



# Investigating AS112 Routing and New Server Discovery

Evan Wright  
Sept 24, 2008



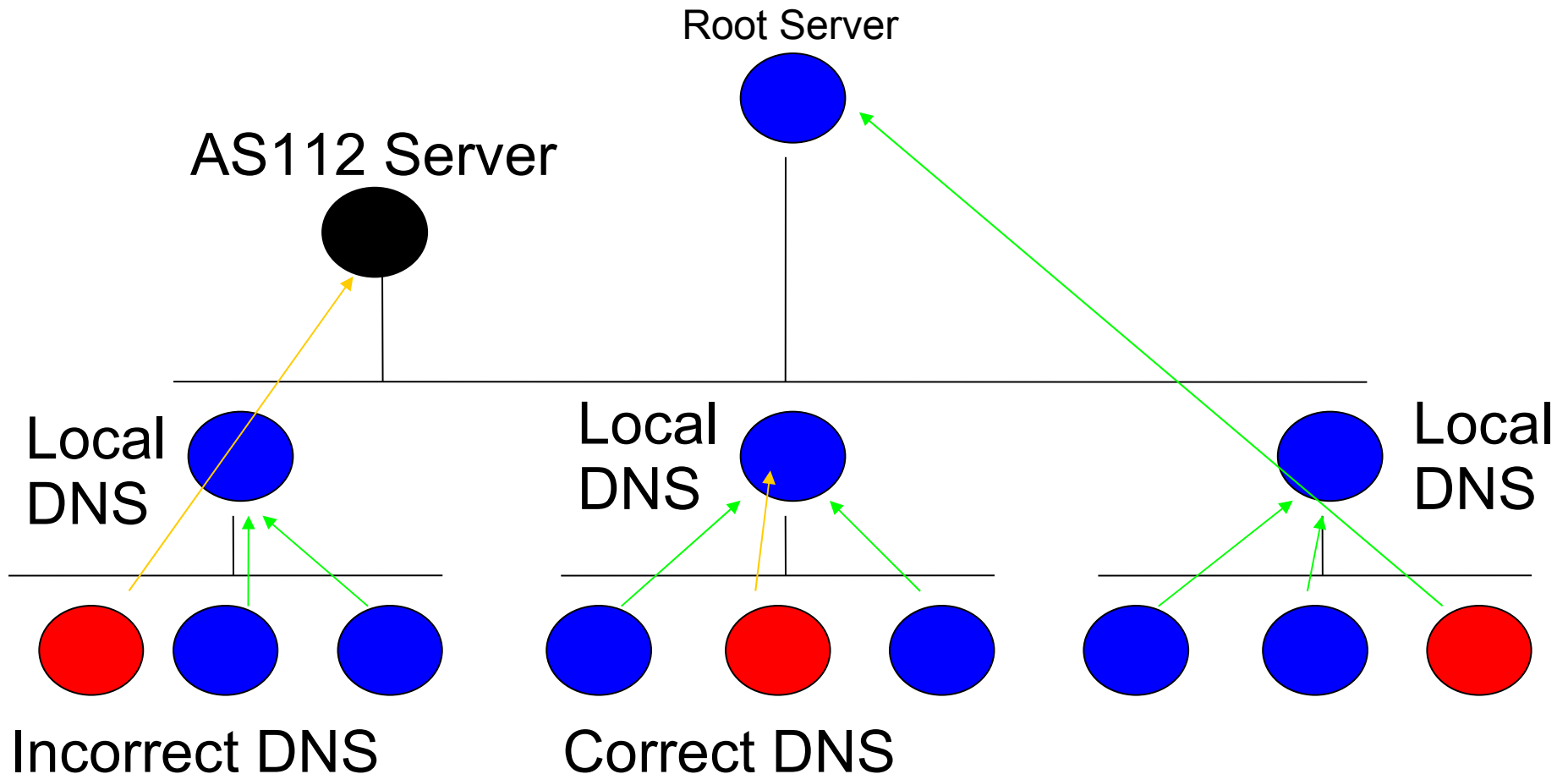
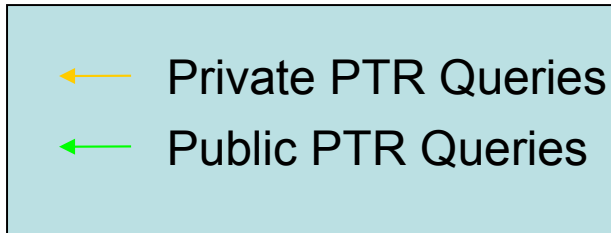
# AS112

---

In case AS112 doesn't matter to you, why care?

- One of few anycast implementations
  - We don't know a lot about how anycast works in practice
  - You haven't seen the routes of where they go intermediately
  - You haven't seen route that are not going to your DNS server/  
packet sniffers
- IPv6 will use anycast much more extensively
  - IPv4 anycast is possibly a pseudo-anycast, but I refer to it as  
the same

# Purpose of AS112



# Agenda

---

2. AS112 Behavior
4. Benefits of Deploying AS112 Server
6. Discovering New AS112 Servers

8.





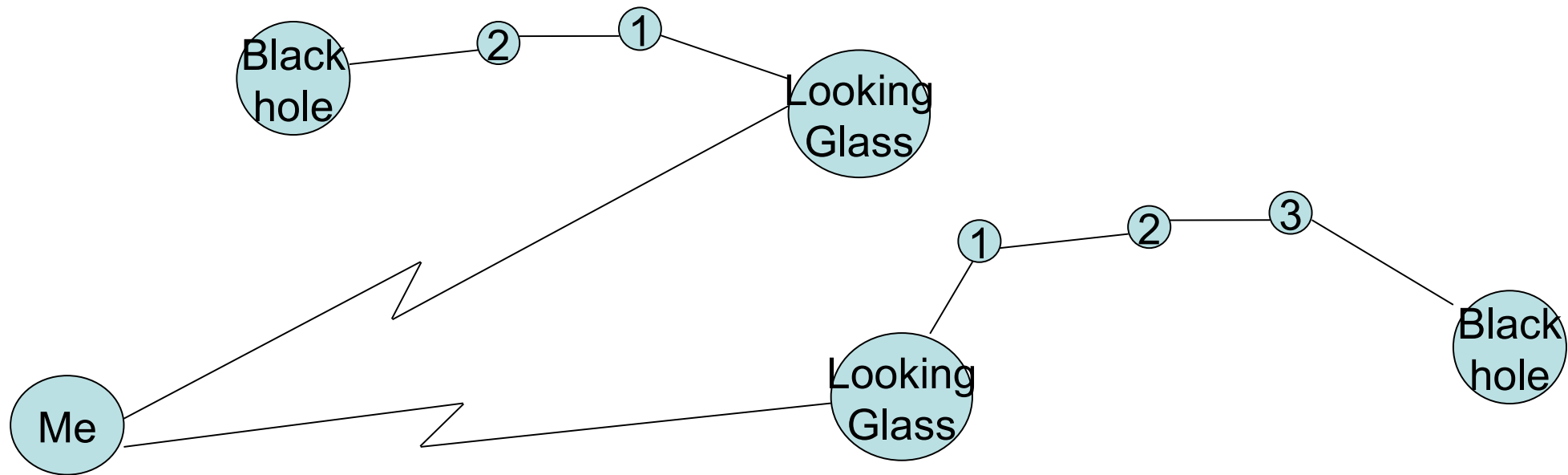
## AS112 Behavior



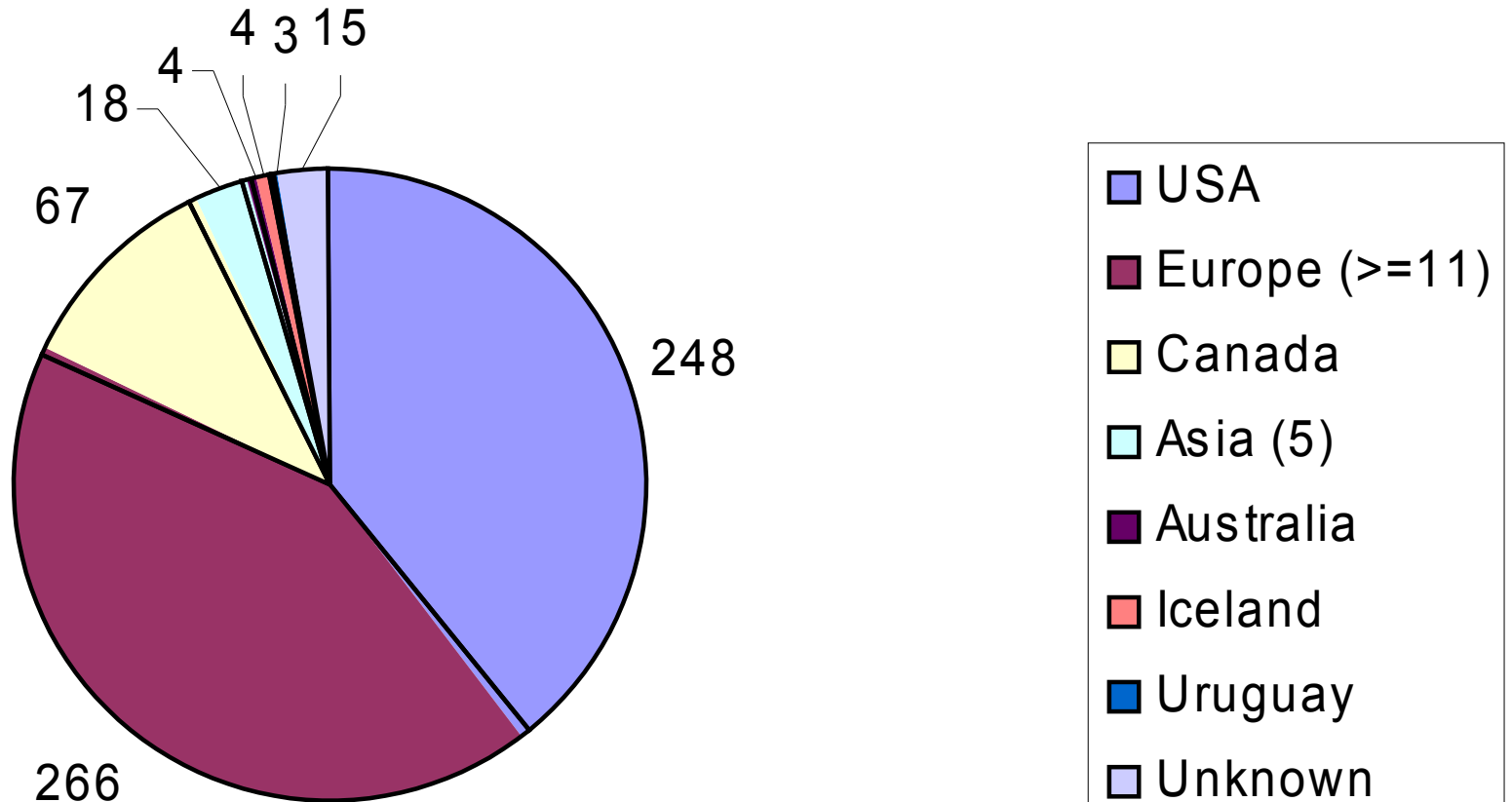
# Method to the Madness

---

- Obtain list of publicly accessible nodes
- Have them traceroute the special anycast address for blackholes - *192.175.48.0/24*



# April Sample Sources by Country



# Destination Countries, Origin= US

---

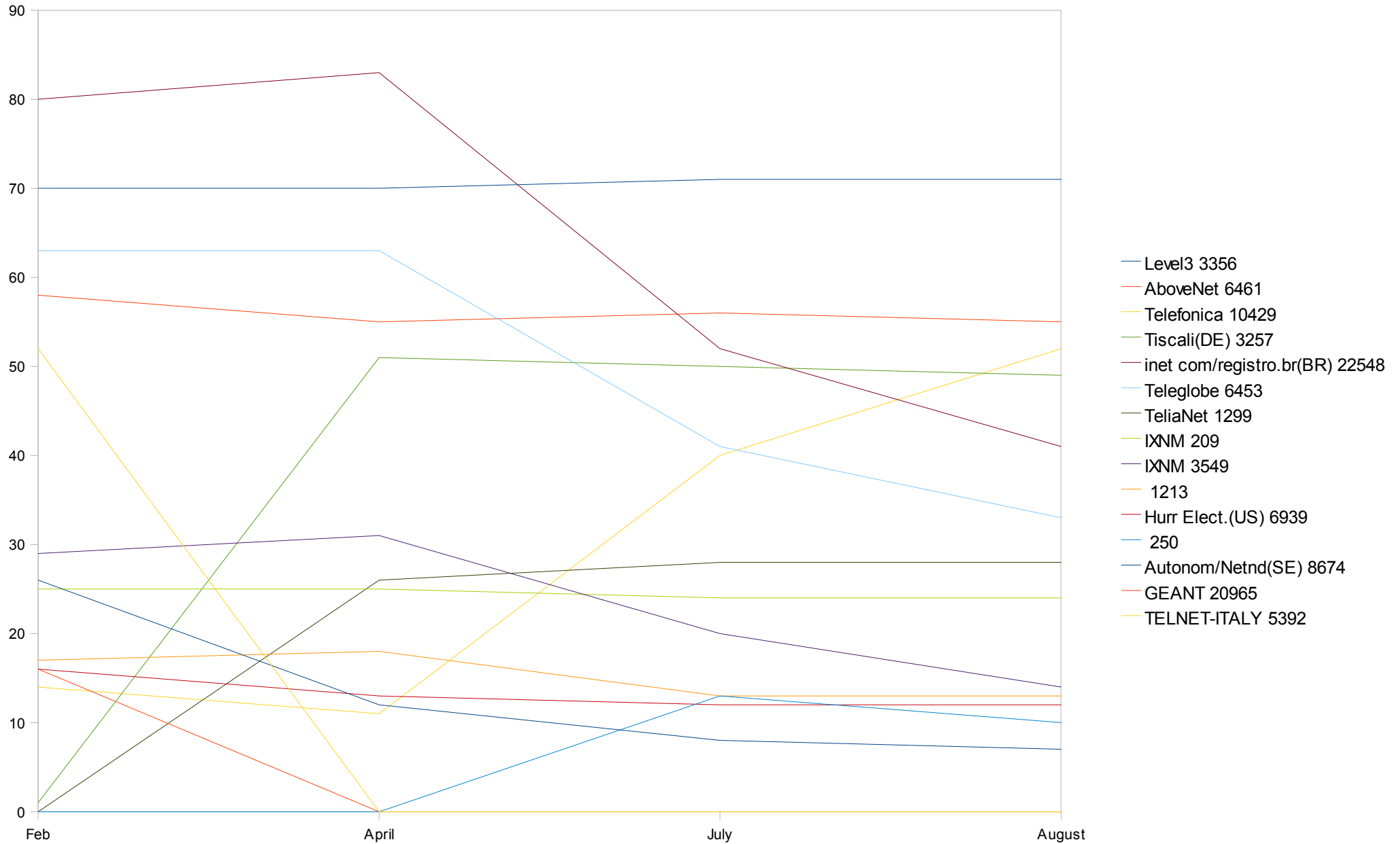
Most routes that originated in the US, terminated in the US

Brazil	22
Italy*	8
Bulgaria*	3
China	1
England	1
Ireland	1
Pakistan*	1
Netherlands	1
Sweden	1
Total	39

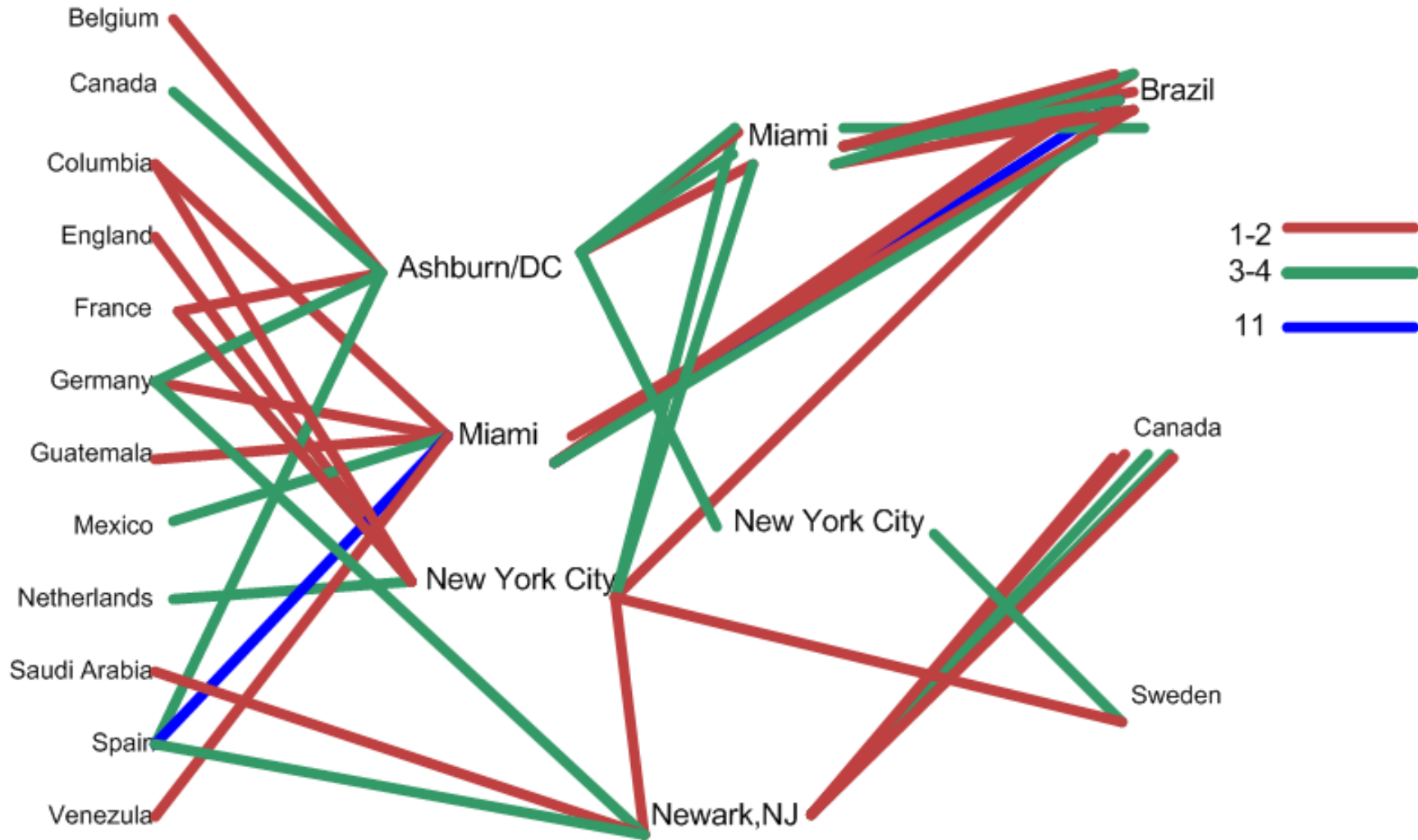
\* Last hop country can't be accurately inferred. Country displayed is n-1 hop



# Volatility



# USA as Transit (April)





## **Benefits of Deploying an AS112 Server**



---

# Behavior of anycast is determined by Routing policy

- Trade secret?
- Learning Anycast behavior == learning routing policy

## AS112 Myths

- Best route
- AS112 queries are garbage (security)

# Strange Routing Behavior in April

---

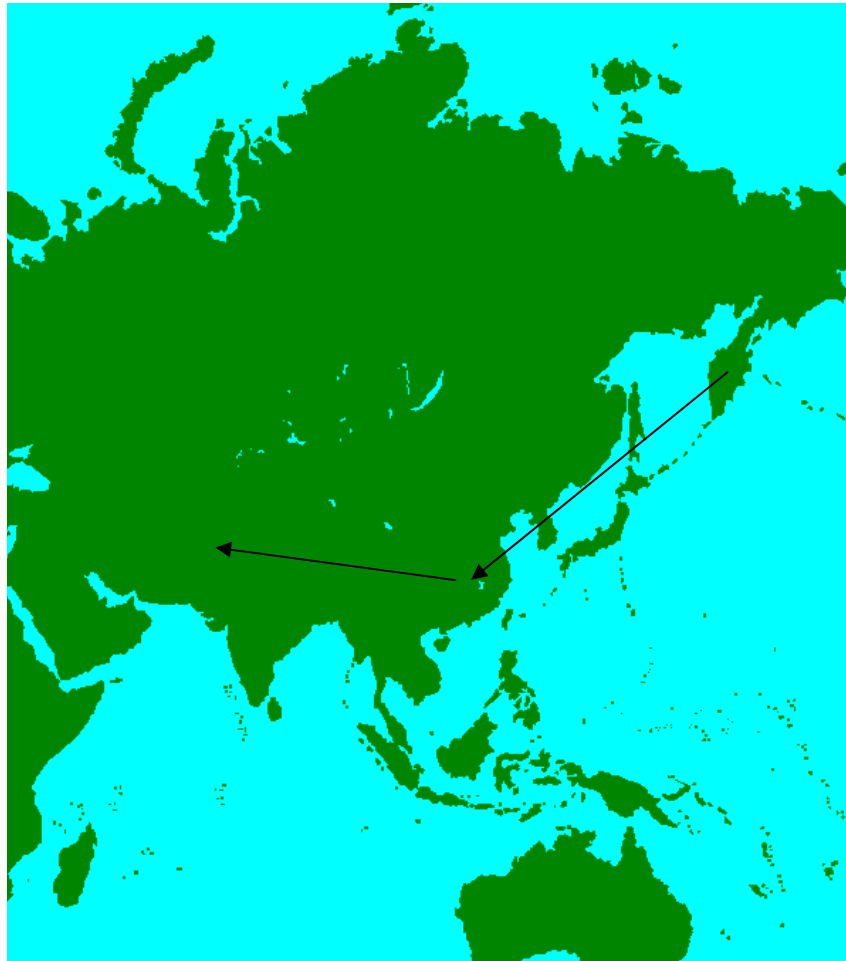
China -> Italy



# Strange Routing Behavior in April

---

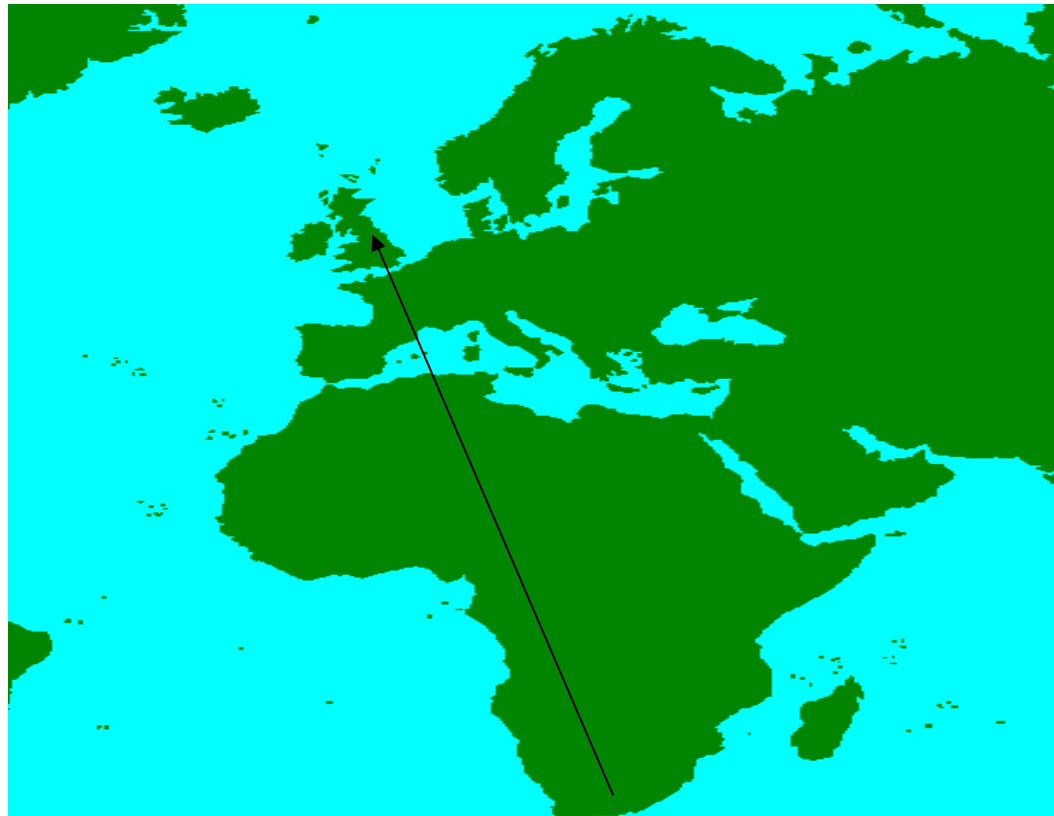
Japan->China->Pakistan -> ?



# Strange Routing Behavior in April

---

South Africa-> England



# Strange Routing Behavior in April

---

Iceland->Italy





# Strange Routing Behavior in April

---

Argentina -> Mexico -> Brazil

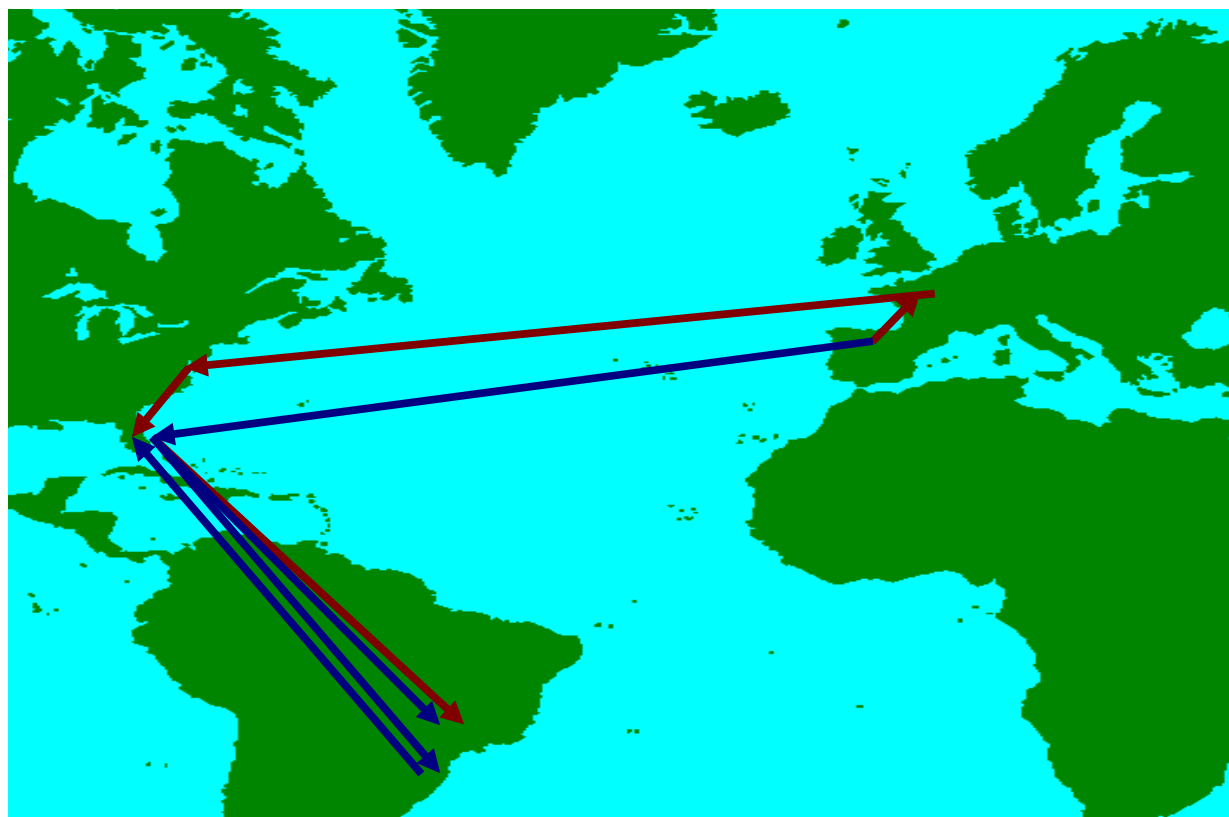


# Strange Routing Behavior in April

---

FE0-1-grrmadtc1.red.telefonica-wholesale.net

April  
August



# TeleGlobe / TATA, > 1 AS112

## Two AS112 Blackholes

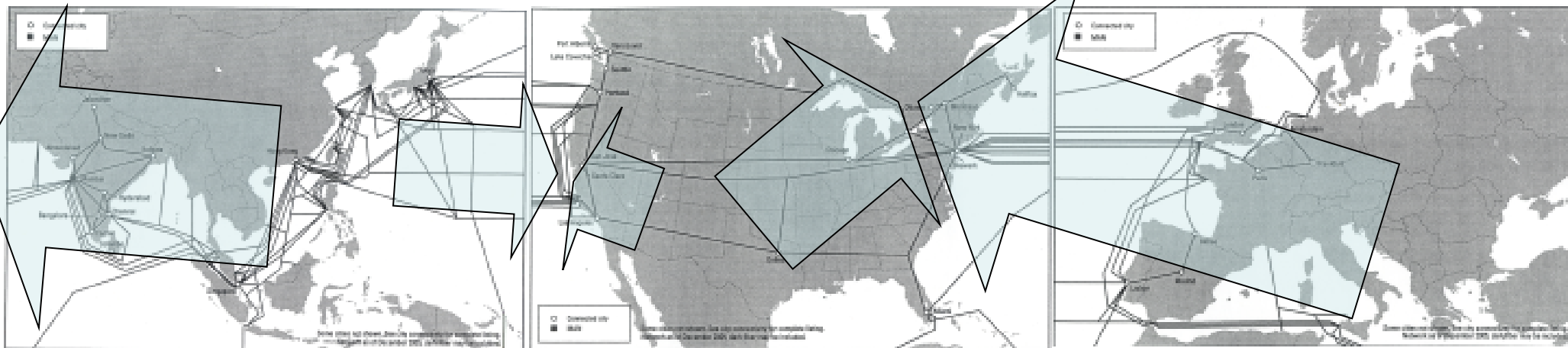
- Toronto, Canada
- Palo Alto, CA, USA

## Most Traffic goes to Canada

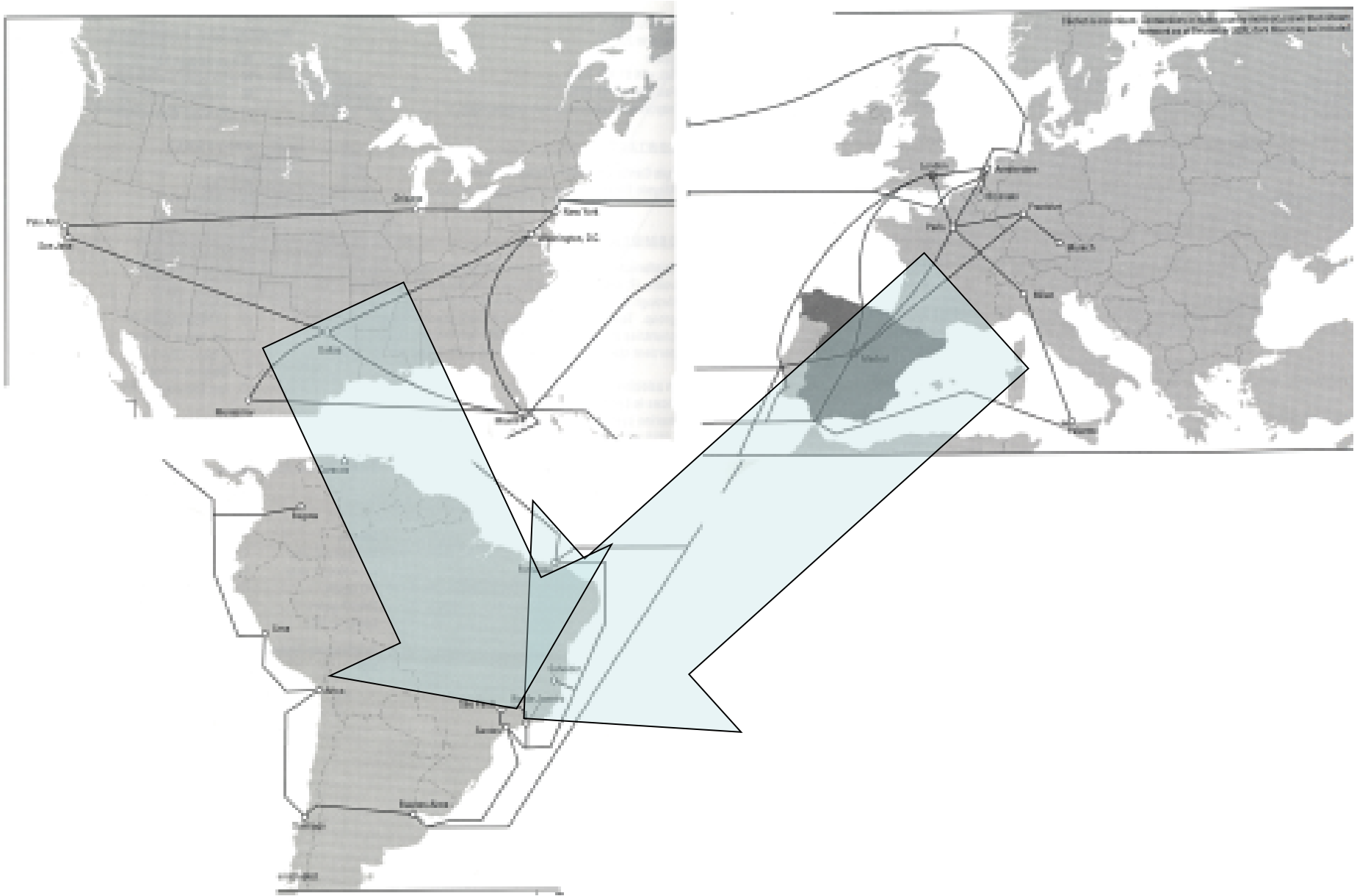
- Africa, Europe, Mid-East, Western SE Asia, Most USA

## A little traffic goes to Palo Alto

- Eastern SE Asia, Far Eastern Asia, Far Western US



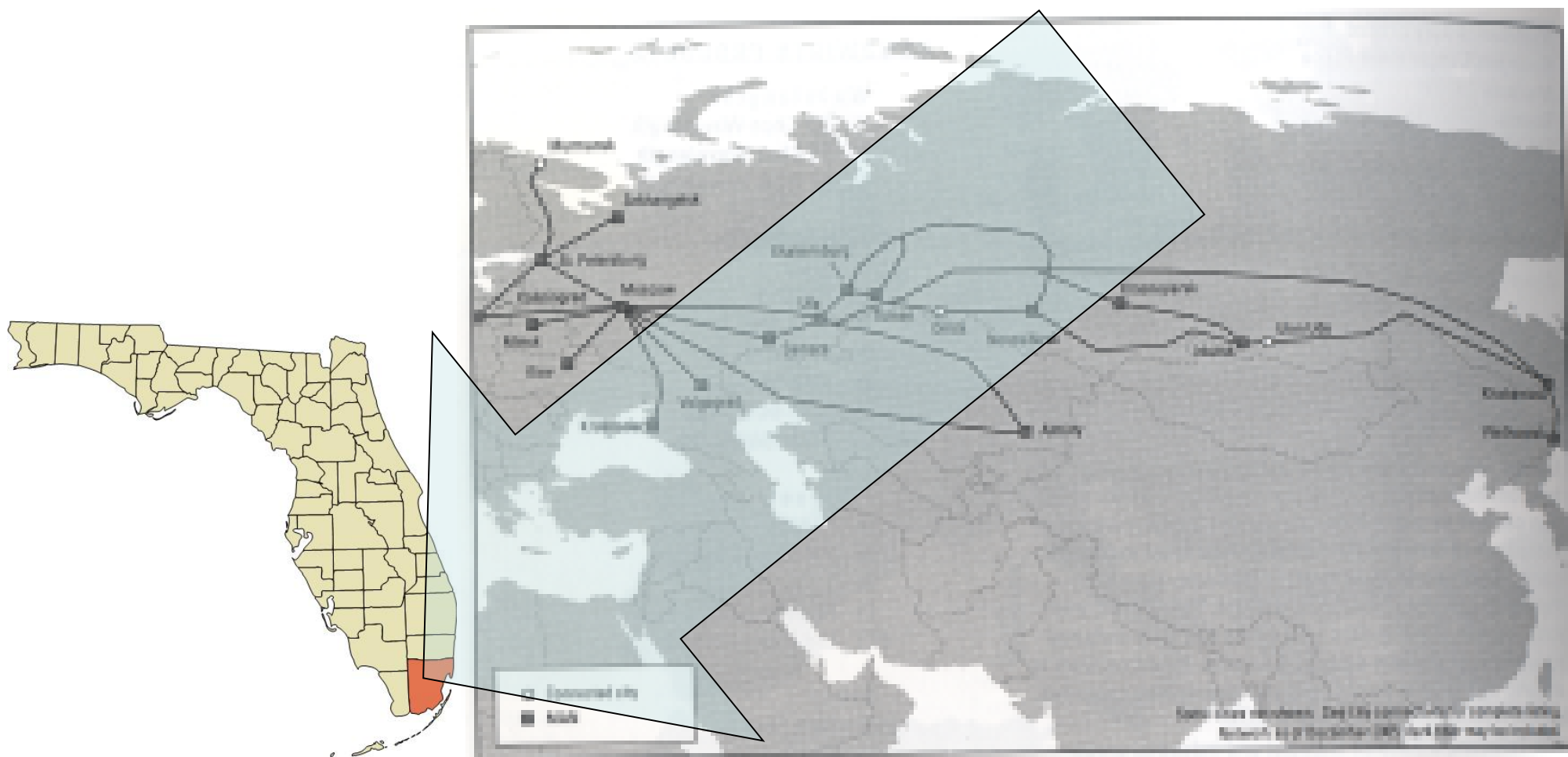
# Telefonica, 1 AS112 Server



# Corbina – 0 AS112 Servers

AKA Golden Telecom, the Largest ISP in Russia

100% of tested nodes send AS112 data to Miami via Level3



# AS112 Myths

---

## Best Route?

- Reflect routing topology
- Some ASes aren't aware of AS112
- Avg route length was 6.94/8.02 hops from LG/RS

## Junk?

- PTR queries hold internal (pre-NAT) IP & hostname
- You never know who will be sending you data

Conclusion: Consider a local AS112 server



## Discovering New AS112 Servers



# Blackhole Registration

---

54 Registered/publicly known AS servers

42 With Geographic Data

<i>Who</i>	<i>Where</i>	<i>Unicast</i>	<i>Transit AS</i>
Internet Software Consortium	CA, US	204.152.184.241-242	3557 and/or 1280
Abovenet Communications, Inc	?	?	3557, via 6461
Accretive Technology Group, Inc.	?	?	3557, via 11608
Afilias	?	?	12041
ASP Networks	Dorset, UK	193.178.223.33	20538
Autonomica	Stockholm, SE	192.36.144.115	8674
...	...	...	...



# Probable Discovered Blackholes

---

218 of 591 routes went to an unregistered blackhole

- 71 go to AS# 3356 operated by Level 3 (Miami)
- 54 go to AS# 5392 operated by Telnet-Italy
- 17 go to AS# 1213 operated by HEAnet
  - Ireland Educational Network
- 16 go to AS# 20965 operated by GEANT
  - Europe-wide Educational Network
- 14 go to AS# 10429 operated by Telefonica ISP (Brazil)
- There were more

# Things Anycast teaches us

---

## Evaluates routing policy

- Harder to keep this secret
- If it doesn't go to your anycast node you don't know where it is going
- Traffic may unnecessarily traverse International/ ISP trunk links to stay in ISP

If any of this bothers you setup your own AS112

# The End

---

Thanks

- [ewright@cert.org](mailto:ewright@cert.org)