RouteViews

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PacNOG 10

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Goals

- Make people aware of peering and telnet access on the **RouteViews** collectors, particularly **route-views.sydney.routeviews.org**
- Generate interest in Routing Research and Analysis, with respect to the live xml **BGPMON** data streams **livebgp.netsec.colostate.edu 50001 livebgp.routeviews.org 50001**
- Encourage people to sign up for **Cyclops** Alerts **http://cyclops.cs.ucla.edu**

Outline

- **RouteViews**
- Research
- BGPMON
- Cyclops
- The Collectors
- The Archives
- Resources


Washington
Montana
A
Oregon
Idaho
Wyoming
Nevada
Utah
Colorado
California


TRACKTOWN USA


UNIVERSITY
OF
OREGON
FOUNDED 1876

What is RouteViews?

- **Initial Concept:** deploy a set of routers with a rich set of BGP peers in order to allow operators to see advertised routes (an early looking glass)
- **Later:** archive the BGP data to allow researchers to perform analysis on routing dynamics
- **Prerequisite:** ISP's must be willing to peer and to allow other ISP's to see their routes-- This requires a sense of community and a spirit of openness. This is the same spirit that existed at the beginning of the Internet.

RouteViews: Research Role

- RouteViews participates in Science Research funded by the National Science Foundation of the USA
- Co-Primary Investigators:
  - Dave Meyer / Univ of Oregon, and Cisco
  - Dan Massey / Colorado State University
  - Lixia Zhang / Univ of California, Los Angeles
- Areas of Research:
  - Routing Dynamics
  - Internet Growth
  - BGP Anomalies, Prefix Hi-jack Alerts

RouteViews: Research Role

- “CRI: Collaborative Research: Building the Next-Generation Global Routing Monitoring System”
- “WIT: A Watchdog System for Internet Routing”
- “IRNC:SP: 6Watch: Routeviews Infrastructure for Monitoring, Tracking and Diagnosing IPv6 Deployment”
  - 6views, 6spider, 6topology, eyep6, Cyclops6
  - http://6watch.net/

RouteViews Partners

- **BGPMON** -- Dan Massey, Colorado State University
  - http://bgpmon.netsec.colostate.edu/

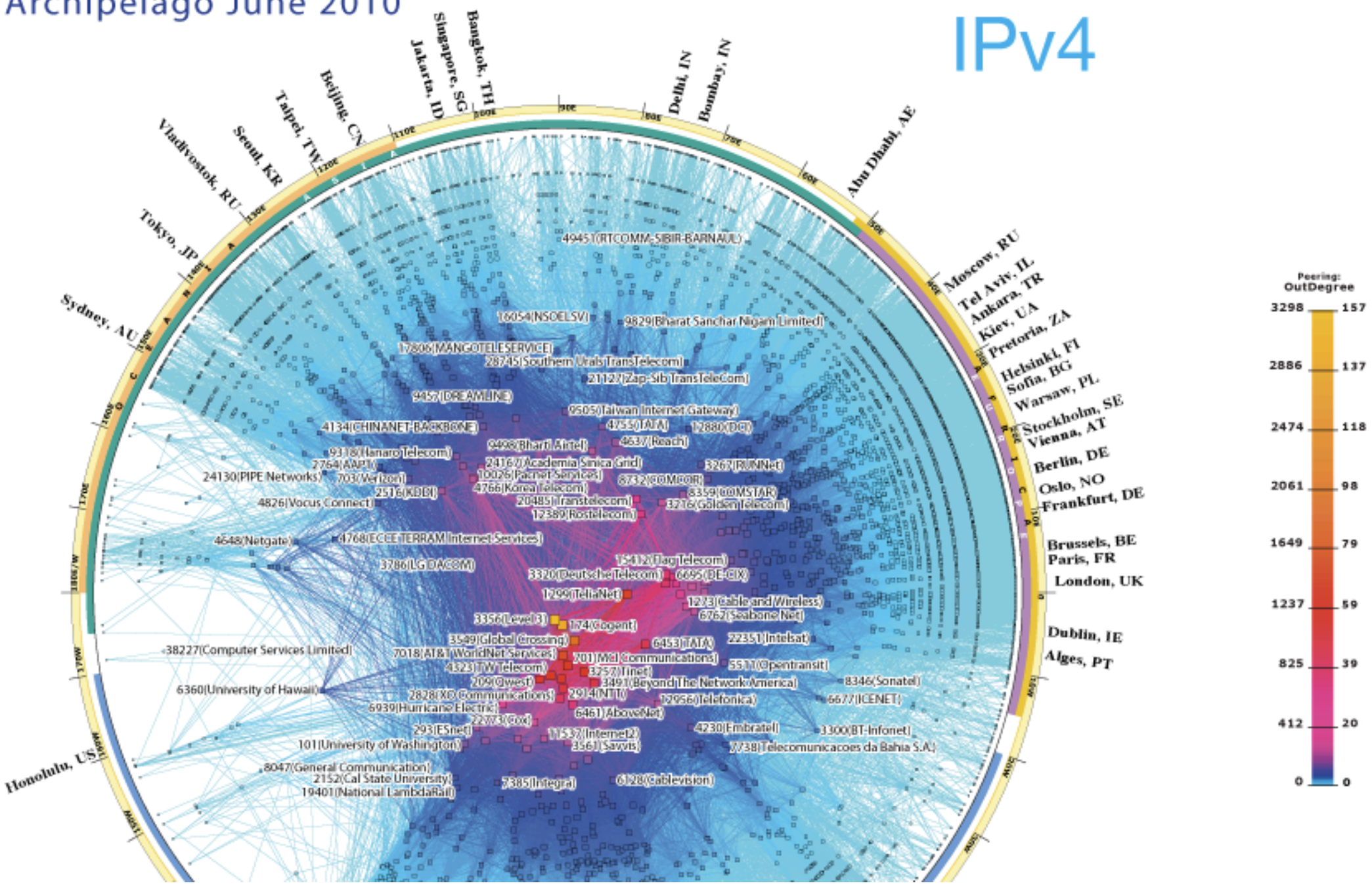
- **Cyclops** -- Lixia Zhang, University California, Los Angeles
  - http://cyclops.cs.ucla.edu

- **BGPlay** -- Lorenzo Collitti, Maurizio Pizzonia, Roma Tre' Universita
  - http://www.dia.uniroma3.it/~compunet/www/view/tool.php?id=bgplay

http://www.caida.org/research/

IPv4 & IPv6 AS Core
AS-level INTERNET GRAPH

Archipelago June 2010



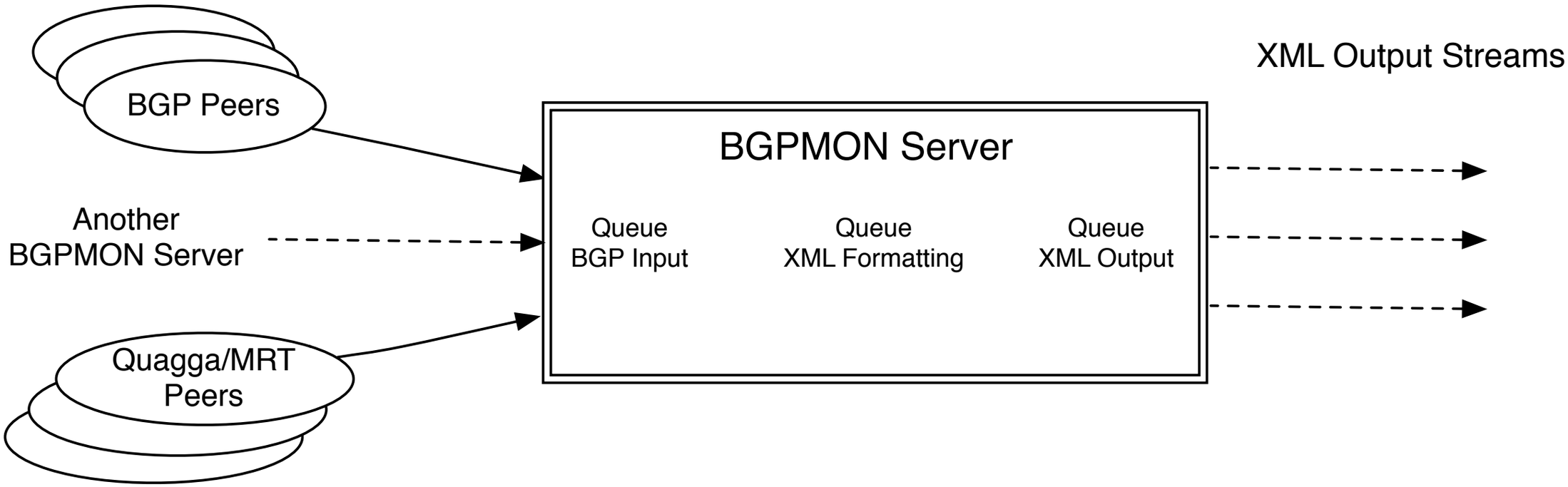
Outline

- RouteViews
- **Research**
- **BGPMON**
- **Cyclops**
- The Collectors
- The Archives
- Resources

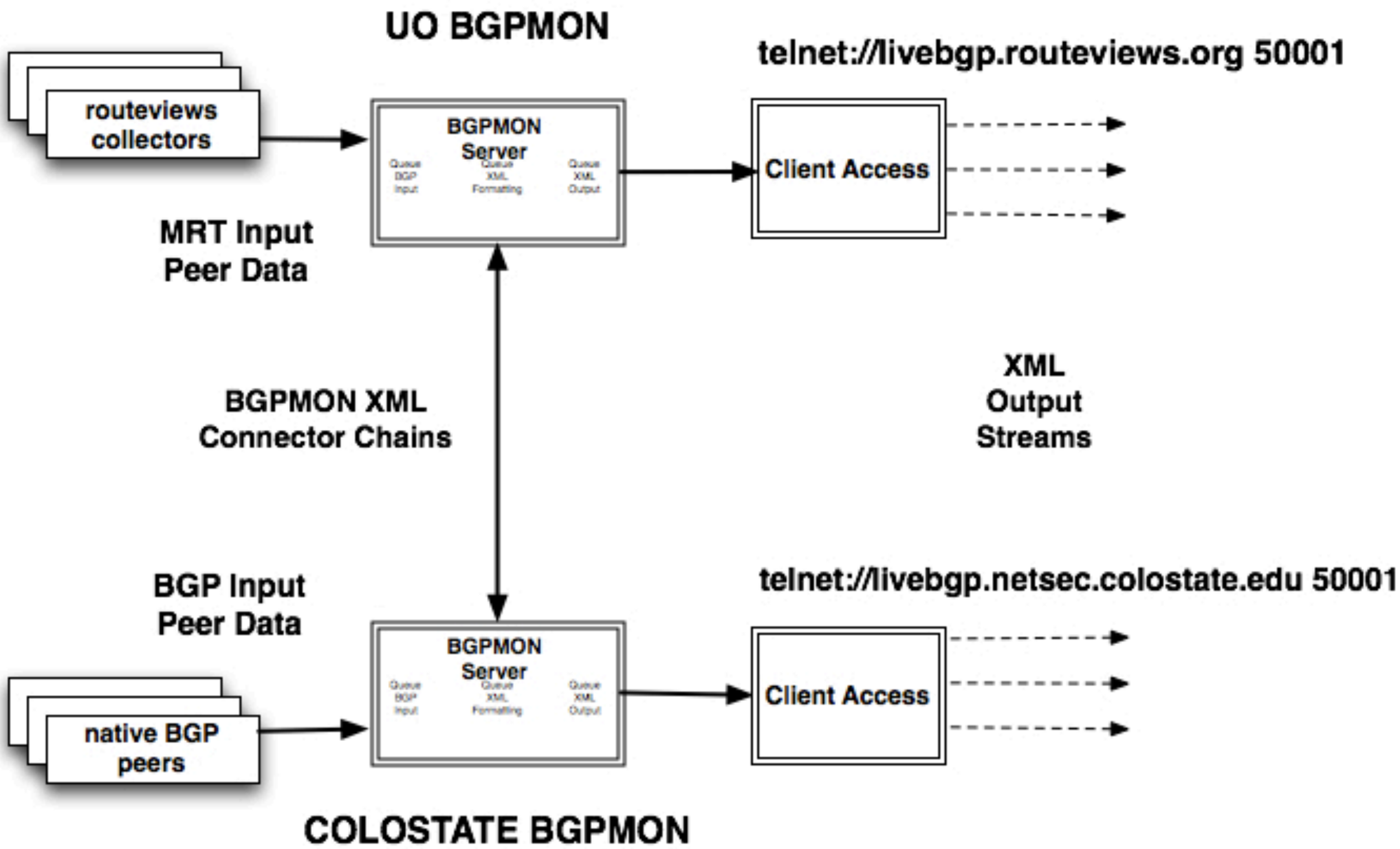
BGPMON: Introduction

- Designed as a Scalable BGP Data Monitor Platform
- Standalone Local Monitor Architecture (or)
- Wide-Area Monitor Architecture
- Supports native **BGP** Peers
- Supports Quagga **MRT** Peers (RouteViews)
- Queues designed to handle Reader/Writer Buffering
- **Chaining** Mechanism used to interconnect mutliple BGPMON servers and create distributed Architecture
- Output is a standardized **BGP/XML** format in a **LIVE** data stream

BGPMON: Basic Architecture



BGPMON: current architecture



BGPMON: XML BGP data stream

```
[kemp@archive ~]$ telnet livebgp.netsec.colostate.edu 50001
Trying 129.82.138.26...
Connected to livebgp.netsec.colostate.edu.
Escape character is '^]'.
<xml><BGP_MESSAGE length="00002763" version="0.2" xmlns="urn:ietf:params:xml:ns:
xfb-0.2" type_value="3" type="MESSAGE"><TIME><TIMESTAMP>1305662362</TIMESTAMP><D
ATETIME>2011-05-17T19:59:22Z</DATETIME><PRECISION_TIME>902</PRECISION_TIME></TIM
E><PEERING><SRC_ADDR afi="IPV4" afi_value="1" if_index="0">128.223.51.102</SRC_A
DDR><SRC_PORT>179</SRC_PORT><SRC_AS>6447</SRC_AS><DST_ADDR afi="IPV4" afi_value=
"1" if_index="0">208.51.134.246</DST_ADDR><DST_PORT>179</DST_PORT><DST_AS>3549</
DST_AS><BGPID>0.0.0.0</BGPID><AS_NUM_LEN>2</AS_NUM_LEN></PEERING><ASCII_MSG><MAR
KER length="16">FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF</MARKER><LENGTH>105</LENGTH><TY
PE value="2">UPDATE</TYPE><UPDATE><WITHDRAWN_LEN>0</WITHDRAWN_LEN><WITHDRAWN cou
nt="0"/><PATH_ATTRIBUTES_LEN>74</PATH_ATTRIBUTES_LEN><PATH_ATTRIBUTES count="5">
<ATTRIBUTE><FLAGS><TRANSITIVE/></FLAGS><LENGTH>1</LENGTH><TYPE value="1">ORIGIN<
/TYPE><ORIGIN value="0">IGP</ORIGIN></ATTRIBUTE><ATTRIBUTE><FLAGS><TRANSITIVE/><
/FLAGS><LENGTH>10</LENGTH><TYPE value="2">AS_PATH</TYPE><AS_PATH><AS_SEG type="A
S_SEQUENCE" length="4"><AS>3549</AS><AS>22822</AS><AS>13720</AS><AS>13720</AS></
AS_SEG></AS_PATH></ATTRIBUTE><ATTRIBUTE><FLAGS><TRANSITIVE/></FLAGS><LENGTH>4</L
ENGTH><TYPE value="3">NEXT_HOP</TYPE><NEXT_HOP>208.51.134.246</NEXT_HOP></ATTRIB
UTE><ATTRIBUTE><FLAGS><OPTIONAL/></FLAGS><LENGTH>4</LENGTH><TYPE value="4">MULTI
_EXIT_DISC</TYPE><MULTI_EXIT_DISC>2504</MULTI_EXIT_DISC></ATTRIBUTE><ATTRIBUTE><
FLAGS><OPTIONAL/><TRANSITIVE/></FLAGS><LENGTH>40</LENGTH><TYPE value="8">COMMUNI
TIES</TYPE><COMMUNITIES><COMMUNITY><AS>3549</AS><VALUE>4524</VALUE></COMMUNITY><
COMMUNITY><AS>3549</AS><VALUE>8280</VALUE></COMMUNITY><COMMUNITY><AS>3549</AS><V
ALUE>31826</VALUE></COMMUNITY><COMMUNITY><AS>13720</AS><VALUE>103</VALUE></COMMU
NITY><COMMUNITY><AS>13720</AS><VALUE>201</VALUE></COMMUNITY><COMMUNITY><AS>13720
</AS><VALUE>886</VALUE></COMMUNITY><COMMUNITY><AS>13720</AS><VALUE>887</VALUE></
```

BGPMON: Benefits

- Provides a near real-time data stream capability that was not previously available
- Consolidates multiple data sources into a single data stream
- XML data format provides a standardized self-describing data
- Flexible chaining architecture for fan-out to multiple sites, and for scaling to larger BGPMON architecture
- Supports new BGP peers, and with small modifications, existing Quagga MRT peers
- Open Source and Open Architecture
- This is what is feeding Cyclops!

BGPMON: Resources

- http://bgpmon.netsec.colostate.edu/
- http://bgpmon.netsec.colostate.edu/download/src/bgpmon-7.2.1.tar.gz
- http://www.netsec.colostate.edu/cgi-bin/mailman/listinfo/bgpmon
- bgpmon@netsec.colostate.edu

Cyclops: Introduction

- Developed at UCLA (University of California, Los Angeles)
- Provides an easy-to-access AS topology database, with automatic updating and built-in change detection and notification
- View of the Internet from your ASNs point-of-view, hence the name, the "**eye of the Cyclops**"
- **FREE** service to any AS/ISP who wishes to subscribe
- Topology Database updates are available as RAW Data
- Provides various forms of **FAULT DETECTION**: prefix hi-jack, de-peering, new peering, weight change, new transit AS, origin AS, bogons, more specifics, new neighbors, next-hop change
- Automatic notifications sent to subscribers
- Operates in near-real-time using BGPMON/rviews data

Cyclops: subscription procedure

- http://cyclops.cs.ucla.edu/
- Sign up for an account
- Enter information about your network
  - My ASNs
  - My Prefixes (quick lookup also available)
  - My Neighbors
- Select Alert Types
  - Prefix Alerts
  - ASN Alerts

Cyclops beta
open eye to your net

- Global Visibility >
- Critical Infrastructure >
- Anomalies >
- My Cyclops >

No. of BGP feeds: **960**

My Cyclops

My Prefixes | Add Prefixes | **My ASNs** | My Neighbors | My Alerts | My Account

To see all origin ASNs leave "My origin ASN" empty bellow.Your neighbor ASNs wil automatically be added to your neighbor list once you add an origin ASN, please check them at My Neighbors tab.

Note: by default you will start receiving **New prefix** alerts if you don't configure your prefixes after you add ASNs. You can configure your prefixes at Add prefixes tab.

ASNs: enter lists as e.g. 7018,701,52

Search my ASNs

My Cyclops

kemp
kemp@network-services.uoregon.edu

0 open alerts

My network:

0 prefixes

1 ASes

2 neighbor ASes

Quick lookup

ASN or AS Name: >

IP address or Host name: >

Total of 1 origin ASNs

Select: All None Delete	ASN	AS name	Alert on: new prefix Yes No	new neighbor Yes No	transit Yes No
Add ASN	enter lists as e.g. 7018,701,52		☑	☑	☑
☐	3582	UONET - University of Oregon	☑	☑	☑

Save

Cyclops beta
open eye to your net

- Global Visibility >
- Critical Infrastructure >
- Anomalies >
- My Cyclops >

No. of BGP feeds: **960**

My Cyclops

My Prefixes | **Add Prefixes** | My ASNs | My Neighbors | My Alerts | My Account

Enter the **ASN list** or **AS name** bellow and Cyclops will automatically generate a table of originated prefixes for the specified ASNs. Multiple ASNs can be entered in a comma separated list, e.g. 52,7018.

ASN list or AS name: 3582

Auto detect prefixes

Or you can enter a comma separated **list of prefixes**, e.g. 192.154.2.0/24, 2607:f010::/32.

Prefix list: Add

My Cyclops

kemp
kemp@network-services.uoregon.edu

0 open alerts

My network:

0 prefixes

1 ASes

2 neighbor ASes

Quick lookup

ASN or AS Name: >

IP address or Host name: >

Total of 5 prefixes found - select prefixes to add

☑ 128.223.0.0/16 (AS3582)	☑ 184.171.0.0/17 (AS3582)	☑ 2001:468:d01::/48 (AS3582)	☑ 207.98.72.0/21 (AS3582)
☑ 2607:8400::/32 (AS3582)			

Add prefixes

Cyclops beta
open eye to your net

- Global Visibility >
- Critical Infrastructure >
- Anomalies >
- My Cyclops >

No. of BGP feeds: **960**

My Cyclops

My Prefixes | Add Prefixes | My ASNs | My Neighbors | My Alerts | My Account

You can edit the alert settings for your prefixes bellow and look up your prefixes explicitly, by origin, by next-hop or by first bits of prefixes. Leave the fields empty to show all the prefixes.

Origin ASN:

Next-hop ASN:

Initial bits of prefix: e.g. 192.154.2, 131.179.

Search my prefixes

My Cyclops

kemp
kemp@network-services.uoregon.edu

0 open alerts

My network:

5 prefixes

1 ASes

2 neighbor ASes

Quick lookup

ASN or AS Name: >

IP address or Host name: >

Total of 5 prefixes

Select: All None Delete	Prefix	Allowed origin ASN Add Remove	Allowed next-hop ASN Add Remove	Alert on: origin change Yes No	next-hop change Yes No	more specific Yes No
Add prefix				☑	☑	☑
☐	128.223.0.0/16	3582	3701 4600	☑	☐	☑
☐	207.98.72.0/21	3582	3701 4600	☑	☐	☑
☐	2607:8400::/32	3582		☑	☐	☑
☐	184.171.0.0/17	3582	3701 4600	☑	☐	☑
☐	2001:468:d01::/48	3582		☑	☐	☑

Cyclops beta
open eye to your net

- Global Visibility >
- Critical Infrastructure >
- Anomalies >
- My Cyclops >

No. of BGP feeds: **960**

My Cyclops

My Prefixes | Add Prefixes | My ASNs | My Neighbors | **My Alerts** | My Account

Bellow are the alerts that were created for your account. You can search alerts, close or delete them. Click on alert id for alert details.

Start date: * 2011-04-29

End date: * 2011-05-20

ASNs:

e.g. 52,7018

Prefixes:

e.g. 192.154.2.0/24, 2607:f010::/32

Alert type: Origin change

Activity: All

Alert status: All

Show my alerts

My Cyclops

Mr. Guest
rveloso@cs.ucla.edu

150172 open alerts

My network:

79 prefixes

8 ASes

3429 neighbor ASes

Quick lookup

ASN or AS Name: >

IP address or Host name: >

Total of 139 alerts (page 1/7)

Select: All None Delete Open Close Mark as false alert	Alert id	Monitored ASN / prefix	Date (UTC)	Type	Announced prefix	Announced AS path	Duration / Activity	No. monitors	Status
☐	75385483	195.27.162.0/23	2011-05-18 00:56:13	**origin change**	195.27.162.0/23	53070 16735 6762 3320 12888	00:23:54 / **Off**	2	Open
☐	75475728	195.27.162.0/23	2011-05-17 22:45:09	**origin change**	195.27.162.0/23	14537 3356 1273 12888	04:14:32 / **Off**	2	Open
☐	75346385	195.27.162.0/23	2011-05-17 22:20:31	**origin change**	195.27.162.0/23	31500 174 3320 12888	00:36:10 / **Off**	2	Open

Cyclops: Resources

- Cyclops Website
  - http://cyclops.cs.ucla.edu/
- Cyclops Raw Data
  - http://cyclops.cs.ucal.edu/rawdata/<LAST-DIGIT>/asnum.YYYYMMDD
- NANOG Presentation Meetings 40/43/46
  - http://www.nanog.org/presentations/archive/
- UCLA IRL Topology Website
  - http://irl.cs.ucla.edu/topology
- Cyclops Mailing List
  - cyclops@lists.cs.ucla.edu

Outline

- RouteViews
- Research
- BGPMON
- Cyclops
- **The Collectors**
- The Archives
- Resources

RouteViews: Operational Role

- RouteViews has both Research and Operational Roles
- RouteViews provides operational support for network operators through open access via **TELNET** to the command-lines of all routers and collectors
- RouteViews provides an **ASPATH** and **ASN** DNS reverse lookup service
- RouteViews provides support to BGP Researchers
- As a non-profit, RouteViews serves both the operational and research communities

The Collectors **(at Univ of Oregon)**

route-views.routeviews.org	7206 G2, **Cisco IOS** 12.4-24T2 45 v4 peers, 11 v6 peers	the original route-views site, can be slow to respond at times
route-views3.routeviews.org	7206 G2, **Cisco IOS** 12.4-24T2 20 v4 peers, 2 v6 peers	installed to carry some of the extra load
route-views2.routeviews.org	Quagga BGPd 0.99.17 44 v4 peers	the source of the "show ip bgp" daily 2HR reports
route-views4.routeviews.org	Quagga BGPd 0.99.17 12 v4 peers, 12 v6 peers	development, Internet2 and International
route-views6.routeviews.org	Quagga BGPd 0.99.17 22 v6 peers	**IPV6 Only**

The Collectors **(at exchanges)**

route-views.paix.routeviews.org PAIX, Palo Alto, California USA	Quagga BGPd 0.99.17 17 v4 peers, 1 v6 peer	Silicon Valley West Coast, USA
route-views.eqix.routeviews.org EQIX, Ashburn, Virginia USA	Quagga BGPd 0.99.17 16 v4 peers, 10 v6 peers	East Coast, USA
route-views.linx.routeviews.org LINX, London, England	Quagga BGPd 0.99.17 39 v4 peers, 21 v6 peers	just upgraded
route-views.wide.routeviews.org DIXIE, Tokyo, Japan	Quagga BGPd 0.99.17 5 v4 peers, 2 v6 peers	renumbering in progress
route-views.sydney.routeviews.org **EQIX, Sydney, Australia**	Quagga BGPd 0.99.17 8 v4 peers, 4 v6 peers	**VOCUS**
route-views.saopaulo.routeviews.org PTTMetro, Sao Paulo, Brazil	Quagga BGPd 0.99.17 10 v4 peers, 10 v6 peers	NIC.br

PeeringDB: peeringdb.com/view.php?asn=6447

Company Information	
Company Name	RouteViews
Also Known As	
Company Website	http://www.routeviews.org/
Primary ASN	6447
IRR Record	
Network Type	Educational/Research
Approx Prefixes	
Traffic Levels	100-1000Mbps
Traffic Ratios	Mostly Inbound
Geographic Scope	Global
Looking Glass URL	
Route Server URL	route-views.routeviews.org
Notes	Telnet to collectors: route-views, route-views{2,3,4,6,.paix,.eqix,.linx,.wide,.sydney.saopaulo}, See also http://archive.routeviews.org for data archives.
Protocols Supported	Unicast IPv4 ☑ Multicast ☑ IPv6 ☑
Date Last Updated	2011-05-10 23:09:29 UTC

Contact Information

Role	Contact Name	Telephone	E-Mail
Policy	David Meyer	0011 1 541 346 1747	dmm@routeviews.org
Technical	John Kemp	0011 1 541 346-1714	kemp@routeviews.org
NOC	NOC	0011 1 541 346-1714	help@routeviews.org

Public Peering Exchange Points

Exchange Point Name	ASN	IP Address	Mbit/sec
DIX-IE	6447	2001:200:0:fe00::192f:0/64	100
DIX-IE	6447	202.249.2.166/24	100
Equinix Ashburn	6447	206.223.115.142/24	100
Equinix Ashburn	6447	2001:504:0:2::6447:1/64	100
Equinix Palo Alto (was: PAIX)	6447	2001:504:D::5/64	100
Equinix Palo Alto (was: PAIX)	6447	198.32.176.5/24	100
Equinix Sydney	6447	202.167.228.100/25	1000
Equinix Sydney	6447	2001:de8:6::6447:1/64	1000
LINX Brocade LAN	6447	2001:7f8:4::192f:1/64	100
LINX Brocade LAN	6447	195.66.225.222/23	100
LINX Extreme LAN	6447	2001:7f8:4:1::192f:1/64	100
LINX Extreme LAN	6447	195.66.227.222/23	100

1 2 of 2 Next > Last >>

Private Peering Facilities

Facility Name	ASN	City	Country	SONET	Ethr	ATM
No records						

Example Output: show peers

```
route-views>show ip bgp summary
BGP router identifier 128.223.51.103, local AS number 6447
BGP table version is 1399463196, main routing table version 1399463196
387094 network entries using 51096408 bytes of memory
12080938 path entries using 628208776 bytes of memory
2025142/68861 BGP path/bestpath attribute entries using 340223856 bytes of memory
1796882 BGP AS-PATH entries using 70824312 bytes of memory
43746 BGP community entries using 3224352 bytes of memory
111 BGP extended community entries using 6492 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 1093584196 total bytes of memory
Dampening enabled. 4560 history paths, 5067 dampened paths
BGP activity 489960/92034 prefixes, 23813035/11662302 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxR
4.69.184.193    4         3356 1553851   25581 1399463272    0    0 2w3d       348935
12.0.1.63       4         7018 2208642   15405 1399463272    0    0 2w3d       349791
64.71.255.61    4          812 2144468   25579 1399463272    0    0 4d02h      350913
64.125.0.137    4         6461       0       0          0    0    0 never    Active
65.106.7.139    4         2828 1015635   25579 1399463272    0    0 2w3d       350338
66.59.190.221   4         6539  781842   25580 1399463272    0    0 2w3d       350931
66.110.0.124    4         6453 1390886   96420 1399463272    0    0 2w3d       349409
66.185.128.48   4         1668 2388389  129881 1399463272    0    0 2w3d       349776
69.31.111.244   4         4436 2335628  129879 1399463272    0    0 2w3d       348953
89.149.178.10   4         3257 1332269   55095 1399463272    0    0 2w3d       350315
114.31.199.1    4         4826 1193555  106189 1399463272    0    0 2d18h      354142
```

Example Output: bgp regexp

```
Username: rviews
route-views>show ip bgp regexp _3582$
BGP table version is 1397220745, local router ID is 128.223.51.103
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  128.223.0.0      217.75.96.60             0             0 16150 3549 11537 460
*                   154.11.98.225            0             0 852 3561 3356 3701 3
*                   157.130.10.233                         0 701 3356 3701 3582 i
*                   216.218.252.164                        0 6939 3701 3582 i
*                   114.31.199.1                           0 4826 6939 3701 3582
*                   203.62.252.186                         0 1221 4637 3356 3701
*                   64.71.255.61                           0 812 11164 4600 3582
*                   208.51.134.254           2786          0 3549 11537 4600 3582
*                   194.85.102.33                          0 3277 3267 50139 2096
*                   194.85.40.15                           0 3267 50139 20965 115
*                   134.222.87.1                           0 286 11164 4600 3582
*                   207.172.6.20                0          0 6079 11537 4600 3582
*                   202.232.0.2                            0 2497 3356 3701 3582
*                   207.172.6.1                 0          0 6079 11537 4600 3582
*                   66.59.190.221                          0 6539 11537 4600 3582
*                   154.11.11.113               0          0 852 3561 3356 3701 3
*                   4.69.184.193                0          0 3356 3701 3582 i
*                   66.185.128.48               2          0 1668 3356 3701 3582
```

The Archives

- archive.routeviews.org (primary data site)
  - 5 of 16TB fibre channel primary, 6 of 16TB backup
  - **MRT binary files**, organized by collector and date
  - Infortrend, Qlogic, Linux Multipath, XFS Filesystem
  - ftp://archive.routeviews.org/
  - http://archive.routeviews.org/

- archive2.routeviews.org (mirror data site)
  - 6TB of 32TB fibre channel
  - ftp://archive2.routeviews.org/
  - http://archive2.routeviews.org/

RouteViews Resources

- RouteViews
  - http://www.routeviews.org/
- 6Watch
  - http://6watch.net/
- BGPLAY
  - http://bgplay.routeviews.org/
- PeeringDB
  - http://www.peeringdb.com/view.php?asn=6447
- Mailing/NOC:
  - help@routeviews.org