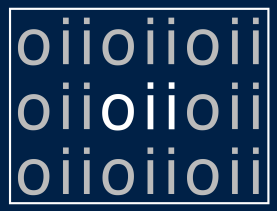

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Link Layer Privacy

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6LO Working Group
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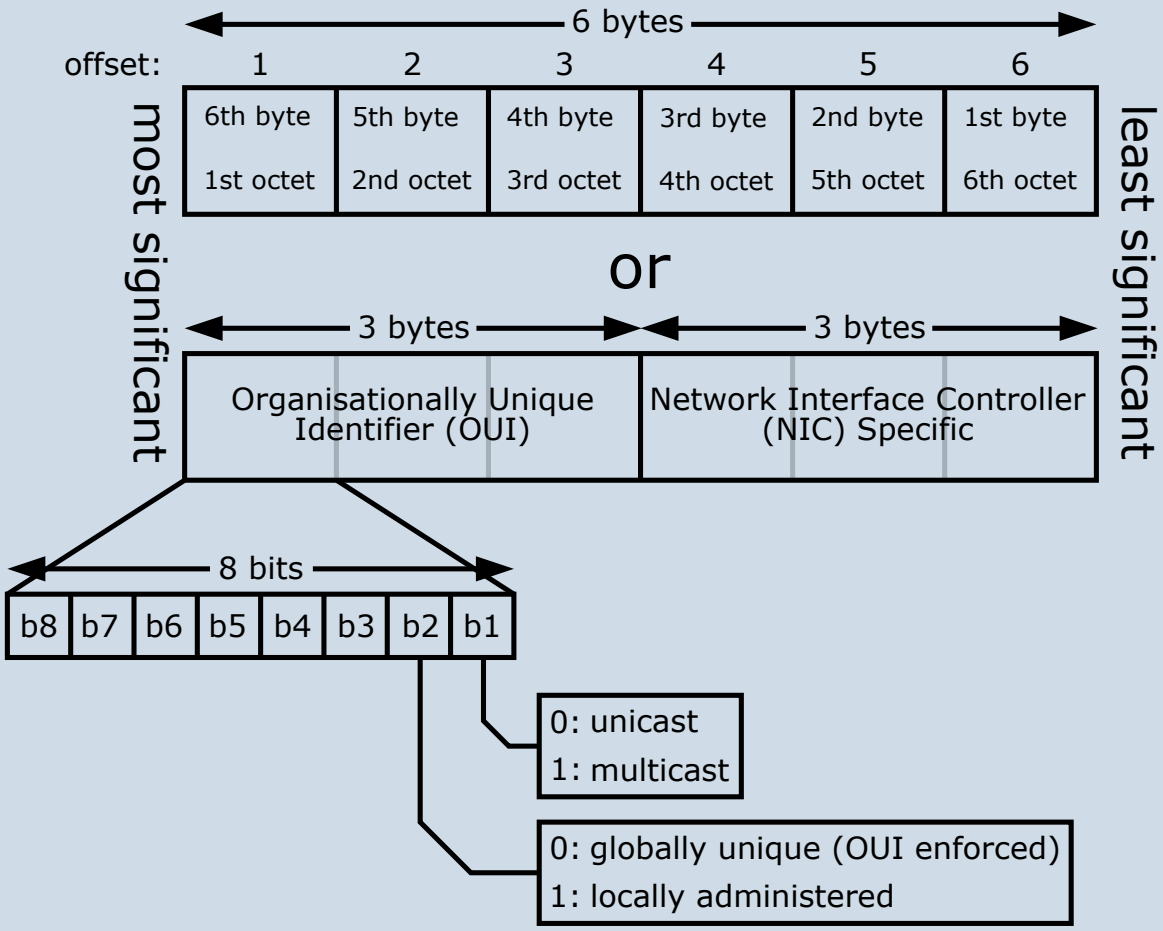
IEEE Link Layer Addressing

- Originally developed by Xerox
  - E.g. 00-00-00-00-00-01
- Standardised by IEEE: ‘Universal LAN MAC addresses’
  - For 802.15.4, WiFi, Bluetooth, Ethernet, etc
- Most addresses are 48-bits in length (EUI-48)
  - Initial 24-bits allocated by IEEE as ‘Organisational Unique Id’ (OUI)
    - Includes 2 flag bits: Individual/Group, Universal/Local admin
  - Second 24-bits are allocated by the Organisation
- Addresses are unchanged for lifetime of device
  - Apart from Virtual Machines/Devices and in a limited set of protocols (e.g. Virtual Router Redundancy Protocol)

EUI-48 MAC Address structure



Privacy issues

- Link layer MAC address is a globally unique identifier
  - Associated with a device's interface for its lifetime
- Each interface uses its address in all local communications
  - IEEE802.15.4, WiFi, Bluetooth, Ethernet
- Effectively facilitates unsolicited tracking
- The MAC addresses of many WiFi Access Points mapped
  - So far to provide for WiFi-based location services
- A number of organisations already deliver MAC based smartphone/device tracking
  - In use by advertisers, security services etc
    - E.g. Trackers in waste bins in London, Canadian CSEC Airport tracking
  - Research papers demonstrate use in construction of social graphs
- Once connected there are range of protocols exchanges
  - E.g. DNA, m/DNS, WISPr…

Potential Privacy mechanisms

- Ephemeral Addressing
  - Utilise randomised [+ local admin bit?] MAC addresses for devices
    - Changing on Interface up and/or DHCP lease expiry
    - Duplicate detection?
  - Randomise MAC on [SSID] discovery phases
- Other approaches
  - Various other research approaches
    - SlyFi, MS Privacy-protected SSIDs
  - IPv6 Cryptographic Addressing (CGA) inspired
    - Use dynamic CGA based MACs
  - Chameleon Addressing: Clone/Share an existing MAC
    - May lead to undesirable behaviours and power issues
- Higher level traffic protection measures
  - VPN, Mixnets, etc