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| Logo of the European Commission | EUROPEAN COMMISSION  DIRECTORATE-GENERAL FOR MOBILITY AND TRANSPORT  Directorate D – Waterborne  D.1 – Maritime Transport and Logistics |

European Maritime Single Window environment

EMSWe Overall Functional Architectural Document

Summary of changes:

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| --- | --- | --- | --- |
| Version | Date | Created by | Short Description of Changes |
| 0.3 | 21/05/2021 | DG MOVE | 1St Draft version of the document |
| 0.4 | 18/06/2021 | DG MOVE | Improvements and changes from the first round of contributions (NL) |
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| 0.7 | 08/10/2021 | DG MOVE | Alignment of the term "sender" with the EMSWe data set and other documents |
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| 0.12 | 09/12/2022 | DG MOVE | Align references to the latest documentation and text of Implementing Acts;  Merging list of components with their descriptions;  Removing component dependency description;  Adding more precise component functionality list;  Removing assumptions not fully defined; |

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# Definition and purpose

European Maritime Single Window environment consists of a network of Maritime National Single Windows with harmonised reporting interfaces (User-2-System and System-2-System) and includes exchanges via SafeSeaNet and other relevant systems as well as common services for user registry and access management, addressing, ship identification, location codes and information on dangerous and polluting goods and on health[[1]](#footnote-2).

All of these components (systems and services) interact with each other forming the reporting environment that allows declarants to fulfil - electronically and in a harmonized way – the reporting obligations for ships arriving at, staying in and departing from a Union port.

The purpose of this document is to describe and put in the spotlight responsibilities of tasks and functions of the various components of the environment when data is exchanged between declarants and MNSWs. Furthermore, the document shall provide a better stakeholder understanding of the interactions between components when data is exchanged within the boundaries of the EMSWe.

This document also aims at providing an overall overview of the European Maritime Single Window environment. It describes the functions of its main components as well as the interactions that may occur among them, in view of providing stakeholders with an immediate understanding of the envisaged technical framework for the electronic transmission of information in the context of the Regulation (EU) 2019/1239. This document does not aim at replacing, modifying or even clarifying the content of the implementing and/or delegated acts related to the implementation of the Regulation itself.

# References

List of documents that were used as reference include the following:

|  |  |
| --- | --- |
| Document code\* | Document |
| REG | [Regulation (EU) 2019/1239 of 20 June 2019 establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R1239)[[2]](#footnote-3) |
| RIMFTS | Functional and Technical Specifications of the Reporting Interface Module v2.61 |
| MIG | Message Implementation Guide |
| IA | Commission Implementing Regulation (EU) XXXX/2022 of 28 October 2022 laying down technical specifications, standards and procedures for the European Maritime Single Window environment pursuant to Regulation (EU) 2019/1239 of the European Parliament and of the Council[[3]](#footnote-4) (Annexes 1-7) |

\*Document code in this functional architecture description serves linking the outlined functionalities with the referenced documents. The purpose of codification is also important to limit discussions that have already taken place. Each function code will consist of two parts – prefix of the document code and the place where the appropriate function is described or mentioned.

# Principles

Principles of this description document shall serve as a guide on how the document shall be developed, scoped and treated.

* P1: EMSWe is an environment where central services, national services and components interact with each other and in different forms may have interaction with other services and systems. The document will define boundaries of such description respecting the various responsibilities and mandates. This description will not describe the functions of systems the Regulation does not mention.
* P2: Functional architecture description will be divided by type of interaction (U2S & S2S) and will not be mixed. The national technical architecture of MNSW will not be described.
* P3: The Regulation reflects a shared responsibility between stakeholders, therefore mandates of each group of stakeholders of its services and components shall be respected and laid out.
* P4: The description per type of interaction (U2S and S2S) shall consist of component/service description, list of actions and functions involved and process flows that puts the components/services and functions in order.
* P5: Process flows shall be limited to a generic level of formality respecting the boundaries of national business processes.

# EMSWe high level architecture



Figure 1: EMSWe high-level architecture representing one Member State, its MNSW and links to other relevant systems. It also represents communication channels for the declarant.

The European Maritime Single Window environment is composed of IT components developed and managed either at a centralised or national level. The maritime National Single Window is a nationally established and operated technical platform for receiving, exchanging and forwarding electronically information to fulfil reporting obligations and includes a harmonised reporting interface module (to enable standardized system-to-system communication) and a graphical user interface. MNSW uses and is supported by a common user registry and access management system, common databases, and a common addressing service.

The central component of EMSWe is the MNSW, which is a nationally established and operated technical platform for receiving, exchanging and forwarding electronically information for declarants to fulfil reporting obligations[[4]](#footnote-5).

The IT components in blue colors represent those components the Commission is responsible for in terms of development or availability. To get a more comprehensive view of the EMSWe architecture links to other systems; communication channels are also represented.

***List of components and common mechanisms***

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Name in diagram | Description | Articles |
| 1 | MNSW | Maritime National Single Window | Article 2(3) |
| 1 | MNSW-Core | This is technically the part (back-end) of maritime National Single Window that declarant does not interact with directly and which is out of the Regulation (EU) 2019/1239 harmonization scope. |  |
| 2 | GUI | A web interface for two-way web-based user-to-system data submission to a maritime National Single Window, allowing declarants to enter data manually, inter alia, by means of harmonised digital spreadsheets and functions that enable reporting data elements to be extracted from those spreadsheets, as well as including common functionalities and features that ensure common navigation flow and data upload experience for the declarants | Articles 2(9), 6(4) |
| 3 | RIM | A harmonised middleware component of the maritime National Single Window through which information can be exchanged between the information system used by the declarant and the relevant maritime National Single Window | Article 2(4), 6(1) |
| 4 | Sender AS4 AP | AS4 Access point operated by the Sender |  |
| 5 | URAM | EMSWe User Registry and Access Management System  This component covers the authentication needs for S2S (with RIM) and U2S (with GUI) interactions. | Article 12 |
| 6 | Common Addressing Service | An additional voluntary service for declarants for initiating direct system-to-system data connections between the system of a declarant and the harmonised reporting interface module of the respective maritime National Single Window | Article 2(10) |
| 7 | CLD | Common Location database | Article 15 |
| 8 | CHD | Common Hazmat Database | Article 16 |
| 9 | ESD | EMSWe Ship Database | Article 14 |
| 10 | MS SSN, Central SSN | SafeSeaNet (National SSN and Central SSN system) | Article 8(4) |
| 11 | Common Ship Sanitation DB | Common Ship Sanitation Database | Article 17 |
| 12 | Other channels | Other means of reporting | Article 7 |

# Functional architecture Models

As the information exchanged in the U2S and S2S channels are distinct with different technical processes, the Functional architecture model has been divided between those channels.

## Functional description for U2S interactions

List of components in the scope of U2S interaction flow

|  |  |
| --- | --- |
| Element | Description |
| 1 | Maritime National Single Window |
| 1 | MNSW-Core |
| 2 | Graphical User Interface |
| 5 | EMSWe User Registry and Access Management System |
| 7 | Common Location database |
| 8 | Common Hazmat Database |
| 9 | EMSWe Ship Database |
| 10 | SafeSeaNet |

Table 2: U2S In-Scope Components

The list of functions and actions of the components in the scope of U2S interaction:

**Graphical User Interface (GUI)**



The functionalities listed below represent the minimum set used by declarants - MNSWs may include additional functionalities. (IA Annex I).

After successful authentication, the ‘user desktop’ shall be made available to declarants (users) with the following common functionalities (IA Annex I) within the limits of the access rights granted by each Member State in accordance with its national rules(REG Article 12), ensuring the confidentiality of commercial and other sensitive information exchanged (REG Article 10):

*Formalities (IA Annex I)*

* **Provision of a new formality**: This functionality shall allow users to provide a new formality for the port call selected from the list of port calls.
* **Re-using existing formalities**: When preparing new formalities for a port call, users shall be able to re-use the available content of formalities related to the same ship which they have previously submitted to the same MNSW.
* **Save draft formalities**: Users shall be able to save draft formalities before submission.
* **Management of formalities**: This functionality shall allow users to consult and update their previously submitted or draft formalities. All formalities that have been submitted using the RIM shall be also available in the GUI. The GUI shall display information (date and time of submission) of all such formalities, including responses from authorities.
* **Submission of formalities**: Users shall be able to submit formalities to the MNSW. Following the submission of the information, the MNSW window shall display the results of the semantic checks performed at Member State level.

*Ship Lists (IA Annex I)*

* The GUI shall allow consultation of:
  + a list of ships when creating a new port call, filtered by Ship IMO number, Ship call sign, MMSI number, Ship name;
  + ship identification information and particulars, including ship reporting exemptions, to be made available from the EMSWe Ship Database, or alternatively from another relevant database.

*Port Calls (IA Annex I)*

* The GUI shall allow the **creation** of a port call by selecting a ship from the functionality ‘list of ships’ or by filling manually the ship’s identification information and the port of call from the information retrieved by the MNSW from the CLD.
* With a creation of the port call, a Visit ID linked to the selected ship and to the port of call shall be provided.
* Users shall have the possibility to **cancel** their previously created port call and withdraw or invalidate their previously submitted formalities associated to that port call.
* The **list of port calls** shall be accessible for a certain period of time as specified in the national data retention rules. The following information shall at least be available: port of call, visit ID, identification of the ship, estimated and actual arrival and departure time of the ship. Using these criteria a filter shall be provided to search the list. The selected port call shall contain the information of the status of formalities and responses from authorities related to that port call including the clearance model (systematic or silent) applied by the MNSW.
* The GUI should make available information provided at departure from a previous port to the declarant at arrival to the next port (REG Article 8)[[5]](#footnote-6).
* **Uploading information from spreadsheets**: When providing or updating one or more formalities, users shall be able to upload information from digital spreadsheets.

*Databases (IA Annex I)*

* In the case a **ship’s identification information and particulars** or records on **ship reporting exemptions** is required for the fulfilment of reporting obligations, the MNSW shall make available the relevant information from the ESD, or alternatively from another relevant database in the GUI by way of pre-filling the relevant fields.
* In case a **location or port facility code** is required for the fulfilment of reporting obligations, the MNSW shall make available the relevant information from the CLD in the GUI.
* In the case information on **dangerous and polluting goods** is required for the fulfilment of reporting obligations, the MNSW shall make available the relevant information from the CHD in the GUI by way of:
  + prefilling the required information on dangerous and polluting goods on the basis of the UN number or the textual reference of a DPG item entered by the declarant;
  + providing a list with dangerous and polluting goods on the basis of the mode of carriage and type of product entered by the declarant.

*Other functionalities (IA Annex I)*

* The ‘landing’ page shall be publicly available and shall contain:
  + information about the maritime National Single Window;
  + a link to the online support website and to the estimated and actual arrival and departure times of ships;
  + a login section for user authentication to access the ‘user desktop’.
* Users shall be able to configure additional personal information set at national level that is not managed by the URAM.
* The GUI shall allow users to switch the language version of the graphical user interface. English shall always be supported.

**EMSWe User Registry and Access Management system (URAM)[[6]](#footnote-7)**



* URAM will allow for the declarants and national authorities to have a single account for the access to MNSWs (REG Article 12)
* URAM to provide common authentication place and mechanism for declarants and national authorities (REG Article 12)

**Maritime National Single Window (MNSW)**



* Exchanges formalities with relevant authorities (REG Article 5, MIG-P2, MIG-P3)
* The MNSW (or at the national level) ensures validation of the semantic rules on formality data and makes formality responses available to the GUI to the declarant (MIG-P14, MIG-P18, MIG-P19).
* Ensures ships identification information & ship particulars reported by declarants are provided to the ESD (REG Article 14).
* Replace mechanism is applied when formality is updated (MIG-P23)

**EMSWe Ship Database (ESD), Common Location database (CLD), Common Hazmat Database (CHD)**

* The **ESD** receives ships identification information & ship particulars reported by declarants from the MNSW (REG Article 14).
* The **ESD** provides ship identification information & ship particulars reported by declarants to MNSW (REG Article 14)
* The **CHD** provides information on dangerous and polluting goods to the MNSW to facilitate ship reporting to declarants (REG Article 16)
* The **CLD** provides information on location and port facilities to the MNSW to facilitate ship reporting to declarants (REG Article 15)

### The journey of a formality and response.

Below is an example of a process flow when a user makes a formality in a U2S interaction with the GUI:

1. An Unauthenticated natural person accesses the MNSW landing page.
2. On the public landing page there are several options available to the unauthenticated natural person. These include (but are not limited to the following):

* An option to select from the available languages.
* A link to the support website;
* A place to execute a log-in process to access authorised area (user desktop) of the GUI.

1. The registered natural person decides to log in to the GUI.
2. The natural person chooses the EMSWe authentication method provided by URAM.
3. The natural person is then redirected to URAM authentication place.
4. The natural person authenticates in the URAM authentication place [[7]](#footnote-8).
5. The information about the user is passed to the GUI.
6. The user is then redirected to the GUI application.
7. The authorisation takes place by computing access rights, permissions and delegations in the GUI.
8. After a successful login, the user in the GUI can interact with common functionalities for the port calls, formalities and other data that user is authorised to interact (IA Annex I)[[8]](#footnote-9).
9. The user, depending on the access rights, can now also view, create & update, and withdraw formalities for one or more port calls (IA Annex I)
10. Information on location, port facility or dangerous and polluting goods will be retrieved by the GUI from CHD and CLD to facilitate ship reporting. (IA Annex I).
11. The user can choose to save the formality as draft or to submit.​ (IA Annex I)
12. The MNSW (or at the national level) ensures that the validation of the semantic rules is performed. The formality data is then shared with the relevant authorities.
13. In cases where a formality contains ship information relevant for ESD, the MNSW, when formality is accepted will provide this ship information to ESD (REG Article 14).
14. The relevant authorities process the data from the formalities submitted by declarants and forms the formality response. MNSW makes the formality response available to the GUI including the indication of a clearance model applied if applicable[[9]](#footnote-10).
15. The relevant authorities process the data from the formalities submitted by declarants and forms the formality response. MNSW makes the formality response available to the GUI including the indication of a clearance model applied if applicable[[10]](#footnote-11).

The below diagram depicts the interactions between the various components. This reflects the process flow described above



**Figure 3:** U2S High-level Process flow

## Functional description for S2S interactions

List of components in the scope of S2S interaction flow

|  |  |
| --- | --- |
| Element | Description |
| 1 | Maritime National Single Window |
| 1 | Maritime National Single Window Core |
| 3 | Harmonised Reporting Interface Module |
| 5 | EMSWe User Registry and Access Management System |
| 9 | EMSWe Ship Database |

Table 3: S2S In-Scope Components

The list of functions and actions of the components in the scope of S2S interaction

**Sender’s IT system**



* Based on the declarant's formality data, conformant to the MIG, the Sender prepares a payload message to be sent through the RIM (RIMFTS 3.1.1)
* Processes Formality, Process responses & technical control messages received from Sender-AS4-AP (RIMFTS 3.1.1)

**SENDER-AS4 AP**

* Prepares the AS4 message where the payload is the formality (RIMFTS 3.1.1)
* Adds the “sender’s” certificate & signature to the AS4 message
* Sends the AS4 message to the MNSW-RIM (RIMFTS 3.1.1)
* Receives from the RIM AS4 messages where the payload can be Formality response, process response, technical control messages. (MIG P-14, MIG P-19)
* Provides a technical receipt confirmation to the RIM when a AS4 message is received (MIG P-19)
* Forwards an exact functional copy (i.e., with same content) of received responses from the RIM to the sender’s back office (RIMFTS 3.1.1)

**Reporting Interface Module (RIM)**



* Provides the functionality to validate the sender either through national or URAM validation service (RIMFTS 3.2)
* Controls that AS4 messages are received from trusted sources - i.e., systems - (MIG 4.1, RIMFTS 3.3.2.2)
* Checks the message structure of the received formality messages to ensure that they meet common agreed structure definitions provided by the EMSWe Message Implementation Guide (syntax checks) (RIMFTS 3.1.1)
* Creates and sends technical control messages to Sender’s AS4-AP in case of syntax errors (MIG P-19, RIMFTS 3.1.1)
* Receive and forward the payload (formalities) to MNSW-core (MIG 4.1, 4.2, RIMFTS 3.1.1)
* Retry-mechanism for delivering messages in case delivery fails (RIMFTS 3.4.3)
* Provides technical receipt confirmation for the “sender” who has sent as4 message (RIMFTS)
* Determine technical endpoint (AS4 AP) for returning messages to the "sender" (RIMFTS 3.3.2.2)
* Provides meta data (of AS4 messages) available for support, monitoring purposes (RIMFTS 3.3.2.1)
* Supports two major versions (which can be major, medium, minor) of each type of formality and each type of response (MIG-5). The support of each version shall be maintained according to the validity periods.

**EMSWe User registry and access management system (URAM)**



* URAM ensures that only registered and trusted sender can submit formalities to the MNSW through the RIM (RFTS 3.2)
* Provided URAM validation service can query National Registries of Senders when sender not found on central Registry of senders (RIMFTS 3.2)
* Central Registry of Senders provides an interface for Member States where to push the registered sender information (RIMFTS 3.2.1.1)
* Makes use of eIDAS compliant electronic certificates and EORI number to recognise a sender (RIMFTS 3.2)
* Provides the possibility to modify & terminate existing accounts (REG Article 12)

**Maritime National Single Window (MNSW)**



* The MNSW Core (or at the national level) ensures the semantic validation of the payload received from RIM (MIG P-14, MIG P-19)
* Returns the formality response with the results of the semantic validation to the sender via the RIM (MIG P-14, MIG P-19)
* Prepares & forwards process responses to the sender via the RIM (MIG P-14, MIG P-16, MIG P-18).
* Response messages are communicated through the channels (e.g., RIM) used by the declarant. (MIG P-17)
* Ensures ships identification information & ship particulars reported by declarants are provided to the ESD (REG Article 14)
* Replace mechanism is applied when formality is updated (MIG P-23)
* Makes available data from received formalities with relevant authorities (MIG P-2, MIG P-3)
* Translates formality messages from MIG common formats to the national formats where necessary (MIG-4.1)
* Supports two major versions (which can be major, medium, minor) of each type of formality and each type of response (MIG-5). The support of each version shall be maintained according to the validity periods.

### The Journey of a formality and response.

Below is an example of a process flow when a user makes a declaration in a S2S interaction.

System to System Declaration

1. Based on the declarant's formality data, conformant to the MIG, the sender prepares a formality message
2. The formality message is passed by the sender’s information system to the AS4 Access Point on his/her side where AS4 message with the formality as a payload is formed and signed with electronic certificate of the sender.
3. The Sender’s AS4 AP then sends the AS4 message (with the payload) to the MNSW-RIM
4. When the MNSW-RIM receives the AS4 message, it returns a technical receipt confirmation to the Sender’s AS4 AP. In order to validate the sender, the validation service is triggered in the RIM and then performed either through:
5. URAM validation service
6. MS validation service.

Based on the MS architecture, validation is performed as follows:

|  |  |
| --- | --- |
| URAM validation service | Member state validation service |
| URAM validation service validates the certificate, its ownership and sender’s identity.  The URAM validation service can validate against its own central registry or national registry. Validation against national registry will happen when the sender is not found centrally and the specific national registry has integrated with the URAM validation service. (RIMFTS 3.2) | Member State validates the certificate, its ownership and sender’s identity.  In case a certificate cannot be validated nationally (because the certificate is registered centrally or in another MS), the request will be passed to the URAM validation service. |

1. If the validation response is positive, the MNSW-RIM extracts the formality message from the AS4 message, checks whether the MIG version of the formality message is compliant and checks the syntax of the formality message (MIG 4.1, RIMFTS)

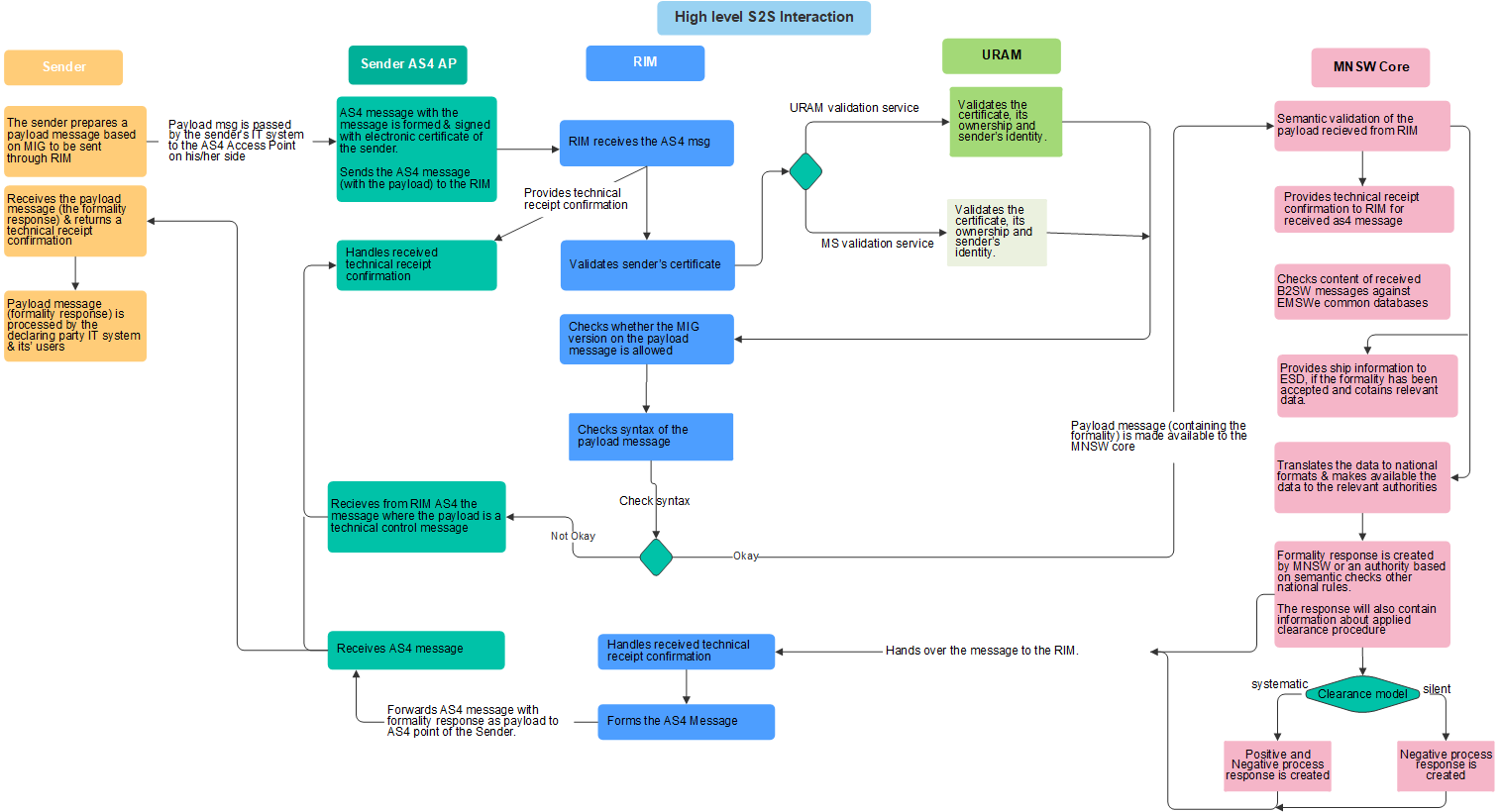
If the syntax check fails, a control message (MIG P-19) is returned by the MNSW-RIM to the Sender’s AS4 AP (RIMFTS 3.2).

1. If the formality message is syntactically valid, it will be made available from the MNSW-RIM to the MNSW core.(RIMFTS 3.2)

The MNSW-Core receives the formality message & ensures validation of the semantic rules is performed at the MNSW Core or at the National level (MIG P-14, MIG P-19).

1. The MNSW-Core may translate the formality data to national formats and makes available the formality data to the relevant authorities (MIG-4.1)
2. A formality response is created by the MNSW-Core or an authority behind it based on semantic checks or other national rules. The formality response will also contain information about the applied clearance procedure (systematic or silent – MIG P14, MIG P16)​
3. In cases where a formality contains ship information relevant for ESD, the MNSW-Core, when formality is accepted, will provide this ship information to ESD (REG Article 14).
4. The MNSW-Core initiates sending of the formality response with the results of the semantic checks to the sender through the MNSW-RIM.
5. When the formality response is received from the MNSW-RIM, the MNSW-RIM returns a technical receipt confirmation to the MNSW-Core (RIM P-19)
6. The MNSW-RIM then forms the AS4 message with the formality response as a payload.
7. The MNSW-RIM then forwards the AS4 message with the formality response as payload to AS4 AP of the sender.​
8. The AS4 AP of the sender receives the AS4 message with the formality response and returns a technical receipt confirmation to the MNSW-RIM.​
9. AS4 AP extracts the formality response, makes it available to the sender’s IT system where then the sender’s IT system processes further the received formality response.
10. A process response will also be sent by the MNSW-Core similar to the steps 12-17 in the following cases(MIG-P16):
    1. Positive and negative process response will be sent in case systematic clearance model is applied for the formality sent
    2. Negative process response will be sent in case silent clearance model is applied for the formality sent

The below diagram depicts the interactions between the various components. This reflects the process flow described above:

**Figure 4: S2S High-level Process flow** 

1. Article 2 paragraph 1 of the Regulation 1239/2019 [↑](#footnote-ref-2)
2. OJ L 198, 25.7.2019, p. 64–87 [↑](#footnote-ref-3)
3. [once published it will contain the reference to the official journal] [↑](#footnote-ref-4)
4. Article 2(3) of the EMSWe Regulation. [↑](#footnote-ref-5)
5. This provision has not been defined yet and shall be addressed in an Implementing Act. [↑](#footnote-ref-6)
6. Technical specifications, standards and procedures for the URAM for U2S interactions are still under discussion within expert groups. [↑](#footnote-ref-7)
7. URAM U2S scenario is not yet fully defined within the expert groups and is subjected to change. [↑](#footnote-ref-8)
8. The GUI may offer more functionalities depending on the national implementation. [↑](#footnote-ref-9)
9. A technical flow of how formality responses get displayed to the declarant is up to each MS. [↑](#footnote-ref-10)
10. A technical flow of how formality responses get displayed to the declarant is up to each MS. [↑](#footnote-ref-11)