WDD 301

Website Publishing and Configuration

Skill Enhancement Course (SEC)

School of Vocational Studies

उत्तराखण्ड मुक्त विश्वविद्यालय

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WDD 301- Website Publishing and Configuration

INDEX

UNIT- 1

INTRODUCTION TO WORLD WIDE WEB

1.1 INTRODUCTION

The World Wide Web or www or W3 is an information space where documents and other web resources are identified by Uniform Resource Identifiers (URIs). Such documents are created using hypertext and can be interlinked by hyperlinks, and also can be accessed via the Internet. The resources on the Web are transferred via the Hypertext Transfer Protocol (HTTP), which may be accessed by users through the web browser. Hypertext documents are commonly called webpages, which are created and formatted using Hypertext Markup Language (HTML). Webpages may contain links to images, videos, text, etc. that are rendered to users of a web browser application, running on the user's computer. Tim Berners-Lee invented the World Wide Web in 1989. Multiple webpages with a common theme make up a website. Websites are stored in Web servers, which is a program that responds to requests made over the Internet from web browsers (called client side) running on a user's computer. Websites are provided for

a myriad of informative, entertainment, commercial, and governmental reasons. Some basic components of World Wide Web are-

- Web Servers: The computers that hold information (web resources) for distribution over the Internet based on client's call.
- Web clients: The machines which can retrieve information from the Web servers.
- HTTP: Hyper Text Transfer Protocol, is used to transmit files between web servers and clients. When you click on a hyperlink or fill out a form in a Web document, at that time the information is transferred by the HTTP. There are several other protocols used in the journey of Internet for various purposes, i. e. FTP, TCP/IP, UDP, SMTP, etc.
- Browser software: It is needed by a Web client for displaying text, images, video clips, etc on the client's machine. some popular browser software names are-Internet Explorer, Google Chrome, Mozilla Fire Fox, Netscape Navigator, etc.

1.2 OBJECTIVES

After the successful completion of this unit you will be able to-

- Understand the key developments of WEB 1.0, WEB 2.0 AND WEB 3.0.
- Know Internet evolution.
- Define the role of Internet in marketing.
- Know the several types of digital transactions.

1.3 INTRODUCTION TO WEB 1.0, WEB 2.0 AND WEB 3.0

The World Wide Web is not synonymous with the internet but is the most prominent part of the internet that can be defined as a techno-social system to interact humans based on technological networks. The immense progress had been made about web and related technologies.

Web 1.0-

Web 1.0 was defined as web of information connection. The Web 1.0 was referred as the first generation of World Wide Web. The first generation of web was the era of static webpages and such webpages are only used for content delivery purposes. In the year 1993 came a turning point for the world wide web with the introduction of the Mosaic web browser, which could display graphics as well as text to the clients' machine, from that date, usage of the web grew rapidly. This early phase of web development, called Web 1.0, where mostly web pages were static documents (read from a server and displayed on a clients' machine) with no options for users to contribute content, or to interact with it. Web 1.0 is a content delivery network (CDN) which enables to showcase the piece of information on the websites. Characteristics of web 1.0 are-

- Static web pages.
- Web 1.0 technologies includes core web protocols, as- HTML, HTTP, and URI.
- Web 1.0 have read only content.
- It establishes an online presence and make their information available to anyone at any time.
- Content is served from the server's file-system.
- Pages built using Server side includes or Common Gateway Interface (CGI).
- Frames and Tables used to position and align the elements on a page.

Web 2.0-

Web 2.0 is the revolution period of computer industry which establishes Internet as a new business platform. It is also referred as participative web or people-centric web or interactive web or read-write web. Several technological advancements were noted, i. e. uses of client-side and server-side scripting languages, uses of Javascript and AJAX framework, etc. In the age of web 2.0, AJAX (Asynchronous JavaScript and XML) and JavaScript frameworks have become a popular means of developing interactive website with rich features, as- interoperable, high usability, ability to create user-generated content, interaction and collaboration with other applications, etc. Characteristics of web 2.0 are-

- Easy information classification and retrieval.
- Dynamic content which is user responsive.
- Information flows bidirectional (as- between website owner and website users by means of feedback and commenting).
- Developed APIs to allow self-usage, such as by a software application.
- Era of social web started, which open the doors of online tools and platforms where people can share their perspectives, opinions, thoughts and experiences.
- Web 2.0 applications tend to interact much more with the end user.
- The following applications/tools were started in trending, as- Podcasting, Blogging, Tagging, Curating with RSS, Social bookmarking, social networking, social media, etc.
- Web 2.0 was facilitated with Flexible web design, creative reuse, updates, collaborative content creation and modification.

Web 3.0-

The basic idea of web 3.0 is to define structure data and link them in order to more effective discovery, automation, integration, and reuse across various applications. Web 3.0 tries to link, integrate, and analyze data from various data sets to obtain new information stream. Web 3.0 is also known as semantic web. Semantic web was thought up by Tim Berners-Lee (inventor of the World Wide Web). The Semantic Web is a vision about an extension of the existing World Wide Web, which provides software programs with machine-interpretable metadata of the published information where computers are able to make meaningful interpretations similar

to the way humans process information to achieve their goals. Web 3.0 is able to improve data management, support accessibility of mobile internet, simulate creativity and innovation, encourage factor of globalization phenomena, enhance customers' satisfaction and help to organize collaboration in social web. It includes transforming the network into a database, a move aimed at making content accessible by multiple applications that are not just the browser, the push of artificial intelligence technologies, the geospatial web, 3D Web, etc. It enables the upgradation of back-end of the web where many evolutions of web usage and interaction among several paths happened. Characteristics of web 3.0 are-

- Towards semantic web.
- Uses of artificial intelligence.
- 3D Graphics.
- Content is accessible by multiple applications
- Several advance web technologies, tools and frameworks were designed and developed.

1.4 HISTORY OF INTERNET

In todays' information age the Internet is a world-wide broadcasting system, which is capable to information dissemination, and a medium for collaboration and interaction between individuals. The original ARPANET (Advanced Research Projects Agency Network) grew into the Internet. Internet was based on the idea that there would be multiple independent networks of rather arbitrary design, beginning with the ARPANET as the pioneering packet switching network. In an open-architecture network, the individual networks may be separately designed and developed and each may have its own unique interface which it may offer to users and/or other providers. including other Internet providers. Each network can be designed in accordance with the specific environment and user requirements of that network. There are generally no constraints on the types of network that can be included or on their geographic scope, although certain pragmatic considerations will dictate what makes sense to offer.

The idea of open-architecture networking was first introduced by Kahn shortly after having arrived at DARPA (Defense Advanced Research Projects Agency) in 1972. This work was originally part of the packet radio program, but subsequently became a separate program in its own right. At the time, the program was called "Internetting". Key to making the packet radio system work was a reliable end-end protocol that could maintain effective communication in the face of jamming and other radio interference, or withstand intermittent blackout such as caused by being in a tunnel or blocked by the local terrain. Kahn first contemplated developing a protocol local only to the packet radio network, since that would avoid having to deal with the multitude of different operating systems, and continuing to use NCP (Network Control Program).

Vint Cerf and Bob Kahn designed a protocol that would improve the efficiency of the network, allow different networks to connect together into one big network (hence Internet: global group

of interconnected networks), and would include error detection, packaging, and routing. The new protocol was called Transmission Control Protocol and was later split into a separate Internet Protocol. Together, the suite of protocols were called TCP/IP. TCP/IP is particularly valuable as it ensures that messages are reliably sent over the Internet over multiple routes in individual packets. Those packets are then reassembled at the receiving system. If there is an error in a packet, a request for a new one is sent to the originating computer.

With the advent of TCP/IP, the 'global network' became a reality. Universities and government offices and agencies increasingly used the network for communication. Up to this time, the Internet was, by law, for strictly official use. However, personal email addresses became commonplace and games began to be played over the network. Unofficial use of the Internet gained impetus in the 1980's when personal computers by Apple and IBM became common in both offices and in homes.

In the year 1984, the Domain Name System (DNS) was introduced. DNS is a global network of servers that translate intuitive host names (Uniform Resource Locators) into numerical IP (Internet Protocol) addresses, which computers on the Internet use to communicate with each other. In the year 1990s, 'the World Wide Web' was introduced by the Tim Berners-Lee at CERN in Switzerland for distributing information across a network of different computers and operating systems.

The 'Hypertext Transfer Protocol' (http) is the communications protocol that enables the transfer of web pages. Http runs on top of TCP/IP and defines how different types of hyperlinked data (text and multimedia) are transmitted and accessed over the Internet. It supports a 'client/server' mode of communications between remote computers where a 'client' is a computer that requests data from a 'server' computer.

The first graphical browser, named Mosaic was came into existence in the year 1992. Further versions of Mosaic became Netscape. It is estimated that the Web has greatly surpassed one billion pages and that individuals, companies, educational institutions, and all other types of organisations are putting Web pages online. The Web is supported by backbone networks that are comprised of major, high capacity, long-distance computer networks with very high data transfer capacity.

1.5 GROWTH OF INTERNET

The Internet refers to the global information system that is logically linked together by a globally unique address space based on the Internet Protocol (IP). As we discussed in previous topic the history of the Internet began to take root out of a network developed by the Advanced Research Projects Agency (ARPA) to aid in the sharing of information and resources among researchers. The ARPANET, the network that became the basis for the Internet and made operational in the year 1969, became an essential tool for remote login, file transfer, electronic mail and the sharing of information by interest groups.

In the year 1973, the U.S. Defense Advanced Research Projects Agency (DARPA) started a research program called the Internetting project to develop communication protocols which would allow networked computers to communicate transparently across multiple, linked packet networks. The system of networks which emerged from the research is what is we know as the Internet. The system of protocols which was developed during this project is the TCP/IP Protocol Suite, after the two initial protocols developed: Transmission Control Protocol (TCP) and Internet Protocol (IP).

Since its creation, the Internet has grown exponentially in terms of numbers of networks connected to it. Over the years, there has been wave of commercialization of the Internet. The Internet has now become almost a "commodity" service, and much of the latest attention has been on the use of this global information infrastructure for support of other commercial services. This has been tremendously accelerated by the widespread and rapid adoption of browsers and the World Wide Web technology, allowing users easy access to information linked throughout the globe.

> **NOTE**- The Cisco Annual Internet Report is a global forecast/analysis that assesses digital transformation across various business segments. The report covers fixed broadband, Wi-Fi, and mobile (3G, 4G, 5G) networking. Quantitative projections are provided on the growth of Internet users, devices and connections. As-
>
> Internet users- Nearly two-thirds of the global population will have Internet access by the year 2023. There will be 5.3 billion total Internet users (66 percent of global population) by the year 2023, up from 3.9 billion (51 percent of global population) in the year 2018.
>
> Devices and connections- The number of devices connected to IP networks will be more than three times the global population by the year 2023. There will be 3.6 networked devices per person by the year 2023, up from 2.4 networked devices per person in the year 2018. There will be 29.3 billion networked devices by the year 2023, up from 18.4 billion in the year 2018.
>
> M2M connections will be half of the global connected devices and connections by the year 2023. The share of Machine-To-Machine (M2M) connections will grow from 33 percent in the year 2018 to 50 percent by the year 2023. There will be 14.7 billion M2M connections by the year 2023.
>
> The consumer segment will have nearly three-fourths share of total devices and connections by the year 2023. Globally, consumer segment’s share of total devices and connections will be 74 percent, with the business segment claiming the remaining 26 percent.

Mobility growth- Over 70 percent of the global population will have mobile connectivity by the year 2023. The total number of global mobile subscribers will grow from 5.1 billion (66 percent of population) in the year 2018 to 5.7 billion (71 percent of population) by the year 2023.

5G devices and connections will be over 10 percent of global mobile devices and connections by the year 2023. By the year 2023, global mobile devices will grow from 8.8 billion in the year 2018 to 13.1 billion by the year 2023– 1.4 billion of those will be 5G capable.

[Source: https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html]

1.6 INTERNET AND DIGITAL MARKETING

Internet marketing performs a major role in present marketing strategy. Internet marketing is a vital part of the success of any business organization. It is beneficial to nearly every aspect of the business. Internet marketing sometimes also called online marketing or digital marketing or web marketing or e-marketing is defined as the process of promoting brands, products, or services, over the Internet. It includes several promotional activities, such as- e-mail marketing, blogging, SEO, website, and social media.

The advent of Internet started a new era of Internet marketing. The worldwide reach of the Internet has made it possible for businesses to easily reach to their customers accross the globe. Through the Internet, business organizations of all sizes are now able to share brands, products, and services on a global scale at any time.

Internet uses are in trending irrespective of gender, age, place and time where vast majority of people spend a significant amount of time online, whether they are at work or home or waiting at the airport on a smartphone or digital device. The selection and execution of right Internet marketing strategies is the key factor to achieve the goal. Internet marketing also helps organizations in achieving better global branding and in building greater awareness of the products or services that they offer. The Internet has enabled the rise of the smart consumer. Today's consumer first takes the complete enquiry of the products or services before to proceed to buy or opt services.

1.7 IMPROTANCE OF INTERNET IN MARKETING

In todays' digital age Internet is a place where anybody can sale or purchase products/services, but for that you must have the art of utilizing Internet in your life. Now, developing online marketing strategy is the central idea for any successful business brand. The role of Internet in marketing is unavoidable. The following point states the importance of Internet in marketing-

- Product awareness and branding- Product awareness and online branding is one of the top reasons for using Internet in marketing.

- Meeting the new Demand- Consumers are gravitating to Internet media outlets such as social media platforms and mobile apps.
- Cost Efficiency- Internet marketing is significantly less expensive than traditional marketing.
- Better Visibility- Online marketing tactics like search engine optimization (SEO) enable your business to be more easily found on the channels your customers are using most.
- Increased Authority- Online marketing is important not just because it helps you to get found online, but also because it can change the way your business is perceived by potential customers.
- Long-Lasting Relationships
- Marketing boosts sales, which keeps your small business afloat. However, online marketing also does something more, which has a greater long-term impact. It enables you to build relationships. Building relationships with customers earns you repeat business.
- Increases Website Traffic- Internet marketing attracts consumers to visit the website.
- Increase Sales- Online marketing has proven to enhance sales. Most consumers research prices, sales and promotions online before proceeding to their online or in store purchase.
- Improve Credibility- Maintaining a consistent online presence via Internet marketing is one of the best ways to maintain credibility.

1.8 E-COMMERCE AND DIGITAL TRANSACTIONS

Digital transactions (in terms of payments) are defined as transactions in where the customer transfers money through electronic means, and the funds (payment) directly flows from one bank account to another bank account. The bank accounts could be held in banks, or with any other entities (such as payment bank). Such digital transfers could be done through means of cards (debit/credit), mobile wallets, mobile apps, net banking, Electronic Clearing Service (ECS), National Electronic Fund Transfer (NEFT), Immediate Payment Service (IMPS), pre-paid instruments or other similar means. Following are the types of digital payments usually followed in India, are-

[1] Banking Cards (Debit / Credit / Cash / Travel / Others)-

Banking cards offer consumers more security, convenience, and control than any other payment method. The wide variety of cards available– including credit, debit and prepaid cards which offers enormous flexibilities. These cards provide two factor authentications for secure payments, e.g, secure PIN and OTP (One Time password). RuPay, Visa, MasterCard are some of the example of banking cards used for payment systems. Such banking cards give people the power to purchase items in stores, on the Internet (online shopping), etc.

[2] Unstructured Supplementary Service Data (USSD)-

The innovative payment service *99# works on Unstructured Supplementary Service Data (USSD) channel. This service allows mobile banking transactions using basic feature mobile phone, there is no need to have mobile internet data facility for using USSD based mobile banking. It is envisioned to provide financial deepening and inclusion of underbanked society in the mainstream banking services. *99# service has been launched to take the banking services to every common man across the country. Banking customers can avail this service by dialling *99#, a "Common number across all Telecom Service Providers (TSPs)" on their mobile phone and transact through an interactive menu displayed on the mobile screen. Key services offered under *99# service include, interbank account to account fund transfer, balance enquiry, mini statement besides host of other services. *99# service is currently offered by 51 leading banks and all GSM (Global System for Mobile Communications) service providers and can be accessed in 12 different languages including Hindi and English.

[3] Aadhaar Enabled Payment System (AEPS)-

AEPS is a bank led model which allows online interoperable financial transaction at PoS (Point of Sale / Micro ATM) through the Business Correspondent (BC)/Bank Mitra of any bank using the Aadhaar authentication.

[4] Unified Payments Interface (UPI)-

UPI is a system that powers multiple bank accounts into a single mobile application (of any participating bank), merging several banking features, seamless fund routing and merchant payments into one place. It also caters to the "Peer to Peer" collect request which can be scheduled and paid as per requirement and convenience. Each Bank provides its own UPI App for Android, Windows and iOS mobile platform(s).

[5] Mobile Wallets-

A mobile wallet is a way to carry cash in digital format. You can link your credit card or debit card information in mobile device to mobile wallet application or you can transfer money online to mobile wallet. Instead of using your physical plastic card to make purchases, you can pay with your smartphone, tablet, or smart watch. An individual's account is required to be linked to the digital wallet to load money in it. Most banks have their e-wallets and some private companies. e.g. Paytm, Freecharge, Mobikwik, Oxigen, mRuppee, Airtel Money, Jio Money, SBI Buddy, itz Cash, Citrus Pay, Vodafone M-Pesa, Axis Bank Lime, ICICI Pockets, SpeedPay etc.

[5] Point of Sale (PoS)-

A PoS is the place where sales are made. On a macro level, a PoS may be a mall, a market or a city. On a micro level, retailers consider a PoS to be the area where a customer completes a transaction, such as a checkout counter. It is also known as a point of purchase.

[6] Internet Banking-

Internet banking, also known as online banking, e-banking or virtual banking, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. Different types of Internet /online financial transactions are:

- **National Electronic Fund Transfer (NEFT)-** NEFT is a nation-wide payment system facilitating one-to-one funds transfer. Under this Scheme, individuals, firms and corporates can electronically transfer funds from any bank branch to any individual, firm or corporate having an account with any other bank branch in the country participating in the Scheme. Individuals, firms or corporates maintaining accounts with a bank branch can transfer funds using NEFT. Even such individuals who do not have a bank account (walk-in customers) can also deposit cash at the NEFT-enabled branches with instructions to transfer funds using NEFT. However, such cash remittances will be restricted to a maximum of Rs.50,000/- per transaction. NEFT, thus, facilitates originators or remitters to initiate funds transfer transactions even without having a bank account. Presently, NEFT operates in hourly batches- there are twelve settlements from 8 am to 7 pm on week days (Monday through Friday) and six settlements from 8 am to 1 pm on Saturdays.
- **Real Time Gross Settlement (RTGS)**- RTGS is defined as the continuous (real-time) settlement of funds transfers individually on an order-by-order basis (without netting). 'Real Time' means the processing of instructions at the time they are received rather than at some later time; 'Gross Settlement' means the settlement of funds transfer instructions occurs individually (on an instruction-by-instruction basis). Considering that the funds settlement takes place in the books of the Reserve Bank of India (RBI), the payments are final and irrevocable. The RTGS system is primarily meant for large value transactions. The minimum amount to be remitted through RTGS is 2 lakh. There is no upper ceiling for RTGS transactions. The RTGS service for customer's transactions is available to banks from 9.00 hours to 16.30 hours on week days and from 9.00 hours to 14:00 hours on Saturdays for settlement at the RBI end. However, the timings that the banks follow may vary depending on the customer timings of the bank branches.
- **Electronic Clearing System (ECS)**- ECS is an alternative method for effecting payment transactions in respect of the utility-bill-payments such as telephone bills, electricity bills, insurance premia, card payments and loan repayments, etc., which would obviate the need for issuing and handling paper instruments and thereby facilitate improved customer

service by banks / companies / corporations / government departments, etc., collecting / receiving the payments.

- **Immediate Payment Service (IMPS)**- IMPS offers an instant, 24X7, interbank electronic fund transfer service through mobile phones. IMPS is an emphatic tool to transfer money instantly within banks across India through mobile, internet and ATM which is not only safe but also economical both in financial and non-financial perspectives.

[7] Mobile Banking-

Mobile banking is a service provided by a bank or other financial institution that allows its customers to conduct different types of financial transactions remotely using a mobile device such as a smart phone or tablet. It uses software, usually called an app, provided by the banks or financial institution for the purpose. Each Bank provides its own mobile banking App for Android, Windows and iOS mobile platform(s).

[8] Micro ATMs-

Micro ATM meant to be a device that is used by a million Business Correspondents (BC) to deliver basic banking services. The platform will enable Business Correspondents (who could be a local kirana shop owner and will act as 'micro-ATM') to conduct instant transactions. The micro platform will enable function through low-cost devices (micro-ATMs) that will be connected to banks across the country. This would enable a person to instantly deposit or withdraw funds regardless of the bank associated with a particular BC.

1.9 POINTS TO REMEMBER

- The World Wide Web or www or W3 is an information space where documents and other web resources are identified by Uniform Resource Identifiers (URIs).
- Hypertext documents are called webpages, which are created and formatted using Hypertext Markup Language (HTML). Webpages may contain links to images, videos, text, etc. that are rendered to users of a web browser application, running on the user's computer.
- The Web 1.0 was referred as the first generation of World Wide Web. The first generation of web was the era of static webpages and such webpages are only used for content delivery purposes.
- Web 2.0 is the revolution period of computer industry which establishes Internet as a new business platform. It is also referred as participative web or people-centric web or interactive web or read-write web.

- Web 3.0 is also known as semantic web. Semantic web was thought up by Tim Berners-Lee (inventor of the World Wide Web).
- The first graphical browser, named Mosaic was came into existence in the year 1992. Further versions of Mosaic became Netscape.
- Internet marketing sometimes also called online marketing or digital marketing or web marketing or e-marketing is defined as the process of promoting brands, products, or services, over the Internet. It includes several promotional activities, such as- e-mail marketing, blogging, SEO, website, and social media.
- Digital transfers could be done through means of cards (debit/credit), mobile wallets, mobile apps, net banking, Electronic Clearing Service (ECS), National Electronic Fund Transfer (NEFT), Immediate Payment Service (IMPS), pre-paid instruments or other similar means.

1.10 GLOSSARY

- Packet: The fundamental unit of data transmitted over the Internet. When a device intends to send a message to another device, it breaks the message down into smaller pieces, called packets. Each packet has the sender's address, the destination address, a sequence number, and a piece of the overall message to be sent.
- Hub: A simple network device that connects other devices to the network and sends packets to all the devices connected to it.
- Bridge: A network device that connects two networks together and only allows packets through that are needed.
- Switch: A network device that connects multiple devices together and filters packets based on their destination within the connected devices.
- Router: A device that receives and analyzes packets and then routes them towards their destination. In some cases, a router will send a packet to another router; in other cases, it will send it directly to its destination.
- IP Address: Every device that communicates on the Internet, whether it be a personal computer, a tablet, a smartphone, or anything else, is assigned a unique identifying number called an IP (Internet Protocol) address. Historically, the IP-address standard used has been IPv4 (version 4), which has the format of four numbers between 0 and 255 separated by a period. For example, the domain Saylor.org has the IP address of 107.23.196.166. The IPv4 standard has a limit of 4,294,967,296 possible unique addresses. As the use of the Internet has proliferated, the number of IP addresses needed has grown to the point where the use of IPv4 addresses will be exhausted. This has led to the new IPv6 (version 6) standard, which is currently being phased in. The IPv6

standard is formatted as eight groups of four hexadecimal digits. The IPv6 standard has a limit of 3.4×1038 possible addresses.

- Domain name: If you had to try to remember the IP address of every web server you wanted to access; the Internet would not be nearly as easy to use. A domain name is a human-friendly name for a device on the Internet. These names generally consist of a descriptive text followed by the top-level domain (TLD). For example, the Uttarakhan Open University's domain name is uou.ac.in; UOU describes the organization and .ac.in is the top-level domain. Other well-known TLDs include .com, .net, .org, .gov, etc.
- DNS: DNS stands for "domain name system," which acts as the directory on the Internet. When a request to access a device with a domain name is given, a DNS server is queried. It returns the IP address of the device requested, allowing for proper routing.
- Packet-switching: When a packet is sent from one device out over the Internet, it does not follow a straight path to its destination. Instead, it is passed from one router to another across the Internet until it is reaching its destination. In fact, sometimes two packets from the same message will take different routes! Sometimes, packets will arrive at their destination out of order. When this happens, the receiving device restores them to their proper order.
- Protocol: In computer networking, a protocol is the set of rules that allow two (or more) devices to exchange information back and forth across the network.

1.11 CHECK YOUR PROGRESS

Descriptive type questions-

a) Explain the key features of Web 1.0 and Web 2.0.
b) Briefly define the history of Internet.
c) Explain the role of Internet in digital marketing.
d) What do you understand by various types of digital transactions? Define Banking Cards and Unified Payments Interface (UPI).
e) What do you mean by Internet banking? Define NEFT, RTGS, IMPS, and ECS.

Objective type questions-

a) In computer networking, a protocol is the set of rules that allow two (or more) devices to exchange information back and forth across the network (True/False).
b) Every device that communicates on the Internet not necessarily needs a unique identifying number called an IP (Internet Protocol) address (True/False).
c) Mobile banking is a service provided by a bank or other financial institution that allows its customers to conduct different types of financial transactions remotely using a mobile device (True/False).

d) The RTGS system is primarily meant for large value transactions (True/False).

e) It is not possible to transfer money using NEFT to someone's bank account without having own bank account (True/False).

f) USSD stands for Unstructured Supplied Service Data (True/False).

g) DARPA stands for Defense Advanced Research Projects Agency (True/False).

h) DNS is a global network of servers that translate intuitive host names (Uniform Resource Locators) into numerical IP (Internet Protocol) addresses (True/False).

i) The Semantic Web is a way to extending software programs with machine-interpretable metadata of the published information where computers are able to make meaningful interpretations (True/False).

Answer (objective type question)-

[a] True [b] False [c] True [d] True [e] False

[f] False [g] True [h] True [i] True

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UNIT- 2
RESPONSIVE WEB AND ITS APPLICATIONS

2.1 INTRODUCTION

Responsive design is an advanced approach to web page design that makes use of flexible layouts, flexible images and CSS media queries. The goal of responsive design is to build web pages that detect the user's screen size and orientation and change the layout consequently. Web pages can be viewed using many different devices such as desktops, tablets, and phones. Responsive design gives you techniques so that your web page should look good, and be easy to use, regardless of the device.

2.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Explore HTML5 and its componants.
- Use HTML5 and CSS3 for creating Responsive Web Layouts.

2.3 REQUIREMENTS

Following tools are required to perform the forthcoming lab practicals.

- Notepad
- Apache Server
- Basic Knowledge of HTML and CSS

2.4 RESPONSIVE WEB - VIEWPORTS

Viewport defines the area of web page that is visible to user. This viewport always varies with different devices (smaller in phones and bigger in desktops).

HTML5 introduced a Meta tag to give web designers a facility so that they can control the viewport. This tag should be included in <head> section of all web pages.

```
    <meta name="viewport" content="width=device-width,     initial-
scale=1.0">
```

Description of Meta tag

Attribute	*Description*
1) Width = device-width	this sets the width of the viewport to the physical-width of the device screen (which will vary depending on the device).
2) initial-scale=1.0	property controls the zoom level when the page is first loaded by browser.

2.5 RESPONSIVE WEB - GRIDS

The Grid view provides the column in web page to place elements on the page. A responsive web layout has 12 columns spanning the 100% of device width. These grids increases and decreases according to the size of the web browser window.

We can create responsive grids with the help of below CSS. For creating design responsive, we always give size in percentage (%).

```
<style>
```

```
            .one {width: 8.33%; float: left; padding: 15px;}
            .two {width: 16.66%; float: left; padding: 15px;}
            .three {width: 25%; float: left; padding: 15px;}
            .four {width: 33.33%; float: left; padding: 15px;}
            .five {width: 41.66%; float: left; padding: 15px;}
            .six {width: 50%; float: left; padding: 15px;}
            .seven {width: 58.33%; float: left; padding: 15px;}
            .eight {width: 66.66%; float: left; padding: 15px;}
            .nine {width: 75%; float: left; padding: 15px;}
            .ten {width: 83.33%; float: left; padding: 15px;}
.eleven {width: 91.66%; float: left; padding: 15px;}
            .twelve {width: 100%; float: left; padding: 15px;}
    </style>
```

All columns must be floating to the left. We can also adjust its padding to 15px (not compulsory, can be adjusted according to design pattern).

2.6 RESPONSIVE WEB - MEDIA QUERIES

Now, we know that responsive design always changes its layout according to device size. This is done with the help of CSS Media Queries. CSS Media queries allow you to set CSS rules based on device's screen size and orientation.

```
/* Mobile Styles */
@media only screen and (max-width: 400px) {
  body {
    background-color: #F09A9D; /* Red */
  }
}
/* Tablet Styles */
@media only screen and (min-width: 401px) and (max-width: 960px) {
  body {
    background-color: #F5CF8E; /* Yellow */
  }
}
/* Desktop Styles */
@media only screen and (min-width: 961px) {
  body {
```

```
    background-color: #B2D6FF; /* Blue */
  }
}
```

When you resize your browser, you should see three different background colors of the page (output as seen in the below figure):

1) Blue when page-width is greater than 960px wide,
2) Yellow when page-width is between 401px and 960px,
3) Red when page-width is less than 400px.

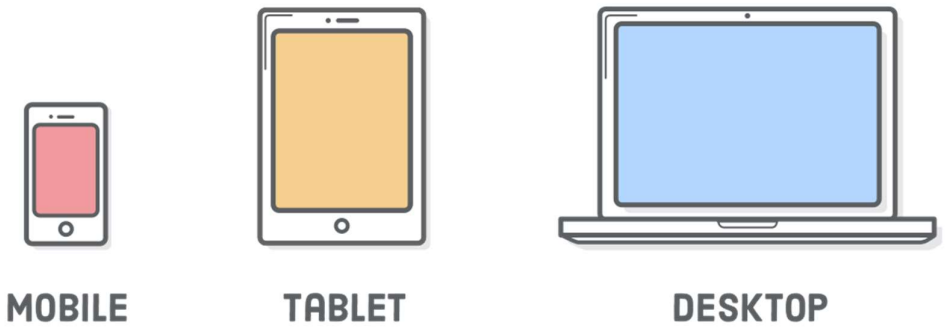

Fig 1.1 (Output of above Media Queries)

Media queries let us design the same HTML content as different CSS layouts. Therefore, instead of maintaining one website for smart phones and an entirely distinct site for laptops/desktops, we can use the same HTML markup (and web server) for both of them.

This means that at any time we add/edit a new content in our HTML, those changes are automatically reflected in both mobile and widescreen layouts.

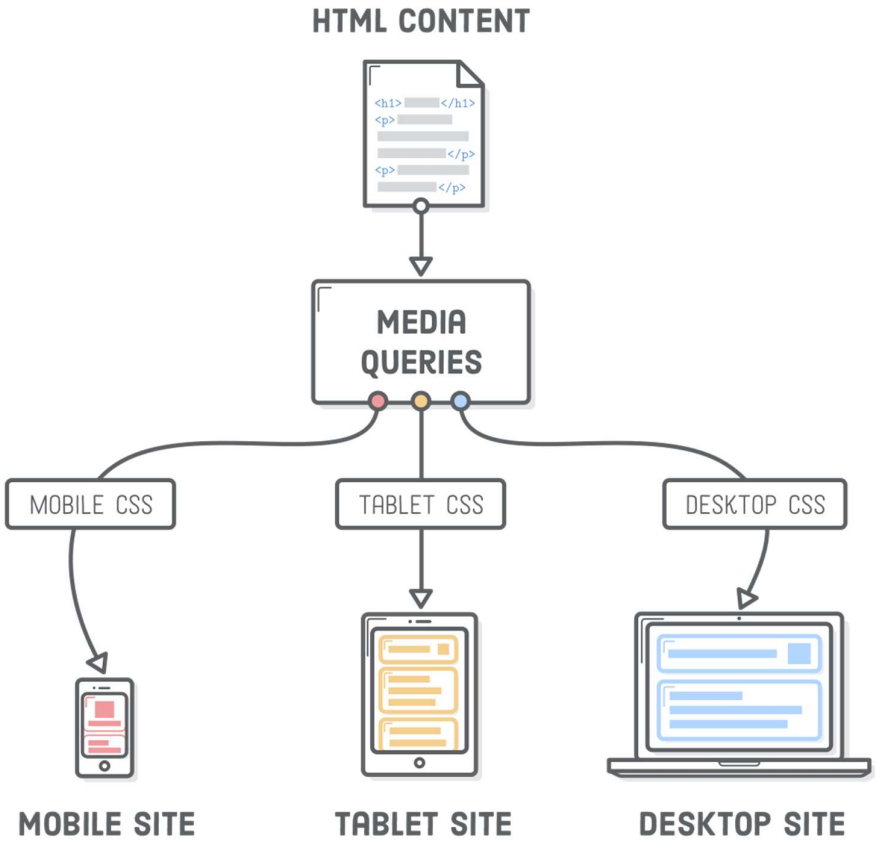

Fig 1.2 (Where media Queries work)

Media queries always begin with the ***@media*** followed by some kind of conditional statement, and then some curly brackets.

Inside the curly brackets, you put a normal CSS rule. The browser only pays attention to those rules if the condition is true.

The ***only screen*** "media type" means that the enclosed styles will apply to devices with display screens (not to printed documents).

The ***min-width*** and ***max-width*** parts are "media features", and they specify the device dimensions you are targeting.

2.7 RESPONSIVE WEB - IMAGES

Images are the integral part of any web design. Responsive images automatically adjust to fit the size of the device screen.

a) Set the ***width*** of image to 100% for creating image responsive:

```
img {
     width: 100%;
     height: auto;
}
```

b) Set the ***max-width*** of image to 100% for creating image responsive. The image will scale down according to device, but never scale up to be larger than its original size:

```
img {
      max-width: 100%;
      height: auto;
}
```

Above both examples (a & b) set the ***height*** of image to ***auto,*** this means that height of image is adjusted according to width automatically.

2.8 RESPONSIVE WEB - VIDEOS

Now-a-days videos are used in web designs to make them more interactive. Responsive video player automatically adjusts to fit the size of the device screen.

a) Set the ***width*** of video to 100% for creating video player responsive:

```
video {
     width: 100%;
     height: auto;
}
```

b) Set the ***max-width*** of video to 100% for creating video responsive. The video-player will scale down according to device, but never scale up to be larger than its original size:

```
video {
      max-width: 100%;
      height: auto;
}
```

Above both examples (a & b) sets the ***height*** of video to ***auto,*** this means that height of video player is adjusted according to width automatically.

2.9 PRACTICAL EXAMPLE FOR LAB PRACTICE

Desired Result (Output)

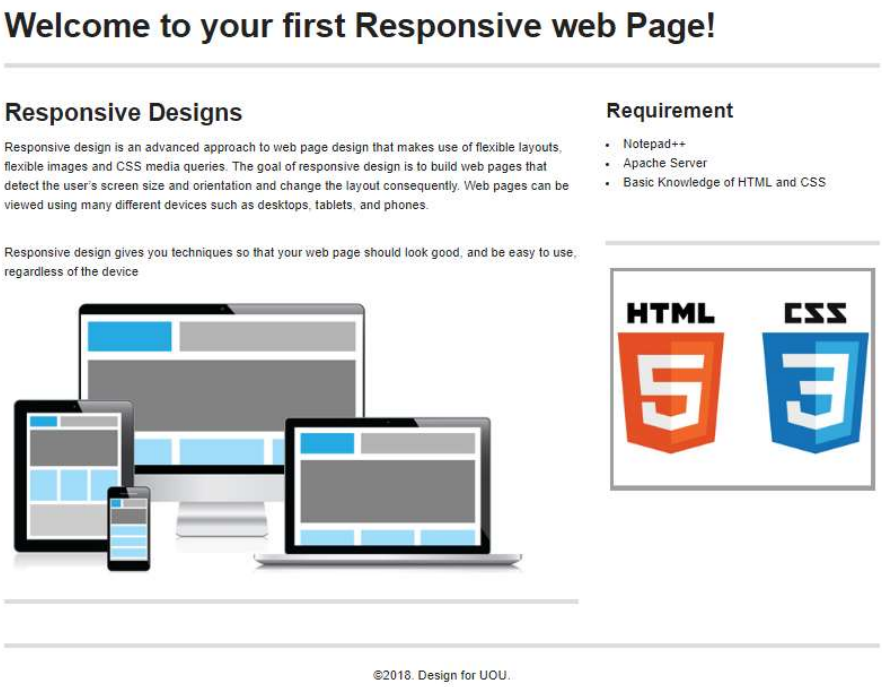

Fig 1.3 (Responsive output in desktop screen)

Fig 1.4 (Responsive output in mobile screen)

Fig 1.5 (Responsive output in tablet screen)

Above output shows that Responsive layout changes according to the width of the device, i.e. it changes its orientation. This is done with the help of HTML5 and CSS3.

Below are the steps for generating output displayed above. Follow the code step-by step.

Step 1) Create a HTML file and name it as "***responsive.html"***

```
<!—Declare that you are using HTML 5 -->
<!DOCTYPE html>
<html>
<head>
<!-- Specifies the character encoding for the HTML document. -->
  <meta charset="utf-8" />

<!-- Set the viewport width to device width for mobile -->
        <meta name="viewport" content="width=device-width, initial-scale=1.0">

  <title>Welcome to Responsive Page</title>
```

```
 <!-- Included CSS Files -->
 <link rel="stylesheet" href="style.css">
</head>

<body>
<div class="row">
<div class="twelve columns">
                <p align="center"><h2>Welcome to your first Responsive web
Page!</h2></p>
                <hr>
        </div>
</div>

<div class="row">
<div class="twelve columns">
                <div class="row">
                        <div class="eight columns">
                                <h3>Responsive Designs</h3>
                                <p>Responsive design is an advanced approach to web page
design that makes use of flexible layouts, flexible images and CSS media queries. The goal of
responsive design is to build web pages that detect the user's screen size and orientation and
change the layout consequently. Web pages can be viewed using many different devices such
as desktops, tablets, and phones.</p><br />
                                <p>Responsive design gives you techniques so that your web
page should look good, and be easy to use, regardless of the device</p>
                                <img src="responsive.jpg" />
                                <hr />
                        </div>

                        <div class="four columns">
                                <h4>Requirement </h4>
                                <ul>
                                        <li>Notepad++</li>
                                        <li>Apache Server</li>
                                        <li>Basic Knowledge of HTML and CSS</li>
```

```
                    </ul>
                    <br />
                    <hr />
                    <img src="logo.jpg" />
                </div>
            </div>
        </div>
</div>
<div class="row">
<div class="twelve columns">
  <hr />
  <p align="center">©2018. Design for UOU. </p>
</div>
</div>
</body>
</html>
```

Steps 2) Now create a file name as “style.css” and define the responsive styling for above html file.

```
 /* with box-sizing element’s specified width and height are not affected by padding or borders. ---------------------- */
*{box-sizing: border-box;}

html { font-size: 62.5%; }

body {font-family: sans-serif; font-size: 14px; font-size: 1.4rem; line-height: 1; color: #222222; position: relative; -webkit-font-smoothing: antialiased; }

p { font-size: 14px; line-height: 1.6; margin-bottom: 17px; }

h2, h4 {line-height: 1.1; margin-bottom: 14px; margin-top: 14px; }

h2 { font-size: 37px; }
```

```
h4 { font-size: 23px; }

hr { border: solid #ddd; border-width: 5px 0 0; clear: both; margin: 22px 0 21px; height: 0; }

/* Lists ---------------------- */
ul{ font-size: 14px; line-height: 1.6; margin-bottom: 17px; list-style-position: inside; }

/* The Grid ---------------------- */
.row { width: 1000px; max-width: 100%; min-width: 768px; margin: 0 auto; }

.columns { float: left; min-height: 1px; padding: 0 15px; position: relative; }

.row .one {width: 8.333%;}
.row .two {width: 16.667%;}
.row .three {width: 25%;}
.row .four {width: 33.333%;}
.row .five {width: 41.667%;}
.row .six {width: 50%;}
.row .seven {width: 58.333%;}
.row .eight {width: 66.667%;}
.row .nine {width: 75%;}
.row .ten {width: 83.333%;}
.row .eleven {width: 91.667%;}
.row .twelve {width: 100%;}

/* Responsive Image css ------------------*/
img { max-width: 100%; height: auto; padding: 5px 5px 5px 5px;}

/* media queries for small and mobile screens---------------------- */
@media only screen and (max-width: 767px) {
body { width: 100%; min-width: 0; margin-left: 0; margin-right: 0; padding-left: 0; padding-right: 0; }
.row { width: auto; min-width: 0; margin-left: 0; margin-right: 0; }
```

```
.columns { width: auto !important; float: none; }
}
```

Note: We have used two images ***responsive.jpg & logo.jpg*** in HTML file. You can use any image of your choice.

Step 3) we have four files now:

1) responsive.html
2) style.css
3) responsive.jpg
4) logo.jpg

If you have installed XAMPP then create a folder named ***responsive HTML*** in ***xampp/htdocs*** folder and place above four files in that folder.

Step 4) Run XAMPP and then open your browser and type URL

localhost/responsive HTML/responsive.html

Step 5) Change your browser screen size and check your HTML file changes its orientation according to width automatically.

Congratulation you have successfully learned to make responsive web pages using HTML5 and CSS3.

2.10 RESPONSIVE WEB FRAMEWORKS

There are many Responsive Web frameworks, very useful for the front-end development of the website. They have ready-to-use CSS libraries needed for creating beautiful and responsive layout.

Some of them are:

1. Bootstrap - ***http://getbootstrap.com/***
2. Jquery-mobile - ***https://jquerymobile.com/***
3. Foundation - ***https://foundation.zurb.com/***
4. Material UI - ***http://www.material-ui.com/***
5. Pure.CSS - ***https://purecss.io/***
6. Skeleton - ***http://getskeleton.com/***
7. Montage - ***http://montagestudio.com/montagejs/***

8. Siimple - ***https://siimple.juanes.xyz/***
9. Gumby - ***https://gumbyframework.com/***
10. Semantic UI - ***https://semantic-ui.com/***

With the use of any of the above framework website designed are functional, fast and easy. One should focus on the HTML part and the framework does rest of the work.

These frameworks provide all the UI elements needed for the responsive website development.

2.11 GLOSSARY

- **HTML:** ***Hyper Text Markup Language*** is a markup language for creating web pages.
- **CSS:** ***Cascading Style Sheet*** is to give styling to HTML.
- **XAMPP:** ***XAMPP*** is a completely free, easy to install Apache distribution containing Apache, MySql, PHP, and Perl.

2.12 ANSWER TO CHECK YOUR PROGRESS

Q1. Define HTML5.

Q2. How CSS is used to give style for HTML?

Q3. What are Media Queries? Explain.

Q4. Name different frameworks used for creating responsive websites.

Q5. Create a responsive webpage using bootstrap framework.

2.13 REFERENCES/BIBLIOGRAPHY

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- https://www.phptpoint.com/web-tutorial/

UNIT- 3

WEB SERVER AND DOMAIN REGISTRATION, PUBLISHING A WEBSITE

3.1 INTRODUCTION

A web server is computer software and underlying hardware that accepts requests via HTTP (the network protocol created to distribute web content) or its secure variant HTTPS

When you done developing your website. You want it to get online. Now before getting your website online, you need to have a domain name. These domain names are web addresses such as ***google.com, uou.ac.in*** etc that most browsers used to find a website.

Before registering Web server, we see that how a domain name is registered

3.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Understand the Concept of web server and domain registration
- Learn about how we publish our website in the hosting.
- Understand the Basic Concept of web server hosting

3.3 DOMAIN NAME REGISTRATION

For registration of domain name, you need to follow the following steps:

1) The first step in registering a domain name is to choose a name for your website. The name can be nearly anything you want, but to be most efficient it should imitate the behavior of your website. If you are selling books, for example, it helps to have a domain name that has some reference to books e.g. ***onlinebooks.com***.

   Rules for choosing a domain name

   1.1 Only letters, numbers or hyphens are acceptable.
   1.2 Its maximum length should be up-to 70 characters. However, we advise you to keep it as short as possible (so that users can remember it).
   1.3 Numerous extensions are available for domain names such as ***.com, .org, .in, .au, .ac.in*** etc. So, choose according to your website nature. For example, if you own a business website than choose **.com**

2) Once the name finalized, it has to register with a registrar (certified by ICANN -Internet Corporation for Assigned Names and Numbers).

   There are number of registrar available in the market. We are using ***hosting.co.in*** for explaining you how can we register a domain name. Almost all registrars use the same process to register the domain name. The domain name will registered for the period of 1-10 years as needed.

3) Open hosting.co.in and go to page domain registration. You will see below page

Fig 1.6 (Domain registration screen in hosting.co.in)

4) Type your domain name in ***www*** text field and choose the domain extension according to your choice from the ***.com*** box, and the press continue button. The domain name you choose will only registered for you if it is free and no one registered it before.

   If it is registered before then the panel above will give you message that this domain name is unavailable. **(See fig 1.7)**

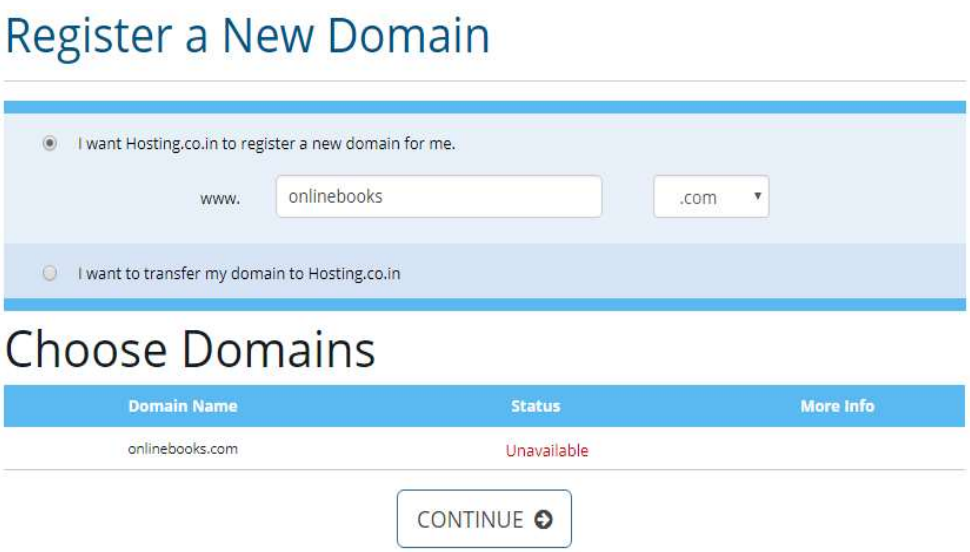

Fig 1.7 (Screen showing that onlinebooks.com is unavailable)

5) Now you have to choose domain name such that it is not taken by anyone. See below we have changed domain to onlinebooks-uttarakhand.com, and it is available. The screen also shows the price option for 1-10 years. Select 1year option and press continue

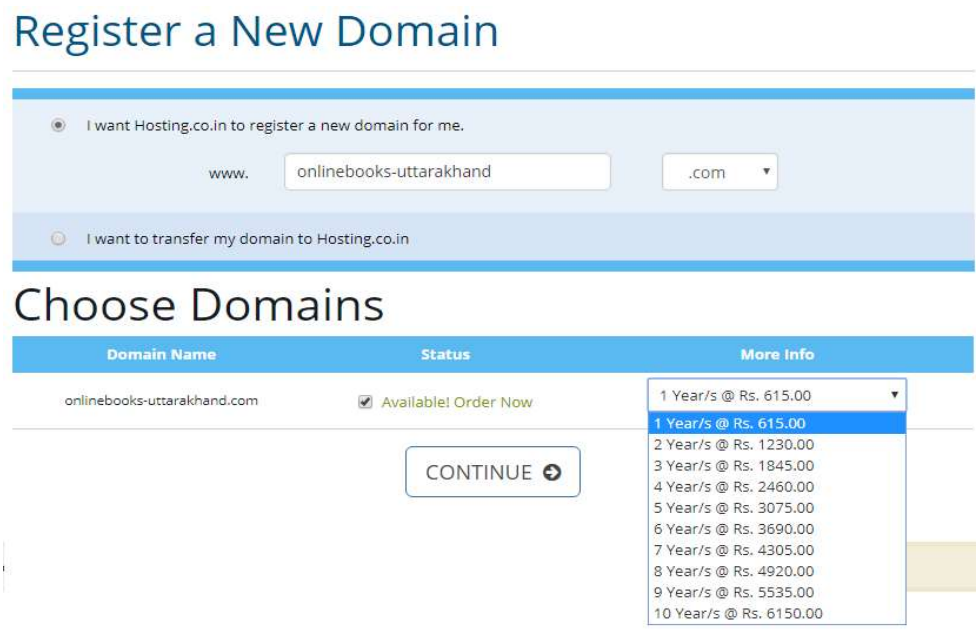

Fig 1.8 (Screen showing that onlinebooks-uttarakhand.com is available)

6) It will take you to shopping cart page

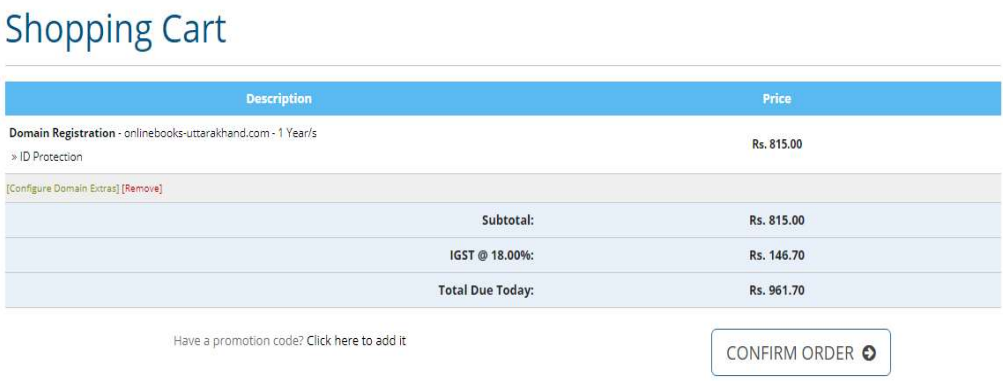

Fig 1.9 (Shopping Cart for onlinebooks-uttarakhand.com booking)

7) If you confirm order then the shopping cart will take you to payment method option.

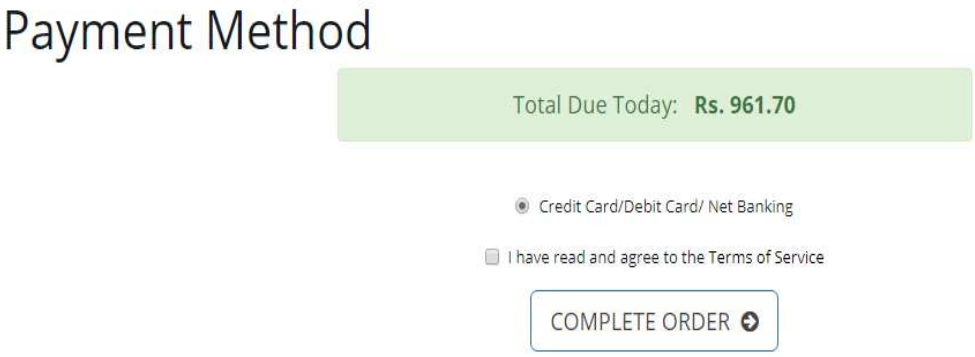

Fig 1.10 (Payment method screen)

8) You can pay by Credit Card/Debit Card/Net Banking. Once you pay the amount, your domain name will be booked and the registrar confirming your domain name booking will send an e-mail to you. Do not forgive to enter your contact detail before completing order. You can also create your account in the registrar website, so that you can get your dashboard and can see/manage all your orders there.

3.4 WEB SERVER HOSTING

As you have purchased your domain name, you have to link it with some space where you put all your website files, so that user can access it from all over the globe. Purchasing the web server hosting is almost similar to domain name purchasing.

1) First, know which server is best suited for you. It depends on the technologies you have used to develop website. For example, if have developed it using PHP/JAVA then you must need Linux Hosting, or if you have used .net technologies than you have to get Windows hosting. Almost all hosting provider gives you the facilities to choose your desired web hosting. We are again using ***hosting.co.in*** for web hosting in our examples.

2) Login to ***hosting.co.in*** and go to web hosting plans. Here we are giving some Linux hosting plans for your reference.

(You can get an idea about web hosting)

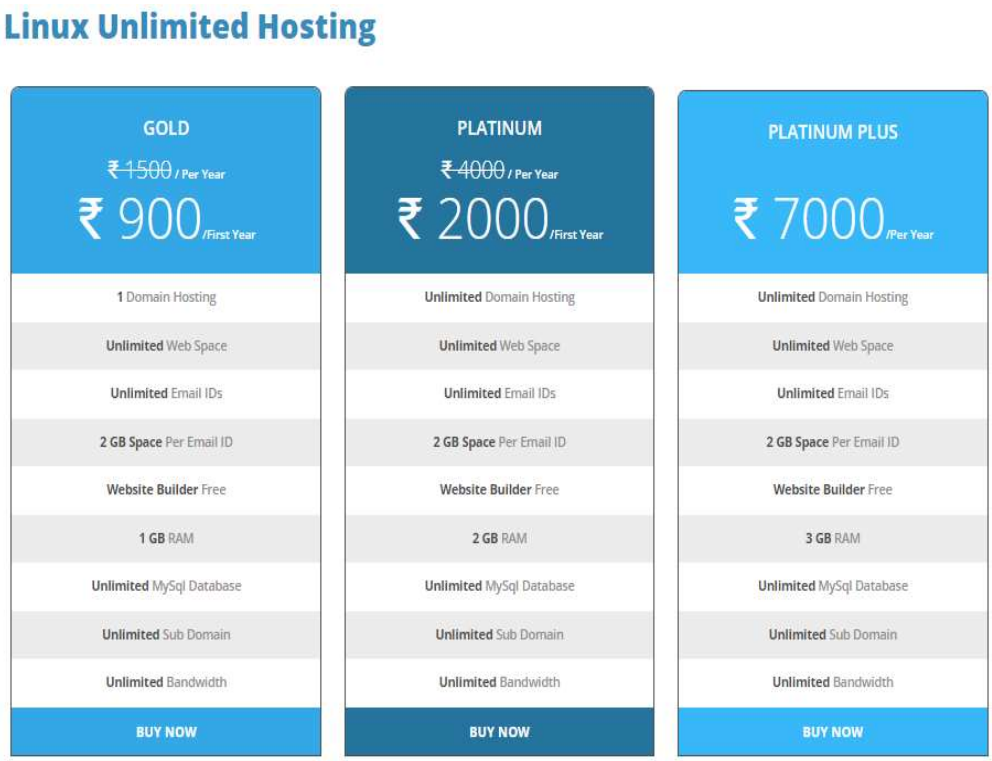

Fig 1.11 (For Example- Unlimited Linux hosting plans from hosting.co.in)

3) Suppose we are ready to buy Gold plan (Rs 900 /year). Then click on Buy button below that plan.

4) You will see a screen where you have to give the domain name of your choice for hosting. Click on *"I already have a domain name"* and type your domain name *onlinebooks-uttarakhand.com.* Now press continue button.

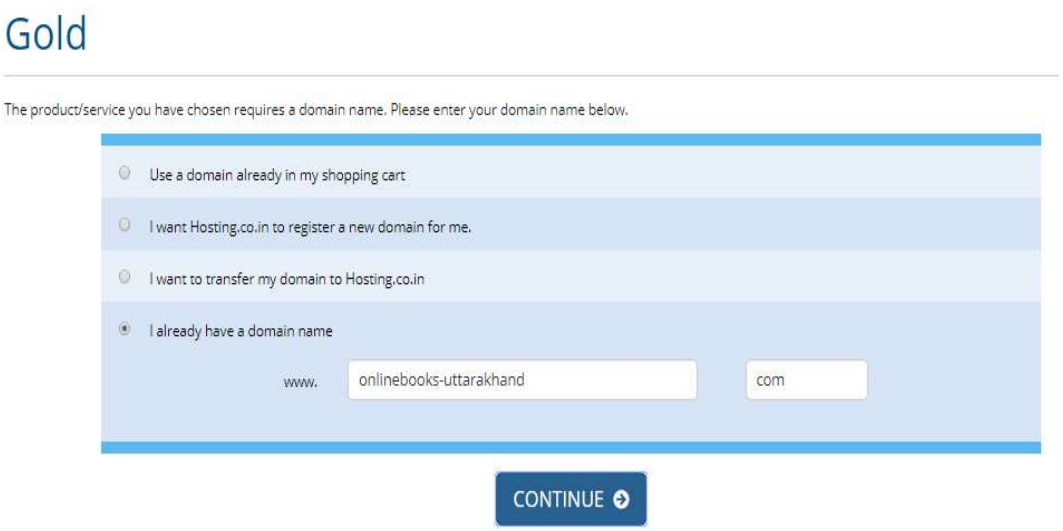

Fig 1.12 (Domain name choose screen)

5) Now you will be redirect to shopping cart screen.

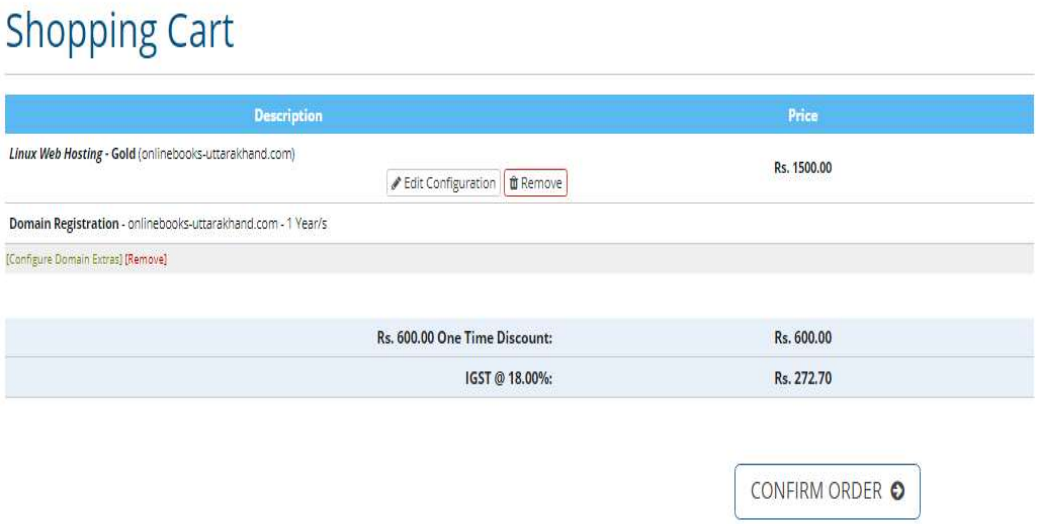

Fig 1.13 (Shopping Cart screen for web hosting)

6) Click confirm order and then make payment as described in **fig 1.10**

7) You will get an email confirming about your web server registration. In addition, this mail has login credential of your Cpanel (Control panel for hosting website). We will check how to use Cpanel in next section.

3.5 PUBLISHING A WEBSITE

We have registered a domain name and hosting in the previous sections. In this section we see that how we publish our website in the hosting.

1) Check that your website home page should be named as ***index.***
2) Now, check your email to get login detail of your web hosting Cpanel. It has Cpanel URL with username and password.
3) Open Cpanel login it will look like ***fig 1.14***. Now enter username and password as provided by registrar and click Log in.

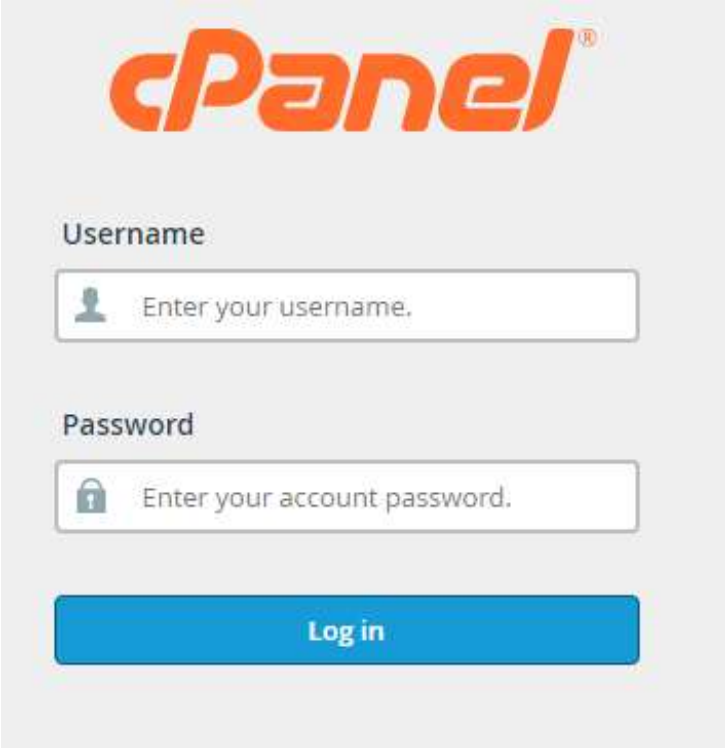

Fig 1.14 (Cpanel Login Screen)

4) You will be redirected to Cpanel dashboard **fig 1.15** (Its look will change according to your registrar, but the option will be the same).

   It contains softwares used for managing your hosting, domain name and website. We will only focus to website publishing. There is a link named ***File Manager*** under ***file tab.*** We will click on that link for further processing.

Fig 1.15 (Cpanel Dashboard)

5) File manager redirect you to a panel from where you can upload your website content.

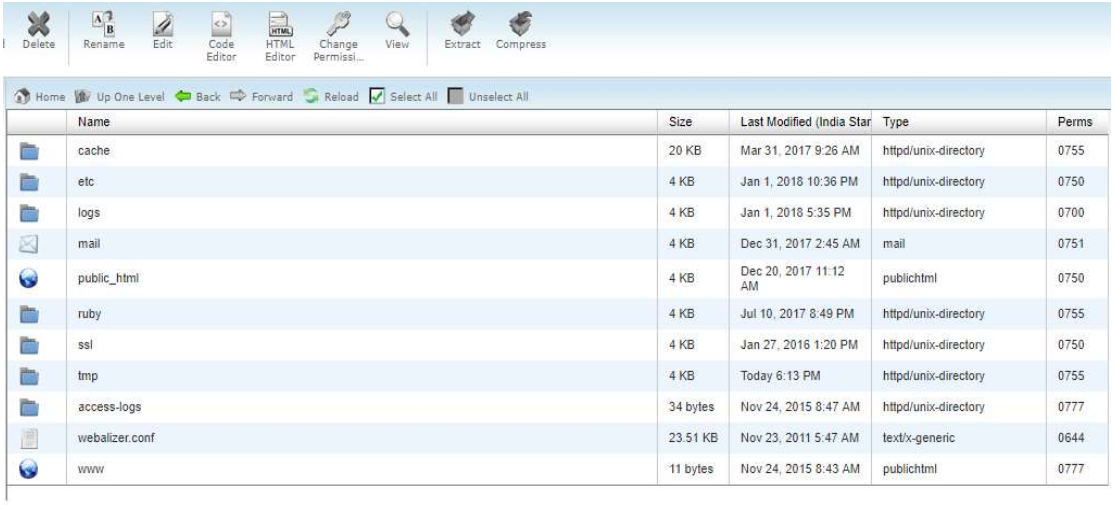

Fig 1.16 (File Manager)

6) The above file manager has folder named ***www.*** Upload all of your content to that folder. ***Index*** file will be the root file for your website, therefore it must be resides inside ***www*** folder.

7) Check your website by opening a browser and type website name ***www.onlinebooks-uttarakhand.com***

8) Your website will open correctly as developed, if you have done the entire steps as suggested.

Why Use cPanel?

1. ***Easy to Use***
   cPanel has interactive and simple interface. It is easy to learn. For doing any task, you just had to press a button. For e.g. to install WordPress you have to click on WP icon on your cPanel dashboard.
2. ***It's Safe***
   Using cPanel is risk free. This software stops web-hosting customers from doing anything harmful to the system.
3. ***Backup***
   Backups are required to bring back your data to a point in the past. If something goes wrong with your computer, data, etc. then you need this backup to restore all files. cPanel gives you a "Backup Wizard", to create backups of all your hosted files in a Click.
4. ***Compatibility***
   cPanel is compatible with all modern browser. Additionally, cPanel can maintain third party software add-ons that can help users in building dynamic and robust websites.
5. ***Portability***
   cPanel is very portable, this means that the user can transfers websites from one hosting company to other without any technical problem.

These five advantages of cPanel also make understandable why this Linux-based control panel has remained very accepted/popular and relevant more than 20 years since its start.

3.6 GLOSSARY

- **Apache:** ***The Apache*** HTTP Server, colloquially called Apache, is free and open-source cross-platform web server software.
- **Web Server:** ***A web server*** is a computer system that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web.

3.7 ANSWER TO CHECK YOUR PROGRESS

Q1. Write steps for registering a domain name.

Q2. What are the steps for registering web hosting for your domain name?

Q3. What do you mean by publishing a website? Explain the steps of publishing?

Q4. Name different frameworks used for creating responsive websites?

Q5. What is Cpanel? Explain.

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- https://www.w3schools.com/bootstrap/
- https://getbootstrap.com/docs/4.0/getting-started/introduction/

UNIT- 4

WEB SERVER CONFIGURATION AND EXECUTION

4.1 INTRODUCTION

A web server is an arrangement that delivers services or content to you (end user/ client) over the internet. It consists of a physical server, server operating system (OS) and software used for {HTTP} communication make possible.

A web server is also known as an *internet server*.

4.2 OBJECTIVES

After implementing this unit, you will be able to-

- Deal with server-side configuration easily.
- Install apache with ease in any of OS *i.e.* closed source or open source.
- Run the web server.

- Easily deal with Optimization and implement SEO friendly website development.

4.3 APACHE

{Apache} is the most broadly used web server in the world. "Roughly 60%-70% of the world's web server use apache server. Reason behind so popular because its open source (so money saved), highly secure, very fast & very reliable. It can be customized to meet our needs with the help of using various modules & extensions."

To define it in a bit more technical terms, it is a modular, process-based web server that creates a new thread every time a new connection is made.

"Apache is also having a major advantage, that it can support multiple website hosting on a single server." There are actually two types of hosting:

- **IP address-based hosting-** For IP based hosting- "we need to have a different IP for every website that we are hosting". IPs then attached to a single or multiple NICs (Network Interface Card).
- **Name based Virtual hosting-** For Name based hosting- "we used to host multiple virtual websites using a single IP address."

4.4 CONFIGURATION

An excellent official .msi installation wizard is available from the "[http:// httpd.apache.org/ download.cgi for linux and https://www.apachelounge.com/download/ for windows]." This option is certainly recommended for you as you are installing Apache for the first time.

Steps for you to install Apache:

Step 1. Remove {IIS}

If you have a Professional or Server version of Windows, you may already have IIS (Internet Information Server) installed. Remove IIS either disabling its services if you prefer to install apache.

Note: *"What is IIS? Internet Information Services/Server (IIS) turns a computer into a Web server that can provide www (World Wide Web) publishing services.IIS is a component of the Microsoft Windows operating system."*

Step 2. Download the files

Please use "unofficial Windows binary from Apache Lounge". This version has performance and stability improvements over the official Apache distribution, "although yet to notice a significant difference. However, it is provided as a manually installable ZIP file from {***www.apachelounge.com/download/***}. Download the file."

Step 3. Extract the files

You have to install Apache in *C:/Apache24,* so extract the ZIP file to the root of the C: drive.

It can be installed anywhere on your system, but you will require to change the configuration file paths accordingly.

Step 4. Configure Apache

Apache is configured with the text file {**httpd.conf}** contained in the Apache folder. Open it with your favourite text editor for *e.g*. notepad, notepad++ etc.

Note that all file path settings use a '/' forward-slash rather than the Windows backslash. If you installed Apache anywhere other than C:Apache24, now is a good time to search and replace all references to "c:/Apache24".

There are several lines you should change for your production environment:

Line 58: listen to all requests on port 80:

```
Listen *:80
```

Line 158, enable mod-rewrite by removing the # (optional, but useful):

```
LoadModule rewrite_module modules/mod_rewrite.so
```

Line 222, specify the server domain name:

```
ServerName localhost:80
```

Line 224, allow .htaccess overrides:

```
AllowOverride All
```

Step 5. Change the web page root

4.5 WAMP SERVER

It is the development environment for windows. It contains **W**indows **A**pache **M**ySQL and **P**HP. It permits you to develop web applications with Apache2, PHP and a MySQL database. With all these PhpMyAdmin allows you manage databases easily on click and go.

FUNCTIONALITIES RELATED TO WAMP SERVER

Its functionalities are very easy and comprehensive to use.

With Left click

- Management of apache and MySql services.
- Switching to online/ offline (give access to everyone or only localhost)
- Installation and switch Apache, MySql and PHP releases.
- Management of servers settings

- Logs accessibility.
- You can also access of setting files.
- You can also create alias.

With Right click

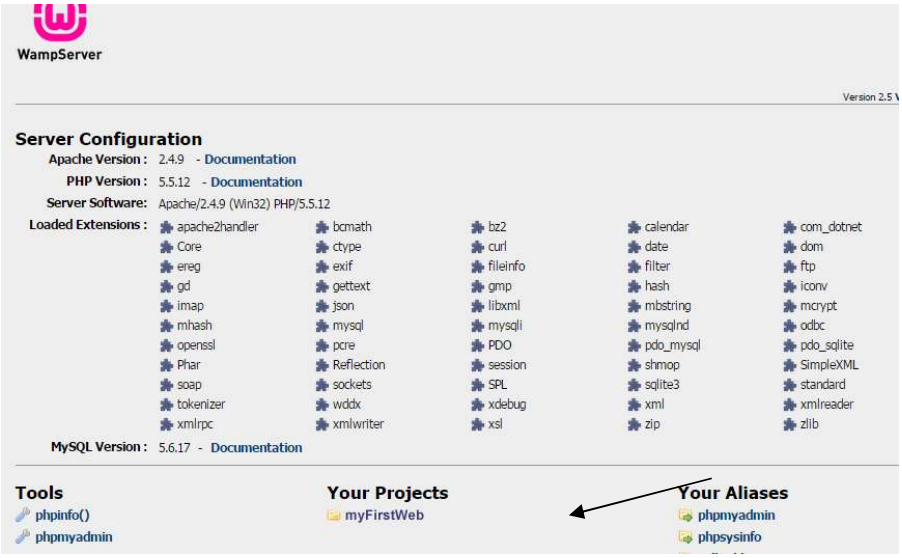
- You can change menu language of WampServer.

WAMP Server Installation

- You can follow the instructions after double clicking on the downloaded file. Everything is automatic.
- The WampServer package is delivered whith the latest releases of Apache, MySQL and PHP.
- Once the WampServer is successfully installed you can manually add additional Apache, Php, MySql versions.

Using WAMP Server

- The root directory for you is automatically created named "www" usually at c:\wamp\www.
- Now you can created sub-directories and put your php files in your sub-directory.
- In the WampSever menu click on the "*localhost*" link or open your internet browser and go to the URL : *http://localhost*.
- Now in projects tab your sub-directory is showing. Just click on your sub-directory to open your web application or website.



- Or you can also click on PhpMyAdmin to use mySql database.

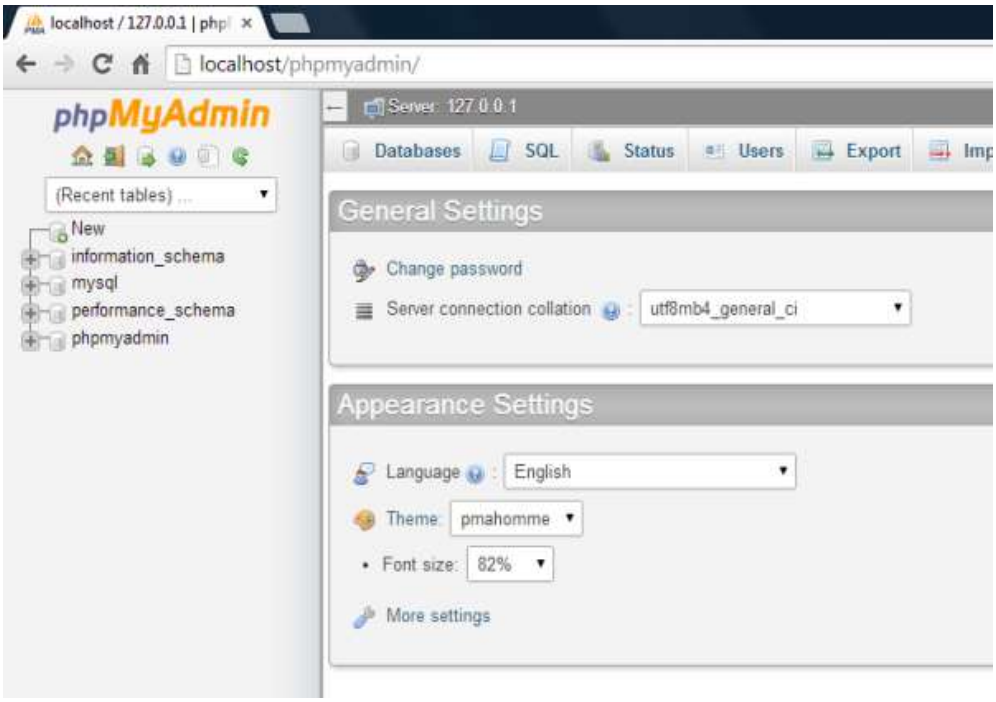
4.6 USING PHPMYADMIN

Tobias Ratschiller, founder of the software company Maguma, start working on a PHP-based web front-end to MySQL in 1998, encouraged by Peter Kuppelwieser's MySQL-Webadmin. He gave up the project (and phpAdsNew, of which he was also the original author) in 2000 because of lack of time.

By that time, phpMyAdmin had already become one of the most popular PHP applications and MySQL administration tools, with a large community of users and contributors. In order to coordinate the growing number of patches, a group of three developers, Olivier Müller, Marc Delisle and Loïc Chapeaux, registered the phpMyAdmin project at SourceForge.net and took over the development in 2001. Since 2015 the development is completely based on GitHub.

PhpMyAdmin is a free tool written in PHP. It act as an interface to mySQL and you can handle the administration of mySQL. Frequently operations involved (managing databases, tables, columns, relations, indexes, users, permissions, etc) can be performed via PhpMyAdmin, while you still have the ability to execute any SQL statement.

To ease usage to a wide range of people, phpMyAdmin is being translated into 72 languages and supports both LTR and RTL languages.



Features of PhpMyAdmin

- spontaneous web interface
- Support for most MySQL features:
  - browse and drop databases, tables, views, fields and indexes
  - create, copy, drop, rename and alter databases, tables, fields and indexes
  - maintenance server, databases and tables, with proposals on server configuration
  - execute, edit and bookmark any SQL-statement, even batch-queries
  - manage MySQL user accounts and privileges
  - manage stored procedures and triggers
- Importing data from CSV and SQL
- various formats can exported: CSV, SQL, XML, PDF, ISO/IEC 26300 - OpenDocument Text and Spreadsheet, Word, LATEX and others
- Administration of multiple servers
- Creation of graphics for your database layout in various formats
- Creation of complex queries using Query-by-example (QBE)
- Searching globally in a database or a subset of it
- Transformed stored data into any format using a set of predefined functions, like displaying BLOB-data as image or download-link
- And much more...

4.7 POINTS TO REMEMBER

- Apache web server software is Developed and maintained by Apache Software Foundation
- Apache is open-source software available for free.
- Apache HTTP Server is configured by placing directives in plain text configuration files.
- The main configuration file is usually called httpd.conf.
- The location of this file is set at compile-time.
- Some other configuration files may be added using the Include directive, and wildcards can be used to include many configuration files.
- Any directive may be placed in any of these configuration files. Changes to the main configuration files are only recognized by httpd when it is started or restarted.
- SEO stands for "search engine optimization." It is the process of getting traffic from the "free," "organic," and "natural" search results on search engines.

4.8 GLOSSARY

- **Blog-** (weB LOG) Basically a journal that is available online and is updated by the owner daily via software that maintains the blog with no technical background knowledge needed by the owner. You can get a free blog from Google at 'Blogger.com'.
- **Cookie-** A message from a website that is stored on your computer and used to customize pages that you view.
- **Cyberspace-** A term used to describe the Internet.
- **Domain Name-** A Domain name is a textual mark used as a form of identification on the Internet. When used in conjunction with online services, domain names are easy to remember, easy to type alternatives to the real address of computers on the Internet which consists of a string of numbers (called IP address).
- **Firewall-** Software that helps protects your computer from viruses and intruders. It creates a "wall" between your computer and the Internet.
- **FTP** (File Transfer Protocol) - The protocol with which you manage files and web pages on our web server.
- **IANA** (Internet Assigned Numbers Authority)- The function that oversees registration for Internet Protocol parameters, such as port numbers, protocol and enterprise numbers and etc.
- **ICANN** (The Internet Corporation for Assigned Names and Numbers)- The non-profit corporation that was formed to assume responsibility for the IP

address space allocation, protocol parameter assignment, domain name system management, and root server system management functions.

4.9 CHECK YOUR PROGRESS

Q1 What is a Web Server?

Answer- It supports HTTP protocol. When a Web server receives an HTTP request, it responds with an HTTP response, such as sending back an HTML page (static content) or delegates the dynamic response generation to some other program such as CGI scripts or Servlets or JSPs in an application server.

Q2 What is an Application Server?

Answer- It exposes business logic and dynamic content to a client through various protocols such as HTTP, TCP/IP, IIOP, JRMP etc. It Uses various scalability and fault-tolerance techniques. In addition, provides resource pooling, component life cycle management, transaction management, messaging, security etc.

Q3 What is a Portal?

Answer- A portal is a Web site or service that offers broad range of resources and services like e-mail, forums, search engines, on-line shopping, news, weather information, stock quotes, etc. Portal is a term generally synonymous with the terms gateway or grand entrance into the Internet for many users.

(Write the answers of following questions by yourself.)

Q4 What is Apache Web Server?

Q5 What do you understand by HTTP and HTTPS?

Q6 How to restart Apache web server?

Q7 What are some important configuration files of Apache HTTP Server?

Q8 How to install Apache web server?

4.10 BIBLIOGRAPHY/REFERENCES

- https://opensourceforu.com/2017/03/top-10-open-source-tools-web-developers/
- https://opensourceforu.com/2016/03/ten-open-source-web-development-tools/

4.11 SUGGESTED READINGS

- https://www.upwork.com/hiring/development/a-guide-to-server-technology/
- https://www.tutorialspoint.com/internet_technologies/web_servers.htm

UNIT- 5

SEARCH ENGINE OPTIMIZATION (SEO), AND OPEN-SOURCE TOOLS FOR WEB

5.1 INTRODUCTION

The process of improving the visibility of a website on organic ('natural' or un-paid) search engine result pages (SERPs) is the objective of Search Engine Optimization. The above said aim is accomplished through the implementation of search engine friendly website architecture, optimized internal navigation and link landscape, as well as optimization of the content (comprised, at a minimum, of readability & usability improvements, and grammatical corrections). SEO is as much art as it is science, but at its core it is the discipline of making user-friendly & useful content understandable and easily digestible by search engines.

5.2 BENEFITS OF SEO

Search Engine Optimization is capable of providing you a strategic edge over your competitors:

- Has a positive psychological impact on a visitor.
- Help you create a brand identity.
- Higher 'brand recall'.
- Increase in targeted on-line traffic.
- Better web site positioning.
- Ability to dominate over competition with your mirror sites.
- Fast, measurable ROI. Increased and boosted product sales, and online visibility.
- Lower client acquisition costs.
- Broader web-marketing share.
- Compete efficiently against larger competitors.
- Continuous Visibility.
- Makes the most out of the best tool for advertising.
- The cheapest marketing tool, even on the net.
- Increases your revenue. Many non-brick and mortar firms have grown only with online presence and the best example is *Amazon.com*.

5.3 WORKING OF SEARCH ENGINE

Search engines carry out numerous activities in order to deliver search results.

- **Crawling:** Practice of obtaining all the web-pages anchored (linked) to a website. This task is performed by software called a crawler or a spider (or Googlebot, in case of Google).
- **Indexing:** Practice of generating index for all the obtained web pages and keeping them into a giant database from where it can later be reclaimed. basically, the process of indexing is identifying the words and expressions that best describe the page and assigning the page to particular keywords.
- **Processing:** When a search request comes, the search engine processes it, i.e., it compares the search string in the search request with the indexed pages in the database.
- **Calculating Relevance:** It is likely that more than one page contains the search string, so the search engine starts calculating the relevancy of each of the pages in its index to the search string.
- **Retrieving results:** The last step in search engine activities is retrieving the best matched results. Basically, it is nothing more than simply displaying them in the browser. Search engines such as Google and Yahoo! often update their relevancy

algorithm dozens of times per month. When you see changes in your rankings, it is due to an algorithmic shift or something else beyond your control.

Key Searches techniques-

Title Tag: Most search engines will truncate meta titles to 70 characters.

Meta Description: Most search engines will truncate meta descriptions to 160 characters.

Most Common Keywords Test: There is likely no optimal keyword density (search engine algorithms have evolved beyond keyword density metrics as a significant ranking factor). It can be useful, however, to note which keywords appear most often on your page and if they reflect the intended topic of your page. More importantly, the keywords on your page should appear within natural sounding and grammatically correct copy.

Keyword Usage: Keyword(s) should be included in Title tag Keyword(s) included in Meta-Description tag.

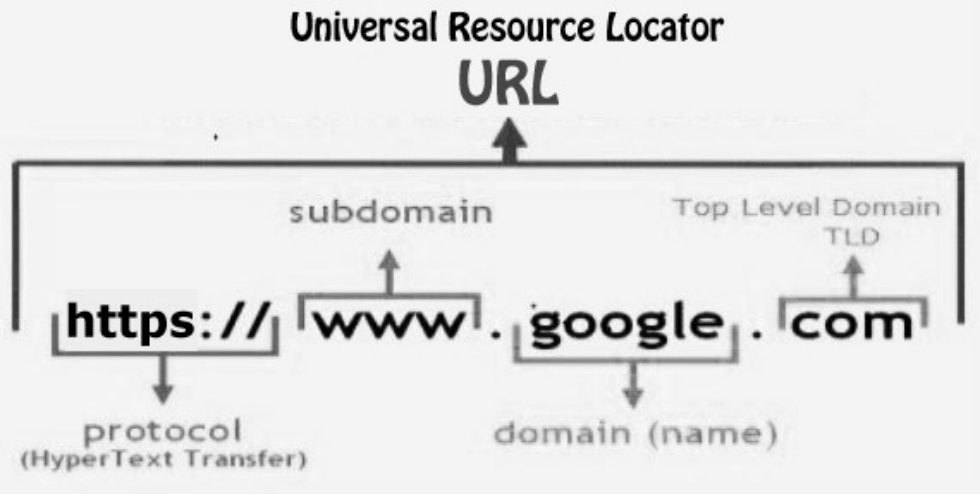
<h1> Headings Status H1 headings help indicates the important topics of your page to search engines. While less important than good meta-titles and descriptions, H1 headings may still help define the topic of your page to search engines.

Robots.txt Test This file can protect private content from appearing online, save bandwidth, and lower load time on your server. A missing "robots.txt" file also generates additional errors in your apache log whenever robots request one. Read more about the robots.txt file, and how to create one for your site.

Sitemap Test Sitemaps can help robots index your content more thoroughly and quickly.

5.4 STEP BY STEP SEO-

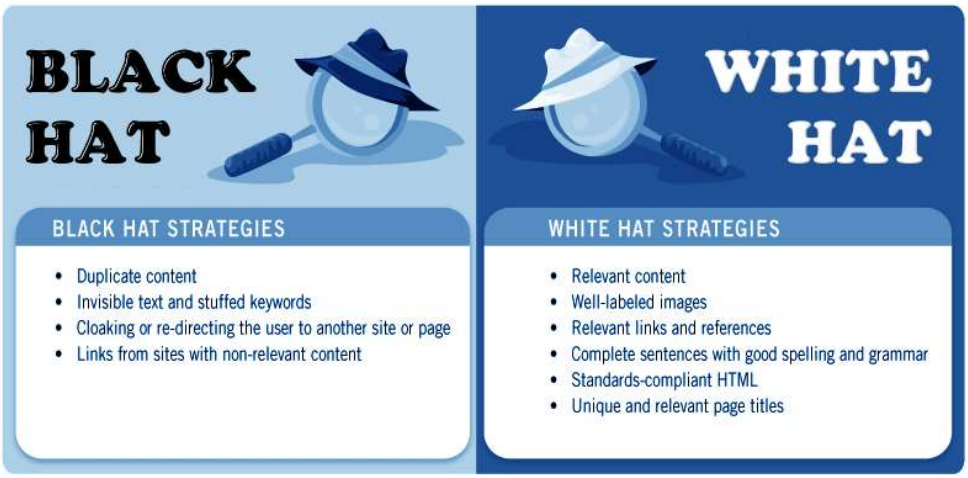
Choosing Domain



Always starts choosing a user-friendly domain for your website. You need to consider some genuine points as below:

- Your target audience
- Your product presentation should clear you want to sell.
- Find out something unique which makes your business different from others positively.
- Apply of keywords in the domain

Knowing SEO tricks & methods-



It includes:

- Without using any deception search engine always follow
- As the search engine indexes and ranks the content the same will be seen by the user without any manipulation.
- It helps you to create web page content for the users and not only for the search engines.
- Under white hat [SEO] practice, the quality of the web pages is good and useful.

Black Hat SEO-

It includes:

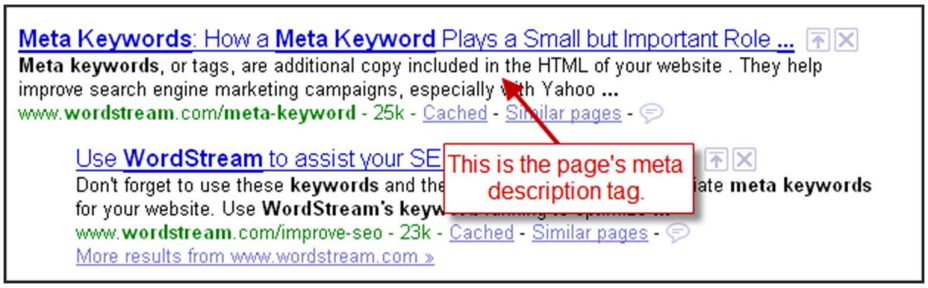
- This practice involves deception and is disapproved by the search engines.
- Redirecting users to human friendly pages from search engine friendly page, or redirecting users to any page which is different from the page which was earlier ranked by search engine
- Using Meta Tag stuffing in which keywords are repeated in meta tags but the content is not related to those keywords
- Using mirror websites in which multiple websites or different URLs use conceptually similar content

Optimization of keywords, meta tags, title & author

Paying heed upon Keyword Frequency, Keyword Weight, Keyword Proximity, Keyword Prominence, Keyword Placement, etc. is important for optimizing Keywords. This is where you should use your main keywords-

- In { <title> tag(s) }
- In {<meta name="description">}
- In {<meta name="keyword">}
- In {<h1> or other headline tags}
- In {keywords link tags}
- In the {body copy}
- In {alt} tags
- In {<!– insert comments here>} comments tags
- In the URL or website address

Optimization of Meta Tag



Building links and Mobile SEO

- *{Create a blog}:* A blog is essential to many strategies outlined here, such as linking out. You absolutely need a blog in today's online environment to survive.
- *{Internal linking}*: Create internal links into every page of your site means link your different pages with different pages internally
- *{Ask people you know for a link}*: Whether it's your friends, relatives, employees, colleagues, business partners, clients, or anyone else, ask them for a link. Someone you know has a website or blog, so take advantage.
- *{Research your competitors}*: Plug in your competitors and export their backlinks to a CSV file. Do this for all your competitors so you can get all their links in one place in a spreadsheet workbook. Then you can sort them by various link metrics to find the best opportunities.
- *{Paid directories}*: Some directories ask for money before accepting your link(s) in their listings. {searchenginewatch.com/tag/yahoo-directory}, for example, is a paid directory.

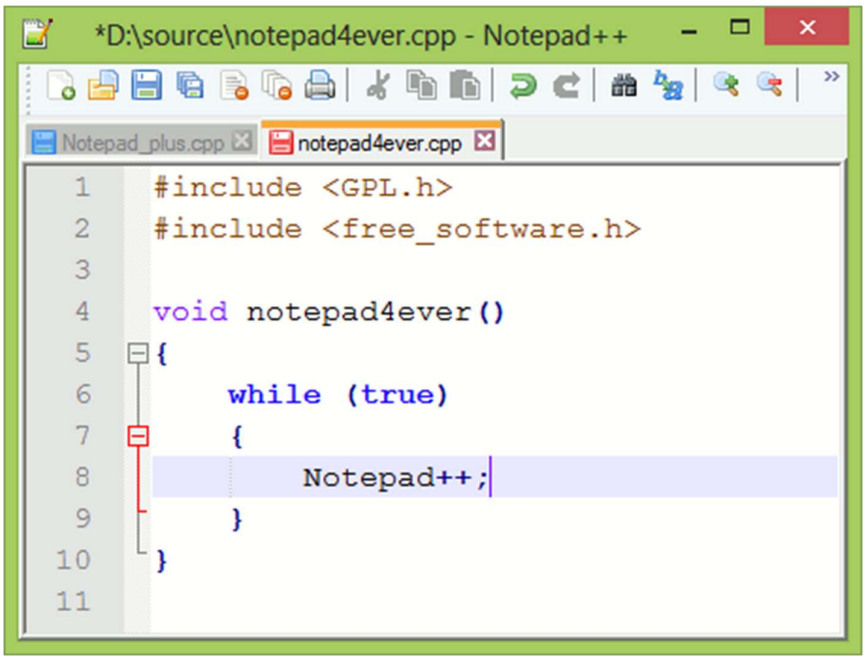
5.5 OPEN-SOURCE TOOLS FOR WEB

Essentially, open-source software is free software for your business or personal use. Open-source developers freely share their knowledge and make the source code available to the public. The software is distributed with a license which allows other developers can modify it and/or add to it.

Generally, the major difference between open-source software and commercially available programs is you don't pay for it. That said some developers make free products for all users while other developers create commercially available products. Some developers create a free

and paid version of their products. The free program is a stripped-down version of the complete version which gives you full functionality

5.6 NOTEPAD++



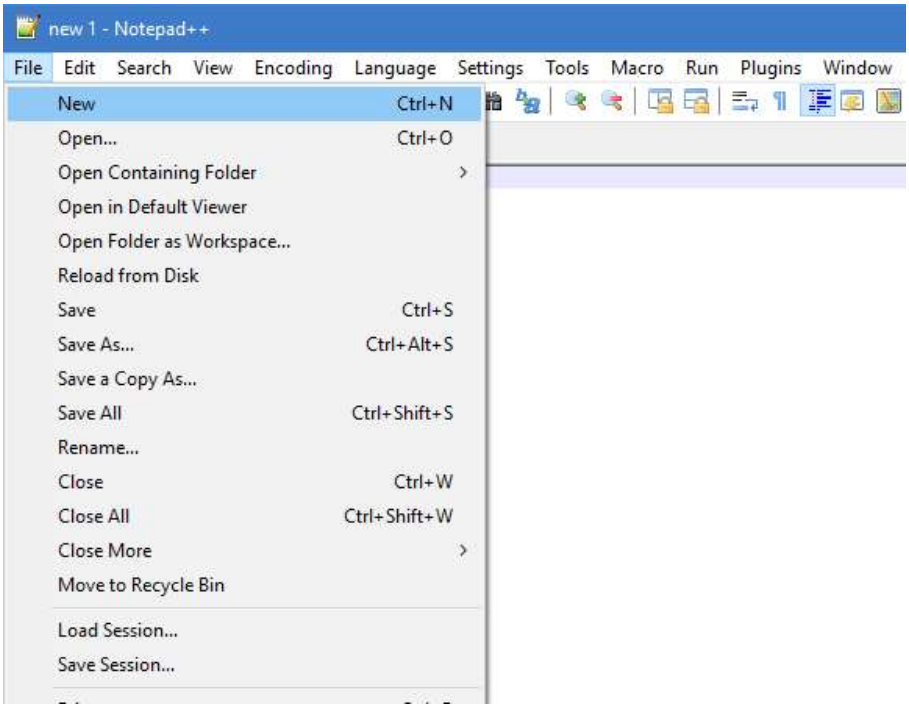
It is free open-source code editor and a very good replacement of notepad, which supports several languages.

Notepad++ is written in C++ and uses pure [Win32 API] and [STL] which ensures high speed in execution and smaller in size.

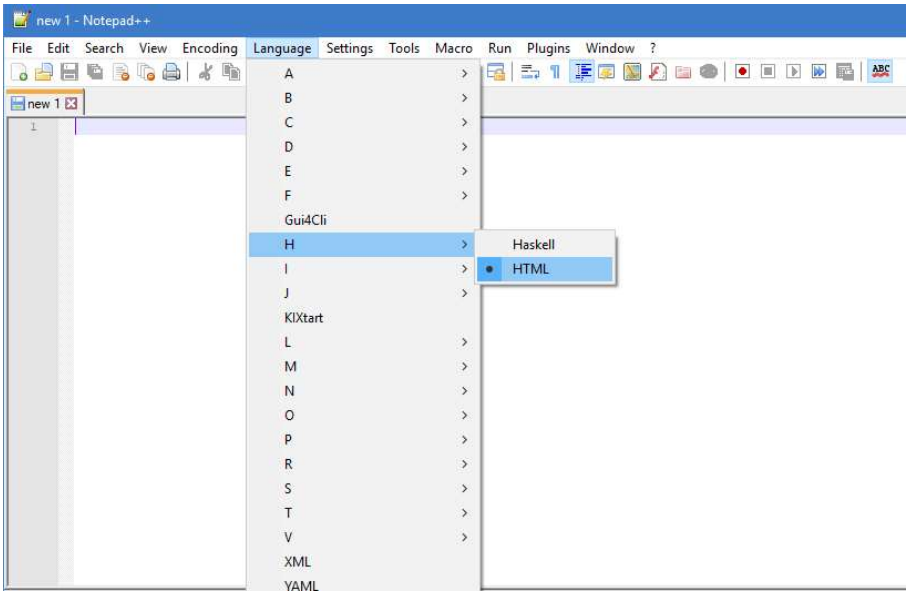
You can download from the {url}- [notepad-plus-plus.org] in [32-bit x86] and [64-bit x64].

Steps to write html code with its help:

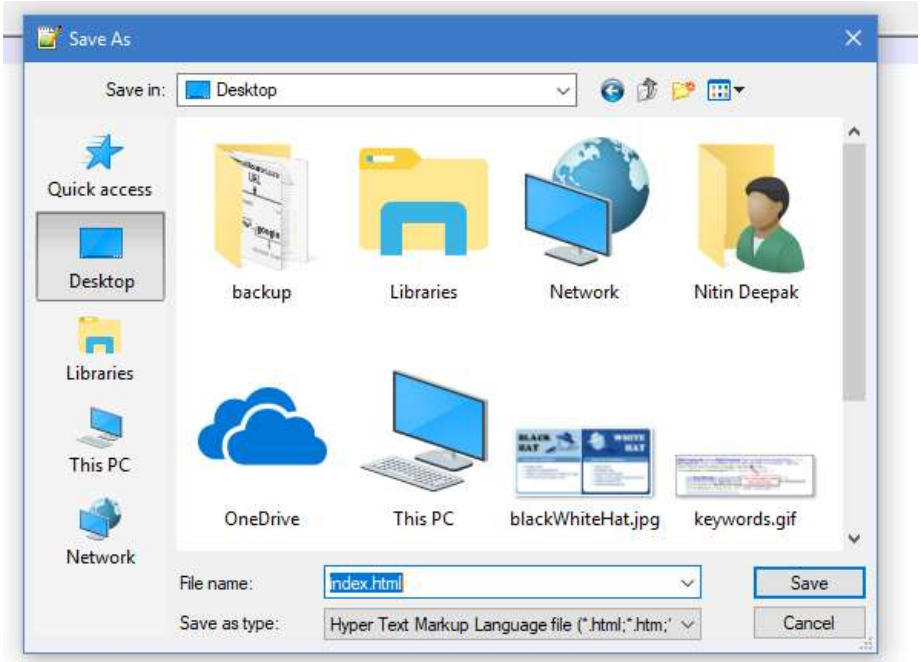
1. Download Notepad++ with the above given {URL}.
2. Install notepad++
3. Got to File -> New or (Ctrl+N)



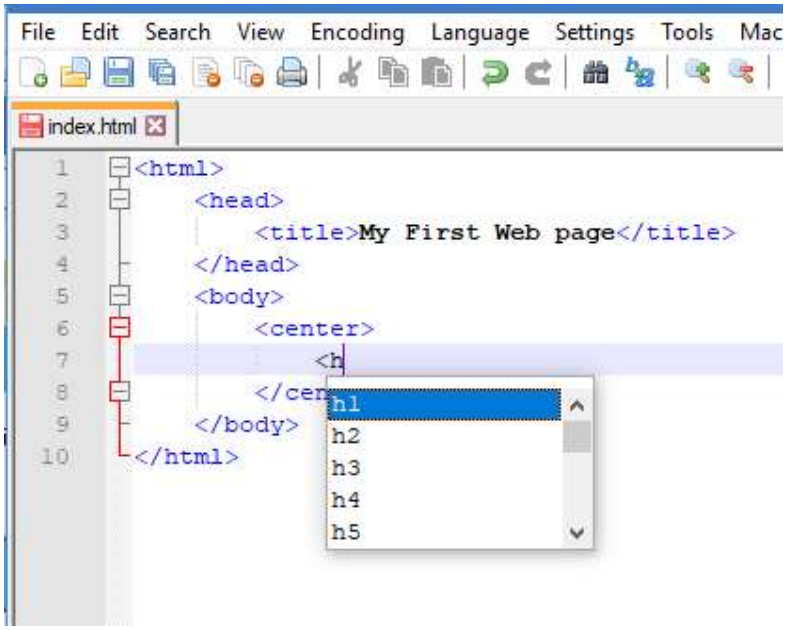
4. Then go to menu Language -> H -> HTML



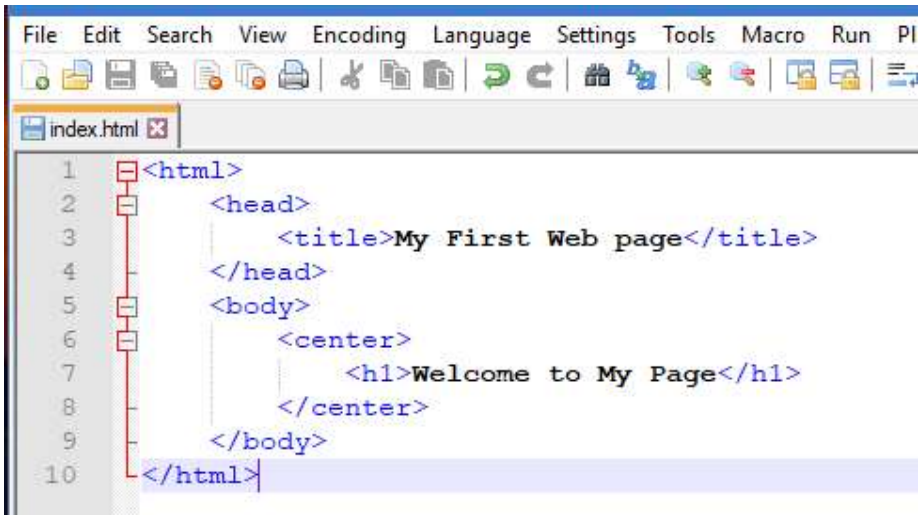
5. Firstly Save a file named index.html. Note extension should be .html then only you will get full html help while writing {HTML}.



6. Write html and enjoy help for the same consistently while using.



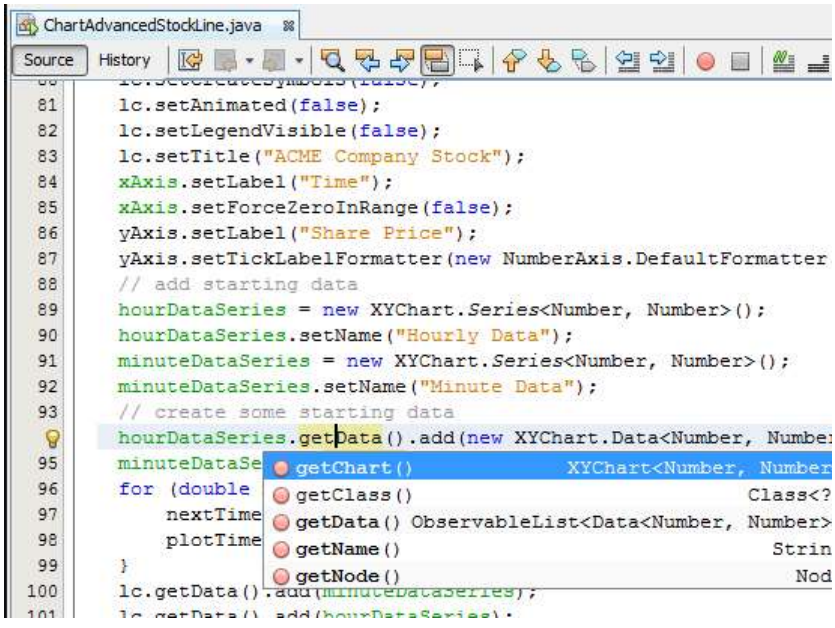
7. Then play a file in browser for to see the output.



5.7 NETBEANS

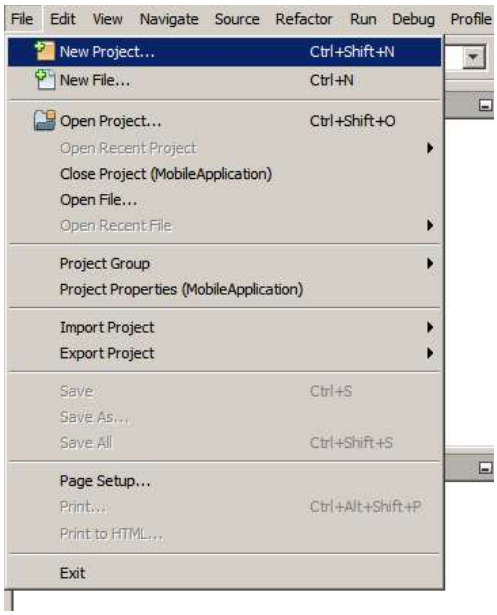
{NetBeans IDE} is the official {IDE} for {Java 8}. With its editors, code analyzers, and converters, you can quickly and smoothly upgrade your applications to use new Java 8 language constructs, such as lambdas, functional operations, and method references.

An {IDE} is much more than a text editor. The {NetBeans} Editor indents lines, matches words and brackets, and highlights source code syntactically and semantically. It lets you easily refactor code, with a range of handy and powerful tools, while it also provides code templates, coding tips, and code generators.

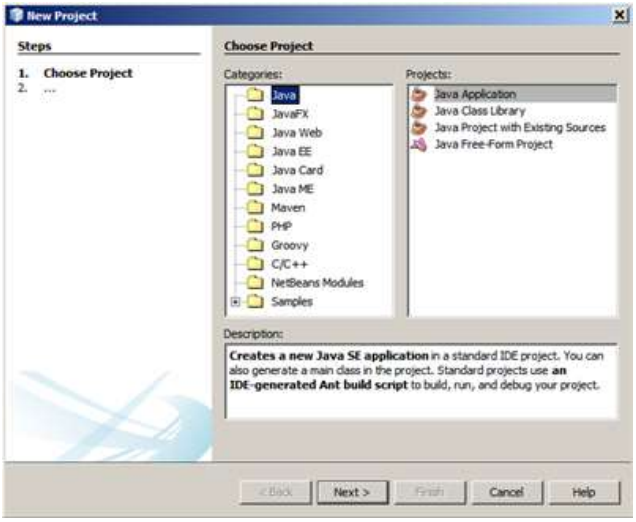


Steps of using {NetBeans}:

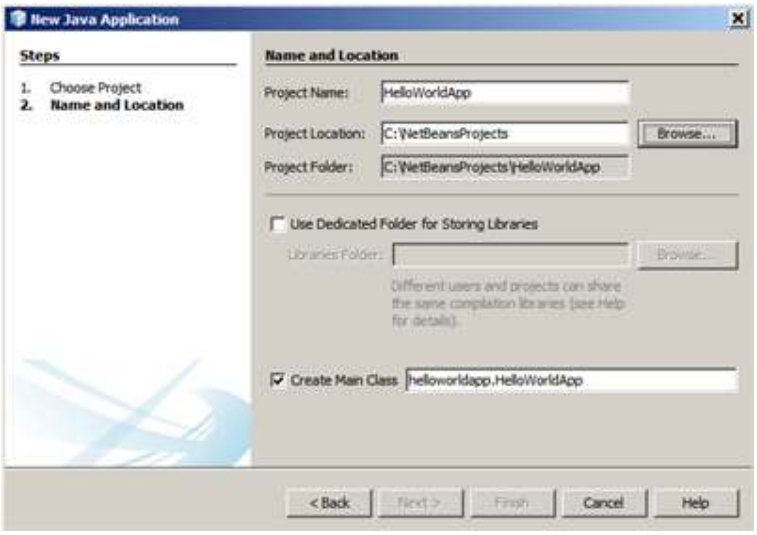
1. Start NetBeans {IDE}.
2. In the {IDE}, choose File > New Project, as shown in the figure below.



3. In the [New Project] wizard, expand the Java category and select Java Application as shown in the figure below. Then click Next.



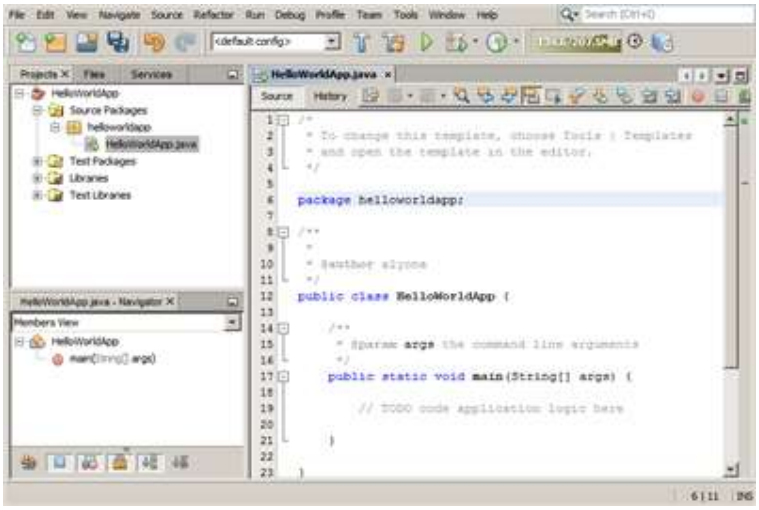
4. In the Name and Location page of the wizard, do the following (as shown in the figure below):
   a. In the Project Name field, type - HelloWorldApp -.
   b. Leave the Use Dedicated Folder for Storing Libraries checkbox unselected.
   c. In the Create Main Class field, type - helloworldapp.HelloWorldApp -.



5. Click finish.

The project is created and opened in the IDE. You should see the following components:

- The Projects window, which contains a tree view of the components of the project, including source files, libraries that your code depends on, and so on.
- The Source Editor window with a file called HelloWorldApp open.
- The Navigator window, which you can use to quickly navigate between elements within the selected class.



5.8 GITHUB

[Git] is a distributed revision control and source code management system with an emphasis on speed. Git was initially designed and developed by Linus Torvalds for Linux kernel development. Git is a free open software distributed under the terms of the GNU General Public License version 2.

Version Control System

Version Control System (VCS) is software that helps software developers to work together and maintain a complete history of their work.

Listed below are the functions of a VCS:

- Allows developers to work simultaneously.
- Does not allow overwriting each other's changes.

It maintains the history of every version. Following are the types of VCS:

- Centralized version control system (CVCS).
- Distributed/Decentralized version control system (DVCS)

Let us see the basic workflow of Git.

Step 1: You modify a file from the working directory.

Step 2: You add these files to the staging area.

Step 3: You perform commit operation that moves the files from the staging area. After push operation, it stores the changes permanently to the Git repository.

STEPS OF WORKING WITH GitHub

Firstly, Install Git (the version control software GitHub is built on).

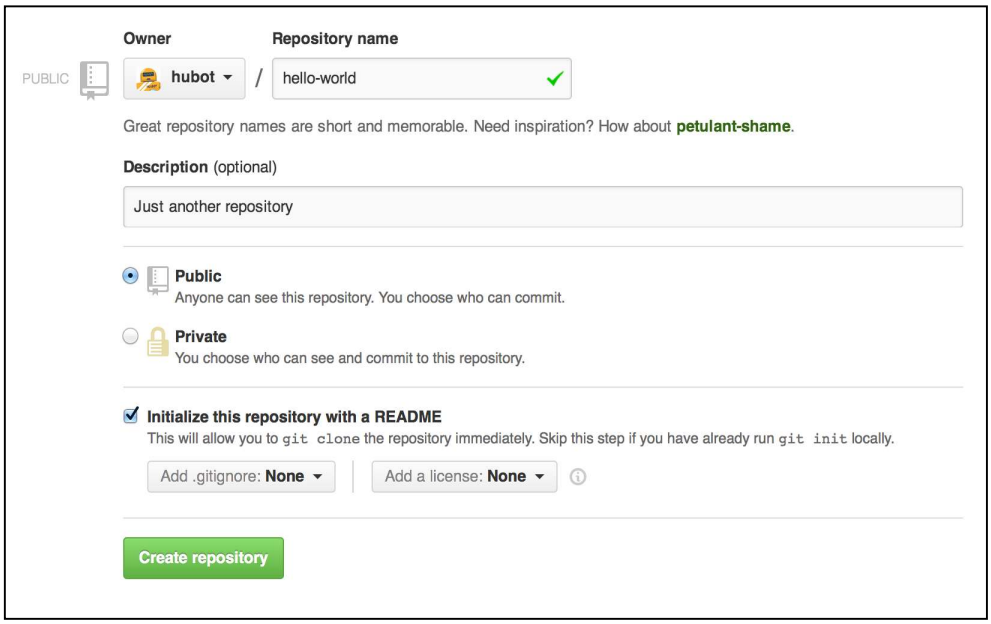
Step 1: Create a repository

A repository is usually used to organize a single project. Repositories can contain folders and files, images, videos, spreadsheets, and data sets – anything your project needs. We recommend including a README, or a file with information about your project. GitHub makes it easy to add one at the same time you create your new repository. It also offers other common options such as a license file.

Your hello-world repository can be a place where you store ideas, resources, or even share and discuss things with others.

To create a new repository

1. In the upper right corner, next to your avatar or identicon, click and then select New repository.
2. Name your repository hello-world.
3. Write a short description.
4. Select initialize this repository with a README.



Click **Create repository**.

Step 2: Create a Branch

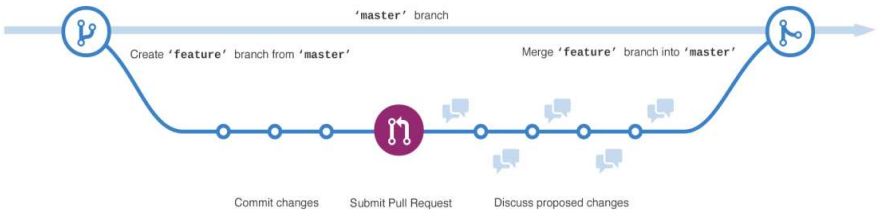
Branching is the way to work on different versions of a repository at one time.

By default, your repository has one branch named master which is considered to be the definitive branch. We use branches to experiment and make edits before committing them to master.

When you create a branch off the master branch, you're making a copy, or snapshot, of master as it was at that point in time. If someone else made changes to the master branch while you were working on your branch, you could pull in those updates.

This diagram shows:

- The master branch
- A new branch called feature (because we're doing 'feature work' on this branch)
- The journey that feature takes before it's merged into master.



Have you ever saved different versions of a file? Something like:

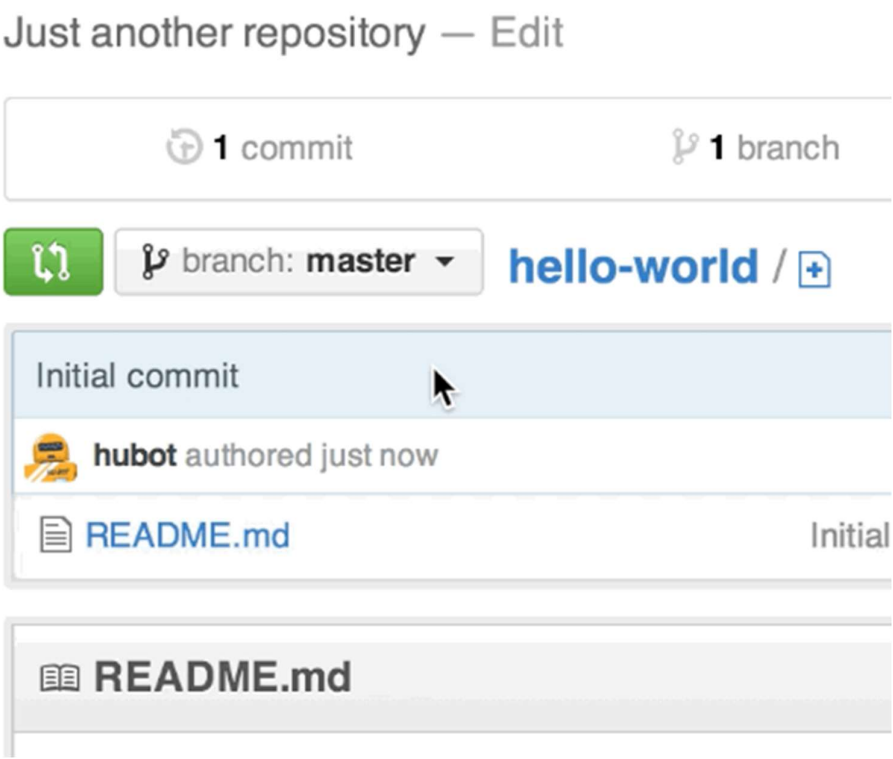
- story.txt
- story-joe-edit.txt
- story-joe-edit-reviewed.txt

Branches accomplish similar goals in GitHub repositories.

Here at GitHub, our developers, writers, and designers use branches for keeping bug fixes and feature work separate from our master (production) branch. When a change is ready, they merge their branch into master.

To create a new branch -

1. Go to your new repository hello-world.
2. Click the drop down at the top of the file list that says branch: master.
3. Type a branch name, readme-edits, into the new branch text box.
4. Select the blue Create branch box or hit "Enter" on your keyboard.



Now you have two branches, master and readme-edits. They look exactly the same, but not for long! Next we'll add our changes to the new branch.

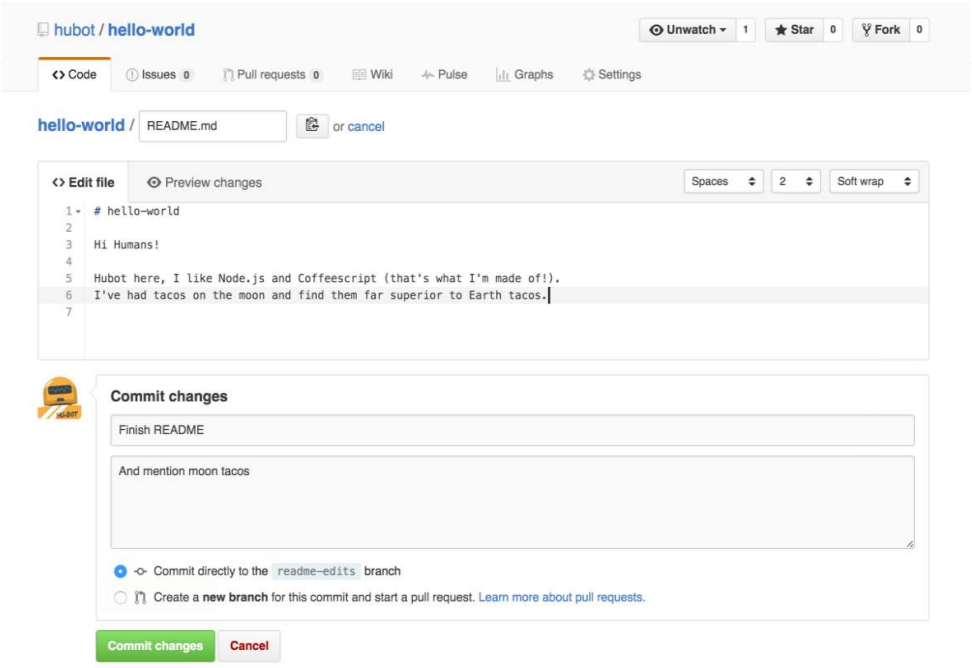
Step 3: Make and commit changes

Bravo! Now, you're on the code view for your readme-edits branch, which is a copy of master. Let's make some edits.

On GitHub, saved changes are called commits. Each commit has an associated commit message, which is a description explaining why a particular change was made. Commit messages capture the history of your changes, so other contributors can understand what you've done and why.

1. Make and commit changes -
2. Click the README.md file.

3. Click the pencil icon in the upper right corner of the file view to edit.
4. In the editor, write a bit about yourself.
5. Write a commit message that describes your changes.
6. Click Commit changes button.



These changes will be made to just the README file on your readme-edits branch, so now this branch contains content that's different from master.

Step 4: Open a Pull Request

Nice edits! Now that you have changes in a branch off of master, you can open a pull request.

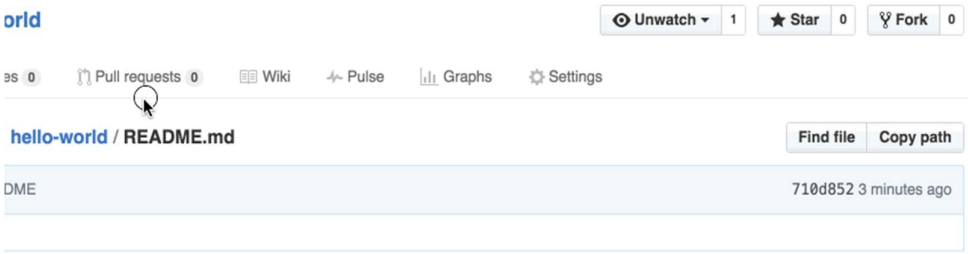
Pull Requests are the heart of collaboration on GitHub. When you open a pull request, you're proposing your changes and requesting that someone review and pull in your contribution and merge them into their branch. Pull requests showdiffs, or differences, of the content from both branches. The changes, additions, and subtractions are shown in green and red.

As soon as you make a commit, you can open a pull request and start a discussion, even before the code is finished.

By using GitHub's @mention system in your pull request message, you can ask for feedback from specific people or teams, whether they're down the hall or 10 time zones away.

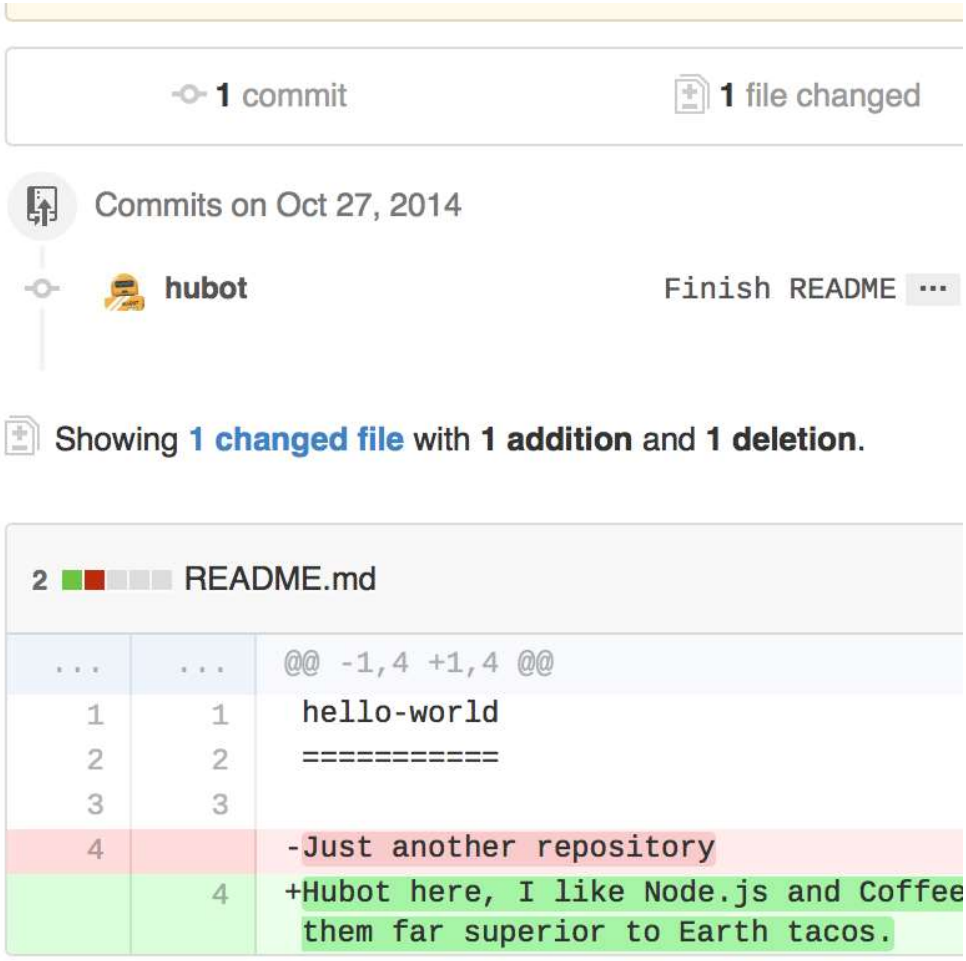
You can even open pull requests in your own repository and merge them yourself. It's a great way to learn the GitHub Flow before working on larger projects.

Step 1: Click the Pull Request tab, then from the Pull Request page, click the green New pull request button.

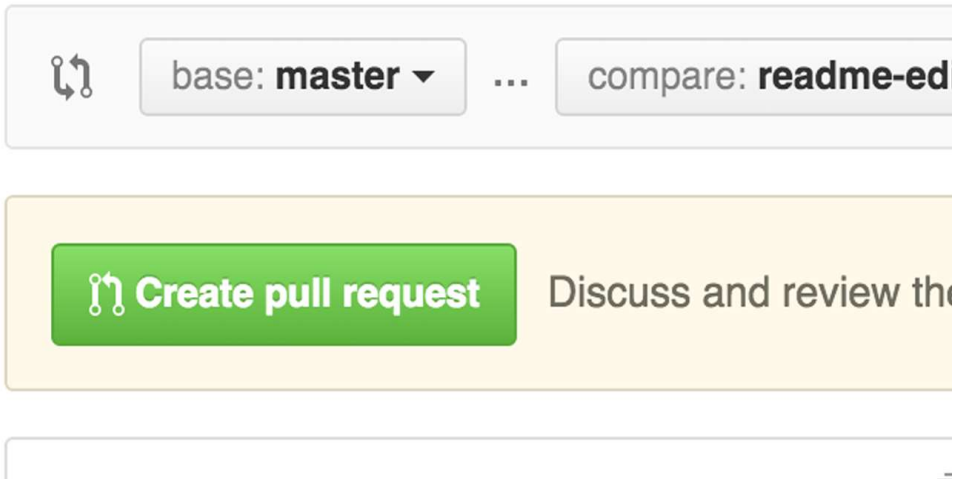


Step 2: Select the branch you made,readme-edits, to compare with master (the original).

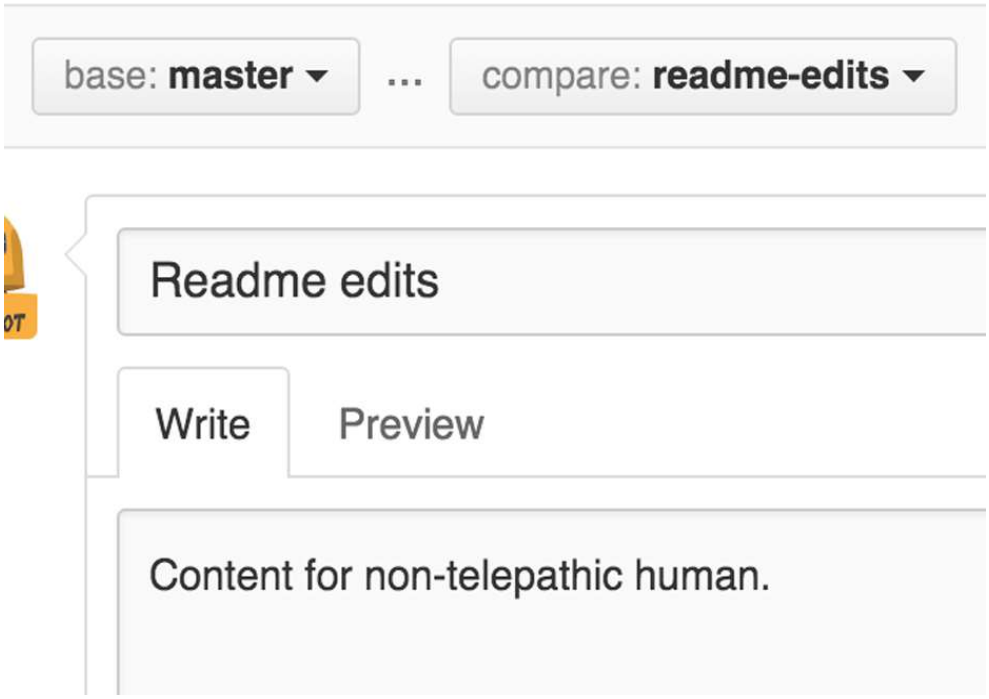
Step 3: Look over your changes in the diffs on the Compare page, make sure they're what you want to submit.



Step 4: When you're satisfied that these are the changes you want to submit, click the big green Create Pull Request button.



Step 5: Give your pull request a title and write a brief description of your changes



When you're done with your message, click **Create pull request**!

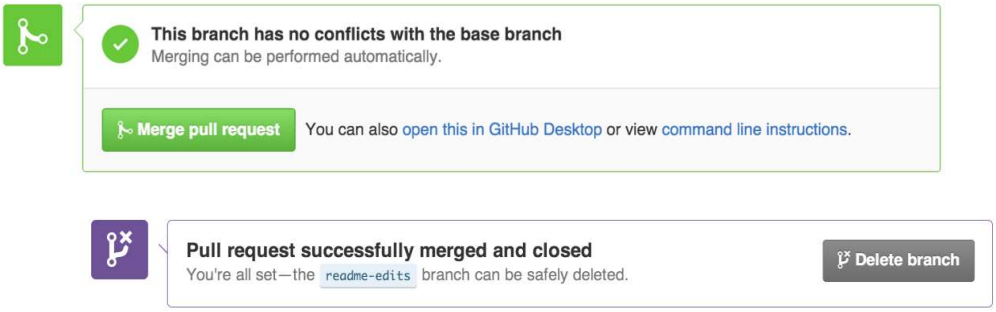
Tip: You can use emoji and drag and drop images and gifs onto comments and Pull Requests.

Step 6: Merge your Pull Request

In this final step, it's time to bring your changes together – merging your readme-edits branch into the master branch.

1. Click the green **Merge pull request** button to merge the changes into master.
2. Click **Confirm merge**.

   Go ahead and delete the branch, since its changes have been incorporated, with the **Delete branch** button in the purple box.



5.9 POINTS TO REMEMBER

- SEO stands for "search engine optimization." It is the process of getting traffic from the "free," "organic," and "natural" search results on search engines.
- There are major groups covered by Search Engine as such SEO Success Factors are: On-the-page SEO, Off-the-page SEO and Violations.
- Content research or keyword research is the most important SEO factor after creating good content is good keyword research.
- Every Web developer needs to be armed with a set of tools that aid and assist in building better and more complex web applications. From the wide range of Web development tools available, we are here to present some of them as per the developer's opinion/usefulness-

  [#] Node.js- Node is an open source, multi-platform, JavaScript runtime built around a Chrome Version 8 engine for developing a variety of Web applications. Node has an event-driven, non-blocking I/O model, which makes it lightweight and efficient. Node.js was initially written by Ryan Dahl in 2009.

  [#] Bootstrap- Bootstrap is an open-source framework based on HTML, CSS and JavaScript. It is the most popular and widely used framework for developing responsive Web applications. Bootstrap was first designed by Mark Otto and Jacob Thornton in 2011.

  [#] AngularJS- AngularJS is an open source, structural framework for designing dynamic Web applications and provides JavaScript based framework. AngularJS was designed by a Google employee, Misko Hevery, in June 2012.

  [#] Brackets- Brackets is an open source, lightweight and modern text editor. It is a platform-independent editor with a focus on Web development. It was designed by Adobe Systems, and is licensed under the MIT licence. It is written in HTML, CSS and JavaScript.

  [#] MongoDB- MongoDB is a free and open source database written in C++. It is a document-oriented database that stores documents in a collection. It is one of the leading NoSQL database and uses JSON-like documents. It is an open format and schema less database, ideal for object-oriented programming. MongoDB was designed by a company called 10gen in 2007.

  [#] ReactJS- ReactJS is an open source, declarative and efficient JavaScript library for designing user interfaces. React has a data binding feature that makes it one of the most popular JavaScript library. ReactJS was developed by Facebook and written by software engineer, Jordan Walke. It is maintained by Facebook's product infrastructure and Instagram's user interface teams.

[#] LESS- LESS is a CSS pre-processor, so it has a syntax that is similar to CSS. LESS supports lots of features that can speed your Web development. It provides features that allow variables, mixins, functions and many other techniques that allow you to make CSS more maintainable, themeable and extendable. It s developed by Alexis Sellier.

[#] Atom- Atom is one of the popular text editors currently. Atom is open source and supports cross-platform editing. It has the support of a built-in package manager, smart auto-completion, AngularJS support, Atom TypeScript, Jshint, and turbo-JavaScript, which can be very helpful for rapid Web development.

[#] There are too many open-source tools to assists web developers; you can find them from internet free of cost.

5.10 GLOSSARY

- **Blog-** (weB LOG) Basically a journal that is available online and is updated by the owner daily via software that maintains the blog with no technical background knowledge needed by the owner. You can get a free blog from Google at 'Blogger.com'.
- **Cookie-** A message from a website that is stored on your computer and used to customize pages that you view.
- **Cyberspace-** A term used to describe the Internet.
- **Domain Name-** A Domain name is a textual mark used as a form of identification on the Internet. When used in conjunction with online services, domain names are easy to remember, easy to type alternatives to the real address of computers on the Internet which consists of a string of numbers (called IP address).
- **Firewall-** Software that helps protects your computer from viruses and intruders. It creates a "wall" between your computer and the Internet.
- **FTP** (File Transfer Protocol) - The protocol with which you manage files and web pages on our web server.
- **IANA** (Internet Assigned Numbers Authority)- The function that oversees registration for Internet Protocol parameters, such as port numbers, protocol and enterprise numbers and etc.
- **ICANN** (The Internet Corporation for Assigned Names and Numbers)- The non-profit corporation that was formed to assume responsibility for the IP address space allocation, protocol parameter assignment, domain name system management, and root server system management functions.

5.11 CHECK YOUR PROGRESS

1) What is SEO?
2) Why is SEO important to businesses?

3) What is a Domain?
4) What is On Page SEO?
5) What is Off Page SEO?
6) Why is GitHub so popular?
7) How do We Use a Search Engine?

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UNIT- 6

COOKIES, BLOGGING, AND MANAGING A WEB PROJECT

6.1 INTRODUCTION

You can think of cookies as text files, which is stored to your computer. Web server, creates such a file on local computer. After the file created, the web server can read and write content from and to this file.

Cookies are developed to remember information about the user, as when web server sent a web page to a browser, the connection is lost, and the server forgets everything about the user.

6.2 OBJECTIVES

After successful completion of this unit, you will be able to-

- We study how to work on cookies using JavaScript.
- Can understand the structure of web application.
- Can manage web project.
- Understand Internet security.
- Implement security and take precautions in web projects from attacks.

6.3 WORKING WITH COOKIES

- **How Cookies work**

A cookie is a small text file that is stored in a browser. It contains some data:

1. A ***name-value pair*** having the actual data
2. An ***expiry date*** after which it is no longer legal
3. The ***domain and path*** of the server it should be sent to

When a page is requested from a server to which a cookie will be sent, the cookie is added to the HTTP header. Server-side programs can then read out the information and make a decision that you have the right to view the page you requested or not.

Therefore, every time you visit the site the cookie comes from, information about you is available. This is very nice occasionally; at other times it may somewhat put in danger your privacy. Luckily, more and more browsers give you the opportunity to manage your cookies (deleting the one from the big ad site, for example).

JavaScript can read cookies too. They are mostly used for storing user preferences.

Name-value

Each cookie has a name-value pair that has the actual information. The name of the cookie is for your benefit, you will get this name when reading out the cookie information.

If you want to read out the cookie, you search for the name and see what value is attached to it.

Expiry date

Each cookie has an expiry date after which it is deleted/ non-validated. If you do not give the expiry date, the cookie will deleted when you close the browser.

Domain and Path

Each cookie also has a domain and a path. The domain tells the browser to which domain the cookie is set. By default, the domain name of the page will be set.

The path gives the directory where the cookie will be stored. Normally the cookie is valid throughout the domain.

- **Working with Cookies**

JavaScript as well as other programming languages like *PHP, JSP, and ASP.net* can be used to work on cookies. Here we will use JavaScript to create, read and delete cookies.

Creating a Cookie

You can create a cookie in JavaScript with ***document.cookie*** method.

document.cookie = "username=Uttarakhand Open University";

The above code creates a cookie named ***username*** with value ***Uttarakhand Open University***. This cookie will delete automatically when the browser is closed. You can also add an expiry date.

document.cookie = "username= Uttarakhand Open University; expires=Mon, 31 Dec 2018 12:00:00 UTC";

Reading a Cookie

For reading a cookie, you can write JavaScript code as:

var readCookie = document.cookie;

The above code will return all cookies in one string like ***cookie1=value; cookie2=value; cookie3=value;***

Deleting a Cookie

To delete a cookie JavaScript, use the same method as we used for creating a cookie. Set ***expires*** parameter to a passed date:

document.cookie = "username=; expires=Thu, 01 Jan 1970 00:00:00 UTC";

Sample Program to work on Cookie

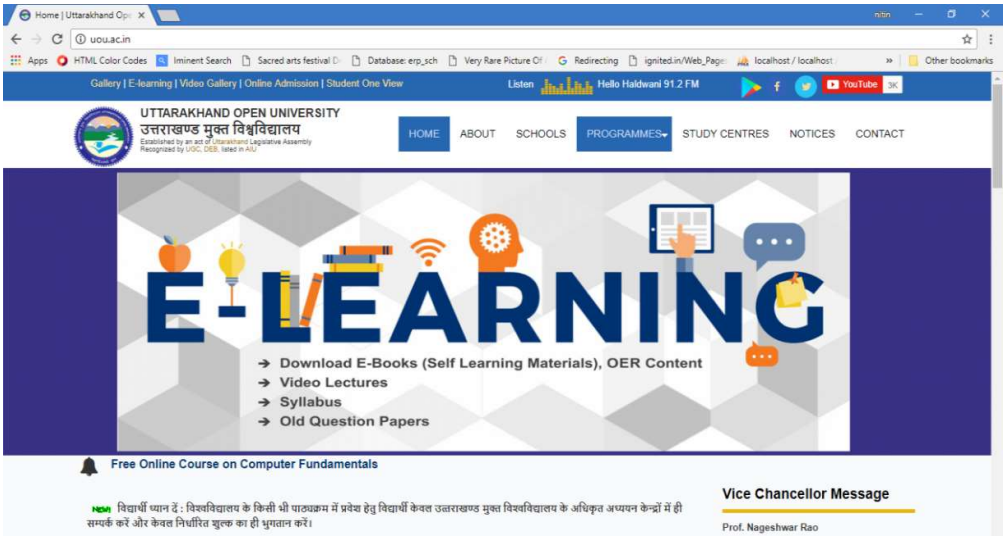
```
<html>
    <head>
        <title>First Cookies Example</title>
    </head>
<body>

<script language="JavaScript">
function set_cookie (name, value, expires_year, expires_month, expires_day)
{
 var cookie_string = name + "=" + escape ( value );
 if ( expires_year )
 {
  Var expires =new Date ( expires_year, expires_month, expires_day);
  cookie_string +="; expires=" + expires.toGMTString();
 }
```

```
  document.cookie = cookie_string;
}

function delete_cookie ( cookie_name )
{
  var cookie_date = new Date ( );  // current date & time
  cookie_date.setTime ( cookie_date.getTime() - 1 );
  document.cookie =cookie_name+= "=; expires=" +
cookie_date.toGMTString();
}

function get_cookie ( cookie_name )
{
  var results = document.cookie.match (cookie_name );
  if ( results )
    return ( results[2] ) );
  else
    return null;
}

if ( ! get_cookie ( "username" ) )
{
  var username = prompt ( "Please enter your name", "" );
  if ( username )
  {
    var current_date = new Date;
    var cookie_year = current_date.getFullYear ( ) + 1;
    var cookie_month = current_date.getMonth ( );
    var cookie_day = current_date.getDate ( );
    set_cookie("username",username,cookie_year, cookie_month, cookie_day );
    document.location.reload();
  }
}
else
{
  var username = get_cookie ( "username" );
  document.write ( "Hi " + username + ", welcome to my website!" );
  document.write( "<br><a href=\"javascript:delete_cookie('username');
document.location.reload( );\">Delete!</a>" );
}
</script>
</body> </html>
```

The above code creates, retrieves and deletes cookie. Try this code in a browser where cookies and JavaScript is enabled.

6.4 MANAGING A WEB PROJECT

A site or website is a central location of several web pages that are related and can access by visiting the home page using a browser. For example, the Uttarakhand Open university website address (URL) is “http://uou.ac.in”. The image below the Uttarakhand Open University looked in 2018.



Web-Page, Website, Web Server, Search Engine and a web project-

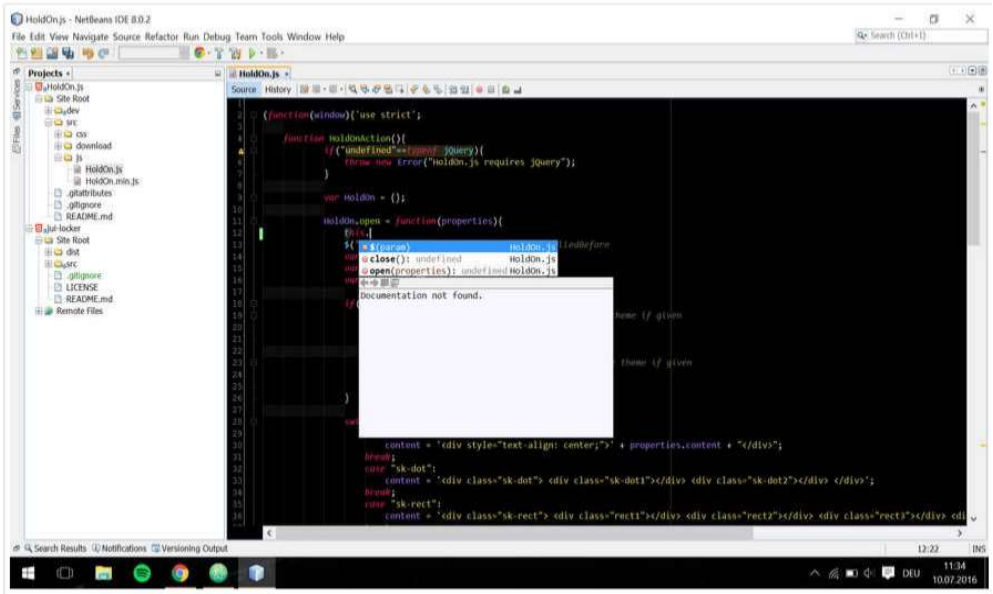
A document that can be viewed in a web browser such as Google Chrome, Opera, Firefox, Microsoft Internet Explorer or Edge, or Apple's Safari. These are also often called just "pages" or “web pages”.

A collection of web pages which are grouped together and usually connected together in various ways often called a "web site".

A computer that hosts a website on the Internet is termed as web server. Search engine is a special kind of website that helps you finds other web pages, such as Google, Bing, or Yahoo. Web project is a web-based development task needs to complete on specific deadlines needs the dedicated and positive team.

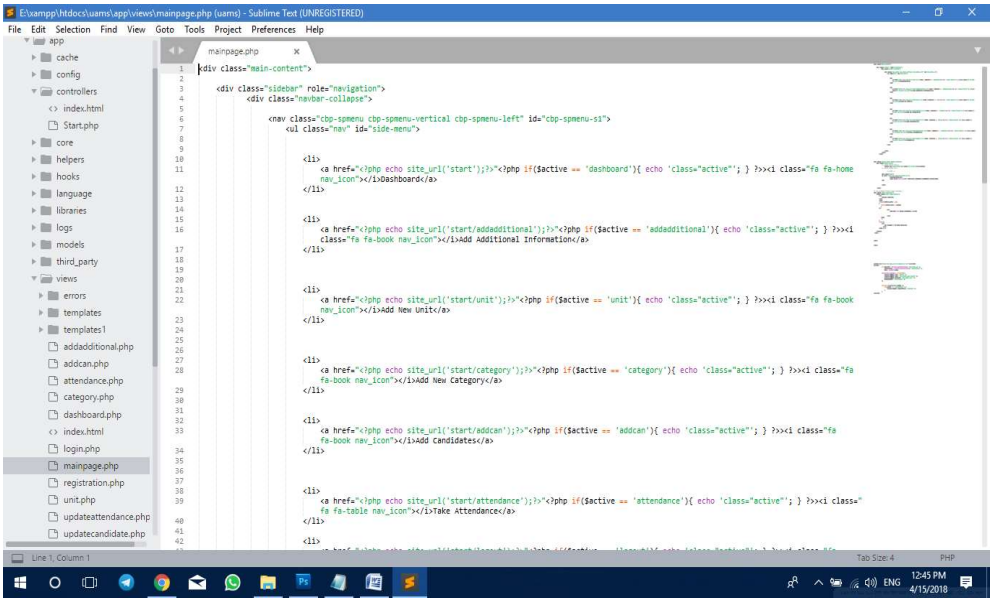
Web project management-

Before you start worrying about how you can manage web project you need to learn some web tools which actually acts as life-line in managing of web project *viz.* “GitHub”, any IDE (“NetBeans, sublime, Dreamweaver, Eclipse”) and also some simple editors like “notepad++” etc for developers and “*Asna, Basecamp, Trello, etc”* for project managers.



Sample figure IDE {Netbeans}

Let's take an example of sublime here.

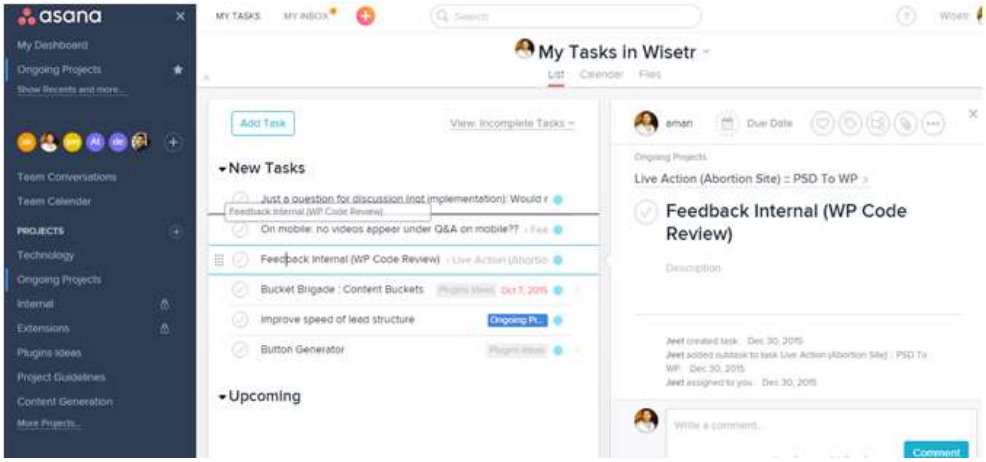


To manage web project you need to:

1. **Firstly No need to use email to discuss project**
   Using email to discuss the project is the worst strategy ever. You may lose your own statements going back and forth while communicating with emails. Instead, you may use communicating tools like *Asana, Basecamp, Trello etc.* can take care of all of these problems really come to rescue. *Asna* like tools are designed to track project status, set milestones and meet deadlines very effectively.
2. **Create proper sub-tasks in your project management system**

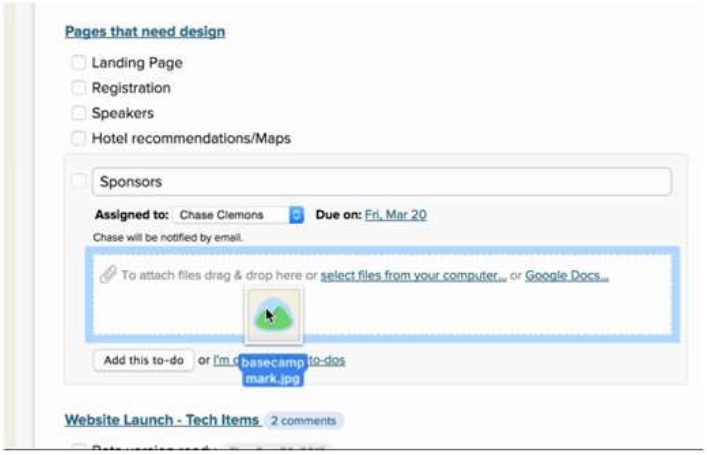
Always be clear in your mind that buying and downloading a project management tool is not a sufficient. The solution is to managing your projects well using these tools is by breaking down your bigger tasks into smaller and in more controllable chunks. Significantly, listing out the subtasks briefly and being specific with your instructions.
Specifying the responsibilities regarding the sub-tasks is key to success of the project management

3. **Always assign a due date for each task**
   For every task or sub-task always assign a due-date so that isolated team knows well the expected date of completion of the particular task. It also concludes that if the assigned task is not completed by the due-date, you can find out the different solution and ensure the progress where lacking.
   Furthermore, you can evaluate the impact of each interruption on the whole release of the project.
4. **Assign task in logical sequence**
   Always set and consider all tasks priority wise in which they are needed. Setting priorities ensures that you are getting the urgent or more important task done first. Prioritise your tasks not only the urgent task done first but also helps in making a clear vision about the execution of the project to the whole team. Here's how you can merely drag-drop tasks to align them in proper sequence in Asana:



5. **Add deadlines**
   After setting priorities create deadlines to every task.
   Deadlines notify completion of a group tasks. They are lined-up with the final deadline and ensure everyone is motivated right up to the very end of the project.
6. **Close the open conversation**
   Most significant rule of the project management is "***the one who opens the task must close it***".
   Finally as the assigner of the task, you need to give feedback and assign it back to the team member or close it, if satisfied.
7. **Keep all the resources related to project at one place**
   The resource section keeps all your project related files readily accessible to everyone. These files could be "Word Docs, PDFs, Wireframes, Images, PSDs, etc."

This is valuable because the team will not have to switch back and forth between "DropBox", e-mails and other file sharing avenues just to locate or upload a file.
Here's how "*Basecamp"* lets you drag and drop all your project related files with ease.



8. **Keep all the conversation at one place**:
   In spite of the project management systems already in place, e-mail can still be used to communicate within the team. When clients send you emails for a project forward those emails into your project management system. This is particularly helpful when you are not at your desk and aren't able to read emails and pick out instructions/feedback.
   All the project management tools that we recommended allow for easy integration with e-mail. They create a new task out of the e-mail subject line and turn the e-mail body into the task notes.
9. **Be active project leader or manager or appoint someone from the team**:
   Though the developers and/or creative professionals are busy doing what they are good at, a Project Manager or key Account Manager ensures it's all done according to schedule. Generally agencies chip away at the role of a Project Manager, but they can be influential in pulling off projects successfully and on time.
   Always remember that the project manager is not the person to up-sell or cross-sell your offers to clients. He is just the person who ensures to get the task or tasks done.
   Project manager keeps the track of the project and do all the stitches wherever needed to avoid project delays.

   Managing web projects from the distance is the skill that you can learn. Be clear with your thoughts and follow the guidelines given above to help you out to manage web projects with ease.

Sample of the architecture to deal the project technically

Project Folder:

- Main files folder
  - File 1
  - File 2
  - ...

- Image folder
  - Image 1
  - Image 2
  - ...
- Scripts folder
  - Script 1
  - Script 2
  - ...
- Templates Folder (if any external file or common modules for your project)
  - Any external files
  - Any common files
  - ....
- Main index file

6.5 POINT TO REMEMBER

Things to Remember for Writing the Perfect Blog Post

- The headline of a blog post should to be creative and magnetic. It's what draws the reader's attention at the first sight.
- The blogs sub header should start, finish, or explain (in short) what the content is about. The sub-header is about to generate interest of viewers.
- The blog post should be more easily understandable by using numbered lists or bullet points.
- Use full stops, commas, colons and dashes to divide the mass of words into smaller chunks of information that make sense.
- Font size and font style is important.
- Use images and graphs as required.

Some of the Common misconception about Website security-

- Hackers aren't interested in me-
- My website was built a year ago and it was secure-
- I updated my website, so I'm all set
- If they break in, I will just have my website fixed
- I don't store customer data, so it won't affect my customers
- SSL keeps me secure

Some tricks to Improve Website Security

- Keep your Software Up-to-Date

- Enforce a Strong Password Policy
- Encrypt your Login Pages
- Keep your Website Clean
- Backup your Data
- Scan your Website for Vulnerabilities.

6.6 GLOSSARY

- **Cookies:** ***Cookies*** are developed to remember information about the user in the browser.
- **JavaScript:** ***JavaScript*** is a high-level, interpreted programming language generally used for client-side scripting.

6.7 ANSWER TO CHECK YOUR PROGRESS

a) Define a bug in Web Application.
b) Why JavaScript is used?
c) Explain Cookies briefly.
d) Explain with example working in cookies with language other than JavaScript.
e) What is “Vulnerability”?
f) What is “SQL injection”?
g) What is XSS or Cross Site Scripting?
h) What is SSL connection and an SSL session?
i) What is a honeypot?
j) What is CSRF?

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UNIT- 7

UI / UX, SECURITY ISSUES, AND GOOGLE ANALYTICS

7.1 INTRODUCTION

An application provides a frontend view to which user interacts. UI/UX provides the platform for the user-computer interaction.

UX design refers to user experience design (UX designers are primarily worried about how the product feels), at the same time UI design stands for user interface design (UI designers are particular about how the product is laid out). Both of these are vital to a computer application and need to work strongly together.

Although being very integral to each other, the roles themselves are relatively dissimilar, involving different processes. The boundary between UI and UX designers is unclear and it is not unusual for companies to opt to combine these roles.

Software is user friendly if its interface is:

- Attractive
- Responsive
- Clear to understand
- Simple to use
- Same pattern in all interface

7.2 OBJECTIVES

After successful completion of this unit, you will be able to-

- Understand the basic concepts of User Interface (UI) Elements
- Learn about Various Tools that can be involved in (UI) Designing Process
- Understand the concepts of Security Issues
- Understand the concepts of Google Analytics

7.3 USER INTERFACE (UI) ELEMENTS

When you design your interface, try to be consistent and expected in your preference of interface elements.

UI Designer's job includes the following:

Look and Feel:

- Customer Analysis
- Design Research
- Branding and Graphic Development
- User Guides/Storyline

Responsiveness and Interactivity:

- UI Prototyping
- Interactivity and Animation
- Adaptation to All Device Screen Sizes
- Implementation with Developer

A user interface designer creates technology easy and intuitive for users to use. User interface designers work on the areas where users directly work together with the product.

Interface elements include but are not restricted to:

- **Input Controls**:

  Checkboxes, radio buttons, dropdown lists, list boxes, buttons, toggles, text fields, date field

- **Navigational Components**:

  Breadcrumb, slider, search field, pagination, slider, tags, icons

- **Informational Components**:

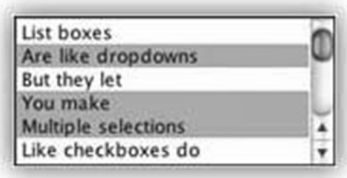
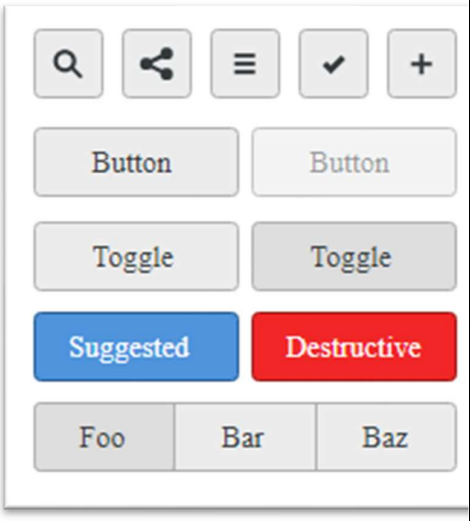
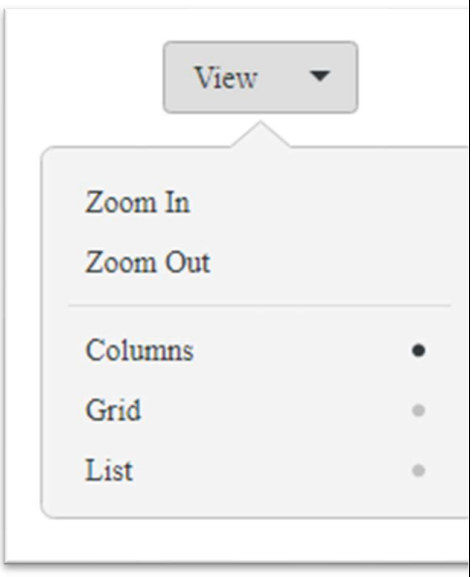
  Tooltips, icons, progress bar, notifications, message boxes, modal windows

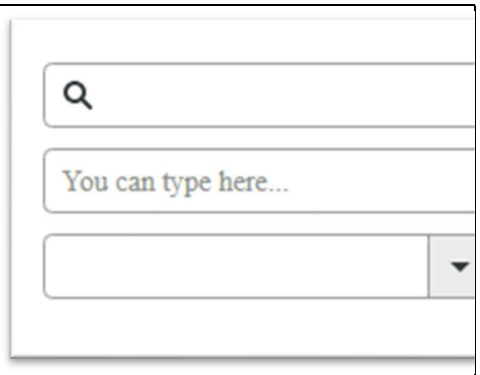
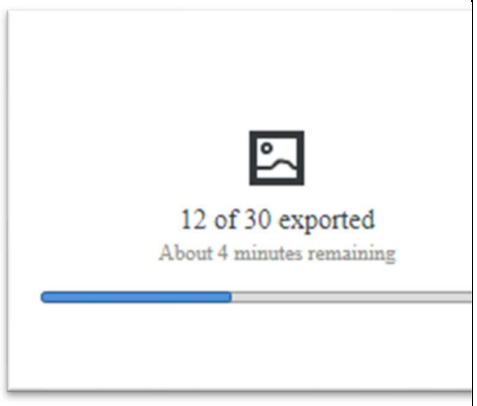
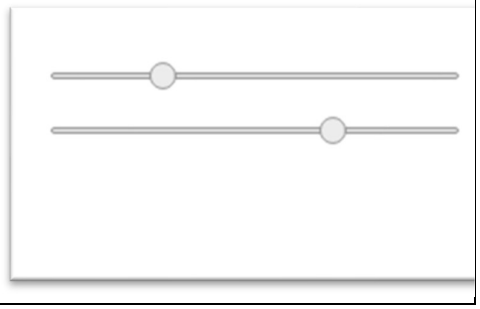
- **Containers**:

  Accordion

Some of the UI/UX Elements used in Softwares are:

Element	*Description*	*Examples*
Chekboxes	Checkboxes allow the user to select one or more options from a given set. It is typically best to present checkboxes in a vertical list.	
Radio buttons	Radio buttons used to allow users to select one item at a time.	
Dropdown lists	Dropdown lists allow users to select one item at a time, likewise to radio buttons, but are denser allowing you to save space.	

List boxes	List boxes, like checkboxes, allow users to select a multiple items at a time, but are more compact and can hold up a longer list of options if required.	
Buttons	A button indicates an action upon touch and labeled using text, an icon, or both.	
Dropdown Button	The dropdown button consists of a button that when pressed displays a drop-down list of grouped items.	
Toggles/ switches buttons	A toggle/switches button allows the user to change a setting between two states. They are most effective when the on/off states are visually distinct.	

Input text fields	Input Text fields allow users to enter text. It can allow either a single line or multiple lines of text.	
Date and time pickers	A date picker allows users to select a date and/or time.	
Progress Bar	A progress bar indicates where a user is as they advance through a series of steps in a process.	
Sliders	A slider, also known as a track bar, allows users to set or adjust a value.	

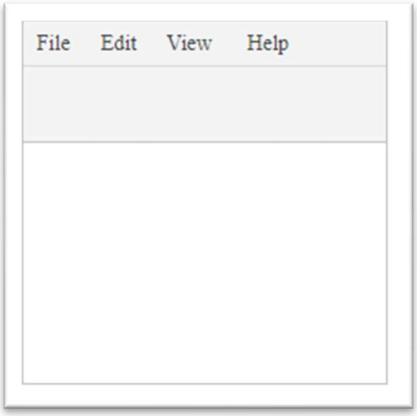
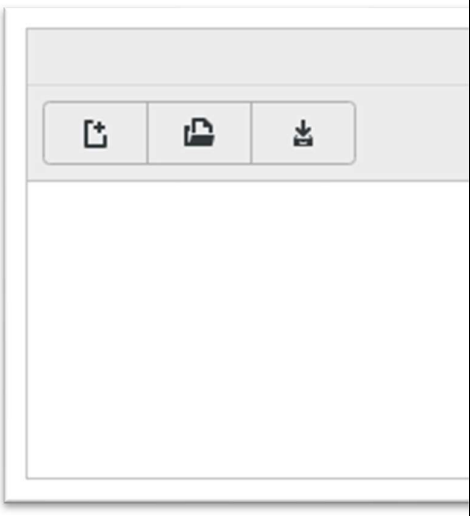
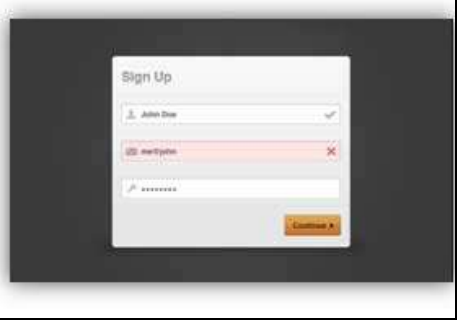
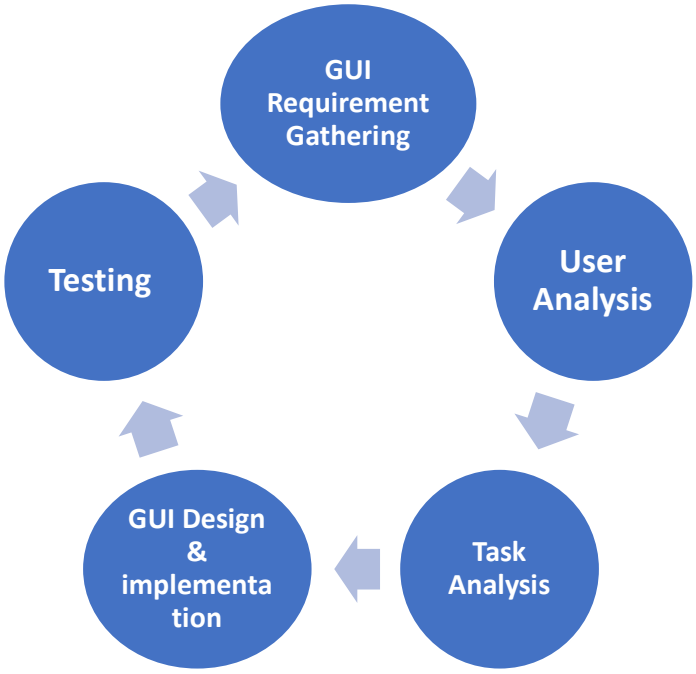
Menu	Menu gives the navigational links, generally situated on top of the application.	
Toolbars	Toolbars provides the important navigation links through icons. They are similar to menu items in functioning.	
Icons	An icon is a simplified image serving as a symbol that is used to help users to navigate the system. Typically, icons are hyperlinked.	
Modal Window (pop-up)	A modal window requires users to interact with it in some way before they can return to the system.	

Image Carousel	Image carousels allow users to scroll through a set of images.	
Breadcrumb	Breadcrumbs allow users to identify their current location within the application by providing a clickable trail of proceeding pages.	
Pagination	Pagination divides content into pages, and allows users to skip between pages or go in order through the content.	
Tool Tips	A tooltip allows a user to see hints when they hover over an item indicating the name or purpose of the item.	
Message Boxes	A message box is a small window that provides information to users and requires them to take an action before they can move forward.	
Notifications	A notification is an update message that announces something new for the user to see.	

7.4 USER INTERFACE (UI) DESIGN PROCESS

For designing user interface various activities are performed. This process of this design phase is like software development life cycle (SDLC).

Various steps that can be involved in designing process are:



- **GUI Requirement Gathering** – GUI requirement can be taken from user and their existing software solution.
- **User Analysis** – Analysis is done on gathered requirement. The UI designer studies who is going to use the software GUI. According to this analysis, designer sets the UI element in the software.
- **Task Analysis** - Tasks provide goals for GUI appearance. Flow of information among sub-tasks determines the flow of GUI components in the software.
- **GUI Design & implementation** - Designers after having information about requirements, tasks and user environment, design the GUI and implements with working software. It is then tested by the developers.
- **Testing** - GUI testing can be done in various ways. Testing may include usability, compatibility, user acceptance etc.

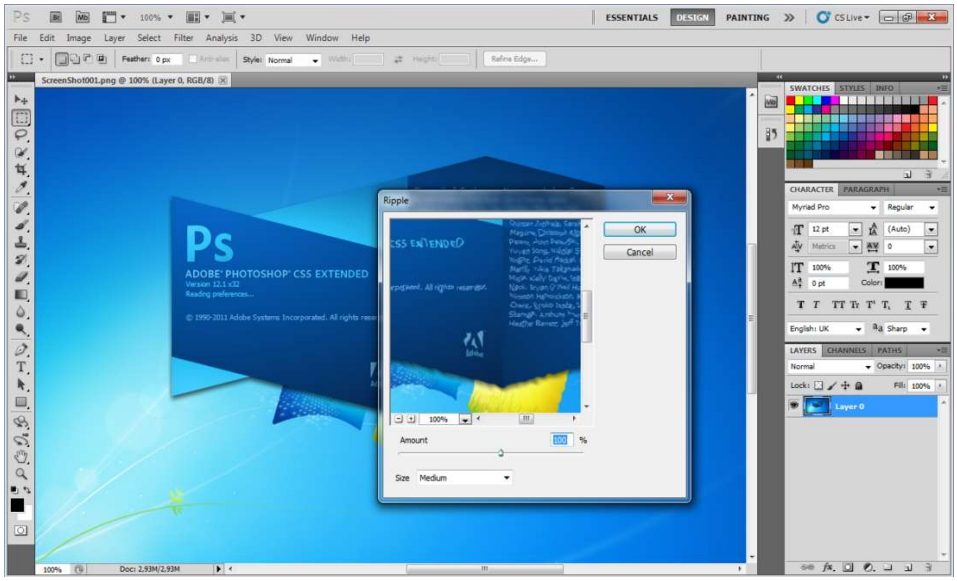
User Interface Design Tools

Designing UI elements is the main concern of any designer. Many software tools enable us to create/develop sophisticated UI elements.

Some of These tools are:

1. ***Visual Design Software, Adobe Photoshop***

   Adobe Photoshop is the industry standard, and most popular visual design tool available. This software supports raster as well as vector-based graphics.

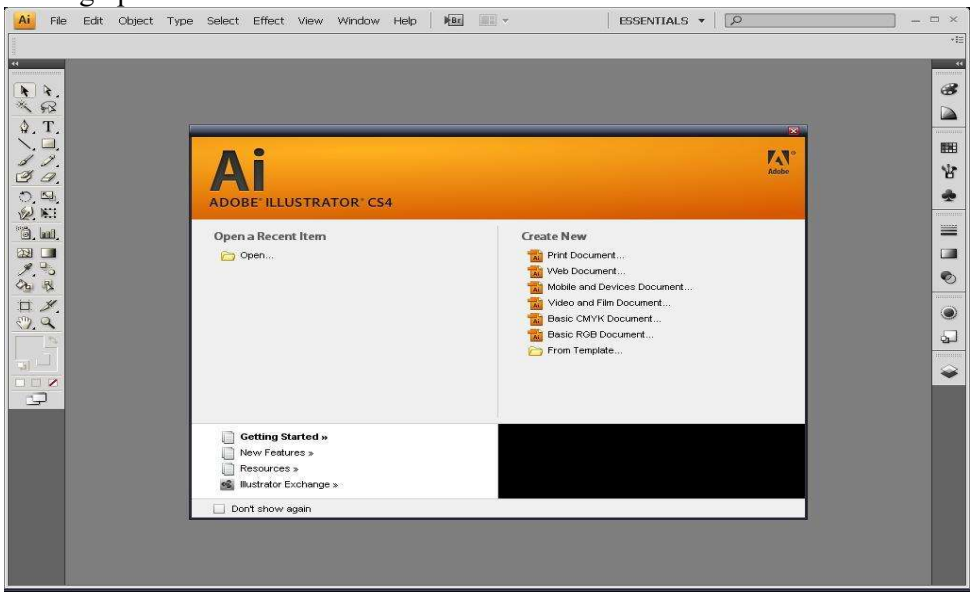


Adobe Photoshop IDE

Some other software available for the same purposes is ***CorelDraw, and FreeHand***. These software are quality product and requires time and training to get expertise.

2. *Adobe Illustrator*

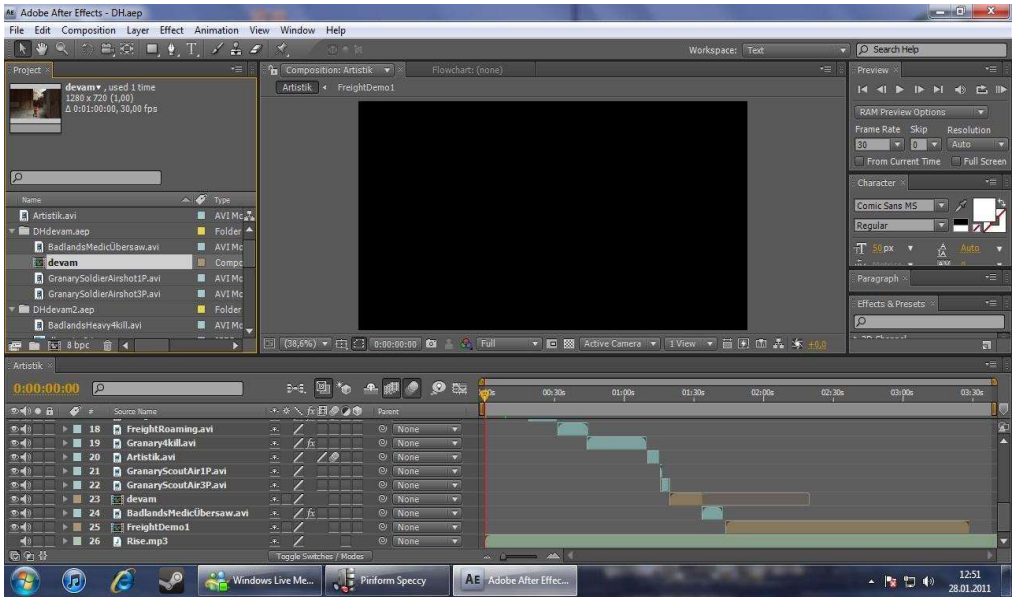
Adobe Illustrator is a vector graphics editor developed and marketed by Adobe Systems. With this drawing tool, you can turn simple shapes and colors into sophisticated logos, icons and graphics.



Adobe Illustrator IDE

3. *AE (Adobe After Effects)*

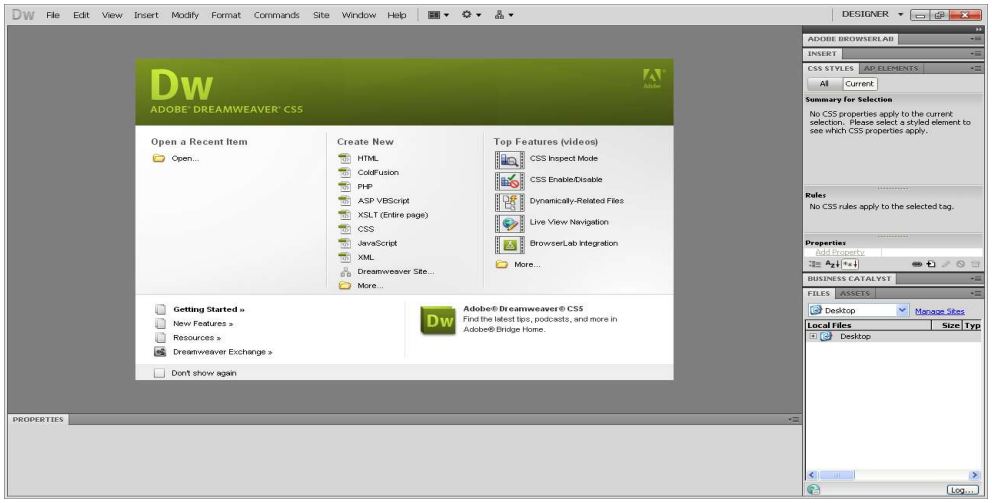
Dynamic design is widely used in UI design. As a UI designer, why should we make the dynamic design? UI designers usually make the dynamic design to express conceptual interaction design. In this way, the development team can have a perceptive of the product. Adobe After Effects is graphic video processing software. UI designers can use it to make the simple UI vibrant effect.



Adobe After Effects IDE

4. Adobe Dreamweaver

Adobe Dreamweaver is a web design and development application that combines a visual design surface known as Live View and a code editor. It provides all the UI elements as visual tools that can be included directly into web application.



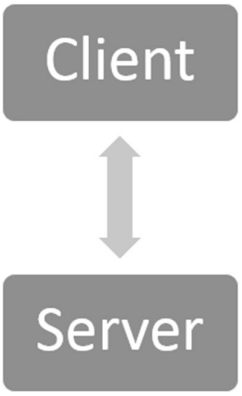
Adobe Dreamweaver IDE

7.5 SECURITY ISSUES

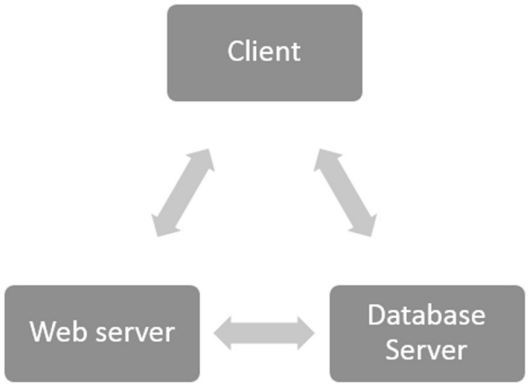
WS (Web Services) Security is a standard that addresses security when data is exchanged as part of a Web service. This is a key feature in SOAP (Simple Object Access protocol message) that makes it very popular for creating web services.

Security is an important feature in any web application. Since almost all web applications are exposed to the internet, there is always a chance of a security threat to web applications.

One of the security measures available for the "HTTP" is the "HTTPS" protocol. HTTPS is the secure way of communication between the client and the server over the web. HTTPS makes use of the "Secure Sockets layer or SSL" for secure communication.



But the above type of security will not work in all situations. There can be the probability when the client can talk to multiple servers. An example given below shows a client talking to both a database and a web server at a time. In such cases, not all information can pass through the https protocol.



Security Issues-

When implementing a Web service, you must think about how you will secure the same. Of course, even if you decide to open up the service to everyone and anyone, you still have to think about security — For example, protecting yourself against people seeking to deny access to your service. Security includes the following:

Equipment implementation

To secure the corporate data you need to use the hardware intelligently. Various things you will have to do:

- Use firewall in your "database machines".
- Depends on routers instead of software firewalls. Hardware is usually faster at routing and is easier to lockdown. The software firewall may have unknown interactions.
- That means, only put the machine serving the Web service on the public Internet.

Authentication of users

You need to authenticate the user when user needs to use your web for his/ her use. Several ways to authenticate the user:

- User can present identity by providing his/ her credentials supplied in the SOAP (Simple Object Access protocol message).
- Username & password can be sent as clear text via HTTP based method, which is not useful for secure applications, but it can be useful in blending with other identification techniques.
- Using a "certificate" provided by a certificate authority, the client can prove its identity during "SSL" authentication.
- All the way through HTTP basic/digest authentication or client certificates, "IIS" can plot a user identity to a real Windows user.

Protecting data so that users only see what they are entitled to see

You can use Access Control Lists to defend files and "SQL-based security" to safeguard data in your database. As part of your security for the Web service, consider using a combination of user identity and other security mechanisms as a way to protect your data.

"NTFS" limits what files a particular user can access.

Active Directory can be used to limit the network resources the user can access. An effective security plan uses a combination of methods to keep things safe.

By validating the user using Windows Integrated Authentication and denying anonymous access to the Web service, the Web method will imitate the caller when it executes. Any rights given to that caller will be imposed. This includes access to files, network resources and database objects.

Monitoring the activities of users

Provision by "google" analytical report you can monitor various activities of user by his/ her location, "IP addresses" etc.

Keep in mind that a lot of this information will be used only when something odd happens.

Web security standards-

Web security is a set of "procedures", "practices", and "technologies" for protecting web servers, web users, and their surrounding organizations. Security protects you against unexpected behaviour.
Previously discussed in earlier section, the "Web Service-Security" standard revolves around having the security definition included in the SOAP Header.

The testimonials in the SOAP header are managed in two ways:

1. *Username token*: It is a special element used to pass the username and password to web service.
2. *Binary security token*: It is used in whenever needed encryption techniques such as "Kerberos or X.509" are used.

Following are the steps which take place for the above figure:

- A demand can be sent from the Web service client to Security Token Service. This service can be an intermediary web service which is exclusively built to supply usernames/passwords or certificates to the actual SOAP web service.
- The security token is then passed to the Web service client.
- The Web service client then called the web service, but, this time, ensuring that the security token is embedded in the SOAP message.
- The Web service then understands the SOAP message with the authentication token and can then contact the Security Token service to see if the security token is authentic or not.

Internet Security-

It means securing communication over the internet. It includes specific security protocols such as:

- "IPSec" – Internet Security Protocol
  Set of protocols designed by Internet Engineering Task Force "IETF". It provides security at network level and helps to create authenticated and confidential packets for IP layer.
- "SSL" – Secure Socket Layer
  It is a security protocol developed by Netscape Communications Corporation. It provides security at transport layer. It addresses the following security issues:
  - Privacy
  - Integrity
  - Authentication

Threats

- Mobile worms
- Malware
- PC and Mobile ransomware
- Large scale attacks like Stuxnet that attempts to destroy infrastructure.
- Hacking as a Service
- Spam
- Phishing

Email Phishing

It is an activity of sending emails to a user claiming to be a legitimate enterprise. Its main purpose is to steal sensitive information such as usernames, passwords, and credit card details.

Such emails have links to websites that are polluted with malware and direct the user to enter details at a fake website whose look and feels are same to genuine one.

Phishing email may contain:

- *Spelling & bad grammar:* Often such emails contain grammatically incorrect text. Ignore such emails, since it can be a spam.
- *Beware of links in email:* Never reacts on any links in suspicious emails means never clicks such emails if showing some doubt in your mind.
- *Threats:* Such emails contain threat like "your account will be closed if you didn't respond to an email message".
- *Spoofing popular websites or companies:* These emails contain graphical objects that appear to be connected to genuine website but they actually are connected to fake websites.
- *Application vulnerabilities & cross-site scripting:* "SQL injection" occurs when attackers take advantage of sites that generate SQL queries using user-supplied data without first checking to make sure it is valid. This permits an attacker to submit malicious SQL queries and pass instructions straight to a database.
- "Cross-site scripting (XSS) attacks" target an application's users by injecting code, usually a client-side scripting such as JS script, into a Web application's output. Whenever the affected page is viewed, the browser executes the code, allowing an attacker to hijack user sessions, redirect the user to a malicious site or simply deface the page.

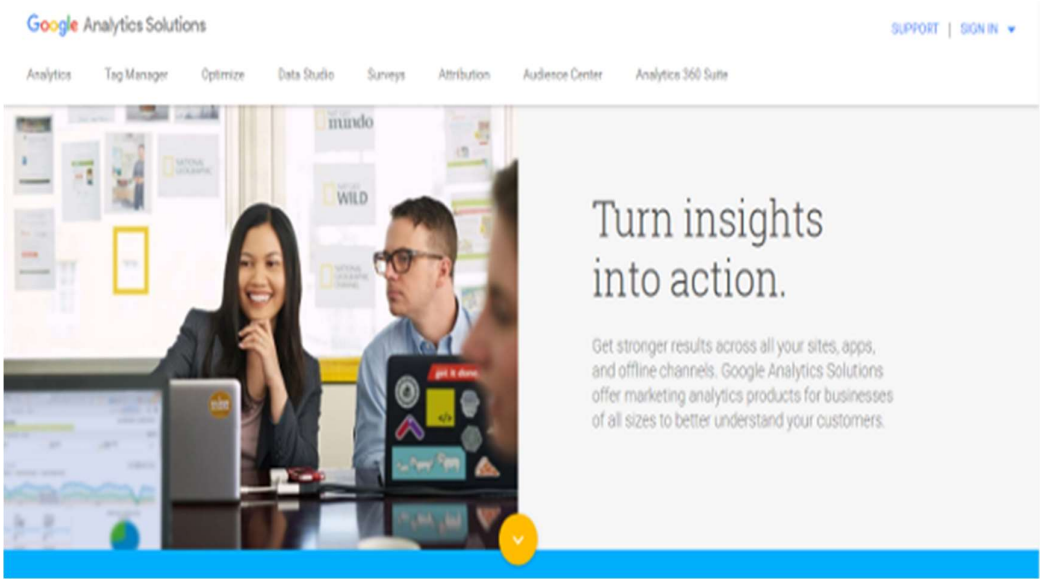
7.6 GOOGLE ANALYTICS

- Google analytics gives you the idea of your website visitors (traffic).
- Web developers use this information given by Google Analytics to improve the performance of websites, and hence ensure the high traffic and user conversion.
- Google Analytics is a free web analytics tool developed by Google that helps you determine your website traffic and collect essential information about your website visitors

Setting Google Analytics Account

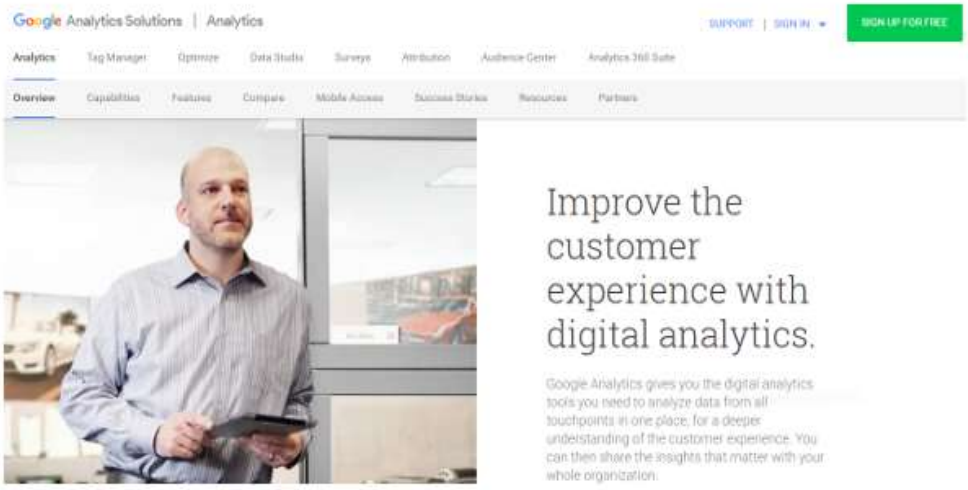
For Setting up Google Analytics Account, follow the following steps:

1. Create a Google Account *(if you do not have one).*
2. With Google Account, you can go to Google Analytics ***(https://www.google.com/analytics/)*** to set new Account.



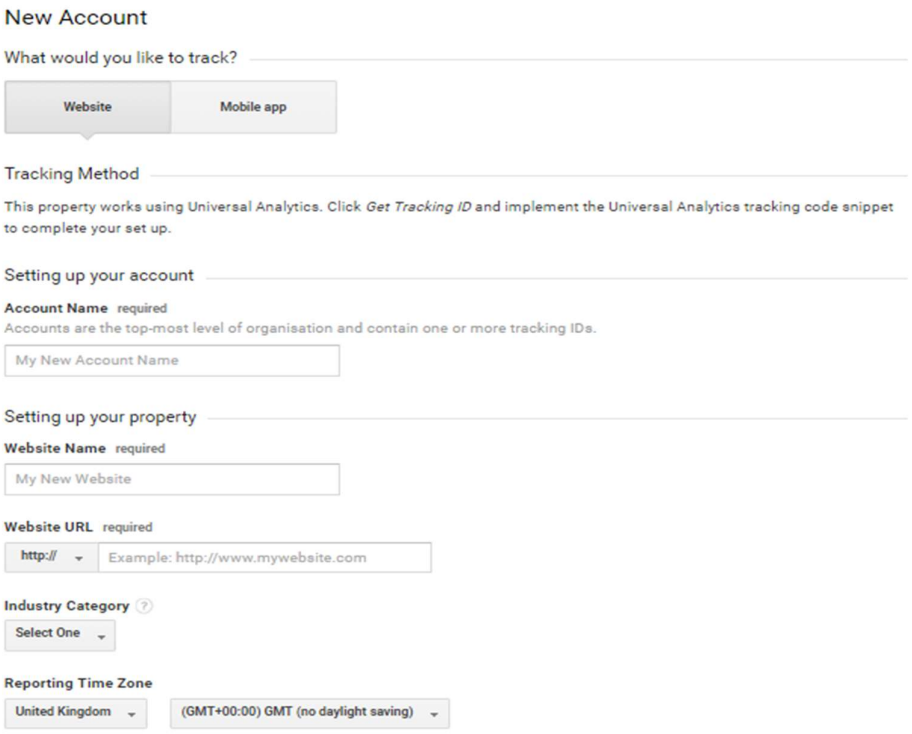
3. Click on Analytics Tab, A new page will open.

Press ***"Sign up for free"*** Green Button to start the registration process.

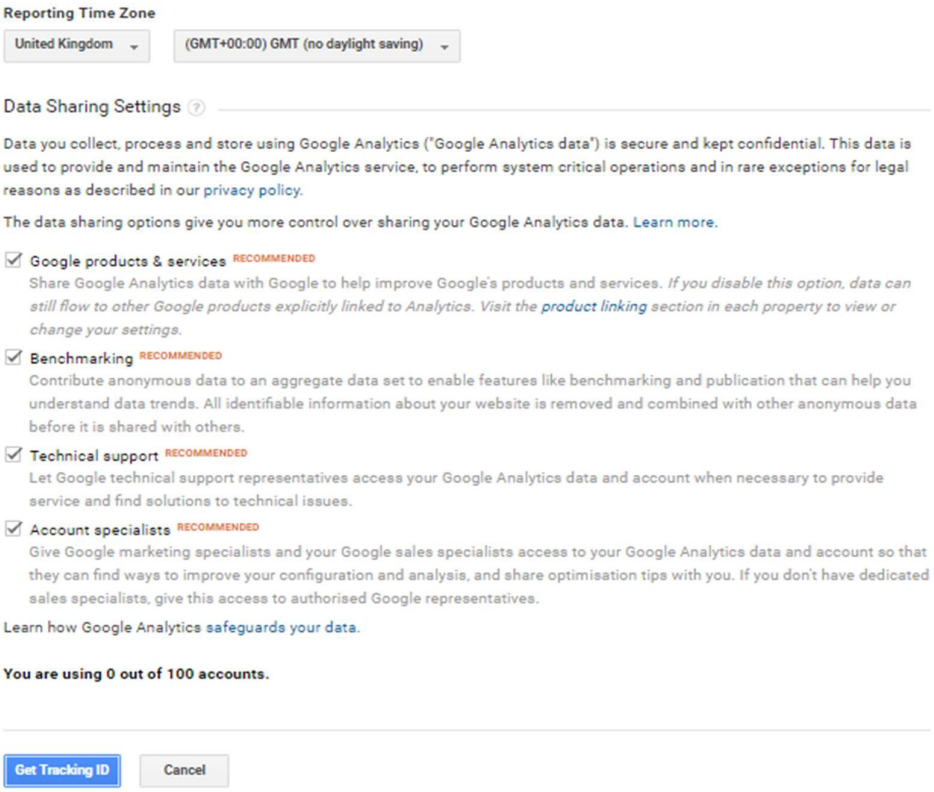


When you click on the green button, you will be provided with the three steps you need to take in order to set up your Google Analytics account. The page you will arrive at will look like this:

4. Now enter our new Account information for your website.



When you enter the required information in above form, you will get the following option.



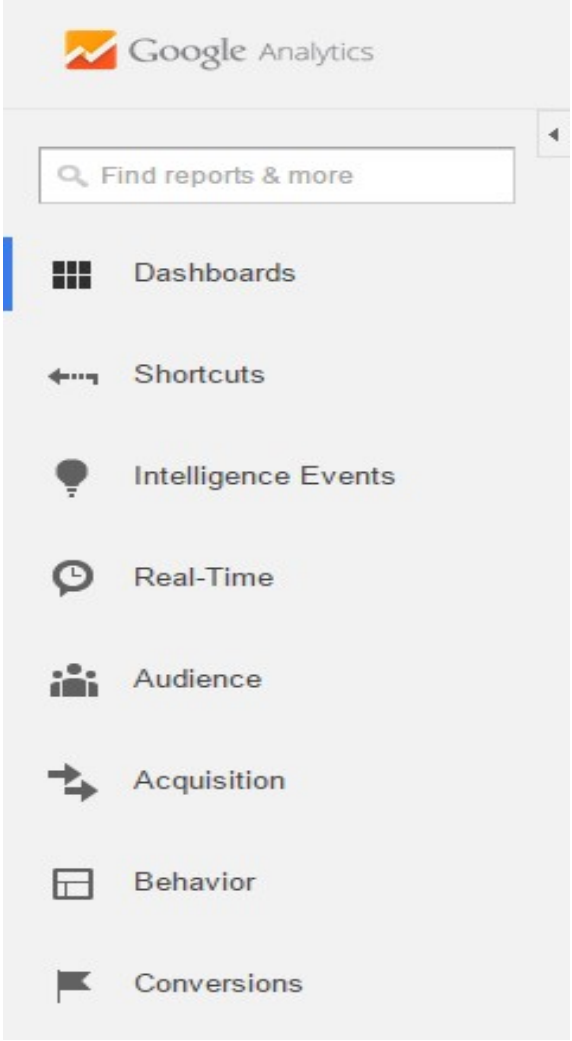
Click on ***"Get Tracking ID"*** blue button.

5. In next step, you will get a website ***tracking ID & tracking code***. This is a JavaScript code bundled in ***<script> </script>*** tag. Through this code, Google will track your website for visitors. You need to copy this tracking code and paste it in every page of your website before closing ***</body>*** tag.

7.7 USING GOOGLE ANALYTICS

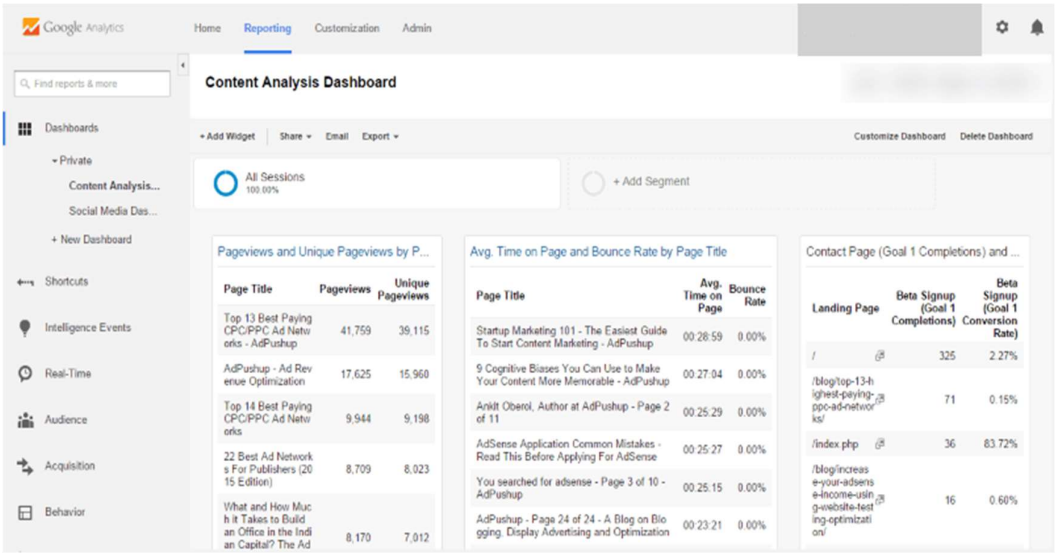
Once you have set your Google Analytics account successfully, within 24 Hrs you will start getting reports based on your website users. Through these reports, you can analyze your website improvement areas. You can see these reports by logging into your Google Analytics Account.

Various Analytic Reports present in Google Analytics are:



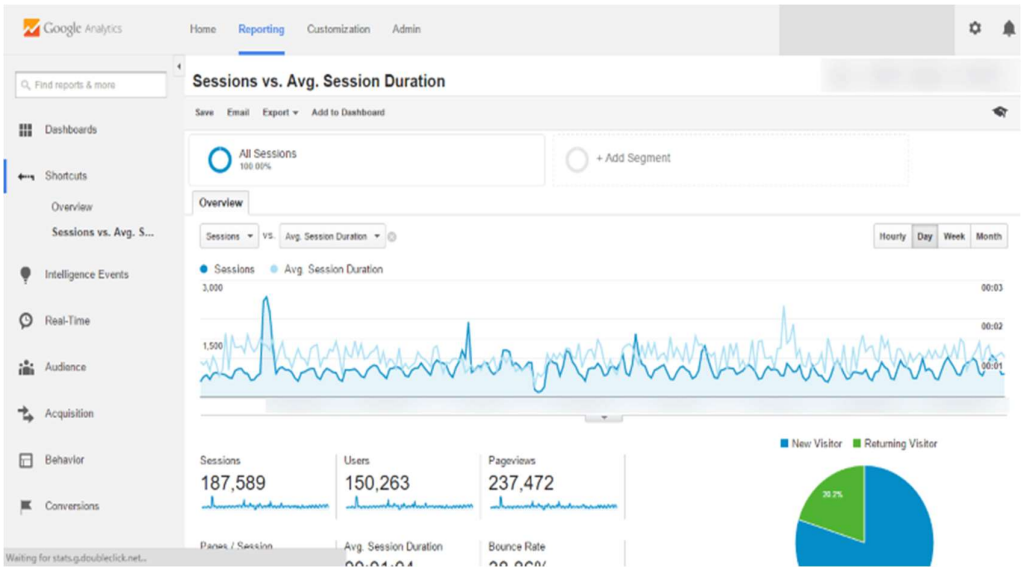
Dashboards

In Dashboards, you can see a summary of your important reports. You can create and customize reports in dashboards very easily, and you can add or delete as many reports as you want.



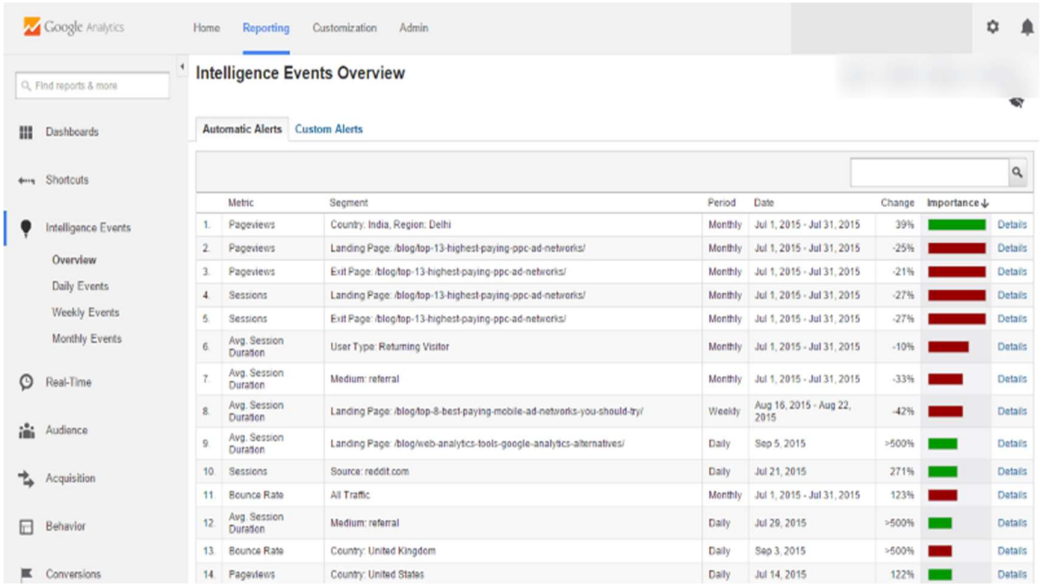
Shortcuts

Shortcuts will provide you the opportunity to find the quick access to most used reports.



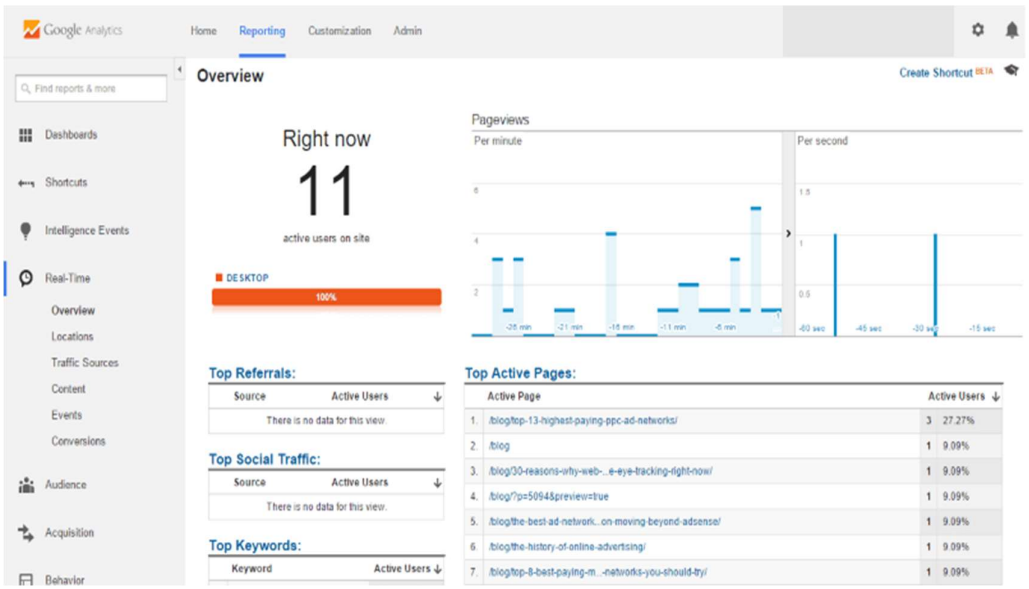
INTELLIGENCE EVENTS

Intelligence events will show you variation in your website traffic.



REAL-TIME REPORTS

Real-time reports will provide you the information of those users who are currently on your website.



AUDIENCE REPORTS

Audience report will give you every detail of your website user like their browser, device, location, session etc.

You can see various reports under sections like:

Demographics: This will give analysis about age and gender of your audience.

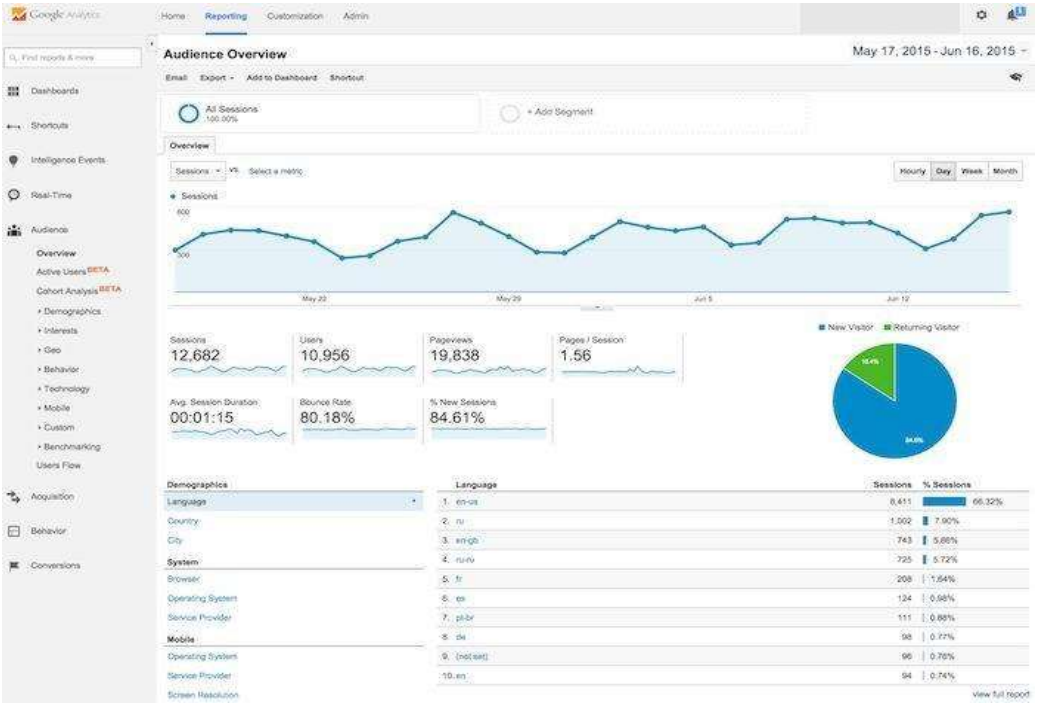
Interest: This will show you the market segmentation.

Geo: This shows you language and location.

Technology: This will give your reports about Browsers, Operating systems, and network of your audience.

Mobile: Under this section, Mobile device information can be seen.

Custom: In this section, you can set the custom report that you want to see from the entire available one.

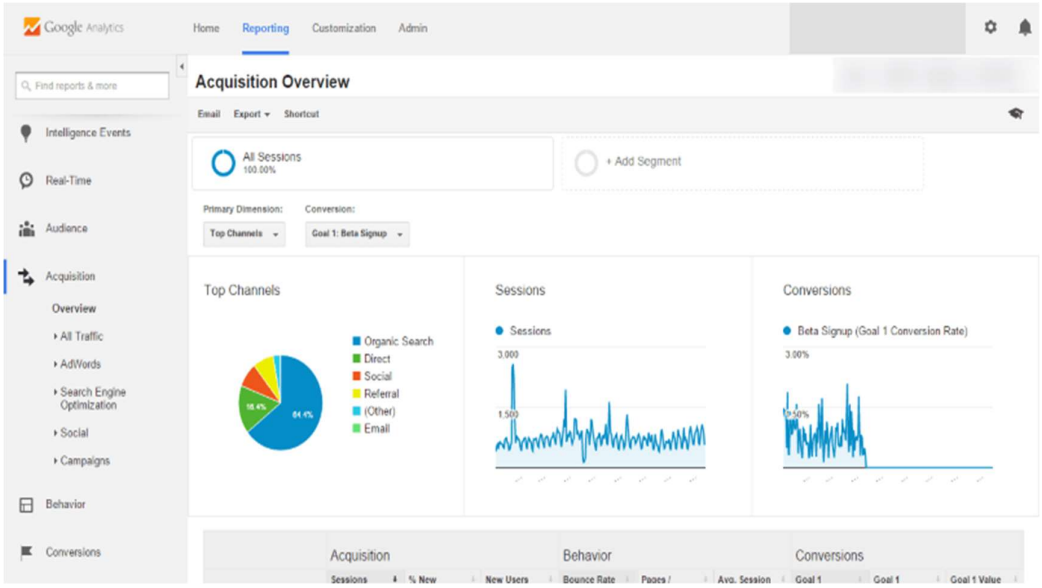


ACQUISITION REPORTS

Acquisition report will give you information about how traffic came to your website. It will provide you with a summary of your direct, organic, referral and social (coming from social media) traffic, as well as traffic coming from email.

Using Acquisition Report, you can:

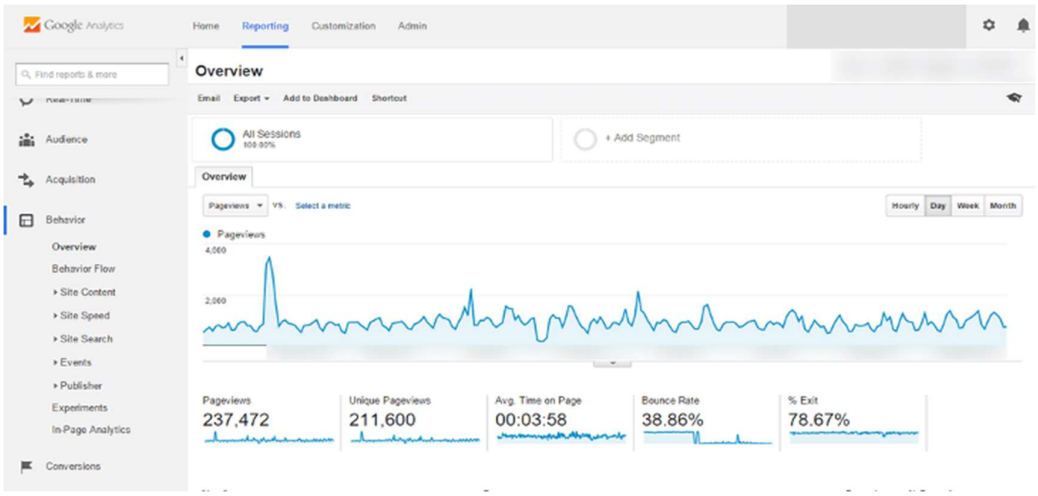
1. Check all the traffic coming from different sources in your website.
2. You can also trace traffic coming from Google Ad-words.
3. You can also track social media (like Facebook, Google+, and LinkedIn) traffic.



BEHAVIOR REPORTS

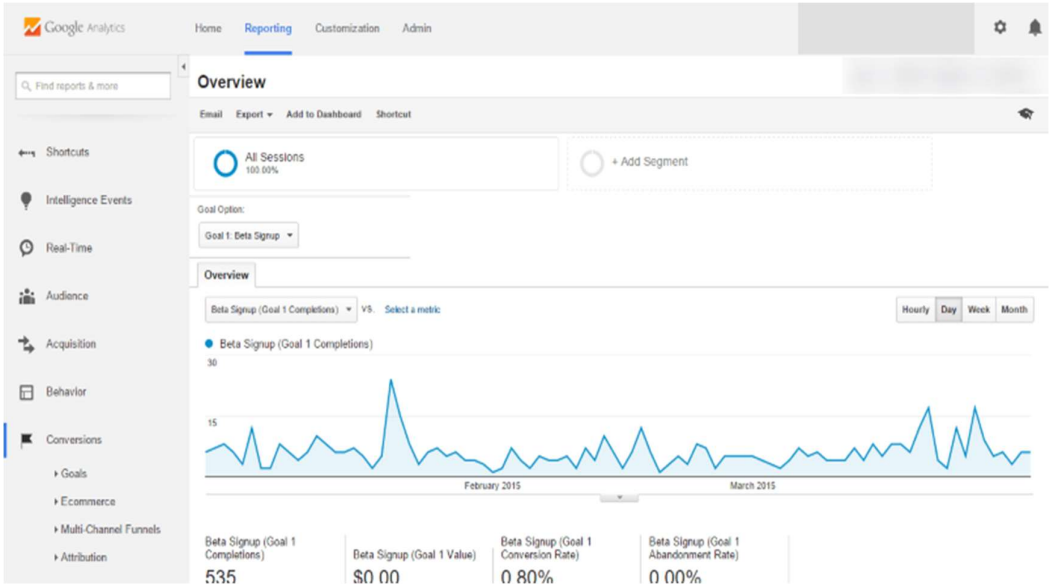
The Behavior reports will give you analysis how your website visitors are interacting with your website, so that you can know how your content is truly performing. Like, which page they are interacting most etc.

1. ***Site Content:*** Here you can see that how many pages of your website the visitors view. You can also check landing pages, exit pages in this section.
2. ***Site Speed:*** Here, you can check page load time, execution speed, and performance data.
3. ***Site Search:*** It gives you a view of how the audience searches across your site, what they usually look for, and how they arrive at a particular page.
4. ***Events:*** Events are users' actions with content (like downloads, sign up, etc.). You can see these events under this section.



CONVERSION REPORTS

The Conversions reports will show you the procedures your website visitors have taken before they actually converted to your website.



7.8 SUMMARY

In this Manual, we study how to work on cookies using JavaScript. We have practice to create retrieves and delete cookies. After that, we study the various UI/UX elements used in application development in software industries. We also check that how to Test and maintain a web project so that user can gain trust in our product.

7.9 GLOSSARY

- **JavaScript:** ***JavaScript*** is a high-level, interpreted programming language generally used for client-side scripting.
- **Web Server:** ***A web server*** is a computer system that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web.
- **Application server:** ***An application server*** is a software framework that provides both services to create web applications and a server environment to run them.

7.10 POINTS TO REMEMBER

Some of the Common misconception about Website security-

- Hackers aren't interested in me-
- My website was built a year ago and it was secure-
- I updated my website, so I'm all set

- If they break in, I will just have my website fixed
- I don't store customer data, so it won't affect my customers
- SSL keeps me secure

Some tricks to Improve Website Security

- Keep your Software Up-to-Date
- Enforce a Strong Password Policy
- Encrypt your Login Pages
- Keep your Website Clean
- Backup your Data
- Scan your Website for Vulnerabilities.
- You can hire a Security Expert

7.11 ANSWER TO CHECK YOUR PROGRESS

Q1. Define a bug in Web Application.

Q2. Why JavaScript is used?

Q4. What do you understand by Software testing?

Q5. Why Hardware needs to be upgrade? Explain.

Q6. What is Security Testing?

Q7. List the attributes of Security Testing?

Q8. List the full names of abbreviations related to Software security.

Q9. What are various elements used in UI/UX of an application.

Q10. What are various techniques used in testing a web projects? Explain.

Q11. Define Google Analytics.

Q12. Why Google Analytics is used? Explain in detail.

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- https://www.w3schools.com/
- http://www.tutorialspoint.com

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- https://www.google.com/analytics/

UNIT- 8

AJAX, CMS (WordPress Installation)

8.1 INTRODUCTION

AJAX stands for ***A****synchronous* ***J****avaScript and* ***X****ML,* is a set of techniques for creating highly interactive websites and web applications. Ajax is all about updating content of webpage without reloading it.

XMLHttpRequest object plays an important role in sending and receiving data to and from server.

Following are the steps carried out when a request is sent to server using XMLHttpRequest object:

1. User sends a request from the browser and a call goes to XMLHttpRequest object.
2. HTTP Request is sent to the server by XMLHttpRequest object.
3. Server interacts with the database using server-side language like PHP etc.
4. Data is retrieved.
5. Server sends XML data to the XMLHttpRequest callback function.
6. HTML and CSS data is displayed on the browser.

8.2 OBJECTIVES

After the successful completion of this unit, you will be able to:

- Understand the basic concepts of Sample Web-Page using AJAX
- Understand the basic concepts of CRM
- Understand the concepts of WordPress Installation, Working with WordPress.

8.3 SAMPLE WEB-PAGE USING AJAX

In this sample, we will use two files one is HTML & other is TEXT file written in notepad.

First, create a text file named as ***data.txt*** and write some text data in that file. Below is the sample text you can use for your reference.

Asynchronous JavaScript and XML

AJAX stands for Asynchronous JavaScript and XML.

XMLHttpRequest Object can be used to call data from text files, databases, XML file etc. in the background unknown to the user.

Now, create an **HTML** file and name it as ***ajaxPractice.html***. We will code for HTML, JavaScript, & XML in this file. We will send request for ***data.txt*** file with the help of ***XMLHttpRequest*** object and then use the data for display in this HTML file.

Below is the Code for handling TEXT file with the help of AJAX:

```
<!DOCTYPE html>
<html>
<body>
      <div id="demo">
      <button type="button" onclick="loadTxt()">Change
      Content</button>
      </div>
<script>
      function loadTxt () {
        var objXMLHTTP = new XMLHttpRequest();
        objXMLHTTP.onreadystatechange = function () {
            if (this.readyState == 4 && this.status == 200)
            {
            document.getElementById("demo").innerHTML =
            this.responseText;
            }
            };
```

```
            objXMLHTTP.open("GET", "data.txt", true);
            objXMLHTTP.send();
        }
</script>
</body>
</html>
```

After the above code has been written we have two files in our hand

1) ***ajaxPractice.html –*** *It has all the source code for HTML, JAVASCRIPT, AJAX*

2) ***data.txt –*** *It has the data, which we used to call in HTML (**ajaxPractice.html**) page, with the help of AJAX. This text data is displayed in HTML file.*

Now, we have to place these files in a ***server*** and then call html file from browser. However, we cannot do this at this time, as we are unaware of a ***Server.*** We will get the information about server in next chapter.

According to above code, data in text file will be displayed in the div block that has ***id="demo"***. Fuction loadTxt() will be called when button is clicked.

The following operation will be performed inside the function

1. A new XMLHttpRequest object XMLHTTP will be created.
2. Onreadystatechange event will be fired automatically when the state of XMLHTTP object changed.
3. When XMLHTTP object will change its state to 4 and status to 200, the txt file data will be displayed on the div tag specified.

8.4 CMS (WordPress)

WordPress is a free and open-source **C**ontent **M**anagement **S**ystem (CMS). It is an online blogging site based on PHP and MySql. You can create simple blog to fully customizable website in WordPress.

8.5 INSTALLING WORDPRESS

WordPress installation is very easy and takes few minutes to complete. All hosting providers allow WordPress installation in their control panel.

- You can install WordPress by just clicking in its icon present in the hosting server.
- For installing WordPress in local Computer
  - If you want to install WordPress in local server, then you need a XAMPP (Apache, PHP, and MySql) install in your computer.
  - Download WordPress from ***WordPress.org*** and install it manually /into the XAMPP control Panel.

8.6 WORKING WITH WORDPRESS

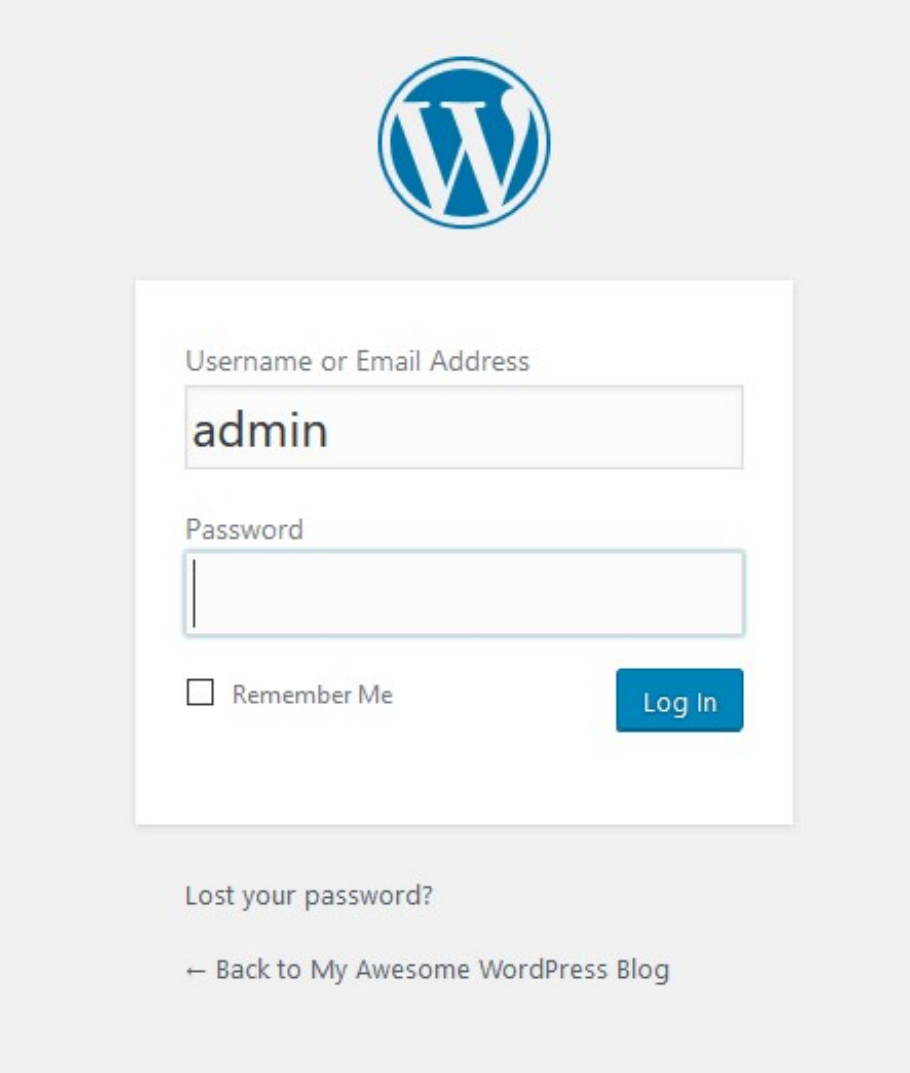
Once you finish installing WordPress, first thing you have to do is to log on to its dashboard for further working.

Logging in to the WordPress

For Logging into your WordPress Admin Panel:

http://www.yourdomain.com/wp-admin

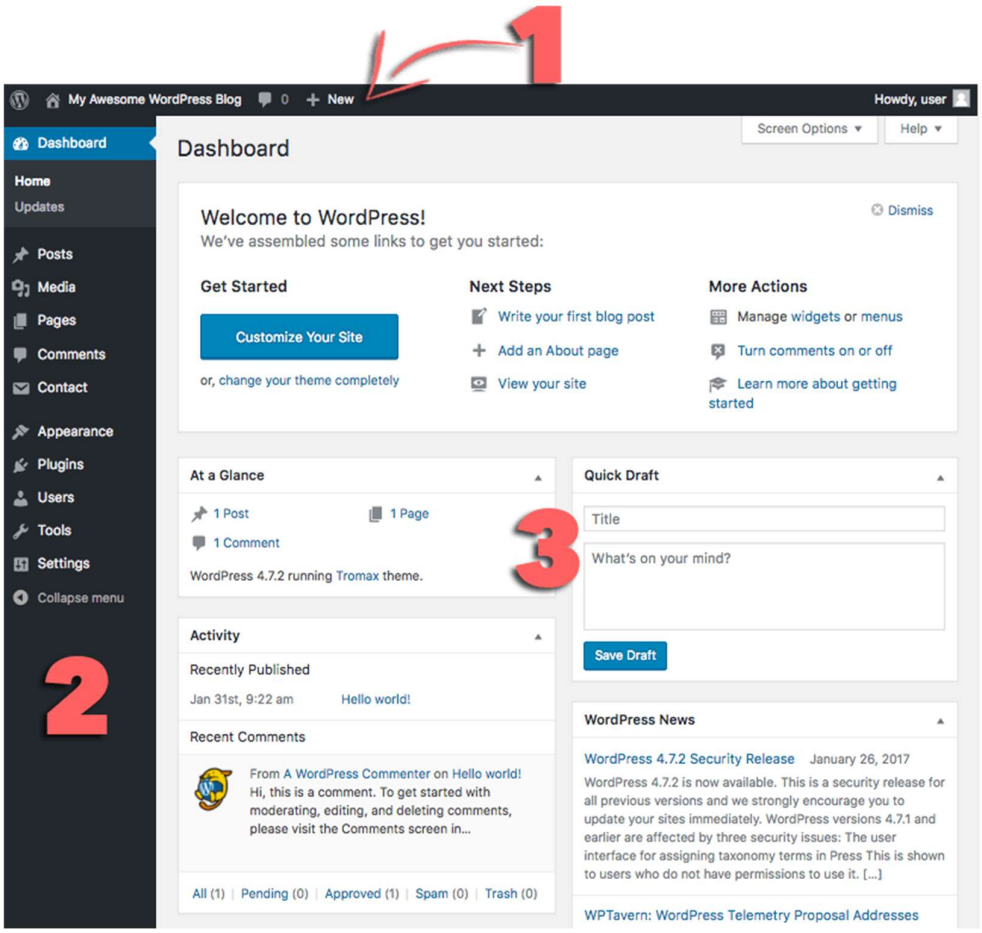
This will redirect you to login screen.



The username and password is the same you have entered at the time of installing WordPress.

After you entered the correct username and password, you will redirect to the WordPress Administrator Dashboard.

It has three main sections:

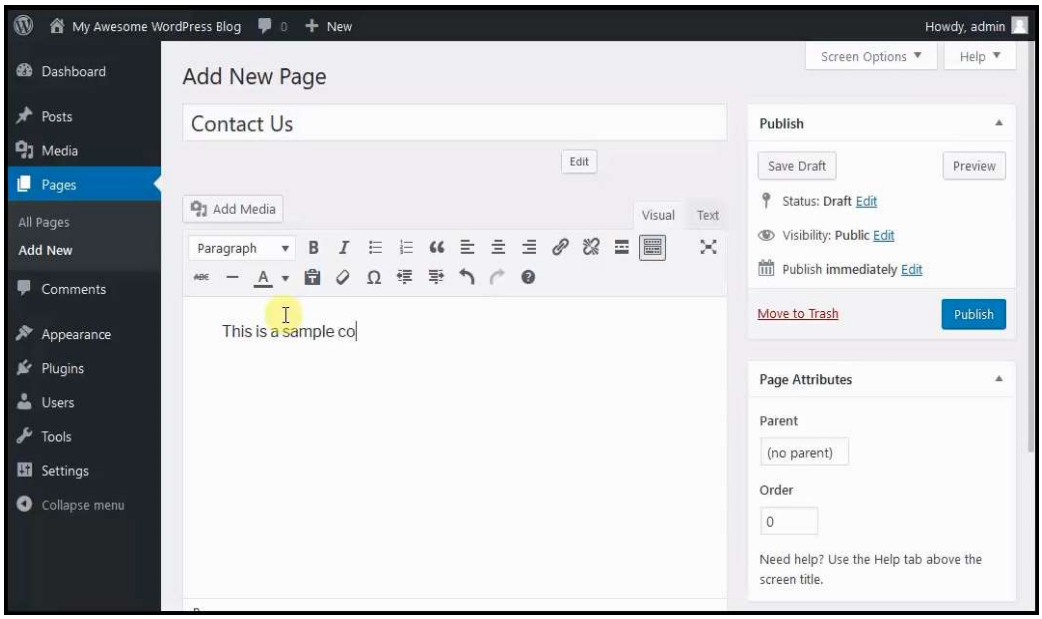


1. Toolbar is at the top of the page. It contains navigation to the commonly used functions.
2. Main navigation menu is on the left-hand side.
3. Main working area where we will find all the content for working.

- **Publishing Content to WordPress**

Step 1 - Creating a New Page

For creating a new page in WordPress, open the **Add New** section under **Pages** menu or click **New** -> **Page** button at the top toolbar.



Step 2 - Creating a New Post

For creating a new post in WordPress open the **Add New** section under **Posts** or choose **New** -> **Post** option from the top toolbar.

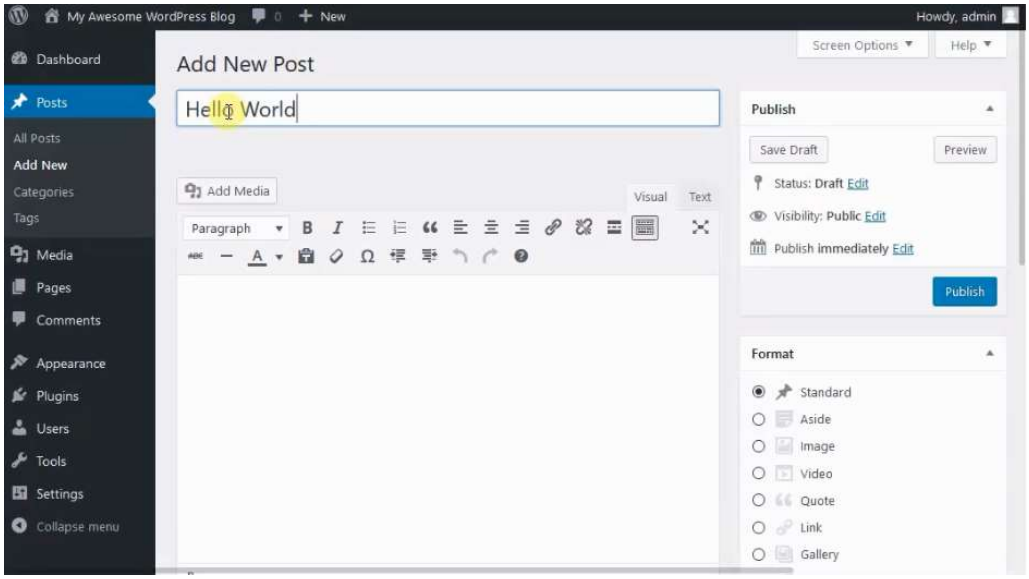
At the right-hand side of the screen, we have certain features.

Publish: By clicking the Publish button your post will go live. If you decide to delete the post, press the Move to Trash button.

Categories: On this box, you can assign your post to a specific category. You can even create a new one by pressing the **+Add New Category** button.

Tags: box allows to quickly adding new tags.

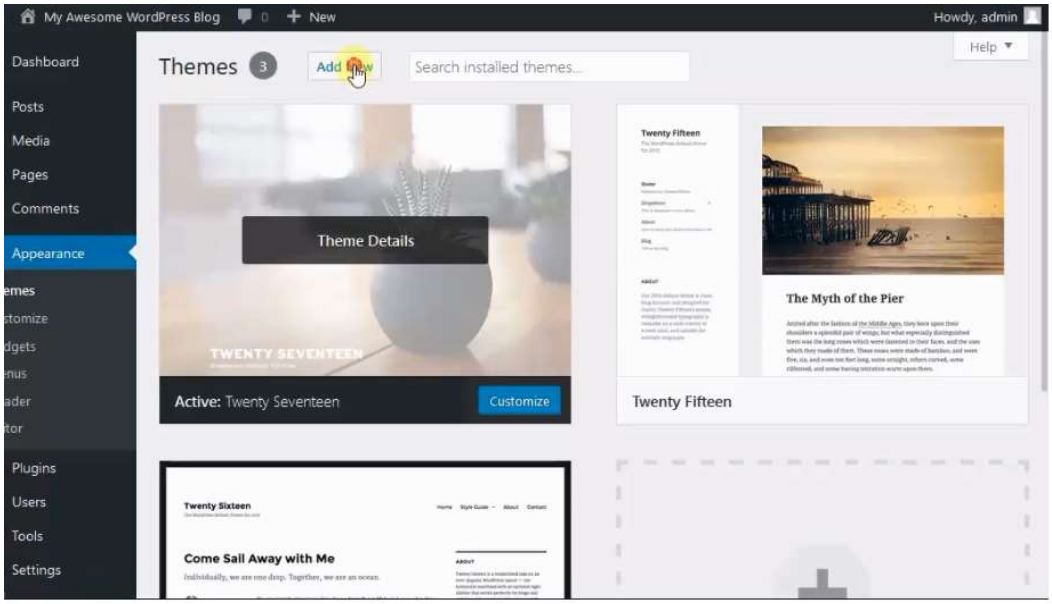
Featured Image: You can assign a featured image to a post. It will be visible at the very top of the post.



Step 3 – Installing WordPress Themes

You can change the look of you WordPress website by installing different themes freely available in your dashboard.

Click on Appearance section and install the particular theme.



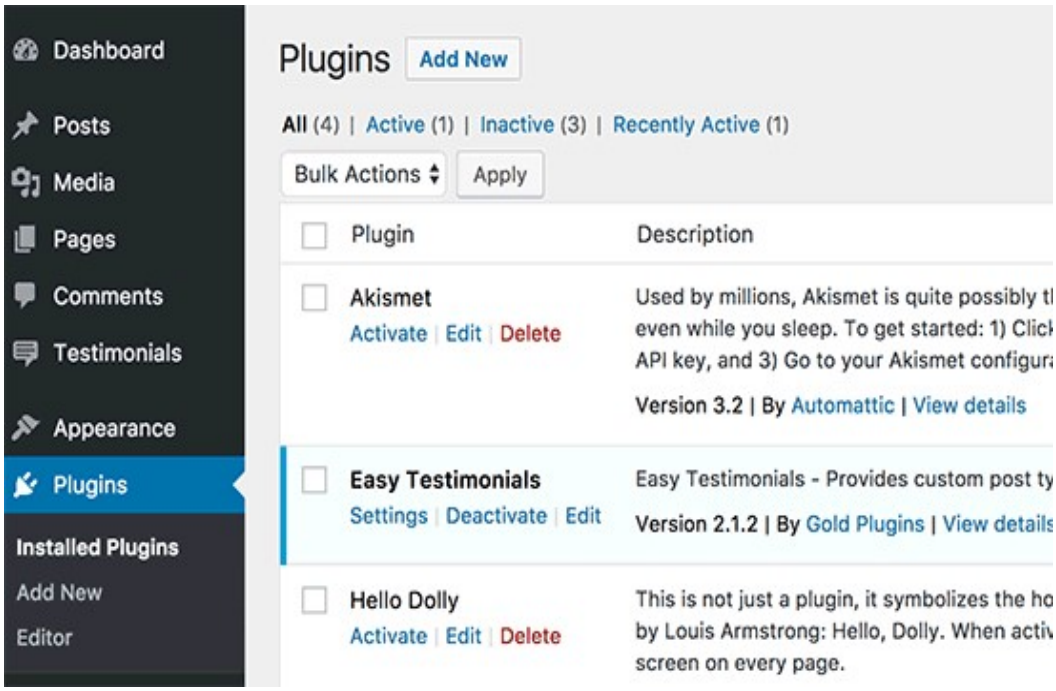
•WordPress Plugins

Plugins adds special features to an existing WordPress website. They also extend the functionality of WordPress. There are about 48,000 Plugins available in WordPress.org plugin directory. Other third-party plugin are also available to use in WordPress.

You can activate or deactivate plugin at any time you want. Once Plugins are installed, they get automatically registered to your WordPress database.

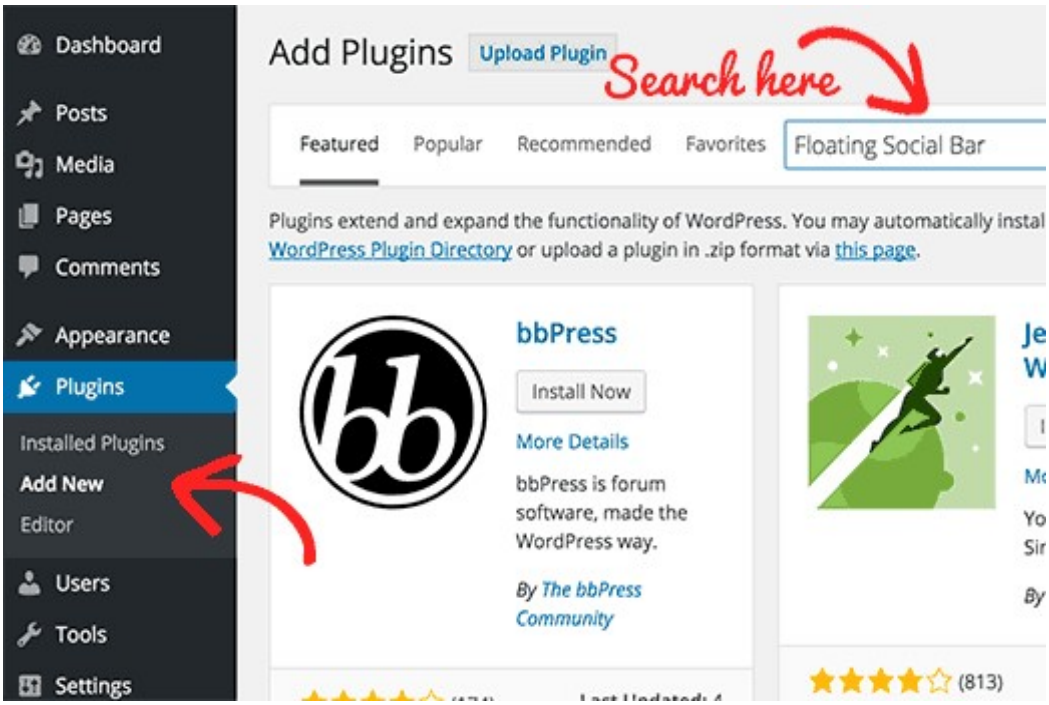
There are WordPress Plugins to create

- E-Commerce
- Image Sliders
- Advance SEO (Search Engine Optimization),
- Enhance performance,
- Add contact forms,
- Social media buttons,
- Build galleries,
- Much more…



How to find WordPress Plugins:

Simply go to **Plugins** >> **Add New** page. Then search by typing plugin name or functionality you want to add.



- **WordPress Users**

Various types of users can be created in WordPress. Every user can be set with different permissions to access WordPress Website. Only Website Administrator can set these roles.

Some of the predefined roles are:

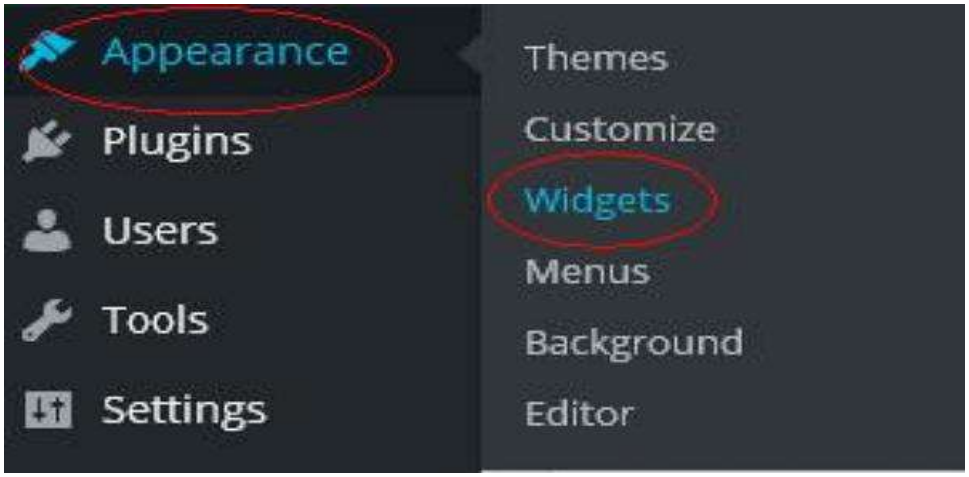
- **Administrator**
  An Administrator can do anything and everything on the WordPress site as it has all the rights, such as creating more users, inviting more users and also removing them.
- **Editor**
  The Editor has right to access all the posts, links, pages, categories, comments, and tags. They can create, publish, edit or delete any posts or pages.
- **Author**
  The Author can only write posts, upload pictures, edit, and publish their own posts.
- **Contributor**
  The Contributor can only write and edit their posts until published. They can build their own posts and pages but cannot publish them. They cannot upload images or files but can see your site's status. When they want to publish any post, it must be first notified individually to the administrator for review. When the post is approved, the contributor cannot make any changes once published.
- **Follower**
  The Follower can only read and comment on the posts.
- **Viewer**
  Viewers can only view your posts.

- ## WordPress Widgets

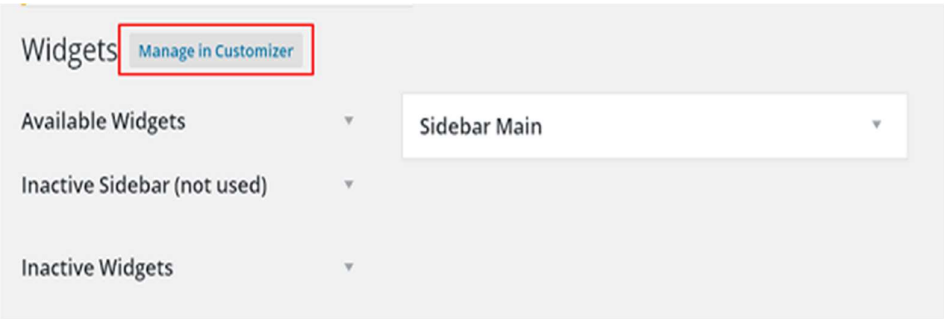
Widgets are the blocks in WordPress websites used to perform specific function. These are the design areas (blocks) of websites. These widgets vary from theme to theme.

For working on WordPress, widgets perform the following action:

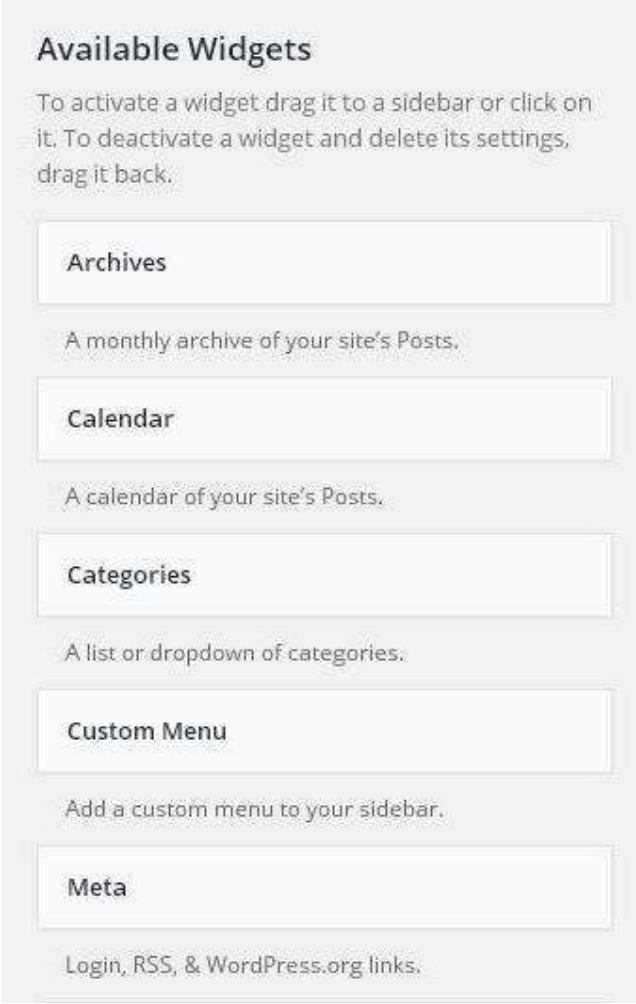
Step 1) Click on **Appearance → Widgets**.

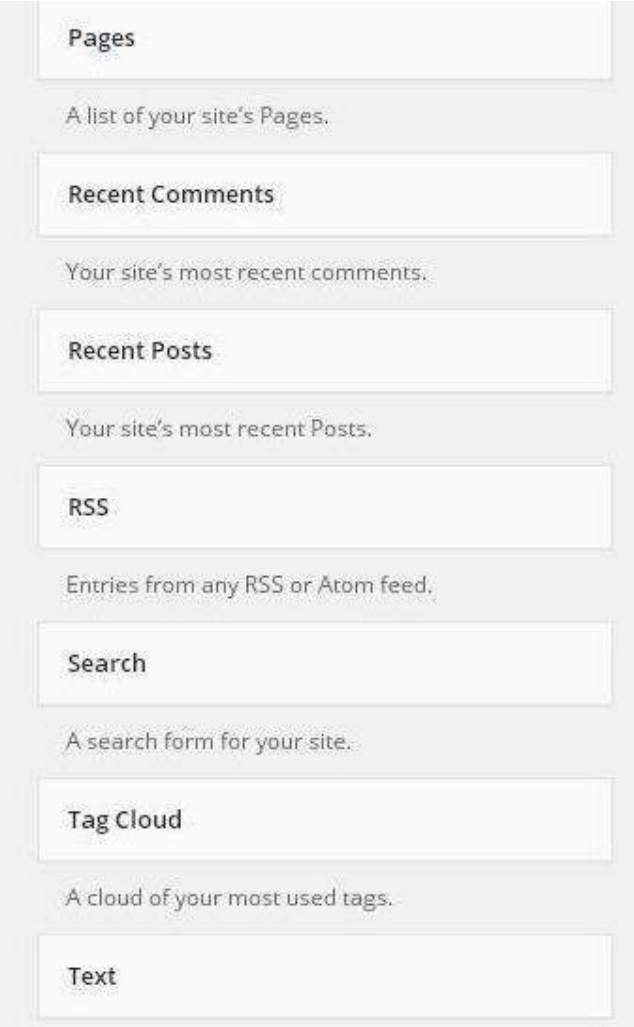


Step 2) The following screen will appear showing available widgets in the website.



Step 3) Click on ***Manage in Customizer,*** you will get the following widgets





Select the available ***widgets*** from above options to get them in your website.

8.7 SUMMARY

In this Manual, we practice how to create work on Google analytics, AJAX and WordPress.

We saw that Google Analytics gives you a free feature to get your website ready for different users. AJAX is all about updating content of webpage without reloading it. In addition, you can create simple blog to fully customizable website in WordPress.

8.8 GLOSSARY

- **XAMPP:** ***XAMPP*** is a completely free, easy to install Apache distribution containing Apache, MySQL, PHP, and Perl.
- **Apache:** ***The Apache*** HTTP Server, colloquially called Apache, is free and open-source cross-platform web server software.

- **Web Server:** ***A web server*** is a computer system that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web.
- **AJAX: AJAX** stands for ***A****synchronous* ***J****avaScript and* ***X****ML,* is a set of techniques for creating highly interactive websites and web applications.

8.9 ANSWER TO CHECK YOUR PROGRESS

Q1. Why AJAX is used?

Q2. Explain CMS?

Q3. What do you understand by XMLHttpRequest object?

Q4. Why WordPress is most popular CMS used? Explain.

Q5. How do you install Plugins in WordPress?

Q6. Explain the difference between Posts and Pages in WordPress

Q7. What is WordPress Taxonomy?

Q8. What are advantages and disadvantages of WordPress?

Q9. Explain Theme in WordPress.

Q10. How WordPress is installed on local machine?

Q11. What do you mean by publishing a CMS? Explain the steps of publishing.

Q12. Explain AJAX with the help of an example.

Q13. What is the difference between wordpress.com and wordpress.org? Explain?

8.10 REFERENCES/BIBLIOGRAPHY

- https://www.w3schools.com/
- http://www.tutorialspoint.com/
- https://www-s.acm.illinois.edu/
- http://www.springer.com/gp/book/

8.11 SUGGESTED READINGS

- https://www.w3schools.com/xml/ajax_intro.asp
- http://api.jquerymobile.com/
- https://www.google.com/analytics/
- https://www.tutorialspoint.com/wordpress/index.htm
- https://learn.wordpress.com/

UNIT- 9 [Part 1]

SEARCH ENGINE OPTIMIZATION (SEO)- I

9.1 INTRODUCTION

We use different search engines like Google, Bing and Yahoo to search anything on web. One can search web pages, content/text, videos, images etc on these search engines. There are no payments or charges are involved with search, but in case of paid search ads payment has to be done in case user wants to optimize his or her web site, improve its visibility, and quality. Then, go for Search engine optimization. Search engine optimization means improving the visibility of a webpage, website or web portal. Your web site will be more visible to users on web search engine. It also increases the quality and quantity of your web site traffic. Search engine optimization may consider following kinds of searches:

- Text search
- Image search
- Video search

- Audio Search
- Academic Search
- News search
- Area-specific searches, etc.

There are a number of techniques used for optimizing a website. It may include-

- Editing the contents of website for specific search
- Adding the content on website as per specific search
- Modifying the HTML and HTML associated coding so that specific keywords could be improved
- To remove the hindrance caused by indexing activities of search engines like Bing, Google and Yahoo.
- For promoting a website, one must increase the number of backlinks. These backlinks are also called inbound links.
- To focus on mobile search along with desktop search.

Search engine optimization is an important part of Internet marketing strategy. It tells us how search engines work. It records the people's search behaviour on search engines and search keywords they type during internet search. It also notices that the choice of particular search engines is preferred by the user. Search engine optimization increases the number of visitors on the website which can be easily converted into customers. It also helps increase website ranks and quickly displays the search engine results page (SERP).

Search engine optimization is different from the local search engine optimization. Local search engine optimization means local search on a particular web site. It is search of any tap or content inside the web page. User can enter products or services as local search. You can learn search engine optimization by some easy-to-understand video.

9.2 OBJECTIVES

After successful completion of this unit, you will be able to-

- Increase your online visibility.
- Help build your website as a brand.
- Optimized website towards more user traffic.
- Boost your credibility and authority.
- Improve user experience and stay ahead of your competitors.

9.3 SEARCH ENGINE OPTIMIZATION LIBRARY

Search engine optimization has a huge library where one can optimize many things during search engine optimization. You have to consider all aspects during search engine optimization. Following are the aspects which could be taken care for search engine optimization-

- Feeds and Blogs
- Doorway Pages and Cloaking
- Content & Writing
- Robots and Crawling
- URLs and Domains
- Duplicate Content
- Flash
- General
- Image Search
- Local
- Mobile Search
- Redirects and Moving Sites
- Spamming
- Sitemaps and Submitting
- Tagging
- Titles and Descriptions
- Video Search

The search engine optimization can be done on following main search engines, e.g. Google search engine optimization, Bing search engine optimization and Yahoo search engine optimization.

9.4 SEARCH ENGINE OPTIMIZATION TECHNIQUE

Many companies prepare their website without considering search engine optimization and are not more successful. Following are some primary steps for search engine optimization, which should be considered while preparing a successful website:

- Figure out what companies' customers are searching?
- How to optimize companies web pages (for their target keywords)?
- How to confirm that your website is accessible by customers and search engines?
- How other websites are linked with companies' website?

Search engine optimization Case study-

(Source: https://ahrefs.com/blog/seo-basics/)

Suppose you run a hotel in Dublin, Ireland but the website developer of that hotel doesn't apply the Search engine optimization. Suppose the customers of the hotel are searching as:

'accommodation in Dublin'

'place to stay in Dublin'

'hotels in Dublin'

Notice that what your customers are searching you should record them. You can also ask them directly to your website. Some more idea should also be collected. We must consider following points:

a) You have to find out the most popular searching way of people.

b) You have to write down the way customer or people search your web site. You have to write down the exact words and exact phrases. Write down which word or phrase is asked by majority of people.

c) The noted words or phrases should be used for Google search. You should mention these phrases in your webpage.

Suppose any customers or tourist searching the hotel at Dublin, Ireland as:

Fig. 7.1Google Search Box (Source: https://ahrefs.com/blog/seo-basics/)

Following are some search results of above query:

Fig. The customers search result of the hotel Dublin, Ireland (Source: https://ahrefs.com/blog/seo-basics/)

After few seconds many results came and each search the common phrase “Dublin hotels” is displayed in the title. So, this is very important for optimizing the title tags for search engine optimization. Therefore it’s (“Dublin hotels”) is the one of the most popular styles that people search for places to stay in Dublin.

Now, we will mention the above keyword search term in Ahrefs Keywords Explorer as following Fig.

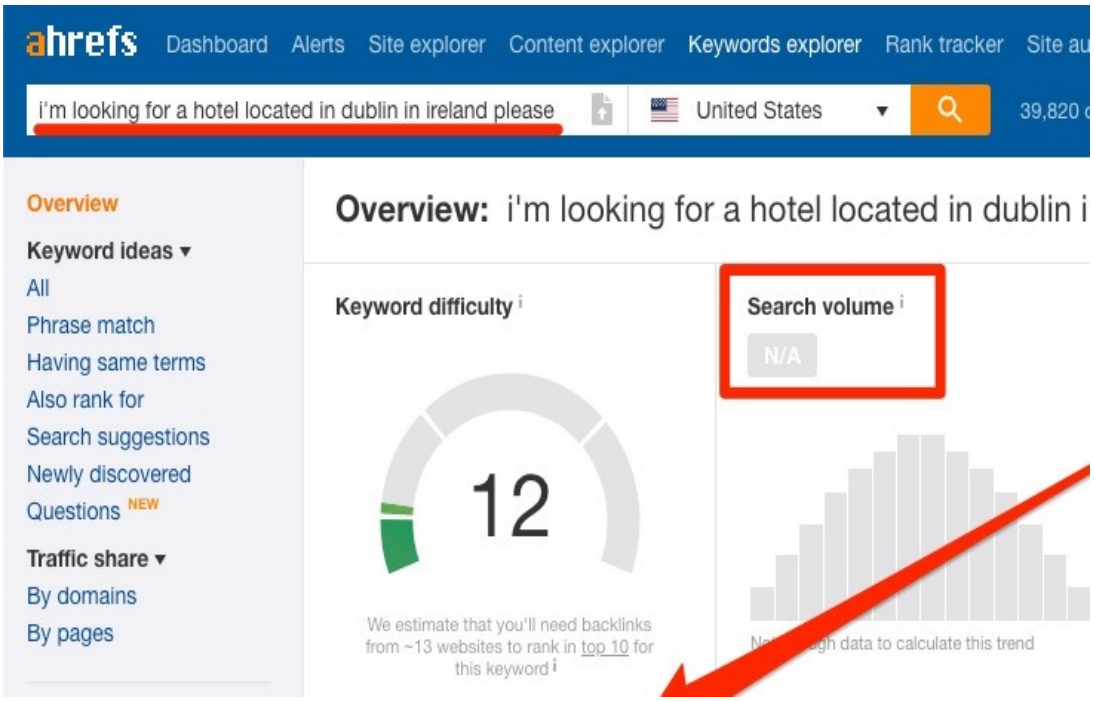


Fig. The keyword search term in Ahrefs Keywords Explorer(Source: https://ahrefs.com/blog/seo-basics/)

When you search for the phrase "Dublin hotels" in Keywords Explorer it will display highest search volume around 9,000. It shows good traffic. This is the actual targeted keyword to search. Now, you can see at the Search engine results page(SERP) for "Dublin hotels" in Keywords Explorer. Following is the snapshot of it:

Fig. Search engine results page (SERP) for "Dublin hotels" in Keywords Explorer (Source: https://ahrefs.com/blog/seo-basics/)

You can see the "Kw." column, which shows top 10 web pages ranking. It shows number of keywords searches. On average 150–200 keywords search is there. These web pages receive

traffic ore then hundreds of other related keywords. People can search “Dublin hotels” by different ways. Now you can get a meaning of other keywords by more Google search methods.

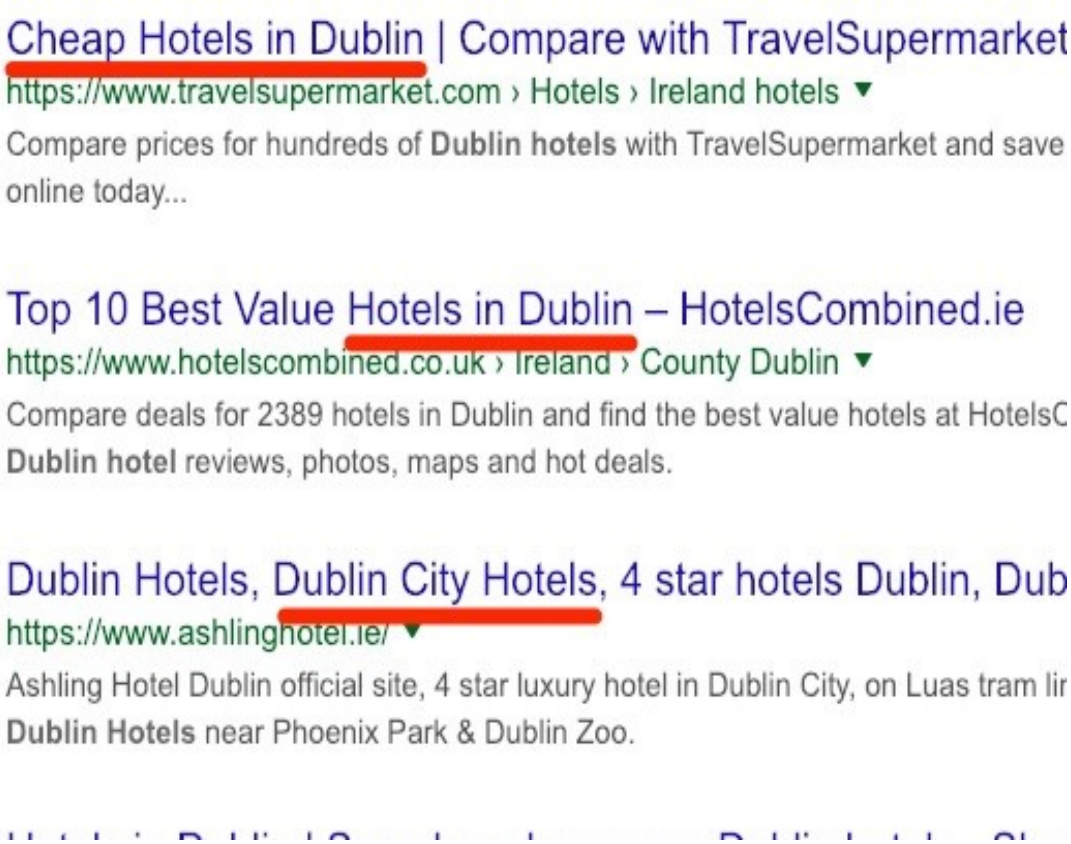


Fig. Keywords by more Google search methods (Source: https://ahrefs.com/blog/seo-basics/)

In the above fig you can see more similar & related phrases display again and again. You can see the phrases like” “Dublin city hotels”, “hotels in Dublin”, and “cheap hotels in Dublin”. These companies have already known above keywords and phrases; therefore, they have included them in their title tags. For more suggestions, try the Also rank for report in Keywords Explorer.

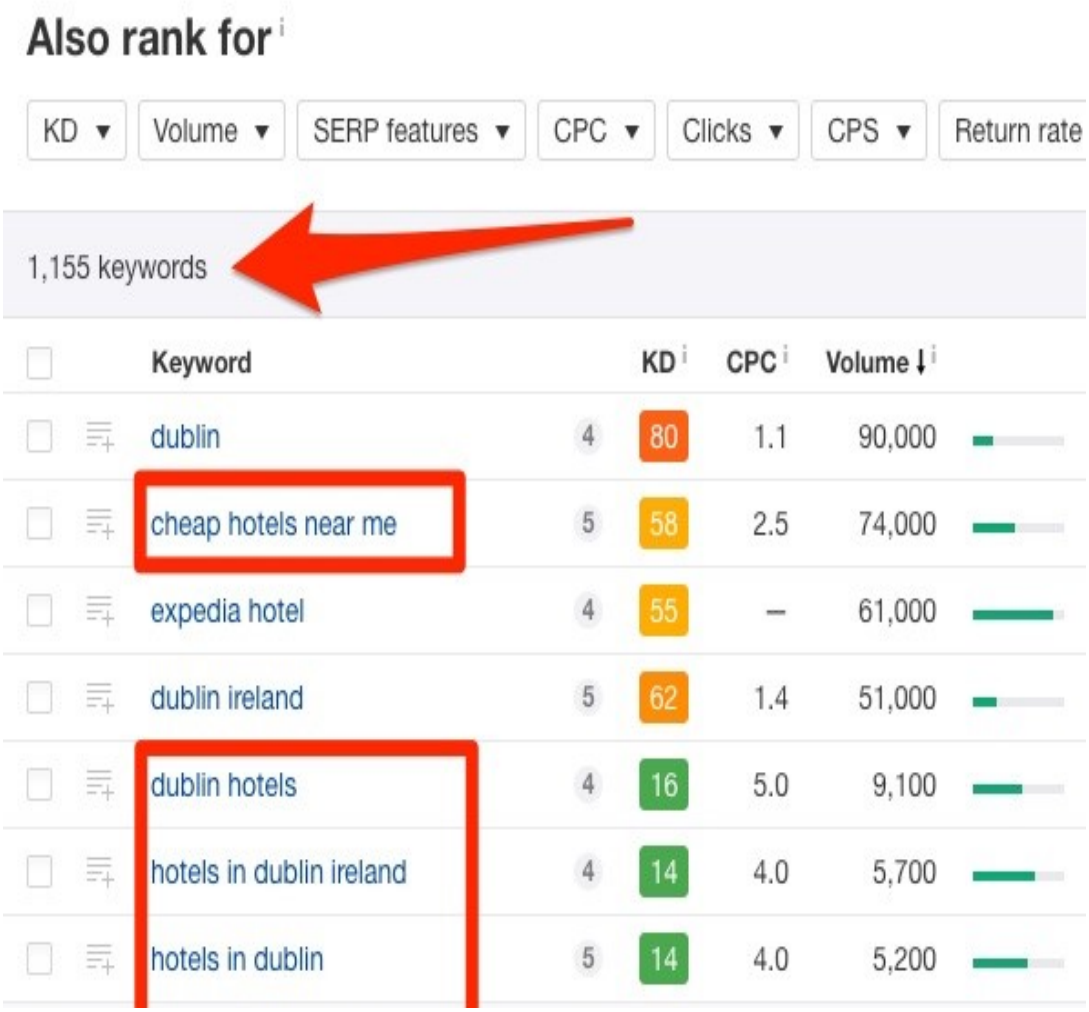


Fig. Also rank for window (Source: https://ahrefs.com/blog/seo-basics/)

The above report shows the different keywords for which the top ten ranking pages rank. But above report surfaces many keywords. Now you have to select most relevant results. It may be 2–3 most relevant top-ranking pages. You can paste these most relevant results into Ahrefs Content Gap tool. You can find out the common keywords for that all of these page's rank.

Google has auto completed results feature. You can open Google and type any query in the search box but do not press Enter key as Fig7. Automatically the Google will display many search terms which can be used by user:

Fig. Google's autocomplete results (Source: https://ahrefs.com/blog/seo-basics/)

The above report effectively automates shows Google auto complete along with Search Engine Optimization.

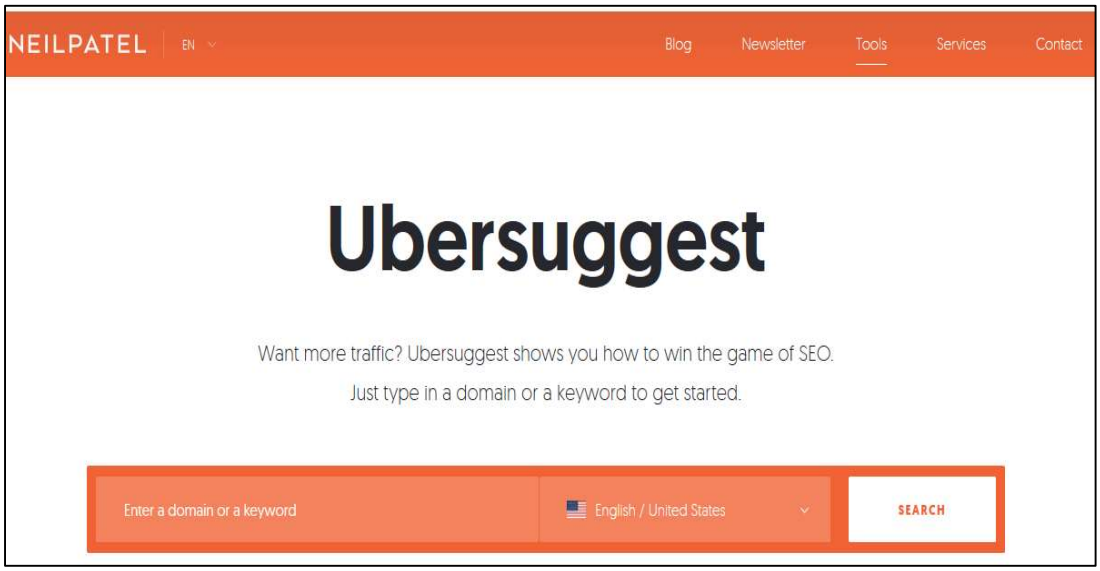
9.5 SEARCH ENGINE OPTIMIZATION TOOLS

There are a number of tools for Search Engine Optimization to help improve your website's online visibility. These tools improve your website keyword research. This keyword research is the one of the primary steps for Search Engine Optimization. Keyword research is part of a good SEO strategy. There are several tools specifically prepared to identify the best possible keywords for your business as already discussed in previous topic. Following are some Search Engine Optimization tools- Ubersuggest, KeywordTool.io and Google Keyword. Planner

Ubersuggest-

Ubersuggest is an amazing free tool for search engine optimization. This tool can find more than hundreds of new long tail keywords in few seconds or minutes. This tool collects data from Google Suggest. Google Suggest display keyword ideas similar and related, of whatever you search on Google. If you look atthe top SEO pages report, you will find your competitor's pages. Following is the snap shot of Ubersuggest:

Fig. 7.8 Ubersuggest search engine optimization Tool (Source:



https://longtailpro.com/ubersuggest/)

For example, you have a website. You want to find the "best running shoes" for different situations and for different people. After typing phrase "running shoes," you will get following results:

Now you can paste above idea in other tool like longtailpro.com (Long Tail Pro). You can critically analyze low competitiveness score, and a fair amount of search volume of each keyword. Within few minutes or seconds, you have number of excellent keywords.

KeywordTool.io

KeywordTool.io is another tool for search engine optimization. This tool can also find more than hundreds of new long tail keywords in few seconds or minutes. Again, if you want to see the phrase "best running shoes".. Following is the snap shot of KeywordTool.io:

Fig. 7.9 Search Result ideas (Source: https://longtailpro.com/ubersuggest/)

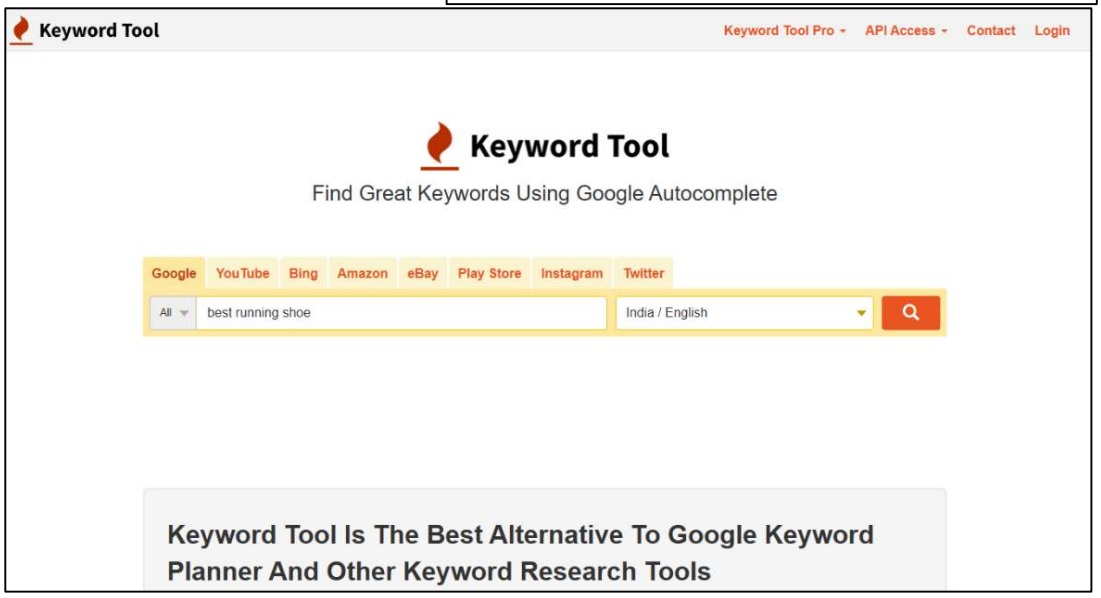
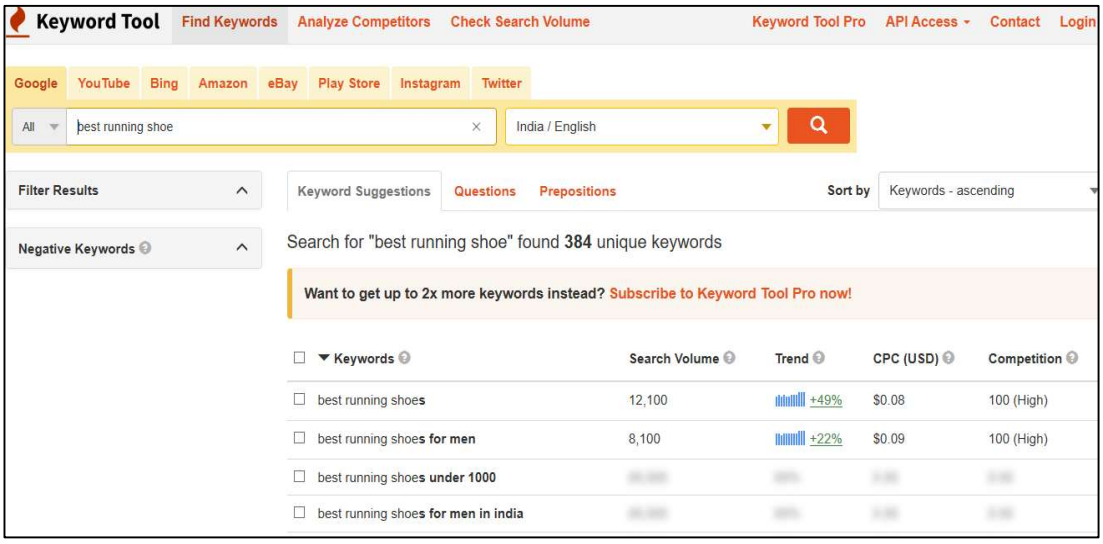


Fig. KeywordTool.io search engine optimization Tool (Source: https://keywordtool.io/)

The above Keyword tool is one of the suitable substitutes of Google Keyword Planner. It is one of the best Keyword Research Tool. You can type keyword according to a particular company and language. Search volume data can be collected from Google, YouTube, Bing, Play Store, Instagram, and Twitter. Following is the result of the phrase "best running shoes



"on KeywordTool.io.

Fig. KeywordTool.io Find Keywords (Source: https://keywordtool.io/)

You can see the search volume, trend, CPC (USD) and competition in ascending order. You can filter your result and also mention the negative keywords.

Google Keyword Planner

It is a free Google Ads tool. This is helpful for digital marketing and new or professional advertising personnel. It also helps you select competitive bids and budgets. Following are steps for using Google Keyword Planner:

- Step 1: Access the Google Keyword Planner.
- Step 2: Choose the Tool.
- Step 3: Filter and Sort the Results.
- Step 4: Analyse the Keyword Ideas Section.
- Step 5: Choose a Keyword

9.6 TOOLS TO SIMPLIFY ON-PAGE AND OFF PAGE OPTIMIZATION

Optimizing a page's on-page elements is an essential part of the search engine optimization process. Following are On-Page Optimization tools, e.g. Screaming Frog, SEMrush, Redirect Path,etc.

Screaming Frog-Screaming Frog helps you quickly identify issues from your website. This tool provides you an immense amount of data. SEO Spider is a small computer program. You can install this program on your PC, Spiders Web site links, CSS, images, script and apps. Screaming Frog search engine optimization permits you to quickly review or analyze a website from an onsite search engine optimization perspective. This tool comes handy in analyzing medium to large websites. Manually checking of each page these websites would be highly labour intensive. You can easily miss a redirect, meta refresh or duplicate page issue on this website. Spider tool permits you to export key onsite search engine optimization elements like meta descriptions, URL, page title, and headings to Excel.

Off page Optimization-

Another essential part of search engine optimization is off-page optimization, which basically involves earning backlinks. Two popular tools for identifying new opportunities for link building include Ahrefs and Open Site Explorer.

Ahrefs- This tool increases your search traffic. It also researches your competitors. Ahrefs tool monitor your niche. Ahrefs informs you how your competitor's rank is increased. It also suggests you how to outrank your competitor. Following page is shows Ahrefs Rank of teespring.com:

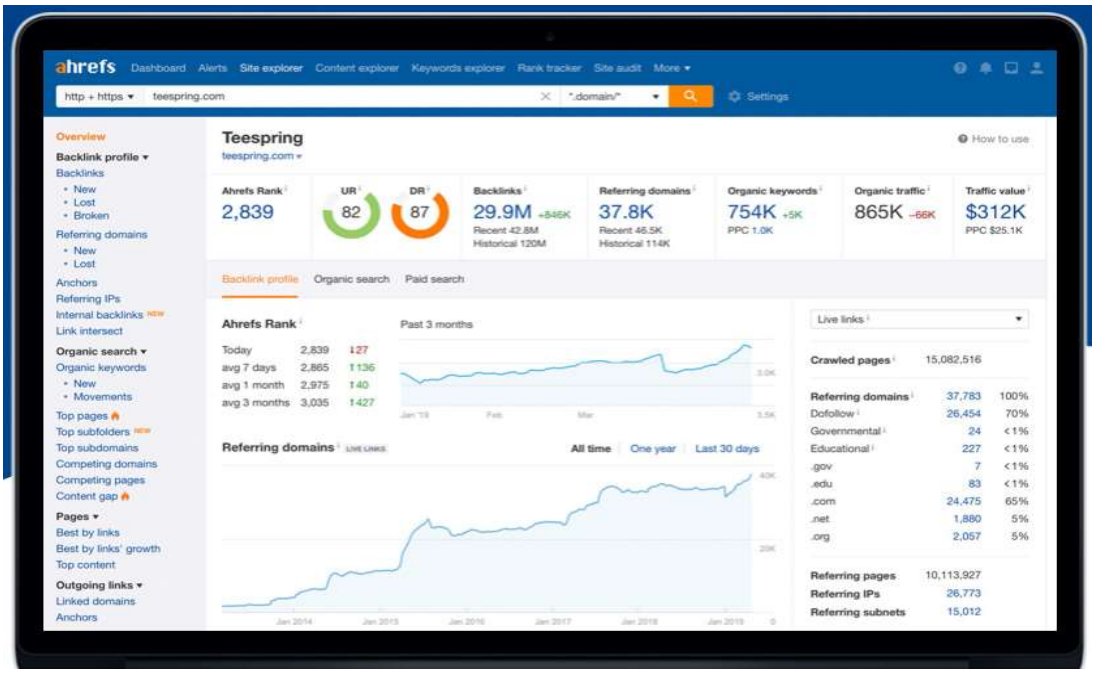


Fig. Ahrefs tool for search traffic (Source: https://ahrefs.com/)

You can perform following operations on Ahref tool:

- Competitive Analysis
- Keyword Research
- Backlink Research

- Content Research
- Rank Tracking
- Web Monitoring

You can perform above operation through Ahrefs tool. However, you can add new tools and features regularly. Following are the tools offered by Ahrefs:

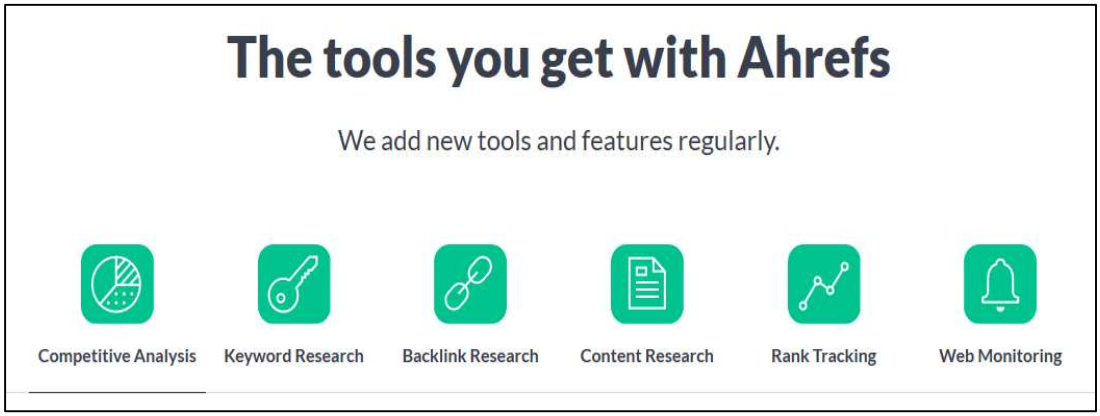


Fig. Ahrefs tools (Source: https://ahrefs.com/)

9.7 RESULTS MONITORING TOOLS

Result monitoring tools measure the impact of changes made on your website, e.g. Google Analytics, Google Search Console.

Google Analytics- Google Analytics is a tool which gets deeper and closer understanding of your customers. It is a free tool by Google and helps you analyze data for your organization in one or single place. It is a web analytics service which reports and tracks website traffic. Google Analytics is also under Google Marketing Platform brand.

It is one of the most commonly used web analytics service on the web. It also permits gathering usage data of Androidapp, and iOS. This type of tool is known as Google Analytics for Mobile Apps. You can block Google Analytics by your browsers, or/and firewalls. (Source: https://en.wikipedia.org/wiki/Google_Analytics)

9.8 TOOLS TO IMPROVE YOUR CONVERSION RATE

The main goal of search engine optimization is not only to attract traffic but also to convert the traffic into customers and clients for your company and business. Your website is designed as per the need of customer and should be designed to encourage conversions. The following search engine optimization tools can help you measure the performance of your website. These tools identify opportunities for improvement in your website, e. g. GTMetrix, Crazy Egg, etc.

GTMetrix-

This tool makes your website fast for every user. GTMetrix tool test your web page in different countries, different browsers, and in different connection speeds. It also optimizes your website. Following is the snapshot of https://gtmetrix.com/ which is showing above all features:

Fig. GTMetrix tool (Source: https://gtmetrix.com/)

The above GTMetrix tool displays the latest performance report. It displays region wise performance of your website. Middle part of the above fig shows the comparative page speed score and total page size and fully page loading time. The bottom apart shows the page speed and other feature of your web site.

Using GTMetrix tool you can keep track of your web page performance with scheduled monitoring. You can visualize this performance with interactive graphs. As given in following fig.15. You can find and get benefited by the following through graphs:

- Monitor pages
- Run a test daily, weekly or monthly
- To ensure optimal performance
- Visualize performance with graphs
- Graphs show: Page Load Time, Page Size & Request Counts and PageSpeed and YSlow scores
- To define a date interval to extract specific performance history
- Annotate areas of interest on your graph
- Give your data context

- Set alerts of Page Speed/YSlow scores
- Set alerts of Page load time
- Set alerts of Total Page size.

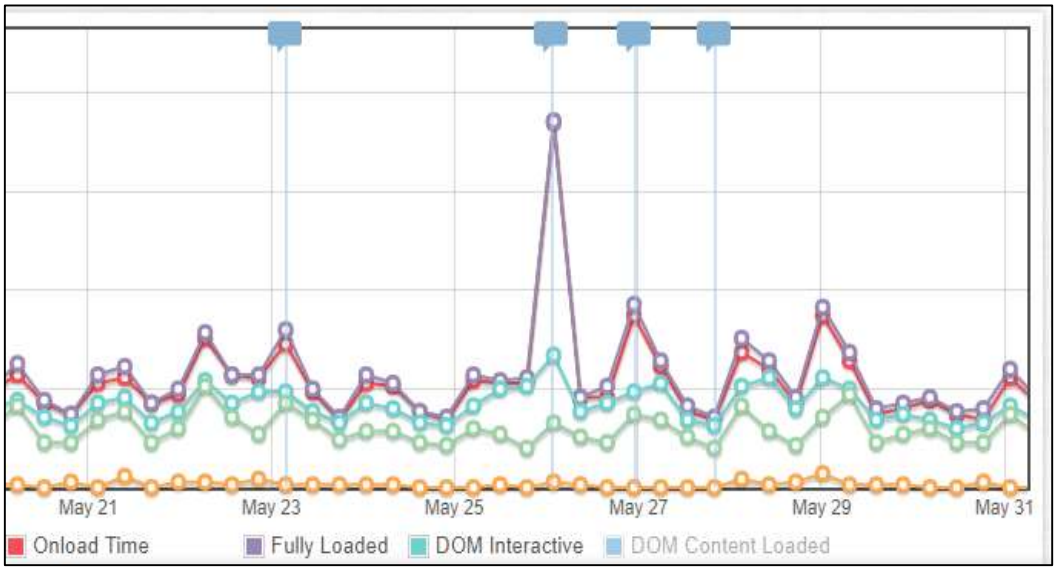


Fig. Page load time by GTMetrix tool (Source: https://gtmetrix.com/)

It provides the following detailed assessment:

- PageSpeed and YSlow scores and recommendations
- Page Load Details (time, size, number of requests)
- Various Analysis Options.
- Waterfall, Video and Report History

(Source: https://gtmetrix.com/)

9.9 POINTS TO REMEMBER

- Search engine can search web pages, content/text, videos, images, etc. There are no payments or charges are involved with search, but in case of paid search ads payment will be involved.
- Search engine optimization means improving the visibility of a webpage, website or web portal.
- Search engine optimization is an important part of Internet marketing strategy
- Many companies prepare their website without considering search engine optimization, without search engine optimization these websites are not more successful.
- The search engine optimization has huge library.
- For search engine optimization, you have to write down the way customer or people search your web site. You have to write down the exact words and exact phrases. Write down which word or phrase is asked by the majority of people.

- Google has auto completed results feature. You can open Google and type any query in the search box but do not press Enter key and automatically Google will display many search terms which can be used by user.
- There are a number of tools for Search Engine Optimization. These tools help improve your website's online visibility.
- GTMetrix and Crazy Egg tools help you measure the performance of your website and these tools will identify opportunities for improvement in your website.
- Google Analytics and Google Search Console tools measure the impact of changes made on your website.
- To optimize any website is a very complex task. Sometimes, search engine optimization is very challenging process. Search engine optimization sometime takes time. It requires good planning, and patience optimizing. Search engine optimization can help you to boost your business, your credibility, popularise you, earn more traffic, and improve your online visibility. Search engine optimization is a very great way improves customer experience and improves the brand value of your product. It will create the website as per customer needs. By this you can develop a user-friendly site. Finally, if you do your web site optimization then you don't need to worry about digital marketing of your web site.

9.10 GLOSSARY

- **Search engine results page (SERP)**-It quickly displays the search engine results page.
- **Ubersuggest-** Is a free tool for search engine optimization. This tool can find more than hundreds of new long tail keywords in few seconds or minutes.
- **KeywordTool.io-** Is another tool for search engine optimization. This tool can also find more than hundreds of new long tail keywords in few seconds or minutes.
- **Google Keyword Planner-** It is a free Google Ads tool. This is helpful for digital marketing and for new or professional advertising personnel. It also helps you select competitive bids and budgets.
- **Ahrefs-** This tool increases your search traffic. It also researches your competitors. Ahrefs tool monitor your niche. Ahrefs informs you how your competitors rank increased. It can suggest you how to outrank your competitor.
- **GTMetrix-** This tool makes your website fast for every user. GTMetrix tool test your web page in different countries, different browsers, and in different connection speeds. It also optimizes your website.

9.11 CHECK YOUR PROGRESS

Descriptive type questions-

a) What are the objectives of search engine optimization? Explain search engine optimization library? Explain each term of search engine optimization library?

b) What do you understand by paid search ads? What are their benefits? Explain.

c) What do you understand by Search engine results page (SERP)? Which tool is used to Search engine results page (SERP)? Explain.

d) What is Ahrefs Keywords Explorer? What is the role of this tool? Explain.

e) What do you understand by Google's auto complete results? What are its benefits? Explain with the help of example.

f) What do you understand by Search Engine Optimization tools? What are the different Search Engine Optimization tools? Explain each of them.

g) Which tools are used to improve off-page optimization? Also explain the tools which are the excellent choices to identify new opportunities for link building.

h) Which tool makes your website fast for every user? Also explain how to optimize websites?

i) How GTMetrix tool test your web page in different countries, browsers, and in different connection speeds? Explain.

j) How GTMetrix tool helps you keep a track of your web page performance with scheduled monitoring? How can one visualize web page performance?

Objective type questions-

a) SEO stands for.....

b) SERP stands for.....

c) SEO library is a.....

d) Ahrefs stands for.....

e) Ubersuggest, KeywordTool.ioare.....

f) Google Keyword Planner is a free.....

g) Ahrefs Open and ..... tools are the excellent choices to identify new opportunities for link building.

h) .....and.....tools help you measure the performance of your website and these tools will identify opportunities for improvement in your website

i) Google Analytics and ..... tools measure the impact of changes made onto your website.

j) Competitive Analysis and Keyword Research operations can be performed by ..... tool.

9.12 BIBLIOGRAPHY/ REFERENCES

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- https://fortunelords.com/ubersuggest/
- https://keywordtool.io/
- https://ahrefs.com/
- https://gtmetrix.com/

9.13 SUGGESTED READINGS

- Google's "Search Engine Optimization Starter Guide." This is a free PDF download that covers basic tips that Google provides to its own employees on how to get listed.
- Moz's "Beginner's Guide To SEO," which present SEO Success Pyramid from Small Business Search Marketing.

UNIT- 9 [Part 2]
SEARCH ENGINE OPTIMIZATION- II

9.1 INTRODUCTION

Search engines such as Google and Bing use bots to crawl pages on the web, going from site to site, collecting information about those pages and putting them in an index. Next, algorithms analyze pages in the index, taking into account hundreds of ranking factors or signals, to determine the order pages should appear in the search results for a given query.

Search ranking factors can be considered proxies for aspects of the user experience. Our Periodic Table of SEO Factors organizes the factors into six main categories and weights each based on its overall importance to SEO. For example, content quality and keyword research are key factors of content optimization, and crawlability and mobile-friendliness are important site architecture factors.

The search algorithms are designed to surface relevant, authoritative pages and provide users with an efficient search experience. Optimizing your site and content with these factors in mind can help your pages rank higher in the search results.

SEO is a fundamental part of digital marketing because people conduct trillions of searches every year, often with commercial intent to find information about products and services. Search is often the primary source of digital traffic for brands and complements other marketing channels. Greater visibility and ranking higher in search results than your competition can have a material impact on your bottom line.

However, the search results have been evolving over the past few years to give users more direct answers and information that is more likely to keep users on the results page instead of driving them to other websites.

Also note, features like rich results and Knowledge Panels in the search results can increase visibility and provide users more information about your company directly in the results.

This unit will also helpful to enhance the skills and knowledge in the following terms-

- **Increasing the Significant Traffic:** The optimization of the website can be done properly by creating the keyword targeted content. Good quality content on the website provides ultimate results in very less time. It drives direct traffic from the search engines to your website.
- **Generating E-commerce Sales:** Another objective of SEO is that helps you generate relevant traffic to your e-commerce website which often leads to the generation of sales. Once you have successfully implemented the SEO strategies on your e-commerce website then you can expect extremely high conversion rates.
- **Branding:** The branding is another powerful tool for the application of SEO. The branding is closely related to creating brand awareness and recognition. You must have noticed that the websites which remain at the top of the search engine ranks get more traffic and popularity. These websites use this exposure to bolster the brand recognition and authority of their brand.
- **Reputation Management:** The businesses who are willing to populate the search results with relevant and positive links. The use of SEO enables this process with the help of content creation and its promotion through link building. Reputation management is considered as one of the most challenging tasks of search engine optimization. This practice involves the optimization of pages on different domains. It uses various social media profiles, public relations, press releases, etc for this task.
- **Lead Generation:** Millions of search queries are made every day on the search engines and most of them have commercial intents. You just have to follow the right SEO strategies for maximizing the lead generation on your website. The more often people

would visit your website, the more likely they would trust you. This can only be achieved by improving the ranking of your website through SEO.

9.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Know the working of search engines.
- Understand Crawling, Ranking and indexing.
- Define search engine challenges.

9.3 HOW SEARCH ENGINE WORKS?

Search engines have three primary functions:

(i) Crawl: Scour the Internet for content, looking over the code/content for each URL they find.
(ii) Index: Store and organize the content found during the crawling process. Once a page is in the index, it's in the running to be displayed as a result to relevant queries.
(iii) Rank: Provide the pieces of content that will best answer a searcher's query, which means that results are ordered by most relevant to least relevant.

What is search engine crawling?

Crawling is the discovery process in which search engines send out a team of robots (known as crawlers or spiders) to find new and updated content. Content can vary it could be a webpage, an image, a video, a PDF, etc. but regardless of the format, content is discovered by links. Googlebot starts out by fetching a few web pages, and then follows the links on those webpages to find new URLs. By hopping along this path of links, the crawler is able to find new content and add it to their index called Caffeine a massive database of discovered URLs to later be retrieved when a searcher is seeking information that the content on that URL is a good match for.

What is a search engine index?

Search engines process and store information, they find in an index, a huge database of all the content they've discovered and deem good enough to serve up to searchers.

Search engine Ranking

When someone performs a search, search engines scour their index for highly relevant content and then orders that content in the hopes of solving the searcher's query. This ordering of search results by relevance is known as ranking. In general, you can assume that the higher a website is ranked, the more relevant the search engine believes that site is to the query. It's possible to block search engine crawlers from part or your entire site, or instruct search engines to avoid storing certain pages in their index. While there can be reasons for doing this, if you want your

content found by searchers, you have to first make sure it's accessible to crawlers and is indexable. Otherwise, it's as good as invisible.

Crawling

Can search engines find your pages?

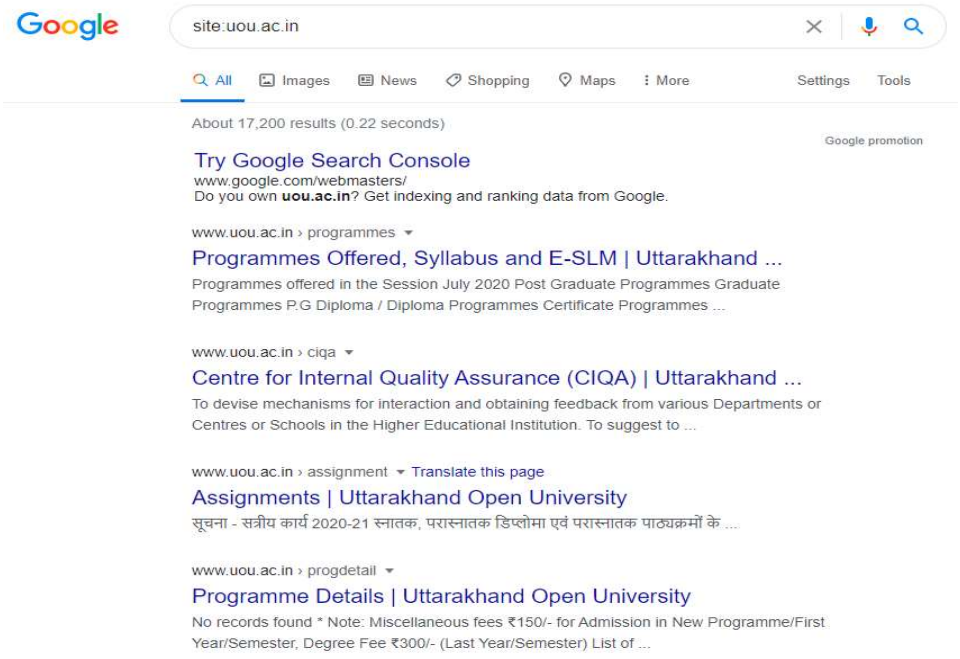
As you've just learned, making sure your site gets crawled and indexed is a prerequisite to showing up in the SERPs. If you already have a website, it might be a good idea to start off by seeing how many of your pages are in the index. This will yield some great insights into whether Google is crawling and finding all the pages you want it to, and none that you don't.

One way to check your indexed pages is "site: yourdomain.com", an advanced search operator. Head to Google and type "site: yourdomain.com" into the search bar. This will return results Google has in its index for the site specified.

9.4 UNDERSTANDING CRAWLING

As you've just learned, making sure your site gets crawled and indexed is a prerequisite to showing up in the SERPs. If you already have a website, it might be a good idea to start off by seeing how many of your pages are in the index. This will yield some great insights into whether Google is crawling and finding all the pages you want it to, and none that you don't.

One way to check your indexed pages is "site: yourdomain.com", an advanced search operator. Head to Google and type "site: yourdomain.com" into the search bar. This will return results Google has in its index for the site specified:



The number of results Google displays (see “About XX results” above) isn't exact, but it does give you a solid idea of which pages are indexed on your site and how they are currently showing up in search results. For more accurate results, monitor and use the Index Coverage report in Google Search Console. You can sign up for a free Google Search Console account if you don't currently have one. With this tool, you can submit sitemaps for your site and monitor how many submitted pages have actually been added to Google's index, among other things. If you're not showing up anywhere in the search results, there are a few possible reasons why:

- Your site is brand new and hasn't been crawled yet.
- Your site isn't linked to from any external websites.
- Your site's navigation makes it hard for a robot to crawl it effectively.
- Your site contains some basic code called crawler directives that is blocking search engines.
- Your site has been penalized by Google for spammy tactics.

Can crawlers find all your important content?

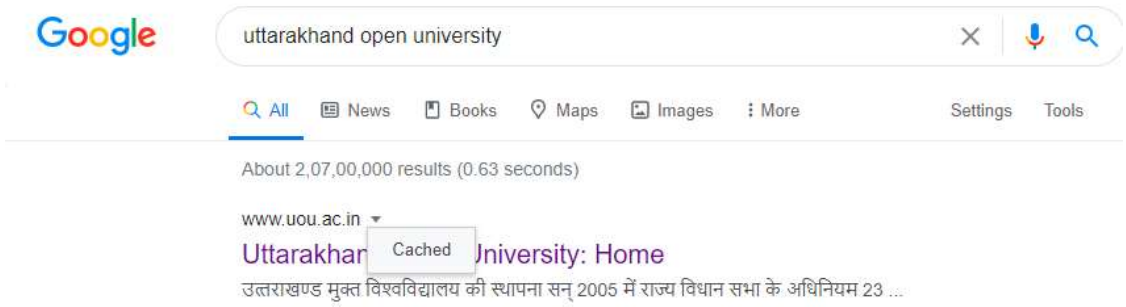
Now that you know some tactics for ensuring search engine crawlers stay away from your unimportant content, let’s learn about the optimizations that can help Googlebot find your important pages. Sometimes a search engine will be able to find parts of your site by crawling, but other pages or sections might be obscured for one reason or another. It's important to make sure that search engines are able to discover all the content you want indexed, and not just your homepage.

9.5 UNDERSTANDING INDEXING

Once you’ve ensured your site has been crawled, the next order of business is to make sure it can be indexed. That is right just because your site can be discovered and crawled by a search engine doesn’t necessarily mean that it will be stored in their index. In the previous section on crawling, we discussed how search engines discover your web pages. The index is where your discovered pages are stored. After a crawler finds a page, the search engine renders it just like a browser would. In the process of doing so, the search engine analyzes that page's contents. All of that information is stored in its index.

Google crawls and caches web pages at different frequencies. More established, well-known sites that post frequently like https://www.nytimes.com will be crawled more frequently than the much-less-famous website for Roger the Mozbot’s side hustle, http://www.rogerlovescupcakes.com (if only it were real…)

You can view what your cached version of a page looks like by clicking the drop-down arrow next to the URL in the SERP and choosing "Cached":



You can also view the text-only version of your site to determine if your important content is being crawled and cached effectively.

Are pages ever removed from the index?

Yes, pages can be removed from the index! Some of the main reasons why a URL might be removed include:

- The URL is returning a "not found" error (4XX) or server error (5XX) – This could be accidental (the page was moved and a 301 redirect was not set up) or intentional (the page was deleted and 404ed in order to get it removed from the index)
- The URL had a noindex meta tag added – This tag can be added by site owners to instruct the search engine to omit the page from its index.
- The URL has been manually penalized for violating the search engine's Webmaster Guidelines and, as a result, was removed from the index.
- The URL has been blocked from crawling with the addition of a password required before visitors can access the page.

If you believe that a page on your website that was previously in Google's index is no longer showing up, you can use the URL Inspection tool to learn the status of the page, or use Fetch as Google which has a "Request Indexing" feature to submit individual URLs to the index. (Bonus: GSC's "fetch" tool also has a "render" option that allows you to see if there are any issues with how Google is interpreting your page).

Tell search engines how to index your site

[1] Robots Meta directives

Meta directives (or "meta tags") are instructions you can give to search engines regarding how you want your web page to be treated.

You can tell search engine crawlers things like "do not index this page in search results" or "don't pass any link equity to any on-page links". These instructions are executed via Robots Meta Tags in the <head> of your HTML pages (most commonly used) or via the X-Robots-Tag in the HTTP header.

[2] Robots meta tag

The robots meta tag can be used within the <head> of the HTML of your webpage. It can exclude all or specific search engines. The following are the most common meta directives, along with what situations you might apply them in.

[3] index/noindex tells the engines whether the page should be crawled and kept in a search engines' index for retrieval. If you opt to use "noindex," you're communicating to crawlers that you want the page excluded from search results. By default, search engines assume they can index all pages, so using the "index" value is unnecessary.

When you might use: You might opt to mark a page as "noindex" if you're trying to trim thin pages from Google's index of your site (ex: user generated profile pages) but you still want them accessible to visitors.

[4] follow/nofollow tells search engines whether links on the page should be followed or nofollowed. "Follow" results in bots following the links on your page and passing link equity through to those URLs. Or, if you elect to employ "nofollow," the search engines will not follow or pass any link equity through to the links on the page. By default, all pages are assumed to have the "follow" attribute.

When you might use: nofollow is often used together with noindex when you're trying to prevent a page from being indexed as well as prevent the crawler from following links on the page.

[5] noarchive is used to restrict search engines from saving a cached copy of the page. By default, the engines will maintain visible copies of all pages they have indexed, accessible to searchers through the cached link in the search results.

When you might use: If you run an e-commerce site and your prices change regularly, you might consider the noarchive tag to prevent searchers from seeing outdated pricing.

Here's an example of a meta robots noindex, nofollow tag:

```
<!DOCTYPE html><html><head><meta name="robots" content="noindex,
nofollow" /></head><body>...</body></html>
```

This example excludes all search engines from indexing the page and from following any on-page links. If you want to exclude multiple crawlers, like googlebot and bing for example, it's okay to use multiple robot exclusion tags.

[6] X-Robots-Tag

The x-robots tag is used within the HTTP header of your URL, providing more flexibility and functionality than meta tags if you want to block search engines at scale because you can use regular expressions, block non-HTML files, and apply sitewide noindex tags.

For example, you could easily exclude entire folders or file.

```
<Files ~ “\/?no\-bake\/.*”> Header set X-Robots-Tag “noindex, nofollow”</Files>
```

The derivatives used in a robots meta tag can also be used in an X-Robots-Tag. Or specific file types (like PDFs):

```
<Files ~ “\.pdf$”> Header set X-Robots-Tag “noindex, nofollow”</Files>
```

9.6 UNDERSTANDING RANKING

How do search engines ensure that when someone types a query into the search bar, they get relevant results in return? That process is known as ranking, or the ordering of search results by most relevant to least relevant to a particular query.

To determine relevance, search engines use algorithms, a process or formula by which stored information is retrieved and ordered in meaningful ways. These algorithms have gone through many changes over the years in order to improve the quality of search results. Google, for example, makes algorithm adjustments every day — some of these updates are minor quality tweaks, whereas others are core/broad algorithm updates deployed to tackle a specific issue, like Penguin to tackle link spam. Check out our Google Algorithm Change History for a list of both confirmed and unconfirmed Google updates going back to the year 2000.

Why does the algorithm change so often? Is Google just trying to keep us on our toes? While Google doesn’t always reveal specifics as to why they do what they do, we do know that Google’s aim when making algorithm adjustments is to improve overall search quality. That’s why, in response to algorithm update questions, Google will answer with something along the lines of: "We’re making quality updates all the time." This indicates that, if your site suffered after an algorithm adjustment, compare it against Google’s Quality Guidelines or Search Quality Rater Guidelines, both are very telling in terms of what search engines want.

What do search engines want?

Search engines have always wanted the same thing: to provide useful answers to searcher’s questions in the most helpful formats. If that’s true, then why does it appear that SEO is different now than in years past?

At first, their understanding of the language is very rudimentary - “See Spot Run.” Over time, their understanding starts to deepen, and they learn semantics - the meaning behind language and the relationship between words and phrases. Eventually, with enough practice, the student knows the language well enough to even understand nuance, and is able to provide answers to even vague or incomplete questions.

When search engines were just beginning to learn our language, it was much easier to game the system by using tricks and tactics that actually go against quality guidelines. Take keyword stuffing, for example. If you wanted to rank for a particular keyword like “funny jokes,” you might add the words “funny jokes” a bunch of times onto your page, and make it bold, in hopes of boosting your ranking for that term:

Welcome to funny jokes! We tell the funniest jokes in the world. Funny jokes are fun and crazy. Your funny joke awaits. Sit back and read funny jokes because funny jokes can make you happy and funnier. Some funny favourite funny jokes.

This tactic made for terrible user experiences, and instead of laughing at funny jokes, people were bombarded by annoying, hard-to-read text. It may have worked in the past, but this is never what search engines wanted.

The role links play in SEO

When we talk about links, we could mean two things. Backlinks or "inbound links" are links from other websites that point to your website, while internal links are links on your own site that point to your other pages (on the same site). Links have historically played a big role in SEO. Very early on, search engines needed help figuring out which URLs were more trustworthy than others to help them determine how to rank search results. Calculating the number of links pointing to any given site helped them do this.

Backlinks work very similarly to real-life WoM (Word-of-Mouth) referrals. Let's take a hypothetical coffee shop, Jenny's Coffee, as an example:

- Referrals from others = good sign of authority

Example: Many different people have all told you that Jenny's Coffee is the best in town

- Referrals from yourself = biased, so not a good sign of authority

Example: Jenny claims that Jenny's Coffee is the best in town

- Referrals from irrelevant or low-quality sources = not a good sign of authority and could even get you flagged for spam

Example: Jenny paid to have people who have never visited her coffee shop tell others how good it is.

- No referrals = unclear authority

Example: Jenny's Coffee might be good, but you've been unable to find anyone who has an opinion so you can't be sure.

This is why PageRank was created. PageRank (part of Google's core algorithm) is a link analysis algorithm named after one of Google's founders, Larry Page. PageRank estimates the importance of a web page by measuring the quality and quantity of links pointing to it. The assumption is that the more relevant, important, and trustworthy a web page is, the more links it will have earned. The more natural backlinks you have from high-authority (trusted) websites, the better your odds are to rank higher within search results.

The role content plays in SEO

There would be no point to links if they didn't direct searchers to something. That something is content! Content is more than just words; it's anything meant to be consumed by searchers

there's video content, image content, and of course, text. If search engines are answer machines, content is the means by which the engines deliver those answers.

Any time someone performs a search, there are thousands of possible results, so how do search engines decide which pages the searcher is going to find valuable? A big part of determining where your page will rank for a given query is how well the content on your page matches the query's intent. In other words, does this page match the words that were searched and help fulfill the task the searcher was trying to accomplish?

Because of this focus on user satisfaction and task accomplishment, there's no strict benchmarks on how long your content should be, how many times it should contain a keyword, or what you put in your header tags. All those can play a role in how well a page performs in search, but the focus should be on the users who will be reading the content.

Today, with hundreds or even thousands of ranking signals, the top three have stayed fairly consistent: links to your website (which serve as a third-party credibility signals), on-page content (quality content that fulfills a searcher's intent), and Rank Brain.

What is RankBrain?

RankBrain is the machine learning component of Google's core algorithm. Machine learning is a computer program that continues to improve its predictions over time through new observations and training data. In other words, it's always learning, and because it's always learning, search results should be constantly improving.

For example, if RankBrain notices a lower ranking URL providing a better result to users than the higher-ranking URLs, you can bet that RankBrain will adjust those results, moving the more relevant result higher and demoting the lesser relevant pages as a by-product.

9.7 SEO– TACTICS AND METHODS

SEO techniques are classified into two broad categories:

- **White Hat SEO** - Techniques that search engines recommend as part of a good design.
- **Black Hat SEO** - Techniques that search engines do not approve and attempt to minimize the effect of. These techniques are also known as spamdexing.

White Hat SEO

An SEO tactic is considered as White Hat if it has the following features:

- It conforms to the search engine's guidelines.
- It does not involve in any deception.
- It ensures that the content a search engine indexes, and subsequently ranks, is the same content a user will see.
- It ensures that a web page content should have been created for the users and not just for the search engines.

- It ensures good quality of the web pages.
- It ensures availability of useful content on the web pages.

Always follow a White Hat SEO tactic and do not try to fool your site visitors. Be honest and you will definitely get something more.

Black Hat or Spamdexing

An SEO tactic, is considered as Black Hat or Spamdexing if it has the following features:

- Attempting ranking improvements that are disapproved by the search engines and/or involve deception.
- Redirecting users from a page that is built for search engines to one that is more human friendly.
- Redirecting users to a page that was different from the page the search engine ranked.
- Serving one version of a page to search engine spiders/bots and another version to human visitors. This is called Cloaking SEO tactic.
- Using hidden or invisible text or with the page background color, using a tiny font size or hiding them within the HTML code such as "no frame" sections.
- Repeating keywords in the metatags, and using keywords that are unrelated to the website content. This is called metatag stuffing.
- Calculated placement of keywords within a page to raise the keyword count, variety, and density of the page. This is called keyword stuffing.
- Creating low-quality web pages that contain very little content but are instead stuffed with very similar keywords and phrases. These pages are called Doorway or Gateway Pages.
- Mirror websites by hosting multiple websites - all with conceptually similar content but using different URLs.
- Creating a rogue copy of a popular website which shows contents similar to the original to a web crawler, but redirects web surfers to unrelated or malicious websites. This is called page hijacking.

Always stay away from any of the above Black Hat tactics to improve the rank of your site. Search engines are smart enough to identify all the above properties of your site and ultimately you are not going to get anything. The website design and layout gives the first impression about your site. There are sites which are too fancy and regular net surfers just reach those sites and come out even without creating a single click.

9.8 DESIGN AND LAYOUT

Search engines are very smart but after all, they are software and not human being, who can read the content of their interest. If you make your site too complicated, then the search engine would not be able to parse the content of your site properly, and finally indexing would not be

efficient, which results in a low rank. The actual page content should have a keyword density of about 10% and should weigh in at about 200 words - but there are as many opinions about this as there are SEO experts. Some say, keyword density should be 5% and some say it should be 20%. You can go with 10% which is good enough. Here are a few guidelines that you should keep in mind while designing a web page.

- You should have more text content than HTML elements.
- No frames. They are the enemies of search engines, and search engines are enemies of frames.
- No ads if possible. Because most of the ads use Java-Script which is not advised to be used.
- No JavaScript. If you need JavaScript, call it from an external file rather than dumping the code in the HTML file. JavaScript drop-down menus prevent spiders from crawling beyond your homepage. If you use them, be sure to include text links at the bottom of the page.
- Do not put anything in the page topic that does not fit perfectly.
- No unnecessary directories. Keep your files as close to the root as possible.

9.9 CHALLENGES OF SEARCH ENGINE OPTIMIZATION

- **Need genuine online reviews:** Even though there's a clear-cut difference between local SEO and online reputation management, the latter has a big impact on your local search rankings.
- **Optimize Google my business page**: Setting up your Google My Business page is rather easy but optimizing it? It needs careful work. Moreover, these details like your business address, phone number, and email address must be similar to what's being displayed on your website. For local businesses, it's crucial to have your website display all these contact details clearly.
- **Need a website re-design:** Over 50% small businesses don't even have a website, even when Google search is the new yellow pages and people use online search before purchasing anything. And then there are businesses which have unresponsive, slow and user repelling websites.
- **Need marketing analytics setup:** Many businesses argue that they never plan to use a certain marketing strategy, and hence, never get the analytics setup done for it. But a good business decision would be to set these analytics up so that you don't miss out on precious data. As a part of our local SEO services, we begin with setting up Google Analytics - with proper goal setting, and e-commerce settings (in case of an e-commerce business) and search console setup. We also recommend our clients to opt for Google ads setup, Facebook ads setup, email marketing setup and basic CRM setup to ensure they're growth ready.

- **Need to use localized keywords naturally**: Using keywords with local intent is the biggest challenge faced by organic marketers. Incorporating such keywords on a page's copy for local SEO is the trickiest.
- **You need to optimize local landing pages**: A few years back, SEOs would make multiple landing pages targeting each location. That meant lots of location specific pages, good keyword density and lots of interlinking. However, Google termed such pages as 'doorway pages' calling it spam.

9.11 POINTS TO REMEMBER

- **Keyword Research:** Research the best keywords for your site. Look at what your competitors are using for keywords, and try a few keyword tools. Remember to target your audience and consider all the word that they will type into the Google and Bing search engines.
- **Put your keywords in Bold:** This is an old trick, but is still effective. All you have to do is highlight one or two of your keywords when they first appear on the page. You do not have to keep highlighting the same keyword; you need only do it for its first appearance. You can also use italic.
- **Make your URLs search engine friendly:** Do not name your pages (URLs) with numbers and symbols. Add in some words to make them easier for a human to read. In addition, you should try to make some of those words as descriptive as possible, and adding in a few keywords will help too.
- **Install SSL Certificate:** Websites that are secure using https:// instead of http:// now appear higher in the search results. If you cannot install your own SSL certificate ask your host to do this for you. When it is installed, you have to make sure all your website pages are secure and not with mixed content. Also make sure that all your website version with http:// and with www. all forwarded to your new https:// URL.
- **Organize your website**: You need to make sure that your website and your menus are well organized so visitors can easily find what they are looking for. Add Call To Action and Forms to your pages to make it easy to contact you or shop.
- **Increase the quality:** Google and Bing/Yahoo are optimized to search out high quality content. Their methods for determining quality are fairly crude, but it will not help your case if your content is weak, fluffy, heavily SEOed and has multiple obvious spelling mistakes. Search engines measure how much time people spend on your website after using search. If you have a bad website people will leave it faster.
- **Add a keyword to each page title:** Your page title is a very important piece of text because it tells the reader what the page is about and it tells the search engine what the page is all about. So, you should try to add a keyword or two into the title. Just make sure the title is still easy to read for humans.

- **Be wary of your loading and render times:** The render time is the time it takes for a web page to go from white, to starting to load. A long render time will increase your bounce rate. The loading time is the time it takes from the beginning of the render, to the point where everything is loaded. A long loading time will damage your websites SEO.
- **Optimize your internal linking:** Every page should have at least three internal links on it. Three is the bare minimum, and this includes checkout pages too. Internal links are the ones that link one page to another. External links are the ones where you link your page to one outside of your website.
- **Integrate social media:** There are hundreds of widgets that you can add to your website. They will help you to link social media and your website. Do not put the widgets everywhere, but the addition of a few here and there will help your SEO in the long term.
- **Optimize your Images:** Make sure they do not take too long to load, and make sure they have their ALT text filled out. If you are able to give them a title, then you should. You should also name your image files something SEO friendly before you upload them onto your website.
- **Create a Sitemap:** Create an XML sitemap. If you have a WordPress website, you can create a nice XML sitemap with the Yoast SEO tool which will create a dynamic XML sitemap for you. Then you have to add the URL of your sitemaps to your Google Search Console and Bing Webmaster Tools account.
- **Make Your Website Mobile Friendly:** This is very important because people now do more searches from mobile devices than from desktop or laptop computers. Make sure that your website can be used easily from a cell phone. Contact forms should be easy to fill and submit. All your phone numbers should be clickable.
- **Fill your Meta Description Tag:** This is what may appear on the search engine's results page, and is a nice opportunity to sell the content of your web page. Create this text that will make people to click on your website. You should make sure that it has keywords in it if you want to feel any positive SEO effect.

9.11 GLOSSARY

- **2xx status codes:** A class of status codes that indicate the request for a page has succeeded.
- **4xx status codes:** A class of status codes that indicate the request for a page resulted in error.
- **5xx status codes:** A class of status codes that indicate the server's inability to perform the request.
- **Advanced search operators:** Special characters and commands you can type into the search bar to further specify your query.
- **Algorithms:** A process or formula by which stored information is retrieved and ordered in meaningful ways.

- Backlinks**:** Or "inbound links" are links from other websites that point to your website.
- **Bots:** Also known as “crawlers” or “spiders,” these are what scour the Internet to find content.
- **Caching:** A saved version of your web page.
- **Caffeine:** Google’s web indexing system. Caffeine is the index, or collection of web content, whereas Googlebot is the crawler that goes out and finds the content.
- **Citations:** Also known as a “business listing,” a citation is a web-based reference to a local business' name, address, and phone number (NAP).
- **Cloaking:** Showing different content to search engines than you show to human visitors.
- **Crawl budget:** The average number of pages a search engine bot will crawl on your site
- **Crawler directives:** Instructions to the crawler regarding what you want it to crawl and index on your site.
- **Distance:** In the context of the local pack, distance refers to proximity, or the location of the searcher and/or the location specified in the query.
- **Engagement:** Data that represents how searchers interact with your site from search results.
- **Google Quality Guidelines:** Published guidelines from Google detailing tactics that are forbidden because they are malicious and/or intended to manipulate search results.
- **Google Search Console:** A free program provided by Google that allows site owners to monitor how their site is doing in search.
- **HTML:** Hypertext markup language is the language used to create web pages.
- **Index Coverage report:** A report in Google Search Console that shows you the indexation status of your site’s pages.
- **Index:** A huge database of all the content search engine crawlers have discovered and deem good enough to serve up to searchers.
- **Internal links:** Links on your own site that point to your other pages on the same site.
- **JavaScript:** A programming language that adds dynamic elements to static web pages.
- **Login forms:** Refers to pages that require login authentication before a visitor can access the content.
- **Manual penalty:** Refers to a Google “Manual Action” where a human reviewer has determined certain pages on your site violate Google’s quality guidelines.
- **Meta robots tag:** Pieces of code that provide crawlers instructions for how to crawl or index web page content.
- **Navigation:** A list of links that help visitors navigate to other pages on your site. Often, these appear in a list at the top of your website (“top navigation”), on the side column of your website (“side navigation”), or at the bottom of your website (“footer navigation”).
- **NoIndex tag:** A meta tag that instructions a search engine not to index the page it’s on.

- **PageRank:** A component of Google's core algorithm. It is a link analysis program that estimates the importance of a web page by measuring the quality and quantity of links pointing to it.
- **Personalization:** Refers to the way a search engine will modify a person's results on factors unique to them, such as their location and search history.
- **Prominence:** In the context of the local pack, prominence refers to businesses that are well-known and well-liked in the real world.
- **RankBrain:** the machine learning component of Google's core algorithm that adjusts ranking by promoting the most relevant, helpful results.
- **Relevance:** In the context of the local pack, relevance is how well a local business matches what the searcher is looking for
- **Robots.txt:** Files that suggest which parts of your site search engines should and shouldn't crawl.
- **Search forms:** Refers to search functions or search bars on a website that help users find pages on that website.
- **Search Quality Rater Guidelines:** Guidelines for human raters that work for Google to determine the quality of real web pages.
- **Sitemap:** A list of URLs on your site that crawlers can use to discover and index your content.
- **Spammy tactics:** Like "black hat," spammy tactics are those that violate search engine quality guidelines.
- **URL folders:** Sections of a website occurring after the TLD (".com"), separated by slashes ("/"). For example, in "moz.com/blog" we could say "/blog" is a folder.
- **URL parameters:** Information following a question mark that is appended to a URL to change the page's content (active parameter) or track information (passive parameter).

9.12 CHECK YOUR PROGRESS

Descriptive type questions-

a) What are the major objectives of search engine optimization?
b) Explain the search engine index.
c) What do you mean by web crawling?
d) What do you mean by indexing in SEO?
e) What is the role of links in search engine optimization?
f) Differentiate between white hat and black hat SEO.
g) What are the major challenges of search engine optimization?
h) List the crucial SEO ranking factors one need to know.

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UNIT- 10

TESTING & MAINTENANCE OF A WEB PROJECT

10.1 INTRODUCTION

Testing is an important part of every software development process on which companies devote considerable time and effort. The burgeoning web applications and their proliferating economic significance in the society made the area of web application testing an area of acute importance. The web applications generally tend to take faster and quicker release cycles making their testing very challenging. The main issues in testing are cost efficiency and bug detection efficiency

10.2 OBJECTIVES

After the successful completion of this unit, you will be able to:

- Understand the basic concepts of Web Application Testing
- Understand the concepts of Web Application Maintenance

10.3 WEB APPLICATION TESTING

Whenever you develop a web application/project, there will be a great opportunity of having bug in your code or in your application. Testing means to check your application for these bugs and getting it ready for deployment.

Various types of testing used in web application are:

1. Functionality Testing
2. Usability testing
3. Interface testing
4. Database Testing
5. Compatibility testing
6. Performance testing
7. Security testing

1. FUNCTIONALITY TESTING

This testing is used to check the overall functioning of web application according to the specification provided by user.

This testing includes

- Testing all links in your WebPages (working correctly or not).
  - Links like internal links, outgoing links, anchor tags, mailto links etc.
- Test all forms in your WebPages
  - Check forms for all possible values, default values, data submission and their formats.
- Test Cookies
  - Test Cookies against all sessions.
- Test HTML & CSS
  - This test is done to ensure that search engine can crawl your website easily. This is done by checking syntax errors, schemas, and other web standards provided by W3C etc. This phase sometimes also called as **validating HTML**.

2. USABILITY TESTING

Small group of users similar to final target audience carries out this testing. In this testing generally, site navigation is tested.

- Buttons, menus or Links to other pages should be simply visible and consistent on all WebPages.
- There should be no grammatical or spelling mistakes in the content.
- All image tag should have alt attributes.

3. INTERFACE TESTING

Three types of server Application server, Web server & database server are present when we are working on a web project. Working of these servers with each other is tested in this phase.

- Application server with database server
- Web server with Application server

Check that all these servers interact with each other without any error. If errors are there then check those errors are handled correctly or not.

4. *DATABASE TESTING*

Database is the most important part of any web application, so it must be tested thoroughly.

- Check if any errors shown while executing queries.
- Data Integrity is maintained while creating, updating or deleting data in database.
- Test data retrieved from your database is shown precisely in your web application

5. *COMPATIBILITY TESTING*

Checking that on which device your application runs smoothly is very necessary now a days as there are number of devices which are used to see web applications by the users.

- ***Browser Compatibility:*** Website behaves differently in different browsers. So, you need to test your application across different browsers like IE, Chrome, and Mozilla etc.
- ***OS Compatibility:*** Make sure that your application works fine for various OS like Windows, Linux, and Macintosh etc.
- ***Device Compatibility:*** Device such as Desktop, TV, mobile can disorient your application look. So, check their compaitability.

6. *PERFORMANCE TESTING*

The website should work proficiently in heavy load. Therefore, it must be tested to:

- Website application response times at different speeds.
- ***Load test*** your web application to determine its activities under normal and peak loads.
- ***Stress tests*** your web site to resolve its break point when pressed to further than normal loads at peak time.

7. *SECURITY TESTING*

Security Testing is important where sensitive data is stored. It Includes:

- Unauthorized access to secure pages should be restricted.
- Restricted files should not be accessed without appropriate login access.
- Check sessions are automatically end after delayed user inactivity
- SSL should be used in accessing web site pages.

10.4 WEB APPLICATION MAINTENANCE

Web applications constantly grow and evolve according to client's need. Application must be always up-to-date to adjust according to environment (OS, Hardware, and Software) changes. Therefore, maintaining web applications after deployment at client's end is very necessary for web application life.

Activities involved in maintaining Web applications:

1. FIXING BUG (ERROR)

A software bug is an error, failure or fault in a computer program or system that causes it to produce a wrong or unpredicted result. A bug can be in a system because of human error, miscommunication, logical error etc. They can be critical and cause your application to crash. Bugs needed to fix for smooth processing of your application.

2. THIRD PARTY UPDATES

When you work on a web application, you know that third-party services like Facebook, Jquery, Google Maps and Twitter etc. are connected to your app. These third party services always update their APIs. Therefore, you need to update your app with these new APIs.

3. SECURITY PATCHES AND UPDATES

There are many softwares on web server which are used for security and providing other important features for your application. They need to update regularly to improve performance, maintain security and stability of the whole system. This also builds trust of customer in your services. Therefore, there must be some sort of provision that these security patches will automatically updated regularly.

4. IMPLEMENTING NEW FUNCTIONALITY

Normally, new features are updated in the application. These modifications are based on the customer's feedback. New features make your application more demanding in market and provide better competition to your competitors.

5. UPGRADING HARDWARE (SCALING)

If users of your application are increasing every day, you need to transfer your app to high performance server, so that it can handle load. Not upgrading results in an overloaded system, and this can also lead to crashing of the system.

6. MONITORING

Bugs can appear unexpectedly when API updates or changes. Therefore, web application needs constant caring. You can set up a team for regular app monitoring.

Web project maintenance is as important as primary product development. Proper bug fixes, improvements and upgrades are crucial for maintaining customer. Keep in mind that your end users notice even small changes, and these small updates show that you care about their response and that you will carry on to support your application.

10.5 GLOSSARY

- **Web Server:** ***A web server*** is a computer system that processes requests via HTTP, the basic network protocol used to distribute information on the World Wide Web.
- **Application server:** ***An application server*** is a software framework that provides both services to create web applications and a server environment to run them.
- **Bug:** A ***bug*** in software is an error, failure or fault that causes it to produce an incorrect or unpredicted result, or to work in unplanned ways.

10.6 ANSWER TO CHECK YOUR PROGRESS

Q1. Define a bug in Web Application.

Q2. What are various techniques used in testing a web projects? Explain.

Q4. What do you understand by Software testing?

Q5. Why Hardware needs to be upgrade? Explain.

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UNIT- 10 (Part 2)

MANAGING CLOUD

(Brief Introduction to Cloud Applications)

10.1 INTRODUCTION

Cloud computing is a new technology for storing data and programs over the internet instead of on a traditional device like hard drive or secondary storage. The term cloud is used as a symbol for the Network or Internet. This uses a software to ensure flawless connectivity between devices/computers linked via cloud computing. This allows users to create, configure and customize applications online. With cloud computing user can access database resources via the internet from anywhere at any time as long as they need it. In other words, we can say cloud is a storage space which is present at remote location.

Cloud computing is the delivery of computing services that includes servers, storage, databases, networking, software, analytics and intelligence over the Internet i.e., “the cloud” to offer faster

innovation, flexible resources and economies of scale. Applications like e-mail, web conferencing, customer relationship management etc. all run in cloud.

10.2 OBJECTIVES

After the successful completion of this unit, we will be able to-

- Understand the concept of cloud computing.
- Describe the major characteristics of cloud computing.
- Explain the architecture of cloud computing.
- Know about different types of cloud computing.
- Familiar with business prospective of cloud computing.
- Know the security measures while using cloud.

10.3 WHAT IS CLOUD COMPUTING

Cloud computing is a new technology for storing as well as accessing data, program and applications over the Internet with remote resources. Now a day the data, program and applications are increasing in volume rapidly. Storing such huge data, program and applications in one computer system becomes difficult due to the limited capacities of storage units like hard drive, secondary storages like CD-ROM, Pen drive external hard disk etc. to overcome this storage problem, the cloud computing technology has emerged and becoming popular day by day among researchers, educationist and in IT industries.

In cloud computing the services are the resources and are owned and managed by the cloud provider rather than the end user. End users need not to bother about the maintenance of these services; they can simply use it for their requirements. These resources may include:

- Browser-based software applications such as Gmail, Yahoo, Netflix etc.
- Third party data storage for photos and other digital media such as iCloud or Dropbox, or
- Third-party servers used to support the computing infrastructure of a business, research, or personal project.

Businesses and general computer users normally had to buy and maintain the software and hardware of their own, before the invention of cloud computing. With the rapid growing of cloud-based applications, the consumers now have access to an on-demand computing resources such as storage, services, businesses and many more. As technology is shifting from traditional use of software and hardware to networked remote and distributed resources, the cloud users need not to invest for the capital or expertise for buying and maintaining these computing resources themselves. This access to additional computing resources has given rise to a new wave of cloud-based businesses, changed IT (Information Technology) scenario across industries and transformed many daily based computer-assisted works. With the cloud-based concepts, we can now work with colleagues over video meetings, access entertainment

and educational content on demand. We can communicate with household appliances, heir a cab with a mobile device and can rent a vacation room in someone's house.

Computer Technology is shifting to the cloud, more and more these days. People and their work are switched from traditional storage software to the Internet in the recent year. Cloud computing is providing different facilities and services like databases, servers, storage, applications, etc. through the Internet. Instead of storing data in local storage on a hard drive or on secondary storage, cloud computing helps us in storing and saving data on a remote database provided the device is equipped with internet.

We can say cloud computing is somewhat outsourcing of computer programs. These computer programs are owned and hosted by an external party and they are located in the remote which is cloud for us. Due to this facility, the users need not to worry about the storage and power. They can access their applications, programs and data from anywhere at any time, which is the biggest advantage. Nowadays, many people are opting for cloud computing for a variety of reasons including increased productivity, better monetary value, time and speed efficient, security and performance.

Despite the growing presence of cloud computing, its details remain unclear to many of us. What exactly is the cloud, how does one use it and what are its benefits for businesses, developers, researchers, government, healthcare practitioners, and students? We will discuss these in the subsequent sections.

10.4 CHARACTERISTICS OF CLOUD COMPUTING

The National Institute of Standards and Technology (NIST), a non-regulatory agency of the United States, Department of Commerce with a mission to advance innovation, defines cloud computing as "A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction". NIST lists the following five essential characteristics of cloud computing:

- **On-demand Self-Service**: Resources available in a 24X7 services and can be accessed or provisioned without human interaction. With this model, users need to sign up to get immediate access of the cloud services. Organizations can also create mechanisms for allowing employees, customers or partners to access internal cloud services on demand as per predetermined logics without needing to go through traditional IT services.
- **Broad Network Access**: The cloud services and resources can be accessed by the users through any device and in any networked location provided that they have permission to use it.

- **Resource Pooling**: Cloud provider resources are shared by many users in a manner to keep the data of individual user hidden from other users. Security aspects are very well maintained.
- **Rapid Elasticity**: Depending on user needs the cloud computing resources can be rapidly increased, decreased, or otherwise modified. There is always a flexibility of changing the resources as per demand.
- **Measured Service**: The user needs to pay only for the resources they are demanding or say using in the cloud. These usages of cloud resources is monitored systematically so that businesses and other cloud users need only to pay for the resources they use in any given period of time. Apart from the above-mentioned characteristics by NIST, there are some other characteristics also of cloud which are as follows:
- **Easy Maintenance**: One of the best cloud characteristics is that, it is very easy for maintenance. The servers are maintained effortlessly and the downtime of servers remains significantly low or absolutely zero sometimes. Resources of Cloud Computing undergo several updates frequently to optimize their capabilities and potential. The updates of these resources are more viable with the devices and perform much quicker than the previous versions.
- **Economical:** This cloud characteristic helps in reducing the expenditure of exiting IT of any organizations. In Cloud Computing, the client needs to pay only the administration charges for the space they are using. There is no hidden, covered up or additional charge that needs to be paid by the user. The cost of administration is economical and some space is allotted for free to the user.
- **Security**: Data security is also one of the best characteristics of Cloud Computing. Cloud services create a replica i.e., copy of the data that is stored to prevent any form of data loss. In case, if any one server is down and loses the data, then the copy version is restored from the other server. This feature is very helpful when there are several users work on a particular file in a real time environment and a file or files are suddenly gets corrupted.
- **Automation:** One of the essential characteristics of cloud computing is automation. The ability of cloud computing to automatically install, configure, and maintain a cloud service that is known as automation in cloud computing. In simple words, we can say that, it is the process of making available most of the technologies and reducing the manual effort. However, to achieve automation in the cloud environment is not a very easy job. This requires the installation and deployment of resources like virtual machines, servers and large storage. After successful deployment, these resources require constant maintenance as well, which needs a continuous monitoring of the entire system by the administrator.

10.5 SERVICES OF CLOUD COMPUTING

In Cloud Computing everything is considered as a service. Cloud computing provides many distinct types of computing services delivered remotely to clients via the internet. Clients typically pay a monthly or annual service fee to providers, to gain access to systems. Services are also considered as model for cloud and according to different models, of which the three standard models per NIST are as follows:

- Infrastructure as a Service (IaaS),
- Platform as a Service (PaaS), and
- Software as a Service (SaaS).

Let us discuss these services first and after that we will discuss some other services of Cloud Computing.

Infrastructure as a Service (IaaS)-

Infrastructure as a service (IaaS) allows clients to use hardware and resources remotely on a payment basis. This also refers to online services that provide high level Application Programming Interface (APIs), which is used to hide low level details of underlying network infrastructure like physical computing resources, location, data partitioning, scaling, security, backup, etc. This service is also popular as hardware as a service (HaaS). Companies like IBM, Google and Amazon.com are main IaaS providers. IaaS provides small start-up firms with a major advantage, since it allows them to gradually expand their IT infrastructure without the need for large capital investments in hardware and peripheral systems.

Infrastructure as a service (IaaS) runs the virtual machine as guests. Pools of hypervisors, i.e., also known as a virtual machine monitor or VMM, is software that creates and runs virtual machines (VMs) within the cloud system and can support a large number of virtual machines and the ability to scale services up and down according to customers' requirements. IaaS clouds often offer additional resources such as a virtual machine, disk image library, raw block storage, file or object storage, firewalls, load balancers, IP addresses, virtual local area networks (VLANs), and software bundles.

The NIST's definition of cloud computing describes IaaS as "where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls)."

IaaS cloud providers supply these resources on demand from their large pools of equipment installed in data centers. For wide area connectivity, customers can use either the Internet or carrier clouds (dedicated virtual private networks). To deploy their applications, cloud users install operating system images and their application software on the cloud infrastructure. In this model, the cloud user patches and maintains the operating systems and the application

software. Cloud providers typically bill IaaS services on a utility computing basis: cost reflects the amount of resources allocated and consumed.

Platform as a Service (PaaS)-

Platform as a service (PaaS) offer an environment for development to application developers. The provider generally develops toolkit and standards for development. This also provides channels for distribution of resources and payment details. In this model, cloud providers deliver a computing platform that includes operating system, programming language execution environment, database, web server. Application developers use these platforms to develop and run their software instead of directly buying and managing the required hardware and software they need for their jobs.

There are some integration and data management providers available and they also use some specialized applications of PaaS as delivery models for data services. For example, Integration Platform as a Service (iPaaS) and Data Platform as a Service (dPaaS) use PaaS services.

The NIST's definition of cloud computing defines Platform as a Service (PaaS) as: "The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment".

Software as a Service (SaaS)-

Software as a Service (SaaS) model provides application software and databases that users have access for their requirements. Cloud providers manage the infrastructure and platforms that run these applications. SaaS is sometimes referred to as "on demand software" and is normally charged on a "pay-per-use" basis or a subscription fee. In the SaaS model, cloud providers install and operate application software in the cloud and cloud users access the software from cloud as and when it is required. Cloud users need not to manage the cloud infrastructure and platform where the application runs. Users need not to install and run the application on their own computers or devices. Due to this facility, this simplifies the maintenance and support.

The NIST's definition of cloud computing defines Software as a Service as:

"The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings".

Generally, the charges claimed by the SaaS applications is either a monthly or yearly and sometimes it provides free of cost for a particular period of time. SaaS gives the potentials to

a business reduce its IT operational costs by outsourcing hardware and software maintenance and support to the cloud provider. In addition, as applications are hosted centrally, updates can be released without the need for users to install new software.

Examples of SaaS include: Google Applications and internet-based email applications like Yahoo! Mail, Hotmail and Gmail. Games and productivity software like Google Docs and Word Online are also examples of applications that offered as SaaS. SaaS applications may be integrated with cloud storage or File hosting services, which is the case with Google Docs being integrated with Google Drive and Word Online being integrated with One Drive.

However, there is a drawback of SaaS that comes with storing the user data on the cloud provider's server. Due to this, there could be a chance of unauthorized access to the data. Cloud applications differ from other applications in their scalability. The tasks are replicated or we can say the tasks are cloned onto multiple virtual machines at the run time to meet the availability of data and program when it is demanded. Load balancers distribute the work over the set of virtual machines. This process is transparent to the cloud user and they can see only a single access point. To accommodate a large number of cloud users, cloud applications can be multitenant, meaning that any machine may serve more than one cloud user organization.

Clients who subscribe to cloud computing services can reap a variety of benefits, depending on their particular business needs at a given point in time. The days of large capital investments in software and IT infrastructure are now a thing of the past for any enterprise that chooses to adopt the cloud computing model for procurement of IT services. The ability to access powerful IT resources on an incremental basis is levelling the playing field for small and medium sized organizations, providing them with the necessary tools and technology to compete in the global marketplace, without the previously requisite investment in on premise IT resources. Clients who subscribe to computing services delivered via the “cloud” are able to greatly reduce the IT service expenditures for their organizations; and gain access to more agile and flexible enterprise level computing services, in the process.

Now we will discuss some other services of Cloud Computing.

Mobile "backend" as a service (MBaaS)-

This is a relatively recent model in cloud computing. This service is a useful service for app developers. In the mobile "backend" as a service (MBaaS) model, which is also known as backend as a service (BaaS). The web app and mobile app developers are able to link their applications to cloud storage and cloud computing services with the help of Application Programming Interfaces (APIs). Developers also use Custom Software Development kits (SDKs), another important tools available for app developers. The other services include user management, push notifications, integration with social networking services and many more.

Server less computing-

Server less computing is a cloud computing code execution service model in which the cloud provider fully manages starting and stopping of virtual machines as necessary to serve requests. The requests are charged by an abstract measure of the resources required to satisfy the request, rather than per virtual machine per hour. Despite the name, it does not actually involve running code without servers. Server less computing is so named because the business or person that owns the system does not have to purchase, rent or virtual machines for the code to run on.

Function as a service (FaaS)

Function as a service (FaaS) is a remote procedure call that supports server-less computing to enable the deployment of individual functions in the cloud that run-in response to some events. FaaS is included under the broader term server-less computing, but the terms may also be used interchangeably.

10.6 TYPES OF CLOUD COMPUTING

Cloud computing types are service deployment models. There are three main types of cloud computing services, sometimes called the cloud computing stack because they build on top of one another. The three kinds of cloud are private, public or a hybrid cloud that are popular.

Private Cloud-

The private cloud refers to cloud services that belongs to the organization and managed by them. This cloud service is available only to the employees of that organization and registered customers. Private clouds allow organizations to have greater control over their computing environment and their stored data. Private clouds are generally more secure than public clouds as they are accessed through private networks and the organization can directly supervise their cloud security. Normally, a private cloud computing resources are being used entirely by a single entity, either a business or an organization. Physically, a private cloud is usually located on the company site. Optionally, a few companies get their private cloud hosted by third-party service providers. The network used in a private cloud is a private network that is responsible for its services and infrastructure.

In private cloud a single organization operates the cloud infrastructure only. Also, a private cloud is a cloud computing system in which IT services are supplied for the specialized use of one organization over private IT facility. It can be run on-site or off-site by the organization or a third party. Private cloud terms are often employed interchangeably with the virtual private cloud (VPC). Technically a VPC is a private cloud that uses the infrastructure of a third-party cloud provider, while an inner cloud is enforced. Examples of private cloud are Amazon Web Services (AWS) and Virtual Machine Software (VMware).

Public Cloud-

The public cloud refers to the cloud services that are offered by some commercial providers to businesses and individuals publicly. The services include virtual machines, storage and several applications. Public cloud resources are available on the commercial provider's hardware,

which the users can access through the internet. Public clouds are owned and maintained by third-party providers of cloud service. Users just use these services and control their account by using a web browser provided to them. The public cloud is also described as computing services provided through the public internet by third party suppliers, making them accessible to those who want to use them or buy them. It can be free or on demand for customers to pay for the cycles, storage or bandwidth they consume per usage.

However, they are not always suitable for organizations in highly regulated industries, like healthcare or finance. As public cloud environments may not comply with industry regulations regarding customer data. Examples of public clouds are Microsoft Azure and Sales force.

Hybrid Cloud-

A hybrid cloud uses elements from both the public cloud and private cloud and combines them. This is binding them with technology that permits their data and applications to be shared. This type of cloud is a computer environment that includes a government i.e. public cloud and private cloud to share information. Many organizations use a hybrid cloud environment which combines public cloud and private cloud resources to support the organization's computing needs and simultaneously maintains compliance with industry regulation. Hybrid cloud is also known as Multi-cloud environments that involve the use of more than one public cloud provider. For example, combining Amazon Web Services (AWS) and DigitalOcean for an organization, where AWS is private cloud and DigitalOcean is public cloud.

By using hybrid cloud organizations can achieve flexibility and the computer capacity of a government cloud i.e., public cloud for fundamental and insensitive computing functions, while it is safe behind a corporate firewall i.e. private cloud for business information.

By consenting data and applications to share between public cloud and private clouds, a hybrid cloud provides more flexibility, in turn helping in optimizing the existing infrastructure.

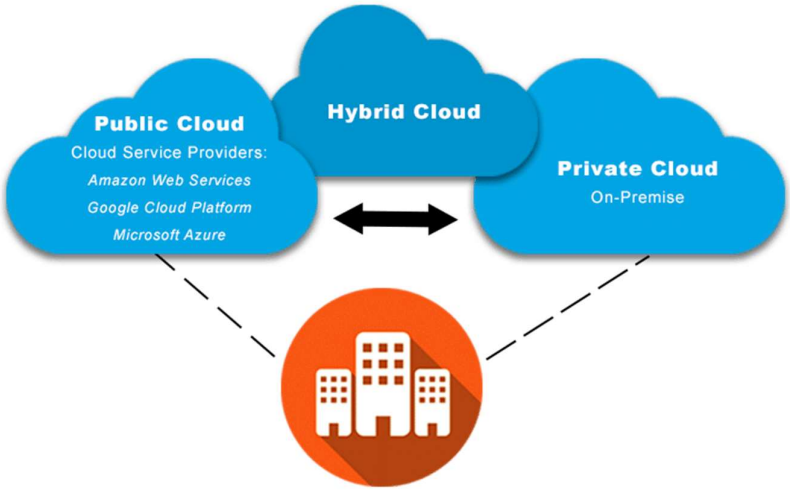

Figure 10.1 Types of Cloud Computing

10.7 BUSINESS PROSPECT OF CLOUD COMPUTING

Prior to the emergence of cloud computing, most businesses and organizations use their own software and hardware that supported their computing activities. As cloud computing resources became available, most of the businesses started using them to store data, provide enterprise software as well as set up online products and services. Some of these cloud-based adoptions and innovations are industry specific. In healthcare industry, they use cloud services that are specifically designed to store and share patient data or communicate with patients.

In the academy, educators and researchers use cloud-based teaching and research apps. But there are also a large number of general cloud-based tools that have been adopted across industries, such as apps for productivity, messaging, expense management, video conferencing, project management, newsletters, surveys, customer relations management, identity management, and scheduling. The rapid growth of cloud-based business apps and infrastructure leads not only just changing business IT strategy but this creates a boom in their business. Cloud based technologies offer businesses several key advantages. First, this helps to optimize the business costs. As businesses shift towards renting computing resources, the business and IT sectors need not to invest in purchasing and maintaining the business and IT infrastructure.

Second, this allows businesses just to pay for the computing resources they actually use. Cost, however, is not the only consideration that drives cloud adoption in business. Third, this can help to make internal IT processes more efficient. The Cloud based apps can improve collaboration across a business as they allow for real time communication and data sharing.

Businesses nowadays are seeking innovative ways to grow and accomplish their business goals. With the help of cloud computing, this business will keep on growing in the future. Cloud computing is powerful and expansive and will continue to grow in the future and provide many benefits. Cloud computing is extremely cost-effective and companies can use it for their growth. The future of cloud computing is bright and will provide benefits to both the host and the customer. One should keep in mind that the owner of the company should be familiar with the latest development taking place in Cloud technology.

10.8 FUTURE OF CLOUD IN IT INDUSTRIES

By analyzing the current trends and usage the future of cloud computing can be predicted and here are some predictions about Cloud computing.

- **Storage Capacity-** Now a day, data from different fields are generated in a high volume and it has become difficult to store it with security. Most of the companies require a place where they can securely store their data. So many businesses are adopting cloud computing and it has been predicted that the Cloud providers will provide more data centres at a lower price as there is a large competition amongst the providers.

- **Modular Software-** The size of an individual program along with the complexity is increasing regularly. Companies are using this software, which is yet to modify. This leads to the fact that Cloud technology will soon require advance system thinking. We can see software development from many angles because in the future applications will store in places other than the cloud. This application will store on different modules, on servers of different Cloud Service. This can also reduce the cost of software as placing components of the program on different storage is economical.
- **Internet of Things Along with Cloud Computing-** The internet of things (IoT) is one of the leading technologies now a day. It comes with continuous innovation in real time data analytics and cloud computing. There are many machine-to-machine communication, data, and process occurring. Cloud computing plays an important role in handling these huge volumes of data and their processing. However, discussion of internet of things (IoT) is beyond the scope of this unit.
- **Growing Market-** The cloud computing market is growing at 22.8 percent and exceeded to $127.5 after 2018. By 2018, 62% of all Customer Relationship Management (CRM) software are based on cloud computing. Moreover, 30% of all application spending is for software as a service-based application.
- **Increasing Security-** The data which are stored in the cloud is secure but not fully. The small companies which are providing cloud services may or may not provide proper security to the data. So, in the future, we can prevent from cyber-attacks by providing better security. The cloud providers provide better security measures opening balance ways to prevent cyber-attacks.
- **Economic-** If cloud computing will continue to evolve the use of hardware will be less as most of the work will be done with the help of cloud computing and virtualization. We can save the setup cost of software by dividing it and this will lead to decreasing the use of hardware.

10.9 LIMITATIONS AND ADVANTAGES OF CLOUD COMPUTING

In this unit we first discuss the limitations of cloud computing and thereafter the benefits of it.

Limitations-

- **Downtime-** Downtime is perhaps the single greatest disadvantage of cloud computing. Here it is not about server downtime, but about the Internet access may go down. As long as Internet access is out, nothing can be done with the cloud. Robust mobile data plans can help to offset that problem temporarily. Cellular service often remains workable when internet access and even power goes off. This is true that, data plans are capped

and mobile devices have limited battery life. Then again, if the power is off, then accessing cloud services hamper.

- **Security-** Security is one major disadvantage at a different level of cloud computing. Security is one area where determining cloud computing advantage and disadvantages depends on the angle from which we look at the issue. Basic digital security methods must be used for security. Think of it this way, If your home has door locks, a security system, and security cameras, the infrastructure to stay safe is all there. Keeping your home safe requires actually locking your doors, arming the security system and keeping the cameras turned on.
- **Poor Economy-** Cloud computing is a young industry with lots of companies looking for business. There is a possibility that the cloud provider will run out of money and close their doors forever. The more important thing is sudden shutdown of any service provider. This problem is magnified by the issue of cloud vendor lock-in, where migrating from one cloud vendor to another is difficult and expensive.

This may be further explained as, like renting a warehouse and filling it with merchandise. Once all merchandise stored in the warehouse then it is a challenge for logistical move. Now imagine if access to the warehouse is lost then how the merchandise will be moved. This may happen if the owner that is the service provider in this case the owner of the warehouse went bankrupt and decides to shut down the service that is the warehouse without warning. Despite the above limitations or disadvantages Cloud computing offers a variety of benefits to individuals, businesses, developers, and other organizations. These benefits vary according to the cloud users' goals and activities.

Benefits

- **Less Costs-** The cloud services are free from capital expenditure. There are no huge costs of hardware in cloud computing. This is just pay per use concept; user need to pay according to their subscription plan.
- **Resource Availability-** Most of the cloud providers are truly reliable in offering their services, with most of them maintaining an uptime of 99.9%. The user can get onto the applications needed basically from anywhere. Some of the applications even function off-line.
- **All over Functioning-** Cloud computing offers yet another advantage of working from anywhere across the globe, as long as user has an internet connection. Even while using the critical cloud services that offer mobile apps, there is no limitation of the device used.
- **Automated Updates on Software**- In cloud computing, the server suppliers regularly update the software including the updates on security, so that users need not to waste

their crucial time on maintaining the system. Users can get extra time to focus on other important things in their businesses.

- **Enhanced Collaboration-** Cloud applications enhance collaboration by authorizing diverse groups of people virtually meet and exchange information with the help of shared storage. Such capability helps in improving the customer service and product development and also reducing the marketing time.
- **Easily Manageable-** Cloud computing offers simplified and enhanced IT maintenance and management, which is backed by Service Level Agreement (SLA), central resource administration and managed infrastructure. Users get to enjoy a basic user interface without any requirement for installation. Plus, they are assured guaranteed and timely management, maintenance, and delivery of the IT services.

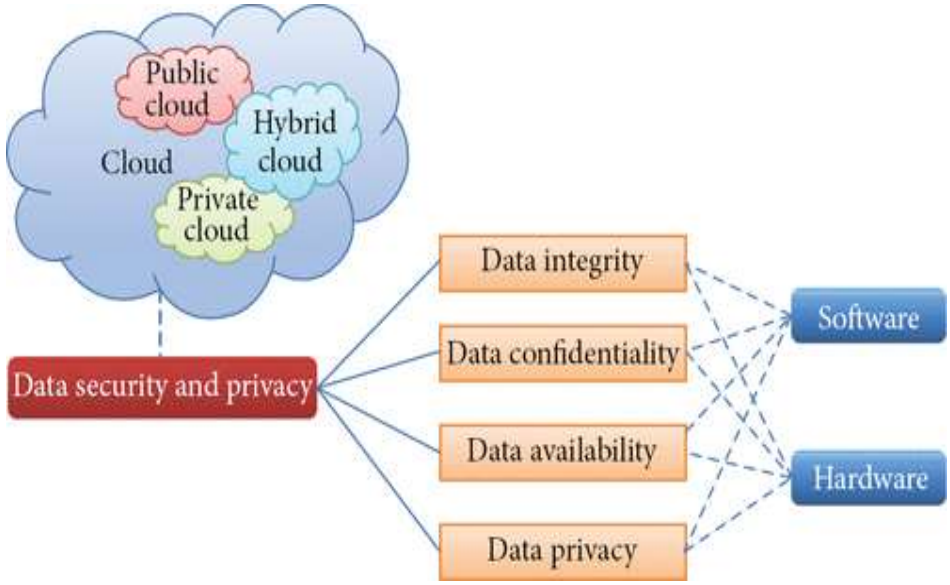

Figure 10.2 Cloud Computing Environment

10.10 MANAGING DATA FROM SENDING TO SHARING

As digital transformation becomes crucial for all businesses, the rapidity for adoption of cloud computing is accelerated. Because of clouds versatile characteristics such as higher flexibility, scalability, reliability, and affordability there is drastic increase in cloud computing trends. Cloud technology not only enables businesses to scale their computing needs as they grow, but also ensure operational success and satisfies evolving customer demands.

According to the statistics published by Cisco, 94% of workloads and compute instances will be processed in cloud data centres by 2021. Whenever anyone decided to move their business operations to the cloud, it is important to conduct detailed survey on that. This is important to have a brief understanding of what we can do and what we should avoid will help us in taking an informed decision.

Security in Cloud-

Data on cloud are mostly secured as security is one of the best characteristics of Cloud Computing. Cloud services generally create a replica i.e., copy of the data that is stored. These prevent any form of data loss. However, the data which are stored in the cloud is secure but not fully. The small companies which are providing cloud services may or may not provide proper security to the data. So, in the future, we can prevent from cyber-attacks by providing better security. The cloud providers provide better security measures opening balance ways to prevent cyber-attacks. Therefore, it important that user must follow some strategy that is what to do and what not to do before using Cloud Computing.

Dos and Don'ts in Cloud-

First, we will discuss about what to do before using any cloud service or model.

- **Do "Strategy Before Cloud Migration"-** It is always very important to plan a detailed strategy before migrating business operations to the cloud. This is desirable to conduct extensive research to learn more about the cloud environment, security and computing services. An in depth understanding about existing business challenges and future goals must be cleared. Figure out a strategy to obtain the maximum benefits of cloud adoption by tracking the fast-changing standards that are now evolving for cloud computing. Moreover, it is also imperative to analyze a different set of migration strategies and consider it a financial issue. Before taking the plunge, do the math and compare cloud computing expenses against in-house IT expenditures. This would help you figure out the solution best suited for your business.
- **Do "Review Cloud Computational Models"-** Every business has unique requirements. So, it is important to evaluate different cloud computing models in detail and see which is suitable to fulfill the business needs. There are normally three cloud deployment models available from which the business organizations have to make a select one or a combination of public, private and hybrid. In addition to the deployment models there are three basic services cloud that is used for different types of computing such as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). It is essential to have a detailed understanding of the high-level differences between different cloud environments and service models so that it helps to choose the best one for any organization or business.
- **Do "Remember Risk and Compliance"-** Implementation of any new technology always comes with some difficulties and use of the same comes with some risk factors. Before making the move into the cloud, it is important to have a deep understanding of the possible risks and regulatory compliance issues. If the business operates in a heavily regulated industry such as healthcare, legal, or e-commerce that handles sensitive user

information, then it is critical to stay in compliance with regulations and standards. Therefore, it is always better to evaluate the terms and conditions of the cloud vendors before accepting its services.

Followings are the points we must remember **NOT TO DO** with cloud computing services.

- **Don't "Gloss Over Details"-** Migrating from traditional business environment to the cloud environment is a big step. However, it is always need to pay attention to every small detail and have a thorough understanding of each factor. Collecting more knowledge not only helps in devising better strategies and taking informed decisions, but also makes the transition process smooth and hassle-free.
- **Don't "Forget About Security"-** Security should always be the primary concern whether entire business operations move to the cloud or only a part of it. Performing automated testing before the cloud migration will help in assessing and reporting performance issues. Before moving to the new environment, one must get the answers of "How does the cloud service provider address the security concerns?", "Do they provide a guarantee in terms of safety of authentication and authorization?", and make sure to discuss all the security and compliance requirements with them in detail.
- **Don't "Force Every Application to The Cloud"-** This is never desirable to move all the existing applications of any businesses or companies to cloud at once. A few programs and files may still need to be stored in traditional data centres for security reasons. On the other hand, some applications might be based on traditional technology and it may need extensive modifications before integrating with the cloud.

10.11 GLOSSARY

- **NIST** The National Institute of Standards and Technology is non-regulatory agency of the United States.
- **IaaS** Infrastructure as a service is one cloud-based service model that allows users to use hardware and resources remotely on a payment basis.
- **PaaS** Platform as a service (PaaS) is one cloud-based service model that offers an environment for development to application developers.
- **SaaS** Software as a Service (SaaS) is one cloud-based service model that provides application software and databases that users have access for their requirements.
- **API** Application Programming Interface is a software intermediary that allows two applications to talk to each other.
- **VPC** Virtual Private Cloud is a private cloud that uses the infrastructure of a third-party cloud provider.
- **VMM** Virtual Machine Monitor is software that creates and runs virtual machines.
- **MBaaS** Mobile Backend as a Service allows linking the applications to cloud storage.

- **AWS** An Amazon Web service is a popular private cloud.
- **IoT** Internet of Things refers to a system of interrelated, internet-connected objects that are able to collect and transfer data over a wireless network without human intervention.

10.12 CHECK YOUR PROGRESS

Objective Type Questions-

a) Dropbox is a resource of Cloud Computing. (True / False)

b) NIST is a regulatory agency of United States. (True / False)

c) Automation of software is not a part of Cloud Computing services. (True / False)

d) Infrastructure as a Service (IaaS) runs virtual machine a guest. (True / False)

e) Private is usually located on the public site. (True / False)

f) AWS is an example of ... ... Cloud.

g) ... ... is the software that creates and runs virtual Machine.

h) ... ... is the service useful for app developers.

i) Hybrid Cloud is also known as ... ... Cloud environment.

j) The maintenance of Cloud Computing is backed by ... ...

Descriptive Type Questions-

a) Define Cloud Computing in details.

b) Explain the major characteristics of Cloud Computing

c) What are the main services that Cloud Computing provides? Explain each.

d) Discuss different types of Cloud services.

e) What are the major advantages and limitations of Cloud Computing?

f) What security measures must be followed before migration to Cloud environment?

g) "The Cloud Computing is the future of all business soon". Justify the statement.

h) Discuss the business prospective of Cloud Computing in details.

Answer (Objective Type Question)-

[a] True	[b] False	[c] False	[d] True	[e] True
[f] Hybrid Cloud	[g] VMM	[h] MBaaS	[i] Multi	[j] SLA

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