

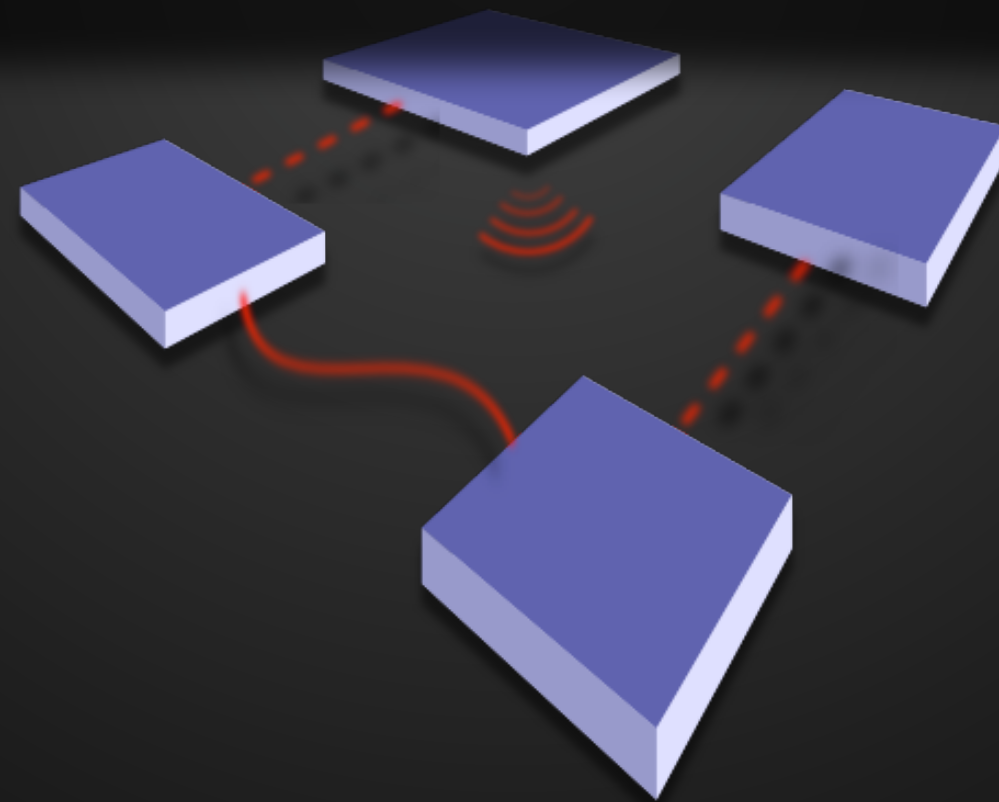
CS-435

spring semester 2025

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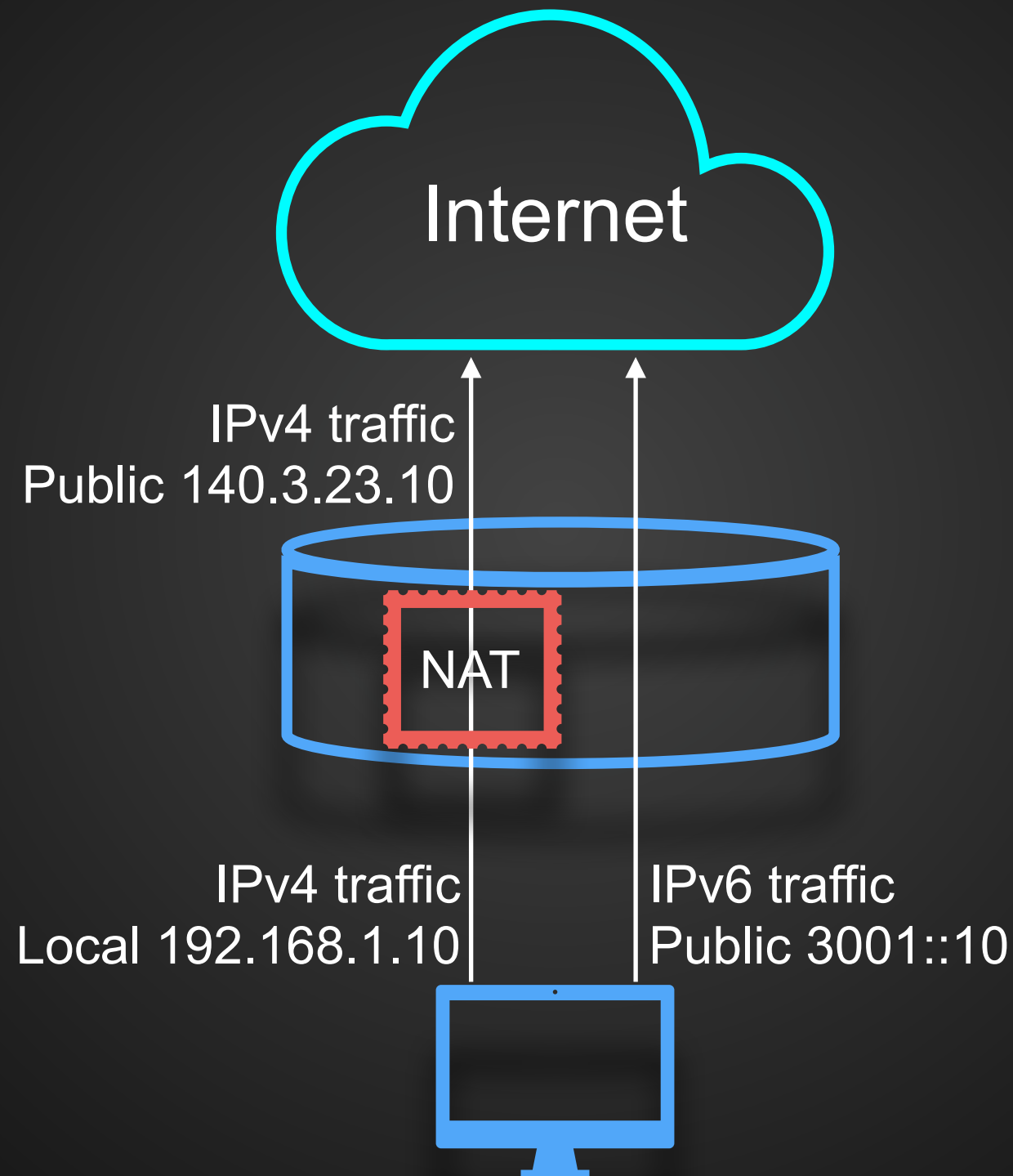


CS-435

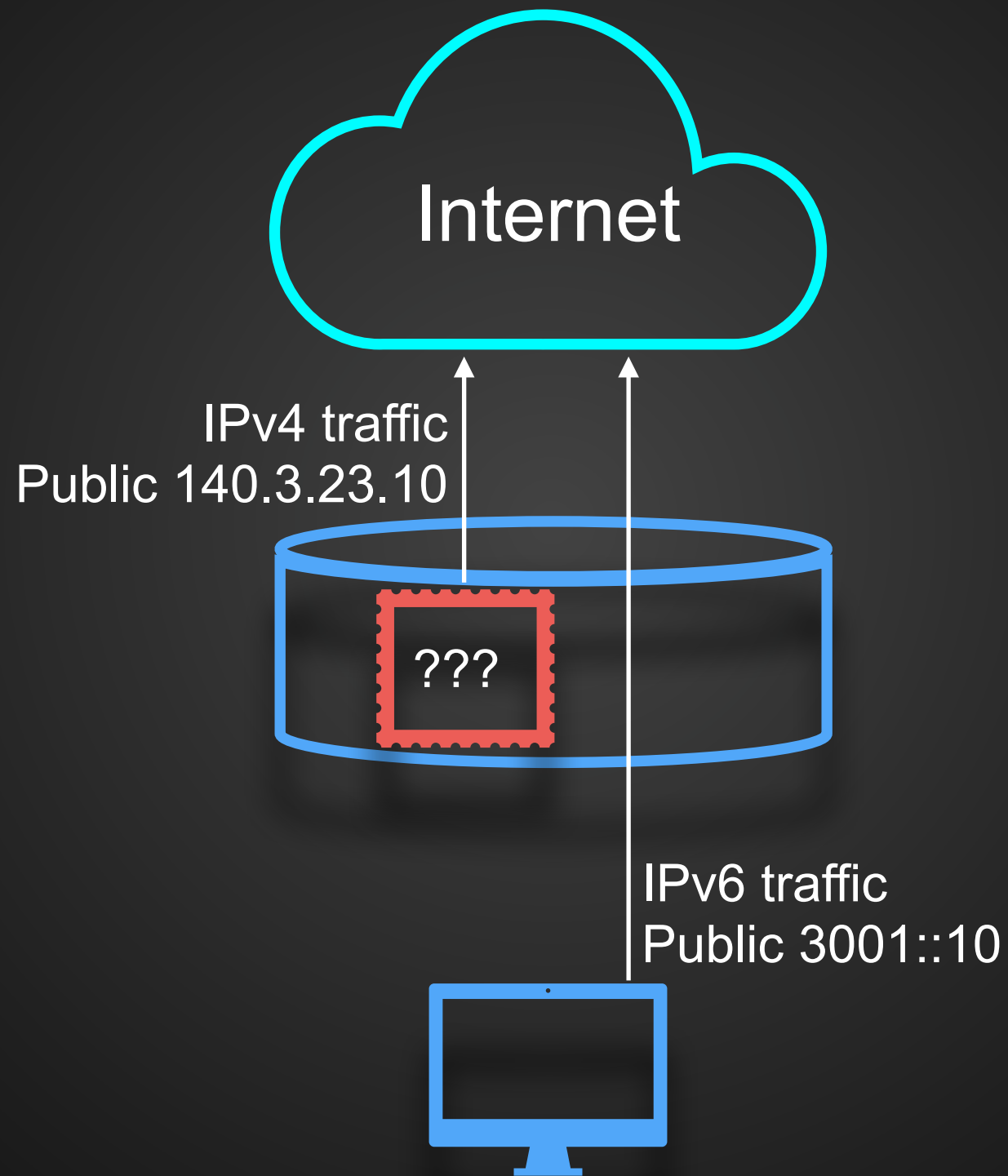
Lecture #15 preview

- IPv6 transition
- DNS64
- NAT64
- 6LoWPAN

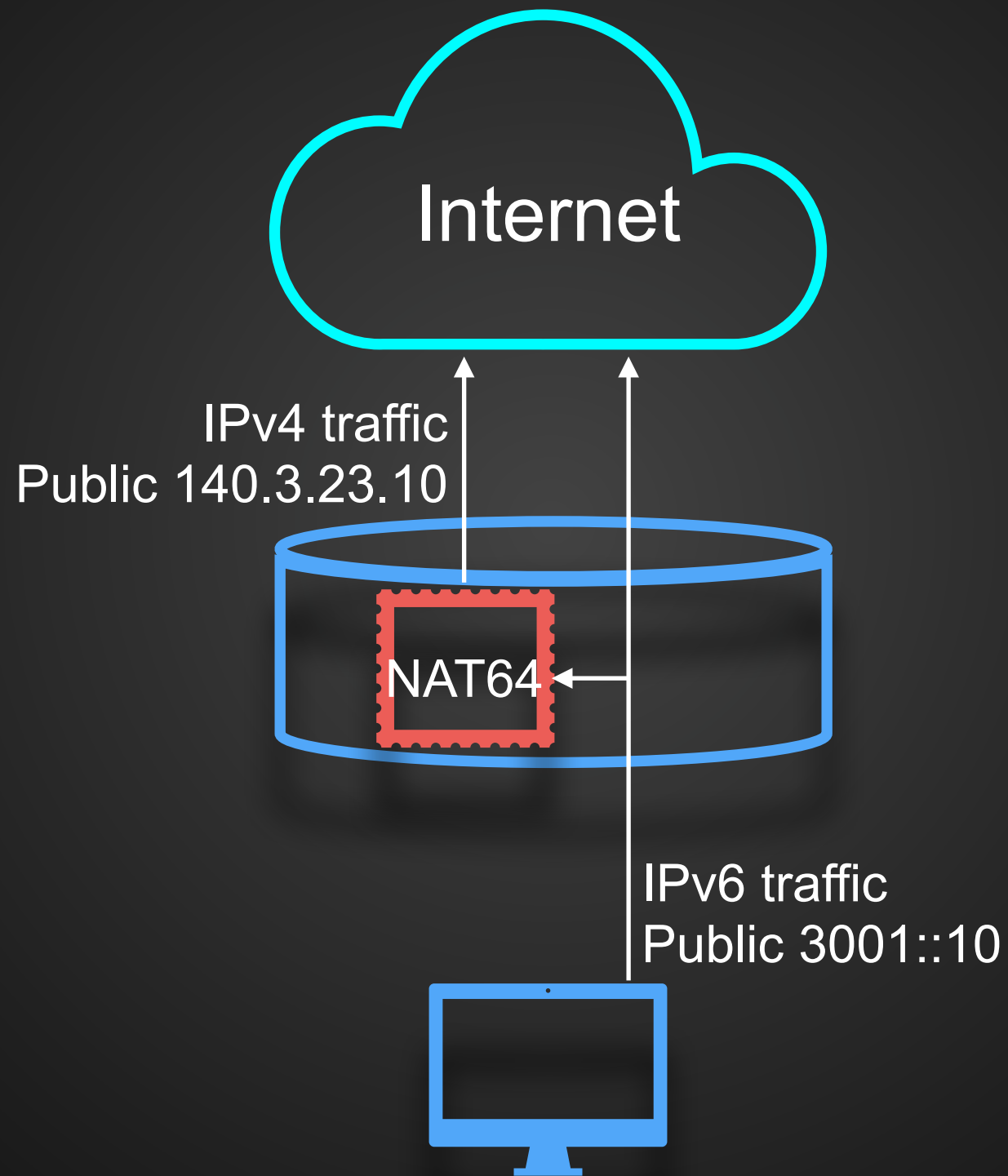
IPv6 + IPv4



IPv6-only



IPv6-only



DNS64

- AAAA vs A records
- Translate A records to AAAA records
 - append 64:ff9b::/96 prefix [RFC6052]

DNS64

- AAAA vs A records
- Translate A records to AAAA records
 - append 64:ff9b::/96 prefix [RFC6052]
- host uses IPv6
- NAT64 translates IPv6 back to IPv4

NAT64

- PLAT (Provider-side transLATor)
 - allows IPv6 hosts to communicate with IPv4 servers
- NAT64 server:
 - at least one IPv4 address endpoint
 - IPv6 network segment of 32-bits, e.g., 64:ff9b::/96.
- IPv6 client:
 - embeds the IPv4 address in IPv6 (using the 64:ff9b::/96 segment) and sends its packets to the resulting address
- NAT64 performs mapping between the resulting IPv6 and the embedded IPv4 address in order to communicate

IPv6-only problems

- assume that application or html code has IPv4 addresses (static) instead of URLs...
- oops!

IPv6-only solutions

- 464XLAT [RFC6877]
- simple and scalable technique to quickly deploy limited IPv4 access service to IPv6-only edge networks without encapsulation
- may be implemented on the host itself or on an intermediate device and is known as the CLAT [Customer-side transLATOR]
- uses SIIT translator

IPv6-only solutions

- Stateless IP/ICMP Translation [SIIT]
- IPv4-translated addresses:
 - IPv4 address - a.b.c.d
 - IPv6 prefix - ::ffff:0:0:0/96
 - IPv6 translated address ::ffff:0:a.b.c.d

IPv6-only problems

- old devices/OSs/software that do not support newer techniques/systems
- networking hardware that does not support IPv6 multicast correctly
- typical bugs

IPv6 in IoT

IEEE 802.15.4

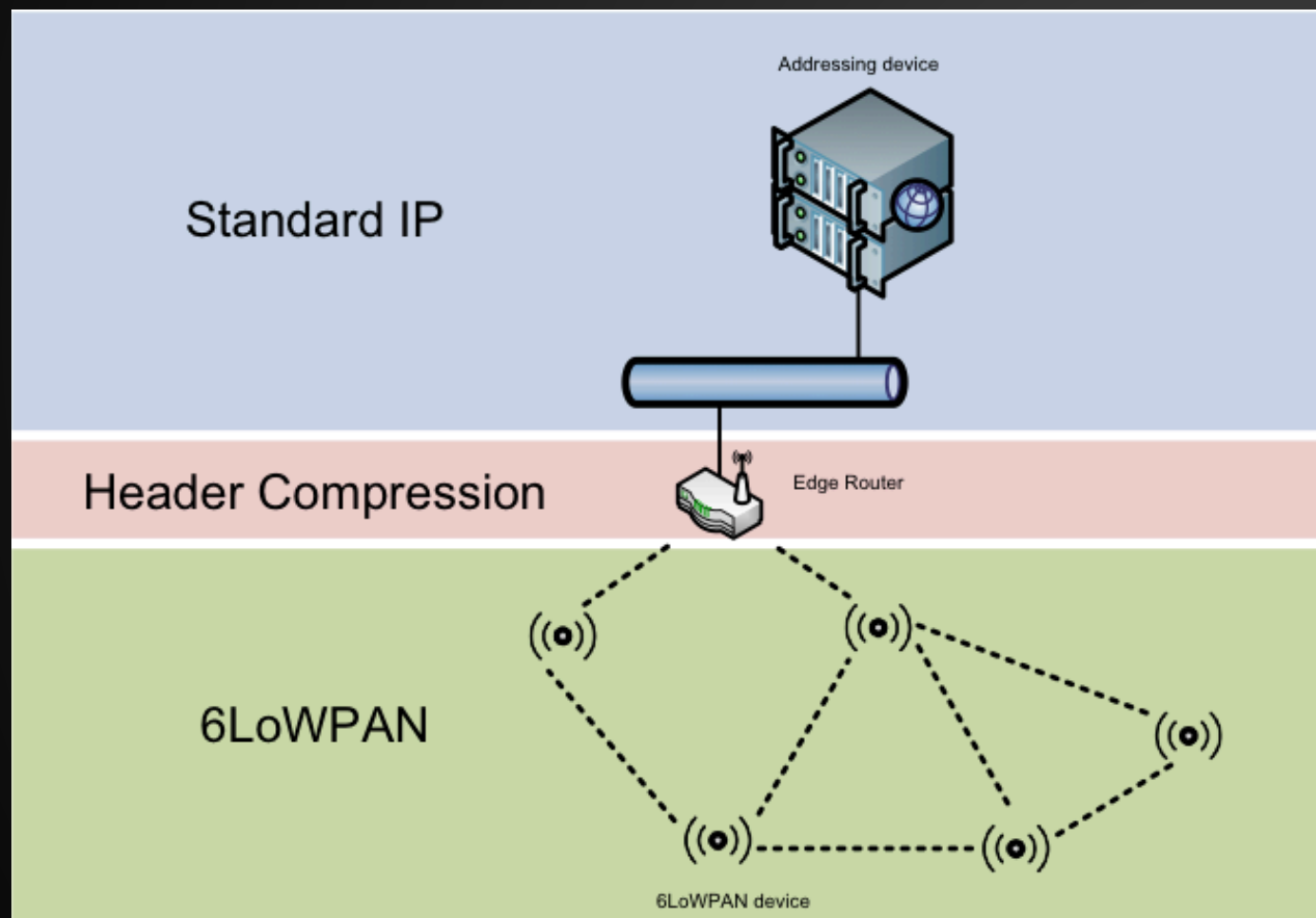
- min transmission unit for an IPv6 is 1280 octets
- max MAC frame size of IEEE 802.15.4 is 127 bytes: 25 bytes reserved for frame overhead - only 102 bytes for payload
- IPv6 header 40 bytes + 8 bytes UDP header: min 48 bytes are lost from payload
- too much overhead...

6LoWPAN

Low-power Wireless Personal Area Networks over IPv6

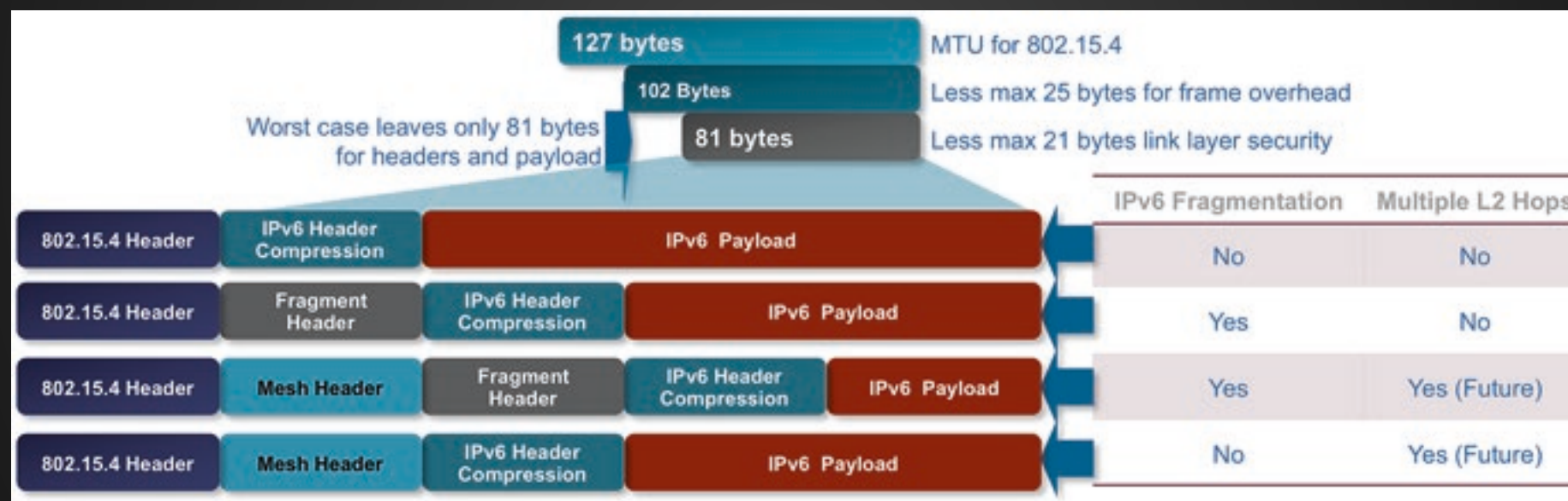
- IETF - RFC 4944, 5944, 4919
- IEEE 802.15.4 radios carry addresses of IPv6 and “directly” access the Internet
- header compression and address translation techniques: IPv6 packets fit in the IEEE 802.15.4 packet format
- used in Thread & Matter

6LoWPAN



Simplified OSI model	6LoWPAN stack
5. Application layer	HTTP, COAP, MOTT, Websocket, etc.
4. Transport Layer	UDP, TCP (Security TLS/DTLS)
3. Network Layer	IPv6, RPL
2. Data Link Layer	6LoWPAN IEEE 802.15.4 MAC
1. Physical Layer	IEEE 802.15.4

6LoWPAN



6LoWPAN

