BGP Hijacking How-To

- The hijacking AS has
  - Router with BGP session(s)
  - Configured to originate the prefix
- Getting access to the router
  - Network operator makes configuration mistake
  - Disgruntled operator launches an attack
  - Outsider breaks in to the router and reconfigures
- Getting other ASes to believe bogus route
  - Neighbor ASes do not discard the bogus route
  - E.g., not doing protective filtering

YouTube Outage: Feb 24, 2008

- YouTube (AS 36561) owns 208.65.152.0/22
- Pakistan Telecom (AS 17557)
  - Government order to block access to YouTube
  - Announces 208.65.153.0/24 to PCCW (AS 3491) who shares it with the world
  - All packets to YouTube get routed to Pakistan
- 20 minutes later AS36561 (YouTube) starts announcing 208.65.153.0/24.
  - With two identical prefixes in the routing system, BGP policy rules, such as preferring the shortest AS path, determine which route is chosen. This means that AS17557 (Pakistan Telecom) continues to attract some of YouTube's traffic.
- 11 minutes later AS36561 (YouTube) starts announcing 208.65.153.128/25 and 208.65.153.0/25.
  - **WHY?**
- Mistakes were made
  - AS 17557: announce to everyone, not just customers
  - AS 3491: not filtering routes announced by AS 17557
- Lasted 100 minutes for some, 2 hours for others

https://www.ripe.net/publications/news/industry-developments/youtube-hijacking-a-ripe-ncc-ris-case-study

Another Example: SPAM

- Spammers sending spam
  - Form a (bidirectional) TCP connection to mail server
  - Send a bunch of spam e-mail, then disconnect
- But, best not to use your real IP address
  - Relatively easy to trace back to you
- Could hijack someone's address space
  - But you might not receive all the (TCP) return traffic
- How to evade detection
  - Hijack unused (i.e., unallocated) address block and forge the correct ASN
  - Temporarily use the IP addresses to send your spam
- Profit $$$

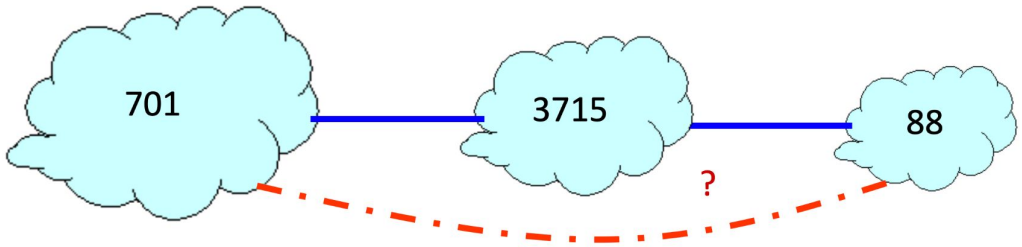
BGP's (terrible) security

#1 BGP does not validate the origin of advertisements

#2 BGP does not validate the content of advertisements

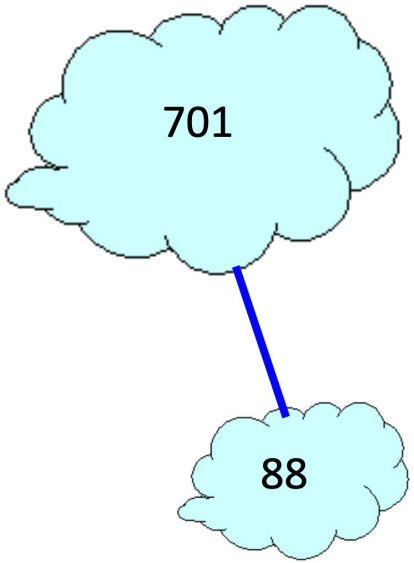
Bogus AS paths

- Remove ASes from the AS path
  - E.g., turn “701 3715 88” into “701 88”
- Motivations
  - Attract sources that normally try to avoid AS 3715
  - Help AS 88 look like it is closer to the Internet’s core
- Who can tell that this AS path is a lie?
  - Maybe AS 88 does connect to AS 701 directly



Bogus AS paths

- Add ASes to the path
  - E.g., turn “701 88” into “701 3715 88”
- Motivations
  - Trigger loop detection in AS 3715
    - Denial-of-service attack on AS 3715
    - Or, blocking unwanted traffic coming from AS 3715
  - Make your AS look like is has richer connectivity
- Who can tell the AS path is a lie?
  - AS 3715 could, if it could see the route
  - AS 88 could, but would it really care?

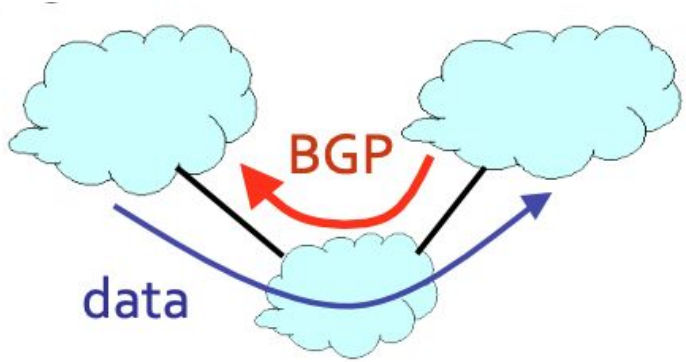


Bogus AS paths

- Adds AS hop(s) at the end of the path
  - E.g., turns “701 88” into “701 88 3”
- Motivations
  - Evade detection for a bogus route
  - E.g., by adding the legitimate AS to the end
- Hard to tell that the AS path is bogus…
  - Even if other ASes filter based on prefix ownership

Invalid paths

- AS exports a route it shouldn’t
  - AS path is a valid sequence, but violated policy
- Example: customer misconfiguration
  - Exports routes from one provider to another
- Interacts with provider policy
  - Provider prefers customer routes
  - Directing all traffic through customer
- Main defense
  - Filtering routes based on prefixes and AS path



S-BGP: Secure BGP

- Address attestations
  - Claim the right to originate a prefix
  - Signed and distributed out-of-band
  - Checked through delegation chain from ICANN
- Route attestations
  - Distributed as an attribute in BGP update message – Signed by each AS as route traverses the network
- S-BGP can validate
  - AS path indicates the order ASes were traversed – No intermediate ASes were added or removed

S-BGP challenges

- Complete, accurate registries of prefix “owner”
- Public Key Infrastructure
  - To know the public key for any given AS
- Cryptographic operations
  - E.g., digital signatures on BGP messages
- Need to perform operations quickly
  - To avoid delaying response to routing changes
- Difficulty of incremental deployment – Hard to have a “flag day” to deploy S-BGP