2019 S&T Cybersecurity and Innovation Showcase

Solutions Now I Innovations for the Future

Homeland Security
Science and Technology

Planning for Anycast as Anti-DDoS (PAADDoS)

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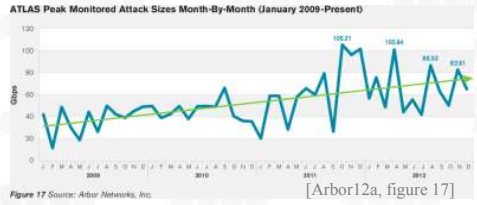
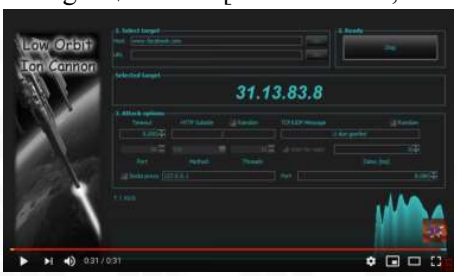
Distributed Denial-of-Service (DDoS) is Bad... and Getting Worse

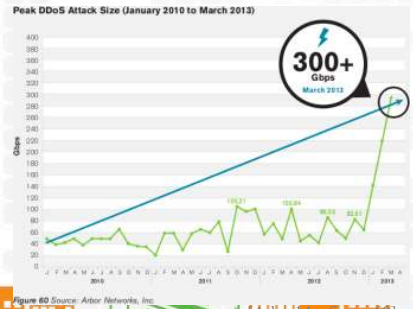


[Arbor12a, figure 17]

big
2012 innovation:
automated botnets
for extortion

cheap: booters offer DDoS-as-a-service
starting at $1/attack [Santanna et al, 2015]





[Arbor14a, figure 60]

bigger
2013 innovation:
DNS amplification

biggest (so far, as of Feb. 2018)
2016: 620 Gb/s KrebsOnSecurity.com
2018: 1.3Tb/s with memcached
innovation: 145k-node botnet from
hacking IoT devices

The Need for Better DDoS Defenses

- Source address filtering…

  good, but a goal since 2000 *(RFC2267)*

- Filtering and scrubbing at the target…

  good, but not vs. 1Tb/s

- CDN services…

  great, but can be expensive

Our goal: best-of-breed DDoS defense, and open-source

PAADDoS: Who We Are

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USC Viterbi School of Engineering
Information Sciences Institute

UNIVERSITY OF TWENTE.

ant.isi.edu

data distribution
support through
DHS/IMPACT

impact Cyber Trust
www.impactcybertrust.org

collaboration with

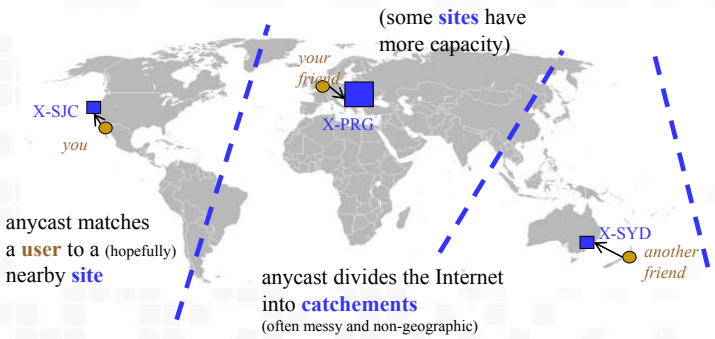
SIDN LABS

USC University of Southern California

B Root

Our Approach: Democratizing Anycast

- Replication of the service … **anycast**
  - multiple physical sites
  - BGP matches users to sites
  - spreads load over sites
- Anycast is widely used but it is a black art
- Our goal: document and democratize anycast



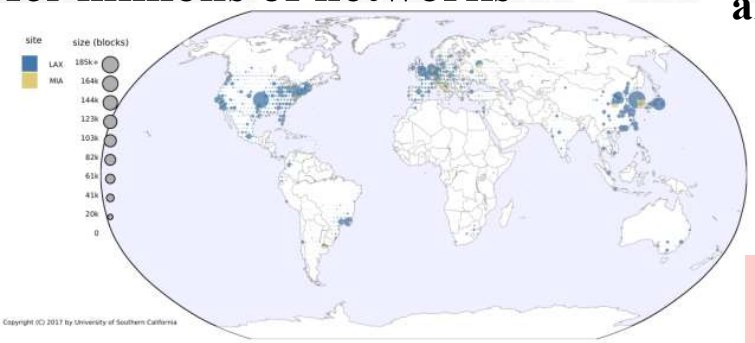
PAADDOS Objectives

- **Map cachements** with active probing with Verfploeter
- **Plan for changes** with new tools
- **Support reconfiguration** during attack
- **Evaluate and document** these ideas

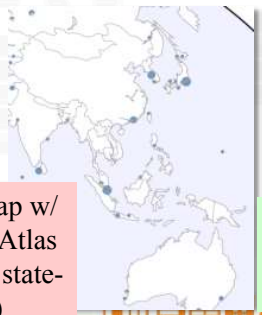
Early Results: Verfplotter Anycast Mapping

Verfplotter idea: use active probing to map anycast

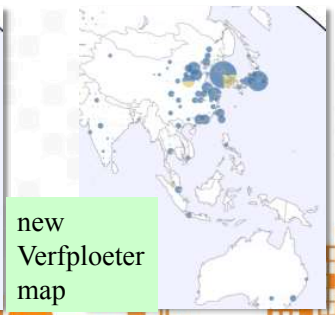
Result: a **global picture** for **millions of networks**



better coverage, in South America **and in China and Korea** (below)



old map w/ RIPE Atlas (prior state-of-art)



new Verfploeter map

Benefits: Better Defenses Against DDoS

- Document use of anycast to support smaller players
- Publish best practices
- New open-source tools that anyone can use

- Goal:
  - Broaden the field of defenders
  - Share practices that are today often closed

Collaboration and Competition

- Current methods: *good, but not enough*
  - source-address validation: *deployment remains incomplete*
  - new filtering techniques: *complement our approach*

- Commercial DDoS defense providers and CDNs
  - great for those who pay for them
  - should not be the *only* option

PAADDoS: Current Status and Next Steps

Current status

- Kick-off meeting and discussion at NCSC ONE in October 2018
- Formally underway in November 2018
- Verfploetter anycast mapping available today
  - https://ant.isi.edu/software/verfploeter/

Plans

- Examine long-term Verfploeter data
- Develop planning tools

Tech Transition Activities

- Verfploeter already in operation at B-Root and a major anycast DNS operator
- Continue work with operators
  - SIDN Labs (Netherlands), operate .nl
  - B-Root (USC), one of the 13 root servers
- Discussions with many other operators
- Code and approaches will be open source

Conclusions and Contact Info

- anycast as a DDoS defense
  - not new
  - but new understanding and docs
- mapping with Verploeter
  - working with multiple DNS operators
- new tools to plan before and react during attacks
  - (in progress)

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