A guide to how email works

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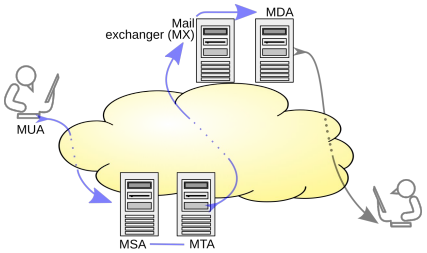
A lot happens when you click “Send”:

1. Email messages are composed using an email program (an email client).
2. The email program assembled the email by combining the message content (the body) with the recipient, subject, date, and time (the header).
3. Email relies on a set of protocols to arrive at the correct destination.
4. The email program (the email client) comes in two forms, a web-based version like Gmail, where users must log in through their browser to access their emails, or a client-based version such as Outlook, where users install software to access emails from their local computer.

What is email?

Email (electronic mail) is a digital communication method that allows users to send and receive messages over the internet. It enables individuals and organizations to exchange text, files, images, and other forms of media almost instantly, regardless of geographical location. Emails are sent through email clients (like Gmail or Outlook) and delivered to recipients via mail servers, which store and manage the messages . Email is widely used for both personal and professional communication due to its speed, convenience, and ability to keep a written record of correspondence.

What are Email servers? (SMTP and MTA)



An SMTP (Simple Mail Transfer Protocol) email server responsible for sending and forwarding outgoing email messages. When you compose and send an email, your email client (like Gmail or Outlook) connects to the SMTP server, which handles the process of delivering the message to the recipient's mail server. SMTP is primarily used for sending emails, not for receiving them. It ensures that the email is properly routed through the internet by determining the destination server and transferring the message. If the recipient’s server is unavailable, the SMTP server may retry sending the email until it is successfully delivered or notify the sender of a delivery failure.

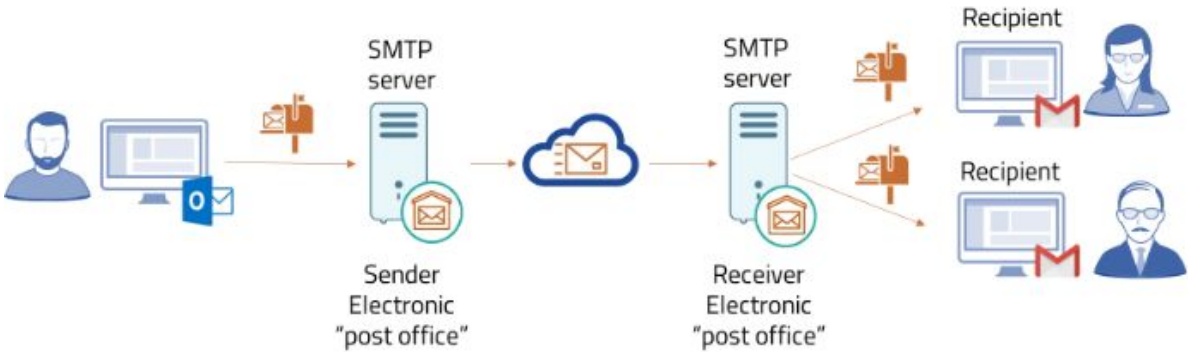
An MTA (Mail Transfer Agent) email server is a software application that plays a key role in routing and delivering email messages between different mail servers. When an email is sent, the MTA receives the message from the sender's SMTP server and determines the most efficient path to deliver it to the recipient's email server. It checks the recipient's domain, handles the transfer process, and ensures that the email reaches its destination. If the delivery fails, the MTA can retry the process or store the message for later delivery. In essence, the MTA acts as a "postal service" for email, managing the backend process of moving messages across networks.

How email works?

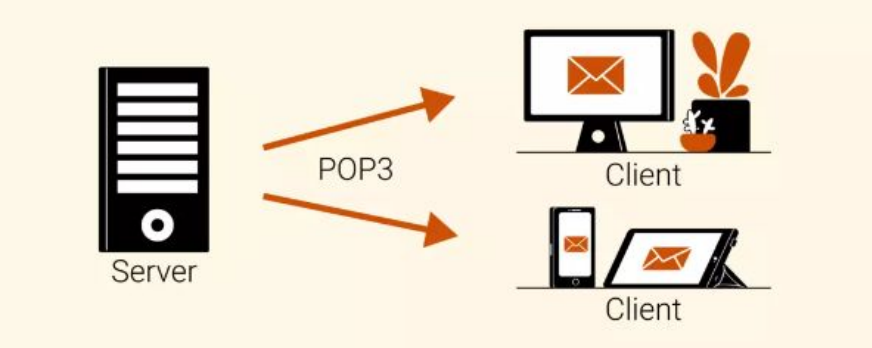
Email works by sending messages over the internet using a series of protocols and servers. When you compose an email and click "Send," your email client sends the message to an SMTP (Simple Mail Transfer Protocol) server, which forwards it to the recipient's mail server. The recipient's server stores the email until they check their inbox, using protocols like IMAP or POP3 to retrieve the message. IMAP syncs the email across devices, while POP3 typically downloads it to a single device. This entire process usually happens in seconds, making email a fast and efficient way to communicate.

What are email protocols?

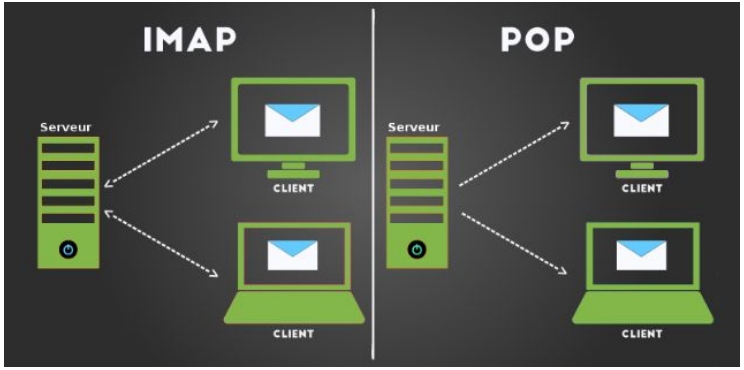
Mail Transfer Agents (MTAs) communicate with each other over the internet using SMTP protocol (SMTP servers). The recipient's MTA then forwards the email to the incoming mail server (MDA, mail delivery agent), tasked with storing the mail until the user accepts it. To retrieve email on an MDA, a supporting protocol must be used. There are two main protocols, POP3 and IMAP. You might recognize these two acronyms since incoming mail servers are called POP servers, or IMAP servers, depending on which protocol they use.



Pop vs. IMAP protocols



POP (Post Office Protocol) and IMAP (Internet Message Access Protocol) are two different methods used to retrieve emails from a mail server. POP typically downloads the email to a single device and removes it from the server, which means the email is only accessible on that device. It's useful for people who want to access emails offline but limits access across multiple devices. IMAP, on the other hand, keeps the email on the server and syncs it across all devices, allowing users to access their messages from anywhere and keeping them updated in real-time. IMAP is generally more flexible for users who want to access their emails from multiple devices.



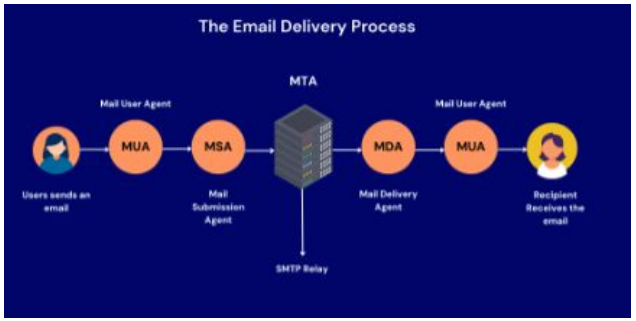
How email is received

Let’s now take a look at how email is received. No surprises here — we’ll revert straight back to our mail carrier analogy. How would an envelope be delivered to the recipient on the front of the envelope? The postal service finds the most logical route to the recipient.

The electronic version of events is handled similarly:

- The mail server locates the recipient’s server, but since the recipient’s server won’t accept every mail that comes its way, it asks who sent the email.
- The sending server gives the recipient server information on who the sender is by querying the envelope. Acknowledging the email is from a legitimate source (not spam, etc.), the recipient server says, "sure, I understand that Namecheap exists, and from that sending address.”
- Satisfied the sender address is correct, the recipient server asks for the receiver’. This is how envelope data is treated. The sending server will now forward the contents of the email contained in the envelope. Once the email has been received, the recipient server gives the mail server a receipt.

What types of MUA are there?



Retrieving email is tasked by a software program called a Mail User Agent (MUA). There are two types of MUA, and these are classed depending on how emails are accessed, via installed software (email client) or through a browser (webmail).

1. When an MUA is installed on a user's system, it's called an email client. To use an email client, MUA such as Microsoft Outlook, Mozilla Thunderbird, and Lotus Notes allows users to add the MUA program to their computer. This program is used to download and store email messages to their computers. With a client MUA, emails can be read and written offline.

2. When email is accessed online, it's called webmail. Web-based MUAs such as Yahoo, Gmail, and Hotmail store messages on their mail servers and can only be accessed through a web page. The main advantage of webmail is sending and receiving mail from a web browser, anywhere. The main disadvantage of using a web-based application is the need to be connected to the internet to use it.

The journey of an email

Let’s break down how an email is transmitted. Like most Internet data, emails travel across the internet as a stream of packets using the internet’s TCP/IP protocol. This process can be broken down into three steps:

1. Once an email is sent, the TCP protocol breaks it down into packets ( ); each packet bears the sender and the email recipient’s address.

2. The IP protocol routes the packets to the intended destination. Routers over the world wide web examine the addresses in each packet to calculate the most efficient route to the email’s destination server. Once a pathway is planned, the packets are forwarded to the next router. Several factors go into how email packets are routed, such as traffic volume on any given network.

3. Once the packets have arrived at the recipient's email server, TCP recombines them into the email format in which it was sent (on that the recipient can read).

How are emails structured?

It might have been a while, but consider how you'd formulate a formal letter you'd take to your mail office or drop in a mailbox. You start by taking pen to paper and writing your name and address on the right-hand side. On the left-hand side, you write the name and address of the intended recipient. Once you've written the body of the letter, you place it in an envelope. This is sealed, and the intended recipient's address is written on the front so that the sorting office knows where the letter will be sent. Just in case there is a problem finding the recipient, the sender's address is written on the back.

As technical as email might sound, the letter analogy is the same as how emails are structured. Emails are composed in a mail client (comparable to pen and paper). This is known as MIME data (multipurpose internet mail extensions). The mail server puts the email into an envelope, including the recipient and sender addresses (this is called envelope data). Email users won't come across the envelope since it's part of an internal process to route an email.

The job of an Email envelope, body, and header

In an email, the **envelope**, **body**, and **header** each serve a distinct purpose. The **header** contains important metadata, such as the sender’s and recipient’s email addresses, the subject line, and the date the email was sent. It helps the email system route the message correctly. The **body** is the main content of the email, where the message is written. It can be plain text or include formatting, images, and links. The **email envelope**, though not visible to the user, is a behind-the-scenes component that contains the information necessary for the email to be delivered, such as the sender's and recipient’s mail servers. It ensures proper routing and delivery but is typically handled by email servers, not the end-user. Together, these elements allow emails to be properly sent, delivered, and read.