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# ABSTRACT

Wireless multimedia communication systems become increasingly more computational intensive and demand for higher flexibility. The realization of these systems on reconfigurable hardware offers a good balance for these requirements. In this paper the suitability of commercially available reconfigurable hardware platforms for the target application domain is evaluated. Based on this evaluation a heterogeneous partly reconfigurable system-on-chip platform is identified as ideal implementation platform for the targeted systems. Systems from different target domains are analysed and different cases where the inclusion of reconfigurable hardware in their realizations would lead to improved quality in terms of implementation efficiency and flexibility are identified. Design methodology requirements for the realization of systems from the target application domain on the targeted platform are analysed and issues not covered by existing methodologies are identified. The principles of a methodology handling these open issues are described. Results from the prototyping of different systems are also presented and show the potentials of a reconfigurable hardware platform, which in the future will lead to reduced costs and increased flexibility of the wireless multimedia communication systems.

Advances in information technologies have made it possible to have Personal Information Service, i.e., personalized multimedia information available anywhere, anytime. Such ubiquitous access requires that a portion of the underlying network infrastructure be wireless. Therefore, a number of challenges associated with operating a wireless multimedia network must be overcome. In this paper we have. identified these challenges and some solutions.

# INTRODUCTION

Wireless communication (or just wireless, when the context allows) is the transfer of information between two or more points without the use of an electrical conductor, optical fiber or other continuous guided medium for the transfer. The most common wireless technologies use radio waves. Some of these terms may be familiar to you: radio and television broadcasting, radar communication, cellular communication, global position systems (GPS), WiFi, Bluetooth and radio frequency identification are all examples of "wireless", with wildly different uses in some cases.

Communication Systems can be Wired or Wireless and the medium used for communication can be Guided or Unguided. In Wired Communication, the medium is a physical path like Co-axial Cables, Twisted Pair Cables and Optical Fiber Links etc. which guides the signal to propagate from one point to other. Such type of medium is called Guided Medium. On the other hand, Wireless Communication doesn't require any physical medium but propagates the signal through space. Since, space only allows for signal transmission without any guidance, the medium used in Wireless Communication is called Unguided Medium. If there is no physical medium, then how does wireless communication transmit signals? Even though there are no cables used in wireless communication, the transmission and reception of signals is accomplished with Antennas. Antennas are electrical devices that transform the electrical signals to radio signals in the form of Electromagnetic (EM) Waves and vice versa. These Electromagnetic Waves propagates through space. Hence, both transmitter and receiver consists of an antenna.

With the affluence that comes with economic developments and technological advances, citizens around the world will demand personalized, on-demand, high quality information services, or Personal Information Service (PIS)[8]. Such services are characterized by being personalized, i.e., tailored to the individual user, and ubiquitous, i.e., available anywhere, any time. For example, while in the past we are satisfied with broadcast TV, in which millions of people watch the same programs, now we want video-on-demand (VoD), which allows one to choose the video at the desired time, and to interact with it. Another example is

Personal Communication Service (PCS) [11]. Each user is assigned a personal telecommunication number, and maybe reached anywhere in the world. In addition, each user will be able to access a variety of communication services on demand. The Internet provides yet another example of such personalized service, with each user customizing his access through a series of mouse clicks to get the information desired. Advances in computer, communication, consumer electronics, and information technologies in recent years have actually made such services available today to selected people. However, to make them available to the masses we must overcome a number of challenges. In particular, we must develop the infrastructure and protocols to support such services. This infrastructure will be a network of networks, including the existing public telecommunication networks, satellite networks, wireless networks, the Internet, etc. We have to study each such network not only as an independent entity, but also as a collection. The underlying protocol will most like be Internet Protocol (IP) based.

# LITERATURE SURVEY

*Literature Review for Multimedia in E-learning*

Multimedia technologies are digital technologies that combine text, graphics, audio, and animations to support e-learning. Without any doubt it is universally acknowledged and true that the 21st century is a knowledge based era and is driven by availability of different information technologies. Several studies in the whole world have shown that the appropriate use of multimedia technology in educational context would provide quite a lot of benefits. However, availability or presence of these technologies in learning institutions, it is not itself sufficient condition for user acceptance or adoption of them. Many challenges still remain to be addressed and are worth to be discussed regarding to the acceptance of these technologies especially in the higher education context in developing countries. In particular the writer focused on challenges as related to the institution, lecturer, student and technology, besides, the writer proposed a conceptual framework to give a clear view of the discussion. Key Words: Multimedia technologies, Information and Communication Technology (ies), Electronic (e) Learning, Technology acceptance model, institution, lecturer, student and technology

*Literature review for Underwater Wireless Communication*

Underwater wireless communications play an important role in marine activities such as environmental monitoring, underwater exploration, and scientific data collection. Underwater wireless communications still remain quite challenging, due to the unique and harsh conditions that characterize underwater channels. These conditions include for example severe attenuation, multipath dispersion, and limited resource utilization. Nonetheless advanced communication techniques using acoustic, electromagnetic and/or optical waves have emerged to tackle fundamental and practical challenges of underwater wireless communications. Recently, many academic and industrial researchers have paid attention to the development of state-of-the-art solutions for future underwater wireless communications and networks. This Special Section will enlighten and guide the potential research communities about the recent progress in the area of underwater wireless communications, and will encourage some of the leading research communities to present the state-of-the-art contributions and future research directions.

In this paper, they have presented a comprehensive survey of underwater optical wireless networks (UOWNs) research. This survey covers different aspects of cutting-edge UOWNs from a layer by layer perspective. Firstly, each layer of UOWNs such as physical, data link, networking, transport, and application layers are briefly presented and then localization techniques for UOWNs are surveyed. We started with defining different possible architectures for UOWNs and then the issues related to each

*Literature Review on Wireless Communication in data-centers*

Data centers (DCs) is becoming increasingly an integral part of the computing infrastructures of most enterprises. Therefore, the concept of DC networks (DCNs) is receiving an increased attention in the network research community. Most DCNs deployed today can be classified as wired DCNs as copper and optical fiber cables are used for intra- and inter-rack connections in the network. Despite recent advances, wired DCNs face two inevitable problems; cabling complexity and hotspots. To address these problems, recent research works suggest the incorporation of wireless communication technology into DCNs. Wireless links can be used to either augment conventional wired DCNs, or to realize a pure wireless DCN. As the design spectrum of DCs broadens, so does the need for a clear classification to differentiate various design options. In this paper, we analyze the free space optical (FSO) communication and the 60 GHz radio frequency (RF), the two key candidate technologies for implementing wireless links in DCNs. We present a generic classification scheme that can be used to classify current and future DCNs based on the communication technology used in the network. The proposed classification is then used to review and summarize major research in this area.

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# OBJECTIVE OF PROJECT

➢ Household environment that connects various automated household appliances through

➢ Routing and network communication technologies Methods that monitor fault parameters, methods using mathematical models, methods using signal processing, and methods using artificial intelligence.

➢ Wi-Fi traffic features like detection algorithm using TDD that can detect fault problems in real time.

➢ Wireless Multimedia Systems to enable seamless wireless hassle-free communication of complex media like audio and video.

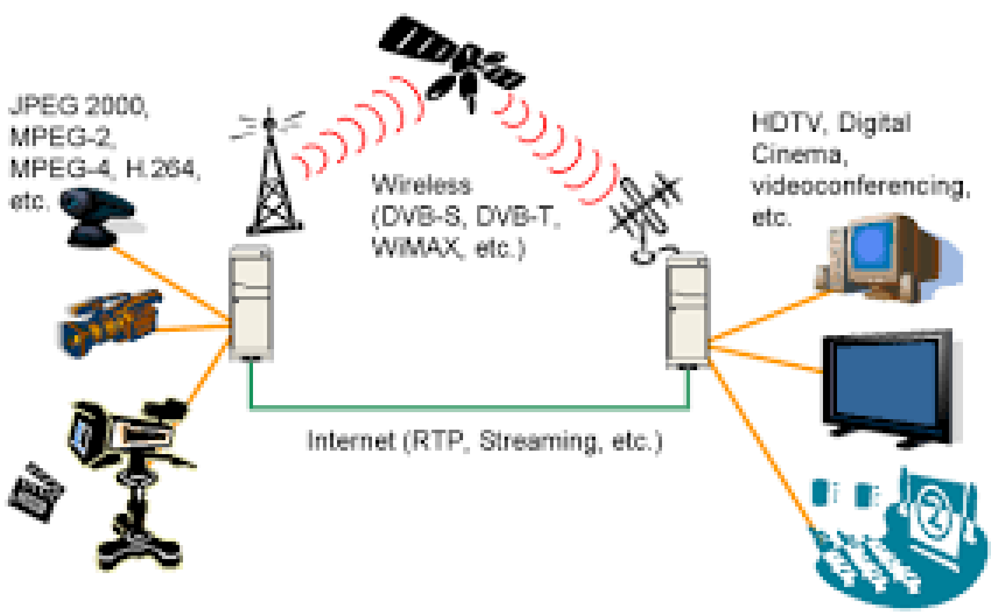
➢ Gateways and programs to transfer and share this multimedia to other devices wirelessly without any interruptions and drop of quality.

# METHODOLOGY

This invention relates to a wireless distribution system for home or business comprising a unitary distribution box, called a wireless multimedia center (WMC), which has inputs for receiving signals from one or more of: a satellite dish; a terrestrial antenna such as a VHF/UHF; a cable line; a telephone or data line such as ISDN, DSL, etc.; and/or fiber optic line, and any other future data or program sources can also be transparently input to the WMC with appropriate modifications or modular plug-ins.

Signals input are then re-broadcast, using OFDM technology, throughout the premises by low energy digital transmissions, at energy levels just above background radiation. These signals are transmitted to and received by individual transceivers, called end units (EU), located throughout the premises. These EU transceivers are presently contemplated as a video end unit (VEU) for TV and radio, and a communications end unit (CEU), for telephone and data.

The data channel instructs the WMC which program and data signals to send to which EU. Special multiplexing techniques result in extraordinary bandwidth and channel capacity.



# HARDWARE AND IMPLEMENTATION

## Wireless Interface Processor

The wireless interface processor (WIP) is a small electronic enclosure that houses the microprocessor, the radio transmitter, the radio receiver, and the antenna and communications interface. A WIP provides a connection to fixed resources such as instruments, computers, machinery, inventory, and property. The WIP provides the communication path from a remote site to a host system, as well as to HHCTs. The host system provides access to information such as inventory databases, equipment status and scheduling, process status, and control. A WIP also allows the HHCT user to access networks such as the Internet and its global information services, including email.

## Remote Data Collection

A remote data collection system can be implemented by using a wireless interface processor connected to the serial communications port of a computer system that has an inventory database application running. A handheld communication terminal with a bar-code scanner attached can then be used to communicate inventory data over a large area. By connecting a bar-code scanner, the HHCT can be used as an inventory-control or data-capture device.

The WIP is connected to the communications port (COM port) of the host computer. The host computer has its console assigned to the COM port and is executing an inventory or database application. The HHCT now can function as the computer console and provide data gathering and control of the host computer at up to 1,000 feet away.

The wireless components of the ArielNet Wireless Communications System12 operate in compliance with Federal Communications Commission allocations (part15) for license-free operation. This puts the communication range for each element of the wireless network at 1,000 feet. With an array of devices, much larger areas can be covered.

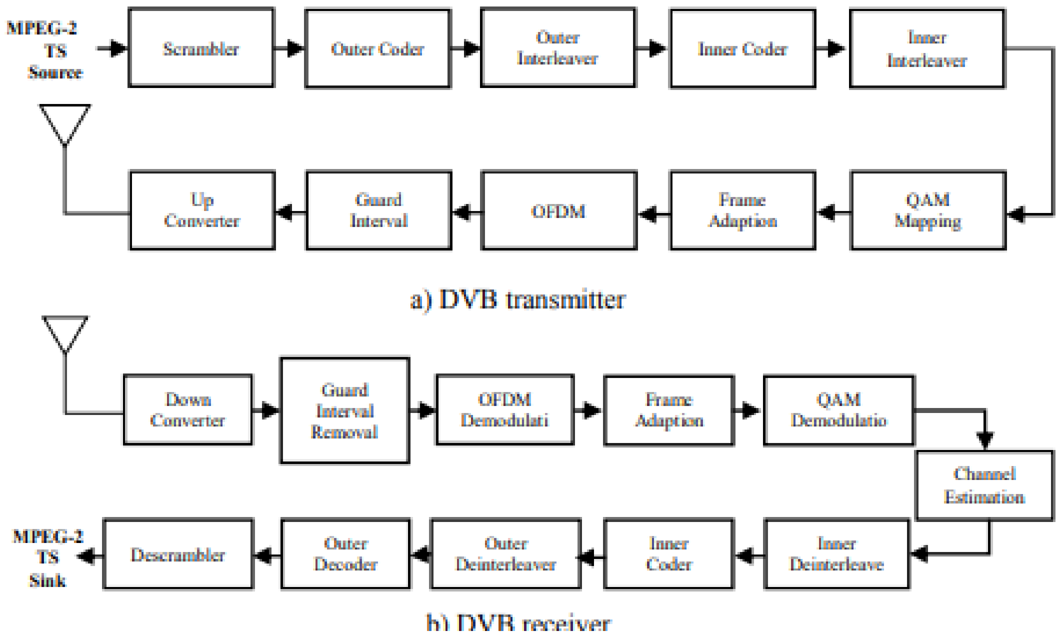
Handheld Communications Terminal

The handheld communications terminal (HHCT) consists of a liquid crystal display (LCD), 40-key keyboard, and RF modem housed in a lightweight, portable case. The low-power microprocessor in the HHCT provides the processing and communications functions. The HHCT unit provides most of the functions of an ANSII standard terminal. The HHCT is battery-operated for up to 12 hours on a charge and has provisions for connecting a bar code wand as an additional data-collection device.

Communications between the wireless interface processor (WIP) and HHCT are carried over a narrowband FM radio channel at a rate of 9600 baud. Any number of HHCTs can be addressed by the WIP as each HHCT has a unique identification number. The communications process is transparent to the user.

## System Models in Wireless Multimedia

Multimedia system can be represented in form of simple functional block units that adapts the MPEG-2 multiplexer. In Fig. 1 physical layer of DVB block diagram with DVB-H standardized benchmark is displayed.




OFDM in Wideband Wireless Multimedia Communication

A wireless digital recording or television studio requires the support of multiple constant-rate data streams at specified bit-error-rates and low delay – a scenario that is very different to the previous one. A centralized, scheduled MAC could be most efficient for such applications, which may also be supported by 4G systems. The 4 G systems has been developed to support at least of 100 Mbit/s at full mobility, i.e., at velocities up to 200–300 km/h [4]–[8],[11]. The term Mobile Broadband Systems (MBS) refers to this type of technology, in a number of references [4]–[6].

A multimedia network is expected to broadcast/transmit various formats of signals including but not limited to: graphics, audio, text etc. In last 20-25 years multi-media has been the highly studied topic as businesses have heavily involved multimedia communication in all of its segments. Multimedia networks has evolved as an independent research topic and includes message and data communication studies. The multimedia communication is segmented into 5 categories by Halsall (2001).

(a) Telephonic communication

(b) Data Networking

(c) TV and Radio broadcasting

(d) ISDN

(e) Internet broadbands)

Telephone Network

In the initial days, the PSTN used the voice signal processing technology for its operations. With increase in technical advancements, now PSTN has evolved not only for voice but for high data multimedia communication.

Data Network

For the simple or non-complex communications that includes but not limited to: email or file transfer, data networks can be deployed. This is the simplest format of PSTN. The only equipment's required to perform such operation is an active internet connection, an email account and a file server.

Integrated Services Digital Network (ISDN)

Conventional telephone lines convey analogue signals. These analogue signals must be first transformed to digital signals for data to be transmitted. This process however causes slow transmission as well as data signal distortion. These factors can be dealt with ISDN which is a comprehensive DTS (Digital Telephone Service) and sends signals in format of text, audio, video etc. in today's telephonic communication mediums. In terms of processing speed, today’s all high data communication channels are nothing but some popular ISDN applications.

# CHALLENGES OF WIRELESS COMMUNICATION

Multimedia communication has become the integral part of human's life style. Communication penetrated so deeply into our culture that most of our jobs are oriented to support this technology. In last to last decade i.e. in 90s, internet radio ranked high in human needs.

Today, multimedia streaming is high in demand and movies songs live matches etc. are streamed over the internet throughout the globe. Many business giants run the core spectrum of technology transfer and funds new entertainment (movies, songs in basic, but expanding to live shows, concerts, speeches, debates etc.). The online social and content streaming websites like Facebook, daily motion and YouTube allows its users to record and upload photos, audio files and videos from simple hand camera. Need of high data rate, less complicated hardware control, power efficient system and low delay tolerant network is must in multimedia wireless communication. To maintain the trade-off between mentioned constraint, selection compression technique, coding technique communication system model is typical in multimedia communication.

# CONSIDERATION OF MULTIMEDIA COMMUNICATION

## Uses of Multimedia

Most of multimedia applications needs delay sensitive, loss tolerant and adaptive bandwidth system design. Unlike traditional wireless and multimedia system which are not efficiently supporting multimedia applications. Wireless networks and Internet have fundamentally impulsive and adaptable structure. These circumstances creates a need of change in the essential properties of communication system for multimedia applications. The conventional information theory of signal processing and communication can be openly relevant in fast time varying channel conditions and communicating multiuser transmission environments. Subsequently, over the recent years, the region of multimedia communication systems has risen to support applications like sitting in front of the TV through the Internet on a portable PC, or to watch video trailers posted on the Internet by means of a wireless connection. Some of these applications are new to the Internet rebellion, while others may appear to be more customary, for example, sending VoIP to an evidently traditional phone, sending TV over IP to a traditional set top box, or sending music over WiFi to a traditional stereo amplifier.

## Encoding Schemes in Multimedia

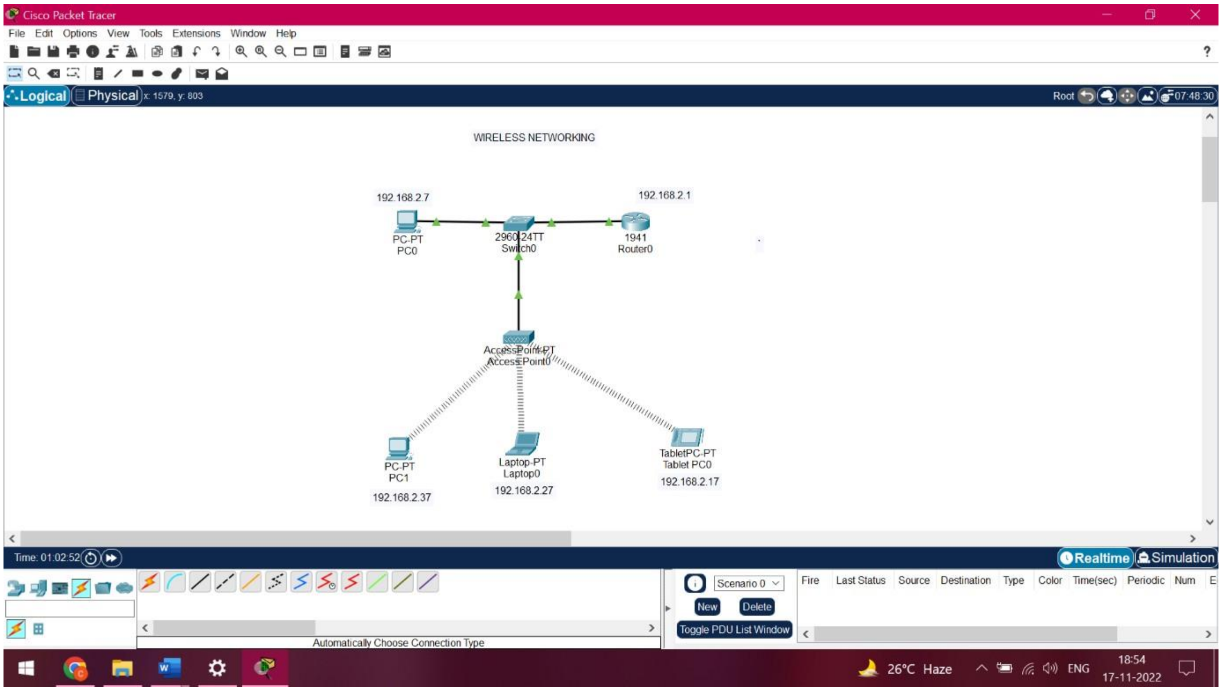
Encoding the multimedia content offline or online is one of the most important analysis of multimedia communication application. When real time communication or live broadcast applications are there then online encoding comes in the picture, other side encoding offline when streaming media is required on demand. Online encoding gives flexibility to achieve adaptive nature according to channel condition. Where receiver can interact with transmitter for transmitter .Further Transmitter can change the encoding or modulation based on CSI (Channel state information).Offline encoding has advantage of optimal encoding for efficient transmission.

## Different Cast Communication in Multimedia

Based upon the number of transmitter and receiver multimedia communication can be categorized into unicast, multicast, broadcast. Unicast involves one transmitter & one receiver, with advantage of back channel communication between transmitter and receiver .In unicast communication , receiver is able provide feedback to transmitter according to channel state condition ,and transmitter can adapt different compression technique ,different forward error technique and other transmission parameters. Multicast transmission involves one transmitter and set of multiple receivers for communication in multicast session. It is more efficient for resource utilization and server complexity reduction. Broadcast communication involves transmitter to transmit signal to all the receivers available in the network. A wireless link is an example of Broadcast communication.

# NETWORK DESIGN AND ARCHITECTURE

The network architecture is as follows:




The architecture consists of the following devices:

- 2 PCs, 1 Laptop, 1 wireless tablet(s)
- Access Pointer
- Router
- Switch

The connections are made Wireless to implement Wireless Network System.

# <u>CODE</u>

```
#include <iostream>
#include <fstream>
#include <string>
#include <sstream>
#include <cstring>
#include <arpa/inet.h>
#include <sys/socket.h>
#include <unistd.h>

#define PORT 8000
#define BUFFER_SIZE 1024

int main() {
    // Create a socket
    int server_socket = socket(AF_INET, SOCK_STREAM, 0);

    // Define the server address
    sockaddr_in server_address;
    server_address.sin_family = AF_INET;
    server_address.sin_addr.s_addr = INADDR_ANY;
    server_address.sin_port = htons(PORT);

    // Bind the socket to the address and port
    if (bind(server_socket, (sockaddr*) &server_address, sizeof(server_address)) < 0)
{
        std::cerr << "Error binding socket\n";
        return 1;
    }

    // Listen for incoming connections
    listen(server_socket, 1);
    std::cout << "Server listening on port " << PORT << "\n";

    // Accept a client connection
    sockaddr_in client_address;
    socklen_t client_address_size = sizeof(client_address);
    int client_socket = accept(server_socket, (sockaddr*) &client_address,
&client_address_size);
    if (client_socket < 0) {
        std::cerr << "Error accepting connection\n";
        return 1;
```

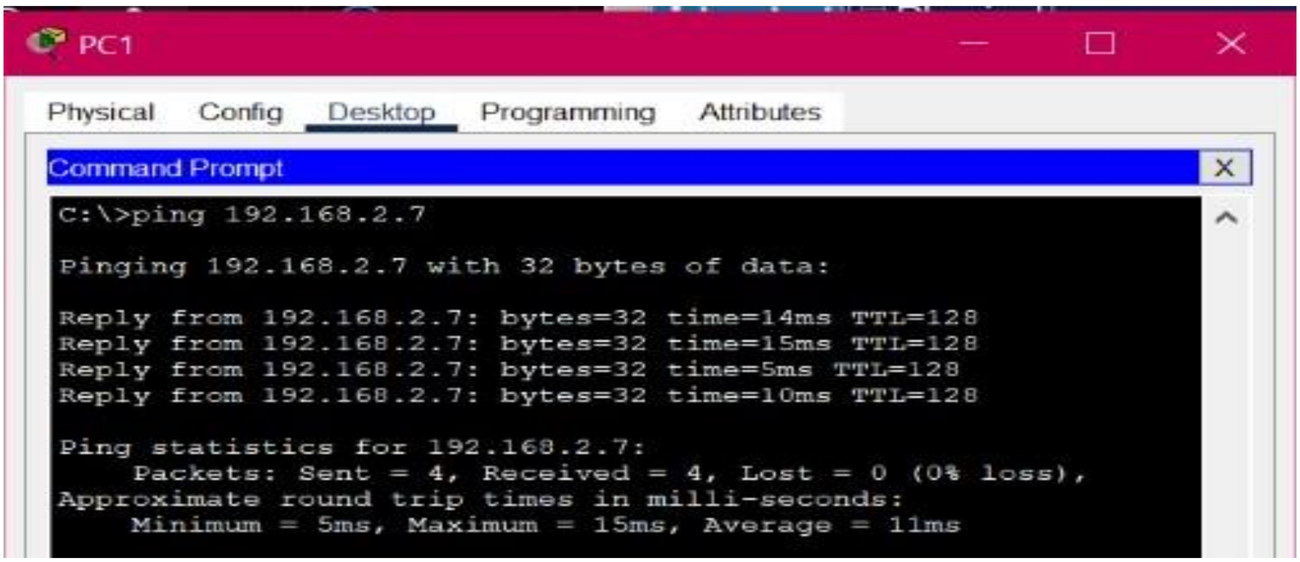
```
    }

    // Open the multimedia file to be sent
    std::ifstream file("example.mp4", std::ios::binary | std::ios::ate);
    if (!file.is_open()) {
        std::cerr << "Error opening file\n";
        return 1;
    }
    std::streampos file_size = file.tellg();
    file.seekg(0, std::ios::beg);

    // Send the multimedia file to the client
    char buffer[BUFFER_SIZE];
    std::streampos bytes_sent = 0;
    while (bytes_sent < file_size) {
        int bytes_to_send = std::min(BUFFER_SIZE, static_cast<int>(file_size -
bytes_sent));
        file.read(buffer, bytes_to_send);
        int bytes_sent_now = send(client_socket, buffer, bytes_to_send, 0);
        if (bytes_sent_now < 0) {
            std::cerr << "Error sending data\n";
            return 1;
        }
        bytes_sent += bytes_sent_now;
    }

    // Close the socket and file
    close(client_socket);
    close(server_socket);
    file.close();

    return 0;
}
```

# RESULTS AND DISCUSSION

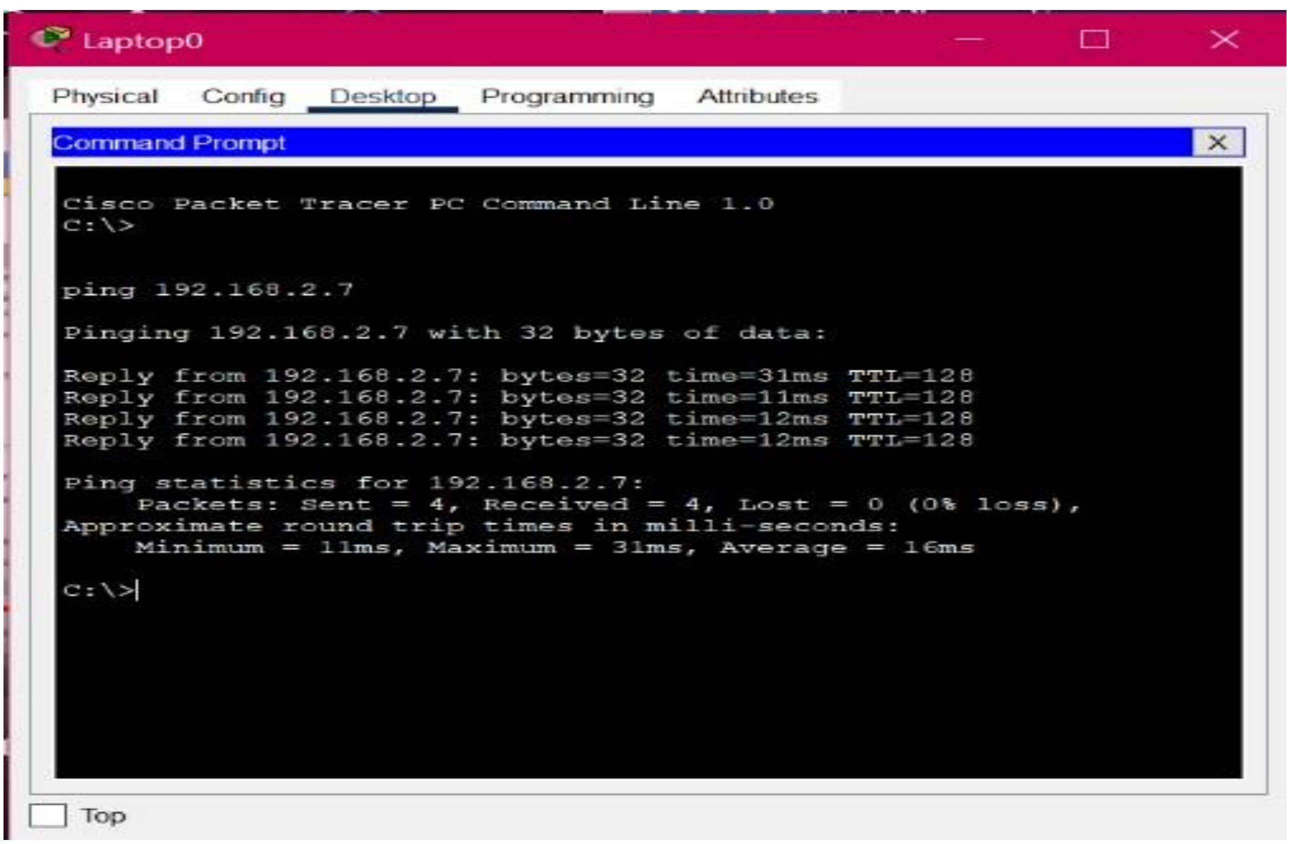
**Connection Check**

The network connections were checked by ping requests:

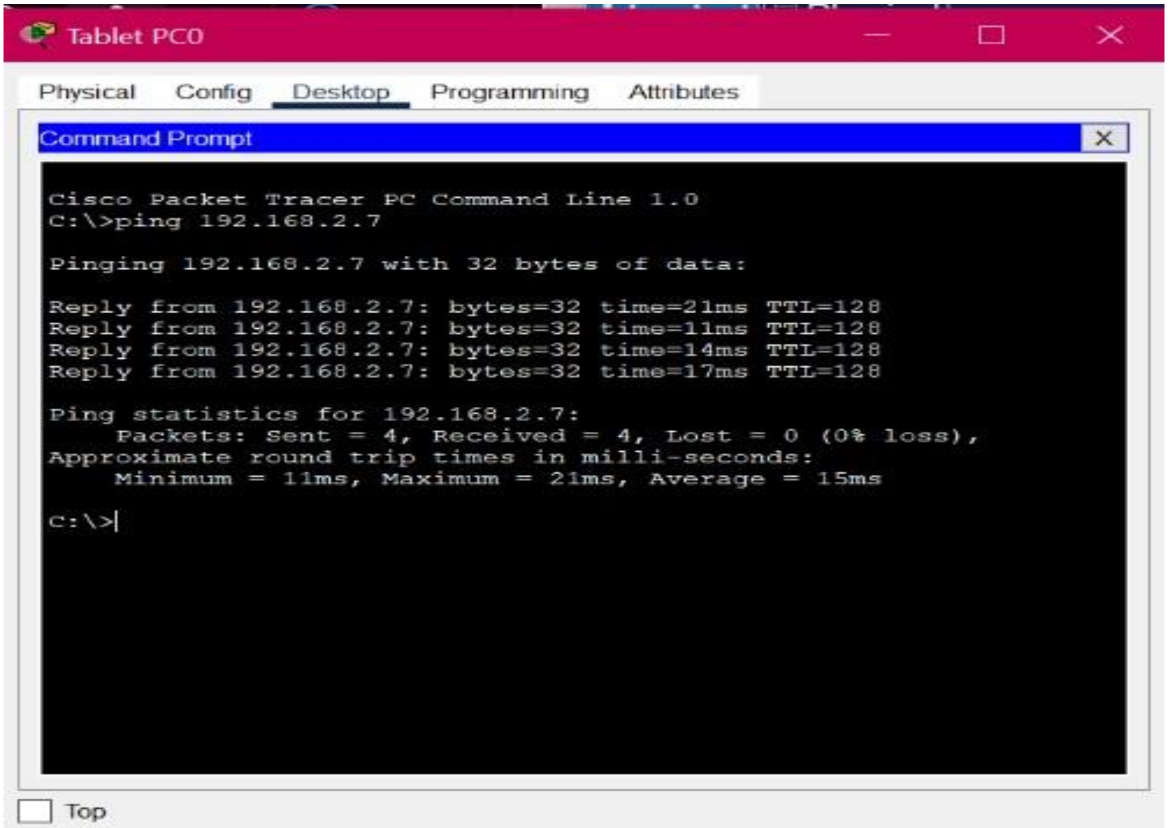
PC1 to PC0:-




Laptop0 to PC0:



TabletPC0 to PC0:-



# CONCLUSION

From this project we can conclude that wireless multimedia communication has become a very essential part of our day-to-day life. This type of communication require highly complex mechanisms to work seamlessly and error free.

Wireless communication involves transfer of information without any physical connection between two or more points. Because of this absence of any 'physical infrastructure', wireless communication has certain advantages. This would often include collapsing distance or space.

Wireless communication has several advantages; the most important ones are-

Cost effectiveness

Wired communication entails the use of connection wires. In wireless networks, communication does not require elaborate physical infrastructure or maintenance practices. Hence the cost is reduced.

Flexibility

Wireless communication enables people to communicate regardless of their location. It is not necessary to be in an office or some telephone booth in order to pass and receive messages. Miners in the outback can rely on satellite phones to call their loved ones, and thus, help improve their general welfare by keeping them in touch with the people who mean the most to them.

Convenience

Wireless communication devices like mobile phones are quite simple and therefore allow anyone to use them, wherever they may be. There is no need to physically connect anything in order to receive or pass messages.

Speed

Improvements can also be seen in speed. The network connectivity or the accessibility were much improved in accuracy and speed.

Accessibility

The wireless technology helps easy accessibility as the remote areas where ground lines can’t be properly laid, are being easily connected to the network.

Constant connectivity

Constant connectivity also ensures that people can respond to emergencies relatively quickly.

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