Ncode™ Service Development Getting Started Guide

Software Dev Center

revision history

Ver	Date	Contents	Writer
1.00	2017-04-13	Created	ksshin
1.01	2017-12-18	Contents Updates & Converting to english (2018.1.8 done, verifier - SooYeol / JiHe / Julie)	ksshin

Table of contents

1. About this document

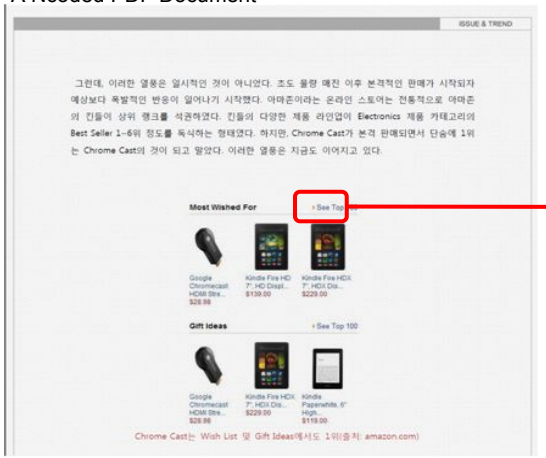
This document summarizes what developers need to know overall,
including what the development of publishing and application services for Ncode™.

1) What is the Ncode™
2) How to make the printed materials with Ncode™
3) How the printed materials, Neo smartpen, and applications interact with each other

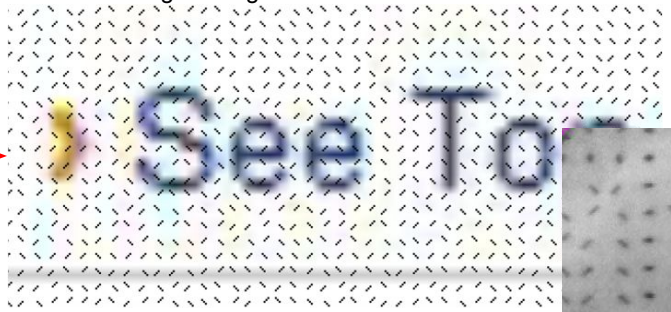
As a technology that prints patterns encoded on paper to read information through optical systems using Steganography technology, printed patterns cannot be identified with the naked eye and can be read through specific optical machines.

Cryptography is the means by which information cannot be read, but Steganography hides the existence of information itself.

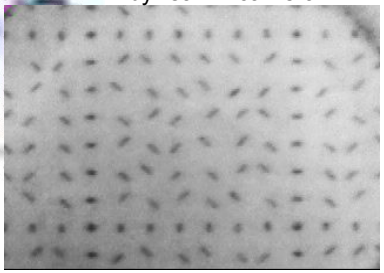
A Ncoded PDF Document



1200% enlarged image



what captured
by real IR camera



How does Neo Smartpen selectively read Ncode ™ from a paper?

Our products are equipped with an IR camera that recognizes only carbon.
And C, M, Y and Non-carbon K colors are used for contents and black letters and only Carbon Black ink is used for Ncode™ printing.
That is why the optical system can recognize Ncode™ only.

1) Ncode™ Cell Size

One unit of Ncode™ consists of 2.37 mm size cell,
on a 600 DPI prints, the each cells are include 56(H) x 56(V) pixels. on 1200 DPI, it is doubled.

Ref:

- 2.37mm = (56 pixels / 600 dpi) * 25.4
- On 1200 DPI, output was designed to maintain the same cell size (2.37 mm)
- Therefore, the calculation of cell coordinates received from a Pen will use the same formula for both 600 DPI and 1200 DPI.

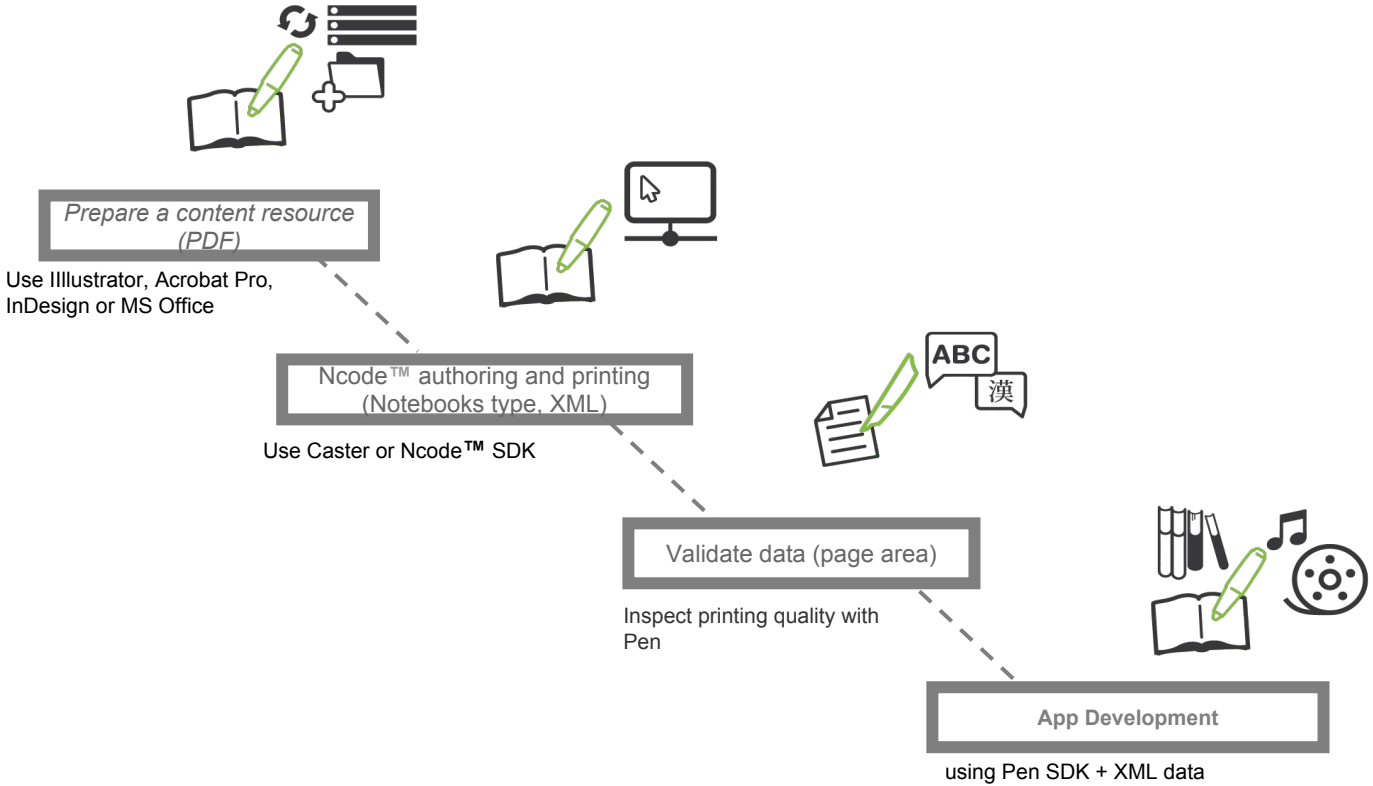
2) Information Structure

Ncode™ Each cell can hold 56 bits of data and consists of Section, Owner, Book, Page, X, and Y information.
Therefore, whenever you write on any area of the paper, your pen could receive these pieces of information.

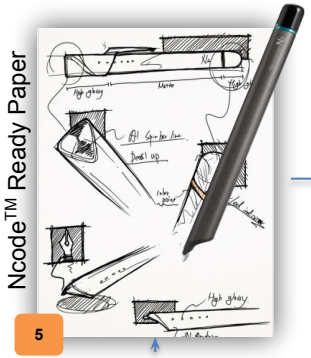
Categories	Contents
Section	We have defined the maximum paper size that can be accommodated according to the section value. Depending on this value, the range of values assigned to Owner, Book, Page, X, and Y will be wide.
Owner	This is the owner code value about the Ncode™, it can be used in the range of 0~255, 0~1023, depending on the Section value, and then the owner code is available for purchase by customers. (The code 27 is reserved for NeoLab Convergence)
Book	It is a value for distinguish the notebook, and it has a certain range value by the Section value.
Page	It is a value for distinguish a page on a notebook, and it has a certain range value by the Section value.
X,Y	It is a coordinate value indicating the position of each Ncode™ Cell in the page, and has two decimal places precision. Since this value is the position coordinate value of Ncode™ Cell, application should converts it into logical coordinates like Inch (we recommend). If you do this, you can convert it to various physical DPI device coordinates at needed. Ex) Converts Ncode™ coordinates to Inch: InchVal(NcodeXY) = NcodeXY * 56.0 / 600.0 Converts Inch to screen coordinates: ScreenXY(InchVal) = InchVal * Screen DPI

Note: In the case of content that should be distributed globally uniquely, It managed by NeoLABConvergence.
In all other cases, you can proceed with code scope management yourself.

1) Overview


Prepare a content resource (PDF)
Use IIIlustrator, Acrobat Pro, InDesign or MS Office
Ncode™ authoring and printing (Notebooks type, XML)
Use Caster or Ncode™ SDK
ABC
漢
Validate data (page area)
Inspect printing quality with Pen
App Development
using Pen SDK + XML data

2) Sample content PDF



6 Pen stroke data
- ncode info
- ncode cell x,y
- pen pressure
- ...

Bluetooth™

Data transmission is sent via SPP or LE base.

3rd party developer can develop own application using Pen SDK

3rd party application

Pen SDK

Biz Logic

XML META info (Ncode™ Info)

PDF Page Image (JPG)

7 rendering (pen stroke + page image)

Screen

Ncode™ Info
- Section, Owner, Book code
- Associated PDF name

PDF source file or Page Image

3

Offset Print Production

Postscript Enabled LASER

PDF5 (CMYK+**K'**)

PDF4 (CMY + **K'**)

4 Ncode™ PDF (PDF4 or PDF5)

Ncode™ PDF Generator (Caster or Custom)

2 Ncode™ data

Ncode™ Service Cloud

1 Source PDF

Prepare your own contents for app service as PDF format.

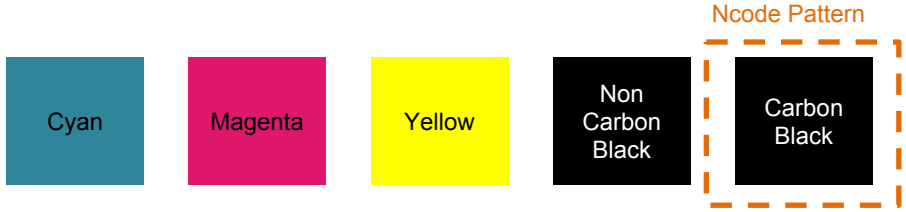
Note: K' is carbon black color plane for Ncode pattern.

1) A Ncode™ PDF can be produced in two types of directions as below.

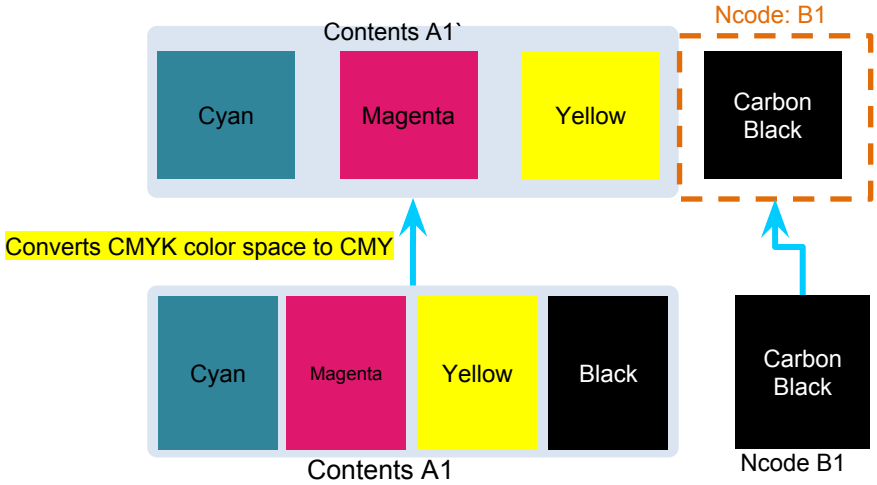
Type	Create Tool	Color plate configuration	Target Service	Printing Method
PDF 5	Caster, or Ncode SDK	Consists of 5 color plates - Contents : Cyan, Magenta, Yellow, blacK (non-carbon) - Ncode : Carbon blacK	- The quantity is large - Content such as textbooks or notes that are fixed - Use for need high-quality printing	- For Offset Printing House (*Where each color plates separation and mass output possible*)
PDF 4	Caster, or Ncode SDK	Consists of 4 color plates - Contents : Cyan, Magenta, Yellow (*Black is represented by a CMY color composite)* - Ncode : Carbon blacK	- The quantity is small - Content that may change frequently - Use only for content that does not matter if the color changes slightly	- We recommend a laser printer what postscript supported - Using Acrobat Reader or other(or own) Print Software

2) Understanding color plates

5 color plates (CMYK+K') only need to add the Ncode plate without color conversion.



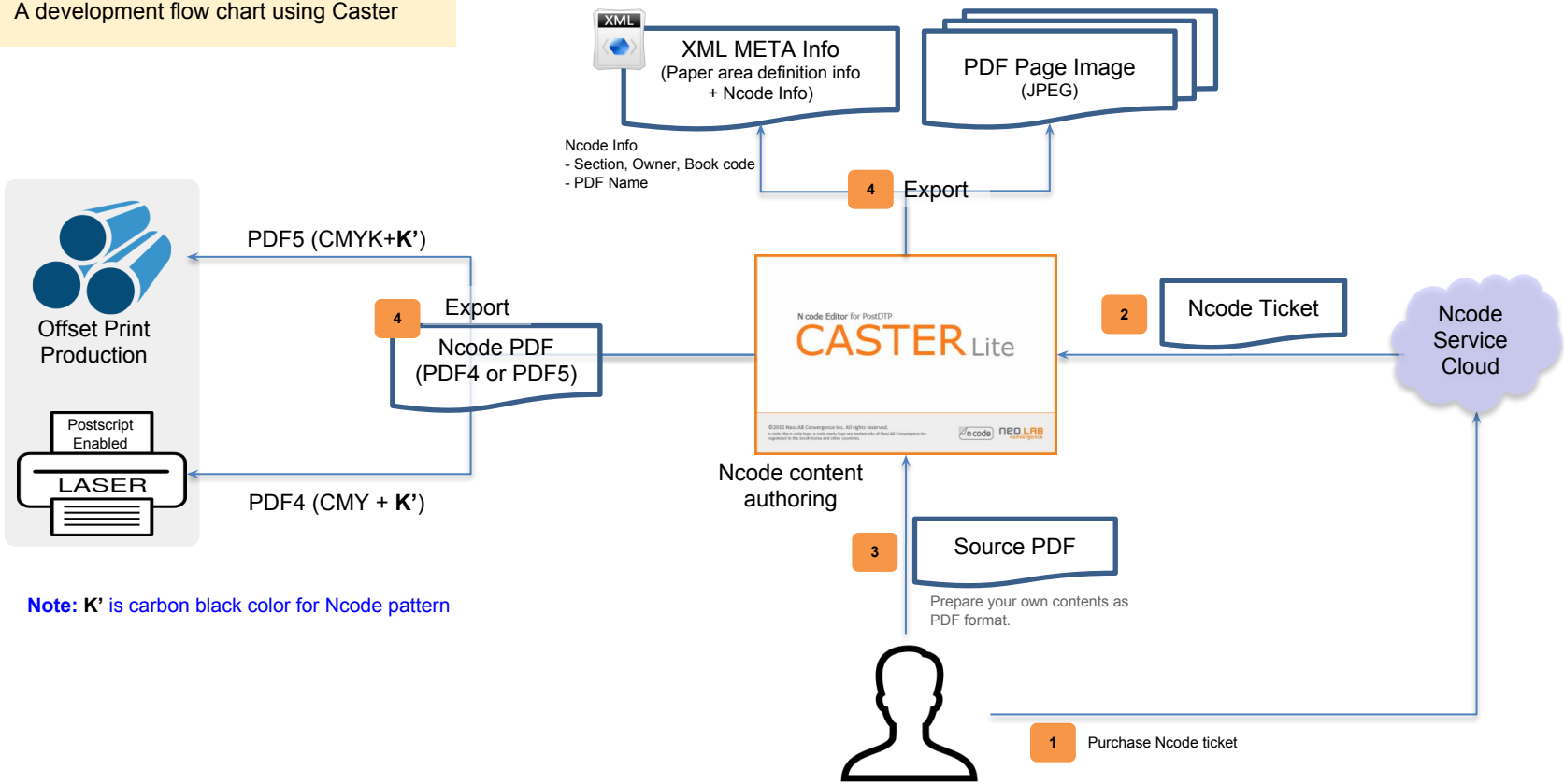
4 color plates (CMYK) Contents A1'B1 Created through the following color conversion process.



Color conversion for creates PDF4 is
- If you use Caster, it will be done automatically when you export to PDF4,
- If you are using the Ncode SDK, you should implement directly.

3) Ncode PDF authoring using Caster

A development flow chart using Caster



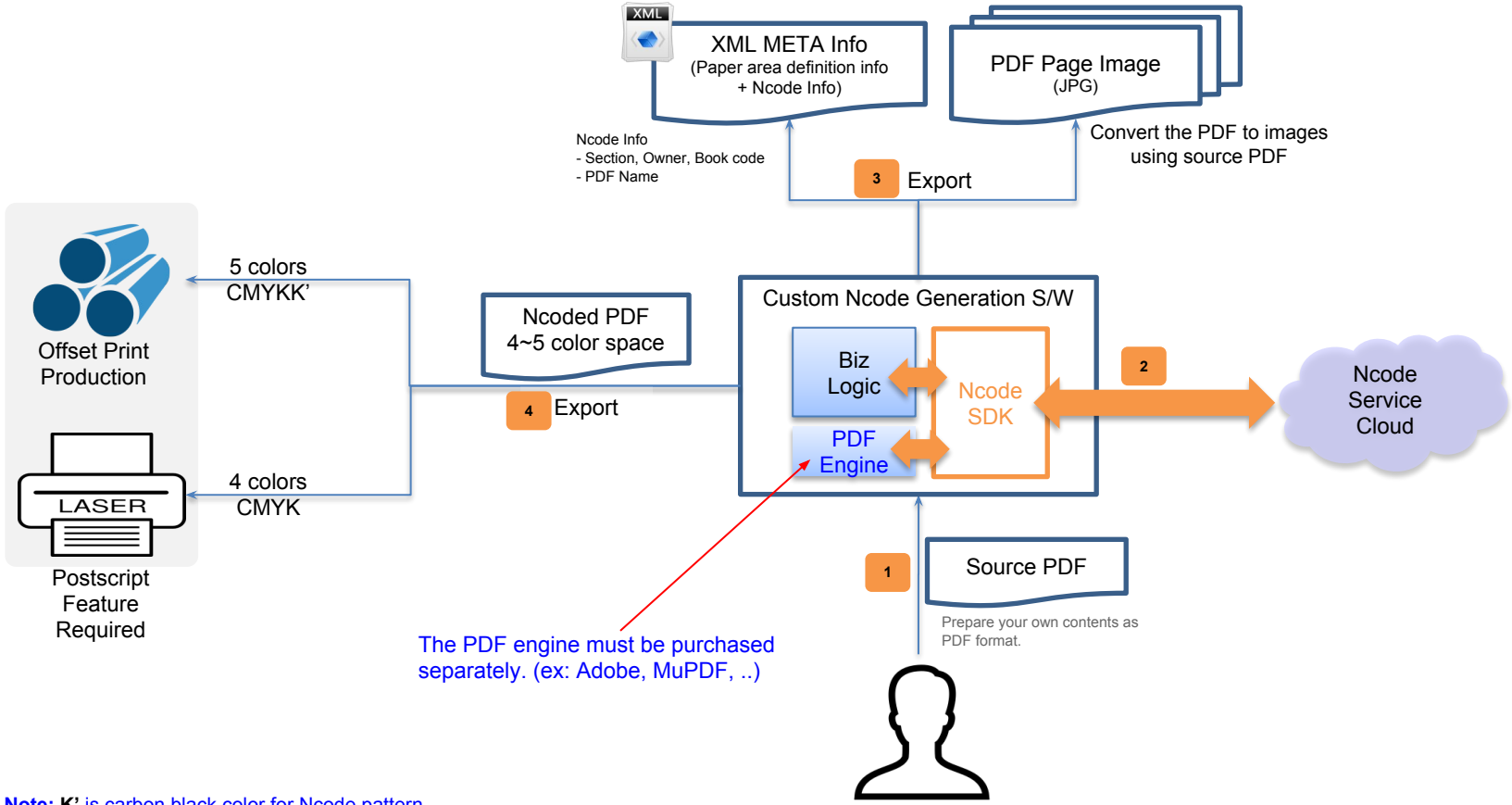
Note: K' is carbon black color for Ncode pattern

3) Ncode PDF authoring using Caster

You can work following with Caster

- Graphical User Interface (GUI) based Ncode authoring software provided by NeoLab Convergence.
- Provides authoring capability to create PDF4~5 type documents for publishing using original contents PDF.
- You can set the area for each page of the PDF and define the reaction required when the pen is tapped in that area.
- The defined information is exported as an XML document format and is used to support the App service to respond when the pen is tapped on a paper.
- We named this XML as .nproj.
- *Refer to the "Caster-Lite User's Manual" for how to use Caster.*

4) Create Ncode™ using Ncode SDK



Note: K' is carbon black color for Ncode pattern

4) Create Ncode™ using Ncode SDK

A point of Ncode SDK

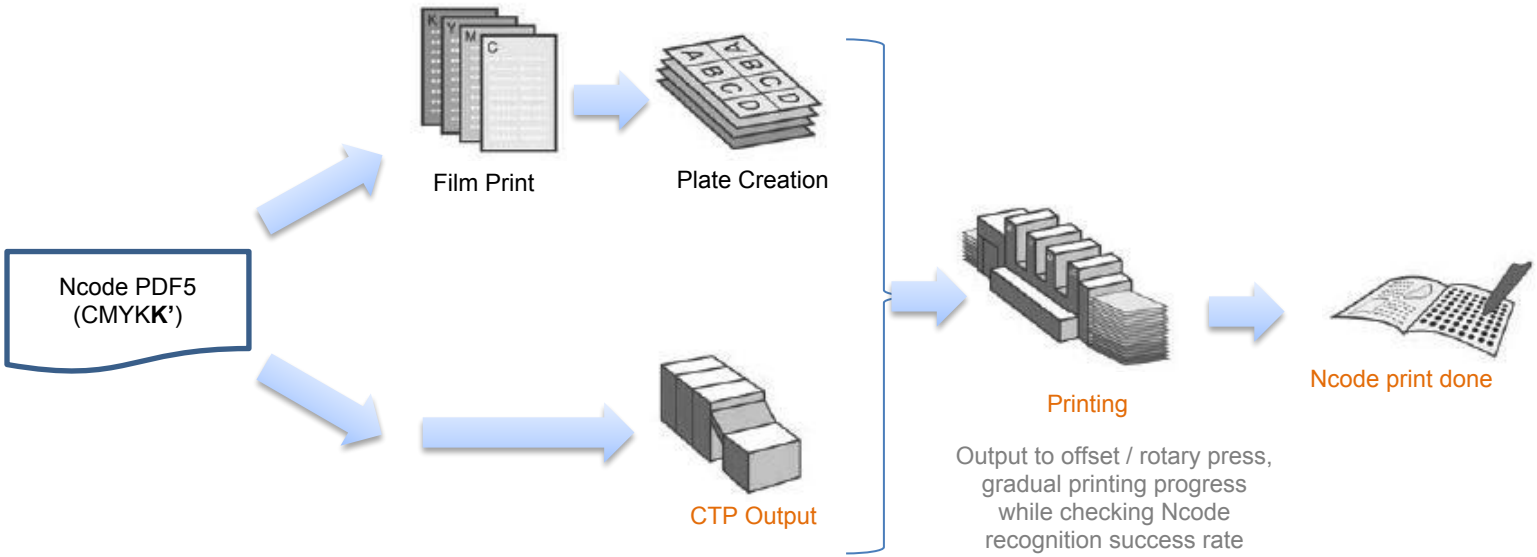
- Can creates Ncoded PDF 4, 5 type documents.
- Ncode SDK is a cloud-based service that generates Ncode data on the server in real time and then downloads it.
- We provides a development guide and necessary code to put Ncode on content PDFs.
- The Caster can only be manually operated by a person, but if you develop own software, it is possible to various.
- A download address for SDK & Sample code - https://github.com/NeoSmartpen/NcodeSDK

1) Supported printer type list

Quality Ranking	Type	Postscript Support	Color Space Separation Control	Whether Ncode image interpolation occurs	Comment
1	Offset Print House	O	O - PDF5 CMYKK' - CMYK is used for background contents - (carbon black) K' is used for Ncode		
2	Postscript Color Laser Printer	O	O - PDF4 CMYK - CMY is used for background contents - (carbon black) K is used for Ncode	Can occur depending on driver & printer device settings. so this setting is very important.	Notice: 1) We do not recommend PS emulation model, because many models are not support Color Space Separation exactly. 2) also, depending on the printer manufacturer, some printers are not fully compliant Postscript Standards because they may not work perfectly.
3	Color Laser Printer	X	X - PDF4 CMYK - CMY is used for background contents (However, may also include black color, because color space separation not supported.) - (carbon black) K is used for Ncode	Can occur	Notice: 1) We do not recommend PS not supported laser printer because Ncode interpolation can be occured. *please check printer device capability first, before you development.

* Notice: We don't support Inkjet printers. it cause ink smearing when printing Ncode.

2) Offset Printing

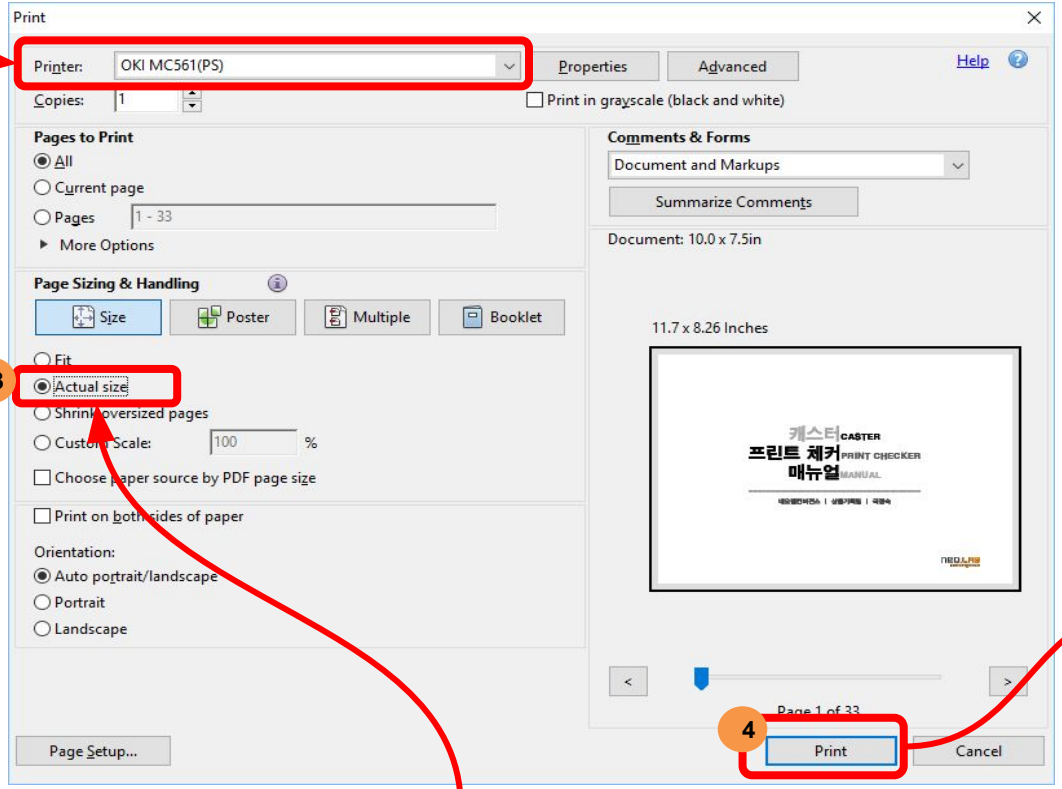


*We recommend CTP output for Ncode

* For more information, please refer to 'Ncode PDF Printing Guideline'.

3) Printing from Laser Printer using Acrobat Reader

2 After click 'Print' on Acrobat Reader, select a printer that supports Postscript



Print as Actual Size

Printer Setting (ex):

1 Admin Setting> Print Setting> Color Menu
- CMY 100% depth: Enabled
- CMYK tranformation: disabled

Postscript
Color Laser Printer

4. Application Development

NeoLab provides the Pen SDK that lets you define and develop how your app will collect and respond to related data when writing using Neo SmartPen on the content paper created.

Neo SmartPen supports only Bluetooth, and most of the necessary tasks related to Bluetooth are performed in Pen SDK, but It is a good idea to develop an App after some preliminary learning about Bluetooth.

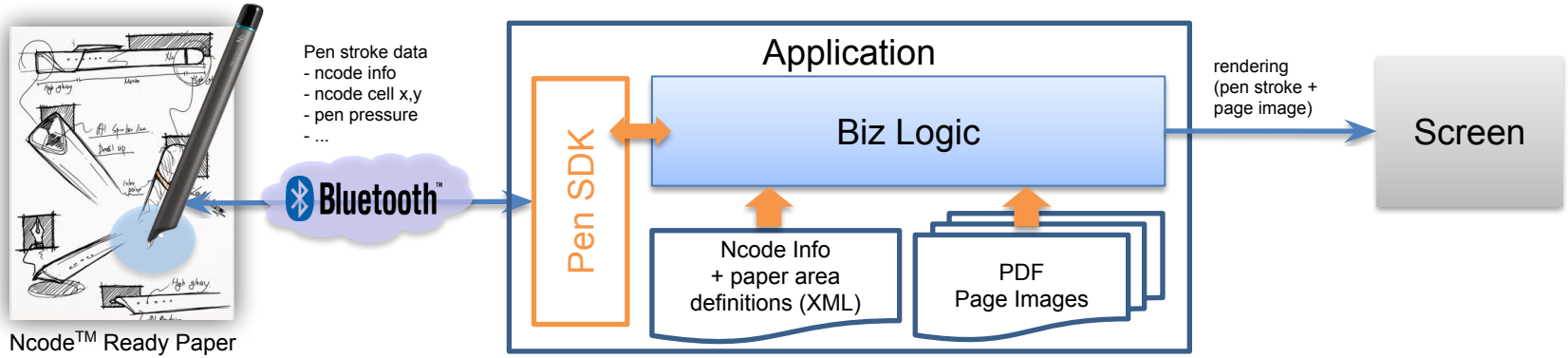
* Bluetooth specification (2 ways as below):

Type	Bluetooth Version	Pairing	Comm Speed (max)	Communication distance (outdoor)
SPP (Serial Port Profile)	2.1 EDR or higher	Pen Pairing required for first time connection.	1~3 Mbits/s (spec) 0.7~2.1Mbit/s (App)	max 100m
LE (Low Energy)	4.0 or higher	Connection is possible with a simple process. but, data speed is slow than SPP. because this BLE speed, user should wait a more time when F/W upgrade and offline data communication.	1Mbits/s (spec) Up to 305 Kbits/s (App)	max 100m

* For more information, please check the link below.
https://www.bluetooth.com

With Pen SDK 2.0, you can develop a modules that receive data from pen and change pen setting and more.

1) Flow chart of interacting and processing of each step at interlocking



*For more information about .nproj - see the document "CasterTM XML (.nproj) format spec".

step1) Read a paper info from .nproj file

step2) Proceeding pen search and register(pairing) & connect using Pen SDK

step3) Receive a paper info (Section, Owner, Book, Page) and xy coordinates from a pen on point of contact of a paper. (this xy is Ncode cell coordinates)

step4) The Pen SDK sends received info to Apps Biz Logic.

step5) Biz Logic loads the Ncode info related page image from the repository and displays it on the screen.

step6) Biz Logic stores the paper info and xy coordinates as a stroke and render to screen in realtime at needed.

(Pen SDK includes a source codes that basic rendering component and utility API)

step7) Biz Logic can perform a predefined command or function when pen xy is located in a predefined paper area.

* Please refer to GitHub for more information about Pen SDK.

2) How to download the Pen SDK

You can download the source codes from following GitHub link.
URL) https://github.com/NeoSmartpen

We supports OS platforms that Android, iOS, Windows .Net, Windows UWP.

Resources Available on Pen SDK GitHub:

- SDK Source code and binary, SDK related Sample Code
- Development related refereneces and guide documents
- Neosmartpen Bluetooth protocol documents (currently 1.0 version can be downloaded. 2.0 version, we will upload as soon as possible.)
- The protocol document is intended to allow 3rd party developers to create the SDK directly for own platforms.

SDKs that are marked as Pen SDK 2.0 is

- Can support protocol 1.0 or protocol 2.0 based pen models such as F110, F120, F121, F50, ..
- Can support bluetooth SPP or LE

SDKs that a version number not marked is

- Can support protocol 1.0 based pen models such as F110 (N2)
- Can support bluetooth SPP or LE

Currently, NeoLab's commercially available commercial notes (owner 27) are supported only through Neo Notes.

Notebook Name (1/2)	Book Code	Paper Size (mm)	Number of Pages	Notebook name (2/2)	Book Code	Paper Size (mm)	Number of Pages
Pocket Note	601	83x148	64p	College Note 1~3	617~619	216x280	200p
Memo Note	602	83x148	70p	Idea pad mini	620	127x200	100p
Ring Note	603	150x210	152p	N blank planner	625	150x210	152p
Plain Note1 ~ 5	604, 610~613	176x250	72p	BLIND NOTEBOOK	629	105x148	144p
Idea Pad	609	210x297	100p				
N_A4	614	210x297	50p				
Professional	615	140x205	250p				
Professional mini	616	90x140	200p				

* We are planning to supply the original PDF files to 3rd-party developers in the future.
so third-party developers can utilize the above notes when developing their apps.

If you want to support the new notes developed by 3rd Party developers through the Neo Notes, please contact the business team of NeoLab Convergence.

we provide a way for our customers to distribute and service their notebooks.
(This service is chargeable)

[Business Team Contacts]

- Global: _global1@neolab.net
- Korea: _biz1@neolab.net

Please refer to the github address below.
Neo Smartpen documentation and Pen SDK and Ncode SDK source codes are available for download.

https://github.com/NeoSmartpen

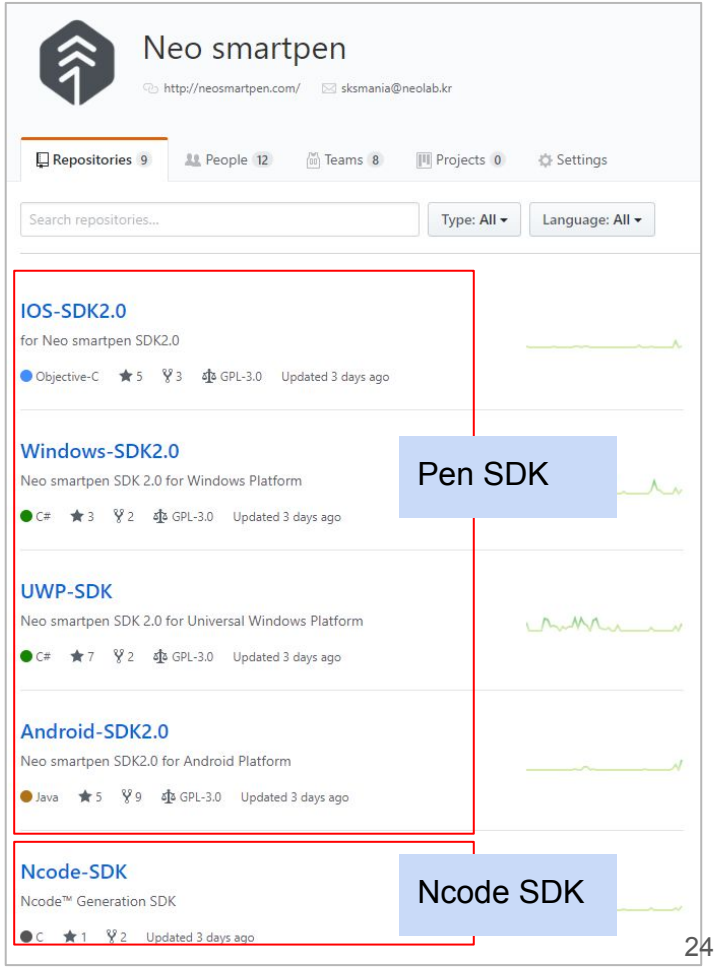
License Policy

1. We provide two types of license for Pen SDK.
   1) GPL license,
      which has the obligation to release the source code. Normally, 3rd party developer can inquiry via the github issue column, but depending on the situation of our internal, the answer may be delayed somewhat.

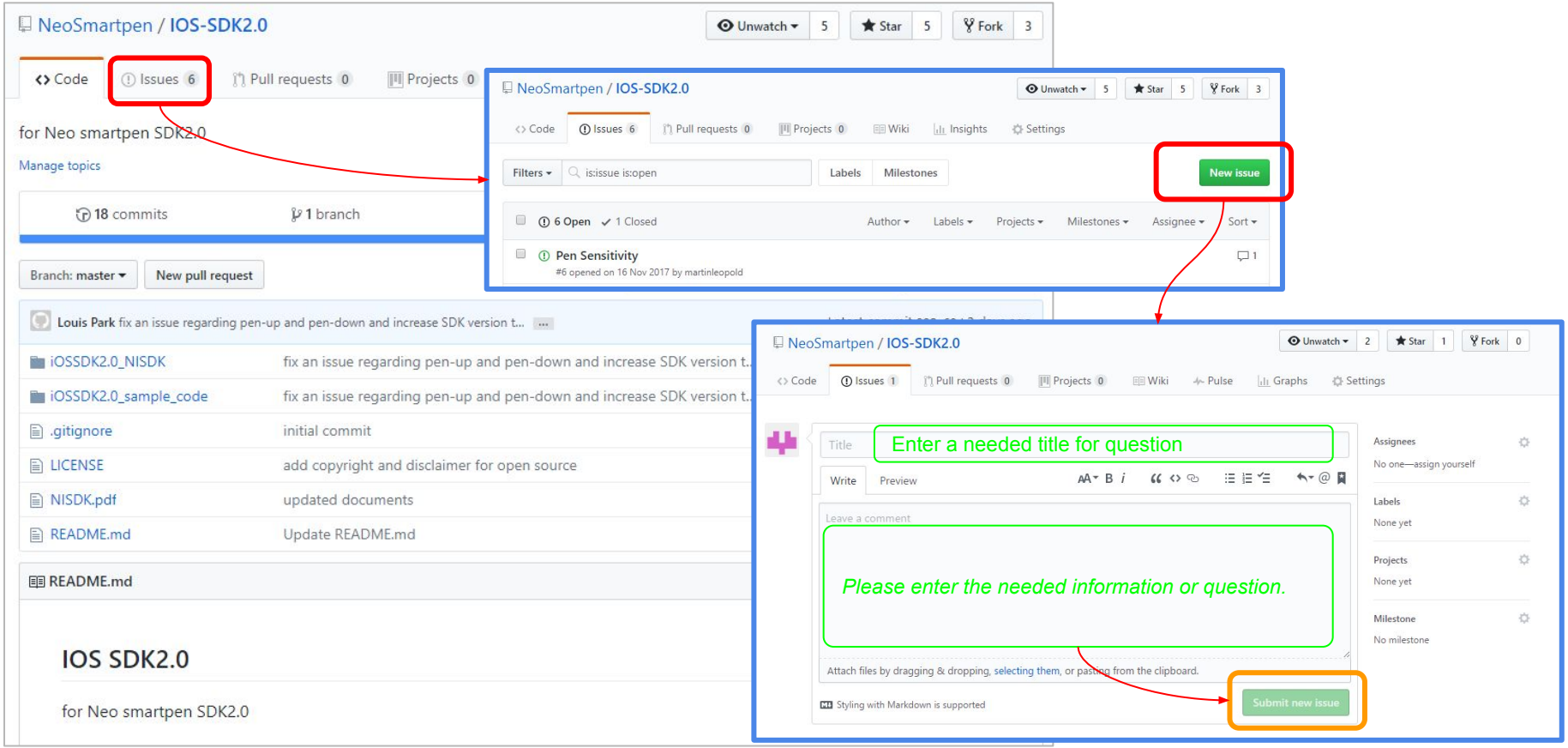
   2) commercial license,
      that does not require the source code open to be released, and technical support is available upon request. but, if business trip required, expenses incurred in case of business trips are charged separately.

2. Ncode SDK license policy is almost identical to the above Pen SDK.
Under the GPL license, Ncode tickets for 1024 pages are supported free, but under commercial license, more tickets are supported.

3. To purchase a commercial license, please contact our business team below.
   - Global: _global1@neolab.net
   - Korea: _biz1@neolab.net



On each GitHub Repository page, you can select the Issues tab and send the necessary information to the development team.



Bit allocation informations per each sections

Section	Owner	Book	Page	X	Y	비고
0	10 bit (1,024)	14 bit (16,384)	12 bit (4,096)	8 bit (256)	8 bit (256)	Supports paper sizes up to 60 cm
3	10 bit (1,024)	13 bit (8,192)	9 bit (512)	10 bit (1,024)	10 bit (1,024)	Supports paper sizes up to 2.4m
4	-	-	-	-	-	reserved
5	-	-	-	-	-	reserved
10	-	-	-	-	-	reserved
14	10 bit (1,024)	13 bit (8,192)	5 bit (32)	12 bit (4,096)	12 bit (4,096)	Supports paper sizes up to 9.7m It used for copyboards.

Thank you