Censorship- and Coercion-Resistant Network Architectures

Edward L. Platt
Daniel M. Romero

“The Net interprets censorship as damage and routes around it.”
— John Gilmore

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“The Net interprets censorship as damage and routes around it.”
— John Gilmore

How Pakistan knocked YouTube offline (and how to make sure it never happens again)

February 25, 2008. CNET.com.

Lavabit held in contempt of court for printing crypto key in tiny font [Updated]

US attorney: Lavabit "treated court orders like contract negotiations."

April 26, 2014. Ars Technica.

How the NSA hacks PCs, phones, routers, hard disks 'at speed of light': Spy tech catalog leaks

It's not as bad as you thought - it's much worse

Dec 31, 2013. The Register.

TCP/IP is decentralized!

TCP/IP is decentralized!

The internet is more than TCP/IP.

Socio-technical system

Geography

Geography
Jurisdiction

Geography

Jurisdiction

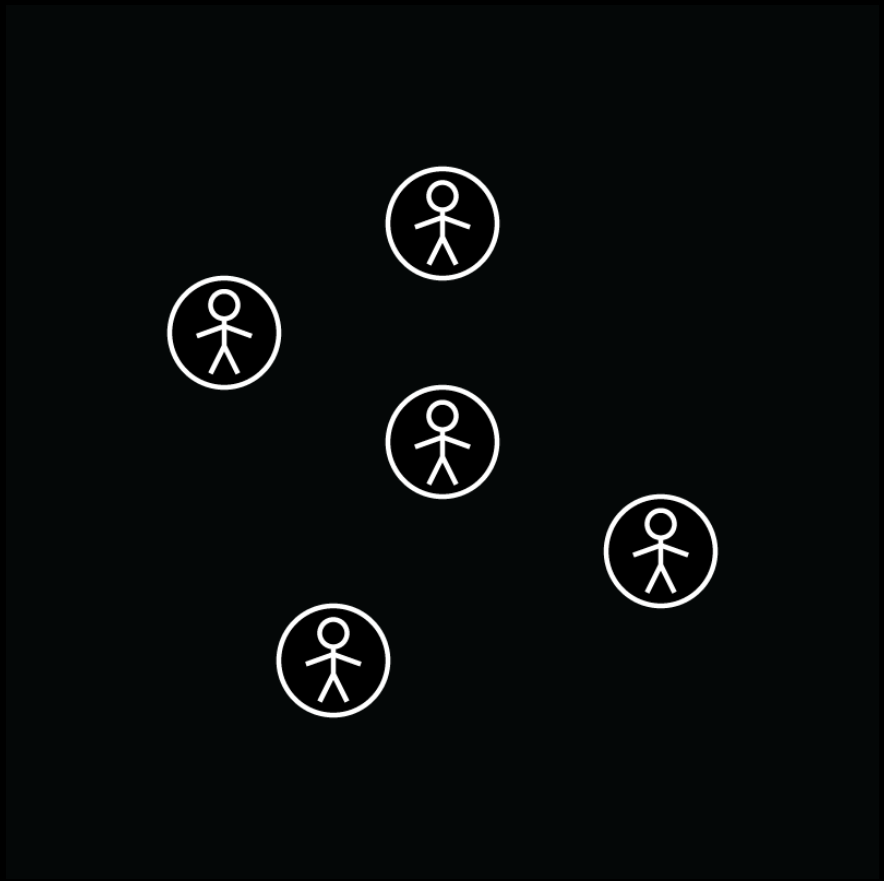
Legal entity

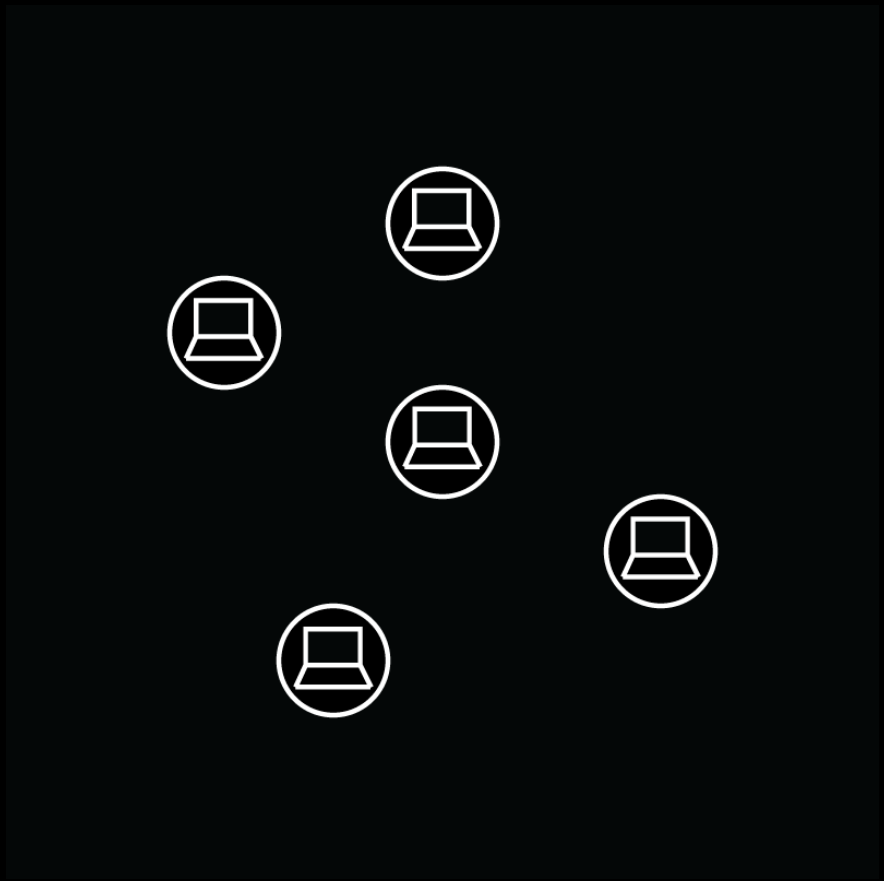
Geography

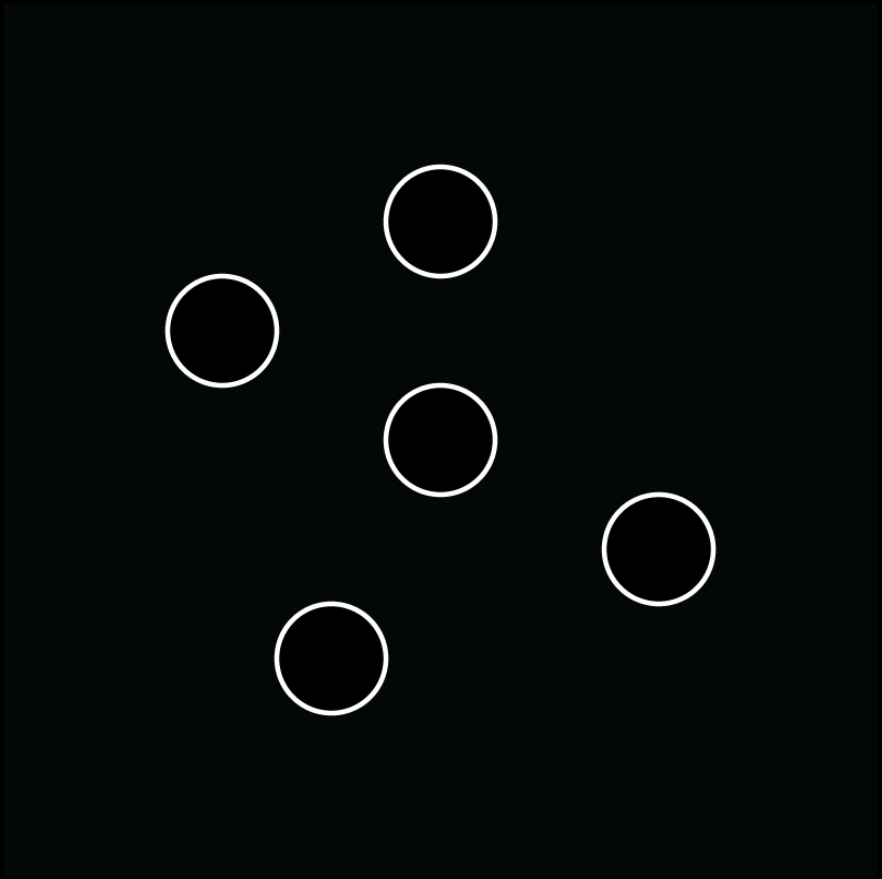
Jurisdiction

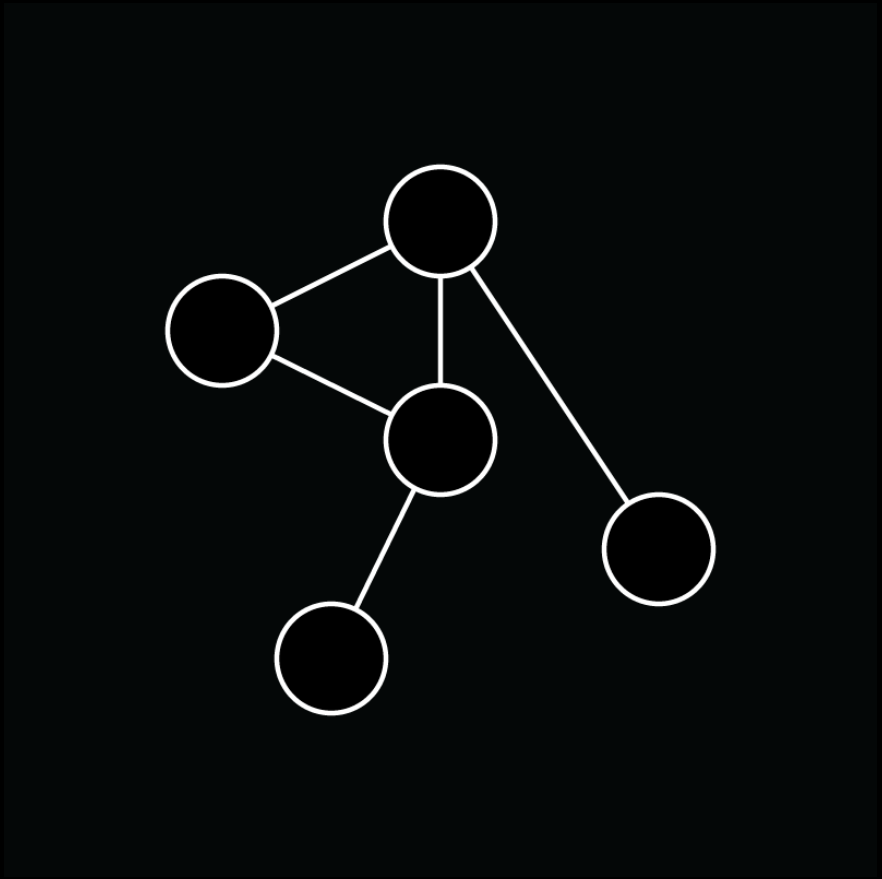
Legal entity

Network structure









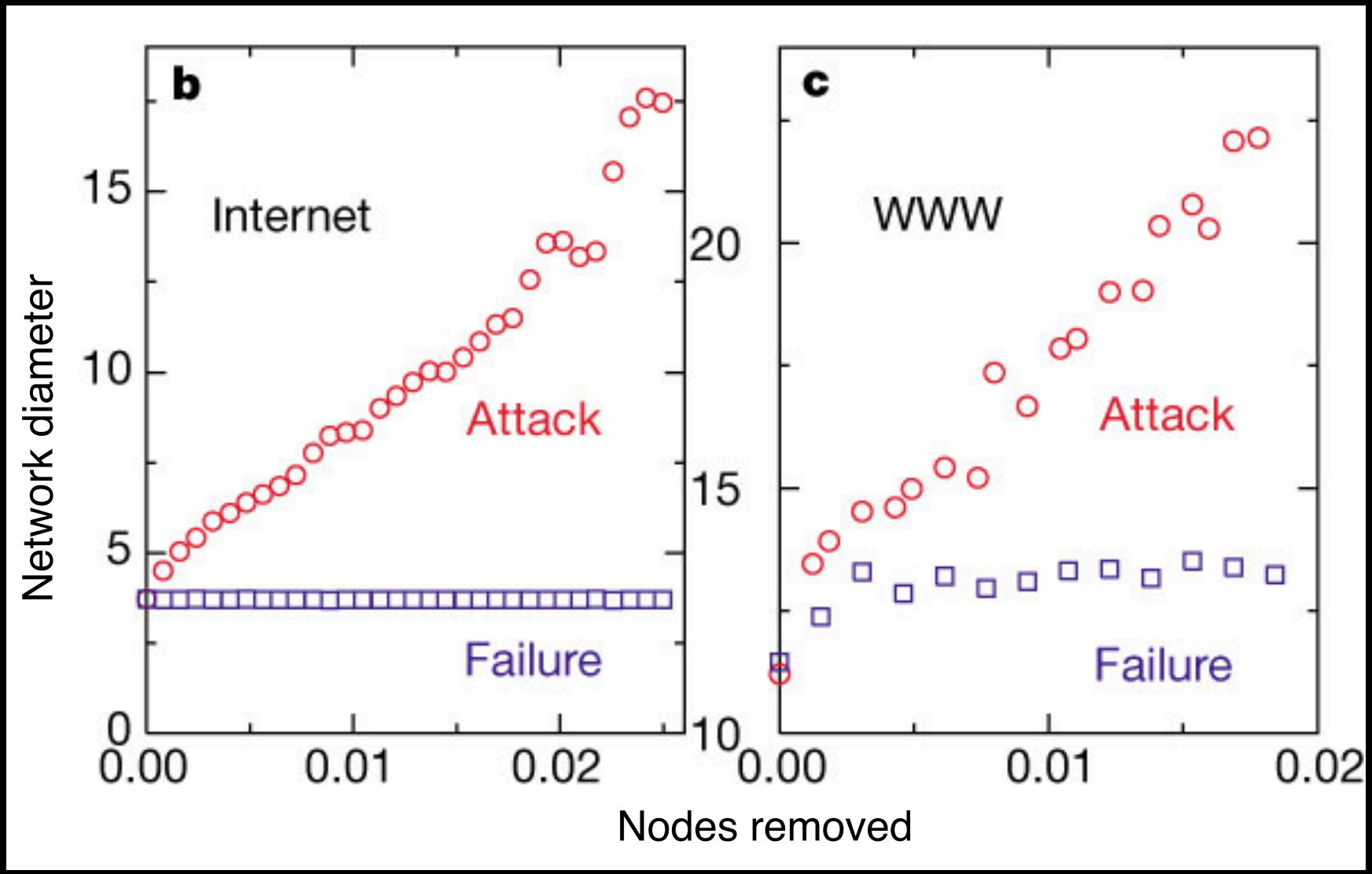
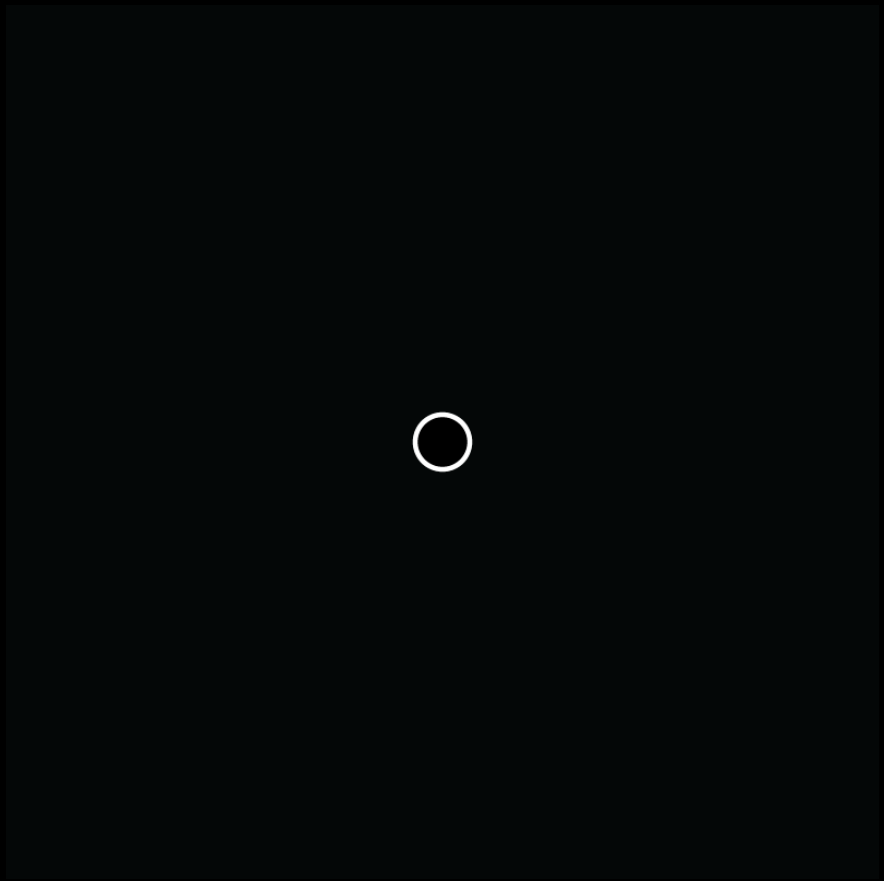
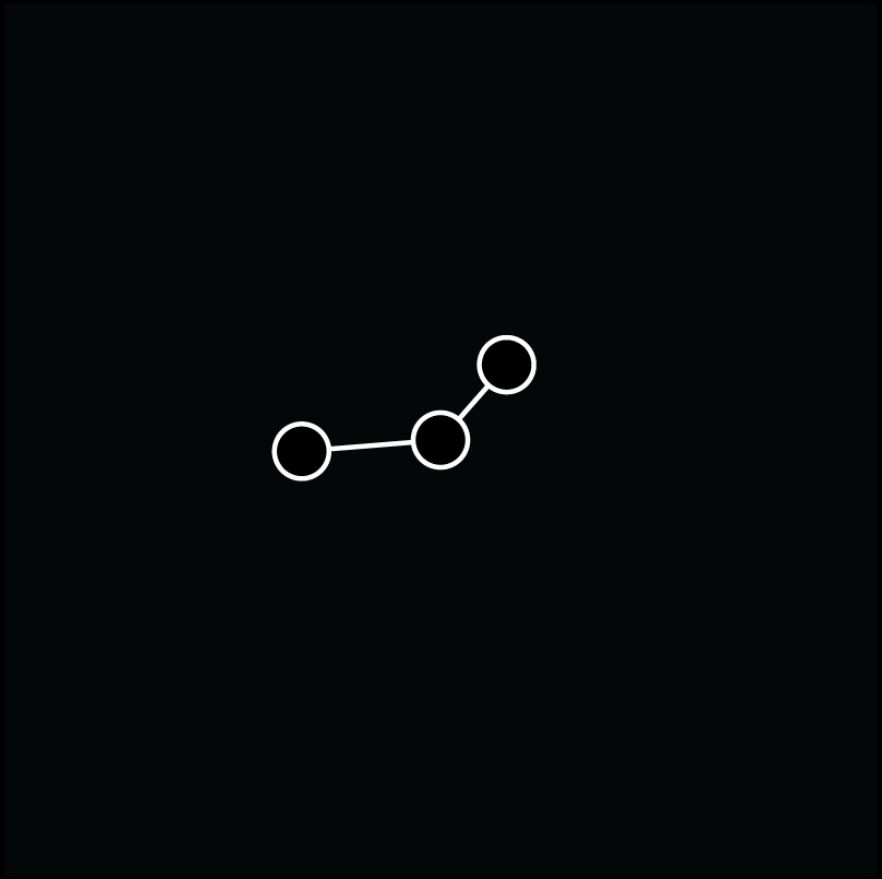
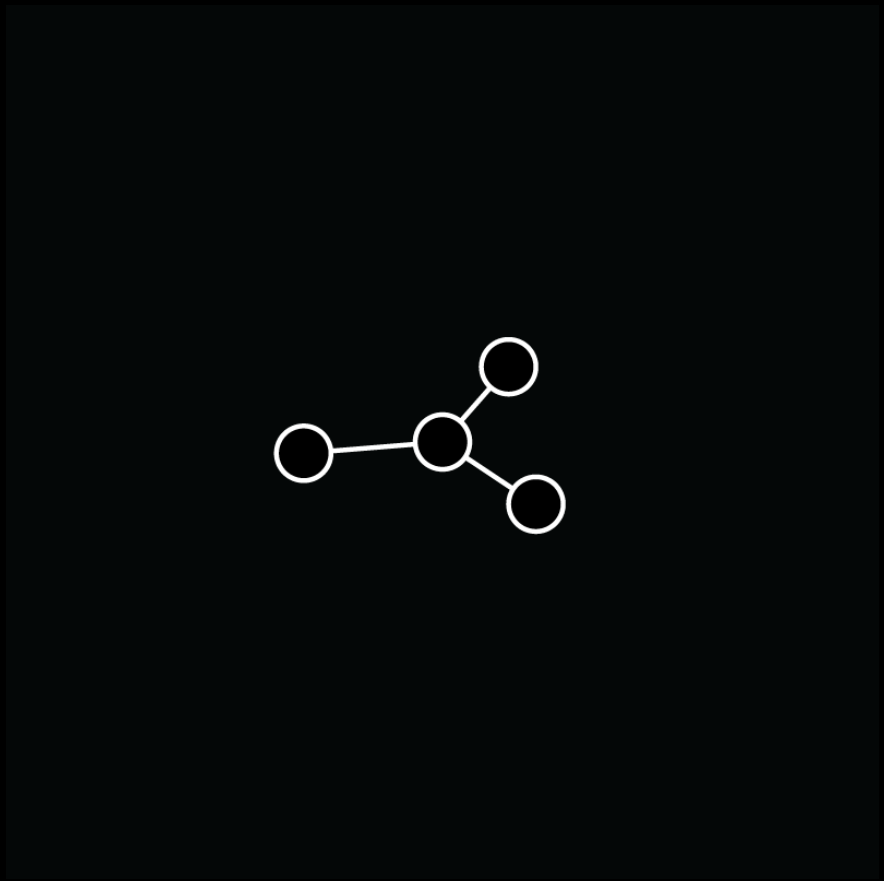
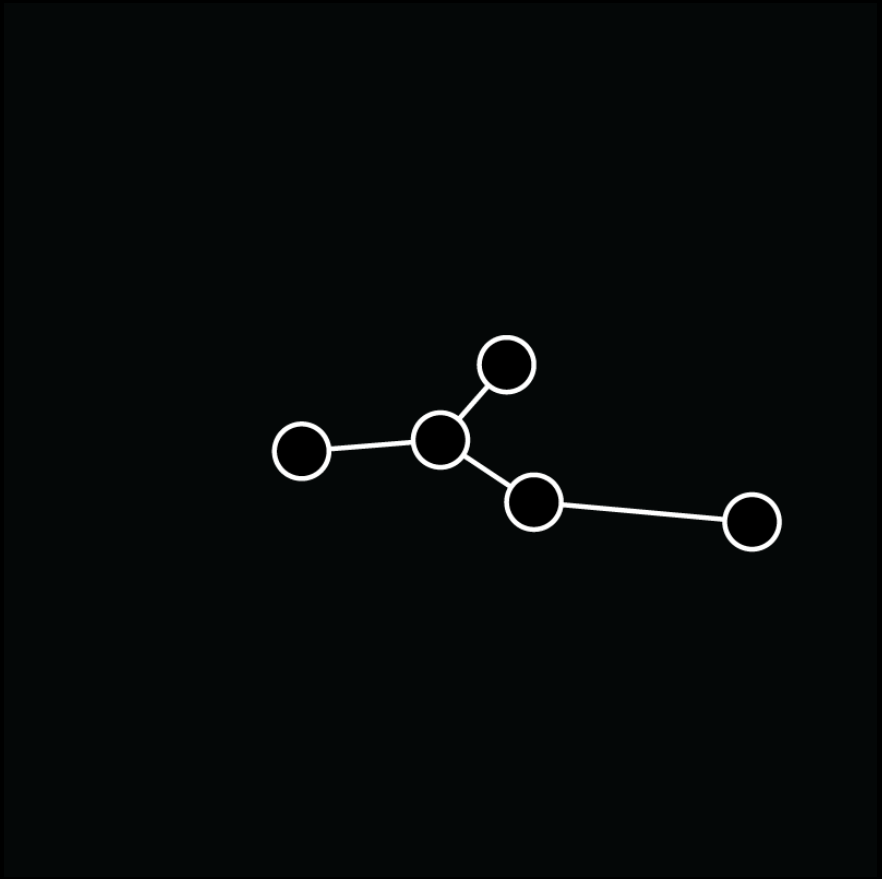


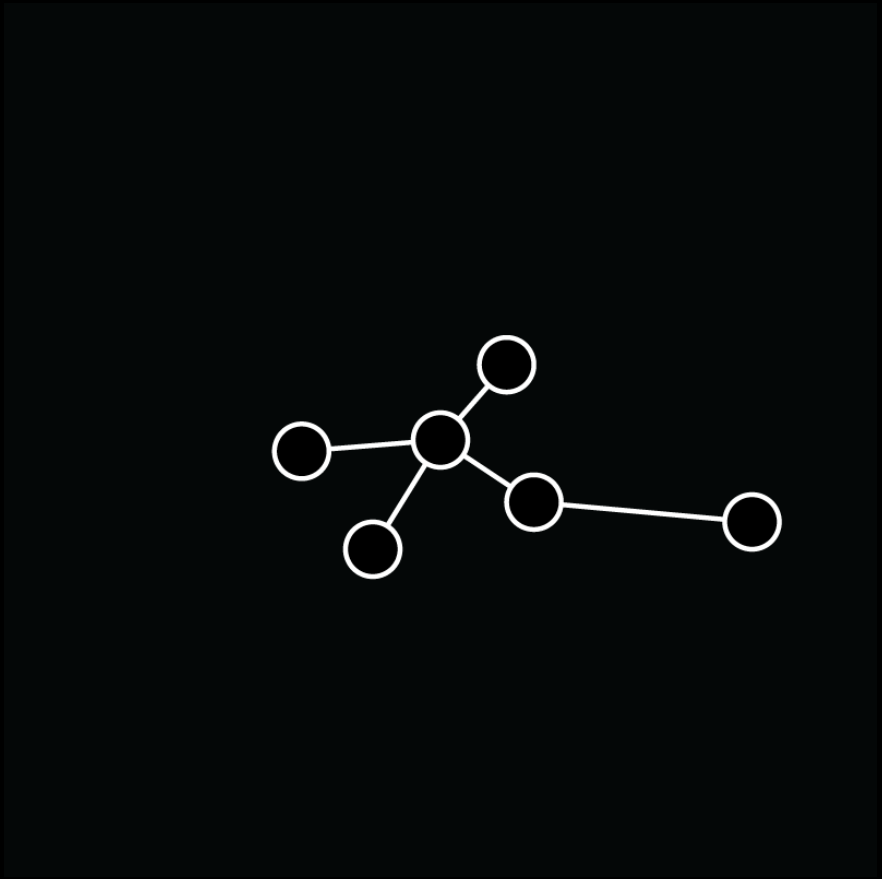
Figure adapted from: Albert, Jeong, & Barabási. 2000. "Error and attack tolerance of complex networks." *Nature* 406.

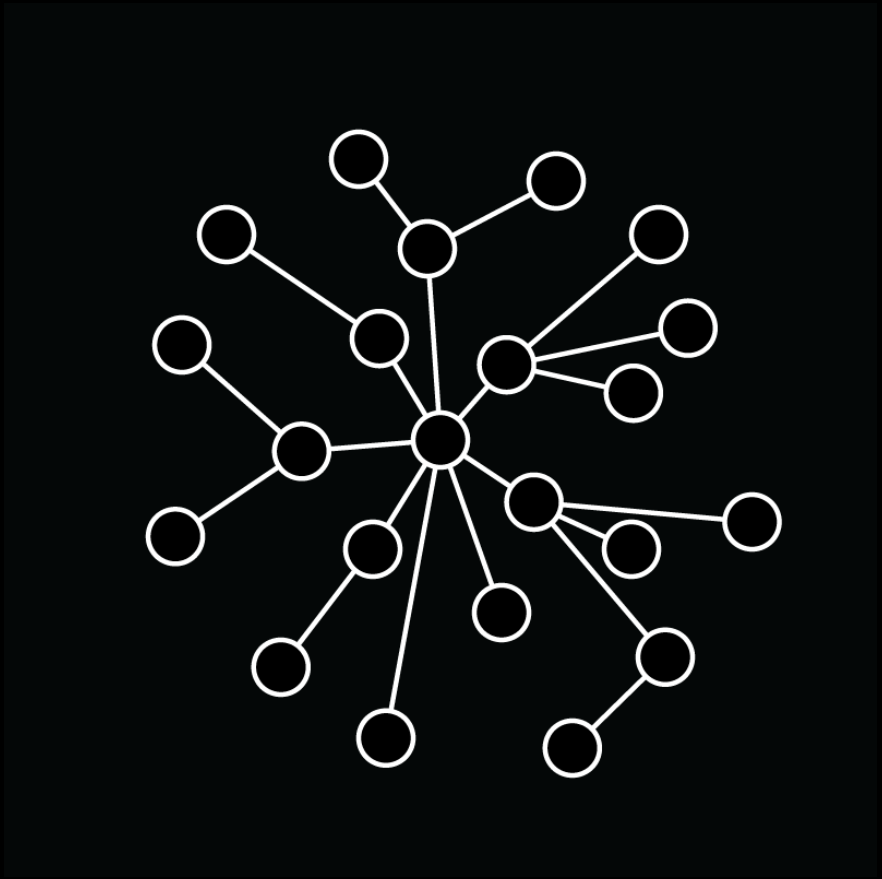


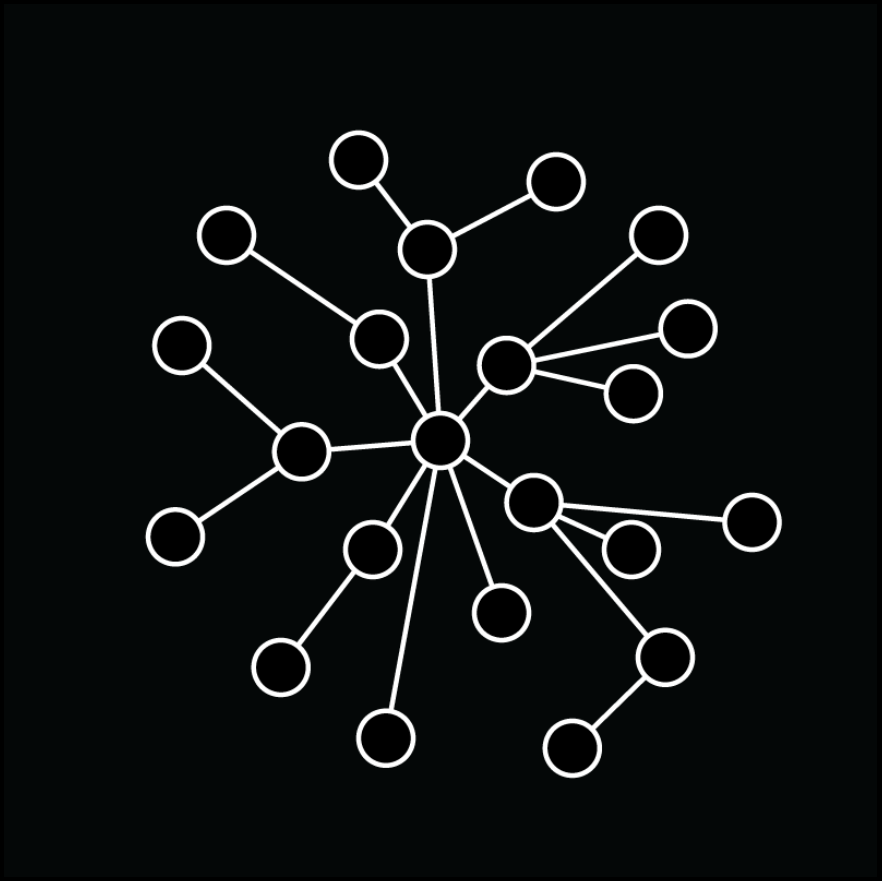




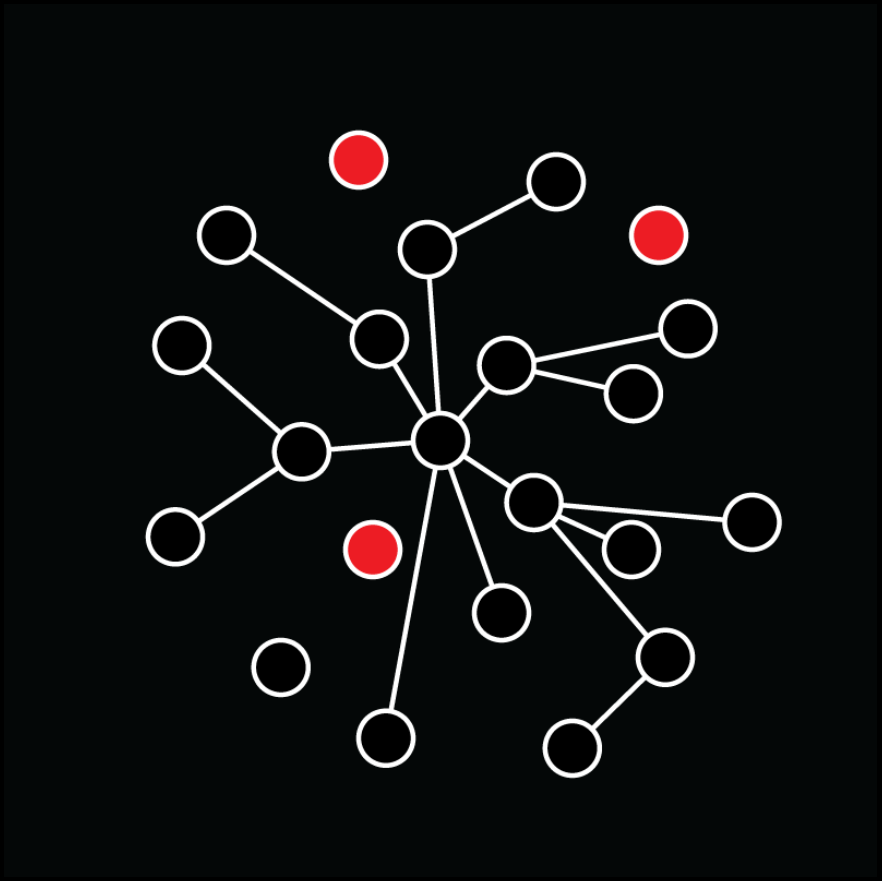




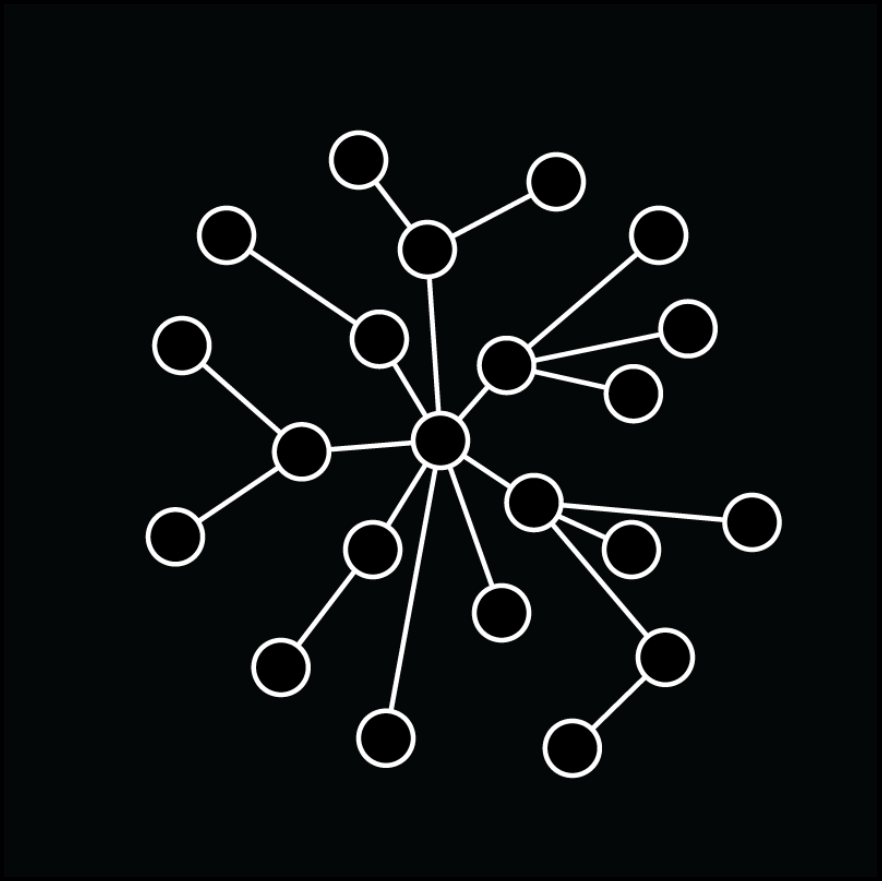




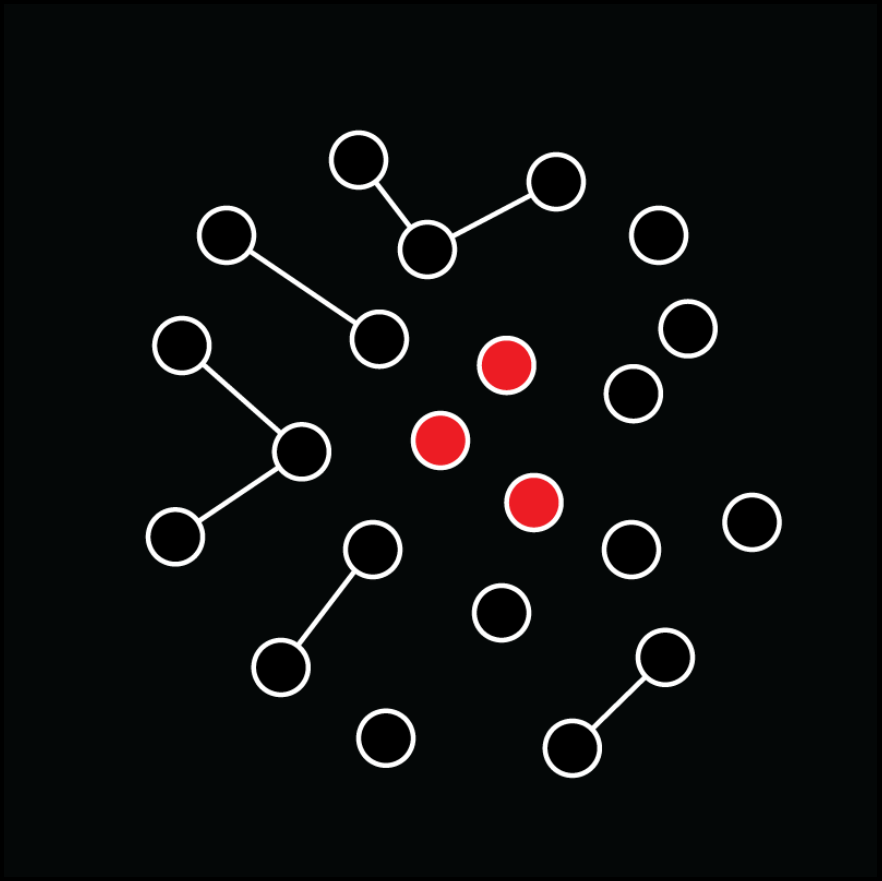
Random faults



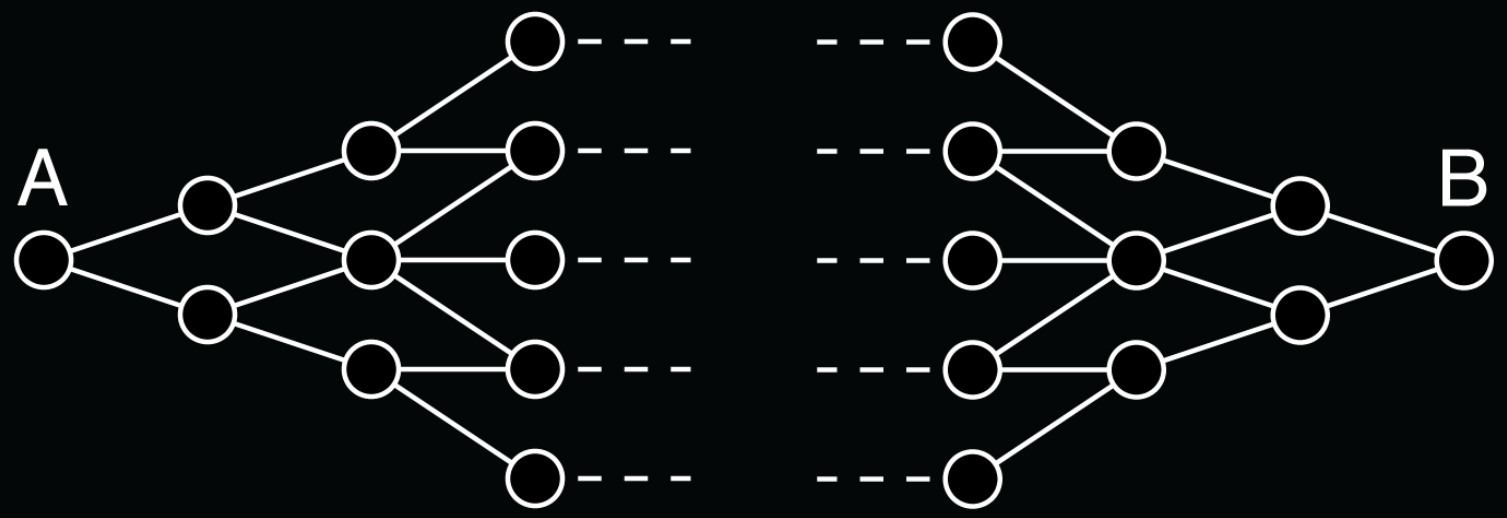
Random faults

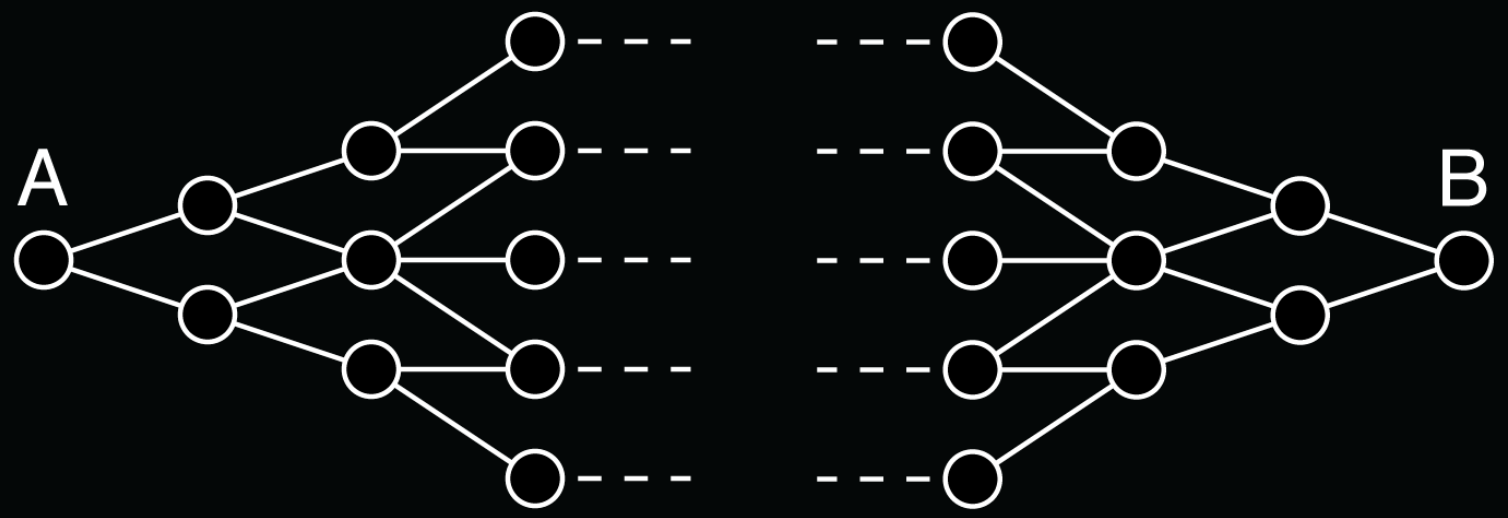


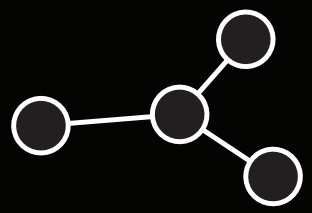
Targeted faults



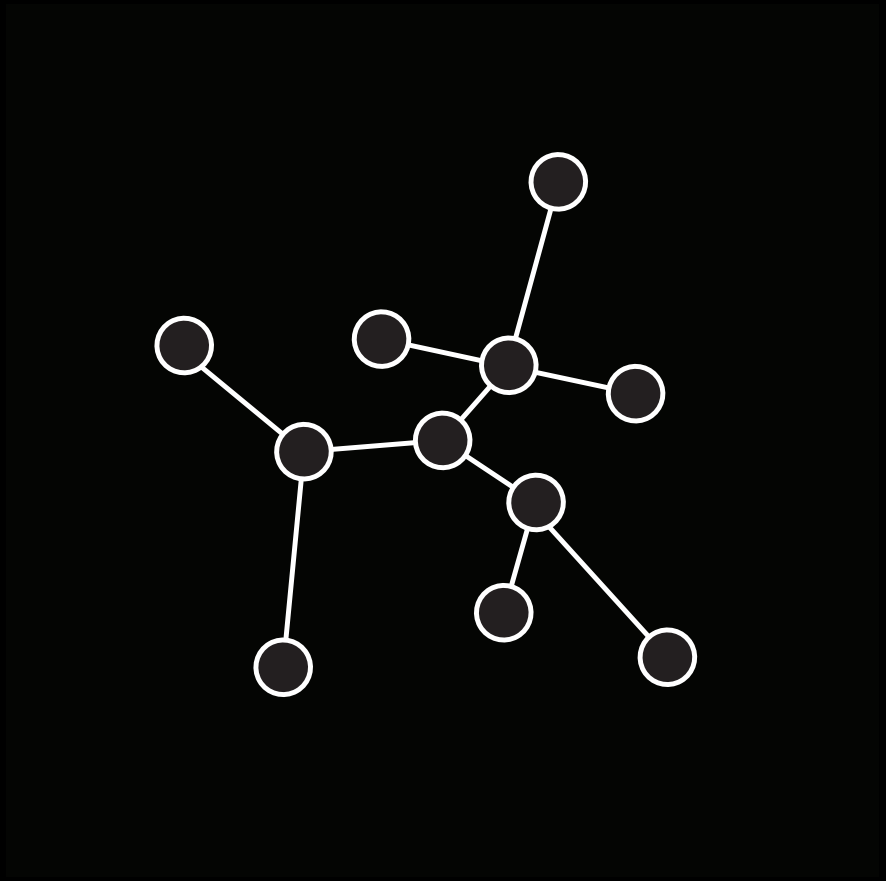
Targeted faults


A
B

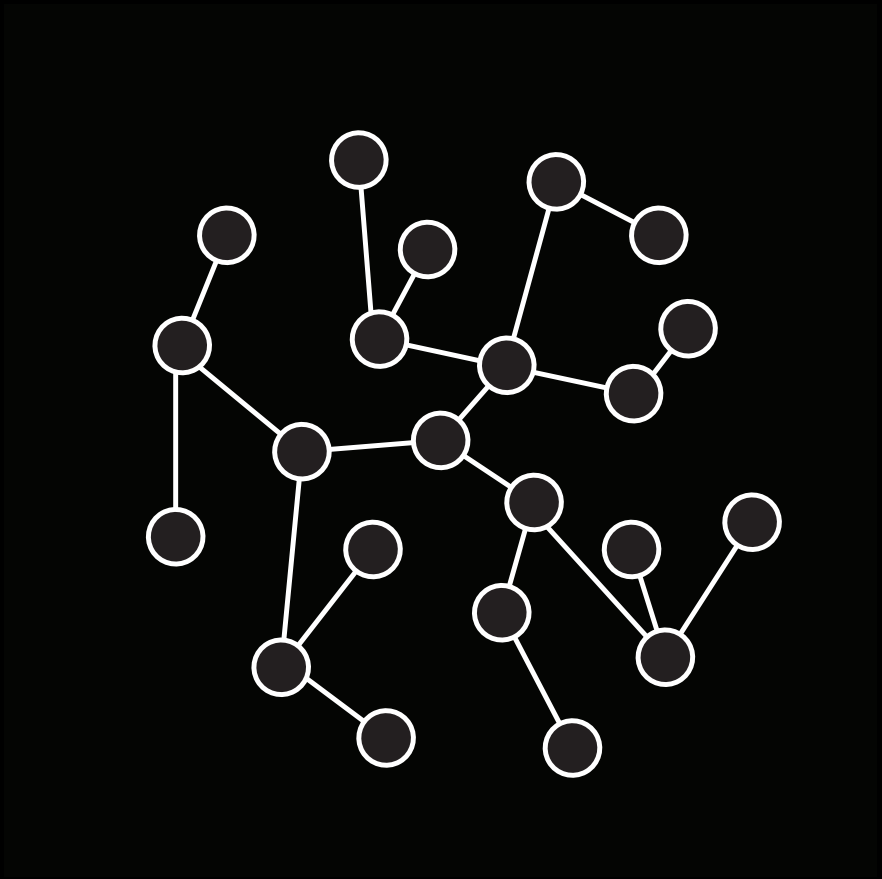

A
B



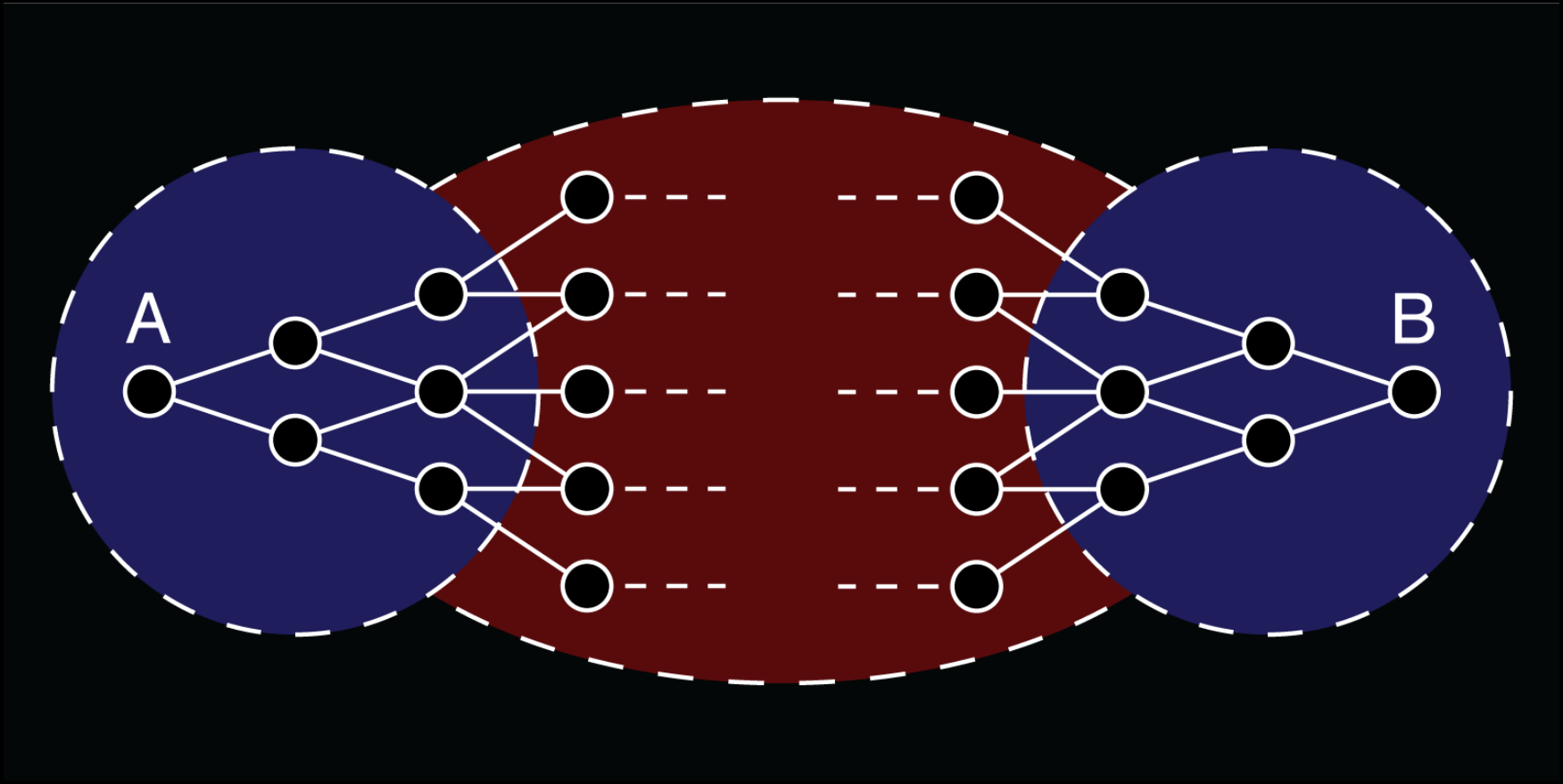
Web of Trust



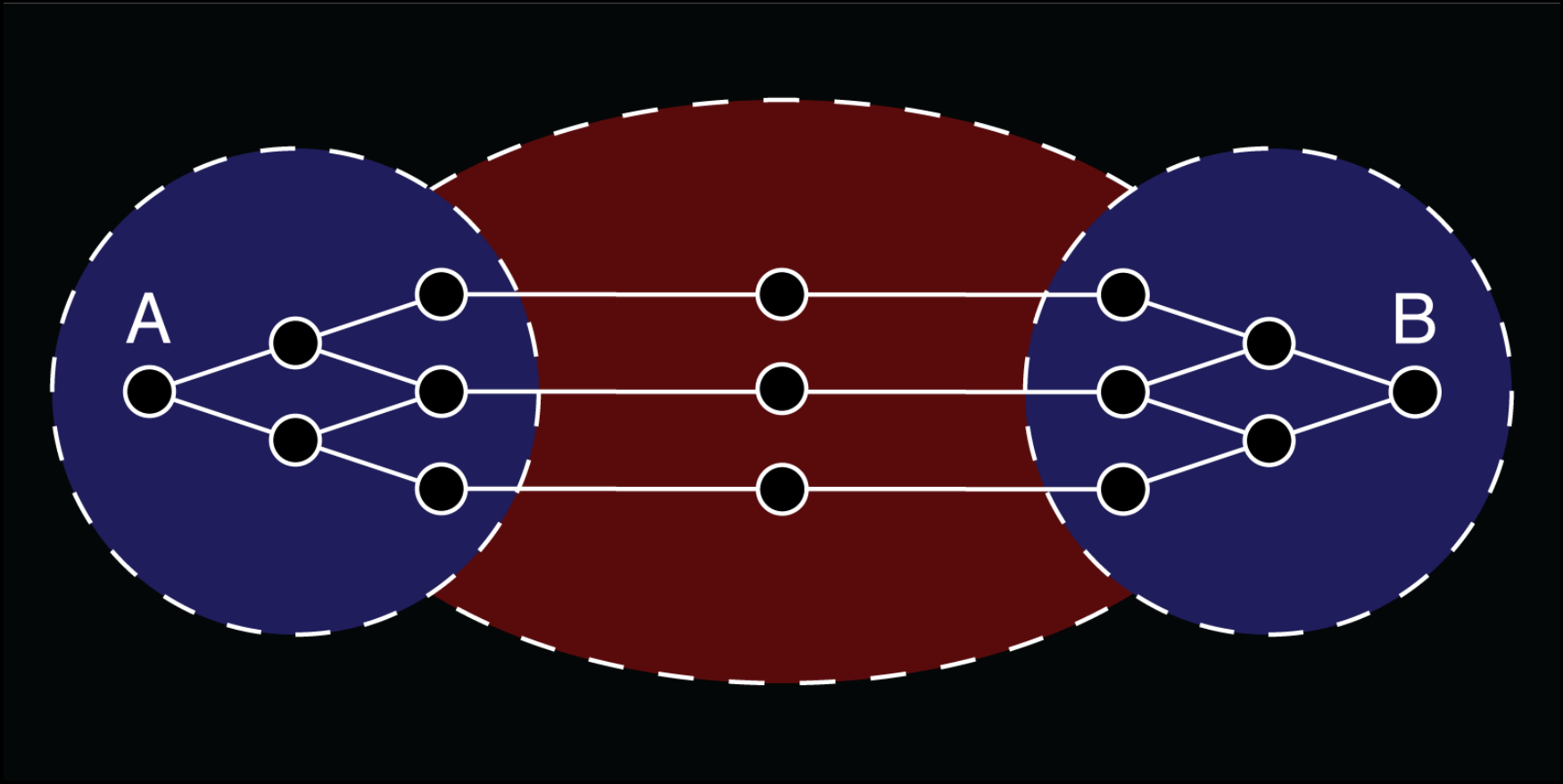
Web of Trust



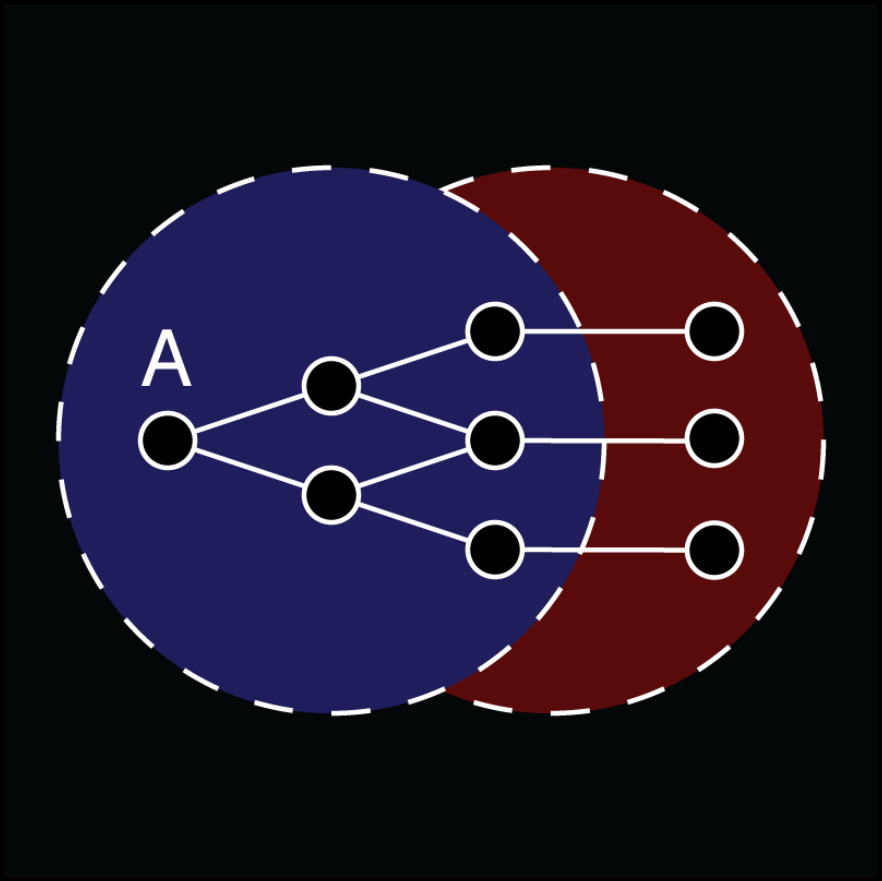
Web of Trust



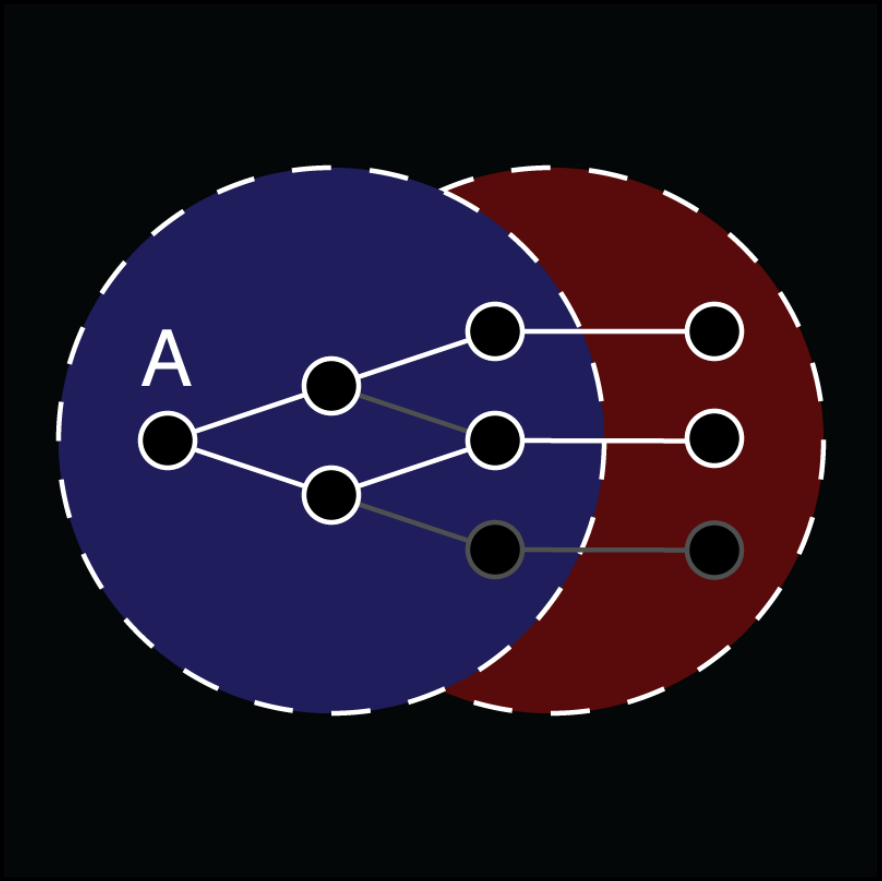
Partial Trust



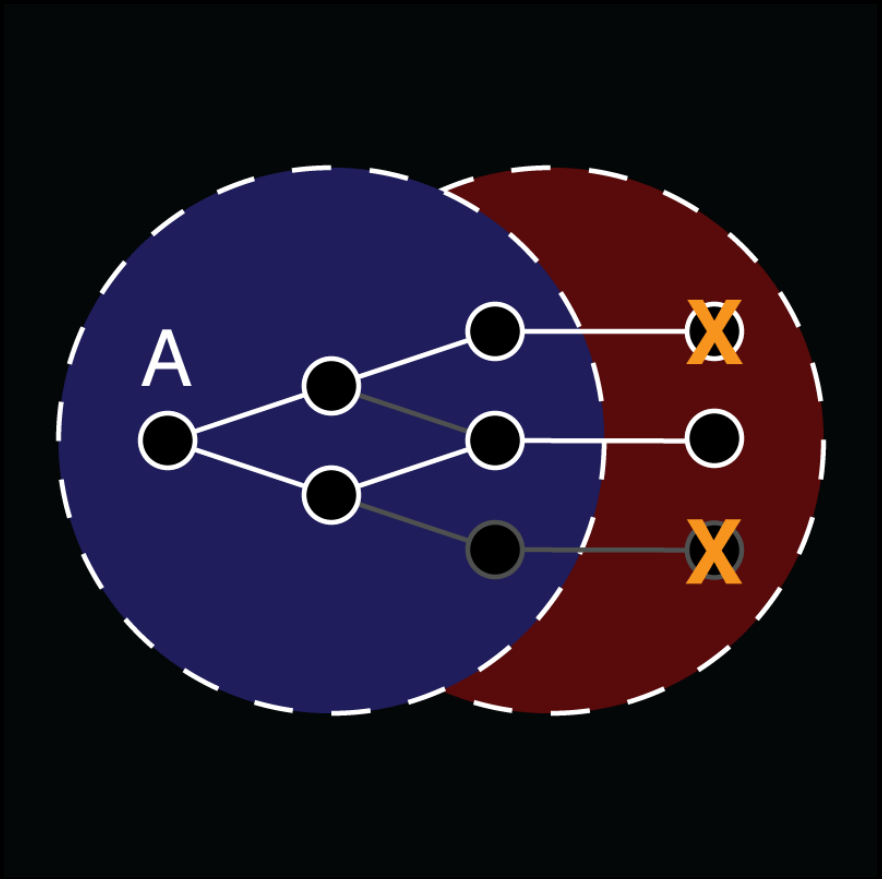
Partial Trust



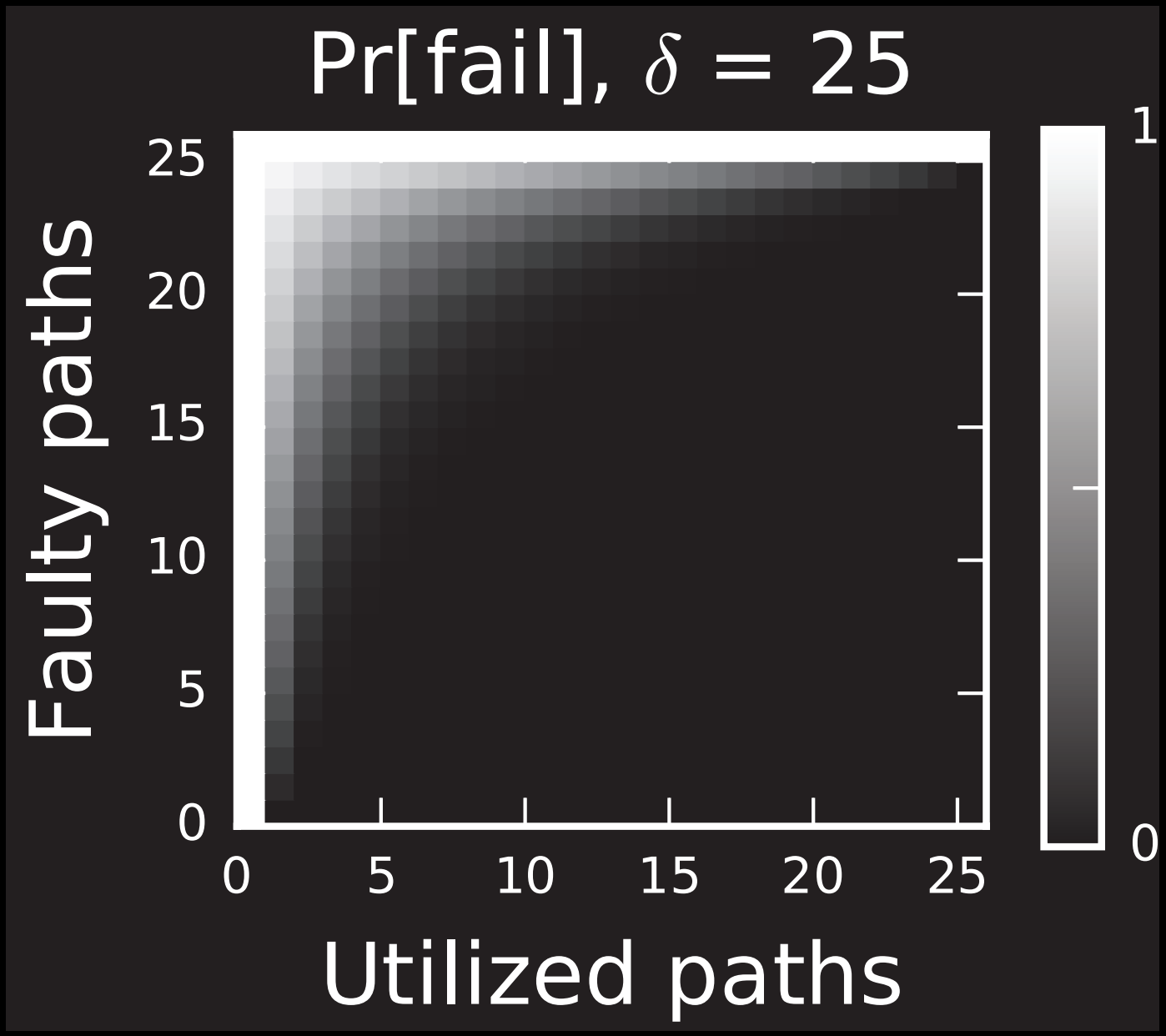
Partial Trust

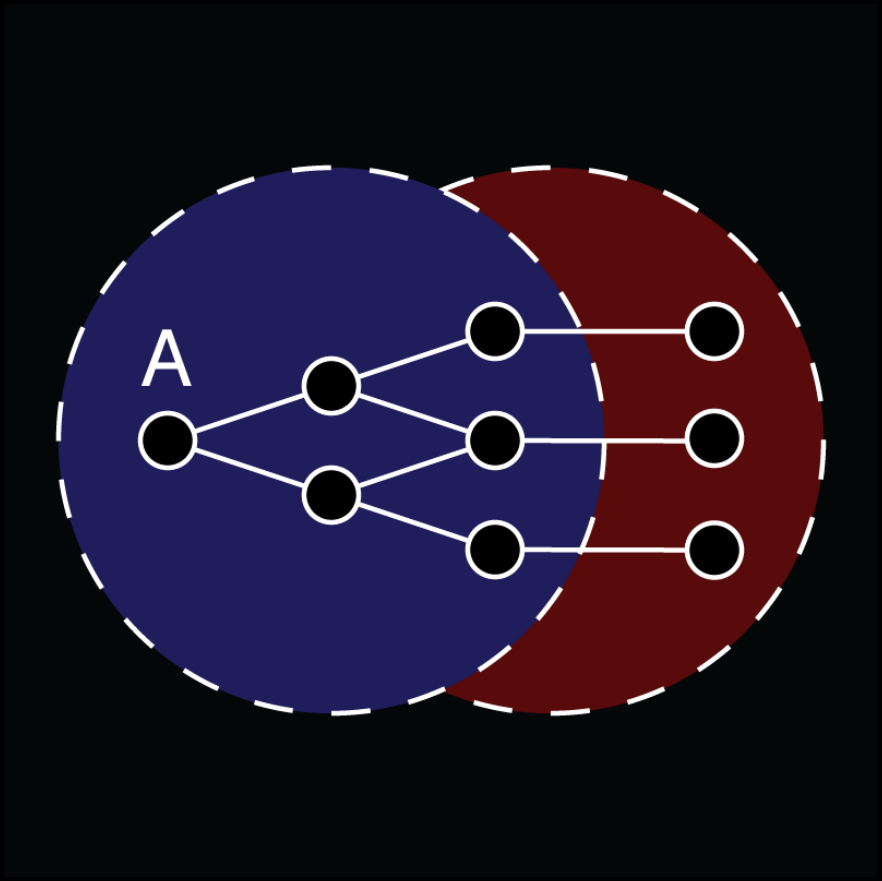


Concurrent Multipath Routing



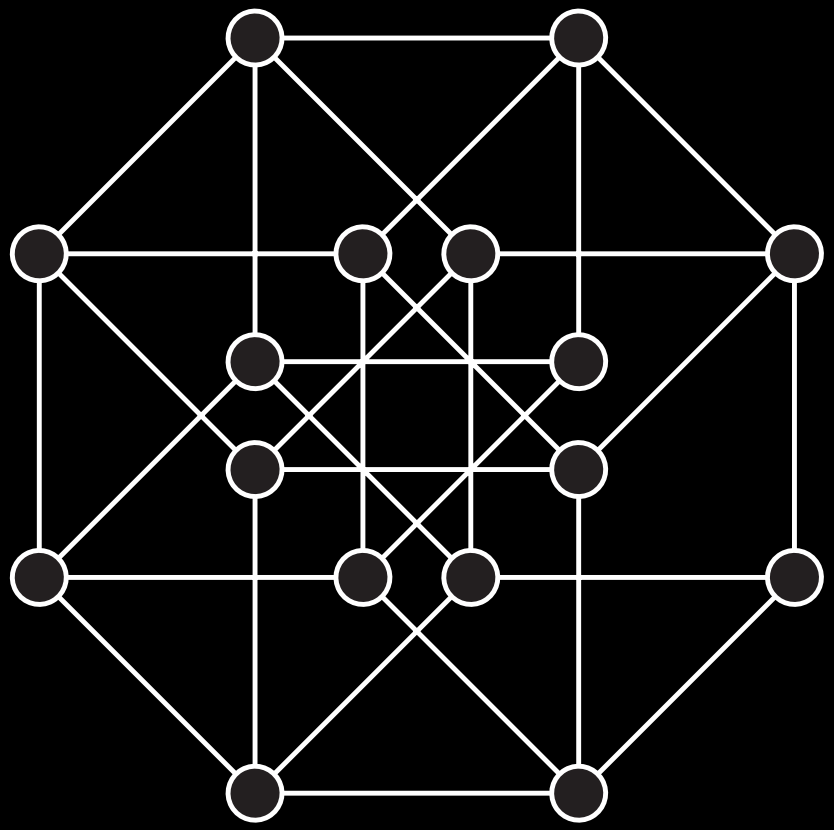
Fault tolerant CMR


Pr[fail], $\delta = 25$
Faulty paths
Utilized paths
0
5
10
15
20
25
1
0

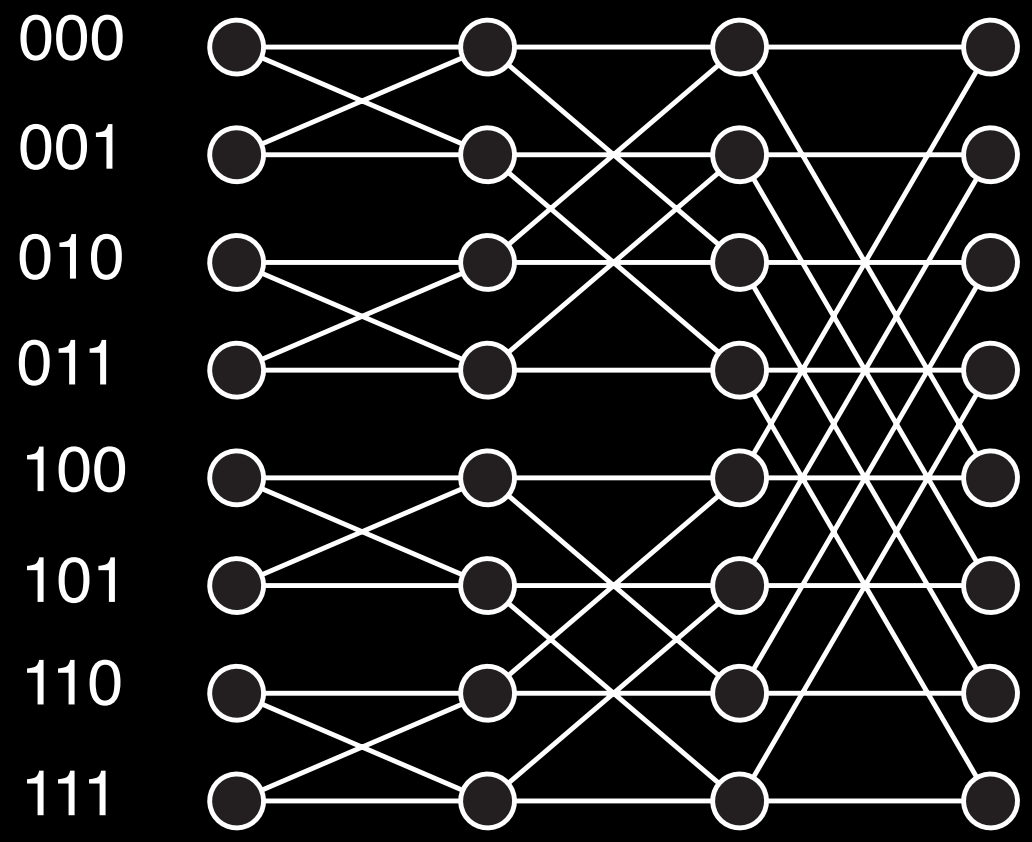


Partial Trust

Vertex-transitive Networks



m-Cube



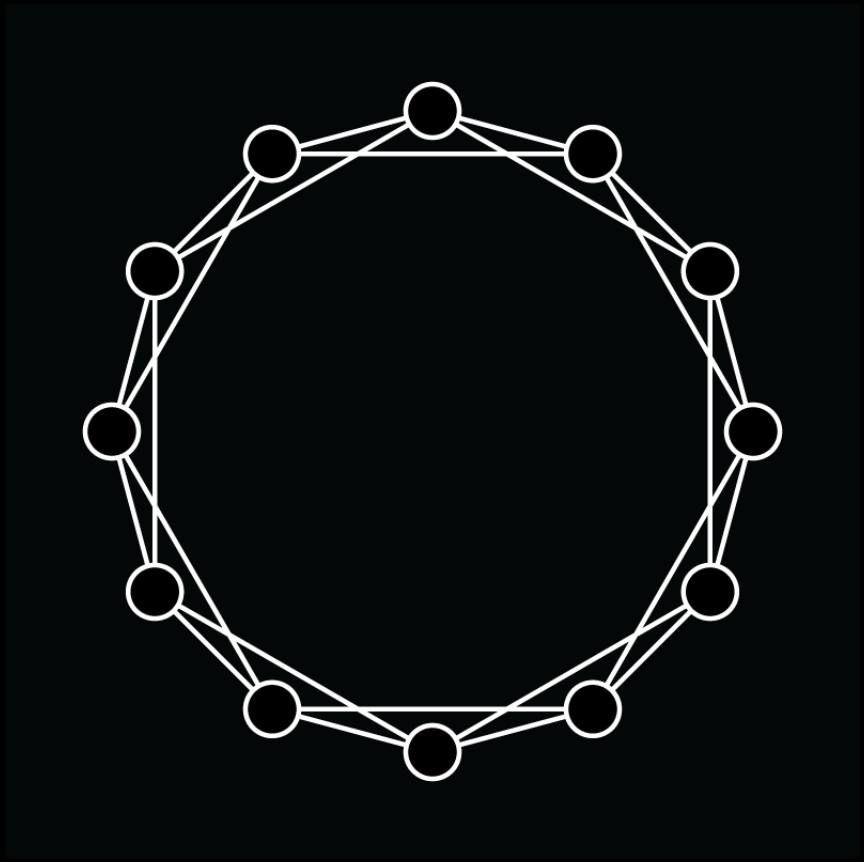
Butterfly

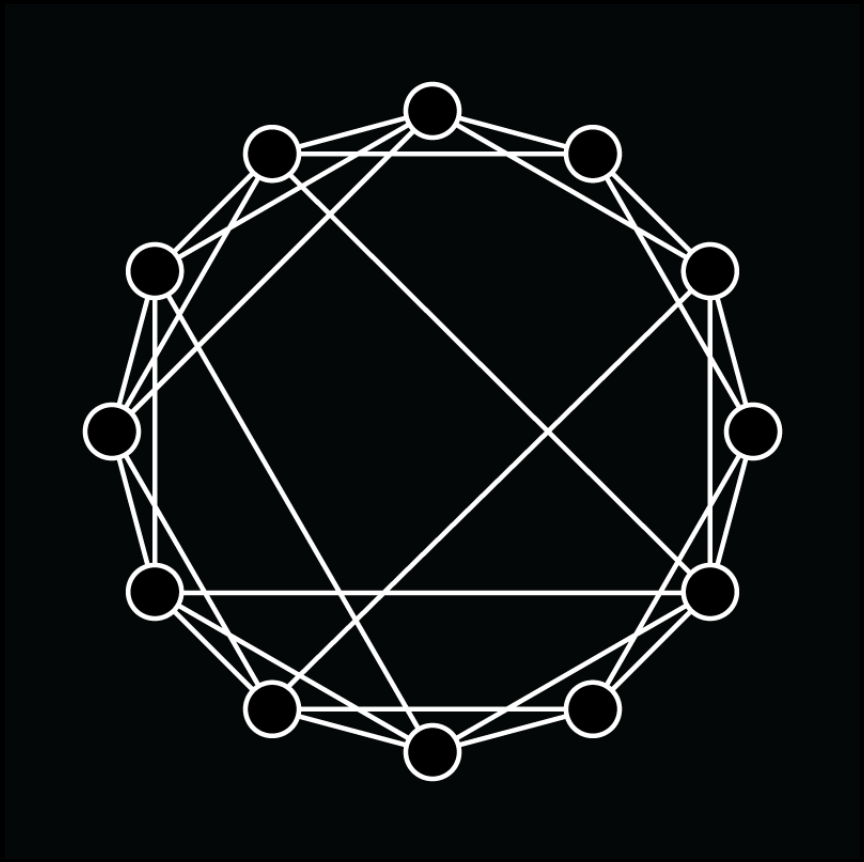
Connectivity

m-Cube: $\approx \left(\frac{1}{h} f(N)\right)^h$

Butterfly: $= O\left(h^2 2^h\right)$

Freenet



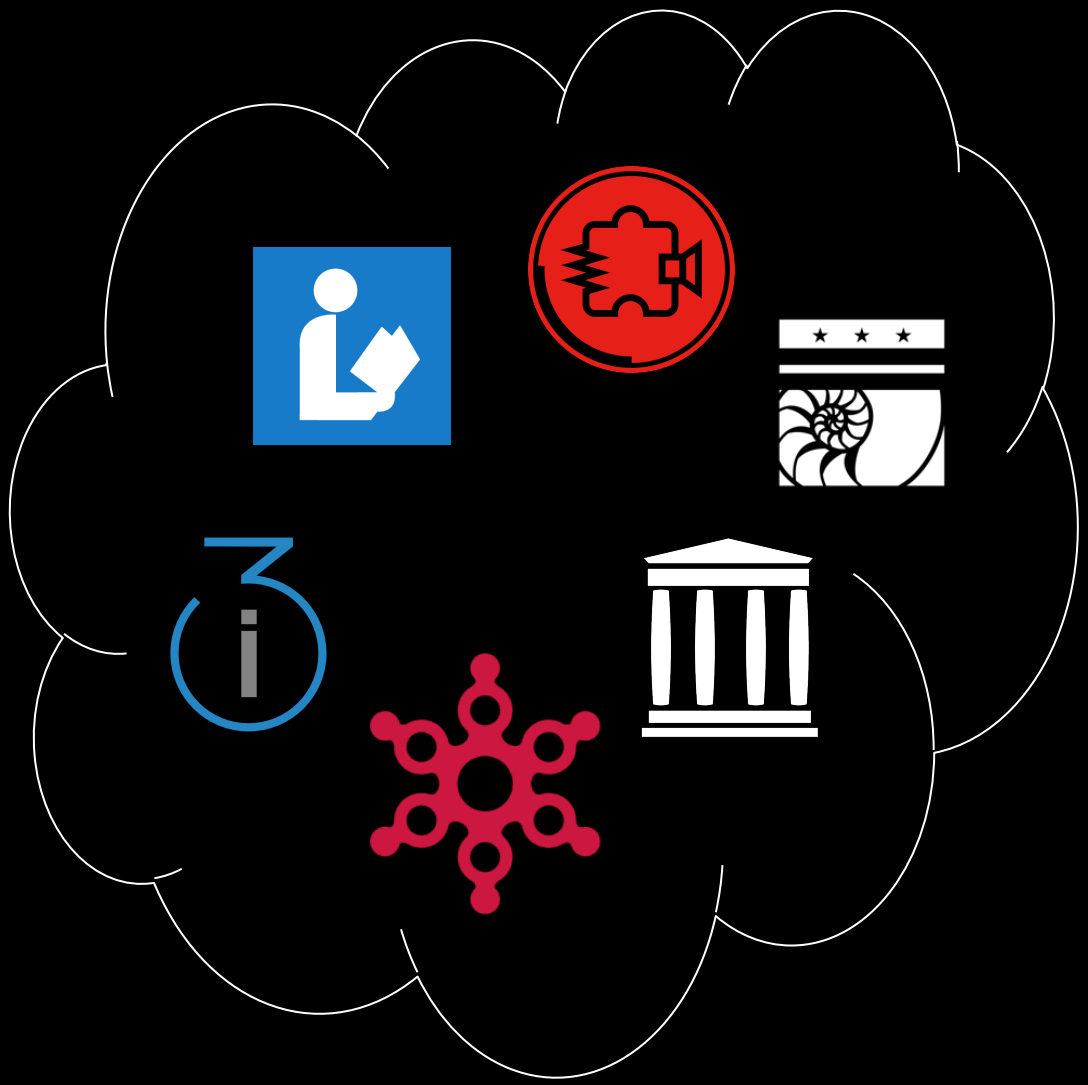


Fiat-Saia

Amos Fiat, Jared Saia. “Censorship resistant peer-to-peer content addressable networks.” Proc. ACM-SIAM Symp. on Discrete Alg. 2002

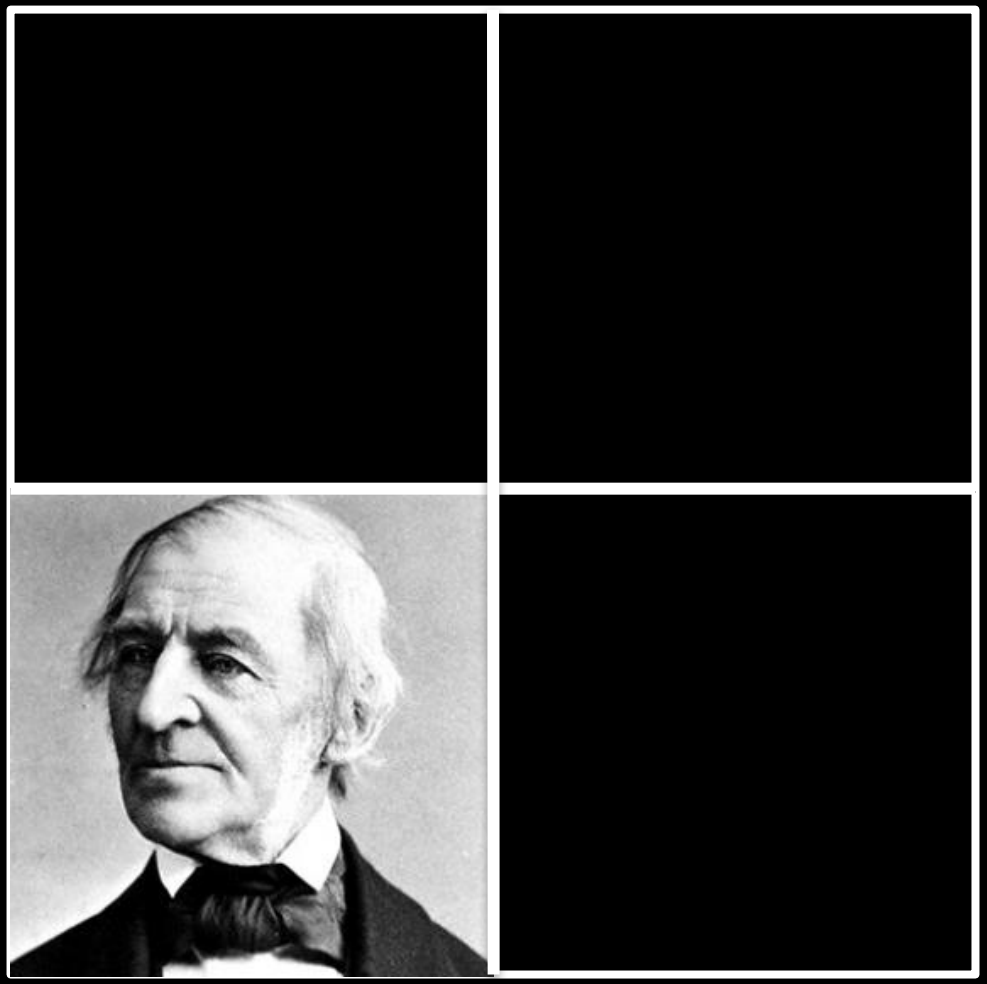
“The Net interprets censorship as damage and routes around it.”
— John Gilmore

Microsoft
Google



Edward L. Platt
@elplatt
https://elplatt.com

Egalitarian →



Scalable →

Egalitarian →

Scalable →

Photo: Dallas County District Attorney, https://www.flickr.com/photos/dallascountyda/14662921752

Egalitarian →

Scalable →

Photo: Dallas County District Attorney, https://www.flickr.com/photos/dallascountyda/14662921752

Egalitarian →

Scalable →

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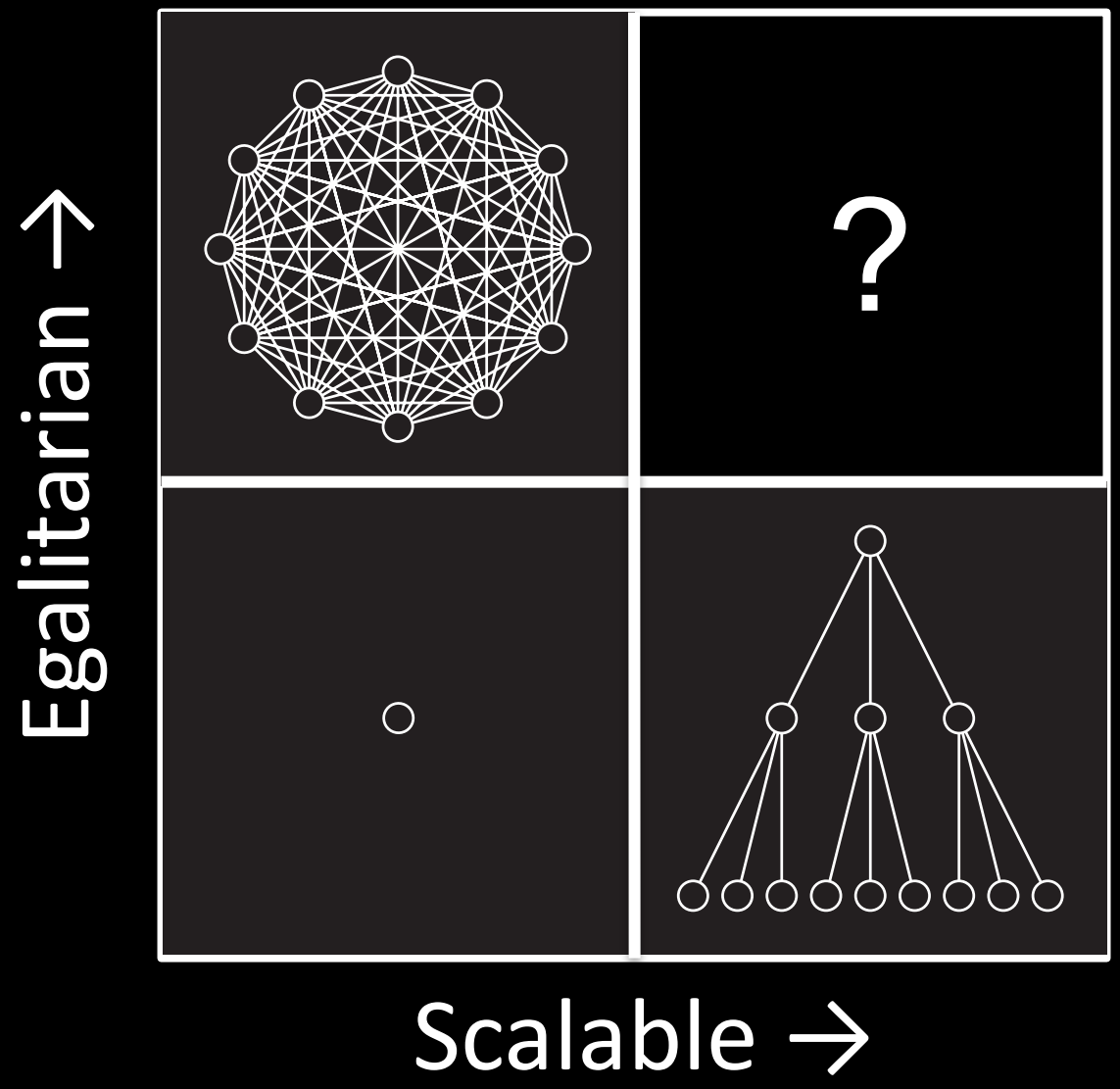
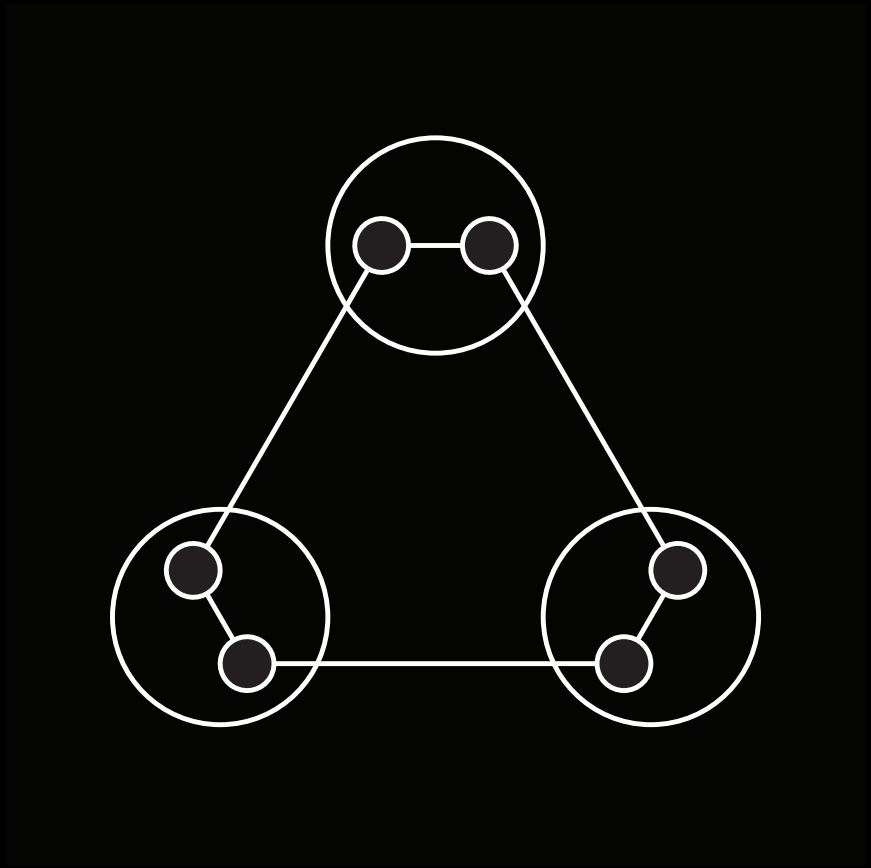
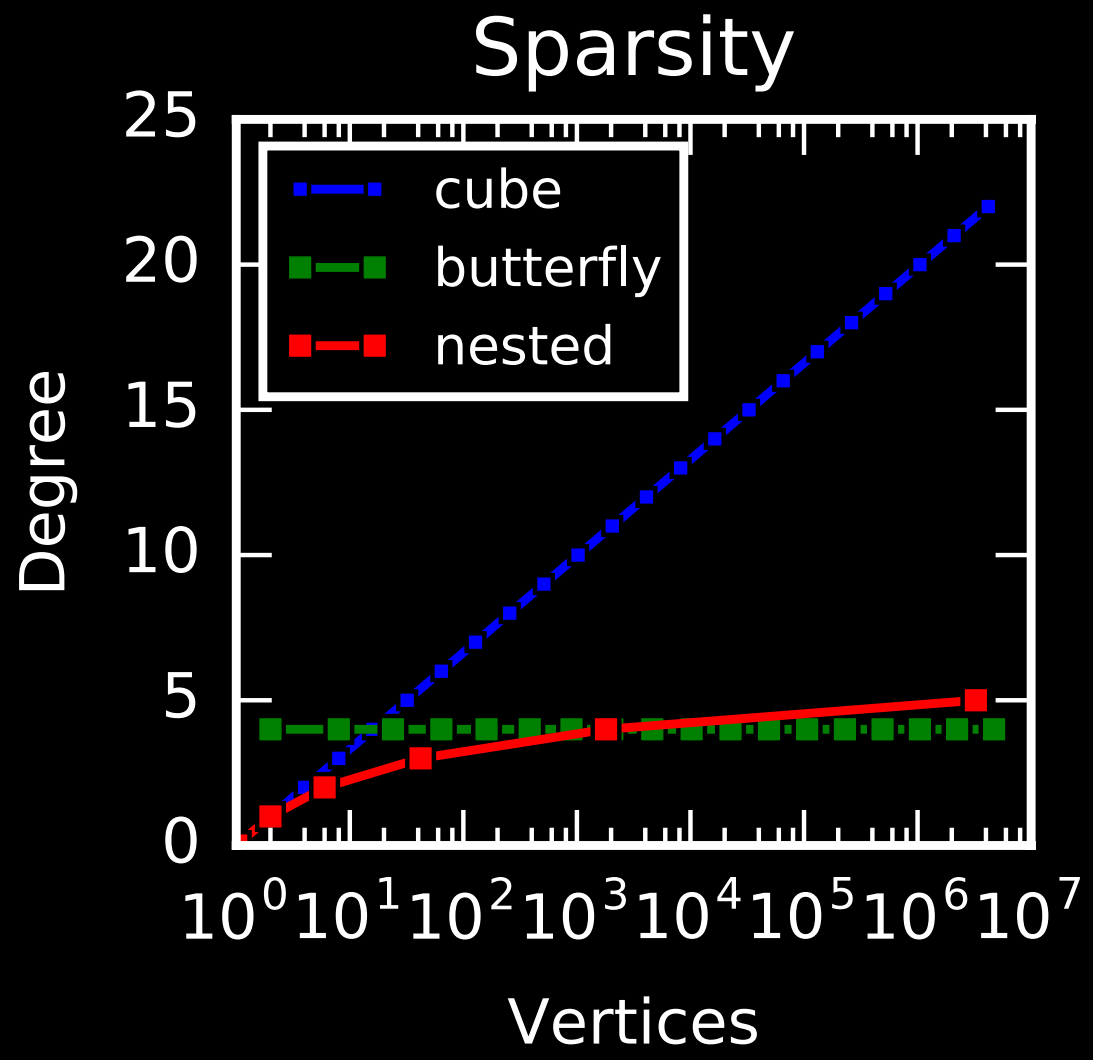
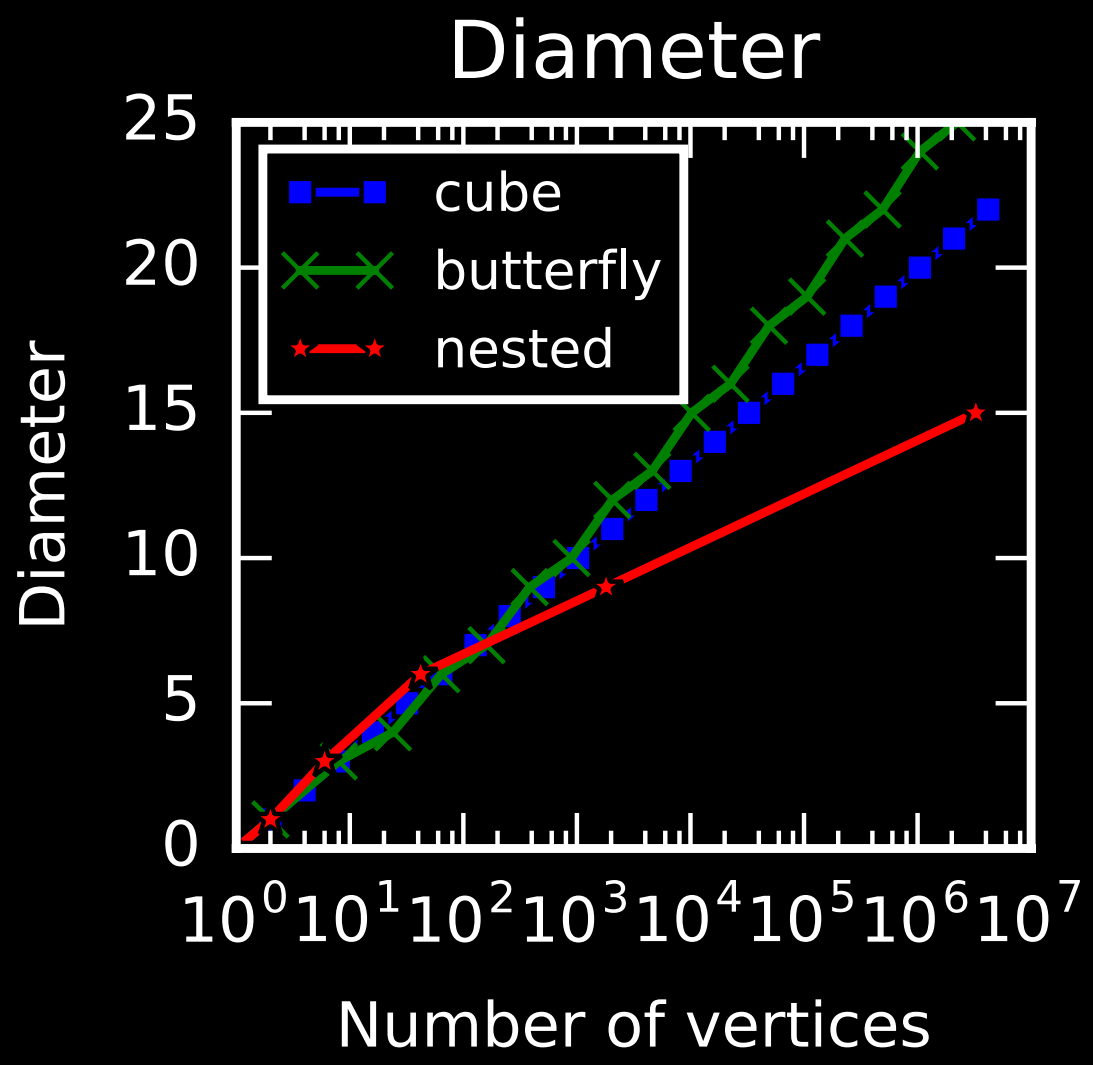
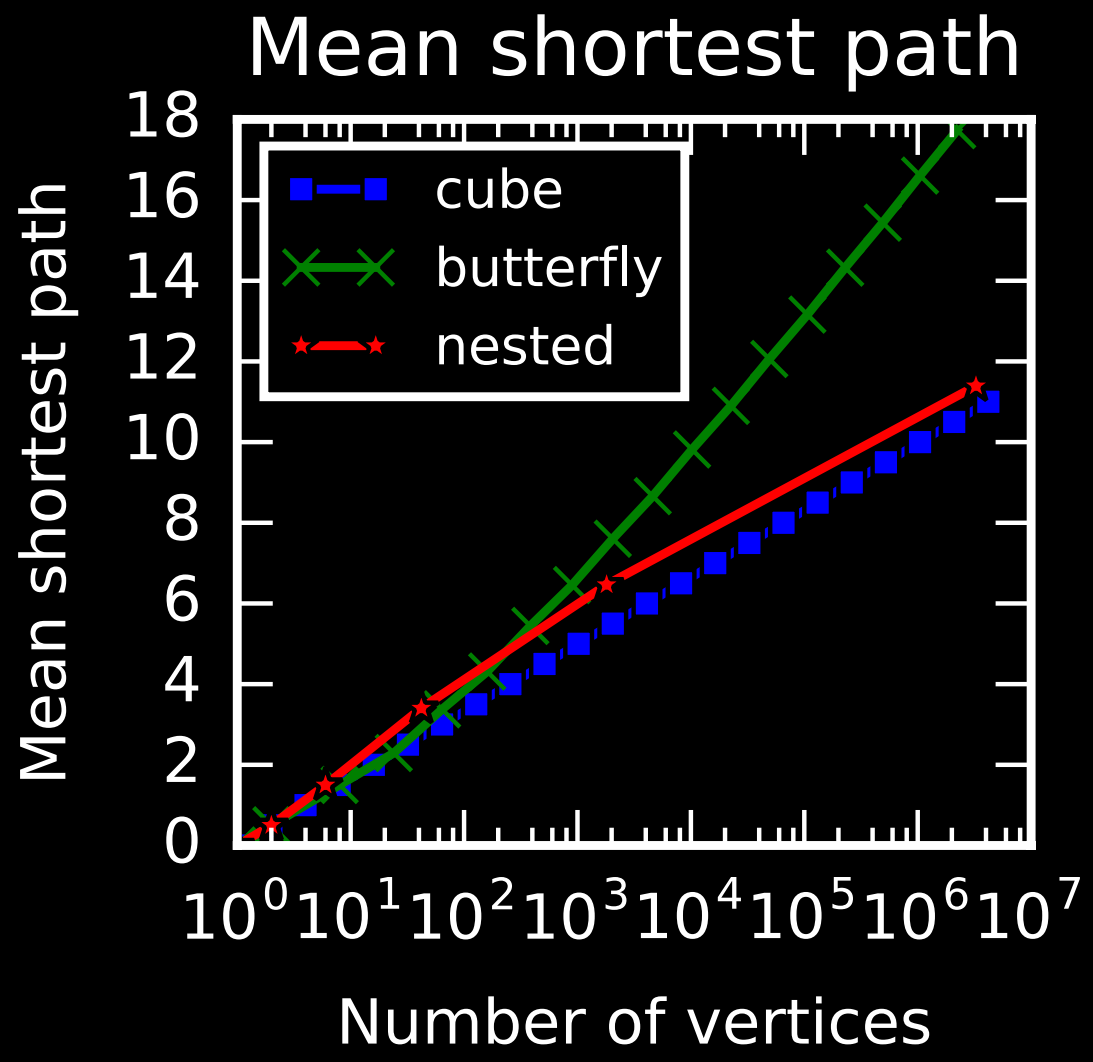

Egalitarian →
?
Scalable →



Nested clique


Sparsity
cube
butterfly
nested
Degree
25
20
15
10
5
0
10^0 10^1 10^2 10^3 10^4 10^5 10^6 10^7
Vertices


Diameter
25
20
15
10
5
0
Diameter
cube
butterfly
nested
$10^0 10^1 10^2 10^3 10^4 10^5 10^6 10^7$
Number of vertices


Mean shortest path
Mean shortest path
18
16
14
12
10
8
6
4
2
0
cube
butterfly
nested
10^0 10^1 10^2 10^3 10^4 10^5 10^6 10^7
Number of vertices