DDoS Mitigation

Keeping the Business Open

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Game Plan

● Things you can do to defend yourself
● Things others can do to help you
● Some further musings
● Questions/discussion/open mike session
Red Alert, Shields Up!
What You Can Do When Under Attack

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Quick Recap

- A Denial-of-Service (DoS) attack *denies* the normal usage of a service
- A *Distributed* DoS attack is a DoS attack simultaneously coming from many sources
- For this talk, we assume *you* are running the victim service
- ... and have decided you are under attack
General DDoS Overview
What Exactly Is Attacked?

There are many ways to DoS a service. Potentially attacked components include:

- Applications and application resources
- systems and system resources
- network components and resources
- network information
- metadata/prerequisite data

Note: Many of these are not under your control!
How to Respond?

- In order to apply an effective countermeasure, it is necessary to identify the layer that is actually being attacked!
- For a given attack, there may be a number of effective countermeasures on a variety of levels
- Most countermeasures require preparation, and all countermeasures are easier to implement with preparation
Applications and Application Resources

In some ways the easiest to defend against:

- Best chance of truly understanding traffic
- Most targeted attack, therefore little collateral damage in technical terms

Possible problems:

- Application code not under your control
- Application protocol set in stone
- Legitimate-looking traffic hard to separate
Applications and Application Resources – Cont’d

Possible courses of action:

- Make sure the service is appropriately sized (number of threads, buffer sizes and so on)
- Start additional service instances
- Restrict or rate-limit access
- Restrict the service level
Systems and System Resources

Require similar, but more generic defense:

- Concepts apply to many target services
- “Only” general systems insight necessary
- No less need to worry about nitty-gritty service details

Possible problems:

- Less insight into what is happening
- if systems themselves are hit, deploying countermeasures might be hard
Systems and System Resources – Cont’d

Possible courses of action:

- Make sure the system is properly sized (CPU, RAM, HDD, sockets)
- Start additional system instances (potentially at backup site)
- Restrict or rate-limit traffic (e.g., the number of TCP connections)
- Restrict service level
Local Mitigation
Network Components and Resources

Defense on this level is a different game and very problematic:

• Adding networking resources or components ad-hoc is often very hard or impossible
• Attacks often take down entire sites, severely limiting response capabilities
• Collateral damage is often substantial
• Affected components or resources only partially under your control, if at all!
Network Components and Resources – Cont’d

Possible courses of action:

- Restrict or rate-limit traffic (e.g., the rate of inbound ICMP packets)
- Move service to backup site with different address and update DNS etc.
- Ask your ISP (or upstream entity) for help
Off-Site Mitigation
What if you are the ISP/upstream entity?

- Blackhole traffic as far upstream as possible.
- If possible, based on traffic sources; if necessary, based on traffic destination.
If someone manages to attack this successfully, there is almost certainly not a whole lot you can do about it:

- Routing and peering information is done outside of your control.
- ... unless you are running your own Autonomous System, in which case you should already know what to do.
Network Information – Cont’d

Possibly courses of action:

• Contact your ISP or upstream entity for help.

If you are the ISP/upstream entity: Fix/reclaim your BGP advertisements and peering info.
Metadata/Prerequisite Data

This is somewhat of a “catch-all” category. What you can sensibly do depends a lot on what exactly has been attacked:

- Services you depend on but that are outside your control (e.g., most of DNS, OCSP, NTP) or
- services you depend on that are under your control (e.g., some DNS, LDAP, Kerberos).
Possible courses of action:

- If the service that is not available is outside of your control: Contact the service provider and tell them they have a problem. (Although they will likely know this already.)

- Otherwise, go fix your own service.

- Or, indeed, **have** your own service – for instance, a local NTP server.
Radio for Backup - How Others Can Help You

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ISP/Upstream Entity

Uniquely, your ISP can blackhole traffic **before** it becomes a problem for your uplink

- Blackhole routing is the name of the game
- Preferably as much upstream as possible
- This will likely take the victim service offline
- ... from the outside, that is
- Furthermore, key connections might even be kept “open” with static explicit routing
ISP/Upstream Entity – Cont’d

• Much easier if you have discussed this beforehand with your ISP

• Having a prepared emergency backup instance of the victim service off-site also helps
Blackhole Routing
DDoS Mitigation Providers

Commercial companies that offer “cleaning” of network traffic. Two flavors: Always-on and On-demand

• Always-on: All traffic is permanently routed through the mitigation provider resources. Adds latency because of longer routes

• On-demand: Traffic is re-routed through mitigation provider resources when an attack is detected. Takes a bit of time to switch over, and mitigation provider might be bypassed by a clever attacker

Either flavor must be established beforehand
Content Delivery Networks

Content Delivery Networks (CDNs) provide decentralized service delivery

• Primary benefit are quicker deliveries because the CDN servers are “closer” to the client, topologically speaking

• But this also means that it is very hard to attack the service as a whole because there are a lot of delivery endpoints

• Only helps if deployed beforehand
Security Teams

Depending on the context and attack details, external security teams might be able to help:

- Insight into botnet operations
- ability to contact third parties
- assistance in incident coordination
DDoS Mitigation Provider/CDN
Miscellaneous Observations
Every Bit Helps

• It is crucial to be able to start working again. Working with your ISP/upstream entity to restore connectivity to your most important communications partners goes a long way

• So does restoring local basic service so that people can start working again internally

• Also realize that losing internet connectivity means losing VoIP telephony!
Be a Good Neighbor

Successfully defending yourself on your own is very hard, if not impossible. It is key that everybody keeps their own turfs clean, especially when not under attack, so that DDoS attacks are made as difficult as possible

- Monitor outbound traffic for bots
- Be sure not to be a reflector/amplifier
- Consider rate-limiting outbound ICMP traffic
Keep the Right People in the Loop

Remember that one of the goals of a DDoS attack is likely to make the target (presumably you) look bad.

If you are attacked, your public reaction is key

- This means that your PR people should probably be briefed on what is happening
- Also consider informing users of the problem so they do not have to guess what is wrong
Collaborative Effort

- Successful DDoS mitigation is a team effort that cannot be pulled off by the victim alone
- The deliberate distribution and dislocation of the attack means that many players are potentially involved
Thank you

Any questions?

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