**BGP**

**Border Gateway Protocol**is used to Exchange routing information for the internet and is the protocol used between ISP which are different ASes.

The protocol can connect together any internetwork of autonomous system using an arbitrary topology. The only requirement is that each AS have at least one router that is able to run BGP and that is router connect to at least one other AS’s BGP router. BGP’s main function is to exchange network reach-ability information with other BGP systems. Border Gateway Protocol constructs an autonomous systems’ graph based on the information exchanged between BGP routers.

**Characteristics of Border Gateway Protocol (BGP):**

**Inter-Autonomous System Configuration:** The main role of BGP is to provide communication between two autonomous systems.

BGP supports Next-Hop Paradigm.

Coordination among multiple BGP speakers within the AS (Autonomous System).

**Path Information:** BGP advertisement also include path information, along with the reachable destination and next destination pair.

**Policy Support:** BGP can implement policies that can be configured by the administrator. For ex:- a router running BGP can be configured to distinguish between the routes that are known within the AS and that which are known from outside the AS.

Runs Over TCP.

BGP conserve network Bandwidth.

BGP supports CIDR.

BGP also supports Security.

**Functionality of Border Gateway Protocol (BGP):**

BGP peers performs 3 functions, which are given below.

The first function consist of initial peer acquisition and authentication. both the peers established a TCP connection and perform message exchange that guarantees both sides have agreed to communicate.

The second function mainly focus on sending negative or positive reach-ability information.

The third function verifies that the peers and the network connection between them are functioning correctly.

**BGP Route Information Management Functions:**

**Route Storage:** Each BGP stores information about how to reach other networks.

**Route Update:** In this task, Special techniques are used to determine when and how to use the information received from peers to properly update the routes.

**Route Selection:** Each BGP uses the information in its route databases to select good routes to each network on the internet network.

**Route advertisement:** Each BGP speaker regularly tells its peer what is known about various networks and methods to reach them.

<https://en.wikipedia.org/wiki/Border_Gateway_Protocol>

<https://www.javatpoint.com/border-gateway-protocol>

[**Border Gateway Protocol (BGP)**](https://practice.geeksforgeeks.org/problems/bgpborder-gateway-protocol)is used to Exchange routing information for the internet and is the protocol used between ISP which are different ASes.

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**What Is BGP?**

Border Gateway Protocol (BGP) is the routing method that enables the Internet to function. Without it, it would not be possible to search on Google or send an email.

BGP is a routing protocol. Here is a simple definition of network routing from John F. Shoch, an American computer scientist who developed the predecessor to [TCP/IP](https://www.imperva.com/learn/ddos/tcp-transmission-control-protocol/):

*“The****name****of a resource indicates what we seek, an****address****indicates where it is, and a****route****tells us how to get there”.*

The BGP protocol helps find the best route for network traffic seeking to reach an autonomous system (AS). An AS can be an Internet Service Provider or a large organization that controls a network prefix, representing a range of IP addresses. An autonomous system has a unique number called an ASN. BGP determines the best path to the ASN, depending on the topology of network nodes and current network conditions.

To use an analogy, an AS is like a city with many streets. A network prefix is one street, and an IP address is one particular house. Network packets are like cars traveling from one house to another, and BGP is like a navigation app that helps them take the best possible route.

**A Brief History of Internet Traffic Routing**

In the early days of the Internet, there were only a few networks connected to each other. As a result, routing between network nodes was quite static. All that needed to be done to set up routing was to define network nodes and make connections between them as needed.

However, the Internet grew quickly, adding more and more networks, which necessitated a more dynamic routing system. EGP (External Gateway Protocol) was invented to do the job.

EGP is a simple routing protocol based on tree-like hierarchical topologies. In modern networks, tree topologies have become fully connected mesh topologies to allow for maximum scalability.

**Tree-like vs. full mesh topologies**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| In a tree-like topology, to reach E or F, A will have to go through B, C and D. |  | In a full mesh topology, nodes have many paths to reach each other. |

**The Need for BGP**

As the Internet continued to expand, it became increasingly difficult to keep track of all the routes from one network to another. The solution was to transition to an Autonomous System (AS) architecture.

An AS can be an Internet Service Provider, a university or an entire corporate network, including multiple locations (IP addresses). Each AS is represented by a unique number called an ASN. Each AS controls a collection of connected routing prefixes, representing a range of IP addresses. When traffic reaches the ASN, it determines the routing policy inside the network.

As the number of autonomous systems on the internet grew, the drawbacks of EGP became more pronounced. Its hierarchical structure hampered scalability and made it difficult to connect new networks in an efficient manner. It was necessary to define an exterior routing protocol that is more scalable and provides more advanced capabilities.

This new protocol, known as the Border Gateway Protocol, was formalized in 1989.

**BGP Technical Deep Dive**

BGP is designed to exchange routing and reachability information between autonomous systems on the Internet.

Each BGP speaker, which is called a “peer”, exchanges routing information with its neighboring peers in the form of network prefix announcements. This way, an AS doesn’t need to be connected to another AS to know its network prefix.

The BGP decision-making mechanism analyzes all the data and sets one of its peers as the next stop, to forward packets for a certain destination.

Each peer manages a table with all the routes it knows for each network and propagates that information to its neighboring autonomous systems.

In this way, BGP allows an AS to collect all the routing information from its neighboring autonomous systems and “advertise” that information further. Each peer transfers the information internally inside its own autonomous system.

Just like in real life, usually more than one route exists to reach a given destination. BGP is responsible for determining the most suitable route according to the information collected and an organization’s routing policy, which is based on cost, reliability, speed, and other factors.