



BASIC NETWORKING AND DIGITAL INFORMATION RESOURCES

WEEK 5

DIGITAL INFORMATION RESOURCES

Objectives



At the end of this chapter you will be able to:

- Explain networking basics
- Use search engines effectively
- Distinguish between e-resources such as e-books, e-journals, tutorials, portals, dictionaries, papers and personal websites
- Understand the importance of the digital libraries
- Understand the limits of search engines, digital libraries and portals and decide when to use them

NETWORKING BASICS

Communication Model



Source: This device generates the data to be transmitted. i.e.: server

Transmitter: Usually, the data generated by a source system are encoded and transformed in such a way that enable data to be transmitted across some type of transmission system.

Transmission system: This can be a single transmission line or a complex network connecting source and destination.

Receiver: The receiver accepts the signal from the transmission system and converts it into a form that can be handled by the destination device. For example, a modem will accept an analog signal (voice data) and convert it into a digital bit stream.

Destination: Takes the incoming data from the receiver. i.e.: personal computer

NETWORKING BASICS

Network

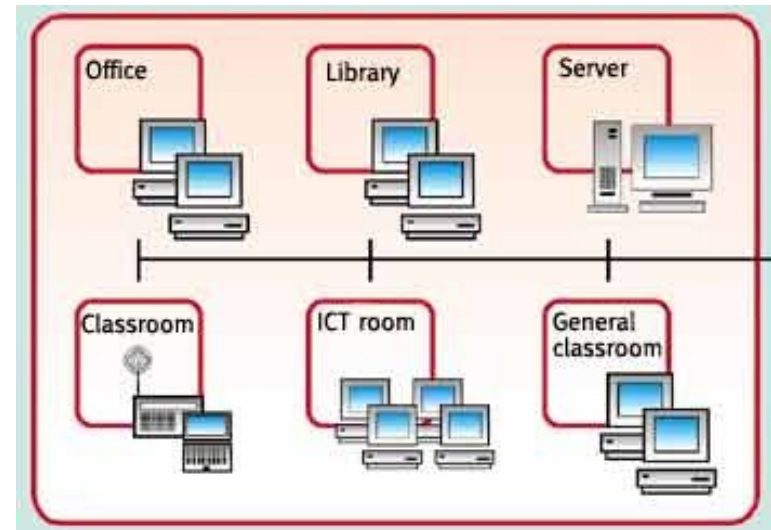
- Computers that are connected together for the purpose of sharing resources and communication constitutes a **network**. The network can be used to transmit
 - data
 - voice
 - video between users on the network.
- **Distance** is important as a classification metric in networks. In this tutorial we will learn:
 - Local Area Networks (**LAN**)
 - Wide Area Networks. (**WAN**)

NETWORKING BASICS

Network

Local Area Networks, (LANs) are privately-owned networks within a single building or campus of up to a few kilometers in size.

They are used to connect PCs to share resources (e.g. printers) and exchange information. METU PC Labs forms a LAN in the campus.

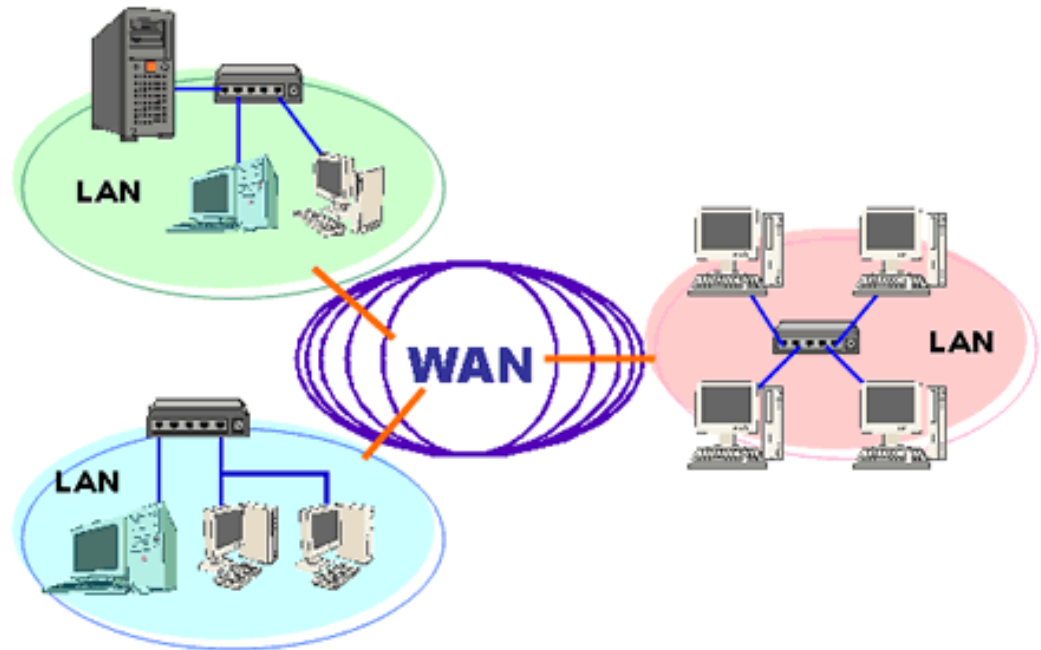


Local Area Network

NETWORKING BASICS

Network

- A **Wide Area Network**, or **WAN**, spans a large geographical area, often a country or continent. WANs typically connect two or more LANs.

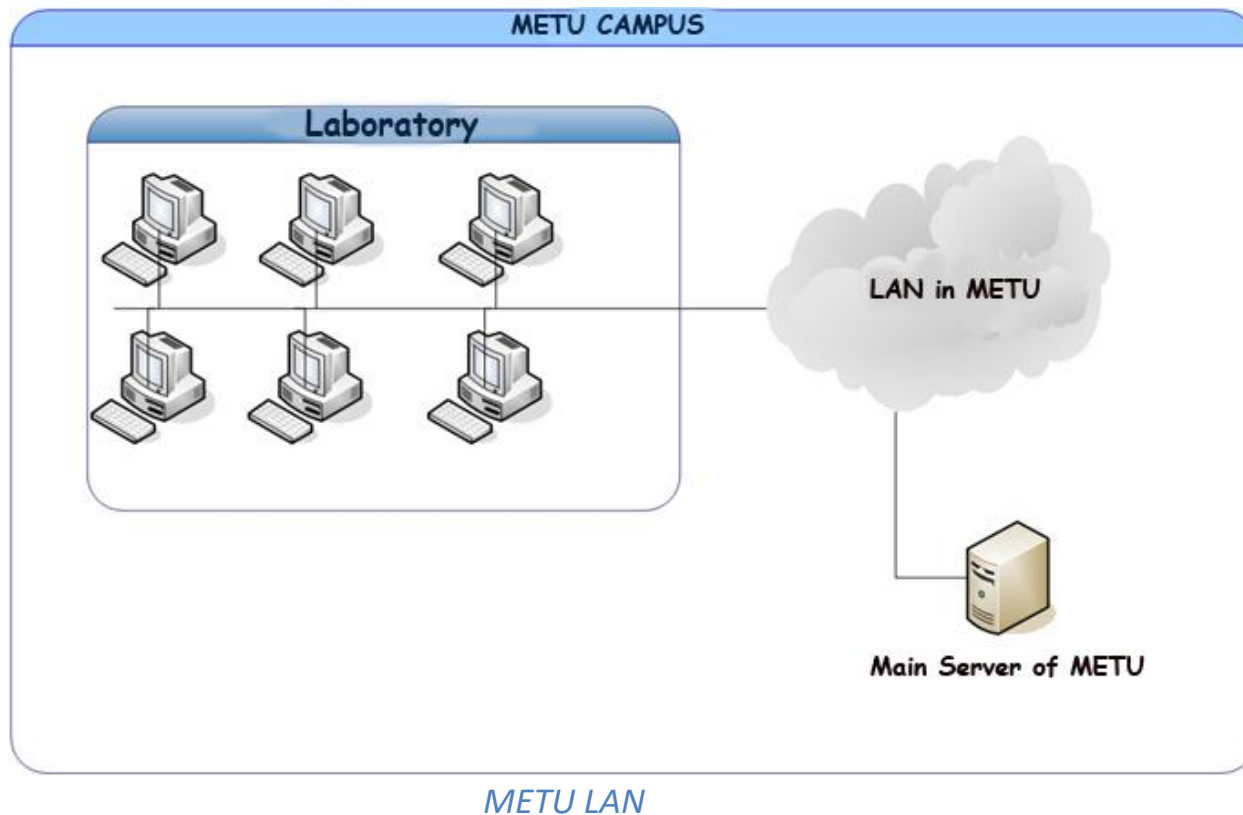


Wide Area Network

NETWORKING BASICS

Network

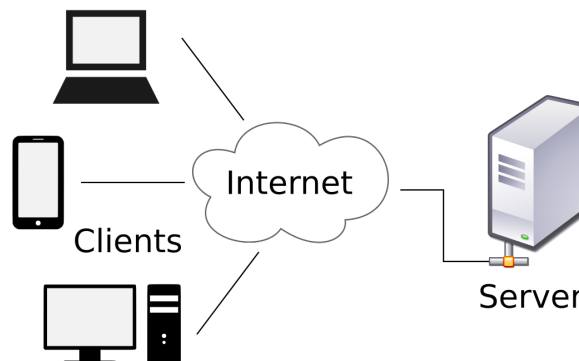
When you want to access METU main page (www.metu.edu.tr), you connect to a LAN and access to METU's main server.



NETWORKING BASICS

Network

- In most cases you can think of a network as being made up of **clients** and **servers**. A **client** is defined as a **requester** of services and a **server** is defined as the **provider** of services.
 - **Example:** **Client** is your own PC, **Server** is METU Mail Server
- A client computer runs a client operating system (Windows, macOS, and Linux). On the other hand, a server runs a network operating system (NOS).
- Network Operating System includes special functions for connecting computers and devices into a local-area network (LAN) or Inter-networking.



The Mechanics of Internet

Internet

- The Internet, which is developed in 1969, is a ***set of rules*** that allows computers to connect and communicate with other computers easily.
- The Internet is a *worldwide, publicly accessible* network of interconnected computer networks that transmit data by packet switching.
- It is a "***network of networks***" or a big WAN that consists of millions of smaller domestic, academic, business, and government networks.

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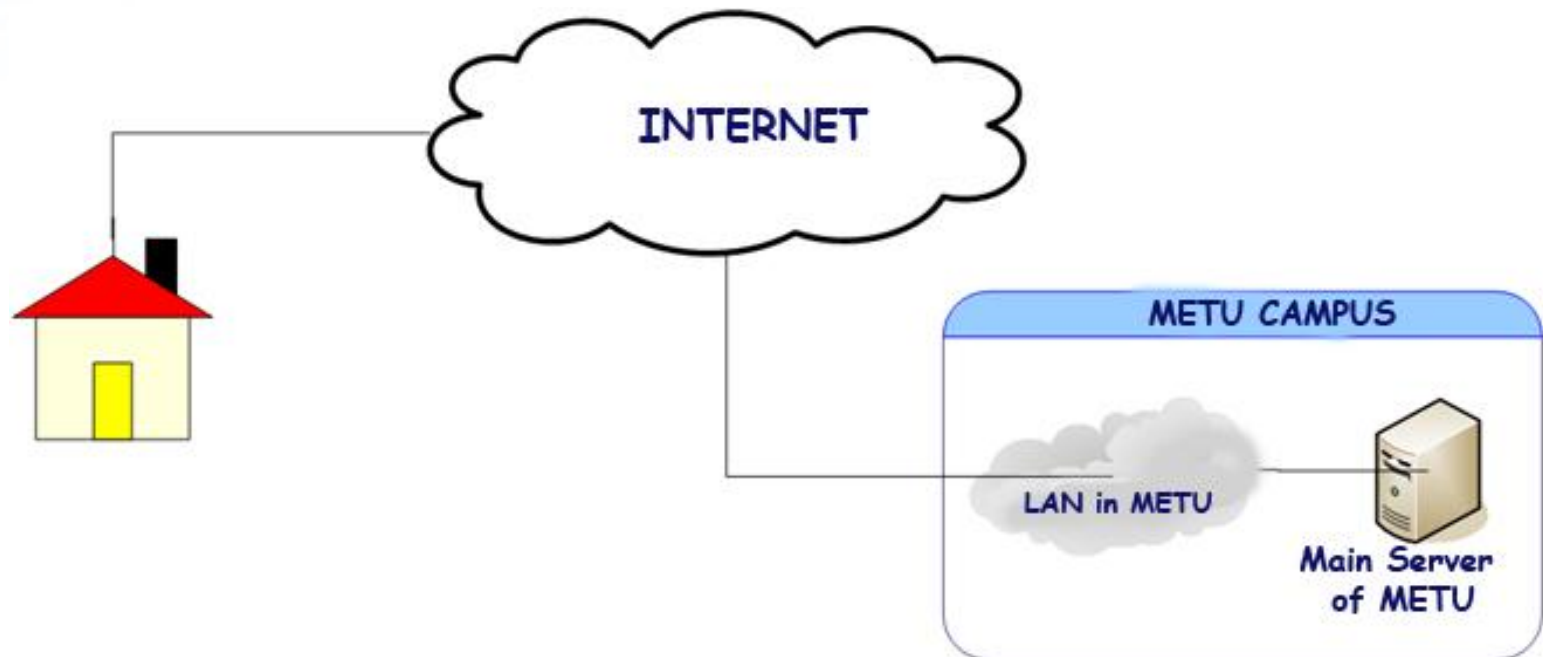
The Mechanics of Internet

- ***World Wide Web (www)***
 - The World Wide Web (www) was constructed as a ***graphic interface*** in 1990 that allows you to see photos and graphics, hear sounds, and view videos by simply clicking on a *hypertext link*.
 - ***So the Web is only a part, a dominant part, of the Internet.***
- ***Internet Service Provider (ISP)***
 - An organization that provides services for accessing, using, and participating in the Internet. i.e.: Türk Telekom

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The Mechanics of Internet

- When you want to access to METU main page from your home, first of all, you connect to the Internet and then to the METU's main server.



Connecting to the Internet

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The Mechanics of Internet

- **Modems**

- Everything on a computer – words, sound, and images- ***is translated into a series of ones and zeros*** so that the computer can “see” or “hear” what it receives.
- When you use a modem to connect to the Internet via telephone line, your computer or device sends out ***digital information*** (ones and zeros) and modem converts them into ***special sounds*** that the phone line can transmit.

- **Internet Protocols**

- When computers are connected to send information back and forth, they do it by sending the data in chunks of information, known as packets.
- The specification standards by which all these computers send information to each other or “talk ” are called ***protocols***. *Protocols are like language of the network.*

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The Mechanics of Internet

- There are hundreds of different types of protocols:
 - SMTP to *send email*
 - FTP to *copy files* from one place to another
 - HTTP to *request web pages*
- The two most important protocols are ***Internet Protocol (IP)*** , which moves the packet data from one place to another, and ***Transmission Control Protocol (TCP)*** which manages the transmission of packets and ensures they arrive without errors. Together they are called ***TCP/IP***.

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IP Address

- Each machine connected to the Internet has an address known as an **Internet Protocol address** (IP address).
- The IP address takes the form of four numbers separated by dots, for example: 144.122.144.160 (www.metu.edu.tr)
 - Each number ranges from 0 to 255
- Most machines also have one or more Domain Names that are easier for people to remember. Domain names are the word based addresses for websites.
- When you are setting up your domain name, you will use a **Domain Name System (DNS)**, which translates domain names like *metu.com* to IP number.
- For example google.com is the domain name and 172.217.21.142 is the IP address mapped to google.com.

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IP Address

- You can consider your TC number (or social security number) as the IP address and your name and surname as the domain name.
- Both the TC number and your name/surname identify you,
 - However, we call each other with our names, not with our IDs, because of its convenience.
- Similarly IP address and domain name identify same machine. However domain names are more convenient for users to remember.

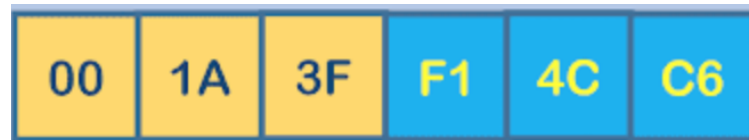


Illustration for IP address

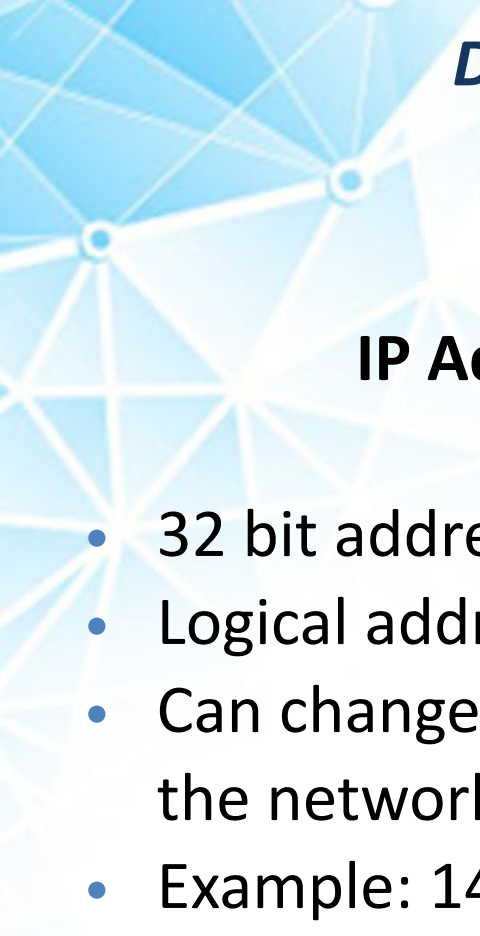
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MAC Address

- Apart from IP addresses, MAC (Media Access Control) addresses are also identifiers of you in the Internet.
- Unlike IP addresses, MAC addresses do not change, they are fixed for each network device and they are assigned by the manufacturers when they are build
- They are also often referred as hardware or physical addresses. They are 48 bits in length and are written in 00:1A:3F:F1:4C:C6 format.



Format of a MAC address



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IP Address vs MAC Address

IP Address

- 32 bit address
- Logical address
- Can change depending on the network environment
- Example: 144.122.98.88

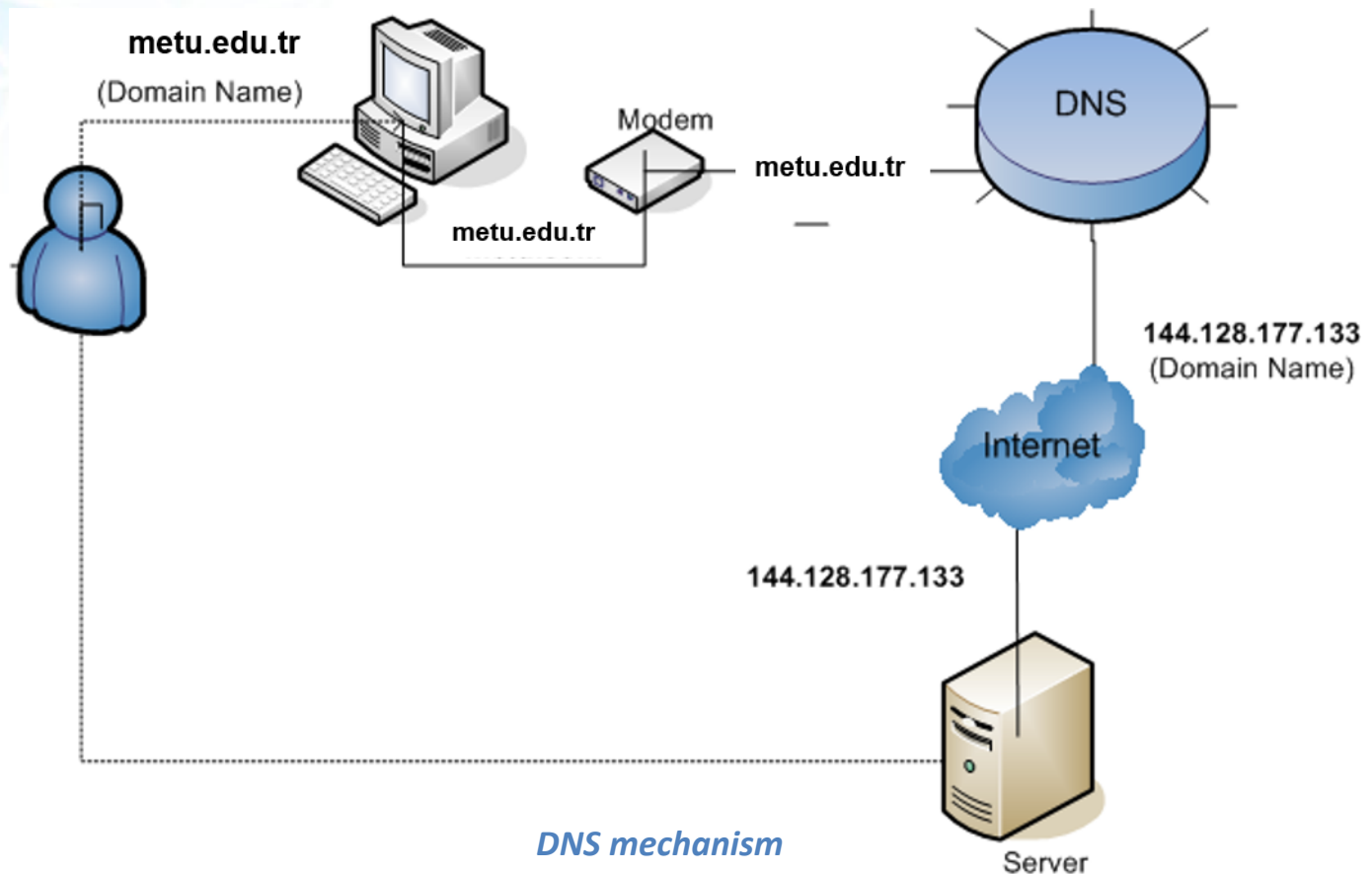
MAC Address

- 48 bit address
- Physical address
- Fixed, assigned by the manufacturer
- Example:
00:1A:3F:F1:4C:C6

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The Mechanics of Internet

- **DNS**



The Mechanics of Internet

How to get your own website

Building your digital presence begins with two key components: a domain name and web hosting. Here are the steps to get your site live:

1. Find a short, memorable and descriptive domain name for your website.
2. Check if your domain name is available from any hosting firm's website. (It may be already in use.)
3. Select appropriate Web hosting firm.
4. Transfer your web files to the hosting firm's server and pay the required service fee.

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The Mechanics of Internet

URL

- A web address is also called a ***Uniform Resource Locator (URL)***. Every web page has a unique URL that can be broken into three parts;
 - The Protocol
 - The Domain Name
 - The File Path
- <http://www.metu.edu.tr/about/misguide.php>

Protocol Domain Name Top Level File Path
Domain Name

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Mechanics of Internet

- Top Level Domains

Top Level Domain	Kind of Organization
.com	Commercial site (most companies use this extension)
.edu	Educational institution
.gov	Government agency
.mil	Military organization
.org	Non-profit or non-commercial organization
.info	Individual or company

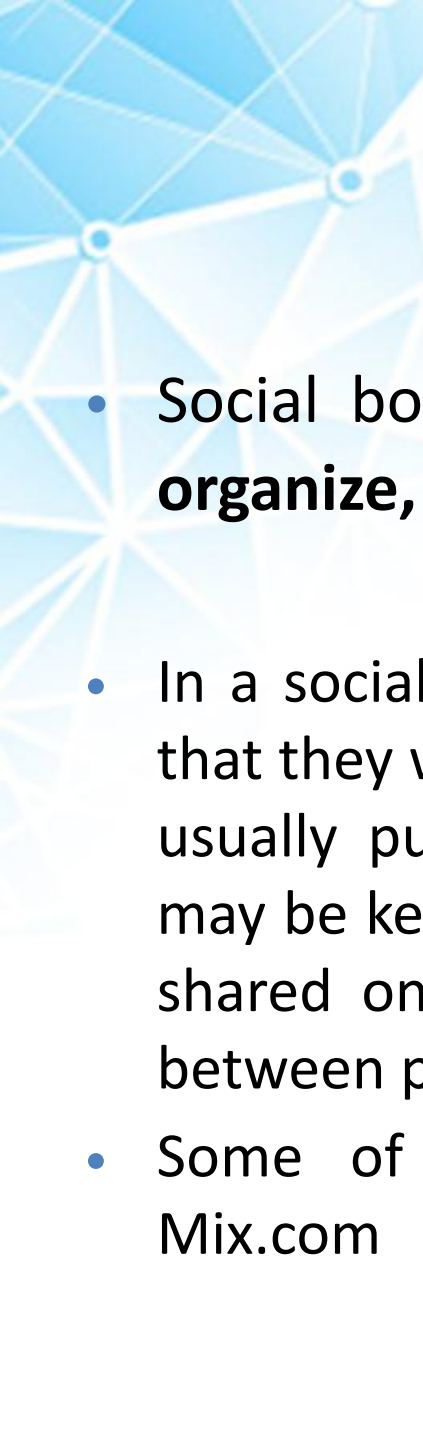
Country Extension	Country
.at	Austria
.au	Australia
.es	Spain
.ca	Canada
.fr	France
.uk	United Kingdom

Top level domains

The Mechanics of Internet

Browsers

- Browser is the program that serves as your window to the Web on the Internet. In order to view a site, you type its address (URL) into the browser's address field.
- Some examples of browsers:
 - Mozilla Firefox
 - Apple Safari
 - Google Chrome
 - Opera
 - Microsoft Edge



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Social Bookmarking

- Social bookmarking is a tool for Internet users to **store, organize, share and search bookmarks** of web pages.
- In a social bookmarking system, users save links to web pages that they want to remember and/or share. These bookmarks are usually public, but depending on the service's features, they may be kept private, shared only with specific people or groups, shared only within certain networks, or another combination between purely public and private.
- Some of the bookmarking sites: Pinterest, Reddit, Diigo, Mix.com

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Search Engines

- A **search engine** is an enormous database of websites compiled by a software robot that seeks out indexed websites, and sometimes other Internet resources as well. There are thousands of search engines, and they vary in *speed* and *skill*.
- **How a Search Engine works?**
 - When you use a search engine, you are *not searching* the entire web for the latest information. What you are doing is searching the full-text **index** of that search engine. Think of **index** as a computerized book index.

Search Engines

- You can consider each search engines as different tools for specific purposes. Common search engines are;
 - Google (www.google.com)
 - Yahoo (www.yahoo.com)
 - Bing (www.bing.com)
 - Yandex (www.yandex.com)
 - DuckDuckGo (www.duckduckgo.com)

Search Engines

- Essentials of Effective Search
 - Type one or more search terms (the words or phrase that best describe the information you want to find) into the search box and hit the 'Enter' key or click on the 'Search' button.
 - In response, the search engine produces a results page: a list of web pages related to your search terms, with the most relevant page appearing first, then the next, and so on.

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Effective Search

- Some tips to maximize the effectiveness of your search:
Boolean Operators
 - AND
 - OR
 - NOT
 - NEAR
- Let's go through the example; Search "Nirvana" in Google.
(that is the final emancipation of the soul from transmigration in Buddhism.)
 1. Try "Nirvana"
 2. Try "Nirvana **AND** Buddhism"
 3. Try "Nirvana **AND** Buddhism **NOT** Cobain"

Effective Search

- **Exclusion of Common Words**
 - Google **ignores** common words and characters such as "**where**" and "**how**", as well as certain **single digits** and **single letters**, because they tend to slow down your search without improving the results.
 - By attaching a + immediately before a word (remember, don't add a space after the +), you are telling Google to match that word precisely as you typed it. Putting double quotes around words will do the same thing.
 - Let's go through another example; Search the Star Wars Episode 1
 1. Try Star Wars Episode 1
 2. Try Star Wars Episode +1
 3. Try "Star Wars Episode 1"

Effective Search

- **Negative Searches:** If your search term has more than one meaning (bass, for example, could refer to fishing or music) you can focus your search by putting a minus sign ("-") in front of the Word that you want to avoid.
 - Example: Search bass which refers to fishing
 1. Try bass
 2. Try bass –music

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Specialized Search Engines

- **Specialized Search Engines:** Collection of web documents along a topical theme. For example, in the Arts, Science-related topics or even more specialized subjects such as Ancient History of the Mediterranean
- The followings sites are some examples of specific search engines or tools:
 - Google Scholar (<http://scholar.google.com/>)
 - Google Patent Search (<https://www.google.com/patents>)
 - Google Dataset Search (<https://toolbox.google.com/datasetsearch>)

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Library Research

- **Research libraries** contain vast ranges of printed books, copyrighted materials in a variety of formats, and online databases which require a subscription to access.
- **Online Public Access Catalog (OPAC)** is an online bibliography of a library collection that is available to the public.
- You can access to the METU library from the following link: <http://lib.metu.edu.tr>

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METU Library Research

- You can search the library's holdings for books, eBooks, digital records, images, periodicals, and more from the” **Library Catalog Search**”
- You can use the in the following link to get detailed information:
<http://lib.metu.edu.tr/guides-library-users>

The screenshot shows the METU Library website search interface. At the top, there is a navigation bar with links like 'New Search', 'E-Journals', 'METU Home', 'Multimedia', 'METU Library Home', 'Support', 'Sign In', 'Folder', 'Language', 'Preferences', 'Library', and 'Help'. Below this, the 'Searching: METUUnique Search' section features a search bar with the keyword 'deep learning' and a 'Search' button. To the left, there is a 'Refine Results' sidebar with options for 'Current Search', 'Boolean/Phrase', 'Expanders', and 'Limit To'. The main search results area displays 'Search Results: 1 - 20 of 74,441' and lists results under the heading 'Research Starter'. The first result is 'Deep learning' by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, published by MIT Press in 2016. To the right of the search results, there is a 'Newswires' section and a list of 'Other Resources' including SciFinder, Books in Print, InCites, International Nuclear Information System (INIS), Journal Citation Reports, statista, ProQuest Dissertations & Theses, and iunidata.

The screenshot shows the Middle East Technical University Library website search interface. At the top, there is a navigation bar with links like 'Home', 'Help', and 'Login'. Below this, the 'Middle East Technical University Library' section features a search bar with the keyword 'deep learning' and a 'Search' button. To the right of the search bar, there is a 'Search Options' sidebar with links for 'Keyword', 'Title', 'Author', 'Subject', 'Call number', 'ISBN/ISSN', 'Advanced Search', 'My Library', 'My account', 'Suggest a purchase', 'Library Links', 'Featured item list', 'Floor Plans', 'Journal Stacks Request Form', 'Course Reserves', 'Course Search', and 'Instructor Search'. The main search results area displays '463 results found. Sorted by relevance | date | title.' and lists results under the heading 'KEYWORDS (1-50 of 463)'. The first result is 'Investigating the performance of segmentation methods with deep learning models for sentiment analysis' by Kurt, Fatih, published by METU in 2018. The second result is 'Crack detection with deep learning: an exemplary study of data design in architecture' by Özgönen, Çağlar Firat, published by Ankara : METU in 2018. The third result is 'Deep learning cookbook : practical recipes to get started quickly' by Douwe Osinga, Douwe, author, published by Cambridge : O'Reilly in 2018. The fourth result is 'Deep learning with Python' by François Chollet, published by Shelter Island, New York : Manning Publications Co. in 2018.

Interfaces of METU library web site

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METU Library Research

- Let's make a search.
- Open METU library web page
 - (<http://lib.metu.edu.tr/>)
 - Try to find the book “Computers are your future”

GENERATIVE AI TOOLS

Effective Prompt Engineering



Unlike traditional search engines (e.g., Google) that rely on simple keywords, modern AI tools require **structured instructions** to yield the best academic research results.

- 1. Assign a Role (Context)** Give the AI a persona to frame the response. (e.g., *"Act as an expert computer science professor..."*)
- 2. Be Specific & Detailed** Replace vague queries with precise instructions. Detail exactly what you need and mention any constraints.
- 3. Specify the Format** Tell the AI exactly how to present the data. (e.g., *"Summarize the differences between LAN and WAN in a table."*)



**METU
ODTÜ**



TEST YOURSELF

DIGITAL INFORMATION RESOURCES

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