Arming the Defenseless: An Incentive-based Approach to DNS Reflection Prevention

Casey Deccio, Brigham Young University

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CAIDA, UCSD, La Jolla, CA

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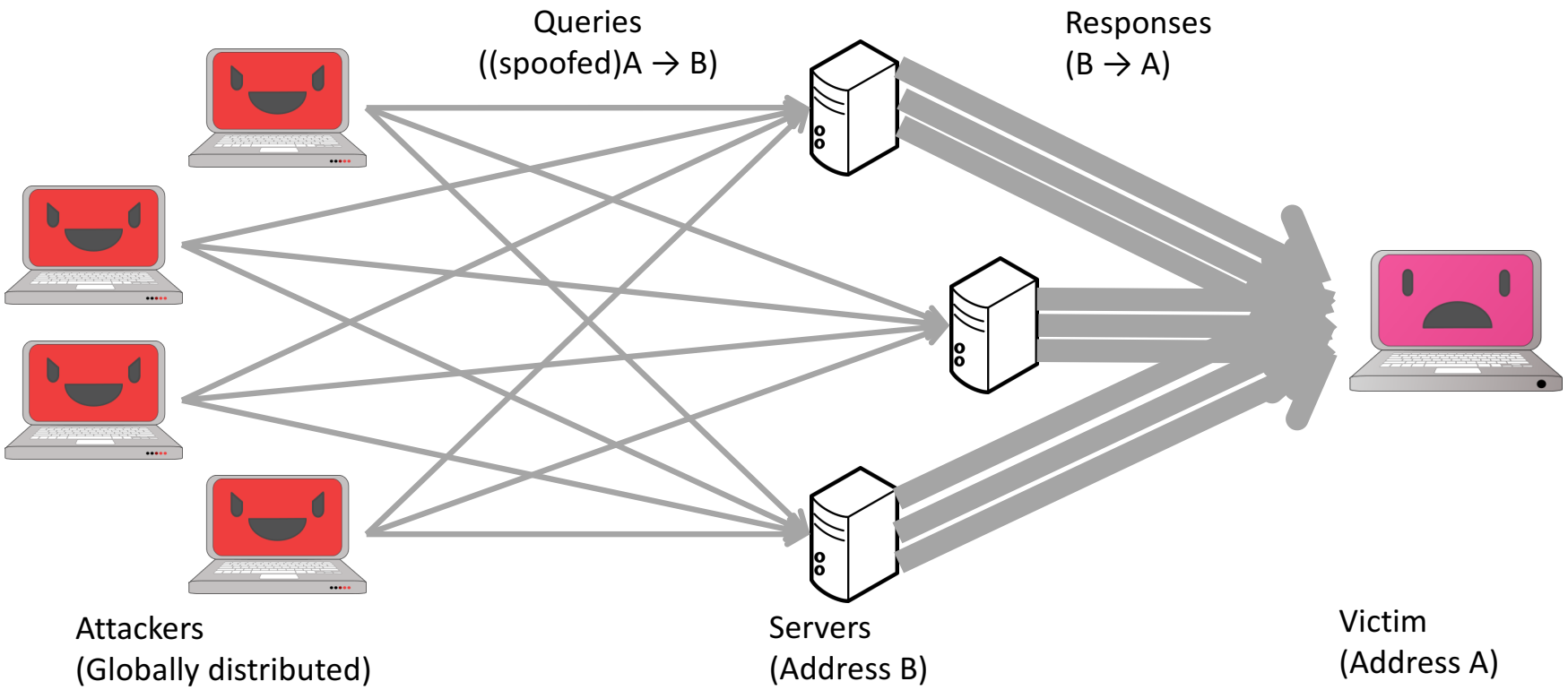
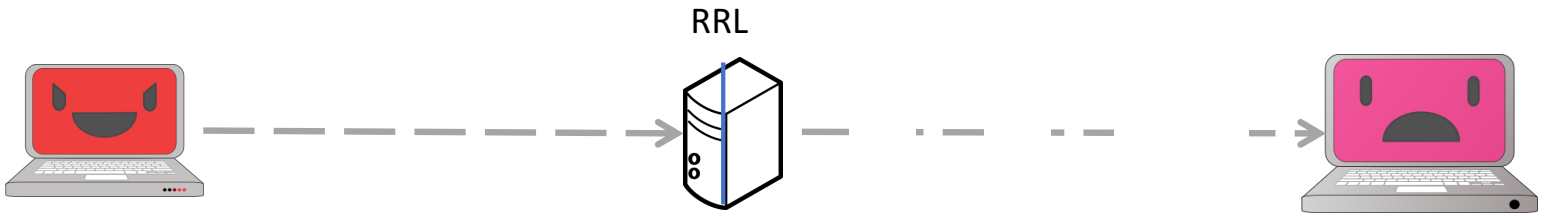
Reflection/Amplification-based DDoS Attack



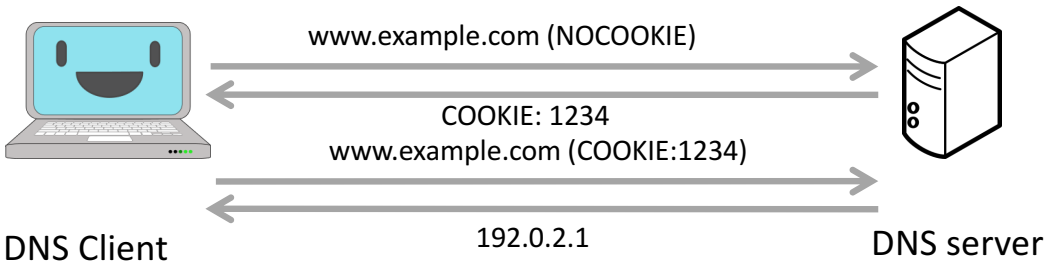
DNS Response Rate Limiting (RRL)



- Responses rate limited based on:
  - Frequency of incoming domain name/type/source IP
- Responses are small – simply request retry over TCP
- Legitimate clients still have a reasonable chance
- Weaknesses:
  - Relies on a threshold
  - Deals with amplification, but not reflection

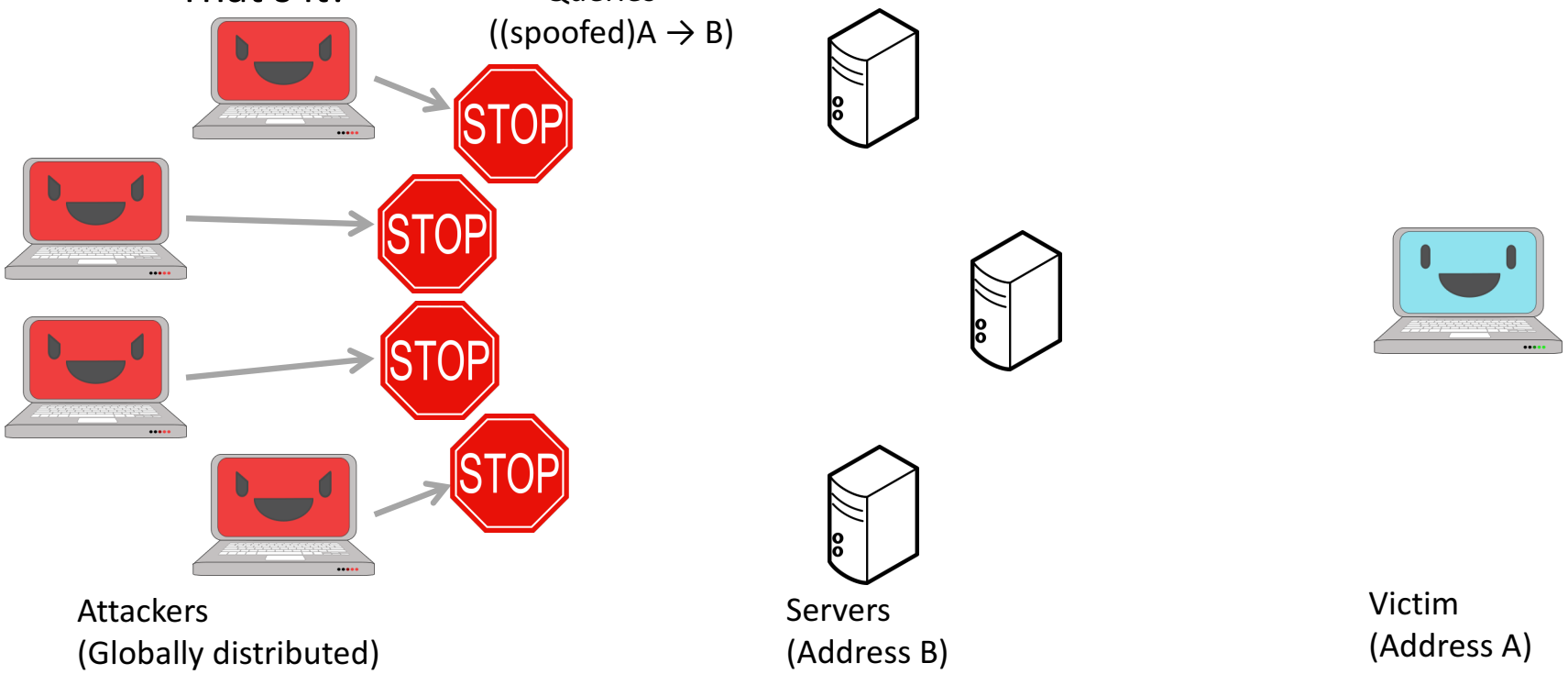
DNS Cookies

- Server sends cookie to client
  - Cookie must be included in subsequent requests
  - Server drops requests from clients that don’t have cookies
- Effective for source IP address validation
- Weaknesses:
  - Cannot be effectively enforced

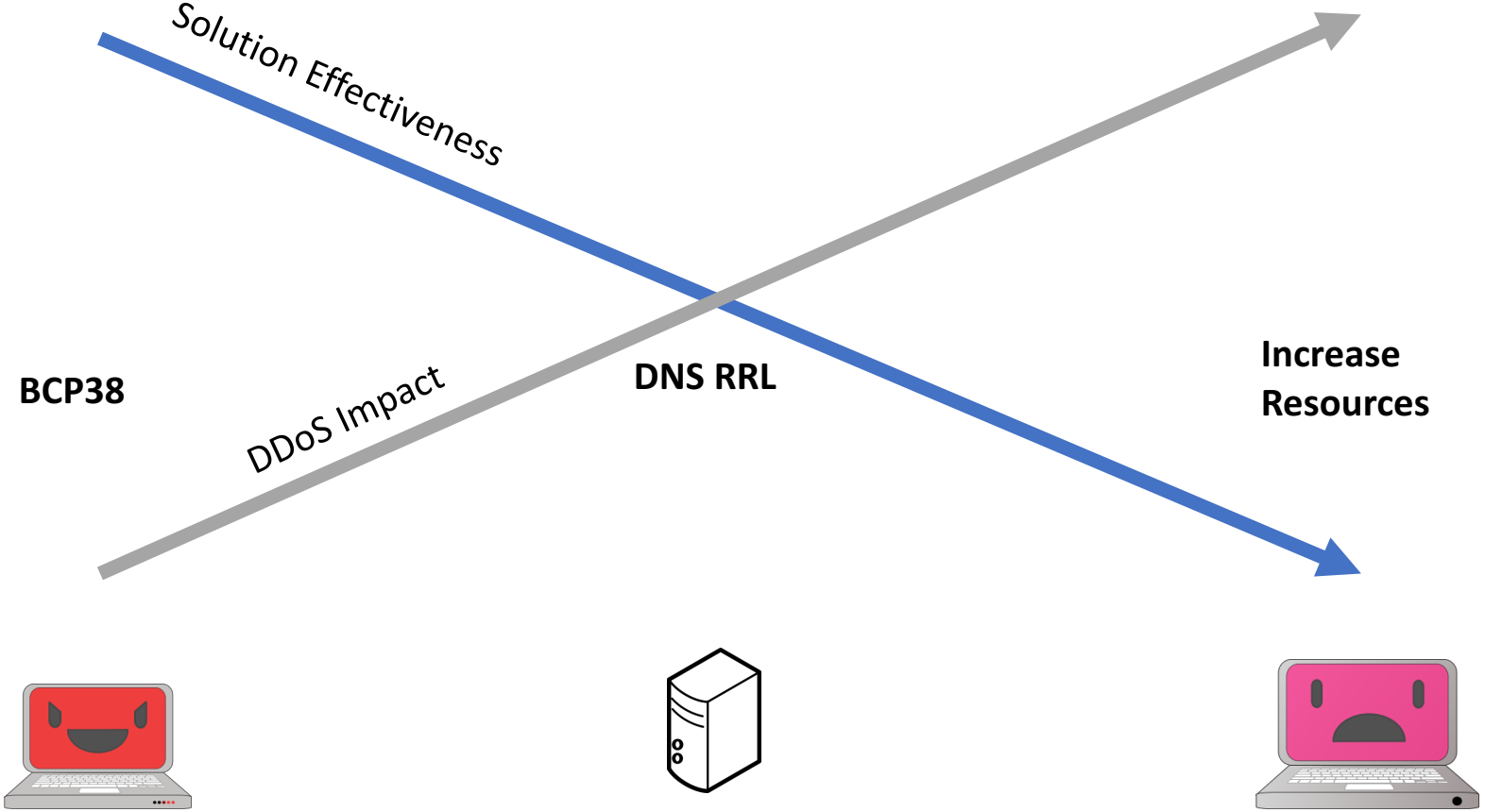


Source Address Filtering: Best Current Practice 38 (BCP38)

- Filter IP packets whose source IP addresses don't originate in-network
- That's it!



Incentives


Solution Effectiveness
DDoS Impact
BCP38
DNS RRL
Increase Resources

We either need to

incentivize the parties

capable of effective solutions

or

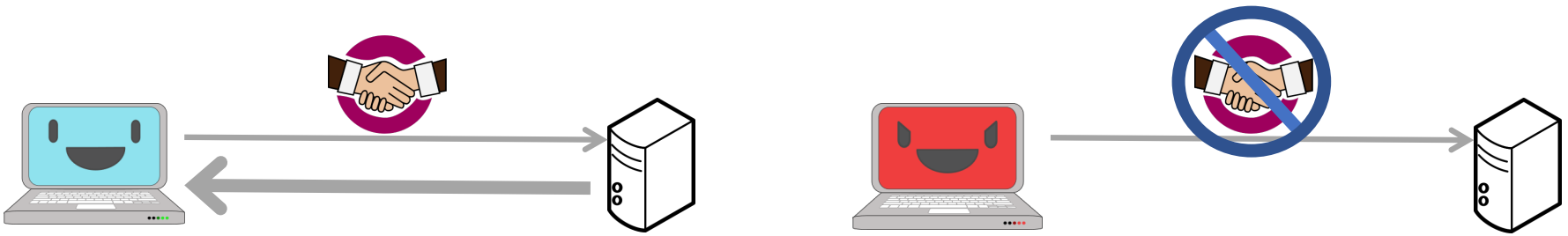
develop effective mechanisms

that can be deployed

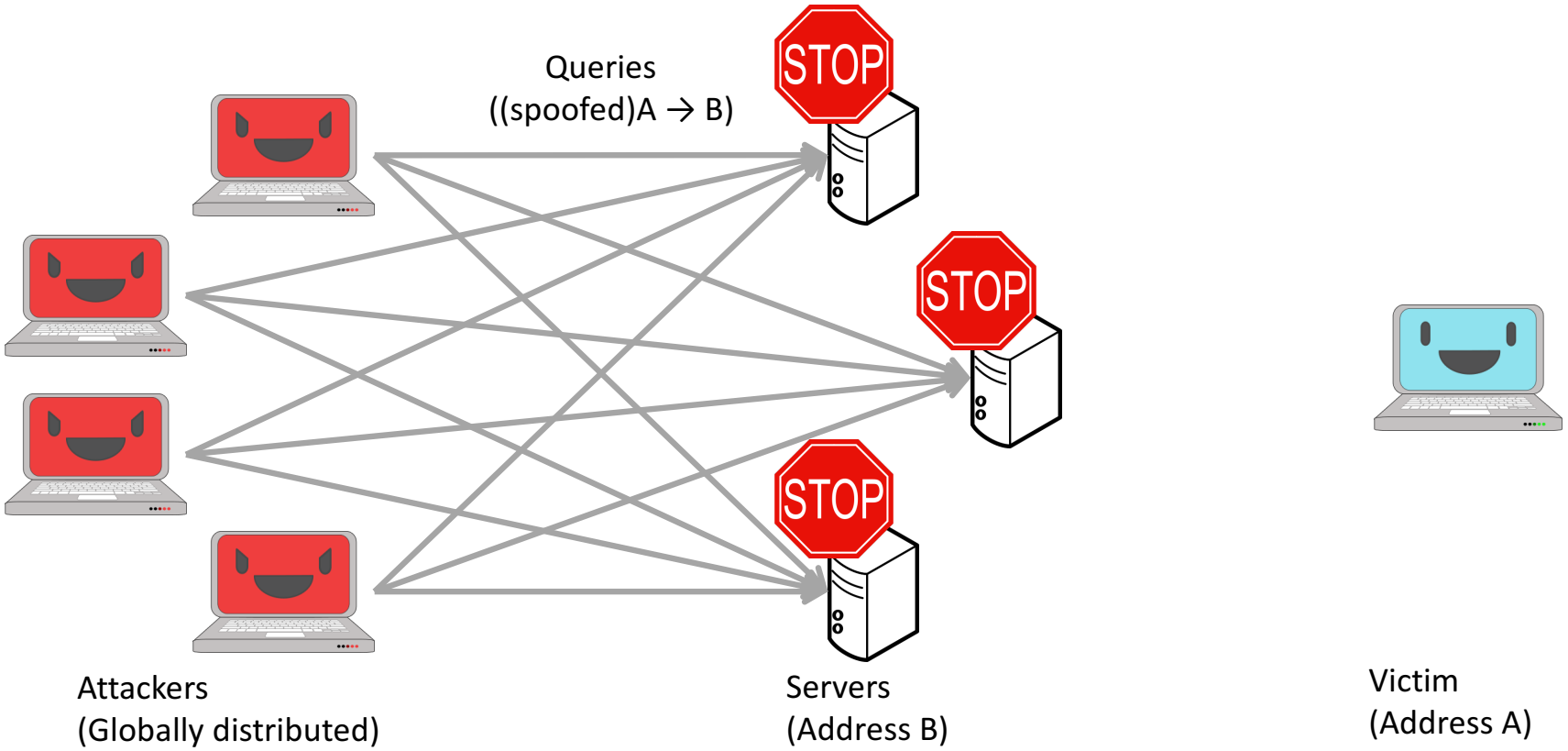
by those with incentive

Network Capability Assertion In a Nutshell

- Server enforces source address validation mechanism
  - on demand; or
  - all the time
- To enforce source address validation
  - a server performs a lookup of network capabilities; and
  - ignores requests that don't validate



Reflection with Enforcement of Source IP Address Validation



Advertising and Detecting Network Capabilities – in the DNS

- Publish and lookup in .arpa tree in the DNS
  - Example: for 192.0.2.1, query the DNS for 2.0.192.in-addr.arpa
- Network capabilities specified at 8-bit granularity
- Child inherits default policy from parent
- Server assumes defaults until lookup completes