RouteViews + BGPmon
Enabling BGP Monitoring and Analysis

Catherine Olschanowsky

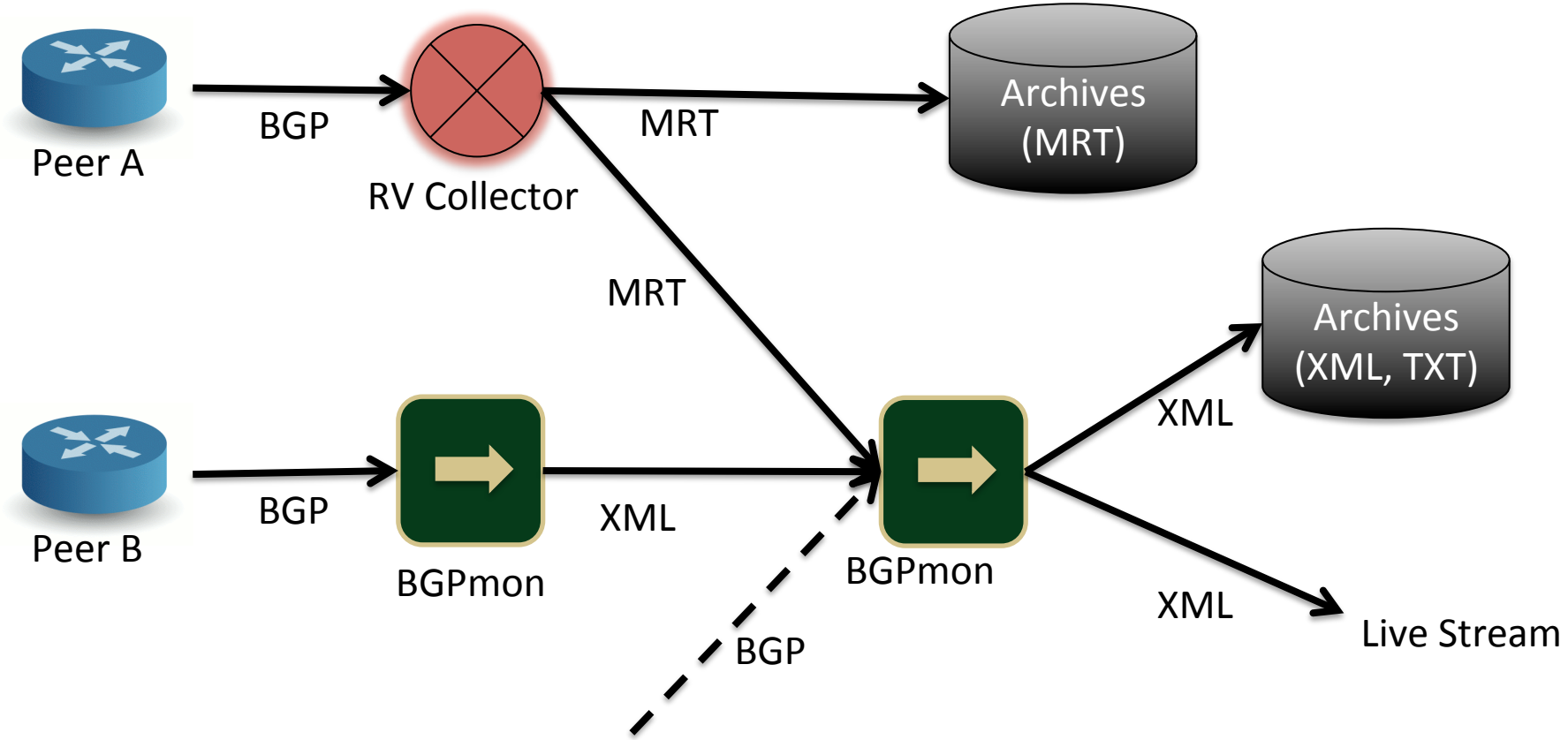
Lawrence Weikum

John Kemp

RouteViews + BGPmon: A Community Infrastructure

- Started by the operations community
  - Unfunded grassroots effort
- Used by
  - University researchers
  - The operations community
  - Government contractors and security teams
- Maintained and Expanded by
  - University of Oregon
  - Colorado State University

RouteViews + BGPmon: Public BGP Monitoring



RouteViews + BGPmon: Made possible by our peers

Introduction | Deployment | Demos | DIY | Updates

RouteViews Deployment

BGP Collectors

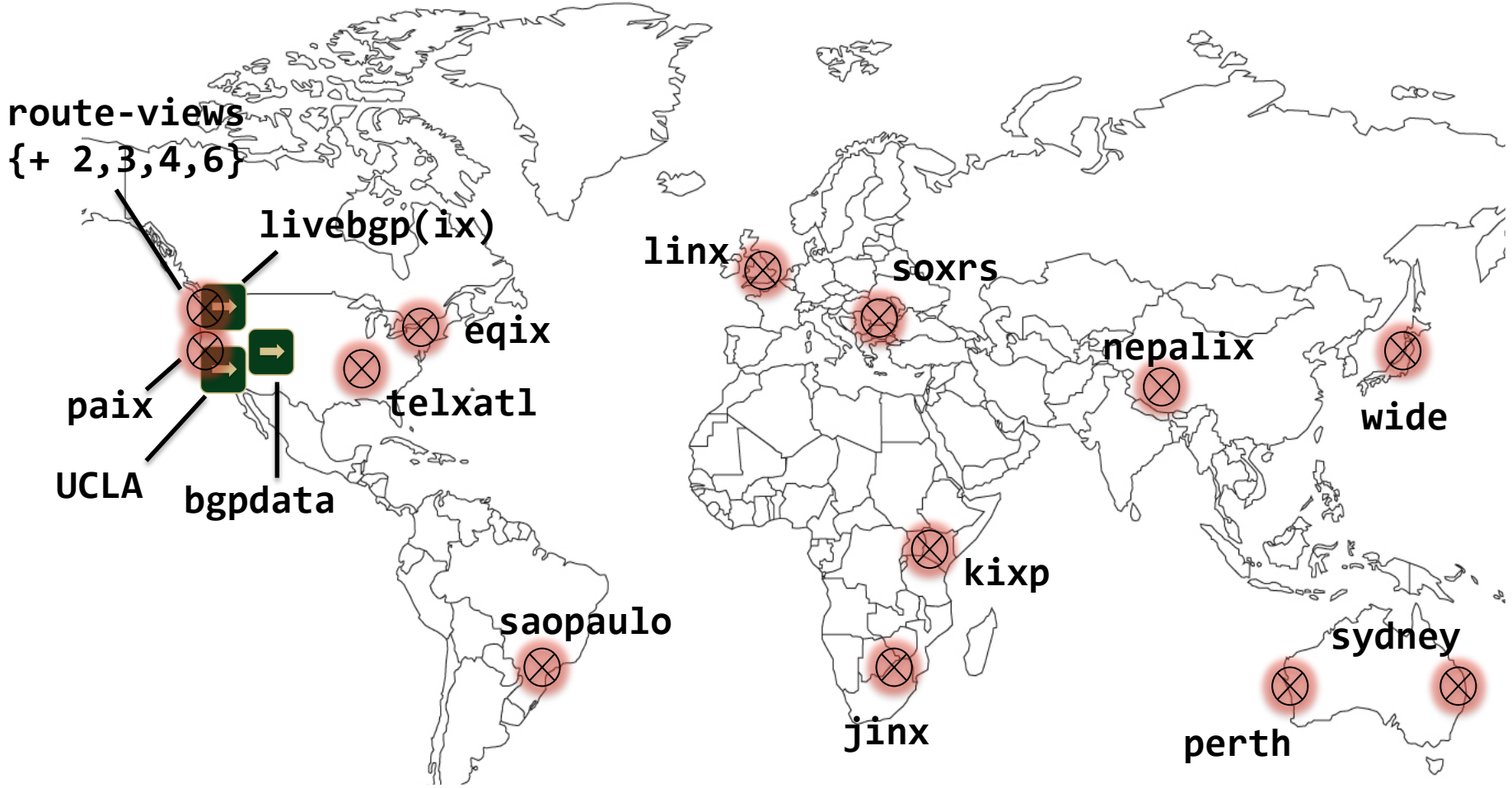
- Multi-hop and at Major Exchanges
- 17 Collectors, 170 v4 peers, 75 v6 peers
- Telnet Cisco Command-Line with Open Access
- Full-Table View from Each Peer to AS6447

BGP Data

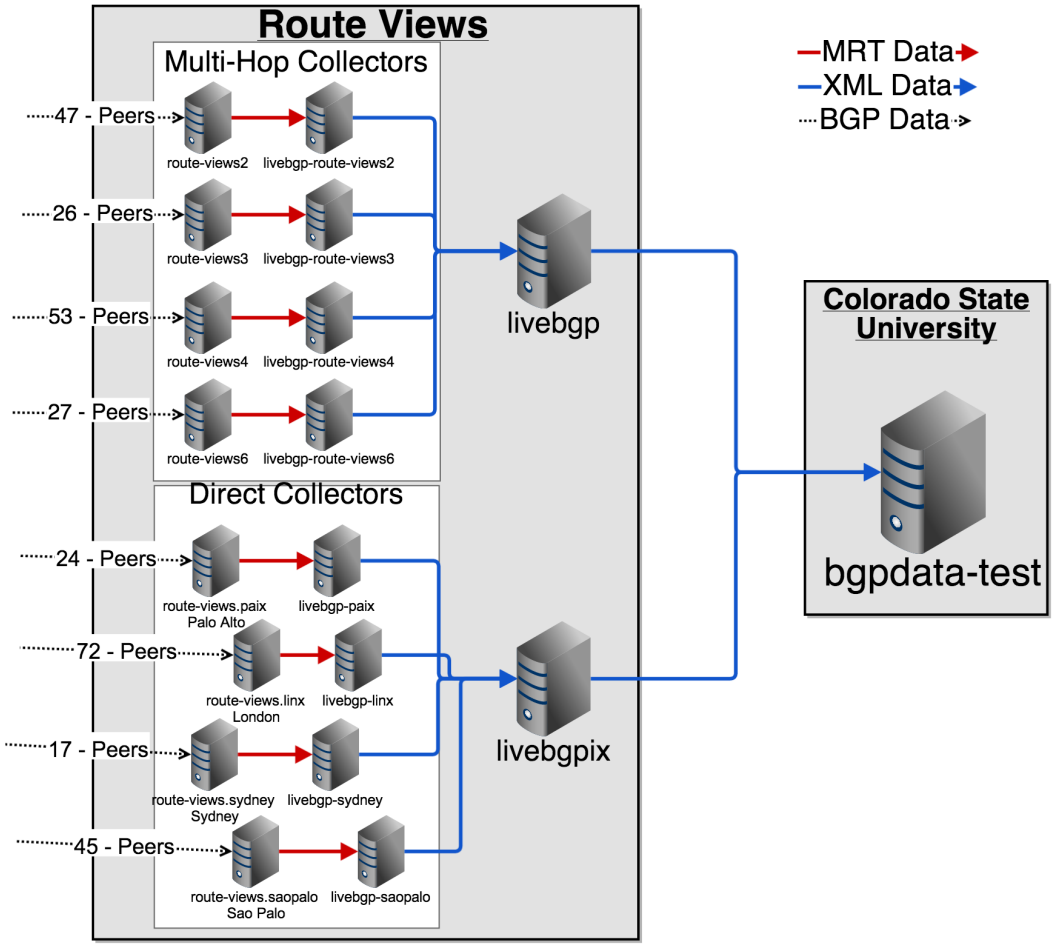
- Collection, Distribution, Archiving, and Operations
- Archive Data in MRT Format, 1997 to present
- Live Data Streams in XML Format

Colorado State University

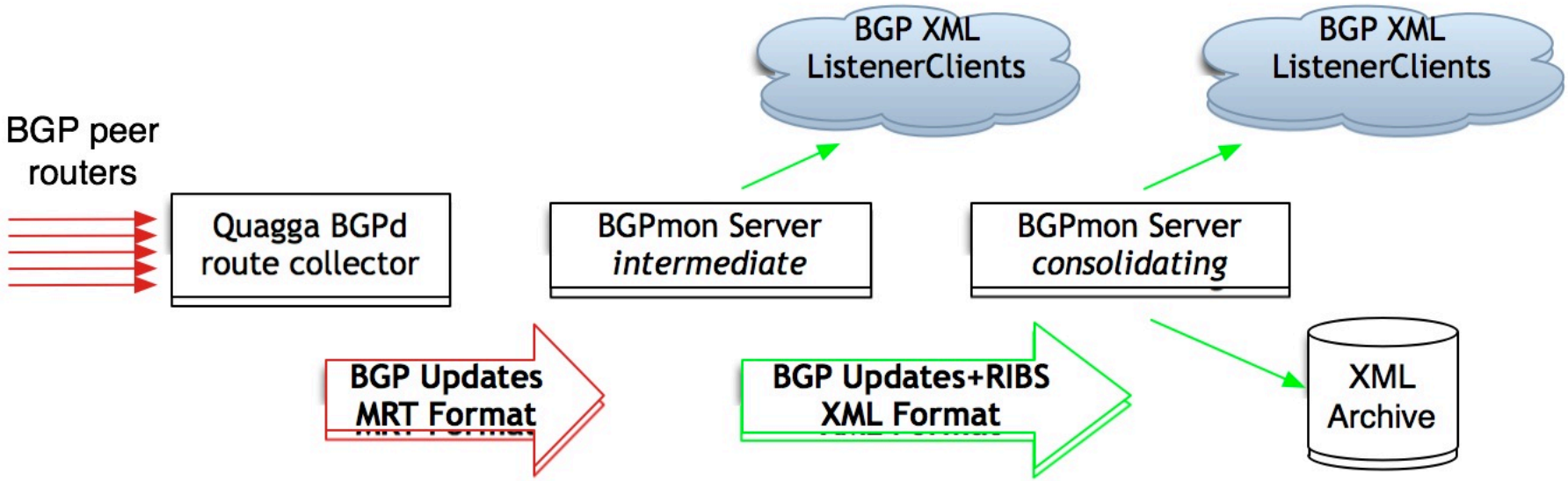
RouteViews + BGPmon Collectors



RouteViews+BGPmon Deployment



RouteViews-BGPmon Architecture (logical)



RouteViews-BGPmon Architecture (current)

RouteViews Resources

RouteViews

http://www.routeviews.org/

PeeringDB, Complete List of Collectors / Exchanges

http://www.peeringdb.com/view.php?asn=6447

A Typical RIB, Route-views2 Every 2 Hours

http://archive.routeviews.org/oix-route-views/oix-full-snapshot-latest.dat.bz2

RouteViews Data

{http,ftp}://archive.routeviews.org/

rsync –list-only archive.routeviews.org::routeviews

rsync –av archive.routeviews.org::routeviews/bgpdata .

BGPlay

http://bgplay.routeviews.org/

ASpath DNS Files

http://archive.routeviews.org/dnszones/

Contact: help@routeviews.org

Internet Wide Monitoring

- Hilbert Graph: Hierarchical view of prefix space (IPv4)
- Focuses on a single peer
- Shows what portion of the address space changes
- When the path for a prefix changes it turns white
- This is the Australian outage in Feb. 2012

Internet Wide Monitoring

A Retrospective on an Australian Routing Event

Kaustubh Gadkari[2] John Heidemann[1] Cathie Olschanowsky[2]
Christos Papadopoulos[2] Yuri Pradkin[1] Lawrence Weikum[2]

1: USC/Information Sciences Institute, 2: Colorado State University
January 2014

Internet Wide Monitoring Multi-Peer View

- Traffic Analytics Feeding Alerts
  - Send Rate
  - Origin Changes
  - Path Changes
  - New Entries
  - Withdrawals
- Alerts triggered by
  - > 1500 path updates (yellow alert)
  - > 3000 path updates (red alert)
  - > 1000 origin changes (yellow alert)

Internet Wide Monitoring

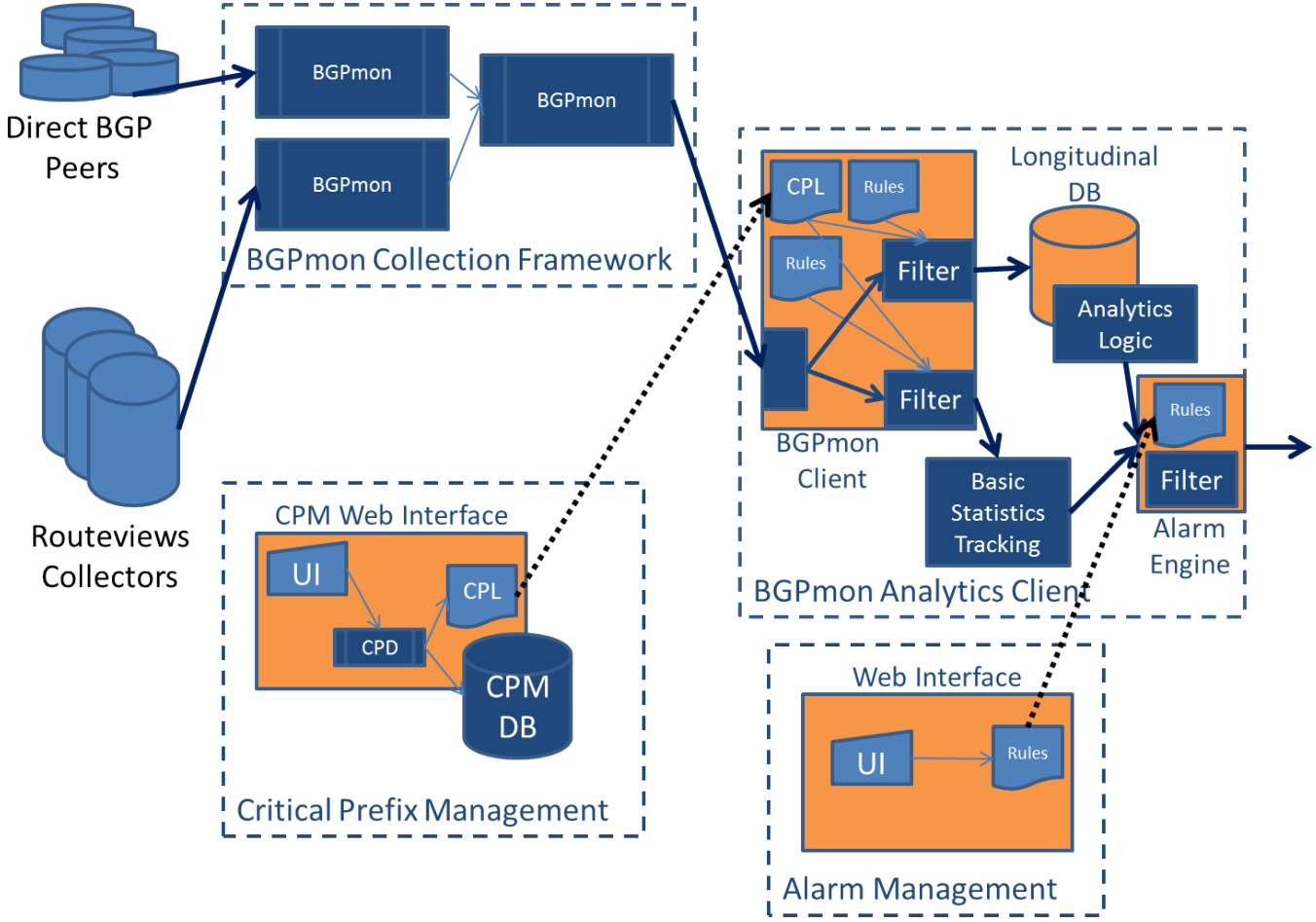
Thu Feb 23 02:30:05 2012 GMT

Peer	RIB Entries	Send Rate	Path Changes	Origin Changes	New Entries	Num Withs
2001:de8:6::1:26:1	7949	0	0	0	0	0
2001:de8:6::3:71:1	7265	0	0	0	0	0
2001:de8:6::3:8809:1	7971	0	0	0	0	0
2001:de8:6::4739:1	7970	0	0	0	0	0
2001:de8:6::4826:1	7950	0	0	0	0	0
2001:de8:6::7575:1	6157	0	0	0	0	0
202.167.228.107	18823	0	0	0	0	0
202.167.228.20	399679	0	0	0	0	0
202.167.228.37	397282	36	8	0	3	0
202.167.228.38	10300	0	0	0	0	0
202.167.228.44	395645	0	0	0	0	0
202.167.228.46	185564	0	0	0	0	0
202.167.228.74	396498	0	0	0	0	0
202.167.228.81	25143	0	0	0	0	0

Organizational Level

- Create a Critical Prefix List (CPL)
- Monitor your address space
- Monitor space of other's whom you depend on for reachability and services.
- Store and compare updates with PostgreSQL database

Organizational Level Monitoring (CERT Australia)



DIY Perl Tools

- Open source Perl Modules Available on CPAN
  - BGPmon-core
    - Fetch, Translate, Configure, Log
  - BGPmon-Archiver
    - Standalone application + modules
  - BGPmon-AnalyticsDB
    - Experimental relational database
  - BGPmon-CPM
    - Critical prefix discover and management

Example Client:
Counts Path Changes for a Specific Peer

```
use BGPmon::Fetch qw/connect_bgpdata read_xml_message is_connected/;
use BGPmon::Translator::XFB2PerlHash::Simpler qw/parse_xml_msg extract_nlri
extract_aspath/;

connect_bgpdata($source, $port);
while(is_connected()){
  my $msg = read_xml_message();
  parse_xml_msg($msg);
  my @as_path = extract_aspath();
  my @announcements = extract_nlri();
  foreach(@announcements){
    num_orig_change += 1 if not(@{ rib->{$_} } ~~ @as_path);
  }
}
```

7.3.3 Release of BGPmon

- Improved Stability
- XSD
- Message changes
- Side-by-side deployments
  - Live feed from bgpdata-test.netsec.colostate.edu
    - Updates on 50001
    - RIBs on 50002
- Receives direct peering data as well as chains from BGPmons at RouteViews.

Conclusions

- RouteViews+BGPmon is a public infrastructure and a valuable community resource
- Our deployment spans 6 continents and comprises over 200 peers
- Internet-wide and organization specific BGP monitoring are well supported
- Try out our DIY Perl tools!

Acknowledgements

- RouteViews Team
  - John Kemp
  - David Meyer
- BGPmon Team
  - Catherine Olschanowsky
  - Lawrence Weikum
  - Kaustubh Gadhari
  - Lixia Zhang
  - Christos Papadopoulos
- Previous Team Members
  - Daniel Massey
- IPv4 Demo (ISI)
  - Yuri Pradkin
  - John Heidemann

This material is based upon work supported by Department of Homeland Security Science and Technology Directorate, Cyber Security Division, via SPAWAR Systems Center Pacific under Contract No. N66001-13-C-3001.
Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of SSC-Pacific.

This work has been supported by the DHS Science and Technology Directorate contract number N66001-08-C-2028 and the National Science Foundation's CISE Research Infrastructure (CRI) Program contract number CNS-1305404.