



HTB Implementation on RouterOS QoS

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Introduction

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- Company: Citraweb Nusa Infomedia
 - Mikrotik Distributor (2002), Training Partner (2005)
 - www.mikrotik.co.id
 - Wireless ISP
 - www.citra.net.id
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- Founder and Volunteer of Airputih Foundation, an IT Emergency Task Force on Disaster Area

Outline



- Basic Concept
- Simple HTB
- Terms in HTB
- Common Mistakes
- More detail information

Basic Concept

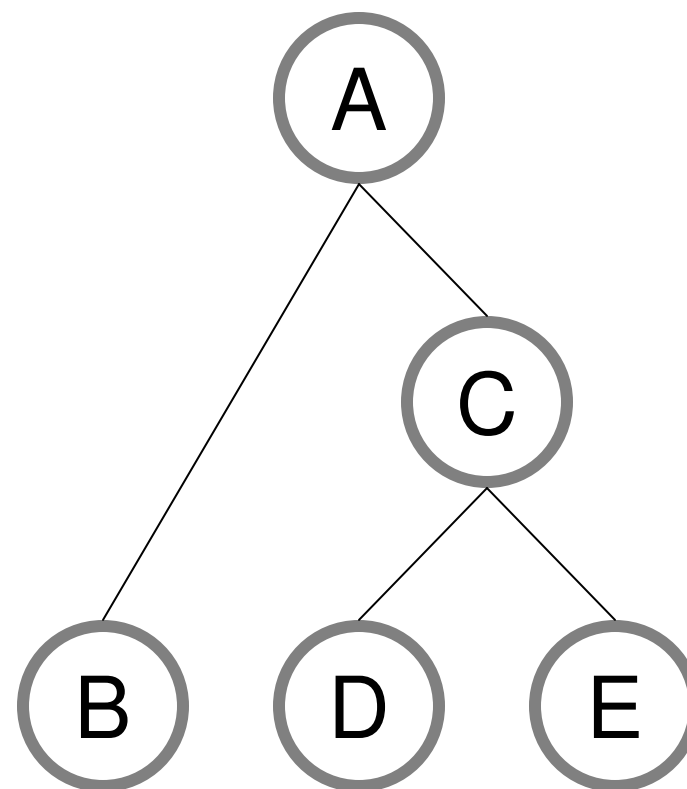
- QoS in RouterOS is not only about bandwidth limitation, but how to distribute the bandwidth fairly
- Things have to consider:
 - How to mangle
 - Check packet flow and firewall documentation on manual and wiki pages
 - Will not covered in this presentation
 - HTB (Hierarchical Token Bucket)

Basic Concept

- HTB (Hierarchical Token Bucket) is part of QoS, to make a hierarchical queue structure and determine relations between queues (priority, burst possibility, etc)
- HTB is meant as a more understandable, intuitive and faster replacement for the CBQ qdisc in Linux.
- HTB assigned to any physical interface or virtual interface (global-in, global-out, global-total)

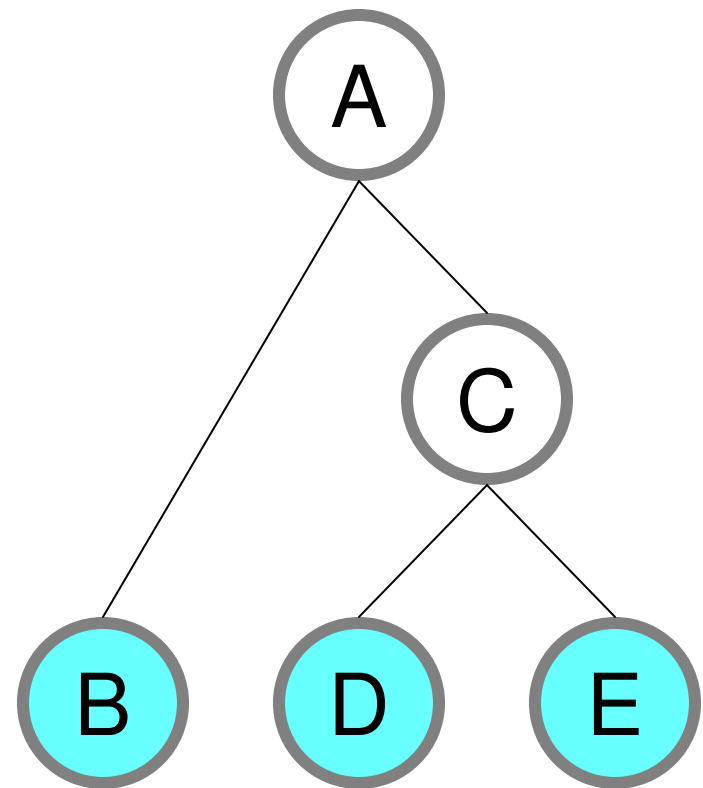
Sample of HTB

- A has 2 children :
 - B
 - C
- C has 2 children :
 - D
 - E



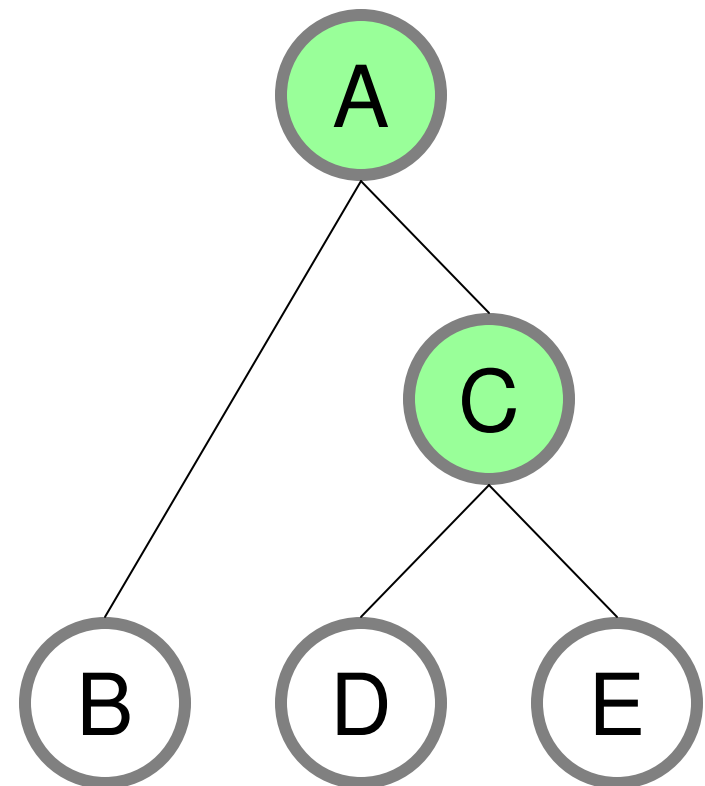
Type of Queues

- Leaf queue
 - Most lower level, has no child
 - Make actual traffic consumption
 - All leaf queues are treated on equal basis
 - All leafs located on the most bottom level of HTB



Type of Queues

- Inner queue
 - Have at least one child
 - Responsible only for traffic distribution



Terms in HTB

- Committed Information Rate (CIR)
 - Limit-at in RouterOS
 - In worst case scenario, flow will get this amount of traffic no matter what (assuming we can actually send so much data)
 - CIR works on both leaf and inner queue

Terms in HTB



- Maximal Information Rate (MIR)
 - Max-limit in RouterOS
 - Rate that flow can get up to, if there queue's parent has spare bandwidth

Terms in HTB



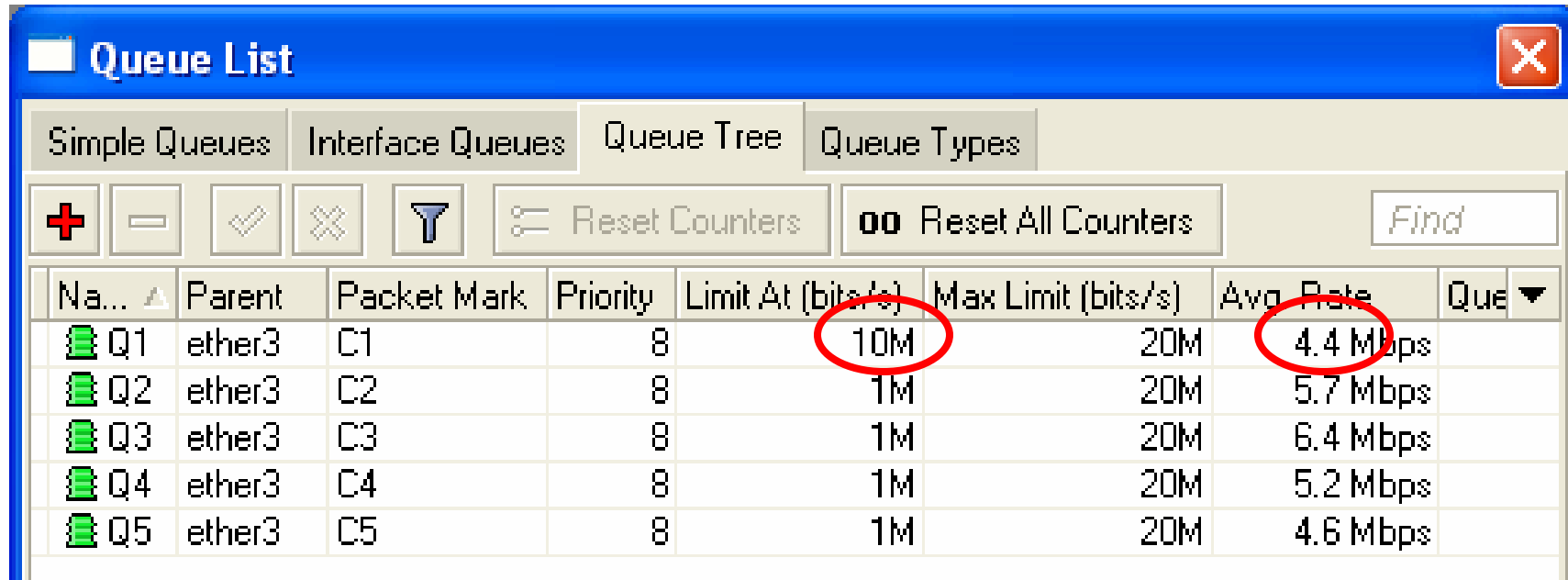
- Priority
 - Work only for leaf (child) queue
 - 1 .. Highest priority, and 8 ... lowest priority
 - Priority will work only if limits are specified
 - Priority calculated only after limit-at achieved

Sample Configuration

- We have 5 leaf queues:

Queue	Limit-at	Max-limit
C1	10M	20M
C2	1M	20M
C3	1M	20M
C4	1M	20M
C5	1M	20M

Winbox Configuration



Queue List

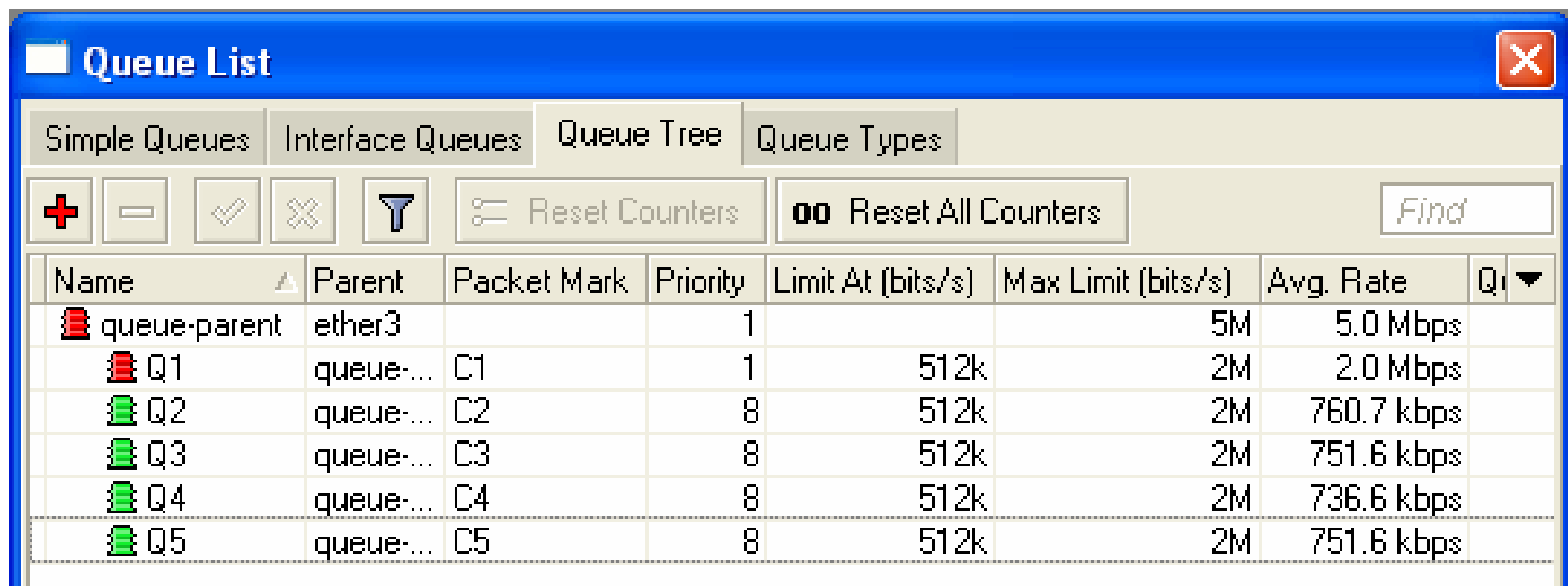
Simple Queues | Interface Queues | Queue Tree | Queue Types

+ - ✓ ✗ ⌵ ⌵ Reset Counters 00 Reset All Counters Find

Na... ▲	Parent	Packet Mark	Priority	Limit At (bits/s)	Max Limit (bits/s)	Avg. Rate	Que ▼
Q1	ether3	C1	8	10M	20M	4.4 Mbps	
Q2	ether3	C2	8	1M	20M	5.7 Mbps	
Q3	ether3	C3	8	1M	20M	6.4 Mbps	
Q4	ether3	C4	8	1M	20M	5.2 Mbps	
Q5	ether3	C5	8	1M	20M	4.6 Mbps	

Router fail to give C1 limit-at (10M)

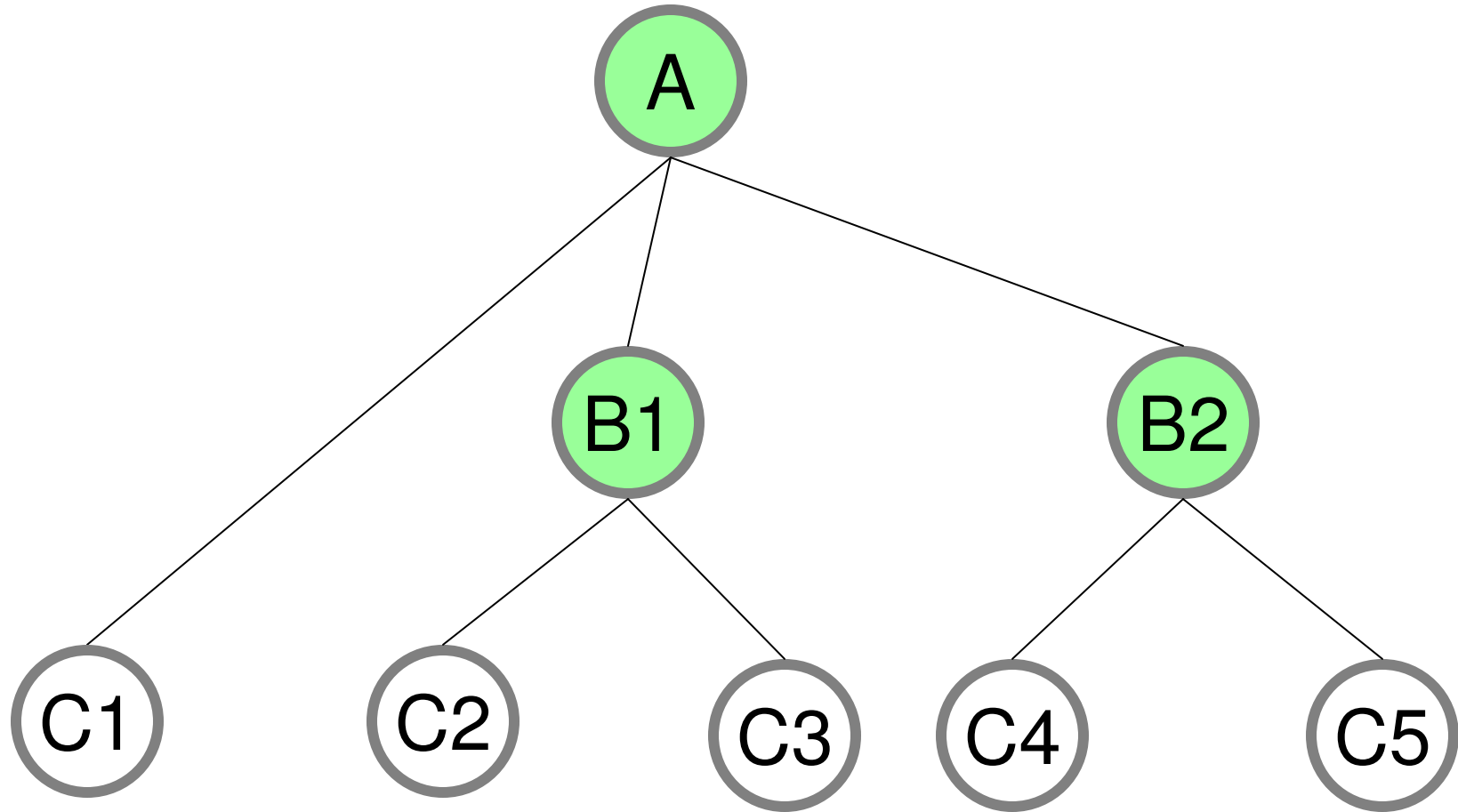
With Parent



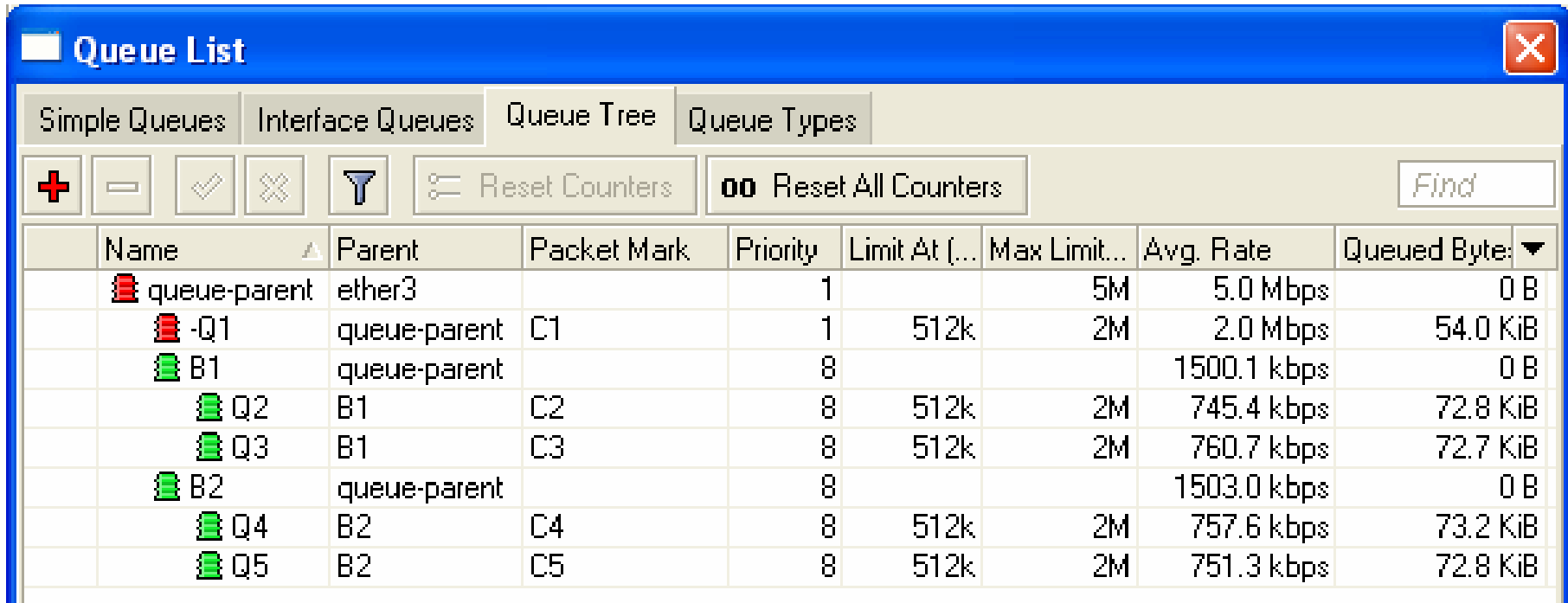
The screenshot shows the 'Queue List' window in Mikrotik WinBox. It features a blue title bar with a close button. Below the title bar are tabs for 'Simple Queues', 'Interface Queues', 'Queue Tree', and 'Queue Types'. A toolbar contains icons for adding (+), deleting (-), checking (✓), deleting (✗), and filtering (funnel), along with buttons for 'Reset Counters' and 'Reset All Counters', and a 'Find' search box. The main area is a table with columns: Name, Parent, Packet Mark, Priority, Limit At (bits/s), Max Limit (bits/s), Avg. Rate, and Q. The table lists a parent queue 'queue-parent' on interface 'ether3' with priority 1 and a 5M limit. It has five child queues (Q1-Q5) with various packet marks (C1-C5) and priority 8, each with a 512k limit and a 2M max limit. The average rates for the child queues are 2.0 Mbps, 760.7 kbps, 751.6 kbps, 736.6 kbps, and 751.6 kbps respectively.

Name	Parent	Packet Mark	Priority	Limit At (bits/s)	Max Limit (bits/s)	Avg. Rate	Q
queue-parent	ether3		1		5M	5.0 Mbps	
Q1	queue-...	C1	1	512k	2M	2.0 Mbps	
Q2	queue-...	C2	8	512k	2M	760.7 kbps	
Q3	queue-...	C3	8	512k	2M	751.6 kbps	
Q4	queue-...	C4	8	512k	2M	736.6 kbps	
Q5	queue-...	C5	8	512k	2M	751.6 kbps	

More Hierarchy



HTB

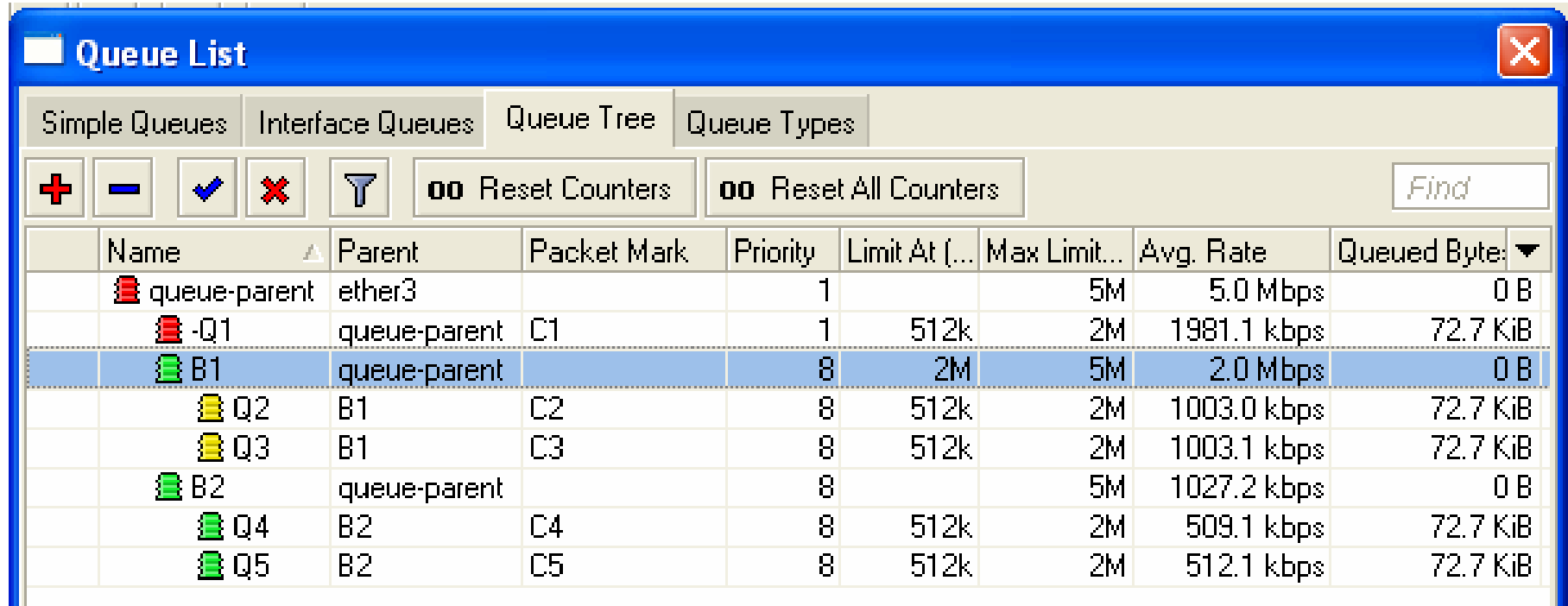


The screenshot shows the Mikrotik WinBox 'Queue List' window. It has a blue title bar with a close button. Below the title bar are tabs for 'Simple Queues', 'Interface Queues', 'Queue Tree', and 'Queue Types'. A toolbar contains icons for adding, deleting, and filtering, along with buttons for 'Reset Counters' and 'Reset All Counters', and a 'Find' search box. The main area is a table with the following columns: Name, Parent, Packet Mark, Priority, Limit At (...), Max Limit..., Avg. Rate, and Queued Byte:.

Name	Parent	Packet Mark	Priority	Limit At (...)	Max Limit...	Avg. Rate	Queued Byte:
queue-parent	ether3		1		5M	5.0 Mbps	0 B
-Q1	queue-parent	C1	1	512k	2M	2.0 Mbps	54.0 KiB
B1	queue-parent		8			1500.1 kbps	0 B
Q2	B1	C2	8	512k	2M	745.4 kbps	72.8 KiB
Q3	B1	C3	8	512k	2M	760.7 kbps	72.7 KiB
B2	queue-parent		8			1503.0 kbps	0 B
Q4	B2	C4	8	512k	2M	757.6 kbps	73.2 KiB
Q5	B2	C5	8	512k	2M	751.3 kbps	72.8 KiB

C1 have better priority, get up to max-limit,
all other capacity split for other leaf queue

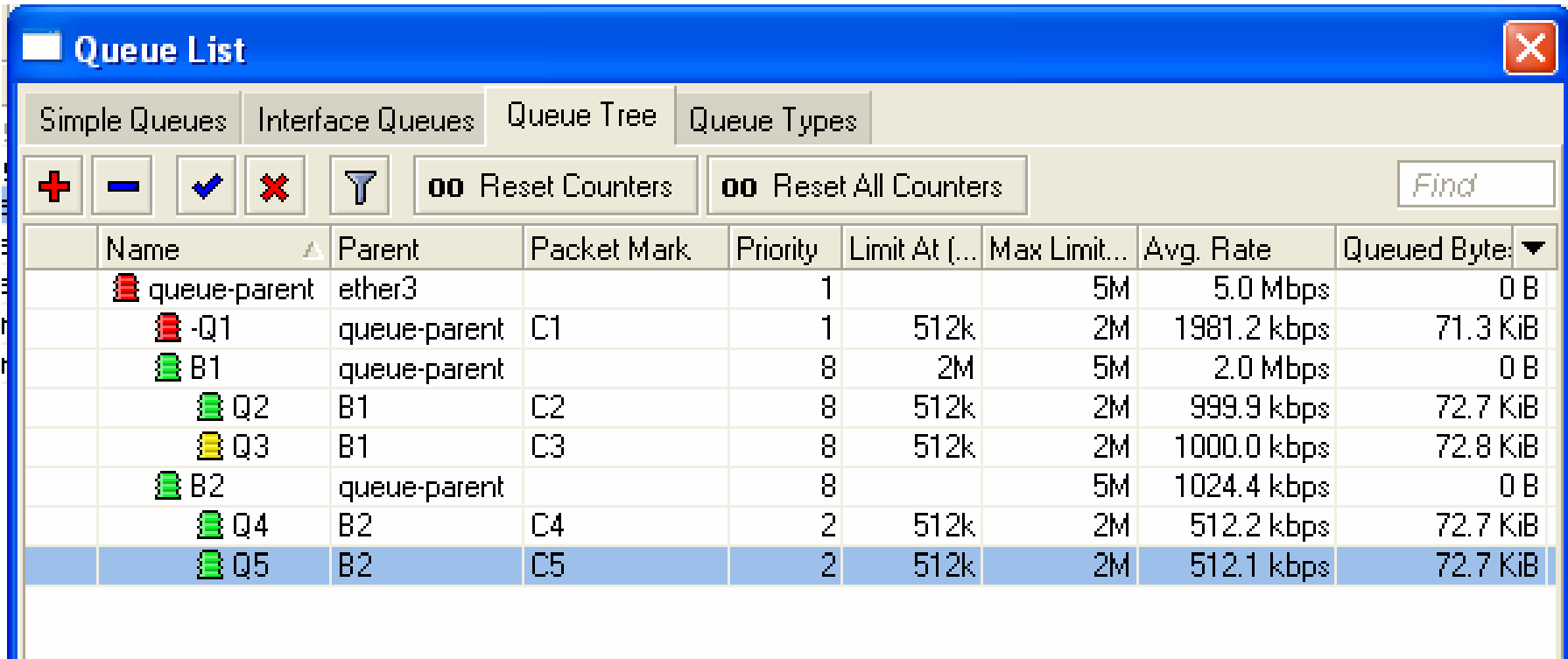
Limit-at on Inner Queue



The screenshot shows the Mikrotik WinBox 'Queue List' window. It features a blue title bar with a close button. Below the title bar are tabs for 'Simple Queues', 'Interface Queues', 'Queue Tree', and 'Queue Types'. A toolbar contains icons for adding (+), deleting (-), enabling (checkmark), disabling (X), and filtering (funnel), along with buttons for 'Reset Counters' and 'Reset All Counters', and a 'Find' search box. The main area is a table with columns: Name, Parent, Packet Mark, Priority, Limit At (...), Max Limit..., Avg. Rate, and Queued Byte:.

Name	Parent	Packet Mark	Priority	Limit At (...)	Max Limit...	Avg. Rate	Queued Byte:
queue-parent	ether3		1		5M	5.0 Mbps	0 B
-Q1	queue-parent	C1	1	512k	2M	1981.1 kbps	72.7 KiB
B1	queue-parent		8	2M	5M	2.0 Mbps	0 B
Q2	B1	C2	8	512k	2M	1003.0 kbps	72.7 KiB
Q3	B1	C3	8	512k	2M	1003.1 kbps	72.7 KiB
B2	queue-parent		8		5M	1027.2 kbps	0 B
Q4	B2	C4	8	512k	2M	509.1 kbps	72.7 KiB
Q5	B2	C5	8	512k	2M	512.1 kbps	72.7 KiB

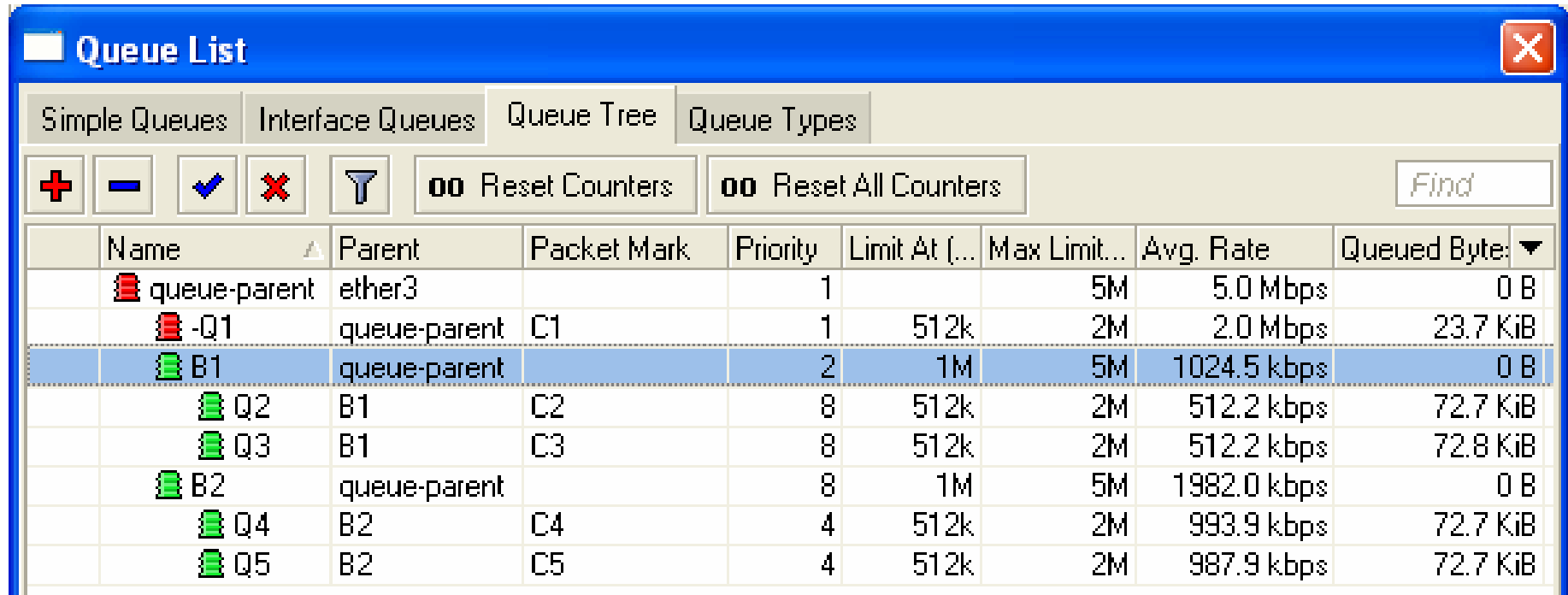
Priority on Leaf Queue



The screenshot shows the Mikrotik WinBox 'Queue List' window. It features a blue title bar with a close button. Below the title bar are tabs for 'Simple Queues', 'Interface Queues', 'Queue Tree', and 'Queue Types'. A toolbar contains icons for adding, deleting, and checking queues, as well as buttons for 'Reset Counters' and 'Reset All Counters'. A search field labeled 'Find' is on the right. The main area is a table with columns: Name, Parent, Packet Mark, Priority, Limit At (...), Max Limit..., Avg. Rate, and Queued Byte:.

Name	Parent	Packet Mark	Priority	Limit At (...)	Max Limit...	Avg. Rate	Queued Byte:
queue-parent	ether3		1		5M	5.0 Mbps	0 B
-Q1	queue-parent	C1	1	512k	2M	1981.2 kbps	71.3 KiB
B1	queue-parent		8	2M	5M	2.0 Mbps	0 B
Q2	B1	C2	8	512k	2M	999.9 kbps	72.7 KiB
Q3	B1	C3	8	512k	2M	1000.0 kbps	72.8 KiB
B2	queue-parent		8		5M	1024.4 kbps	0 B
Q4	B2	C4	2	512k	2M	512.2 kbps	72.7 KiB
Q5	B2	C5	2	512k	2M	512.1 kbps	72.7 KiB

Priority on Inner Queue



The screenshot shows the Mikrotik Queue List window with the following data:

Name	Parent	Packet Mark	Priority	Limit At (...)	Max Limit...	Avg. Rate	Queued Byte:
queue-parent	ether3		1		5M	5.0 Mbps	0 B
-Q1	queue-parent	C1	1	512k	2M	2.0 Mbps	23.7 KiB
B1	queue-parent		2	1M	5M	1024.5 kbps	0 B
Q2	B1	C2	8	512k	2M	512.2 kbps	72.7 KiB
Q3	B1	C3	8	512k	2M	512.2 kbps	72.8 KiB
B2	queue-parent		8	1M	5M	1982.0 kbps	0 B
Q4	B2	C4	4	512k	2M	993.9 kbps	72.7 KiB
Q5	B2	C5	4	512k	2M	987.9 kbps	72.7 KiB

Priority works only on Leaf Queue, will not work on Inner Queue

Common Mistakes



- Leaf queue without parent
- Priority on Inner queue

Test case

- We have 300 hosts on our network
- In worst scenario, 200 hosts will online on the same time
- At least 20 hosts online at minimum.
- All hosts have same priority
- Total bandwidth = 10 Mbps

Tips



- For an office network that all computer have same speed and same priority:
 - Limit-at = Total bandwidth / max hosts
 - Max-limit = Total bandwidth / min hosts

- Max-limit = 10 mbps / 20 (min host)
= 500 kbps
- Limit-at = 10 mbps / 200 (max host)
= 50 kbps

More Detail Information



- <http://wiki.mikrotik.com/wiki/HTB>
- <http://luxik.cdi.cz/~devik/qos/htb/>

Thank you!



- Q&A.....
- Or email to: valens@mikrotik.co.id