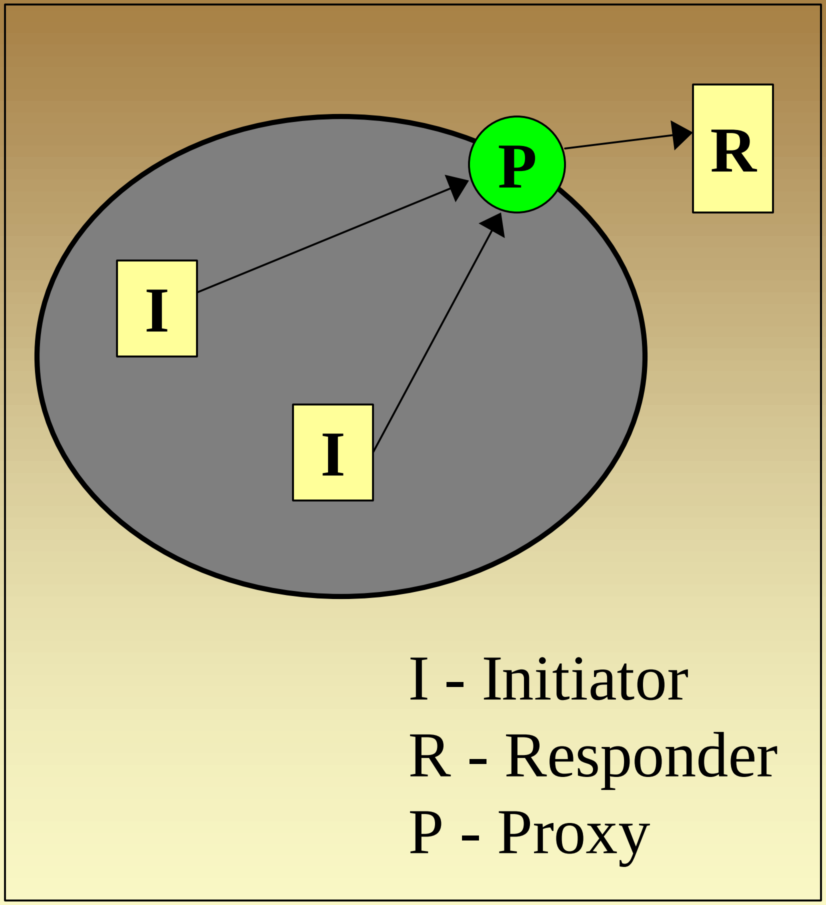
# WHY DO WE NEED ANONYMITY?

- Protect legitimate personal privacy concerns
  - Privacy in medical issues or psychological counseling
  - Allow for safe “whistle blowing”
- American Association for the Advancement of Science (AAAS) believes that privacy is a fundamental human right, and certainly a right guaranteed by the U.S. Constitution

# PREVIOUS EFFORTS AT ANONYMITY

- Single Proxy
  - Pre-assigned machine forwards data for the network
  - Responder can determine Proxy but not Initiator
  - Disadvantage
    - Initiator not anonymous from Proxy

# SINGLE PROXY



I - Initiator
R - Responder
P - Proxy

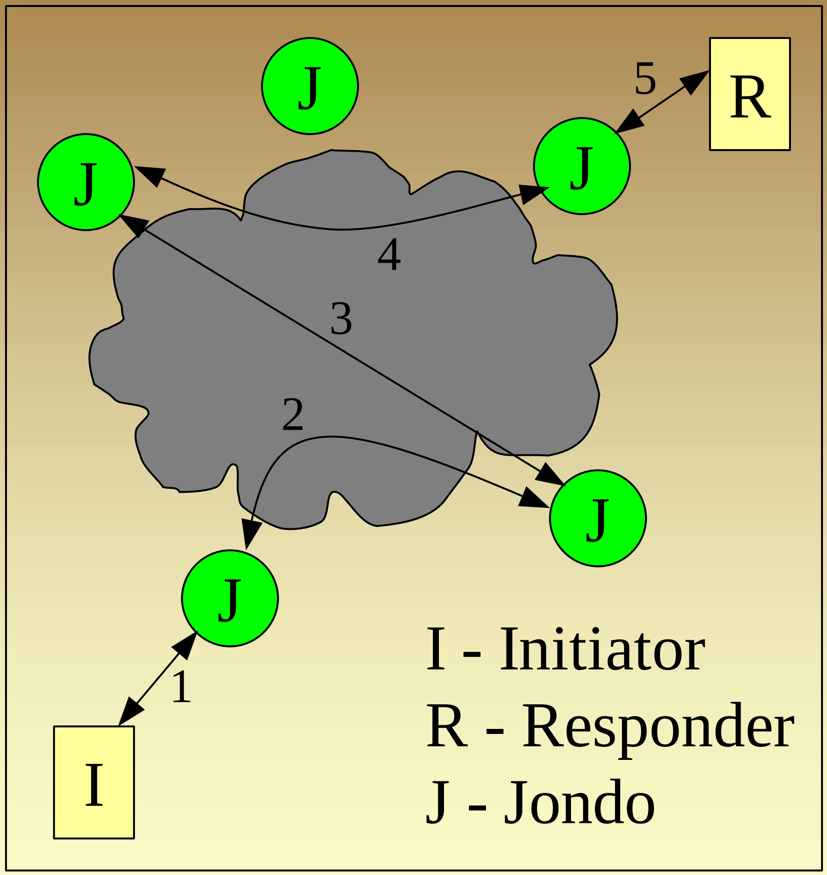
# EXISTING ANONYMOUS PROTOCOLS

## *CROWDS*

- Forward connection randomly through series of host-level proxies
- Should be a jondo to participate
- Anonymous as no proxy can determine if last hop was Initiator

# EXISTING ANONYMOUS PROTOCOLS

## *CROWDS*



I - Initiator

R - Responder

J - Jondo

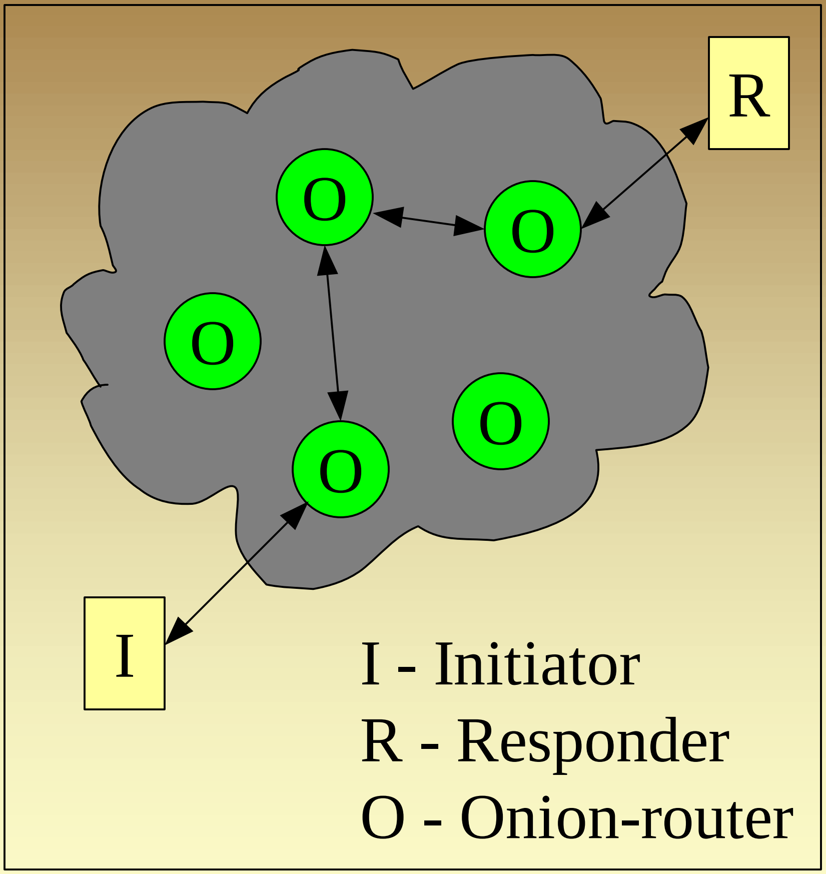
# EXISTING ANONYMOUS PROTOCOLS

## *ONION ROUTING*

- Onion Routers added to network as special service
- Initiator connects to onion router
- Onion router encodes network path in packet
- Packet follows constructed path to R

# EXISTING ANONYMOUS PROTOCOLS

## *ONION ROUTING*



I - Initiator
R - Responder
O - Onion-router

# DRAWBACKS

- Latency Issues
  - Crowds members located all over Internet.
  - Latency can be arbitrarily bad, depending on location of random members on path
- Traceback
  - When connection is active, follow flow of packets *(active trace back)*
  - When connection is inactive, examine internal state at each member *(passive trace back)*

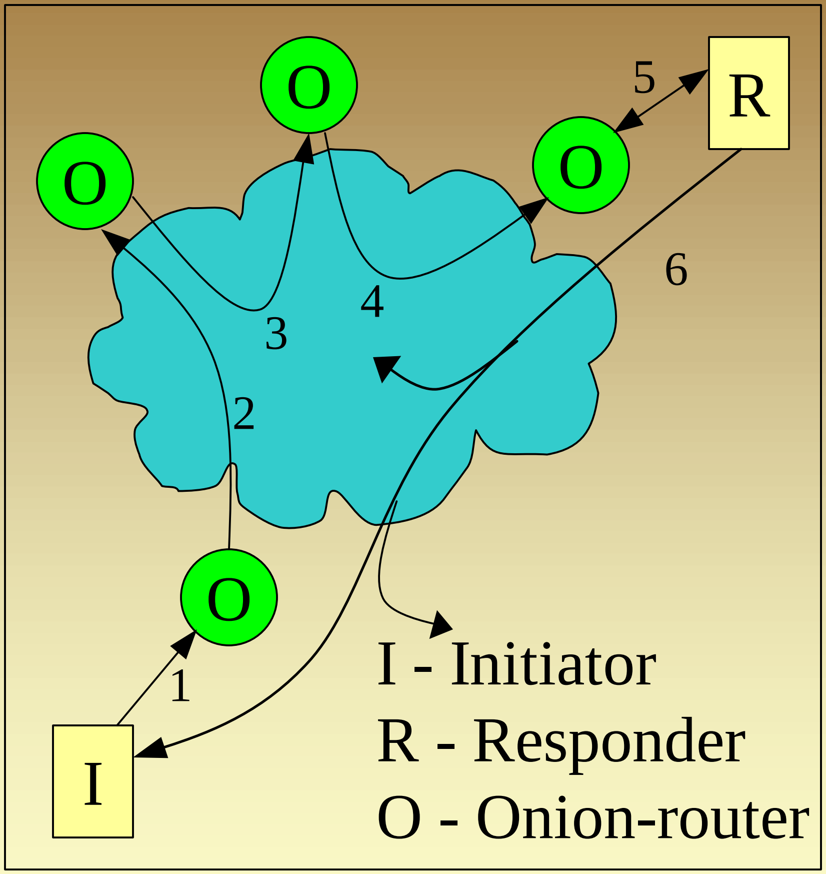
# OUR DESIGN GOALS

- Provide privacy for individual users
- No new network infrastructure
- Reduce latency
- Limit Traceback

# HORDES

- Forward path: Layered encoding, similar to Onion Routing, allows control of path
- Return Path: Use IP Multicast
- IP Multicast allows anonymous reception over shortest path

# HORDES



I - Initiator

R - Responder

O - Onion-router

# ADVANTAGES OF HORDES

- Uses existing network services
- No return path stored at intermediate hops - limits trace-back
- Multicast on return path - reduces latency
- Multiple receivers - provides anonymity

# HORDES

- Work done
  - Implementation for HTTP protocol
- What’s next?
  - Modules for other protocols: FTP, Telnet etc
  - Real world testing and distribution
  - Interoperability across various platforms
  - Improved Key distribution and management