# Twilio Glossary

## N/A

N/A

## 7 bit Encoding

More info: https://www.twilio.com/docs/glossary/what-is-7-bit-encoding

7 bit encoding is the same as Ascii encoding: both represent alphanumeric characters and symbols as numbers.

### 7 bit Encoding

7 bit encoding is the same as Ascii encoding: both represent alphanumeric characters and symbols as numbers.

7 bit encoding is a reference to the Ascii character set — pronounced "Askey" and standing for "American Standard Code for Information Interchange" — which is a mapping of English alphabet characters, numbers and symbols to 7 bit numerical values in the range 0 to 127. The set includes all the English lowercase letters, uppercase letters, numbers from 0 to 9, and symbols such as.,!, and@.

The first 32 values, 0 through 31, are reserved for terminal control codes, such as Escape, New Line, Carriage Return, and Acknowledge.

The reason the characters are encoded as 7 bit values is because early computers handled data in bytes — blocks of 8 bits. The extra, eighth bit was originally reserved for error checking. Computers can only process numbers, so text characters need to represented by numbers too. Ascii was devised to ensure that when any machine output, say, the value 65 as text, it presented anA. Before Ascii, different computers used their own encodings, so textual information was difficult to transfer between machines from different manufacturers.

Today, SendGrid requires 7 bit encoding in ourSMTPAPI categories header(link takes you to an external page).

For more information on Ascii, visit Wikipedia for the entirehistory of the standard(link takes you to an external page).

## N/A

N/A

## A Record

More info: https://www.twilio.com/docs/glossary/what-is-an-a-record

An A Record — more accurately, a ‘DNS A Record’ — links a domain to an IP address.

### A Record

An A Record — more accurately, a 'DNS A Record' — links a domain to an IP address.

Your A Record — the 'A' is short for 'address' — links your chosen domain to the IP address of the system that hosts that domain.

For example, if your domain and subdomain ismarketing.example.com, and your dedicated IP address is101.10.10.101, then any attempt to accessmarketing.example.com— from a web browser, say, or by usingcurlat the command line — will be transparently routed to101.10.10.101. The browser will send a query to a DNS server, which uses the A Record to determine the target IP address. The DNS server returns this address to the browser, which uses it to request the web page.

The A Record is a file. It contains the domain, the target IP address, the record type, a TTL (Time to Live) value which indicates how long changes made to the record can be expected to take effect, and a subdomain value. This can be an actual subdomain —marketingin the example above — or a symbol:\*to indicate all possible subdomains, or@to specify the root domain.

A Records only hold IPv4 addresses. If your website has an IPv6 address, it will instead use a AAAA Record.

## Account Notifications

More info: https://www.twilio.com/docs/glossary/account-notifications

Account Notifications are timely, relevant, and personalized messages sent by companies to their customers about their accounts.

### Account Notifications

Account Notifications are timely, relevant, and personalized messages sent by companies to their customers about their accounts.

Before the advent of the web, businesses were only able to use postal mail, fax or the telephone to keep their customers notified of account updates and changes. Today, many businesses let customers choose how they want to receive account related communications, leveragingnew messaging technologies(link takes you to an external page)and the Internet. Customers can now opt to receiveaccount notificationsvia email, text alerts, or both.

Transaction basede commerce companies, in particular, often need to communicate with customers about important security related issues, for example whether their credit card has been declined or if someone has tried to access their account fraudulently. By employingSMS account notificationsas part of theircommerce communications, business can ensure their customers receive these critical alerts faster and are able to act on them quickly.Netflix(link takes you to an external page), for example, uses messaging to send alerts to customers when their credit card is about to expire or if they need to reset their password.

Notificationssuch as these can be sent in many ways. But not all channels are equally effective. For example, four out of five emails go unopened, so email is not the best way to ensure customers get important notifications. SMS has five times the open rate that email does.SMS alertsare the single best way to keep customers in the loop about important changes to their account.

By ensuring customers are notified in real time — and receivingthese notifications via their preferred channels(link takes you to an external page)— you can build a real time relationship with the customer and increase customer satisfaction.

## Ahoy

More info: https://www.twilio.com/docs/glossary/what-is-ahoy

Ahoy, a signal word originally used to call a ship, was once a standard way to greet others and was Alexander Graham Bell’s suggested greeting for answering the telephone.

### Ahoy!

Ahoy, a signal word originally used to call a ship, was once a standard way to greet others and was Alexander Graham Bell's suggested greeting for answering the telephone.

Ahoy(link takes you to an external page)is a signal word used to call to a ship or boat. The word stems from the Middle English cry "Hoy!", a greeting derived from the Dutch "Hoi".

Seafarers used the word 'ahoy' in song well before the word's first recorded use in print. The term was first referenced as a new nautical term in the 1751 novelThe Adventures of Peregrine Pickle(link takes you to an external page)by Tobias Smollett. In its early usage, 'ahoy' was used as both an exclamation and a way to get someone's attention. By 1813, 'ahoy' was a widely used word in the English language, and the first half of the 19th Century brought the term (or a close variant) to neighboring languages. 'Ahoy' soon became a popular greeting outside of nautical situations.

While 'ahoy' fell out of the popular English lexicon for a time, the word later rose from obscurity as the sport of sailing grew in popularity. 'Ahoy' can still be heard used as a greeting, a warning, or to say farewell.

While 'hello' is the standard English language greeting today, the word has only been around since 1827. In its early days, 'hello' was used to attract attention or express surprise, as in, "Well, hello, what have we here?"

'Hello' didn't become the standard greeting as we know it today until the arrival of the telephone.Thomas Edison(link takes you to an external page)urged people to say 'hello' when answering his phone.

Alexander Graham Bell(link takes you to an external page), the Scottish born innovator credited with patenting the first commercial telephone, originally suggested 'Ahoy hoy' as the standard greeting when answering the telephone. 'Ahoy' had been around at least 100 years longer than 'hello', and its nautical origins along with common usage as a greeting made it a strong candidate.

Thede factotelephone greeting we know and use today was solidified after the first telephone books sanctioned 'hello' as the official greeting in their authoritative How To... sections. 'Hello' quickly eclipsed 'ahoy', but Bell insisted upon answering the phone with 'ahoy' for the rest of his life.

In pop culture,The Simpsons' Mr. Burns also answers the telephone as Mr. Bell intended:

'Ahoy, world' is just a few lines of code away. Learn how to greet people in whatever language you speak (and code) with Twilio'sProgrammable SMSandProgrammable Voicequickstarts.

## Alphanumeric Sender ID

More info: https://www.twilio.com/docs/glossary/what-alphanumeric-sender-id

An Alphanumeric Sender ID is your company name or brand used as the Sender ID in one way SMS messages sent to supported countries. Alphanumeric Sender IDs may be up to 11 characters long. Accepted characters include both upper and lower case Ascii letters, the digits 0 through 9, and the space character. They may not be only numerals.

### Alphanumeric Sender ID

An Alphanumeric Sender ID is your company name or brand used as the Sender ID in one way SMS messages sent tosupported countries(link takes you to an external page). Alphanumeric Sender IDs may be up to 11 characters long. Accepted characters include both upper and lower case Ascii letters, the digits 0 through 9, and the space character. They may not be only numerals.

Not all countries support Alphanumeric Sender IDs, and many that do require you to register your Alphanumeric Sender ID before it is first used. Here is alist of countries that support Alphanumeric Sender IDs(link takes you to an external page)which includes the pre registration requirements for each one.

You canadd Alphanumeric Sender IDs to a Messaging Service. When you send SMS messages to a supported country, your Twilio Messaging Service will set your Alphanumeric Sender ID as theFromparameter to deliver your message. When you send SMS messages to a country where Alphanumeric Sender IDs are not supported, Twilio will use a regular phone number from your messaging service.

In order to use Alphanumeric Sender IDs with your Messaging Service, Alphanumeric Sender ID must be enabled in yourAccount's SMS Settings(link takes you to an external page). For more information on how to use Alphanumeric Sender ID with Messaging Services, please see oursupport article(link takes you to an external page).

To learn more, seeGetting Started with Alphanumeric Sender ID(link takes you to an external page).

## API

More info: https://www.twilio.com/docs/glossary/what-is-an-api

An Application Programming Interface (API) is provided by a service owner so that others may use the features and functions enabled by the service. APIs describe how a consumer will make requests of the service, and what they will receive in return.

### API

An Application Programming Interface (API) is provided by a service owner so that others may use the features and functions enabled by the service. APIs describe how a consumer will make requests of the service, and what they will receive in return.

An API defines the means by which the consumer or user of a service invokes service functions and receives data in return from the provider of the API. There are many different kinds of APIs, from theSwift(link takes you to an external page)APIs provided by iOS to provide mobile apps with access to the many facilities provided by the operating system, toREST APIsprovided by Twilio that allow developers to send SMS and do tons of other things.

Twilio, as an API company, provides many different APIs to our customers to help them build applications that communicate. Check out theAPI referencefor a full listing of the APIs Twilio provides for developers to use. Primarily, Twilio provides REST APIs and software APIs for developers to use in order to do fun things like answer phone calls, make video calls, or instantly synchronize data between two clients.

AREST APIallows systems to communicate with one another and invoke functions over the Internet.

In a typical software program, you will use a combination of a programming language's built in features, its syntax, and APIs provided either by the language's standard library or libraries created and published by third parties. Twilio provideslibraries for many popular programming languagesthat allow developers on those platforms to consume our services.

Here's an example of using Twilio's helper libraries to send an SMS message using different languages.

Don't know an API from anIPA(link takes you to an external page)?Talk to an expert(link takes you to an external page), or get some help from oursupport team(link takes you to an external page).

## API Key

More info: https://www.twilio.com/docs/glossary/what-is-an-api-key

An Application Programming Interface (API) Key is a unique identifier that is used to authenticate a developer or program to an API.

### API Key

An Application Programming Interface (API) Key is a unique identifier that is used to authenticate a developer or program to an API.

When you create a Twilio Account, Twilio generates anAccount SID (String IDentifier)and an Auth Token. These are your Account API credentials. Any time you share these credentials, say with a colleague, you increase the risk of those credentials becoming compromised. Luckily, Twilio also allows you to authenticate using API Keys.

API Keys are the preferred way to authenticate to Twilio's services.

Check out theAPI Keys Overview pageto learn about the types of API Keys that Twilio offers and how to create and delete API Keys

Read the"Make an HTTP Request to Twilio" docto learn how to authenticate your requests with API Keys.

## Application

More info: https://www.twilio.com/docs/glossary/what-is-an-application

An Application, often shortened to ‘app’, is a program, or set of programs, that allows end users to perform particular functions. For example, ecommerce companies provide applications to customers to facilitate purchases and service.

### Application

An Application, often shortened to 'app', is a program, or set of programs, that allows end users to perform particular functions. For example, ecommerce companies provide applications to customers to facilitate purchases and service.

The terms 'software', 'program', and 'application' are often used together or interchangeably. While these terms are related, they are not the same thing.

A program is a set of instructions that tells a computer what to do. Programs are written in various programming languages, such as Python, PHP, Java, and many others.

Software refers to the programs used by a computer. The term is used to describe the functionality provided by a computer that is not a feature of the hardware. Software is usually though of as programs that can be installed on, or removed from, the computer. 'Firmware' is software that it integrated into the hardware. System software comprises programs that manage the computer and may run without user interaction.

An application is also a type of software and is sometimes called 'application software'. Like other software, an application is made of a program, or set of programs. What makes an application different is that it's designed to interact with the user of the computer. It helps the user perform certain broad tasks, such as preparing textual documents, or working with numerical data.

The term 'app' is more commonly used when referring to a mobile application — one intended to be used a smartphone or tablet. Application is used more often when describing desktop or laptop software. However, these terms can be used interchangeably. The common thread is they are designed to interact with a user.

A special type of Application is the 'web application'. This is an application that is stored on a remote server and accessed through a browser. While most web applications won't work without Internet access, others applications can work without an Internet connection because they rely on resources stored on the device that they are installed on.

A third type of application is the 'software as a service (SaaS) application'. This any of the other kinds of Application, but crucially stores user data in the cloud. What sets SaaS applications apart is that many of them charge a subscription fee to use the application and its cloud environment. Well known examples of SaaS applications include Salesforce.com, Google Docs, and Microsoft Office 365.

When businesses and developers want to add communications capabilities to their applications, they often turn to Twilio. Twilio provides Application Programming Interfaces (APIs) that software developers can use to add communications features like voice, video, chat, authentication, and messaging to their applications.

AnAPIis a set of rules that lets programs talk to each other, exposing data and functionality across the Internet in a consistent format. With Twilio APIs, developers can grab the tools they need to give applications the power to exchange messages of any variety, with minimal development effort.

Using web languages they already know, developers use Twilio APIs to route communications to the right person (and even thing), over the preferred communication channel. This enables businesses to create communications experiences that were previously not possible and provide the right experiences for their customers faster.

## Application to Person Messaging

More info: https://www.twilio.com/docs/glossary/what-a2p-sms-application-person-messaging

Application to Person messaging (A2P) is any kind of message traffic in which a person is receiving messages from an application rather than another individual, and which is not expected to receive a reply. A2P message includes, but is not limited to, marketing communications, appointment reminders, chatbots, notifications, and one time passwords (OTPs) or PIN codes.

### Application to Person Messaging

Application to Person messaging (A2P) is any kind of message traffic in which a person is receiving messages from an application rather than another individual, and which is not expected to receive a reply. A2P message includes, but is not limited to, marketing communications, appointment reminders, chatbots, notifications, and one time passwords (OTPs) or PIN codes.

Carriers in the US and Canada have a strict interpretation of A2P, and consider all messaging that passes through Twilio — or other messaging application platforms — to be A2P.

Wireless carriers treatP2PandA2Ptraffic differently in terms of the type and volume of traffic that they allow. It is important to understand your use case so you can use the correct tools, such asphone numbers(link takes you to an external page),short codes, orAlphanumeric Sender ID(link takes you to an external page).

Learn more aboutthe difference between A2P and P2P SMS(link takes you to an external page).

'US A2P 10DLC' is a system in the US that allows businesses to send A2P messages via standard 10 digitlong code(10DLC) phone numbers.

'A2P 10DLC' is also the new standard for businesses to send trusted messages in the US and to minimize unwanted messages. Businesses register their brands and campaigns with mobile carriers. In return, the carriers provide them with high volume, high deliverability messaging.

For more detailed information on A2P 10DLC in the US, the registration process, fees, and benefits, please seeWhat is A2P 10DLC?(link takes you to an external page)

## Appointment Reminder

More info: https://www.twilio.com/docs/glossary/what-is-an-appointment-reminder

An Appointment Reminder is a message sent by a business to notify a customer of an upcoming event, such as an eye test, a restaurant booking or a package delivery. While some businesses call customers to remind them of their appointments, text messaging has emerged as the preferred channel for this kind of communication.

### Appointment Reminder

An Appointment Reminder is a message sent by a business to notify a customer of an upcoming event, such as an eye test, a restaurant booking or a package delivery. While some businesses call customers to remind them of their appointments, text messaging has emerged as the preferred channel for this kind of communication.

Businesses that usetext messagingcan send customers a reminder a few days — or even hours — in advance of their scheduled service or order delivery date. This helps reduce the number of missed appointments and enables customers to contact the business directly if they need to make any changes. For example,Yelp, the crowd sourced business review site(link takes you to an external page), sends reminders to users who've made restaurant bookings through its app, allowing them to confirm or change their reservations via SMS.

Likewise, whenArkansas Children's Hospital(link takes you to an external page)schedules an appointment, they ask patients to opt into SMS or voice reminders at the time of scheduling. In that way, ACH can send reminders of appointments, which can be confirmed or changed via text. By interacting directly with customers,this two way communication(link takes you to an external page)allows businesses to reduce no shows and increase customer communications.

Appointment Reminders, like allnotificationssent usingtext and voice messaging(link takes you to an external page), receive attention more quickly than email and other channels. And best of all, businesses typically receive customer replies in real time. This enables companies toautomate customer communicationsand deliver a first rate customer experience.

Try out our tutorials, which walk you through building an Appointment Reminder system, ortalk to sales(link takes you to an external page)for help with your unique Appointment Reminder scenario.

## Area Code Overlay

More info: https://www.twilio.com/docs/glossary/what-area-code-overlay

An Area Code Overlay is an area code that covers the same geographical space as another area code. In North America, each area code has a potential capacity of around 8 million unique phone numbers — 7,919,900, to be exact. Many area codes have exhausted all possible phone numbers, so one or more area codes are added to accommodate.

### Area Code Overlay

An Area Code Overlay is an area code that covers the same geographical space as another area code. In North America, each area code has a potential capacity of around 8 million unique phone numbers — 7,919,900, to be exact. Many area codes have exhausted all possible phone numbers, so one or more area codes are added to accommodate.

212is the original area code for New York City (Manhattan, to be exact). The overlays646,917, and332were added later as the need for phone numbers has grown past each code's maximum of 7,919,900 numbers. Here is afull list of overlays in the North American Numbering Plan(link takes you to an external page).

To check if Twilio has available phone numbers in your target area code, or in an overlay, use theConsole(link takes you to an external page):

In the above image, you can see a search for the area code209, for the general area around Stockton, CA. If you were searching for a San Francisco number, you could try 415 or the Area Code Overlay628. Availability will be detailed in the results, but Twilio very often will have numbers available from primary area codes and overlays.

## Arrival Alerts

More info: https://www.twilio.com/docs/glossary/what-are-arrival-alerts

An Arrival Alert is sent by a business to inform one of its customers when they might expect their product or service to arrive.

### Arrival Alert

An Arrival Alert is sent by a business to inform one of its customers when they might expect their product or service to arrive.

Arrival Alerts can be sent via SMS,in app chat(link takes you to an external page), orpush notifications. They allow organizations to keep customers informed.

WithSMS messaging(link takes you to an external page), businesses can share real time tracking and transit information, so customers know exactly when their order will arrive. For example,Uber(link takes you to an external page)keeps customers up to date by sending SMS car arrival estimates. Likewise,Instacart(link takes you to an external page), an on demand grocer, sends alerts to its customers when their personal shopping courier has finished selecting their groceries, and when orders are out for delivery.

Arrival Alerts, like allnotificationssent usingtext and voice messaging(link takes you to an external page), receive attention more quickly than email and other channels do. Best of all, businesses typically receive replies in real time. This enables companies toautomate customer communicationsand deliver a first rate customer experience.

## Artificial Intelligence

More info: https://www.twilio.com/docs/glossary/what-is-artificial-intelligence

Artificial Intelligence (AI) is the ability of a computer to mimic human cognitive skills, such as learning and understanding.

### Artificial Intelligence

Artificial Intelligence (AI) is the ability of a computer to mimic human cognitive skills, such as learning and understanding.

Although still in its early stages, AI is already changing the landscape of company communications. It allows businesses to engage with larger numbers of customers without sacrificing the quality of the interaction. Today, businesses use AI to chat with customers, route calls, send emails, and more. By 2020, research company Gartner predicts that 85% of a customer's engagement with an enterprise will occur without interacting with a human being.

This is possible because of advances in machine learning — the ability of AI systems to learn and improve automatically. They do so by taking in data through observations and interactions, and adapting accordingly without being explicitly programmed. Essentially, machine learning systems program themselves.

Rapid advances in AI like machine learning are bringing many businesses opportunities forgrowth and revenue(link takes you to an external page). There are three main factors influencing this fast moving space:

AI offers multiple benefits to both customers and businesses. Among the most apparent benefits to customers is shorter hold times. AI can be used to help route callers to the right destination quickly, skipping some — or all — of the traditional phone menu.

An example of an intelligent routing system is theTwilio TaskRouter API. TaskRouter dynamically assigns messages to the human agents that can best handle them. Messages and other types of data can be routed based on the "skills" required and the applied priority. AI applications like this help build superior customer experiences.

For businesses, cost savings are a significant driver behind the adoption of AI for customer support. While a customer service phone call costs a business$6 20 per call(link takes you to an external page), automated calls cost, on average, 25 cents. However, the benefits of AI extend far beyond the bottom line. When automated services take care of a portion of customer service requests, agents are free to handle more complex requests. This reduces customer frustration while continuing to reduce the load on each live agent, allowing operators to specialize and give better service.

Bots are instances of software that lets a customer interact with a business through messaging. They are a common use of AI in business communications. While some bots operate on their own, many others support and augment a human agent who is representing the business.

Bots provide automated responses based on message analysis using technologies such as Natural Language Understanding (NLU) and Intent Extraction. Bots can learn from human decisions, so they get better with algorithmic and data driven decisions day by day. Eventually this reduces the need for humans to step in.

When bots deliver a subpar experience compared to a human agent, companies are left to balance higher costs associated with human support agents and the negative customer satisfaction scores generated by a poor bot. It doesn't have to be this way. At Twilio, we allow you to integrate with third party bot providers to create a conversational AI interface, to bridge the gap between human agents and self service bots.

Contact centers are a hive of activity, filled with repetitive work and lots and lots of data. This is an ideal environment for AI and automation. If AI can deliver what we want it to, we can actually decrease costs while simultaneously increasing customer satisfaction.

However, we still need human agents to create intimacy with our customers. Intimacy drives customer satisfaction which creates loyalty. Loyal, satisfied customers tend to spend more money.

Ultimately, the question is notwhetherwe should be using AI, but how do weapply it appropriatelywhile still keeping that human touch.

We also need to keep our human agents happy. Agents with positive attitudes create better experiences for customers and stay with your contact center longer, reducing churn. Agent assist AI can also be useful here. Ultimately, the goal of AI is to help customers have a more personalized and efficient experience without them even noticing. AI improves agent conversations by helping to anticipate customer needs and automate actions where possible. In cases where customers can self serve, AI tools can help those interactions be more human.

Twilio Flex(link takes you to an external page)was built to allow complete customization all the way through the stack. AI can be applied at every layer. You can focus on using AI before the agent interaction, such as by building chatbots or using sentiment analysis to improve routing. Or you can use AI to assist agents during an interaction or for agent training in conjunction withworkforce optimizationanalytics.

## Attribute Based Routing

More info: https://www.twilio.com/docs/glossary/what-is-attribute-based-routing

Attribute Based Routing is a process used by contact center applications to distribute tasks according to a set of defined characteristics.

### Attribute Based Routing

Attribute Based Routing is a process used by contact center applications to distribute tasks according to a set of defined characteristics.

Attribute Based Routing intelligently steerscontact centertasks. For example, you can specify in the workflow how you want to route calls and then send voice callers to the most qualified agent based on the attributes you defined. Some examples of attributes include:

TaskRouteris Twilio's Attribute Based Routing engine. TaskRouter can route any interaction, whether it originates from Twilio or another system.

When a call, lead, chat, SMS, support ticket, messaging app request, or even machine data comes in, TaskRouter dynamically assigns the incoming task to the person and process that can best handle it. TaskRouter does so using the attributes you apply, such as the skills required by the agent and the task priority.

With TaskRouter, you can define the characteristics of each task using any number of attributes. You can also write syntax to route those tasks based on combinations of attributes, including escalation and fallback rules, so you don't have to write custom code.

Example applications for TaskRouter include:

With an attribute based routing system like TaskRouter, customer support agents and other workers are matched to tasks based on their skills. As an admin, you can specify what agent skills are required to take work from each queue and also update worker skills at any time. TaskRouter will immediately update the state and routing logic with no code changes required.

Attribute based routing engines let teams get away from the administrative work of manually routing tasks and back to what's most important — creating great customer experiences. And of course, it's easier for them to create great customer experiences when they are given tasks that match their skill set.

Attribute based routing also makes it easier for workers to multitask, since you can specify how many different tasks each agent can handle concurrently, with different limits per channel. For example, a worker might be able to handle three simultaneous chats, a voice call and a chat, or only one voice call at a time. The engine notes a worker's capacity and their activity to determine if they are available for a new task. By using incremental escalation to constantly keep track of every task in the system, wherever it is in the queue, you can define escalation logic to incrementally expand the set of agents who can be assigned to each task.

Lending platform LendUp(link takes you to an external page)implemented TaskRouter to intelligently route customers' calls to different specialists. For example:

Using TaskRouter, LendUp can write its own call routing logic, and let TaskRouter do the heavy lifting.

## Authentication Token

More info: https://www.twilio.com/docs/glossary/what-is-an-authentication-token

An Authentication Token (auth token) is a piece of information that verifies the identity of a user to a website, server, or anyone requesting verification of the user’s identity.

### What is an Authentication Token?

An Authentication Token (auth token) is a piece of information that verifies the identity of a user to a website, server, or anyone requesting verification of the user's identity.

Auth Tokens add an extra layer of security, along with having the additional benefit of being scalable and providing better access control. In terms of scalability, authentication tokens contain the data needed to verify a user's identity, and are stored locally on a user's device. They have negligible impact on a user's hardware, and therefore can be scaled to an arbitrarily large number of users. Since each token can store user specific data, auth tokens can tell a server what amount of access to give to a user, providing access control to the server distributing authentication tokens.

Auth tokens come in the form of hardware or software tokens:

Once this additional layer of software based authentication is passed, the application or server will give the user an authentication token, which is similar to a ticket allowing the user to access the site. Like a ticket, authentication tokens outline the duration of validity and scope of access which will grant the user access until expiry.

Typically, the user will send the server or application a JSON Web Token(JWT), which is a standard set inRFC7519(link takes you to an external page). A JWT is made up of three parts: a header, a payload, and a signature.

The information is encrypted, concatenated together with periods, and then sent over to the server. Once the server receives it and verifies the information, the server will return an authentication token, which grants access and outlines the lifetime of the token. This token is then saved locally (within the browser or through cookies) and can be checked every time the user accesses the site. Once the token expires, it is removed from local storage, requiring the user to authenticate again.

## Autonomous Agents

More info: https://www.twilio.com/docs/glossary/what-are-autonomous-agents

Autonomous Agents are artificial intelligence (AI) systems that can perform a series of complex tasks entirely undirected to achieve a goal. An autonomous agent needs to reason, plan and interact with the necessary systems and real world to solve a problem.

### What are autonomous agents?

Autonomous Agents is the concept ofartificial intelligence (AI)systems that can perform a series of complex tasks entirely undirected to achieve a goal. For this an autonomous agent needs to reason, plan and interact with the necessary systems & real world to solve the problem.

Sparked by the rapid advance ofLarge Language Models (LLMs), there is an increased amount of exploration towards a world of autonomous agents by building more purpose built "agents" that can perform a set of tasks.  
To build these agents, researchers and companies are using different techniques to leverage LLM capabilities and work around limitations. These techniques include different prompting strategies such as"Chain of Thought" prompts(link takes you to an external page)where an LLM  
is asked to think through a problem step by step and outline what actions it would like to perform.

Some of the most known research projects that have been moving the exploration of agents forward are theGenerative Agents(link takes you to an external page)paper that used GPT 3.5 to create a small town simulation of different agents interacting with each other,  
as well as theVoyager project(link takes you to an external page)an LLM powered agent that was left alone to play and control Minecraft by being able to generate code and learn new skills.

As AI companies develop increasingly capable agents, more companies are looking to leverage agents for parts of their customer engagement, whether for customer support, initial sales engagements or to provide customers with a type of "copilot" that can help the customer navigate and set up their product.

## N/A

N/A

## Basic Authentication

More info: https://www.twilio.com/docs/glossary/what-is-basic-authentication

Basic Authentication is a method for an HTTP user agent (e.g., a web browser) to provide a username and password when making a request.

### Basic Authentication

Basic Authentication is a method for an HTTP user agent (e.g., a web browser) to provide a username and password when making a request.

When employing Basic Authentication, users include an encoded string in theAuthorization header(link takes you to an external page)of each request they make. The string is used by the request's recipient to verify users' identity and rights to access a resource.

The Authorization header follows this format:

We then construct thecredentialslike this:

So if your username and password aretwilioandahoy!, the combination istwilio:ahoy!, and when base64 encoded, this becomesdHdpbGlvOmFob3kh. So requests made by this user would be sent with the following header:

When your server orTwilio Functionreceives this request, it can access the Authorization header, decode the credentials, and look up the user to determine if they should be allowed access to the requested resource.

## N/A

N/A

## C#

More info: https://www.twilio.com/docs/glossary/what-is-csharp

C# — pronounced “see sharp” — is an object oriented and statically typed computer programming language created by Microsoft for use on its .NET platform. Its name comes from the C language, from which it inherits a similar syntax.

### C#?

C# — pronounced "see sharp" — is an object oriented andstatically typed(link takes you to an external page)computer programming language created by Microsoft for use on its .NET platform. Its name comes from the C language, from which it inherits a similar syntax.

C# was created byMicrosoft(link takes you to an external page)and standardized byISO(link takes you to an external page)andECMA(link takes you to an external page). It was officially released in 2002. Since then, the language has seen numerous improvements with the most recent version beingC# 6.0(link takes you to an external page).

C# developers are frequently referred to as .NET developers since the C# language is almost exclusively used with the .NET Framework. It is quite a popular language, generally ranking among the top five on manydifferent(link takes you to an external page)popularity(link takes you to an external page)charts(link takes you to an external page). It is most commonly used in enterprise software development but also has a thrivingopen source ecosystem(link takes you to an external page).

C# was designed to run on theCLI (Common Language Infrastructure)(link takes you to an external page)and utilize the.NET Framework(link takes you to an external page). It was built for multipleprogramming paradigms(link takes you to an external page), such as oject oriented programming (OOP) andfunctional(link takes you to an external page)programming. The language is compiled. It is statically typed, which means that the type of every variable is checked by the compiler. However, in version 4.0, C# did introduce a keyword,dynamic, for dynamic variable binding.

While originally built to run on Windows, C# was quickly ported to Linux and macOS by theMono(link takes you to an external page)project. Today, C# isopen source(link takes you to an external page)and runs on the cross platform.NET Core(link takes you to an external page).

Modern C# and .NET development can be carried out on a variety of platforms. The most common usage on Windows is through theVisual Studio(link takes you to an external page)integrated development environment (IDE) but there are other tools available as well, such as the lightweight, cross platform VS Code editor.

There is a wealth of C# information online, but here are a few links to get you started:

## Call Attribution

More info: https://www.twilio.com/docs/glossary/what-is-call-attribution

Call Attribution is a way to track calls by tying phone numbers to data from an ad source, such as keywords, sessions or campaigns. It provides visibility into digital campaigns and allows accurate measurement of marketing return on investment (RoI).

### Call Attribution

Call Attribution is a way totrack calls(link takes you to an external page)by tying phone numbers to data from an ad source, such as keywords, sessions, or campaigns. It provides visibility into digital campaigns and allows accurate measurement of marketing return on investment (RoI).

Call Attribution is a form of conversion tracking technology that performance marketers use to determine which online channels generate the most customer calls. Call attribution can provide the same level ofinsight for call conversions(link takes you to an external page)that tools like Google Analytics and Mixpanel provide for digital campaigns.

Call Attribution works by tying a unique phone number to each channel, a technology also known as dynamic number insertion (DNI). DNI basically uses asnippet of JavaScriptwhich sets the phone number shown by an ad or webpage by taking one from a pool of local, international or toll free trackable phone numbers. This allows marketing agencies likeScorpion(link takes you to an external page)to tie phone leads back to the ads, campaigns or keywords that were used to generate each specific engagement.

Marketers can attribute calls at thecampaign, keyword or visitor level(link takes you to an external page). Call Attribution captures profile data once an online user calls the number on a landing page or ad. This data can then be integrated with other marketing software to provide a full picture of what happens online and offline to help drive higher quality conversions.

By using Call Attribution, marketing teams can better choose how to allocate their marketing spend. It gives them the data they need to focus on the ads and keywords that are driving the most calls. This can help increase revenue while reducing the cost per acquisition (CPA). Call Attribution can alsodemonstrate the value(link takes you to an external page)of an online directory or listings website by generating more qualified leads for professionals. Bridging online behavior to offline conversions also helps marketers optimize overallperformance(link takes you to an external page)by concentrating marketing efforts on campaigns that bring tangible business results.

To find out more about how you can implement call attribution, watchthis demo(link takes you to an external page). For a crash course in managing and attributing numbers, take a look atNumber Management 101(link takes you to an external page)and follow upNumber Management 102(link takes you to an external page).

## Call Center

More info: https://www.twilio.com/docs/glossary/what-is-a-call-center

A call center is the heart of customer service for many businesses, where customers call in for help and reps call out for sales. It’s referred to as a “call center” because traditional models of customer service are based on phone support as the main method of contact between customers and companies. A modern call center is often referred to as a contact center.

### What is a Call Center?

Acall centeris the heart of customer service for many businesses, where customers call in for help and reps call out for sales. It's referred to as a "call center" because traditional models of customer service are based on phone support as the main method of contact between customers and companies. A modern call center is often referred to as acontact center.

Traditionally, a call center is an office where a large number of call center agents provide customer service over the telephone.Inbound call centersreceive calls for customer support that are initiated by customers and prospects and often serve as a knowledge base for tech support, billing questions, and other customer service issues. These call centers focus on quick call resolution times and agent productivity. Inoutbound call centers, agents make calls rather than receive them. These could be sales calls, marketing offers, surveys, fundraising requests, or debt collection, for example.

The termcontact centerreflects the reality that there are many other ways to connect with a customer besides telephone. The combined trends of increased customer expectations and newer technologies that allow formany channels of communication(link takes you to an external page)are creating a shift in thetraditional call center modelwhich has existed for decades. Consumers want more ways to reach businesses, and businesses are looking for new ways to improve customer experience.

While call center agents generally focus oninbound and outbound calls(link takes you to an external page)either on traditional phone lines or overVoIP, contact center agents handle a wide variety of communications. In a modern multichannel contact center, technical support might be delivered overin app chat(link takes you to an external page)orvideo(link takes you to an external page), while order status updates are delivered viaSMS(link takes you to an external page), event promotions are sent aspush notifications, surveys are deployed overFacebook Messenger(link takes you to an external page), and sales inquiries received by email are sent directly to an agent to connect by phone. Anomnichannelcall center takes the multichannel approach one step further and connects and integrates all channels of communication for a seamless customer experience.

In short, the difference between a call center and a contact center is that call centers handle voice communications, contact centers handleallcommunications.

Many businesses built their call centers with costly infrastructure that was expensive and time consuming to install and customize. Most legacy call center systems take an average of nine months of professional services to make even the smallest changes. It's very hard to experiment, iterate, and improve a contact center under those circumstances. In the meantime, customer expectations continue to change rapidly as new technologies and communication channels become the norm.

Today, a new approach to the traditional call center is available that allows businesses to deliver the caliber of real time customer experience necessary to win in increasingly competitive markets. Instead of taking an 'off the shelf' system from a telecom vendor and accepting inflexible systems with a monolithic feature set, thiscall center software(link takes you to an external page)approach enables companies to build the exact solution they need, when they need it. It's an approach that offers more than updated technology; it re envisions how call center operations are designed and built.

Software based on APIs allow real time customer experiences over multiple channels (voice(link takes you to an external page),chat(link takes you to an external page),SMS(link takes you to an external page),IVR, email,social media(link takes you to an external page), etc.). They act as an automatic call distributor (ACD) that canroute any taskfrom multiple sources. The ACD recognizes an incoming call and scans for predetermined identifying information. This information is cross referenced against a database of call routing instructions and distributes the call accordingly. The software maintains context of conversations and surfaces customers to the correct agent throughcomputer telephony integration (CTI)(link takes you to an external page)andWebRTC.

When you build your contact center with communication building blocks like Twilio's programmable APIs, you can choose the channels and features you need and add more as your call center expands. APIs give you the flexibility to build the exact customer experience you want, and the freedom to iterate your IVR, call flows, and other aspects of your communications as frequently as you like.

See alsoWhat is a Cloud Contact Center?

## Call Routing

More info: https://www.twilio.com/docs/glossary/what-is-call-routing

Call routing refers to the procedure of sending voice calls to a specific queue based on predetermined criteria. A call routing system is also known as an automatic call distributor (ACD).

### What is Call Routing?

Call routingrefers to the procedure of sending voice calls to a specific queue based on predetermined criteria. A call routing system is also known as anautomatic call distributor (ACD).

Since traditional models of customer service were based on phone support as the primary method of contact between customers and companies, the procedure of sending calls to the right agent became known ascall routing. However, modern agents interact with customers through a variety of channels. Thecall centerhas evolved into thecontact center.

Today,SMS(link takes you to an external page)messages,chat(link takes you to an external page)andmessaging(link takes you to an external page)requests, support tickets, leads, or even machine data are routed based on pre set attributes, such as skills required by the agent, time zone or language preferences, and priority of the task. This process is often referred to asattribute based routing, which matches tasks to the people or processes that can best handle them.

When there's a queue of customers waiting on the line, most businesses agree: getting those customers connected to the right agent as quickly as possible is a high priority.

Call routing allows businesses to connect their customers to the right agent faster. Attribute based routing assesses the needs and context of each caller and connects them to the most qualified agent available with the skills to address those needs. Priority based routing lets businesses elevate the most important callers to the front of the queue.

Intelligent call routing (ortask routing) isn't just beneficial for customers. It also increases agent productivity by ensuring that agents are working on the right task at the right time, instead of prioritizing less urgent tasks or working on tasks that they aren't suited for.

Call routing helps customers not only have their needs met quickly, but also have an overall better experience. By anticipating customer needs and automating actions where possible, call routing creates a more personalized and efficient customer experience—which has a direct impact on a business's bottom line.

Consumer research(link takes you to an external page)shows that 67% of customers will give more business to a company as a result of positive communication experiences. But after a poor communication experience, 38% of customers will switch to a competitor or cancel orders or services, 66% will tell a friend about their experience, and 41% will stop doing business with the company altogether.

In cases where human agents aren't necessary, call routing enables virtual assistants andinteractive voice response (IVR) systemsto provide instant help. In fact,Gartner(link takes you to an external page)predicts that customer preferences for independence and self service automation will likely rise to 85% by 2020.

An IVR system with custom built menus can expedite incoming calls, accurately route callers, or even schedule a callback, reducing both the cost and the time to resolution.

Becausecustomers prefer self help(link takes you to an external page)features over waiting on hold for human contact, implementing an IVR system makes good business sense. This is especially true since IVR handled calls cancost 100 times less(link takes you to an external page)than those involving a live agent. Equipped with intelligent call routing, IVR systems can reduce operating costs while increasing customer satisfaction.

Twilio TaskRouteris an example of an attribute based routing API, for calls as well as other channels of communication, such asSMS messages, or interactions from any other system such as aCRM. TaskRouter dynamically routes incoming tasks to the agents that can best handle them based on applied attributes, such as skills required by the agent and priority of the task.

Twilio chose TaskRouter as the routing engine for the contact center application platformTwilio Flex(link takes you to an external page), which can handle thousands of agents in one instance, because of its powerful ability to dynamically filter workers, optimize and prioritize tasks, and strategize for workers taking tasks on multiple channels concurrently. TaskRouter is at the very heart of every Twilio contact center deployment.

## Call Tracking

More info: https://www.twilio.com/docs/glossary/what-is-call-tracking

Call Tracking is a software based performance marketing technique that generates and assigns a unique phone number to a specific advertisement or marketing campaign. Call Tracking systems then follow and analyze leads through that phone number “channel” to understand the channel’s true effectiveness and ROI or receive a commission for driving that lead.

### What is Call Tracking?

Call Tracking(link takes you to an external page)is a software based performance marketing technique that generates and assigns a unique phone number to a specific advertisement or marketing campaign. Call Tracking systems then follow and analyze leads through that phone number "channel" to understand the channel's true effectiveness and ROI or receive a commission for driving that lead.

Call Tracking lets marketers assignunique phone numbers(link takes you to an external page)to each product, advertisement, region, or other segment they desire and route those calls to the endpoint (typically a contact center) they designate. Call Tracking turns a phone number into areferral source(link takes you to an external page)that is then used to track and analyze leads. Not only does Call Tracking allow for automatic call routing to the best available agent based on lead origin, it also provides a much more accurate picture of each campaign's effectiveness, profitability, andtrue ROI(link takes you to an external page).

Call Tracking can improve campaign effectiveness by using metadata to optimize call routing. Sales and service agents receive only the calls that originate in their region, from product pages and listings that they own, or from advertisements that are part of their campaigns. This provides useful context to calls, and can also be used to connect callers with live agents immediately, which can improve conversion rates.

Call Tracking improves forecasting and budgeting, too. Call Tracking provides visibility into theROI of each campaign(link takes you to an external page)by revealing exactly whichcampaigns(link takes you to an external page),keywords(link takes you to an external page)andsessions(link takes you to an external page)drive revenue, and which are not worth the investment. Companies can then double down on the sources that matter and cut the ones that underperform.

Twilio's ProgrammableVoice APIs(link takes you to an external page)provide a cost effective way to create andcustomize call tracking programs(link takes you to an external page). Local and toll free phone numbers can be purchased in bulk, then leads can be sent to any endpoint with Twilio's APIs. Customers such as Trulia have used Twilio Programmable Voice APIs to drive local, qualified leads to their agents that convert 100x better than traditional lead generation programs.Read more(link takes you to an external page)→

Not a developer? Check out these great Twilio poweredCall Tracking providers(link takes you to an external page).

## Call Transcription

More info: https://www.twilio.com/docs/glossary/what-is-call-transcription

Call transcription is the conversion of a voice or video call audio track into written words to be stored as plain text in a conversational language. Call transcription can either be live as a call or event happens or based on the recording of a past conversation.

### What is Call Transcription?

The call transcription process converts a voice or video call audio track into written words stored as plain text in a conversational language. The process can transcribe calls eitherlive as a call or event happens or use a recording of apastconversation.

Call transcription is an important and powerful tool for business, training, medical, or legal reasons. As far more advanced search and analysis features exist for text than audio, many use cases need a text based history of conversations. Additionally, real time speech to text transcription services (such asClosed Captioning) increase accessibility which improves understanding for people who are hard of hearing or new to a language.

When it comes to voice calls, call transcription is often used in a business context, for example, toimprove training and feedback for call center employees(link takes you to an external page). Logging the context and words spoken in a call can help you identify business problems algorithmically, making it easier to deploy resources in an evidence based manner. Additionally, call transcriptions and recordings are valuable for legal purposes, where contemporaneous transcriptions, recordings, and notes are superior to other types of records.

Twilio allows you to add call transcriptions to ourProgrammable Voice(link takes you to an external page)product. For recorded transcriptions, you can use our REST API's provisions totranslate recordings to speech(link takes you to an external page). Twilio additionally has areal time transcription servicewith multiple language support and contextual analysis and Natural Language Processing support.Talk to Sales(link takes you to an external page)about your call transcription requirements for information on that product.

Call transcription legality differs by jurisdiction. Some jurisdictions ban the transcribing or recording of calls or transcribing real time speech over a call or video. Some require some or all parties in a conversation to provide informed consent. Twilio can't comment on the specifics of your local laws. Consult your relevant laws or consult with your legal representation for your unique situation.

Due to differences in volume, accents, timing, and connection quality, the final mixed track of a voice or video call can often be unintelligible even for professional human transcribers. So calledSingle Channel Recordingsonly store the one final mixed track pre transcription. This can increase the eventual number of transcription errors, especially if participants are speaking at the same time.

The highest accuracy call transcription solutions record each (or all) sides of the call separately. With individual recordings, aDual Channel Recordingsolution (orMulti Channel Recording solution) performs better at eliminating cross talk and cancellation noise which would otherwise interfere with the final mix. It also prevents most (or all) misattribution errors.

To learn more about our dual channel call transcription options,consult our blog post on the topic(link takes you to an external page).

TheGatherorRecordTwiMLVoice verbs both support eventual transcribing, while ourPhone Call Speech Transcription Productcan help with your real time requirements.

To learn more about Natural Language Processing and determining caller intent orsentimentin real time,contact sales(link takes you to an external page).

## Call whisper

More info: https://www.twilio.com/docs/glossary/call-whisper

Call Whisper, also commonly referred to as Call Screening, involves playing a message to the callee while the caller continues to hear ringing. It can provide additional information such as the source or purpose of the call to the callee before the call begins and even allow the callee to accept or reject the call based on that information.

### What is Call Whisper?

Call Whisper, also commonly referred to asCall Screening, involves playing a message to the callee while the caller continues to hear ringing. It can provide additional information such as the source or purpose of the call to the callee before the call begins and even allow the callee to accept or reject the call based on that information.

The<Dial>verb inTwiMLallows you to add a call whisper feature to your Twilio voice application by providing a call screening URL that controls the call once the callee picks up while the caller continues to hear ringing (requiredanswerOnBridgeset to true). If the call is being answered by a client created using theVoice JavaScript SDK, theurlattribute on the<Client>noun can be used. If the call is being answered using a phone number, the same attribute is available on the<Number>.This attribute can point to a URL that can return TwiML containing the<Play>and<Say>verbs to play a message to the callee before connecting the call. It can also contain<Gather>and<Hangup>verbs, allowing the callee to accept or reject the call by pressing a key.

For more detailed information, please check out thistutorial on Call Screening.

## Chatbot

More info: https://www.twilio.com/docs/glossary/what-is-chatbot

A chatbot is an artificial intelligence (AI) program that creates conversational interaction between the chatbot and another user through voice commands or text chats.

### What is a Chatbot?

A chatbot is an artificial intelligence (AI) program that creates conversational interaction between the chatbot and another user through voice commands or text chats.

A chatbot is also known as an Artificial Conversational Entity (ACE), chat robot, talk bot, chatterbot, or chatterbox. A user can ask a chatbot a question (What's the weather today?) or make a command (Play Rick Astley), and the chatbot responds or performs the action.

Early versions of chatbots included the iconicELIZA(link takes you to an external page)program (1966) which simulated a psychotherapist, andPARRY(link takes you to an external page)(1972), meant to mimic a person with paranoid schizophrenia. Both of these chatbot programs simulated typed conversations.

Now, many chatbots include voice interaction that leveragenatural language processing (NLP)and Natural Language Understanding (NLU. This gives them complex functional features, like the ability to carry out a task or gather information for a user.

Modern chatbots are often used where short interactions and limited responses are required. They play a significant role in customer service and marketing applications. A chatbot can answer questions about products, services, or policies. If a customer needs to do more than the chatbot can handle, the program can escalate to hand off the interaction to a human operator.

Modern chatbots are also often used online and in messaging apps. They are also included in operating systems as virtual intelligence assistants (e.g., Apple's Siri and Windows' Cortana). Chatbot appliances like Alexa and Google Home are also growing in prevalence and can perform a myriad of functions based on user commands.

Chatbots may function in two main ways, depending on if they are built on aset of rulesormachine learning.

A chatbot based on a set of rules is quite limited. It can only respond to a limited set of precise commands. If a chatbot is programmed to tell you the time or the weather, it will not be able to respond to a request like "Which artist wrote 'Never Gonna Give You Up?'" These chatbots are oftenstateless, meaning that they approach each interaction as if it were with a new user. These bots have no active memory of prior communication.

A chatbot that functions usingmachine learningis built on artificial intelligence (AI) technologies, including natural language processing, deep learning, and machine learning algorithms. These complex chatbots understand language, not just specific commands.

AI powered chatbots require a massive amount of data and arestateful, meaning that they can review past interactions and include that context in its responses. The more stateful a bot interacts with its users, the better the bot gets at recognizing human speech and predicting the appropriate response or action to take.

Some examples of chatbots you might interact with on a daily basis are virtual assistants like Google Assistant & Amazon's Alexa. Messaging apps like Facebook Messenger or WhatsApp also often leverage chatbots for businesses to better communicate with their customers.

While bots appear vastly different, they fall into two main categories: transactional (stateless)or conversational (stateful).

The time savings and efficiency gained from AI chatbots and conversational assistants help companies increase their customer service productivity or sales. By leveraging chatbots, human agents are freed up to focus on high profile customer service or sales rather than spending all day answering questions about a business' return policy.

Chatbots also help improve the customer experience. Many businesses have leveraged phone trees for decades, which work but are time consuming for the customer to navigate. A chatbot can turn "Press 1 for Alex, press 2 for Joey" into "Who can I connect you with?" The chatbot can understand the caller's input if they say "Joey" and route the call directly.

Today, people are using messenger apps more than they use telephones or social networks. Providing chatbots on these messaging platforms opens up large markets to a business.

Interested in learning more about chatbots, or even building one yourself? Read ourcomplete guide to intelligent bots(link takes you to an external page)for all the chatbot resources you need in one spot.

Once you're ready to build, the following resources may help you out:

## Click to Call

More info: https://www.twilio.com/docs/glossary/what-is-click-to-call

Click to call, sometimes called click to talk or click to dial, is a way to let people connect with a company representative by phone while they’re browsing a website or in an app.

### What is Click to Call?

Click to call, sometimes calledclick to talkorclick to dial, is a way to let people connect with a company representative by phone while they're browsing a website or in an app.

Your website or app may be full of useful information, but sometimes, your customers really just want to talk with a real, live person. Perhaps they want to know more about your product or service before they make the decision to buy, or maybe they have a support issue and don't want to wait around for email. Click to call creates a way for your customers to contact your sales and support teams right on your website.

You may be wondering, "Do people really talk on the phone anymore?" The answer is, actually, yes!

Studies have shown that88% of website visitors(link takes you to an external page)are more likely to contact your company if you provide a click to call button. And if they've taken the initiative totalkto you, chances are greatly increased they'llbuyfrom you too.

The numbers really do speak for themselves.Market research(link takes you to an external page)shows adding a click to call button can lead to a 200% increase in call to conversion rates. In addition to helping you increase sales and improve customer satisfaction, adding click to call functionality can help reduce negative impressions as well.

One way businesses can add a click to call system is through anAPI(link takes you to an external page)like Twilio Voice. Twilio works with browsers built with JavaScript, Android, and iOS. Add on features likeTaskRouterlet you route calls to the best agent to provide an even better customer experience. There are two main ways click to call can work.

With one click, the user initiates a voice call directly from their browser or app. For example,Airbnb(link takes you to an external page)createdVoice Connect(link takes you to an external page), a click to call application that lets hosts call potential guests by clicking a link on Airbnb's site or within the Airbnb app. With Voice Connect, hosts and guests connect usingmasked numbers, which allows them to keep their personal phone numbers private. Click to call usesVoIPso the call connects over the internet rather than by phone.

A button, image, or text on the site or app lets the user enters a phone number and requests an immediate call back. While the call is being established, contextual information about the customer—such as their name, the page they're currently visiting, and any other relevant information the API can access—is passed to the representative on the call. The customer doesn't have to actually enter this information, the service knows it automatically. An HTTP request initiated by the web form initiates an outbound call to the user's phone number and the user gets their callback right away. This process allows users to receive highly personalized customer service, with the click of a button.

Many companies choose to offer their customers both text chat and phone connection options, and find that the customer's device type affects their choice of channel. For example, Twilio customeriAdvise finds that 70%(link takes you to an external page)of their customers opt for text chat when connecting to their site on desktop, while 30% choose voice calls. However, when customers are on mobile devices the percentages are reversed, with 70% of users selecting click to call to connect via voice and 30% choosing text chat.

Another way that businesses use click to call is for sales and support agents working in a CRM. Twilio offers an integrated dialer that lets reps automatically place outbound calls with just one click. For example, withLightning Dialer in Salesforce(link takes you to an external page), one click calls a customer and opens their entire contextual record. Reps can take notes seamlessly, automatically log calls, drop pre recorded voicemails, power through call lists, and more. This ability to "click" the phone number without manually entering it saves time, reduces errors, and increases agent efficiency.

Adding click to call to your website with a Twilio SDK is fast and can be accomplished in a matter of minutes. It's also affordable, with callsstarting very cheaply per minute(link takes you to an external page). And you always pay only for what you use—no monthly fees or sign up costs.

Ready to get started?Add Click to Call to your website here

## Cloud Contact Center

More info: https://www.twilio.com/docs/glossary/what-is-a-cloud-contact-center

Cloud contact centers make contact center software functionality that was previously only accessible through on premise hardware available through the internet. A cloud contact center provides quick and easy access to the tools and services businesses need to communicate in today’s web based world.

### What is a Cloud Contact Center?

Cloud contact centersmake contact center software functionality that was previously only accessible through on premise hardware available through the internet. A cloud contact center provides access to the tools and services businesses need to communicate in today's web based world.

Until recently, existing contact center technology gave businesses limited options. Many companies got locked into expensive, on premise contact center infrastructure that won't scale, because it was the best option available at the time.

However, cloud contact centers use the latest in communications technology to give businesses a modern alternative to on premise contact centers. With a cloud contact center, companies don't have to maintain the additional redundant hardware and data center space required by anon premise solution.

When yourcloud contact center(link takes you to an external page)includes the global infrastructure for your business communications, you can get to market without building, deploying, and maintaining those complex services yourself. The cloud based approach to the contact center deliversmajor advantages(link takes you to an external page):

By moving your communications from legacy, on premise systems tocloud based software(link takes you to an external page), you can experience greater reliability, global carrier connectivity, and multi function numbers. Here are thetop 10 best practices(link takes you to an external page)to look for when choosing a cloud contact center provider:

Cloud platforms like Twilio allow you to control your own roadmap, so you can make the incremental upgrades you want on your own timeline, without downtime or upfront investment. Legacy and "off the shelf" call center software options come with a pre defined roadmap. They offer specific features and a "one size fits all" approach that may not offer the flexibility you need to create the exact customer experience you want. With a cloud contact center, as your business goals change, you can adjust your technology to meet your new goals.

## Contact Center

More info: https://www.twilio.com/docs/glossary/what-is-a-contact-center

A contact center is a business’s central point for managing all customer communications across all channels. A company’s contact center is usually integrated with their customer relationship management (CRM) system, where all interactions between the organization and the public are tracked, coordinated, and managed.

### What is a Contact Center?

A contact center is a business's central point for managing all customer communications across all channels. A company's contact center is usually integrated with their customer relationship management (CRM) system, where all interactions between the organization and the public are tracked, coordinated, and managed.

The termcontact centeris replacing the older term "call center" to reflect the modern reality that there are many other ways to connect with a customer these days besides the telephone. The International Customer Management Institute (ICMI) defines a contact center as a coordinated system of people, processes, technologies, and strategies that provides access to information, resources and expertise, through appropriate channels of communication, enabling interactions that create value for the customer and organization.

The combined trends of increased customer expectations and newer technologies that allow formany channels of communication(link takes you to an external page)are creating a shift in the traditional call center model which has existed for decades. Consumers want more ways to reach businesses, and businesses are looking for new ways to improve customer experience.

Contact centers support a number of different industries and functions, and often handle contacts via channels beyond the telephone, including email, chat, social media, and SMS. Contact centers deploy technological solutions and operational processes to distribute contacts to teams of contact center agents, often located in one or more locations.

In a modernmultichannel or omnichannel(link takes you to an external page)contact center, agents handle a wide variety of communications. For example, technical support might be delivered overin app chat(link takes you to an external page)or video, while order status updates are delivered viaSMS(link takes you to an external page), event promotions are sent aspush notifications, surveys are deployed overFacebook Messenger, and inbound email sales inquiries are sent directly to an agent to connect by phone.

Multichannelrefers to a contact center that uses multiple independent channels to reach a customer, such as telephone, social media, and email. Whereasomnichannelis an extension of the multichannel approach, emphasizing the synergies across all channels for an enhanced shopping and customer care experience. For example, a customer can browse a furniture company's website, live chat with an agent to ask questions about a particular couch, switch seamlessly to a video call to confirm that the couch will fit in a specific space, purchase the couch online, and then pick it up at a brick and mortar location.

Contact centers can handle inbound communications—such as incoming calls, emails, chats, social media, or SMS inquiries that are initiated by customers and prospects. And they can also be the hub for outbound communications—contacts made by contact center agents to reach customers and prospects, such as calls, emails, and chats.

Legacy,on premise contact centerslet businesses customize the experience they want to deliver but require costly professional services and take months (or years!) to deploy changes.

Many of these systems are running on outdated technology and infrastructure. This underlying technology impacts systems reliability, performance, and security, which is why so many businesses are migrating to a modern alternative.

When you build your contact center with communication building blocks like Twilio's programmable APIs, you can choose the channels and features you need and add more as your call center expands into multiple channels. APIs give you the flexibility to build the exact customer experience you want, and the freedom to iterate yourIVR, call flows, and other aspects of your communications as frequently as you like.

If you don't want to build your own software with APIs, you can use software that already exists through a Contact Center as a Service (CCaaS) provider. CCaaS providers host the software, maintaining the servers, databases, and code. Customers access it via the internet and pay for their use on a subscription or pay as you go basis. Many CCaaS offerings are built on Twilio APIs. They've taken written and tested logic, and packaged it together usingcontact center best practices(link takes you to an external page)for SMBs.

However, as many of the small and medium size enterprises using these CCaaS solutions grow, they find that their software isn't flexible enough to adapt to their changing customer and business needs. With the introduction of the programmable contact center platform, technology has evolved to offer businesses the best of both worlds. Platforms likeTwilio Flex(link takes you to an external page)enable companies to build at unprecedented speed while customizing a unique design for their specific customer and business requirements. Although Twilio Flex is more intuitive than building with APIs, it's still an open platform meant for custom software development rather than a completely out of the box solution.

See alsoWhat is a Cloud Contact Center??

## CPS

More info: https://www.twilio.com/docs/glossary/cps

Calls per second

### CPS

Calls per second

The rate at which outbound calls are executed for a given account. By default each account is granted 1 CPS for Programmable Voice API calls and 1 CPS per trunk per region for Elastic SIP Trunking calls. Inbound calls and <Dial> calls are not limited by CPS.

CPS can be managed in Console under Voice > Settings > General for Programmable Voice, and under Elastic SIP Trunking > Trunk Name > Termination. New accounts without an approved Business Profile cannot self serve calls per second (CPS).About Business Profiles(link takes you to an external page).

In aggregate calls are executed at the rate defined by the CPS. Individual calls may not execute at the anticipated rate — you may see individual seconds with more or fewer CPS, especially for bursty traffic — but over a month the call execution rate will average the CPS rate set for that account or trunk.

## Customer Engagement

More info: https://www.twilio.com/docs/glossary/what-is-customer-engagement

Customer engagement is the emotional connection between your company and your customers, sentiments which strongly influence their buying decisions. Customers who actively engage with a business tend to be more loyal and spend their money supporting brands they feel connected to.

### What is Customer Engagement?

Customer engagement is the emotional connection between your company and your customers, sentiments which strongly influence their buying decisions. Customers who actively engage with a business tend to be more loyal and spend their money supporting brands they feel connected to.

Customer engagementcan differ widely for each business.

For some companies, a customer engagement strategy means getting customers to share your content on social media. For others, engagement is all about sales. For most businesses though, customer engagement revolves around developing an ongoing and loyal relationship. Ongoing, loyal relationships go much deeper than an individual transaction. They are complex, personalized, and require careful consideration and planning.

So, how do you create the engagement that matters for your business? When it comes to yourcontact center(link takes you to an external page), the central means of communication many businesses have with their customers, your customer engagement strategy can be the driving force behind the technology you use to power your customer interactions.

Customer engagement goes deeper than how much or how frequently your customers spend. To stand out in today's world of technology and information, you have to think outside the box to know what your customers want—perhaps even before they realize it themselves. As end users around the world demand access to brands through a growing range of channels, companies risk losing business if they can't adapt their customer engagement strategies quickly.

For some businesses, this will feel like a challenge. For others, it will be an opportunity.

With the rise ofcommunications APIs(link takes you to an external page), businesses can build their own customized communications experiences that are tailored to meet the unique needs of their customers. The choice to use APIs isn't just atechnicaldecision, it's also abusinessdecision to prioritize agile development, A/B testing, and quick software iterations while integrating feedback from contact center agents into communications improvements. Ultimately, the choice to use APIs is a choice to make customer engagement the cornerstone of your communications.

With APIs, you can build a contact center that equips your agents to anticipate and meet customer needs effectively across the channels they prefer. By providing your agents with the exact information they need about each specific customer, you're empowering them to give excellent customer service. Do this every time, and you're setting your business up for ongoing successful customer relationships and loyalty.

## Customer Experience

More info: https://www.twilio.com/docs/glossary/what-is-customer-experience

Customer experience (CX) refers to the interactions between a customer and an organization throughout all points of contact along the customer journey. Based on this customer experience definition, customer loyalty and company revenue growth will naturally follow positive interactions with your brand.

### What Is Customer Experience (CX)?

Customer experience (CX) refers to the interactions between a customer and an organization throughout all points of contact along thecustomer journey. Based on this customer experience definition, customer loyalty and company revenue growth will naturally follow positive interactions with your brand.

Loyal customers help businesses acquire new customers through positive testimonials and rave reviews. Sometimes even more effective than marketing efforts, investing in customer service is the best marketing strategy.

Research supports the notion that happy customers come back for more. In fact,56%(link takes you to an external page)of consumers have left a brand due to a poor customer experience, while59%(link takes you to an external page)have paid more for a great experience.

In other words, consumers have options, and their opinions matter.

And with83%(link takes you to an external page)of customers revealing that a brand's experience is equally important as its products or services, a customer first approach to customer service is just good business—a satisfying customer service experience reflects the strength of your business and increases customer loyalty over time.

Positive brand perceptions generally arise from useful and enjoyable engagements for the consumer. For a winning CX recipe, add:

Finally, consistency is crucial because each customer interaction creates an instant impression and adds to a lasting overall perception.

When an interaction exceeds customer expectations, the experience is positive. And when it fails, the experience is negative. To measure your customer experience strategy, determine exactly how it performs and see if there'sroom for growth(link takes you to an external page). You can use a variety of metrics, including:

Using metrics to measure customer experience is crucial for your business to stay competitive. Collect and analyze data on key metrics—like customer satisfaction, engagement, and churn—to identify opportunities and make data driven decisions to enhance the customer experience.

To deliver an optimal customer experience, you need theright technology(link takes you to an external page)to support every step of the customer journey. WithAPIs, you can use what you know about your customers to create experiences that anticipate their needs and deliver personalized services. Here are a few ways to use APIs to create a superior customer experience:

As the demand for digital experiences continues to grow, choosing to use APIs isn't just a technical decision but a business one. APIs are a powerful tool to enhance customer satisfaction and drive business success.

To create a sustainable, positivecustomer experience(link takes you to an external page), it's necessary to gather customer feedback, analyze relevant metrics, eliminate ineffective processes, and retain successful best practices.

Need help connecting the dots?Twilio Flex(link takes you to an external page)equips you with the tools to provide data driven, personalized customer service across all channels. With Flex, you can:

Flex helps you create tailored customer experiences, intuitive employee workflows, and revenue building opportunities.Sign up today(link takes you to an external page)to get started for free.

## Customer Journey

More info: https://www.twilio.com/docs/glossary/what-is-a-customer-journey

A customer journey is the total sum of experiences a customer has when interacting with a business or organization. Rather than focusing on a specific interaction, the customer journey takes all points of contact into account.

### What is a Customer Journey?

Acustomer journeyis the total sum of experiences a customer has when interacting with a business or organization. Rather than focusing on a specific interaction, the customer journey takes all points of contact into account.

It's the journey that counts, not the destination.You've probably heard this statement before—it's something of a cliché about life. But could it apply to your business?

To understand the customer journey, you must look at the experience from your customer's perspective.

At Twilio, we take the value of "wearing the customer's shoes" so seriously that we have shoes literally hanging on the wall in our headquarters to remind us. When you take a walk in your customers' shoes, can you pinpoint when they "arrive" at their final destination? You'd probably like your customers' journey with your business to be long and fruitful (perhaps with no end in sight!).

So, when exactly does the customer journey with your company begin? Is it when customers purchase their first product, or when they make contact through one of yourcommunication channels(link takes you to an external page)?

It's actuallybeforethat, when a customer hears about your business or organization for the first time. The customer journey starts withawareness. Perhaps it begins when a customer sees one of your ads or hears about your business from a friend. That's why your marketing team is hard at work making sure people hear about you.

The next step in the customer journey isengagement(link takes you to an external page). This is when a customer interacts with your company in some way; perhaps they visit your website, download your app, or walk into your brick and mortar location. There may be many points of engagement along the customer journey, and hopefully, they will all be positive. Engagement revolves around developing an ongoing and loyal relationship with your customers which leads to increased retention, revenue, and reach.

At some point, the customer will buy your product or service—but the journey doesn't end when the sales transaction is over. If their experience is great at every step along the way, your customers will become advocates for your product or service and keep coming back for more. At this stage, the cycle continues at awareness once again, only now, your customers are the ones making sure people hear about you.

Thecontact center(link takes you to an external page)is the central means of communication for many businesses and their customers. Traditional, phone based call centers have evolved intomultichannel(link takes you to an external page)contact centers designed to deliver a great customer experience—an experience that matters greatly to a business's bottom line.Consumer research(link takes you to an external page)shows that 67% of customers will give more business to a company as a result of positive communication experiences.

On the flip side, Twilio's recentCustomer Communications Report(link takes you to an external page)found that after a poor communication experience, 38% of customers will switch to a competitor or cancel orders or services, 66% will tell a friend about their experience, and 41% will stop doing business with the company altogether.

Today, contact center agents interact with customers through a variety of channels. Within the span of a few minutes, an agent could be on a livechat(link takes you to an external page)assisting a customer who is browsing your website, sending anSMS(link takes you to an external page)that lets a customer know her order has been shipped, or answering a technical question delivered viaFacebook Messenger(link takes you to an external page). These modern contact centers are built withAPIs, software building blocks that let you create the exact experiences you want.

So, how do you create a customer journey that will turn customers into your biggest fans? Just like your favorite dish at that beloved restaurant you rave about, a great contact center customer journey is made up of essential ingredients. The following four ingredients are the keys to a great customer journey in your contact center:

Every business is different, and so are their customers' needs. Likewise, there is no "one size fits all" when it comes to the customer journey. To create an ongoing superior customer journey, you need to develop the perfect recipe for your contact center. As long as your recipe includes these four key ingredients, you'll be well on your way to five star reviews.

Your customer journey encompasses more than your products and services. The experience you create for your customers at every touchpoint contributes to the overall journey they have with your business. The key to creating the customer journey you want is having theright technology(link takes you to an external page)in place to support your customers at every point of contact.

In the rising on demand economy, customer preference is changing at an accelerated rate. Businesses who are successful in meeting this change aren't only putting communications at the heart of their interactions with the customer but also understand the need to empower their developers to build and iterate these communications quickly and creatively. APIs make it possible to build communications that connect with customers on the right channel at the right time.

With APIs, today's businesses can quickly develop applications that fit their global business needs, and deliver rich, contextual communications that take the customer experience to the next level. This is how both brick and mortar and online brands can create journeys that nurture lifelong customers, all while evolving with consumer communication trends and expectations.

## Customer Relationship Management (CRM)

More info: https://www.twilio.com/docs/glossary/what-is-customer-relationship-management

Customer relationship management, usually referred to as CRM, is a method for managing an organization's relationships with its customers. Most often, the term CRM refers to a CRM system—which is software for managing contacts, streamlining sales processes, and improving business relationships.

### What is Customer Relationship Management (CRM)?

Customer relationship management, usually referred to asCRM, is a method for managing an organization's relationships with its customers. Most often, the term CRM refers to a CRM system—which is software for managing contacts, streamlining sales processes, and improving business relationships.

While the term CRM can refer to a company's customer relationship management strategy or the process the company uses to manage relationships, it usually refers to a cloud based CRM software system. CRM software organizes customer and colleague information, including contact information, communications records, and other relevant details.

The CRM system is where all interactions between an organization and the public are tracked, coordinated, and managed. This software provides businesses with a central repository of information, so they can develop better relationships over time. With CRM software, a customizable dashboard displays everything in one place: customers' contact information, history with the company, previous orders and communications, and more.

CRM software has many uses at a company, including:

CRM software provides a streamlined way for businesses to manage relationships with partners, supply chain providers, and customers with the ability to add notes, schedule meetings, and more.

Relationships are paramount to the success of any business. CRM software helps businesses maintain and deepen their relationships with customers and other individuals and businesses with whom they interact. Many businesses today use a CRM system to organize their contact data and inform their actions. Whereas only 12% of businesses used cloud based CRM software in 2008, this figure rose to87% by 2018(link takes you to an external page).

According to Salesforce, one of the world'smost popular CRM platforms(link takes you to an external page), in addition to helping businesses organize and manage their information in order to stay organized and proactive, CRM software provides the following 10 benefits:

When a company'scontact center(link takes you to an external page)is integrated with their CRM system, agents can access analytics that help track progress and amplify success. Sales teams get full visibility into revenue, costs, and profit. With this type of transparency, they can see the whole picture and assess their sales calls not only on how long they take, but also on their outcomes. Ultimately, tracking the unique metrics that apply to each business helps to improve customer relationships and accelerate company growth.

When you integrate your contact center with your CRM and continually measure your success, you see what's happening in real time so you know where your immediate focus needs to be. You know when and how to reach customers so you can improve your productivity and efficiency. By looking at historical reports, you can compare and contrast, to see if you're making improvements over time.

APIsare like building blocks. Using APIs, you can build an entire contact center from scratch, or add the features you want to the one you already have. Twilio API building blocks includeProgrammable Voice(link takes you to an external page),SMS(link takes you to an external page),Chat(link takes you to an external page),Video(link takes you to an external page),Sync,Notify,WhatsApp(link takes you to an external page), andTaskRouter, which fit together to build a world class contact center experience piece by piece.

Because Twilio is vendor agnostic, our APIs can integrate with any CRM. Rather than enforcing a set of certified applications and relying solely on in house developers for innovation, Twilio draws on a vast pool of developers in the wider community who are constantly building their own solutions using all kinds of platforms and software and sharing the code with other Twilio users. Armed with this knowledge, your in house team can use Twilio APIs to build, integrate, and test your communication workflows with agility, with little or no impact on existing CRM infrastructure.

Here are a few examples of things you can do with Twilio APIs and your CRM:

If you'd like to know more about how Twilio APIs can work with your CRM,talk to a Twilio expert(link takes you to an external page).

## Customer Satisfaction Score (CSAT)

More info: https://www.twilio.com/docs/glossary/what-is-a-csat-score

Short for Customer Satisfaction Score, CSAT is a measurement to determine whether a customer feels their expectations have been fulfilled by a company’s products and services.

### What is a CSAT Score?

Short forCustomer Satisfaction Score, CSAT is a measurement to determine whether a customer feels their expectations have been fulfilled by a company's products and services.

A company's average CSAT score reflects the percentage of customers who are satisfied with the company's products or services. It is expressed as a percentage with 100 percent representing complete customer satisfaction.

Across industries and around the world, businesses knowhappy customers come back for more. A study published in theHarvard Business Review(link takes you to an external page)found customers who gave their experiences the highest ratings spent 140% more than customers who gave their experiences the lowest ratings.

CSAT scores are an important metric for every business. Satisfied customers buy more, stay longer, and share their positive experiences with others. In fact, after a positive communications experience,7 out of 10 consumers(link takes you to an external page)will recommend the business to their friends or purchase more products or services. However, most businessesoverestimatehow effective they are at delivering a positive communication experience.

This lack of awareness can have devastating effects for businesses.

Twilio'sCustomer Communications Report(link takes you to an external page)found that after a poor communication experience, 38% of customers will switch to a competitor or cancel orders or services, 66% will tell a friend about their experience, and 41% will stop doing business with a company altogether. And91%(link takes you to an external page)of those dissatisfied customers will give the company zero warning before they take their business elsewhere.

These stats go to show that to truly understand how satisfied your customers are, you need to ask them. When you're doing business face to face, customer satisfaction comes across in a smile, a generous tip, or of course, repeat business. But when your customers are mostly interacting with your business online, it can be harder to gauge how happy they are. If you want to estimate whether they'll be back for more, you often need to ask them with a customer satisfaction survey.

Ultimately, customer satisfaction is a measurement of customer perception and expectations. When an interaction exceeds customer expectations, the experience is positive. When an interaction fails to meet customer expectations, the experience is negative. Customer satisfaction surveys help you begin to understand your customer experience. You can learn how your customers really feel about the service they've just experienced by conducting post contact surveys via channels likeSMS(link takes you to an external page),email(link takes you to an external page),IVR, or a star rating after aweb chat(link takes you to an external page).

When you gather customer feedback, you can look at the metrics that make sense for your company and change what isn't working. The only way to provide ongoing customer satisfaction is to stay informed about your customers' expectations and perceptions.

## N/A

N/A

## Deliverability Score

More info: https://www.twilio.com/docs/glossary/deliverability-score

Get an overview of how your Twilio messaging traffic is performing with your Deliverability Score.

### Messaging Deliverability Score

The deliverability score is a metric that offers an overview of your Twilio messaging traffic's performance. It includes five subscores: Sent Rate, Compliance, Fraud, Latency, and Engagement.

The total score is the sum of these five subscores, with a maximum possible score of 100.

Monitoring your Deliverability Score offers several advantages:

## Direct Inward Dialing (DID)

More info: https://www.twilio.com/docs/glossary/what-direct-inward-dialing-did

Direct Inward Dialing (DID) is a telephone service that allows a phone number to ring through directly to a specific phone at a business instead of going to a menu or a queue and needing to dial an extension. A phone number that is used like this is often called a ”DID” (and multiple numbers are called ”DIDs”).

### What is Direct Inward Dialing (DID)?

Direct Inward Dialing (DID) is a telephone service that allows a phone number to ring through directly to a specific phone at a business instead of going to a menu or a queue and needing to dial an extension. A phone number that is used like this is often called a "DID" (and multiple numbers are called "DIDs").

There are 2 ways to get DID like functionality with TwilioPhone Numbers, via a SIP trunk, and with SIP registration.

You can connect a TwilioSIP Trunkto your PBX. When a call comes in to Twilio to any of your phone numbers Twilio will send the call to your PBX over the SIP Trunk. Your PBX can then route the call to an extension based on the number dialed.

List theSIP configuration guides sectionof the docs to get step by step instructions.

Using TwilioSIP Registrationyou can connect a call directly to a VoIP desk phone or soft phone. When a call comes in to Twilio to your phone number, Twilio will send it directly to your SIP registered endpoint.

Seedocumentation for registering a SIP endpointon Twilio.

## DTMF Tones (Dual Tone Multi Frequency Tones)

More info: https://www.twilio.com/docs/glossary/what-is-dtmf

DTMF, or Dual Tone Multi Frequency tones, are in band telecommunications signals sent over voice frequencies.  Commonly used over telephone lines, DTMF tones are also commonly called Touch Tones.

### What are DTMF Tones?

DTMF, orDual Tone Multi Frequencytones, are in band telecommunications signals sent over voice frequencies. Commonly used over telephone lines, DTMF tones are also commonly calledTouch Tones.

Almost as long as we've had telegraph and telephony systems, humans have needed a way to reliably interact with the system in a mechanical and reproducible way. Signalling systems have evolved to fill that role both for routing and dialing calls as well as for interacting with phone systems once connected.

The first commonly used telephony signaling system waspulse dialing. Rotary phones interrupt electrical connections while spinning, and the resulting electrical pulses produced are interpreted as commands (such as 'dial this number').

The first DTMF tone producing telephone was introduced inNovember of 1963(link takes you to an external page)for the Bell System. More user friendly than the rotation of a rotary dial, touch tone phones quickly supplanted the rotary phone. Dialing speed increased, stress on the network decreased, and users flocked to the new technology.

DTMF tones today are standardized in the International Telecommunication Union's (ITU T)Recommendation Q.23(link takes you to an external page).

Nowadays, DTMF tones are the dominant signalling protocol for interacting with the telephone system or with automated telephone services. IVRs, orInteractive Voice Responsesystems allow callers to navigate without tying up an operator. Many other use cases for DTMF tones have also emerged from booking appointments to checking bank balances to changing language on a phone call.

DTMF tones are an example of anin band signaling protocol; that is, signals are sent over the same communications channel as the primary data on that channel. For DTMF tones that means that tones are in the same frequency range as human voice any DTMF tones produced can be heard over the line.

Out of Band signaling protocolstake an opposite tack signals are sent over a separate channel. Commonly used telecommunications protocols such as Signaling System No. 6 (SS6) and Signaling System No. 7 (SS7) use an out of band channel for signaling and switching purposes.

Although out of band signaling systems aren't immune from abuse, when in band signaling protocols were dominant (especially for switching and routing) they were an order of magnitude easier to exploit. This manifested in the so called 'Phreaking' subculture, wherein knowledgeable people could exploit tones and tone order to gain access to phone features or avoid charges. One infamous in band signaling exploit (no longer viable) was on the2600 Hz tone(link takes you to an external page), which denoted an idling phone trunk.

While in band signals shouldn't be used to control mission critical infrastructure, they are still very useful for telephone users. Audible feedback in the same channel gives the user some indication they properly entered a command. While building a telephony application, DTMF tones are an excellent way to add user directed interaction.

All digits sent are encoded using RFC 2833.

Ready to start building out anapp that uses DTMF tonesto navigate? We've got you covered in all of our supported languages.

Whatever your use case,Twilio's Programmable Voice(link takes you to an external page)can help you achieve success. We can't wait to see and hear what you build!

## Dynamic Number Insertion (DNI)

More info: https://www.twilio.com/docs/glossary/what-is-dynamic-number-insertion

Dynamic Number Insertion (DNI) is a call tracking feature where a unique phone number is tied to each ad source. This helps marketers analyze offline behavior much in the same way they track online behavior with the help of cookies.

### What is Dynamic Number Insertion (DNI)?

Dynamic Number Insertion (DNI) is acall tracking(link takes you to an external page)feature where a unique phone number is tied to each ad source. This helps marketers analyze offline behavior much in the same way they track online behavior with the help of cookies.

Call tracking allowsattributionof offline phone calls to online advertising spend, making it possible to accurately measure conversion rates and ROI. Throughcall tracking(link takes you to an external page), marketing agencies can help their clients understand which channels are performing most effectively, where to find their best prospects, how to make each marketing dollar go further.

Phone numbers can be programmed to link online activities such as click and page views to calls. This way, marketers know which marketing activity drove the most traffic to their website, which keywords led to engagement and which conversations turned into conversions.

Marketing agencies(link takes you to an external page)drive traffic to their customers' landing pages in different ways. They may publish paid ads in Google AdWords, Bing, and social networks like Facebook. They could invest in SEO. Or they could partner up with other publishers, broadcast it through emails, or spend their advertising on offline or outdoor channels.

Understanding which acquisition channels are the most effective requires attribution and this is where DNI comes in.Programmable Voice APIsis essential to building a great DNI solution. APIs allow the provisioning and configuration of numbers on the fly and make it easier to retrieve data into actionable dashboards. This in turn allows marketers to direct advertising spend to the channels that move the needle and cut it from those that don't.

Dynamic Number Insertion basically means tying unique phone numbers to each advertisement (or type of advertisement) you want to track.

For instance, let's say you want to know which provides a higher ROI: your billboard ads or your late night TV spot. You would put unique call tracking numbers on each of the two, log when a call came into that number, then forward inbound phone calls to your office landline. To see what a call tracking system built with Twilio and Google Analytics looks, take a look at thisblog post(link takes you to an external page).

The idea is that you attach a unique phone number to an ad or lead source. Any subsequent calls to that number can be attributed to that ad. This works well if you have a few lead sources that never change. Most marketers today are operating at a larger scale with hundreds of different lead sources, meaning they have to allocate phone numbers in large numbers which is costly.

Dynamic number insertion allows marketers to recycle numbers not in use to reduce total usage volume.Phone Number APIsare flexible enough to accommodate recycling strategies for any business. Here's an example of number pooling and recycling at the listing level for online directories:

## N/A

N/A

## E.164

More info: https://www.twilio.com/docs/glossary/what-e164

E.164 is the international telephone numbering plan that ensures each device on the PSTN has globally unique number.  
This number allows phone calls and text messages can be correctly routed to individual phones in different countries. E.164 numbers are formatted [+] [country code] [subscriber number including area code] and can have a maximum of fifteen digits.

### What is E.164?

E.164 is the international telephone numbering plan that ensures each device on the PSTN has globally unique number.

This number allows phone calls and text messages can be correctly routed to individual phones in different countries. E.164 numbers are formatted [+] [country code] [subscriber number including area code] and can have a maximum of fifteen digits.

Learn more abouthow to build international phone number input in HTML and JavaScript on the Twilio blog(link takes you to an external page), including how to transform the phone number input into E.164 format.

You canuse the Twilio Lookup APItoperform phone number validation and formatting without the need for RegEx(link takes you to an external page). You can also findinternational telephone input and validation in the Twilio Code Exchange(link takes you to an external page).

Reasons to programmatically verify that a string is in a valid E.164 phone number include:

According to theofficial ITU E.164 recommendation(link takes you to an external page)the format must be a number up to fifteen digits in length starting with a '+'. You can also exclude 0 as the first character since there are nocountry codes(link takes you to an external page)that start with 0. Here is a sample regular expression:

^\+[1 9]\d{1,14}$

However, this will also match numbers that are not a valid phone number.We recommend using theTwilio Lookup APIfor comprehensive phone number validation.

## ETA Alerts

More info: https://www.twilio.com/docs/glossary/what-are-eta-alerts-estimated-time-of-arrival

ETA Alerts, or Estimated Time of Arrival Alerts, are periodic notifications on the status of an item, delivery, or person that include a probable time of arrival at the destination.  Usually delivered through SMS messages or voice calls, ETA alerts keep customers updated on the location and timing of their upcoming deliveries.

### What are ETA Alerts?

ETA Alerts, orEstimated Time of Arrival Alerts, are periodic notifications on the status of an item, delivery, or person that include a probable time of arrival at the destination. Usually delivered through SMS messages or voice calls, ETA alerts keep customers updated on the location and timing of their upcoming deliveries.

Applications with ETA alerts have exploded in popularity during the surge of the on demand economy. Companies promising quick food, laundry, and shopping delivery (and more) have seized on the intimacy and deliverability of text messaging to create a constant flow of interaction with their customers. Customers appreciate the effort, and now ETA Alerts have evolved into a major business priority in many fields. Common practices include notifications when an item is picked up or a driver leaves, one or more updates along the way, and a final update as the driver arrives at the destination.

Having an ETA Alert system in place also confers other unexpected benefits as well especially along the lines of delivery exceptions. Accidents, breakdowns, routing delays, and other exceptions previously confused customers. Communicating problems by pushing out batch emails at the end of the day or (worse!) sending customers to arcane status pages further compounded customer frustration.

With constant contact, customer schedules are less disrupted than with the previous "X Hour Window" paradigm. And when the inevitable exceptions do occur, quick communication can save the relationship.

Twilio has experience helping our customers build ETA Alerts into customer use cases both overSMS(link takes you to an external page)and updates overVoice(link takes you to an external page). Commonly, a Twilio ETA Alert infrastructure buildout takes a form similar to the following:

We've compiled use cases on how our customers havesuccessfully implemented ETA Alerts(link takes you to an external page)with Twilio. Always feel free to talk through your business needs and current implementation best practices withTwilio Sales(link takes you to an external page)as well.

One advanced use case for ETA Alerts is two way communication, where the ETA Alert stream also forwards messages between multiple parties. For example, your business case might implement ETA Alerts but also allow drivers and customers to communicate when either an exception occurs or delivery will be late.

As this type of communication is ephemeral, and you want to prevent out of band communications after the transaction, best practice dictates masked orproxied phone numbersbe automatically assigned to all parties. Through those masked numbers, you can facilitate exceptional communications while still keeping personal information personal.

Twilio Proxycan quickly get you up and running with temporary or masked phone numbers with minimal infrastructure investment on your end.

We also include detailed examples of one approach to integrating ETA Alerts into your application. On our documentation website, we includeETA Alert Tutorialsacross six web languages and many web frameworks, greatly reducing the time to add ETA Alerts to your product or use case.

As always, we're here to help you add ETA Alerts and other powerful communications integrations to your application.Talk to Sales(link takes you to an external page)or browse our ETA AlertCustomer Case Studies(link takes you to an external page). We can't wait to see and receive ETA Notifications on what you build.

Related Links

## N/A

N/A

## Flex Dialpad

More info: https://www.twilio.com/docs/glossary/what-is-flex-dialpad

The Flex Dialpad is a native feature of the Flex UI v1.18.0 and above which offers all of the theming and customizability features of a React component.  
Flex Dialpad allows agents to make outbound calls to customers directly from the UI and real time and historical reporting through Flex Insights.  
With the programmable Flex Dialpad, developers can build click to dial use cases via the new Action Framework action, startOutboundCall. For instance, you can program the Dialpad in such a way that Flex retrieves contact data from your business application and subsequently present it to an agent. This kind of automation avoids any possible risk of misdialing and reduces time to call by leveraging data that resides in your application.

### What is Flex Dialpad?

The Flex Dialpad is a native feature of theFlex UI v1.18.0and above which offers all of the theming and customizability features of a React component.

Flex Dialpad allows agents to make outbound calls to customers directly from the UI andtransfer callsto a supervisor for immediate help. Additionally, it helps supervisorsmonitor calls, and users runreal time and historical reportingthrough Flex Insights.

With the programmable Flex Dialpad, developers can build click to dial use cases via the new Action Framework action,startOutboundCall(link takes you to an external page). For instance, you can program the Dialpad in such a way that Flex retrieves contact data from your business application and subsequently present it to an agent. This kind of automation avoids any possible risk of misdialing and reduces time to call by leveraging data that resides in your application.

Check out these helpful tutorials and blog post:

## Flex Insights

More info: https://www.twilio.com/docs/glossary/what-is-flex-insights

Flex Insights allows you to perform workforce optimization (WFO) in Twilio Flex. It provides a 360 degree view of every conversation in your Flex contact center so that you can provide agents with valuable feedback, knowledge, and skills.

### What is Flex Insights?

Flex Insightsallows you to perform workforce optimization (WFO) in Twilio Flex. It provides a 360 degree view of every conversation in yourFlex contact center(link takes you to an external page)so that you can provide agents with valuable feedback, knowledge, and skills.

Contact centers use Flex Insights software to improve performance in three major areas:

Flex Insights helps contact centers protect their brand by mitigating risk, addressing compliance, and simplifying dispute resolution. It verifies conversations for compliance, objection handling, and upselling skills while freeing up time for higher value tasks such as agent coaching.

Flex Insights helps contact centers shorten the time it takes to onboard agents, track their progress, and provide them with relevant feedback and personalized coaching. This helps create a more confident workforce and leads to greater agent retention.

Flex Insights helps contact centers see a unified view of the customer journey. This helps companies discover opportunities to improve their products, processes, and agent skills in customer conversations.

Flex Insights software provides contact centers with valuable insights to track key performance indicators (KPIs) from a high level down to individual conversations. These insights help you find the root causes behind KPI changes and trends and make data driven improvements as needed. Flex Insights technology ultimately helps contact centers measure the right metrics and optimize their performance.

When Twilio developed Flex—our next generation programmable contact center platform—we knew that a growing number of businesses were looking for workforce optimization capabilities in their contact centers. To that end, we included our best practices Flex Insights suite in the platform. Flex users can use these tools to maximize their contact center performance right away, with the freedom to customize dashboards, metrics, and KPIs to fit their business's needs.

Here are some of the tools available in the full workforce optimization solution included in Twilio Flex:

## N/A

N/A

## General Data Protection Regulation (GDPR)

More info: https://www.twilio.com/docs/glossary/what-general-data-protection-regulation-gdpr

The General Data Protection Regulation (GDPR) of the European Union (EU) is a law that regulates the handling of personal data and outlines the rights individuals have with regard to their data. It was implemented on May 25, 2018. It applies to any“individual, company, or organization”(link takes you to an external page)that processes the data of a person in the EU. This applies whether the organization is based in the EU or elsewhere.

### What is the General Data Protection Regulation (GDPR)?

The General Data Protection Regulation (GDPR) of the European Union (EU) is a law that regulates the handling of personal data and outlines the rights individuals have with regard to their data. It was implemented on May 25, 2018. It applies to any"individual, company, or organization"(link takes you to an external page)that processes the data of a person in the EU. This applies whether the organization is based in the EU or elsewhere.

The European Union views the protection of personal data as a fundamental right ofnatural persons(link takes you to an external page). The GDPR establishes requirements of organizations that process data, defines the rights of individuals to manage their data, and outlines penalties for those who violate these rights.

To better understand the GDPR, you should know what qualifies aspersonal dataand dataprocessing.

Think ofpersonal dataas any information that can be used to identify someone or is associated directly or indirectly with a living individual. This includes a person's name, driver's license number, location data, IP address, biometric data, and more.

Processingis a broad term that encompasses nearly any use of personal data, including collection, storage, organization, alteration, destruction, and transmission. For all intents and purposes, any use of personal data is considered processing.

Under the GDPR, an organization processing personal data acts as either acontrolleror aprocessor. A controller determines the purpose for processing the data. Whether the controller processes the data itself or contracts another party to do the processing, the controller decides how the data are used. A processor processes data only on behalf of the controller. The sole objective of the processor is to process the data for the controller.

For example, imagine a law office that conducts virtual office consultations usingTwilio Video(link takes you to an external page). The video calls could contain many pieces of personal information shared between the clients and attorneys. With regard to all the data shared during the consultations, the law practice is the controller, and Twilio is the processor. The law office determines how to use the clients' information. However, Twilio manages the transmission of the data. The law practicecontrolsthe personal data by determining a specific use for the data. Twilio handles theprocessingby providing the technical infrastructure to facilitate the video call.

Many organizations are both controllers and processors. For example, Twilio is a processor on behalf of its customers' content, but it is also a controller with respect to the data it processes for its own business needs—like billing, marketing, and HR functions.

In order to be GDPR compliant, an organization cannot collect more data than it needs to achieve a specific lawful purpose. This means that data shouldn't be collected because the datamightbe useful in the future. Once the original purpose for processing data has been served, the data must be deleted oranonymized(link takes you to an external page)as soon as possible.

Data and processing records should also be kept up to date, and all processing should be done securely usingencryption(link takes you to an external page)and other data handling best practices. If something does go wrong, and there's a data breach that creates a risk to the privacy rights of individuals, the organization has to notify its supervisory authority of that breach within 72 hours of becoming aware of it.

There are some exceptions to these rules, and this text is not meant to be comprehensive. Complete information is available inChapter IV(link takes you to an external page)of the GDPR legal text.

As an individual, you have the right to be informed about how your data will be processed and for what purpose. You can also request that your personal data be updated or even erased in certain circumstances. If you want to move your data to another system, you are free to do so. Your data will be provided to you in a common machine readable format that other organizations can understand.

Information about your personal data must be communicated to you in plain and transparent language. This means you shouldn't have to scroll through legalese that obfuscates the true use of your data. Again, this is just an overview. For more about the rights of a data subject, seeChapter III(link takes you to an external page)of the full GDPR text.

At Twilio, we view the GDPR as another opportunity to develop trust and put our customers first. In addition to having a Privacy team and implementing Privacy by Design principles, we apply GDPR standards to all the data we control and process. For more information, please visit ourGDPR page(link takes you to an external page).

Secure communication is easier than you might think. Send your firstTwilio powered SMSorVoice messagewith one of our quickstarts today. Want to know more about GDPR? Listen to Twilio Data Protection OfficerSheila Jambekar's talk at SIGNAL London 2017(link takes you to an external page).

## General Packet Radio Service (GPRS)

More info: https://www.twilio.com/docs/glossary/what-general-packet-radio-service-gprs

GPRS, or General Packet Radio Service, is a best effort packet switching communications protocol for cellular networks.    
GPRS was one of the first widely used data transfer protocols on cellular networks, first standardized in began to support GPRS in 2000.

### What is the General Packet Radio Service (GPRS)?

GPRS, orGeneral Packet Radio Service, is a best effort packet switching communications protocol for cellular networks.

GPRS was one of the first widely used data transfer protocols on cellular networks, first standardized in3GPP's Release 97(link takes you to an external page)in the first quarter of 1998. Commercial cellular networksbegan to support(link takes you to an external page)GPRS in 2000.

GPRS was originally astandard under ETSI(link takes you to an external page)but was eventuallytransferred to(link takes you to an external page)the 3rd Generation Partnership Project (3GPP) and published in 1998. As a standard, it is compatible with 2G, 3G and WCDMA networks via theGPRS Core Network(link takes you to an external page).

GPRS is apacket switching communications protocol, as opposed to other circuit based switching protocols coming before it on 2G networks. Notably, this means that data delivery isbest effort; latency and deliverability will vary at times. Quality of Service (QoS) with GPRS varies because it depends on the number of other users sharing the service.

Before GPRS, there were two commonly used protocols for data transfer:Circuit Switched Data(link takes you to an external page)(CSD) and High Speed Circuit Switched Data (HSCSD). While an improvement over previous data solutions (such as cellular modems), they worked in much the same manner as phone calls and were billed similarly by time.

GPRS was an improvement in efficiency and a feature boon for customers as well. Instead of the transmission schemes used in CSD, GPRS uses Time Division Multiple Access (TDMA) and Frequency Division Duplex (FDD) over shared channels to transmit data. It enables always on internet access as well asMultimedia Messagesand other advanced phone features. Additionally, the packet based routing allows service providers to bill by volume instead of time active.

GPRS and other packet based data protocols originally built on top of 2G networks earned informal names. Notably, GPRS is often called2.5GandEDGE(link takes you to an external page)(a later, competing technology) is sometimes called2.75G.

Traditionally, GPRS (2.5G) speeds are quoted over 2G networks; over 2G GPRS can theoretically transmit around 120 kilobits per second. Due to real world conditions, you can usually expect 20 50 kbps. Latency will vary but often can approach .5 to 1 seconds.

EDGE (2.75G) speeds come closer to a 1 Mbit/sec rate, with real world speeds closer to 150 400 kbps.

Yes, Twilio'sProgrammable Wirelesssupports GPRS where coverage is available.Talk to sales(link takes you to an external page)for the most recent details on coverage.

However,we do not recommend starting new development in the United States with GPRS or on 2G networks.2G networks are being sunset, and we can't ensure long term coverage or reliability on 2G networks. We suggest development on 4G.

While we don't currently suggest starting development on a GPRS based hardware product,Twilio's Programmable Wirelesshas you covered for your connected device project. We can help takeyourcontribution to the Internet of Things from Dream to MVP (and beyond).Get in touch(link takes you to an external page), and we'll help you evaluate all the options we can't wait to see what you build.

## GSM 7

More info: https://www.twilio.com/docs/glossary/what-is-gsm-7-character-encoding

GSM 7 is a character encoding standard which packs the most commonly used letters and symbols in many languages into 7 bits each for usage on GSM networks.  As SMS messages are transmitted 140 8 bit octets at a time, GSM 7 encoded SMS messages can carry up to 160 characters.

### What is GSM 7 Character Encoding?

GSM 7 is a character encoding standard which packs the most commonly used letters and symbols in many languages into 7 bits each for usage on GSM networks. As SMS messages are transmitted 140 8 bit octets at a time, GSM 7 encoded SMS messages can carry up to 160 characters.

GSM 7 is the standard alphabet forSMSmessages, written up in the standardGSM 03.38(link takes you to an external page). It is always supported onGSM(link takes you to an external page)networks. In languages with more than 128 commonly used symbols, GSM 7 is mandated. However, local language support is implemented with shift tables or by changing text encoding to (16 bit)UCS 2encoding.

The basic character set for GSM 7can be found here(link takes you to an external page).

For some characters, such as '{' and ']', an escape code is required so even in a GSM 7 encoded message these characters will be encoded using two characters.

SMS messages contain 140 8 bit octets, so up to 160 GSM 7 characters may be transmitted: (140\*8)/7 = 160.

When sending SMS messages with Twilio, we'll automatically send messages in the most compact encoding possible. If you includeanynon GSM 7 characters in your message body, we will automatically fall back toUCS 2encoding (which will limit message bodies to 70 characters each).

Additionally, for long messages greater than 160 GSM 7 characters or 70 UCS 2 characters Twilio will split the message into multiple segments. Twilio also prepends aUser Data Header(link takes you to an external page)of six (6) Bytes to instruct the receiving device on how to re assemble messages. For multi segment messages, this leaves153 GSM 7 charactersor67 UCS 2 charactersper segment.

Note that this may cause more message segments to be sent than you expect a body with 152 GSM 7 compatible characters and a single unicode character will be split into three (3) messages because the unicode character changes the encoding into less compact UCS 2. This will incur charges for three outgoing messages against your account.

This page(link takes you to an external page)contains an interactive tool which can check if encoding your message in GSM 7 is possible, or if UCS 2 is needed.

Unfortunately, GSM 7 is not a supported character encoding in many text editors. Even setting encoding to ASCII (or US\_ASCII, or UTF 8) will not guarantee that text you write will be limited to GSM 7. You can use the above linked tool to quickly check the number of segments that is, total messages some text will be divided into.

If you are writing in an editor with Unicode support you'll need to be particularly careful. Text editors designed for writing might automatically add angled smart quotes, non standard spaces, or punctuation which looks similar to GSM 7 but is a different Unicode character. We've discussed a few of these issueson our blog(link takes you to an external page).

Sign up for afree Twilio trial account today(link takes you to an external page) you'll have enough credit to explore the two major encodings we use, and a lot more.

## N/A

N/A

## Interactive Voice Response (IVR)

More info: https://www.twilio.com/docs/glossary/what-is-ivr

Interactive voice response (IVR), also known as a phone tree, provides an automated telephony system for callers using voice and touch tones (DTMF).

### Interactive Voice Response (IVR)

Interactive voice response (IVR), also known as a phone tree, provides an automated telephony system for callers using voice and touch tones (DTMF).

Customers don't like to wait in an age of lightning fast connectivity. Incoming calls flood today's organizations with customers who want their questions answered pronto.

Interactive voice response (IVR)(link takes you to an external page)is an automated telephony system that helps companies handle inbound calls efficiently. In its basic form, IVR—also known as an interactive voice recording or interactive voice recorder—uses voice recognition and touch tone keypad selections to steer callers through menu options and information.

Also called a phone tree, IVR works with automatic call distribution (ACD) to route inbound calls to the best departments and agents for customer inquiries. IVR also gives callers information and helps them complete tasks without ever speaking to a human representative. This frees agents to handle more complex customer concerns, shortens hold times, and eliminates extra hiring.

Learn how to build a self service IVR system that wows your customers.Contact Twilio for support(link takes you to an external page).

IVR saves companies time and money by speeding up calls and requiring fewer agents to handle customer inquiries. The main features that allow IVR to process requests include dual tone multi frequency (DTMF) signaling and voice recognition.

DTMF signaling occurs when callers select menu options using their keypad. They "press 1 to make an appointment, 2 for billing," and so on. In other words, this technology routes callers to the departments and specialists most likely to address their needs—reducing hold times. But some callers get impatient with inefficiently designed menu options.

That's why more advanced IVR incorporates increasingly sophisticated voice recognition technology to help customers handle tasks on their own. The most cutting edge technology is natural language processing (NLP), which can understand full sentences instead of key presses or short commands. When done well, NLP resolves customers' questions quickly and makes calls more enjoyable, improving their impression of the business.

From a caller's perspective, IVR is a common phone menu that prompts them to press touch tone keys that emitDTMF tonesor say words that speech recognition detects.

Here's a breakdown of the process:

Once upon a time, IVR relied on many expensive components to function:

Today, cloud contact center solutions like Twilio'sProgrammable Voice API(link takes you to an external page)come integrated with IVR, combining decoded DTMF tones and web application logic to help you build your call center's menu in a snap.OurVoice API(link takes you to an external page)builds custom IVR systems without specialized hardware. For example, you can integrate custom data sources and business processes into your IVR using flexible API tools, helping you weave context into every customer interaction and deliver a tailored experience to each customer.Visit ourIVR solution page(link takes you to an external page)and see how to create a cloud based IVR to route callers and intelligently craft the seamless experience your customers want.

IVR systems can scale contact centers without requiring agents to answer calls. The technology enables intelligent, segmented call routing for a richer context and a faster resolution, which90% of consumers(link takes you to an external page)rate as important or very important when it comes to handling a customer support issue.

Moreover, IVR systems also supply general and account specific information to callers, freeing representatives to handle more complex inquiries—automated IVR systems are especially beneficial for organizations with high call volume. Plus, customers can find quick answers to questions and perform basic tasks themselves, such as paying bills, making reservations, and tracking orders.

Helping customers help themselves can reduce transfers and prevent delays, paving the way to customer satisfaction. When your IVR software is up to date and runs smoothly, customers are less likely to get frustrated and demand to speak to an agent. In other words, better experiences benefit your call center as a whole and increase profitability.

Contrary to popular belief, IVR is no longer reserved for large corporations or enterprises with big call centers. Small and medium sized businesses benefit greatly from the lower costs, decreased staff workload, and improved customer service.

Learn more about interactive voice response with these resources:

For expertly managed call flow and superior customer service,set up IVR(link takes you to an external page)with Twilio today. We help clients create IVR systems that provide stress free, user friendly call experiences.

Interested in customization? Or need to modernize your outdated IVR system? Talk through your use case with Sales for IVR expertise you can lean on. We can't wait to see what youbuild with IVR for your business.

## Internet of Things (IoT)

More info: https://www.twilio.com/docs/glossary/internet-of-things-iot

The Internet of Things (IoT) refers to devices that sense or manipulate some part of the physical world and are connected through the Internet. By virtue of their being networked, these devices can share information and data, and enable new applications and business models.

### Internet of Things (IoT)

The Internet of Things (IoT) refers to devices that sense or manipulate some part of the physical world and are connected through the Internet. By virtue of their being networked, these devices can share information and data, and enable new applications and business models.

The term Internet of Things (IoT) encompasses three components: physical devices, networks, and data. When these three elements are combined so that devices can communicate sensor data and interact with other systems though the Cloud, that's the Internet of Things.

Central to the idea of the IoT is the notion of connecting to the Cloud devices which are not traditionally networked or smart. Computers, tablets, and phones are not IoT 'things', but pretty much everything else can be once it's connected.

Here's an example: a connected scooter. Cellular technology allows the scooter you're about to ride to receive a message from your phone to unlock itself. Sensors in the scooter track your ride. When you've reached your destination, the on board microcontroller detects that the scooter has been parked sends the ride information to the cloud so that you can be billed for your journey and the system knows the scooter is now ready for another rider. Maybe it even sends an alert that its sensors have detected that the tyres are wearing thin.

A non example — something that is not considered IoT — would be several computers sharing an Internet connection via a local area network.

Twilio provides global cellular connectivity forIoT devicesthrough its SIM products:

Learn more about how to leveragecellular connectivity for IoT.

## N/A

N/A

## Jitter

More info: https://www.twilio.com/docs/glossary/what-is-jitter

Jitter is the variation in periodicity of a signal or periodic event from its target or true frequency.  In telecommunications, jitter further refers to the variation in latency of packets carrying voice or video data over a communications channel.

### What is Jitter?

Jitteris the variation in periodicity of a signal or periodic event from its target or true frequency. In telecommunications, jitter further refers to the variation in latency of packets carrying voice or video data over a communications channel.

Telecommunications traffic nowadays often travels across apacket switched network and quite often on the public internet. For participants in a session, voice or video data is converted into packets and routed 'towards' a recipient. Packet switched networks make no guarantee that all packets will take the same route to the destination. They are forwarded based on the current network status (and various algorithms) based upon the destination in the packet header and potentially the type of traffic.

Because of the lack of promises, packets traveling a fixed physical distance can take longer or shorter to arrive or even arrive out of order. The variation in arrival times (latency) is thejitter.

There are many potential causes of jitter on a network. However, variation in routing and forwarding packets causes the majority of issues. Cache sizes and configuration differences in intermediate forwarding nodes can change routes, but most commonly network congestion causes routes to change and latency to vary.

In the above image,packet 1makes six hops whilepacket 2only needs to make two. This might be the difference between 10 ms and 40 ms of latency and might meanpacket 2actually arrives beforepacket 1. If a call continues to split between the two possible routes, latency will average 25 milliseconds, but the average instantaneous latency difference between packets taking the opposite route will be 30 ms.

Jitter is an overloaded term;RFC 3393(link takes you to an external page)labels the +/ 30 ms measurement asIP Packet Delay Variation. Another common measurement of jitter is to use thevariance(link takes you to an external page)of packet latencies if they are expected or known to be randomly distributed (not bifurcated as in our example).

Small amounts of jitter can be counteracted with thejitter buffer. The jitter buffer queues incoming packets on the receiver side and can reorder or smooth incoming packets before releasing them to the user. Buffer length is generally a user setting; note that buffer length trades off with increasing latency. Setting too large a buffer directly increases the latency of actions on the sender side being received by a user.

Routers and operating systems queue outgoing packets in a buffer before releasing them to a wider network. A poorly set buffer size in your operating system or on network equipment can cause a condition known asbufferbloat, whereexcess packet queueing(link takes you to an external page)introduces irrecoverable jitter.

Quality of Service (QoS) routing settings on your network equipment can also factor into higher jitter. Prioritizing voice and video traffic can work around buffering problems. If you've tried other optimizations, QoS settings are the next place to look.

Twilio can provideSIP Trunking(link takes you to an external page)services with our ownprivate connections(link takes you to an external page)and routing choices, potentially greatly increasing the reliability of routes from source to destination and back. We can route your traffic over the public internet or on our private backbone, depending on availability.Talk to sales(link takes you to an external page)to discuss this option in further detail.

Twilio'sProgrammable Voice(link takes you to an external page)has a large suite of tools to monitor network and call quality in a package we callVoice Insights(link takes you to an external page).

Beyond measurement of jitter, Insights also can alert you when latency is too high, or packets are being dropped. It also can roll up metascores such as the number of dropped calls in your setup or mean opinion scores. You can seemore about Voice Insightshere.

If you need further help on debugging jitter or other call quality issues with your Twilio service, pleaseget in touch with support(link takes you to an external page). One of our experts will be able to talk you through optimizing your Voice or Video setup.

## N/A

N/A

## Large Language Model (LLM)

More info: https://www.twilio.com/docs/glossary/what-is-a-large-language-model

Large Language Models or LLMs are artificial intelligence models that can generate and process human like text. Some popular LLMs include OpenAI's GPT 4, Google's Gemini and Meta's Llama 2.

### What is a Large Language Model (LLM)?

Large Language Models or LLMs are a form ofArtificial Intelligence (AI), specifically Generative AI. An LLM is a model that was trained on a large amount of text and can generate new text.  
An LLM generates new text by taking an input text (typically called "prompt") and predicting what words come next. The result are models that can generate human like content and some have even displayed reasoning capabilities to work through complex problems.  
This is the reason why for many, LLMs are an important step towards a world ofautonomous agentsandArtificial General Intelligence (AGI)(link takes you to an external page)

Some of the most famous LLMs areOpenAI's GPT models(link takes you to an external page),Google's Gemini models(link takes you to an external page),Anthropic's Claude models(link takes you to an external page)and open source models such asMeta's Llama models(link takes you to an external page)andMistral's Mistral & Mixtral models(link takes you to an external page)

Since LLMs are great at generating and processing human like text, they are incredibly well suited for communication use cases. You can use them directly to generate content for the messages you plan to send, perform analysis on your communications by parsing through call transcripts or leveraging built in Twilio capabilities such asVoice Intelligence's Natural Language Operators(link takes you to an external page).

Increasingly LLMs are also becoming multi modal, meaning additionally to processing and responding to text they can process audio, video, and images. This opens up further communication use cases such as using an LLM to answer questions about images that were sent via MMS or WhatsApp.

As much as LLMs are incredibly powerful, there are some real considerations to make when using LLMs or products that use LLMs. The three most common considerations are around privacy, hallucinations, and manipulation.

Once an LLM was trained, it does not magically learn new information but is essentially frozen in time. However, some AI systems might choose to collect the data sent to the model to perform additional training later to improve the accuracy of the LLM. This process is typically called "fine tuning" and can be done through a variety of different techniques.

The important part regardless of whether an LLM gets initially trained or fine tuned later on, it's important to understand how data is going to be used in this training process. Since LLMs use probabilities to generate their output, there is always a chance that the training data can surface in responses from the LLM.

At Twilio we useAI Nutrition Labels(link takes you to an external page)to make it clear to customers if and how we use data to further train the models we use, as well as which LLM we used as the base.

Since LLMs use probabilities based on the data they were trained on to generate their responses, LLMs will always try to respond with information. While this is the thing that makes LLMs intriguing in the first place, it can at times result in the LLM returning non factual responses that are referred to as "hallucinations".

While there are mitigations to reduce the risk of hallucinations, such as leveragingretrieval augmented generation (RAG), using fine tuning, or using additional LLMs to "validate" the output, there is always a risk of an LLM hallucinating some content.

The nature of how LLMs are architected makes them prone to manipulation. While the types of attacks have different names such as "prompt injection", "prompt leakage" or "jailbreaks" they all aim at coercing the LLM to do something it isn't supposed to do.This might be coercing it to reveal the prompt instructions it received to perform a task ("prompt leakage"), injecting content that modifies the behavior outlined in the original "prompt" ("prompt injection") or to break out of the safety mechanisms in the model ("jailbreaks").

Because of the risk of manipulation it's important to consider safety mechanisms not just within the LLM (by modifying your prompt) but also outside of your LLM through additional input screening, strong permissioning (if you let LLMs decide to perform tasks) and generally not considering your prompts as "private" if the remaining input is untrusted.

## Latency

More info: https://www.twilio.com/docs/glossary/what-is-latency

Latency is the time delay between the initiation of an event and its perception by some observer.  In networking and telecommunications, latency is the time between a sender causing a change in a system's state and its reception by an observer.  Network latency is often informally used interchangeably with lag.

### What is Latency?

Latency is the time delay between the initiation of an event and its perception by some observer. In networking and telecommunications, latency is the time between a sender causing a change in a system's state and its reception by an observer. Network latency is often informally used interchangeably withlag.

Excess latency is one of the most common causes of poor Voice or Video communications quality over a network. As networked communications emulate face to face or verbal communications, long delays between transmission and reception of a signal are noticeable and off putting. High latency, especially without prepared participants, causes communications breakdowns and stops conversation flow.

Latency's effects depend on observers, but most will perceive latency around 100 120 milliseconds. Communications will start to break down around 250 300ms. If all parties are aware of large latency in a session (e.g. if all parties know a call is over a satellite connection), this delay might still be acceptable.

The International Telecommunications Union has codified recommendations onmaximum acceptable one way latencyinITU T G.114(link takes you to an external page). Their recommendation for network planning is to keep one way latencybelow 400msat the absolute low end while noting that atarget of 150ms one way latencyis suitable for most purposes. Some applications, especially those with interactive sessions, will be best experienced with latencies under 100ms.

For many applications of IP communications, the largest contributor to latency is the routing between the sender and receiver. This is caused by the physical routes the packets are forwarded over, as well as the individualized caches, settings, and congestion on intermediate forwarding nodes.

A partial list of other contributors to latency (but by no means an exhaustive one) follows:

Latency measurement was standardized in IETF'sRFC 2544(link takes you to an external page), based on definitions of latency fromRFC 1242(link takes you to an external page). RFC 1242 draws a distinction between store and forward devices and bit forwarding devices, but latency measures from when the last of the data leaves an output to when the first of the data reaches the input. Generally, in IP applications, latency measures the time between when the last piece of data leaves a sender to when the recipient receives the first piece of data.

pingis a utility which sends ICMPECHOpackets to measure network performance. In itsmost commonly used implementation(link takes you to an external page), ping will sendECHOpackets and receiveECHO REPLYpackets. Ping then rolls up results to calculate statistics related to round trip times.

Although closely related to latency (especially when routing or network latency dominates), ping is slightly different. On top of taking two trips through the network, there is also some compute time involved for the recipient to receive and process theECHOpacket and to send anECHO REPLY. However, ping often gives an excellent estimate of latency and can be used to diagnose or identify many latency issues.

In many cases, network effects cause the largest increase in latency. Although physical distance matters, the actual routes taken by packets in a session may be much longer. Take, for instance, the following example:

Two participants are both on the equator, 1,000 miles apart in a straight line.Their communications path is through a satellite in Geosynchronous (more accuratelyGeostationary(link takes you to an external page)) Orbit exactly bisecting the two, 22,236 miles above earth. Rounding off, the path from A or B to the Satellite is 22,273 miles.It takes light about 119.6 ms to travel that distance, so if the satellite takes 2 ms to process packets, the minimum one way latency added by the route is241.2 milliseconds!

Compare a satellite route with a wired connection around the curve of the earth, which would be around 1,003 miles long at a minimum.

Routing paths can cause a significant increase in latency, as seen in this example. The effect of this latency is often seen in television interviews and talks given via satellite; there is a noticeable delay between parties talking.

While Twilio can't help decrease the physical distance between the participants in your IP Video or Voice communications, we can assist with avoidable routing delays and help you monitor your session quality.

Ourlow latency Voice Conference Product(link takes you to an external page)has a global low latency routing architecture, helping improve the routing between intermediate nodes in your calls. OurProgrammable(link takes you to an external page)Video Product also uses this global low latency architecture to optimize routing for Twilio Voice JavaScript SDK's WebRTC streaming traffic. By ensuring low congestion and possibly more direct routes, we might be able to reduce your latencies;talk to sales(link takes you to an external page)to see if we have a solution for you.

Additionally, ourVoice Insights producthelps you monitor and quantify your IP communications sessions with Twilio. We will monitor latency, as well as other measures likejitter(the variation in latency between multiple packets) and packet loss. We also roll up metascores such as the number of calls dropped and accepted as well as subjective measures such as Mean Opinion Score.

## Live Chat

More info: https://www.twilio.com/docs/glossary/what-is-live-chat

Live chat is a type of online chat distinguished by its simplicity and user accessibility. Live chat appears in a web browser or in mobile applications, usually via a small pop up modal through which the visitor can exchange text messages with a chat operator in real time.

### What is Live Chat?

Live chat is a type ofonline chat(link takes you to an external page)distinguished by its simplicity and user accessibility. Live chat appears in a web browser or in mobile applications, usually via a small pop up modal through which the visitor can exchange text messages with a chat operator in real time.

Similar in function to other instant messaging chat clients that handle 1:1 communication, live chat doesn't require that your visitors install any special software as the chat client lives within your website's ecosystem. There's nothing for your visitors to maintain or manage they can start talking with a representative immediately.

Depending on the specific use case, either a support representative will reach out to a user to see if they need help with anything or a person visiting the website or application will initiate the chat and the appropriate agent will join the conversation.

Live chat typically does more than just allow two users to send messages to each other instantly. Robust live chat systems include typing indicators, chat history, read receipts, and integration into third party software (e.g. ticketing support issues, collecting and analyzing data, or routing customers to the most appropriate representative), all of which improve the chat experience for both the agent and the customer. While we often think of live chat as a tool for websites, it is also widespread in mobile applications.

One of the most dynamic ways to connect with users, live chat is now an integral part of many companies' customer support process. Live chat is faster than email and is far more efficient than phone support. An experienced customer service representative can field multiple chat instances at a time. Incorporating automated greetings and responses both decreases the amount of work repetitive work a CS agent has to do and provides instant contact for the user who needs help.

Web and mobile users have adapted quickly to live chat for their support needs. Live chat gives customers instant access to support, with nothing to download and no need to leave the website to make a call or send an email. Live chat offers shorter wait times, and customers can multitask while waiting, which eases the pain of waiting for answers. A sense of privacy and swift responses also increase customer engagement and happiness

Not only does live chat improve customer service efficiency and efficacy, but it also can give an organization insight into customer habits, trends, and pain points. Marketing, sales, and customer support teams can analyze the efficacy of their support team, and even extract data to aid business intelligence efforts.

Insight is likewise more available to customer service agents using live chat. Because live chat is built into the website or application it serves, a good chat client will provide the customer service agent visibility about the user who needs help, e.g. how long they've been on the site, if they are a new or returning user, or how many others are waiting to chat.

You can add full featured live chat into any application on mobile or web withTwilio Conversations, which offers full featured SDKs and global real time messaging infrastructure across multiple messaging channels. For more ideas about how to integrate live chat into your applications,check out these blog posts(link takes you to an external page)that describe different live chat use cases and features.

If you are looking for a full featured contact center solution,Twilio Flexoffers built in live chat as well as phone and email support for your Contact Center agents.

## Long Code

More info: https://www.twilio.com/docs/glossary/what-long-code-phone-number

A long code number is a standard phone number used to send and receive voice calls and SMS messages. Phone numbers are typically called “long codes” (10 digit numbers in many countries) when comparing them with SMS short codes (5 6 digit numbers).

### What is a Long Code?

A long code number is a standard phone number used to send and receive voice calls and SMS messages. Phone numbers are typically called "long codes" (10 digit numbers in many countries) when comparing them with SMS short codes (5 6 digit numbers).

For example, compare the following numbers innational(link takes you to an external page)andE.164formats.

Twilio allows you to get long codes numbers on demand forlocal, national, mobile, and toll free(link takes you to an external page)in 50+ countries. You can programmaticallysearch for available phone numbers via APIandpurchase numbers via API. Orlog in to find and purchase phone numbers(link takes you to an external page)via the Twilio Console.

Short codes are carrier approved to send A2P SMS and thus require carrier approval (typically an 8 12 week process). Twilio manages the carrier approval process for you forUS, UK, and Canadian short codes(link takes you to an external page).

For more information seewhat is the difference between short codes and long codes(link takes you to an external page)?

## N/A

N/A

## Machine Learning

More info: https://www.twilio.com/docs/glossary/what-is-machine-learning

Machine learning is an application of artificial intelligence that enables computer programs to learn and improve automatically as they are exposed to new data, without being explicitly programmed.

### What is Machine Learning?

Machine learningis an application of artificial intelligence that enables computer programs to learn and improve automatically as they are exposed to new data, without being explicitly programmed.

Artificial Intelligence (AI)(link takes you to an external page)is the ability of a computer to mimic human cognitive skills such as learning and understanding. Machine learning refers to the ability of AI systems to take in data through observations and interactions and adapt accordingly. Essentially, machine learning models program themselves. Futurists predict that every facet of our lives and every line of business will eventually be transformed by machine learning.

By 2020,Gartner predicts(link takes you to an external page)that customers will manage 85% of the relationship with an enterprise without interacting with a human. This is becoming possible because of advances in machine learning. There are three main factors influencing this fast moving space:

Machine learning algorithms are at the core of Twilio's most advanced communication deployments. From individual developers to major enterprises around the globe, Twilio powers the natural language understanding and dialog management of their entire customer experience.

NLU is branch ofnatural language processing (NLP), which helps computers understand and interpret human language by breaking down the elemental pieces of speech. Speech recognition and text analytics are powered by statistical machine learning methods which add numeric structure to large datasets.

Of course, understanding language requires more than finding statistical patterns in numbers. That's where machine learning helps NLU models improve over time as they learn to recognize syntax, context, language patterns, unique definitions, sentiment, and intent.

## Masked Calling

More info: https://www.twilio.com/docs/glossary/what-is-masked-calling

Masked Calling is a technique used in ecommerce to protect buyers’ and sellers’ personal phone numbers. Each party gets a temporary number, allowing them to communicate for a specified time period. When the time period expires, the numbers are recycled and reassigned to other parties on the platform. This prevents transactions from happening outside the platform.

### Masked Calling

Masked Calling is a technique used in ecommerce to protect buyers' and sellers' personal phone numbers. Each party gets a temporary number, allowing them to communicate for a specified time period. When the time period expires, the numbers are recycled and reassigned to other parties on the platform. This prevents transactions from happening outside the platform.

Masked Calling is made possible byVoice APIs(link takes you to an external page)like Twilio where a developer can set up phone number proxies to keep parties from knowing each other's real phone numbers during a call. The same technique can also allow the parties to send SMS to each other without revealing their personal phone numbers.

The basic technique involves using an intermediate number to forward the call to the user's real number. The customer may see number AAA AAAA, but behind the scenes, AAA AAAA is being forwarded to the seller's true number, BBB BBBB. When the seller's phone rings, or an SMS arrives, she also sees AAA AAAA as the caller ID as, even though the buyer's real number is CCC CCCC.

Applications using Masked Calling usually leave the numbers assigned for a set period of time: say, the length of the taxi ride plus a couple hours in case the rider left her backpack in the car. After this time, the numbers are recycled and reassigned.

More resources

## Masked Phone Numbers

More info: https://www.twilio.com/docs/glossary/what-are-masked-phone-numbers

Masked Phone Numbers are a common pattern to anonymize communication between multiple parties and hide participant phone numbers. Instead of dialing directly from phone to phone, users communicate via a third ('proxy') phone number that forwards a call to the eventual destination.

### What are Masked Phone Numbers?

Masked Phone Numbersare a common pattern to anonymize communication between multiple parties and hide participant phone numbers. Instead of dialing directly from phone to phone, users communicate via a third ('proxy') phone number that forwards a call to the eventual destination.

Many business use cases require a flurry of communications over a limited time frame. Having a service provider and a customer trade phone numbers for a transaction that will be over quickly is wholly unnecessary. While communications via text message and phone are necessary for logistical purposes, there often isn't a social need for two parties to trade phone numbers.

This is where the need for so called masked phone numbers arises. Also known asproxied,anonymized, orcloakedphone communications, your business can enable this time boxed communication without revealing unnecessary customer or worker information.

Many business cases have use for this pattern; a non exhaustive list of where masked phone numbers might make sense is:

While setting up the infrastructure for anonymous communications is often a good choice for your users and workers, it also has a strong business case. With masked phone numbers, you add friction for users attempting to move off your platform for transactions, keeping more business with your company.

See more of ourguidance on anonymous communications.

In many cases, revealing a private phone number is a major cause of friction. Inextremecases, keeping phone numbers and other personally identifiable information private can even be a safety issue.

For limited duration conversations needed for logistics, there is no need for one party to continue to contact the other when the transaction or service is complete. By proxying communications from the start, your business can avoid any potential problems down the road or even just annoyance from accidental dials.

Twilio's Proxyautomatically puts the infrastructure in place for your business to support masked phone numbers. From a phone number pool, Proxy will automatically assign and route communications back and forth, without revealing 'true' phone numbers unnecessarily.

For the self service types, ourVoice APIshelp you build your own masked communication infrastructure. We have extensive documentation onbuilding masked numbers into your web application.

Want to learn more about masked phone numbers?Talk to Twilio Sales(link takes you to an external page), and we'll be happy to talk you through how anonymous calling can help your bottom line.

## Mean Opinion Score (MOS)

More info: https://www.twilio.com/docs/glossary/what-is-mean-opinion-score-mos

A Mean Opinion Score (MOS) is a numerical measure of the human judged overall quality of an event or experience.  In telecommunications, a Mean Opinion Score is a ranking of the quality of voice and video sessions.  
Most often judged on a scale of 1 (bad) to 5 (excellent), Mean Opinion Scores are the average of a number of other human scored individual parameters.  Although originally Mean Opinion Scores were derived from surveys of expert observers, today a MOS is often produced by an Objective Measurement Method approximating a human ranking.

### What is a Mean Opinion Score (MOS)?

AMean Opinion Score (MOS)is a numerical measure of the human judged overall quality of an event or experience. In telecommunications, a Mean Opinion Score is a ranking of the quality of voice and video sessions.

Most often judged on a scale of 1 (bad) to 5 (excellent), Mean Opinion Scores are the average of a number of other human scored individual parameters. Although originally Mean Opinion Scores were derived from surveys of expert observers, today a MOS is often produced by anObjective Measurement Methodapproximating a human ranking.

Generically, a Mean Opinion Score can be employed anywhere human subjective experience and opinion is useful. In practice, it is often used to judge digital approximations of world phenomena.

Commonly employed domains where Mean Opinion Score is applied include static image compression (e.g. JPG, GIF), audio codecs (e.g. MP3, Vorbis, AAC, Opus) and video codecs (e.g. H.264, VP8). It is also very commonly employed in streaming sessions where network effects can degrade communications quality.

Mean Opinion Scores, as commonly used today, originated from polls of test subjects listening to audio or observing video. A number of current standards can be traced back to expert listeners and observers in distraction free quiet rooms subjectively logging experience scores. A MOS itself is a metascore, averaged from a number of individual components of session quality.

Nowadays, audio and video communications isn't scored by a panel of individuals, but by a number of algorithms (\*Objective Measurement Methods)\*that attempt to approximate human experience. ITU T'sP.800.1(link takes you to an external page)discusses objective and subjective scoring of telephone transmission quality, while recommendations such asP.863(link takes you to an external page)andJ.247(link takes you to an external page)cover speech and video quality, respectively.

The most commonly used rating scale is the Absolute Category Ranking (ACR) scale, which ranges from 1 to 5. The levels of the Absolute Category Ranking are:

Due to the human tendency to avoid perfect ratings (now reflected in the objective approximations), somewhere around 4.3 4.5 is considered an excellent quality target. On the low end, call or video quality becomes unacceptable below a MOS of roughly 3.5.

All links in the chain from sender to receiver can cause a drop in mean opinion score. Everything from a human's health to audio and video equipment to computer settings can cause a degradation in communications quality. However, network effects are most readily apparent and measurable on these calls jitter,latency, andpacket losslend themselves to numerical measurement, and have a direct effect on perceived call quality.

Twilio monitors average call quality over time and other metrics such as packet loss, round trip time, and jitter in theVoice Insights API. Sustained high jitter, packet loss, or round trip time, or a low mean opinion score will raise an event with a warning. Warnings are only cleared when measures improve for a specific amount of time; current event thresholds can be seenhere.

If you're experiencing persistent call quality issues with Twilio, we have written up a number ofclient best practices(link takes you to an external page)to follow. If problems persist, talk toTwilio Support(link takes you to an external page)for help debugging your setup.

Additionally, Twilio can provideSIP Trunking(link takes you to an external page)services with our ownprivate connections(link takes you to an external page)and routing choices, which usually greatly improves routing quality and improves mean opinion scores. Depending on availability, we can route your communications traffic over the internet or through our high speed, low latency global backbone. To discuss this option in further detail,talk to sales(link takes you to an external page).

## Microprocessor

More info: https://www.twilio.com/docs/glossary/what-is-a-microprocessor

A Microprocessor is an integrated circuit whose function is almost infinitely changeable through programming.

### Microprocessor

A Microprocessor is an integrated circuit whose function is almost infinitely changeable through programming.

In the 1950s and 1960s, computers were large. Mainframe machines filled entire rooms. Minicomputers were smaller but still chunky, though there were a few desktop models. All of them were constructed out of function specific modules — units for performing arithmetic and logic tasks, memory managers, input/output controllers, for example — each of which was constructed out of integrated circuits (the first "silicon chips") and discrete components.

The first commercial Microprocessor, Intel's 4004, launched in November 1971. It was a single integrated circuit like those used in computer modules but of far greater complexity. It compressed a mainframe or mini's entire Central Processing Unit onto a tiny sliver of silicon. It required separate memory, IO and program storage chips, but it was architecturally no different from the 'big iron' running company payrolls, handling airline bookings, logging data in labs, or monitoring nations' defences.

The Microprocessor would come to dominate computing. Today, all computers, from the largest super computer to the smallest Internet of Things (IoT) device, derive their computing capacity from Microprocessors.

The irony is that Microprocessors were never intended to be used in computers. The first Microprocessors, developed simultaneously by Intel and Texas Instruments, were attempts to simplify application specific chipsets by replacing fixed function components with programmable ones. "How can I replace dozens of chips with just a handful?" these two companies were asked by their clients. The solution: create a general purpose platform that could be programmed to deliver any desired application's functionality.

It was amateur computing buffs who latched onto the Microprocessor as the basis for cheap computers. Enthusiasts in the US, the UK, and other countries couldn't afford minicomputers, even small ones, so they had to build their own. Some parts were taken from machines discarded by businesses and institutions. Other modules were hand assembled. But the new Microprocessor technology allowed these folks to construct computers with much fewer parts and much more cheaply.

That's why Steve Wozniak built the Apple I. It was his personal hobby machine — until Steve Jobs realized it could be sold to enthusiasts who lacked Woz' electronics skills. MITS' Altair kit, featured on the January 1975 cover ofPopular Electronicsmagazine, was their inspiration, as it was for other 'micro' pioneers. In the UK, John Miller Kirkpatrick, Tim Moore, Chris Shelton, and Mike Fischer designed machines they or their clients would commercialize.

That was in the mid 1970s. Within a couple of years, on both sides of the Atlantic, enthusiasts were becoming entrepreneurs and offering their designs as commercials systems, first as single board computers — naked but complete circuit boards — then as packaged computers with integrated keyboards. Then came the killer applications, then the graphical user interface (GUI), then the OS wars — Windows vs Mac OS. By the 1990s, all personal computing was done on microprocessor based systems. Many of PCs in use in business were linked over networks to microprocessor based servers. Out went the minicomputer. The servers were soon connected to other servers, and data centers ditched mainframes for racks of microprocessor filled units. Today, the entire Internet runs off them, even the routers that manage the massive flow of data around the global network. Mainframes are museum pieces.

Today there are billions, possible trillions, of microprocessors in use all over the world, in almost every electronic device. The Microprocessor has achieved this is its first 50 years. What will the next 50 years hold for this truly revolutionary technology?

## MMS

More info: https://www.twilio.com/docs/glossary/what-is-mms

MMS, short for Multimedia Messaging Service, is a standard way to send multimedia such as pictures, videos, and other attachments over text messaging channels.

### What is an MMS?

MMS, short forMultimedia Messaging Service, is a standard way to send multimedia such as pictures, videos, and other attachments over text messaging channels.

MMS is an extension of the SMS (Short Message Service) protocol, allowing the exchange oftext messages(link takes you to an external page)exceeding 160 characters. Unlike SMS, which is text only, MMS can deliver a variety of media. This media may include up to forty seconds of video, audio, one image, or a slideshow of multiple images. MMS requires a third generation (3G) network to send large MMS messages (though smaller MMS messages may be transmitted over second generation networks usingGPRS).

When sending an MMS message, the sending device must encode the multimedia content, similar to sending aMIME(link takes you to an external page)message. The message then is forwarded to the carrier's MMSC (Multimedia Messaging Service Center), which is astore and forward(link takes you to an external page)server. The MMSC acts as a relay if the receiver is on a different carrier from the sender and forwards the MMS message to the MMSC of the receiving carrier.

On receipt of the MMS message by the recipient's MMSC, it determines whether the receiver's device is MMS capable (i.e. supports the standards for receiving MMS). Some MMSCs include conversion service that attempts to modify the content into a format suitable for the receiver. If the message's recipient does not have an MMS capable device, the MMSC will often deliver the message to a web service. This way, the recipient can view the content from a browser after receiving the URL via an SMS message.

MMS with Twilio is currently supported in the US and Canada. Please seeour MMS page(link takes you to an external page)for current information on Twilio's MMS offerings, including location availability.

Some benefits of sending MMS messages with Twilio:

Check out ourdocumentationor thisblog post(link takes you to an external page)if you're eager to get started sending MMS messages with Twilio. We can't wait to see what you build!

## Multichannel

More info: https://www.twilio.com/docs/glossary/what-is-multichannel

In a multichannel contact center, companies connect with customers via multiple communications channels – such as email, social media, web chat, and voice. However, just because customers connect via multiple channels does not mean that their experience is seamless.

### What is Multichannel?

In amultichannel contact center, companies connect with customers via multiple communications channels such as email, social media, web chat, and voice. However, just because customers connect via multiple channels does not mean that their experience is seamless.

In the contact center, the termsmultichannelandomnichannelare often confused. Many companies say they offer omnichannel communications, when what they really have is a multichannel approach. An agent who connects with a customer in a multichannel contact center by phone may not have any information about that customer's previous interactions on another channel. Often in a multichannel contact center channels aresiloed— agents can't see the context from interactions customers had on other channels on their contact center dashboard, which limits the level of service they can provide.

In anomnichannel contact center, however, allcommunication channels(link takes you to an external page)(such as phone, SMS, online chat, and email) are connected and integrated to provide a seamless customer experience. Omnichannel contact centers let agents switch between channels from one user interfacewithoutlosing context from customer interactions across all other channels. For example, when a customer can begin with achat session(link takes you to an external page)on a website and then roll that chat into avideo(link takes you to an external page)co browse session orvoice call(link takes you to an external page)with an agent, that customer is having a seamless, omnichannel experience.

Today's customers want to communicate over multiple channels—whether it'sVoice(link takes you to an external page),SMS(link takes you to an external page),WhatsApp(link takes you to an external page), orFacebook Messenger(link takes you to an external page)—they want companies to communicate with them on the channels they like to use.

So how can companies create this experience for their customers? The answer lies inapplication programming interfaces (APIs): routines, protocols, resources, and tools developers use to create software applications. APIs are like building blocks. Using APIs, you can build an entire contact center from scratch, or add the features you want to the one you already have.

APIs let customers engage with you on the channels they use every day. When you build yourcontact centerwith APIs, you can provide the full omnichannel experience, or just add the channels you need one at a time. Twilio API building blocks includeProgrammable Voice(link takes you to an external page),SMS(link takes you to an external page),Chat(link takes you to an external page),Video(link takes you to an external page),Sync,Notify, andTaskRouter, which fit together to build a world class contact center experience piece by piece. Explore each of the following channels to determine the priorities for your contact center:

When choosing a contact center solution, look for a single interface for multiple channels — SMS, phone calls, in app chat, email, messaging apps, and more — to save you the effort of maintaining separate integrations. You want to add new channels to your contact center as they become popular as well as create custom channels. Make sure the multichannel messaging app solution gives you complete ownership of your customer interaction data across all channels while providing a single omnichannel desktop to set your agents up for success.

Twilio APIs are architected at every layer for handling an omnichannel system. To find out more, check out this interactiveinfographic: How to Future Proof Your Contact Center with APIs(link takes you to an external page).

## N/A

N/A

## National Format

More info: https://www.twilio.com/docs/glossary/national-format

Twilio’s Lookup API returns phone numbers in national format, a string containing the phone number formatted according to the most common style in the associated country.

### What is National Format

Twilio's Lookup API returns phone numbers innational format, a string containing the phone number formatted according to the most common style in the associated country.

For example, phone numbers in the United States are defined by theNorth American Numbering Plan(link takes you to an external page)(NANP) as ten digit numbers consisting of:

The national format returned by Twilio for NANP numbers is therefore (NXX) NXX XXXX.

## Natural Language Processing (NLP)

More info: https://www.twilio.com/docs/glossary/what-natural-language-processing-nlp

Natural language processing (NLP) describes the methods computers use to parse human speech. It’s been a branch of research in linguistics, computer science, and artificial intelligence (AI) for many decades. In what follows, we’ll explore what NLP is and discuss some of its applications.

### What Is Natural Language Processing (NLP)?

Natural language processing (NLP) describes the methods computers use to parse human speech. It's been a branch of research in linguistics, computer science, and artificial intelligence (AI) for many decades. In what follows, we'll explore what NLP is and discuss some of its applications.

Although you may see the acronym spelled out as neuro linguistic programming in psychotherapy circles, in computer science, NLP stands for:

The mysteries of how human beings grasp language—and develop the capacity to speak more than one—are so complex that many linguists believe language acquisition must be somehow coded into the human brain.

While computers are great at handling structured data, such as database tables and spreadsheets, human language is diverse and complex. It spans hundreds of dialects, each with a set of grammar rules, syntax, terms, and slang.

Although we don't consciously engage in natural language processing, our minds subconsciously dissect spoken phrases into parts, much like how we learned to diagram sentences in middle school. Similarly, computer systems tag various elements of speech, detect the language spoken or written, and identify semantic relationships between words.

NLP technology allows computers to communicate with humans by pulling meaningful data from text or speech prompts. Because computers can scale language related tasks, it enables them to read and interpret text or speech and determine what to do with the information. This framework is the foundation for most automation software programs we use today.

Additionally, NLP resolves ambiguity in language by adding numeric structure to large data sets, which makes text analytics andspeech recognition technology(link takes you to an external page)possible.

Computers understand and process human language through techniques ranging from NLP machine learning methods toadvanced language models like ChatGPT(link takes you to an external page), which use large quantities of data to create probable responses to user inputs.

NLP technology generally follows 3 steps:

You can learn more aboutthe steps to NLP(link takes you to an external page)to discover the vast amounts of natural language data available, improve customer engagement and satisfaction, and automate or optimize business processes.

Homonyms—words that are spelled and sounding the same but have different meanings—create an intricate problem for computers. Consider the sentence, "Paris Hilton listens to Paris Hilton at the Paris Hilton." A native English speaker with some background knowledge understands this sentence and can differentiate between "Paris" as a person's name and "Paris" as the name of a place—but how does a computer program make the same leap?

Semantic analysis is a key aspect of natural language processing that involves understanding the meaning of words and the contextual relation to each other. The term semantics refers to the study of meaning: what does a personrefer toorintendwhen they make a statement? Techniques like named entity recognition, sentiment analysis, and topic modeling identify and extract key concepts and relationships from the text.

Used in various applications—such as chatbots, search engines, and recommendation systems—semantic analysis provides more accurate and personalized results to users. It plays a critical role in enabling computers to understand and process natural language text or speech effectively.

Twilio's Speech Recognition API(link takes you to an external page)leverages NLP to convert speech into text in real time during a voice call, while its robustnatural language understandingengine analyzes the text for meaning and intent. Some of the most important use cases include:

As this branch of computer science continues to evolve, there's always something new to discover and explore. At one time, it was a novelty to ask a smart device to play your favorite song. Now, there are advanced AI platforms that can compose a brand new song similar to your favorite one—all you have to do is ask.

NLP technology is an exciting frontier for any business that wants to improve customer service and streamline operations. Twilio'sProgrammable Voice API(link takes you to an external page)enables seamless voice experiences to help call centers improve customer satisfaction, reduce wait times, and increase efficiency.

Go beyonddual tone multi frequencyphone tree menus to conversational interactions between your system and your users with a scalable, customizable API.Get started(link takes you to an external page)for free today.

## Natural Language Understanding (NLU)

More info: https://www.twilio.com/docs/glossary/what-is-natural-language-understanding

Natural language understanding (NLU) uses the power of machine learning to convert speech to text and analyze its intent during any interaction.

### What is Natural Language Understanding (NLU)?

Natural language understanding(NLU) uses the power of machine learning to convert speech to text and analyze its intent during any interaction.

NLU is a branch ofnatural language processing (NLP), which helps computers understand and interpret human language by breaking down the elemental pieces of speech. Whilespeech recognitioncaptures spoken language in real time, transcribes it, and returns text, NLU goes beyond recognition to determine a user'sintent. Speech recognition is powered by statistical machine learning methods which add numeric structure to large datasets. In NLU, machine learning models improve over time as they learn to recognize syntax, context, language patterns, unique definitions, sentiment, and intent.

Business applications often rely on NLU to understand what people are saying in both spoken and written language. This data helps virtual assistants and other applications determine a user's intent and route them to the right task.

NLU is becoming more widely used for customer communication. This gives customers the choice to use their natural language to navigate menus and collect information, which is faster, easier, and creates a better experience.

Here are some areas where NLU is being used in applications that interact with human language:

Turn nested phone trees into "what can I help you with" voice prompts. Analyze answers to "What can I help you with?" and determine the best way to route the call.

Automate data capture to improve lead qualification, support escalations, and find new business opportunities. For example, ask customers questions and capture their answers using Access Service Requests (ASRs) to fill out forms and qualify leads.

Build fully integrated bots, trained within the context of your business, with the intelligence to understand human language and help customers without human oversight. For example, allow customers to dial into a knowledge base and get the answers they need.

## Net Promoter Score (NPS)

More info: https://www.twilio.com/docs/glossary/what-is-net-promoter-score

Net promoter score, often referred to as NPS, is an important metric that measures how likely customers are to recommend a business. The idea behind NPS is companies who are recommended by their customers are more likely to grow.

### What is Net Promoter Score (NPS)?

Net promoter score, often referred to asNPS, is an important metric that measures how likely customers are to recommend a business. The idea behind NPS is companies who are recommended by their customers are more likely to grow.

In 2003, business strategist Frederick F. Reichheldpublished a groundbreaking article(link takes you to an external page)inHarvard Business Reviewtitled, "The One Number You Need to Grow." Reichheld suggested that instead of focusing on growingprofits, companies need to focus on growingloyal customers. In an era when customer loyalty was gauged by satisfaction surveys and retention rates, this was a radical idea.

Companies who receive positive word of mouth and customer recommendations are more likely to grow, Reichheld explained. This claim, and the years of research to back it, led to the creation of the Net Promoter Score (NPS), which is widely used today to determine customer loyalty.

Reichheld's research, which linked customer survey results with purchasing patterns, referrals, and ultimately company growth, culminated in what he called "The Ultimate Question"—the most reliable way to actually determine customer loyalty. That ultimate question is the single most important item Reichheld suggested including on a customer survey:

"On a zero to ten scale, how likely is it that you would recommend our product, service, or brand to a friend or colleague?"

He suggested following with the qualifier, "What is the primary reason for your score?" and leaving it open for customers to complete in their own words.

Reichheld called customer satisfaction surveys "long and complicated, yielding low response rates and ambiguous implications that are difficult for operating managers to act on." In contrast, Reichheld claimed that NPS survey responses are the most reliable indicator of a company's ability to grow,regardlessof industry.

"By substituting a single question for the complex black box of the typical customer satisfaction survey, companies can actually put consumer survey results to use and focus employees on the task of stimulating growth." Frederick F. Reichheld, Harvard Business Review

Customer satisfaction (CSAT) surveys are commonly sent to customers shortly after an interaction with a company. These can help you understand how your customers really feel about the service they've just experienced and show you if you're meeting their expectations. These post contact surveys are usually conducted via channels likeSMS(link takes you to an external page), email, or a star rating after aweb chat(link takes you to an external page). The results yield what is known as a company'scustomer satisfaction score,the percentage of customers who are satisfied with the service they receive.

While CSAT surveys can give you a measurement of short term happiness regarding yourcustomer experience, they may not tell you what Reichheld says you really need to know:will your customers be back for more?

In contrast, an NPS survey asks customers about their satisfaction in a different way. Rather than focusing on a recent experience, NPS surveys look to the future by asking how likely customers are to recommend your company. If they're likely to recommend you, they're likely to remain loyal themselves.

You can deploy NPS surveys viaSMS(link takes you to an external page), email,IVR, in appchat(link takes you to an external page),Facebook Messenger, or any othercommunication channel.

Following the question, "On a zero to ten scale, how likely is it that you would recommend our product, service, or brand to a friend or colleague?" The customer is presented with a rating scale of0 10.

Customer responses are categorized into three groups:

Detractors:customers who gave a score of 0 to 6 aredissatisfiedwith your company. These customers are considered more likely to discourage friends or colleagues from using your product and services than to recommend you. Detractors are at risk of switching to a competitor and encouraging others to do the same.

Passives:customers who gave a score of either 7 or 8 areneutraland indicating that they probably won't be recommending your company to others any time soon. They might not be unhappy, but they aren't happy enough to promote your company. Passives could be swayed by competitors.

Promoters: customers who gave a score of 9 or 10 arehappyand most likely to actively recommend you and become repeat customers. Promoters are your loyal supporters and the ones who will spread the word about your company.

Your NPS is calculated by adding up the total from each category and determining its percentage of the total number surveyed, with a range from 100 to +100. The highest possible score would be 100, which would mean 100% of your customers arePromoters. At 100, all of your customers areDetractors.Passivesare essentially considered neutral.

Subtract the percentage of your detractors from the percentage of your promoters andvoilà! You have your NPS. Since any score above zero indicates more Promoters than Detractors, a score of 50 or more would be considered "excellent" by global standards. This indicates that your company has significantly more satisfied and loyal customers than dissatisfied ones.

"The only path to profitable growth may lie in a company's ability to get its loyal customers to become, in effect, its marketing department." Frederick F. Reichheld, Harvard Business Review

When you follow your main NPS survey question with the qualifier "What is the primary reason for your score?" pay attention to the feedback your customers leave. From this information, you'll see why Detractors aren't happier, what's holding Passives back from being Promoters, and why Promoters love your company so much. With that feedback in hand you can develop a plan on how to improve your score.

You'll likely want to send an NPS survey every three to six months to a representative sample of your customer base, not just the ones who've purchased recently. Over time, your NPS should ideally increase. To make that happen, Reichheld recommends three steps:

"The path to sustainable, profitable growth begins with creating more promoters and fewer detractors and making your net promoter number transparent throughout your organization. This number is the one number you need to grow. It's that simple and that profound."

Frederick F. Reichheld, Harvard Business Review

Despite its widespread use, the accuracy of NPS has been widely debated. Aresearch study reported in The Journal of Service Research(link takes you to an external page)looked at this debate, which centers around the question of whether NPS should be treated as being equivalent across customers. The study measured the NPS and online word of mouth messages of 189 customers.

While promoters consistently spread positive messages and detractors' messages were negative, passives—who have no weight in calculating the NPS—spread both positive and negative messages online. The study concluded that "companies should flag passives for further attention and action."

Want to know how likely your customers are to recommend your company to others? Ask them. With a contact center based on APIs likeTwilio Flex(link takes you to an external page), you can conduct post contact surveys over any channel.

## Network Address Translation (NAT)

More info: https://www.twilio.com/docs/glossary/what-is-network-address-translation-nat

Network Address Translation (NAT) is the modification of in transit network packets to map one IP address space to another.  It is most commonly used in IP Masquerading, where a large private IP network shares a relatively small number of publicly facing IP addresses behind a router or gateway.

### What is Network Address Translation (NAT)?

Network Address Translation (NAT) is the modification of in transit network packets to map one IP address space to another. It is most commonly used in IP Masquerading, where a large private IP network shares a relatively small number of publicly facing IP addresses behind a router or gateway.

IETF'sRFC 791(link takes you to an external page)lays out Internet Protocol version 4 (IPv4) which assigned publicly accessible machines 32 bit addresses. Those addresses commonly referred to with the shorthandIP Addresses can "only" address a maximum of 2^32 or 4,294,967,296 devices.

While 4.3 billion addressable endpoints was once sufficient, the explosion in popularity of the internet (and recently, internet connected devices) means thatIP address exhaustion(link takes you to an external page)is inevitable. Compounding the issue, IPv4 addresses wereassigned in very large blocks(link takes you to an external page)at first, so many IPv4 addresses are effectively unusable for current devices. WhileInternet Protocol version 6(link takes you to an external page)fixes the issue with 128 bit addresses (read: 2^128, 3.4e38, or more than the number ofatoms in the universe) it isn't yet universally implemented.

NAT has become synonymous with the concept ofIP Masquerading, where the true source or destination address of a packet isn't what's listed.

Analogous to a community mailbox, IP Masquerading can allow a single gateway device such as a router to sit in front of a network of dozens or in some cases, millions of computers on a private network. That single gateway will forward the packets on to the actual destination.

At home that might mean you have a router connected to the modem, a computer in the office, 2 laptops, a tablet, and an internet connected thermostat. Other than the router, the devices might haveprivate network IP addresses(link takes you to an external page)of the form:

The router will usually have the only publicly accessible IPv4 address in the house while other devices aremasqueradedusing Network Address Translation.

NAT on a large scale means that ~4.3 billion IP addresses have sustained IPv4past4.3 billion internet connected devices. However, it has introduced a number of complications and at some times showstoppers when dealing with routing.

When a device is the recipient or initiator of a communications session (such aswith SIP), it's very likely the device does not have a publicly accessible IP address. Twilio has deployed a number of services to avoid the complexity of NAT for your business communication needs.

UsingSTUN(link takes you to an external page) Session Traversal Utilities for NAT and TURN Traversal Using Relays Around NAT Twilio can route around any NAT traversal complexities when establishing peer to peer connections. STUN allows a host to discover its publicly accessible IP address while TURN will relay an incoming connection to a NATted device.

Twilio's Network Traversal Serviceis a globally distributed media relay service to improve the reliability of your peer to peer communications. We perform STUN lookups for you, and if STUN is insufficient to make a peer to peer connection we automatically provision a TURN Media Relay point in our global network on your behalf.

\* See Twilio's Q&A Writeup on STUN and TURN \*

With our STUN and TURN capabilities and your business, the possibilities are endless...

You can help your internal workflow by ensuring geographically diverse sites have more reliable peer to peer connections. You can improve global service and support for your WebRTC applications. Whatever your need, Twilio has your back read about ourNetwork Traversal Service, diveinto the docsortalk to sales today(link takes you to an external page).

## Network Edge

More info: https://www.twilio.com/docs/glossary/what-is-a-network-edge

A network edge is a location where a computer network interfaces with the Internet. A network connected to the Internet may have one or more network edges located in data centers throughout the world.

### What is a Network Edge?

A network edge is a location where a computer network interfaces with the Internet. A network connected to the Internet may have one or more network edges located in data centers throughout the world.

Many Internet providers have one or more core networks where services and content originate. These networks are often connected to a larger and more geographically distributed collection of network edges which can be used to efficiently deliver those services and content to end users.

Since network edges can be nearer to end users than the services hosted within the core network, providers often serve as much content as possible from devices in the network edge in order for the content to reach the end user with minimal delay. Content delivery networks (CDNs), which typically serve cached copies of static assets to end users, are an example of this pattern.

Twilio operates a collection of network edges around the world known as TwilioEdge Locations. These allow customers to select the site where their application's network traffic will enter and exit Twilio's platform. Selecting an Edge Location closest to an application's servers (for API traffic) or to its end users (for voice and video traffic) can result in improved reliability and reduced latency.

Twilio's Edge Locations support the following types of network traffic:

To learn more about Edge Locations and how to leverage them to optimize connectivity in your own use cases, check out the following resources:

In addition to the public Edge Locations that are available to all Twilio customers, Twilio also offers a selection of private Edge Locations for use by ourInterconnectcustomers. Private Edge Locations provide enhanced security and reliability by enabling your applications to connect directly from your private infrastructure to Twilio's servers, without traversing the public Internet.

For a complete list of available public and private Edge Locations, see theGlobal Infrastructure documentation.

## North American Area Codes

More info: https://www.twilio.com/docs/glossary/north-american-area-codes

North American Area Codes are prefixed to a phone number to assist in routing phone calls in North America. The North American Numbering Plan (NANP) dictates the regional and non geographic area codes assigned to signatory countries. The United States, Canada, some Caribbean countries, and all US territories are covered by the plan.

### What are North American Area Codes?

North American Area Codesare prefixed to a phone number to assist in routing phone calls in North America. The North American Numbering Plan (NANP) dictates the regional and non geographic area codes assigned to signatory countries. The United States, Canada, some Caribbean countries, and all US territories are covered by the plan.

There are317 geographic area codesin the United States and an additional18 non geographicarea codes totalling335 US area codes.

What's confusing to people not familiar with theNorth American Numbering Plan(link takes you to an external page)is that many countries share the +1 prefix, whereas most countries around the world have their owncountry calling code(link takes you to an external page). This means that +1 prefixed area codes are spread out amongst 25 countries including the United States

Canada has 40 geographic area codesand two non geographic area codes bringing the total number of area codes dedicated to use in Canada to 42 (there is also toll free).

NANPA is the organization charged to run theNorth American Numbering Plan (NANPA)(link takes you to an external page)by the FCC. In NANPA terminology area codes are called NPA's, short for Number Plan Areas. For the rest of us, we just call them area codes.

NANPA publishes two reports that show where area codes are distributed to:

There are currently25 countries(link takes you to an external page)that are members of NANPA. The US makes up the majority of the numbers (335/380) and California has the most numbers of any state. Canada has the second most dedicated area codes at 42.

Twilio has306 US area codes(link takes you to an external page)available to use on the Twilio platform.

## N/A

N/A

## Omnichannel Contact Center

More info: https://www.twilio.com/docs/glossary/what-is-omnichannel

In an omnichannel contact center, all communication channels (e.g., phone, SMS, online chat, and email) connect and integrate to provide a seamless customer experience. Omnichannel contact centers also let agents switch between channels with a single user interface without losing context from customer interactions across channels.

### What is an Omnichannel Contact Center?

In an omnichannel contact center, allcommunication channels(link takes you to an external page)(e.g., phone, SMS, online chat, and email) connect and integrate to provide a seamless customer experience. Omnichannel contact centers also let agents switch between channels with a single user interface without losing context from customer interactions across channels.

The terms multichannel and omnichannel are often confused, despite meaning different things. Many companies claim to offer omnichannel communications when really it's a multichannel approach, while others recognize there's still a way to go. In fact, according to Twilio Segment'sState of PersonalizationReport(link takes you to an external page), only 35% of businesses claim to have a successful, personalized omnichannel approach.

Companies that connect with customers via multiple channels—such as email, social media, chat, and telephone—have a multichannel contact center. However, just because customers connect with you via multiple channels doesn't mean that their experience is seamless.

For example, an agent who connects with a customer by phone may not have any information about that customer's previous interactions on live chat. This is because channels are typically siloed in multichannel contact center channels—meaning agents can't see the context from interactions customers had on other channels, which limits the level of service they can provide.

Giving your customers the ability to seamlessly switch between channels is what takes your customer journey to a whole new level. Enter the omnichannel contact center, which lets agents follow a customer conversation wherever it goes, without being boxed into one channel or spread across dozens of tabs.

When your customer can begin with achat session(link takes you to an external page)on your website and then switch to avideo(link takes you to an external page)co browsing session orvoice call(link takes you to an external page)with an agent, you can offer that customer more personalized, higher quality service. This seamless interaction across channels is the key to a great omnichannel experience.

Although the literal translation ofomniisall, an omnichannel contact center isn't necessarily operating on every possible channel (in today's technology landscape, these are constantly changing anyway). However, all the channels it does operate on are connected. This allows you to provide continuity and personalized customer service. Additionally, with an omnichannel contact center solution, agents can see the entire customer journey throughreal time dashboards. This means they can look at trends over time and by channel while tracking themetrics(link takes you to an external page)that matter to the business.

Your business can even customize the omnichannel dashboard for your specific needs and integrate it with your customer relationship management and other relevant platforms. This takes the mystery out of the customer journey by giving you visibility and extensive reporting and analytics.

Along with the visibility of the dashboard, an omnichannel approach also allows for a level of personalization that a multichannel contact center can't provide. The impact on the bottom line is undeniable—49% of consumers(link takes you to an external page)say they're more likely to become repeat customers after a personalized shopping experience.

Integrating your communication channels and providing seamless context throughout the customer journey—especially in a complex environment like a contact center—requires the rightinfrastructure(link takes you to an external page). This makes omnichannel difficult to achieve with out of the box contact centers. However, that's true of any system that requires a lengthy installation process and has limited features and integration with other platforms—it can't provide the agility needed to deliver an excellent customer experience.

How do you choose a cloud based omnichannel contact center solution? For starters, look for a single interface for all channels. You also want the ability to add new channels to your contact center as those channels become popular with your customers. Finally, make sure the solution gives you complete ownership of your customer interaction data across all channels through a single dashboard to set your agents up for success. This is where Twilio APIs come in.

Twilio APIs—such asProgrammable Voice(link takes you to an external page),Programmable SMS(link takes you to an external page),Programmable Video(link takes you to an external page),Programmable Chat(link takes you to an external page), and theWhatsApp Business(link takes you to an external page)—are architected at every layer to handle an omnichannel system. In other words, Twilio APIs can help you deliver an exceptional omnichannel customer experience, step by step. Not to mention,Twilio Flex(link takes you to an external page)brings all the channels together in one powerful platform, and you can deploy it in a matter of days. To find out more, check out the resources below.

## On Premise Contact Center

More info: https://www.twilio.com/docs/glossary/what-is-an-on-premise-contact-center

An on premise contact center is a model where the customer houses all the required software and hardware. Companies that use an on premise system generally employ or contract specialized IT staff to configure, upgrade, and maintain the contact center.

### What Is an On Premise Contact Center?

An on premise contact center is a model where the customer houses all the required software and hardware. Companies that use an on premise system generally employ or contract specialized IT staff to configure, upgrade, and maintain the contact center.

Theon premise contact centerorlegacy contact centerrelies on inflexible and proprietary platforms from vendors such as Cisco, Avaya, and Genesys. And with everything companies need on site, it's no wonderMcGee Smith Analytics(link takes you to an external page)estimates about 85% of contact center agent seats will remain housed by on premise models.

However, recently, cloud based contact centers emerged to offer an alternative. Some of the most prominent features of a cloud based model are that it places core contact center services off site and customers remotely connect to the center via the internet or by phone.

But this is only the beginning for cloud vs. on premise based contact centers. Read on to learn the features, drawbacks, and differences of on premise andcloud contact centers(link takes you to an external page).

Most legacy contact centers haven't aged gracefully. After all, inflexible, expensive contact center infrastructures can't scale or adapt to evolving customer expectations and digital innovations. Even worse, with mounting operating expenses, there's little room to invest and improve. The result is often a poor customer experience that devastates businesses:56% of respondents of Twilio's 2022 State of Customer Engagement Report(link takes you to an external page)said they would no longer patronize a business after a frustrating customer support experience.

Additionally, on premise license fees are expensive. For example, the annual maintenance can cost about a quarter of the license cost, while changes to the system—such as adding a new channel—can become so expensive it's effectively impossible for businesses to afford.

Beyond costs, specialists trained in on premise systems are increasingly hard to find and hire. As a whole, it's more expensive to run an on premise contact center when it requires heavy virtual machine power for high availability. Fortunately, the modern cloud contact center answers the legacy problem.

While custom on premise hardware and software models provide customization, integration, reliability, and scale, these are also pricey and difficult to deploy. In fact, the benefits of custom on premise contact centers appear only when companies invest heavily in professional services or trained developers. Not to mention, with on premise contact centers, deployment of new features takes a lengthy 24 months, and every change takesan average of 9 months(link takes you to an external page). Such infrastructure can't keep up with changes in consumer behavior.

Lastly, because many on premise systems run on outdated data technology and infrastructure, which impacts reliability, performance, and security, businesses must choose a modern alternative.

Companies frustrated with existing on premise contact centers will inevitably look to augment or replace them. Some will augment existing contact centers, which typically means adding functionality and channels using a cloud based product like Twilio. And others will replace the existing contact center experience to better match business requirements. Next, we'll delve into both.

Software as a service (SaaS) models help businesses subscribe to solutions, while Contact Center as a Service (CCaaS) providers offer hosted software and maintenance of servers, databases, or code. Customers access these solutions through the internet and pay for usage. And while these products offer limited customization and are quick to set up, unlike on premise contact centers, customers provide hardware.

API based companies like Twilio offer a third option: the flexibility of an on premise solution with the speed and ease of a SaaS solution. With pay as you go APIs, businesses find the annual costs of on premise maintenance alone far cheaper. Not to mention, these APIs also make businesses agile and strengthen deployment.

For companies that don't want to build with APIs and find CCaaS options too inflexible, there's another option. Platforms likeTwilio Flex(link takes you to an external page)help companies build at an unprecedented speed while customizing a unique design for specific customer and business needs. Although Twilio Flex is more intuitive than building with APIs, it's still an open platform for custom software development rather than an out of the box solution.

While on premise and cloud contact centers offer customers similar functionality, there are notable differences:

Now that you've seen the differences between on premise fromcloud contact centers(link takes you to an external page), it's clear why the future of business favors the flexibility and convenience of the cloud.Request a demo of Twilio Flex(link takes you to an external page)to learn how you can create an innovative cloud contact center that meets your growing company's needs.

## Order notifications

More info: https://www.twilio.com/docs/glossary/order-notifications

Order notifications give businesses the ability to inform customers of the status of their order, which could include confirmations, pricing adjustments, delays in fulfillment, or delivery scheduling.

### Order notifications

Order notificationsgive businesses the ability to inform customers of the status of their order, which could include confirmations, pricing adjustments, delays in fulfillment, or delivery scheduling.

One of the most popular methods that businesses use to send notifications is viatext messaging(link takes you to an external page)as it's the fastest and most reliable way to notify and interact with their customers in real time. By integratingSMS notifications(link takes you to an external page)within their CRM, businesses are able to automatically inform their customers of the status of an order.

Whether you are an ecommerce retailer or local pizza shop, informing customers of an upcoming order via text based messaging enhances the business/customer relationship.Dell(link takes you to an external page), for example, keeps customers informed of the status of their Dell.com purchases, including order, payment, and shipping information, using SMS alerts.DoorDash(link takes you to an external page), a restaurant to table food delivery service, uses SMS to take the order, notify the customer that their dinner prep is in progress, and keep them in the loop concerning delivery.

Order notifications, like allnotifications(link takes you to an external page)sent usingtext and voice messaging,(link takes you to an external page)receive attention more quickly than email and other mediums. And best of all, businesses typically receive customer replies in real time. This enables companies toautomate customer communicationswhile delivering a first rate customer experience.

## N/A

N/A

## P2P SMS

More info: https://www.twilio.com/docs/glossary/what-p2p-sms-person-person-messaging

P2P stands for Person to Person messaging. In simple terms, this is when two or more people communicate over text messaging. For example, when you send a text message from your phone to another person's phone, that's P2P. Under some circumstances, this may also include traffic that goes through an API to connect two people, however some countries (including the US and Canada) do not consider any application mediated traffic to be P2P.

### What is P2P SMS (Person to Person messaging)?

P2P stands for Person to Person messaging. This is when two or more people communicate overtext messaging(link takes you to an external page). For example, when you send a text message from your phone to another person's phone, that's P2P. Under some circumstances, this may also include traffic that goes through an API to connect two people, however some countries (including the US and Canada) do not consider any application mediated traffic to be P2P.

SMS is most often referred to as P2P when compared withA2P (Application to person)messaging. Wireless carriers treat P2P and A2P traffic differently in terms of the type and volume of traffic allowed. To avoid carrier filtering it is important to understand your use case so you can use the correct tools such asphone numbers(link takes you to an external page),short codes(link takes you to an external page), androuting intelligence(link takes you to an external page).

Carriers in the United States and Canada have a strict interpretation of A2P, and considerall messaging that passes through Twilio (or other messaging application platforms) to be A2P.

Learn more aboutthe difference between A2P and P2P SMS(link takes you to an external page).

## Packet Loss

More info: https://www.twilio.com/docs/glossary/what-is-packet-loss

Packet loss refers to the failure of packets to reach their destination on a network.  Packet loss is most often a consequence of network congestion and usually caused by network equipment dropping, ignoring, misdelivering, or discarding packets.

### What is Packet Loss?

Packet lossrefers to the failure of packets to reach their destination on a network. Packet loss is most often a consequence of network congestion and usually caused by network equipment dropping, ignoring, misdelivering, or discarding packets.

Symptoms of packet loss are mostly application specific some use cases are more resilient to packet loss than others. Two applications particularly affected by packet loss are networked games and networked communications sessions.

In internet gaming, packet loss can cause 'jumpy' or 'jerky' movements on network dependent events. This potentially causes weird behavior with timeouts and any type of counter, causing games to be unplayable in ways similar to highlatency.

In telecommunications, high amounts of packet loss can be particularly annoying and even cause complete communications breakdowns. Dropped packets can cause the 'robot' effect on stuttering voices (on calls or in video). In video, packet loss also causes frozen frames and stuttering behavior.

Some occasional packet loss is inevitable in packet switched networks. Especially as the number of packets moving across a network increases, nodes can encounter more data than they are able to handle. At that point, traffic will be rejected or dropped as it times out. Wireless (WiFi) networks are especially prone to packet loss.

Different Twilio products use TCP/IP or UDP for traffic (and some are configurable). We'll briefly discuss how packet loss is handled with TCP/IP and UDP traffic.

In Transmission Control Protocol/Internet Protocol (TCP/IP), all dropped packets are automatically retransmitted either after a notification (TCP Fast Retransmission) or after a timeout (TCP Retransmission). The retransmission scheme is documented inRFC 3366(link takes you to an external page). Further, TCP congestion control is laid out inRFC 2581(link takes you to an external page)and retransmission timing is inRFC 2988(link takes you to an external page).

Determining when to stop submitting packets is implementation specific, but after a certain number of unacknowledged or dropped packets a host is considered down.

With User Datagram Protocol (UDP) traffic, there is no automatic transmission of lost packages. UDP is used in real time streaming applications which can deal with some amount of packet loss (or out of order reception). If an application requires UDP retransmission it must implement it on its own or switch to TCP/IP.

Twilio'sProgrammable Voice(link takes you to an external page)has a suite of tools which can monitor network and call quality. We call this packageVoice Insights(link takes you to an external page).

Insights can alert on (and log) high amounts of packet loss, along with other common causes of poor communications quality such aslatencyorjitter. It also computes metascores such as dropped calls andmean opinion scores. Read more aboutmore about Voice Insightshere.

If you'd like help your Twilio setup to fix excessive dropped packets or other issues, pleaseget in touch with support(link takes you to an external page). Our experts can help you optimize your Voice or Video setup.

## PDD

More info: https://www.twilio.com/docs/glossary/what-is-post-dial-delay

Post dial delay (PDD) is the measurement of how long it takes for a calling party to hear a ringback tone after initiating a call. Technically it is the delta between the SIP INVITE and a 180 Ringing or 183 Session Progress response.

### What is Post Dial Delay?

Post dial delay (PDD) is the measurement of how long it takes for a calling party to hear a ringback tone after initiating a call. Technically it is the delta between theSIP INVITEand a180 Ringingor183 Session Progressresponse.

Callers who experience post dial delay will report long waits before hearing ringing. In extreme cases high post dial delay will be reported as dead air, one way audio, or dropped calls since the calling party has no indication that the call has been properly established, or whether the destination has answered.

Tolerance for post dial delay varies widely by geography. In North America most users will notice post dial delay of ~5 seconds, but in some locations like South Africa post dial delay of 10 seconds or more is common and even 15 seconds of silence before hearing ringing can go without remark by callers.

Most post dial delay is due to improper SIP signaling response from destination networks due to different interpretations of the SIP RFC. For example, in general a180 Ringingresponse from a destination indicates that the calling party network should play the caller whatever their local ringback tone is and a183 Session Progressfrom a destination includes specific audio in the SDP to be played back to the caller; however, in some cases a destination may try to provide specific ringback with a180 Ringingresponse, or neglect to provide one with a183 Session Progressresponse. Further, in some cases the ringback provided may be silence.

Post dial delay can also be experienced when calling geographically remote destinations from the caller. Non geographic destinations like satellite phones are also prone to greater post dial delay.

Twilio's Super Network actively monitors our carrier partners for increases in post dial delay and will proactively notify and resolve problems that are detected without action required from customers.

In some cases calls to a specific destination may encounter post dial delay that is not significant enough in aggregate to alert Super Network to the issue; in these instances customers can reach out to Twilio Support for assistance in investigating the issue and escalating to carrier partners if appropriate.

Post dial delay can be proactively monitored by customers using theVoice Insights DashboardandVoice Insights Advanced Features Call Summary API.

## Personally Identifiable Information (PII)

More info: https://www.twilio.com/docs/glossary/what-is-personally-identifiable-information-pii

Personally Identifiable Information (PII), or personal data, is data that corresponds to a single person. PII might be a phone number, national ID number, email address, or any data that can be used, either on its own or with any other information, to contact, identify, or locate a person.

### What is Personally Identifiable Information (PII)?

Personally Identifiable Information(PII), or personal data, is data that corresponds to a single person. PII might be a phone number, national ID number, email address, or any data that can be used, either on its own or with any other information, to contact, identify, or locate a person.

In response to businesses collecting and storing more and more individuals' PII (also known as personal data), individuals and regulators have been applying greater scrutiny to how businesses use and safeguard that data. As a result, various jurisdictions have passed legislation to limit the use, distribution, and accessibility of PII, while allowing companies who need it to manage the data safely.

As PII (or personal data) is a legal concept rather than a technical concept, legislation around PII varies across different jurisdictions. Global privacy laws likeGDPR(link takes you to an external page)in the European Union, sectoral laws likeHIPAA(link takes you to an external page)andPCI(link takes you to an external page)in the United States, state laws likeCCPA(link takes you to an external page),CPRA(link takes you to an external page),CalOPPA(link takes you to an external page), state and regional data breach laws, and other regulations control what defines PII. Which data is classified as PII may also differ by use case. For instance, depending on the jurisdiction or your use case, IP addresses may or may not be considered PII.

Twilio takes the management of our customers' information seriously. We have software, configurations, processes, and guidelines for managing data internally to keep your data safe and secure. Inside Twilio's systems, we manage data that could be PII in different ways.

Tools like Twilio'sPhone Number redaction(link takes you to an external page),Message Body redaction(link takes you to an external page), andCall Recording Encryption(link takes you to an external page)allow you to remove PII or encrypt it so no one can see it but you.

Twilio manages fields marked PII in Twilio's documentation as though they contain PII, also known as personal information or personal data. This means that Twilio implements appropriate technical and organizational security controls as appropriate to the risk associated with that data. For example, data will not be visible to Twilio's employees unless they are acting as a surrogate for you (e.g., debugging on your behalf) or have some other legitimate businesses need to access it. As well, values are anonymized or removed when we need to hold on to information for statistical analysis, reporting, and capacity planning none of which require the PII itself. Names, your end users' phone numbers, or transcriptions of voice calls and chats are all examples of fields that Twilio treats as containing PII. Phone numbers that you rented from Twilio, whether a long code or short code, because they are owned by Twilio, are managed differently from non Twilio numbers.

Each Twilio field marked as PII is also marked with an MTL a Minimum Time to Live. This is the number of days after creation that data will be stored in Twilio's systems for carrier reconciliation, tax management, or other business purpose that requires us to hold the data. Outside of the MTL, deletions from a Twilio API will be applied immediately, however it may take up to 30 days to delete from backups and other interconnected systems. For example, if a resource has MTL of 90 days, and you delete it on day 1 after creation, information will be completely gone 91 days after creation, because of the MTL. If you delete it on day 90, it will be gone by day 120, taking 30 days. If you have special retention requirements,check with our support team(link takes you to an external page)or success manager for potential options.

When you leave Twilio following a reasonable grace period to allow you to change your mind, all PII data is anonymized or removed from Twilio's systems where possible within 30 days except where the MTL is longer.Please note that in addition to the MTL listed, we may also retain PII in connection with detecting, preventing, and investigating spam, fraudulent activity, and network exploits and abuse, or if required to do so in connection with legal matters such as litigation, law enforcement requests, or government investigations.

Fields marked with "Not PII" are stored in Twilio and may be used for counting or other operations as Twilio runs its systems. These fields generally cannot be redacted or removed.In some instances, you might be able to control the data in these fields. You should take care not to place PII in fields with this designation. Twilio does not treat this data as PII, and its value may be visible to Twilio employees, stored long term, and may continue to be stored after you've left Twilio's platform.If you think you need to put PII in these fields, pleasecheck with our support team(link takes you to an external page)to see if there's a better way to manage your data.

Check out these resources to better understand data privacy at Twilio:

## Phone Menu

More info: https://www.twilio.com/docs/glossary/what-is-a-phone-menu

A phone tree or phone menu is an automated navigation menu presented to voice callers. Using interactive voice response with DTMF codes (touch tones) or voice recognition, a phone menu helps a caller find automated information, complete a transaction, talk to the proper human operator, or leave a voicemail with a company.

### What is a Phone Menu?

Aphone treeorphone menuis an automated navigation menu presented to voice callers. Using interactive voice response with DTMF codes (touch tones) or voice recognition, a phone menu helps a caller find automated information, complete a transaction, talk to the proper human operator, or leave a voicemail with a company.

Interactive Voice Responseis the key to a phone menu, allowing incoming callers to interact with vocal prompts to find the right department or information, leave a voicemail, or complete common transactions. Commonly, phone trees understandDTMF tonesemitted from a touch tone phone, although some advanced systems use voice recognition to assist incoming callers.

Even though phone trees ostensibly have a negative reputation, they're actually a massive time saver for your customersandyour business. Your customers can complete common transactions or receive requested information (e.g. account balances or transfer dates) by punching in credentials on a home phone or mobile device. When they call in for support or sales information, your business logic can route them to the right people without them having to talk to multiple levels of support first.

On the business side, a phone tree is the perfect complement to human operators in your call center. By triaging crucial support and sales tickets while handling common information requests, you'll increase the throughput of callers supported by the staff in your call center. With the right business logic in place, your call center will never sleep see ourIVR Tutorials pageto see how you can add voicemail and text transcription to a Twilio IVR setup.

See ourIVR Solution overview(link takes you to an external page)andcheckout additional explanations and best practices(link takes you to an external page)on how to build a phone tree with Twilio. If you're a developer, ourIVR tutorials pagehas the sample code, guides, and quickstarts you'll want to get going quickly in your chosen web language. Here's a quick look at the custom phone tree for a fictional entity namedPieHard:

Once you're developing your IVR setup, Twilio has the integrations you need as you build toward your IVR phone tree goals. Twilio'sProgrammable Voice(link takes you to an external page)has DTMF support baked in, while ourUnderstand API(link takes you to an external page)can help you add IVR voice recognition.Taskroutercan handle your toughest workflows and intelligently route incoming callers to the proper resources and operators.

Of course, we're always here to help you take the first step if you'd like guidance talk to sales(link takes you to an external page)to get started today.

## Platform

More info: https://www.twilio.com/docs/glossary/what-is-a-platform

A platform is any combination of hardware and software used as a foundation upon which applications, services, processes, or other technologies are built, hosted, and/or run. Platforms offer the ability to build within an existing technical framework, decreasing both development time and cost.

### What is a Platform?

Aplatformis any combination of hardware and software used as a foundation upon which applications, services, processes, or other technologies are built, hosted, and/or run. Platforms offer the ability to build within an existing technical framework, decreasing both development time and cost.

There are many different types of platforms, including computing platforms like Apple iOS and Microsoft Windows, social platforms like Facebook and WeChat, and marketplace platforms like eBay and AirBnB.

Twilio is a technology platform, like Amazon Web Services (AWS) or Microsoft Azure, which provides building blocks that are used in other technology products. Technology platforms are usually not visible to the end users of a product built on the platform. For example, while Netflix runs its services on top of AWS, Netflix's video watching users never see or interact with AWS.

Likewise, an end user of Lyft's ridesharing service doesn't see or interact directly with Twilio, even though Lyft uses the Twilio platform to communicate with their users. This type of platform is also known asplatform as a service, or PaaS. The provider, such as Twilio, hosts applications on its infrastructure, and developers pay for what they use.

Specifically, Twilio is acloud communications platform. This is sometimes referred to ascommunications platform as a service, or CPaaS. The term CPaaS emerged when companies like Twilio started offeringapplication program interfaces(APIs)—a more developer friendly and lower cost option to integrate communications capabilities likevoice(link takes you to an external page),messaging(link takes you to an external page),email(link takes you to an external page), andvideo(link takes you to an external page)directly into software applications.

Rather than building their own communications infrastructure from scratch, businesses that use cloud based APIs from CPaaS vendors add real time communications into their applications with a few lines of code. Unlike traditional communications infrastructure, communications built on a cloud communications platform are available without the burdens of capacity planning, carrier contracts, telecom hardware integration, and fragmented security.

Cloud communications platforms like Twilio bring the world of communications to every web and mobile developer in the programming languages they already use. Twilio can power solutions from a large, complex contact center to replacing a legacy corporate phone system and building SMS notifications into a supply chain management app. Without separate equipment, protocols, traditional infrastructure, telecom contracts, and software to deal with, the focus can be on building and iterating on the right solution for the task.

Cloud communications platforms operate with the latest security practices used by the largest banks and multinational companies. Strong encryption, role based access control, and signature validation protect the experience. Dedicated security experts are always improving security with incident response teams proactively monitoring and patching potential vulnerabilities around the clock.

Cloud communications platforms offer a distributed, self healing infrastructure to eliminate maintenance windows and guarantee uptime. Users get the benefit of dedicated communications engineers who constantly monitor and optimize for changing traffic patterns. Each service performed is always transparent and customers are backed by a service level agreement (SLA).

With geographically distributed hosting, horizontally scalable architecture, and thousands of carrier connections worldwide, cloud communication platforms present the opportunity to be truly global immediately. Local communications infrastructure and local connections in every geography are no longer required, allowing for vastly wider reach and the ability to scale as quickly as a company demands.

Unlike traditional infrastructure, cloud communication platforms don't focus on peak usage estimates and preparing for extra capacity that may or may not be used. There is no upfront capital or commitment required: users only pay for what they use.

## Private Branch Exchange (PBX)

More info: https://www.twilio.com/docs/glossary/what-is-pbx-private-branch-exchange

PBX, short for Private Branch Exchange, is a phone system in an enterprise that manages incoming and outgoing phone calls as well as an organization’s internal communications.

### What is a Private Branch Exchange (PBX)?

PBX, short forPrivate Branch Exchange, is a phone system in an enterprise that manages incoming and outgoing phone calls as well as an organization's internal communications.

Modern PBX systems help make an organization's communication more streamlined and robust. At the most basic level, a PBX connects communications devices such as hubs, switches, telephone adapters, routers, and phone sets. Size and complexity vary with each PBX. There are at home PBX systems that upgrade a traditional phone line to cloud hosted programs as well as complex and expensive corporate communications systems owned and operated by an individual enterprise.

Note: PBX is sometimes written PABX (Private Automatic Branch Exchange). While the first PBX systems required a human operator, almost all modern PBX systems are now automated. 'PBX' is still the term most commonly used to refer to this kind of system.

A PBX system makes it affordable to use more than one phone line in an organization. Managing incoming and outgoing calls, a PBX makes it possible to split a single phone line into several private lines identified by extensions (usually assigned 3 or 4 digit numbers). Not only does this allow a customer to reach anyone in an office through a single phone number, but it also grants the group free internal phone communication since multiple unique phone lines are no longer a requirement. PBX systems also empowerVoIP communication.

PBX systems perform four main call processing duties:

While it's safe to assume that all PBXes offer the above features, most modern PBX systems provide a whole host of other calling features and capabilities (though each PBX may differ in which features they offer). Some commonly provided PBX features include:

The arrival of IP telephony (VoIP) changed a lot about PBX. While PBX systems were initially analog and built on telephone lines and switches, IP PBX systems use VoIP technology and IP networks to channel calls.

IP PBX is the preferred flavor of modern PBX, switching calls between a VoIP user and a traditional phone user or between two standard phone users. Not only are IP PBX systems feature rich, but they also don't require separate networks for voice and data communications. With IP PBX, a single user has access to the internet, VoIP communications, and traditional phone communications through one line. Most, though not all, PBX systems today are IP PBX.

Also known as Virtual PBX, a Hosted PBX delivers PBX functionality as a service through the cloud. Various companies offer PBXes at a monthly cost, and all users need are their telephone sets and routers. While Hosted PBX systems generally cannot be tailored to more complex business needs, they are a great option for those running a small business due to their relatively low cost and the fact that they don't require any upfront investment.

If your business uses a PBX and you're interested in integrating your system with Twilio, we're here to help!

Twilio'sProgrammable Voice SIPallows you to use your existing SIP communications infrastructure to initiate SIP sessions with Twilio. You can alsoadd WebRTC to your PBX call center(link takes you to an external page)orconnect your PBX to Twilio's Elastic SIP trunking.

## PSTN (Public Switched Telephone Network)

More info: https://www.twilio.com/docs/glossary/what-is-pstn

The PSTN (Publicly Switched Telephone Network) is the network that carries your voice calls when you call from a landline or cell phone. It refers to the worldwide network of voice carrying telephone infrastructure, including privately owned and government owned infrastrucure.

### What is the PSTN (Public Switched Telephone Network)?

The PSTN (Publicly Switched Telephone Network) is the network that carries your voice calls when you call from a landline or cell phone. It refers to the worldwide network of voice carrying telephone infrastructure, including privately owned and government owned infrastrucure.

The PSTN is the network that carries voice calls, and interfacing between the internet and the PSTN has traditionally been very costly and difficult. The Twilio ProgrammableVoice API(link takes you to an external page)abstracts this complexity away, giving developers verbs like<Dial>and <Conference> to execute what have been extremely difficult voice calling tasks in the past.

## Push Notification

More info: https://www.twilio.com/docs/glossary/what-is-push-notification

A push notification (also known as a server push notification) is the delivery of information to a computing device from an application server where the request for the transaction is initiated by the server rather than by an explicit request from the client. While 'push notification' is most often used to refer to notifications on mobile devices, web applications also leverage this technology.

### What is a Push Notification?

A push notification (also known as aserver push notification(link takes you to an external page)) is the delivery of information to a computing device from an application server where the request for the transaction is initiated by the server rather than by an explicit request from the client. While 'push notification' is most often used to refer to notifications on mobile devices, web applications also leverage this technology.

APNS (Apple Push Notification Service(link takes you to an external page)) launched as the first mobile push notification service in 2009. Since then, Google released and iterated on its own push service andRich Notifications(link takes you to an external page)became par for the course on Android and iOS devices. In addition to these advancements, theW3C Push API(link takes you to an external page)sets the standard for push notifications from web applications.

Push notifications do not require a particular application to be open on a device for the message to be received by the end user, so a smartphone user can see notifications even when their phone is locked, or an app is not running.

The end user must opt in to receive push notifications from a given application. An application usually makes the opt in request on its initial installation, and the user may always grant or revoke consent for notifications at any time.

Each native mobile application platform (iOS, Android, Windows, Fire OS, Blackberry) has its own set of development guidelines and standards, as well as its own OSPNS (Operating System Push Notification Service). Most of these OSPNS allow push notifications to include text, images, app badges, and sounds. The OSPNS routes the notification from the application provider to the application user's device.

To add push notifications to an application, the application publisher registers with the push notification service of the OS for which they're developing. Then their OS service provides anAPIto the app publisher so that the app can communicate with the service. The app publisher then adds theSDKto their application, then uploads the app to the appropriate app store.

There are several benefits of push notifications:

While push notifications are now instrumental to communicating with an application's users, there are some unique challenges raised in this ecosystem. Making good business decisions around what, when, and how frequently to push is critical to relevant and appropriate communication with your customers. For instance, respecting time zones and sleep patterns, as well as user engagement habits, can go a long way to providing useful notifications.

Targeting your push notifications to user segments and personalizing messaging for specific users can help ensure you aren't flooding users with unwanted messaging. The goal of push notifications is to provide value to your end users, not just to provide marketing value to your business. Twilio'sNotifycan help you orchestrate notificationsacross platforms, devices, and users to better serve and delight your customers.

## N/A

N/A

## React

More info: https://www.twilio.com/docs/glossary/what-is-react

React (or sometimes ReactJS) is a JavaScript library for building user interfaces. It's sometimes also referred to as a framework.  
   
The library focuses on creating declarative UIs using a component based concept. Although React is often connected to front end JavaScript development it can also be used to render views server side in React Native. While React is open source, it is mainly developed by Facebook.

### What is React?

React(link takes you to an external page)(or sometimes ReactJS) is a JavaScript library for building user interfaces. It's sometimes also referred to as aframework.

The library focuses on creating declarative UIs using a component based concept. Although React is often connected to front end JavaScript development it can also be used to render views server side inNode.js(link takes you to an external page)or power mobile apps usingReact Native(link takes you to an external page). While React is open source, it is mainly developed by Facebook.

React was created byFacebook(link takes you to an external page)but is widely used by a variety of companies. It is often compared to frameworks likeAngular(link takes you to an external page)orVue.js(link takes you to an external page)but follows a more lightweight approach. Instead of being opinionated on the build and structure of your applications, it leaves those to the individual and subsequently the community. This leads to a variety of solutions for different problems. You might therefore find different attempts/libraries across articles and books.

Theonething that React is opinionated on is how your views are rendered. React works with a components system and a "props down, events up" approach with the focus on building as many reusable components as possible.

React projects often leverage a syntax calledJSX(link takes you to an external page):

The syntax is widely favored in the community, however, you are not bound to it and can use theReact.createElement(link takes you to an external page)syntax instead. In fact your JSX code will ultimately becompiled under the hood toReact.createElementcalls(link takes you to an external page)anyways.

React is centered around the concept of components. Your React application will have a root component that subsequently can have childcomponents that create an overall"component tree". Components should render their output based on two things:

If any of the two change, it will trigger React to efficiently re render the affected components.

The only way to send state changes up the component tree is byusing events(link takes you to an external page).

A component can be described as a function:

It can also be defined as aJavaScript class(link takes you to an external page):

A term that is often mentioned in combination with React isRedux(link takes you to an external page). Even though they are often mentioned together, you can use either of them without the other. The goal of Redux is to provide a structured way to handle the central state of your application.

Its way of dealing with application state is inspired by the conceptFlux(link takes you to an external page). The concept is based on a centralized state that is read only and that can only be modified via specific "actions" that are defined by the application.

Redux(link takes you to an external page)is not tied to React and can be used with other applications as well. You canread more about the concepts of Redux(link takes you to an external page)in their documentation.

There's a variety of ways that you can get started with React. TheReact documentation(link takes you to an external page)is a great resource, but we'll get you started here.

If you already gotNode.js(link takes you to an external page)andnpm(link takes you to an external page)5.2+, you can run these commands in your terminal to create a basic React application:

Alternatively, you can try an online playground likeCodeSandbox.io directly in your browser(link takes you to an external page)

Twilio Flex is built using both React and Redux. The component centric model allows you to create your own components for Flex, re use existing ones or tap into the global state of Flex using Redux by buildingTwilio Flex Pluginsusingcreate flex plugin.

If you want to learn more about React, check out some of these resources:

## REST API

More info: https://www.twilio.com/docs/glossary/what-is-a-rest-api

A REST API allows software programs to expose functionality and data to other programs over the Internet in a consistent format. APIs are considered RESTful if the means of accessing the API provider's functionality adhere to the architectural style of REST.

### What is a REST API?

A REST API allows software programs to expose functionality and data to other programs over the Internet in a consistent format. APIs are considered RESTful if the means of accessing the API provider's functionality adhere to the architectural style ofREST(link takes you to an external page).

A RESTAPIis a popular way for systems to expose useful functions and data to consumers over the Internet. REST stands forRepresentational State Transfer(link takes you to an external page), which can be described as an architectural pattern describing how distributed systems can expose a consistent interface. API stands for application programming interface, which is essentially a set of software functionality that can be consumed by other software programs (see full definition). Twilio, for example, provides a REST APIs for sending messages, making phone calls, looking up phone numbers, anda lot more.

Generally speaking, when people use the term REST API, they are referring to an API that is accessed via the HTTP protocol at a predefined set of URLs (uniform resource locators) representing the variousresourceswith which interactions can occur.

A REST API will be made up of one or more resources. A resource is any information or content accessed at a given URL resources could be JSON, images, HTML, or audio files. Resources can usually have one or moremethodsthat can be performed on them over HTTP. Some of the most common are in the table below.

These HTTP verbs sometimes DO NOT map 1:1 to these tasks, but commonly REST APIs provide a "CRUD" interface to remote resources. "CRUD" stands for these four operations.

To send a text message with Twilio, for example, youCreatea new Message resource. This creates aninstanceof the resource. You can thenReadthis instance later to review the message,Updatethe message body to redact the message, and evenDeletethe message.

The REST architectural style goes much deeper. If you'd like to learn more about the REST architectural pattern and REST API's, please check out these resources:

## Retrieval Augmented Generation (RAG)

More info: https://www.twilio.com/docs/glossary/what-is-retrieval-augmented-generation

Retrieval augmented generation is a technique in which relevant content (typically text) gets retrieved and pre processed to augment the prompt that gets passed to a Large Language Model to provide additional knowledge and improve accuracy.

### What is Retrieval Augmented Generation (RAG)?

Retrieval augmented generation (RAG) is a technique in which relevant content (typically text) gets retrieved and pre processed to augment the prompt that gets passed to aLarge Language Modelto provide up to date knowledge to the model, improve accuracy and reduce the risk of hallucinations.

Different projects might choose different architectures and setups for their "RAG pipelines" but at a high level they all follow similar steps, which are outlined below.

In order to be able to retrieve relevant information for RAG, the stored information needs to be searchable. The most common approach for this is to use avector database(link takes you to an external page).  
For this, the information that should gets stored first gets turned into "chunks" if the information is too large.

From there the content gets turned into "embeddings" using an embedding model. At a high level this is a model that will turn text (or other data) into a series of numbers (called a vector) that represents the text.  
This vector can then be used later to compare the similarity of different pieces of content.

This vector along with the raw information gets then stored in a database that is optimized for similarity searching among different vectors. All of this process typically happens separately on a regular basis and not part of the actual RAG process.

Once the data is stored, if you want to use an LLM to generate an answer to a question you firstretrieverelevant data from your vector database.  
This is done by turning the question into an vector using the same embedding model that was used to process the original information. Then you use the vector database to perform a "similarity search" to find similar chunks of  
information.

After the data is retrieved it then gets processed toaugmentthe prompt you want to send to the LLM to generate the final information. This might include additional steps like further filtering the retrieved information or summarizing it using another LLM.

Lastly, the now augmented prompt including the original question then gets sent to the LLM togeneratethe final response to the question. By including the relevant information through RAG it increases the likelihood of an accurate answer and also enables you to have access to timely data that the model might not have been trained on.

Twilio uses RAG for a multitude of applications. One is within theRFP Genie tool(link takes you to an external page)that Twilio built to help our sales teams with filling out RFPs.  
For this all relevant Twilio information such as documentation on various topics was placed into a vector database and the team built a RAG system on top that can be used to generate responses to questions to make sure Twilio's sales team always gets accurate and up to date information.

## N/A

N/A

## SDK

More info: https://www.twilio.com/docs/glossary/what-is-an-sdk

A software development kit, or SDK, is a downloadable software package that contains the tools you need to build on a platform.

### What is an SDK?

A software development kit, or SDK, is a downloadable software package that contains the tools you need to build on a platform.

An individual SDK is often heavily customized for its platform, but a typical SDK may contain:

Imagine you wanted to make some popcorn...

You wouldn't go out and plant, grow, and harvest your own corn every time you wanted to make some delicious popcorn. The time and effort required would be totally unreasonable for most humans of this earth to endure.

When it comes to developing a software application, this is where an SDK would come in. The libraries in a popcorn SDK could contain pre written functions like plantCorn(), growCorn(), harvestCorn(), and popCorn() that you can call on. Now it's up to you how you season and serve that popcorn.

If you're building an application and want to leverage Twilio, we've made various SDKs available to you depending on your programming language, the platform you're developing for, and the kind of communication solution you need. For instance, Twilio has SDKs available forvoice calls(link takes you to an external page)andchat(link takes you to an external page).

Check out thefull list of Twilio SDKs here.

## Sentiment Analysis

More info: https://www.twilio.com/docs/glossary/what-is-sentiment-analysis

Sentiment Analysis, or opinion mining, is the process of determining whether language reflects positive, negative, or neutral sentiment. Using sentiment algorithms, developers and brand managers can gain insights into customer opinions about a topic.

### What is Sentiment Analysis?

Sentiment Analysis, oropinion mining,is the process of determining whether language reflects positive, negative, or neutral sentiment. Using sentiment algorithms, developers and brand managers can gain insights into customer opinions about a topic.

Customer opinion can make or break a brand's success, and the decision to monitor it can mean the difference between a well timed course correction or a missed opportunity. Sentiment can also inform marketing and product strategy by revealing chances to reframe the customer experience.

Automated sentiment analysis is a powerful tool for gauging customer opinion at scale. Rather than relying on humans to read and evaluate large volumes of text, an algorithm can process and score sentiment rapidly and efficiently.

You can do sentiment analysis by setting up a dictionary based model. First, create a set of predetermined words with positive and negative values (or find apre made dictionary(link takes you to an external page)). Then, write a function that parses text, checks for the presence of those words, and uses the preset sentiment values to calculate the overall sentiment of the text. You can layer on additional functionality by including regular expressions and additional code to check for patterns that resemble sentence structures. This rule based approach can be quick to implement but may require significant work to derive a nuanced analysis.

Machine learning (ML) algorithms such as theNaive Bayes Classifier(link takes you to an external page)can be used for a more data driven approach to opinion mining. These models are fed sample datasets and trained to recognize positive, negative, and neutral opinions when they encounter a new piece of text.

Most comprehensive sentiment algorithms will cover:

Advanced approaches can discern the subject and object of opinions, parse complex statements ("I used to prefer shopping in person, but now I love buying online"), and account for slang ("that move was really sick!").

Twilio has partnered withIBM Watson(link takes you to an external page)to feature theMessage Sentiment Add on(link takes you to an external page)for Programmable SMS. When activated, this Add on can be used to track opinion across incoming SMS and can be used in support of customer surveys or other feedback gathering tools.

Sample JSON output from the Twilio Message Sentiment Add On

Message Sentiment is a tool for mining insights from unstructured message data. IBM Watson's Natural Language Understanding service is capable of advanced text analysis. The sophisticated algorithm reads text from inbound customer messages, looks for words and phrases indicating sentiment, and scores each message as positive, negative, or mixed. It's smart enough to understand negation and modifiers and speaks seven languages (with more in development).

## Serverless Architecture

More info: https://www.twilio.com/docs/glossary/what-is-serverless-architecture

Serverless architecture (also known as serverless computing or function as a service, FaaS) is a software design pattern where applications are hosted by a third party service, eliminating the need for server software and hardware management by the developer. Applications are broken up into individual functions that can be invoked and scaled individually.

### What is Serverless Architecture?

Serverless architecture (also known asserverless computingorfunction as a service,FaaS) is a software design pattern where applications are hosted by a third party service, eliminating the need for server software and hardware management by the developer. Applications are broken up into individual functions that can be invoked and scaled individually.

Hosting a software application on the internet usually involves managing some kind of server infrastructure. Typically, this means a virtual or physical server that needs to be managed, as well as the operating system and other web server hosting processes required for your application to run. Using a virtual server from a cloud provider such asAmazon(link takes you to an external page)orMicrosoft(link takes you to an external page)does mean the elimination of the physical hardware concerns, but still requires some level of management of the operating system and the web server software processes.

With a serverless architecture, you focus purely on the individual functions in your application code. Services such asTwilio Functions(link takes you to an external page),AWS Lambda(link takes you to an external page)andMicrosoft Azure Functions(link takes you to an external page)take care of all the physical hardware, virtual machine operating system, and web server software management. You only need to worry about your code.

PaaS, or Platform as a Service, products such asHeroku(link takes you to an external page),Azure Web Apps(link takes you to an external page)andAWS Elastic Beanstalk(link takes you to an external page)offer many of the same benefits as Serverless (sometimes called Function as a Service or FaaS). They do eliminate the need for management of server hardware and software. The primary difference is in the way you compose and deploy your application, and therefore the scalability of your application.

With PaaS, your application is deployed as a single unit and is developed in the traditional way using some kind of web framework like ASP.NET, Flask, Ruby on Rails, Java Servlets, etc. Scaling is only done at the entire application level. You can decide to run multiple instances of your application to handle additional load.

With FaaS, you compose your application into individual, autonomous functions. Each function is hosted by the FaaS provider and can be scaled automatically as function call frequency increases or decreases. This turns out to be a very cost effective way of paying for compute resources. You only pay for the times that your functions get called, rather than paying to have your application always on and waiting for requests on so many different instances.

You should especially consider using a serverless provider if you have a small number of functions that you need hosted. If your application is more complex, a serverless architecture can still be beneficial, but you will need to architect your application very differently. This may not be feasible if you have an existing application. It may make more sense to migrate small pieces of the application into serverless functions over time.

Using a product likeTwilio Functions(link takes you to an external page)is especially helpful for builders and developers wanting to implement a Twilio solution. They are able to select pre defined templates and deploy common communications use cases without the need to host a server or use any other providers.

Check out these links to get started with Twilio Functions:

Learn how to use Twilio with other serverless providers. Check out these tutorials:

We can't wait to see what you build!

## Session Initiation Protocol (SIP)

More info: https://www.twilio.com/docs/glossary/what-is-session-initiation-protocol-sip

Session Initiation Protocol (SIP) is a signalling protocol for initiating, terminating, and modifying user sessions over an IP network.  Most commonly, SIP is used for Voice Over IP (VoIP) services, but is also often used for other communications sessions such as video calls and instant messaging sessions.

### What is Session Initiation Protocol (SIP)?

Session Initiation Protocol (SIP) is a signalling protocol for initiating, terminating, and modifying user sessions over an IP network. Most commonly, SIP is used for Voice Over IP (VoIP) services, but is also often used for other communications sessions such as video calls and instant messaging sessions.

Compared to predecessors such asH.323(link takes you to an external page), SIP is a much easier to implement and much more flexible protocol. It was first standardized in March 1999'sRFC 2543(link takes you to an external page)and has been subsequently revised in June 2002'sRFC 3261(link takes you to an external page)(with various updates since then).

By mapping SIP endpoints (user agents, in SIP terminology) to Uniform Resource Identifiers (URIs), SIP is quite similar to the HTTP model of requests and responses. Unlike HTTP, SIP can use UDP or other transport types. SIP is a text based protocol and uses UTF 8 encoding.

\* See Twilio's Best Practices for SIP Security \*

Using SIP to connect to Twilio is one way(link takes you to an external page)to get access to Twilio's global reach and powerful automation and scripting functions.

Here's our overview ofconnecting your existing SIP communicationsinfrastructure to us.

Twilio also offersTwilio Interconnect(link takes you to an external page), a varied service where we offer a direct connection that can largely or wholly avoid the public internet. We have provisions to connect with your cloud infrastructure directly (such as with Amazon Web Services, Google's Compute Cloud, and Microsoft Azure), physically interconnect atone of our global locations(link takes you to an external page), tunnel over a VPN, or connect to your MPLS Network.

Twilio Interconnectalso offers additional QoS guarantees and SLAs as well as enterprise grade security.

Twilio also offers ourElastic SIP Trunking(link takes you to an external page)service, where we caninstantlyprovision a SIP network for you worldwide. Connect to a SIP URI that's local to your firm and we will do the rest all over a global private backbone that minimizes traversal on the public internet. See some possibleSIP Trunking setups(link takes you to an external page).

We offerunlimitedconcurrent call capacity let us worry about the scaling and the capacity while you run your business. We've also written more aboutSIP Trunkingif you're itching to get started or just want to learn more.

Whether you're taking the first steps towards modernizing a call center, adding additional channels of support such as WebRTC, Chat, and SMS, or looking to reduce latency and leverage our massive scale, Twilio has a solution for you.

Read about ourSIP Trunking offerings(link takes you to an external page), read about our SIP integration in our documentation, ortalk to sales(link takes you to an external page). We can't wait to help you build.

## Short Code

More info: https://www.twilio.com/docs/glossary/what-is-a-short-code

A multiple countries. Their name is derived from the fact that they are shorter (usually five to six digits) than their ten digit long code counterparts.

### What is an SMS Short Code?

Ashort code(link takes you to an external page)is a special telephone number designed for high throughput, two way messaging. Short codes are used to send and receive SMS and MMS messages to and from mobile phones. Twilio currently offers short codes inmultiple countries(link takes you to an external page). Their name is derived from the fact that they are shorter (usually five to six digits) than their ten digit long code counterparts.

If you're sending more than a few hundred messages a day from along code, your messages run the risk of being marked as spam. Short codes are pre approved by carriers to have a high throughput and are not subject to carrier filtering. This makes them perfect for sending those high volume or time sensitive messages. Here are some ways they're being used by developers:

Receive an SMS message and don't know who it's from? Want a short code, but find out it's unavailable? Use ashort code lookup tool(link takes you to an external page)to find the owner. It'll tell you when it was registered and who registered it. It'll also tell you what to text to unsubscribe from their messages.

There are two costs to consider when planning to use a short code:

You canobtain a short code from Twilioormigrate an existing one(link takes you to an external page)to our platform.

## SIM

More info: https://www.twilio.com/docs/glossary/sim

The acronym SIM stands for Subscriber Identification Module. A SIM is used to authorise a subscriber to access a mobile network. SIMs can come in many form factors, including cards and chips.

### SIM

The acronym SIM stands for Subscriber Identification Module. A SIM is used to authorise a subscriber to access a mobile network. SIMs can come in many form factors, including cards and chips.

Any device that wants to communicate using a cellular network needs to demonstrate that it is authorised to do so: that its owner is one of the network provider's customers, or of another provider that has a roaming agreement with the home network. The SIM in the device contains the information used to grant — or reject — access to the network.

All SIMs are microchips. Most are embedded in a small plastic card, of which there are four sizes: standard, mini, micro, and nano. Large, credit card sized standard cards aren't generally used these days, but you will almost certainly have taken one of the smaller cards out of a larger one to slot into a phone or tablet.

Some device have built in SIMs, which are just SIM chips mounted on the device's circuitboard. This is known as the 'MFF2' form factor.

Originally, SIM hardware and software were considered a single entity. Nowadays, the SIM functionality is an application running on more general purpose hardware called the UICC, or 'Universal Integrated Circuit Card'. This is the platform on which Twilio Super SIM operates, to deliver its ability to switch between global cellular networks. Check outSuper SIM's Multi IMSI Appletto find out how it works its magic.

## SIP INVITEs

More info: https://www.twilio.com/docs/glossary/sip-invites

A SIP INVITE is a SIP request message that initiates a SIP call.   
   
A SIP INVITE is made up of lines of text. The first line in an INVITE is called a Request Line, which is followed by more lines of text called ”headers”. The headers contain information about the INVITE, such as the identity of the caller, whether the INVITE was forwarded before being sent to the recipient, and the number of times a call may be forwarded.

### SIP INVITEs

A SIP INVITE is a SIP request message that initiates a SIP call.

A SIP INVITE is made up of lines of text. The first line in an INVITE is called a Request Line, which is followed by more lines of text called "headers". The headers contain information about the INVITE, such as the identity of the caller, whether the INVITE was forwarded before being sent to the recipient, and the number of times a call may be forwarded.

Example SIP INVITE

SIP URIs

SIP Request Line

Common SIP INVITE Headers

Other SIP INVITE Headers

Below is an example of a SIP INVITE request message, which includes some commonly used SIP INVITE headers.

In the INVITE above, you can see several examples of what are calledSIP URIsthat look like email addresses. A SIP URI identifies a users' contact information by indicating a specific user at a specific host/domain. A SIP URI could be an identifier for a specific person, a voice mailbox, a group within an organization (like "sales" or "marketing"), etc.

The parts of a SIP URI are described below.

Theuseris a phone number, word, or username that sits between thesip:and the@in a SIP URI.

Thehostordomainfollows the@in a SIP URI and can be a domain or IP address.

A SIP URI can also contain aport number. It is written after a:following the host. If no port is included in the SIP URI, the default SIP port5060is used.

A SIP INVITE is a type of SIP request. The first line in any SIP request is called theRequest Line.

TheRequest Linecontains three parts:

TheRequest URIis the contact information for the recipient of the SIP INVITE. It is found within the Request Line of the INVITE.

SIP headers contain information about the SIP message.

The SIP headers in a SIP request follow the Request Line.

A SIP header has anameand avalue. The header name is before the colon (:), the header value is what follows the colon. For the header on line 7 above, the header would be called the "CSeq header", and value of the CSeq header is1 INVITE.

This header field describes the transport used for the transaction (SIP/2.0/UDP) and identifies where responses should be sent (to192.168.10.10on port5060). Thebranchparameter is a unique value used to identify the transaction that is created by the SIP request.

This header limits the number of hops a request can make on the way to its destination. The value is an integer that decreases by one at each hop. If the value of the Max Forwards header reaches 0 before the SIP request reaches its destination, the request will be rejected with a 483 error (Too Many Hops).

TheTo headercontains the contact information for the called party (the recipient of the SIP INVITE).

TheFrom headercontains the contact information for the party that initiated the SIP INVITE.

TheCall ID headeracts as a unique identifier that helps group a series of messages together. It must be the same for all requests and responses sent by either party in a dialog (an exchange of related messages between two user agents). The value should be a cryptographically random group of characters, and can be followed by@and a host/domain.

TheCSeq headerserves as a way to identify and order transactions. It is made up of an integer and a SIP method.

TheContact headerprovides a SIP or SIPS URI that should be used to contact the user agent that sent the INVITE.

TheDiversion headercontains information about any re directing/forwarding the call has undergone. It includes the contact information for the party that forwarded the call.

TheP Asserted Identity headercontains the Caller ID information for the call that was authenticated in some way. This header may be used when forwarding calls within trusted domains, in order to maintain the original caller's caller ID rather than the forwarding entity's.

TheRemote Party Id (RPID) headeridentifies the originator of the call.

TheP Charge Info headercontains information about the identity of the party to be charged.

## SIP Trunking

More info: https://www.twilio.com/docs/glossary/what-is-sip-trunking

What is SIP Calling?  
SIP (Session Initiation Protocol) trunking refers to phone calls that are routed over the Internet rather than traditional phone lines. SIP calling, therefore, refers to the act of placing calls via a SIP trunk. Because SIP calls take place across the Internet, they tend to be cheaper and more efficient than calls placed through traditional phone systems.  
Physical connections to a phone company are eliminated with the use of a SIP trunk. Using SIP trunks, a SIP provider can connect multiple channels to your private branch exchange (Voice over IP (VoIP) infrastructure.

### What is SIP Trunking?

SIP (Session Initiation Protocol(link takes you to an external page)) trunking refers to phone calls that are routed over the Internet rather than traditional phone lines. SIP calling, therefore, refers to the act of placing calls via a SIP trunk. Because SIP calls take place across the Internet, they tend to be cheaper and more efficient than calls placed through traditional phone systems.

Physical connections to a phone company are eliminated with the use of a SIP trunk. Using SIP trunks, a SIP provider can connect multiple channels to your private branch exchange (PBX(link takes you to an external page)) system, allowing you to instantly provision global voice connectivity for yourVoice over IP(VoIP) infrastructure.

SIP trunking allows you to extend VoIP beyond your organization's firewall and bypasses the need for anIP PSTN(link takes you to an external page)gateway by carrying many signals at once to connect nodes in a communications system.

While typically used for voice calls, SIP trunks can also carry instant messages, multimedia conferences, user presence information,E 911(link takes you to an external page)emergency calls, and other SIP based, real time communications services.

The basis of SIP trunking is the Session Initiation Protocol (SIP), usually pronounced 'sip', not 'ess eye pee'. SIP is an application layer protocol for setting up real time sessions of audio or video between two endpoints, and is leveraged to produce a VoIP call. You canlearn more about SIPand how to leverage SIP for your business.

The "trunk" in SIP trunking derives from circuit switched telecommunications and refers to a dedicated physical line that connects switching equipment. A SIP trunk accomplishes a similar task as its circuit switched predecessor but works over a virtual connection on the Internet.

Twilio'sElastic SIP Trunking(link takes you to an external page)grants you the freedom to manage your SIP connectivity however you like. Check out some video tutorials to get started withtrunking termination(link takes you to an external page)(placing outbound calls),trunking origination(link takes you to an external page)(receiving incoming calls), andinternational trunking(link takes you to an external page).

With Twilio and SIP trunking, you can instantly provision global voice connectivity for your VoIP infrastructure. Whatever your current company's scale and needs, Twilio offers a SIP trunking service that's right for you.

With Twilio's Elastic SIP Trunking, you can instantly provision a SIP network worldwide. Connect to a SIP URI that's local to your company, and we'll do the rest. Check out some of the possibleSIP Trunking setups(link takes you to an external page)and ourSIP Trunking Overview(link takes you to an external page)to see how you can leverage SIP trunking for your business. We can't wait to help you build and scale!

## SMS

More info: https://www.twilio.com/docs/glossary/what-is-an-sms-short-message-service

SMS stands for Short Message Service and is another name for a text message. An SMS is generally sent from one mobile device to another over the cellular network. SMS is a text only standard first formalized in 1985 in the Global System for Mobile Communications (GSM) standards.

### What is an SMS?

SMSstands forShort Message Serviceand is another name for atext message. An SMS is generally sent from one mobile device to another over the cellular network. SMS is a text only standard first formalized in 1985 in the Global System for Mobile Communications (GSM) standards.

A singleSMS is limited to 160 GSM 7 characters, however most modern mobile phones are capable of segmenting and re assembling messages up to 1,600 characters. To fit emojis and other characters outside theGSM 7 alphabetin text messages,UCS 2 character encodingis used. A single unicode character causes the whole text message to be encoded using UCS 2, which limits messages to 70 characters.

The limit was originally set because SMS was designed to fit in between existing phone protocols. After it took off, the limit was then enshrined in theSMPP Protocol(link takes you to an external page). SMPP is how text messages are transmitted between carriers.

Natively, SMS can't handle pictures, videos, or multimedia attachments. To serve those purposes, in 1999 the MMS standard was ratified.MMSstands forMultimedia Messaging Servicewhich enables people to send pictures, videos, and attachments over text messaging channels.

Once the multimedia is received by the destination carrier the carrier sends an SMS asking the phone to download the content.

The standard for SMS was agreed upon in 1984 but the very first text message ever sent was from Neil Papworth on the Vodafone networkin 1992(link takes you to an external page). You'll be happy to know it was a happy one; "MERRY CHRISTMAS" was the body of Neil's original text.

From the very humble beginnings of SMS, text messages have exploded onto the scene. Every year,trillionsof text messages are sent between SMS capable devices. An entire ecosystem has grown up around text messaging;SMS Marketing(link takes you to an external page)is now a huge industry, while other applications have built safety and support services onto the SMS platform. All the while, it's also remained a tremendous way to keep in touch with friends and loved ones.

With the popularity of SMS, it was inevitable that business use cases would grow up around texting. SMS remains one of the best ways to communicate with customers and boasts a5x open ratewhen compared to email.

SMS Notificationsand SMS Marketing have both proven to be great applications of text messaging in business. Combining the extremely high open rates, universal receiving capability, and always present nature of mobile devices, they're an excellent way to communicate with customers. For service, too, the informal nature of an SMS is sometimes the perfect touch for business applications.

Twilio hashad an SMS API(link takes you to an external page)since the very beginning and over the years we've scaled the service to adapt it to changing customer needs. Using Twilio'sProgrammable SMS(link takes you to an external page), you can quickly integrate text messaging capabilities (sendingandreceiving) into your web, mobile, or desktop application.

Once you're ready to take it to the next level,Twilio Notifycan help you add SMS Notifications (and other channels) for delivery or status updates to your business. We also have laid out plays for you to add other common use cases such as SMS Marketing to your business's repertoire;see our learn articles(link takes you to an external page)for game plans for the solutions you need.

## SMS API

More info: https://www.twilio.com/docs/glossary/what-is-sms-api-short-messaging-service

A SMS API is well defined software interface which enables code to send SMS Gateway.  
As the infrastructures for SMS communications and the internet are mostly divided, SMS APIs are often used to 'bridge the gap' between telecommunications carrier networks and the wider web.  SMS APIs are used to allow web applications to send and receive text messages through logic written for standard web frameworks.

### What is an SMS API?

ASMS APIis well defined software interface which enables code to send short messages via a SMS Gateway.

As the infrastructures for SMS communications and the internet are mostly divided, SMS APIs are often used to 'bridge the gap' between telecommunications carrier networks and the wider web. SMS APIs are used to allow web applications to send and receive text messages through logic written for standard web frameworks.

As the number of developers with web experience outnumbers developers with a telecommunications focus, there is a huge demand for SMS APIs and Communications APIs that allow productivity from both worlds. Twilio'sProgrammable Messaging(link takes you to an external page)product offers a stableRESTful APIand powerful features that bring telecommunications programming to the web domain.

Twilio offers both API endpoints which you can hit with any language, as well as a selection ofHelper Librarieswhich help to build complex communications services into products in little time. Here are some code snippets that demonstrate SMS sending with Twilio:

Our goal, once you are signed up (Twilio offers a free trial(link takes you to an external page)), is to have you sending SMS messages in minutes not weeks.

For every step on your communications journey, Twilio is here to help.

Once you have the base 'sending SMS' case working, we've got a wide variety of sample applications, quickstarts, guides and tutorials onour Documentation site. We have snippets and samples for all of our core supported web languages (and sometimes other languages), example Curl commands, and a variety of best practices and troubleshooting tips for basic and advanced applications.

Twilio also offers a best in class SMS API, with low latency, high delivery, a very large number inventory, and downtime measured in justminutesannually.Twilio Sales(link takes you to an external page)is eager to talk through your business's unique challenges and requirements, and ourSupport team(link takes you to an external page)is ready to help you through any roadblocks.

Get started withTwilio's Programmable Messaging API(link takes you to an external page)today... we can't wait to see what you build.

Related Links:

## SMS Character Limit

More info: https://www.twilio.com/docs/glossary/what-sms-character-limit

A single SMS message technically supports up to 160 characters, or up to 70 if the message contains one or more Unicode characters (such as emoji or Chinese characters).  
However, modern phones and mobile networks support message concatenation, which enables longer messages to be sent. Messages longer than 160 characters are automatically split into parts (called ”segments”) and then re assembled when they are received. Message concatenation allows you to send long SMS messages, but this increases your per message cost, because SMS are billed per segment.  
The 160 character limit is for messages encoded using the GSM 7 character set. Messages not encoded with GSM 7 are limited to 70 characters. For detail on how these character limits change on concatenated (multi segment) messages, see below.  
Twilio's platform supports long messages up to 1600 characters across all Programmable Messaging channels, including SMS. However, for SMS messaging, Twilio recommends sending messages that are no more than 320 characters to ensure the best deliverability and user experience. See this article for details.

### SMS Character Limit

A singleSMSmessage technically supports up to 160 characters, or up to 70 if the message contains one or more Unicode characters (such as emoji or Chinese characters).

However, modern phones and mobile networks supportmessage concatenation,which enables longer messages to be sent. Messages longer than 160 characters are automatically split into parts (called "segments") and then re assembled when they are received. Message concatenation allows you to send long SMS messages, but this increases your per message cost, because SMS are billed per segment.

The 160 character limit is for messages encoded using theGSM 7character set. Messages not encoded with GSM 7 are limited to 70 characters. For detail on how these character limits change on concatenated (multi segment) messages, see below.

Twilio's platform supports long messages up to 1600 characters across all Programmable Messaging channels, including SMS. However, for SMS messaging, Twilio recommends sending messages that are no more than 320 characters to ensure the best deliverability and user experience. Seethis article(link takes you to an external page)for details.

When you send anSMSmessage containing more than 160 characters, the message is split into smaller messages for transmission. Large messages are split into 153 character "segments" and sent individually, then re assembled by the recipient's device. The effective character limit per segment is 153 rather than 160, because a data header must be included with each segment to ensure correct re assembly.

For example, a 161 character message will be sent as two messages: one with 153 characters and a second with eight characters.

If you includenon GSM 7 characters, such as Chinese script or emoji, in SMS messages, those messages have to be sent using theUCS 2encoding. Messages containingone or moreUCS 2 characters can contain up to 70 characters in a single, non segmented message. UCS 2 messages of more than 70 characters will be split into 67 character segments.

If you choose, Twilio's Smart Encoding feature canreplace certain non GSM characters with equivalent GSM characters,to reduce message cost when possible. For example, angled quotation marks "" are not in the GSM character set, but Twilio Smart Encoding will replace them automatically with straight quotation marks "".

Twilio bills SMS for every message segment sent. So, for example, if you need to send a message that is 140 characters long and contains only one non GSM character, you (or Twilio Smart Encoding) can avoid the cost of a second message segment by removing that UCS 2 character.

Toll Free multi segment SMS messages sent to the US or Canada have a total of 152 characters available per segment for GSM encoded messages and 66 for UCS 2 messages.

The Short Messaging Service (SMS) is a standardized communication protocol that enables devices to send and receive brief text messages. It was designed to "fit in between" other signalling protocols, which is why SMS message length is limited to 160 7 bit characters, i.e., 1120 bits, or 140 bytes. SMS was first standardized as part of the1985 GSM protocol(link takes you to an external page)and was subsequently codified into theSMPP signalling protocol(link takes you to an external page)that transmits SMS.

But things get tricky because GSM 7, the original character set designed for SMS, can only encompass 128 different characters, thanks to that 7 bit limit. So if you want to include characters from extended Latin or non Latin scripts, you'll need to use UCS 2.

A common mistake is to inadvertently use a UCS 2 character. GSM 7 isn't a supported character set in many text editors, which may replace GSM 7 compatible characters with characters outside of GSM 7. For example, if your text editor changes"to“— a 'curly' or 'smart' quote mark — you will have a UCS 2 character in your message and that will reduce the character limit from 160 to 70.

We recommend that you check any messages that you plan to send frequently usingour Message Segment calculator(link takes you to an external page)before you send them. This tool can flag any characters that would force the message to be sent using UCS 2 encoding, so you can decide whether to remove those characters and reduce the cost per message.

You can see whether any Twilio SMS message sent from your account was encoded as UCS 2 or GSM 7 by viewing the message in your Console logs.

## SMS Delivery

More info: https://www.twilio.com/docs/glossary/what-is-sms-delivery-deliverability

SMS Delivery is a measure of the percentage of outgoing SMS and MMS messages which are received at their intended destination.  While sometimes referring to the status of a single message, SMS delivery usually is a rate of delivered versus intended messages and summarized as an 'SMS Delivery Rate.'

### What is SMS Delivery or Deliverability?

SMS Deliveryis a measure of the percentage of outgoing SMS and MMS messages which are received at their intended destination. While sometimes referring to the status of a single message, SMS delivery usually is a rate of delivered versus intended messages and summarized as an 'SMS Delivery Rate.'

Whether sending a text message from a phone or through anSMS API, the nature of theshort messaging servicemeans some percentage of SMS messages will never be delivered.

As opposed to thumbing out a text on a phone, SMSes sent programmatically through an SMS Gateway have an advantage; application logic can verify delivery, increasing total SMS Deliverability by working around issues with sent messages. Through choosing reliable API partners (Twilio's current SLAs withProgrammable SMS(link takes you to an external page)are here),implementing read receipts(link takes you to an external page)or falling back to a different processor number(link takes you to an external page), you can keep your SMS Deliverability rate close to 100%.

Twilio's Messaging Services'Fallback to Long Codefeature can automatically fall back to long codes on SMS delivery failure

Of course even with best practices in place, you'll still have some failures. Here's how to measure your success... and how to improve it.

There is no standard time frame for measuring SMS or text message deliverability, but most often rates are quotedannually,quarterly, ordaily. The equation then becomes:

TOTAL MESSAGES DELIVERED / MESSAGES INTENDED

It's important to note that deliverabilityisn't measured by total API calls or messages sent. Message Deliverability strictly measures how many messages are delivered versus the number intended in a defined time frame.

This key difference means that your logic can implement fallbacks and use messaging auditing features to increase deliverability, even if that requires additional API calls and redundant logic. As SMS deliverability strictly focuses on intention versus result, Twilio can help you increase deliverability through our value added services and your business logic and code.

There are quite a few places where SMS and MMS delivery might fail, especially as messages move through the interfaces between pieces of infrastructure.

Although not an exhaustive list, common failure vectors include:

The device endpoint is an especially common vector for deliverability issues. Sometimes roaming devices or quickly moving devices do not acknowledge SMS or MMS reception, leading to messages being received more than once, or never received at all. (As with multiple API calls, messages delivered multiple times should only be counted as one delivered message.) Additionally, sometimes end devices or numbers just can't receive SMSes Twilio's Phone Number Lookup(link takes you to an external page)can help solve this problem.

Note that sometimes deliverability issues are deliberate for example, messages judged 'spam' may be blocked by our carrier partners. Twiliolists message error codes here.

Invalid numbers are the most common reason for message delivery problems. Changed (or fake) phone numbers won't reach their intended destination, decreasing your message delivery score.

As listed above, there are quite a few SMS delivery failure modes but not all are in your control. For your application, the content and meta content as well as any recovery logic are reasonable places to improve your deliverability.

With these best practices, you'll ensure high SMS delivery rates. High quality content and graceful exception handling will ensure you see the highest possible deliverability.

If you still would like more help with deliverability,talk to Twilio sales(link takes you to an external page) we have loads of experience helping customers perfect their SMS Marketing efforts.

Related Content

## SMS Gateway

More info: https://www.twilio.com/docs/glossary/what-is-a-sms-gateway

An SMS Gateway enables a computer to send and receive SMS text messages to and from a SMS capable device over the global telecommunications network (normally to a mobile phone). The SMS Gateway translates the message sent, and makes it compatible for delivery over the network to be able to reach the recipient.

### What is an SMS Gateway?

AnSMS Gatewayenables a computer to send and receive SMS text messages to and from an SMS capable device over the global telecommunications network (normally to a mobile phone). The SMS Gateway translates the message sent, and makes it compatible for delivery over the network to be able to reach the recipient.

At one point, SMS Gateways were actual physical pieces of hardware with SIM cards and embedded radios. Each SMS Gateway was individually connected to mobile phone networks to send text messages in a very similar way to a regular cellular phone.

Nowadays, modern SMS Gateways usually route SMS text messages to the telco networks via an SMPP interface that networks expose, either directly or via an aggregator that sells messages to multiple networks.

SMPP, orShort Message Peer to Peer,is a protocol for exchanging SMS messages between Short Message Service Centers (SMSCs) and/or External Short Messaging Entities (ESMEs).

Computers can interact with SMS Gateways in multiple ways:

## SMS Notifications

More info: https://www.twilio.com/docs/glossary/what-are-sms-notifications

SMS Notifications are out of band text messages sent in response to events or transactions which occur somewhere else. While often used as a marketing tool to increase the percentage of returning visitors, SMS notifications are very useful for organization and public safety purposes as well.

### What are SMS Notifications?

SMS Notifications are out of band text messages sent in response to events or transactions which occur somewhere else. While often used as a marketing tool to increase the percentage of returning visitors, SMS notifications are very useful for organization and public safety purposes as well.

Because of the enviable open and interaction rates of text messages, using SMS as a delivery channel for notifications is a compelling option. Since SMSes work as apushto devices, you won't have to rely on people checking in on a site, app, dashboard or other channels to keep apprised of events,ETA updates, or changes to plans. Additionally, the out of band aspect of SMSes is essential for public safety purposes (e.g., police activity, fires, or natural disasters), as well as maintaining a backup channel in case primary means of communications fail.

In marketing, SMS notifications increase the stickiness and interaction of your site for opted in customers (local laws vary, check with your legal team about your local opt in regulations). Whether notifying people of sales and providing coupons, keeping the conversation going on social networks, or directing people to a retail store, SMS notifications are the secret weapon for your business's engagement.

SMS Notifications also have a pivotal role in logistics. Whether sending event updates, keeping people apprised of schedule (or even providing support) at live events, or for notifying the proper teams when bad things occur, SMS is a great channel to tie everything together. Use SMS Notifications to keep things running smoothly on the day of the show, fight exceptions, and avoid those logistical nightmares you're dreading.

Twilio has quite a few products that ease or automatically provide SMS Notifications for events or transactions.Twilio's Notify producthas the SMS channel built in, and can also push notifications to smartphones and browsers as well as messaging apps.See more of the waysNotify is employed.

Alternatively,Programmable SMS(link takes you to an external page)allows you to roll your own notifications using SMS as the delivery channel. We have someexamples on our documentation siteshowing how to use it for server exception notifications, ETA Notifications, and marketing notifications.

As always with Twilio, ease of use is paramount. See how to send your first SMS Notification with Twilio through ourSMS API(link takes you to an external page).

## SMS Pumping Fraud

More info: https://www.twilio.com/docs/glossary/what-is-sms-pumping-fraud

SMS pumping fraud happens when fraudsters take advantage of a phone number input field to receive a one time passcode, an app download link, or anything else via SMS. The messages are sent to a range of numbers controlled by a specific mobile network operator (MNO) and the fraudsters get a share of the generated revenue.

### What is SMS Pumping Fraud?

SMS pumping fraud happens when fraudsters take advantage of a phone number input field to receive a one time passcode, an app download link, or anything else via SMS. The messages are sent to a range of numbers controlled by a specificmobile network operator(link takes you to an external page)(MNO) and the fraudsters get a share of the generated revenue.

This happens in one of two scenarios:

In the second case, smaller MNOs get paid by larger MNOs for subscribers and traffic, so a fraudster can create a fake company and promise large amounts of traffic. The MNO may not care what the source of the traffic is and ends up supporting the fraud. In either case, you're more likely to see this type of fraud occur with smaller operators.

You will likely see a spike of messages sent to a block of adjacent numbers (i.e. +1111111110, +1111111111, +1111111112, +1111111113, etc.) controlled by the same MNO.

If you're sending SMS for a one time passcode (OTP) use case, you will likely not see a completed verification cycle.

## SMS Tracker

More info: https://www.twilio.com/docs/glossary/what-sms-tracker

An SMS tracker is software that uncovers detailed information about the delivery and content of text and picture messages. It allows anyone to analyze an individual message or group of messages to see delivery patterns, encoding details, and error conditions.

### What is an SMS tracker?

An SMS tracker is software that uncovers detailed information about the delivery and content of text and picture messages. It allows anyone to analyze an individual message or group of messages to see delivery patterns, encoding details, and error conditions.

From the moment you (or your application) kick off a new message to when that message reaches the recipient's phone screen, there are many possible points of failure. We take for granted that anSMS or MMS(link takes you to an external page)arrives quickly and unscathed. Yet it almost always does. In each case, that means the message was sent correctly by the handset or application, was properly encoded and segmented for the downstream carrier, navigated the global carrier network without incident, and was assembled and displayed correctly on the recipient's handset. If something went wrong along the way, an SMS tracker provides the insight needed to quickly diagnose what happened. It can determine when a delay or failure condition occurred and what part of the communication chain was responsible.

Delivery Status

An SMS tracker provides real time information when a message is queued, sent, delivered successfully, or not delivered by the carrier. It provides useful error information for delivery failures, such as when:

With Twilio, you can directly notify your app aboutSMS(link takes you to an external page)delivery status via awebhook, which is a user defined HTTP callback. The followingguidewill show you how to set it up.

Detailed information on an individual message is also available through a web based Console view. It might look like the following:

Message Content

Whether your message contains alphanumeric characters, emoji, or pictures, the content of the message can dictate how it's sent (e.g. using SMS or MMS) and the encoding mechanism used. Different carriers around the world use different encoding methods and this can sometimes impact whether your message looks the same way to the recipient as it does when you sent it.

With an SMS Tracker, you can learn about how message content was formatted or encoded and can log the actual text and picture content for compliance.

It's even possible to retrieve sentiment and keyword analysis about the messages with services that augment an SMS API likeIBM Watson(link takes you to an external page). This way you can gain insight into what's said across a group of messages without having to read each one.

Conversation Tracking

You can also trackSMS conversationsbetween two specific phone numbers using HTTP cookies. To do this, you must create a unique cookie for each to/from phone number pair and store the unique cookie messages sent between that pair of numbers. So, for example, the cookie for messages sent between 650 555 2222 and 212 555 9999 will be different than a cookie used in a text conversation between 408 555 3333 and 925 555 1111.

User Actions

While infrastructure can provide a wealth of information about delivery and content, there's no substitute for direct user feedback. Twilio, for example, programmatically gathers information about user actions that relate to an SMS. So, using Twilio's API, you could build an application in which:

You can then process these actions to locate network issues and improve message delivery rates.

An SMS tracker uses network data, various monitoring techniques, and direct user feedback data to improve delivery and give you a complete view of the messages you send and receive. It exposes the data to you, and helps inform carrier routing decisions so your messages are always delivered quickly and reliably.

## Sticky Sender

More info: https://www.twilio.com/docs/glossary/what-is-a-sticky-sender

Sticky Sender is a valuable feature for SMS or Voice marketing where all outbound customer contact comes from a single number. This 'sticky' or 'unchanging' number increases customer familiarity and trust. With a two way Voice or SMS system, it also allows customers to contact businesses and organizations through the very same number.

### What is a Sticky Sender?

Sticky Senderis a valuable feature for SMS or Voice marketing where all outbound customer contact comes from a single number. This 'sticky' or 'unchanging' number increases customer familiarity and trust. With a two way Voice or SMS system, it also allows customers to contact businesses and organizations through the very same number.

Implementing Sticky Sender functionality in your SMS marketing application is one way to increase trust with your customers. While you may have many numbers in your phone number pool, keeping that common touchpoint for individual customer contact means you won't overwhelm anyone by changing outgoing numbers.

Furthermore, handling inbound messages from the same number means your customers can get back in touch with the number they trust instead of hunting down your company's primary support or sales number. A sticky sender also means customers can save your number into their phone book and not be surprised by an unknown texter when you do make outbound contact.

AMessaging Service, a part of Twilio Programmable Messaging, is the perfect partner for your SMS marketing or support operation. Using a set of rules, it will automatically use a sticky sender for numbers you have contacted before and assist you with the localization of new (uncontacted) numbers with Geo Match functionality.

To turn on Sticky Sender, visit theSMS Services section of the console(link takes you to an external page). (Here are detailed instructions for enabling Sticky Sender for your Messaging Service.)

Additionally, you can build your own Sticky Sender functionality into an app with ourMessaging APIor ourVoice APIusing Programmable Messaging and Programmable Voice, respectively.

We suggest implementing Sticky Sender in your final application you should see customer dividends paid relatively quickly. To discuss how your business or organization can best utilize a Messaging Service, feel free toget in touch with sales(link takes you to an external page)or toget support(link takes you to an external page)for Twilio Messaging's awesome functionality. (Note that we don't recommend using a Sticky Sender for account security applications.)

## String Identifier (SID)

More info: https://www.twilio.com/docs/glossary/what-is-a-sid

A String Identifier (SID) is a unique key that is used to identify specific resources.

### What is a String Identifier (SID)?

A String Identifier (SID) is a unique key that identifies specific resources.

Every Twilio resource has a 34 character SID. You can use the first two characters of the SID to identify its type. For example, Call resource SIDs begin with the lettersCA, and Message resources begin withMM. The remaining 32 characters of the SID are digits.

Many API calls to Twilio return a JSON object containing a resource's SID. Using this SID, you can retrieve more information about the specific resource.

For example, the following code creates an SMS message:

The JSON response to this API call from Twilio has a property namedsid. Using this value, you can later fetch this specific message that you created.

Using the message SID, which is prefixed withMM, you were able to get more information about that specific resource.

## Studio Flow Context

More info: https://www.twilio.com/docs/glossary/what-is-studio-flow-context

Studio Flow Context is the data and information captured in a Liquid Template Language by specifying the data type and desired variable.

### What Is Studio Flow Context?

Studio Flow Context is the data and information captured in aStudio Flowwhile a user is engaging with it. There are four data types that can be accessed to retrieve this information: Flow, Trigger, Widgets, and Contact. Studio Flow Context can be referenced in a Studio Widget using theLiquid Template Languageby specifying the data type and desired variable.

Flow Context describes the environment — including users and variables — within a Twilio Studio workflow. Where a Studio Flow defines the order of events that take place during an execution, Flow Context is responsible for storing any values involved with the execution. Flow Context is accessible from anyWidgetwithin the Flow, allowing global access to variables and information from other Widgets.

You would use Flow Context frequently when accessing user input for theSend & Wait For Reply WidgetandGather Input On Call Widget. The four data types in a Flow Context are used to access the various forms of data associated with a Flow.

Flow data refers to information built into a Studio Flow such as the Twilio phone number designated to carry out its execution.

Trigger data is information, such as properties of an incoming message or phone call and its recipient, stored when a Studio Flow begins execution. A Studio Flow execution is initiated when an incoming phone call, message, or REST API request is detected. The unique trigger variables are detailed in theTrigger (Start) Widgetdocumentation.

Widgets data handles information saved by each Widget upon execution. This could include user input from a message or voice response. Widgets are referenced by their unique name using{{widgets.<widget\_name>.<variable>}}, with variables found on each Widget's documentation page.

Contact data keeps track of information referring to the user interacting with the Studio Flow. An example of this is a user's phone number.

Studio Flow Context also includes variables which can be set during execution using theSet Variables Widget. Custom variables are accessed as a Flow data type using{{flow.variables.<key>}}, where key is the custom variable name specified.

Find additional information about Studio Flow Context within theStudio Getting Started Guideand in theStudio Usage Guide.

## N/A

N/A

## TCPA

More info: https://www.twilio.com/docs/glossary/what-is-telephone-consumer-protection-act-tcpa

The TCPA (Telephone Consumer Protection Act) is a federal statute enacted in 1991 designed to safeguard consumer privacy. This legislation restricts telemarketing communications via voice calls, SMS texts, and fax.

### What is the Telephone Consumer Protection Act (TCPA)?

The TCPA (Telephone Consumer Protection Act) is a federal statute enacted in 1991 designed to safeguard consumer privacy. This legislation restricts telemarketing communications via voice calls, SMS texts, and fax.

The TCPA was signed into law in 1991 as a response to a growing rise in unregulated and harassing telemarketing calls and faxes.

The TCPA restricts telephone solicitations (i.e. telemarketing) and the use of automated phone equipment. The Act limits the use of pre recorded voice messages, automatic dialing, and SMS and fax use. Without explicit customer consent, companies must adhere tostrict solicitation rules(link takes you to an external page), solicitors must honor theNational Do Not Call Registry(link takes you to an external page), and subscribers may sue a company that does not follow the TCPA guidelines.

Consumer consent is an essential defense under the TCPA and should be a primary focus of any business that communicates with consumers directly via voice call or text.

With the passing of the TCPA, Congress delegated do not call rules to the FCC (Federal Communications Commission(link takes you to an external page)), who initially required every company to build and maintain their own do not call database. In 2003 the National Do Not Call Registry was created by the Federal Trade Commission (FTC), implementing regulations that prohibit commercial telemarketers from making unwanted, unsolicited sales calls.

Over time, the TCPA was amended and more clearly defined. In July 2015, the FCC officially released the TCPA Declaratory Ruling and Order which addressed petitions and requests for clarity on how the TCPA is to be interpreted by the FCC. This order defined a handful of terms found in the TCPA and further clarified restrictions on telemarketers and consumer rights. Some key components on this ruling include:

You should consult with your legal counsel to ensure that your opt out process is compliant with applicable law and consistent with industry standards.

If you're a Twilio customer using SMS, voice or Fax to reach your customers, please familiarize yourself with Twilio's defaultsupport for opt out keywords(link takes you to an external page). You may also want to check out ourMobile Commons Optout Classifier(link takes you to an external page)andProve TCPA Compliance(link takes you to an external page)Add ons.

## Toll Fraud

More info: https://www.twilio.com/docs/glossary/what-is-toll-fraud

Toll fraud, also known as International Revenue Sharing Fraud (IRSF), happens when an application is exploited to generate a high volume of voice calls to the fraudster’s own international premium rate numbers. The victim of the toll fraud bears the entire financial responsibility for each minute of the call.

### What is Toll Fraud?

Toll fraud, also known as International Revenue Sharing Fraud (IRSF), happens when an application is exploited to generate a high volume of voice calls to the fraudster's own international premium rate numbers. The victim of the toll fraud bears the entire financial responsibility for each minute of the call.

Toll fraud commonly exploits applications with phone verification or two factor authentication flows. This type of fraud continues to grow and has led to billions of dollars of annual revenue loss globally.

Toll fraud is carried out by well coordinated teams of criminals distributed around the globe. It exists across 200+ countries, all phone number types, and wide price ranges. The creation and reselling of number ranges is very dynamic every week there are more than 10,000 new IRSF ranges being advertised.

Here are the steps fraudsters take to complete a toll fraud attack:

There is no single solution to completely prevent toll fraud, so combating it requires a multi pronged approach.

## TOTP

More info: https://www.twilio.com/docs/glossary/totp

TOTP stands for Time based One Time Passwords and is a common form of two factor authentication (2FA). Unique numeric passwords are generated with a standardized algorithm that uses the current time as an input. The time based passwords are available offline and provide user friendly, increased account security when used as a second factor.

### What is a Time based One time Password (TOTP)?

TOTP stands forTime based One Time Passwordsand is a common form of two factor authentication (2FA). Unique numeric passwords are generated with a standardizedalgorithm(link takes you to an external page)that uses the current time as an input. The time based passwords are available offline and provide user friendly, increased account security when used as a second factor.

Example TOTP accounts in an authenticator app

TOTP is also known as app based authentication, software tokens, or soft tokens. Authentication apps likeAuthy(link takes you to an external page)and Google Authenticator support the TOTP standard.

Twilio'sVerify APIoffers support for TOTP authentication in addition toSMS, voice(link takes you to an external page),email, andpushchannels. Get started with ourTOTP sample application(link takes you to an external page)orstep by step QuickStart.

2FAadds an extra layer of account protection by requiring two types of authentication. This can be something a user knows, like a password, and something the user has, like a phone. One time passwords, including TOTP, are a common possession or "something you have" factor and help increase the security of your users accounts.

Arecent study(link takes you to an external page)about the usability of 2FA methods found that TOTP had the highest usability score of the various second factors tested. This tells us that TOTP is not only a viable method for authentication, but will be preferred by many users.

system usability scale (SUS) scores show TOTP is most usable

The TOTP algorithm follows an open standard documented inRFC 6238(link takes you to an external page). The inputs include a shared secret key and the system time. The diagram below shows how the two parties can separately calculate the passcode without internet connectivity.

The algorithm uses a form of symmetric key cryptography: the same key is used by both parties to generate and validate the token.

The inputs to the TOTP algorithm are device time and a stored secret key. Neither the inputs nor the calculation require internet connectivity to generate or verify a token. Therefore a user can access TOTP via an app likeAuthy(link takes you to an external page)while offline.

TOTP's offline support is ideal for users who might need to access their authentication while traveling abroad, on a plane, in a remote area, or otherwise without network connectivity.

While SMS is an ideal solution for2FA adoption(link takes you to an external page)and ease of use, TOTP has several benefits including:

Most customers end up implementing multiple forms of 2FA, so their users can choose the channel that works best for them. Other channels Twilio Verify supports includepush, voice, andemail. Thisblog post(link takes you to an external page)takes a more detailed look at the security concerns of SMS 2FA.

HOTP stands forHMAC(link takes you to an external page) based One Time Password and is the original standard that TOTP was based on. Both methods use a secret key as one of the inputs, but while TOTP uses the systemtimefor the other input, HOTP uses acounter, which increments with each new validation. With HOTP, both parties increment the counter and use that to compute the one time password.

The HOTP standard is documented inRFC 4226(link takes you to an external page).

While HOTP is still used, consumer authenticator apps like Authy and Google Authenticator implement the TOTP standard.

Here's the code to create a TOTP factor. Follow theTOTP Quickstartfor more details about how to generate a QR code and validate tokens.

Here is an example of a TOTP generated with the Verify API inside the Authy App. Tokens expire in 30 seconds by default, but you can change the expiration period when youcreate a Factor.

Download the Authy app for iOS or Android(link takes you to an external page)and learn more about how to add authenticator app support on your favorite websites withAuthy's 2FA guides(link takes you to an external page).

TOTP support through a consumer authenticator app is widely available, PII less, and offers increased security. TOTP is a great solution for both providing a good user experience and strong authentication. Many companies now offer TOTP support as a step up from SMS based 2FA.

Check out these resources for more information on Twilio's APIs for multichannel user verification:

## Transport Layer Security (TLS)

More info: https://www.twilio.com/docs/glossary/what-is-transport-layer-security-tls

TLS, or Transport Layer Security, is a widely used cryptographic protocol that ensures data security during communication over a network. The TLS protocol, like its predecessor SSL (Secure Sockets Layer), is primarily designed to enable reliable, authenticated, and secure communication between two or more computer applications. In modern browsers, connections secured with TLS are usually indicated by a lock icon next to the URL.

### What is Transport Layer Security (TLS)?

TLS, orTransport Layer Security, is a widely used cryptographic protocol that ensures data security during communication over a network. The TLS protocol, like its predecessor SSL (Secure Sockets Layer), is primarily designed to enable reliable, authenticated, and secure communication between two or more computer applications. In modern browsers, connections secured with TLS are usually indicated by a lock icon next to the URL.

We won't go too deep here (there are whole books written on the subject!) but at its most basic, cryptography is the study and practice of techniques for secret communication between two or more parties. Everything from kids' invisible ink to the Enigma encryption machine used during WWII are parts of cryptography.

When it comes to the internet, usually cryptography is applied to creating sets of rules (protocols) that allow secure, encrypted communication over a network.

Sending data over a network is like sending a postcard. Once you've mailed the postcard, there are a lot of people who have the opportunity to read what you've written...postal workers, mail thieves, anyone who gets their hands on the card. If you want to send something private on a postcard, you need to obscure the message. The same is true of data sent over the internet: it is possible for unintended audiences to peek at that data while it is in transport.

In the early days of the internet, there were fewer people with the access, motivation, or the knowledge to snoop on this data in transit. But as the internet became a larger part of daily life, internet users needed a way to ensure data security over a network.

In the early 1990s, Netscape developed the first transport layer protocol designed for network security — Secure Sockets Layer (SSL). The internet widely adopted this protocol and it saw numerous iterations over the next few years, until it was completely overhauled to become TLS in 2006. Today, TLS is a key requirement of most network connections and SSL has been completely deprecated.

There are two primary types of cryptography we'll talk about here: "asymmetric" and "symmetric". Asymmetric cryptography (or "public key cryptography(link takes you to an external page)") is facilitated by pairs of keys, one public and one private. The message recipient shares their public key with a message sender. The message sender uses the recipient's public key to encrypt their message. When the recipient gets the message, they use their private key to decrypt the message. Other than verifying that the public key belongs to the legitimate recipient (see Certificate Authorities, below), no secure key exchange is required. However, generating and using the public key is slow because the key needs to be very large to support this scheme.

Symmetric cryptography only requires one shared key that is used to encrypt and decrypt messages back and forth. This scheme is faster because the key can be smaller, but presents a kind of chicken and egg problem. How do you securely share a secret key to enable encrypted communication?

TLS uses a combination of these schemes to solve the key exchange problem and facilitate the private connections needed for sending sensitive data.

Certificate Authorities(link takes you to an external page)(CAs) are an important part of the TLS protocol. They are entities (likeLetsEncrypt(link takes you to an external page)) that issue digital certificates which validate that a public key is owned by a legitimate organization. CAs act as trusted, independent third parties giving clients assurance that they are communicating with the right system, and that all parties involved will comply with the rest of the TLS protocol.

TheTLS handshake(link takes you to an external page)is the start of secure communication over a network. It is a series of steps in which the client and server negotiate the parameters of their secure connection and generate and exchange their symmetric encryption keys. Here is a simplified overview of the steps involved in a TLS handshake:

As of June 2019, the Twilio REST API only supports connections that use TLS v1.2. It is important to stay up to date on security updates for the Twilio REST API to be sure that your applications built with the Twilio API are secure and trustworthy.

Find more information about how to monitor updates to the Twilio REST API security settings here.(link takes you to an external page)

Find tips on how to upgrade your environment to support the latest TLS requirements here.(link takes you to an external page)

## Twilio Markup Language (TwiML)

More info: https://www.twilio.com/docs/glossary/what-is-twilio-markup-language-twiml

TwiML, or the Twilio Markup Language, is an XML based language which instructs Twilio on how to handle various events such as incoming and outgoing calls, SMS messages and MMS messages.  When building a Twilio application you will use TwiML when communicating your desired actions to Twilio.

### What is the Twilio Markup Language (TwiML)?

TwiML, or the Twilio Markup Language, is an XML based language that instructs Twilio on how to handle various events such as incoming and outgoing calls, SMS messages, and MMS messages. When building a Twilio application you will use TwiML when communicating your desired actions to Twilio.

TwiMLis the Twilio Markup Language, which is just to say that it's anXML(link takes you to an external page)document with special tags defined by Twilio to help you build your SMS and voice applications. TwiML is easier shown than explained. Here's some TwiML you might use to respond to an incoming phone call:

And here's some TwiML you might use to respond to an incoming SMS message:

Every TwiML document will have the root<Response> element and within that can contain one or moreverbs. Verbs are actions you'd like Twilio to take, such as<Say>a greeting to a caller, or send an SMS<Message>in reply to an incoming message. For a full reference on everything you can do with TwiML, refer to ourTwiML API Reference.

TwiML is composed of a number ofverbsandnounswhich act as instructions for Twilio. Those verbs include:

Nounsgenerally are acted on by averbor will modify the verb's behavior. For example, theMessageverb will send a text message but the text inside the tags andBody, andMediaare nouns which change exactly what Twilio will do. Depending on how you use the nouns, theMessagemight be a SMS, multiple SMSes, or an MMS.

Click on individualverbsto see thenounsavailable.

TwiML is the primary language used to control actions on Twilio and is especially powerful when combined with our products such asProgrammable MessagingandProgrammable Voice.

Your application will return TwiML in response to various events. Some of those events might be an incoming phone call or SMS, or perhaps a change in delivery status for a SMS your application sent.

Yes! We encourage you to look atTwiML Bins(link takes you to an external page), Twilio's no code, serverless solution for running TwiML. It's the most frictionless way to start using Twilio: don't worry about spinning up a new VPS or exposing a route to your development machine. TwiML Bins allow you to quickly prototype your app or even run it in production directly from our servers.

For those of you who are writing code,the Twilio helper librarieswill automatically create valid TwiML for you. If you don't use one of our primary languages, don't sweat it! We've included curl commands and raw TwiML with most of our examples so you can call the API or return TwiML from your language of choice.

We know you're going to like TwiML as much as we do. Sign up for a Twilio account andtry TwiML bins(link takes you to an external page)or hop rightinto the SDKs.

We can't wait to see what you build.

## Two Factor Authentication (2FA)

More info: https://www.twilio.com/docs/glossary/what-is-two-factor-authentication-2fa

Two factor authentication (commonly abbreviated 2FA) adds an extra layer of security to your user’s account login by requiring two types of authentication. This is usually something your user knows and something they have.

### What is Two Factor Authentication?

Two factor authentication (commonly abbreviated2FA) adds an extra layer of security to your user's account login by requiring two types of authentication. This is usuallysomething your user knowsandsomething they have.

Looking for how to add 2FA to your personal accounts? Check outAuthy's 2FA guides(link takes you to an external page)for adding 2FA to sites like Gmail, Fortnite, Gemini, and many more.

There are three types of factors:

2FA means using any two of these factors. In web authentication, this is commonly something you know and something you have.

Also known as multi factor authentication (MFA), two factor authentication is a common authentication best practice to increase account security normally provided by passwords. Passwords became a de facto standard for online authentication because unlike a possession factor, you can'tlosea password.

According to the websitehaveibeenpwned.com(link takes you to an external page), guessable passwords like 123456 are still incredibly common. That password, 123456, has been seen in data breaches over24 million times. To make matters worse, a2019 Google study(link takes you to an external page)shows that 64% of people admit to reusing passwords across multiple sites. This is a problem because even if someone has a complex password, if they're reusing it for many sites, a data breach atMySpace(link takes you to an external page)orAdobe(link takes you to an external page)could lead to the user's account getting breached onyour company'ssite through a process known as credential stuffing.

Things like password reuse, poorly encrypted passwords, social engineering, and leaked databases make even a secure password vulnerable. By requiring users to add a second factor to their authentication flow, an account with a compromised password will still be protected. Even targeted attacks are more difficult because the attacker would be required to access to different forms of authentication. AGoogle study(link takes you to an external page)showed that SMS based authentication "can block up to 100% of automated bots, 99% of bulk phishing attacks, and 66% of targeted attacks".

Mobile phone 2FA has become the industry standard, as most people carry their mobile phones at all times. It's a user friendly flow, and dynamically generated passcodes are safe to use and users can receive special tokens through SMS or a dedicated authenticator app like Twilio'sAuthy(link takes you to an external page).

SMS authentication has long been a popular choice for securing consumer accounts. It's a familiar channel to deploy and SMS 2FA usage has evengrown9%(link takes you to an external page)in the last two years. While the SMS channel has legitimate security concerns, businesses should consider their threat model and offer a spectrum of 2FA options. Offering more secure channels like authenticator apps and push authentication is especially important when you're protecting high value targets like a bank account or email. For more details, check out thisblog post on 5 reasons SMS 2FA isn't going away(link takes you to an external page).

Offering 2FA isn't enough: your users also have to turn it on. Check out thisblog post with tips for incentivizing 2FA(link takes you to an external page)including real world examples from banking and gaming companies.

When you use your credit card and are prompted for your billing zip code, that's 2FA in action.Knowledge factors(link takes you to an external page)like your zip code may also be passwords or a personal identification number (PIN).Possession factors(link takes you to an external page)like your credit card include (but are not limited to) a physical key, fob, and personal cell phones. Two factor authentication for web applications similarly requires something your user knows (their password) and something they have (their personal mobile phone).

Using two knowledge factors like a password and a PIN is two step authentication. Using two different factors like a password and a one time passcode sent to a mobile phone via SMS is two factor authentication.

Most people add a possession authentication factor in addition to an existing knowledge channel. When a user signs up or logs in to your application 1) a numeric code is sent to their mobile device either via SMS, calls, email, 2) with a push notification or 3) through an authenticator app.

Each channel has different tradeoffs:

Only after the user enters the correct numeric code in your application's login flow are they authenticated.

There are a wide variety of ways to add two factor authentication to your application. By using theTwilio Verify API, implementation is simplified and can boil down to just a few lines of code.

Ready to add 2FA to your application with Twilio? Here are some resources to get you started:

We can't wait to see what you build!

## N/A

N/A

## UCS 2

More info: https://www.twilio.com/docs/glossary/what-is-ucs-2-character-encoding

UCS 2 is a character encoding standard in which characters are represented by a fixed length 16 bits (2 bytes).  It is used as a fallback on many GSM networks when a message cannot be encoded using GSM 7 or when a language requires more than 128 characters to be rendered.

### What is UCS 2 Character Encoding?

UCS 2 is a character encoding standard in which characters are represented by a fixed length 16 bits (2 bytes). It is used as a fallback on many GSM networks when a message cannot be encoded usingGSM 7or when a language requires more than 128 characters to be rendered.

UCS 2 and the other UCS standards are defined by the International Organization for Standardization (ISO) inISO 10646(link takes you to an external page). UCS 2 represents a possible maximum of 65,536 characters, or inhexadecimals(link takes you to an external page)from 0000h FFFFh (2 bytes). The characters in UCS 2are synchronized(link takes you to an external page)to theBasic Multilingual Plane(link takes you to an external page)in Unicode.

Characteris an overloaded term, so it is actually more correct to refer tocode points(link takes you to an external page). Code points allow abstraction from thecharacterterm, and are the atomic unit of storage of information in an encoding.

UCS 2 is a fixed width encoding; each encoded code point will take exactly 2 bytes. As an SMS message is transmitted in 140 octets, a message which is encoded in UCS 2 has a maximum of 70 characters (really, code points): (140\*8) / (2\*8) = 70.

When sending SMS messages with Twilio, we'll automatically send messages in the most compact encoding possible. If you includeanynonGSM 7characters in your message body, we will automatically fall back to UCS 2 encoding (which will limit message bodies to 70 characters each). Additionally, Twilio prepends aUser Data Header(link takes you to an external page)of 6 Bytes (this instructs the receiving device on how to assemble messages), leaving153 GSM 7 charactersor67 UCS 2 charactersfor your message.

Note that this may cause more messages to be sent than you expect a body with 152 GSM 7 compatible characters and a single Unicode character will be split into 3 messages when encoded in UCS 2. This will incur charges for 3 outgoing messages against your account.

This page(link takes you to an external page)contains an interactive tool which can check if encoding your message in GSM 7 is possible, or if UCS 2 is needed.

Unfortunately, GSM 7 is not a supported character encoding in many text editors. Even setting encoding to ASCII (or US\_ASCII) will not guarantee that text you write will be limited to GSM 7. You can use the above linked tool to quickly check the number of segments that is, total messages some text will be divided into.

If you are writing in an editor with Unicode support you'll need to be particularly careful. Text editors designed for writing might automatically add angled smart quotes, non standard spaces, or punctuation which looks similar to GSM 7 but is a different Unicode character. We've discussed a few of these issueson our blog(link takes you to an external page).

In some languages, more than 128 symbols are commonly used, so a larger universe of potential characters is needed. UCS 2 has been implemented in many GSM networks and on many mobile devices, and is considered the de facto standard fallback.

By the Unicode standard, UCS 2 is an obsolete encoding because it wasn't designed to allow characters in the so calledsupplementary or 'astral' planes in Unicode(link takes you to an external page). Plane 0, the Basic Multilingual Plane, contains character encodings for what are believed to be the most commonly used characters in modern languages. UCS 2 is limited to FFFFhcode points(link takes you to an external page), or 65,536 possible characters.

UTF 16 is the successor to UCS 2. And has the ability to address Base and 16 Supplementary planes, for a total maximum number of characters of 10FFFFh, or 1,114,112 code points.

Sign up for afree Twilio trial account today(link takes you to an external page) you'll have enough credit to explore the two major encodings we use, and a lot more.

## Unicode

More info: https://www.twilio.com/docs/glossary/what-is-unicode

Unicode is an international character encoding standard that provides a unique number for every character across languages and scripts, making almost all characters accessible across platforms, programs, and devices.

### What is Unicode?

Unicode is an international character encoding standard that provides a unique number for every character across languages and scripts, making almost all characters accessible across platforms, programs, and devices.

Before Unicode, there were hundreds of different character encodings for assigning letters and other characters to a number that could be read by a computer.

The limitations of this system meant that it couldn't encode enough characters to cover all of the world's languages, and could not, in fact, hold all letters, punctuation, and technical systems in common use. Conflicts between character encodings also meant that two encodings could use the same number for two different characters, or even multiple numbers for the same character. Any computer would need to support multiple encodings, and this system created a high risk of data corruption when data passed through different machines or between different encodings.

In October 1991, theUnicode Consortium's goal(link takes you to an external page)to "unify the many hundreds of conflicting ways to encode characters, replacing them with a single, universal standard" was realized with the publication of version 1.0 of the Unicode Standard.

Unicode provides a unique number for every character including punctuation marks, mathematical symbols, technical symbols, arrows, and characters making up non Latin alphabets such as Thai, Chinese, or Arabic script. Since its inception, Unicode has been adopted by all modern software providers, allowing the transportation of data through devices, applications, and platforms without corruption. It is now used in all major operating systems, browsers, search engines, laptops, smartphones, and across the internet.

Unicode is maintained by theUnicode Consortium(link takes you to an external page), a non profit organization that exists to develop and promote the Unicode Standard. Changes to the Unicode Standard must be approved by both the consortium as well as the international standardISO/IEC 10646(link takes you to an external page), ensuring that character assignments are kept in sync. The Unicode Standard and ISO/IEC 10646 support three encoding forms:UTF 8,UTF 16, andUTF 32. Each of these encoding forms uses a common repertoire of characters, and allow for encoding as many as a million characters.

"Unicode SMS" refers to SMS messages sent and received containing characters not found in theGSM 7 character set. An SMS allows up to 160 characters from the GSM 7 character set (see more on theSMS Character Limit), which includes all Latin characters A Z, digits 0 9, plus a few special characters. Unicode handles any known character but also takes up more SMS space than GSM's 7 bit binary code. Therefore, Unicode SMS messages are limited to 70 characters, and messages longer than this will be segmented. See more aboutUCS 2 character encoding, used for SMS messages which aren't encoded in GSM 7.

By default, SMS messages sent with Twilio support Unicode via UCS 2 character encoding to accurately represent global languages as they're sent between different geographic locations and across carriers.

Smart Encoding, built into Twilio's Messaging Copilot, can help youavoid using Unicode characters that often go unnoticed(link takes you to an external page)by checking for Unicode characters such as smart quotes or Unicode whitespaces andreplacing them with similar GSM 7 characters.

Whether you're trying to avoid unintentional Unicode characters sneaking into your carefully crafted SMS messages or sending messages written inKanji(link takes you to an external page), Twilio SMS has you covered.

## UTF 8

More info: https://www.twilio.com/docs/glossary/what-utf-8

UTF 8 is a variable width character encoding standard that uses between one and four eight bit bytes to represent all valid Unicode code points.

### What is UTF 8?

UTF 8 is a variable width character encoding standard that uses between one and four eight bit bytes to represent all valid Unicode code points.

UTF 8 (Unicode Transformation 8 bit) is an encoding defined by the International Organization for Standardization (ISO) inISO 10646(link takes you to an external page). It can represent up to 2,097,152 code points (2^21), more than enough to cover the current 1,112,064Unicodecode points.

Instead ofcharacters, it is actually more correct to refer tocode points(link takes you to an external page)when discussing encoding systems. Code points allow abstraction from the termcharacterand are the atomic unit of storage of information in an encoding. Most code points represent a single character, but some represent information such as formatting.

UTF 8 is a "variable width" encoding standard. This means that it encodes each code point with a different number of bytes, between one and four. As a space saving measure, commonly used code points are represented with fewer bytes than infrequently appearing code points.

UTF 8 uses one byte to represent code points from 0 127. These first 128 Unicode code points correspond one to one withASCII(link takes you to an external page)character mappings, so ASCII characters are also valid UTF 8 characters.

The first UTF 8 byte signals how many bytes will follow it. Then the code point bits are "distributed" over the following bytes. This is best explained with an example:

Unicode assigns the French letter é to the code point U+00E9. This is11101001in binary; it is not part of the ASCII character set. UTF 8 represents this eight bit number using two bytes.

The leading bits of both bytes contain meta data. The first byte begins with110. The 1s indicate that this is a two byte sequence, and the0indicates that the code point bits will follow. The second byte begins with 10 to signal that it is a continuation in a UTF 8 sequence.

This leaves 11 "slots" for the code point bits. Remember that the U+00E9 code point only requires eight bits. UTF 8 pads the leading bits with three0s to fully "fill out" the remaining spaces.

The resulting UTF 8 representation of é (U+00E9) is1100001110101001.

UTF 8 is the dominant encoding of the World Wide Web, so your code is likely encoded with this standard.

For SMS messages, Twilio uses the most compact encoding method available. Twilio defaults toGSM 7and falls back toUCS 2if your message contains any non GSM 7 characters. The use of GSM 7 versus UCS 2 encoding standards can affectthe number of segments it takes to send your message.

Twilio Copilot'sSmart Encodingautomatically detects Unicode characters such as a smart quote (〞) or long dash (—) and replaces them with a similar character. This keeps your number of message segments, and pricing, as low as possible.

No need to worry if your UTF 8 encoded string "Ooh làlà" will arrive over SMS Twilio's Programmable SMS has you covered.

## N/A

N/A

## Virtual Phone Number

More info: https://www.twilio.com/docs/glossary/what-virtual-phone-number

A virtual phone number is a standard telephone number that is not locked down to a specific phone. A virtual number can route a voice call or text message to any phone or workflow. With virtual numbers powered by an API, complex software workflows can be built that are triggered by calls and texts.

### What is a Virtual Phone Number?

Avirtual phone numberis a standardtelephone number(link takes you to an external page)that is not locked down to a specific phone. A virtual number can route a voice call or text message to any phone or workflow. With virtual numbers powered by an API, complex software workflows can be built that are triggered by calls and texts.

With Twilio, you can get instant access tolocal, national, mobile, and toll free(link takes you to an external page)virtual numbers in 50+ countries. You can programmaticallysearch for available phone numbers via APIandpurchase numbers via the same API. Or,log in to find and purchase phone numbers(link takes you to an external page)via the Twilio Console.

Below are just a few of the ways virtual numbers can be used.

Using a local number allows foreign business to have a local presence in multiple countries.

Due to the high cost of international long distance, customers arefarmore likely to dial a local number. Similarly, individuals with friends and family in other countries can use aTwimlBin(link takes you to an external page)to setup their virtual number with call forwarding. This allows their loved ones to call them on a local number.

Businesses use virtual phone numbers to track the effectiveness and conversion rates of marketing campaigns. By putting a unique phone number on each campaign (e.g. different search engine ads, billboards, or magazine ads) marketers can track which ad received the most calls.

Marketplaces and on demand services can use virtual phone numbers to anonymize interactions. For example,Lyft allows riders and drivers to call each other without revealing their personal phone numbers(link takes you to an external page).

Businesses can give each employee their own phone number and route the call into their extension using Direct Inward Dialing (DID). DID allows callers to skip a queue or phone tree and ring directly through to the phone of the specific person they want to get in touch with.

## Virtual SMS

More info: https://www.twilio.com/docs/glossary/what-is-virtual-sms

Virtual SMS enables you to send and receive SMS text messages over the internet without having to use a physical phone. This is especially useful when you want to use software to communicate with telephone networks that would be impossible on a physical phone, e.g. Uber notifying a customer that their car is outside or to have local phone numbers in different countries.

### What is Virtual SMS?

Virtual SMS enables you to send and receive SMS text messages over the internet without having to use a physical phone. This is especially useful when you want to use software to communicate with telephone networks that would be impossible on a physical phone, e.g. Uber notifying a customer that their car is outside or to have local phone numbers in different countries.

Virtual SMS enables you to use localvirtual phone numbers(link takes you to an external page)to send messages, enabling recipients to reply to you without incurring international charges.

There are two main ways to send Virtual SMS text messages:

Sending SMS text messages via software is the new normal for companies to get hold of their customers. SMS has 5x the open rate of email and much greater reach than apps so Virtual SMS is used for things like:

## Voice API

More info: https://www.twilio.com/docs/glossary/what-is-voice-api

A PSTN) and applications connected to the internet. By using a voice API, software developers can program voice calling into their applications without specialized telecommunications knowledge and hardware.

### What is a Voice API?

Avoice API(link takes you to an external page)is a tool for software developers to make and receive phone calls programmatically. Behind the scenes, a voice API bridges the Public Switched Telephone Network (PSTN(link takes you to an external page)) and applications connected to the internet. By using a voice API, software developers can program voice calling into their applications without specialized telecommunications knowledge and hardware.

Using a voice API enables developers to build call logic that extends to users on any device, over any network, anywhere in the world. It also allows developers to add full VoIP functionality to apps to make and receive calls over the internet alone, without interfacing with the PSTN.

The Twilio Programmable Voice API gives developers programmatic control over their calls, with APIs built for a wide variety of uses from basic phone to phone calling, app to phone calling, Interactive Voice Response (IVR), conference calling, SIP interfacing, call recording, transcription,call tracking(link takes you to an external page), and more.

Read more about the TwilioProgrammable Voice API(link takes you to an external page)here.

## Voice Proxy

More info: https://www.twilio.com/docs/glossary/what-is-voice-proxy

Voice Proxy is the technique used to protect users’ private information by providing an intermediary number so that neither sender nor receiver can see the other’s true phone number during voice calls or SMS exchanges.

### Voice Proxy

Voice Proxy is the technique used to protect users' private information by providing an intermediary number so that neither sender nor receiver can see the other's true phone number during voice calls or SMS exchanges.

Voice Proxy is also known asMasked Calling. It is the technique used to protect users' private information by providing an intermediary number so that neither sender nor receiver can see the other's true phone number during voice calls or SMS exchanges.

Voice Proxy is especially useful for scenarios where you want to track or control the transaction between two users, for example in a marketplace. Examples of peer to peer marketplaces that use Twilio as a Voice Proxy are Uber, Lyft, Airbnb, Postmates, and Instacart.

There are two key ways to build a Voice Proxy system:

More resources

## Voice Trace

More info: https://www.twilio.com/docs/glossary/what-voice-trace

Voice trace is a voice quality troubleshooting feature that captures the media stream for calls and stores them for Twilio Support to use in their investigations.

### What is Voice Trace?

Voice trace is a voice quality troubleshooting feature that captures the media stream for calls and stores them for Twilio Support to use in their investigations.

In order to effectively troubleshoot voice quality issues like missing/duplicated DTMF digits or in stream audio issues like noise/echo Twilio Support may need to reconstruct the media stream. Voice trace allows our support team to perform this deep analysis by saving every RTP packet of a call. Capturing the RTP gives Twilio Support the ability to listen to the call audio itself and view DTMF key presses captured during the call.

Some limitations to be aware of:

Once enabled, voice trace will begin capturing RTP on all calls for an account until it is disabled. If you prefer voice trace automatically expire after a certain number of days, contact Twilio Support who can enable voice trace with a scheduled expiration.

Depending on your use case, your reasons for enabling voice trace, and the laws of the jurisdiction(s) you operate in, you may need to obtain consent from the parties to the call before requesting Twilio to enable voice trace. Please be sure you have all necessary consents from relevant parties before enabling voice trace.

Voice trace can be enabled in theVoice Settings(link takes you to an external page)section of Console or using theVoice Insights Settings API.

## VoIP (Voice Over IP)

More info: https://www.twilio.com/docs/glossary/what-is-voip

Voice Over Internet Protocol (VoIP) is a category of hardware and software that enables voice calls to be made and received over the internet.

### What is VoIP (Voice Over IP)?

Voice Over Internet Protocol (VoIP) is a category of hardware and software that enables voice calls to be made and received over the internet.

VoIP allows users to send and receive voice calls over the internet, without the need for traditional telephones or circuit transmission. Instead, VoIP sends voice data as data packets that are delivered over a packet switched network with media delivery protocols that allow callers to speak and listen as if they were talking over a PSTN connection.

VoIP is particularly popular in contact centers for its cheaper price point and tight integration capabilities with CRM systems. Although special VoIP enabled desktop "hard" phones have been used in contact centers for many years, most contact centers now use a headset equipped with a microphone to connect the agent and caller. This is known as a "soft" phone.

VoIP also hasfunctionality advantages(link takes you to an external page)over conventional telephony. Incoming calls can be routed to a VoIP phone, no matter where in the network it is physically plugged in, allowing "phones" to be anywhere with a stable internet connection. Calls can be routed in concert with any number of digital protocols, and contact center agents can work remotely from anywhere using a VoIP phone. This makes call center scalability a much more practical reality than with conventional telephony alone.

The TwilioProgrammable Voice SDKs(link takes you to an external page)give developers the ability to build a VoIP system that connects to any endpoint they choose, whether it is a desktop browser or a mobile app. Developers can also useVoice Insights(link takes you to an external page)to diagnose network and device problems and respond to them during a live call.

## N/A

N/A

## Webhook

More info: https://www.twilio.com/docs/glossary/what-is-a-webhook

HTTP callbacks. They are triggered by some event in a web application and can facilitate integrating different applications or third party APIs, like Twilio.

### What is a Webhook?

Webhooks(link takes you to an external page)are user definedHTTP(link takes you to an external page)callbacks. They are triggered by some event in a web application and can facilitate integrating different applications or third party APIs, like Twilio.

Want to learn more about how Twilio uses webhooks?Check out theWebhooks Hub in our developer documentation!

Twilio uses webhooks to let your application know when events happen, such as receiving an SMS message or getting an incoming phone call. When the event occurs, Twilio makes an HTTP request (usually aPOSTor aGET(link takes you to an external page)) to the URL you configured for the webhook. Twilio's request will include details of the event such as the incoming phone number or the body of an incoming message. Many other modern web services like GitHub and Slack also make use of webhooks to communicate events.

To handle a webhook you only need to build a small web application that can accept the HTTP requests. If you already have a web application set up, handling a webhook usually involves adding a new URL to your application.

If you don't already have a web application, almost all server side programming languages offer frameworks to help you build one. Examples include:

Webhooks can also be handled by serverless frameworks likeAWS Lambda(link takes you to an external page)andAzure Functions(link takes you to an external page). Really anything that can receive and reply to an HTTP request will do. Got aRaspberry Pi(link takes you to an external page)lying around?

Whichever framework and language you choose, webhooks function the same for every Twilio application. An HTTP request will be made to aURI(link takes you to an external page)that you provide to Twilio. Your application performs whatever logic you feel necessary read/write from a database, integrate with another API, or perform some computation then replies to Twilio with a TwiML response with the instructions you want Twilio to perform.

Check out these tutorials that show you how to work with webhooks on a variety of platforms:

## WebRTC

More info: https://www.twilio.com/docs/glossary/what-is-webrtc

Web Real Time Communication (WebRTC) is a collection of communications protocols and APIs originally developed by Google that enable real time voice and video communication over peer to peer connections.

### What is WebRTC?

Web Real Time Communication (WebRTC) is a collection of communications protocols and APIs originally developed by Google that enable real time voice and video communication over peer to peer connections.

WebRTC is a set of protocols and APIs that allow web browsers to request real time information from the browsers of other users, enabling real time peer to peer and group communication including voice, video, chat, file transfer, and screen sharing.

WebRTC allows developers to embed communications directly into web browser based enterprise tools, such as CRM software or social apps. This gives users the power to communicate from within their primary web interface without the need for specialized hardware or complicated plug ins. WebRTC also allows users to send voice only calls to a web browser, video conference within a web browser, or even make calls to mobile client or SIP endpoints.

The TwilioProgrammable Video APIs(link takes you to an external page)give developers the ability to get up and running on WebRTC quickly, without worrying about scaling out servers to handle their traffic. Twilio also provides STUN/TURN infrastructure for WebRTC developers. Learn more aboutWebRTC development with Twilio(link takes you to an external page).

## WebSockets

More info: https://www.twilio.com/docs/glossary/what-are-websockets

A WebSocket is a persistent bi directional communication channel between a client (e.g. a browser) and a backend service. In contrast with HTTP request/response connections, websockets can transport any number of protocols and provide server to client message delivery without polling.

### What are WebSockets?

AWebSocketis a persistent bi directional communication channel between a client (e.g. a browser) and a backend service. In contrast withHTTP request/response connections(link takes you to an external page), websockets can transport any number of protocols and provide server to client message delivery without polling.

WebSockets are exciting for developers because they allow forbidirectionalreal time communication between servers and clients.

WebSockets establishTCP style connections(link takes you to an external page)in a browser compatible fashion using HTTP during initial setup. Messages over websockets can be provided in any protocol, freeing the application from the sometimes unnecessary overhead of HTTP requests and responses (including headers, cookies, and other artifacts). But most critical is the ability to deliver downstream (server to client) messages to connected clients. In the browser, for instance, the same thing was once only possible by polling a server resource, which is a comparatively racy, high latency, and bandwidth intensive affair.

WebSockets are available on many platforms, including the most common browsers and mobile devices. They're often applied to solve problems of millisecond accurate state synchronization andpublish subscribe messaging(link takes you to an external page), both of which leverage Websockets' provision for downstream pushes. A challenge of operating a WebSocket based system is the maintenance of a stateful gateway on the backend. A WebSocket is erected by making a common HTTP request to that server with anUpgradeheader, which the server (after authenticating and authorizing the client) should confirm in its response. After this, the connection remains established between that physical client server pair; if at some point the service needs to be redeployed or the load redistributed, its WebSocket connections needs to be re established.

At Twilio, we use WebSockets to connect our SDKs to our backend in several of our products:

## Workforce Optimization

More info: https://www.twilio.com/docs/glossary/what-is-workforce-optimization

Workforce Optimization (WFO) is the process of performing quality checks to ensure that all a company staff’s interactions with its customers are performed to the same standard

### Workforce Optimization

Workforce Optimization (WFO) is the process of performing quality checks to ensure that all a company staff's interactions with its customers are performed to the same standard

To run a contact center well, a manager needs to run it by the numbers. While many contact centers collect data about their operations, the most successful ones use that data to keep up with customer expectations and make necessary improvements. When you continuallymeasure the data coming out of your contact center(link takes you to an external page), you see what's happening in real time and know where your immediate focus needs to be.

With the right tools, metrics, and informed interpretation, you have the power to accelerate growth by providing a best in class customer experience. This is why products likeFlex Insightsare a critical component to a successful contact center.