iBiome - RIP User Guide

RAPTOR™

Intelligent Cyber Secure Platform

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GLOSSARY ENTRIES

802.1D

IEEE 802.1D is the Ethernet MAC bridges standard which includes Bridging, Spanning Tree and others. It is standardized by the IEEE 802.1 working group. It includes details specific to linking many of the other 802 projects including the widely deployed 802.3 (Ethernet), 802.11 (Wireless LAN) and 802.16 (WiMax) standards.

Bridges using virtual LANs (VLANs) have never been part of 802.1D, but were instead specified in separate standard, 802.1Q originally published in 1998.

By 2014, all the functionality defined by IEEE 802.1D has been incorporated into either IEEE 802.1Q (Bridges and Bridged Networks) or IEEE 802.1AC (MAC Service Definition).

802.1Q

IEEE 802.1Q, often referred to as DOT1Q or 1Q, is the networking standard that supports virtual LANs (VLANs) on an IEEE 802.3 Ethernet network. It is the most widely used encapsulation method for VLAN tagging.

802.1X

IEEE 802.1X is an IEEE Standard for port-based Network Access Control (PNAC). 802.1X authentication requires a client, an authenticator, and an authentication server. The client is a device that wants to connect to the network.

802.1W

IEEE 802.1W feature provides rapid traffic reconvergence for point-to-point links within a few milliseconds (0-500 milliseconds), following the failure of bridge or bridge point. This reconvergence occurs more rapidly than the reconvergence provided by the 802.1F spanning Tree Protocol (STP) or by RSTP.

AAA

Authentication, Authorization and Accounting (AAA) functionalities. AAA are provided by TACACS+. TACACS+ is used because it provides independently separate and modular authentication, authorization, and accounting (AAA) facilities achieved by a single access control server (the TACACS+ daemon).

AARP

AppleTalk Address Resolution Protocol (AARP). The AARP maps computers' physical hardware addresses to their temporarily assigned AppleTalk network addresses. AARP is functionally equivalent to Address Resolution Protocol (ARP). The AARP table permits management of the address mapping table on the managed device. This protocol allows Apple computers' AppleTalk hosts to generate their own network addresses

ABR

Area Border Router (ABR)

ACK

ACK stands for acknowledgment. ACK is one of the TCP flags.

TCP flags are various types of flag bits present in the TCP header. Each of them has its own significance. They initiate connections, carry data, and tear down connections. The commonly used TCP flags are SYN, ACK, RST, FIN, URG, PSH.

- SYN (synchronize): Packets that are used to initiate a connection.
- ACK (acknowledgment): Packets that are used to confirm that the data packets have been received, also used to confirm the initiation request and tear down requests.
- RST (reset): Signify the connection is down or maybe the service is not accepting the requests.
- FIN (finish): Indicate that the connection is being torn down. Both the sender and receiver send the FIN packets to gracefully terminate the connection.
- PSH (push): Indicate that the incoming data should be passed on directly to the application instead of getting buffered.
- URG (urgent): Indicate that the data that the packet is carrying should be processed immediately by the TCP stack

ACL

An access-control list (ACL) is a list of permissions associated with a system resource (object). An ACL specifies which users or system processes are granted access to objects, as well as what operations are allowed on given objects. Each entry in a typical ACL specifies a subject and an operation. For instance, if a file object has an ACL that contains (Admin: read, write; guest 1: read), this would give Admin permission to read and write the file, and only give guest 1 permission to read it.

AES

The Advanced Encryption Standard (AES) is a symmetric-key block cipher algorithm and U.S. government standard for secure and classified data encryption and decryption.

ARAP

Apple Remote Access Protocol (ARAP); the Apple Remote Access Protocol (ARAP) sends traffic based on the AppleTalk protocol across PPP links and ISDN switched-circuit networks. ARAP is still pervasive in the Apple market, although the company is attempting to transition into an Apple-specific TCP stack for use over a PPP link.

ARP

ARP (Address Resolution Protocol). The ARP is a communication protocol used for discovering the link layer address, such as a MAC address, associated with a given Internet layer address, typically an IPv4 address.

AS

Autonomous System (AS)

ASBR

Autonomous Border System Router (ASBR)

BDR

BDR stands for Backup Designated Router.

BFD

Bidirectional Forwarding Detection (BFD) is a super fast protocol that is able to detect link failures within milliseconds or even microseconds. BFD runs independent from any other (routing) protocols. Once it's up and running, you can configure protocols like OSPF, EIGRP, BGP, HSRP, MPLS LDP etc. to use BFD for link failure detection instead of their own mechanisms. When the link fails, BFD will inform the protocol

BIDIR-PIM

Bi-directional Sparse Mode (PIM-SM); Derived from PIM-SM, BIDIR-PIM builds and maintains a bidirectional RPT, which is rooted at the RP and connects the multicast sources and the receivers. Along the bidirectional RPT, the multicast sources send multicast data to the RP, and the RP forwards the data to the receivers. Each router along the bidirectional RPT needs to maintain only one (*, G) entry, saving system resources.

Another difference between PIM sparse mode and PIM bidirectional mode is that with sparse mode traffic only flows down the shared tree. Using PIM bidirectional mode, traffic will flow up and down the shared tree. When the multicast packets arrive at the RP, they will be forwarded down the shared tree (if there are receivers) or dropped (when we don't have receivers).

BMS

Best Master Clock (BMS); The ordinary clock executes the port state machine and BMC (Best Master Clock) algorithm to select the *PTP* port state.

BOOTP

The Bootstrap Protocol (BOOTP) is a computer networking protocol used in Internet Protocol networks to automatically assign an IP address to network devices from a configuration server. The BOOTP was originally defined in RFC 951.

BPDU

Bridge Protocol Data Units (BPDUs) are frames that contain information about the spanning tree protocol (STP). A switch sends BPDUs using a unique source MAC address from its origin port to a multicast address.

There are two kinds of BPDUs for 802.1D Spanning Tree:[

- Configuration BPDU, sent by root bridges to provide information to all switches.
- TCN (Topology Change Notification), sent by bridges towards the root bridge to notify changes in the topology, such as port up or port down.

BPS

BPS (Bits-per-second)

BR

Border Router (BR)

BSD

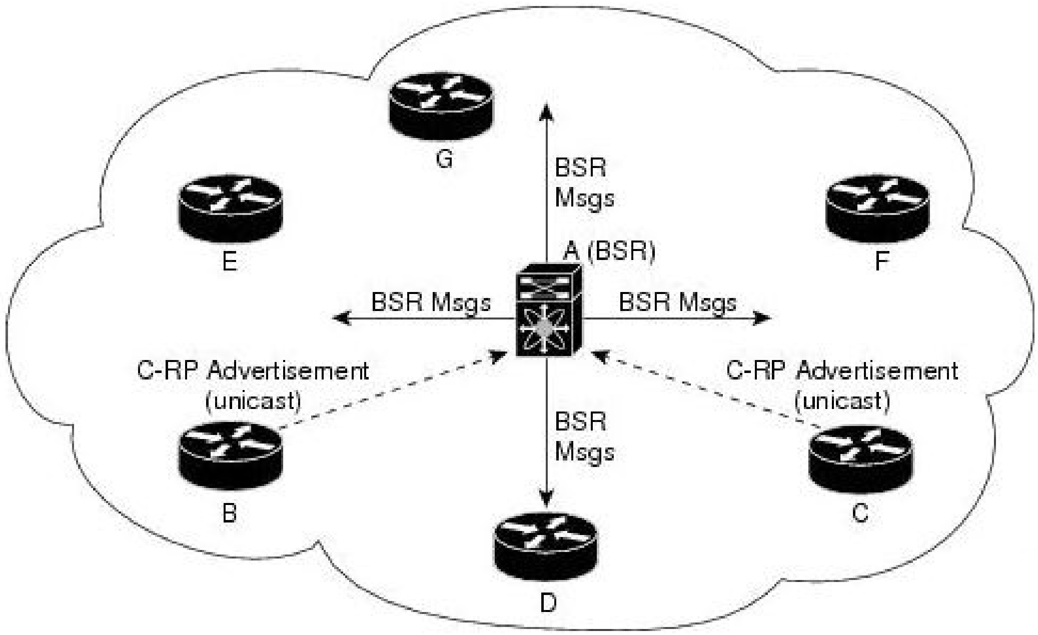
Berkeley Software Distribution (BSD)

BSR

The bootstrap router (BSR) ensures that all routers in the PIM domain have the same RP cache as the BSR. You can configure the BSR to help you select an RP set from BSR candidate RPs. The function of the BSR is to broadcast the RP set to all routers in the domain. You select one or more candidate BSRs to manage the RPs in the domain. Only one candidate BSR is elected as the BSR for the domain.

This figure shows the BSR mechanism. Router A, the software-elected BSR, sends BSR messages out all enabled interfaces (shown by the solid lines in the figure). The messages, which contain the RP set, are flooded hop by hop to all routers in the network. Routers B and C are candidate RPs that send their candidate-RP advertisements directly to the elected BSR (shown by the dashed lines in the figure).

The elected BSR receives candidate-RP messages from all the candidate RPs in the domain. The bootstrap message sent by the BSR includes information about all of the candidate RPs. Each router uses a common algorithm to select the same RP address for a given multicast group.



CA

Certificate Authorization (CA)

CBP

Customer Backbone Port (CBP)

CBS

Committed burst size (CBS). During periods of average traffic rates below the Committed information rate (CIR), any unused bandwidth capacity accumulates up to a maximum amount defined by the CBS. Short periods of bursting traffic (back-to-back traffic at averages rates that exceed the CIR) are also categorized as green provided that unused bandwidth capacity is available.

CEP

Customer Edge Port (CEP). The Customer Edge Port (CEP) and each Provider Edge Port are treated as separate Bridge Ports by the spanning tree protocol. If the C-VLAN component connects to the S-VLAN component with a single Provider Edge Port, and the associated service instance supports no more than two customer interfaces, then all frames (including Spanning Tree BPDUs) addressed to the Bridge Group Address may be relayed between the two Ports of the C-VLAN component without modification. Otherwise, the Spanning Tree Protocol Entity shall execute the Rapid Spanning Tree Protocol (RSTP, Clause 17 of IEEE Std 802.1D), as modified by the provisions of this subclause.

CFI

Canonical Format Identifier (CFI). If Drop Eligible Indicator (DEI) bit is enabled in 802.1ad header or has Canonical Format Identifier (CFI) bit enabled in 802.1q header on an arriving packet, such packets will be dropped using QoS.

MS-CHAP

CHAP stands for Challenge Handshake Authentication Protocol. MS-CHAP is the Microsoft version of the Challenge-Handshake Authentication Protocol, CHAP. The protocol exists in two versions, MS-CHAPv1 (defined in RFC 2433) and MS-CHAPv2 (defined in RFC 2759). MS-CHAPv2 provides mutual authentication between peers by piggybacking a peer challenge on the Response packet and an authenticator response on the Success packet.

CIDR

Classless Inter Domain Routing (CIDR).

CIR

Committed information rate (CIR) is defines the guaranteed bandwidth for traffic arriving at or departing from the interface under normal line conditions.

CIST

The Common and Internal Spanning Tree (CIST) is a collection of the ISTs in each MST region.

CLI

Command line interface (CLI) is a text-based interface that is used to operate software and operating systems while allowing the user to respond to visual prompts by typing single commands into the interface and receiving a reply in the same way

CLKIWF

CLKIWF is short for Clock InterWorking Function.

CoS

Output queue scheduling defines the class-of-service (CoS) properties of output queues. Based on certain types of traffic are preferred. The level of service is determined by the egress port queue to which the traffic is assigned. When traffic is queued for transmission, the rate at which it is serviced depends on how the queue is configured and possibly the amount of traffic present in other queues for that port.

Some traffic is classified for service (i.e., packet marking) before it arrives at the switch. If you decide to use these classifications, you can map this traffic to egress queues by setting the CoS in the Queue table.

CPLD

A Complex Programmable logic device (CPLD) is a logic device with completely programmable AND/OR arrays and macrocells. Macrocells are the main building blocks of a CPLD, which contain complex logic operations and logic for implementing disjunctive normal form expressions. AND/OR arrays are completely reprogrammable and responsible for performing various logic functions.

CPU

The central processing unit (CPU) is the primary component of a computer that processes instructions. It runs the operating system and applications, constantly receiving input from the user or active software programs. It processes the data and produces output.

CRT

CRT stands for "Internet security certificate.

CSR

Certificate Signing Request (CSR)

CST

common spanning tree (CST); The common spanning tree (CST) that interconnects the MST regions and single spanning trees

CTS

CTS stands for Clear to Send. Request to Send (RTS)/CTS Flow Control is another flow control mechanism that is part of the RS232 standard.

CVID

The C-VID registration table is as follows:

Table 1: C-VID registration table

C-VID Registration Table	Description
Cvid value	The value of the Customer VLAN id on the Customer edge port. (Table key)
Svid Value	The S-VLAN tag. Auto creates an S-VLAN component and the CNP and PNP and links the PEP of the C-VLAN component to the CNP.
Untagged-pep	A boolean indicating frames for this C-VLAN should be forwarded untagged through the Provider Edge Port (PEP).
Untagged-cep	A boolean indicating frames for this C-VLAN should be forwarded untagged through the Customer Edge Port (CEP).

CVLAN

Set of ports & inner VLANs (CVLAN); or C-VLAN or Customer Bridge (CB)

DB9

DB9 refers to a common connector type from the D-Subminiatures (D-Sub) connector family, which when introduced, was among the smallest connectors used on computer systems. DB9 houses 9 pins (for the male connector) or 9 holes (for the female connector). DB9 connectors were once very common on PCs and servers. Today, the DB9 has mostly been replaced by more modern interfaces such as USB, PS/2, Firewire, and others.

DB25

The DB25 connector is an analog socket, with 25 pins, from the D-Subminiatures (D-Sub) connector family. The prefix "D" represents the D-shape of the connector shell. The DB25 connector is mainly used in serial and parallel ports, allowing asynchronous data transmission according to the RS-232 standard (RS-232C).

DCD

DCD stands Data Carrier Detect. The description is modem connected to another.

DEC

Digital Equipment Corporation (DEC)

DEI

Drop Eligible Indicator (DEI). If DEI bit is enabled in 802.1ad header or has Canonical Format Identifier (CFI) bit enabled in 802.1q header on an arriving packet, such packets will be dropped using QoS.

DES

The Advanced Encryption Standard (AES) is a symmetric-key block cipher algorithm and U.S. government standard for secure and classified data encryption and decryption.

DF

Designated Forwarder (DF).

DHCP

Dynamic Host Configuration Protocol (DHCP)

DITA

Darwin Information Typing Architecture (DITA); the DITA specification defines a set of document types for authoring and organizing topic-oriented information, as well as a set of mechanisms for combining, extending, and constraining document types.

D-LAG

Distributed Link Aggregation (D-LAG or DLAG)

DLF

The Destination Lookup Failure (DLF). When a packet arrives at the device and the device doesn't have an entry for the destination MAC address in its MAC address table, the packet is classified as a Destination Lookup Failure (DLF)

DM

DM stands for Dense Mode. Protocol-Independent Multicast Dense Mode (PIM-DM) uses dense multicast routing.

DNAT

Destination network address translation (DNAT) is a technique for transparently changing the destination IP address of an end route packet and performing the inverse function for any replies.

DNS

Domain Name System

DOT1Q

IEEE 802.1Q, often referred to as DOT1Q or 1Q, is the networking standard that supports virtual LANs (VLANs) on an IEEE 802.3 Ethernet network. It is the most widely used encapsulation method for VLAN tagging.

Dot1x

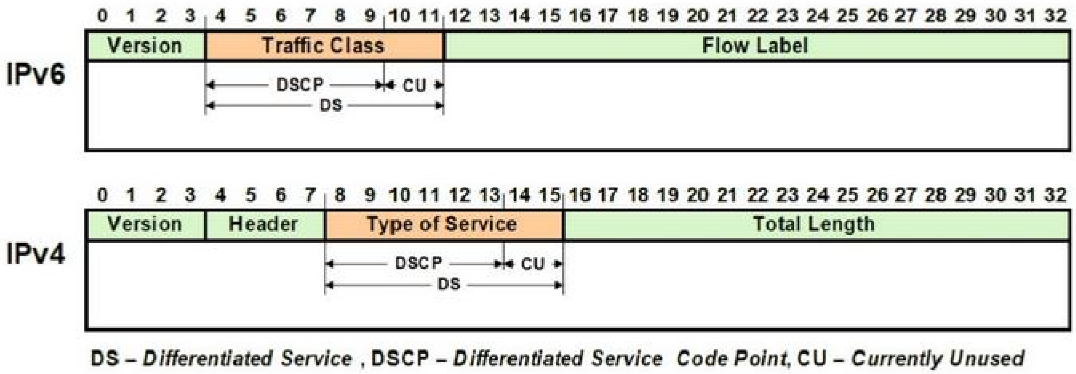
Dot1x Authentication is enabled when dot1x system-auth-control is enabled, and aaa authentication dot1x default is local. If you enable authentication on a port by using the default setting of dot1x port-control, which is force-authorized, it disables 802.1X authentication and causes the port to transition to the authorized state without any authentication exchange required. The port transmits and receives normal traffic without 802.1X-based authentication of the client

DR

The Designated Router (DR) is the router that will forward the PIM join message from the receiver to the RP (rendezvous point).

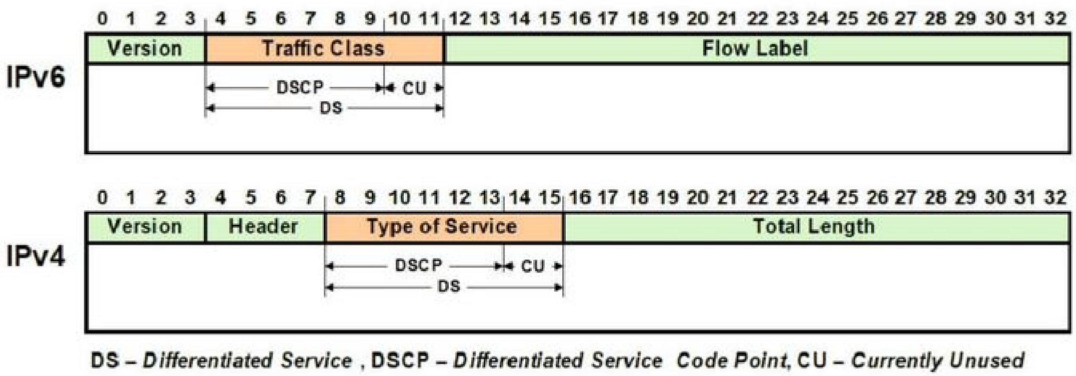
DS

Differentiated Services (DS).



DSCP

A Differentiated Services Code Point (DSCP) is a packet header value that can be used to request (for example) high priority or best effort delivery for traffic.



DSR

DSR stands Data Set Ready. The description is ready to communicate.

DST

Daylight Saving Time (DST) is a system of setting clocks ahead so that both sunrise and sunset occur at a later hour. The effect is additional daylight in the evening. Many countries observe DST, although most have their own rules and regulations for when it begins and ends. The dates of DST may change from year to year

DTR

DTR stands Data Terminal Ready. The description is ready to communicate.

DUT

Device under Test (DUT)

DVMRP

Distance Vector Multicast Routing Protocol (DVMRP)

E2E

End-to-end (E2E) transparent clock for Precision Time Protocol (PTP). With an E2Etransparent clock, only the residence time is included in the timestamp in the packet.

EAP

Extensible Authentication Protocol (EAP) is an authentication framework frequently used in network and Internet connections. EAP is usually tunnelled over RADIUS between the Authenticator and the Authentication Server. 802.1x uses EAP.
EAP is an authentication framework, not a specific authentication mechanism. Commonly used modern methods capable of operating in wireless networks include EAP-TLS, EAP-SIM, EAP-AKA, LEAP and EAP-TTLS. Requirements for EAP methods used in wireless LAN authentication are described in RFC 4017.
The Lightweight Extensible Authentication Protocol (LEAP) method was developed by Cisco Systems prior to the IEEE ratification of the 802.11i security standard.

EAPOL

Extensible Authentication Protocol (EAP) over LAN (EAPoL) is used between the Supplicant (software on your laptop) and the Authenticator (switch)

EBS

The Excess Burst size (EBS) specifies how much data above the committed burst size (CBS) a user can transmit. The EBS is the size up to which the traffic is allowed to burst without being discarded. EBS allows for moderate periods of bursting traffic that exceeds both the committed information rate (CIR) and the committed burst size (CBS).

ECN

Explicit Congestion Notification (ECN)

EGP

Exterior Gateway Protocol (EGP) is a defunct routing protocol used in autonomous systems to exchange data between surrounding gateway sites. Border Gateway Protocol (BGP) supplanted EGP, widely utilized by research institutes, universities, government agencies, and commercial companies (BGP). EGP is built on poll instructions to request update answers and periodic message exchange polling for neighbor reachability.

EIR

The excess information rate (EIR) specifies the rate above the CIR (committed information rate) at which traffic is allowed into the network and that may get delivered if the network is not congested. The EIR has an additional parameter associated with it called the excess burst size (EBS). The EBS is the size up to which the traffic is allowed to burst without being discarded.

ESD

ElectroStatic Discharge (ESD) is the sudden flow of electricity between two electrically charged objects caused by contact, an electrical short or dielectric breakdown. A buildup of static electricity can be caused by tribocharging or by electrostatic induction. The ESD occurs when differently-charged objects are brought close together or when the dielectric between them breaks down, often creating a visible spark.

EXEC

exec: Protocol
Commands that are invoked using the exec: protocol must be executable as standalone commands. Commands that are built into a command interpreter or other program cannot be executed directly, but must be executed (if possible) within the context of the application that provides them. For example, the following seed URL would not work on Microsoft Windows systems because the dir command is built into the Windows command interpreter (cmd.exe):

exec: dir e:\data
To use the exec protocol with commands that are built into the Windows command interpreter, you must do something as the following:
exec: cmd /c dir 'e:\data'

EVB

Edge Virtual Bridge (EVB) is an IEEE standard that involves the interaction between virtual switching environments in a hypervisor and the first layer of the physical switching infrastructure. The EVB enhancements are following 2 different paths – 802.1qbg and 802.1qbh.

EVC

Ethernet Virtual Connection (EVC).

FCS

A frame check sequence (FCS) is an error-detecting code added to a frame in a communication protocol. Frames are used to send payload data from a source to a destination.

FDB

Forwarding Database (FDB)

FID

Filtering ID (FID)

FHRP

First Hop Redundancy Protocol (FHRP)

FPGA

The Field Programmable Gate Array (FPGA) is a programmable logic device that can have its internal configuration set by the firmware.

FTP

The File Transfer Protocol (FTP) is a standard communication protocol used for the transfer of computer files from a server to a client on a computer network. FTP is built on a client–server model architecture using separate control and data connections between the client and the server.[1] FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it. For secure transmission that protects the username and password, and encrypts the content, FTP is often secured with SSL/TLS (FTPS) or replaced with SSH File Transfer Protocol (SFTP).

GARP

GARP (Generic Attribute Registration Protocol) is a local area network (LAN) protocol that defines procedures by which end stations and switches can register and deregister attributes, such as network identifiers or addresses, with each other. Every end station and switch thus has a record, or list, of all the other end stations and switches that can be reached at any given time.
When an attribute for an end station or switch is registered or deregistered according to GARP, the set of reachable end stations and switches, called participants, is modified according to specific rules. The defined set of participants at any given time, along with their attributes, is a subset of the network topology called the reachability tree. Data frames are propagated only to registered end stations. This prevents attempts to send data to end stations that are not reachable.

GGP

Gateway-to-Gateway Protocol (GGP) is an obsolete protocol defined for routing datagrams between Internet gateways. It was first outlined in 1982. The GGP was designed as an IP datagram service similar to the TCP and the UDP.

GMRP

GARP Multicast Registration Protocol (GMRP) is a Generic Attribute Registration Protocol (GARP) application that provides a constrained multicast flooding facility similar to IGMP snooping.

GND

Ground

GPS

Global Positioning System

GR

Graceful Restart (GR)

GVRP

GVRP (GARP VLAN Registration Protocol or Generic VLAN Registration Protocol) is a protocol that facilitates control of virtual local area networks (VLANs) within a larger network. GVRP conforms to the IEEE 802.1Q specification, which defines a method of tagging frame s with VLAN configuration data

HA

High Availability (HA)

HDMI

HDMI (High-Definition Multimedia Interface) is digital interface capable of transmitting high-quality and high-bandwidth streams of audio and video between devices

HOL

Head-Of-Line (HOL) blocking should be prevented on a port. HOL blocking happens when HOL packet of a buffer cannot be switched to an output port (i.e. HOL occurs when a line of packets is held up by the first packet).

HTTP

Hyper Text Transfer Protocol (HTTP)

HTTPS

Hyper Text Transfer Protocol Secure (HTTPS)

IANA

Internet Assigned Numbers Authority (IANA)

ICMP

Internet Control Message Protocol

IDPR

Inter-domain Routing Protocol (IDPR). The objective of IDPR is to construct and maintain routes, between source and destination administrative domains, that provide user traffic with the requested services within the constraints stipulated for the domains transited.

IETF

Internet Engineering Task Force (IETF) is an open standards organization, which develops and promotes voluntary Internet standards, in particular the technical standards that comprise the Internet protocol suite (TCP/IP).

IGMP

The Internet Group Management Protocol (IGMP) is a communications protocol used by hosts and adjacent routers on IPv4 networks to establish multicast group memberships. IGMP is an integral part of IP multicast and allows the network to direct multicast transmissions only to hosts that have requested them.

IGP

Interior Gateway Protocol (IGP) is a type of routing protocol used for exchanging routing table information between gateways (commonly routers) within an autonomous system (for example, a system of corporate local area networks). This routing information can then be used to route network-layer protocols like IP.

IGRP

Interior Gateway Routing Protocol (IGRP) is a proprietary distance vector routing protocol that manages the flow of routing information within connected routers in the host network or autonomous system. The protocol ensures that every router has routing tables updated with the best available path. IGRP also avoids routing loops by updating itself with the changes occurring over the network and by error management.

IGS

The Internet Group Management Protocol (IGMP) Snooping (IGS) is designed to prevent hosts on a local network from receiving traffic for a multicast group they have not explicitly joined. It provides switches with a mechanism to prune multicast traffic from links that do not contain a multicast listener (an IGMP client). Essentially, IGS is a layer 2 optimization for the Layer 3 IGMP.

IKE

Internet Key Exchange (IKE)

IP

Internet Protocol (IP).

IPSec

IPSec (Internet Protocol Security) is a suite of protocols that provides security to Internet communications at the IP layer. The most common current use of IPSec is to provide a Virtual Private Network (VPN), either between two locations (gateway-to-gateway) or between a remote user and an enterprise network (host-to-gateway); it can also provide end-to-end, or host-to-host, security.

IPv4

IPv4 and IPv6 are Internet protocol version 4 and Internet protocol version 6. IPv4 supports:

- IPv4 has a 32-bit address length
- IPv4 binary bits are separated by a dot(.) whereas IPv6 binary bits are separated by a colon(:).
- IPv4 is a numeric addressing method whereas IPv6 is an alphanumeric addressing method
- It Supports Manual and DHCP address configuration
- In IPv4 end to end, connection integrity is Unachievable
- It can generate 4.29×109 address space

- Fragmentation performed by Sender and forwarding routers
- In IPv4 Packet flow identification is not available
- In IPv4 checksum field is available
- It has broadcast Message Transmission Scheme
- In IPv4 Encryption and Authentication facility not provided
- IPv4 has a header of 20-60 bytes.

IPv6

IPv6 stands for Internet protocol version 6. An IPv6 address consists of eight groups of four hexadecimal digits. Anexample of IPv6 address is as follows
3001:0da8:75a3:0000:0000:8a2e:0370:7334
there are different ypes of IPv6 addresses:

- Unicast addresses—it identifies a unique node on a network and usually refers to a single sender or a single receiver.
- Multicast addresses—it represents a group of IP devices and can only be used as the destination of a datagram.
- Anycast addresses—it is assigned to a set of interfaces that typically belong to different nodes.

IRTP

Internet Reliable Transaction Protocol (IRTP) is a transport level host to host protocol designed for an Internet environment. It provides reliable, sequenced delivery of packets of data between hosts and multiplexes / demultiplexes streams of packets from/to user processes representing ports.

ISAKMP

Internet Security Association and Key Management Protocol (ISAKMP)

ISDN

Integrated Services Digital Network (ISDN)

ISL

ISL stands for Inter-Switch Link which is one of the VLAN protocols. The ISL is proprietary of Cisco and is used only between Cisco switches. It operates in a point-to-point VLAN environment and supports up to 1000 VLANs and can be used over Fast Ethernet and Gigabit Ethernet links only.

ISP

Internet service provider (ISP)

ISS

Intelligent Switch Solution (ISS).

IST

The Internal Spanning Tree (IST) instance receives and sends BPDUs to the CST. The IST can represent the entire MST region as a CST virtual bridge to the outside world.

IVL

Independent VLAN Learning (IVL)

IVR

Inter VLAN Routing (IVR)

IWF

InterWorking Function (IWF).

L2GP

Layer 2 Gateway Port (L2GP)

LA

Link Aggregation

LACP

Link Aggregation Control Protocol

LAG

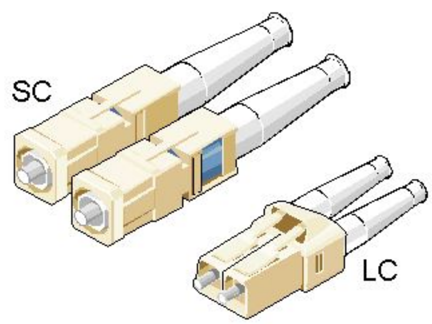
Link Aggregation Group

LAN

Local Area Network

LC

LC (Lucent Connector) is a miniaturized version of the fiber-optic SC (Standard Connector) connector. It looks somewhat like the SC, but is half the size with a 1.25mm ferrule instead of 2.5mm.



SC and LC Connectors

LED

Light-emitting diode (LED) is a widely used standard source of light in electrical equipment.

LLDP

Link Layer Discovery Protocol (LLDP)

LM

Line Module (LM)

LSA

Link State Advertisement (LSA)

LSDB

link state database (LSDB)

LSR

link state routing (LSR)

MAC

Media access control (MAC) is a sublayer of the data link layer in the seven-layer OSI network reference model. MAC is responsible for the transmission of data packets to and from the network-interface card, and to and from another remotely shared channel.

MAU

Medium Attachment Unit (MAU)

MD5

Message Digest Algorithm 5 (MD5) is a cryptographic hash algorithm that can be used to create a 128-bit string value from an arbitrary length string.

A hash function provides encryption using an algorithm and no key. A variable-length plaintext is “hashed” into a (typically) fixed-length hash value (often called a “message digest” or simply a “hash”). Hash functions are primarily used to provide integrity; if the hash of a plaintext changes, the plaintext itself has changed.

Common older hash functions include Secure Hash Algorithm 1 (SHA-1), which creates a 160-bit hash and Message Digest 5 (MD5), which creates a 128-bit hash.

Although there has been insecurities identified with MD5, it is still widely used, and its most common use is to verify the integrity of files.

MDI

Media Independent Interface (MDI) and Media Independent Interface with Crossover (MDIX) are basically ports on a computer and a network switch, router, or hub, respectively.

MDIX

Media Independent Interface with Crossover (MDIX) and Media Independent Interface (MDI) are basically ports on a computer and a network switch, router, or hub, respectively.

MED

Media Endpoint Discovery (MED); LLDP does not contain the capability of negotiating additional information such as PoE management and VLAN assignments. This capability was added as an enhancement known as Media Endpoint Discovery or MED, resulting in the enhanced protocol LLDP-MED.The MED enhancement has been standardized by the Telecommunications Industry Association in standard number ANSI/TIA-1057.

MHRP

Multipath Hybrid Routing Protocol (MHRP) is a multipath routing protocol for hybrid Wireless Mesh Network (WMN), which provides security and uses technique to find alternate path in case of route failure.

MIB

Management Information Base (MIB) is the hierarchical database used by the simple network management protocol (SNMP) to describe the particular device being monitored.

MIB OID

Management Information Base (MIB) is the hierarchical database used by the simple network management protocol (SNMP) to describe the particular device being monitored.

MIB Object IDentifier (OID), as known as a MIB object identifier in the SNMP, is a number assigned to devices in a network for identification purposes. OID numbering is hierarchical. Using the IETF notation of digits and dots, resembling very long IP addresses, various registries such as ANSI assign high-level numbers to vendors and organizations. They, in turn, append digits to the number to identify individual devices or software processes.

MIC

Media redundancy Interconnection Client (MIC) is a member node of a MRP Interconnect ring.

MIM

Media redundancy Interconnection Manager (MIM) is a node in a MRP Interconnect ring which acts a redundancy manager.

MLDS

Multicast Listener Discovery Snooping (MLDS) constrains the flooding of IPv6 multicast traffic on VLANs. When MLDS is enabled on a VLAN, adevice examines MLD messages between hosts and multicast routers and learns which hosts are interested in receiving traffic for a multicast group. On the basis of what it learns, the device then forwards multicast traffic only to those interfaces in the VLAN that are connected to interested receivers instead of flooding the traffic to all interfaces.

MM

MultiMode (MM) Mode is in optical fiber with a larger core than singlemode fiber. Typically, MM has a core diameter of 50 or 62.5 µm and a cladding diameter of 125 µ.

MIC

Media redundancy Interconnection Client (MIC) is a member node of a MRP Interconnect ring.

MPLS

Multiprotocol Label Switching (MPLS) is a routing technique in telecommunications networks that directs data from one node to the next based on short path labels rather than long network addresses, thus avoiding complex lookups in a routing table and speeding traffic flows. The labels identify virtual links (paths) between distant nodes rather than endpoints. MPLS can encapsulate packets of various network protocols, hence the "multiprotocol" reference on its name.

MRA

Media Redundancy Automanager (MRA). To configure a Media Redundancy Automanager (MRA), the node or nodes elect an MRM by a configured priority value.

MRC

Media Redundancy Client (MRC) is a member node of a MRP ring.

MRM

Media Redundancy Manager (MRM) is a node in the network which acts a redundancy manager.

MRP

Media Redundancy Protocol (MRP) is a networking protocol designed to implement redundancy and recovery in a ring topology.

MSR

1) MSR (MIB Save and Restore).
2) Model-Specific Register (*MSR*)

MST

MST (Multiple Spanning Tree) is the version of STP that allows multiple VLANs to a single instance. It is the standard based protocol defined with IEEE 802.1s. Unlike other spanning tree protocols, in which all the spanning tree instances are independent, MST establishes and maintains IST, CIST, and CST spanning trees.

MSTI

Multiple spanning trees, called MSTIs; inside an MST region, multiple spanning trees, called MSTIs, are calculated. Among these MSTIs, MSTI 0 is the IST.

MSTP

Multiple Spanning-Tree Protocol

MTU

Maximum Transmission Unit (MTU)

MVLAN

Multicast VLANs (MVLAN)

NAP

Network Access Protection (NAP)

NAPT

Network address port translation (NAPT) is a variation of the traditional *NAT*. NAPT extends the notion of translation one step further by also translating transport identifiers (e.g., TCP and UDP port numbers, ICMP query identifiers).

NAS

The Network Access Server (NAS) is the front line of authentication – it's the first server that fields network authentication requests before they pass through to the RADIUS. The NAS Identifier (NAS-ID) is a feature that allows the RADIUS server to confirm information about the sender of the authentication request.

NAT

Network address translation (NAT) is a method of mapping an IP address space into another by modifying network address information in the IP header of packets while they are in transit across a traffic routing device.

NBMA

NBMA (Non Broadcast Multi Access)

NBNS

NetBIOS Name Server where NetBIOS stands for Network Basic Input / Output System.

NC

NC (normally closed) is a closed (short) circuit creating a path for the current.

ND

Neighbor Discovery (ND); the Virtual Router Redundancy Protocol (*VRRP*) for IPv6 provides a much faster switchover to an alternate default router than can be obtained using standard neighbor discovery (ND) procedures.

NETBIOS

Network Basic Input / Output System (NETBIOS)

NIP

This set of fields are a vector of N IP unicast addresses, where the value N corresponds to the Number or Sources (N) field.

NMS

Network Management System (NMS)

NO

NO (normally open) is an open circuit not creating a path for the current.

NPS

Network Policy Server (NPS)

NSSA

Not-so-stubby Area (NSSA)

NTP

Network Time Protocol (NTP)

NVP

Network Voice Protocol (NVP)was a pioneering computer network protocol for transporting human speech over packetized communications networks. It was an early example of Voice over Internet Protocol technology.

NVRAM

Non-volatile random-access memory (NVRAM) is random-access memory that retains data without applied power. This is in contrast to dynamic random-access memory (DRAM) and static random-access memory (SRAM), which both maintain data only for as long as power is applied, or such forms of memory as magnetic tape, which cannot be randomly accessed but which retains data indefinitely without electric power.

OID

Object IDentifier

OSPF

Open Shortest Path First routing protocol

OUI

organization unique identifiers (OUI)s. LLDP enables defining optional *TLV* units by using organization unique identifiers (OUIs) or organizationally-specific TLVs. An OUI identifies the category for a *TLV* unit depending on whether the OUI follows the IEEE 802.1 or IEEE 802.3 standard.

P2P

Peer-to-peer (P2P) transparent clock for Precision Time Protocol (PTP).

PAE

Port Access Entity (PAE). 802.1X-2001 defines two logical port entities for an authenticated port—the "controlled port" and the "uncontrolled port". The controlled port is manipulated by the 802.1X PAE (Port Access Entity) to allow (in the authorized state) or prevent (in the unauthorized state) network traffic ingress and egress to/from the controlled port. The uncontrolled port is used by the 802.1X PAE to transmit and receive EAPOL frames.

PAP

Password Authentication Protocol (PAP) is a password-based authentication protocol used by Point to Point Protocol (PPP) to validate users. PAP stops working after establishing the authentication; thus, it can lead to attacks on the network.

PC

Personal Computer

PCB

Provider Core Bridge (PCB) or S-VLAN Bridge; PCB integrates only one S-VLAN component. It is capable of providing single service on a port.

PDU

A Protocol Data Unit (PDU) is a single unit of information transmitted among peer entities of a computer network. A PDU is composed of protocol-specific control information and user data.

P/E

Program/Erase (P/E). Writing a byte to flash memory involves two steps: Program and Erase (P/E). P/E cycles can serve as a criterion for quantifying the endurance of a flash storage device.

PEB

Provider Edge Bridge (PEB); Provider Edge Bridge integrates one S-VLAN component with zero or many C-VLAN components as well as integrates each C-VLAN (up to 4094 C-VLANs) individually with a different S-VLAN (up to 4094 S-VLANs).

PEM

PEM (originally “Privacy Enhanced Mail”) is the most common format for X.509 certificates, CSRs, and cryptographic keys. A PEM file is a text file containing one or more items in Base64 ASCII encoding, each with plain-text headers and footers (e.g. -----BEGIN CERTIFICATE----- and -----END CERTIFICATE-----). A single PEM file could contain an end-entity certificate, a private key, or multiple certificates forming a complete chain of trust. Most certificate files downloaded from SSL.com will be in PEM format

PEP

Provider Edge Port (PEP). The Customer Edge Port and each Provider Edge Port are treated as separate Bridge Ports by the spanning tree protocol. If the C-VLAN component connects to the S-VLAN component with a single Provider Edge Port, and the associated service instance supports no more than two customer interfaces, then all frames (including Spanning Tree BPDUs) addressed to the Bridge Group Address may be relayed between the two Ports of the C-VLAN component without modification. Otherwise, the Spanning Tree Protocol Entity shall execute the Rapid Spanning Tree Protocol (RSTP, Clause 17 of IEEE Std 802.1D), as modified by the provisions of this subclause.

PHB

PHB (Per Hop Behavior) is a term used in differentiated services (DiffServ) or multiprotocol label switching (MPLS). It defines the policy and priority applied to a packet when traversing a hop (such as a router) in a DiffServ network.

PHY

A PHY, an abbreviation for "physical layer", is an electronic circuit, usually implemented as an integrated circuit, required to implement physical layer functions of the OSI model in a network interface controller.A PHY connects a link layer device (often called MAC as an acronym for medium access control) to a physical medium such as an optical fiber or copper cable. A PHY device typically includes both physical coding sublayer (PCS) and physical medium dependent (PMD) layer functionality.[16]-PHY may also be used as a suffix to form a short name referencing a specific physical layer protocol, for example M-PHY. .

PIM

Protocol-Independent Multicast (PIM) is a family of multicast routing protocols for Internet Protocol (IP) networks that provide one-to-many and many-to-many distribution of data over a LAN, WAN or the Internet. It is termed protocol-independent because PIM does not include its own topology discovery mechanism, but instead uses routing information supplied by other routing protocols. PIM is not dependent on a specific unicast routing protocol; it can make use of any unicast routing protocol in use on the network. PIM does not build its own routing tables. PIM uses the unicast routing table for reverse-path forwarding.
There are four variants of PIM:

- PIM Sparse Mode (PIM-SM) explicitly builds unidirectional shared trees rooted at a rendezvous point (RP) per group, and optionally creates shortest-path trees per source. PIM-SM generally scales fairly well for wide-area usage.
- PIM Dense Mode (PIM-DM) uses dense multicast routing. It implicitly builds shortest-path trees by flooding multicast traffic domain wide, and then pruning back branches of the tree where no receivers are present. PIM-DM is straightforward to implement but generally has poor scaling properties. The first multicast routing protocol, DVMRP used dense-mode multicast routing. See the PIM Internet Standard RFC 3973.
- Bidirectional PIM (Bidir-PIM) explicitly builds shared bi-directional trees. It never builds a shortest path tree, so may have longer end-to-end delays than PIM-SM, but scales well because it needs no source-specific state. See Bidirectional PIM Internet Standard RFC 5015, 70–73 .
- PIM Source-Specific Multicast (PIM-SSM) builds trees that are rooted in just one source, offering a more secure and scalable model for a limited number of applications (mostly broadcasting of content). In SSM, an IP datagram is transmitted by a source S to an SSM destination address G, and receivers can receive this datagram by subscribing to channel (S,G). See informational RFC 3569

Bidirectional (Bidir) *PIM*

Bidirectional PIM (Bidir-PIM) explicitly builds shared bi-directional trees. It never builds a shortest path tree, so may have longer end-to-end delays than PIM-SM, but scales well because it needs no source-specific state. See Bidirectional PIM Internet Standard RFC 5015, 70–73.

PIM-DM

Protocol-Independent Multicast Dense Mode PIM-DM) uses dense multicast routing. It implicitly builds shortest-path trees by flooding multicast traffic domain wide, and then pruning back branches of the tree where no receivers are present. PIM-DM is straightforward to implement but generally has poor scaling properties.

PIM-SM

Protocol-Independent Multicast Sparse Mode (PIM-SM) explicitly builds unidirectional shared trees rooted at a rendezvous point (RP) per group, and optionally creates shortest-path trees per source. PIM-SM generally scales fairly well for wide-area usage.

PING

Packet INternet Groper (PING or Ping)

PIP

Provider Instance Port (PIP)

PIR

Peak Information Rate (PIR) is a burstable rate set on routers and/or switches that allows throughput overhead. Related to committed information rate (CIR) which is a committed rate speed guaranteed/capped.

PMBR

PIM Multicast Border Router (PMBR)

PMTU

Path Maximum Transmission Unit (PMTU)

PNAC

Port Based Network Access Control (PNAC), or 802.1X, authentication requires a client, an authenticator, and an authentication server. The client is a device that wants to connect to the network.

PNP

Provider Network Ports (PNP)

PoE

Power over Ethernet (PoE) is distributing power over an Ethernet network. Because the power and signal are on the same cable, PoE enables remote network devices such as ceiling-mounted access points, surveillance cameras and LED lighting to be installed far away from AC power sources.

PPP

Point-to-Point Protocol (PPP); The user or machine sends a request to a Network Access Server (NAS) to gain access to a particular network resource using access credentials. The credentials are passed to the NAS device via the data link layer (L2) protocol—for example, Point-to-Point Protocol (PPP) in the case of many dial up or DSL providers or posted in an HTTPS secure web form.

PPVID

Port and Protocol *VLAN* ID (PPVID)

PS

Power Supply

PTP

Precision Timing Protocol

PVID

Port *VLAN* ID (PVID)

PVLAN

Private VLAN (PVLAN); Private VLAN, also known as port isolation, is a technique in computer networking where a VLAN contains switch ports that are restricted such that they can only communicate with a given uplink. The restricted ports are called private ports

PVRST

Per VLAN Rapid Spanning-Tree

PVRSTP

Per VLAN Rapid Spanning-Tree Protocol

PW

An Ethernet pseudowire (PW) is used to carry Ethernet/802.3 Protocol Data Units (PDUs) over an MPLS network. See RFC 4448 for details.

Q-in-Q

802.1Q tunneling (Q-in-Q) is a technique often used by Ethernet providers as a layer 2 VPN for customers. During 802.1Q (or dot1q) tunneling, the provider will put an 802.1Q tag on all the frames that it receives from a customer with a unique VLAN tag. By using a different VLAN tag for each customer we can separate the traffic from different customers and also transparently transfer it throughout the service provider network.

QoS

Quality of Service (QoS) refers to traffic prioritization and resource reservation control mechanisms rather than the achieved service quality. QoS defines the ability to provide different priorities to different applications, users, or data flows or the ability to guarantee a certain level of performance to a data flow.

QRV

Querier's Robustness Variable (QRV).

RADIUS

Remote Authentication Dial-In User Service

RAM

Random-access memory (RAM) is a form of computer memory that can be read and changed in any order, and typically is used to store working data and machine code.

RARP

The Reverse Address Resolution Protocol (RARP) is an obsolete computer communication protocol used by a client computer to request its Internet Protocol (IPv4) address from a computer network, when all it has available is its link layer or hardware address, such as a MAC address.

RBAC

Role Based Authentication (RBAC)

RED

Random early detection (RED) is where a single queue may have several different sets of queue thresholds.

RIP

RIP (Routing Information Protocol) sends routing-update messages at regular intervals and when the network topology changes. When a router receives a routing update that includes changes to an entry, it updates its routing table to reflect the new route. The metric value for the path is increased by 1, and the sender is indicated as the next hop. RIP routers maintain only the best route (the route with the lowest metric value) to a destination. After updating its routing table, the router immediately begins transmitting routing updates to inform other network routers about the change. These updates are sent independently of the regularly scheduled updates that RIP routers send. RIP uses a hop count as a way to determine network distance. Each host with a router in the network uses the routing table information to determine the next host to route a packet for a specified destination.

RMON

Remote network monitoring (RMON) is the process of monitoring network traffic on a remote Ethernet segment for detectingnetwork issues such as dropped packets, network collisions, and traffic congestion

RP

Rendezvous point (RP)

RPF

RPF stands for Reverse Path Forwarding. PIM uses reverse-path forwarding (RPF) to prevent multicast routing loops by leveraging the unicast routing table on the virtual router. When the virtual router receives a multicast packet, it looks up the source of the multicast packet in its unicast routing table to see if the outgoing interface associated with that source IP address is the interface on which that packet arrived. If the interfaces match, the virtual router duplicates the packet and forwards it out the interfaces toward the multicast receivers in the group. If the interfaces don't match, the virtual router drops the packet. *This is called a RPF failure.*

RPT

Root Part Tree (RPT)

RRD

Route Redistribution (RRD)

RSVP

Resource Reservation Protocol (RSVP) is a transport layer protocol designed to reserve resources across a network using the integrated services model. RSVP operates over an IPv4 or IPv6 and provides receiver-initiated setup of resource reservations for multicast or unicast data flows.

RS-232

RS-232 is a short range connection between a single host and a single device (such as a PC to a modem) or another host (such as a PC to another PC). The standard uses a single TX line, a single RX line, numerous modem handshaking lines and a ground line with the option of DB9 and DB25 connectors. A minimal 3-wire RS-232 connection consists only the TX, RX, and ground lines, but if flow control is required a minimal 5-wire RS-232 is used adding the RTS and CTS lines. The RS-232 standard has been commonly used in computer serial ports and is still widely used in industrial communication devices.

RS-422

RS-422 was meant as a replacement for RS-232 as it offered much higher speeds, better immunity to noise and allow for longer cable lengths making it better suited to industrial environments. The standard uses the same signals as the RS-232 standard, but used differential twisted pair so requires double the number of wires as RS-232. Connectors are not specified in the standard so block or DB connectors are commonly used. RS-422 cannot implement a true multi-point communications network since there can be only one driver on each pair of wires. However, one driver can fan-out to up to ten receivers.

RS-485

RS-485 standard addresses some short coming of the RS-422 standard. The standard supports inexpensive local networks and multidrop communication links, using the same differential signalling over twisted pairs as RS-422. The main difference being that in RS-485 drivers use three-state logic allowing the individual transmitters to deactivate while not transmitting, while RS-422 the transmitter is always active therefore holding the differential lines. Up to 32 devices can be connected, but with repeaters a network with up to 256 devices can be achieved. RS-485 can be used in a full-duplex 4-wire mode or half-duplex 2-wire mode. With long wires and high baud-rates it is recommended that termination resistors are used at the far ends of the network for signal integrity

RST

RST stands for reset. RST is one of the TCP flags.

TCP flags are various types of flag bits present in the TCP header. Each of them has its own significance. They initiate connections, carry data, and tear down connections. The commonly used TCP flags are SYN, ACK, RST, FIN, URG, PSH.

- SYN (synchronize): Packets that are used to initiate a connection.
- ACK (acknowledgment): Packets that are used to confirm that the data packets have been received, also used to confirm the initiation request and tear down requests.
- RST (reset): Signify the connection is down or maybe the service is not accepting the requests.

- FIN (finish): Indicate that the connection is being torn down. Both the sender and receiver send the FIN packets to gracefully terminate the connection.
- PSH (push): Indicate that the incoming data should be passed on directly to the application instead of getting buffered.
- URG (urgent): Indicate that the data that the packet is carrying should be processed immediately by the TCP stack.

RSTP

Rapid Spanning-Tree Protocol

RTS

Request to Send (RTS)/CTS Flow Control is another flow control mechanism that is part of the RS232 standard.

RX

Receive

SA

Security Associations (SA). A SA is a relationship between two or more entities that describes how the entities will utilize security services to communicate securely. In endpoint-to-endpoint Transport Mode, both end points of the IP connection implement IPSec.

SEM

State Event Machines (SEM)

SFP

SFP (Small Form-factor Pluggable) is a small transceiver that plugs into the SFP port of a network switch and connects to fibre channel and gigabit Ethernet (GbE) optical fiber cables at the other end. The SFP converts the serial electrical signals to serial optical signals and vice versa. SFP modules are hot swappable and contain ID and system information for the switch.

SFTP

SSH File Transfer Protocol (SFTP)

SHA

Secure Hash Algorithm is the name of a series of hash algorithms.
A hash function provides encryption using an algorithm and no key. A variable-length plaintext is “hashed” into a (typically) fixed-length hash value (often called a “message digest” or simply a “hash”). Hash functions are primarily used to provide integrity; the hash of a plaintext changes, the plaintext itself has changed.
Common older hash functions include Secure Hash Algorithm 1 (SHA-1), which creates a 160-bit hash and Message Digest 5 (MD5), which creates a 128-bit hash.

SIP

Session Initiation Protocol (SIP) is mostly well known for establishing voice and video calls over the Internet. To initiate such sessions, SIP uses simple request and response messages. For example, the INVITE request message is used to invite a user to begin a session and ACK confirms the user has received the request. The response code 180 (Ringing) means the user is being alerted of the call and 200 (OK) indicates the request was successful. Once a session has been established, BYE is used to end the communication.

SISP

Switch Instance Shared Port (SISP)

SLA

Service-level agreements (SLA).

SLIP

Serial Line Internet Protocol (SLIP); SLIP is the predecessor protocol of Point-to-Point Protocol (PPP). SLIP does not provide authentication, is a static IP addressing assignment, and data is transferred in synchronous form.

SM

State Machine

SNAT

Static Network Address Translation (SAT, SNAT) performs one-to-one translation of internal IP addresses to external ones.

SNMP

Simple Network Management Protocol

SNTP

Simple Network Time Protocol (SNTP)

SPT

Shortest path tree (SPT) is used for multicast transmission of packets with the shortest path from sender to recipients.

SR

State Refresh (SR) message. For a given (S,G) tree, SR messages will be originated byall routers that use an interface directly connected to the source as the RPF interface for the source. Ref: IETF “State Refresh in PIM-DM”

SRM

State Refresh Message (SRM). For a given (S,G) tree, SRM will be originated byall routers that use an interface directly connected to the source as the RPF interface for the source. Ref: IETF “State Refresh in PIM-DM”

SSD

SSD (Solid State Drive) is an all-electronic, non-volatile random access storage drive.

SSH

(Secure SHell) is a security protocol for logging into a remote server. SSH provides an encrypted session for transferring files and executing server programs on all platforms. Also serving as a secure client/server connection for applications such as database access and email, SSH supports a variety of authentication methods.

SSL

Secure Sockets Layer

SSM

Source-Specific Multicast (SSM)

SST

Single Spanning Tree (SST); SST is formed in either of the following situations:

- A switch running STP or RSTP belongs to only one spanning tree.

- An MST region has only one switch.

STP

Spanning Tree Protocol (STP) is a Layer 2 protocol that runs on bridges and switches. The specification for STP is IEEE 802.1D. The main purpose of STP is provide path redundancy while preventing undesirable loops in the network.

SVL

Shared VLAN Learning (SVL)

S-VLAN

Stacked VLAN (S-VLAN)

TAC

Taxonomy Access Control (TAC) allows the user administrator to control access to nodes indirectly by controlling which roles can access which categories.

TACACS

Terminal Access Controller Access-Control System

TAI

International Atomic Time (TAI); if the port is in the master state, the local clock is synchronized to an external source of time traceable to TAI (International Atomic Time) and UTC (Universal Coordinated Time) such as GPS (Global Positioning System) system.

TB

Token Bucket (TB). The TB algorithm is based on an analogy of a fixed capacity bucket into which tokens, normally representing a unit of bytes or a single packet of predetermined size, are added at a fixed rate. When a packet is to be checked for conformance to the defined limits, the bucket is inspected to see if it contains sufficient tokens at that time. If so, the appropriate number of tokens, e.g. equivalent to the length of the packet in bytes, are removed ("cashed in"), and the packet is passed, e.g., for transmission. The packet does not conform if there are insufficient tokens in the bucket, and the contents of the bucket are not changed.

TC

TC (Topology Change); once the Root Bridge is aware of a change in the topology of the network, it sets the Topology Change (TC) flag on the sent BPDs.

TCN

TCN (Topology Change Notification), a kind of BPDU, is sent by bridges towards the root bridge to notify changes in the topology, such as port up or port down.

TCP

Transmission Control Protocol

TFTP

Trivial File Transfer Protocol

TLS

Transport Layer Security (TLS), the successor of the now-deprecated Secure Sockets Layer (SSL), is a cryptographic protocol designed to provide communications security over a computer network.

TLV

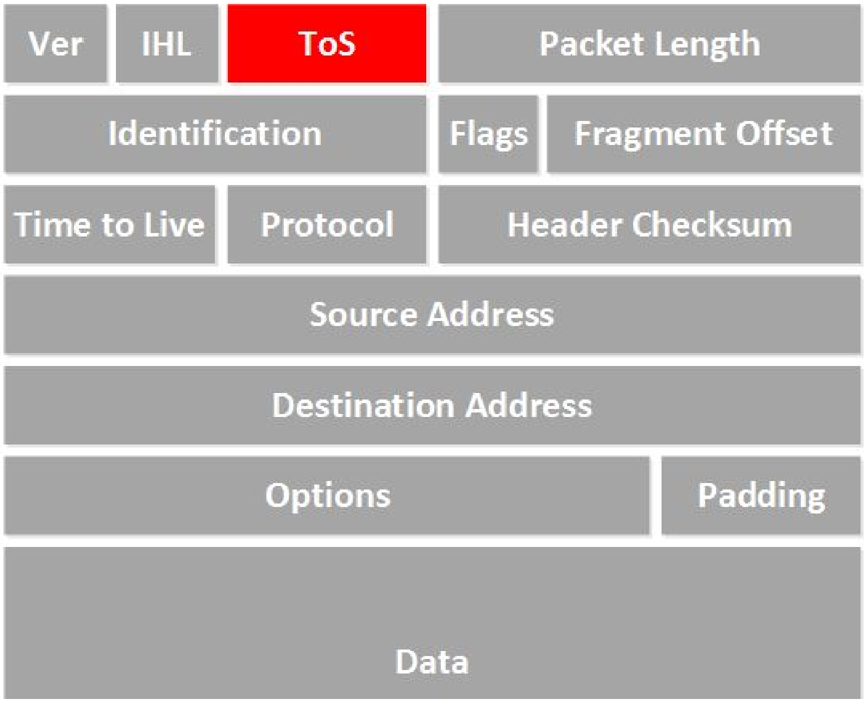
type, length, and value (TLV) traces

TN

Telnet (TN) is a networking protocol and software program used to access remote computers and terminals over the Internet or a TCP/IP computer network. Upon providing correct login and sign-in credentials, a user may access a remote system's privileged functionality. Telnet sends all messages in clear text and has no specific security mechanisms.

TOS

Type of Service (TOS). IP packets have a field called the Type of Service field (also known as the TOS byte).



TPID

Tag Protocol Identifier (TPID)

TTL

TTL (time to live). Under IP, TTL is an 8-bit field. In the IPv4 header, TTL is the 9th octet of 20. In the IPv6 header, it is the 8th octet of 40. The maximum TTL value is 255, the maximum value of a single octet. A recommended initial value is 64.

TX

Transmit

UAP

Uplink Access Port (UAP); when a tagged LLDP is enabled, the LLDP packets with destination address as 'nearest bridge address (01-80-c2-00-00-0E)' will be replicated for all S-Channels emulated over that UAP.

UART

UART (Universal Asynchronous Transmitter Receiver) is the most common protocol used for full-duplex serial communication.It is a single LSI (large scale integration) chip designed to perform asynchronous communication. This device sends and receives data from one system to another system.

UDP
: User Datagram Protocol

UFD
: Uplink failure detection (UFD)

URM
: Unified Route Map (URM)

USM
: USM stands for User based Security Model; USM (User based Security Model) and VACM (View-based Access Control Model) are the main features added as a part of the SNMPv3 specification. USM provides both encryption and authentication of the SNMP PDUs, while VACM specifies a mechanism for defining access policies for different users with different MIB trees.

UTC
: Coordinated Universal Time (UTC); If the port is in the master state, the local clock is synchronized to an external source of time traceable to TAI (International Atomic Time) and UTC (Universal Coordinated Time) such as GPS (Global Positioning System) system.

UTP
: Unshielded Twisted Pair (UTP) is a pair of wires that are twisted around each other to minimize interference. Ethernet cables are common example of UTP wires.

UUID
: A Universally Unique IDentifier (UUID) is a 128-bit domain UUID unique to a MRP domain/ring. All MRP instances belonging to the same ring must have the same domain ID.

VACM
: VACM stands for View-based Access Control Model); USM (User based Security Model) and VACM (View-based Access Control Model) are the main features added as a part of the SNMPv3 specification. USM provides both encryption and authentication of the SNMP PDUs, while VACM specifies a mechanism for defining access policies for different users with different MIB trees.

Varbind
: A Variable Binding (Varbind) represents a set of Oid/Value pairs. Individual Variable Bindings are stored in the Vb class. Individual Variable Bindings are stored in the Vb class.
Create a variable binding and add the Object identifier in string format:
Vb vb = new Vb("1.3.6.1.2.1.1.1.0")
Create a variable binding and add the Object identifier in Oid format:
Oid oid = new Oid("1.3.6.1.2.1.1.1.0");
Vb vb = new Vb(oid);

VFI
: Virtual Forwarding Interface (VFI)

VID
: Management VLAN ID (VID)

VINES
: Virtual Integrated Network Service (VINES)

VLAN
: Virtual Local Area Network (VLAN) is a logical subgroup within a local area network that is created via software rather than manually moving cables in the wiring closet.

VPN

Virtual Private Network (*VPN*)

VRF

Virtual Routing and Forwarding (VRF). In IP-based computer networks, VRF is a technology that allows multiple instances of a routing table to co-exist within the same router at the same time. One or more logical or physical interfaces may have a VRF and these VRFs do not share routes; therefore, the packets are only forwarded between interfaces on the same VRF. VRFs are the TCP/IP layer 3 equivalent of a VLAN. Because the routing instances are independent, the same or overlapping IP addresses can be used without conflicting with each other.

VRRP

VRRP (Virtual Router Redundancy Protocol) is an election protocol that dynamically assigns responsibility for one or more virtual router(s) to the VRRP router(s) on a LAN, allowing several routers on a multi-access link to utilize the same virtual IP address. A VRRP router is configured to run the VRRP protocol in conjunction with one or more other routers attached to a LAN. In a VRRP setup, one router is elected as the virtual router master, and the other routers are acting as backups in case of the failure of the virtual router master. VRRP is designed to eliminate the single point of failure inherent in the static default routed environment

VSA

Vendor Specific Attribute (VSA)

WAN

A wide area network is a telecommunications network that extends over a large geographic area for the primary purpose of computer networking.

Web UI

Web User Interface (Web UI) is a control panel in a device presented to the user via the Web browser. Network devices such as gateways, routers, and switches typically have such control panel that is accessed by entering the IP address of the device into a Web browser in a computer on the same local network.

WRED

WRED (Weighted Random Early Detection) is a queueing discipline for a network scheduler suited for congestion avoidance. It is an extension to random early detection (RED) where a single queue may have several different sets of queue thresholds.

WRR

Weighted Round Robin (WRR) is one of the scheduling algorithms used by the device. In WRR, there is a number of queues and to every queue is assigned weight (*w*). In a classical WRR, the scheduler cycles over the queues, and when a queue with weight *w* is visited, the scheduler can send consequently a burst of up *to w* packets. This works well for packets with the same size.

XNS

Xerox Network Systems (XNS)

Contents

INTRODUCTION

1. Introduction

The iS5Com *RIP* is a portable implementation of the industry standard routing protocol.

1.1. Purpose and Scope

This document describes the basic and advanced configuration tasks of iS5Com *RIP* that are running as a part of iS5Com *ISS*.

1.2. Purpose and Scope

This document describes the basic and advanced configuration tasks of iS5Com *RIP* that are running as a part of iS5Com *ISS*.

1.3. CLI Document Convention

To provide a consistent user experience, this *CLI* document convention adhere to the Industry Standard *CLI* syntax.

In addition, the font and format are updated to show *DITA* / Structured Framemaker 2019 layout.

Convention	Usage	DESCRIPTION
Italics	User inputs for *CLI* command	`configure terminal`
Font as shown	Syntax of the *CLI* command	`configure terminal`
< >	Parameter inside the brackets < > indicate the Input fields of syntax	`<integer (100-1000)>`
[ ]	Parameter inside [ ] indicate optional fields of syntax	`show split-horizon [all]`

Convention	Usage	DESCRIPTION
{ }	Grouping parameters in the syntax	`ip address <ip-address> [secondary {node0	node1}]`
|	Separating grouped parameters in the syntax	`set http authentication-scheme {default| basic| digest}`

Font & format as shown	Example & CLI command outputs	iS5comm# show split-horizon interface 1
		`Ingress Port VlanId     StorageType Egress List`
		`============    ======    =========== ===========`
		`Gi0/1              -         Volatile Gi0/2,Gi0/3,Gi0/6`

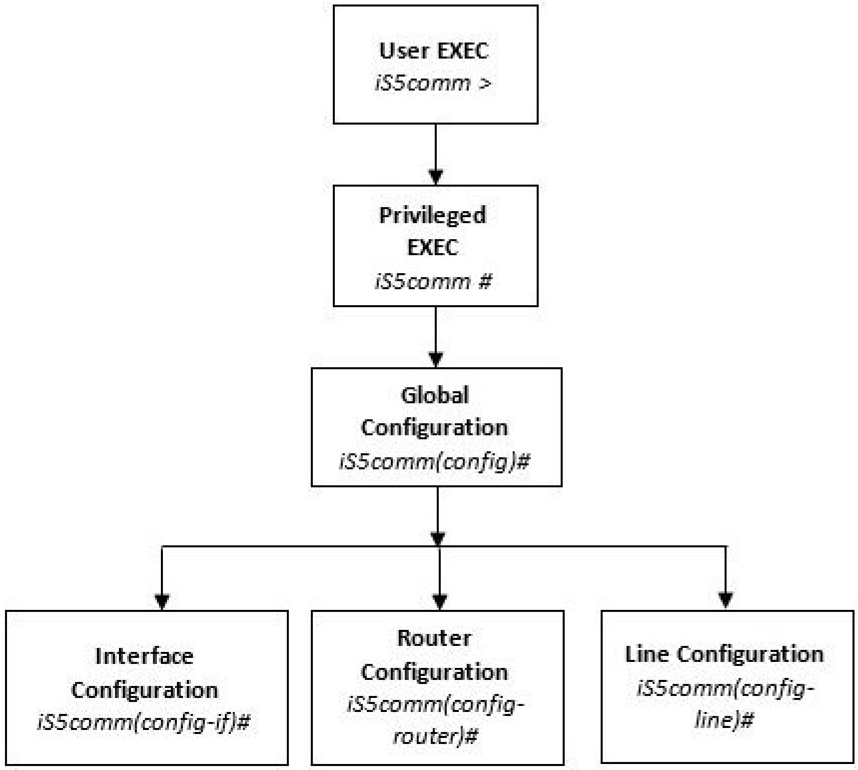
Note	Notes	**NOTE:** All commands are case-sensitive

1.4. CLI Command Modes

The *CLI* Modes are as follows.

The hierarchical structure of the command modes is as shown on the figure below.

Figure 1: CLI Command Modes


User EXEC
iS5comm >
Privileged EXEC
iS5comm #
Global Configuration
iS5comm(config)#
Interface Configuration
iS5comm(config-if)#
Router Configuration
iS5comm(config-router)#
Line Configuration
iS5comm(config-line)#

User Exec Mode

Prompt	Access method	Exit Method
`iS5comm>`	This is the initial mode to start a session.	logout

Privileged Exec Mode

Prompt	Access method	Exit Method
`iS5comm#`	The User EXEC mode command `enable` is used to enter the Privileged EXEC Mode	To return from the Privileged EXEC mode to User EXEC mode, the command `disable` is used.

Global Configuration Mode

Prompt	Access method	Exit Method
`iS5comm(config)#`	The Privileged EXEC mode command `configure terminal` is used to enter the Global Configuration Mode.	To return from the Global Configuration Mode to Privileged Mode, the command `exit` is used.

Interface Configuration Mode

Prompt	Access method	Exit Method
`iS5comm(config-if)#`	The Global Configuration mode command `interface <interface-type><interface-id>` is used to enter the Interface Configuration Mode.	To return from the Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the Interface Configuration mode to Privileged EXEC Mode, the command `end` is used.

Port Channel Interface Configuration

Prompt	Access method	Exit Method
`iS5comm(config-if)#`	The Global Configuration mode command `interface port <port channel-id>` is used to enter the Port Channel Interface Configuration Mode.	To return from the Port Channel Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the Port Channel Interface Configuration mode to Privileged EXEC Mode, the command `end` is used.

VLAN Interface Configuration Mode

Prompt	Access method	Exit Method
`iS5comm(config-if)#`	The Global Configuration mode command `interface vlan <vlan id>` is used to enter the VLAN Interface Configuration Mode.	To return from the VLAN Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the VLAN Interface Configuration mode to Privileged EXEC Mode, the command `end` is used.

MRP Interface Configuration Mode

Prompt	Access method	Exit Method
`iS5comm(config-mrp)#`	The Global Configuration mode command `mrp ringid 1`s used to enter the MRP Interface Configuration Mode.	To return from the MRP Interface Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the MRP Interface Configuration mode to Privileged EXEC Mode, the command `end` is used.

UFD Configuration Mode

Prompt	Access method	Exit Method
`iS5comm(config-if)#`	The Global Configuration mode command `ufd group <group-id (1-65535)>` is used to enter the UFD Interface Configuration Mode.	To return from the UFD Configuration mode to Global Configuration Mode, the command `exit` is used. To exit from the UFD Configuration mode to Privileged EXEC Mode, the command `end` is used.

DHCP Pool Configuration Mode

Prompt	Access method	Exit Method
`iS5comm(dhcp-config)#`	The Global Configuration mode command **`(config)# ip dhcp pool`***`<pool number (1-2147483647)>`* is used to enter the UFD Interface Configuration Mode.	To return from the DHCP Pool Configuration Mode to Global Configuration Mode, the command `exit` is used. To exit from the DHCP Pool Configuration Mode to Privileged EXEC Mode, the command `end` is used.

Privilege Levels and Command Access

The following table will list out the commands available for the different user levels in Privileged and User Exec levels.

Command	First Param	Guest	Tech	Admin	Description
archive	download-sw		x	x	Downloads software image
clear					Clears the specified parameters
	alarm	x	x	x	Alarm related information
	au-message	x	x	x	Address update messages related information
	cfa	x	x	x	CFA module related information
	interfaces	x	x	x	Protocol specific configuration of the interface
	meter-stats	x	x	x	Specific configuration for meter
	poe	x	x	x	PoE related configuration

Command	First Param	Guest	Tech	Admin	Description
	screen	x	x	x	Screen information
	ip		x	x	IP related configuration
	line		x	x	Configures line information
	logs		x	x	Log information
	protocol		x	x	Clears the specified protocol counters
	spanning-tree		x	x	Spanning tree related configuration
	tcp		x	x	TCP related configuration
clock	set		x	x	Sets the system clock value
config-restore					Configures the restore option
	flash		x	x	File in flash to be used for restoration
	norestore		x	x	No configuration restore
	remote		x	x	Remote location configuration
configure	terminal		x	x	Configures the terminal
copy			x	x	Various copy options
debug					Configures trace for the protocol
	ip	x	x	x	IP related configuration
	show	x	x	x	Show mempool status
	sntp	x	x	x	SNTP related configuration
	crypto		x	x	Crypto related information
	cybsec		x	x	Cybsec related information
	dot1x		x	x	PNAC related configuration
	etherchannel		x	x	Etherchannel related information
	firewall		x	x	Firewall related configuration
	garp		x	x	GARP related configuration
	interface		x	x	Configures trace for the interface management
	lacp		x	x	LACP related configuration
	lldp		x	x	LLDP related configuration

Command	First Param	Guest	Tech	Admin	Description
	lns		x	x	LCD notification server
	nat		x	x	Network Address Translation related configuration
	np		x	x	NPAPI configuration
	ptp		x	x	Precision time protocol related configuration
	qos		x	x	QOS related configuration
	security		x	x	Security related configuration
	spanning-tree		x	x	Spanning tree related protocol configuration
	ssh		x	x	SSH related configuration
	tacm		x	x	Transmission and admission control related configuration
	vlan		x	x	VLAN related configuration
display firewall rules				x	Display firewall rules
dot1x	clear	x	x	x	Clear dot1x configuration
	initialize		x	x	State machine and fresh authentication configuration
	re-authenticat e		x	x	Re-authentication
dump					Display memory content from the given memory location
	mem		x	x	Dump memory
	que		x	x	Show the queue related information
	sem		x	x	Show the semaphore related information
	task		x	x	Show the task related information
egress bridge			x	x	
end			x	x	Exit to the privileged Exec (#) mode

Command	First Param	Guest	Tech	Admin	Description
erase			x	x	Clears the contents of the startup configuration
exit		x	x	x	Logout
factory reset				x	Reset to factory default configuration
factory reset	users			x	Reset all users on switch
firmware			x	x	Upgrades firmware
generate	tech		x	x	Generate the tech report of various system resources and protocol states for debugging
help		x	x	x	Displays help for commands
ip	igmp snooping clear counters	x	x	x	Clears the IGMP snooping statistics
	clear counters		x	x	Clear operation
	dhcp		x	x	DHCP related configuration
	pim		x	x	PIM related configuration
	ssh		x	x	SSH related information
listuser			x	x	List the user, mode and groups
lock			x	x	Lock the console
logout		x	x	x	Logout
memtrace			x	x	Configures memtrace
no ip					IP related information
	dhcp		x	x	DHCP related configuration
	ssh		x	x	SSH related information
no debug					Configures trace for the module
	ip	x	x	x	Stops debugging on IGMP or PIM
	sntp	x	x	x	Stops debugging on SNTP related configurations
	additional options...		x	x	Stops debugging for other options
ping					

Command	First Param	Guest	Tech	Admin	Description
	A.B.C.D	x	x	x	Ping host
	ip dns host name	x	x	x	Ping host
	ip A.B.C.D	x	x	x	Ping host
	vrf	x	x	x	Ping vrf instance
readarpfromHardware ip	A.B.C.D		x	x	Reads the arp for the given IP
readregister			x	x	Reads the value of the register from the hardware
release dhcp			x	x	Performs release operation
reload			x	x	Restarts the switch
renew dhcp			x	x	Performs renew operation
run script			x	x	Runs CLI commands
shell				x	Shell to Linux prompt
show		x	x	x	Shows configuration or information
sleep		x	x	x	Puts the command prompt to sleep
ssl				x	Configures secure sockets layer related parameters
snmpwalk mib					Allows the user to view Management Information Base related configuration.
	name	x	x	x	
	oid	x	x	x	
traceroute					Traces route to the destination IP
	A.B.C.D		x	x	
write			x	x	Writes the running-config to a flash file
writeregister			x	x	writes in the specified register

Configuration Terminal Access

The Guest user level does not have access to the configuration terminal.

The Administration level has access to all commands in the configuration terminal.

The Technical level has access to all commands in the configuration terminal with the following exceptions listed below.

- bridge-mode
- enableuser
- mst
- password
- traffic

2. Protocol Description

RIP (Routing Information Protocol) is a widely-used protocol for managing router information within a self-contained network such as a corporate local area network or an interconnected group of such LANs. *RIP* is classified by the Internet Engineering Task Force (*IETF*) as one of the several internal gateway protocols (Interior Gateway Protocol).

RIP sends routing-update messages at regular intervals and when the network topology changes. When a router receives a routing update that includes changes to an entry, it updates its routing table to reflect the new route. The metric value for the path is increased by 1, and the sender is indicated as the next hop. *RIP* routers maintain only the best route (the route with the lowest metric value) to a destination. After updating its routing table, the router immediately begins transmitting routing updates to inform other network routers of the change. These updates are sent independently of the regularly scheduled updates that *RIP* routers send. *RIP* uses a hop count as a way to determine network distance.

The iS5Com *RIP* basic and advanced configuration tasks are described in the next sections.

CONFIGURING RIP

3. Configuring RIP

The following sections describe the configuration of iS5Com *RIP* running as a part of iS5Com *ISS*.

3.1. Topology for Testing iS5Com RIP

The figures below represent a simple network topology for testing *RIP*.

Figure 1: Topology 1 for Testing iS5Com RIP

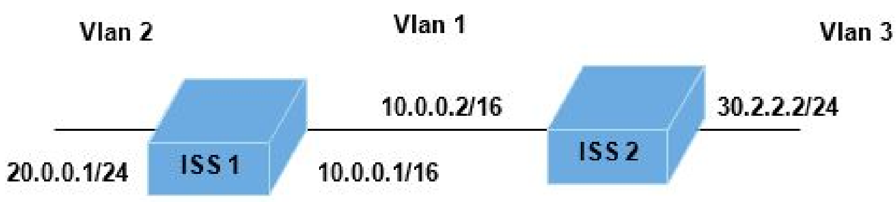
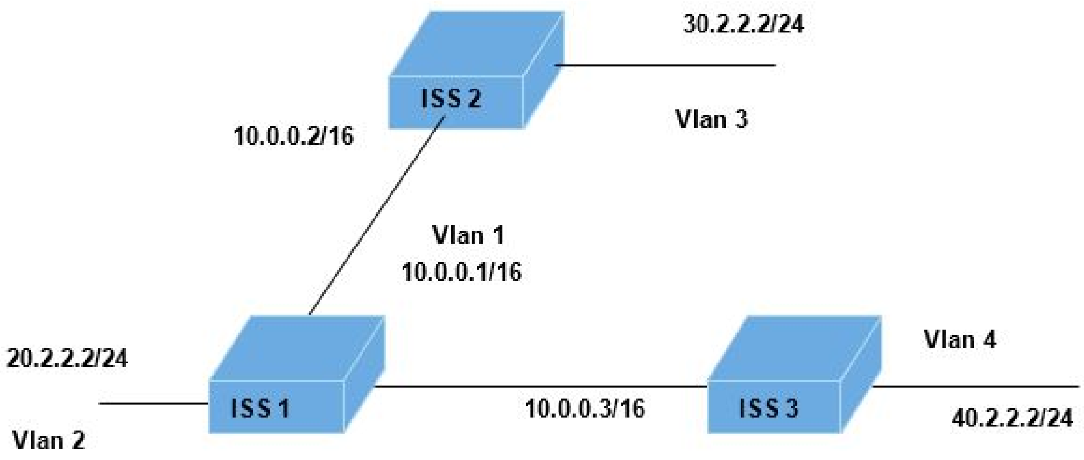


Figure 2: Topology 2 for Testing iS5Com RIP



3.2. Configuration Guidelines

The following configuration needs to be done in switches ISS 1, ISS2, and ISS 3.This is a prerequisite for configuring the iS5Com's *RIP*.

Configuration in ISS1

CONTEXT:

For setup, refer to Figure Topology 1 for Testing iS5Com *RIP*.

Prerequisite: Configuration of *VLAN* Interfaces (*VLAN*1 and *VLAN*2)

1. Configure the *VLAN* interfaces by executing the following commands.

   FOR EXAMPLE: Execute the following commands

```
iS5comm# configure terminal
iS5comm(config)# set gvrp disable
iS5comm(config)# set gmrp disable
iS5comm(config)# interface vlan 1
iS5comm(config-if)# shutdown
iS5comm(config-if)# ip address 10.0.0.1 255.255.0.0
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
iS5comm(config)# vlan 1
iS5comm(config-vlan)# ports gigabitethernet 0/1 untagged gigabitethernet
0/1
iS5comm(config-vlan)# exit
iS5comm(config)# interface vlan 2
iS5comm(config-if)# shutdown
iS5comm(config-if)# ip address 20.0.0.1 255.255.255.0
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
iS5comm(config)# vlan 2
iS5comm(config-vlan)# ports gigabitethernet 0/2 untagged gigabitethernet
0/2
iS5comm(config-vlan)# exit
iS5comm(config)# interface gigabitethernet 0/2
iS5comm(config-if)# switchport pvid 2
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
```

Configuration in ISS2

CONTEXT:

For setup, refer to Figure Topology 1 for Testing iS5Com *RIP*.

Prerequisite: Configuration of *VLAN* Interfaces (vlan1 and vlan3)

1. Configuration of *VLAN* Interfaces (*VLAN* 1and *VLAN* 3)

   FOR EXAMPLE: Execute the following commands

```
iS5comm# configure terminal
iS5comm(config)# set gvrp disable
iS5comm(config)# set gmrp disable
iS5comm(config)# interface vlan 1
iS5comm(config-if)# shutdown
iS5comm(config-if)# ip address 10.0.0.2 255.255.0.0
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
iS5comm(config)# vlan 1
iS5comm(config-vlan)# ports gigabitethernet 0/1 untagged gigabitethernet
0/1
iS5comm(config-vlan)# exit
iS5comm(config)# interface vlan 3
iS5comm(config-if)# shutdown
iS5comm(config-if)# ip address  30.2.2.2 255.255.255.0
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
iS5comm(config)# vlan 3
iS5comm(config-vlan)# ports gigabitethernet 0/3 untagged gigabitethernet
0/3
iS5comm(config-vlan)# exit
iS5comm(config)# interface gigabitethernet 0/3
iS5comm(config-if)# switchport pvid 3
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
```

Configuration in ISS3

CONTEXT:

For setup, refer to Figure Topology 1 for Testing iS5Com *RIP*.

Prerequisite: Configuration of *VLAN* Interfaces (VLAN 1 and VLAN 2)

1. Configuration of *VLAN* Interfaces (VLAN 1and VLAN 4)

   FOR EXAMPLE: Execute the following commands

```
iS5comm# configure terminal
iS5comm(config)# set gvrp disable
iS5comm(config)# set gmrp disable
iS5comm(config)# interface vlan 1
```

```
iS5comm(config-if)# shutdown
iS5comm(config-if)# ip address 10.0.0.3 255.255.0.0
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
iS5comm(config)# vlan 1
iS5comm(config-vlan)# ports gigabitethernet 0/1 untagged gigabitethernet
0/1
iS5comm(config-vlan)# exit
iS5comm(config)# interface vlan 4
iS5comm(config-if)# shutdown
iS5comm(config-if)# ip address  40.2.2.2 255.255.255.0
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
iS5comm(config)# vlan 4
iS5comm(config-vlan)# ports gigabitethernet 0/4 untagged gigabitethernet
0/4
iS5comm(config-vlan)# exit
iS5comm(config)# interface gigabitethernet 0/4
iS5comm(config-if)# switchport pvid 4
iS5comm(config-if)# no shutdown
iS5comm(config-if)# exit
```

3.3. Default Configuration

The default RIP configuration is as follows.

Feature	Default Setting
RIP	Disabled
default-metric	3
Auto-Summarization of routes	Enabled
Output Delay	Disabled
Retransmission timeout interval	5 sec
Number of retransmission retries	36
split horizon with poison reverse	Enabled

3.4. Enabling RIP

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (ISS 1 and ISS 2) before configuring *RIP*. *RIP* is disabled by default.

1. To enable *RIP* in the Switch ISS, execute the following commands.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in ISS1.

   ```
   iS5comm# configure terminal
   ```

   – Enable *RIP* globally in the switch ISS1.

   ```
   iS5comm(config)# router rip
   ```

   – Exit from the Router Configuration Mode.

   ```
   iS5comm(config-router)# exit
   ```

3.5. Disabling RIP

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (ISS 1 and ISS 2) before configuring *RIP*.

1. In switch ISS, execute the following commands.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in ISS1.

   ```
   iS5comm# configure terminal
   ```

   – Disable *RIP* globally in the switch ISS1.

   ```
   iS5comm(config)# no router rip
   ```

   – Exit from the Global Configuration Mode.

   ```
   iS5comm(config)# exit
   ```

3.6. Enabling RIP on IP Network

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To disable *RIP* in the switch *ISS*, execute the following commands.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS*1.

   ```
   iS5comm# configure terminal
   ```

   – Enable *RIP* globally in the switch *ISS*1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface VLAN 1 (IP address 10.0.0.1/16.

```
iS5comm(config-router)# network 10.0.0.1
```

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# exit
```

2. View the *RIP* interface using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip statistics
RIP Global Statistics:
----------------------
Total number of route changes is 0
Total number of queries responded is 0
Total number of periodic updates sent is 11
Total number of dropped packets is 0
RIP Interface Statistics:
-------------------------
Interface   Periodic      BadRoutes   Triggered      BadPackets   Admin
IP Address  Updates Sent  Received    Updates Sent   Received     Status
----------- ------------  ---------   ------------   ----------   ------
10.0.0.1      11             0            0              0       Enabled
```

3. View the *RIP* route.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip database
10.0.0.0/8[1]     summary route
10.0.0.0/16        directly connected, vlan1
```

NOTE: *RIP* can be enabled on Pseudowire (*PW*) interface similarly to *RIP* on router port. *RIP* can be enabled on Secondary IP Address configured on Interface Level.

3.7. Configuring RIP Security

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com RIP for the Setup. The prerequisite configuration needs to be done in the switches (ISS 1 and ISS 2) before configuring RIP.

CONTEXT:

For enabling authentication, refer to Section 3.15.1.

1. To enable RIP security, execute the following commands in the switch ISS1.

FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in ISS1.

```
iS5comm# configure terminal
```

– Enable RIP globally in the switch ISS1.

```
iS5comm(config)# router rip
```

– Enable RIP over the interface vlan 1 (IP address 10.0.0.1/16.

```
iS5comm(config-router)# network 10.0.0.1
```

– Enable RIP security.

```
iS5comm(config-router)# ip rip security minimum
```

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# exit
```

2. To disable RIP security, execute the following commands in the switch ISS1.

   FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in ISS1.

```
iS5comm# configure terminal
```

– Enable RIP globally in the switch ISS1.

```
iS5comm(config)# router rip
```

– Enable RIP over the interface vlan 1 (IP address 10.0.0.1/16.

```
iS5comm(config-router)# network 10.0.0.1
```

– Disable RIP security.

```
iS5comm(config-router)# no ip rip security
```

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# exit
```

3.8. Configuring RIP Packets Retransmission Interval and Retries Count

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To configure the *RIP* packets retransmission interval and retries count, execute the following commands in the switch *ISS*1.

   FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS*1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch *ISS*1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16.

```
iS5comm(config-router)# network 10.0.0.1
```

– Configure the retransmission interval.

```
iS5comm(config-router)# ip rip retransmission interval 10
```

– Configure the retransmission count.

```
iS5comm(config-router)# ip rip retransmission retries 20
```

2. View the configured retransmission interval and the number of retries count using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
Redistributing : rip
Output Delay is disabled
Retransmission timeout interval is 10 seconds
Number of retransmission retries is 20
Default metric is 3Auto-Summarisation of routes is enabled
Routing for Networks :
10.0.0.0
Routing Information Sources :
Interface Specific Address Summarisation :
 Interface vlan1
Sending updates every 30 seconds
Invalid after 180 seconds
Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
 Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf"  Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
Routing Information Sources:
 Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
```

```
Routing Information sources:
Gateway  Last Update
```

– Configure the default retransmission interval.

```
iS5comm(config-router)# no ip rip retransmission interval
```

– Configure the default retransmission retry count.

```
iS5comm(config-router)# no ip rip retransmission retries
```

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# exit
```

3. View the default retransmission interval and the number of retries count using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
Redistributing : rip
Output Delay is disabled
Retransmission timeout interval is 5 seconds
Number of retransmission retries is 36
Default metric is 3Auto-Summarisation of routes is enabled
Routing for Networks :
10.0.0.0
Routing Information Sources :
Interface Specific Address Summarisation :
 Interface vlan1
Sending updates every 30 seconds
Invalid after 180 seconds
Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
 Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf"  Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
Routing Information Sources:
 Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
```

```
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.9. Configuring RIP Neighbor

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 2 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To configure *RIP* Neighbor, execute the following commands in the switch ISS1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in ISS1.

   `iS5comm# configure terminal`

   – Enable *RIP* globally in the switch ISS1.

   `iS5comm(config)# router rip`

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16.

   `iS5comm(config-router)# network 10.0.0.1`

   – Configure the RIP trusted neighbor.

   `iS5comm(config-router)# neighbor 10.0.0.2`

NOTE: In *ISS* 1, you can view only the routes that are sent as *RIP* updates from the neighbor router ISS2 (10.0.0.2).

   – Delete the configured *RIP* neighbor.

   `iS5comm(config-router)# no neighbor 10.0.0.2`

NOTE: In *ISS* 1, you can view the routes that are sent as *RIP* updates from both neighbor routers *ISS*2 (10.0.0.2) and *ISS*3 (10.0.0.3)

   – Exit to the Global Configuration Mode.

   `iS5comm(config-router)# exit`

3.10. Configuring RIP Passive Interface

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To configure *RIP* passive interface, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Configure the passive interface.

```
iS5comm(config-router)# passive-interface vlan 1
```

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# exit
```

2. View the passive interface configuration information using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip statistics
RIP Global Statistics:
----------------------
 Total number of route changes is 0
 Total number of queries responded is 0
 Total number of periodic updates sent is 0
 Total number of dropped packets is 0
RIP Interface Statistics:
-------------------------
Interface   Periodic      BadRoutes   Triggered      BadPackets   Admin
IP Address  Updates Sent  Received    Updates Sent   Received     Status
----------- ------------  ---------   ------------   ----------   ------
10.0.0.1        0             0            0              0      Passive
```

NOTE: From the printout above, it is confirmed that no routing updates are sent over the passive interface vlan1.

3. Execute the following commands in the switch *ISS* 1 to disable *RIP* passive interface status.

FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface vlan 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Disable the passive interface status.

iS5comm(config-router)# no passive-interface vlan 1

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# exit
```

4. View the *RIP* interface for the periodic updates sent overusing the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip statistics
RIP Global Statistics:
----------------------
 Total number of route changes is 0
 Total number of queries responded is 0
 Total number of periodic updates sent is 1
 Total number of dropped packets is 0
RIP Interface Statistics:
-------------------------
Interface   Periodic      BadRoutes   Triggered      BadPackets   Admin
IP Address  Updates Sent  Received    Updates Sent   Received     Status
----------- ------------  ---------   ------------   ----------   ------
10.0.0.1        1             0           0              0       Enabled
```

3.11. Configuring output-delay

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To enable the interpacket delay, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   ```
   iS5comm# configure terminal
   ```

   – Enable RIP globally in the switch *ISS* 1.

   ```
   iS5comm(config)# router rip
   ```

   – Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   ```
   iS5comm(config-router)# network 10.0.0.1
   ```

   – Enable the interpacket delay for *RIP* updates.

   ```
   iS5comm(config-router)# output-delay
   ```

   – Exit to the Global Configuration Mode.

   ```
   iS5comm(config-router)# end
   ```

2. View the enabled output-delay using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
```

```
 Output Delay is Enabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3. To disable the interpacket delay, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   ```
   iS5comm# configure terminal
   ```

   – Enable RIP globally in the switch *ISS* 1.

   ```
   iS5comm(config)# router rip
   ```

   – Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Disable the interpacket delay for *RIP* updates.

```
iS5comm(config-router)# no output-delay
```

– Exit to the Global Configuration Mode.

```
iS5comm(config-router)# end
```

4. View the disabled output-delay using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway          Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
```

```
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.12. Configuring Redistribution

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To configure Redistribution, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   `iS5comm# configure terminal`

   – Enable RIP globally in the switch *ISS* 1.

   `iS5comm(config)# router rip`

   – Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   `iS5comm(config-router)# network 10.0.0.1`

   – Configure the redistribution of static routes into *RIP* domain.

   `iS5comm(config-router)# redistribute static`

   – Exit from the Router Configuration Mode.

   `iS5comm(config-router)# end`

Sample Configuration for Testing Redistribution

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To test Redistribution, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   `iS5comm# configure terminal`

   – Enable RIP globally in the switch *ISS* 1.

   `iS5comm(config)# router rip`

   – Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   `iS5comm(config-router)# network 10.0.0.1`

   – Configure the redistribution of static routes into RIP domain.

   `iS5comm(config-router)# redistribute static`

   – Exit from to the Router Configuration Mode.

```
iS5comm(config-router)# exit
```

– Add static routes.

```
iS5comm(config)# ip route 50.0.0.0 255.0.0.0 vlan 2
iS5comm(config)# ip route 60.0.0.0 255.0.0.0 vlan 2
iS5comm(config)# ip route 70.0.0.0 255.0.0.0 vlan 2
iS5comm(config)# ip route 80.0.0.0 255.0.0.0 vlan 2
```

2. To test Redistribution, execute the following commands in the switch *ISS* 2.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 2.

```
iS5comm# configure terminal
```

   – Enable RIP globally in the switch *ISS* 2.

```
iS5comm(config)# router rip
```

   – Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.2
```

3. View the redistribution of static routes using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip, static
 Output Delay is Enabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
```

```
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

4. View the *RIP* route entries for the static routes added in *ISS* 1. Static routes added in *ISS* 1 with metric 3 are redistributed into the *RIP* domain. In *ISS*2, view the redistributed static routes with metric 4 using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip database
10.0.0.0/8  [1]        auto-summary
10.0.0.0/16 [1]        directly connected, vlan1
50.0.0.0/8  [4]        auto-summary
50.0.0.0/8  [4]        via 10.0.0.1, vlan1
60.0.0.0/8  [4]        auto-summary
60.0.0.0/8  [4]        via 10.0.0.1, vlan1
70.0.0.0/8  [4]        auto-summary
70.0.0.0/8  [4]        via 10.0.0.1, vlan1
80.0.0.0/8  [4]        auto-summary
80.0.0.0/8  [4]        via 10.0.0.1, vlan1
iS5comm# show ip route
C 10.0.0.0/16 is directly connected, vlan1
C 30.2.2.0/24 is directly connected, vlan3
R 50.0.0.0/8  [4] via 10.0.0.1
R 60.0.0.0/8  [4] via 10.0.0.1
R 70.0.0.0/8  [4] via 10.0.0.1
R 80.0.0.0/8  [4] via 10.0.0.1
```

5. To disable Redistribution, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Disable the redistribution of static routes into *RIP* domain.

```
iS5comm(config-router)# no redistribute static
```

– Exit from the Router Configuration Mode.

```
iS5comm(config-router)# end
```

6. View in ISS2, the *RIP* route entries for the static routes added in *ISS* 1, which are made as unreachable with metric as infinity (16). Static routes added in *ISS* 1 are redistributed into the *RIP* domain by using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip database
10.0.0.0/8  [1]        auto-summary
10.0.0.0/16 [1]        directly connected, vlan1
50.0.0.0/8  [4]        via 10.0.0.1, vlan1
60.0.0.0/8  [4]        via 10.0.0.1, vlan1
70.0.0.0/8  [4]        via 10.0.0.1, vlan1
80.0.0.0/8  [4]        via 10.0.0.1, vlan1
iS5comm# show ip route
C 10.0.0.0/16 is directly connected, vlan1
C 30.2.2.0/24 is directly connected, vlan3
```

Redistribution of Connected Networks

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 2 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1, *ISS* 2 and *ISS* 3) before configuring *RIP*.

PREREQUISITE:

Use **redistribute connected** command to make sure that connected networks between the switches are redistributed as well and have full reachability.

Note that the **redistribute connected** command will just redistribute all connected networks regardless of their involvement in the redistribution process.

If we want to filter the redistributed connected networks to include only the connected networks between the switches, use a route map to filter them.

1. For connected redistribution, execute the following commands:

   FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode.

```
iS5comm# configure terminal
```

– Enable RIP globally in the switch*ISS*1.

```
iS5comm(config)# router rip
```

– Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Use option **connected** to ensure that the connected network between the switches are redistributed.

```
iS5comm(config-router)# redistribute connected
```

– Exit from to the Router Configuration Mode.

```
iS5comm(config-router)# exit
```

3.13. Configuring default-metric

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To configure default-metric, execute the following commands in the switch *ISS* 1.

FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable RIP globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Configure default-metric for redistributed routes in the RIP domain

```
iS5comm(config-router)# default-metric 10
```

– Exit from the Router Configuration Mode.

```
iS5comm(config-router)# end
```

Sample Configuration to Test Default-metric

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To test default-metric, execute the following commands in the switch *ISS* 1.

FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable RIP globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Configure default-metric for redistributed routes in the *RIP* domain.

```
iS5comm(config-router)# default-metric 10
iS5comm(config-router)# exit
```

– Add static routes.

```
iS5comm(config)# ip route 50.0.0.0 255.0.0.0 vlan 2
iS5comm(config)# ip route 60.0.0.0 255.0.0.0 vlan 2
iS5comm(config)# ip route 70.0.0.0 255.0.0.0 vlan 2
iS5comm(config)# ip route 80.0.0.0 255.0.0.0 vlan 2
```

– Exit from to the Router Configuration Mode.

```
iS5comm(config-router)# end
```

2. To test default-metric, execute the following commands in the switch *ISS* 2.

FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch*ISS* 1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.2
```

– Configure default-metric for redistributed routes in the RIP domain

```
iS5comm(config-router)# default-metric 10
```

3. View the metric for redistributed *RIP* route entries as 10 in*ISS* 1 using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 10
Auto-Summarisation of routes is enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
```

```
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
iS5comm# show ip rip database
10.0.0.0/8  [1]        auto-summary
10.0.0.0/16 [1]        directly connected, vlan1
50.0.0.0/8  [10]        auto-summary
50.0.0.0/8  [10]        redistributed via 0.0.0.0
60.0.0.0/8  [10]        auto-summary
60.0.0.0/8  [10]        redistributed via 0.0.0.0
70.0.0.0/8  [10]        auto-summary
70.0.0.0/8  [10]        redistributed via 0.0.0.0
80.0.0.0/8  [10]        auto-summary
80.0.0.0/8  [10]        redistributed via 0.0.0.0
```

4. Execute the following commands in the switch *ISS* 1 to disable redistribution.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   ```
   iS5comm# configure terminal
   ```

   – Enable *RIP* globally in the switch *ISS* 1.

   ```
   iS5comm(config)# router rip
   ```

   – Disable the redistribution of static routes into *RIP* domain.

   ```
   iS5comm(config-router)# no redistribute static
   ```

   – Exit from to the Router Configuration Mode.

```
iS5comm(config-router)# end
```

– Configure default metric for redistributed routes.

```
iS5comm(config-router)# no default-metric
```

– Enable static route redistribution.

```
iS5comm(config-router)# redistribute static
iS5comm(config-router)# end
```

5. View in *ISS* 1, the metric for redistributed *RIP* route entries as 3 using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip database
10.0.0.0/8[1]      summary route
10.0.0.0/16         directly connected, vlan1
50.0.0.0/8[3]      summary route
50.0.0.0/8 [3]         redistributed via vlan2
60.0.0.0/8[3]      summary route
60.0.0.0/8 [3]         redistributed via vlan2
70.0.0.0/8[3]      summary route
70.0.0.0/8 [3]         redistributed via vlan2
80.0.0.0/8[3]      summary route
80.0.0.0/8 [3]         redistributed via vlan2
```

3.14. Configuring auto-summary

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To configure auto-summary, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Disable auto-summary of *RIP* routes.

```
iS5comm(config-router)# auto-summary disable
```

– Exit from the Router Configuration Mode.

```
iS5comm(config-router)# end
```

2. View the disabled auto summarization using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is disabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3. To enable auto-summary, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

– Enable *RIP* globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable auto-summary of *RIP* routes.

```
iS5comm(config-router)# auto-summary enable
```

– Exit from the Router Configuration Mode.

```
iS5comm(config-router)# end
```

4. View the enabled auto summarization using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is none
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
```

```
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.15. Configuring Interface-Specific RIP Parameters

The following configurations are done in the Interface Mode.

1. To configure interface-specific *RIP* parameters, execute the following commands in the switch *ISS* 1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   `iS5comm# configure terminal`

   – Enter the Interface Configuration mode.

   `iS5comm(config)# interface vlan 1`

   – Exit from the Interface Configuration Mode.

   `iS5comm(config-if)# exit`

3.16. Configuring Interface-Specific Authentication

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. To enable interface specific authentication, execute the following commands in the switch *ISS*1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   `iS5comm# configure terminal`

   – Enable RIP globally in the switch *ISS* 1.

   `iS5comm(config)# router rip`

   – Enable RIP over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   `iS5comm(config-router)# network 10.0.0.1`

   – Exit Router Configuration Mode.

   `iS5comm(config-router)# exit`

   – Enter Interface Configuration Mode.

   `iS5comm(config)# interface vlan 1`

   – Enable sha-1 Crypto authentication.

   `iS5comm(config-if)# ip rip auth-type sha-1`

– Enable sha-256 Crypto authentication.

```
iS5comm(config-if)# ip rip auth-type sha-256
```

– Enable sha-384 Crypto authentication.

```
iS5comm(config-if)# ip rip auth-type sha-384
```

– Enable sha-256Crypto authentication.

```
iS5comm(config-if)# ip rip auth-type sha-256
```

– Enable Crypto authentication key-id.

```
iS5comm(config-if)# ip rip authentication key-id 1 key FSS
```

– Configure the start-generate time for crypto authentication key-id.

```
iS5comm(config-if)# ip rip key-id 1 start-generate 2021-05-12,21:40:20
```

– Configure the stop-generate time for crypto authentication key-id.

```
iS5comm(config-if)# ip rip key-id 1 stop-generate 2021-05-12,22:40:20
```

– Configure the start-accept time for crypto authentication key-id.

```
iS5comm(config-if)# ip rip key-id 1 start-accept 2021-05-12,21:40:20
```

– Configure the stop-accept time for crypto authentication key-id.

```
iS5comm(config-if)# ip rip key-id 1 stop-accept 2021-05-12,22:40:20
```

– Delete the configured crypto authentication key-id.

```
iS5comm(config-if)# no ip rip authentication key-id 1
```

– Disable authentication.

```
iS5comm(config-if)# no ip rip authentication
```

– Exit from the Interface Configuration Mode.

```
iS5comm(config-if)# exit
```

2. To enable authentication last-key lifetime status, execute the following commands in the switch ISS1.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

```
iS5comm# configure terminal
```

   – Configure the lifetime status for authentication key-id.

```
iS5comm(config)# rip authentication last-key infinite lifetime true
```

   – Exit from the Global Configuration Mode.

```
iS5comm(config)# exit
```

Sample Configuration for Enabling Authentication

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in both switches for enabling authentication

   FOR EXAMPLE: Type the following:

– Configure the following in *ISS* 1.

```
iS5comm# config terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.1
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
```

– Enable md5 authentication.

```
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip authentication mode md5 key-chain 12345
iS5comm(config-if)#end
```

– Configurations in*ISS* 2.

```
iS5comm# config terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.2
iS5comm(config-router)# exit
```

– Enable md5 authentication

```
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip authentication mode md5 key-chain 12345
iS5comm(config-if)#end
```

2. View the authentication type using the following command.

FOR EXAMPLE: Type the following:

– View in *ISS* 1 all RIP packets have authentication information

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
```

```
 Authentication type is md5
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

– View in ISS2 that all RIP packets have authentication information.

Sample Configuration for Enabling Crypto Authentication

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in both switches for enabling authentication

   FOR EXAMPLE: Type the following:

   – Configure the following in *ISS* 1.

```
iS5comm# config terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.1
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
```

   – Enable any one of the crypto authentication

```
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip auth-type sha-1
iS5comm(config-if)# ip rip authentication key-id 1 key FSS
iS5comm(config-if)# ip rip key-id 1 start-generate 2013-05-12,21:40:20
iS5comm(config-if)# ip rip key-id 1 stop-generate 2013-05-12,22:40:20
```

```
iS5comm(config-if)# ip rip key-id 1 start-accept 2013-05-12,21:40:20
iS5comm(config-if)# ip rip key-id 1 stop-accept 2013-05-12,22:40:20
iS5comm(config-if)#end
```

– Multiple keys can be configured over an interface. If the start time for generate, accept & stop time for generate, accept are not configured, default values will be taken.

```
iS5comm# config terminal
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip auth-type sha-1
iS5comm(config-if)# ip rip authentication key-id 2 key FSS2
iS5comm(config-if)#end
```

– Configure the following in ISS2.

```
iS5comm# config terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.2
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
```

– Enable all crypto authentication.

```
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip auth-type sha-1
iS5comm(config-if)# ip rip authentication key-id 1 key FSS
iS5comm(config-if)# ip rip key-id 1 start-generate 2021-05-12,21:40:20
iS5comm(config-if)# ip rip key-id 1 stop-generate 2021-05-12,22:40:20
iS5comm(config-if)# ip rip key-id 1 start-accept 2021-05-12,21:40:20
iS5comm(config-if)# ip rip key-id 1 stop-accept 2021-05-12,22:40:20
iS5comm(config-if)#end
```

– Multiple keys can be configured over an interface. If the start time for generate, accept & stop time for generate, accept are not configured default values will be taken.

```
iS5comm# config terminal
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip auth-type sha-1
iS5comm(config-if)# ip rip authentication key-id 2 key FSS2
iS5comm(config-if)#end
```

2. View the configured authentication information and the active key-id in use during packet transmission in *ISS* 1 and *ISS* 2 using the following show commands.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip rip authentication
RIP Interface Authentication Statistics:
Vrf default
Interface Name                    vlan1
Authentication Type               sha-1
```

```
Authentication KeyId in use:     1
Authentication Last key status:  true

RIP Authentication Key Info:
Authentication KeyId        1
Start Accept Time           2021-05-12,21:40:20
Start Generate Time         2021-05-12,21:40:20
Stop Generate Time          2021-05-12,22:40:20
Stop Accept Time            202113-05-12,22:40:20

Authentication KeyId        2
Start Accept Time           2021-05-11,13:13:37
Start Generate Time         2021-05-11,13:13:37
Stop Generate Time          2131-02-06,06:28:15
Stop Accept Time            2131-02-06,06:28:15
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is sha-1
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
 Restricts default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
```

```
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.17. Configuring RIP Default Route Propagation

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in the switch *ISS* 1 to configure *RIP* default route propagation.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in *ISS* 1.

   `iS5comm# configure terminal`

   – Enable *RIP* globally in the switch *ISS* 1.

   `iS5comm(config)# router rip`

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   `iS5comm(config-router)# network 10.0.0.1`

   – Exit the Router Configuration Mode.

   `iS5comm(config-router)# exit`

   – Enter Interface Configuration Mode.

   `iS5comm(config)# interface vlan 1`

   – Configure *RIP* default route origination.

   `iS5comm(config-if)# ip rip default route originate 10`

   NOTE: Refer to Section 3.17.1 for sample configuration to test Default Route Origination and Default Route Installation.

3.18. Installing Default Route

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in the switch *ISS* 1 to install the default route.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in*ISS* 1.

   ```
   iS5comm# configure terminal
   ```

   – Enable *RIP* globally in the switch *ISS* 1.

   ```
   iS5comm(config)# router rip
   ```

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   ```
   iS5comm(config-router)# network 10.0.0.1
   ```

   – Exit the Router Configuration Mode.

   ```
   iS5comm(config-router)# exit
   ```

   – Enter the Interface Configuration Mode.

   ```
   iS5comm(config)# interface vlan 1
   ```

   – Enable installation of default route.

   ```
   iS5comm(config-if)# no ip rip default route install
   ```

Sample Configuration for Default Route Origination and Installation

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in both switches.

   FOR EXAMPLE: Type the following:

   ```
   iS5comm# configure terminal
   iS5comm(config)# router rip
   iS5comm(config-router)# network 10.0.0.1
   iS5comm(config-router)# exit
   iS5comm(config)# interface vlan 1
   ```

   – Enable installation of default route.

   ```
   iS5comm(config-if)# ip rip default route install
   iS5comm(config-if)# end
   ```

   – Configure the following in *ISS* 2 to test Default Route Origination and Default Route Installation.

   ```
   iS5comm# configure terminal
   iS5comm(config)# router rip
   iS5comm(config-router)# network 10.0.0.2
   ```

```
iS5comm(config-router)# exit
iS5comm(config)# interface vlan 1
```

– Enable default route origination

```
iS5comm(config-if)# ip rip default route originate 11
iS5comm(config-if)# end
```

2. View in *ISS* 2 the *RIP* response packet sent out through the interface *VLAN* 1 in the switch *ISS* 2. The *RIP* response packets will have a default route.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is sha-1
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
Originate default route
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
```

```
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3. View in *ISS* 1, the default route with next hop as 10.0.0.2 (*ISS* 2 interface VLAN 1 IP address) and metric as 12 (11+1) using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
 Send version is 1 2, receive version is 1 2
 Authentication type is sha-1
 Split Horizon with poissoned reverse is enabled
Installs default route received  Restricts  default route origination
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
```

```
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
iS5comm# show ip rip database
0.0.0.0/0  [12]        via 10.0.0.2, vlan1
10.0.0.0/8  [1]        auto-summary
10.0.0.0/16 [1]        directly connected, vlan1
iS5comm# show ip route
R 0.0.0.0/0  [12] via 10.0.0.2
C 10.0.0.0/16 is directly connected, vlan1
C 20.0.0.0/24 is directly connected, vlan2
```

3.19. Configuring Version for Receiving RIP Advertisements

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in the switch ISS 1 for configuring version for receiving RIP advertisements.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in*ISS* 1.

   ```
   iS5comm# configure terminal
   ```

   – Enable *RIP* globally in the switch *ISS* 1.

   ```
   iS5comm(config)# router rip
   ```

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   ```
   iS5comm(config-router)# network 10.0.0.1
   ```

   – Exit the Router Configuration Mode.

   ```
   iS5comm(config-router)# exit
   ```

   – Enter Interface Configuration Mode.

   ```
   iS5comm(config)# interface vlan 1
   ```

   – Configure version of *RIP* packets to be received over the interface VLAN 1.

   ```
   iS5comm(config-if)# ip rip receive version 1
   ```

2. View how *ISS* 1 will receive only *RIP* Version 1 packets over the interface vlan1 using the following command.

   FOR EXAMPLE: Type the following:

   – View the *RIP* receive version in interface VLAN 1 is 1.

   ```
   iS5comm# show ip protocols
   Routing Protocol is rip
   ```

```
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 30 seconds
 Invalid after 180 seconds
 Flushed after 120 seconds
Send version is 1 2, receive version is 1
 Authentication type is sha-1
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
Originate default route
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance     Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.20. Configuring Version for Transmitting RIP Advertisements

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands to configure version for transmitting RIP advertisement.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in*ISS* 1.

   ```
   iS5comm# configure terminal
   ```

   – Enable *RIP* globally in the switch *ISS* 1.

   ```
   iS5comm(config)# router rip
   ```

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   ```
   iS5comm(config-router)# network 10.0.0.1
   ```

   – Exit the Router Configuration Mode.

   ```
   iS5comm(config-router)# exit
   ```

   – Enter Interface Configuration Mode.

   ```
   iS5comm(config)# interface vlan 1
   ```

   – Configure version of *RIP* packets to be received over the interface *VLAN* 1.

   ```
   iS5comm(config-if)# ip rip receive version 1
   ```

2. View how *ISS* 1 will send (transmit) only *RIP* version 1 packets over the interface *VLAN* 1 using the following command.

   FOR EXAMPLE: Type the following:

   – View the *RIP* receive version in interface *VLAN* 1 is 1.

   ```
   iS5comm# show ip protocols
   Routing Protocol is rip
   RIP2 security level is Maximum
    Redistributing : rip
    Output Delay is Disabled
    Retransmission timeout interval is 5 seconds
    Number of retransmission retries is 36
   Default metric is 3
   Auto-Summarisation of routes is Enabled
    Routing for Networks:
    10.0.0.0
    Routing Information Sources :
   Interface Specific Address Summarisation:
    Interface vlan1
    Sending updates every 30 seconds
    Invalid after 180 seconds
   ```

```
 Flushed after 120 seconds
Send version is 1, receive version is 1 2
 Authentication type is sha-1
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
Originate default route
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.21. Configuring RIP summary-address

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in the switch *ISS* 1 to configure *RIP* summary-address.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in*ISS* 1.

   `iS5comm# configure terminal`

   – Enable *RIP* globally in the switch *ISS* 1.

   `iS5comm(config)# router rip`

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   `iS5comm(config-router)# network 10.0.0.1`

   – Exit the Router Configuration Mode.

   `iS5comm(config-router)# exit`

   – Enter Interface Configuration Mode.

   `iS5comm(config)# interface vlan 1`

– Configure the version of *RIP* packets to be sent over the interface *VLAN* 1.

```
iS5comm(config-if)# ip rip summary-address 40.0.0.0 255.0.0.0
iS5comm(config-if)# end
```

Sample Configuration of RIP summary-address

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following configuration commands in *ISS* 1 to configure *RIP* summary-address.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.1
iS5comm(config-router)# redistribute all
```

   – Disable auto-summary feature

```
iS5comm(config-router)# auto-summary disable
iS5comm(config-router)# exit
```

   – Configure Static routes

```
iS5comm(config-router)# ip route 40.1.0.0 255.255.0.0 vlan 2
iS5comm(config-router)# ip route 40.2.0.0 255.255.0.0 vlan 2
iS5comm(config-router)# ip route 40.3.0.0 255.255.0.0 vlan 2
iS5comm(config-router)# ip route 40.4.0.0 255.255.0.0 vlan 2
```

   – Configure Summary address for 20.0.0.0/8:

```
iS5comm(config)# interface vlan 1
iS5comm(config-if)# ip rip summary-address 40.0.0.0 255.0.0.0
iS5comm(config-if)#end
```

2. Execute the following configuration commands in *ISS* 2 to configure *RIP* summary-address.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.2
iS5comm(config-router)# redistribute all
```

3.22. Configuring Debug Level for RIP

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in the switch *ISS* 1 to configure the debug level for *RIP*.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 10.0.0.1
iS5comm(config-router)# end
```

   – Configure the debug level for *RIP* module.

```
iS5comm # debug ip rip all
RIP: Sending regular Update over this interface 0
RIP: Authentication not needed for this interface, So 25 routes can be composed
RIP: If Agg Rt added to update with metric : 3
RIP: Sending RIP update through Port 0
RIP: Sending regular Update over this interface 0
RIP: Authentication not needed for this interface, So 25 routes can be composed
RIP: If Agg Rt added to update with metric : 3
RIP: Sending RIP update through Port 0
RIP: Sending regular Update over this interface 0
RIP: Authentication not needed for this interface, So 25 routes can be composed
RIP: If Agg Rt added to update with metric : 3
```

   – Disable the debug level for *RIP* module.

```
iS5comm# no debug ip rip all
```

3.23. Configuring Basic Timers

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

1. Execute the following commands in the switch *ISS* 1 to configure basic timers.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in*ISS* 1.

```
iS5comm# configure terminal
```

   – Enable *RIP* globally in the switch *ISS* 1.

```
iS5comm(config)# router rip
```

– Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

```
iS5comm(config-router)# network 10.0.0.1
```

– Exit the Router Configuration Mode.

```
iS5comm(config-router)# exit
```

– Enter the Interface Configuration Mode.

```
iS5comm(config)# interface vlan 1
```

– Configure basic timers.

```
iS5comm(config-if)# timers basic 60 120 120
```

2. View the *RIP* update packets that are sent after 60 seconds and the configured timer values using the following command.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 60 seconds
 Invalid after 120 seconds
 Flushed after 120 seconds
Send version is 1 2, receive version is 1
 Authentication type is sha-1
 Split Horizon with poissoned reverse is enabled
Restricts default route installation
Originate default route
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway          Distance      Last Update(secs)
```

```
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

3.24. Configuring RIP Split Horizon

Refer to the Section 3.1 for Configuration Guidelines and Figure Topology 1 for Testing iS5Com *RIP* for the Setup. The prerequisite configuration needs to be done in the switches (*ISS* 1 and *ISS* 2) before configuring *RIP*.

CONTEXT:

By default, split horizon with poison reverse will be enabled on all RIP interfaces.

1. Execute the following commands in the switch *ISS* 1 to configure *RIP* Split Horizon.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode in*ISS* 1.

   `iS5comm# configure terminal`

   – Enable *RIP* globally in the switch *ISS* 1.

   `iS5comm(config)# router rip`

   – Enable *RIP* over the interface *VLAN* 1 (IP address 10.0.0.1/16).

   `iS5comm(config-router)# network 10.0.0.1`

   – Exit the Router Configuration Mode.

   `iS5comm(config-router)# exit`

   – Enter the Interface Configuration Mode.

   `iS5comm(config)# interface vlan 1`

   – Enable split horizon.

   `iS5comm(config-if)# ip split-horizon`

2. View the Split Horizon enabled in *ISS* 1 using the following command.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip protocols
Routing Protocol is rip
RIP2 security level is Maximum
 Redistributing : rip
 Output Delay is Disabled
```

```
 Retransmission timeout interval is 5 seconds
 Number of retransmission retries is 36
Default metric is 3
Auto-Summarisation of routes is Enabled
 Routing for Networks:
 10.0.0.0
 Routing Information Sources :
Interface Specific Address Summarisation:
 Interface vlan1
 Sending updates every 60 seconds
 Invalid after 120 seconds
 Flushed after 120 seconds
Send version is 1 2, receive version is 1
 Authentication type is sha-1
 Split Horizon is enabled
Restricts default route installation
Originate default route
Routing Protocol is "ospf" Router ID 0.0.0.0
 Number of areas in this router is 0 . 0 normal 0 stub 0 nssa
 Routing for Networks:
 Passive Interface(s):
 Routing Information Sources:
Gateway         Distance      Last Update(secs)
 Distance: (default is 121)
Routing Protocol is "bgp 0"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
IGP synchronization is disabled
Neighbor(s):
Address
Routing Information sources:
Gateway  Last Update
```

– Disable split horizon.

```
iS5comm(config-if)# no ip split-horizon
```

– Enable split horizon with poison reverse.

```
iS5comm(config-if)# ip split-horizon poison
```

3.25. Configuring Route Map – RIP

iS5Com *URM* (Unified Route Map) is a portable implementation of the route map capability for IPv4 and IPv6 unicast routing software. The *URM* provides a single interface for the administrator to set up and manage route maps. It also provides a common unified method for routing protocols and static route management software to use route maps for different purposes. The independent nature of the implementation helps to avoid the duplication of the route maps in the different routing modules in a router.

Configuring Route Map

This section lists the *CLI* configuration steps to define a route map with a specified name and the related parameters such as permission and sequence number.

1. Execute the following commands in the switch *ISS* 1 to configure *RIP* summary-address.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode.

   ```
   iS5comm# configure terminal
   ```

   – Configure the route map name, permission and sequence number.

   ```
   iS5comm(config)# route-map aa permit 1
   ```

   – View the configured route map.

   ```
   iS5comm# show route-map
   ```

   – Execute the no form of the command to delete the route map.

   ```
   iS5comm(config)# no route-map aa 1
   ```

Configuring Route Match Criteria

This section lists the *CLI* configuration steps for defining the filtering criteria for the route map and its related parameters.

1. Execute the following commands in the switch *ISS* 1 to configure Route Match Criteria.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode.

   ```
   iS5comm# configure terminal
   ```

   – Configure the route map name, permission and sequence number.

   ```
   iS5comm(config)# route-map aa permit 1
   ```

   – Configure the route map match source IP address and the subnet mask.

   ```
   iS5comm(config-rmap-aa)# match source ip 34.0.0.3 255.0.0.0
   ```

   – Configure the route map match source IPv6 address and the prefix length

   ```
   iS5comm(config-rmap-aa)# match source ipv6 2120::3 64
   ```

   – Configure the route map match destination IP address and the subnet mask.

   ```
   iS5comm(config-rmap-aa)# match destination ip 91.0.0.1 255.0.0.0
   ```

   – Configure the route map match destination IPv6 address and the prefix length.

```
iS5comm(config-rmap-aa)# match destination ipv6 2150::2 64
```

– Configure the route map match route-type as remote. (Route-type can be configured either as local or remote.)

```
iS5comm(config-rmap-aa)# match route-type remote
```

– Configure the route map match metric-type as inter-area. (Metric type can be inter-area / intra-area / type-1-external / type-2-external.)

```
iS5comm(config-rmap-aa)# match metric-type inter-area
```

– Configure the route map match metric value.

```
iS5comm(config-rmap-aa)# match metric 44
```

– Configure the route map match next-hop IP address.

```
iS5comm(config-rmap-aa)# match next-hop ip 91.0.0.1
```

– Configure the route map match next-hop IPv6 address.

```
iS5comm(config-rmap-aa)# match next-hop ipv6 3000::3
```

– Configure the route map match tag.

```
iS5comm(config-rmap-aa)# match tag 10
```

– View the configured parameters

```
iS5comm# show running-config route-map
Building configuration...route-map aa permit 1
match destination ip 91.0.0.1  255.0.0.0
match destination ipv6 2150::2  64
match source ip 34.0.0.3  255.0.0.0
match source ipv6 2120::3  64
match next-hop ip 91.0.0.1
match next-hop ipv6 3000::3
match metric 44
match tag 10
match metric-type inter-area
match route-type remote
end
```

– Execute the no form of the commands to delete the corresponding configurations.

Configuring RIP Distance

This section lists the *CLI* configuration steps to set the administrative distance for the *RIP* router.

1. Execute the following commands in the switch ISS 1 to configure *RIP* distance.

   FOR EXAMPLE: Type the following:

   – Enter the Global Configuration Mode.

   ```
   iS5comm# configure terminal
   ```

   – Enter the *RIP* Router Configuration mode.

   ```
   iS5comm(config)# router rip
   ```

– Configure the distance for the *RIP* routes.

```
iS5comm(config-router)# distance 100
```

– View the configured distance.

```
iS5comm# show running-config rip
Building configuration...
router rip
distance  100
!
end
```

– Execute the no form of the command to re-configure the distance to its default value.

```
iS5comm(config-router)# no distance
```

– View the configured distance.

```
iS5comm# show running-config rip
Building configuration...
router rip
!
end
```

Configuring Redistribution with Route Map

This section lists the *CLI* configuration steps to configure the protocol from which the routes have to be redistributed into *RIP* by applying the Route Map.

1. Execute the following commands in the switch *ISS* 1 to configure *RIP* distance.

FOR EXAMPLE: Type the following:

– Enter the Global Configuration Mode.

```
iS5comm# configure terminal
```

– Enter the *RIP* Router Configuration mode.

```
iS5comm(config)# router rip
```

– Configure the network.

```
iS5comm(config-router)# network 12.0.0.1
```

– Configure the redistribution of all routes with route-map aa.

```
iS5comm(config-router)# redistribute all route-map aa
```

– View the configured parameters.

```
iS5comm# show running-config rip
Building configuration...
router rip
redistribute all route-map aa
network 12.0.0.1
!
interface vlan 1
```

```
!
end
```

– Execute the no form of the command to disable the redistribution of all routes with route-map.

```
iS5comm(config-router)# no redistribute all route-map aa
```

– View the configured distance.

```
iS5comm# show running-config rip
Building configuration...
router rip
network 12.0.0.1
!
interface vlan 1
!
end
Building configuration...
router rip
!
end
```

Topology Configuration for RIP Testing

This section provides the sample configuration for testing route map with *RIP*.

PREREQUISITE:

Some prerequisite configuration must be done in the switches R1, R2, R3 and R4 before configuring *RIP*.

CONTEXT:

Figure 3: Topology for Testing Route Map with RIP

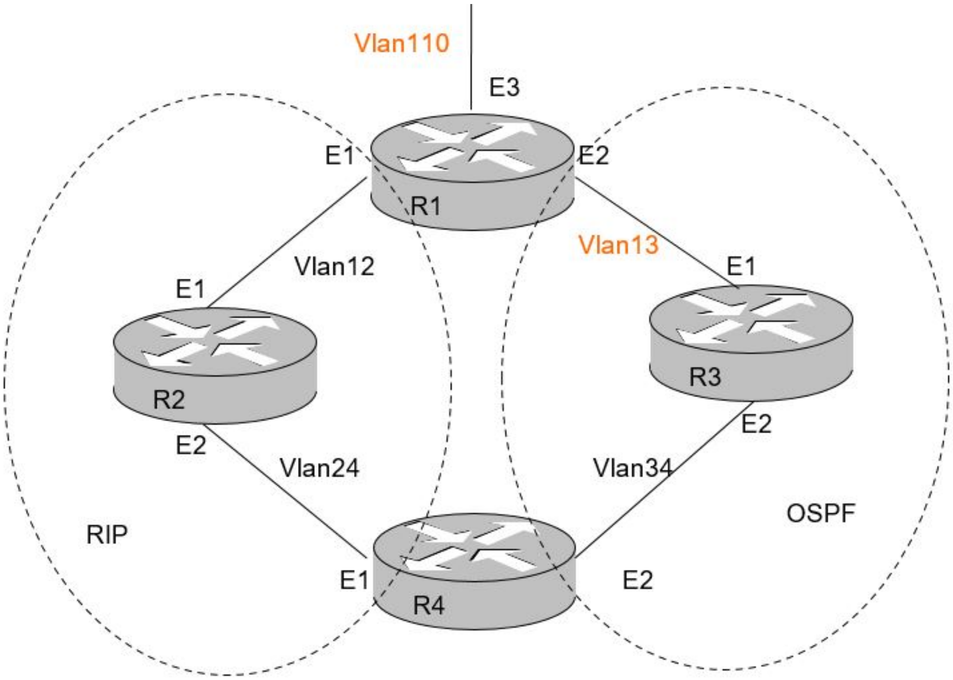


Table 1: IPv4 and IPv6 Addresses of Interfaces in the Routers

Router No	Interface	Port	IPv4 Address / Mask	Prefix Length / Mask
R1	Vlan 12	Tagged ports E1	12.0.0.1/8	2120::1/24
	Vlan 13	Tagged ports E2	13.0.0.1/8	2130::1/24
	Vlan 110	Tagged ports E3	70.0.0.1/8	2070::1/24
R2	Vlan 12	Tagged ports E1	12.0.0.2/8	2120::2/24
	Vlan 24	Tagged ports E2	24.0.0.2/8	2240::2/24
R3	Vlan 13	Tagged ports E1	13.0.0.3/8	2130::3/24
	Vlan 34	Tagged ports E2	34.0.0.3/8	2340::3/24
R4	Vlan 24	Tagged ports E1	24.0.0.4/8	2240::4/24
	Vlan 34	Tagged ports E2	34.0.0.4/8	2340::4/24

R1 – *ASBR* router.

All *OSPF* routers have router-ID 0.0.0.N, where N - number of router.

All *OSPF* routers use area 0.0.0.0.

1. To test the behavior of route selection, when distance command is applied to the RIP router, execute the following commands in R1, R2, R3 and R4.

   FOR EXAMPLE: Type the following:

   – **R1:**

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 12.0.0.1
iS5comm(config-router)# exit
iS5comm(config)# router ospf
iS5comm(config-router)# router-id 0.0.0.1
iS5comm(config-router)# ASBR Router
iS5comm(config-router)# network 13.0.0.1 area 0.0.0.0
iS5comm(config-router)# end
```

   – **R2:**

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 12.0.0.2
iS5comm(config-router)# network 24.0.0.2
iS5comm(config-router)# exit
```

   – **R3:**

```
iS5comm# configure terminal
iS5comm(config)# router ospf
iS5comm(config-router)# router-id 0.0.0.2
iS5comm(config-router)# network 13.0.0.3 area 0.0.0.0
iS5comm(config-router)# network 34.0.0.3 area 0.0.0.0
iS5comm(config-router)# end
```

   – **R4:**

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 24.0.0.4
iS5comm(config-router)# network 24.0.0.2
iS5comm(config-router)# exit
iS5comm(config)# router ospf
iS5comm(config-router)# router-id 0.0.0.3
iS5comm(config-router)# network 34.0.0.4 area 0.0.0.0
iS5comm(config-router)# end
```

2. Configure the route-map aa with match criteria at R4.

FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# route-map aa permit 1
iS5comm(config-rmap-aa)# match source ip 24.0.0.2 255.0.0.0
iS5comm(config-rmap-aa)# end
```

3. Apply redistribute all to *RIP* and *OSPF* routers at R4.

FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router ospf
iS5comm(config-router)# redistribute all
iS5comm(config-router)#exit
iS5comm(config)# router rip
iS5comm(config-router)# redistribute all
iS5comm(config-router)#end
```

4. View the routes at R4.

FOR EXAMPLE: Type the following:

```
iS5comm# show ip route
Vrf Name:          default
C 12.0.0.0/8  is directly connected, vlan1
O 13.0.0.0/8  [2] via 34.0.0.3
O 15.0.0.0/8  [10] via 34.0.0.3
C 24.0.0.0/8  is directly connected, vlan24
C 34.0.0.0/8  is directly connected, vlan34
O 70.0.0.0/8  [10] via 34.0.0.3
```

5. Set the administrative distance 100 to the *RIP* router in R4.

FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# distance 100 route-map aa
iS5comm(config-router)# exit
```

6. Force routes updates in R1.

FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router ospf
iS5comm(config-router)# no redistribute all
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
iS5comm(config)# router rip
```

```
iS5comm(config-router)# no redistribute all
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
```

7. View the routes at R4.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
C 12.0.0.0/8  is directly connected, vlan1
O 13.0.0.0/8  [2] via 34.0.0.3
R 15.0.0.0/8  [2] via 24.0.0.2
C 24.0.0.0/8  is directly connected, vlan24
C 34.0.0.0/8  is directly connected, vlan34
R 70.0.0.0/8  [5] via 24.0.0.2
```

8. Reset the administrative distance to the *RIP* router in R4.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# no distance 100 route-map aa
iS5comm(config-router)# exit
```

9. Force routes updates in R1.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router ospf
iS5comm(config-router)# no redistribute all
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
iS5comm(config)# router rip
iS5comm(config-router)# no redistribute all
iS5comm(config-router)# redistribute all
iS5comm(config-router)# exit
```

10. View the routes at R4.

    FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
C 12.0.0.0/8  is directly connected, vlan1
O 13.0.0.0/8  [2] via 34.0.0.3
O 15.0.0.0/8  [10] via 34.0.0.3
C 24.0.0.0/8  is directly connected, vlan24
C 34.0.0.0/8  is directly connected, vlan34
O 70.0.0.0/8  [10] via 34.0.0.3
```

Redistribution of Routes into RIP Topology

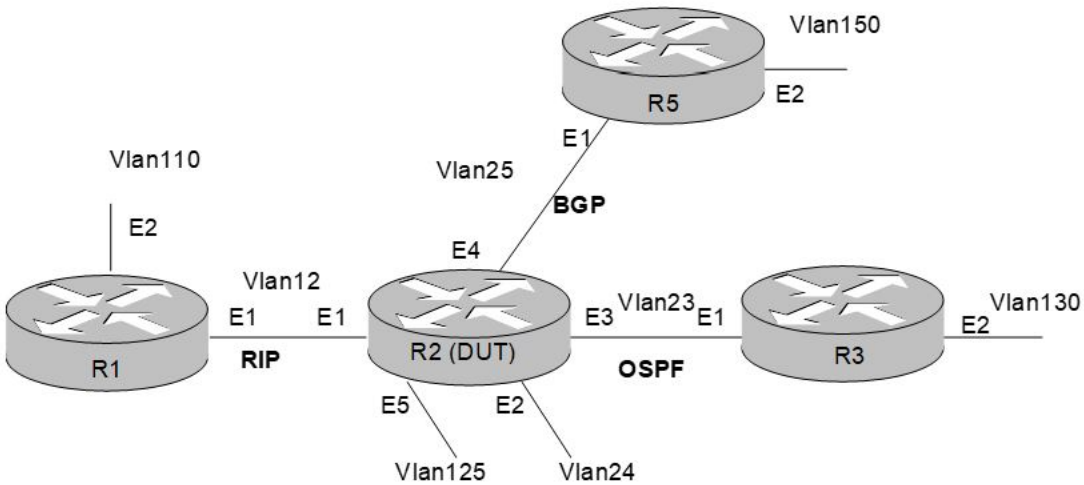
This section provides the sample configuration for testing redistribution of routes into *RIP* with route map.

PREREQUISITE:

Some prerequisite configuration must be done in the switches R1, R2, R3 and R4 before configuring *RIP*.

CONTEXT:

Figure 4: Redistribution Topology Configuration



Redistribution Interface Configuration

CONTEXT:

Table 2: IPv4 and IPv6 Addresses of Interfaces in the Routers (Sheet 1 of 2)

Router No	Interface	Port	IPv4 Address / Mask	Prefix Length / Mask
R1	Vlan 12	Tagged ports E1	140.0.0.1/16	2140::1/24
	Vlan 110	Tagged ports E3	70.0.0.1/8	2070::1/24
R2	Vlan 12	Tagged ports E1	140.0.0.2/16	2140::1/24
	Vlan 23	Tagged ports E3	20.0.0.2/8	2020::2/24
	Vlan 24	Tagged ports E2	60.0.0.2/8	2040::2/24
	Vlan 25	Tagged ports E4	40.0.0.2/8	2060::2/24
	Vlan 125	Tagged ports E5	50.0.0.2/8	2050::2/24
R3	Vlan 23	Tagged ports E1	20.0.0.3/8	2020::2/24
	Vlan 130	Tagged ports E2	11.0.0.3/8	2011::3/24

Table 2: IPv4 and IPv6 Addresses of Interfaces in the Routers (Continued) (Sheet 2 of 2)

Router No	Interface	Port	IPv4 Address / Mask	Prefix Length / Mask
R4	Vlan 25	Tagged ports E1	40.0.0.5/8	2060::5/24
	Vlan 150	Tagged ports E2	14.1.0.5/16	2014::5/24

Redistribution Protocol Configuration

CONTEXT:

Table 3: Redistribution Protocol Configuration

Configuration: Protocol configuration
Configure the protocols in the given interfaces in each of the routers as follows: At R1 • Interface *VLAN* 12 • Enable *RIP*v2. • Enable *RIP*ng. At R2 • Interface *VLAN* 12 • Enable *RIP*v2. Enable RIPng.Interface Vlan 23 • Enable *OSPF*v2 with Area 0. Configure this as the *ASBR* router. • Enable *OSPF*v3 with Area 0. Configure this as the *ASBR* router. • Interface *VLAN* 25 • Enable *BGP* with peer *VLAN* 25 interface on R5 with remote AS 30 At R3 • Interface *VLAN* 23 • Enable *OSPF*v2 with Area 0. • Enable *OSPF*v3 with Area 0. At R2 • Interface *VLAN* 25 • Enable *BGP* with peer as *VLAN* 25 interface on R2 with remote AS 100.

1. To test the following behaviors, execute the following commands:
    - redistribution of static routes into *RIP* with the route map with <match destination ip> clause.
    - redistribution of static routes into *RIP*, when the route map is modified or deleted.
    - redistribution of static routes into *RIP*, when static routes for redistribution are added or deleted.

    FOR EXAMPLE: Type the following:

Configurations at R1:

```
iS5comm# configure terminal
iS5comm(config-router)# network 140.0.0.1
iS5comm(config-router)# exit
```

Configurations at R2:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# network 140.0.0.2
iS5comm(config-router)# exit
iS5comm(config)# router ospf
iS5comm(config-router)# router-id 0.0.0.1
iS5comm(config-router)# ASBR Router
iS5comm(config-router)# network 20.0.0.2 area 0.0.0.0
iS5comm(config-router)# exit
iS5comm(config)# as-num 100
iS5comm(config)# router-id 40.0.0.2
iS5comm(config)# router bgp 100
iS5comm(config-router)# neighbor 40.0.0.5 remote-as 300
iS5comm(config-router)# exit
```

Configurations at R3:

```
iS5comm# configure terminal
iS5comm(config-router)# router-id 0.0.0.2
iS5comm(config-router)# network 20.0.0.3 area 0.0.0.0
iS5comm(config-router)# exit
```

Configurations at R5

```
iS5comm# configure terminal
iS5comm(config)# as-num 300
iS5comm(config)# router-id 40.0.0.5
iS5comm(config)# router bgp 300
iS5comm(config-router)# neighbor 40.0.0.2 remote-as 100
iS5comm(config-router)# exit
```

2. In R2, create static routes and create a route-map aa.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# ip route 91.0.0.0 255.0.0.0 vlan 24
iS5comm(config)# ip route 92.0.0.0 255.0.0.0 vlan 24
iS5comm(config)# route-map aa permit 1
iS5comm(config-rmap-aa)# match destination ip 91.0.0.0 255.0.0.0
iS5comm(config-rmap-aa)# end
iS5comm#configure terminal
```

```
iS5comm(config)# route-map aa deny 2
iS5comm(config-rmap-aa)# match destination ip 93.0.0.0 255.0.0.0
iS5comm(config-rmap-aa)# end
```

3. Enable redistribution of static routes into with route map aa.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# router rip
iS5comm(config-router)# redistribute static route-map aa
```

4. Verify the route in R1; verify that 91.0.0.0/8 is present in the general routing table.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip route
Vrf Name:          default
C 12.0.0.0/8  is directly connected, vlan1
C 70.0.0.0/8  is directly connected, vlan110
R 91.0.0.0/8  [4] via 140.0.0.2
C 140.0.0.0/8  is directly connected, vlan12
```

5. In R2, modify the route map aa.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# route-map aa permit 1
iS5comm(config-rmap-aa)# no match destination ip 91.0.0.0 255.0.0.0
iS5comm(config-rmap-aa)# match destination ip 92.0.0.0 255.0.0.0
iS5comm(config-rmap-aa)# exit
```

6. In R1, verify that 91.0.0.0/8 is removed from the general routing table and 92.0.0.0/8 is present in the general routing table

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip route
Vrf Name:          default
C 12.0.0.0/8  is directly connected, vlan1
C 70.0.0.0/8  is directly connected, vlan110
R 92.0.0.0/8  [4] via 140.0.0.2
C 140.0.0.0/8  is directly connected, vlan12
```

7. In R2, add/remove static routes.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# ip route 93.0.0.0 255.0.0.0 vlan 24
iS5comm(config)# no ip route 92.0.0.0 255.0.0.0 vlan 24
iS5comm(config)# end
```

8. In R1, verify 92.0.0.0/8 is removed from the general routing table and verify 93.0.0.0/8 is present in the general routing table

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip route
Vrf Name:          default
C 12.0.0.0/8  is directly connected, vlan1
C 70.0.0.0/8  is directly connected, vlan110
R 93.0.0.0/8  [4] via 140.0.0.2
C 140.0.0.0/8  is directly connected, vlan12
```

9. Delete the route map aa.

   FOR EXAMPLE: Type the following:

```
iS5comm# configure terminal
iS5comm(config)# no route-map aa 1
iS5comm(config)# no route-map aa 2
iS5comm(config)# end
```

10. In R1, verify that all connected routes and static routes are present in the general routing table.

   FOR EXAMPLE: Type the following:

```
iS5comm# show ip route
Vrf Name:          default
C 12.0.0.0/8  is directly connected, vlan1
C 70.0.0.0/8  is directly connected, vlan110
R 91.0.0.0/8  [4] via 140.0.0.2
R 93.0.0.0/8  [4] via 140.0.0.2C 140.0.0.0/8  is directly connected,
vlan12
```