464XLAT Experiences

464XLAT: Combination of Stateful and Stateless Translation

Japan Internet Exchange Co., Ltd.

Masataka MAWATARI
<mawatari[at]jpix.ad.jp>

Agenda

1. What is 464XLAT ?
2. Our motivation
   - IPv4/IPv6 situation in ISP
   - JPIX approach to this issue
3. Service implementation in JPIX
   - Introduction
   - Previous steps
   - Current status
4. Request for comments

What is 464XLAT ? (1)

- **Simple technique to provide IPv4 access service across IPv6 network by combining existing stateful and stateless translation. (No new protocol required)**
  - **Stateful translation : RFC 6146**
  - **Stateless translation : RFC 6145**

- **464XLAT has low barriers to entry since only a small amount of IPv4 addresses are needed to support the stateful translation function in the PLAT.**

- **464XLAT can apply to wireline network and wireless 3GPP network.**

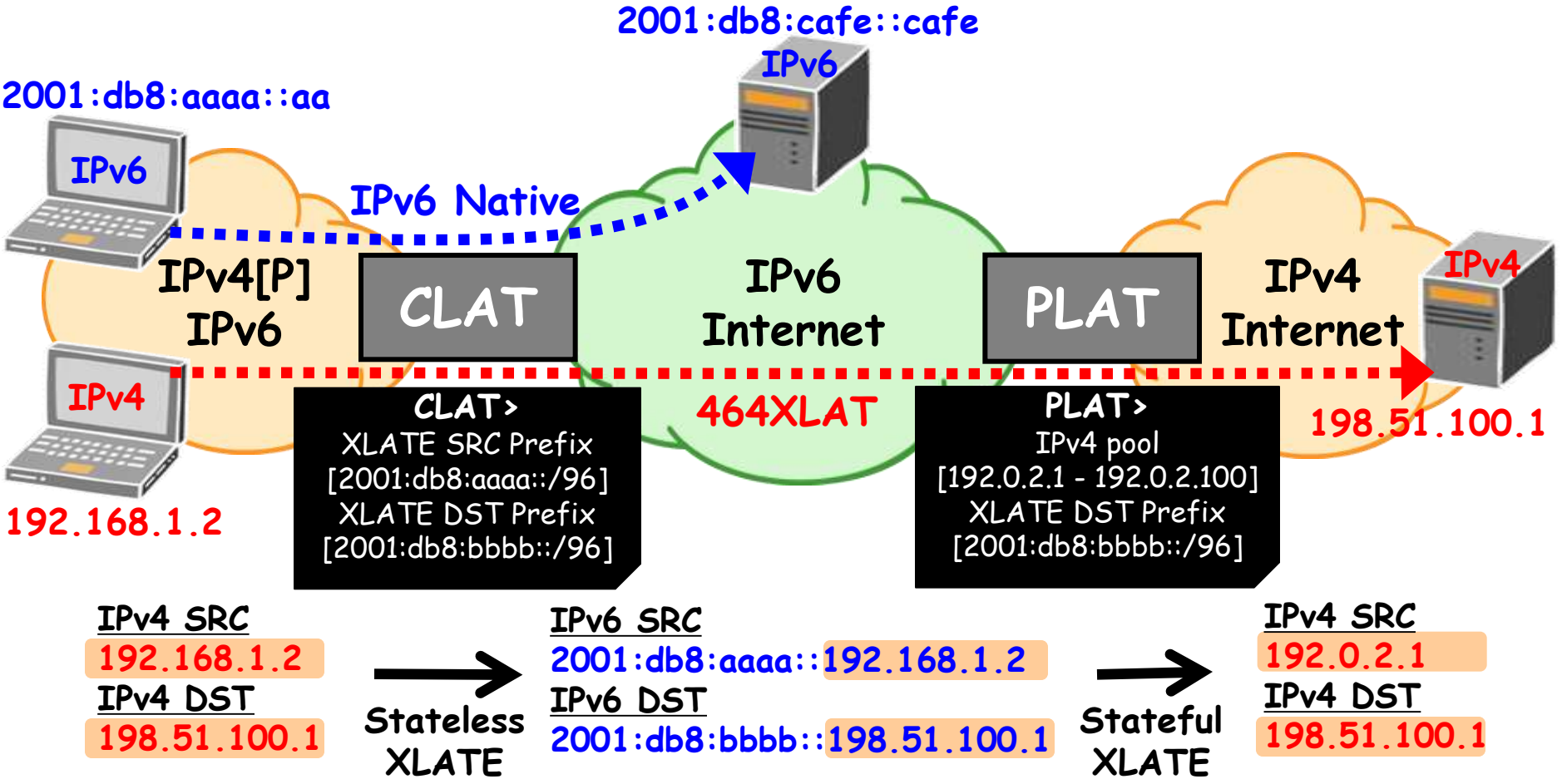
Ref : http://tools.ietf.org/html/draft-ietf-v6ops-464xlat

What is 464XLAT ? (2)

- Termnology
  - PLAT : Provider side translator(XLAT)
    - A stateful translator complies with [RFC6146] that performs 1:N translation. It translates global IPv6 address to global IPv4 address, and vice versa.
  - CLAT : Customer side translator(XLAT)
    - A stateless translator complies with [RFC6145] that performs 1:1 translation. It algorithmically translates private IPv4 address to global IPv6 address, and vice versa.
    - CLAT function is applicable to a router, or endnode such as a mobile phone.
    - The presence of DNS64 [RFC6147] and any port mapping algorithm are not required.

What is 464XLAT ? (3)

- **Network architecture**



- **This architecture consists of CLAT and PLAT have the applicability to wireline network (e.g. FTTH) and wireless network (e.g. 3GPP).**

What is 464XLAT ? (4)

- **Uniquness of 464XLAT**
  1. **Minimal IPv4 resource requirements**
     - **ISPs can effectivly and reasonably share limited global IPv4 address pool.**
     - **If ISPs have little IPv4 adress (e.g. ISPs in APAC already had exhausted IPv4), they can share it for end-users.**
  2. **No new protocols required**
     - **It is only necessary to use standard technologies based on RFC already published.**
     - **Most of ISPs do not have a lot of time to make a new protocol.**

What is 464XLAT ? (5)

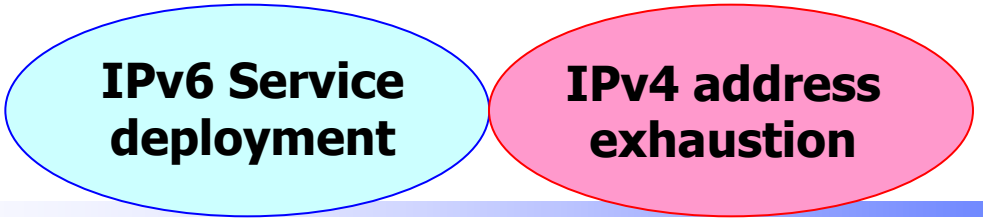
- **Uniquness of 464XLAT (cont.)**
  - **3. Cost-effective transition to IPv6**
    - **When combined with DNS64, ISP can provide sharing IPv4 address and IPv4/IPv6 translation at same time.**
    - **Encap/Decap is not required, ISPs can do traffic engineering for translated IPv6 packets by common backbone routers.**
      - **No use any "deep packet inspection" for processing translated IPv6 packets**
    - **Saving the resource in customer side CPE.**
      - **low-load in custmer side can widely adapt from the wireline to the wireless.**

What is 464XLAT ? (6)

- **Introduction example**
  - **Wireline network**
    - **JPIX has started trial service. (details later)**
  - **Wireless 3GPP network**
    - **T-Mobile USA has been operating on trial network now.**
      - **PLAT : T-Mobile USA**
      - **CLAT : Android, Nokia N900**
    - **Android-CLAT**
      - **http://code.google.com/p/android-clat/**
    - **Nokia N900 CLAT**
      - **http://code.google.com/p/n900ipv6/wiki/Nat64D**

About ISPs immediate situation (Especially APAC)

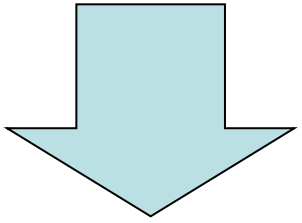
- **Two major tasks facing each ISP**
  - **IPv6 Service deployment**
    - **Investment in IPv6 infrastructure. When? How far?**
    - **However... Growing more importance of IPv6 with increating end-users and end-nodes.**
  - **IPv4 address exhaustion solution**
    - **APNIC unallocated pool was already exhausted.**
      - **All end-users need IPv4 global reachability until IPv6 is deployed all over the internet.**
    - **How long do you have to provide IPv4 global connectibity for all end-users???**
      - **5-year, 10-year, and more? Nobody knows.**



JPIX's motivation and approach of 464XLAT

- **"IPv6 service deployment" is forcused by each ISPs.**
  - **IPv6 network is used by end-users and services available for years to come!!**

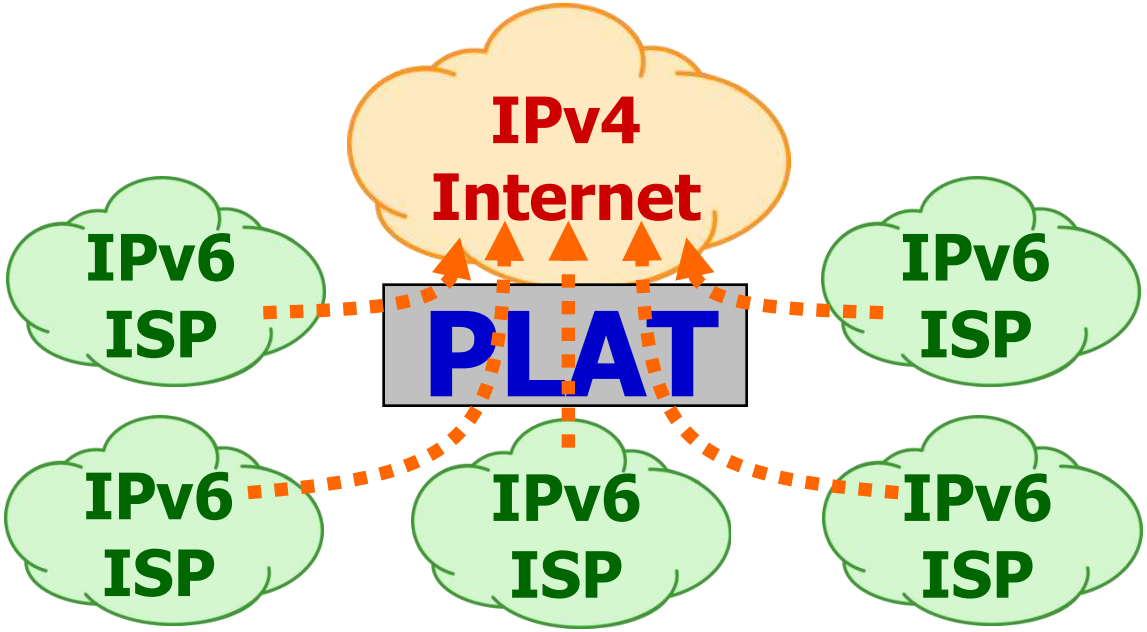
- **"IPv4 address exhaustion solution" is supported by JPIX.**
  - **Sharing IPv4 address techniques and equipments are needed during only IPv4/IPv6 transition period only.**
  - **Small-medium ISPs don't have a operation resource and much IPv4 address pool to solve IPv4 address exhaustion in each ISP backbone network.**
  - **Outsourcing service is more reasonable than deploying CGN/LSN in each ISPs. (Of course, depending on ISP network)**



IPv6v4 Exchange Service

What is IPv6v4 Exchange Service ?

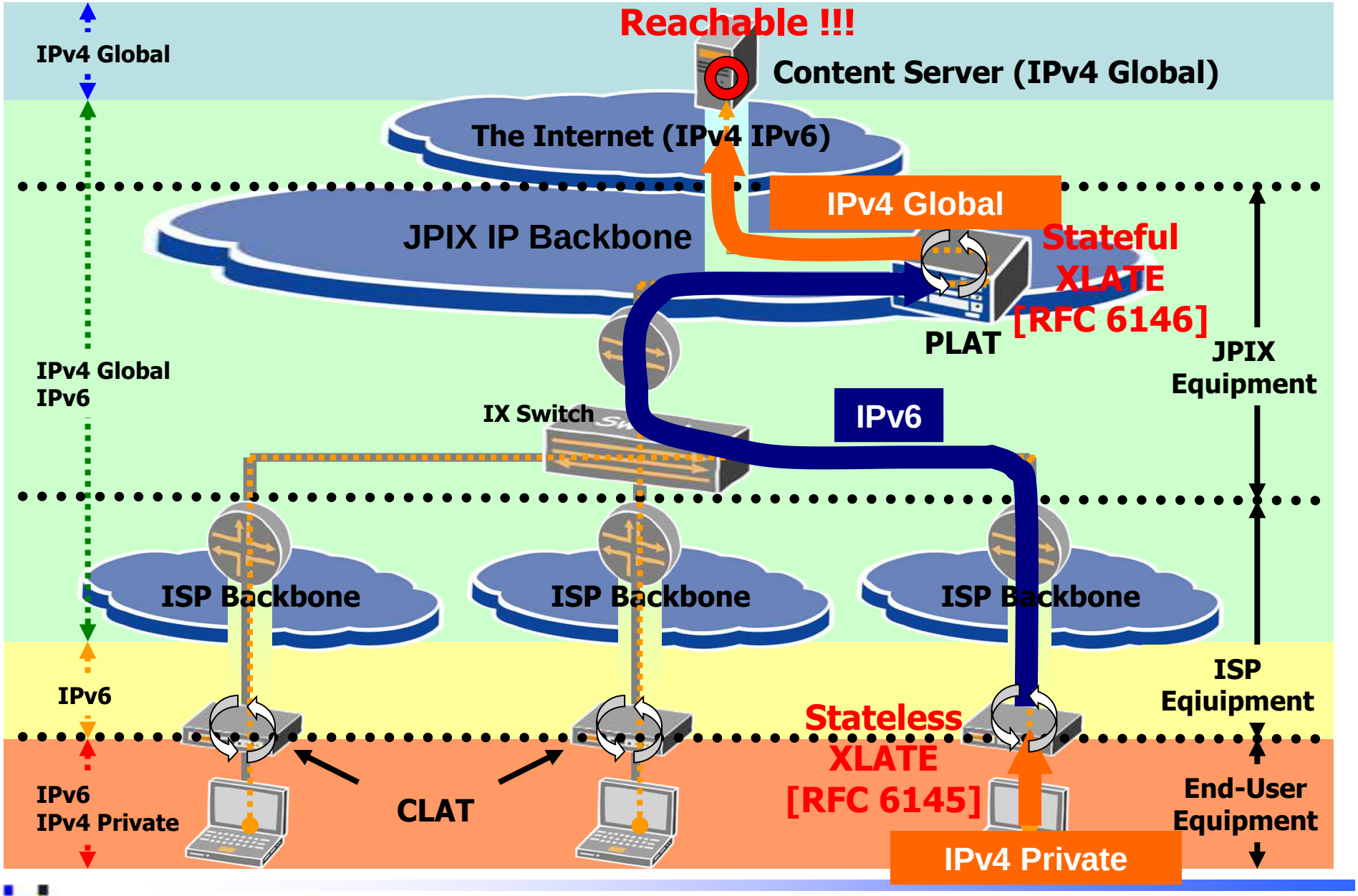
- **This solution...**
  - **uses 464XLAT architecture.**
  - **can provide to share PLAT function among IX members.**
  - **is useful and reasonable because the PLAT is not required in each ISP backbone networks.**



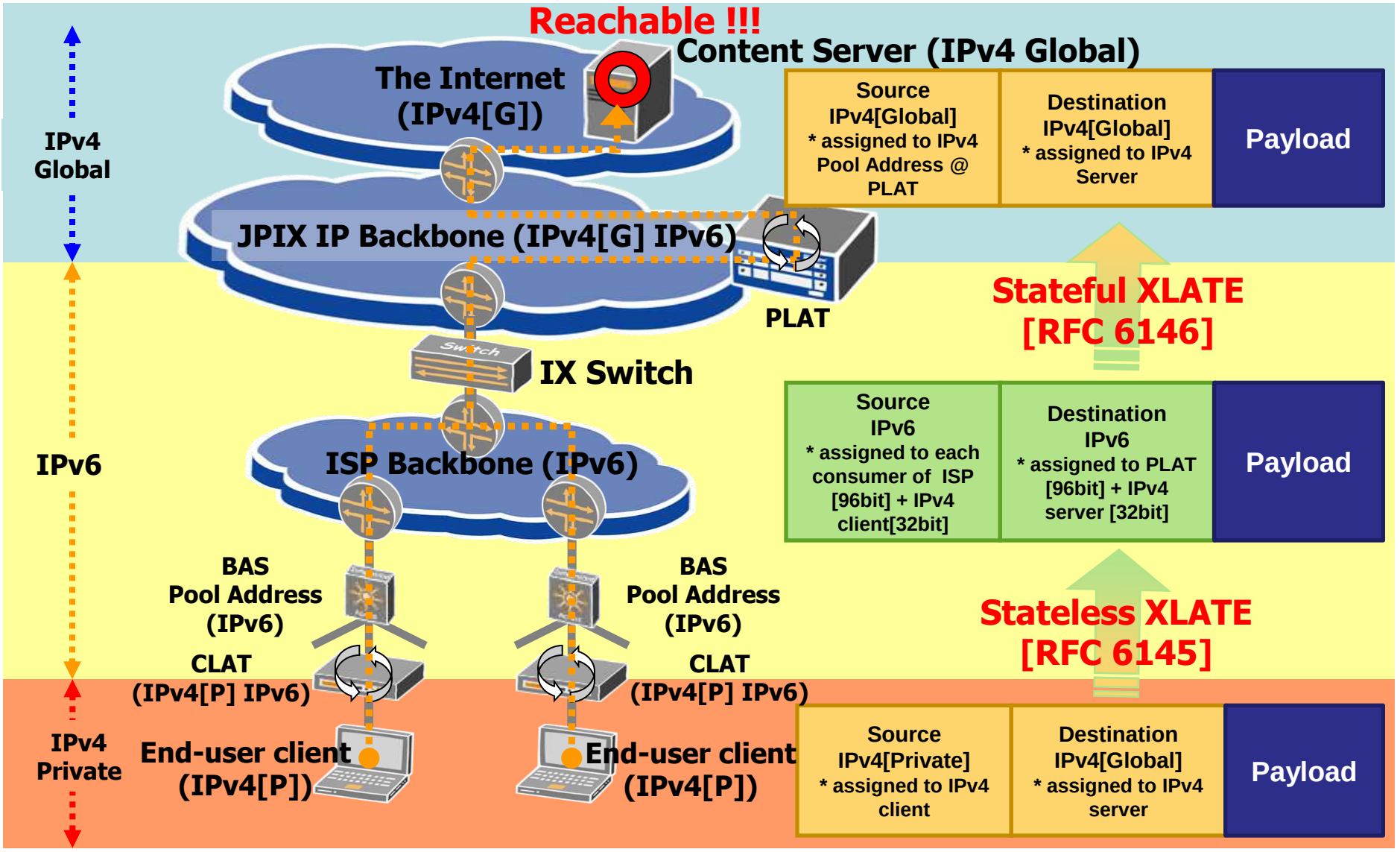
Previous steps in JPIX

- 2008 Dec.
  - Starting service investigation in JPIX
    - Discussing about translation method
    - Testing some translators (NAT-PT [historical])
- 2009
  - Starting development a prototype of PLAT and CLAT
- 2010 Jul.
  - Starting trial service for JPIX IX members
- 2011 Apr.
  - RFC 6144, RFC 6145 and RFC 6146 are published
  - Some network vendors started to implement XLATE (RFC 6145 and RFC 6146)
- 2011 Oct.
  - Internet-Draft of 464XLAT is published
- 2012 Feb.
  - 464XLAT have been adopted as v6ops WG document.

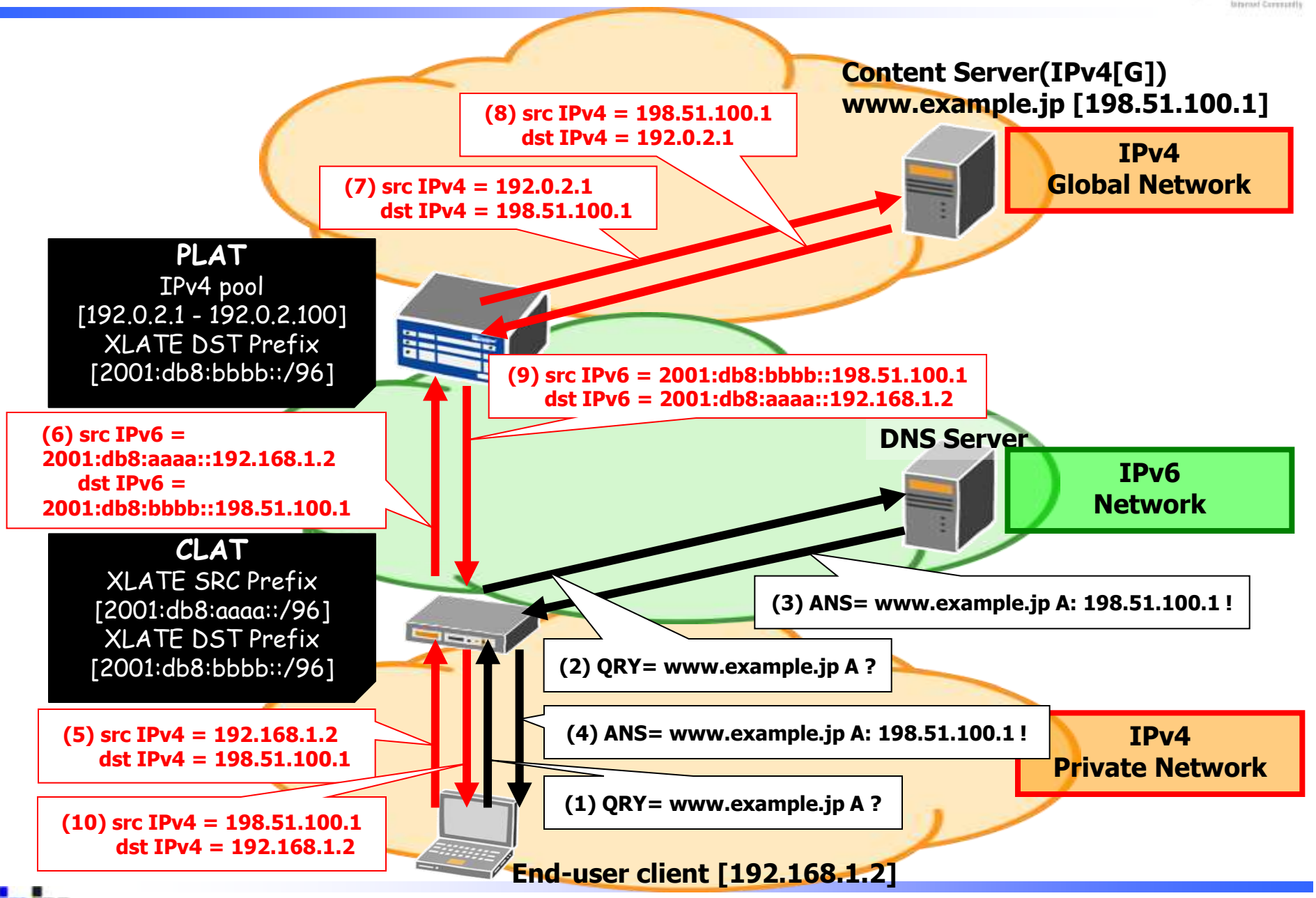
Brief image of JPIX trial service



464XLAT Architecture Address Translation Chart



464XLAT Architecture Address Translation Chart



Current status in JPIX trial service

- **Providing trial service for JPIX IX members**
  - **Started on July 2010.**
  - **Trial service members : 16 ISPs. (Jan. 2012)**
    - **Broadband Internet Provider : 10**
    - **CATV Internet Provider : 3**
    - **Hosting, Contents Provider : 3**
  - **CLAT is implemented to existing CPE router.**
  - **CLAT is lent out free of charge for trial service members.**
  - **We can continuously accept new trial members.**

- **Application Availability**
  - **Web, Mail, Video Streaming.. OK.**
  - **Instant Message, Skype... OK.**
  - **We have no major issue.**

NEC AccessTechnica CL-AT1000P

Current status in JPIX trial service

- **Feedbacks from trial service members**
  - **About 464XLAT architecture**
    - **464XLAT can overcome the IPv6-only network issues described in draft-arkko-ipv6-only-experience.**
    - **Edge access network growth in ISP is no longer coupled to the availability of scarce IPv4 addresses.**
  - **About CLAT CPE**
    - **Easy to configure IPv4/IPv6 translation statement.**
      - **CLAT function has a low number of parameters.**
      - **CLAT function is more applicable to existing CPE.**

Current status in JPIX trial service

- **We have running code.**
  - **PLAT is officially released as NAT64 feature by major router vendors.**
  - **CLAT for wireline network is implemented by NEC AccessTechnica.**
- **We learned a lot of knowledge by running code.**
  - **We have already removed unknown issues of translation.**
    - **Design and Operation**
    - **Application behavior**

References

- **RFC 6052 (IPv6 Addressing of IPv4¥IPv6 Translators)**
  - **http://tools.ietf.org/html/rfc6052**
  - **This describes IPv6 addressing for IPv4/IPv6 translation.**
- **RFC 6144 (Framework for IPv4/IPv6 Translation)**
  - **http://tools.ietf.org/html/rfc6144**
  - **This describes IPv4/IPv6 translation scenarios and Framework.**
- **RFC 6145 (IP/ICMP Translation Algorithm)**
  - **http://tools.ietf.org/html/rfc6145**
  - **This describes stateless IP packet header and ICMP packet header translation.**
- **RFC 6146 (Stateful NAT64)**
  - **http://tools.ietf.org/html/rfc6146**
  - **This describes stateful translation for sharing IPv4 address among IPv6 clients.**
- **Internet-Draft : 464XLAT**
  - **http://tools.ietf.org/html/draft-ietf-v6ops-464xlat**
  - **This describes combination of stateful and stateless translation.**
- **android-clat (CLAT Support for android)**
  - **http://code.google.com/p/android-clat/**

Thank you.