# Using Graphic Turing Tests to Counter Automated DDoS Attacks Against Web Servers

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joint work with:
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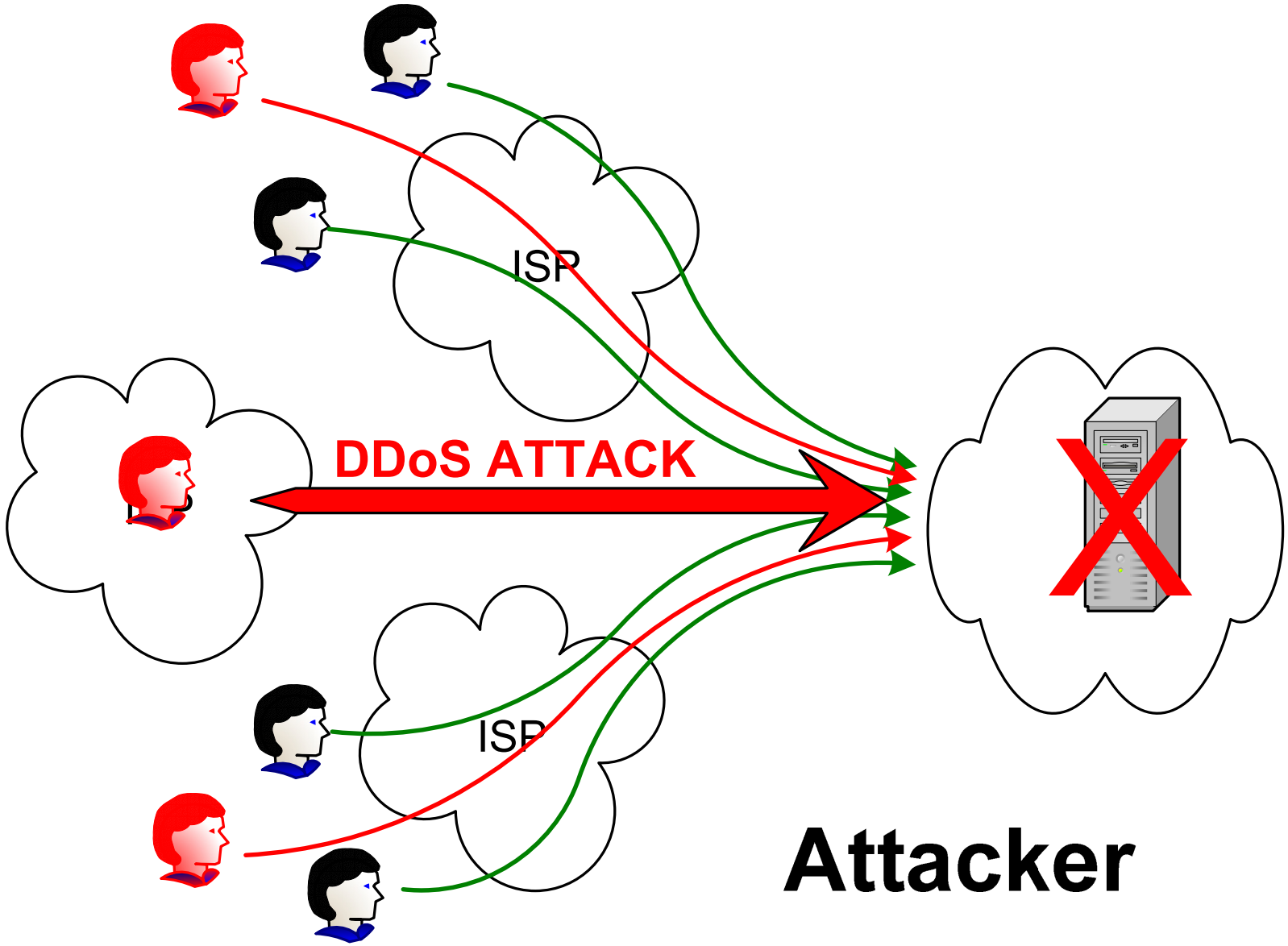
# Overview of the talk

- Description of the Problem
  - What are DDoS Attacks?
- Description of the SOS Architecture
  - Previous Work
- Our Approach (WebSOS)
  - Extensions to SOS
- Experimental Results
- Other Approaches
- Future Work

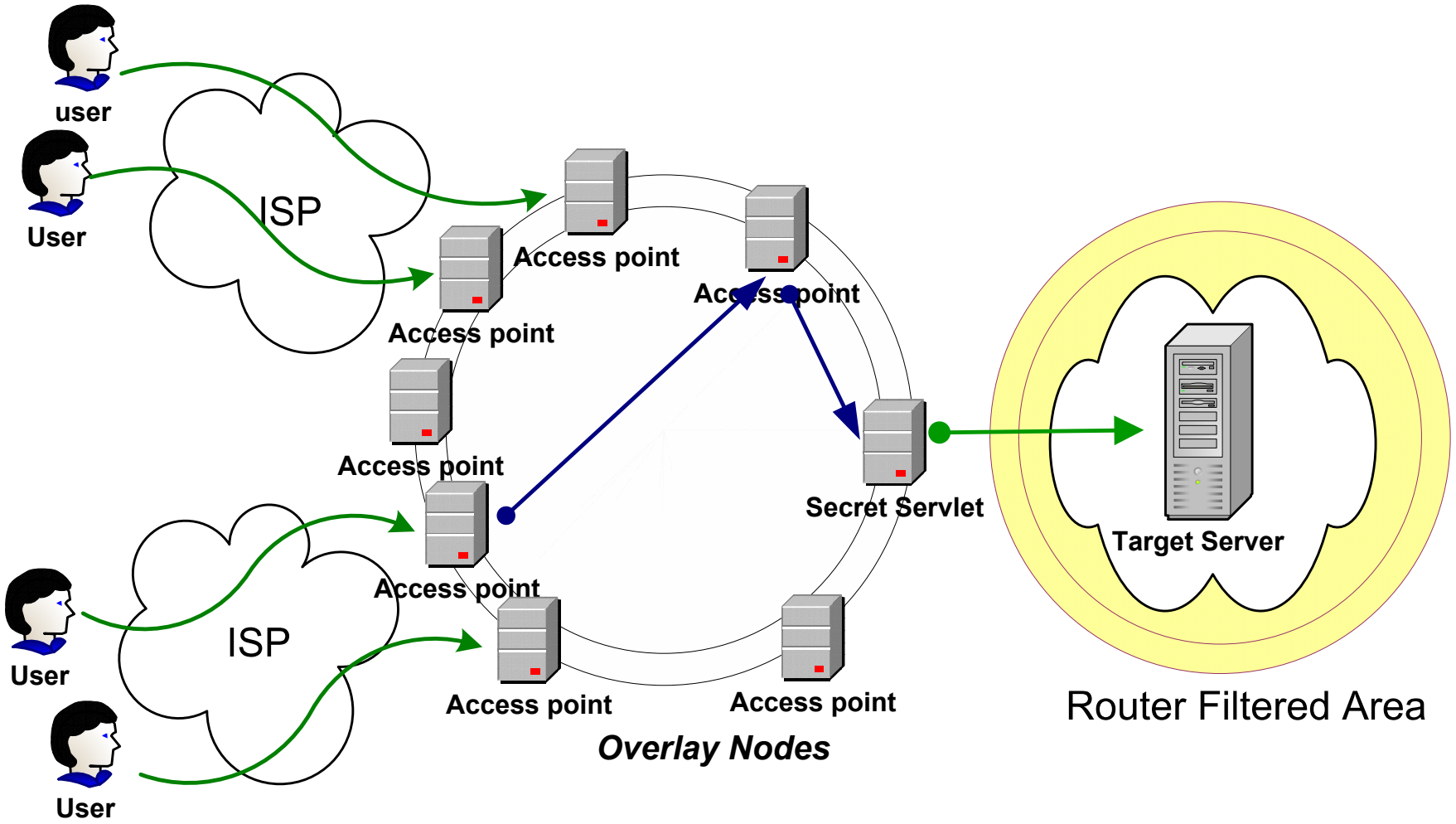
# Network DoS

- Over a network
  - No need to be a legitimate user
- Action at a distance
  - Minimize risk of exposure
- Easily Automated
  - Can use “hijacked” machines
  - Distributed DoS (DDoS)

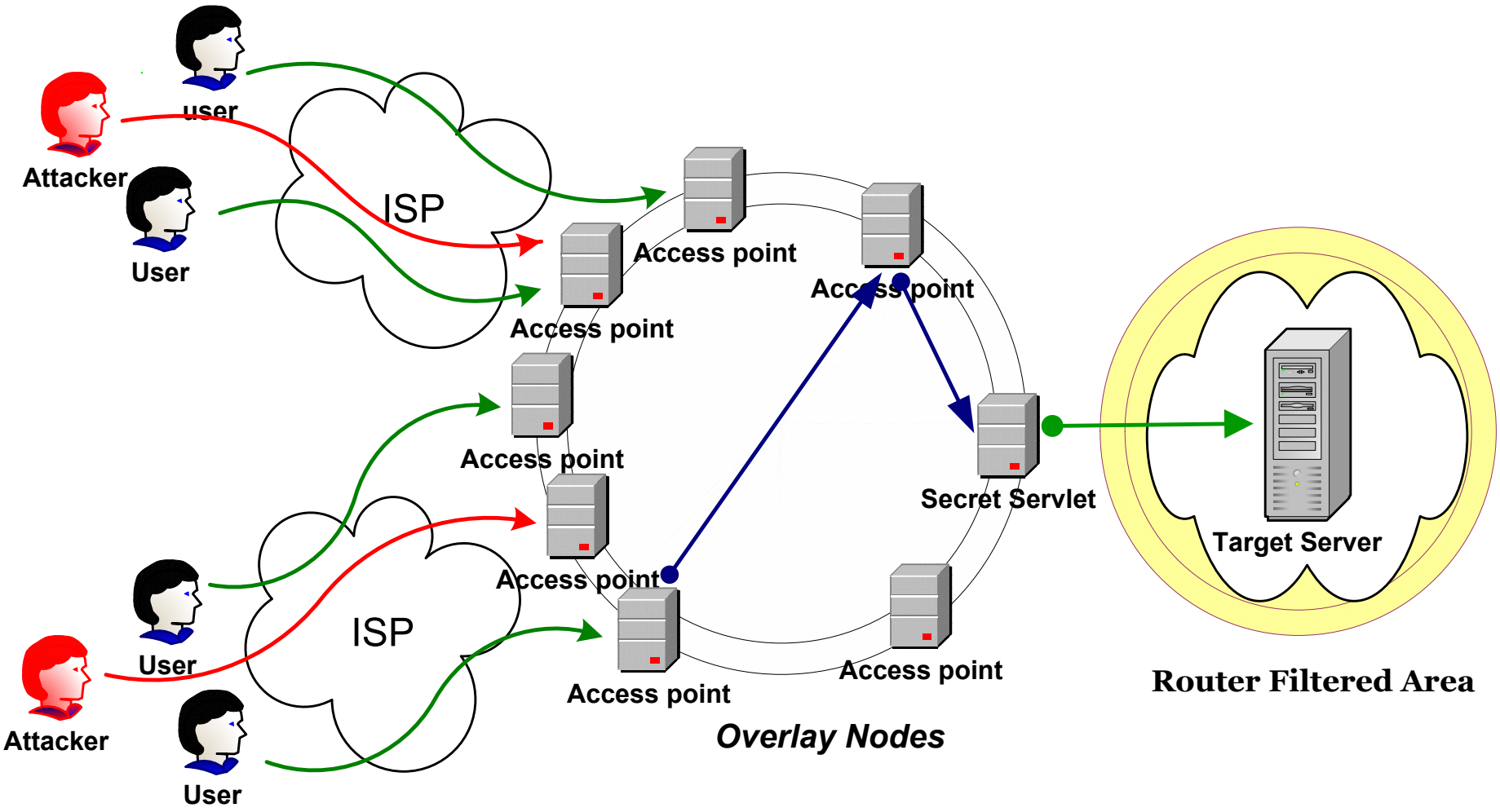
# DDoS Attack



# Network with SOS



# DDoS in an SOS-Equipped network



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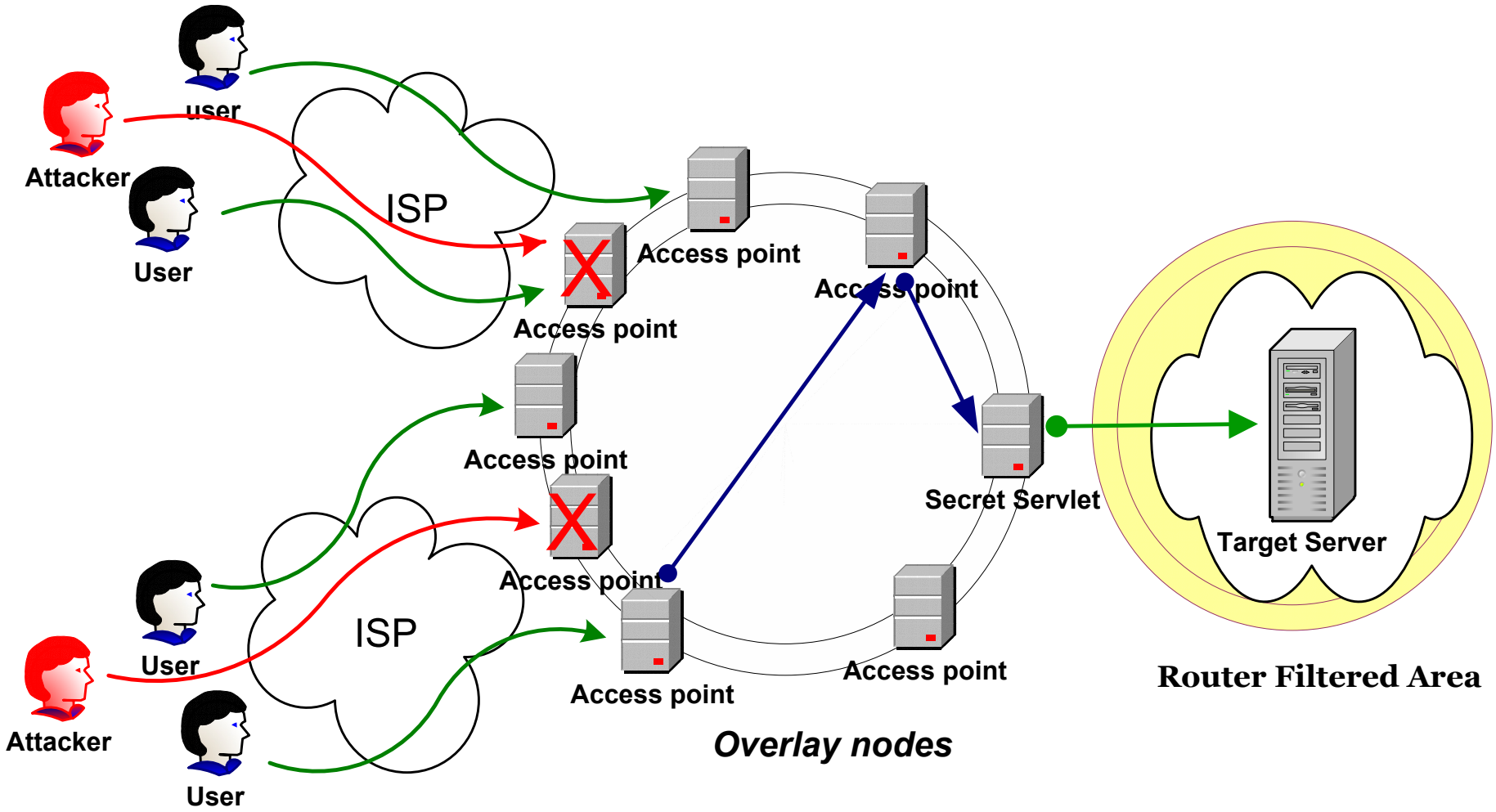


# Our Approach

- Separate good from bad/unknown traffic
  - Authenticate users for entering the overlay
  - Route good traffic through overlay
- Treat good traffic preferentially
  - Filter on packet characteristic
    - Routers can filter source IP address VERY fast
  - Vary characteristic with time
- Attacker must guess, or attack infrastructure

# Remaining issue

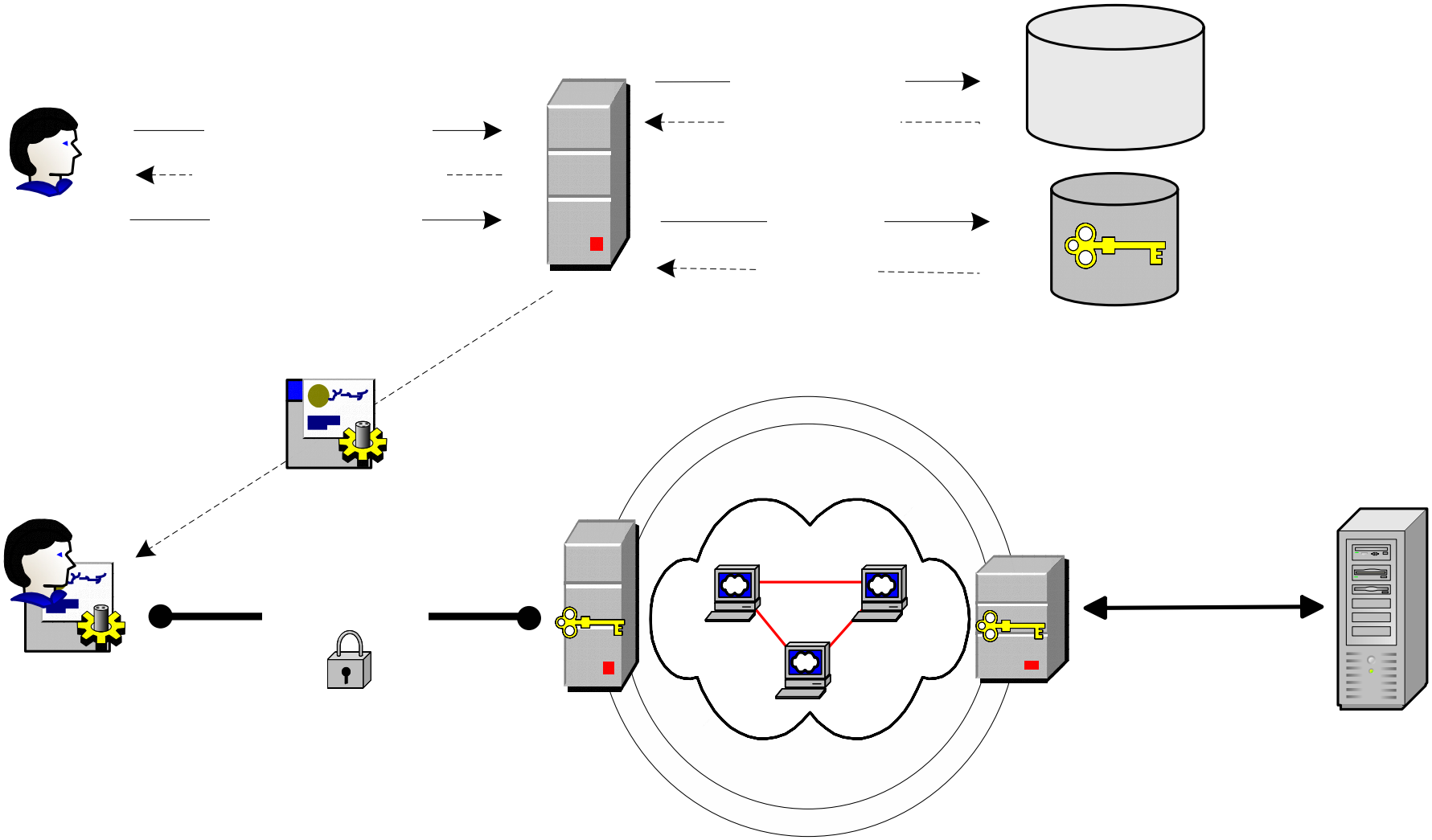
- Prevent Large Scale Automated Attacks,
  allow enough time for the overlay system to “heal”
- Requiring known users is too restrictive
- What we really want is guarantee no "zombies“

# Solution

- Extend SOS with Graphic Turing Tests
  - Tests that humans can perform, but difficult for computers

# Graphic Turing Tests

# WebSOS with GTT

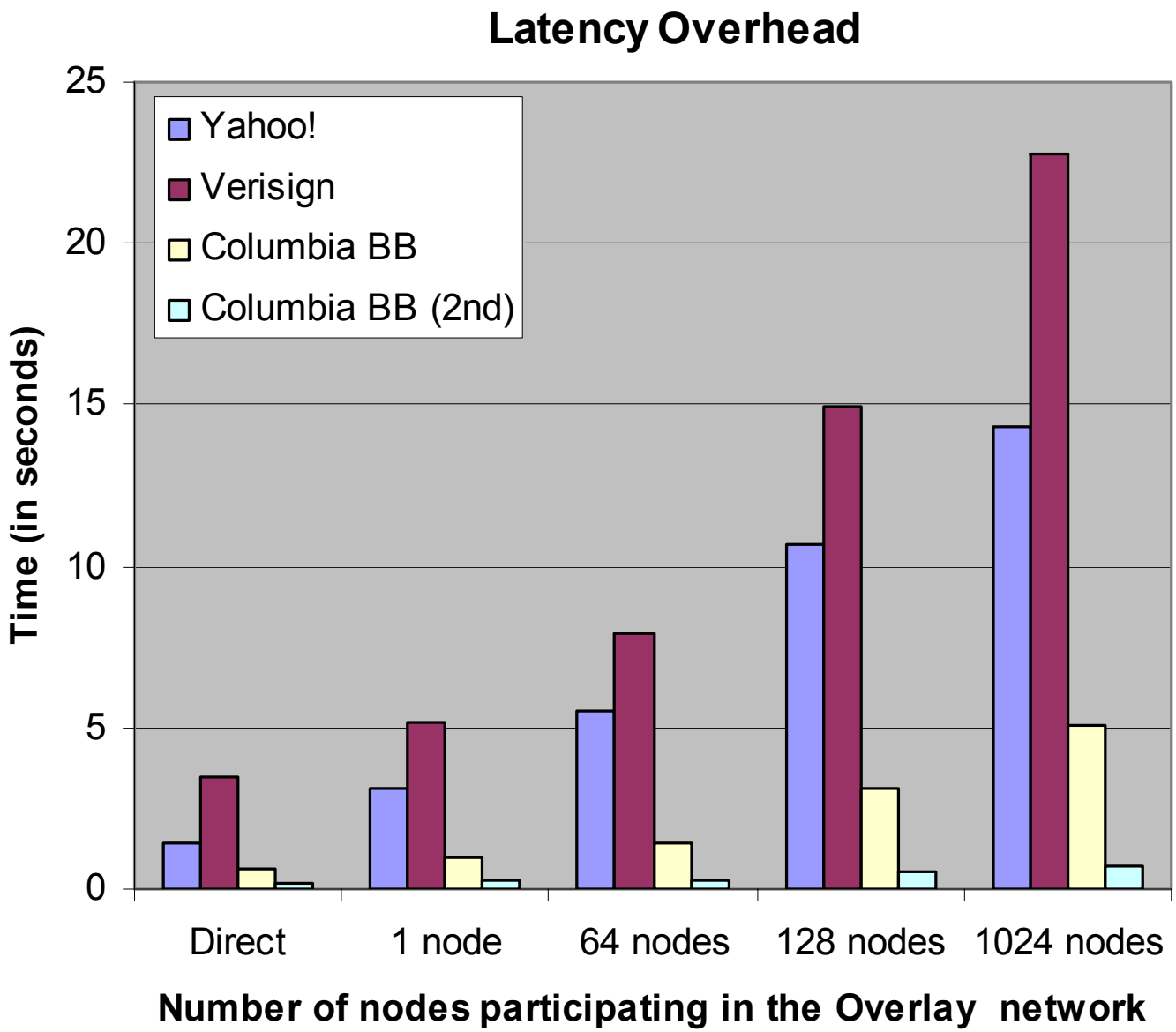


**Session Request**

# Experimental prototype

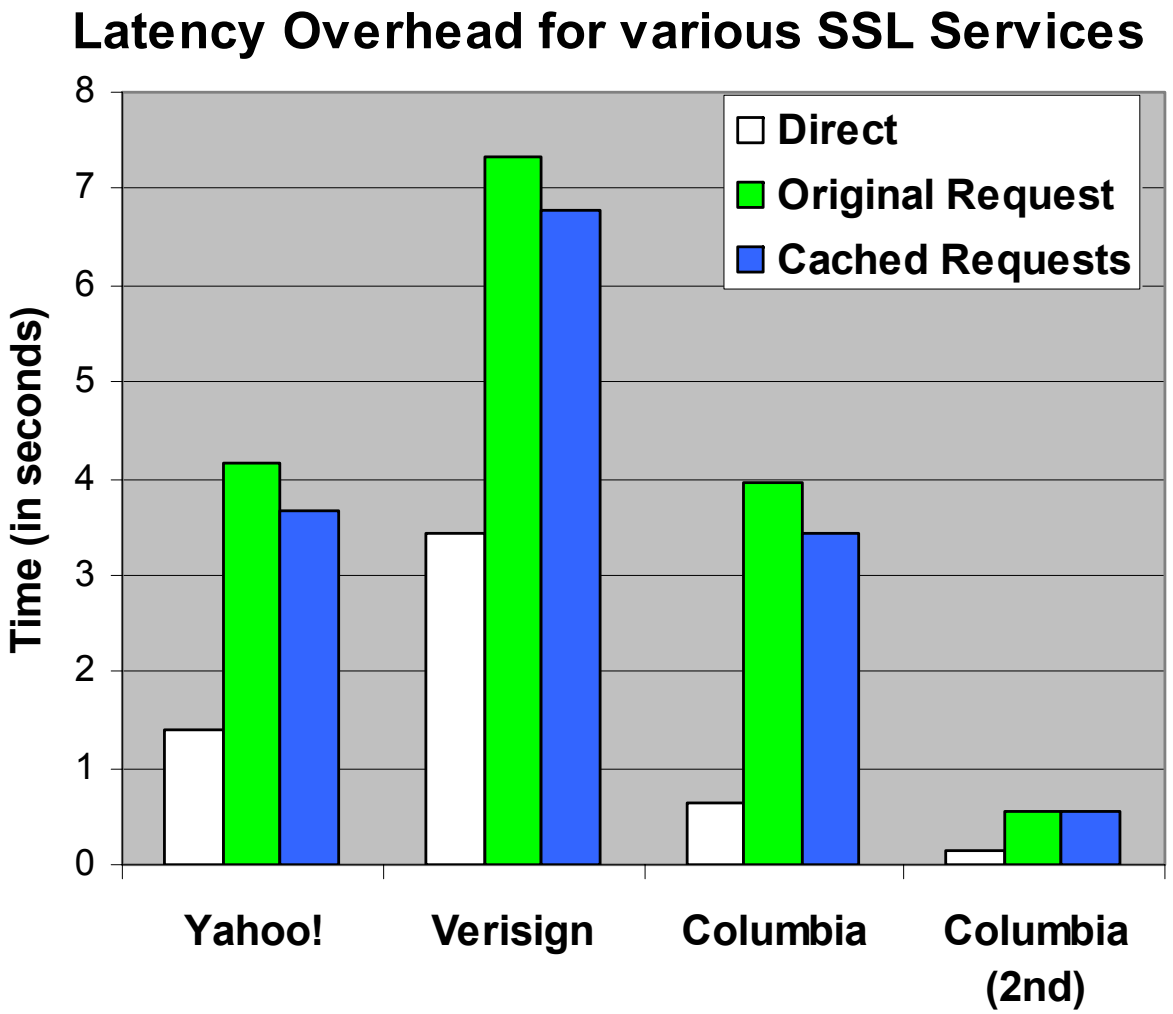
- Implementation for web services (WebSOS)
- Use SSL to protect traffic inside overlay
- Use SSL to authenticate user to overlay
- Unmodified browsers and web servers
  - Java applet on browser for first-hop SSL encapsulation
- Overlay nodes implemented as proxies
- Deployed over PlanetLab

# Experimental results



# Another Approach: Short-cut Routing

- Use overlay only to determine secret servlet
- Route data from the Access Point directly to secret servlet



# Other Approaches

- Pushback
  - Support from the routers
  - Trust issues
- Probabilistic Packet Marking (PPM)
  - Support from the routers
- Polling-based Traceback
  - Hardware support required

# Open Problems, Future Directions

- Deploy WebSOS in a large scale network
- Use WebSOS protection for services other than Web
- Detect and prevent attacks from within WebSOS