

# Synthetic Webs of Trust for Egalitarian Communities

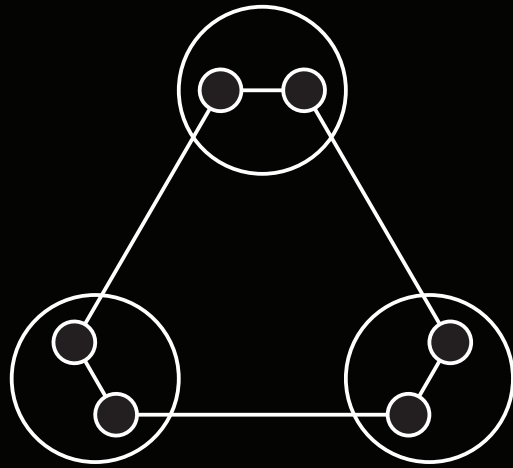
Edward L. Platt, Daniel M. Romero

University of Michigan  
School of Information

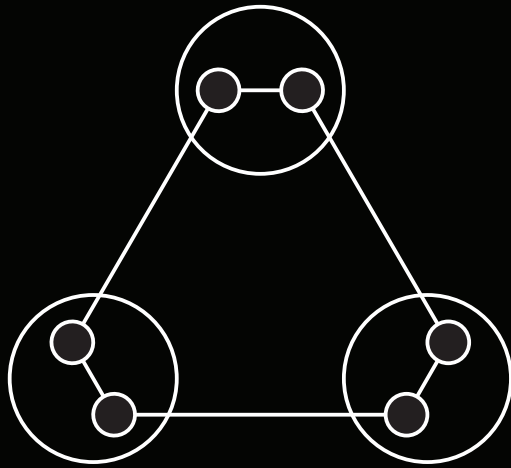
# Synthetic Webs of Trust for Egalitarian Communities

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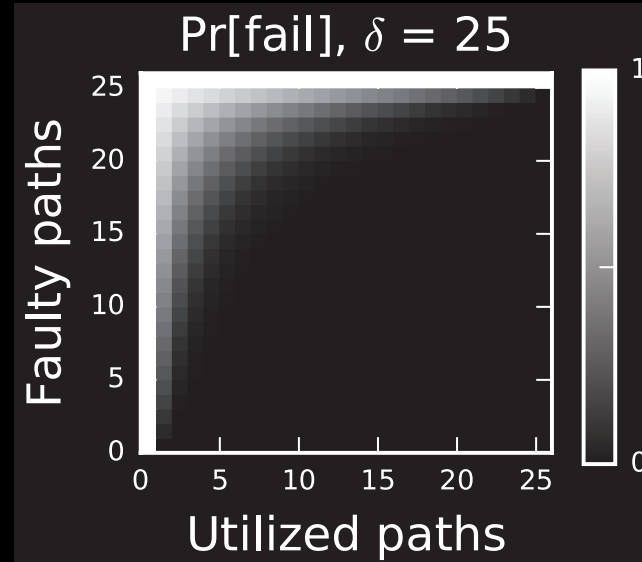
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# Nested Clique



Nested Clique



Partial Trust

# Decentralized Technology

# Communities

# Decentralized ~~Technology~~

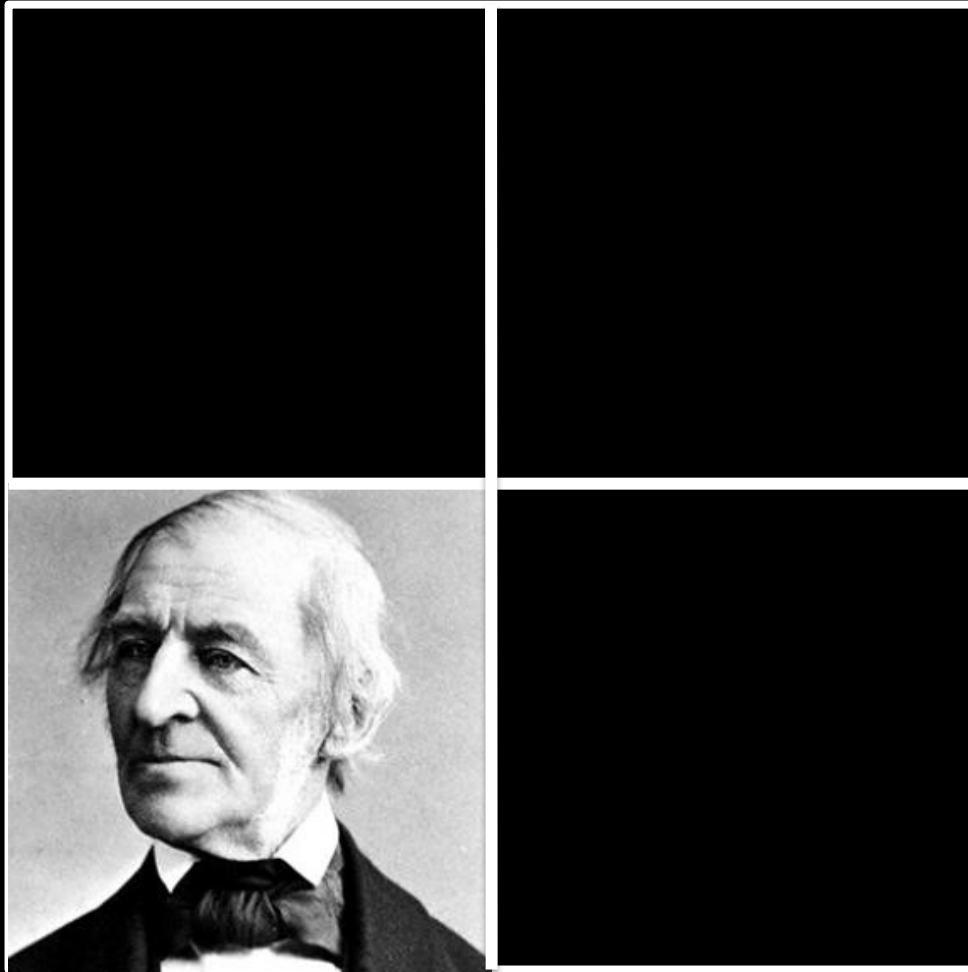
# Egalitarian Communities

## ~~Decentralized Technology~~

Network Science for  
Egalitarian Communities  
~~Decentralized Technology~~

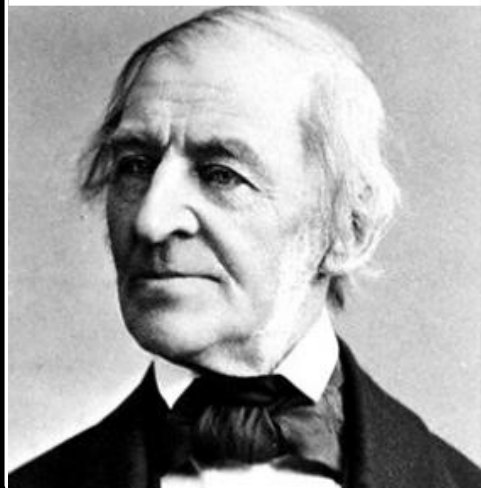


Egalitarian →



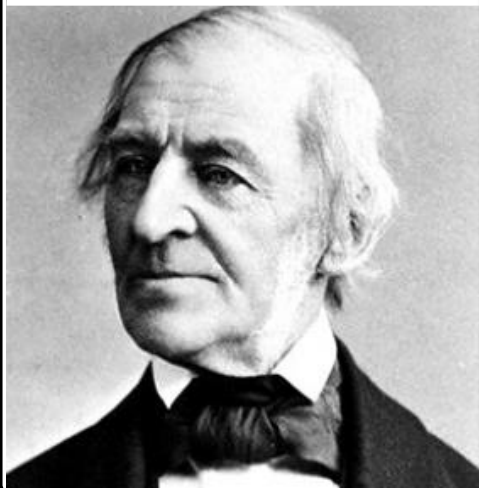
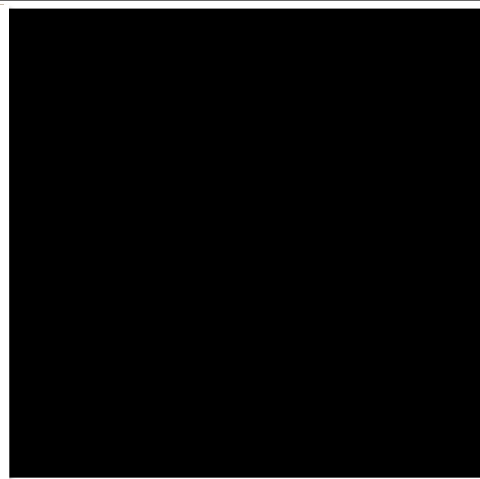
Scalable →

Egalitarian →



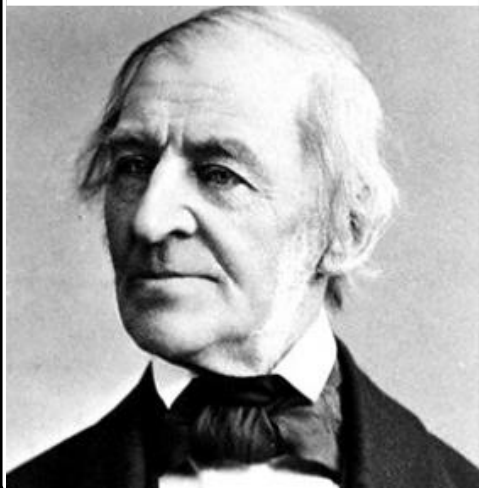
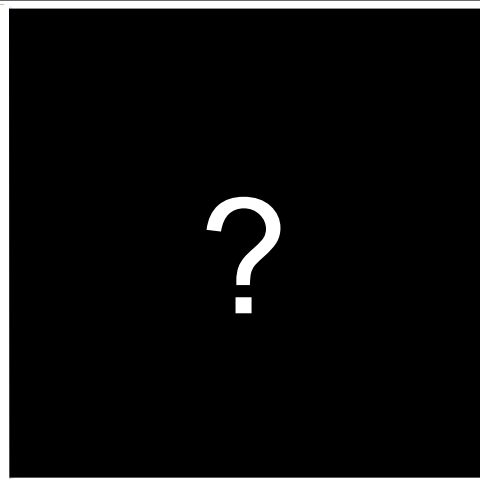
Scalable →

Egalitarian →



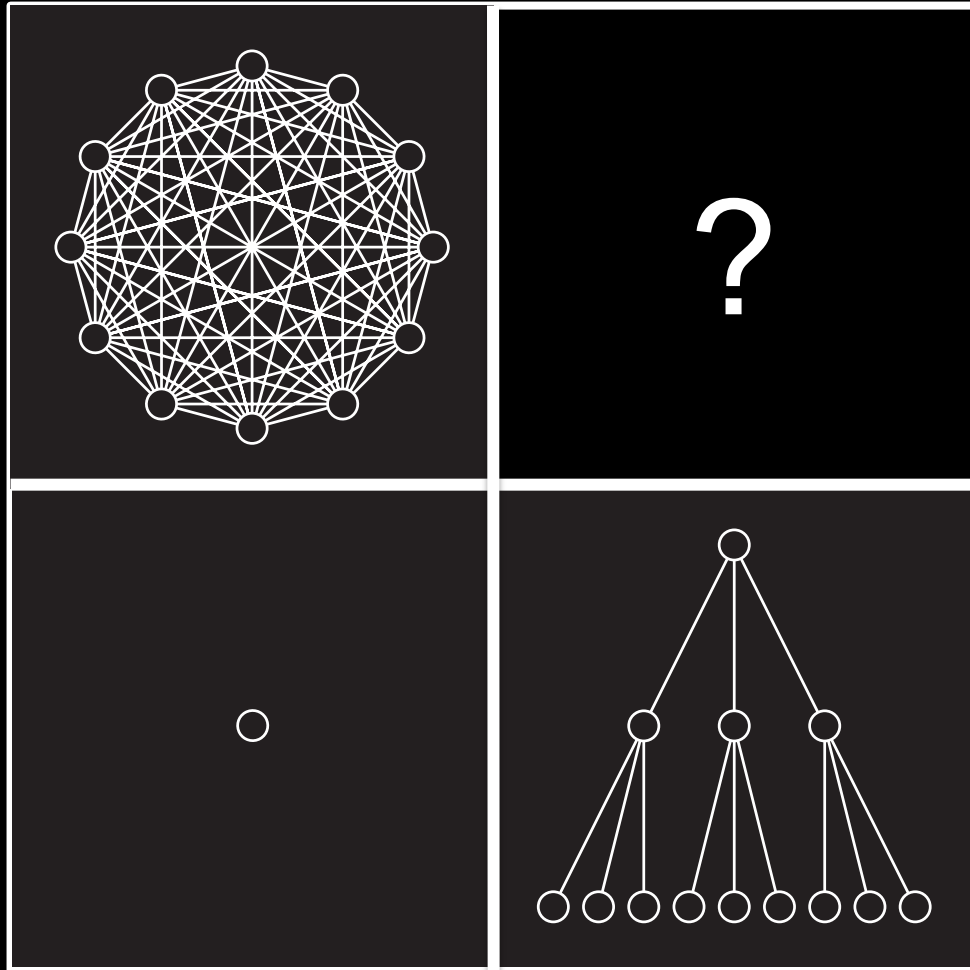
Scalable →

Egalitarian →



Scalable →

Egalitarian →



Scalable →

Scalable → Sparse

Scalable  $\rightarrow$  Sparse

Scalable  $\rightarrow$  Low-diameter

Scalable → Sparse

Scalable → Low-diameter

Egalitarian → Decentralized



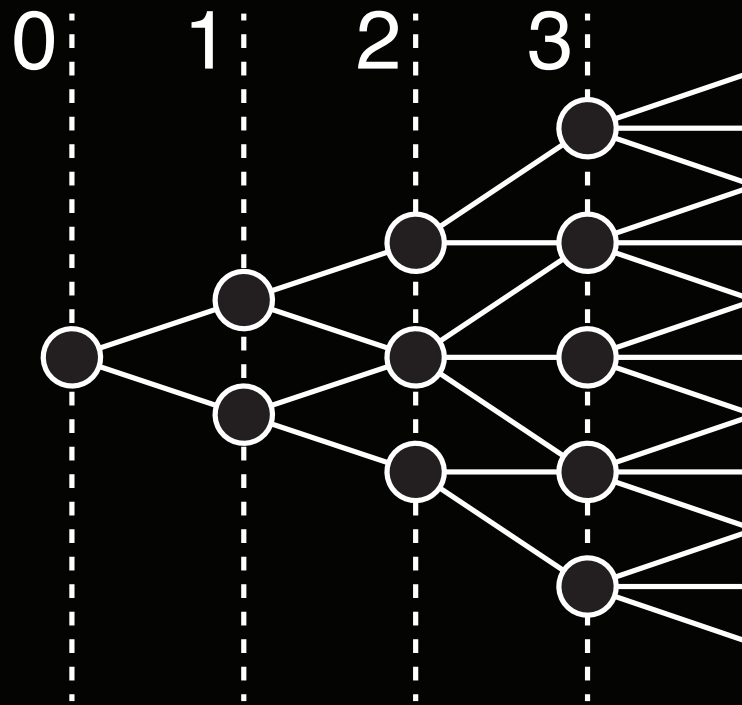
Scalable → Sparse

Scalable → Low-diameter

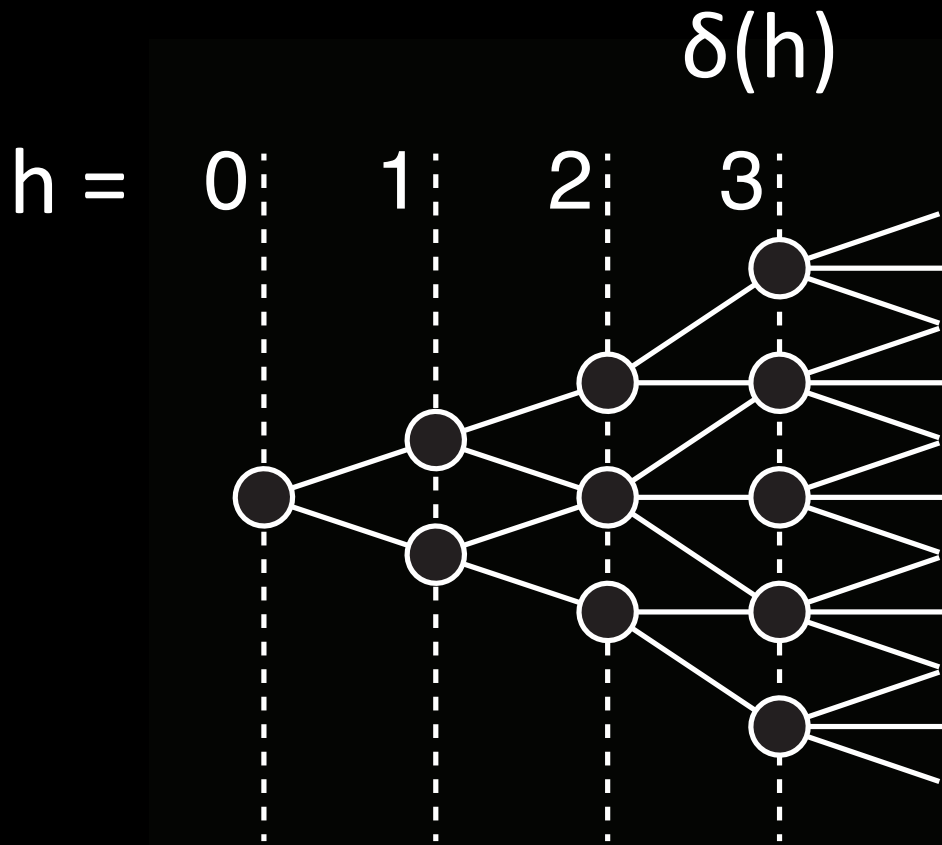
Egalitarian → Decentralized

Egalitarian → High-connectivity

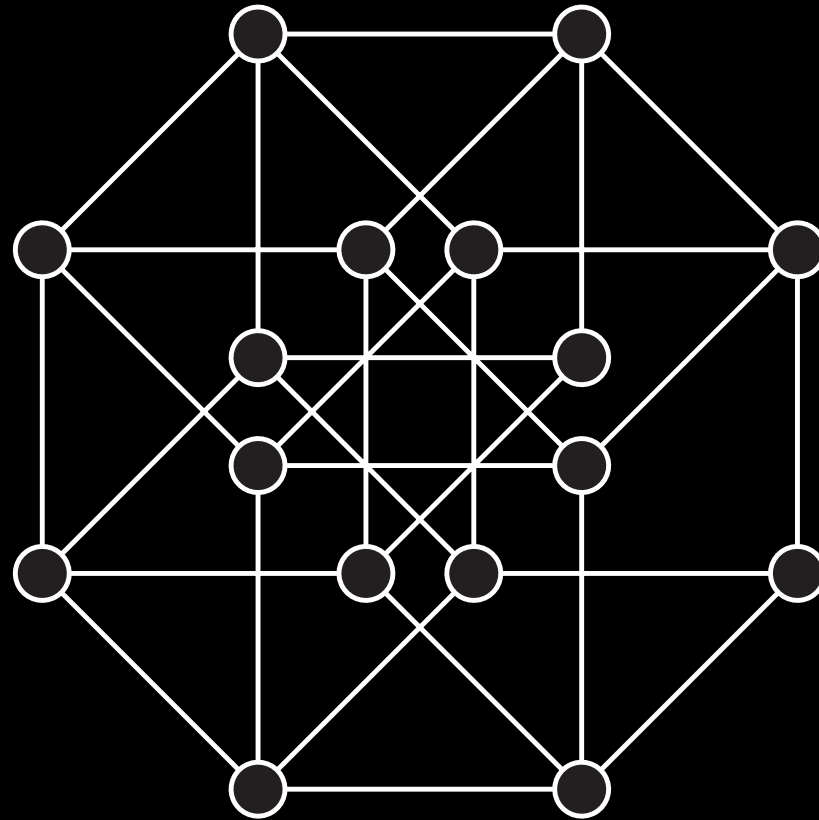
$h =$



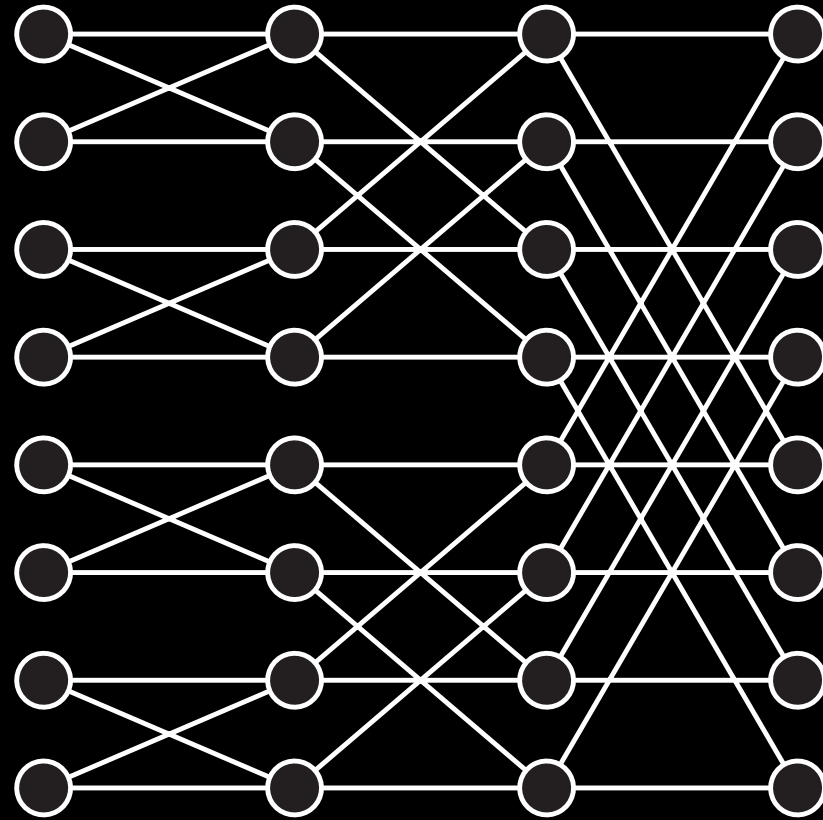
# Connectivity



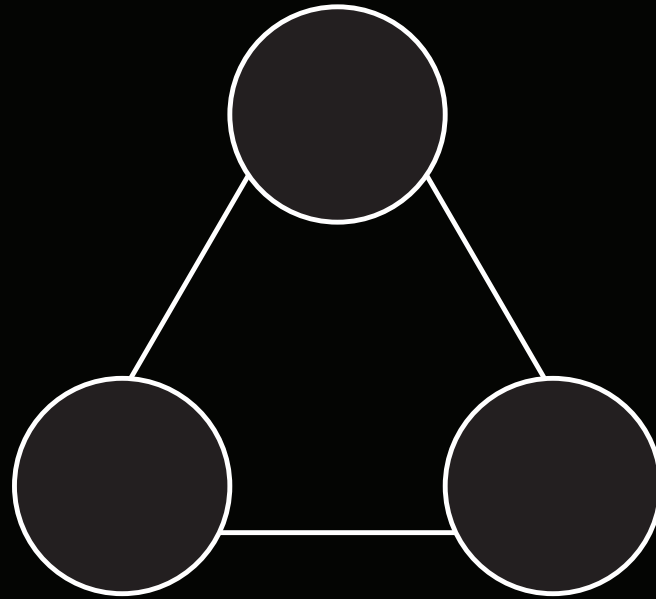
Connectivity



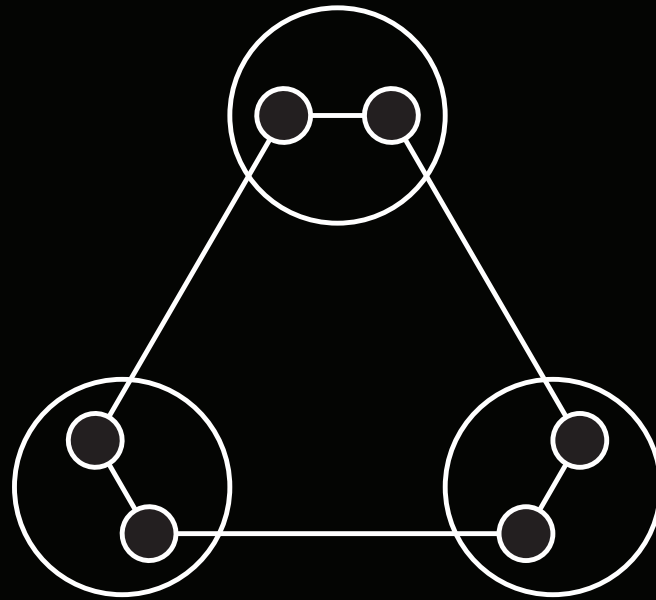
m-Cube



# Butterfly

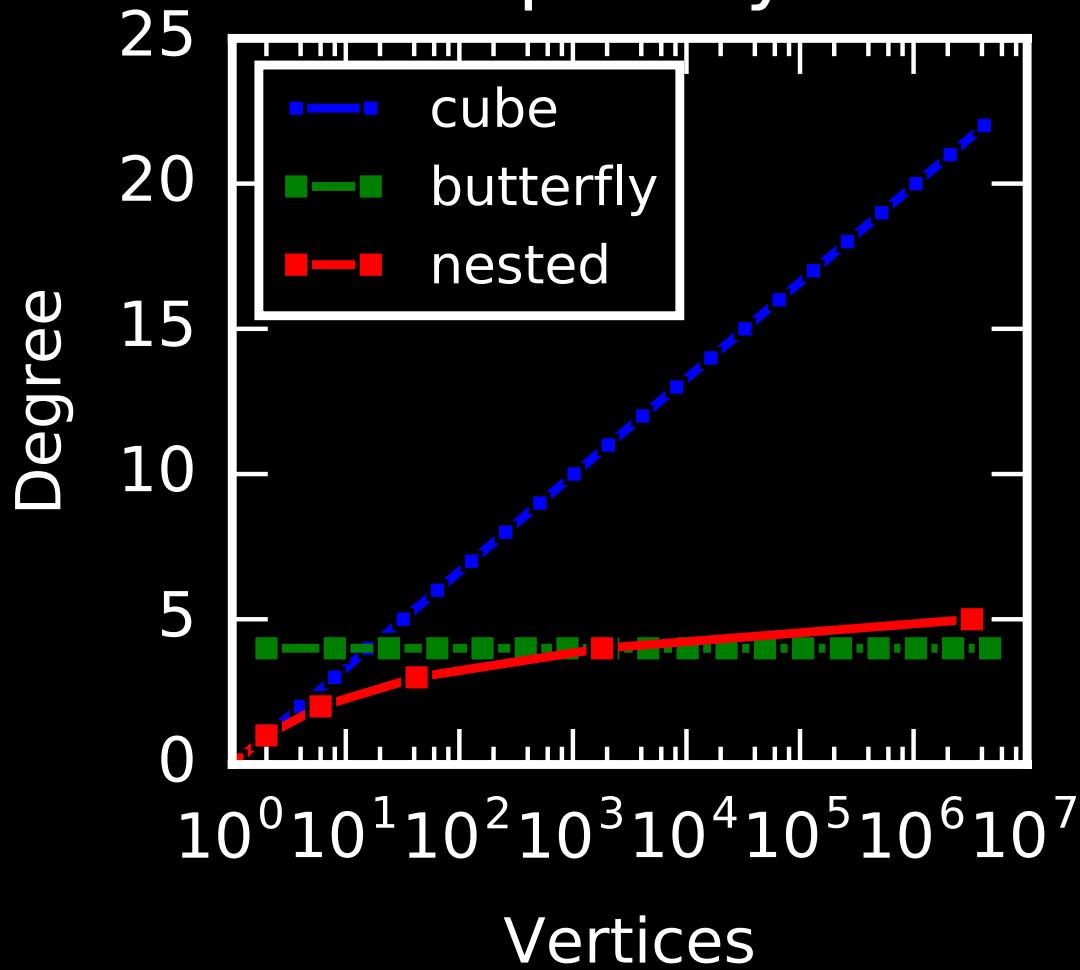


Nested clique



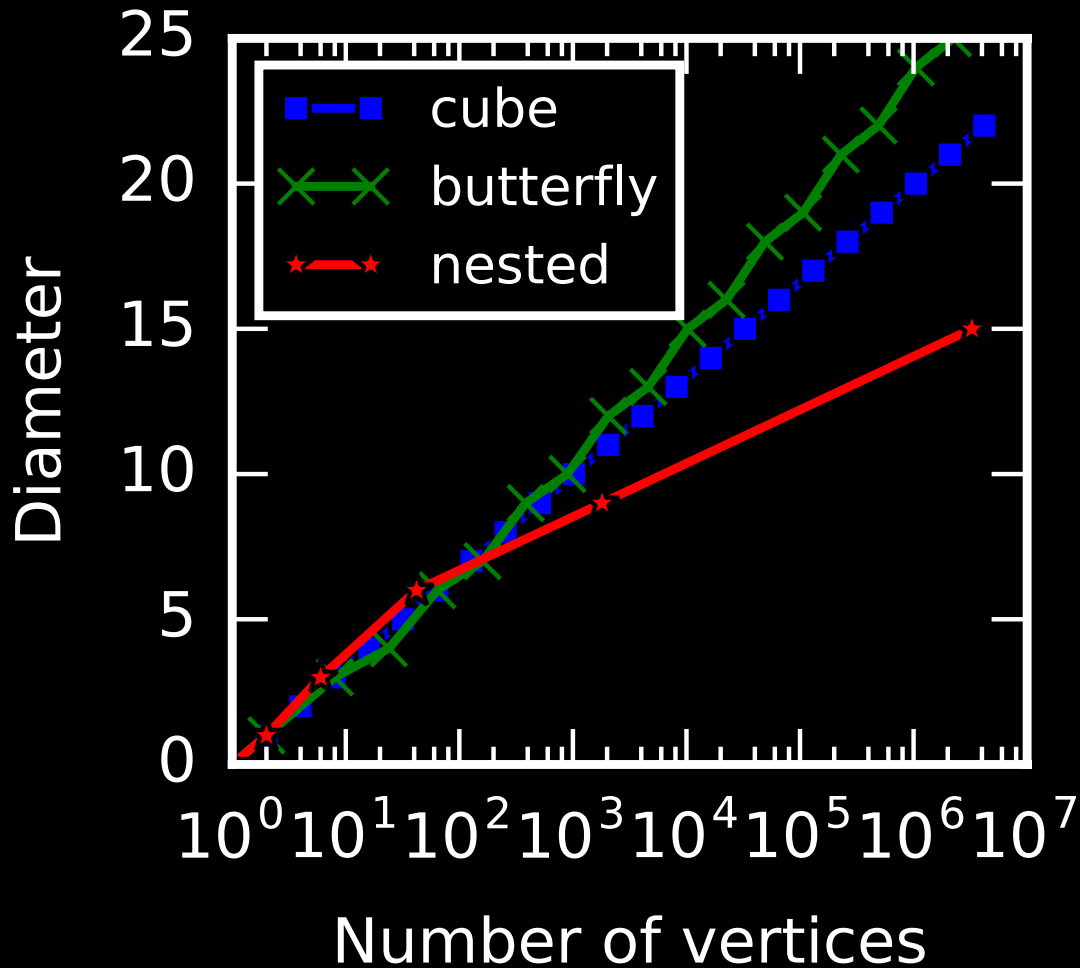
# Nested clique

# Sparsity





# Diameter

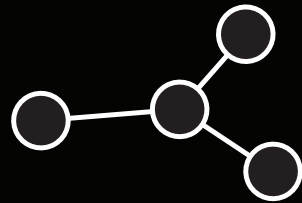


# Connectivity

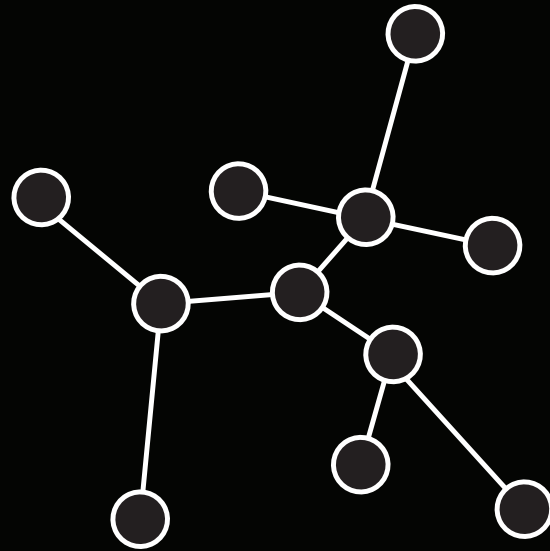
$$\text{m-Cube: } \approx \left( \frac{1}{h} f(N) \right)^h$$

$$\text{Butterfly: } = O(h^2 2^h)$$

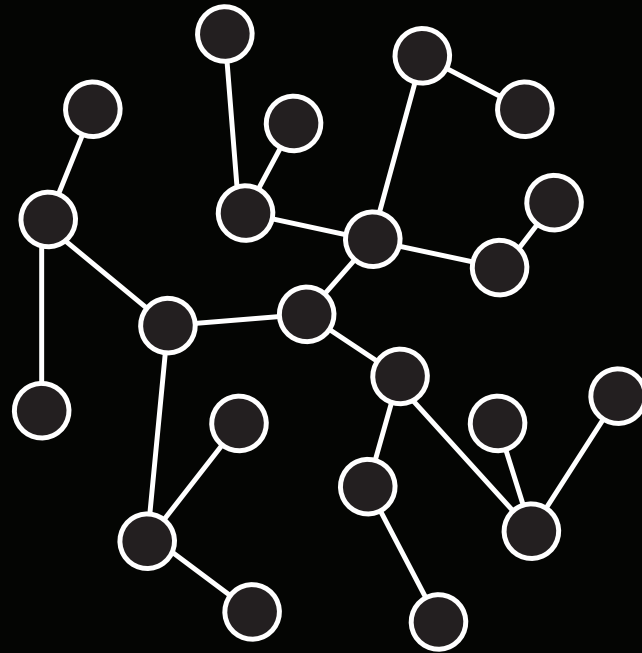
$$\text{Nested Clique: } = \Omega(\theta^h)$$



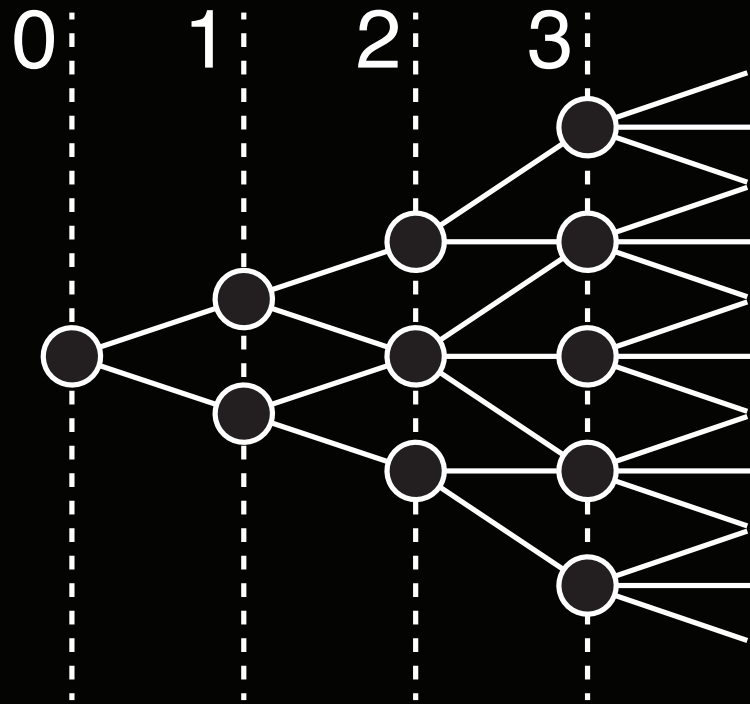
# Web of Trust



# Web of Trust

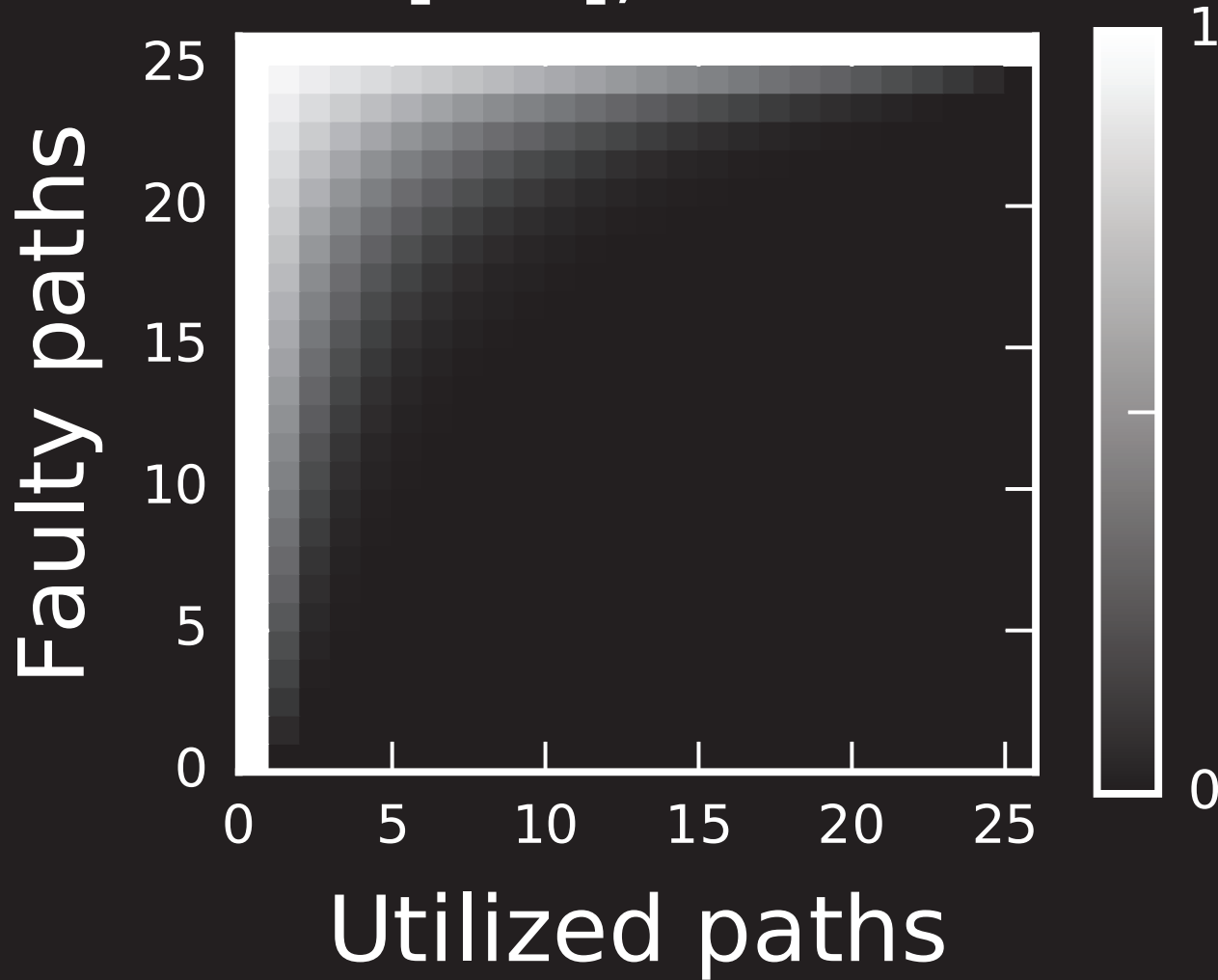


# Web of Trust



# Partial Trust

Pr[fail],  $\delta = 25$

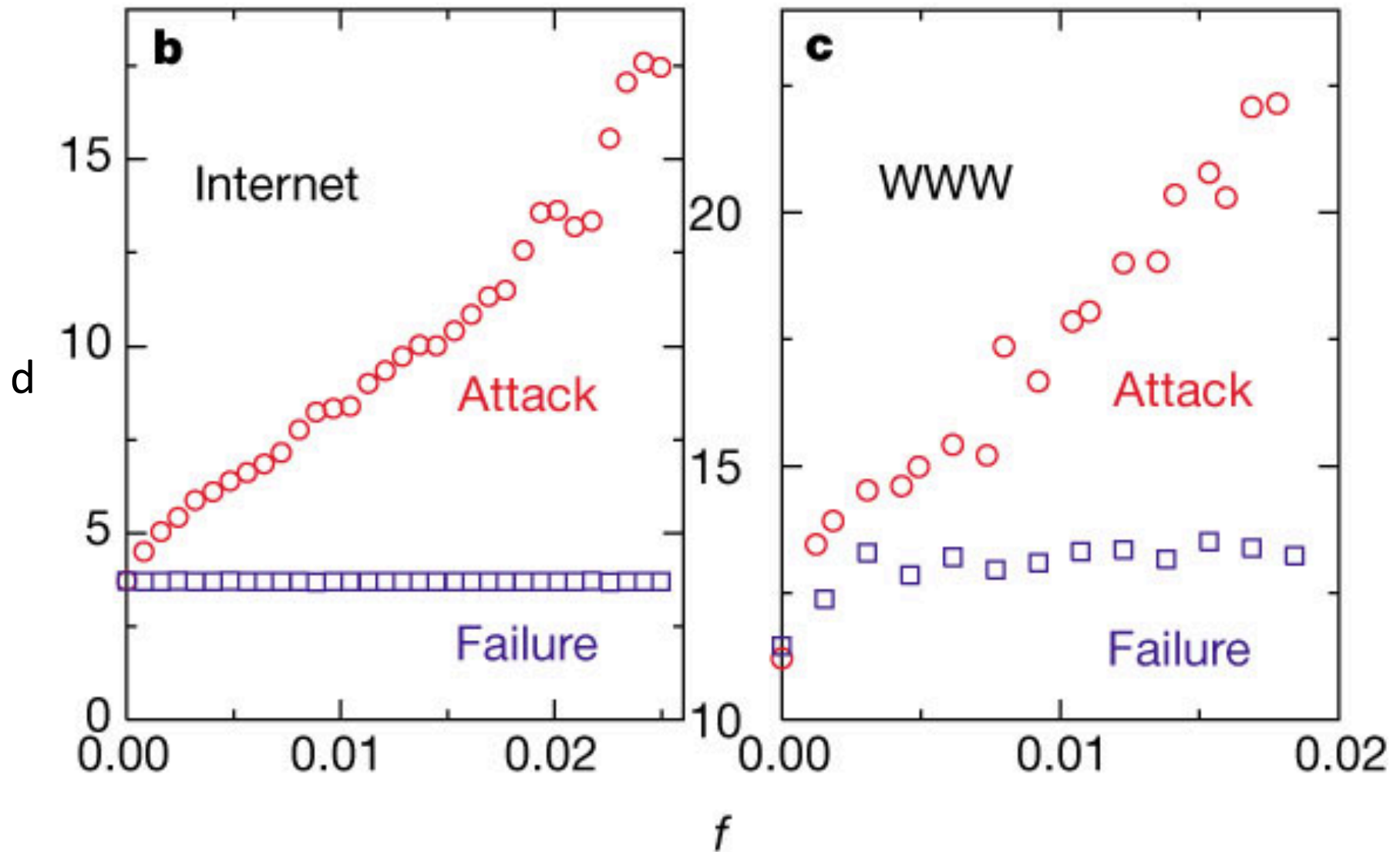


- Nested clique
  - diameter  $<$  than cube, butterfly
  - degree  $<$  cube
  - connectivity  $>?$  butterfly



- Nested clique
  - diameter  $<$  than cube, butterfly
  - degree  $<$  cube
  - connectivity  $>?$  butterfly
- Partial trust
  - More realistic than WoT
  - Incorporates network structure
  - Effective fault tolerance

# Diameter vs. Fraction of Nodes Removed



# Mean shortest path

