

Internet Electronic Mail

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March 11, 2020

- General concepts
- Transport protocol: SMTP
- Basic message format
- MIME format

A Postal Service for the Internet

A Postal Service for the Internet



Alice

A Postal Service for the Internet



Alice

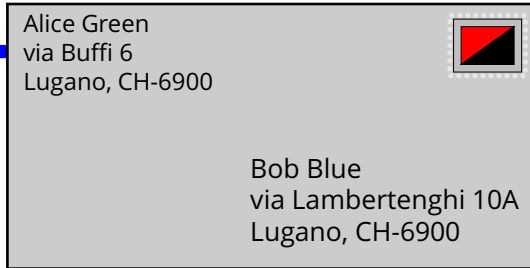


Bob

A Postal Service for the Internet



Alice

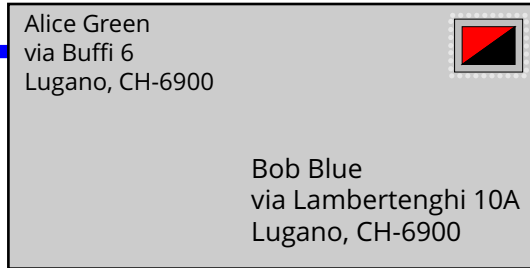


Bob

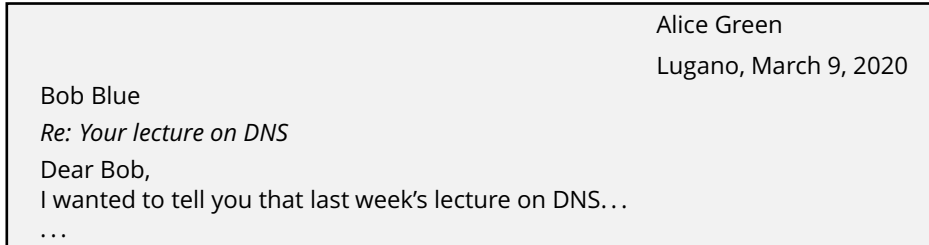
A Postal Service for the Internet



Alice



Bob



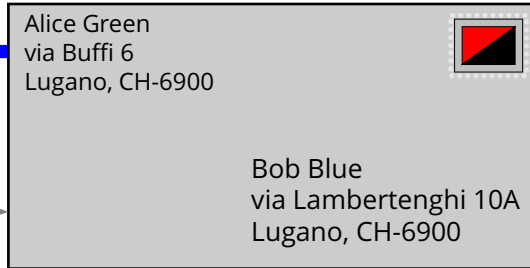
A Postal Service for the Internet



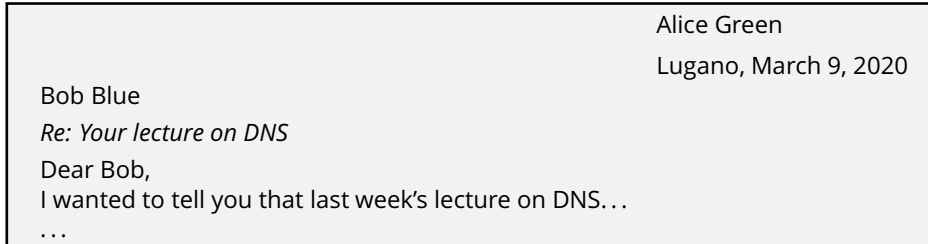
Alice



envelope →



Bob



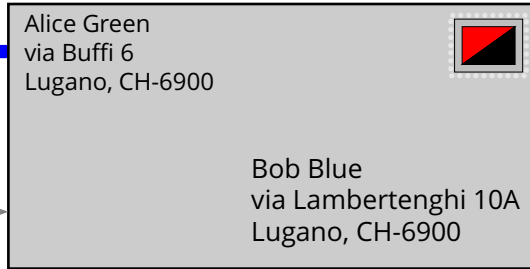
A Postal Service for the Internet



Alice



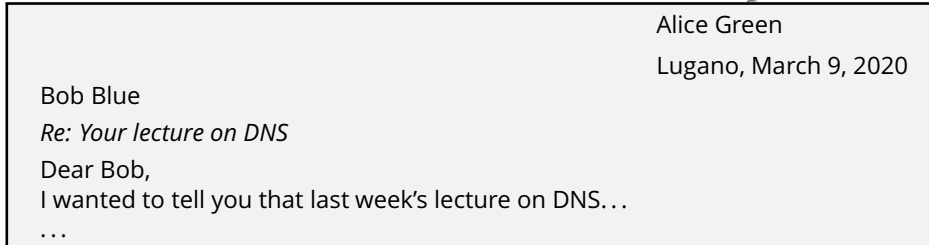
envelope →



Bob



message ←



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■ Multi-media content

- ▶ images and all sorts of attachments as well as normal text

■ No authentication

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■ Little or no delivery guarantees

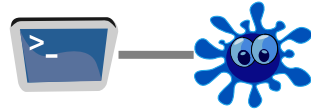
- ▶ Alice has no idea whether the messages was in fact receiver (much less read!) by Bob
- ▶ messages can be accidentally lost or intentionally blocked
- ▶ no reliable acknowledgement system

Architecture and Terminology

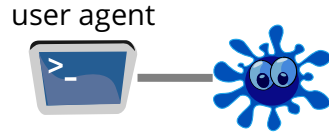
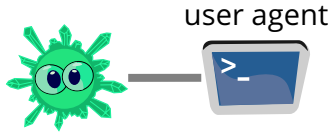
Architecture and Terminology



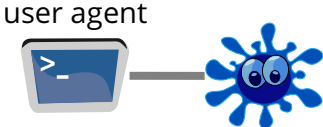
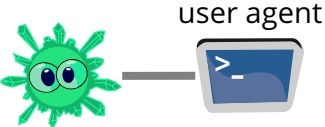
Architecture and Terminology



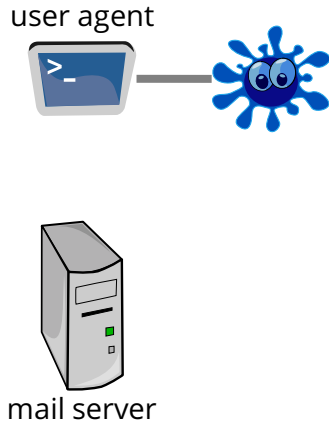
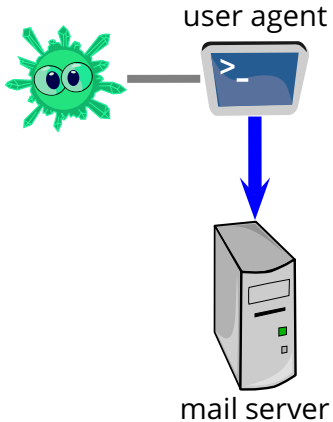
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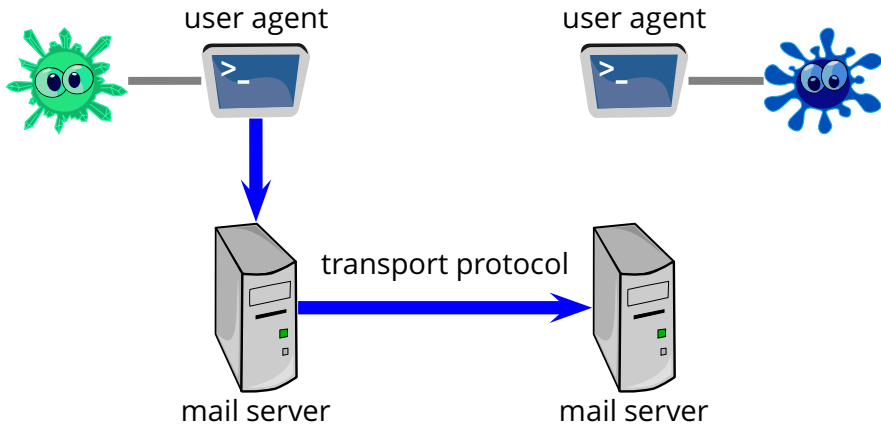
Architecture and Terminology



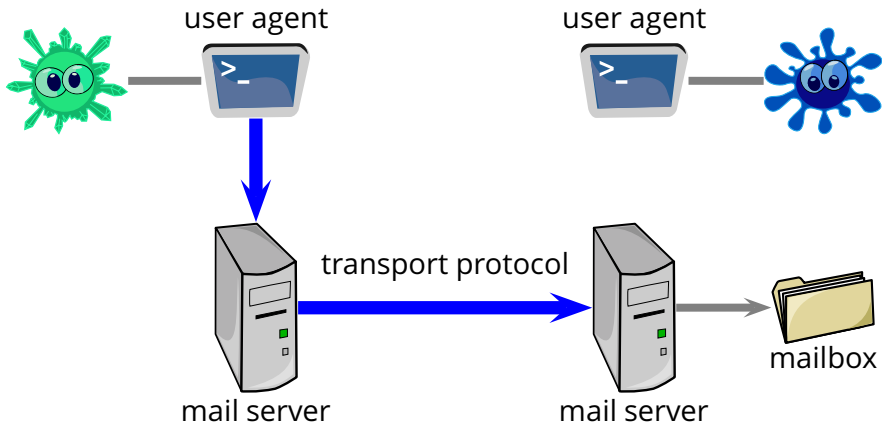
Architecture and Terminology



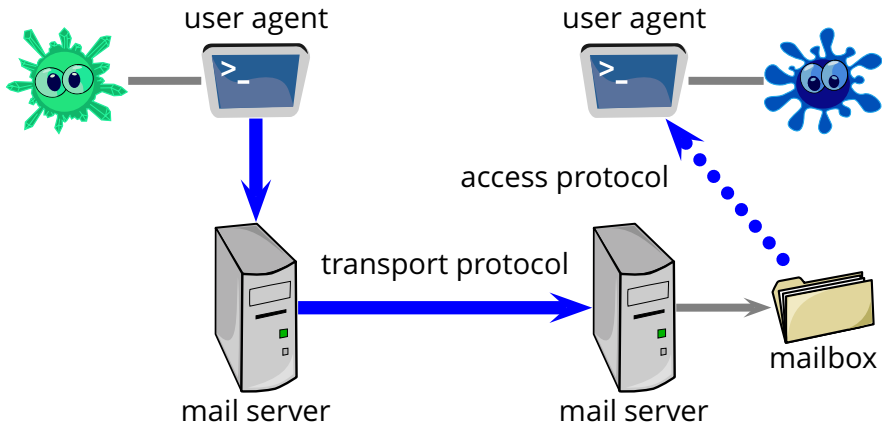
Architecture and Terminology



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■ *Mail servers*

- ▶ accept messages for *remote delivery*
 - ▶ store messages in a local persistent queue
 - ▶ deliver messages to a remote (destination) server using the *transport protocol*
- ▶ accept messages for *local delivery*
 - ▶ save messages in some local persistent mailbox
- ▶ allow user agents to *access local mailboxes*
 - ▶ user agents can retrieve and/or delete messages
 - ▶ this is done through an *access protocol*

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- It is “simple”
 - ▶ indeed its simplicity is a reason for its success
- It is an old protocol, compared to HTTP; the first RFCs date back to the early 80s
 - ▶ it has some archaic characteristics. E.g., it is restricted to 7-bit characters

SMTP Abstract Example

usi.ch

client



colorado.edu

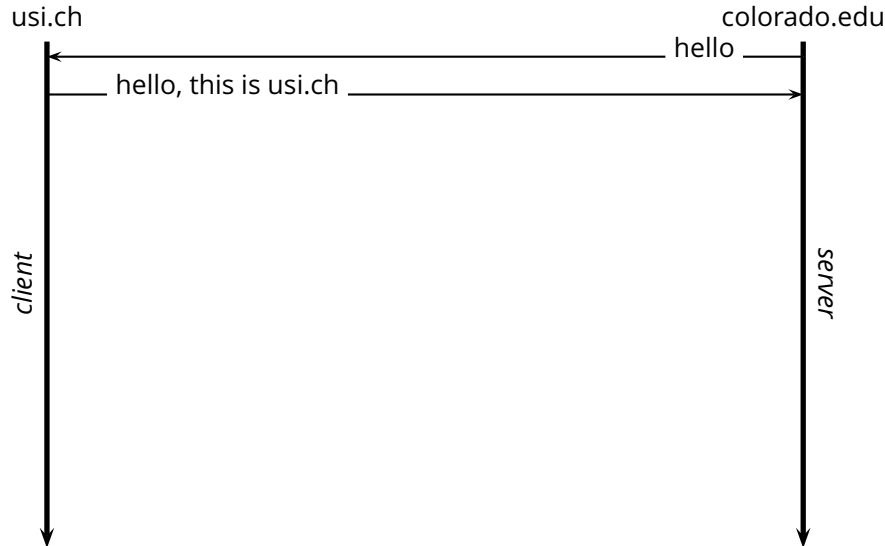
server



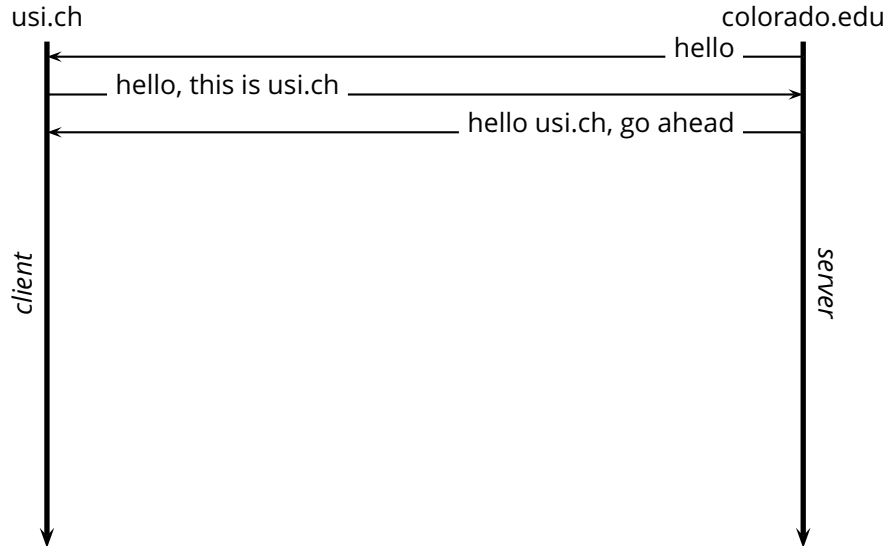
SMTP Abstract Example



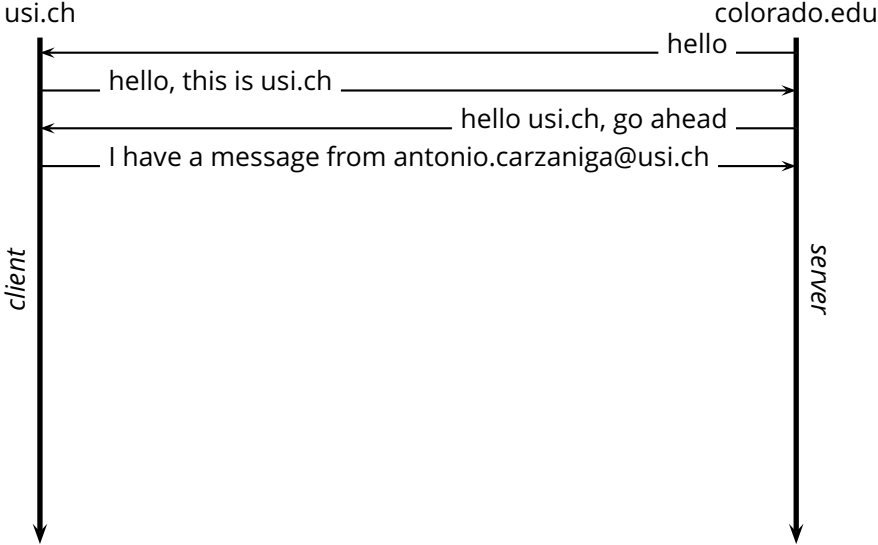
SMTP Abstract Example



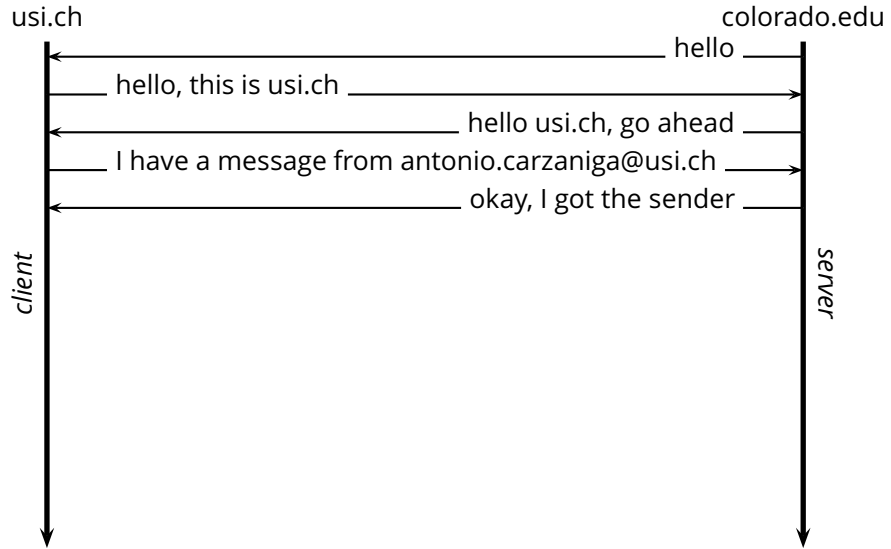
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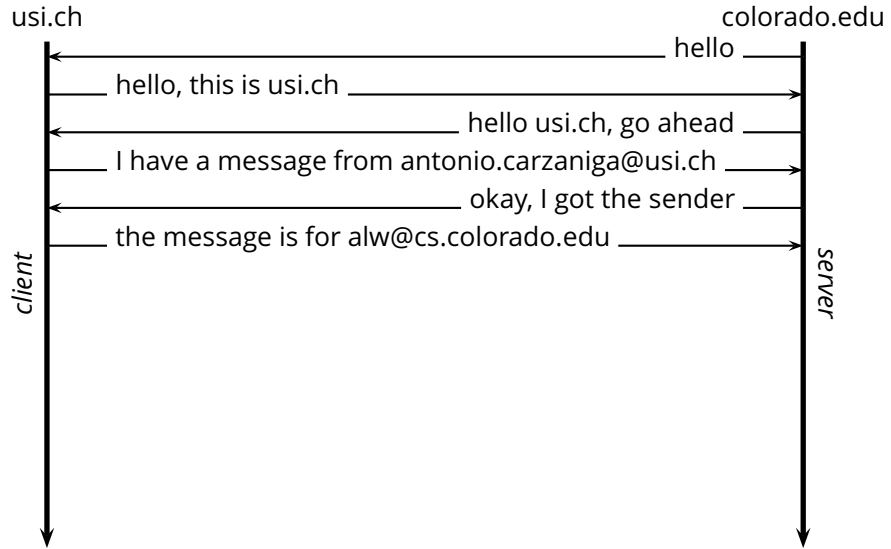
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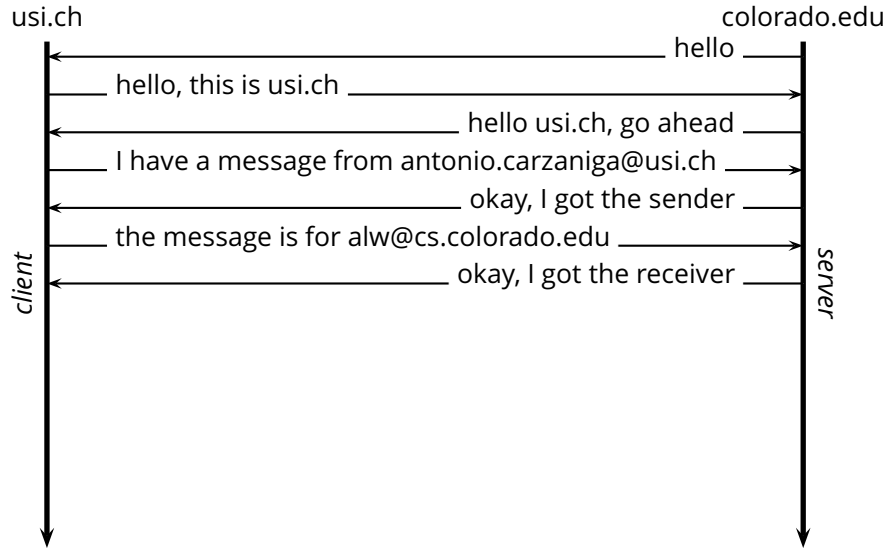
SMTP Abstract Example



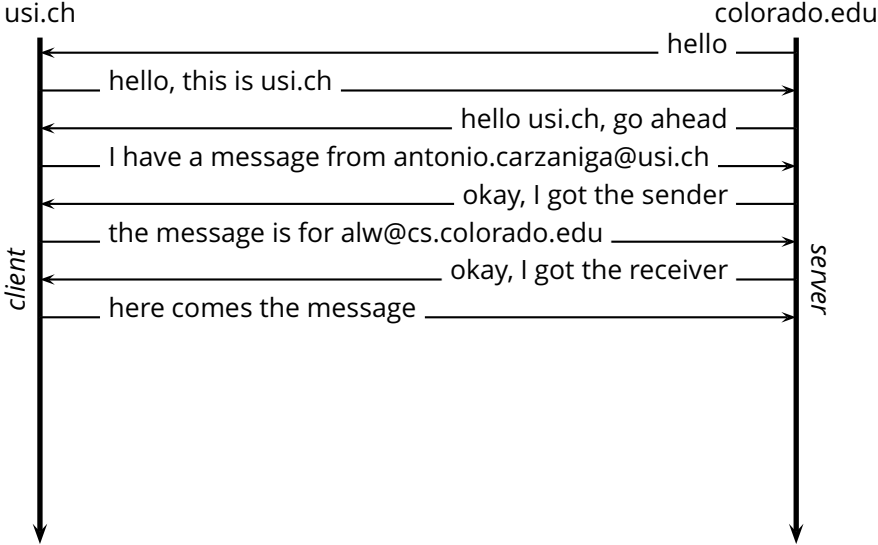
SMTP Abstract Example



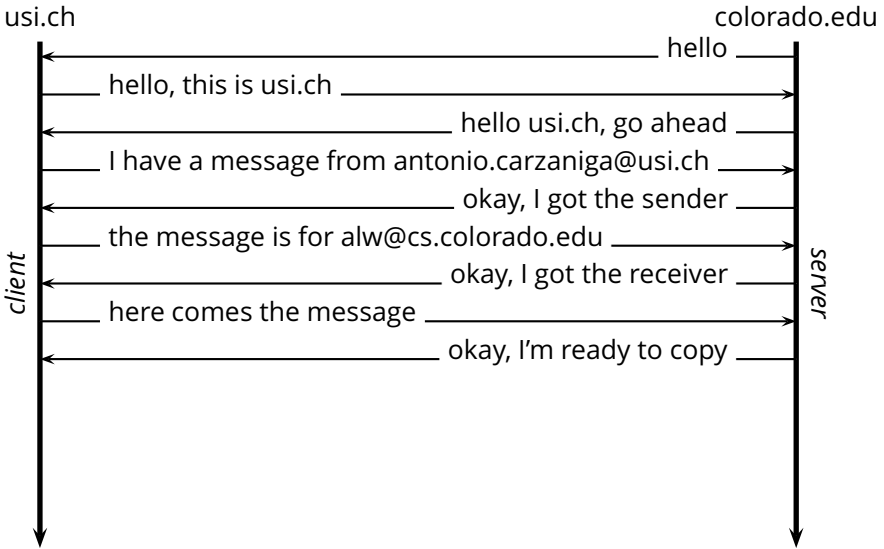
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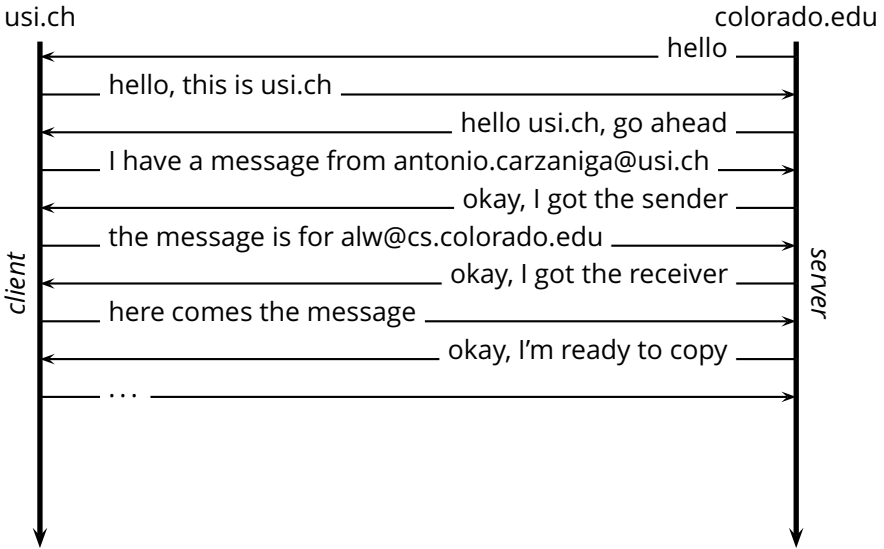
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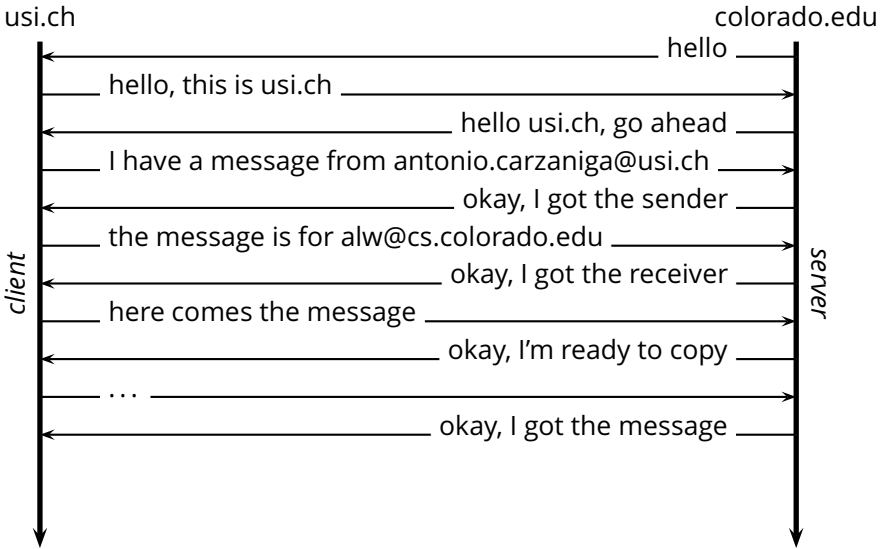
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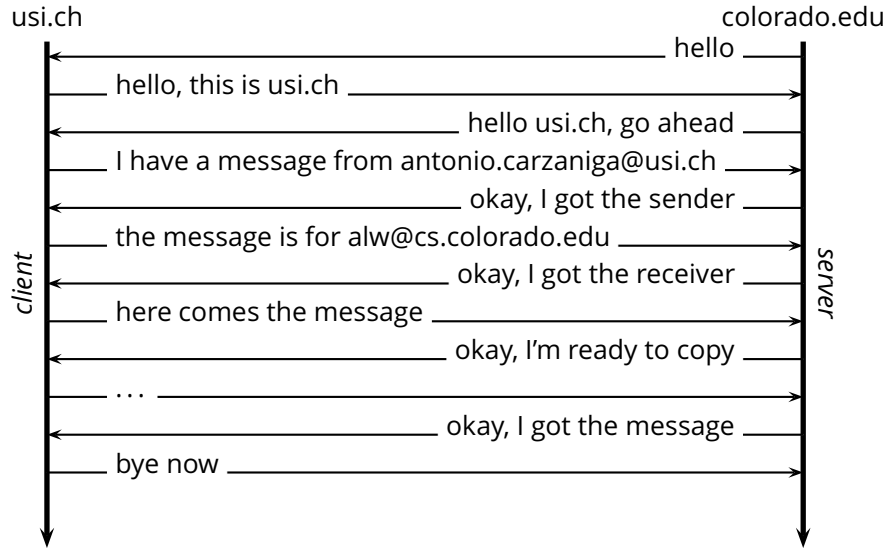
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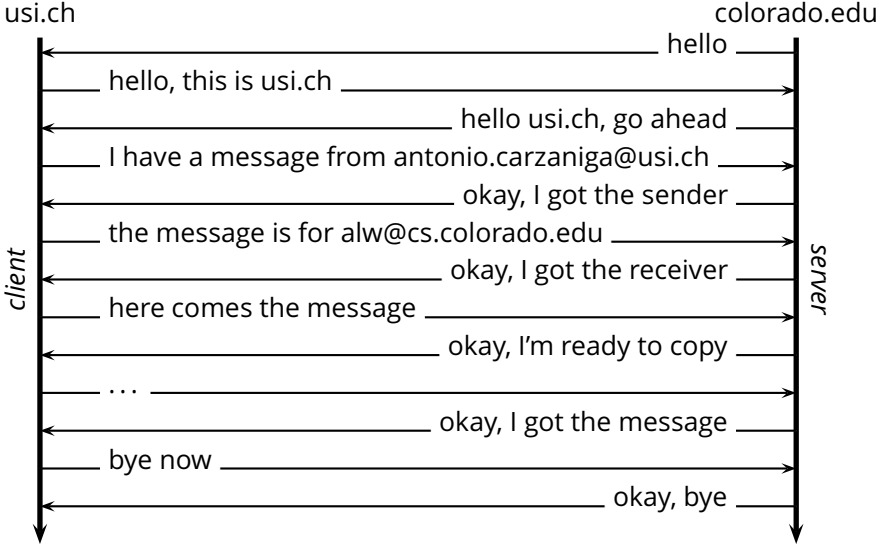
SMTP Abstract Example



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SMTP Concrete Example

usi.ch

client

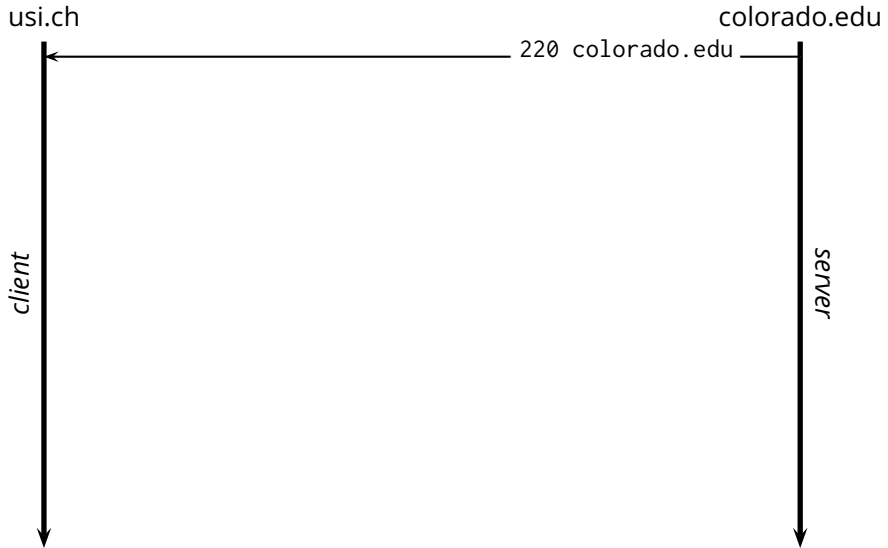


colorado.edu

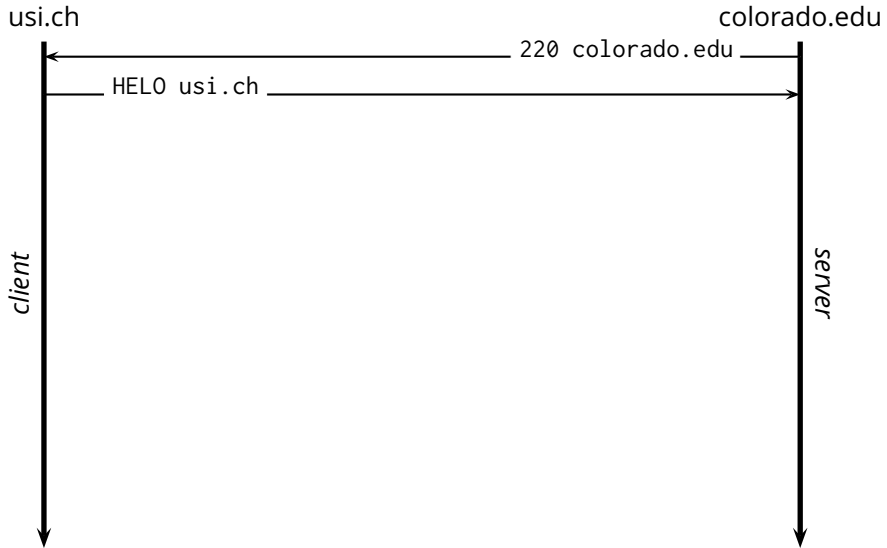
server



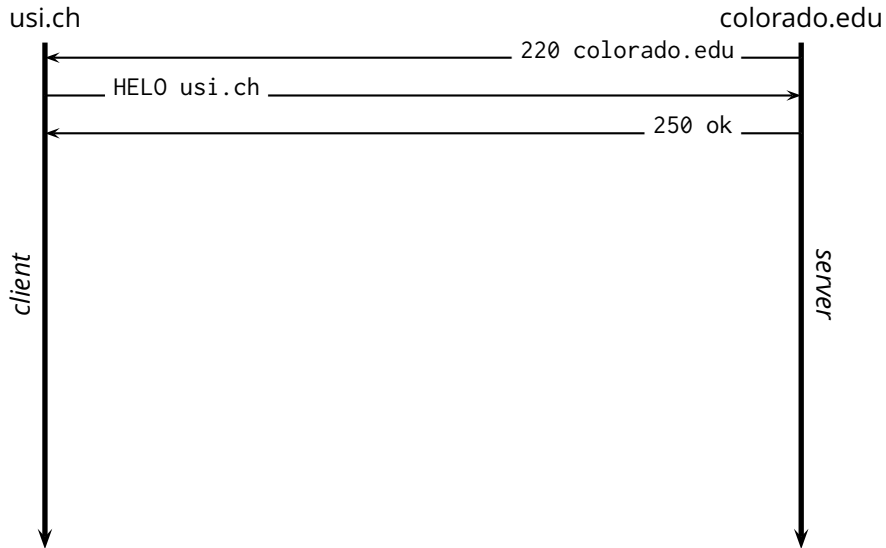
SMTP Concrete Example



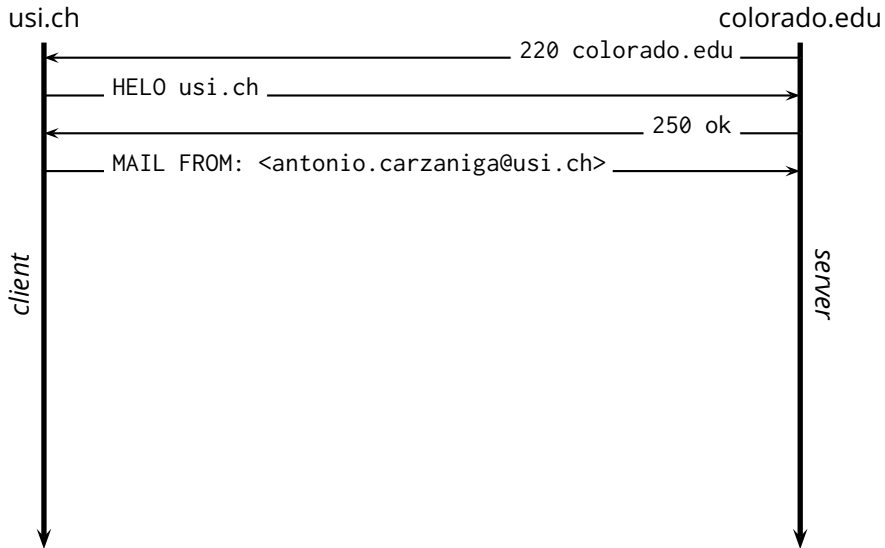
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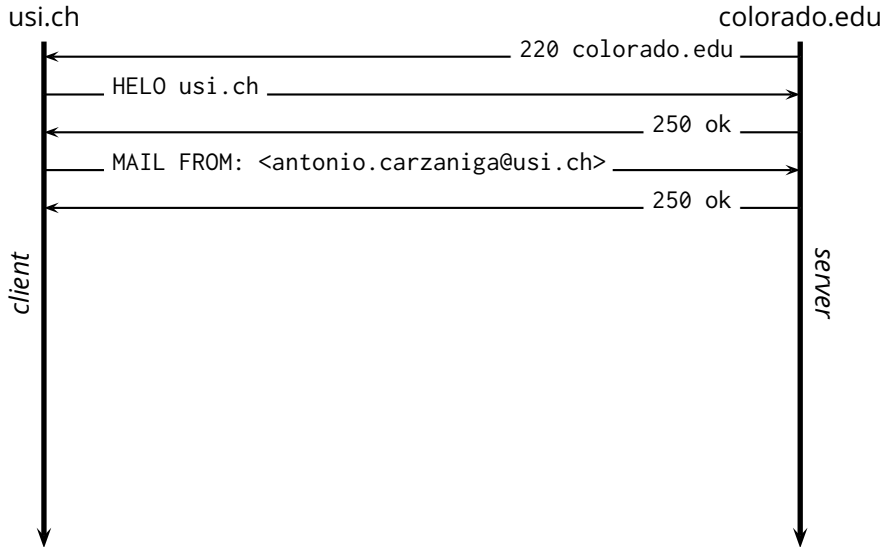
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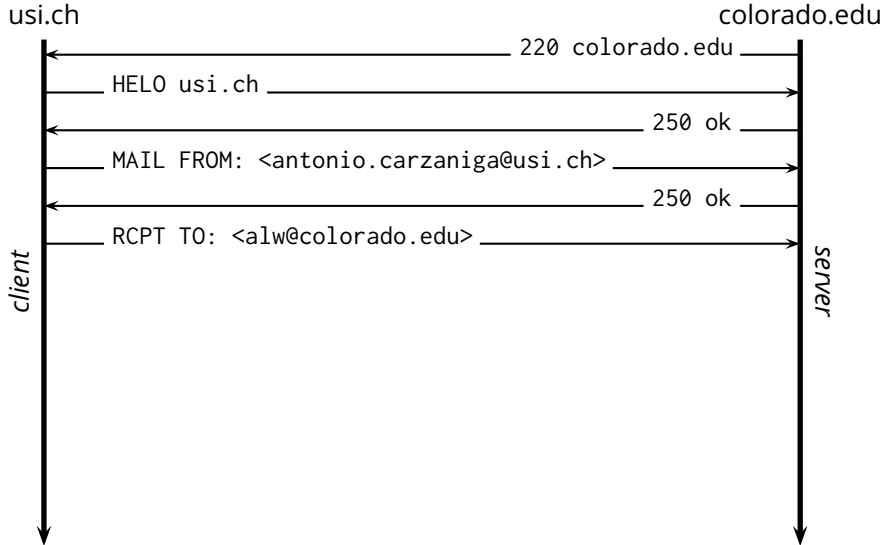
SMTP Concrete Example



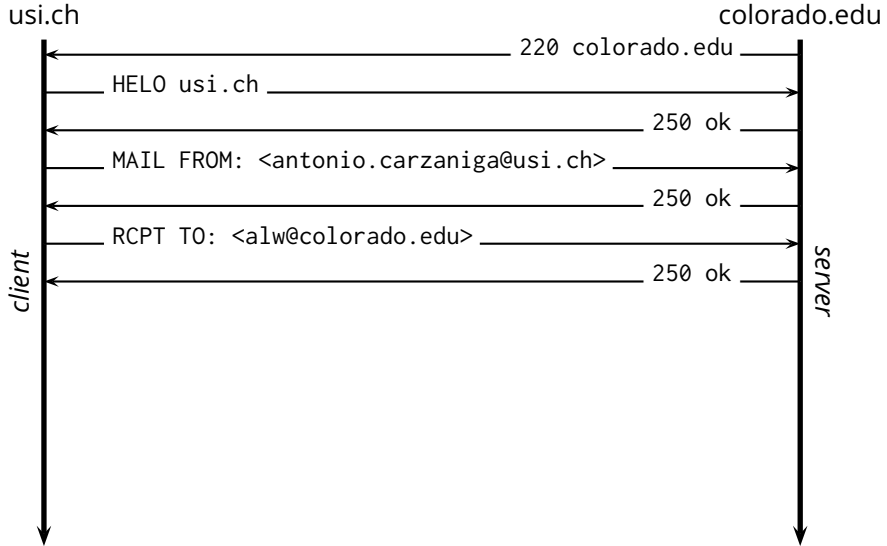
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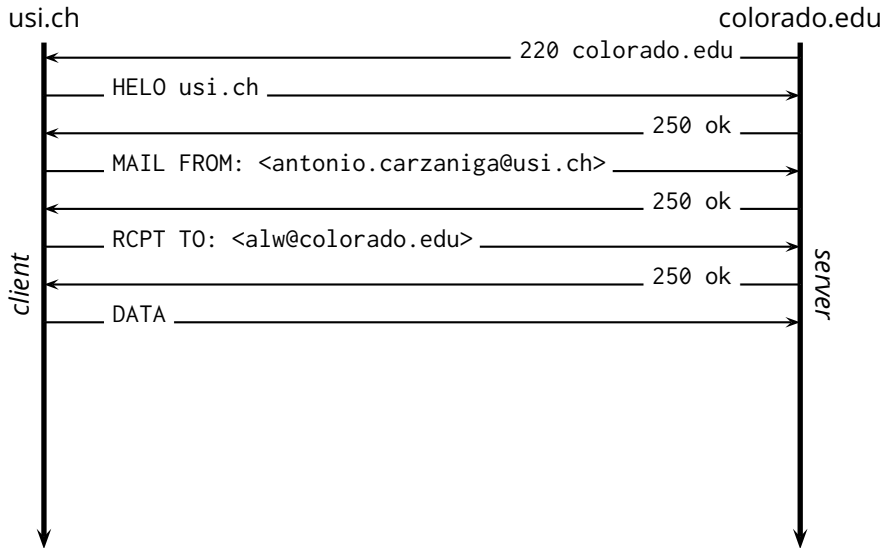
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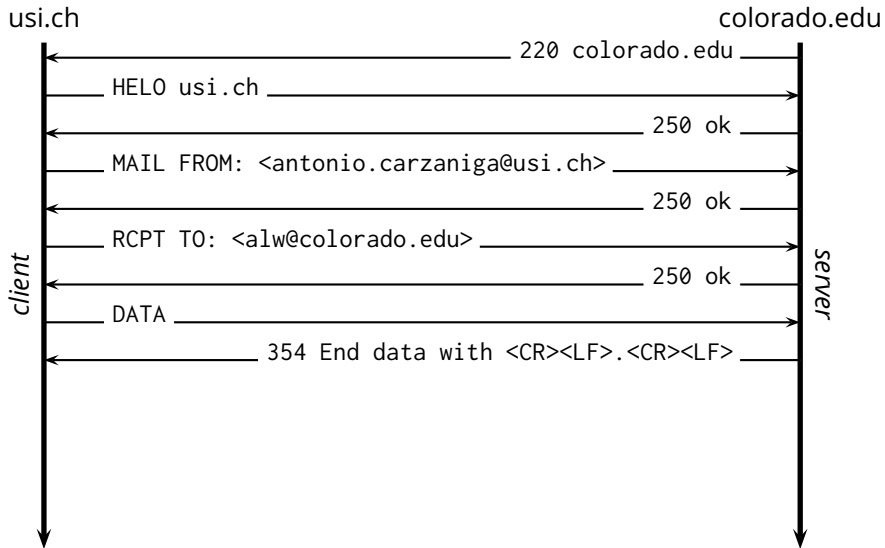
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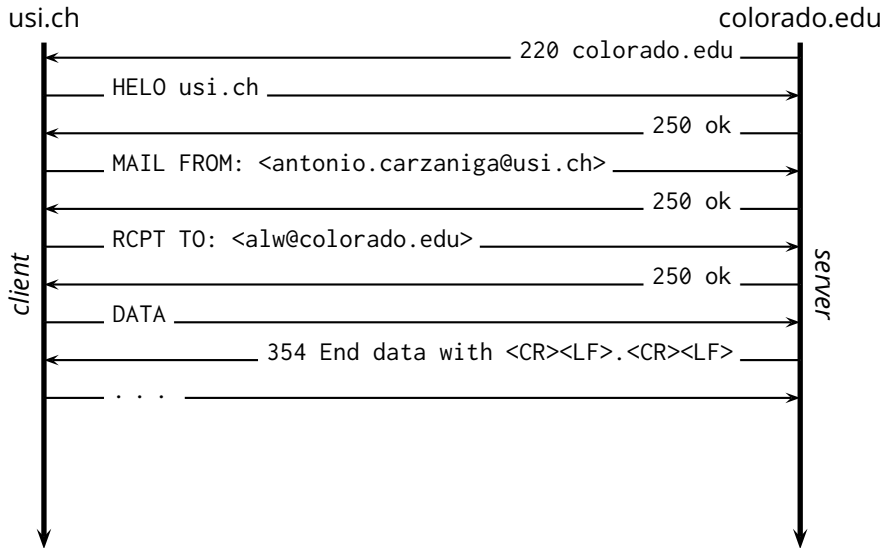
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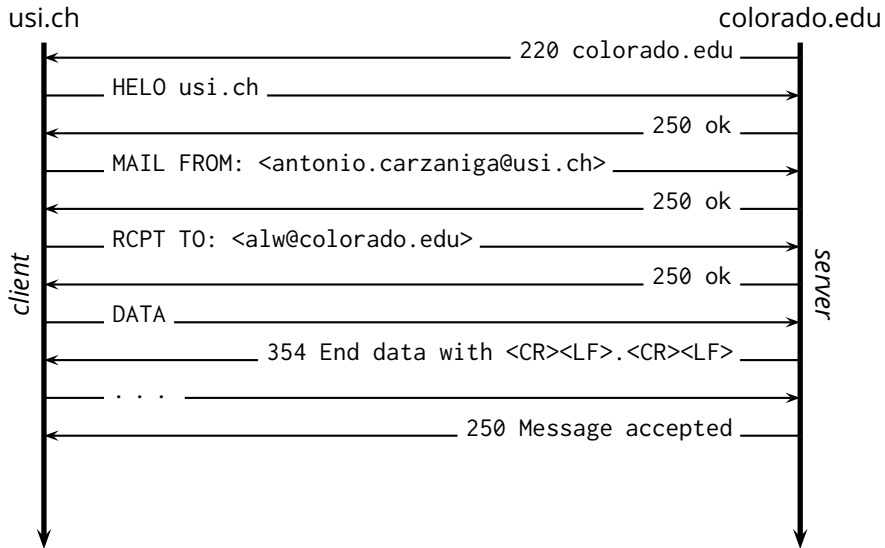
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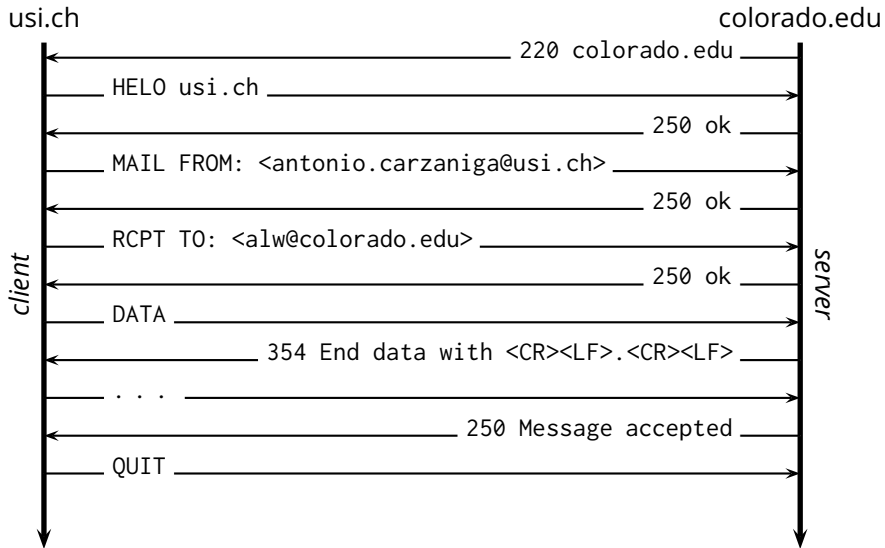
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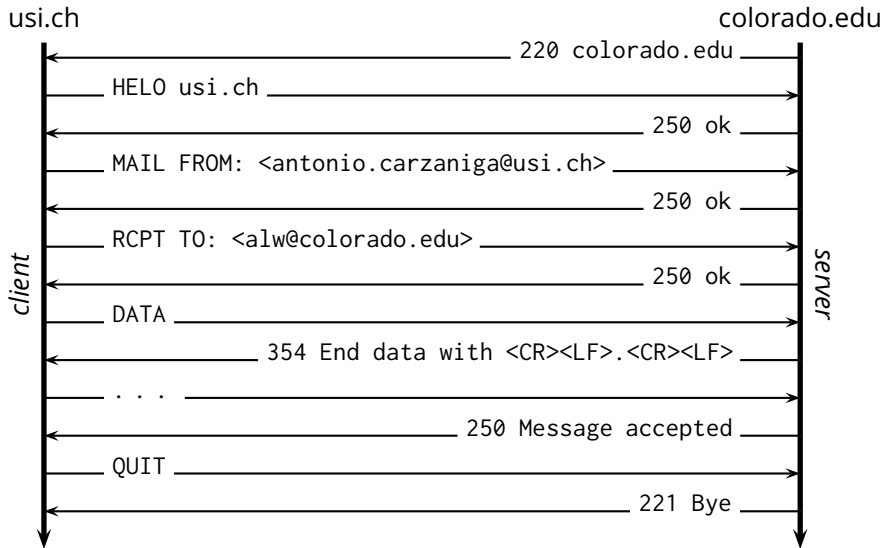
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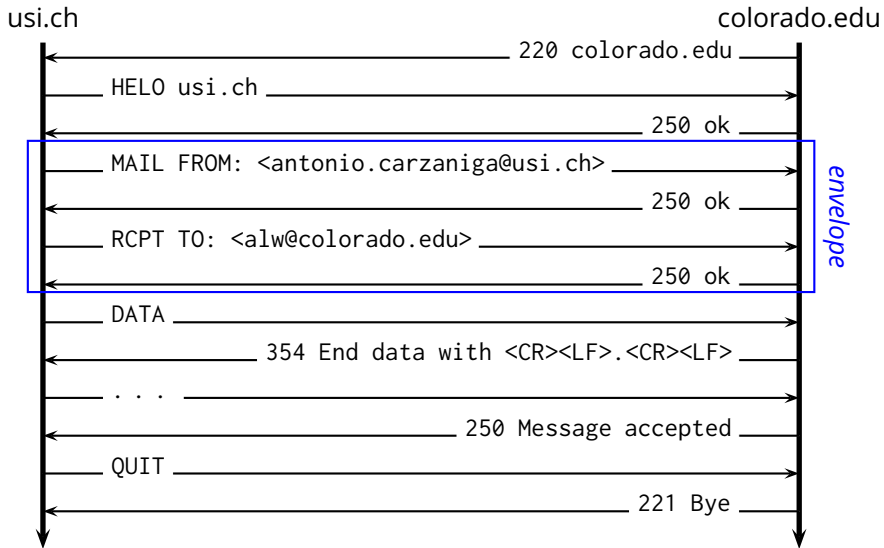
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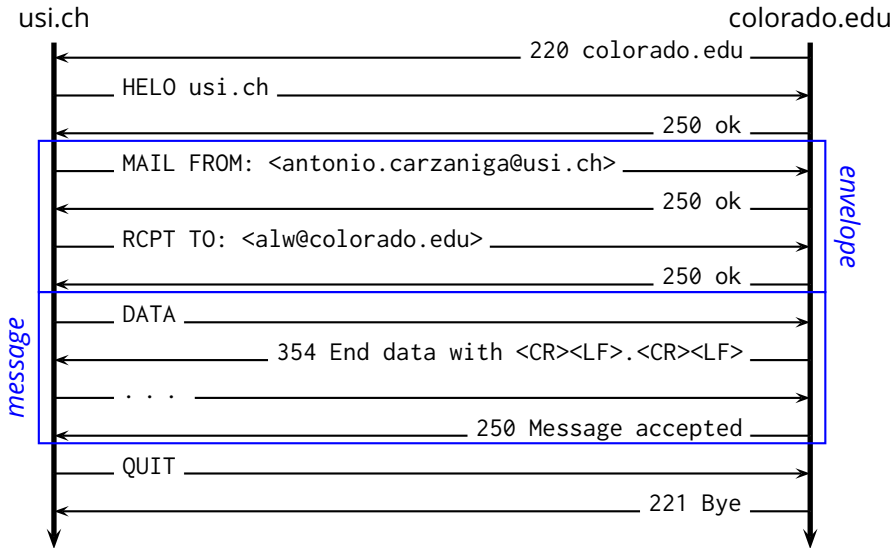
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Message Format

<p>From: antonio.carzaniga@usi.ch Date: Mon, 3 Apr 2005 16:48:22 -0600 (MDT) To: carzanig@cs.colorado.edu Subject: how to send fake e-mail messages</p>	
---	--

<p>Hey Dude, I heard this story about forging messages. Do you know anything about that? ...</p>	
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```
Received: from mroe.cs.colorado.edu (mroe-fs.cs.colorado.edu
[128.138.242.197])
  by ser1.cs.colorado.edu (Postfix) with ESMTP id 9AC463D07
  for <carzanig@ser1.cs.colorado.edu>; Mon, 3 Apr 2006 13:39:28 -0600
Received: from max.colorado.edu (max.colorado.edu [128.138.129.234])
  by mroe.cs.colorado.edu (Postfix) with ESMTP id 541C8577A
  for <carzanig@cs.colorado.edu>; Mon, 3 Apr 2006 13:43:59 -0600
Received: from cs.colorado.edu (host132-91.pool82107.interbusiness.it
[82.107.91.132])
  by max.colorado.edu (8.13.6/8.13.6/Hesiod+SSL) with ESMTP id . . .
  for <carzanig@cs.colorado.edu>; Mon, 3 Apr 2006 13:38:12 -0600
```

Message vs. Envelope

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To: Deserters <all@iobject.org>
Subject: warning...

You can run, but you can't hide!

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- Anything wrong with this exchange?

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 - ▶ a forwarded (or re-sent) message

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- The ***Multipurpose Internet Mail Extensions (MIME)*** specification (RFC 2045 and RFC 2046) defines *extensions* of the basic message format that support all of the above

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- Supports messages consisting of multiple parts
 - E.g.,
 - ▶ a message containing some text and an image
 - ▶ a message containing a binary attachment (e.g., an executable program, a document, etc.)
 - ▶ a message containing another message
 - ▶ a message containing some Italian text plus another message containing German text
 - ▶ a message containing another message, containing another message, ...

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An Internet mail message must contain only 7-bit characters, therefore any content that does not fit the 7-bit (ASCII) character set must be *encoded*

- Content-Transfer-Encoding:
defines the encoding for the message content (or a part thereof). Common values are:
 - ▶ base64
 - ▶ Quoted-Printable

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MIME Multipart Messages

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- The message consists of a list of *parts* (e.g., the main message text and an attached document)
 1. parts are separated by a *boundary line*
 2. parts are introduced (right after the separator line) by a set of specific headers that define that part
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- This format is naturally recursive

MIME Example

```
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="gJ7ppttFJL"
Content-Transfer-Encoding: 7bit
Date: Fri, 15 Apr 2005 15:24:31 +0200
From: Antonio Carzaniga <antonio.carzaniga@usi.ch>
To: Antonio Carzaniga <carzanig@cs.colorado.edu.ch>
Subject: Immagini e testo
```

```
--gJ7ppttFJL
Content-Type: text/plain; charset=iso-8859-15
Content-Description: message body text
Content-Transfer-Encoding: quoted-printable
```

questo =E8 un esempio di un messaggio che usa il formato MIME.

-A

```
--gJ7ppttFJL
Content-Type: image/png
Content-Disposition: inline;
filename="anto.png"
Content-Transfer-Encoding: base64
```

```
iVBORw0KGgoAAAANSUHEUgAAAMgAAADICAIAAAAI0jnJAAAACXBIWXMAAAIxAAACMQF3BQBZAAAA
B3RJTUUH1AwdCiYGBdI1HQAAIABJREFUeNqEu1mMJteVJnaWe2P5l/wz88+tcqusnRT3fRMpiqOW
Wt0De9w9bczAGAM2jPHAFvOLDcNvfVODAW8YeOC1DbeN7ullZnpa6kUttZqiKIoiWawiWaxibVlZ
uVTu+a+x3Hv08UOq7cEAxsRTRCAiXuLDud928T/7L/6hoDZazYnu8kxnbqLdbbab7Xa71ZxoNZt5
```

```
. . .
Ts2sSh8efiVxP3z3GtgR5/9Wz/8DNJKaidrd/8MAAAAASUVORK5CYII=
```

```
--gJ7ppttFJL--
```