How the Internet works

Level B2/B2+

Exercise 1. Some important Internet terms are usually referred to with acronyms (e.g. www). Some such terms are defined below. Find appropriate words in the list to create full phrases.

domain	provider	hypertext	digital	locator	area
protocol	subscriber	system	service	local	file
uniform	language	Internet	network	extensible	line
transfer	markup	name	resource	wide	control

- It makes it possible to write www.google.com in the address bar rather than 216.58.209.67.

- It is the network of computers at your office or home.

- It is a network that connects computers in a large area.

- This standard makes it possible to transfer files between servers and clients on a network.

- It enables two hosts to connect and exchange data.

- This is who you pay for your web access.

- It is a popular broadband Internet access technology.

- It is a method of encoding documents so that both humans and computers can read them.

- It is the default standard for transferring documents on the Internet.

- It specifies where something is on the network.

Exercise 2. Read the text below and put the verbs in brackets in the correct form.

How does the Internet work?

Adapted from developer.mozilla.org

The Internet [be] _____ the backbone of the Web, the technical infrastructure that [make] _____ the Web possible. Its history [be] _____ somewhat obscure. It [begin] _____ in the 1960s as a US-army-funded research project, then [evolve] _____ into a public infrastructure in the 1980s with the support of many public universities and private companies. The various technologies that [support] _____ the Internet [evolve] _____ over time, but the way it [work] _____ [not change] _____ that much: Internet is a way to connect computers all together and ensure that, whatever happens, they find a way to stay connected.

When two computers need to communicate, you [have] _____ to link them, either physically or wirelessly. Such a network [not be] _____ limited to two computers. You can connect as many computers as you wish. But it [get] _____ complicated quickly. If you [try] _____ to connect, say, ten computers, you [need] _____ 45 cables, with nine plugs per computer!

To solve this problem, each computer on a network [connect] _____ to a special tiny computer called a router. This router [have] _____ only one job: like a signaler at a railway station, it [make] _____ sure that a message sent from a given computer [arrive] _____ at the right destination computer. To send a message to computer B, computer A must send the message to the router, which in turn [forward] _____ the message to computer B and [make] _____ sure the message [not deliver] _____ to computer C.

Once we add a router to the system, our network of 10 computers only [require] _____ 10 cables: a single plug for each computer and a router with 10 plugs. That's great, but what about connecting hundreds, thousands, billions of computers? Of course a single router can't scale that far, but a router is a computer like any other, so what keeps us from connecting two routers? By connecting computers to routers, then routers to routers, we [be] _____ able to scale infinitely.

Such a network _____ [come] very close to what we call the Internet, but we [miss] _____ something. We [build] _____ that network for our own purposes. There are other networks out there: your friends, your neighbors, anyone can have their own network of computers. But [not be] _____ not really possible to set cables up between your house and the rest of the world, so how can you handle this? Well, there [be] _____ already cables linked to your house, for example, electric power and telephone. To connect our network to the telephone infrastructure, we [need] _____ a special piece of equipment called a modem. This modem [turn] _____ the information from our network into information manageable by the telephone infrastructure and vice versa.

So we [connect] _____ to the telephone infrastructure. The next step is to send the messages from our network to the network we want to reach. To do that, we will [connect] _____ our network to an Internet Service Provider (ISP). An ISP is a company that [manage] _____ some special routers that [link] _____ all together and can also [access] _____ other ISPs' routers.

Exercise 3. Use a noun derived from one of the verbs in Exercise 2 to complete the gaps in the sentences below.

- Effective _____ requires good infrastructure.

- Broadband Internet _____ is now common around the world.

- Files sent over the Internet are divided into small chunks called packets which are reassembled upon _____ at the client computer.

- Port _____ is a method of making a computer on your network accessible to computers on the Internet, even though you are behind a router.

- We specialize in business-class Internet service _____ and hosting.
- The Transmission Control Protocol provides reliable data _____ to client machines.
- If the page is not loading, check your Internet _____.
- Bandwidth _____ is the process of measuring and controlling the communications on a network link, to avoid overfilling the link, which would result in network congestion and poor performance of the network.
- After January 12, 2016, Microsoft will no longer provide security updates or technical _____ for older versions of Internet Explorer.
- Click here to learn about minimum system _____.
- The Internet of Things (IoT) is the next step in the _____ of the Internet.

Exercise 4. Some important Internet terms can have other, unrelated meanings. Find two meanings for each of the terms below.

ping	anchor	footer	client	bit
host	packet	backbone	header	server

- a waiter
- the part of the webpage where contact info is typically found
- someone who buys something, especially services
- a small piece
- a program used to diagnose networks
- the row of bones that protect the spinal cord
- a heavy device used to keep a ship in place
- a small chunk of data
- the portion of a data packet that contains such information as sender's and receiver's IP address, packet number
- a device used to access resources on a network
- a computer that provides data and services to other computers
- a sharp sound
- a tag that specifies links to other Web pages
- the core infrastructure of the Internet
- someone who entertains guests
- a small, thin package
- the section of a webpage that contains the company name, logo and navigation bar
- the final portion of a data packet, also called a trailer
- basic unit of digital information

Why We Need IPv6?

Adapted from www.orbit-computer-solutions.com

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Why do we need IPv6?... It's quite simple - we need to communicate efficiently! It's a well-known fact that the Internet is growing at an astronomical speed.

The previous IP addressing version – IPv4 – is been depleted since late 2010 to 2011 according to Cisco, so we need a larger addressing space to accommodate the ever increasing growth of network devices (billions of users in Asia, Europe and America and mobile phones, cars, tablets homes and industrial devices).

Many methods have been adopted to deal with the depletion of IPv4, including, Subnetting, VLSM and NAT, to mention a few. But these methods are not enough to scale the networks for future demands.

IPv6 satisfies these increasingly complex requirements of IP addressing and greater mobility.

Difference between IPv4 & IPV6

IPv4 Address.

Number of octets: Four

Binary example: 11000000.10101000.00010100.01100100

Decimal example: 192.168.0.100

Number of IP addresses: 4,294,467,295 (2 to the power of 32)

IPv6 Addresses.

Number of octets: Sixteen

Binary example:
11010001.11011100.11001001.01110001.11011100.11001100.01110001.11010001.110 11100.11001001.11010001.11011100.11001001.01110001.00000010.11011110

Hexadecimal example: A524:72D3:2C80:DD02:0029:EC7A:002B:EA73

Number of addresses: 3.4 x 10 to the power of 38, or:
340,282,366,920,938,463,463,374,607,431,768,211,456 (that's approximately a trillion addresses for every human being on the planet!)

What is IPv6 Address? Expression and Examples

Unlike the 32-bit IPv4 addresses with four 8-bit fields separated by periods, IPv6 addresses are 128-bit long and use colons to separate the 16-bit hexadecimal entries.

IPv6 address Format:

2041:0000:130F:0000:0000:07C0:853A:140B

Global Prefix   Subnet   Interface ID

The IPv6 address can be shortened. Let's use the following IPv6 address as an example:

2041:0000:130F:0000:0000:07C0:853A:140B.

The leading zeros in a field are optional. That means that the field "07C0" equals "7C0", and the field "0000" can be written as "0".

So, the above IPv6 address can be written as :

2041:0:130F:0000:0000:7C0:853A:140B.

In addition, the fields of zeros can be represented as two colons " :: ". So the address can also be written as:

2041:0:130F:: 7C0:853A:140B

Exercise 5. True or false:

1. Cisco's pool of IP addresses has been used up since 2010-2011.

2. There are only three methods to deal with the lack of IPv4 addresses.

3. There are fewer IPv4 addresses than people in the world.

4. You can omit all zeros except the last one.

Exercise 6. In the text above, find words or phrases that mean the following:

effectively

used up

available addresses

machines

dividing a network into two or more

to make bigger

ability to move around

a unit of information containing 8 bits

represented by 1s and 0s

based on the number 10

based on the number 16

the first part of an address or number

initial, first

Exercise 7. Your teacher will give you a couple of addresses or numbers. Read them out to the rest of the class. Next, check if everybody in the class was able to write it down correctly.

Exercise 8. Put the verbs in brackets in the appropriate form.

A domain name server, or DNS server [resolve] _____ (in other words, [translate] _____) a domain name into an IP address. That sounds like a simple task, and it would be, except for the following points:

- There [be] _____ billions of IP addresses currently in use, and most machines [have] _____ a human-readable name as well.
- The world's DNS servers [process] _____ a huge number of requests every day. Right now, billions of such requests [process] _____ across the Internet.
- New domain names and IP addresses [appear] _____ every day. As we speak, millions of people [add] _____ and [change] _____ domain names and IP addresses.

With so much work to do, DNS servers [rely] _____ on network efficiency and Internet protocols. Part of the IP's effectiveness is that each machine on a network [have] _____ a unique IP address in both the IPV4 and IPV6 standards.

How did the DNS system come about?

Paul Mockapetris [design] _____ the Domain Name System at the University of California, Irvine in 1983, and [write] _____ the first implementation at the request of Jon Postel from ISI. The Internet Engineering Task Force [publish] _____ the original specifications in RFC 882 and RFC 883 in November 1983, which [establish] _____ the concepts that still [guide] _____ DNS development.

In 1984, four UC Berkeley students [write] _____ the first Unix name server implementation, called the Berkeley Internet Name Domain (BIND) Server. In 1985, Kevin Dunlap of DEC substantially [revise] _____ the DNS implementation. Mike Karels, Phil Almquist, and Paul Vixie [maintain] _____ BIND since then. BIND [port] _____ to the Windows NT platform in the early 1990s. BIND [be] _____ widely distributed, especially on Unix systems, and [be] _____ still the most widely used DNS software on the Internet.

In November 1987, RFC 1034 and RFC 1035 [supersede] _____ the 1983 DNS specifications. Several additional Request for Comments [propose] _____ extensions to the core DNS protocols.

Exercise 9. Fill the gaps with an appropriate word in the correct form.

webpage	octet	cache	website	uptime
saturate	traffic	top-level	upstream	go out
configure	register	come in	display	downtime
downstream	latency	subdomain	byte	

The data that you download is called _____ or _____ data, and the data that you upload is called _____ or _____ data.

Browser _____ contains records of every item viewed or downloaded while using the Internet.

A unit of digital information comprising 8 bits is called an _____ or a _____, although the latter name can be ambiguous because it was not standardized in the past.

In ecommerce, _____ is money and _____ is money lost.

_____ domains typically show the country of _____.

In a sense, a _____ is a collection of _____.

If your website has multiple _____, measuring _____precisely can be an issue.

Slower download times, in other words an increase in _____, may indicate that the network is approaching _____.

If some characters are nor _____ properly, you may need to check your _____.

How will the Internet work on Mars?

https://www.youtube.com/watch?v=FMUDfEhyi-o

Exercise 10. Watch the video and answer the following questions:

1. What is the distance between Earth and Mars and how does this impact radio communication?

2. What are the advantages of using laser waves?

3. True or false: Future space Internet will be based entirely on new satellites..

Exercise 11. Fill the gaps with the appropriate word / words. Then watch the video again and verify your answers.

Here on earth the Internet _____ by a web of fiber-optic cables.

Space Internet can be as slow as _____.

This wouldn't work very well for Martians looking to stream or chat _____.

Since we can't _____ Internet cables between planets, we'll need to use _____ differently than we do now.

A laser wave is about 100,000 times shorter than a radio wave, which means there's more room to _____ data in the same amount of space.

Exercise 12. Fill the gaps with the correct preposition(s).

1. Yesterday was the first day ever that I was late for work, and I had to run _____ my boss in the parking lot!

2. In the VoIP technology, voice is carried _____ the same connections as data.

3. The first VoIP experiments were carried _____ in the 1970s.

4. WIRED reported back in 2011 that the Internet had run _____ IP addresses.

5. Donald Trump is the first reality star who is running _____ president of the US.

6. We will carry _____ with the discussion after the break.

7. We are going to run _____ the presentation again before the clients come.

8. Black Hat security researchers are warning that two first-generation flaws have been carried _____ to HTTP/2.

9. During the first two years of its existence, the startup ran _____ 4 billion dollars in debt.

*Exercise 13. For each sentence in Exercise 12, ask a question which the underlined phrases answer.

    1. Who did you run into yesterday?

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

*Exercise 14. Work in pairs. Rephrase each of the sentences below using a phrase or idiom based on *run* or *carry*.

I don't know if we are going to make it to the conference; we don't have enough fuel!

This project can still be successful, but we have less and less time to ensure this.

Unfortunately, our store does not have this particular product in stock.

Unless we are sitting in the proper position, with the monitor and keyboard appropriately placed, there is a danger that we will have problems such as headaches, eye ache, joint ache and other potential health issues.

Under the federal Computer Fraud and Abuse Act of 1986, computer fraud is a felony that is punishable by a maximum of 5 years for the first offense.

I have to leave early today because I've got to do a couple of things for my mother.

I hate music, I can't even sing accurately!

Surely, this is a big investment, but it will pay off in the distant future.

My boss always makes sure that everybody follows all the rules.

The motion was approved by 5 votes to 3.

Exercise 15. Presentation. Work with a partner. You have accepted an invitation to visit an elementary school and give first graders a talk on how the Internet works. Prepare a short presentation that explains the basic concepts in a way that is understandable and attractive to seven-year-olds. You may want to use pictures, comparisons to things that the kids know directly etc. When you present, the rest of the group plays the kids – and they can ask any question they want!