INFOGRAPHHUB SERIES · 9 PARTS · AGES 11–16

How the Internet Works

Nine infographics that follow your data from your phone, through routers and undersea cables, to a server and back.

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Each part is one printable infographic. Work through them in order, or use the part you need. The quiz answers are printed upside down at the foot of the quiz. Sources for every part are listed on its page at infographhub.com.

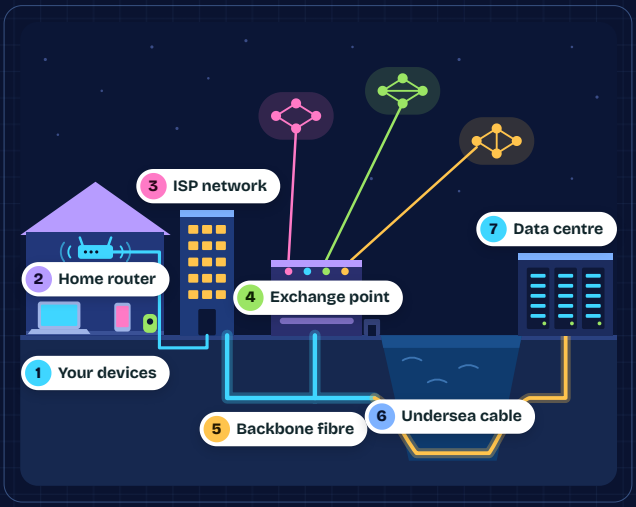
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HOW THE INTERNET WORKS · PART 1 OF 9 · AGES 11–16

How the Internet Works

The internet is a network of networks. Follow data from your phone to a server on another continent.



1 Your devices

Phones, laptops, consoles and smart speakers connect to a home network by Wi-Fi radio or by cable. Away from home, phones use a mobile network instead.

2 Home router

Links your home network to the outside world and lets every device share one connection. Its built-in modem sends data along the line to your provider.

3 ISP network

Your internet service provider runs its own network of routers and cables, and connects it to other networks so you can reach any website.

4 Exchange point

At an internet exchange point (IXP), many networks plug into shared switches and swap traffic directly, keeping local data local, fast and cheap.

5 Backbone fibre

High-capacity fibre-optic cables, mostly underground, link cities and countries. They carry data as pulses of light through hair-thin glass strands.

6 Undersea cable

Cables laid on the sea floor carry almost all data between continents. Near the coast they are buried under the seabed for protection.

7 Data centre

Servers in data centres store websites, videos and apps and send them out on request. 'The cloud' means servers in buildings like these.

No one is in charge

The internet has no central control room. Each network is run by its own owner, and they all follow shared, open protocols. If one cable or data centre fails, data can usually take another route.

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2. What Happens When You Open a Website?

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HOW THE INTERNET WORKS · PART 2 OF 9 · AGES 11–16

What Happens When You Open a Website?

Seven steps between pressing Enter and seeing the page, and most of them are over in a fraction of a second.

1. **You enter a URL**
   The browser splits https://www.example.com/news into a scheme (https), a domain name (www.example.com) and a path (/news).

2. **DNS finds the IP address**
   Computers use number addresses, not names. A DNS resolver asks root, .com and example.com name servers in turn, then hands the browser the IP address.

3. **TCP opens a connection**
   A three-way handshake: the browser sends SYN, the server replies SYN-ACK, the browser answers ACK. Both sides are now ready to send data.

4. **TLS makes it secure**
   For https, the server shows a certificate proving who it is, and both sides agree secret keys. Everything after this is encrypted.

5. **The browser sends a request**
   An HTTP request asks the server for the page: GET /news. It also says which browser you use and what kinds of file it accepts.

6. **The server responds**
   It replies with a status code (200 OK means success, 404 means not found) and the page's HTML, split into many small packets.

7. **The browser builds the page**
   Packets are put back in order. The browser reads the HTML, fetches CSS, JavaScript and images, then paints the finished page on screen.

Why the second visit is faster

Browsers, computers and DNS resolvers remember (cache) recent answers. On a return visit the IP address, and often the images and styles, are already stored, so several steps are skipped.

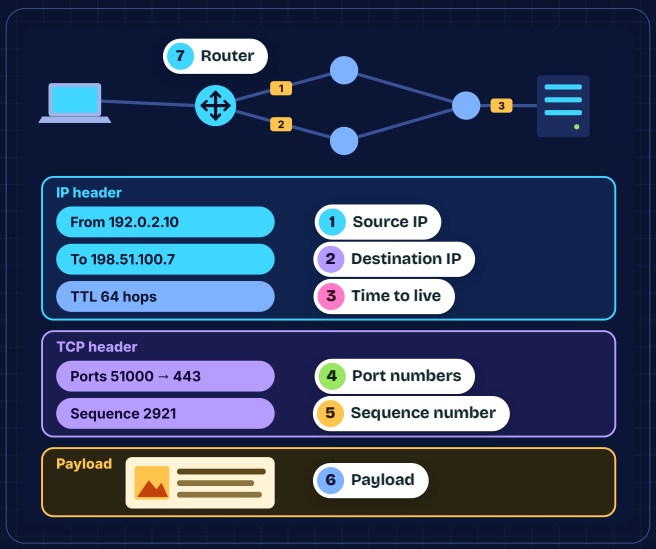
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3. Data Packets Explained: What's Inside a Packet

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Data Packets Explained

Everything online travels in small packets. Here is what one packet carries, and how routers move it.



1 Source IP

The IP address of the device that sent the packet, like a return address on an envelope. Replies are sent back to it.

2 Destination IP

The IP address the packet is going to. It is the field every router reads to decide where to send the packet next.

3 Time to live

A counter that drops by one at every router. If it reaches zero the packet is discarded, so lost packets cannot circle forever.

4 Port numbers

In the TCP header: which program the data is for. Secure websites use port 443; your device picks a temporary port for the reply.

5 Sequence number

Says where this piece belongs in the whole message, so packets that arrive out of order can be put back in the right order.

6 Payload

The data itself: a small slice of a photo, video or web page. A packet is at most about 1,500 bytes, about 40 of them headers.

7 Router

Reads the destination address, checks its routing table and forwards the packet one hop closer. Packets of one message may take different routes.

Lost a packet? Send it again

The receiving computer uses TCP to acknowledge the packets it gets. If one goes missing or arrives damaged, only that packet is sent again, not the whole file.

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4. The Internet vs the Web: What's the Difference?

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The Internet vs the Web

They are not the same thing. One is the network; the other is a service that runs on it.

The internet		The web
WHAT IT IS		
A worldwide network of networks that carries data between devices.		A collection of linked pages and files that you reach through the internet.
MADE OF		
Hardware: cables, routers, mobile masts and servers, plus the rules that join them.		Content: web pages, images and videos stored on web servers and joined by hyperlinks.
MAIN RULES		
TCP/IP: IP moves packets to the right address; TCP checks they all arrive in order.		HTTP and HTTPS to request pages, HTML to write them.
ADDRESSES		
An IP address for every connected device, for example 192.0.2.10		A URL for every page or file, for example https://example.com/news
YOU USE IT THROUGH		
Any connected app or device: email, games, video calls, smart speakers.		A web browser, such as Chrome, Safari, Firefox or Edge.
WITHOUT THE OTHER?		
Works fine: email, apps and games would carry on without the web.		Impossible: every web page is delivered over the internet.

Roads and deliveries

Think of the internet as the road network and the web as one delivery company using it. Email, games and video calls are other companies on the same roads.

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5. The Internet by the Numbers

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HOW THE INTERNET WORKS · PART 5 OF 9 · AGES 11–16

The Internet by the Numbers

How many people are online, how data crosses oceans, and how many addresses the internet has, with the year of every figure.

6 billion

people used the internet in 2025: 74% of the world's population

Up from 5.8 billion in 2024, according to ITU estimates.

2.2 billion

people were still offline in 2025

94% of people in high-income countries are online, but only 23% in low-income countries (ITU).

Over 99%

of international data travels through undersea cables

Satellites carry only a very small share of the data that moves between continents (ITU; TeleGeography).

1.5 million km

of undersea internet cable was in service in early 2026

Enough to go round the Equator about 37 times. TeleGeography tracks over 600 active and planned cables.

~200

undersea cable faults happen each year

About two-thirds are caused by fishing boats and ships dragging anchors (TeleGeography, 2026).

~79,500

separate networks (autonomous systems) make up the internet

Counted in the global routing table on 1 October 2026 by the CIDR Report.

4.3 billion

possible IPv4 addresses: 2^{32} = 4,294,967,296

The central pool of unused IPv4 addresses ran out on 3 February 2011.

3.4×10^{38}

possible IPv6 addresses: 2^{128}, about 340 trillion trillion trillion

On 29 September 2026, about 46% of Google's users reached it over IPv6.

Check the year

Internet figures change fast. User numbers are estimates for 2025, cable counts are for 2026, and network counts are a snapshot from 1 October 2026. Always quote the year with the number.

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6. Timeline of the Internet: From ARPANET to Today

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Timeline of the Internet

How four linked US research computers grew into the network most of the world uses today.

Oct 1969

ARPANET's first words

UCLA sends the first message to the Stanford Research Institute. The system crashes after two letters: "LO".

1972

Email arrives

Ray Tomlinson writes the first basic email software, and ARPANET is shown to the public.

Jan 1983

Switch to TCP/IP

ARPANET adopts Cerf and Kahn's TCP/IP rules, letting different networks join into one internet.

Mar 1989

The web is proposed

Tim Berners-Lee, at CERN, proposes a system for sharing linked documents.

1990

First website

HTML, HTTP and URLs are defined, and info.cern.ch goes live as the first web server.

Apr 1993

The web is made free

CERN puts the web software in the public domain, so anyone can build on it.

Apr 1995

The internet goes commercial

The US government stops funding the NSFNET backbone, and commercial companies take over running the network.

No single inventor

The internet was built by many people: Kleinrock's team sent the first ARPANET message, Cerf and Kahn designed TCP/IP, and Berners-Lee invented the web that runs on top of it.

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7. Internet Key Terms: A Cheat Sheet

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Internet Key Terms

The words you need to explain how the internet works, each with a one-line definition.

Addresses and names

IP address	The number that identifies a device on a network, like a street address. IPv4 uses four numbers from 0 to 255, such as 192.0.2.10.
Domain name	A website's human-friendly name, such as example.com. It stands in for the IP address, which is hard to remember.
DNS	The Domain Name System: the internet's phone book, which translates domain names into IP addresses.
URL	The full address of one page or file: a scheme (https), a domain name and a path, as in https://example.com/news.

Moving data

Packet	A small chunk of data sent across a network, with a header (addresses and other details) and a payload (the data itself).
Protocol	An agreed set of rules for formatting and sending data, so that different devices can understand each other.
TCP/IP	The internet's core protocols. IP addresses and delivers packets; TCP checks they all arrive, in order, and resends lost ones.
Router	A device that forwards packets between networks, choosing the next step towards each packet's destination address.
ISP	Internet service provider: the company that connects your home, school or phone to the internet.
Bandwidth	How much data a connection can carry each second, measured in megabits or gigabits per second (Mbps, Gbps).
Latency	How long data takes to travel from one point to another, in milliseconds. Lower is better; distance adds latency.

The web and security

HTTP	Hypertext Transfer Protocol: the rules a browser uses to request web pages and a server uses to send them back.
HTTPS	HTTP sent over an encrypted connection, so others on the network cannot read or change it. Shown by a padlock.
TLS	Transport Layer Security: encrypts the connection and checks the server's certificate. Its older name is SSL.
Server	A computer that stores data or runs a service and answers requests from clients, such as your web browser.
The cloud	Servers in data centres that you use over the internet, for storage, email, apps or games, instead of your own device.

Lanes and journey time

Bandwidth is like the number of lanes on a road; latency is how long the journey takes. More lanes carry more traffic, but they do not make a long trip short.

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8. Internet Myths: What People Get Wrong

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HOW THE INTERNET WORKS · PART 8 OF 9 · AGES 11–16

Internet Myths

Seven things many people believe about the internet, and what is really going on.

1

✕ MYTH **Wi-Fi is the internet.**

✓ FACT Wi-Fi is only the radio link between your device and the router. The router reaches your ISP by cable, fibre or phone line. You can have full Wi-Fi bars and still no internet.

2

✕ MYTH **Most data between countries goes by satellite.**

✓ FACT Undersea fibre-optic cables carry over 99% of international data (ITU). Satellites help in remote places, on ships and planes, but carry only a small share.

3

✕ MYTH **Incognito or private browsing makes you anonymous.**

✓ FACT It only stops your browser saving history and cookies on that device. Websites, and whoever runs the network (school, employer, ISP), may still see what you do.

4

✕ MYTH **The cloud is not physical: your files float online.**

✓ FACT The cloud means servers in data centres: real buildings full of computers, using electricity and cooling. Your cloud photos sit on drives in some of them.

5

✕ MYTH **A padlock or https means a website is trustworthy.**

✓ FACT HTTPS means the connection is encrypted. It does not prove who runs the site: phishing sites use HTTPS too. Check the exact address before you type anything.

6

✕ MYTH **Someone controls the internet and could switch it all off.**

✓ FACT There is no central control room. The internet is tens of thousands of separate networks run by different owners, joined by shared rules. There is no master switch.

7

✕ MYTH **A faster broadband package fixes every slow connection.**

✓ FACT Bandwidth sets how much data arrives per second, not how far it travels. Distance adds latency, so a server on another continent stays laggy on any package.

⚠ **Padlock = private, not proof**

The padlock means nobody on the network can read what you send. It cannot tell you whether the site at the other end is honest. Check the web address, not just the lock.

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9. Internet Quiz: 10 Questions on How the Internet Works

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HOW THE INTERNET WORKS · PART 9 OF 9 · AGES 11–16

Internet Quiz

Ten questions on the whole series. Answer them all, then turn the page round to check.

1 **Which phrase best describes the internet?**

- A One giant computer owned by a company
- B A network of networks
- C Another name for the World Wide Web
- D A system of satellites

2 **What does DNS do?**

- A Encrypts data so nobody can read it
- B Translates domain names into IP addresses
- C Splits files into packets
- D Stores web pages

3 **When you open a website, which order do these steps happen in?**

- A HTTP request, DNS lookup, TCP handshake
- B DNS lookup, TCP handshake, HTTP request
- C TCP handshake, HTTP request, DNS lookup
- D HTTP request, TCP handshake, DNS lookup

4 **Which part of a packet does a router read to decide where to send it next?**

- A The payload
- B The destination IP address
- C The sequence number
- D The source port

5 **What does latency measure?**

- A How much data arrives each second
- B How long data takes to travel
- C How many devices share a router
- D How big each packet is

6 **Which of these uses the internet but is not part of the World Wide Web?**

- A A page on a news website
- B Email sent between mail servers
- C A URL
- D HTML

7 **Roughly what share of international data travels through undersea cables?**

- A About 25%
- B About 50%
- C About 75%
- D Over 99%

8 **In which year did ARPANET switch to TCP/IP, joining networks into one internet?**

- A 1969
- B 1983
- C 1991
- D 1995

9 **IPv4 addresses are 32 bits long. How many possible IPv4 addresses are there?**

10 **True or false: a padlock in the address bar proves a website is honest. Explain your answer.**

ANSWERS

1. B: A network of networks
2. B: Translates domain names into IP addresses
3. B: DNS lookup, TCP handshake, HTTP request
4. B: The destination IP address
5. B: How long data takes to travel (how much per second is bandwidth)
6. B: Email sent between mail servers
7. D: Over 99% (satellites carry only a small share)
8. B: 1983 (on 1 January)
9. $2^{32} = 4,294,967,296$, about 4.3 billion: fewer than the number of people on Earth.
10. False. It shows the connection is encrypted (HTTPS). Phishing sites can use HTTPS too, so check the web address.

SERIES COMPLETE

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