How to use
the BGP community attribute

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Introduction

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Overview

• Review of routing policy
  – Routing preference – current common practices
  – Impact to routing system load
• Allocations vs advertisements
• Review of community attribute
  – "no_export" usage
• Conclusion
Review of routing policy

- Routing preferences can be expressed via routing policy:
  - How can you direct incoming traffic to your site in a way that does not overload any single link?
  - How can you put VoIP traffic in a high quality, low delay link and put other traffic on cheaper links?
  - Minimise your costs by maximising your use of links with the lowest unit cost?
  - Set up primary and backup links with dynamic failover?

Routing preferences – common practices

- Advertise specifics as well as aggregates
- Use selective advertising of specifics to create preferred primary paths
- Use AS prepending to make relative AS path lengths a primary path selector
- These common practices do impact routing system load

Routing system load

- More specifics and AS path prepending:
  - are coarse-grained tools
  - impose a load on the global inter-domain routing system
- How big is this imposed overhead?
What is going on?

- Global routing table size is steadily growing
  - How fast is it growing?
  - What is the major cause of the growth?
  - What can we do to suppress the growth?

Suppressing growth of the global routing table is in everyone’s best interest! ☺

Global routing table growth

Reference: http://bgp.potaroo.net/ last updated 22/10/04

Allocations vs advertisements

- RIRs made 4506 IPv4 allocations (Jan 2003 – Feb 2004)
  - 3641 allocations announced
  - 865 allocations not yet announced
- 10904 routing advertisements used to span the 3641 allocations
  - 2938 advertisements precisely match the RIR allocation
  - 7966 advertisements are more specific advertisements of 1206 RIR allocations

Reference: “Allocation vs advertisements” presented by Geoff Huston at APNIC 17
http://www.apnic.net/meetings/17/docs/sigs/routing/huston-allocvsadvertisement.pdf
Allocations vs advertisements

4506 allocations made by RIRs

Advertisements that matched the RIR allocations: 2938

10904 routing Announcements

More specific advertisements of 1206 RIR allocations: 7966

Analysis of statistics

- Advertising more specific /24 address prefixes within an allocated address block
  - This is the predominant form of advertising a split allocation block in fragments
  - Many of these more specific advertisements appear to be local
- One fifth of allocations are fragmented in this fashion
  - On average there are 6.6 additional advertisements of fragments of the address block

Limits to routing

- The routing system does not have infinite capacity
- Too many routing entries will cause widespread routing failure
- How many is too many?
  - We don’t know precisely
  - We will know when we see widespread routing failure, but by then it will be too late!
What can we do?

• Look after the routing system
  – Use aggregate routing announcements wherever possible
  – Use explicit signalling to transmit policy preferences – community attributes
  – Limit the propagation of more specific routes to the local domain where they will have their effect – community attributes

• Effective use of the BGP community attribute
  – will reduce unnecessary announcements of fragmented prefixes

Review of community attribute

• A BGP route object (a unit of routing information carried by BGP) is composed of:
  – IP prefix value and prefix size
  – An AS-path attribute
  – Nexthop IP address
  – Community attribute (optional)

Note: A BGP route object is different to an IRR route object

Review of community attribute

• Community attribute:
  – is an optional component of a BGP route object
  – is a way for a route advertiser to signal to a route receiver some additional information about the BGP route object
  – may be bilateral or transitive
  – are intended to:
    • alter the way the receiver makes decisions about forwarding
    • alters the further propagation of the BGP route object
  – improve the capability of BGP speaker to describe the policy intention regarding distribution of routing information
BGP community attribute

- Optional transitive variable length attribute of a BGP route object
- 32 bit value
  - Format = $asn:n$
    - $asn = 1 - 65,535$
    - $n = 1 - 65,535$
  - Standards-defined values
    - Commonly agreed values
      - Agreed value by a community
      - Amongst ISPs
        - For example: [http://info.us.tel.net/netinfo.html](http://info.us.tel.net/netinfo.html)

RFC 1997

- Specifies the BGP community attribute
- Community
  - a means to specify a property of a BGP route object that affects the interpretation or manipulation of the BGP route object
- Communities are attached to a unit of BGP routing information by a BGP speaker
- Communities are received by the BGP listener:
  - Communities may be left attached
  - Stripped off such routing information
  - Translated to another community

Example of using communities

- A transit AS may allow its customers to selectively determine how a route is readvertised by the transit provider:
  - A customer can associate community values with each route object to limit the extent to which the route is readvertised by the transit provider
  - The customer controls the transit service

```
<table>
<thead>
<tr>
<th>Community</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advertise to all regions</td>
</tr>
<tr>
<td>10</td>
<td>Advertise in Asia</td>
</tr>
<tr>
<td>100</td>
<td>Advertise in North America</td>
</tr>
<tr>
<td>101</td>
<td>Advertise in Western Europe</td>
</tr>
<tr>
<td>102</td>
<td>Advertise in Eastern Europe</td>
</tr>
</tbody>
</table>
```

ActionCommunity
Some well-known communities

- **NO_EXPORT**
  - All routes received carrying a community attribute containing this value MUST NOT be advertised to EBGP peers
- **NO_ADVERTISE**
  - All routes received carrying a community attribute containing this value MUST NOT be advertised to any BGP peers (internal and external)

How does “no_export” work?

AS1 advertises 192.200.1.0/24 to AS2 with community attribute no_export
AS2 will propagate the route within AS2 but will not send this route to AS3 or any other external AS

What do you need to do?

- **ISP**
  - Think what routing policies are relevant to you
  - Publishes multiple values of user-settable communities
  - Filters incoming route announcements to match them
  - Modifies route parameters accordingly
- **Customer**
  - Marks their announcements with wanted communities

Common use of communities

- Customer control of readvertisement
  - Regional-based transit
  - Peering control
- Customer control of preferences
  - Primary / Backup preference for routes
- Supplier information to customer
  - Where the route object was learned
  - Relationship to supplier (peer, customer, upstream)
  - Desired preference (primary / backup)

Further reading

- Cisco Internet Protocol Journal
- Using BGP Community Values to Control Routing Policy in Upstream Provider Network

Conclusion

- Review your routes announcements
  - Are you announcing fragmented, more specific prefixes unnecessarily?
    - If so, consider use of no_export
  - Refer your router vendor’s manual to learn how to use the community attribute
- Your efforts will help to slow down the growth of the global routing table
- And you will have better control of your external relationships with your IP suppliers and customers
  - It will benefit your business positively
Example 1: community attribute “no_export” usage

AS2 only announces aggregated routes to AS1 (no need to announce AS4’s two /24s to EBGP peers)

How can AS2 express such policy in RPSL?

Customer of AS1

ISP

AS 2

AS 1

Customer of AS2

AS 4

2 of 24 assignments out of AS2’s address block

community NO_EXPORT
Example of community attribute usage in IRR

**aut-num:** AS2
**import:** from AS1 accept ANY
**import:** from AS4 accept AS4
**export:** to AS1 action community {NOT_EXPORT};
announce ANY
AND NOT {0.0.0.0/0}
AND NOT fltr-bogons
**export:** to AS4 announce ANY AND
NOT {0.0.0.0/0} AND NOT fltr-bogons

Example of community attribute usage in IRR

**aut-num:** AS2
**import:** from AS1 accept ANY
**import:** from AS4 accept AS4
**export:** to AS1 action community {NOT_EXPORT};
announce ANY
AND NOT {0.0.0.0/0}
AND NOT fltr-bogons
**export:** to AS4 announce ANY AND
NOT {0.0.0.0/0} AND NOT fltr-bogons

Example of Cisco command to use no_export

```
route-map community-map
match ip address 1
set community no-export
```

- Even if we set the community attribute, this attribute will not be sent to neighbors by default.
- In order to send the attribute to our neighbor we have to use the following:

```
neighbor (ip-address|peer-group-name) send-community
```

Example:

```
Router A
router bgp 1
neighbor 3.3.3.1 remote-as 2
neighbor 3.3.3.1 send-community
neighbor 3.3.3.1 route-map community-map out
```

Cisco command for no_export

RouterA#
router bgp 1
network 192.200.1.0
neighbor 3.3.3.1 remote-as 2
neighbor 3.3.3.1 send-community
neighbor 3.3.3.1 route-map SET_NO_EXPORT out
! access-list 1 permit 192.200.1.0 0.255.255.255
route-map SET_NO_EXPORT permit 10
match ip address 1
set community no_export


Juniper command for no_export

bgp
local-as 1;
group test {
type external;
passive;
import bgp-in;
peer-as 2;
neighbor 3.3.3.1;
}
policy-options {
policy-statement bgp-in {
term 10 {
from {
protocol bgp;
community example;
}
then accept;
}
term 20 {
then reject;
}
community example members { no-export; }
}"