

# Data Communication and Managing Associated Security Issues

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**Abstract:-** The core purpose of data communication is to exchange information between two devices (Yekini, Bello & Adebari, 2012), regardless of their geographical location, technological medium or data content, which is achieved via the set of rules and regulation known as protocols and standards.

Computers, Telephones, and other devices are channels of communication. In addition, communication devices are made up of hardware and software. In recent years, technology has made it very easy for quick and effective communication. with these communication devices running businesses has become an easy operation.

This paper details Data communication and managing security issues. It examined what data communication is all about, principles that uphold data communication, components, and types of data communication, data communication tools, security issues in data communication, data security risk and control, ways of handling / managing security issues in data communication, and many more.

## I. INTRODUCTION

The explosion of the World Wide Web has created greater awareness of computer networks and has made understanding network fundamentals and data communications essential. (Shay, 2003) Data communication is the cornerstone of modern telecommunications. Telephones, the internet, computers, and wireless technology have transformed the world at large in all aspects of life; without them, the entire globe will be in the dark. Prior to the invention of networks, data had to be physically transferred from one device to another; the innovation of data communication and the network has saved us that stress. The most important aspect of data communication is the ability to help businesses and education reduce expenses and improve efficiency no matter where the individual parties are located. More so, people can share information and communicate virtually across the world.

The major characteristics of Data Communication include the following Jitter, accuracy, timeliness, and delivery. Moreso the cure requirement for effective communication are The sender, the receiver, and the medium which will be discussed in detail in the latter part of this journal.

Data security refers to protecting digital data from unauthorized access, corruption, or theft, to computers,

databases, and websites such as a cyber-attack or a data breach.

The major aim and objective of this paper are to understand data communication and manage its associated security issues.

- Understand what data communication is all about
- Discuss the characteristics, components/elements, and types of data communication/data flow
- Tools of data communication
- Important of data communication
- Security issues in data communication
- Ways of handling/managing security issues in data communication and many more.
- Security risk and solutions.

In data communication, the objective is to get the data to its final and correct destination at the right time at a low cost and error-free. Data security entails safeguarding digital information from unwanted users. It incorporates every aspect of Information security ranging from securing hardware physically, access control, storage devices, and administrative control. (IBM, 2020). (Fischer. B, 2020)

## II. DATA COMMUNICATION

Data communication comprises two terms “data” and “communication”. Data can be audio, image, video, multimedia files, and as well as text. Communication refers to the process of sharing or receiving a message or data; for instance, a conversation between two people. with Data communication electronic messages phone calls, instant messages, and emails. communication.

Simply put, “Data Communication” is an electronic transmission of data and information from one station to another independent of their geographical or current position, between two or more networked or connected devices. These devices must have the capacity to send and receive data over a communication medium. Examples of such devices include mobile phones, laptops, personal computers, etc. In data communication, data is transferred from the sender to the receiver.

Datacommunication comprises several components which facilitate the movement of data to its destination. these components include the following: The message, Sender, Receiver, and Transmission medium.

### III. CHARACTERISTICS OF DATA COMMUNICATION

Data communication depends on these core fundamentals: Accuracy, delivery, Timeliness, and Jitter. Delivery, It's expected that that data is delivered to the right source. the delivery process is handled by MAC and IP address. Media Access Control or MAC broadcast a device to other devices on the same local network and it comes with your system whereas IP or Internet Protocols are assigned by your internet provider. this address helps your device to be identified globally. (Burke & Partsenidis, 2022).

Consequently, accuracy means that Data should be delivered error-free. Besides, if there are any abnormalities during transmission, It should be retransmitted to the source. Moreso, delivery of these messages is handled by MAC and IP address. With MAC address and IP address data are being delivered to the correct destination and must be received by the intended user. Likewise, in Timeliness, data must be delivered during the specified time period without any delay. The late delivered data become unusable. Thus, Jitter refers to different variations. associated with packet arrival time. Also, the delay in data packets delivery of audio and video could reduce the quality of video

### IV. DATA COMMUNICATION/DATA FLOW TYPES

Transmission modes refer to the direction of signal flow between two devices that are connected together. Modes of data communication are as follows: Simplex, half-duplex, full-duplex, and serial communication. Simplex mode transmits the message in only one direction. whereas the message source is referred to as the transmitter the same way the destination becomes the receiver. This is known as unidirectional, the sender can only send data but not receive it. An example of Simplex mode is TV broadcasts and radio stations. Meanwhile, the Half-duplex communication system provides two-directional flow but allows transfer in one direction ie one at a time. This mode allows each station to send and receive data but not at the same time. Hence, the receiver must wait once the sender starts sending the transmission before responding. This is better than simplex. Example Walkie-talkie. Meanwhile, full-duplex is a mode that offers two-directional communication simultaneously as a result, the sender can send and receive data simultaneously. Therefore, it is regarded as the best mode of transmission. For example, Telephone. Finally, serial communication breaks data into smaller packets before delivering a message through a channel. However, it's the most common type of electronic device. (Gibson et al, 2022).

#### A. The Basic Data Communication tools

For every company to increase efficiency and productivity some IT tools need to be implored to find user-friendly solutions, simplify IT management, and stimulate employees' motivation. With the application of these tools, small-scale businesses, and large and medium-sized businesses start and build successful businesses. These are the basic communication tools for your business.

#### B. Basic Communication Tools

- Email
- Mail
- Telephones
  - Smartphones
  - Cell phones
  - Landline telephones
- SMS and messaging
  - Private group messaging and chat tools
- Video and web conferencing
  - Skype
  - Zoom
- Social networking site
- Computers
  - Notebook
  - Tablets
  - Laptops
  - Software
  - Desktop
- Internet
- Projects managements tools
  - Task managements tools

#### C. Important of data communication in the 21st-century

Communication is very essential to us on a daily bases and plays a huge role in all facets of life, especially in this 21<sup>st</sup> century, communication on the internet made what took months into seconds. Communication through mails box and physical letters has been reduced to almost zero. It has virtually made life to be easy. Here is some important data communication in the 21<sup>st</sup> century.

- **Communication and Interaction:** Communication technologies provide lots of opportunities to collaborate and communicate. With the help of communication technologies, online learning and distance are made possible. This creates a space for discussion, chatting, and video conferences.
- **Information access:** From the comfort of your home, You can access a wealth of information within seconds. Online articles, journals, and E-book collections offer thousands of texts and content for research purposes.
- **Creativity and Self-Expression:** digital recording functions integrated into tablets, and smartphones help us in expressing ourselves. With photo, audio, and video editing software we can access information and contribute to its creation.

### V. SECURITY ISSUES IN DATA COMMUNICATION

Security breaches have been a very big problem in data communication. Data Security ensures that data is received meaningfully only by the intended recipient

#### A. Why is data security important?

Most importantly, protecting your company's data from unauthorized access, and corruption is protecting your company from financial loss, consumer confidence, reputation damage, and brand erosion. According to the 2019 Cost of Data Breach Report from Ponemon Institute and IBM Security, the global average cost of a data breach has grown by 12 percent in the last five years to

\$3.92 million in 2020. The United States had the highest cost at \$8.19 million and healthcare had the highest average industry cost of \$6.45 million likely due to their high amount of personal data.

A review from IBM shows that the average time to contain a data breach was 73 days (IBM). The average time to identify a breach in 2020 was 220 days (IBM). The data breach lifecycle of a malicious or criminal attack in 2020 took an average of 280 days (IBM). An average of 4,800 websites per month are compromised with form jacking code (Symantec).20 Dec 2020.

**B. Most Common Data Security Threats**

**Computer virus:** this is a malicious software program used to perform a destructive activity that can spread from one computer system to another and disrupt computer programs. Consequently, it deletes data, corrupt the data, and uses email to disseminate this virus to every other mail.

**Trojan Horse:** Metaphorically, a “Trojan horse” refers to tricking someone to invite a cracker into securely protected files and documents. It appears as a mail from someone you are familiar with but if you click on the mail automatically you have downloaded this malware. Likewise, when you click on a false advertisement that contains a virus your is open to having the same.

**Computer Worms:** It’s a standalone malware program that replicates itself to spread to other computers. Majorly, it uses a computer network to spread itself leveraging on security failures. From an infected computer, the worms spread by sending themselves to every contact in another computer that is connected to it.

**Phishing:** Phishing is a type of malware whereby an unauthorized user obtains sensitive information such as credit card numbers, usernames, and passwords. The attacker sends phishing emails that appear legitimate to their victims, when the recipient clicks the malicious link it leads to the installation of the malware in his system.

**Adware and spyware:** Adware and spyware are common malware invasions that are stored on your computer systems without your permission. Its major role of spyware is to report your browsing activities including your visited website to the publisher of the spyware. Adware pops up ads that are useful to you.

**VI. WAYS OF HANDLING/MANAGING SECURITY ISSUES IN DATA COMMUNICATION**

**Authentication:** this is the process of checking the user's login data (password, biometric) before they have access to data. In fact, what authentication does is that it verifies users' credentials and matches them with those stored in your database. In addition, Backups & Recovery: The primary and most effective way to safeguard your information is by backing it up to the cloud. However, physical and local devices are additional ways to secure your data, this should be done regularly. Furthermore, Access control: Access control entails regulating users that should have access to your contents. Besides, only authorized personnel or system admins should be given access to a particular portal for optimal use and security

Likewise, encryption is a computer algorithm (called a cipher) and an encryption key transforms text characters into an unreadable format encrypted ciphertext such that someone can't read it without the precise information (encryption key) needed to unveil it. The encryption key needs to be kept safe and secured. Moreso, password protection is the commonest type of data security that is used over computer devices even without a network. It should be strong, with a combination of letters, numbers, and special characters, as well as unique. Finally, Tokenization: This is a process of turning a piece of data into a random string character called a token. It serves as a reference to original data.

S/N	PROBLEMS	SOLUTIONS	SECURITY IN PLACE
1	Unauthorized access to data	Minimize data access. Data encryption Query modification	Access control Data encryption Fine-grained access control
2	Unauthorized users	Have full knowledge of your user	Authentication
3	Service denial	Control access to resources	Availability
4	Lack of accountability	Users account monitoring	Auditing
5	Huge account database	Centralized management	LDAP-compliant directory services

Table 1: DATA SECURITY RISKS AND CONTROL

**• How to avoid spyware**

- Avoid clicking on banners that appear on your web pages
- Do not download free software
- Avoid spam e-mail messages
- Minimize music or file sharing

**VII. CONCLUSION**

Data communication is the transfer of information between two points or more networked/connected devices like printers, laptops, PCs, and routers from a source to a destination which is also called a sink. In data communication, data must be transmitted at the right time, and to the correct destination through a transmission media. The major components of data communication are as

follows: message, sender, receiver, transmission medium, and protocol.

Summarily, Data communication can take place through simplex communication, half-duplex, full-duplex, and serial- communication. Meanwhile, data could be communicated in form of numbers, text, images, audio, and video form. A protocol is a set of rules that governs data communication. The communicating parties: - the receiver, the sender and other devices need to follow e.g. access control and flow control are examples of protocol and its key elements are semantics, timing, and syntax. Summarily, there is no communication without a sender, receiver, message, and channels of communication.

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