



THE DIGIMARC PLATFORM

25 Years in the Making

Discover how Digimarc and the Digimarc Platform began with a glimpse into the stars, and over the decades, grew to become a Platform adopted by the world's leading retail and consumer brands.



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THE DAWN OF DIGITAL WATERMARKING

In the early 1990s astronomer and entrepreneur Geoff Rhoads left his position with an electronics manufacturer to invent signal processing innovations now known as digital watermarking; his inventions arose from his work removing noise from digital photos of deep space imaging. His development of commercial applications of these inventions led him to found Digimarc in 1995, and one year later, the company released one of the first products based on the science of digital watermarking: a software plug-in for applying digital watermarks to images, the first third-party add-on bundled with Adobe Photoshop®.

Digimarc's inventions in this field have been adopted in many industries and ecosystems and under several different brands to make media more useful and manageable. And nearly a quarter of a century later, this early work with digital watermarking has blossomed into the Digimarc Platform, a Multi-sided Platform (MSP) backed by over 1,100 issued and pending [patents](#).

During its first quarter century, Digimarc has leveraged its expertise in digital watermarking technology and successfully applied and scaled the Platform to support and develop global solutions that solve complex challenges. The Platform enables auto-identification of common objects, such as product packaging, labels and audio and even plastic containers by using Digimarc Barcode and Digimarc Discover® software.

In an Internet of Things (IoT) world where nearly everything will soon be connected online, the Platform is now more relevant than ever. We live in an economy where mobile devices and network coverage are pervasive; and accurate identification of media objects is essential to many critical business models. Identifying and connecting these objects through a digital identity is a core requirement for business processes, analytics and a fundamental need for future transformations. This is central to the Digimarc mission to give all forms of objects a digital identity for reliable and efficient discovery and identification.

Unlike conventional technologies, such as traditional barcodes in retail and RFID, Digimarc's Platform technology provides a robust, pervasive and imperceptible data channel without adding material cost or impacting the aesthetics of objects. Furthermore, it is adaptable for use with media of various kinds, including physical objects and digital content such as audio, video, photos and e-books.

The heart of the Platform is Digimarc Barcode, an indelible, imperceptible data carrier that can infuse machine readable data into all forms of media and many physical objects.

The Digimarc Platform provides many benefits for connected objects, including:



Security: An imperceptible and indestructible digital watermark encoded in the object provides a singularly unique identification, whether in a digital image, video or audio file, on paper, cardboard, or etched within material substrates as with plastics and other materials. Among other things, this helps support strong authentication.



Protection: A unique ID enables fraud deterrence across many use cases, from preventing “barcode swapping” to copyright detection, from images to e-books.



Traceability: The ID can carry serial numbers for easier tracking of individual items or entire lots. This has many uses, from ensuring product legitimacy to preventing product pirating to easily identifying products for recall based on source provenance and sales destination.



Sustainability: The ID can contain information specific to packaging content as an aid to broader and more efficient recycling. For example, a microscopic pattern embossed in the plastic can be used to identify use of the materials and composition as an aid for sorting and recapture. Similarly, enhanced labels for fresh foods can be used to dynamically adjust pricing and thereby reduce food waste.



Engagement: Consumers can directly interact with enhanced objects simply by scanning the item with their smartphones. Brands can then share additional product information online including recipes, instructions, information about ingredients and sources, how-to videos, future coupons, and more.



Efficiency: Connected items, reliably scanned by machines and mobile devices, enhance supply chain efficiencies, from parts matching in manufacturing through to faster and more accurate inventory scanning and faster and easier front-of-store checkout experiences.

All this information becomes content for refined business processes and predictive analytics.

THE PLATFORM COMPONENTS

The three core functions of the Platform are identification, discovery and verification. Digimarc provides objects with an indelible, imperceptible data carrier—Digimarc Barcode. Data in the carrier uniquely identifies the object. The Platform also provides software for relevant devices to “discover” objects (i.e., decode data from that carrier) using Digimarc software, known as Digimarc Discover. Quality management is embodied in the third function. Digimarc Verify, a suite of verification and quality control (QC) tools, is used to assess signal quality and validate data at critical stages of production when the Digimarc Barcode is applied to an object. Together, these core functions enable organizations, application developers, and other solution providers to build new features, functionality and additional value on the Digimarc Platform.

An example of the Platform supporting the retail industry:

Our retail customers add Digimarc Barcode to private label packaging. The package printer uses Digimarc Verify software to assess signal quality and validate the data in Digimarc Barcode. When the private label product reaches checkout at a store, the retail barcode scanner with Digimarc Discover software scans and identifies the package. A shopper could also scan that same package in aisle or at home using a retail app enabled with Digimarc Discover software for easy mobile scanning and digital engagement for product information and more.

The Digimarc Platform is a critical business platform for the digital age, as we pass beyond the stages of the Internet and mobile technology to the IoT wave of development.

The heart of the Platform is Digimarc Barcode, an indelible, imperceptible data carrier that can infuse machine readable data into all forms of media and many physical objects in ways that are not noticeable by people, providing a digital identity to all these objects without an obvious visual or other human-discernible symbol like traditional barcodes and QR codes.

Digimarc Barcode, whether it is employed as an advanced data carrier in the retail consumer goods sector—going beyond what the traditional Universal Product Code (UPC) can deliver today—or in the media and entertainment industry as an indelible marker for combating piracy, provides a reliable and efficiently identifiable digital identity for all objects and media. Today's data-driven economy with digitally empowered consumers and businesses, increasingly requires products and media to have reliable, robust (and imperceptible in some cases) identifiers that can automatically connect media and objects to network-based information and services.

The Digimarc Platform with Digimarc Barcode can:

- Be incorporated into everyday objects, audio, digital images and print
- Digitally connect objects, audio and digital images to branded online experiences
- Protect, identify and track digital files, as well as manage digital rights
- Confirm content and objects are genuine, unaltered and originating from an authorized source, while also deterring counterfeiting and piracy
- Support multiple applications and use cases working with leading companies including Microsoft and Adobe

Adaptable, Flexible Platform

The Platform represents the culmination of years of research and development, combined with direct experience leveraging our digital watermarking technology for banknotes, government IDs and for content protection of e-books in publishing. For more than two decades our inventions have been employed to address complex media management problems with its unique identification/discovery model in multiple, unrelated industries.

The Platform addresses many challenges in a wide range of industries as varied as accurate identification of media, validation for security documents, product authenticity, parts-matching in manufacturing, copyright protection for music and e-books and consumer communication for brands.

The multi-sided Digimarc Platform generates its value primarily by enabling direct interactions between two or more participant groups in numerous industries. In the retail and consumer goods sector, for example, the Platform creates benefits along each of the three sides of relationships among consumer goods manufacturers, retailers and consumers. All parties benefit directly and indirectly from the synergies created by the Digimarc Platform.

Supporting Certainty & Security

The 2019 Edelman Trust Barometer shows record highs in “trust inequality,” among the population with the news media and business both scoring poorly for trustworthiness. But it isn’t just individuals who are uncertain, many industries and business models now require security measures that rely on the authentication of products and services. Today certainty and security go together and are fundamental for generating trust.

One critical component of trust is identification certainty. Digimarc Discover software engenders trust because it enables reliable and efficient identification of media and objects containing a Digimarc digital watermark, most notably delivered under the brand name Digimarc Barcode. Digimarc Discover software is adaptable to a variety of devices and industries. Some of the machines and applications that already use or have used Digimarc Discover software include: ID card readers at police and border crossing facilities, high-speed inspection systems in manufacturing, inventory management robots, retail barcode scanners and retail shopper apps.

The Digimarc Mobile Software Development Kit (SDK) that enables integration of Digimarc Discover has been employed in high profile consumer apps. Microsoft has also integrated Digimarc Discover scanning software into Windows 10 core.

Our mission and vision have remained the same from the beginning: to give all forms of media and objects a digital identity for reliable and efficient discovery. The Platform has been adapted for a variety of applications in many industries.

THE PLATFORM IN ACTION

Entertainment Content

One of the first global applications of Digimarc's digital watermarking technology was to help protect content in the entertainment industry.

Anti-piracy for Entertainment Content

In the late 1990s, Digimarc was identified as an important contributor to the entertainment industry's initiatives to fight piracy of music and video content. The company established a program to license our Intellectual Property (IP) for copy control, broadcast monitoring and forensic tracking applications for the entertainment industry. In collaboration with leaders in entertainment, consumer electronics and the IT industries, including Macrovision (current day TiVo Corporation), Phillips Consumer Electronics and Digimarc developed video and audio watermarking technology for copy protection. Digimarc's audio watermark technology was applied to Blu-ray movies under the Advanced Access Content System (AACs) standard and added to digital cinema to deter piracy.

Real-Time Broadcasts

In 2007 Digimarc licensed its inventions and collaborated with Nielsen to improve the use of audio watermarking in audience measurement and to expand its use in content filtering on the Internet. Digimarc formed two joint ventures aimed at enabling consumer engagement with TV programming through over-the-air detection of audio watermarks (so-called "second screen" applications) and improving content filtering.

Mobile Engagement with Shazam

Digimarc enabled visual recognition on Shazam's mobile engagement platform. In 2015, Shazam integrated Digimarc's patented visual recognition technology into its Shazam mobile app, which enabled branded, measurable experiences on mobile devices. Shazam used this with a range of its partners to Shazam-enable their products with this new functionality, including The Walt Disney Company, Target, HarperCollins Publishers, Esquire, Time, The Wall Street Journal and others. Apple acquired Shazam in 2018 and discontinued image identification to focus the application solely on music.

Immersive Movie Experiences

Rovio, the creator of the Angry Birds entertainment franchise, collaborated with Digimarc to deliver a novel enhanced in-theater experience as part of the motion picture, "The Angry Birds Movie." Rovio incorporated Digimarc Barcode for Audio into the end credits of "The Angry Birds Movie," allowing for a unique way to activate new capabilities via audio. When filmgoers opened the "Angry Birds Action!" game app during the end credits, the app seamlessly identified the enabled audio and participating moviegoers were granted access to a new area of the game along with an exclusive movie clip.

Banknotes & Government IDs

Banknotes

In 1997 Digimarc began working with a consortium of banks to develop a global system to deter unauthorized production of banknotes. While the details of this application are confidential, Digimarc developed a discreet and confidential identification and discovery model with the consortium of banks and their suppliers, demonstrating the early multi-sided benefits of the Platform. Digimarc continues today to maintain its relationship to the banks, supporting a large-scale global counterfeit deterrence system.

Government-Issued IDs

In 2001 Digimarc acquired the Large Government Programs division of Polaroid Corporation and built a business known as Digimarc ID Systems®. Digimarc added its digital watermark inventions to driver licenses in 30 states, enhancing security for 60 million IDs per year. Digimarc sold ID Systems in August 2008 for \$310 million in cash which was distributed directly to shareholders. Management used retained working capital to continue R&D, with a focus on building out remaining elements of the Digimarc Platform and establishing footholds in markets that would demonstrate its general utility in a digitally connected world.

Digital Images & E-Books

Digital Images

The company announced digital asset and image protection with the debut of its Digimarc for Images (now known as Digimarc Barcode for Digital Images) in 2010. This technology enables highly robust, pervasive, and imperceptible digital watermarks to be embedded into images such as digital photographs, illustrations and artwork — persisting through a variety of file manipulations and transformations — all without affecting the quality of the image or the enjoyment of its viewers. Combining imperceptible identifiers with complementary crawl services, enterprise customers benefit from greater insight into where brand assets are being used.

E-Books

Digimarc has provided digital anti-piracy solutions to some of the world's largest and most prominent publishers, including Pearson, Hachette Livre, Reed Elsevier, Harvard Business Publishing, and Oxford University Press. A powerful solution developed specially for the publishing industry, Digimarc Guardian Piracy Intelligence works with key content metadata to discover, authenticate and enforce the rights of intellectual property owners. In 2020, a new e-book watermarking solution will be launched leveraging Digimarc Barcode, making this the first full-circle watermarking and anti-piracy solution commercially available in the publishing industry.

Consumer Packaging & Retail Thermal Labels

Digimarc Barcode represents the next generation of data carrier for the retail brands/consumer goods sector. Digimarc Discover software enables consumer phones, associate mobile devices, inventory robots and retail barcode scanners to reliably and efficiently scan Digimarc Barcode on product packaging, retail label shelf-edge tags, and other visual and audio media. Retailers using our technology benefit from easier and faster checkout, greater product transparency, improved inventory management, loss prevention, reduced food waste and more. Their customers benefit from greater access to product information, both in-aisle and at home.

Platform support of retailers and consumer brands includes partnerships with many industry-leading suppliers. Resulting solutions provide parties engaging the Platform with ready access to its many benefits. For instance, the SmartLabel initiative, which promotes product transparency, has a consumer app with Digimarc Discover software and can read product packaging with Digimarc Barcode. SmartLabel was developed by two industry trading groups, the Grocery Manufacturers Association (GMA) and the Food Marketing Institute (FMI). In further support for product transparency, digital watermarking, the scientific foundation of Digimarc Barcode, is a USDA-approved digital technology for complying with bioengineered foods labeling. To further support retailers, Digimarc supports the GS1 Digital Link standard for encoding GS1 Application Identifiers and translating these identifiers into a URL for web lookup of product information.

In 2018 Digimarc entered into a 15-year partnership with Microsoft that includes integration of Digimarc scanning software into Windows®, as part of the Windows 10 update. This built-in support of Digimarc detection technology gives the Windows development community easy access to Platform benefits. Using standard Windows APIs, developers can enable scanning of state-of-the-art Digimarc Barcode and other legacy barcodes commonly used in retail.

Digimarc recently added new manufacturing and quality control capabilities making automatic identification of certain packaging components easier during manufacturing and improving accuracy rates for in-line inspection systems to read labels with alternatives such as Data Matrix codes, especially on difficult shapes such as cylinders. Procter & Gamble and Conagra Brands are first to leverage these new capabilities in their manufacturing environments.

Quality Management

Quality management is integral to effective operation of the Platform. Digimarc has created a Quality Management System (QMS) for pre-press operators and printers. The QMS makes quality control easy for those working with Digimarc Barcode and includes Digimarc Verify (signal quality measurement for scan performance and data validation) tools (mobile and desktop software); the Center for Digimarc Education (CODE), an online learning system featuring an interactive curriculum; and technical specifications to ensure data accuracy and quality control.

CONCLUSION: THE BARCODE OF EVERYTHING

Today, machines of all kinds, including consumer mobile devices, have sensor configurations that mimic the human senses of seeing and listening. When objects have a digital data identity, business leaders can use this vital intel to inform short- and long-term strategic thinking such as demand planning and risk management.

The Platform is a critical business platform for the digital age, as we pass beyond the stages of the Internet and mobile technology to the IoT wave of development, where interconnected devices and accurate data are no longer tangential, but central to the economy.

Improved Plastic Sorting

The Platform also holds the potential for impacting the product packaging post-consumption. Digimarc has pledged a commitment to improve the reliability and efficiency of sorting plastic waste, most notably signing the Ellen MacArthur Foundation's New Plastics Economy Global Commitment, which is focused on building a Circular Economy for plastics. Digimarc participated in the Ellen MacArthur Foundation's Pioneer Project HolyGrail, where Digimarc Barcode was shown in testing to overcome many current limitations in plastic sorting technology. Digimarc Barcode proved effective in technical trials in more accurately identifying recyclable plastics that could prevent their unnecessary disposal into landfills or incinerators.

A Signal Rich Future

For nearly 25 years Digimarc has been pioneering the art and the science of digital watermarking for countless applications—and the future promises even more innovation. The Platform is supporting revolutionary new developments to integrate reliable and efficient auto identification into media creation. In a glimpse of the future, Digimarc is developing Signal Rich™ art, where the data carrier is inherent in the design. Graphic artists and package designers will harness the power of new design tools using mathematical algorithms to create a new generation of IoT ready artwork, with inherent, persistent digital identities.

One can only imagine where Digimarc will next take the art and science of digital watermarking.

Digimarc Corporation

9405 SW Gemini Drive

Beaverton, OR 97008

T: +1 800 DIGIMARC (344 4627)

F: +1 503 469 4777

info@digimarc.com

www.digimarc.com

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ABOUT DIGIMARC CORPORATION

Digimarc Corporation (NASDAQ: DMRC) is a pioneer in the automatic identification of everyday objects such as product packaging and virtually any media, including print, images and audio. The Digimarc Platform provides innovative and comprehensive automatic recognition technologies to simplify search, and transform information discovery through unparalleled reliability, efficiency and security. Digimarc has a global patent portfolio, which includes over 1,100 granted and pending patents. These innovations include state-of-the-art identification technology, Digimarc Barcode, as well as Digimarc Discover® software for barcode scanning, image recognition, as layers of its ground-breaking Platform. Digimarc is based in Beaverton, Oregon. The Digimarc Platform enables applications that benefit retailers and consumer brands, national and state government agencies, media and entertainment industries, and others. Visit digimarc.com and follow us @digimarc to learn more about The Barcode of Everything®.