What is traceroute?

Traceroute is a command used to know the path of data packets sent by a local network user as they travel all over the internet, until they reach a destination. Think about the internet as a big set of networks that are interconnected with the use of multiple routers that track the packet traffic between computers and servers all over the world. With this in mind, it’s pretty clear that a packet does not travel from a point to another directly, passing through different networks and, implicitly, different routers.

Traceroute command is more complex than the ping one – while *ping* only pings the final destination, traceroute not only pings the final destination, but it also pings each router on its way to the final destination; the computer sends three data packets to all routers they pass, and they send back these packets, allowing to obtain DNS domains and measure the round trip time that these took to and from each router. Note that traceroute is based on TTL mechanism: data packets are sent with a related value, and this value is decremented when they reach a router, reaching zero when they discover a new “checkpoint” (a new router).

With all of this said, traceroute can be a great tool to help discover network issues when it is not possible to establish a communication with a given IP address or domain.

Traceroute command executions

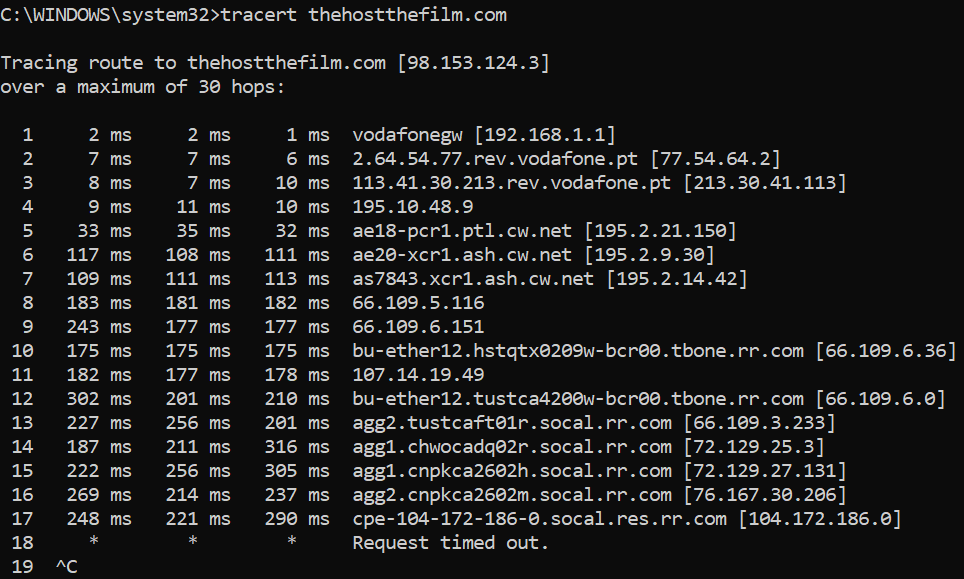


Fig.1 – Example of usage of the tracert command within Anthony’s network

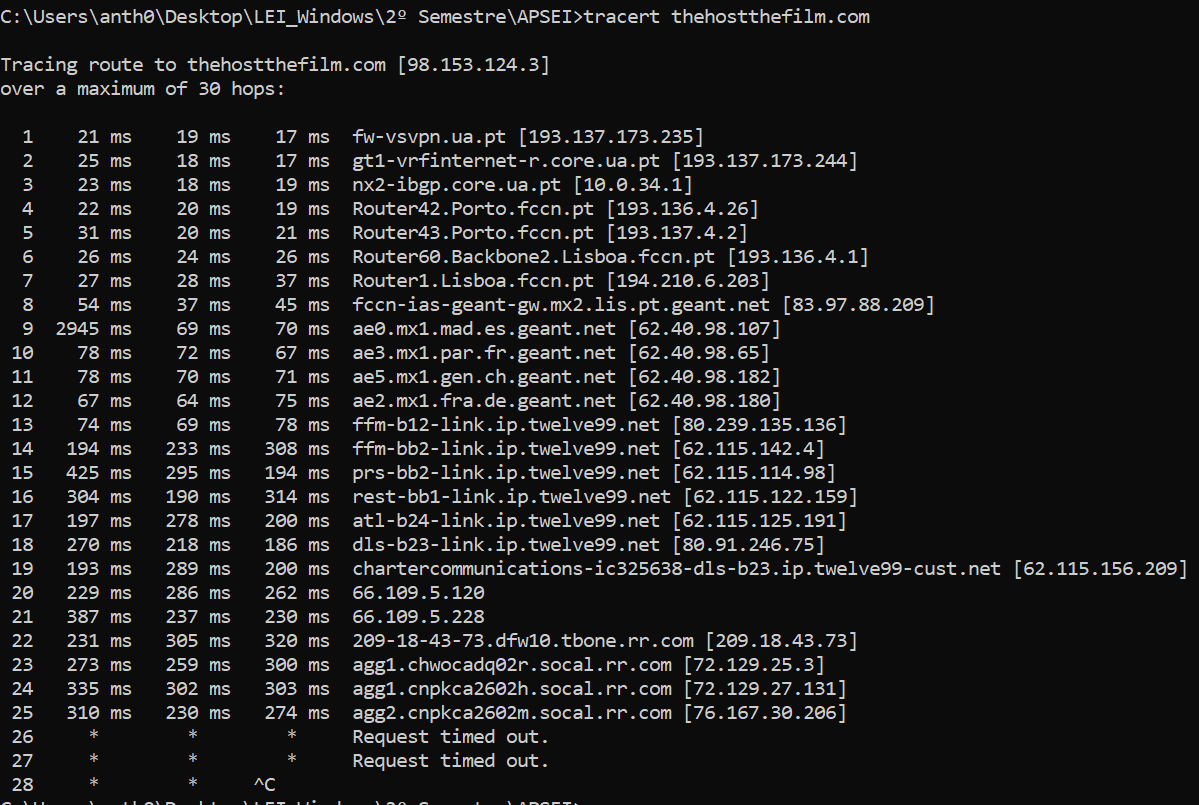


Fig. 2 – Example of usage of the tracert command within the UA network

Traceroute result interpretations

As shown by the screenshots above, the location of an user interferes with the traceroute results, for instance, by changing the initial IPs and domains. This happens because the user was in different networks, so the path that each data packet chose to reach its destination has changed.

Both inside and outside the network of the unniversity, it was never possible to complete the traceroute research - the last hops always have the “request timed out” message and there is no hop with the IP that’s used as parameter for the traceroute command. Most of the time, the last shown IP is 76.167.30.206 (check the screenshot above), but sometimes there is a new one – 104.172.186.0. Pay attention because we’ll come back to this later.

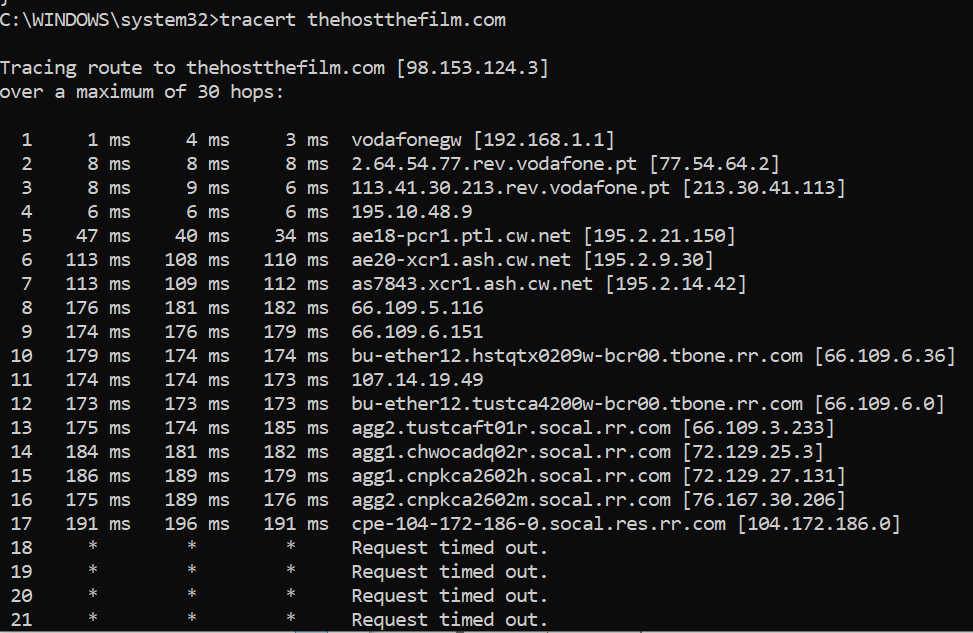


Fig.3 – Traceroute with a new last shown IP.

To help the process of interpeting the results obtained while testing the traceroute command, an IP geolocation API was used – ipinfo.io. Using the curl command together with ipconfig and the IP to be analyzed, it was possible to retrieve a json with additional information related to that IP:

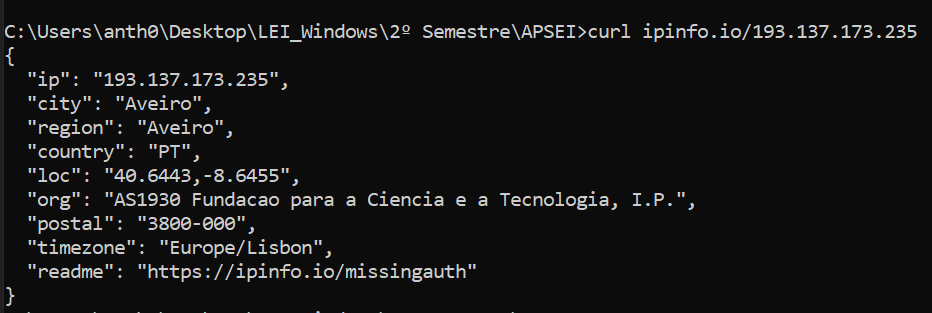


Fig.2 – Example of usage of the IP geolocation API ipinfo.io

With this in mind, a python program was made to help obtain all the jsons for each of the IPs obtained when executing the tracert command – this program accepts as an argument the name of a file where the output of a traceroute command is saved, and it filters the document to obtain all the IPs and perform the curl with each one, obtaining the multiple json outputs in a results file:

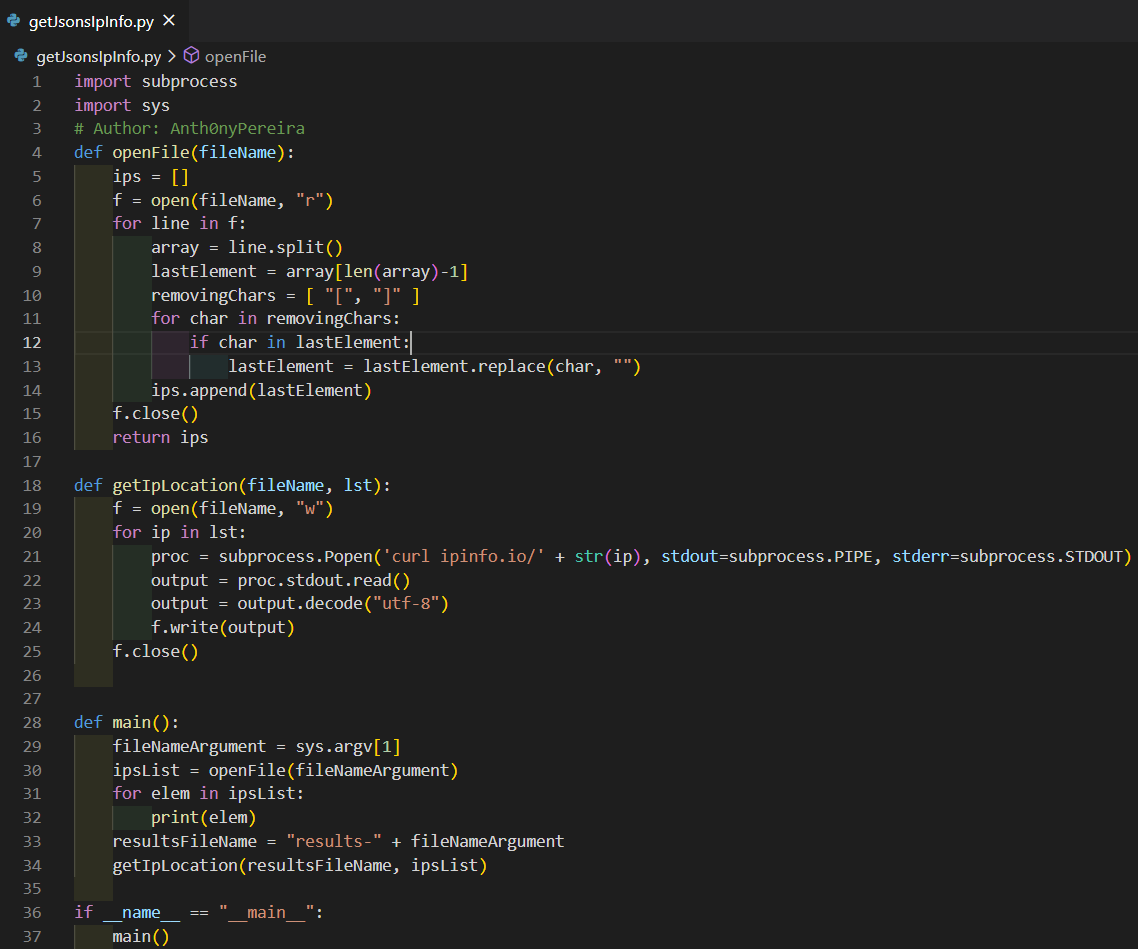
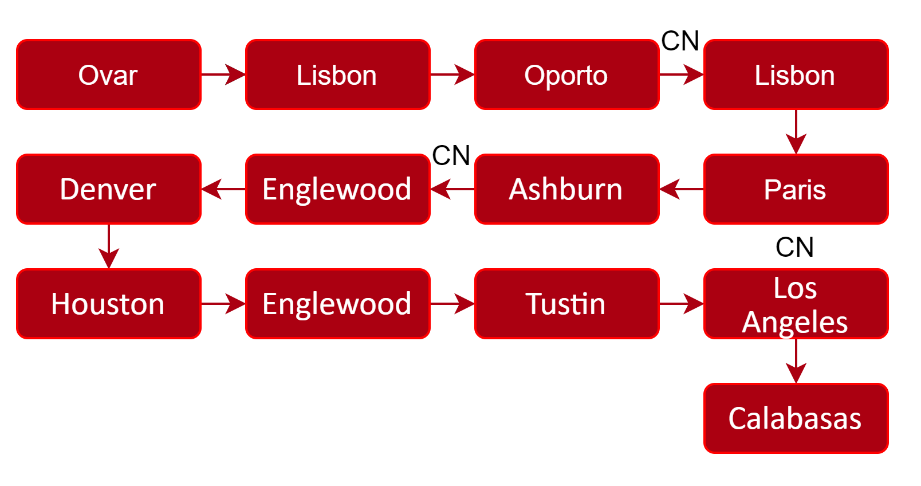
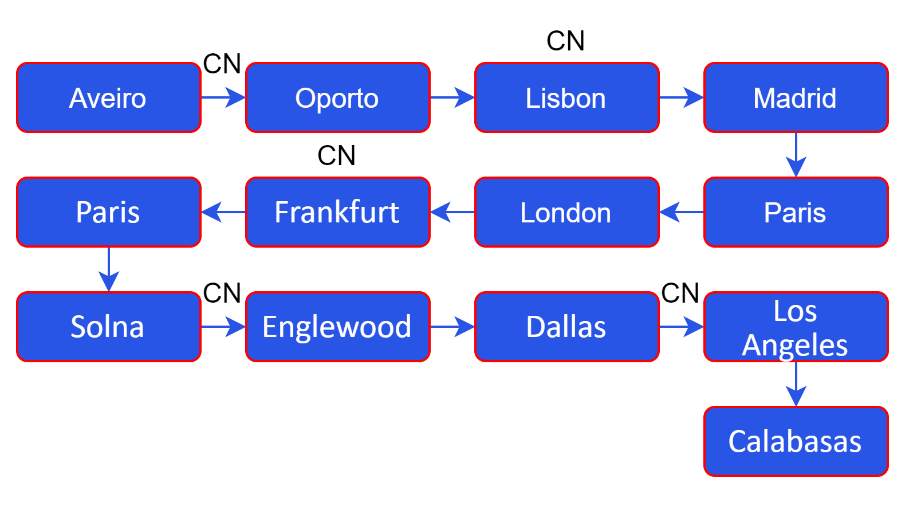


Fig.3 – Python program to obtain a sequence of JSONs using an IP geolocation API

With the results that were achieved, two diagrams were made for helping to visualize the way that these data packets perform during the traceroute command (CN means “changed network”):



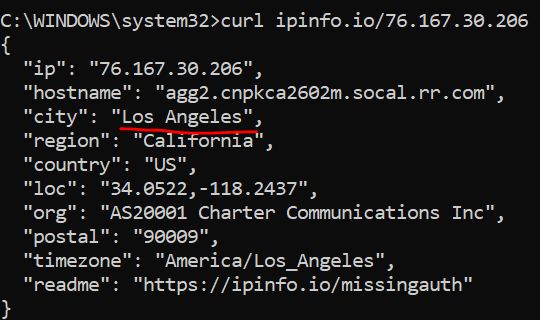
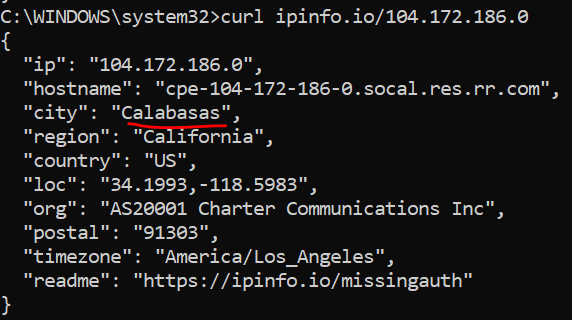
Diag.1 – Path traced with VPN switched off



Diag.2 – Path traced with VPN switched on

Some cities are out of place or have changed (check Tustin and Dallas, for example), so, it’s reliable to say (again) that the path changed in these two different situations. Checking the two tables (see the appendix), it can be observed that even the networks (organizations) have changed too, even after the UA network. So, we can assume that the tracert path is not always the same and that it’s dependent on the location where the user is, leading to a possible mid-different path/networks – not only the user’s network can (obviously) change, everything can change.

Now that the location of the IPs were recorded, let’s go back a little bit and check the location of both IPs 76.167.30.206 and 104.172.186.0:

Figs. 4 & 5 – Results of the consultation of the geolocation API for two specific IPs

The target IP 98.153.124.3 was also inspected:

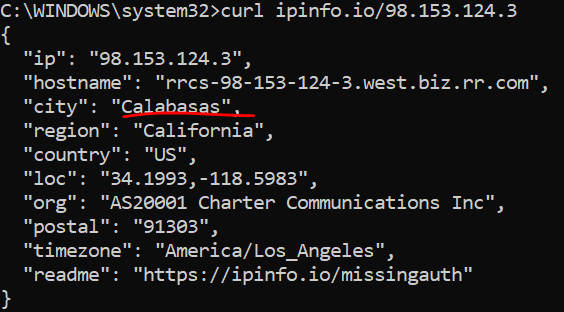


Fig.6 – Result of the consultation of the geolocation API for the target IP

All three IPs are from the same organization and region – California. 104.172.186.0 and 98.153.124.3 (the IP that sometimes appears in the trace and the initial IP, respectively) are from the same city – Calabasas!

Now, let’s check the distance between Los Angeles and Calabasas:

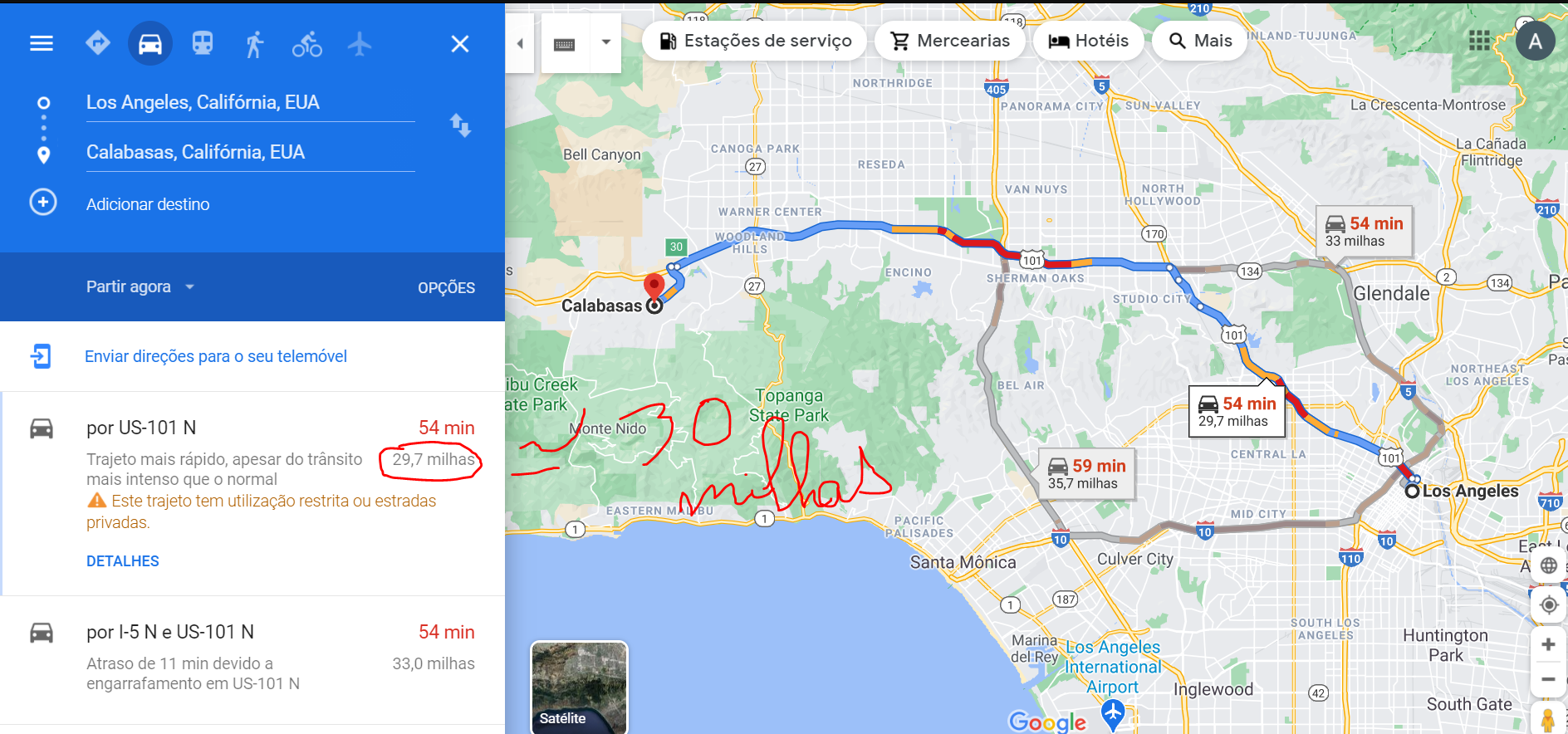


Fig. 7 – Distance between Los Angeles and Calabasas, using Google Maps

Time to make a conversion:

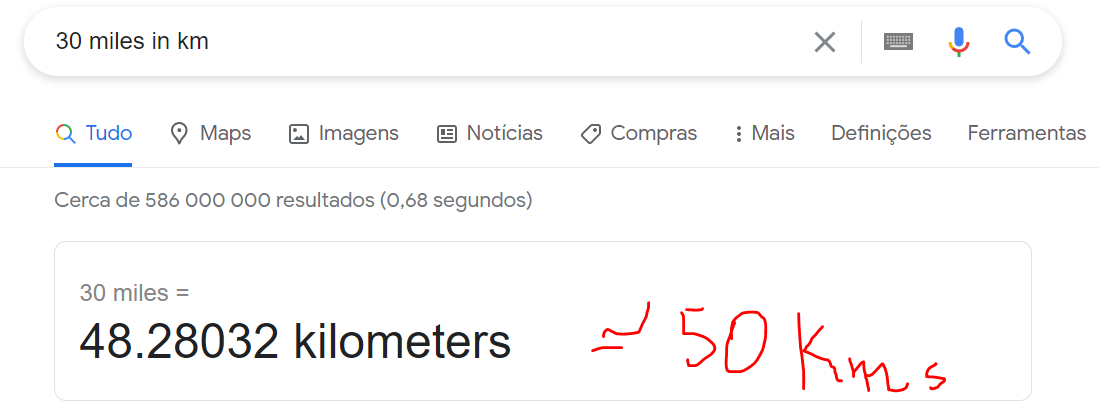


Fig.8 – Conversion between miles and kilometers, using Google

With all of this shown, it can be deduced that the server where the website that is being targeted by traceroute is located is probably denying any interaction with the user, that is, it is not responding with the traceroute packages that were sent to it. Both possible last IPs are close to the real location of the server - either they are from the same city or are 50 km apart from each other - so it’s safe to discard the possibility of 98.153.124.3 being too far away from 76.167.30.206 that they are not able to connect to each other. Another thing is that all three IPs are from the same network, so, we can surely say that the problem is not that it’s not possible to move from a previous network to the last one. We can prove this by executing the ping command, that shows that there is na established connection:

(insert ping command output that is working)

A quick search was performed and a curious result was gotten:

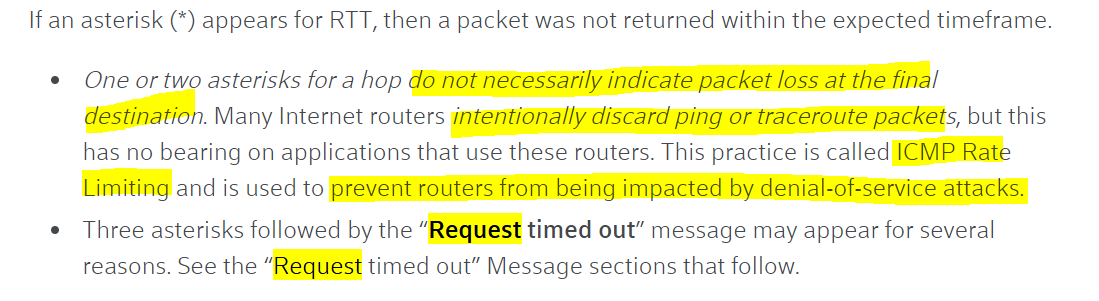


Fig.9 – Paragraph from the website Xfinity.com

It seems that some routers can “intentionally discard traceroute packets” because of security reasons, such as preventing DoS attacks. This could be what’s happening in this case.

Another reason that sustains this assumption is the fact that the website seems forgotten by everyone:

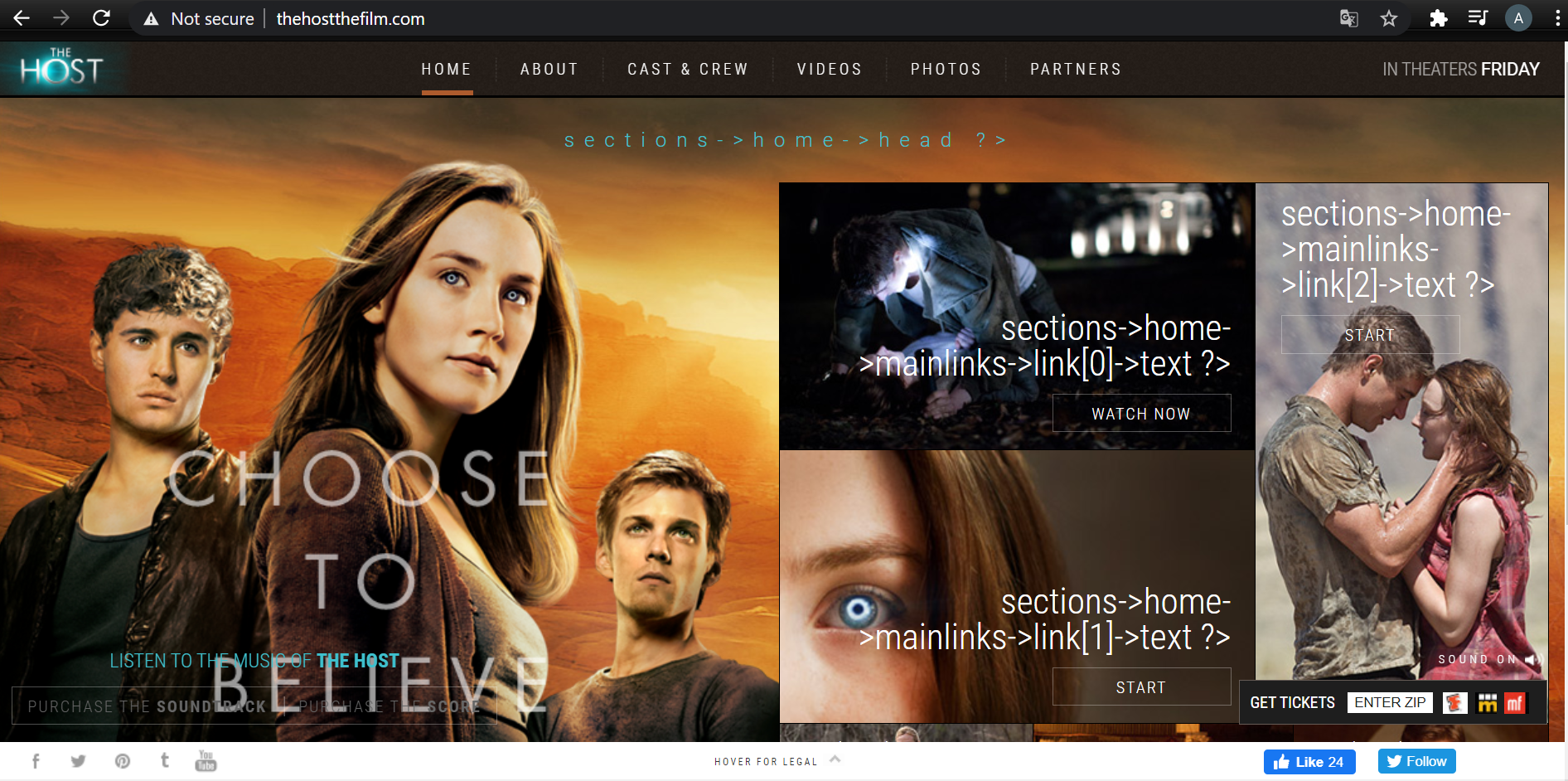


Fig.10 – Homepage of the website The Host, a movie from the year 2013

As we can clearly see from the screenshot taken, some things seem misconfigured (some raw code appears) and even if we check some features that it offers (or that it once offered), we can see that there are some bugs or some features that no longer exist. Thus, it’s possible to assume that this website is no longer maintained – which can lead to security problems. So, the owners could probably block some ways to communicate with the internet – to protect what’s left.

<https://www.netnod.se/ix/what-is-an-ixp-and-what-is-peering>

<https://www.xfinity.com/support/articles/run-traceroute-command>

Social implication of the Internet or a web connection

It’s clear that the ability to connect to a large universe of interconnected networks, which we call the Internet, has allowed us to feel “less alone” - it is easier to communicate with a family member who is far away, you’re able to watch in real time a ceremony in a country thousands of kilometers away without having to be there physically and can learn about news or events from countries on the other side of the world. We are increasingly becoming a “global village” - a concept introduced by canadian Herbert Marshall McLuhan that seeks to explain the relationship between new communication technologies and the idea that by shortening figuratively the distance between all human beings that inhabit, we are all in a village in which we know each other and know everything that goes on all over the world. Just think about it: how could we send an e-mail to our boss or a message via Messenger or WhatsApp to a friend without a web connection?

The access to the internet also allowed public figures to show their authority beyond television, using social media or blogs, or to become public figures through their constant presence in these same social networks and / or blogs: let’s remember Kim Kardashian, who after having participated in a reality show about her family, started to publish her personal life experiences on her social networks, taking the opportunity to advertise her own brands of perfumes, makeup, partnerships with magazines and clothing brands, etc. Now, let’s talk about Ana Garcia Martins, better known as “A Pipoca Mais Doce”, owner of a blog with the same name that was created in 2004 and a pioneer in this type of technologies, which made her famous by having the most visited blog ever in Portugal. A better known example - Justin Bieber, singer, composer and actor quite acclaimed nowadays that started posting covers on Youtube in 2007 and then he was found by Scooter Braun, becoming his agent, and signed a professional contract with Island Records two years later, beginning his artistic career. To finish this topic, another example: Mário Daniel, the famous Portuguese illusionist who was also presenter on the SIC television program, “Minutos Mágicos”, is a recurring presence on Facebook, in which he shares articles and gives his opinion about covid-19 - recommending what people should and shouldn't do.

However, the access to the internet has also created even more social inequalities, as not everyone has the chance to access this service equally - in third world countries, this is still not a very common reality. Thus, it can be said that this social inequality is also related to the existing economic inequalities, in the country and in the world. If there are no resources to end hunger in Africa, if there are no resources to end all homeless people who roam the cities and suburbs of Oporto and Lisbon, how would it be possible to guarantee equal access to the internet?

Another negative implication inherent in the possibility of a web is how quick online news are spread. We live in an era in which it’s increasingly common to view fake news on current topics that are not yet consensual (unfortunately) and that incite to violence and hatred. This is the case with issues related to the LGBTQ + community and covid-19. The internet also promotes the spread of catastrophic news, such as accidents, homicides, bombings, wars, promoting a feeling of insecurity and creating the idea that the world was once safer. My grandmother says that "when I was little, we could leave the door open that no one would bother us". This thought may be slightly distorted from reality – it’s possible that the rate of incidents has not changed significantly over time, but taking into account that it’s possible for us to know more quickly and more often what’s happening in the world, this can create a false sense of insecurity and panic.

Implicações económicas

- teletrabalho

- serviços de streaming

- lojas online

Economic implications of the Internet or a web connection

Não existiria Internet sem hardware. Não existiria Internet sem manutenção constante, sem melhoria das comunicações e de materiais para transporte de informação como fibras óticas, sem implementações de mecanismos de segurança, entre outros. Logo, é claro que a existência da internet criou mais postos de trabalho ligados às áreas das tecnologias informáticas como redes, eletrónica e segurança, bem como da engenharia em geral.

Mas para além da oferta de trabalho e crescimento de empresas proporcionados pela existência e manutenção da Internet, também permitiu o surgimento do teletrabalho, atualmente tão importante em tempos de pandemia – é o caso de empresas como a Ubiwhere e lojas de roupa que, atualmente, publicitam os seus produtos em lives na Internet.

A Internet também trouxe um novo conjunto de funcionalidades, proporcionando um conjunto de bens e serviços sem que o cliente tenha que sair de casa. Esse é o caso de lojas online, como a Fnac, Amazon e Continente que permitem uma rápida compra de bens, serviços de saúde como consultas online de medicina geral ou psicologia, transferências bancárias através de serviços como Paypal e MB WAY, serviços de streaming como Netflix, YouTube e Spotify, permitindo assistir a filmes sem ter que se dirigir a um cinema e ouvir música sem ter de assistir a um concerto. Relativamente aos serviços de streaming, existem inclusive parcerias com empresas para exibirem propagandas, como é o caso do YouTube e a versão gratuita do Spotify, em que a cada cinco músicas ouvidas, um anúncio é mostrado, surgindo assim novas formas de rendimento. E por falar em formas de rendimento, graças a estas plataformas surgiram os youtubers, quem cria conteúdo e publica no YouTube, sendo remunerado por isso, e os streamers, quem cria conteúdo acerca de videogames e mostra partidas ao vivo, sendo igualmente remunerado. Volta-se a verificar o potencial da Internet em criar emprego e formas de remuneração.

Por outro lado, todos estes serviços automatizados presentes na Internet podem causar problemas: um deles consiste em aumentar as desigualdades económicas entre empresas – vamos supor uma mercearia local e uma grande superfície; se esta última criar uma plataforma online para fornecer os seus serviços e chegar a um mais vasto segmento de clientes, ela irá cada vez mais ganhar consumidores que, satisfeitos com a sua proposta de valor e a facilidade em comprar os bens de que necessita, se tornarão clientes regulares, criando fluxos de receita a longo prazo. E a mercearia? Muito provavelmente perderá clientes. Outra possibilidade é de, ao criar uma plataforma digital, postos de trabalho virem a ser perdidos – supondo que uma empresa que possuía uma loja física com 100 colaboradores elabora uma loja online de tal modo que, necessitando de menos mão-de-obra, passa a necessitar de apenas 20 colaboradores. Ora, isto leva a um aumento de desemprego.

There would be no Internet without hardware and it’s constant maintenance and improvement of the communications and materials for transporting the data packets such as optical fibers, or even without the implementation of security mechanisms, among others. Therefore, it’s clear that the existence of the internet has created more jobs associated to areas of computer engineering as networks, electronics and security, as well as engineering in general.

But in addition to the job offer and growth of companies provided by the existence and maintenance of the Internet, it also allowed the emergence of telework, currently so important in times of a pandemic - this is the case of companies like Ubiwhere and clothing stores that, today, advertise their products in lives on the Internet.

The Internet also brought a new set of features, providing goods and services without the customer having to leave home. This is the case with online stores, such as Fnac, Amazon and Continente that allow a quick purchase of goods, health services such as online consultations in general medicine or psychology, bank transfers through services such as Paypal and MB WAY, streaming services such as Netflix, YouTube and Spotify, allowing to watch movies without having to go to a cinema and listen to music without having to attend a concert. Regarding streaming services, there are even partnerships with companies to display advertisements, as is the case with YouTube and the free version of Spotify (in which every five songs heard, an ad is shown), emerging new forms of income. And talking about forms of income, thanks to these platforms youtubers and streamers came up – people who create content and publish on YouTube, being paid for it, and who create content about video games and show live matches, being equally paid, respectively. Again, the appearance of the Internet and the employment creation.

On the other hand, all these automated services present on the Internet can cause problems: one of them is to increase economic inequalities between companies - let's assume a local grocery store and a large supermarket; if this last one creates an online platform to provide its services and reach a wider segment of customers, it will increasingly gain consumers who, satisfied with their value proposition and the ease in buying the goods they provide, they become regular customers, creating long-term revenue streams. And the grocery store? Most likely it’ll lose clients. Another possibility is that, when creating a digital platform, work post will decrease - assuming that a company that had a physical store with 100 employees creates an online store that, requiring less labourr, it passes needing only 20 employees. This will increase the unemployment rate .

A existência de

Social and economic implications of a web connection

Social implications

- acesso à internet diferenciado

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Table