IPv6 at Facebook

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Network Engineering Team
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Google IPv6 Implementors Conference
<table>
<thead>
<tr>
<th></th>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intro</td>
</tr>
<tr>
<td>2</td>
<td>Project Chicago</td>
</tr>
<tr>
<td>3</td>
<td>Project Cakewalk</td>
</tr>
</tbody>
</table>
Goals

- Serve Facebook application to v6 users
- Deploy IS-IS early
- Go dual-stack on routers
- Make no changes to hosts
- Start with two projects
  - Chicago
  - Cakewalk
Project Chicago
IPv6 Deployment Decisions

- No change to servers
- Minimal changes to production network
- Identify portions of app that hard-write back to v4 URLs
IPv6 Deployment

IPv6 Transit/Peering
IPv6 Addressing

Exchange Router
IPv4 Addressing

Production Network
• Production LBs
• Servers

LB
IPv6 Deployment
Router Config

wlawton@router> show configuration interfaces ge-2/1/7
description "Reserved for HE v6 LB --wlawton";
gigether-options {
   802.3ad ae3;
}
wlawton@router> show configuration interfaces ge-2/1/8
description "Reserved for HE v6 LB --wlawton";
gigether-options {
   802.3ad ae3;
}
wlawton@router> show configuration interfaces ae3
vlan-tagging;
aggregated-ether-options {
   lacp {
      active;
   }
}
unit 300 {
   description "Reserved for v6 LB --wlawton";
   vlan-id 300;
   family inet6 {
      address 2620:0:1cfe:face::1/64;
   }
}
unit 301 {
   description "Reserved for v6 LB --wlawton";
   vlan-id 301;
   family inet {
      address 74.119.77.66/31;
   }
}
IPv6 Deployment
LB Config

self 74.119.77.67 {
    netmask 255.255.255.254
    vlan internal
    allow default
}

self 2620:0:1cfe:face::2 {
    netmask ffff:ffff:ffff:ffff::
    vlan external-v6
    allow default
}

route default inet6 {
    gateway 2620:0:1cfe:face::1
}

route default inet {
    gateway 74.119.77.66
}

pool www.http.pool {
    monitor all http-php-monitor
    members {
        66.220.145.10:http {}
        66.220.145.11:http {}
        66.220.145.12:http {}
        66.220.145.13:http {}
        66.220.146.11:http {}
        66.220.146.18:http {}
        66.220.146.25:http {}
        66.220.146.32:http {}
        69.63.181.11:http {}
        69.63.181.12:http {}
        69.63.181.15:http {}
        69.63.181.16:http {}
    }
}

virtual www.v6.facebook.com_vs {
    snat automap
    pool www.http.pool
    destination 2620:0:1cfe:face:b00c::3.http
    ip protocol tcp
    rules v6_rewrite_streamproc
    profiles {
        http {}
        stream {}
        tcp-wan-optimized {}
    }
}
IPv6 Deployment
LB Config cont.

rule v6_rewrite_streamproc {
    when HTTP_RESPONSE {
        # Disable the stream filter by default
        STREAM::disable
        # Check if response type is text
        if {{HTTP::header value Content-Type] contains "text"} {
            # set up stream replacement strings
            STREAM::expression { @login.v6.facebook.com@login.facebook.com@ <snip for length>}
            # Enable the stream filter for this response only
            STREAM::enable
        }
    }
}

Project Cakewalk
Locator/ID Separation Protocol (LISP)

- Scalable routing and addressing
- IETF working group
- draft-(farinacci|fuller|lewis)-lisp-*.txt
- Decoupling of client’s identifier and location
- IP encapsulation
  - Eg. v4 in v4, v6 in v4, v6 in v6
- Map and encap
Locator/ID Separation Protocol (LISP)

- No changes to end systems
- Incrementally deployable
- Multi-homing controls for stub AS
- Facebook was the first major website on LISP (v4 and v6)
LISP forwarding

1.0.0.0/8 EID

Provider A
10.0.0.0/8

Provider B
11.0.0.0/8

Provider X
12.0.0.0/8

Provider Y
13.0.0.0/8

S
1.0.0.1

ETR
12.0.0.2

ETR
13.0.0.2

D

1.0.0.1 \rightarrow 2.0.0.2

11.0.0.1 \rightarrow 12.0.0.2

11.0.0.1 \rightarrow 1.0.0.2

1.0.0.1 \rightarrow 2.0.0.2

11.0.0.1 \rightarrow 12.0.0.2

2.0.0.0/8 EID
Production v4

Public v4

FB BB (mostly) v4

Production v4 VIPs
LISP6 overview

Public v6

PITR

PETR

Public v4

FB BB (mostly) v4

v6 required here only

v6

Production v4 VIPs

v4

v4

v4

v4
LISP6 overview

Public v6

PITR

Public v4

XTR

FB BB (mostly) v4

v6 to v4 auto-translation

Production v4 VIPs

LB

PITR

v4

LB

v4

LB

v4

v4
LISP6 deployment

XTR

LB

Metro/Backbone

Cluster Switch

Racks
LISP6 deployment

XTR

::1

::2

LB

v6

2610:d0:face::9

Metro/Backbone

Cluster Switch

Racks
LISP6 config

XTR

ipv6 lisp use-petr 149.20.48.60
ipv6 lisp database-mapping 2610:D0:FACE::/48 74.119.77.125 priority 1 weight 50
ipv6 lisp itr map-resolver 128.223.156.35
ipv6 lisp etr map-server 206.223.132.89 key f00bar

LB

virtual www.lisp6.facebook.com_vs {
  snat automap
  pool www.http.vips.pool
  destination 2610:d0:face::9.http
  ip protocol tcp
  profiles {
    http {}
    tcp-wan-optimized {}
  }
}

DNS

www.lisp6 IN AAAA 2610:d0:face::9
LISP6 config

XTR
ipv6 lisp use-petr 149.20.48.60
ipv6 lisp database-mapping 2610:D0:FACE::/48 74.119.77.125 priority 1 weight 50
ipv6 lisp itr map-resolver 128.223.156.35
ipv6 lisp etr map-server 206.223.132.89 key f00bar

LB
virtual www.lisp6.facebook.com_vs {
  snat automap
  pool www.http.vips.pool
  destination 2610:d0:face::9.http
  ip protocol tcp
  profiles {
    http {}
    tcp-wan-optimized {}
  }
}

DNS
www.lisp6 IN AAAA 2610:d0:face::9
Cakewalk results

- Same FB codebase as v4
- Deployed in 4 hours
- Added one router (LISP XTR)
- Required three v6 addresses
- $0 cost
www.v6.facebook.com
m.v6.facebook.com

www.lisp6.facebook.com
m.lisp6.facebook.com

Experimental, non-production

Make your next status update over IPv6
What's on your mind?

Austin M likes The San Francisco SPCA, Getting Jello'd and Olechka. 9 minutes ago

Brian W is now friends with Jon V and Mary Ann 16 minutes ago

Serge T and Anoop N like Zynga Game Network Inc. 17 minutes ago · Like

Facebook Culinary Team
Chef Graham Brown’s Cervena Vealison Salad
Ingredients: 1 Venison Strip Loin silver skin removed & seasoned with salt & black Pepper 12 baby red beets roasted in a bed of rock salt for 1 hour @ 300 degrees, cool, peel & cut into quarters 1 rib celery cut into julienne...

Kevin L really wants to go home and enjoy the nice weather. 28 minutes ago · Comment · Like

Jimmy A About to embark on a car washing spree later this afternoon - 4 cars lined up, and if time, a fifth. I know what you are thinking, but sorry, I am overbooked for appointments today :(
http://apps.facebook.com/fish-friends/?track=bookmark-20100311-0-32&ref=games_my_recent&fa=1
Summary

- Easy to make site available on v6
  - Dual-stack, LB auto-translation
- Service provider enablers
  - v6 transit, LISP betanet
- Networking piece = fast bring-up & workarounds
  - Site codebase will take time
- Get mobile for free thanks to {www | m | iphone}.*.facebook.com model