RCM: A user friendly Router Configuration Machine

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Abstract—In this paper a router configuration machine for Cisco routers using GUI is presented. It is developed using Visual C# .NET programming, in which the interface provides GUI platforms for various types of configuration for entire series of Cisco routers. It communicates with the Cisco Internetwork Operating System to configure the router. It includes the configuration for all interior routing protocols and all types of most common used tools. The developed system is implemented on different series of Cisco routers and it worked successfully. It is observed that it eliminates the traditional use of Command Line Interface (CLI) for configuration of Cisco routers.

Index Terms—.NET, command line interface, internetwork operating system, router, router configuration machine

I. INTRODUCTION

The Router is the essential part of today’s internetworking. Every network attached to the internet is attached by a router. Some may be Linux boxes acting as routers, others may be firewalls also performing routing, but most will be dedicated Cisco routers. Current estimates indicate that 80 percent of the internet runs on Cisco equipments [1].

Virtually all of Cisco's products run the Internetwork Operating System (IOS). This is both a great advantage and a great disadvantage. On the one hand, when you're familiar with one Cisco router, you're reasonably familiar with them all. Someone using a small ISDN router in a home office could look at a configuration file for a high-end router at an ISP and not be lost. He might not understand how to configure the more esoteric routing protocols or high-speed network interfaces, but he'd be looking at a language that was recognizably the same [2]. The Cisco IOS software is a complicated real-time operating system consisting of multiple sub-systems and tens of thousands of possible configuration parameters [3]. Human error in configuring routers undermines attempts to provide reliable, predictable end-to-end performance on IP networks [4].

Small scale routers such as Cisco Linksys have GUI installed in them [5] and they do not need configuration via CLI. But other larger scale routers such as the Cisco 2600 Series [6] do not have installed GUI. For them Cisco has developed a browser based software known as Cisco Security Device Manager which needs to be installed on both the computer and router [7].

The goal for RCM is to develop an application for router configuration which is easy to implement and as well as easy to use.

The paper is organized as follows: section II will define the system overview and the basic architecture of RCM. Section III will represent the Graphical User interface of RCM which is the application running on computer. Section IV represents the security and user friendly design. Section V gives the results. Section VI gives the future work while at the end section VII gives the
conclusion.

II. SYSTEM OVERVIEW

A. Programming using C#

In RCM the programming language used to create the applications is C#. C# is a versatile language which makes use of the .NET Framework as its library

B. Communication with Router

RCM communicates with the Cisco IOS via computer serial port and router console port. The Communication is based on the same method used for configuration of a Cisco router using the traditional command line interface (CLI).

C. Support for Cisco Routers

RCM support all types of Cisco routers, because it sends the CLI commands to the IOS which are written in the data link libraries inside the application.

III. GRAPHICAL USER INTERFACE

This section will give the structure and some of the GUIs which are in the RCM. It will show how RCM looks like and how various types of protocols and features are supported.

Figure 1 shows the main theme of RCM, which if the application starts up this is the first theme the user can see. It shows buttons to select pages such as the page shown in this figure the basic configuration page is selected, which contains setups of IP setup, banner configuration, interface description, hostname configuration, and password configuration. It also contains the interior routing protocols Routing Information Protocol (RIP), Enhanced Interior Routing Gateway Protocol (IGRP), Open Shortest Path First (OSPF) and as well as Static Routing. It also contains protocol authentication for RIP V2, OSPF V4 and EIGRP.

The configuration buttons further opens sub applications from where the data is entered into the application by the user. For configuration of IP addresses and related fields to the router the IP Setup button opens figure 2.

The IP configuration setup sets the IP address, selects the interface, and selects the Clock rate for serial ports. It also setup the subnet mask and in case the defaults class A, B or C subnet mask is required then it is intelligent to put it by looking at
the IP. In case if the IP address is not from Class A, B or C then it will generate a message that IP address is not supported by RCM. It also selects the status of the interface whether you want to make it up or down.

After the configuration is all set the information is shown in the text box below with the CLI commands to verify if someone wants to see what the status of the CLI is. By clicking done the router will be configured.

The other applications are such as password configuration shown in figure 3.

RCM can configure the interior routing protocols. RCM is self supported and does not need any connection from Hyper Terminal or any other serial port tool to get access to the router.

The oldest of the distance vector IP routing protocols still in widespread use is RIP [8]. Figure 4 shows configuration of RIP version 1 on RCM. RIP Version 2 is also supported by RCM.

The RCM configures OSPF protocol and as well as EIGRP protocol as shown in figure 5 and figure 6 respectively.

RCM provides flexible and easy to use features for the protocols configuration. As shown as an example in figure 6 that how the EIGRP protocol can be configured, all the required fields are given and the user just need to put the values into these fields and do not worry about the actual command line.

RCM also supports the static routing. Figure 7 shows how RCM takes the input from the user with the required fields only and configure static routing.
IV. SECURITY AND USER FRIENDLY DESIGN

RCM is secure due to the fact that it does not use any new method to communicate with the router but communicate with the Cisco IOS in the language of its CLI. But for the user there is a friendly design and the user do not need to remember and apply commands.

When the fields are filled in a particular application in RCM, these fields are stored in a variable and sent data link libraries created for RCM within the program and those data link libraries contain the CLI language. These user input fields are added to the standard CLI language commands and then these commands are sent to the Cisco IOS. The Cisco router even does not know that it is communicating with a different application and not it’s actual CLI. This method makes it easy to implement and secure.

V. RESULTS

RCM is tested in University Lab and provides successful results on different series of routers such as the Cisco 2500 series and Cisco 2600 series.

VI. FUTURE WORK

RCM require lots of future work and this paper gives the start of such kind of application on .NET Framework. Some of the future works can be as follows:

1. Include support for Exterior Routing Protocols such as BGP etc.
2. Include VPN support.
3. Make RCM vendor independent i.e. right now RCM supports only Cisco routers. In future it can include support for other popular vendors such as Juniper, Maipu etc.
4. Include autonomous configuration support. Right now RCM is only manually configurable and the user needs to provide information.

VII. CONCLUSION

RCM provides flexible, easy to use, easy to implement and secure solution to the conventional Command Line Interface (CLI) method and as well as to the complex GUI architecture of Cisco Configuration Professional. It further makes it important that RCM communicates with the router with the same CLI commands but invisible to the user. RCM configure the most widely used configuration commands and the interior routing protocols such as RIP V1, RIP V2, EIGRP and OSPF. It also provides protocol authentication for interior routing protocols. RCM right now supports Cisco routers only.
REFERENCES


