

Introduction to routing

Routing is a way of connecting different networks. Having data flow makes you want to maintain a healthy network. There are many different types of routing methods also called routing protocols. You can benefit from using different protocols if you use the protocol properly. A network needs to be stable. The protocols help a user to maintain a constant connection. The user might need to restrict the network in case of fragile or secret information. Some of the protocols enables the user to put on authentication whenever the user is reaching a specific destination within the network.

The most efficient way to run you network will be to have the shortest or fastest connection ready for usage all the time. There are a lot of ways to make sure the network is running smoothly all depending of which network you are running. Each protocol has its own flaws and benefits. Therefor it is important that the user knows all the types of protocol and how to use it right.

The basics of routing – If you need to set up a network you will need to name the components on the network. We do this by giving the Component or Pc an IP address. The IP should be unique on each station. The IP address might look like “192.168.2.1”, this indicates that the computer is on a network using the “2” as their group (LAN). If you need to set up another computer you can give the new computer the address “192.168.2.2” and now you have configured computer one and two.

In order for these two to be a part of a network you will need to setup a router. The router on this network can get the name/IP address “192.168.2.0/24”. The default gateway we give the IP “192.168.2.254” as it is the last spot, but there is no perfect number – “254” is only our preferred. The default gateway makes it possible for the messages to leave the network. The router will get the IP “192.168.3.0” since this is the first spot. The router could be connected to another router which then needs another setup. The next router could get the IP “192.168.3.0” and now we have two different networks also called WAN. Then you can connect a computer to the new network by giving it the IP “192.168.3.1”.

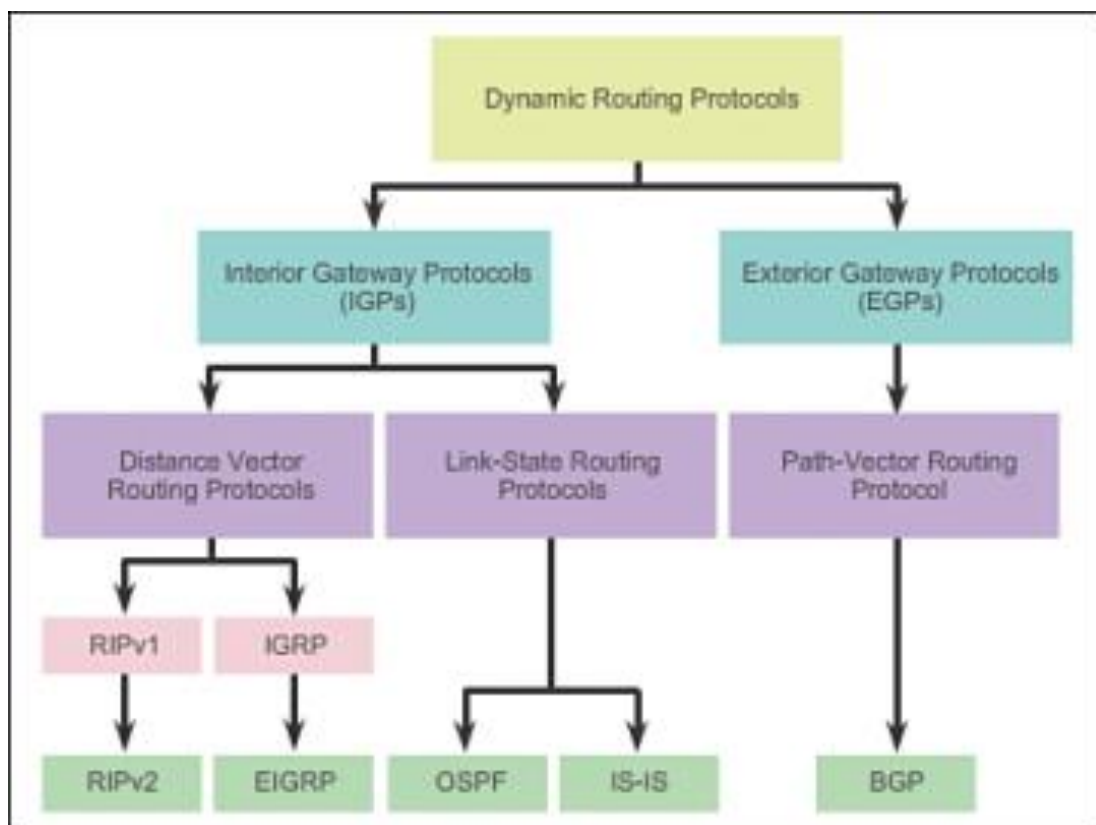
LAN is a local area network. Like the case mentioned above you can have 2 computers linked together which makes a LAN. WAN on the other hand means wireless area network. WAN is used when you need to combine two offices together or just two networks.

The message you want to send to the receiver will find its way through the system by looking for the IP address of the receiver.

“Routing protocol is used by router to determine the appropriate path over which data is transmitted”

- Routing is a path (direct) of machines connection.
- Connect machines in a network.
- Control data's flow.
- Enables you to set up a backup.
- You can restrict your network

This table shows us the different types of protocols. It helps us identify the protocols and define them. We have to know the difference between IGP (Interior Gateway Protocol) and EGP (Exterior Gateway Protocol).



Static routing

Static routing sets the user in control. The user has to program all the paths and specifications. The user has more control this way. Although it can be time consuming if you have to set up a big or complicated network. This makes it better for small enterprises or home networks. In case you want to leave somebody out of the network you can program it yourself.

The static networks makes it easier for the user to find flaws or faults in the system.

The static routing is persistent and goes down a predetermined path. This makes the static routing less attractive to bigger networks, since it will not find a "Plan B" in case the specific connection has been lost.

- A lot of control.
- Can be time-consuming.
- Better for small networks or networks you want to control entirely.
- Goes on a predetermined path.
- It is fault tolerant.

Dynamic routing

Dynamic routing is an intellectual kind of routing. The user does not have to adjust the settings, the whole network configures itself. This takes away a lot of the control which the user might want to have. In case of a breakdown the dynamic routing will make sure the connection is not lost. It can be a time saver if you for an example have to install some new machines to your network – the whole network will configure itself automatically.

- Automatic set up of a path.
- Establish a backup path, you can use those in case of a breakdown.
- Easy to maintain.
- It is fault tolerant.
- Time-saving.

Dynamic vs. static routing

Dynamic routing is better for bigger setups. You don't have to do everything yourself.

The static routing can be a lot safer. The user himself will configure all the paths and this prevents unwanted traffic on the user's network. The dynamic routing could allow some unwanted guests on the network.

The dynamic routing does use some of the users CPU, compared to the static. This feature makes the dynamic routing more resource consuming.

- Dynamic is better for bigger networks.
- Dynamic is less secure than static.
- Dynamic uses CPU, memory and link bandwidth whereas static uses no extra resource.

Routing protocols

RIPv2 (Routing Information Protocol Version 2)

RIPv2 protocol uses algorithm to calculate the distance to the paths in the network. Although it is used a lot, it is not fit for bigger networks. RIPv2 has a restriction of 15 hops. This means that the network can only have connection equal to 15 or less hops. If the network gets bigger it will fail. This feature is meant for the program to prevent it from looping indefinitely. This is handy for smaller networks. The different protocols described in this essay have different ways of keeping track of the connections. RIPv2's routing table is updated periodically which slows the process down.

- Uses algorithm
- Unsuitable for bigger systems because when it goes over 15 hubs it cannot reach a machine.
- Prevents from looping indefinitely.
- Updates the routing table periodically.

OSPF (Open Shortest Path First)

This protocol is often used for bigger networks. One of the features with OSPF is that it updates the routing table instantaneously. This routing protocol doesn't have limitations the hops in the same way that RIPv2 has which also makes this protocol the best fitted for most big networks. In case you want your network to be private or semi-private, you can restrict some parts of the network by using the authentication feature which OSPF enables the user to take advantage of.

- Updates the routing table instantaneously.
- Gives no limitations to hops
- It is safer than RIPv2 since it has got routing authentication.

EIGRP (Enhanced Interior Gateway Routing Protocol)

EIGRP is a popular choice for most big companies. It has an enhanced way of calculating the shortest path.

Compared to the two other routing protocols this one only updates the part of the routing table which has been changed, instead of updating the whole table like OSPF does every time there has been a change on the network.

- Enhanced distance vector protocol to calculate the shortest path.
- It only updates the part of the routing table which has been changed.
- Suitable for bigger companies.

This chart shows us the different features and qualities the protocols are fitted with.

Routing Protocol Comparison

	RIP v1	RIP v2	IGRP	EIGRP	OSPF	IS-IS	BGP
<i>Interior/Exterior?</i>	Interior	Interior	Interior	Interior	Interior	Interior	Exterior
<i>Type</i>	Distance Vector	Distance Vector	Distance Vector	Hybrid	Link-state	Link-state	Path Vector
<i>Default Metric</i>	Hopcount	Hopcount	Bandwidth/Delay	Bandwidth/Delay	Cost	Cost	Multiple Attributes
<i>Administrative Distance</i>	120	120	100	90 (internal) 170 (external)	110	115	20 (external) 200 (internal)
<i>Hopcount Limit</i>	15	15	255 (100 default)	224 (100 default)	None	None	EBGP Neighbors: 1 (default) IBGP Neighbors: None
<i>Convergence</i>	Slow	Slow	Slow	Very Fast	Fast	Fast	Average
<i>Update timers</i>	30 seconds	30 seconds	90 seconds	Only when change occurs	Only when changes occur; (LSA table is refreshed every 30 minutes, however)	Only when changes occur	Only when changes occur
<i>Updates</i>	Full table	Full table	Full table	Only Changes	Only Changes	Only changes	Only changes
<i>Classless</i>	No	Yes	No	Yes	Yes	Yes	Yes
<i>Supports VLSM</i>	No	Yes	No	Yes	Yes	Yes	Yes
<i>Algorithm</i>	Bellman-Ford	Bellman-Ford	Bellman-Ford	DUAL	Dijkstra	Dijkstra	Best Path Algorithm
<i>Update Address</i>	Broadcast	224.0.0.9	224.0.0.10	224.0.0.10	224.0.0.5 (All SPF Routers) 224.0.0.6 (DR's and BDR's)		Unicast
<i>Protocol and Port</i>	UDP port 520		IP Protocol 9	IP Protocol 88	IP Protocol 89		TCP port 179

Some of the protocols have the same features and some are more unique.

IGP (Interior Gateway Protocols) & EGP (Exterior Gateway Protocols)

EGP is used to link two autonomous/independent networks together.

IGP usually used to work on one independent network.

Let's say you have a company and you want to expand, the next task will be to connect the new office with the old one, but how? To connect a new branch in another country you should use EGP whereas IGP is to be used within one office.

