BGP protection without global cooperation

Josh Karlin[1] Stephanie Forrest[1,2] Jennifer Rexford[3]

[1]University of New Mexico

[2]Santa Fe Institute

[3]Princeton University

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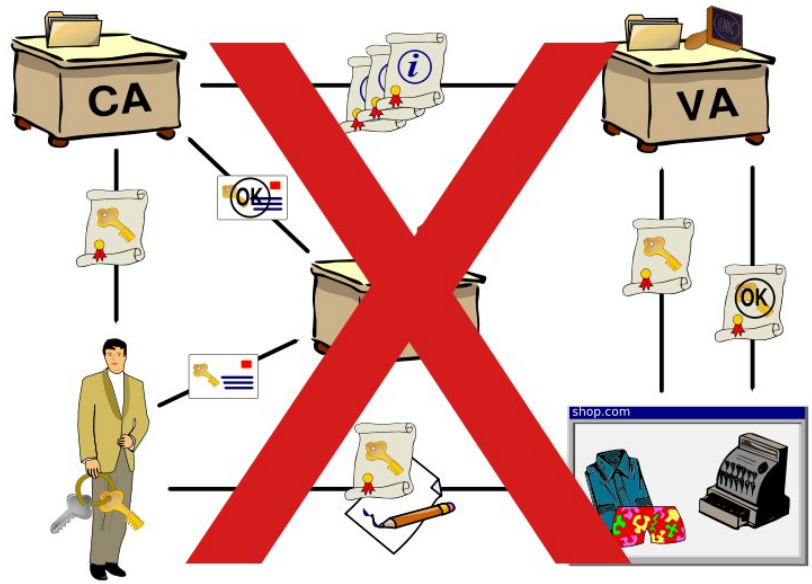
Last time... Pretty Good BGP (PGBGP)

- Autonomous security for autonomous systems
  - No PKI
  - No sensitive network information revealed
  - Immediate protection for early adopters

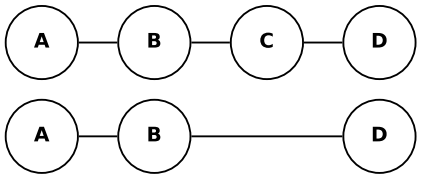


Last time... Pretty Good BGP (PGBGP)

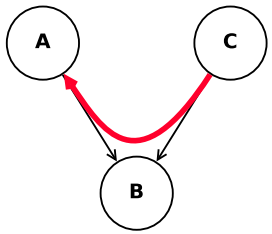
- Hijack detection
  - Routes with new origin ASes for a prefix are suspicious
- Notification
  - Internet Alert Registry
  - Notifies affected operators of suspicious routes
  - http://iar.cs.unm.edu
- Router alteration
  - Temporarily depreferences suspicious routes
  - Prevents the propagation of hijacks while notified operators intervene

PGBGP was vulnerable to malicious adversaries

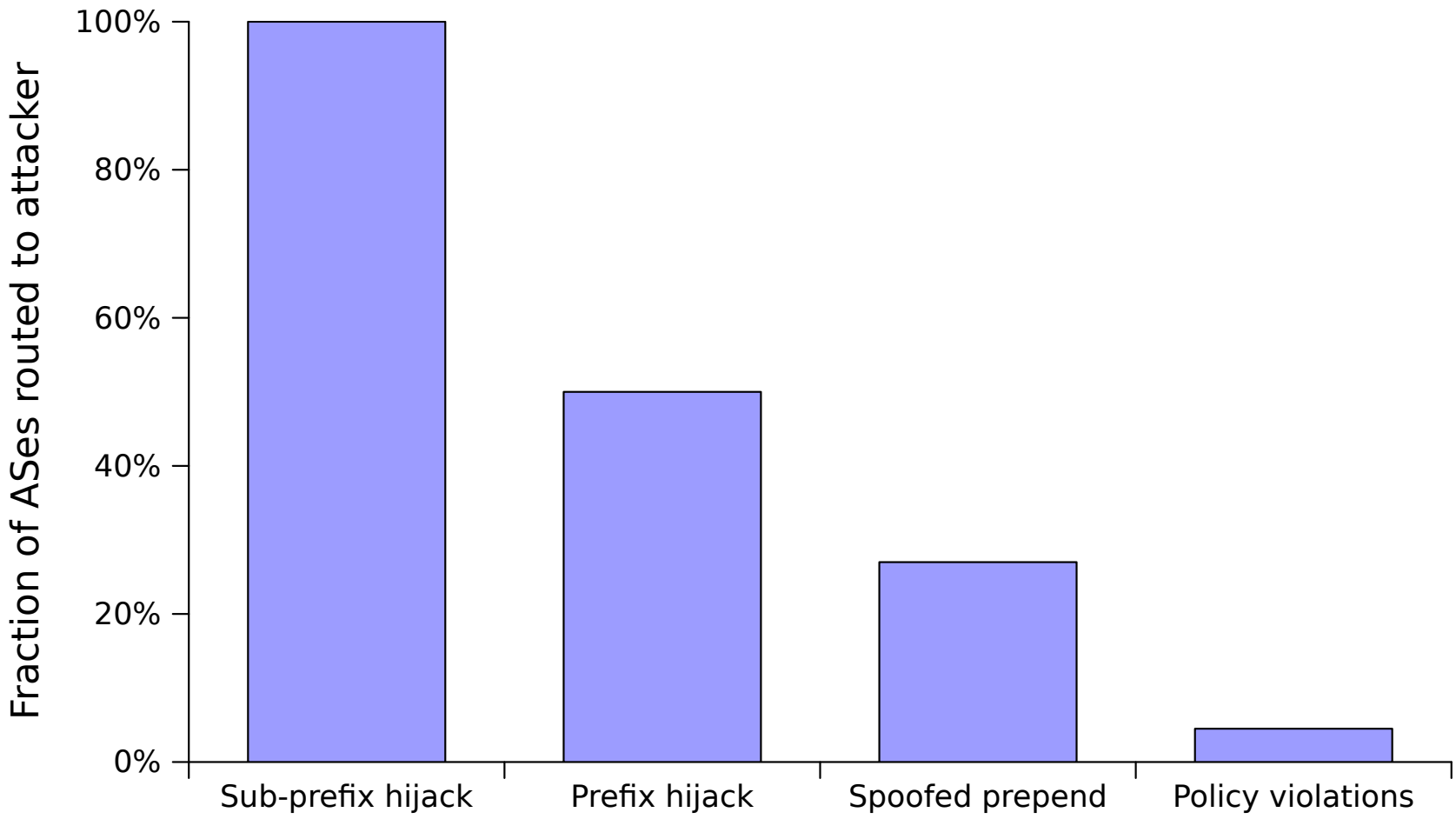
- Adversary could use spoofed edges (e.g. prepend legitimate origin to path)



- Adversary could announce a path which violates contractual policy



Impact of exploits and misconfigurations

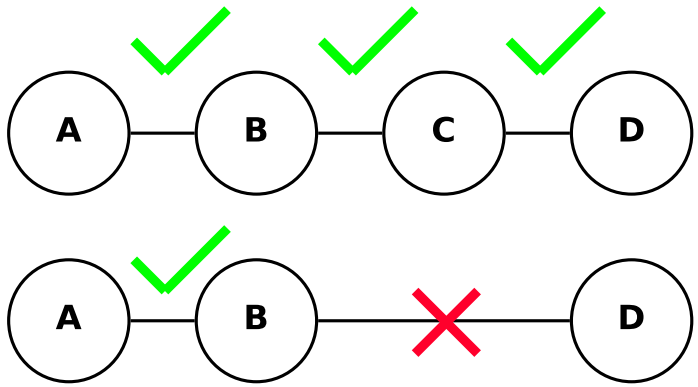


Pretty Good BGP today

- Detection
  - Hijacks, spoofed edges, and policy violations
- Internet Alert Registry
  - True positive only notification
- Router alteration
  - Implementation in the works, for Quagga/Zebra

Enhancements to detection algorithm

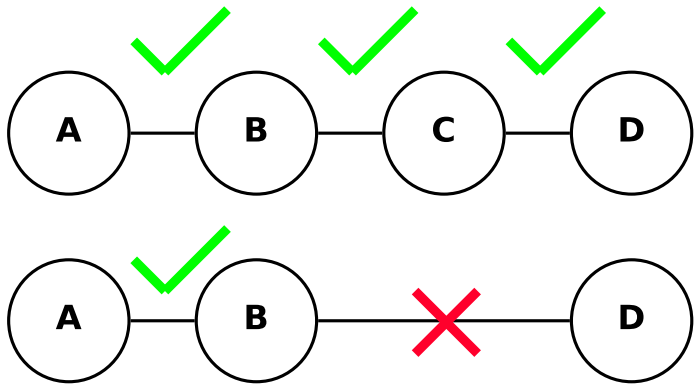
- Detecting spoofed edges is easy
  - Monitor edges in use, flag new edges as suspicious



- In response, lower the local preference for 24 hours

Enhancements to detection algorithm

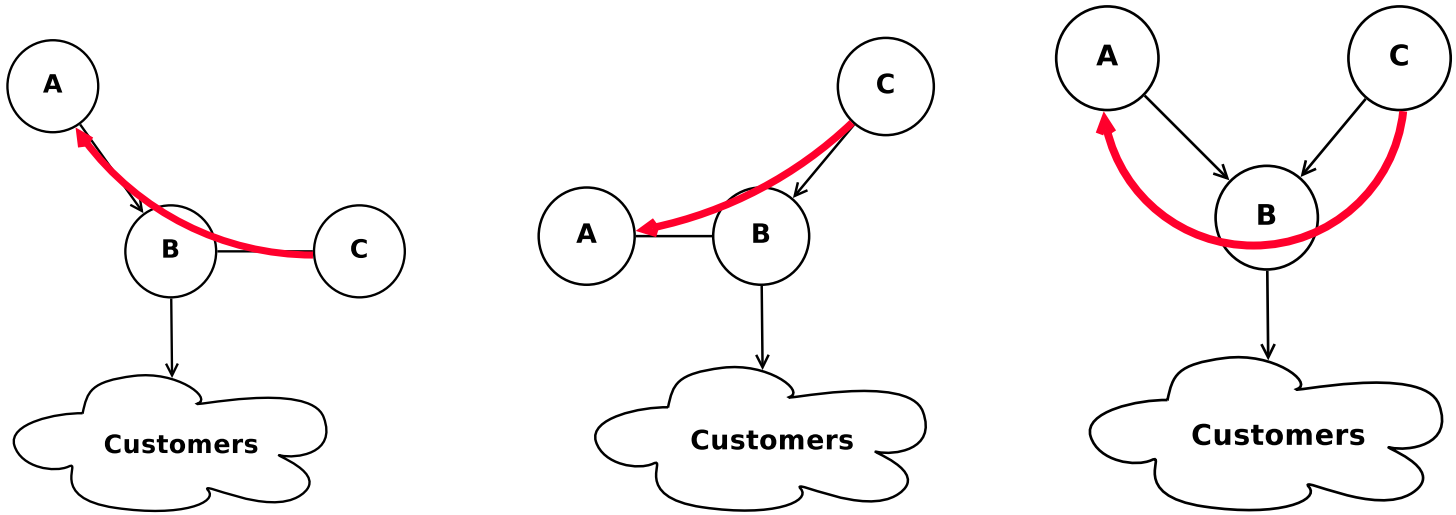
- Detecting spoofed edges is easy
  - Monitor edges in use, flag new edges as suspicious



- In response, lower the local preference for 24 hours
- This can also detect policy violations!

Policy violations produce new edges

- Provider edges should only be seen by customers
  - Only customers of B should see DIRECTED edge (B,C)
- Peer edges should only be seen by customers
  - Only customers of B should see DIRECTED edge (B,C)



The Internet Alert Registry

- http://iar.cs.unm.edu/
- Runs the PGBGP algorithm on public BGP feeds
- Two methods of receiving alerts
  - Email alerts for AS numbers of your interest 
  - RSS feed of alerts 

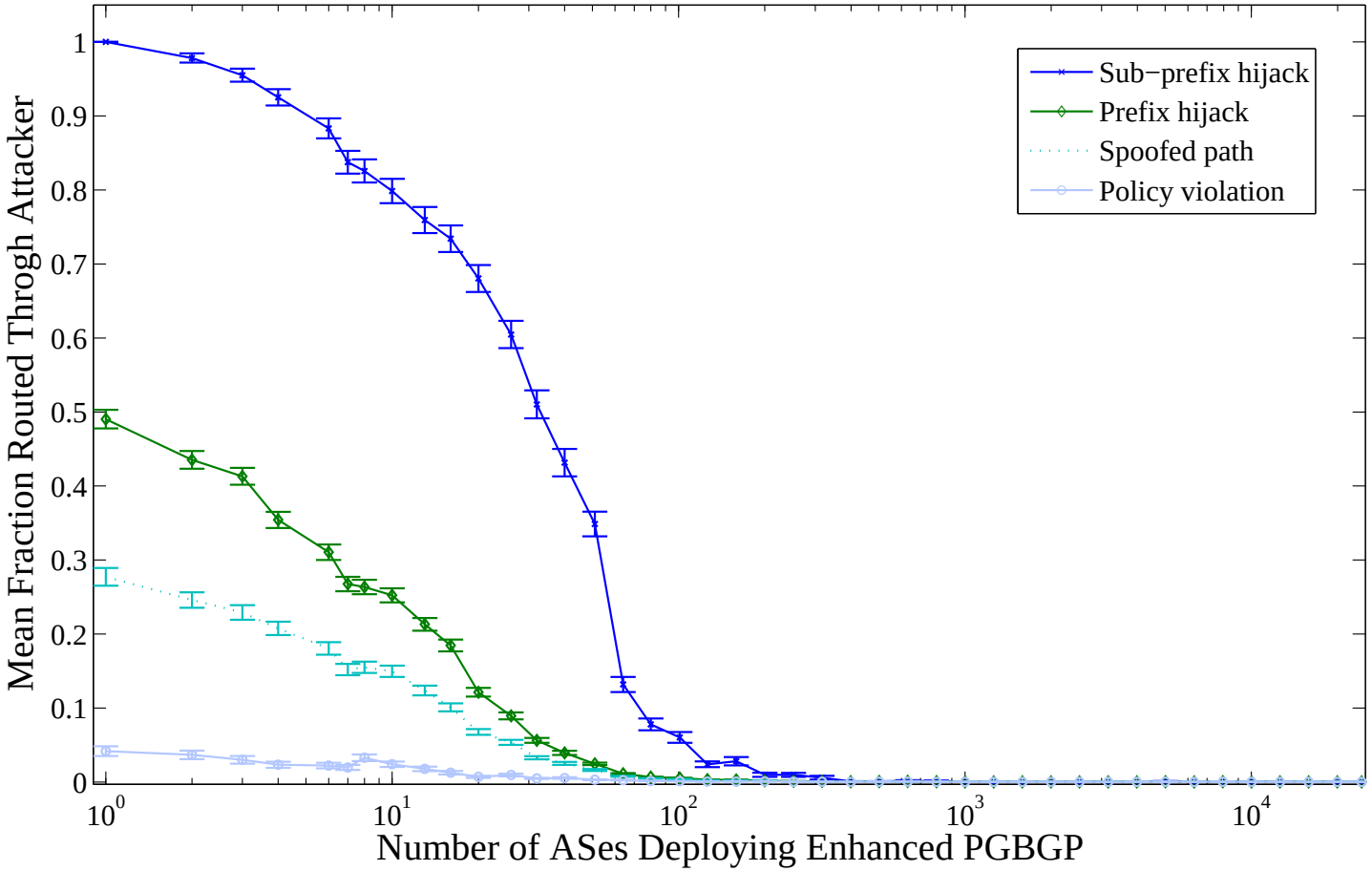
IAR Tracker

- We have created a program (the IAR Tracker) that will regularly scan the IAR RSS feed and compare it to your network's topology database
  - Programatically check for new alerts that pertain to your network
  - Filter out all but true positive alerts
  - Without revealing any network information!

Evaluation

- Is it effective?
- Are there a lot of false positives?
- How will false positives affect my network?

Would a partial deployment be effective?

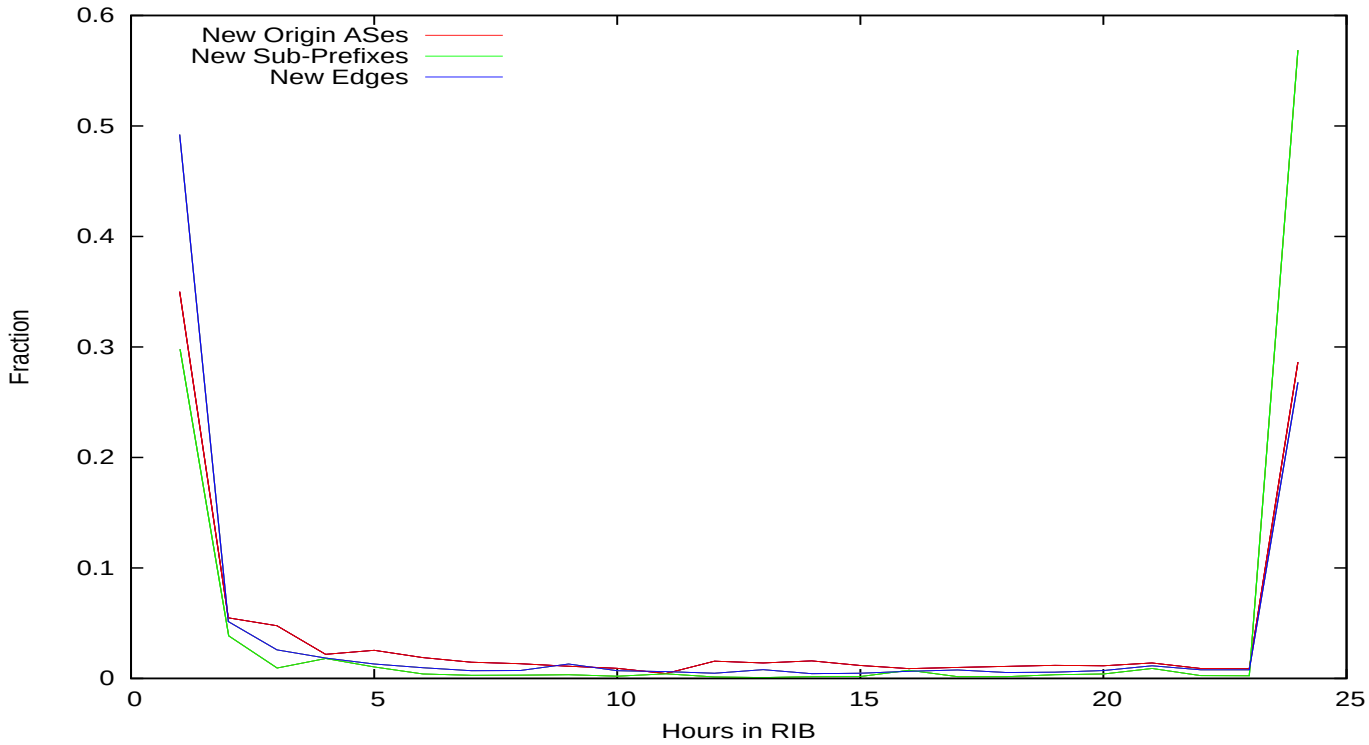


Are there a lot of false positives?

- Yes
- The IAR discovers ~200 anomalies per day, some could be false

How will false positives affect my network?

- Reachability is not lost!
  - Suspicious routes are depreferenced, not discarded
- Many false positives are brief (e.g. due to flaps)



Conclusions

- It is possible to protect networks without global cooperation
    - Simple anomaly detector coupled with a soft, but effective, response mechanism
- The IAR is ready for testing now
- Prototype router implementation available soon
    - The University of New Mexico ITS is helping to test the routing implementation
    - Additional help would be appreciated

Thank you!

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http://iar.cs.unm.edu/