Logo

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School of Computing and Information Science

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**Lab Logbook**

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Table of Contents

[Logbook activity 1: Number Systems 2](#_Toc146125212)

[1. Binary to decimal (base 2 to base 10) 2](#_Toc146125213)

[2. Decimal to binary (base 10 to base 2) 2](#_Toc146125214)

[3. Hexadecimal to decimal (base 16 to base 10) 3](#_Toc146125215)

[4. Decimal to hexadecimal (base 10 to base 16) 3](#_Toc146125216)

[5. Value-added work 3](#_Toc146125217)

[6. Self-reflection and feedback 4](#_Toc146125218)

[Logbook activity 2: Logic Gates 5](#_Toc146125219)

[1. Creating truth tables from existing logic diagrams 5](#_Toc146125220)

[2. Creating logic diagrams and truth tables from real-life scenarios 5](#_Toc146125221)

[3. Value-added work 6](#_Toc146125222)

[4. Self-reflection and feedback 7](#_Toc146125223)

[Logbook activity 3: Introduction to Packet Tracer 8](#_Toc146125224)

[Logbook activity 4: IPv4 Network Address Calculations 17](#_Toc146125225)

[1. Determine whether IP addresses are on same network 17](#_Toc146125226)

[2. Identify the default gateway address. 19](#_Toc146125227)

[Logbook activity 5: Subnetting Network Topologies 20](#_Toc146125228)

[1. Calculate subnet information 20](#_Toc146125229)

[Logbook activity 6: VLSM Design and Implementation Practice 24](#_Toc146125230)

[Part 1. Examine the Network Requirements 25](#_Toc146125231)

[Step 1. Determine the number of subnets needed. 25](#_Toc146125232)

[Step 2. Determine the subnet mask information for each subnet. 26](#_Toc146125233)

[Part 2. Design the VLSM Addressing Scheme 27](#_Toc146125234)

[Step 1. Divide the 172.31.103.0/24 network based on the number of hosts per subnet. 27](#_Toc146125235)

[Step 2. Document the VLSM subnets. 27](#_Toc146125236)

[Step 3. Document the addressing scheme. 28](#_Toc146125237)

[Part 3. Assign IP Addresses to Devices and Verify Connectivity 29](#_Toc146125238)

[Step 1: Configure Building-1 router LAN and WAN interfaces. 30](#_Toc146125239)

[Step 2: Configure Building-2 router LAN and WAN interfaces. 30](#_Toc146125240)

[Step 3: Configure SW-1, SW-2, and SW-3 switches including the default gateway. 31](#_Toc146125241)

[Step 4: Configure Host-A, Host-B, Host-C, and Host-D, hosts including the default gateway. 32](#_Toc146125242)

[Part 4: Verify connectivity. 32](#_Toc146125243)

# Logbook activity 1: Number Systems

## 1. Binary to decimal (base 2 to base 10)

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| Convert the following binary numbers into decimal. Show your working. [12 marks]   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1. 110011012  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | |  | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |  | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | |  | 128 | 64 | 0 | 0 | 8 | 4 | 0 | 1 | | TOTAL | 128 + 64 + 0 + 0 + 8 + 4 + 0 + 1 = 205 | | | | | | | | |  | 1. 11011012  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | |  | 1 | 1 | 0 | 1 | 1 | 0 | 1 | |  | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |  | 64 | 32 | 16 | 8 | 4 | 2 | 1 | |  | 64 | 32 | 0 | 8 | 4 | 0 | 1 | | TOTAL | 64 + 32 + 0 + 8 + 4 + 0 + 1 = 109 | | | | | | | |  |   So, the decimal equivalent of 110011012 is 20510. So, the decimal equivalent of 11011012 = 10910 |

## 2. Decimal to binary (base 10 to base 2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Convert the following decimal numbers into binary. Show your working. [12 marks]   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1. 11810  |  |  |  | | --- | --- | --- | |  | **Quotient** | **Remainder** | | 2 | 118 |  | |  |  |  | | 2 | 59 | 0 | |  |  |  | | 2 | 29 | 1 | |  |  |  | | 2 | 14 | 1 | |  |  |  | | 2 | 7 | 0 | |  |  |  | | 2 | 3 | 1 | |  |  |  | | 2 | 1 | 1 | |  |  |  | | 2 | 0 | 1 | |  | 0 |  | |  | 1. 14910  |  |  |  | | --- | --- | --- | |  | **Quotient** | **Remainder** | | 2 | 149 |  | |  |  |  | | 2 | 74 | 1 | |  |  |  | | 2 | 37 | 0 | |  |  |  | | 2 | 18 | 1 | |  |  |  | | 2 | 9 | 0 | |  |  |  | | 2 | 4 | 1 | |  |  |  | | 2 | 2 | 0 | |  |  |  | | 2 | 1 | 0 | |  |  |  | | 2 | 0 | 1 | |  |  |  | |  | |

1. ANSWER = 11101102 2) ANSWER = 100101012

## 3. Hexadecimal to decimal (base 16 to base 10)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Convert the following hexadecimal numbers to decimal. Show your working. [12 marks]   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1. 935E16  |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | 9 | 3 | 5 | E | |  | 3 | 2 | 1 | 0 | |  | 4096 | 256 | 16 | 1 | |  | 36864 | 768 | 80 | 14 | | TOTAL | 36864 + 768 + 80 + 14 = 37726 | | | |   Therefore, the decimal equivalent of 935E16​ is 3772610. |  | 1. BD1E16  |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | B | D | 1 | E | |  | 3 | 2 | 1 | 0 | |  | 4096 | 256 | 16 | 1 | |  | 45056 | 3328 | 16 | 14 | | TOTAL | 45056 + 3328 + 16 + 14 = 48414 | | | |   Therefore, the decimal equivalent of BD1E16 is 4841410. |  | |

## 4. Decimal to hexadecimal (base 10 to base 16)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Convert the following decimal numbers to hexadecimal. Show your working. [12 marks]   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | 1. 4921010  |  |  |  |  | | --- | --- | --- | --- | |  | **Quotient** | **Remainder** | **Hexadecimal** | | 16 | 49210 |  |  | |  |  |  |  | | 16 | 3075 | 10 | A | |  |  |  |  | | 16 | 192 | 3 | 3 | |  |  |  |  | | 16 | 12 | 0 | 0 | |  | 0 | 12 | C | |  |  |  |  | |  | ANSWER = C03A16 |  |  | |  | 1. 3621410  |  |  |  |  | | --- | --- | --- | --- | |  | **Quotient** | **Remainder** | **Hexadecimal** | | 16 | 36214 |  |  | |  |  |  |  | | 16 | 2263 | 6 | 6 | |  |  |  |  | | 16 | 141 | 7 | 7 | |  |  |  |  | | 16 | 8 | 13 | D | |  | 0 | 8 | 8 | |  |  |  |  | |  | ANSWER = 8D7616 |  |  | |  | |

## 5. Value-added work

|  |
| --- |
| For each question part (48 in total), an additional 1 mark is available if working is shown (even if the answer is incorrect). There are therefore an additional [48 marks] available for showing working. |

6. Self-reflection and feedback

|  |
| --- |
| After completing the lab, please answer the following questions in your logbook. [An automatic 4 marks is awarded for full completion of this section.]   1. Roughly how long did it take you to complete this lab and write up the logbook?   ANSWER = Roughly within 10 Minutes   1. On a scale of 1 (very easy) to 5 (very hard), how difficult did you find this lab?   ANSWER = On Scale 1   1. Which parts did you find the least challenging?   ANSWER = Part 1 and 2   1. Which parts did you find the most challenging?   ANSWER = Part 3   1. On a scale of 1 (not very confident at all) to 5 (very confident), how confident are you now with converting between different number systems?   ANSWER = On Scale 1   1. Please list any external resources (textbooks, websites, other people, etc.) used when completing this lab or the logbook.   My Class workbook that I used to take notes while attending the Class. |

# Logbook activity 2: Logic Gates

## 1. Creating truth tables from existing logic diagrams

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Complete the truth tables for the following logic diagrams. [40 marks]   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | G  F  E  D | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | A | B | C | D | E | F | G | X | | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | | |

## 2. Creating logic diagrams and truth tables from real-life scenarios

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A nuclear power station has a safety system based on three inputs to a logic network. A warning signal (S = 1) is produced when certain conditions in the nuclear power station occur based on these three inputs:  Macintosh HD:Users:ivan:Desktop:Screen Shot 2016-01-20 at 21.54.04.png  A warning signal (S = 1) will be produced when either a) OR b) are TRUE:   1. Temperature > 115°C AND Cooling water <= 120 litres/hour 2. Temperature <= 115°C AND (Reactor pressure > 15 bar OR   Cooling water <= 120 litres/hour)  Draw a logic diagram and truth table to show all the possible situations when the warning signal (S) could be received. [45 marks]  Go to <https://online.visual-paradigm.com/diagrams/features/logic-diagram-software/>, to draw logic diagrams online.  Answer:  T P W S   |  |  |  |  | | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | | 0 | 0 | 1 | 1 | | 0 | 1 | 0 | 1 | | 0 | 1 | 1 | 1 | | 1 | 0 | 0 | 0 | | 1 | 0 | 1 | 1 | | 1 | 1 | 0 | 0 | | 1 | 1 | 1 | 1 | |

## 3. Value-added work

|  |
| --- |
| Additional marks are available if your answers satisfy the following criteria:   * **Question 1.** Are attempted. All intermediate logic gates are labelled, and their outputs added to the truth table. [5 marks] * **Question 2.** Are attempted. All inputs and outputs in logic diagrams are fully labelled and explained. [5 marks]   Your answers do not necessarily need to be correct to satisfy the above criteria. No “part marks” will be awarded (you will be awarded either 0 or 5 marks per criterion). |

## **4. Self-reflection and feedback**

|  |
| --- |
| After completing the lab, please answer the following questions in your logbook. [5 marks]   * + - 1. Roughly how long did it take you to complete this lab and write up the logbook?   Less than 20 Minutes.   * + - 1. On a scale of 1 (very easy) to 5 (very hard), how difficult did you find this lab?   On Difficulty I’d say a (3).   * + - 1. Which parts did you find the least challenging?   Part 1.   * + - 1. Which parts did you find the most challenging?   Part 2.   * + - 1. On a scale of 1 (not very confident at all) to 5 (very confident), how confident are you now with logic gates, truth tables and logic diagrams?   I’m on Scale 4.   * + - 1. Please list any external resources (textbooks, websites, other people, etc.) used when completing this lab or the logbook.   I’ve used the website <https://online.visual-paradigm.com/diagrams/features/logic-diagram-software/>, to draw logic diagrams online. |

# Logbook activity 3: Introduction to Packet Tracer

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Instruction:** Provide screenshots and explanation throughout to provide evidence of your work.  **Task 1.** Start a New Packet Tracer activity and connect two PCs and a switch as shown:  Graphical user interface, application, Excel  Description automatically generated  **Task 1.1.** Configure the two PCs Ethernet interfaces with the IP addresses shown and prove that they can communicate by sending ping between them.   * + **PC0** IP Address: **192**.**168.1.10**   + **PC0** Subnet Mask: **255.255.255.0**   + **PC1** IP Address: **192.168.1.11**   + **PC1** Subnet Mask: **255.255.255.0**   + Ping worked  |  | | --- | | 00E0.B05E.064A | | 0050.0F14.E456 |  * + MAC Address of **PC0 –**   + MAC Address of **PC1 –**     **Task 2.** Extend the topology as shown below  Diagram  Description automatically generated with medium confidence  **Task 2.1**. Configure the Ethernet interface on **Server0** with     * + IP Address: **192.168.2.254**   + Subnet mask: **255.255.255.0**   **Task 2.2.** On **Server0** configure the DHCP service with   * + Default Gateway: **192.168.2.1**   + DNS Server: **192.168.2.254**   + Start IP Address: **192.168.2.10**   + Subnet Mask: **255.255.255.0**   + Maximum number of users: **89**   + Turn the Service On   + Save the configuration   **Task 2.3.** Configure **PC2** and **PC3** to use a DHCP IP configuration.   * + What is **PC2**  |  | | --- | | 192.168.2.1 | | 192.168.2.254 | | 192.168.2.10 | | 255.255.255.0 |  * + 1. Default Gateway     2. DNS Server     3. IP Address     4. Subnet Mask   + What is **PC3**  |  | | --- | | 192.168.2.1 | | 192.168.2.254 | | 192.168.2.11 | | 255.255.255.0 |  * + 1. Default Gateway     2. DNS Server     3. IP Address     4. Subnet Mask   **Task 2.4.** Check that **PC2** can ping **PC3**    Diagram  Description automatically generated with medium confidence**Task 3.** Extend the topology as shown below. Note that the switches are connected to the routers using the Gigabit interfaces and that the lights on the interfaces remain at red.  **Task 3.1.** Configure the Gigabit interface on **Router0** and notice that there is an IOS command window that indicates the commands being executed to perform the configuration. You will learn more about this during the module.   * + IP Address: **192.168.1.1**   + Subnet Mask: **255.255.255.0**   + It is also necessary to change Port Status to: **On**   + The interface lights have now turned green:   **Task 3.2.** Repeat (4.1) with **Router1** with   * + IP Address: **192.168.2.1**   + Subnet Mask: **255.255.255.0**   + It is also necessary to change Port Status to: **On**   + The interface lights have now turned green:     **Task 3.3.** **PC2** should be able to ping the router interface **192.168.2.1**       * If the ipconfig is executed at the command prompt, it should show the Default Gateway as **192.168.2.1** * This is because we set the DHCP server to inform the PC that this was the Default Gateway value (check 3.2 & 3.3) * Research online and write on your words what is a Default Gateway?  |  | | --- | | The Default Gateway is the path used to pass information when the device doesn't know where the destination is. |   **Task 3.4.** Check that **PC1** can ping **192.168.1.1**   * And that **ipconfig** shows the Default Gateway as **0.0.0.0** * This is because we did not manually set the Default Gateway. * Configure the Default Gateway of **PC1** to **192.168.1.1**. Do not configure the Default Gateway of **PC0** at this point.   **Task 4.** Complete the topology by connecting the two routers together using a cross-over cable (a dotted one).   * + Configure and enable the second Router0 Gigabit interface as     - IP Address: **192.168.3.1**     - Subnet Mask: **255.255.255.252**   + Configure and enable the second Router1 Gigabit interface as     - IP Address: **192.168.3.2**     - Subnet Mask: **255.255.255.252**   + The lights on the interface between the two routers is now Green     **Task 4.1.** Select the CLI tab for **Router1**.   * + Keep entering exit until the prompt changes to **Router#**   + Ping the other router     **Task 4.2.** Testing   * + **PC0** and **PC1** can communicate   + **PC2** and **PC3** can communicate   + **PC1** can communicate with **Router0**   + **PC3** can communicate with **Router1**   + **Router1** can communicate with **Router0**   + **PC1** can communicate **PC3**     **Task 4.3.** -10 marks if you ticked the final box. You should get request timed out.  **Task 4.4.** At the **PC1** Command Prompt issue the command **netstat –r**. Copy the information about the active routed in the box below   |  | | --- | |  |   This is the Routing Table in the PC and should tell you that for any network destination it does not know (**0.0.0.0**) then it will ship the packet to **192.168.1.1** (the Default Gateway) via the **192.168.1.11** (FastEthernet) interface.  **Task 4.5.** On **Router0**, if it shows ‘Press **RETURN** to get started’ then press **Return**, otherwise enter the command exit until you reach the **Router> prompt**.   * + Enter the command **show ip route**.   + Enter the lines displayed after ‘Gateway of last resort not set’ in the box below  |  | | --- | |  |   Now note the lines starting with ‘L’. This means the router only knows about its own Local interfaces. In order for it to pass packets to the other router it must know about it. We are going to set this up manually.  **Task 4.6.** In the Config tab for **Router0** Click on the Static button under Routing. Enter the following information   * + Network **192.168.2.0**   + Mask **255.255.255.0**   + Next Hop **192.168.3.2** (what route to take to get to the destination network)   + Click on **Add**   + Enter the **show ip route** command in **Router0** CLI tab. What is the difference in the Routing Table compared to the previous time?   Comparing to previous time, there is significant change in Routing table. There is a new note starting with ‘S’ following 192.168.2.0/24 [1/0] via 192.168.3.2    **Task 4.7.** Testing   * + **PC0** and **PC1** can communicate   + **PC2** and **PC3** can communicate   + **PC1** can communicate with **Router0**   + **PC3** can communicate with **Router1**   + **Router1** can communicate with **Router0**   + **PC1** can communicate **PC3**     **Task 4.8.** -20 marks if you ticked the final box (you should have learnt from last time). You should get request timed out.  **Task 4.9.** Although **Router0** knows how to get to **192.168.2.0** network **Router1** does not know how to send the response back to **PC1**. Configure **Router1** with the info below.   * + Network: **192.168.1.0**   + Mask: **255.255.255.0**   + Next Hop: **255.255.255.0** (what route to take to get to the destination network)   + Click on Add   + Enter the **show ip route** command in **Router1** CLI tab. What is the difference in the Routing Table compared to the previous time?   This time on the Routing table, the line ‘S’ has disappeared.   |  | | --- | |  |   **Task 4.10.** Testing   * + **PC0** and **PC1** can communicate   + **PC2** and **PC3** can communicate   + **PC1** can communicate with **Router0**   + **PC3** can communicate with **Router1**   + **Router1** can communicate with **Router0**   + **PC1** can communicate with **PC3**   + **PC0** can communicate with **PC2**   **Task 4.11.** Don’t make me give you -30 marks!   * Why did the last test not work?   There were no routing configured to allow Router0 and Router1 to share information. That’s why, the last test didn’t work.   * What did you do to fix it?   To fix it, I need to add a route on Router0 for the 192.168.2.0 via the interface connected to Router1 for 192.168.1.0 vice versa**.**  **Task 5.** Now is time for showing off.   * + Add **Server1** to **Switch0**.   + Configure its Ethernet interface so it has a similar IP address to **PC0** & **PC1**   + Enable the Web (HTTP) service.   + Check that **PC3** can browse to the Web server.   + What are the Quick Links on the server home page?  |  | | --- | | copyrights.html  cscoptiogo177x111.jpg  helloworld.html  image.html  index.html | |
| **Logbook activity 3 reflection questions:**  Answer the questions below in a maximum of two sentences, incorporating details from this lab.  **Task 1: Basic Network Setup**  What is the role of the switch in this basic topology?  In basic network topology, a switch serves as a central point to connect multiple devices within a local area network (LAN), efficiently routing data based on MAC addresses and enabling full two-way communication, enhancing network performance and reducing collision domains. Its role includes packet switching, filtering, and creating individual collision domains for connected devices.  What would happen if the PCs were on different subnets? Would they be able to communicate?  If the PCs are connected to different subnets it becomes an issue when one of the hosts believes the remote is in another subnet and they both need to be on the same physical network and the same subnet in order for them to communicate.  Explain the process that takes place when one PC pings another.  The Ping command first sends a request to an address and then waits for a reply. It is only successful if the request gets to the destination and is able to get a reply back to the source of the ping within a fixed interval.  How did you identify the MAC addresses of the PCs? Why might this information be useful?  The MAC Addresses of PCs can be found on your devices Network Interface Card.  The information is useful because it could help in communication between two networked devices.  **Task 2: Extending the Topology**  What new challenges did you encounter when extending the topology?  One of the main challenges that I had to encounter while doing this topology was figuring out why the communication in between PC0, PC1, PC2, PC3. Other than that most of were basically time consuming but doable.  What is the role of a DHCP server, and why is it useful in a network?  The Role of a DHCP Server is to assign IP Addresses to devices, configuring network parameters (IP Addresses, subnet masks, DNS Servers.  The usefulness of DHCP in a network that mostly it eliminates the manual effort required for typing IP Address and configuration. In large networks, DHCP ease the work by automating the IP assignment process.  How does the DHCP service affect the network configurations of PC2 and PC3?  The DHCP Service helping in automating the IP Address in PC2 and PC3. By activating DHCP PC2 and PC3 synced. After turning on the DHCP Service we cannot manually edit the IP Address, Subnet Mask, Default gateway from PC2 and PC3.  What would be the implications if the DHCP server went down?  If DHCP went down you need to set a static IP Address, as well as a subnet mask and a default gateway.    **Task 3: Further Extension with Routers**  What is the significance of a router in a network topology?  The Router manages traffic between the network by forwarding data packets to their intended IP Addresses and allowing multiple devices to use the same internet connection.  Why do you think the interface lights changed from red to green after configuring the Gigabit interface?  The interface light changed from red to green after configuring the gigabit interface is due to the establishment of a successful link at higher speed.  In your own words, explain what a Default Gateway is. How does it facilitate network communication?  The default gateway is the path used to pass information when the device doesn’t know where the destination is.  It helps in facilitating the exchange of data between devices that exit on different subnets.  **Task 4: Complete Topology with Routers**  Why is a crossover cable used to connect the two routers?  The crossover cable has the send pins on one side connected to the receive pins on the other end.  What did you observe in the routing table before and after configuring the static route?  After the changes, there were significant changes in the routing table. Before configuring there were four lines starting from (C, L, C, L). After my configuration a new line has emerged ‘S’.  What challenges did you encounter when configuring the routers to communicate with each other?  While configuring the router, I wouldn’t say I encountered problems. But there were some difficulties connecting the two routers together using a cross-over cable and making sure you typed in the correct IP Address and all that. Overall, these aren’t difficult. But these are my experience while doing it.  Explain why the last test didn't work initially and what steps you took to rectify it.  The last test didn’t work because there were no routing configured to allow Router0 and Router1 to share information. To fix it, I need to add a route on Router0 for the 192.168.2.0 via the interface connected to Router1 for 192.168.1.0 vice versa**.**  **Task 5: Extended work**  What is the role of a web server in a network?  The primary role of a web server is to store, process, and deliver requested information or webpages to the end users.  How did you ensure that PC3 could browse to the Web server?  To ensure that PC3 Could browse Web server, I pinged it to make sure that PC3 is connected to the network and can reach Server1. I checked whether the HTTP was turned ON.  What are the 'Quick Links' on the server home page, and what do they signify?  These are the Quick Links copyrights.html  cscoptiogo177x111.jpg  helloworld.html  image.html  index.html  and they signify t of hyperlinks that provide easy access to important or frequently visited sections of the website.  **General Questions**  What was the most challenging part of this lab for you?  The most challenging part was task 5 for me. It took some of my time to complete that.  What did you find most interesting or surprising while completing the lab tasks?  While doing logbook activity 3, it was very interesting doing work on packet tracer and the instructions were very clear and helped me complete the activity very well. Most of my doubts about this module were cleared while doing this activity.  How has this lab improved your understanding of network configurations and topologies?  The lab has improved my understanding of network topologies and configuration very well.  Are there any real-world applications or scenarios where you can see these skills being applied?  There are so many real-world applications for these skills like In large organizations, network administrators are responsible for designing, configuring, and maintaining complex enterprise networks. Some in data centres, Telecommunications. Etc |
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**Logbook activity – 3 Marking Scheme:**

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| --- | --- |
| **Description** | **Marks possible** |
| **Tasks** | **50** |
| Start a New Packet Tracer activity and connect two PCs and a switch | 5 |
| Extend the topology | 10 |
| Extend the topology with switches and routers | 10 |
| Complete the topology by connecting the two routers together | 20 |
| Time for showing off | 5 |
| **Reflection questions** | **50** |
| Basic Network Setup | 8 |
| Extending the Topology | 10 |
| Further Extension with Routers | 10 |
| Complete Topology with Routers | 10 |
| Extended work | 6 |
| General Questions | 6 |

# Logbook activity 4: IPv4 Network Address Calculations

## 1. Determine whether IP addresses are on same network

|  |  |  |
| --- | --- | --- |
| * + 1. You are configuring two PCs for your network. PC-A is given an IP address of 192.168.1.18, and PC-B is given an IP address of 192.168.1.24. Both PCs receive a subnet mask of 255.255.255.248. [25 marks]   What is the network address for PC-A?  Answer: 192.168.1.16  What is the network address for PC-B?  Answer: 192.168.1.24  Will these PCs be able to communicate directly with each other?  Answer: Yes, they will be able to communicate with each other.  Answer:   |  | | --- | | **EXPLANATION for a:**  The Subnet mask is 255.255.255.248.  In binary it is 11111111.11111111.11111111.11111000 which means that the first 29 bits are network bits, and the remaining 3 bites are host bits.  For PC-A (192.168.1.18):  192.168.1.18 when converted to binary is 11000000.10101000.00000001.00010010  For the subnet mask 255.255.255.248.it is 11111111.11111111.11111111.11111000  After performing a bitwise AND operation, the network address for PC-A is 192.168.1.16  For PC-B (192.168.1.24):  192.168.1.24 when converted to binary is 11000000.10101000.00000001.00011000  For the subnet mask it 255.255.255.248. is 11111111.11111111.11111111.11111000  After performing a bitwise AND operation, the network address for PC-B is 192.168.1.24.  The Conclusion is that Both PCs are on the same subnet (192.168.1.16/29), and they can communicate directly because they share the same network address and subnet mask. The subnet mask ensures that both PCs consider each other as part of the same local network. |  * + 1. You are configuring two PCs for your network. PC-A is given an IP address of 10.2.0.25, and PC-B is given an IP address of 10.3.0.50. Both PCs receive a subnet mask of 255.255.0.0. [25 marks]   What is the network address for PC-A?  Answer: 10.2.0.0  What is the network address for PC-B?  Answer: 10.3.0.0  Will these PCs be able to communicate directly with each other?  Answer: Not directly; router is required.  What is the lowest address that can be given to PC-B that allows it to be on the same network as PC-A?  Answer: 10.2.0.1   |  | | --- | | **EXPLANATION for b:**  The subnet mask 255.255.0.0  In binary is 11111111.11111111.00000000.00000000. which means that the first 16 bits are network bits, and the remaining 16 bites are host bits.  For PC-A (10.2.0.25):  10.2.0.25 when converted to binary is 00001010.00000010.00000000.00011001  For the subnet mask 255.255.0.0 it is 11111111.11111111.00000000.00000000  After performing a bitwise AND operation , the network address for PC-A is 10.2.0.0  For PC-B (10.3.0.50):  10.3.0.50 when converted to binary is 00001010.00000011.00000000.00110010  For the subnet mask 255.255.0.0 it is 11111111.11111111.00000000.00000000  After performing a bitwise AND operation , the network address for PC-B is 10.3.0.0  About the communication between PC-A and PC-B , they are on different subnets because they have different network addresses (10.2.0.0 and 10.3.0.0).  Therefore, they cannot communicate directly without the intervention of a router.  To allow PC-B to be on the same network as PC-A, the lowest address in the subnet 10.2.0.0/16 that can be assigned to PC-B is 10.2.0.1. This ensures that both PCs share the same network address.  In Conclusion, PC-A and PC-B are on different networks due to their different network addresses, and communication between them would require a router. Adjusting the IP address of PC-B to be in the same subnet as PC-A (10.2.0.1) would enable direct communication within the same network. | |

## 2. Identify the default gateway address.

|  |  |  |
| --- | --- | --- |
| Your company has a policy to use the first IP address in a network as the default gateway address. A host on the local-area network (LAN) has an IP address of 172.16.140.24 and a subnet mask of 255.255.192.0. [25 marks]  What is the network address for this network?  Answer: 172.16.128.0.  What is the default gateway address for this host?  Answer: 172.16.128.1   |  | | --- | | **EXPLANATION for a:**  The IP Address (172.16.140.24) when converted to binary will give us 10101100.00010000.10001100.00011000.  And for the Subnet mask (255.255.192.0) when converted will give us 11111111.11111111.11000000.00000000  After Performing a bitwise AND operation, the network address for the given IP Address and Subnet mask is 172.16.128.0.  For the default gateway address, it’s always the first IP Address. In calculated network address (172.16.128.0), the first usable IP Address is 172.16.128.1 Therefore the default gateway is 172.16.128.1.  In Conclusion the network address is determined by applying the subnet mask to the host’s IP Address, resulting in 172.16.128.0. The first usable address in this network is 172.16.128.1. |   Your company has a policy to use the first IP address in a network as the default gateway address. You have been instructed to configure a new server with an IP address of 192.168.184.227 and a subnet mask of 255.255.255.248. [25 marks]  What is the network address for this network?  Answer: 192.168.184.224  What is the default gateway for this server?  Answer: 192.168.184.225   |  | | --- | | **EXPLANATION for b:**  The IP (192.168.184.227) Address when converted to binary will give 11000000.10101000.10111000.11100011  And for the Subnet mask (255.255.255.248) we will get 11111111.11111111.11111111.11111000  After performing bitwise AND Operation, the network address for the given IP address and subnet mask is 192.168.184.224.  For the default gateway Address, it’s always the first IP Address. In calculated network address (192.168.184.224), So the first usable IP Address is 192.168.184.225.  Therefore, the default gateway address for this server is 192.168.184.225. | |

# Logbook activity 5: Subnetting Network Topologies

## 1. Calculate subnet information

Use the 192.168.2.0/24 network address to provide addresses to the network devices in the following network topology. Also provide an IP address scheme that will accommodate these additional devices. For this topology, assign a subnet to each network.

A picture containing text, clock

Description automatically generated

**Step 1: Determine the number of subnets in Network Topology C. [25 marks]**

1. How many subnets are there? There are 6 Subnets.
2. How many bits should you borrow to create the required number of subnets? 3 Bits are required to create the required number of subnets.
3. How many usable host addresses per subnet are in this addressing scheme? 30 Usable host address per subnets.
4. What is the new subnet mask in dotted decimal format? 255.255.255.224
5. How many subnets are available for future use? 2 Subnet is available for future use.

|  |
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| **EXPLANATION:**  a. There are 3 subnets (one for each switch S1, S2, S3).  b. To create 3 subnets, you need to borrow 2 bits (since 22 = 4 gives us 4 subnets, one of which is reserved).  c. The number of usable host addresses per subnet in this addressing scheme is  2(8 -number of borrowed bits) - 2. So, in this case, it would be 2(8 - 2) - 2 = 62 usable addresses.  d. The new subnet mask would be 255.255.255.192. This is because borrowing 2 bits adds 128 + 64 = 192 to the last octet of the subnet mask.  e. If we have created 3 subnets and we can create a total of 4 subnets by borrowing 2 bits, then we have 1 subnet available for future use. |

**Step 2: Record the subnet information. [25 marks]**

Fill in the following table with the subnet information:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subnet Number** | **Subnet Address** | **First Usable Host**  **Address** | **Last Usable Host**  **Address** | **Broadcast**  **Address** |
| 0 | 192.168.2.0 | 192.168.2.1 | 192.168.2.30 | 192.168.2.31 |
| 1 | 192.168.2.32 | 192.168.2.33 | 192.168.2.62 | 192.168.2.63 |
|  | 192.168.2.64 | 192.168.2.65 | 192.168.2.94 | 192.168.2.95 |
| 3 | 192.168.2.96 | 192.168.2.97 | 192.168.2.126 | 192.168.2.127 |
| 4 | 192.168.2.128 | 192.168.2.127 | 192.168.2.158 | 192.168.2.159 |
| 5 | 192.168.2.160 | 192.168.2.159 | 192.168.2.190 | 192.168.2.191 |
| 6 | Blank | Blank | Blank | Blank |
| 7 | Blank | Blank | Blank | Blank |

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| **EXPLANATION:** |

**Step 3: Assign addresses to network devices in the subnets. [50 marks]**

1. Fill in the following table with IP addresses and subnet masks for the router interfaces:

|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** |
| R1 | GigabitEthernet 0/1 | 192.168.2.1 | 255.255.255.224 |
|  | Serial 0/0/0 | 192.168.2.33 | 255.255.255.224 |
|  | Serial 0/0/1 | 192.168.2.65 | 255.255.255.224 |
| R2 | GigabitEthernet 0/1 | 192.168.2.97 | 255.255.255.224 |
|  | Serial 0/0/0 | 192.168.2.129 | 255.255.255.224 |
|  | Serial 0/0/1 | 192.168.2.34 | 255.255.255.224 |
| R3 | GigabitEthernet 0/1 | 192.168.2.161 | 255.255.255.224 |
|  | Serial 0/0/0 | 192.168.2.66 | 255.255.255.224 |
|  | Serial 0/0/1 | 192.168.2.130 | 255.255.255.224 |

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| **EXPLANATION:** |

1. Fill in the following table with the IP addresses and subnet masks for devices in the LAN as displayed in topology.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| PC-A | NIC | 192.168.2.30 | 255.255.255.224 | 192.168.10.1 |
| PC-B | NIC | 192.168.2.29 | 255.255.255.224 | 192.168.10.1 |
| S1 | VLAN 1 | 192.168.2.2 | 255.255.255.224 | 192.168.10.1 |
| PC-C | NIC | 192.168.2.126 | 255.255.255.224 | 192.168.10.97 |
| PC-D | NIC | 192.168.2.125 | 255.255.255.224 | 192.168.10.97 |
| S2 | VLAN 1 | 192.168.2.98 | 255.255.255.224 | 192.168.10.97 |
| PC-E | NIC | 192.168.2.190 | 255.255.255.224 | 192.168.10.161 |
| PC-F | NIC | 192.168.2.189 | 255.255.255.224 | 192.168.10.161 |
| S3 | VLAN 1 | 192.168.2.162 | 255.255.255.224 | 192.168.10.161 |

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| **EXPLANATION:** |

# Logbook activity 6: VLSM Design and Implementation Practice

**Objectives**

**Part 1: Examine the Network Requirements**

**Part 2: Design the VLSM Addressing Scheme**

**Part 3: Assign IP Addresses to Devices and Verify Connectivity**

**Background**

In this activity, you are given a /24 network address to use to design a VLSM addressing scheme. Based on a set of requirements, you will assign subnets and addressing, configure devices and verify connectivity.

Create the following network topology.

**Network Topology:**

Diagram

Description automatically generated

## Part 1. Examine the Network Requirements

### Step 1. Determine the number of subnets needed.

You will subnet the network address 172.31.103.0/24. The network has the following requirements:

* SW-1 LAN will require 27 host IP addresses.
* SW-2 LAN will require 25 host IP addresses.
* SW-3 LAN will require 14 host IP addresses.
* SW-4 LAN will require 8 host IP addresses.

**Question:**

How many subnets are needed in the network topology?

4 Subnets are needed in this network topology.

### Step 2. Determine the subnet mask information for each subnet.

**Questions:**

* + - * 1. Which subnet mask will accommodate the number of IP addresses required for SW-1?

The Subnet mask for SW-1 would be /27.

The subnet for SW-1 needs to accommodate 27 hosts. The closest power of 2 that is greater than 27 is 32, (.

So, we need a subnet mask that provides 32 addresses. In binary, 32 addresses require 5 bits. Since an IPv4 address is 32 bits long, this leaves us with 32 - 5 = 27 bits for the network.

How many usable host addresses will this subnet support?

There will be 30 Usable Host Addresses. The Subnet mask will provide 32 addresses, and 30 of them are usable host addresses. (we need to subtract 2 for the network and broadcast addresses).

* 1. Which subnet mask will accommodate the number of IP addresses required for SW-2?

The Subnet mask for SW-2 would be /27.

The subnet for SW-2 needs to accommodate 25 hosts. The closest power of 2 that is greater than 25 is 32, (25 = 32).

So, we need a subnet mask that provides 32 addresses. In binary, 32 addresses require 5 bits. Since an IPv4 address is 32 bits long, this leaves us with 32 - 5 = 27 bits for the network.

How many usable host addresses will this subnet support?

There will be 30 Usable Host Addresses. The Subnet mask will provide 32 addresses, and 30 of them are usable host addresses. (we need to subtract 2 for the network and broadcast addresses).

* 1. Which subnet mask will accommodate the number of IP addresses required for SW-3?

The Subnet mask for SW-3 would be /28.

The subnet for SW-3 needs to accommodate 14 hosts. The closest power of 2 that is greater than 14 is 16, ).

So, we need a subnet mask that provides 16 addresses. In binary, 16 addresses require 4 bits. Since an IPv4 address is 32 bits long, this leaves us with 32 - 4 = 28 bits for the network.

How many usable host addresses will this subnet support?

There will be 14 Usable Host Addresses. This subnet mask will provide exactly 16 addresses, 14 of which are usable for hosts.

* 1. Which subnet mask will accommodate the number of IP addresses required for SW-4?

The Subnet Mask for SW-4 would be /28.

The subnet for SW-3 needs to accommodate 14 hosts. The closest power of 2 that is greater than 14 is 16, (24=16).

So, we need a subnet mask that provides 16 addresses. In binary, 16 addresses require 4 bits. Since an IPv4 address is 32 bits long, this leaves us with 32 - 4 = 28 bits for the network.

How many usable host addresses will this subnet support?

There will be 14 Usable Host Addresses. This subnet mask will provide exactly 16 addresses, 14 of which are usable for hosts.

* 1. Which subnet mask will accommodate the number of IP addresses required for the connection between Building-1 and Building-2?

The subnet mask for the connection between Building-1 and Building-2 would be /30.

## Part 2. Design the VLSM Addressing Scheme

### Step 1. Divide the 172.31.103.0/24 network based on the number of hosts per subnet.

Now fill in the following summary table with the VLSM subnet information:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subnet Number** | **Subnet address/CIDR** | **Subnet Mask** | **First Usable  Host Address** | **Broadcast Address** | **Usable Hosts** |
| 0 | 172.31.103.0/27 | 255.255.255.224 | 172.31.103.1 | 172.31.103.31 | 30 | |
| 1 | 172.31.103.32/27 | 255.255.255.224 | 172.31.103.33 | 172.31.103.63 | 30 | |
| 2 | 172.31.103.64/28 | 255.255.255.240 | 172.31.103.65 | 172.31.103.79 | 14 | |
| 3 | 172.31.103.80/28 | 255.255.255.240 | 172.31.103.81 | 172.31.103.95 | 14 | |
| 4 | 172.31.103.96/30 | 255.255.255.252 | 172.31.103.97 | 172.31.103.99 | 2 | |

### Step 2. Document the VLSM subnets.

Complete the **Subnet Table**,listing the subnet descriptions, number of hosts needed, then network address for the subnet, the first usable host address, and the broadcast address. Repeat until all addresses are listed.

1. Use the first subnet to accommodate the largest LAN.
2. Use the second subnet to accommodate the second largest LAN.
3. Use the third subnet to accommodate the third largestLAN.
4. Use the fourth subnet to accommodate the fourth largestLAN.
5. Use the fifth subnet to accommodate the connection between Building-1and Building-2.

**VLSM Subnet Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Subnet Description** | **Number of Hosts  Needed** | **Network Address/CIDR** | **First Usable Host Address** | **Broadcast Address** |
| Building 1, SW-1 | 27 | 172.31.103.0/27 | 172.31.103.1 | 172.31.103.31 |
| Building 1, SW-2 | 25 | 172.31.103.32/27 | 172.31.103.33 | 172.31.103.63 |
| Building 2, SW-3 | 14 | 172.31.103.64/28 | 172.31.103.65 | 172.31.103.79 |
| Building 2, SW-4 | 8 | 172.31.103.80/28 | 172.31.103.81 | 172.31.103.95 |
| Connection between Building-1 and Building-2 | 2 | 172.31.103.96/30 | 172.31.103.97 | 172.31.103.99 |

### 

### Step 3. Document the addressing scheme.

1. Assign the first usable IP addresses to Building-1 for the two LAN links.
2. Assign the first usable IP addresses to Building-2 for the two LAN links.
3. Assign the IP addresses to the WAN link.
4. Assign the second usable IP addresses to the switches.
5. Assign the last usable IP addresses to the hosts.

**Addressing Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| Building-1 | G0/0 | 172.31.103.1 | 255.255.255.224 | N/A |
| G0/1 | 172.31.103.33 | 255.255.255.224 | N/A |
| S0/0/0 | 172.31.103.97 | 255.255.255.252 | N/A |
| Building-2 | G0/0 | 172.31.103.65 | 255.255.255.240 | N/A |
| G0/1 | 172.31.103.81 | 255.255.255.240 | N/A |
| S0/0/0 | 172.31.103.98 | 255.255.255.252 | N/A |
| SW-1 | VLAN 1 | 172.31.103.2 | 255.255.255.224 | 172.31.103.1 |
| SW-2 | VLAN 1 | 172.31.103.34 | 255.255.255.224 | 172.31.103.33 |
| SW-3 | VLAN 1 | 172.31.103.66 | 255.255.255.240 | 172.31.103.65 |
| SW-4 | VLAN 1 | 172.31.103.82 | 255.255.255.240 | 172.31.103.81 |
| Host-A | NIC | 172.31.103.30 | 255.255.255.224 | 172.31.103.1 |
| Host-B | NIC | 172.31.103.62 | 255.255.255.224 | 172.31.103.33 |
| Host-C | NIC | 172.31.103.78 | 255.255.255.240 | 172.31.103.65 |
| Host-D | NIC | 172.31.103.94 | 255.255.255.240 | 172.31.103.81 |

## 

## Part 3. Assign IP Addresses to Devices and Verify Connectivity

Choose Option 1, if you are using given topology. Choose Option 2, if you are creating your own topology. Use Command Line Interface to configure devices.

**Example Configuration:**

|  |
| --- |
| You have used GUI to configure router before. Now use CLI to configure router. Use below example.  Building-Router:  Router>en // User EXEC mode; View-only mode  Router#conf t // Privileged EXEC mode; The user can use this for any  // monitoring commands and execute configuration and  // management commands.  Router(config)#int g0/0 // global configuration mode  Router(config-if)#ip add <ip-address> <subnet-mask> // interface  // configuration  // mode  Router(config-if)#no shut // enable the interface  Router(config-if)#int g0/1  Router(config-if)#ip add <ip-address> <subnet-mask>  Router(config-if)#no shut    To access the switch remotely, an IP address and a subnet mask must be configured on the Switch Virtual Interface (SVI). To configure an SVI on a switch, use the interface vlan 1 global configuration command. Vlan 1 is not an actual physical interface but a virtual one. Next assign an IPv4 address using the **ip address <ip-address> <subnet-mask>** interface configuration command. Finally, enable the virtual interface using the **no shutdown** interface configuration command.  After these commands are configured, the switch has all the IPv4 elements ready for communication over the network.  Note: Similar to a Windows hosts, switches configured with an IPv4 address will typically also need to have a default gateway assigned. This can be done using the **ip default-gateway <ip-address>** global configuration command. The ip-address parameter would be the IPv4 address of the local router on the network.  Use the below example to configure switches using CLI  LAN-Switch:  Switch>en  Switch#conf t  Switch(config)#int vlan 1  Switch(config-if)#ip add <ip-address> <subnet-mask>  Switch(config-if)#no shut  Switch(config-if)#ip def <default-gateway-address> |

Implement the following steps to complete the addressing configuration.

### Step 1: Configure Building-1 router LAN and WAN interfaces.

|  |
| --- |
| Building-1 configuration:  Router>en  Router#conf t  Router(config)#int g0/0  Router(config-if)#ip add 172.31.103.1 255.255.255.224  Router(config-if)#no shut  Router(config)#int g0/1  Router(config-if)#ip add 172.31.103.33 255.255.255.224  Router(config-if)#no shut  Router(config)#int s0/0/0  Router(config-if)#ip add 172.31.103.97 255.255.255.252  Router(config-if)#no shut |

### Step 2: Configure Building-2 router LAN and WAN interfaces.

|  |
| --- |
| Building-2 configuration:  Router>en  Router#conf t  Router(config)#int g0/0  Router(config-if)#ip add 172.31.103.65 255.255.255.240  Router(config-if)#no shut  Router(config)#int g0/1  Router(config-if)#ip add 172.31.103.81 255.255.255.240  Router(config-if)#no shut  Router(config)#int s0/0/0  Router(config-if)#ip add 172.31.103.98 255.255.255.252  Router(config-if)#no shut |

### Step 3: Configure SW-1, SW-2, and SW-3 switches including the default gateway.

|  |
| --- |
| SW-1 configuration:  Switch>en  Switch#conf t  Switch(config)#int vlan 1  Switch(config-if)#ip add 172.31.103.2 255.255.255.224  Switch(config-if)#no shut  Switch(config)#ip default-gateway 172.31.103.1 |

|  |
| --- |
| SW-2 configuration:  Switch>en  Switch#conf t  Switch(config)#int vlan 1  Switch(config-if)#ip add 172.31.103.34 255.255.255.224  Switch(config-if)#no shut  Switch(config)#ip default-gateway 172.31.103.33 |

|  |
| --- |
| SW-3 configuration:  Switch>en  Switch#conf t  Switch(config)#int vlan 1  Switch(config-if)#ip add 172.31.103.66 255.255.255.240  Switch(config-if)#no shut  Switch(config)#ip default-gateway 172.31.103.65 |

### Step 4: Configure Host-A, Host-B, Host-C, and Host-D, hosts including the default gateway.

|  |
| --- |
| Host-A  ipconfig /set address "Local Area Connection" static 172.31.103.30 255.255.255.224 172.31.103.1 |

|  |
| --- |
| Host-B  ipconfig /set address "Local Area Connection" static 172.31.103.62 255.255.255.224 172.31.103.33 |

|  |
| --- |
| Host-C  ipconfig /set address "Local Area Connection" static 172.31.103.78 255.255.255.240 172.31.103.65 |

|  |
| --- |
| Host-D  ipconfig /set address "Local Area Connection" static 172.31.103.94 255.255.255.240 172.31.103.81 |

## Part 4: Verify connectivity.

Verify connectivity from all hosts. If you successfully configure all devices, you should be able to ping every IP address listed in the **Addressing Table**. Show your successful test using a screenshot. If ping does not work, explain why? What have you done to fix it?

|  |
| --- |
| **Explanation:** |

**Logbook Activity – 6 Marking Scheme:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tasks** | **Subtasks** | **Description** | **Criteria for Full Marks** | **Marks Possible** |
| Part 1: Examine the Network Requirements | Step 1: Determine the number of subnets needed. | Number of subnets needed based on network requirements | Correctly determined the number of subnets needed | 5 |
| Step 2: Determine the subnet mask information for each subnet. | Subnet mask for SW-1, SW-2, SW-3, SW-4 | Correctly identified the subnet masks for all LANs | 10 |
| Part 2: Design the VLSM Addressing Scheme | Step 1: Divide the given network based on the number of hosts per subnet. | Completed VLSM Summary Table | All entries in the VLSM Summary Table are correct | 8 |
| Step 2: Document the VLSM subnets. | Completed VLSM Subnet Table | All entries in the VLSM Subnet Table are correct | 10 |
| Step 3: Document the addressing scheme. | Completed Addressing Table | All entries in the Addressing Table are correct | 14 |
| Part 3: Assign IP Addresses to Devices and Verify Connectivity | Step 1: Configure IP addressing on the Building-1 router LAN and WAN interfaces. | Commands for Building-1 configuration | Correct commands and IP addresses for Building-1 | 5 |
| Step 2: Configure IP addressing on the Building-2 router LAN and WAN interfaces. | Commands for Building-2 configuration | Correct commands and IP addresses for Building-2 | 5 |
| Step 3: Configure IP addressing on the SW-1, SW-2, and SW-3 switches including the default gateway. | Commands for switches configuration | Correct commands and IP addresses for switches | 15 |
| Step 4: Configure IP addressing on the Host-A, Host-B, Host-C, and Host-D, hosts including the default gateway. | Commands for Hosts configuration | Correct commands and IP addresses for hosts | 8 |
| Part 4: Verify Connectivity | N/A | Screenshot showing successful ping tests and explanation | Screenshot verifies that all devices can communicate, with sufficient explanation and appropriate configuration commands | 20 |

**Logbook Marking Scheme:**

|  |  |
| --- | --- |
| **Logbook activity** | **Marks possible** |
| 1 | 10% |
| 2 | 10% |
| 3 | 20% |
| 4 | 10% |
| 5 | 10% |
| 6 | 30% |
| Overall impression | 10% |