

# **Confronting IPv4 Address Exhaustion - What Content Providers Should Do?**

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# Nikkei Inc.



- Established
  - December 2, 1876
- Operations
  - Acts as an operating holding company with **newspaper businesses** as a core. Group operations range from books, magazines to digital media, database service, broadcasting and other activities such as economic/cultural events



# INTERNET MULTIFEED CO.

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- Established in 1997 by:
  - IIJ and NTT Communications
  - Major content providers in Japan



- Services

- “MultiFEED” (Multi + Feed) since 1997
  - One of the oldest **Internet Data Centers** in Japan

**MultiFEED**

- “JP NAP” since 2001
  - The largest **Exchange point** in Japan



- “TimeFEED” (Time + Feed) since 2005
  - Japanese Standard Time distribution and monitoring Service

**TimeFEED**

# Outline

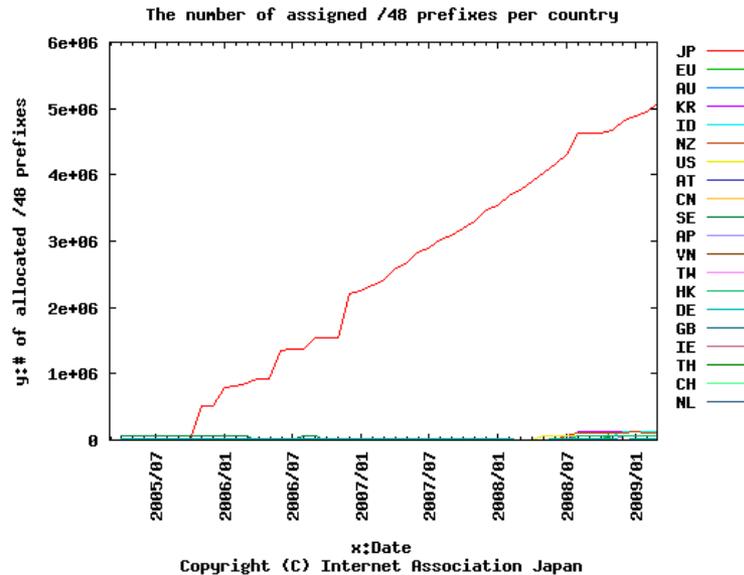
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- Background
- Motivation for this trial
- Experiments
- Interim report

# Background

# Myth

- Japan is advanced country regarding IPv6.
  - Assigned /48 prefixes in Japan are over 5 million.



<http://v6metric.inetcore.com/en/html/st01/12.html>

# IPv6 internet in Japan

- These IPv6 assignment is **NOT for the Internet**, but for closed service by NTT East and West.
  - IPv6 internet connectivity is commercially available, but still **few ISPs** and **few users**.

**For consumers:**  
**NTTCom, IIJ,**  
**Nifty, Freebit, Densan**  
**(5 ISPs)**

**For enterprises and service providers:**  
**NTTCom, NTT-ME,**  
**IIJ, KDDI, ... (9 ISPs)**

**Broadband access-line infrastructure:**  
**NTT West, NTT East**  
**“walled garden”**

**Enterprise networks:**  
 -Retail chain store  
 -IP Business phone  
 -Building facility management



# When IPv6 Internet comes in Japan?

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- It will start increasing from **2011**
  - NTT East and West will begin “IPv6 internet access” service for ISP in 2011.
- And it will take a few years that IPv6 becomes “popular.”
- Content providers cannot be positive to support IPv6...

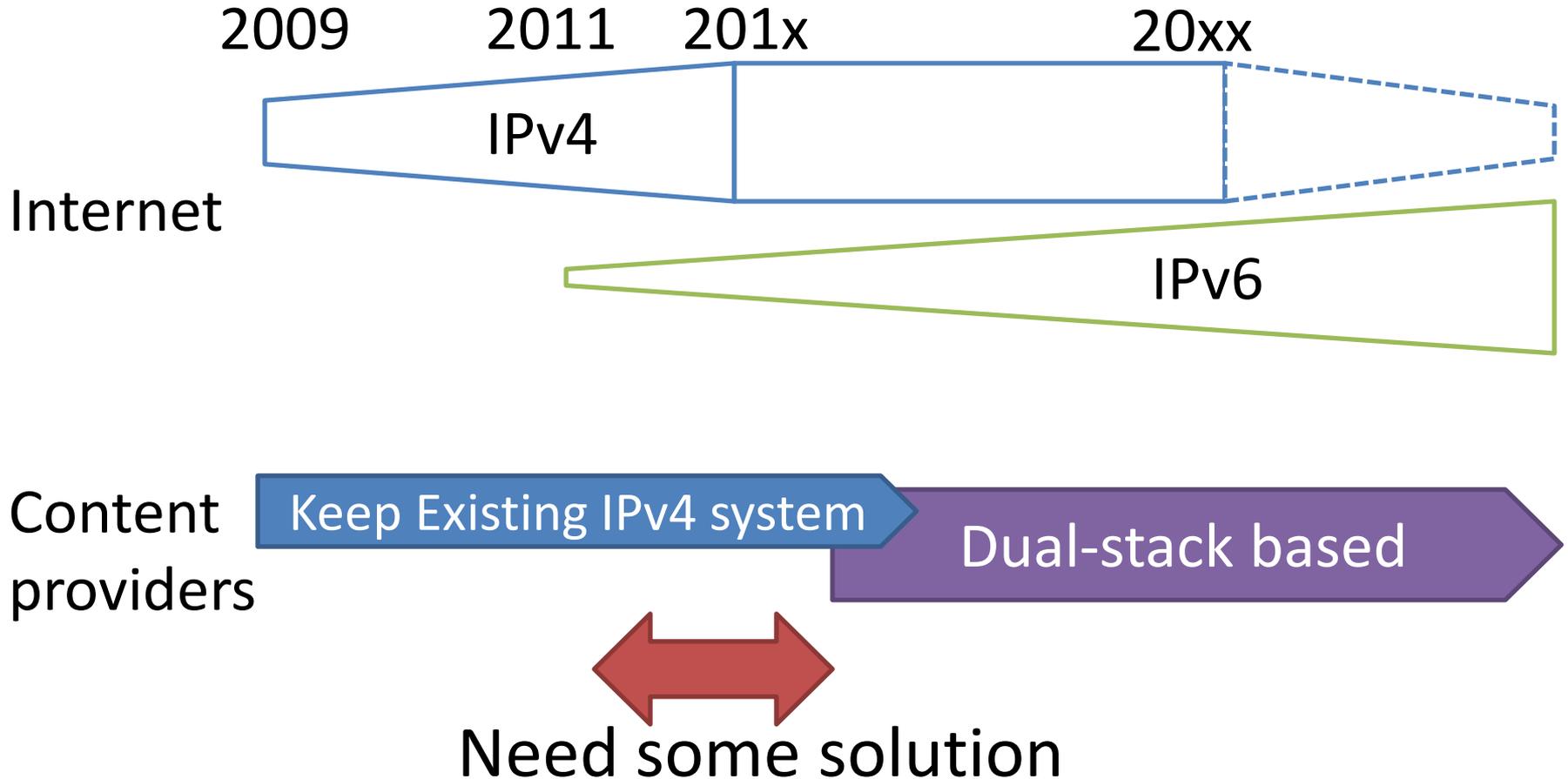
# Motivation for this trial

# Content providers' view

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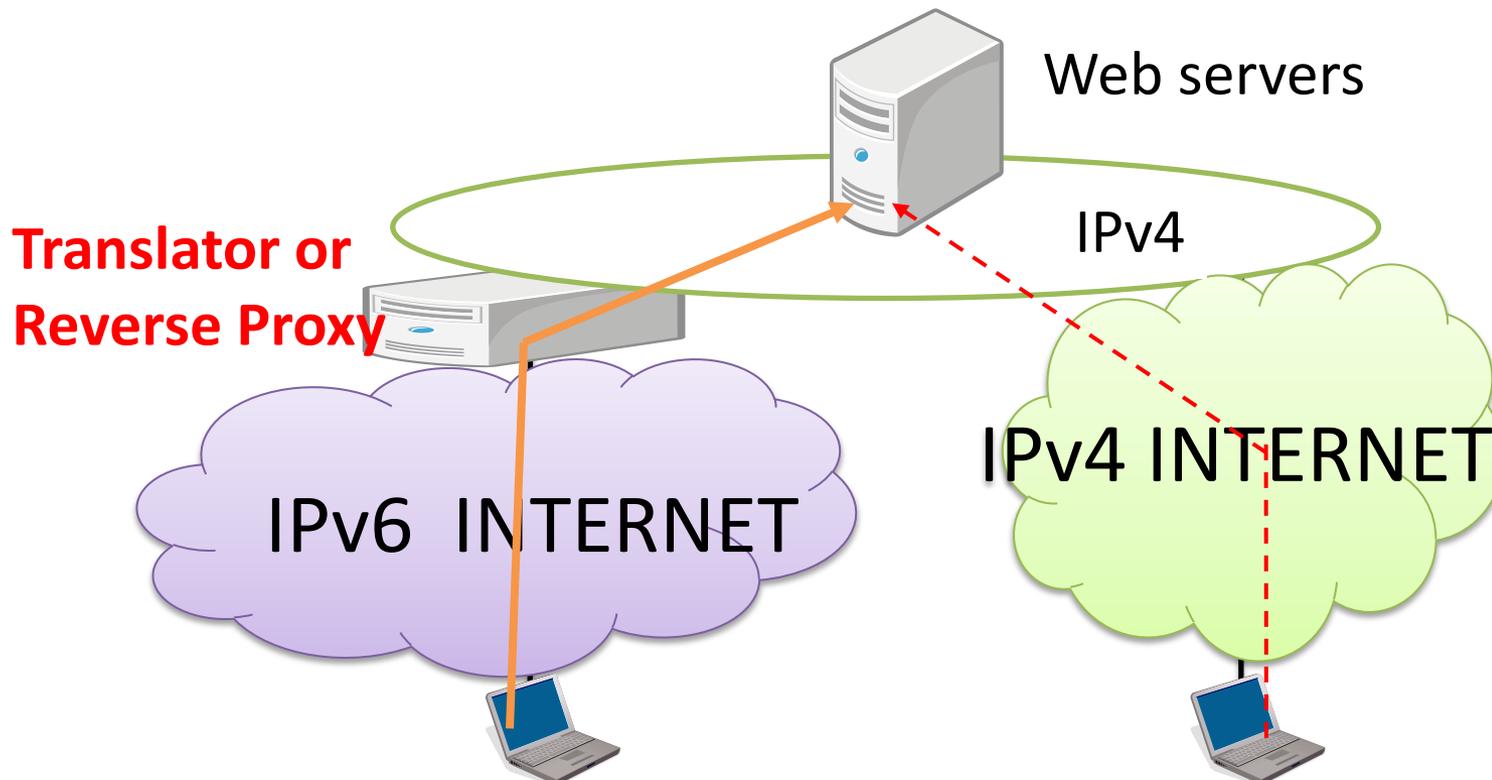
- Should not affect current IPv4 services, which are “cash cow.”
- For example, they have to avoid:
  - **Claims** from end-users.
  - Delayed or failed delivery of content, especially **Ads**.
  - Impacts on their **content production/management systems**.

# When do they deploy IPv6 on servers?



# A possible approach

- Put v6/v4 translator or reverse proxy in front of the existing IPv4 servers.



# Our motivation

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## Nikkei Inc.

- As a content provider
- Trying some possible ways to support IPv6 in NIKKEI.NET
  - Complex content is affected by use of IPv6?
  - Reverse proxy with rewriting URLs in HTML is effective?

## Internet Multifeed Co.

- As a datacenter
- Exploring the possibilities of IPv4/ip6 translation or reverse proxy service
  - Ipv4/v6 translators works well?
  - This service is valuable?
  - Any restrictions on content?

**Agreed to joint experiment on IPv6.**

# Experiments

# Two experiments

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## (1) Nikkei's experiment

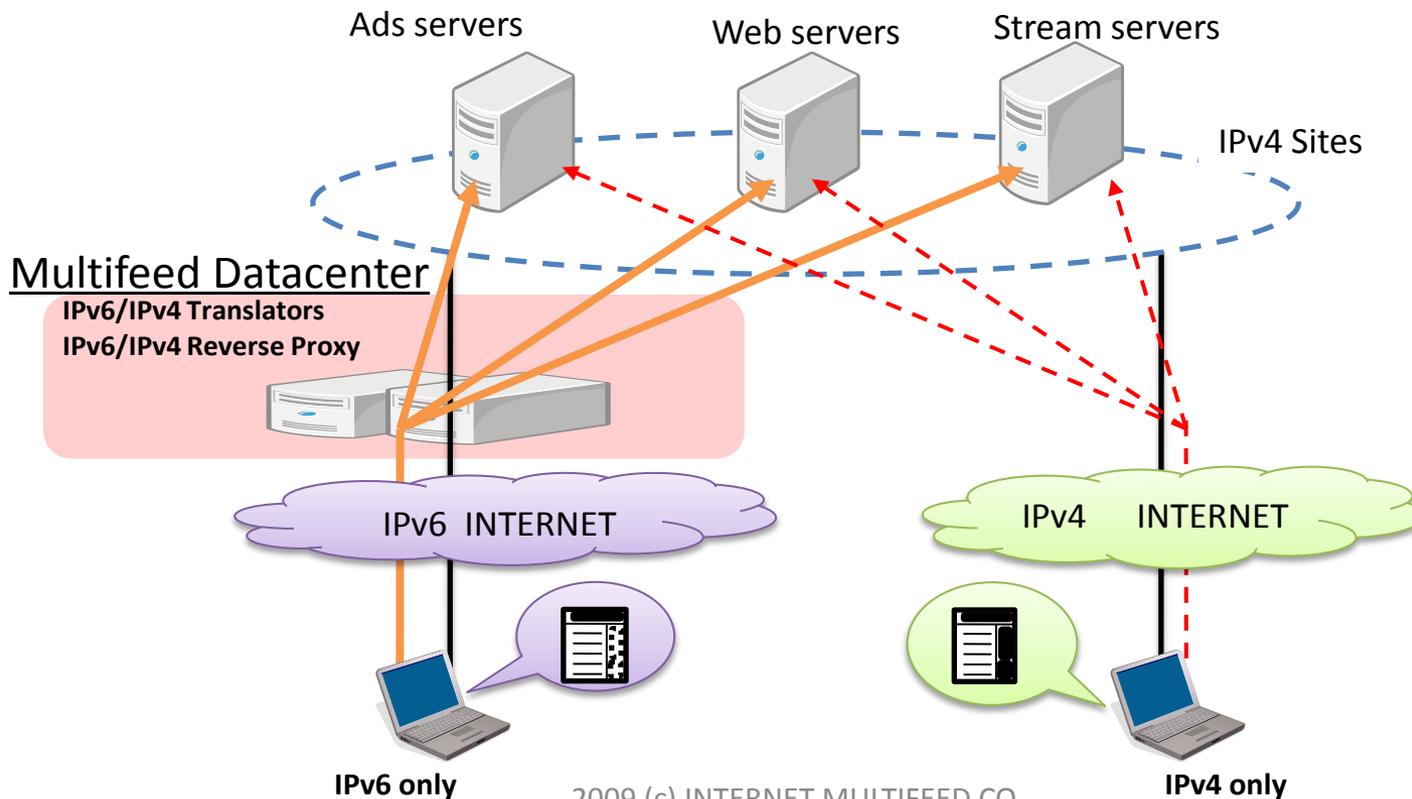
- Approach from the content providers
- Different URLs for IPv6 from those for IPv4
- Based on reverse proxy, with rewriting URLs.

## (2) MF's experiment

- Approach from the datacenter
- Same URLs for both IPv4 and IPv6
- Based on translators

# experimental network

- Access from IPv6-only and IPv4-only environment.
- Compare displayed content, and find out reasons of differences if any.



# Nikkei's "Complex" content

- Comprised of multiple URLs
- 160 parts including pictures, CSS, javascripts, and so on

URLs are described in "[a](#)" tag or "[script](#)" tags

## Adopting ASP

- log analysis
- ads
- movies (by CDN)

## Javascript/AJAX

Flash, dynamically communicating to other sites

## User authentication

- SSL
- Cookies, including cross-domain cookies and third-party cookies

Updating content in 24x7, such as articles, pictures, links, and so on

# (1) Nikkei's experiment

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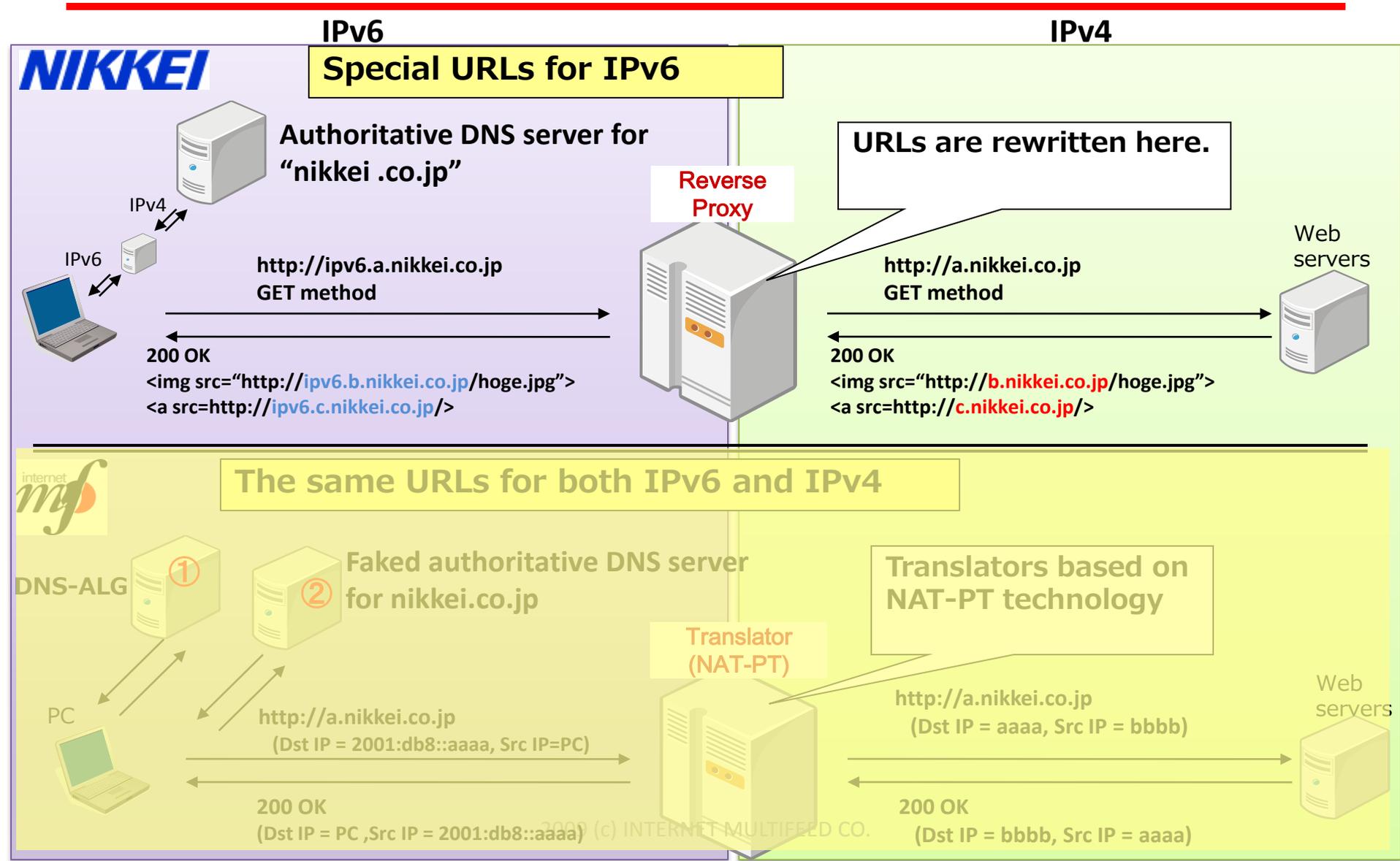
- Tentative policy for IPv6
  - IPv6 trial on some pages of NIKKEI.NET, without any impacts on the current services on IPv4
- **Separate URLs for IPv6 content**
  - Just like “ipv6.google.com”
  - Intend to avoid “IPv6-to-IPv4 fallback problem”
  - No modification on their current content management system
  - Assume that clients are IPv6-only, not dual-stack.
    - The most severe situation after IPv4 depletion

# (1) Nikkei's implementation

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- Separate URLs for IPv6
  - Separate but consistent naming scheme
    - Add prefix “ipv6” to the current FQDN
    - <http://a.nikkei.co.jp/> → [http://\*ipv6\*.a.nikkei.co.jp/](http://ipv6.a.nikkei.co.jp/)
    - <http://b.nikkei.co.jp/> → [http://\*ipv6\*.b.nikkei.co.jp/](http://ipv6.b.nikkei.co.jp/)
- Implementation: Reverse Proxy
  - URLs in HTMLs or scripts are rewritten at the reverse proxy

# (1) Nikkei's implementation



## (2) MF's experiment

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- Assuming NIKKEI.NET is a customer of our translation service.
- Same URLs for both IPv6 and IPv4
  - put IPv6/IPv4 translator in front of the active IPv4 server farm.
  - IPv6 packets from clients are translated to IPv4 packets and sent to IPv4 servers, and vice versa.
  - Customer's domain names are resolved:
    - by registering AAAA records with translator's IPv6 address, or
    - dynamically through DNS-ALG.

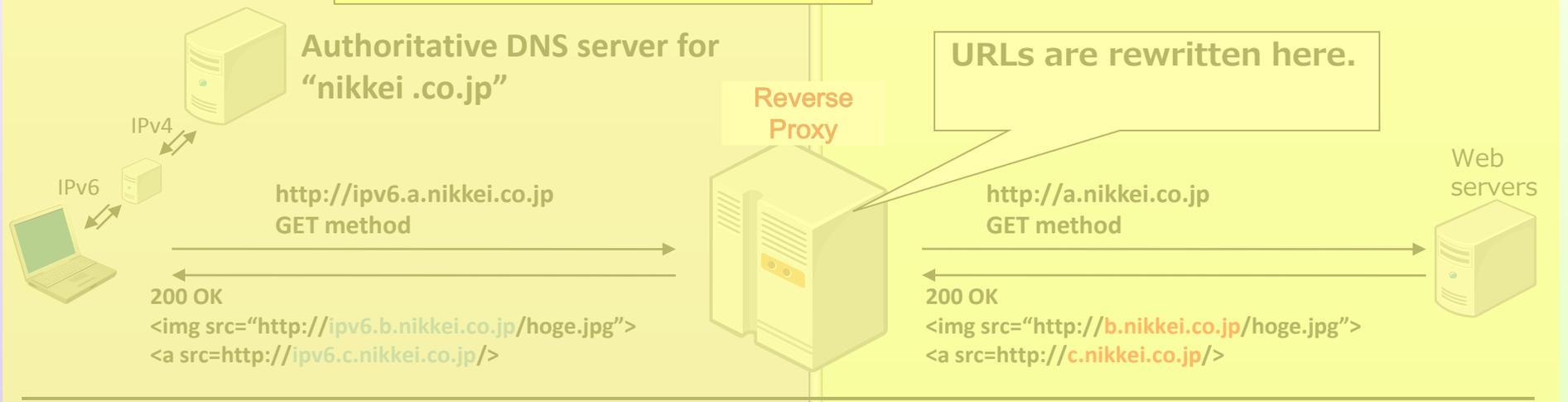
# (2) MF's implementations

IPv6

IPv4

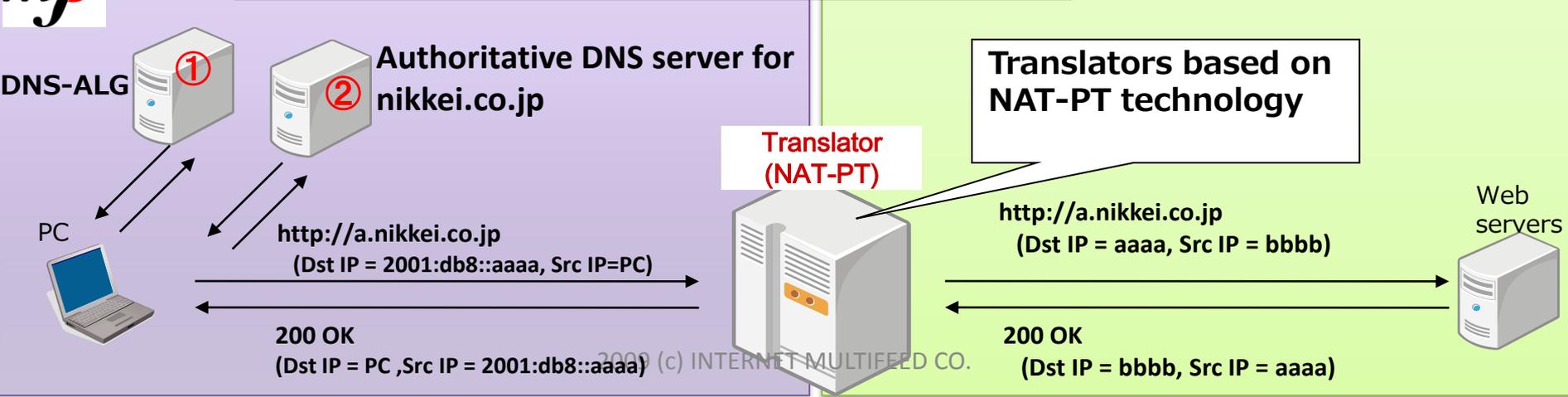
NIKKEI

Special URLs for IPv6



internet mf

The same URLs for both IPv6 and IPv4



# Interim report

# (1) Nikkei's findings

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- Nikkei's content can be displayed without any issues related to IPv6.
  - Dynamic content using Flash, JavaScript, Ajax, and so on.
- Separate URLs for IPv6 to IPv6-only clients:
  - Generally OK for content under “nikkei.co.jp” domain.
  - Unable to rewrite URLs in binary code of Flash.
  - Handling URLs of ASP is unsolved problem.

## (2) MF's findings

- Nikkei content can be displayed without any issues related to IPv6.
  - Same result as Nikkei's
- Outstanding issue
  - Content that comprises of parts from some other domains

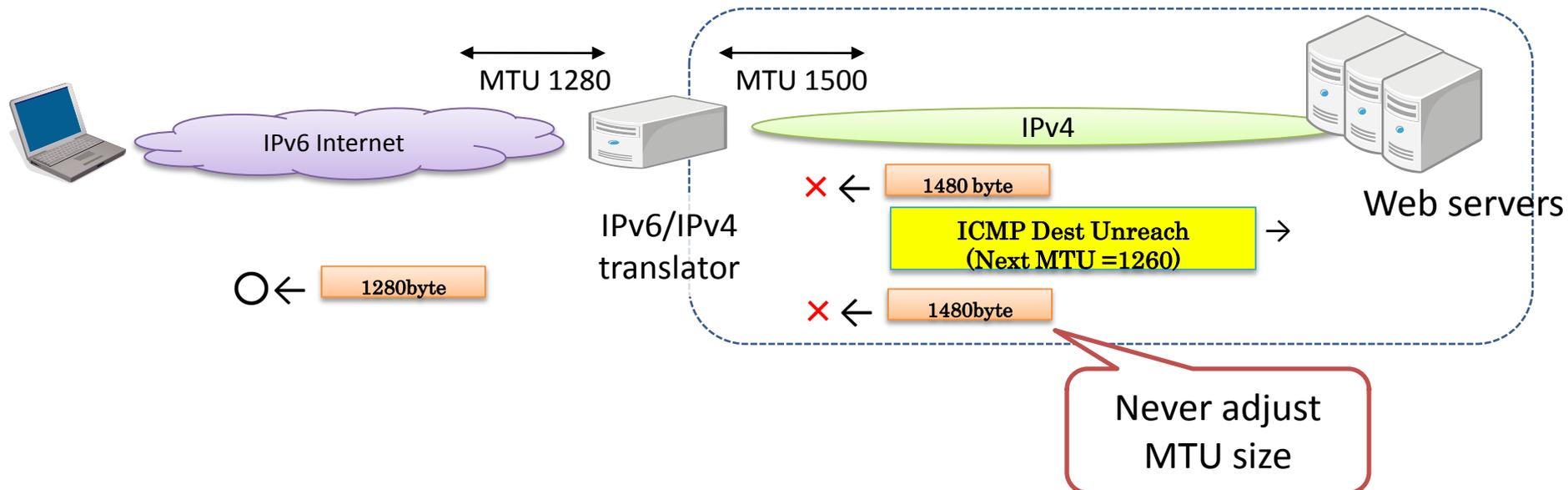


**Ads should be displayed here.**

# Another important issue: MTU

- Minimum MTU size in IPv6 is 1280.
- Usually IPv4 servers use 1400-1500 as their MTU size.
- Some servers do not adjust MTU according to ICMP Destination Unreachable message.

Translators are required to enforce fragmentation.



# Advices

# What should content providers do?

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- At least content providers or application service providers should do:
  - “Risk analysis”
    - What if IPv4 address cannot be obtained?
    - What part of your system should be modified for IPv6 if its access increased?

# For content providers

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- Start discussion with upstream ISPs or datacenters that you are using.
- Analyze what will be caused to your services by IPv4 depletion and IPv6 support, and then prepare in advance.

# For content providers

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- The case of Nikkei Inc.
  - They have to choose separate URLs for IPv6, if deploying IPv6 now.
    - But the same URLs are strongly preferable, because managing two kinds of URLs is not so easy.
  - Expects application service providers to support IPv6 in the same way as content providers do.
    - Use separate URLs for IPv6 in early stage, and migrate to the same URLs for IPv4 and IPv6.
    - Wish Google Adsense start IPv6 soon. 😊

# For datacenters

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- IPv6/IPv4 Translation or reverse proxy supporting IPv6 could be options for datacenter customers.
  - temporary solutions, though.

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- Thank you!
  - Any questions and comments?

# Contact

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