Wells Fargo’s IPv6 Journey

John M. Burns and Wayne A. Smith

John.Burns1@WellsFargo.com
Wayne.A.Smith@WellsFargo.com
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

We are 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.
# Wells Fargo at a Glance

<table>
<thead>
<tr>
<th>Category</th>
<th>Measure as of 1/1/14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$5 trillion</td>
</tr>
<tr>
<td>Employees</td>
<td>More than 265,000</td>
</tr>
<tr>
<td>Customers</td>
<td>70 million</td>
</tr>
<tr>
<td>Locations</td>
<td>More than 9,000</td>
</tr>
<tr>
<td>ATMs</td>
<td>More than 12,500</td>
</tr>
</tbody>
</table>

- Wells Fargo is America’s fourth-largest bank when ranked by assets, and first by market capitalization.
- Team members are located in 36 countries.

**Our Vision**

We want to satisfy all our customers’ financial needs and help them succeed financially.
IPv6 Awareness

• Some of us remember 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 prime time at Wells Fargo
• Formed a technical working group in 2010, meeting monthly
  o Mainly network SMEs, but some security, compute, app, etc.
  o Have members present on IPv6 topics
  o Invite vendors to share their thoughts
  o 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
# Motivation for WF to adopt IPv6

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

- Developed separate work streams for applications and network infrastructure
Assessment--Technology Exposure Areas

- Primary IPv6 exposure in next 3-5 years can be mitigated through IPv6 → IPv4 translation in the DMZ. Strategically, IPv6 compliance should be considered during the normal technology refresh.
- Initial remediation efforts should focus on technology in the DMZ that is not IPv6 compliant.
- Evaluate the likelihood of exposure to IPv6 traffic in the next 3-5 years.
- Determine the percentage of the environment that is IPv6 capable without requiring major upgrades.
- Identify the risk of execution by considering the strength of effort required to prepare for IPv6:
  - Is a plan in place? If so, how detailed is it?
  - Has funding been secured?
# Sample Assessment Chart Chart -- Technology Exposure Areas

<table>
<thead>
<tr>
<th>Category</th>
<th>Likelihood</th>
<th>Capability</th>
<th>Execution Risk</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infra.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Network</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>Upgrades are required in DMZs.</td>
</tr>
<tr>
<td>Network Security</td>
<td>M</td>
<td>M</td>
<td>L</td>
<td>Part of this environment has limited or no IPv6 support and will need a comprehensive approach to upgrade.</td>
</tr>
<tr>
<td>Servers</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>Large server environment supports IPv6 at the OS level and testing is needed to identify and remediate DMZ Web Servers.</td>
</tr>
<tr>
<td><strong>Software Platforms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems Monitoring and</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>Moderate IPv6 exposure as these tools will need to manage IPv6 traffic and devices supporting it.</td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application Platforms</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>DMZ components have higher capability and lower risk of enablement.</td>
</tr>
<tr>
<td>(Web and App Servers)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Assessment – LOB / Application Exposure Areas

- LOB’s were rated relative to each other for Business Impact and IPv6 Risk
- The cross midpoint represents the average for the LOB
- Wider horizontal lines represent a wider range of technology used
- Taller vertical lines represent more varied business impact range per Enterprise BCP
IPv6 Operating Committee
Senior Leaders - monitor & guide

- Key stakeholders in technology, procurement, and operational risk management organizations plus subject matter experts; coordination with LOB executive stakeholders
- Meets monthly

IPv6 Executive Steering Committee
Executive Leaders – oversee, direct & provide resources

- Executive leaders in the technology organization
- Meets bi-annually

Enterprise Production & Technology Services

Program Sponsor

Program Manager

Infrastructure Enablement

- Defines scope, plans and executes deployment of IPv6 across infrastructure domains:
  - DMZ, DC, Backbone, Access, End User Devices, Storage, International, Mainframe, Distributed Servers

Line of Business Enablement

- LOB coordination, consultation, and support to facilitate transition strategy development, planning and execution
- Works closely with Infrastructure Enablement PMs to align priorities and roadmaps

Working Group

- Daily management and tactical oversight of efforts
- Meets weekly

Program Support

- Analytics
- Communications
- Training
- Integration/coordination
- Financial management
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 ("BUY")**

**Vendor IPv6 Support/Adoption**

- 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

---

**External Drivers ("SELL")**

**Business/Regulatory Requirements**

- 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

Access (Users)
Desktops, laptops, mobile devices, End User Devices, software, voice, video

DMZ
Internet and Extranet-facing

Data Center (Apps)
Intranet app, SW tools, open systems, mainframe, storage, network

Phased adoption to support growth and technology evolution
IPv6 Adoption by Wells Fargo Customers

% of IPv6-capable visitors to www.wellsfargo.com

Dec. 2013

8.6%

Unique Visitors: 200K – 300K

July 2014

12.6%

Unique Visitors: 200K – 450K
CIO communications

Provide leadership with assessment results for their team -- number of applications rated high, medium, and low on two scales.

IPv6 Impact and Implementation Effort

Impact

Implementation Effort

High Impact
Medium Impact
Low Impact

High Effort
Medium Effort
Low Effort

-1,500
-1,000
-500
-0
500
1,000
1,500
2,000

42
60
133
210
559
1,776
87
90

Rocky Mountain IPv6 Task Force
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)
• To succeed in a large enterprise, it is critical to continually build awareness, education and organizational support
• Tension exists between business drivers and infrastructure enablement – each “waiting” for the other to be ready
• 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)
Thank you

John Burns,  John.Burns1@wellsfargo.com
Wayne Smith,  Wayne.A.Smith@wellsfargo.com