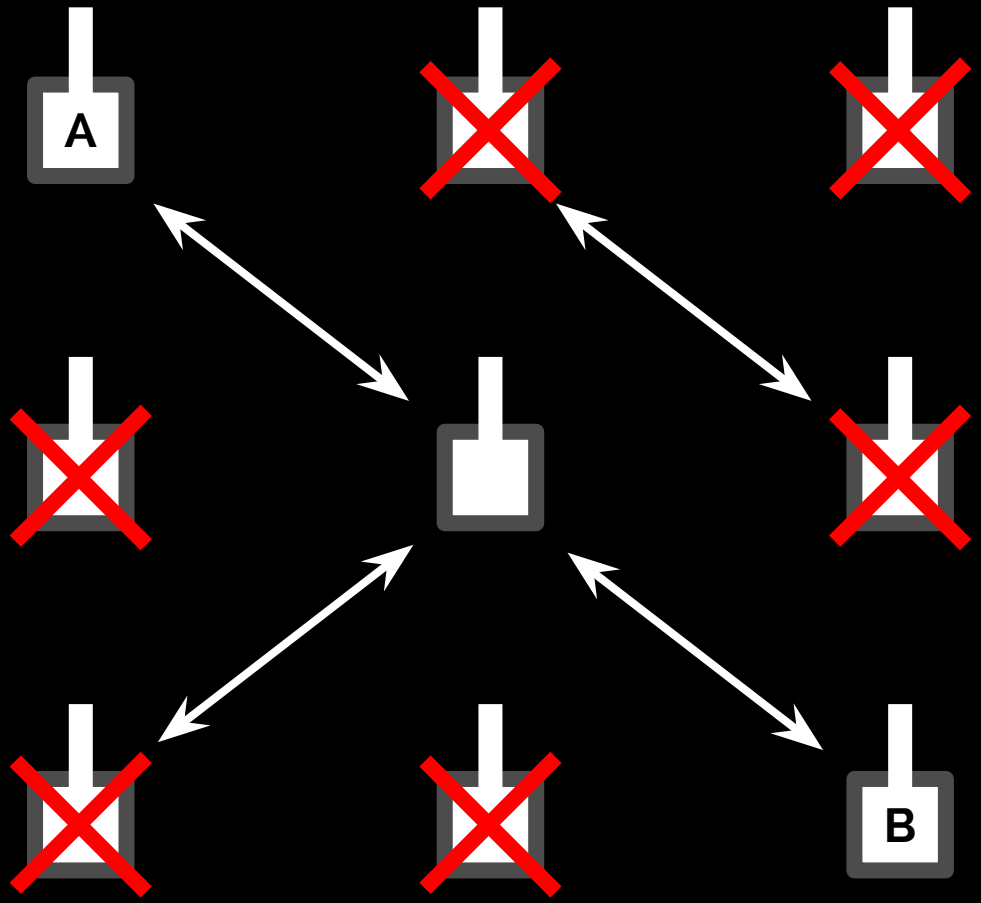

TCP SYN
TCP SYNACK
HTTP POST
200 OK

Min. 4 round trips...





Min. 4 round trips...





For each tweet!

Making it work

- Directional antennas
- Mobility
- Multi-radio nodes
- Delay tolerance
- Small networks
- Small number of users
- Network planning
- Coordinated management



Your government just shut off your country's Internet access.

And your basic mesh network didn't work.

Are there practical modifications that might?

Satellite?

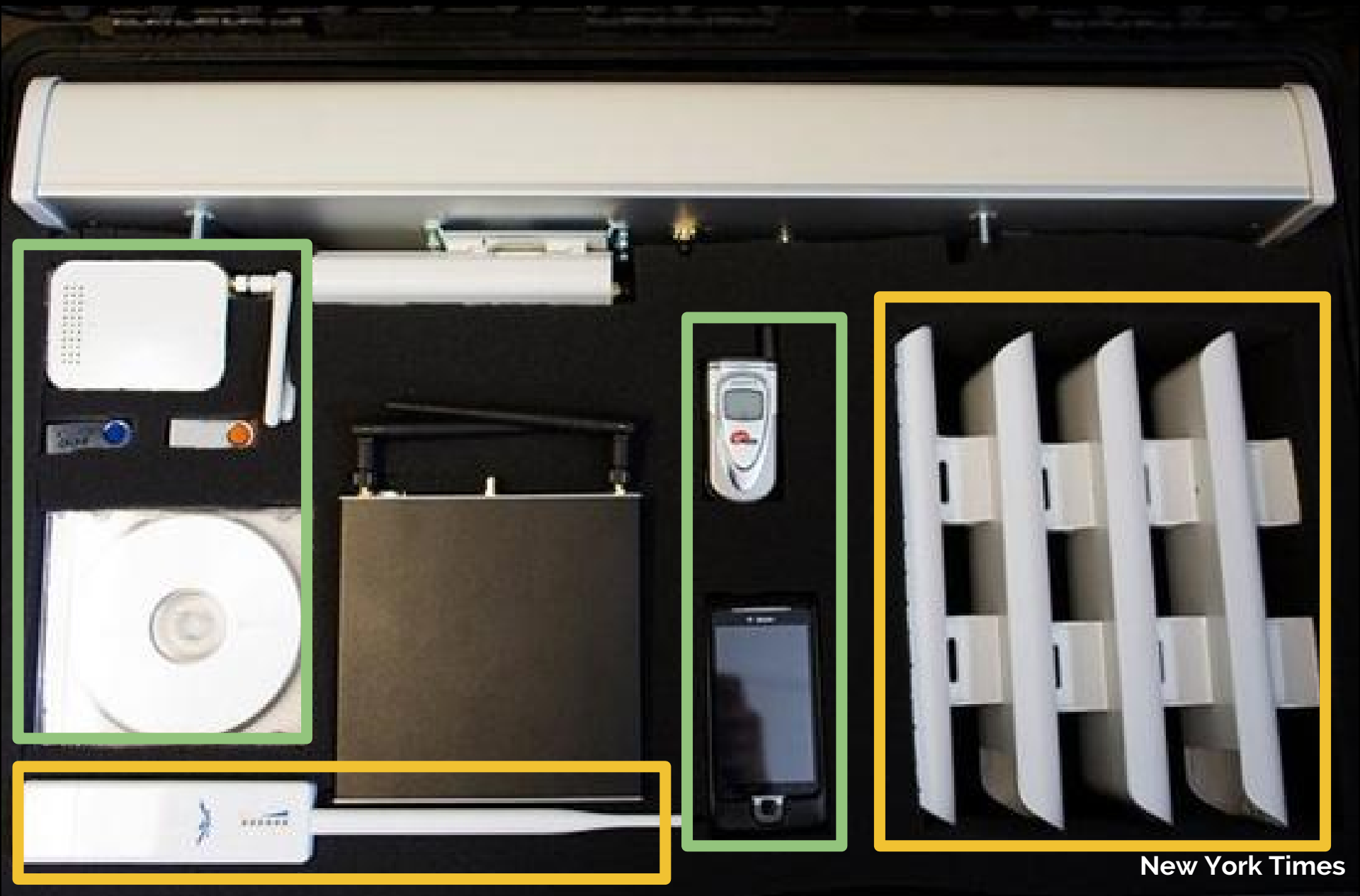
+ Easy to deploy
+ Works!

- Expensive
- Slow
- Hard to source
- Easy to trace
- Easy to jam
- May be illegal!

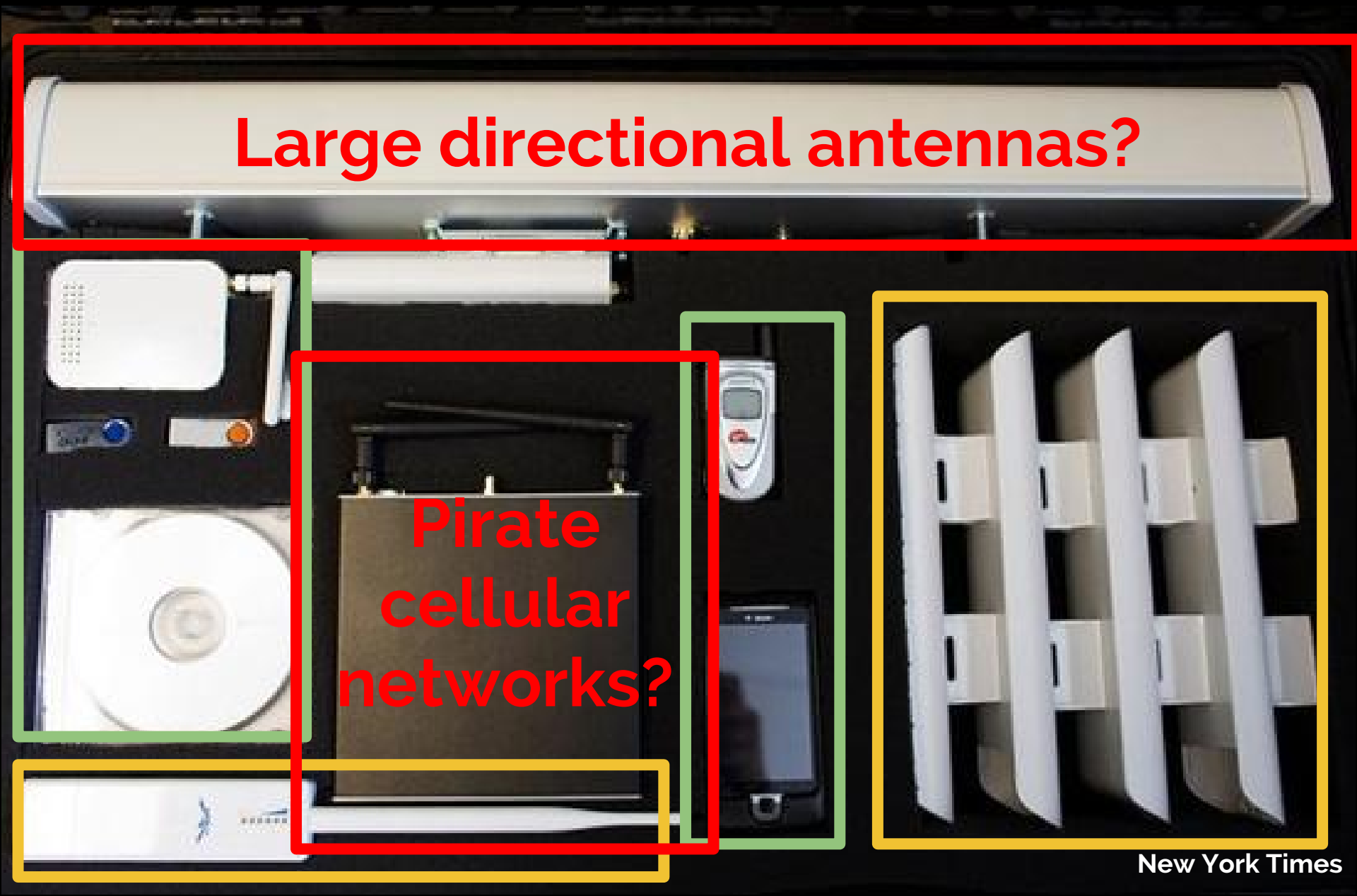



New York Times


New York Times



New York Times


Large directional antennas?
Pirate cellular networks?
New York Times


AirJaldi networks

Let's assume we successfully build an effective network for activists.

What about anonymity?

(TS//SI//NF) FAA702 Operations

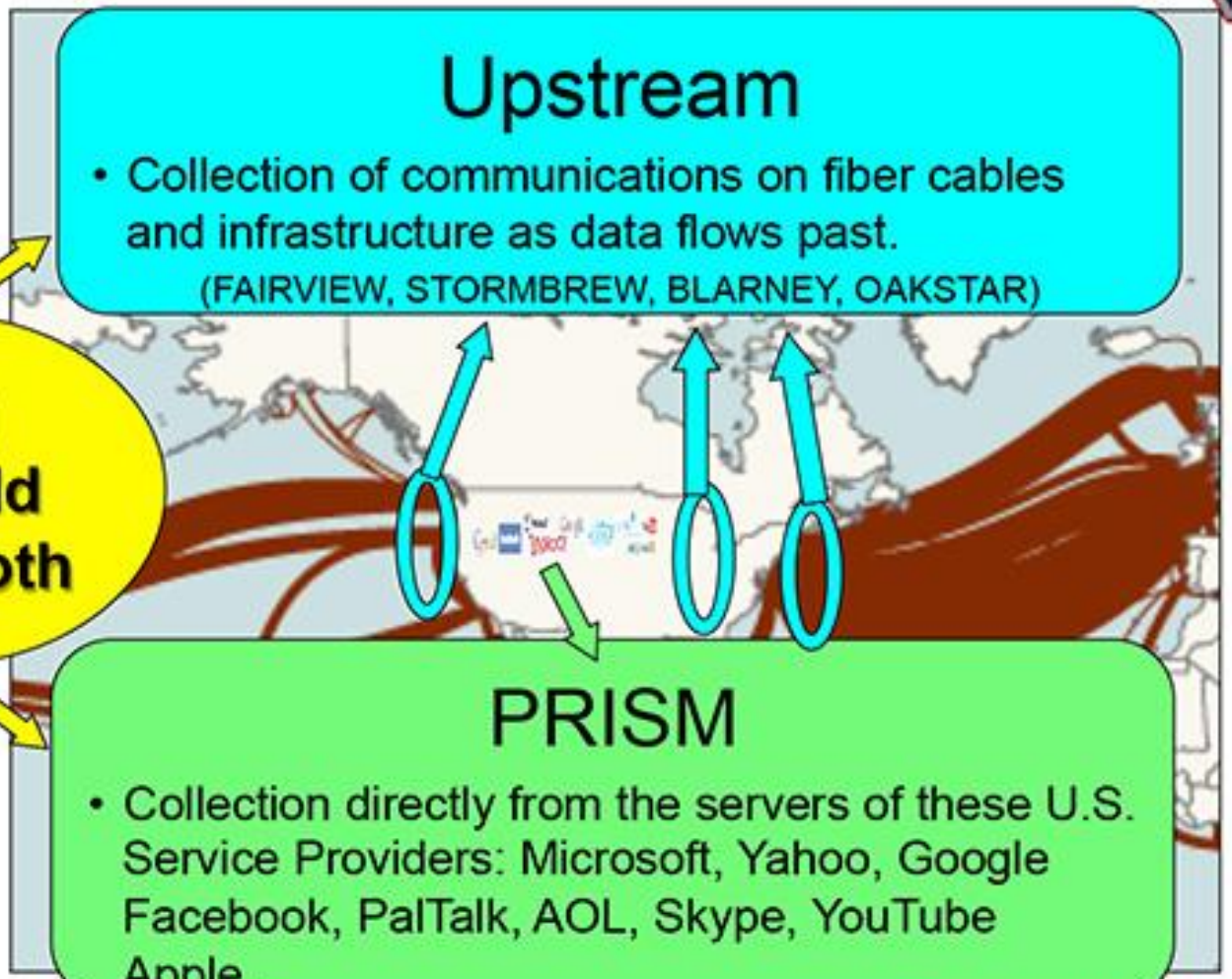
Two Types of Collection

Upstream

- Collection of communications on fiber cables and infrastructure as data flows past.

(FAIRVIEW, STORMBREW, BLARNEY, OAKSTAR)

You Should Use Both



PRISM

- Collection directly from the servers of these U.S. Service Providers: Microsoft, Yahoo, Google Facebook, PalTalk, AOL, Skype, YouTube Apple.

Keeping users safe

(a) True anonymity

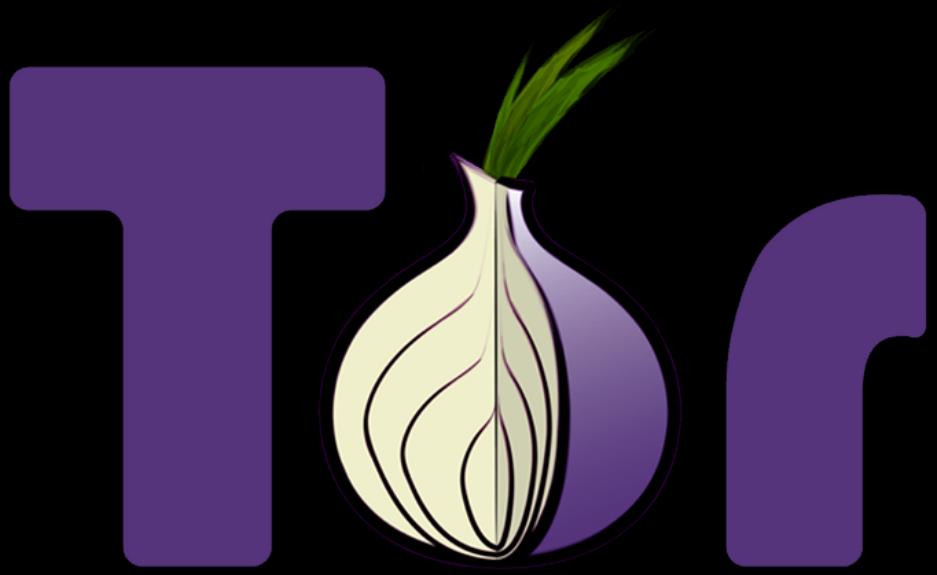
- Encryption is not enough
- “Just the metadata” is still dangerous

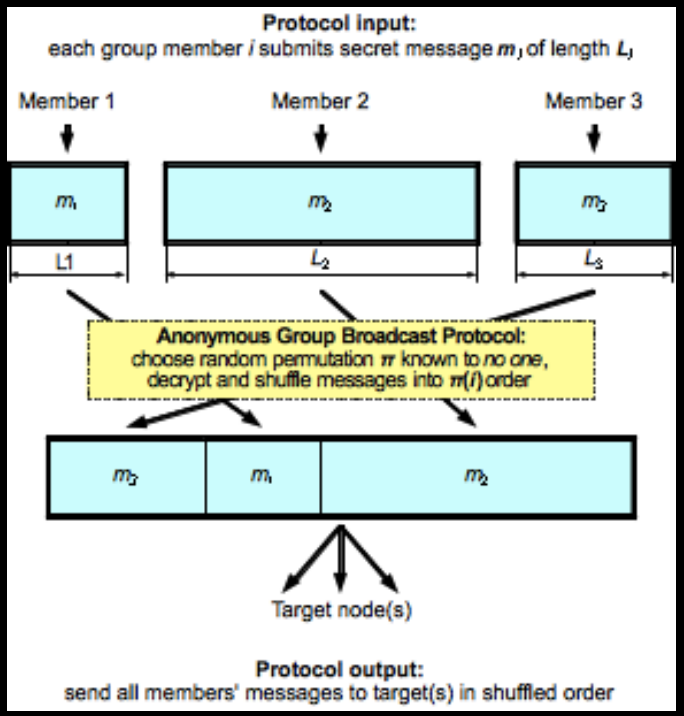
(b) Deniability

- Non-dissent uses of network (Tor)
- Hide dissent in innocuous traffic (Telex)

Real answer: some combination of these

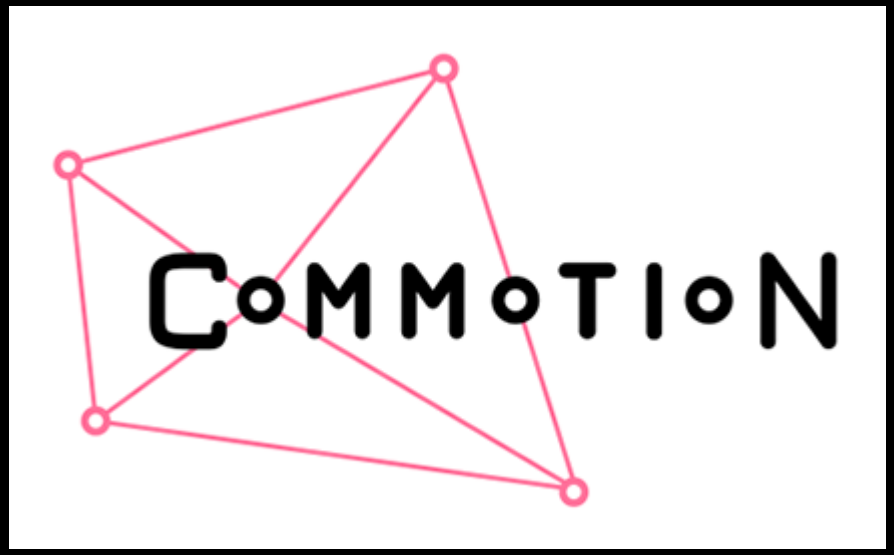
So now what?





Dissent [Corrigan-Gibbs10]

So now what?





So now what?

Download Commotion Android

Android

Here you can find pre-built downloads for the Commotion android devices we currently support.

NOTE: Your phone must be rooted to run this package. See the **Commotion Android Supported Hardware** page for device-specific information.

Current Release = (PR3) Pre-Release 3
Next Release = (DR1.1) Developer Release 1.1

STABLE BUILDS (PR3) :

- **CommotionMeshTether-pr3.apk** - 09/17/2012 02:36 am - (1 MB)



So now what?


Rangzen
Circumventing Government-Imposed Communication Blackouts

Recap:

Mesh networks don't scale.

Recap:

Weird looking equipment gets you arrested.

Recap:

Anonymity matters

just like

confidentiality.

Dissent Networks

Resilient to disruption

Meaningful scalability

Innocuous components

Resistant to tracking

Thanks!

Shaddi Hasan

shaddi@cs.berkeley.edu
@shaddih
http://cs.berkeley.edu/~shaddi

Backup slides

Directional Antennas	Fewer routes
Mobility	Complex routing
Multi-radio nodes	Increased cost
Delay tolerance	Poor UX, new apps
Small networks	Limits reach
Few users	Limits reach
Network planning	Slows growth
Coordinated management	Single point of failure

Pseudonymity is not enough!

[Goga13] *Exploiting Innocuous Activity for Correlating Users Across Sites*

[Reid13] *An Analysis of Anonymity in the Bitcoin System*

[Srivatsa12] *Deanonymizing mobility traces: Using social network as a side-channel*

Many others!