# Where are we with Securing Addressing and Routing?

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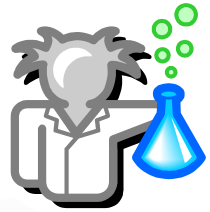
Chief Scientist, APNIC



# On the Internet…

# …there are many ways to be bad!

# An Ascending Scale of Badness

- Port Scan for known exploits

  General annoyance

- Spew spam

  Yes, there are still gullible folk out there!

- Mount a fake web site attack

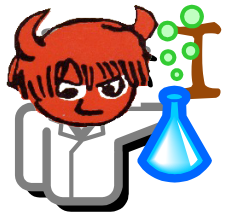
  And lure victims

- Enlist a bot army and mount multi-gigabit DOS attacks

  Extortion leverage and general mayhem

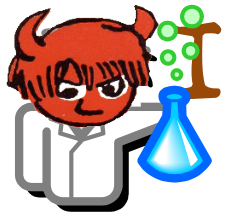
- Mount a routing attack

  And bring down an entire region / country / global network!



# If I were really bad (and evil)…

I'd attack routing.



# If I were really bad (and evil)…

- Through routing I'd attack:
  - the DNS root system
  - isolate critical public servers and resources
  - overwhelm the routing system with spurious information

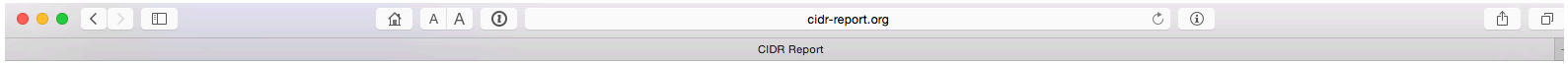
And bring selected parts of the network to a complete chaotic halt!

# How many advertisements in today's BGP are "lies"?

We've all heard of the "YouTube" route hijack, and similar incidents of injecting false information into the routing system.

But the situation is a little more mundane than a few isolated high profile incidents - who uses addresses and AS numbers that are not registered as "in use" in our Internet number registry system?

# www.cidr-report.org




## Possible Bogus Routes and AS Announcements

### Possible Bogus Routes

| Prefix | Origin AS | AS Description | Unallocated block |
|---|---|---|---|
| 5.100.241.0/24 | AS199573 | -Reserved AS-,ZZ | 5.100.240.0 - 5.100.247.255 |
| 23.92.160.0/24 | AS14013 | EPSON-ROBOTS - EPSON America (Factory Automation/Robotics),US | 23.92.160.0 - 23.92.175.255 |
| 23.92.161.0/24 | AS14013 | EPSON-ROBOTS - EPSON America (Factory Automation/Robotics),US | 23.92.160.0 - 23.92.175.255 |
| 23.252.224.0/20 | AS62502 | -Reserved AS-,ZZ | 23.252.224.0 - 23.252.239.255 |
| 23.252.224.0/21 | AS62502 | -Reserved AS-,ZZ | 23.252.224.0 - 23.252.239.255 |
| 23.252.232.0/21 | AS62502 | -Reserved AS-,ZZ | 23.252.224.0 - 23.252.239.255 |
| 24.231.96.0/24 | AS21548 | MTO - MTO Telecom Inc.,CA | 24.231.96.0 - 24.231.111.255 |
| 27.100.7.0/24 | AS56096 | | 27.100.4.0 - 27.100.7.255 |
| 31.217.248.0/21 | AS44902 | COV-ASN COVAGE NETWORKS SASU,FR | 31.217.248.0 - 31.217.255.255 |
| 37.16.88.0/23 | AS57652 | -Reserved AS-,ZZ | 37.16.88.0 - 37.16.95.255 |
| 41.73.1.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.10.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.11.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.12.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.13.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.15.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.16.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.18.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.20.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.73.21.0/24 | AS37004 | -Reserved AS-,ZZ | 41.73.0.0 - 41.73.31.255 |
| 41.76.48.0/21 | AS36969 | MTL-AS,MW | 41.76.48.0 - 41.76.55.255 |
| 41.78.180.0/23 | AS37265 | -Reserved AS-,ZZ | 41.78.180.0 - 41.78.183.255 |
| 41.189.96.0/20 | AS37000 | -Reserved AS-,ZZ | 41.189.96.0 - 41.189.159.255 |
| 41.189.127.0/24 | AS37000 | -Reserved AS-,ZZ | 41.189.96.0 - 41.189.159.255 |
| 41.189.128.0/24 | AS37000 | -Reserved AS-,ZZ | 41.189.96.0 - 41.189.159.255 |
| 41.191.108.0/22 | AS37004 | -Reserved AS-,ZZ | 41.191.108.0 - 41.191.115.255 |
| 41.191.108.0/24 | AS37004 | -Reserved AS-,ZZ | 41.191.108.0 - 41.191.115.255 |
| 41.191.109.0/24 | AS37004 | -Reserved AS-,ZZ | 41.191.108.0 - 41.191.115.255 |
| 41.191.110.0/24 | AS37004 | -Reserved AS-,ZZ | 41.191.108.0 - 41.191.115.255 |
| 41.191.111.0/24 | AS37004 | -Reserved AS-,ZZ | 41.191.108.0 - 41.191.115.255 |
| 41.223.208.0/22 | AS37000 | -Reserved AS-,ZZ | 41.223.208.0 - 41.223.211.255 |
| 41.242.152.0/22 | AS37558 | LITC,LY | 41.242.152.0 - 41.242.159.255 |
| 41.242.156.0/22 | AS37558 | LITC,LY | 41.242.152.0 - 41.242.159.255 |
| 62.122.74.0/23 | AS5577 | ROOT root SA,LU | 62.122.72.0 - 62.122.79.255 |
| 64.18.128.0/24 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 64.18.128.0 - 64.18.159.255 |
| 64.25.16.0/23 | AS19535 | -Reserved AS-,ZZ | 64.25.16.0 - 64.25.31.255 |
| 64.25.20.0/24 | AS19535 | -Reserved AS-,ZZ | 64.25.16.0 - 64.25.31.255 |
| 64.25.21.0/24 | AS19535 | -Reserved AS-,ZZ | 64.25.16.0 - 64.25.31.255 |
| 64.25.22.0/24 | AS19535 | -Reserved AS-,ZZ | 64.25.16.0 - 64.25.31.255 |
| 64.25.24.0/23 | AS19535 | -Reserved AS-,ZZ | 64.25.16.0 - 64.25.31.255 |
| 64.25.27.0/24 | AS7046 | RFC2270-UUNET-CUSTOMER - MCI Communications Services, Inc. d/b/a Verizon Business,US | 64.25.16.0 - 64.25.31.255 |
| 64.25.28.0/23 | AS19535 | -Reserved AS-,ZZ | 64.25.16.0 - 64.25.31.255 |
| 64.44.0.0/16 | AS46879 | -Reserved AS-,ZZ | 64.44.0.0 - 64.44.255.255 |
| 64.112.0.0/17 | AS46879 | -Reserved AS-,ZZ | 64.112.0.0 - 64.112.191.255 |
| 64.112.128.0/18 | AS46879 | -Reserved AS-,ZZ | 64.112.0.0 - 64.112.191.255 |
| 64.140.128.0/18 | AS7385 | INTEGRATELECOM - Integra Telecom, Inc.,US | 64.140.128.0 - 64.140.191.255 |
| 64.187.208.0/24 | AS174 | COGENT-174 - Cogent Communications,US | 64.187.208.0 - 64.187.223.255 |
| 65.75.216.0/23 | AS10494 | AAI - Accurate Automation, Inc.,US | 65.75.192.0 - 65.75.223.255 |
| 65.75.217.0/24 | AS10494 | AAI - Accurate Automation, Inc.,US | 65.75.192.0 - 65.75.223.255 |
| 65.111.1.0/24 | AS32258 | SDNGLOBAL - SDN Global,US | 65.111.0.0 - 65.111.31.255 |
| 66.180.64.0/21 | AS32558 | ZEUTER - Zeuter Development Corporation,CA | 66.180.68.0 - 66.180.79.255 |

# and…


| | | | |
|---|---|---|---|
| 66.187.240.0/20 | AS14552 | ACS-SOUTHEASTDATACENTER - Affiliated Computer Services, Inc.,US | 66.187.240.0 - 66.187.255.255 |
| 66.205.224.0/19 | AS16526 | BIRCH-TELECOM - Birch Telecom, Inc.,US | 66.205.224.0 - 66.205.255.255 |
| 66.251.128.0/24 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 66.251.133.0/24 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 66.251.134.0/24 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 66.251.136.0/21 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 66.251.140.0/24 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 66.251.141.0/24 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 66.251.142.0/24 | AS33227 | BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US | 66.251.128.0 - 66.251.191.255 |
| 67.210.0.0/20 | AS62502 | -Reserved AS-,ZZ | 67.210.0.0 - 67.210.15.255 |
| 67.210.0.0/21 | AS62502 | -Reserved AS-,ZZ | 67.210.0.0 - 67.210.15.255 |
| 67.210.8.0/21 | AS62502 | -Reserved AS-,ZZ | 67.210.0.0 - 67.210.15.255 |
| 72.19.0.0/19 | AS16526 | BIRCH-TELECOM - Birch Telecom, Inc.,US | 72.19.0.0 - 72.19.31.255 |
| 74.113.200.0/23 | AS46939 | -Reserved AS-,ZZ | 74.113.200.0 - 74.113.203.255 |
| 74.114.52.0/22 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.52.0/23 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.52.0/24 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.53.0/24 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.54.0/23 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.54.0/24 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.55.0/24 | AS40818 | -Reserved AS-,ZZ | 74.114.52.0 - 74.114.55.255 |
| 74.114.184.0/22 | AS19888 | -Reserved AS-,ZZ | 74.114.184.0 - 74.114.187.255 |
| 74.118.132.0/22 | AS5117 | -Reserved AS-,ZZ | 74.118.132.0 - 74.118.135.255 |
| 74.120.212.0/23 | AS32326 | MORPHOTRUST-USA - MorphoTrust USA, Inc.,US | 74.120.212.0 - 74.120.215.255 |
| 74.120.214.0/23 | AS32326 | MORPHOTRUST-USA - MorphoTrust USA, Inc.,US | 74.120.212.0 - 74.120.215.255 |
| 74.121.24.0/22 | AS36263 | FORONA - Forona Technologies, Inc.,US | 74.121.24.0 - 74.121.27.255 |
| 74.123.136.0/21 | AS53358 | -Reserved AS-,ZZ | 74.123.136.0 - 74.123.143.255 |
| 77.243.91.0/24 | AS42597 | -Reserved AS-,ZZ | 77.243.80.0 - 77.243.95.255 |
| 80.78.133.0/24 | AS16422 | NEWSKIES-NETWORKS - New Skies Satellites, Inc.,US | 80.78.128.0 - 80.78.143.255 |
| 80.78.134.0/23 | AS16422 | NEWSKIES-NETWORKS - New Skies Satellites, Inc.,US | 80.78.128.0 - 80.78.143.255 |
| 80.78.134.0/24 | AS16422 | NEWSKIES-NETWORKS - New Skies Satellites, Inc.,US | 80.78.128.0 - 80.78.143.255 |
| 80.78.135.0/24 | AS16422 | NEWSKIES-NETWORKS - New Skies Satellites, Inc.,US | 80.78.128.0 - 80.78.143.255 |
| 80.250.32.0/22 | AS37106 | ODUA-AS,NG | 80.250.32.0 - 80.250.47.255 |
| 83.142.48.0/24 | AS13213 | UK2NET-AS UK2 - Ltd,GB | 83.142.48.0 - 83.142.55.255 |
| 83.142.49.0/24 | AS13213 | UK2NET-AS UK2 - Ltd,GB | 83.142.48.0 - 83.142.55.255 |
| 91.103.8.0/24 | AS42551 | -Reserved AS-,ZZ | 91.103.8.0 - 91.103.15.255 |
| 91.103.9.0/24 | AS42551 | -Reserved AS-,ZZ | 91.103.8.0 - 91.103.15.255 |
| 91.103.10.0/24 | AS42551 | -Reserved AS-,ZZ | 91.103.8.0 - 91.103.15.255 |
| 91.103.11.0/24 | AS42551 | -Reserved AS-,ZZ | 91.103.8.0 - 91.103.15.255 |
| 91.193.60.0/22 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 91.193.60.0 - 91.193.63.255 |
| 91.195.66.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 91.195.64.0 - 91.195.67.255 |
| 91.197.36.0/22 | AS43359 | -Reserved AS-,ZZ | 91.197.36.0 - 91.197.43.255 |
| 91.220.84.0/24 | AS5577 | ROOT root SA,LU | 91.220.84.0 - 91.220.84.255 |
| 91.230.27.0/24 | AS57022 | -Reserved AS-,ZZ | 91.230.27.0 - 91.230.27.255 |
| 98.143.160.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.161.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.162.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.163.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.164.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.165.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.166.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.167.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.168.0/22 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.172.0/22 | AS26566 | -Reserved AS-,ZZ | 98.143.160.0 - 98.143.175.255 |
| 98.143.172.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.173.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.174.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 98.143.160.0 - 98.143.175.255 |
| 98.143.175.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS. LLC.US | 98.143.160.0 - 98.143.175.255 |

# plus…

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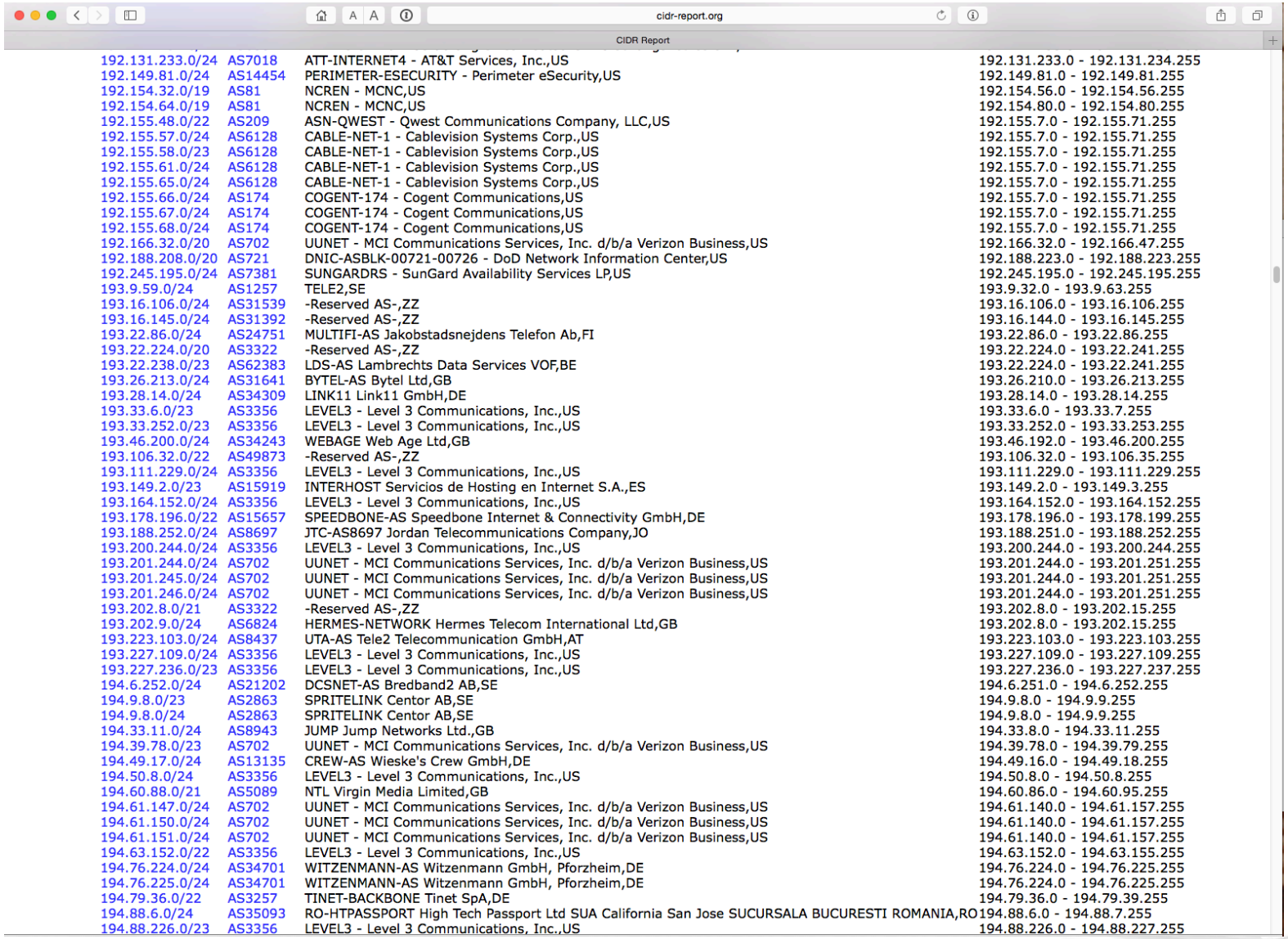
CIDR Report

| | | | |
|---|---|---|---|
| 102.2.88.0/22 | AS38456 | PACTEL-AS-AP Pacific Teleports. ,AU | 102.0.0.0 - 102.255.255.255 |
| 103.10.222.0/24 | AS131891 | | 103.10.222.0 - 103.10.222.255 |
| 103.15.92.0/22 | AS23818 | JETINTERNET JETINTERNET Corporation,JP | 103.15.92.0 - 103.15.95.255 |
| 103.18.248.0/22 | AS18097 | DCN D.C.N. Corporation,JP | 103.18.248.0 - 103.18.251.255 |
| 103.19.0.0/22 | AS18097 | DCN D.C.N. Corporation,JP | 103.19.0.0 - 103.19.3.255 |
| 103.20.100.0/24 | AS23937 | | 103.20.100.0 - 103.20.103.255 |
| 103.20.101.0/24 | AS23937 | | 103.20.100.0 - 103.20.103.255 |
| 103.20.219.0/24 | AS55795 | VERBDC1-AS-AP Verb Data Centre Pty Ltd,AU | 103.20.219.0 - 103.20.219.255 |
| 103.21.4.0/22 | AS12182 | INTERNAP-2BLK - Internap Network Services Corporation,US | 103.21.4.0 - 103.21.11.255 |
| 103.23.148.0/23 | AS132090 | | 103.23.148.0 - 103.23.149.255 |
| 103.23.148.0/24 | AS132090 | | 103.23.148.0 - 103.23.149.255 |
| 103.26.116.0/22 | AS17676 | GIGAINFRA Softbank BB Corp.,JP | 103.26.116.0 - 103.26.119.255 |
| 103.243.72.0/24 | AS36351 | SOFTLAYER - SoftLayer Technologies Inc.,US | 103.243.72.0 - 103.243.75.255 |
| 103.243.73.0/24 | AS36351 | SOFTLAYER - SoftLayer Technologies Inc.,US | 103.243.72.0 - 103.243.75.255 |
| 103.243.74.0/23 | AS36351 | SOFTLAYER - SoftLayer Technologies Inc.,US | 103.243.72.0 - 103.243.75.255 |
| 103.248.88.0/22 | AS23818 | JETINTERNET JETINTERNET Corporation,JP | 103.248.88.0 - 103.248.91.255 |
| 103.248.220.0/22 | AS17676 | GIGAINFRA Softbank BB Corp.,JP | 103.248.220.0 - 103.248.223.255 |
| 103.250.0.0/22 | AS17676 | GIGAINFRA Softbank BB Corp.,JP | 103.250.0.0 - 103.250.3.255 |
| 103.252.116.0/22 | AS10015 | CWJ-NET Cyber Wave Japan Co., Ltd.,JP | 103.252.116.0 - 103.252.119.255 |
| 111.92.184.0/22 | AS9797 | NEXONASIAPACIFIC-AS-AP Nexon Asia Pacific P/L,AU | 111.92.184.0 - 111.92.187.255 |
| 116.206.72.0/24 | AS6461 | ABOVENET - Abovenet Communications, Inc,US | 116.206.0.0 - 116.206.255.255 |
| 116.206.85.0/24 | AS6461 | ABOVENET - Abovenet Communications, Inc,US | 116.206.0.0 - 116.206.255.255 |
| 116.206.103.0/24 | AS6461 | ABOVENET - Abovenet Communications, Inc,US | 116.206.0.0 - 116.206.255.255 |
| 117.120.56.0/21 | AS4755 | TATACOMM-AS TATA Communications formerly VSNL is Leading ISP,IN | 117.120.56.0 - 117.120.63.255 |
| 124.158.28.0/22 | AS45857 | | 124.158.28.0 - 124.158.31.255 |
| 142.147.62.0/24 | AS3958 | AIRCANADA - Air Canada,CA | 142.147.62.0 - 142.147.65.255 |
| 162.216.176.0/22 | AS36114 | VERSAWEB-ASN - Versaweb, LLC,US | 162.216.176.0 - 162.216.179.255 |
| 162.217.156.0/22 | AS62502 | -Reserved AS-,ZZ | 162.217.156.0 - 162.217.159.255 |
| 162.217.156.0/23 | AS62502 | -Reserved AS-,ZZ | 162.217.156.0 - 162.217.159.255 |
| 162.217.158.0/23 | AS62502 | -Reserved AS-,ZZ | 162.217.156.0 - 162.217.159.255 |
| 162.221.48.0/21 | AS62502 | -Reserved AS-,ZZ | 162.221.48.0 - 162.221.55.255 |
| 162.221.48.0/22 | AS62502 | -Reserved AS-,ZZ | 162.221.48.0 - 162.221.55.255 |
| 162.221.52.0/22 | AS62502 | -Reserved AS-,ZZ | 162.221.48.0 - 162.221.55.255 |
| 162.222.128.0/21 | AS36114 | VERSAWEB-ASN - Versaweb, LLC,US | 162.222.128.0 - 162.222.135.255 |
| 162.223.64.0/21 | AS62502 | -Reserved AS-,ZZ | 162.223.64.0 - 162.223.71.255 |
| 162.223.64.0/22 | AS62502 | -Reserved AS-,ZZ | 162.223.64.0 - 162.223.71.255 |
| 162.223.68.0/22 | AS62502 | -Reserved AS-,ZZ | 162.223.64.0 - 162.223.71.255 |
| 166.93.0.0/16 | AS23537 | CRITIGEN - Micro Source, Inc.,US | 166.93.0.0 - 166.93.255.255 |
| 172.102.0.0/22 | AS4812 | CHINANET-SH-AP China Telecom (Group),CN | 172.64.0.0 - 172.127.255.255 |
| 176.111.168.0/22 | AS50586 | MACROSOLUTIONS MacroSolution SRL,RO | 176.111.168.0 - 176.111.175.255 |
| 182.237.25.0/24 | AS10201 | DWL-AS-IN Dishnet Wireless Limited. Broadband Wireless,IN | 182.237.24.0 - 182.237.31.255 |
| 185.28.180.0/22 | AS18097 | DCN D.C.N. Corporation,JP | 185.28.180.0 - 185.28.183.255 |
| 186.65.108.0/22 | AS22927 | Telefonica de Argentina,AR | 186.65.104.0 - 186.65.111.255 |
| 190.124.252.0/22 | AS7303 | Telecom Argentina S.A.,AR | 190.124.252.0 - 190.124.255.255 |
| 192.9.0.0/16 | AS11479 | BRM-SUN-AS - Sun Microsystems, Inc,US | 192.9.200.0 - 192.9.200.255 |
| 192.25.10.0/24 | AS5714 | HPES - Hewlett-Packard Company,US | 192.25.10.0 - 192.25.11.255 |
| 192.25.11.0/24 | AS5714 | HPES - Hewlett-Packard Company,US | 192.25.10.0 - 192.25.11.255 |
| 192.25.13.0/24 | AS5714 | HPES - Hewlett-Packard Company,US | 192.25.13.0 - 192.25.14.255 |
| 192.25.14.0/24 | AS5714 | HPES - Hewlett-Packard Company,US | 192.25.13.0 - 192.25.14.255 |
| 192.34.152.0/21 | AS10835 | VISIONARY - Visionary Communications, Inc.,US | 192.34.152.0 - 192.34.159.255 |
| 192.75.23.0/24 | AS2579 | AS2579 - Alcatel-Lucent,FR | 192.75.23.0 - 192.75.23.255 |
| 192.75.239.0/24 | AS23498 | CDSI - COGECODATA,CA | 192.75.239.0 - 192.75.239.255 |
| 192.81.70.0/24 | AS393636 | NPLUSNETWORKS - NPlus Networks,CA | 192.81.70.0 - 192.81.71.255 |
| 192.84.24.0/24 | AS4323 | TWTC - tw telecom holdings, inc.,US | 192.84.24.0 - 192.84.24.255 |
| 192.101.70.0/24 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 192.101.64.0 - 192.101.74.255 |
| 192.101.71.0/24 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 192.101.64.0 - 192.101.74.255 |
| 192.101.72.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 192.101.64.0 - 192.101.74.255 |
| 192.124.252.0/22 | AS680 | DFN Verein zur Foerderung eines Deutschen Forschungsnetzes e.V.,DE | 192.124.255.0 - 192.124.255.255 |

# yes, there's more

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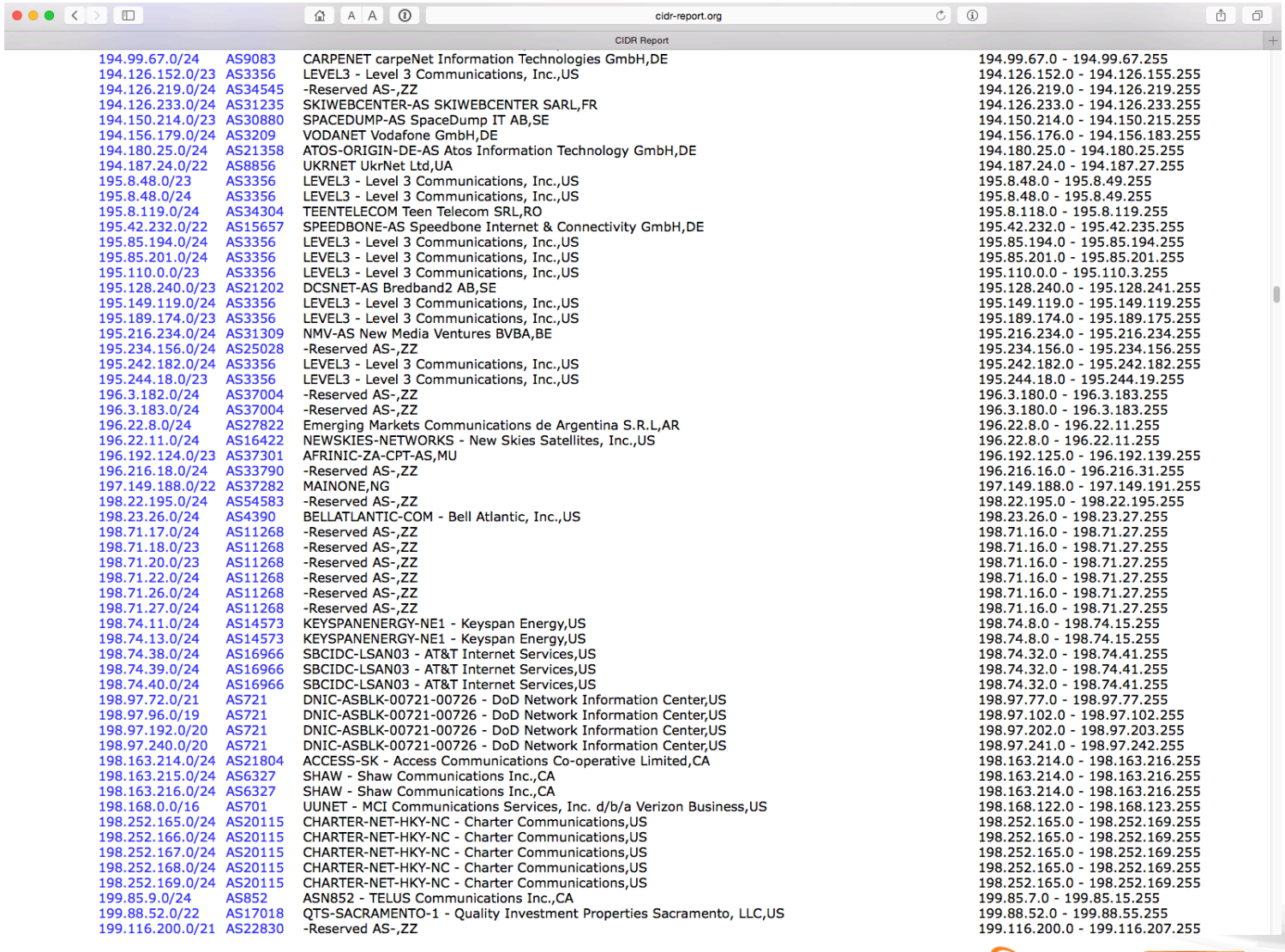
| 192.131.233.0/24 | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US | 192.131.233.0 - 192.131.234.255 |
| 192.149.81.0/24 | AS14454 | PERIMETER-ESECURITY - Perimeter eSecurity,US | 192.149.81.0 - 192.149.81.255 |
| 192.154.32.0/19 | AS81 | NCREN - MCNC,US | 192.154.56.0 - 192.154.56.255 |
| 192.154.64.0/19 | AS81 | NCREN - MCNC,US | 192.154.80.0 - 192.154.80.255 |
| 192.155.48.0/22 | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.57.0/24 | AS6128 | CABLE-NET-1 - Cablevision Systems Corp.,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.58.0/23 | AS6128 | CABLE-NET-1 - Cablevision Systems Corp.,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.61.0/24 | AS6128 | CABLE-NET-1 - Cablevision Systems Corp.,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.65.0/24 | AS6128 | CABLE-NET-1 - Cablevision Systems Corp.,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.66.0/24 | AS174 | COGENT-174 - Cogent Communications,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.67.0/24 | AS174 | COGENT-174 - Cogent Communications,US | 192.155.7.0 - 192.155.71.255 |
| 192.155.68.0/24 | AS174 | COGENT-174 - Cogent Communications,US | 192.155.7.0 - 192.155.71.255 |
| 192.166.32.0/20 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 192.166.32.0 - 192.166.47.255 |
| 192.188.208.0/20 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 192.188.223.0 - 192.188.223.255 |
| 192.245.195.0/24 | AS7381 | SUNGARDRS - SunGard Availability Services LP,US | 192.245.195.0 - 192.245.195.255 |
| 193.9.59.0/24 | AS1257 | TELE2,SE | 193.9.32.0 - 193.9.63.255 |
| 193.16.106.0/24 | AS31539 | -Reserved AS-,ZZ | 193.16.106.0 - 193.16.106.255 |
| 193.16.145.0/24 | AS31392 | -Reserved AS-,ZZ | 193.16.144.0 - 193.16.145.255 |
| 193.22.86.0/24 | AS24751 | MULTIFI-AS Jakobstadsnejdens Telefon Ab,FI | 193.22.86.0 - 193.22.86.255 |
| 193.22.224.0/20 | AS3322 | -Reserved AS-,ZZ | 193.22.224.0 - 193.22.241.255 |
| 193.22.238.0/23 | AS62383 | LDS-AS Lambrechts Data Services VOF,BE | 193.22.224.0 - 193.22.241.255 |
| 193.26.213.0/24 | AS31641 | BYTEL-AS Bytel Ltd,GB | 193.26.210.0 - 193.26.213.255 |
| 193.28.14.0/24 | AS34309 | LINK11 Link11 GmbH,DE | 193.28.14.0 - 193.28.14.255 |
| 193.33.6.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.33.6.0 - 193.33.7.255 |
| 193.33.252.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.33.252.0 - 193.33.253.255 |
| 193.46.200.0/24 | AS34243 | WEBAGE Web Age Ltd,GB | 193.46.192.0 - 193.46.200.255 |
| 193.106.32.0/22 | AS49873 | -Reserved AS-,ZZ | 193.106.32.0 - 193.106.35.255 |
| 193.111.229.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.111.229.0 - 193.111.229.255 |
| 193.149.2.0/23 | AS15919 | INTERHOST Servicios de Hosting en Internet S.A.,ES | 193.149.2.0 - 193.149.3.255 |
| 193.164.152.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.164.152.0 - 193.164.152.255 |
| 193.178.196.0/22 | AS15657 | SPEEDBONE-AS Speedbone Internet & Connectivity GmbH,DE | 193.178.196.0 - 193.178.199.255 |
| 193.188.252.0/24 | AS8697 | JTC-AS8697 Jordan Telecommunications Company,JO | 193.188.251.0 - 193.188.252.255 |
| 193.200.244.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.200.244.0 - 193.200.244.255 |
| 193.201.244.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 193.201.244.0 - 193.201.251.255 |
| 193.201.245.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 193.201.244.0 - 193.201.251.255 |
| 193.201.246.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 193.201.244.0 - 193.201.251.255 |
| 193.202.8.0/21 | AS3322 | -Reserved AS-,ZZ | 193.202.8.0 - 193.202.15.255 |
| 193.202.9.0/24 | AS6824 | HERMES-NETWORK Hermes Telecom International Ltd,GB | 193.202.8.0 - 193.202.15.255 |
| 193.223.103.0/24 | AS8437 | UTA-AS Tele2 Telecommunication GmbH,AT | 193.223.103.0 - 193.223.103.255 |
| 193.227.109.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.227.109.0 - 193.227.109.255 |
| 193.227.236.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 193.227.236.0 - 193.227.237.255 |
| 194.6.252.0/24 | AS21202 | DCSNET-AS Bredband2 AB,SE | 194.6.251.0 - 194.6.252.255 |
| 194.9.8.0/23 | AS2863 | SPRITELINK Centor AB,SE | 194.9.8.0 - 194.9.9.255 |
| 194.9.8.0/24 | AS2863 | SPRITELINK Centor AB,SE | 194.9.8.0 - 194.9.9.255 |
| 194.33.11.0/24 | AS8943 | JUMP Jump Networks Ltd.,GB | 194.33.8.0 - 194.33.11.255 |
| 194.39.78.0/23 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 194.39.78.0 - 194.39.79.255 |
| 194.49.17.0/24 | AS13135 | CREW-AS Wieske's Crew GmbH,DE | 194.49.16.0 - 194.49.18.255 |
| 194.50.8.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 194.50.8.0 - 194.50.8.255 |
| 194.60.88.0/21 | AS5089 | NTL Virgin Media Limited,GB | 194.60.86.0 - 194.60.95.255 |
| 194.61.147.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 194.61.140.0 - 194.61.157.255 |
| 194.61.150.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 194.61.140.0 - 194.61.157.255 |
| 194.61.151.0/24 | AS702 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 194.61.140.0 - 194.61.157.255 |
| 194.63.152.0/22 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 194.63.152.0 - 194.63.155.255 |
| 194.76.224.0/24 | AS34701 | WITZENMANN-AS Witzenmann GmbH, Pforzheim,DE | 194.76.224.0 - 194.76.225.255 |
| 194.76.225.0/24 | AS34701 | WITZENMANN-AS Witzenmann GmbH, Pforzheim,DE | 194.76.224.0 - 194.76.225.255 |
| 194.79.36.0/22 | AS3257 | TINET-BACKBONE Tinet SpA,DE | 194.79.36.0 - 194.79.39.255 |
| 194.88.6.0/24 | AS35093 | RO-HTPASSPORT High Tech Passport Ltd SUA California San Jose SUCURSALA BUCURESTI ROMANIA,RO | 194.88.6.0 - 194.88.7.255 |
| 194.88.226.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 194.88.226.0 - 194.88.227.255 |

# getting the point yet?

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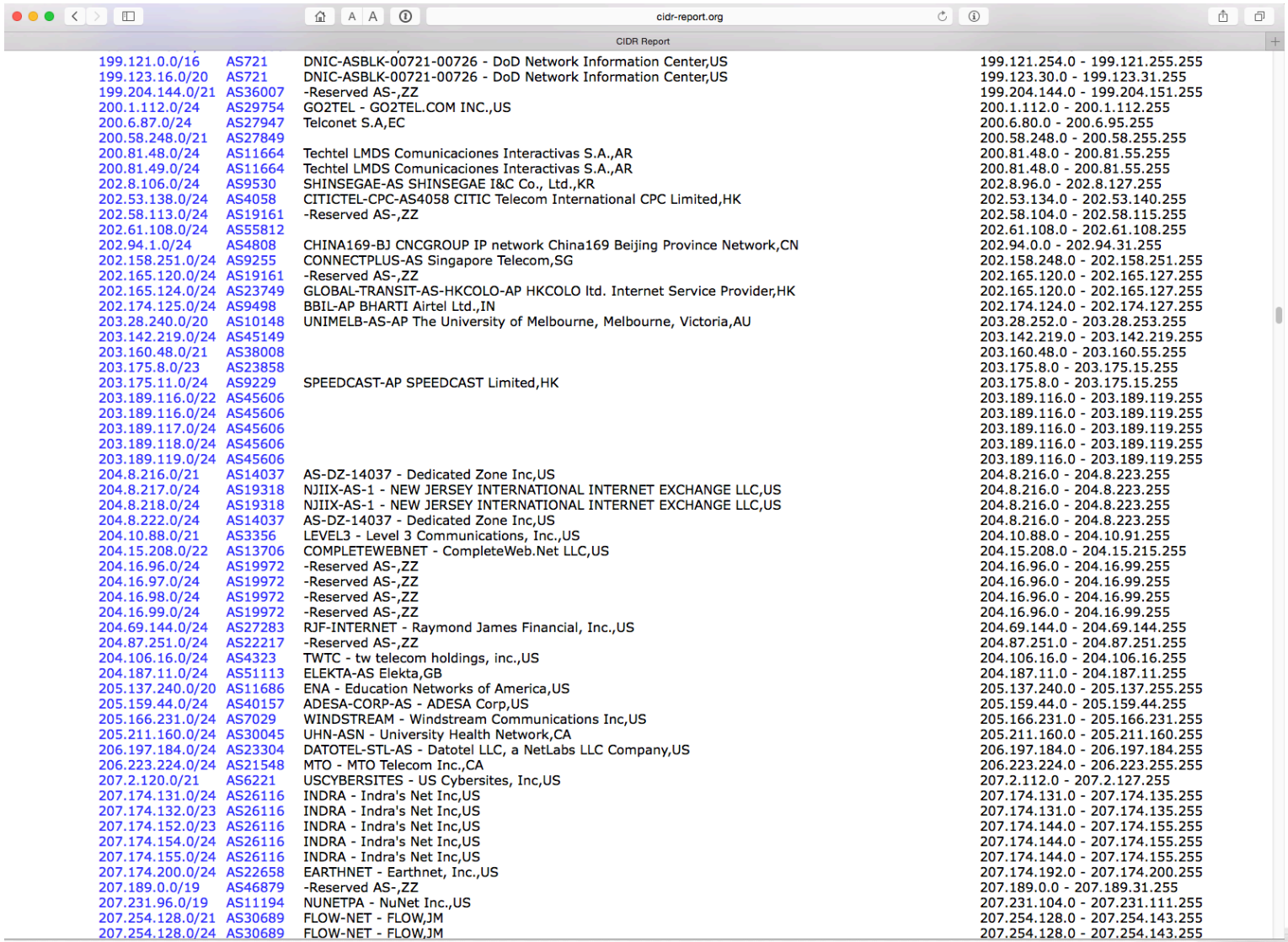
| 194.99.67.0/24 | AS9083 | CARPENET carpeNet Information Technologies GmbH,DE | 194.99.67.0 - 194.99.67.255 |
| 194.126.152.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 194.126.152.0 - 194.126.155.255 |
| 194.126.219.0/24 | AS34545 | -Reserved AS-,ZZ | 194.126.219.0 - 194.126.219.255 |
| 194.126.233.0/24 | AS31235 | SKIWEBCENTER-AS SKIWEBCENTER SARL,FR | 194.126.233.0 - 194.126.233.255 |
| 194.150.214.0/23 | AS30880 | SPACEDUMP-AS SpaceDump IT AB,SE | 194.150.214.0 - 194.150.215.255 |
| 194.156.179.0/24 | AS3209 | VODANET Vodafone GmbH,DE | 194.156.176.0 - 194.156.183.255 |
| 194.180.25.0/24 | AS21358 | ATOS-ORIGIN-DE-AS Atos Information Technology GmbH,DE | 194.180.25.0 - 194.180.25.255 |
| 194.187.24.0/22 | AS8856 | UKRNET UkrNet Ltd,UA | 194.187.24.0 - 194.187.27.255 |
| 195.8.48.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.8.48.0 - 195.8.49.255 |
| 195.8.48.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.8.48.0 - 195.8.49.255 |
| 195.8.119.0/24 | AS34304 | TEENTELECOM Teen Telecom SRL,RO | 195.8.118.0 - 195.8.119.255 |
| 195.42.232.0/22 | AS15657 | SPEEDBONE-AS Speedbone Internet & Connectivity GmbH,DE | 195.42.232.0 - 195.42.235.255 |
| 195.85.194.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.85.194.0 - 195.85.194.255 |
| 195.85.201.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.85.201.0 - 195.85.201.255 |
| 195.110.0.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.110.0.0 - 195.110.3.255 |
| 195.128.240.0/23 | AS21202 | DCSNET-AS Bredband2 AB,SE | 195.128.240.0 - 195.128.241.255 |
| 195.149.119.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.149.119.0 - 195.149.119.255 |
| 195.189.174.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.189.174.0 - 195.189.175.255 |
| 195.216.234.0/24 | AS31309 | NMV-AS New Media Ventures BVBA,BE | 195.216.234.0 - 195.216.234.255 |
| 195.234.156.0/24 | AS25028 | -Reserved AS-,ZZ | 195.234.156.0 - 195.234.156.255 |
| 195.242.182.0/24 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.242.182.0 - 195.242.182.255 |
| 195.244.18.0/23 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 195.244.18.0 - 195.244.19.255 |
| 196.3.182.0/24 | AS37004 | -Reserved AS-,ZZ | 196.3.180.0 - 196.3.183.255 |
| 196.3.183.0/24 | AS37004 | -Reserved AS-,ZZ | 196.3.180.0 - 196.3.183.255 |
| 196.22.8.0/24 | AS27822 | Emerging Markets Communications de Argentina S.R.L,AR | 196.22.8.0 - 196.22.11.255 |
| 196.22.11.0/24 | AS16422 | NEWSKIES-NETWORKS - New Skies Satellites, Inc.,US | 196.22.8.0 - 196.22.11.255 |
| 196.192.124.0/23 | AS37301 | AFRINIC-ZA-CPT-AS,MU | 196.192.125.0 - 196.192.139.255 |
| 196.216.18.0/24 | AS33790 | -Reserved AS-,ZZ | 196.216.16.0 - 196.216.31.255 |
| 197.149.188.0/22 | AS37282 | MAINONE,NG | 197.149.188.0 - 197.149.191.255 |
| 198.22.195.0/24 | AS54583 | -Reserved AS-,ZZ | 198.22.195.0 - 198.22.195.255 |
| 198.23.26.0/24 | AS4390 | BELLATLANTIC-COM - Bell Atlantic, Inc.,US | 198.23.26.0 - 198.23.27.255 |
| 198.71.17.0/24 | AS11268 | -Reserved AS-,ZZ | 198.71.16.0 - 198.71.27.255 |
| 198.71.18.0/23 | AS11268 | -Reserved AS-,ZZ | 198.71.16.0 - 198.71.27.255 |
| 198.71.20.0/23 | AS11268 | -Reserved AS-,ZZ | 198.71.16.0 - 198.71.27.255 |
| 198.71.22.0/24 | AS11268 | -Reserved AS-,ZZ | 198.71.16.0 - 198.71.27.255 |
| 198.71.26.0/24 | AS11268 | -Reserved AS-,ZZ | 198.71.16.0 - 198.71.27.255 |
| 198.71.27.0/24 | AS11268 | -Reserved AS-,ZZ | 198.71.16.0 - 198.71.27.255 |
| 198.74.11.0/24 | AS14573 | KEYSPANENERGY-NE1 - Keyspan Energy,US | 198.74.8.0 - 198.74.15.255 |
| 198.74.13.0/24 | AS14573 | KEYSPANENERGY-NE1 - Keyspan Energy,US | 198.74.8.0 - 198.74.15.255 |
| 198.74.38.0/24 | AS16966 | SBCIDC-LSAN03 - AT&T Internet Services,US | 198.74.32.0 - 198.74.41.255 |
| 198.74.39.0/24 | AS16966 | SBCIDC-LSAN03 - AT&T Internet Services,US | 198.74.32.0 - 198.74.41.255 |
| 198.74.40.0/24 | AS16966 | SBCIDC-LSAN03 - AT&T Internet Services,US | 198.74.32.0 - 198.74.41.255 |
| 198.97.72.0/21 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 198.97.77.0 - 198.97.77.255 |
| 198.97.96.0/19 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 198.97.102.0 - 198.97.102.255 |
| 198.97.192.0/20 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 198.97.202.0 - 198.97.203.255 |
| 198.97.240.0/20 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 198.97.241.0 - 198.97.242.255 |
| 198.163.214.0/24 | AS21804 | ACCESS-SK - Access Communications Co-operative Limited,CA | 198.163.214.0 - 198.163.216.255 |
| 198.163.215.0/24 | AS6327 | SHAW - Shaw Communications Inc.,CA | 198.163.214.0 - 198.163.216.255 |
| 198.163.216.0/24 | AS6327 | SHAW - Shaw Communications Inc.,CA | 198.163.214.0 - 198.163.216.255 |
| 198.168.0.0/16 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 198.168.122.0 - 198.168.123.255 |
| 198.252.165.0/24 | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US | 198.252.165.0 - 198.252.169.255 |
| 198.252.166.0/24 | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US | 198.252.165.0 - 198.252.169.255 |
| 198.252.167.0/24 | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US | 198.252.165.0 - 198.252.169.255 |
| 198.252.168.0/24 | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US | 198.252.165.0 - 198.252.169.255 |
| 198.252.169.0/24 | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US | 198.252.165.0 - 198.252.169.255 |
| 199.85.9.0/24 | AS852 | ASN852 - TELUS Communications Inc.,CA | 199.85.7.0 - 199.85.15.255 |
| 199.88.52.0/22 | AS17018 | QTS-SACRAMENTO-1 - Quality Investment Properties Sacramento, LLC,US | 199.88.52.0 - 199.88.55.255 |
| 199.116.200.0/21 | AS22830 | -Reserved AS-,ZZ | 199.116.200.0 - 199.116.207.255 |

# still more!

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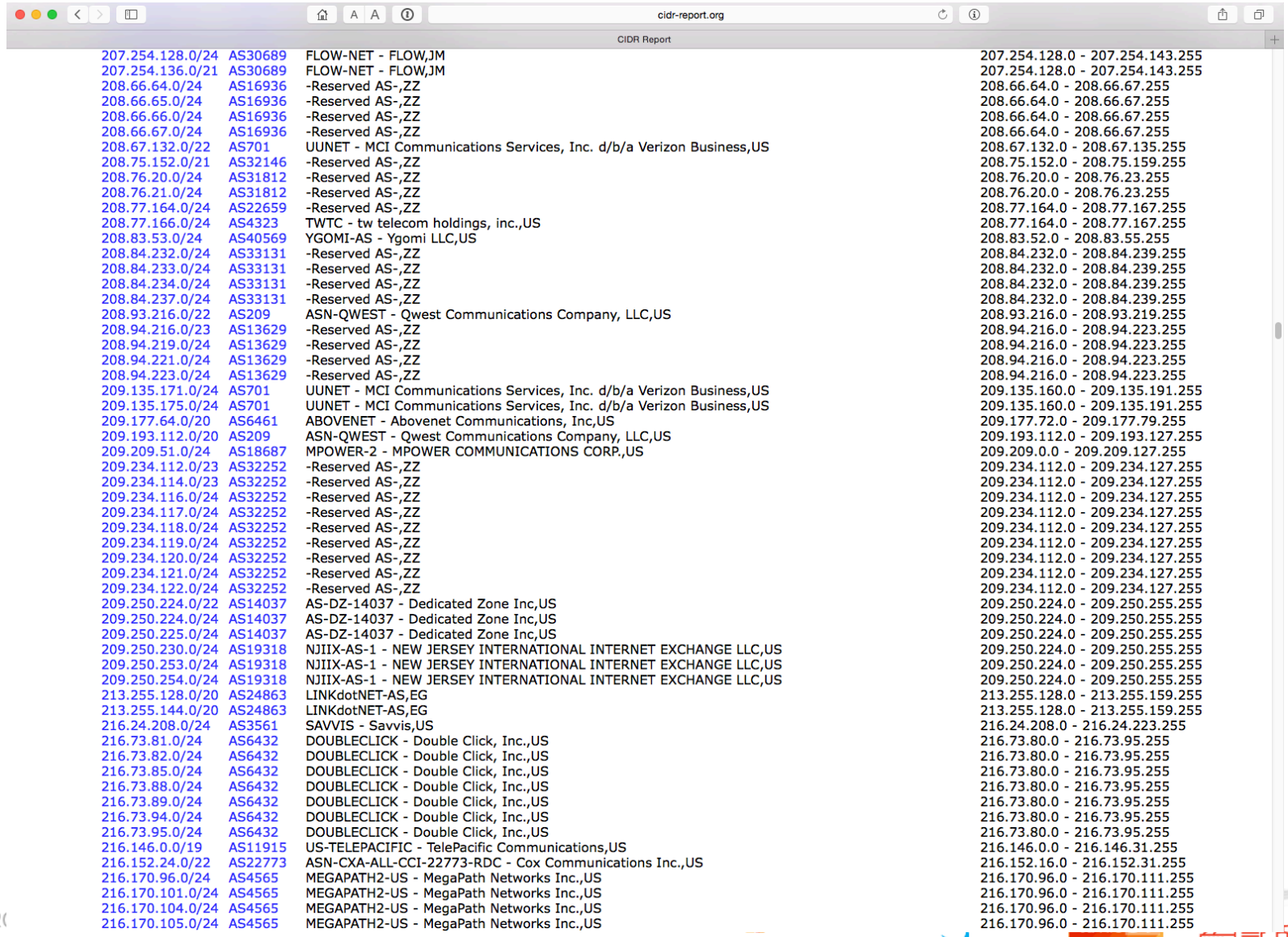
| 199.121.0.0/16 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 199.121.254.0 - 199.121.255.255 |
| 199.123.16.0/20 | AS721 | DNIC-ASBLK-00721-00726 - DoD Network Information Center,US | 199.123.30.0 - 199.123.31.255 |
| 199.204.144.0/21 | AS36007 | -Reserved AS-,ZZ | 199.204.144.0 - 199.204.151.255 |
| 200.1.112.0/24 | AS29754 | GO2TEL - GO2TEL.COM INC.,US | 200.1.112.0 - 200.1.112.255 |
| 200.6.87.0/24 | AS27947 | Telconet S.A,EC | 200.6.80.0 - 200.6.95.255 |
| 200.58.248.0/21 | AS27849 | | 200.58.248.0 - 200.58.255.255 |
| 200.81.48.0/24 | AS11664 | Techtel LMDS Comunicaciones Interactivas S.A.,AR | 200.81.48.0 - 200.81.55.255 |
| 200.81.49.0/24 | AS11664 | Techtel LMDS Comunicaciones Interactivas S.A.,AR | 200.81.48.0 - 200.81.55.255 |
| 202.8.106.0/24 | AS9530 | SHINSEGAE-AS SHINSEGAE I&C Co., Ltd.,KR | 202.8.96.0 - 202.8.127.255 |
| 202.53.138.0/24 | AS4058 | CITICTEL-CPC-AS4058 CITIC Telecom International CPC Limited,HK | 202.53.134.0 - 202.53.140.255 |
| 202.58.113.0/24 | AS19161 | -Reserved AS-,ZZ | 202.58.104.0 - 202.58.115.255 |
| 202.61.108.0/24 | AS55812 | | 202.61.108.0 - 202.61.108.255 |
| 202.94.1.0/24 | AS4808 | CHINA169-BJ CNCGROUP IP network China169 Beijing Province Network,CN | 202.94.0.0 - 202.94.31.255 |
| 202.158.251.0/24 | AS9255 | CONNECTPLUS-AS Singapore Telecom,SG | 202.158.248.0 - 202.158.251.255 |
| 202.165.120.0/24 | AS19161 | -Reserved AS-,ZZ | 202.165.120.0 - 202.165.127.255 |
| 202.165.124.0/24 | AS23749 | GLOBAL-TRANSIT-AS-HKCOLO-AP HKCOLO ltd. Internet Service Provider,HK | 202.165.120.0 - 202.165.127.255 |
| 202.174.125.0/24 | AS9498 | BBIL-AP BHARTI Airtel Ltd.,IN | 202.174.124.0 - 202.174.127.255 |
| 203.28.240.0/20 | AS10148 | UNIMELB-AS-AP The University of Melbourne, Melbourne, Victoria,AU | 203.28.252.0 - 203.28.253.255 |
| 203.142.219.0/24 | AS45149 | | 203.142.219.0 - 203.142.219.255 |
| 203.160.48.0/21 | AS38008 | | 203.160.48.0 - 203.160.55.255 |
| 203.175.8.0/23 | AS23858 | | 203.175.8.0 - 203.175.15.255 |
| 203.175.11.0/24 | AS9229 | SPEEDCAST-AP SPEEDCAST Limited,HK | 203.175.8.0 - 203.175.15.255 |
| 203.189.116.0/22 | AS45606 | | 203.189.116.0 - 203.189.119.255 |
| 203.189.116.0/24 | AS45606 | | 203.189.116.0 - 203.189.119.255 |
| 203.189.117.0/24 | AS45606 | | 203.189.116.0 - 203.189.119.255 |
| 203.189.118.0/24 | AS45606 | | 203.189.116.0 - 203.189.119.255 |
| 203.189.119.0/24 | AS45606 | | 203.189.116.0 - 203.189.119.255 |
| 204.8.216.0/21 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 204.8.216.0 - 204.8.223.255 |
| 204.8.217.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 204.8.216.0 - 204.8.223.255 |
| 204.8.218.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 204.8.216.0 - 204.8.223.255 |
| 204.8.222.0/24 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 204.8.216.0 - 204.8.223.255 |
| 204.10.88.0/21 | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US | 204.10.88.0 - 204.10.91.255 |
| 204.15.208.0/22 | AS13706 | COMPLETEWEBNET - CompleteWeb.Net LLC,US | 204.15.208.0 - 204.15.215.255 |
| 204.16.96.0/24 | AS19972 | -Reserved AS-,ZZ | 204.16.96.0 - 204.16.99.255 |
| 204.16.97.0/24 | AS19972 | -Reserved AS-,ZZ | 204.16.96.0 - 204.16.99.255 |
| 204.16.98.0/24 | AS19972 | -Reserved AS-,ZZ | 204.16.96.0 - 204.16.99.255 |
| 204.16.99.0/24 | AS19972 | -Reserved AS-,ZZ | 204.16.96.0 - 204.16.99.255 |
| 204.69.144.0/24 | AS27283 | RJF-INTERNET - Raymond James Financial, Inc.,US | 204.69.144.0 - 204.69.144.255 |
| 204.87.251.0/24 | AS22217 | -Reserved AS-,ZZ | 204.87.251.0 - 204.87.251.255 |
| 204.106.16.0/24 | AS4323 | TWTC - tw telecom holdings, inc.,US | 204.106.16.0 - 204.106.16.255 |
| 204.187.11.0/24 | AS51113 | ELEKTA-AS Elekta,GB | 204.187.11.0 - 204.187.11.255 |
| 205.137.240.0/20 | AS11686 | ENA - Education Networks of America,US | 205.137.240.0 - 205.137.255.255 |
| 205.159.44.0/24 | AS40157 | ADESA-CORP-AS - ADESA Corp,US | 205.159.44.0 - 205.159.44.255 |
| 205.166.231.0/24 | AS7029 | WINDSTREAM - Windstream Communications Inc,US | 205.166.231.0 - 205.166.231.255 |
| 205.211.160.0/24 | AS30045 | UHN-ASN - University Health Network,CA | 205.211.160.0 - 205.211.160.255 |
| 206.197.184.0/24 | AS23304 | DATOTEL-STL-AS - Datotel LLC, a NetLabs LLC Company,US | 206.197.184.0 - 206.197.184.255 |
| 206.223.224.0/24 | AS21548 | MTO - MTO Telecom Inc.,CA | 206.223.224.0 - 206.223.255.255 |
| 207.2.120.0/21 | AS6221 | USCYBERSITES - US Cybersites, Inc,US | 207.2.112.0 - 207.2.127.255 |
| 207.174.131.0/24 | AS26116 | INDRA - Indra's Net Inc,US | 207.174.131.0 - 207.174.135.255 |
| 207.174.132.0/23 | AS26116 | INDRA - Indra's Net Inc,US | 207.174.131.0 - 207.174.135.255 |
| 207.174.152.0/23 | AS26116 | INDRA - Indra's Net Inc,US | 207.174.144.0 - 207.174.155.255 |
| 207.174.154.0/24 | AS26116 | INDRA - Indra's Net Inc,US | 207.174.144.0 - 207.174.155.255 |
| 207.174.155.0/24 | AS26116 | INDRA - Indra's Net Inc,US | 207.174.144.0 - 207.174.155.255 |
| 207.174.200.0/24 | AS22658 | EARTHNET - Earthnet, Inc.,US | 207.174.192.0 - 207.174.200.255 |
| 207.189.0.0/19 | AS46879 | -Reserved AS-,ZZ | 207.189.0.0 - 207.189.31.255 |
| 207.231.96.0/19 | AS11194 | NUNETPA - NuNet Inc.,US | 207.231.104.0 - 207.231.111.255 |
| 207.254.128.0/21 | AS30689 | FLOW-NET - FLOW,JM | 207.254.128.0 - 207.254.143.255 |
| 207.254.128.0/24 | AS30689 | FLOW-NET - FLOW,JM | 207.254.128.0 - 207.254.143.255 |

# wake me up when we're done




| | | | |
|---|---|---|---|
| 207.254.128.0/24 | AS30689 | FLOW-NET - FLOW,JM | 207.254.128.0 - 207.254.143.255 |
| 207.254.136.0/21 | AS30689 | FLOW-NET - FLOW,JM | 207.254.128.0 - 207.254.143.255 |
| 208.66.64.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.66.65.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.66.66.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.66.67.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.67.132.0/22 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 208.67.132.0 - 208.67.135.255 |
| 208.75.152.0/21 | AS32146 | -Reserved AS-,ZZ | 208.75.152.0 - 208.75.159.255 |
| 208.76.20.0/24 | AS31812 | -Reserved AS-,ZZ | 208.76.20.0 - 208.76.23.255 |
| 208.76.21.0/24 | AS31812 | -Reserved AS-,ZZ | 208.76.20.0 - 208.76.23.255 |
| 208.77.164.0/24 | AS22659 | -Reserved AS-,ZZ | 208.77.164.0 - 208.77.167.255 |
| 208.77.166.0/24 | AS4323 | TWTC - tw telecom holdings, inc.,US | 208.77.164.0 - 208.77.167.255 |
| 208.83.53.0/24 | AS40569 | YGOMI-AS - Ygomi LLC,US | 208.83.52.0 - 208.83.55.255 |
| 208.84.232.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.84.233.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.84.234.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.84.237.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.93.216.0/22 | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US | 208.93.216.0 - 208.93.219.255 |
| 208.94.216.0/23 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 208.94.219.0/24 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 208.94.221.0/24 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 208.94.223.0/24 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 209.135.171.0/24 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 209.135.160.0 - 209.135.191.255 |
| 209.135.175.0/24 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 209.135.160.0 - 209.135.191.255 |
| 209.177.64.0/20 | AS6461 | ABOVENET - Abovenet Communications, Inc,US | 209.177.72.0 - 209.177.79.255 |
| 209.193.112.0/20 | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US | 209.193.112.0 - 209.193.127.255 |
| 209.209.51.0/24 | AS18687 | MPOWER-2 - MPOWER COMMUNICATIONS CORP.,US | 209.209.0.0 - 209.209.127.255 |
| 209.234.112.0/23 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.114.0/23 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.116.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.117.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.118.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.119.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.120.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.121.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.122.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.250.224.0/22 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.224.0/24 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.225.0/24 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.230.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.253.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.254.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 209.250.224.0 - 209.250.255.255 |
| 213.255.128.0/20 | AS24863 | LINKdotNET-AS,EG | 213.255.128.0 - 213.255.159.255 |
| 213.255.144.0/20 | AS24863 | LINKdotNET-AS,EG | 213.255.128.0 - 213.255.159.255 |
| 216.24.208.0/24 | AS3561 | SAVVIS - Savvis,US | 216.24.208.0 - 216.24.223.255 |
| 216.73.81.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.82.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.85.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.88.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.89.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.94.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.95.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.146.0.0/19 | AS11915 | US-TELEPACIFIC - TelePacific Communications,US | 216.146.0.0 - 216.146.31.255 |
| 216.152.24.0/22 | AS22773 | ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US | 216.152.16.0 - 216.152.31.255 |
| 216.170.96.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |
| 216.170.101.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |
| 216.170.104.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |
| 216.170.105.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |

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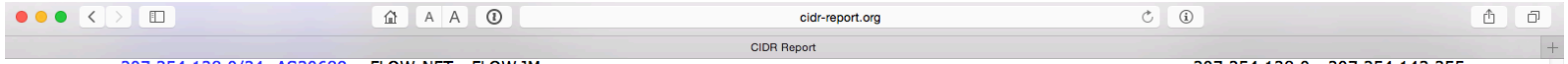


| | | | |
|---|---|---|---|
| 207.254.128.0/24 | AS30689 | FLOW-NET - FLOW,JM | 207.254.128.0 - 207.254.143.255 |
| 207.254.136.0/21 | AS30689 | FLOW-NET - FLOW,JM | 207.254.128.0 - 207.254.143.255 |
| 208.66.64.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.66.65.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.66.66.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.66.67.0/24 | AS16936 | -Reserved AS-,ZZ | 208.66.64.0 - 208.66.67.255 |
| 208.67.132.0/22 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 208.67.132.0 - 208.67.135.255 |
| 208.75.152.0/21 | AS32146 | -Reserved AS-,ZZ | 208.75.152.0 - 208.75.159.255 |
| 208.76.20.0/24 | AS31812 | -Reserved AS-,ZZ | 208.76.20.0 - 208.76.23.255 |
| 208.76.21.0/24 | AS31812 | -Reserved AS-,ZZ | 208.76.20.0 - 208.76.23.255 |
| 208.77.164.0/24 | AS22659 | -Reserved AS-,ZZ | 208.77.164.0 - 208.77.167.255 |
| 208.77.166.0/24 | AS4323 | TWTC - tw telecom holdings, inc.,US | 208.77.164.0 - 208.77.167.255 |
| 208.83.53.0/24 | AS40569 | YGOMI-AS - Ygomi LLC,US | 208.83.52.0 - 208.83.55.255 |
| 208.84.232.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.84.233.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.84.234.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.84.237.0/24 | AS33131 | -Reserved AS-,ZZ | 208.84.232.0 - 208.84.239.255 |
| 208.93.216.0/22 | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US | 208.93.216.0 - 208.93.219.255 |
| 208.94.216.0/23 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 208.94.219.0/24 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 208.94.221.0/24 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 208.94.223.0/24 | AS13629 | -Reserved AS-,ZZ | 208.94.216.0 - 208.94.223.255 |
| 209.135.171.0/24 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 209.135.160.0 - 209.135.191.255 |
| 209.135.175.0/24 | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US | 209.135.160.0 - 209.135.191.255 |
| 209.177.64.0/20 | AS6461 | ABOVENET - Abovenet Communications, Inc,US | 209.177.72.0 - 209.177.79.255 |
| 209.193.112.0/20 | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US | 209.193.112.0 - 209.193.127.255 |
| 209.209.51.0/24 | AS18687 | MPOWER-2 - MPOWER COMMUNICATIONS CORP.,US | 209.209.0.0 - 209.209.127.255 |
| 209.234.112.0/23 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.114.0/23 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.116.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.117.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.118.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.119.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.120.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.121.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.234.122.0/24 | AS32252 | -Reserved AS-,ZZ | 209.234.112.0 - 209.234.127.255 |
| 209.250.224.0/22 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.224.0/24 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.225.0/24 | AS14037 | AS-DZ-14037 - Dedicated Zone Inc,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.230.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.253.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 209.250.224.0 - 209.250.255.255 |
| 209.250.254.0/24 | AS19318 | NJIIX-AS-1 - NEW JERSEY INTERNATIONAL INTERNET EXCHANGE LLC,US | 209.250.224.0 - 209.250.255.255 |
| 213.255.128.0/20 | AS24863 | LINKdotNET-AS,EG | 213.255.128.0 - 213.255.159.255 |
| 213.255.144.0/20 | AS24863 | LINKdotNET-AS,EG | 213.255.128.0 - 213.255.159.255 |
| 216.24.208.0/24 | AS3561 | SAVVIS - Savvis,US | 216.24.208.0 - 216.24.223.255 |
| 216.73.81.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.82.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.85.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.88.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.89.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.94.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.73.95.0/24 | AS6432 | DOUBLECLICK - Double Click, Inc.,US | 216.73.80.0 - 216.73.95.255 |
| 216.146.0.0/19 | AS11915 | US-TELEPACIFIC - TelePacific Communications,US | 216.146.0.0 - 216.146.31.255 |
| 216.152.24.0/22 | AS22773 | ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US | 216.152.16.0 - 216.152.31.255 |
| 216.170.96.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |
| 216.170.101.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |
| 216.170.104.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |
| 216.170.105.0/24 | AS4565 | MEGAPATH2-US - MegaPath Networks Inc.,US | 216.170.96.0 - 216.170.111.255 |

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CIDR Report

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|---|---|---|---|
| 216.212.192.0/19 | AS46879 | -Reserved AS-,ZZ | 216.212.192.0 - 216.212.223.255 |
| 216.234.132.0/24 | AS14545 | ADR-DRIVING-RECORDS - AMERICAN DRIVING RECORDS, INC.,US | 216.234.130.0 - 216.234.132.255 |
| 216.238.192.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 216.238.192.0 - 216.238.207.255 |
| 216.238.193.0/24 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 216.238.192.0 - 216.238.207.255 |
| 216.238.194.0/24 | AS26566 | -Reserved AS-,ZZ | 216.238.192.0 - 216.238.207.255 |
| 216.238.196.0/22 | AS17184 | ATL-CBEYOND - CBEYOND COMMUNICATIONS, LLC,US | 216.238.192.0 - 216.238.207.255 |
| 216.251.50.0/24 | AS38191 | INFOSYS-AS Infosys Technologies Ltd,IN | 216.251.48.0 - 216.251.63.255 |
| 216.251.53.0/24 | AS38191 | INFOSYS-AS Infosys Technologies Ltd,IN | 216.251.48.0 - 216.251.63.255 |
| 216.251.62.0/24 | AS38191 | INFOSYS-AS Infosys Technologies Ltd,IN | 216.251.48.0 - 216.251.63.255 |

Report: Allocated and Reserved IPv4 address blocks

**Possible Bogus ASs**

| Bogus AS | | Announcing-AS | |
|---|---|---|---|
| AS1446 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS2733 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS3322 | Announced by | AS6824 | HERMES-NETWORK Hermes Telecom International Ltd,GB |
| AS3328 | Announced by | AS8452 | TE-AS TE-AS,EG |
| AS3402 | Announced by | AS2914 | NTT-COMMUNICATIONS-2914 - NTT America, Inc.,US |
| AS3402 | Announced by | AS16880 | AS2-TRENDMICRO-COM - TREND MICRO INCORPORATED,US |
| AS3708 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS3708 | Announced by | AS12182 | INTERNAP-2BLK - Internap Network Services Corporation,US |
| AS4892 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS4892 | Announced by | AS18647 | ACCEL-AS - Accel Net, Inc.,US |
| AS4946 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS5116 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS5117 | Announced by | AS3561 | SAVVIS - Savvis,US |
| AS5402 | Announced by | AS5387 | NSC Institute of Computational Technologies of SB RAS,RU |
| AS5669 | Announced by | AS8928 | INTEROUTE Interoute Communications Limited,GB |
| AS6183 | Announced by | AS3561 | SAVVIS - Savvis,US |
| AS6746 | Announced by | AS2614 | ROEDUNET Agentia de Administrare a Retelei Nationale de Informatica pentru Educatie si Cercetare,RO |
| AS6973 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS6973 | Announced by | AS5049 | MORGAN-ASN - Morgan Stanley Group Inc.,US |
| AS6973 | Announced by | AS12179 | INTERNAP-2BLK - Internap Network Services Corporation,US |
| AS6973 | Announced by | AS13789 | INTERNAP-BLK3 - Internap Network Services Corporation,US |
| AS7960 | Announced by | AS3549 | LVLT-3549 - Level 3 Communications, Inc.,US |
| AS8214 | Announced by | AS21183 | ABCOM-AS ABCOM Shpk,AL |
| AS10926 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS10931 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS10946 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS11245 | Announced by | AS6661 | EPT-LU Entreprise des Postes et Telecommunications,LU |
| AS11245 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS11245 | Announced by | AS51964 | ORANGE-BUSINESS-SERVICES-IPSN-ASN Equant Inc.,FR |
| AS11268 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS11289 | Announced by | AS19893 | RAGINGWIRE - RagingWire Data Centers, Inc.,US |
| AS11316 | Announced by | AS20141 | QUALITYTECH-SUW-300 - Quality Technology Services, LLC.,US |
| AS11364 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS11364 | Announced by | AS19855 | MASERGY - Masergy Communications,US |
| AS11480 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS11531 | Announced by | AS18710 | GKG-NET - GKG.NET, INC,US |
| AS11568 | Announced by | AS803 | SASKTEL - Saskatchewan Telecommunications,CA |
| AS11568 | Announced by | AS21804 | ACCESS-SK - Access Communications Co-operative Limited,CA |
| AS11636 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS11789 | Announced by | AS20161 | TRGO - TeraGo Networks Inc.,CA |

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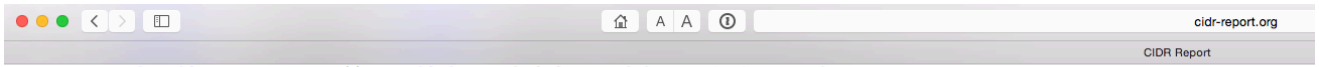
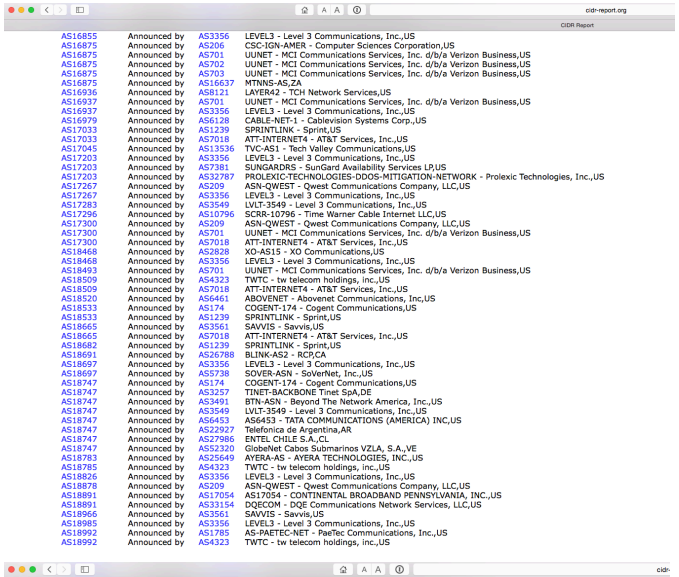
|---|---|---|---|
| AS11793 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS11793 | Announced by | AS22773 | ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US |
| AS11929 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS11930 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS11930 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS11936 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS12011 | Announced by | AS20001 | ROADRUNNER-WEST - Time Warner Cable Internet LLC,US |
| AS12017 | Announced by | AS33154 | DQECOM - DQE Communications Network Services, LLC,US |
| AS12058 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS12058 | Announced by | AS8220 | COLT COLT Technology Services Group Limited,GB |
| AS12071 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS12122 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS12122 | Announced by | AS19108 | SUDDENLINK-COMMUNICATIONS - Suddenlink Communications,US |
| AS12122 | Announced by | AS22911 | SINAP-TIX - SINAP-TIX, LLC,US |
| AS12126 | Announced by | AS10594 | CEC - Cutting Edge Communications, Inc.,US |
| AS12172 | Announced by | AS2379 | EMBARQ-WNPK - Embarq Corporation,US |
| AS12172 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS12195 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS12240 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS12343 | Announced by | AS8218 | NEO-ASN Neo Telecoms S.A.S.,FR |
| AS12910 | Announced by | AS3215 | AS3215 Orange S.A.,FR |
| AS12910 | Announced by | AS6461 | ABOVENET - Abovenet Communications, Inc,US |
| AS13317 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS13347 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS13405 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS13430 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS13471 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS13540 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS13540 | Announced by | AS14744 | INTERNAP-BLOCK-4 - Internap Network Services Corporation,US |
| AS13570 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS13570 | Announced by | AS13789 | INTERNAP-BLK3 - Internap Network Services Corporation,US |
| AS13599 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS13599 | Announced by | AS6128 | CABLE-NET-1 - Cablevision Systems Corp.,US |
| AS13629 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS13629 | Announced by | AS3561 | SAVVIS - Savvis,US |
| AS13629 | Announced by | AS6461 | ABOVENET - Abovenet Communications, Inc,US |
| AS13696 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS13723 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS13723 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS13758 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS13847 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS13847 | Announced by | AS10796 | SCRR-10796 - Time Warner Cable Internet LLC,US |
| AS13956 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS14004 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS14015 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS14045 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS14045 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS14045 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS14045 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS14106 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS14118 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS14130 | Announced by | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US |
| AS14147 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS14147 | Announced by | AS11019 | HAPROXY-TECHNOLOGIES - HAProxy Technologies, Inc.,US |
| AS14150 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |

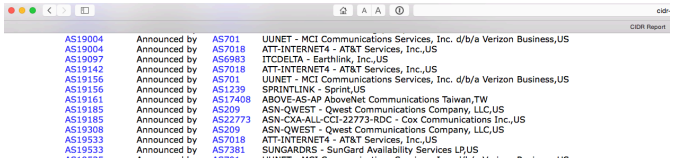
# ZZZZZZZ

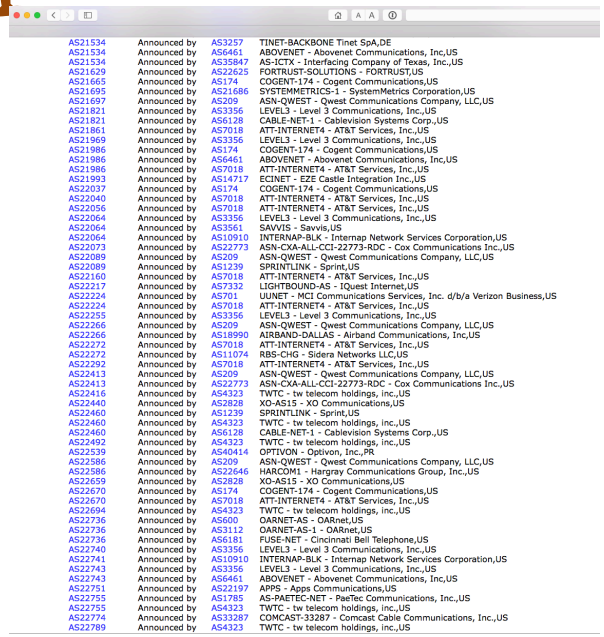


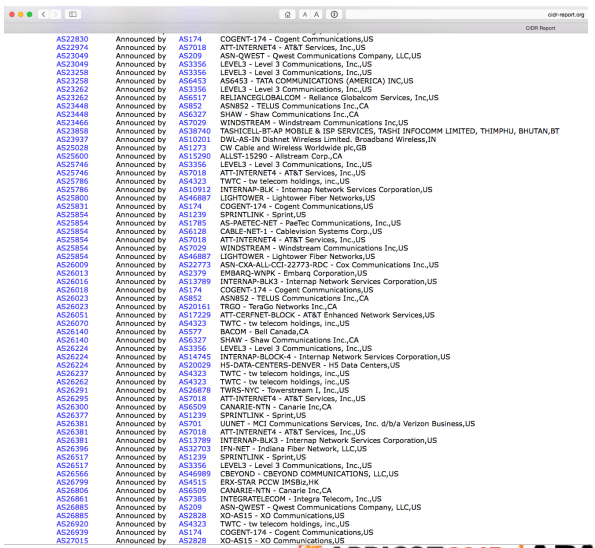

| | | | |
|---|---|---|---|
| AS14190 | Announced by | AS852 | ASN852 - TELUS Communications Inc.,CA |
| AS14267 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS14310 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS14310 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS14353 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS14360 | Announced by | AS13789 | INTERNAP-BLK3 - Internap Network Services Corporation,US |
| AS14422 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS14461 | Announced by | AS22773 | ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US |
| AS14528 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS14566 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS14566 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS14630 | Announced by | AS12179 | INTERNAP-2BLK - Internap Network Services Corporation,US |
| AS14630 | Announced by | AS13791 | INTERNAP-BLK3 - Internap Network Services Corporation,US |
| AS14665 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS14691 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS14694 | Announced by | AS6939 | HURRICANE - Hurricane Electric, Inc.,US |
| AS14731 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS14756 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS14764 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS14806 | Announced by | AS3561 | SAVVIS - Savvis,US |
| AS14844 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS14892 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS14942 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS14993 | Announced by | AS20161 | TRGO - TeraGo Networks Inc.,CA |
| AS15009 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS15009 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS15009 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS15037 | Announced by | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US |
| AS15115 | Announced by | AS10912 | INTERNAP-BLK - Internap Network Services Corporation,US |
| AS15132 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS15182 | Announced by | AS20001 | ROADRUNNER-WEST - Time Warner Cable Internet LLC,US |
| AS15239 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS15239 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS15289 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS15292 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS15302 | Announced by | AS1616 | CORELINK-US-ASN - CoreLink Data Centers,US |
| AS15302 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS15347 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS15347 | Announced by | AS12064 | ASN-CXA-HR-12064-CBS - Cox Communications Inc.,US |
| AS16159 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS16437 | Announced by | AS10796 | SCRR-10796 - Time Warner Cable Internet LLC,US |
| AS16468 | Announced by | AS2828 | XO-AS15 - XO Communications,US |
| AS16468 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS16547 | Announced by | AS5713 | SAIX-NET,ZA |
| AS16555 | Announced by | AS3491 | BTN-ASN - Beyond The Network America, Inc.,US |
| AS16584 | Announced by | AS20115 | CHARTER-NET-HKY-NC - Charter Communications,US |
| AS16665 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS16665 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS16667 | Announced by | AS22773 | ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US |
| AS16667 | Announced by | AS22911 | SINAP-TIX - SINAP-TIX, LLC,US |
| AS16708 | Announced by | AS13789 | INTERNAP-BLK3 - Internap Network Services Corporation,US |
| AS16756 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS16769 | Announced by | AS10910 | INTERNAP-BLK - Internap Network Services Corporation,US |
| AS16797 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS16797 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |

# let's speed this up…

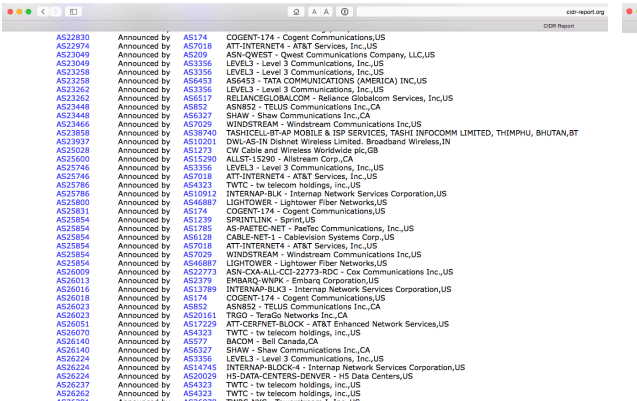


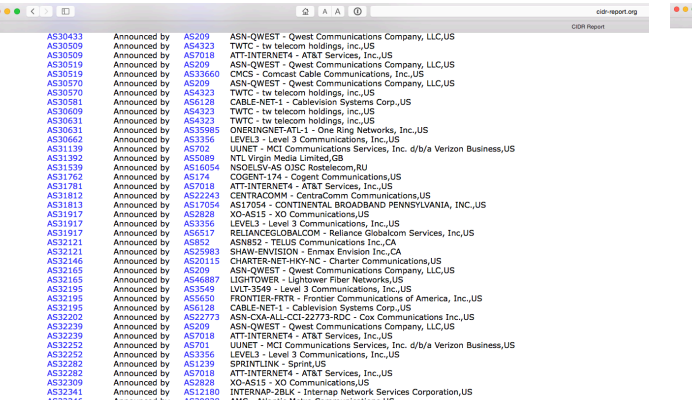



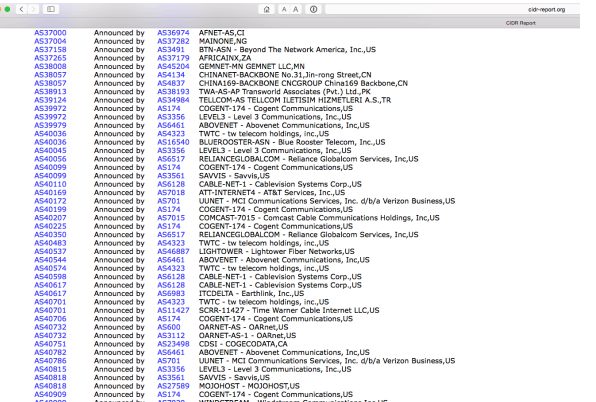



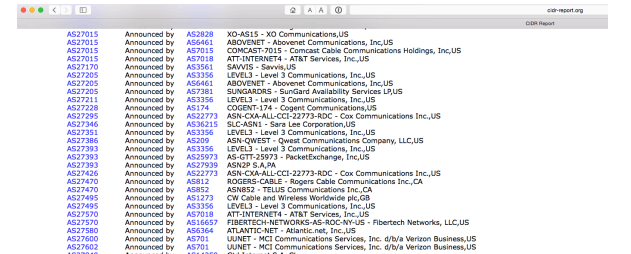



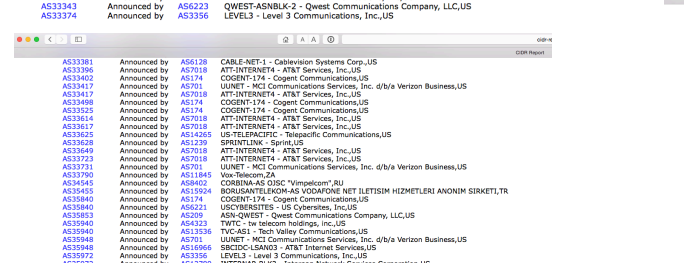
# don't forget: ALL of these advertised addresses and ASes are bogus!



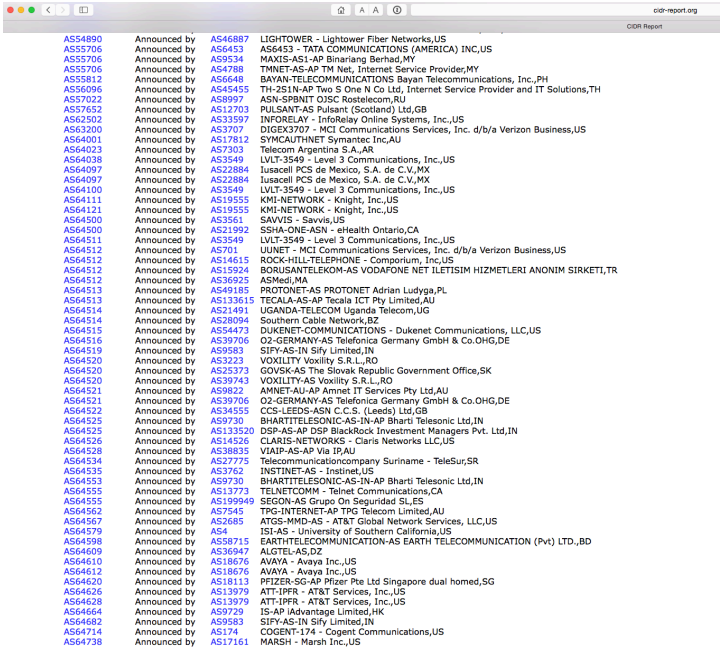



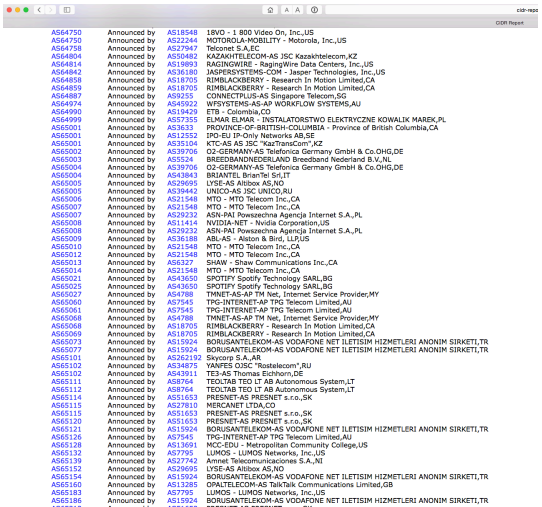




# almost done…



| | | | |
|---|---|---|---|
| AS54890 | Announced by | AS46887 | LIGHTOWER - Lightower Fiber Networks,US |
| AS55706 | Announced by | AS6453 | AS6453 - TATA COMMUNICATIONS (AMERICA) INC,US |
| AS55706 | Announced by | AS9534 | MAXIS-AS1-AP Binariang Berhad,MY |
| AS55706 | Announced by | AS4788 | TMNET-AS-AP TM Net, Internet Service Provider,MY |
| AS55812 | Announced by | AS6648 | BAYAN-TELECOMMUNICATIONS Bayan Telecommunications, Inc.,PH |
| AS56096 | Announced by | AS45455 | TH-2S1N-AP Two S One N Co Ltd, Internet Service Provider and IT Solutions,TH |
| AS57022 | Announced by | AS8997 | ASN-SPBNIT OJSC Rostelecom,RU |
| AS57652 | Announced by | AS12703 | PULSANT-AS Pulsant (Scotland) Ltd,GB |
| AS62502 | Announced by | AS33597 | INFORELAY - InfoRelay Online Systems, Inc.,US |
| AS63200 | Announced by | AS3707 | DIGEX3707 - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS64001 | Announced by | AS17812 | SYMCAUTHNET Symantec Inc,AU |
| AS64023 | Announced by | AS7303 | Telecom Argentina S.A.,AR |
| AS64038 | Announced by | AS3549 | LVLT-3549 - Level 3 Communications, Inc.,US |
| AS64097 | Announced by | AS22884 | Iusacell PCS de Mexico, S.A. de C.V.,MX |
| AS64097 | Announced by | AS22884 | Iusacell PCS de Mexico, S.A. de C.V.,MX |
| AS64100 | Announced by | AS3549 | LVLT-3549 - Level 3 Communications, Inc.,US |
| AS64111 | Announced by | AS19555 | KMI-NETWORK - Knight, Inc.,US |
| AS64121 | Announced by | AS19555 | KMI-NETWORK - Knight, Inc.,US |
| AS64500 | Announced by | AS3561 | SAVVIS - Savvis,US |
| AS64500 | Announced by | AS21992 | SSHA-ONE-ASN - eHealth Ontario,CA |
| AS64511 | Announced by | AS3549 | LVLT-3549 - Level 3 Communications, Inc.,US |
| AS64512 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS64512 | Announced by | AS14615 | ROCK-HILL-TELEPHONE - Comporium, Inc,US |
| AS64512 | Announced by | AS15924 | BORUSANTELEKOM-AS VODAFONE NET ILETISIM HIZMETLERI ANONIM SIRKETI,TR |
| AS64512 | Announced by | AS36925 | ASMedi,MA |
| AS64513 | Announced by | AS49185 | PROTONET-AS PROTONET Adrian Ludyga,PL |
| AS64513 | Announced by | AS133615 | TECALA-AS-AP Tecala ICT Pty Limited,AU |
| AS64514 | Announced by | AS21491 | UGANDA-TELECOM Uganda Telecom,UG |
| AS64514 | Announced by | AS28094 | Southern Cable Network,BZ |
| AS64515 | Announced by | AS54473 | DUKENET-COMMUNICATIONS - Dukenet Communications, LLC,US |
| AS64516 | Announced by | AS39706 | O2-GERMANY-AS Telefonica Germany GmbH & Co.OHG,DE |
| AS64519 | Announced by | AS9583 | SIFY-AS-IN Sify Limited,IN |
| AS64520 | Announced by | AS3223 | VOXILITY Voxility S.R.L.,RO |
| AS64520 | Announced by | AS25373 | GOVSK-AS The Slovak Republic Government Office,SK |
| AS64520 | Announced by | AS39743 | VOXILITY-AS Voxility S.R.L.,RO |
| AS64521 | Announced by | AS9822 | AMNET-AU-AP Amnet IT Services Pty Ltd,AU |
| AS64521 | Announced by | AS39706 | O2-GERMANY-AS Telefonica Germany GmbH & Co.OHG,DE |
| AS64522 | Announced by | AS34555 | CCS-LEEDS-ASN C.C.S. (Leeds) Ltd,GB |
| AS64525 | Announced by | AS9730 | BHARTITELESONIC-AS-IN-AP Bharti Telesonic Ltd,IN |
| AS64525 | Announced by | AS133520 | DSP-AS-AP DSP BlackRock Investment Managers Pvt. Ltd,IN |
| AS64526 | Announced by | AS14526 | CLARIS-NETWORKS - Claris Networks LLC,US |
| AS64528 | Announced by | AS38835 | VIAIP-AS-AP Via IP,AU |
| AS64534 | Announced by | AS27775 | Telecommunicationcompany Suriname - TeleSur,SR |
| AS64535 | Announced by | AS3762 | INSTINET-AS - Instinet,US |
| AS64553 | Announced by | AS9730 | BHARTITELESONIC-AS-IN-AP Bharti Telesonic Ltd,IN |
| AS64555 | Announced by | AS13773 | TELNETCOMM - Telnet Communications,CA |
| AS64555 | Announced by | AS199949 | SEGON-AS Grupo On Seguridad SL,ES |
| AS64562 | Announced by | AS7545 | TPG-INTERNET-AP TPG Telecom Limited,AU |
| AS64567 | Announced by | AS2685 | ATGS-MMD-AS - AT&T Global Network Services, LLC,US |
| AS64579 | Announced by | AS4 | ISI-AS - University of Southern California,US |
| AS64598 | Announced by | AS58715 | EARTHTELECOMMUNICATION-AS EARTH TELECOMMUNICATION (Pvt) LTD.,BD |
| AS64609 | Announced by | AS36947 | ALGTEL-AS,DZ |
| AS64610 | Announced by | AS18676 | AVAYA - Avaya Inc.,US |
| AS64612 | Announced by | AS18676 | AVAYA - Avaya Inc.,US |
| AS64620 | Announced by | AS18113 | PFIZER-SG-AP Pfizer Pte Ltd Singapore dual homed,SG |
| AS64626 | Announced by | AS13979 | ATT-IPFR - AT&T Services, Inc.,US |
| AS64628 | Announced by | AS13979 | ATT-IPFR - AT&T Services, Inc.,US |
| AS64664 | Announced by | AS9729 | IS-AP iAdvantage Limited,HK |
| AS64682 | Announced by | AS9583 | SIFY-AS-IN Sify Limited,IN |
| AS64714 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS64738 | Announced by | AS17161 | MARSH - Marsh Inc.,US |

| | | | |
|---|---|---|---|
| AS65222 | Announced by | AS6407 | PRIMUS-AS6407 - Primus Telecommunications Canada Inc.,CA |
| AS65300 | Announced by | AS5563 | URAL CJSC Ural WES,RU |
| AS65300 | Announced by | AS8387 | T-SYSTEMS-AT T-Systems Austria GesmbH,AT |
| AS65306 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |
| AS65403 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS65403 | Announced by | AS1803 | ICMNET-5 - Sprint,US |
| AS65408 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS65412 | Announced by | AS4847 | CNIX-AP China Networks Inter-Exchange,CN |
| AS65412 | Announced by | AS8764 | TEOLTAB TEO LT AB Autonomous System,LT |
| AS65412 | Announced by | AS9583 | SIFY-AS-IN Sify Limited,IN |
| AS65412 | Announced by | AS36866 | JTL,KE |
| AS65430 | Announced by | AS23383 | METRORED S.A. DE C.V.,HN |
| AS65500 | Announced by | AS22884 | Iusacell PCS de Mexico, S.A. de C.V.,MX |
| AS65500 | Announced by | AS31133 | MF-MGSM-AS OJSC MegaFon,RU |
| AS65501 | Announced by | AS32098 | TRANSTELCO-INC - Transtelco Inc,US |
| AS65501 | Announced by | AS65000 | -Private Use AS-,ZZ |
| AS65502 | Announced by | AS41710 | MIITLTD-AS MIIT Ltd.,UA |
| AS65506 | Announced by | AS42362 | ALANIA-AS OJSC Rostelecom,RU |
| AS65512 | Announced by | AS42806 | Magticom Ltd.,GE |
| AS65512 | Announced by | AS45899 | VNPT-AS-VN VNPT Corp,VN |
| AS65514 | Announced by | AS3209 | VODANET Vodafone GmbH,DE |
| AS65515 | Announced by | AS48861 | APAGA Apaga Technologies CJSC,AM |
| AS65518 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS65521 | Announced by | AS39442 | UNICO-AS JSC UNICO,RU |
| AS65525 | Announced by | AS9497 | DIGITELONE Digital Telecommunications Philippines Inc.,PH |
| AS65525 | Announced by | AS22485 | MONTANA-OPTICOM-AS22485 - Montana Opticom, LLC,US |
| AS65529 | Announced by | AS15836 | AXAUTSYS ARAX I.S.P.,MD |
| AS65530 | Announced by | AS3255 | UARNET-AS State Enterprise Scientific and Telecommunication Centre "Ukrainian Academic and R |
| AS65530 | Announced by | AS39442 | UNICO-AS JSC UNICO,RU |
| AS65530 | Announced by | AS52596 | GABRIEL MORAIS SIMOES ME,BR |
| AS65531 | Announced by | AS3255 | UARNET-AS State Enterprise Scientific and Telecommunication Centre "Ukrainian Academic and R |
| AS65531 | Announced by | AS53125 | NAPE - Núcleo de Assessoria aos Prof. e Empr.,BR |
| AS65533 | Announced by | AS201540 | PJCO Pishgaman Toseeh Fanavari Etelaat va Ertebatat Jonoub,IR |
| AS65534 | Announced by | AS11274 | ADHOST - Adhost Internet Advertising, LLC,US |
| AS65534 | Announced by | AS25983 | SHAW-ENVISION - Enmax Envision Inc.,CA |
| AS65534 | Announced by | AS45786 | HTSNET-AS-ID HTSNET - ISP,ID |
| AS65535 | Announced by | AS13773 | TELNETCOMM - Telnet Communications,CA |
| AS65535 | Announced by | AS28885 | OMANTEL-NAP-AS OmanTel NAP,OM |
| AS65535 | Announced by | AS33771 | SAFARICOM-LIMITED,KE |
| AS65535 | Announced by | AS133178 | ACABPS-AS-AP Australian Customs and Border Protection Service,AU |
| AS65536 | Announced by | AS3491 | BTN-ASN - Beyond The Network America, Inc.,US |
| AS65536 | Announced by | AS8697 | JTC-AS8697 Jordan Telecommunications Company,JO |
| AS65538 | Announced by | AS1273 | CW Cable and Wireless Worldwide plc,GB |
| AS65539 | Announced by | AS1273 | CW Cable and Wireless Worldwide plc,GB |
| AS65545 | Announced by | AS9441 | NEXT-BD Next Online Limited,BD |
| AS65555 | Announced by | AS19771 | EMERGE-AS1 - Emerge Technologies LLC.,US |
| AS65600 | Announced by | AS30372 | SUNESYS2 - Sunesys, LLC,US |
| AS65735 | Announced by | AS12735 | ASTURKNET TurkNet Iletisim Hizmetleri A.S,TR |
| AS131306 | Announced by | AS20884 | CZ-CTNET-AS Telefonica Czech Republic, a.s.,CZ |
| AS131891 | Announced by | AS9498 | BBIL-AP BHARTI Airtel Ltd.,IN |
| AS132090 | Announced by | AS45671 | SAU-NET-AU Servers Australia Pty Ltd,AU |
| AS132210 | Announced by | AS9503 | FX-PRIMARY-AS FX Networks Limited,AU |
| AS197993 | Announced by | AS42652 | DELUNET inexio Informationstechnologie und TelekommunikationKGaA,DE |
| AS199573 | Announced by | AS3356 | LEVEL3 - Level 3 Communications, Inc.,US |
| AS393223 | Announced by | AS174 | COGENT-174 - Cogent Communications,US |
| AS393223 | Announced by | AS1239 | SPRINTLINK - Sprint,US |
| AS393223 | Announced by | AS1273 | CW Cable and Wireless Worldwide plc,GB |
| AS393223 | Announced by | AS6939 | HURRICANE - Hurricane Electric, Inc.,US |
| AS12845938 | Announced by | AS12741 | AS-NETIA Netia SA,PL |
| AS4220210733 | Announced by | AS7029 | WINDSTREAM - Windstream Communications Inc,US |
| AS4261171720 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |



| | | | |
|---|---|---|---|
| AS64750 | Announced by | AS18548 | 1BVO - 1 800 Video On, Inc.,US |
| AS64750 | Announced by | AS22244 | MOTOROLA-MOBILITY - Motorola, Inc.,US |
| AS64758 | Announced by | AS27947 | Telconet S.A,EC |
| AS64804 | Announced by | AS50482 | KAZAKHTELECOM-AS JSC Kazakhtelecom,KZ |
| AS64814 | Announced by | AS19893 | RAGINGWIRE - RagingWire Data Centers, Inc.,US |
| AS64842 | Announced by | AS36180 | JASPERSYSTEMS-COM - Jasper Technologies, Inc.,US |
| AS64858 | Announced by | AS18705 | RIMBLACKBERRY - Research In Motion Limited,CA |
| AS64859 | Announced by | AS18705 | RIMBLACKBERRY - Research In Motion Limited,CA |
| AS64887 | Announced by | AS9255 | CONNECTPLUS-AS Singapore Telecom,SG |
| AS64974 | Announced by | AS49322 | WFSYSTEMS-AS-AP WORKFLOW SYSTEMS,AU |
| AS64990 | Announced by | AS19429 | ETB - Colombia,CO |
| AS64999 | Announced by | AS57355 | ELMAR ELMAR - INSTALATORSTWO ELEKTRYCZNE KOWALIK MAREK,PL |
| AS65001 | Announced by | AS3633 | PROVINCE-OF-BRITISH-COLUMBIA - Province of British Columbia,CA |
| AS65001 | Announced by | AS12552 | IPO-EU IP-Only Networks AB,SE |
| AS65001 | Announced by | AS35104 | KTC-AS AS JSC "KazTransCom",KZ |
| AS65002 | Announced by | AS39706 | O2-GERMANY-AS Telefonica Germany GmbH & Co.OHG,DE |
| AS65003 | Announced by | AS5524 | BREEDBANDNEDERLAND Breedband Nederland B.V.,NL |
| AS65004 | Announced by | AS39706 | O2-GERMANY-AS Telefonica Germany GmbH & Co.OHG,DE |
| AS65004 | Announced by | AS43843 | BRIANTEL BrianTel Srl,IT |
| AS65005 | Announced by | AS29695 | LYSE-AS Altibox AS,NO |
| AS65005 | Announced by | AS39442 | UNICO-AS JSC UNICO,RU |
| AS65006 | Announced by | AS21548 | MTO - MTO Telecom Inc.,CA |
| AS65007 | Announced by | AS21548 | MTO - MTO Telecom Inc.,CA |
| AS65007 | Announced by | AS29232 | ASN-PAI Powszechna Agencja Internet S.A.,PL |
| AS65008 | Announced by | AS11414 | NVIDIA-NET - Nvidia Corporation,US |
| AS65008 | Announced by | AS29232 | ASN-PAI Powszechna Agencja Internet S.A.,PL |
| AS65009 | Announced by | AS36188 | ABL-AS - Alston & Bird, LLP,US |
| AS65010 | Announced by | AS21548 | MTO - MTO Telecom Inc.,CA |
| AS65012 | Announced by | AS21548 | MTO - MTO Telecom Inc.,CA |
| AS65013 | Announced by | AS6327 | SHAW - Shaw Communications Inc.,CA |
| AS65014 | Announced by | AS21548 | MTO - MTO Telecom Inc.,CA |
| AS65021 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |
| AS65025 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |
| AS65027 | Announced by | AS4788 | TMNET-AS-AP TM Net, Internet Service Provider,MY |
| AS65060 | Announced by | AS7545 | TPG-INTERNET-AP TPG Telecom Limited,AU |
| AS65061 | Announced by | AS7545 | TPG-INTERNET-AP TPG Telecom Limited,AU |
| AS65068 | Announced by | AS4788 | TMNET-AS-AP TM Net, Internet Service Provider,MY |
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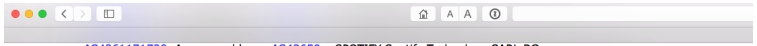
| AS65069 | Announced by | AS18705 | RIMBLACKBERRY - Research In Motion Limited,CA |
| AS65073 | Announced by | AS15924 | BORUSANTELEKOM-AS VODAFONE NET ILETISIM HIZMETLERI ANONIM SIRKETI,TR |
| AS65077 | Announced by | AS15924 | BORUSANTELEKOM-AS VODAFONE NET ILETISIM HIZMETLERI ANONIM SIRKETI,TR |
| AS65101 | Announced by | AS262192 | Skycorp S.A.,AR |
| AS65102 | Announced by | AS34875 | YANFES OJSC "Rostelecom",RU |
| AS65102 | Announced by | AS43911 | TE3-AS Thomas Eichhorn,DE |
| AS65111 | Announced by | AS8764 | TEOLTAB TEO LT AB Autonomous System,LT |
| AS65112 | Announced by | AS8764 | TEOLTAB TEO LT AB Autonomous System,LT |
| AS65114 | Announced by | AS51653 | PRESNET-AS PRESNET s.r.o.,SK |
| AS65115 | Announced by | AS27810 | MERCANET LTDA,CO |
| AS65115 | Announced by | AS51653 | PRESNET-AS PRESNET s.r.o.,SK |
| AS65120 | Announced by | AS51653 | PRESNET-AS PRESNET s.r.o.,SK |
| AS65121 | Announced by | AS15924 | BORUSANTELEKOM-AS VODAFONE NET ILETISIM HIZMETLERI ANONIM SIRKETI,TR |
| AS65126 | Announced by | AS7545 | TPG-INTERNET-AP TPG Telecom Limited,AU |
| AS65128 | Announced by | AS13691 | MCC-EDU - Metropolitan Community College,US |
| AS65132 | Announced by | AS7795 | LUMOS - LUMOS Networks, Inc.,US |
| AS65139 | Announced by | AS27742 | Amnet Telecomunicaciones S.A.,NI |
| AS65152 | Announced by | AS29695 | LYSE-AS Altibox AS,NO |
| AS65154 | Announced by | AS15924 | BORUSANTELEKOM-AS VODAFONE NET ILETISIM HIZMETLERI ANONIM SIRKETI,TR |
| AS65160 | Announced by | AS13285 | OPALTELECOM-AS TalkTalk Communications Limited,GB |
| AS65183 | Announced by | AS7795 | LUMOS - LUMOS Networks, Inc.,US |
| AS65186 | Announced by | AS15924 | BORUSANTELEKOM-AS VODAFONE NET ILETISIM HIZMETLERI ANONIM SIRKETI,TR |
| AS65212 | Announced by | AS51653 | PRESNET-AS PRESNET s.r.o.,SK |



| | | | |
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| AS4261171721 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |
| AS4261171722 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |
| AS4261181720 | Announced by | AS43650 | SPOTIFY Spotify Technology SARL,BG |
| AS4267245596 | Announced by | AS51653 | PRESNET-AS PRESNET s.r.o.,SK |
| AS4267245596 | Announced by | AS51653 | PRESNET-AS PRESNET s.r.o.,SK |

# and lets not forget IPv6!


## Possible Bogus Routes and AS Announcements

No Bogus Routes

Report: Allocated and Unallocated IPv6 address blocks

### Possible Bogus ASs

| Bogus AS | | | Announcing-AS |
|---|---|---|---|
| AS3402 | Announced by | AS2914 | NTT-COMMUNICATIONS-2914 - NTT America, Inc.,US |
| AS5669 | Announced by | AS8928 | INTEROUTE Interoute Communications Limited,GB |
| AS14844 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS15009 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS18747 | Announced by | AS3257 | TINET-BACKBONE Tinet SpA,DE |
| AS19972 | Announced by | AS4323 | TWTC - tw telecom holdings, inc.,US |
| AS25746 | Announced by | AS209 | ASN-QWEST - Qwest Communications Company, LLC,US |
| AS26806 | Announced by | AS6509 | CANARIE-NTN - Canarie Inc,CA |
| AS27205 | Announced by | AS6461 | ABOVENET - Abovenet Communications, Inc,US |
| AS30037 | Announced by | AS701 | UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US |
| AS30037 | Announced by | AS7018 | ATT-INTERNET4 - AT&T Services, Inc.,US |
| AS32346 | Announced by | AS29838 | AMC - Atlantic Metro Communications,US |
| AS33343 | Announced by | AS6223 | QWEST-ASNBLK-2 - Qwest Communications Company, LLC,US |
| AS41102 | Announced by | AS9009 | M247 M247 Ltd,BE |
| AS56418 | Announced by | AS5541 | ADNET-TELECOM SC AD NET MARKET MEDIA SRL,RO |
| AS64401 | Announced by | AS11271 | BT Latam Brasil Ltda,BR |
| AS64560 | Announced by | AS10024 | LGA-AS-SG-AP LGA International,SG |
| AS65000 | Announced by | AS3.341 | PODRYAD-AS Kozitskiy A.M. PI,RU |
| AS65123 | Announced by | AS38294 | SERVERWORKS-NZ-AP Serverworks Content Provider,NZ |
| AS65149 | Announced by | AS3758 | ERX-SINGNET SingNet,SG |
| AS65201 | Announced by | AS21688 | GMP-METROCAST - GMP Cable TV,US |
| AS65206 | Announced by | AS9930 | TTNET-MY TIME dotCom Berhad,MY |
| AS65251 | Announced by | AS3758 | ERX-SINGNET SingNet,SG |
| AS65260 | Announced by | AS3758 | ERX-SINGNET SingNet,SG |
| AS65441 | Announced by | AS3758 | ERX-SINGNET SingNet,SG |
| AS65530 | Announced by | AS4788 | TMNET-AS-AP TM Net, Internet Service Provider,MY |
| AS2.2077 | Announced by | AS9931 | CAT-AP The Communication Authoity of Thailand, CAT,TH |

# What's the base problem here?

***We are not doing a very good job***

- Routing is built on vague mutual trust models
- Routing auditing is a low value activity that noone really performs with any level of thoroughness
- We have grown used to lousy solutions and institutionalized lying in the routing system
- And because instances of abuse are supposedly relatively infrequent we are prepared to tolerate the risk of having a completely insecure routing system

# What's the base problem here?

Noone seems to want to care enough about the integrity of the network to address routing integrity!

# Routing Security is a shared problem

It's a tragedy of the commons situation

- Nobody can single-handedly apply rigorous tests on the routing system
- And the lowest common denominator approach is to apply no integrity tests at all
- It's all misplaced trust and absolutely no effective defence!

# What SHOULD we be doing?

# Routing Security AOI

1. Protecting the **routers**
   - Threat model:
     - Compromised router used to insert corrupted address information into your network's routing tables
     - Insert corrupt reachability information into your network's forwarding tables
     - Allow the routing protocol to disseminate the corrupted information across the entire internet
   - Response:
     - Secure your routers!

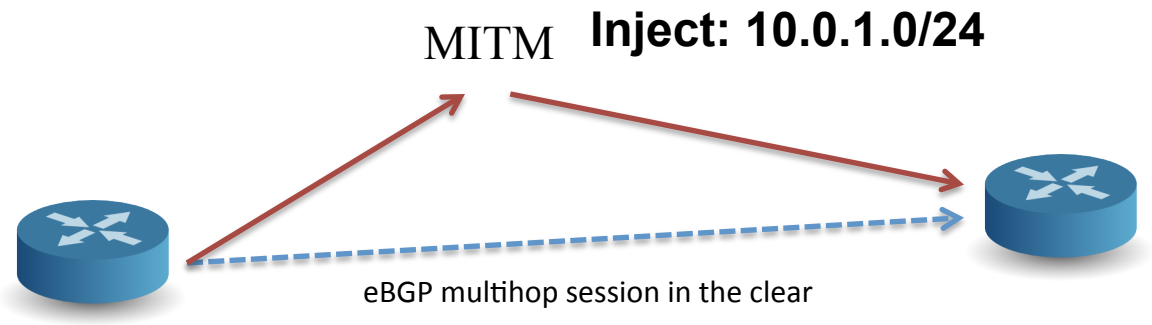
# Routing Security AOI

1. Protecting the **routers**
   - Threat model:
     - Compromised router used to i… …mation into your network's routi…
     - Insert corr… …warding t…
     - … …e corrupted information a…
   - Respo…
     - Secu… …ur routers!

This is up to you, and the tools and operational practices are widely disseminated to achieve this – it's not rocket science!

# Routing Security A02

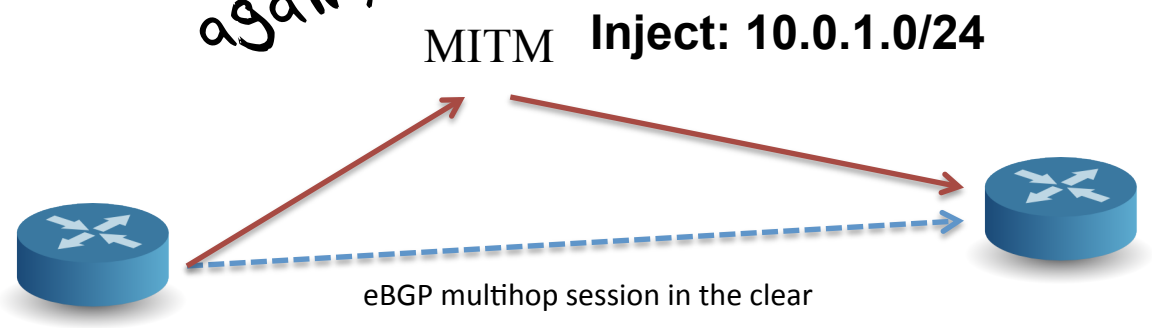
2. Protecting **routing protocols** and their operation
   - Threat model:
     - Disrupt the operation of the routing protocol by a “man-in-the-middle” attack
     - Compromise the topology discovery / reachability operation of the routing protocol by injection of false routing information
   - Response:
     - Current operational best practice uses TCP-MD5 and avoids multihop for all eBGP sessions



# Routing Security A02

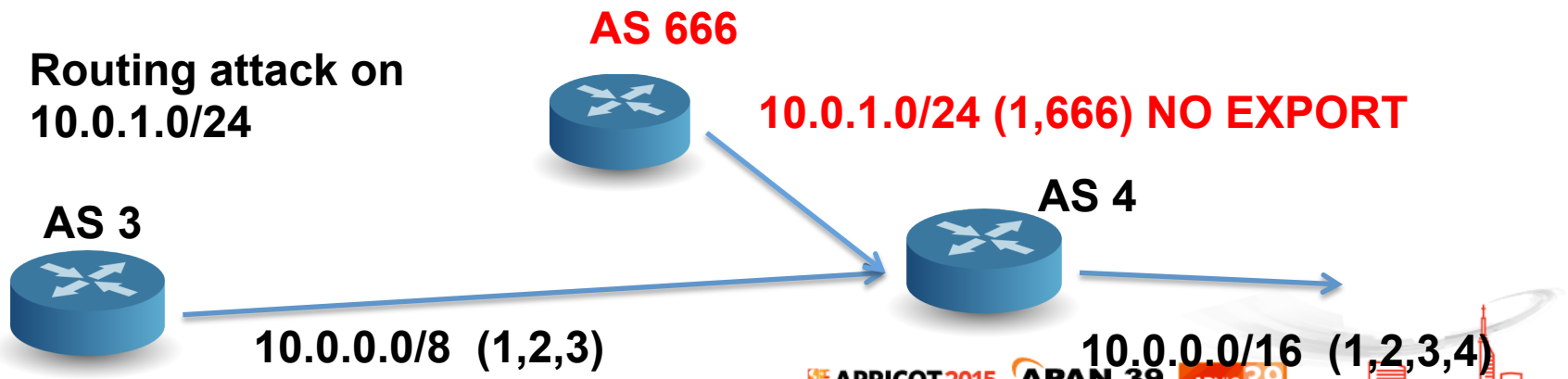
2. Protecting **routing protocols** and their operation
   - Threat model:
     - Disrupt the operation of ... the-middle" attack
     - Comp... of the
   - Res...
     - C... CP-MD5 and avoids multihop for al...

This is up to you and your eBGP peers, and the tools and operational practices are widely disseminated to achieve this – again, it's not rocket science!



# Routing Security A03

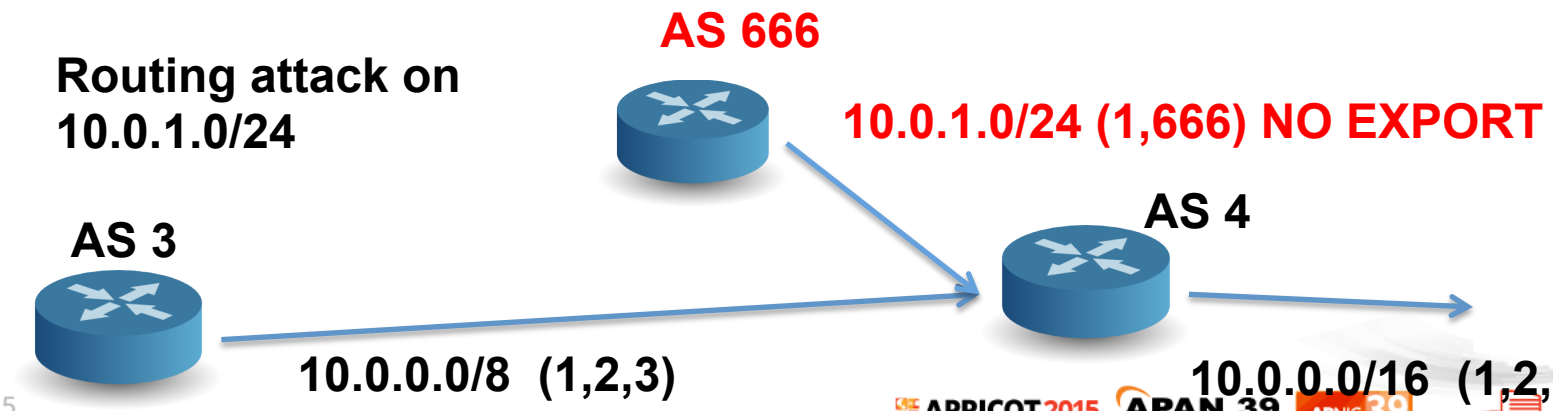
3. Protecting the **routing protocol payload**
   - Threat model:
     - Insert corrupted address information into your network's routing tables
     - Insert corrupt reachability information into your network's forwarding tables
     - Allow the routing protocol to disseminate the corrupted information across the entire internet
   - Response:
     -



# Routing Security A03

3. Protecting the **routing protocol payload**
   - Threat model:
     - Insert corrupted address information into routing tables
     - Insert corrupt reachability information into forwarding tables
     - Allow the routing system to propagate the corrupted information across
   - Response:
     -

Unfortunately, this could well be rocket science!



Can we "tweak" BGP so that it can detect the difference between good and evil and only advertise and propagate the "good" routes?

# Routing Security

- The basic routing payload security questions that need to be answered are:
  - **Who** injected this address prefix into the network?
  - Did they have the necessary **credentials** to inject this address prefix? Is this a valid address prefix?
  - Is the forwarding path to reach this address prefix **trustable**?
- And can these questions be answered by any BGP speaker quickly and cheaply?

# A (random) BGP Update

2015/01/26 00:03:35 rcvd UPDATE w/ attr:

nexthop 203.119.76.3, origin i, path 4608 1221 4637 3561 3356 4657 4773

124.197.64.0/19

# BGP Update Validation

2015/01/26 00:03:35 rcvd UPDATE w/ attr:

nexthop 203.119.76.3, origin i, path 4608 1221 4637 3561 3356 4657 4773

124.197.64.0/19

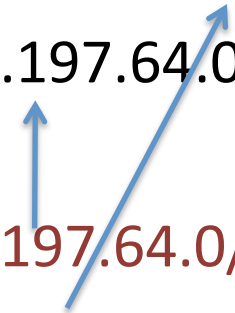
Is 124.197.64.0/19 a “valid” prefix?

# BGP Update Validation

2015/01/26 00:03:35 rcvd UPDATE w/ attr:

nexthop 203.119.76.3, origin i, path 4608 1221 4637 3561 3356 4657 4773

124.197.64.0/19



Is 124.197.64.0/19 a “valid” prefix?

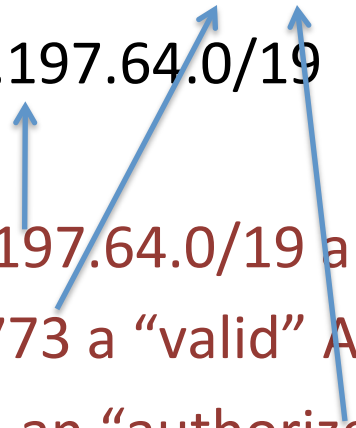
Is AS4773 a “valid” ASN?

# BGP Update Validation

2015/01/26 00:03:35 rcvd UPDATE w/ attr:

nexthop 203.119.76.3, origin i, path 4608 1221 4637 3561 3356 4657 4773

124.197.64.0/19



Is 124.197.64.0/19 a “valid” prefix?

Is AS4773 a “valid” ASN?

Is 4773 an “authorized” AS that is permitted to advertise a route to this prefix?

# BGP Update Validation

2015/01/26 00:03:35 rcvd UPDATE w/ attr:
nexthop 203.119.76.3, origin i, path 4608 1221 4637 3561 3356 4657 4773
124.197.64.0/19

- Is 124.197.64.0/19 a “valid” prefix?
- Is AS4773 a “valid” ASN?
- Is 4773 an “authorized” AS that is permitted to advertise a route to this prefix?
- Is the AS Path “valid”?
  - Is AS 4657 a valid AS, and did AS 4773 advertise this route to AS 4657?
  - Is AS 3356 a valid AS, and did AS 4657 advertise this route to AS 3356?
  - Etc
- Does this AS Path represent a viable forwarding path to reach this address prefix?

# The Basics of Update Validation

- The VALIDITY of the Address and AS number
- The AUTHORISATION provided by the address holder to permit the AS to originate the route
- The CORRECTNESS of the path to reach the destination

# Approaches to Validity

- The awesome power of Whois!
- Entries in a routing registry
- Delegation of reverse DNS zone
- Certification of an allocation registry entry

# Approaches to Validity

- The awesome power of Whois!
- Entries in a routing registry
- Delegation of reverse DNS zone
- Certification of an allocation registry entry

All of these approaches rely on some form of trusted third party attestation to provide information about the address

The credentials of the party holding the address are not well described in the first two approaches

For reverse DNS it's the delegated zone admin

For certification it's the holder of the private key

# None of these Approaches are a Perfect Fit

Route Registries:

- The route registry model relies on the maintenance of a trustable registry write access model. Too often this access model becomes a Mail From access or user / password. Efforts to move to keyed access and user certs have often foundered on user resistance to cert management tools in user systems
- There is no single IRR, but many IRRs each with partial (and sometimes conflicting data) or dubious quality and uncertain validity
- The Route Registry Object access model is variously implemented
- All this can be improved, but to do so probably requires keys (and certs) and signed objects
- In theory, and practice, this can work for a diligent, mutually trusting community using simple origination registry objects
- If you operate a network high in the interconnection hierarchy, then the large ACL filters pose a scaling issue in terms of router config / state bloat
- The operating overhead of maintaining current accurate data is high and the integrity of the route registry contents is vulnerable to bad actors

# None of these Approaches are a Perfect Fit

## Populating Reverse DNS:

- The reverse DNS model does not cleanly map across CIDR delegations
  - It can be coerced to do so, but its not a smooth fit
- The approach relies on integrity of zone delegation and management
- Mapping AS numbers?
  - How can you answer “assemble the list of all addresses originated by an AS” if all you have in the reverse DNS is address -> AS mapping
- Integrity of critical information in the DNS really needs DNSSEC
  - Which in turn implies private key management tools and practices on the part of address holders
- Would this approach be a case of overloading the DNS?

# None of these Approaches are a Perfect Fit

## Number PKI:

- A PKI for Addresses and AS numbers has issues has its own issues
- Key / Cert management for a new PKI requires a dedicated tool set
- Familiarity with managing keys is an issue
- Hardware and software tools for use in this PKI tend to be incomplete and expose much of the underlying mechanics of the crypto system
- Acceptance by operators is an issue
- Distribution of Certificates and CRLs uses “just in case” flooding and runs into a novel set of issues of distribution and synchronization of routing information and the associated credentials that need to be used to validate the routing information

# A Foundation for Routing Security

A PKI for addresses and ASNs makes a lot of sense: (*)

- Use digital signatures to both the integrity, the authenticity and the currency of the signed data. This allows systems to automatically validate attestations about addresses and their use

- Digital signatures that can be validated in this PKI can be used to sign:
  - Route Registry Entries
  - Route Requests
  - BGP

* Yes, that's a personal opinion!

# What about BGP?

- What are the trade-offs in adding any of these approaches into the context of BGP?
  - How a BGP speaker can be assured that the origination of the route is valid?
  - And that the AS path that is being presented is an authentic representation of a viable forwarding path to the address?

# BGP Elements

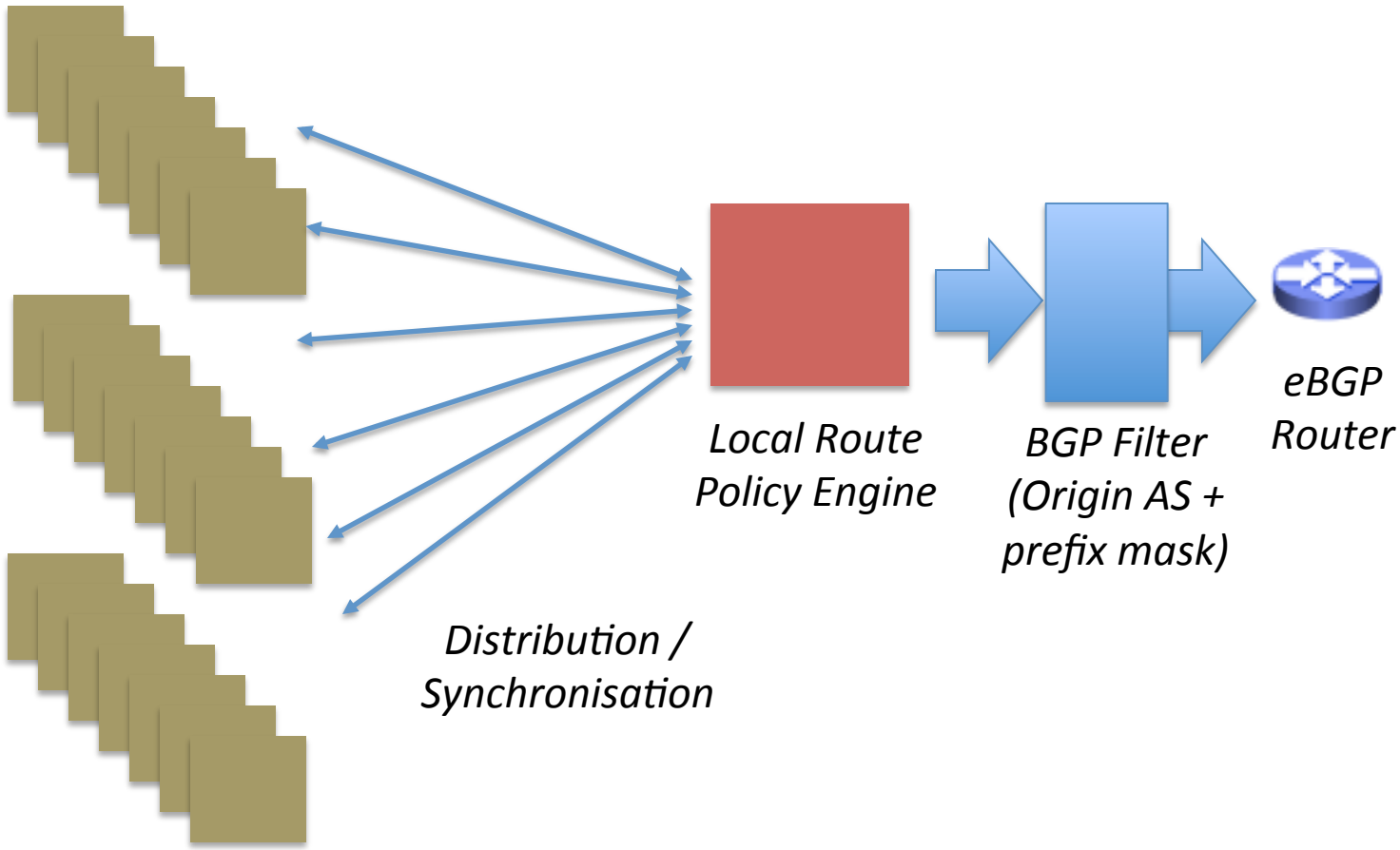
- Origination
  - Is the address valid?
  - Is the origination of this route a duly authorized use of this address?
- Path
  - Is the forwarding path represented in the route an authentic path?
  - If I pass a packet into this path will it get to its intended destination?

# BGP Origination (1)

## Managed Filters

- Filter lookup is fast within the router, and filter construction can be undertaken by a trusted off-unit subsystem, using an incremental difference sync protocol to keep the router state in sync
- Route Registry model of declaring in advance what addresses you may advertise to your BGP peers
  - The peer constructs an acceptance filter based on this list
- RPKI ROA model of declaring in advance what addresses you may advertise to your BGP peers
  - The peer constructs an acceptance filter based on this list

# A filter-based architecture for securing BGP origination

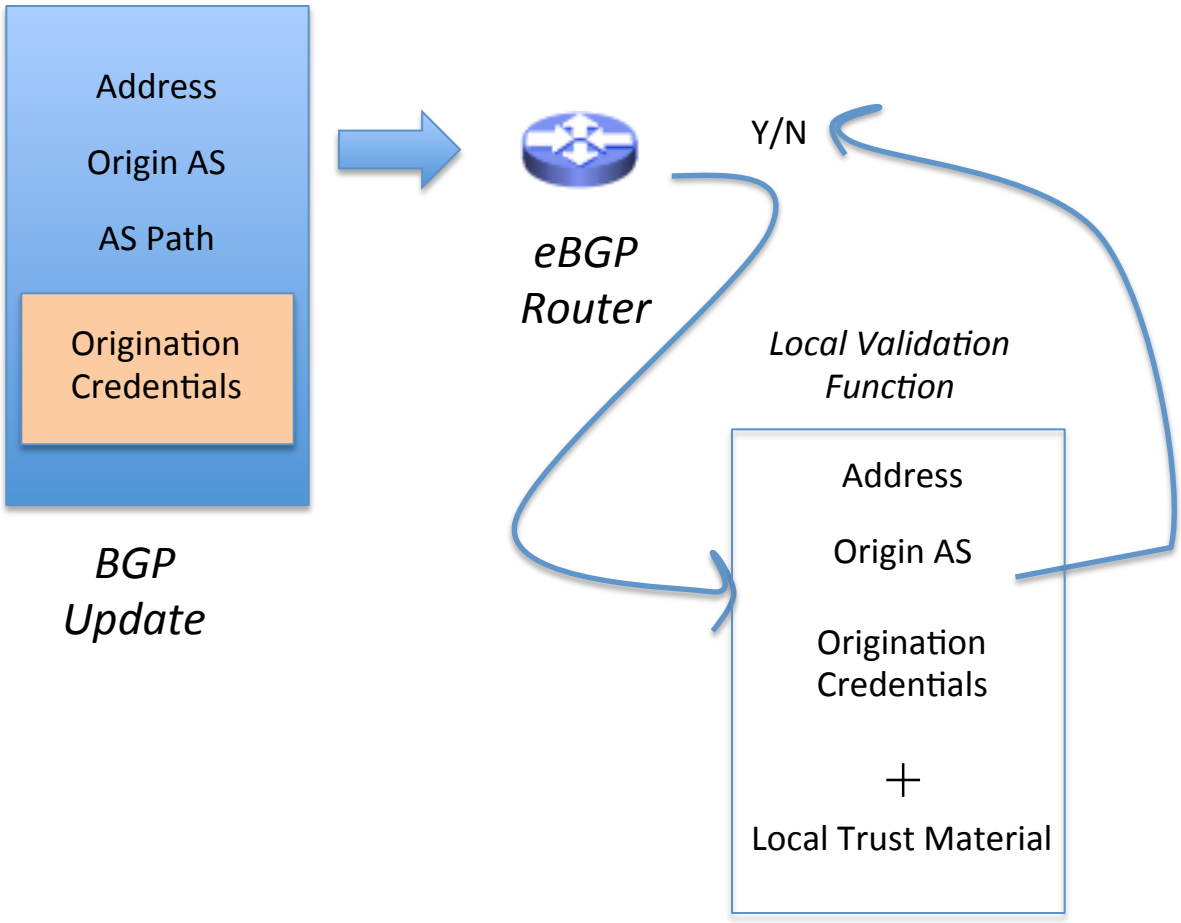


# BGP Origination (2)

## Update Filtering

- Update filtering allows the credential information to be passed with the data, allowing for "just in time" delivery of credentials and information
- Can be undertaken on-board, or outsourced to update filtering BGP route server(s) within each AS
- RKPI ROA attached to the update as an opaque transitive attribute?
  - BGP bloat?
  - Digital signatures plus PKI Certs can add significant size to updates and processing load to routers (as in a BGP peer session reset)
- Or perform a Reverse DNS lookup
  - Validate originating AS through a DNS query of the prefix

# A update-based architecture for securing BGP origination



# Path Validation

Origination validation reduces the attack surface, but an attacker can still inject bogus routes as long as it synthesizes the specified originating AS in the bogus route entry

So while origination protection is a good initial step, it is just an initial step and by itself its not a completely adequate approach to routing security

But how far (and at what cost) should we go to secure AS Paths?

# option a: Route Registries and RPSL

- Using RPSL and various forms of export and import attestations in a route registry it is feasible to construct AS Path filters that allow a BGP speaker to filter out implausible AS Paths from incoming updates
- In practice RPSL never gained widespread acceptance. Some communities worked hard to promulgate its use, but overall it was unable to achieve widespread adoption and the effort / benefit equation was unsustainable
- RPSL path filters can filter out what's implausible

# option b: AS Adjacency and soBGP

- A similar approach was described in soBGP, where a pair of adjacent ASs would publish and propagate a signed AS Adjacency Attestation
- If a BGP speaker receives a AS Path it can break the path into a sequence of AS adjacency pairs and determine if the AS Path represents a plausible transit path through the network
- This plausibility test can be performed through a filter operation performed on received updates, either on-board or off-loaded

# option c:
# AS Path Validation and BGPsec

- BGPsec proposes a stricter form of AS Path validation where each eBGP speaker uses its own digital key to sign across the path and the AS to whom the update is being sent
- It is not possible for a third party to construct a bogus route in this scenario unless it gains access to keys
- But this sequence of interlocking signatures implies:
  - BGPsec routers are required to unchain the signature set and match it to the AS Path in the update, using the local RPKI cache to validate the router signatures
  - BGP bloat in carrying interlocking signatures
  - a high crypto processing overhead in processing updates
  - no useful validation in cases of piecemeal adoption of BGPsec

# Concerns

A major issue here is that of ***partial use and deployment***

- This security mechanism has to cope with partial deployment in the routing system
  - The basic conventional approach of "what is not certified and proved as good must be bad" will not work in a partial deployment scenario
- In BGP we need to think about both origination and the AS Path of a route object in a partial deployed environment
  - AS path validation is challenging indeed in an environment of piecemeal use of secure credentials, as the mechanism cannot tunnel from one BGPsec "island" to the next "island"
- A partially secured environment may incur a combination of high incremental cost with only marginal net benefit to those deploying BGPsec

# Concerns

Is a ***trust hierarchy*** the best approach to use?

- The concern here is **concentration of vulnerability**

  If validation of routing information is dependent on the availability and validity of a single root trust anchor then what happens when this single digital artifact is attacked?

- But is there a viable alternative approach?

  Can you successfully incorporate robust diversity of authentication of security credentials into a supposedly highly resilient secure trust framework?

This is a very challenging question about the nature of trust in a diverse networked environment!

# Concerns

Is certification the ***only way*** to achieve useful outcomes in securing routing?

- Is this form of augmentation to BGP to enforce "protocol payload correctness" over-engineered, and does it rely on impractical models of universal adoption?
- Can various forms of *routing anomaly detectors* adequately detect the most prevalent forms of typos and deliberate lies in routing with a far lower overhead, and allow for unilateral detection of routing anomalies?
- Or are such anomaly detectors yet another instance of "cheap security pantomime" that offer a thinly veiled placebo of apparent security that is easily circumvented or fooled by determined malicious attack?

# What are we trying to do?

Is securing the routing system alone actually enough?

- Can you validate the "correctness" of the forwarding paths being proposed by a routing system?
  - Is secure routing helpful in and of itself?
  - Or this this just pushing the vulnerability set to a different point in the network integrity space?
  - Does this adequately reduce the level of exposure to attack?
  - Is BGP too incomplete in terms of its information distribution properties to allow robust validation of the intended forwarding state?

If not, then is this a case of too high a cost or too low a benefit?

- Is this a case of reducing the security credential generation and validation workload by reducing the security outcomes through reduced trust and/or reduced amount of validated information
- Or is this a case of increasing the level of assurance and the amount of routing information secured by these mechanisms

# What are we trying to do?

Is Partial Deployment of any value?

- Are the semantics of routing security and incomplete credentials compatible concepts?
  - Can you deploy high integrity security using partial deployment scenarios?
  - The issue here is that credentials can assure a recipient that the information that they receive are authentic. They can mark what's "good". But the aim of the exercise is to identify what's "bad".
  - In a scenario of comprehensive deployment, then the inability to determine "good" implies "bad"
  - In partial deployment scenarios the inability to determine "good" means…?

# Good, Fast, or Cheap? Pick one!

We just can't make secure routing mechanisms cheaper, faster, more robust, and more effective than existing routing tools …

- We can make it robust, but it won't be cheap, and probably not fast!
- We can make it fast, but it won't be robust and it won't be cheap!
- We can make it cheap, but it won't be completely robust!

# Good, Fast, or Cheap? Pick one!

We just can't make secure routing mechanisms cheaper, faster, more robust, and more compatible with existing routing tools ..

- We can make it cheaper and it won't be robust and it won't be fast
- We can make it fast and it won't be cheap, but it won't be completely robust!

So where should we compromise in the design of a secure routing infrastructure?

# Caution: Opinions!

My personal view of design compromise:

- Improve the robustness of RPKI certs by altering the cert validation algorithm
- Place origination signatures, ROAs and certs into the BGP protocol updates as opaque attributes
- Use AS Adjacency attestations in preference to a fully signed path
- Place AS Adjacency attestations into BGP protocol updates as opaque attributes
- Exploit the use of TCP in BGP to never resend already sent certs
- Flatten parts of the CA hierarchy by using RAs rather than CA delegations
- Reduce OOB credential distribution to TA material
  - For which you can use the DNS and DNSSEC if you really want!

*Like all the other approaches, this represents a particular set of compromises about speed, complexity, cost, deployment characteristics and robustness – it has it's weaknesses in terms of comprehensive robustness, but it attempts to reduce the number of distinct moving parts*

# Thank You

Questions?