What protocols and servers are involved in sending an email, and what are the steps?

Asked 16 years, 3 months ago   Modified 3 years, 9 months ago

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15

For the past few weeks, I've been trying to learn about just how email works. I understand the process of a client receiving mail from a server using POP pretty well. I also understand how a client computer can use SMTP to ask an SMTP server to send a message. However, I'm still missing something...

The way I understand it, outgoing mail has to make three trips:

1. Client (gmail user using Thunderbird) to a server (Gmail)

2. First server (Gmail) to second server (Hotmail)

3. Second server (Hotmail) to second client (hotmail user using OS X Mail)

As I understand it, step one uses SMTP for the client to communicate. The client authenticates itself somehow (say, with USER and PASS), and then sends a message to the gmail server.

However, I don't understand how gmail server transfers the message to the hotmail server.

For step three, I'm pretty sure, the hotmail server uses POP to send the message to the hotmail client (using authentication, again).

So, the big question is: **when I click send Mail sends my message to my gmail server, how does my gmail server forward the message to, say, a hotmail server so my friend can recieve it?**

Thank you so much!

~Jason

Thanks, that's been helpful so far.

As I understand it, the first client sends the message to the first server using SMTP, often to an address such as smtp.mail.SOMESERVER.com on port 25 (usually).

Then, SOMESERVER uses SMTP again to send the message to RECEIVESERVER.com on port 25 (not smtp.mail.RECEIVESERVER.com or anything fancy).

Then, when the recipient asks RECEIVESERVER for its mail, using POP, s/he recieves the message... right?

Thanks again (especially to dr-jan),

Jason

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7 Answers

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The SMTP server at Gmail (which accepted the message from Thunderbird) will route the message to the final recipient.

It does this by using DNS to find the MX (mail exchanger) record for the domain name part of the destination email address (hotmail.com in this example). The DNS server will return an IP address which the message should be sent to. The server at the destination IP address will hopefully be running SMTP (on the standard port 25) so it can receive the incoming messages.

Once the message has been received by the hotmail server, it is stored until the appropriate user logs in and retrieves their messages using POP (or IMAP).

Jason - to answer your follow up...

> Then, SOMESERVER uses SMTP again to send the message to RECEIVESERVER.com on port 25 (not smtp.mail.RECEIVESERVER.com or anything fancy).

That's correct - the domain name to send to is taken as everything after the '@' in the email address of the recipient. Often, RECEIVESERVER.com is an alias for something more specific, say something like incoming.RECEIVESERVER.com, (or, indeed, smtp.mail.RECEIVESERVER.com).

You can use nslookup to query your local DNS servers (this works in Linux and in a Windows cmd window):

```
nslookup
> set type=mx
> stackoverflow.com
Server:         158.155.25.16
Address:        158.155.25.16#53

Non-authoritative answer:
stackoverflow.com       mail exchanger = 10
aspmx.l.google.com.
stackoverflow.com       mail exchanger = 20
alt1.aspmx.l.google.com.
stackoverflow.com       mail exchanger = 30
alt2.aspmx.l.google.com.
stackoverflow.com       mail exchanger = 40
aspmx2.googlemail.com.
stackoverflow.com       mail exchanger = 50
aspmx3.googlemail.com.

Authoritative answers can be found from:
aspmx.l.google.com      internet address =
64.233.183.114
```

```
aspmx.l.google.com       internet address =
64.233.183.27
>
```

This shows us that email to anyone at stackoverflow.com should be sent to one of the gmail servers shown above.

The Wikipedia article mentioned (http://en.wikipedia.org/wiki/Mx_record) discusses the priority numbers shown above (10, 20, ..., 50).

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16 years later, but a top hit on search engine, so: in 2024 port 25 is almost banned. If your user agent uses port 25 of the MTA, does the MTA use that same port 25 to the final MTA or MDA? Or does it "upgrade" it to port 465 or 587? Or, perhaps, even if you use port 465 or 587 to your first MTA, does it then go back to port 25, perhaps encrypted even tho it's port 25? – john v kumpf May 22 at 3:25

You're looking for the Mail Transfer Agent, Wikipedia has a nice article on the topic.

> Within Internet message handling services
> (MHS), a message transfer agent or mail transfer

agent (MTA) or mail relay is software that transfers electronic mail messages from one computer to another using a client–server application architecture. An MTA implements both the client (sending) and server (receiving) portions of the Simple Mail Transfer Protocol.

The terms mail server, mail exchanger, and MX host may also refer to a computer performing the MTA function. The Domain Name System (DNS) associates a mail server to a domain with mail exchanger (MX) resource records containing the domain name of a host providing MTA services.

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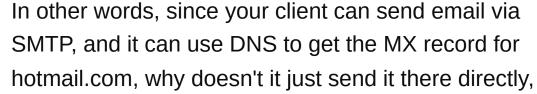
▼

You might also be interested to know why the GMail to HotMail link uses SMTP, just like your Thunderbird client. In other words, since your client can send email via SMTP, and it can use DNS to get the MX record for hotmail.com, why doesn't it just send it there directly, skipping gmail.com altogether?

There are a couple of reasons, some historical and some for security. In the original question, it was assumed that
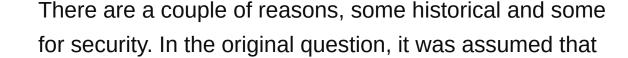
your Thunderbird client logs in with a user name and password. This is often not the case. SMTP doesn't actually require a login to send a mail. And SMTP has no way to tell who's really sending the mail. Thus, spam was born!

There are, unfortunately, still many SMTP servers out there that allow anyone and everyone to connect and send mail, trusting blindly that the sender is who they claim to be. These servers are called "open relays" and are routinely black-listed by smarter administrators of other mail servers, because of the spam they churn out.

Responsible SMTP server admins set up their server to accept mail for delivery only in special cases 1) the mail is coming from "its own" network, or 2) the mail is being sent to "its own" network, or 3) the user presents credentials that identifies him as a trusted sender. Case #1 is probably what happens when you send mail from work; your machine is on the trusted network, so you can send mail to anyone. A lot of corporate mail servers still don't require authentication, so you can impersonate anyone in your office. Fun! Case #2 is when someone sends you mail. And case #3 is probably what happens with your GMail example. You're not coming from a trusted network, you're just out on the Internet with the spammers. But by using a password, you can prove to GMail that you are who you say you are.

The historical aspect is that in the old days, the link between gmail and hotmail was likely to be intermittent.

By queuing your mail up at a local server, you could wash your hands of it, knowing that when a link was established, the local server could transfer your messages to the remote server, which would hold the message until the recipient's agent picked it up.

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The first server will look at DNS for a MX record of Hotmail server. MX is a special record that defines a mail server for a certain domain. Knowing IP address of Hotmail server, GMail server will sent the message using SMTP protocol and will wait for an answer. If Hotmail server goes down, GMail server wiil try to resend the message (it will depend on server software configuration). If the process terminates ok, then ok, if not, GMail server will notify you that he wasn´t able to deliver the message.

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If you really want to know how email works you could read the SMTP RFC or the POP3 RFC.

2

answered Aug 28, 2008 at 16:55

Corin Blaikie
18.1k ● 10 ● 39 ● 39

1

All emails are transferred using SMTP (or ESMTP). The important thing to understand is that the when you send message to someguy@hotmail.com this message's destination is not his PC. The destination is someguy's inbox folder at hotmail.com server.
After the message arrives at it's destination. The user can check if he has any new messages on his account at hotmail server and retrieve them using POP3

Also it would be possible to send the message without using gmail server, by sending it directly from your PC to hotmail using SMTP.

edited Feb 14, 2011 at 11:23

answered Aug 28, 2008 at 17:03

Michał Piaskowski
3,840 ● 2 ● 36 ● 46

Step 2 to 3 (i.e. Gmail to Hotmail) would normally happen through SMTP (or ESMTP - extended SMTP).

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Hotmail doesn't send anything to a client via POP3. It's important to understand some of the nuances here. The client contacts Hotmail via POP3 and requests its mail. (i.e. the client initiates the discussion).

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