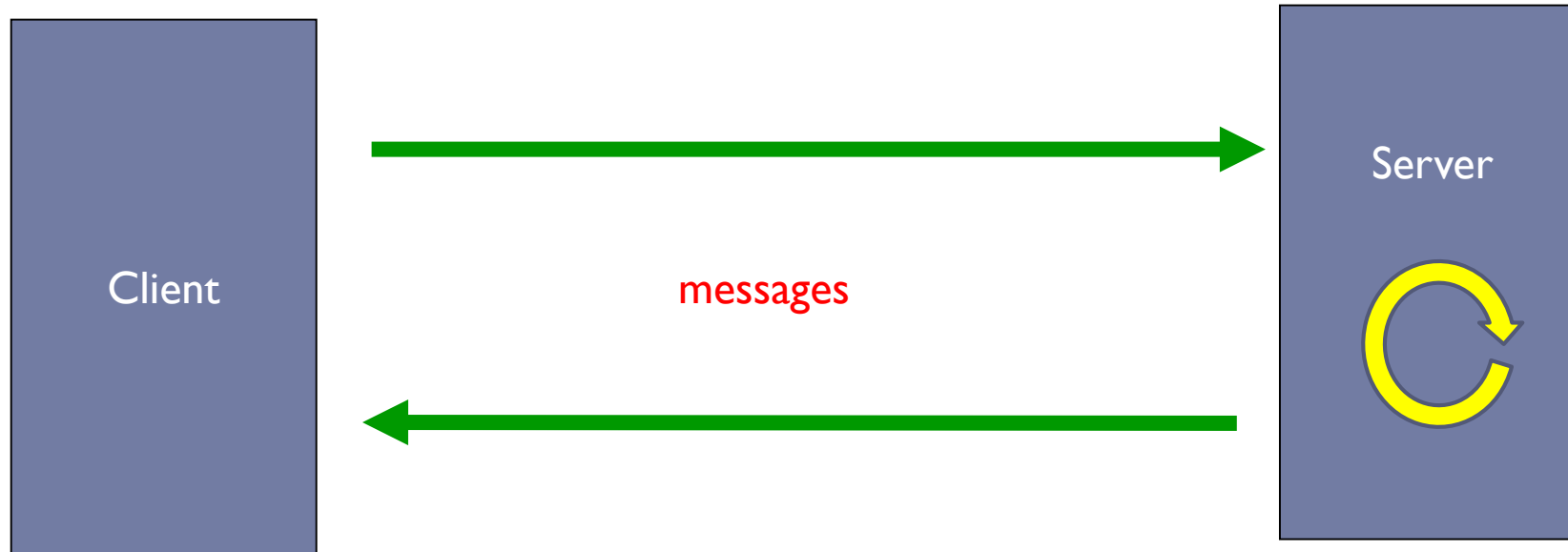
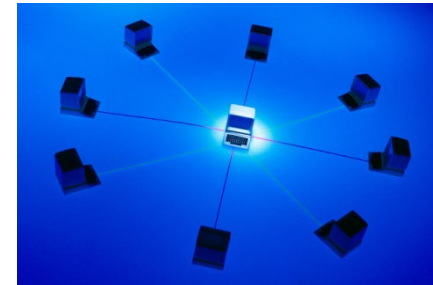


# Communicating entities – Client/server concept

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- ▶ In a distributed system, there are communications between at least two entities.
- ▶ An exchange of messages is called a **dialog**.
- ▶ The entity initiating the dialog is called the **client**.
- ▶ The entity responding is called the **server**.
- ▶ Server **sits in a loop** waiting to be contacted.



# Services and servers

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- ▶ Often there are multiple, co-operating servers providing a service
- ▶ A computer may be a server in the context of one service and a client in another. Some services are peer to peer
- ▶ Services and protocols (such as IMAP and CalDAV) determined by the IETF (<https://www.ietf.org/>)



# Key internet concepts

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- ▶ Port – computer's virtual connector for data connection, e.g., port 22
- ▶ MAC address – computer's low-level address on LAN, e.g. 1d:01:17:04:c2:78
- ▶ IP address – computer's globally routable address: 146.141.16.252
- ▶ Domain name – volt.ee.wits.ac.za



# Web services and addressing

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Services are addressed using URLs (uniform resource locator)

- ▶ **Web page** consists of **objects**
- ▶ Object can be HTML file, JPEG image, Java applet, audio file,...
- ▶ Web page consists of **base HTML-file** which includes several referenced objects
- ▶ Each object is addressable by a **URL**
- ▶ Example URL:

`http://www.someschool.edu:80/pic.gif`

  
protocol                      domain                      port      resource

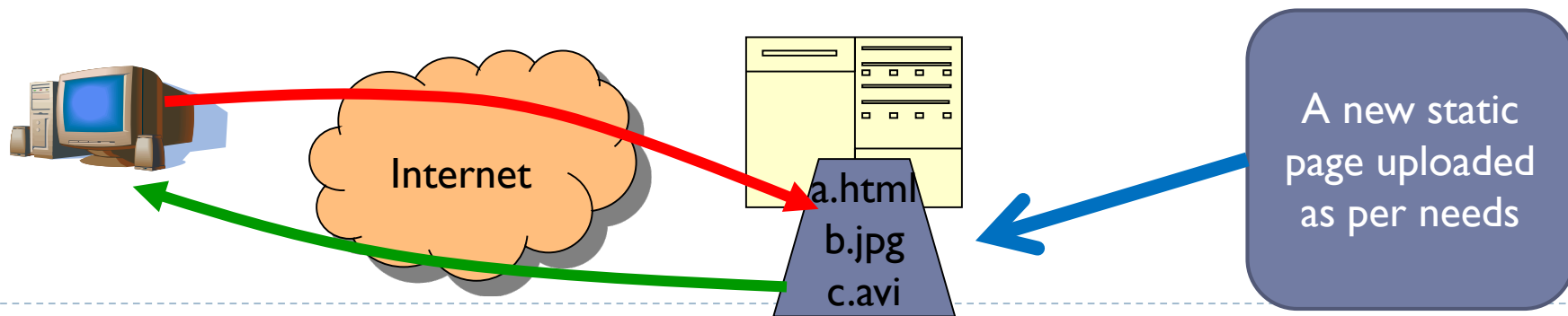
---



# The early web – A publishing medium

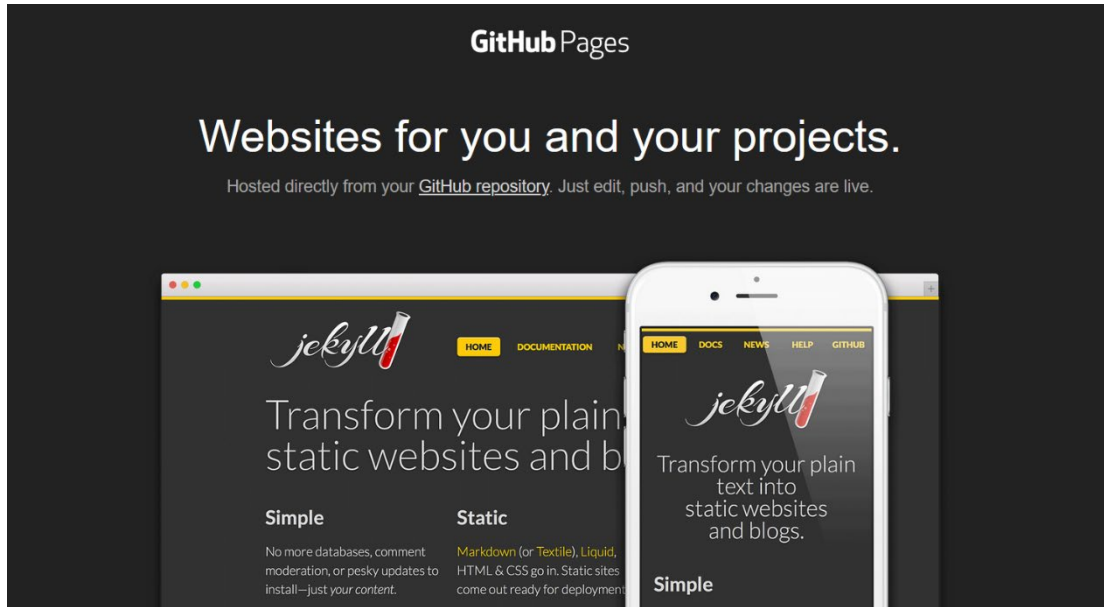
---

- ▶ The initial web (sometimes referred to as web 1.0) was primarily used as a **publishing** medium.
- ▶ People published **documents** (HTML) about many different things:
  - ▶ Entertainment, education, news, General information
- ▶ For the most part the information **did not change very often** e.g. a company website.
- ▶ Thus the content was considered **static**.



# Static sites

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## Contents

When should one apply for ethics clearance?

Which ethics committee should you apply to?

How do you make an application to the School Committee?

When can you start conducting your research?

- Eleventy: <https://www.11ty.dev/>
- Jekyll: <https://jekyllrb.com/>



# Limitations of statically authored HTML

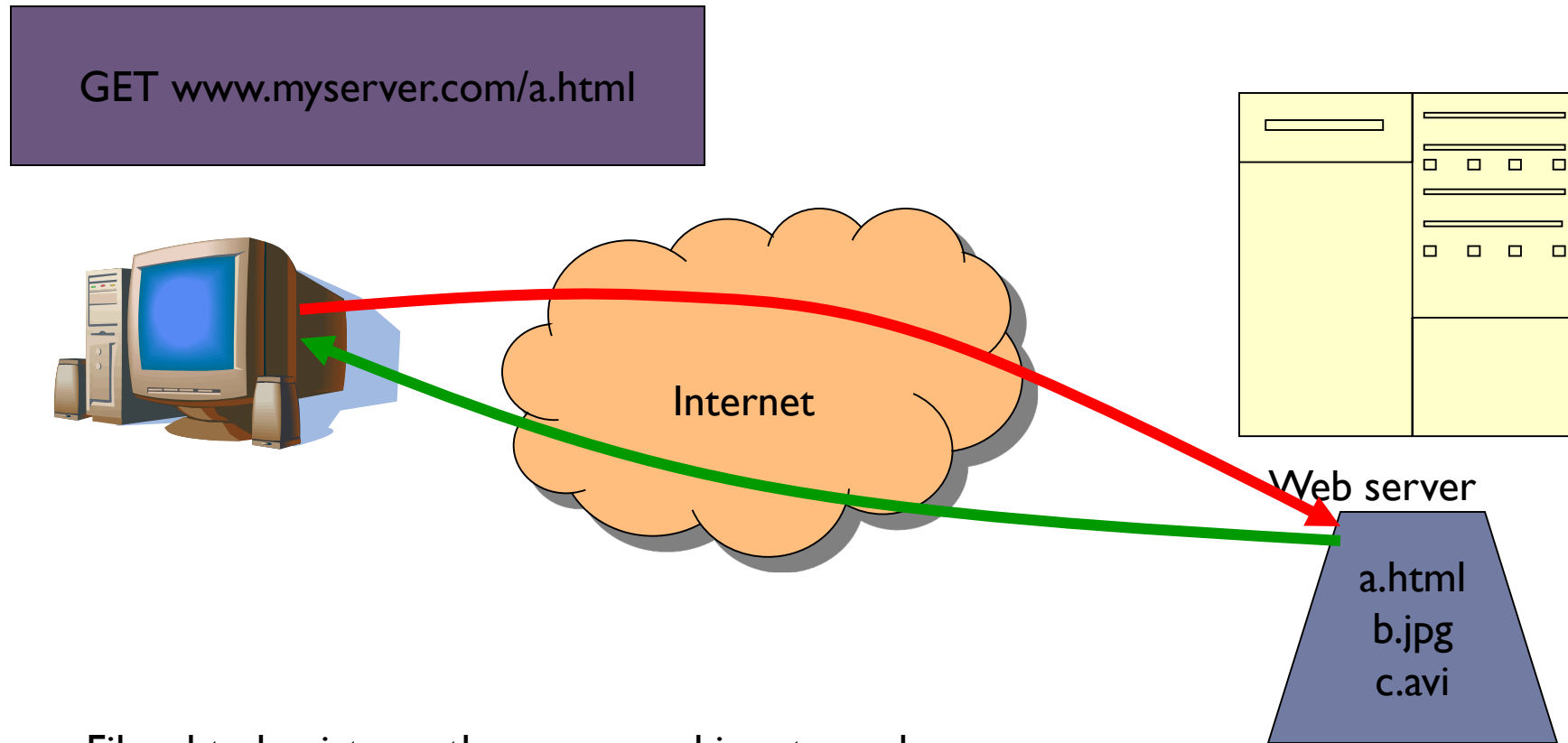
---

- ▶ Certain classes of applications saw the **need for regular updates** e.g. a news site like CNN.com
- ▶ The **manual update-publish cycle was too slow** and error-prone.
- ▶ HTML by itself was intended for presentation and did not contain any other capabilities.
- ▶ Thus **tools and programming languages** were applied to **generate HTML documents dynamically** when they were requested. This is known as web 2.0.



# Static page retrieval

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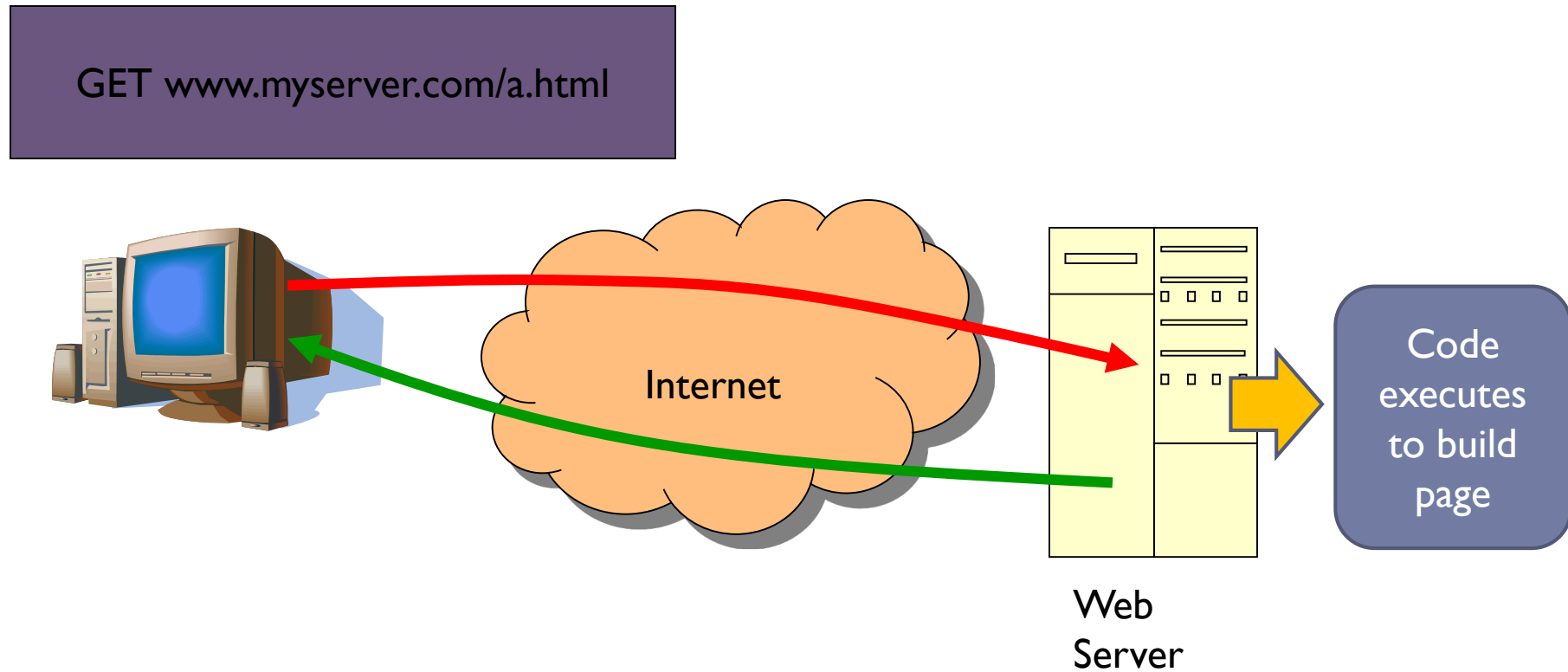
File a.html exists on the server, and is returned





# Dynamic page creation

---



File a.html does not exist.

HTTP request triggers a call to web server.

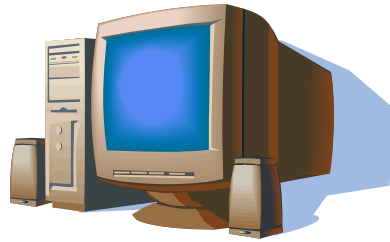
Web server returns result a.html, which is created dynamically.

# An example

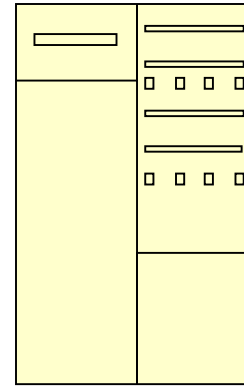
www.ee.wits.ac.za/test\_results?id=12345

HTTP GET

Parameters passed in  
HTTP –  
called a query string



HTTP Response



Web  
Server

Code  
executes  
to build  
page

## Results for Student 12345

ELEN1001	65%
ELEN1002	70%
ELEN1004	84%

```

public HttpResponse onRequest (HttpRequest r) {

    //Get the student no
    String student_no = r.getParams("uid");

    //Create HTML Doc for response
    HTMLDoc h = new HTMLDoc();
    HttpResponse res = new HttpResponse();
    res.addHTMLDoc(h);

    h.addHeading ("Results for student " + student_no);

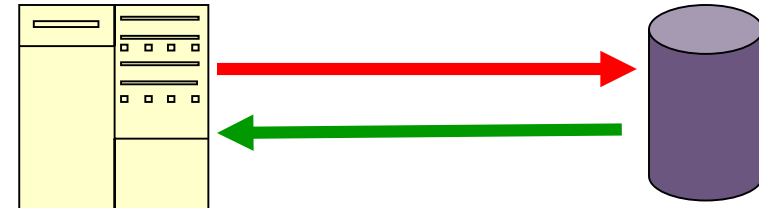
    //Search database for results
    DataTable d = db.queryResultsByStudentNo(student_no);

    if(d.rows.Count > 0) {
        //add a results table
        HTMLTable t = h.createTable();
    } else {
        h.addText("No results found");
    }

    whilst (d.hasMoreRows()) {
        t.addRow(d.currentRow("COURSE_NUMBER"),
            d.currentRow("COURSE_RESULT"));
    }

    return res;
}

```



Web  
Server

Database

```

<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional
<html>
<head>
<title>Results</title>
</head>
<body>

<h2> Results for Student 12345 </h2>

<table summary="Results" border="1" bgcolor="yellow">
<tr><td>ELEN1001</td><td>65%</td></tr>
<tr><td>ELEN1002</td><td>70%</td></tr>
<tr><td>ELEN1004</td><td>84%</td></tr>
</table>

</body>
</html>

```

# Types of applications to emerge

- ▶ Server side programming allowed a number of interactive applications to emerge, thus going well beyond the publishing mode.

The screenshot shows a multi-layered web interface. At the top, a Gmail header is visible with the 'Gmail' logo and a search bar. Below it, a Takealot.com banner includes the logo, navigation links like 'Help' and 'Sell on Takealot', and user account options such as 'Login', 'Register', and 'My Account'. The main content area is a Microsoft Teams chat window. On the left, a 'Shop by Department' sidebar lists various categories like 'Baby & Toys', 'Beauty', and 'Beverages'. The Teams interface includes a search bar for commands, a list of teams (Pinned, Your teams), and a chat conversation. The chat shows a message from 'Princess Carolyn' starting a 'Book Club' channel, followed by a reply from 'Jill Duffy' and another message from 'Princess Carolyn' about a book recommendation.

# Web servers and server-side web frameworks

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## Web server

- ▶ Primary function is to deliver web pages in response client requests
- ▶ It takes care of issues such as concurrent (parallel) requests, thus simplifying view of application developer.



**NGINX**

## Web application framework

- ▶ Supports the development of dynamic websites, web applications and services
- ▶ Uses a web server to deliver responses to the client



**django**



# Web architecture

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#software #coding #softwaredevelopment  
Web Architecture Basics

## Web Architecture 101

The basic architecture concepts I wish I knew when I was getting started as a web developer



Jonathan Fulton [Follow](#)

Nov 8, 2017 · 11 min read



# Summary

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- ▶ Client-Server architecture and what this means within the context of a web application
- ▶ Static websites
- ▶ Dynamic websites
- ▶ Web servers and server-side frameworks
- ▶ Web architecture

