GALILEO EGNOS
NAVIGATION MADE IN EUROPE

Emergency Warning Service in Galileo

State of play

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SUMMER 2021

Regulatory Framework –Early Warning Systems

Global trend to develop Disaster Risk Reduction technologies:

- United Nations' Sendai Framework for Disaster Risk Reduction: *"Substantially increase the availability of and access to **multi-hazard early warning systems** and disaster risk information and assessments to people by 2030"*

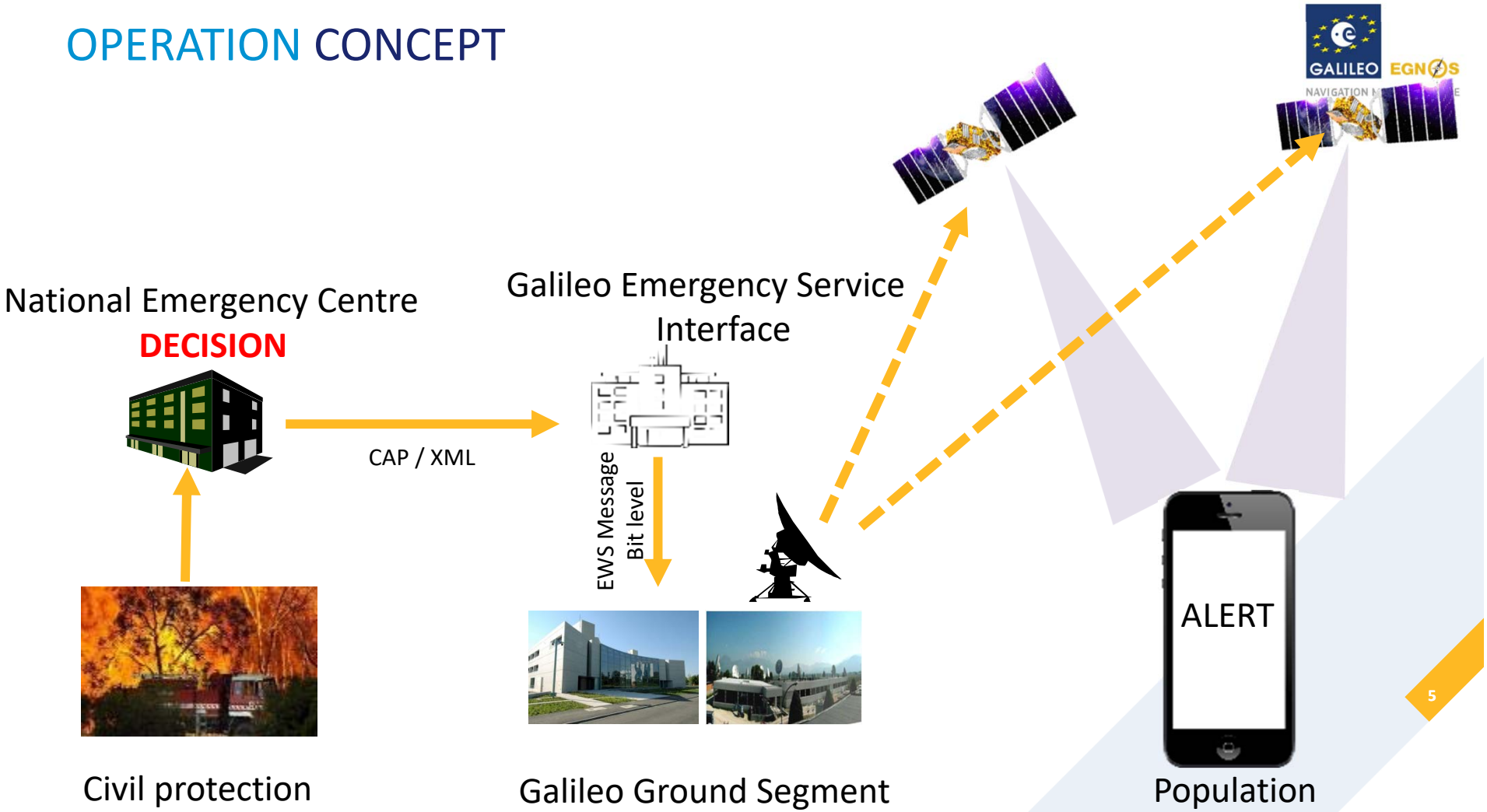
- World Meteorological Organization – 2020 State of Climate Services report (13 October 2020), confirms the importance of ***early warning systems*** for disaster prevention and risk reduction

- **The European Commission is introducing a new service in Galileo: the Emergency Warning service.**
  - Purpose: **Alerting the population** in case of a looming disaster (fire, storm, floods, tsunamis, volcano, industrial…)
  - Civil Protection entities **decide** to trigger the alert **and contact** Galileo to broadcast a message.
  - People receive the alert message on their **mobile phone/nav' device**.

SERVICE CONCEPT

- Dissemination of an alert message including associated guidance to react
- Global coverage, no ‘mobile’ coverage required
- On-demand
- **Complementary alert system to those already operated at national level**
- Reach out population at large & small scale in a timely manner (~ minutes)
- geo-location information encoded in the message is used to target only the relevant population.
- Targetted region can be of any size.
- Message is displayed when user terminal is located within the encoded **ellipse**.

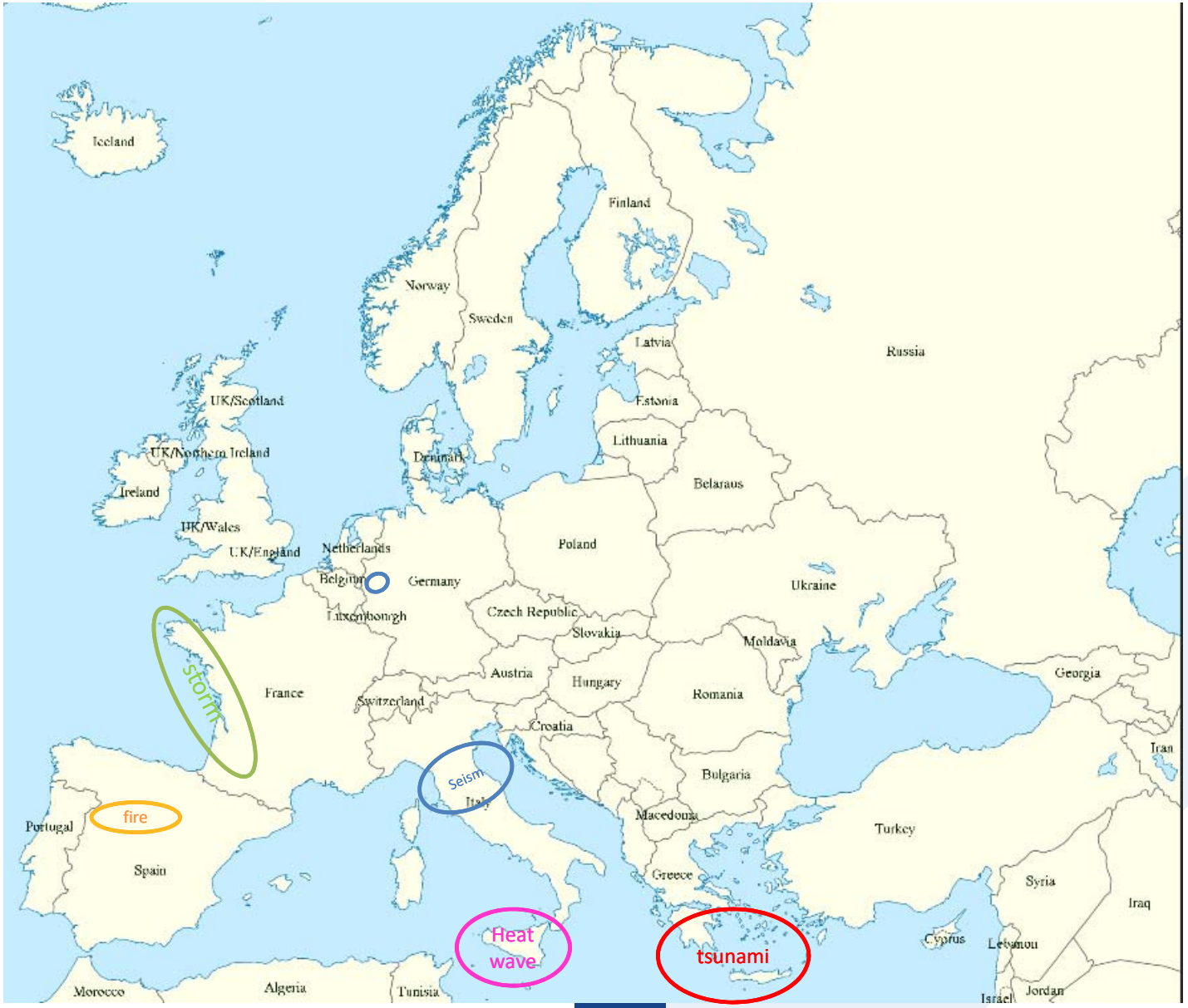
OPERATION CONCEPT



The service is realised by three components:

Civil Protection Authorities **Galileo infrastructure** **end users**

GALILEO – The Emergency Warning Service (1)



GALILEO – The Emergency Warning Service (2)

EWS is NOT designed to replace any existing system. It has also intrinsic limitations:

- no free text, no indoor penetration

EWS has advantages of its own:

- Global coverage
- The service is available when nothing else remains (destruction/saturation of traditional alert systems)
- No specific user device required: directly compatible with smartphones or navigation devices.

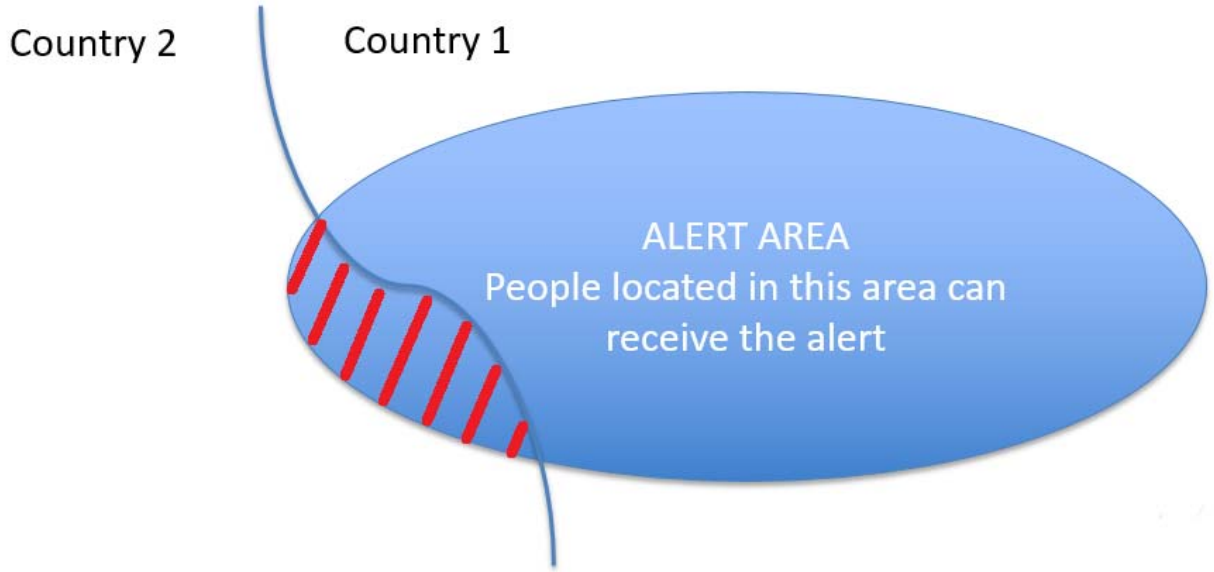
EWS is a satellite capacity offered as a dissemination means.

SERVICE FOOTPRINT

Challenge: avoid broadcasting an alert message over a neighbouring country. Risk of confusion and misguidance !

Solution: filter out the incoming satellite data at user equipment level if the receiver's own position is outside alert area.

Country 1 sends an alert request to Galileo
Targetted area overlaps with country 2 jurisdiction



- Only people located **{ in Ellipse AND in Country 1 }** will be notified.
- People located **outside** this area will **NOT** be notified.

MESSAGE FORMAT

Challenge: limited space in the signal to code the necessary information for the alert

Solution: use ***ellipse*** coding for the target area, and ***libraries*** for the instructions to react.

Approach: develop common format with other GNSS-based initiatives

Emergency Alert Message is coded on 122 bits for transmission in the Galileo signal

- Message Type: Alert/Update/Test/Cancel
- Country ID: ID of the country from which the alert is issued.
- Provider ID: National agency raising the alert
- Ref ID: unique identifier for the messages sent
- Event Category: Tsunami, Forest Fire, pandemic, volcano, storm, etc
- Severity: minor/moderate/severe/extreme
- Event Onset: Day/Hour/Minute
- Duration: in hours, from < 0.25 h to 48 h
- ***Target Area: 2D ellipse, with radius from 0,3 km to 11000 km***
- ***Instructions: Generic instructions taken from library (up to 256 individual instructions)***
- Additional information for message customization

Message Type 2 bits	Issuing entity 14 bits	Ref 4 bits	Hazard type 7 bits	Hazard Characteristics 22 bits	Guidance library 8(+1) bits	Target area 46 bits	Specific settings 18 bits

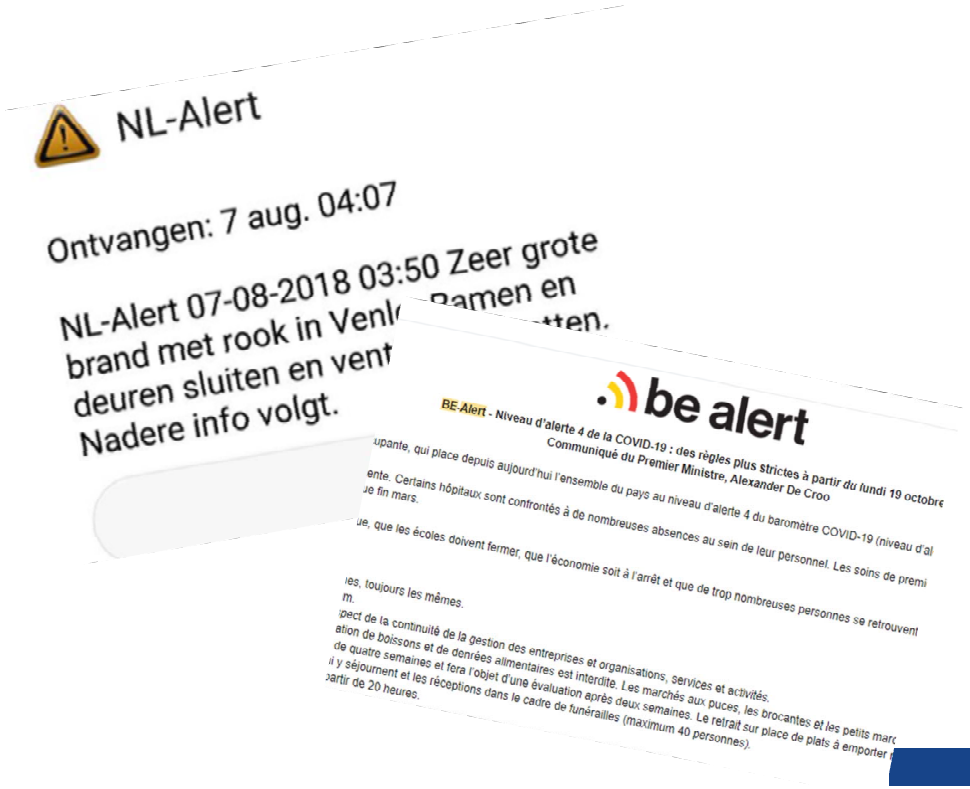
INSTRUCTIONS TO REACT

Challenge: no free text possible

Solution: use ***libraries*** pre-coded in user terminal

Approach: develop EWS-specific instructions, while keeping the possibility to use national corpus of instructions.

National approach with free text



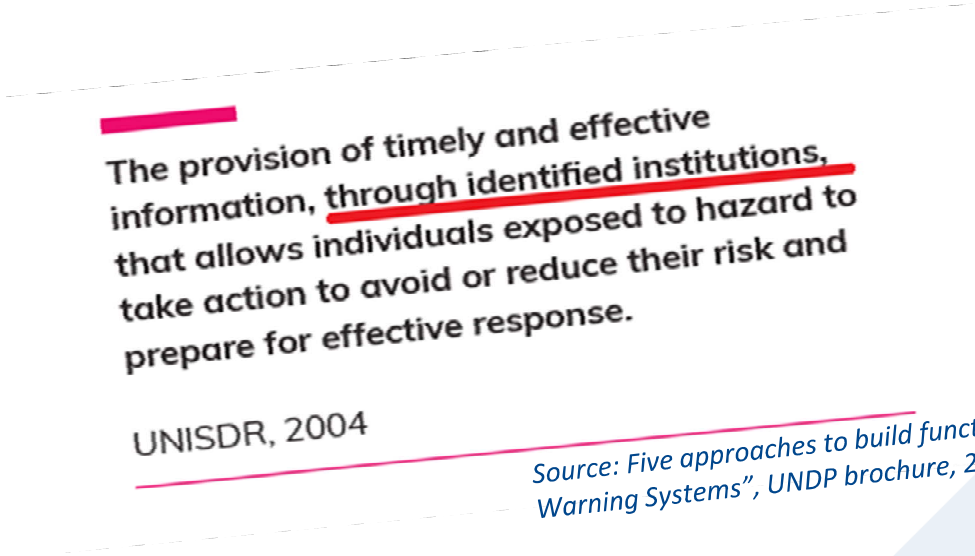
Galileo-EWS generic instructions

00000001	Avoid the affected area.
00000010	Avoid the danger zone.
00000011	Leave the affected area immediately.
00000100	Give the affected area a wide berth.
00000101	Modify your driving behaviour to suit conditions.
00000110	Avoid driving.
00000111	Seek shelter. Avoid driving.
00001000	Switch on the car radio and listen for further information.
00001001	Get information from the media, for example on local radio.
00001010	If possible, get information from the media, for example on local radio.
00001011	Listen to regional radio stations.
00001100	Inform your neighbours.
00001101	Warn other people to prevent them from entering the danger zone.
00001110	We will inform you when the danger has passed.
00001111	Pay attention to announcements made by the police and fire brigade.
00010000	Follow the instructions of the emergency services.

IDENTIFYING THE SENDER

Challenge: identify the institution responsible for emitting the alert, in order to increase **credibility** and **authenticity**.

Solution: EWS format contains a field for 'Country ID' and for 'Provider ID'. This 'Provider ID' shall be registered in a database at the EWS collection center.



Source: Five approaches to build functional "Early Warning Systems", UNDP brochure, 2018

- **EWS message format makes it possible for United Nations' entities to be identified as official 'EWS senders': UNDRR, WHO, ICAO, WMO, FAO, IMO*, etc**

*: United Nations office for Disaster Risk Reduction, World Health Organization, International Civil Aviation Organization, World Meteorological Organization, Food and Agricultural Organization, International Maritime Organization

BUILDING THE SERVICE

- Constant interaction with **Civil protection authorities** for confirming service design.

- Coordination with **Japan** and **India** to establish a **common format** of the alert message. **Interoperability is key to ensure broadest reception by as many people as possible !**

- Coordination with international GNSS partners at **UN-ICG** for the establishment of such international service.

- Dialogue with **mobile manufacturers** and operating systems developers to introduce the 'decode & display' functionalities in the firmware.
  - Qualcomm, Broadcom, Mediatek, Apple, Google, STM, u-blox, Sony…

- Analyse **architecture** and **service provision scheme** for introduction in the system.

- **Test and validate** the service before entry in service: 2023. Stay tuned !

THANK YOU

http://ec.europa.eu/galileo

STRUCTURE OF EWS MESSAGE

- Message Type: Alert/Update/Test/Cancel
- Country ID: ID of the country from which the alert is issued.
- Provider ID: Authorised entity raising the alert
- Ref ID: unique identifier for the message sent
- Event Category: tsunami, forest Fire, pandemic, volcano, storm, factory incident, noxious gases, air pollution, etc
- Severity: minor/moderate/severe/extreme
- Event Onset: Day/Hour/Minute
- Duration: in hours, from < 0.25 h to 48 h
- Target Area: 2D ellipse, with radius from 0,5 km to 11000 km

- Guidance Library: library of instructions to be used
- Instructions: Generic instructions taken from library (256 individual instructions)

- Additional information for message customization