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Concept of Analysis and Implementation of Burst On Mikrotik Router

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Abstract. Implementation of bandwidth management by optimizing the use of existing facilities and features, is a way / effort improvement of the quality of service on the network (Quality of Service). Mikrotik router has queue facility that can make bandwidth allocation arrangement for each user computer with analysis and application of careful burst calculation. Burst is a feature of the mikrotik router that allows a user computer to gain more than Maximum Information Rate (MIR) bandwidth allocation in a given time period. In this research we analyze burst calculation from bandwidth with upload / download capacity 1024 kbps (1 Mbps) and application of simple queue configuration. A careful calculation and understanding technique must be performed if the burst will be applied to properly calculate the burst-threshold, burst run, data-rate, average data-rate, burst-limit, max-limit and bandwidth available on the network, can be optimally managed.

1. Introduction

Mikrotik RouterOS is an operating system and software that can be used to make the computer a reliable network router, covering various features including: firewall and nat, routing, hotspot, point to point tunneling protocol, DNS server, DHCP server, hotspot, burst and still many more features [1], [2]. Mikrotik suitable for use by ISP and hotspot provider [3]. For the installation of mikrotik is not required additional software or other additional components. Mikrotik is designed to be easy to use and easy work for the purposes of computer network administration such as designing and building a small to complex computer network system though [3]. Based on the form of hardware in mikrotik can be classified into two types [1], [4], [5]:

a. Mikrotik RouterOS in the form of ISO software from RouterOS which can be downloaded at www.mikrotik.com or www.mikrotik.co.id and can be installed on PC / X86 computer.

b. Mikrotik Routerboard (Embedded Router) in the form of hardware that is specifically packed include with Mikrotik RouterOS.

In network management, it is very important to do bandwidth usage management that will be used by each user computer [6]–[10]. Mikrotik routers have queue facilities that can perform bandwidth allocation management for each user's computer [5]. By implementing bandwidth management, is a
way / effort to improve the quality of service on the network (Quality of Service) [2], [11]. Quality of Service (QoS) will guarantee the minimum bandwidth allocation / Committed Information Rate (CIR) on each user's computer in the network and the bandwidth allocation over Maximum Information Rate (MIR) within a certain time period, so each computer user will not have to worry about not get the bandwidth [12].

Implementation the use of the burst feature with careful calculation and in accordance with the desired conditions, allows a user's computer to obtain a bandwidth allocation over Maximum Information Rate (MIR) within a certain time frame. Burst can only occur if the average queue level for the last burst-time burst is smaller than the burst-threshold threshold. The burst will stop if the average queue for the last burst-time seconds is greater than or equal to the burst-threshold.

2. Methodology
The method used in this research is Network Development Life Cycle (NDLC) which begins with the stages of analysis, design, simulation prototyping, implementation, monitoring and management [12].

![Network Development Life Cycle (NDLC) Model](image)

**Figure 1.** Network Development Life Cycle (NDLC) Model

For burst implementation, there are options that must be known before the configuration is done. Here are the options in the burst feature [12]:

a. Burst-limit is the maximum bandwidth value (either upload / download) to be received by a user when a burst occurs. The burst-limit value must be greater than the max-limit (MIR) given.

b. Burst-time is the time period used to calculate the average data-rate, not to indicate how long the burst takes.

c. Burst-threshold is the value that determines when burst can be executed and when burst should be stopped. The burst-threshold value is generally $\frac{3}{4}$ of the max-limit value. If the average data-rate value is lower than the burst-threshold, then the burst will run. But if the average data-rate value is equal to or greater than the burst-threshold, then the burst will be stopped.

To calculate how long a user gets the burst when first using the bandwidth allocation, the following formula can be used:

$$Old \ burst \ run = \left( \frac{burst - threshold}{burst - limit} \right) \times burst \ time$$

In burst feature there are some variables that must be determined its value, among others burst-limit, burst-threshold and burst-time. Note that if the average data flow is lower than the burst-threshold, the burst will actually follow the burst-limit, where every second the router will calculate the average data achieved through the last burst-time.
3. Result and Discussion
In this study the researchers conducted a burst calculation analysis of bandwidth with upload / download capacity of 1024 kbps (1 Mbps). The following topology of the network scenario will be calculated long burst run along with the average data-rate calculation in every second.

Figure 2. Network Scenario

Suppose the configuration is applied with the provision: limit-at = 128 kbps, max-limit = 512 kbps, burst-threshold = 384 kbps, burst-limit = 1024 kbps and burst-time = 8s for each user based on the picture above network scenario with the following command:

```
[admin@ MikroTik ] > queue simple add name=konpi-2 target-addresses=192.168.20.2 interface=ether2 max-limit=512 kbps burst-limit=1024 kbps burst-threshold=384 kbps burst-time=8s
[admin@ MikroTik ] > queue simple add name=konpi-3 target-addresses=192.168.20.3 interface=ether2 max-limit=512 kbps burst-limit=1024 kbps burst-threshold=384 kbps burst-time=8s
[admin@ MikroTik ] > queue simple add name=konpi-4 target-addresses=192.168.20.4 interface=ether2 max-limit=512 kbps burst-limit=1024 kbps burst-threshold=384 kbps burst-time=8s
[admin@ MikroTik ] > queue simple add name=konpi-5 target-addresses=192.168.20.5 interface=ether2 max-limit=512 kbps burst-limit=1024 kbps burst-threshold=384 kbps burst-time=8s
```

Figure 3. Burst Configuration On The User’s Computer

To see the configuration results can be used the following command:

```
[admin@ MikroTik ] > queue simple print
```

Figure 4. Result of Quee Simple Print
The above burst-threshold determination is obtained from the following formula:

\[ \text{Burst threshold} = \frac{3}{4} \times \text{max limit} \]  

\[ \text{Burst threshold} = \frac{3}{4} \times 512 \]

\[ = 384 \text{ kbps} \]

So from the configuration can be calculated long burst run, to get bandwidth allocation of 384 kbps (1Mbps) to the user.

\[ \text{Old burst run} = \left( \frac{\text{burst} - \text{threshold}}{\text{burst} - \text{limit}} \right) \times \text{burst time} \]

\[ \text{Old burst run} = \left( \frac{384}{1024} \right) \times 8 \]

\[ = 3 \text{ seconds} \]

The results obtained from the above calculation is the burst will be given to the user for the first 3 seconds. Then the data-rate of the above scenario is calculated from the 1/16 burst-time used ie 8s, following the calculation:

\[ \text{Data rate} = \frac{\text{burst time}}{16} \]

\[ \text{Data rate} = \frac{8}{16} \]

\[ = 0.5 \text{ seconds} \]

So the average data-rate will be calculated every 0.5 second interval to determine if the burst can be given: Yes or No. Here is the formula for calculating the average data-rate:

\[ \text{Average data rate} = \frac{\text{Actual rate}}{\text{burst time}} \]

Table 1. Burst Calculations

| (s) | Data-rate rata-rata / average-rate (Kbps) | Burst (Yes/No) | Actual Rate ` (Kbps) | Actual Rate (per 0,5 s) |
|-----|------------------------------------------|----------------|----------------------|------------------------|
| 0   | 0                                       | Yes            | 1024                 | 512                    |
| 5   | 0                                      | Yes            | 1024                 | 512                    |
| 1   | 64                                      | Yes            | 1024                 | 512                    |
| 1.5 | 128                                     | Yes            | 1024                 | 512                    |
| 2   | 256                                     | Yes            | 1024                 | 512                    |
Actual-rate (Kbps) in the above table is the allocation of bandwidth provided to the computer, either in burst condition given or burst not given. Here’s how to calculate average data-rate with 1 second interval:

Seconds to-0
Average data rate = (0+0+0+0+0+0+0+0)
burst-time
= 0/8
= 0 kbps

Seconds to -1
Average data rate = (0+0+0+0+0+0+1024)
burst-time
= 1024/8
= 128 kbps

Seconds to -2
Average data rate = (0+0+0+0+0+1024+1024)
burst-time
= 2048/8
= 256 kbps

Seconds to -3
Average data rate = (0+0+0+0+1024+1024+1024)
burst-time
= 3072/8
= 384 kbps

Seconds to -4
Average data rate = (0+0+0+1024+1024+1024+512)
burst-time
= 3584/8
= 448 kbps
Seconds to -5
Average data rate = \frac{(0+0+1024+1024+1024+512+512)}{burst-time}
= 4096/8
= 512 kbps

From the burst calculation in the above table it is obtained from 0 to 0.5 to 1 to 1.5 to 2 and so on to 2.5 indicates that the average data-rate obtained is lower than the configured burst-threshold value of 384 Kbps, so the burst is still given on seconds with the value of 1024 Kbps bandwidth. Then at the 3rd second and later shows that the burst is no longer given to the user's computer, since the average data-rate obtained is the same as the burst-threshold value of 384 Kbps or greater than the 384 Kbps burst-threshold value. So that computer user will only get a bandwidth allocation of max-limit of 512 Kbps.

4. Conclusion
Based on the discussion conducted, it can be concluded several things as follows:

a. If the average data-rate (Kbps) value is equal to or greater than the burst-threshold value, then the burst will not be given again on the user's computer, but only get the bandwidth allocation of max-limit that has been predefined.

b. Implementation of burst will be very beneficial for users who only do browsing, because it will get additional bandwidth in the first time to open the website, but otherwise will not be profitable for users who perform download activities.

c. By utilizing burst-limit facilities, then we actually allocate bandwidth to the device with the maximum.

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