

# CCR Tuning in Infrastructure Use

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# Resources

- MikroTik RouterOS v6 Whats new??  
<http://mum.mikrotik.com/presentations/RU13/megis.pdf>
- CloudCoreRouter and RouterOS v6.x Tips & Tricks  
<http://mum.mikrotik.com/presentations/RU14/megis.pdf>
- FastTrack  
<http://www.mikrotik.com/download/share/FastTrack.pdf>

# What did we get in ROS 6?

- Fast Path
- Improved Queueing
- PPP MultiCore (from 6.8)
- RouterOS 6.19 (More about this later)
- FastTrack (from 6.29)

# CCR vs x86

- Memory Limits - Gone
- Parallel Architecture
- Many Small Cores - Up to 72 in CCR's to come
- Ports directly linked to core (Excl. CCR1009)
  
- So what does this mean for us?



# Practicalities of CCR Architecture

We have to take one of two approaches:

1. Handle packets in isolation
2. Handle flows

Both have their place but both need tuning

# Handle Packets in Isolation

- This is our preferred approach to core infrastructure
- Avoiding state exhaustion
- Core agnostic packet handling
- Fast Path (Maybe)



# Fast Path

- Fast path shortens the path of the packets through user space / software
- Very fast handling of compliant packets
- Critical structure underlying “Millions of Packets” specs for CCR Products
- Tight Criteria



# Fast Path

## List of devices with FastPath support

RouterBoard	
RB6xx series	ether1,2
RB7xx series	all ethernets
RB8xx series	ether1,2
RB9xx series	all ethernets
RB1000	all ethernets
RB1100 series	ether1-10,11
RB2011 series	all ethernets and sfp
CCR series routers	all ethernets and sfps
All RouterBOARD devices	wireless interfaces, if wireless-fp package used
x86	wireless interfaces, if wireless-fp package used

- [http://wiki.mikrotik.com/wiki/Manual:Fast\\_Path](http://wiki.mikrotik.com/wiki/Manual:Fast_Path)



# Fast Path Handlers

- RouterOS Handlers:

- There are still limitations inside these handlers

- Whats Missing?

- PPP
- VLAN

## FastPath Handlers

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Currently RouterOS has following fast path handlers:

- ipv4
- traffic generator
- mpls
- bridge

- [http://wiki.mikrotik.com/wiki/Manual:Fast\\_Path](http://wiki.mikrotik.com/wiki/Manual:Fast_Path)

# Fast Path Restrictions

- No Connection Tracking
- No Netflow
- No Firewall Rules
- No Interface Queues / Queues
- No VRF's

This list is only some of the key restrictions



# Fast Path Effect

## Performance test results

CCR1036-12G-4S		Tile 36 core max possible throughput test					
Mode	Configuration	1518 byte		512 byte		64 byte	
		kpps	Mbps	kpps	Mbps	kpps	Mbps
Bridging	none (fast path)	1,299.1	15,776.3	3,759.0	15,396.9	23,808.0	12,189.7
Bridging	25 bridge filter rules	1,299.1	15,776.3	3,759.0	15,396.9	5,704.8	2,920.9
Routing	none (fast path)	1,299.1	15,776.3	3,759.0	15,396.9	23,808.0	12,189.7
Routing	25 simple queues	1,299.1	15,776.3	3,759.0	15,396.9	8,353.1	4,276.8
Routing	25 ip filter rules	1,299.1	15,776.3	3,392.9	13,897.3	3,481.8	1,782.7

- <http://routerboard.com/CCR1036-12G-4S>

# PPP Optimisations (6.8)

- Starting in 6.8 Mikrotik made PPP operate on all cores
- Making CCR much more effective as a PPP Concentrator
- A single CCR1016 now handles potentially thousands of connections
- Took a few versions to settle down (I suggest 6.19+)

# Mikrotik Comparison

## Single PPPoE Tunnel Performance on CCR1036

in packets per second with 0,01% loss tolerance

Encryption	Conntrack	Version	64	512	1024	1280	1518
			byte	byte	byte	byte	byte
No	No	6.7	294,828	305,358	302,276	305,326	N/A
No	No	6.8rc1	5,519,320	4,633,852	2,376,862	1,912,372	N/A
No	Yes	6.7	277,156	260,386	192,272	183,856	83,844
No	Yes	6.8rc1	2,730,596	2,462,744	2,103,608	1,910,588	80,028
Yes	No	6.7	71,730	51,084	37,940	33,894	N/A
Yes	No	6.8rc1	212,052	239,322	228,588	208,552	N/A
Yes	Yes	6.7	56,286	43,412	33,318	29,754	19,358
Yes	Yes	6.8rc1	234,840	234,962	226,366	208,552	29,004

- <http://mum.mikrotik.com/presentations/RU14/megis.pdf>





# What's so Important About RouterOS 6.19?

What's new in 6.19 (2014-Aug-26 14:05):

- \*) wireless - improvements for nv2 and 802.11ac
- \*) sstp - make sstp work on i386 as well;
- \*) ipool - improve performance when acquiring address without preference;
- \*) partitions - copying partitions did not work on some boards;
- \*) bridge - added "Auto Isolate" stp enhancement (802.1q-2011, 13.25.6)
- \*) ipsec - when peer config is changed kill only relevant SAs;
- \*) vpls - do not abort BGP connection when receiving invalid 12 byte nexthop encoding;
- \*) dns-update - fix zone update;
- \*) dhcpv4 server - support multiple radius address lists;
- \*) console - added unary operator 'any' that evaluates to true if argument is not null or nothing value;
- \*) CCR - improved performance;
- \*) firewall - packet defragmenting will only happen with connection tracking enabled;
- \*) firewall - optimized option matching order with-in a rule;
- \*) firewall - rules that require CONNTRACK to work will now have Invalid flag when CONNTRACK is disabled;
- \*) firewall - rules that require use-ip-firewall to work will now have invalid flag when use-ip-firewall is disabled;
- \*) firewall - rules that have interface with "Slave" flag specified as in-/out-interface will now have Invalid flag;
- \*) firewall - rules that have interface without "Slave" flag specified as in-/out-bridge-port will now have Invalid flag;
- \*) firewall - rules with Invalid flags will now be auto-commented to explain why;
- \*) l2tp - force l2tp to not use MPPE encryption if IPsec is used;
- \*) sstp - force sstp to not use MPPE encryption (it already has TLS one);
- \*) sstp - make it work for x86 systems
- \*) winbox - added dual PSU stats in health menu
- \*) ipv6 - Gre6 can now correctly fragment large packets
- \*) simple queue performance optimisation/improvement for multi-core RouterOS devices (especially CCR)

Prior to 6.19 even with conntrack disabled the packet reassembly and disassembly was still performed

# Handle Flows

- Flow handling brings conntrack into play
- FastTrack (from 6.29)
- Needed for NAT / Stateful firewall

# Fast Track (6.29)

- Fast Track - Fast Path for Connection Tracking
- Lab Test first (or dog food it heavily)
- Reports on the forums are suggesting 2.5-3x real world improvement
- Restrictions the same as for Fast Path (No PPP, No VLAN)



# Fast Track Announcement

FastTrack - New feature in 6.29

by [strods](#) » Tue Apr 28, 2015 9:58 am

Starting from v6.29rc9, we introduced new and existing feature - FastTrack. Easy way to make your Firewall/NAT router up to 5x faster.

- \*) ipv4 fasttrack fastpath - accelerates connection tracking and nat for marked connections (more than 5x performance improvement compared to regular slow path conntrack/nat) - currently limited to TCP/UDP only;
- \*) added `~fasttrack-connection~` firewall action in filter/mangle tables for marking connections as fasttrack;
- \*) added fastpath support for bridge interfaces - packets received and transmitted on bridge interface can go fastpath (previously only bridge forwarded packets could go fastpath);
- \*) packets now can go half-fastpath - if input interface supports fastpath and packet gets forwarded in fastpath but output interface does not support fastpath or has interface queue other than `only-hw-queue` packet gets converted to slow path only at the dst interface transmit time;
- \*) `trafflow`: add natted addrs/ports to ipv4 flow info.

Re: FastTrack - New feature in 6.29

by [macgaiver](#) » Tue Apr 28, 2015 11:00 am

As far as i understood, in case of regular home router, you should have these 3 rules in beginning of firewall filter forward, to use Fasttrack.

Code: Select all

```
/ip firewall filter
add chain=forward action=fasttrack-connection connection-state=established,related
add chain=forward action=accept connection-state=established,related
add chain=forward action=drop connection-state=invalid
```

Note, that all packets that goes fasttrack, will not be visible in firewall and you will not be able to limit them in queue global.



# 6.29RC20 Change Log

## NOTE!

What's new in 6.29rc20 (2015-May-14 16:00):

- \*) fasttrack - correctly close fasttrack connections;
- \*) firewall - fixed sector writes rising starting since 6.28;
- \*) tile - fixed fasttrack;
- \*) snmp - fix rare bug when some OIDs were skipped;
- \*) ssh - added aes-ctr cipher support;
- \*) mesh - fixed kernel crash;
- \*) ipv4 fasttrack fastpath - accelerates connection tracking and nat for marked connections (more than 5x performance improvement compared to regular slow path conntrack/nat) - currently limited to TCP/UDP only;
- \*) added ~fasttrack-connection~ firewall action in filter/mangle tables for marking connections as fasttrack;
- \*) added fastpath support for bridge interfaces - packets received and transmitted on bridge interface can go fastpath (previously only bridge forwarded packets could go fastpath);
- \*) packets now can go half-fastpath - if input interface supports fastpath and packet gets forwarded in fastpath but output interface does not support fastpath or has interface queue other than only-hw-queue packet gets converted to slow path only at the dst interface transmit time;
- \*) trafficflow: add natted addrs/ports to ipv4 flow info;
- \*) queue tree: some queues would stop working after some configuration changes;
- \*) tilegx: enable autoneg for sfp ports in netinstall;
- \*) health - fix voltage on some RB4xx;
- \*) romon - fix 100% CPU usage;
- \*) romon - moved under tools menu in console;
- \*) email - store hostname for consistency;
- \*) vrrp - do not reset interface when no interesting config changes;
- \*) async - fixed ppp server;
- \*) sstp - fixed router lockup;
- \*) queue tree: some queues would stop working after some configuration changes.
- \*) console - allow '-' characters in unknown command argument names;
- \*) snmp - fix rare bug when some OIDs were skipped;
- \*) fixed CRS226 10G ports could lose link (introduced in 6.28);
- \*) fixed FREAK vulnerability in SSL & TLS;



Any Questions?  
Discussions?



# Thank You

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