

# IGF2016 BFP-IPv6

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# Session Proceeding

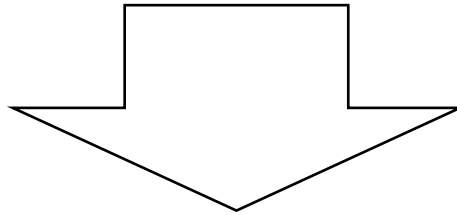
- Part I: Summary of BPF-IPv6 document: Sumon & Izumi (20 min)
- Part II: Sectoral & regional Observations: Marco & Susan (45 min)
- Part III: Summary – Take aways: Sumon & Izumi (25 min)

# Why is IPv6 deployment needed and Why discuss at IGF?

- IPv4 had run out
- For the Internet to continue to grow in manner which accommodates innovation we want the Internet that work with IPv6
- Needs collaboration with wider stakeholder than among technical community for wide spread IPv6 adoption in global scale
- IGF2016 BPF-IPv6
  - Building on work in 2015
  - This year focused on economic incentives of IPv6 deployment
  - Developed based on feedback by participants, case studies

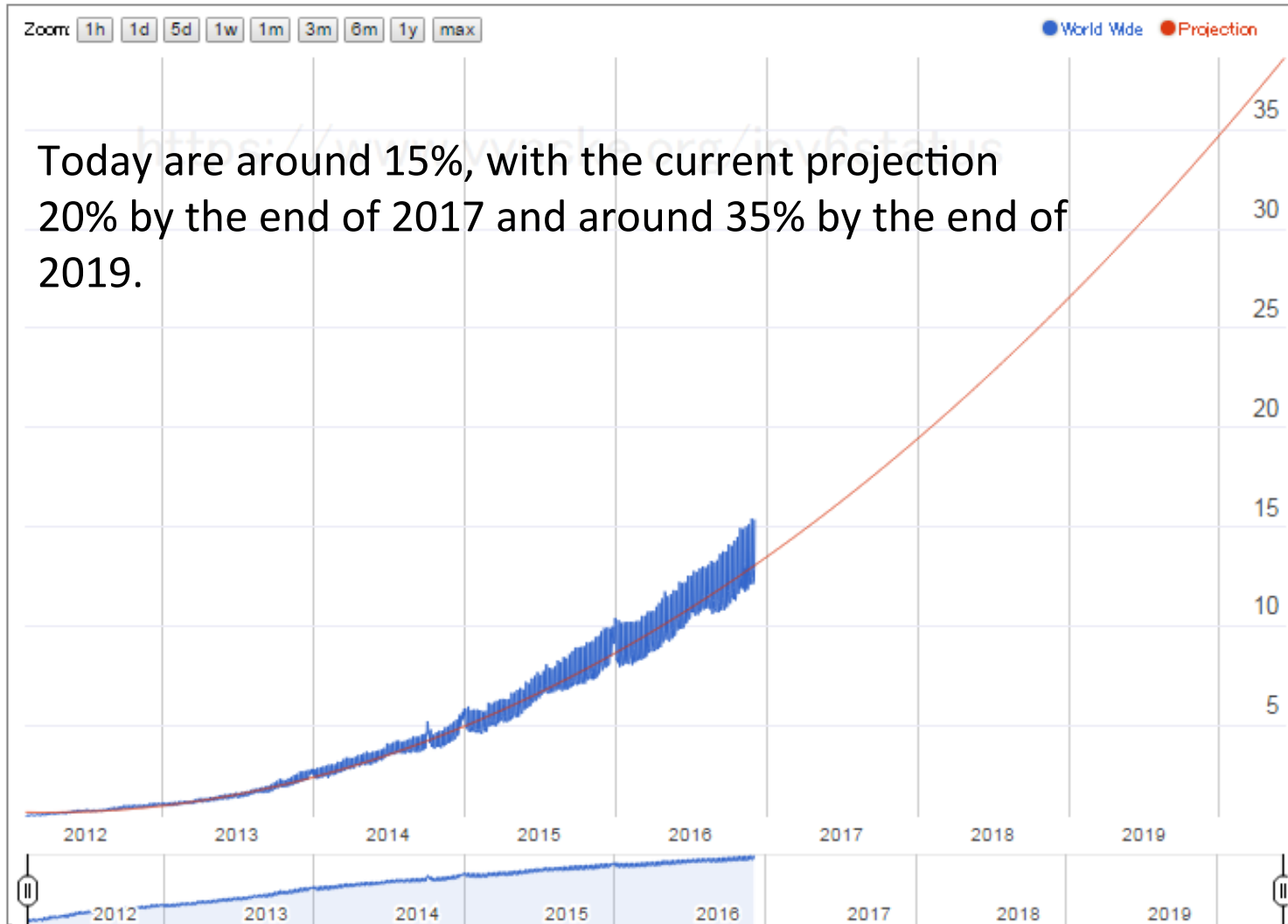
# General Status

- Major global contents support IPv6
  - Google, youtube, facebook, LinkedIn
- Major Cloud/CDN players support IPv6
  - Cloudflare, Akamai, MS Azure, Amazon AWS
- Latest OS for general users supports IPv6
  - Windows, MacOS



If ISPs turn on IPv6 by default, you get certain volume of IPv6 traffic  
e.g., In Bhutan, if ISPs enable IPv6 80% of traffic is IPv6 ready

# Projection of IPv6 %-age of IPv6-Enabled Web Browsers (courtesy Google) in World Wide

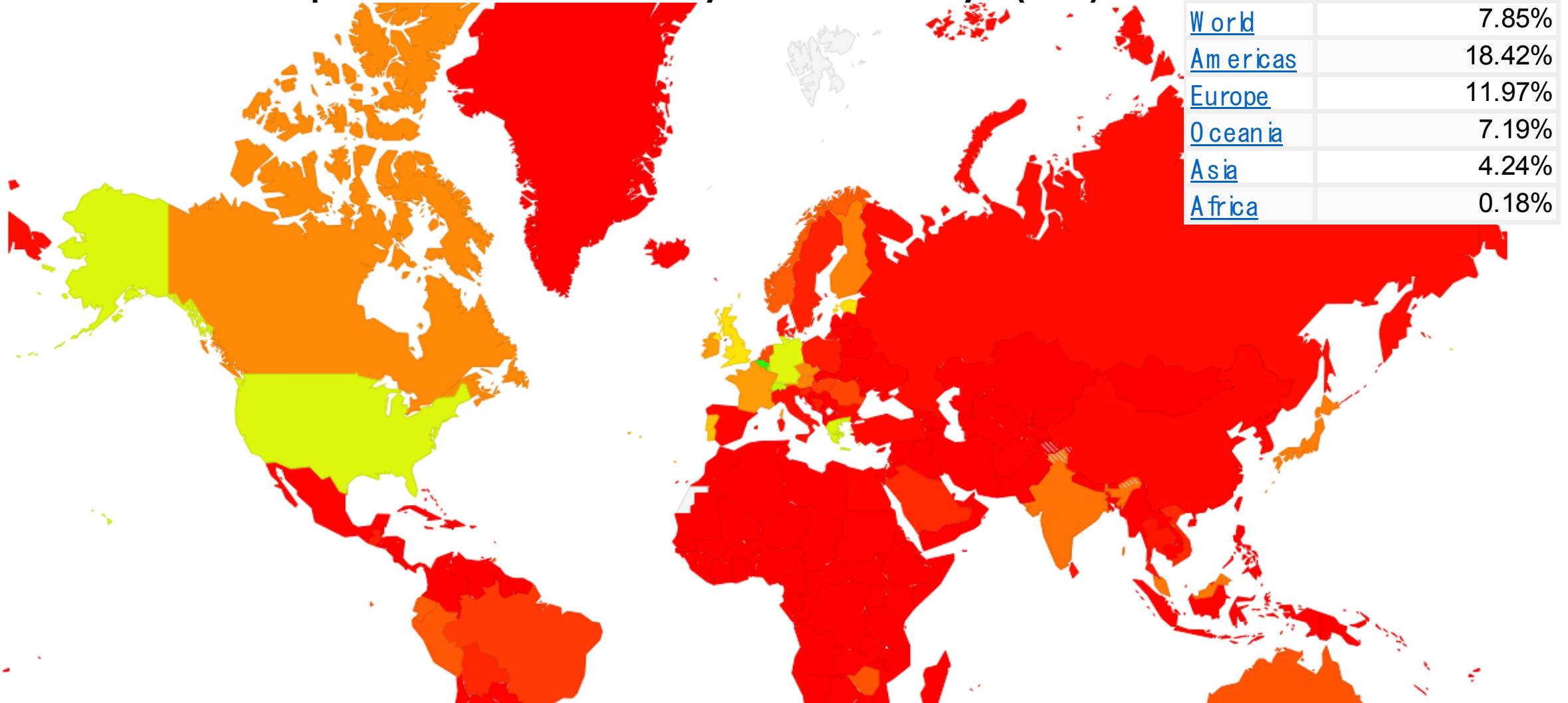


<https://www.vyncke.org/ipv6status/project.php?metric=p&timeforward=1280&timebackward=1280&country=ww>

# Other Trends

- Mobile
  - Large deployment in the US: T-mobile, Verizon Wireless, over 70% traffic in IPv6:  
<http://www.worldipv6launch.org/measurements/>
- IAB Statement on IPv6
  - IETF will stop requiring IPv4 compatibility in new or extended protocols.
  - Future IETF protocol work will then optimize for and depend on IPv6.
  - <https://www.iab.org/2016/11/07/iab-statement-on-ipv6/>
- Cases outside the Internet Industry
  - Global companies: BMW, Sony
  - Financial organisations: WellsFargo, Rabobank
  - Electric Smart Meter Measurement
  - IPv6 Multicast provides advantage on large national scale streaming infrastructure
  - TV: Sony has commercial TV which supports IPv6 connection

# IPv6 Capable Rate by country (%)



APNIC Labs IPv6 Measurement Maps: <http://stats.labs.apnic.net/ipv6/>

# IPv6 deployment rate is not linked to GDP

	Country	IPv6 Capable
1	Belgium	53.83%
2	Switzerland	36.46%
3	United States of America	33.88%
4	Germany	31.02%
5	Greece	28.05%
6	Luxembourg	27.17%
7	Portugal	23.14%
8	United Kingdom of Great Britain and Northern Ireland	22.11%
9	Peru	18.59%
10	Ecuador	18.17%
11	Estonia	17.54%
12	Canada	16.54%
13	Japan	15.96%
14	Malaysia	14.77%
15	France	13.73%
16	Trinidad and Tobago	13.58%
17	Finland	12.25%
18	India	11.01%
19	Brazil	10.95%
20	Norway	10.44%

Countries in red = GDP below 200 billion USD in 2016

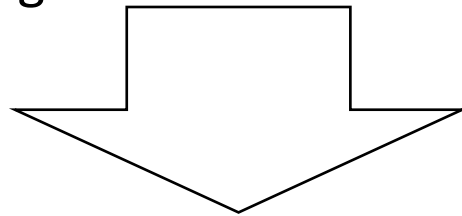
“International Monetary Fund World Economic Outlook (October-2016)”  
<http://statisticstimes.com/economy/countries-by-projected-gdp.php>

<http://stats.labs.apnic.net/ipv6/>



# Motivation based on Case Studies

- Collected over 20 cases from different regions
  - [https://docs.google.com/document/d/15HP5OkTPfnWkK4z4Z5qNbyuqNmAAP1o\\_xlxuZjrkt28/edit](https://docs.google.com/document/d/15HP5OkTPfnWkK4z4Z5qNbyuqNmAAP1o_xlxuZjrkt28/edit)
- Reasons for IPv6 deployment:
  - Long term business continuity
  - Cost simulation - less expensive than continue with IPv4
  - Good "leading edge" image



IPv6 used to be for "insurance" but substantial traffic is flowing today  
Need to be ready for the reality now, not as hypothetical situation

# IPv6 Deployment Challenges in General

# Areas for more work

- Access line
  - Backbone has been ready, more commercial IPv6 support needed in the last mile
  - An observation: If top 30 ISPs deploy IPv6 (which cover over 40% of entire Internet traffic), deployment rate could rise to 20%  
<http://www.potaroo.net/presentations/2015-05-14-ipv6-stats.pdf>
- Contents
  - Top Alexa website 22.50% IPv6 reachable (7<sup>th</sup> Dec 2016)
  - More variety of contents need to be available in IPv6, esp. local contents

# Common IPv6 Deployment Challenges

- Bugs and technical issues - More vendor support needed
  - Particularly for specific functionality (such as ND inspection OSPFv3 neighbor authentication, VXLAN overlay v6 transport, etc.)
  - Lack of support entirely in some critical product sets
  - Limited or missing v6 support in many operational and security tools and services (including DDOS mitigation services, Intrusion detection, monitoring)
- Cost of staff training and human resources
- ISP infrastructure is IPv6 ready but CPEs in customer premises do not support IPv6
  - Consumers are allowed to buy their own modems and gateways, and there is no incentive for those retail manufacturers to include IPv6 support
  - Unlike ISPs, most consumers don't know anything about IP, and therefore IPv6 does not drive sales.
- Some ISPs require customers to apply for IPv6 service, to enable IPv6
  - From fear of getting customer complaints by making IPv6 available by default
- It requires additional costs to or limitation for small businesses
  - No economy of scale

# IPv6 Deployment Challenges in Developing Countries

# Challenges for ISPs

- Corporate/Enterprise users
  - No technical challenge at all but most users don't want to deploy IPv6 into their network
    - Lack of technical knowledge on IPv6 in IT department

# Challenges for ISPs

- Broadband users
  - Some ISPs don't have good solutions for bandwidth shaping in dual stack environment so can't comply with commercial packages they offer
  - Some acknowledged lack of IPv6 knowledge specially on IPv6 security
  - IPv4 only CPE(Wifi Access Point) considered as a major challenge by some ISP. 90% of them are IPv4 only

# Challenges for Mobile Operators

- Still not interested to deploy IPv6 as number of smart phone is not significant (20%)



# Challenges for the Content Providers

- No real challenges except lack of IPv6 security knowledge
- Only a handful deployed IPv6

# Part III

# Take aways for Policy Makers

- Request vendors to support IPv6
- Awareness raising of consumers
  - Share information on which product supports IPv6
  - Encouraged purchasing IPv6 supported CPE
- Outreach to decision makers in the industry
- Training engineers for mid-small scale business/developing countries
  - Could be public-private collaboration: RIRs provide trainings in their respective regions

# Take aways for Business decision makers

- Vendors
  - Have your products support IPv6
- Service providers
  - By starting deployment now, you save large invest at once in the long term
  - Chose IPv6 supported products in network update/renewal
  - Training your staff is not hard if they know how to run IPv4 network
    - Use outside training courses available
  - When you deploy IPv6 commercially, turn it on by default (not make it opt-in)
    - Several companies have experiences and not getting into trouble
    - Trouble conceived to be caused by IPv6 is often due to mis-configuration: having properly trained staff will save many such troubles

# Summary

- If you are in the Internet industry, you should deploy IPv6 for long term business sustainability
  - IPv4 has run out will reach a block at some point.
- Growing trend - IPv6 deployment no longer "insurance" for unexpected situation
  - Mobile has potential to grow in coming years, over 70% for some operators
  - Key global contents are IPv6 ready, large CDNs are IPv6 ready
  - % of IPv6 Web browsers today are around 15%, with the current projection 20% by the end of 2017 and around 35% by the end of 2019.
- Let's each do our part to get ready!