

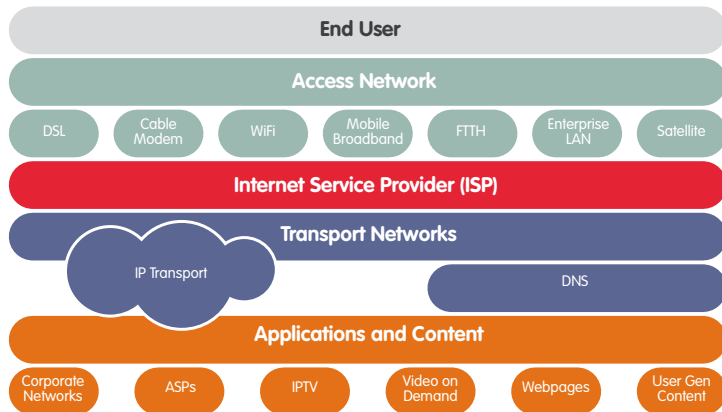


The Internet — Working for Consumers



1 — How the Internet works

The Internet and its key applications – email, the World Wide Web and file transfers – provide people all over the world with access to information, commerce, communication and entertainment services. The Internet's extraordinary success is based on its scalable, flexible and robust technical structure.



Internet access

A computer, mobile phone or another suitable device with a browser is typically connected to the Internet in one of two ways:

- Via a fixed-line connection to a telephone wire or a television cable
- Via a wireless connection to a local mobile network base station or wireless-enabled router

In both cases, an Internet service provider (ISP) – a fixed-line telecoms company, a mobile operator or a third party – uses a local telecommunications network to transmit data to and from the user's mobile phone or computer. This local network is connected to national networks which are then connected to networks in other countries, together forming the global Internet.

A range of standard protocols enable connected devices to communicate with other connected devices, exchange files or access web sites anywhere in the world.

The speed and performance of an Internet connection is determined by the weakest link in the chain, which could be the limitations of the access device, the quality of one of the networks used to carry the packets, congestion in an international gateway or undersea cable, or the capacity of the web server being queried by the device.



Such factors can affect both fixed and mobile networks, but on mobile networks the traffic that can be carried at any one time is also limited by the finite amount of spectrum available to the operator. Devices accessing the Internet via a mobile base station have to share the available spectrum with other devices in the same area.

Many more devices are now being equipped with mobile connectivity enabling them to access the Internet. Examples of such devices include laptops, netbooks, electronic readers, photo-frames, smart meters, environmental sensors, health monitors, navigation systems and cameras.



Travelling in packets

Information travels across the Internet in small packets of data, which are directed to their ultimate destination by routers – essentially electronic signposts located at each node of the network – using a system of Internet Protocol (IP) addresses. If one route is blocked, the routers direct packets on an alternative route until they reach their destination and are reassembled in the correct order.

Most web services are designed to be tolerant of some delay in the transmission of packets – for example, a video-on-demand service will typically store, or buffer, some of the content before it is viewed so that the user can watch the video without interruptions.

2 — Internet business models and how they support innovation

Offering a cost-effective way to reach a vast global market, the Internet sustains a very broad commercial ecosystem made up of large and small companies. These companies are continually experimenting with new relationships, services and business models, made possible by the Internet's highly-scalable and flexible structure.

As a result, the Internet has spawned an extraordinary array of very rich, low-cost or free information, communication and entertainment services.

ISPs typically 'peer' with each other, meaning they exchange traffic without exchanging money, in a form of barter. However, ISPs lacking the network reach or compelling content necessary to give them bargaining power, will often have to pay transit charges to transfer Internet traffic onto networks owned or managed by other entities.

ISPs generally recoup the cost of building/renting and running networks by charging consumers and/or organisations Internet access fees. Internet users usually pay their ISP a monthly access fee, which typically entitles them to send and receive a certain volume of data each month.

In many cases, a customer can choose to pay a higher access fee for a better quality of service, differentiated, for example, by overall data throughput speeds or the size of the monthly volume cap. In some cases, there is no volume cap, or the cap is so high that the ISP is effectively offering an unlimited or 'all-you-can-eat' service. Spectrum constraints mean that ISPs are less likely to offer unlimited mobile Internet access services.

Some ISPs, notably those running WiFi hotspots, charge for Internet access according to time or provide Internet access bundled with another product or service, such as a hotel room or cup of coffee. In some cases, people pay just for a specific Internet-based service, such as email.





Web service providers

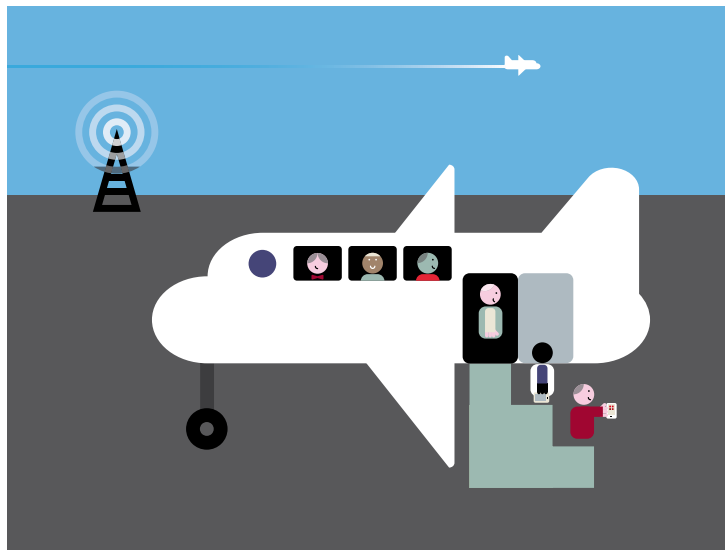
Once they are on the Internet, individuals can easily access a vast range of information, software applications, communication and entertainment services funded by a very wide variety of business models, most of which involve some combination of advertising, subscriptions and one-off payments. Many web-based services and content are free, either funded entirely by advertising, which can be highly targeted and cost-effective online, or designed as a promotional tool for an offline product or service.

Some companies provide free tools for individuals to build web sites and then offer them the opportunity to host advertising on their sites and earn a slice of the revenue generated by that advertising. In some cases, individuals might receive a free service in exchange for providing some information about themselves. Of course, web surfers can also shop for goods and services online, paying for what they purchase, just as they do in the physical world.

Web service providers and ISPs sometimes work together to optimise their network to deliver specific services demanded by their customers.

3 — Network management and why it is important

Both fixed and mobile ISPs manage the traffic on their networks to provide customers with a quality of service that meets or exceeds their expectations. Mobile operators, in particular, have a limited amount of network capacity constrained by the spectrum available to them. They have to actively manage their networks to ensure that this scarce resource is shared fairly amongst their customers in line with the terms of their service offering. The customer experience is the result of interactions in a complex ecosystem and it is in the interests of all that participants are incentivised to efficiently utilise networks.



Mobile operators also have to balance the network requirements of different types of traffic, using network management techniques to try to give priority to so-called real-time services, such as video calls, which could become unusable if packets are delayed too long.

As web services become increasingly sophisticated, network management will become ever more important to ensure that each application can obtain the bandwidth it needs without compromising other applications and users. Today, the network efficiency of applications varies significantly and mobile operators are seeking to engage with application providers to help them make their software as efficient as possible and improve the overall experience for consumers.

Quality of service

The demands placed on networks vary dramatically during the course of a day or a year and can be heavily dependent on local events. For example, 250 business passengers disembarking an aircraft may all turn on their mobile devices at the same time to look at their incoming emails and text messages, and listen to voicemails. The mobile operator uses network management techniques to ensure that the local network isn't overwhelmed by this surge in demand.

Network management techniques are also used by some ISPs to offer consumers a choice of different levels of service at different price points. ISPs manage the network to ensure that traffic generated by customers who have chosen to pay more for a better class of service takes precedence over traffic generated by customers who have chosen not to.



Examples of network management techniques

Content caching

Some popular web sites appear to download very quickly because an ISP has stored their content on local servers, so that they don't have to retrieve packets of data from the original web site, which may be on the other side of the world.

Content control and filtering

Children are prevented from accessing adult content by ISPs' software filters, which require customers to prove they are over 18. Many also take steps to block access to web sites that have been identified as carrying child sexual abuse content or other illegal material. In many countries, ISPs are also legally obliged to intercept Internet traffic at the request of law enforcement agencies.

Active monitoring

To ensure they maintain a good quality of service, ISPs actively monitor the performance of their networks, measuring the proportion of packets lost and the speed of customers' connections. They also take steps to prevent denial of service attacks, designed to bring down web sites or other services, and the spread of malicious software or viruses.

Capacity planning and spectrum

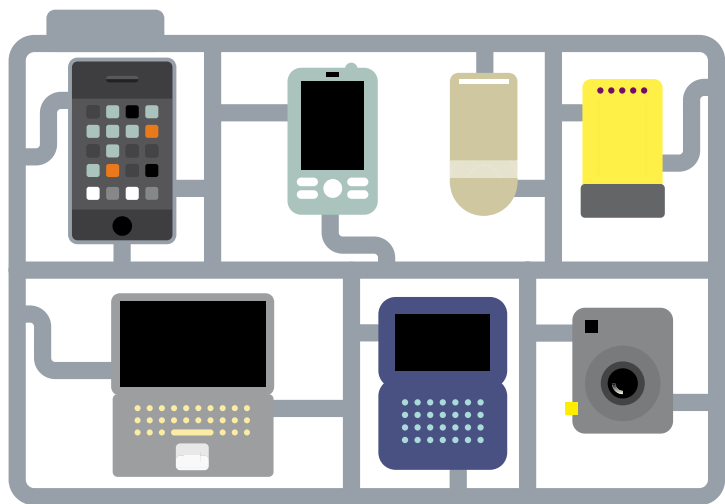
If they have to carry too much traffic at once, telecommunications networks, particularly mobile networks, will become congested, and possibly unusable for some services. To prevent this, ISPs can:

- Cap the amount of traffic a customer can send or receive in a specific time period.
- Give priority to particular types of traffic associated with a real-time service, such as video calls, which requires a steady supply of bandwidth.
- Limit throughput speeds.
- Alter the number of packets a computer on its network can accept before it needs to acknowledge the sender.
- Send redundant packets along with the requested packets to reduce the likelihood that the traffic will have to be retransmitted in the event of an error.

Mobile operators also sometimes use a mechanism, known as a scheduler, to control the speeds and number of data users that can access a given radio channel, time slot or spectrum slice. A mobile operator may also establish dedicated data and voice channels within its network to ensure that heavy Internet traffic doesn't prevent voice calls from being connected.

4 — Consumer Choice

The Internet is enormously beneficial to both individuals and society as a whole. By providing much greater access to information and communication, the Internet has made people better-informed, making a major contribution to the democratic process in many countries. It also enables people to run businesses and organisations that wouldn't be viable in the offline world, fuelling economic growth and greater prosperity.



Moreover, the Internet has given households and companies access to a much broader range of communication and entertainment services than they had twenty years ago. In fact, its uses are as varied and individual as the citizens and organisations that have come to rely on it.

In most countries, a wide variety of ISPs have emerged to serve the many different segments of Internet users. Competition between these ISPs has led to consumers and businesses being able to choose from a very wide selection of keenly-priced Internet access devices, tariff plans and service options. ISPs' service portfolios are continually evolving as they seek to gain a competitive edge and to keep pace with the increasing sophistication of both access networks and web services.

More new business models are likely to emerge in future as both existing players and new entrants forge agreements or take on new roles within the Internet value chain. It is this kind of experimentation and plurality in the market that has made the Internet such a rich source of innovation and resulted in such a wide variety of online services.



Choice of tariff plans and service

In most markets, consumers can choose from a wide variety of tariff plans, enabling them to buy Internet access sliced and diced in many different ways. They can pay up-front for a set amount of usage or via a monthly contract. A longer service contract may include a subsidised, or free, Internet access device. There are also Internet access services, notably Wi-Fi hotspots, that enable people to pay by the hour or by the day. In many cases, a customer can also choose from service plans with different volume caps or throughput speeds.

With the proliferation of choice, ISPs need to ensure that they preserve transparency so that potential customers can easily compare competitive offerings. Mobile operators are taking steps to ensure that their service plans and tariffs are as clear and transparent as possible.

Network investment

Telecommunications companies are investing heavily in expanding the capacity and improving the performance of their networks so that they, and third-party ISPs that use their networks, can continue to meet the rapid growth in demand for the Internet.

On both mobile and fixed-line networks, Internet users are spending more time online, while sending and receiving greater volumes of data, increasing the pressure on the capacity of networks. Mobile networks, in particular, are experiencing very rapid growth and network operators are investing heavily in upgrading their networks to run at broadband speeds.

In 2010, mobile operators around the world will invest up to \$72 billion in mobile broadband technologies, according to Deutsche Bank.

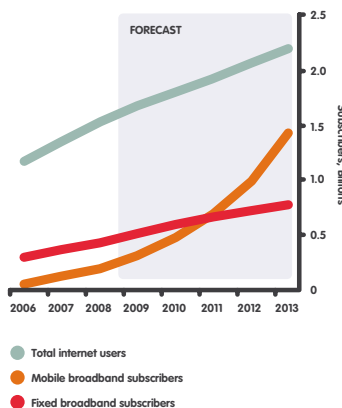
Conclusion

In less than 25 years, the Internet has evolved from a spartan text-based network used primarily by scientists to an incredibly rich, multimedia medium in which even people with limited financial means can create and publish content.

The Internet is a phenomenally complex system that has grown organically through evolution rather than through the realisation of a grand design or plan. This organic growth has been fundamental to the Internet's success, enabling it to adapt to the many new demands that are being placed upon it, as companies and individuals conceive innovative new services, business models and access-mechanisms. Just as it would have been impossible to have foreseen this extraordinary evolution in 1985, it is impossible now to foresee how the Internet will evolve over the next 25 years.

To discuss the contents of this pack or find out further information, please contact Robindhra Mangtani at the GSMA

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Sources: Informa Telecoms & Media; ITU; Forrester Research



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