

IT1100 - Internet and Web Technologies

Web based Systems development

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Distributed systems and their architectures

Distributed systems and their Architectures

Computer based systems can be mainly divided into 2 types, *according to the distribution of the components*

- Standalone systems (or commonly referred as desktop applications)
- Distributed systems

Distributed Systems vs Standalone Systems

Standalone Computer System

- All the components are executed within a single device
- Do not need a network
- Usually one or tightly coupled set of technologies are used to develop (JAVA, .NET)

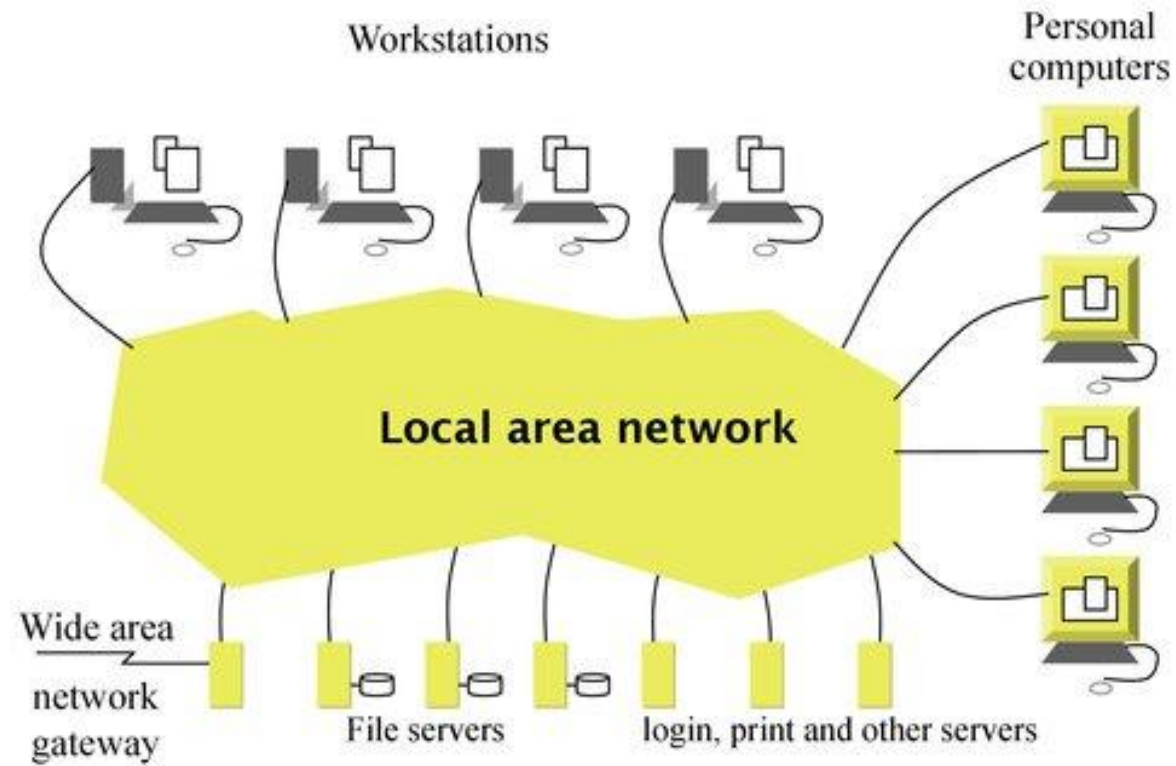
Distributed system

- The components are distributed and executed in multiple devices
- Need a network
- Multiple and loosely coupled set of technologies are used to develop (HTML+CSS+JS + PHP)₅

Distributed systems

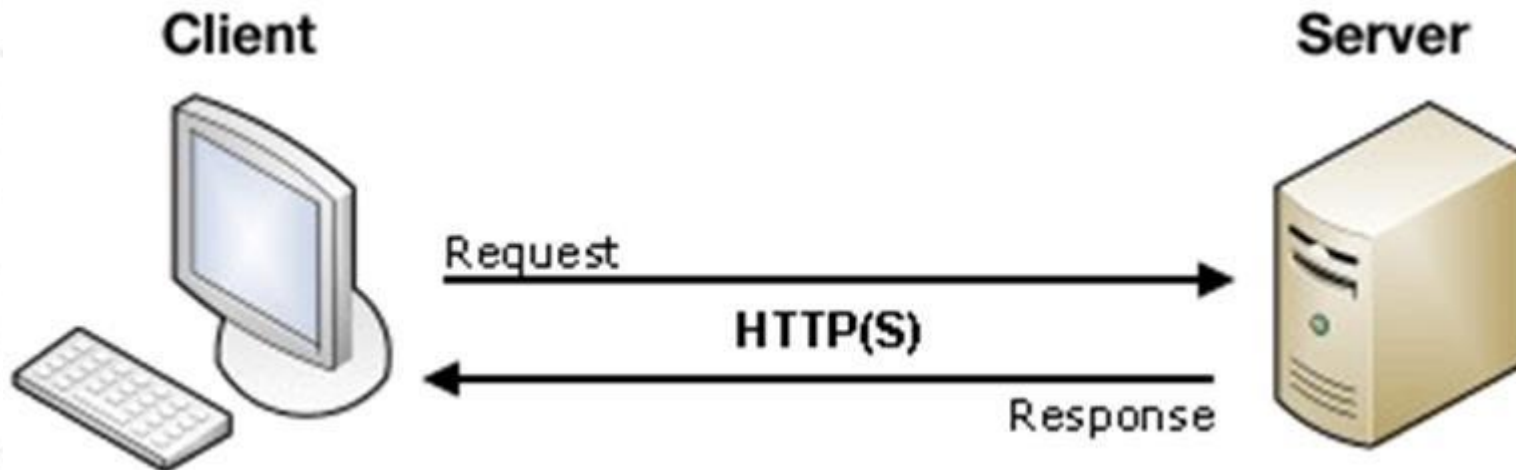
- There are multiple, slightly different definitions and arguments about the terms **distributed systems** and **distributed computing**
- We are here focusing on the systems, whose **components** are **distributed among multiple devices** and **using a network** for the **communication** between these components.

A Distributed System



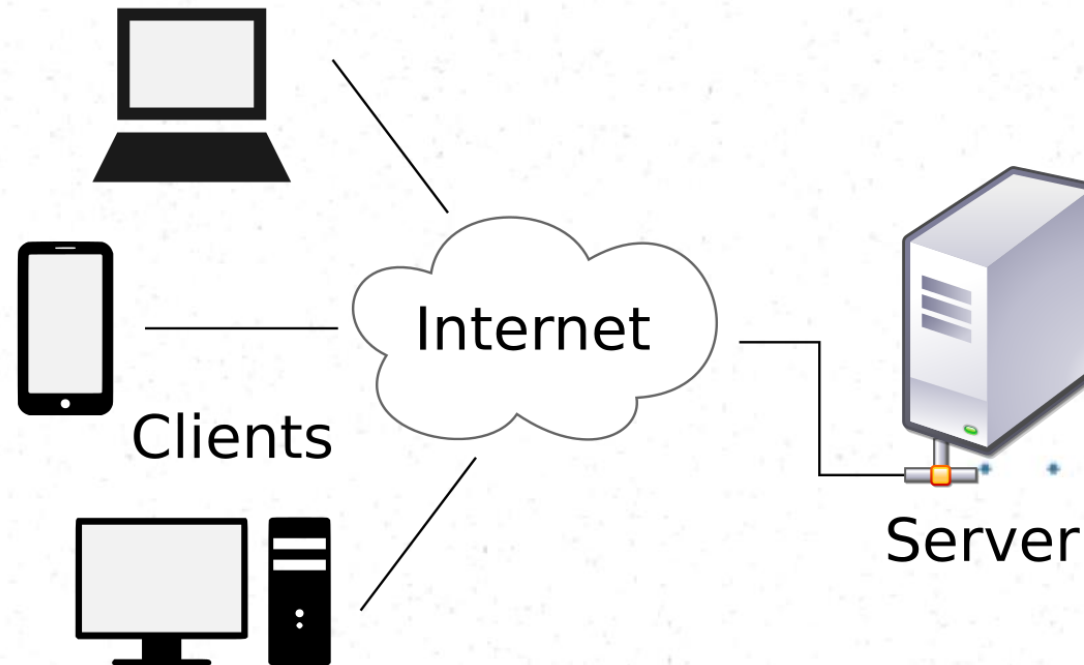
Client-server architecture (2-tier)

- The basic architecture of the distributed systems is called the client-server (or two-tier) architecture
- Usually the client (user) sends a **request** asking the server for some service and the server **responses** with the resources



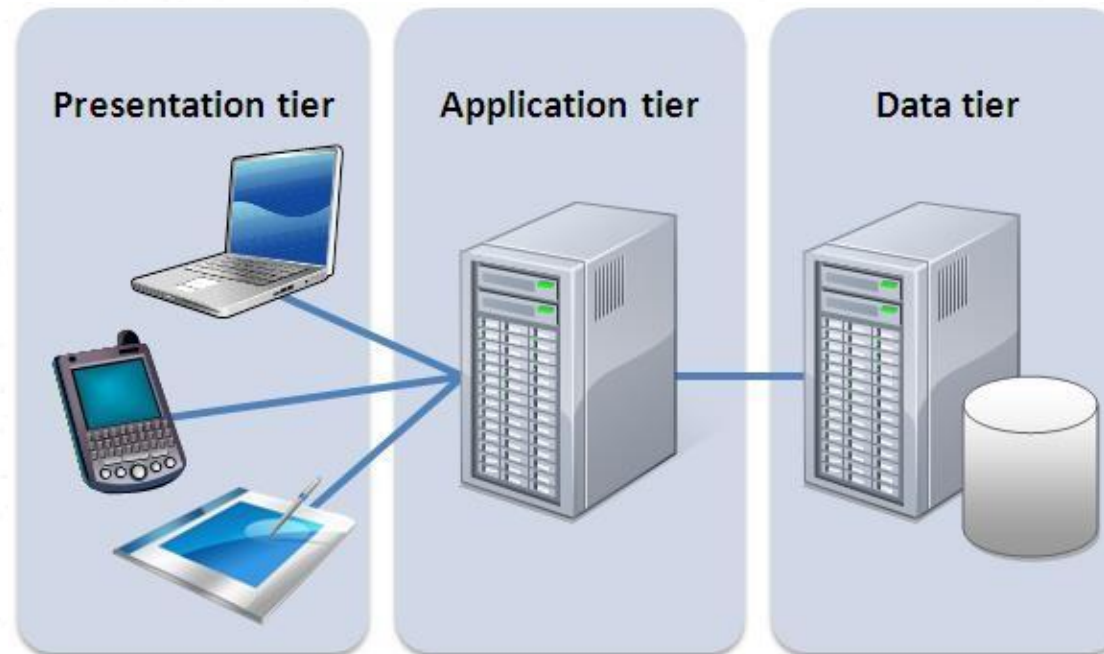
Client-server architecture (2-tier)

- There can be multiple clients, accessing the same server.
- These clients may use different types of devices



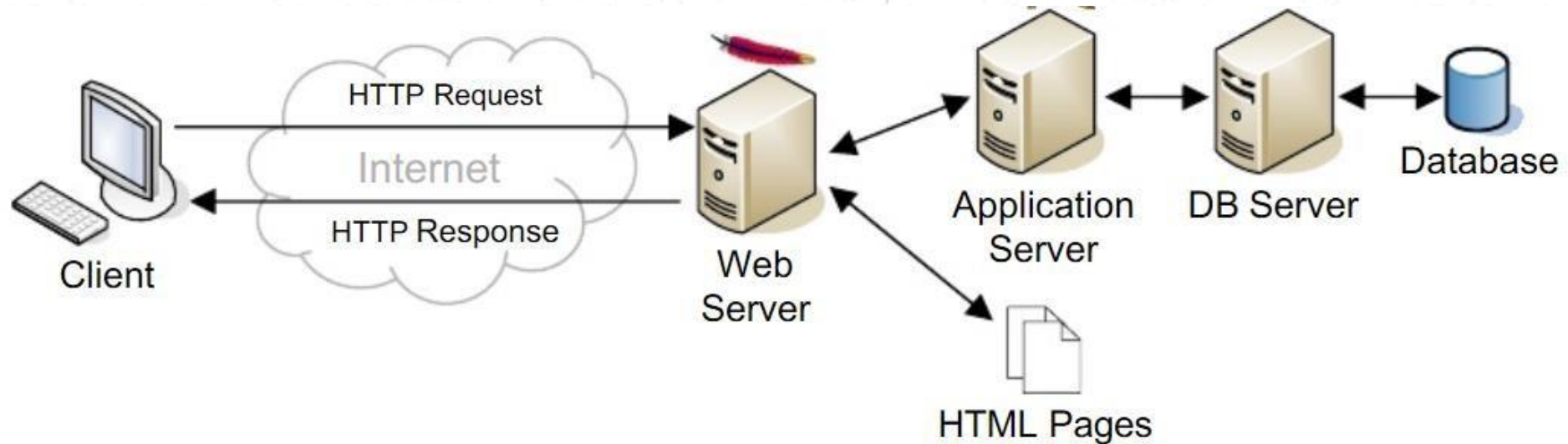
Client-server architecture (3-tier)

- 3-tier architecture is used, when there is a need for **data persistence** and also to separate the application logic from the data
- This can be seen as an extension of 2-tier architecture



Client-server architecture (n-tier)

- When there is a need for further separation and distribution of the components, more tiers can be added and extend the 2-tier or 3-tier architecture into an n-tier architecture



Main concepts of Web

Web server

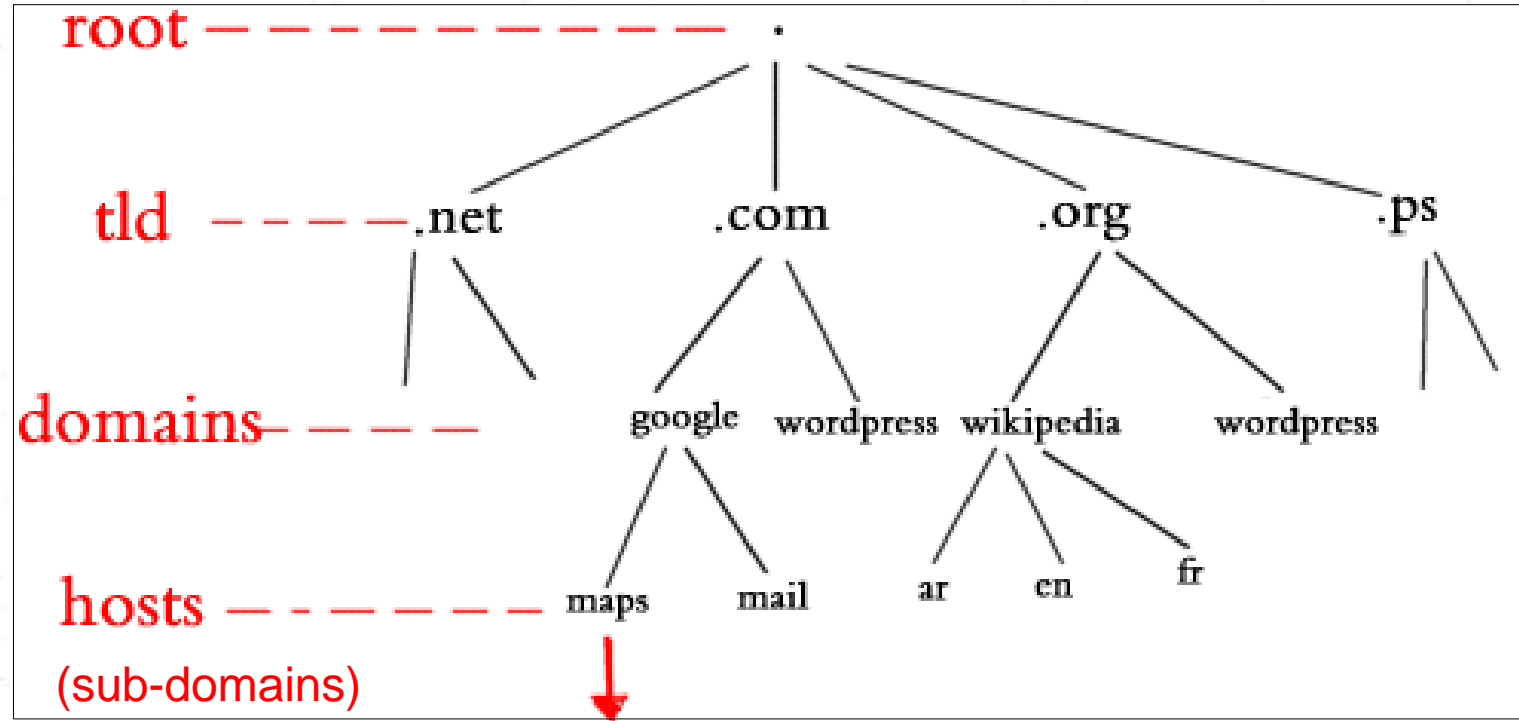
- Web server is a server software, which responses to the HTTP requests.
- Web server means
 - The server software
 - the hardware
 - other software infrastructures
 - which provide a platform to the server software to work and perform well.

Domain name

- The server computer has an IP address, which is used to access and communicate with the server.
 - Ex: 74.125.236.199
- An IP address is *not human friendly*, therefore more human friendly name is given for humans to identify the server, which is called the **domain name**
 - ex: www.google.com

Domain name

There is a hierarchy for the domain names



maps.google.com.

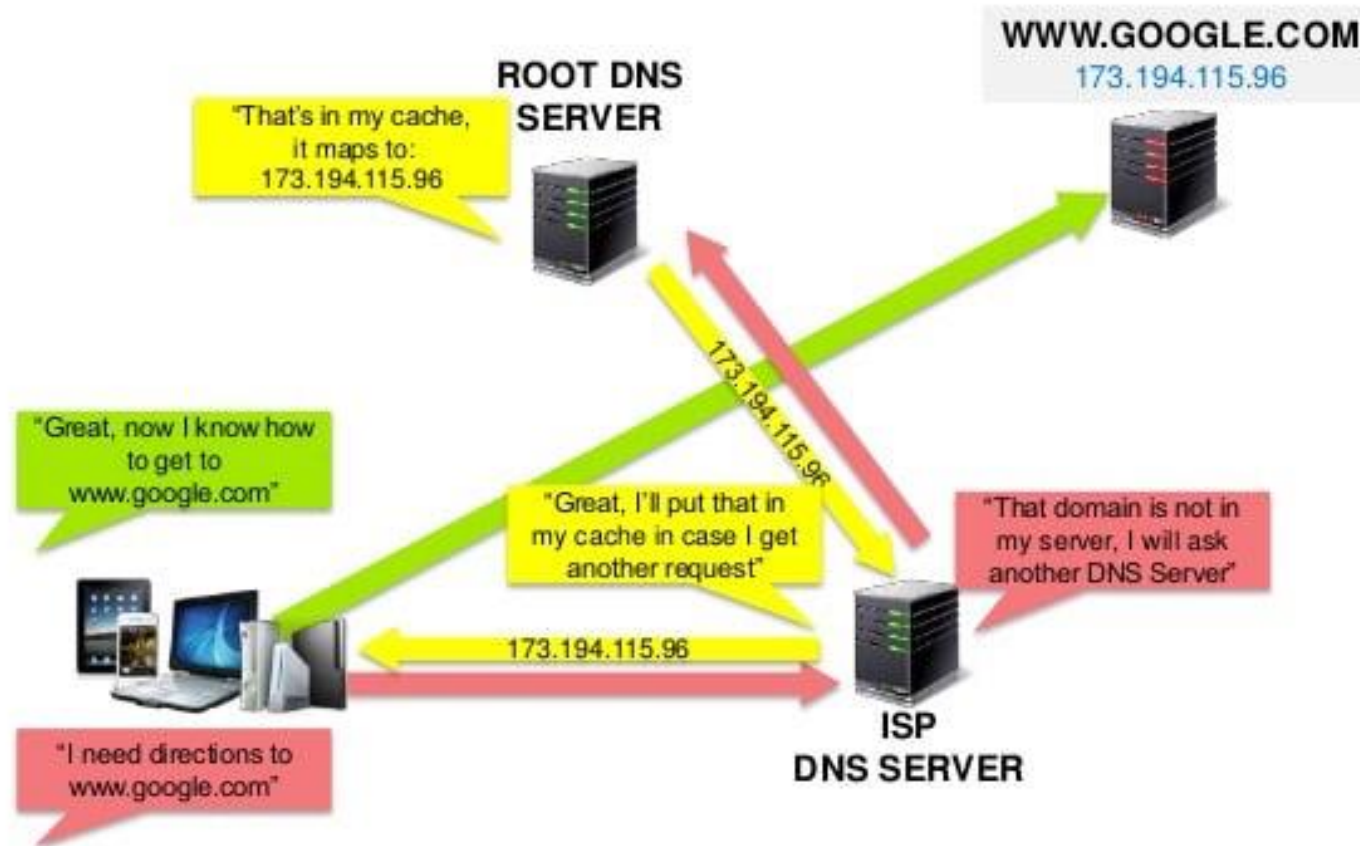
Domain Name System (DNS)

- DNS is a network, which consists of Domain Name Servers
- DNS helps to map the domain name to the IP address
 - This process is called the address resolution (DNS resolution)

https://en.wikipedia.org/wiki/Domain_Name_System¹⁷

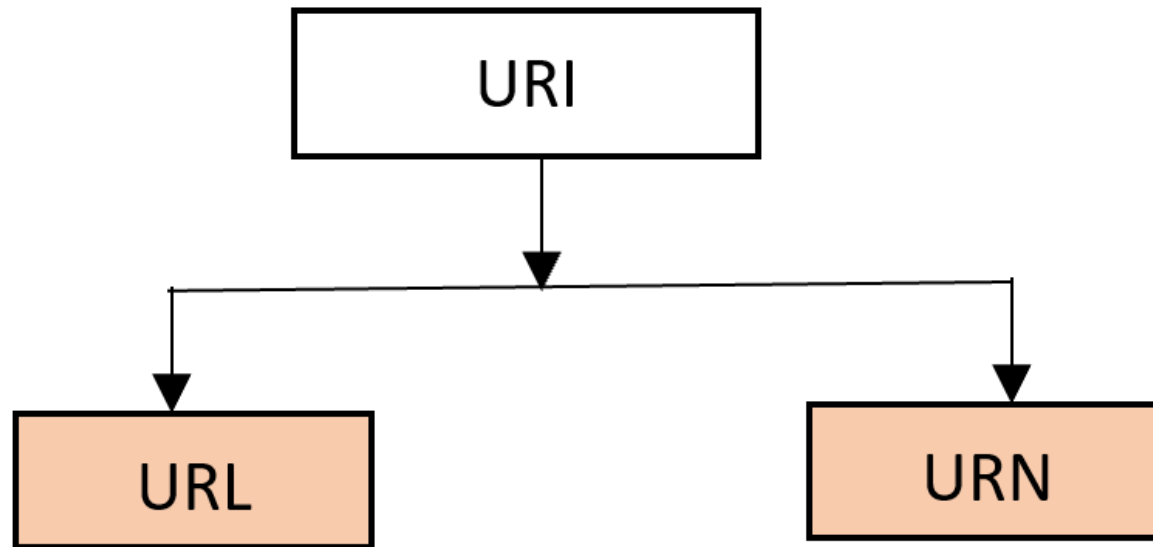
Domain Name System (DNS)

How Does DNS Work?



Unified Resource Identifier (URI)

- URI is a string of characters designed for **unambiguous identification** of resources.
- URI is extensible via the URI scheme



Unified Resource Identifier (URN)

- Unified Resource Name(URN) is a persistent, location-independent identifier

urn:nbn:de:101:3-2019075675872913

urn:uuid:6r4bc420-9c3a-12i9-97d9-0665700c9a66

ISBN 1-446-2776877-40

Unified Resource Identifier (URL)

Unified Resource Locator (URL) can be seen as a web address, which is a reference to a web resource that specifies its location on a computer network.

- www.google.com/search?q=examples
- <https://www.w3schools.com/html/default.asp>
- <https://en.wikipedia.org/wiki/URL>

URI, URL and URN example

Difference between URI, URL and URN

http Protocol define
How to access
resources

Path of the
file,directory or
resource

http://www.assignmenthelp.net/assignment_help/What-is-a-URL

Location where
resource resides

Resource

URI: http://www.assignmenthelp.net/assignment_help/What-is-a-URL

URL: http://www.assignmenthelp.net/assignment_help

URN: www.assignmenthelp.net/assignment_help/What-is-a-URL

Websites

- **Website** can be seen as a collection of web pages with **static content**
- Early websites were entirely developed only using HTML
 - Nowadays, some server-side application components and databases are used to dynamically generate the content
 - However, still the content is not user tailored

Web Applications

- **Web application** is a single page or a collection of web pages, with *interactive components* to *dynamically* generate the content
- Users can enter data., process them, and get information as the result using a web application

WEBSITE



VS

WEB APP



Websites Vs. Web Applications

- The processing is done by the application components in
 - Client-side (in browser) [JS is used to develop]
 - Server-side (in web server) [PHP, Java can be used]
 - Both the client and the server sides
- These application components may allow the user to interact with the web application by entering data, selecting content, clicking, dragging and dropping, etc...

E-commerce systems and forms

E-commerce systems and forms

Nowadays, the web technologies are used to develop many types of applications, including

- Email (Gmail, yahoo mail, outlook)
- Office tools (Google docs, google sheets, etc..)
- Games (Poki, Miniclips)
- Multimedia (YouTube)
- Social media and networking (Facebook, Tweeter)
- E-commerce (Amazon, e-bay)
- And many more.....

E-commerce systems

E-commerce is a large domain, which covers many related concepts like

- Internet marketing
- Electronic fund transfer
- Online transaction processing
- And many more.....

E-commerce systems

E-commerce systems provide online buying and selling over the internet.

There is a large variety of types of e-commerce systems

- Online goods/soft items (software, e-books, videos)
- Retail services (travel, food, cloths)
- Marketing services (advertising, auctions)
- Customer services (help centers, online banking)
- Many more.....

E-commerce systems

- E-commerce systems can also be categorized according to the stakeholder engagement
 - Business-to-Business (B2B) – between companies
 - Business-to-Consumer (B2C) – traditional operations
 - Consumer-to-Consumer (C2C) – via an online platform

Advantages of e-commerce

- To customers
 - No queues
 - Reduced price
 - Global transactions
 - Available 24/7
 - Wide collection for easy selection

Disadvantages of e-commerce

- To customers
 - Cannot examine the product
 - Lacks the shopping experience
 - Needs internet access
 - Can be addicted

Advantages of e-commerce

- *To businesses*
 - After the capital cost, maintenance cost is low
 - Global customers
 - Increased market share

Disadvantages of e-commerce

- *To businesses*
 - For physical items, storing and distributing is needed
 - Need to update the system frequently
 - Depends on the power and the internet

Web Forms

- E-commerce systems use web forms to capture the customers' data and send to the server for processing

Checkout

Language: English

✓ You received 25 GBP flat-rate shipping!

Shipping Information

First Name * Last Name *

Address Line 1 *

Address Line 2 Address Line 3

City * Region Postal Code *

Country * [Ship to the United States](#)

United Kingdom

Primary Phone Number *

Alternate Phone Number Email Address * [We value your privacy](#)

Order Summary:

Items:	GBP 60.50
Shipping:	GBP 30.99 GBP 25.00
Duties & Taxes:	GBP 11.66 INCLUDED
Order Total:	GBP 85.50

Web Forms

- Forms use variety of fields (elements) or structures not only to capture the users' data, but also to display data and information
- Input fields
 - Text boxes, dropdown lists, option buttons, radio buttons, selectable items, drag and drop items, file selectors, etc..
- Data/information display structures
 - Lists, tables, charts, images, files, etc..

Web Forms Development

- When developing HTML web forms, all the form elements are wrapped by the parent element named “form”, which has 2 main attributes

`<form method="get" action="controller.php">`
`</form>`

The form is developed inside the form element

The diagram illustrates the HTML form element structure. It shows the opening tag `<form method="get" action="controller.php">` and the closing tag `</form>`. A large curly brace spans the space between these two tags. A blue callout bubble points to this space, containing the text "The form is developed inside the form element". The attributes `method="get"` and `action="controller.php"` in the opening tag are highlighted with red rectangular boxes.

Form method

- Used to specify the type of the intended action the form submission is needed

Ex: available form methods in HTML

- When submitting data, the form method specifies the way the data should be submitted
 1. GET
 2. POST

Form method – get

- Default form method to submit data
- Data is visible on the address bar
- www.myDomain.com/controller.php?name=Saman&age=35
- Appends form-data into the URL in name/value pairs (Query string)
- The length of a URL is limited (about 3000 characters)
- Never use GET to send sensitive data! (will be visible in the URL)
 - – GET is better for non-secure data
- Useful for form submissions where a user want to bookmark the result

Form method – post

- Use POST method to send sensitive or personal information.
 - The POST method does not display the submitted form data in the page address field.
- POST has no size limitations, and can be used to send large amounts of data.
- Form submissions with POST cannot be bookmarked

Form action

- Specifies the address (URL) to submit the form
 - Usually, a script file or a program
- This address points to a component in the server
- When the form is filled and submitted, this component will receive the form values then process and responds with the necessary output

Form submission

- There should be a submit button to submit the form to the action end, using the specified form method

`<input type="submit" value="Submit">`

Form elements

- Many form fields are developed using the input element

<code><input type="text"></code>	Defines a one-line text input field
<code><input type="radio"></code>	Defines a radio button (for selecting one of many choices)
<code><input type="submit"></code>	Defines a submit button (for submitting the form)

- You will learn more possible form elements and their use in the practical session

https://www.w3schools.com/html/html_forms.asp


```
<fieldset>
<legend>Personal information:</legend>
```

```
<input type="button" value="Button 1"><BR />
<input type="checkbox">value1<BR />
<input type="color"><BR />
<input type="date"><BR />
<input type="datetime-local"><BR />
<input type="email"><BR />
<input type="file"><BR />
<input type="hidden"><BR />
<input type="image"><BR />
<input type="month"><BR />
<input type="number"><BR />
<input type="password"><BR />
<input type="radio">option 1<BR />
<input type="range"><BR />
<input type="reset"><BR />
<input type="search"><BR />
<input type="submit"><BR />
<input type="tel"><BR />
<input type="text"><BR />
<input type="time"><BR />
<input type="url"><BR />
<input type="week"><BR />
```

```
</legend>
</fieldset>
```

Personal information:

Button 1

☐ value1

Choose File No file chosen

Submit

☐ option 1

Reset

Week

Form validation

- It is very important to validate the data values entered into a form, before processing them
- Form validation can be done
 - Using HTML5 in **client-side** (before submitting the form)
 - Using JS in **client-side** (before submitting the form)
 - Using a **server-side** component (usually the component pointed by the form action) in the server (After submitting the form)

Form validation

Form validation – using HTML

`<input type="text" name="name" required>`

`<input type="text" name="name" value="Sam" readonly>`

`<input type="text" name="name" value="Sam" disabled >`

`<input type="text" name="name" value="Sam" size="20" >`

`<input type="text" name="name" value="Sam" maxlength="50" >`

- You will learn the use of JS and PHP to validate form data, when you learn JS and PHP

Summary

- Distributed systems and their architectures
- Main concepts of web
- E-commerce systems and forms