

IRR – Additional Route Attributes

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Outline

- IRR Recap
- New Route Attributes
 - Rpki
 - Geo-tagging
- Examples
- Conclusion

Review: What is the IRR

- A loose collection of independently operated routing policy registries:
- Current set of RADB mirrors
 - [ALTDB](#)
 - [AOLTW](#)
 - [APNIC](#)
 - [ARIN](#)
 - [BCNET](#)
 - [BELL](#)
 - [BBOI](#)
 - [D](#)
 - [DERU](#)
 - [DIGITALREALM](#)
 - [EASYNET](#)
 - [EBIT](#)
 - [EPOCH](#)
 - [GT](#)
 - [GW](#)
 - [HOST](#)
 - [JPIRR](#)
 - [LEVEL3](#)
 - [MTO](#)
 - [NESTEGG](#)
 - [NTTCOM](#)
 - [OPENFACE](#)
 - [OTTIX](#)
 - [PANIX](#)
 - [PEGASUS](#)
 - [RADB](#)
 - [REACH](#)
 - [RGNET](#)
 - [RIPE](#)
 - [RISQ](#)
 - [ROGERS](#)
 - [SAVVIS](#)
 - [WVFIBER](#)

Review: Purpose of IRR

- Growing out the NSFNet the high-level purpose of the IRR was to provide a mechanism for network operators to publish information about their networks
- Types of declarations:
 - Route, ASN, Route-set, as-set, role, maintainer
 - Policy: import, export

Example

aut-num: AS237
as-name: MERIT-ASN
descr: Merit Network Inc.
Ann Arbor, MI 48109 USA
import: from AS38
action pref=100;
accept AS-UIUC
import: from AS103
action pref=100;
accept AS103
import: from AS217
action pref=100;
accept AS217

import: from AS293
action pref=100;
accept AS-ESNET

import: from AS600
action pref=100;
accept AS-OAR
export: to AS8175
announce AS-MICHNET

export: to AS6461
announce AS237 AS238 AS7016 AS10330

admin-c: Larry Blunk
tech-c: Bert Rossi

notify: routing-notify@merit.edu
mnt-by: MAINT-AS237

changed: har@merit.edu 19991216
changed: ljb@merit.edu 20070404 #13:25:10(UTC)
changed: ljb@merit.edu 20070517 #20:42:25(UTC)
changed: ljb@merit.edu 20080702 #17:10:53Z
source: RADB

route: 198.108.0.0/14
descr: MERIT Network Inc.
1000 Oakbrook Drive, Suite 200
Ann Arbor
MI 48104, US
origin: AS237
mnt-by: MAINT-AS237
changed: rik@merit.edu 20050922
changed: ljb@merit.edu 20060919 #20:06:08(UTC)
source: RADB

RPKI

- The problem: Signed objects called roa provide mapping between prefix and authorized origin AS. Network operator can choose to publish roa anywhere.
- Essentially an RPKI certificate is an attribute of your prefix and can be published in a similar manner

roa-uri:

- Add new attribute to irrd route object that references a roa publication point, validation based on modified public tools such as ripencc-rpki-validator, and tools from subvert-pki.hactrn.net

```
% ./whois 180.214.160.0/21
```

```
route:          180.214.160.0/21
```

```
descr:          Net Sys International Limited —
```

```
origin:         AS45932
```

```
roa-uri:
```

```
http://rpki.apnic.net/member\_repository/  
A91DE034/92965FE6B31611DEBFE5ED86864992D1/4EFBB47EB31711  
DE8A473387864992D1.roa
```

```
notify:         ipadmin@netsys.com.hk
```

```
mnt-by:         MAINT-NET-SYS-HK
```

```
changed:        ipadmin@netsys.com.hk 20100525
```

```
source:         APNIC
```

Resolving the roa-uri

- Modify whois client or add wrapper to perform manual validation of the cert for that prefix:

```
% ./rpki-whois 180.214.160.0/21
route:      180.214.160.0/21
descr:      Net Sys International Limited - IP Administrator
origin:      AS45932
roa-uri:     http://rpki.apnic.net/member\_repository/A91DE034/92965FE6B31611DEBFE5ED86864992D1/4EFBB47EB31711DE8A473387864992D1.roa
country:     HK
notify:      ipadmin@netsys.com.hk
mnt-by:      MAINT-NET-SYS-HK
mnt-routes:  MAINT-NET-SYS-HK
changed:     ipadmin@netsys.com.hk 20100525
source:      APNIC
```

```
Validating ROA...
16:57:11,001 INFO rsync://rpki.apnic.net/repository/APNIC.cer is VALID
16:57:17,113 INFO rsync://rpki.apnic.net/repository/8BDFC7DED5FD11DCB14CF4B1A703F9B7/KR8WDankLJ7uq4RBE212svl-C0A.crl is VALID
16:57:17,138 INFO rsync://rpki.apnic.net/repository/8BDFC7DED5FD11DCB14CF4B1A703F9B7/CVPQSGUkLy7p0XdNeVWGvnFX_0s.cer is VALID
16:57:27,330 INFO rsync://rpki.apnic.net/repository/A3C38A24D60311DCAB08F31979BDBE39/CVPQSGUkLy7p0XdNeVWGvnFX_0s.crl is VALID
16:57:27,349 INFO rsync://rpki.apnic.net/repository/A3C38A24D60311DCAB08F31979BDBE39/gmWi22CLcYxBndU1BysIAAMTrYM.cer is VALID
16:57:33,118 INFO rsync://rpki.apnic.net/member_repository/A91DE034/92965FE6B31611DEBFE5ED86864992D1/gmWi22CLcYxBndU1BysIAAMTrYM.crl
is VALID
16:57:33,126 INFO file:/tmp/rw.roa is VALID
```


Invalid/expired roa

```
% rpki-whois 116.197.128.0/21
route:      116.197.128.0/21
descr:      WINET NETWORK OPERATION CENTER
descr:      Jakarta
country:     ID
origin:      AS38542
mnt-by:      MAINT-ID-WINET
changed:     admin@wi.net.id 20100906
source:      APNIC
```

Validating ROA...

```
16:28:15,608 INFO rsync://rpki.apnic.net/repository/APNIC.cer is VALID
16:28:21,621 INFO rsync://rpki.apnic.net/repository/8BDFC7DED5FD11DCB14CF4B1A703F9B7/KR8WDankLJ7uq4RBE212svl-C0A.crl is VALID
16:28:21,642 INFO rsync://rpki.apnic.net/repository/8BDFC7DED5FD11DCB14CF4B1A703F9B7/CVPQSGukLy7p0XdNeVWGvnFX_0s.cer is VALID
16:28:31,129 INFO rsync://rpki.apnic.net/repository/A3C38A24D60311DCAB08F31979BDBE39/CVPQSGukLy7p0XdNeVWGvnFX_0s.crl is VALID
16:28:31,139 INFO rsync://rpki.apnic.net/repository/A3C38A24D60311DCAB08F31979BDBE39/0lpvV13S0bd44AnJFkbXH0n08oI.cer is VALID
16:28:37,051 INFO rsync://rpki.apnic.net/member_repository/A91893D1/7917259278E611DEADE3059B864992D1/0lpvV13S0bd44AnJFkbXH0n08oI.crl is VALID
```

```
16:28:37,056 ERROR <FAIL> file:/tmp/rw.roa: Not valid after 2010-07-28T23:59:59.000Z
```

```
16:28:37,057 INFO file:/tmp/rw.roa is INVALID
```

```
Content type: 1.2.840.113549.1.9.16.1.24
```

```
Signing time: 2009-07-28T21:10:03.000Z
```

```
ASN: AS38542
```

```
Prefixes:
```

```
116.197.128.0/21 [32]
```

```
ROA prefix matches IRR prefix
```

Geo-Tagging

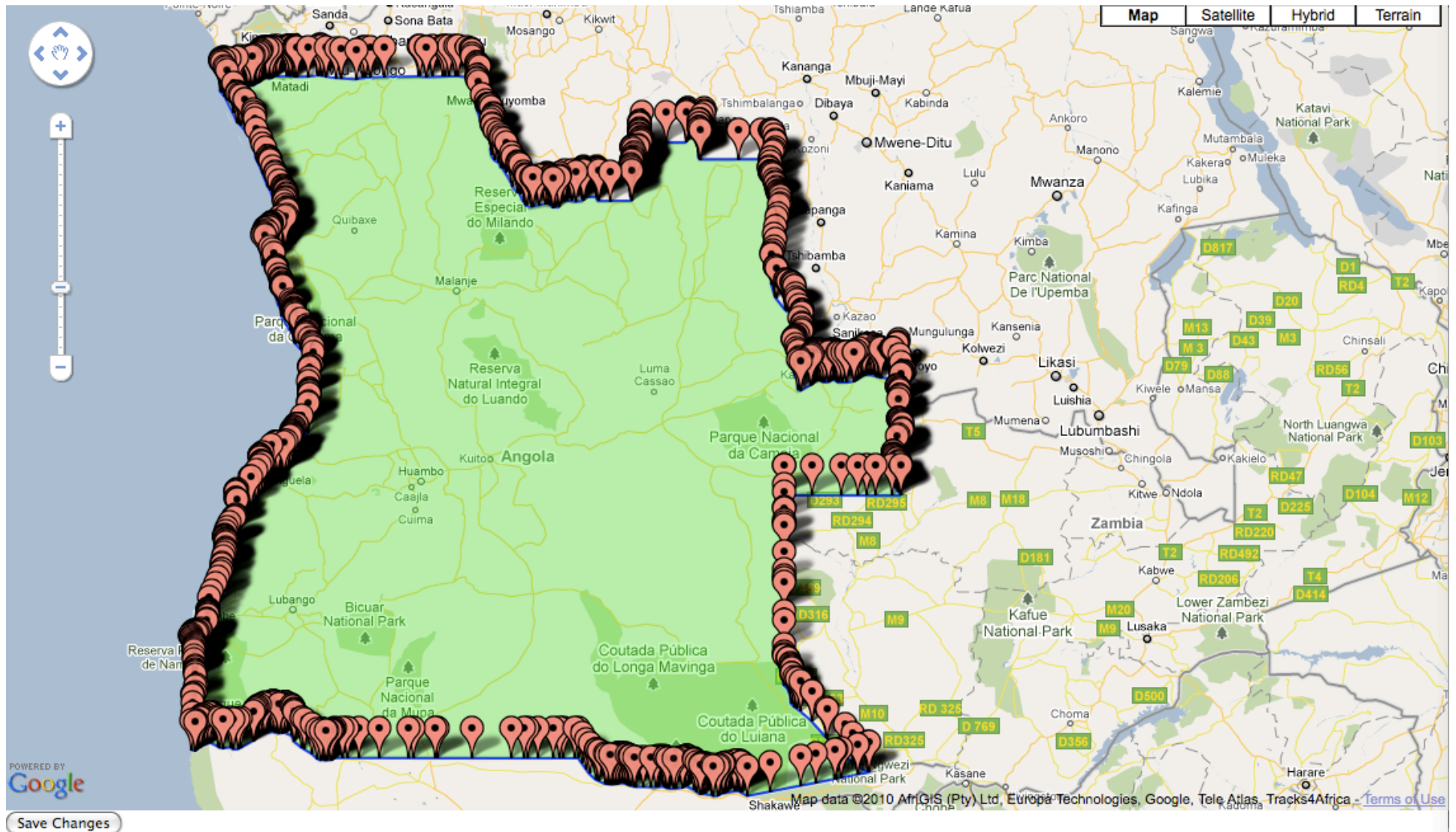
- The problem: Tailor content/view of content to geographic region – performance, language customization, access control. But we only have “inferred” sources of geographic mappings for prefixes.
- Geographic information – a form of network policy – owner/operator should be able to declare intent

geoidx:

- Use IRRd codebase and add additional attribute to a route object that allows us to specify geographic information:

```
$ whois -h localhost 24.92.0.0
route:                24.92.0.0/19
descr:                Time Warner Communications Tampa
origin:               AS10994
notify:               john@example.com
mnt-by:               TAMPA2-TWC
changed:               john@example.com 19990416
source:               ARIN
geoidx:               13
cntry_name:           Angola
fips_cntry:           AO
```

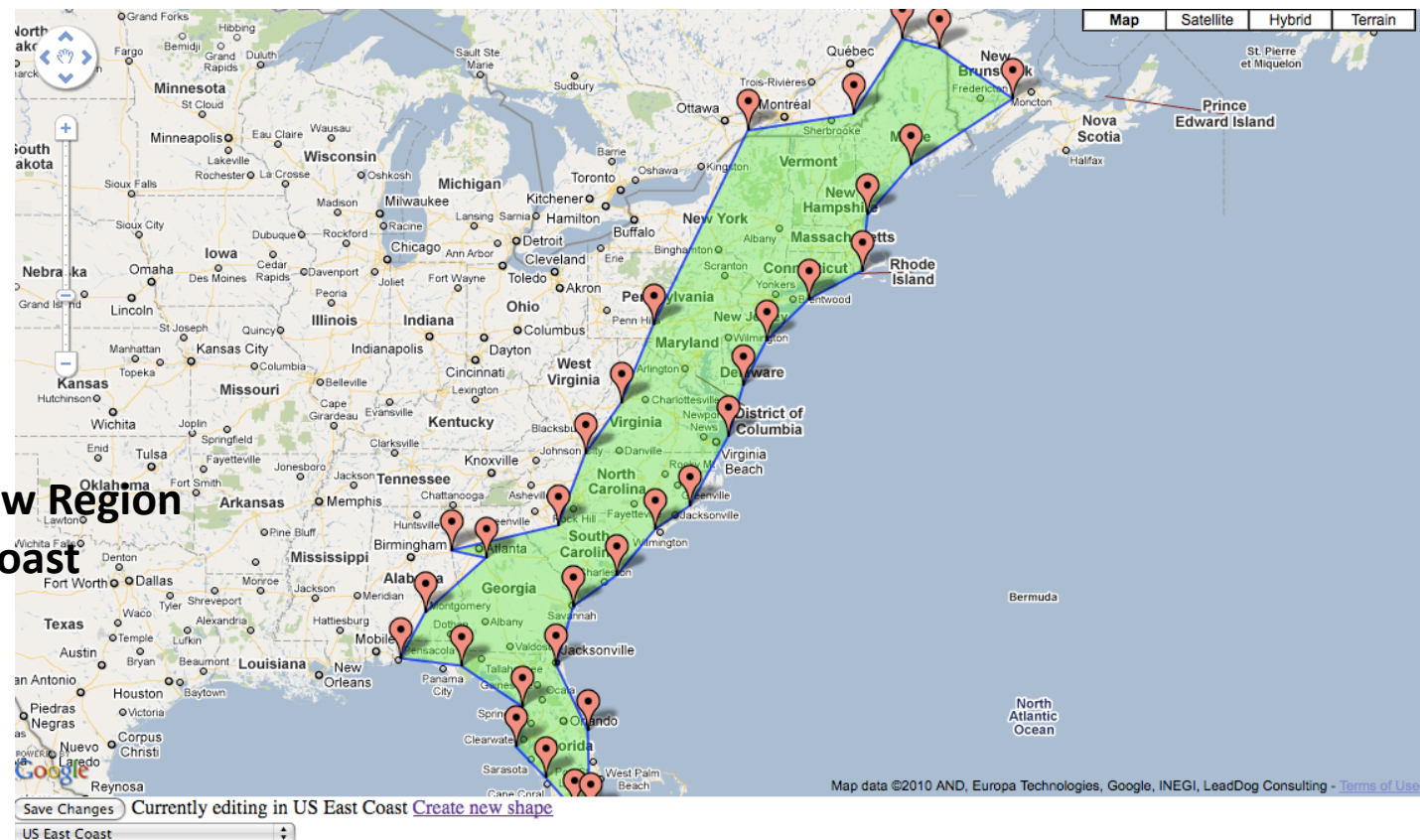
Resolving the geoidx



Defining custom regions

- Simple postgres backed website that uses googlemaps API. Click to add connected points on map, add, remove, move as needed, save region with label. Use resulting index in route object.

Defining New Region
– US East Coast



Conclusions

- It is possible to use IRR system to declare policy about your network prefixes in addition to just routing policy
- We have proposed the use of two additional tags for specifying geographic and authentication information
- No these are not part of RPSL, no we don't have plans to push for changes to the RPSL spec.
- These new features and other code cleanups and enhancements will be part of irrd-3.0 release currently slated for Nov 2010.
- Open to suggestions for additional features and capabilities that you might find useful in irrd.