

Introduction to the Livescribe Platform

Livescribe™ SDKs

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IntroLSPlatform-PlatformSDK-1.4.0-REV-B

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The Livescribe Platform

Livescribe has developed a new paper-based computing platform that bridges the gap between the paper and digital worlds. The platform enables a broad range of new applications in personal productivity, learning, communication, and self expression.

The Livescribe platform includes:

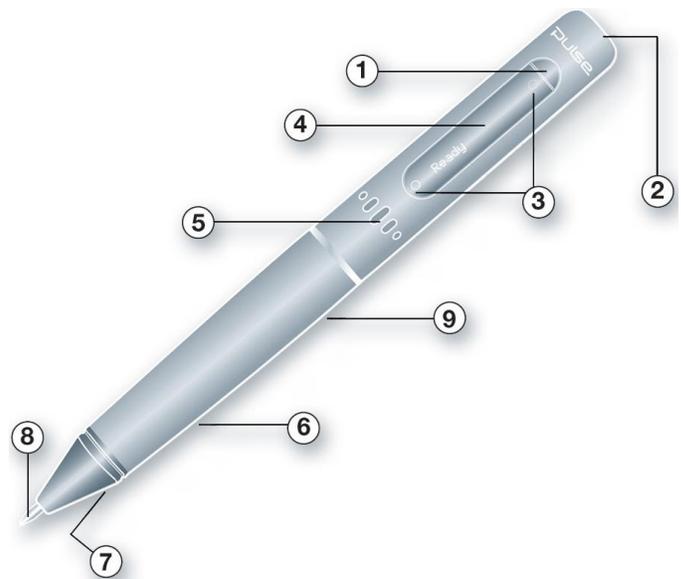
- **Livescribe™ Smartpen:** a Montblanc-size computer with advanced processing power, audio/visual feedback, and substantial memory for handwriting capture, audio recording, and applications
- **Livescribe™ Dot Paper:** technology that enables interactive, “live” documents using plain paper printed with micro-dots
- **Software Applications and Tools:** a breadth of solutions that leverage audio/ink capture, handwriting recognition, and Internet connectivity to enhance personal productivity, learning, communication and self expression
- **Development Tools:** easy-to-use tools for consumers and developers to create, publish, and share or sell new applications and content online



Livescribe Smartpen

The Livescribe smartpen is an advanced paper-based computer, providing both audio and visual feedback, powerful processing capabilities, and substantial built-in storage. The Livescribe smartpen integrates several components and technologies. It also uses firmware and application software to support the interaction of all of its components and to enable built-in handwriting recognition, and applications such as Paper Replay, among many others.

1. Power button
2. Stereo headset jack with an external microphone input
3. Built-in microphone
4. Organic Light-Emitting Diode (OLED) display
5. Built-in monophonic speaker
6. USB connector
7. Infrared camera
8. Removable ink cartridge
9. Rechargeable lithium battery (non-removable)



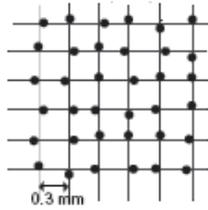
Livescribe Dot Paper

To perform its many operations, the Livescribe smartpen requires Livescribe dot paper. This paper is standard paper with printed microdots on its surface. These dots are nearly invisible to the human eye. However, the Livescribe smartpen can easily see these dots and uses them to know which page you are writing on and the exact location on that page. The Livescribe smartpen can even see these dots through the ink you write on your pages.

The microdots are printed on each page in a special pattern based on technology from Anoto, Inc. This dot pattern consists of small dots (100 micrometers in diameter) arranged with a spacing of approximately 0.3 mm. The dot pattern overlays an imaginary square grid. The dots are

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slightly displaced from the grid, with each dot in one of four possible positions, forming the proprietary Anoto dot pattern.



The dot pattern identifies the specific page and locations on the page of the notes you write. The Livescribe smartpen uses the dot pattern in a way similar to geographical positioning system (GPS). But, instead of identifying locations on land, it finds locations on paper and stores your writing as digital ink using those locations. Using this patented dot-positioning system (DPS), the Livescribe smartpen precisely tracks its own movement on paper. As a result, anything you write – words, numbers or drawings – can be stored, recognized, and intelligently responded to.

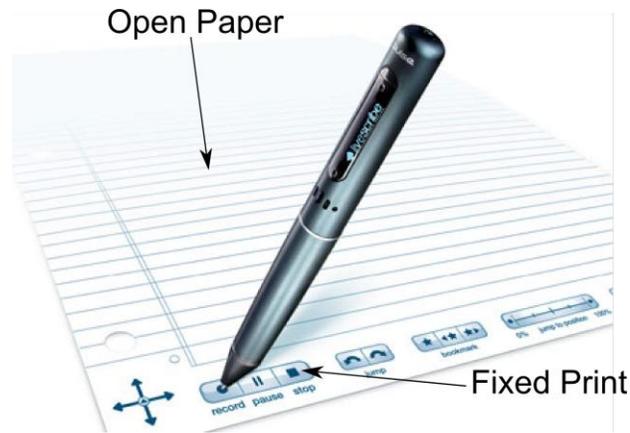
The area of the entire Anoto dot pattern is huge, and represents a piece of paper the combined size of Europe and Asia. Livescribe dot paper is based on a subset of the entire Anoto dot pattern.

Open Paper and Fixed Print Paper

The Livescribe smartpen can use two kinds of dot paper: Open Paper and Fixed Print. A printed page can contain Open Paper regions, Fixed Print regions, or both:

- **Open Paper (OP):** Open Paper refers to regions of a Livescribe dot page that various Livescribe smartpen applications can claim at runtime. When a user runs a particular application and writes on those dots, the application can claim these dots.
- **Fixed Print (FP):** Fixed Print refers to regions of a Livescribe dot page that are defined by a Livescribe smartpen application during application development. No other application can claim them at runtime. Printed graphics on the page identify these areas to the Livescribe smartpen user as “paper controls” for operating the application.

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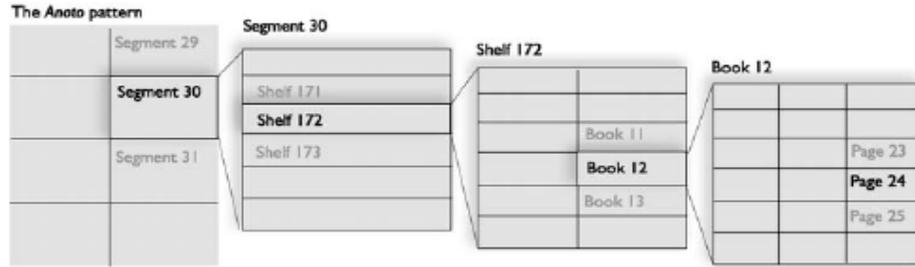
Most of the paper products from Livescribe contain both Open Paper and Fixed Print regions. For instance, the pages of the Livescribe notebooks have Fixed Print controls at the bottom and Open Paper dots in the blank lines above them. These Fixed Print controls allow users to record, pause, and stop audio sessions while writing notes, access various points in the audio stream, manipulate playback speed, and adjust volume. The special Nav Plus control in the lower left-hand corner activates the main menu, visible on the Livescribe smartpen's OLED display.

Open Paper areas (lined or not lined) above the Fixed Print controls can be used by any Open Paper application, such as Paper Replay to capture notes and audio, and Quick Commands, such as Quick Calc, where a user write math problems and have the Livescribe smartpen calculate and display the answers.

Dot Pattern Organization

Because the Anoto dot pattern space is so large, the Anoto dot pattern used by Livescribe is divided into smaller parts called pattern pages for administrative and licensing purposes. Pattern pages are grouped into books, which are grouped into shelves, and each shelf belongs to a segment, as shown below. In a specific segment all pattern pages have the same size; all books hold the same amount of pages; and all shelves hold the same amount of books.

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A company can license a unique part of the pattern to implement a service or application. During the license period, the company has exclusive use of the licensed pattern area.

A pattern page is identified by a page address, which is a combination of four numbers, like this: *segment.shelf.book.page*

For example, 1.2.3.4 denotes pattern page 4 in book 3, which is located on shelf 2 in segment 1.

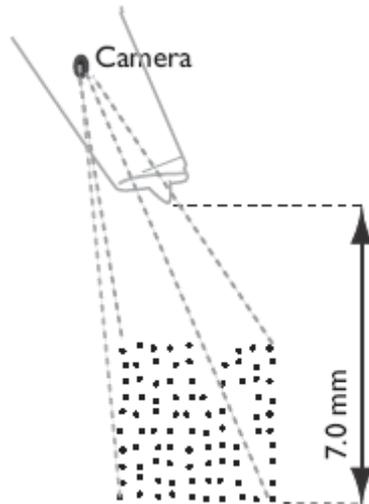
The first pattern page in a book and the first book on a shelf are identified as number 0. An asterisk (*) in an address is used to address an entire book or shelf. For example, 1.2.3.* means all pattern pages in book 3, which is located on shelf 2 in segment 1.

How the Livescribe Smartpen Works

When you power on the Livescribe smartpen and begin writing on Livescribe paper, the Livescribe smartpen captures and stores the notes you write. To capture your writing, the Livescribe smartpen uses its built-in infrared camera to take digital snapshots of the dot pattern as the tip moves over the paper as you write.

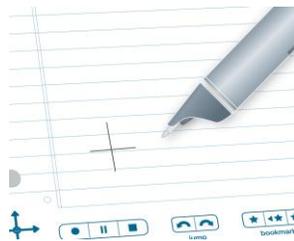
The camera takes snapshots between 50 and 100 times per second. Instead of taking snapshots exactly where the tip is, the infrared camera takes snapshots of the dot pattern up to 7 mm from the tip, depending on how you hold the Livescribe smartpen.

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The Livescribe smartpen processes these snapshots by calculating the absolute position of your writing based on the entire dot pattern for the notebook you are using, and then stores the snapshots for processing.

You can record audio along with your written notes by activating the record feature of the Livescribe smartpen. This feature is called Paper Replay. When recording audio, the Livescribe smartpen links the recorded audio to your notes based on the dot pattern grid. With this information, the Livescribe smartpen can play back the audio that was recorded at the exact time you were writing your notes. Specifically, when you tap on your notes with the Livescribe smartpen, it locates the position where you are tapping and starts to play back the audio at the position linked to that paper location.



Livescribe Smartpen Applications

Livescribe smartpen applications are fundamental to the Livescribe mobile computing platform. These applications associate a user's Livescribe smartpen actions (writing, tapping, and audio recording) to Livescribe dot paper.

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The most basic definition of a Livescribe smartpen application is a *Paper Product and one or more associated (linked) Penlets*.

Penlet + Paper Product = Pen Application

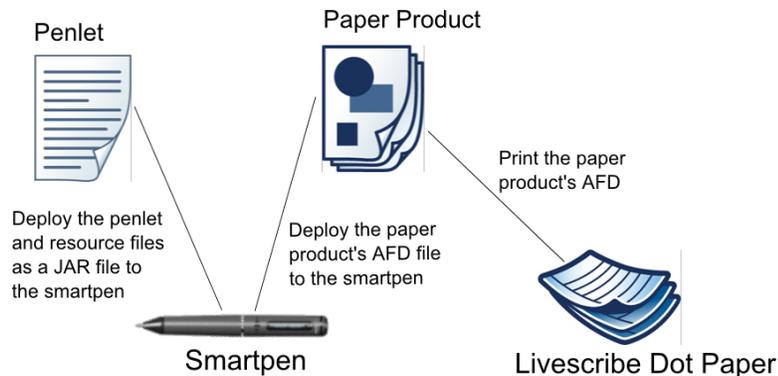


A *Penlet* is a Java application developed to interact with specific active regions defined on a Paper Product. The active regions can be either pre-defined (static, Fixed Print) regions, or dynamic (established during the runtime interaction of a user with Open Paper). The Penlet handles smartpen events and performs actions dictated by the active regions. You create a Penlet using the Livescribe Java API and a Livescribe IDE plug-in. The Livescribe Java API based on the Java Platform, Micro Edition (Java ME) and CLDC (Connected Limited Device Configuration).

A *Paper Product* consists of:

- Physical dot paper a user interacts with using the Livescribe smartpen
- Electronic file representation of the physical dot paper

The electronic file representation of a Paper Product is a proprietary container file called an Anoto Functionality Document (AFD). The AFD describes the Paper Product to Penlets and to other components in the Livescribe mobile computing platform. AFD files are installed on the Livescribe smartpen along with Penlets that use them. This enables the Livescribe smartpen to recognize and use the Paper Product.



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Livescribe™ Smartpen Emulator

The Livescribe™ Smartpen Emulator is a desktop tool that emulates the Livescribe smartpen. You can use this emulator as you develop Livescribe smartpen applications and exercise smartpen functionality on screen.

