Administration Of The Wireless Network Of The Autonomous Government Decentralized Of Ibarra's San Miguel Across The Platform Mikrotik Based On The Model Of Management FCAPS Of The ISO

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Abstract – This actual document presents the process of the administration centralized of the Wireless network of the PROJECT CITY DIGITAL IBARRA, at the expense of the Autonomous Decentralized Government Ibarra's San Miguel (GAD - Ibarra), by means of the implementation of a software of management that will cover five functional areas that there establishes the model FCAPS (Faults, Configuration, accounting, presentations and security) of the ISO, allowing to optimize the network and his resources you exist.

The implementation of the software of management in this case The dude of Mikrotik, by means of his tools it allows to the administrator to support a real time monitoring of the situation of the wireless network, being based on the model FCAPS of ISO to obtain as proved a guide for the organization across policies and manuals of procedure, which allows to solve problems that are provoked in the environment of the wireless network of an effective and efficient way.

***Indexed terms* — FCAPS, ISO, NEs, NMS, ITU-T, RFC Trap, UDP.**

I. INTRODUCTION

The autonomous Government decentralized of san miguel de Ibarra is one public that is employed at the well-being of the citizenship that it plans, regulates, executes and promotes the integral sustainable development of the canton, across efficient and transparent services of quality with the active participation of the socially responsible citizenship in order to achieve the good one to live there proposes and implements the PROJECT IBARRA DIGITAL CITY.

The project Ibarra digital city in order to expire with his axes of connectivity and digital incorporation covers the rural and urban areas of the canton IBARRA with the implementation of wireless networks of public access in strategic points, parks, parochial meetings, educational units, centers of health and Info-centers, in the main 50 % of the project already is implemented and his culmination has a great expectation

The wireless networks are vulnerable networks in the way and to the moment of his implementation it is necessary to him to install IT systems with mechanisms that help to that the service that it provides to the community is available and without anomalies, the fact that they are of public domain is of major reason in order that the network or system is kept in constant maintenance, control and monitoring.

II. DEFINITION

A. Wireless Networks

The wireless networks are those that allow the communication, across not holding a permit means (without cable) as they it are the electromagnetic waves; this type of networks appear as evolution of the wired up networks, being a perfect complement of the same ones, providing flexibility to the users at the moment of interacting with her. [1]

Requirements of the wireless networks
- Performance: to operate between 1-20 Mb/s.
- Service area: it has a diameter between 100 and 300 m.
- Energy consumption: they possess own characteristics to reduce the consumption of power.
- Hardiness in the transmission and security: it allows trustworthy transmissions.
- Functioning of adjacent networks.
- Functioning without license.
- Transfers (Handoff)/Itinerancia (Roaming).
- Dynamic Configuration: the aspects of addressing MAC and of management of the network LAN.

- Assignment of frecuencia: the functioning of a wireless network needs users operating in band of common frequency

The specifications most used in the wireless way of the standard of the Norm IEEE 802.11, close to his respective excellent characteristics are described later [2] (see table 1):

Table 1: Specifications of the standard 802.11

Specifications IEEE Características	802.11 b	802.11 a	802.11 g	802.11 i	802.11 n
Speed max. transference	11 Mbps	54 Mbps	54 Mbps	Specification determined for the security	300 Mbps
Protocol	CSMA/CA	CSMA/CA	CSMA/CA		CSMA/CA
Band of frequency	2,4 GHz	5 GHz	2,4 GHz		2,4 GHz 5GHz
Note.	Original standard	Not compatible 802.11b	It replaces to 802.11b		Technology MIMO

B. Administration of Network

The process of the administration realizes it across tools and mechanisms (software, hardware) that allow to obtain real time a control and monitoring of the current condition of the network, announcing the existing failings and the continuity of the same one, with it to improve the services, taking a base for future problems that they present giving them an immediate solution, obtaining this way a network increasingly ideal and with a percentage of high availability. [3]

Basic elements system of administration of networks.
In order that an administration shows his efficiency in a network, it is necessary to stress that inside this one elements exist in the network that they need and must be administered with the help of applications of administration, the same ones that must be interconnected between yes to fulfill certain activities, processes and organization that there allow to obtain a correct functioning and a good quality in the service that provides the network. [3]

Managed Devices Network Elements - NEs: It is the principal component in the Administration of the network consists in or the devices and software that they compose the network, they are administered and to be from a host, router, switch, printer, hub or modem.

Agent of administration of network: Resident modules executes in every administered device (NEs), in order administratrix communicates with the entity, sending information of requests. The agent of administration consists

of three principal parts the same ones that will be described brief later:

- The interface of administration.
- Base of information of administration (MIB).
- The logical core of the agent.

The system of management: The system of management they provide to the suppliers of the network with the tools for the management, these tools include applications to monitor the network, the systems of provision of services, terminuses and all the applications

Protocol of administration of network: East executes between the entity administratrix and the administered device, allowing to the entity administratrix to consult the condition of the devices and indirectly to realize actions in the above mentioned devices across the agents.

All the elements that form a part of the management expire with very important and united papers make possible that the process of the administration works in a most suitable way, doing that the network has an improvement and notable availability. (See in Figure 1)

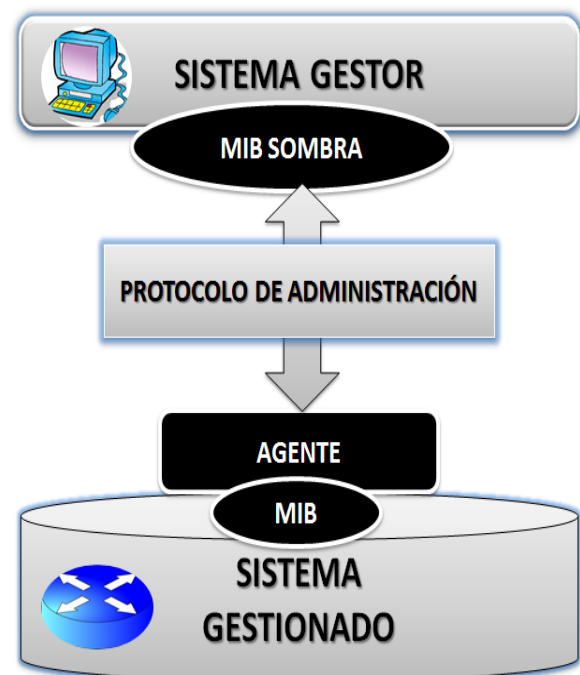Figure 1.Elements of a system of administration of network
Reference: Alexander Clemm, P.(2007). N.M.F.Indianapolis, USA: Cisco Press.

C. Network Management

It is named a management inside a network when a set of elements, means of activities of control, supervision, organization and planning guarantee a total communication with a normal functioning of the network. [4]

Goal of management of network

The basic aim of the management of the network takes root in covering his three components, to possess a networking with activities, methods, procedures and tools; that allow the operation, administration, maintenance and system supply in the network post.

Component Organizational: It defines the structure for the process of management and the strategy adapted all that carries out her depended the need of the business. [5]

Technical component: It defines the tools to using to realize the function of management and his implantation in the infrastructure.

Functional component: It defines the functions of management that the component organizational must execute using the management tools.

Architecture of management of network
The architecture of management of network is the system or certain processes, by which the platform guides to provide the different services inside the management and administration of the network, the same ones that they need of three important components that any architecture must consider. [6]

- Methods of management
- Human Resources
- Tools of support

The networking to provide functionality to the system does it across a platform, the same one that can have several architectures and inside these we have to three types. [7]

- Centralized architecture.
- Architecture - hierarchic.
- Distributed Architecture

The model of management TCP/IP or Internet

In the model TCP/IP, SNMP is the protocol of management of network that uses the services offered by TCP/IP and that has managed to turn into a standard. For the protocol SNMP the network constitutes a set of basic elements the same ones that were explained in this chapter previously: Administrators or Managers located in the equipments of management of network and Agents

D. *Model of management FCAPS of ISO*

The management inside the networks of communication decides as the action to plan, monitoring and controlling, across models that standardize the system, allowing

obtaining real time information, for this reason the International Union of Telecommunications ITU-T (Consultative International Telegraphic And Telephonic Committee, 1992) there presents as model of management the Model FCAPS of ISO with his air functional five

FCAPS is used when they relate to five functional areas defined in the functional model determined by the interconnection of opened systems (OSI) of the architecture of management (See in Figure 2) [8]

Figure 2. Functional areas FCAPS of ISO
Reference: Abeck, S., Morrow, M., Bryskin, I., P. Nadeau, T., Evans, J., Neumair, B., et al. (2009). Network Management Know It All. United State

Fault Management
The Management of failures understands measures that against reduce unexpected events or events that alter the good functioning of the network, failures called concerning the resources and services of the network, between the mechanisms that the management of failures presents they are: the detection, isolation, identification and the follow-up of the same one; in the network and in the system for his correction, it is necessary takes into very in mind this management since he meets difficulty secretly for a variety of reasons, one of them is that this process is linked by all the systems of processing of information.[8]

Management of configuration
The management of configuration includes the configuration of parameters that define the values of threshold, the establishment of filters, to assign names to the objects managed (information of configuration of the load, if it is necessary), providing the documentation of the changes of configuration, and the change of the configurations of form activates. [8]

Account Management.

Inside the management of accounting the users' administration is determined indispensably, understanding tasks as summary of information of use (use of resources or services of accounting based on the use of monitoring, statistics and measurement) name, direction of administration, services of authorization for utilization of resources and services of accounting. [8]

Performance Management

The management of performance can be a sight as a continuation of the management of failures. Thinking that the management of failures is a person in charge of making sure itself that a network of communications or a system should produce with normality, this is not sufficient to satisfy the aims of the management of presentations, working as a whole in order that the network has a good performance is to say that it should possess quality of service.

Safety Management

Management of the safety needs of an analysis of threats, for what the point of discussion they are the resources of the company to which it is necessary to to protect, already be this the information or the infrastructures of YOU, they are a point of vulnerability that they are exposed to the threats of assault or undue use.

E. Protocol SNMP

The simple protocol of administration of networks (SNMP) is a standard of management of network, used in the networks that support the protocol TCP/IP, the same one that provides a method of management of machines in the network, such as working stations or servants, routers, bridges and concentrating of the software of networking IT in functioning. SNMP realizes services of administration that use systems of management and agents. [9]

Poll SNMP.

The values of poll can be exact for the administrator and there are three types of poll:

- Supervision Polling: he verifies that the devices are available and activates an alarm.
- Threshold of poll: it detects when the conditions turn aside of a number of base line in a percentage superior to the allowed one and to notify her.
- Polling performance: there measures the performance of the constant network during periods more lengths and analyzes them.

Management of information base (MIBs).

MIB SNMP is a set of parameters that a station of management SNMP can consult or establish in the agent SNMP of a device of network. There are extensions MIB for every set of entities of network related that can be managed.
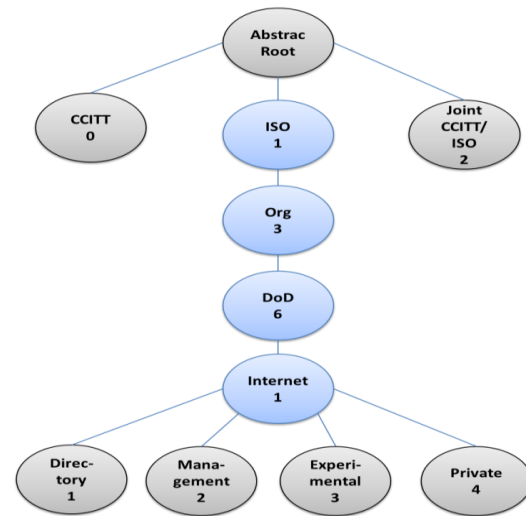

Figure 3. Tree of objects SMI
Reference: Karris, S. T. (2009).Networks Design and Management, (2da ed.)

F. Policy of Management

here does not exist a specific standard that index the exact or only process of how to determine the policies of management, for what it is said that the policies of management are a set of rules that are established by procedures bases to control, to monitor and you administer the network in general being based on the needs that the administered network has.

G. Management Software of network.

The platform of management of network is a visible element inside the system of communication and his correct functioning, his physical location, the maintenance, configuration of elements that it´s necessary to consider that there should not be major problems and they consist of systems of monitoring and differ for the following attributes. [10]

H. Management tools.

The tools for the monitoring inside a network can change depending on needs of the entity where she is implemented this way they can be devices that analyze the sign that circulates across the network or monitors that include all the traffic of the links, are tools that help to that the devices realize additional work of which it is possible to stand out. [11]

A. Precedents I Project Ibarra Digital.

Objective

The principal objective of Digital Ibarra Ciudad is brings the municipal administration over to the citizen by means of the use of the New Technologies of the Information and Communication, which will allow to stimulate the technological, economic and social development, facilitating the creation of wealth and quality employment (in technological areas) that redounds to the well-being of all his citizens. [12]

Parish of the project IBARRA DIGITAL CITY.

The canton Ibarra is constituted by five urban parishes and seven rural parishes, the project Ibarra digital city extended strategic points about all the parishes, offering the service of free Internet strengthening and motivating to the citizenship to the use of the technology as way of communication (see table 2)

Table 2. Urban and rural parishes of the canton Ibarra

PARISHES CANTON IBARRA			
URBAN PARISHES		**RURAL PARISHES**	
1	Caranqui	1	Ambuquí
2	Guayaquil de Alpachaca	2	Angochagua
3	Sagrario	3	Carolina
4	San Francisco	4	La Esperanza
5	La Dolorosa del Priorato	5	Lita
PROJECT DIGITAL CITY		6	Salinas
		7	San Antonio

B. Current situation of the Wireless Network Digital City

To be able to analyze and to determine of better way the condition of the wireless network of the GAD-Ibarra, his analysis has been divided in: physical information and the logical analysis respectively.

Physical analysis of the wireless network

The physical analysis of the wireless network of the GAD - Ibarra, consists of the summary of information of the points of connectivity, characteristics of the links of radio frequency, the distribution of the principal backbone of the network, ranges of assigned IP addresses, typical of the equipments used in the strategic places where there were placed the points of access to the service.

Connectivity de point

The points distributed by the whole canton and that form a part of the Project Digital Ibarra Ciudad, are in all his parishes in strategic points as: info-centers, schools, communal houses, centers of health, parks between other points of easy access, with the aim that the citizenship enjoys the services with facility. (see table 3 and figure 5) [13]

Table 3. Geographical location of points of the wireless network

PARISH	LOCATION	GEOGRAPHICAL COORDINATE	
		LATITUDE	LENGTH
PRINCIPAL NODES OF THE WIRELESS NETWORK			
San Francisco	Ibarra – IMI	0°21'12' N	78°7'5' O
Alpachaca	Loma de Azaya	0°21'37,93'' N	78°8'13,93'' O
San Antonio	Casa Comunal San Antonio	0°19'59,06'' N	78°10'13,01'' O
PARISH	LOCATION	GEOGRAPHICAL COORDINATE	
		LATITUDE	LENGTH
POINTS OF THE WIRELESS NETWORK			
Sagrario	Parque de la Familia	0°20'23,36''N	78°07'27,81''O
Sagrario	Parque Boyacá	0°21'21,48'' N	78°07'02,56'' O
Sagrario	Parque San Agustín	0°21'03,37'' N	78°06'58,70'' O
Sagrario	Teatro Gran Colombia	0°21'05,69'' N	78°07'00,76'' O
SanFrancisco	Es del Coco	0°20'59,63'' N	78°07'03,08'' O
SanFrancisco	Jparroquial San Francisco	0°20'53,61'' N	78°07'19,03'' O
San Francisco	Parque Pedro Moncayo	0°21'05,53'' N	78°07'05,78'' O
Caranqui	Administración-Caranqui	0°19'18,48'' N	78°07'25,17'' O
Caranqui	Los Ceibos	0°19'54,23'' N	78°07'02,75'' O
Caranqui	Parque Caranqui	0°19'18,48'' N	78°07'25,17'' O
Alpachaca	JParroquial Alpachaca	0°21'45,14'' N	78°07'55,96'' O
La Dolorosa del Priorato	Priorato	0°23'04,18'' N	78°06'04,18'' O
La Dolorosa del Priorato	Priorato Centro	0°22'17,22'' N	78°06'18,36'' O
La Dolorosa del Priorato	Priorato Alto	0°21'56,59'' N	78°06'01,13'' O
Ambuqui	Centro Luis Napoleón Dilon	0°26'58,87'' N	78°00'39,86''O
Ambuqui	Junta parroquial Ambuqui	0°26'46,03'' N	78°00'18,55'' O
La Esperanza	Cuerpo de Bomberos	0°18'18,01'' N	78°07'23,06'' O
La Esperanza	Escuela Mariano Acosta	0°17'40,49'' N	78°06'58,50'' O

Principal Backbone - zone CORE.

The wireless network of the GAD-Ibarra has his head office of information and services, located in it dates center (quarter of communications), in the building of the Autonomous Decentralized Government San Miguel of Ibarra, the same one that possesses the fundamental requirements and mechanism for his functioning.

Description of network wireless to level of links.

The wireless network of the GAD-Ibarra distributes across links point to point and point multipoint, using as technology for the wireless connection.

The parishes, Ambuquí, Alpachaca, The Priory, Sagrario, San Antonio, Caranqui, San Francisco, The Esperanza and Azaya's hills in the Figure 4 detail it, are interconnected between them to offer total connectivity to the canton and to

provide the Internet services making possible the aim of the project Ibarra Digital

Later there will be detailed all the links already implemented up to the moment in centers, parochial meetings and parks of the canton.

- Technical Characteristics of links point to point.
- Characteristics technology of links point to multipoint.
- Technical Characteristics connect point to multipoint with repeater.
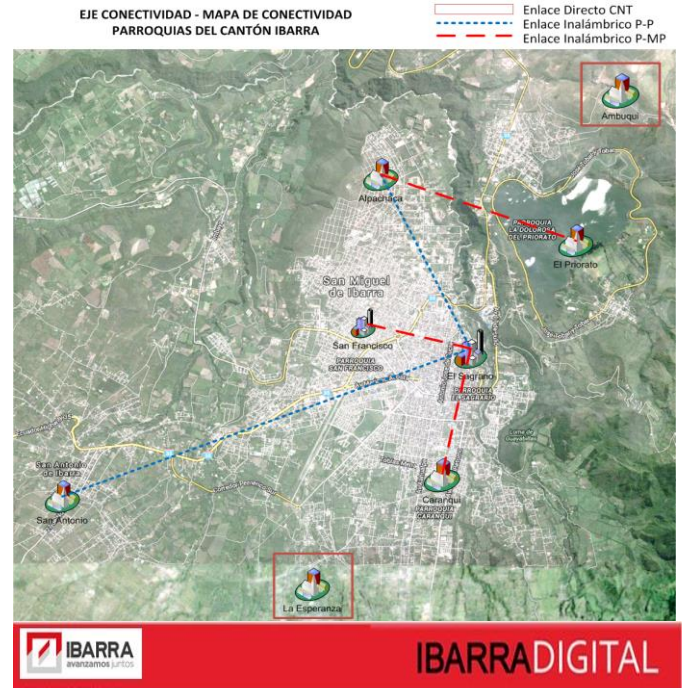- Technical Characteristic of links of direct connection CNT 2

Figure 4. Map of Connectivity - Ibarra's Parishes
Reference: Unidad de hardware y Comunicaciones, 2013

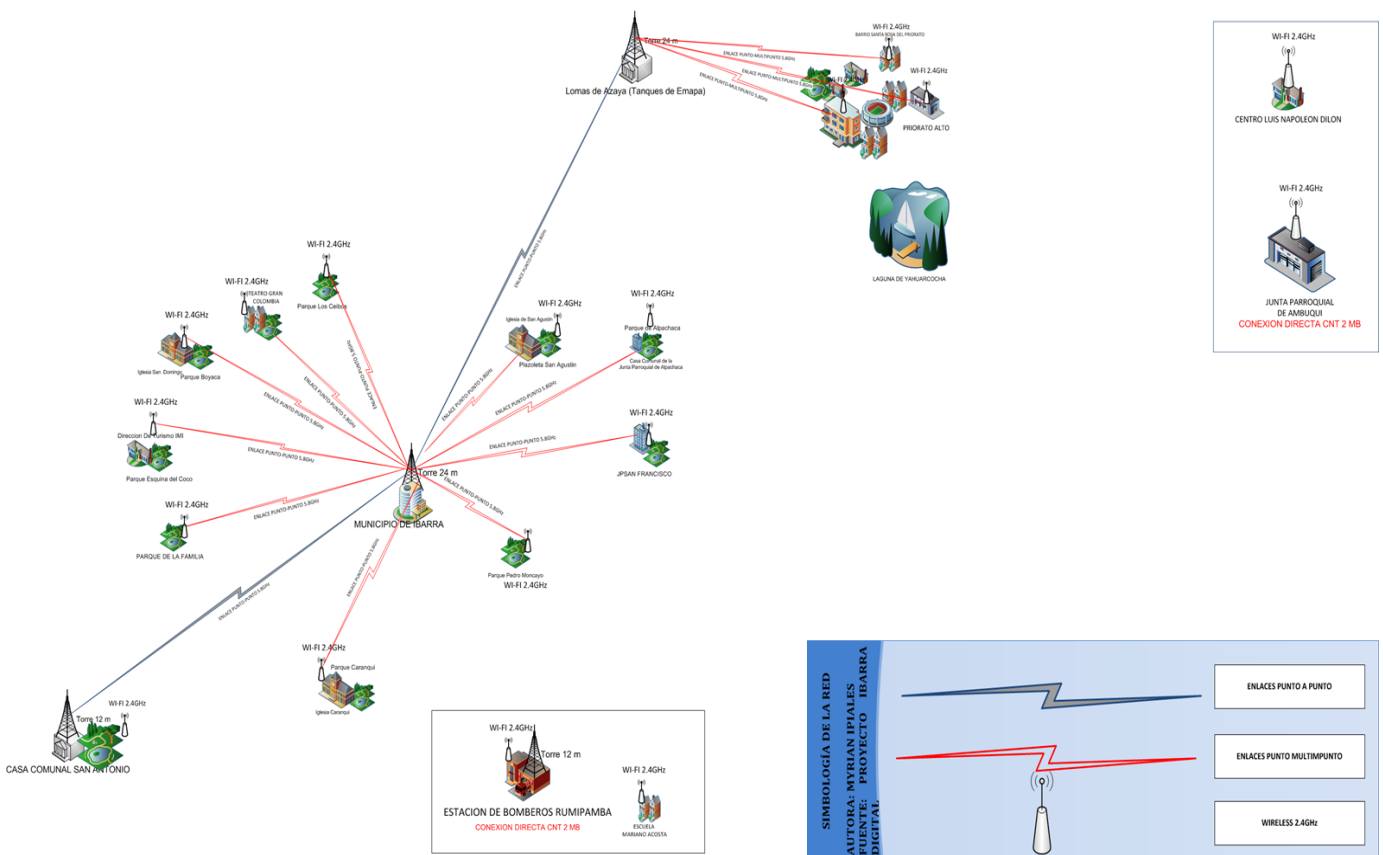# NODOS IMPLEMENTADOS RED INALÁMBRICA DEL GAD-Ibarra

Figura 5. Wireless Network GAD-Ibarra
Fuente: Unidad de hardware y Comunicaciones, 2013

Devices used in the wireless network

The devices of communication described in the Table 4, where one shows his principal characteristics and they are the used ones in the wireless network.

Table 4.Devices used in the Wireless network digital City

DIVICES	MEMORY	OS	Ethernet	SNMP
RouterBoard SXT 5HnD	32MB	ROS / 3	1 - FastEternet auto-MDIx	SI
Routerboard RB450G	256MB	ROS / 5	5 - Gigabit auto-MDIx	SI
RouterBoard RB433AH	128MB	ROS/ 3	3 - FastEternet auto-MDIx	SI
RouterBoard RB411AH	128MB	ROS / 3	3 - FastEternet auto-MDIx	SI
RouterBoard RB711-5HnD	32MB	ROS/ 4	3 - FastEternet auto-MDIx	SI
Routerboard RB711UA-2HnD	64MB	ROS/ 4	1 - FastEternet auto-MDIx	SI
Routerboard RB1100AHx2	2 GB	ROS/ 6	13- GigaEternet auto-MDIx	SI
TP-LINK TL-WR941ND	300 Mbps	3T3R MIMO™		NO

Applications and implemented protocols

The wireless network of the GAD-Ibarra for his effective functioning has implemented applications that allow to support the control and to give the best service to the citizens.

- Firewall.
- DCHP.
- DNS server.
- Hotspot o portal cautivo.
- User manager.
- ThunderCache
- Modulo Ups
- Time server

IV. MANAGEMENT AND ADMINISTRATION OF THE WIRELESS NETWORK OF THE GAD-IBARRA

A. Establishment of Policies for the Management

The principal aim is regulate the processes that are realized in the institution guiding of policies established by means of which it supports the wireless network in correct functioning and taking advantage of the existing resources to offer the services efficiently to the citizenship

Purpose

The present document has the principal aim to present policies of management for the wireless network of the GAD-Ibarra, the same ones that will have to be expired for the personnel at the expense of the administration, with the basic intention of supporting the good functioning of the network and the efficient delivery of the service of connectivity to the citizenship.

Organizationally Levels.

The director: Authority of top level. Under his administration they are the acceptance of the policies of management, in conformity with the chief of the unit of Hardware and Communications and the administrator of the wireless network.

Manager of Unit of hardware and communications: The authority and manager of the unit of hardware and communications takes decisions in case of the top authority is not with matters related to the wireless network.

Administrator of the network: Person in charge of the management and manipulation of the devices that shape the wireless network with total access for configuration.

Technology Assistant: Person entrusted to fulfil the technical help-desk in case of being needed in the wireless network.

Users: Users who accede to the services offered to the wireless network.

Reference:

For the accomplishment of this document there takes the format that the institution already possesses of previous projects and for the establishment of the policies of management a specific standard does not exist but they are realized on the basis of the functional areas of the model FCAPS of ISO:

- Politics of Management of the wireless network.
    - Aim of the Politics of Management.
    - Commitment of the Authorities.

- Management of Faults.
    - Managing fault.

- Management of Configuration.
    - Revenue of equipment.
    - Configuration of equipment.
- Management of Configuration.
    - Revenue of equipment.
    - Configuration of equipment.

- Management of Accounting.
    - Parameters of monitoring.

- Management of Performance.
    - Reports.
    - Collection of statistical information

- Management of Security.
    - Access to the Software of Management.
    - Access to the devices of network

- Fulfillment.
    - Fulfillment of Policies

B. Implementation of Management and Administration of the Wireless Network GAD-Ibarra

To help the model of management FCAPS of the ISO decides requirements of software and hardware that cover 5 functional areas determined by his initials and related between yes with the system of management; composed by the application of management The dude as tool monitor principal and that together with the analyzer of traffic wireshark, the tools of support Mikrotik, VPN-Teamviewer between other tools, fulfill the aim to administer and manage the wireless network in its entirety. (See figure 6)
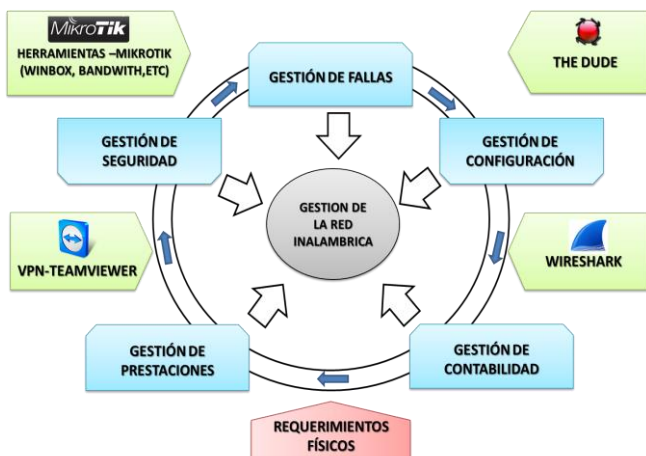

Figure 6. Management tools acting together with the Functional Areas of the Model of management FCAPS of ISO
Fuente: Model of management ISO.

Requirements for the implementation of the model of management

For the implementation of the model of management it is necessary takes into account the requirements to level hardware and software in order that the application of management in this case the dude realizes the monitoring, control and correct procedure.

It is important bear in mind the topology constructed on having implemented the software of management the one that is clear of a local servant that it will have total access to the wireless network and a remote client who will connect to the application across the option that gives the same software of management or across VPN in case of being necessary the monitoring out of the network of administration. (See Figure 7)
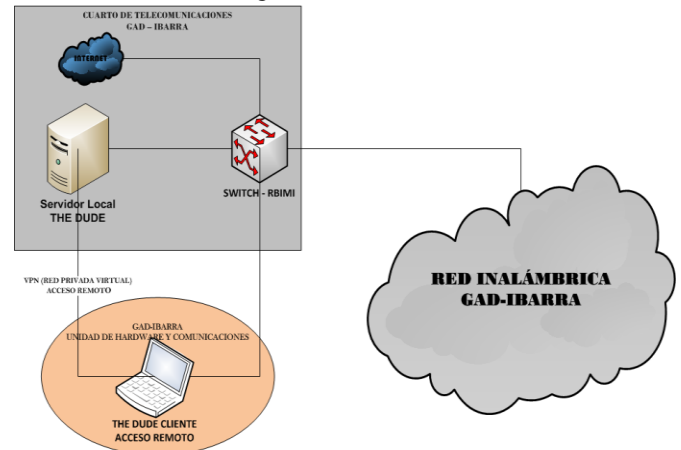

Figure 7. Topology of wireless management
Fuente: I inventory department TIC's del GAD-Ibarra

Implementation of the model for fault management

For the implementation of the management of failures it is considered that already the management of configuration is implemented, the managing of the management of failures determined by the OSI establishes two functions to analyzing, the same ones that will be covered with the application of management the dude and his tools, the implementation of the management of configuration not only determines the process of configuration, in addition he presents the formats to document the information of new devices that they add.

- Management of preventive tests when the failure has not happened.
    - PING
    - TRACEROUTE
    - CONSOLE
    - PACKET SNIFFER
    - WIRESHARK

- Management reactivates: Management of life cycle of incidents
    - Detection of fault.
    - Isolation of fault.
    - Diagnosis of fault.
    - Resolution of fault.

Implementation of the model for the management of configurations.

In order that the system of management implemented administers the wireless network of the GAD-Ibarra and realizes his function in totality, it is necessary that each of the tools, applications and services that shape it are formed since one proceeds later.

- Process of installation The Dude MIKROTIK
- Configuration of the management tools

- Remote Access offered to the application of management The Dude.
- VPN from the client across Teamviewer's application.
- Wireshark Analyzer of Traffic of the wireless network, SNMP's monitoring.

- To enable SNMP in the devices of the wireless network of the GAD-Ibarra

Implementation of the model for the account management.

As part of the system of management, the accounting has as principal aim obtain the reports of the current situation of the use of the resources in order that the network offers the services, for what the dude allows that the following tools should show a system of compilation that offers the pertinent information of the use of the resources of the wireless network.

- Implementation of parameters of monitoring in the dude.
  - Implementation: To add parameters of monitoring.
  - Try function
  - Test SNMP
  - Test TCP, UDP, ICMP and DNS

The ranges established for the monitored parameters are given for default of factory according to the equipment, the details of the thresholds that decide of the parameters it is detailed in the manual of management of accounting.

Parameter Monitory

Once implemented the parameters in every device, it is kept in constant monitoring of the services and resources, across the eyelashes: services and record in the general window of configurations where there is visualized the active or inactive condition of the parameters and the graphical record given in percentage of the same ones respectively.

- Device to check/eyelash Services
- Device to check/Historic eyelash

Implementation of the model for the management of performance

For the implementation of the management of performance also called management of performance, one possesses the scanning by means of Troubleshooting tools, across the following tools, besides completing the information with reports and statistics printed to support the constant monitoring of the wireless network

- Implementation of analyzer of traffic Wireshark.
  - EXPERT INFOS user's interface
  - Summary of traffic of packages

- Statistics of the traffic for hierarchy of protocol
- Statistics of Traffic TCP and UDP in target IP
- Statistical Graphs of the traffic. Bits/s

- Tools Mikrotik for analysis of traffic - Troubleshooting tools.
  - Tool: Packet Sniffer.
  - Tool: Profile
  - left Menu/chart

- Reports and Record.
  - left Menu / devices
  - left Menu / historic of actions
  - left Menu/link
  - left Menu/Network Maps
  - left Menu/network
  - left Menu/Outages
  - left Menu/notifications/generals
  - left Menu/log

Implementation of the model for the security management.

The safety management is the manager of handling the revenue to the system of monitoring and all the tools that help to administer the wireless network, by what three types of users were implemented by different privileges that later are detailed.

Table 5. Users of access

NAME	PRIVILEGE OF GROUP	PRIVILEGE OF ACCESS	DESCRIPTION
Administrator	FULL	More of one to allow To separate panels	Administrator of the wireless network
Management	To read, locally, web, remotely	To separate panels	Monitor: fault Instantaneous
Monitor	Remote, local, to read	To separate panels	Monitor: without privileges

To accede to the application of management The dude there exist two forms of access of a remote way with the remote tool The Dude, by means of a mariner from THE PC one connected to the local network or by means of the VPN across Teamviewer, this process of access is detailed in the safety manual.

C. Procedures Manual

The manual of procedures is a general guide who allows to be able in what situation use the implemented tools, does not try to be a law but rather a help of rapid access in order that the administrator solves the problems provoked without

disadvantages inside the wireless network of the GAD-Ibarra. Later there are described the processes, information and tools that are used in every manual of management that it covers in the areas FCAPS of the model OSI.

Procedures Manual Fault Management

Objective: To present the process to continuing to solve the failures that are provoked inside the wireless network, in the minor possible time guaranteeing hereby the availability of the wireless network without causing inconveniences to the final users.

*Scope.-*This manual this one realized to be applied in all the points that form a part of the wireless network to all the implemented devices that provide access to wireless Internet, covering strategic areas of the canton Ibarra; this procedure applies to itself to the failures in general that appear in the wireless network in functioning.

There is annexed a database of the specific failures that they have presented up to the moment in the monitoring; in case of one exists new failure will receive documents his newly procedures for in a future to solve with efficiency new provoked faults.

- General Procedure for resolution of fault in the wireless network - GAD-Ibarra.
    - Database of problems
    - Recommendation for users of the wireless network of the GAD-Ibarra.
    - The forms MPF-01 and MPF-02, it is detailed in the Annexes' J: Forms

Manual of procedures for the management of Configuration

Objective: To present the procedure to continue on having added a new device to the wireless network in order that it should form a part of the administration and should realize the function to which there is assigned him.

Scope: This manual this one realized to add new devices in the wireless network, the procedure is applied to any new device that one adds to the wireless network, he was presenting the formats to document the information of new devices that they add, besides the procedures to continue to obtain backup of the system of management and the devices.

- Procedure to add a device in the wireless network GAD-Ibarra
    - Nomenclature for devices of network
    - Configuration of network
    - SNMP's Configuration
    - Backup

- · Procedure to add a device in the wireless network GAD-Ibarra
    - Nomenclature for devices of network
    - Configuration of network
    - SNMP's Configuration
    - Backup

Manual of procedures for the management of Accounting

Objective.- To present the procedure to continue for the configuration and monitoring of the resources and services that show the condition of the devices of the wireless network.

Scope: This manual is the guide to add the resources and services in the devices of the wireless network allowing that the application The dude should support the network in constant monitoring, the procedure applies to everything the resources and services allowing to obtain the reports of the current situation of the use of the resources in order that the network offers the services.

- Procedure to add services and resources in the device of the wireless network GAD-Ibarra for the management with the dude.
    - To add parameters of monitoring in The dude
    - To add parameters of monitoring in the device
    - Ranges established for the devices by the manufacturers

- Procedures to add services and resources of monitoring in the dude.
    - Device to check/eyelash Services
    - Device to check/eyelash records

Manual of procedures for the management of Performance

Objective: To present the procedure to continue to scan the traffic of the wireless network and the diverse reports that the management presents, supporting the good performance of the wireless network offering constant monitoring in time royal.

Scope: This manual is the process guide for the scanning of the traffic and presentation of reports is the management that complements the management of failures, the process applies to the tools Troubleshooting that the management possesses and especially to the reports and records that there presents the application the dude to support the constant monitoring of the wireless network

- Procedure to obtain reports and records that present the current condition of the wireless network GAD-Ibarra.

- Visualization of report or record
- Impression of report or record

• Procedure for monitoring traffic in the wireless network - GAD-Ibarra.
  - Tools troubleshooting
  - Visualization of records of use of traffic

Manual of procedures for the management of Security

Objective: To present the procedure to continue for the access to the devices of the wireless network, the system of management and all his tools.

Scope: This manual is the process guide for the access to the systems of management and devices, the process applies to the system of management especially to the application the dude and the devices that form a part of the wireless network of the GAD-Ibarra.

• Procedure for access to the system of management of the wireless network GAD-Ibarra.
  - Type of User
  - Form of access to the management

V. COST BENEFIT

The relation Cost-benefit is a reason that has as principal aim provide a measure of the profitability that the project was generating in the community, this project is established by means of the comparison of the costs that implies the implementation and the expenses of operation that carries the management of the wireless network to offer the quality service to the final users.

The equation that determines the relation Cost-benefit to determine the viability of the project is the following one:

$$CB = \frac{Beneficio - Contrabeneficios}{Costo}$$

Ecuación 1: formulates cost - benefit
Fuente: Leland Blank, Anthony T. (2006). Ingeniería Económica. McGrawHill. México.

Where:
Benefit: the benefits that the project carries are it cost them that it implies the implementation that it will not have to pay, in addition the costs of the technical assistances personalized to the place without the application of management it was working.

Against Benefit: they are disadvantages that the project was presenting in execution, in this case the value is 0, to the being a variable not certain value, the costs of maintenance, installation and configurations are realized by the personnel of TIC's del GAD-Ibarra.

Cost: They are the operative expenses that are realized when the application of management is in execution and that allow his good functioning.

Benefit: 3 307,50+3 900 =7 207,50 dólares
Against Benefit: 0 dólares
Cost (Probable expense): 1950 dólares

$$\frac{B}{C} = \frac{7\ 207,50}{1950}$$

CB = 3,69

Cost - Benefit being based on the criterion of the relation, the project is economically viable and considering the benefits that he presents not only to the GAD-Ibarra as public entity but the permanent availability of the services that gives the wireless network of the project Ibarra Digital city to the community Ibarreña as final users.

Beneficiaries
The direct beneficiaries of the proposed project serious the Administrator and personnel at the expense of the wireless network, allowing them to realize the processes of maintenance and solution of problems of a centralized and immediate way across processes that improve the solution and minimize the resources.

Since direct beneficiaries also there are had all the inhabitants of the parishes of the canton Ibarra where there are distributed the points of access to free Internet; parks, schools, sub-center and Info-centers with the estimated one of 30 users for point of access what would cover 6360 users per day, allowing them to enjoy a quality service with a permanent availability

VI. CONCLUSIONS

With the evolution of the wireless networks there is born the complexity of administering them, for what there believe themselves processes that they allow to plan, to monitor and to control the network, since the ISO defines it in the functional areas of his model of management FCAPS, used for this present Project.

Once analyzed the model of management, could decide the guidelines that adapt to the needs of the wireless network of

the project digital Ibarra Ciudad directed by the GAD-Ibarra and that it must consider to be parameters of administration, especially in places of difficult access, for with it to offer to the citizenship the service of free, totally available Internet and optimizing the existing resources.

Across the analysis of the audit that presents the current condition of the wireless network, one determined the policies of management that cover the functional areas of: faults, configuration, accounting, presentations and safety with which the administrator, the personnel in charge of the network and users can have a norm of utilization to support the correct functioning of the wireless network and to do this way without his services and resources.

The platform of management the dude it is one Mikrotik's proprietary application that allows to the administrator of the GAD-Ibarra to manage the wireless network of centralized form, presenting not only the monitoring of a graphical amicable way but also the option to manipulate and control the configurations making the administration more effective.

To cover the management the application the dude there works together with the analyzer of traffic wireshark that allows to know the condition of the connection of network and to detect the possible problems that it exists in the transmission of packages, the tools of support Mikrotik, winbox as proprietary tool for configuration, packet sniffer as instantaneous analyzer of traffic, profile as a tool that shows the consumption of the CPU of every device and VPN-Teamviewer as private virtual network for the remote external access towards the servant, they fulfill the aim to manage and monitor real time the wireless network in its entirety.

The dude as principal monitor it shows notifications of the faults that produce to themselves automatically, across messages on the screen, a beep of notice and with the code of colors with that the administrator identifies the fault and remotely with the help of tools included in the application it solves the problem without causing inconveniences to the users.

Since the GAD-Ibarra is a public entity that as all supports bylaws and policies that determine processes for his good functioning, in this project there decide the policies of the wireless network of the Project Digital Ibarra Ciudad directed by the GAD-Ibarra who across the manuals of procedure obtain a guide for the utilization of the application the dude and management tools that it allows them immediate resolutions of events and unexpected events

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