

A MOBILE APP FOR EARTHQUAKE EARLY WARNING

Design and implementation of a mobile device app for network-based
earthquake early warning systems (EEWSs):
application to the PRETo EEWS in southern Italy

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THE CONCEPT OF EARTHQUAKE EARLY WARNING SYSTEMS

When an earthquake happens, **Early Warning Systems (EWS)** are advanced seismic infrastructures able to provide **real-time information** about the ongoing event and send an **alert message** to a target site, before the arrival of the strongest shaking.

The time between the alert release and the arrival of the strongest shaking is called **lead time** and can be used to activate **emergency procedures**.



THE IMPORTANCE OF ALERT DISSEMINATION



A fundamental feature of any earthquake early warning system is the ability of **rapidly broadcast earthquake information** to a wide audience of potential end users and stakeholders, in an intuitive way.

Smartphones and other **mobile devices** represent the ideal tools for earthquake **alert dissemination**, to inform a large number of users about the potential damaging shaking of an impending earthquake.

WHAT WE DID: THE ISNET EWAPP

We present a **mobile app** for Android devices which can receive the alerts generated by the network-based Early Warning system **PRESTo**, currently running on the accelerometric stations of the Irpinia Seismic Network (ISNet) in southern Italy.

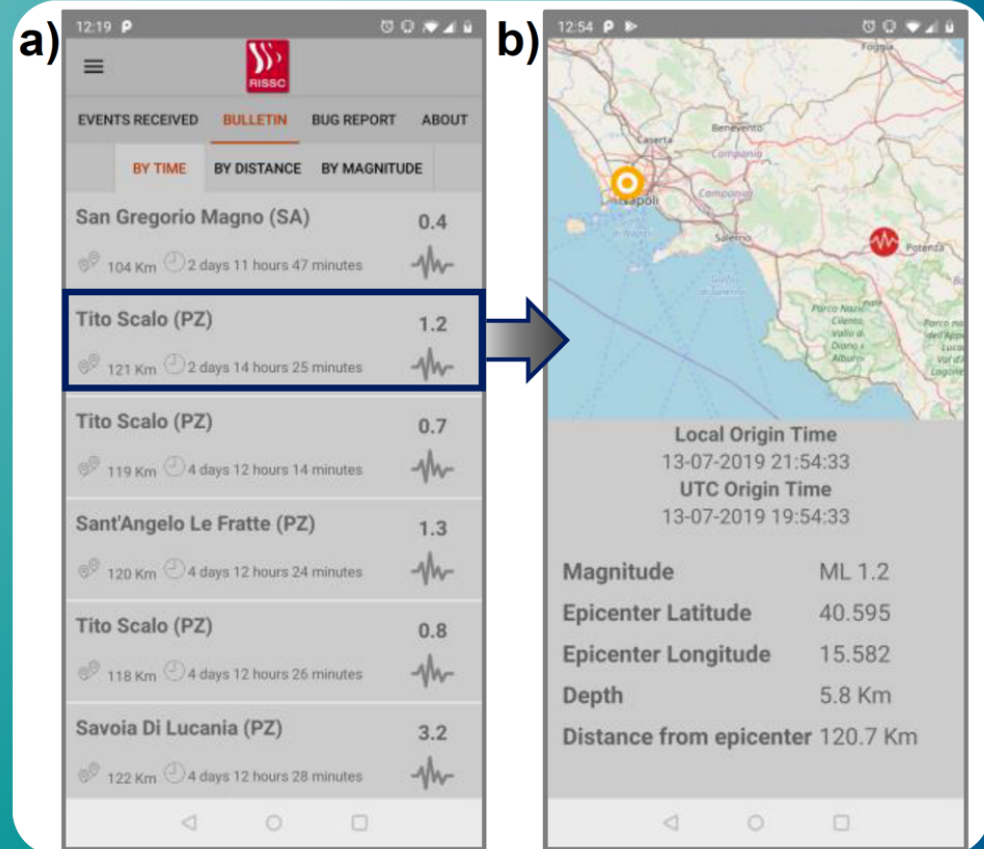
The App has a double operation mode:

- **PASSIVE MODE** similar to a standard seismic bulletin;
- **ACTIVE MODE** as a warning device at the occurrence of an earthquake;

PASSIVE MODE (ABSENCE OF EARTHQUAKES)

The passive mode is similar to a **standard seismic bulletin** and allows for the visualization of seismic events that could be of interest to the smartphone user.

In this mode, the app duplicates the **list of the events** recorded by the ISNet. The events can be sorted as a function of time, distance from the user's position or magnitude. As the user taps on an event, the relevant features are available.



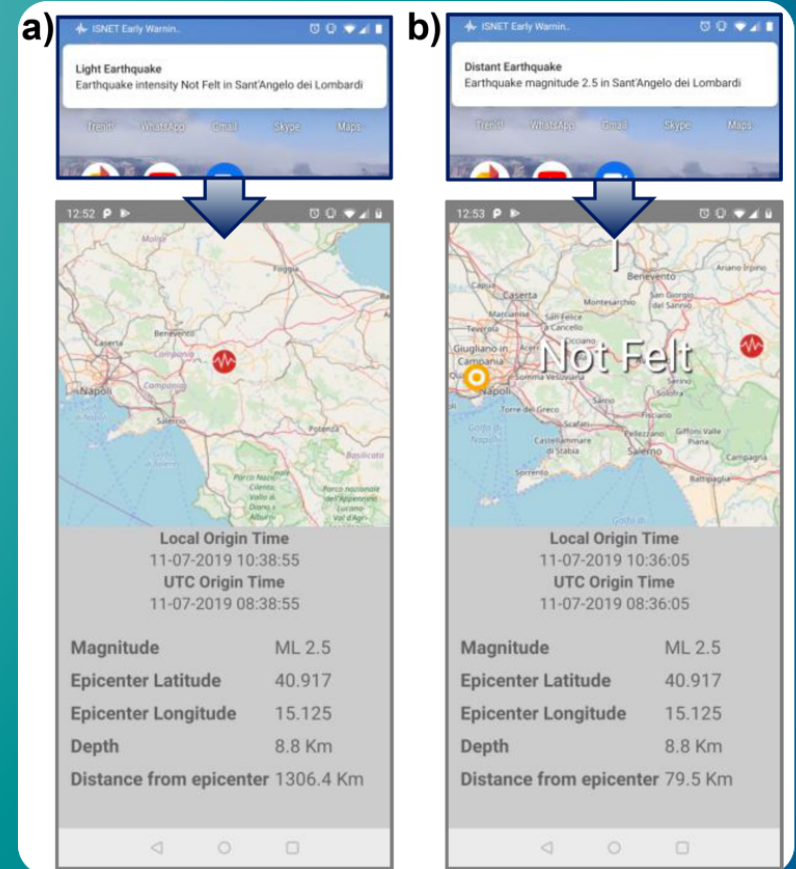
ACTIVE MODE (EARTHQUAKE OCCURRING & NO ALERT)

When an earthquake is detected by the EWS, the app evaluates whether to release a warning or not. If:

- the detected event is **far from the user (distance > 200km)**
- or the predicted intensity at the user's site (I_{MM}) is lower than a threshold (I_{MM}^*) ($I_{MM} < I_{MM}^*$)



a **push notification** warns the user that a seismic event has occurred within the ISNet network and its impact at the user's site is negligible.
NO WARNING is issued.

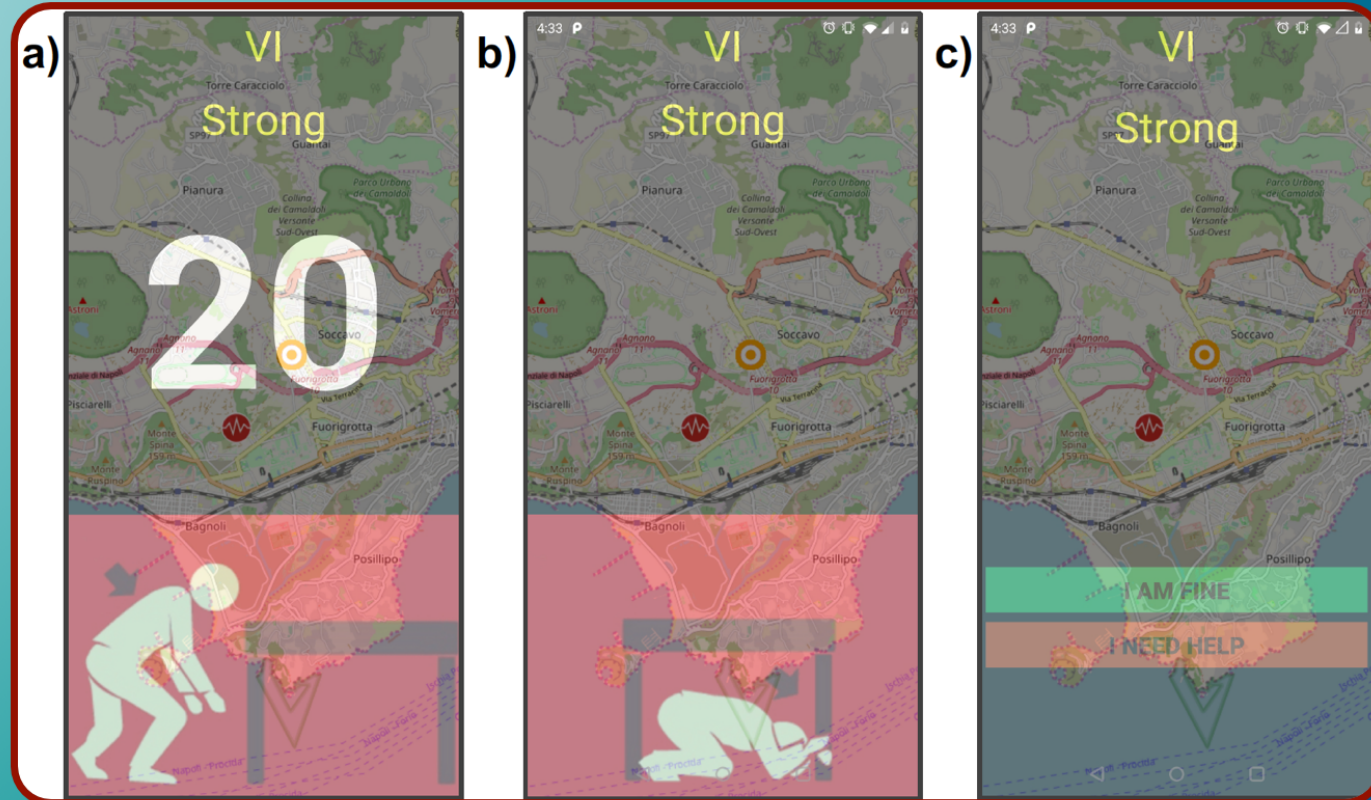


ACTIVE MODE (EARTHQUAKE OCCURRING & **ALERT**)

When the predicted intensity at the user's site exceeds the threshold level ($I_{MM} \geq I_{MM}^*$) the **alert mode** is activated.



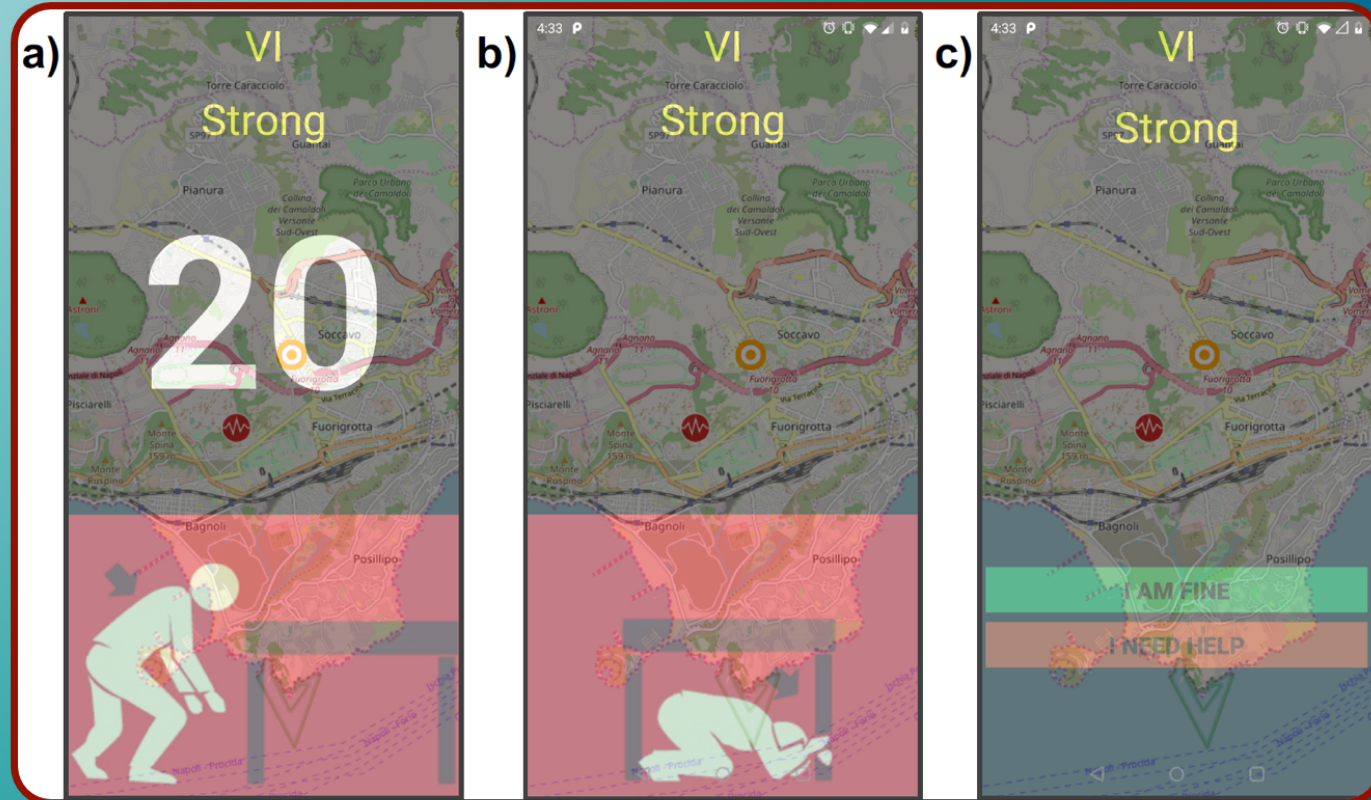
From this moment on, the **alert levels** are progressively updated every second, based on the estimated location and magnitude of the event from the EW system.



ACTIVE MODE (EARTHQUAKE OCCURRING & **ALERT**)

➔ A **push notification** appears on the screen.

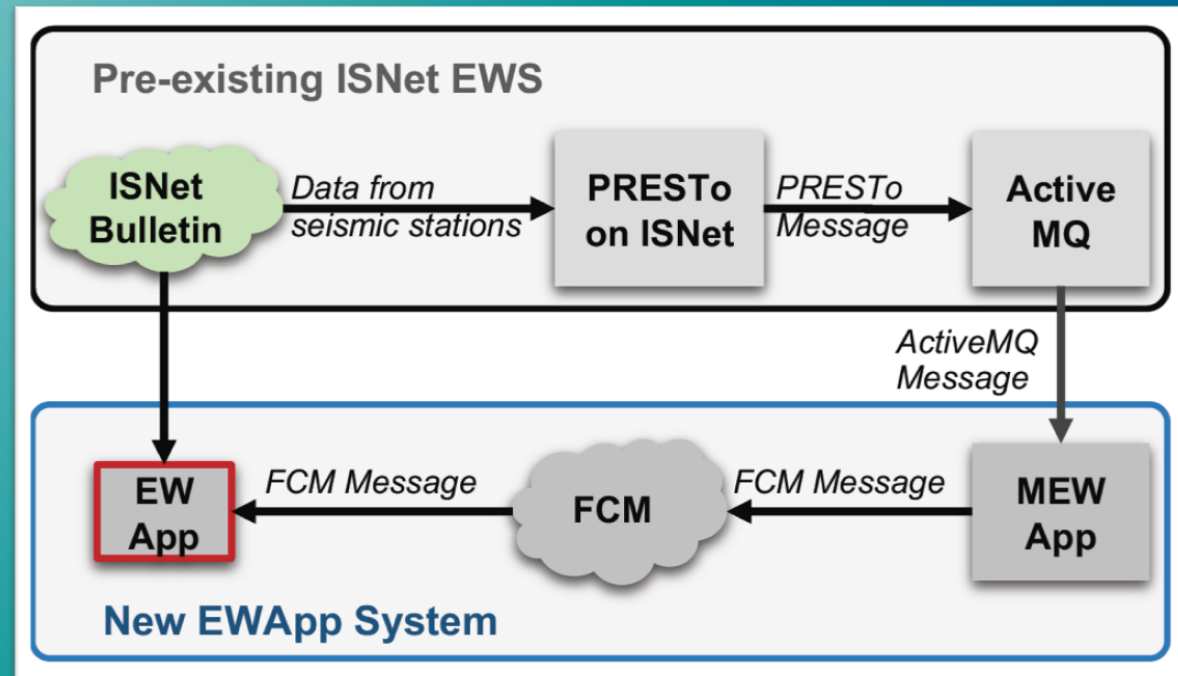
The display shows the **countdown** with the available lead time and the **predicted level of intensity** at the user's position. The App also notifies the user when the strongest shaking has passed and the emergency time has finished.



ARCHITECTURE & INFRASTRUCTURE OF THE EWAPP

The architecture involves the **network of stations**, the **EW software** (ISNet and PRETo EW platform) and **EWApp**. The app is designed in a way that is **easily exportable** to any other network-based early warning system.

PRETo processes the waveforms, sending evolutive earthquake information (in QuakeML format) to a message broker (ActiveMQ). The middleware (MEWApp) releases earthquake information to the FCM cloud that broadcasts it to all the EWApps. EWApp also downloads the ISNet bulletin on request.



MORE INFORMATION



For further information, please, take a look at the related [paper](#) and contact us!

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THANK YOU!