

Routing Basics

Routers and how they route IP (Internet Protocol) traffic is a very complex subject. This application note is designed to explain only the most basic aspects of routing. Having a good understanding of these basics will simplify the planning and configuration of a NovaRoam network.

Prerequisites

There are several terms you will have to understand in order to get the most from the paper.

IP Address - a 32-bit dotted quad number that corresponds to the hardware address of a piece of hardware. An example would be 111.222.33.4

Subnet Mask - determines the Network and Host portions of the IP Address. An example would be 255.255.255.0

IP Network - collection of network addresses that can communicate directly with each other without the use of a router.

Class C Network - network address space containing 256 IP addresses. In a Class C Network, the first three octets of the IP address specify the address while the last octet specifies the host ID. For example, using the address 10.1.1.5, 10.1.1.0 signifies the network address range, while .5 represents the host ID or device address.

Route Table - a list of destination networks and associated interface that the router must send the packet through in order to reach a specific network or device.

Gateway - an entry point to a network.

Static Route - a route table entry that defines the next-hop gateway to a specific network.

Default Route - a route table entry that specifies the next-hop gateway for all networks that do not have static routes.

Hub - a connecting device in a network that joins communications lines together

Bridge - connects two LAN (Local Area Network) segments. Bridges work at the data link layer (OSI layer 2), whereas routers work at the network layer (layer 3).

What is a router?

A router is a device that transfers data packets between different IP networks. Routers receive data packets then determine the next network point to which the packet should be forwarded in order to reach its destination. In order to keep their route tables updated, routers use various protocols to exchange information with other each other.

How does a router work?

Network devices on the same IP network do not require a router in order to communicate with each other. However, when network devices are on different IP networks, a router must be used in order to communicate with each other. Routers and computers maintain route tables, which are lists of destinations and the associated gateways necessary to reach each destination. A router looks at the intended destination of a data packet and determinations which gateway to send the packet.

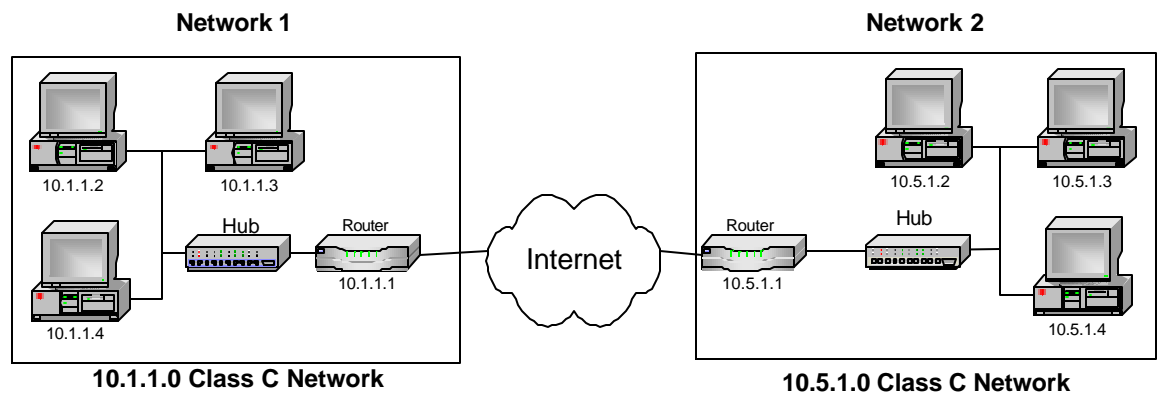


Figure 1: Example of two networks being connected by routers

For this example, the computer with the IP address of 10.1.1.2 is sending data to the computer with the IP address of 10.5.1.3. Since the two devices are on different networks, a router will be called upon to route the traffic.

When data leaves the computer at 10.1.1.2, the computer first looks in its route table to see if there is a route to the destination network. If an appropriate route does not exist, the data is forwarded to the computer's default gateway, the router at 10.1.1.1. The router then determines the most efficient path to the destination network. Once the packet reaches the router of the destination network, 10.5.1.1, the data is forwarded to the appropriate host.

What is not shown in **Figure 1** is what happens to the data from the time it leaves the source network until the time it reaches the destination network. Once the data reaches the router of the source network it is sent to the Internet, where it will travel through other routers until finally reaching its destination. Each router checks its route table to see if there is a route to the destination. If there is a route to the destination, the data is sent to the appropriate gateway. If there is not a route to the destination, the data is sent to the routers default gateway. This process continues until the data reaches a router that has a static route to the destination network. This means the data may travel through one router, or through many.

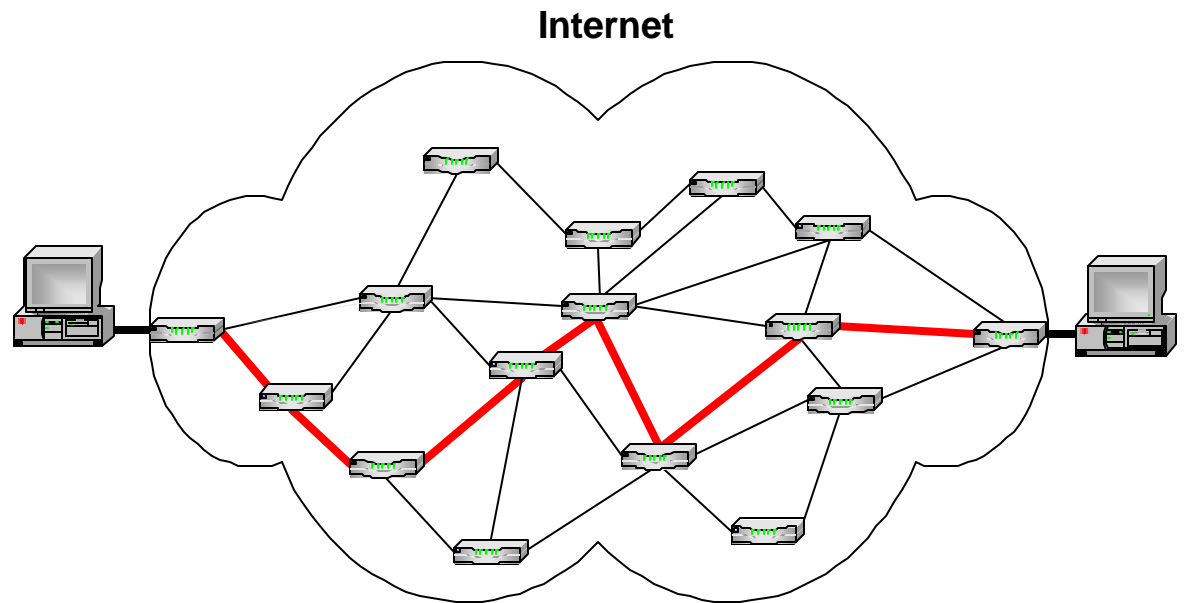


Figure 2: Example of data traveling across the Internet to reach the destination network

Using Wireless Routers

Now that you are familiar with the basics of routing, let's substitute NovaRoam Wireless IP Routers for the wired routers we have been using. The setup will be the same; only the connection between routers will be a wireless connection as opposed to a wired connection. **Figure 3** shows two networks connected by NovaRoam Wireless IP Routers.

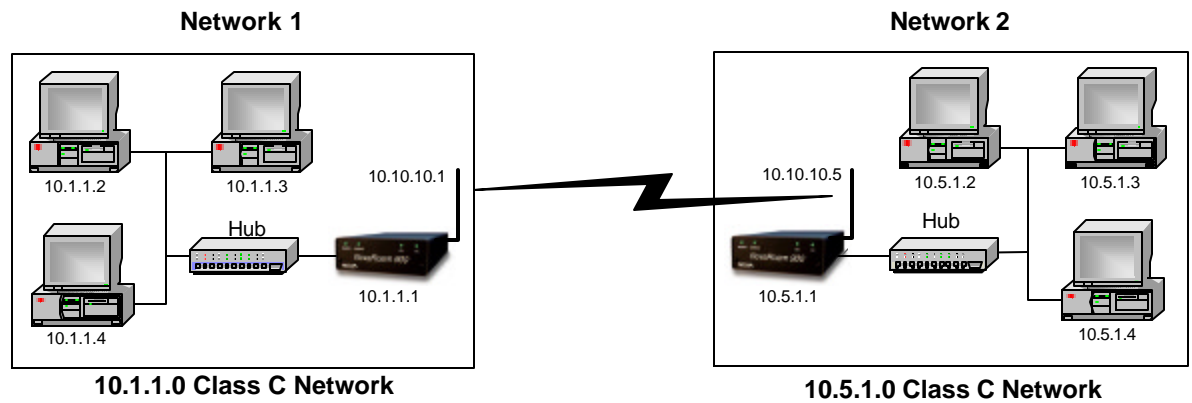


Figure 3: Two networks connected by NovaRoam Wireless IP Routers

The wireless routers are setup the same as the wired routers from **Figure 1**. However, the wireless interface of each wireless router is assigned an IP address from the same network address range. The wireless routers use the wireless network that they share to route traffic between networks.

Keywords:

router, address, network, hardware, route table, gateway, bridge, LAN, local area network, OSI, layer, wireless, IP, Internet Protocol, traffic



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