IPv6

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What is IPv6?

1. Current version of IP is version 4.
2. IPv6 is an evolution of IPv4.
3. Not backwards or forwards compatible.

Why start again?

- Simply not enough addresses.
- Try to clear out baggage.
- Internet usage has changed a lot.

Still, IPv4 worked fairly well.

Major changes

- Bigger addresses.
- Better extensibility.
- Built in autoconfig.
- Mandatory IPsec.
- More integrated multicast.

Addresses

IPv4 addresses: 32 bit `134.226.81.11` IPv6 addresses:

- 128 bit addresses `340282366920938463463374607431768211456`,
- Written in 8 hex quads,
- Several shortcuts allowed.

Examples

- 2001:0770:0010:0300:0000:0000:86e2:510b
- 2001:770:10:300:0:0:86e2:510b
- 2001:770:10:300::86e2:510b
- 2001:770:10:300::134.226.81.11

Special Addresses

::	Unspec
::1	localhost
fe80:: block	link-local
fec0:: block	site-local
ff00:: block	multicast

IPv4 Header

Version 4 bit	Head Len 4 bit	ToS 8 bit	Total Length 16 bit	
ID 16 bit			Flags 3 bit	Frag Offset 13 bit
Time to Live 8 bit		Protocol 8 bit	Header Checksum 16 bit	
Source Address (32 bit)				
Destination Address (32 bit)				
Options — *variable*				

IPv6 header

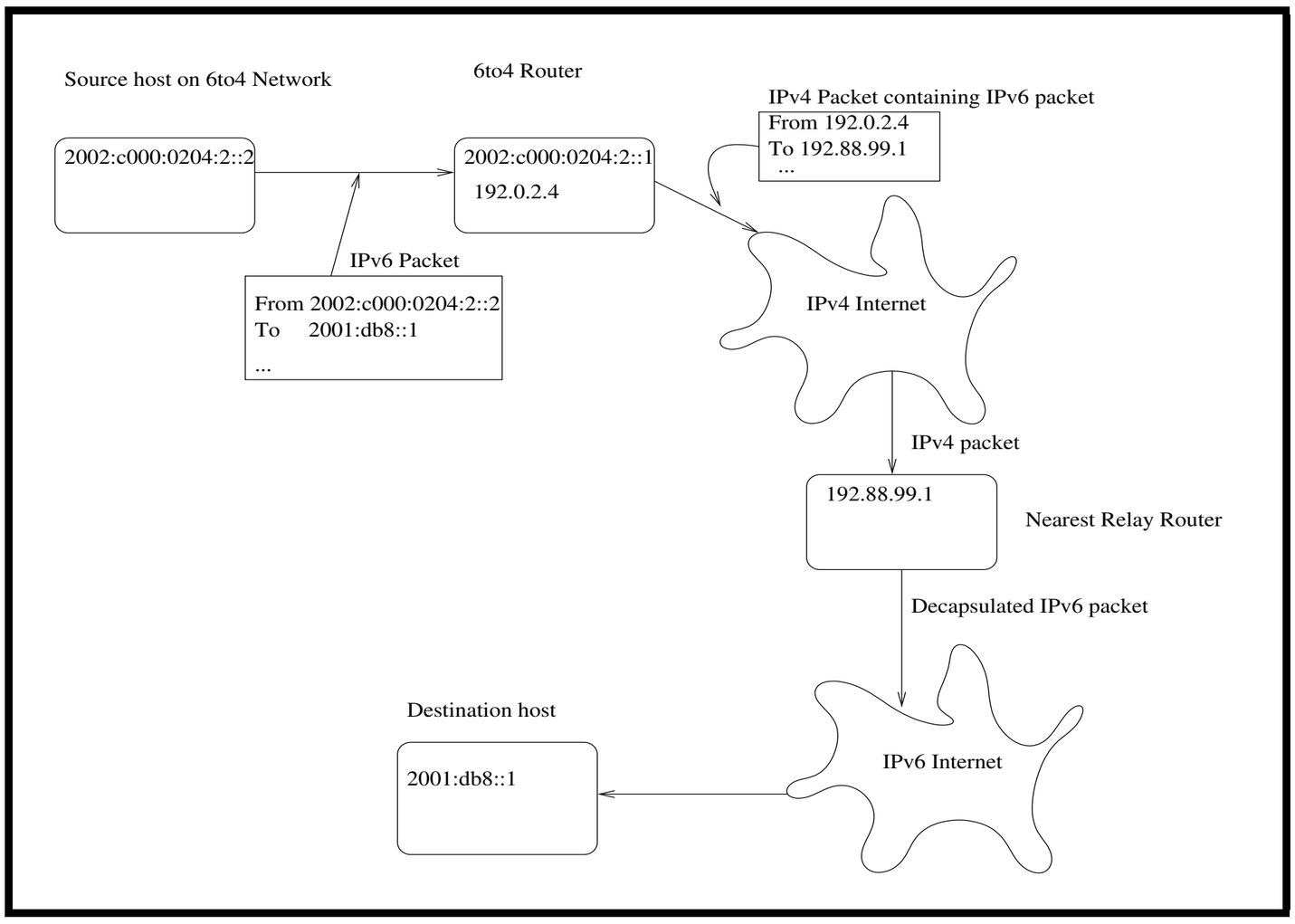
Version 4 bit	Traffic Class 8 bit	Flow Label 20 bit
Payload Length 16 bit	Next Header 8 bit	Hop Limit 8 bit
Source Address 128 bit		
Destination Address 128 bit		

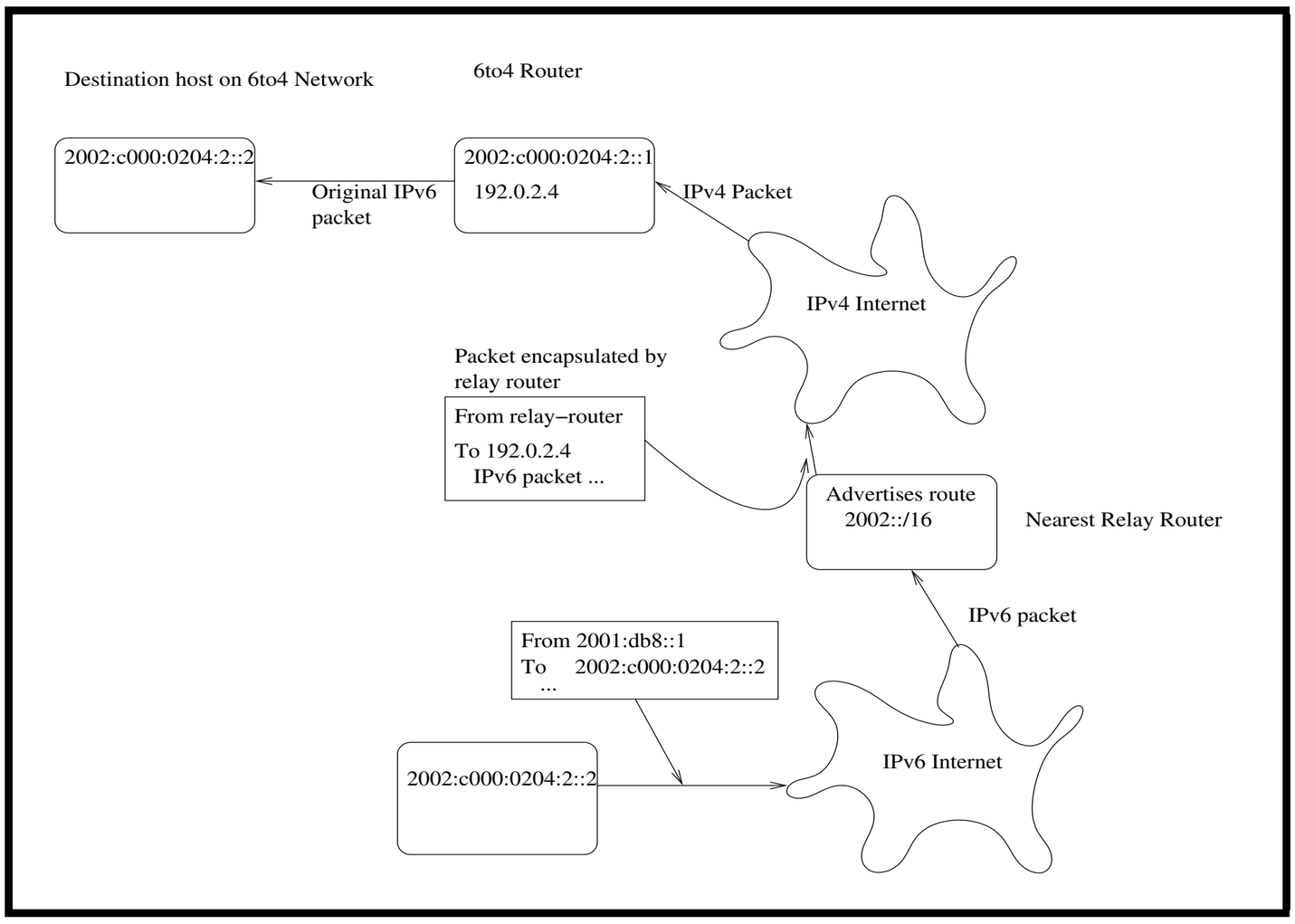
What's in it for HPC?

- No more scrounging addresses for clusters.
- Simplified headers.
- Really big packets.
- End-to-end addressing.
- End-to-end auth and privacy.

Getting connected

- HEAnet from Japan to doorstep.
- TCD/DIAS native, DIT/WIT via tunnels.
- Most all platforms have support.
- Connecting at home also possible.


Source host on 6to4 Network
6to4 Router
IPv4 Packet containing IPv6 packet
From 192.0.2.4
To 192.88.99.1
...
2002:c000:0204:2::2
2002:c000:0204:2::1
192.0.2.4
IPv6 Packet
From 2002:c000:0204:2::2
To 2001:db8::1
...
IPv4 Internet
IPv4 packet
192.88.99.1
Nearest Relay Router
Decapsulated IPv6 packet
Destination host
2001:db8::1
IPv6 Internet


Destination host on 6to4 Network
6to4 Router
2002:c000:0204:2::2
Original IPv6 packet
2002:c000:0204:2::1
192.0.2.4
IPv4 Packet
IPv4 Internet
Packet encapsulated by relay router
From relay−router
To 192.0.2.4
IPv6 packet ...
Advertises route
2002::/16
Nearest Relay Router
IPv6 packet
From 2001:db8::1
To 2002:c000:0204:2::2
...
IPv6 Internet
2002:c000:0204:2::2