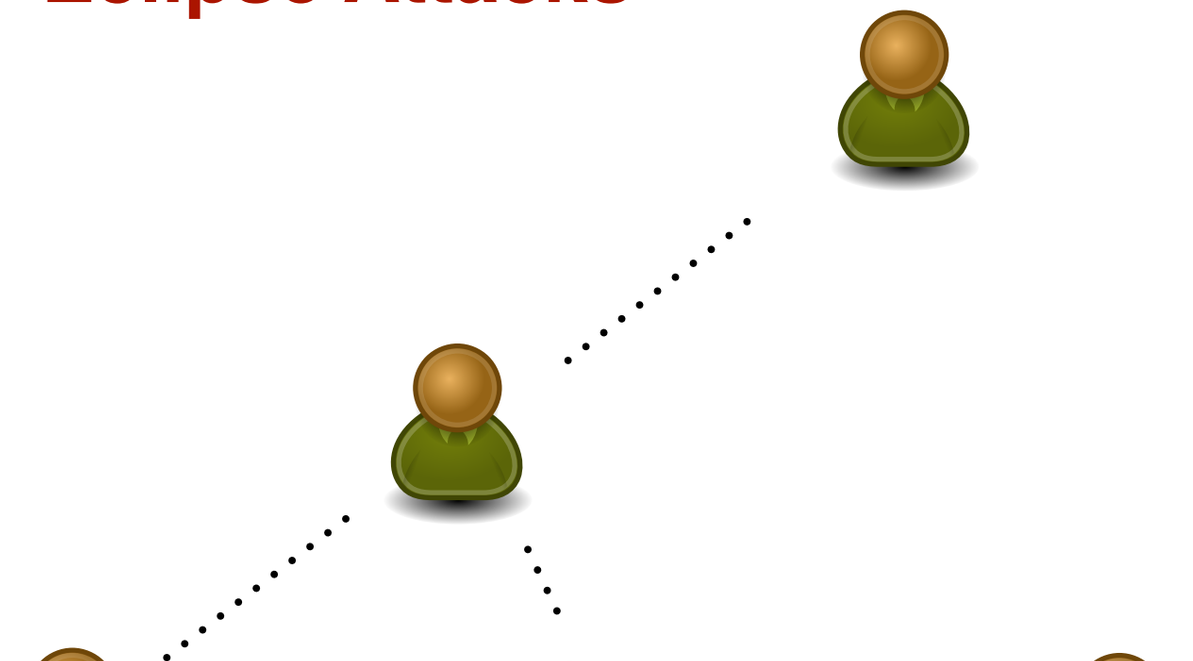
Network Security - Eclipse Attacks

Eclipse Attacks



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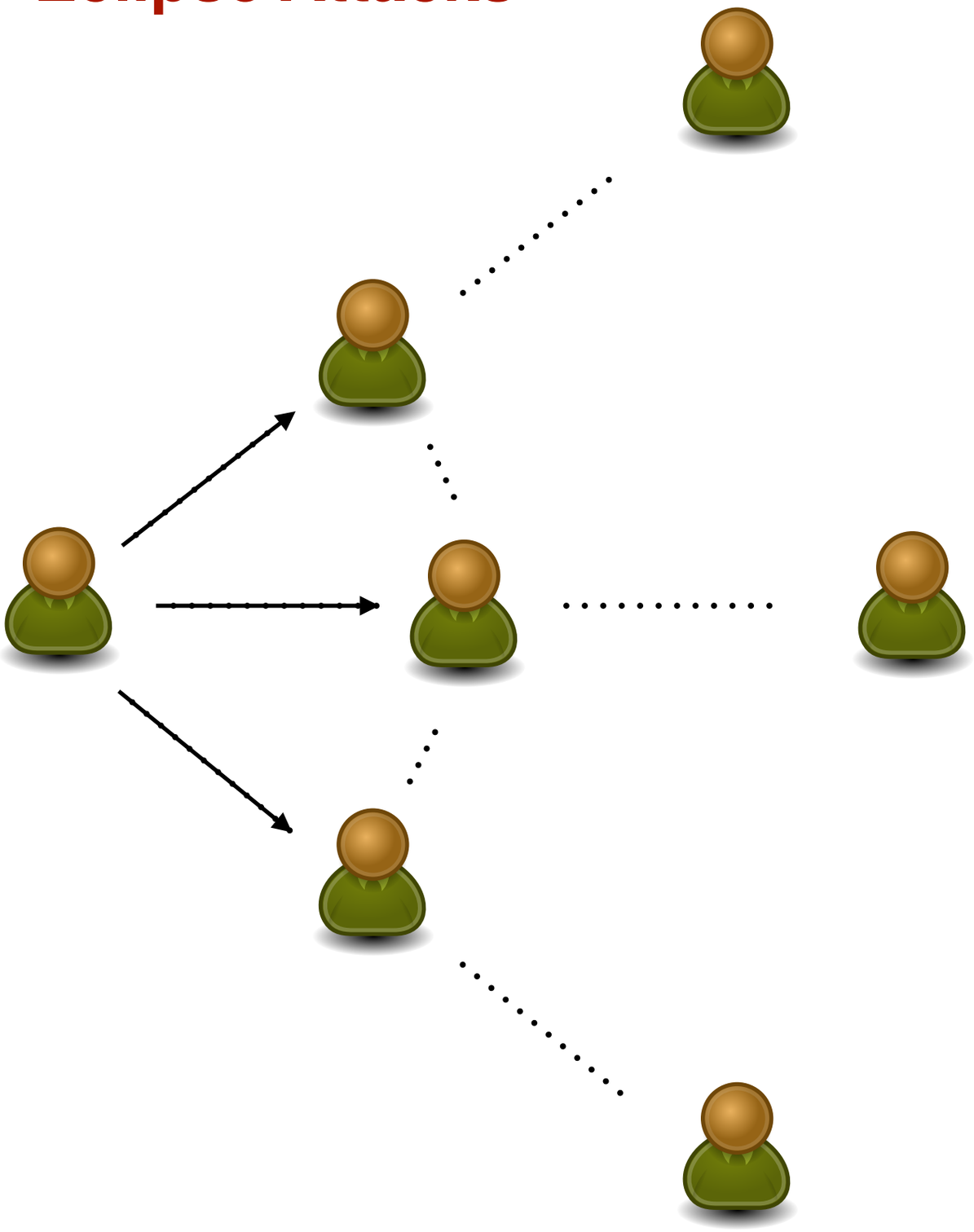

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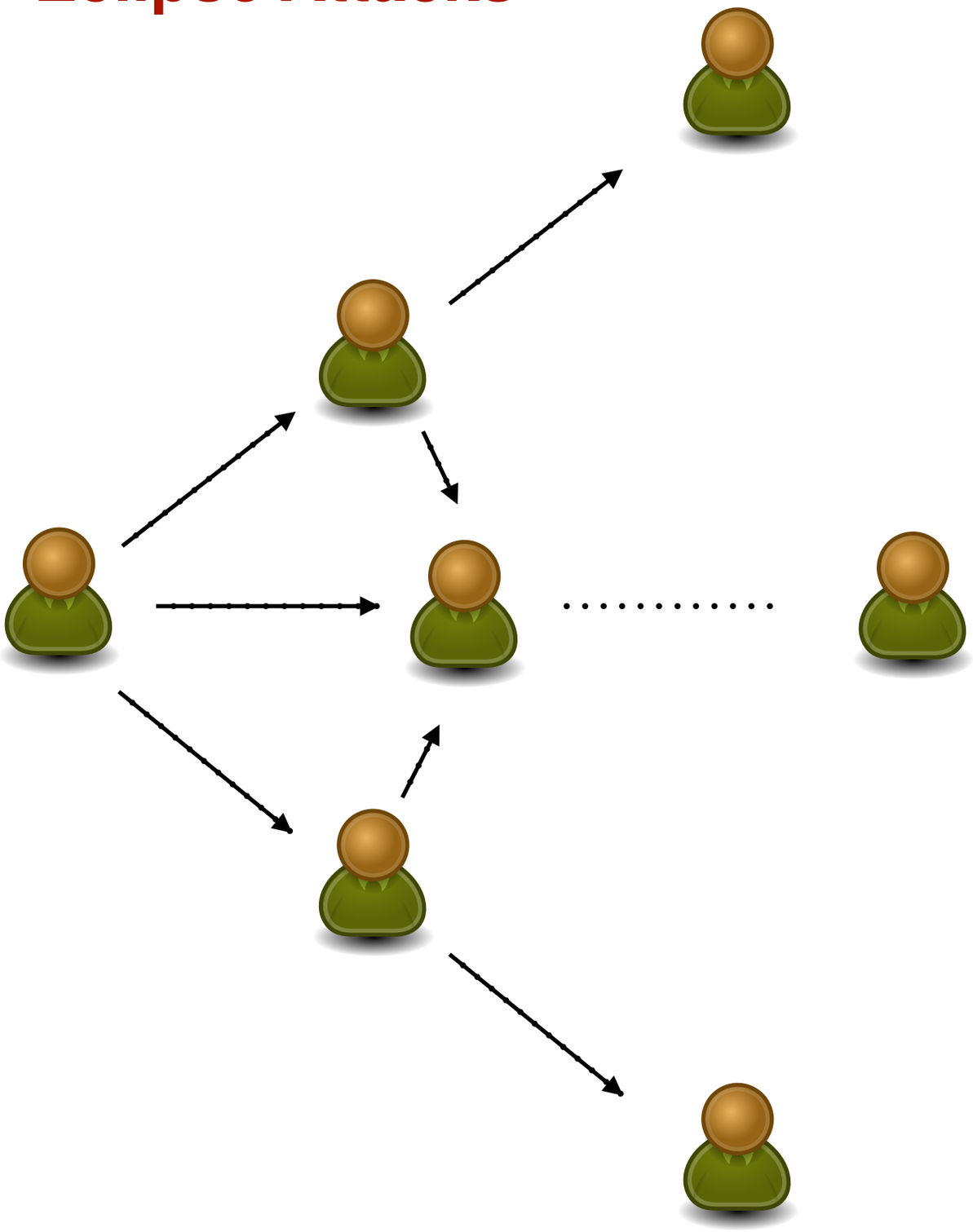

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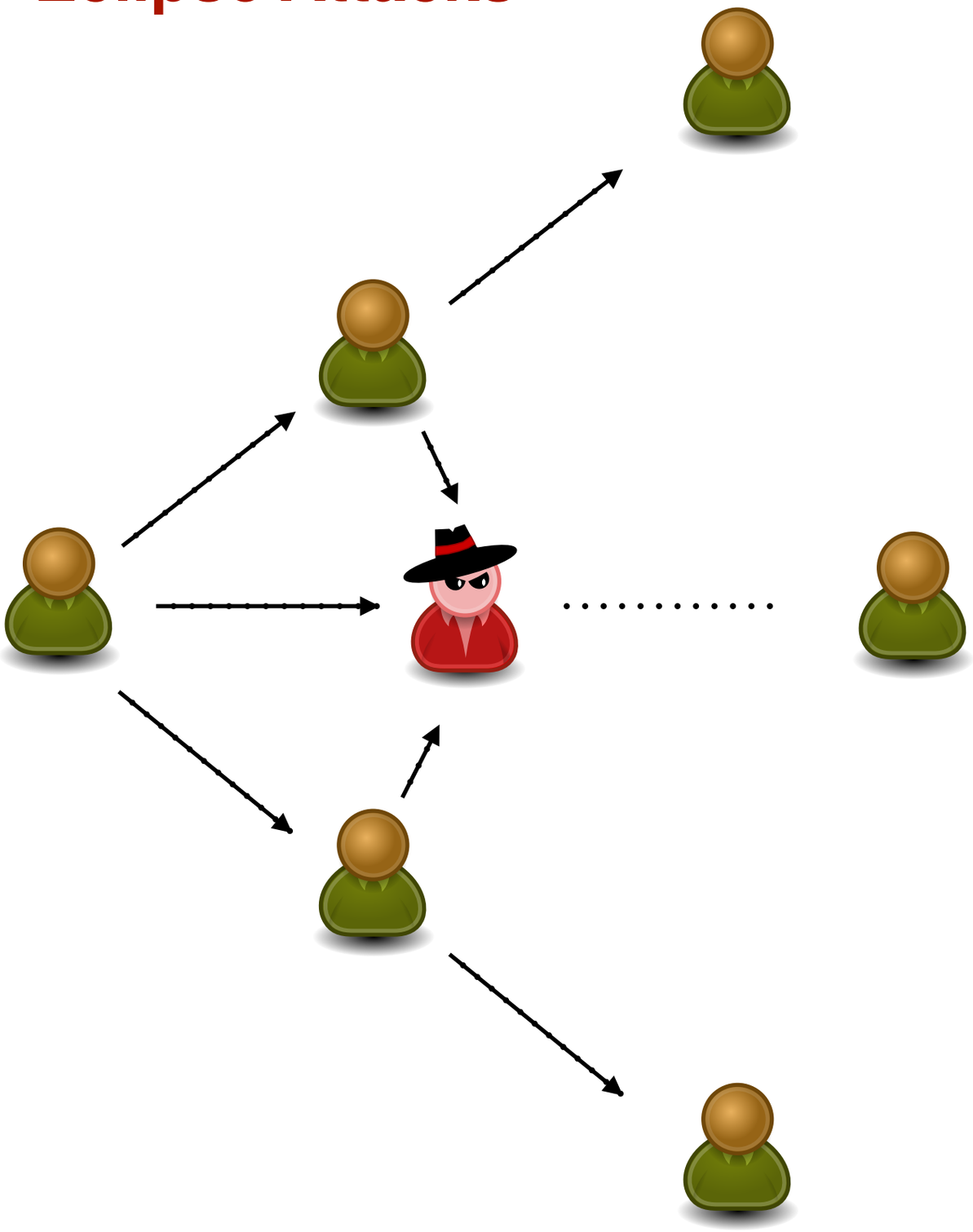

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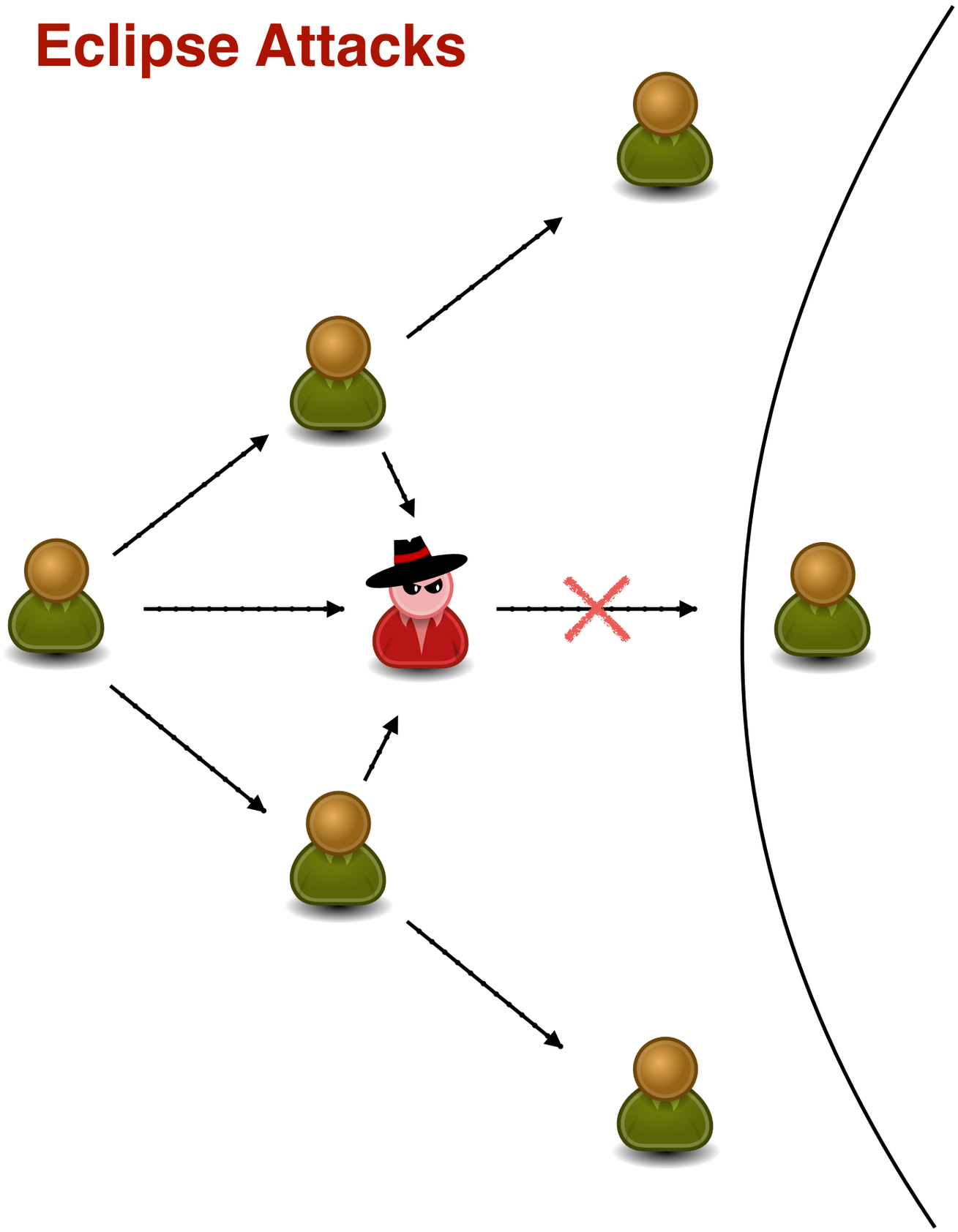

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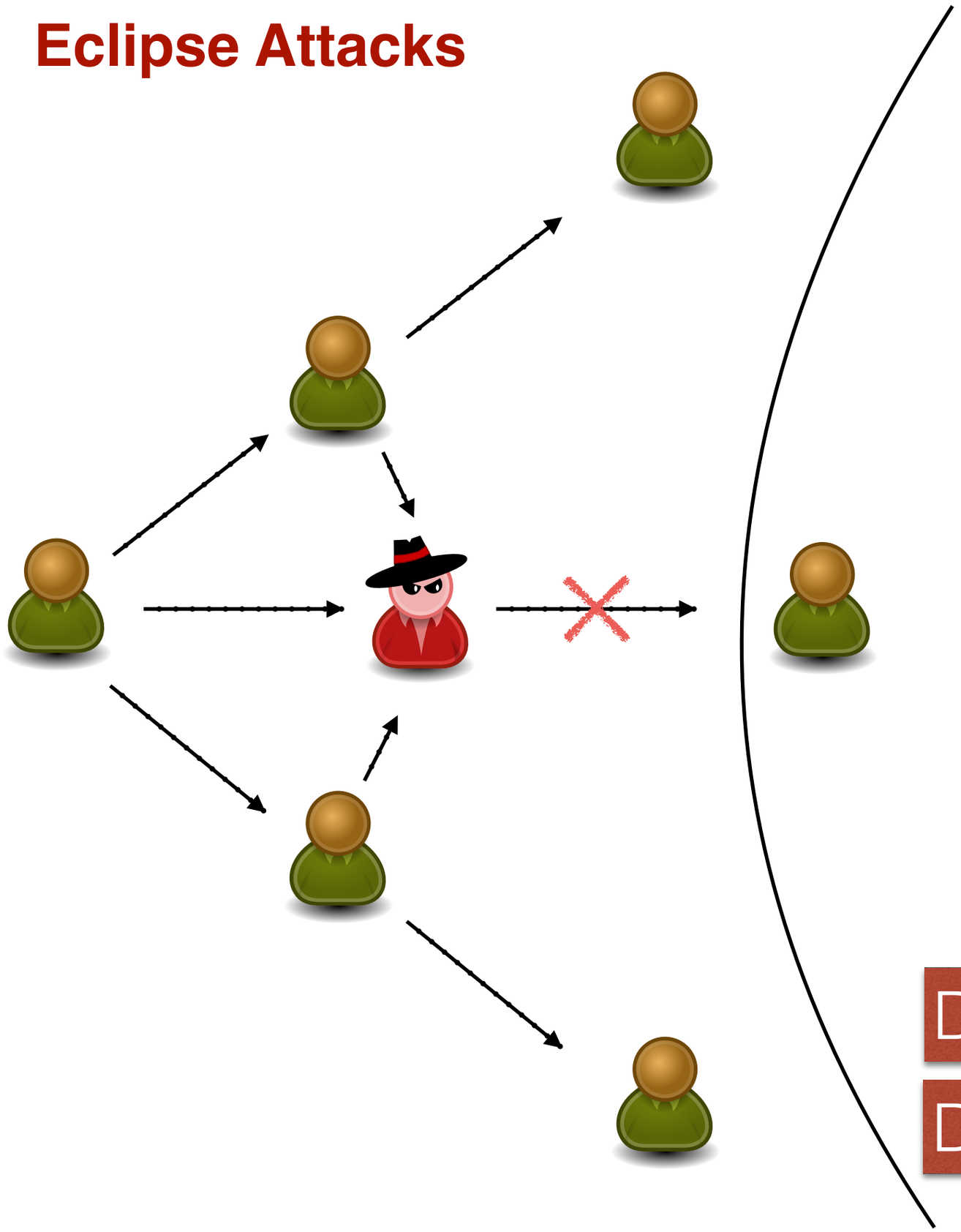
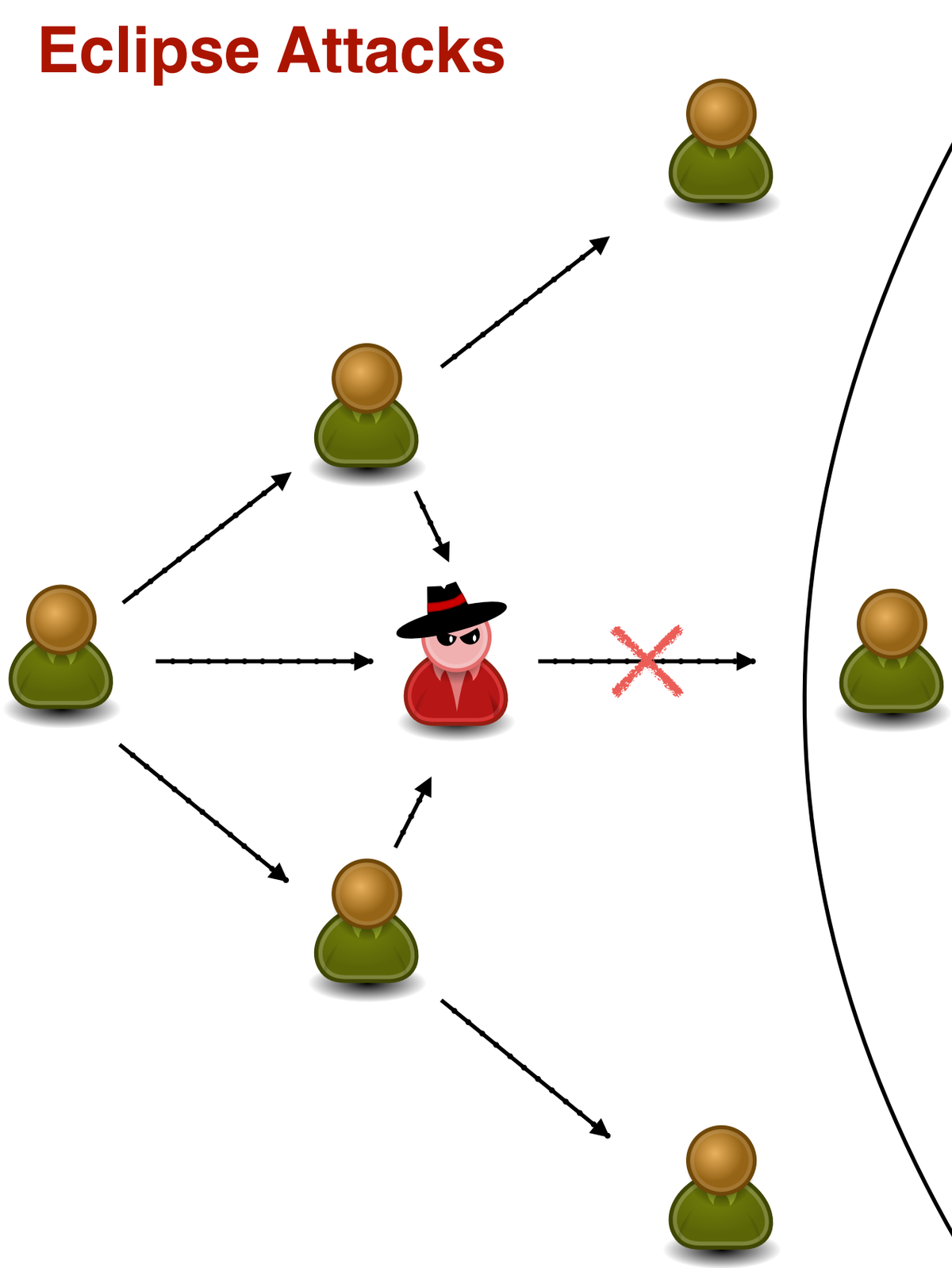


Denial of Service

Double Spending

Eclipse Attacks

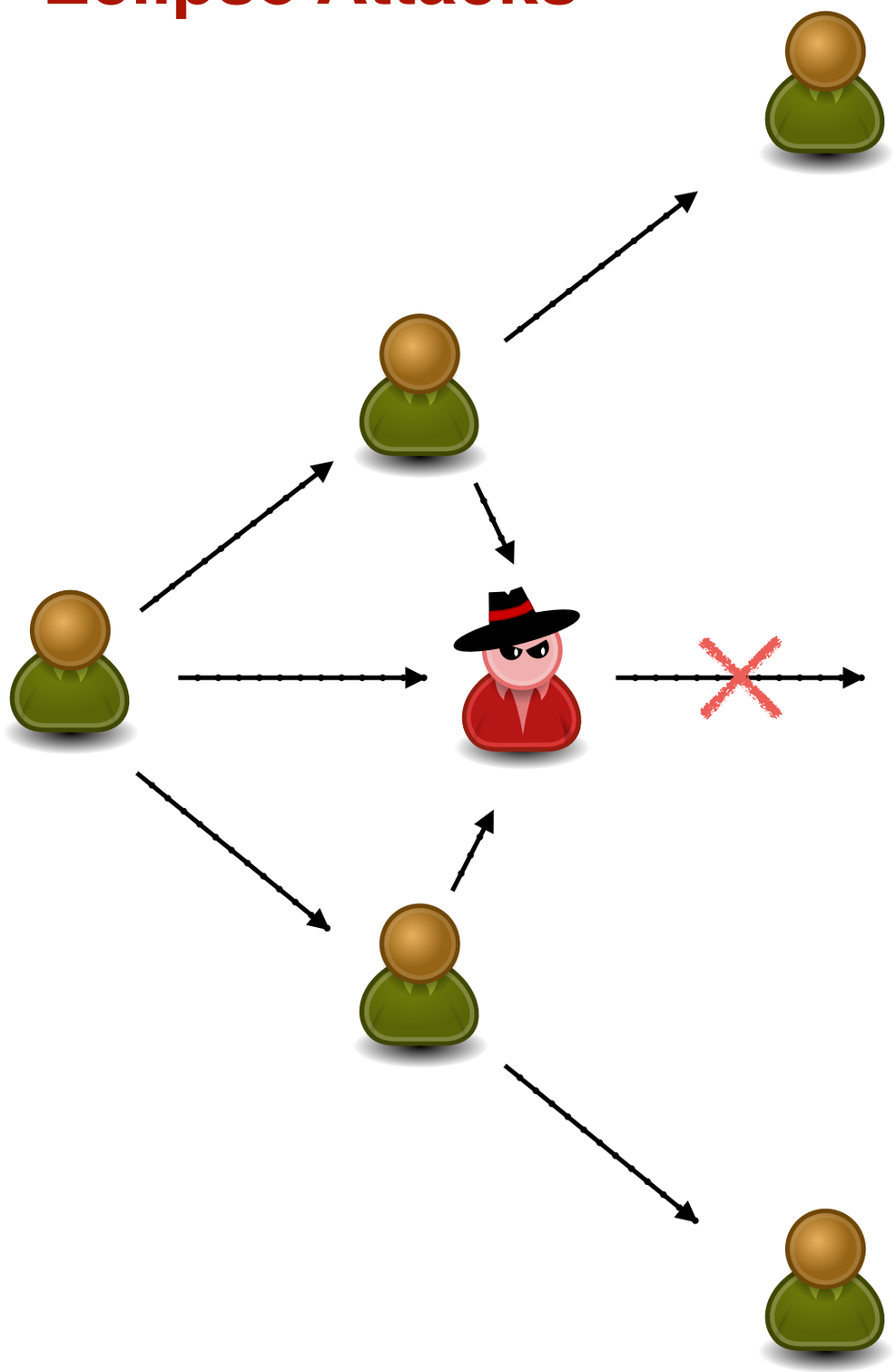


Eclipse attacks
Heilman et al., Usenix ’15

Denial of Service

Double Spending

Eclipse Attacks



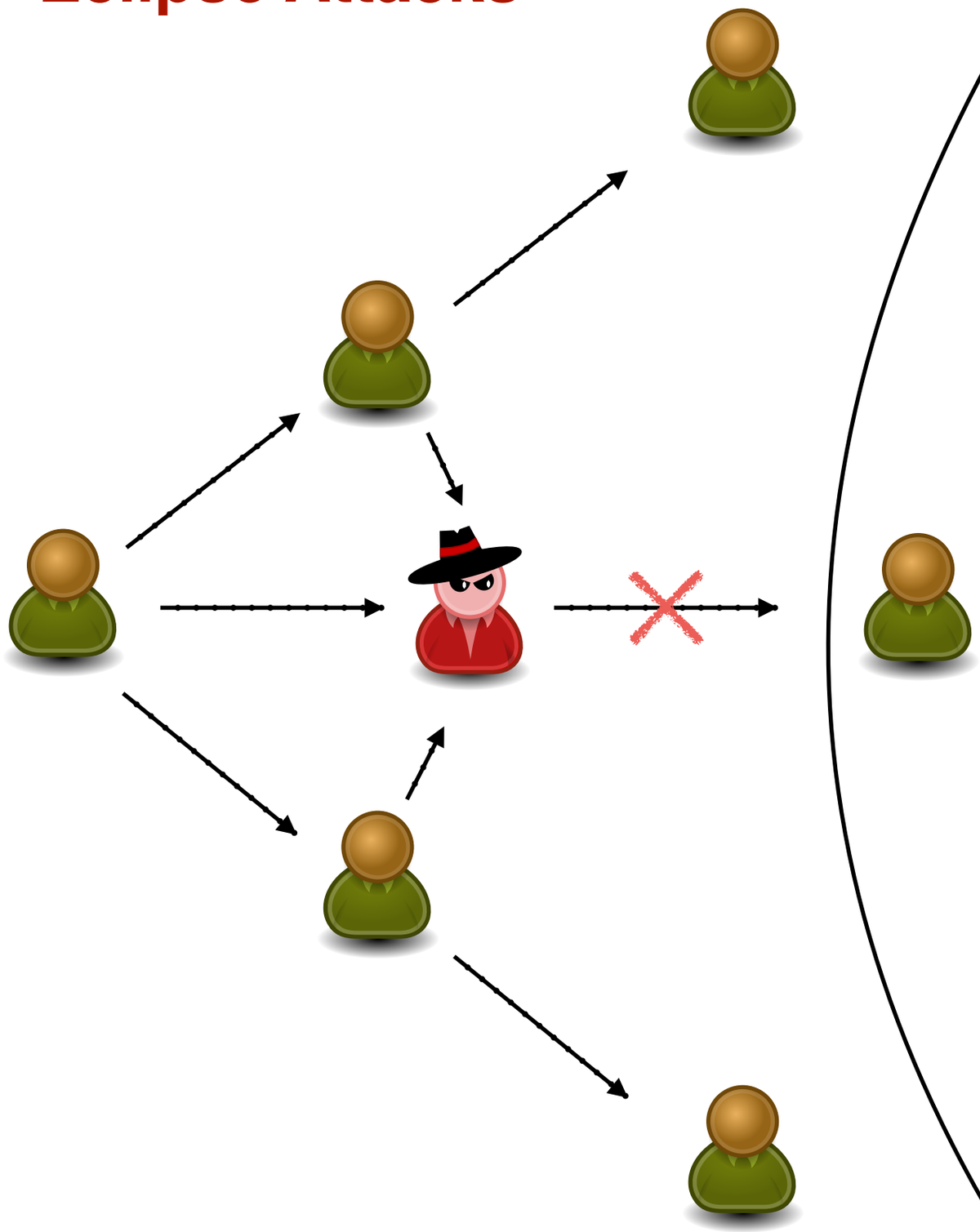
Eclipse attacks
Heilman et al., Usenix ’15

Monopolize connections
Spamming addresses
Forcing node restart
Requires many bots

Denial of Service

Double Spending

Eclipse Attacks



1 connection sufficient
No victim restart necessary

Eclipse attacks
Heilman et al., Usenix ’15

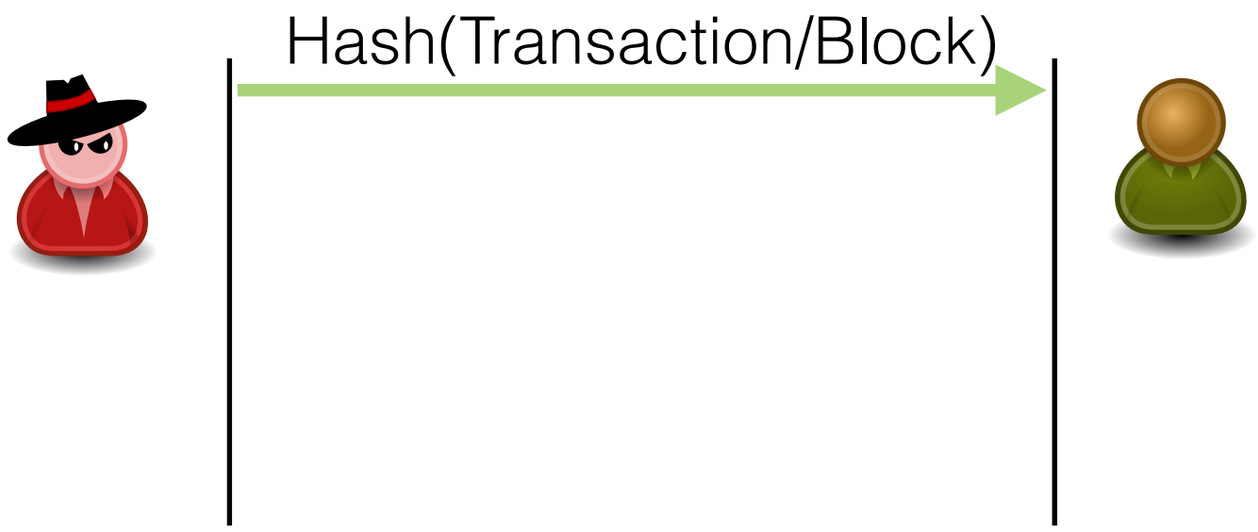
Monopolize connections
Spamming addresses
Forcing node restart
Requires many bots

Denial of Service

Double Spending

Request timeouts

Request timeouts



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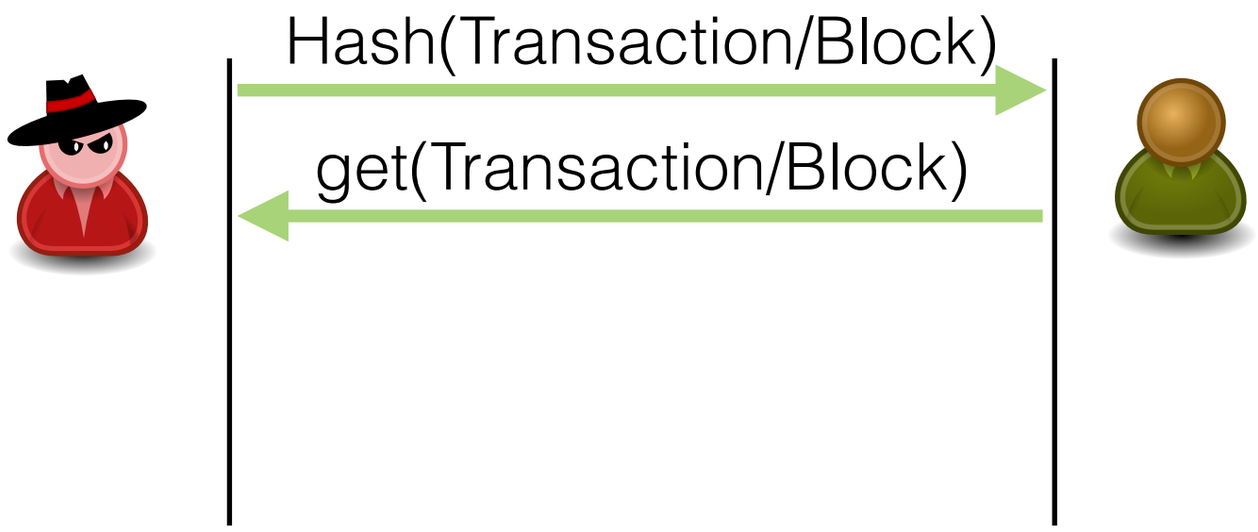

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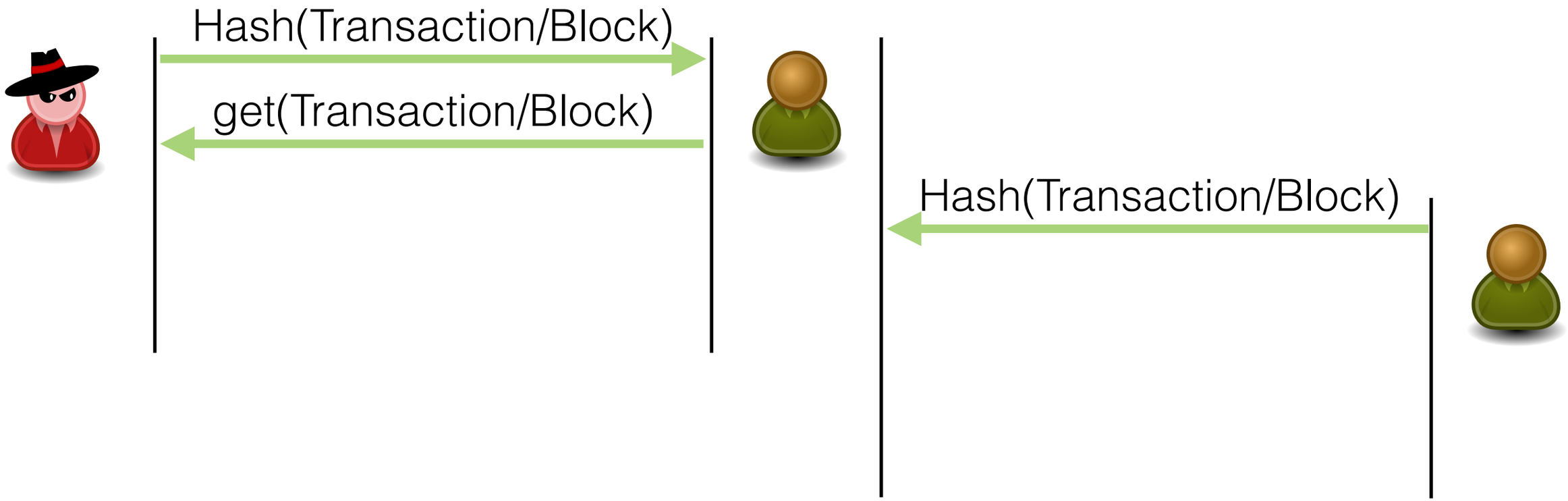

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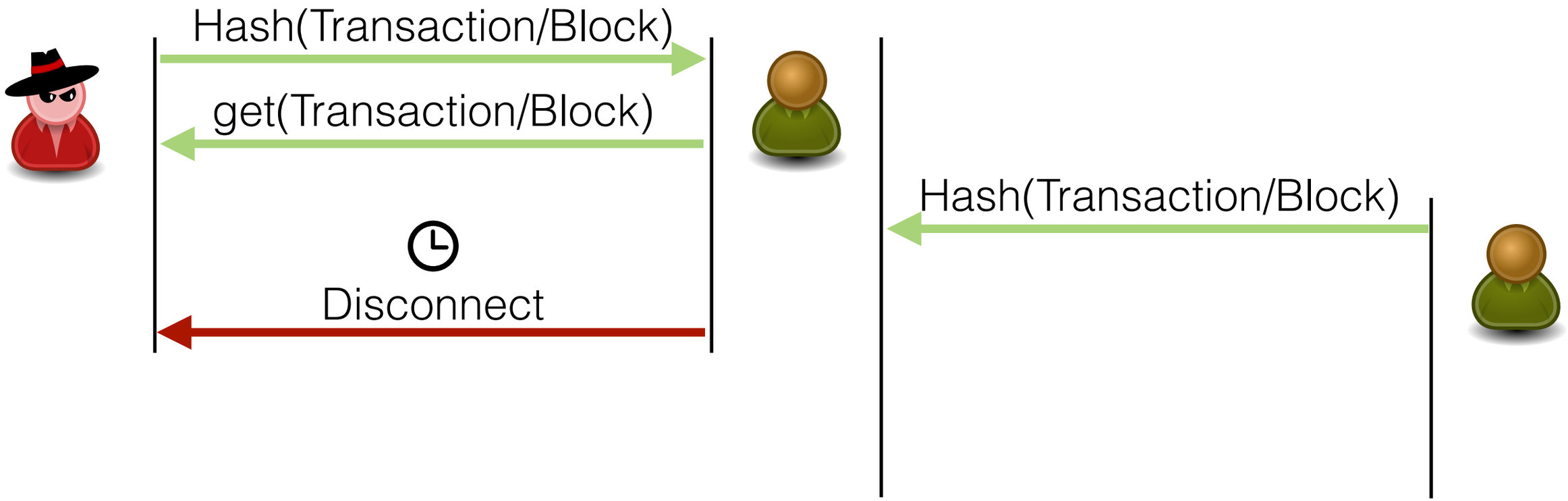

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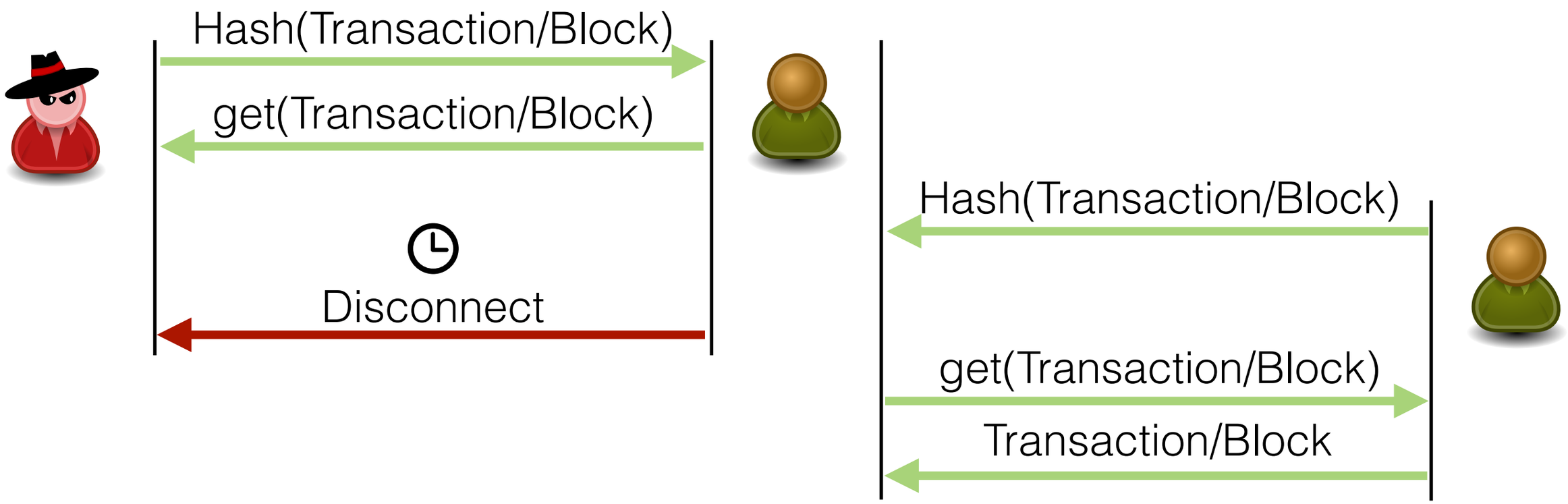

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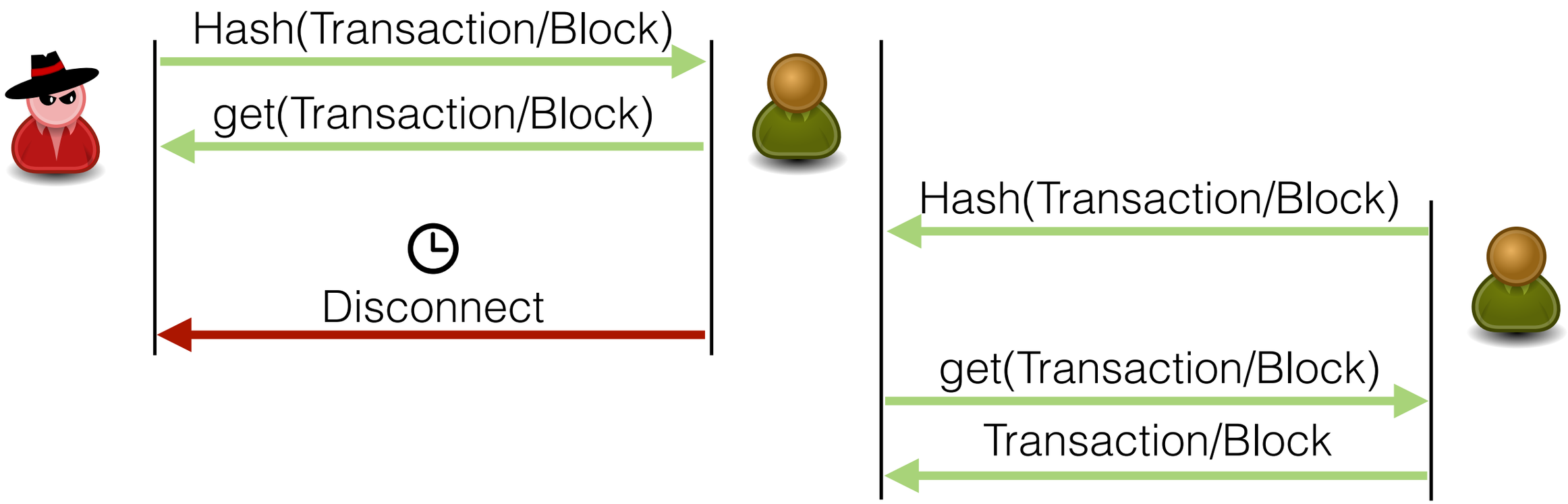


Block timeout: 20 minutes
Transaction timeout: 2 minutes

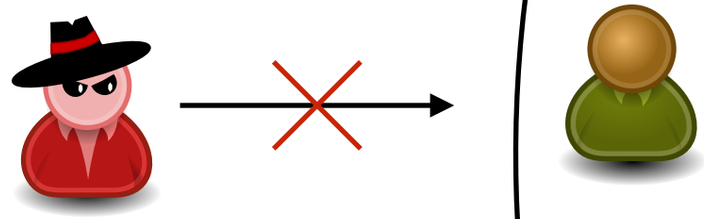
Implications

Adversary

- Blinds victim from blocks and transaction > 20 min
- Experimental validation

Impact

- **Double spend transactions**
- Aggravated selfish mining
- **Network wide Denial of Service**

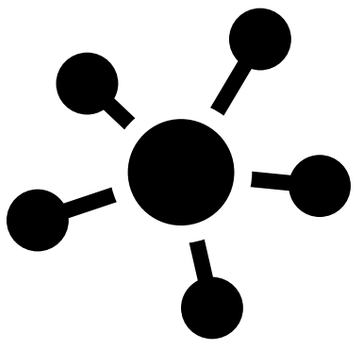


Mitigations

- **Hardening measures**
- Estimate waiting time for secure transactions

Necessary requirements

1. Must be **first** peer to advertise Transaction/Block



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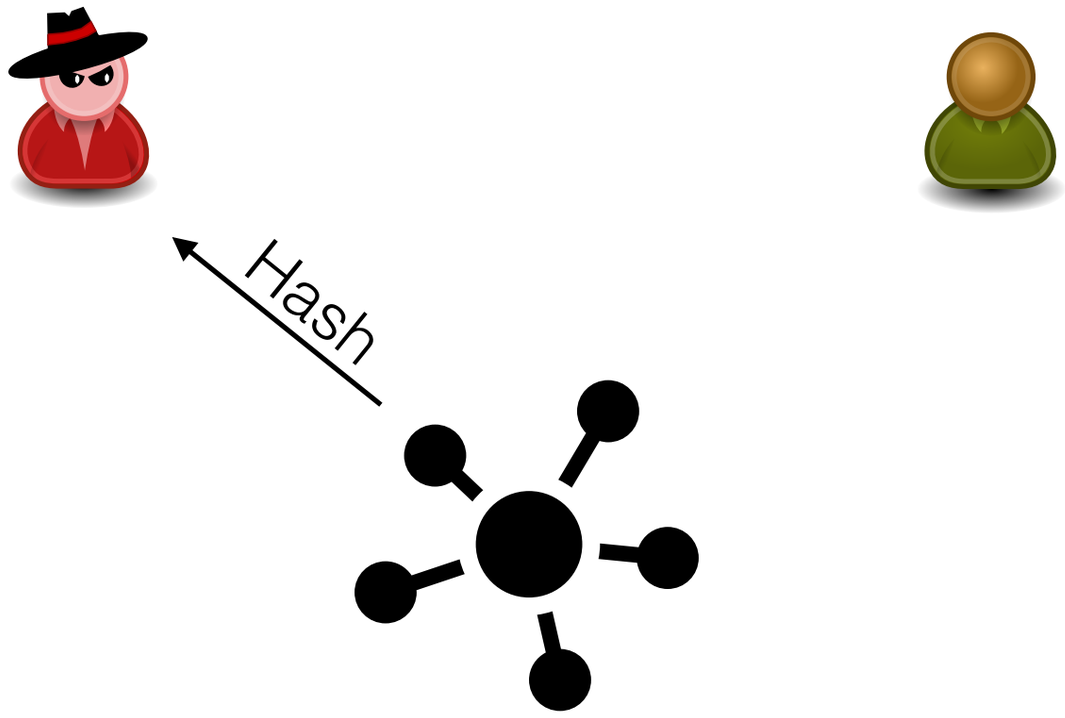

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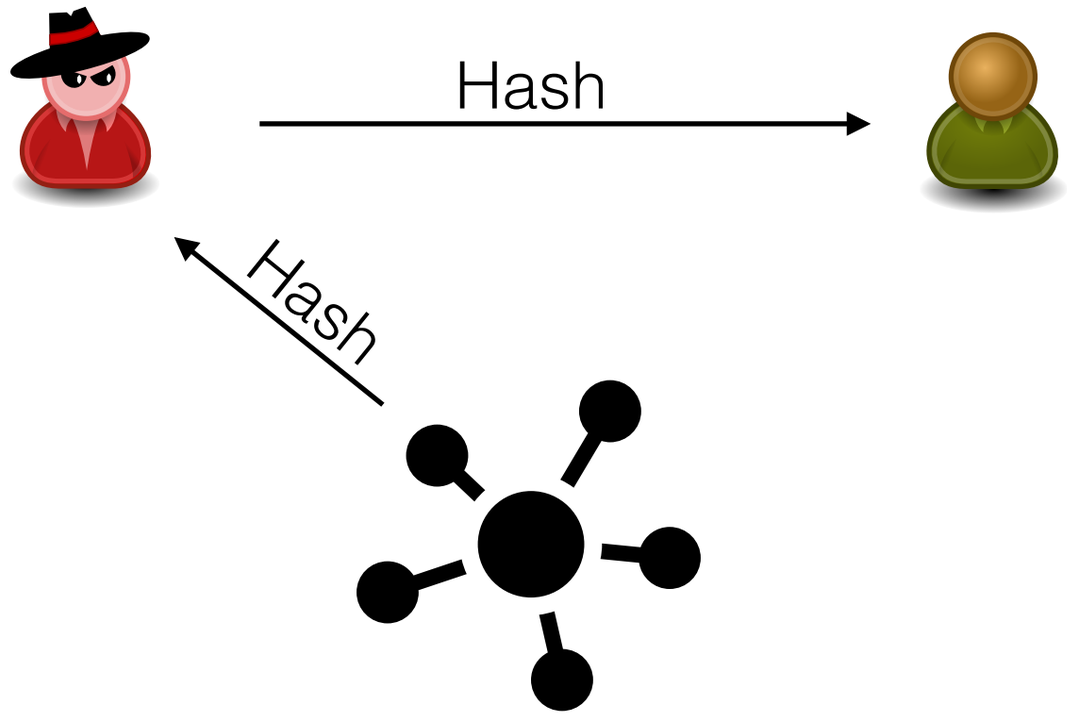

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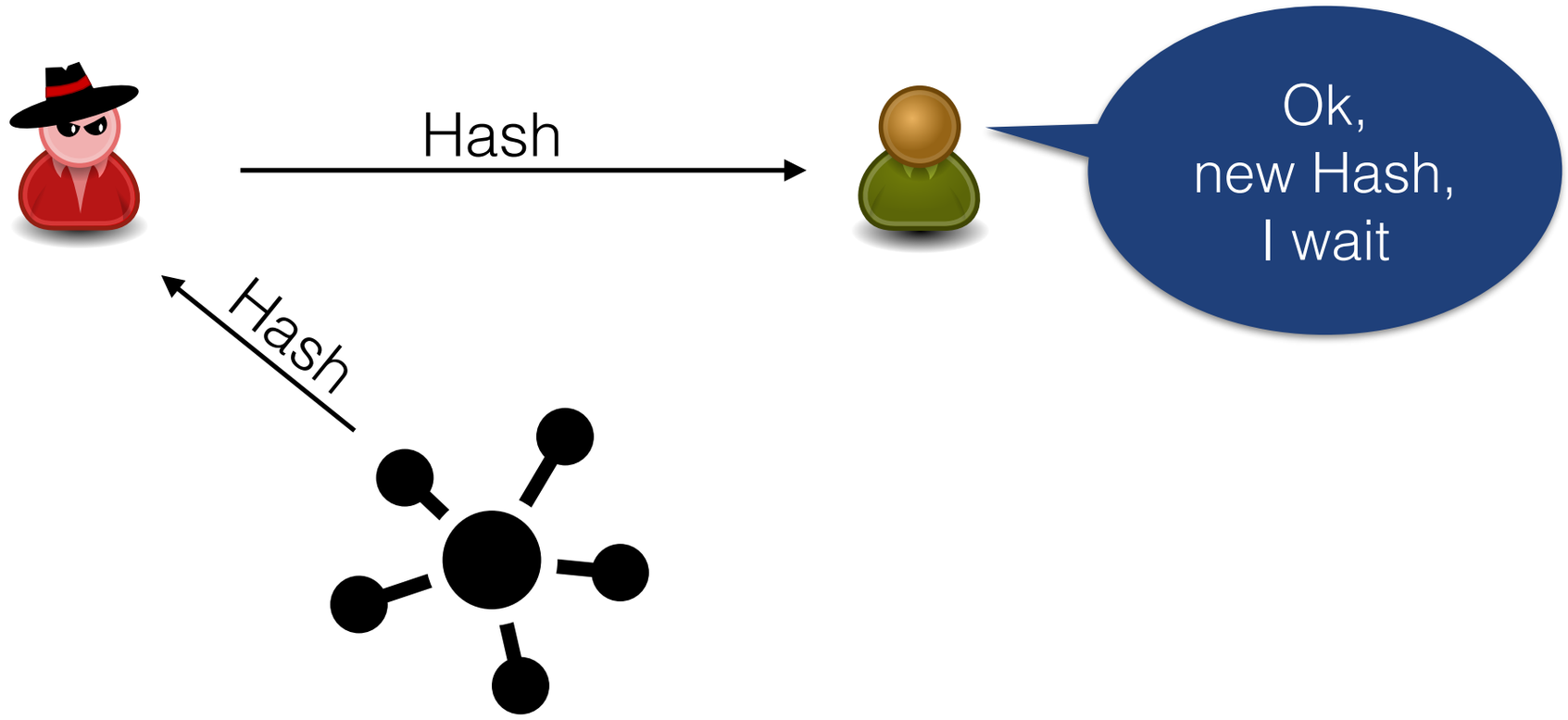

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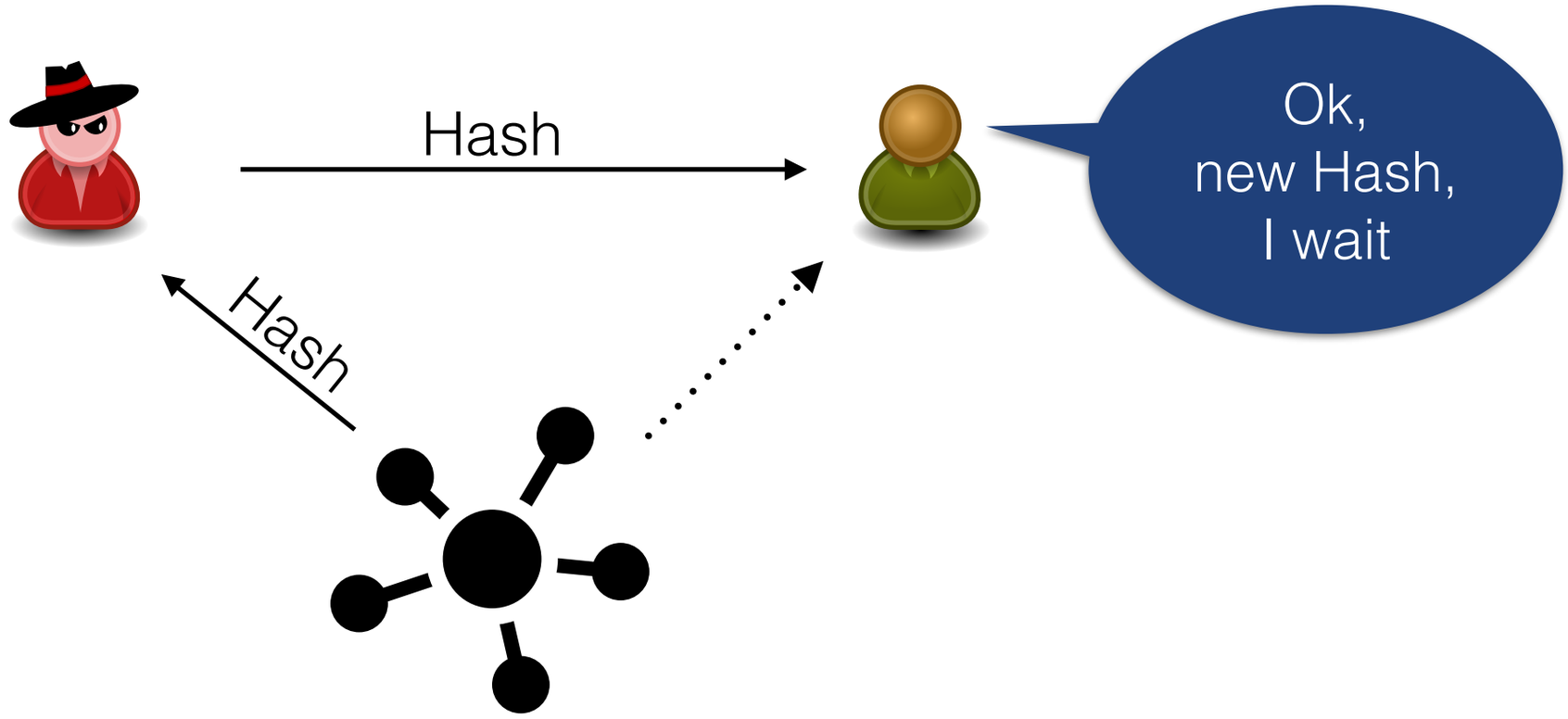

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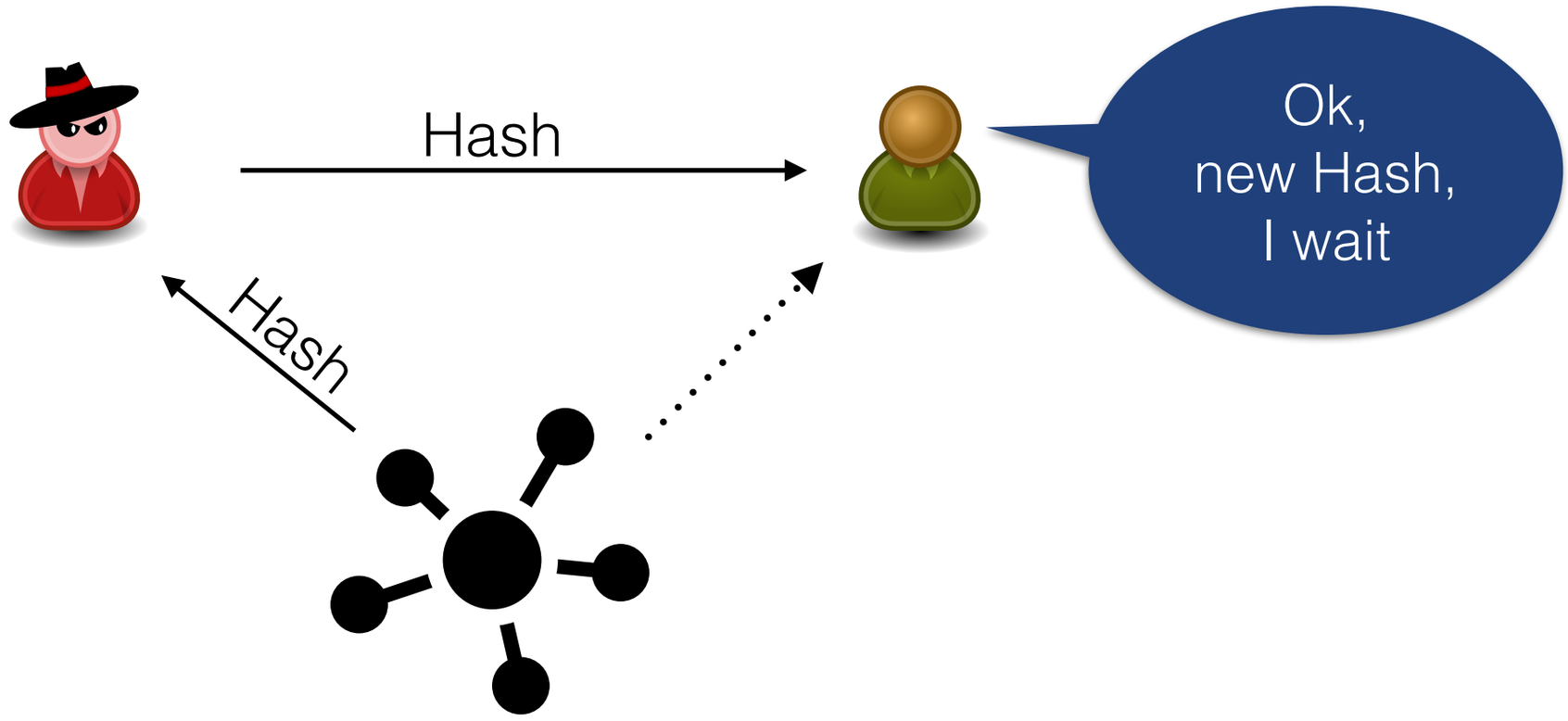
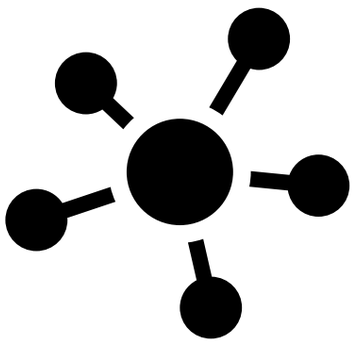


2. Victim should wait
   - Block timeout: 20 minutes
   - Transaction timeout: 2 minutes

Being First

Zurich



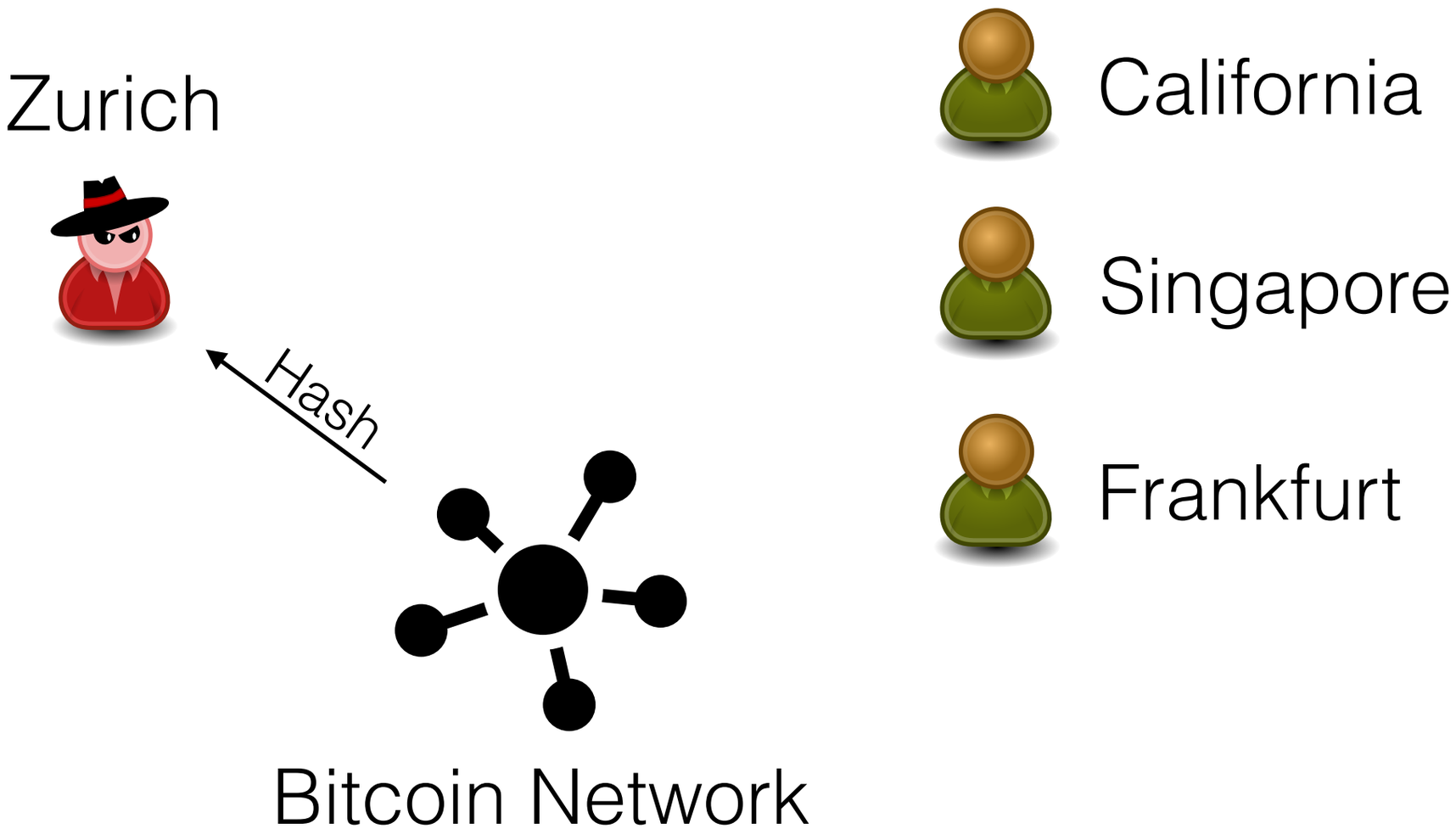
Bitcoin Network

California

Singapore

Frankfurt

Being First


Zurich
Hash
Bitcoin Network
California
Singapore
Frankfurt

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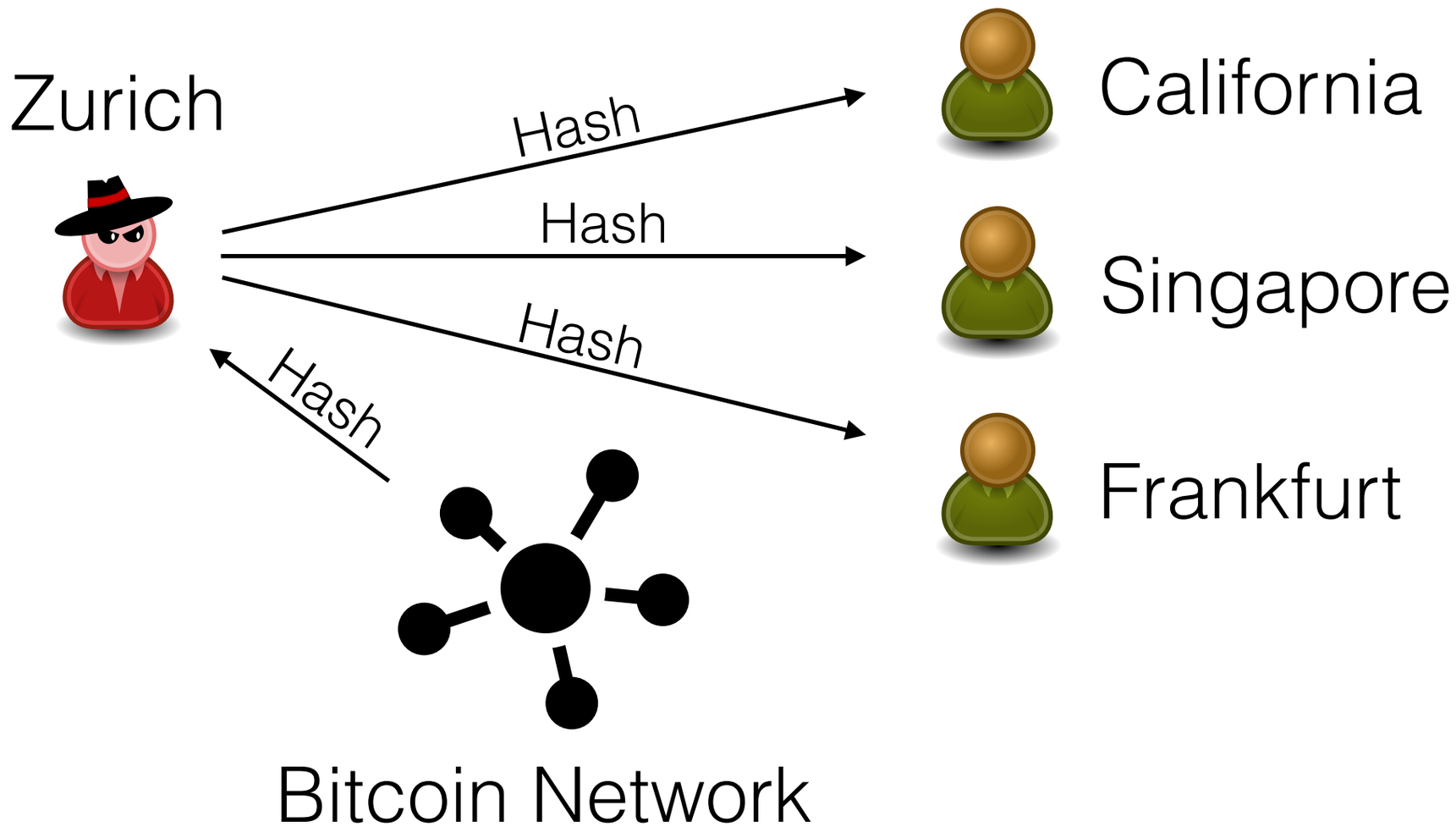
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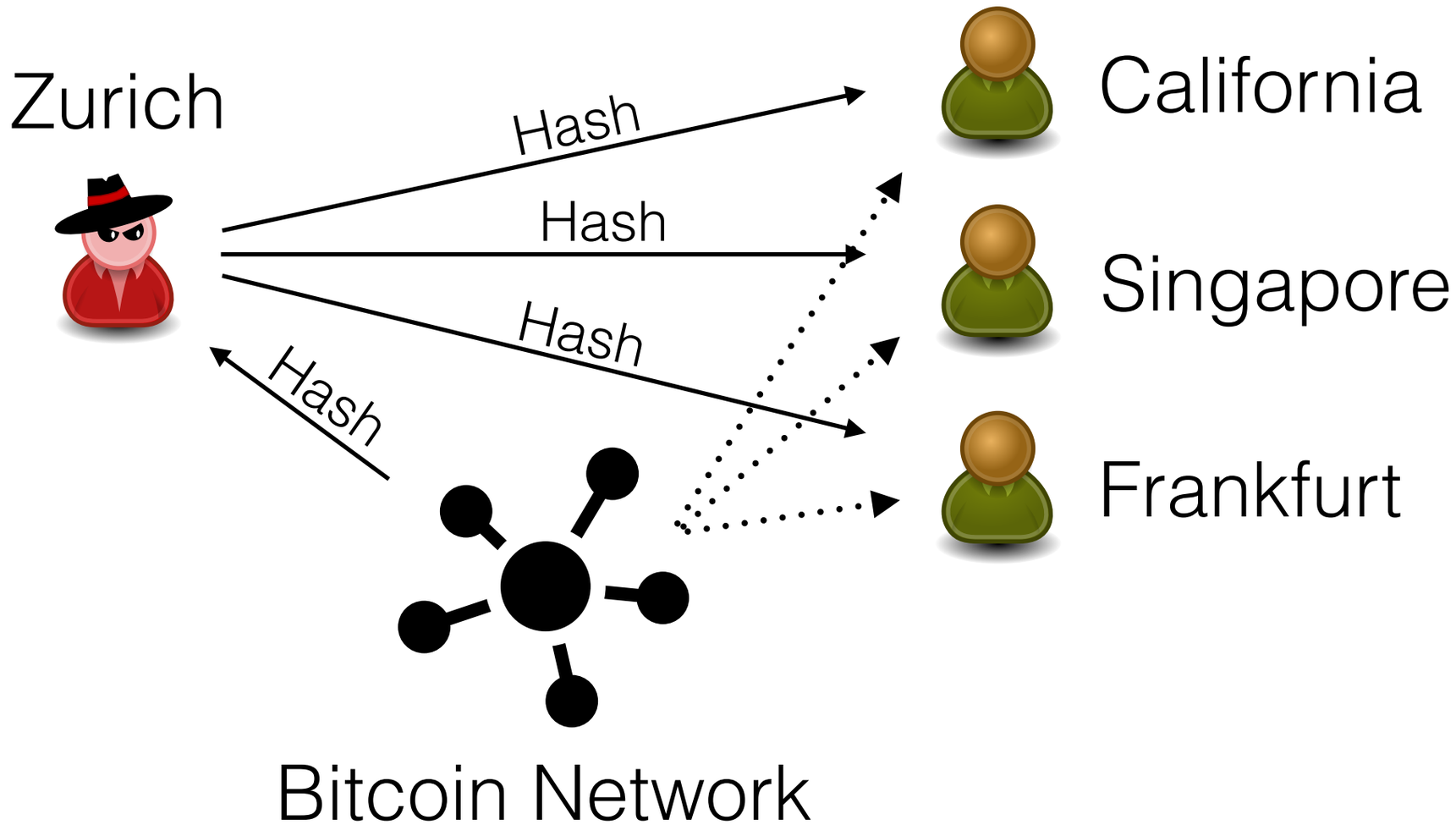
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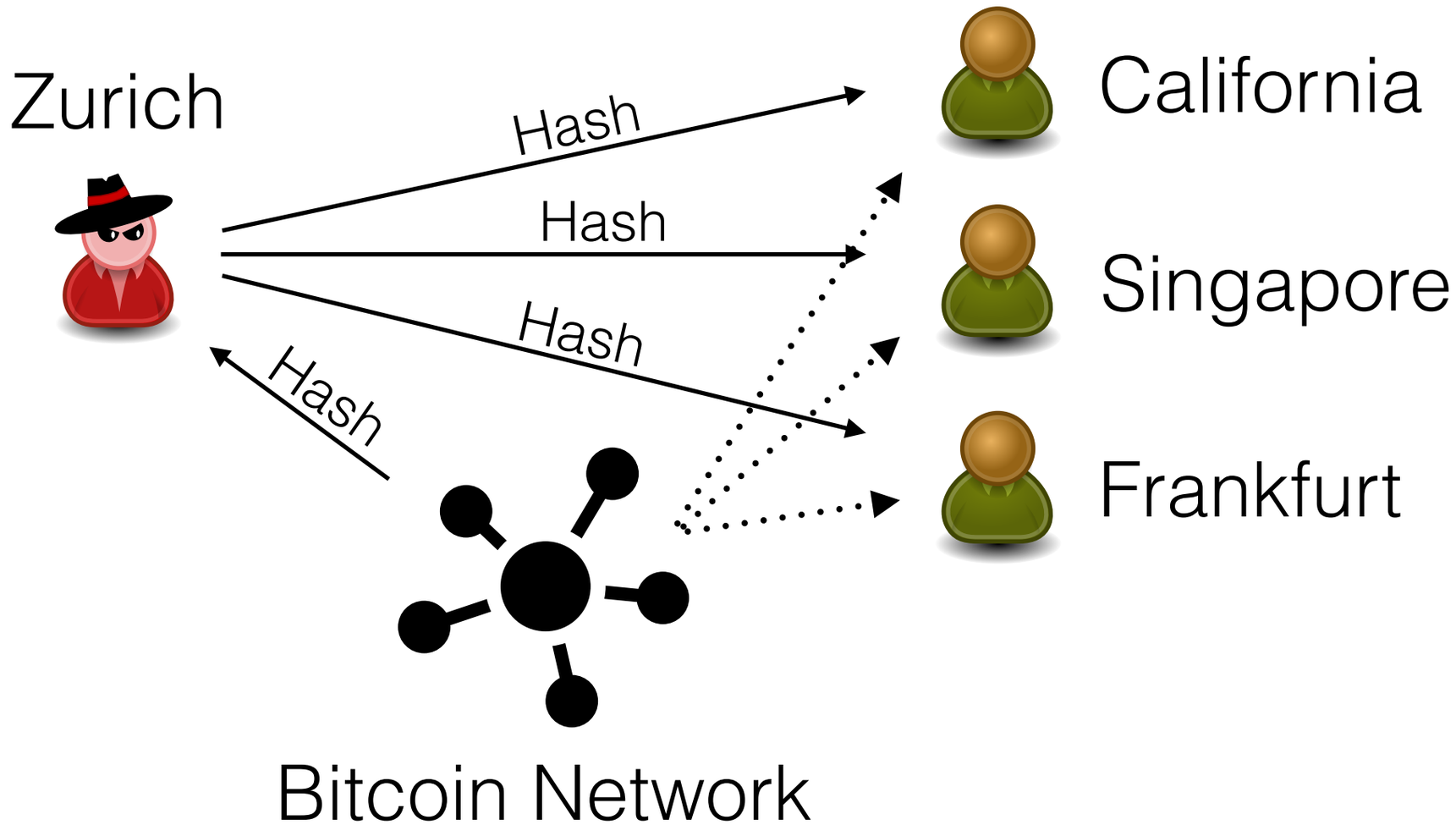

Connections of Adversary	40	80	200	800
Connections of Victim	40	40	40	40
Average success in being first	0.44± 0.14	0.57± 0.20	0.80± 0.14	**0.89± 0.07**

Waiting

Transactions

- After 2 minutes request from other peer (FIFO)

Waiting

Transactions

- After 2 minutes request from other peer (FIFO)

FIFO queue

Waiting

Transactions

- After 2 minutes request from other peer (FIFO)

Waiting

Transactions

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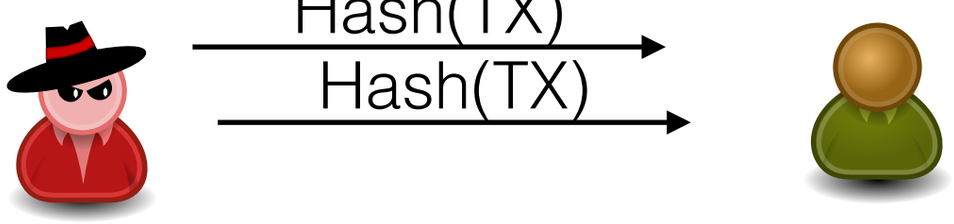

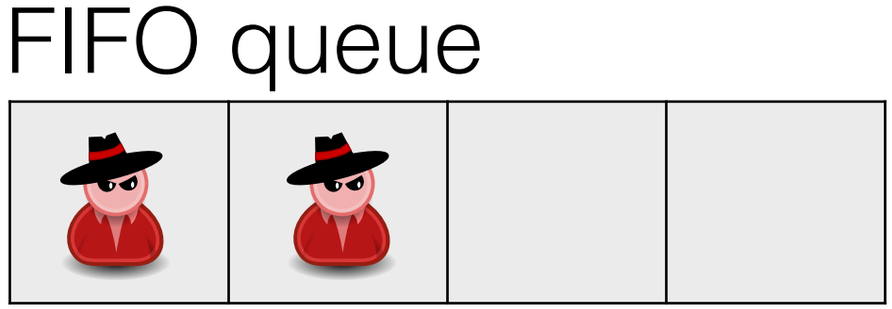

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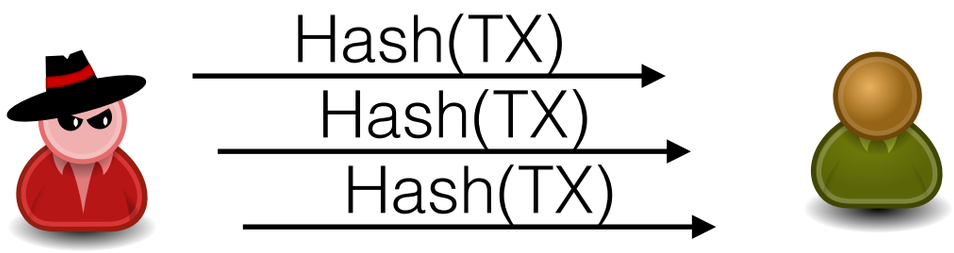

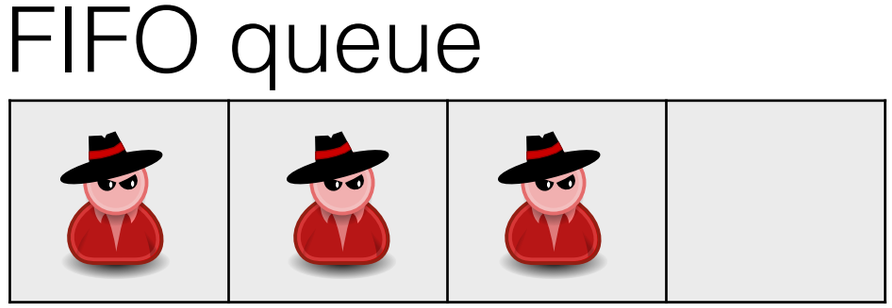

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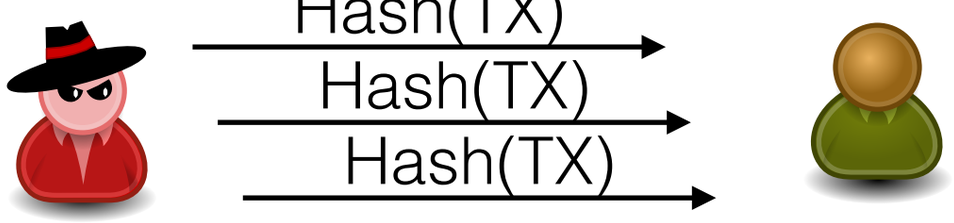

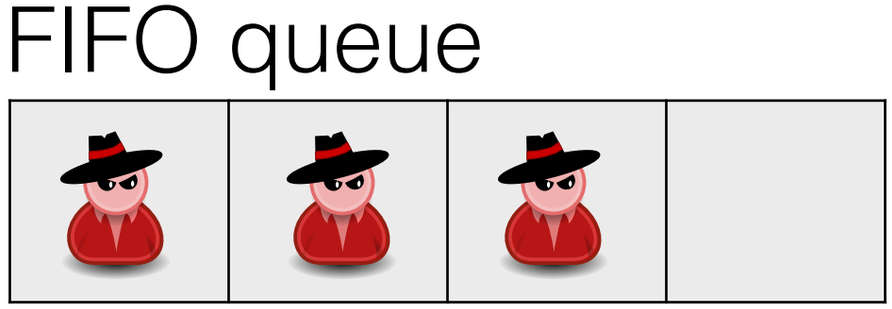

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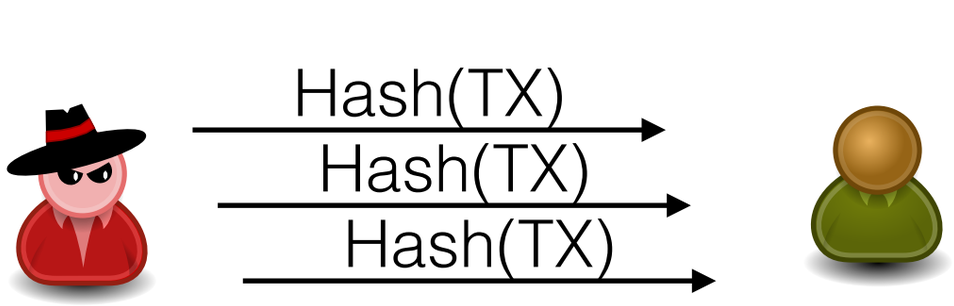

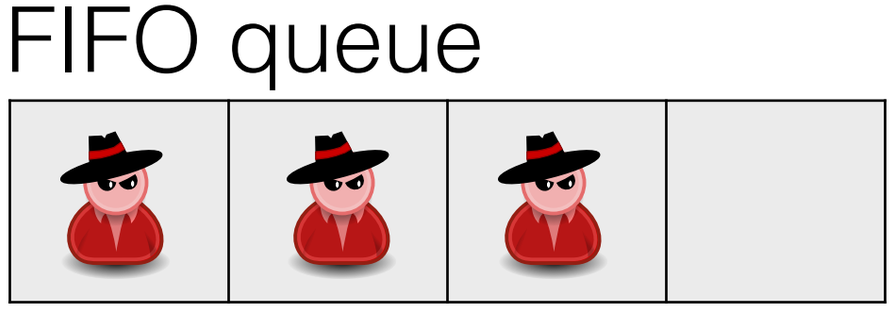

Blocks

- After 20 minutes disconnect and do nothing
- If received header, disconnect and request block from another peer