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BEACON TECHNOLOGY

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Report By
TT Consultants Pvt. Ltd

Introduction

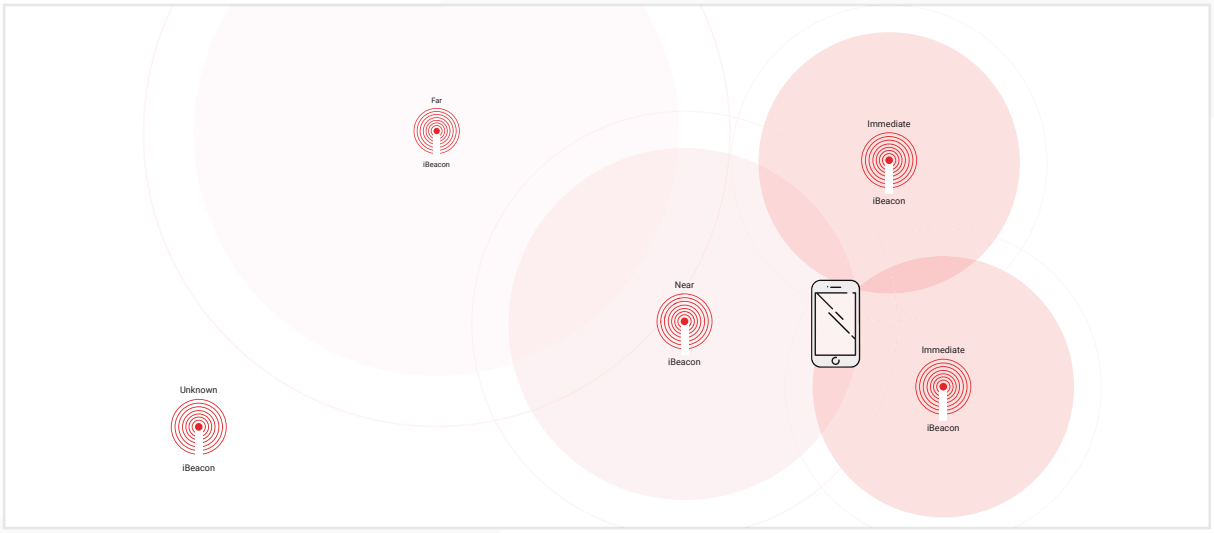
While GPS remains the crucial instrument for outdoor navigation, it requires an unobstructed line of sight to satellites from the receiver. The satellite-based GPS signal loses a significant amount of strength indoors due to signal degradation caused by building materials. As a result, all mobile location-based apps, such as navigation, are inoperable within airports, malls, subways, and other public spaces.

So, GPS has some major flaws as it does not operate efficiently inside the buildings. That is where the technology of Indoor Positioning Systems comes into play.

An Indoor Positioning System (IPS) depends on local anchors (nodes with known positions) instead of satellites to either actively find tags or offer environmental context for devices to perceive. IPS can be local to a user's smartphone (or other portable navigation devices) and produce a location fix invisibly.

There are four different types of positioning approaches:

- **Pattern Recognition**
- **Proximity Sensing**
- **Trilateration**
- **Triangulation**



Out of four positioning approaches, proximity sensing is proved to be most effective in indoor environments. The novel form of proximity sensing technology is Beacon Technology.

What are Beacons?

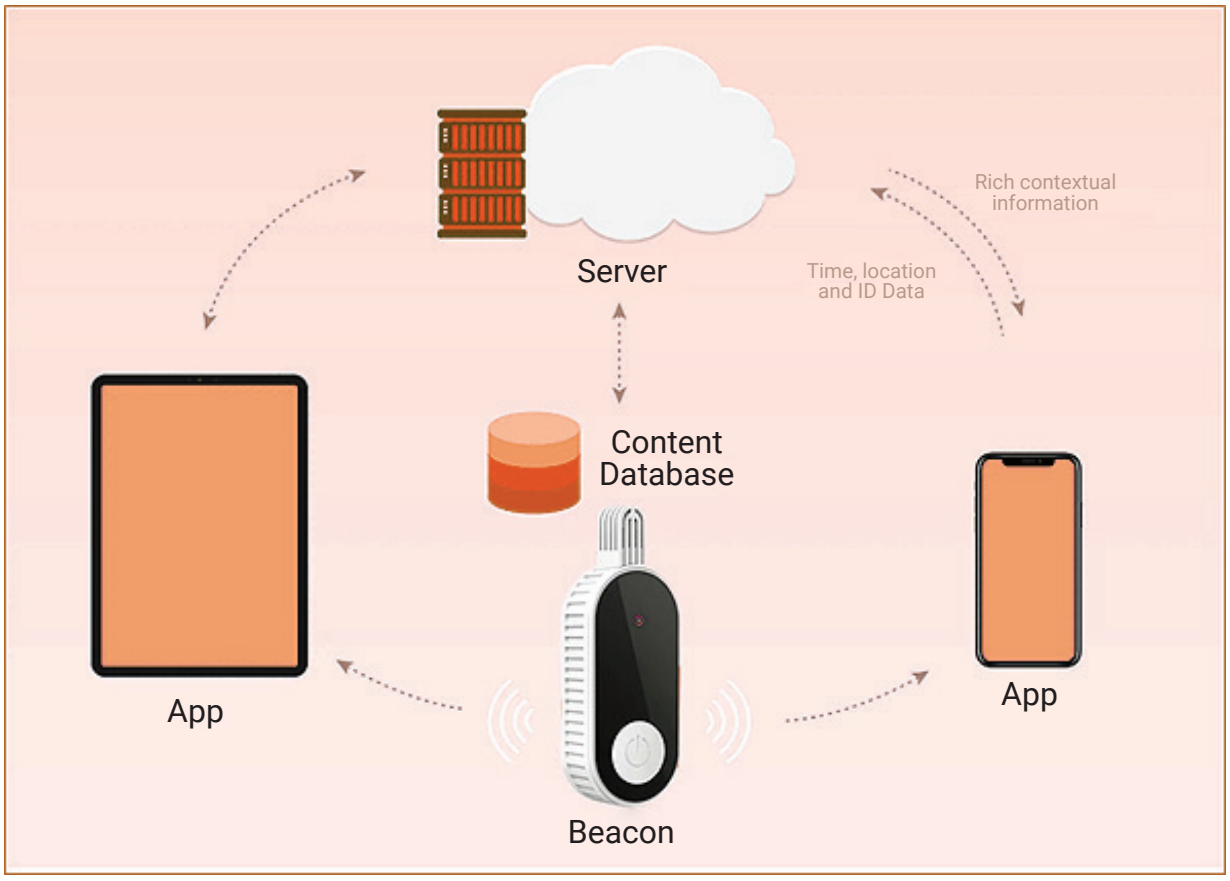
Beacons are one of the most developed technological devices which are often used for proximity marketing, based on location technology. A beacon is a small, wireless Bluetooth transmitter that uses low-energy Bluetooth technology to send signals to other smart devices nearby. The beacon devices are indoor and outdoor navigation systems. They send out a specific signal that can only be seen by a limited number of devices (that are allowed) within its range. They are being used to detect person's presence via wireless transmitters. Instead of emitting visible light, the beacon device broadcasts a radio signal made up of a combination of letters and numbers transmitted at short, regular intervals.

Evolution of Beacon

In 2013, the Beacon technology was first launched with an introduction of iBeacon, released along with iOS 7, Apple laid out its architecture for location-based technologies. Beacons were utilised by Apple to send in-store notifications to customers. In 2015, famous mobile applications such as Facebook or Shazam had also started using beacons.

Later in 2016, Google launched its platform, Eddystone to provide open-source beaconing with cross-platform functionality. Eddystone, which debuted in July 2015, allows for a variety of methods for the basic beacon interaction.

How Do Beacons Work?



The technology functions through beacon signals to repeatedly broadcast a short radio signal at a set rate. Bluetooth beacon technology uses forty radio channels running at 2.4 GHz. Beacon-based identifiers are unique ID numbers sent through low-energy Bluetooth technology to wireless devices. The beacon broadcasts its ID, which is picked up by a customer's smartphone present in the range and as an app installed allows the smartphone to interact with the beacon. When the smartphone receives the ID number, it transmits the ID to a Cloud server. Once the beacon is connected to the smartphone, it will perform the specific work it has been programmed for. The different types of beacons create multiple opportunities as the standard ones suitable for indoor tracking, portable/small beacons that are the size of a credit card, or USB beacons are best suited for asset tracking.

Applications of Beacon Technology

Retailers

Retailers are the first apparent market for beacons, from in-store discounts emailed to user phones through beacons to data collection for individualised loyalty programmes and ad campaigns.

Push Notifications

People might use beacons to give them notifications when they enter a certain area of their home, such as inquiring if they remembered to turn off the basement light.

Payments

This Application includes a retail component, but it also has the potential to be very widespread. When a person departs a given spot, beacons can trigger an automated payment, making payment simple.

Transportation

Beacons will be installed across airports, railway stations, and urban transit hubs to notify passengers of delays, changes, and weather conditions.

Events

Beacons may be used to broadcast information, direct users to related material, and boost purchases during music and athletic events. This past season, a handful of Major League Baseball stadiums experimented with using Apple's iBeacon technology at their venues.

Benefits & Limitations

Benefits

Low-cost and simple to use: Beacons are less expensive than other cutting-edge technology. Beacon technology comes with backend administration tools and a software development kit, making them simple and quick to install, especially with existing applications (SDK).

Customised customer experiences: Beacon technology allows you to send personalized notifications and adverts to your consumers. Based on the information offered by beacon technology, businesses may tailor their offer specifically to each individual client. This will allow for more specific suggestions, resulting in more discussions, sales, and consumer involvement.

Durable devices: Beacons are durable devices that can pick up signals from a wide range of locations, including underground or through thick walls. Exogenous influences are also considered by certain providers.

Limitations

Beacon marketing is confined to the BLE signal: Customers who do not have Bluetooth enabled will be unable to be identified by beacon technology. This restricts the amount of information that firms may acquire from their customers.

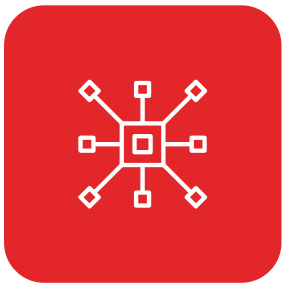
Developing a beacon solution isn't always simple: In the retail and marketing industries, beacon technology has obvious applications. Hotels and organizations that develop smart room solutions can also benefit from beacons. In other circumstances, you'll need a creative or employ a software engineer that specialises in beacon-based or geofencing solutions, which will take time, primarily if your organisation is a medium-sized business or enterprise that requires a highly scalable solution.

For beacon technology to connect with the customer's smartphone, **most beacons rely on installed business apps.** If you go to Tim Horton's and don't have the Tim Horton's app, you might not be able to get beacon signals with personalized offers.

Challenges for Beacons Technology

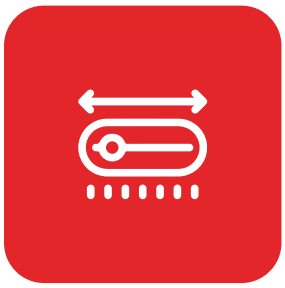
IRRELEVANT ALERTS

While beacons are well-known for their proximity marketing capabilities, an excessive number of irrelevant push notifications, or an avalanche of messages, might cause users to abandon an app or delete it. According to Market research, marketers risk a 313 percent loss in app usage for every additional push message given per shop visit.



DIFFICULTIES IN DEPLOYING BEACONS

Before moving forward with beacon deployment, companies must decide on a variety of issues, ranging from how many beacons should be installed (and where) to how to optimize the alignment of numerous beacons to avoid interference. Having to consider so many variables may be a difficult challenge for marketers.



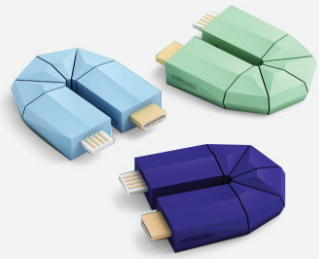
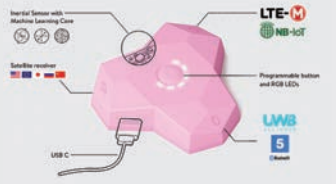
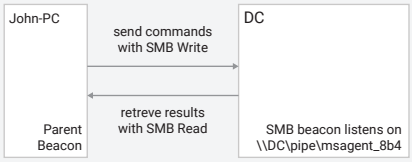
BEACON RANGE IS LIMITED

The "maximum range" supplied by a beacon is frequently insufficient because the beacon range is directly proportional to 'Broadcasting Signal Power,' improved by increasing broadcasting power. You'll need to extend the range in circumstances when your beacons must broadcast over a big area, such as a parking lot, or where you wish to gather temperature data wirelessly from the farthest spots in your office block. Unfortunately, as the transmitting strength increases, beacons become less energy efficient as the battery drains quicker.

WAR OF SPECIFICATIONS

Specification battles between Apple and Google are another issue voiced by marketers as part of the Oho Interactive poll. As both companies build their specs, iBeacons will soon only operate with iOS devices, and beacons will only work with Android smartphones. As a result, there will be no single, open standard, forcing businesses to buy, install, and operate beacons that support each platform, as well as build applications for both iOS and Android.

Types of Beacons

Types	Illustration	Features
Portable/ Small Beacon		• These are smaller beacons. • These are just like the size of a sticker or a debit card. • They save a lot of space and are mostly based on proximity. • This is ideal for ensuring that products in containers or cartons make it to their intended destination.
USB Beacon		• USB beacon is shaped like a standard flash drive and may/may not be compatible with USB connections. • These are ideal for tracking shipments of goods or products that are on their way to delivery.
Video Beacon		• Bluetooth device that is connected to the back of a screen to provide contextual visual information and advertisements. • This works well for enterprises like restaurants, bookstores, and the like, as it acts as an interface transmitter. • They can be connected to screens that allow users to enter preferences, orders, or searches. • These can also be utilized to allow employees, visitors, and others to sign in.
AI Beacon		• AI beacon is a machine learning-based program that can recognize a variety of actions and gestures. • AI variations are commonly available as video interfaces with or without cameras.
Parent Beacon		• A parent beacon is the largest piece of equipment in what is effectively a hive system. • This is around the same size as or slightly larger than most modems. • It communicates with and manages a myriad of smaller beacons, organizing all the information that gives the beacon its meaning.
Dedicated Beacon		• Dedicated beacons are the most durable of all beacon kinds. • They are used in places where they will be subjected to a lot of abuse from the environment. Examples include rain, snow, dust, muck, and anything else that might block data transmission.

Indoor Positioning Systems for Visually Impaired People

- An indoor positioning system (IPS) works similarly to a GPS in an indoor context. It's a system that employs mobile devices to detect goods or people inside a facility by using lights, radio waves, magnetic fields, audio signals, or other sensory information.
- Beacons have been used to help people with visual impairment traverse their local environment in recent years. The lively Euston station in London and the French city of Strasbourg are two famous examples. Beacons are electrical devices that are strategically scattered across physical space.
- Real-time interior navigation is provided through mobile app thanks to a mix of iBeacons, smartphone sensors, and indoor algorithms.
- By using an audio tour, a visually impaired person will be able to accurately assess their location inside the structure and efficiently proceed to their chosen Point of Interest on their own.
- An indoor positioning system allows for internal navigation and location in a variety of industries and environments. The whole indoor positioning system includes digital maps, navigation, and analytics.

Use Cases of Beacon Technology for Visually Impaired People

A London-based digital design studio is collaborating with the Royal London Society for the Blind (RLSB) on a project to see if iBeacons/Bluetooth Low Energy beacon technology can be used to help visually impaired people navigate public transportation by dynamically mapping their location and providing audio cues to guide them through stations and onto trains via an app.

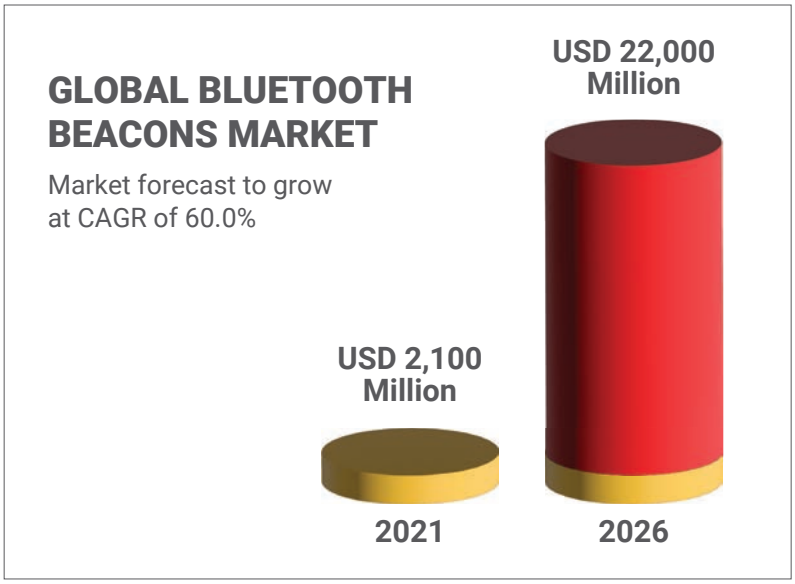
Guide Beacon invented by Wichita State University is an indoor wayfinding system for the blind, visually impaired, and disoriented (BVID) that assists people in navigating between two points within indoor places. The system allows users equipped with smartphones to interact with low-cost Bluetooth-based beacons deployed strategically within the indoor space to navigate their surroundings of interest.

BlindWays provides crowdsourced visual clues to help users navigate the last few final and crucial feet. MBTA pilot program is also in the early stages of placing Bluetooth sensor technology on bus stops that act as beacons and can guide. BlindWays users to the exact spot through a series of cues from a person's smartphone

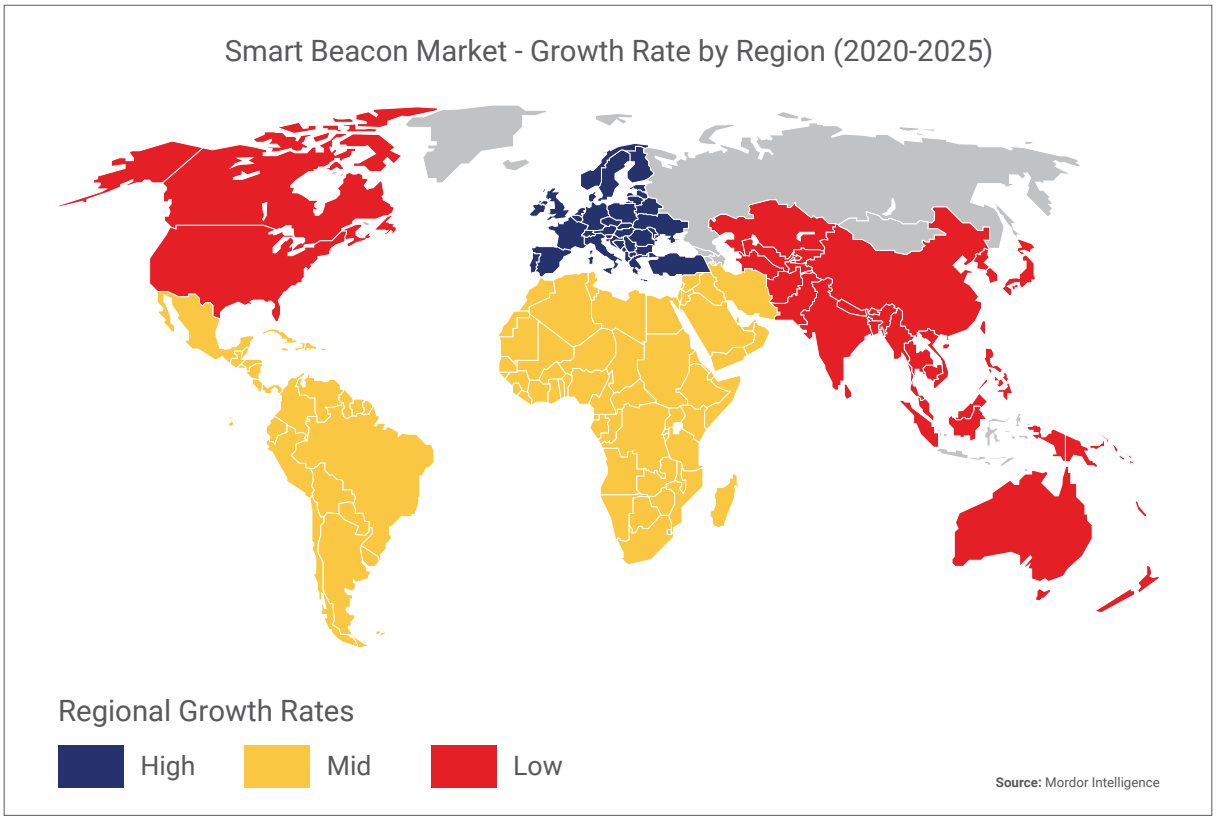
Beacon technology in the airport is making airports smart by helping differently abled travelers to reach from one place to another. Beacons and Voice Assistants in the smartphone in combination help the visual aid person to determine the shortest route to reach the destination.

Market Insights

CAGR Report



Potential Market Regions



The countries in APAC region are leading in Beacon Technology market, while South America, Africa and Middle East are having less share in Beacon Technology. [Mordor Intelligence]

Market Insights

Stakeholders in Beacon Market

- Smart Beacon End User
- Smart Beacon Providers
- Smart Beacon Distributors
- Venture Capitals, Start-Up Companies
- Research Organization & Consulting Companies

Market Segmentation

By Segmentation
1. Software
2. Hardware

By Connectivity
1. BLE
2. Wi-Fi
3. Others

By End User
1. Retail
2. Non-Retail

By Technology
1. iBeacon
2. Eddystone
3. Others

By Region
1. North America
2. Europe
3. Asia Pacific
4. Rest

Market Dynamics

Driver
- High demand for a personalized experience and real-time marketing experience.
- Growing adoption of IoT Demand for location-based marketing solutions
- Increasing penetration of mobile devices.
- Emphasis on developing smart cities.

Restrains
- Trust and Security Limitations.
- Networking and precision challenges.

Opportunities
- Expansion in organized retail stores such as departmental stores, supermarkets.
- High Conversion rate offering by providing targeted discounts to nearby customers.

Market Insights

Top Companies

Apple	Samsung	Google	Radius Networks
Fujitsu	Cisco	Estimote	K2B Solutions
Multidots	Infograins Software Solutions	Seamgen	Lets Nurture
Mindinventory	Hyperlink Infosystem	Clearbridge	Enuke Software
Blue Cat	Hid	Sensoro	Gelo Company
Accent Advanced Systems	Leantegra	Kontakt.io	Qualcomm
Aruba Networks	Blue Sense Network	Onyx Beacon	Bluvision, Inc

Top Universities

University of Tokyo	University of Oklahoma	Macomb Community College
Curtin University	Xavier University	University Of Miami
Sheffield Hallam University	Lees-Mcrae College	Emory University
University Of Hartford	Clemson University	Clark Atlanta University
Southeastern Baptist Theological Seminary (SEBTS)	University of the Virgin Islands	Harvard University
Colorado State University	Birmingham-Southern College	Nova Scotia Community College
California State University	Atlantic Cape Community College	Grossmont Cuyamaca Community Colleges
Del Mar College	University Of North Georgia	University of Detroit Mercy
University of Wyoming	Hawai'i Pacific University	Texas A&M University

Market Insights

Top Start-ups

JET ENGINEERING — Founded in 2020, United Kingdom

wiliot — Founded in 2017, Israel

BEACON BIOSIGNALS — Founded in 2019, USA

BATTLE SIGHT TECHNOLOGIES — Founded in 2017, USA

data zoom — Founded in 2019, USA

lifebit — Founded in 2017, United Kingdom

ASGARD SPACE — Founded in 2018, Spain

彼岸教育 BEACON EDUCATION — Founded in 2018, China

beekalabs UNLOCKING TECHNOLOGY — Founded in 2017, United Kingdom

Beacon — Founded in 2018, United Kingdom

Mergers And Acquisitions

Beacon Communications headquartered in Littleton has acquired California-based communications and security company Comtel Systems Technology for an undisclosed amount.

beacon — COMTEL Systems Technology, Inc. Healthcare • Education • Security

Beacon Mergers & Acquisitions is a full-service advisory firm with offices across Ontario, Canada, and in Washington, D.C, U.S.A. Beacon Mergers & Acquisitions also has a strategic partnership in the Asian subcontinent with Prime Bank Investment Limited.

BEACON MERGERS & ACQUISITIONS — PBIL Prime Bank Investment Ltd.

BeneSys a leading third-party administrator of benefit plans for Taft-Hartley multiemployer trust funds has acquired Beacon Technologies Group Inc.

BeneSys — BEACON Technologies Group Inc.

Shelfbucks Widens Beacon Tech Footprint with Emmoco Acquisition.

Shelfbucks — emmoco

Market Insights

Major Retail Brands Using Beacon Mobile Advertising

S.No.	Retail Brands	Features
1	Target	• Target app uses beacons to help buyers find their way through stores and locate specific products. • The target app represents the real-time location of the buyer on the store map and shows a listing of aisle numbers where products can be located. • The buyer clicks an item in the shopping list to see its location on the map, including the aisle number and any current promotions for that item.
2	Macy's	• Macy's used a beacon-powered mobile game "Black Friday Walk in and Win" game and encouraged holiday shoppers to plan and win Macy's gift codes. • Customers receive push notifications triggered by their proximity to beacons placed inside the stores.
3	Nordstrom	• Nordstrom uses beacon technology to bridge the gap between online shopping and the in-store experience. • This beacon-enabled app notifies customers if an item in their mobile shopping bag is in stock as they pass a store with beacons installed. Also, the app shows online options to in-store shoppers and makes suggestions based on the customer's interest and expedites try-on and check-out.
4	CVS Pharmacies	• CVS uses beacon-powered push notifications to deliver notifications like a reminder to refill a prescription or to pick up one that is ready.
5	Walmart	• Walmart partnered with GE to place beacons inside LED light bulbs throughout the store and parking lots. • This allowed to send personalized push notifications and discounts to in-store customers and saved tens of thousands on energy costs per store every year.
6	Neiman Marcus	• Neiman Marcus piloted beacons at three stores to promote in-store events like trunk shows, guest designers, and book signings.

Market Insights

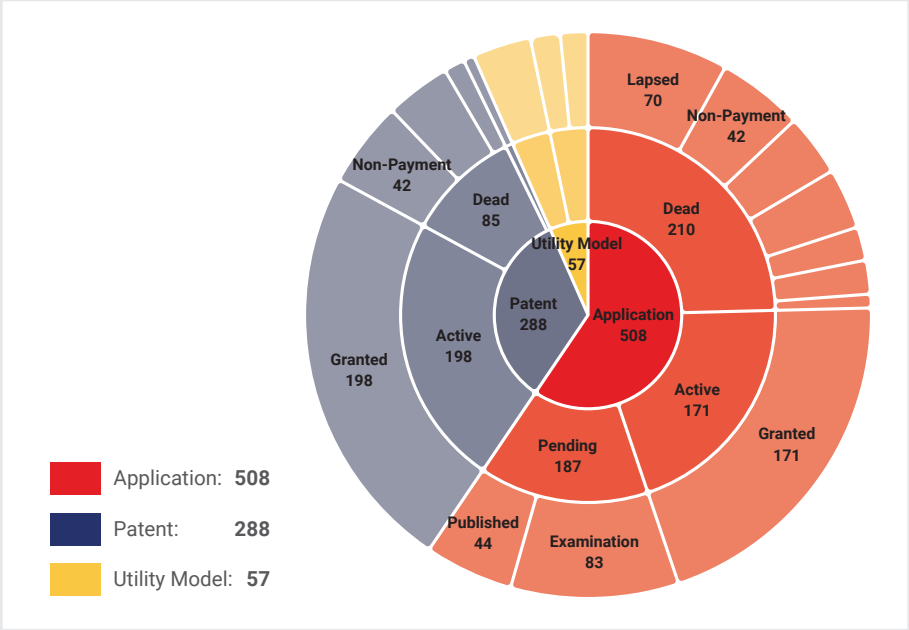
Major Retail Brands Using Beacon Mobile Advertising

S.No.	Retail Brands	Features
7	Universal Display	• This global mannequin company has supplied major retailers like Lord & Taylor, Saks, and Uniqlo with placed beacons inside their mannequins. • These “smart mannequins” in window displays can send a signal to anyone within a 100-foot range of the store to increase foot traffic. • Shoppers can instantly see the details of an outfit, or purchase any of its components right from their phones.
8	Levi’s Stadium Concessions	• Levi’s Stadium features nearly 17,000 Bluetooth beacons that fans can use to find their seats, the nearest restrooms, and concessions. • Paired with the Levi’s Stadium app, visitors can even have food delivered right to their seats.
9	Hillshire Farms	• Shopping app users received a personalized message that highlighted the quality of Hillshire Farms’ products and prompted them to either add American Craft sausages to their in-app shopping lists or directly into their carts.
10	Alex And Ani	• This jewellery retailer used beacons in all its 40 stores to optimize store layouts and product placement. • The brand used beacons to capture customer analytics, enhance store layouts, and educate consumers about its products.

IP Insights

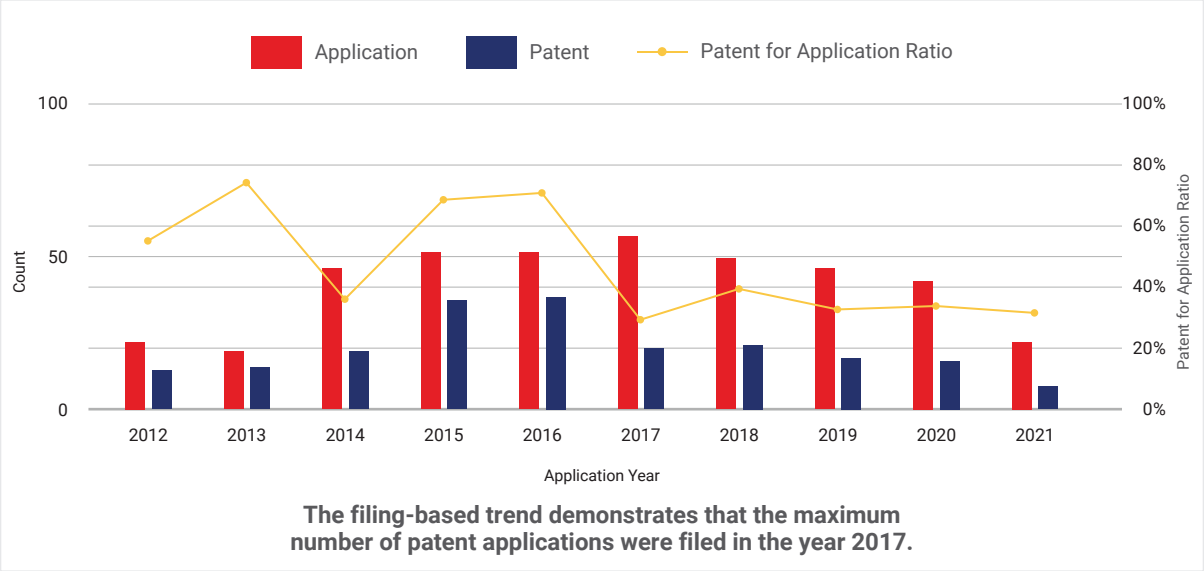
1. Legal Status of Patents:

The Pie chart shows the legal status of Patents, also the breakdown of Patent types.



2. Grant Rate of Patents:

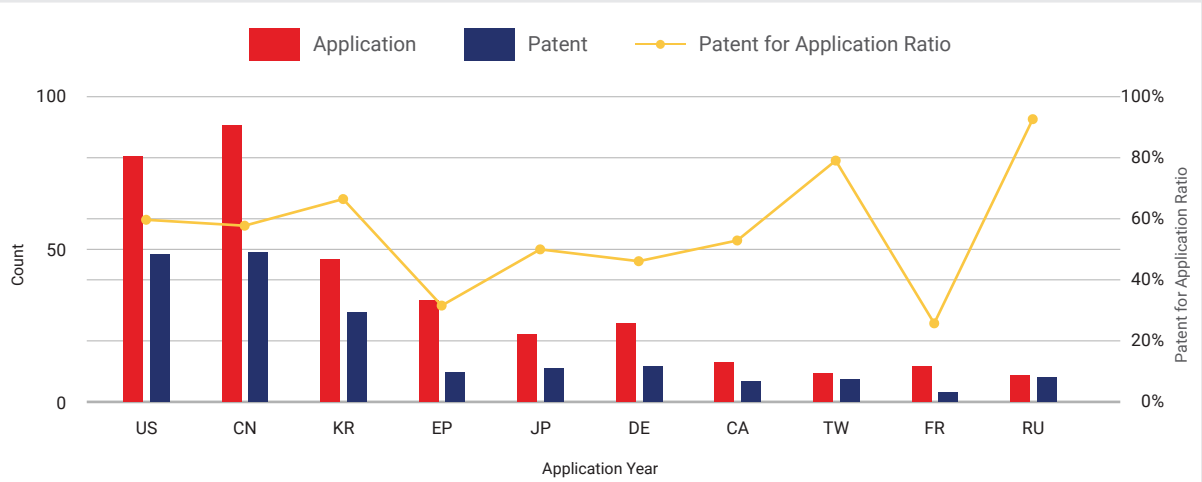
The Bar Graph shows the grant rate of patents with respect to their Application Year.



The filing-based trend demonstrates that the maximum number of patent applications were filed in the year 2017.

IP Insights

3. Country-Wise Patent Trend:



The graph is showing the grant rate of Patents with respect to the countries. The Country-wise filing-based trend demonstrates that a maximum number of patent applications were filed in China.

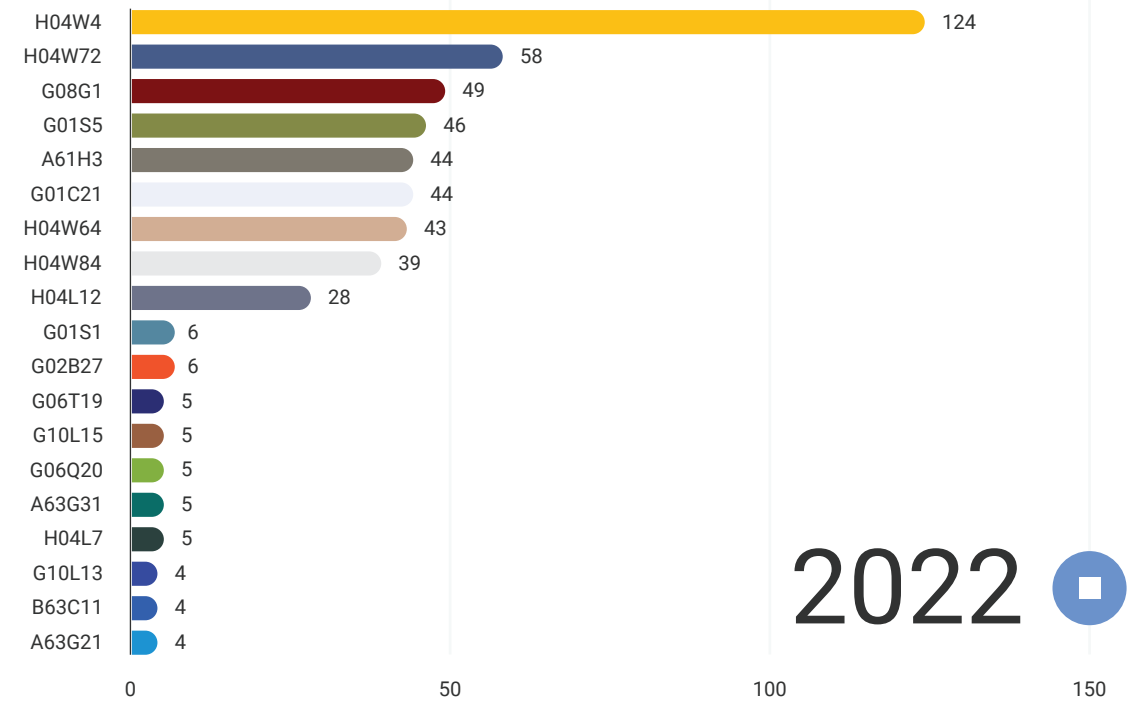
4. Technology Breakdown:

This is the visualization of major concepts of Technology breakdown. The numeric number shown in each block is presenting the no. of patents count in the corresponding field.

IP Insights

5. Technology Timeline Trend:

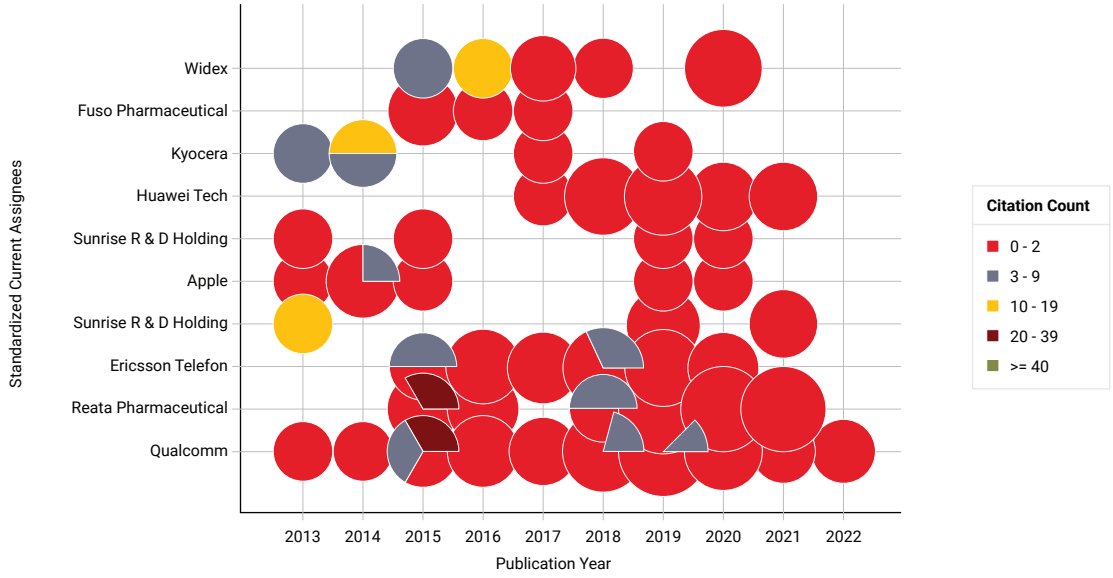
This chart shows the top classes that are being used in respective Patents.



Most patent applications were assigned with IPC “H04W4” followed by IPC “H04W72” and “G08G1”.

6. Core Assignees:

This chart is showing the top players in the domain with the citation ranges respectively.

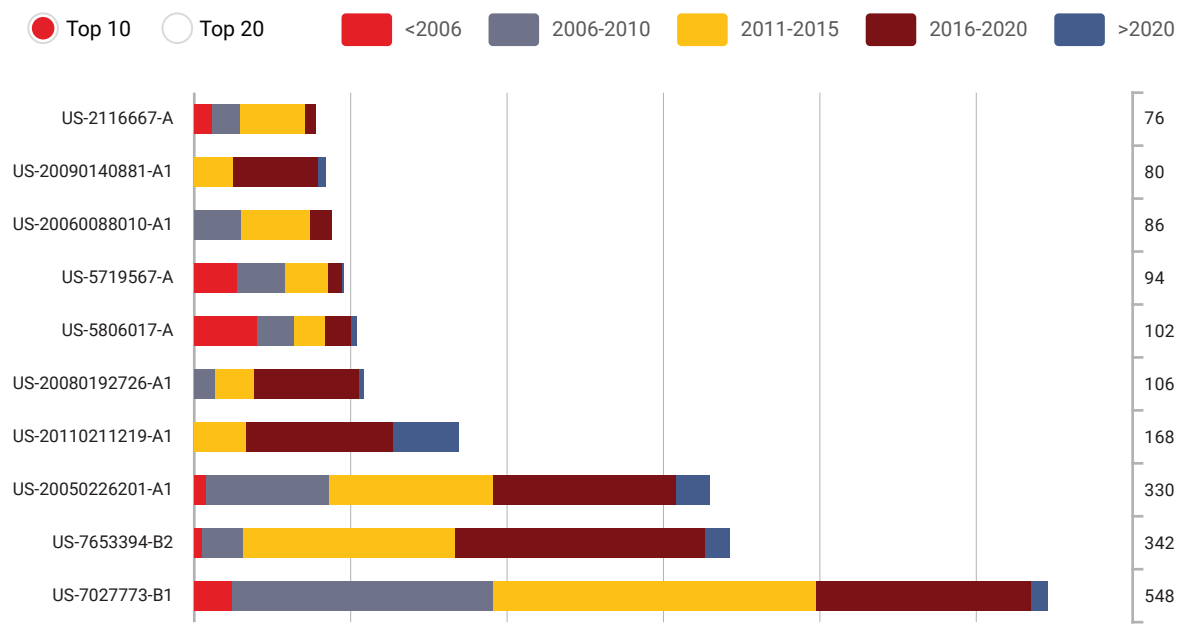


The chart represents that the Qualcomm is leading player with a higher forward citation frequency.

IP Insights

7. Core publications:

The following chart is showing the core publication of patents related to this domain with the publication number of Patents on vertical axis.



US Patent – US7027773B1 is the most cited patent reference by assignee AFx Technology Group International.

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