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A PATH FOR HORIZING YOUR INNOVATIVE WORK

NETWORK MONITORING AND ADMINISTRATION USING ANDROID PHONE

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Abstract: In a concern, computers are grouped together to form a network. To manage and control the activities of the network while in office is an easy task. But, while you are outstation away from office, how do you go about with monitoring and controlling of network? Instead of depending on third party information, you can always have your Cell Phone, email accounts serve the purpose. The interaction between the clients and the remote administrator is achieved via a central monitoring server. The main objective of this paper is to provide maximum details about the network to the administrator on their android phones, when administrator is away from office goes out station. In the era of internet services & mobile phones, email & mobile applications are widely used and it has penetrated every part of our life, but remote monitoring of networks through android mobile applications which are GPRS or Wi-Fi enabled is still a mirage, this paper is an effort to make this mirage a reality, and this is where the genesis of this of this paper lies.

Keywords: LAN, PRTGroid, Wi-Fi, GPRS, GSM, Serversocket



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INTRODUCTION

In a concern, computers are grouped together to form a network. To manage and control the activities of the network while in office is an easy task. But, while you are outstation away from office, how do you go about with monitoring and controlling of network? Instead of depending on third party information, you can always have your cell phone and email accounts serve the purpose. The interaction between the clients and the remote administrator is achieved via a central monitoring server. Using cell phone we can monitor and control the network using sms service and see who is busy with what in the office. It aims to develop an integrated software solution that allows a network administrator to remotely monitor his LAN by his cell. The interaction between the clients and the wireless media happens through this server.

Also using email we can develop various network utilities which are required to effectively monitor a LAN network. It aims to develop an integrated software solution that allows a network administrator to remotely monitor his LAN network by his email account. But there are lots of disadvantages to monitor and control the network using email and sms. Cost of sms matters a lot, and there can be connection problem in email. So we will implement a new idea in which network monitoring and control using android cell. In this system the cell is connected to the server using Wi-Fi or GPRS. The administrator can have cell phone always with it. So to control and monitor the network using android cell phone is always convenient. In any circumstances this idea is more reliable, Portable and easy to communicate.

Network monitoring can be useful in various applications such as college, university, malls, and offices. Network monitoring at the university/college level can be used for monitoring, logging and retention of network packets that traverse university networks. The goal of this system is to maintain confidentiality, integrity and availability of the university network infrastructure and information assets. Network monitoring at the office level can be used to monitor the office Network by the administrator at any time if at a particular point he/she cannot be present there. He/she does not have to depend on any third party information regarding the Network and can instead check the Network status himself using his mobile. Network monitoring at the malls is used to monitor all information of malls by administrator at any time if at particular time he/she cannot be present there.

Network monitoring

The term network monitoring describes the use of a system that constantly monitors a [computer network](#) for slow or failing components and that notifies the [network administrator](#) (via email, SMS or other alarms) in case of outages[11].

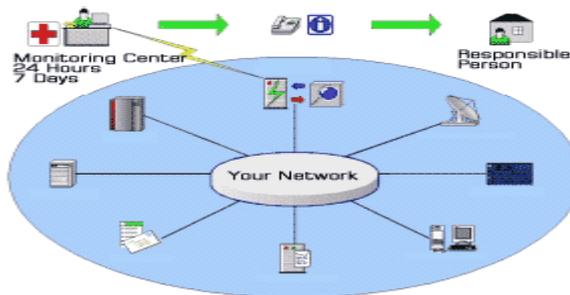


Fig. 1 General View of Network Monitoring

To manage and control the activities of the network while in office is an easy task. But, while you are outstation / away from office, how do you go about with monitoring and controlling of network? Instead of depending on third party information we can use different Network Monitoring schemes.

The above figure shows the general view of network monitoring. There should be at least one monitoring centre that can control and manage all the network activities. The network monitoring should be performed continuously that is 24 hours of the day. Network monitoring includes control and manages all the components connected in the network such as router, server, network provider etc. Also the network monitoring centre informs the all the activities which happened in the network to the administrator.

In modern large scientific and industrial facilities, more and more information is needed due to the rising capabilities of the electronics and computing devices. For this reason, communications must be assured in every place of the facility. And this must be done in a reliable, fast and secure way. At this point cables seem to be the perfect solution. But when they are not really needed for performance reasons, wireless is a good option for monitoring and control.

Wireless communications offer many advantages as reduced costs, mobility, scalability and ease of maintenance.

Several wireless solutions such as ZigBee Bluetooth or Wi-Fi can be found on the market. The IEEE 802.11 standard for WLAN, Wi-Fi, is a very flexible technology, easy to implement, cheap and provides a wide bandwidth. For these reasons, it has been implemented in large-scale systems.

Second we can monitor and control the network using email. It provides maximum details about the network to the administrator on their email account, when administrator is away from office / goes out station. In the era of internet services, emails are widely used and it has penetrated every part of our life, but remote monitoring of networks through email is still a mirage. It develops various network utilities which are required to effectively monitor a LAN network. It aims to develop an integrated software solution that allows a network administrator to remotely monitor his LAN network by his email account. Disadvantages of this system are that you always required logging in to email account for network monitoring purpose. And to perform each task such as to start a particular process on particular pc you have to type the command as `STARTP##CLIENTNAME##ProcessName` which is not easier process [6].

PRTGroid

Our aim is to control and monitor the network using android cell phone. Previously in android play market many tools are available which can be used for the network monitoring purpose. The one of the tool is PRTG Network Monitor. PRTGdroid is a free Android app that connects your smart phone or tablet to your PRTG installation.

With this app you can keep an eye on your network while on the go. All you need is an Android phone or tablet. The app supports checking multiple accounts in the background, and can alert you whenever new alarms occur in any account. Monitoring data and alarm details are displayed with PRTG's built-in 'Mini HTML' interface which is optimized for small displays and low bandwidth



Fig. 3 PRTGdroid Screen Shot

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displayed with PRTG's built-in 'Mini HTML' interface which is optimized for small displays and low bandwidth [1].

Also there are different network monitoring tools are available in windows system such as Observium, Ganglia, Spiceworks, Nagios, Zabbix etc.

system architecture

A. *Proposed System Architecture*

The main objective of this system is to provide maximum details about the network to the administrator on their android phones, when administrator is away from office / goes out station. In the era of internet services & mobile phones, email & mobile applications are widely used and it has penetrated every part of our life, but remote monitoring of networks through android mobile applications which are GPRS or Wi-Fi enabled is still a mirage, this system is an effort to make this mirage a reality, and this is where the genesis of this of this paper lies. There can be number of protocols are used to monitor and control the network using android phone; it can be android protocols and network management protocols or combination of them. Simple Network Management Protocol (SNMP) is an "Internet-standard protocol for managing devices on IP networks." Devices that typically support SNMP include routers, switches, servers, workstations, printers, modem racks, and more." It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention. SNMP operates in the Application Layer of the Internet Protocol Suite (Layer 7 of the OSI model). The SNMP agent receives requests on UDP port 161. The manager may send requests from any available source port to port 161 in the agent. The agent response will be sent back to the source port on the manager. The manager receives notifications (Traps and Inform Requests) on port 162. The agent may generate notifications from any available port. When used with Transport Layer Security or Datagram Transport Layer Security requests are received on port 10161 and traps are sent to port 10162[3][4].



Fig. 4 Android Cell Interfacing with Computer

Android provides an API that supports the Session Initiation Protocol (SIP). This lets us add SIP-based internet telephony features to your applications. Android includes a full SIP protocol stack and integrated call management services that let applications easily set up outgoing and incoming voice calls, without having to manage sessions, transport-level communication, or audio record or playback directly[7].

The figure 5 is the overview of the architecture. The network monitoring and control is achieved through Remote procedural call and socket programming.

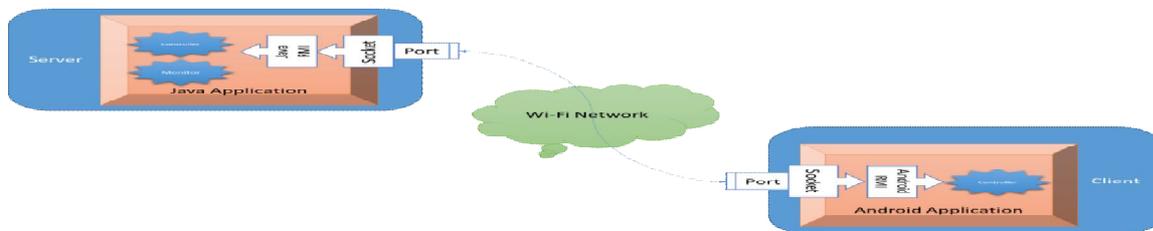


Fig. 5 System Architecture

Socket Programming

Sockets provide the communication mechanism between two computers using TCP. A client program creates a socket on its end of the communication and attempts to connect that socket to a server. When the connection is made, the server creates a socket object on its end of the communication. The client and server can now communicate by writing to and reading from the

socket. The `java.net.Socket` class represents a socket, and the `java.net.ServerSocket` class provides a mechanism for the server program to listen for clients and establish connections with them [12].

The following steps occur when establishing a TCP connection between two computers using sockets.

- 1) The server instantiates a `ServerSocket` object, denoting which port number communication is to occur on.
- 2) The server invokes the `accept()` method of the `ServerSocket` class. This method waits until a client connects to the server on the given port.
- 3) After the server is waiting, a client instantiates a `Socket` object, specifying the server name and port number to connect to
- 4) The constructor of the `Socket` class attempts to connect the client to the specified server and port number. If communication is established, the client now has a `Socket` object capable of communicating with the server.
- 5) On the server side, the `accept()` method returns a reference to a new socket on the server that is connected to the client's socket.

After the connections are established, communication can occur using I/O streams. Each socket has both an Output Stream and an Input Stream. The client's Output Stream is connected to the server's Input Stream, and the client's Input Stream is connected to the server's Output Stream [12].

TCP is a two way communication protocol, so data can be sent across both streams at the same time.

Remote Procedural Call

Remote procedure call (RPC) is an [inter-process communication](#) that allows a [computer program](#) to cause a [subroutine](#) or procedure to execute in another [address space](#) (commonly on another computer on a shared network) without the programmer explicitly coding the details for this remote interaction. That is, the programmer writes essentially the same code whether the subroutine is local to the executing program, or remote. When the software in question uses [object-oriented](#) principles, RPC is called remote invocation or remote method invocation.

An RPC is initiated by the client, which sends a request message to a known remote server to execute a specified procedure with supplied parameters. The remote server sends a response to the client, and the application continues its process. While the server is processing the call, the client is blocked (it waits until the server has finished processing before resuming execution), unless the client sends an asynchronous request to the server, such as an XHTTP call. There are many variations and subtleties in various implementations, resulting in a variety of different (incompatible) RPC protocols [9].



Fig. 6 Remote Procedural Call

An important difference between remote procedure calls and local calls is that remote calls can fail because of unpredictable network problems. Also, callers generally must deal with such failures without knowing whether the remote procedure was actually invoked. [Idempotent](#) procedures (those that have no additional effects if called more than once) are easily handled, but enough difficulties remain that code to call remote procedures is often confined to carefully written low-level subsystems. The following sequence of events is occurred at the time of remote procedural call [9].

- 1) The client calls the client [stub](#). The call is a local procedure call, with parameters pushed on to the stack in the normal way.
- 2) The [client stub](#) packs the parameters into a message and makes a system call to send the message. Packing the parameters is called [marshalling](#).
- 3) The client's local [operating system](#) sends the message from the client machine to the server machine.
- 4) The local [operating system](#) on the server machine passes the incoming packets to the [server stub](#).
- 5) The server stub unpacks the parameters from the message. Unpacking the parameters is called [unmarshalling](#).

6) Finally, the server stub calls the server procedure. The reply traces the same steps in the reverse direction.

V. features controlled through android phone

A. *Net View*: Get in your android screen, the list of entire client's in LAN. Keep pinging every time to check the latest status of the PC's. Anytime, the PC goes off line, its name is removed from the list.

B. *Process List*: Get the list of all the processes running in the remote machine.

C. *Activate Process*: Activate different processes in either the server machine or any of the client's.

D. *Kill Process*: Kill the desired processes in either the server or clients

E. *Read*: You can read the drives, folders, files of any of the client machines/ the server machine from android cell phone.

F. *Open File*: A small text file residing in any of the client or the server machine can be opened in your android cell phone.

G. *Broadcast Message*: Broadcast messages to clients, Server from android cell phone.

H. *New File*: Create a new document and save the same in either the server or client machine.

I. *Delete file*: Deletes a file activated on client side

J. *Shut Down*: Shut down the client machine.

K. *Mail File*: Mails a client file to administrator when requested.

L. *Screen Shot*: Gives screen shots of the desktop of the selected client machine.

VI. System Implementation

There are the three separate modules are implemented in the network monitoring and controlling using android phone. The modules are android remote, multi remote client and multi remote server. The module multi remote server is the first module we have to run. It

should be run on the server system. After successful run of this module at the output we will get the ip address of server and the port number at which the next network monitoring commands will get executed. If the port number is 8888 then output will come as "Listening: 8888". Listening means at this port number now the next commands will get executed. If the ip address is 100.71.111.222 then output will come as "Current: 100.71.111.222". Current means the ip address of current server. After successful execution of multi remote server, multi remote client module is to be run on the client machine, the machine which to be monitored and controlled from android cell phone. After successful completion of multi remote client module, the final module i.e. android remote module should be executed. The module android remote should run as android application in the eclipse "run as" menu. At the execution the android emulator will launch and will show the output as,

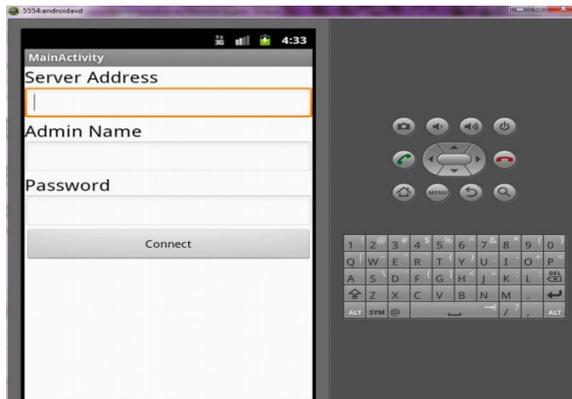


Fig. 7 First Screen Shot of Android Emulator

There are three fields have to be entered to connect android cell phone to server system. The first is server ip address; it is the same ip address which we got at the output when the multi remote server module is successfully executed. At the admin name field enter the name of the admin of the server system. At the password field enter the desired password which you have provided to connect the android cell phone to server system. The figure 8 shows the simple example how the three fields to be entered.

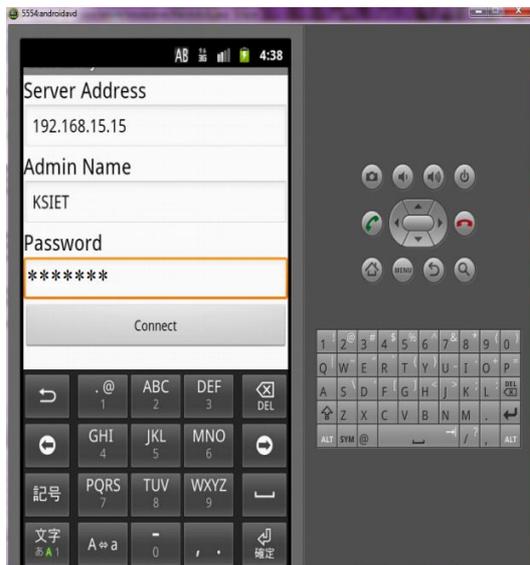


Fig. 8 General example for ip address, admin name and password

If all the three entered fields are correct then the “log in successful” message will appear at the console of server system. Then at the android remote module the next screen will appear the number of clients connected to server system with each one of them ip address is mentioned. The client systems at which the multi remote client module is successful executes that ip addresses are appear in the android remote module. Then select the client ip address to which we have to perform network monitoring and controlling, after selecting the client the screen will appear as,

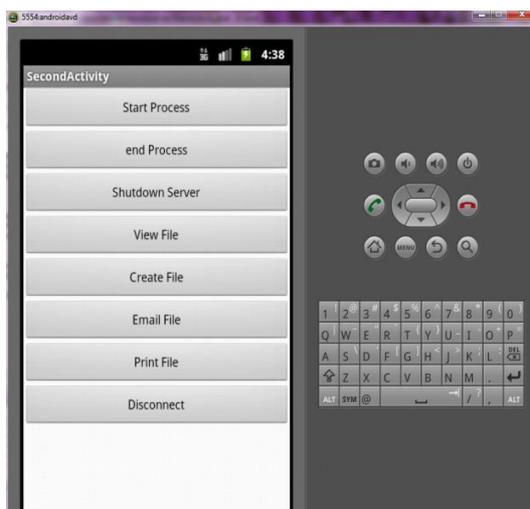


Fig. 9 list of options for network monitoring

These are the different options are appear when we select the client at which monitoring is to be performed. The different options are start process, end process, shutdown server, view file, create file, create file, email file, print file, and disconnect. Each one of them is explained above.

All such functions are done via remote procedural call and socket programming in java. Sockets consist of ip address and port number. So on particular port the remote method is invoked. The port number is 8888 and 8889 on which network monitoring of clients is performed. The system requires android operating system version 2.3 minimum. The latest android operating system version is 4.4 which are known as kit-kat. The system is gives good performance on the later versions of android operating systems. Because the application is invoked fast and as the speed of the internet increases the speed of the commands to be executed gets increase.

Conclusion

This application will provide assistance to the system administrator in monitoring the task. Due to wide use of android devices, this application is developed for all devices having android operating system version 2.3 and later and it provides mobility for users for controlling their computer desktops from remote place over internet through various functions such as view running process, run process, end process, shutdown system, create file, view file, print file, mail file.

Thus the extended scope of this system will prove to be helpful in providing mobility and accessing the remote Server over the internet in feasible and scalable way.

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