



Wells Fargo and IPv6

John Burns
Infrastructure Architect

March 2014



Agenda



- About Wells Fargo

- A chronological walk through our IPv6 journey:
 - 2010/11 Tracking
 - 2012 Assessing
 - 2013 Planning
 - 2014+ Executing

Wells Fargo at a glance

A diversified financial services company providing banking, insurance, investments, mortgage, and consumer and commercial finance across North America and internationally.

One in three households in America does business with Wells Fargo.

Our vision:

“We want to satisfy all our customers’ financial needs and help them succeed financially.”



Key facts (at June 30, 2013)

Assets	\$1.5 trillion
Team members	More than 270,000
Customers	70 million
Stores	More than 9,000
ATMs	More than 12,000
Businesses	80+

IPv6 awareness

2010/11

- Some of us remembered IPv6 training circa 1999
- The merger of Wachovia and Wells Fargo in 2009 started to put pressure on our IPv4 registered and RFC1918 address space
- IPv6 seemed an obvious long-term candidate, but not sure it was ready for primetime at WFC
- Formed a technical working group in 2010, meeting monthly
 - Mainly network SMEs, but some security, compute, app, etc.
 - Have members present on IPv6 topics
 - Invite vendors to share their thoughts
 - Review industry milestones and commentary
- IANA IPv4 exhaustion in February 2011 was a call to action – industry was getting serious
- Began promoting awareness among architect and technical community

Motivations for WFC to adopt IPv6

2012

Potential IPv6 Impact		Business Impact	Timeline
Customers experience inconsistent or degraded performance	➔	Low switching costs may lead to loss of customers	Mid-term
Challenges identifying the user and location with original IP Address	➔	Increased fraud risk and marketing limitations	Mid-term
Exhaustion of current internal IPv4 addressing resources	➔	Significant constraint on organic & inorganic growth	Business Driven
Client requirements and regulatory mandates to support IPv6	➔	Opportunity loss or financial penalties	Long-term
Remote employee/partner challenges in accessing WFC via VPN	➔	Workforce and client mobility challenges	Mid-term

Mid-term : 2 to 4 years
 Long-term : >4 years

Fundamentally IPv6 is about growth, and experience strongly suggests that growth can rapidly reshape business models and industries

IPv6 Assessment Project Objectives and Approach

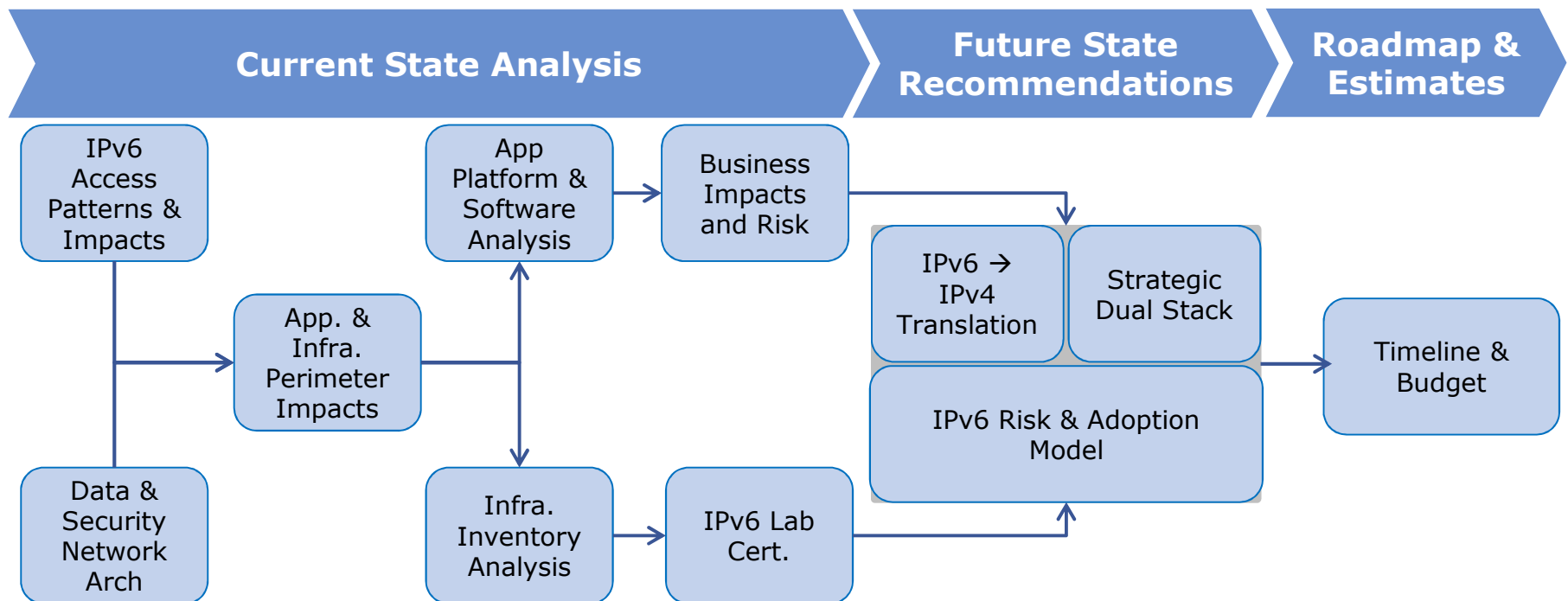
2012

Objective:

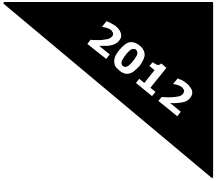
An IPv6 Readiness Assessment was conducted to deliver the following:

- Analysis of market drivers and leading indicators of IPv6
- Assessment of current application and infrastructure capabilities to support IPv6
- Evaluation of IPv6 overall impact to technology, business, and organization
- IPv6 enablement recommendations
- High level IPv6 enablement roadmap and associated cost estimate

Approach:



Assessment – Technology Exposure Areas



- Applied a taxonomy to the “technology stack”
 - Infrastructure Categories
 - Application Categories
- Assembled current state inventory and vendor-reported IPv6 readiness
- Assessed impact (high/medium/low) across three areas:
 - Likelihood of needing IPv6 support
 - Current capability to support IPv6
 - Risk associated with execution of IPv6 enablement (current state)

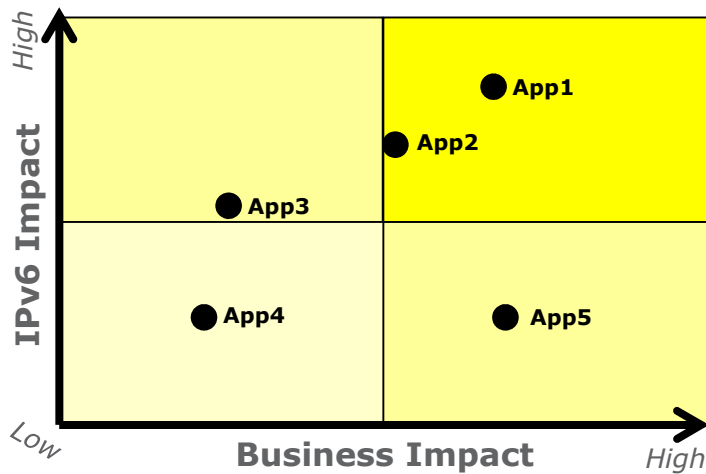
Infrastructure Categories
Data Network
Network Security
Voice / Video Network
Servers
Storage
End User Devices
Mobile Devices
Peripherals

Application Categories
Application Platforms
Database
Business COTS
Integration Environments, Image and Content Mgmt
Security
User Messaging and Collaboration
Data Warehouse and Business Intelligence
Systems Monitoring and Mgmt
Storage and Backup Software
Development Tools

Assessment – LOB / Application Exposure Areas

2012

- Used application inventory to assess business value/impact
 - Number of customers
 - Revenue impact
 - BCP criticality/regulatory drivers
- Used deployment patterns to assess IPv6 impact
 - Available over Internet/extranet channels (including VPN)
 - Dependence on processing IP addresses
 - Supports a “perimeter” application
- Graphed business impact against IPv6 impact to prioritize solution development
- Initially sampled top 100 applications, then expanded out via regular surveys



N.B. Comprehensive and detailed application inventories are difficult to obtain; may have to “munge” data from many sources to build a complete picture.

IPv6 Program Governance Structure

- Needed a structure that could persist and evolve over many years
- Needed to balance technical aspects with business realities and impacts
- Built up program organization over a period of ~2 years



Executive leaders in technology organization providing oversight and overall approval for scope and program direction

Stakeholders in technology, LOB, procurement, risk, etc. providing guidance and oversight across work streams

Coordinate individual work streams, plus communications, reporting, centralized planning/testing/execution management

Drivers and responses on “Buy” and “Sell” sides

The IPv6 program is at the core of external adoption factors, from increasing regulatory and business requirements to suppliers’ support and product roadmaps

External Drivers

*Vendor IPv6 Support/
Adoption – “Buy”*

- Vendor Product Roadmap
- Vendor Services
- Industry Certifications

Response

- Develop WFC IPv6 Profile technical requirements
- Institute capability and instantiation tracking
- Update RFX and contract language to specify IPv6 compliance

Wells Fargo IPv6 Program

External Drivers

*Business and Regulatory
Requirements – “Sell”*

- Business Partner Requests
- Customer IPv6 adoption
- Competitive landscape
- Regulatory Requirements

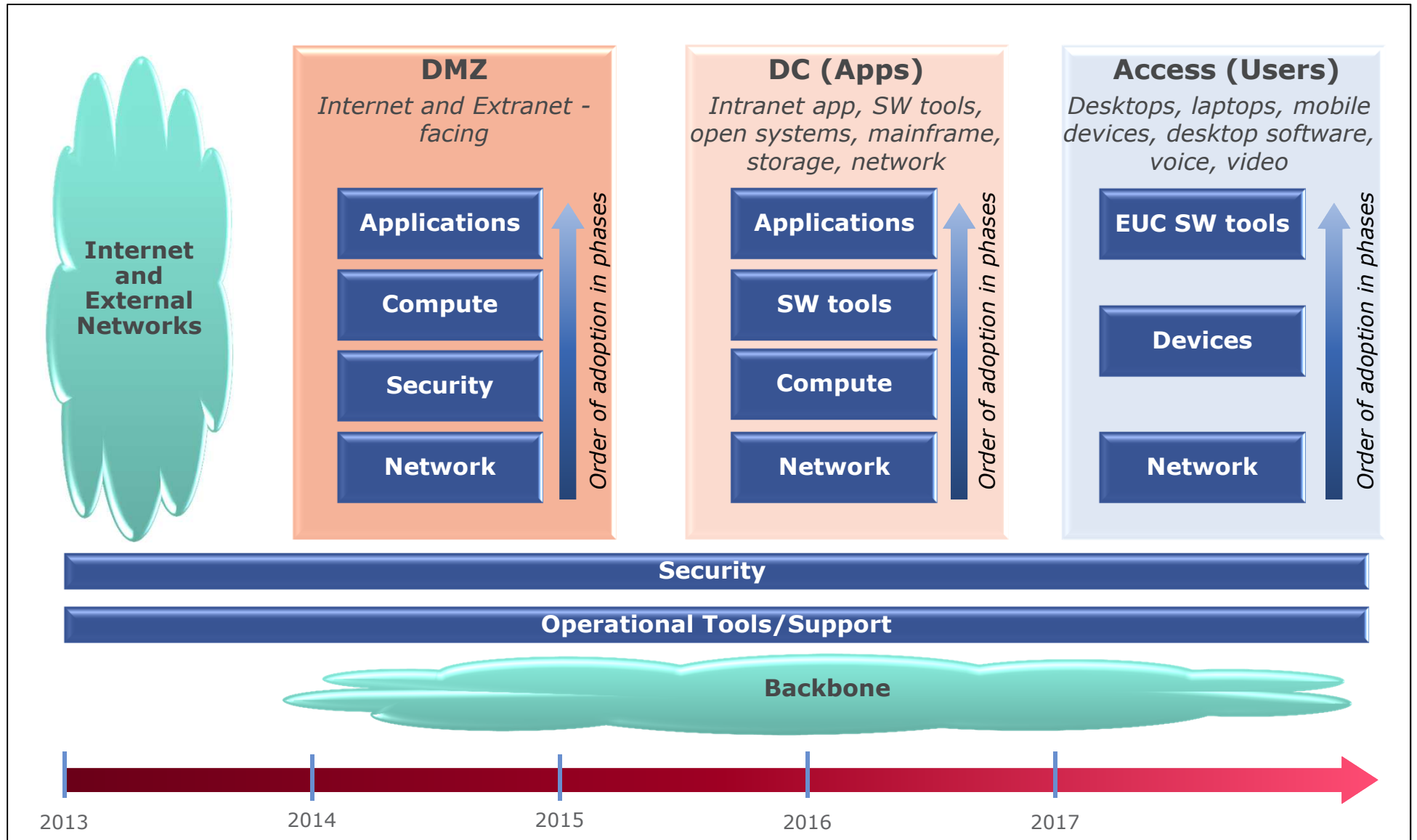
Response

- Begin monitoring peer adoption
- Track national and international mandates
- Educate LOB on potential impacts

Gradual IPv6 Adoption

2013

Phased adoption of IPv6 to support growth and technology evolution



Startling 2013 IPv6 adoption rate among US providers

Percentage of traffic measured at Google, Facebook, Yahoo and Akamai that is IPv6*

Provider	Dec 2012	Dec 2013	Growth %
T-Mobile	0.0%	6.5%	>5000%
Time Warner	0.3%	4.0%	1200%
Comcast	1.6%	20.2%	1100%
Verizon Wireless	17.0%	40.4%	137%
AT&T	8.2%	14.8%	80%

* Source: <http://www.worldipv6launch.org/measurements>

Alexa Top-US Websites*

- | | | |
|--|--|--|
| 1 google.com | 2 facebook.com | 3 youtube.com |
| 4 yahoo.com | 5 amazon.com | 6 linkedin.com |
| 7 wikipedia.org | 8 ebay.com | 9 twitter.com |

Other Notable Websites

- www.netflix.com
- www.apple.com
- www.aol.com
- www.hanover.com
- ipv6.bloomberg.com

Green = IPv6-enabled

* Source www.alexa.com

[comcast-pace-complete-ipv6-network-rollout-early-2014/146911](http://www.multichannel.com/distribution/comcast-pace-complete-ipv6-network-rollout-early-2014/146911)

<http://www.multichannel.com/distribution/>

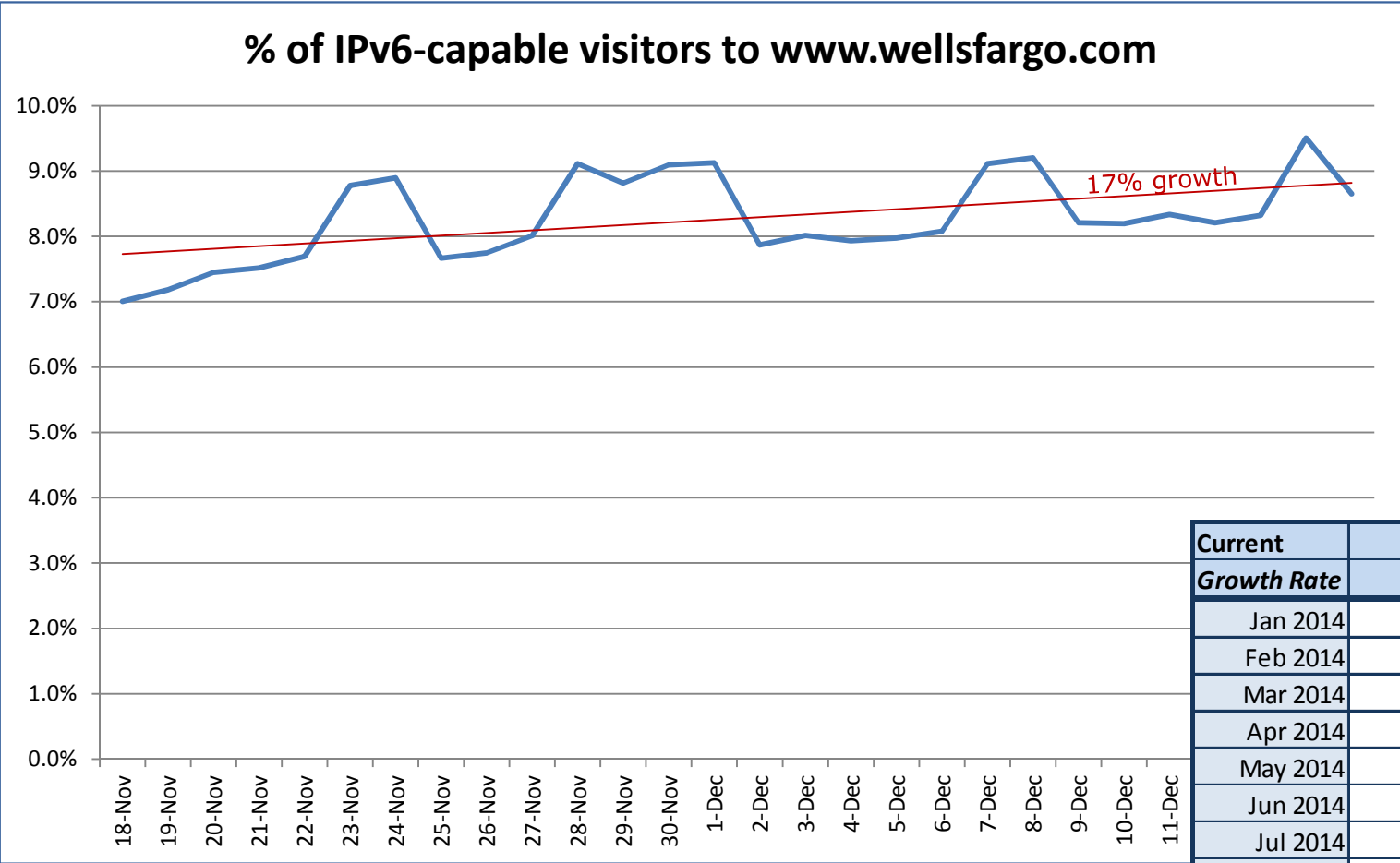
Comcast On Pace To Complete IPv6 Network Rollout By Early 2014

Stakes Claim To World's Largest Native IPv6 Deployment

By: Jeff Baumgartner
Nov 26 2013 - 05:02pm

2014

Adoption rate growing among wells Fargo.com users



Unique IPv6 visitors currently ranging from 200,000 to 300,000 per day

Growth Projections

Current	8.6%	8.6%	8.6%
Growth Rate	1%	5%	10%
Jan 2014	8.7%	9.0%	9.5%
Feb 2014	8.8%	9.5%	10.4%
Mar 2014	8.9%	10.0%	11.4%
Apr 2014	8.9%	10.5%	12.6%
May 2014	9.0%	11.0%	13.9%
Jun 2014	9.1%	11.5%	15.2%
Jul 2014	9.2%	12.1%	16.8%
Aug 2014	9.3%	12.7%	18.4%
Sep 2014	9.4%	13.3%	20.3%
Oct 2014	9.5%	14.0%	22.3%
Nov 2014	9.6%	14.7%	24.5%
Dec 2014	9.7%	15.4%	27.0%

Gomez measurement of IPv6 vs IPv4 performance shows steady improvement, and IPv6 appears to be approaching parity (was 4x to 6x slower mid-2013)

Observations



- US Government has paved the way in a number of key areas
- Natural approach is to try to treat IPv6 as “IPv4 with bigger addresses” – need to continually challenge that thinking
- Have to relearn many IPv4 lessons over again with IPv6 (but usually with a twist)
- Lots of helpful information and tools available from the “coalition of the willing”
- Need to allow extra time for almost every aspect
- The IPv6 journey is full of surprises (good and bad)