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A NEW ADAPTIVE THROUGHPUT POLICY ALGORITHM ON CAMPUS IP-BASED NETWORK INTERNET TRAFFIC

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ABSTRACT

This paper presents the development of a new scheme called Adaptive Throughput Policy (ATP) algorithm to control internet inbound throughput utilization in an IP-based network by considering traffic flows and their processing times. Real live inbound internet traffics collected from a Campus Network with Committed Access Rate (CAR) of 16 Mbps bandwidth allocations to internal users are analyzed. New mathematical model with identified parameters are derived and policies are simulated using Token Bucket theory control mechanism. Three main policies conditions called P1 which is controlled on 5% under threshold, P2 which is controlled on threshold rate and P3 which is controlled beyond 10% threshold are defined as filtered condition. ATP simulation evaluated throughput performance on the real live internet traffic. Result present achievement in throughput performance which includes Bucket Capacity, Bandwidth Saving and Processing Time for daily and weekly traffics. The findings show that ATP algorithm resulted in higher bandwidth saving and faster traffic process time in particular during under threshold (P1). Burst throughput are managed to control according to identified implement policies in the development system.

Keywords: *Policy, Throughput, Internet Traffic, Algorithm, Model, Bandwidth Management, IP-based Network.*

1. INTRODUCTION

IP-based bandwidth management need regular Quality of Service (QoS) in network management. Although IP-based network is already a standard platform, but the connections within the networks are large which consist of heterogeneous network especially in a Campus University network. Traffics that run in the IP-based network may comprise from different network protocols and heterogeneous applications which cause burst traffic with the used of new technology on the internet[1]. Some traffic burst has to be measured in order to support with reliability and good network services. A study on used of HTTP protocols faces issues in network performance. Thus, monitoring HTTP used is a need in controlling bandwidth used and traffic burst [2]. Upgraded bandwidth like upgraded leased line or Committed Access Rates (CAR) to Wide Area Network (WAN) is the final solutions to solve problems on network slow performances. But keeping upgrading the bandwidth rate is not the final solutions where no QoS measurement is done and cause of problems is not identified. Thus, QoS network traffic and management is a need and some computer and engineering methods are discussed and developed to overcome the problem [3] .

Policing network traffic is one example of bandwidth management in controlling resources like network traffic. Example of traffic policing algorithm is detecting bad flows in the network and filtered. Others policing may act different filter policy. Traffic policing theories use token bucket mechanism which is one of the flow processes in resource management. Traffic Policing identifies a policer which typically drops traffic[4]. Policing can be implemented at various network protocols at different or more standard network layers in Open Systems Interconnection model (OSI) examples like at the packet layer [5]. This is the standard flow

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of network traffics which are transferred between its links according to its standard method classifications in seven OSI network layers. Other mechanisms of bandwidth management are shaping and scheduling which differ in the way it responds to the identified traffic violations[6], fair resourcing [7], [8].

This paper presents new scheme called Adaptive Throughput Policy (ATP) algorithm to control Real Live internet Campus IP-based throughput traffic. Campus internet is supported by 16Mbps CAR speed line. The 16 Mbps is engaged as the policy threshold mark in the new algorithm. Traffic parameters are identified and mathematical model are derived. A Token Bucket theory in policing algorithm is used. Three main filtered policy conditions named as P1, P2 and P3 which controlled on 5% under threshold, P2 that controlled on threshold rates, and P3 which controlled beyond 10% threshold are defined. Matlab programming tools is used and simulated with the real live internet traffic. Performance of the new model is presented in three bandwidth management criteria which are the throughput in bucket capacity, bandwidth save and processing time. These criteria are presented and compared in three different policy conditions which simulated in a day and one week traffics. ATP algorithm successfully identify the performance differences of bucket capacity, larger bandwidth save and fast traffic processing time in an IP-based Network. Thus burst throughput also are managed to control.

2. TRAFFIC POLICY AND BANDWIDTH MANAGEMENT

Network Traffic policy involves many developments of new framework, new algorithm or new model to handle the issue of network performance in bandwidth management [9]. The arise of new technology and enhancement applications especially working on World Wide Web (www) and internet applications causes challenging situation in bandwidth performance especially burst traffic problem [10]. The appearances of various new applications have resulted in the rapid increase of internet users and the explosive growth of network traffic. Under this circumstance, internet users received unreliable and unguaranteed services [11], [12]. In order to provide reliable network services, solving burst or overflows traffic issues, methods to improve network performance are implemented and planned [13]. Thus, reliable network services and excellence traffic performances would satisfy the Quality of Service (QoS) which is important in network performance [14]. Bandwidth management and traffic policy study most involved in development of new scheme or algorithm, enhanced scheme, new model, new framework and traffic analysis. Difference areas of network protocols and standard are studied on the implementation on bandwidth controlled example like IP-Network [15], [16], WiMax Network[17], Wireless and Mobile Network [18], [19], System Performance[20] and Applications Layer[21].

3. METHOD ON NEW POLICY MODEL

The proposed model is developed based on the identified network architecture exist in a Campus Wide Area Network (WAN) traffic. Existing network is identified that there are no policy or control mechanism done at the internet throughput traffic gateway.

3.1 Proposed Model

Figure 1 shows the proposed model for ATP algorithm. The input of the model is the byte flow inbound throughput of internet traffic. Policy condition is identified as P is chosen before traffic policing is derived on the traffic. Three selected policy conditions of P1, P2 and P3 are identified. P1 is throughput filtered with 5 percent under threshold; P2 is throughput controlled on threshold, and P3 is 10 percent throughput beyond the threshold. Policy condition is applied once at a time where if P1 is selected, then all throughput will be applied with P1 conditions, and the same goes for P2 and P3 condition. Policy condition is based on percentage level cut-off measured according to threshold speed rate at 16Mbps as implemented in the real the network. Performance level is identified based on the three implemented policies.

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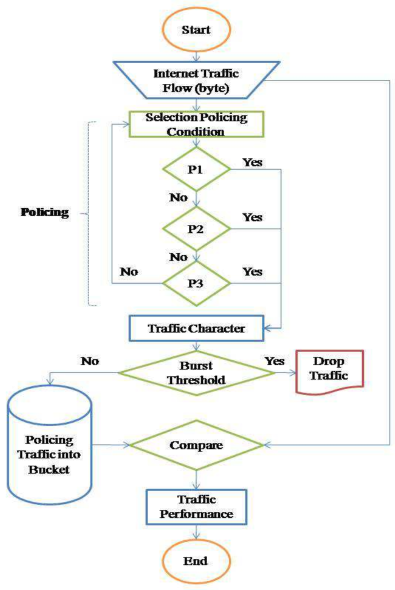

Figure 1: Proposed Model for Adaptive Policy on Bandwidth Flow

Selection of policy conditions can be changed based on burst of internet traffic, peak times or other identified rules. In normal IP-based network practise, the threshold acted as the Committed Access Rate (CAR) facilitated by the telecommunication services. Incoming and outgoing traffic are stored in memory using the token bucket mechanism. Filtered throughput that passes the policy conditions is kept in the bucket (adequate throughput) but throughput that goes beyond the policy conditions is cut-off and dropped (burst throughput). The drawback of this ATP is that byte losses can occur if throughput burst the chosen policy, but this scheme would save bandwidth and faster processing time which improves the bandwidth performances. This proposed model is simulated with the real live Campus Network traffic that is collected in a day and a week for generating the different result. Real traffic data are collected in every 10 minutes inter-arrival time. Throughput collections are done by using a monitoring network traffic machine and applications called Solarwinds. The limitation of Solarwinds traffic monitor is where the possible minimum captures time is 10 minutes. Daily of 144 tracers and weekly of 1008 tracers are captured. No left captures thorough out the tracers. The model measured the throughput capacity and performance, bucket capacity, time processing and burst traffic of the real live data.

3.2 Token Bucket Theory

The token bucket mechanism used in packet switched computer networks and telecommunications networks. It checks data transmissions in the form of bytes or packets [4]. Token bucket confirm the defined limits on bandwidth throughput and burst of network traffic. It also used for scheduling algorithm to determine the transmissions time, limits set for the bandwidth and burst traffic which is called the Scheduler. Figure 2 shows how token bucket works. Example of byte flow at T inter-arrival time for Ti=1 to n. B is taken as the one cycle of bucket transform of byte. One cycle is as the identified cumulated period of time for collected bytes or packet. Token bucket is conceptually understood as follows [22], [23]:

- A token is added to the bucket every 1 over rate second, 1/r.
- The bucket can hold at the most *Th=P* tokens. If a token arrives when the bucket is full, it is discarded.
- When a packet (network layer PDU) or a byte (physical layer) of *n* packet or bytes arrive, *n* tokens are removed from the bucket, and the packet or byte is sent to the network.
- If fewer than *n* tokens are available, no tokens are removed from the bucket, and the packet/ byte is considered to be *non-conformant* or burst traffic.

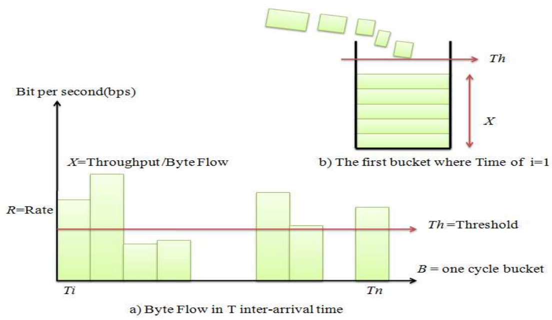

Figure 2: Bucket Drop on Heavy tail over threshold

3.3 Burst Size

Figure 3 presents the Token bucket transitions of Throughput, X on policy. Threshold, *Th* acted like the CAR service rent by an organization. Thus, *Th* is the maximum possible transmission rate in bytes/second or identified Policy, *P*. The maximum burst time is the time where the rate of throughput, *X* is fully utilized. Figure 3 illustrates how bytes as token are discarded from the bucket if it goes

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beyond the threshold, Th or policy, P, per Bucket size, B_K. The incoming throughput is put in bucket according to identified policy condition, P. The red bar is called burst traffic.

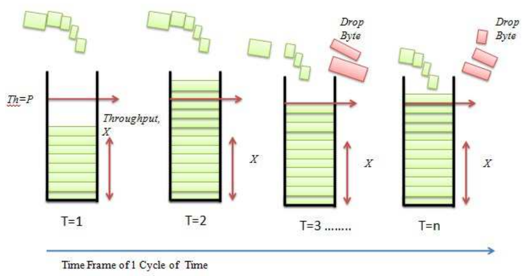

Figure 3: Token bucket Transitions of Throughput on Policy

4. ADAPTIVE THROUGHPUT POLICY ALGORITHM

Traffic Parameters from the real live campus internet traffic and mathematical model are presented for the Adaptive Throughput Policy (ATP) Algorithm.

4.1 Identified Parameter

Table 1 presents the analysed identified parameters. Traffic throughput is in byte flow, B_T, Allocation bandwidth, B_A for the Committed Access Rate (CAR) with 16Mbps and Inter-arrival Time, T_A is throughput captured every 10 minutes. The equation for Max throughput, B_{Max} for the byte flow collections in 10 minutes time with Bandwidth Speed, B_A at 16Mbps is as calculated in Eq.(1).

$$B_{Max} = B_A \times T_A \quad (1)$$

Table 1: Identified Parameters from Real Live Internet Traffic used in Adaptive Policy Algorithm

Parameter	Value
Committed Access Rate, Speed, *S*	16Mbps
Inter-Arrival Time, T_A	10 minutes
Daily and weekly Captured Time	00:00 to 23:50
Daily Tracers, *Cmin*	144 times
Weekly Tracers. *Cmax*	1008 times
Real Live Traffic threshold, *Th*	1200MByte
Maximum Bucket *P1*	1140MByte
Maximum Bucket *P2*	1200MByte
Maximum Bucket *P3*	1320MByte
Daily and Weekly Minimum throughput	22.04 MByte
Daily and Weekly Maximum throughput	2121.1MByte

4.2 Mathematical Modelling

The bandwidth threshold, B_{Th} is used in the simulation. After converting to byte flow in Eq. (1), the value of maximum throughput, B_{Max} is taken as value of maximum Bucket Size, B_{KMax}. The ATP algorithm is differentiated by three different policy conditions.

- Condition 1, p_1B_{Max}-The first policy condition is by filtering the traffic with threshold 5% below B_{Max},
- Condition 2, p_2B_{Max}-The second policy condition with threshold equal to B_{max}
- Condition 3, p_3B_{Max}-The third policy condition with threshold 10% beyond B_{max}.

The incoming throughput bytes are put in bucket with bucket capacity as bucket size, B_K. B_K is the original bucket size before policy implementation. New traffic after policing is put in new bucket, B_{Kn}. Maximum bucket is identified as BK_{Max}. The performance outputs of the model are also derived based on the mathematical model. The traffic performance output on the new ATP algorithm is derived based on the mathematical model which is throughput in bucket capacity, bandwidth saving and processing time for daily and weekly traffics that benefit the system and network QoS.

Eq. (2) presents the total of bucket size in a cycle, C_{min}/C_{max}. Let's, throughput, B_T =*X*, bandwidth allocation, B_A=Z, Speed, S, Policy Condition=*P* and bandwidth threshold, B_{TH} =*Y* for all presented equations below. Bucket Size, B_K is modelled according to real live parameter captured throughput, B_T. Daily inter-arrival time is from i to n. Daily maximum tracers, C_{min} or buckets is equal to is equal to144 and weekly maximum tracers, C_{max} is equal to 1008. Rotations between C_{min} and C_{max} are changed based on selected test traffic either to policy daily or weekly test.

$$\sum_{i=1}^{n} Bk = \sum_{i=1}^{n} x, 0 < x < Cmin \quad (2)$$

Eq. (3) derives a mathematical model on ATP algorithm. The total throughput after policing is derived and put in a new bucket with bucket size, B_{kn}. Daily and weekly data numbered from i to n is policing according to three condition threshold is simulated. Equations presented that with filtered on B_T. B_T under policy threshold, py is put in B_{kn} and B_T which is greater than policy threshold, py, is filtered and put in new bucket, B_{kn}.

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$$\sum_{i=1,j=1}^{n,m} Bkn = \begin{cases} \sum_{i=0,j=1}^{n,m} (x_i - (x_i - p_j y)), 0 < x < C_{Min}, B_{Min} < y > B_{Max} and x > py \\ x_i, 0 < x < C_{Min} and x < py \end{cases} \quad (3)$$

Performance of this model is presented by two mathematic models which are called the Bandwidth Save, B_s and Processing Time, P_T. Bandwidth Save is calculated as in Eq.(4) and total of B_s is derived based on Eq. (5). Byte Burst, B_b in the equation also is equal to byte loss, B_L.

$$B_s = B_b \times S \quad (4)$$

$$\sum_{i=1,j=1}^{n,m} Bs = \sum_{i=1,j=1}^{n,m} (x_i - p_j y) \times S, 0 < x < Cmax, B_{Min} < y > B_{Max} and x > py \quad (5)$$

Processing time is taken into consideration to look into network performance of the develop model. There are two main processing times which are calculated to present the difference of total time before and after policy is implemented. Eq. (6) presents mathematical calculation before policy action. It presents the total Process Time, P_{T1} before Policing. Traffic before policy is multiplied with parameter speed and divided with Bandwidth Allocation, B_A in the implemented system where z. P_{T1} is considered one cycle processing time which is a day. Comparison result on daily and weekly basis are presented in the result section.

$$\sum_{i=1}^{n} P_{T1} = \frac{\sum_{i=1}^{n} Bk \times S}{z} \quad (6)$$

Eq. (7) derives the Total Process Time after Policing, P_{T2} for the internet traffic.

$$\sum_{i=1,j=1}^{n,m} P_{T2} = \frac{\sum_{i=1,j=1}^{n,m} Bkn \times S}{z}, 0 < x < C_{Min}, B_{Min} < y > B_{Max} and x > py \quad (7)$$

Eq. (8) presents the different of total difference of Processing Time between after and before implementation of adaptive throughput policy algorithm.

$$\sum_{i=1,j=1}^{n,m} D = \sum_{i=1,j=1}^{n,m} P_{T1} - \sum_{i=1,j=1}^{n,m} P_{T2} \quad (8)$$

5. REAL LIVE CAMPUS INTERNET TRAFFIC ANALYSIS

A real Live Campus Wide Internet traffics are collected in daily and weekly for every 10 minutes inter-arrival time. Campus Leased line back bone is connected with The Network Termination Unit (NTU) provided from the telecommunications service provider supported with 16 Mbps speed link to the WAN. Connections level to the LAN is very huge where two GE slot switches are supported from the main 16 Mbps link to the LAN. It supported both the inbound and outbound traffic to the internet. Solarwinds Data Network machine is set up at the main gateway router to run the traffic collector. Specified traffic parameters are set at the machine and router to capture the inbound and outbound internet traffic. Three types of internet traffics are collected which are the throughput flow size in bytes, throughput speed in bits per second and collected time. The Campus WAN supports many domains internet campus which runs on Internet Protocol Virtual Private Network (IP-VPN) technology. Only one campus is studied in this research which supports quite huge users of the internet.

Figure 4 and 5 present the collected daily and weekly throughput in every 10 minutes inter-arrival data collected for both data collections. Daily time frame started from 00:00 until 23:50 and weekly time frame started also from 00:00 until 23:50. Analysis identified there are about 114 numbers of daily throughput tracers and 1008 times weekly throughput tracers. Both figures presented the throughput in bytes from minimum value which is 0 and highest which is more than 1200 MBytes, which is the threshold byte flow for 16Mbps for 10 minutes. Threshold line of 16 Mbps rate bandwidth is shown as guide in the graph which presents that burst traffic happened in the network traffic. By converting the 16Mbps rate into byte, it is identified by converting the speed multiplied by time which is 10 minutes inter-arrival time. Figure 6 and Figure 7 present the daily and weekly traffic throughput distribution. Number of frequencies of tracers is identified in both graphs. Figure 6 show that there are about 10 times of daily traffic burst which value more than 1200 MBytes bytes flow. Figure 7 shows more than 50 times of weekly traffic burst of throughput tracers. There is about 50 time traffic burst which value more than 2000 MBytes flow and others burst byte flow are between 1200 MBytes and 2121.1 MBytes. Analysis presented there are throughput burst happened in real live internet traffic. Based on the tracers also, it is identified that the peak time of traffic burst is between 08:00 until

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20:00 which is in the day time of working hours. Thus, the ATP algorithm is derived upon analysis on real live traffic which has no policy implemented on the WAN backbone traffic.

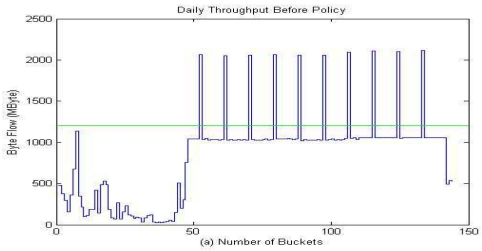

Figure 4: Sample Daily Throughput

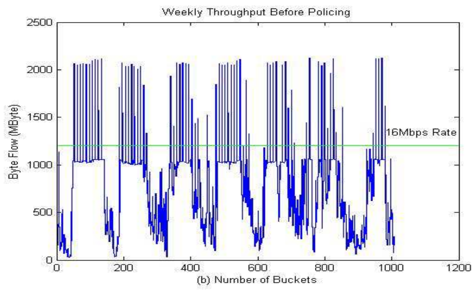

Figure 5: Sample Weekly Throughput

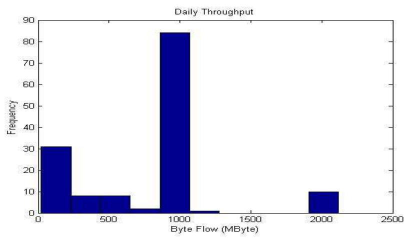

Figure 6: Daily Throughput Distribution

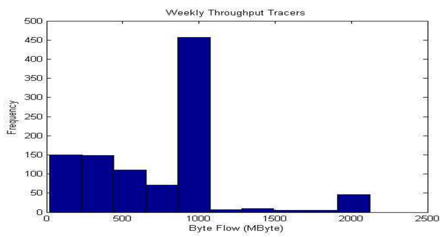

Figure 7: Weekly Throughput Distribution

6. PERFORMANCE RESULT

Real live internet traffic are taken and compared between daily and weekly data. Detail router's configuration is identified where there is no policy setup done at the main router configuration. This means that all inbound and outbound traffic to the internet pass out and in to the internet without any policy control. Throughput is identified as byte flows are captured and token bucket theory mechanism for policing the internet traffic is applied on the new algorithm. A new Adaptive Throughput Policy (ATP) Algorithm based on real live traffic is presented below.

6.1 Policing Throughput and Token Bucket Capacity

Figure 8 and 9 present the daily traffic result on the new ATP. All figures presented 144 traces of data collections which collected every 10 minutes inter-arrival time. Every inter-arrival time traces of byte are put in a similar number of buckets which is also 144. This algorithm used 1 bucket per time. In real Campus wide network, the maximum throughput allowed is the value of it threshold, B_{Max} or equal to B_A which is 16Mbps. Result presented the compared performance on adaptive throughput policy.

Figure8 (a) to (c) presents the three different ATP algorithms on P1, P2 and P3 at 1 cycle traces. Total of 144 buckets are created for each traces at each inter-arrival time of inbound throughput traffic collected. The minimum throughput value, B_{Min} is equal to 22.04MByte and the maximum throughput is equal to 2121.6MByte which large over the setup B_{Max}. Bmax is the real live bandwidth allocation which is coloured in green line in the graph. The blue graph shows the permitted bytes that are filled in the buckets. The red graphs shows the overflow bytes that burst the identified policy filtered. The plotted graph presents the minimum and maximum values of throughput after policy. The minimum values for the three policies are equally same but the maximum value is identified as BKMaxP1 is equal to 1140 MByte, BKMaxP2 is equal 1200 MByte and BKMaxP3 is equal to 1320 MByte. This shows the value of percentage cut off according to Bmax threshold on the real implementation of BA. Throughput flow that burst the bucket is cut off. At this bucket, some byte is loss based on the policy implementations. After policy the plotted bucket slot is policed according to threshold. Only lower bytes are received and filled in the buckets. Figure 9(a) to (c) present daily different of ATP algorithms after policing on P1, P2 and P3.This shows the value of percentage cut off according to Bmax threshold on the real implementation of ATP.

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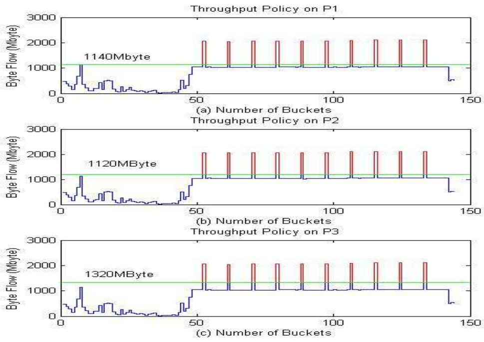

Figure 8: Real live Throughput with Policing

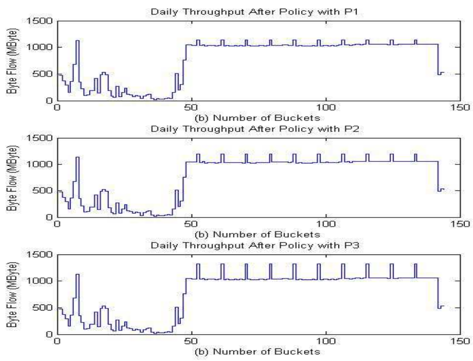

Figure 9: Throughput after Policing

Figure 10 (a) – (c) derive the ATP algorithm on weekly policing. The graph shows the difference of throughput on policing condition of P1, P2 and P3. Total of 1008 buckets are created for each traces at each 10 minutes inter-arrival time of inbound throughput traffic collected. The green lines in the three figures present the policy threshold which is the maximum bandwidth as in Fig 10 (a) 1140 MByte (b) 1200 MByte and (c) 1320 MByte.

Figure11 (a)-(c) present all permitted bytes traffic which fill the buckets. The plotted graphs show the minimum and maximum values of throughput bytes after policy. The minimum values are all equal the same as in the result before policing. The difference between all the graphs is the bytes allowed in the bucket and the cut off bytes after filtered. The advantage of the algorithm is the processing performance which relates to time of transfer and control mechanism if there is a peak time for priority task. The total minimum and maximum bucket capacity is much larger compared to daily traffic because longer time internet collected traffic is simulated.

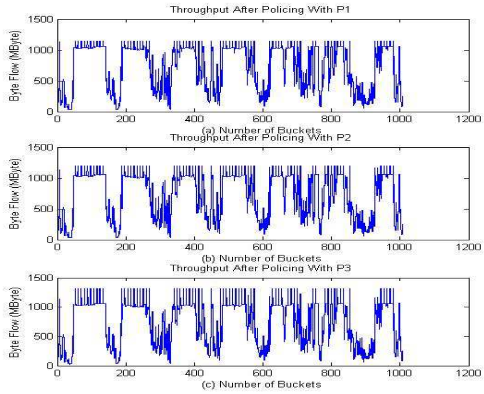

Figure 10 Weekly Throughput on Policing (a) P1 (b) P2 (c) P3

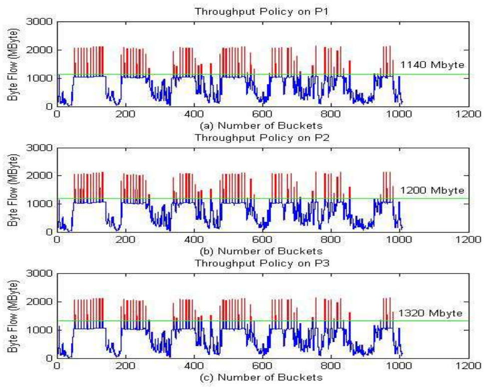

Figure 11 Weekly Throughput after Policing (a) P1 (b) P2 (c) P3

Table 2: The Differences of Total Bucket Capacity before and after Policy Condition

	Total Max Bucket Capacity (MByte)	
Policy Condition	Daily	Weekly
No Policing	120640	781530
P1	111260	730670
P2	111860	734770
P3	113060	742600

Table 2 present the differences of total bucket capacity before and after policy condition. The minimum values for the three policies are same which 22.04 MBytes and the maximum values are as presented in the table. Three policy conditions are shown in the table compared to no policy condition. No policy condition presented the highest volume of traffic in both daily and weekly traffic. After policy, results presented there are

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certain traffics are filtered according to policy. P1 policy is the highest filtered traffic which presented the smallest bytes filled in the bucket compared to P2 and P3. P3 has the highest bytes filled in the bucket because it has the lowest filtered condition.

6.2 Bandwidth Save and Byte Loss

The differences of bandwidth save and byte loss is presented in Table 3. Bandwidth saved presented the performance improvement of the new scheme. Table 3 presented result on bandwidth saved on three identified conditions as P1, P2 and P3 compared to without policing condition to control the bandwidth traffic, but there are also bytes losses in the system. Among the four conditions no policing shows there are no bandwidth save and no byte loss. P1 present the best result where large bandwidth save is filtered compared to P2 and P3 in both daily and weekly but it also presented the largest byte loss compared with 2 other policy conditions. P3 shows the lowest bandwidth saved and byte loss for daily and weekly traffic.

Table 3: Policy Condition on Internet Traffic with (a) Total Bandwidth Save and (b) Total Byte Loss

	a. Total Bandwidth Save (Mbps)		b. Total Byte Loss (MByte)	
Policy Cond.	Daily	Weekly	Daily	Weekly
No Policing	0	0	0	0
P1	125.08	678.21	9380.66	50865.87
P2	117.08	623.44	8780.66	46758.32
P3	101.08	519.02	7580.66	38926.81

6.3 Improved Performance by Process Time

Network performance in process time for the three different applied conditions policing P1, P2 and P3 on the traffic is presented in Table 4. Daily and weekly process time in minutes before(Bf) and after(Af) the policy condition is derived. Among the daily policy condition(PC) identified is that P1 has the lowest process time compared to P2 and P3. The same result goes to weekly policing condition which shows that P1 has the lowest processing time between P2 and P3. The result presents that the lowest policy condition which is 95% presented the fastest processing time. It has the highest differences of process time with the original traffic before policing. The result for differences(Dif) of processing time are also presented the same in weekly policing, where P1 has the highest different processing time compared to P2 and P3.

Table 4: The Differences of Daily and Weekly Total Process Time in Minutes

	Daily (Minute)			Weekly (Minute)		
PC	Bf	Af	Dif	Bf	Af	Dif
p1	1005	927	78	6513	6089	424
p2	1005	932	73	6513	6123	390
p3	1005	942	63	6513	6188	324

The different of process time can clearly be identified in Cumulative Distribution Functions (CDF) as in Figure 11 and 12. Figure 11 presents the comparison of three policing conditions in Process Time of the identified traffic. CDF plots against time in minute are presented as in Figure 11 (a) Real Traffic (b) Policing Condition P1 (c) Policing Condition P2 and (d) Policing Condition P3. The maximum process time for the all the tracers is equal to 17.67 minute in the real traffic compared to P1 is equal to 9.5 minute P2 is equal to 10 minute and P3 is equal to 11 minute. Results presented seven (7) minutes different of maximum process time if policy is not implemented.

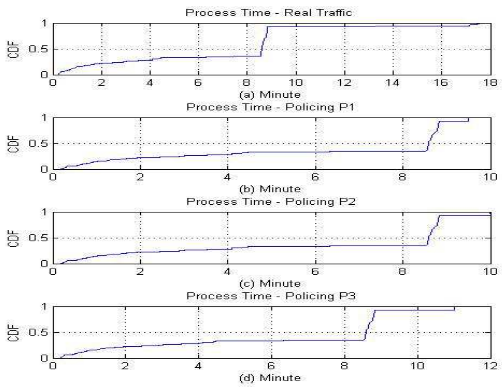

Figure 11: Comparison of Daily Process Time (a) Real Traffic (b) Policing P1 (c) Policing P2 (d) Policing P3

Figure 12 presented the comparison of weekly three policing conditions of Process Time on the real live traffic. CDF plots against time in minute are presented as in Figure12 (a) Real Traffic (b) Policing Condition P1 (c) Policing Condition P2 and (d) Policing Condition P3. It is identified that the maximum process time for each of the weekly tracers is the same as the value identified in daily process time. This is because the same policy condition is applied to weekly traffic but the CDF distributions in weekly are larger that daily traffic.

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The conditions shows a differences in faster processing time which has improved the network performance in time.

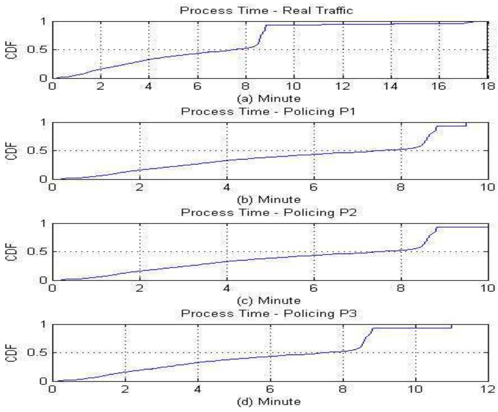

Figure 12: Comparison of Weekly Process Time (a) Real Traffic (b) Policing P1 (c) Policing P2 (d) Policing P3

7. CONCLUSION

This paper has successfully presented the development of a new scheme called Adaptive Throughput Policy algorithm to control internet inbound throughput utilization in an IP-based network. Real live inbound Campus internet traffic is collected and analyzed. New mathematical model with identified parameters is derived and policies are simulated using token bucket theory control with threshold policy. Three main policy conditions called P1 which is controlled on 5% under threshold, P2 which is controlled on threshold rate and P3 which is controlled beyond 10% threshold are defined as filtered condition. Result presented throughput performance where higher bandwidth saving is performed and fast traffic processing time in particular during under threshold (P1). Thus, the new ATP algorithm manages to control throughput burst according to identified implement policy in the development system.

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