

Applying Effective Software for Controlling Computers Remotely

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Abstract. Today, many educational institutes, labs, houses or organisations have their private Local Area Network (LAN), so they need to monitor employees, students in exams or machines which are working on the network. This paper aims to design and implement efficient application that can be used to track everyone who is working between 1-10 users (operating systems) on LAN network remotely; so access PC, Mac and Linux. In other words, it can monitor screens remotely, send a warning message and shutdown system. Including, it operates at low-cost, enables daily using in the services of all scales; and provide the network performance simultaneously. The implementation has achieved using Front end- JDK, JAVA language, Windows 7, 8, and 10, Visio, Wireshark, Task manager, chart expert, Microsoft excel, ten computers, Ethernet & Wireless of LAN network, etc. This software has applied in real-world in students examinations at three schools in Iraq. As a result, this software eligible to allocate the task to clients to restrict them from misusing the resources. As well as, automates lab and monitor attendance with performance analysis.

Keywords. Web Real Time Communication (WebRTC), Local Area Network (LAN), Quality of Experience (QoE), Screen Monitoring, System Controlling.

1. Introduction

Web Real-Time Communication (WebRTC) framework offers the ability of direct interactive communication for audio, video and data between two web browsers (peer-to-peer) [1]. This technology does not need to registration, downloading, installation, external software (plugins), license, etc [2]. Also, it describes the aspects of media transport and identifies how the Real-Time Transport Protocol (RTP) is employed in the WebRTC context [3]. Also, it supported by Google, Opera, Mozilla, Apple, and Microsoft, as well as its limitations have been distributed by the World Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF) [4].

Screen monitoring or remote desktop service as emphasised in [5][6][7][8], is a technique that monitors and creates screenshots from computer's screen that working on the network; this monitoring able to capture and record whatever happening on screens of computer desktop like file, transfer and print documents remotely. These data can be images, videos, diagrams, playing games, files, etc. So, amendment, enhancement, and usage can occur on data; also, this data uses as feedback or report. In other words, an administrator can access all files, applications, and obtain network performance of other computers precisely [9].

Now a day, the mechanism of screen monitoring plays an essential role [10] and can support many applications at schools, companies and so on [11]. In addition, in [12][13][14] demonstrated that screen monitoring can support invigilator to monitor students in examinations and to improve their knowledge through getting feedback of assignment weaknesses, and also for developing writing skill

and academic skills. In [15], emphasised that screen monitoring is required to improve studying and establishing a useful learning environment. Moreover, screen monitoring is necessary to protect the network from critical threats through obtaining screenshots by the network administrator. Similarly, screen monitoring becomes important while the detection has related to it, especially it is automatically joining investigative data within a screen capture [16]. Furthermore, the necessity of screen monitoring has been required directly in real-time to capture complete screen when wanted [17]. Additionally, screen monitor are still widely utilised; also, it is powerful to improve a system that records all dynamic activities on screen [17][18][19]. Besides, in [20] illustrated that as long as a remote screen can share systems to display contents, so it is possible to gain device control at the same time. Equally important, using screen monitoring presents the accuracy of more than 70% and reveal valuable information about the communication between clients and computers [21]. Not only that but also, parental use screen monitoring to understand how adolescents are using media which support parental to select a better way to adjust implications on it [22][23].

The primary objectives of this research are to design and test an application That Can Be Used To Invigilate Students, Children, Employees Who Are Using Between 1-10 laptops (operating systems) on the network remotely; as long as, this software is able to monitor computer screens and get different files, such as images, videos, applications, etc.

Accordingly, this application enables controlling the client's usage by sending a warning message and shutdown system. Moreover, this research works at low-cost, allows daily using in the services of all applications, and offers the network performance concurrently.

Identically, the application has implemented in real-world at schools in Iraq. Uniquely, this application has designed and established without using commercial servers, external software or hardware; also, it is not an extension of a TV structure.

The organisation of this paper is as shows; Section 2 discusses problem definition. In section 3, is a presentation of the methodology, implementation and analysis. Lastly, the conclusion and future effort have mentioned in Section 4.

2. Problem Definition

In [24][25][26], illustrated that using sensors for monitoring is: expensive for measuring or analysing, need a specific type of exercise, need to select a suitable platform to use a sensor, error is available through personal usage. Moreover, in [27][28][29][30], explained that using screen monitoring via cloud leads to: downtime, security and privacy issues, limit control and flexibility, using a cloud is still under development phase, using a cloud requires a certain amount of confidence.

However, screen monitoring through the network has advantages that save content from a screen, such as images, videos, and files. In other words, the content can be as follows: (a) streaming online data from platforms or applications, (b) audio and video calls from various forms, such Skype, and Google Hangouts, and (c) because of Covid-19, live multimedia like audio or video social media can be offered among people. Therefore, in [31][32][33][34] emphasised that many applications have been required developed screen monitoring apps and system controlling through a network that gains the following tasks: cost-effectiveness, better security, increased productivity, flexibility, real-time notifications, and early detection of problems, monitor the different activities of users, support organisations to monitor the behaviour of their employees, communicate with the users and providing instructions and share tasks, and gain information about network performance. This stage contains five points:

- Data performance.
- Data process and analysis.
- Present the data in an appropriate form.
- Economic Feasibility (if someone goes to harm the system).

- Behavioural Feasibility (if someone goes to annoy colleagues).

3. Methodology, Implementation, and Analysis

3.1. Methodology

In this project, it has used JAVA language and front end- JDK as a platform, C++ language (Object-Oriented concepts) for networking; generate portable executable code to be downloaded. Besides, many computers linked through (Ethernet and Wireless) of the LAN network was used. Figure (1), presents the control flow diagram of this research.

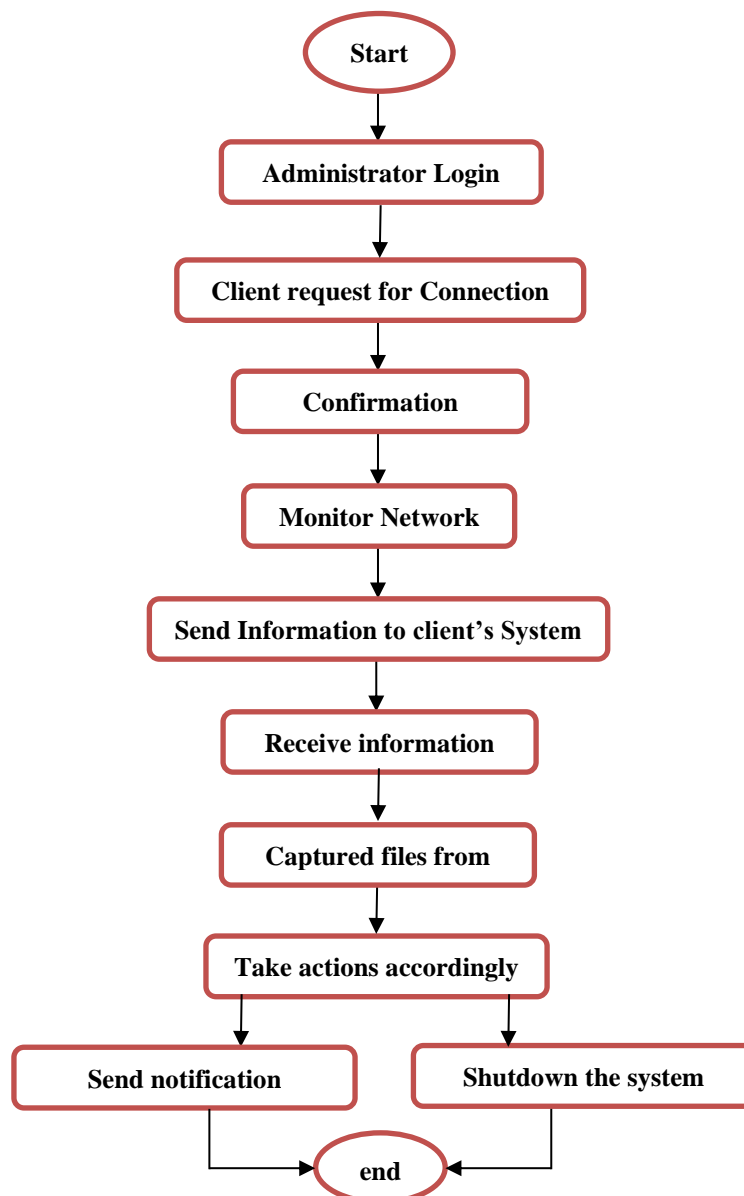


Figure 1. Control flow diagram

3.2. Implementation

A network lab was prepared to test this application among different computers via (Ethernet & Wireless) of LAN network. In this implementation, new application has tested to monitor other computers remotely by capturing screen, sending warning messages to the clients, and shutdown the system. Uniquely, various classes have created using JAVA and C++ languages to test mechanisation, self-running demos, and other applications. The primary classes and preparation can explain as follows:

- a) Robot Class: to produce a natural system and input actions for the exam, such as mechanisation.
- b) AWTException Class: to support when the configuration does not permit low-level input control.
- c) SecurityException Class: to build and adjust the main browser.
- d) Establish socket connection using Mnemonics.
- e) Administrator specifies the valid IP address and DNS server.

In this research, networking management services and supports social network in monitoring and maintaining a different kind of files with network's performance too. Furthermore, it has divided into many types based on ISO network management model as follows: (a) performance management, (b) configuration management, (c) accounting management, (d) fault management, and (e) security management. Based on network performance, it measures different aspects and shows them in the preferred form. As a result, it can display the number of parameters:

- a) Sends and receives bytes every second.
- b) Sends and receives packet every second.
- c) Output and bandwidth consumption.

In this project has been utilised Use Case Diagrams to assess the behaviour of the application. Thus, each programmed class can show a group of use cases and relationships between them. For the administrator, it login to the network monitoring and then begins monitoring the screen on the Ethernet or Wireless of LAN network. So, the administrator gets the right action depending on the status; therefore, it can prevent the client from running the system, or communicate to the client as shown in figure (2).

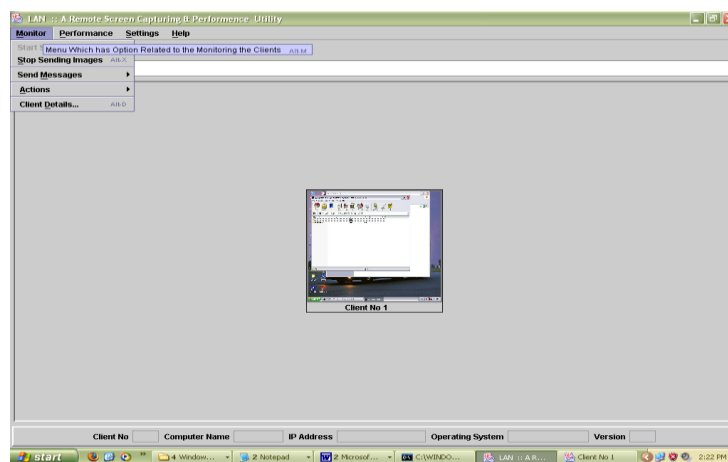


Figure 2. Selecting order based on the client's screen

In contrast, the server should present the captured images and then works consequently. Similarly, the administrator can cooperate with the client and help if needed. On the other hand, the application will capture images from client-side and deliver them to the server, as shown in figures (3&4). Accordingly, the server will send a message to the client-side. As well as, figure (5), shows software pseudocode.

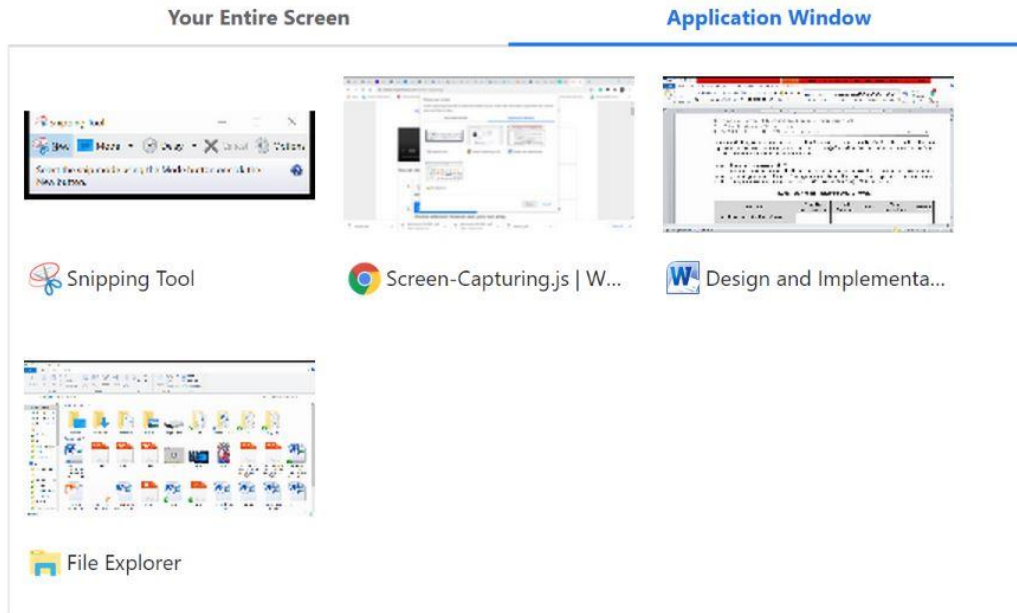


Figure 3. Screenshot from client no.1

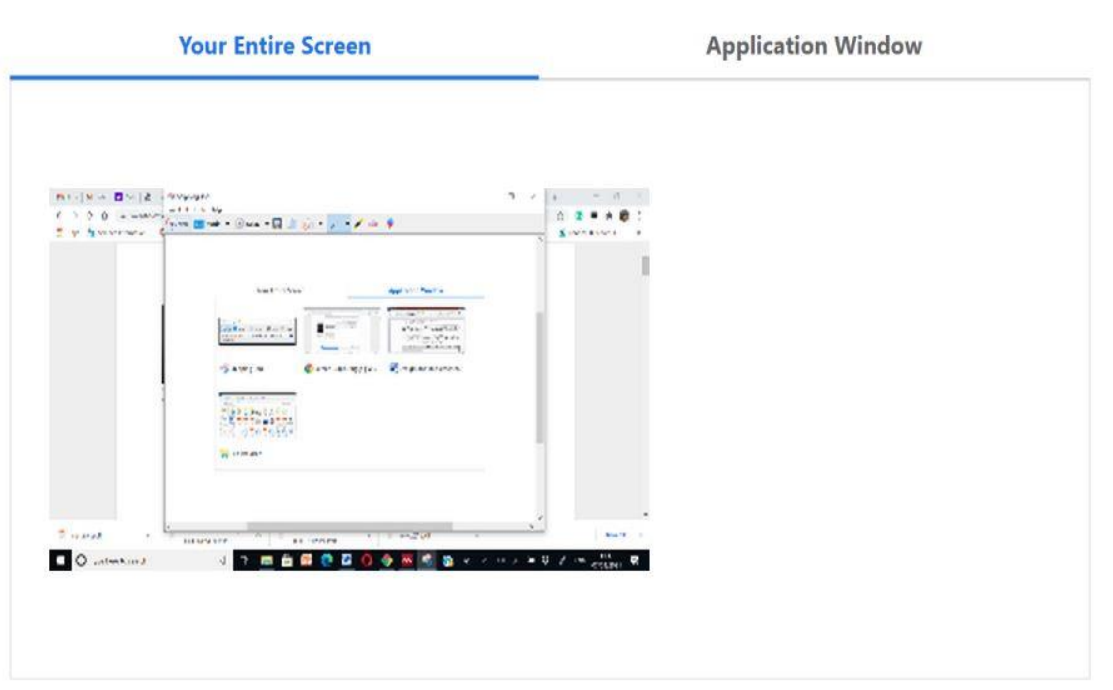


Figure 4. Screenshot from client no.2

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1. SET JButton;
2. SET JDialog
4. SET JMenuBar;
5. SET JMenuItem;
6. SET MediaStream;
7. SET Navigator;
8. SET Console.log;
9. SET BufferedInputStream;
10. SET BufferedOutputStream;
11. SET BufferedReader;
12. SET BufferedWriter;
13. SET ClientImageDisplay;
14. SET ClientsDetailDisplay;
15. SET ScreenCapture;
16. SET PerformanceDetail;
17. SET CP = Client Performance;
18. SET CP = 1 (good), CP = 0 (bad);
19. SWITCH Start Connection;
20. CASE1: start monitoring;
21.     IF CP =1;
22.         THEN keep capturing screen;
23.         ELSE send a warning message;
24. CASE2: keep monitoring
25.     IF CP = 0;
26.         THEN shutdown system;
27.         ELSE keep capturing screen;
28. END
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Figure 5. Implementation Pseudocode

3.3. Analysis

It has proved that this application has enabled screen monitoring among different systems via LAN network. This implementation using a new approach can offer controlling among ten operating systems that can send a warning message and shutdown system. Moreover, it can save images, videos, documents, and network performance for different clients. Identically, it keeps running even if any client gets in or leaves any time. In particular, it has created without using any commercial server, external software or supportive hardware; also, it is not an extension of a TV system. This software has advanced to enable cooperative work, and it can be supposed as a accomplished screen monitoring and controlling computer devices remotely. On the other hand, it does not support more than ten operating systems. In contrast, the QoE confirms that this software has worked perfectly so that it can achieve additional tests in the future.

3.4. Quality of Experience (QoE)

Using questionnaires, actual clients have involved in this test to give their views on the recognised user knowledge, as displayed in Table (1). This experiment confirmed that this software is productive and can be used in different applications and among ten clients via (Ethernet & Wireless) of LAN network.

Table 1. QoE of ten clients using this software

Questions	Very Bad Very annoying	Bad Annoyin g	Fair	Good Perceptibl e	Excellen t
Rate the ease of using this software					10
Rate the quality of using this software					10
Rate the ease of this software in different fields				2	8
Rate the ease of this software comparing with sensors				4	6
Rate this software for capturing image, videos and files				6	4

4. Conclusion And Future Effort

In this paper, a productive application to monitor and control operating systems through capturing screen, send a warning message to the user and shutdown system has designed and tested. Using this application can serve many organisations, such as educational institutes, labs, houses and so on. In other words, everyone who is working on the network can be located, monitored and restricted from misusing the resources, wasting time, annoying others, harm devices, etc. As long as, this application able to control various activities of clients by the network administrator, restrict clients from performing an illegal task and give them instructions or other duties. Moreover, it offers benefits, such as low-cost, enables daily using in the services of all scales, and obtain network performance altogether. On the other hand, this application needs effort in the future, such as scalability to be worked over more than ten operating systems, and works over the Internet.

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