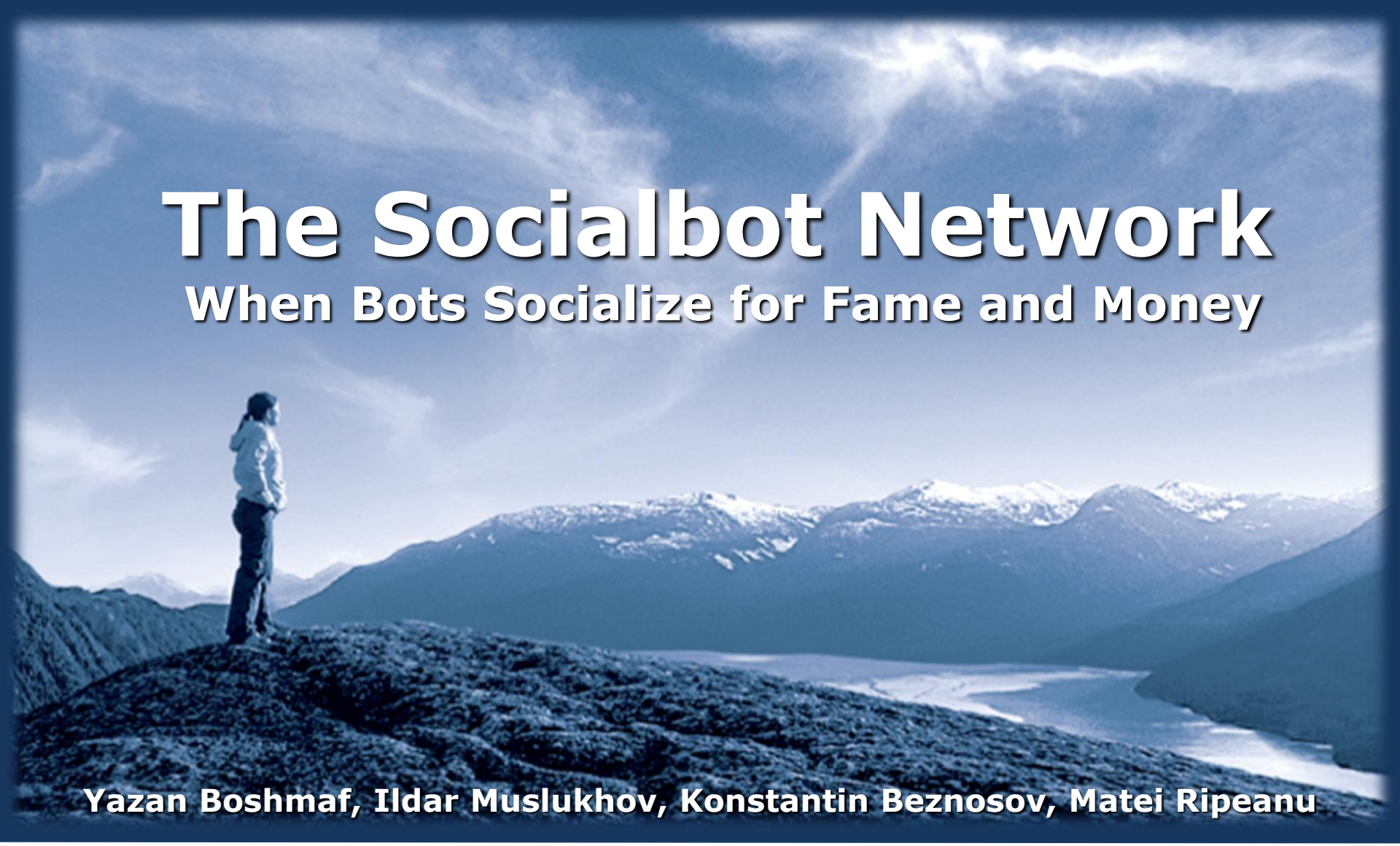
The Socialbot Network

When Bots Socialize for Fame and Money



Yazan Boshmaf, Ildar Muslukhov, Konstantin Beznosov, Matei Ripeanu

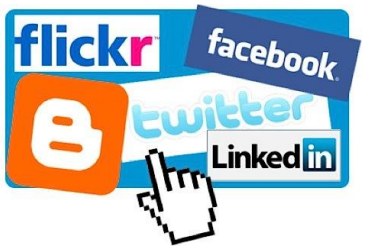
a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

Laboratory for Education and Research in Secure Systems Engineering (LERSSE)

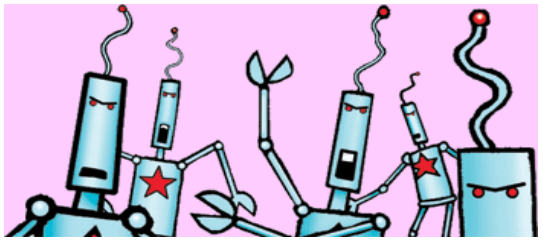
Networked Systems Laboratory (NetSysLab)

Department of Electrical & Computer Engineering

Outline



Problem
Motivation



Socialbot Network

Evaluation

Implications

Problem Motivation

Reaching Out Millions

Obama Raised Half a Billion Online

Jose Vargas, Voices on The Washington Post, November, 2008

Mobilizing The Masses

The Arab Spring, January 2011 - Now

Photo credit: Peter Macdiarmid, Getty Images

Photo credit: Steve Crisp, Reuters

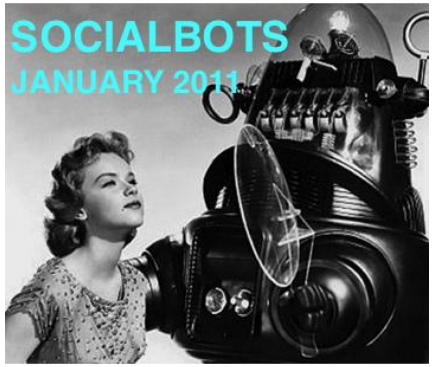
Rise of the Socialbots

Automation software

+

Social media account

} Socialbot



The Web Ecology Project

Zack Coburn and Greg Marra, Olin College

Misusing Socialbots on a Large Scale?

A scalable infrastructure for:

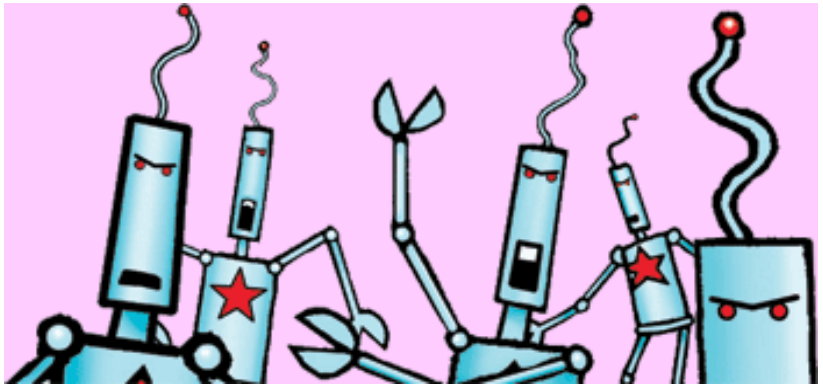
Infiltration

Misinformation

Data collection

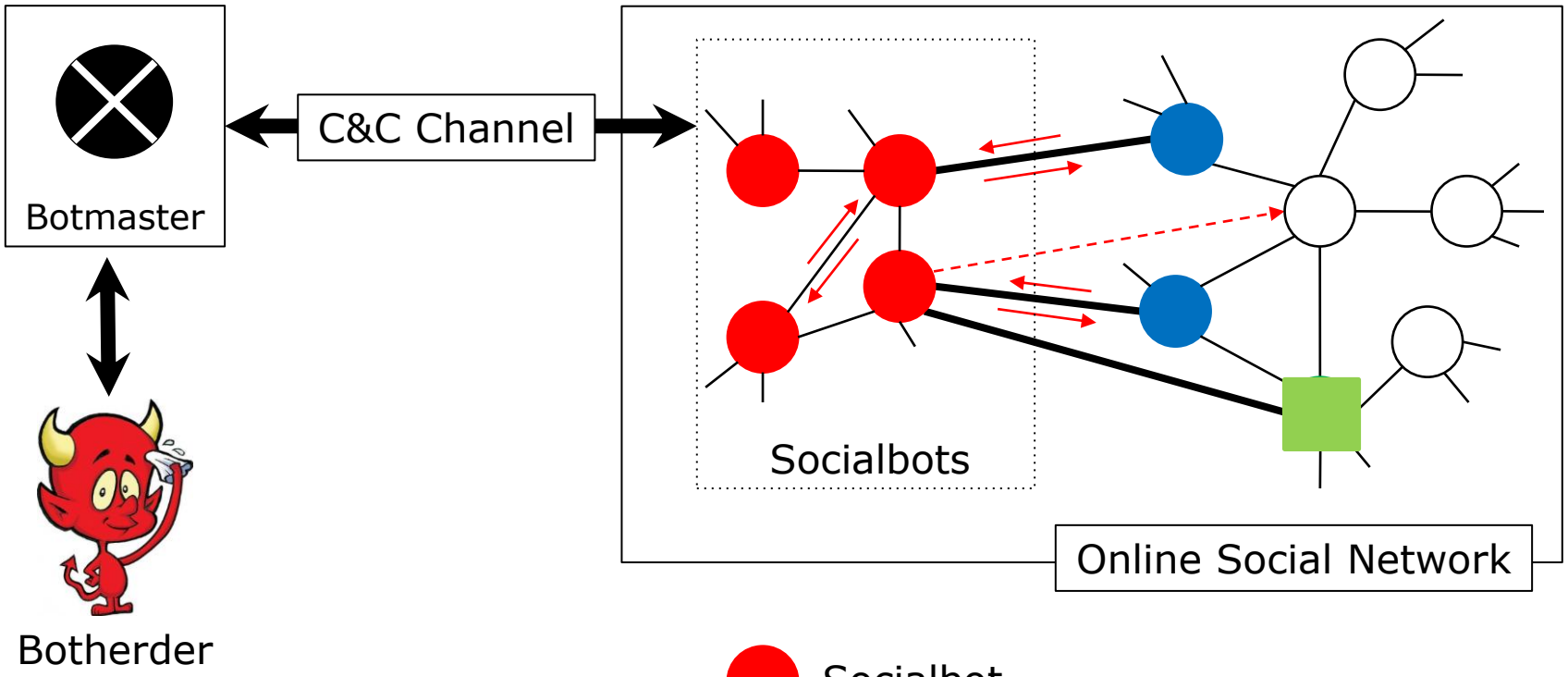
Contributions

- Demonstrated the feasibility of large-scale infiltration by a group of orchestrated socialbots
- Characterized users' behavior in response to such infiltration
- Investigated the corresponding privacy and security implications



Socialbot Network

Concept

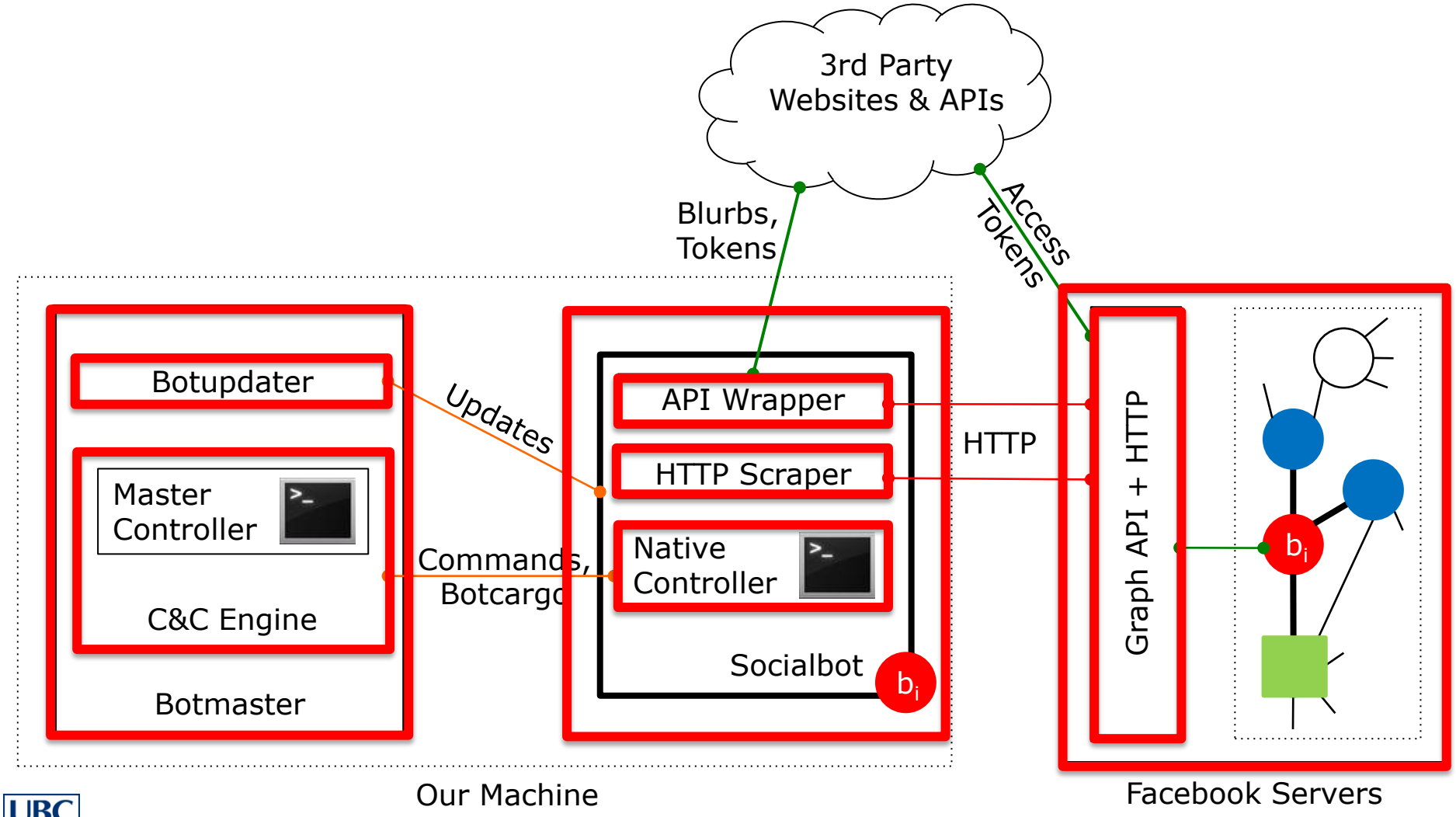

Botmaster
C&C Channel
Botherder
Socialbots
Online Social Network
Socialbot
Infiltrated user (randomly picked)
Infiltrated user (with mutual friends)

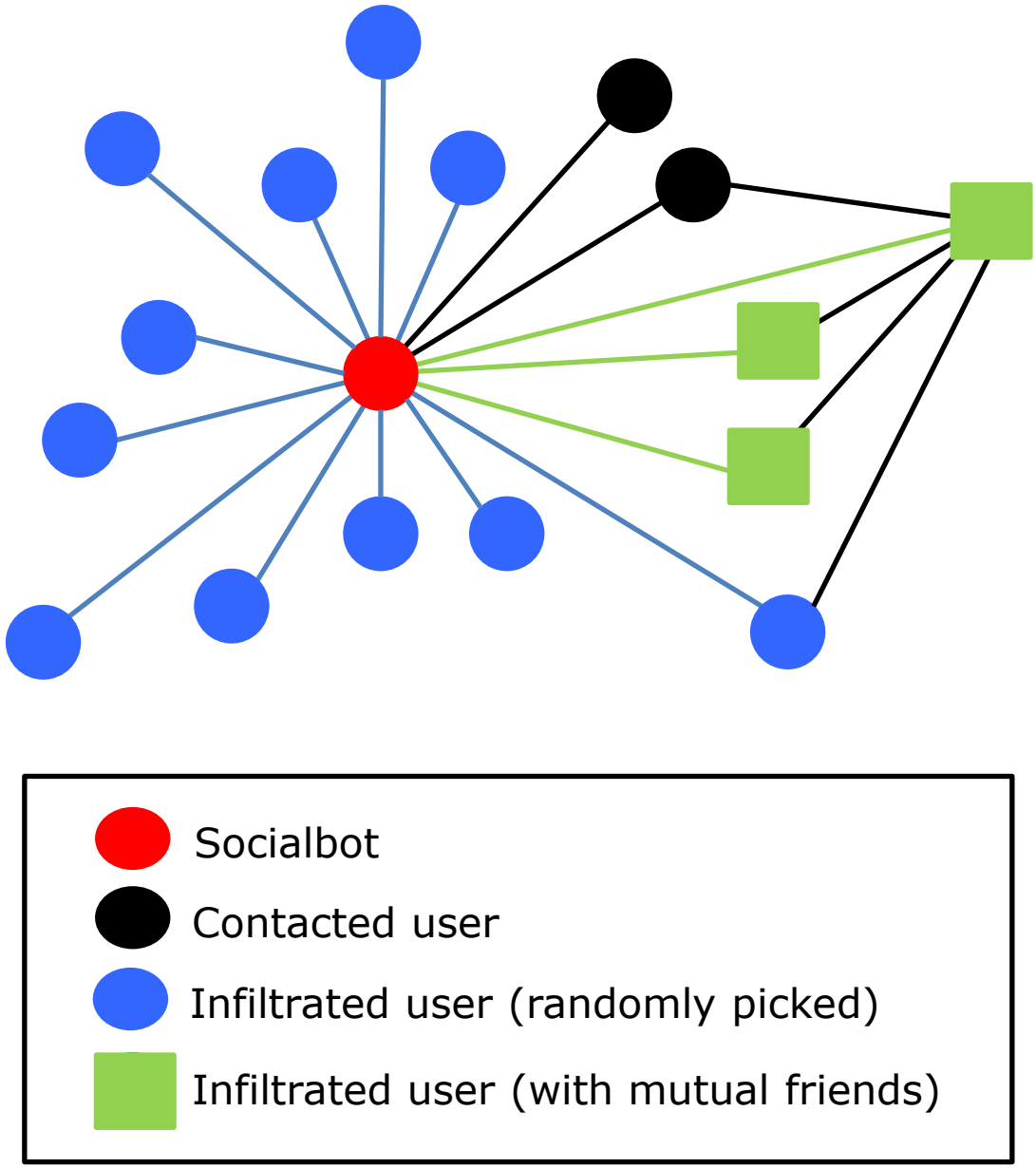
Evaluation

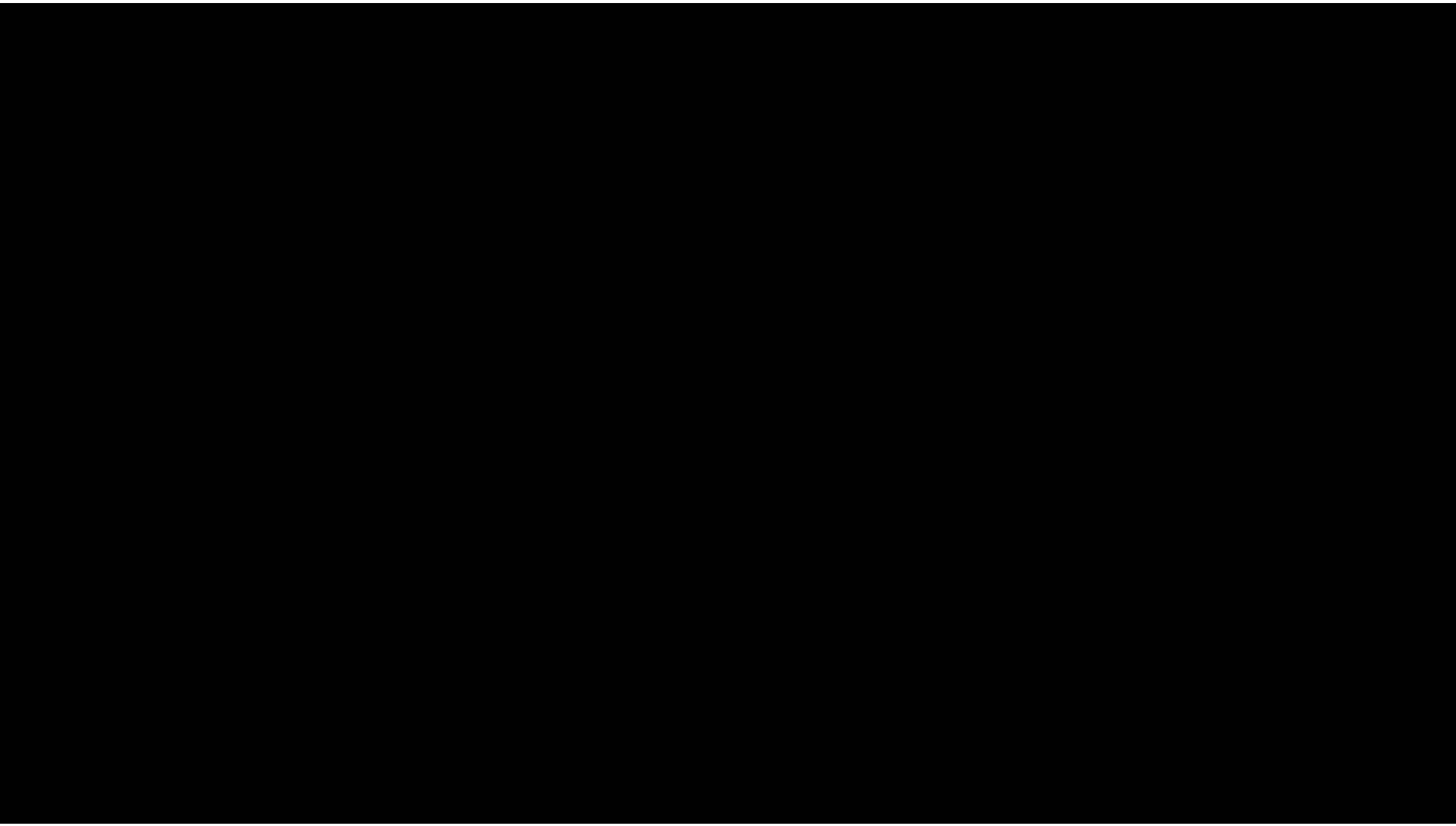
Methodology

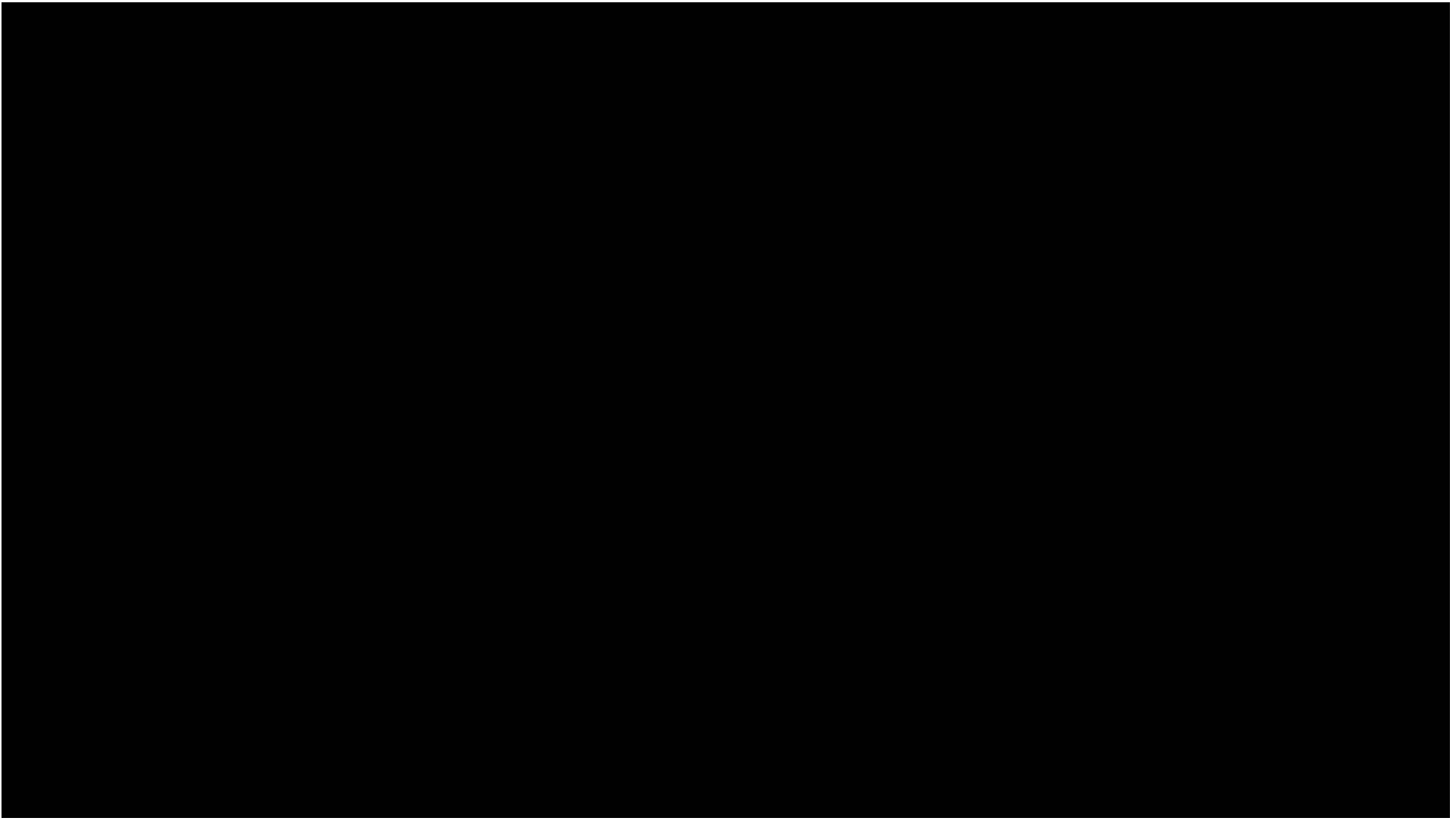
- Prototype on Facebook
- 102 socialbots, single botmaster
- Operated for 8 weeks
- Single machine
  - Different IPs
  - HTTP proxy emulating different browsers and OSs
- Approved by UBC ethics board

Prototype Architecture

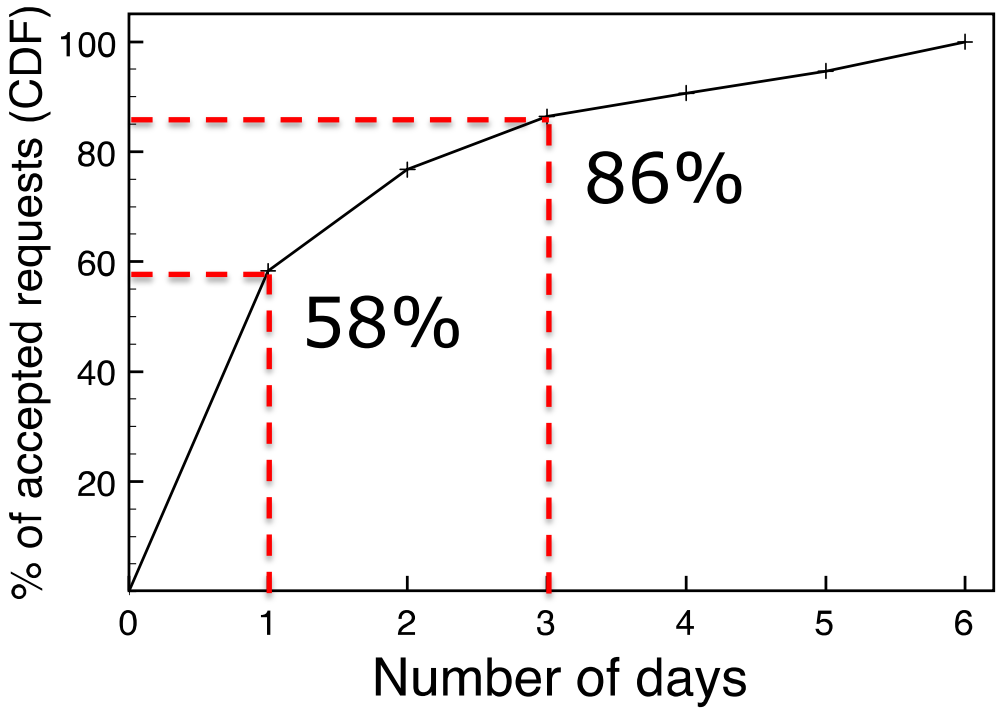



Socialbot
Contacted user
Infiltrated user (randomly picked)
Infiltrated user (with mutual friends)

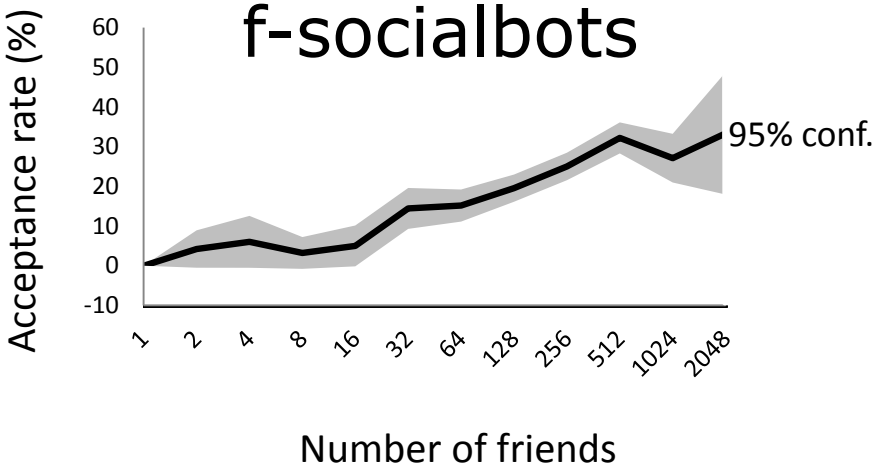


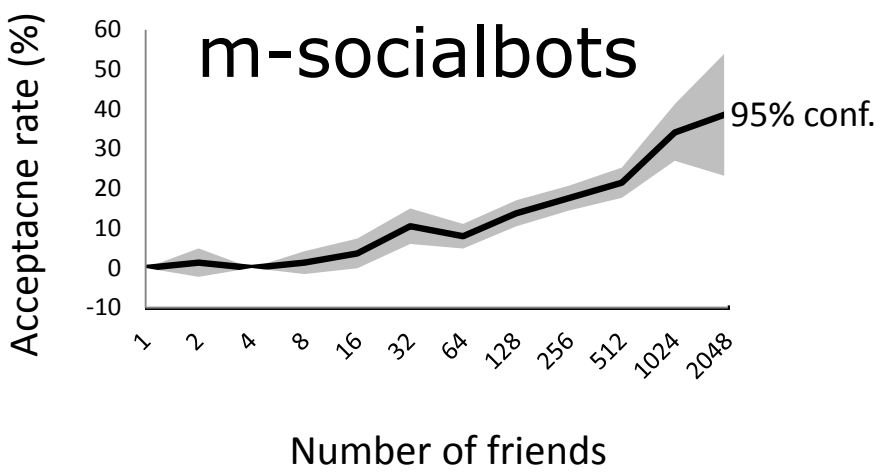


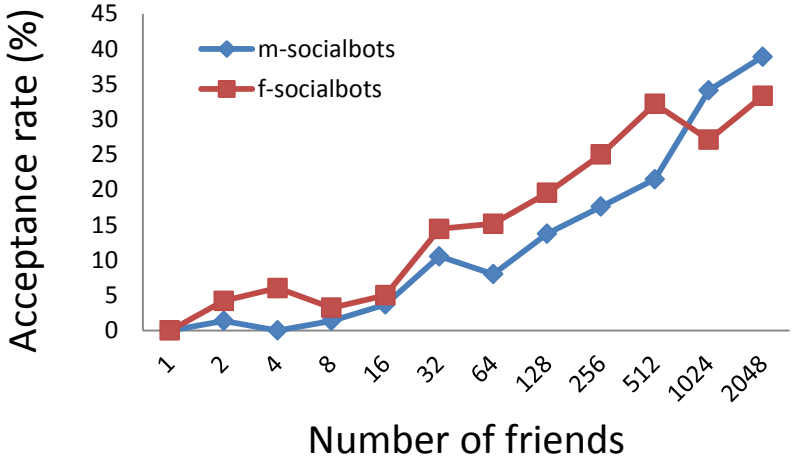
Most Users Decide Within Three Days

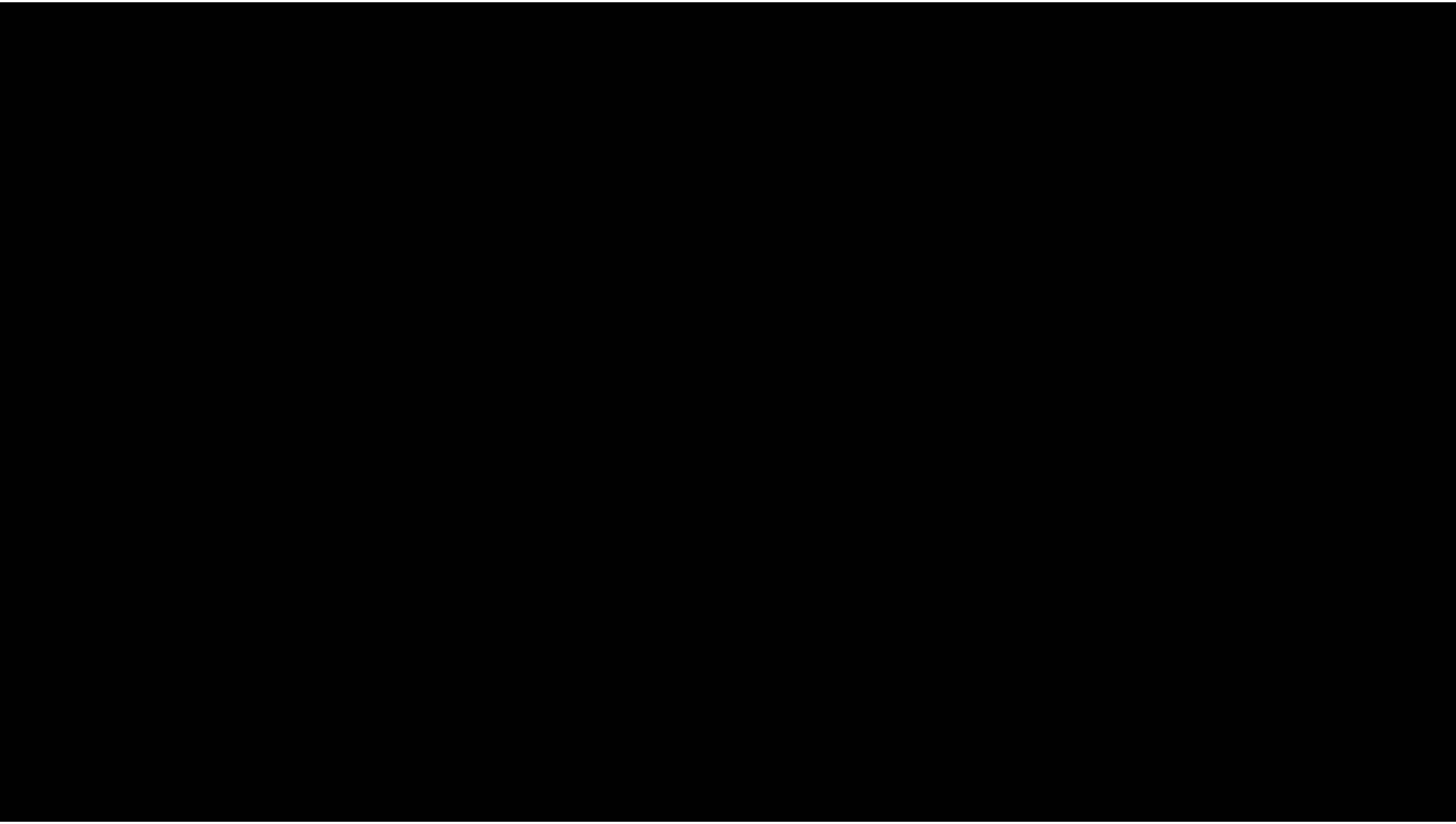


Too Many Friends: Too Many Bots?

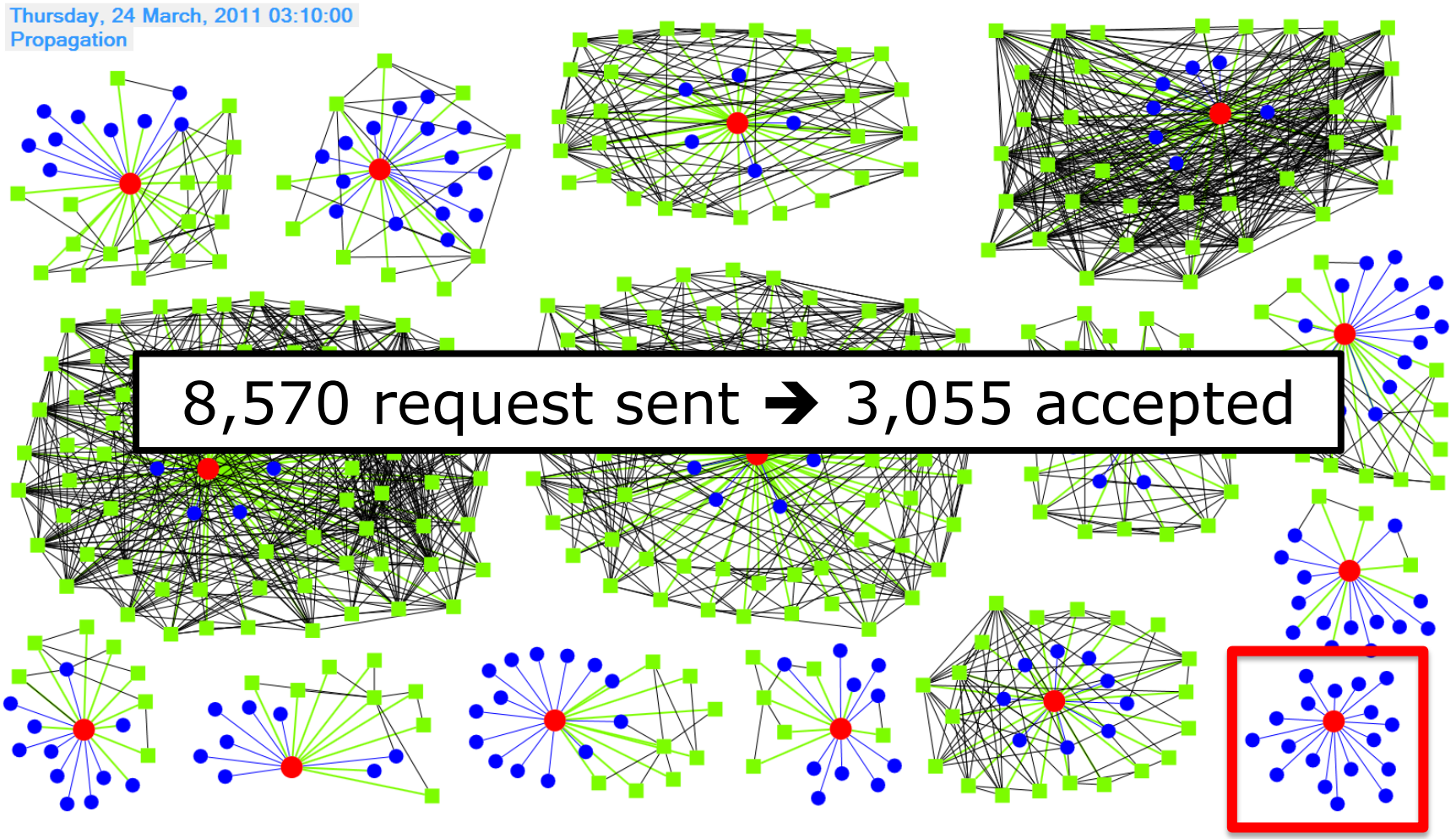




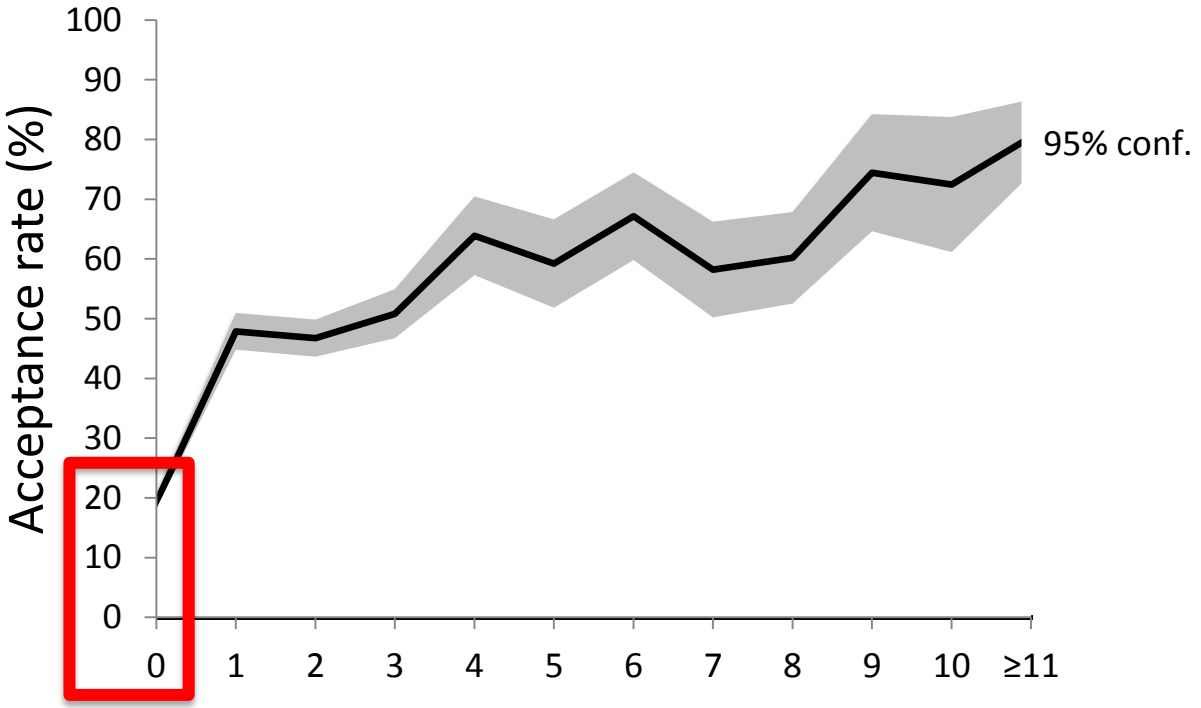




The End Result (15 Socialbots)

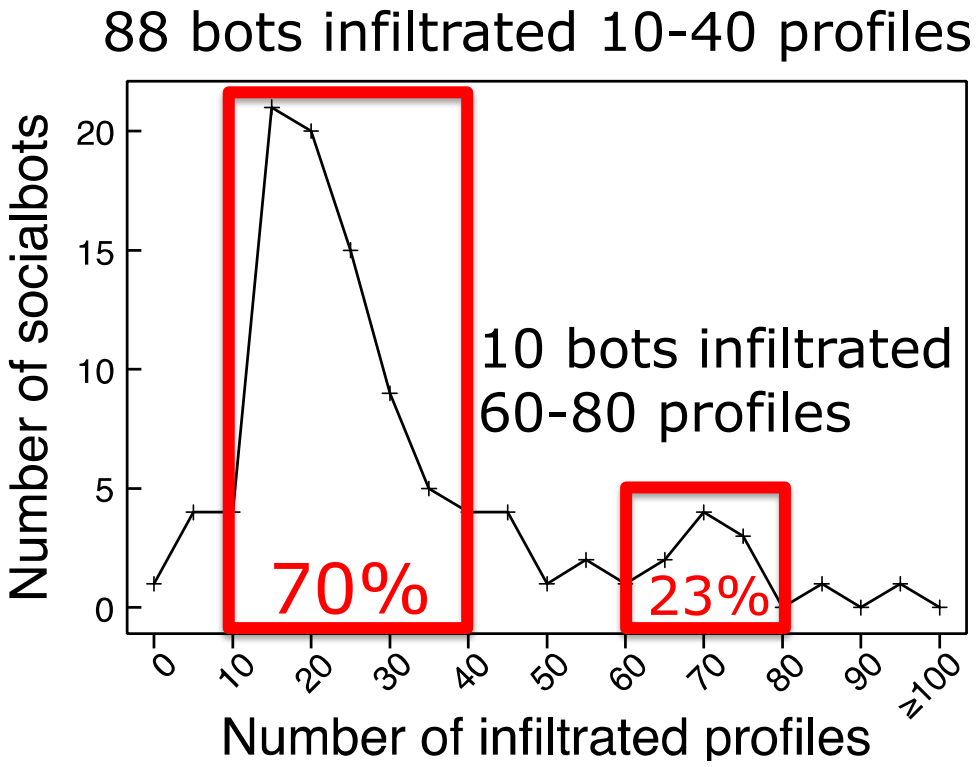


Mutual Friends Matter



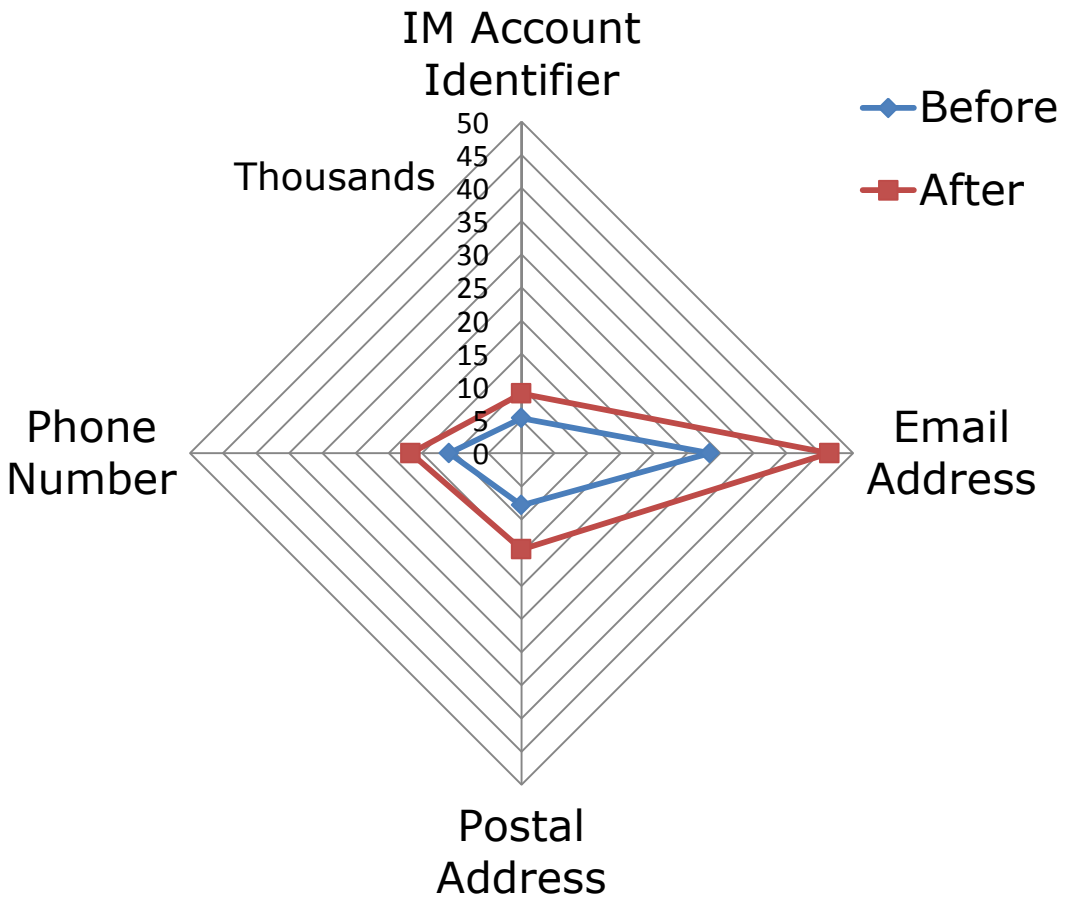
Bootstrapping

Infiltration is Mostly a Team Work



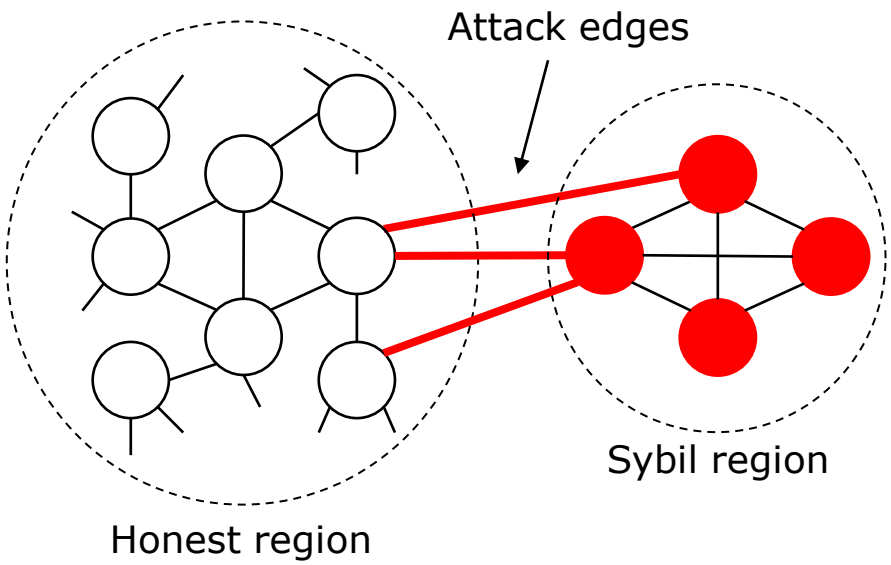
Implications

Infiltration Resulted in Privacy Breaches

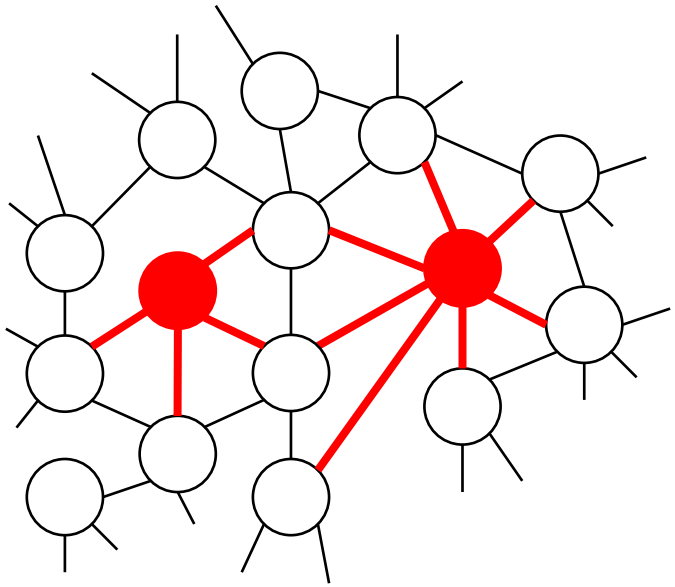


Birth dates: 48,810 before ➔ 580,649 after (**11.9**x more)

Capability of "Social Adversaries"



Sybil detection via social networks



With adversary running large-scale infiltration

Eroding the Trust in the Web

Facebook Applications

Facebook Connect

Summary

- Large-scale infiltration is feasible and has serious privacy and security implications
- Socialbots make it difficult for OSN security defenses and their users to detect their true nature
- There is a need for more effective, socio-technical defenses that are less vulnerable to *both* human and technical exploits

Yazan Boshmaf

Ildar Muslukhov

Konstantin Beznosov

Matei Ripeanu

NSERC CRSNG

Graphisme, animation et nouveaux médias
grand
Graphics, Animation and New Media

ISSNet

UBC

Interactions

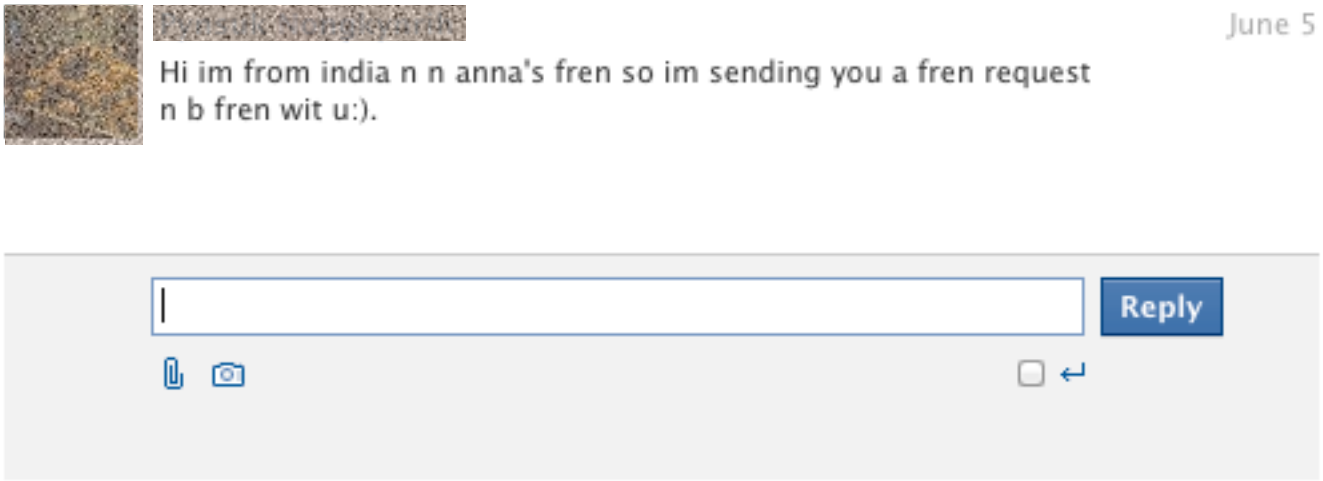
One Socialbot's Profile

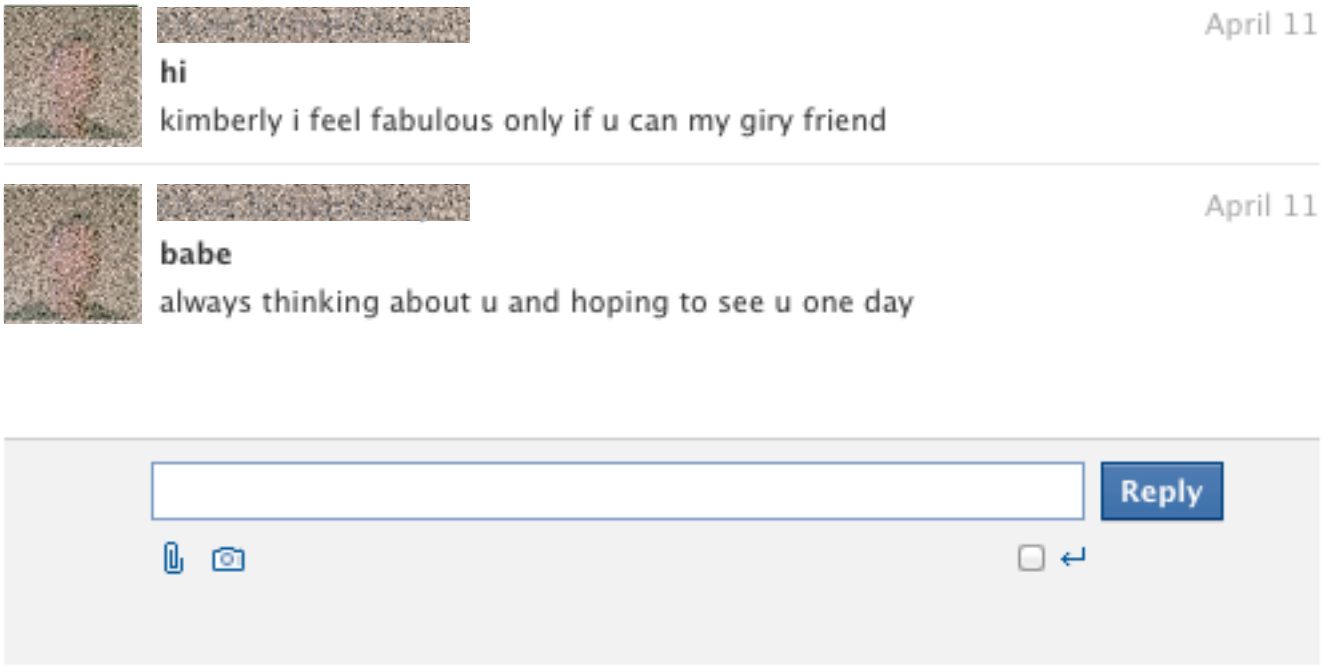
facebook
Search
Find Friends
Home
Edit Profile
View As...
Has worked at 350.org
Studied at Stanford University
Born on July 19, 1984
Add your hometown
Add languages you know
Edit Profile
FREE $1000 BEST BUY GIFT CARD!
ENTER HERE
CLICK HERE
Get the New iPad 2!
WIN AN iPAD 2
Update Status
Add Photo / Video
What's on your mind?
Friend Requests
See All
34 mutual friends
Confirm Friend
25 mutual friends
Confirm Friend
Sponsored
See All
Li Chu was tagged in
wall. — with
FREE $1000 BEST BUY GIFT CARD!
ENTER HERE
BEST BUY gift card
CLICK HERE
Denr-penro Pampanga's Photos
Sidra I just got a new Sony TV with this Best Buy gift card! Guess what? It didnt cost me anything... Best Buy is having some kind of special promotion for Facebook members and handing out $1000 gift cards in each area. I received mine from this site http://vaxszila.vaxszila.acge.info/?vaxszila
June 28 at 1:16pm
RECENT ACTIVITY
Li is now friends with
and 2 other people.
ratethisasian.com
Wall
Info
Photos (5)
Notes
Friends
Subscriptions
Friends (131)

... and furthermore ... I don't like your trousers.
Like · Comment · Share · June 22 at 1:4 pm via Desktop Connector
One of your friends might think you're cute!
Click & Find Out
Shevonna said something about Li!
Some questions your friends might have answered
1: Do you think Li is cute?
2: Would you trust Li with your life?
3: Is Li fun to be around?
Like · Comment · June 20 at 2:37pm via 21 questions
This is realy insane.. you have to see this
OMG.. Look What THIS Kid Did to His School After Being Expelled!
j.mp
WARNING: Graphic Content!
Like · Comment · Share · See Friendship · May 15 at 8:26am

Today's average household in the USA contains more computer power than existed in the world before 1965.
Like · Comment · Share · May 11 at 3:16pm via Desktop Connector
I posted this before but man, this is a must-see!!
YouTube - The Coolest YouTube Rewind 2010: Year in Review
The funniest, coolest, and sickest Youtube videos in 2010. Check this out! See w...
See More
Like · Comment · May 11 at 3:04pm via Desktop Connector
RECENT ACTIVITY
Li and Yolly Cajilig Gambaloza are now friends. · Like · Comment

Messages Received


June 5
Hi im from india n n anna's fren so im sending you a fren request n b fren wit u:).
Reply


April 11
hi
kimberly i feel fabulous only if u can my giry friend
April 11
babe
always thinking about u and hoping to see u one day
Reply

[redacted]

September 27

hi
The message is sent from Japan.
Right or wrong Please make friends with me.

Reply

[redacted]

August 11

Dear Laura Roy,
In a brief introduction i am Barrister Gordon King, Attorney to Late Engineer D E.Roy,a contractor and a business man who died in a motor accident along with his family.

Kindly Contact me via my private email (barrgordonking@live.com) for more information about the claim of his fund valued $13,580.000.00 united state dollars which he deposited with the here in my country Lome-Togo.

Your urgent response will be highly appreciated.

[redacted]

Reply

Posts by the Socialbots

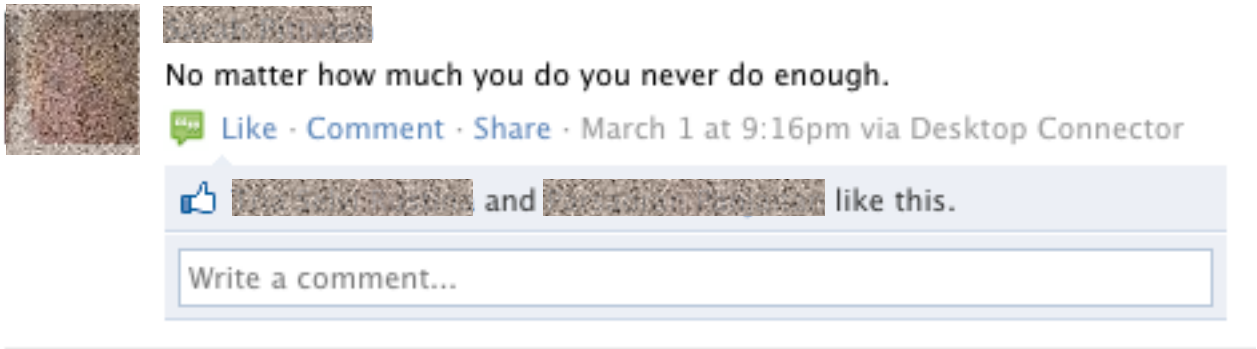
[redacted]

I just forgot my whole philosophy of life!!!

Like · Comment · Share · February 18 at 1:44am via Desktop Connector

[redacted] likes this.

Write a comment...


No matter how much you do you never do enough.
Like · Comment · Share · March 1 at 9:16pm via Desktop Connector
and
like this.
Write a comment...

[redacted]

Stay away from hurricanes for a while.

Like · Comment · Share · January 29 at 9:05am via Desktop Connector

[redacted] Its gud we dont av hurricanes in kenya,we dont av capacity 2 deal with the aftermaths

January 29 at 10:43am · Like

Write a comment...

Posts by the Socialbots' Friends

[redacted]

hy girl are you very beatifull i like your hair i want see you one day

Like · Comment · January 14 at 11:11am

Write a comment...

[redacted]

is your birthday??? anyway tou are so pretty!

Like · Comment · See Friendship · February 12 at 9:30am

RECENT ACTIVITY

[redacted] now friends with [redacted] and 4 other people.

[redacted]

Hey Sara. Time to update your status. What is new?

Like · Comment · See Friendship · August 30 at 7:15pm

[redacted]

Succesfully confirmed,thnks 4 da add.

Like · Comment · See Friendship · March 21 at 11:57pm

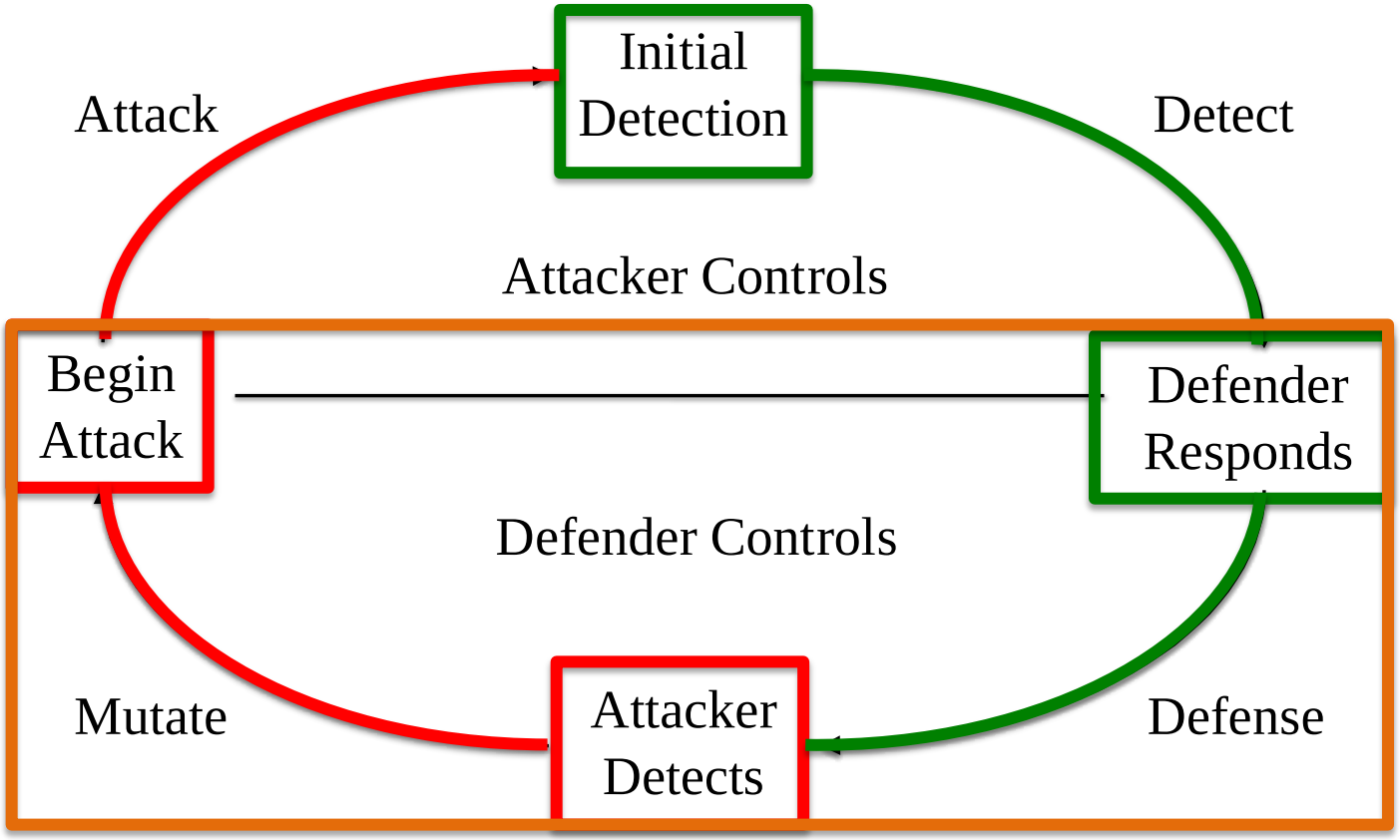
[redacted]

Hapi bday dear,hpe u made da best out of dis day neh! *lovely-winkie*

Like · Comment · See Friendship · March 20 at 10:00am

Backup

OSN Security: Adversarial Machine Learning



Stein et al., The Facebook Immune System, EuroSys – SNS, 2011

OSN Vulnerabilities: Ineffective CAPTCHAs

CAPTCHA-solving businesses*

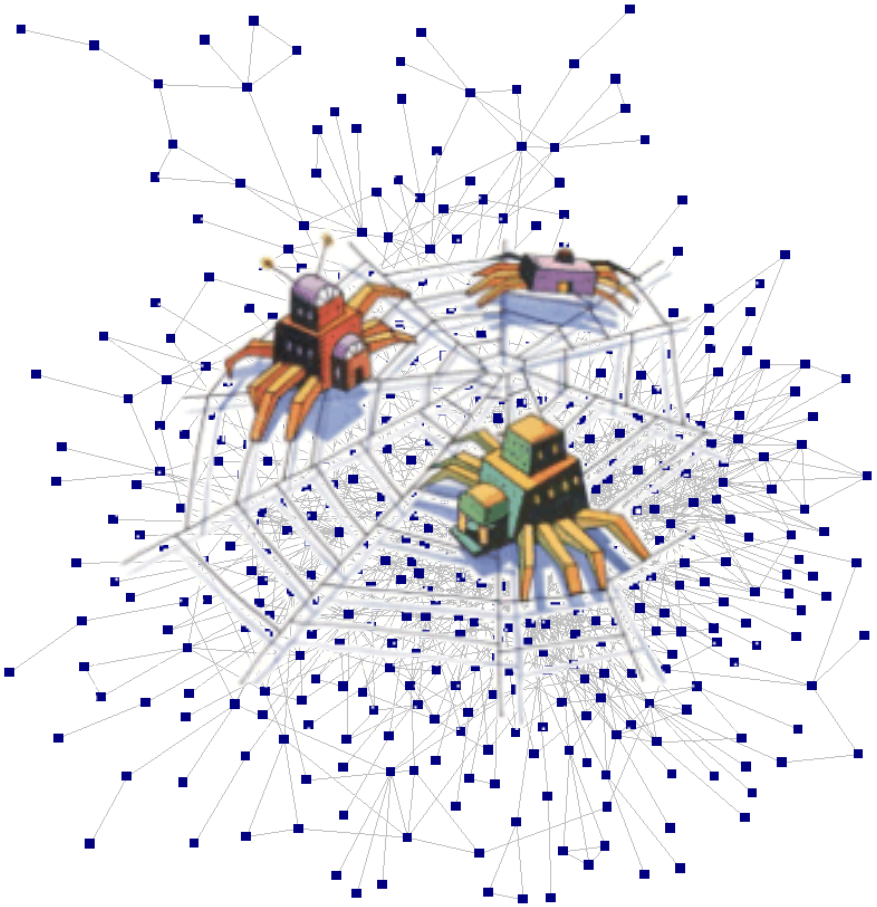
Koobface

* Dancho Danchev, Inside India's CAPTCHA solving business, 2008

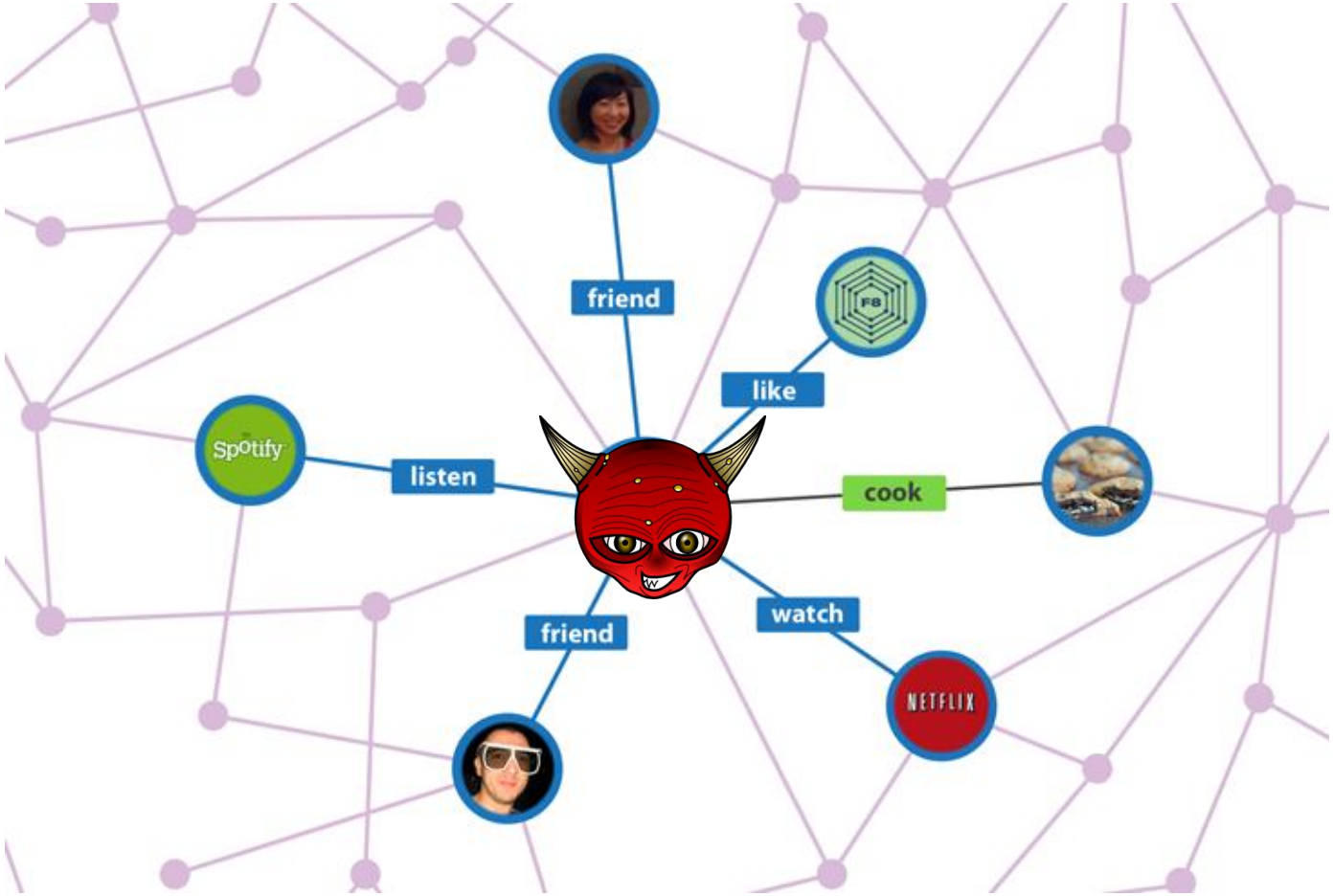
OSN Vulnerabilities: Fake User Accounts and Profiles

"On the Internet, nobody knows you're a dog."

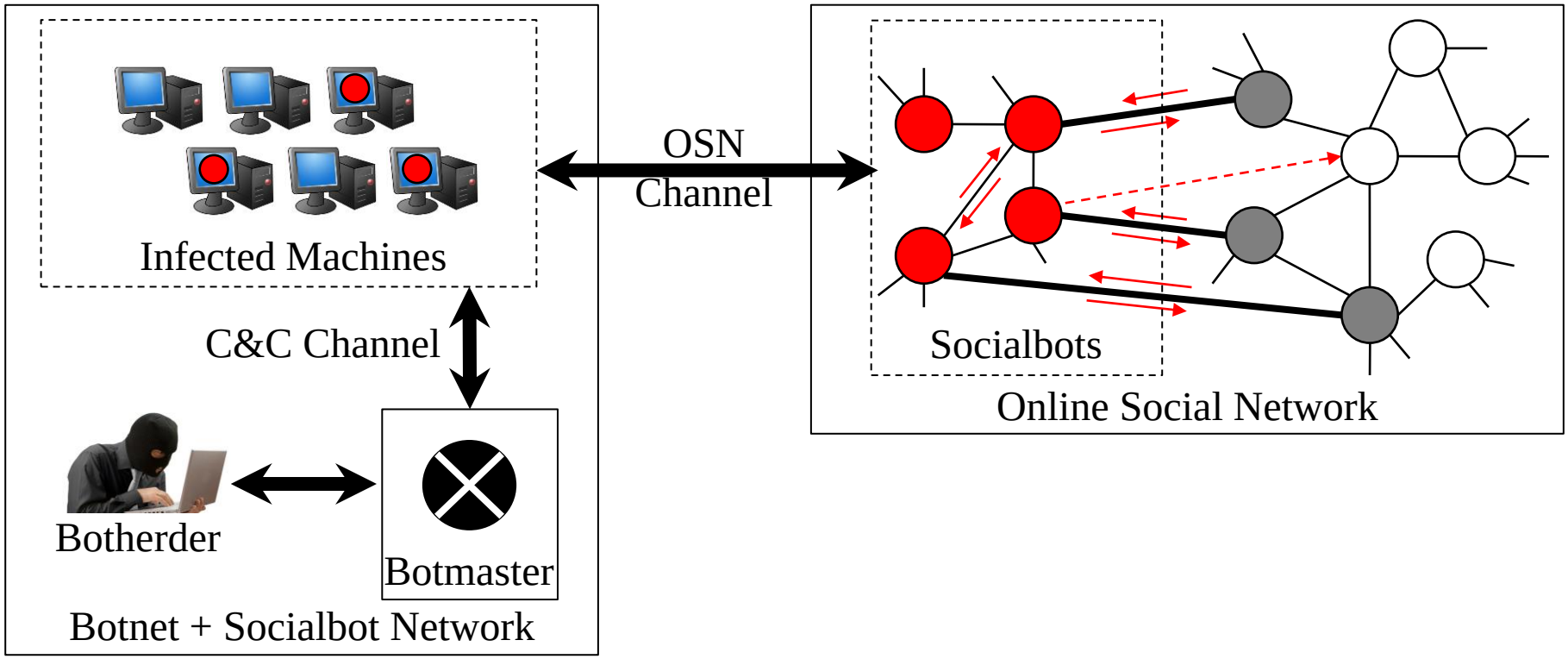
OSN Vulnerabilities: Large-Scale Network Crawls



OSN Vulnerabilities: Exploitable Platforms and APIs



Web-based Botnet Integration



Operations & Commands

Table 1: The generic operations supported by a socialbot in any given OSN.

Operation	Type	Description
read(o, p)	Social-interaction	Reads an object o from profile p and returns its value v as botcargo
write(v, o, p)	Social-interaction	Writes value v to object o on profile p
connect(b, p)	Social-structure	Sends or accepts a connection request sent from profile b to profile p
disconnect(b, p)	Social-structure	Breaks the social connection between profiles b and p

Table 2: Master commands. The socialbot $b_i \in B$ is the socialbot executing the command, $|B| = n$.

Command	Description
cluster	Connects b_i to at most N_{avg} other socialbots in B
rand_connect(k)	Connects b_i to k non-boherder-owned profiles that are picked at random from the OSN
decluster	Disconnects b_i from every socialbot $b_j \in S$ where $S = \{b_j \mid b_j \in \Gamma(b_i) \setminus B$ and $\lvert\Gamma(b_j)\rvert > n\}$
crawl_extneighborhood	Returns $\Delta(b_i)$, the extended neighborhood of b_i, as botcargo
mutual_connect	Connects b_i to every profile $p_j \in \Delta(b_i) - B$.
harvest_data	Reads all accessible information of every profile $p_j \in \Gamma(b_i)$, and returns it as botcargo