

Application notes



RAy Switch Settings Examples

version 1.0 12/29/2017

RACOM s.r.o. • Mirova 1283 • 592 31 Nove Mesto na Morave • Czech Republic Tel.: +420 565 659 511 • Fax: +420 565 659 512 • E-mail: racom@racom.eu

www.racom.eu

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1. Switch settings examples

The examples of the most common configurations.

1.1. Default settings



Fig. 1.1: Default

Description of communication:

User traffic entering the ETH 1 can be output to a remote station from ETH 1 or ETH 2. Additionally, packets entering ETH 2 can be output to a remote station from ETH 1 or ETH2.

Ports ETH1 to ETH2 are not interconnected. The menu "VLAN / Member / p2, p4".

The link is transparent for the untagged and tagged frames that are queued according to their priority. The menu "VLAN / VTU priority override / none".

Management of units is possible from any port. "Management VLAN" is disabled by default and when turned on, the switch does not need to be set.

Internal traffic uses the "Internal VLAN" and has the highest priority set (7). It is queued number 3, again with the highest priority. Valid for "Link settings / Service access / Services / Service channel = standard". When "Service channel = direct" is set, internal operation with unit IP addresses is performed, without default priority setting.

Setting procedure:

Initial settings: Show defaults

VLAN S	τυ ντυ	ATU setti	ngs ATU	Mor	nitoring, Policy	R	STP	Trunk	
Global									?
Link authorizat	ion guard	✓							
Remove one pr	rovider tag								
ARP without br	oadcast checking	✓							
Ports settin	gs p2 Eth1	n/	Eth2		5 CPU		n6 Air		
Egress		P4		•	unmadif.			I:C.	
mode	unmodiry	v ur	modiry	•	unmoairy	•	unmod	шу	*
802.1q mode	disabled	✓ dis	abled	¥	disabled	¥	disable	ed	~
Discard tagged				[
Discard untagged				[
VTU priority override	none	✓ no	ne	v	none	*	none		v
Force default VID				[
Default VID	1	1			1		1		
FID	0	0			0		0		
IGMP snooping				[
ARP mirroring				[
VLAN tunnel				[
Member									
p2 Eth1				[✓		\checkmark		
p4 Eth2				[✓		\checkmark		
p5 CPU	✓	✓		[✓		
p6 Air	\checkmark	1		[•				
		Apply Re	fresh Show	/ default	show backup				

1.2. Interconnection ETH1 and ETH2 ports



Fig. 1.2: ETH1 + ETH2

Description of communication:

Connection from port ETH 1 to ETH 2 is added to default configuration. Menu "VLAN / Member / p2, p4".

Setting procedure:

Only set on Local, Remote can be adjusted in the same way if needed.

VLAN ST	υ ντυ	ATU set	tings	ATU	Monit	oring, Policy	RSTP	Trunk	
Global Link authorizatio	n guard	۲							?
Remove one prov	vider tag								
ARP without broa	dcast checking	~							
Ports setting	S p2 Eth1		p4 Eth2			p5 CPU		p6 Air	
Egress mode	unmodify	•	unmodify	y	•	unmodify	•	unmodify	•
802.1q mode	disabled	•	disabled		•	disabled	•	disabled	•
Discard tagged									
Discard untagged									
VTU priority override	none	•	none		•	none	•	none	•
Force default VID									
Default VID	1		1			1		1	
FID	0		0			0		0	
IGMP snooping									
ARP mirroring									
VLAN tunnel									
Member									
p2 Eth1						V		\checkmark	
p4 Eth2								\checkmark	
p5 CPU			•						
p6 Air	V		×						

1.3. Prioritization according to the VLAN ID



Fig. 1.3: VLAN ID

Description of communication:

In the internal switch set the priority of a particular VLAN ID. Menu "VTU / Edit / Use VID priority", "VTU / Edit / VID priority".

Frames in this VLAN will then pass through the link with a higher priority. After passing through the link the frame retains this new priority. Menu "VLAN / 802.1q / fallback", "VLAN / VTU priority override / frame"

Setting procedure:

Only set on Local, Remote can be adjusted in the same way if needed.

Local: Step 1, Step 2, Step 3

Step 1

VL	N STU	VTU AT	U settings	ATI	J Mon	itoring	g, Policy	RST	P Trunk		
STU	table										?
SID®	Label	Z	p2 Eth1	Z	p4 Eth2	Z	p5 CPU	Z	p6 Air	Z	
1	all		forwarding		forwarding		forwarding		forwarding		

In table STU the item with number SID = 1 is prepared for reference in VTU table.

Step 2

VLA	N ST	υ	VTU	AT	TU :	setti	ng	s A	TU	Monito	ring, P	olicy	RSTF	Trunk		
VTU t	able															?
VIDS	La 🖄	FID	SID 🖄	Pri	Z	P	Z	p2 Eth	I 🛛	p4 Eth2	Z	p5 CPU	Z	p6 Air	- 🔨	
10	VTU10	0	1	6		false		egress	unmodi	egress u	nmodi	egress ur	nmodi	egress tagge	d	

A frame with VID = 10 is assigned priority 6 in VTU table with output mode "egress tagged".

Step 3

VLAN S	Τυ ντυ ΑΤ	U settings ATU	Monitoring, Policy	RSTP Trunk
Global Link authorizat	tion guard 🔽	I		?
Remove one p	rovider tag			
ARP without b	roadcast checking 🔽	l		
Ports settin Port name	gs p2 Eth1	p4 Eth2	p5 CPU	p6 Air
Egress mode	unmodify	unmodify	v unmodify	v unmodify v
802.1q mode	fallback	fallback	✓ disabled	✓ disabled ✓
Discard tagged				
Discard untagged				
VTU priority override	frame	frame	✓ none	v none v
Force default VID				
Default VID	1	1	1	1
FID	0	0	0	0
IGMP snooping				
ARP mirroring				
VLAN tunnel				
Member				
p2 Eth1			<	\checkmark
p4 Eth2			\checkmark	\checkmark
p5 CPU	•	✓		<
p6 Air	\checkmark	\checkmark		

Selecting "802.1q = fallback mode" for the Eth2 and Eth1 port means that the framework prefers to use its own VID when it is contained in VTU (Step 2). The "VTU priority override = frame" causes the frame leaving the RAy unit to have a priority according to VTU table content.

For the "VLAN ID = 10" priority 6 is set. Packets queued with the highest priority (default priority 6 and 7) should never have a higher bit rate than that which is available "in the air" for the lowest modulation ACM. Priorities 6 and 7 also use internal communication packets that are necessary for the link!

For prioritization work, QoS must be enabled under 802.1p (default setting). "Switch settings / QoS / 802.1p / Enabled"

1.4. Prioritization according to MAC address



Fig. 1.4: MAC address

Description of communication:

In the switch there is priority set according to the source or destination MAC address. Packets with this MAC address will be queued at a higher priority. The packet passes through the link unchanged.

Setting procedure:

Set the desired MAC address priority to Local, Remote or both dependant on the direction in which we want the packet to travel.

Step 1, Local

"ATU / Edit / Use MAC priority" "ATU / Edit / Entry state = static" "ATU / Edit / MAC priority / 5"

VLA	AN STU A	TU ATU set	tings ATU	Monito	oring, Policy	RSTP	Trunk	
ATU	table							?
FID™	MAC 🗠	Label 🛛	🔺 Entry state 🛛 🖄	Prior 🖄	Destination t 🖄	Port asso	ciation / Tr	unk id 📨
0	00:02:a9:9c:26:09	local	static	off	port association	p5 CPU		
0	00:02:a9:9c:29:f1		dynamic	off	port association	p6 Air		
3	00:02:b6:43:4d:4e		dynamic	off	port association	p4 Eth2		
3	00:0c:42:2e:f7:64		dynamic	off	port association	p4 Eth2		
3	00:13:3b:11:71:07		dynamic	off	port association	p4 Eth2		
3	00:21:70:93:d1:78	MAC priority	static	5	port association	p4 Eth2		
3	00:24:81:8f:62:9b		dynamic	off	port association	p4 Eth2		
3	00:24:e8:a8:69:5d		dynamic	off	port association	p4 Eth2		
3	00:26:b9:d5:8d:70		dynamic	off	port association	p4 Eth2		
3	38:63:bb:07:35:88		dynamic	off	port association	p4 Eth2		

For each link with a "MAC priority" set, Entry state = static, Priority level is selected.

Step 2, Local

"ATU settings / DA priority override / queue"

VLAN S	JUT	VTU	J	ATU	settir	ngs	ATU	J	Mon	itorin	g, Po	licy	RS	TP	Trur	ık	
Global																	?
Aging timeout	[s]		330														
Reserved mult	icast to	CPU															
Reserved mult	icast pri	iority	7				~										
Reserved mult DA	icast																
	x	0	1	2	3	4	5	6	7	8	9	а	b	с	d	е	f
01:80:c2:00	:00:0x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
01:80:c2:00	:00:2x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ports settin	ngs p2 Fth	1			p4 F	th2			D	5 CPU				p6 Air			
Learning	✓				v					/				✓			
Hold at 1									[
ATU refresh	unloc	ked		~	unl	ocked		~	1	unlocke	d		*	unloc	ked		~
DA mapping	•				~					•				~			
Egress block	none			~	nor	пе		¥	•	none			*	none			\checkmark
SA filtering	disab	led		~	dis	abled		v	·	disabled	1		۷	disab	ed		\checkmark
Learn limit	0				0				()				0			
SA priority override	none			~	nor	ne		~	•	none			•	none			\checkmark
DA priority override	none			*	que	eue		v	•	none			*	none			~
Port association																	
p2 Eth1	✓								[
p4 Eth2					✓				[
p5 CPU									ŀ	•							
p6 Air									[•			

Step 3, Remote

"ATU / Edit / Use MAC priority" "ATU / Edit / Entry state = static" "ATU / Edit / MAC priority / 5"

VLAN	I STU	VTU	ATU settings	ATU	Monito	oring, Policy	RSTP	Trunk	
ATU ta	able								?
FID	MAC	🛯 Labe	l 🕾 Ent	ry state 🛛 🖄	Prior	Destination t	Port asso	ociation / T	runk id 🖄
0	00:02:a9:9c:26	:09	dyna	amic	off	port association	p6 Air		
0	00:02:a9:9c:29	:f1 local	stat	ic	off	port association	p5 CPU		
0	00:02:b6:43:4d	:4e	dyna	amic	off	port association	p6 Air		
0	00:0c:42:2e:f7:	64	dyna	amic	off	port association	p6 Air		
0	00:13:3b:11:71	:07	dyna	amic	off	port association	p6 Air		
0	00:21:70:93:d1	:78 MAC	priority stat	ic	5	port association	p6 Air		
0	00:24:e8:a8:69	:5d	dyna	amic	off	port association	p6 Air		
0	00:26:b9:d5:8d	:70	dyna	amic	off	port association	p6 Air		
0	38:63:bb:07:35	:88	dyna	amic	off	port association	p6 Air		
0	5c:8a:38:d6:ed	:4c	dyna	amic	off	port association	p6 Air		

Step 4, Remote

"ATU settings / DA priority override / queue"

VLAN S	TU	VTU	J	ATU	settir	ngs	ATU	J	Moni	toring	g, Pol	licy	RS	TP	Trur	ık	
Global																	?
Aging timeout	[s]		330														
Reserved multi	cast to	CPU															
Reserved multi	cast pri	ority	7				*										
Reserved multi	cast																
	x	0	1	2	3	4	5	6	7	8	9	а	b	с	d	е	f
01:80:c2:00:	00:0x	✓	•	✓	-	•	✓	✓	•	•	✓	✓	✓	✓	✓	-	-
01:80:c2:00:	00:2x	✓	•	•	✓	•	✓	✓	-	~	✓	✓	-	-	•	-	•
Desta settin																	
Ports settin Port name	p2 Eth	1			p4 E	th2			p5	i CPU				p6 Air			
Learning	~				~					1				•			
Hold at 1																	
ATU refresh	unloc	ked		\checkmark	unl	ocked		~	1	inlocke	d		\checkmark	unloc	ked		~
DA mapping	~				~					1				-			
Earess block	none			~	nor	ne		~		one			~	none			~
SA filtering	disabl	bol		~	die	abled		~		licabled	1		~	disabl	od		×
Loarn limit	0	icu			0	ubieu				IISubleu				0	cu		
SA priority	0			_	U				0				_	U			
override	none			\mathbf{v}	nor	ne		~	ľ	ione			\checkmark	none			~
DA priority override	none			~	nor	ne		*	r	one			*	queue	9		~
Port association																	
p2 Eth1	✓																
p4 Eth2					✓												
p5 CPU									•	•							
p6 Air														✓			

For the MAC address 02: 21: 70: 93: d1: 78 the priority 5 is set. Packets in the queue with the highest priority (default priority 6 and 7), should never have a higher data rate than the "air" for the lowest modulation ACM. This priority/queue using packets of internal communications that are required for the link!

1.5. Two separate customers



Fig. 1.5: ETH1, ETH2 separated

Description of communication:

For two separate customers - ETH 1 and ETH 2; management unit is possible from all ports, management VLAN is not set.

Packets from port ETH 1 are packed into VLAN 100 and transferred to the other side of the link, where they are unpacked and sent in their original format on the ETH 1. Similarly, packets from port ETH 2 are packed into VLAN 200.

Internal communication is also packed in VLAN 300 to set the highest priority.

Setting procedure:

Both units have the same settings. Remote: Step 1, Step 2, Step 3, Local: Step 1. Step 2, Step 3

Step 1: STU table

VL/	AN	STU VTU	ATU	settings	ATU	Monitor	ring, F	Policy	RSTP	Trunk		
STU	tab	le										?
SID	\mathbb{Z}	Label	Z	p2 Eth1	Z	p4 Eth2	Z	p5 CPU	Z	рб Аіг	Z	
10		STU10		forwarding		disabled		forwardin	g	forwarding		
20		STU20		disabled		forwarding		forwardin	g	forwarding		
30		STU30		forwarding		forwarding		forwardin	g	forwarding		

Step 2: VTU table

VLAN	I STU	V	TU	ATU sett	ings .	ATU	Monite	oring, Policy		RSTP	Trun	ik 👘	
VTU ta	able												
VID 📨	Label 🖄	FID 📨	SID 🖄	Priority 🖄	Policy 🖄	p2 Eth1	Z	p4 Eth2	Z	p5 CPU	Z	p6 Air	~
100	VLAN100	0	10	off	false	egress u	untagged	not member		egress un	tagged	egress	tagged
200	VLAN200	0	20	off	false	not mem	nber	egress untagge	ed	egress un	tagged	egress	tagged
300	VLAN 300	0	30	7	false	egress u	untagged	egress untagge	ed	egress un	tagged	egress	tagged

Step 3: VLA	N				
VLAN S	TU VTU A	TU settings ATU	Monitoring, Policy	RSTP Trunk	
Global Link authorizatio	on guard 🔽				?
Remove one pro	vider tag				
ARP without bro	adcast checking 🛛 🗹				
Ports setting	gs p2 Eth1	n4 Eth2	55 CDU	n6 Air	
Faress mode	pz curi		y untra	Tage Tage	a
Lyress mode	director	- uncag	uncay		1 1
Discard				secure	1
tagged Discard untagged					
VTU priority override	none	▼ none	▼ none	▼ queue ▼]
Force default VID					
Default VID	100	200	300	1	
FID	0	0	0	0	7
IGMP snooping					
ARP mirroring					
VLAN tunnel					
Member					
p2 Eth1				\checkmark	
p4 Eth2				\checkmark	
p5 CPU	V				
p6 Air	\checkmark	V			

The opening image is simplified to show separation of user traffic. The following figure show the more precise route packets in the VLAN. The diagram highlights the way in which management packets from ETH1 through one VLAN pass towards the CPU. It also highlights packets pass in the other direction from the CPU:



Fig. 1.6: ETH1, ETH2 separated



1.6. Separation of unit management from customer traffic

Fig. 1.7: Management separated

Description of communication:

Unit management is possible from ETH2 port, customer traffic on ETH1, VLAN management not set.

Packets from port ETH 1 are packed into VLAN 100 and transferred to the other side of the link, where they are unpacked and sent in their original format on the ETH 1. These packets can not go to the CPU nor the ETH2 port. Similarly, packets from the EHT 2 port are packaged in the VLAN 200 and can be transferred to the CPU or ETH2 on the opposite side.

Additionally, internal communications are packaged in the VLAN 300 with the highest priority set.

Setting procedure:

Both units have the same settings. Remote: Step 1, Step 2, Step 3, Local: Step 1. Step 2, Step 3

Step 1: STU table

VL/	AN	STU VTU	ATU	settings	ATU	Monitor	ing, F	Policy	RSTP	Trunk		
STU	tab	le										?
SID	\mathbb{Z}	Label	\mathbb{Z}	p2 Eth1	Z	p4 Eth2	Z	p5 CPU	Z	p6 Air	Z	
10		STU10		forwarding		disabled		forwardin	g	forwarding		
20		STU20		disabled		forwarding		forwardin	g	forwarding		
30		STU30		forwarding		forwarding		forwardin	g	forwarding		

Step 2: VTU table

VLAN	STU		VTU	AT	U settings	AT	υ	Monit	oring	, Policy	RST	P	Trunk			
VTU ta	ble															?
VID 📨	Label	\mathbb{Z}	FID 🐁	SID 🖄	Priority 📨	Policy	Z	p2 Eth1	Z	p4 Eth2	Z	p5 CPU		Z	p6 Air	-
100	VLAN 100		0	10	off	false		egress untag	ged	not member		not mem	ber		egress tagged	
200	VLAN 200		0	20	off	false		not member		egress untag	ged	egress i	intagged		egress tagged	
300	VLAN 300		0	30	7	false		egress untag	ged	egress untag	ged	egress i	untagged		egress tagged	

Step 3: VLA	N							
VLAN ST	TU VTU	ATU setti	ngs ATU	Monit	oring, Policy	RSTP	Trunk	
Global Link authorization Remove one prov ARP without broa	n guard vider tag udcast checking	₹						?
Ports setting Port name	s p2 Eth1	F	4 Eth2		p5 CPU		p6 Air	
Egress mode	untag	•	untag	•	untag	•	tag	•
802.1q mode	disabled	•	disabled	•	disabled	•	secure	
Discard tagged								
Discard untagged								
VTU priority override	none	•	none	•	none	•	queue	▼
Force default VID								
Default VID	100		200		300		1	
FID	0		0		0		0	
IGMP snooping								
ARP mirroring								
VLAN tunnel								
Member	_				_		_	
p2 Eth1								
p4 Eth2								
p5 CPU			v				\checkmark	
p6 Air								

The opening image is simplified to show the traffic separation. As with the separation of two customers, the packets go in the direction to the CPU via VLAN ID 200 and back are packed into the VLAN ID 300.

Appendix A. Revision History

Revision 1.0 First issue 2017-11-28