Token Ring Paper

Introduction

For some strange reason, that I have never been able to figure out, the CCIE written exam (Exam # 350-001) has been overloaded with questions relating to Token Ring, Source Route Bridging (SRB), Remote Source Route Bridging (RSRB), Source Route Transparent Bridging (SR/TB) and Source Route Translational (SR/TLB) Bridging!

For as much emphasis of these topics on the exam, you would think that everyone in the world is running Token Ring and bridging all of it! I know there is a lot of Token Ring out there, but give me a break. At the time of this writing the CCIE written is overloaded with this stuff and Cisco should really take a second look at this exam and make some changes.

It is almost as if Cisco wants you to fail the exam the first time by giving you questions about a topic that many of us have never used and for which they themselves do not offer much information about. Cisco would not do that, would they? 8-)

The most often asked question at our web site (CCIEprep.com) always relates to the above areas and understandably so. In all of the classes that my sons and I teach the manuals never cover these topics in such detail as the exams do.

At this moment in time I know of no single source that you can go to pull all of these topics together in a nice compact package.

I have had to piece together information from several different Cisco training manuals and the Cisco Documentation CD to learn as much as I have. And to be honest, I still have some gray areas.

First of all let me explain that I am not a Token Ring expert in all of the installations that I have done over the years I have never installed Token Ring, and as a matter of fact I don't think I have ever supported Token Ring at any site.

This paper will not go into the deep dark recesses of Token Ring.
I will not give you actual test questions.

I will provide information that will help you with the test objectives.

I will give you the information you need to get the Token Ring questions right.

Good luck to all of you in pursuit of CCIE.

Sincerely,

Lou Rossi Sr.

Token Ring/802.5

Over the years I have often said that the world has a way of doing things. Then, there is the IBM way of doing things and they are always at opposite ends of the spectrum.

- The world has ASCII - IBM has EBCDIC.
- The world has “Smart bridges - IBM has “Dumb bridges.
- The world has “dumb” Ethernet cards - IBM has “smart” Token Ring cards.
- The world most significant bit is IBM’s least significant bit.
- The world has reasonably priced computer equipment - IBM has outrageously priced computer equipment.

Well I am sure you have the idea.
With that said lets take a high level view of Token Ring.

As the name Token Ring implies there is a Token and there is a Ring.
Token Ring is a physical Ring and a logical Bus.
If you have the Token, you get to put data on the ring. If you don’t have the Token, you get to sit there and wait. For example if there are 5 hosts ahead of you on the ring and they don’t have any data to transmit. You still have to wait for them to get the Token and for them to release the Token. This is called “deterministic”.

Every time I explain Token Ring in class I always think of the old Saturday Night Live sketch where John Belushi is behind the counter at the bakery and Dan Akroyd walks in and he is the only customer. Belushi makes him take a number and the number is about 115. Then Belushi starts calling off number beginning with 1!

Well that’s Token Ring. You sit and wait until everyone gets the Token and releases the Token even when they have no data to transmit. However the Token passes around the Ring at such a very high rate of speed that this system actually works very well.

When a station places a data frame on the ring the source station has the responsibility to remove the data frame.

If the source station dies the **Active Monitor** will remove the frame. This is one of the duties of the Active Monitor. The Active Monitor is also a timing source that provides additional maintenance functions. The first Token Ring Station inserted into the Ring is usually the Active Monitor.

There is also something called **Early Token Release**. Early Token Release means that a host on the ring can release their Token before they have received verification that the data frame was copied. This means there can be multiple data frames on the ring simultaneously. Multiple Tokens are NOT allowed.

Bridging

Important Points to Remember

- In any bridging environment the source or the destination MAC address are NEVER changed (translational bridging could be considered an exception we will discuss that later).
- Bridges and switches are Layer 2 devices

Transparent Bridging (TB)

Transparent Bridging never changes a frame. The frame, based upon its destination MAC address, is either forwarded across the bridge or filtered. Because of this fact a TB is considered an intelligent device.

Important Points to Remember

- No RIF is ever present.

Source Route Bridging

Source Route Bridging is a method in which multiple rings can be connected together via bridges. The name of this bridging method is derived from the fact the source actually knows the route to the destination.

Again IBM has its own unique way of doing things. Transparent Bridging means that the source is unaware of the fact that a bridge might exist.

Each bridge will be assigned a unique number 1-15, because 4 bits of the RIF are used to describe the bridge. The highest number that can be represented with 4 bits is 15.
IBM also has a limitation of 7 bridges, which means that SRB is not scalable to large networks. The only difference I know of between Token Ring and 802.5 is that 802.5 has a bridge limitation of 13.

How does a Token Ring destination host know where the data is located within the frame.

Destination Address	RII	Source Address	RIF	Data	FCS

A Token Ring host needs the location of the data. The RII bit keys the host off as to whether there is a RIF located within the frame.

0 no RIF
1 RIF is present

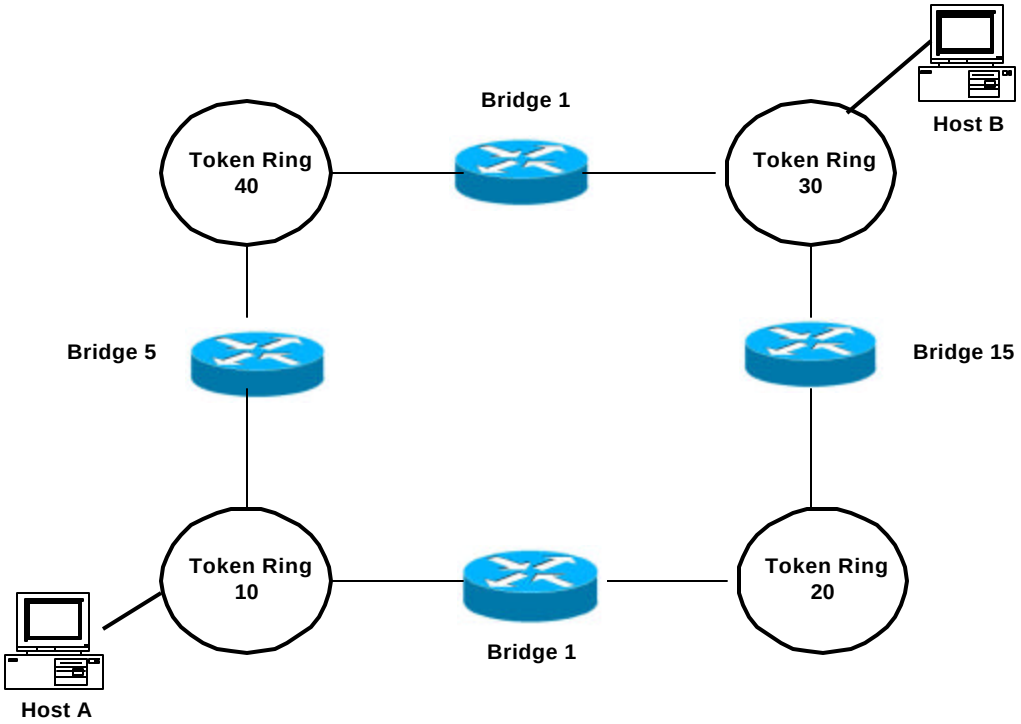
The RII is the first byte of the source MAC address.

If we do the binary to HEX arithmetic any source MAC address that begins with an a-f or 8-9 would signify that a RIF is present.

If the RII bit is 0(zero) the data immediately follows the Source Address.
If the RII bit is 1 the data follows the RIF

How does the source find a path to the destination?

Well let's take a look at the following diagram and we will describe the process.



Assume Host A needs to communicate with Host B.

Host A will ARP for Host B. This ARP broadcast will travel the entire network and to all hosts. Host B will ARP reply with its MAC address. At this point Host A knows the MAC address of Host B but not the location.

The next step is to send a local test frame that will travel around Ring 10. The purpose is to take a shot that Host B is local to Host A and there by saving traffic being sent through out the entire network. In our case, the local test frame will indicate that Host B was not found.

Now, Host A will send out an explorer broadcast frame. This frame will travel the entire network. As the frame crosses a bridge, the Bridge will place its Bridge ID into the RIF. As the frame crosses a ring the ring will insert its Ring ID into the RIF. Eventually, Host B will receive this explorer frame and recognize its on MAC address, and then turn the frame around by setting the direction bit to 1. The fact is that in our example, Host B will receive 2 explorer frames and will turn both of them around.

Host A will get two replies in most cases. The first reply will be the path that Host A will use to get to Host B. All subsequent replies will be ignored.

The RIF

0830.00a1.014f.01e0

The above RIF represents a possible path from Host A to Host B.

- The RIF is made up of 2 fields, RC and RD.
- The RIF is represented in HEX.

Route Control field (RC)

0830	00a1	014f	01e0

The following is a sample of an RC:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
	0					8			3				0		

The **Bits 15-13** (first 3) bits describe the type of packet:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
	0					8			3				0		

0xx Specific Route
10x All rings, all routes
11x Spanning Route

Bits 12-8 (next 5) bits describe the total length of the RIF represented in bytes.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
	0					8			3				0		

In the above example the RC has a value of 0830. The 8 signifies the total length of the RIF.

- A value of “a” means that there are three bridges
- A value of “8” means that there are two bridges
- A value of “6” means there is one bridge

0630.001**1**.019**1**.0030

The above example is not a legal RIF because the 6 means that the total RIF length is 6 bytes and yet we can see that it is eight bytes in length.
I have also bolded the two bridge numbers. If a frame goes over two bridges, the RIF length is 8 bytes.

Bit 7 describes the direction the RIF should be read.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
	0					8			3				0		

0 means the RIF is read from left to right
1 means the RIF is read from right to left

Bits 6-4 (next 3**)** describe the largest frame that will be accepted on this route to the destination:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
	0					8			3				0		

BIT 6	BIT 5	BIT 4	Frame Size
0	0	0	516
0	0	1	1500
0	1	0	2052
0	1	1	4472
1	0	0	8144
1	0	1	11407
1	1	0	17800
1	1	1	64000

Bits 3-0 are always Zero(0).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0
	0					8			3				0		

Route Descriptor field (RD)

0830	00a1	014f	01e0

In decimal form, let's take a look at what the Route Descriptor (RD) field might look like for one of these paths. The RD is part of the RIF that identifies the path the frame took.

Ring 10
Bridge 1
Ring 20
Bridge 15
Ring 30

Or again in decimal form: 101201530, but the RIF is NOT represented in decimal form. It is represented in HEX form.

3 HEX digits are used to describe a Ring
1 hex digit is used to describe a Bridge

0x represents a HEX digit

The 10 becomes an 0xa
The 1 is a 0x1
The 20 is a 0x14
The 15 is 0xf
The 30 is 0x1e

So the RD is: **00a1.014f.01e0**

The RD contains Ring and Bridge identifiers.
The structure of the Route Descriptor (RD) field is ***ring*** **bridge.*ring*** **bridge.*ring*** **bridge** etc.
Since a frame always end on a ring we now know that all RIFs will end with a bridge value of 0!

RIFs always end in zero(0)!

Think about the frame as the frame travels across a bridged network.
The frame begins on a ring, then a bridge, then a ring, then a bridge, and continues in this manner until it reaches the destination host, which of course is on a ring.
A frame is never sent to a bridge.
The frame goes to a Token Ring host, which is on a ring.

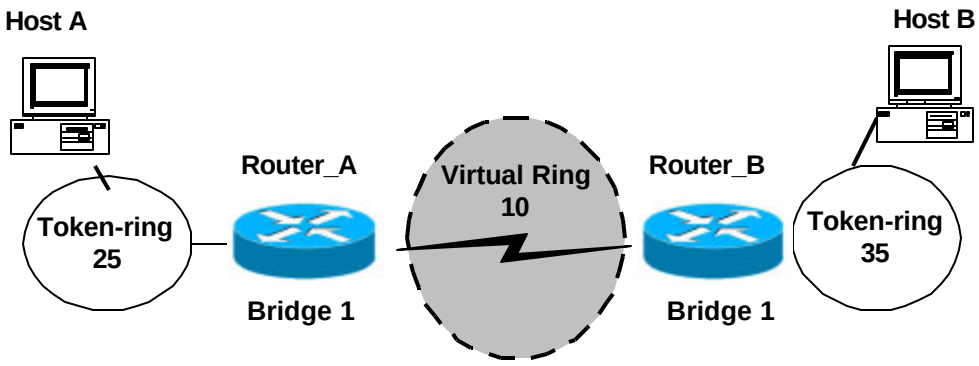
Important Point to Remember

- The RIF is represented in HEX
- The RIF is comprised of the RC and the RD fields
- The RIF will always end in 0 (zero)
- The RIF does NOT contain a MAC address
- The RD field is always the same regardless of the direction of travel

Remote Source Route Bridging (RSRB)

Now that we understand how to read a RIF, the rest is a piece of cake.

RSRB is Cisco's technique for connecting Token Ring networks over non-Token Ring network segments.



In the diagram above the non-Token Ring network segment is the serial connection between ring 35 and ring 25.

One of the limitations of using RSRB is the limitation of 7 total bridges between source and destination.

The reason this limitation exists is because the RIF defines the total path between the source and the destination. DLSw does NOT have this limitation because DLSw terminates the RIF as we shall soon see.

Note that we have two bridge numbers that are NOT unique. This is not a problem because the bridge will always be located between two unique ring numbers.

Assuming RSRB is configured on both routers, a possible RIF value would be:

0830.0191.00a1.0230

A virtual ring must be configured to keep the continuity of the RIF.

The virtual ring number configured on both routers ***must be the same!***
Remember the RD field is constructed of ***ring*** **bridge** ***ring*** **bridge**. If we had two different ring numbers we would need to have a bridge in the middle.

Important Point to Remember

- RSRB maintains the RIF from end-to-end.
- Bridge numbers can be the same
- Virtual Ring Numbers must be the same

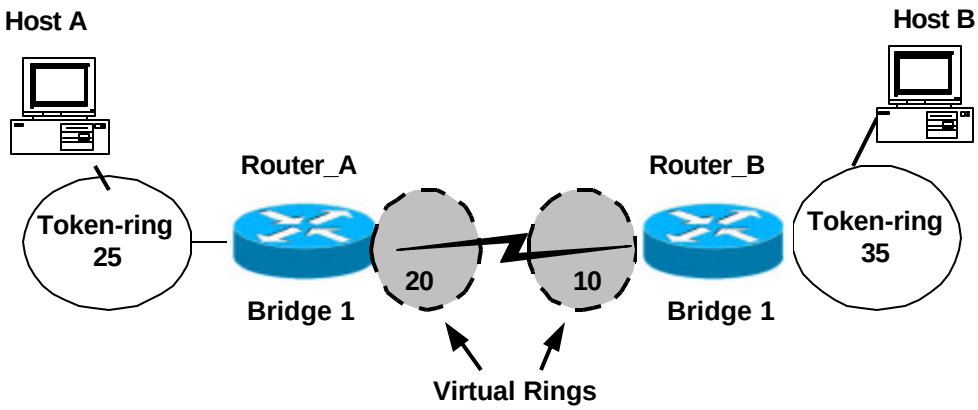
Data Link Switching (DLSW)

The DLSw standard is documented in RFC 1795. One requirement of this standard is that the RIF must be terminated at the DLSw router.

DLSw overcomes several of the limitations of RSRB.

Refer to the diagram below.

We now have two RIFs (one on each side of our serial connection). Notice since we are terminating the RIF, the ***virtual ring numbers need NOT match***.



RIF value at Router_A: **0630.0191.0140**

RIF value at Router_B: **0630.0231.00a0**

Important Point to Remember

- DLSw terminates the RIF
- Virtual Ring numbers need NOT be the same

Data Link Switching Plus (DLSW+)

Source Route Transparent Bridging (SRT)

SRT is used by Token Ring networks, where some Token Ring hosts are performing source route bridging (SRB) and some hosts are performing transparent bridging (TB).

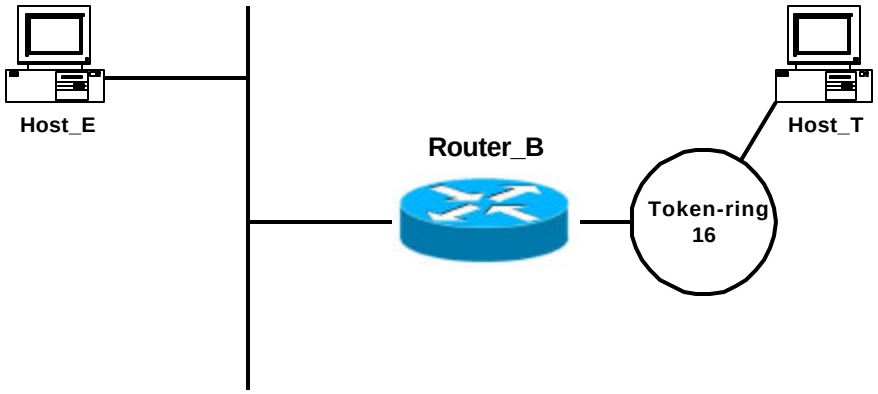
There is no translation provided by SRT. In other words, an ethernet host can NOT communicate with a Token Ring host.

SRT provides for Token Ring to Token Ring communication only.

Important Points to Remember

- SRT bridging does not support Ethernet to Token Ring communication.

Source Route Translational Bridging (SR/TLB)



Given:

Router_B is configured as a SR/TLB
Host_T with a MAC address of 0110.1234.5678.
Host_E with a MAC address of 0060.09c3.df60
Ehthernet address of Router_B is 0060.09d3.df60
The Token Ring interface of Router_B is 0110.1256.8765
Host_T sends a frame of data to Host_E

SRTLB allows for communication between Ethernet and Token Ring hosts. In order for communication to occur translation of the frame must take place. There are several issues related to converting the frame including, but not limited to:

- RIF Removal
- RIF Insertion
- BIT ordering
- Maximum Transmission Unit (MTU)

RIF

As we learned earlier there is no RIF in an Ethernet frame. So if Host_T were to communicate to Host_E Router_B would have to remove the RIF.

Alternatively if Host_E were to communicate to Host_T a RIF would have to be inserted into the Token Ring frame.

Bit Ordering

If Host_T send a frame to Host_E the MAC address of Host_T would be represented as the source address on the Etherent segment.

But Ethernet and Token Rings use opposite or swapped bit ordering.

This MAC address of Host_T on the ethernet segment would appear as 8008.482c.6a1e.

The following will serve as an explanation:

Token Ring MAC	**0**	**1**	**1**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	0000	0001	0001	0000	0001	0010	0011	0100	0101	0110	0111	1000
After Bit Swap	**8**	**0**	**0**	**8**	**4**	**8**	**2**	**c**	**6**	**a**	**1**	**e**
	1000	0000	0000	1000	0100	1000	0010	1100	0110	1010	0001	1110

Important Points to Remember

- SR/TLB supports communication from Ethernet to Token Ring and vice versa.
- Token Ring and Ethernet Links use opposite or “swapped” bit orderings in relationship to each other
- SR/TLB will add and remove RIFs

- SR/TLB has to contend with maximum frame lengths
- There is no RIF on the ethernet segment

Canonical vs Non-Canonical

Canonical is the way we expect to see things. For instance when looking at baseball line scores We always expect the home team to be listed at the bottom.

Mets 000 000 006
Yanks 001 002 001

This line score tells us the Yanks played at home (it also tells us they lost!) :-)

Non-canonical is not the way that you would expect to see things.

Mathematically you expect to see X+4 NOT 4+X. Of course it is not as though 4+X is wrong it is just not the way you expect to see it!

Since the MAC address bits of a Token Ring host are swapped when compared to the Ethernet MAC address bit order. The following is true:

Ethernet is said to be canonical, because that is the way we expect to see the MAC address.

Token-Ring is said to be non-canonical, because it is not the way we expect to see the MAC address!

Exercises

Short Answer

1. When is a Token Ring station “allowed” to put data on the network?

2. What station has the responsibility to remove a data frame from the Ring?

3. If the source host is not available to remove the data frame what procedure takes place?

4. What is Early Token Release?

5. There can be multiple data frames on the ring at any one time. (T/F)

6. There can be multiple Tokens on the ring at any one time. (T/F)

7. Collisions are common on a Token Ring network? (T/F)

Multiple Choice

Question 1.[TxPx] What are two major problems with bridging between two dissimilar media? i.e. bridging between Token Ring and Ethernet and FDDI and ethernet

a) bit-ordering
b) MTU
c) media contention
d) ring speed
e) broadcast

Question 2. [TxPx] Which of the following is true of Source Route Transparent Bridging? (answer all that apply)

a) allows communication between Ethernet and Token Ring hosts
b) will insert a RIF when communicating to a Source Route Bridge
c) will remove a RIF when communicating to a Transparent Bridge
d) frames that don't have a RIF never gain a RIF, frames that have a RIF never loose a RIF
e) when the RII bit is set to 1 frames will be transparently bridged

Question 3. [TxPx] Which of the following is true of Source Route Translational Bridging (SR/TLB) (answer all that apply)

a) allows communication between Ethernet and Token Ring hosts
b) will insert a RIF when communicating from a Transparent Bridge domain to a Source Route Bridge domain
c) will remove a RIF when communicating from a Source Route Bridge domain to a Transparent Bridge domain
d) multiple paths may exist between SRB and TB domains
e) it may be necessary to configure MTU manually

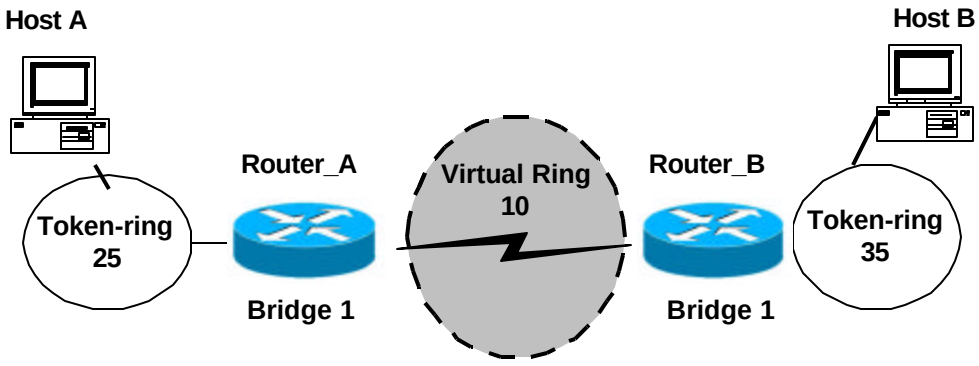
Question 4.[TxPx] Which of the following are true of Source Route Translational Bridging?

a) Mac addresses will appear the same on both a Token Ring and an Ethernet Link
b) Ethernet links will "bit swap" the MAC addresses of a Token Ring link
c) Ethernet and Token Ring use opposite "bit ordering" in relation to each other
d) None of the above

Question 5. [TxPx] Which of the following is a possible "legal RIF"? (answer all that apply)

a) 0630.0011.0191.0030
b) 0630.0011.0191
c) 0630.0011.0190
d) 0630.0011.0191.0030
e) 0830.0011.0191.0031

Questions 6-12 relate to the following diagram:



Question 6. [TxPx] Assume Remote Source Route Bridging (RSRB) is configured on both routers which of the following are true:

a) The Virtual Ring numbers can be different on both bridges
b) Virtual Ring numbers must be the same on both bridges
c) When Host A communicates to Host B the RIF will contain the entire path
d) The Route Description (RD) field will change based upon the direction the frame travels
e) The Route Control (RC) field will change based upon the direction the frame travels

Question 7. [TxPx] Assume Data Link Switching (DLSw) is configured on both routers. Which of the following are true:

a) The virtual ring numbers can be different on both bridges
b) Virtual Ring numbers must be the same on both bridges
c) When Host A communicates to Host B the RIF will contain the entire path
d) The Route Description (RD) field will change based upon the direction the frame travels
e) The Route Control (RC) field will change based upon the direction the frame travels

Question 8. [TxPx] If RSRB is configured at both routers which of the following could represent a RIF.
(Choose the best answer)

a) 0830.0191.00a1.0230
b) 0630.0191.00a1.0230
c) 0830.0191.00a1.0231
d) 0630.0191.00a1
e) 0830.0251.0101.0350

Question 9. [TxPx]If DLSW is configured at both routers which of the following could represent a RIF.
(Choose all correct answers)

a) 0830.0191.00a1.0230
b) 0630.0191.00a0
c) 0830.0191.00a1.0231
d) 0630.00a1.0230
e) 0830.0251.0101.0350

Question 10. [TxPx] When Host A sends a frame to Host B what is the destination MAC address on Host A's Token Ring segment?

a) MAC of Host A
b) MAC of Host B
c) Serial MAC of Router A
d) Token Ring MAC of Router B
e) Token Ring MAC of Router A

Question 11. [TxPx] When Host A sends a frame to Host B what is the source MAC address on Host B's Token Ring segment?

a) MAC of Host A
b) MAC of Host B
c) Serial MAC of Router A
d) Ethernet MAC of Router B

e) Ethernet MAC of Router A

Question 12. [TxPx]Assume Transparent Bridging is configured on both Routers. Which of the following would be the value of the RIF on Host B's Token Ring segment.

a) 0830.0191.00a1.0230
b) 0630.0191.00a1.0230
c) 0830.0191.00a1.0231
d) 0630.0191.00a1
e) None of the above

Question 13. [TxPx] Enabling forwarding of spanning-tree explorers is recommended:
(choose the best answer)

a) in all transparent bridged (TB) networks
b) in all SRB environments
c) In complex SRB environments
d) in all SR/TLB environments
e) is never recommended

Question 14. [TxPx] In a Token Ring MAC frame, the RIF route descriptor field contains the following information: [Choose all that apply)

a) Mac Address
b) ring number
c) explorer type
d) length of RIF
e) direction in which the RIF should be read
f) largest frame size
g) bridge number

Question 15. [TxPx] In a Token Ring MAC frame the RIF route control field contains the following information:
[Choose all that apply)

a) Mac Address
b) ring number
c) explorer type
d) length of RIF
e) direction in which the RIF should be read
f) largest frame size
g) bridge number

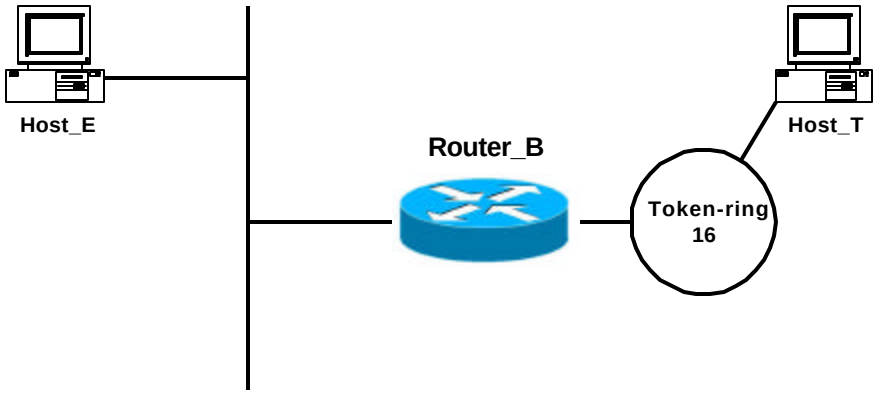
Question 16. [TxPx] What is the purpose of the "source-bridge proxy-explorer" command?

a) Enables a Token Ring interface to send explorer packets
b) Enables a Token Ring interface to participate in Spanning-Tree
c) Enables SRB in a Transparent Bridge environment
d) Allows an interface to convert explorer packets to specifically routed frames
e) none of the above

Question 17. [TxPx] If Host_T communicates with Host_E, which of the following represents the RIF on the ethernet segment?

a) 0830.0191.00a1.0230
b) 0630.0191.00a1.0230

c) 0830.0191.00a1.0231
d) 0630.0191.00a1
e) None of the above



Given:

Router_B is configured as a SR/TLB
Host_T with a MAC address of 0110.1234.5678.
Host_E with a MAC address of 0060.09c3.df60
Ehthernet address of Router_B is 0060.09d3.df60
The Token Ring interface of Router_B is 0110.1256.8765
Host_T sends a frame of data to Host_E

Referring to the diagram and the given of question 17.

Question 18. [TxPx] Assuming that Host_T sends a frame to Host_E, which of the following represents the source MAC address as it would be represented on the Ethernet segment?

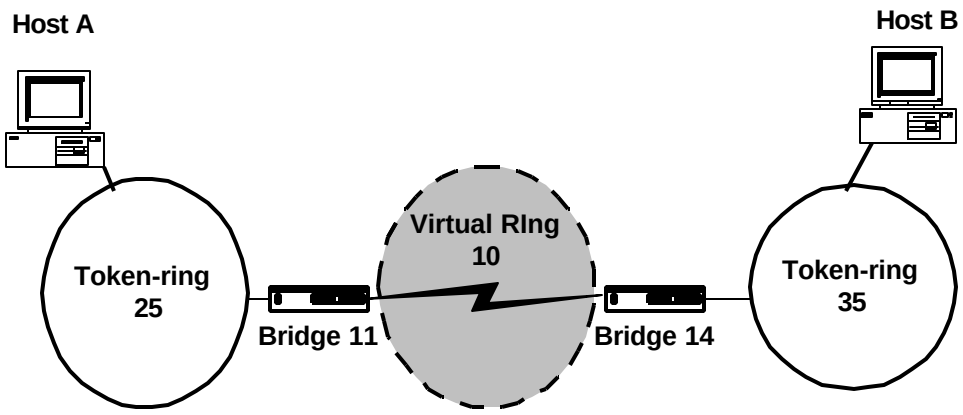
a) 0110.1234.5678.
b) 0060.09c3.df60
c) 0060.09d3.df60
d) 0110.1256.8765
e) None of the above

Referring to the diagram and the given of question 17.

Question 19. [TxPx] Assuming Host_T sends a frame to Host_E, which of the following represents the source MAC address as it would be represented on the Ethernet segment?

a) 0110.1234.5678.
b) 0060.09c3.df60
c) 0060.09d3.df60
d) 0110.1256.8765
e) 8008.482c.6a1e

Questions 20-24 refer to the following diagram:



20. (TxPx) Assume Source Route Bridging (SRB) is configured and Host A knows the location of Host B and sends a frame to Host B.
What is the value of the most significant bit of the source MAC address?

a) 0
b) 1
c) Cannot be determined

Since SRB is configured, Host A will set the Routing Information Indicator (RII) bit to 1.
The RII bit is the most significant bit of the source MAC address.

21. (TxPx) Assume Source Route Bridging (SRB) is configured and Host A knows the location of Host B and sends a frame to Host B.
With in the frame, what follows Host A's MAC address?

a) Data
b) RIF
c) Host B's layer 3 address
d) Host A's Layer 3 address
e) Can not be determined

Since SRT is configured Host A will set the Routing Information Indicator bit to 1. As a result Source Route Bridges will know that a Routing Information Field (RIF) follows the Source address.

22. (TxPx)Assume Source Route Bridging(SRB)is configured and Host A sends a frame to Host B.
Which of the following would best describes the contents of the RIF at Host B?

a) 0630.019b.00ae.0230
b) 2511.1014.3500
c) 0830.2511.1014.3500
d) 0830.019b.00ae.0230

e) None of the above

The RIF is represented in HEX. If the ring and bridge numbers are given to you in decimal you will have to convert.
The RIF is made up of 2 fields the RD and the RC.

23. (TxPx) Assume Data Link Switching (DLSw) is configured and Host A sends a frame to Host B.
Which one of the following would be the RIF at Host B?

a) 0630.019b.00ae.0230
b) 2511.1014.3500
c) 0830.2511.1014.3500
d) 0830.190b.00ae.0230
e) None of the above

One of the advantages of DLSw is that the RIF is terminated on each end which can make the token ring environment more scalable. IBM Token Ring has a limitation of 8 rings and 7 bridges. Since the RIF is terminated the first ring in the RIF will be the virtual ring 10. Which gives us a RIF of:
0630.00ae.0230

HINT: Since DLSw will terminate the RIF it is not required that the virtual rings configured on our routers have the same value. In our case I show a single virtual ring, but in actuality there are two virtual rings configured one on each router. The router on the right could have a value of 10 the router on the left could have a value of 20.
This is not the case of RSRB the virtual ring values must match because the RIF is end to end route information.

24. (TxPx) If communication was to go from Host B to Host A assuming RSRB what would be the value of the Route Descriptor Field?

a) 019b.00ae.0230
b) 2511.1014.3500
c) 3514.1011.2500
d) 023e.ooab.1900
e) None of the above

Answer the RD does not change when the frame flows in the opposite direction. The only bit that changes is the direction bit. The direction bit is part of the Route Control Field (RC).

25. (TxPx) Which of the following is **NOT** true?

a) The RIF contains Bridge information
b) The RIF contains Ring information
c) The RIF contains Packet Type information
d) The RIF contains MAC address information
e) The RIF indicates what direction the RIF should be read

Answers

Short Answer

1. When is a Token Ring station “allowed” to put data on the network?

When it has the Token.

2. What station has the responsibility to remove a data frame from the Ring?

Source Host

3. If the source host is not available to remove the data frame what procedure takes place?

The Active Monitor will remove the data frame.

4. What is Early Token Release?

A station releasing a Token before receiving verification that the data frame was copied.

5. There can be multiple data frames on the ring at any one time. (T/F)

True

6. There can be multiple Tokens on the ring at any one time. (T/F)

False

7. Collisions are common on a Token Ring network? (T/F)

False

Multiple Choice

Answer1

a) bit-ordering
b) MTU

Answer 2

d) frames that don't have a RIF never gain a RIF, frames that have a RIF never loose a RIF

Answer 3

a) allows communication between Ethernet and Token Ring hosts
b) will insert a RIF when communicating from a Transparent Bridge domain to a Source Route Bridge domain
c) will remove a RIF when communicating from a Source Route Bridge domain to a Transparent Bridge domain
e) it may be necessary to configure MTU manually

Answer 4

b) Ethernet links will "bit swap" the MAC addresses of a Token Ring link
c) Ethernet and Token Ring use opposite "bit ordering" in relation to each other

A MAC address on the Token Ring link will not appear the same on the Ethernet link due to " bit swapping".

Answer 5

c) 0630.0011.0190

Answer 6

b) Virtual Ring numbers must be the same on both bridges
c) When Host A communicates to Host B the RIF will contain the entire path
e) The Route Control (RC) field will change based upon the direction the frame travels

RSRB is not scalable because the entire path is maintained in the RIF and there is a limitation of 7 bridges.
Because the RIF is maintained end to end the virtual ring numbers of both bridges must match.

One of the advantages of DLSw is that the RIF is terminated.
DLSw is scalable because of this fact.

One of the bits of the RC is direction which tells the bridge in what direction the RIF should be read. The Route Descriptor field does not change.

Answer 7

a) The virtual ring numbers can be different on both bridges
e) The Route Control (RC) field will change based upon the direction the frame travels

Since DLSw terminates the RIF, it is of no consequence that the virtual ring numbers of the bridges are different.

Answer 8

a) 0830.0191.00a1.0230

Keep in mind the RIF is represented in HEX.
The virtual ring value used is 10 or 0xa.

Answer 9

b) 0630.0191.00a0
d) 0630.00a1.0230

DLSw terminates the RIF.
The above answers are the RIF as they would be represented on each side.

Answer 10

b) MAC of Host B

Answer 11

a) MAC of Host A

This is bridging.
It does not make any difference what kind of bridging, it still takes place at Layer 2.
MAC addresses are used to determine location.
Bridges take frames and pass them along or they filter
A bridge does not insert new MAC addresses into a frame.

Answer 12

e) None of the above

Transparent Bridging and a RIF I don't think so!

Answer 13

c) In complex SRB environments

When a source does not know the location of the destination device the source will send an explorer packet. There are two types of explorer packets.

All-routes Explorers
Spanning –Tree Explorers

An All-routes Explorer, as the name implies, takes all possible routes on its way to the destination. In a complex network, this is not a good thing. The amount of traffic generated can be considerable.

Spanning-Tree Explorers solve this problem by sending packets to a defined group of nodes. The administrator can statically assign interfaces that will forward Spanning-Tree Explorers and assign interfaces that will block them. The administrator could also use spanning-tree algorithm to automatically set a single route explorer.

Answer 14

b) ring number
g) bridge number

The route descriptor field is made up of ring and bridge numbers only.

Answer 15

c) explorer type
d) length of RIF
e) direction in which the RIF should be read
f) largest frame size

The first 2 bytes of a RIF is the Route Control field.

Answer 16

d) Allows an interface to convert explorer packets to specifically routed frames

A bridge may receive an explorer packet looking for a destination MAC. If the bridge has RIF information for that destination MAC, the bridge will change the explorer packet to a specifically routed frame there by reducing traffic.

Answer 17

e) None of the above

There is no RIF in an Ethernet frame.

Answer 18

e) None of the above

Because we are bridging, the source MAC address will be that of Host_T, but bit swapping will take place therefore we know that the source MAC address on the ethernet segment will NOT be the "original" MAC addresses of Host_T

Answer 19

e) 8008.482c.6a1e

The following illustrates the bit swapping.

Token Ring MAC	**0**	**1**	**1**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	0000	0001	0001	0000	0001	0010	0011	0100	0101	0110	0111	1000
After Bit Swap	**8**	**0**	**0**	**8**	**4**	**8**	**2**	**c**	**6**	**a**	**1**	**e**
	1000	0000	0000	1000	0100	1000	0010	1100	0110	1010	0001	1110

Answer 20

b) 1

Since SRB is configured, Host A will set the Routing Information Indicator (RII) bit to 1.
The RII bit is the most significant bit of the source MAC address.

Answer 21

b) RIF

Since SRT is configured Host A will set the Routing Information Indicator bit to 1. As a result Source Route Bridges will know that a Routing Information Field (RIF) follows the Source address.

Answer 22

d) 0830.019b.00ae.0230

The RIF is represented in HEX. If the ring and bridge numbers are given to you in decimal you will have to convert.
The RIF is made up of 2 fields the RD and the RC.

Answer 23

e) none of the above

One of the advantages of DLSw is that the RIF is terminated on each end which can make the token ring environment more scalable. IBM Token Ring has a limitation of 8 rings and 7 bridges. Since the RIF is terminated the first ring in the RIF will be the virtual ring 10. Which gives us a RIF of:

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HINT: Since DLSw will terminate the RIF it is not required that the virtual rings configured on our routers have the same value. In our case I show a single virtual ring, but in actuality there are two virtual rings configured one on each router. The router on the right could have a value of 10 the router on the left could have a value of 20.
This is not the case of RSRB the virtual ring values must match because the RIF is end to end route information.

Answer 24

a) 019b.00ae.0230

Answer the RD does not change when the frame flows in the opposite direction. The only bit that changes is the direction bit. The direction bit is part of the Route Control Field (RC).

Answer 25

d) The RIF contains MAC address information