

Minimizing Radio Link Breakdown Frequency by Avoiding Overheating of the Dongle

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ABSTRACT

This research focuses on minimizing the breakdown frequency of the "Radio LAN PC". "Radio LAN PC" device is the unit that helps to connect LAN to the internet. This is the way that the organizations get the internet facility from the service provider. This device uses radio waves for connecting receiver and transmission point. Radio LAN connection is not the latest technology to get the internet facility. But there is only one issue with this technology. That is the radio link may breakdown at any moment. If the "Radio LAN PC" device exceeds the maximum temperature it will disconnect the internet line automatically. Overheating of the "Radio LAN PC" device is the main reason for the disconnection. To overcome this problem, a new overheat control device is proposed. This device is similar to a PIC programming unit. Following software's were used for the development of the system. MPLAB 7:62, Winpic 800

The developed circuit is the best solution for the overheating of the radio LAN PC (dongle). Before the disconnection of the Radio LAN PC, it automatically switch on the overheat control device and prevents the radio link breakdown. After reaching a certain temperature level, the device automatically switches off.

KEYWORDS: Direct Memory Access, International Telecommunication Union, Media Access Control, Radio Local Area Network Plurality Communication,

INTRODUCTION

The well reputed company situated in Nawala is a total solution provider for the midrange computer industry. At present, company has customers in Sri Lanka and all around the world who use their software and services. According to their services, they handle many services. Therefore we have to provide a full customer support for our customers in order to maintain the company reputation.

- Communication Solutions
- Software Services(Customer's Software Solution)
- Data Centre Service
- Disaster Recovery Service
- Maintenance Services
- Security Services

Those are;

Due to some bugs occurring during the services (especially in the software solutions), and at running time, the customers had to wait long time to get the service completed. If a particular customer was far away,

then company had to spend much time to recover the errors & it was much difficult for overseas customers. Therefore probably two facilities were to overcome these problems.

1. Online Technical Support
2. Electronic Customer Support (ECS)

During the Online Technical Support and Electronic Customer Support (ECS) services, normally used Radio Link Connection to connect the internet. But the major issue of this link was that it might breakdown at any moment. Some days it was happening for considerable times. This was a big issue for the online supporting customers. If this was occurring with the installation part, sometimes the data have lost. As the breakdown link results to waste time in both client side and company's point of view. That was negatively affected for the company image. It indirectly resulted to loss existing customers and rejected software from their business.

During the system work, most of the time the company had to support their customers through internet. But sometimes several problems occurred when getting the online support. The major issue was connection breakdown/ connection loss. Therefore best solution is decided to develop a circuit to overcome this disconnection problem of the radio LAN PC.

This research is pointed to minimize the radio link breakdown frequency. From the basic research related to "radio link breakdown", Realized this breakdown occurs due to overheating of the Radio LAN PC (dongle) component in the client side. Basically that if cut off the overheat generating points of this device, it provides the minimum radio link disconnection. From this research, target is expected to avoid the component from

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reaching the disconnection temperature. This is the research of project and the research objectives are;

- Minimize the radio link breakdown frequency
- Increase customer satisfaction
- Provide best service to the customer
- Increase profit of the company
- To support future improvement for this type of research

LITERATURE

Wireless Ethernet for Industrial Applications:

Wireless technology has continued to evolve for the industrial market; however, there are several issues and challenges that must be addressed to ensure successful implementation. (springerlink) This paper discusses the development of wireless technology and standards and those that are currently applicable to industrial applications. Key considerations for successful implementation of industrial wireless Ethernet are presented, along with potential applications.

Wireless technology development is discussed, along with pertinent characteristics. The use of standard Ethernet with automation protocols and their use with wireless is examined. Topics to consider when implementing wireless Ethernet in industrial applications are illustrated. (Kojo , Raatikainen and Alanko , 2005)

According to this literature, they were not presenting any reasons for the breakdown and suggestions to overcome the problem. Therefore I decided to find the solution for this incident.

Speed	Working Distance
1Mbps	8Km
2Mbps	5Km
5.5Mbps	2.2Km
11Mbps	1.2Km

Table 1 Speed and Working Distance

Connecting mobile workstations to the internet over a digital cellular telephone network:

Modern portable computers and wireless connections over a cellular telephone network have created a new platform for distributed information processing. We were presented a Communication Architecture framework which made it possible to exploit the existing TCP/IP communication architecture but which also was taken into accounts the specific features of wireless links. Our communication architecture was

based on the principle Indirect Interaction. The mediating interceptor, Mobile-Connection Host was the Bridge between worlds of wireless and wire line communication. The interceptor also offered enhanced functionality that improves fault-tolerance and performance for applications aware of mobility. (Piggin, Brandt, 2006) Prototypes of the architecture are implemented both for the Unix (Linux) and for the Windows (3.11) platform.

Recent developments in mobile communication and personal computer technology have created a new platform for information processing. A modern portable computer has given remarkable processing power always at hand for a nomadic user. (Stallings , 2004)

Any link was affected by several factors:

- How much power is output by the bridge or access point
- How much power is lost from the cable connecting the bridge to the aerial
- How much loss is experienced travelling the distance through the air
- How much gain is provided by the receiver aerial
- How much loss is experienced through the cable between the aerial and the receiving bridge

The range that a radio link works over was dependent on its speed, so as an example with the same equipment used in each case, the distance covered changes with speed as below.(wireless navigator)

Normal Radio LAN PC Process System

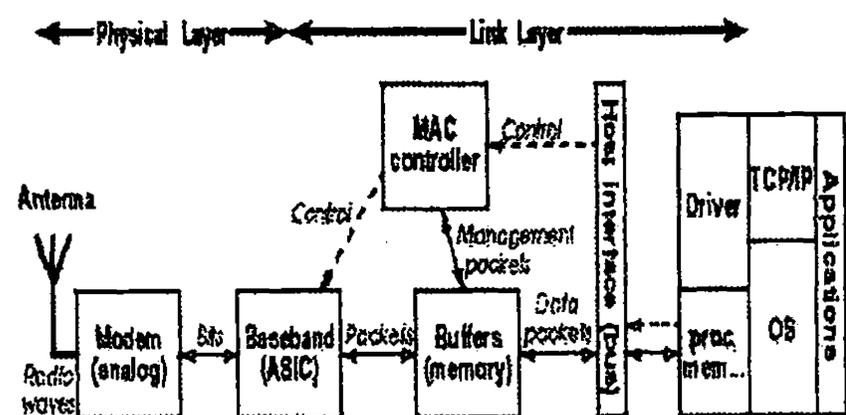


Figure 1 Normal Radio LAN PC Process System

METHODOLOGY

Under this section collected data through "observation". Compared with other research designing process such as (survey / experimental / secondary data study), the observation was the most appropriate method for this research project. According to this project collected the data under four sections. They are;

1. Date
2. Break down time

3. Duration of disconnection

4. Number of customers connected prior to the disconnection

This research was like an applied research, because row data was got from the breakdown of the radio link and then undertaken to answer questions about the Radio link breakdown. This row data was real data. Finally make a decision about a particular problem.

Used inductive reasoning theory building method for the "Radio link breakdown" to get the general proposition basis of observation of related row facts. Because observed that the breakdown occurs due to overheat of the Radio LAN PC. This research processes is similar to bottom to top process. Collected row data under these four fields and then expected to analysis this data thoroughly. Then tried to find out the relationship between temperature (heat) & breakdowns. This technique was suitable for research problem because;

- Couldn't use secondary data(there are no pass records data)
- No previous survey records are to be found

Therefore "Observation" is the more convention way to handle this research problem.

The aim of this research was to minimize the breakdown frequency by introducing a overheat control system to the radio LAN PC.

In the second part of research, expect to introduced the newly developed overheat control Device to overcome the radio link breakdown. That was simply like a PIC programming unit. The proposed circuit was the solution for the overheat dongle. It automatically controlled the radio Link breakdown.

Used "MPLAB" and "Win PIC" softwares for programming and used Assembling language for cording.

DATA COLLECTION & ANALYSIS

Two months data collection was taken in order to do the research project in a proper way. Appropriate data sample was selected and predicted for the required time period using first two months. Identify the breakdown pattern of this company within the six months time was the purpose of the research. Sample data collection was taken for that purpose and sampling technique was applied as needed to find the pattern of data. Other available techniques were not suited for the project.

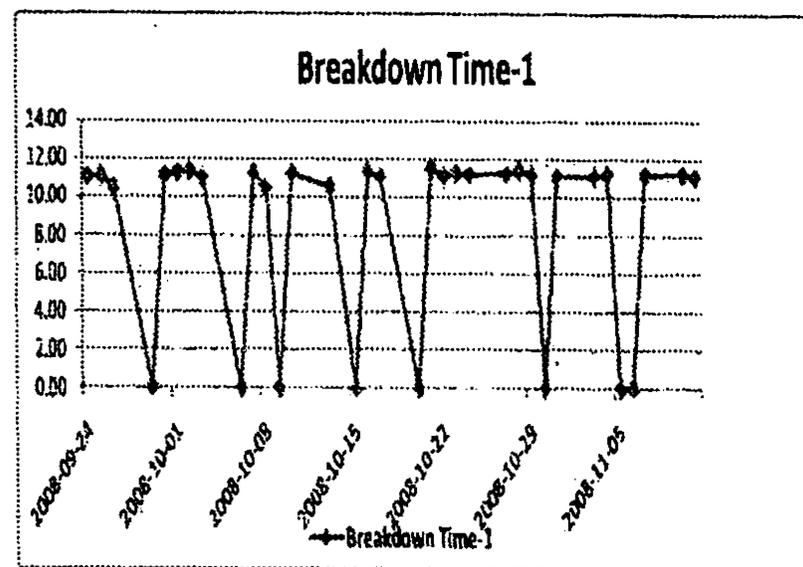


Figure 2 Breakdown Time-1 Vs Date

Figure 2 clearly shows that the first breakdown regularly happens at about 10.00 a.m. Percentage for a breakdown around 10.00 a.m. per day is 76.47%. That means, the probability of radio link breakdown equals to 0.7647 per day around 10.00 a.m. This implies that the first radio link breakdown can happen at about 10.00 a.m.

Facts were collected related to radio link disconnection within two months time.

- Number of times disconnected per day
- Time duration to overcome those problem
- How many clients got support according to that situation
- Countdown the disconnection after new introduce circuit installation

Previous information and new information clearly give the best output & clear data analysis. This is the way how the data could collect. For this purpose "observation" method was used to collect data. Personal interview, telephone interview, questionnaires were not taken as primary data.

The connection of each section is shown in the graph below.

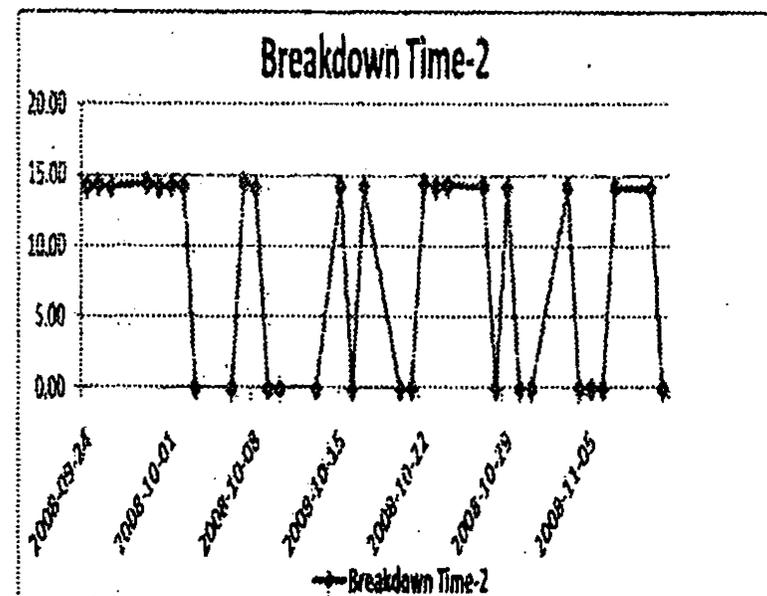


Figure 3 Breakdown Time-2 Vs Date

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No of Breakdown Frequencies Vs Date

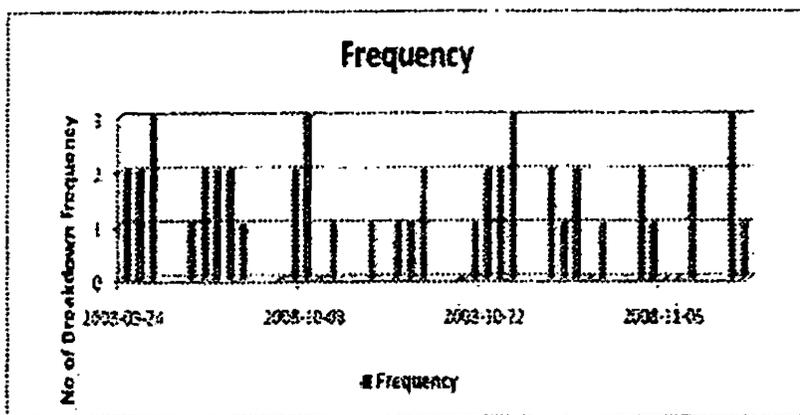


Figure 4 No of Breakdown Frequencies Vs Date

Figure 4 shows the Date Vs Breakdown Frequencies. Total breakdown for the two months time period is 49. Mean number of breakdowns per day is 1.44. This concludes the number of breakdowns can occur regularly is equals to 1.44. Mean number of breakdowns per day is 2.

RESULTS AND DISCUSSION

The result of this project is totally dependent on the proposed overheat control device. This circuit is similar to a PIC programming circuit. It reduces the "Radio LAN PC" overheat temperature. This is the best solution for the current system. According to the Basic research realized that the "radio link breakdown" when the temperature exceed 40° C. The automatic cooling system was switched on before "Radio LAN PC" touch 40° C. therefore expects to start the heat absorbing system at the temperature of 35° C.

When "Radio LAN PC" reaches 35° C, the cooling system automatically turns on. Therefore the "Radio LAN pc" does not exceed the 40°C. The new proposed circuits reduce the radio link breakdown frequency. It implies the breakdown occurs due to the heat of the "Radio LAN PC" system.

The problem of my research study is "Breakdown of the radio link connection". A new circuit was developed to minimize the breakdown frequency to avoid the problem. According to basic feasibility study, many points were realized regarding to this "Radio link breakdown". Those are mentioned bellow.

- Breakdown occurs when the dongle is overheated
- This overheat is generate when the device process transmission and receiving data
- According to the transmission and receiving part device generate more power

Radio LAN PC is a device which control all the transmission, receiving and the AC to DC current converting in the simple unit. Therefore

we can guess two main reasons for overheat. Those are;

- AC to DC conversion generates reasonable heat in the "Radio LAN PC". When the "Radio LAN PC" Device is running on the 24 hours per day. Therefore it regularly converts AC to DC. Radio LAN PC is a fully sealed unit. Therefore heat inside the unit cannot convention to the air.
- According to the transmission and receiving the data, the "Radio LAN PC" generates reasonable heat.

There are three best alternative solutions to overcome this problem. Those are;

- Change the "Radio LAN PC" device structure
- Introducing New System to get the Internet Facility
- Introduce overheat control circuit

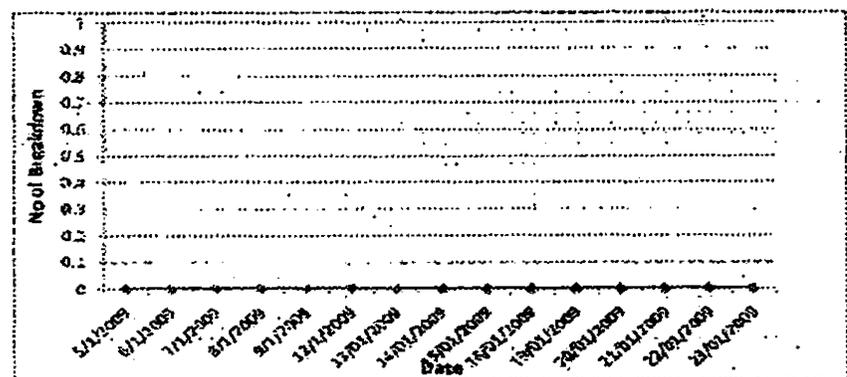


Figure 5 No. of Breakdown vs. Date

Figure 5 clearly shows the output when the new introduce overheat control circuit introduce. There was no breakdown within nearly three weeks time. This graph proves that the new introduced heat absorbing circuit avoid the radio link breakdown and it's proved that the breakdown of the radio link happen due to the overheating of the radio LAN PC.

Developing Overheat Control Circuit

Developing overheat cutoff system is the main part of the solution. Practically this is the best suite to minimize the radio link breakdown. Solution for the "radio link breakdown" is simply based on the PIC programming system. According to PIC program, it basically does four set of operation. This all four process were handled to develop the device.

- Themistor fixed to the Radio LAN PC device.
- If the device is heated, it sense to the themistor.(circuit used themistor reduce it resistance when the device heat increasing.
- The analog resistance of the themistor sends to the PIC 16F877A micro controller.

- The analog signal converted to digital and it shown by using seven segment displays.
- If the device reaches to the disconnection temperature point then the circuits identify the level and then generate a signal.
- Can set this signal to switch on cooling system or absorb fan or temperature reduce device.
- If the device cool down and touch the certain temperature it will automatically turn off the circuit.

Recommendation

- It is difficult to count the breakdown events per day, because it is necessary to search the internet connection always.
- Stop watch was taken to calculate the "breakdown time range". Human errors can be happen, when we calculating the disconnecting time by using stop watch.
- Disconnection can happen due to the services providers' error. It should be recognized. Otherwise wrong data can be added to the final result.
- Temperatures of LAN PC's were calculated by thermo couple. But the correct answer was not given. Therefore a simple temperature measuring equipment was used to get a rough idea about disconnection temperature.
- Disconnection can happen due to the climate change. Identification of this type disconnection is difficult.
- Disconnection can happen due to the power fault of the system.

CONCLUSION

Radio LAN PC is a simple device that is useful to connect to the internet. But the distance between transmission tower and the receiving point affect the maximum power generation. More power generation is the reason for the generation of the heat inside the Radio LAN PC device. If we minimize the distance between transmission tower and receiving point, we can reduce heat generation. This implies the minimum radio link breakdown.

The company can minimize the radio link breakdown of the device by following points below. Those are;

- Change the structure of the Radio LAN PC device
- Introduce overheat control device

- Introducing new system to get the internet facility(Fiber optic or WI- Fi connection)

"Change the Structure of the Radio LAN PC device" is a huge changing of the internal structure. should take more time to build. Therefore we can ignore this solution. 52

"Introducing New System to get the Internet Facility" is high cost solution. If it is so we have to change all organization structure to adapt the new system.

When consider about cost and time; "Introducing Overheat Control Device" is the best solution for the radio link breakdown of the Radio LAN PC device. Because of this introduce new circuit can be built up easier and from the low cost by avoiding the structure of the current system.

Benefits of the Proposed Circuit

Using this new developed circuit, the organization can get many benefits. Those are;

- Reduce breakdown sequence
- System can handle automatically
- Increase profitable of the company
- Increase customer satisfactionary
- Increase goodwill of the company
- No need to reset the Radio LAN PC device

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