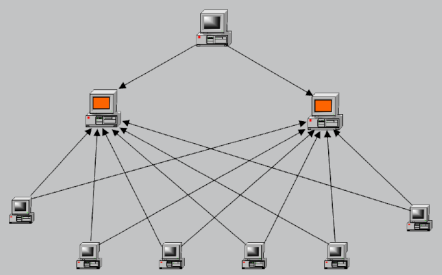
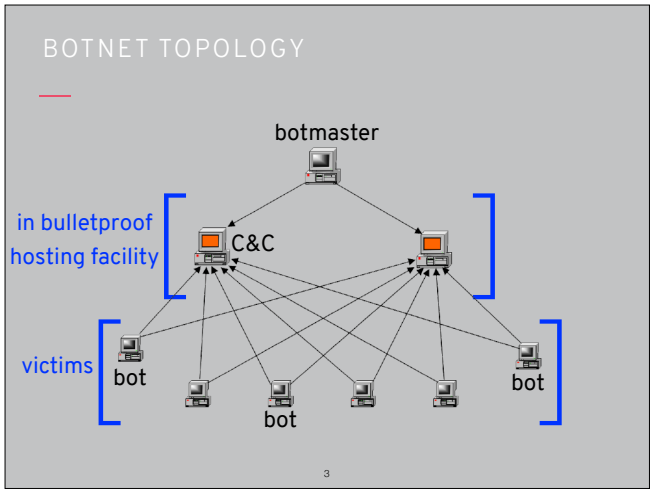
SECURITY (COMP0141): BOTNETS

UCL

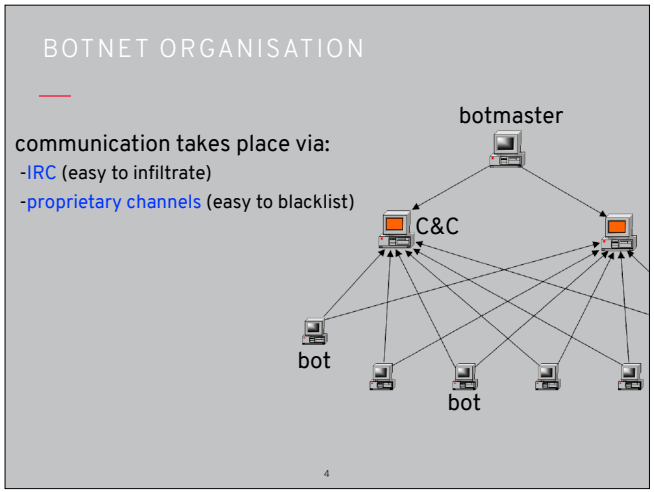
BOTNETS



Botnets are just large networks of compromised machines



Bots are victims that are not in on the scheme. Command and control (C&C) servers are hosted in bulletproof facilities, and many botmasters are in places like Russia



-IRC is like a chat room, this approach is easy to set up but too public so law enforcement can easily infiltrate and see the commands being issued
-Proprietary channels use some form of encryption, harder to spy on but there's a single C&C server they communicate with so it's easy to blacklist that fixed location

HONEYPOTS


A honeypot is designed to be highly attractive to an attacker

- unlocked car with keys in the ignition
- computer with unpatched OS, old browser version, etc.

Operated to find out more information about them (IP address, location, etc.) or provide enough evidence to report

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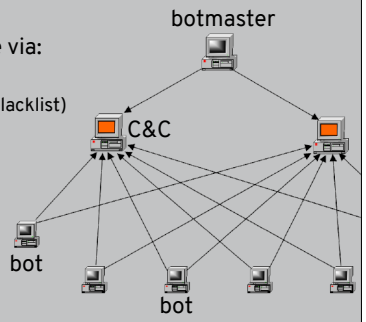
Honeypots are a common way for law enforcement or researchers to infiltrate a botnet

BOTNET ORGANISATION

communication takes place via:
-IRC (easy to infiltrate)
-proprietary channels (easy to blacklist)

structure uses:
-multiple tiers (expensive)
-p2p (easy to infiltrate)
-fast flux/domain flux (hard!)



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-To hide the C&C server we can set up a tiered approach so bots see proxy server rather than direct IP address of C&C server
-This is too static though, since proxy could get taken down. Could use peer-to-peer (P2P) networks where bots with better connectivity get treated as proxy servers, used to both receive and send commands. Again though anyone could act as a peer to see commands
-Even this could still be too static, so we use fast flux/domain flux (see demo) where domain names and IP addresses change quickly so no one knows where the C&C server is (or will be soon)

EXAMPLES

Grum
-shut down in 2012
-500-900K infected

ZeroAccess
-shut down in 2013
-2M infected

Cutwail
-shut down in 2010
-1.5-2M infected

Storm
-peak in 2007
-1-50M infected

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Here are some examples of big historic botnets

BUSINESS MODEL

q: but how do booter services work? how to do it myself?
a: use a **botnet**.

q: what is the monetary point of creating a botnet?
a: DDoS as a service, **click fraud**, **spam**.

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Aside from DDoS, what do you use a botnet for?

PAY PER CLICK


Pay-per-click (PPC) advertising means advertiser (Alice) pays publisher every time the ad is clicked

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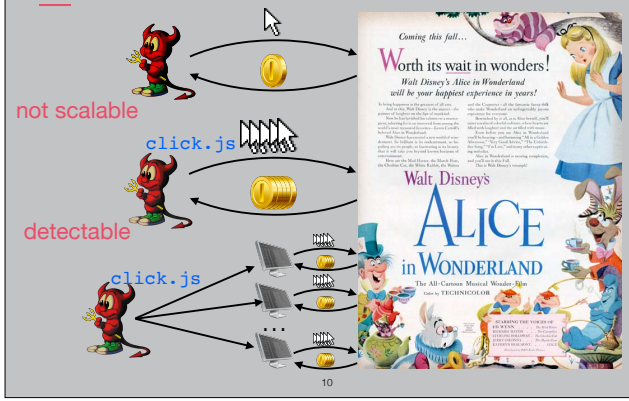
Let's consider what happens if the publisher is malicious

CLICK FRAUD



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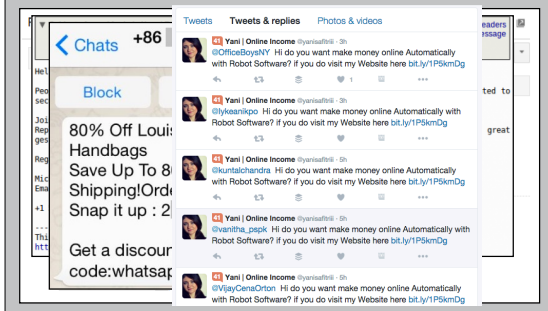
One use of a botnet is click fraud, in which the attacker repeatedly clicks on an advertisement in order to inflate their own revenue

SPAM



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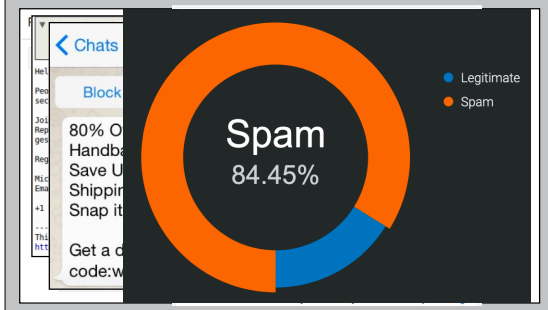
More prevalent use case is spam, which we're familiar with in email but also happens via text, Twitter, etc. What percentage of all emails do you think is spam?

SPAM



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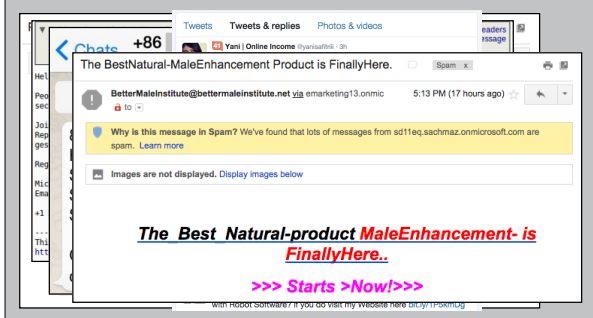
Spam is incredibly prevalent (number from https://talosintelligence.com/reputation_center/email_rep#tab=1), which is why we're all likely familiar with it

SPAM



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Let's focus on a "classic" type of spam, selling pharmaceuticals

AFFILIATE PROGRAMS

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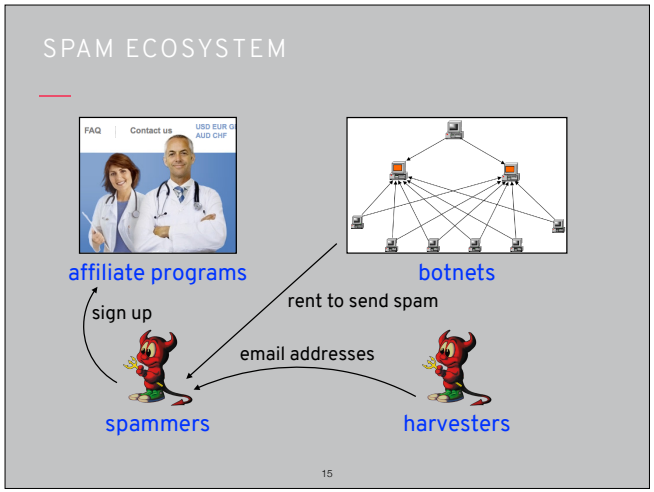
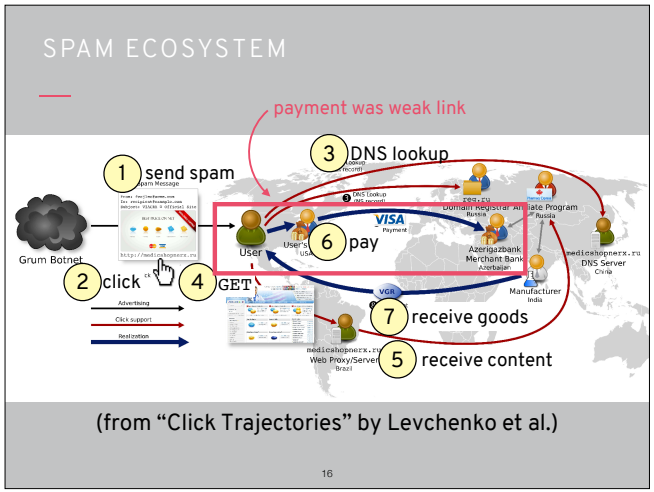


We think of spam as email, but what happens if you click on the link? Get to a website that belongs to something called an affiliate program. Affiliate program is separate from spam, spammer typically signs up with affiliate and gets a cut of the profits per customer. Spammer gets list of people to email from harvest, who scrapes websites to find email addresses. He then rents a botnet to send emails



(from “Click Trajectories” by Levchenko et al.)

This is very much a worldwide ecosystem

EXAMPLES

Grum
-shut down in 2012
-500-900K infected
-26% of spam in 2010 (40B/day)

ZeroAccess
-shut down in 2013
-2M infected
-click fraud/Bitcoin mining

Cutwail
-shut down in 2010
-1.5-2M infected
-46% of spam in 2009 (74B/day)

Storm
-peak in 2007
-1-50M infected
-20% of spam in 2008

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These botnets were responsible for sending a significant percentage of all spam at their peaks. ZeroAccess had a different revenue model

WHERE DO BOTNETS COME FROM?

q: but how do booter services work? how to do it myself?
a: use a **botnet**.

q: what is the monetary point of creating a botnet?
a: DDoS as a service, **click fraud**, **spam**.

q: but how do I create a botnet in the first place?
a: infect computers with **malware**.

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Botnets are formed using malware, which is also our third major threat to availability