



# RMT SCENARIO

Orhan Ergun

## **Background Information:**

### RMT Information

RailMail Telecom is a US Telecom company that was initially owned by Mr. Morgan 1970, Mr. Morgan sold the company 10 years later when it had 7500 paid subscribers, to National Railway Transportation (NRT) Company. NRT company did not have any backbone network at the moment, and it took the another 10 years to build their own backbone network starting from West Coast in Salem, WA and all the way to Atlanta on the East Coast. Initially they had been using SONET technology but eventually they migrated to Ethernet based circuits. Currently their backbone has 100G links all over their backbone.

RMT will keep using their name, not NRT since they have an existing customer base. RMT is still expanding heavily and their customer growth forecast is 30% year-to-year basis for the next 5-6 years. All the forecasts had been successful for far.

As RMT built their network from scratch, they planned their network very well, so they are using next IP addressing:

For Internal purposes they are using 10.0.0.0/8 block:

- /16 per Data Center
- /16 per State
- /31 for point to point links

For public routing they are using 151.27.0.0/16 block:

- /22 per State
- /22 per Data Center
- /31 for point to point links

RMT network is QoS enabled but they did not have any need implementing it as all the backbone links are overprovisioned the way that if there's a link failure it will there's always enough available bandwidth and utilization does not go above 90%. There's still some place to grow, but if they are going to have more clients, it might not be the case anymore.

Their IGP is flat ISIS L1 network. They are running BGP as external protocol and they are also using BGP as CE-PE protocol due to the corporate network security policy.

Services provides to clients:

- Internet Access

- L3VPN
- L2VPN VPLS
- L2VPN VPWS

RMT using SAP, a TCP based application, as their CRM. It is very slow and very sensitive to any kind of delay and drops. There's also a billing system that primarily using IPFIX to communicate with networking HW and their Corporate File Exchange protocol is NFS. RMT is internally using Voice over IP and the video conferencing and they are utilizing FTP heavily for their HR applications specifically. They are using an entertaining application but they don't want these applications to consume more bandwidth.

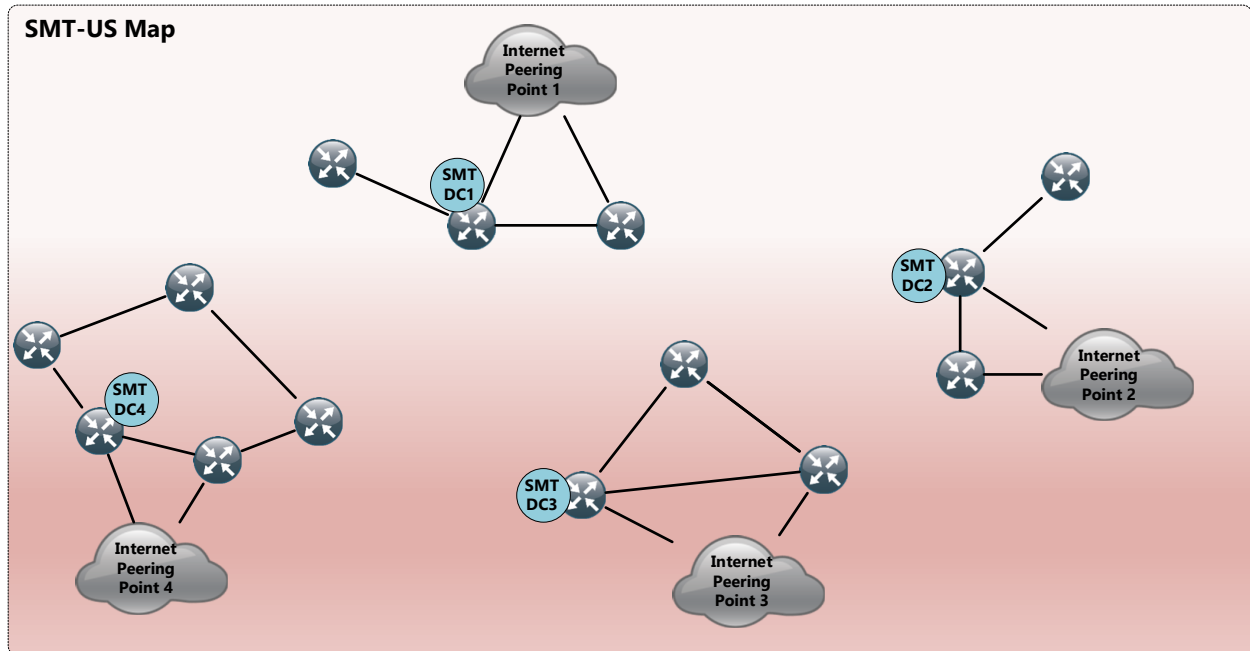
### SMT Information

SnailMail telecom lived primarily by acquisitions. They have started in San Francisco 15 years ago and prior to this moment they acquired 3 small Service providers in the different parts of US. There was some IP addressing overlap between the POPs in Raleigh and Austin but they have been able to fix it.

All SPs are connected by full mesh GRE tunnels over the internet. SMT uplink bandwidth to Internet Peering Points is 10G and they are using BGP as their EGP.

So far SMT was providing only Internet services to their customers.

Design Documents



**Figure:** SMT US Map

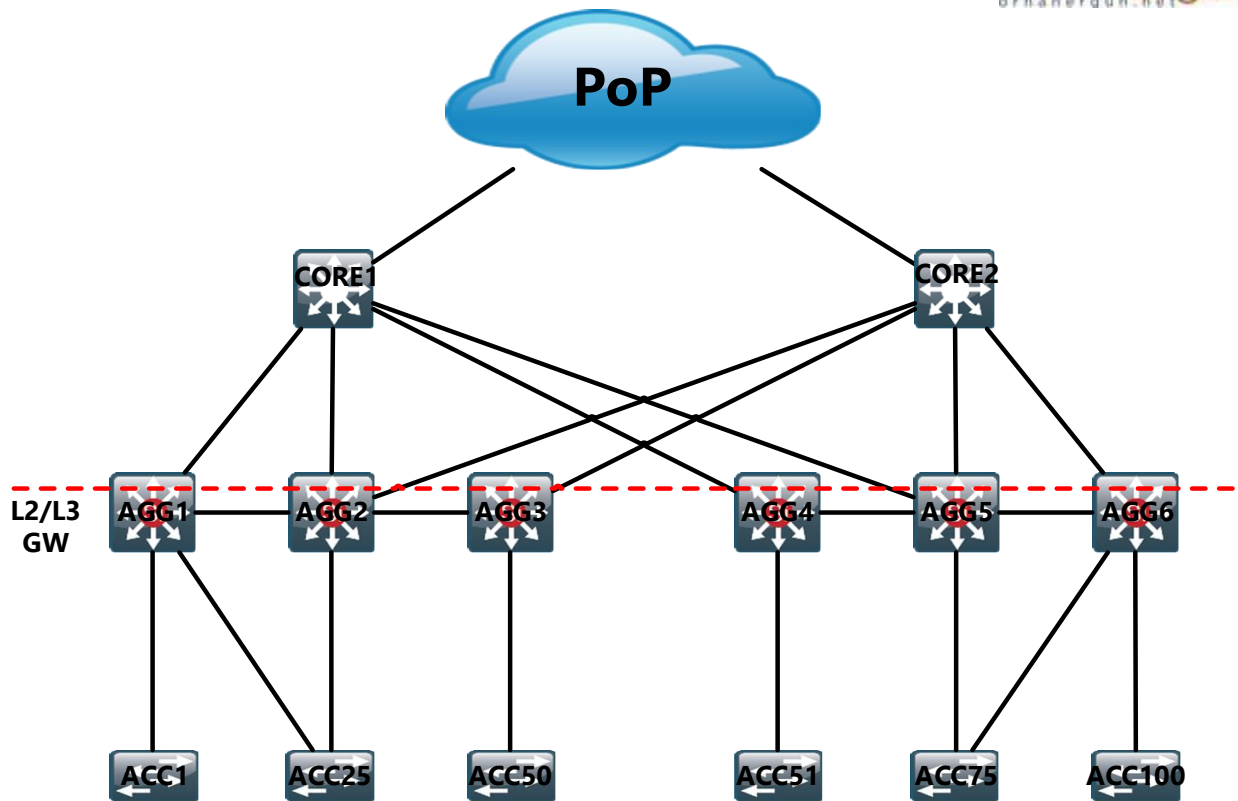


Figure: SMT DC Design

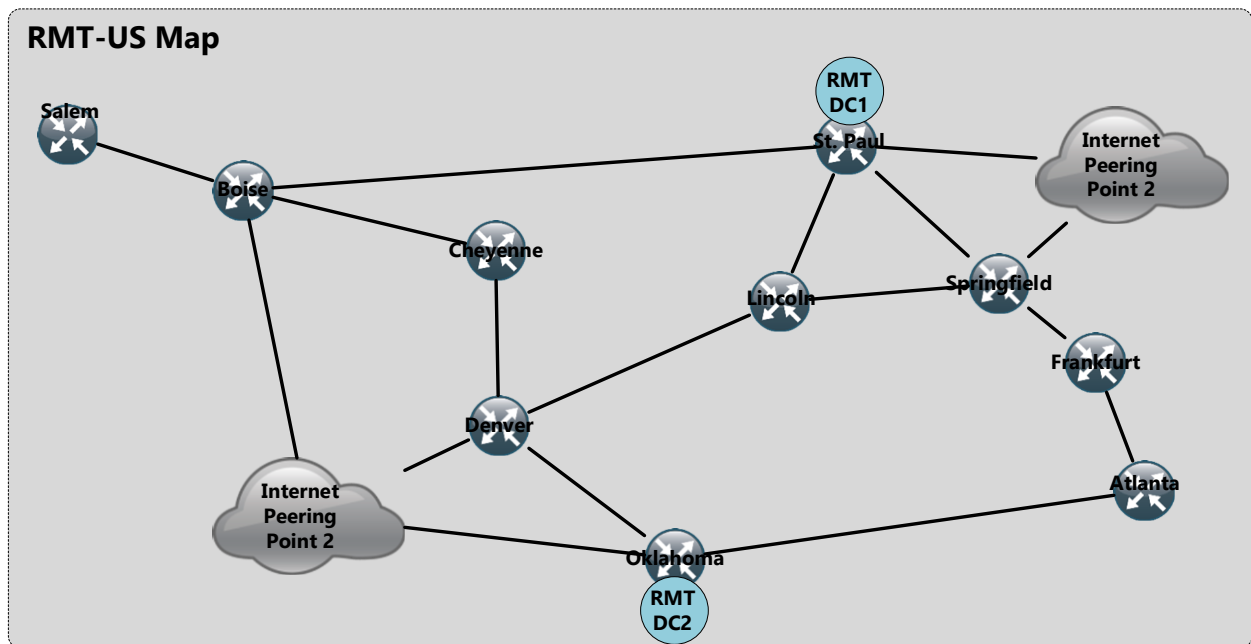


Figure: RMT US Map

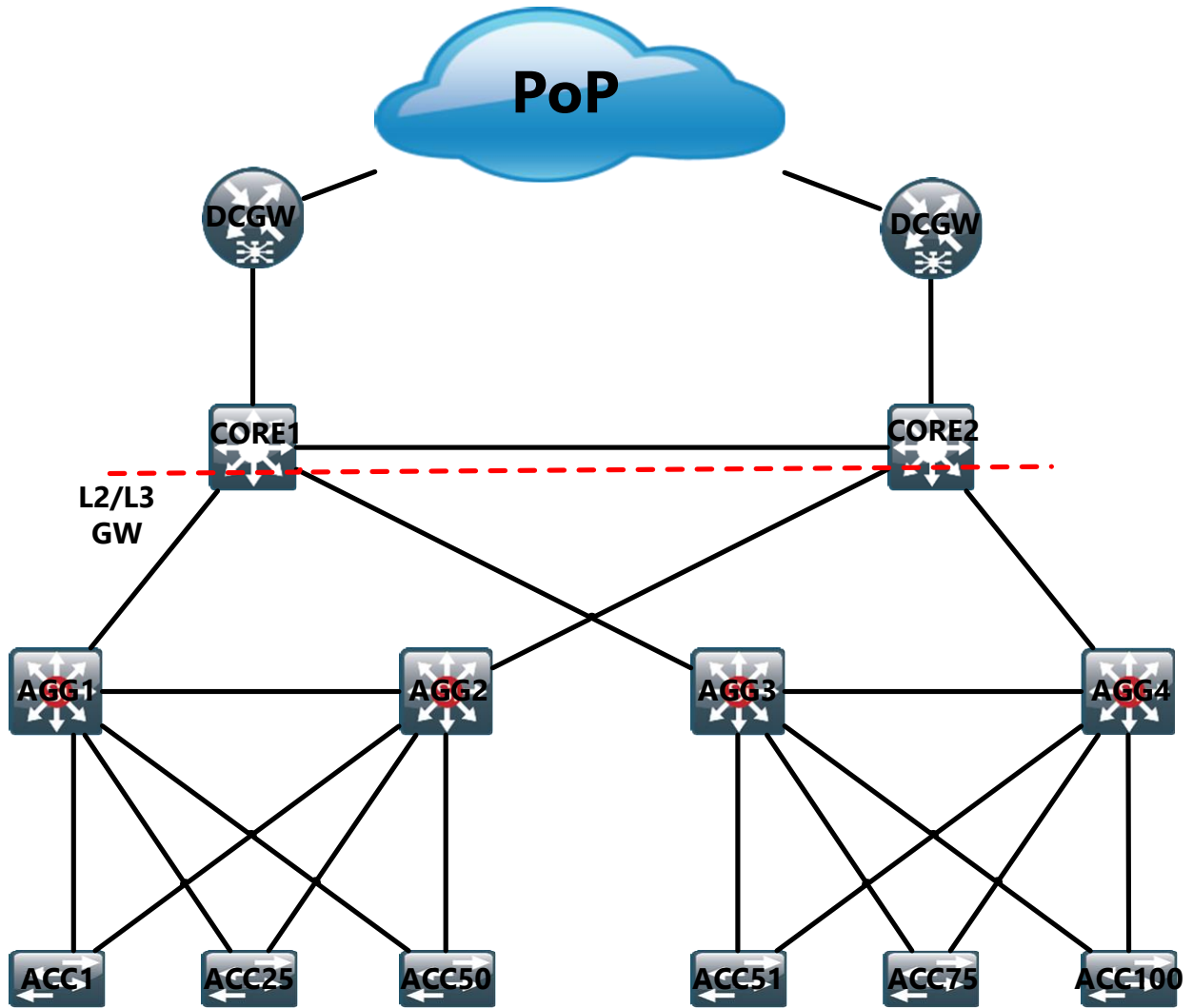


Figure: RMT DC Design

**E-Mail 1 is Available:**

*As we have mentioned previously, SMT made 3 more acquisitions few years ago. Unfortunately, they could not keep their promises to main investors so they have just sold company to RMT. Now we have to deal with it. First thing to do is identify which kind of information we are still missing before we proceed with merging both RMT and SMT.*

*Our main concern and top priority is that merged network should be able to provide all of our current MPLS VPN services.*

**Q1) What information you need from RMT to start merging design?**

- a) IP addressing
- b) IGP routing
- c) BGP architecture
- d) POP Architecture
- e) Backbone speed
- f) QoS information
- g) MPLS VPN support

**Q2) What info you need from SMT to start merging design?**

- a) IP addressing
- b) IGP routing
- c) BGP architecture
- d) POP Architecture
- e) QoS information
- f) Backbone speed
- g) MPLS VPN support

**E-Mail 2 is Available:**

*This is some of the information we have been able to get for you:*

*RMT BGP is using single AS in their network. Each Pop has a BGP RR for both BGP and VPN services.*

*RMT POP with Data Center architecture is given below*

*SMT IGP is Single area OSPF*

*SMT backbone network bandwidth is 2x10G links*

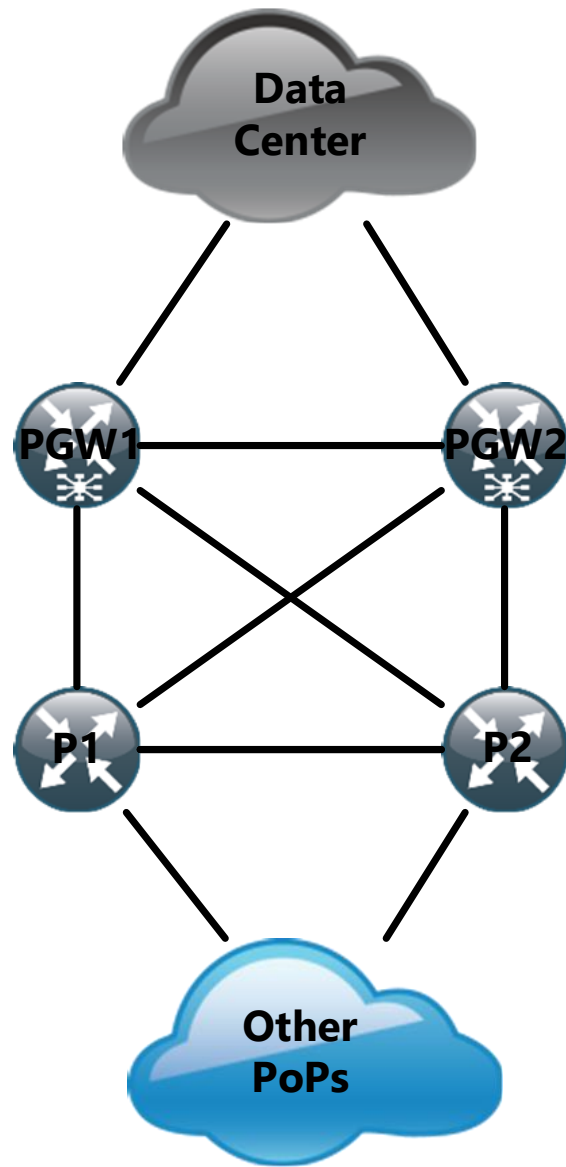
*SMT is using 10.10.0.0/16, 10.0.0.0/16, 172.16.0.0/18 and 172.22.0.0/16 IP addressing blocks*

*SMT does not use any MPLS VPN services at the moment but their equipment has all the support.*

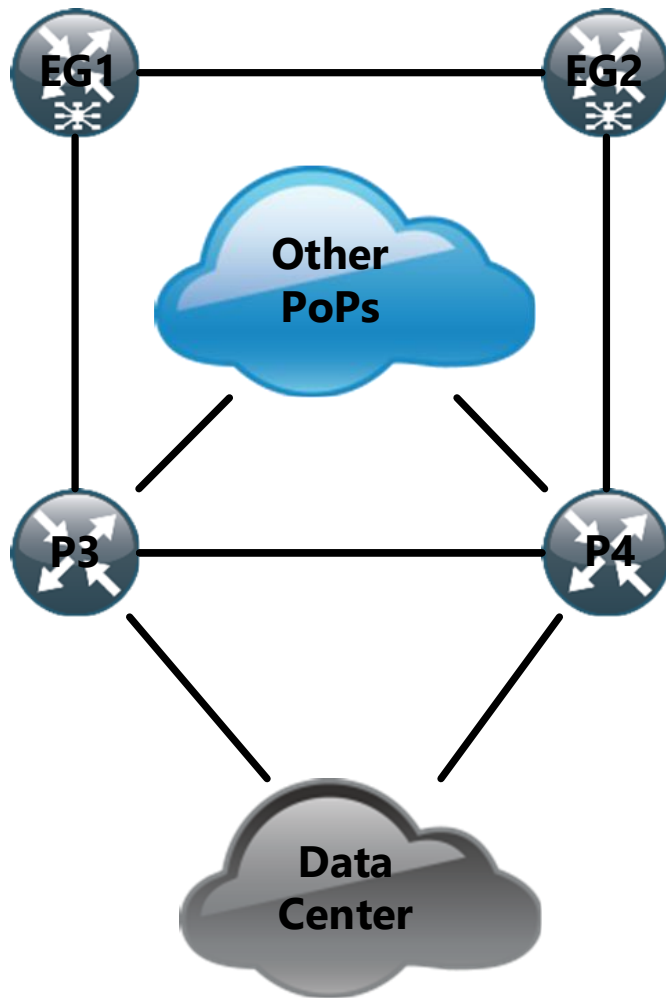
*Also SMT has currently full mesh IBGP peering at the moment.*

*RMT also has 2x10G links from each POP connected to Internet Peering Points, not sure if you need this information though.*

*There are few other diagrams that might help you.*



**Figure:** RMT PoP with Data Center



**Figure:** SMT PoP with Data Center

**E-Mail 3 is Available:**

*One of our new network architects was concerned about current IS-IS in RMT. He thinks that we might be facing some issues while merging RMT and SMT networks together.*

**Q3) Is there any problem with the current ISIS design?**

- a) Yes
- b) No

**Q4) What might be the concern of the RMT for their IS-IS?**

- a) Migration from IS-IS L1 to Multiple flooding domains is hard
- b) IS-IS L1 does not support traffic engineering
- c) Redistribution is not possible to ISIS L1
- d) ISIS L1 is not a scalable solution

**Q5) Should they migrate the IGP protocols to run a common IGP for the merged network?**

- a) Yes
- b) No

**Q6) What would be the problem if SMT wants to deploy BGP Route Reflector based on their current BGP design? (Choose all that apply)**

- a) They would lose path visibility
- b) There is no problem, it is same as running full mesh
- c) BGP RR always bring benefits to BGP design
- d) BGP RR puts additional load into the control plane
- e) BGP RR can cause suboptimal routing

**Q7) Which below methods can be used eliminate the possible path visibility problem of BGP Route Reflector?**

- a) Using BGP Add-Path
- b) BGP Shadow Sessions
- c) Not using BGP Route Reflector
- d) Using full-mesh and BGP Route Reflector in the same network
- e) BGP Shadow Route Reflectors

- f) BGP Best External
- g) BGP PIC-Prefix Independent Convergence

**Email 4 is Available:**

*One of our customers asked us about the best way to provide connectivity between their HQs and the remote sites. Could you help us out?*

**Q8) Please fill in the table below**

	Multicast support over Internet (Yes/No)	Multicast replication at Hub/WAN (Yes/No)	Topology (P2P/P2MP/MP2MP)	Overlay/Underlay routing	Redundancy (Yes/No)	Runs over (Internet/Private WAN/Any)
DMVPN						
GETVPN						
mGRE						
P2P IPSEC						
GRE						

**Q9) What is the best solution for VPN security with minimal OpEx?**

- a) GETVPN
- b) DMVPN
- c) mGRE
- d) P2P IPSec

**Email 5 is Available:**

*Top management and company owners have been pushing to come up with new backbone design as soon as possible. They wanted new backbone network to be simple and flexible, efficient and be able to handle any single point of failure at POPs connecting to Data Centers.*

*After merging both RMT and SMT we have started experiencing bandwidth utilization problems. Between different region the traffic flow always follow the shortest IGP path. Please can you help us to start sending traffic over all the available paths?*

**Q10) Which would be the best short-term solution in this case?**

- a) Use MPLS Traffic Engineering- Tactical Approach and distribute the traffic between the regions based on bandwidth constraint
- b) Use static routes and GRE tunnels and optimize traffic flow
- c) Implement DiffServ QoS all over the backbone network
- d) Implement DiffServ QoS at places of traffic congestion
- e) Redesign Backbone network and add few more inter-POP links
- f) Use MPLS Traffic Engineering Strategic Approach

**Q11) What about permanent solution? (Pick all that Apply)**

- a) Use MPLS Traffic Engineering Strategic Approach
- b) Use static routes and GRE tunnels and optimize traffic flow
- c) Implement DiffServ QoS all over the backbone network
- d) Implement DiffServ QoS at places of traffic congestion
- e) Redesign Backbone network and add few more inter-POP links
- f) Use MPLS Traffic Engineering- Tactical Approach and distribute the traffic between the regions based on bandwidth constraint

**Email 6 is Available:**

*It seems that MPLS Traffic Engineering Strategic Approach can provide us a better capacity management. Can you help us to setup an MPLS Traffic Engineering on our network? Also we will have series of questions for you regarding MPLS Traffic Engineering.*

*We have been also told to provide QoS all across the new network within the next couple of months.*

**Q12) Which features need to be enabled in order for MPLS TE to function properly? (Choose all the apply)**

- a) LDP
- b) RSVP
- c) MP-BGP
- d) Unidirectional tunnel headend
- e) Unidirectional tunnel tailend
- f) Bidirectional tunnel headend and tailend
- g) IGP TE (TED)
- h) VRF
- i) Send-Label

**Email 7 is Available:**

*We created an MPLS tunnels, RSVP and other necessary extensions are in place but unfortunately our traffic doesn't go through the TE tunnels.*

*Once you help to get the traffic into the MPLS TE tunnels one little thing will left. We still need to enable DiffServ QoS throughout our new network. One of our engineers told us that it is not possible to run both IntServ and DiffServ QoS.*

**Q13) Why do you think RMT cannot send traffic into the MPLS TE tunnels although everything is set?**

- a) Multicast traffic can pass but unicast traffic might have an issue
- b) Routing table should point to the tunnel interface for the TE destination prefixes
- c) TE tunnel links must be advertised into the IGP protocol
- d) RMT probably didn't create reverse unidirectional tunnel

**Q14) Is it possible and recommend to run IntServ and DiffServ QoS in the same network?**

- a) Yes, it's possible but it's not a good idea to run both IntServ and DiffServ in the same network
- b) No, there's no specific restrictions and they can both run in the same network

**Q15) We are considering several QoS models. Which one is the best fit for us?**

- a) 1 PQ, 3 BQ
- b) 1 PQ, 4 BQ
- c) 3BQ
- d) 5BQ
- e) 3PQ, 1BQ

**Email 8 is Available:**

*We have chosen unified 1 PQ and 4 BQ model. One of our large banking customers requested MPLS VPN with 8 Class QoS model. But as a policy, we provide 3 different QoS models. Among our offerings, they can get Gold QoS Service which can give 5 classes.*

*Here's brief information about QoS configuration on our gear for the Gold QoS Service:*

- EXP0 – Best effort, FIFO, BW remain (all non SLA traffic by default put into EXP0)*
- EXP3 –CBWFQ, BW 30%*
- EXP4 – WRED, BW 20%*
- EXP5 –PQ, BW 30%*
- EXP1- CBWFQ, BW %5*

*Here's brief information about QoS and applications configuration on our customer:*

- CS1 – FTP for file sharing, UDP*
- CS3 – Internal gaming platform, UDP,*
- AF33 - Internet web browsing, TCP*
- AF41 –Network storage replication, TCP*
- AF42 – Corporate CRM, TCP*
- EF – Videoconference, UDP, traffic loss sensitive*
- CS6 - Financial department business application, real-time, delay sensitive*
- DF- All remaining applications*

**Q16) Provide the right DSCP to EXP mapping for banking customer**

	EXP0	EXP1	EXP3	EXP4	EXP5
CS1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF33	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF41	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF42	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CS6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Email 9 is Available:**

*All our users have a problem accessing to cloud gaming application we have deployed recently and it looks like the somewhere in our network, but we are not sure where. We need your help to identify the problem!*

**Q17) Which part of the network should we focus on?**

- a) Place the monitoring probes closer to application
- b) Place the monitoring probes closer to end users
- c) Place the probes closer to both end users and application
- d) Place the probes at all the POPs
- e) Place the probes everywhere in the network

**Q18) Why should we put the probes there?**

- a) Because RMT can monitor individual flows from every user
- b) Centralized place for monitoring which can ease of the operation
- c) Better data flow visibility

**Email 10 is Available:**

*Since we have done merging, we have lots of requests from the RMT customers to extend their current VPN networks to different locations where SMT have presence at. RMT wants to have separation of their core network task from the Inter domain task, that's why they implemented a new ASBR routers but SMT is okay with the existing routers for new inter domain communication.*

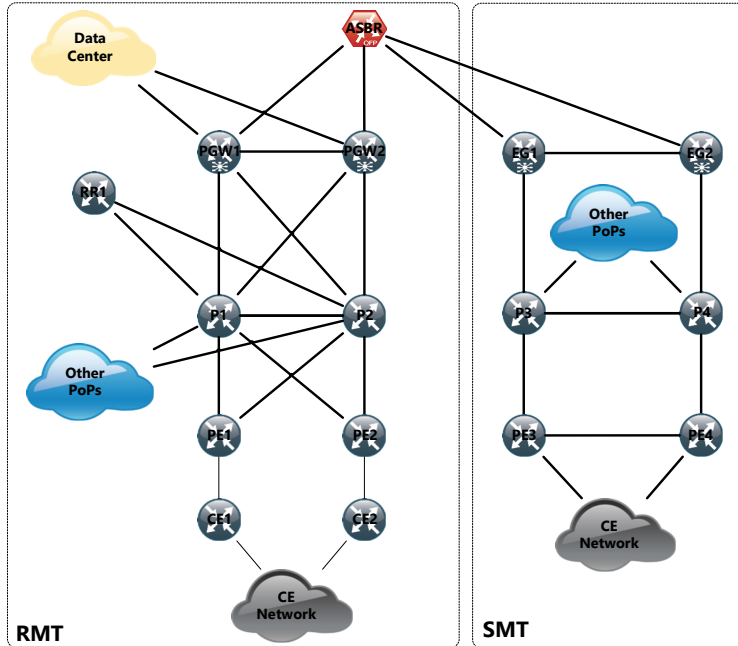
**Q19) Which option would you suggest to implement in order to extend your VPNs to SMT backbone?**

- a) Inter-AS Option A
- b) Inter-AS Option B
- c) Inter-AS Option C
- d) Inter-AS Option D
- e) Inter-AS Option E

**Q20) What is the main reason to implement it?**

- a) It is the most secure option among the others
- b) It fits RMT scalability needs
- c) It is the most easiest option to configure
- d) It provides end-to-end LSP

**Q21) Please check the right boxes to implement it.**



PE12	PE34	P12	P34	PGW	ASBR	EG	RR	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MP-eBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ISIS (GRT)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	EIGRP (GRT)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	iBGP (GRT)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	iBGP RR
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VPNv4 = MP-iBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RR VPNv4 = MP-iBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VRF
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Next-hop-self
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	LDP/RSVP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Next-hop-unchanged
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Labeled Unicast
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	eBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BGP <-> IGP Redistribution
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VRF IGP (EIGRP/ISIS)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VRF iBGP/eBGP

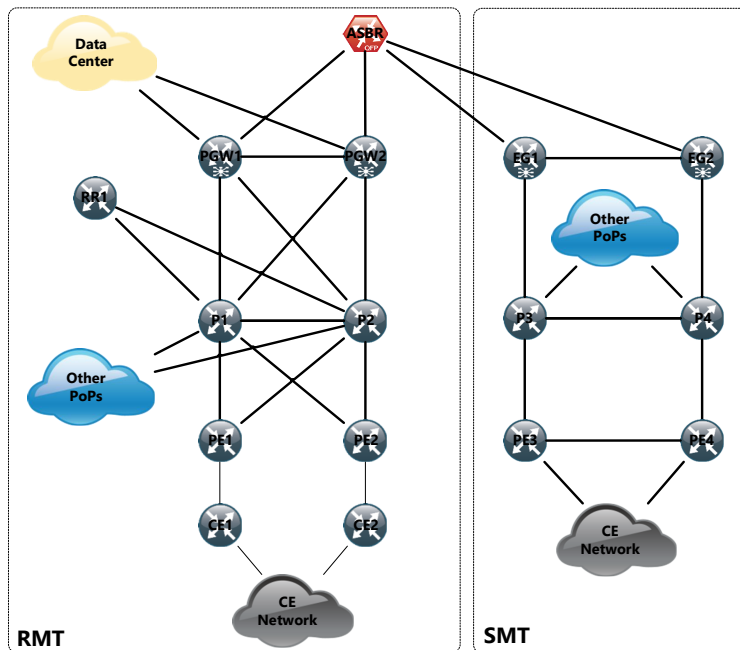
**Q22) What is the right set of steps in order to perform that merging?**

- 1) Add link between EG1-ASBR
- 2) Activate MP-BGP between ASBR1 and EG1
- 3) LDP between PGW2-ASBR1
- 4) Activate MP-BGP between ASBR1 and EG2
- 5) IS-IS between PGW2-ASBR1
- 6) Verify the connectivity
- 7) LDP between PGW1-ASBR1
- 8) Remove the leftovers if any
- 9) IS-IS between PGW1-ASBR1
- 10) Add link between EG2-ASBR

**Email 11 is Available:**

One of our lead architect came up with new IP addressing scheme that new network is going to migrate to within the next 6 months. It gives us opportunity to use Inter-AS Option C.

**Q23) Please check the right boxes to implement Inter-AS Option C.**



PE12	PE34	P12	P34	PGW	ASBR	EG	RR	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MP-eBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ISIS (GRT)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	EIGRP (GRT)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	iBGP (GRT)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	iBGP RR
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VPNv4 = MP-iBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	RR VPNv4 = MP-iBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VRF
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Next-hop-self
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	LDP/RSVP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Next-hop-unchanged
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Labeled Unicast
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	eBGP
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BGP <-> IGP Redistribution
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VRF IGP (EIGRP/ISIS)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	VRF iBGP/eBGP

**Q24) What are the main benefits of implementing Inter-AS Option-C between RMT and SMT?**

- a) The only option with the support of 6VPE
- b) Better scalability compared to Inter-AS Option B
- c) Allows end to end QoS for VPN services
- d) The easiest Inter-AS Option to implement
- e) More secure compare to Inter AS Option B

**Email 12 is Available:**

*Hi Designer,*

*As you know we have MPLS Layer 3 VPN, Internet, Point to point MPLS VPN and VPLS customers. Especially for the VPLS customers, when we want to add a new site to the current VPLS of the customers, it is operationally very hard for us to touch every PE of the customer. We afraid that this will be a bigger problem for the merged network since we want to span the VPLS and our other services throughout the merged network. But especially for the VPLS issue, we want to have an immediate solution.*

*Please note that we have an LDP-based VPLS in our network and the SMT network doesn't have VPLS at all currently.*

*Can you help us to fix our operational problem?*

**Q25) Which below option is defined the RMT's operational problem?**

- a) Their network engineers don't have a capability to manage merged network
- b) Their existing gear don't have a capability to keep the state of merged network
- c) They want to reduce the operational touch point for the existing services, especially VPLS
- d) They don't know whether VPLS service can be extended over the Inter-AS links

**Q26) What would be your solution for their VPLS service?**

- a) Use H-VPLS
- b) Use A-VPLS
- c) Replace VPLS with EVPN
- d) Replace VPLS with PBB-EVPN
- e) Use BGP AD for their VPLS solution

**Q27) If RMT would request to have the most granular QoS support for their Inter-AS VPLS service, which below option you would recommend?**

- a) Inter-AS Option A
- b) VPLS cannot be extended over Inter-AS
- c) Inter-AS Option B
- d) Inter-AS Option C
- e) Inter-AS Option AB

**Q28) Would you recommend RMT to deploy BGP-VPLS in the SMT locations?**

- a) Yes

b) No

**Q29) Is there any problem for LDP and BGP based VPLS to support end to end VPLS?**

a) Yes

b) No

**Email 13 is Available:**

*One of our customers is asking whether we can provide IPv6 L3 VPN services for them. We have not been thinking about it, but as our assessment all our networking nodes support IPv6*

**Q30) Which technology will help RMT to meet the requirements above?**

- a) 6PE
- b) DMVPN
- c) 6vPE
- d) NAT64
- e) NAT46

**Q31) Which additional technology/protocol is needed as an underlay transport to support 6VPE service for RMT?**

- a) IPv6 LDP in the core
- b) IPV6 IGP in the core
- c) IPv6 RSVP-TE
- d) Both IPv6 IGP and LDP
- e) IPv4 transport is enough for 6VPE

**Q32) In case if there would be no support for 6vPE, which below methods can be implemented at Customer side in order to overcome the problem? (Choose all that apply)**

- a) 6PE
- b) DMVPN
- c) PAT
- d) NAT64 + DNS 64
- e) NAT46

**Q33) If customer would choose to run DMVPN over MPLS VPN for both IPv4 and IPv6 traffic, how many DMVPN tunnels per site they would need?**

- a) One
- b) Two
- c) Three
- d) Four

**Q34) How much of an effort it is to upgrade current network and provide L2 and L3 VPN for IPv6 services? (Choose all that apply)**

- a) Little to no changes for L3VPN IPv6 support
- b) Little to no changes for L2VPN to support IPv6
- c) Major changes for L2VPN to support IPv6 support
- d) Major changes for L3VPN IPv6 support

**Email 14 is Available:**

*In the future, we are planning to expand to EMEA region. Our management has found one of the small local service provider in UK that they are going to acquire within the next several months. We are looking for a cost effective short-term solution for acquisition to extend MPLS VPN services between the two networks.*

*We also need a good design and migration plan for a long-term solution if this acquisition goes well. We don't have a budget issue for long haul links. As we are planning to provide different value added services for our customers, both short-term and long-term solutions must support end-to-end QoS and Multicast.*

**Q35) What is the fastest short-term solution to connect current RMT network and a new one in the UK?**

- a) Use L2VPN from another MPLS Service Provider to connect current RMT network and a new one with MPLS and QoS over that L2VPN
- b) Use L3VPN from another MPLS Service Provider to connect current RMT network and a new one with MPLS and QoS over that L3VPN
- c) Build GRE tunnels over Internet and run MPLS and the necessary services on top of it
- d) Order dedicated circuits

**Q36) What would be the problem with this short term solution? (Choose all that apply)**

- a) It is not reliable and there is no SLA guarantee
- b) It is not secure
- c) QoS is not under control of RMT
- d) For each customers require separate overlays
- e) Multicast routing is not supported with it
- f) All of the above

**Q37) What is the best long-term solution to connect current RMT network and a new one in the UK?**

- a) Use L2VPN from another MPLS Service Provider to connect current RMT network and a new one with MPLS and QoS over that L2VPN
- b) Use L3VPN from another MPLS Service Provider to connect current RMT network and a new one with MPLS and QoS over that L3VPN
- c) Build GRE tunnels over Internet and run MPLS

d) Order dedicated circuits