[Template:About](/wiki/Template:About" \o "Template:About) [Template:Redirect](/wiki/Template:Redirect) [thumb|150px|The](/wiki/File:(at).svg) [at sign](/wiki/At_sign), a part of every SMTP [email address](/wiki/Email_address).[[1]](#cite_note-1)

**Electronic mail** is a method of exchanging digital messages between computer users; such messaging first entered substantial use in the 1960s and by the 1970s had taken the form now recognised as **email**. Email operates across [computer networks](/wiki/Computer_network), now primarily the [Internet](/wiki/Internet).

Some early email systems required the author and the recipient to both be [online](/wiki/Online_and_offline) at the same time, in common with [instant messaging](/wiki/Instant_messaging). Today's email systems are based on a [store-and-forward](/wiki/Store-and-forward) model. Email [servers](/wiki/Server_(computing)) accept, forward, deliver, and store messages. Neither the users nor their computers are required to be online simultaneously; they need connect only briefly, typically to a [mail server](/wiki/Message_transfer_agent), for as long as it takes to send or receive messages.

Originally an [ASCII](/wiki/ASCII) text-only communications medium, Internet email was extended by [Multipurpose Internet Mail Extensions](/wiki/Multipurpose_Internet_Mail_Extensions) (MIME) to carry text in other character sets and multi-media content attachments. [International email](/wiki/International_email), with internationalized email addresses using [UTF-8](/wiki/UTF-8), has been standardized, but as of 2016 not widely adopted.[Template:Citation needed](/wiki/Template:Citation_needed)

The history of modern, global Internet email services reaches back to the early [ARPANET](/wiki/ARPANET), with standards for encoding email messages proposed as early as 1973 (RFC 561). An email message sent in the early 1970s looks very similar to a basic text email sent today. Email played an important part in creating the Internet,[[2]](#cite_note-2) and the conversion from ARPANET to the Internet in the early 1980s produced the core of the current services. The ARPANET initially used extensions to the [File Transfer Protocol](/wiki/File_Transfer_Protocol) (FTP) to exchange network email, but this is now done with the [Simple Mail Transfer Protocol](/wiki/Simple_Mail_Transfer_Protocol) (SMTP), first published as [Internet standard](/wiki/Internet_standard) 10 (RFC 821) in 1982.

## Contents

* 1 Terminology[[edit](/index.php?title=(none)&action=edit&section=1)]
* 2 Origin[[edit](/index.php?title=(none)&action=edit&section=2)]
  + 2.1 Host-based mail systems[[edit](/index.php?title=(none)&action=edit&section=3)]
  + 2.2 LAN email systems[[edit](/index.php?title=(none)&action=edit&section=4)]
  + 2.3 Email networks[[edit](/index.php?title=(none)&action=edit&section=5)]
  + 2.4 Attempts at interoperability[[edit](/index.php?title=(none)&action=edit&section=6)]
  + 2.5 From SNDMSG to MSG[[edit](/index.php?title=(none)&action=edit&section=7)]
  + 2.6 ARPANET mail[[edit](/index.php?title=(none)&action=edit&section=8)]
* 3 Operation[[edit](/index.php?title=(none)&action=edit&section=9)]
* 4 Message format {{anchor|Internet Message Format}}[[edit](/index.php?title=(none)&action=edit&section=10)]
  + 4.1 Message header[[edit](/index.php?title=(none)&action=edit&section=11)]
    - 4.1.1 Header fields[[edit](/index.php?title=(none)&action=edit&section=12)]
  + 4.2 Message body[[edit](/index.php?title=(none)&action=edit&section=13)]
    - 4.2.1 Content encoding[[edit](/index.php?title=(none)&action=edit&section=14)]
    - 4.2.2 Plain text and HTML[[edit](/index.php?title=(none)&action=edit&section=15)]
* 5 Servers and client applications[[edit](/index.php?title=(none)&action=edit&section=16)]
  + 5.1 Email marketing[[edit](/index.php?title=(none)&action=edit&section=26)]
  + 5.2 Mobile[[edit](/index.php?title=(none)&action=edit&section=27)]
  + 5.3 Flaming[[edit](/index.php?title=(none)&action=edit&section=28)]
  + 5.4 Email bankruptcy[[edit](/index.php?title=(none)&action=edit&section=29)]
* 6 Problems[[edit](/index.php?title=(none)&action=edit&section=30)]
  + 6.1 Attachment size limitation[[edit](/index.php?title=(none)&action=edit&section=31)]
  + 6.2 Information overload[[edit](/index.php?title=(none)&action=edit&section=32)]
  + 6.3 Spam[[edit](/index.php?title=(none)&action=edit&section=33)]
  + 6.4 Malware[[edit](/index.php?title=(none)&action=edit&section=34)]
  + 6.5 Email spoofing[[edit](/index.php?title=(none)&action=edit&section=35)]
  + 6.6 Email bombing[[edit](/index.php?title=(none)&action=edit&section=36)]
  + 6.7 Privacy concerns[[edit](/index.php?title=(none)&action=edit&section=37)]
  + 6.8 Tracking of sent mail[[edit](/index.php?title=(none)&action=edit&section=38)]
* 7 U.S. government[[edit](/index.php?title=(none)&action=edit&section=39)]
* 8 See also[[edit](/index.php?title=(none)&action=edit&section=40)]
* 9 References[[edit](/index.php?title=(none)&action=edit&section=41)]
* 10 Further reading[[edit](/index.php?title=(none)&action=edit&section=42)]
* 11 External links[[edit](/index.php?title=(none)&action=edit&section=43)]

## Terminology[[edit](/index.php?title=(none)&action=edit&section=1)]

Historically, the term *electronic mail* was used generically for any electronic document transmission. For example, several writers in the early 1970s used the term to describe [fax](/wiki/Fax) document transmission.[[3]](#cite_note-3)[[4]](#cite_note-4) As a result, it is difficult to find the first citation for the use of the term with the more specific meaning it has today.

Electronic mail has been most commonly called **email** or **e-mail** since around 1993,[[5]](#cite_note-5) but various variations of the [spelling](/wiki/Spelling) have been used:

* *email* is the most common form used online, and is required by [IETF](/wiki/IETF) [Requests for Comments](/wiki/Request_for_Comments) and working groups[[6]](#cite_note-6) and increasingly by [style guides](/wiki/Style_guide).[[7]](#cite_note-7)[[8]](#cite_note-8) This spelling also appears in most dictionaries.[[9]](#cite_note-9)[[10]](#cite_note-10)[[11]](#cite_note-11)[[12]](#cite_note-12)[[13]](#cite_note-13)[[14]](#cite_note-14)[[15]](#cite_note-15)\* *e-mail* has long been the form that appears most frequently in edited, published American English and British English writing as reflected in the [Corpus of Contemporary American English](/wiki/Corpus_of_Contemporary_American_English) data[[16]](#cite_note-16) and style guides.[[8]](#cite_note-8)[[17]](#cite_note-17)\* *mail* was the form used in the original RFC. The service is referred to as *mail*, and a single piece of electronic mail is called a *message*.[[18]](#cite_note-18)[[19]](#cite_note-19)[[20]](#cite_note-20)\* *EMail* is a traditional form that has been used in RFCs for the "Author's Address"[[19]](#cite_note-19)[[20]](#cite_note-20) and is expressly required "for historical reasons".[[21]](#cite_note-21)\* *E-mail* is sometimes used, capitalizing the initial *E* as in similar abbreviations like [*E-piano*](/wiki/E-piano), [*E-guitar*](/wiki/E-guitar), [*A-bomb*](/wiki/A-bomb), and [*H-bomb*](/wiki/H-bomb).[[22]](#cite_note-22)

## Origin[[edit](/index.php?title=(none)&action=edit&section=2)]

The [AUTODIN](/wiki/AUTODIN) network, first operational in 1962, provided a message service between 1,350 terminals, handling 30 million messages per month, with an average message length of approximately 3,000 characters. Autodin was supported by 18 large computerized switches, and was connected to the [United States General Services Administration](/wiki/United_States_General_Services_Administration) Advanced Record System, which provided similar services to roughly 2,500 terminals.[[23]](#cite_note-23)

### Host-based mail systems[[edit](/index.php?title=(none)&action=edit&section=3)]

With the introduction of [MIT's](/wiki/Massachusetts_Institute_of_Technology) [Compatible Time-Sharing System](/wiki/Compatible_Time-Sharing_System) (CTSS) in 1961[[24]](#cite_note-24) multiple users could log in to a central system[[25]](#cite_note-25) from remote dial-up terminals, and to store and share files on the central disk.[[26]](#cite_note-26) Informal methods of using this to pass messages were developed and expanded:

* 1965 – [MIT's](/wiki/Massachusetts_Institute_of_Technology) [CTSS](/wiki/Compatible_Time-Sharing_System) MAIL.[[27]](#cite_note-27)

Developers of other early systems developed similar email applications:

* 1962 – [1440/1460 Administrative Terminal System](/wiki/IBM_Administrative_Terminal_System)[[28]](#cite_note-28)\* 1968 – [ATS/360](/wiki/IBM_Administrative_Terminal_System)[[29]](#cite_note-29)[[30]](#cite_note-30)\* 1971 – [*SNDMSG*](/wiki/SNDMSG), a local inter-user mail program incorporating the experimental file transfer program, *CPYNET*, allowed the first [networked](/wiki/Computer_network) electronic mail[[31]](#cite_note-31)\* 1972 – [Unix](/wiki/Unix) [mail](/wiki/Mail_(Unix)) program[[32]](#cite_note-32)[[33]](#cite_note-33)\* 1972 – APL Mailbox by [Larry Breed](/wiki/Lawrence_M._Breed)[[34]](#cite_note-34)[[35]](#cite_note-35)\* 1974 – The [PLATO](/wiki/PLATO_(computer_system)) IV Notes on-line [message board](/wiki/Message_board) system was generalized to offer 'personal notes' in August 1974.[[23]](#cite_note-23)<ref name=wooley>David Wooley, [PLATO: The Emergence of an Online Community](http://www.thinkofit.com/plato/dwplato.htm#pnotes), 1994.</ref>
* 1978 – *Mail* client written by Kurt Shoens for Unix and distributed with the Second Berkeley Software Distribution included support for aliases and distribution lists, forwarding, formatting messages, and accessing different mailboxes.[[36]](#cite_note-36) It used the Unix *mail* client to send messages between system users. The concept was extended to communicate remotely over the Berkley Network.[[37]](#cite_note-37)\* 1979 – *EMAIL* written by [V.A. Shiva Ayyadurai](/wiki/Shiva_Ayyadurai) to emulate the interoffice mail system of the [University of Medicine and Dentistry of New Jersey](/wiki/University_of_Medicine_and_Dentistry_of_New_Jersey)[[38]](#cite_note-38)<ref name=SmithsonianStatement>[Template:Cite press release](/wiki/Template:Cite_press_release)</ref>
* 1979 – [MH Message Handling System](/wiki/MH_Message_Handling_System) developed at RAND provided several tools for managing electronic mail on Unix.[[39]](#cite_note-39)\* 1981 – [PROFS](/wiki/IBM_OfficeVision) by IBM[[40]](#cite_note-40)[[41]](#cite_note-41)\* 1982 – [ALL-IN-1](/wiki/ALL-IN-1)[[42]](#cite_note-42) by [Digital Equipment Corporation](/wiki/Digital_Equipment_Corporation)

These original messaging systems had widely different features and ran on systems that were incompatible with each other. Most of them only allowed communication between users logged into the same host or "mainframe", although there might be hundreds or thousands of users within an organization.

### LAN email systems[[edit](/index.php?title=(none)&action=edit&section=4)]

In the early 1980s, networked [personal computers](/wiki/Personal_computer) on [LANs](/wiki/LAN) became increasingly important. Server-based systems similar to the earlier mainframe systems were developed. Again, these systems initially allowed communication only between users logged into the same server infrastructure. Examples include:

* [cc:Mail](/wiki/Cc:Mail)
* [Lantastic](/wiki/Lantastic)
* [WordPerfect Office](/wiki/WordPerfect_Office)
* [Microsoft Mail](/wiki/Microsoft_Mail)
* [Banyan VINES](/wiki/Banyan_VINES)
* [Lotus Notes](/wiki/Lotus_Notes)

Eventually these systems too could link different organizations as long as they ran the same email system and proprietary protocol.[[43]](#cite_note-43)

### Email networks[[edit](/index.php?title=(none)&action=edit&section=5)]

To facilitate electronic mail exchange between remote sites and with other organizations, telecommunication links, such as dialup modems or leased lines, provided means to transport email globally, creating local and global networks. This was challenging for a number of reasons, including the widely [different email address formats](/wiki/Non-Internet_email_address) in use.

* In 1971 the first [ARPANET](/wiki/ARPANET) email was sent,[[44]](#cite_note-44) and through RFC 561, RFC 680, RFC 724, and finally 1977's RFC 733, became a standardized working system.
* PLATO IV was networked to individual terminals over leased data lines prior to the implementation of personal notes in 1974.<ref name=wooley/>
* Unix mail was networked by 1978's [uucp](/wiki/Uucp),[[45]](#cite_note-45) which was also used for [USENET](/wiki/USENET) newsgroup postings, with similar headers.
* BerkNet, the Berkeley Network, was written by [Eric Schmidt](/wiki/Eric_Schmidt) in 1978 and included first in the Second Berkeley Software Distribution. It provided support for sending and receiving messages over serial communication links. The Unix mail tool was extended to send messages using BerkNet.[[37]](#cite_note-37)\* The [delivermail](/wiki/Delivermail) tool, written by [Eric Allman](/wiki/Eric_Allman) in 1979 and 1980 (and shipped in 4BSD), provided support for routing mail over different networks, including Arpanet, UUCP, and BerkNet. (It also provided support for mail user aliases.)[[46]](#cite_note-46)\* The mail client included in 4BSD (1980) was extended to provide interoperability between a variety of mail systems.[[47]](#cite_note-47)\* [BITNET](/wiki/BITNET) (1981) provided electronic mail services for educational institutions. It was based on the IBM VNET email system.[[48]](#cite_note-48)\* 1983 – [MCI Mail](/wiki/MCI_Mail) Operated by MCI Communications Corporation. This was the first commercial public email service to use the internet. MCI Mail also allowed subscribers to send regular postal mail (overnight) to non-subscribers.[[49]](#cite_note-49)\* In 1984, IBM PCs running DOS could link with [FidoNet](/wiki/FidoNet) for email and shared bulletin board posting.

### Attempts at interoperability[[edit](/index.php?title=(none)&action=edit&section=6)]

[Template:Refimprove section](/wiki/Template:Refimprove_section) Early interoperability among independent systems included:

* [ARPANET](/wiki/ARPANET), a forerunner of the Internet, defined protocols for dissimilar computers to exchange email.
* [uucp](/wiki/Uucp) implementations for Unix systems, and later for other operating systems, that only had dial-up communications available.
* [CSNET](/wiki/CSNET), which initially used the UUCP protocols via dial-up to provide networking and mail-relay services for non-ARPANET hosts.
* [Novell](/wiki/Novell) developed the [Message Handling System](/wiki/Message_Handling_System) (MHS) protocol,[[50]](#cite_note-50)[[51]](#cite_note-51)[[52]](#cite_note-52) but abandoned it after purchasing the non-MHS WordPerfect Office (renamed [Groupwise](/wiki/Novell_GroupWise)).
* The [Coloured Book protocols](/wiki/Coloured_Book_protocols) ran on [UK](/wiki/United_Kingdom) academic networks until 1992.
* [X.400](/wiki/X.400) in the 1980s and early 1990s was promoted by major vendors, and mandated for government use under [GOSIP](/wiki/GOSIP), but abandoned by all but a few in favor of [Internet](/wiki/Internet) [SMTP](/wiki/SMTP) by the mid-1990s.

### From SNDMSG to MSG[[edit](/index.php?title=(none)&action=edit&section=7)]

In the early 1970s, [Ray Tomlinson](/wiki/Ray_Tomlinson) updated an existing utility called [SNDMSG](/wiki/SNDMSG) so that it could copy messages (as files) over the network. [Lawrence Roberts](/wiki/Lawrence_Roberts_(scientist)), the project manager for the ARPANET development, took the idea of READMAIL, which dumped all "recent" messages onto the user's terminal, and wrote a programme for [TENEX](/wiki/TOPS-20#TENEX) in [TECO](/wiki/Text_Editor_and_Corrector) macros called *RD*, which permitted access to individual messages.[[53]](#cite_note-53) Barry Wessler then updated RD and called it *NRD*.[[54]](#cite_note-54) Marty Yonke rewrote NRD to include reading, access to SNDMSG for sending, and a help system, and called the utility *WRD*, which was later known as *BANANARD*. John Vittal then updated this version to include three important commands: *Move* (combined save/delete command), *Answer* (determined to whom a reply should be sent) and *Forward* (sent an email to a person who was not already a recipient). The system was called *MSG*. With inclusion of these features, MSG is considered to be the first integrated modern email programme, from which many other applications have descended.[[53]](#cite_note-53)

### ARPANET mail[[edit](/index.php?title=(none)&action=edit&section=8)]

Experimental email transfers between separate computer systems began shortly after the creation of the [ARPANET](/wiki/ARPANET) in 1969.[[27]](#cite_note-27) [Ray Tomlinson](/wiki/Ray_Tomlinson) is generally credited as having sent the first email across a network, initiating the use of the "[@](/wiki/At_sign)" sign to separate the names of the user and the user's machine in 1971, when he sent a message from one [Digital Equipment Corporation](/wiki/Digital_Equipment_Corporation) [DEC-10](/wiki/DEC-10) computer to another DEC-10. The two machines were placed next to each other.[[31]](#cite_note-31)[[55]](#cite_note-55) Tomlinson's work was quickly adopted across the ARPANET, which significantly increased the popularity of email.

Initially addresses were of the form, *username@hostname*[[56]](#cite_note-56) but were extended to "username@host.domain" with the development of the [Domain Name System](/wiki/Domain_Name_System) (DNS).

As the influence of the ARPANET spread across academic communities, [gateways](/wiki/Gateway_(telecommunications)) were developed to pass mail to and from other networks such as [CSNET](/wiki/CSNET), [JANET](/wiki/JANET_NRS), [BITNET](/wiki/BITNET), [X.400](/wiki/X.400), and [FidoNet](/wiki/FidoNet). This often involved addresses such as:

hubhost!middlehost!edgehost!user@uucpgateway.somedomain.example.com

which routes mail to a user with a "[bang path](/wiki/UUCP#Mail_routing)" address at a UUCP host.

## Operation[[edit](/index.php?title=(none)&action=edit&section=9)]

The diagram to the right shows a typical sequence of events[[57]](#cite_note-57) that takes place when sender [Alice](/wiki/Placeholder_names_in_cryptography) transmits a message using a [mail user agent](/wiki/E-mail_client) (MUA) addressed to the [email address](/wiki/Email_address) of the recipient. [400px|Email operation](/wiki/File:email.svg)

1. The MUA formats the message in email format and uses the submission protocol, a profile of the [Simple Mail Transfer Protocol](/wiki/Simple_Mail_Transfer_Protocol) (SMTP), to send the message to the local [mail submission agent](/wiki/Mail_submission_agent) (MSA), in this case *smtp.a.org*.
2. The MSA determines the destination address provided in the SMTP protocol (not from the message header), in this case *bob@b.org*. The part before the @ sign is the *local part* of the address, often the [username](/wiki/Username) of the recipient, and the part after the @ sign is a [domain name](/wiki/Domain_name). The MSA resolves a domain name to determine the [fully qualified domain name](/wiki/Fully_qualified_domain_name) of the [mail server](/wiki/Message_transfer_agent) in the [Domain Name System](/wiki/Domain_Name_System) (DNS).
3. The [DNS server](/wiki/DNS_server) for the domain *b.org* (*ns.b.org*) responds with any [MX records](/wiki/MX_record) listing the mail exchange servers for that domain, in this case *mx.b.org*, a [message transfer agent](/wiki/Message_transfer_agent) (MTA) server run by the recipient's ISP.[[58]](#cite_note-58)# smtp.a.org sends the message to mx.b.org using SMTP. This server may need to forward the message to other MTAs before the message reaches the final [message delivery agent](/wiki/Message_delivery_agent) (MDA).
4. The MDA delivers it to the [mailbox](/wiki/Email_Mailbox) of user *bob*.
5. Bob's MUA picks up the message using either the [Post Office Protocol](/wiki/Post_Office_Protocol) (POP3) or the [Internet Message Access Protocol](/wiki/Internet_Message_Access_Protocol) (IMAP).

In addition to this example, alternatives and complications exist in the email system:

* Alice or Bob may use a client connected to a corporate email system, such as [IBM](/wiki/IBM) [Lotus Notes](/wiki/Lotus_Notes) or [Microsoft](/wiki/Microsoft) [Exchange](/wiki/Microsoft_Exchange_Server). These systems often have their own internal email format and their clients typically communicate with the email server using a vendor-specific, proprietary protocol. The server sends or receives email via the Internet through the product's Internet mail gateway which also does any necessary reformatting. If Alice and Bob work for the same company, the entire transaction may happen completely within a single corporate email system.
* Alice may not have a MUA on her computer but instead may connect to a [webmail](/wiki/Webmail) service.
* Alice's computer may run its own MTA, so avoiding the transfer at step 1.
* Bob may pick up his email in many ways, for example logging into mx.b.org and reading it directly, or by using a webmail service.
* Domains usually have several mail exchange servers so that they can continue to accept mail even if the primary is not available.

Many MTAs used to accept messages for any recipient on the Internet and do their best to deliver them. Such MTAs are called [*open mail relays*](/wiki/Open_mail_relay). This was very important in the early days of the Internet when network connections were unreliable.[Template:Citation needed](/wiki/Template:Citation_needed) However, this mechanism proved to be exploitable by originators of [unsolicited bulk email](/wiki/Email_spam) and as a consequence open mail relays have become rare,[[59]](#cite_note-59) and many MTAs do not accept messages from open mail relays.

## Message format {{anchor|Internet Message Format}}[[edit](/index.php?title=(none)&action=edit&section=10)]

The Internet email message format is now defined by RFC 5322, with multi-media content attachments being defined in RFC 2045 through RFC 2049, collectively called [*Multipurpose Internet Mail Extensions*](/wiki/Multipurpose_Internet_Mail_Extensions) or *MIME*. RFC 5322 replaced the earlier RFC 2822 in 2008, and in turn RFC 2822 in 2001 replaced RFC 822 – which had been the standard for Internet email for nearly 20 years. Published in 1982, RFC 822 was based on the earlier RFC 733 for the [ARPANET](/wiki/ARPANET).[[60]](#cite_note-60) Internet email messages consist of two major sections, the message header and the message body. The header is structured into [fields](/wiki/Field_(computer_science)) such as From, To, CC, Subject, Date, and other information about the email. In the process of transporting email messages between systems, SMTP communicates delivery parameters and information using message header fields. The body contains the message, as unstructured text, sometimes containing a [signature block](/wiki/Signature_block) at the end. The header is separated from the body by a blank line.

### Message header[[edit](/index.php?title=(none)&action=edit&section=11)]

Each message has exactly one [header](/wiki/Header_(computing)), which is structured into [fields](/wiki/Field_(computer_science)). Each field has a name and a value. RFC 5322 specifies the precise syntax.

Informally, each line of text in the header that begins with a [printable character](/wiki/Printable_characters) begins a separate field. The field name starts in the first character of the line and ends before the separator character ":". The separator is then followed by the field value (the "body" of the field). The value is continued onto subsequent lines if those lines have a space or tab as their first character. Field names and values are restricted to 7-bit [ASCII](/wiki/ASCII) characters. Non-ASCII values may be represented using MIME [encoded words](/wiki/MIME#Encoded-Word).

#### Header fields[[edit](/index.php?title=(none)&action=edit&section=12)]

Email header fields can be multi-line, and each line should be at most 78 characters long and in no event more than 998 characters long.[[61]](#cite_note-61) Header fields defined by RFC 5322 can only contain [US-ASCII](/wiki/US-ASCII) characters; for encoding characters in other sets, a syntax specified in RFC 2047 can be used.[[62]](#cite_note-62) Recently the IETF EAI working group has defined some standards track extensions,[[63]](#cite_note-63)[[64]](#cite_note-64) replacing previous experimental extensions, to allow [UTF-8](/wiki/UTF-8) encoded [Unicode](/wiki/Unicode) characters to be used within the header. In particular, this allows email addresses to use non-ASCII characters. Such characters must only be used by servers that support these extensions.

The message header must include at least the following fields:[[65]](#cite_note-65)\* *From*: The [email address](/wiki/Email_address), and optionally the name of the author(s). In many email clients not changeable except through changing account settings.

* *Date*: The local time and date when the message was written. Like the *From:* field, many email clients fill this in automatically when sending. The recipient's client may then display the time in the format and time zone local to him/her.

The message header should include at least the following fields:[[66]](#cite_note-66)\* *Message-ID*: Also an automatically generated field; used to prevent multiple delivery and for reference in In-Reply-To: (see below).

* *In-Reply-To*: [Message-ID](/wiki/Message-ID) of the message that this is a reply to. Used to link related messages together. This field only applies for reply messages.

RFC 3864 describes registration procedures for message header fields at the [IANA](/wiki/Internet_Assigned_Numbers_Authority); it provides for [permanent](http://www.iana.org/assignments/message-headers/perm-headers.html) and [provisional](http://www.iana.org/assignments/message-headers/prov-headers.html) message header field names, including also fields defined for MIME, netnews, and http, and referencing relevant RFCs. Common header fields for email include:[[67]](#cite_note-67)\* *To*: The email address(es), and optionally name(s) of the message's recipient(s). Indicates primary recipients (multiple allowed), for secondary recipients see Cc: and Bcc: below.

* *Subject*: A brief summary of the topic of the message. [Certain abbreviations](/wiki/E-mail_subject_abbreviations) are commonly used in the subject, including ["RE:" and "FW:"](/wiki/E-mail_subject_abbreviations).
* *Bcc*: [Blind carbon copy](/wiki/Blind_carbon_copy); addresses added to the SMTP delivery list but not (usually) listed in the message data, remaining invisible to other recipients.
* *Cc*: [Carbon copy](/wiki/Carbon_copy); Many email clients will mark email in one's inbox differently depending on whether they are in the To: or Cc: list.
* [Content-Type](/wiki/Content-Type): Information about how the message is to be displayed, usually a [MIME](/wiki/MIME) type.
* *Precedence*: commonly with values "bulk", "junk", or "list"; used to indicate that automated "vacation" or "out of office" responses should not be returned for this mail, e.g. to prevent vacation notices from being sent to all other subscribers of a mailing list. [Sendmail](/wiki/Sendmail) uses this header to affect prioritization of queued email, with "Precedence: special-delivery" messages delivered sooner. With modern high-bandwidth networks delivery priority is less of an issue than it once was. [Microsoft Exchange](/wiki/Microsoft_Exchange_Server) respects a fine-grained automatic response suppression mechanism, the X-Auto-Response-Suppress header.[[68]](#cite_note-68)\* *References*: [Message-ID](/wiki/Message-ID) of the message that this is a reply to, and the message-id of the message the previous reply was a reply to, etc.
* *Reply-To*: Address that should be used to reply to the message.
* *Sender*: Address of the actual sender acting on behalf of the author listed in the From: field (secretary, list manager, etc.).
* *Archived-At*: A direct link to the archived form of an individual email message.

Note that the *To:* field is not necessarily related to the addresses to which the message is delivered. The actual delivery list is supplied separately to the transport protocol, [SMTP](/wiki/SMTP), which may or may not originally have been extracted from the header content. The "To:" field is similar to the addressing at the top of a conventional letter which is delivered according to the address on the outer envelope. In the same way, the "From:" field does not have to be the real sender of the email message. Some mail servers apply [email authentication](/wiki/Email_authentication) systems to messages being relayed. Data pertaining to server's activity is also part of the header, as defined below.

SMTP defines the *trace information* of a message, which is also saved in the header using the following two fields:[[69]](#cite_note-69)\* *Received*: when an SMTP server accepts a message it inserts this trace record at the top of the header (last to first).

* *Return-Path*: when the delivery SMTP server makes the *final delivery* of a message, it inserts this field at the top of the header.

Other header fields that are added on top of the header by the receiving server may be called *trace fields*, in a broader sense.[[70]](#cite_note-70)\* *Authentication-Results*: when a server carries out authentication checks, it can save the results in this field for consumption by downstream agents.[[71]](#cite_note-71)\* *Received-SPF*: stores results of [SPF](/wiki/Sender_Policy_Framework) checks in more detail than Authentication-Results.[[72]](#cite_note-72)\* *Auto-Submitted*: is used to mark automatically generated messages.[[73]](#cite_note-73)\* *VBR-Info*: claims [VBR](/wiki/Vouch_by_Reference) whitelisting[[74]](#cite_note-74)

### Message body[[edit](/index.php?title=(none)&action=edit&section=13)]

#### Content encoding[[edit](/index.php?title=(none)&action=edit&section=14)]

Email was originally designed for 7-bit [ASCII](/wiki/ASCII).[[75]](#cite_note-75) Most email software is [8-bit clean](/wiki/8-bit_clean) but must assume it will communicate with 7-bit servers and mail readers. The [MIME](/wiki/MIME) standard introduced character set specifiers and two content transfer encodings to enable transmission of non-ASCII data: [quoted printable](/wiki/Quoted_printable) for mostly 7 bit content with a few characters outside that range and [base64](/wiki/Base64) for arbitrary binary data. The [8BITMIME](/wiki/8BITMIME) and [BINARY](/wiki/BINARY) extensions were introduced to allow transmission of mail without the need for these encodings, but many [mail transport agents](/wiki/Mail_transport_agent) still do not support them fully. In some countries, several encoding schemes coexist; as the result, by default, the message in a non-Latin alphabet language appears in non-readable form (the only exception is coincidence, when the sender and receiver use the same encoding scheme). Therefore, for international [character sets](/wiki/Character_set), [Unicode](/wiki/Unicode) is growing in popularity.[Template:Citation needed](/wiki/Template:Citation_needed)

#### Plain text and HTML[[edit](/index.php?title=(none)&action=edit&section=15)]

Most modern graphic [email clients](/wiki/Email_client) allow the use of either [plain text](/wiki/Plain_text) or [HTML](/wiki/HTML#HTML_email) for the message body at the option of the user. [HTML email](/wiki/HTML_email) messages often include an automatically generated plain text copy as well, for compatibility reasons.

Advantages of HTML include the ability to include in-line links and images, set apart previous messages in [block quotes](/wiki/Block_quote), wrap naturally on any display, use emphasis such as [underlines](/wiki/Underline) and [italics](/wiki/Italics), and change [font](/wiki/Font) styles. Disadvantages include the increased size of the email, privacy concerns about [web bugs](/wiki/Web_bug), abuse of HTML email as a vector for [phishing](/wiki/Phishing) attacks and the spread of [malicious software](/wiki/Malware).[[76]](#cite_note-76) Some web based [mailing lists](/wiki/Mailing_list) recommend that all posts be made in plain-text, with 72 or 80 [characters per line](/wiki/Characters_per_line)[[77]](#cite_note-77)[[78]](#cite_note-78) for all the above reasons, but also because they have a significant number of readers using [text-based email clients](/wiki/List_of_email_clients#Text-based) such as [Mutt](/wiki/Mutt_(email_client)).

Some [Microsoft](/wiki/Microsoft) [email clients](/wiki/Email_client) allow rich formatting using their proprietary [Rich Text Format](/wiki/Rich_Text_Format) (RTF), but this should be avoided unless the recipient is guaranteed to have a compatible [email client](/wiki/Email_client).[[79]](#cite_note-79)

## Servers and client applications[[edit](/index.php?title=(none)&action=edit&section=16)]

[thumb|right|300px|The interface of an email client,](/wiki/File:Mozilla_Thunderbird_3.1.png) [Thunderbird](/wiki/Mozilla_Thunderbird). Messages are exchanged between hosts using the [Simple Mail Transfer Protocol](/wiki/SMTP) with software programs called [mail transfer agents](/wiki/Mail_transfer_agent) (MTAs); and delivered to a mail store by programs called [mail delivery agents](/wiki/Mail_delivery_agent) (MDAs, also sometimes called local delivery agents, LDAs). Accepting a message obliges an MTA to deliver it,[[80]](#cite_note-80) and when a message cannot be delivered, that MTA must send a [bounce message](/wiki/Bounce_message) back to the sender, indicating the problem.

Users can retrieve their messages from servers using standard protocols such as [POP](/wiki/Post_Office_Protocol) or [IMAP](/wiki/IMAP), or, as is more likely in a large [corporate](/wiki/Corporation) environment, with a [proprietary](/wiki/Proprietary_software) protocol specific to [Novell Groupwise](/wiki/Novell_Groupwise), [Lotus Notes](/wiki/Lotus_Notes) or [Microsoft Exchange Servers](/wiki/Microsoft_Exchange_Server). Programs used by users for retrieving, reading, and managing email are called [mail user agents](/wiki/Mail_user_agent) (MUAs).

Mail can be stored on the [client](/wiki/Client_(computing)), on the [server](/wiki/Server_(computing)) side, or in both places. Standard formats for mailboxes include [Maildir](/wiki/Maildir) and [mbox](/wiki/Mbox). Several prominent email clients use their own proprietary format and require conversion software to transfer email between them. Server-side storage is often in a proprietary format but since access is through a standard protocol such as [IMAP](/wiki/IMAP), moving email from one server to another can be done with any [MUA](/wiki/Mail_user_agent) supporting the protocol.

Many current email users do not run MTA, MDA or MUA programs themselves, but use a web-based email platform, such as Gmail, Hotmail, or Yahoo! Mail, that performs the same tasks.[[81]](#cite_note-81) It has some key benefits to business, including:

* *The problem of logistics*: Much of the business world relies on communications between people who are not physically in the same building, area, or even country; setting up and attending an in-person meeting, [telephone call](/wiki/Telephone_call), or [conference call](/wiki/Conference_call) can be inconvenient, time-consuming, and costly. Email provides a method of exchanging information between two or more people with no set-up costs and that is generally far less expensive than a physical meeting or phone call.
* *The problem of synchronisation*: With [real time](/wiki/Real-time_computing) communication by meetings or phone calls, participants must work on the same schedule, and each participant must spend the same amount of time in the meeting or call. Email allows [asynchrony](/wiki/Wikt:asynchrony): each participant may control their schedule independently.
* *Cost*. Sending an email is much less expensive than sending postal mail, or [long distance telephone calls](/wiki/Long_distance_telephone_call), [telex](/wiki/Telex) or [telegrams](/wiki/Telegrams).
* *Speed*. Much faster than most of the alternatives.
* *A "written" record*. Unlike the telephone, or verbal meetings, email by its nature creates a detailed written record.

#### Email marketing[[edit](/index.php?title=(none)&action=edit&section=26)]

Email marketing via "[opt-in](/wiki/Opt-in_email)" is often successfully used to send special sales offerings and new product information,<ref name=brett/> but offering hyperlinks or generic information on consumer trends is less useful<ref name=brett>[Template:Cite journal](/wiki/Template:Cite_journal)</ref> - and email sent without permission such as "opt-in" is likely to be viewed as unwelcome "[email spam](/wiki/Email_spam)".

### Mobile[[edit](/index.php?title=(none)&action=edit&section=27)]

Email has become widely used on smart phones. Mobile apps for email increase accessibility to the medium. While before users could only access email on computers, it is now possible for users to check their email out of the home and out of the library while on the go. Alerts can also be sent to the phone to notify them immediately of new messages. This has given email the ability to be used for more frequent communication between users and allowed them to check their email and write messages throughout the day. Today, there are an estimated 1.4 billion email users worldwide and 50 billion non-spam emails that are sent daily.

It was found that US adults check their email more than they browse the web or check their [Facebook](/wiki/Facebook) accounts, making email the most popular activity for users to do on their smart phones. 78% of the respondents in the study revealed that they check their email on their phone.[[84]](#cite_note-84) It was also found that 30% of consumers use only their smartphone to check their email, and 91% were likely to check their email at least once per day on their smartphone. However, the percentage of consumers using email on smartphone ranges and differs dramatically across different countries. For example, in comparison to 75% of those consumers in the US who used it, only 17% in India did.[[85]](#cite_note-85)

### Flaming[[edit](/index.php?title=(none)&action=edit&section=28)]

[Flaming](/wiki/Flaming_(Internet)) occurs when a person sends a message with angry or antagonistic content. The term is derived from the use of the word Incendiary to describe particularly heated email discussions. The ease and impersonality of email communications mean that the [social norms](/wiki/Social_norms) that encourage civility in person or via telephone don't exist and civility may be forgotten.[[86]](#cite_note-86)

### Email bankruptcy[[edit](/index.php?title=(none)&action=edit&section=29)]

[Template:Main](/wiki/Template:Main) Also known as "email fatigue", email bankruptcy is when a user ignores a large number of email messages after falling behind in reading and answering them. The reason for falling behind is often due to information overload and a general sense there is so much information that it is not possible to read it all. As a solution, people occasionally send a boilerplate message explaining that the email inbox is being cleared out. [Harvard University](/wiki/Harvard_University) law professor [Lawrence Lessig](/wiki/Lawrence_Lessig) is credited with coining this term, but he may only have popularized it.[[87]](#cite_note-87)

## Problems[[edit](/index.php?title=(none)&action=edit&section=30)]

### Attachment size limitation[[edit](/index.php?title=(none)&action=edit&section=31)]

[Template:Main](/wiki/Template:Main) Email messages may have one or more attachments. In principle there is no technical restriction on the size or number of attachments, but in practice email clients, servers and service providers implement various limitations on the size of files, or complete email - typically to 25MB or less.[[88]](#cite_note-88)[[89]](#cite_note-89)[[90]](#cite_note-90) Furthermore, due to technical reasons, attachment sizes as seen by these transport systems can differ to what the user sees,[[91]](#cite_note-91) which can be confusing to senders when trying to assess whether they can safely send a file by email. Where larger files need to be shared, [file hosting services](/wiki/File_hosting_service) of various sorts are available; and generally suggested.[[92]](#cite_note-92)[[93]](#cite_note-93)

### Information overload[[edit](/index.php?title=(none)&action=edit&section=32)]

The ubiquity of email for knowledge workers has led many to suggest that people face an "information overload" in dealing with increasing volumes of email,[[94]](#cite_note-94)[[95]](#cite_note-95) and even suggested that this has a significant negative economic effect.[[96]](#cite_note-96)

### Spam[[edit](/index.php?title=(none)&action=edit&section=33)]

[Template:Main](/wiki/Template:Main) Email "spam" is the term used to describe unsolicited commercial, or bulk, email. The low cost of sending such email meant that by 2003 up to 30% of total email traffic was already spam.[[97]](#cite_note-97)[[98]](#cite_note-98)[[99]](#cite_note-99) and was threatening the usefulness of email as a practical tool. The US [CAN-SPAM Act of 2003](/wiki/CAN-SPAM_Act_of_2003) and similar laws elsewhere[[100]](#cite_note-100) had some impact, and a number of effective [anti-spam techniques](/wiki/Anti-spam_techniques_(email)) now largely mitigate the impact of spam by filtering or rejecting it for most users,[[101]](#cite_note-101) but the volume sent is still very high - and increasingly consists not of advertisements for products, but malicious content or links.[[102]](#cite_note-102)

### Malware[[edit](/index.php?title=(none)&action=edit&section=34)]

A range of malicious email types exist. These range from [various types of email scams](/wiki/List_of_email_scams), including ["social engineering"](/wiki/Social_engineering_(security)) scams such as [advance-fee scam](/wiki/Advance-fee_scam) "Nigerian letters", to [phishing](/wiki/Phishing), [email bombardment](/wiki/Email_bomb) and [email worms](/wiki/Computer_worm).

### Email spoofing[[edit](/index.php?title=(none)&action=edit&section=35)]

[Template:Main](/wiki/Template:Main) [Email spoofing](/wiki/Email_spoofing) occurs when the email message header is designed to make the message appear to come from a known or trusted source. [Email spam](/wiki/Email_spam) and [phishing](/wiki/Phishing) methods typically use spoofing to mislead the recipient about the true message origin.

### Email bombing[[edit](/index.php?title=(none)&action=edit&section=36)]

[Template:Main](/wiki/Template:Main)

[Email bombing](/wiki/Email_bomb) is the intentional sending of large volumes of messages to a target address. The overloading of the target email address can render it unusable and can even cause the mail server to crash.

### Privacy concerns[[edit](/index.php?title=(none)&action=edit&section=37)]

[Template:Main](/wiki/Template:Main)

Today it can be important to distinguish between Internet and internal email systems. Internet email may travel and be stored on networks and computers without the sender's or the recipient's control. During the transit time it is possible that third parties read or even modify the content. Internal mail systems, in which the information never leaves the organizational network, may be more secure, although [information technology](/wiki/Information_technology) personnel and others whose function may involve monitoring or managing may be accessing the email of other employees.

Email privacy, without some security precautions, can be compromised because:

* email messages are generally not encrypted.
* email messages have to go through intermediate computers before reaching their destination, meaning it is relatively easy for others to intercept and read messages.
* many Internet Service Providers (ISP) store copies of email messages on their mail servers before they are delivered. The backups of these can remain for up to several months on their server, despite deletion from the mailbox.
* the "Received:"-fields and other information in the email can often identify the sender, preventing anonymous communication.

There are [cryptography](/wiki/Cryptography) applications that can serve as a remedy to one or more of the above. For example, [Virtual Private Networks](/wiki/Virtual_Private_Network) or the [Tor anonymity network](/wiki/Tor_(anonymity_network)) can be used to encrypt traffic from the user machine to a safer network while [GPG](/wiki/GNU_Privacy_Guard), [PGP](/wiki/Pretty_Good_Privacy), SMEmail,[[103]](#cite_note-103) or [S/MIME](/wiki/S/MIME) can be used for [end-to-end](/wiki/End-to-end_principle) message encryption, and SMTP STARTTLS or SMTP over [Transport Layer Security](/wiki/Transport_Layer_Security)/Secure Sockets Layer can be used to encrypt communications for a single mail hop between the SMTP client and the SMTP server.

Additionally, many [mail user agents](/wiki/Mail_user_agent) do not protect logins and passwords, making them easy to intercept by an attacker. Encrypted authentication schemes such as [SASL](/wiki/Simple_Authentication_and_Security_Layer) prevent this.

Finally, attached files share many of the same hazards as those found in [peer-to-peer filesharing](/wiki/Peer-to-peer). Attached files may contain [trojans](/wiki/Trojan_horse_(computing)) or [viruses](/wiki/Computer_virus).

### Tracking of sent mail[[edit](/index.php?title=(none)&action=edit&section=38)]

The original SMTP mail service provides limited mechanisms for tracking a transmitted message, and none for verifying that it has been delivered or read. It requires that each mail server must either deliver it onward or return a failure notice (bounce message), but both software bugs and system failures can cause messages to be lost. To remedy this, the [IETF](/wiki/Internet_Engineering_Task_Force) introduced [Delivery Status Notifications](/wiki/Delivery_Status_Notification) (delivery receipts) and [Message Disposition Notifications](/wiki/Return_receipt#Email) (return receipts); however, these are not universally deployed in production. (A complete Message Tracking mechanism was also defined, but it never gained traction; see RFCs 3885[[104]](#cite_note-104) through 3888.[[105]](#cite_note-105))

Many ISPs now deliberately disable non-delivery reports (NDRs) and delivery receipts due to the activities of spammers:

* Delivery Reports can be used to verify whether an address exists and so is available to be spammed
* If the spammer uses a forged sender email address ([email spoofing](/wiki/Email_spoofing)), then the innocent email address that was used can be flooded with NDRs from the many invalid email addresses the spammer may have attempted to mail. These NDRs then constitute spam from the ISP to the innocent user

In the absence of standard methods, a range of system based around the use of [web bugs](/wiki/Web_bug) have been developed. However, these are often seen as underhand or raising privacy concerns,[[106]](#cite_note-106)[[107]](#cite_note-107)[[108]](#cite_note-108) and only work with e-mail clients that support rendering of HTML. Many mail clients now default to not showing "web content".[[109]](#cite_note-109) [Webmail](/wiki/Webmail) providers can also disrupt web bugs by pre-caching images.[[110]](#cite_note-110)

## U.S. government[[edit](/index.php?title=(none)&action=edit&section=39)]

The U.S. state and federal governments have been involved in electronic messaging and the development of email in several different ways.

Starting in 1977, the U.S. Postal Service (USPS) recognized that electronic messaging and electronic transactions posed a significant threat to First Class mail volumes and revenue. The USPS explored an electronic messaging initiative in 1977 and later disbanded it. Twenty years later, in 1997, when email volume overtook postal mail volume, the USPS was again urged to embrace email, and the USPS declined to provide email as a service.[[111]](#cite_note-111)[[112]](#cite_note-112)[[113]](#cite_note-113) The USPS initiated an experimental email service known as [E-COM](/wiki/E-COM). E-COM provided a method for the simple exchange of text messages. In 2011, shortly after the USPS reported its state of financial bankruptcy, the USPS Office of Inspector General (OIG) began exploring the possibilities of generating revenue through email servicing.[[114]](#cite_note-114)[[115]](#cite_note-115)[[116]](#cite_note-116) Electronic messages were transmitted to a post office, printed out, and delivered as hard copy. To take advantage of the service, an individual had to transmit at least 200 messages. The delivery time of the messages was the same as First Class mail and cost 26 cents. Both the [Postal Regulatory Commission](/wiki/Postal_Regulatory_Commission) and the [Federal Communications Commission](/wiki/Federal_Communications_Commission) opposed E-COM. The FCC concluded that E-COM constituted common carriage under its jurisdiction and the USPS would have to file a [tariff](/wiki/Tariff).[[117]](#cite_note-117) Three years after initiating the service, USPS canceled E-COM and attempted to sell it off.[[118]](#cite_note-118)[[119]](#cite_note-119)[[120]](#cite_note-120)[[121]](#cite_note-121)[[122]](#cite_note-122) The early ARPANET dealt with multiple email clients that had various, and at times incompatible, formats. For example, in the [Multics](/wiki/Multics), the "@" sign meant "kill line" and anything before the "@" sign was ignored, so Multics users had to use a command-line option to specify the destination system.[[27]](#cite_note-27) The [Department of Defense](/wiki/United_States_Department_of_Defense) [DARPA](/wiki/DARPA) desired to have uniformity and interoperability for email and therefore funded efforts to drive towards unified inter-operable standards. This led to David Crocker, John Vittal, Kenneth Pogran, and [Austin Henderson](/wiki/Austin_Henderson) publishing RFC 733, "Standard for the Format of ARPA Network Text Message" (November 21, 1977), a subset of which provided a stable base for common use on the ARPANET, but which was not fully effective, and in 1979, a meeting was held at BBN to resolve incompatibility issues. [Jon Postel](/wiki/Jon_Postel) recounted the meeting in RFC 808, "Summary of Computer Mail Services Meeting Held at BBN on 10 January 1979" (March 1, 1982), which includes an appendix listing the varying email systems at the time. This, in turn, led to the release of David Crocker's RFC 822, "Standard for the Format of ARPA Internet Text Messages" (August 13, 1982).[[123]](#cite_note-123) RFC 822 is a small adaptation of RFC 733's details, notably enhancing the [host](/wiki/Host_(network)) portion, to use [Domain Names](/wiki/Domain_Name), that were being developed at the same time.

The [National Science Foundation](/wiki/National_Science_Foundation) took over operations of the ARPANET and Internet from the Department of Defense, and initiated [NSFNet](/wiki/NSFNet), a new [backbone](/wiki/Backbone_network) for the network. A part of the NSFNet AUP forbade commercial traffic.[[124]](#cite_note-124) In 1988, [Vint Cerf](/wiki/Vint_Cerf) arranged for an interconnection of [MCI Mail](/wiki/MCI_Mail) with NSFNET on an experimental basis. The following year [Compuserve](/wiki/Compuserve) email interconnected with NSFNET. Within a few years the commercial traffic restriction was removed from NSFNETs AUP, and NSFNET was privatised.

In the late 1990s, the [Federal Trade Commission](/wiki/Federal_Trade_Commission) grew concerned with fraud transpiring in email, and initiated a series of procedures on spam, fraud, and phishing.[[125]](#cite_note-125) In 2004, FTC jurisdiction over spam was codified into law in the form of the [CAN SPAM Act.](/wiki/Can_Spam_Act)[[126]](#cite_note-126) Several other U.S. federal agencies have also exercised jurisdiction including the [Department of Justice](/wiki/United_States_Department_of_Justice) and the [Secret Service](/wiki/United_States_Secret_Service).

NASA has provided email capabilities to astronauts aboard the Space Shuttle and International Space Station since 1991 when a [Macintosh Portable](/wiki/Macintosh_Portable) was used aboard [Space Shuttle](/wiki/Space_Shuttle) mission [STS-43](/wiki/STS-43) to send the first email via [AppleLink](/wiki/AppleLink).[[127]](#cite_note-127)[[128]](#cite_note-128)[[129]](#cite_note-129) Today astronauts aboard the International Space Station have email capabilities via the [wireless networking](/wiki/WI-FI) throughout the station and are connected to the ground at 10 [Mbit/s](/wiki/Mbit/s) Earth to station and 3 Mbit/s station to Earth, comparable to home [DSL](/wiki/DSL) connection speeds.<ref name=issit>[Template:Cite news](/wiki/Template:Cite_news)</ref>

## See also[[edit](/index.php?title=(none)&action=edit&section=40)]

[Template:Colbegin](/wiki/Template:Colbegin)

* [Anonymous remailer](/wiki/Anonymous_remailer)
* [Anti-spam techniques](/wiki/Anti-spam_techniques)
* [biff](/wiki/Biff)
* [Bounce message](/wiki/Bounce_message)
* [Comparison of email clients](/wiki/Comparison_of_email_clients)
* [Dark Mail Alliance](/wiki/Dark_Mail_Alliance)
* [Disposable email address](/wiki/Disposable_email_address)
* [E-card](/wiki/E-card)
* [Electronic mailing list](/wiki/Electronic_mailing_list)
* [Email art](/wiki/Email_art)
* [Email authentication](/wiki/Email_authentication)
* [Email digest](/wiki/Email_digest)
* [Email encryption](/wiki/Email_encryption)
* [Email hosting service](/wiki/Email_hosting_service)
* [Email storm](/wiki/Email_storm)
* [Email tracking](/wiki/Email_tracking)
* [HTML email](/wiki/HTML_email)
* [Information overload](/wiki/Information_overload)
* [Internet fax](/wiki/Internet_fax)
* [Internet mail standards](/wiki/Internet_mail_standard)
* [List of email subject abbreviations](/wiki/List_of_email_subject_abbreviations)
* [MCI Mail](/wiki/MCI_Mail)
* [Netiquette](/wiki/Netiquette)
* [Posting style](/wiki/Posting_style)
* [Privacy-enhanced Electronic Mail](/wiki/Privacy-enhanced_Electronic_Mail)
* [Push email](/wiki/Push_email)
* [RSS](/wiki/RSS)
* [Telegraphy](/wiki/Telegraphy)
* [Unicode and email](/wiki/Unicode_and_email)
* [Usenet quoting](/wiki/Usenet_quoting)
* [Webmail](/wiki/Webmail), [Comparison of webmail providers](/wiki/Comparison_of_webmail_providers)
* [X-Originating-IP](/wiki/X-Originating-IP)
* [X.400](/wiki/X.400)
* [Yerkish](/wiki/Yerkish)

[Template:Colend](/wiki/Template:Colend)

## References[[edit](/index.php?title=(none)&action=edit&section=41)]

[Template:Reflist](/wiki/Template:Reflist)

## Further reading[[edit](/index.php?title=(none)&action=edit&section=42)]

[Template:Refbegin](/wiki/Template:Refbegin)

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[Template:Refend](/wiki/Template:Refend)

## External links[[edit](/index.php?title=(none)&action=edit&section=43)]

[Template:Wiktionary](/wiki/Template:Wiktionary)

* [Template:Dmoz](/wiki/Template:Dmoz)
* [IANA's list of standard header fields](http://www.iana.org/assignments/message-headers/perm-headers.html)
* [The History of Email](http://emailhistory.org/) is Dave Crocker's attempt at capturing the sequence of 'significant' occurrences in the evolution of email; a collaborative effort that also cites this page.
* [The History of Electronic Mail](http://www.multicians.org/thvv/mail-history.html) is a personal memoir by the implementer of an early email system
* [A Look at the Origins of Network Email](http://www.circleid.com/posts/20140903_a_look_at_the_origins_of_network_email/) is a short, yet vivid recap of the key historical facts
* [Business E-Mail Compromise - An Emerging Global Threat](https://www.fbi.gov/news/stories/2015/august/business-e-mail-compromise), [FBI](/wiki/FBI)

[Template:Computer-mediated communication](/wiki/Template:Computer-mediated_communication) [Template:E-mail clients](/wiki/Template:E-mail_clients)

[Template:Authority control](/wiki/Template:Authority_control)

[Template:DEFAULTSORT:Email](/wiki/Template:DEFAULTSORT:Email) [Category:Email](/wiki/Category:Email) [Category:Internet terminology](/wiki/Category:Internet_terminology) [Category:Electronic documents](/wiki/Category:Electronic_documents) [Category:History of the Internet](/wiki/Category:History_of_the_Internet) [Category:1971 introductions](/wiki/Category:1971_introductions)