



CCIE Service Provider v5.0
Real Labs Design Module
Scenario 1 – Emerald and
Garnet SP



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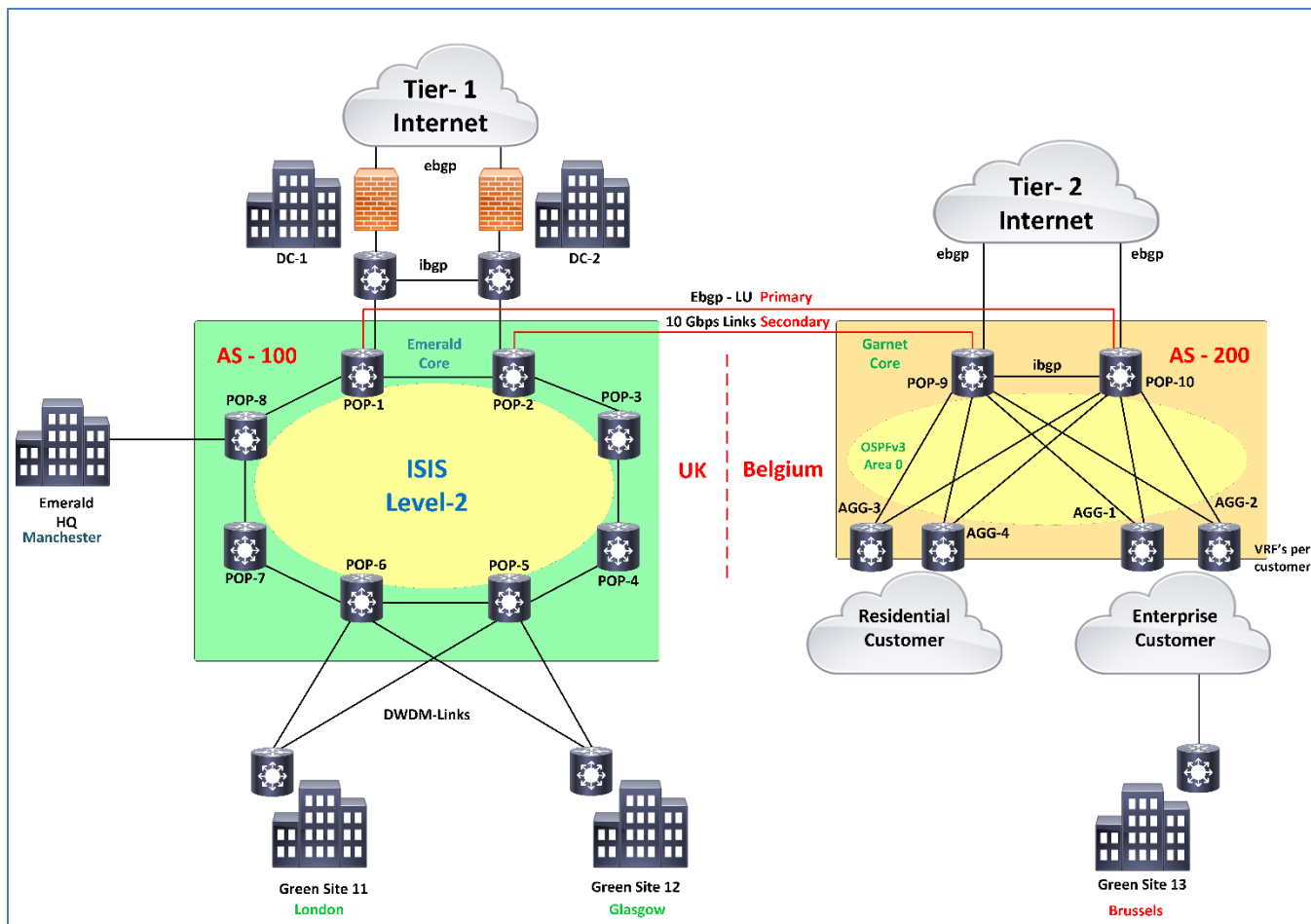
CCIE Design Guidelines

Before starting, please read the below guidelines:

1. In this module, you will be creating, analyzing, validating and optimizing a low-level network design. All relevant resources needed to successfully complete this module are provided within this module.
2. The menu bar on the main screen can be used to navigate to:
 - a) **Exam content.** Here you will find the exam questions. This module is scenario-based and contains about 30 to 35 web-based items. No device access is provided.
 - b) **Resources.** Here you will find provided resources. An initial set of resources is provided at the start of the module. Additional resources are provided as you progress. Resources are cumulative and remain available throughout the remainder of the module. It is recommended to read all the provided resources prior to answering a question.
 - c) **Guidelines.** If you want to review this guideline again during your exam, you can find them here.
 - d) **Help.** Here you will find more information about the exam environment and functionalities.
 - e) **End Exam Section.** Clicking this button will end this exam section
3. Backward navigation in this module is disabled; once you proceed to the next question, you will not be able to return to the previous question
4. Question point values will not be visible in this module. More complex items may have partial scoring opportunities
5. Item level feedback can be provided at question level. Feedback will be processed, but Cisco will not reach out to you to discuss any feedback provided. Any time spent on providing feedback will not be compensated.
6. Access to selected Cisco online documentation is available from your desktop. Access to select 3rd party product documentation (such as python) is available from the resources window under the "External Documentation" category.
7. If you suspect an issue with your exam environment, contact the lab proctor as soon as possible.
8. You have 3 hours to complete this module. If you finish early, you may start with the next module but any unused time will not be carried over to the next module.

Diagram

Emerald SP and Garnet SP Integrated Topology



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Documents

Executive summary

Emerald SP is a regional service provider that is based in the UK. In recent years its focus has shifted towards capturing a growing market in Europe. Emerald SP Has acquired several smaller regional providers to gain a footprint in this lucrative market. Its network architecture teams pride itself on being "cutting edge" in terms of technology and capabilities.

The main business drives are based on rapid growth expansion, highest levels of uptime. OPEX saving, delivering new and innovative services exceptional customer satisfaction. The company business specifications are listed here.

Internal Business Services:

Data Center

- Two data centers are located in London and Glasgow
- Some customer services are also hosted within the data centers.

Collaboration

- Emerald SP is distributed across multiple location within the UK. VoIP has been implemented and reduce toll charges and is used extensively by all employees.

Customer Network Services:

Managed Internet

- The most popular service that is sold to customers is the standard internet connectivity. Emerald SP is a Tier-1 service provider for internet and hence does not incur traffic charges for Inter Tier-1 traffic.

Layer 3 VPN

- In addition to internet connectivity, Layer 3 VPNs are actively pushed by the sales organization because it delivers a much higher margin compared to basic internet services. They also provide services such as management, QoS, and automated provisioning.

Layer 2 VPN

- The demand for Layer 2 VPNs has been increasing exponentially in the last 1-2 years. Some portions of the network can deliver this functionality, and this capability is being added across the network.

Leased Lines

- In some countries, the leased-line infrastructure is significant, although Ethernet is becoming increasingly popular.

Network Design Information.

Emerald SP has followed a strict set of design rules when deploying new sites. However, the acquisitions introduce standardization challenges and adhering to Emerald standard architecture has been difficult. Emerald SP has 8-POPs in UK.

Physical POP Topology

A core router exists per each core POP. Each of the non-core devices is connected to two different core devices over dark fiber DWDM links.

IGP

Currently Emerald SP uses a single IS-IS domain that consists of one large Level-2 area. This area should always cover with backbone core routers and aggregation devices, which allows Emerald SP to scale for multiple service provider acquisitions in future.

BGP

Emerald SP uses a single public AS-100 and has several router reflectors to distribute routes throughout the network. The PE router run IPv4 and VPNv4 BGP, and the core routers (also used for peering) run only IPv4 and hold the full internet routing table.

QoS

Some QoS has been implemented by Emerald SP to protect important business service over internet services. The existing QoS policies were optimized around five classes with the protection of voice traffic. It is anticipated that video service will be delivered in the future, and the network must be optimized to deliver those services. The companies that have been acquired each have their own QoS implementations that do not always map directly to the existing Emerald SP model.

Security

A security solution has been implemented at the Emerald SP Peering to inspect that comes from the internet at the perimeter. When an anomaly is detected, traffic can be dropped or inspected. Remotely triggered black-holing techniques are used to steer the traffic from the peering points to the centralized cleaning device.

Emerald SP Acquires Garnet SP

Emerald SP has acquired Garnet SP, which is a Belgium-based Tier-2 regional ISP that provides only residential broadband internet services and internet services to enterprises customers. The last mile is predominantly delivered via xDSL (residential) and metro-Ethernet (enterprise) circuits. Garnet SP consists of two POPs in Brussels and has multiple edge routers. Business customer are connected on dedicated access routers and residential customers are connected on dedicated xDSL devices. A pair of aggregation routers connects all of the different routers to the upstream transit ISPs. All of the access routers run OSPF, advertise customer routes, and receive a default route from aggregation routers. The aggregation routers hold a full view of the global BGP table from the two transit upstream ISPs, and they also run the iBGP between them. As a consequence of the acquisition by Emerald SP, Garnet SP must add the capability to deliver the Emerald SP service portfolio on its infrastructure (MPLS VPN). The ultimate plan is to fully intergrade Garnet SP to become a new POP in Belgium. However, in the short term, temporary solutions are needed to active some services. Emerald SP requires POP redundancy to interconnect with Garnet SP. The long-term plan is to have unified network management solution across the integrated SP. The logical topology of Emerald SP and its newly acquired Garnet SP is shown in resource topology.

Emerald SP Customer: Green Corporation

Emerald SP has multiple enterprise customers, however one of their prime customers "Green Corporation" is shown in the topology with two sales "site-11 in London" and "site-12 in Glasgow. Both this site has redundant 1G links from POP-5 and POP-6. A third site, "site-13 in Brussels", is connected to the Garnet SP. Green Corporation has MPLS service subscription from Emerald SP in the UK and Garnet SP in Belgium.

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Question 1

To integrate the Emerald SP and Garnet SP IGP to ISIS which two steps are needed for successful integration? (Choose two)

- Enable ISIS Level 2 on links between POP-1-2 and POP-9-10
- Enable ISIS Level 2 on links between POP-9-10 and AGG-1-2
- Remove OSPF from Garnet SP routers
- Enable ISIS Level 1 on links between POP-1-2 and POP-9-10
- Enable ISIS Level 1 on links between POP-9-10 and AGG-1-2
- Enable ISIS Level 2 on links between POP-9-10 and AGG-1-2-3-4
- Enable ISIS Level 1 on links between POP-9-10 and AGG-1-2-3-4

Answer: A, F

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New Resource

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Emails

IPv4 Design after Merger

From: Network Manager (Emerald SP)

To: Network Manager (Garnet SP)

Subject: IPv4 Design after merger

Garnet SP network manager,

As we plan to implement the merger between Emerald SP and garnet SP, I would like to learn more about how your network ipv4 addressing and network configuration is configured.

- Do you have separate networks for your management, network environment?
- What private IP addressing schema (RFC 1918) is used within your core network that we would be merging together?
- Are you only assign public IP space to your broadband customers?
- Is there any MTU globally setup on your edge devices? (Note that we use default MTU across our core)

Best regards,

Network Manager

Emerald SP

From: Network Manager (Garnet SP)

To: Network Manager (Emerald SP)

Subject Re: IPv4 Design after merger

Emerald SP Network Manager,

Our core network is relatively small so we have not implemented a proper ipv4 address design schema.

Please see my responses in-line below

a- Do you have separate network for each of your management, network and compute environments?

<Garnet SP>: we have not used hierarchical and separate network address schema for management, network and compute environments.

b- What private IP addressing schema (RFC 1918) is used within your core that we would be merging together?

<Garnet SP>: we have randomly assigned addresses that include 10.x.x.x 172.16.x.x and 192.168.x.x networks.

c- Are you only assign public IP space to your broadband customers?

<Garnet SP>: yes, we only assign public IP space to your broadband customers.

d- Is there any MTU globally setup on your edge devices?

<Garnet SP>: no default MTU is in place on core.

Hope this answer you concerns. We can have a meeting if more detailed information is required.

Best Regards

Network manager

Garnet SP

Question 2

Refer to the new resource(s) available.

One of the members of the merger team from Garnet SP is suggesting running OSPFv3 across the merged network instead of ISIS. Which three design aspects would need to be considered if choosing OSPFV3 over ISIS? (Choose Three)

- OSPFV3 can add complexity due to mandatory area design requirements.
- OSPFV3 is less stable and slower in convergence compare to OSPF.
- OSPFV3 summary routes on the ABR may lead to suboptimal routing.
- OSPFV3 extension into the data center of Emerald SP may result in scalability issues.
- Converting Emerald SP to OSPFV3 will cause downtime.
- OSPFV3 is not modular and thus cannot be easily extended compared to ISIS.

Answer: B, C, D

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