# NAT64

World IPv6 Launch
UvA Amsterdam
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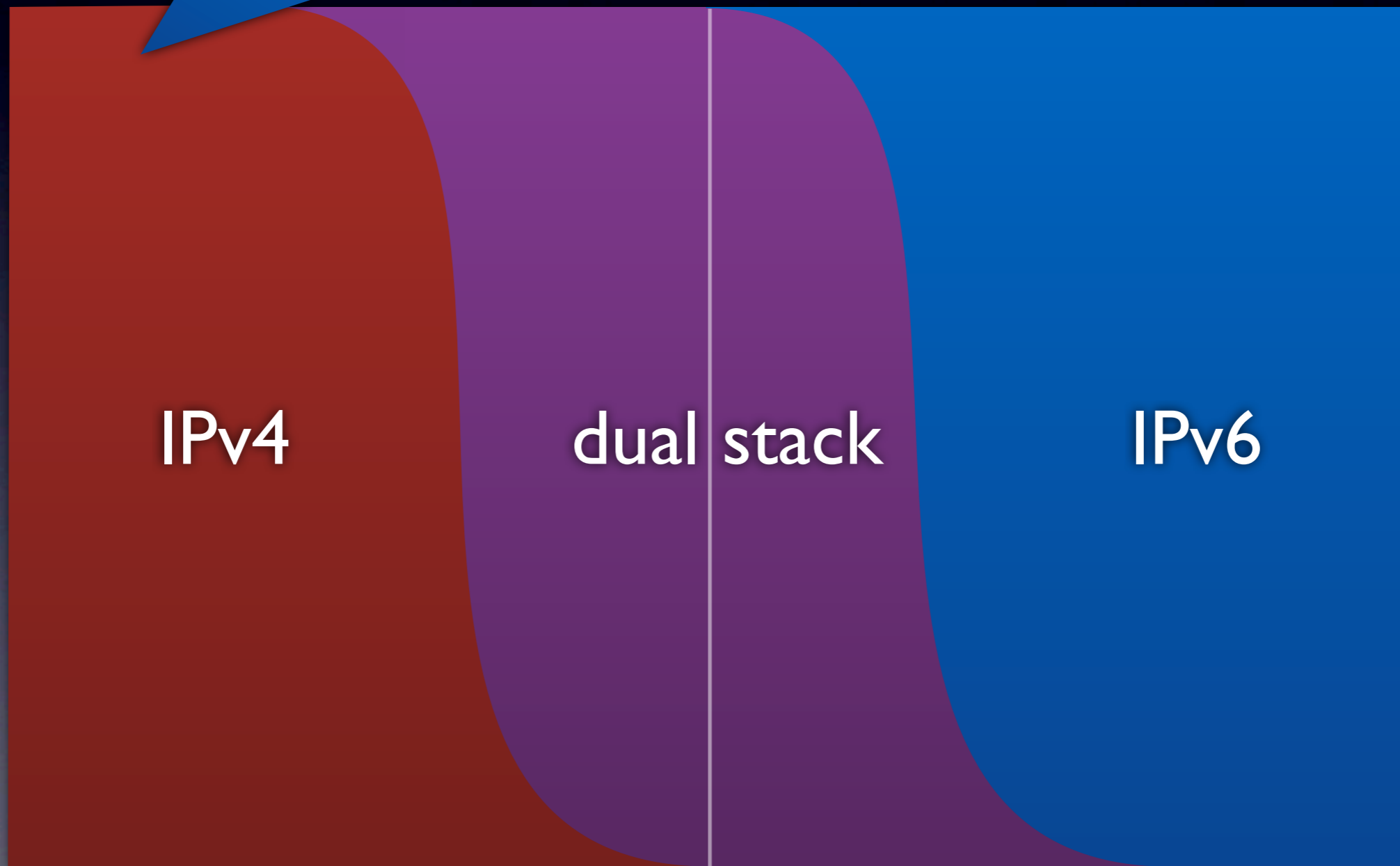
Iljitsch van Beijnum

# Transition technologies

- Brought to you by the Internet Engineering Task Force, inventors of IPv6:

    - tunnels

    - dual stack

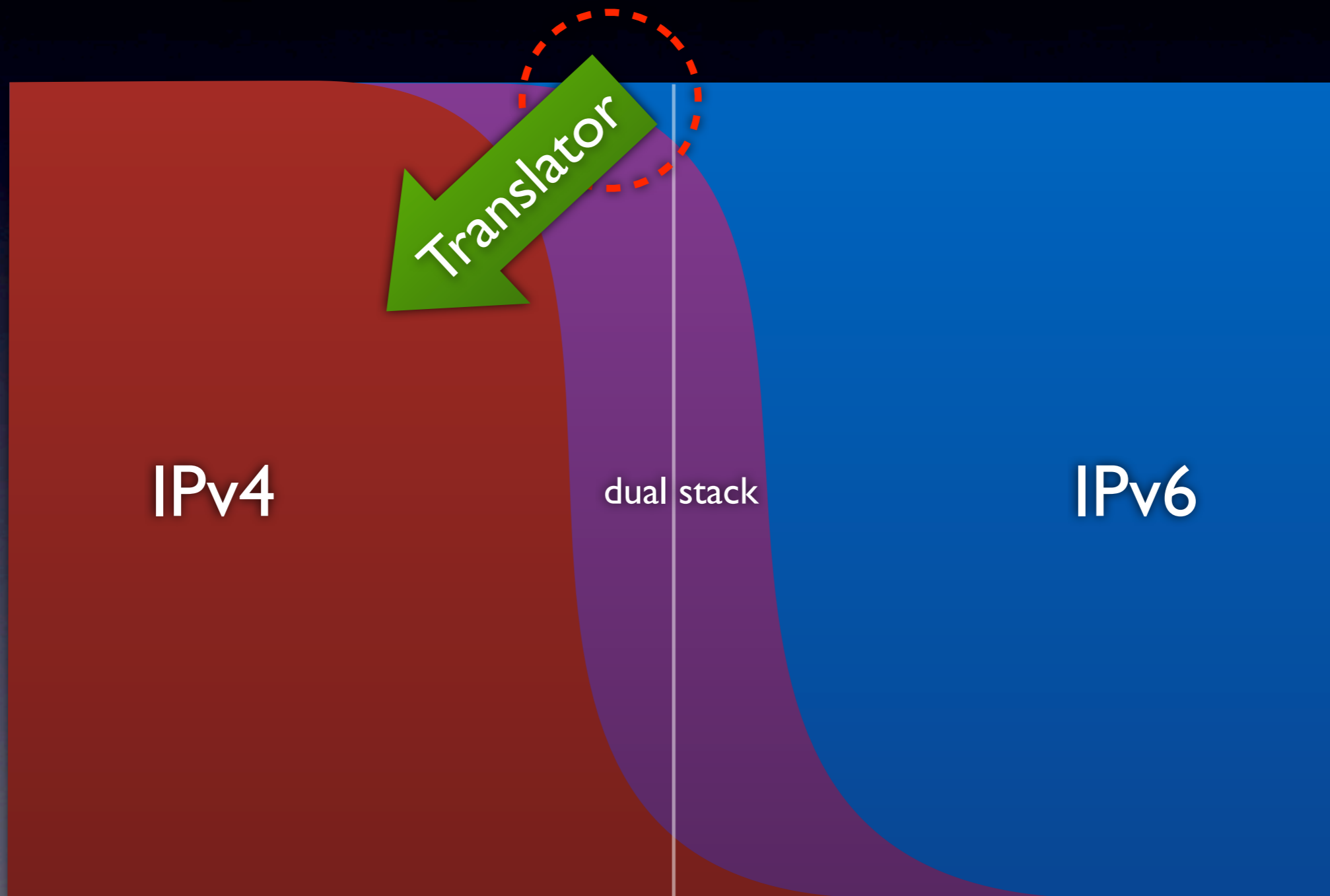    - translation

# Transition: dual stack

YOU ARE HERE

IPv4    dual stack    IPv6

# No time for dual stack

- The idea:
  - everyone adds IPv6
  - when everyone has v6, start removing v4
- Could have worked if we had started 10 years ago
- But we didn't, too late now

# Transition: translation

# RFC 2766: NAT-PT

- Network Address Translation - Protocol Translation

- Published in 2000

- In 2007 "deprecated" by the Internet Architecture Board

  - problems with DNS-ALG, other issues

  - also some searching for nails at low tide

# From the ashes: NAT64

- Around 2007/2008: interest in the IETF to revive NAT-PT in some form

- In 2009, work started in the IETF BEHAVE working group:

  - stateless NAT64

  - stateful NAT64 + DNS64

  - FTP64

# Terminology

- NAT XY: a box that translates from X to Y

- NAT XYZ: a box that translates from X to Y + a box that translates from Y to Z

- NAT44: from IPv4 to IPv4

- NAT444: from v4 to v4 (in your house), then again from v4 to v4 (in ISP network)

# State

- State: stuff you need to remember

  - (we don't like that)

- Stateless NAT64: one IPv6 address = one IPv4 address

  - uses too many IPv4 addresses!

- Stateful NAT64: many IPv6 users, one IPv4 address

# NAT64 vs NAT46

- NAT64: from IPv6 clients to IPv4 servers
- NAT46: from IPv4 clients to IPv6 servers
  - (doesn't exist today as far as I know)

# So how does it work?

# DNS64

- Regular DNS server:

  - Q: IPv6 address of example.com?

  - A: doesn't exist

- DNS64:

  - Q: IPv6 address of example.com?

  - A: Pref64 + IPv4 address

# DNS64 (2)

- Pref64: a *prefix* that points to the NAT64 translator

    - often: 64:FF9B::/96

    - so 192.0.2.31 becomes 64:ff9b::c000:21f

# The NAT64 translator

- The Pref64 is routed to the translator

- So packets for 64:ff9b::c000:21f go to the NAT64 translator

- NAT64 translates IPv6 to IPv4

  - 64:ff9b::c000:21f → 192.0.2.31

- NAT64 applies <u>standard</u> IPv4 NAT

# Limitations

- Only works
  - *from* IPv6 <u>clients</u>
  - *to* IPv4 <u>servers</u>
- Application must be IPv6-compatible
  - (so Skype is out!)
- Doesn't work with literal IPv4 addresses

# Competition: DS-Lite

- ISP (or corporate network) still runs IPv6 network + big NAT box

- But end-users send IPv4 packets that are *tunneled* over IPv6, then translated

- So compatible with IPv4-only devices/applications

# Thanks for listening!

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