Auto-Detecting Hijacked Prefixes?

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Address Hijacking

- Is the unauthorized use of an address prefix as an advertised route object on the Internet
  - It’s not a bogon
    - the address block has been assigned by an RIR for use
  - It may include identity fraud
    - this may involve misrepresentation of identity in order to undertake a database change
  - It’s commonly associated with identity cloaking
    - Spam generation, attack launching platforms, etc

- How prevalent is this?
  - Very hard to isolate hijacking incidents
What is a hijack signature?

- What address blocks would not be noticed if they were used for a short period?
  - Has been unadvertised for a ‘long time’
  - Is used only for a ‘short time’
  - Uses an entirely different origin AS and first hop AS
  - Is not covered by an aggregate announcement

![Diagram showing idle interval and reannouncement interval.]
Data Collections

- Aggregated BGP route collection data
- Can provide information for any prefix:
  - When was this prefix advertised and withdrawn?
  - What was the announcing AS?
  - What was the first hop AS?
  - What other prefixes were also advertised at the same time?
Noise reduction in BGP data

• BGP update logs are unhelpful here
  • The high frequency noise of BGP convergence is different from the longer frequency signal of prefix use through network connectivity and prefix advertisement

• Use successive static BGP snapshots
  • Highest frequency component of 2 hours reduces protocol-induced noise
Initial results

• Readvertisement of prefixes with different Origin AS and First Hop AS
2nd Pass

- Very short window announce
  > 2 months down, < 3 days up, > 1 month down
3rd Pass

- Short window
  > 2 months down, 5 - 14 days up, > 1 month down
Some comments

- Address announcement patterns do not appear to be a reliable hijack indicator in isolation.
  - There is no clear signature in the patterns of prefix appearance that forms a reliable indicator of misuse.

- Address use profiles can assist in the process of identifying address hijacking for suspect prefixes.
  - Additional information is necessary to reliably identify candidate hijack prefixes.

- Careful checking of the provenance of an address before accepting it into the routing system make good sense
  - But thorough checks of a prefix’s history of use as a precondition to accepting it into the local routing session as a valid advertisement consume time and increase an ISPs’ operating overhead costs.
It’s not a very reassuring answer.
Address and Routing Security

The basic routing payload security questions that need to be answered are:

- Is this a valid address prefix?
- Who injected this address prefix into the network?
- Did they have the necessary credentials to inject this address prefix?
- Is the forwarding path to reach this address prefix an acceptable representation of the network’s forwarding state?
Address and Routing Security

What we have today is a relatively insecure system that is vulnerable to various forms of deliberate disruption and subversion.

Address hijacking is just one aspect of the insecurity of the Internet’s routing system.
What I really would like to see...

The use of a public key infrastructure to support attestations that allow automated validation of:

• the **authenticity of the address object** being advertised

• **authenticity of the origin AS**

• the **explicit authority** given from the address to AS that permits a routing announcement
What would also be good...

• If the attestation referred to the address allocation path
  • use of an RIR issued certificate to validate the attestation signature chain

• If the attestation was associated with the route advertisement
  • Such attestations to be carried in BGP as an Update attribute

• If validation these attestations was treated as a route object preference indicator
  • Attestation validation to be a part of the BGP route acceptance process
But…

We are nowhere near where we need to be:

• We need more than “good router housekeeping” – it’s trusting the protocol payload as well as trusting the protocol’s operation and the routing engines

• We need so much more than piecemeal distributed 2nd hand bogon and martian lists, filters and heuristics about use patterns for guessing at ‘bad’ addresses and ‘bad’ routes

• We need to adopt some basic security functions into the Internet’s routing domain:
  • Injection of reliable trustable data
    • Address and AS certificate PKI as the base of validation of network data
  • Explicit verifiable mechanisms for integrity of data distribution
    • Adoption of some form of certification mechanism to support validation of distributed address and routing information
Oh yes, and about address hijacking…

• This type of resource security framework would make address hijacking much harder to perform!
Questions?