

ILNP – Identifier Locator Network Protocol

FreeBSD 14.0 demo

Saleem Bhatti <saleem@st-andrews.ac.uk>

<https://ilnp.cs.st-andrews.ac.uk/>

School of Computer Science, University of St Andrews

ILNP – The story so far ...

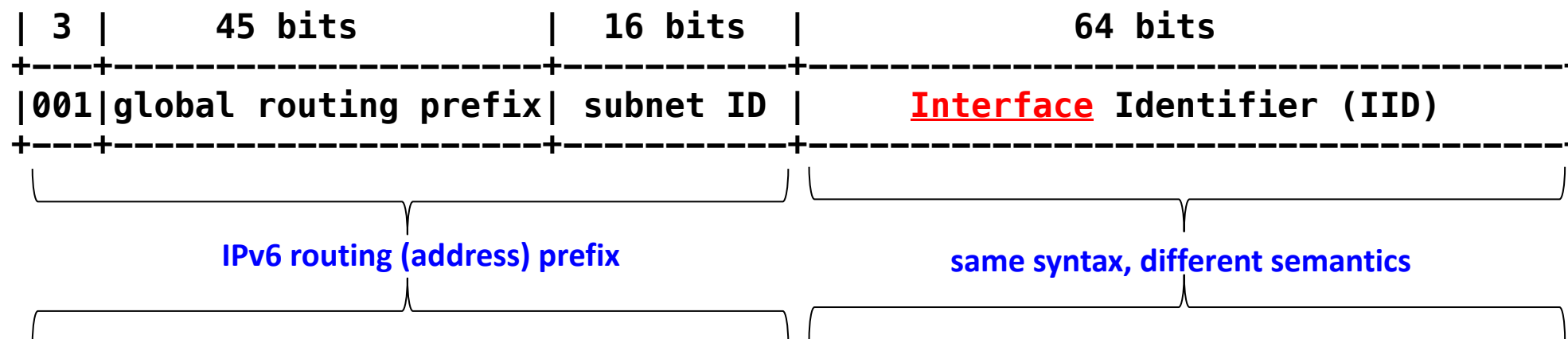
- RFCs 6740 – 6748 (Experimental)
- Ongoing research and development:
 - University of St Andrews
- IETF104/Prague – Linux 4.9 kernel
- **IETF118/Prague – FreeBSD 14.0 kernel**

IETF118/Prague

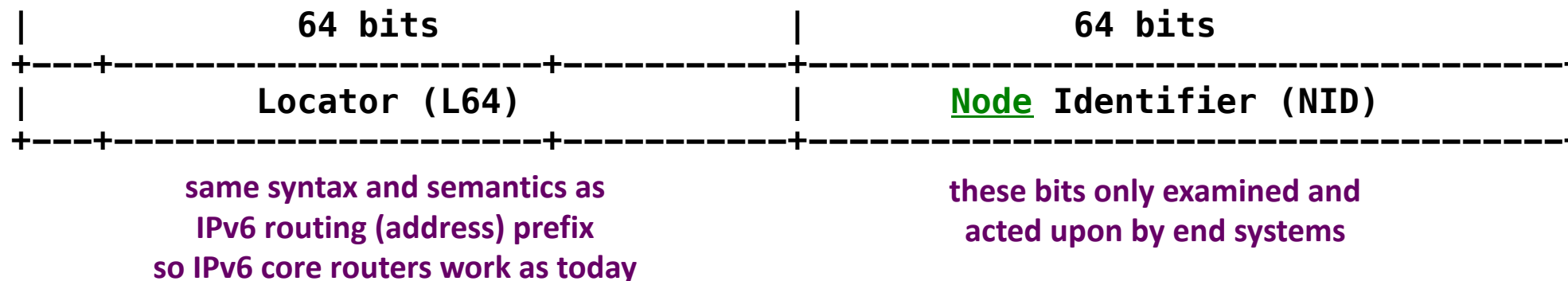
- Team:
 - Gregor Haywood (BSD dev, remote)
 - Ryo Yanagida (Demo, Prague)
 - Saleem Bhatti (Project lead, Prague)

ILNP addressing changes

IPv6 (RFC8200(S)) – general IPv6 global address format:

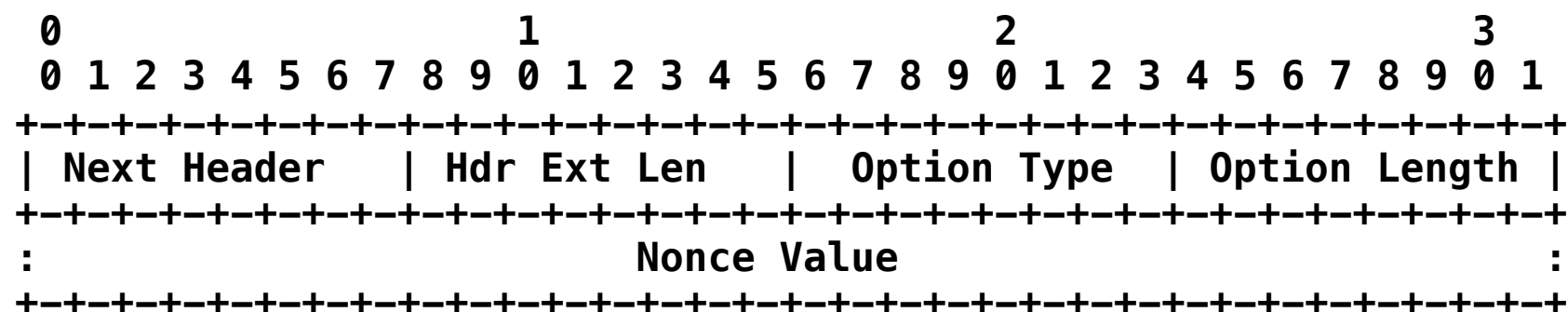


ILNP (RFC6741(E)) – Identifier Locator Vector (I-LV):



ILNP Nonce Extension Header

IPv6 Destination Options header (RFC6744(E)):



Option Type = 0x8B / 139

Hdr Ext Len = 4 or 16

Option Length = 4 or 6

Nonce Value = 4 or 6 byte value (ala RFC4086(BCP)), to prevent off-path attacks.

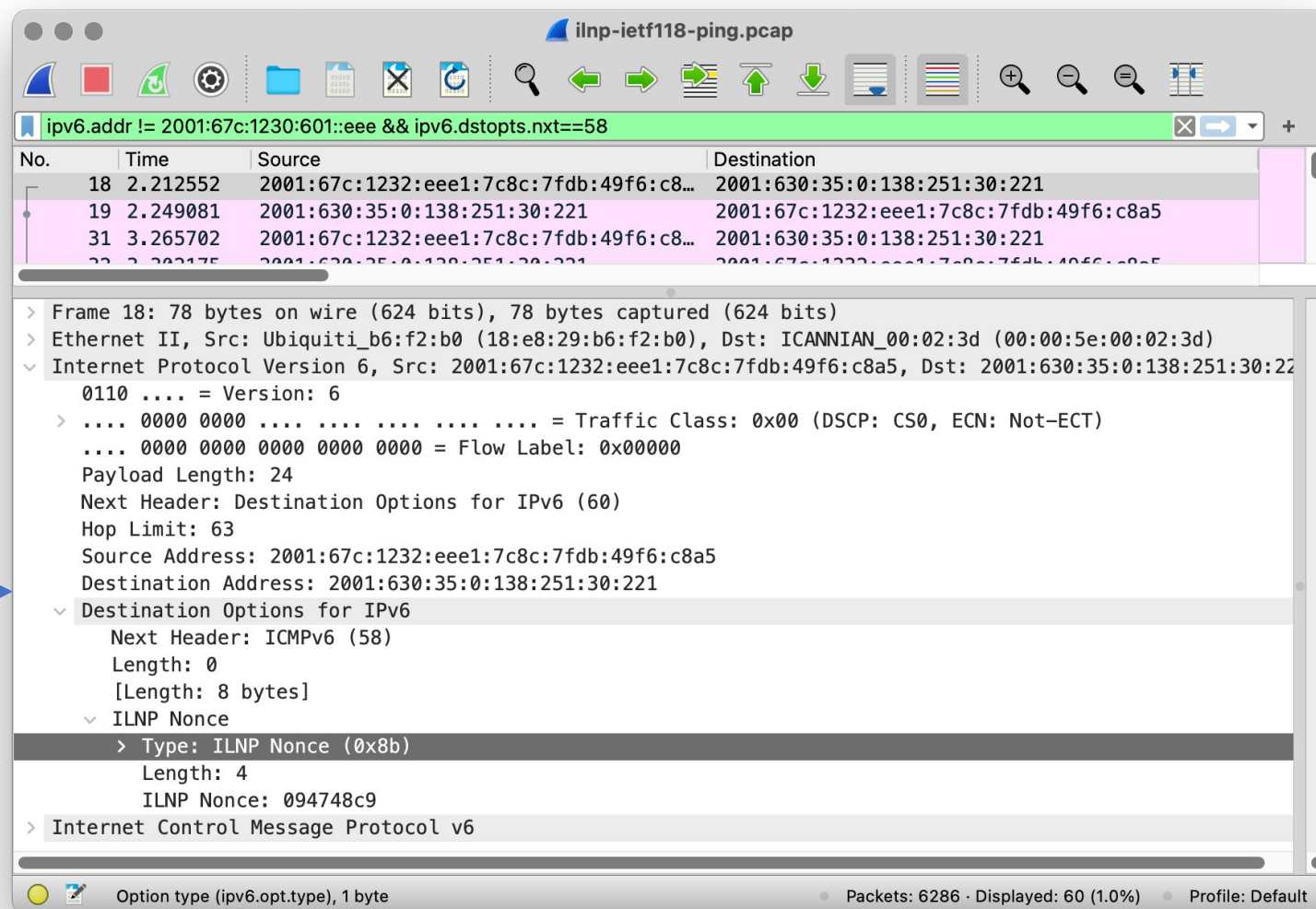
Experiment

1. ILNP addressing architecture (RFC6741(E)).
 2. ILNP IPv6 Destination Option (RFC6744(E)).
 3. **Ephemeral node identifiers (NIDs):**
 - for privacy (internet-draft in progress ...)
- **Test basic end-to-end connectivity with ILNP:**
 - *ping, rsync, ssh* (using 1., 2. and 3. above).
 - IPv6 binaries (not modified for ILNP).
 - ietf118-server-ilnp (University of St Andrews, Scotland).
 - ietf118-client-alice (IETF118, Prague).

Results (Hackathon, 05 Nov 2023)

- *ping* 😊
- *rsync* 😊
- *ssh* 😊
- Ephemeral (NIDs) 😊

from first-hop router



ilnp-ietf118-ping.pcap

Filter: ipv6.addr != 2001:67c:1230:601::eee && ipv6.dstopts.nxt==58

No.	Time	Source	Destination
18	2.212552	2001:67c:1232:eee1:7c8c:7fdb:49f6:c8...	2001:630:35:0:138:251:30:221
19	2.249081	2001:630:35:0:138:251:30:221	2001:67c:1232:eee1:7c8c:7fdb:49f6:c8a5
31	3.265702	2001:67c:1232:eee1:7c8c:7fdb:49f6:c8...	2001:630:35:0:138:251:30:221

Frame 18: 78 bytes on wire (624 bits), 78 bytes captured (624 bits)

- Ethernet II, Src: Ubiquiti_b6:f2:b0 (18:e8:29:b6:f2:b0), Dst: ICANNIAN_00:02:3d (00:00:5e:00:02:3d)
- Internet Protocol Version 6, Src: 2001:67c:1232:eee1:7c8c:7fdb:49f6:c8a5, Dst: 2001:630:35:0:138:251:30:221
 - 0110 = Version: 6
 - 0000 0000 = Traffic Class: 0x00 (DSCP: CS0, ECN: Not-ECT)
 - 0000 0000 0000 0000 0000 = Flow Label: 0x00000
 - Payload Length: 24
 - Next Header: Destination Options for IPv6 (60)
 - Hop Limit: 63
 - Source Address: 2001:67c:1232:eee1:7c8c:7fdb:49f6:c8a5
 - Destination Address: 2001:630:35:0:138:251:30:221
 - Destination Options for IPv6
 - Next Header: ICMPv6 (58)
 - Length: 0
 - [Length: 8 bytes]
 - ILNP Nonce
 - Type: ILNP Nonce (0x8b)
 - Length: 4
 - ILNP Nonce: 094748c9
 - Internet Control Message Protocol v6

Option type (ipv6.opt.type), 1 byte

Packets: 6286 · Displayed: 60 (1.0%) · Profile: Default