

Computer Networks

IP Version 6 (§5.6.3)



David Wetherall (djw@uw.edu)

Professor of Computer Science & Engineering

UNIVERSITY *of* WASHINGTON

Topic

- IP version 6, the future of IPv4 that is now (still) being deployed

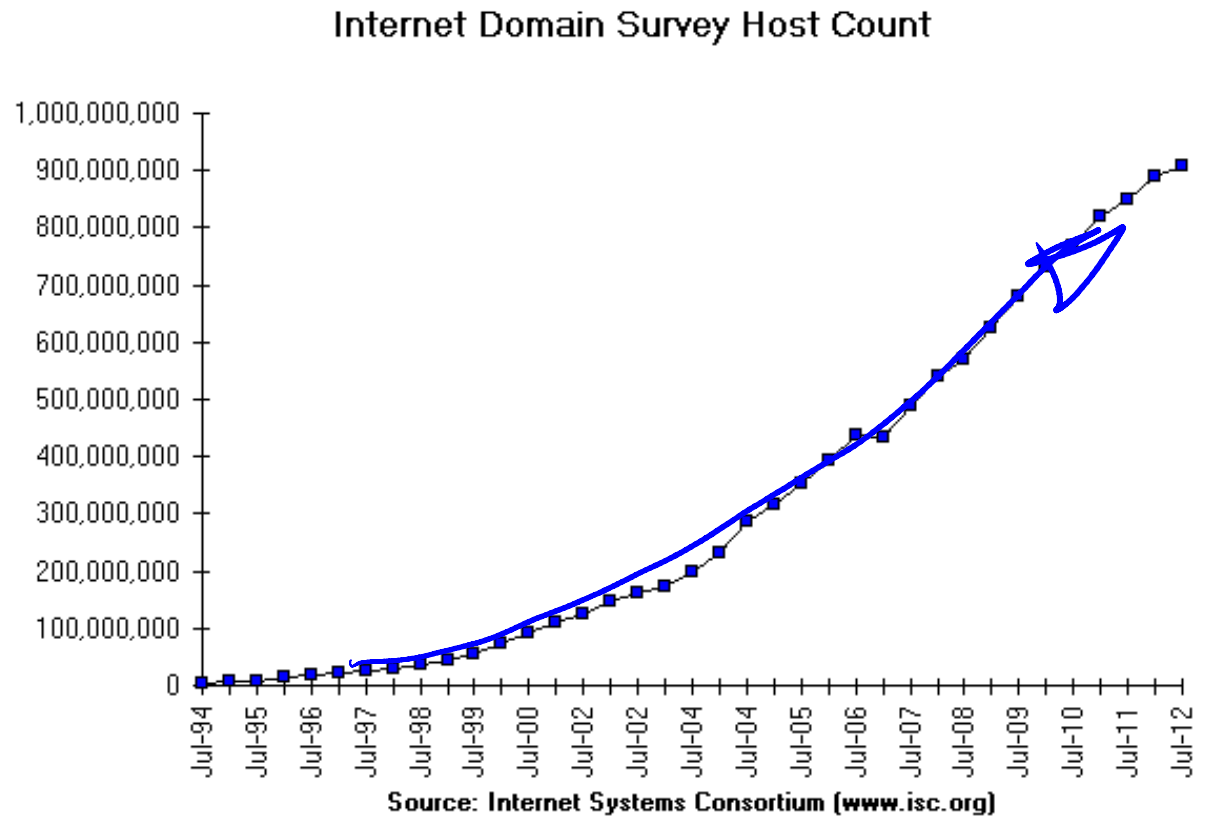


Why do I want IPv6 again?

Internet Growth

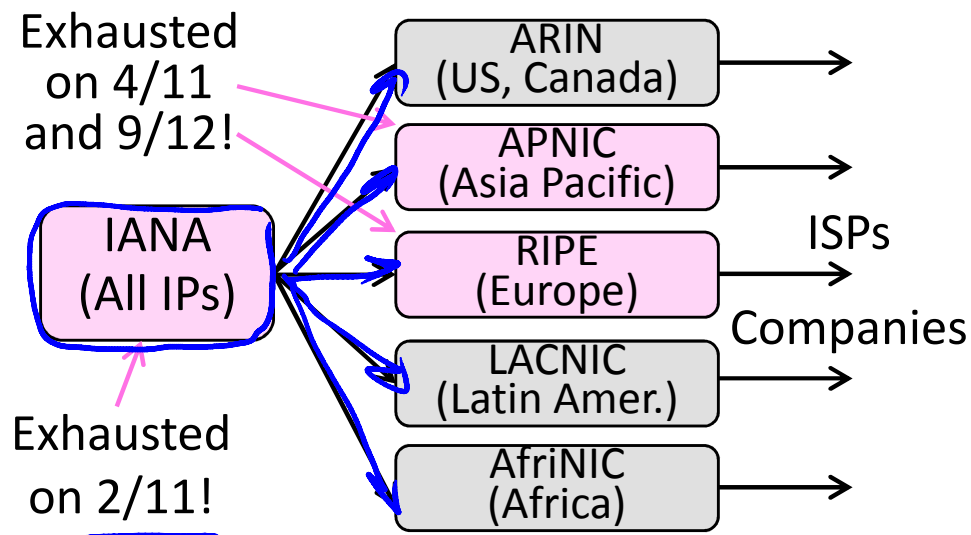
- At least a billion Internet hosts and growing ...
- And we're using 32-bit addresses!

$2^{32} \sim 4B$



The End of New IPv4 Addresses

- Now running on leftover blocks held by the regional registries; much tighter allocation policies



End of the world ? 12/21/12?

IP Version 6 to the Rescue

- Effort started by the IETF in 1994
 - Much larger addresses (128 bits)
 - Many **sundry** improvements
- Became an IETF standard in 1998
 - Nothing much happened for a decade
 - Hampered by deployment issues, and a lack of adoption incentives
 - Big push ~2011 as exhaustion looms

IPv6 Deployment

Percentage of users accessing Google via IPv6

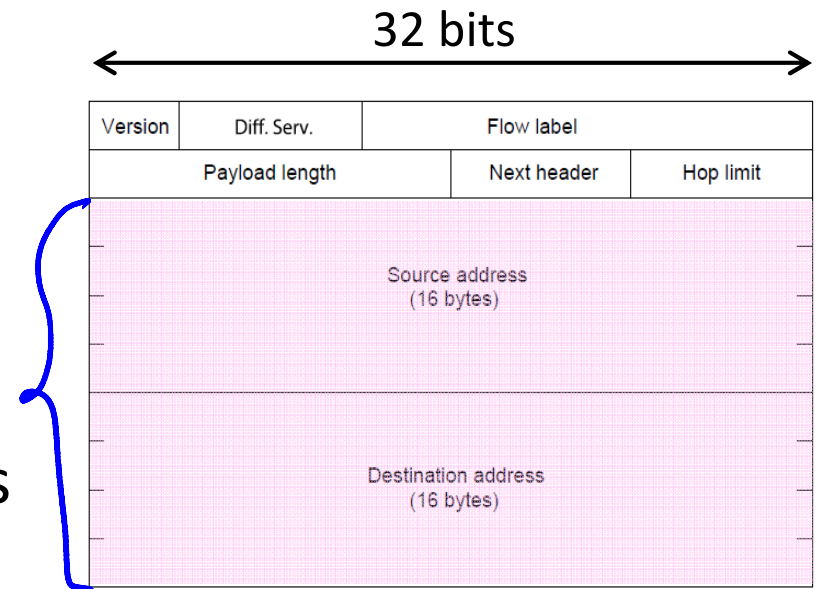


Time for growth!



IPv6

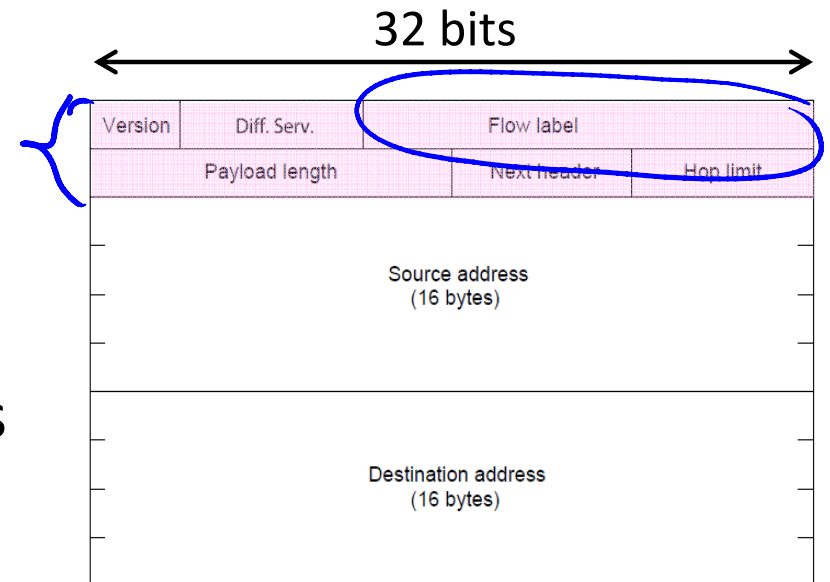
- Features large addresses
 - 128 bits, most of header
- New notation
 - 8 groups of 4 hex digits (16 bits)
 - Omit **leading zeros**, groups of zeros



Ex: ~~2001:0db8:0000:0000:0000:ff00:0042:8329~~
→ 2001:db8::ff00:42:8329

IPv6 (2)

- Lots of other, smaller changes
 - Streamlined header processing
 - Flow label to group of packets
 - Better fit with “advanced” features (mobility, multicasting, security)

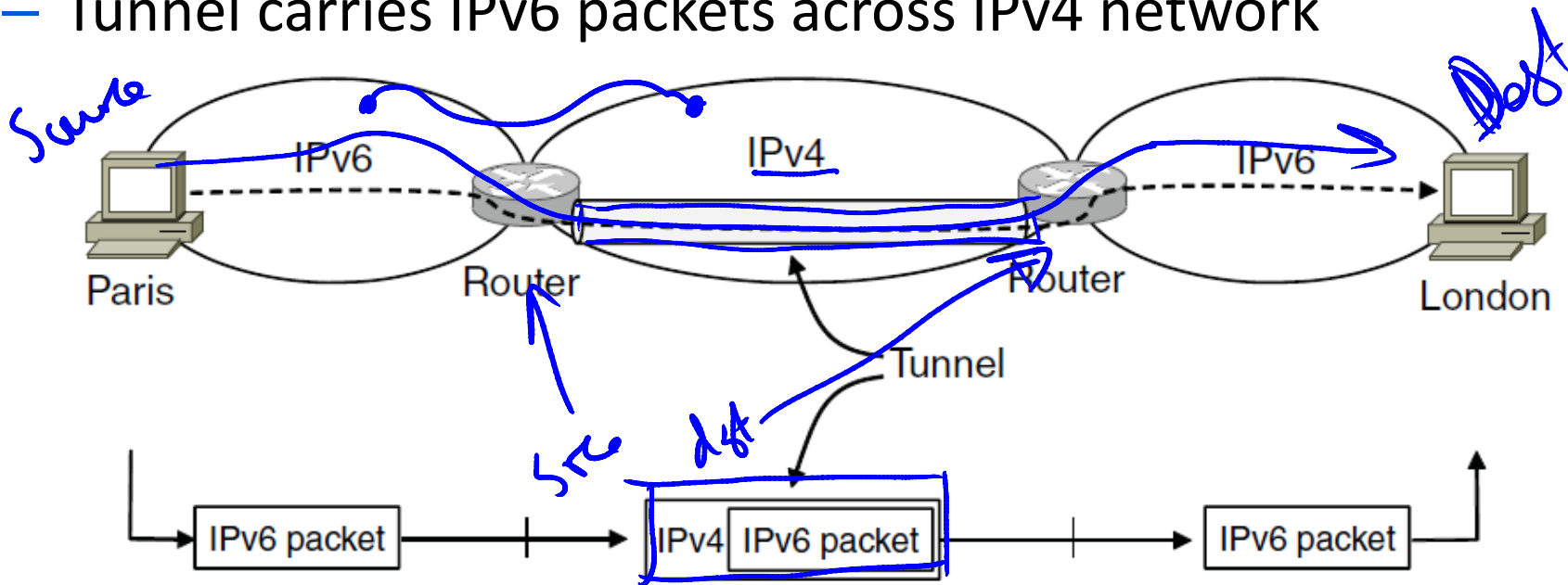


IPv6 Transition

- The Big Problem:
 - How to deploy IPv6?
 - Fundamentally incompatible with IPv4
- Dozens of approaches proposed
 - Dual stack (speak IPv4 and IPv6)
 - Translators (convert packets)
 - Tunnels (carry IPv6 over IPv4) »

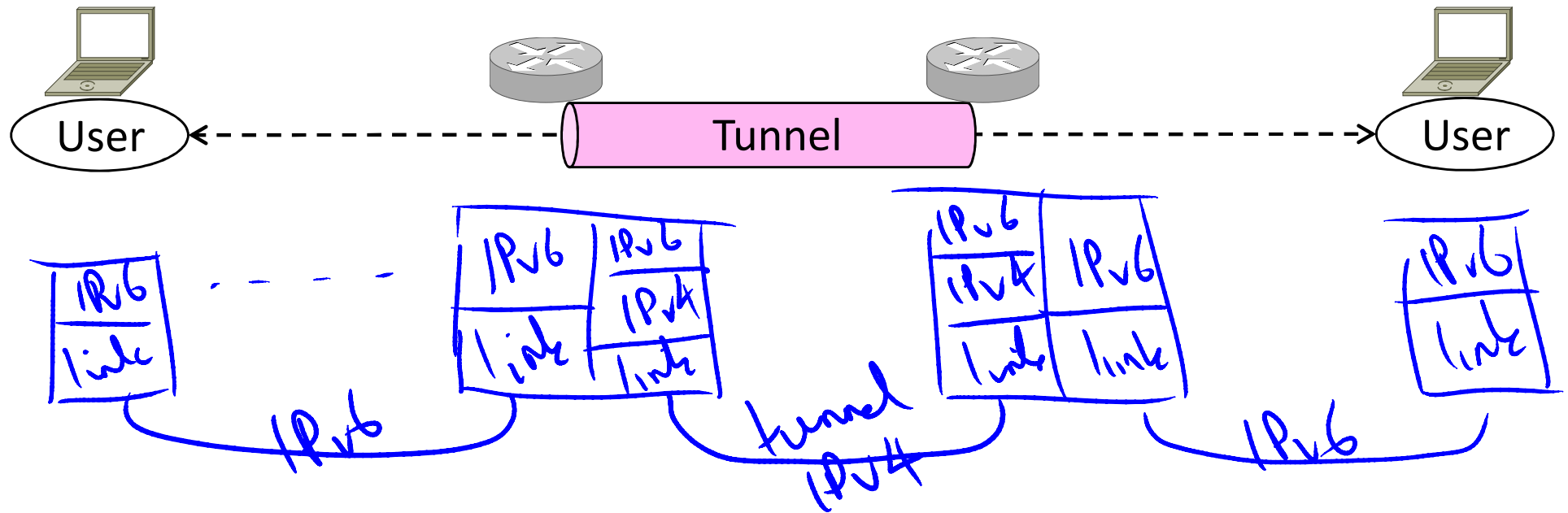
Tunneling

- Native IPv6 islands connected via IPv4
 - Tunnel carries IPv6 packets across IPv4 network



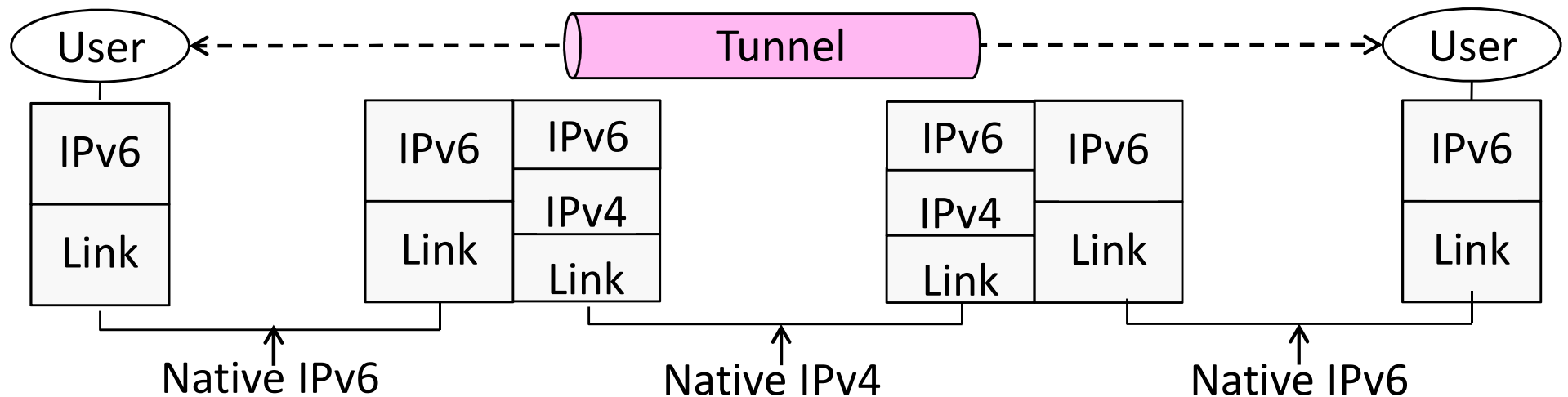
Tunneling (2)

- Tunnel acts as a single link across IPv4 network



Tunneling (3)

- Tunnel acts as a single link across IPv4 network
 - Difficulty is to set up tunnel endpoints and routing



END

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