facebook

IPv6 at Facebook

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Network Engineering Team
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Google IPv6 Implementors Conference

Agenda

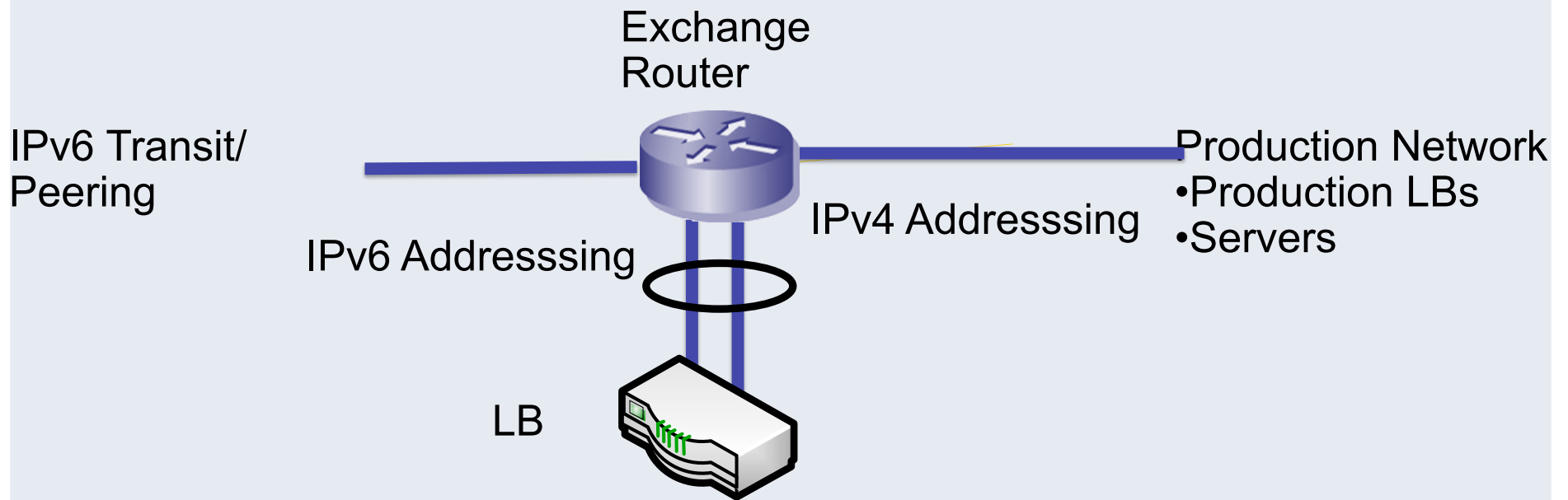|	
1	Intro
2	Project Chicago
3	Project Cakewalk

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

Exchange
Router

IPv6 Transit/
Peering

Production Network
•Production LBs
•Servers

IPv6 Addresssing

IPv4 Addresssing

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

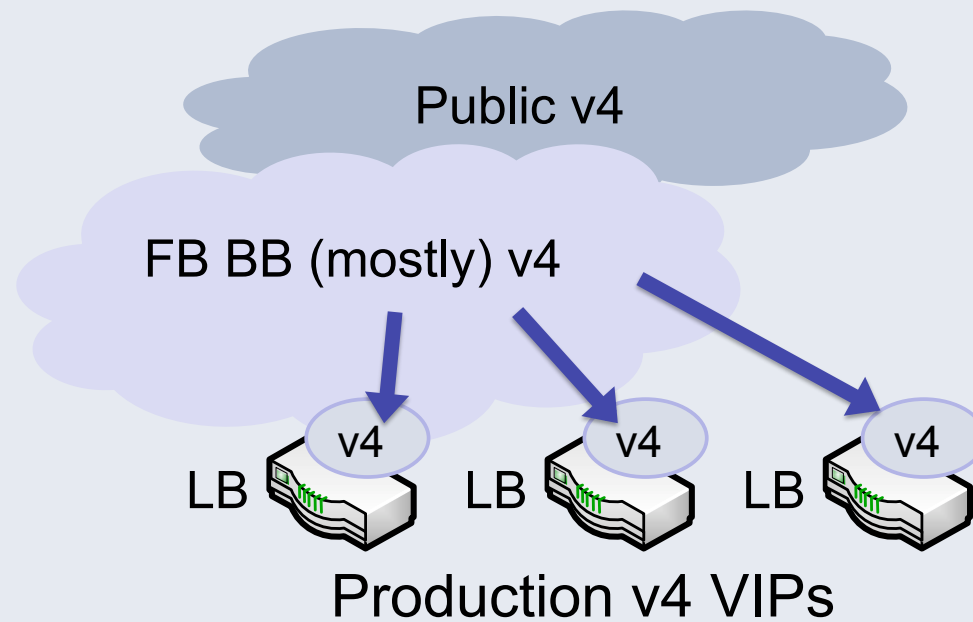 - Eg. v4 in v4, v6 in v4, v6 in v6

- Map and encap

Locator/ID Separation Protocol (LISP)

- No changes to end systems

- Incrementally deployable

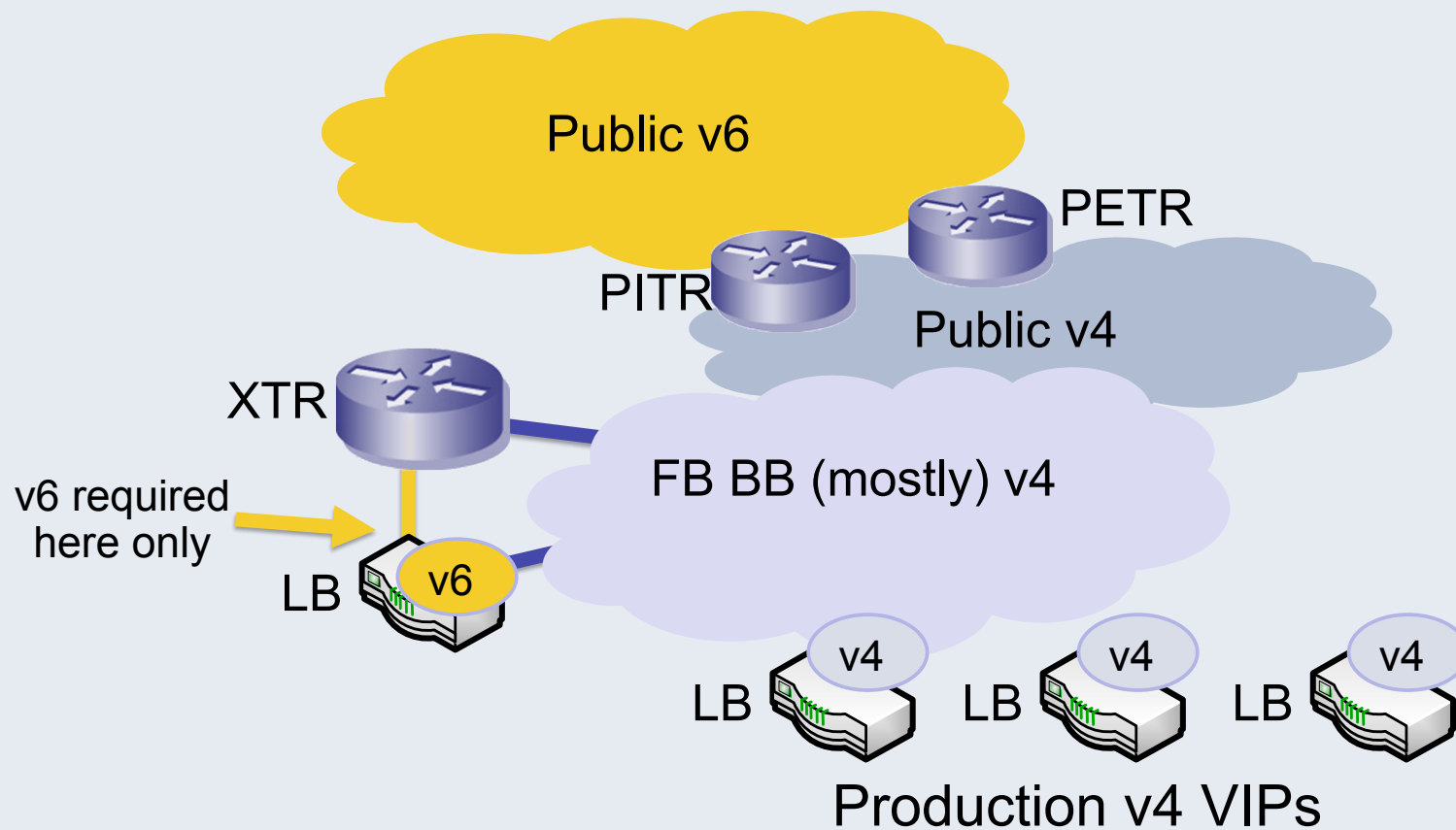- Multi-homing controls for stub AS

- Facebook was the first major
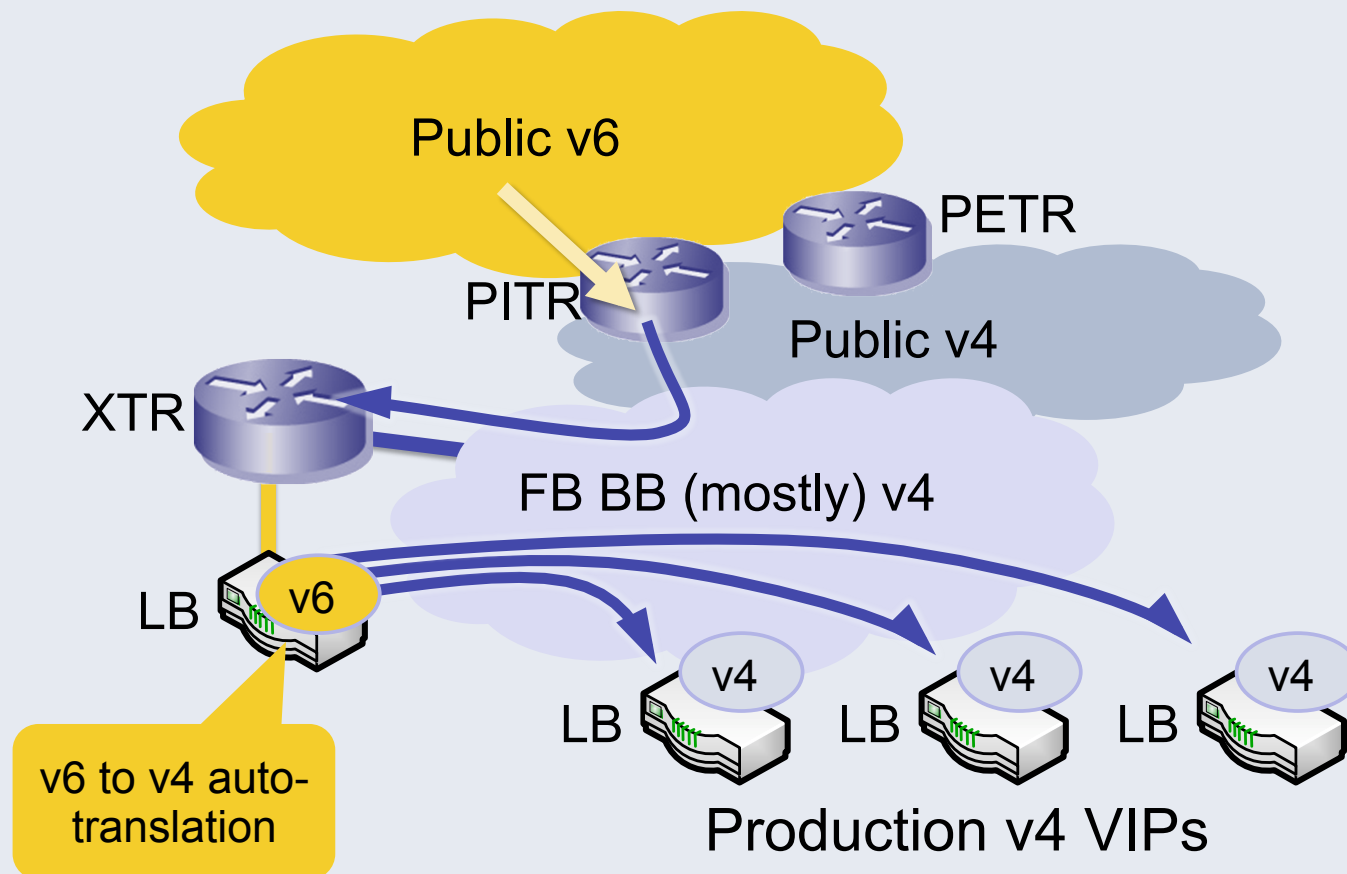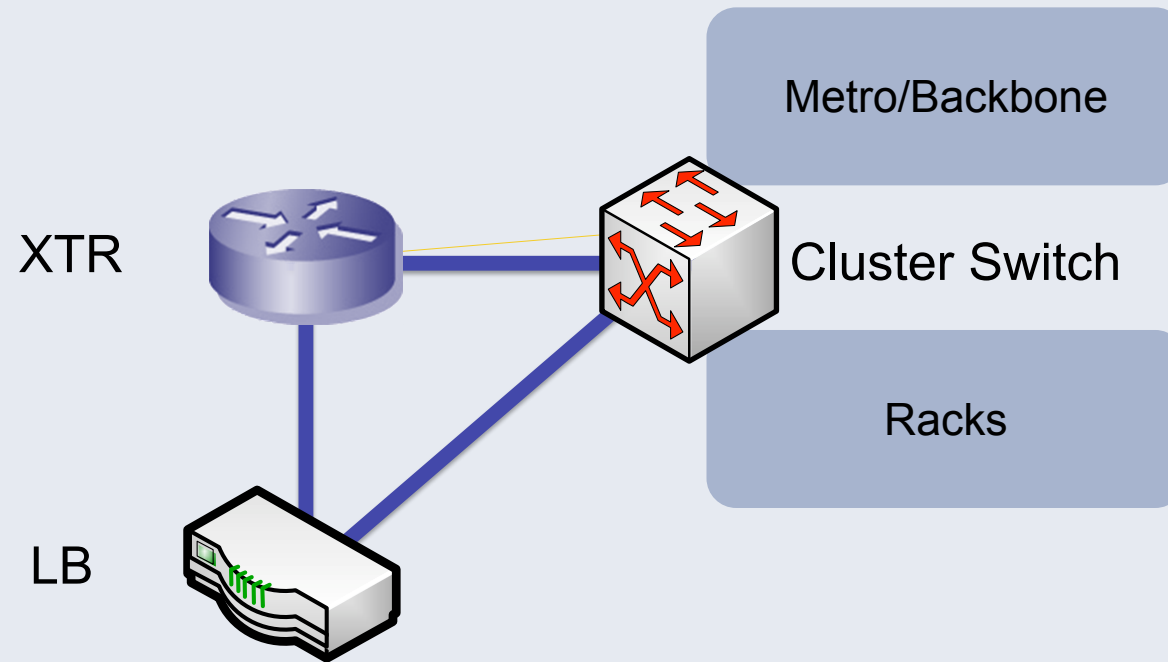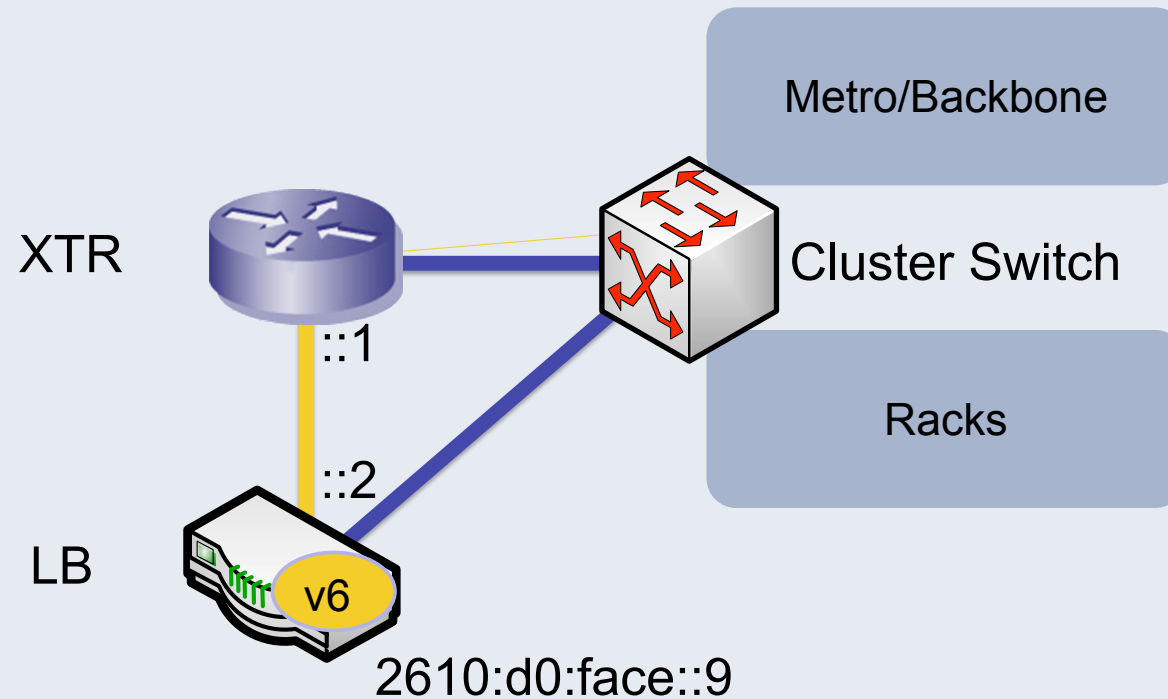 website on LISP (v4 and v6)

LISP forwarding

Provider X
12.0.0.0/8

2.0.0.0/8 EID

1.0.0.0/8 EID

Provider A
10.0.0.0/8

ITR   10.0.0.1

12.0.0.2 ETR

D

S

Provider B
11.0.0.0/8

Provider Y
13.0.0.0/8

13.0.0.2

11.0.0.1

ITR

ETR

1.0.0.1 →
2.0.0.2

11.0.0.1 →
12.0.0.2
1.0.0.1 → 2.0.0.2

11.0.0.1 →
12.0.0.2
1.0.0.1 → 2.0.0.2

1.0.0.1 →
2.0.0.2

Production v4

Public v4

FB BB (mostly) v4

v4

v4

v4

LB

LB

LB
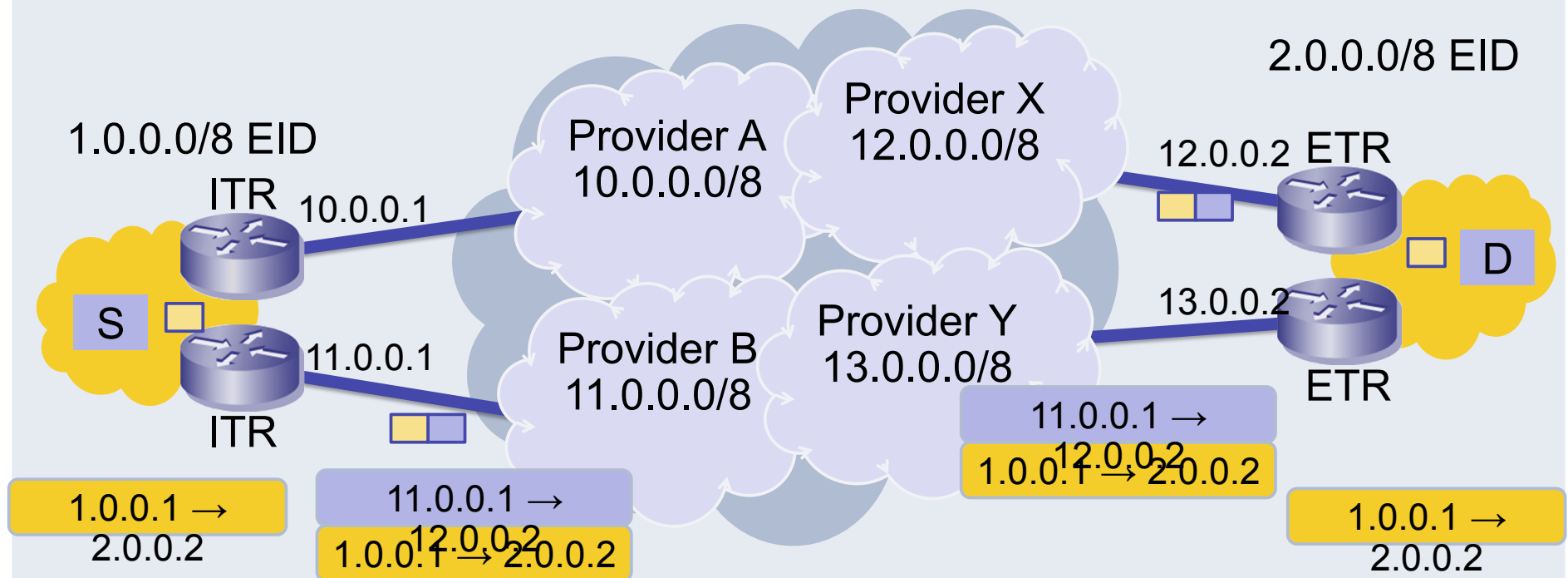
Production v4 VIPs

LISP6 overview

LISP6 overview

Public v6

PETR

PITR

Public v4

XTR

FB BB (mostly) v4

LB

v6

v6 to v4 auto-translation

LB v4   LB v4   LB v4

Production v4 VIPs

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 {}
    }
}
```

::1

::2

v6

2610:d0:face::9

DNS

www.lisp6	IN	AAAA	2610:d0:face::9
*.lisp6	IN	CNAME	www.lisp6.facebook.com.

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
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::1

::2

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 {}
    }
}

v6

2610:d0:face::9

DNS

www.lisp6   IN   AAAA   2610:d0:face::9
*.lisp6   IN   CNAME   www.lisp6.facebook.com.
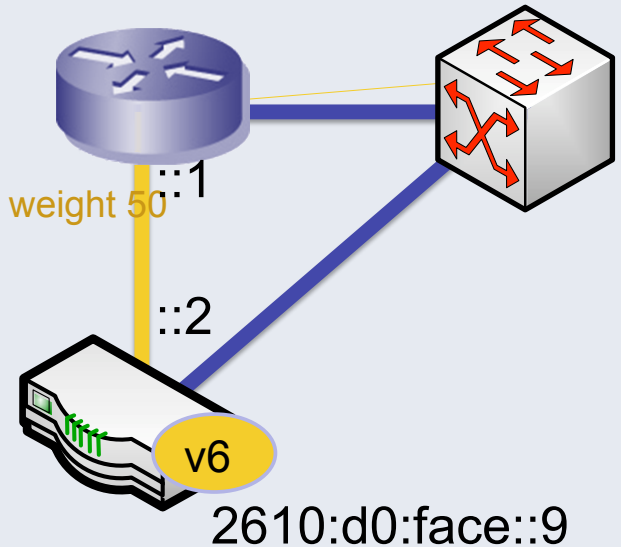
Cakewalk results

- Same FB codebase as v4

- Deployed in 4 hours

- Added one router (LISP XTR)

- Required three v6 addresses

- $0 cost

::1

::2

v6

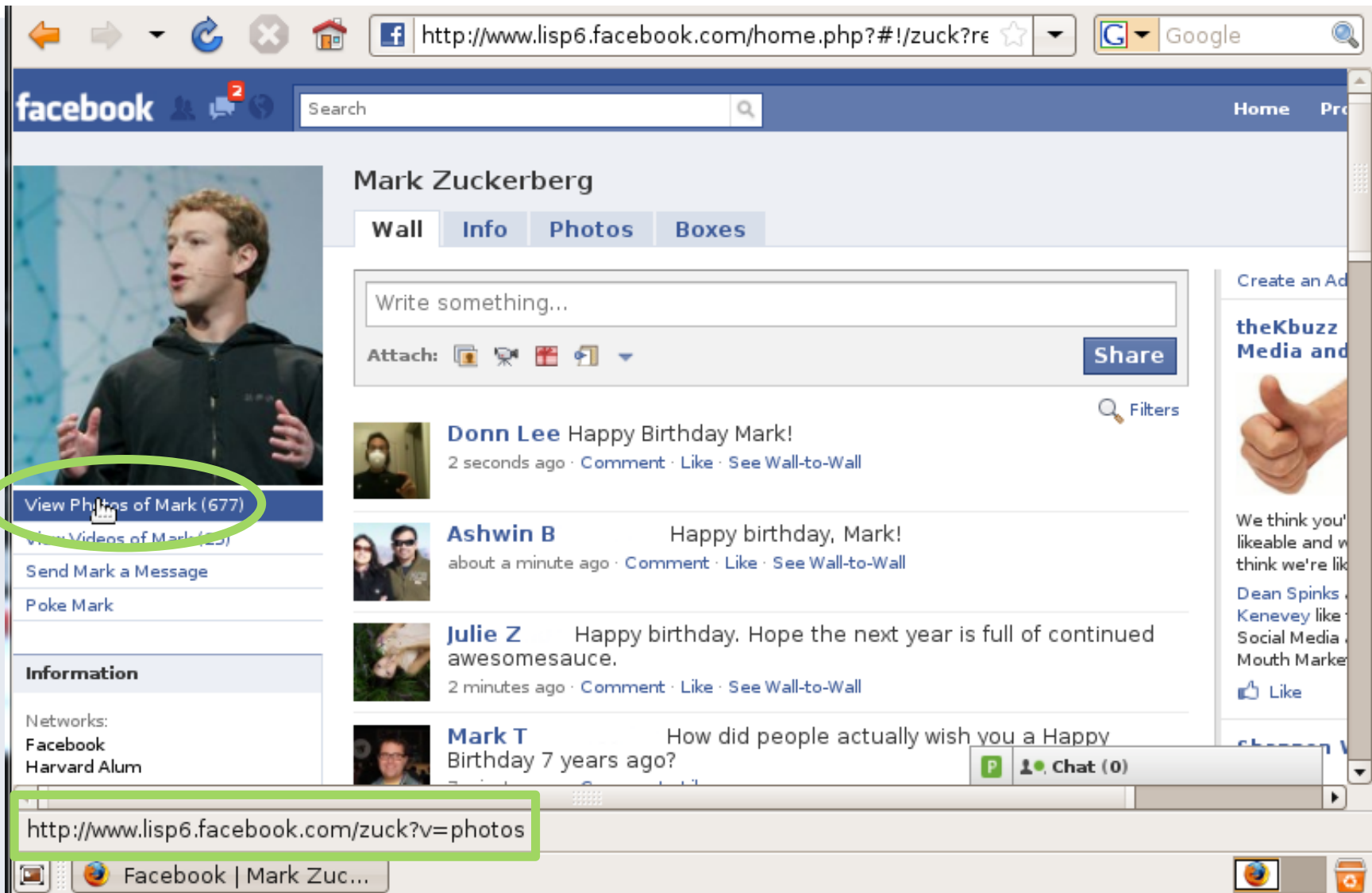2610:d0:face::9

LB v4   LB v4   LB v4
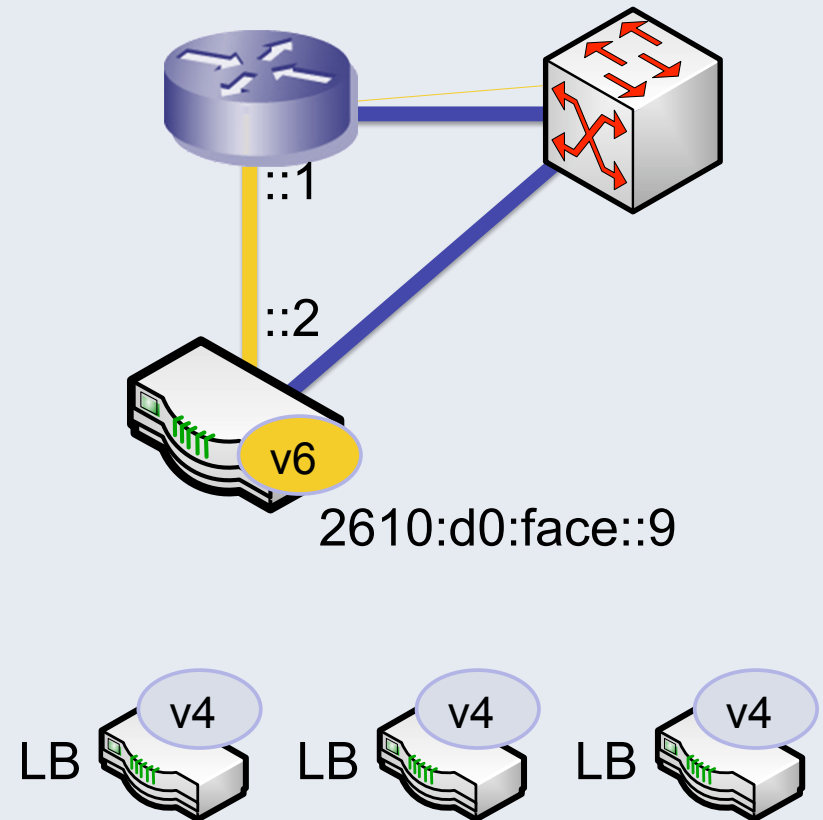
www.v6.facebook.com
m.v6.facebook.com

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

Experimental, non-production

Make your next status update over
IPv6

facebook

Search

Lonn Lee
Edit My Profile

News Feed
Messages (128)
Events (4)
Photos (3)
Friends (62)

Applications
Games
Ads and Pages →
Groups (12)
More

Friends Online
No one is online.

📰 **News Feed**

Top News · **Most Recent**

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 Venison Salad
Ingredients: 1 Venison Strip Loin sliver skin removed & seasoned with salt & black Pepper 12 baby red beets roasted in a bed of rock salt for for 1 hour @ 300 degrees, cool, peel & cut into quarters 1 rib celery cut into julienne ...
20 minutes ago · Comment · Like · Share

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. :)

Events   See All

What are you planning?

📅 **4 event invitations**
📅 **Ops Corporate Friday** Now
🎁 **Mark Zuckerberg**'s birthday Today
   Taner H   's birthday Saturday
   Don K   's birthday Sunday

Suggestions   See All

OnLive
John   likes this.
👍 Like

Janice T
Reconnect with her.
✉ Send her a message

Sponsored   Create an Ad

Get More Fans
Facebook Ads is an easy and effective way to grow your Page's fan base. Click here to create an ad.
👍 Like

Requests   See All

👥 **52 friend requests**
👫 **10 friend suggestions**
📇 **12 group invitations**
📋 **120 other requests**

P 👤● Chat (0)

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

facebook