# Performance Monitoring of Data Traffic in ADSL network using MSAN UA5000

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***Abstract* — MSAN which is known as Multi Service Accesses Network is a fiber equipments that is located between Central Office and subscribers. MSAN UA5000 is a fiber cabinet manufactured by HuaWei Technologies and it is one of the reknowned fiber's equipments for ADSL network especially in rural areas. The requirement of broadband service in rural areas has become very important because broadband has becomes the basic needs. This paper will embark on the collection of data at one of the UA 5000 located 5 kilometre away from Local Exchange. A few testing needs to be done repeatedly to determine the peak hour and the cause of variations in the traffic performance. The measurement results show the variations of data transmit and received where the data can be utilize by the Service Provider to determine peak hour traffic and monitor the service to the customers. The outcome of this study can be used to improve and maximize the quality of service and at the same time resolve the inconsistency of the transmitted data rate to subscribers.**

***Index Terms* – Multi Service Accesses Network (MSAN), UA 5000, Huawei Technologies.**

## 1.0 INTRODUCTION

Broadband network is very important to our daily lives nowadays. People around the world communicate using internet daily via VoIP, data transfer and also video conferencing applications. The internet has now become an officially 'essential things' people cannot do without, just like the phones or television. Telecommunication industries currently are one of the rapidly growing industries around the world. Furthermore, Malaysia has invested nationwide for the broadband infrastructure that would enable Malaysians to stay in the forefront of technology. Asymmetric Digital Subscriber Line (ADSL)_[1][4], Next Generation Network (NGN)_[2],Long Term Evolution (LTE), Fiber to The Home (FTTH)_[3] are part of the technologies that are currently being implemented in Malaysia to fulfil the needs of high speed broadband.

However, the latest technologies are always deployed in the urban area because of higher demands of broadband services from the subscribers in the city. They experienced high speed internet access as compared to the subscribers in the rural area. This study will focus on monitoring the performance of ADSL network in rural areas_[5]. One of the equipments that have been widely used for the ADSL network is Multi-service Access Node (MSAN).

MSAN which is known as Multi Service Access Network is a fiber equipment that is located between Central Office and subscribers. MSAN UA5000 is a fiber cabinet manufactured by HuaWei Technologies and it is one of the fiber's equipment for ADSL network especially in rural areas. The MSAN UA5000 is used as a tool for traffic monitoring and data collections.

The objective of this study is to identify the cause of variations in the traffic performance and to analyse the root problem that affects the traffic performance. The focus will be on traffic monitoring using MSAN UA 5000 that is located in rural areas. The location of the selected MSAN UA 5000 is 5 kilometre from the Local Exchange and is currently serving 65 subscribers. The MSAN UA 5000 is serving the ADSL network together with the POTS service to the subscribers.

### *A. Multi Service Accesses Network (MSAN)*

In Malaysia, MSAN is widely used by Telekom Malaysia, (TM) in their network after Streamyx is launched. Streamyx using ADSL technology and can provide higher speed as compared to previous traditional PSTN network. Most of the PSTN network has been replaced with MSAN because the PSTN network is using copper cable in comparison to the MSAN which is using fiber optic cable for transmission. Other than that, the speed factor is one of the main reasons that the PSTN is replaced with the MSAN beside the issues of copper cable's being stolen from the network. By using MSANs, ISP can reduce their losses and offer better service to the customers.

MSAN is located mostly outdoor but in certain location such an apartments and big buildings MSAN is installed indoor. The location of MSAN normally is nearby the previous copper Remote Terminal (RT) or cabinet. The connection from MSAN to subscriber's house will remain unchanged which is using the copper cable. MSAN will overcome the problem of limitation in copper cable from Central Office Terminal (COT) or Local Exchange to Remote Terminal (RT). The distance between

COT and RT is variable depending on the location of subscriber and Local Exchange. Subscriber that is located in rural area or farthest from COT will not receive the same speed as the subscribers that are located nearer to COT. Copper networks are also exposed to stolen cases and require very high maintenance. This can be overcome by using MSAN because of the bandwidth capabilities and the cost of fiber optic cable is less expensive than copper cable. In general, fiber optic can offer 1000 times as much bandwidth over distances of 100 times further as compared to the copper cable.

### *B. Huawei UA5000 MSAN*

There are various types of MSANs from various vendors used by the TM networks. For instance, Huawei, Zte, Alcatel and Lucent are some of the examples. Huawei and ZTE are the most being deployed in the network.

TM uses three types of Huawei MSANs in their current networks. There are UA 5000, MA 5600T and MA 5616. UA 5000 is used to serve ADSL services and is the most being implemented as compared to MA 5600T and MA 5616. MA 5600T is use for Very High bit rate Digital Subscriber Line (VDSL) services such as Unifi MA 5616 is also known as Mini MSAN and is used in low density area. Mini MSAN also serves ADSL services.

Most of the rural area used MSAN UA5000 because of the service offered from the ISP is the ADSL. ADSL has covered most areas in Malaysia as compared to VDSL service which is only covering the city areas.

The operations of MSAN UA 5000 in Malaysia mostly are Full IP cabinet as shown in Figure 1. The broadband service is coming directly from the servers to the MSAN while the Plain Old Telephone Service (POTS) is originated from the Local Exchange. The POTS and Broadband services are combined in the MSAN using the splitter card and the output from the MSAN is from both which are the POTS and Broadband services.

As technology evolves, UA 5000 MSAN is also deployed for Next Generation Networks (NGN) projects as shown in Figure 2. NGN will not get the POTS service from the Local Exchange. Signal for POTS service is provided directly from server instead of Local Exchange.

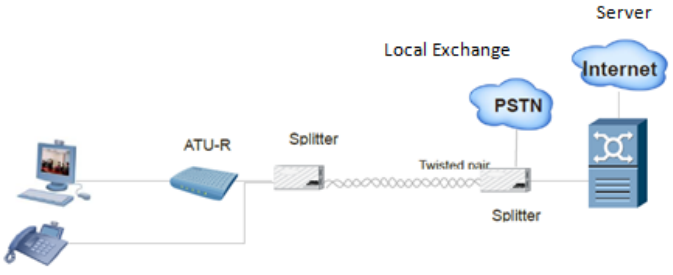


Figure 1 : Full IP Diagram

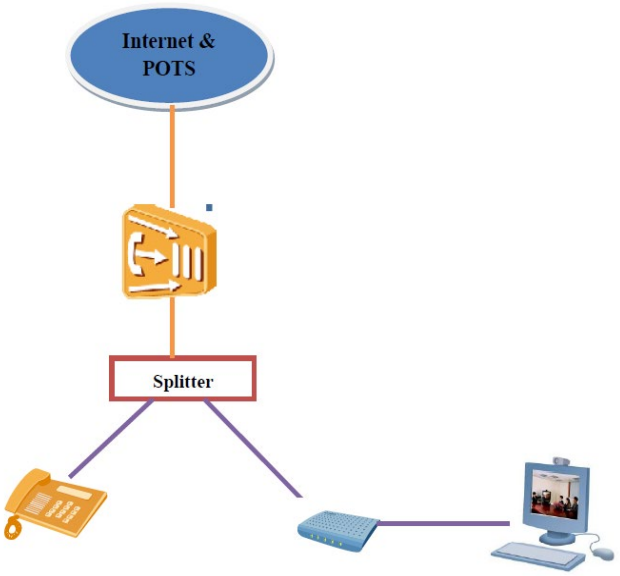


Figure 2 : New Generation Network Diagram

## 2.0 METHODOLOGY

Figure 3 shows the research framework during the monitoring process. The first step starts with determining the time period and schedule for the traffic monitoring process. The schedule varies depending on the results obtained. The first schedule is prepared for 3 hours every day from 0900 until 1200 for three weeks. Unfortunately, the results are not precise and need to be rescheduled. The trial and error process is repeated until precise data is obtained.

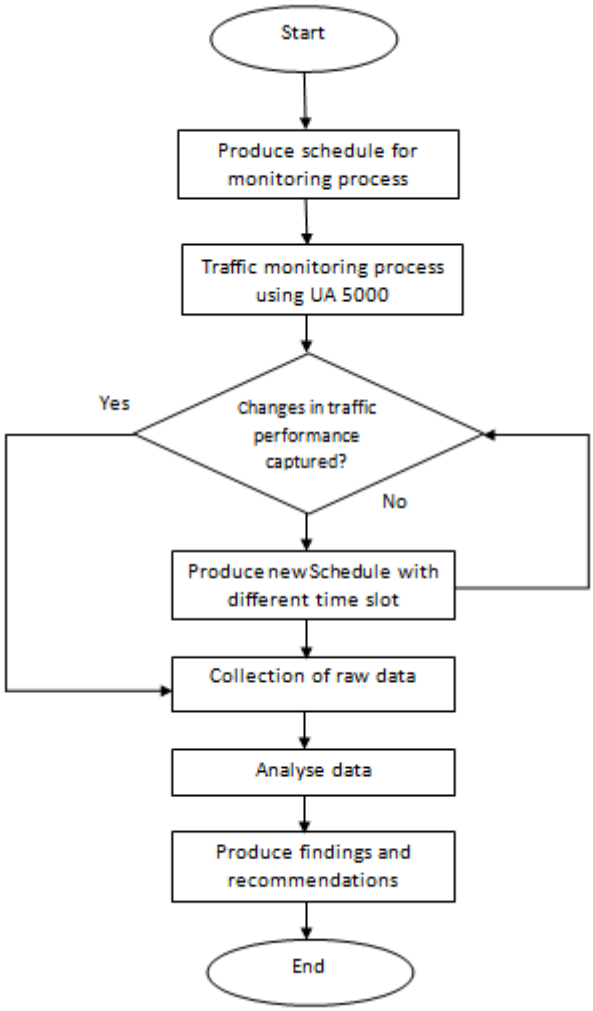


Figure 3 : Research Framework

Transmit and Received data rate are the parameters captured in this process referring to the schedule produced. The process is repeated if there are problems or inconsistency in the captured data.

Data from monitoring process is recorded after several trial and error processes. These raw data are important for this study. Raw data is analyzed to determine the cause of variations in traffic performance.

The analyzed data will help to produce findings and recommendations for improvement of the ADSL network especially in rural area that is located far from Local Exchange. These findings can also be used by the ISP to determine the common problem of their network more precisely.

### *2.1 Monitoring Parameters*

Figure 4 shows the location of selected UA5000 MSAN for this study. The location of this MSAN is nearby Kampung Aman, Taiping Perak.

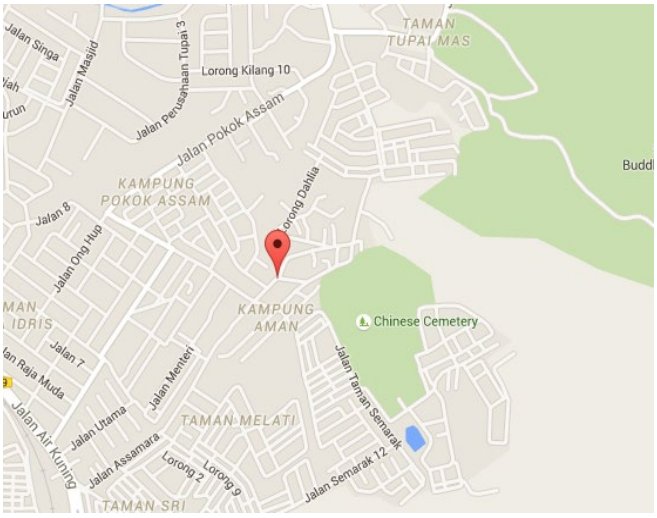


Figure 4 : Location of UA 5000

The UA 5000 MSAN is selected because of its location which is near to the village area and there is no high priority subscriber such as offices, industries and VIP residents. All subscribers from Kg Aman are subscribing the service for personal used. The importance of determining the types of subscriber is to prevent any unwanted issues if something happened during this monitoring process that can affect the existing subscriber such as slow browsing and service intermittent. Service Level Agreement (SLA) for high priority subscriber downtime is less than the normal subscriber. From the monitoring, we can determine the accurate time of the occurrence of peak hour for the normal subscriber since the peak hour is depending on the type of subscribers using the service. The peak hour parameter is important to the Service Provider in order to gather the information of the MSAN capability to serve the current subscribers. This will provide a deeper insight to the Service Provider especially in planning their network utilization in future.

```
TP_V0080V>enable

TP_V0080V#config

TP_V0080V(config)#display board 0
------------------------------------------------------------------------------
  SlotID  BoardName Status         SubType0 SubType1    Online/Offline
------------------------------------------------------------------------------
  0
  1
  2       H612IPMD  Active_normal
  3       H612IPMD  Standby_normal
  4
  5
  6
  7
  8
  9       H603ADRB  Normal
  10      H603ADRB  Normal
  11      H603ADRB  Normal
  12
  13
```

Figure 5 : UA 5000 Service Board

Figure 5 shows the number of service board which is 3 units. Each board has 32 channels capacity and can serve up to 96 subscribers.

```
TP_V0080V(config-if-ipm-0/2)#display
 Temperature(C)          : 55.500000
 Supply voltage(V)       : 3.260800
 TX bias current(mA)     : 12.584000
 TX power(dBm)           : -4.943074
 RX power(dBm)           : -6.820992
```

Figure 6 : Fiber Reading

Figure 6 shows the fiber optic reading from the Local Exchange to the MSAN. The received power from the Local Exchange is -6.82 dBm and the transmit power from the MSAN to the Local Exchange is -4.94 dBm. The reading of this MSAN is in the acceptable range because the Huawei specifications define the value of less than -19 dBm for MSAN to operate smoothly.

*Monitoring Process*

The duration selected for this monitoring process is starting from 6th November 2015 until 13th November 2015. The monitoring process took one week and the time interval for traffic monitoring process is set to every hour continuously for the whole week.

The monitoring process is done by using IManager U200 Network Management System as a server. The MSAN id, time duration and time intervals have been set before the monitoring process begin. The system will remotely enter the selected UA 5000 and automatically captured the information inside the UA 5000. All captured data is stored in the system server.

## 3.0 RESULTS

In this section, we analyzed and discussed the results from the monitoring activities. As aforementioned, the results are captured for 1 week with 1 hour data interval.

1. One Week Data Performance



Figure 7 : Data Transmit in one week

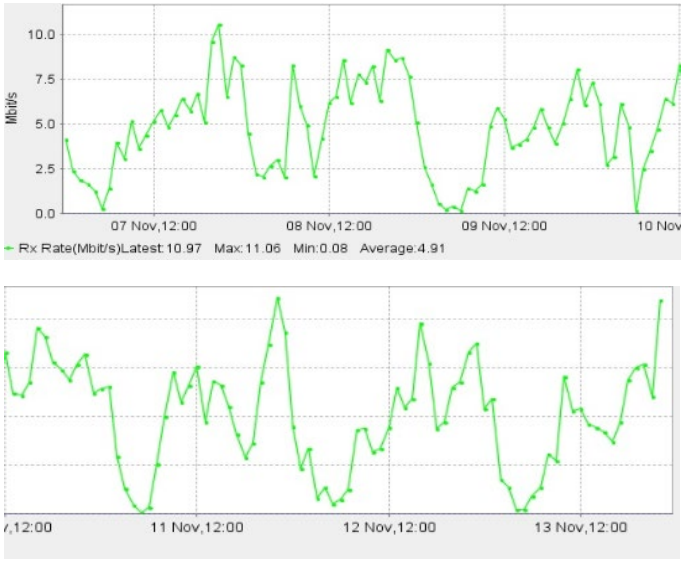


Figure 8 : Data Received in one week

Figure 7 and 8 show the data transmit and data received respectively. Both data are recorded starting from the 6 November 2015 until 13 November 2015. Data transmit represents data uploaded from the UA 5000 MSAN to server and data received represents data downloaded from the server to UA 5000 MSAN.

The highest data transmit captured is 1.18 Mbit/s on 12 November 2015 at 2300 and the lowest transmit data captured is 0.02 Mbit/s on 13 November 2015 at 0400. The average data transmit for the whole week is 0.44 Mbit/s. The observations for the whole week showed that there is a similar trending for the transmitted data. From here, we can conclude that the subscribers often used the internet service during night time because the transmit data captured is the highest.

The highest data received captured is 11.06 Mbit/s on 11 November 2015 at 2200 and the lowest received data captured is 0.08 Mbit/s on 11 November 2015 at 0500. The average data received for the whole week is 4.91 Mbit/s. The observations for the whole week showed that there is a similar trending for the received data. High download rate during night time showed that the subscribers in this area is actively browsing and downloading.

2. One Hour for One Day Data Performance

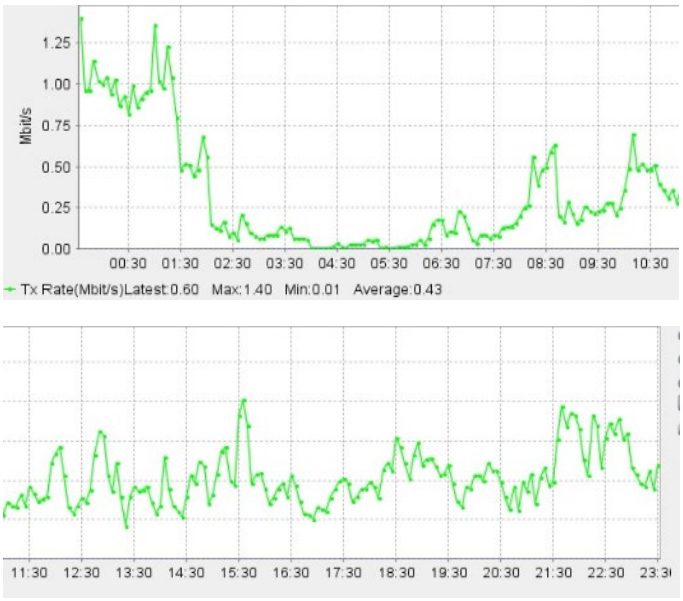


Figure 9 : Data Transmit for One Hour Interval

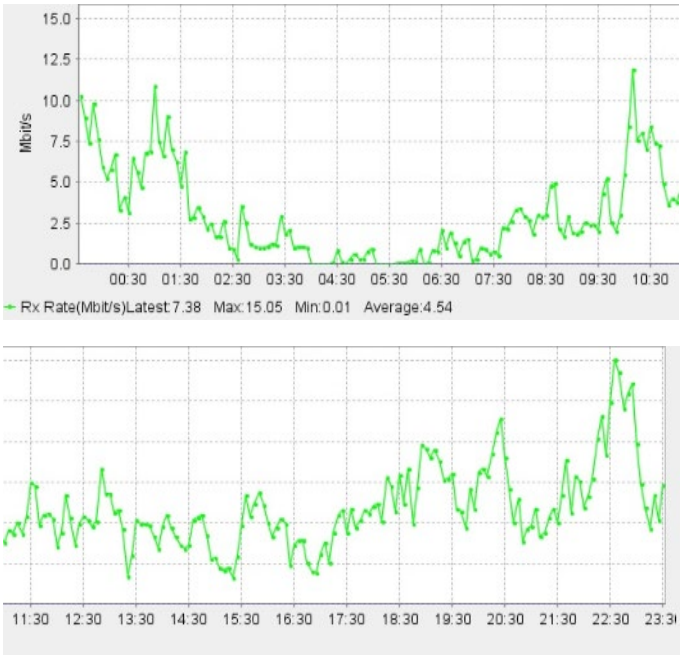


Figure 10 : Data Received for One Hour Interval

Figure 9 shows the data transmit and Figure 10 shows the data received for one hour interval. Both data is recorded starting from 11 November 2015 till 13 November 2015. Data transmit represents data uploaded from UA 5000 MSAN to server and data received represents data downloaded from server to UA 5000 MSAN.

The highest data transmit captured is 1.4 Mbit/s on 12 November 2015 at 2330 and the lowest transmit data captured is 0.1 Mbit/s on 13 November 2015 at 0700. The average data transmit for the whole week is 0.43 Mbit/s. The highest transmit data and the lowest transmit data for one hour interval is consistent with the data captured for a week.

The highest data received captured is 15.05 Mbit/s on 13 November 2015 at 2230 and the lowest received data captured is 0.01 Mbit/s on 13 November 2015 at 0400. The average data received for the whole week is 4.54 Mbit/s. The highest received data and the lowest received data for one hour intervals is consistent with data captured for a week. From here, we can determine the peak hour of the traffic is from 2230 to 2330.

## 4.0 ANALYSIS

Data captured for one hour interval for one day provides better information as compared to one week duration. The results for one hour interval clearly determined the peak hour for this MSAN which is from 2230 to 2330. The graph consistently recorded highest of data request from MSAN and data downloaded to the MSAN during this hour. This data shows that the subscribers in this area often surf the internet during the peak hour. The peak hour determined from the study is in accordance to the category of subscriber in this area which is residential users. There are no industries, offices, or VIP customers from this MSAN. The recorded data will differentiate and less accurate if there are many categories of subscribers served by the MSAN. This is mainly due to the difference in browsing time of the subscribers. The industries and offices peak hour interval are usually in the morning because of their operation hours. Result from one week data also shows the similar pattern as the data recorded daily.

From these monitoring activities it shows that UA 5000 MSAN is capable to serve up to 4Mb/s for subscribers in the uplink and up to 20Mb/s in the downlink transmission respectively. This is observed from the results of one week interval where the highest data transmit and data received during peak hour is 1.4 Mb/s and 15.05 Mb/s respectively. The information gathered from this study is important to the Service Provider especially to identify the cause of the problem from the subscribers' complaint. The Service Provider only needs to focus on the connection from the UA 5000 MSAN to subscriber's resident for troubleshooting because it is demonstrated that the MSAN is capable to serve up to 4Mb/s. Some examples of the problems that might happen are due to the faulty modem, internal wiring, and the quality of the cable which connect from the MSAN to subscriber's resident.

## CONCLUSION

This paper has demonstrated the results and analysis of traffic performance using UA 5000 MSAN in rural area. Results from this study have determined the peak hour for the

area. There are no issues regarding the operation of MSAN and fiber optic cables that degrades the traffic performance. The fiber cables are in good condition and the MSAN is serving the ADSL network appropriately. The Streamyx is currently offering up to 4Mb/s for this area and the speed is within the MSAN UA5000 capability. As for future recommendations, the study can be extended in the urban areas. Urban areas serve higher internet speed and different categories of subscribers. Furthermore, it is suggested that the study is conducted using different types of MSAN such as MA 5600T that serves VDSL network in urban area. Conclusively, it is hope that this investigation will be the basis for future MSAN traffic monitoring study.

## ACKNOWLEDGEMENT

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