INNOVATIVE BLOCKCHAIN TRACEABILITY TECHNOLOGY AND STAKEHOLDERS' ENGAGEMENT STRATEGY FOR BOOSTING SUSTAINABLE SEAFOOD VISIBILITY, SOCIAL ACCEPTANCE AND CONSUMPTION IN EUROPE

DELIVERABLE D3.9 – SDK Documentation

Lead Partner Organization	Page Up
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Document information

Settings	Value
Deliverable Title	SDK Documentation
Work Package Number & Title	WP3 - Traceability technologies development
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Review History

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3			

Document Approval

Name	Role	Action	Date
Carlos Mazorra	Project Coordinator	*Approved*	13-Dec-24

Nature of the deliverable

R	Document, report (excluding the periodic and final reports)	☐
DEM	Demonstrator, pilot, prototype, plan designs	☐
DEC	Websites, patents filing, press & media actions, videos, etc.	☐
DATA	Data sets, microdata, etc.	☐
DMP	Data management plan	☐
Ethics	Deliverables related to ethics issues.	☐
SECURITY	Deliverables related to security issues	☐
Other	Software, technical diagram, algorithms, models, etc.	☒

Dissemination level

PU	Public — fully open (automatically posted online on the Project Results platforms)	☒
SEN	Sensitive — limited under the conditions of the Grant Agreement	☐

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Current seafood traceability tools and services have the potential to take advantage of novel blockchain technologies to obtain a wide range of data making sustainable seafood practices more visible to consumers. Sea2See project will fill in existing seafood traceability gaps through development and demonstration of an innovative end-to-end blockchain traceability model throughout the seafood value chain and professional and consumer applications to increase trust and social acceptance of sustainably fished and farmed seafood.

The project will provide technological solutions to answer the need of a valuable source of data collected throughout the whole seafood value chain, verified, and covering inputs from diverse stakeholders. For that purpose, a specific focus will be put on active commitment of stakeholders and real empowerment of consumers through the implementation of societal and sectoral strategies for co-creation, communication and awareness raising.

The project runs from July 2022 to June 2026. It involves 14 partners from 6 EU countries, and is coordinated by SMARTWATER PLANET SL, Spain.

More information about the project can be found at: http://www.sea2see.eu/

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EXECUTIVE SUMMARY

The current document describes the SDKs provided by Page Up to handle the data collection and the data transmission to the Sea2See platform.

ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
RFID	Radio Frequency IDentification
SDK	Software Development Kit
UHF	Ultra-High Frequency (type of RFID)
GMS	Google Mobile Services

PROJECT PARTNERS

#	Partners full name	Short	Country	Website
1	SMARTWATER PLANET SL	SmartWater	ES	www.smartwaterplanet.com
2	TILKAL	Tilkal	FR	www.tilkal.com
3	PAGE UP	PAGE UP	FR	www.pageup.fr
4	SUBMON	SUBMON	ES	www.submon.org
5	CENTRO DE CIENCIAS DO MAR DO ALGARVE	CCMAR	PT	www.ccmar.ualg.pt
6	ASOCIACION NACIONAL DE FABRICANTES DE CONSERVAS DE PESCADOS Y MARISCOS-CENTRO TECNICO NACIONAL DE CONSERVACION DE PRODUCTOS DE LA PESCA	ANFACO	ES	www.anfaco.es
7	IOANNA N.ARGYROU SIMBOULOI EPICHEIR ISIAKIS ANAPTYXIS ETAIREIA PERIORISMENIS EYTHYNIS	NAYS	EL	www.nays.gr
8	SEAENTIA-FOOD, LDA	SEAentia	PT	www.seaentia.com
9	LANDLNG AQUACULTURE BV	LA	NL	www.landingaquaculture.com
10	UNIVERSIDADE DE AVEIRO	UAVR	PT	www.ua.pt
11	VITAGORA POLE	VITAGORA	FR	www.vitagora.com
12	ETHIC OCEAN	Ethic Ocean	FR	www.ethic-ocean.org
13	EVROPROJECT OOD	EP	BG	www.europroject.bg
14	ANP - ASSOCIACAO NATUREZA PORTUGAL	ANP	PT	www.natureza-portugal.org

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INTRODUCTION

What is and SDK ?

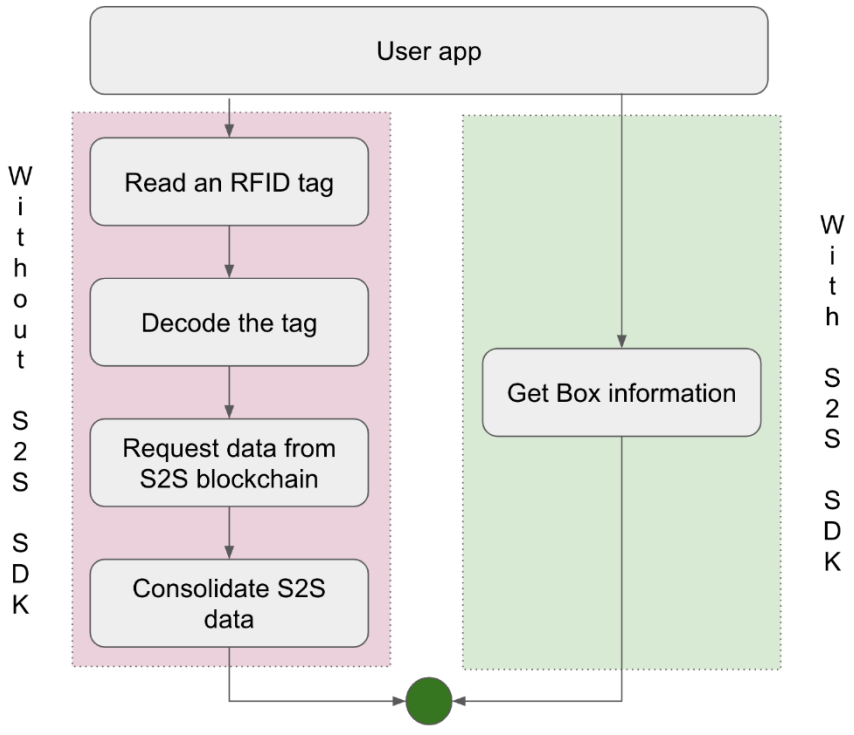
A Software Development Kit (SDK) is a set of tools provided to developers to leverage and simplify the development of specific functionalities. It is commonly provided to help integration of hardware (printers, RFID or barcode readers…). It can also be provided to facilitate integration with third parties' software.

An SDK is composed of:

- Software libraries for one or several languages - these libraries will be embedded into the final application.
- Documentation - to explain and help using the SDK.
- Demonstration application - to provide working examples to the developers.

Role of the SDK in the Sea2See project

In the Sea2See project, the SDK will abstract to the final developers all the complexity of communicating with an RFID reader and with our blockchain by providing high level methods exposed in a business centered way:

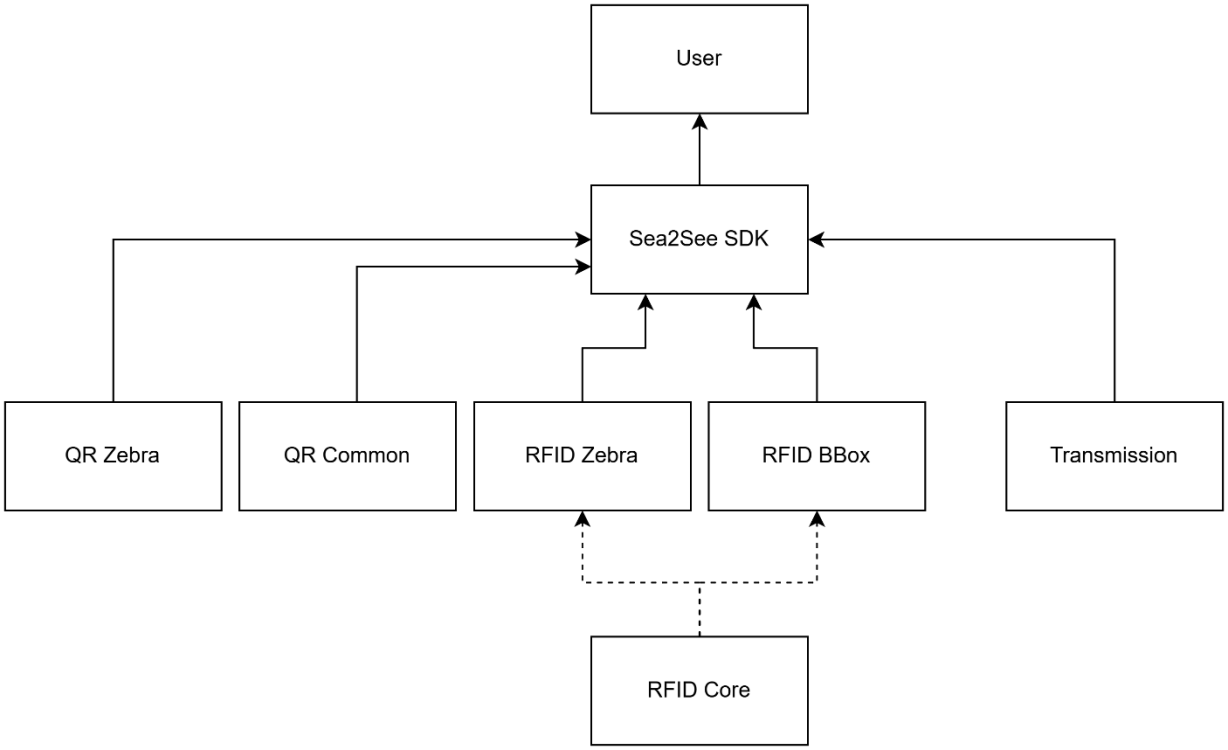


The Sea2See SDK will concentrate on two critical parts of the global process:

- RFID readers - by providing a high-level set of methods to interact with some RFID readers and providing interfaces so final developers could integrate their own readers. All technical aspects are abstracted by the SDK and developers can easily use business methods.
- Blockchain communication - abstracting all security and technical topics from the final user also by providing high level methods.

The main goal of these two abstractions is to allow any developer of any existing solutions to integrate Sea2See processes without having to dive into the technical layers of the Sea2See project.

This is a powerful way to leverage the Sea2See project deployment.



ABSTRACTION LAYER OF THE DATA COLLECTION

Preamble

This abstraction layer aims at providing developers an easy way to integrate and use RFID and Barcode reading without being aware of the technical details of each device.

Along with readers' communications, this layer also handles all RFID memory banks' formats (EPC and User) by providing a convenient set of classes to the developer.

Exhaustive list of supported RFID readers

MOBILE RFID UHF READERS

For Android ≥ 8.0 compatibility

Zebra RF8500

For Android ≥ 10.0 compatibility

Zebra RFD40

Zebra RFD90

FIXED RFID UHF READERS

Based on the PAGE UP UHF BBox

Impinj R420

Impinj R220

NON-EXHAUSTIVE LIST OF SUPPORTED ZEBRA RUGGED DEVICES

Zebra rugged devices with integrated barcode reader

ZEBRA TC2X Series Mobile devices

ZEBRA TC5X Series Mobile devices

ZEBRA TC7X Series Mobile devices

SCALABILITY

The QR ZEBRA and the RFID ZEBRA are given for example. Page Up frequently works with Zebra so it was a normal choice for us to make. Of course, any other device manufacturers can be integrated in the project based on their own specific libraries with some specific development to provide the SDK compatibility.

GENERAL ARCHITECTURE

The RFID SDK implementation holds two main features:

- Connection - Specify and connect to a given reader
- Inventory - Allows user to perform a reading at high power to retrieve information from several tags

All the implementation of the RFID SDK must follow this specific implementation:

- connect(String connectionType)
- disconnect()
- startInventory()
- stopInventory()
- configurePower(int power)
- epcStream

The epcStream variable is a Stream of String in which every EPC read by the reader while the inventory is running is emitted.
About the QR SDK depending on the operations of the reader the architecture could change.
If the reader is an integrated reader (like Zebra TC27), the SDK exposes a Stream of String in which the scanned result will be exposed.

If it’s a regular phone / doesn't have any integrated barcode reader, a method call will open the camera to scan the code and return its value.

Because of that differentiation, the methods of the different QR SDK aren’t generic.

SPECIFIC DESCRIPTIONS

QR ZEBRA

The ZEBRA QR SDK works with Datawedge which is installed on every Zebra device. The Datawedge configuration needed for the QR reading is created with the initialization of the SDK. This profile is named "**sea2see_profile**". The configuration of the profile is the following:

- **intent_output** = enabled
- **intent action** = sea2see_broadcast_receiver
- **intent_category** = Default
- **intent_delivery_mode** = broadcast intent
- **package_name** = context package name
- **activity_list** = *
- **profile_name** = sea2see_profile
- **profile_enable** = true
- **config_mode** = create_if_not_exist
- **reset_config** = true
- **send_result** = complete_result
- **command_identifier** = create_profile

QR COMMON

The common QR SDK works with the Google library com.google.android.gms:play-services-code-scanner rendering the SDK unusable on non-gms phones.
Thanks to this, the SDK doesn't require any specific permissions.
This SDK only exposes one method: "scanQrCode" which opens the camera and returns the scanned data as a String.

1D (CODE128, EAN13...) and 2D (QR CODES, Datamatrix...) barcodes can be read thanks to this.

RFID ZEBRA

The Zebra RFID SDK depends on the Android Zebra SDK RFID_API3. Every AAR file needed to integrate RFID_API3 is stored within the SDK libs folder.
This SDK can't be used by devices with API level < 26, which is Android 8.
The configuration set at the SDK initialization is the following:

- **UHF_Session** = 2
- **Default power** = 300

- **TARI** = 0
- **RFMode** = Default

The power is the only parameter available for modification because it is

RFID BBOX

The RFID BBOX Sea2See SDK depends on the dedicated SDK described in the D3.8 “Page Up Embedded UHF reader documentation”.

RFID BBOX integrates that original Java Android SDK to provide compatibility with Flutter (Dart).

ABSTRACTION LAYER OF THE DATA TRANSMISSION

Initialization

This part describes the transmission SDK which is designed to make the connection and API calls between production apps and Sea2See platform easier.
This SDK is made up of three distinct parts.

1. A Connection service which is dedicated to the AWS Cognito authentication part for sign in and sign out.
2. A Data Retrieving service which is dedicated to the fixed data retrieving like fishing zones, fish species etc. This part is made up of several WEB API calls and will use the token retrieved by the signIn method of the Authentication module.
3. A data publication service dedicated to the publication of data retrieved by the client application. All the classes that the client application needs to send these data are exposed by the SDK and described further in this document.

NB : The initialization is registered at the top level of the SDK and will initialize each service by giving them the required information. Those required information are:

- AWS PoolId
- AWS ClientID
- RetrieveServerAddress
- PublishServerAddress
- ServerChannel (ex: pageup.sea2see)
- StakeholderID (ex: GENFROCO000000022)
- StakeholderUnit (ex: genfroco-trade)

Authentication

The Authentication service will use the AWS pool Id, the AWS client id provided during the SDK initialization.

The AWS Cognito configuration is performed during the initialization of the SDK with the provided data.

The Authentication service is composed of three methods but only two are exposed. A **SignIn** method which takes the username and password as arguments to authenticate the user on the server and will return a Boolean value to inform the user if the process is successful.

A **SignOut** method which will clean the authentication service, sign out the user and return a Boolean value to inform the user if the process is successful.

A **RefreshToken** method which is not exposed by the SDK and will only be called within it. This method will perform the refreshing token operation in case the current token just timed out.

Web Services

RETRIEVING

The Retrieving service will use the **RetrieveServerAddress** provided during the SDK initialization.

The sole responsibility of this service is to perform API calls to the Sea2See traceability platform to retrieve the server-side data. Those data are:

- Boats
- Fishing zones
- Species
- Buyers

A connection timeout is set to 5 seconds, and a response timeout is set to 3 seconds on each call.

PUBLISHING

The Publishing service will use the **PublishServerAddress**, **ServerChannel**, **StakeholderID** and the **StakeholderUnit** provided during the SDK initialization.

The sole responsibility of this service is to perform API calls to the Sea2See platform to publish the data. There is one method (and 1 API call) per production step, the production steps are:

- Receiving
- Shipping
- Landing
- Fishing
- Auction
- Distribution (Receiving/Shipping)
- Packaging
- Retail

The Distribution step is a blend of Receiving and Shipping and doesn't have its own Production step in the Sea2See platform. However, in the SDK, the Distribution method performs only 1 call.

A connection timeout is set to 5 seconds, and a response timeout is set to 3 seconds on each call.

LIST OF EXPOSED CLASSES BY THE TRANSMISSION SDK

ClassName	Description	Extended Description
Sea2seeTransmissionClient	Main client class for Sea2see API	Singleton class that handles all API interactions including authentication, data retrieval, and event publishing. Provides methods for initialization, sign-in/out, and various API operations.
QuantityList	Base class for quantity information	Stores information about product quantities including epcClass (product identifier), quantity amount, and unit of measure (uom). Implements DtoBase for JSON serialization.
SourceList	Base class for source information	Manages source identifiers and types, tracking where products or events originate from. Implements DtoBase for JSON serialization.

DestinationList	Base class for destination information	Handles destination identifiers and types, tracking where products or events are headed. Implements DtoBase for JSON serialization.
ReceivingEvent	Event class for receiving operations	Represents product receiving events with timestamps, quantities, locations, and business transaction details. Includes source and destination tracking.
ShippingEvent	Event class for shipping operations	Manages shipping events with information about quantities shipped, destinations, and transport conditions. Includes temperature tracking capabilities.
LandingEvent	Event class for landing operations	Handles fish/seafood landing events at ports, including quantity information and source vessel details. Specific to port receiving operations.
PackagingEvent	Event class for packaging operations	Manages packaging transformation events, tracking both input and output quantities along with packaging details and location information.
Boat	Reference data class for vessels	Stores basic vessel information including unique identifier (rowId), country of registration, and vessel name.
Buyer	Reference data class for buyers	Maintains buyer information including unique identifier (rowId), country, and display identifier for UI purposes.
FishingZone	Reference data class for fishing areas	Contains fishing zone information including identifier, country jurisdiction, and display name.
Specie	Reference data class for fish species	Comprehensive species information including GTIN, region, category, size class, country of origin, and description.

BizTransactionType	Enumeration for transaction types	Defines standard business transaction types such as sales and trades.
FreshFishWhole	Enumeration for fish states	Defines different states of whole fish (e.g., entire, gutted).
FreshnessGrade	Enumeration for product freshness	Standard grades for product freshness (E, A, B, Unfit).
MarketableSizeRange	Enumeration for size ranges	Standardized size ranges for fish products.
MaterialOfPackaging	Enumeration for packaging materials	Defines types of packaging materials (LDPE, PP, PS).
Vocabulary	Enumeration for standard vocabularies	Standardized vocabulary types used throughout the system.

SDK ARCHITECTURE