

FIT9137

Introduction to Computer Architecture and Networks

Week 10: Workshop on Application Layer

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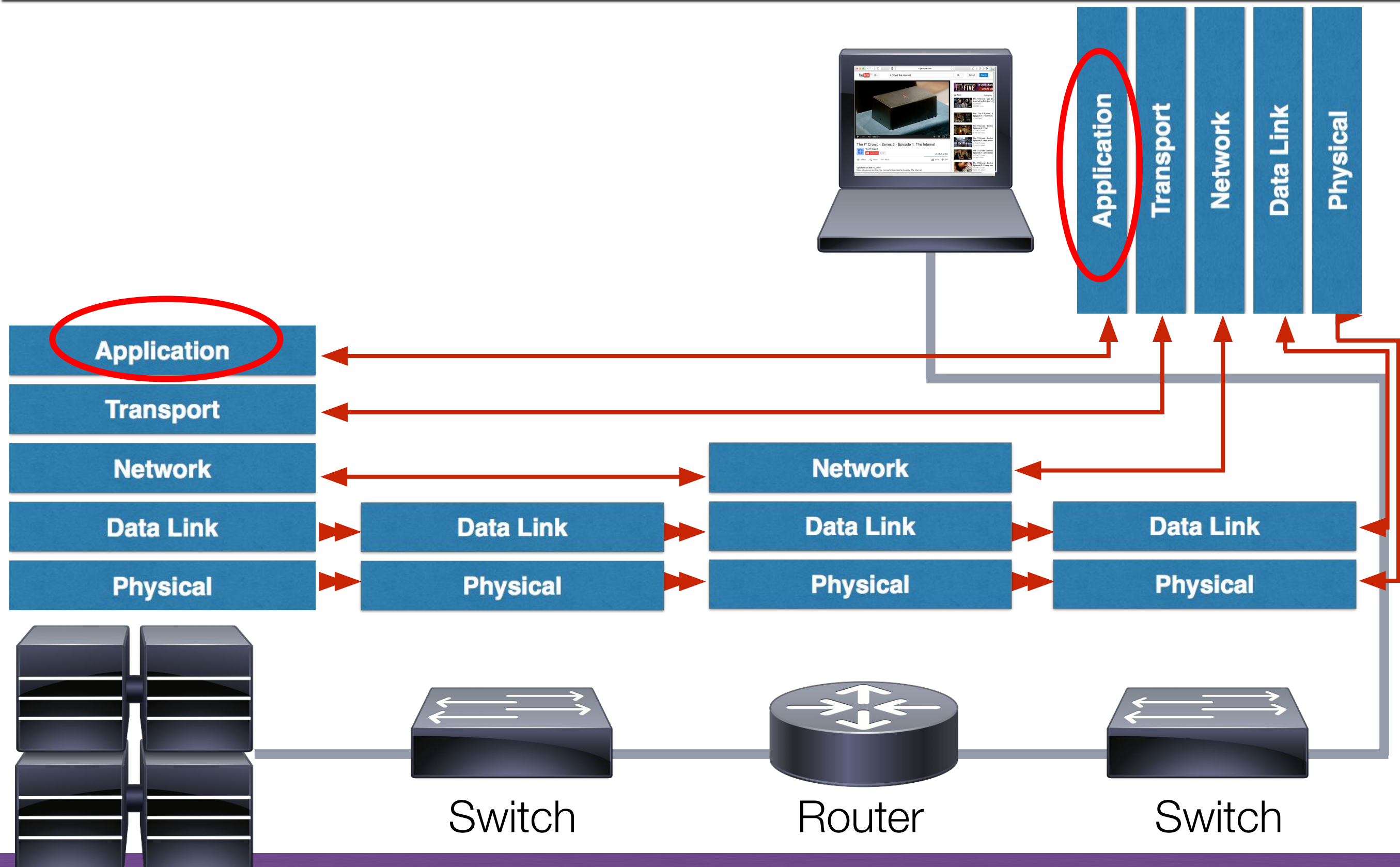
Today: Week-10 Workshop

How long	What ?	Why ?
20 mins	Application layer	Recap from pre-class activities and recorded videos
5 mins	Flux Q&A	Recap
40 mins	<ul style="list-style-type: none">• ACTIVITY A: Application Layer Protocols• Activity A.1 - HTTP Protocol: web service	<ul style="list-style-type: none">• Apply your knowledge in Application Layer• HTTP & HTML• Web Client & Web Server interaction
5 mins	Take-home message	Conclusion
10 mins	Overview of Application Layer - SMTP Protocol and Flux Q&A	Recap on SMTP Protocol
25 mins	<ul style="list-style-type: none">• ACTIVITY B: Application Layer Protocols• Activity B.1 - SMTP Protocol: email service	<ul style="list-style-type: none">• Apply your knowledge in Application Layer• SMTP Protocol• Email Client & Server interaction on SMTP
5 mins	Take-home message	Conclusion

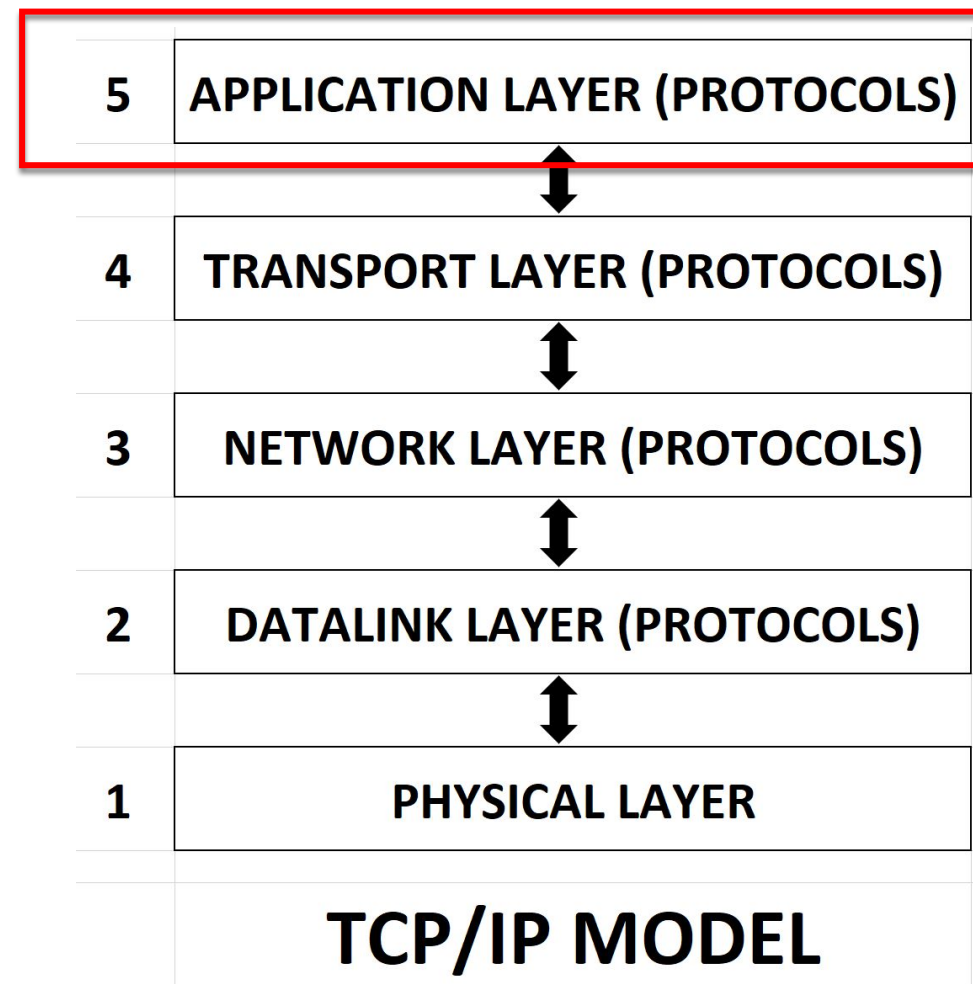
The
Application Layer
contains software that enables the
user to **perform** useful **work**.

This is software layer that provides the
business value.

Layers of Abstraction

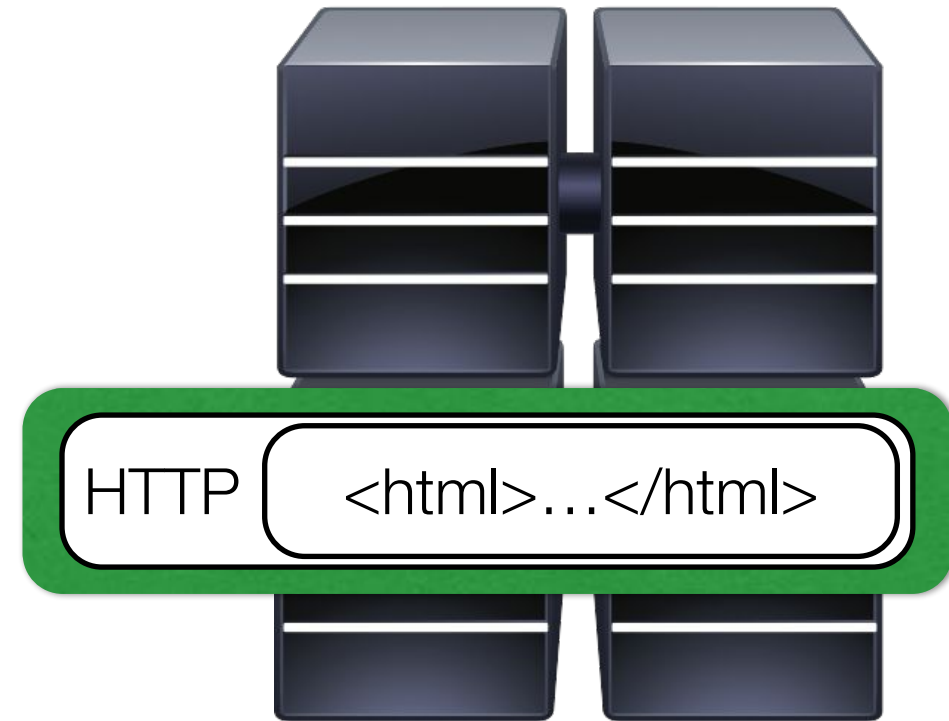


World Wide Web



- Based on two main technologies:
- **HTTP** is the protocol for communication between browser and server
- **HTML** is the format in which web pages are described

What is HTTP?
What is HTML?



HTTP www.youtube.com

Request - Response-Cycle

Response

HTTP

<html>...</html>

Internet

Request

HTTP

www.youtube.com

Basic HTTP session

client:

```
GET /~guidot/test.html
HTTP/1.1
```

Request line

```
Host: www.csse.monash.edu
```

Req. header
Response

server:

```
HTTP/1.1 200 OK
```

**status(http=status
codes)**

```
Date: Thu, 05 Mar 2015 08:30:48 GMT
Server: Apache/1.3.26 (Unix)
Transfer-Encoding: chunked
Content-Type: text/html
```

**Response
header**

```
<html>
<body>
  <h1>Guido Tack</h1>
  
</body>
</html>
```

**Response
body**

Activity A.1: We shall see the basic HTTP Interaction.

Basic HTTP session

```
<html>  
<body>  
  <h1>Guido Tack</h1>  
    
</body>  
</html>
```

client:

```
GET /~guidot/images/guido3.jpg HTTP/1.1  
Host: www.csse.monash.edu
```

Basic HTTP session

client: GET /~guidot/images/guido3.jpg HTTP/1.1
Host: users.monash.edu

server: HTTP/1.1 200 OK
Date: Thu, 05 Mar 2015 08:31:23 GMT
Server: Apache/1.3.26 (Unix)
Last-Modified: Tue, 20 Nov 2012 03:29:22 GMT
Accept-Ranges: bytes
Content-Length: 15681
Content-Type: image/jpeg

JFIFHH@ICC_PROFILE0appl mntrRGB
...

HTTP Methods

- **GET:**
Retrieve specified URL from server
- **HEAD:**
Retrieve **only header** for specified URL
- **POST:**
Add data specified in request body to specified URL

E.g. add a message to a web forum, or an item to a shopping cart. Also retrieves document.
- Other methods (**PUT**, **DELETE**, **OPTIONS**...) less common

FLUX Question: Application

HTTP is called *stateless* protocol because _____ .

- A. It has very basic architecture.
- B. The server and client are aware of each other only during a current request.
- C. Of longtime duration between client and server response time.
- D. None of these options

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FLUX Question: HTTP

The HTTP request line contains a _____ *method* to request a document from the server.

- A. GET
- B. POST
- C. COPY
- D. ACCESS
- E. none of these options

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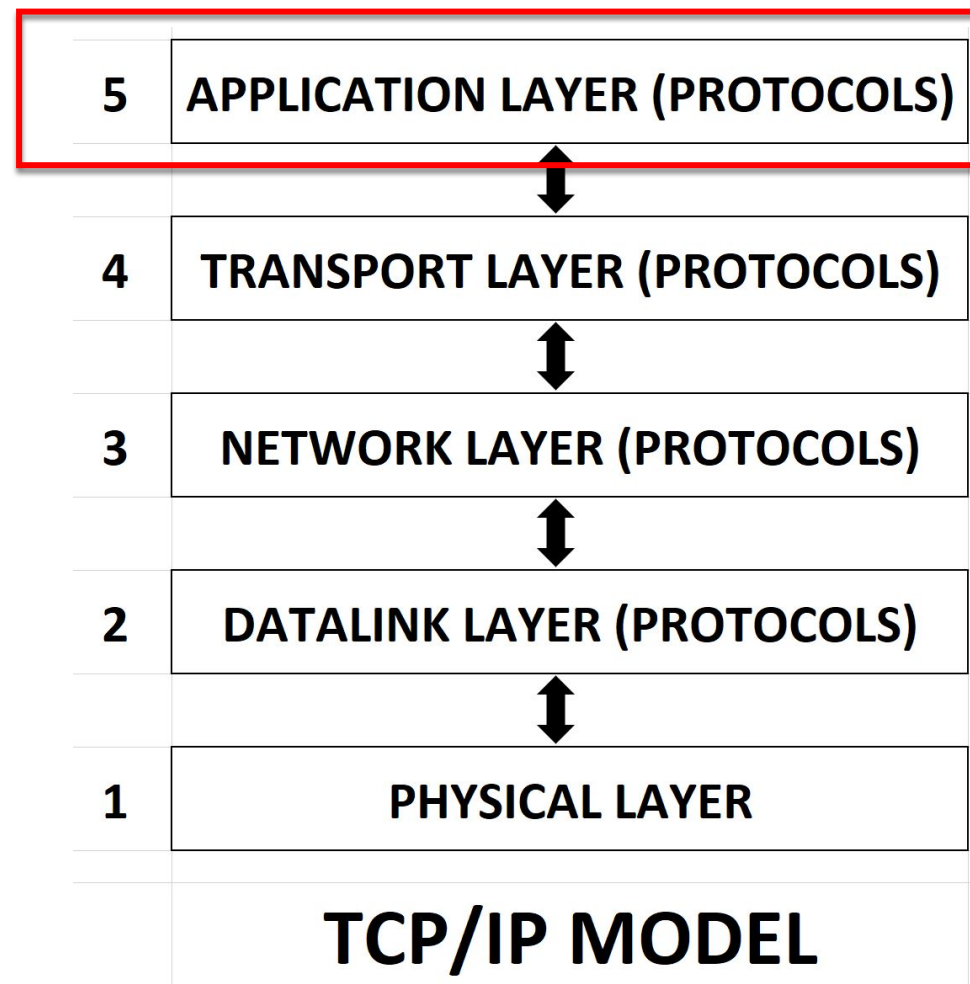
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ACTIVITY A

Download the file inside VM (no spaces or new lines):

<https://drive.google.com/file/d/19XJ0msPTOM7h5iZQGEY9IrkTte49GgUw/view>

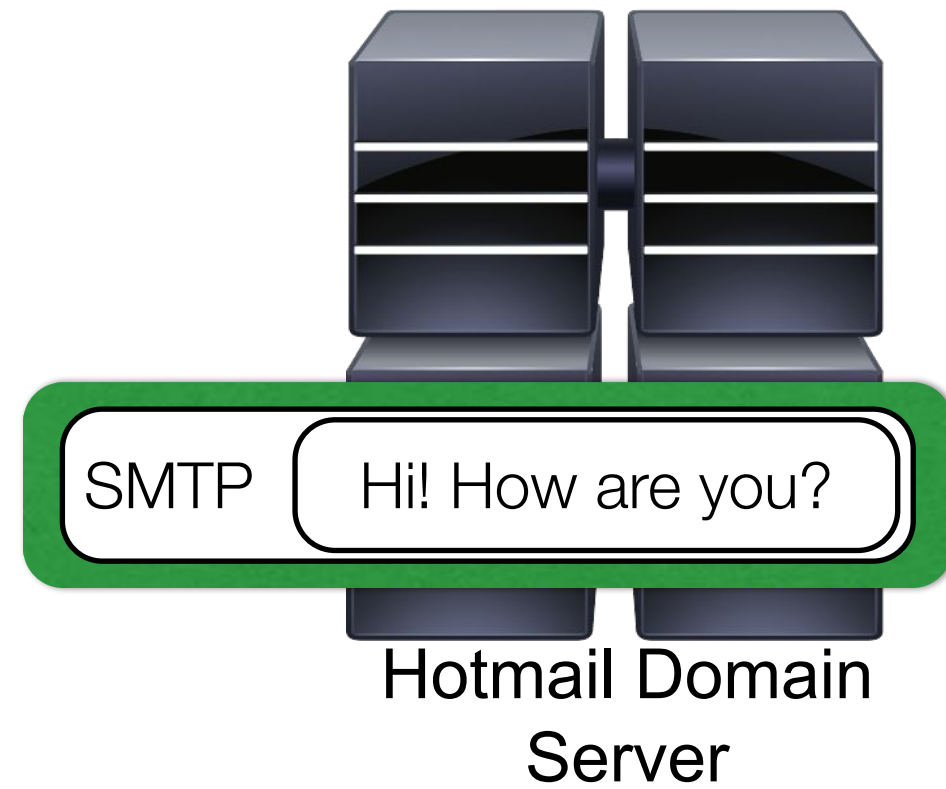
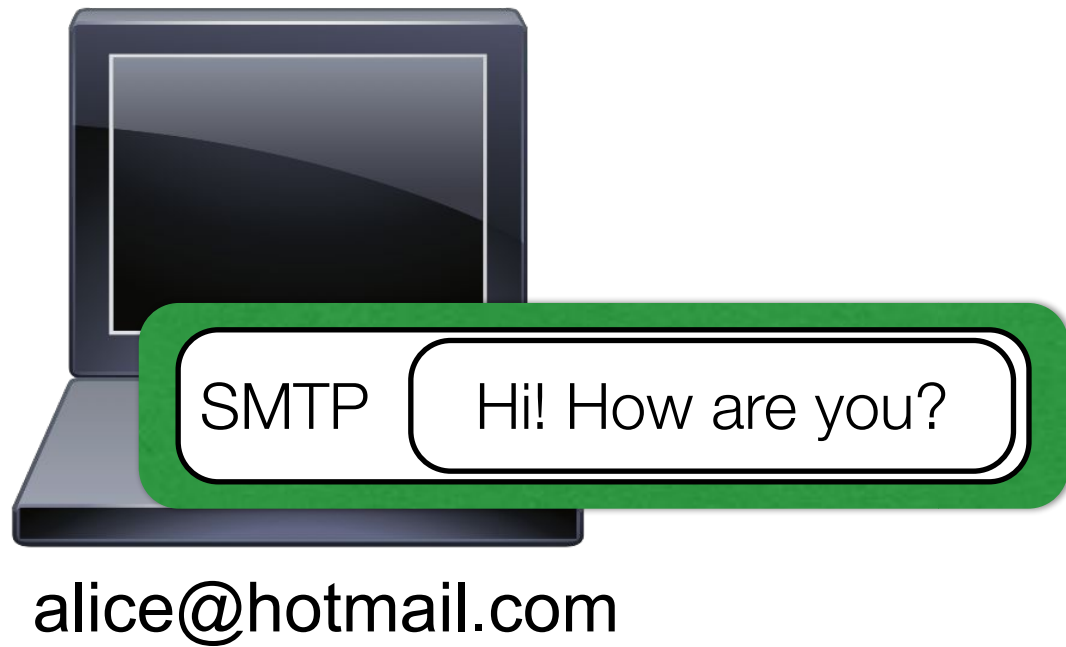
Electronic Mail



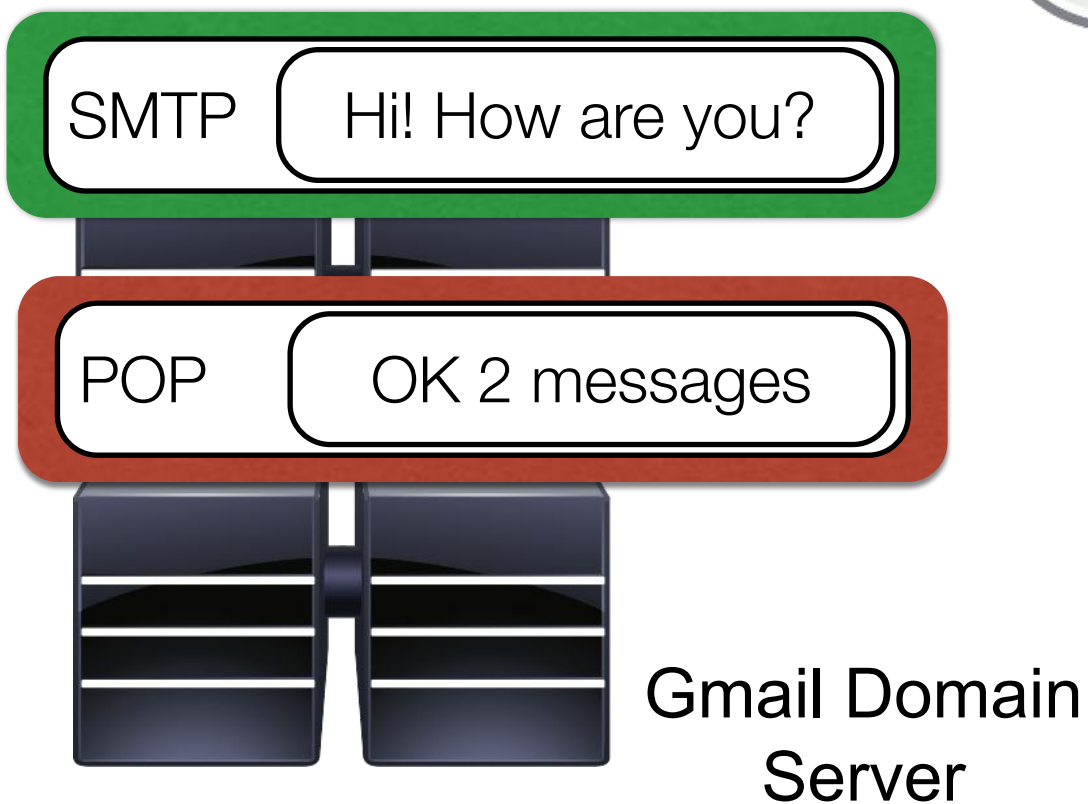
Electronic Mail

- Invented in 1971 by Raymond Tomlinson
- That's before what we call the Internet!
(it was called the ARPANET at the time)
- Key invention: name@server
(address that separates the *user* from the *destination machine*, because machines were shared)
- Emails : Identifies the user @ a Domain Address.

e.g., alice@hotmail.com, OR bob@gmail.com



bob@gmail.com





alice@hotmail.com

SMTP



Hotmail Domain
Server



Internet

SMTP

SMTP/POP/IMAP/

smtp.gmail.com



Gmail Domain
Server

bob@gmail.com



Example SMTP Session

220 MyMailServer ESMTP Exim 4.82 Ubuntu Sat, 09 May 2020 20:37:24 +1100

HELO my.laptop

250 MyMailServer

MAIL FROM:<alice@example.com>

250 OK

RCPT TO:<malik.khan@example.com>

250 Accepted

DATA

354 Enter message

From: "Alice" <alice@example.com>

To: "Malik Khan" <malik.khan@example.com>

Date: Mon, 09 May 2020 20:37:24 +1100

Subject: test message

```
S: 220 smtp.example.com ESMTP Postfix
C: HELO relay.example.org
S: 250 Hello relay.example.org, I am glad to meet you
C: MAIL FROM:<bob@example.org>
S: 250 Ok
C: RCPT TO:<alice@example.com>
S: 250 Ok
C: RCPT TO:<theboss@example.com>
S: 250 Ok
C: DATA
S: 354 End data with <CR><LF>.<CR><LF>
C: From: "Bob Example" <bob@example.org>
C: To: "Alice Example" <alice@example.com>
C: Cc: theboss@example.com
C: Date: Tue, 15 Jan 2008 16:02:43 -0500
C: Subject: Test message
C:
C: Hello Alice.
C: This is a test message with 5 header fields and 4 lines in the message body.
C: Your friend,
C: Bob
C: .
S: 250 Ok: queued as 12345
C: QUIT
S: 221 Bye
{The server closes the connection}
```

Reference: https://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol

FLUX Question: Email

The formal protocol that defines the Mail Transfer Agent (MTA) - client and server on the Internet is called _____.

- A. SMTP
- B. SNMP
- C. TELNET
- D. none of these options

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FLUX Question: Spam

Spam = "Unsolicited Bulk Email"

Estimates: **between 50% and 70% of all emails are spam**

How would you solve this problem?

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ACTIVITY B