Where are we with Securing Addressing and Routing?

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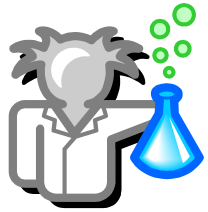
1 September 2015



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!

- Cryptolocker extortion

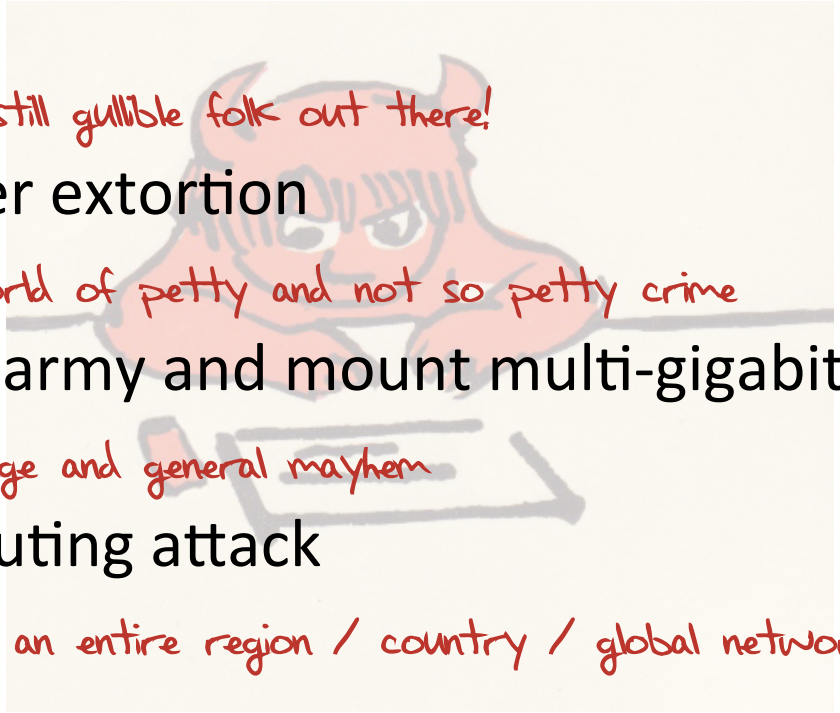
  And enter a world of petty and not so petty crime

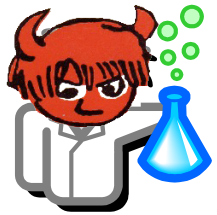
- Enlist a bot army and mount multi-gigabit DOS attacks

  Extortion leverage and general mayhem

- Mount a routing attack

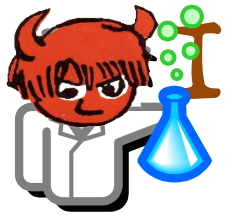
  And bring down an entire region / country / global network!





If I were really bad (and evil)…

I'd attack routing.



If I were really bad (and evil)…

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

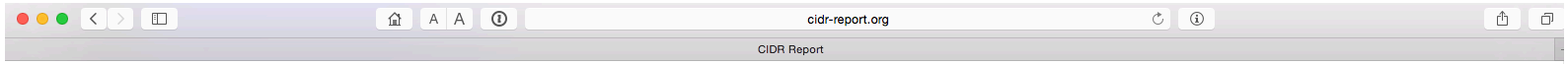
And bring selected parts of the network to a complete chaotic halt!

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

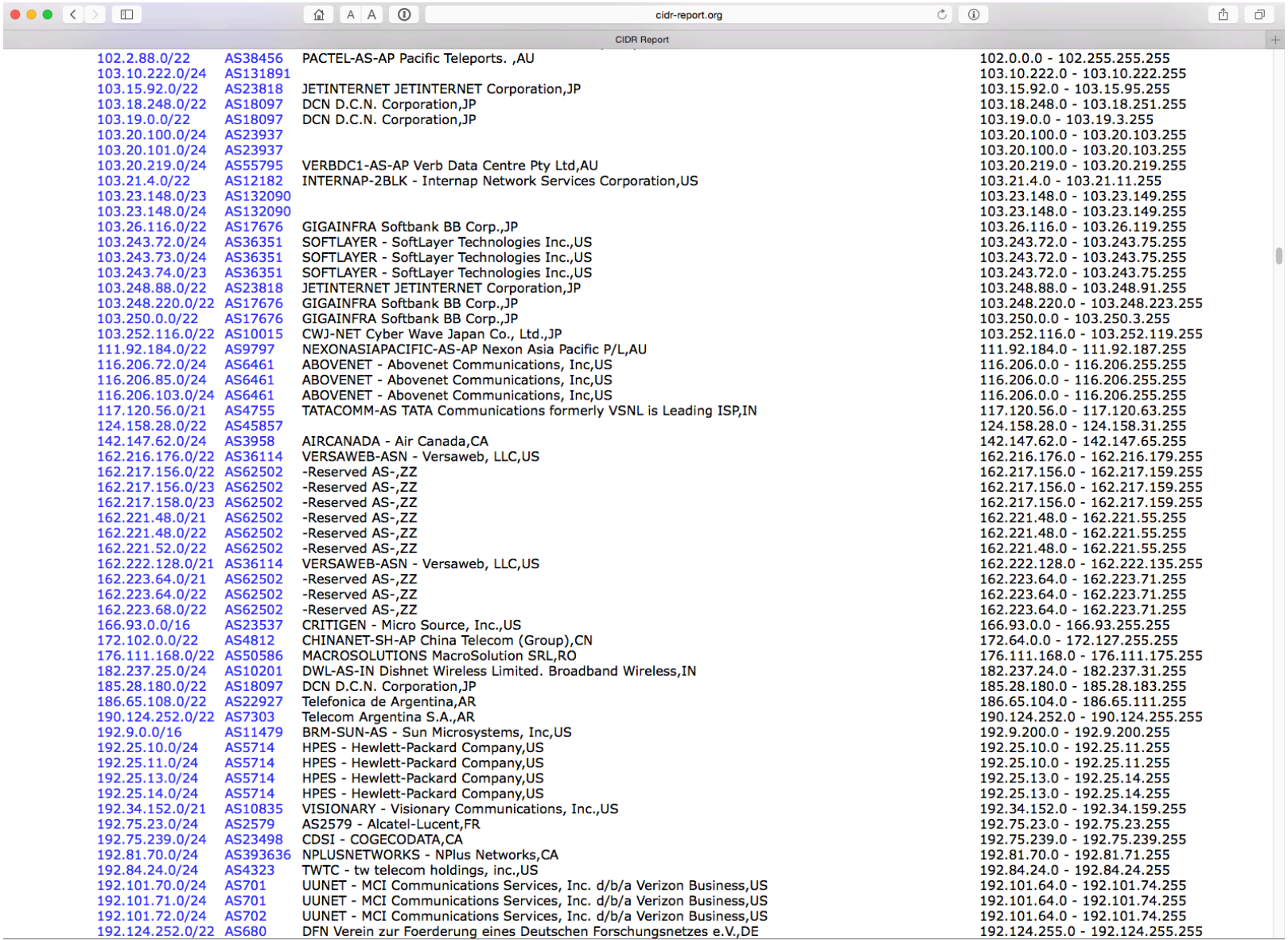
Possible Bogus Routes

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...

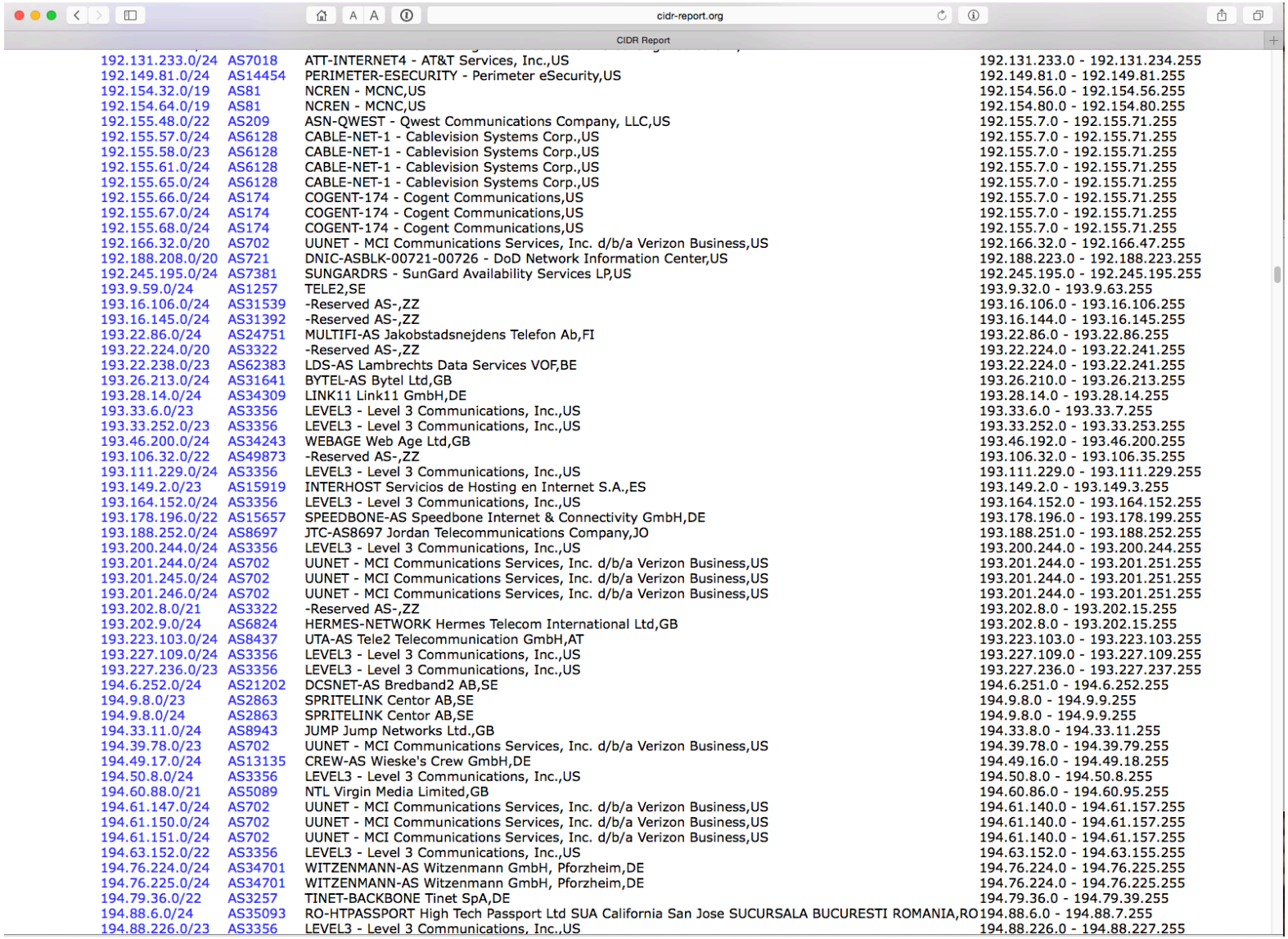
66.187.240.0/20	AS14552	ACS-SOUTHEASTDATACENTER - Affiliated Computer Services, Inc.,US	66.187.240.0 - 66.187.255.255
66.205.224.0/19	AS16526	BIRCH-TELECOM - Birch Telecom, Inc.,US	66.205.224.0 - 66.205.255.255
66.251.128.0/24	AS33227	BLUEBRIDGE-NETWORKS - Blue Bridge Networks,US	66.251.128.0 - 66.251.191.255
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…



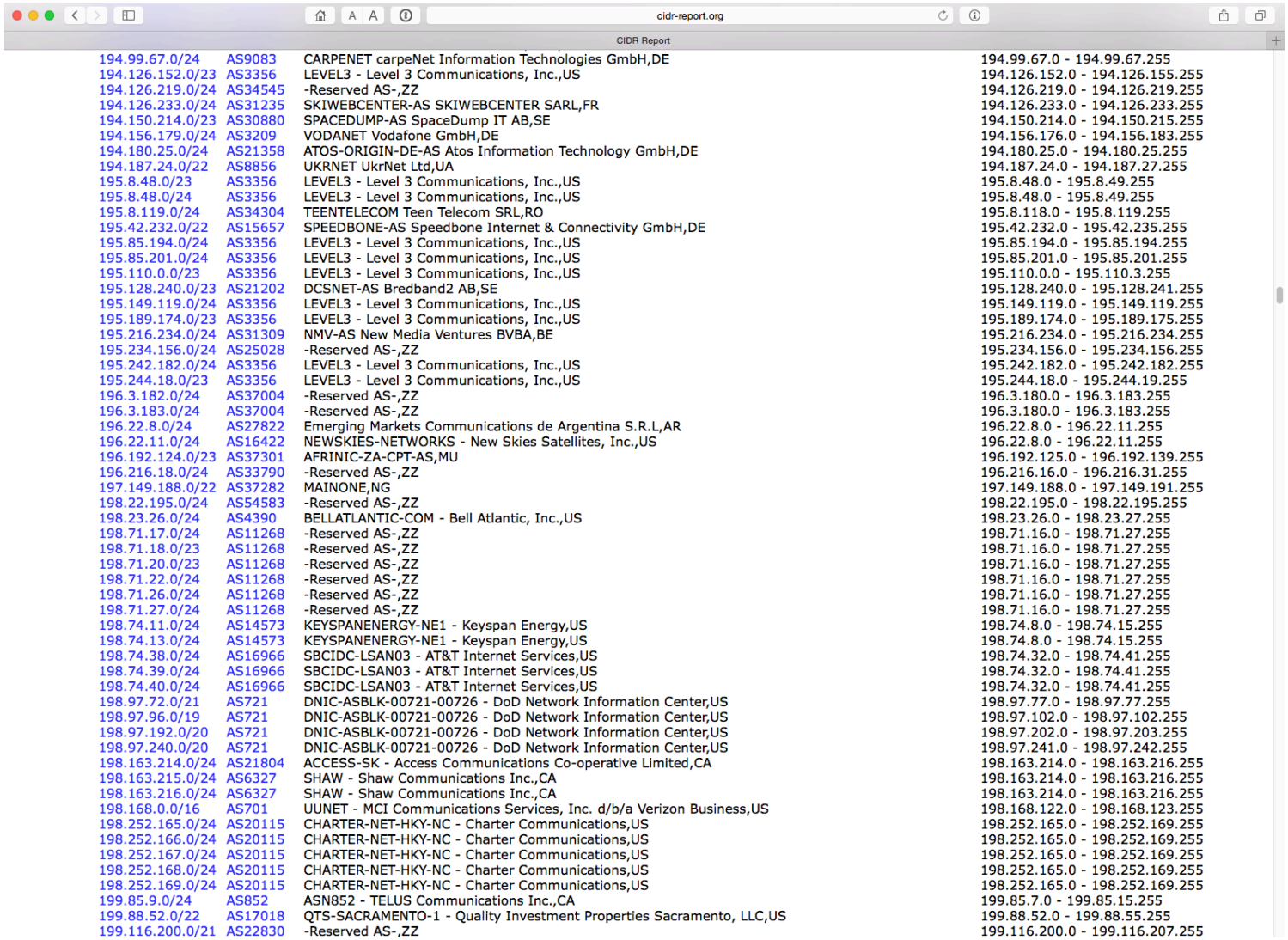
102.2.88.0/22	AS38456	PACTEL-AS-AP Pacific Teleports. ,AU	102.0.0.0 - 102.255.255.255
103.10.222.0/24	AS131891		103.10.222.0 - 103.10.222.255
103.15.92.0/22	AS23818	JETINTERNET JETINTERNET Corporation,JP	103.15.92.0 - 103.15.95.255
103.18.248.0/22	AS18097	DCN D.C.N. Corporation,JP	103.18.248.0 - 103.18.251.255
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



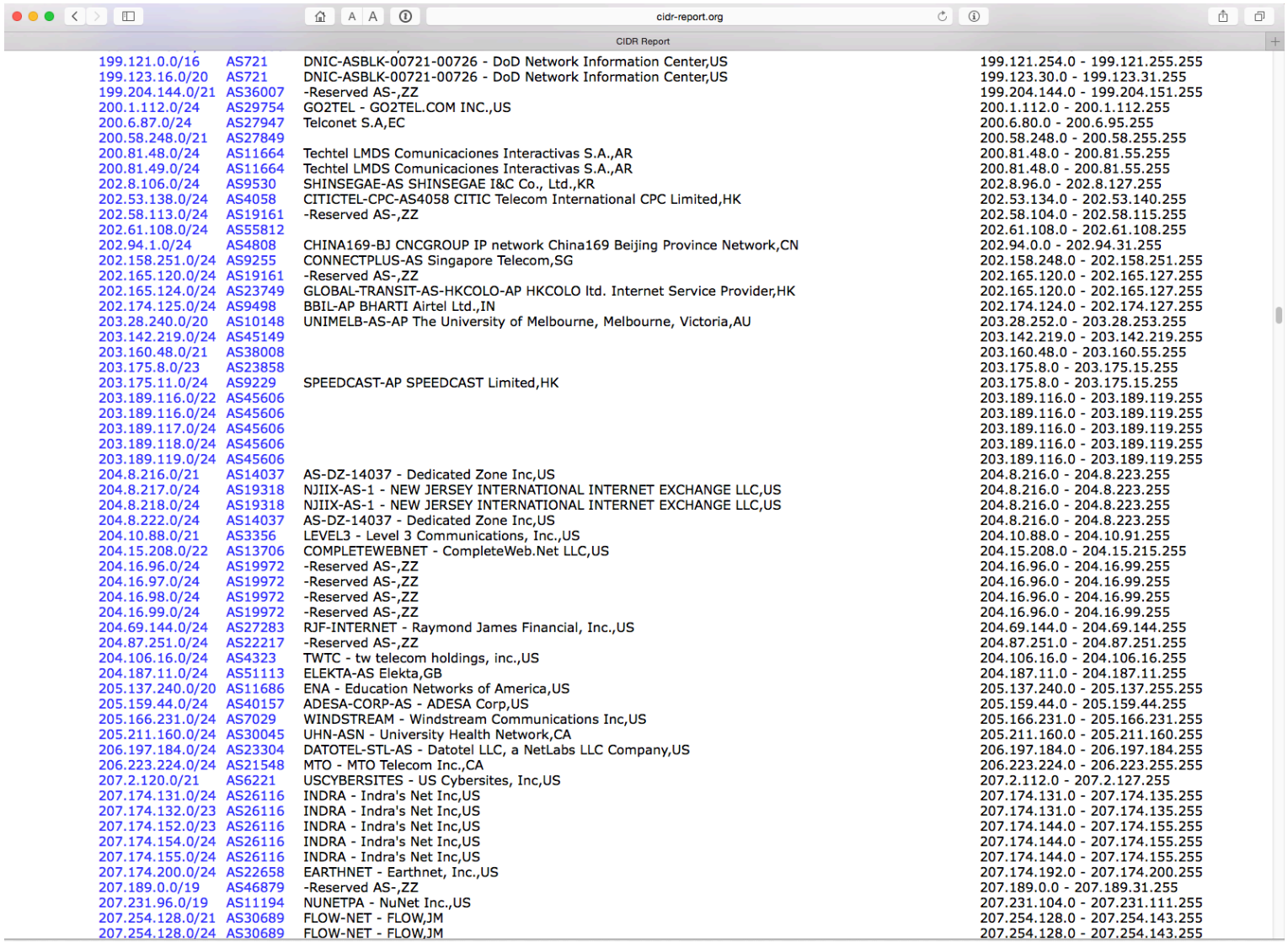
192.131.233.0/24	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US	192.131.233.0 - 192.131.234.255
192.149.81.0/24	AS14454	PERIMETER-ESECURITY - Perimeter eSecurity,US	192.149.81.0 - 192.149.81.255
192.154.32.0/19	AS81	NCREN - MCNC,US	192.154.56.0 - 192.154.56.255
192.154.64.0/19	AS81	NCREN - MCNC,US	192.154.80.0 - 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?



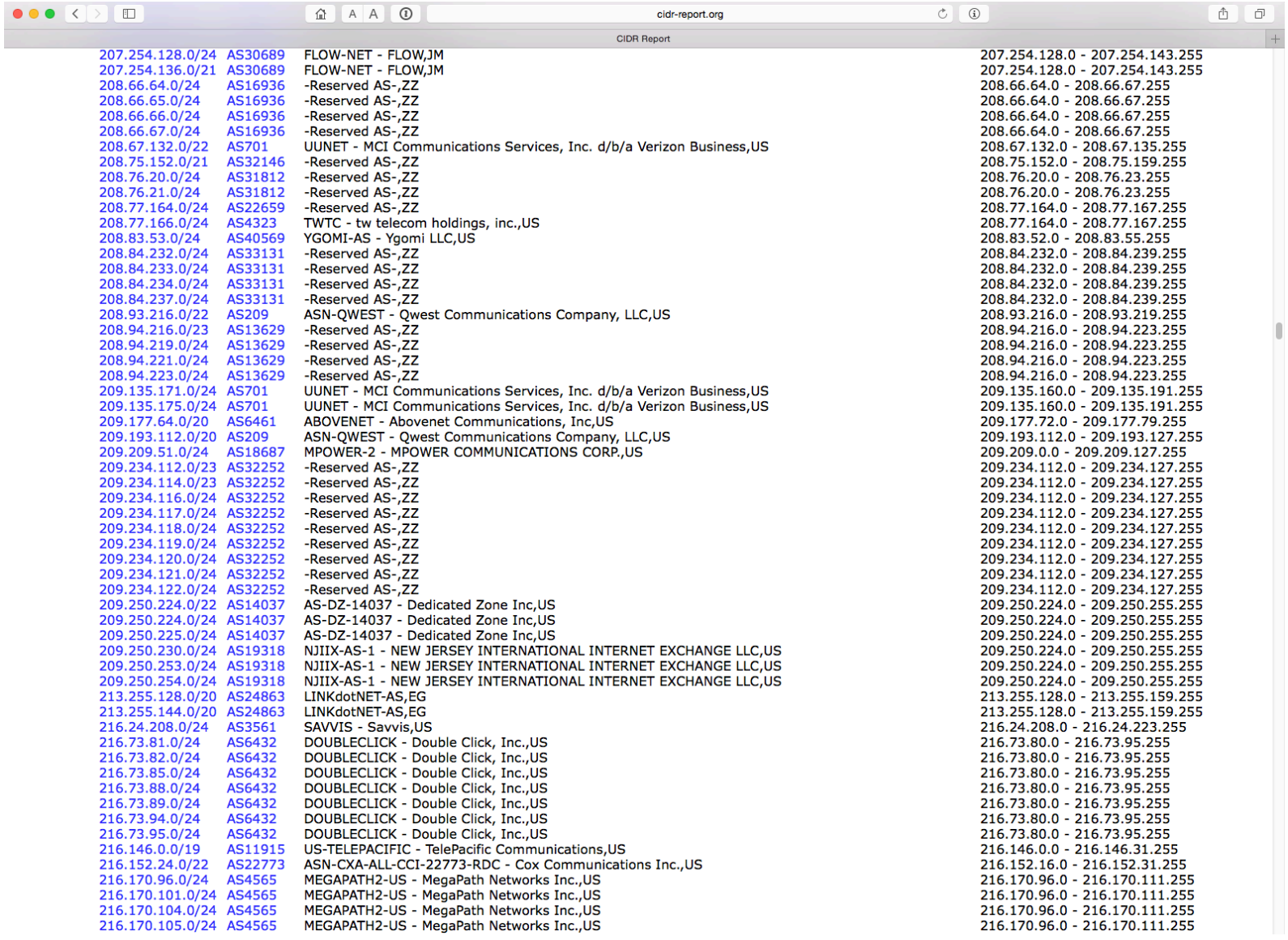
194.99.67.0/24	AS9083	CARPENET carpeNet Information Technologies GmbH,DE	194.99.67.0 - 194.99.67.255
194.126.152.0/23	AS3356	LEVEL3 - Level 3 Communications, Inc.,US	194.126.152.0 - 194.126.155.255
194.126.219.0/24	AS34545	-Reserved AS-,ZZ	194.126.219.0 - 194.126.219.255
194.126.233.0/24	AS31235	SKIWEBCENTER-AS 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!



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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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

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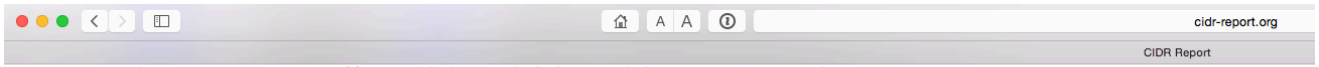
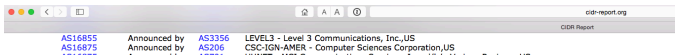


AS14190	Announced by	AS852	ASN852 - TELUS Communications Inc.,CA
AS14267	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS14310	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS14310	Announced by	AS2828	XO-AS15 - XO Communications,US
AS14353	Announced by	AS1239	SPRINTLINK - Sprint,US
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…



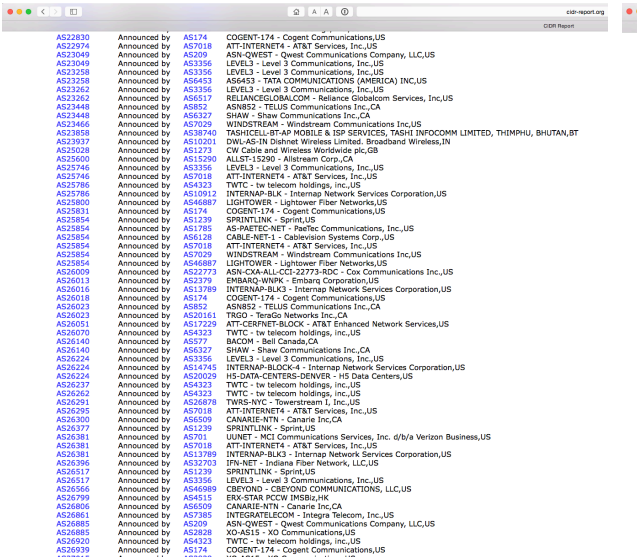
AS16855	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS16875	Announced by	AS206	CSC-IGN-AMER - Computer Sciences Corporation,US
AS16875	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS16875	Announced by	AS702	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS16875	Announced by	AS703	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS16875	Announced by	AS16637	MTNNS-AS,ZA
AS16936	Announced by	AS8121	LAYER42 - TCH Network Services,US
AS16937	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS16937	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS16979	Announced by	AS6128	CABLE-NET-1 - Cablevision Systems Corp.,US
AS17033	Announced by	AS1239	SPRINTLINK - Sprint,US
AS17033	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS17045	Announced by	AS13536	TVC-AS1 - Tech Valley Communications,US
AS17203	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS17203	Announced by	AS7381	SUNGARDRS - SunGard Availability Services LP,US
AS17203	Announced by	AS32787	PROLEXIC-TECHNOLOGIES-DDOS-MITIGATION-NETWORK - Prolexic Technologies, Inc.,US
AS17267	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS17267	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS17283	Announced by	AS3549	LVLT-3549 - Level 3 Communications, Inc.,US
AS17296	Announced by	AS10796	SCRI-10796 - Time Warner Cable Internet LLC,US
AS17300	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS17300	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS17300	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS18468	Announced by	AS2828	XO-AS15 - XO Communications,US
AS18468	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS18493	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS18509	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS18509	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS18520	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS18533	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS18533	Announced by	AS1239	SPRINTLINK - Sprint,US
AS18665	Announced by	AS3561	SAVVIS - Savvis,US
AS18665	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS18682	Announced by	AS1239	SPRINTLINK - Sprint,US
AS18691	Announced by	AS26788	BLINK-AS2 - RCP,CA
AS18697	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS18697	Announced by	AS5738	SOVER-ASN - SoVerNet, Inc.,US
AS18747	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS18747	Announced by	AS3257	TINET-BACKBONE Tinet SpA,DE
AS18747	Announced by	AS3491	BTN-ASN - Beyond The Network America, Inc.,US
AS18747	Announced by	AS3549	LVLT-3549 - Level 3 Communications, Inc.,US
AS18747	Announced by	AS6453	AS6453 - TATA COMMUNICATIONS (AMERICA) INC,US
AS18747	Announced by	AS22927	Telefonica de Argentina,AR
AS18747	Announced by	AS27986	ENTEL CHILE S.A.,CL
AS18747	Announced by	AS52320	GlobeNet Cabos Submarinos VZLA, S.A.,VE
AS18783	Announced by	AS25649	AYERA-AS - AYERA TECHNOLOGIES, INC.,US
AS18785	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS18826	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS18878	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS18891	Announced by	AS17054	AS17054 - CONTINENTAL BROADBAND PENNSYLVANIA, INC.,US
AS18891	Announced by	AS33154	DQECOM - DQE Communications Network Services, LLC,US
AS18966	Announced by	AS3561	SAVVIS - Savvis,US
AS18985	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS18992	Announced by	AS1785	AS-PAETEC-NET - PaeTec Communications, Inc.,US
AS18992	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US

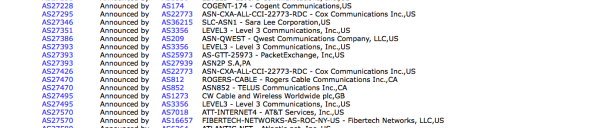
AS19004	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS19004	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS19097	Announced by	AS6983	ITCDELTA - Earthlink, Inc.,US
AS19142	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS19156	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS19156	Announced by	AS1239	SPRINTLINK - Sprint,US
AS19161	Announced by	AS17408	ABOVE-AS-AP AboveNet Communications Taiwan,TW
AS19185	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS19185	Announced by	AS22773	ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US
AS19308	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS19533	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS19533	Announced by	AS7381	SUNGARDRS - SunGard Availability Services LP,US
AS19535	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS19535	Announced by	AS3707	DIGEX3707 - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS19535	Announced by	AS33660	CMCS - Comcast Cable Communications, Inc.,US
AS19577	Announced by	AS7832	PCISYS - WW/Precision Communication,US
AS19610	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS19610	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS19628	Announced by	AS27476	TWCME - Time Warner Cable of Maine,US
AS19645	Announced by	AS25556	NEXCOM-BG-AS Nexcom Bulgaria EAD,BG
AS19657	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS19657	Announced by	AS7349	WINDSTEAM-HOSTED-SOLUTIONS-1 - Windstream Hosted Solutions, LLC,US
AS19658	Announced by	AS11096	FLORIDANET - FloridaNet,US
AS19658	Announced by	AS33132	FPL-FIBERNET - FPL FiberNet, LLC,US
AS19681	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS19684	Announced by	AS1239	SPRINTLINK - Sprint,US
AS19714	Announced by	AS6128	CABLE-NET-1 - Cablevision Systems Corp.,US
AS19746	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS19746	Announced by	AS8121	LAYER42 - TCH Network Services,US
AS19765	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS19811	Announced by	AS11778	DBSINTL1 - DBS INTERNATIONAL,US
AS19879	Announced by	AS33490	COMCAST-33490 - Comcast Cable Communications, Inc.,US
AS19888	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS19888	Announced by	AS22773	ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US
AS19972	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS19972	Announced by	AS11855	ASN-INTERNAP-BLK - Internap Network Services Corporation,US
AS19972	Announced by	AS14744	INTERNAP-BLOCK-4 - Internap Network Services Corporation,US
AS19977	Announced by	AS3549	LVLT-3549 - Level 3 Communications, Inc.,US
AS19977	Announced by	AS3561	SAVVIS - Savvis,US
AS19977	Announced by	AS16967	SBCIDC-DLLSTX - AT&T Internet Services,US
AS20111	Announced by	AS1239	SPRINTLINK - Sprint,US
AS20111	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS20137	Announced by	AS1790	SPRINTLINK2 - Sprint Government Systems Division,US
AS20137	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS20149	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS20184	Announced by	AS19024	INTERNAP-BLK5 - Internap Network Services Corporation,US
AS20190	Announced by	AS33491	COMCAST-33491 - Comcast Cable Communications, Inc.,US
AS20249	Announced by	AS702	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS20249	Announced by	AS2828	XO-AS15 - XO Communications,US
AS20249	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS20249	Announced by	AS3491	BTN-ASN - Beyond The Network America, Inc.,US
AS20249	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS20249	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS20249	Announced by	AS8220	COLT COLT Technology Services Group Limited,GB
AS20282	Announced by	AS27506	RBS-NYC - Sidera Networks LLC,US
AS20282	Announced by	AS46887	LIGHTOWER - Lightower Fiber Networks,US
AS20378	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS20421	Announced by	AS7385	INTEGRATELECOM - Integra Telecom, Inc.,US
AS20429	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS20429	Announced by	AS10912	INTERNAP-BLK - Internap Network Services Corporation,US
AS21043	Announced by	AS21236	AICHYNA-AS Additional Liability Company Aichyna Plus,BY

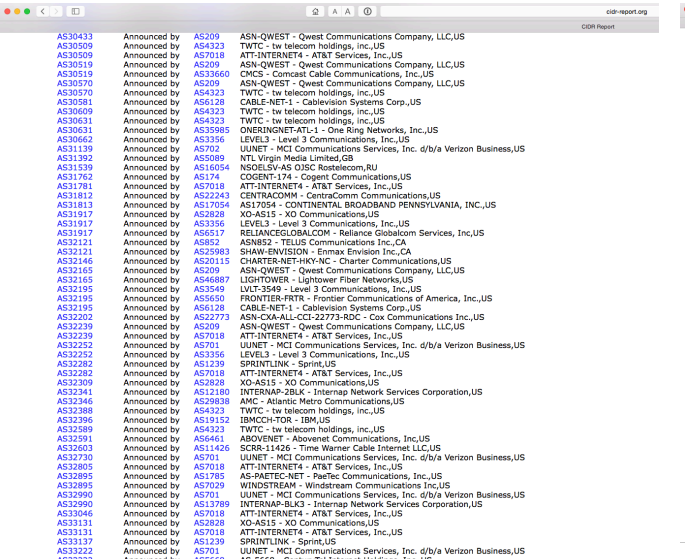
AS21534	Announced by	AS3257	TINET-BACKBONE Tinet SpA,DE
AS21534	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS21534	Announced by	AS35847	AS-ICTX - Interfacing Company of Texas, Inc.,US
AS21629	Announced by	AS22625	FORTRUST-SOLUTIONS - FORTRUST,US
AS21665	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS21695	Announced by	AS21686	SYSTEMMETRICS-1 - SystemMetrics Corporation,US
AS21697	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS21821	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS21821	Announced by	AS6128	CABLE-NET-1 - Cablevision Systems Corp.,US
AS21861	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS21969	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS21986	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS21986	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS21986	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS21993	Announced by	AS14717	ECINET - EZE Castle Integration Inc.,US
AS22037	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS22040	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22056	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22064	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS22064	Announced by	AS3561	SAVVIS - Savvis,US
AS22064	Announced by	AS10910	INTERNAP-BLK - Internap Network Services Corporation,US
AS22073	Announced by	AS22773	ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US
AS22089	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS22089	Announced by	AS1239	SPRINTLINK - Sprint,US
AS22160	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22217	Announced by	AS7332	LIGHTBOUND-AS - IQuest Internet,US
AS22224	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS22224	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22255	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS22266	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS22266	Announced by	AS18990	AIRBAND-DALLAS - Airband Communications, Inc,US
AS22272	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22272	Announced by	AS11074	RBS-CHG - Sidera Networks LLC,US
AS22292	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22413	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS22413	Announced by	AS22773	ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US
AS22416	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS22440	Announced by	AS2828	XO-AS15 - XO Communications,US
AS22460	Announced by	AS1239	SPRINTLINK - Sprint,US
AS22460	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS22460	Announced by	AS6128	CABLE-NET-1 - Cablevision Systems Corp.,US
AS22492	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS22539	Announced by	AS40414	OPTIVON - Optivon, Inc.,PR
AS22586	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS22586	Announced by	AS22646	HARCOM1 - Hargray Communications Group, Inc.,US
AS22659	Announced by	AS2828	XO-AS15 - XO Communications,US
AS22670	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS22670	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS22694	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS22736	Announced by	AS600	OARNET-AS - OARnet,US
AS22736	Announced by	AS3112	OARNET-AS-1 - OARnet,US
AS22736	Announced by	AS6181	FUSE-NET - Cincinnati Bell Telephone,US
AS22740	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS22741	Announced by	AS10910	INTERNAP-BLK - Internap Network Services Corporation,US
AS22743	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS22743	Announced by	AS6461	ABOVENET - Abovenet Communications, Inc,US
AS22751	Announced by	AS22197	APPS - Apps Communications,US
AS22755	Announced by	AS1785	AS-PAETEC-NET - PaeTec Communications, Inc.,US
AS22755	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS22774	Announced by	AS33287	COMCAST-33287 - Comcast Cable Communications, Inc.,US
AS22789	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US

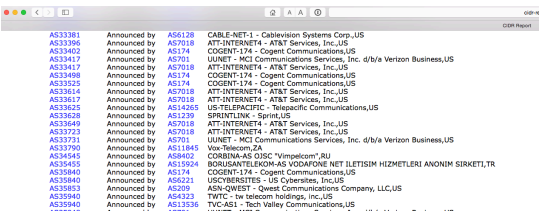
AS22830	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS22974	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS23049	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS23049	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS23258	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS23258	Announced by	AS6453	AS6453 - TATA COMMUNICATIONS (AMERICA) INC,US
AS23262	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS23262	Announced by	AS6517	RELIANCEGLOBALCOM - Reliance Globalcom Services, Inc,US
AS23448	Announced by	AS852	ASN852 - TELUS Communications Inc.,CA
AS23448	Announced by	AS6327	SHAW - Shaw Communications Inc.,CA
AS23466	Announced by	AS7029	WINDSTREAM - Windstream Communications Inc,US
AS23858	Announced by	AS38740	TASHICELL-BT-AP MOBILE & ISP SERVICES, TASHI INFOCOMM LIMITED, THIMPHU, BHUTAN,BT
AS23937	Announced by	AS10201	DWL-AS-IN Dishnet Wireless Limited. Broadband Wireless,IN
AS25028	Announced by	AS1273	CW Cable and Wireless Worldwide plc,GB
AS25600	Announced by	AS15290	ALLST-15290 - Allstream Corp.,CA
AS25746	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS25746	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS25786	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS25786	Announced by	AS10912	INTERNAP-BLK - Internap Network Services Corporation,US
AS25800	Announced by	AS46887	LIGHTOWER - Lightower Fiber Networks,US
AS25831	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS25854	Announced by	AS1239	SPRINTLINK - Sprint,US
AS25854	Announced by	AS1785	AS-PAETEC-NET - PaeTec Communications, Inc.,US
AS25854	Announced by	AS6128	CABLE-NET-1 - Cablevision Systems Corp.,US
AS25854	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS25854	Announced by	AS7029	WINDSTREAM - Windstream Communications Inc,US
AS25854	Announced by	AS46887	LIGHTOWER - Lightower Fiber Networks,US
AS26009	Announced by	AS22773	ASN-CXA-ALL-CCI-22773-RDC - Cox Communications Inc.,US
AS26013	Announced by	AS2379	EMBARQ-WNPK - Embarq Corporation,US
AS26016	Announced by	AS13789	INTERNAP-BLK3 - Internap Network Services Corporation,US
AS26018	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS26023	Announced by	AS852	ASN852 - TELUS Communications Inc.,CA
AS26023	Announced by	AS20161	TRGO - TraGo Networks Inc.,CA
AS26051	Announced by	AS17229	ATT-CERFNET-BLOCK - AT&T Enhanced Network Services,US
AS26070	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS26140	Announced by	AS577	BACOM - Bell Canada,CA
AS26140	Announced by	AS6327	SHAW - Shaw Communications Inc.,CA
AS26224	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS26224	Announced by	AS14745	INTERNAP-BLOCK-4 - Internap Network Services Corporation,US
AS26224	Announced by	AS20029	HS-DATA-CENTERS-DENVER - HS Data Centers,US
AS26237	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS26262	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS26291	Announced by	AS26878	TWIRS-NYC - Towerstream 1, Inc.,US
AS26295	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS26300	Announced by	AS6509	CANARIE-NTN - Canarie Inc,CA
AS26377	Announced by	AS1239	SPRINTLINK - Sprint,US
AS26381	Announced by	AS701	UUNET - MCI Communications Services, Inc. d/b/a Verizon Business,US
AS26381	Announced by	AS7018	ATT-INTERNET4 - AT&T Services, Inc.,US
AS26381	Announced by	AS13789	INTERNAP-BLK3 - Internap Network Services Corporation,US
AS26396	Announced by	AS32703	IFN-NET - Indiana Fiber Network, LLC,US
AS26517	Announced by	AS1239	SPRINTLINK - Sprint,US
AS26517	Announced by	AS3356	LEVEL3 - Level 3 Communications, Inc.,US
AS26566	Announced by	AS46989	CBEYOND - CBEYOND COMMUNICATIONS, LLC,US
AS26799	Announced by	AS4515	ERX-STAR PCCW IMSBiz,HK
AS26806	Announced by	AS6509	CANARIE-NTN - Canarie Inc,CA
AS26861	Announced by	AS7385	INTEGRATELECOM - Integra Telecom, Inc.,US
AS26885	Announced by	AS209	ASN-QWEST - Qwest Communications Company, LLC,US
AS26885	Announced by	AS2828	XO-AS15 - XO Communications,US
AS26920	Announced by	AS4323	TWTC - tw telecom holdings, inc.,US
AS26939	Announced by	AS174	COGENT-174 - Cogent Communications,US
AS27015	Announced by	AS2828	XO-AS15 - XO Communications,US

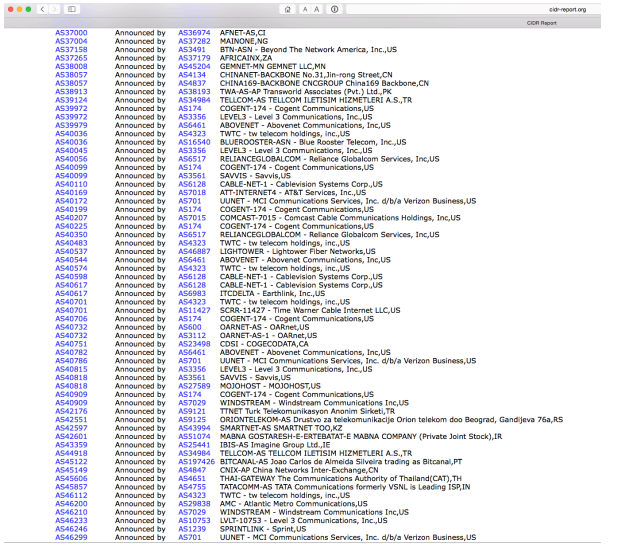
don't forget: ALL of these advertised addresses and ASes are bogus!



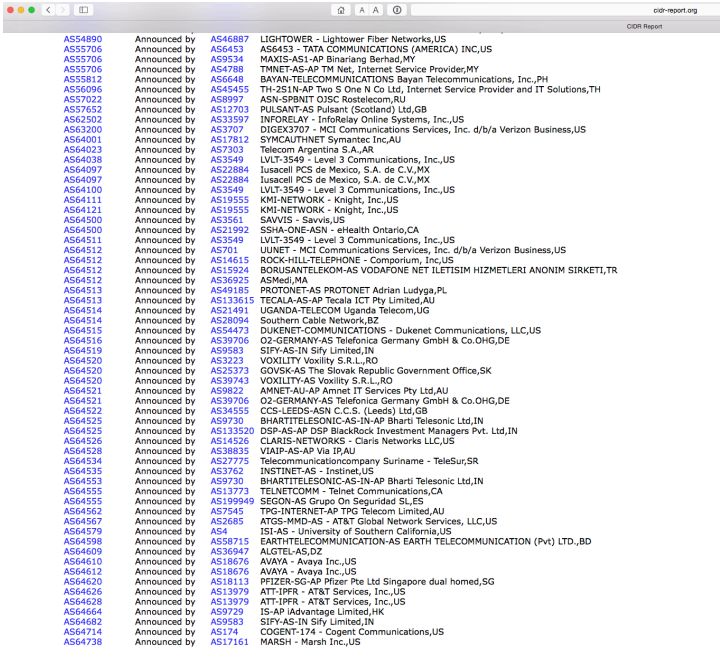




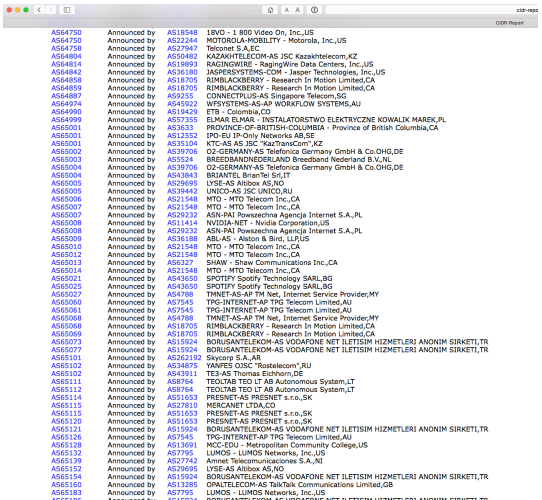




almost done…

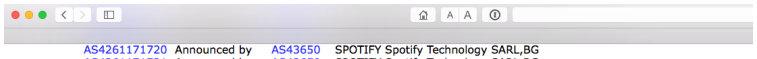


AS54890	Announced by	AS46887	LIGHTOWER - Lightower Fiber Networks,US
AS55706	Announced by	AS6453	AS6453 - TATA COMMUNICATIONS (AMERICA) INC,US
AS55706	Announced by	AS9534	MAXIS-AS1-AP Binariang Berhad,MY
AS55706	Announced by	AS4788	TMNET-AS-AP TM Net, Internet Service Provider,MY
AS55812	Announced by	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



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	AS49922	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
AS65068	Announced by	AS18705	RIMBLACKBERRY - Research In Motion Limited,CA
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

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



AS4261171720	Announced by	AS43650	SPOTIFY Spotify Technology SARL,BG
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?

What's the base problem here?

We really are not doing a very good job!

Why?

The Internet uses a decentralised and distributed model of control in many aspects of its operation

Routing is perhaps the best example:

- There is no point of "authority"
- There is no arbitrator or referee, and no reference source of information
- Everyone is trusted by everyone else to act correctly and honestly
- And not everyone has the same set of motives to act honestly and with good intent all the time
- And not all software and hardware is perfect all of the time

What's the base problem here?

- Routing is built on vague mutual trust models
- Routing auditing is a low value activity that noone really performs with any level of thoroughness
  - And no matter how good a job you may do, that does not mean everyone else shares your enthusiasm and zeal to police the routing system
- We have grown used to lousy solutions and institutionalized lying in the routing system, and accept that as "normal"
- And because instances of abuse are supposedly relatively infrequent we are prepared to tolerate the risks with having a completely insecure routing system

What's the base problem here?

Noone is sufficiently motivated to care enough about the integrity of the network to address routing integrity!

And we all need to act to be effective!

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!

So we have routing "problems" from time to time

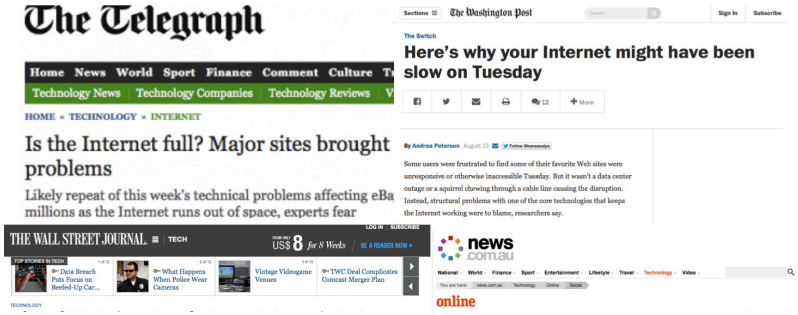
Leaking Routes

March 2012

Its happened again.

We've just had yet another major routing leak, this time bringing down the Internet for most of an entire country. Maybe twenty years ago no one would've noticed, let alone comment, but now of course its headline material in the media. What happened? And how could this have been prevented? Can we do better? I'd like to look at this incident in here, and also look at the implications for the current efforts to secure our inter-domain routing system, BGP.

In my previous column I described an approach to detect the presence of so-called bogon filters in the Internet by using online ads, and embedding our reachability tests into the advertisement using embedded Flash code. (http://www.potaroo.net/ispcol/2012-02/bogonfilter.html) In that article I also noted that the continued use of bogon filters were perhaps an anachronism in today world:



Press Clip - Dodo Route Leak

More Leaky Routes

June 2015

Most of the time, mostly everywhere, most of the Internet appears to work just fine. Indeed, it seems to work just fine enough to the point that that when it goes wrong in a significant way then it seems to be fodder for headlines in the industry press.

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!

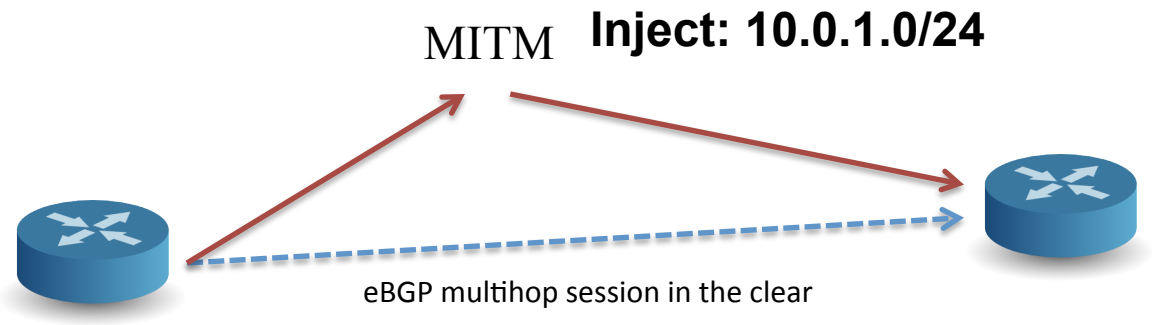
Routing Security A01

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

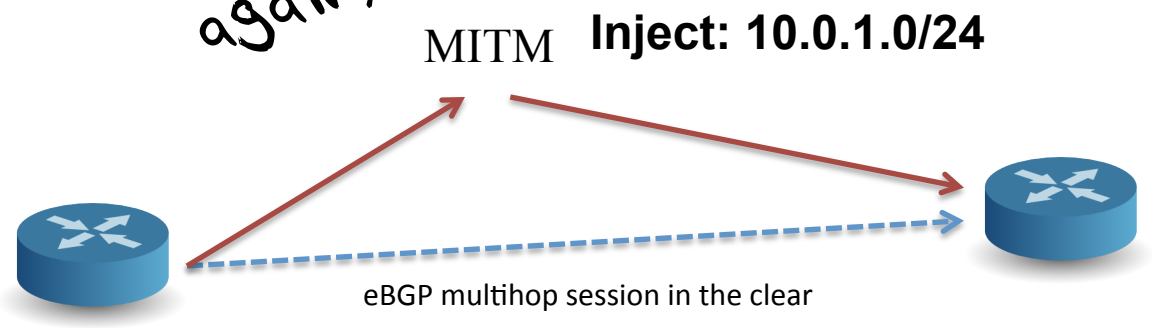
2. Protecting **routing protocols** and their operation
   - Threat model:
     - Disrupt the operation of the routing protocol by a “man-in-the-middle” attack
     - Compromise the topology discovery / reachability operation of the routing protocol by injection of false routing information
   - Response: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



Routing Security A02

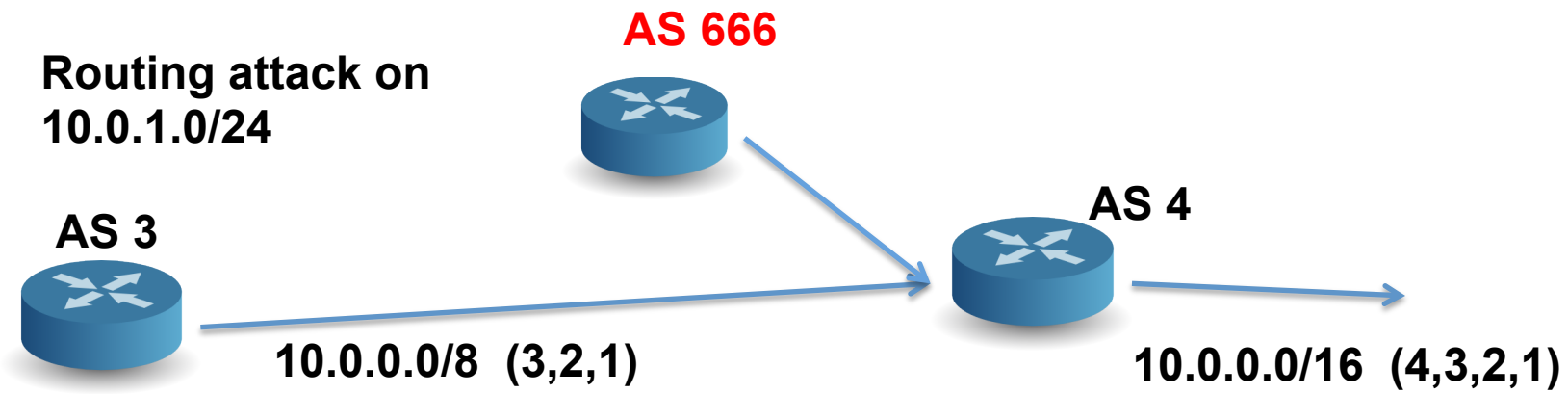
2. Protecting **routing protocols** and their operation
   - Threat model:
     - Disrupt the operation of [illegible] the-middle" attack
     - Com[illegible] of the
   - Res[illegible]
     - [illegible] CP-MD5 and avoids multihop for al[illegible]

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!



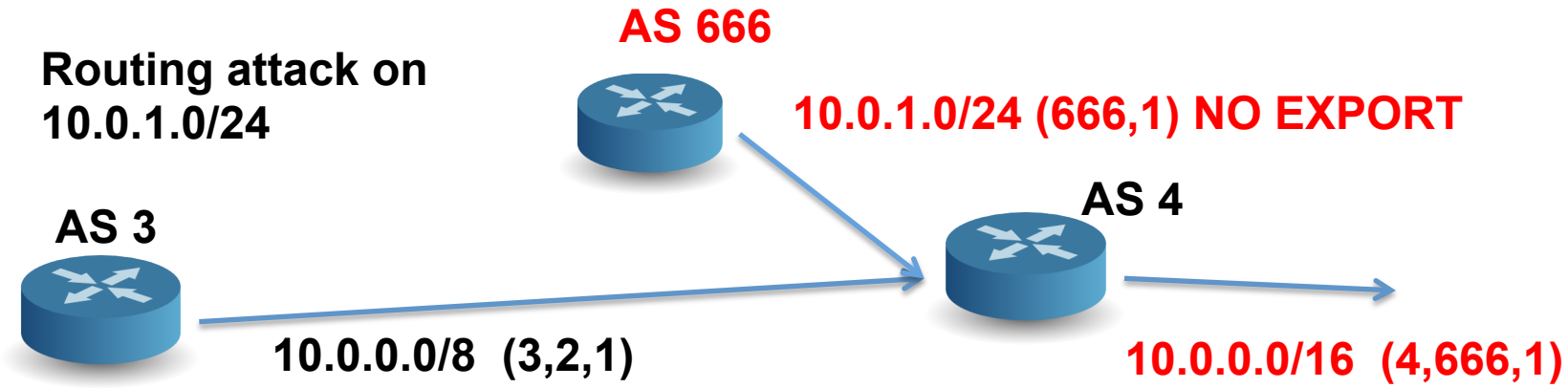
Routing Security A03

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

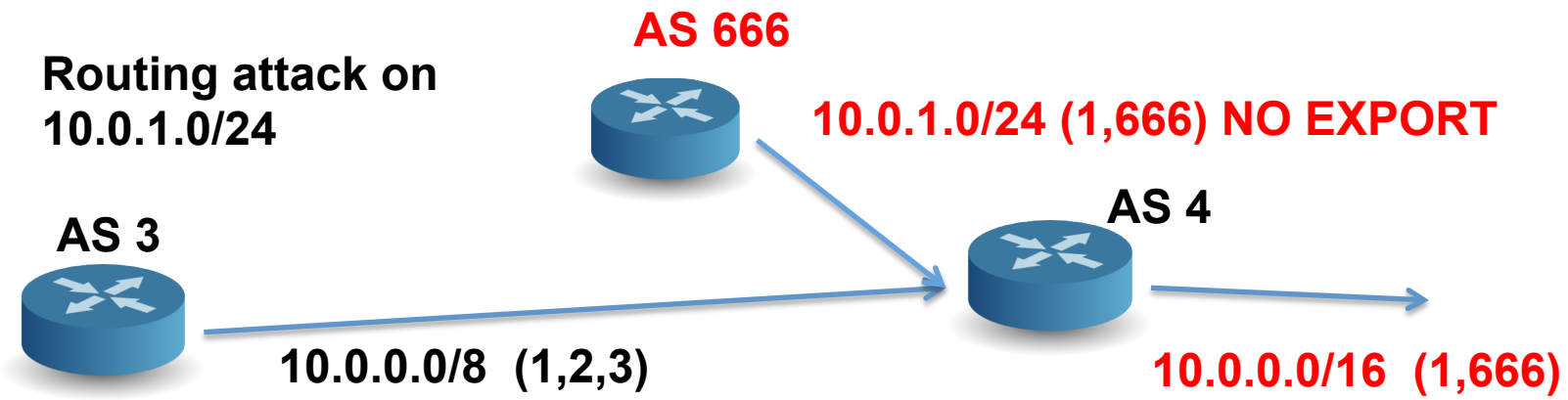
3. Protecting the **routing protocol payload**
   - Threat model:
     - Insert corrupted address information into your network's routing tables
     - Insert corrupt reachability information into your network's forwarding tables
     - Allow the routing protocol to disseminate the corrupted information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



Routing Security A03

3. Protecting the **routing protocol payload**
   - Threat model:
     - Insert corrupted address information … outing tables
     - Insert corrupt reachability … orwarding tables
     - Allow … corrupted information
   - Resp…
     -

Unfortunately, detecting and preventing 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?
- 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

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
- End User unfamiliarity with managing keys is an issue
- Current hardware and software tools for use in this PKI tend to be “raw” and they expose much of the underlying mechanics of the crypto system to the user
- Distribution of Certificates and CRLs using “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

But

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!

But 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

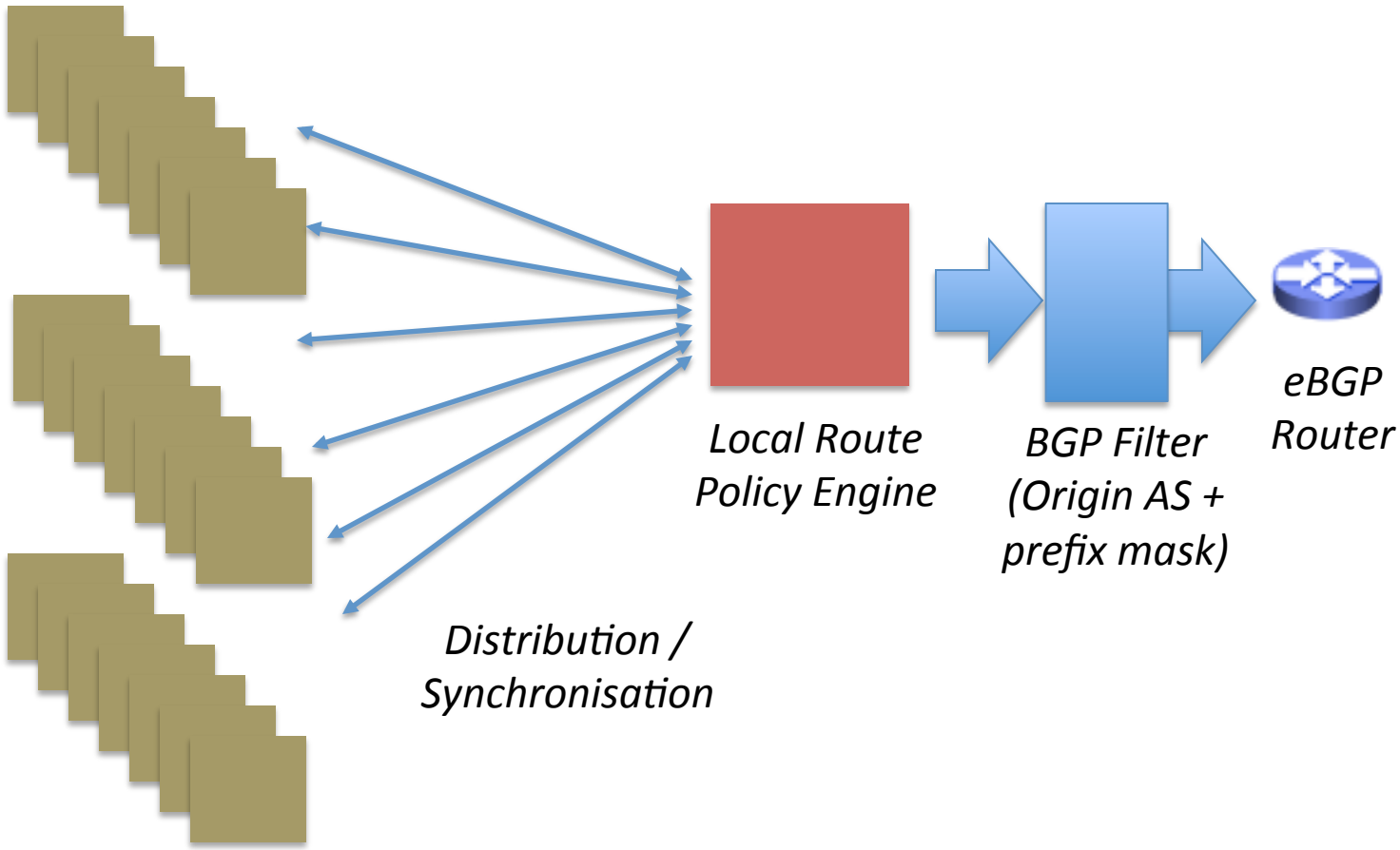
- Origination
  - Is the address valid?
  - Is the origination of this route a duly authorized use of this address?
- Path
  - Is the forwarding path represented in the route an authentic path?
  - If I pass a packet into this path will it get to its intended destination?

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
- This is a “just in case” provisioning model (all filtered systems install filters for all ROA-managed prefixes)

A filter-based architecture for securing BGP origination

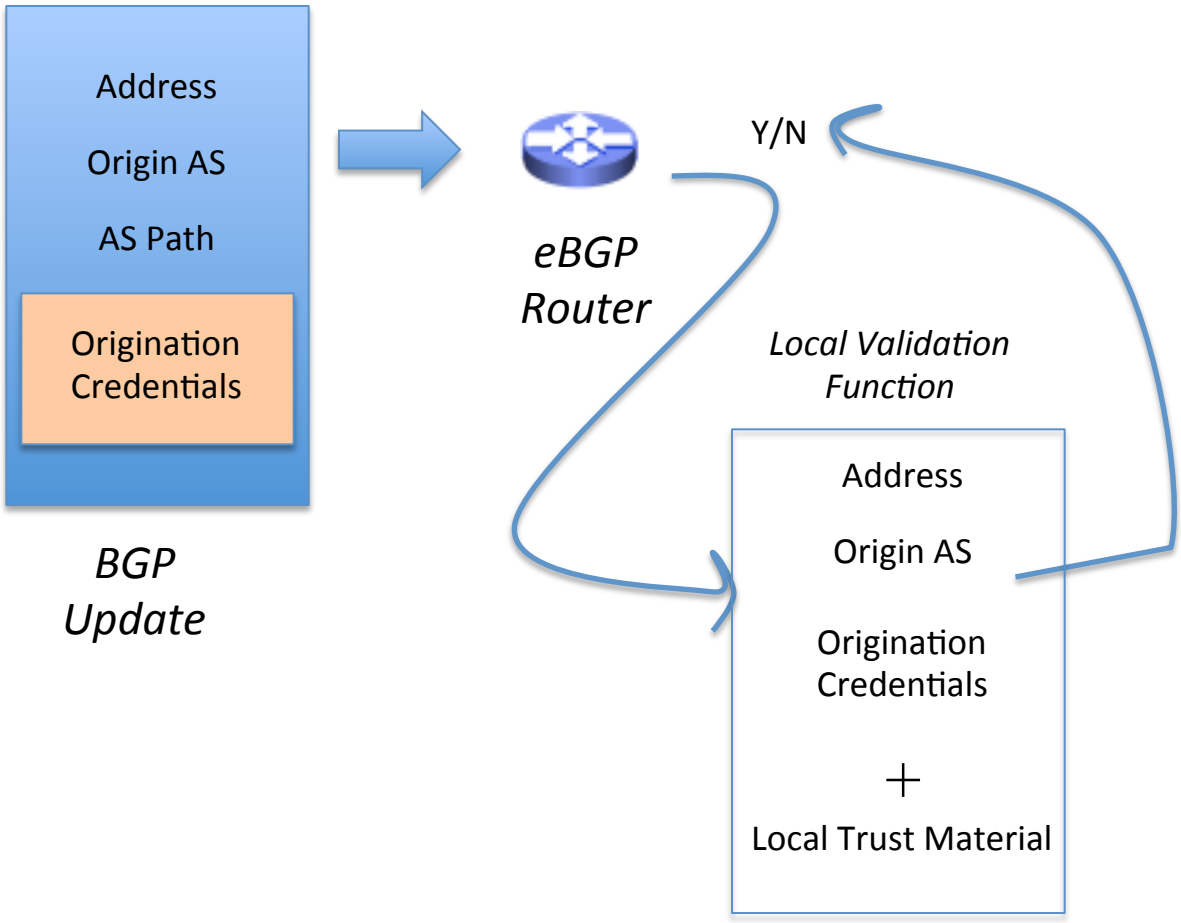


BGP Origination (2)

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 has never really gained widespread acceptance. Some communities have worked hard to promulgate its use, but overall it has been unable to achieve widespread adoption and the effort / benefit equation looks like its unsustainable

Option b:
AS Path Validation and BGPsec

- BGPsec proposes a strict 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 in the router
  - no useful validation in cases of piecemeal adoption of BGPsec

Option c:
AS Adjacency and soBGP

- In soBGP a pair of adjacent ASs publish and propagate a signed AS Adjacency Attestation, saying that they peer directly and exchange routes
- 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 based on signed adjacencies
- This plausibility test can be performed through a filter operation performed on received updates, either on-board or off-loaded

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 ... existing routing tools ..

- We can ...

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

... robust and it won't be

... ke it cheap, but it won't be completely robust!

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?

Do you envision a world in the not so distant future where RPKI will be used to secure routing globally on an operational level; and if so when would you predict this will happen?

If you mean RPKI + BGPsec then this is just not going to happen in my opinion. Path Validation is just too difficult and Origin Validation is not enough by itself. So my answer is a bold: “never!” with BGPsec - The technology model needs to change before adoption begins to look feasible.

However, if we are allowed to look at other methods of Path Validation, then I can’t can’t see how we can build a validatable framework of routing addresses without using a validation framework based on this RPKI. In other words, any approach that tries to secure routing should take advantage of the RPKI, due to its ability to validate the implicit assertions made in a routing system

Can RPKI itself be attacked, misconfigured, or legally forced to misclassify a legitimate BGP route as bogus? Using the example of where DNS is subject to legal orders to take down domains; could RPKI be used to take down IP prefixes?

Yes, and yes.

The first question exposes some strange subtle aspects of PKIs. In an environment of multiple trust anchors, and where clients are free to choose whom they trust there is no “absolute” legitimacy.

There are issues with the validation algorithm in RPKI that allows windows of opportunity for otherwise valid routes to be classified as bogus. If you attack the local cache synchronisation mechanisms then you can play with a out of date cache, which can be used to categorise valid routes as bogus

Hypothetically, if an Australian court ordered APNIC to remove 203.10.60.0/24 from its trust anchor certificate then that prefix has a hypothetical problem. But ordering APNIC to REMOVE a resource from its TA set does not make it “unroutable.” It just makes it “not found”. We’d need an order to generate a ROA for 203.10.60.0/24 with an Originating AS of 0 to cause the route to be regarded as invalid . But as long as noone uses RPKI seriously its probably a very small problem! But IF we all start using RPKI as the trust foundation for the routing system then yes, it is a potential mechanism for takedowns.

Is it true that RPKI cannot prevent some classes of attacks - such as route leaks and path shortening attacks? Can you explain why this is?

The mechanisms in BGPSEC talk about correctness of the *protocol*, NOT correctness of *policy*.

Example: A is both a "customer" of Band a "customer of "C" . What if A forwarded all the routes it learned from B to C? C might believe A and hand to A all the traffic it would've passed through other connections to get to B, particularly if B is not directly connected to C. Obviously this is wrong, but in protocol terms there is no violation of BGP as a protocol, and BGPsec would not find anything wrong here.

Equally in this example there is nothing that is "wrong" or invalid in the context of the underlying RPKI. Its just that the routes are being passed through the network in a way that is counter to the policy-driven intention. Stopping leaks requires the formal statement of "intent" (policy) and including this intent into the framework (i.e. route registries).

The BGPsec model has avoided the concept of route policy objects, and frankly it seems daft to redo the old RPSL work. But that then brings us back to routing registries and their issues.

I have now created ROA objects for my resources in MyAPNIC. I understand the benefits of creating ROA objects. However, since ROA objects are still in a testing phase, will this achieve the benefits of creating ROA object? What will actually happen to my resources now?

Hopefully, nothing!

If you have been careful in the construction of your ROAs then some others will pick up these ROAs and construct BGP route admission filters. In the event that some third party attempts a route hijack of your routes using more specific prefixes and a false origin AS then the points in the network that use such ROA-based filters will filter out this.

Of course, if the attacker puts your AS in as the origin AS and advertised within the bounds of the permitted more specifics of your ROAS then the attack will be successful.

And of course , if you have not been careful and complete in the construction of your ROAs, or let your keys elapse, then you stand the risk of having your legitimate routes filtered!

Is ROA object and RPKI framework “standard” among all the RIR? If not, what are the differences?

The public key certificates, signed attestations and published products conform to the published RFCs – they are standards, and we believe that all the RIRs produce certificates that comply in every respect to the specifications described in the RFCs.

The Trust Anchors published by the RIRs are not all the same. In practice the differences are inconsequential as long as nothing goes wrong. APNIC’s practice is to includes only those resources that are listed in its database, but the cost of this accuracy is operational fragility. Other RIRs (e.g. ARIN) list 0/0 (all numbers) in its trust anchor. Operationally, this approach is robust, but in another sense it is a misrepresentation of the resources that are under the RIRs administrative control.

I did not receive the resources directly from APNIC. However, I am keen to set up the ROA objects to secure my announcement. How can I get these ROA objects created?

The trust implicit in the PKI is that each certificate issuer only issues certificates according to its published practices statement. APNIC has a published a practice statement that it issues certificates for resources that APNIC itself has allocated, AND ONLY THOSE RESOURCES, and it issues those certificates to those entities who received those resources AND ONLY THOSE SUBJECTS.

You need to speak to whoever allocated those resources to you and ask them for a certificate that covers those allocated resources that you did not receive directly from APNIC.

Would Route Origin Authorisation every become a mandate attribute with routing, if yes, the approximate time frame?

Personally, I doubt that this will happen anytime soon. What we have is still an early iteration of this technology (BGPsec) and I suspect that more ideas will emerge in the coming years that address some of the shortcomings in the BGPsec model.

It's likely that ROAs will persist in any BGP security model – ROAs represent a minimal and useful testable attestation about the origination of a route into the routing system.

How could we up sell ROA? Benefits of ROA?

Errr Ummm – I wouldn't go there myself!

Any technical aspects that Member Service staff should know to promote ROA into the community.

Well there are a number of considerations here

One view is that we (APNIC) undertake a simple Registry function.

There are very good reasons to have RPKI certificates over resources, and there are a wide set of opportunities to explore about how to use signed attestations to ensure that addresses are handled with integrity. ROAs are just one form of attestation and right now its one that has a set of issues that would mean that a responsible voice would be one of caution rather than "promotion".

We usually say RKPI does not guarantee 100% routing security. If everyone has created their ROAs and everyone uses validators, what other threats exist for BGP routing security ?

If you lock the doors they can still come in the windows!

Without path security the ROA is not all that useful (as all you need to do is fake the origin) But even with path protection there are still problems with policy violations. And even then this does not get to the heart of the problem: what we actually want is certainty in forwarding, and strengthening the routing system is just one part of the larger problem.

Validators are an essential part of RPKI framework. What kind of a cost factor are we looking at if a large ISP wants to implement validators? And what kind of hardware is required?

The current approach to construction of filters (just in case) offloads the validation overhead for ROA validation, and the software solutions (typically based on OpenSSL libraries) on general commodity hardware are easily up to it.

Path validation is an entirely different problem, and validating a full route set following a BGP session restart requires some 2 – 5 million asymmetric crypto operations, and this cannot be readily outsourced from the BGP speaker. Its hard to see how this can happen

With cryptographic information, ROAs are relatively big objects. Validation may take bit of time too. Is there any possibility that the routing performance will go down (noticeably) because of RPKI ?

ROAS are NOT big objects – they are relatively compact ASN.1 data objects.

The implementation of ROAs as filters has no real impact on routing performance, with the possible exception of an increased update load through route refresh operations. But this is not a major factor for routing performance.

But, as with the previous response, path validation is an entirely different problem, and BGPsec-style and validating a full route set following a BGP session restart requires some 2 – 5 million asymmetric crypto operations, and this cannot be readily outsourced from the BGP speaker. Its hard to see how this can happen. Path validation is not going to happen easily.

Is ROA intended to ultimately replace route objects or will it need to coexist with route objects? If coexist: What is the operational difference between ROA and route object? Why should network operators worry about maintaining both these objects?

I assume you mean a “route object in a routing registry”. The difference is the policy framework – a ROA associates a prefix with an originating AS. A route object is capable of associating a prefix with an AS with a routing policy

In theory, if you had signed route objects you would not need ROAs, but not vice versa. But we don’t have signed route objects, and that means that the route registry system is lacking in explicit validation capability. There are other problems with route registries including currency, completeness and consistency.

If they won't coexist: Route objects are used for both human and router consumption. Our members often ask us to register route object and then verify visually that the object is visible in their choice of IRR. The ROA object is a binary file stored in repositories only meant for router consumption. People can not visually see if a ROA is created for a prefix or not. Shouldn't the registries provide some mechanism for relying parties to visually see what ROAs are created like they can for route objects by querying IRRs?

When we designed the ROA system we thought about what tools we would build and deploy and what we would leave to others to build. It's a good question about what we should do as APNIC using member's resources and what we should leave for others to do.

Please show me the actual configuration in BGP router which relates with RPKI.

```
bgp rpki server 192.168.179.3 port 43779 refresh 60

route map validity-0
   match rpki valid
   set local-preference 100
route map validity-1
   match rpki not-found
   set  local-preference 50
```

What type of equipment and the average cost for ISP or a company to run this service.

RPKI relying party software (rpki.net)

*nix server

Cisco / Juniper routers

Major cost components are investments in processes and expertise, not in equipment per se

What is the biggest issue if something goes wrong with the RPKI system, and how does the ISP/company fix it. Do you have any specific example of what would go wrong? One of the example:
If there are networks on the other side can not validate and dropped the traffic, although everything in the IP source network side has been configured correctly.
How does the IP source network quickly identify this issue before the customer got affected.

There are many moving parts in this operation and much to go wrong. Keys expire, and if this occurs in a trust anchor than large parts of the RPKI can no longer be validated. If the local cache sync tool fails then similarly larges amount of the address space can no longer be validated.

But the implications to BGP are probably more to the bounds of 'slight' rather than 'significant'. The reason is that validation is applied to updates, not to stored routes. So if a previously valid route is invalidated then that will only be apparent when that route is updated. This is good and bad – good in that the impacts of a PKI error are not immediately applied to the routing system and bad in that PKI problems may not be noticed for some time,

During MyNOG, someone presented how you can verify if the prefix have valid or invalid ROAs in your router configuration. Apparently not all routers supported this, would he know a list where we can verify what routers support this? (ex. Juniper apparently does not support this yet).

Speak to your router vendor. I do not sell routers.

Will RPKI be fully operational at all, if so when do we expect this to happen judging the percentage of ROAs created now (still low)? Any suggestions on how we get people to create their ROAs on top of the initiatives we do now?

Its hard to sell fragility, particularly if the supposed benefits are significantly discounted by the lack of Path validation.

ROAs are easily circumvented through Path manipulation, and only really protect against mis-origination leaks, which are not all that common

Path protection is significantly harder than Origin protection and noone is doing it. That makes it tough to “sell” ROAs when all it does is introduce new fragility factors and not much else

What is the difference of creating ROA objects than creating route objects with other Routing Registry (i.e. RADB)? Does creating ROA objects affect my actual routing configuration?

In both cases the object creator (ROA, IRR Route Object) is creating information that other people can use in their BGP configuration to populate a BGP filter.

However … a few folk use a general route registry to populate their routing filters. The data is not consistent and of dubious quality so it becomes a risk to use it to drive a routing filter. In theory only the prefix holder can create a valid ROA so there are fewer issues about authenticity of the data. But a ROA contains no policy information, so has a more limited application

If a member has a /22 and routes the /22 (only). Should they create a ROA with (and why?):
-no max length
-max length of /24 (in case of future requirement)
-max length of /22

/22 – otherwise they are opening the door for more specific attacks with origin spoofing

Should we be actively contacting our members with "invalids" and notify them? Is there a way of automatically notifying the network operators once their ROA becomes invalid?

Who made us the routing police?

By the way, “Invalidity” is NOT a global condition – it’s a local condition. Its relative to local trust anchors, which makes this a tougher proposition – there is no assured global in/out judgement here.

For some large organizations when creating ROA's they need to do their research first, then push it up to their management. What kinds of things can they add to their business case before submitting to their management?

To what extent do address holders see integrity of routing of their own addresses being their own responsibility, and to what extent do they see it as their upstream ISP problem or more generally SEP?

- Some folk are happy to use APNIC's online system to generate and maintain ROAs.
- Some folk think its so important that they want to do it themselves and not rely on APNIC
- Some folk don't care enough to do it at all

Given that the investment / cost is nonzero and the benefits are arguable from the current very very low use of ROAs and BGPsec any of those responses are reasonable!