Topic 6
Web Server Implementation and Management

CST4013 | Website Designing

Learning Outcomes

1

Describe the concept of Common Gateway Interface (CGI) on a web server.

2

Discuss web hosting and the relationship with a web server.

Web Server Introduction

- A web server is a type of server software responsible for hosting websites and serving web content to clients over the internet or a local network.

- It processes requests from web browsers or other client applications, retrieves the requested resources such as HTML pages, images, CSS files and sends them back to the client for display in the browser.

Web Server Introduction

- Web servers can also handle other tasks such as managing user sessions, handling secure connections (using protocols like HTTPS), executing server-side scripts (e.g., PHP, Python, or Ruby), and interacting with databases to generate dynamic content.

Request
Response

Request
Response

Web Browsers

Internet
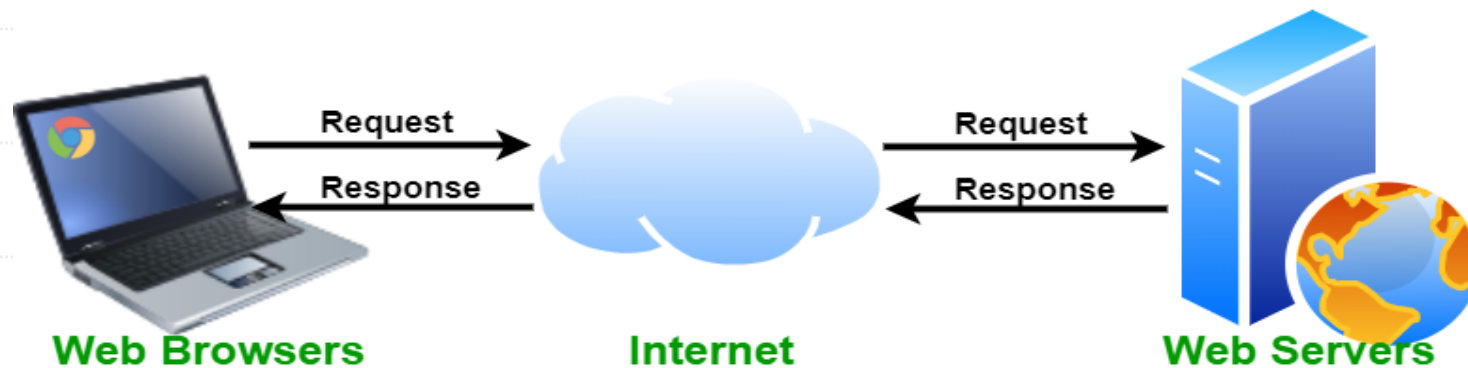
Web Servers

CGI
Introduction

CGI stands for Common Gateway Interface.

It is a standard protocol used to enable interaction between web servers and external programs, typically scripts written in languages such as Perl, Python, C and Shell.

CGI allows web servers to run external programs and use their output to create dynamic web pages.

This is essential for web applications that require interaction with users, such as form submissions or database queries.

Common Gateway Interface Concepts

Common	It is a standard method that works across different web servers and platforms, ensuring interoperability and uniformity
Gateway	Acts as an intermediary between the web server and external applications, facilitating communication and data exchange.
Interface	Provides a defined way for the web server to execute external scripts and programs, and to pass data to and from these programs.

How CGI Works

1. Client Request	A client (usually a web browser) sends a request to a web server for a resource that requires server-side processing, such as a form submission.
2. Server Execution	The web server recognizes that the requested resource is a CGI script and executes the script.
3. Data Passing	The server passes data to the script using environment variables and standard input (for POST requests).
4. Script Processing	The CGI script processes the input data, performs necessary computations or database operations, and generates the output.
5. Response Generation	The script outputs the result, typically as HTML, along with necessary HTTP headers.
6. Server Response	The web server sends the script's output back to the client's web browser, which renders the content.

How CGI Works
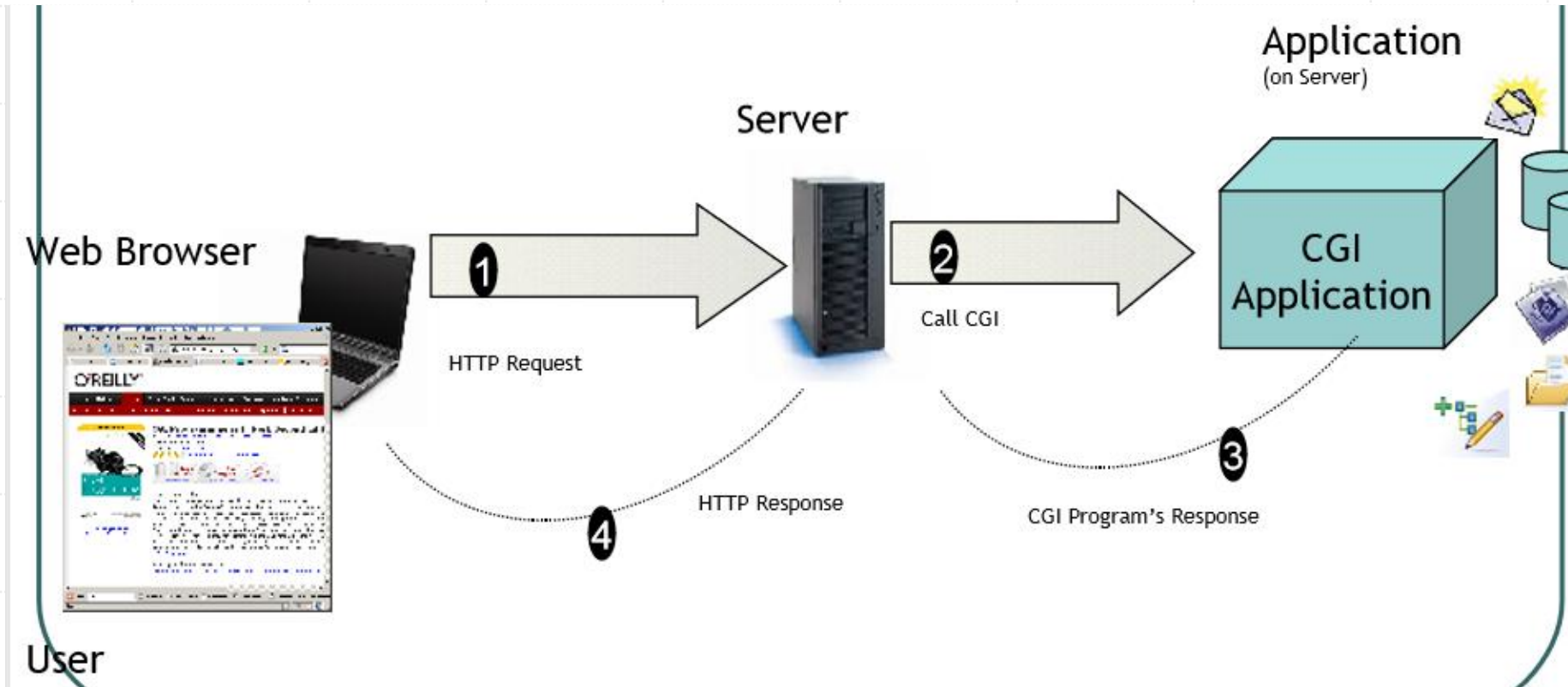
Example Scenario

1. **Client Request:**

```plaintext
GET /cgi-bin/hello.py?name=Alice HTTP/1.1
Host: example.com
```

2. **Environment Setup:**

- `REQUEST_METHOD=GET`

- `QUERY_STRING=name=Alice`

- Additional environment variables like `SERVER_NAME`, `REMOTE_ADDR`, etc.

Example Scenario

3. **Script Execution:**

```python
#!/usr/bin/env python3
import os
import cgi

print("Content-Type: text/html")
print()
print("<html><head><title>CGI Script</title></head>")
print("<body>")
print("<h1>Hello, {}!</h1>".format(os.environ.get('QUERY_STRING').split('=')[1]))
print("</body></html>")
```

4. **Server Response:**

```plaintext
HTTP/1.1 200 OK
Content-Type: text/html

<html><head><title>CGI Script</title></head>
<body>
<h1>Hello, Alice!</h1>
</body></html>
```

Advantages and Disadvantages of CGI

Advantages

- Simplicity: Easy to set up and understand for simple tasks.

- Language Flexibility: Can be written in many programming languages like Python, Perl, Shell script, etc.

- Server Independence: Works with almost any web server.

## Disadvantages

- Performance: Each request spawns a new process, which can be resource-intensive and slow under heavy load.

- Scalability: Not suitable for high-traffic websites due to overhead.

- Security: Scripts can pose security risks if not properly validated and sanitized.

Modern Alternatives to CGI

1. Fast CGI

- Enhanced version of the Common Gateway Interface (CGI) protocol designed to improve the performance and scalability of web applications.
- It addresses the inefficiencies of the traditional CGI model, where each request spawns a new process.

Client Request

Fast CGI Process Handling

Communication

Response
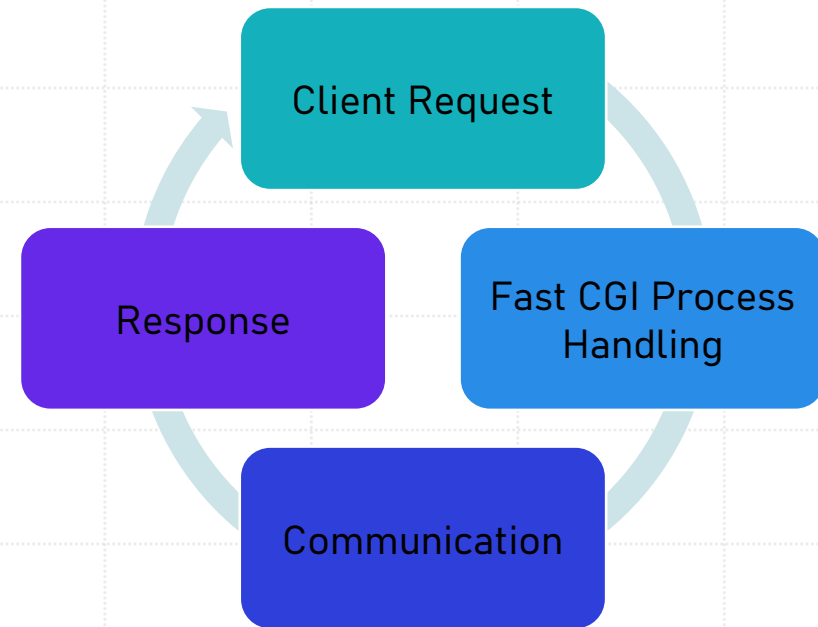
Modern Alternatives to CGI

2. Server side scripting

- Server–side scripting languages are programming languages used to create scripts that run on a web server to generate dynamic web content.

- These languages are essential for developing interactive and responsive web applications, as they allow servers to process user input, access databases, and generate custom responses.

Examples of Server Side Scripting

- PHP (Hypertext Preprocessor)
  - A widely-used open-source server-side scripting language designed primarily for web development.
  - Well-suited for creating dynamic web pages and application
- Python
  - Python is widely used in web development, primarily through powerful web frameworks (Django) that simplify the creation of robust and scalable web applications.
  - Common uses web applications, data analysis, machine learning integrations.

Examples of Server Side Scripting

- Ruby
  - Ruby is known for its elegant syntax and is the basis for the Ruby on Rails framework, which emphasizes convention over configuration.
- JavaScript (Node.js)
  - JavaScript is traditionally a client-side language, but with Node.js, it is also used on the server side.
  - Node.js is built on the V8 JavaScript engine, which powers Google Chrome, and is designed to build scalable network applications.
- ASP.NET
  - Developed by Microsoft, ASP.NET is a framework for building dynamic web applications using C# or VB.NET.

Web Hosting

Hosting refers to the service provided by a hosting provider or company that allows individuals or organizations to make their websites accessible via the World Wide Web.

When you purchase web hosting services, you're essentially renting space on a server where your website's files, data, and content are stored.

Hosting providers offer various types of hosting plans, including shared hosting, VPS hosting, dedicated hosting, and cloud hosting.
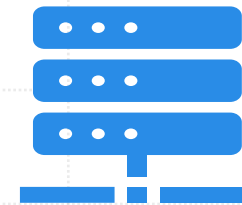
Relationship between Web Hosting and Web Server

Physical Infrastructure

Hosting companies provide the physical infrastructure (servers) on which web servers run.

When you purchase web hosting services, your website's files and data are stored on the hosting provider's server.
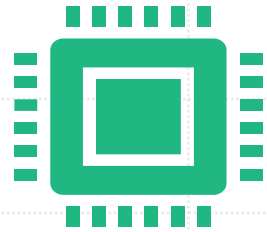
Software Environment

Web servers are installed and configured on the servers provided by hosting companies.

The type of web server software used (e.g., Apache, Nginx, Microsoft IIS) depends on the hosting provider's infrastructure.

Relationship between Web Hosting and Web Server

Access and Configuration

Hosting companies manage the installation, configuration, and maintenance of the web server software to ensure that websites hosted on their servers are accessible and performant.

Resource Allocation

Hosting providers allocate resources (such as CPU, RAM, disk space, and bandwidth) to each hosting account based on the chosen hosting plan.

The web server software running on the server manages these resources to handle incoming requests efficiently and ensure optimal performance for hosted websites.

Types of Web Hosting

Types of Web Hosting	Description
Shared Hosting	Multiple websites share the same server and resources like CPU, RAM, and disk space.
Virtual Private Server (VPS) Hosting	A single physical server is divided into multiple virtual servers, each with its own resources and operating system.
Dedicated Hosting	A single physical server dedicated entirely to one website or application.
Cloud Hosting	Uses a network of virtual servers (cloud) to host websites or applications, providing flexibility and scalability.
Managed Hosting	Type of hosting where the provider manages the server, including maintenance, updates, security, and backups
Colocation Hosting	You own the server hardware, but rent space in a data center for network connectivity, power, and cooling.

Web Hosting Providers

Bluehost
- Known for its excellent customer support, easy-to-use interface, and integration with WordPress.

Site Ground
- Known for its reliable performance, excellent customer service, and advanced security features.

AWS (Amazon Web Services)
- Offers highly scalable and flexible cloud hosting solutions.

Web Hosting Providers

Google Cloud Platform
- Provides robust cloud hosting solutions with excellent performance and scalability.

Exabytes
- Offers a wide range of hosting services including shared hosting, VPS hosting, dedicated servers, cloud hosting, and domain registration.

Web Server MY
- A Malaysian hosting provider offering shared hosting, VPS hosting, dedicated servers, cloud hosting, and domain registration services.

Thank you