

Package ‘MAC.address’

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Title Find, Validate and Identify Device MAC Addresses

Version 0.1.0

Description Tools to work with MAC (Media Access Control) addresses: list the MAC addresses of the local network interfaces and of the neighbors in the ARP cache on Linux, macOS and Windows, extract MAC addresses from free text, validate and normalize their notation, check the multicast and locally administered bits, generate random addresses, derive IPv6 interface identifiers (modified EUI-64), and identify the manufacturer using the public IEEE (Institute of Electrical and Electronics Engineers) MA-L, MA-M and MA-S registries
<<https://regauth.standards.ieee.org/standards-ra-web/pub/view.html#registries>>.

URL <https://github.com/EnriquePH/mac-address>,
<https://enriqueph.github.io/mac-address/>

BugReports <https://github.com/EnriquePH/mac-address/issues>

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Author Enrique Pérez Herrero [aut, cre]

Maintainer Enrique Pérez Herrero <eph.project1500@gmail.com>

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eui64_MAC	<i>Modified EUI-64 interface identifier of MAC addresses</i>
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Description

Derives the IPv6 interface identifier from a MAC address, as used by stateless address autoconfiguration (RFC 4291, appendix A): FF:FE is inserted in the middle of the address and the U/L bit is inverted.

Usage

```
eui64_MAC(mac, link_local = FALSE)
```

Arguments

mac	A character vector of MAC addresses.
link_local	Logical. If TRUE, return the IPv6 link-local address (fe80::/64 prefix) instead of the interface identifier alone.

Value

A character vector in IPv6 notation (lower case, leading zeros omitted, as recommended by RFC 5952). NA for invalid addresses.

Examples

```
eui64_MAC("1C:4C:7E:30:D8:13")
eui64_MAC("1C:4C:7E:30:D8:13", link_local = TRUE)
```

get_arp_table	<i>Get the ARP table of this device</i>
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Description

Lists the IPv4 neighbors (other devices in the local network) that this machine has recently talked to, with their MAC addresses, as stored in the operating system ARP cache. Combined with [lookup_vendor\(\)](#), it helps to identify the devices in a network.

Usage

```
get_arp_table()
```

Details

Works on Linux (reads `/proc/net/arp`), macOS and other Unix systems (parses `arp -an`) and Windows (parses `arp -a`). Only the existing cache is read: no packets are sent, so devices that have not communicated with this machine recently are not listed.

Value

A data frame with columns `ip`, `mac` (normalized, see [normalize_MAC\(\)](#)) and `interface` (on Windows, the IP address of the interface). Incomplete entries are dropped. If the table cannot be read, a warning is given and a data frame with no rows is returned.

See Also

[get_MAC\(\)](#) for the addresses of this device.

Examples

```
arp <- get_arp_table()
head(arp)

# Manufacturer of each neighbor (needs an internet connection once)
oui <- try(get_oui_registry(cache_dir = tempdir()))
if (is.data.frame(oui)) arp$vendor <- lookup_vendor(arp$mac, oui)
```

`get_MAC`*Get the MAC addresses of this device*

Description

Lists the hardware (MAC) address of each network interface of the local machine. Works on Linux (reads `/sys/class/net`), macOS and other Unix systems (parses `ifconfig -a`) and Windows (parses `getmac`).

Usage

```
get_MAC(include_null = FALSE)
```

Arguments

`include_null` Logical. Keep interfaces whose address is `00:00:00:00:00:00` (e.g. the loop-back interface)?

Value

A named character vector of normalized MAC addresses (`XX:XX:XX:XX:XX:XX`), named by interface. If the addresses cannot be read, a warning is given and an empty vector is returned.

Examples

```
get_MAC()
```

`get_oui_registry`*Download the IEEE OUI registry*

Description

Downloads the public IEEE registries of MAC address blocks and combines them in one data frame. The result is cached on disk, so later calls do not need an internet connection.

Usage

```
get_oui_registry(  
  registry = c("MA-L", "MA-M", "MA-S"),  
  refresh = FALSE,  
  cache_dir = NULL  
)
```

Arguments

registry	Which registries to download.
refresh	Logical. Download again even if a cached copy exists?
cache_dir	Directory where the CSV files are cached. By default, the user cache directory given by <code>tools::R_user_dir("MAC.address", "cache")</code> . To remove the cached files, delete the cache directory, e.g. <code>unlink(tools::R_user_dir("MAC.address", "cache"), recursive = TRUE)</code> .

Details

Registries:

- MA-L: MAC Address Block Large (24-bit prefix, the classic OUI).
- MA-M: MAC Address Block Medium (28-bit prefix).
- MA-S: MAC Address Block Small (36-bit prefix).

Value

A data frame with columns `registry`, `assignment` (hexadecimal prefix), `organization` and `address`.
If a registry cannot be downloaded (e.g. no internet connection), an error with an informative message is given.

Examples

```
# Needs an internet connection; the MA-L registry is about 4 MB
oui <- try(get_oui_registry("MA-L", cache_dir = tempdir()))
if (is.data.frame(oui)) head(oui)
```

is_local_MAC

Check whether MAC addresses are locally administered

Description

Locally administered addresses (e.g. randomized addresses used by phones for Wi-Fi privacy, or virtual machines) have the second least significant bit of the first octet set (the U/L bit).

Usage

```
is_local_MAC(mac)
```

Arguments

mac	A character vector of MAC addresses.
-----	--------------------------------------

Value

A logical vector (NA for invalid addresses).

See Also

`is_multicast_MAC()`, `random_MAC()`

Examples

```
is_local_MAC(c("02:00:00:00:00:01", "1C:4C:7E:30:D8:13"))
```

is_MAC

Check whether strings are valid MAC addresses

Description

Check whether strings are valid MAC addresses

Usage

```
is_MAC(x)
```

Arguments

x A character vector.

Value

A logical vector, TRUE where the whole string is a MAC address in colon, hyphen or Cisco dotted notation.

Examples

```
is_MAC(c("1C:4C:7E:30:D8:13", "1C:4C:7E:30:D8", "1C:4C-7E:30:D8:13"))
```

is_multicast_MAC	<i>Check whether MAC addresses are multicast</i>
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Description

Multicast (group) addresses have the least significant bit of the first octet set (the I/G bit). The broadcast address FF:FF:FF:FF:FF:FF is a multicast address. Network interfaces always have unicast addresses.

Usage

```
is_multicast_MAC(mac)
```

Arguments

mac	A character vector of MAC addresses.
-----	--------------------------------------

Value

A logical vector (NA for invalid addresses).

See Also

[is_local_MAC\(\)](#)

Examples

```
is_multicast_MAC(c("01:00:5E:00:00:FB", "FF:FF:FF:FF:FF:FF",  
  "1C:4C:7E:30:D8:13"))
```

lookup_vendor	<i>Find the manufacturer of a MAC address</i>
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Description

Looks up the organization that owns each MAC address block, using the longest matching prefix (MA-S, then MA-M, then MA-L).

Usage

```
lookup_vendor(mac, registry = get_oui_registry())
```

Arguments

mac	A character vector of MAC addresses in any supported notation.
registry	A data frame as returned by get_oui_registry() , with at least the columns assignment and organization.

Details

Locally administered addresses (see `is_local_MAC()`), such as randomized Wi-Fi addresses, are not part of the IEEE registries and usually return NA.

Value

A character vector with the organization names (NA if unknown).

Examples

```
# A small registry, to run without internet access
registry <- data.frame(
  registry = c("MA-L", "MA-M"),
  assignment = c("00000C", "70B3D51"),
  organization = c("Cisco Systems, Inc", "Example Medium Co")
)
macs <- c("00-00-0C-12-34-56", "70:B3:D5:1A:00:00", "02:00:00:00:00:01")
lookup_vendor(macs, registry)

# With the full IEEE registries (needs an internet connection)
oui <- try(get_oui_registry(cache_dir = tempdir()))
if (is.data.frame(oui)) lookup_vendor(get_MAC(), oui)
```

normalize_MAC	<i>Normalize MAC addresses</i>
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Description

Converts MAC addresses written in any supported notation to a common upper-case format.

Usage

```
normalize_MAC(mac, sep = ":")
```

Arguments

- mac A character vector of MAC addresses.
- sep Separator to use in the output. Use "" for plain hexadecimal.

Value

A character vector. Invalid addresses become NA.

Examples

```
normalize_MAC(c("1c-4c-7e-30-d8-13", "1c4c.7e30.d813", "not a MAC"))
normalize_MAC("1C:4C:7E:30:D8:13", sep = "-")
```

random_MAC	<i>Generate random MAC addresses</i>
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Description

Generates random MAC addresses, e.g. for virtual machines, containers or tests. By default they are locally administered unicast addresses, so they never clash with addresses assigned by the IEEE to manufacturers. Uses R's random number generator, so results can be reproduced with `set.seed()`.

Usage

```
random_MAC(n = 1, local = TRUE, multicast = FALSE, sep = ":")
```

Arguments

n	Number of addresses.
local	Logical. Set the locally administered bit (see <code>is_local_MAC()</code>)? If FALSE, the bit is cleared.
multicast	Logical. Set the multicast bit (see <code>is_multicast_MAC()</code>)?
sep	Separator to use, as in <code>normalize_MAC()</code> .

Value

A character vector of n MAC addresses.

Examples

```
set.seed(1)
random_MAC(3)
random_MAC(1, sep = "-")
```

search_MAC	<i>Search MAC addresses in a text</i>
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Description

Extracts every MAC-48 address found in txt. Supports the usual notations: colon (1C:4C:7E:30:D8:13), hyphen (1C-4C-7E-30-D8-13) and Cisco dotted (1C4C.7E30.D813). The separator must be the same inside each address, and longer hexadecimal sequences (e.g. EUI-64 or IPv6) are not partially matched.

Usage

```
search_MAC(  
  txt,  
  sep = c(":", "-"),  
  dotted = TRUE,  
  normalize = FALSE,  
  unique = FALSE  
)
```

Arguments

txt	A character vector with the text to search.
sep	A character vector with the allowed single-character separators. Use <code>character()</code> to search only the dotted notation.
dotted	Logical. Also search Cisco dotted notation (xxxx.xxxx.xxxx)?
normalize	Logical. If TRUE, results are returned in canonical XX:XX:XX:XX:XX:XX form (see normalize_MAC()); otherwise they are returned as found, in upper case.
unique	Logical. Remove duplicated addresses?

Value

A character vector with the MAC addresses found (possibly empty).

Examples

```
sample_txt <- "MAC addresses 1C:4C:7E:30:d8:13 and 00-1A-2B-3C-4D-5E"  
search_MAC(sample_txt)  
search_MAC(sample_txt, normalize = TRUE)  
search_MAC("Cisco style: 001a.2b3c.4d5e")
```

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