

# Life without IPv4

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# We'll see Norwegian end users without their own IPv4 addresses appear soon

- This is an inevitable consequence of IPv4 depletion, and the primary driving force for IPv6 adoption
- In other countries this is already happening, especially in the Asia-Pacific region
- Let's find out how these users will perceive the internet by putting ourselves in their shoes

Please try to connect to the wireless network «**telenor\_ipv6\_only**» now

# Supported operating systems

- Microsoft Windows (Vista and newer):
  - Full support - should work right away
- Apple iPhone & iPad (with latest firmware 4.3):
  - Full support - should work right away
  - Turn off cellular data in order to get the IPv6-only experience
- Nokia (Symbian):
  - Full support - should work right away
- Linux (recent Fedora and Ubuntu):
  - Works, but requires changes to default connection settings:
    - Turn off «Require IPv4 addressing for this connection to complete»
    - Set «IPv6 mode» to «Automatic»
  - Fedora also requires an firewall opening for the DHCPv6 client (546/udp)

# Unsupported operating systems

- Microsoft Windows XP
  - Can not perform DNS queries over IPv6
  - Also, IPv6 is off by default
- Apple Mac OS X
  - Unable to learn the IPv6 DNS server addresses
  - Will likely be fixed in version 10.7 «Lion» later this year
- Google Android
  - Unable to successfully connect to a network without IPv4 service
- All of the above will be able to successfully use IPv6 on a dual-stacked network
  - Typically IPv4 will be used for DNS lookups (even for IPv6-enabled names)



# Confirming network connectivity

*http://aaaa.test-ipv6.com*

Firefox Test din IPv6

TEST-IPV6 http://aaaa.test-ipv6.com/

TEST-IPV6

Test IPv6 Ofte Stilte Spørsmål IPv6-dagen Speil Endringer/å gjøre Statistikk

## Test din IPv6-konnektivitet

Oppsummering Utførte tester Teknisk informasjon Del resultater / kontakt

- Din offentlige IPv6-adresse ser ut til å være 2001:4610:5:2:21c:bfff:fe02:f2a5
- Ingen IPv4-adresse oppdaget [\[mer informasjon\]](#)
- [World IPv6 day](#) er den 8. juni 2011. **Ingen problemer er i vente for deg** med denne nettleseren fra denne lokasjonen. [\[mer informasjon\]](#)
- Du ser kun ut til å være i stand til å nå IPv6-internettet. Du har ingen tilgang til IPv4. Det er temmelig tøft av deg!
- Din DNS-tjener (muligens driftet av din ISP) ser ut til å ha tilgang til IPv6-internettet.

**Ditt test-resultat**

**0/10** for din IPv4-tilgang, når innholdsleverandører tilbyr både IPv4 og IPV6

**10/10** for din IPv6-tilgang, når innholdsleverandører tilbyr kun IPV6

Klikk for å se [test-data](#)

(Oppdaterer server-statistikk over IPv6-tilgjengelighet)

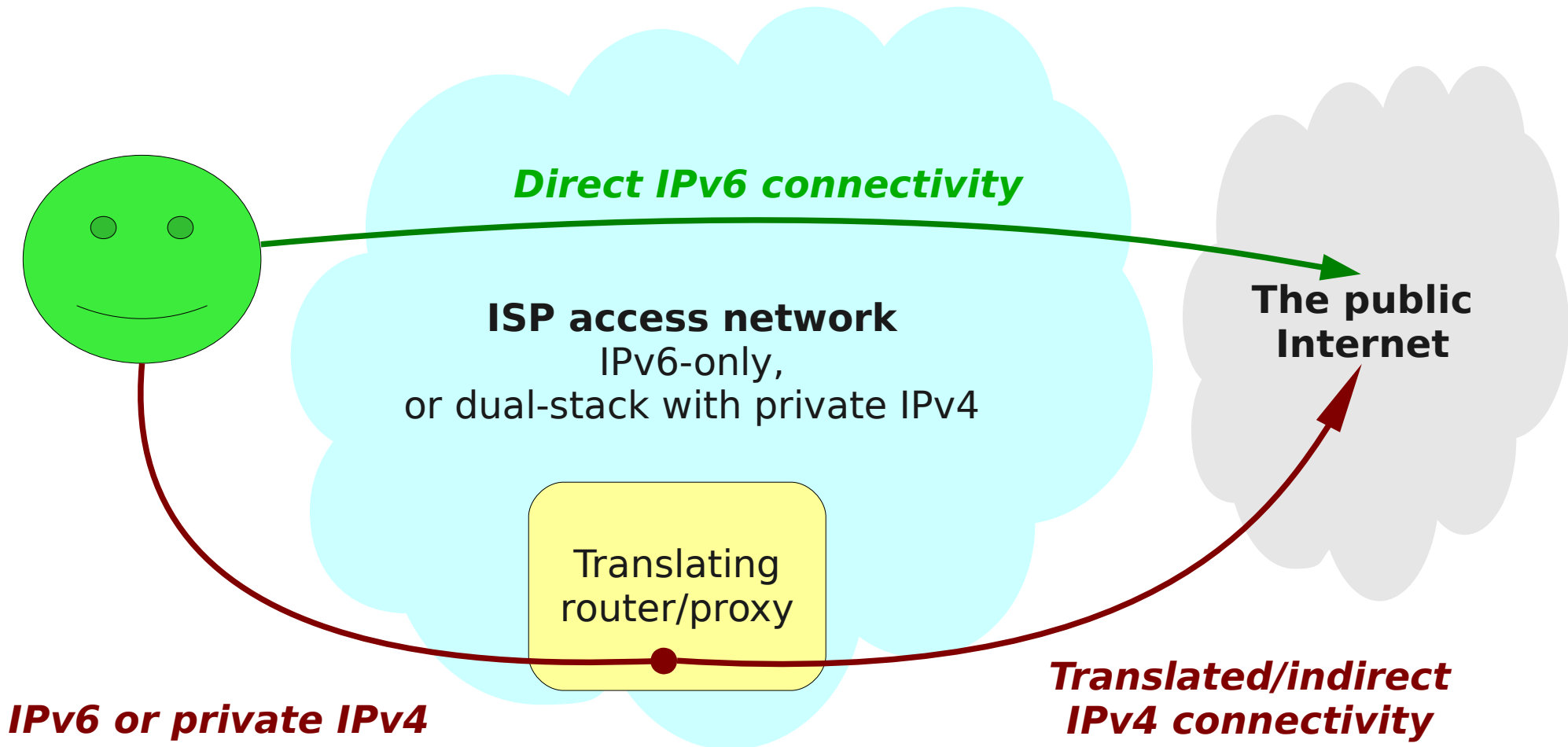
## Stuff that works:

- <http://www.ipv6forum.no>
- <http://www.vg.no>
- A-pressen's sites: <http://www.ba.no>, <http://www.nordlys.no>, 50+ others
- <http://www.redpill-linpro.com>
- <http://www.google.com>, <http://www.youtube.com>
- <http://www.venstre.no>
- There may be links and features that don't work - IPv6-only functionality is generally not tested very thoroughly

## What doesn't work?

- Pretty much everything else...
- An end user without IPv4 is unlikely to be very happy

# End users will expect and need some form of [indirect] IPv4 connectivity:



# There's more than one way to do it

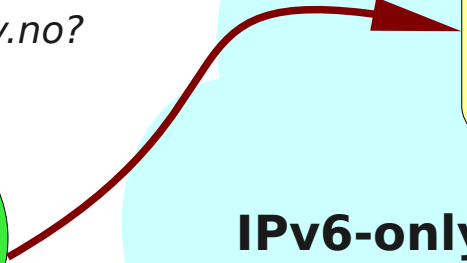
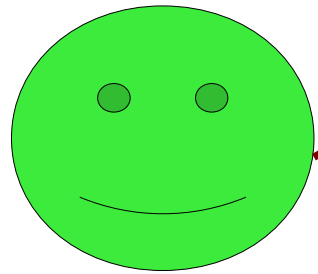


- NAT64+DNS64, DS-Lite, NAT444, A+P, ....
- All of them facilitate rationing of IPv4 addresses
  - Several subscribers may share a single address
  - Allows an ISP to grow its customer base post IPv4 depletion
  - But there's a price: loss of functionality and performance

For a demo of NAT64/DNS64, please  
try to connect to the wireless  
network «**nat64\_demo**» now

# DNS64 operation:

1) What is the IPv6 address of www.ipv4-only.no?



DNS64  
resolver

**IPv6-only ISP access network**

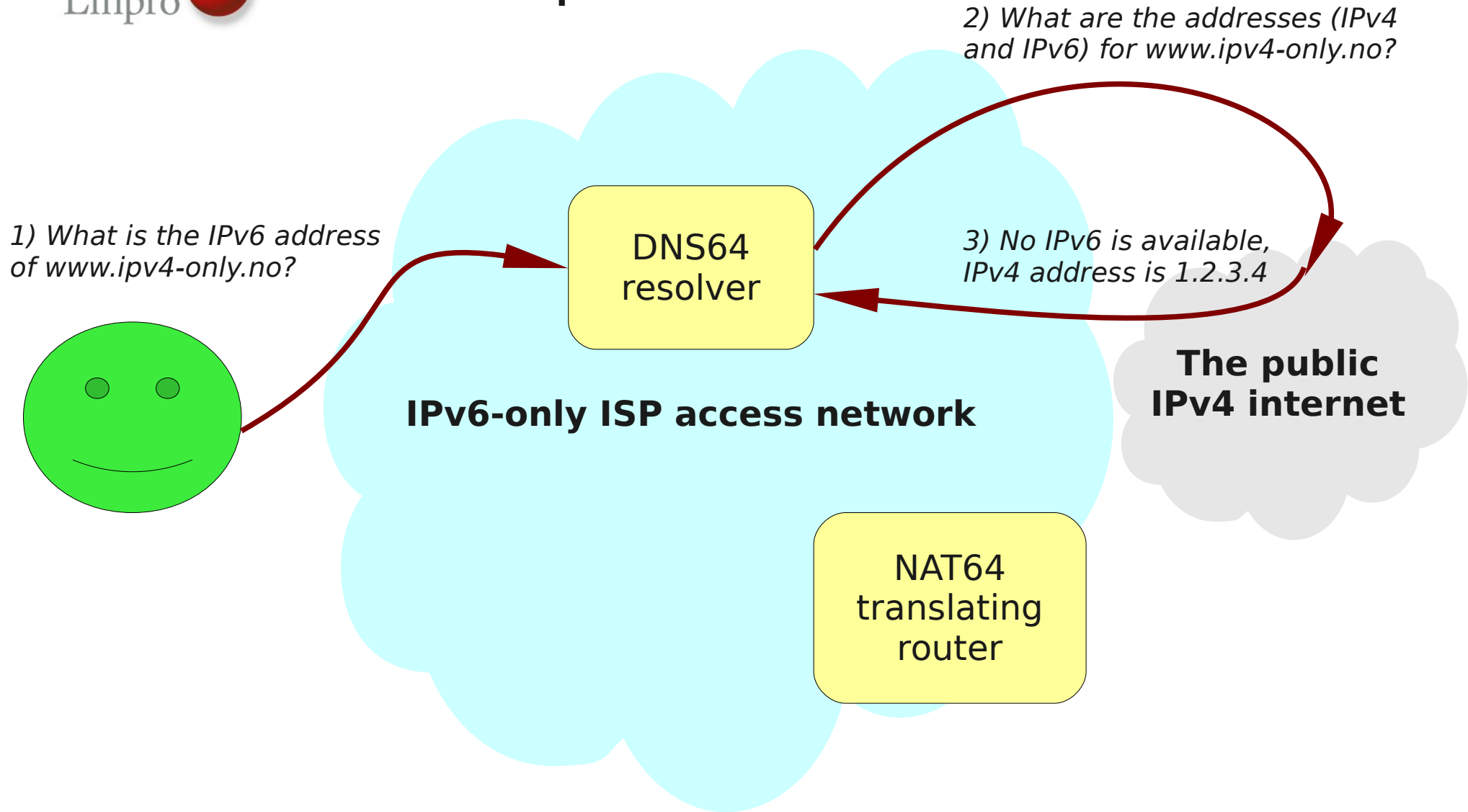
NAT64  
translating  
router



**The public  
IPv4 internet**

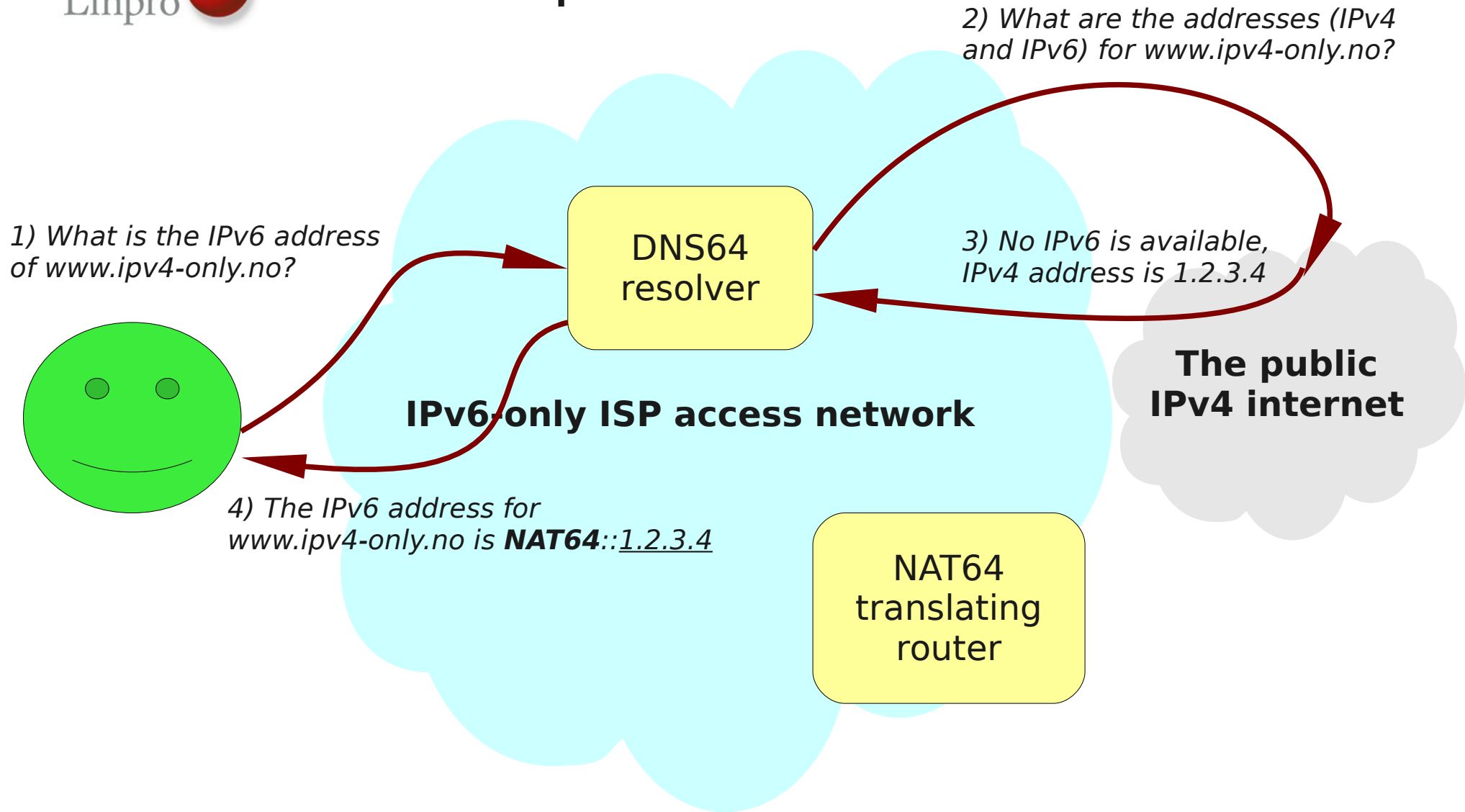
- The end user's computer asks the ISP's DNS resolver to resolve a IPv4-only hostname to a IPv6 address

# DNS64 operation:



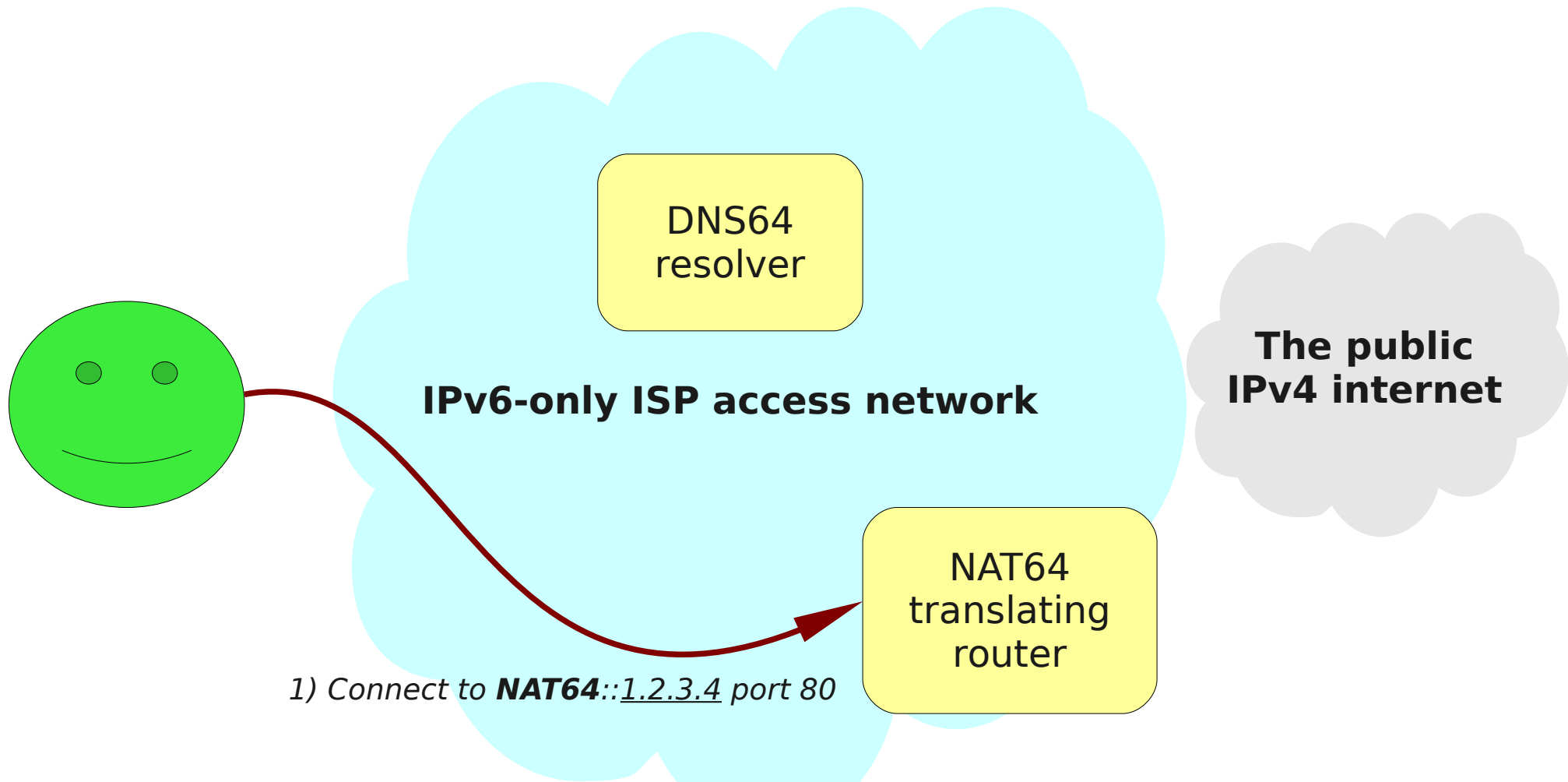
- The resolver finds only an IPv4 address published for www.ipv4-only.no

# DNS64 operation:



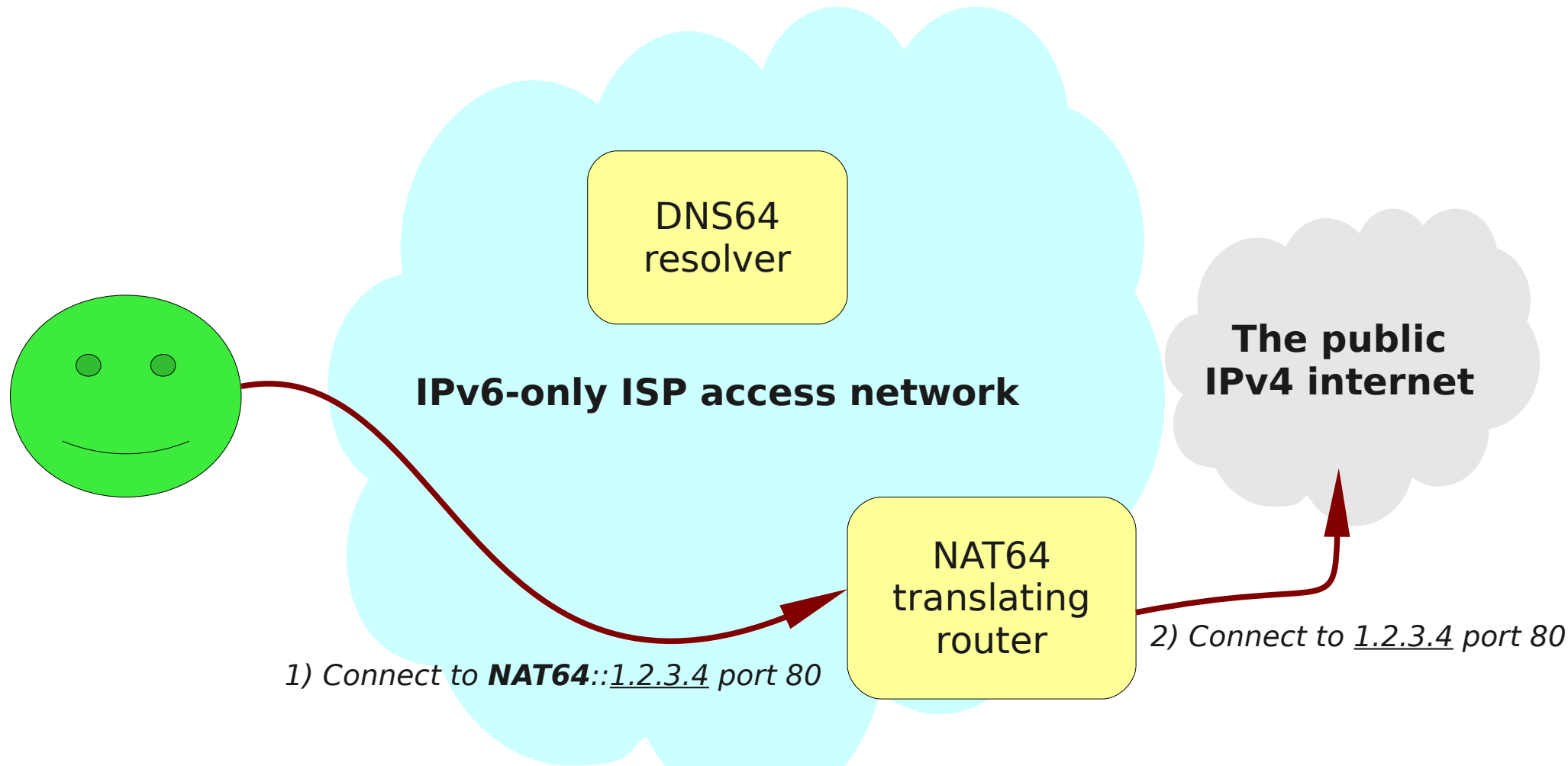
- The resolver fakes an IPv6 address - embeds the real IPv4 address inside the answer returned to the client

# NAT64 operation:



- The end user establishes an outbound connection to the fake IPv6 address, ignorant of the fact that is indeed a fake.
- The ISP proceeds to route these fake addresses to the NAT64 router

# NAT64 operation:



- The NAT64 box extract the original IPv4 address from the fake IPv6 address and translates the original IPv6 packets to IPv4, which are then transmitted to the original destination (and vice versa)

# What works?

- The web, e-mail, and other client->server protocols that use hostnames

## Then what's the problem?

- Many protocols and services fail to work through NAT64
  - Skype
  - BitTorrent
  - IP telephony (SIP)
  - Online gaming (Playstation, Xbox, ...)
- If your neighbour behaves badly, you'll be blacklisted as well
- ISP-level NAT will be a performance bottleneck

# In summary

- Many of tomorrow's Internet users will have to make do without IPv4
- They will likely have to access IPv4 services through a translator
- Translated connectivity will have less performance and functionality than today's IPv4 connectivity or tomorrow's IPv6 connectivity
  - Owners of online services therefore need to deploy IPv6 in order to maintain the best performance and user experience available
- **Questions?**
- Feel free to contact me:
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