www.ijecs.in
International Journal Of Engineering And Computer Science ISSN:2319-7242
Volume 4 Issue 7 July 2015, Page No. 13076-13081

Quality Of Experience In Remote Virtual Desktop Services

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Abstract: The Remote Desktop (RD) paradigm allows end users to remotely access content and applications running on their PCs through a network connection. Remote desktop system uses ARM 32-bit Raspberry Pi micro controller useful for the development of remote virtual desktop services. Raspberry pi board is interface with keyboard, mouse and monitor. Raspberry Pi board setup is interfaced to the PC using LAN connection and communication is done using RDP protocol. To access PC have to use xserver both in PC and Raspberry Pi. Xserver (GUI) is used as interface between user and operating system. Xserver is used to control all actions generated by key board, mouse and gives indication to the system to perform the task. For example if any icon is pressed on the desktop using mouse then it raises event to operating system to perform certain action.

Since PC and raspberry Pi both are interfaced through LAN network can be access the desktop using RDP protocol. RDP protocol is remote desktop protocol which is used to read frame buffer from remote desktop and allows displaying the received frame buffer on the monitor connected to Raspberry Pi. Now remote desktop on monitor connected to raspberry pi board. By using keyboard and mouse can be access desktop like opening web browser or entering data on note pad through key board etc.

Index Terms—RDP protocol, thin client, virtual desktop

INTRODUCTION

Modern thin-client systems are designed to provide the same graphical interfaces and applications available on traditional desktop computers while centralizing administration and allowing more efficient use of computing resources. Despite the rapidly increasing popularity of these client-server systems, there are few reliable analyses of their performance. Industry standard benchmark techniques commonly used for measuring desktop system performance are ill-suited for measuring the performance of thin-client systems because these benchmarks only to measure application performance on the server, not the actual user-perceived performance on the client. To address this problem, we have developed slow-motion benchmarking, a new measurement technique for evaluating thin-client systems. In slow-motion benchmarking, performance is measured by capturing network packet traces between a thin client and its respective server during the execution of a slow-motion version of a conventional benchmark application. These results can then be used either independently or in conjunction with conventional benchmark results to yield an accurate and objective measure of the performance of thin-client systems. We have demonstrated the effectiveness of slow-motion benchmarking by using this technique to measure the performance of several popular thin-client systems in various network environments on Web and multimedia workloads. Our results show that slow-motion benchmarking solves the problems with using conventional benchmarks on thin-client systems and is an accurate tool for analyzing the performance of these systems.

PROPOSED SYSTEM

The Remote Desktop (RD) paradigm allows end-users to remotely access content and applications running on their PCs through a network connection. In this system uses ARM 32-bit Raspberry Pi micro controller useful for the development of remote virtual desktop services. In Fig1 the raspberry pi board can interface with a keyboard, mouse and monitor. This Raspberry Pi board setup is interfaced to the PC using LAN connection and communication is done using RDP protocol. To access PC need to use xserver both in PC and Raspberry Pi. Xserver (GUI) is used as interface between user and operating system. Xserver is used to control all actions generated by key board, mouse and gives indication to the system to perform the task. Example as if press any icon on the desktop using mouse then it raises event to operating system to perform certain action.

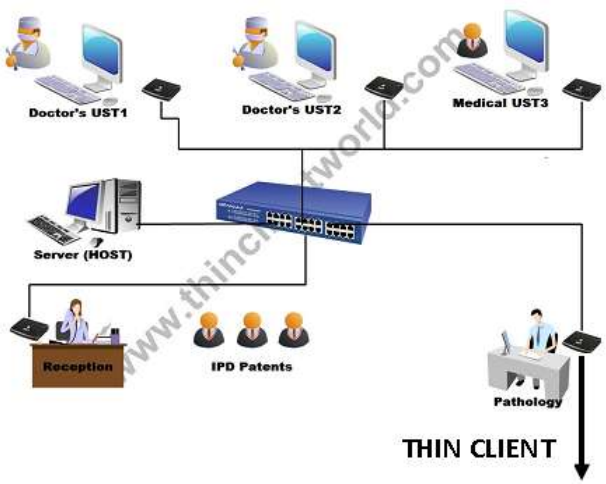


Fig.1 Thin client machine

Since PC and raspberry Pi both are interfaced through LAN network and it can access the desktop using RDP protocol. RDP protocol is remote desktop protocol which is used to read frame buffer from remote desktop and allows displaying the received frame buffer on the monitor connected to Raspberry Pi. Then the remote desktop on monitor connected to raspberry pi board. By using keyboard and mouse it can access a desktop like opening web browser or entering data on note pad through key board etc.Citrix Xenserver is the platform that is required on all the devices (arm board, pc n laptops) to form a connection between them using the RDP protocol..

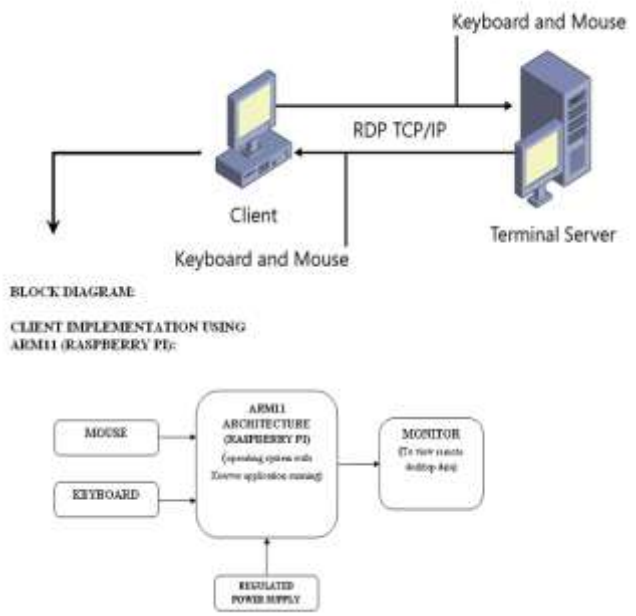


Fig.2 Block diagram for Implementing Thin client using ARM11 Architecture

There is a network emulator to control the netwotk performance at different levels. The modem is used to LAN connections between arm-pc's and pc-pc. Traffic capturing monitors if there is any traffic in the network

QUALITY OF EXPERIENCE

Quality of Experience is a measure of a customer's experiences with a service (web browsing, phone call, TV broadcast, call to a Call Center). QX focuses on the entire service experience, and is a more holistic evaluation than the more narrowly focused user experience and customer support experience. QoE is a fast emerging multidisciplinary field based on social psychology, cognitive science, economics, and engineering science, focused on understanding overall human quality requirements. QoE is the design of all human quality needs and expectations. Traditionally, technology centric approaches based on QoS parameters have been employed to ensure service quality to end users. QoE is a design of all human subjective and objective quality needs and experiences arising from the interaction of a person with technology and with business entities in a particular context. Toward Total Quality of Experience a QoE Model in a Communication Ecosystem. Although QoE is perceived as subjective, it is the only measure that counts for customers of a service. Being able to measure it in a controlled manner helps operators understand what may be wrong with their services.

PROTOCOLS

A. RDP Protocol

Remote Desktop Protocol (RDP) is a proprietary protocol developed by Microsoft, which provides a user with a graphical interface to connect to another computer over a network connection. The user employs RDP client software for this purpose, while the other computer must run RDP server software. Clients exist for most versions of Microsoft Windows (including Windows Mobile), Linux, Unix, OS X, iOS, Android, and other operating systems. RDP servers are built into Windows operating systems; an RDP server for UNIX and OS X also exists. By default, the server listens on TCP port 3389 and UDP port 3389. Microsoft currently refers to their official RDP server software as Remote Desktop Connection, formerly "Terminal Services Client". The protocol is an extension of the ITU-T T.128 application sharing protocol.

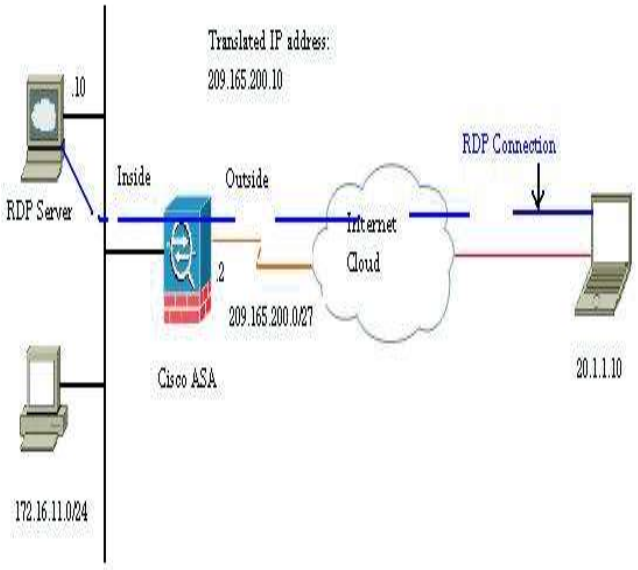


Fig.3 RDP Protocol

B. RFB Protocol

RFB ("remote frame buffer") is a simple protocol for remote access to graphical user interfaces. Because it works at the frame buffer level it is applicable to all windowing systems and applications, including X11, Windows and Macintosh. RFB is the protocol used in Virtual Network Computing (VNC) and its derivatives. RFB was originally developed at Olivetti Research Laboratory (ORL) as a remote display technology to be used by a simple thin client with ATM connectivity called a Videotile. In order to keep the device as simple as possible, RFB was developed and used in preference to any of the existing remote display technologies. RFB found a second and more enduring use when VNC was developed. VNC was released as open source software and the RFB specification published on the web. Since then RFB has been a free protocol which anybody can use. When ORL was closed in 2002 some of the key people behind VNC and RFB formed RealVNC, Ltd., in order to continue development of VNC and to

maintain the RFB protocol. The current RFB protocol is published on the RealVNC website.

By default, a viewer/client uses TCP port 5900 to connect to a server (or 5800 for browser access), but can also be set to use any other port. Alternatively, a server can connect to a viewer in "listening mode" (by default on port 5500). One advantage of listening mode is that the server site does not have to configure its firewall/NAT to allow access on the specified ports; the burden is on the viewer, which is useful if the server site has no computer expertise, while the viewer user would be expected to be more knowledgeable. Although RFB started as a relatively simple protocol, it has been enhanced with additional features (such as file transfers) and more sophisticated compression and security techniques as it has developed. To maintain seamless cross-compatibility between the many different VNC client and server implementations, the clients and servers negotiate a connection using the best RFB version, and the most appropriate compression and security options that they can both support.

C. X WINDOW SYSTEM (X SERVER)

In computing, the X Window System (X11, X, and sometimes informally X-Windows) is a windowing system for bitmap displays, common on UNIX-like operating systems.X provides the basic framework for a GUI environment: drawing and moving windows on the display device and interacting with a mouse and keyboard. X does not mandate the user interface — this is handled by individual programs. As such, the visual styling of X-based environments varies greatly; different programs may present radically different interfaces.

X originated at the Massachusetts Institute of Technology (MIT) in 1984. The protocol version has been X11 since September 1987. The X.Org Foundation leads the X project, with the current reference implementation, X.Org Server, available as free and open source software under the MIT License and similar permissive licenses. X uses a client-server model: an X server communicates with various *client* programs. The server accepts requests for graphical output (windows) and sends back user input (from keyboard, mouse, or touchscreen). The server may function as:

- An application displaying to a window of another display system
- A system program controlling the video output of a PC
- A dedicated piece of hardware.

This client–server terminology—the user's terminal being the server and the applications being the clients—often confuses new X users, because the terms appear reversed. But X takes the perspective of the application, rather than that of the end-user: X provides display and I/O services to applications, so it is a server; applications use these services, thus they are clients. The communication protocol between server and client operates network-transparently: the client and server may run on the same machine or on different ones, possibly with different architectures and operating systems. A client and server can even communicate securely over the Internet by tunneling the connection over an encrypted network session. An X client itself may emulate an X server by providing display services to other clients. This is known as "X nesting". Open-source clients such as Xnest and Xephyr support such X nesting.

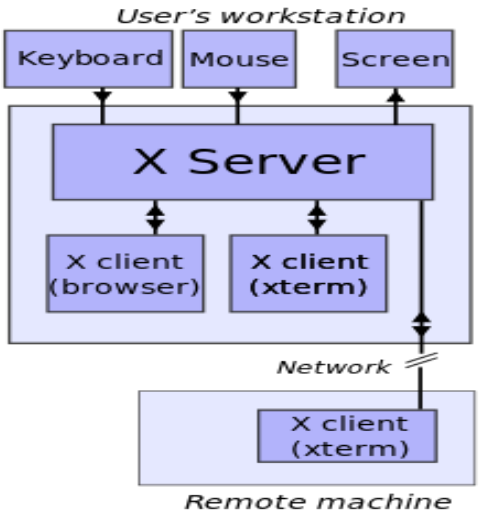


Fig.4 User's Workstation

I. HARDWARE IMPLEMENTATION

A. RASPBERRY PI BOARD

Fig.5 RASPBERRY PI Board

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks. The hardware is the same across all

manufacturers. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage.

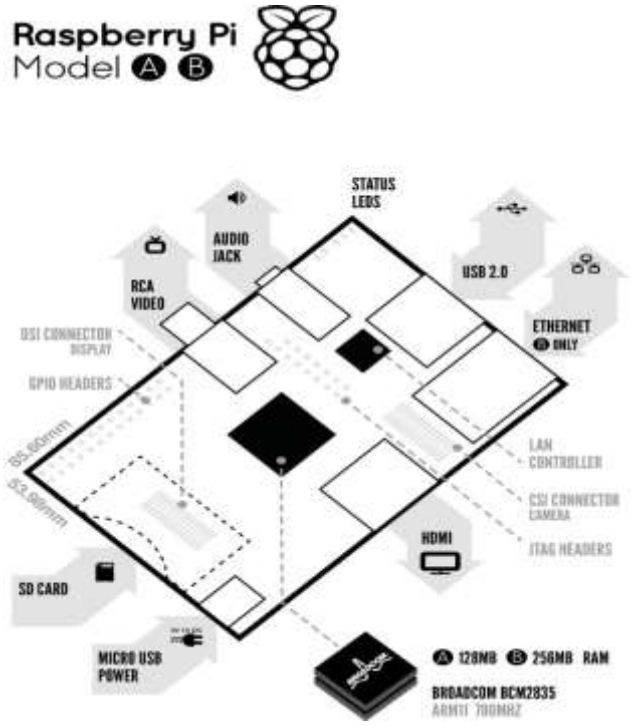


Fig.6 RASPBERRY PI Board features

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

B. TFT display unit

TFT stands for Thin Film Transistor, and is a type of technology used to improve the image quality of an LCD. Each pixel on a TFT-LCD has its own transistor on the glass itself, which offers more control over the images and colors that it renders.

While TFT-LCDs can deliver sharp images, they also tend to offer relatively poor viewing angles, meaning they look best when viewed head-on. If you view a TFT-LCD from the side, it can be difficult to see. TFT-LCDs also consume more power than other types of cell phone displays.

II. SOFTWARE IMPLEMENTATION

A. Linux Operating System:

Linux or GNU/Linux is a free and open source software operating system for computers. The operating system is a collection of the basic instructions that tell the electronic parts of the computer what to do and how to work. Free and open source software (FOSS) means that everyone has the freedom to use it, see how it works, and changes it.There is a lot of software for Linux, and since Linux is free software it means that none of the software will put any license restrictions on users. This is one of the reasons why many people like to use Linux.A Linux-based system is a modular Unix-like operating system. It derives much of its basic design from principles established in UNIX during the 1970s and 1980s. Such a system uses a monolithic kernel, the Linux kernel, which handles process control, networking, and peripheral and file system access. Device drivers are either integrated directly with the kernel or added as modules loaded while the system is running.

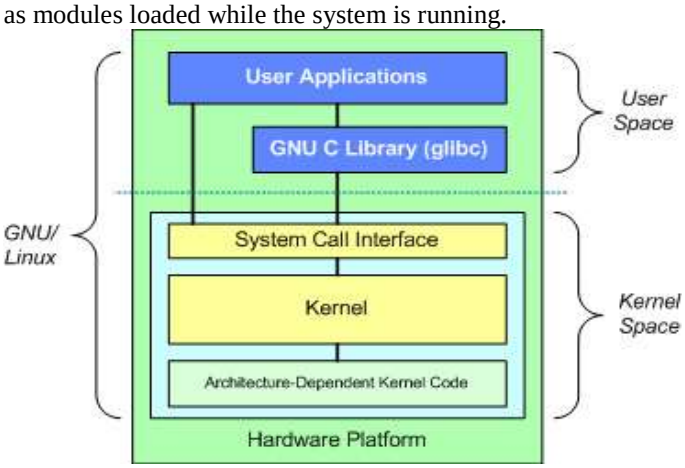
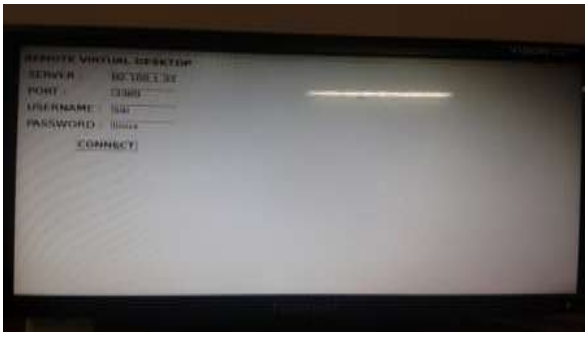


Fig.7 Architecture of Linux Operating System

B. Qt for Embedded linux:

Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface (GUI) (in which cases Qt is classified as awidget toolkit), and also used for developing non-GUI programs such ascommand-line tools and consoles for servers. Qt uses standard C++ but makes extensive use of a special code generator (called the Meta Object Compiler, or moc) together with several macros to enrich the language. Qt can also be used in several other programming languages via language bindings. It runs on the major desktop platforms and some of the mobile platforms. Non-GUI features include SQL database access, XML parsing, thread management, network support, and a unified cross-platform application programing interface for file handling.It has extensive internationalization support.

III. RESULTS



IV. CONCLUSION

The project "Quality of experience in remote virtual desktop services" has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced ARM board and with the help of growing technology the project has been successfully implemented.

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