

# SAPI 2.0d

## System Overview

SENAF A.V.

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# Contents

<b><u>CONTENTS</u></b>	<b><u>2</u></b>
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## FIGURES 3

<b><u>1</u></b>	<b><u>INTRODUCTION</u></b>	<b><u>4</u></b>
1.1	WHAT IS SENAF?	4
1.2	THE SAPI	4
1.3	CONTENTS OF THIS DOCUMENT	4
1.4	OTHER RELEVANT DOCUMENTS	4
<b><u>2</u></b>	<b><u>SENAF MARKET OVERVIEW</u></b>	<b><u>5</u></b>
2.1	MEMBERS OF THE MARKET	5
2.2	TIME STRUCTURE OF THE MARKET	6
2.3	MESSAGES TYPES	6
<b><u>3</u></b>	<b><u>DEFINITIONS</u></b>	<b><u>8</u></b>
<b><u>4</u></b>	<b><u>GENERAL DESCRIPTION OF THE SAPI</u></b>	<b><u>9</u></b>
<b><u>5</u></b>	<b><u>SENAF SYSTEM ARCHITECTURE</u></b>	<b><u>10</u></b>
5.1	OVERVIEW	10
5.2	NETWORK ARCHITECTURE	10
5.3	SECURITY	11
5.4	OPERATION OF THE SYSTEM	12
<b><u>6</u></b>	<b><u>APPLICATIONS DEVELOPMENT</u></b>	<b><u>13</u></b>
<b><u>7</u></b>	<b><u>SAPI – CONDITIONS OF USE</u></b>	<b><u>14</u></b>

## Figures

<b>Figure 1:</b> Time structure of the market.....	6
<b>Figure 2:</b> Structure of the connection with the market.....	10
<b>Figure 3:</b> Network architecture.....	11

# 1 Introduction

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## 1.1 What is Senaf?

Senaf, "*Sistema Electrónico de Negociación de Activos Financieros*", Financial Asset Electronic Trading System, allows automatic order processing and dealing on the Spanish Public Debt Market and other fixed income markets. Use of this trading system involves the establishment of a computerised link between each of the members of the market and the Senaf central system via hardware and software provided and installed by SENAF A.V.

## 1.2 The SAPI

The gateway to the Senaf trading system is the Senaf Application Programming Interface Server (called "SAPI"), which allows the information systems of each market member to receive information and issue transaction orders, all electronically. In order that the SAPI can be integrated with the software applications used by market members, specific modules (called "Component Modules") must be added to these applications.

## 1.3 Contents of this document

This document presents an introduction to the Senaf market, its conditions of use and its technical implementation. This is a general purpose document intended to the executives, operators, and traders, as well as technical staff who wish to get an overall understanding of the SAPI. SENAF A.V. will provide all parties concerned with specific detailed documents as required. The available documents are listed in the following section.

## 1.4 Other relevant documents

- ⇒ SAPI specification
- ⇒ SAPI Component Modules certification guide
- ⇒ Developer's guide

## 2 Senaf Market Overview

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Senaf is a blind market, i.e., it denies its members any knowledge of the counterparts with which they are dealing.

Senaf provides an open interface to the market for which specific applications can be developed, allowing the system to be tailored to the needs of each of its members. Through this open interface (the SAPI), market members can enjoy the advantages of an electronic market running on a last-generation platform.

The SAPI allows entities to integrate their computer systems, information processing systems and client service systems with the market and to use them to operate within it. In brief, by means of the SAPI server, complete information on the market can be obtained and orders can be sent to it.

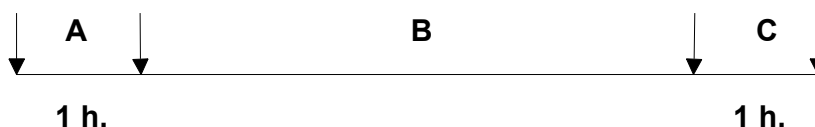
### 2.1 Members of the market

All of the following entities can operate in the market:

- ⇒ Brokerage Members (Brokers): Participants of the system that are authorised by the competent bodies to mediate in the system and that have entered into the relevant contracts with SENAF A.V.
- ⇒ Dealer Members (Banks or Entities): Participants of the system that are authorised by the competent bodies to trade in the market and which have entered into the relevant contracts with SENAF A.V. Dealer Members can send orders to Senaf directly in their own name or through the Brokerage Members. There exist two categories of Dealer Members:
  - Dealer Members with entire capacity: Members that are authorised to make transactions directly in Senaf without limitations as to their ability to send orders.
  - Dealer Members with limited capacity (Price-Takers): Members that are authorised to enter in Senaf only buy or sell orders (hit) for existing bid and ask prices, but not to quote their own prices.
- ⇒ Senaf Supervision: The market supervisory body; it is the only member of the market authorised to cancel and modify hits that have already been done. Senaf Supervision may place positions in the name of SENAF A.V. or third parties, as well as hit on existing positions. SENAF A.V. is the Brokerage Firm responsible for the management and operation of Senaf, and is also the owner of the System.
- ⇒ Bank of Spain: The market regulatory body; it is authorised to take part in the market and place its own positions but not those of third parties, as well as hit on existing positions.
- ⇒ Treasury: The issuer, able to visualise all positions.

## 2.2 Time structure of the market

The time frames that determine the communications status of the SAPI with the Senaf market are shown in Figure 1.



**Figure 1:** Time structure of the market

- ⇒ Zone A: Starting one hour before the trading session opens, the SAPI accepts connections from the users in order that emissions that are going to be traded can be composed.
- ⇒ Zone B: This is the time interval during which trading takes place in the market.
- ⇒ Zone C: Until one hour after trading has concluded, connections can be effected in order to obtain information about the trading session.

Outside these three time zones, connection attempts will be rejected.

## 2.3 Messages types

The messages that can be processed by the market fall into two general types:

- ⇒ Requests: These are messages sent by Members to the Senaf market. They are regarded as firm orders, but will not be deemed valid until they have been fully processed, registered and published by the Senaf central system; only then can their outcome be considered (whether a buy operation has been produced, whether the request is invalid for some reason, etc.).
- ⇒ Publications: These are messages sent by the market to all its Members. Contrary to other markets, Senaf publishes absolutely every price quoted and every operation crossed in the market to all its Members.

A Member receives publications in response to its requests as well as publications in response to requests sent by others or due to market events.

Using the publications a Member can obtain all the prices traded in the market and to keep updated information about the market.

Requests can be further divided into the following order types:

- ⇒ Connection with and disconnection from the market:
  - Connection establishment.
  - User authentication by means of his user ID and password.
  - Disconnection request.
- ⇒ Quote handling:

- Buy or sell requests.
- Bid or ask requests.
- Combined bid/ask request.
- Quote modification request.
- Combined quote modification request.
- Quote cancellation request.

All these requests admit multiple variations concerning prices, volume, brokers, positions, etc.

⇒ Information requests:

- Compliance information.
- Operations information.
- Traded instruments information.
- Operations summary information.

All these requests admit multiple variations, permitting them to meet the precise requirements of the user.

There are also several types of publications that do not originate from a request sent by the Member:

⇒ Market session status:

- Market session start/end.
- Trading session start/end.

⇒ Quote information:

- Crossed operation.
- Operation modification.
- Reference update.

⇒ Recovery:

- Recovery start/end.
- Recovery messages.

⇒ Control:

- Control response.
- System problems notification.

### 3 Definitions

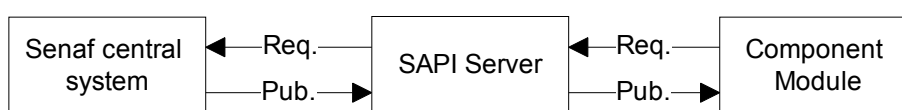
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A summary of the terminology used to describe the Senaf market, its components and its operation is presented below:

- ⇒ Market: This is where financial assets trading, quotes publishing, etc. takes place.
- ⇒ SAPI: A connection protocol that links the Component Module with the Senaf market, sending and receiving messages in both directions.
- ⇒ Broker: Entity that introduces orders in the market.
- ⇒ Member : Entity by means of which an order is issued to the market, either in its own name or on behalf of a broker.
- ⇒ User: A user name and a password registered in Senaf registry. Most order have a user scope. In SAPI a user can refer to its own quotes or operations. A user can have more than one simultaneous connection with Senaf. Many users can exists within a member.
- ⇒ Component Module: Information system that an entity certifies for its connection with the Senaf market. It is through this module that Users can operate in the market.
- ⇒ Applications Supplier: An entity authorised by SENAF A.V. to develop software that can interact with a SAPI server. All Members subscribing to the SAPI Service can be Application Suppliers.
- ⇒ Terminal session: Period of time during which a User can obtain information from the market and interact with it in accordance with the certification level of his software.
- ⇒ Request: A message sent by the Component Module to the SAPI.
- ⇒ Publication: A message sent by the SAPI to the Component Module.
- ⇒ Reference: An emission traded at a certain date.
- ⇒ Level: Bid/Ask price for a reference.
- ⇒ Position: Rank that a bid/ask quote for a reference occupies within a particular level. Positions are assigned by strict arrival order.
- ⇒ Involved entity: Entities to which privacy restrictions do not apply. In a quote the owner member, the issuer broker, as well as SENAF A.V., Bank of Spain, and Treasury are involved entities.

## 4 General Description of the SAPI

The SAPI functions as an interface between the entities taking part in the market and Senaf. Most entities currently have terminals from which market developments can be observed in real time, but these terminals do not allow automatic interaction with the system or the acquisition of data for processing. The purpose of the SAPI is to enable the members to construct applications that receive market data and integrate them into their own information systems, permitting them to process this data and to send their orders manually or automatically.



**Figure 2:** Message flow between a Component Module and the Market through the SAPI Server.

The SAPI is installed in a special server, generally located on the entity's premises. The Terminal/Client opens a connection to the SAPI server and sends system commands by means of a series of messages. The SAPI server interprets these messages and sends a command to the central system, if required; the central system processes the command and responds to the SAPI server with a new message. The server transfers the response to the Terminal/Client with the requested data or modifications. The user's application, installed in the Terminal/Client, will process the information as appropriate. (See Figure 2)

The system offers different information flow levels for members of the market to choose from:

- ⇒ 1) Back-office level: the user will receive only the operations crossed.
- ⇒ 2) Summary level: the operations crossed and the summarised or aggregate position are received. (Not implemented yet).
- ⇒ 3) Short position level: the operations crossed and all changes of positions are received.
- ⇒ 4) Long position level: the operations crossed and the complete references are received. (Not implemented yet).
- ⇒ 5) Minimum Operating flow level: the operations crossed and request acknowledge.

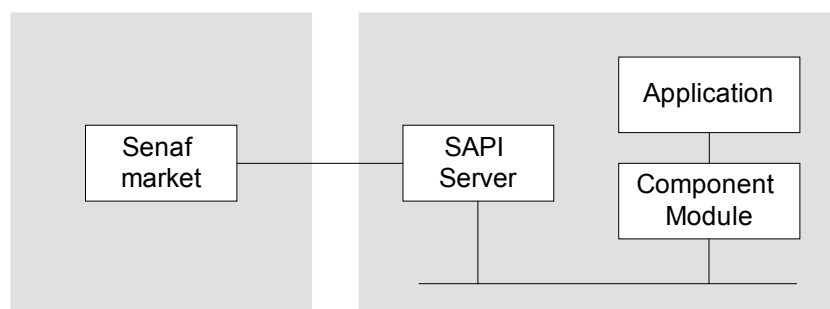
The wide array of messages included in the SAPI system make it possible to carry out most functions to be expected of a trading system:

- ⇒ quoting
- ⇒ order routing
- ⇒ information registration and distribution
- ⇒ decision support system
- ⇒ risk analysis, etc.

## 5 Senaf System Architecture

### 5.1 Overview

Figure 3 shows how the user's information systems are connected with the Senaf central system. The following Senaf components can be seen:

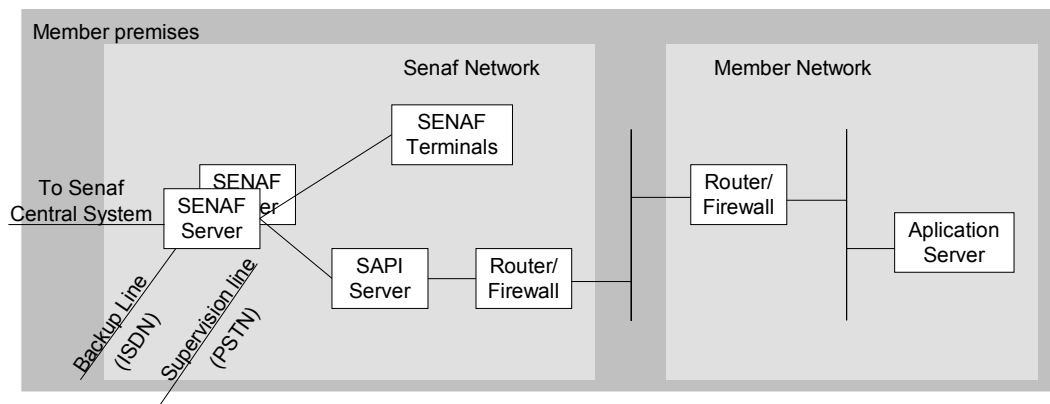


**Figure 3:** Structure of the connection with the market

- ⇒ The Senaf market: Interaction with this component is possible only through the SAPI server provided by SENAF A.V.
- ⇒ The SAPI Server: This connection server is located on the premises of the entity that is using the Component Module, linking it with the market by the SAPI protocol.
- ⇒ The Component Module: This information system operates in the Senaf market through the SAPI. It must be certified by SENAF A.V.
- ⇒ The Application: This software uses the Component Module to operate in Senaf. This application is not certified by Senaf. Senaf will not have any responsibility about the behaviour and usage of this application.

### 5.2 Network architecture

Figure 4 depicts the network architecture of the Senaf infrastructure installed in the Member's premises. The following elements can be found:



**Figure 4:** Network architecture

- ⇒ The system uses three different kinds of communication lines:
  - A leased line that links the Member with SENAF A.V. This is the usual channel through which the Member communicates with the market and operates within it.
  - A backup line (ISDN) that can be used when some problem arises with the leased line, providing the Member with redundant communication channels with the market.
  - An analog supervision line. Through this line, SENAF A.V. can verify the correct functioning of the system and for Operation & Maintenance.
- ⇒ The Senaf Server. This is the gateway to the Senaf central system. It is duplicated in order to secure the connection against the failure of the master server.
- ⇒ The SAPI Server.
- ⇒ Senaf Terminals. These terminals are provided by SENAF A.V. for connection with the market.

### 5.3 Security

When designing the Senaf system, a great deal of attention was devoted to security issues regarding access to the market and Member connections. The main security aspects from the Member's point of view are the following:

- ⇒ The existence of a local Router/Firewall in the gateway to the Senaf network, separate from the Member's own main Router/Firewall. This element allows traffic through a single TCP port. It is important to keep in mind that the system uses its own protocol; in particular, http protocol is not admitted.
- ⇒ Every User of the system must have a username and a password.
- ⇒ A signature is embedded into the Member's Component Module, permitting the Senaf system to ensure that it is communicating with an application certified by SENAF A.V. Moreover, this signature is different for each new version of the application.

## 5.4 Operation of the system

A session can be started within any one of the three time zones described in Section 2.2, "Time structure of the market". The framework operation of the system is as follows:

- ⇒ Connection to the system
- ⇒ The User logs in the system and receives the traded instruments.
- ⇒ Whenever the user sends a request
  - the market validates the order
  - updates the market
  - publishes the outcome of the order properly filtered

The requests are kept in strict arrival order to the Senaf market.

Until one hour after trading has concluded, the User can keep his terminal session open (or open a new session) and obtain whatever information he requires about the trading session.

The User can log out of the system at any moment and log in again later.

## 6 Applications Development

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The members of the Senaf market are not obliged to develop their own applications in order to interact with the market: they can use either third-party applications or the terminals provided by SENAF A.V.

If a member entity is willing to develop specific software, it can turn to its own development teams or to the official Senaf Application Suppliers. In either case, the resulting application must undergo a certification process. The nature of this process will depend on the information flow level the entity is using, giving rise to the following different certification levels:

- ⇒ Level 1: Back-office. The certified Component Module is able to receive and correctly interpret the operations crossed in the market, without taking part in it.
- ⇒ Level 2: Minimum Operating.
- ⇒ Level 3: Non-operative summary. (Not implemented yet).
- ⇒ Level 4: Summary. (Not implemented yet).
- ⇒ Level 5: Non-operative Short market. The certified Component Module is able to correctly interpret the operations crossed and the market positions.
- ⇒ Level 6: Short market. The certified Component Module is able to correctly interpret the operations crossed and the market positions, and to effect hits on these positions.
- ⇒ Level 7: Non-operative long market. (Not implemented yet).
- ⇒ Level 8: Long market. (Not implemented yet).

SENAF A.V. will provide application developers with a Development Kit that includes:

- ⇒ Kit documentation.
- ⇒ Recommended development stages.
- ⇒ Support guidelines.
- ⇒ Expected application behaviour.

## 7 SAPI – Conditions of Use

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- 1 Each Member has a computerised link to Senaf via Terminals, Servers, and a SAPI Server installed and provided, both its hardware and software components, by SENAF A.V. The aforementioned connection allows the Member's information systems to receive information and issue transaction orders, all electronically. This requires a perfect integration between the SAPI and the Member's software applications (hereinafter, the "Applications"), and so a separate component or module is required, integrated into the Applications, which alone can communicate with the SAPI, transmitting and receiving messages from the SAPI, in the format defined by Senaf, and in line with all the technical requirements of the system. This module (hereinafter, "the Component Module") therefore becomes a vital tool for the effective functioning of Senaf, since it must enable the integration and communication between the remainder of the components of the Applications and the SAPI, avoiding the integration problems which can arise with the Applications, and thus enable the Member to operate within Senaf with all the advantages and performance which this system offers equally with the other Members within the category, without malfunctions which could affect or prejudice Senaf.
- 2 The Component Modules which are integrated in the Applications should be in compliance, under SENAF A.V. criteria and in line with the technical guidelines, with all the characteristics, specifications and conditions which enable the exchange and flow of information between the Applications and the SAPI. In order to achieve this, as well as establishing the required format and protocols of use, as contained in this document, a system of certifications of Component Modules and authorisations has been created, which requires the express recognition of the suppliers concerned, who are authorised to develop and install the Component Modules (hereinafter, the "Authorisation"), so that only those Members or suppliers authorised by SENAF A.V., as elected by the Member, may develop the Component Modules for the Applications.
- 3 The Member will only be able to integrate his Applications with the SAPI, and thus exchange information between the SAPI and the Member's equipment if, in addition to complying with the formats and the protocols of use established by SENAF A.V. in the technical information in force at the time, and in the event that the Component Module has been developed and/or installed either by the Member, using his own resources, or by a supplier authorised by SENAF A.V., the Component Module has been certified by SENAF A.V. (hereinafter, this requisite will be referred to as the "Certification").
- 4 SENAF A.V. will provide the Member, on a regular basis, with a list of authorised suppliers. It will be the responsibility of the Member to contract the services of the latter for the development and/or installation of the Component Modules of their Applications (in which case the Certification of these Component Modules will be obtained from the corresponding authorised supplier), or to develop and/or install the Component Modules using their own resources, in which case the Member will be responsible for obtaining the Certification.
- 5 In the event that the Member carries out the development/installation of the Component Modules, without recourse to a SENAF A.V. authorised supplier, a

Certification must take place. There will only be Certification of the Component Modules when, in the judgement of SENAF A.V., the tests referred to in paragraphs 6 and 7, have been satisfactorily passed.

- 6 The certification procedure will be initiated following a written application by the Member.
- 7 SENAF A.V. will carry out all tests and checks it deems necessary on the Component Module, in which respect the Member will, at all times, lend his full support, in terms of both technical and human resources, as required. The duration of the tests will be determined by SENAF A.V. in accordance with the complexity of the product concerned and the workload of the certification team.
- 8 SENAF A.V. will evaluate the results of the tests and will go on to decide whether the Component Module (or version or subsequent development of the same) is appropriate in its totality to fulfill the integration function of the Application with the SAPI. If this is the case, the product concerned will be certified. If not, the Member may be required to carry out the necessary modifications before certification is granted.
- 9 The Member will be advised of the changes in the SAPI by means of an update of this technical specifications document, at least three months prior to the date on which they are planned to come into effect.
- 10 Within a maximum period of two months from this advice, the Member will carry out, or request an authorized supplier to carry out, the necessary modifications to permit integration with the SAPI. Once this has taken place, the process referred to in paragraphs 6, 7 and 8 above will be initiated to determine the effective date of the Certification.

The certification process may not be extended beyond the date planned for the introduction of the modifications to the SAPI, unless the Member, or authorized supplier making the modifications concerned, if applicable, is the cause of this delay, or if the above-mentioned two-month period was not complied with, in which case the product in question will be excluded from Certification until such time as the Certification process has been completed. However, in all events, the changes in the SAPI may take effect on the date communicated by SENAF A.V. in accordance with paragraph 9 above.

- 11 SENAF A.V.'s liability toward the Member is limited to faults produced in the SAPI, provided that such faults are not attributable to any handling, modification, relocation, or operation of the component pieces of equipment by the Member, the authorized supplier, or any other third party other than SENAF A.V., outside the parameters established in the existing documentation, and in any event if such handling, modification, relocation or operation of equipment has been carried out by a person not authorized by SENAF A.V., or by the Member. The SAPI issues and receives a flow of information which exceeds the boundaries of the physical equipment itself. The liability of SENAF A.V. will, in this respect, be limited to the physical equipment (SAPI) which generates the flow of information. The Member will therefore be responsible for the correct interpretation and treatment of outgoing messages. Likewise, the Member will be responsible for ensuring the arrival of the messages to the SAPI, in compliance with the formats and protocols as established by SENAF A.V. within this SAPI description, and the technical documentation in force at the time.

- 12 The Member will be liable to SENAF A.V. for damages which may be caused to the SAPI or to Senaf systems, deriving from the defective reception of signals or messages from their Applications, when the Component Module of these aforementioned Applications has not been certified by SENAF A.V., or in the event the Certified Component Modules are used in an inappropriate, negligent or improper manner.
- 13 The Member is obliged to maintain, and to ensure that his employees also maintain, absolute confidentiality in respect of the information, received by whatever means or method and whatever its nature, whether or not originating directly from SENAF A.V., to which they may have access in relation to the SAPI and the systems which constitute Senaf, and in particular in respect of the content of this SAPI Descriptive Document and any other technical information supplied by SENAF A.V.

The confidentiality obligation contained in this stipulation will remain in force, and as such will be required of the Member, beyond the period of the contract with SENAF A.V.

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