# Where are you taking me? Understanding abusive Traffic Distribution Systems

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# Motivation

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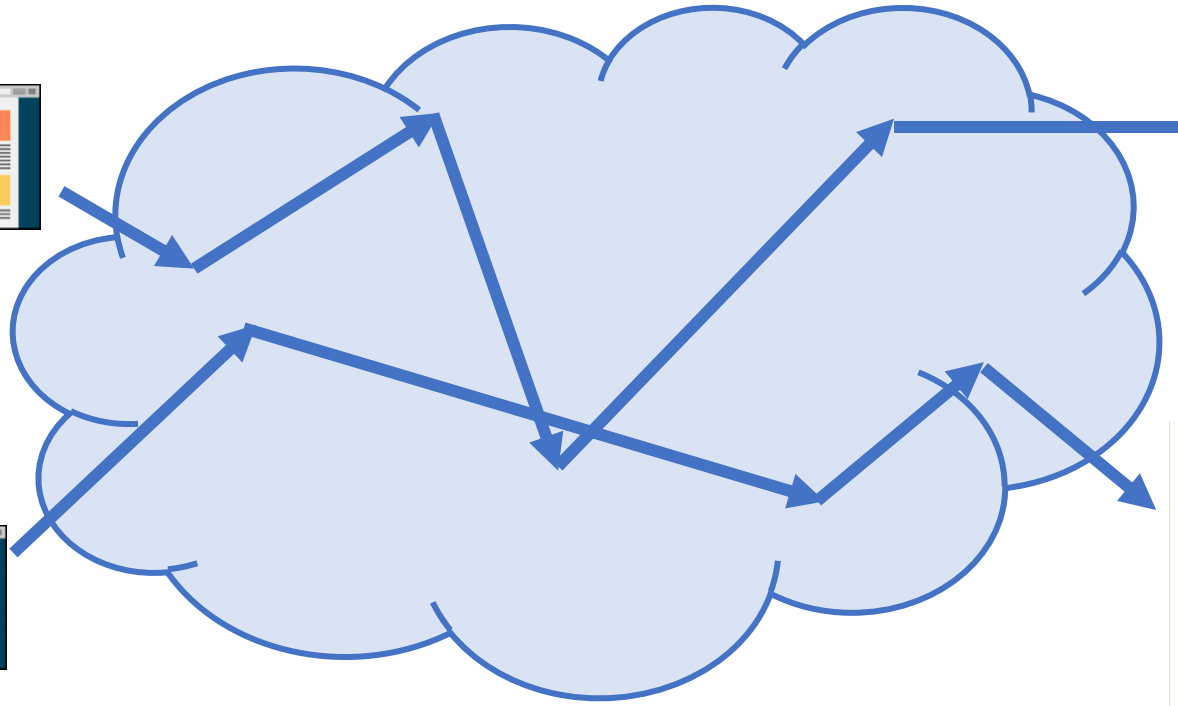

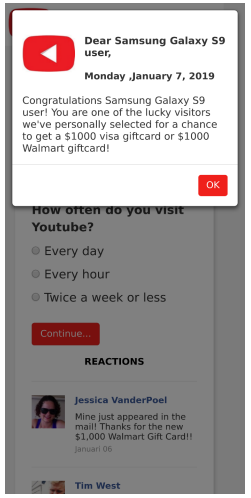


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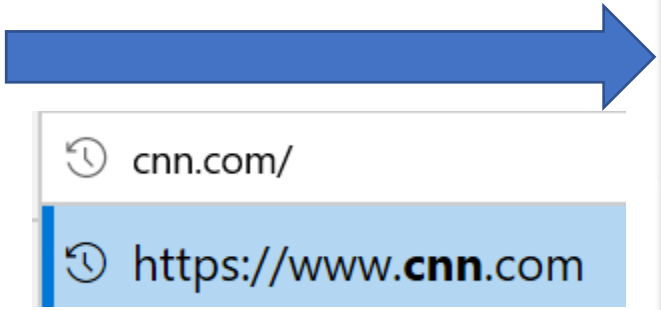
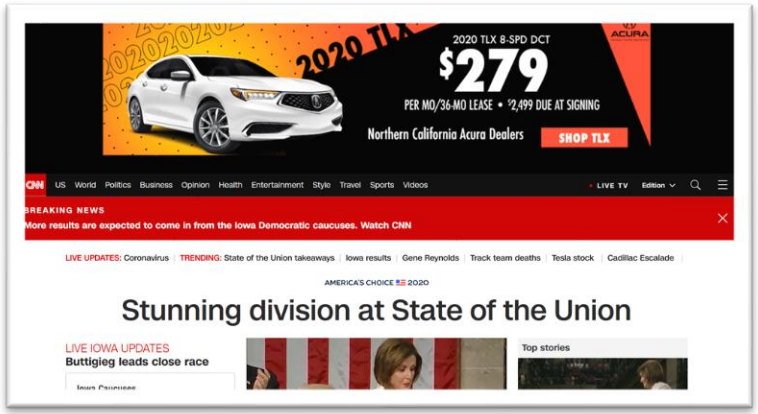
## Traffic Distribution Systems

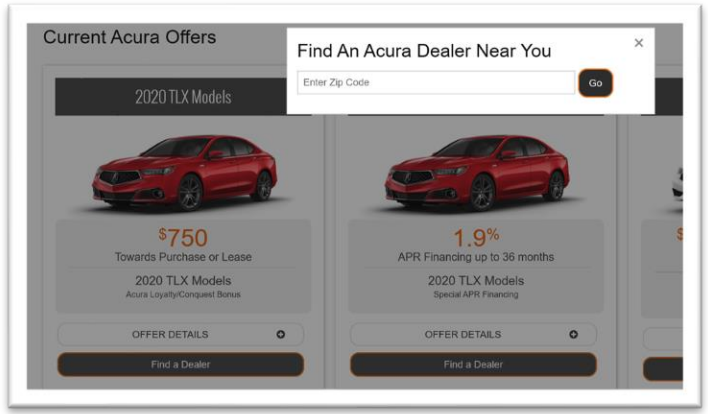
# Traffic Monetization

## Pay-Per-Click:

1. User types
2. User Clicks
3. User Redirected

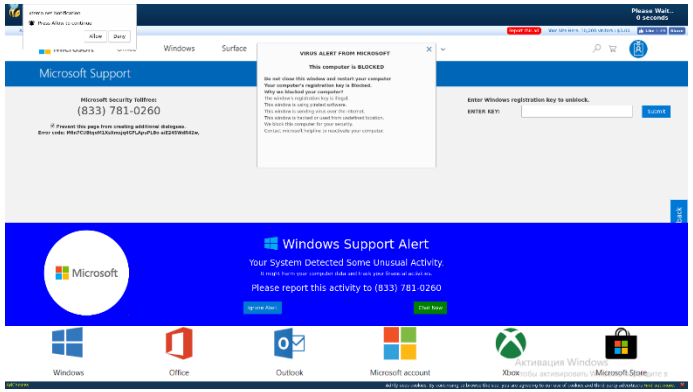



## Pay-Per-Redirect:

1. User types
2. User Automatically Redirected

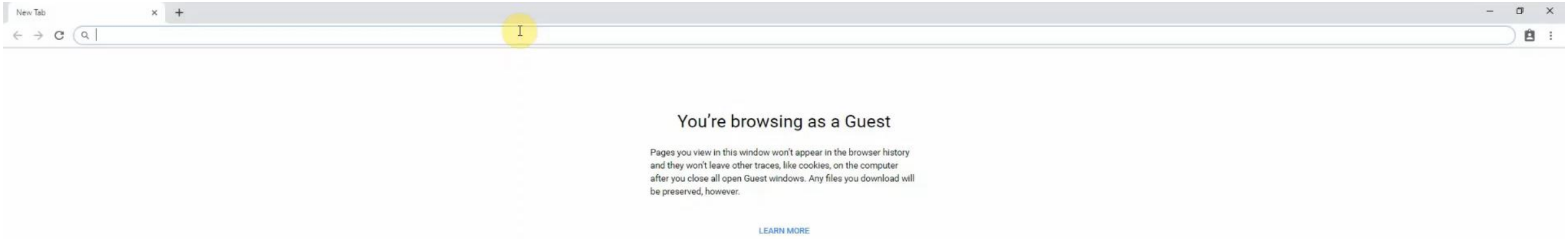




**Traffic Source**

**Traffic Brokers**

**Destination page**

# Typo: steampowerTed.com



# Three Questions

1. Cooperation between different illicit traffic sources

2. User Differentiation

3. Cloaking and blocking
   - Cloaking: hiding malicious content from security researchers

# Measurement in an Adversarial Setting

**Goal of Adversary:** send users to malicious landing pages while hiding from security researchers to maximize profit

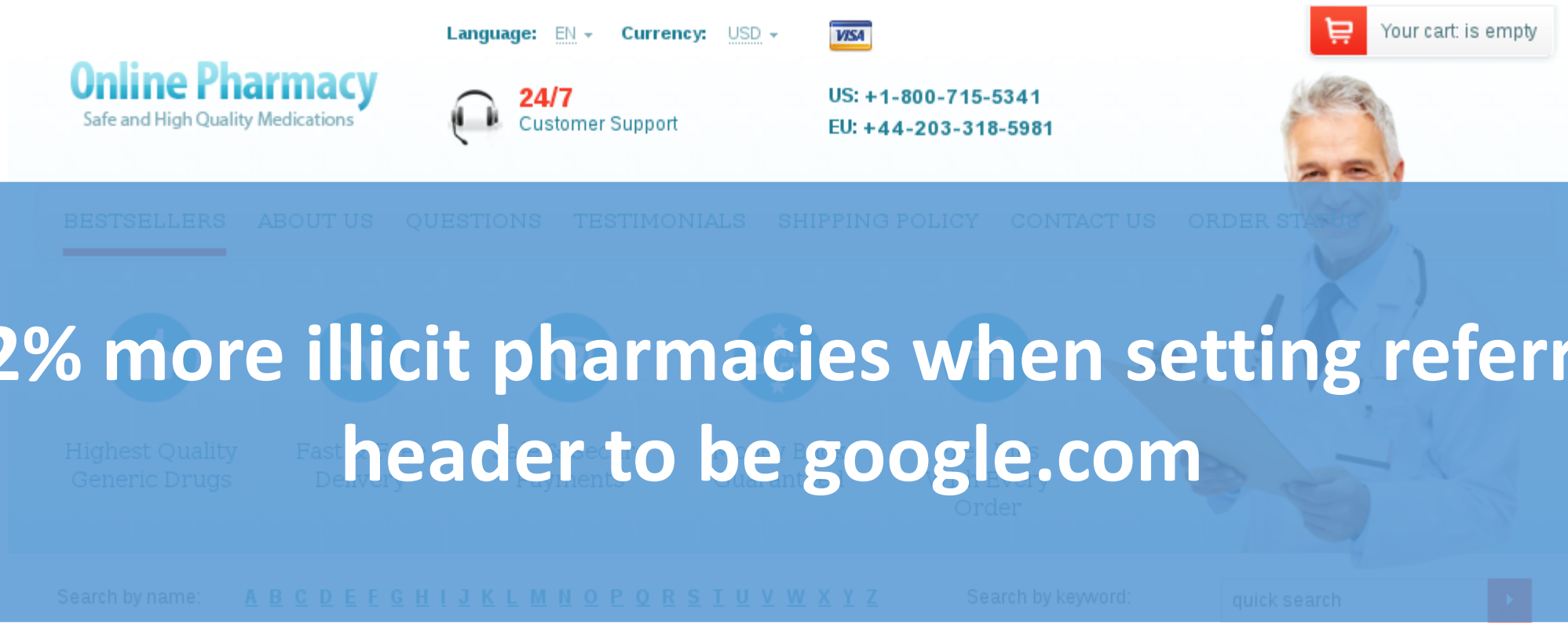
**Example methods:**

- **IP Reputation:** cloak when visit is from a datacenter IP
- **IP Rate limiting:** cloak if too many requests from same IP
- **Header based:** show malicious content only to users coming from a Google search
- **Basic bot detection:** do not show malicious content if bot is detected
  - E.g., can handle cookies and JavaScript

# Cloaking: Blackhat SEO

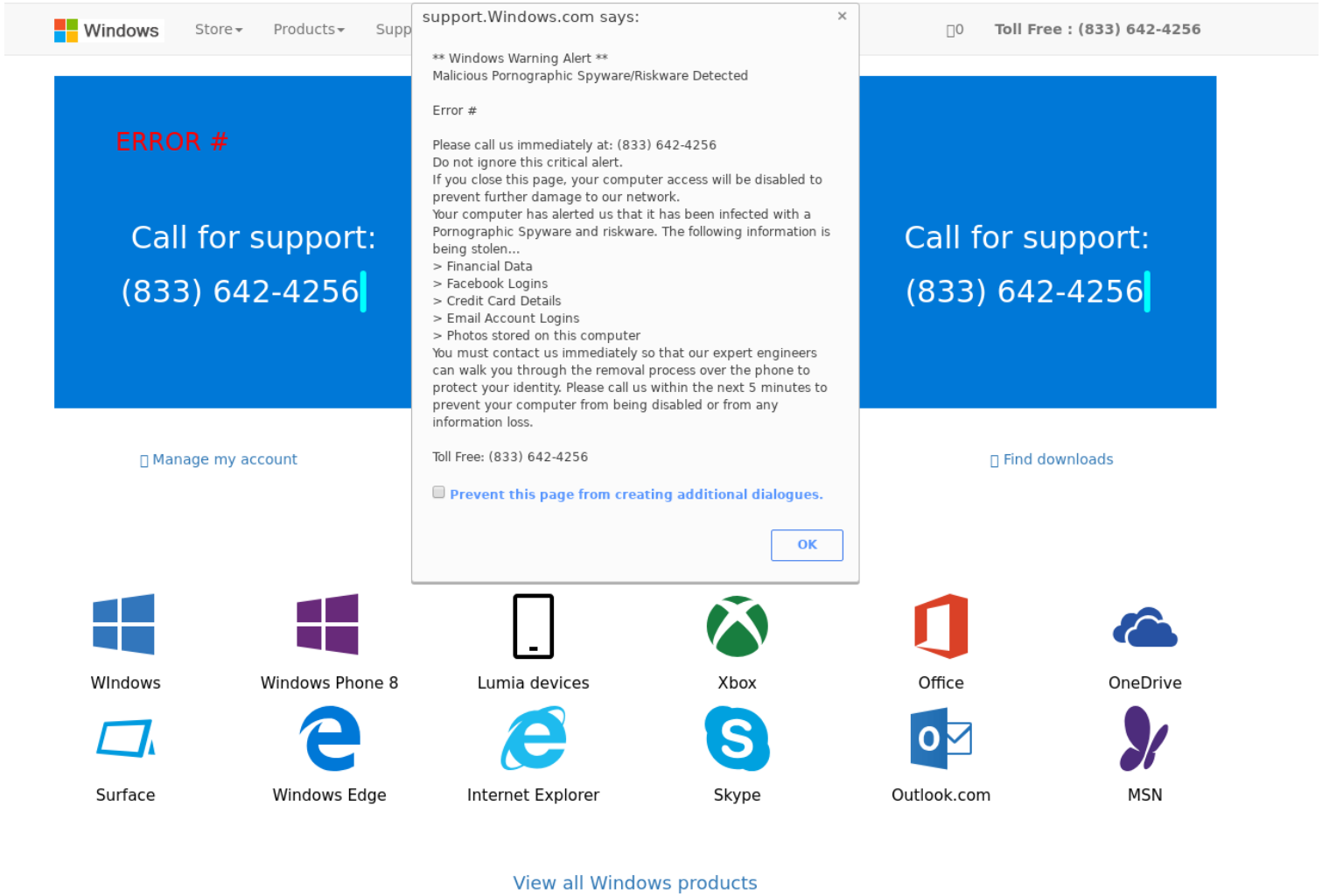
# Cloaking: Blackhat Search Engine Optimization

# Cloaking: Blackhat SEO

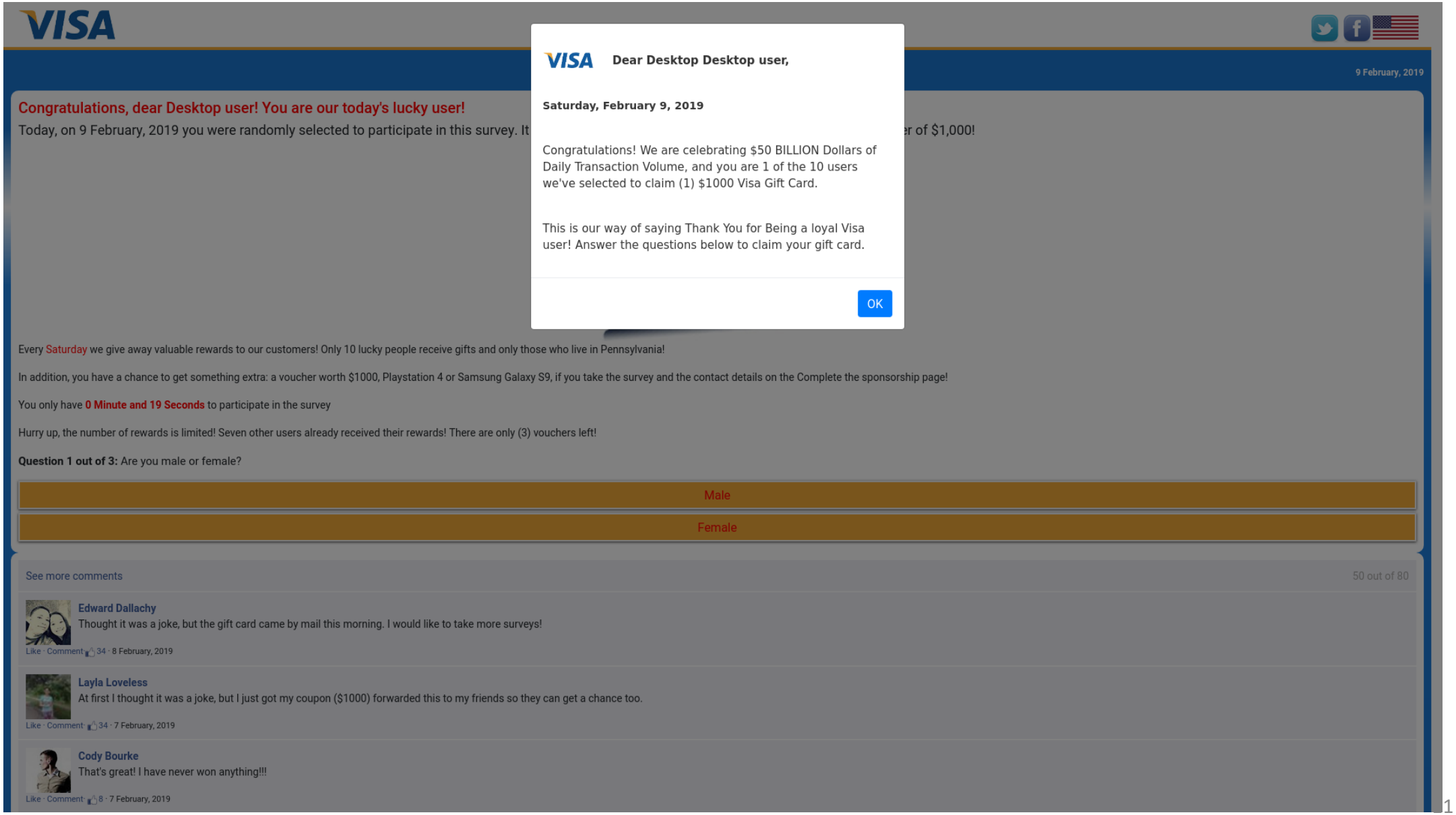



**252% more illicit pharmacies when setting referrer header to be google.com**

# Cloaking: IP Based



# Cloaking: IP Based



# Cloaking: IP Based

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**0 - 2** bed **1 - 2** bath **300+** sqft
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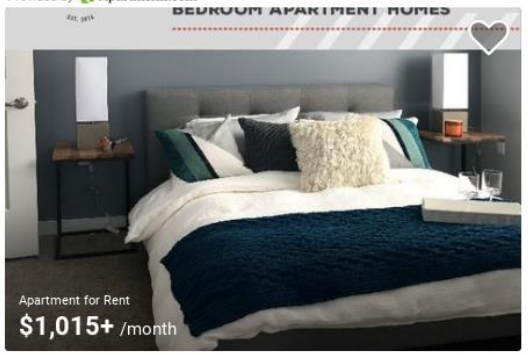

Apartment for Rent
**$1,015+** /month

**0 - 3** bed **1 - 2** bath **345+** sqft
Arsenal 201 3922 Foster St, Pittsburgh, PA 15201

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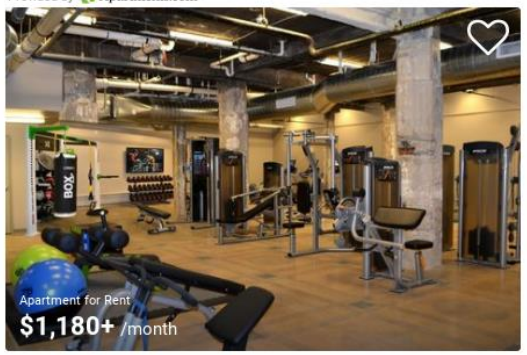

Apartment for Rent
**$1,180+** /month

**1 - 2** bed **1 - 2** bath **308+** sqft
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Apartment for Rent
**$885+** /month

**0 - 2** bed **1 - 2** bath **415+** sqft
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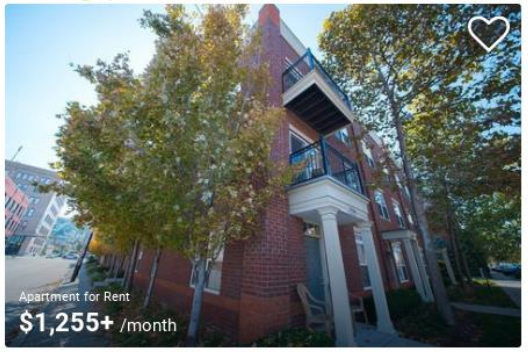

Apartment for Rent
**$1,255+** /month

**1 - 2** bed **1 - 2** bath **575+** sqft
Carson Street Commons 2525-2539 E Carson St, Pittsburgh, PA 1...

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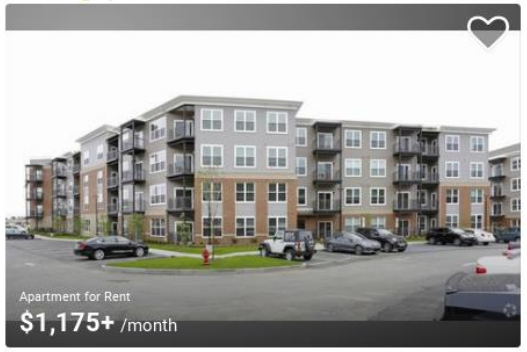

Apartment for Rent
**$1,175+** /month

**1 - 3** bed **1 - 2** bath **616+** sqft
The Ashby at South Hills Village Station 1100 Village Dr, Pittsburg...

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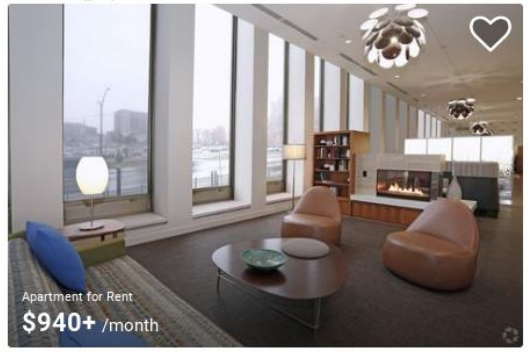

Apartment for Rent
**$940+** /month

**0 - 2** bed **1 - 2** bath **460+** sqft
City View 1420 Centre Ave, Pittsburgh, PA 15219

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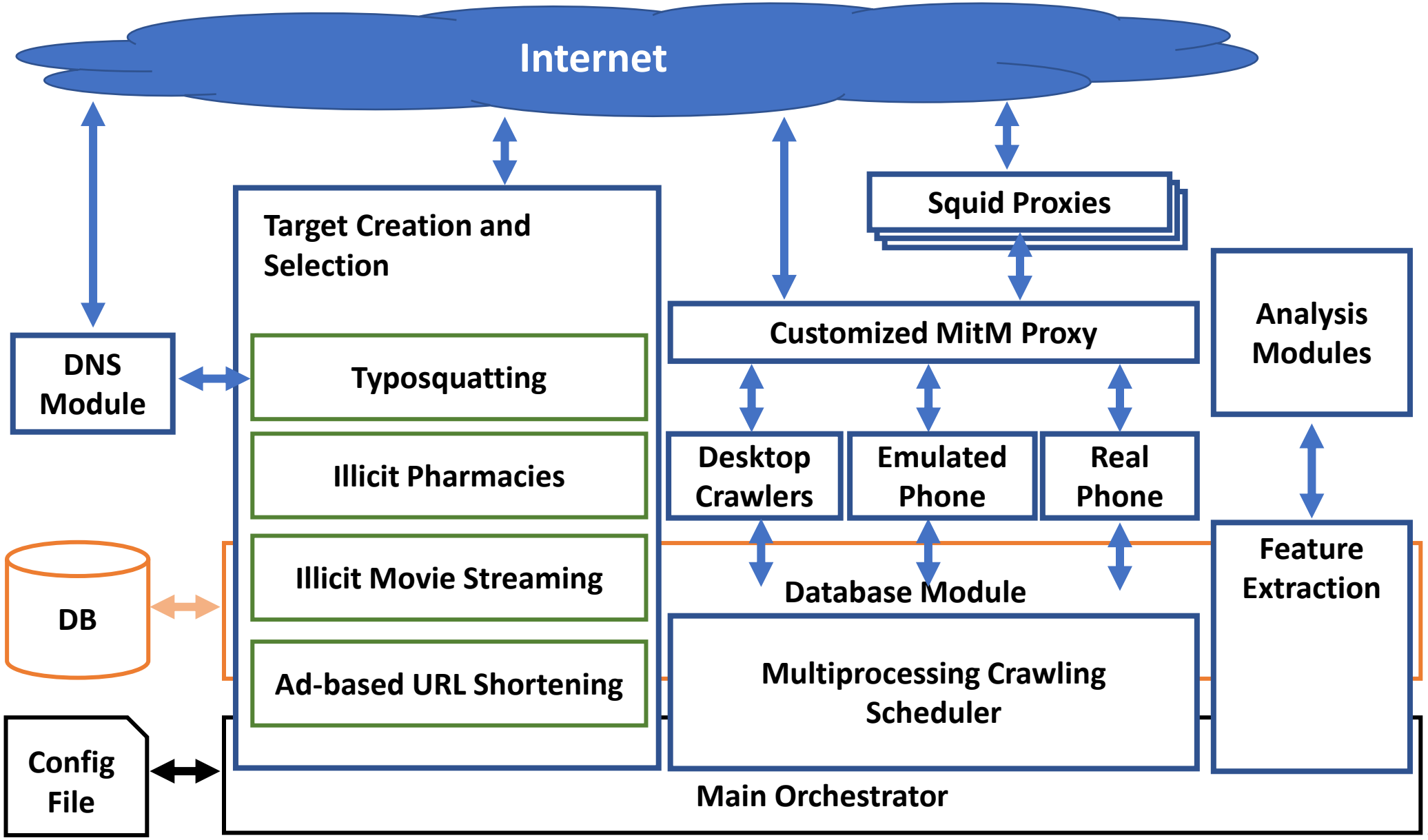
# Observatory and Detector of Illicit ad Networks



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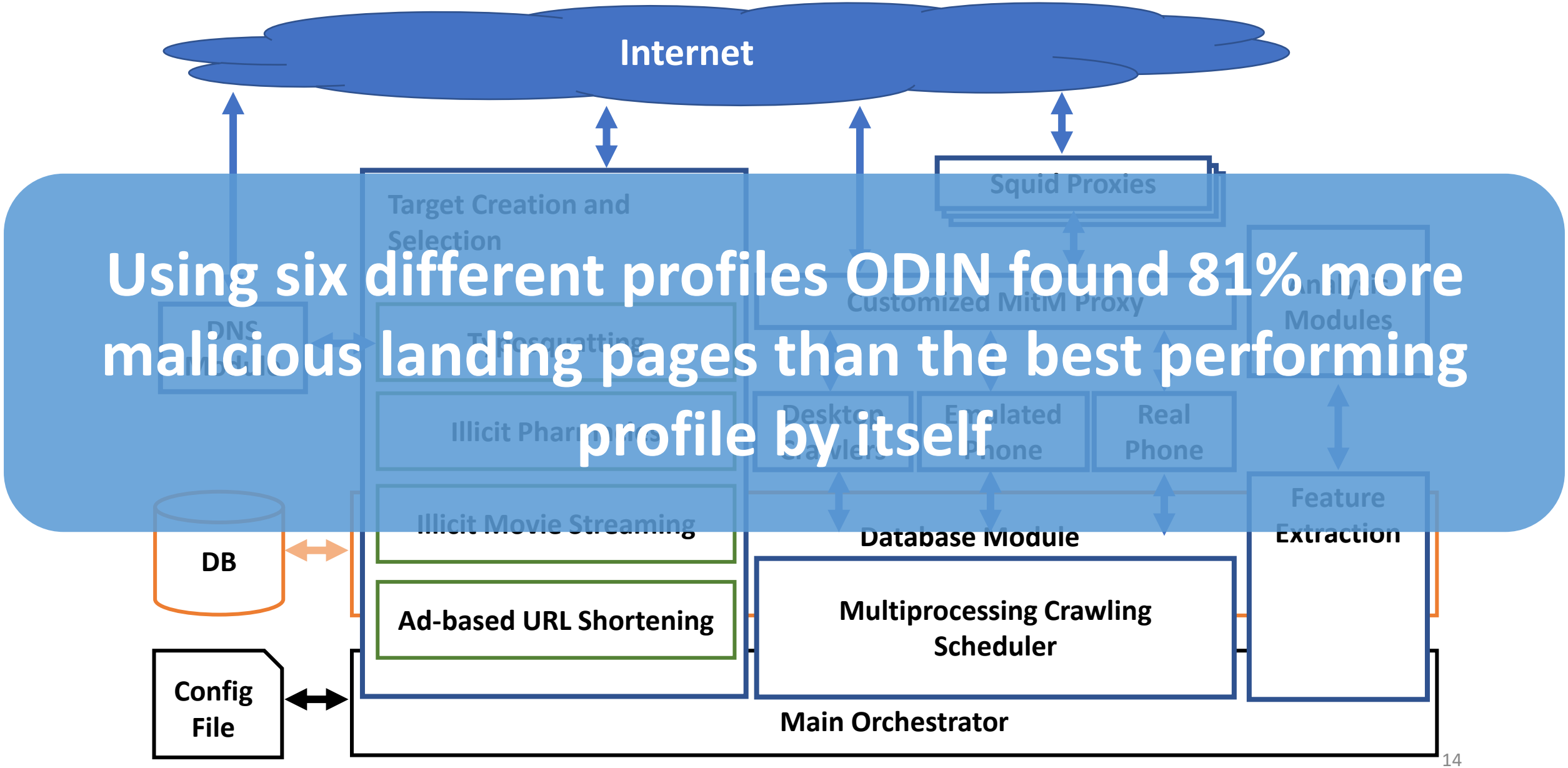
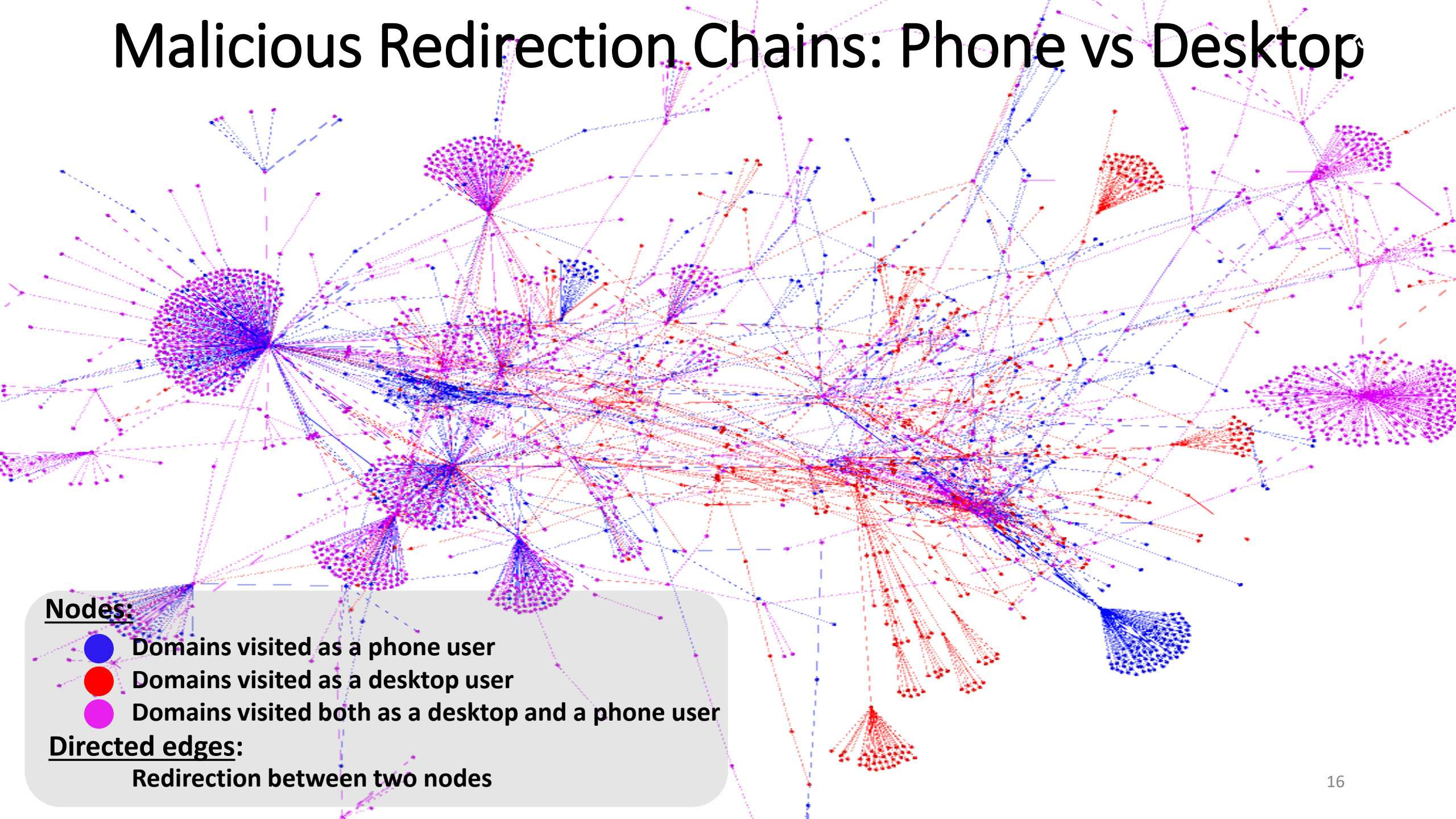



**Using six different profiles ODIN found 81% more malicious landing pages than the best performing profile by itself**

# IP Cloaking experiment

| Label | One IP | 240 IPs | Difference |
|---|---|---|---|
| **Error** | 62,947 | 56,794 | -9.8 |
| **Benign** | 144,756 | 148,428 | +2.5 |
| **Illicit** | 9,937 | 10,835 | +9.0 |
| **Suspicious** | 1,373 | 1,672 | +21.8 |
| **Malicious** | 1,287 | 2,690 | +109.0 |

# Malicious Redirection Chains: Phone vs Desktop



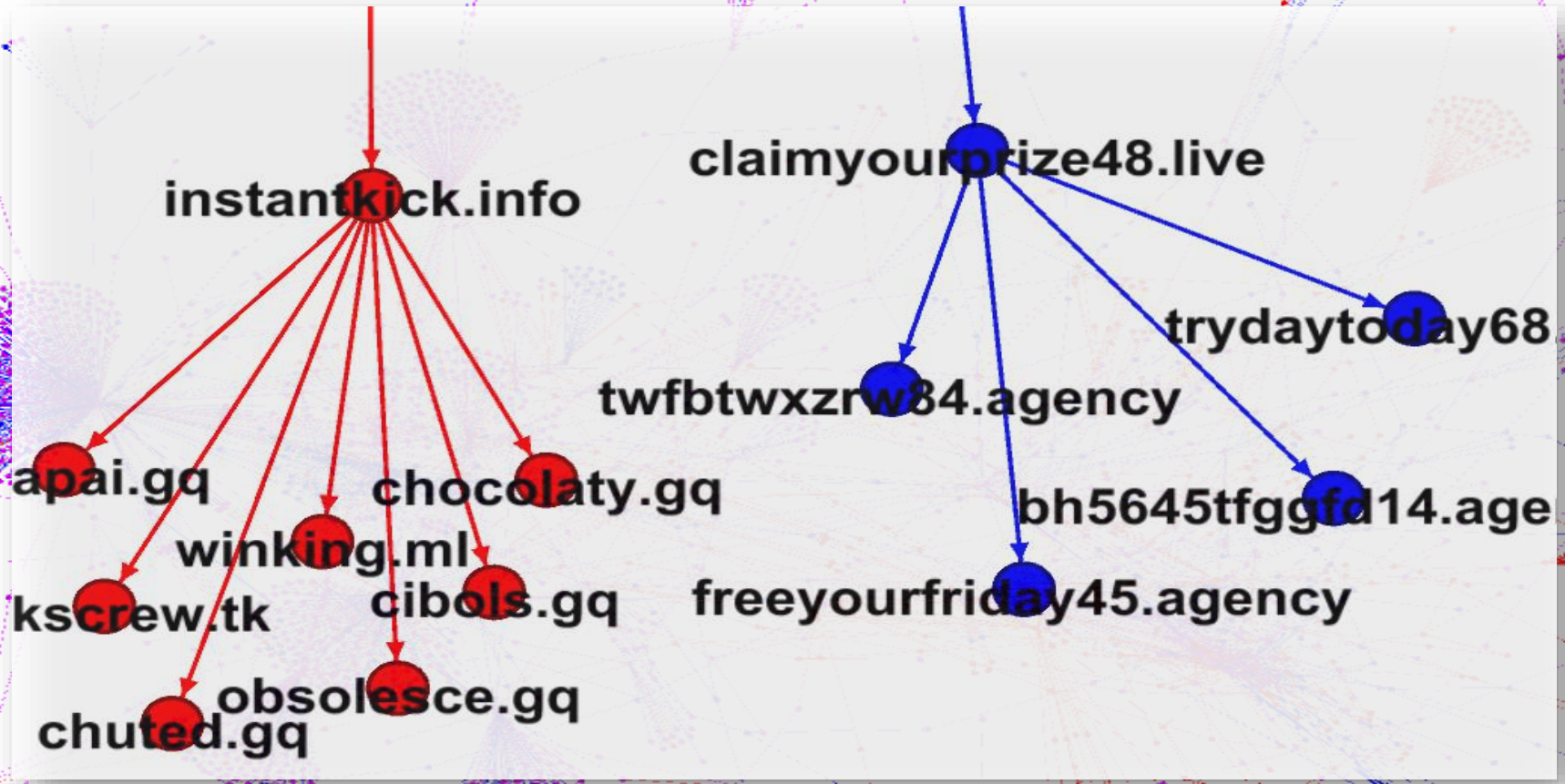
**Nodes:**

- Domains visited as a phone user
- Domains visited as a desktop user
- Domains visited both as a desktop and a phone user

**Directed edges:**

Redirection between two nodes

# Malicious Redirection Chains: Phone vs Desktop




**Nodes:**

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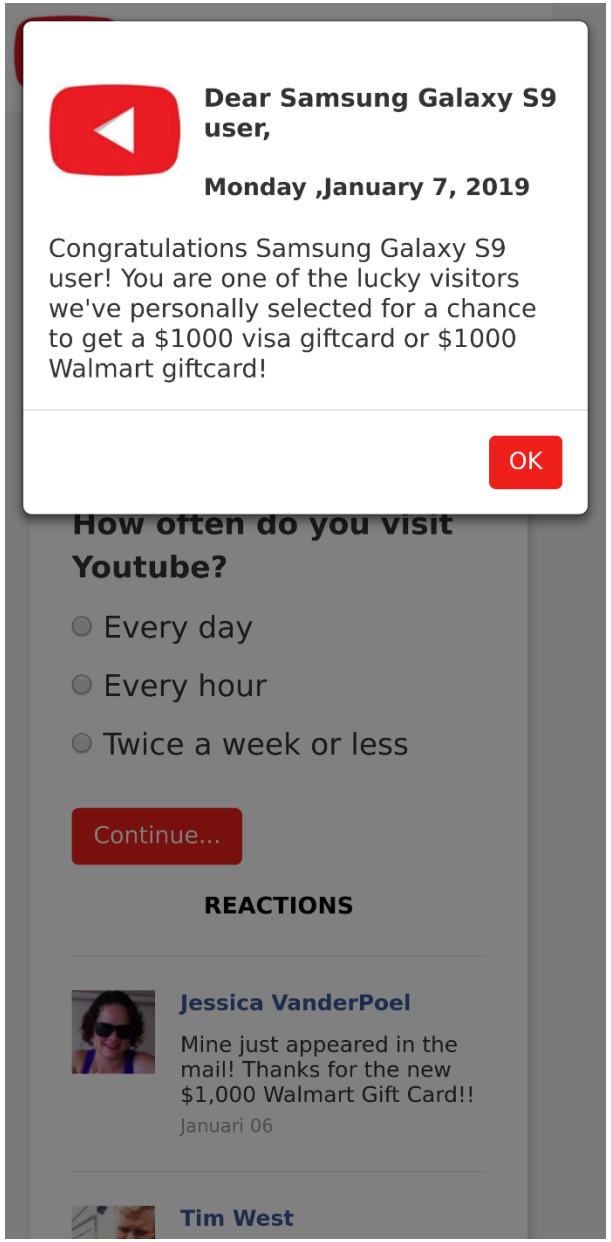
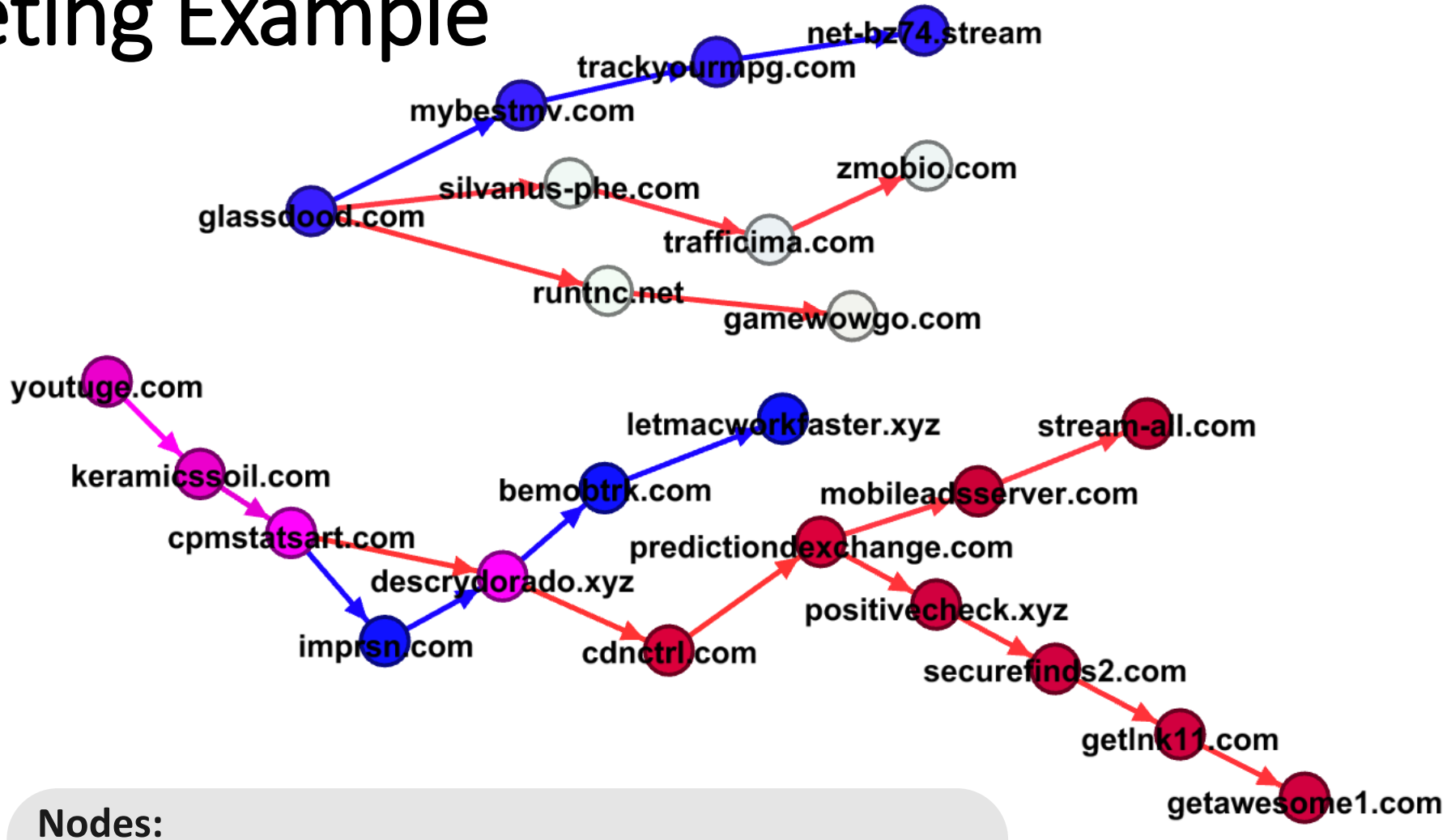
**Directed edges:**

Redirection between two nodes

# User Targeting Example




**Nodes:**

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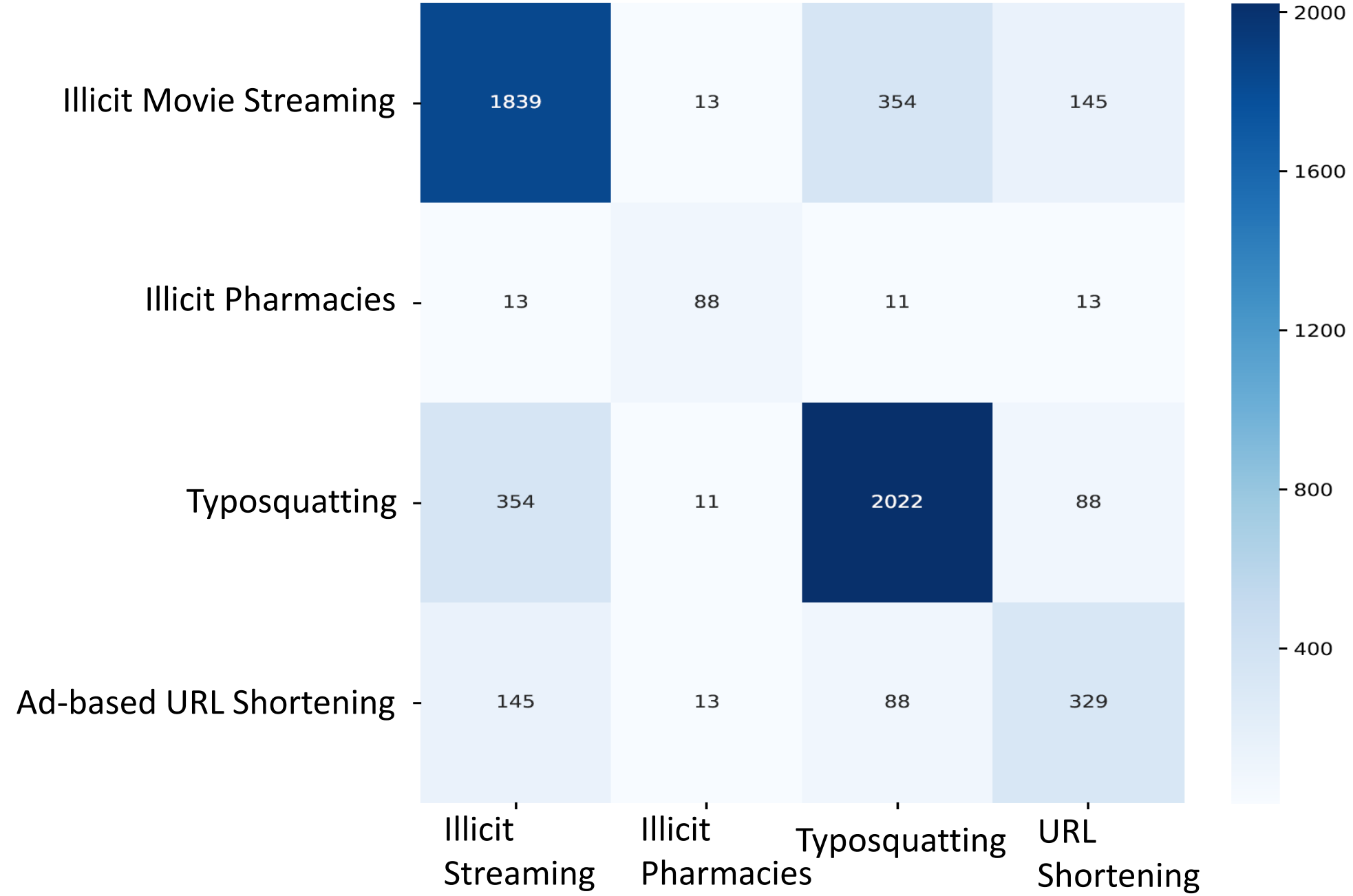
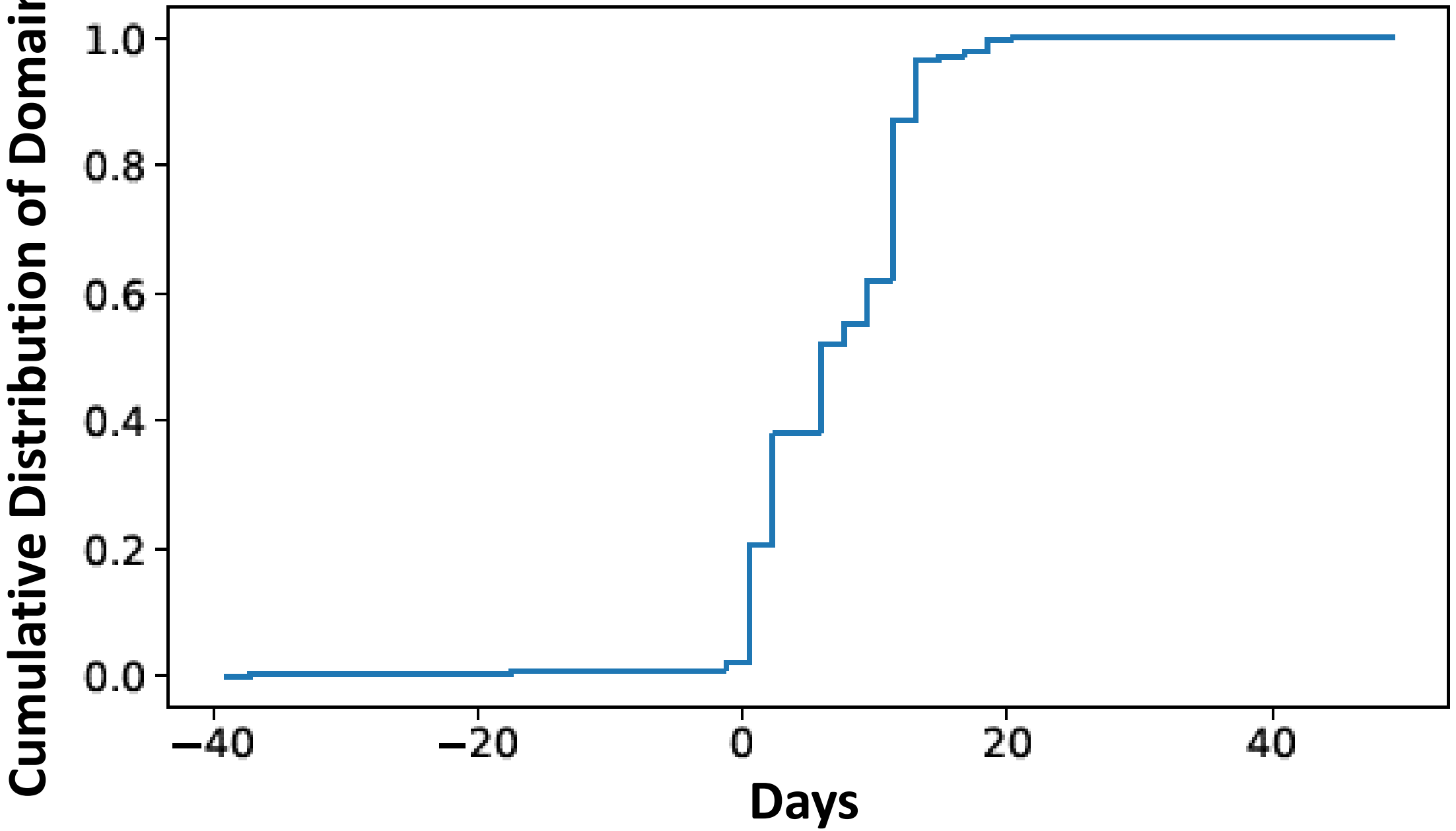
**Directed edges:**

Redirection between two nodes

# Shared Traffic Broker Domains



# Google Safe Browsing Performance



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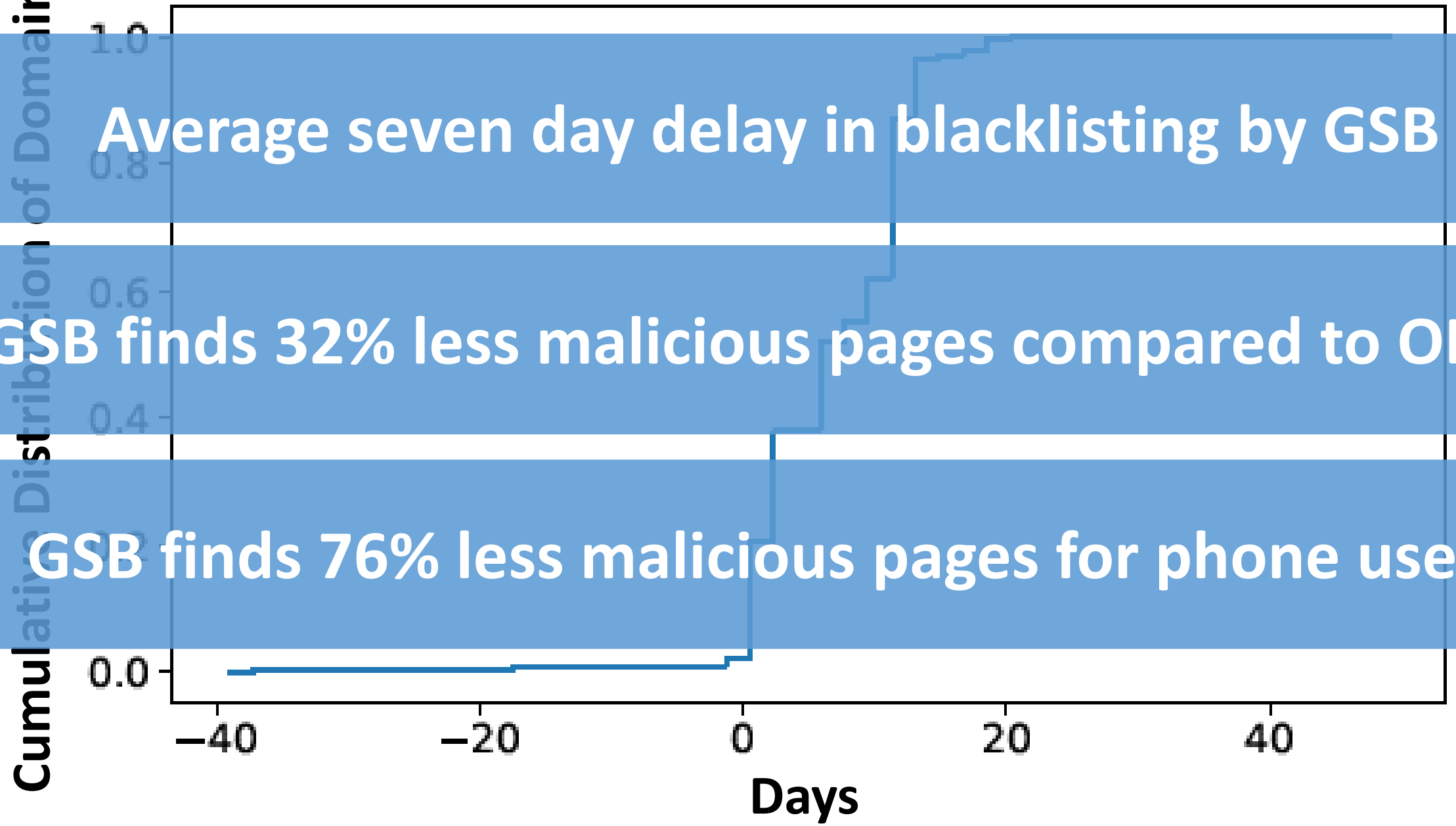
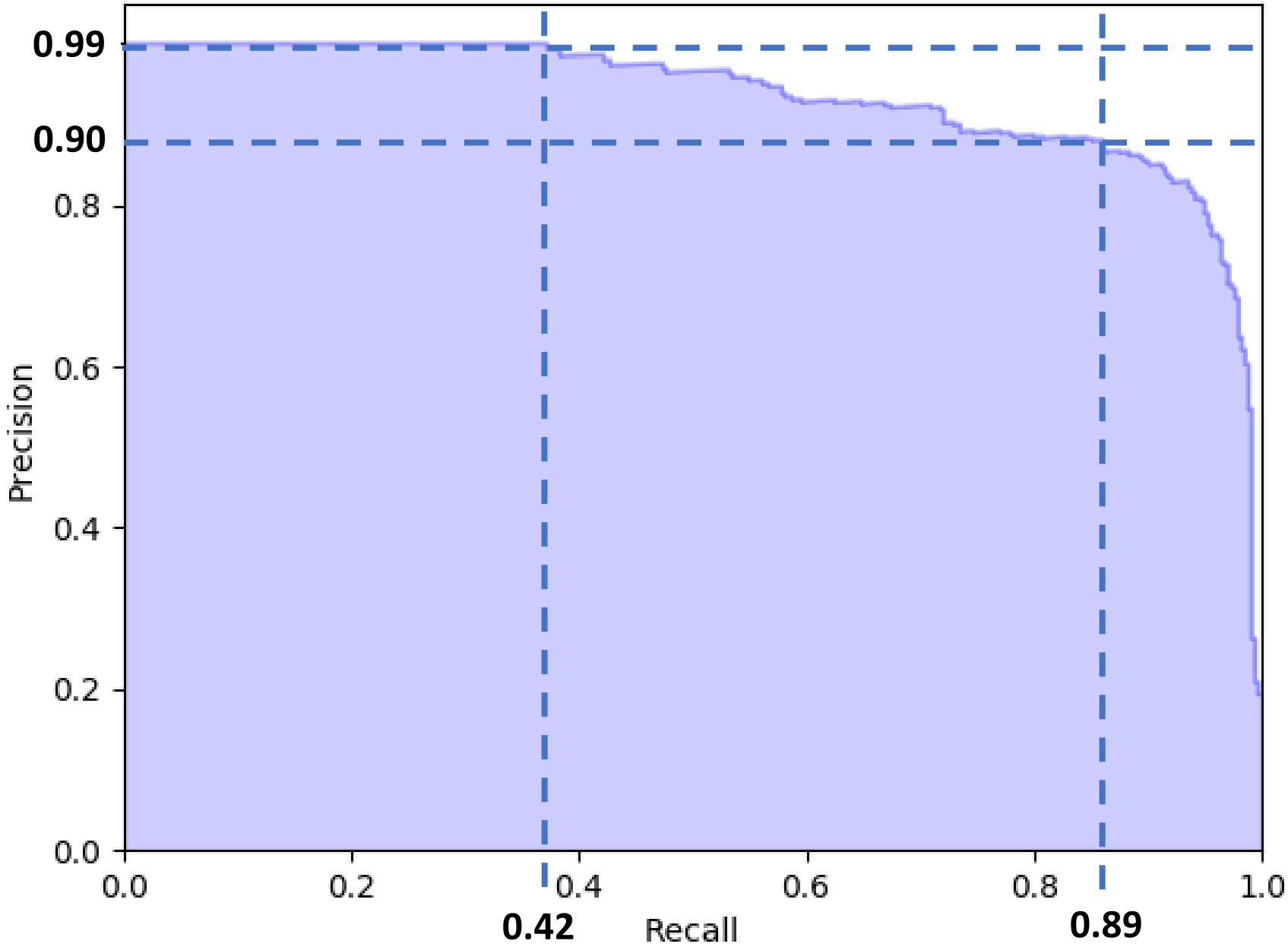



**Average seven day delay in blacklisting by GSB**

**GSB finds 32% less malicious pages compared to ODIN**

**GSB finds 76% less malicious pages for phone users**

# Predicting Malicious Redirection Chains



# Takeaways

1. Different illicit traffic sources often use the same TDSs for profit
2. Cloaking and blocking are widely adopted
3. Phone and desktop users are treated differently
4. Popular blacklists lack coverage for phone users
5. We can protect users by predicting malicious redirection chains

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