

# Sistema de monitoreo de redes y equipos networking utilizando la herramienta MRTG y la tecnología Mikrotik para la empresa J&STECHNOLOGY

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**Abstract.** In this paper grade implementation of a monitoring system for wireless network in J & STECHNOLOGY using to monitor traffic MRTG package with the SNMP protocol it is proposed and a platform on Linux CentOS version 6.4, operating system showing information can be obtained from a web browser.

The first chapter is a need for this system by the company, the assessment of the current situation of the problem, delimitation, justification and scope that the project will, the general and specific objectives also raises proposed grade for this work.

In the second chapter the structure of the wireless network that is implemented in J & STECHNOLOGY is studied the basics of operating system Linux CentOS, the MRTG tool, database PostgreSQL, the PHP programming language, the SNMP protocol is described and the Mikrotik Technology.

In the third chapter step by step configuration services CentOS server, the database, the MRTG tool, the PHP programming language and detailed Mikrotik Technology.

In the fourth chapter we proceed to the design of the system, following the RUP methodology, the phases of Home, Development, Construction and Transition.

The Fifth Chapter conclusions and recommendations on the results obtained in the development of this project is detailed.

## *Keywords*

Monitoring system, wireless network, MRTG , SNMP .

Mesh.

## 1. Introduction

Early detection of failures and monitoring of the elements of a wireless network are highly relevant activities to provide good service to users of wireless internet. Hence the importance of having a system capable of notifying the network failures and show their behavior by analyzing traffic and collection is derived.

In the market there are a variety of software to watch the network traffic and one of them is the PRTG , but cost the most appropriate is MRTG which has open code to be modified .

The system will help optimize the network, allowing detail the use of the bandwidth of each of the wireless equipment that you have SNMP service.

## PROBLEM

Suggestions of internet customers of the company, has been that services offered, are on a web page to access at any time and for possible referral customers, this has considerably reduced economic activity of the company.

Currently it maintains records of failures or problems presented by clients manually and stored in folders. Personalized customer tracking what is not done in a quick way, hoping the customer service report inconvenience.

It does not have an automated recording of customer data and information staff working in the company, which affects obtaining information.

The customer does not have a history of bandwidth, so sometimes the customer is dissatisfied of the service and technical staff of the company is not aware of the quality of radio links that are operating in each of the customers assets.

The company provides hardware and software for the realization of the monitoring system, to be seen through the web.

Internet equipment acquired by the company for the installation of Internet service customers are not recorded, causing no details of the date on which have been bought and usage time with you have.

## General objectives

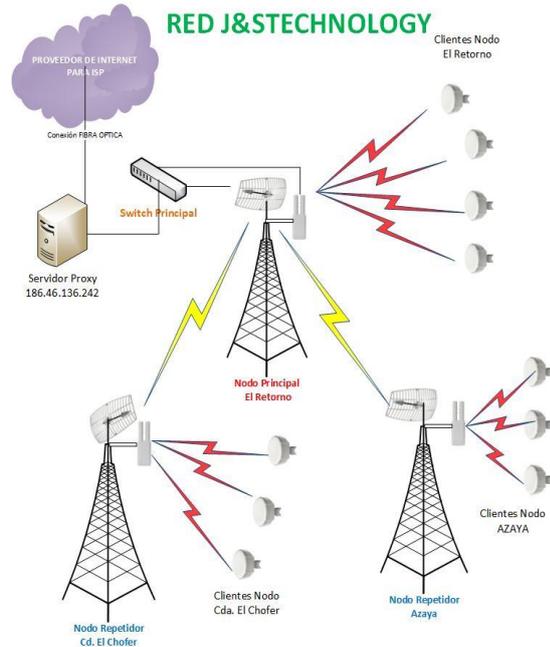
Implement a web monitoring system networks and equipment Networking, setting the MRTG (Multi Router Traffic Grapher) tool and Mikrotik technology (supplier Latvian company disruptive technology hardware and software for networking) in a CentOS server for J & STECHNOLOGY.

**Justification**

At present there are different programs that provide graphical monitoring networks with SNMP (Simple Management Protocol Network) one of them is PRTG (monitoring network easy - Paessler), the disadvantage of using this type of program is that to use have to pay high prices for their licenses, so the implementation will be done at MRTG is a free tool.

The monitoring system network directly benefit the company J & STECHNOLOGY, increasing productivity and facilitating the management of the wireless network via remote management and accurate documentation of the network, enabling them to provide good internet service for customers.

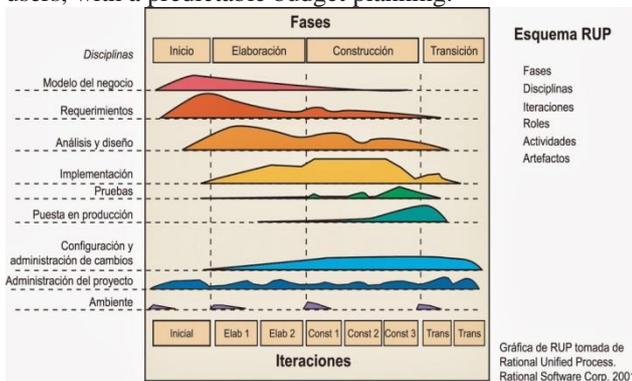
The development of a web application for J & STECHNOLOGY allows a quick, secure and interactive make bug reports and timely solutions give way.



**2. Materials and Methods**

**2.1 Methodology RUP**

The methodology for the implementation of Web System is the RUP (Rational Unified Process) to mainly ensure the production of high quality software that meets the needs of users, with a predictable budget planning.



**2.2 Network structure of J & STECHNOLOGY**

Below the main structure of the network implemented by the company, all Access Point and computers that are installed on customers detailed. Three main nodes that the company for coverage in the city of Ibarra is fully detailed. All teams are formed in the RED brand Mikrotik, with its different models that have this brand of equipment.

**2.3 CentOS Linux**



It is one of the different versions available to GNU / Linux, CentOS Linux is a stable, predictable, manageable and reproducible platform, derived from the sources of Red Hat Enterprise Linux (RHEL). CentOS works well for servers, because the default settings easy to use and programs included, including MySQL, Apache and PHP. It includes a standard range of web browsers and office utilities except unnecessary programs for server use. CentOS provides tools for installation and management of guest operating systems on the same computer. In fact, the servers can even run multiple copies of CentOS on the same hardware. CentOS also includes security features and functions to help create clustered for greater processing power equipment.

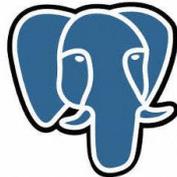
**2.4 MRTG**



Multi Router Traffic Grapher (MRTG) is a free tool to monitor the traffic load on network links, written in Perl, based on the use of SNMP protocol. In the beginning, it was developed to read traffic counters of monitored devices and generate the graphs that represent it. These graphs are displayed in static Web pages that can be viewed from any computer on a corporate network.

## 2.5 DATABASE POSTGRESQL

PostgreSQL



The PostgreSQL database is an open source product available at no charge. PostgreSQL, originally developed at the Department of Informatics, University of California, Berkeley, pioneered many of the object-relational concepts that are currently available in some commercial databases. It provides support for language SQL92 / SQL99, transactions, referential integrity, stored procedures and type extensibility.

## 2.6 PROGRAMMING LANGUAGE PHP



PHP language is a programming language classic style, ie it is a programming language with variables, conditional statements, loops, functions, etc. Not a markup language as it could be HTML, XML or WML. closer to JavaScript or C. It is

## 2.7 MIKROTIK



The main product of this company is an independent operating system based on Linux, known as MikroTik RouterOS that turns a PC into a router dedicated, bridge, firewall, management bandwidth, wireless access point, backhaul link, hotspot gateway, VPN and server.

CPE Mikrotik SXT 5

Mikrotik SXT is a team of low cost, high speed 5GHz MIMO wireless outdoor device.

Omnidirectional antenna OmniTIK UPA-5HnD

OmniTIK antenna is a rugged outdoor access point weatherproof dual polarized, works perfectly with the CPE SXT, or any other device 802.11a standard.

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## 3. Results

### 3.1 Product Overview

The monitoring system networks and networking equipment will record consumption of customers using the SNMP service that each team has, through MRTG and to be shown via a web page that can be observed from anywhere. It also will record all information is archived manually as customer data, invoices, equipment, Ips, fault reporting.

### Assumptions and Dependencies

The system will be installed on the server of the company, and a tool used by staff and customers of the same.

The developer will have all the available configurations make it deems appropriate for the proper functioning of the

system without this affecting the configuration of the installed services.

**Cost and Price**

	Descripción	Presupuesto (USD)	Presupuesto Real (USD)
HARDWARE	Servidor i7 8 Gb RAM 1 T en disco duro	980,00	0,00
	Laptop para el desarrollo	1000,00	0,00
SOFTWARE	CentOS	0,00	0,00
	PostgreSQL	0,00	0,00
	Servicio Internet con Dirección IP Pública (/año)	400,00	0,00
CAPACITACIÓN	CCNA1	400,00	200,00
	Certificación Linux	200,00	200,00
OTROS	Desarrollo en implementación del Sistema	5000,00	5000,00
<b>TOTAL</b>		<b>8090,00</b>	<b>5400,00</b>

**Product Features**

Through the system's technical staff the company will have a flexible tool to manage, oversee the company network, with data at the time of a failure.

For the administrative staff of the company will be very useful when debiting of bills, cuts and customer activations.

**Restrictions**

If a request manager is beyond the financial scope of the project an alternative look to replace it.

**Product quality**

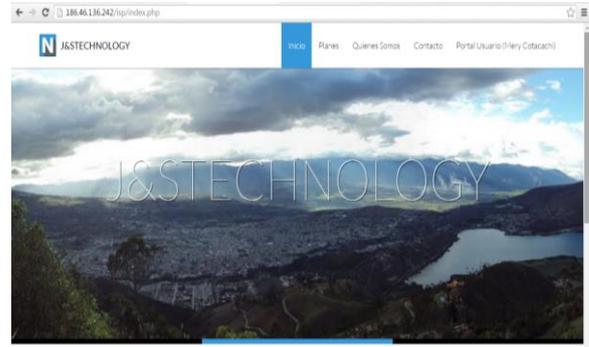
The development of the monitoring system fits the Software Development Methodology RUP, will be under the quality parameters that define this methodology.

**General conditions**

For proper system operation, the terminal equipment should be installed any type of web browser, the system to be displayed on computers.

**3.2 Description Website**

The main page that the user can observe is composed of essential business information such as: Who we are, mission and vision, the geographic location of ISP you can see it in google maps (It is an application server maps the web belonging to Alphabet Inc), the services offered by the company in this case the different plans offered for hiring and Internet service mainly logon clients who are registered.



To enter the boot option customer section is necessary for the staff of the company will provide the email address of the company and the password allocated to each customer by administrative staff. Then the login page seen profile customers.

The system to facilitate access to information is mounted on the server of the company which at the moment can be accessed through the Public IP address with which they can access the instant they require.

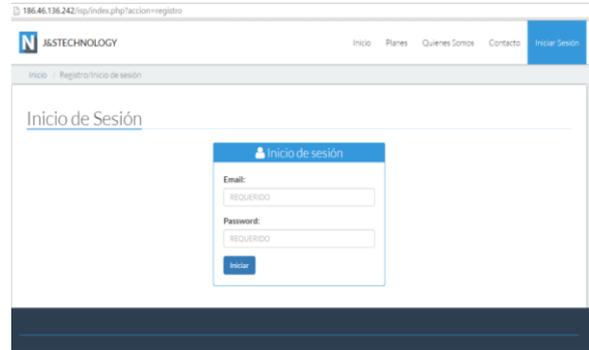
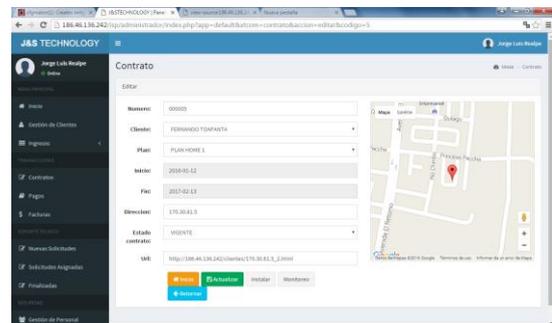


Figure. Page login for clients

**Manager System Description**

The Administrator profile is the one that has full control of the system, everything that was described earlier in the case specifications for each of the profiles.



administrative staff Page

Additionally the system administrator has extra options that only the administrator can perform how, being important for the system and the company.

In the plans option the administrator can enter a new internet plan or modify the content or value of the plan if required, in the content option may modify the content on the company, the Bank Option could enter the number of accounts banks where the customer can deposit the payment service internet in the parameters option can enter the data of the company as RUC, company name, and another, the option New applications is where the system administrator can designate report fault reported by customers a technician to your solution, when this failure report is assigned to a technician also send an SMS saying that you have to solve an inconvenience for the conduct of as soon as possible depending on the priority the report and lastly the option to manage the system administrator personnel may enter new staff to the company with different roles.

### Description Monitoring MRTG

One of the main uses of the monitoring system is to observe the flow charts of traffic passing through any network interface for each installed wireless equipment in the homes of clients and nodes repeat business.

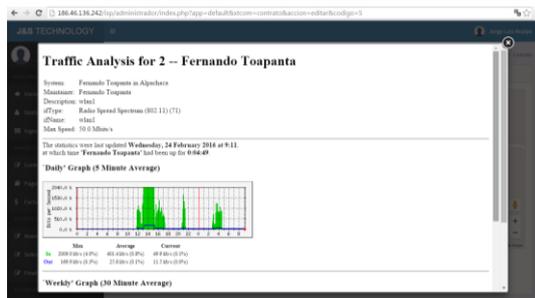


Figure. Page Bandwidth Monitoring

## 4. Conclusions

- The development of this application will allow J & STECHNOLOGY have a tool for monitoring wireless network in real time.
- With Mikrotik technology and using the tool MRTG is possible to observe monitoring and traffic control accurate on Access Point, Point-Point, equipment existing customers in the wireless network of a company way.
- The use of free software based implementation for database technologies, provides facilities and potential as rich as any exclusive tool of this type, implementing secure, robust and low cost systems.
- PHP is a versatile and powerful tool for building modern web applications in view of having a support for the use and management of most current database.
- We conclude that learned to use different tools and technologies to reach the goal, analysis, design, process

different parts of the system. It was also noted that a good analysis and design gives results in a system with good performance and scalable

- The web monitoring system allows an agile access to traffic information and allows the client company to report claims, we also provide constant monitoring of your payments and invoices generated.

## 5. Recommendations

- The MRTG tool allows us to graphically obtain traffic information based on SNMP in such virtue should be the subject of further study for following this project.
- Make use of free software tools as this avoids the cost of licensing and legal problems with using pirated software.
- The Mikrotik equipment currently in a boom in telecommunication area in Ecuador, due to its versatility and safety equipment provided by their faculty should allow certification training for Mikrotik.
- Consider using PostgreSQL both for creating new systems, such as migration of existing systems to be a robust database and it is low cost implementation.

## Bibliographic references

- Alvarez, D. L. (2011). *Proyecto Monitorización de red con SNMP y MRTG*. Obtenido de <http://es.slideshare.net/francescperezfdez/monitorizacin-de-red-con-snm-p-y-mrtg>
- ARCOTEL. (S.F.). *Agencia de Regulación y Control de las Telecomunicaciones*. Obtenido de ARCOTEL: <http://www.arcotel.gob.ec/la-arcotel/>
- Doyle, M. (2010). *Fundamentos PHP Práctico*. Madrid: Anaya Multimedia.
- Emmanuel, C. (S.F.). *HERRAMIENTAS DE MONITOREO DE SERVIDORES (SNMP)*. Obtenido de [http://cristian-emm.blogspot.com/2012\\_05\\_01\\_archive.html](http://cristian-emm.blogspot.com/2012_05_01_archive.html)
- Gallardo, M. (2016). *Redes Inalámbricas*. Obtenido de slideshare: <http://www.slideshare.net/chel0nline/redes-inalambricas-presentation>
- Hughes, J. (2015). *Base Distribución*. Obtenido de Download CentOS Linux ISO images: <https://wiki.centos.org/Download>
- Lameda, L. (2016). *Enlaces Inalámbricos Punto a Punto y Punto Multipunto*. Obtenido de <http://xiboard.com.ve/enlaces-inalambricos-punto-a-punto-y-punto-multipunto/>

Maraboli, M. (06 de 2013). *Manual de Programación en PHP*. Obtenido de <https://www.mundomanuales.com/manuales/3144.pdf>

Martinez , R. (02 de 10 de 2012). *Introducción*. Obtenido de Sobre PostgreSQL: [http://www.postgresql.org.es/sobre\\_postgresql](http://www.postgresql.org.es/sobre_postgresql)

Mendoza, M. S. (2010). *php con PostgreSQL 8*. Megabyte s.a.c Grupo Editorial.

Mikrotik. (17 de 12 de 2015). *License Levels*. Obtenido de Manual:License: [http://wiki.mikrotik.com/wiki/Manual:License#License\\_Levels](http://wiki.mikrotik.com/wiki/Manual:License#License_Levels)

Neoclan Networks. (2010). *Internet Dedicado*. Obtenido de Empresas y Negocios: <http://www.neoclan.net/productos/internet/>

Network Management Software. (2016). Obtenido de <http://www.networkmanagementsoftware.com/snmp-tutorial>

Oetiker , T. (13 de 01 de 2012). *Creates mrtg.cfg files (for mrtg-2.17.4)*. Obtenido de MRTG: <http://oss.oetiker.ch/mrtg/doc/cfgmaker.en.html>

PHP. (2008). <http://php.net/manual/es/intro.pgsql.php>.

Puertas, J. P. (2011). *Creación de un portar con PHP y MySQL 4ta. Edición*. México: Alfaomega Editorial.

SCHACH, S. R. (2012). *Análisis y Diseño Orientado a Objetos con UML y el PROCESO UNIFICADO*. MEXICO: Mc Graw - Hill interamericana.

Somnerville, I. (2011). *Ingeniería de Software 9na. edición*. Mexico: Pearson Editorial.

Subell, M. G. (2010). *Manual Práctico de Linux, comandos, editor y programación Shell*. Madrid: Anaya Multimedia.

Tangient. (2016). *CENTOS*. Obtenido de Administración de Sistemas Operativos en Red: <https://asorufps.wikispaces.com/CENTOS>

The PHP Group. (2011). *Extensiones de bases de datos específicas del proveedor*. Obtenido de <http://php.net/manual/es/intro.pgsql.php>

Tuxifer. (2010). *RUP vs XP en la UCI: una opinión muy personal*. Obtenido de humanOS: <https://humanos.uci.cu/2010/03/rup-vs-xp-una-opinion-muy-personal/>

Vaewani, V. (2010). *Fundamentos de PHP*. México: Mc Graw - Hill interamericana.

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