IDN Homographs

ASCII Look-alikes vs IDN Homographs

- ASCII Look-alike: One of two or more **ASCII** strings that appear identical or very similar
- Solutions exist for detecting some ASCII look-alikes that do not exist for IDN Homographs

acme.example

acrne.example

IDN Homographic Attacks

- Humans are really good at pattern recognition
- Many glyphs originating from the Unicode repertoire look similar or even identical to others depending on the font
- So… register an IDN that is a homograph of a well-known (usually non-internationalized) domain name
- Extort, camp, cash-park, phish, distribute malware, or do other antisocial things by using the IDN in a URL
- ???
- Profit

Examples

Real Site	Homograph	A-label
easyjet.com.	easyjeț.com.	xn--easyje-n17b.com.
delta.com.	de|ta.com.	xn--deta-1kb.com.
ryanair.com.	ryanaiṛ.com.	xn--ryanai-1x7b.com.
poloniex.com.	polonìex.com.	xn--polonex-3ya.com.
bittrex.com.	bītt’rex.com.	xn--btrex-m3a12b.com.
linkedin.com.	lìnkedin.com.	xn--lnkedin-zya.com.

Courtesy of
Mike Schiffman,
Farsight Security

Observed via Passive DNS

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Courtesy of
Mike Schiffman,
Farsight Security

Observed in the Wild

- 1,936 impersonation domains observed in a review of Certificate Transparency logs (2017) [1]
- Farsight January 2018 research [2]
  - Examined 125 brand names
  - In a 3 month period observed 116,113 homographs
  - Discovered 10+ live phishing sites
  - 382 impersonation domains reported from Passive DNS logs

[1]: https://github.com/CyberMonitor/defcon-25-Packet-Hacking-Village/blob/master/YOU'RE%20GOING%20TO%20CONNECT%20TO%20THE%20WRONG%20DOMAIN%20NAME%20phv2017-serb.pdf
[2]: https://www.farsightsecurity.com/2018/01/17/mschiffm-touched_by_an_idn/

Observed in the Wild (cont)

- Farsight October 2018 research [3]
  - Examined 509 brand names
  - In a 20 month period observed 11,766 unique IDN homographs
  - In same period observed 61,443 total IDNs
    - 20% in banking/finance
    - 52% in .com
    - 68% geolocate to the USA
    - 93% using IPv4

Data courtesy of Mike Schiffman, Farsight Security

What We've Seen: All The IDNs

161,935,465 total IDN observations

34,460,574 total unique IDNs

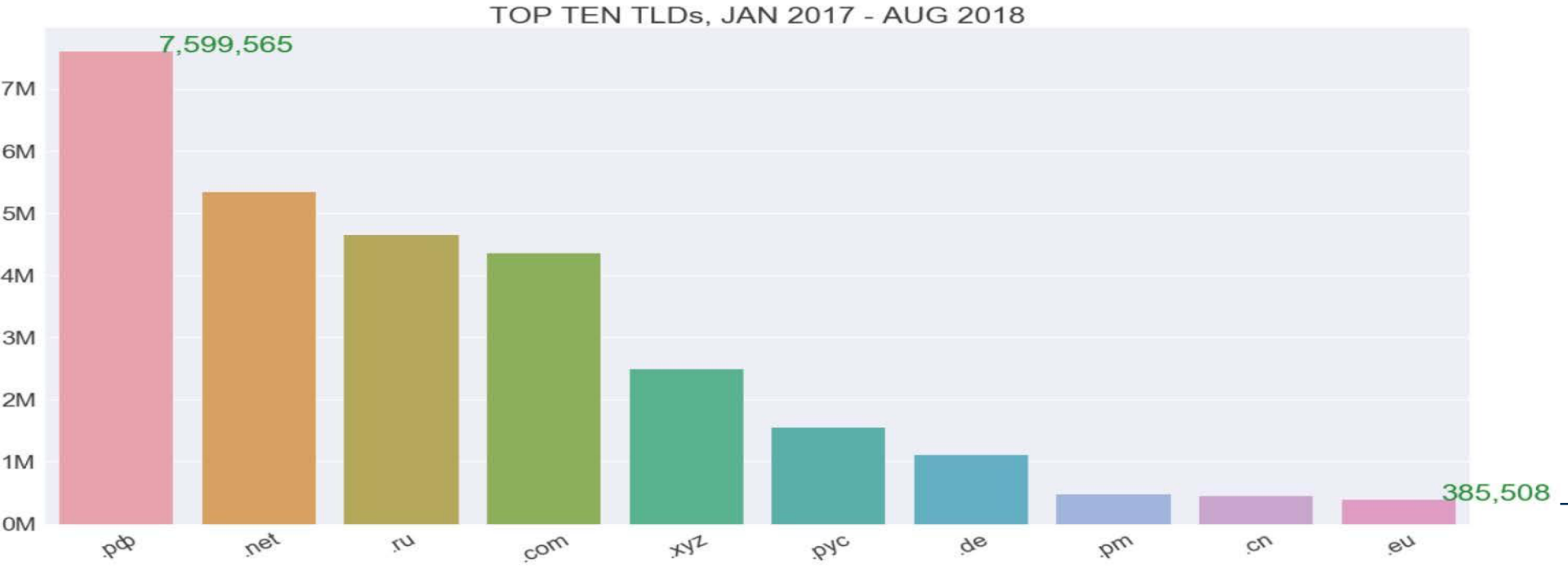
Summer vacation?

Diagram courtesy of Mike Schiffman, Farsight Security

What We've Seen: Top 10 IDN TLDs

1,675 total unique TLDs

Diagram courtesy of Mike Schiffman, Farsight Security

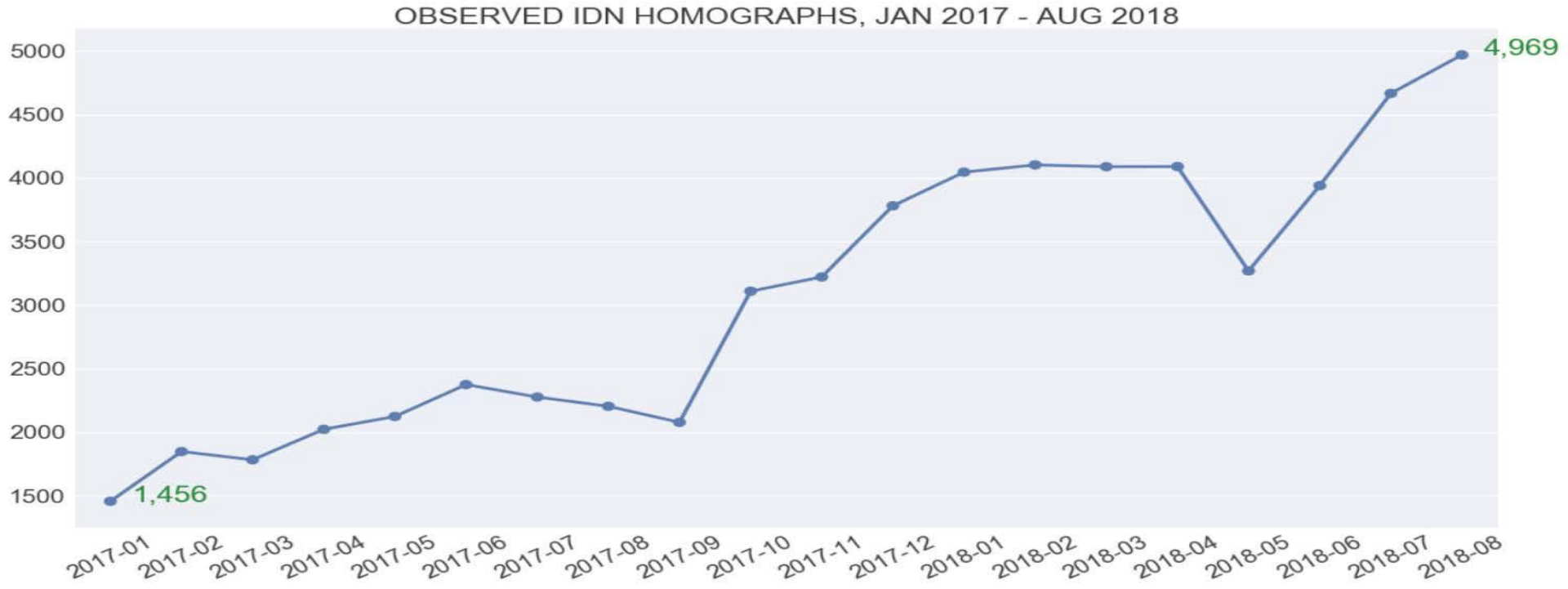


What We've Seen: IDN Homographs

61,443 total IDN homograph observations

11,766 total unique IDN homographs

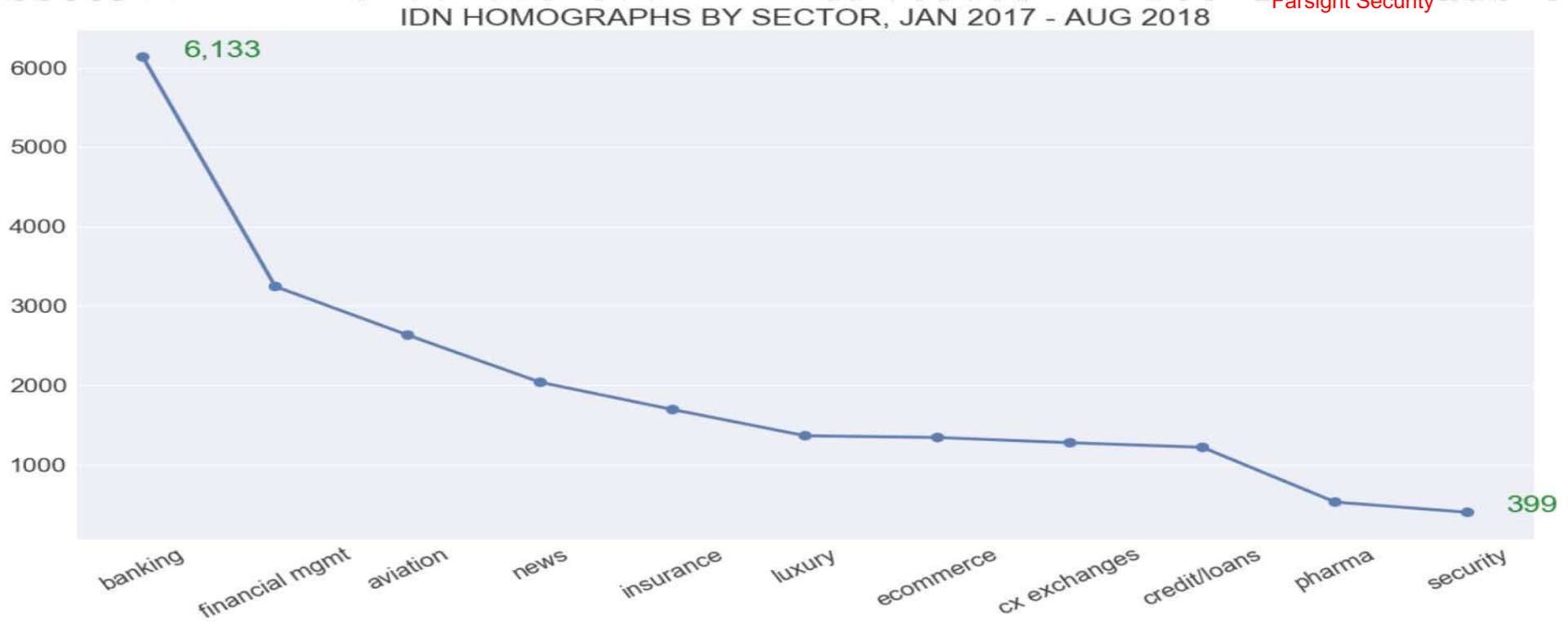
Diagram courtesy of Mike Schiffman, Farsight Security



What We've Seen: IDN Homographs by Sector

Of the 61,443 total IDN homograph observations,
20% are in banking/finance

Diagram courtesy of
Mike Schiffman,
Farsight Security



Detection and Mitigation

How to Detect Attacks

- Monitor certificate transparency logs
- Monitor DNS zone files
- Utilize passive DNS services
- Detecting IDN homographs reliably typically requires human eyes

Mitigation

- Stricter rules at registry and registrar
  - Registries and registrars implement recommendations from IDNA2008 (RFC 5890-5894, specifically RFC5894)
  - Use an inclusion based process before allowing code points
    - For example, base rules on what script a code point belongs to
  - Be extremely conservative with mixed scripts within a label, and within a domain name
  - Adapt the Label Generation Rules (LGRs)
  - Mandate homographic lookup checks
- Browsers often implement homograph preventions, but with limited success

Why is this Important?

- ICANN's mission of **Security**, Stability and Resiliency of the global unique identifiers
  - Phishing, malware, malicious email
- Affects universal acceptance
  - Failure to act may result in ad-hoc blocking or other display tricks
- Business Email Compromise (BEC) is a growing problem
  - Failure to act may result in blocking of emails that use IDNs

What Can the Community do to Help?

- Opportunity for development of tools to detect IDN Homographs
  - Visualization
  - Comparison to known homographic targets
  - Facilitate brand protection
- Awareness and outreach of the potential malicious use of IDN Homographs
  - End-user awareness
  - Implementor education
  - Service provider awareness

Relevant SSAC Publications

Relevant SSAC Publications

- https://www.icann.org/groups/ssac/documents

- SAC037: Display and usage of Internationalized Registration Data Support for characters from local languages or scripts
- SAC052: SSAC Advisory on Delegation of Single-Character IDN TLDs
- SAC084: SSAC Comments on Guidelines for the Extended Process Similarity Review Panel for the IDN ccTLD Fast Track Process
- SAC088: SSAC Response to the ccNSO evaluation of SAC084
- SAC099: SSAC Response to the ICANN Internationalized Domain Name Guidelines Working Group

Thank you