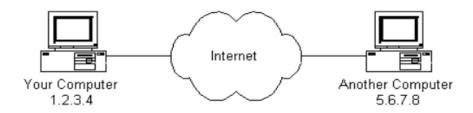# HOW DOES THE INTERNET WORK

What is the Internet?

The Internet, sometimes called simply "the Net," is a worldwide system of computer networks -- a network of networks in which users at any one computer can, if they have permission, get information from any other computer (and sometimes talk directly to users at other computers).

How does it work?

Because the Internet is a global network of computers each computer connected to the Internet must have a unique address. Internet addresses are in the form nnn.nnn.nnn.nnn where nnn must be a number from 0 - 255. This address is known as an IP address. (IP stands for Internet Protocol; more on this later.)

The picture below illustrates two computers connected to the Internet; your computer with IP address 1.2.3.4 and another computer with IP address 5.6.7.8. The Internet is represented as an abstract object in-between. (As this paper progresses, the Internet portion of Diagram 1 will be explained and redrawn several times as the details of the Internet are exposed.)

Your Computer
1.2.3.4

Internet

Another Computer
5.6.7.8

If you connect to the Internet through an Internet Service Provider (ISP), you are usually assigned a temporary IP address for the duration of your dial-in session. If you connect to the Internet from a local area network (LAN) your computer might have a permanent IP address or it might obtain a temporary one from a DHCP (Dynamic Host Configuration Protocol) server. In any case, if you are connected to the Internet, your computer has a unique IP address.

The internet works by using a packet routing network that follows Internet Protocol (IP) and Transport Control Protocol (TCP) [5].

TCP and IP work together to ensure that data transmission across the internet is consistent and reliable, no matter which device you're using or where you're using it.

When data is transferred over the internet, it's delivered in messages and packets. Data sent over the internet is called a message, but before messages get sent, they're broken up into tinier parts called packets.

These messages and packets travel from one source to the next using Internet Protocol (IP) and Transport Control Protocol (TCP). IP is a system of rules that govern how information is sent from one computer to another computer over an internet connection.

Using a numerical address (IP Address) the IP system receives further instructions on how the data should be transferred.

The Transport Control Protocol (TCP) works with IP to ensure transfer of data is dependable and reliable. This helps to make sure that no packets are lost, packets are reassembled in proper sequence, and there's no delay negatively affecting the data quality.

When you type in a web address into your browser…

Step 1: Your PC or device is connected to the web through a modem or router. Together, these devices allow you to connect to other networks around the globe [6]. Your router enables multiple computers to join the same network while a modem connects to your ISP (Internet Service Provider) which provides you with either cable or DSL (Digital Subscriber Line) internet.

Step 2: Type in a web address, known as a URL (Uniform Resource Locator). Each website has its own unique URL that signals to your ISP where you want to go.

Step 3: Your query is pushed to your ISP which connects to several servers which store and send data like a NAP Server (Network Access Protection) and a DNS (Domain Name Server).

Next, your browser looks up the IP address for the domain name you typed into your search engine through DNS. DNS then translates the text-based domain name you type into the browser into the number-based IP address.

- Example: Google.com becomes 64.233.191.255

Step 4: Your browser sends a Hypertext Transfer Protocol (HTTP) request to the target server to send a copy of the website to the client using TCP/IP.

Step 5: The server then approves the request and sends a "200 OK" message to your computer. Then, the server sends website files to the browser in the form of data packets.

Step 6: As your browser reassembles the data packets, the website loads allowing you to learn, shop, browse, and engage.

Step 7: Enjoy your search results!

Messages + Packets
- Data sent over the internet is called a message
- Before messages get sent, they're broken up into tiny parts called packets

Internet Protocol (IP)

- Rules that govern how information is sent from one computer to another computer over an internet connection
- Specifies how computers should send information to other computers by sending data with an attached numerical address (IP Address)
    - **Public IP Address:** Accessible over the internet

○ **Private IP Address:** Assigned to a device on a closed network such as a home or business network that's not accessible over the internet

Transport Control Protocol (TCP)

- Works with IP to ensure transfer of data is dependable and reliable
- No packets lost, no delay negatively affecting data quality, packets reassembled in proper sequence

Modem

A device that converts signals produced by one type of device (such as a computer) to a form compatible with another (such as a telephone) and that is used especially to transmit and receive information between computers via landlines.

How a modem works.

The modem receives information from your ISP through the phone lines, optical fiber, or coaxial cable in your home (depending on your service provider) and converts it into a digital signal. The router's job is to push this signal out to connected devices, either through wired Ethernet cables or WiFi, so that all of your devices can hop on board and access the Internet. Your router and ISP can't communicate directly because they speak different languages—or rather, they transmit different signal types—which is why the modem's role as a translator is so important.

Types of Modems

There are three types of modems: cable, digital subscriber line (DSL) and dial-up. A cable modem uses coaxial cables that connect to the back of the modem and the bolt-like outlet in your wall or on your cable box. This type of modem delivers high speed internet to your device.

DSL and dial-up modems use a cable that connects to your phone line. DSL, however, still allows you to use your landline telephone while connected to the internet.

Fiber-optic technology doesn't require a modem for its Internet service.

Router

The router is a physical or virtual internetworking device that is designed to receive, analyze, and forward data packets between computer networks. A router examines a destination IP address of a given data packet, and it uses the headers and forwarding tables to decide the best way to transfer the packets.

Internet Service Providers (ISP)

An Internet service provider (ISP) is an organisation that provides services for accessing, using, or participating in the Internet. ISPs may be commercial, non-profit, privately owned or community owned companies.
Most providers offer the same types of internet services to customers, including:

- internet access
- email access
- domain name registration
- web hosting
- co-location (or data centre services)

Some ISPs also provide services such as website design or development of e-commerce facilities.

Different types of ISP connections
ISPs use a range of technologies to enable customers' connection to their network. The most common types of internet connections include:

- DSL (digital subscriber line)
- cable broadband
- fibre optic broadband
- wireless or Wi-Fi broadband
- satellite and mobile broadband
- dedicated leased line

As mentioned before, ISPs can also be classified by the type of service they offer.

Access providers

These are ISPs that offer access to the internet in the widest sense of the term. Their main function is to enable user connectivity to the world wide web through physical devices like routers or modems. They may also provide internet access after acquiring or renting it from another ISP. The services are usually sold in packages priced according to the bandwidth and/or data consumed.

Access providers are usually classified into tiers. Tier 1 ISPs are organizations that own and have access to an entire internet region, without needing to purchase access rights from other companies. There are only a few Tier 1 ISPs, including AT&T, Verizon, and a few others. On the other hand, Tier 2 ISPs can only deliver their services after purchasing internet access from Tier 1 businesses and/or through peering agreements, whereas a Tier 3 internet service provider usually does not own any network and only acts as a middleman between end customers and other ISPs.

Hosting providers

A hosting provider offers its users website hosting services. These are virtual spaces where websites are uploaded and held. Hosting space is measured in units like kilobytes, megabytes, and gigabytes, and is priced accordingly. These companies can also host email accounts and related services, such as email forwarding, email spam filters, auto-responders, the ability to organize mail in folders, etc.

Some hosting providers also offer online storage services. These can include:

- Cloud hosting, which relies on multiple interconnected servers instead of a single one to host a website, email, or data.
- Datacenter services, which provide the storage and management of IT operations ranging from managed hosting to data backup or cybersecurity.

Application Service providers

These businesses offer their clients access to digital services and software with a primarily practical application. Some offer services that cater to the general market (such as payment processing software, database reporting applications, or software packages offering word processors and spreadsheets), whereas others offer solutions to specific verticals or industries.

The range of services offered by ASPs has been gaining popularity among organizations and individual consumers. This is because they offer an alternative to traditional models whereby access to the software required purchasing and downloading these programs. Instead, ASPs offer applications that can be accessed remotely by the client.

Content providers

A content provider is an organization that produces and makes available digital content in a variety of formats. Internet content providers usually operate in one focus area, such as news or entertainment, although there are some that deliver educational content too. Their content can be delivered via third parties or using proprietary solutions.

The content produced may be available at no cost, or on a membership basis. Some of these businesses also rely on advertising to support their platforms, often using pay-per-click strategies.

How do ISP make their money

I like to give you most simplest explanations how Internet Service providers like airtel, MTN and etc earn money

All website or domain link will have to register with main client like google, yahoo etc

They will have an agreement to get amount or profit or payment with the terms and condition's agreed with main client.

Main client will have agreement with the internet provider and as well as with website.

Example : You paid for Data allowances with your service provider like Airtel, Reliance etc

You got 1gb data for 200 INR from your service provider.

You are using 1 MB data in Wikipedia, Then Wikipedia sent your usage to their client for example say Google,

Google will give this usage report to your service provider. Based on the agreement they had with the servive provider they will get money

Airtel internet pack for 30 days

Allowances 1 GB

Rate 200

So you will be charged 19 paise for 1MB

You are accessing internet in Wikipedia and you have used 1 MB

Wikipedia will send the reports to google and Wikipedia will get 10 paise (profit of your Service provider will be based on the money spent for that particular page.

Google will send the report to Your service provider and google will get 15 paise from you service provider from 19 paise you have paid.

So for your 1MB usage

Your service provider will 4 praise as profit and google get 5 paise profit and website will get 10 paise for getting the 10 paise the website need to spend money to have details in the website.

They will also get money from advertisement and the same works as mentioned above.

Profit Through Advertising

One of the most common ways internet services companies are able to generate profit without charging users for access to content is through advertising revenue. Because site content on search engines and social media platforms are offered to consumers at no cost, millions of users visit and spend time on internet service websites such as Google, Facebook, and Twitter every day.

Each of these users represents a potential customer for other businesses that offer their products and services via the internet.

Companies that want or need exposure to potential customers can purchase advertising space on no-cost content sites in an effort to reach consumers to whom they may otherwise be unable to deliver a marketing message. Sites charge fees to other e-commerce businesses for presenting a specific advertising message to those users, either as a broad or customized advertising campaign. Businesses advertising on free

sites can pay for greater exposure to their intended audience through higher placement in search results or targeted messages to specific consumer groups.

Profit Through Data Collection

Advertising space purchased by e-commerce companies is a profitable endeavor for free content sites such as search engines, high traffic blogs, and social media platforms because of its reach to millions of users. However, free internet service companies are also able to generate revenue through the collection of data from those users and providing that valuable information back to companies who want or need it.

Data is gathered and stored on the millions of users that spend time on free content sites, including specific user location, browsing habits, buying behavior, and unique interests. This collected data can be used to help e-commerce companies tailor their marketing campaigns to a specific set of online consumers.

User data is also beneficial to companies offering products and services on the internet when used as marketing research. This collection of data helps a business understand how well a product or service is received by its consumers, what specific products certain consumers may be interested in, and how well the business is presenting its marketing message. Each of these aspects makes the data collected from free content sites incredibly valuable to e-commerce companies.

Why do ISP have to pay for local access?

First, what is local access? Local access is a localized transport service, often referred to as the last-mile, which connects an end-user or customer's physical B-end location to their network provider's core network.

This A-end network provider edge node is usually referred to their point of presence (PoP), and is found at a local carrier aggregation point, a data center, a colocation site, or some other networking facility.

Local access links may use a variety of underlying transport technologies.

Carriers will often bundle local access with a core network service (e.g., MPLS VPN) into a complete solution, but it may also be purchased separately from local providers in certain use cases.

As for **why internet service providers need to pay for local access**, ISP facilities ultimately need to reach their customers, right? This means they either need to build their own last-mile infrastructure or rent/lease said infrastructure from another vendor. (This is what happens at the aforementioned A-end network provider edge node.)

Once that infrastructure is in place, an ISP must then access the internet backbone, which comes at a price.

Backbone access costs vary. Exact pricing depends on things like bandwidth demand and traffic destination.