

IPv4 CONSORTIUM

PIM-SM Operations Test Report Revision 2.1

Month Day, Year

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Mr(s). Vendor,

Enclosed are the results from PIM Sparse Mode testing performed on:

RUT HERE. Identified as "SHORT RUT HERE" MAC Address 01-02-03-04-05-06 s/n 1234567. Console "system" command reports software version 1.2.3.

This testing pertains to a set of standard requirements, put forth in RFC 2236 and Internet Draft-ietf-pim-sm-v2new-12.txt. The tests performed are part of the PIM Sparse Mode Test Suite, which is available on the UNH Inter-Operability Lab's website:

ftp://ftp.iol.unh.edu/pub/ipv4/testsuites/PIM-SM_Description.pdf

During the testing process, the following issues were uncovered:

Test #	Result
PIM_SM.1.2d	The RUT does not support configuration of Triggered_Hello_Delay.
PIM_SM.1.6d	The RUT waits 105 seconds before removing TR1 from its neighbor list. The RUT should wait 56 seconds before removing TR1 from its neighbor list.
PIM_SM.1.6f,g	The RUT did not transmit a Hello message with a zero Holdtime.

As always, we welcome any comments regarding this Test Suite. If you have any questions about the test procedures or results, please feel free to contact me via e-mail at <u>techniciana@iol.unh.edu</u> or by phone at +1-603-862-3941.

Regards,

Technician A



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The following table contains the test results and their meanings.

Result	Interpretation
PASS	The RUT was observed to exhibit conformant behavior.
FAIL	The RUT was observed to exhibit non-conformant behavior.
PASS with	The RUT was observed to exhibit conformant behavior, however this behavior deviated from
Comments	previous compliant results. An additional explanation of the situation is needed.
WARN	The RUT was observed to exhibit behavior that is not recommended.
NOTE	From the observations, a valid pass or fail could not be determined. An additional explanation of
	the situation is included.
N/S	Not Supported: The specified behavior is optional and is applicable but not implemented.
N/T	Not Tested: The specified behavior cannot be tested due to a(n) (un)related failure.
5	



GROUP 1: Hello Messages and Designated Router Election

The following tests verify conformance with Hello Messaging and DR Election for PIM-SM.

Test #			R	esult
PIM_SM.1.1	Sending Hello Messages		a	PASS
			b	PASS
Purpose: To ve	rify that a router properly transm	nits Hello messages.	•	
Comments on 7	est Procedure	ž		
b The Hello I	Period is configured to a value of	f 90 seconds on the RUT PIM-SM is restart	ed on the RI	UT Pack
	Period is configured to a value of ved on network 0.	f 90 seconds on the RUT. PIM-SM is restart	ed on the RI	UT. Pack
	ved on network 0.	f 90 seconds on the RUT. PIM-SM is restart Draft-ietf-pim-sm-v2-new-12.txt -Sections		

The RUT transmits a Hello message to the ALL-PIM-Routers multicast address 224.0.0.13 on network 0 every b. 90 seconds (Hello_Period).

Tes	t #			Re	esult
PIN	1_SM.1.2	Triggered Hello Messages		a	PASS
				b	PASS
				с	PASS
				d	N/S
Pur	pose: To verify	that a router properly transmits a t	riggered Hello message.		
	nments on Test				
a.	PIM-SM is enab	led on the RUT on network 0. PI	M-SM is not enabled on TR1 on network	0. Hello	messages
			econds. Packets are observed on networ		
b.			transmits a Hello message with a new C		etwork 0.
		erved on network 0.			
c.	PIM-SM is disal	oled on the RUT and factory defau	Its are reset. PIM-SM is enabled on the	RUT. Pac	kets are
	observed on net				
d.	PIM-SM is disal	oled on the RUT and the Hello Pe	riod is configured to a value of 10 secon	ds. PIM-S	M is en-
		T. Packets are observed on netwo			
Cor	nments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt -Sections 4.	.3.1 and 4.12	
a.	The RUT transm	nits the first Hello message in less	than Triggered_Hello_Delay (5) seconds	5.	
b.		•	than Triggered_Hello_Delay (5) seconds		
c.			than Triggered_Hello_Delay (5) seconds		T trans-
			ggered_Hello_Delay (5) seconds after Pl		
d.	The RUT does n	ot support configuration of Trigge	ered Hello Delay.		

ort configuration of Triggered_Hello_Delay.



_								
Tes			Res					
PIN	M_SM.1.3	DR Election	a	PASS				
			b	PASS				
			c	PASS				
			d	PASS				
			e	PASS				
			f	PASS				
		that a router properly performs DR Election.						
Co	mments on Test	Procedure						
a. b. c. d. e.	RUT. TR2 has a TR2 transmit He transmits data pa work 1. The RUT has a Hello messages packets with a m The RUT has a transmit Hello m 224.0.6.130 on m TR2 has an IP ac 0. TR1 transmit DR_Election_Pr 224.0.6.130 on m TR1 has an IP ac RP, TR1 and TR transmits Hello	R Priority of 1. TR1 has DR Priority of 2 and an IP address lower than that a DR Priority of 1 and an IP address higher than that of TR1 and the RUT. ello messages on network 0. TR1 and TR2 transmit Hello messages on network ackets with a multicast destination of 224.0.6.130 on network 1. Packets are DR Priority of 2 and an IP address lower than that of TR1. The RP, TR1 and on network 0. TR1 and TR2 transmit Hello messages on network 1. The S nulticast destination of 224.0.6.130 on network 1. Packets are observed on the DR Priority of 3. The RP, TR1 and TR2 transmit Hello messages on network 1. DR Priority of 3. The RP, TR1 and TR2 transmit Hello messages on network nessages on network 1. The SRC transmits data packets with a multicast destination the priority of 2. The RP, TR1 and TR2 transmit Hello messages on network nessages on network 1. The SRC transmits data packets with a multicast destination the sessages on network 1. The SRC transmits data packets with a multicast destination the sessages on network 1. The SRC transmits data packets with a multicast destination the shello messages on network 1. TR2 transmits Hello messages without the tority Option on network 1. TR2 transmits data packets with a multicast the twork 1. Packets are observed on network 1. ddress lower than that of the RUT. The RP, TR1 and TR2 transmit Hello messages on the transmit Hello messages on network 1. The SRC transmits Hello messages without the tority Option on network 1. The SRC transmits data packets with a multicast the twork 1. Packets are observed on network 1. ddress higher than that of the RUT. TR2 has an IP address lower than that of 2 transmit Hello messages on network 0. TR1 transmits Hello messages on messages without the DR_Election_Priority Option on network 1. The SRC multicast destination of 224.0.6.130 on network 1. Packets are observed on the twork 1. Packets are observed on the twork 1. Packets are observed on the twork 1. Packets are observed on network 1. Packets are observed on the twork 1. Packets are obs	The RP, The observed of TR2 transform RC transminetwork 1. Trk 0. TR1 stination of trk 0. TR1 stination of essages on st destination of the RUT. network 1 C transmits	R1 and ne SRC on net- asmit its data and TR2 f and TR2 f network ion of . The . TR2				
Co	mments on Test	Results Draft-ietf-pim-sm-v2-new-12.txt -Sections 4.3	.1 and 4.3.2					
	unitents on rest	incourto						
a. b. c. d. e. f.	TR1 is elected th The RUT is elect on network 0. The RUT is elect on network 0. The RUT is elect on network 0.	he DR. The RUT does not forward the multicast data received on network 1 he DR. The RUT does not forward the multicast data received on network 1 ted the DR, encapsulates the multicast data packets on network 1 and forwar ted the DR, encapsulates the multicast data packets on network 1 and forwar ted the DR, encapsulates the multicast data packets on network 1 and forwar ted the DR, encapsulates the multicast data packets on network 1 and forwar ted the DR. The RUT does not forward the multicast data received on network 1	rds them to rds them to rds them to	o the RP				





Tes	st #		Re	sult
	M_SM.1.4	Change of DR	a	PASS
			b	PASS
			с	PASS
			d	PASS
			e	PASS
Pu	rpose: To verify	that a router properly changes Designated Routers.		•
Co	mments on Test	Procedure		
a. b. c.	Hello message w tion of 224.0.6.1 multicast destina The RUT has pr message with D 224.0.6.130 on a destination of 22 The RUT has D Hello message w tion of 224.0.6.1 SRC transmits n observed on all The RUT has D Hello message w tion of 224.0.6.1 SRC transmits d all networks.	R priority of 3. The RP and TR1 transmit Hello messages on network 0. with DR priority of 5 on network 1. The SRC transmits data packets with 130 on network 1. TR2 transmits a Hello message with DR priority of 2 o data packets with a multicast destination of 224.0.6.130 on network 1. Packets with a multicast destination of 224.0.6.130 on network 1.	a multicast of lata packets transmits a icast destina its with a mu TR1 transmi a multicast of on Network ork 1. Packet TR1 transmi a multicast of n network 1 kets are obs	lestina- with a Hello ttion of ilticast its a destina- t 1. The ets are its a lestina- . The erved on
e.	Hello message v network 1. The ceases transmiss	R priority of 4. The RP and TR1 transmit Hello messages on network 0. with DR priority of 3 on network 1. TR2 transmits a Hello message with I SRC transmits data packets with a multicast destination of 224.0.6.130 or sion of Hello messages on network 1. Packets are observed on all network	OR priority on network 1.	of 9 on
Co	mments on Test	Results Draft-ietf-pim-sm-v2-new-12.txt-Section 4.	3.2	
a.	After the priorit	TR2 as the DR. The RUT does not forward any of the multicast data receipt is reconfigured, the RUT wins the DR election and thus encapsulates an work 1 onto network 0.		
b.	work 0. After th	ted as the DR and thus encapsulates and transmits the data received on ne the priority is reconfigured, TR2 wins the DR election. TR2 does not forw eccived on network 1 after the priority is reconfigured.		
c.	work 0. After th	cted as the DR and thus encapsulates and transmits the data received on ne he priority is reconfigured, TR2 wins the DR election. TR2 does not forw eccived on network 1 after the priority is reconfigured.		
d.	The RUT elects After the priority received on network	TR2 as the DR. The RUT does not forward any of the multicast data receipt is reconfigured, the RUT wins the DR election and thus encapsulates an work 1 onto network 0.	d transmits t	he data
e.		es transmission of Hello messages on network 1, the RUT is elected the Di neapsulate the data and forward it onto network 0.	R on networ	k 1. The



Tes	t #			Re	sult				
PIN	PIM_SM.1.5 Generation ID in DR Election			a	PASS				
				b	PASS				
Pu	Purpose : To verify that a router properly handles the Generation ID Option when present.								
Co	mments on Test I	Procedure							
a. b.	the RUT. Packets are observed on network 0. The previous steps are repeated with a large enough sample size to ensure that the Generation_Identifier is a random number.								
Co	mments on Test l	Results	Draft-ietf-pim-sm-v2-new-12.txt -Section 4.3.	1					
a.	The RUT advert								

- be random.
- b. The RUT sent another join message after receiving the new GenID.

Ге	st #			R	esult
_	M_SM.1.6	HoldTime in Hello Messages		a	PASS
1	v1_51v1.1.0	Hold I line in Heno Wessages		b a	PASS
				c	PASS
				d	FAIL
				e	PASS
				f	WARN
				g	WARN
		that a router properly handles the Hel	lo HoldTime Option.		
20	mments on Test	Procedure			
	The factory defa	ults are reset on the RUT PIM SM i	s enabled on the RUT. Packets are of	aserved or	n network
•	0.	and are reset on the ROT. This-Sivia	s chabled on the ROT. Tackets are of		Includik
	*.	Hello messages with Holdtime of 0x	8C on network 0. TR1 stops transmit	ting Hello	messages
·•		ackets are observed on network 0.	be on network of their stops transmit	ting mene	messages
			ello Holdtime Option on network 0.	FR1 stops	transmit-
-		ages on network 0. Packets are observ		F ~	
١.			IM-SM is enabled on the RUT. Packet	ets are obs	served on
	network 0.				
•	TR1 transmits se	everal properly formatted Hello messa	ages on network 0. TR1 transmits a H	Iello mess	age with
			ceases Hello message transmission of	n network	0. Pack-
	ets are observed				
			ages on network 0. The RUT's interfa	ace to netw	work 0 is
		ts are observed on network 0.			
ţ.			ages on network 0. The IP address of	the RUT'	s interface
2	to network 0 is c	hanged. Packets are observed on net	work 0.		

b. When TR1 stops transmitting Hello messages, the RUT waits 140 seconds before removing TR1 from its



neighbor list.

- c. When TR1 stops transmitting Hello messages, the RUT waits 105 seconds before removing TR1 from its neighbor list.
- d. The RUT waits 105 seconds before removing TR1 from its neighbor list. According to Draft-ietf-pim-sm-v2new-12.txt section 4.10.2 "*holdtime is the amount of time a receiver must keep the neighbor reachable*". Therefore, the RUT should wait 56 seconds before removing TR1 from its neighbor list.
- e. The RUT immediately removes TR1 from its neighbor list.
- f. The RUT did not transmit a Hello message with a zero Holdtime. According to Draft-ietf-pim-sm-v2-new-12.txt section 4.3.1 "*before an interface goes down or changes IP address, a Hello message with a zero Hold-Time should be sent immediately*". Therefore, the RUT should have transmitted a Hello message with a zero Holdtime after the interface was disabled.
- g. The RUT did not transmit a Hello message with a zero Holdtime. According to Draft-ietf-pim-sm-v2-new-12.txt section 4.3.1 "*before an interface goes down or changes IP address, a Hello message with a zero Hold-Time should be sent immediately*". Therefore, the RUT should have transmitted a Hello message with a zero Holdtime after the IP address of the interface was changed.

GROUP 2: Multicast Forwarding

The following tests verify conformance of multicast forwarding in PIM-SM.

Test #			Re	esult
PIM_SM.2.1	Forwarding Packets		a	PASS
			b	PASS
			с	PASS
Purpose: To verif	by that a router properly forwards multi	cast data packets.		
Comments on Tes	st Procedure			
 group 224.0.6 ets are observe b. The RP transm This causes th multicast grou c. The RP transm IGMP reports 	.130 on network 0. The RP forwards d ed on all networks. nits Hello messages on network 1. IGN e RUT to send a (*,G) Join message up p 224.0.6.130. Packets are observed o nits Hello messages on network 1. IGN are transmitted for 224.0.6.130 on network	ks 0 and 1. TR1 transmits a (*,G) Join lata packets from the multicast group 22 MP reports for 224.0.6.130 are transmit ostream to the RP. The RP forwards da on all networks. MP reports are transmitted for 224.0.6.1 work 1. The RP forwards data packets mitted on network 0. Packets are obser	24.0.6.130 ted on net ta packets 30 on net from the 1	D. Pack- work 0. s from the work 0. multicast \mathcal{N}
Comments on Tes	t Results	Draft-ietf-pim-sm-v2-new-12.txt-Sections 3 ar	nd 4.2	$\left(\right)$
b. The RUT forv	vards the data packets onto network 0. vards the data packets onto network 0. vards the data onto network 0 until the	Leave message is received.		
Test #			Re	esult
PIM_SM.2.2	Encapsulate Packets		a	PASS
	y that a router properly encapsulates d	āta packets.		
		e SRC transmits data packets with a mu on all networks.	lticast des	tination
Comments on Tes	st Results	Draft-ietf-pim-sm-v2-new-12.txt-Section 4.4.1		
		s the packets upstream to network 0 for		



Test # Result					
PIM_SM.2.3	Forwarding Encapsula	ated Data Packets	a	PASS	
Purpose : To verify that a router appropriately uses the Link TLV field.					
Comments on Test	Procedure				
a. The RP and TR1 transmit Hello messages on networks 0 and 1. TR1 transmits encapsulated data packets for multicast group 224.0.6.130 from the source network on network 0. Packets are observed on all networks.					
Comments on Test 1	Results	Draft-ietf-pim-sm-v2-new-12	2.txt-Section 4.2		
a. The RUT forwards the encapsulated data packets from network 0 onto network 1 for the RP.					

Test #			Re	esult	
PIM_SM.2.4	Encapsulation for Multiple RP's		a	PASS	
Purpose : To verify that a router properly encapsulates and transmits data packets to the proper RP.					
Comments on Test	Procedure				
				\sim	
cast group 224.	0.6.131. RP1 and RP2 transmit Hello	24.0.6.130 and RP2 is statically config messages on networks 0 and 1. The S	RC1 trans	mits data	
with a multicast destination address of 224.0.6.130 on network 2. The SRC2 transmits data with a multicast destination address of 224.0.6.131 on network 3. Packets are observed on all networks.					
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt-Section 3			
a. The RUT encapsulates the data packets from network 2 and transmits them onto network 0. The RUT also encapsulates the data packets from network 3 and transmits them onto network 1.					

Test #			R	esult
PIM_SM.2.5	Source Packets		а	PASS
Purpose: To veri	fy that a router properly forwa	ards source packets.	·	•
Comments on Te	st Procedure			
a. The RP and T	R1 transmit Hello messages of	on networks 1 and 0. TR1 transmits an (S,	G) Join messag	e with a
	s of 224.0.6.130 and a source a	address of 10.10.15.81 on network 0. IGM		
group address			IP reports are the	ransmitted
group address for the group	224.0.6.130 on network 1. Th	address of 10.10.15.81 on network 0. IGN	IP reports are the icast group 224	ransmitted 4.0.6.130
group address for the group with a source	224.0.6.130 on network 1. Th address of 10.10.15.80 on net	address of 10.10.15.81 on network 0. IGM he RP transmits data packets from the mult	IP reports are the ficast group 224 for the multicast	ransmitted 4.0.6.130 st group

a. The RUT forwards the data with a source address of 10.10.15.81 onto network 0. The data with a source address of 10.10.15.80 is not forwarded.



Test #		R	esult
PIM_SM.2.6	Forward Encapsulated and Decapsulated Data Packets	a	PASS
Purpose: To verify	that a router properly forwards both encapsulated and decapsulated da	ta packets.	
Comments on Test	Procedure		
	s Hello messages on network 1. The SRC with an IP address of 10.10 nulticast group address of 224.0.6.130 on network 0. The RUT encap		

Test #		Re	sult
PIM_SM.2.7	RegisterStop (S,G)	a	PASS
Purpose: To verify	that a router properly accepts a RegisterStop message.		
Comments on Test	Procedure		

a. The RP transmits Hello messages on network 1. The SRC with an IP address of 10.10.10.80 transmits data packets with a multicast group address of 224.0.6.130 on network 0. The RUT should encapsulate these packets and forward them to the RP. The RP transmits a Join (S,G) with the source of 10.10.10.80 and the group address of 224.0.6.130 on network 1. After the RP receives both the encapsulated and decapsulated data packets, the RP transmits a RegisterStop to the RUT on network 1. Packets are observed on all networks.

Comments on Test Results

Draft-ietf-pim-sm-v2-new-12.txt-Section 3

a. Upon receiving the RegisterStop, the RUT stops forwarding the encapsulated data packets. The decapsulated data packets continue to be forwarded onto network 1.

Test #		R	esult
PIM_SM.2.8 RegisterStop (*,G)		a	PASS
Purpose: To verify that a router properly a	ccepts RegisterStop (*,G) from the DR.		
Comments on Test Procedure			
of 224.0.6.130 on network 0. The RUT The RP transmits a Join (S,G) for group	twork 1. The SRC transmits data packets with a mu cencapsulates these data packets and forwards them 224.0.6.130. The RP transmits a RegisterStop (*,C address set to a value of all zeros on network 1. Pac	onto net G) for the	work 1. multicast
group 224.0.6.130 containing a source on all networks.			

a. Upon receiving the RegisterStop, the RUT accepts the RegisterStop and stops encapsulating data.



Tes	st #		Re	esult
PIN	M_SM.2.9	Data Forwarding to Several Networks	а	PASS
			b	PASS
			с	PASS
Pu	rpose: To verify	that a router properly forwards data packets onto the correct network.		
	mments on Test			
а. b. c.	group 224.0.6.1 wards data pack The RP and TR group 224.0.6.1 wards data pack The RP and TR group 224.0.6.1 wards data pack	1 transmit Hello messages on networks 1 and 2. TR1 transmits a (*,G) Join 30 on network 2. IGMP reports for 224.0.6.131 are transmitted on network ets from the multicast group 224.0.6.130 on network 1. Packets are observed 1 transmit Hello messages on networks 1 and 2. TR1 transmits a (*,G) Join 30 on network 2. IGMP reports for 224.0.6.130 are transmitted on network ets from the multicast group 224.0.6.130 on network 1. Packets are observed 1 transmit Hello messages on networks 1 and 2. TR1 transmits a (*,G) Join 30 on network 2. IGMP reports for 224.0.6.130 are transmitted on network ets from the multicast group 224.0.6.130 on network 1. Packets are observed network 2. IGMP reports for 224.0.6.130 are transmitted on network ets from the multicast group 224.0.6.130 on network 1. IGMP leave message network 0. Packets are observed on all networks.	0. The R ed on all n message : 0. The R ed on all n message : 0. The R	P for- networks. for the P for- networks. for the P for-
Co	mments on Test	Results Draft-ietf-pim-sm-v2-new-12.txt-Section 4.3		
a.		rds the data packets from network 1 to network 2.		\cap
b.		rds the data packets from network 1 to networks 0 and 2.		
c.		rds the data packets from network 1 to networks 0 and 2. After the Leave n	nessage is	received,
	data packets are	only forwarded onto network 2.		
-				
Tes				esult
	M_SM.2.10	Multiple Sources	а	PASS
		that a router properly transmits data packets from several sources.		
Co	mments on Test	Procedure		
a.	message for the an (S,G) Join m TR3 transmits a packets from the	R2 and TR3 transmit Hello messages on networks 1, 2, 0 and 3. TR1 transmulticast group 224.0.6.130 containing a source of 10.10.15.80 on network essage for the multicast group 224.0.6.130 containing a source of 10.10.15.8 (*,G) Join message for the multicast group 224.0.6.130 on network 3. The e multicast group 224.0.6.130 from the source 10.10.15.80. The RP transmi ast group 224.0.6.130 from the source 10.10.15.84 on network 1. Packets and	2. TR2 t 84 on netw RP transr ts data pa	ransmits vork 0. nits data ckets

Comments on Test Results	Draft-ietf-pim-sm-v2-new-12.txt-Section 4.3

a. The RUT forwards the multicast data with a source address of 10.10.15.80 from network 1 to network 2. The RUT forwards the multicast data with a source address of 10.10.15.84 from network 1 to network 0. The RUT forwards both streams of multicast data from network 1 to network 3.



networks.

Test #			Res	sult
PIM_SM.2.11	Forwarding From Multiple R	Ps	a	PASS
Purpose: To verify	that a router properly forwards en	capsulated data packets to the correct RP.		
Comments on Test	Procedure			
group 224.0.6.1 a (*,G) Join me for the multicas 224.0.6.130 on Packets are obs	31. RP1, RP2, TR1 and TR2 trans ssage for the multicast group 224.0 group 224.0.6.131 on network 3. network 0. RP2 transmits data pace erved on all networks.	p 224.0.6.130. RP2 is statically configured mit Hello messages on networks 0,1,2 and 0.6.130 on network 2. TR2 transmits a (*, RP1 transmits data packets from the multi- ckets from the multicast group 224.0.6.131	l 3. TR1 t G) Join m ticast grou	ransmits essage p
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt-Section 2.1		
	L L	ast destination of 224.0.6.130 from networ ast destination of 224.0.6.131 from networ		

Test #		R	esult
PIM_SM.2.12	PIM Tree Receiver	а	PASS
		b	PASS
Purpose: To verify	y that a router properly creates a PIM tree.		
Comments on Tes	t Procedure		

- a. TR1 and TR2 transmit Hello messages on network 2. IGMP reports for 224.0.6.130 are transmitted on network 0. This causes the RUT to send a (*,G) Join message upstream to the RP. The RP transmits data packets on network 1 to the multicast destination address of 224.0.6.130. TR2 forwards the data packets on to network 2. Packets are observed on all networks.
- b. The RUT transmits a Join (S,G) with the source address of 10.10.15.80 and a group address of 224.0.6.130 on network 1. TR1 transmits multicast data packets to TR1 on network 2. Both TR1 and TR2 transmit multicast data packets with the source address of 10.10.15.80 with a group address of 224.0.6.130. Packets are observed on all networks.

Comments on Test Results

Draft-ietf-pim-sm-v2-new-12.txt-Section 3

- a. The RUT forwards multicast data packets from network 2 to network 0.
- b. On network 2 the RUT continues to forward data packets from network 2.



Test #			Re	sult
PIM_SM.2.13	PIM Tree - Source		a	PASS
			b	PASS
			c	PASS
Purpose : To verify	that a router properly creates a PIM tr	ee when connected to the source netw	ork.	1
Comments on Test				
 SRC transmits r Join with a grou b. RP transmits a J work 2. The RF networks. c. The TR1 transmit 	nulticast data packets for the multicas p address of 224.0.6.130 on network oin (S,G) with the source address of 1 transmits a RegisterStop message on its an (S,G) Join with the source addr receives two copies of the data packe	0.10.12.80 and a group address of 224 network 1 to the RUT. Packets are ob ess of 10.10.10.80 and a group address ts, one from the SPT and one from the	1 transmits 4.0.6.130 c pserved on s of 224.0.	s a (*,G) on net- all 6.130 on
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt-Section 3		
b. The RUT stops	sulates the data packets from the SRC encapsulating the data. The RUT forw 1 forward data packets from network	vards no data.		

GROUP 3: Reception of Join and Prune Messages

The following tests verify conformance with the receiving of Join and Prune messages in PIM-SM.

Tes	st #				R	esult
PI	M_SM.3.1	Unknown Join Messages			a	PASS
		_			b	PASS
					c	PASS
					d	PASS
Pu	rpose: To verif	y that the router properly ignores	s PIM Join messages fr	om unknown neighbo	rs.	
Co	mments on Tes	t Procedure				
a. b. c. d.	source address RP on network observed on al The RP and TI multicast grou 224.0.6.130 or Packets are ob The RP and TI source address message with a 1, data for the The RP, TR1 a for the multica 224.0.6.130 or	R1 transmit Hello messages on n of the RP on network 0. TR2 to 2. On network 1, data for the r l networks. R1 transmit Hello messages on n p 224.0.6.130 on network 0. Th n network 2. On network 1, data served on all networks. R1 transmit Hello messages on n of 10.10.15.80 for the multicast a source address of 10.10.15.80 f multicast group 224.0.6.130 is f and TR2 transmit Hello message ast group 224.0.6.130 on network n network 2. On network 1, data served on all networks.	ransmits a (*,*,RP) Join multicast group 224.0.6 networks 0 and 1. TR1 R2 transmits a (*,G) Join a for the multicast group networks 0 and 1. TR1 t group 224.0.6.130 on for the multicast group Forwarded by the RP. P es on networks 1, 0 and k 0. TR2 transmits a (*	n message with a sour 5.130 is forwarded by t transmits a (*,G) Join in message for the mu p 224.0.6.130 is forwa transmits an (S,G) Joi network 0. TR2 trans 224.0.6.130 on netwo ackets are observed o 2. TR1 transmits a (* ⁵ ,G) Join message for	ce address the RP. P message liticast gro urded by th n message smits an (S ork 2. On n all netw (G) Join r the multic	s of the ackets are for the pup ne RP. e with a S,G) Join network orks. nessage ast group
Co	mments on Tes	t Results	Draft-ietf-pim-sm	n-v2-new-09.txt – Sections 4	4.5 and 4.3.1	
a. b. c. d.	The RUT does The RUT does	not forward the multicast data of not forward the multicast data of not forward the multicast data of rards the multicast data onto netwo	onto network 2. onto network 2.	~		

Test #			R	esult
PIM_SM.3.2	Join Messages Destination Addre	255	a	PASS
			b	PASS
			с	PASS
Purpose: To verify	that a router properly processes desti	nation addresses.		
Comments on Test	Procedure			
 with a source ad of TR2. TR2 tra address field sho the RP on netwo b. TR1, the RP and with a group add address of TR2. stream neighbor is forwarded by c. TR1, the RP and with a source ad neighbor address address of 10.10 should contain t 224.0.6.130 is for 	TR2 transmit Hello messages on ne dress of the RP on network 0. The u unsmits a Join message with a source ould contain the address of the RUT. rk 1. Packets are observed on all net TR2 transmit Hello messages on ne dress of 224.0.6.130 on network 1. T TR2 transmits a (*,G) Join message address field should contain the add the RP on network 1. Packets are ob TR2 transmit Hello messages on ne dress of 10.10.15.80 and a group add s field should contain the address of 10.80 and a group address of 224.0. he address of the RUT. Data with a so prwarded by the RP on network 1. P	pstream neighbor address field sho address of the RP on network 2. T Data for the multicast group 224.0 works. tworks 0, 1 and 2. TR1 transmits a the upstream neighbor address field with a source address of the RP on ress of the RUT. Data for the multi served on all networks. tworks 0, 1 and 2. TR1 transmits a lress of 224.0.6.130 on network 1. TR2. TR1 transmits an (S,G) Join 6.130 on network 2. The upstream gource address of 10.10.10.80 for n ackets are observed on all networks	uld contain the he upstream (6.130 is forw (*,G) Join m should contain network 2. icast group 22 n (S,G) Join The upstream message with neighbor adoutticast group s.	ne address neighbor warded by nessage ain the The up- 24.0.6.130 message n a source dress field
Comments on Test		Draft-ietf-pim-sm-v2-new-12.txt – Section	on 4.5.1	
	rds all the multicast data packets from			
	rds 224.0.6.130 multicast data packet rds the multicast data packets with a		tion of 224.0	6 130
from network 1		source of 10.10.15.00 and a destina	1011 01 224.0	.0.150
Hom network 1			10 10	
5				



16	st #				Re	sult
PI	M_SM.3.3	Transitions from (*,*,RP) NoInfo	State		a	PASS
					b	PASS
Pι	rpose: To verify	that a router properly transitions from	n the NoInfo State whe	n receiving a (*,*	,RP) me	ssage.
Co	omments on Test	Procedure				
b.	the RP. Packet TR1 and the R	of the RP on network 0. On network s are observed on all networks. P transmit Hello messages on network				•
	forwarded by the	source address of the RP on network ne RP. TR1 transmits a (*,*,RP) Join reved on all networks.	0. On network 1, data	for multicast gro	up 224.0	.6.130 is
Co	forwarded by the	he RP. TR1 transmits a (*,*,RP) Join erved on all networks.	0. On network 1, data	for multicast gro address of the Rl	up 224.0 P on netw	.6.130 is

				$\left(\right) \left(\right)$
Tes	st #		Re	esult
PI	M_SM.3.4	Transitions from (*,*,RP) State	а	PASS
			b	PASS
Pu	rpose: To verify	that a router properly transitions from the Join State when receiving a (*,*	,RP) messa	ge.
Co	mments on Test	Procedure		
a.	TR1 and the RF	P transmit Hello messages on networks 0 and 1. TR1 transmits a (*,*,RP) J	loin messag	e with a
	source address	of the RP on network 0. On network 1, data for multicast group 224.0.6.13	30 is forwar	ded by
	the RP. After 3	0 seconds, a second (*,*,RP) Join message is transmitted on network 0 wit	h a source a	address of
	the RP. Packets	s are observed on all networks.		
b.	TR1 and the RP	P transmit Hello messages on networks 0 and 1. TR1 transmits a (*,*,RP) J	loin messag	e with a
	source address	of the RP on network 0. On network 1, data for multicast group 224.0.6.13	30 is forwar	ded by
	the RP. TR1 tra	ansmits a (*,*,RP) Prune message with a source address of 224.0.6.130. Pa	ackets are o	bserved
	on all networks.			

Comments on Test Results

Draft-ietf-pim-sm-v2-new-12.txt - Section 4.5.1

- a. The RUT forwards the multicast data packets 105 seconds after the second Join message was sent. After 105 seconds, the RUT stops sending data onto network 0.
- b. The RUT stops forwarding multicast data onto network 0 after the Prune message is received.



Tes	st #			R	esult
PI	M_SM.3.5	Transitions from (*,*,RP) Prune	Pending State	a	PASS
				b	PASS
				с	PASS
Pu	rpose: To verify	that a router properly transitions from	the Prune Pending State when	receiving a (*,*	,RP) mes
sag	e.				
Co	mments on Test	Procedure			
b. с.	the RP on network transmits a (*,* transmits a (*,* networks. TR1 and TR2 tr transmits a (*,* Join message w warded by the F network 0. Pac TR1 and TR2 tr transmits a (*,* Join message w warded by the F	ddress of the RP on network 0. TR2 tr ork 0. Data for the multicast group 22 ,RP) Prune message with a source addrest ansmit Hello messages on networks 0 ,RP) Join message with a source addrest ith a source address of the RP on network RP on network 1. TR1 transmits a (*,* kets are observed on all networks. ransmit Hello messages on networks 0 ,RP) Join message with a source addrest ith a source address of the RP on network (*,* kets are observed on all networks. ransmit Hello messages on networks 0 ,RP) Join message with a source addrest ith a source address of the RP on network (*,* 2 transmits a (*,*,RP) Prune message v all networks.	4.0.6.130 is forwarded by the R ress of the RP on network 0. A ss of the RP on network 0. Pa . The RP transmits Hello messa ss of the RP on network 0. TR rork 0. Data for the multicast gr ;RP) Prune message with a sou . The RP transmits Hello messa ss of the RP on network 0. TR rork 0. Data for the multicast gr ;RP) Prune message with a sou	P on network 1 fter 2.5 seconds ckets are observ ages on network 2 transmits a (* roup 224.0.6.13 rce address of t ages on network 2 transmits a (* roup 224.0.6.13 rce address of t	. TR1 s, TR2 red on all a 1. TR1 ,*,RP) 0 is for- he RP on a 1. TR1 ,*,RP) 0 is for- he RP on
Co	mments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt - Se	ection 4.5.1	
a. b.	The RUT forware message is trans	ards the multicast data onto network 0 ards the multicast data onto network 0 smitted onto network 0 and multicast or ards the multicast data onto network 0	until TR1 transmits its prune. A lata is not forwarded.		

c. The RUT forwards the multicast data onto network 0 until TR1 transmits its Prune. Afterwards, a Prune Echo message is transmitted onto network 0 and multicast data is not forwarded.

Test #					R	esult
PIM_SN	A.3.6	Transitions from (*,G) NoInfo St	ate		a	PASS
					b	PASS
Purpose	: To verify	that a router properly transitions from	the NoInfo State wh	en receiving a (*	G) messa	nge.
Comme	nts on Test 1	Procedure				
 a. TR1 and the RP transmit Hello messages on network 0 and network 1, respectively. On network 0, TR1 transmits a Join (*,G) message with a group address of 224.0.6.130. Multicast data for multicast group 224.0.6.130 is forwarded by the RP on network 1. Packets are observed on network 0. b. TR1 and the RP transmit Hello messages on network 0 and network 1, respectively. On network 0, TR1 transmits a Prune (*,G) message with a group address of 224.0.6.130. Multicast data for multicast group 224.0.6.130 is forwarded by the RP on network 1. On network 0, TR1 transmits a Join(*,G) message with a group address of 224.0.6.130. Multicast data for multicast group 224.0.6.130 is forwarded by the RP on network 1. On network 0, TR1 transmits a Join(*,G) message with a group address of 224.0.6.130. Received on all networks. 						
Comme	Comments on Test Results Draft-ietf-pim-sm-v2-new-12.txt – Section 4.5.2					
a. The RUT forwards the multicast data packets onto network 0.b. The RUT forwards multicast data packets onto network 0 until after having received a Join (*,G) message.						

Test #			Re	sult
PIM_SM	3.7	Transitions from (*,G) Join State	a	PASS
	b 1			
Purpose:	To verify	that a router properly transitions from the Join State when receiving a (*,G)	message.	
Comment	s on Test]	Procedure		
a. TR1 a	nd the RP	transmit Hello messages on networks 0 and 1, respectively. TR1 transmits a	a (*,G) Jo	oin mes-
sage v	vith a grou	up address of 224.0.6.130 on network 0. On network 1, data for the multicas	t group	
224.0	.6.130 is fo	orwarded by the RP. After 30 seconds, a second (*,G) Join message is transported	nitted on	network
0 with	a source a	address of the RP. Packets are observed on all networks.		
b. TR1 a	nd the RP	transmit Hello messages on networks 0 and 1, respectively. TR1 transmits a	a (*,G) Jo	oin mes-
sage v	vith a grou	up address of 224.0.6.130 on network 0. On network 1, data for the multicas	t group	
224.0	.6.130 is fo	orwarded by the RP. TR1 transmits a (*,G) Prune message with a group add	ress of	
224.0	.6.130 on 1	network 0. Packets are observed on all networks.		
Comment	s on Test l	Results Draft-ietf-pim-sm-v2-new-12.txt – Section 4.5	.2	
a. The F	UT contin	nues to forward the multicast data 105 seconds after the second Join message	was sent	. After
105 s	econds, the	e RUT stops sending data onto network 1.		
b. The F	UT stops	forwarding data onto network 1 after the Prune message is received.		

Tes	t #			R	esult
PIN	1_SM.3.8	Transitions from (*,G) Prune Per	nding State	a	PASS
			-	b	PASS
				с	PASS
Pur sage		that a router properly transitions from	the Prune Pending State when re-	ceiving a (*,G) mes-
Coi	nments on Test	Procedure			
a. b.	transmits a (*,G message with a 224.0.6.130 is fo on network 0. A network 0. Pac TR1 and TR2 tra- transmits a (*,G message with a 2 warded by the R network 0. Pack TR1 and TR2 tra- transmits a (*,G message with a 2 warded by the R	ansmit Hello messages on network 0.) Join message with a group address of group address of 224.0.6.130 on network orwarded by the RP. TR1 transmits a After 2.5 seconds, TR2 transmits a (*, kets are observed on all networks. ansmit Hello messages on networks (0) Join message with a group address of group address of 224.0.6.130 on networks. ansmit Hello messages on networks. ansmit Hello messages on networks (0) Join message with a group address of group address of 224.0.6.130 on networks. ansmit Hello messages on networks (0) Join message with a group address of group address of 224.0.6.130 on networks (1) poin message with a group address of group address of 224.0.6.130 on networks (1) ansmit Hello message with a group address of group address of 224.0.6.130 on networks (1) poin message with a group address of group address of 224.0.6.130 on networks (1) address of 224.0.6.130 on networks (2) poin message with a group address of group address of 224.0.6.130 on networks (2) poin metwork 1. TR1 transmits a (*, transmits a (*,G) Prune message with all networks.	of 224.0.6.130 on network 0. TR2 york 0. On network 1, data for the (*,G) Prune message with a group add b. The RP transmits Hello message of 224.0.6.130 on network 0. TR2 york 0. Data for the multicast grou G) Prune message with a group ad b. The RP transmits Hello message of 224.0.6.130 on network 0. TR2 york 0. Data for the multicast grou G) Prune message with a group ad b. The RP transmits Hello message of 224.0.6.130 on network 0. TR2 york 0. Data for the multicast grou G) Prune message with a group ad	transmits a (multicast gro address of 22 ress of 224.0. es on network transmits a (p 224.0.6.130 dress of 224.0 es on network transmits a (p 224.0.6.130 dress of 224.0	*,G) Join up 24.0.6.130 6.130 on 1. TR1 *,G) Join 0.6.130 on 1. TR1 *,G) Join 0 is for- 0.6.130 on
Cor	nments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt - Secti	on 4.5.2	
a. b.		rds the multicast data onto network 0 rds the multicast data onto network 0		. Afterwards,	a Prune

- Echo message is transmitted onto network 0 and multicast data is not forwarded.
 The RUT forwards the multicast data onto network 0 and multicast data is not forwarded.
- c. The RUT forwards the multicast data onto network 0 until step TR2 transmits its Prune. Afterwards, a Prune Echo message is transmitted onto network 0 and multicast data is not forwarded.

Test #				Result	
PIM_SM.3.9	Transitions from (S,G) NoInfo State			а	PASS
				b	PASS
Purpose: To ve	ify that a router properly transiti	ons from the NoInfo State w	hen receiving an (S	G,G) mess	sage.
Comments on T	est Procedure				
source addre source addre served on al b. TR1 and the	RP transmit Hello messages on ass of 10.10.11.80 and a group ac ass of 10.10.11.80 for the multical networks. RP transmit Hello messages on ass of 10.10.11.80 and a group ac	ddress of 224.0.6.130 on networks 0 and 1. TR1 trans ddress of 224.0.6.130 is forw	work 0. On network arded by the RP. F smits an (S,G) Join work 0. Data for a p	k 1, data Packets ar message multicast	with a re ob- with a group
224.0.6.130	is forwarded by the RP on netwo 0.11.80 and a group address of 2		· · · · · · · · · · · · · · · · · · ·		

b. The RUT does not forward the multicast data packets onto network 0 until after having received an (S,G) Join message. After the (S,G) Prune the data was no longer forwarded.

			$\left(\right) \left(\right)$	
Test #			Re	sult
PIM_SM.3.10	Transitions from (S,G) Join State		a	PASS
			b	PASS
Purpose: To verify	that a router properly transitions from	n the Join State when receiving an (S,C	G) message	e.
Comments on Test	Procedure			
a. TR1 and the RP	transmit Hello messages on network	s 0 and 1. TR1 transmits an (S,G) Join	message	with a
source address o	f 10.10.15.80 and a group address of	224.0.6.130 on network 0. On netwo	rk 1, data v	with a
source address o	f 10.10.15.80 for the multicast group	224.0.6.130 is forwarded by the RP.	After 30 s	econds,
		ddress of 10.10.15.80 and a group add		
on network 0. P	ackets are observed on all networks.			
b. TR1 and the RP	transmit Hello messages on network	s 0 and 1. TR1 transmits an (S,G) Join	message	with a
source address o	f 10.10.15.80 and a group address of	224.0.6.130 on network 0. On network	rk 1, data v	with a
source address of	f 10.10.15.80 for a multicast group 2	24.0.6.130 is forwarded by the RP on	network 1.	. TR1
		ress of 10.10.15.80 and a group addres	s of 224.0.	.6.130 on
network 1. Pack	tets are observed on all networks.			
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt – Section 4.	5.3	
a. The RUT contin	ues to forward the multicast data 105	seconds after the second Join message	e was trans	smitted.
b. The RUT stops t	forwarding the multicast data packets	onto network 0 after the Prune message	ge is receiv	ved.



Tes	st #		R	esult
PI	M_SM.3.11	Transitions from (S,G) Prune Pending State	а	PASS
			b	PASS
			с	PASS
sag	- •	that a router properly transitions from the Prune Pending State when rec Procedure	eiving an (S,	G) mes-
a.	transmits an (S, network 0. TR2 224.0.6.130 on 1 224.0.6.130 is for 10.10.11.80 and message with a observed on all		ss of 224.0.6 nd a group a the multicast e address of ransmits an (work 0. Pac	.130 on ddress of t group S,G) Join ckets are
b.	transmits an (S, network 0. TR2 224.0.6.130 on 1 224.0.6.130 is for 10.10.11.80 and TR1 and TR2 tr transmits an (S, network 0. TR2 224.0.6.130 is for 10.10.15.80 and source address of	ansmit Hello messages on network 0. The RP transmits Hello messages G) Join message with a source address of 10.10.11.80 and a group addrest transmits an (S,G) Join message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 224.0.6.130 on network 0. Packets are observed on ansmit Hello messages on network 0. The RP transmits Hello messages G) Join message with a source address of 10.10.11.80 and a group addrest of 224.0.6.130 on network 0. The RP transmits Hello messages G) Join message with a source address of 10.10.11.80 and a group addrest of transmits an (S,G) Join message with a source address of 10.10.11.80 and a group addrest of transmits an (S,G) Join message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 for brwarded by the RP. TR1 transmits an (S,G) Prune message with a source address of 224.0.6.130 on network 0. Packet are breaked by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 and a group address of 224.0.6.130 on network 0. Packet are breaked by the RP. TR1 transmits an (S,G) Prune message with a source address of 10.10.11.80 and a group address of 224.0.6.130 on network 0. Packet are breaked by the RP. TR1 transmits an transmits and transmits an transmits and transmits an transmits an transmits an transmits and transmits and tr	ss of 224.0.6 nd a group a the multicasi e address of all networks on network ss of 224.0.6 nd a group a the multicasi e address of Prune messag	.130 on ddress of t group 5. 1. TR1 .130 on ddress of t group te with a
	networks.			
Co	mments on Test	Results Draft-ietf-pim-sm-v2-new-12.txt – Section	on 4.5.3	
a. b. c.	The RUT forwa message is trans The RUT forwa	rds the multicast data onto network 0, rds the multicast data onto network 0 until TR1 transmits its Prune. Afte mitted onto network 0 and multicast data is not forwarded. rds the multicast data onto network 0 until step TR2 transmits its Prune. transmitted onto network 0 and multicast data is not forwarded.		
	Leno nessage l	transinities onto network o and multicast data is not forwarded.		



GROUP 4: Transmission of Join and Prune Messages

The following tests verify conformance with transmission of Join and Prune messages in PIM-SM.

Test #	Test #		Result		
PIM_SM.4.1	Transmission from (*,*,RP) N	lotJoined State	а	PASS	
Purpose : To verify that a router properly transitions to (*,*,RP) Joined state.					
Comments on Test	Procedure				
a. TR1 and the RP transmit Hello messages on networks 0 and 1. TR1 transmits a (*,*,RP) Join message with a source address of the RP on network 0. Packets are observed on network 1.					
		Durft istf wing our sil more 12 test for the	<i>E E</i>		
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt-Section 4	.5.5		

Test #		Re	esult	
PIM_SM.4.2	Transitions from (*,*,RP) Joined State, Setup 1	а	PASS	
Purpose : To verify that a router properly transitions its state while in (*,*,RP) Joined state.				
Comments on Test l	Procedure			
 Comments on Test Procedure a. TR1 and the RP transmit Hello messages on networks 0 and 1. TR1 transmits a (*,*,RP) Join message with a source address of the RP on network 0. After 10 seconds, TR1 transmits a (*,*,RP) Join message with a source address of the RP. Packets are observed on all networks. 				
Comments on Test Results Draft-ietf-pim-sm-v2-new-12.txt – Section 4.5.5				
Comments on Test 1	Results Draft-ietf-pim-sm-v2-new-12.txt – Section 4.3	5.5		

a. After 60 seconds, the RUT transmits another Join (*,*,RP) to the RP.



Test #				Re	esult
PI	M_SM.4.3	M.4.3 Suppression and Override in (*,*,RP) Joined State		a	PASS
				b	PASS
Pu	rpose: To verify	that a router properly transitions its st	tate while in Joined state.		
Co	mments on Test	Procedure			
b.	Join message wi TR1 transmits H transmits a (*,*, Join message wi	RP) Join message with a source addres ith a source address of the RP on netw Hello messages on network 0. The RP RP) Join message with a source addres ith a source address of the RP on netw of the RP on network 0. Packets are of	work 0. Packets are observed on all ne and TR2 transmit Hello messages on ess of the RP on network 0. TR2 trans- work 1. TR1 transmits a (*,*,RP) Prur	etworks. network 1 smits a (*,*	. TR1 *,RP)
Co	omments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt - Section 4	.5.5	
a. b.		t_joinsuppress seconds before transm nits a (*,*,RP) Join message within 60			sent on

Test #			sult			
PIM_SM.4.4	Transitions from (*,*,RP) Joined State, Setup 2		PASS			
		b	PASS			
Purpose: To verify	Purpose : To verify that a router properly transitions its state while in Joined state.					
Comments on Test Procedure						

- a. TR1 transmits Hello messages on network 0. TR2 transmits Hello messages on networks 1 and 3. TR3 transmits Hello messages on networks 2 and 3. The RP transmits Hello messages on Network 3. TR2 is the upstream next hop for the RUT. TR1 transmits a (*,*,RP) Join message with a source address of the RP on network 0. Packets are observed on all networks.
- b. TR1 transmits Hello messages on network 0. TR2 transmits Hello messages on networks 1 and 3. TR3 transmits Hello messages on networks 2 and 3. The RP transmits Hello messages on Network 3. TR2 is the upstream next hop for the RUT. TR1 transmits a (*,*,RP) Join message with a source address of the RP on network 0. TR2 transmits a Hello message with a new GenID on network 1. Packets are observed on all networks.

Comments on Test Results

Draft-ietf-pim-sm-v2-new-12.txt - Section 4.5.5

- a. 60 seconds after step 3, the RUT transmits a (*,*,RP) Prune message to TR2. The RUT sends a (*,*,RP) Join message to TR3 and sets the Join Timer to expire after 60 seconds. After 60 seconds, the RUT transmits another (*,*,RP) Join message to TR2.
- b. 60 seconds after step 7, the RUT sets the Join Timer to t-Override seconds. After 60 seconds, the RUT transmits a (*,*,RP) Join message to TR2.



Test #			Res	sult
PIM_SM.4.5	Transmission from (*,G) Not	LJoined State	a	PASS
Purpose: To verify	that a router properly transitions	state when in (*,G) NotJoined state.		
Comments on Test	Procedure			
	6	works 0 and 1. TR1 transmits a (*,G) Join 1 224.0.6.130 on network 0. Packets are obs	0	
Comments on Test		Draft-ietf-pim-sm-v2-new-12.txt-Section 4.5.6	Ś	

a. Immediately after TR1 transmits a (*,G) Join message on network 0, the RUT transmits a (*,G) Join message to the RP for the multicast group 224.0.6.130. The RUT sets the Join Timer for TR1. After 60 seconds, the RUT transmits another (*,G) Join message to the RP for the multicast group 224.0.6.130.

Tes	st #		Res	sult
PIN	M_SM.4.6	Transitions from (*,G) Joined State, Setup 1	а	PASS
Pu	rpose: To verify	that a router properly transitions state when in (*,G) Joined state.		
Co	mments on Test l	Procedure		
a.	TR1 and the RP	transmit Hello messages on networks 0 and 1. The RP is the upstream next	t hop for th	ne RUT.
	TR1 transmits a	(*,G) Join message for the multicast group 224.0.6.130 on network 0. Pack	tets are obs	served

on all networks.

Comments on Test Results

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a. Immediately after TR1 transmits a (*,G) Join message on network 0, the RUT transmits a (*,G) Join message for the multicast group 224.0.6.130 to the RP and resets the Join Timer to 60 seconds. After 60 seconds, the RUT transmits another (*,G) Join message for the multicast group 224.0.6.130 to the RP.

Test	#				R	esult
PIM	[_SM.4.7	Suppression and Override in (*,G) Joined State		a	PASS
					b	PASS
Purp	pose: To verify	that a router properly transitions state	when in (*,G) Joined sta	ate.		
Com	nments on Test	Procedure				
		\dot{f}) loin message for the multicast group			11fs 9 (*	G) Ioin
b. '	message for the TR1 transmits 1 transmits a (*,C message for the	G) Join message for the multicast group e multicast group 224.0.6.130 on network Hello messages on network 0. The RP G) Join message for the multicast group e multicast group 224.0.6.130 on network 4.0.6.130 on network 1. Packets are ob	ork 0. Packets are observ and TR2 transmit Hello 224.0.6.130 on network ork 1. TR2 transmits a (*	ved on all netwo messages on ne k 0. TR2 transm	orks. etwork 1 nits a (*	1. TR1 ,G) Join
b. '	message for the TR1 transmits 1 transmits a (*,C message for the	e multicast group 224.0.6.130 on network Hello messages on network 0. The RP G) Join message for the multicast group e multicast group 224.0.6.130 on network 4.0.6.130 on network 1. Packets are ob	ork 0. Packets are observ and TR2 transmit Hello 224.0.6.130 on network ork 1. TR2 transmits a (*	ved on all netwo o messages on ne k 0. TR2 transm *,G) Prune mess	orks. etwork (nits a (* sage for	1. TR1 ,G) Join

			\square	()
Test #			Re	sult
PIM_SM.4.8	Transitions from (*,G) Joined Sta	ite, Setup 2	a	PASS
			b	PASS
Purpose: To verify	that a router properly transitions state	when in (*,G) Joined state.		·
Comments on Test	Procedure			
a. TR1 transmits H	ello messages on network 0. TR2 tra	nsmits Hello messages on networks 1	and 2. TR	3 trans-
mits Hello mess	ages on networks 1 and 3. TR1, TR2	and TR3 should be elected DR on ne	tworks 0, 2	and 3.
TR1 transmits a	(*,G) Join message for the multicast	group 224.0.6.130 on network 0. The	e RUT's ne	xt hop
for the RP chang	ges from TR2 to TR3. Packets are ob	served on networks 2 and 3.		•
b. TR1 transmits H	ello messages on network 0. TR2 tra	nsmits Hello messages on networks 1	and 2. TR	3 trans-
mits Hello mess	ages on networks 1 and 3. TR1, TR2	and TR3 should be elected DR on ne	tworks 0, 2	and 3.
TR1 transmits a	(*,G) Join message for the multicast	group 224.0.6.130 on network 0. TR	2 transmits	a Hello
messages with a	new GenID on network 1. Packets a	re observed on all networks.		
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt - Section 4	.5.6	
	e e e e e e e e e e e e e e e e e e e	lticast group 224.0.6.130 on network	2 and then	a (*,G)
Join message for	the multicast group 224.0.6.130 on i	ietwork 5.		

b. The RUT transmits a (*,G) Join message for the multicast group 224.0.6.130 on network 2.



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Test #			R	esult
PIM_SM.4.9	Transmission (S,G) Not	Joined State	a	PASS
Purpose: To verify	that a router properly transi	tions state when in (S,G) NotJoined state.		
Comments on Test	Procedure			
source address of 1.	of the RP for the multicast g	n networks 0 and 1. TR1 transmits an (S,G) group 224.0.6.130 on network 0. Packets are	e observed on	
$\mathbf{\Omega}$	Results	Draft-ietf-pim-sm-v2-new-12.txt-Section	n 4.5.7	

a. Immediately after TRT transmits a Join (S,G) message on network 0, the RUT transmits an (S,G) Join message to the RP. The RUT sets the Join Timer for TR1. After 60 seconds, the RUT transmits another (S,G) Join message to the RP.

Test #			R	esult
PIM_SM.4.10	Transitions from (S,G) Joined	State, Setup 1	а	PASS
Purpose: To verify	that a router properly transitions sta	ate when in (S,G) Joined state.		
Comments on Test	Procedure			
TR1 transmits a			group 22	
Comments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt – Section 4.	5.7	
•		age on network 0, the RUT transmits an After 60 seconds the RUT transmits and		-

a. Immediately after TR1 transmits a Join (S,G) message on network 0, the RUT transmits an (S,G) Join message to the RP and resets the Join Timer to 60 seconds. After 60 seconds, the RUT transmits another (S,G) Join message to the RP.



Tes	st #			Re	sult
PI	M_SM.4.11	Suppression and Override in (S,G	a) Joined State	a	PASS
				b	PASS
Pu	rpose: To verify	that a router properly transitions state	when in (S,G) Joined state.		
Co	mments on Test	Procedure			
a. b.	transmits an (S, network 1. TR 224.0.6.130 on TR1 transmits 1 transmits an (S, network 0. TR 224.0.6.130 on	Hello messages on network 0. The RP, G) Join message with a source address 1 transmits an (S,G) Join message with network 0. Packets are observed on al Hello messages on network 0. The RP, G) Join message with a source address 2 transmits an (S,G) Join message with network 1. TR2 transmits an (S,G) Pr o 224.0.6.130 on network 1. Packets are	s of 10.10.15.80 for the multicast group a a source address of 10.10.15.80 for t ll networks. and TR2 transmit Hello messages on s of 10.10.15.80 for the multicast group a source address of 10.10.15.80 for t rune message with a source address of	p 224.0.6. he multica network 1 p 224.0.6. he multica	130 on ast group . TR1 130 on ast group
Co	mments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt - Section 4.	5.7	
a. b.	224.0.6.130 on The RUT transp	t_joinsuppress seconds before transminetwork 1. mits an (S,G) Join message for the mul) Prune message.		-	-

Test	:#				Re	sult
PIM	I_SM.4.12	Transitions from (S,G) Joined Sta	ate, Setup 2		a	PASS
					b	PASS
Pur	pose: To verify	that a router properly transitions state	when in (S,G) Joined state.			
Con	nments on Test	Procedure				
b.	network 0. TR2 and 3. The RP t 0, 2 and 3. TR1 224.0.6.130 on r changes to TR3. The RUT is con network 0. TR2 and 3. The RP t 0, 2 and 3. TR1 224.0.6.130 on r message with a	figured to transmit Hello messages on transmits Hello messages on network ransmits Hello messages on network transmits an (S,G) Join message with network 0. This causes the RUT to tr Packets are observed on networks 2 figured to transmit Hello messages on transmits Hello messages on network transmits Hello messages on network transmits an (S,G) Join message with network 0. This causes the RUT to tr new GenID on network 2. Packets ar	ks 1 and 2. TR3 transmits Hello 3. TR1, TR2 and TR3 should be a source address of the RP for the ansition to (S,G) Joined state. The and 3. a networks 0, 2 and 3. TR1 transf ks 1 and 2. TR3 transmits Hello 3. TR1, TR2 and TR3 should be a source address of the RP for the ansition to (S,G) Joined state. The e observed on network 2.	message elected ne multione RUT' mits Hel message elected ne multion R2 transi	es on net DR on cast gro s next h llo mess es on net DR on cast gro	twork 1 networks up op ages on twork 1 networks up
Con	nments on Test	Results	Draft-ietf-pim-sm-v2-new-12.txt – Sec	tion 4.5.7		
b.	and also transmi	s, the RUT transmits an (S,G) Prune ts an (S,G) Join message for the mult seconds, the RUT transmits an (S,G)	icast group 224.0.6.130 on netwo	ork 3.		

Test #			R	lesult
PIM_SM.4.13	Transitions from (S,G) NotPru	ned State	a	PASS
			b	PASS
Purpose: To verify	that a router properly transitions s	ate when in (S,G) NotPruned sta	ate.	
Comments on Test				
 work 1. The R multicast group forwards multic report for multi message upstre 224.0.6.130 wit (S,G,rpt) Prune of TR2 on netw TR1, TR2, and work 1. The R multicast group forwards multic report for multi sage upstream. with the upstrea message for the network 0. TR 	TR3 transmit Hello messages on ne P and TR2 transmit Hello messages 224.0.6.130 with the upstream nei ast data from source 10.10.15.80 ff cast group 224.0.6.130 is transmitte am. TR1 transmits an (S,G) Join m h the upstream neighbor address se message for the multicast group 22 ork 0. Packets are observed on all TR3 transmit Hello messages on m P and TR2 transmit Hello messages 224.0.6.130 with the upstream nei east data from source 10.10.15.80 ff cast group 224.0.6.130 is transmitte TR1 transmits an (S,G) Join messa am neighbor address set to the addr multicast group 224.0.6.130 with I transmits an (S,G,rpt) Join messa as set to the address of TR2 on netw	on network 2. TR1 transmits a ghbor address set to the address or the multicast group 224.0.6.12 ed by the receiver. The RUT sho essage for source 10.10.15.80 and to the address of TR3 on network 24.0.6.130 with upstream neighb networks. etwork 0. TR2 and TR4 transmits on network 2. TR1 transmits a ghbor address set to the address or the multicast group 224.0.6.12 ed by the RUT. The RUT should age for source 10.10.15.80 and n ess of TR3 on network 0. TR1 t the upstream neighbor address set ge for the multicast group 224.0. work 0. Packets are observed on	n (S,G) Join messa of TR2 on network 30 on network 1. ould transmit a (*, nd multicast group ork 0. TR1 transm oor address set to th it Hello messages of (*,G) Join message of TR2 on network 30 on network 1. d transmit a (*,G) nulticast group 224 transmits an (S,G, et to the address of .6.130 with upstre- all networks.	age for the k 0. TR4 An IGMP G) Join on nits an he address on net- ge for the k 0. TR4 An IGMP Join mes- 4.0.6.130 rpt) Prune f TR2 on
		Draft-ietf-pim-sm-v2-new-12,txt -	Section A 5 0	

- a. The RUT sets the Override Timer to t_override seconds. After t_override seconds, the RUT transmits an (S,G,rpt) Join message for source 10.10.15.80 and multicast group 224.0.6.130 with the upstream neighbor address set to the address of TR2.
- b. The RUT cancels the Override Timer and does not transmit an (S,G,rpt) Join message.

