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IPv6 Security: Oxymoron or Oxycodone?

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So many new security issues with IPv6!

Or are there…

IPv6 Security issues

- Same problem, different name
- A few myths & misconceptions
- Actual new issues
- FUD (Fear Uncertainty & Doubt)

Round up the usual suspects!

Remember these?

- ARP cache poisoning
- P2p ping pong attacks
- Rogue DHCP

ARP cache poisoning

- Bad guy broadcasts fake ARP
- Hosts on subnet put bad entry in ARP Cache
- Result: MiM or DOS

Ping pong attack

- P2P link with subnet > /31
- Bad buy sends packet for addr in subnet but not one of two routers
- Result: Link clogs with routers sending packet back and forth

Rogue DHCP

- Client broadcasts DHCP request
- Bad guy sends DHCP offer w/his “bad” router as default GW
- Client now sends all traffic to bad GW
- Result: MiM or DOS

Look similar?

- **Neighbor cache corruption**
- **P2p ping pong attacks**
- **Rogue DHCP + rogue RA**

Solutions?

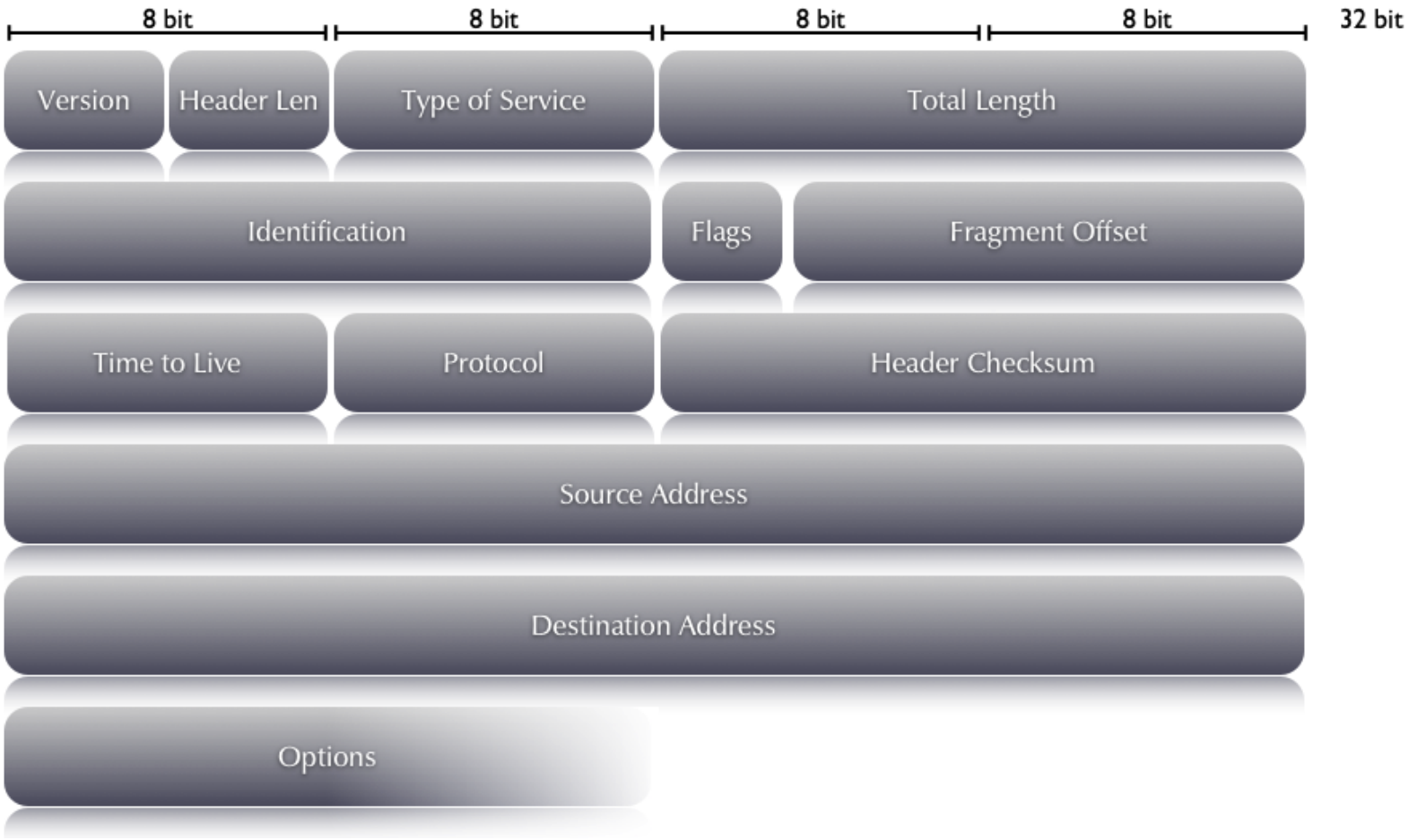
- Lock down local wire
- /127s for p2p links (RFC 6164)
- RA Guard (RFC 6105)

And now for something completely different!

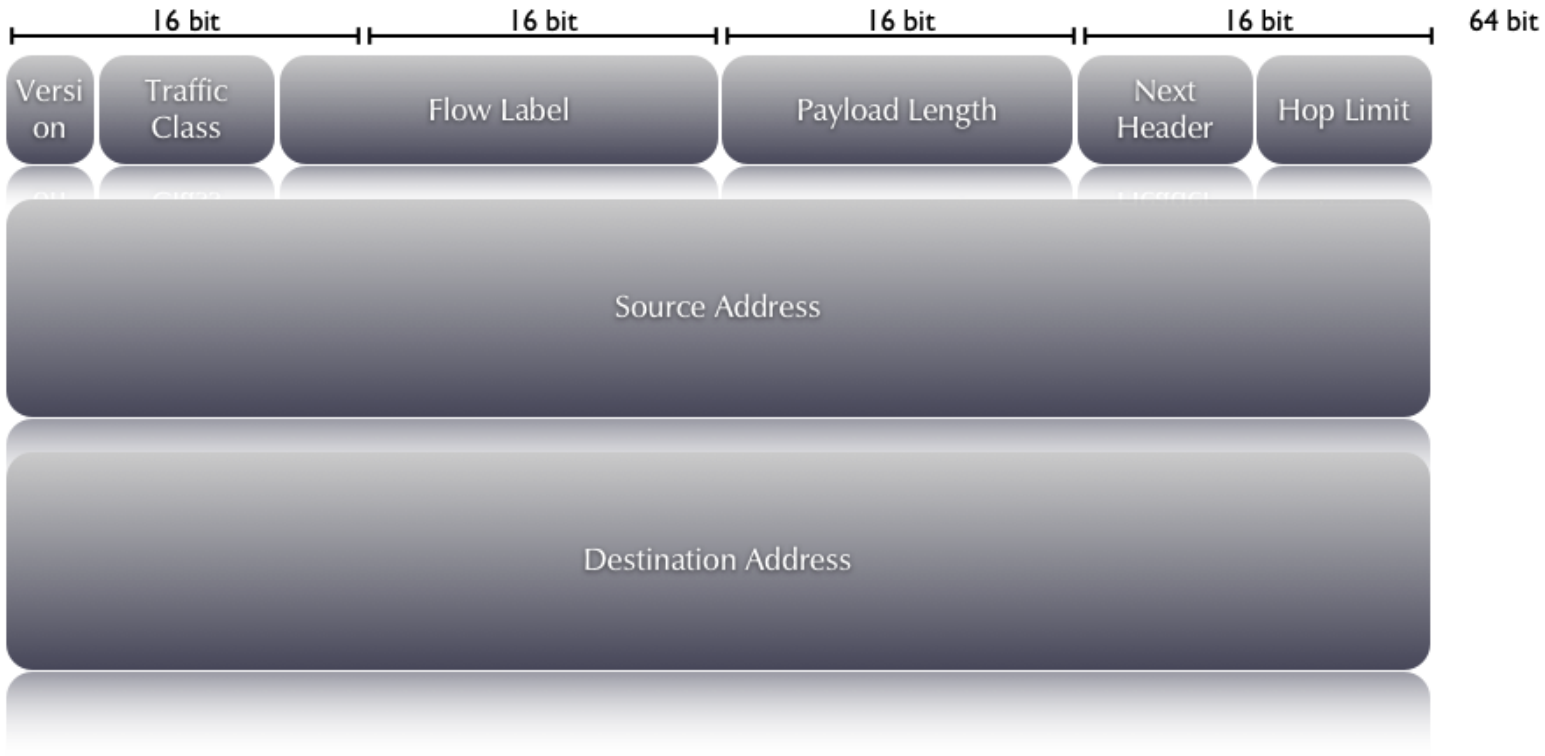
So what *is* new?

- Extension header chains
- Packet/Header fragmentation
- Predictable fragment headers
- Atomic fragments
- Tunnels

The IPv4 Packet



The IPv6 Packet



Fragmentation

- Minimum 1280 bytes
- Only source host can fragment
- Destination must get all fragments
- What happens if someone plays with fragments?

IPv6 Extension Header Chains

- No limit on length
- Deep packet inspection bogs down
- Confuses stateless firewalls
- Fragments a problem
- See RFC 7112

Predictable Fragments

- Fragment Header ID field
- No requirement other than “unique”
- Some implementations predictable
- draft-gont-6man-predictable-fragment-id

Results of predicting ID

- Determine the packet rate
- Perform stealth port scans
- Uncover the rules of a number of firewalls
- Count the # of systems behind a middle-box
- Perform a Denial of Service (DoS) attack

Atomic Fragments

- Packet w/Fragment Header but not fragmented
- Usually forced by forged “Packet too big” msg
- Fragments can overlap
- Results: various fragmentation attacks possible
- See RFC 6946

Tunnels

- ACLs catch port/IP/protocol
- Some IPv6 tunnels don’t use standard port/IP/protocol
- Signatures

Reality

- **Most of these attacks are complicated**
- **Most attackers are lazy and will find easier vectors of attack**
- **But, there are toolsets out there:**
  - http://www.si6networks.com/tools/ipv6toolkit
- **Beat on your vendors!**

You're already running IPv6…

“I’m not using IPv6”

- **Are you running:**
  - Windows 8, Server 2012, Vista or newer
  - Windows clustering
  - Mac OSX
  - Any modern LINUX or FreeBSD

Guess again

Congratulations,
you're running IPv6

Get used to it…

- Test now
- Train your staff
- Beat on your vendors
- Monitor it, don’t try to disable it

But everybody says…

IPSEC: the myth

IPSEC in IPv6 is better than IPv4 because it was designed in and mandated.

IPSEC: the reality

- RFCs said “MUST” support IPSEC (but softening to “SHOULD”…)
- Didn’t define “support”, let vendors do it
- Vendors shipped, didn’t enable
- No PKI…

IPv6 is *HUGE!*

- **So big you can't scan it…**
- **Unless you don't really use it…**

Use the space we have

- Give the whole /64 to DHCP pools
- Randomize address assignments across the whole /64
- Avoid EUI-64 (draft-gont-6man-deprecate-eui64-based-addresses)

It’s the end of the world as we know it!

IPv6 will destroy the Internet!

- Apps will break
- Firewalls won't work
- ICMP is scary
- We don't understand it so it must be insecure

Apps

- Yes, you will need to test and possibly rewrite all your code
- You need to reach everyone, including mobile devices
- Most bad ideas also in IPv4 code

If it was wrong in IPv4…

- Hard coding IP addresses
- Not checking inputs/sizes
- Using relative DNS labels
- No longer have source
- Not tested since Y2K

Where to read more

- **RIPE presentation:**
  - https://ripe66.ripe.net/presentations/134-Making_an_application_fully_IPv6_compliant_(2).pdf

Firewalls won't work

- **What do you do if your gear doesn't meet your needs?**
  - Beat on your vendors until it does…
  - But you need to know what to ask for

ICMP is scary, turn it off!

- ICMPv4 wasn't that scary…
- ICMPv6 is much more tightly defined
- Read RFC 4890

We don’t understand it, so…

- If someone is telling you that IPv6 is evil incarnate, it’s because:
  - They are a vendor that doesn’t support IPv6 but their competitors do
  - They are trying to sell you a security product

Test!!!

Know what you need

- **And ask for it!**
- **Hold vendors to IPv6 support**
- **Use the USGv6 standard:**
  - **http://www-x.antd.nist.gov/usgv6**

Q & A

Thank you!