SpamTracer
Tracking Fly-By Spammers

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Where It All Begins

- CONJECTURE
  - Spammers would use **BGP hijacking** to send **spam** from the stolen IP space and remain untraceable
  - Short-lived (< 1 day) routes to unused IP space + spam [Ramachandran2006, Hu2007]
  - Anecdotal reports on mailing lists

- POTENTIAL EFFECTS
  - Misattribute attacks launched from hijacked networks due to hijackers stealing **IP identity**
  - Spam filters heavily rely on IP reputation as **a first layer** of defense

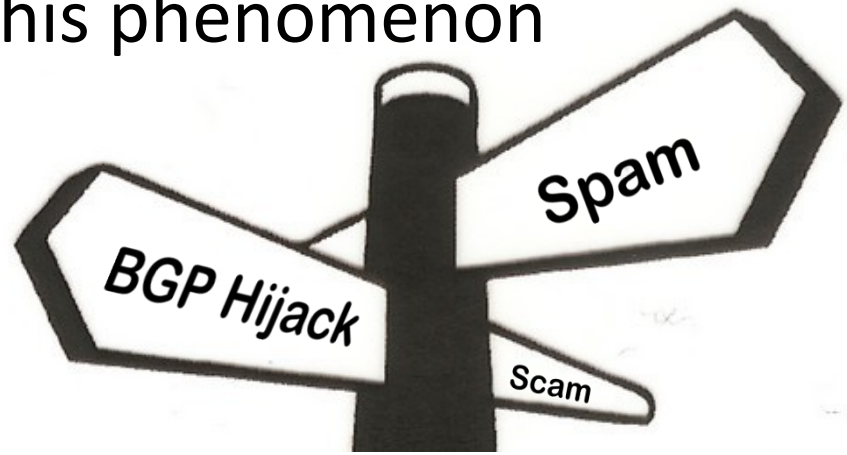
Fly-By Spammers :: Myth or Reality?

BGP Hijacking

- CAUSE
  - The injection of **erroneous** routing information into BGP
  - No widely deployed security mechanism yet
    - E.g., ROA, BGPsec
- EFFECTS
  - **Blackhole** or **MITM** [Pilosof 2008] of the victim network
- EXPLANATIONS
  - Router misconfiguration, operational fault
    - E.g., Hijack of part of Youtube network by Pakistan Telecom
  - **Malicious intent?**

Your Mission, Should You Accept It

- **Validate** or **invalidate** on a large scale the conjecture about fly-by spammers
- Assess the **prevalence** of this phenomenon



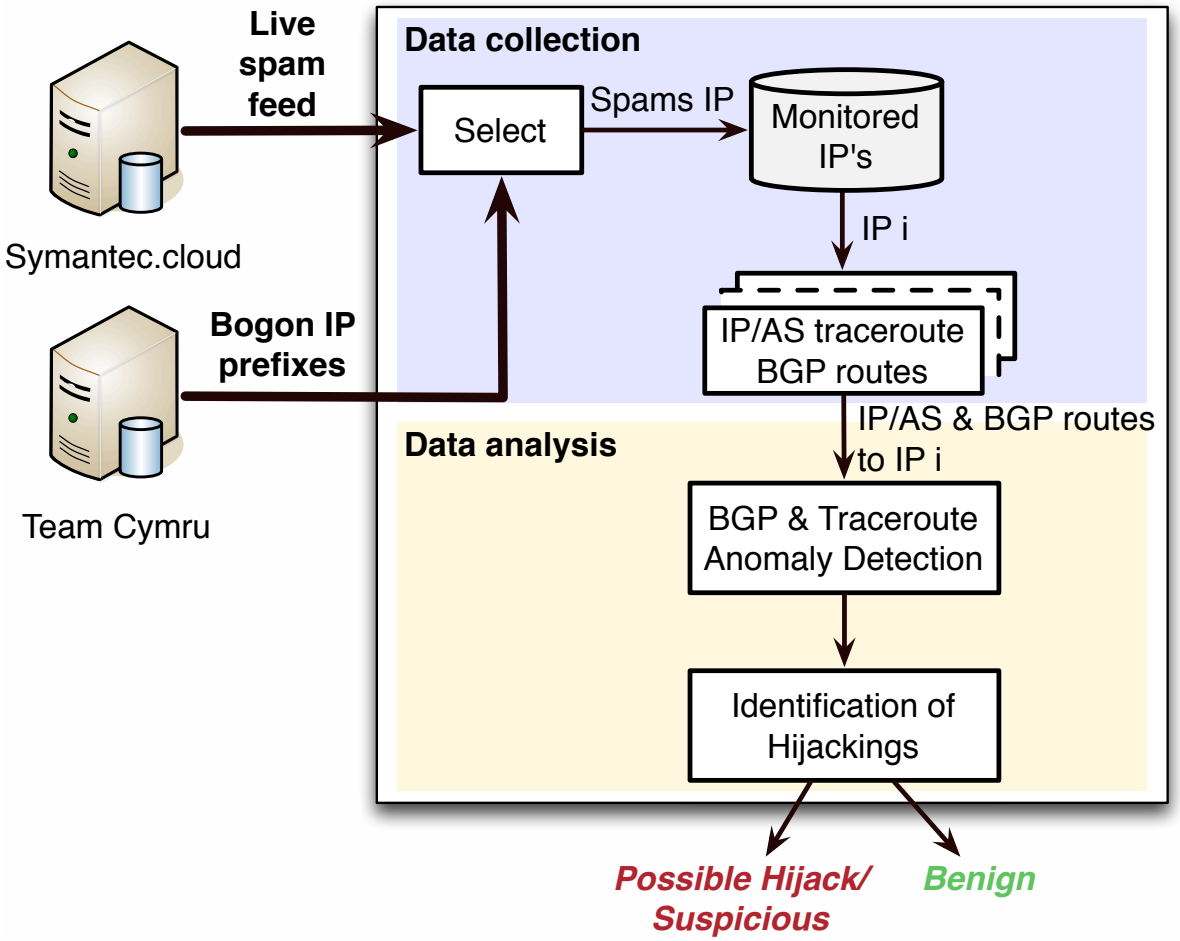
- **SPAMTRACER**
  - collect **routing** information about **spam** networks
  - extract abnormal routing behaviors to detect possible **BGP hijacks**

SPAMTRACER :: Presentation

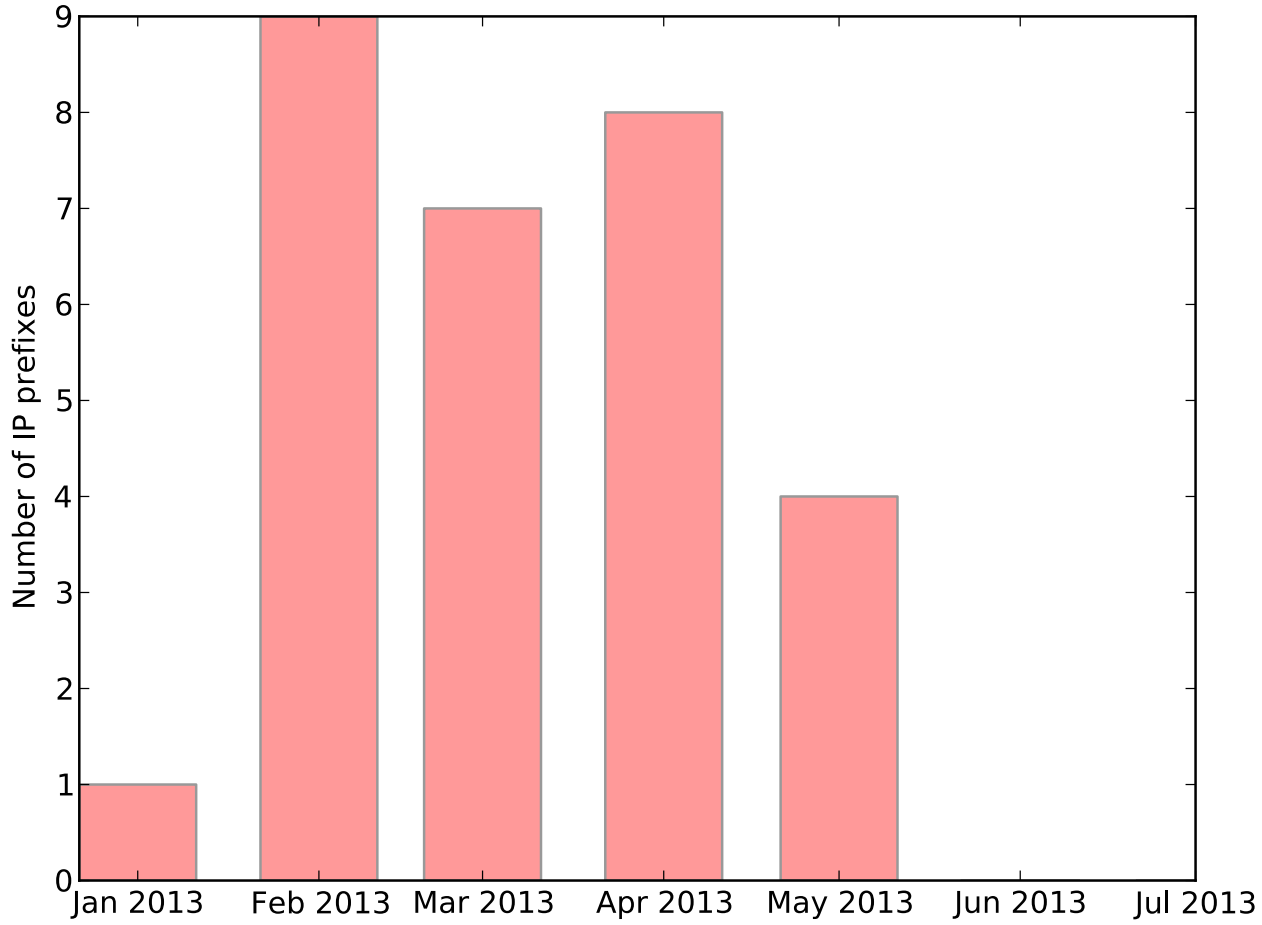
- ASSUMPTION
  - When an IP address block is hijacked for stealthy spamming, a **routing change** will be observed when the **block is released** by the spammer to remain stealthy

- METHOD
  - Collect **BGP routes** and **IP/AS traceroutes** to spamming networks just after spam is received and during several days
  - Look for a routing change from the **hijacked state** to the **normal state** of the network

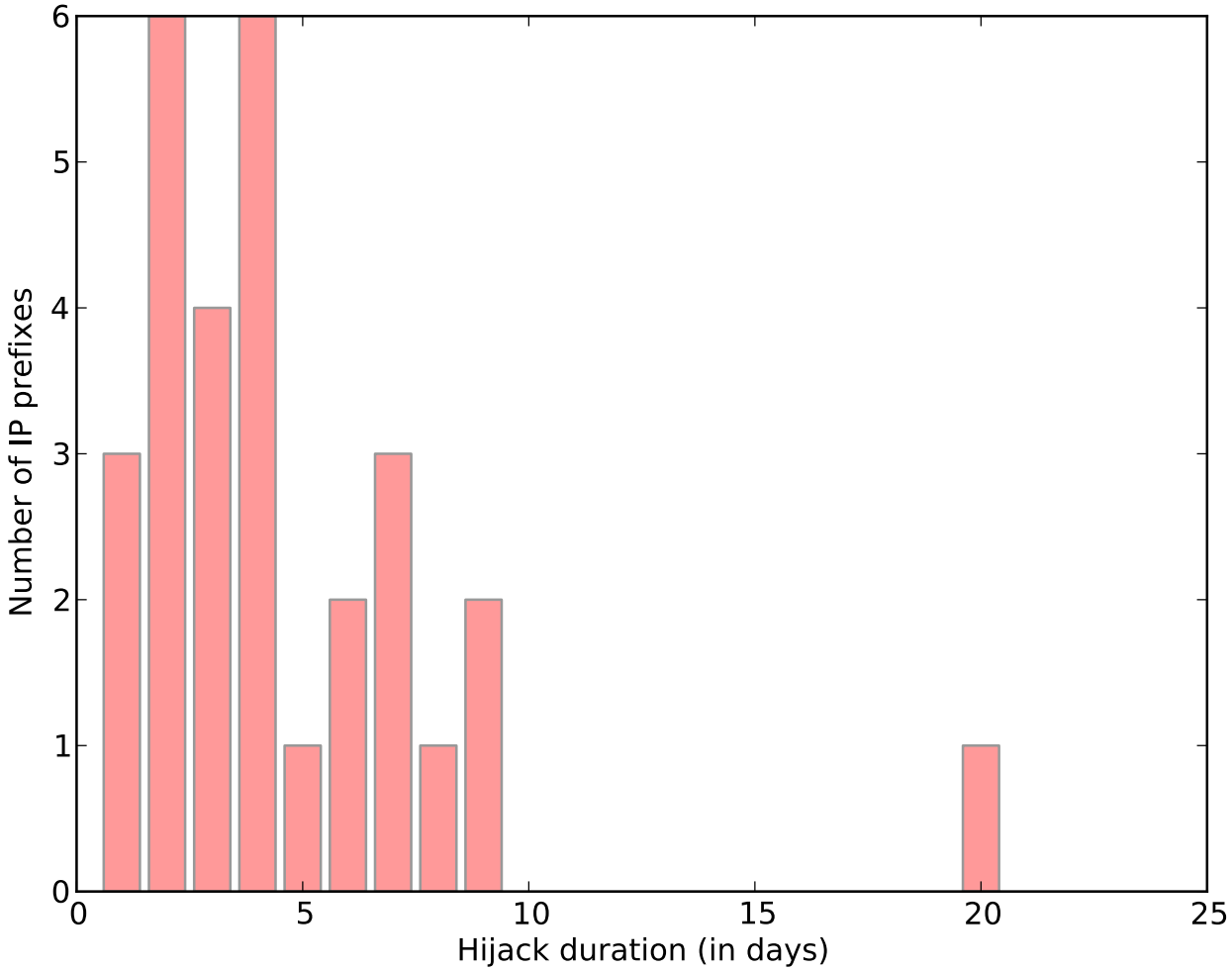
SPAMTRACER :: System Architecture



29 hijacked prefixes from Jan. to Jul. 2013



Hijack duration between 1 and 20 days

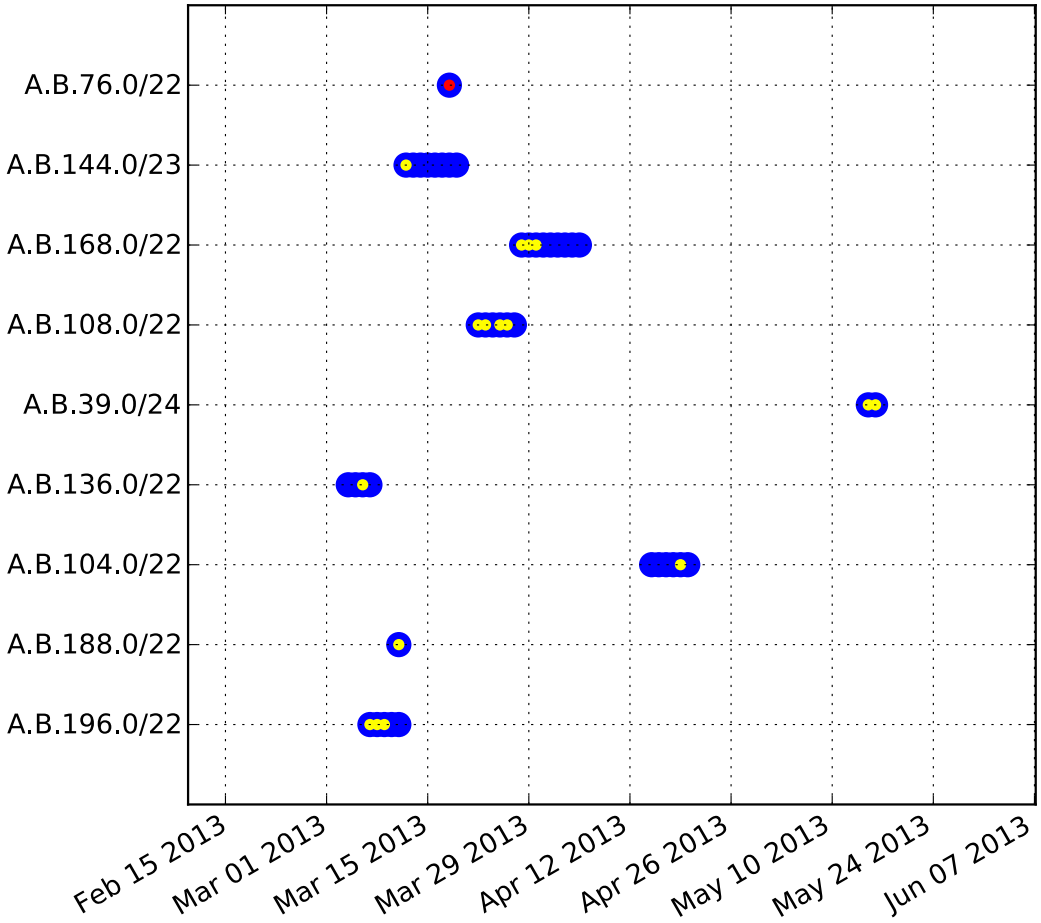


Fly-By Spammers :: Hijack Signature

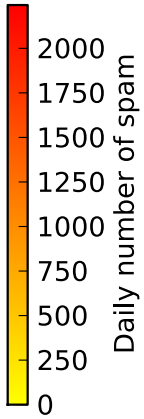
- Hijacked networks
  - were **dormant** address blocks, i.e., by the time the networks were hijacked they had been left **idle** by their owner
  - advertised for a **short** period of time
  - advertised from an apparently **legitimate origin** AS but via a **rogue upstream** AS
  - see [Huston2005]

- In practice, we observed
  - idle **intervals** between 3 months and 7 years
  - hijack **durations** between 1 day and 20 days, mostly < 5 days
  - rogue **upstream ASes** were hijacked too

Case Studies ::
Suspicious BGP Routes & Spam



Suspicious
BGP announcements

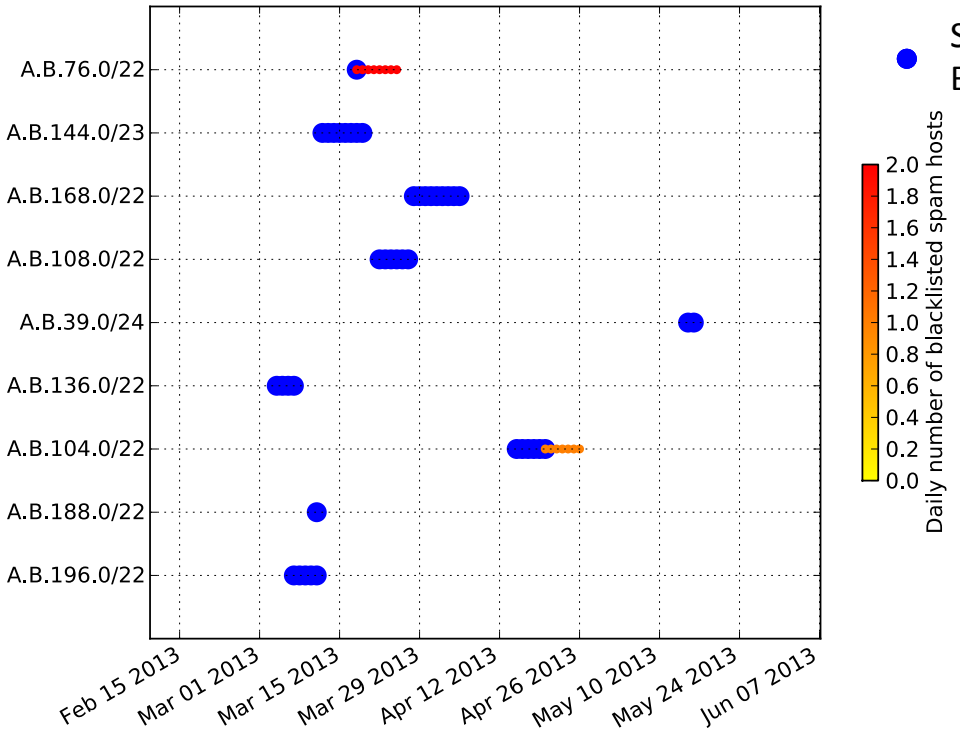


Case Studies :: Suspicious BGP Routes & Spam

- Strong temporal correlation between
  - suspicious BGP announcements and
  - spam
- BGP announcements are quite short-lived!
- No identified spam bot!
- A lot of scam web sites advertised in spam mails were hosted in the hijacked networks

Case Studies :: Suspicious BGP Routes & DNSBLs

- Only 2 address blocks appeared in the Uceprotect* blacklist at the time of the suspicious BGP announcements



Notice: blacklist entries automatically expire after 7 days

*http://www.uceprotect.net

How Stealthy Were Spammers?

- Out of 29 hijacked address blocks
  - 6 (21%) were listed in Uceprotect
  - 13 (45%) were listed in Spamhaus DROP (Don't Route Or Peer)
    - DROP is supposed to list hijacked address blocks
    - but little is known about their listing policy
  - 29 (100%) were observed only once during the time period of the experiment
- Fly-by spammers seem to manage to remain under the radar!

Which Networks Were Targeted?

- All hijacked address blocks were **assigned** to a different organization (i.e., a different owner)
- Out of 29 organizations
  - 12 (41%) were found to be dissolved or very likely **out of business**
  - 17 (59%) were found to be **still in business** or no conclusive evidence of them being out of business could be found
- Fly-by spammers seem to simply target dormant address blocks regardless of their owner still being business or not

What About Long-Lived Hijacks?

- We looked specifically for short-lived hijacks
  - each spam network was monitored for 1 week after spam was received
- But what about long-lived ones
  - it happens also, e.g., LinkTelecom hijack [Nanog2011, ISTR2012, Vervier2013, Schlamp2013] lasted 5 months
  - but they are less straightforward to detect
  - and it seems to defeat the assumed purpose of evading blacklisting
- We are working on updating our framework to detect these cases

How To Prevent Fly-By Spammers?

- In the observed hijack cases, spammers
  - did **not** tamper with the origin of the address blocks
  - but advertised the address blocks via rogue upstream ASes
- BGPsec is currently the most promising architecture for securing BGP
  - both **Route Origination** and **Route Propagation** must be secured to prevent fly-by spammers
  - secured Route Origination via ROAs is being more and more deployed
  - but secured Route Propagation is still at a too early stage
- The solution for now is thus to
  - encourage the following of routing **best practices** and
  - use **detection systems** to mitigate the effect of these attacks, e.g., by feeding IP-based reputation systems with hijacked address blocks

Conclusion

- The observed fly-by spammer cases show that this phenomenon is happening though it does **not currently** seem to be a very **prevalent** technique to send **spam**, e.g., compared to botnets

- However, it is important to detect those attacks because hijacking address blocks **hinder traceability** of attackers and can lead to **misattributing** attacks when responding with possibly legal actions!

Perspectives

- Provide an **interface** for network operators to query identified hijacks

- Ongoing **collaboration** with Institut Eurécom (FRA) and TU München (GER) to build a comprehensive system for the detection and investigation of malicious BGP hijacks

Thank you!

Time for Q&A!

Some references

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