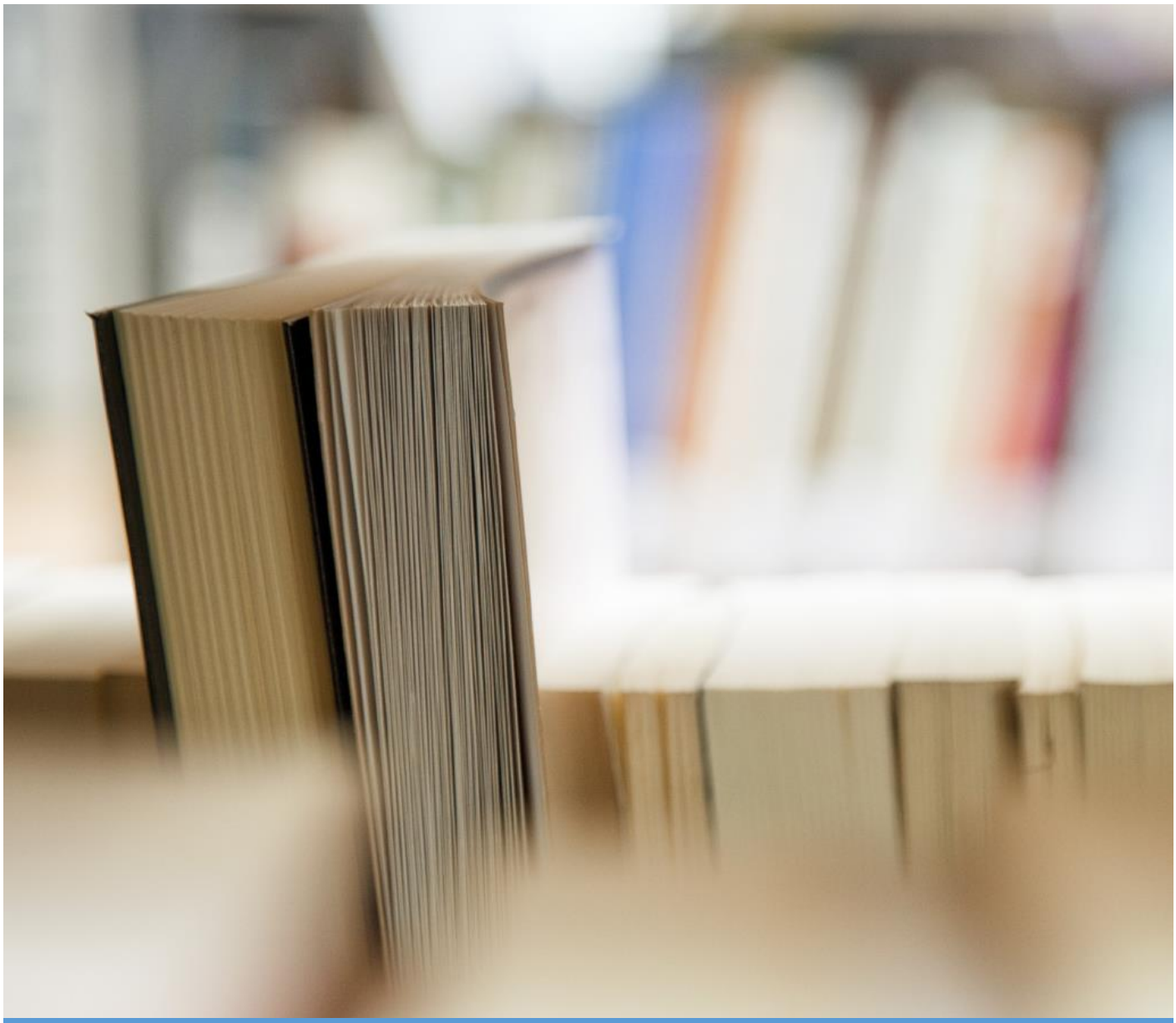


Ornio Scenario

Orhan Ergun

Introduction:

Ornio is a company that has been engaged in the production of high quality carpets, and it's one of the most well-known carpet brands worldwide in the field of carpet manufacturing. They produce Iranian, Indian and Turkish carpets in their 80 production facilities.

Ornio was created as a workshop but by the time they have expanded their brand to many countries because of their excellent quality carpets and accessories.

Today the Ornio boasts turnover of more than 80million usd, 70% of which is due to continuously increasing exports and product offerings.

The group's headquarters is located in Turkey, one of the most famous districts in the carpet industry, and includes a main office alongside several production facilities.

Additionally, there are also other operational offices abroad, a distribution network that includes branches in the Dubai, Qatar, India, Egypt, and Iran constituting an organization of sales based on retailers located in over 30 countries throughout in the Middle East, Europe and Unites States. They have around 800 stores in total and growing very fast.

Ornio's datacenter is located in Istanbul, Turkey. Currently they have only one datacenter and started to consider second datacenter for disaster recovery purpose.

Entire IT team is located in Turkey, Ornio handles their IT operations in the remote offices through local service contractors.

All of the applications of Ornio reside in the Datacenter; there are no data or voice applications in the branch offices. Ornio uses IP telephony solution for their voice communication between the branches and Head Quarter offices.

Their call manager and Voice gateways are located in the datacenter. For redundancy purpose, they use two voice gateways for incoming and outgoing voice traffic in the datacenter.

Also they have subscriber and publisher call managers for optimal resource usage and high availability.

All the branch offices of Ornio is connected to single head Quarter router via Frame Relay circuit. Currently there is only one connection from all the branches.

There is no frame relay connection between the branch offices so all the traffic between branches offices go through the Head Quarter.

Branch offices have their own Internet connection. Ornio is considering to build a backup VPN connection over the Internet.

Although it is acceptable for them to not having encryption over the Frame Relay, they definitely want to have an encryption over the Internet if they setup secondary VPN connections as backup.

Company recently had many problems with their routing infrastructure and decided to outsource the control of their routing infrastructure to the Service Provider.

Also they want to have better Quality of Service for their Voice Traffic and they want to have direct communication between their branch offices. Although overall bandwidth required for the voice is low on the network, it is one of the highly critical applications for Ornio.

Due to their increasing bandwidth need, Ornio has concerns with their Frame Relay WAN network. If they want to upgrade their WAN bandwidth it should be immediate and flexible.

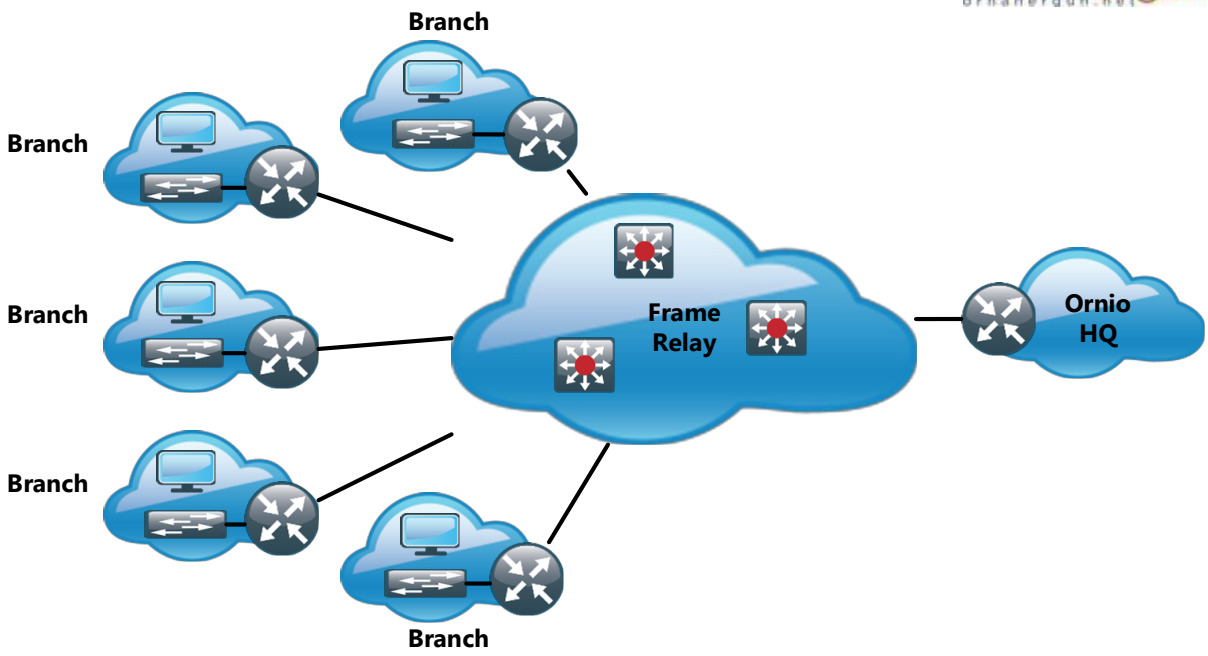


Figure: Network Diagram

Q) What is the concern of Ornio with their Voice communication?

a) It is not encrypted
b) There is no loss, jitter, latency guarantee over Frame Relay
c) Frame Relay is a legacy solution which doesn't offer higher rate bandwidth if it is needed
d) Their Frame Relay network is hub and spoke based. Voice communication is not optimal

Q) Should Ornio change their Frame Relay WAN?

a) Yes
b) No

Q) Which solution Ornio should choose for their Frame Relay WAN Replacement?

a) IPSEC VPN over Internet
b) IPSEC with Frame Relay

c) MPLS VPWS
d) VPLS
e) MPLS L3 VPN

Q) Why? (Choose all that apply)

a) It can support encryption
b) It can provide hub and spoke VPN for Onion, so they don't need to change their existing infrastructure
c) It provides full mesh communication pattern
d) Ornio can outsource their WAN network to the service provider
e) It can provide better QoS control compare to layer 2 VPNs

Q) Which additional information do you need from Ornio to start migration their WAN network? (Choose all that apply)

a) Their QoS Policy
b) Their Application traffic pattern
c) Their routing information
d) Hardware capabilities
e) Does service provider have L3 VPN Offering in every site?

E-Mail 1 is Available:

***From**: Levent Tokgoz (levent_tokgoz@ornio.com)*
***To**: Orhan Ergun (orhan@orhanergun.net)*
***Subject**: WAN Routing and Service Provider Reach*

Orhan,
We have several problems with our Wide Area network recently and decided to continue with MPLS Layer 3 VPN offering. We want to have very smooth migration, we can't tolerate to lose connectivity to our branches.

Our local Service Provider has its own POP location at all our branch office locations as well as at the Head Quarter except United States branches.

We have 25 stores throughout the United States and we want to connect them via MPLS layer 3 VPN. I talked with our Service Provider account manager, He said, it is long distance Inter-AS service and costly but we are okay with that.

We are currently using EIGRP as a routing protocol over the frame relay connections. We have one router at all the branches, which does layer 3 routing between local area network Vlans.

We want to have the ability to engineer our WAN whenever we want without asking from the service provider.

We know that with MPLS Layer 3 VPN, the Service Provider will control our routing mostly but we still want to influence as much as we can.

This is very big project for us and we want to have full visibility from your site.

Thanks,
Levent Tokgoz
Network and Security Director
Ornio Group
Maslak/Istanbul
26674

Q) Should Ornio change their routing protocol?

a) Yes
b) No

Q) Which routing protocol Ornio should choose?

a) OSPF
b) ISIS
c) RIPv2
d) Static Routing
e) BGP

Q) Why?

a) Not all service providers support EIGRP
b) It is Cisco owned protocol so Ornio do not want to be vendor locked
c) If they want to do traffic engineering over their WAN ; they can have this ability without service provider communication
d) They can carry more prefixes over BGP more than any other routing protocol
e) They can send non-IP traffic over BGP

Q) Should Ornio use the same AS on every location or unique AS per location?

a) Same AS
b) Unique AS

Q) Why? (Choose all that apply)

a) Using unique AS per site limits the number of customer sites to number of available BGP AS
b) Using unique AS may require allocation of AS numbers outside of AS numbers private range
c) Not all service providers allow using unique AS number per location
d) Requires very careful attention to avoid AS collision
e) Using the same AS is the common practice

E-Mail 2 is Available:

***From**: Levent Tokgoz (levent_tokgoz@ornio.com)*
***To**: Orhan Ergun (orhan@orhanergun.net)*
***Subject**: New WAN Routing Protocol*

Hi Orhan,

As per your recommendation, we are okay to continue with the BGP as a new WAN routing protocol

But we want to know what could be the problem with BGP. If there is something from the Service Provider side that can be done, let us know. We can accept to have some amount of configuration in order for the solution to work but if the configuration is required on every site, we prefer Service Provider to do it.

Thanks,

Levent Tokgoz
Network and Security Director
Ornio Group
Maslak/Istanbul
26674

Q) Is there any problem of using same AS Number on everywhere?

a) Yes
b) No

Q) What is the problem of using same BGP AS # everywhere?

a) It requires redistribution from VRF to MP-BGP on the PEs
b) BGP loop prevention mechanism rejects prefixes if the same AS # is seen in the AS path
c) BGP Fast Reroute mechanism can be implemented with the same AS # everywhere design
d) Service provider should remove private AS number if it will be announced to the Internet
e) No site unique characteristics can be identified from the AS path

Q) How can the same AS on every location problem be solved?

a) Use unique AS per location
b) Service Provider can override the AS Path so customer sites don't receive their AS number in the path.
c) Using MPLS in the Provider Network Customer still can allow the same AS path to be received by changing the way of BGP loop prevention
d) It is not a problem with single homed site, unless Ornio multi-homed their site, it is not a problem.

Q) Does BGP AS-override configuration on the Service Provider side create any issue?

a) Yes
b) No

Q) What is the problem with BGP AS-override configuration at the Service Provider side?

a) Service Provider BGP configuration become more complex
b) BGP routing loop at the multi-homed customer site
c) Customer BGP configuration become more complex

d) Some customer sites still reject the BGP prefixes due to its own AS # in the BGP update
e) It is not supported on the BGP route reflector

Q) Does BGP AS-override configuration at the service provider PE create a problem at the Ornio sites?

a) Yes
b) No

Q) Please provide the necessary steps in the correct order for Ornio's MPLS L3VPN migration:

1) Remove the old Frame Relay circuit from the transit site
2) Establish a BGP connection over the MPLS circuit
3) Arrange the routing protocol metric to choose MPLS over Frame Relay
4) Establish a new circuit at the transit site
5) Choose a transit site for the communication between migrated and non-migrated sites
6) Establish a new circuit at the remote site
7) Remove the old Frame Relay circuit from the remote site
8) Enable Quality of service and monitoring for the new MPLS connection

E-Mail 3 is Available:

***From**: Levent Tokgoz (levent_tokgoz@ornio.com)*
***To**: Orhan Ergun (orhan@orhanergun.net)*
***Subject**: MPLS Layer 3 VPN Migration and Multicast Service*

Hi Orhan,

It was great achievement. Thanks for helping us for the MPLS migration.

Although we do not have superior expertise in BGP, we followed your advice and chose BGP as a WAN protocol, although our service provider could offer EIGRP as a WAN protocol which we are comfortable with, as you indicated, BGP will provide us the traffic engineering capability.

However, we want to implement a new multicast application over our WAN.

We will have two media servers located at the data center. We want to send the new corporate training videos when it is available to some of our branches at the same time. We do not need to have any multicast stream from the branch offices toward the data center.

As per our discussion with the service provider, they are providing a multicast service over the MPLS L3VPN.

We heard that multicast PIM-BiDir minimizes the resource requirement on the routers but we want to get your advice.

Thanks,

Levent Tokgoz
Network and Security Director
Ornio Group
Maslak/Istanbul
26674

Q) Please provide the correct answers for each item in the below chart:

	PIM SSM	PIM ASM	PIM BiDir
Minimum amount of state in the router	☐	☐	☐
Most optimal routing	☐	☐	☐
Requires RP	☐	☐	☐
Works with IGMPv2	☐	☐	☐
RP Load Balancing	☐	☐	☐

Q) Should Ornio use PIM BiDir between HQ and the remote offices over MPLS L3VPN?

a) Yes
b) No

Q) Why Ornio should not use PIM BiDir for their multicast traffic?

a) Their application is point to multipoint, so PIM SSM or ASM is more suitable
b) Service Provider cannot have data MDT for their Rosen GRE multicast implementation
c) Not every router supports PIM BiDir in Ornio network
d) PIM BiDir requires much more configuration compared to PIM ASM and SSM

Q) What Ornio would do to carry multicast traffic if their service provider would not support for multicast for the MPLS L3VPN service? (Choose all that apply)

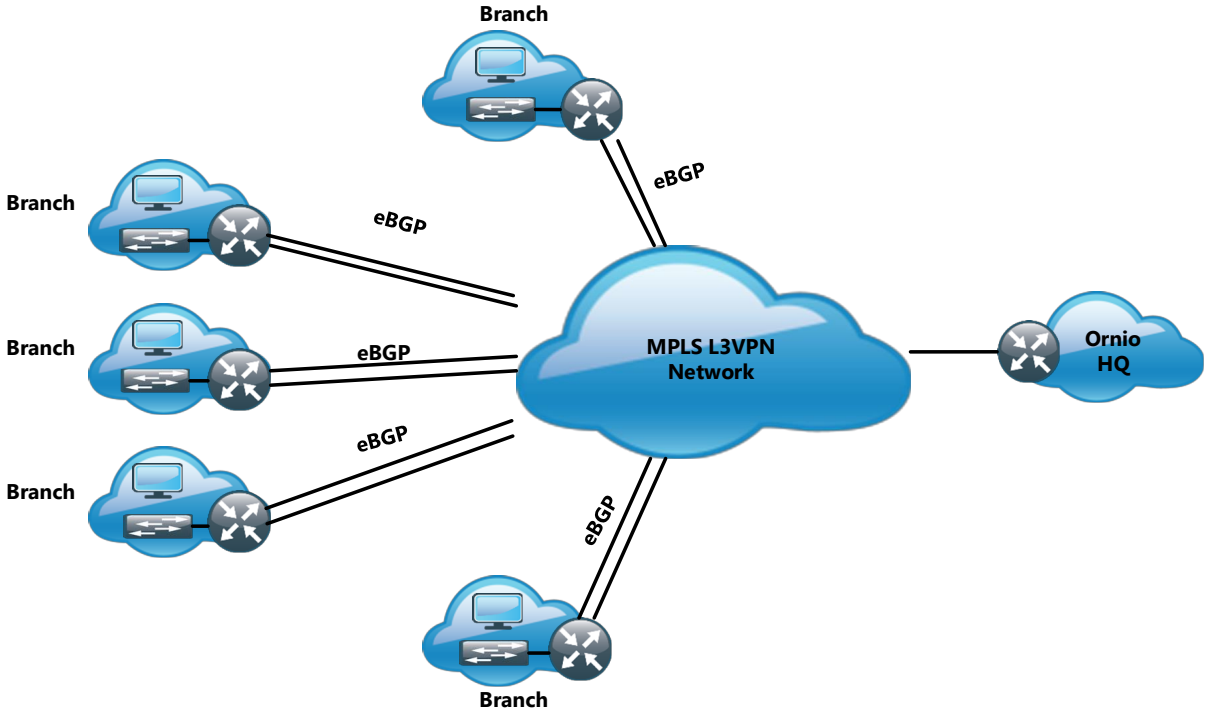
a) Nothing, multicast traffic passes as unicast over the service provider
b) Service Provider needs to have multicast
c) Ornio could create overlay tunnels on top of the Service Provider
d) Change MPLS layer 3 VPN to layer 2 VPN

Q) Do you need additional information for Ornio's future redundancy plan for the branch offices?

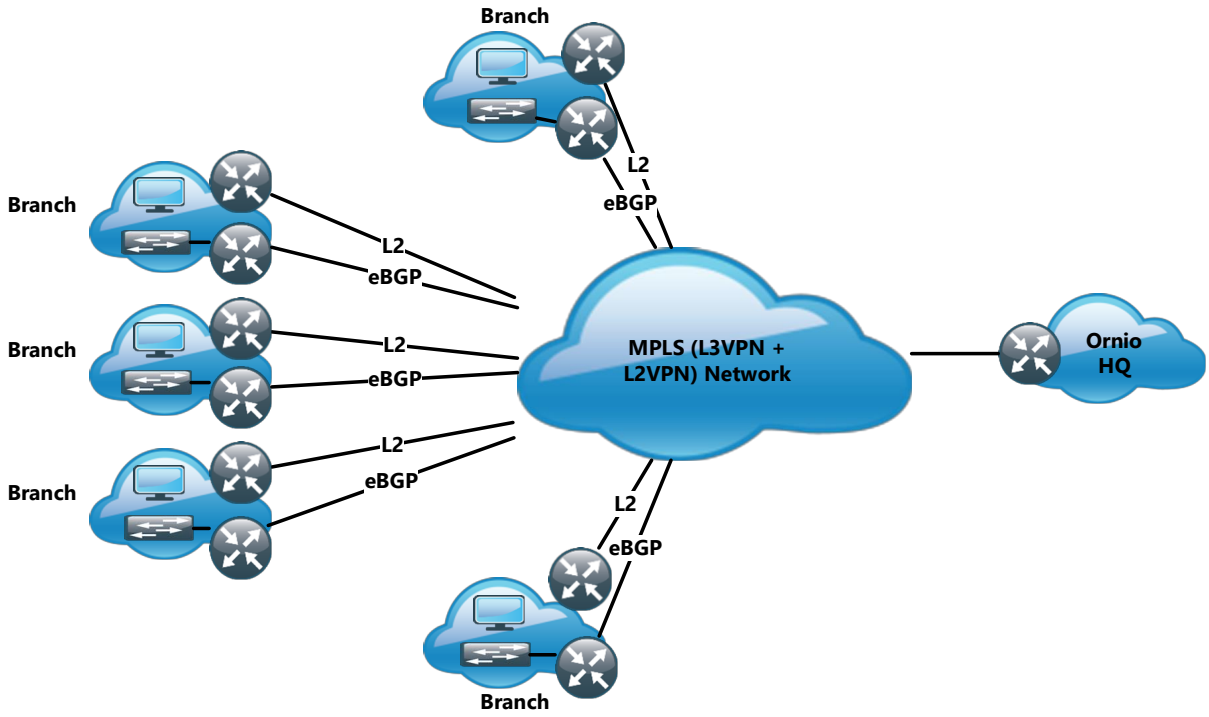
a) Yes
b) No

Q) Which of the below topologies would you recommend for the Wide Area Network based on Ornio's business requirement?

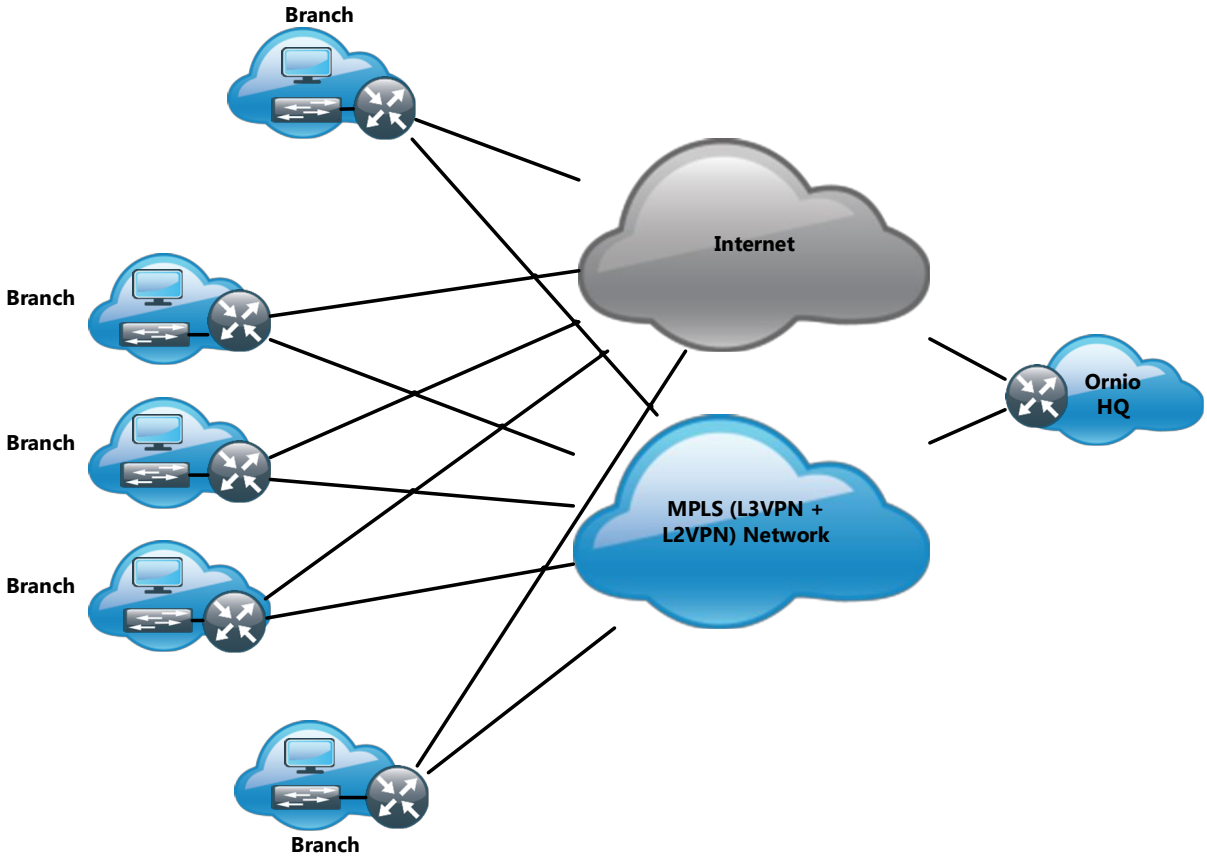
a)



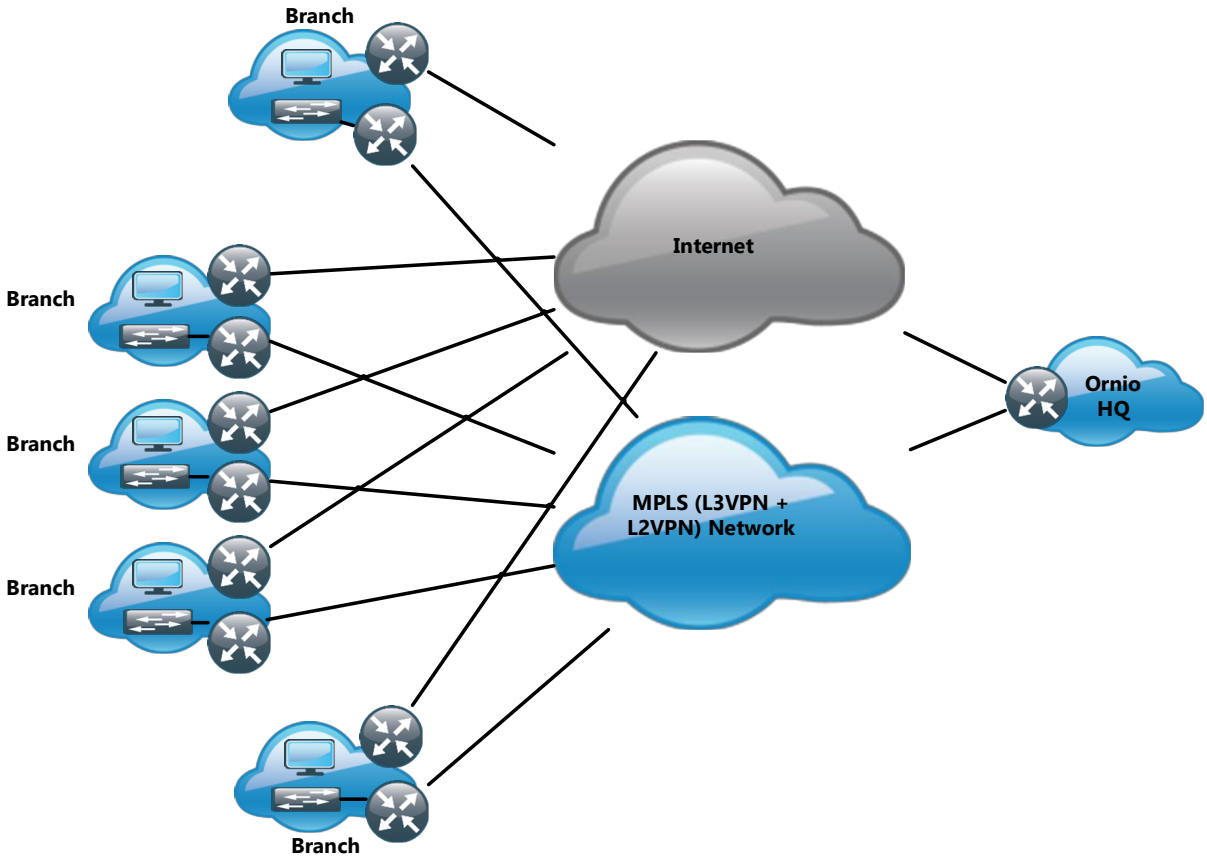
b)



c)



d)



Q) Which below overlay technology you would recommend to deploy for the Internet as a backup for Ornio's new WAN design to minimize OPEX?

a) GRE
b) IPSEC
c) GRE+IPSEC
d) DMVPN
e) GETVPN

Q) Which DMVPN phase should be chosen to start overlay tunnel deployment for Ornio? (Choose all that apply)

a) Phase 1
b) Phase 2
c) Phase 3
d) Phase 4
e) Phase 1 and 2

Q) Which routing protocol over the DMVPN network would you recommend to be implemented?

a) ISIS
b) OSPF
c) BGP
d) EIGRP
e) EIPv2

Q) Is there any other benefit of using DMVPN over Internet for the Ornio besides having resiliency?

a) Yes
b) No

Q) What are the other benefits of having Internet backup for Ornio?

a) IPv6 can be tunneled over the DMVPN overlays if L3VPN provider do not support it
b) Multicast can be carried over the DMVPN overlays if L3VPN provider do not support it

c) Better security can be achieved for the traffic which is going to pass through DMVPN tunnels
d) None of the above

Q) Which below technology would you recommend to have over the MPLS L3VPN ir Ornio request encryption?

a) IPSEC
b) DMVPN
c) GETVPN
d) No need, it is already encrypted
e) Carrier supporting Carrier (CsC)

Q) Please mark the correct option in the below table for DMVPN vs. GETVPN design:

	DMVPN	GETVPN
Better scalability	☐	☐
Suitable over public Internet	☐	☐
Requires overlay tunnels	☐	☐
Standard protocol	☐	☐
Better QoS support	☐	☐
Better Multicast support	☐	☐
Requires less resources	☐	☐
Default convergence	☐	☐