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image caching"Image caching stores frequently used image files locally or on the server, reducing the time it takes to display them to returning visitors. Best [SEO Sydney Agency](#). This improves website performance, speeds up load times, and enhances the overall user experience."

image caching strategies"Image caching strategies involve storing image files on local devices or servers to reduce load times. Best [SEO Agency Sydney Australia](#). Proper caching ensures that frequently accessed images display quickly, improving performance and user satisfaction."

image captions"Image captions provide additional context for users and search engines. By including informative, keyword-rich captions, you enhance the user experience, improve engagement, and help your images rank better in search results."

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- [SEO consultants Sydney](#)
- [SEO content marketing](#)
- [SEO conversion optimization](#)
- [SEO copywriting](#)
- [SEO cost analysis](#)
- [SEO expert](#)

image CDN integration"Integrating a content delivery network (CDN) for images distributes image files across multiple servers, reducing latency and improving load times. This results in a smoother user experience and better search engine performance."

image color profilesEnsuring that image color profiles are consistent and web-friendly maintains visual quality across different devices. Best [Search Engine Optimisation Services](#). Proper color management improves user experience and ensures that images look as intended on all screens.

image compression"Image compression reduces file size without compromising quality, leading to faster page loading times. Smaller image files improve user experience, decrease bandwidth usage, and help maintain good search rankings."

SEO content marketing

image compression formatsChoosing the right compression formatsuch as lossless or lossyensures the best balance between quality and file size. Using efficient compression formats helps maintain image clarity while improving page load times.

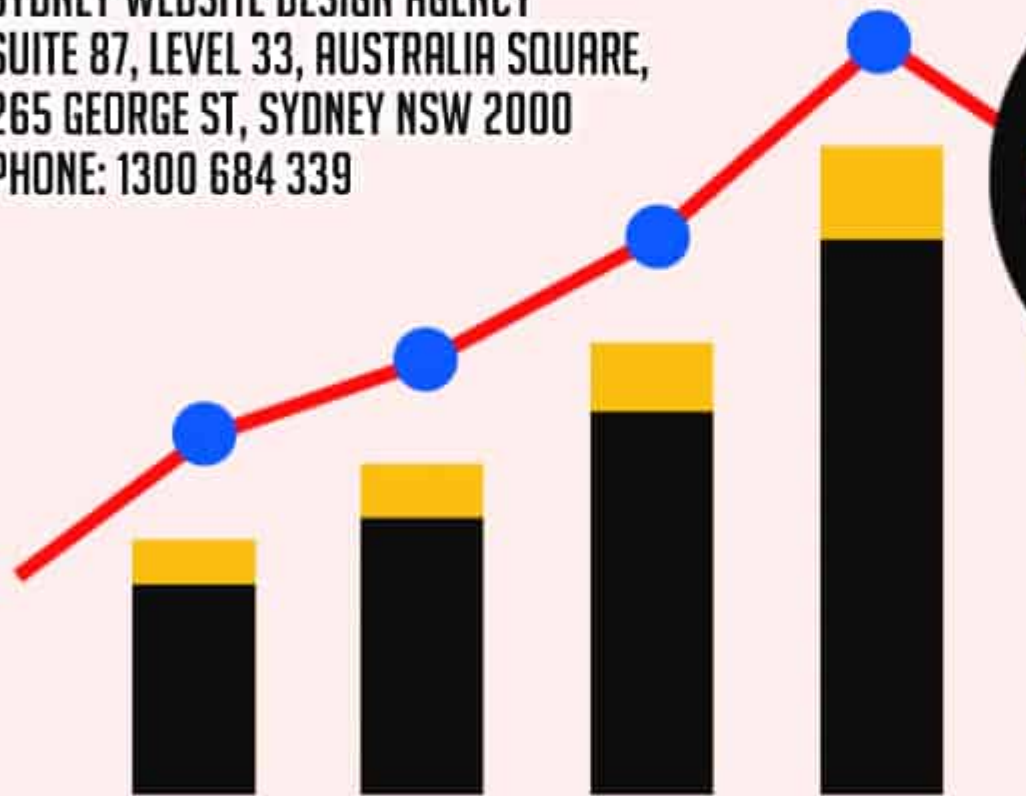
image content delivery networks"Using a content delivery network (CDN) to serve images reduces latency by delivering files from servers closer to the user. CDNs improve load times, enhance user experience, and help maintain good search rankings."

image display optimizations"Image display optimizations ensure that visuals render correctly across different browsers, devices, and resolutions. Proper display optimization enhances user experience, maintains quality, and improves overall site performance."

Best Local SEO Sydney.

HOW SEARCH ENGINE MARKETING HELPS BUSINESS GROW OVER TIME

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265 GEORGE ST, SYDNEY NSW 2000
PHONE: 1300 684 339





SEO conversion optimization

image editing for optimization"Image editing for optimization involves adjusting resolution, cropping unnecessary elements, and enhancing clarity. Proper editing improves visual appeal, reduces file size, and contributes to a faster-loading, more engaging website."

image file formats"Choosing the right image file formatsuch as JPEG, PNG, or WebPhelps balance quality and file size. Using efficient formats improves load times, maintains visual clarity, and contributes to a faster, more user-friendly website."

image folder structure"A well-organized image folder structure makes it easier to manage, update, and optimize images. SEO Packages Sydney . Clear naming and logical folder organization improve site maintenance and ensure that images remain accessible and properly indexed."

SEO with wordpress - Google Knowledge Panel

- Search intent signals
- Keyword cannibalization checks

SEO copywriting

image hosting performance"Image hosting performance measures the speed and reliability of the servers that deliver your images.

SEO with wordpress - Google Knowledge Panel

1. Rich result eligibility
2. SEO content strategies
3. Meta tags optimization

range of SEO Services and Australia . High-performing hosting solutions reduce load times, improve user experience, and help maintain strong search rankings."

image hosting solutionsChoosing the right image hosting solutionssuch as CDNs or dedicated image serversimproves load times and reliability. Better hosting reduces page load speeds and ensures a smoother browsing experience for users.

image link optimization"Optimizing image links involves ensuring that each image is correctly linked to relevant pages or media. Proper image linking improves navigation, enhances the user experience, and increases the value of your visual content."

KEY ADVANTAGES LOCAL SEO





SEO cost analysis

image load testing"Image load testing measures how quickly images appear on a website under different conditions. By conducting load tests, you identify opportunities to optimize image delivery, improve page speed, and enhance the overall user experience."

image load time improvements"Reducing image load times involves compressing files, using efficient formats, and implementing lazy loading. Faster image load times improve user experience, reduce bounce rates, and contribute to higher search rankings."

image metadata"Image metadata includes details like title, description, and keywords that provide context for search engines. Optimizing metadata helps improve image search visibility and makes it easier for users to find relevant images online."

SEO expert

image naming conventions"Using clear, descriptive file names for images makes it easier for search engines to understand the image content.

SEO with wordpress - Search intent signals

1. Google Knowledge Panel
2. Content authority signals

Naming conventions that include keywords help improve search visibility and attract more traffic to your site."

image optimization"Image optimization involves reducing file sizes, using descriptive file names, and adding alt text to improve search visibility. Optimized images load faster, enhance user experience, and help search engines understand the content, ultimately contributing to better rankings."

image optimization"Image optimization involves using descriptive file names, adding alt text, and reducing file sizes to enhance page load speed and accessibility. Optimized images improve user experience, boost page performance, and can contribute to better search engine rankings."



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About Google Maps



This article's **"criticism" or "controversy" section** may compromise the article's **neutrality**. Please help rewrite or integrate negative information to other sections **through discussion** on the **talk page**. *(June 2024)*

Google Maps

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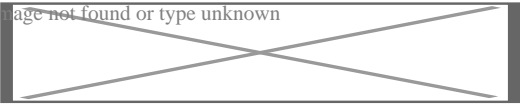
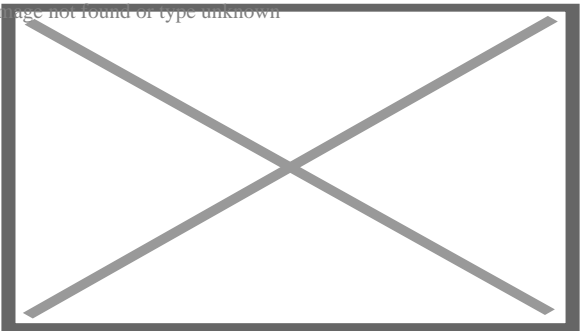


Image not found or type unknown



Screenshot of Google Maps in a web browser

Type of site
Available in

Web mapping
74 languages

List of languages

Afrikaans, Azerbaijani, Indonesian, Malay, Bosnian, Catalan, Czech, Danish, German (Germany), Estonian, English (United States), Spanish (Spain), Spanish (Latin America), Basque, Filipino, French (France), Galician, Croatian, Zulu, Icelandic, Italian, Swahili, Latvian, Lithuanian, Hungarian, Dutch, Norwegian, Uzbek, Polish, Portuguese (Brazil), Portuguese (Portugal), Romanian, Albanian, Slovak, Slovenian, Finnish, Swedish, Vietnamese, Turkish, Greek, Bulgarian, Kyrgyz, Kazakh, Macedonian, Mongolian, Russian, Serbian, Ukrainian, Georgian, Armenian, Hebrew, Urdu, Arabic, Persian, Amharic, Nepali, Hindi, Marathi, Bengali, Punjabi, Gujarati, Tamil, Telugu, Kannada, Malayalam, Sinhala, Thai, Lao, Burmese, Khmer, Korean, Japanese, Simplified Chinese, Traditional Chinese

Owner
URL
Commercial
Registration
Launched
Current status
Written in

Google
google.com/maps  [Edit this at Wikidata](#)
Yes
Optional, included with a **Google Account**
February 8, 2005; 20 years ago
Active
C++ (back-end), **JavaScript**, **XML**, **Ajax** (UI)

Google Maps is a **web mapping** platform and consumer application offered by **Google**. It offers **satellite imagery**, **aerial photography**, street maps, 360° **interactive panoramic** views of streets (**Street View**), real-time traffic conditions, and **route planning** for traveling by foot, car, bike, air (in **beta**) and **public transportation**. As of 2020, Google Maps was being used by over one billion people every month around the world.^[1]

Google Maps began as a **C++** desktop program developed by brothers **Lars** and **Jens Rasmussen** in Australia at Where 2 Technologies. In October 2004, the company was acquired by Google, which converted it into a web application. After additional acquisitions of a geospatial data visualization company and a real-time traffic analyzer, Google Maps was launched in February 2005.[2] The service's **front end** utilizes **JavaScript**, **XML**, and **Ajax**. Google Maps offers an **API** that allows maps to be embedded on third-party websites,[3] and offers a locator for businesses and other organizations in numerous countries around the world. **Google Map Maker** allowed users to collaboratively expand and update the service's mapping worldwide but was discontinued from March 2017. However, crowdsourced contributions to Google Maps were not discontinued as the company announced those features would be transferred to the Google Local Guides program,[4] although users that are not Local Guides can still contribute.

Google Maps' satellite view is a "top-down" or **bird's-eye view**; most of the high-resolution imagery of cities is aerial photography taken from aircraft flying at 800 to 1,500 feet (240 to 460 m), while most other imagery is from satellites.[5] Much of the available satellite imagery is no more than three years old and is updated on a regular basis, according to a 2011 report.[6] Google Maps previously used **a variant** of the **Mercator projection**, and therefore could not accurately show areas around the poles.[7] In August 2018, the desktop version of Google Maps was updated to show a 3D globe. It is still possible to switch back to the 2D map in the settings.

Google Maps for mobile devices was first released in 2006; the latest versions feature **GPS turn-by-turn navigation** along with dedicated **parking** assistance features. By 2013, it was found to be the world's most popular **smartphone** app, with over 54% of global smartphone owners using it.[8] In 2017, the app was reported to have two billion users on Android, along with several other Google services including **YouTube**, **Chrome**, **Gmail**, **Search**, and **Google Play**.

History

[[edit](#)]

Acquisitions

[[edit](#)]

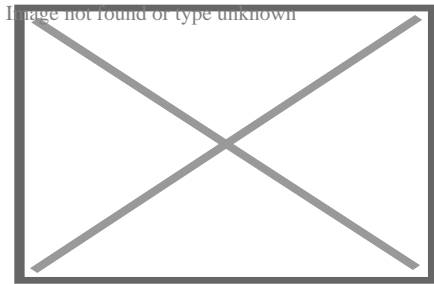
Google Maps first started as a **C++** program designed by two Danish brothers, **Lars** and **Jens Eilstrup Rasmussen**, and Noel Gordon and Stephen Ma, at the Sydney-based company Where 2 Technologies, which was founded in early 2003. The program was initially designed to be separately downloaded by users, but the company later pitched the idea for a purely Web-based product to Google management, changing the method of distribution.[9] In October 2004, the company was acquired by Google Inc.[10] where it transformed into the web application Google Maps. The Rasmussen brothers, Gordon and Ma joined Google at that time.

In the same month, Google acquired **Keyhole**, a geospatial data visualization company (with investment from the **CIA**), whose marquee application suite, Earth Viewer, emerged as the

Google Earth application in 2005 while other aspects of its core technology were integrated into Google Maps.[11] In September 2004, Google acquired ZipDash, a company that provided real-time traffic analysis.[12]

2005–2010

[edit]

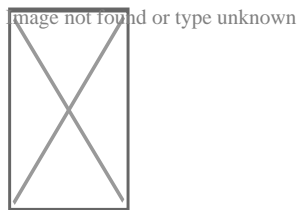


Google Maps Beta in 2005

The launch of Google Maps was first announced on the Google Blog on February 8, 2005.[13]

In September 2005, in the aftermath of Hurricane Katrina, Google Maps quickly updated its satellite imagery of New Orleans to allow users to view the extent of the flooding in various parts of that city.[14][15]

As of 2007, Google Maps was equipped with a miniature view with a draggable rectangle that denotes the area shown in the main viewport, and "Info windows" for previewing details about locations on maps.[16] As of 2024, this feature had been removed (likely several years prior).



Original Google Maps icon

On November 28, 2007, Google Maps for Mobile 2.0 was released.[17][18][19] It featured a beta version of a "My Location" feature, which uses the GPS / Assisted GPS location of the mobile device, if available, supplemented by determining the nearest wireless networks and cell sites.[18][19] The software looks up the location of the cell site using a database of known wireless networks and sites.[20][21] By triangulating the different signal strengths from cell transmitters and then using their location property (retrieved from the database), My Location determines the user's current location.[22]

On September 23, 2008, coinciding with the announcement of the first commercial Android device, Google announced that a Google Maps app had been released for its Android operating system. [

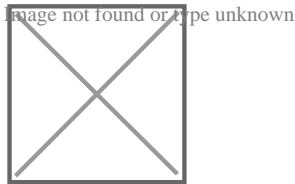
23][24]

In October 2009, Google replaced **Tele Atlas** as their primary supplier of geospatial data in the US version of Maps and used their own data.[25]

2011–2015

[edit]

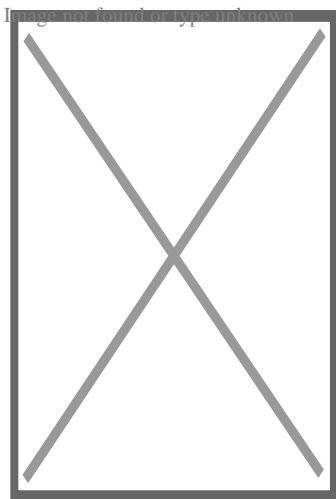
On April 19, 2011, Map Maker was added to the American version of Google Maps, allowing any viewer to edit and add changes to Google Maps. This provides Google with local map updates almost in real-time instead of waiting for digital map data companies to release more infrequent updates.



Icon used from 2015 to 2020

On January 31, 2012, Google, due to offering its Maps for free, was found guilty of abusing the dominant position of its Google Maps application and ordered by a court to pay a fine and damages to Bottin Cartographer, a French mapping company.[26] This ruling was overturned on appeal.[27]

In June 2012, Google started mapping the UK's rivers and canals in partnership with the **Canal and River Trust**. The company has stated that "it would update the program during the year to allow users to plan trips which include locks, bridges and towpaths along the 2,000 miles of river paths in the UK." [28]



A monument in the shape of a [Google Maps pin](#) in the center of the city of [Szczecin](#), Poland

In December 2012, the Google Maps application was separately made available in the App Store, after Apple removed it from its default installation of the mobile operating system version [iOS 6](#) in September 2012.[\[29\]](#)

On January 29, 2013, Google Maps was updated to include a map of [North Korea](#).[\[30\]](#) As of May 3, 2013, Google Maps recognizes [Palestine](#) as a country, instead of redirecting to the [Palestinian territories](#).[\[31\]](#)

In August 2013, Google Maps removed the Wikipedia Layer, which provided links to Wikipedia content about locations shown in Google Maps using [Wikipedia geocodes](#).[\[32\]](#)

On April 12, 2014, Google Maps was updated to reflect the [annexation of Ukrainian Crimea by Russia](#). Crimea is shown as the [Republic of Crimea](#) in Russia and as the [Autonomous Republic of Crimea](#) in Ukraine. All other versions show a dotted disputed border.[\[33\]](#)

In April 2015, on a map near the Pakistani city of Rawalpindi, the imagery of the Android logo urinating on the Apple logo was added via Map Maker and appeared on Google Maps. The [vandalism](#) was soon removed and Google publicly apologized.[\[34\]](#) However, as a result, Google disabled user moderation on Map Maker, and on May 12, disabled editing worldwide until it could devise a new policy for approving edits and avoiding vandalism.[\[35\]](#)

On April 29, 2015, users of the classic Google Maps were forwarded to the new Google Maps with the option to be removed from the interface.[\[36\]](#)

On July 14, 2015, the Chinese name for [Scarborough Shoal](#) was removed after a petition from the [Philippines](#) was posted on [Change.org](#).[\[37\]](#)

2016–2018

[\[edit\]](#)

On June 27, 2016, Google rolled out new satellite imagery worldwide sourced from [Landsat 8](#), comprising over 700 trillion pixels of new data.[\[38\]](#) In September 2016, Google Maps acquired mapping analytics startup Urban Engines.[\[39\]](#)

In 2016, the Government of South Korea offered Google conditional access to the country's geographic database – access that already allows indigenous Korean mapping providers high-detail maps. Google declined the offer, as it was unwilling to accept restrictions on reducing the quality around locations the South Korean Government felt were sensitive (see [restrictions on geographic data in South Korea](#)).[\[40\]](#)

On October 16, 2017, Google Maps was updated with accessible imagery of several planets and moons such as **Titan**, **Mercury**, and **Venus**, as well as direct access to imagery of the **Moon** and **Mars**.^{[41][42]}

In May 2018, Google announced major changes to the API structure starting June 11, 2018. This change consolidated the 18 different endpoints into three services and merged the basic and premium plans into one pay-as-you-go plan.^[43] This meant a 1400% price raise for users on the basic plan, with only six weeks of notice. This caused a harsh reaction within the developers community.^[44] In June, Google postponed the change date to July 16, 2018.

In August 2018, Google Maps designed its overall view (when zoomed out completely) into a **3D** globe dropping the **Mercator projection** that projected the planet onto a flat surface.^[45]

2019–present

^[edit]

Google Maps icon 2020

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2020 icon redesign

In January 2019, Google Maps added speed trap and **speed camera** alerts as reported by other users.^{[46][47]}

On October 17, 2019, Google Maps was updated to include incident reporting, resembling a functionality in **Waze** which was acquired by Google in 2013.^[48]

In December 2019, Incognito mode was added, allowing users to enter destinations without saving entries to their Google accounts.^[49]

In February 2020, Maps received a 15th anniversary redesign.^[50] It notably added a brand-new app icon, which now resembles the original icon in 2005.

On September 23, 2020, Google announced a COVID-19 Layer update for Google maps, which is designed to offer a seven-day average data of the total COVID-19-positive cases per 100,000 people in the area selected on the map. It also features a label indicating the rise and fall in the number of cases.^[51]

In January 2021, Google announced that it would be launching a new feature displaying COVID-19 vaccination sites.^[52]

In January 2021, Google announced updates to the route planner that would accommodate drivers of electric vehicles. Routing would take into account the type of vehicle, vehicle status including current charge, and the locations of charging stations.^[53]

In June 2022, Google Maps added a layer displaying air quality for certain countries.^[54]

In September 2022, Google removed the COVID-19 Layer from Google Maps due to lack of usage of the feature.^[55]

Functionality

^[edit]

Directions and transit

^[edit]

Google Maps provides a **route planner**,^[56] allowing users to find available directions through driving, public transportation, walking, or biking.^[57] Google has partnered globally with over 800 public transportation providers to adopt **GTFS** (General Transit Feed Specification), making the data available to third parties.^{[58][59]} The app can indicate users' transit route, thanks to an October 2019 update. The incognito mode, eyes-free walking navigation features were released earlier.^[60] A July 2020 update provided bike share routes.^[61]

In February 2024, Google Maps started rolling out glanceable directions for its Android and iOS apps. The feature allows users to track their journey from their device's **lock screen**.^{[62][63]}

Traffic conditions

^[edit]

Screenshot of Google Maps with traffic option enabled

Image not found or type unknown

Screenshot of Google Maps with traffic option enabled

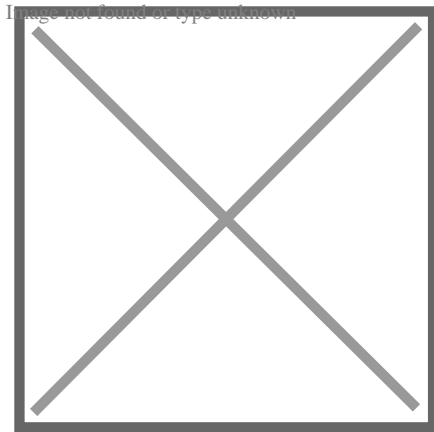
In 2007, Google began offering traffic data as a colored overlay on top of roads and motorways to represent the speed of vehicles on particular roads. **Crowdsourcing** is used to obtain the GPS-determined locations of a large number of cellphone users, from which live traffic maps are produced.^{[64][65][66]}

Google has stated that the speed and location information it collects to calculate traffic conditions is anonymous.^[67] Options available in each phone's settings allow users not to share information about their location with Google Maps.^[68] Google stated, "Once you disable or opt out of My Location, Maps will not continue to send radio information back to Google servers to determine your handset's approximate location".^[69]^{*failed verification*}

Street View

^[edit]

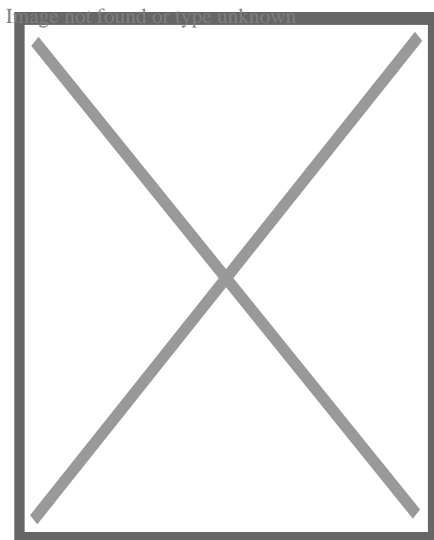
Main article: [Google Street View](#)



A Google Maps car at [Googleplex](#), [Mountain View](#)

On May 25, 2007, Google released [Google Street View](#), a feature of Google Maps providing [360°](#) panoramic street-level views of various locations. On the date of release, the feature only included five cities in the U.S. It has since expanded to thousands of locations around the world. In July 2009, Google began mapping college campuses and surrounding paths and [trails](#).

Street View garnered much controversy after its release because of [privacy concerns](#) about the uncensored nature of the panoramic photographs, although the views are only taken on public streets.^[70]^[71] Since then, Google has blurred faces and license plates through automated [facial recognition](#).^[72]^[73]^[74]



Google Maps Street View Trekker backpack being implemented on the sidewalk of the Hudson River Greenway in New York City

In late 2014, Google launched Google Underwater Street View, including 2,300 kilometres (1,400 mi) of the Australian [Great Barrier Reef](#) in 3D. The images are taken by special cameras which turn 360 degrees and take shots every 3 seconds.^[75]

In 2017, in both Google Maps and Google Earth, Street View navigation of the [International Space Station](#) interior spaces became available.

3D imagery

[\[edit\]](#)

Main article: [Google Earth § 3D imagery](#)

Google Maps has incorporated^[*when?*] 3D models of hundreds of cities in over 40 countries from Google Earth into its satellite view. The models were developed using aerial [photogrammetry](#) techniques.^{[76][77]}

Immersive View

[\[edit\]](#)

At the [I/O 2022](#) event, Google announced Immersive View, a feature of Google Maps which would involve composite 3D images generated from [Street View](#) and aerial images of locations using AI, complete with synchronous information. It was to be initially in five cities worldwide, with plans to add it to other cities later on.^[78] The feature was previewed in September 2022 with 250 photorealistic aerial 3D images of landmarks,^[79] and was full launched in February 2023.^[80] An expansion of Immersive View to routes was announced at Google I/O 2023,^[81] and was launched in October 2023 for 15 cities globally.^[82]

The feature uses [predictive modelling](#) and [neural radiance fields](#) to scan Street View and aerial images to generate composite 3D imagery of locations, including both exteriors and interiors, and routes, including driving, walking or cycling, as well as generate synchronous information and forecasts up to a month ahead from historical and environmental data about both such as weather, traffic and busyness.

Immersive View has been available in the following locations:^[*citation needed*]

Locations with Immersive View

Country	Locations
 Argentina	Buenos Aires

	Australia	Melbourne, Sydney
	Austria	Vienna
	Belgium	Brussels
	Brazil	Brasília, Rio de Janeiro, São Paulo
	Canada	Calgary, Edmonton, Montreal, Ottawa, Toronto, Vancouver
	Chile	Santiago
	Czech Republic	Prague
	France	Nice, Paris
	Germany	Berlin, Cologne, Frankfurt, Munich
	Greece	Athens
	Hong Kong	Hong Kong
	Hungary	Budapest
	Italy	Florence, Milan, Rome, Venice
	Japan	Kyoto, Nagoya, Osaka, Tokyo
	Mexico	Guadalajara, Mexico City
	Netherlands	Amsterdam
	Norway	Oslo
	Poland	Warsaw
	Portugal	Lisbon, Porto
	Romania	Bucharest
	Singapore	Singapore
	South Africa	Cape Town, Johannesburg
	Spain	Barcelona, Madrid
	Sweden	Stockholm
	Switzerland	Zurich
	Taiwan	Taichung, Taipei
	United Kingdom	Edinburgh, London
	United States	Atlanta, Boston, Chicago, Detroit, Houston, Las Vegas, Los Angeles, Miami, New York City, Philadelphia, San Diego, San Francisco, Seattle
	Vatican City	Vatican City

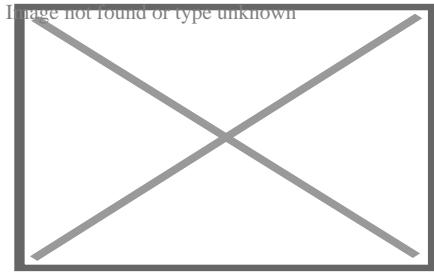
Landmark Icons

[[edit](#)]

Google added icons of city attractions, in a similar style to [Apple Maps](#), on October 3, 2019. In the first stage, such icons were added to 9 cities.^[83]

45° imagery

[\[edit\]](#)



An example of the [Leaning Tower of Pisa](#) in the 45° view

In December 2009, Google introduced a new view consisting of 45° angle aerial imagery, offering a "[bird's-eye view](#)" of cities. The first cities available were [San Jose](#) and San Diego. This feature was initially available only to developers via the Google Maps API.^[84] In February 2010, it was introduced as an experimental feature in Google Maps Labs.^[85] In July 2010, 45° imagery was made available in Google Maps in select cities in South Africa, the United States, Germany and Italy.^[86]

Weather

[\[edit\]](#)

In February 2024, Google Maps incorporated a small weather icon on the top left corner of the Android and iOS mobile apps, giving access to weather and [air quality index](#) details.^[87]

Lens in Maps

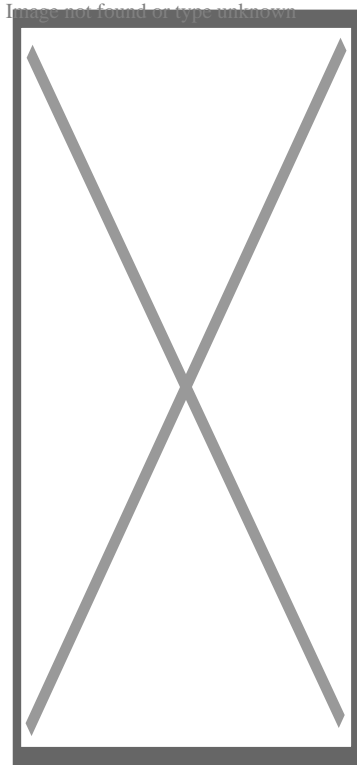
[\[edit\]](#)

Previously called Search with Live View, Lens In Maps identifies shops, restaurants, transit stations and other street features with a phone's camera and places relevant information and a category pin on top, like closing/opening times, current busyness, pricing and reviews using AI and [augmented reality](#). The feature, if available on the device, can be accessed through tapping the Lens icon in the search bar. It was expanded to 50 new cities in October 2023 in its biggest

expansion yet, after initially being released in late 2022 in Los Angeles, San Francisco, New York, London, and Paris.[88][89] Lens in Maps shares features with Live View, which also displays information relating to street features while guiding a user to a selected destination with virtual arrows, signs and guidance.[90]

Business listings

[[edit](#)]



A business listing in Google Maps showing opening times, reviews and photos. This screenshot is from the Android mobile app.

Google collates business listings from multiple on-line and off-line sources. To reduce duplication in the index, Google's algorithm combines listings automatically based on address, phone number, or geocode,[91] but sometimes information for separate businesses will be inadvertently merged with each other, resulting in listings inaccurately incorporating elements from multiple businesses.[92] Google allows business owners to create and verify their own business data through *Google Business Profile* (*GBP*), formerly *Google My Business* (*GMB*).[93] Owners are encouraged to provide Google with business information including address, phone number, business category, and photos.[94] Google has staff in India who check and correct listings remotely as well as support businesses with issues.[95] Google also has teams on the ground in most countries that validate physical addresses in person.[96] In May 2024, Google announced it would discontinue the chat feature in Google Business Profile. Starting July 15, 2024, new chat conversations would be disabled, and by July 31, 2024, all chat functionalities would end.[97]

Google Maps can be manipulated by businesses that are not physically located in the area in which they record a listing. There are cases of people abusing Google Maps to overtake their competition by placing unverified listings on online directory sites, knowing the information will roll across to Google (duplicate sites). The people who update these listings do not use a registered business name. They place keywords and location details on their Google Maps business title, which can overtake credible business listings. In Australia in particular, genuine companies and businesses are noticing a trend of fake business listings in a variety of industries.^[98]

Genuine business owners can also optimize their business listings to gain greater visibility in Google Maps, through a type of search engine marketing called [local search engine optimization](#).^[99]

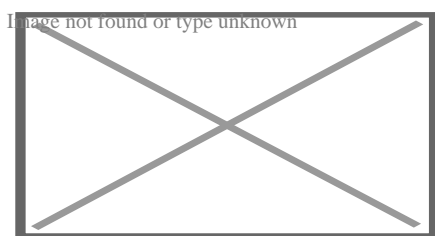
Indoor maps

[\[edit\]](#)

In March 2011, indoor maps were added to Google Maps, giving users the ability to navigate themselves within buildings such as [airports](#), [museums](#), shopping malls, [big-box stores](#), universities, [transit stations](#), and other public spaces (including underground facilities). Google encourages owners of public facilities to submit floor plans of their buildings in order to add them to the service.^[100] Map users can view different floors of a building or [subway station](#) by clicking on a level selector that is displayed near any structures which are mapped on multiple levels.

My Maps

[\[edit\]](#)



Google My Maps

My Maps is a feature in Google Maps launched in April 2007 that enables users to create custom maps for personal use or sharing. Users can add points, lines, shapes, notes and images on top of Google Maps using a [WYSIWYG](#) editor.^[101] An Android app for My Maps, initially released in March 2013 under the name Google Maps Engine Lite, was available until its removal from the [Play Store](#) in October 2021.^{[102][103][104]}

Google Local Guides

[\[edit\]](#)

Google Local Guides is a volunteer program launched by Google Maps^[105] to enable users to contribute to Google Maps when registered. It sometimes provides them additional perks and benefits for their collaboration. Users can achieve Level 1 to 10, and be awarded with badges. The program is partially a successor to [Google Map Maker](#) as features from the former program became integrated into the website and app.^[106]

The program consists of adding reviews, photos, basic information, and videos; and correcting information such as [wheelchair accessibility](#).^{[107][108]} Adding reviews, photos, videos, new places, new roads or providing useful information gives points to the users.^[109] The level of users is upgraded when they get a certain amount of points.^{[110][111]} Starting with Level 4, a star is shown near the avatar of the user.^[111]

Timelapse

[\[edit\]](#)

Earth Timelapse, released in April 2021, is a program in which users can see how the earth has been changed in the last 37 years. They combined the 15 million satellite images (roughly ten quadrillion [pixels](#)) to create the 35 global cloud-free Images for this program.^[112]

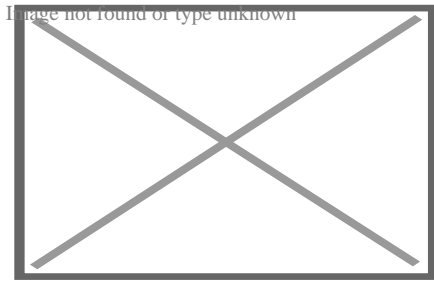
Timeline

[\[edit\]](#)

If a user shares their location with Google, Timeline summarises this location for each day on a [Timeline map](#).^[113] Timeline estimates the mode of travel used to move between places and will also show photos taken at that location. In June 2024, Google started progressively removing access to the timeline on web browsers, with the information instead being stored on a local device.^{[114][115]}

Implementation

[\[edit\]](#)



A split-view screenshot of Google Maps. In the bottom half *Street Maps* is shown, while in the top half *Street View* is shown. A user can zoom in and out of either of them independently of the zoom level of each.

As the user drags the map, the grid squares are downloaded from the server and inserted into the page. When a user searches for a business, the results are downloaded in the background for insertion into the side panel and map; the page is not reloaded. A hidden [iframe](#) with form submission is used because it preserves browser history. Like many other Google web applications, Google Maps uses [JavaScript](#) extensively.^[116] The site also uses protocol buffers for data transfer rather than [JSON](#), for performance reasons.

The version of [Google Street View](#) for classic Google Maps required [Adobe Flash](#).^[117] In October 2011, Google announced MapsGL, a [WebGL](#) version of Maps with better renderings and smoother transitions.^[118] Indoor maps use JPG, .PNG, .PDF, .BMP, or .GIF, for [floor plans](#).^[119]

Users who are logged into a [Google Account](#) can save locations so that they are overlaid on the map with various colored "pins" whenever they browse the application. These "Saved places" can be organized into default groups or user named groups and shared with other users. "Starred places" is one default group example. It previously automatically created a record within the now-discontinued product [Google Bookmarks](#).

Map data and imagery

[[edit](#)]

See also: [List of satellite map images with missing or unclear data](#)

The Google Maps terms and conditions^[120] state that usage of material from Google Maps is regulated by Google Terms of Service^[121] and some additional restrictions. Google has either purchased local map data from established companies, or has entered into lease agreements to use copyrighted map data.^[122] The owner of the copyright is listed at the bottom of zoomed maps. For example, street maps in Japan are leased from [Zenrin](#). Street maps in China are leased from [AutoNavi](#).^[123] Russian street maps are leased from Geocentre Consulting and [Tele Atlas](#). Data for [North Korea](#) is sourced from the companion project [Google Map Maker](#).

Street map overlays, in some areas, may not match up precisely with the corresponding satellite images. The street data may be entirely erroneous, or simply out of date: "The biggest challenge is the currency of data, the authenticity of data," said Google Earth representative [Brian](#)

McClendon. As a result, in March 2008 Google added a feature to edit the locations of houses and businesses.[124][125]

Restrictions have been placed on Google Maps through the apparent censoring of locations deemed potential security threats. In some cases the area of redaction is for specific buildings, but in other cases, such as Washington, D.C.,[126] the restriction is to use outdated imagery.

Google Maps API

[edit]

Google Maps API, now called Google Maps Platform, hosts about 17 different APIs, which are themed under the following categories: Maps, Places and Routes.[127]

After the success of reverse-engineered mashups such as [chicagocrime.org](#) and [housingmaps.com](#), Google launched the Google Maps API in June 2005[128] to allow developers to integrate Google Maps into their websites. It was a free service that did not require an API key until June 2018 (changes went into effect on July 16), when it was announced that an API key linked to a Google Cloud account with billing enabled would be required to access the API.[129] The API currently does not contain ads, but Google states in their terms of use that they reserve the right to display ads in the future.[130]

By using the Google Maps API, it is possible to embed Google Maps into an external website, onto which site-specific data can be overlaid.[131] Although initially only a JavaScript API, the Maps API was expanded to include an API for Adobe Flash applications (but this has been deprecated), a service for retrieving static map images, and web services for performing geocoding, generating driving directions, and obtaining elevation profiles. Over 1,000,000[132] web sites use the Google Maps API, making it the most heavily used web application development API.[133] In September 2011, Google announced it would deprecate the Google Maps API for Flash.[134]

The Google Maps API was free for commercial use, provided that the site on which it is being used is publicly accessible and did not charge for access, and was not generating more than 25,000 map accesses a day.[135][136] Sites that did not meet these requirements could purchase the Google Maps API for Business.[137]

As of June 21, 2018, Google increased the prices of the Maps API and requires a billing profile.[138]

Google Maps in China

[edit]

Due to [restrictions on geographic data in China](#), Google Maps must partner with a Chinese digital map provider in order to legally show Chinese map data. Since 2006, this partner has been [AutoNavi](#).^[123]

Within China, the State Council mandates that all maps of China use the [GCJ-02](#) coordinate system, which is offset from the [WGS-84](#) system used in most of the world. [google.cn/maps](#) (formerly Google Ditu) uses the GCJ-02 system for both its street maps^[139] and satellite imagery.^[140] [google.com/maps](#) also uses GCJ-02 data for the street map, but uses WGS-84 coordinates for satellite imagery,^[141] causing the so-called [China GPS shift problem](#).

Frontier alignments also present some differences between [google.cn/maps](#) and [google.com/maps](#). On the latter, sections of the Chinese border with India and Pakistan are shown with dotted lines, indicating areas or frontiers in dispute. However, [google.cn](#) shows the Chinese frontier strictly according to Chinese claims with no dotted lines indicating the border with India and Pakistan. For example, the [South Tibet](#) region claimed by China but administered by India as a large part of [Arunachal Pradesh](#) is shown inside the Chinese frontier by [google.cn](#), with Indian highways ending abruptly at the Chinese claim line. [Google.cn](#) also shows Taiwan and the [South China Sea Islands](#) as part of China. Google Ditu's street map coverage of Taiwan no longer omits major state organs, such as the Presidential Palace, the [five Yuans](#), and the Supreme Court.^[142]^{[[addition needed](#)]}

Feature-wise, [google.cn/maps](#) does not feature My Maps. On the other hand, while [google.cn](#) displays virtually all text in Chinese, [google.com/maps](#) displays most text (user-selectable real text as well as those on map) in English.^{[[citation needed](#)]} This behavior of displaying English text is not consistent but intermittent – sometimes it is in English, sometimes it is in Chinese. The criteria for choosing which language is displayed are not known publicly.^{[[citation needed](#)]}

Criticism and controversies

[edit]

Incorrect location naming

[edit]

There are cases where Google Maps had added out-of-date neighborhood monikers. Thus, in Los Angeles, the name "Brooklyn Heights" was revived from its 1870s usage^[143] and "Silver Lake Heights" from its 1920s usage,^[144] or mistakenly renamed areas (in Detroit, the neighborhood "Fiskhorn" became "Fishkorn").^[145] Because many companies utilize Google Maps data, these previously obscure or incorrect names then gain traction; the names are often used by [realtors](#), hotels, [food delivery](#) sites, [dating sites](#), and [news organizations](#).

Google has said it created its maps from third-party data, public sources, satellites, and users, but many names used have not been connected to any official record.^{[143][145]} According to a former Google Maps employee (who was not authorized to speak publicly), users can submit changes to Google Maps, but some submissions are ruled upon by people with little local knowledge of a place, such as contractors in India. Critics maintain that names like "BoCoCa" (for the area in Brooklyn between Boerum Hill, Cobble Hill and Carroll Gardens), are "just plain puzzling" or simply made up.^[145] Some names used by Google have been traced to non-professionally made maps with typographical errors that survived on Google Maps.^[145]

Potential misuse

[edit]

See also: [Google Street View privacy concerns](#) and [List of satellite map images with missing or unclear data](#)

In 2005 the [Australian Nuclear Science and Technology Organisation](#) (ANSTO) complained about the potential for terrorists to use the satellite images in planning attacks, with specific reference to the [Lucas Heights nuclear reactor](#); however, the Australian Federal government did not support the organization's concern. At the time of the ANSTO complaint, Google had colored over some areas for security (mostly in the U.S.), such as the rooftop of the [White House](#) and several other Washington, D.C. buildings.^{[146][147][148]}

In October 2010, Nicaraguan military commander [Edén Pastora](#) stationed [Nicaraguan troops](#) on the [Isla Calero](#) (in the delta of the [San Juan River](#)), justifying his action on the border delineation given by Google Maps. Google has since updated its data which it found to be incorrect.^[149]

On January 27, 2014, documents leaked by [Edward Snowden](#) revealed that the [NSA](#) and the [GCHQ](#) intercepted Google Maps queries made on smartphones, and used them to locate the users making these queries. One leaked document, dating to 2008, stated that "[i]t effectively means that anyone using Google Maps on a smartphone is working in support of a GCHQ system."^[150]

In May 2015, searches on Google Maps for offensive racial epithets for African Americans such as "[nigger](#)", "nigger king", and "nigger house" pointed the user to the [White House](#); Google apologized for the incident.^{[151][152]}

In December 2015, 3 Japanese [netizens](#) were charged with vandalism after they were found to have added an unrelated law firm's name as well as indecent names to locations such as "[Nuclear test site](#)" to the [Atomic Bomb Dome](#) and "Izumo [Satya](#)" to the [Izumo Taisha](#).^{[153][154]}

In February 2020, the artist Simon Weckert^[155] used 99 cell phones to fake a Google Maps traffic jam.^[156]

In September 2024, several schools in Taiwan and Hong Kong were altered to incorrect labels, such as "[psychiatric hospitals](#)" or "[prisons](#)". Initially, it was believed to be the result of hacker attacks. However, police later revealed that local students had carried out the prank. Google quickly corrected the mislabeled entries. Education officials in Taiwan and Hong Kong expressed concern over the incident.^{[157][158][159]}

Misdirection incidents

[\[edit\]](#)

Australia

[\[edit\]](#)

In August 2023, a woman driving from [Alice Springs](#) to the Harts Range Racecourse was stranded in the Central Australian desert for a night after following directions provided by Google Maps.^{[160][161]} She later discovered that Google Maps was providing directions for the actual [Harts Range](#) instead of the rodeo. Google said it was looking into the naming of the two locations and consulting with "local and authoritative sources" to solve the issue.^[160]

In February 2024, two German tourists were stranded for a week after Google Maps directed them to follow a dirt track through [Oyala Thumotang National Park](#) and their vehicle became trapped in mud.^{[162][163]} [Queensland Parks and Wildlife Service](#) ranger Roger James said, "People should not trust Google Maps when they're travelling in remote regions of [Queensland](#), and they need to follow the signs, use official maps or other navigational devices."^[162]

North America

[\[edit\]](#)

In June 2019, Google Maps provided nearly 100 [Colorado](#) drivers an alternative route that led to a dirt road after a crash occurred on [Peña Boulevard](#). The road had been turned to mud by rain, resulting in nearly 100 vehicles being trapped.^{[164][161]} Google said in a statement, "While we always work to provide the best directions, issues can arise due to unforeseen circumstances such as weather. We encourage all drivers to follow local laws, stay attentive, and use their best judgment while driving."^[164]

In September 2023, Google was sued by a [North Carolina](#) resident who alleged that Google Maps had directed her husband over the Snow Creek Bridge in [Hickory](#) the year prior, resulting in him drowning. According to the lawsuit, multiple people had notified Google about the state of the bridge, which collapsed in 2013, but Google had not updated the route information and continued to direct users over the bridge.^{[165][166][161]} At the time of the man's death, the barriers placed

to block access to the bridge had been vandalized.[167][168]

In November 2023, a hiker was rescued by helicopter on the backside of **Mount Fromme** in **Vancouver**. **North Shore Rescue** stated on its Facebook page that the hiker had followed a non-existent hiking trail on Google Maps. This was also the second hiker in two months to require rescuing after following the same trail. The fake trail has since been removed from the app.[169][170]

Also in November 2023, Google apologized after users were directed through desert roads after parts of **Interstate 15** were closed due to a **dust storm**.^[171] Drivers became stranded after following the suggested detour route, which was a "bumpy dirt trail".^[172] Following the incident, Google stated that Google Maps would "no longer route drivers traveling between **Las Vegas** and **Barstow** down through those roads."^[171]

Russia

[edit]

In 2020, a teenage motorist was found frozen to death while his passenger was still alive but suffered from severe **frostbite** after using Google Maps, which had led them to a shorter but abandoned section of the **R504 Kolyma Highway**, where their **Toyota Chaser** became disabled.[173]

India

[edit]

In 2024, three men from **Uttar Pradesh** died after their car fell from an under-construction bridge. They were using Google Maps for driving which misdirected them and the car fell into the **Ramganga** river.[174][175]

Renaming of the Gulf of Mexico

[edit]

In February 2025, as a response to Donald Trump's **Executive Order 14172**, the **Gulf of Mexico** was renamed to "Gulf of America" for US users and "Gulf of Mexico (Gulf of America)" elsewhere, except for Mexico itself where it remained the Gulf of Mexico. The decision received criticism, with Mexican president **Claudia Sheinbaum** asking Google to reconsider its decision.^[176] Google subsequently blocked and deleted negative reviews of the gulf after the name change occurred.[177][178]

Discontinued features

[[edit](#)]

Google Latitude

[[edit](#)]

Main article: [Google Latitude](#)

Google Latitude was a feature that let users share their physical locations with other people. This service was based on Google Maps, specifically on mobile devices. There was an iGoogle widget for desktops and laptops as well.^[179] Some concerns were expressed about the privacy issues raised by the use of the service.^[180] On August 9, 2013, this service was discontinued,^[181] and on March 22, 2017, Google incorporated the features from Latitude into the Google Maps app.^[182]

Google Map Maker

[[edit](#)]

Main article: [Google Map Maker](#)

In areas where Google Map Maker was available, for example, much of Asia, Africa, Latin America and Europe as well as the United States and Canada, anyone who logged into their Google account could directly improve the map by fixing incorrect driving directions, adding biking trails, or adding a missing building or road. General map errors in Australia, Austria, Belgium, Denmark, France, Liechtenstein, Netherlands, New Zealand, Norway, South Africa, Switzerland, and the United States could be reported using the Report a Problem link in Google Maps and would be updated by Google.^[183] For areas where Google used [Tele Atlas](#) data, map errors could be reported using Tele Atlas map insight.^[184]

If imagery was missing, outdated, misaligned, or generally incorrect, one could notify Google through their contact request form.^[185]

In November 2016, Google announced the discontinuation of Google Map Maker as of March 2017.^[186]

Mobile app

[[edit](#)]

Screenshot

Image not found or type violation



	Screenshot of Google Maps on Android 14
Android	25.10.04 (Build 732665141) / 7 March 2025; 10 days ago[187][188]
Wear OS	25.09.00 (Build 730474011) / 25 February 2025; 20 days ago[187][189]
iOS	25.10.02 / 7 March 2025; 10 days ago[190]
Android Go,[a] discontinued	161.1 / 13 October 2023; 17 months ago[191][192]

Android (Beta) 11.143.0303 / 20 August 2024; 6 months ago[193]

Google Maps

image not found or type unknown



Original author(s) Google

Initial release 2006; 19 years ago

Stable release(s) [±]

Preview release(s) [±]

Operating system

- **Android**
- **iOS**
- **KaiOS Wear OS WatchOS Web Fitbit OS**

Formerly: **Java ME**, **Symbian**, **Windows Mobile**

Google Maps is available as a **mobile app** for the **Android** and **iOS** mobile operating systems. The first mobile version of Google Maps (then known as Google Local for Mobile) was launched in beta in November 2005 for mobile platforms supporting **J2ME**.^{[194][195][196]} It was released as Google Maps for Mobile in 2006.^[197] In 2007 it came preloaded on the **first iPhone** in a deal with Apple.^[198] A version specifically for **Windows Mobile** was released in February 2007^[199] and the **Symbian** app was released in November 2007.^[200]

Version 2.0 of Google Maps Mobile was announced at the end of 2007, with a stand out *My Location* feature to find the user's location using the cell towers, without needing **GPS**.^{[201][202][203]} In September 2008, Google Maps was released for and preloaded on Google's own new platform Android.^{[204][205]}

Up until **iOS 6**, the built-in maps application on the **iOS** operating system was powered by Google Maps. However, with the announcement of iOS 6 in June 2012, **Apple** announced that they had created their own **Apple Maps** mapping service,^[206] which officially replaced Google Maps when iOS 6 was released on September 19, 2012.^[207] However, at launch, Apple Maps received

significant criticism from users due to inaccuracies, errors and bugs.[208][209] One day later, *The Guardian* reported that Google was preparing its own Google Maps app,[210] which was released on December 12, 2012.[211][212] Within two days, the application had been downloaded over ten million times.[213]

Features

[edit]

The Google Maps apps for iOS and Android have many of the same features, including turn-by-turn navigation, street view, and public transit information.[214][215] Turn-by-turn navigation was originally announced by Google as a separate beta testing app exclusive to Android 2.0 devices in October 2009.[216][217] The original standalone iOS version did not support the iPad,[215] but tablet support was added with version 2.0 in July 2013.[218] An update in June 2012 for Android devices added support for offline access to downloaded maps of certain regions,[219][220] a feature that was eventually released for iOS devices, and made more robust on Android, in May 2014.[221][222]

At the end of 2015 Google Maps announced its new offline functionality,[223] but with various limitations – downloaded area cannot exceed 120,000 square kilometers[224][225] and require a considerable amount of storage space.[226] In January 2017, Google added a feature exclusively to Android that will, in some U.S. cities, indicate the level of difficulty in finding available parking spots,[227] and on both Android and iOS, the app can, as of an April 2017 update, remember where users parked.[228][229] In August 2017, Google Maps for Android was updated with new functionality to actively help the user in finding parking lots and garages close to a destination.[230] In December 2017, Google added a new two-wheeler mode to its Android app, designed for users in India, allowing for more accessibility in traffic conditions.[231][232] In 2019 the Android version introduced the new feature called live view that allows to view directions directly on the road thanks to augmented reality.[233] Google Maps won the 2020 Webby Award for Best User Interface in the category Apps, Mobile & Voice.[234] In March 2021, Google added a feature in which users can draw missing roads.[235] In June 2022, Google implemented support for toll calculation. Both iOS and Android apps report how much the user has to pay in tolls when a route that includes toll roads is input. The feature is available for roads in the US, India, Japan and Indonesia with further expansion planned. As per reports the total number of toll roads covered in this phase is around 2000.[236]

Reception

[edit]

USA Today welcomed the application back to iOS, saying: "The reemergence in the middle of the night of a Google Maps app for the iPhone is like the return of an old friend. Only your friend, who'd gone missing for three months, comes back looking better than ever." [237] Jason Parker of *CNET*, calling it "the king of maps", said, "With its iOS Maps app, Google sets the standard for what mobile navigation should be and more." [238] Bree Fowler of the *Associated Press* compared Google's and Apple's map applications, saying: "The one clear advantage that Apple has is style. Like Apple devices, the maps are clean and clear and have a fun, pretty element to them, especially in 3-D. But when it comes down to depth and information, Google still reigns superior and will no doubt be welcomed back by its fans." [239] *Gizmodo* gave it a ranking of 4.5 stars, stating: "Maps Done Right". [240] According to *The New York Times*, Google "admits that it's [iOS app is] even better than Google Maps for Android phones, which has accommodated its evolving feature set mainly by piling on menus". [241]

Google Maps' **location tracking** is regarded by some as a threat to users' privacy, with Dylan Tweney of *VentureBeat* writing in August 2014 that "Google is probably logging your location, step by step, via Google Maps", and linked users to Google's location history map, which "lets you see the path you've traced for any given day that your smartphone has been running Google Maps". Tweney then provided instructions on how to disable location history. [242] The history tracking was also noticed, and recommended disabled, by editors at *CNET* [243] and *TechCrunch*. [244] Additionally, *Quartz* reported in April 2014 that a "sneaky new privacy change" would have an effect on the majority of iOS users. The privacy change, an update to the *Gmail* iOS app that "now supports sign-in across Google iOS apps, including Maps, *Drive*, YouTube and *Chrome*", meant that Google would be able to identify users' actions across its different apps. [245]

The Android version of the app surpassed five billion installations in March 2019. [246] By November 2021, the Android app had surpassed 10 billion installations. [247]

Go version

[edit]

Google Maps Go, a version of the app designed for **lower-end devices**, was released in beta in January 2018. [248] By September 2018, the app had over 10 million installations. [249]

Artistic and literary uses

[edit]

The German "geo-novel" *Senghor on the Rocks* (2008) presents its story as a series of spreads showing a Google Maps location on the left and the story's text on the right. Annika Richterich explains that the "satellite pictures in *Senghor on the Rocks* illustrate the main character's travel through the West-African state of *Senegal*". [250]

Artists have used Google Street View in a range of ways. [Emilio Vavarella's](#) *The Google Trilogy* includes glitchy images and unintended portraits of the drivers of the Street View cars.^[251] The Japanese band [group inou](#) used Google Street View backgrounds to make a music video for their song EYE.^[252] The Canadian band [Arcade Fire](#) made a customized music video that used Street View to show the viewer their own childhood home.^{[253][254]}

See also

[[edit](#)]

- o [icon](#) [Internet portal](#) Image not found or not yet known
- o [Azure Maps](#)
- o [Apple Maps](#)
- o [Bing Maps](#)
- o [Comparison of web map services](#)
- o [GeoGuessr](#)
- o [Google Earth](#)
- o *[Google Maps Road Trip](#)*, live-streaming documentary
- o [Here WeGo](#)
- o [MapQuest](#)
- o [OpenStreetMap](#)
- o [Terravision \(computer program\)](#)
- o [Wikiloc](#), a mashup that shows trails and waypoints on Google Maps
- o [Wikimapia](#), a mashup combining Google Maps and a [wiki](#) aimed at "describing the whole planet earth"
- o [Yandex Maps](#), popular in Russia and [CIS](#)

Notes

[[edit](#)]

- [^] [Lite version for Android](#)

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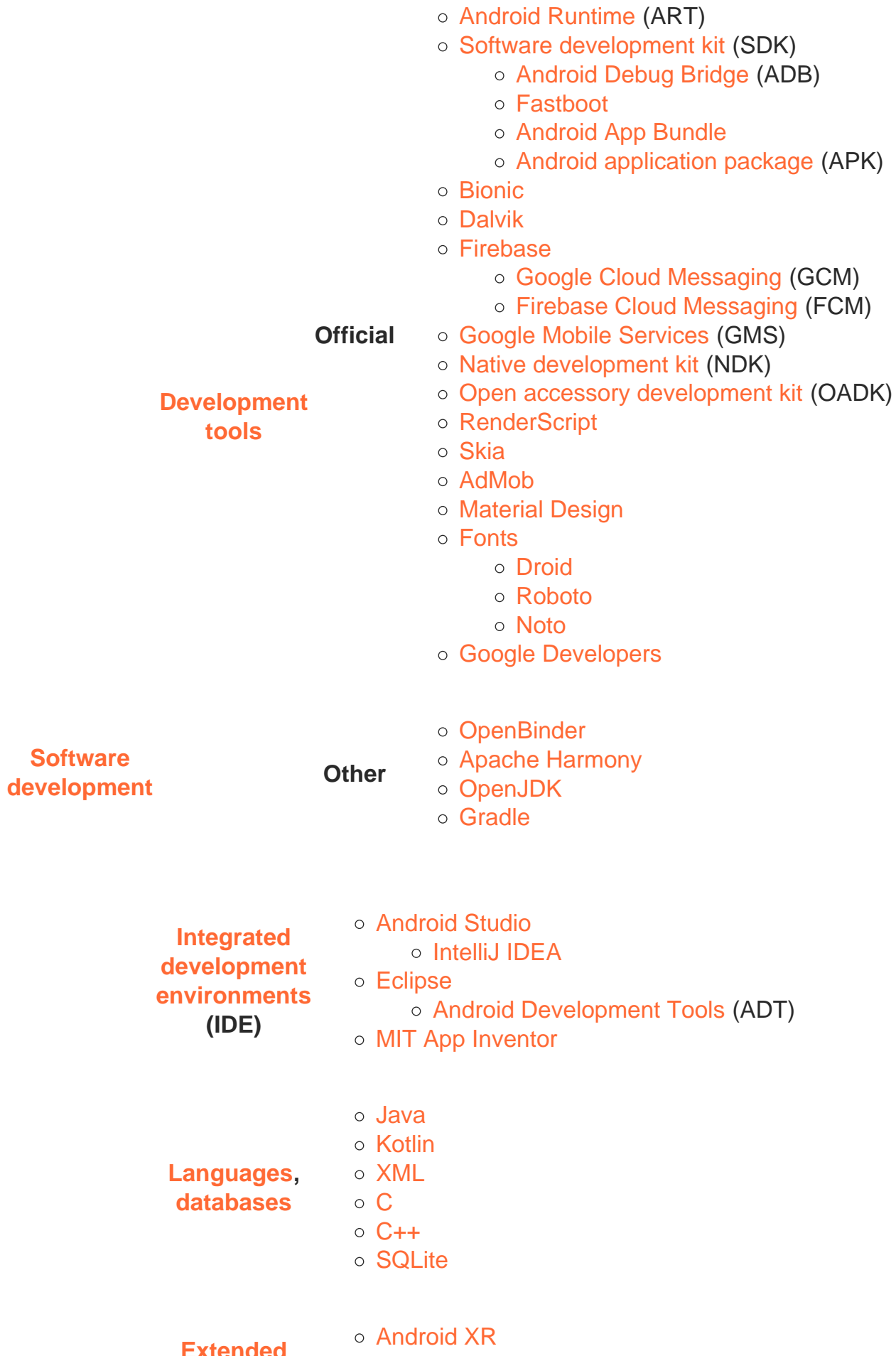
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Android

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- TV
 - devices
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Devices

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- Pixel & Pixel XL
- 2 & 2 XL
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- 5
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- 6 & 6 Pro
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- 7 & 7 Pro
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- Fold
- Tablet
- 8 & 8 Pro
 - 8a
- 9, 9 Pro & 9 Pro XL
 - 9 Pro Fold

Nexus

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- Galaxy Nexus
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Play edition

- HTC One (M7)
- HTC One (M8)
- LG G Pad 8.3
- Moto G
- Samsung Galaxy S4
- Sony Xperia Z Ultra

- Android One
- other smartphones

Custom distributions

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- Baidu Yi
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- Fire OS
- Flyme OS
- GrapheneOS
- Xiaomi HyperOS
 - MIUI
 - MIUI for POCO
- LeWa OS
- LineageOS
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- Nokia X software platform
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 - [Google v. Oracle](#)
 - [smartphone patent wars](#)

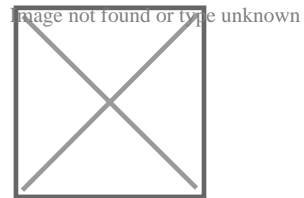
-  [Category:Android development](#)
-  [Category:Mobile telecommunications](#)
-  [Software portal](#)
-  [Telecommunication portal](#)

- [v](#)
- [t](#)
- [e](#)

[OpenStreetMap](#)

Organisations

- [Geochicas?](#)
- [Humanitarian OpenStreetMap Team](#)
- [Mapbox](#)
- [MapTiler](#)
- [Mapzen](#)
- [Missing Maps](#)
- [OpenStreetMap Foundation](#)
- [Ramani Huria](#)
- [Wikimedia Italia](#)



Software	Editing	<ul style="list-style-type: none"> o iD o JOSM o KartaView o Mapillary o OpenDroneMap o Potlatch o StreetComplete
	Visualisation	<ul style="list-style-type: none"> o Leaflet o Mapnik o Marble o OpenLayers o OpenRailwayMap o OpenSeaMap
	Navigation	<ul style="list-style-type: none"> o GNOME Maps o GraphHopper o Karta GPS o Komoot o Locus Map o Maps.me o Navit o Neshan o Open Source Routing Machine o Organic Maps o OsmAnd o Wheelmap.org
Derivations		<ul style="list-style-type: none"> o FOSM o OpenGeofiction o OpenHistoricalMap o Overture Maps
People		<ul style="list-style-type: none"> o Steve Coast o Allan Mustard

Authority control databases  [Edit this at Wikidata](#)

International

- VIAF
- FAST

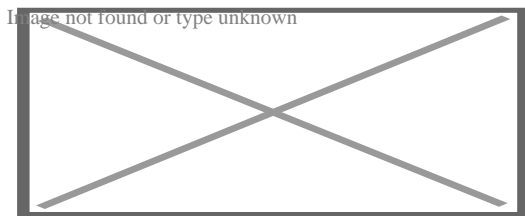
National

- Germany
- United States
- France
- BnF data
- Israel

Other

- IdRef

About Semantic Web



A **tag cloud** (a typical Web 3.0 phenomenon in itself) presenting Web 3.0 themes

- **v**
- **t**
- **e**

Semantics

- Linguistic
- Logical

Subfields

- Computational
- Lexical (lexis, lexicology)
- Statistical
- Structural

Topics

- Analysis
- Compositionality
- Context
 - Prototype theory
 - Force dynamics
- Semantic feature
- Semantic gap
- Theory of descriptions

Analysis

- Latent
- Computational
- Machine-learning

Applications

- Semantic file system
- Semantic desktop
- Semantic matching
- Semantic parsing
- Semantic similarity
- Semantic query
 - Semantic Web
 - Semantic wiki

**Semantics of
programming languages**

Types

- Action
- Algebraic
- Axiomatic
- Categorical
- Concurrency
- Denotational
- Game
- Operational
- Predicate transformational

Theory

- Abstract interpretation
- Abstract semantic graph

- Language
- Linguistics

The **Semantic Web**, sometimes known as **Web 3.0** (not to be confused with **Web3**), is an extension of the **World Wide Web** through standards[1] set by the **World Wide Web Consortium** (W3C). The goal of the Semantic Web is to make **Internet** data **machine-readable**.

To enable the encoding of **semantics** with the data, technologies such as **Resource Description Framework** (RDF)[2] and **Web Ontology Language** (OWL)[3] are used. These technologies are used to formally represent **metadata**. For example, **ontology** can describe **concepts**, relationships between **entities**, and categories of things. These embedded semantics offer significant advantages such as **reasoning** over data and operating with heterogeneous data sources.[4] These standards promote common data formats and exchange protocols on the Web, fundamentally the RDF. According to the W3C, "The Semantic Web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries." [5] The Semantic Web is therefore regarded as an integrator across different content and information applications and systems.

History

[edit]

The term was coined by **Tim Berners-Lee** for a web of data (or **data web**)[6] that can be processed by machines[7]—that is, one in which much of the **meaning** is **machine-readable**. While its critics have questioned its feasibility, proponents argue that applications in **library** and

information science, industry, biology and human sciences research have already proven the validity of the original concept.[8]

Berners-Lee originally expressed his vision of the Semantic Web in 1999 as follows:

I have a dream for the Web [in which computers] become capable of analyzing all the data on the Web – the content, links, and transactions between people and computers. A "Semantic Web", which makes this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines. The "intelligent agents" people have touted for ages will finally materialize.[9]

The 2001 *Scientific American* article by Berners-Lee, Hendler, and Lassila described an expected evolution of the existing Web to a Semantic Web.[10] In 2006, Berners-Lee and colleagues stated that: "This simple idea...remains largely unrealized".[11] In 2013, more than four million Web domains (out of roughly 250 million total) contained Semantic Web markup.[12]

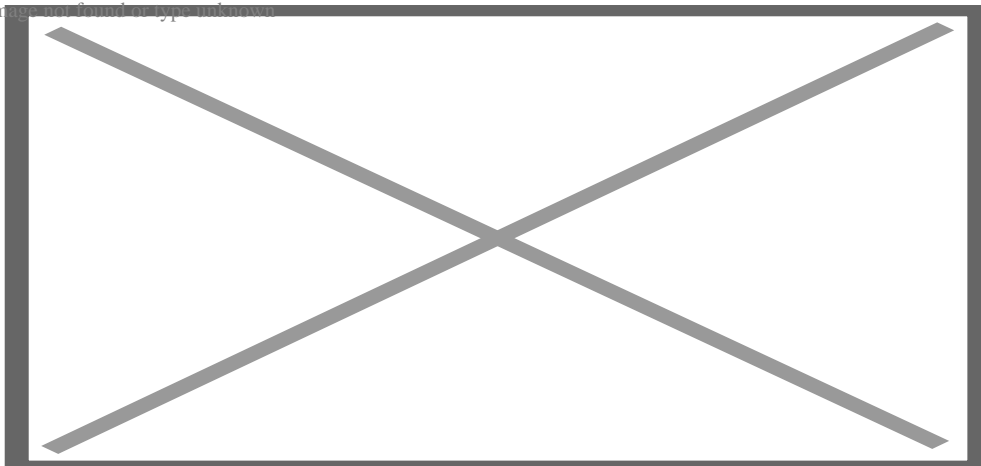
Example

[edit]

In the following example, the text "Paul Schuster was born in Dresden" on a website will be annotated, connecting a person with their place of birth. The following HTML fragment shows how a small graph is being described, in RDFa-syntax using a schema.org vocabulary and a Wikidata ID:

```
<div vocab="https://schema.org/" typeof="Person">
  <span property="name">Paul Schuster</span> was born in
  <span property="birthPlace" typeof="Place" href="https://www.wikidata.org/entity/Q1731">
    <span property="name">Dresden</span>.
  </span>
</div>
```

Image not found or type unknown

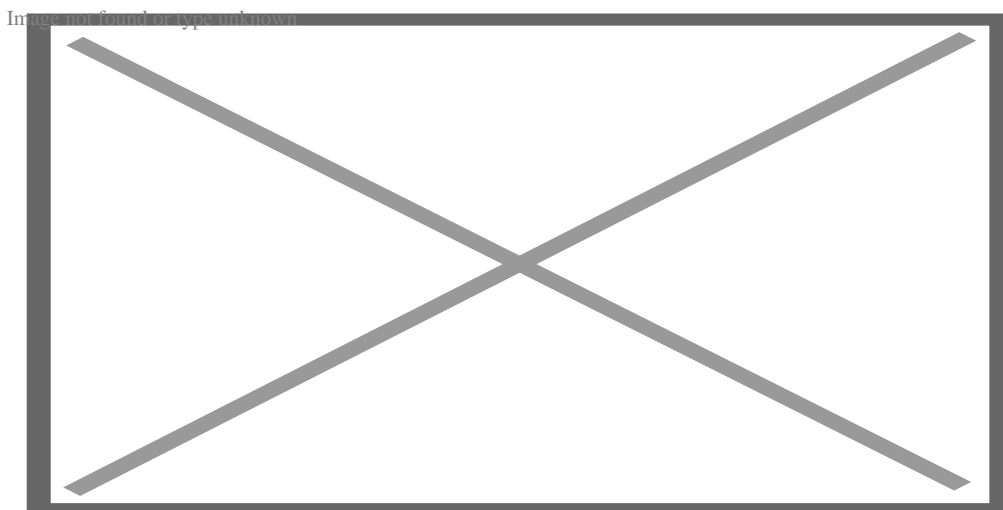


Graph resulting from the RDFa example

The example defines the following five **triples** (shown in **Turtle** syntax). Each triple represents one edge in the resulting graph: the first element of the triple (the *subject*) is the name of the node where the edge starts, the second element (the *predicate*) the type of the edge, and the last and third element (the *object*) either the name of the node where the edge ends or a literal value (e.g. a text, a number, etc.).

```
_:a <https://www.w3.org/1999/02/22-rdf-syntax-ns#type> <https://schema.org/Person> .
_:a <https://schema.org/name> "Paul Schuster" .
_:a <https://schema.org/birthPlace> <https://www.wikidata.org/entity/Q1731> .
<https://www.wikidata.org/entity/Q1731> <https://schema.org/itemtype> <https://schema.org/Place> .
<https://www.wikidata.org/entity/Q1731> <https://schema.org/name> "Dresden" .
```

The triples result in the graph shown in **the given figure**.



Graph resulting from the RDFa example, enriched with further data from the Web

One of the advantages of using **Uniform Resource Identifiers (URIs)** is that they can be dereferenced using the **HTTP** protocol. According to the so-called **Linked Open Data** principles, such a dereferenced URI should result in a document that offers further data about the given URI. In this example, all URIs, both for edges and nodes (e.g. <http://schema.org/Person>, <http://schema.org/birthPlace>, <http://www.wikidata.org/entity/Q1731>) can be dereferenced and will result in further RDF graphs, describing the URI, e.g. that Dresden is a city in Germany, or that a person, in the sense of that URI, can be fictional.

The second graph shows the previous example, but now enriched with a few of the triples from the documents that result from dereferencing <https://schema.org/Person> (green edge) and <https://www.wikidata.org/entity/Q1731> (blue edges).

Additionally to the edges given in the involved documents explicitly, edges can be automatically inferred: the triple

```
_:a <https://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://schema.org/Person> .
```

from the original RDFa fragment and the triple

```
<https://schema.org/Person> <http://www.w3.org/2002/07/owl#equivalentClass> <http://xmlns.com/foaf/
```

from the document at <https://schema.org/Person> (green edge in the figure) allow to infer the following triple, given **OWL** semantics (red dashed line in the second Figure):

```
_:a <https://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/Person> .
```

Background

[[edit](#)]

Further information: [Semantic network § History](#)

The concept of the **semantic network** model was formed in the early 1960s by researchers such as the **cognitive scientist Allan M. Collins**, **linguist Ross Quillian** and **psychologist Elizabeth F. Loftus** as a form to represent semantically structured knowledge. When applied in the context of the modern internet, it extends the network of **hyperlinked** human-readable **web pages** by inserting machine-readable metadata about pages and how they are related to each other. This enables **automated agents** to access the Web more intelligently and perform more tasks on behalf of users. The term "Semantic Web" was coined by **Tim Berners-Lee**,^[7] the inventor of the World Wide Web and director of the World Wide Web Consortium ("**W3C**"), which oversees the development of proposed Semantic Web standards. He defines the Semantic Web as "a web of data that can be processed directly and indirectly by machines".

Many of the technologies proposed by the W3C already existed before they were positioned under the W3C umbrella. These are used in various contexts, particularly those dealing with information that encompasses a limited and defined domain, and where sharing data is a common necessity, such as scientific research or data exchange among businesses. In addition, other technologies with similar goals have emerged, such as **microformats**.

Limitations of HTML

[edit]

Many files on a typical computer can be loosely divided into either human-readable documents, or machine-readable data. Examples of human-readable document files are mail messages, reports, and brochures. Examples of machine-readable data files are calendars, address books, playlists, and spreadsheets, which are presented to a user using an application program that lets the files be viewed, searched, and combined.

Currently, the World Wide Web is based mainly on documents written in **Hypertext Markup Language** (HTML), a markup convention that is used for coding a body of text interspersed with multimedia objects such as images and interactive forms. Metadata tags provide a method by which computers can categorize the content of web pages. In the examples below, the field names "keywords", "description" and "author" are assigned values such as "computing", and "cheap widgets for sale" and "John Doe".

```
<meta name="keywords" content="computing, computer studies, computer" />
<meta name="description" content="Cheap widgets for sale" />
<meta name="author" content="John Doe" />
```

Because of this metadata tagging and categorization, other computer systems that want to access and share this data can easily identify the relevant values.

With HTML and a tool to render it (perhaps **web browser** software, perhaps another **user agent**), one can create and present a page that lists items for sale. The HTML of this catalog page can make simple, document-level assertions such as "this document's title is 'Widget Superstore'", but there is no capability within the HTML itself to assert unambiguously that, for example, item number X586172 is an Acme Gizmo with a retail price of €199, or that it is a consumer product. Rather, HTML can only say that the span of text "X586172" is something that should be positioned near "Acme Gizmo" and "€199", etc. There is no way to say "this is a catalog" or even to establish that "Acme Gizmo" is a kind of title or that "€199" is a price. There is also no way to express that these pieces of information are bound together in describing a discrete item, distinct from other items perhaps listed on the page.

Semantic HTML refers to the traditional HTML practice of markup following intention, rather than specifying layout details directly. For example, the use of `` denoting "emphasis" rather than `<i>`, which specifies **italics**. Layout details are left up to the browser, in combination with **Cascading Style Sheets**. But this practice falls short of specifying the semantics of objects such as items for sale or prices.

Microformats extend HTML syntax to create **machine-readable** semantic markup about objects including people, organizations, events and products.^[13] Similar initiatives include **RDFa**, **Microdata** and **Schema.org**.

Semantic Web solutions

[[edit](#)]

The Semantic Web takes the solution further. It involves publishing in languages specifically designed for data: [Resource Description Framework](#) (RDF), [Web Ontology Language](#) (OWL), and Extensible Markup Language ([XML](#)). HTML describes documents and the links between them. RDF, OWL, and XML, by contrast, can describe arbitrary things such as people, meetings, or airplane parts.

These technologies are combined in order to provide descriptions that supplement or replace the content of Web documents. Thus, content may manifest itself as descriptive data stored in Web-accessible [databases](#),[\[14\]](#) or as markup within documents (particularly, in Extensible HTML ([XHTML](#)) interspersed with XML, or, more often, purely in XML, with layout or rendering cues stored separately). The machine-readable descriptions enable content managers to add meaning to the content, i.e., to describe the structure of the knowledge we have about that content. In this way, a machine can process knowledge itself, instead of text, using processes similar to human [deductive reasoning](#) and [inference](#), thereby obtaining more meaningful results and helping computers to perform automated information gathering and research.

An example of a tag that would be used in a non-semantic web page:

```
<item>blog</item>
```

Encoding similar information in a semantic web page might look like this:

```
<item rdf:about="https://example.org/semantic-web/">Semantic Web</item>
```

Tim Berners-Lee calls the resulting network of [Linked Data](#) the [Giant Global Graph](#), in contrast to the HTML-based World Wide Web. Berners-Lee posits that if the past was document sharing, the future is [data sharing](#). His answer to the question of "how" provides three points of instruction. One, a URL should point to the data. Two, anyone accessing the URL should get data back. Three, relationships in the data should point to additional URLs with data.

Tags and identifiers

[[edit](#)]

Tags, including hierarchical categories and tags that are collaboratively added and maintained (e.g. with **folksonomies**) can be considered part of, of potential use to or a step towards the semantic Web vision.^{[15][16][17]}

Unique **identifiers**, including hierarchical categories and collaboratively added ones, analysis tools and **metadata**, including tags, can be used to create forms of semantic webs – webs that are to a certain degree semantic.^[18] In particular, such has been used for structuring scientific research i.a. by research topics and **scientific fields** by the projects **OpenAlex**,^{[19][20][21]} **Wikidata** and **Scholia** which are under development and provide **APIs**, Web-pages, feeds and graphs for various **semantic queries**.

Web 3.0

[\[edit\]](#)

Tim Berners-Lee has described the Semantic Web as a component of Web 3.0.^[22]

People keep asking what Web 3.0 is. I think maybe when you've got an overlay of **scalable vector graphics** – everything rippling and folding and looking misty – on **Web 2.0** and access to a semantic Web integrated across a huge space of data, you'll have access to an unbelievable data resource ...

—*Tim Berners-Lee, 2006*

"Semantic Web" is sometimes used as a synonym for "Web 3.0",^[23] though the definition of each term varies.

Beyond Web 3.0

[\[edit\]](#)

The next generation of the Web is often termed Web 4.0, but its definition is not clear. According to some sources, it is a Web that involves **artificial intelligence**,^[24] the **internet of things**, **pervasive computing**, **ubiquitous computing** and the **Web of Things** among other concepts.^[25] According to the European Union, Web 4.0 is "the expected fourth generation of the World Wide Web. Using advanced artificial and ambient intelligence, the internet of things, trusted blockchain transactions, virtual worlds and XR capabilities, digital and real objects and environments are fully integrated and communicate with each other, enabling truly intuitive, immersive experiences, seamlessly blending the physical and digital worlds".^[26]

Challenges

[[edit](#)]

Some of the challenges for the Semantic Web include vastness, vagueness, uncertainty, inconsistency, and deceit. **Automated reasoning systems** will have to deal with all of these issues in order to deliver on the promise of the Semantic Web.

- Vastness: The World Wide Web contains many billions of pages. The **SNOMED CT medical terminology ontology** alone contains 370,000 **class** names, and existing technology has not yet been able to eliminate all semantically duplicated terms. Any automated reasoning system will have to deal with truly huge inputs.
- Vagueness: These are imprecise concepts like "young" or "tall". This arises from the vagueness of user queries, of concepts represented by content providers, of matching query terms to provider terms and of trying to combine different **knowledge bases** with overlapping but subtly different concepts. **Fuzzy logic** is the most common technique for dealing with vagueness.
- Uncertainty: These are precise concepts with uncertain values. For example, a patient might present a set of symptoms that correspond to a number of different distinct diagnoses each with a different probability. **Probabilistic** reasoning techniques are generally employed to address uncertainty.
- Inconsistency: These are logical contradictions that will inevitably arise during the development of large ontologies, and when ontologies from separate sources are combined. Deductive reasoning fails catastrophically when faced with inconsistency, because "**anything follows from a contradiction**". **Defeasible reasoning** and **paraconsistent reasoning** are two techniques that can be employed to deal with inconsistency.
- Deceit: This is when the producer of the information is intentionally misleading the consumer of the information. **Cryptography** techniques are currently utilized to alleviate this threat. By providing a means to determine the information's integrity, including that which relates to the identity of the entity that produced or published the information, however **credibility** issues still have to be addressed in cases of potential deceit.

This list of challenges is illustrative rather than exhaustive, and it focuses on the challenges to the "unifying logic" and "proof" layers of the Semantic Web. The World Wide Web Consortium (W3C) Incubator Group for Uncertainty Reasoning for the World Wide Web[27] (URW3-XG) final report lumps these problems together under the single heading of "uncertainty".[28] Many of the techniques mentioned here will require extensions to the Web Ontology Language (OWL) for example to annotate conditional probabilities. This is an area of active research.[29]

Standards

[[edit](#)]

Standardization for Semantic Web in the context of Web 3.0 is under the care of W3C.[30]

Components

[[edit](#)]

The term "Semantic Web" is often used more specifically to refer to the formats and technologies that enable it.^[5] The collection, structuring and recovery of linked data are enabled by technologies that provide a **formal description** of concepts, terms, and relationships within a given **knowledge domain**. These technologies are specified as W3C standards and include:

- **Resource Description Framework** (RDF), a general method for describing information
- **RDF Schema** (RDFS)
- **Simple Knowledge Organization System** (SKOS)
- **SPARQL**, an RDF query language
- **Notation3** (N3), designed with human readability in mind
- **N-Triples**, a format for storing and transmitting data
- **Turtle** (Terse RDF Triple Language)
- **Web Ontology Language** (OWL), a family of **knowledge representation languages**
- **Rule Interchange Format** (RIF), a framework of web rule language dialects supporting rule interchange on the Web
- **JavaScript Object Notation for Linked Data** (JSON-LD), a JSON-based method to describe data
- **ActivityPub**, a generic way for client and server to communicate with each other. This is used by the popular decentralized social network **Mastodon**.

The **Semantic Web Stack** illustrates the architecture of the Semantic Web. The functions and relationships of the components can be summarized as follows:^[31]

- XML provides an elemental syntax for content structure within documents, yet associates no semantics with the meaning of the content contained within. XML is not at present a necessary component of Semantic Web technologies in most cases, as alternative syntaxes exist, such as **Turtle**. Turtle is a de facto standard, but has not been through a formal standardization process.
- **XML Schema** is a language for providing and restricting the structure and content of elements contained within XML documents.
- RDF is a simple language for expressing **data models**, which refer to objects ("**web resources**") and their relationships. An RDF-based model can be represented in a variety of syntaxes, e.g., **RDF/XML**, N3, Turtle, and RDFa. RDF is a fundamental standard of the Semantic Web.^{[32][33]}
- RDF Schema extends RDF and is a vocabulary for describing properties and classes of RDF-based resources, with semantics for generalized-hierarchies of such properties and classes.
- OWL adds more vocabulary for describing properties and classes: among others, relations between classes (e.g. disjointness), cardinality (e.g. "exactly one"), equality, richer typing of

- properties, characteristics of properties (e.g. symmetry), and enumerated classes.
- SPARQL is a protocol and query language for semantic web data sources.
- RIF is the W3C Rule Interchange Format. It is an XML language for expressing Web rules that computers can execute. RIF provides multiple versions, called dialects. It includes a RIF Basic Logic Dialect (RIF-BLD) and RIF Production Rules Dialect (RIF PRD).

Current state of standardization

[[edit](#)]

Well-established standards:

- RDF - Resource Description Framework
- RDFS - Resource Description Framework Schema
- RIF - Rule Interchange Format
- SPARQL - 'SPARQL Protocol and RDF Query Language'
- Unicode
- URI - Uniform Resource Identifier
- OWL - Web Ontology Language
- XML - Extensible Markup Language

Not yet fully realized:

- Unifying Logic and Proof layers
- SWRL - Semantic Web Rule Language

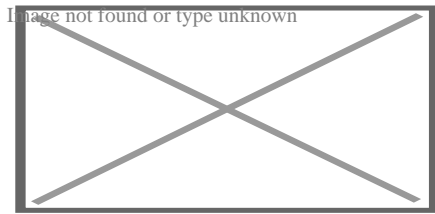
Applications

[[edit](#)]

The intent is to enhance the **usability** and usefulness of the Web and its interconnected **resources** by creating **semantic web services**, such as:

- Servers that expose existing data systems using the RDF and SPARQL standards. Many converters to RDF exist from different applications. [\[34\]](#) **Relational databases** are an important source. The semantic web server attaches to the existing system without affecting its operation.
- Documents "marked up" with semantic information (an **extension** of the HTML <meta> **tags** used in today's Web pages to supply information for **Web search engines** using **web crawlers**). This could be **machine-understandable** information about the human-understandable content of the document (such as the creator, title, description, etc.) or it could be purely metadata representing a set of facts (such as resources and services elsewhere on the site). Note that *anything* that can be identified with a *Uniform Resource Identifier* (URI) can be described, so the semantic web can reason about animals, people,

places, ideas, etc. There are four semantic annotation formats that can be used in HTML documents; Microformat, RDFa, Microdata and **JSON-LD**.^[35] Semantic markup is often generated automatically, rather than manually.



Arguments as distinct semantic units with specified relations and version control on **Kialo**

- Common metadata vocabularies (**ontologies**) and maps between vocabularies that allow document creators to know how to mark up their documents so that agents can use the information in the supplied metadata (so that *Author* in the sense of 'the Author of the page' will not be confused with *Author* in the sense of a book that is the subject of a book review).
- Automated agents to perform tasks for users of the semantic web using this data.
- **Semantic translation**. An alternative or complementary approach are improvements to contextual and semantic understanding of texts – these could be aided via Semantic Web methods so that only increasingly small numbers of mistranslations need to be corrected **in manual or semi-automated post-editing**.
- Web-based services (often with agents of their own) to supply information specifically to agents, for example, a **Trust service** that an agent could ask if some online store has a history of poor service or **spamming**.
- Semantic Web ideas are implemented in collaborative structured **argument mapping** sites where their relations are organized semantically, arguments can be mirrored (linked) to multiple places, reused (copied), rated, and **changed** as semantic distinct units. Ideas for such, or a more widely adopted "World Wide Argument Web", go back to at least 2007^[36] and have been implemented to some degree in **Argüman**^[37] and **Kialo**. Further steps towards semantic web services may include enabling "Querying", argument search engines,^[38] and "summarizing the contentious and agreed-upon points of a discussion".^[39]

Such services could be useful to public search engines, or could be used for **knowledge management** within an organization. Business applications include:

- Facilitating the integration of information from mixed sources^[40]
- Dissolving ambiguities in corporate terminology
- Improving **information retrieval** thereby reducing **information overload** and increasing the refinement and precision of the data retrieved^{[41][42][43][44]}
- Identifying relevant information with respect to a given domain^[45]
- Providing decision making support

In a corporation, there is a closed group of users and the management is able to enforce company guidelines like the adoption of specific ontologies and use of **semantic annotation**. Compared to the public Semantic Web there are lesser requirements on **scalability** and the information circulating within a company can be more trusted in general; privacy is less of an issue outside of

handling of customer data.

Skeptical reactions

[\[edit\]](#)

Practical feasibility

[\[edit\]](#)

Critics question the basic feasibility of a complete or even partial fulfillment of the Semantic Web, pointing out both difficulties in setting it up and a lack of general-purpose usefulness that prevents the required effort from being invested. In a 2003 paper, Marshall and Shipman point out the cognitive overhead inherent in formalizing knowledge, compared to the authoring of traditional web [hypertext](#):[\[46\]](#)

While learning the basics of HTML is relatively straightforward, learning a knowledge representation language or tool requires the author to learn about the representation's methods of abstraction and their effect on reasoning. For example, understanding the class-instance relationship, or the superclass-subclass relationship, is more than understanding that one concept is a "type of" another concept. [...] These abstractions are taught to computer scientists generally and knowledge engineers specifically but do not match the similar natural language meaning of being a "type of" something. Effective use of such a formal representation requires the author to become a skilled knowledge engineer in addition to any other skills required by the domain. [...] Once one has learned a formal representation language, it is still often much more effort to express ideas in that representation than in a less formal representation [...]. Indeed, this is a form of programming based on the declaration of semantic data and requires an understanding of how reasoning algorithms will interpret the authored structures.

According to Marshall and Shipman, the [tacit](#) and changing nature of much knowledge adds to the [knowledge engineering](#) problem, and limits the Semantic Web's applicability to specific domains. A further issue that they point out are domain- or organization-specific ways to express knowledge, which must be solved through community agreement rather than only technical means.[\[46\]](#) As it turns out, specialized communities and organizations for intra-company projects have tended to adopt semantic web technologies greater than peripheral and less-specialized communities.[\[47\]](#) The practical constraints toward adoption have appeared less challenging where domain and scope is more limited than that of the general public and the World-Wide Web.[\[47\]](#)

Finally, Marshall and Shipman see pragmatic problems in the idea of ([Knowledge Navigator](#)-style) intelligent agents working in the largely manually curated Semantic Web:[\[46\]](#)

In situations in which user needs are known and distributed information resources are well described, this approach can be highly effective; in situations that are not foreseen and that bring together an unanticipated array of information resources, the Google approach is more robust. Furthermore, the Semantic Web relies on inference chains that are more brittle; a missing element of the chain results in a failure to perform the desired action, while the human can supply missing pieces in a more Google-like approach. [...] cost-benefit tradeoffs can work in favor of specially-created Semantic Web metadata directed at weaving together sensible well-structured domain-specific information resources; close attention to user/customer needs will drive these federations if they are to be successful.

Cory Doctorow's critique ("[metacrap](#)")[\[48\]](#) is from the perspective of human behavior and personal preferences. For example, people may include spurious metadata into Web pages in an attempt to mislead Semantic Web engines that naively assume the metadata's veracity. This phenomenon was well known with metatags that fooled the [Altavista](#) ranking algorithm into elevating the ranking of certain Web pages: the Google indexing engine specifically looks for such attempts at manipulation. [Peter Gärdenfors](#) and [Timo Honkela](#) point out that logic-based semantic web technologies cover only a fraction of the relevant phenomena related to semantics.[\[49\]](#)[\[50\]](#)

Censorship and privacy

[\[edit\]](#)

Enthusiasm about the semantic web could be tempered by concerns regarding [censorship](#) and [privacy](#). For instance, [text-analyzing](#) techniques can now be easily bypassed by using other words, metaphors for instance, or by using images in place of words. An advanced implementation of the semantic web would make it much easier for governments to control the viewing and creation of online information, as this information would be much easier for an automated content-blocking machine to understand. In addition, the issue has also been raised that, with the use of [FOAF](#) files and geolocation [meta-data](#), there would be very little anonymity associated with the authorship of articles on things such as a personal blog. Some of these concerns were addressed in the "Policy Aware Web" project[\[51\]](#) and is an active research and development topic.

Doubling output formats

[\[edit\]](#)

Another criticism of the semantic web is that it would be much more time-consuming to create and publish content because there would need to be two formats for one piece of data: one for human

viewing and one for machines. However, many web applications in development are addressing this issue by creating a machine-readable format upon the publishing of data or the request of a machine for such data. The development of microformats has been one reaction to this kind of criticism. Another argument in defense of the feasibility of semantic web is the likely falling price of human intelligence tasks in digital labor markets, such as Amazon's Mechanical Turk.^[*citation needed*]

Specifications such as **eRDF** and RDFa allow arbitrary RDF data to be embedded in HTML pages. The **GRDDL** (Gleaning Resource Descriptions from Dialects of Language) mechanism allows existing material (including microformats) to be automatically interpreted as RDF, so publishers only need to use a single format, such as HTML.

Research activities on corporate applications

[[edit](#)]

The first research group explicitly focusing on the Corporate Semantic Web was the ACACIA team at **INRIA-Sophia-Antipolis**, founded in 2002. Results of their work include the **RDF(S)** based Corese^[52] search engine, and the application of semantic web technology in the realm of **distributed artificial intelligence** for knowledge management (e.g. ontologies and **multi-agent systems** for corporate semantic Web) ^[53] and **E-learning**.^[54]

Since 2008, the Corporate Semantic Web research group, located at the **Free University of Berlin**, focuses on building blocks: Corporate Semantic Search, Corporate Semantic Collaboration, and Corporate Ontology Engineering.^[55]

Ontology engineering research includes the question of how to involve non-expert users in creating ontologies and semantically annotated content^[56] and for extracting explicit knowledge from the interaction of users within enterprises.

Future of applications

[[edit](#)]

Tim O'Reilly, who coined the term Web 2.0, proposed a long-term vision of the Semantic Web as a web of data, where sophisticated applications are navigating and manipulating it.^[57] The data web transforms the World Wide Web from a **distributed file system** into a **distributed database**.^[58]

See also

[[edit](#)]

- **AGRIS**
- **Business semantics management**

- Computational semantics
- Calais (Reuters product)
- DBpedia
- Entity–attribute–value model
- EU Open Data Portal
- History of the World Wide Web
- Hyperdata
- Internet of things
- Linked data
- List of emerging technologies
- Nextbio
- Ontology alignment
- Ontology learning
- RDF and OWL
- Semantic computing
- Semantic Geospatial Web
- Semantic heterogeneity
- Semantic integration
- Semantic matching
- Semantic MediaWiki
- Semantic Sensor Web
- Semantic social network
- Semantic technology
- *Semantic Web*
- Semantically-Interlinked Online Communities
- Smart-M3
- Social Semantic Web
- Web engineering
- Web resource
- Web science

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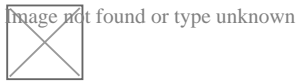
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External links

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- [Official website](#)

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Semantic Web

Background

- Databases
- Hypertext
- Internet
- Ontologies
- Semantics
- Semantic networks
- World Wide Web

Sub-topics

- Dataspaces
- Hyperdata
- Linked data
- Rule-based systems

Applications

- Semantic analytics
- Semantic broker
- Semantic computing
- Semantic mapper
- Semantic matching
- Semantic publishing
- Semantic reasoner
- Semantic search
- Semantic service-oriented architecture
- Semantic wiki
- Solid

Related topics

- [Collective intelligence](#)
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- [Knowledge management](#)
- [Knowledge representation and reasoning](#)
- [Library 2.0](#)
- [Digital library](#)
- [Digital humanities](#)
- [Metadata](#)
- [References](#)
- [Topic map](#)
- [Web 2.0](#)
- [Web engineering](#)
- [Web Science Trust](#)

Syntax and supporting technologies

- HTTP
- IRI
 - URI
- RDF
 - triples
 - RDF/XML
 - JSON-LD
 - Turtle
 - TriG
 - Notation3
 - N-Triples
 - TriX (no W3C standard)
- RRID
- SPARQL
- XML
- Semantic HTML

Schemas, ontologies and rules

- Common Logic
- OWL
- RDFS
- Rule Interchange Format
- Semantic Web Rule Language
- ALPS
- SHACL

Standards

Semantic annotation

- eRDF
- GRDDL
- Microdata
- Microformats
- RDFa
- SAWSDL
- Facebook Platform

Common vocabularies

- DOAP
- Dublin Core
- FOAF
- Schema.org
- SIOC
- SKOS

Microformat vocabularies

- hAtom
- hCalendar
- hCard
- hProduct
- hRecipe

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Emerging technologies

Fields

Information and communications

- Ambient intelligence
 - Internet of things
- Artificial intelligence
 - Applications of artificial intelligence
 - Machine translation
 - Machine vision
 - Mobile translation
 - Progress in artificial intelligence
 - Semantic Web
 - Speech recognition
- Atomtronics
- Carbon nanotube field-effect transistor
- Cybermethodology
- Extended reality
- Fourth-generation optical discs
 - 3D optical data storage
 - Holographic data storage
- GPGPU
- Memory
 - CBRAM
 - ECRAM
 - FRAM
 - Millipede
 - MRAM
 - NRAM
 - PRAM
 - Racetrack memory
 - RRAM
 - SONOS
 - UltraRAM
- Optical computing
- RFID
 - Chipless RFID
- Software-defined radio
- Three-dimensional integrated circuit

Topics

- Automation
- Collingridge dilemma
- Differential technological development
- Disruptive innovation
- Ephemeralization
- Ethics
 - Bioethics
 - Cyberethics
 - Neuroethics
 - Robot ethics
- Exploratory engineering
- Proactionary principle
- Technological change
 - Technological unemployment
- Technological convergence
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 - Horizon scanning
 - Moore's law
 - Technological singularity
 - Technology scouting
- Technology in science fiction
- Technology readiness level
- Technology roadmap
- Transhumanism

-  **List**

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Digital humanities

- Computational archaeology
- Computational philosophy
- Computational theory of mind
- Computers and writing
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- Digital history
- Digital library
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What should I expect from SEO agencies in Sydney?

SEO agencies in Sydney typically offer comprehensive services such as keyword research, technical audits, on-page and off-page optimization, content creation, and performance tracking. Their goal is to increase your site's search engine rankings and drive more targeted traffic to your website.

Why is keyword research important for SEO?

Keyword research helps identify the terms and phrases that potential customers are using to search for products or services. By targeting these keywords in your content, you can improve your visibility in search engine results, attract more qualified leads, and drive higher conversion rates.

What sets SEO specialists in Sydney apart?

SEO specialists in Sydney often have deep expertise in the local market. They understand the competitive landscape, know which keywords resonate with Sydney-based audiences, and are skilled at optimizing websites to rank well in local search results.

What is SEO?

SEO, or search engine optimisation, is the practice of improving a website's visibility on search engines like Google. It involves optimizing various elements of a site such as keywords, content, meta tags, and technical structure to help it rank higher in search results.

How can a digital agency in Sydney help with SEO?

A digital agency in Sydney can offer a comprehensive approach, combining SEO with other marketing strategies like social media, PPC, and content marketing. By integrating these services, they help you achieve a stronger online presence and better ROI.

What does SEO mean for my business?

SEO, or search engine optimisation, means improving your website's structure, content, and overall performance to rank higher in search results. This leads to more organic traffic, increased brand visibility, and better conversion rates, ultimately supporting your business's

growth.

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Zip : 2000

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