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NASA WorldWind: virtual globe for an open smart city

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Introduction

- ✓ Sustainability is a rising issue that must be addressed.
- ✓ “OpenCitySmart” provides a set of tools to benefit city operations to increase sustainability and the quality of urban life. All the material is under open license and designed to be extended by others. (More detailed information: <https://wiki.osgeo.org/wiki/OpenCitySmart>)
- ✓ Technologies available in OpenCitySmart:
 - ✓ NASA WorldWind (Java, iOS, Android)
 - ✓ NASA Web WorldWind (JavaScript)
 - ✓ PoliCrowd 2.0
 - ✓ i-locate
 - ✓ GRASS GIS
 - ✓ QGIS...



Virtual Globes

- ✓ NASA WorldWind (initially relied on .NET and then Java) in 2004 and Google Earth in 2005
- ✓ NASA Web WorldWind, based on Web technologies (JavaScript, WebGL, HTML5) is released almost a year ago.
 - ✓ has graphical capabilities, such as display of placemarks, text, polygons, shapefiles, and imagery (JPEG, PNG and GeoTIFF)
 - ✓ supports OGC standards: WMS, WMTS, KML
 - ✓ supports Collada
 - ✓ examples: <https://webworldwind.org/>
 - ✓ source code: <https://github.com/NASAWorldWind/WebWorldWind/>



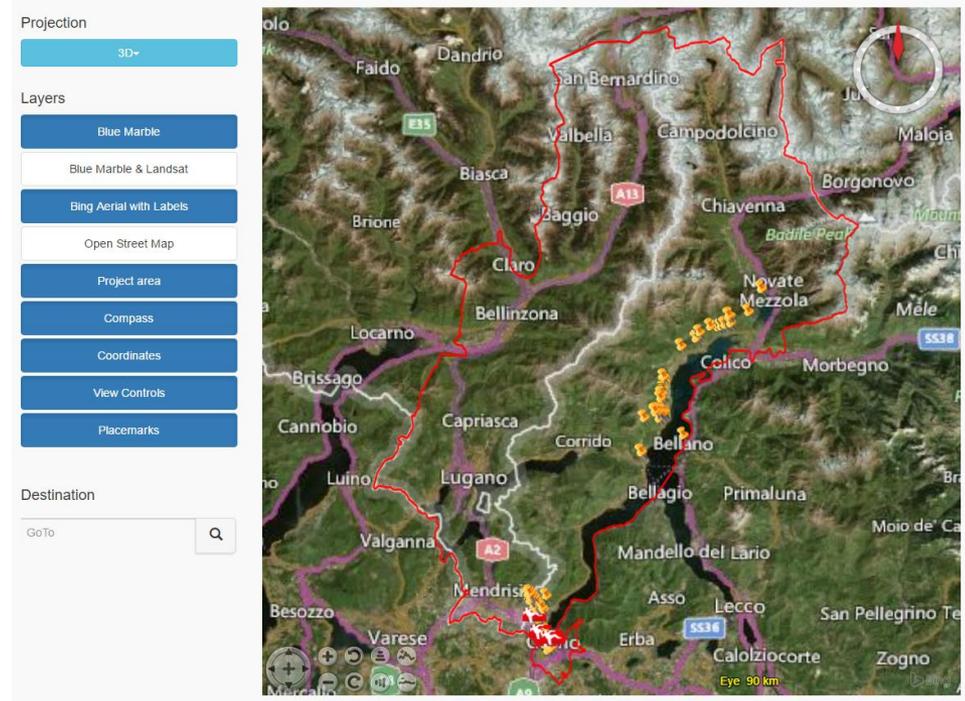
Modern Virtual Globes

- ✓ Two notable examples are NASA Web WorldWind and Cesium.
- ✓ Both frameworks display the data via Web standards, but Web WorldWind is focusing more on formats used by United States Department of Defense.
- ✓ Web WorldWind uses a geographic interface for configuring the objects, while Cesium's primary interface is 3D-centric.
- ✓ Web WorldWind uses WCS and DTED for elevation data, whereas Cesium uses proprietary data.
- ✓ Cesium has a "Pro" version, on the other hand Web WorldWind offers all functionalities free of charge.



NASA Web WorldWind API based VGI platform

- ✓ The virtual globe (<http://viaregina3.como.polimi.it/WorldWind/>), developed using NASA Web WorldWind API is able to display data stored in the ODK Aggregate server of Via Regina project and in the CouchDB database of a cross-platform application (Via Regina), both on desktop and on mobile browsers, as long as WebGL is supported.
- ✓ The general look of the virtual globe, where yellow markers represent the ODK POIs and red ones represent the CouchDB POIs is on the right. The area of the Via Regina project's scope is highlighted with red borders.



NASA Web WorldWind API based VGI platform

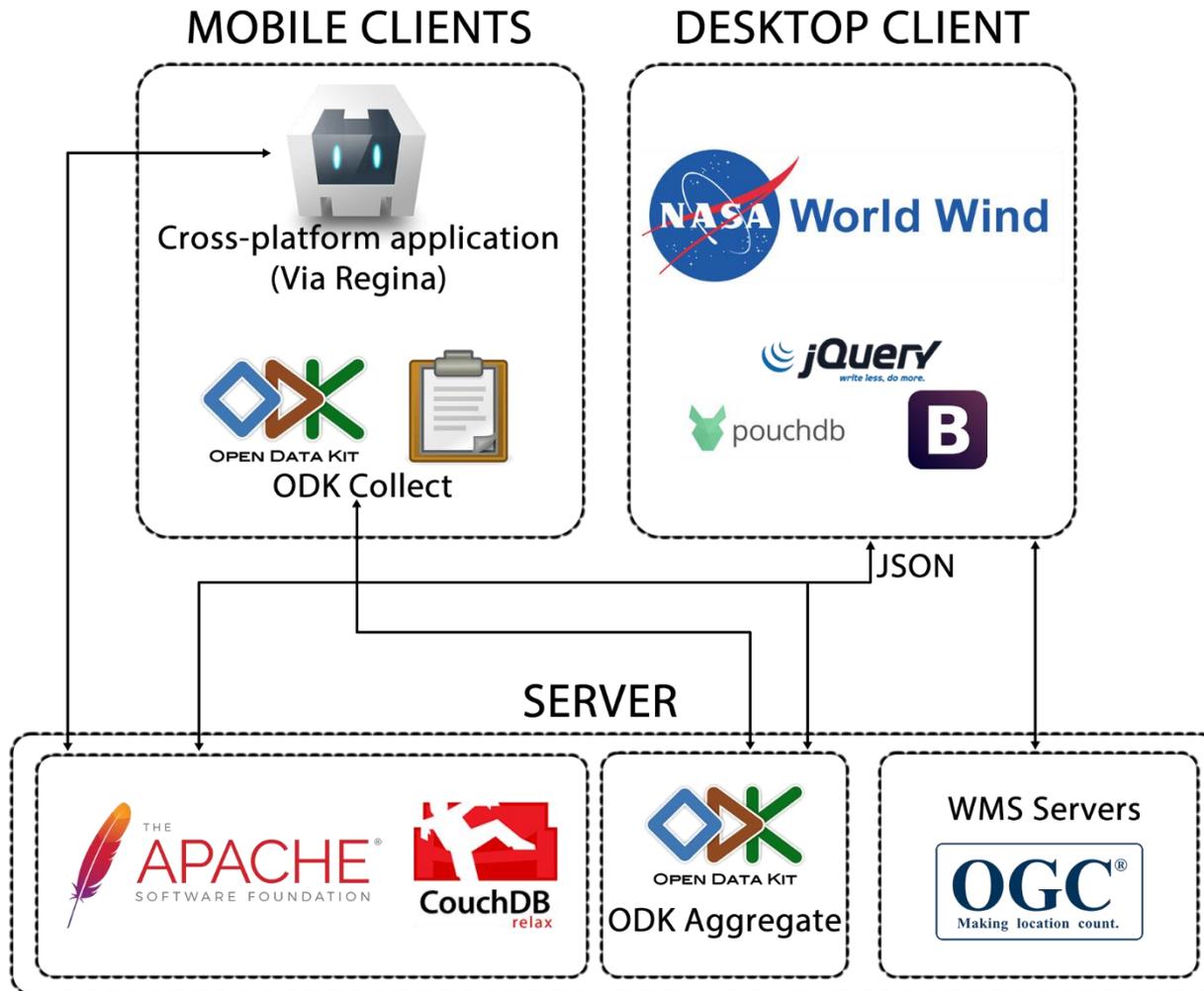
- ✓ The data of each POI is displayed inside a popup upon clicking the marker.



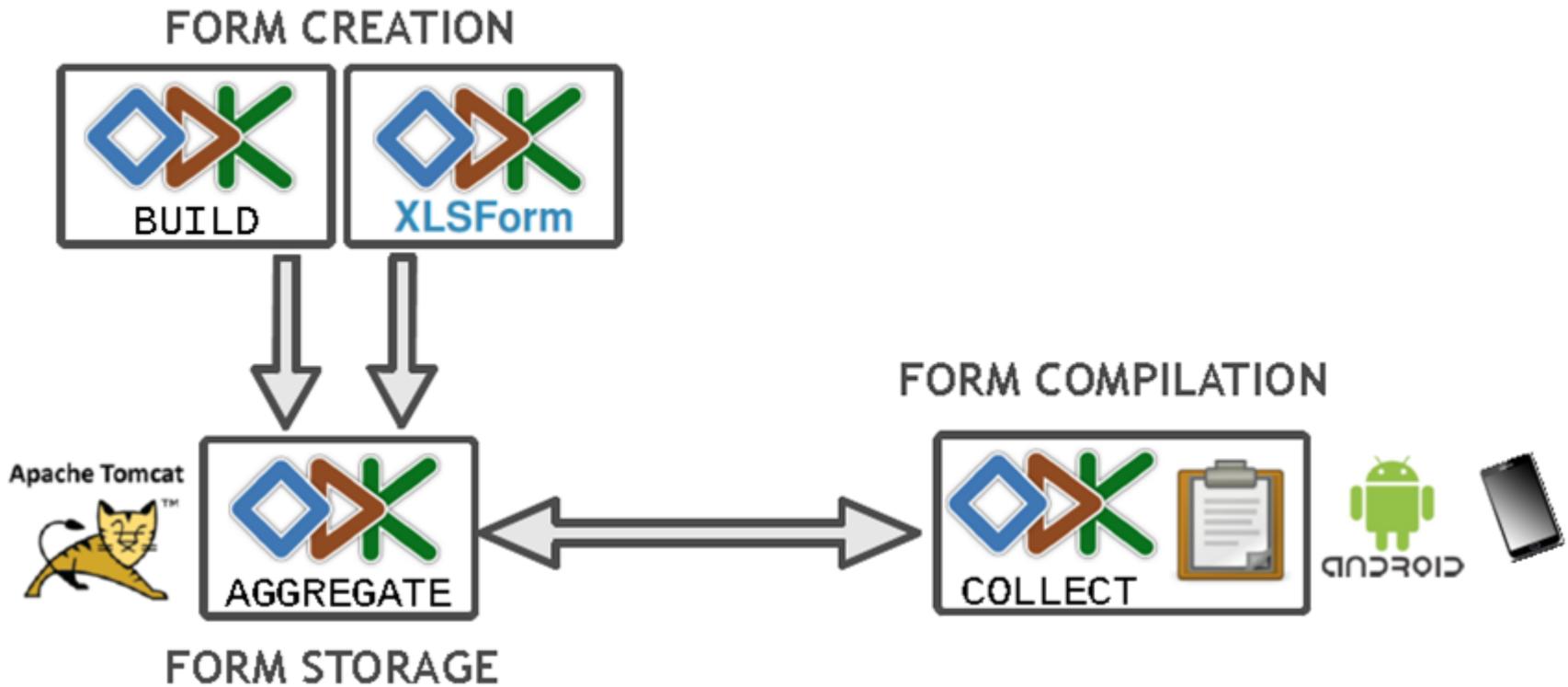
- ✓ Available at <http://viaregina3.como.polimi.it/WorldWind/>



NASA Web WorldWind API based VGI platform - architecture

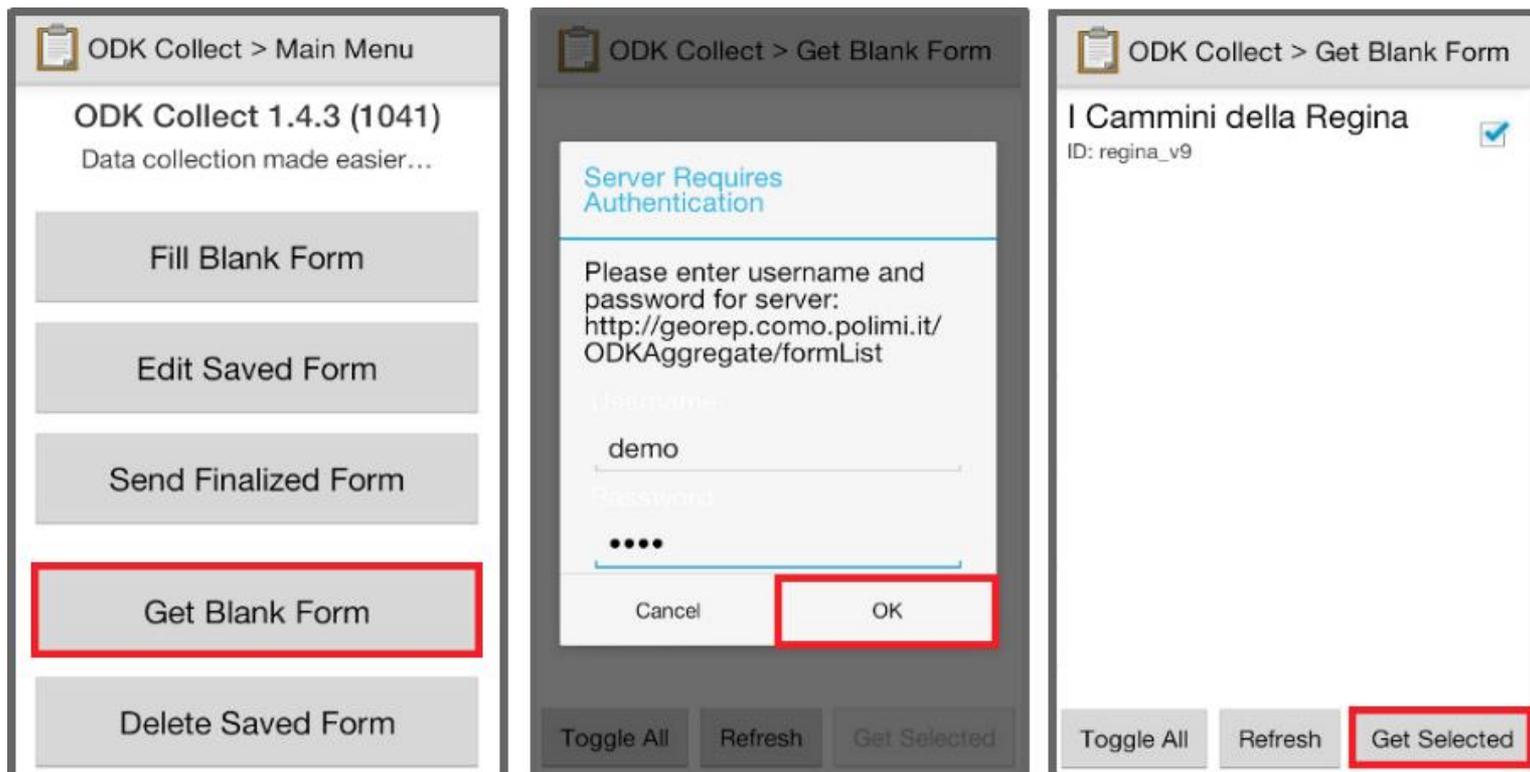


ODK (Open Data Kit)



ODK Collect (Via Regina)

- ✓ Main menu of the application



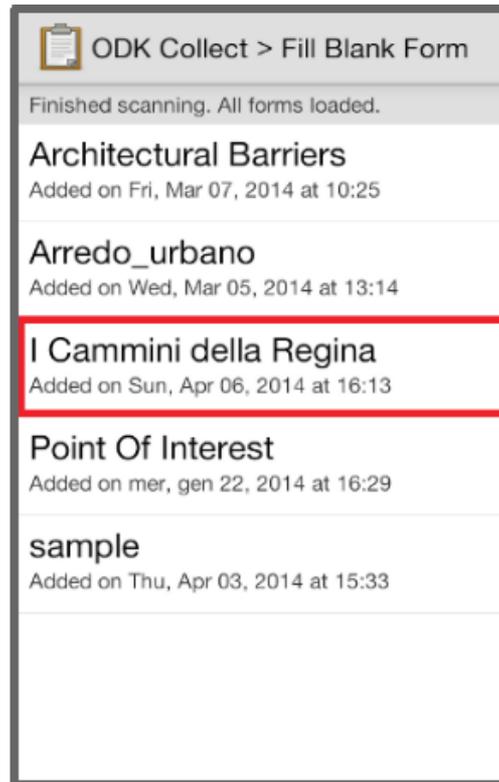
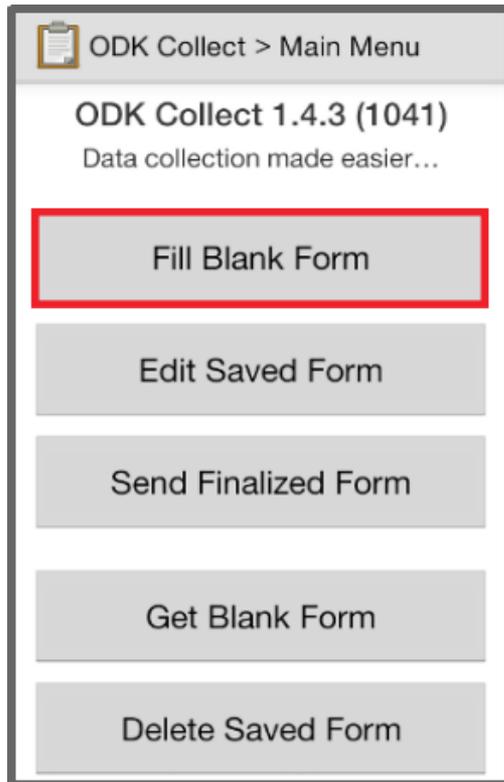
- ✓ Detailed instructions:

http://www.viaregina.eu/files/documenti/2014/istruzioni_eng.pdf



ODK Collect (Via Regina)

- ✓ Form compilation



- ✓ Detailed instructions:

http://www.viaregina.eu/files/documenti/2014/istruzioni_eng.pdf



ODK Collect (Via Regina)

- ✓ Form compilation



ODK Collect...

Date of report

Aprile 2014

D	L	M	M	G	V	S
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3
4	5	6	7	8	9	10

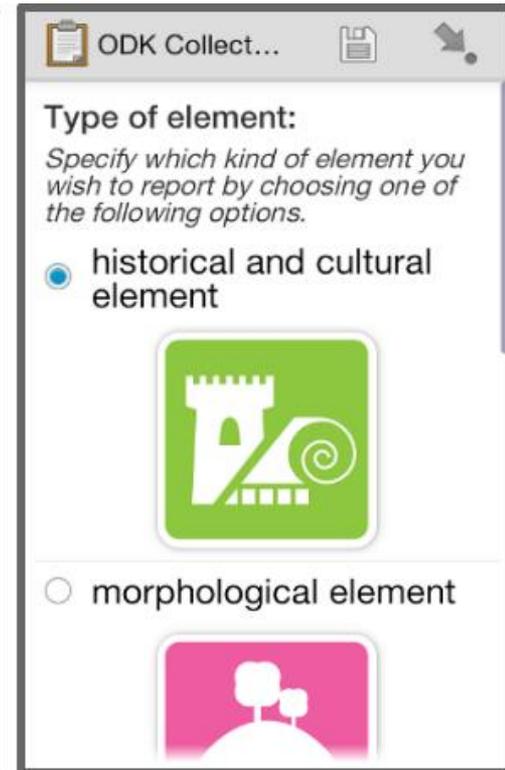


ODK Collect...

Type of user:

Specify which kind of user you are by choosing one of the following options.

- tourist from Italy
- tourist from abroad
- citizen of Como province
- citizen of Ticino Canton



ODK Collect...

Type of element:

Specify which kind of element you wish to report by choosing one of the following options.

- historical and cultural element
- morphological element



- ✓ Detailed instructions:

http://www.viaregina.eu/files/documenti/2014/istruzioni_eng.pdf



ODK Collect (Via Regina)

- ✓ Form compilation

The image displays three sequential screenshots of the ODK Collect mobile application interface, illustrating the form compilation process. Each screenshot shows a different screen of the form, with a title, instructions, and a list of options or input fields.

Screenshot 1: Classification of the element:
Instructions: *Classify the element you wish to report by choosing one of the following options.*
Options: museum (with a green icon of a classical building), religious building (with a green icon of a church).

Screenshot 2: Subclassification of the element:
Instructions: *Classify the element you wish to report by choosing one of the following options (optional).*
Options: ethnographic, thematic, gallery, collections.

Screenshot 3: Name of the element:
Instructions: *Type the name of the element you wish to report (optional).*
Input field: Museum of Villa Erba

- ✓ Detailed instructions:

http://www.viaregina.eu/files/documenti/2014/istruzioni_eng.pdf



ODK Collect (Via Regina)

- ✓ Form compilation

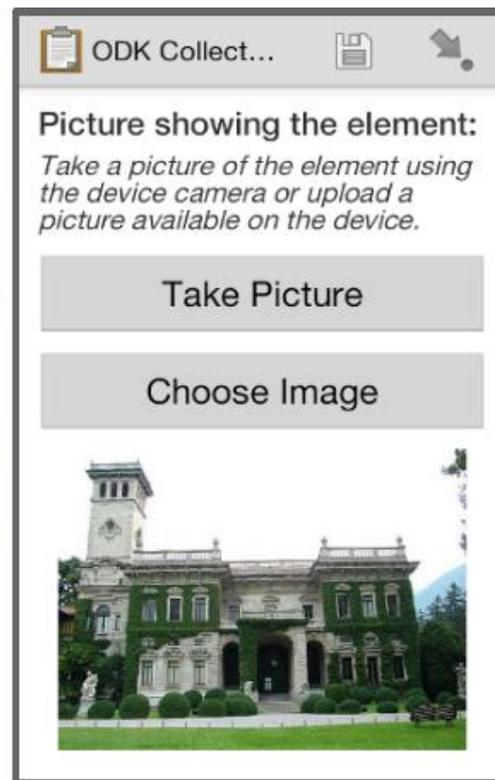
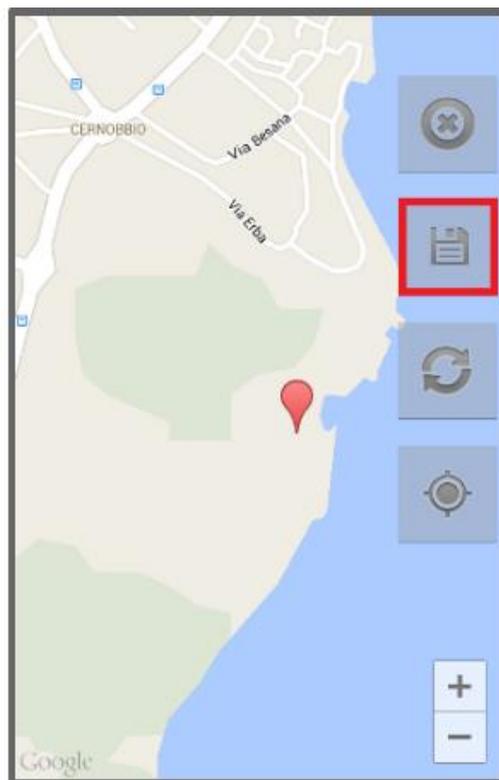


ODK Collect...

Position of the element:
Be sure to be outdoors and check that the device GPS is on. Alternatively, you can also determine the position by connecting to a wi-fi network.

Replace Location

Latitude: N 45°50'16"
Longitude: E 9°4'39"
Altitude: 0m
Accuracy: 5.5m



ODK Collect...

Picture showing the element:
Take a picture of the element using the device camera or upload a picture available on the device.

Take Picture

Choose Image



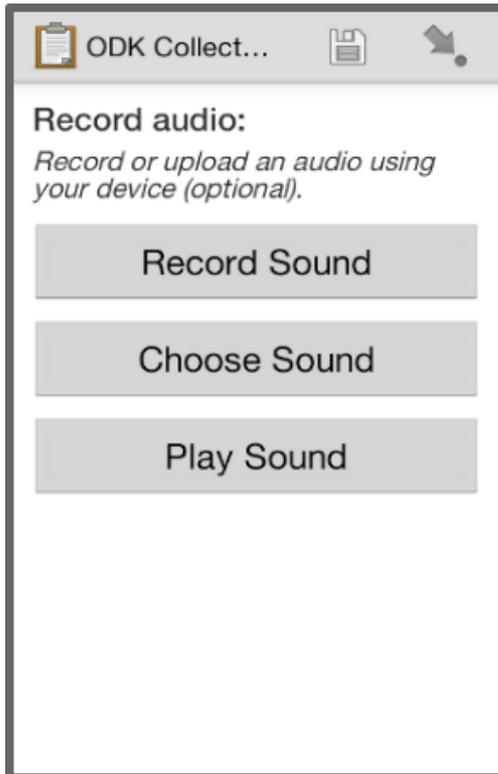
- ✓ Detailed instructions:

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ODK Collect (Via Regina)

- ✓ Form compilation



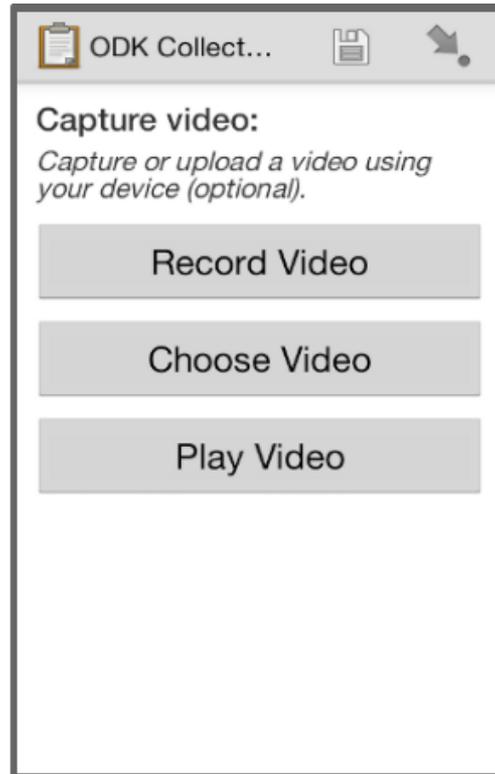
ODK Collect... [Save] [Back]

Record audio:
Record or upload an audio using your device (optional).

Record Sound

Choose Sound

Play Sound



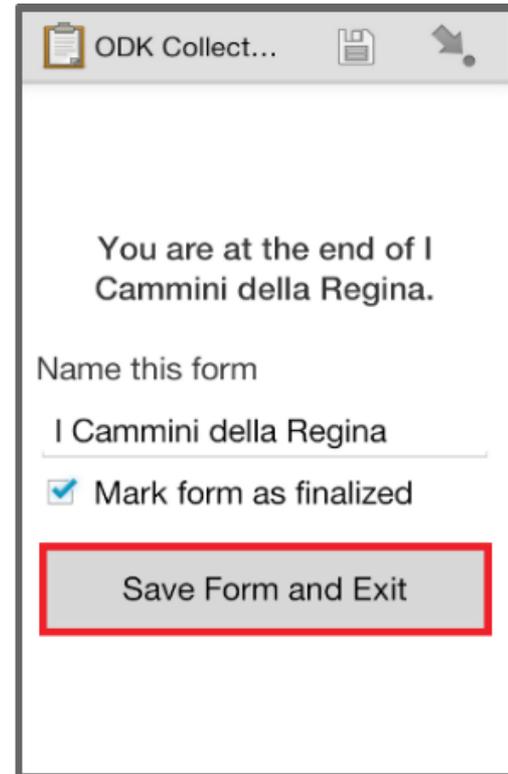
ODK Collect... [Save] [Back]

Capture video:
Capture or upload a video using your device (optional).

Record Video

Choose Video

Play Video



ODK Collect... [Save] [Back]

You are at the end of I Cammini della Regina.

Name this form
I Cammini della Regina

Mark form as finalized

Save Form and Exit

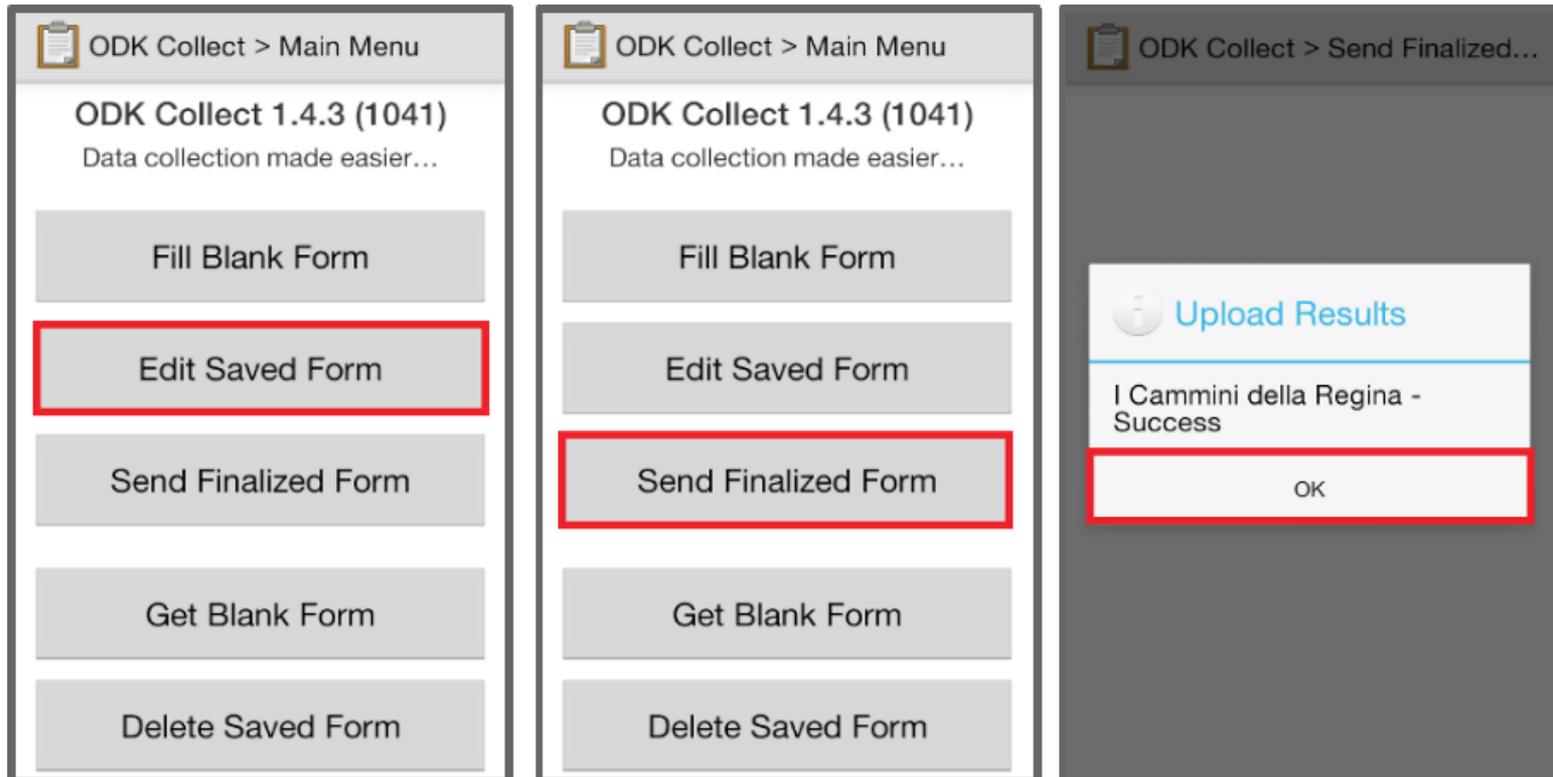
- ✓ Detailed instructions:

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ODK Collect (Via Regina)

- ✓ Main menu of the application



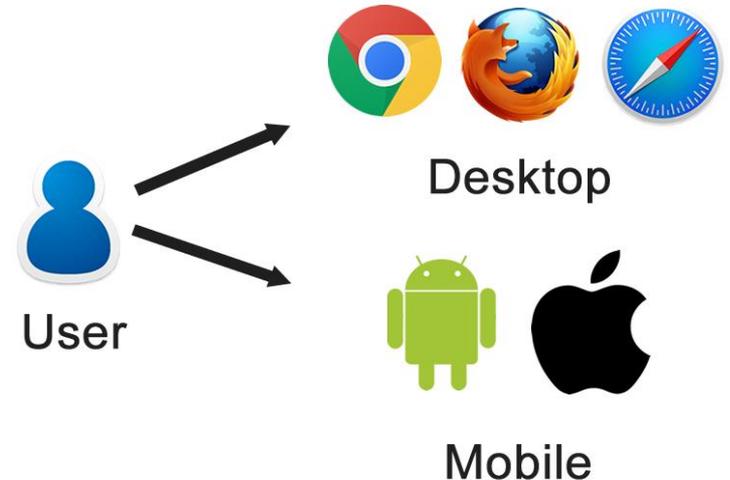
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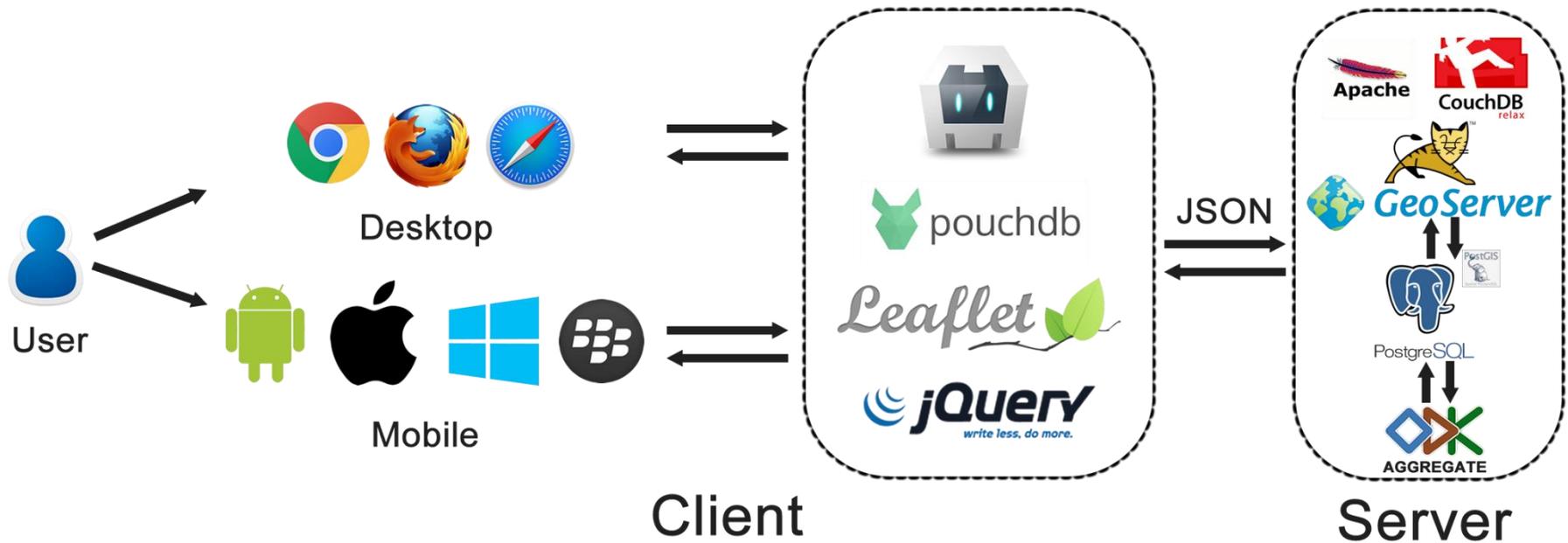


Cross-platform VGI application

- ✓ Available on desktop and mobile browsers: <http://viaregina3.como.polimi.it/app>.
- ✓ The apk for Android devices can be downloaded from:
<http://viaregina3.como.polimi.it/app/viaregina.apk>
- ✓ The app is also available on Android and iOS online stores, named as “Via Regina”.
- ✓ Main features:
 - ✓ **offline** data collection
 - ✓ POI rating
 - ✓ **integrated maps** showing collected POIs

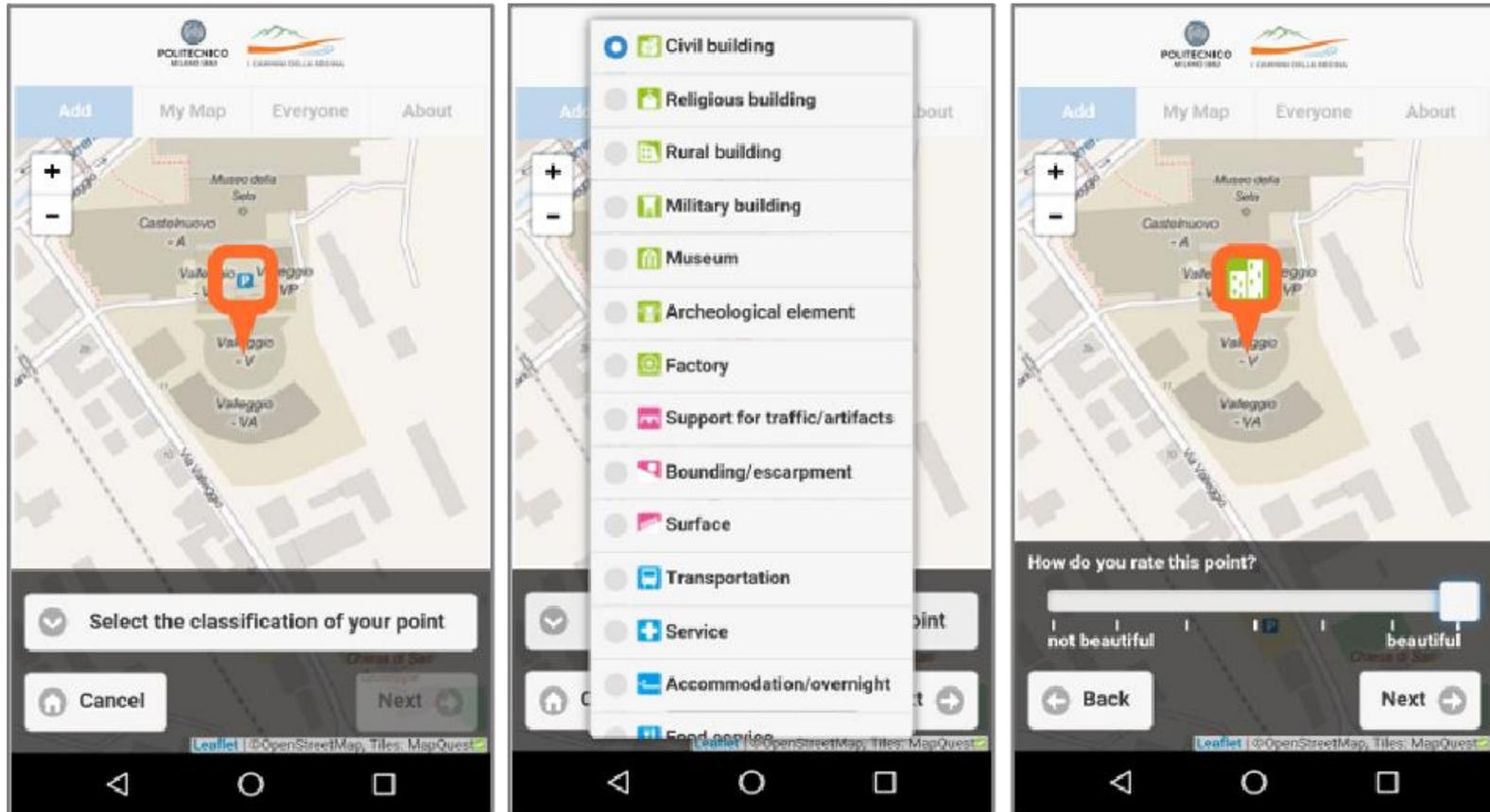


Cross-platform VGI application - architecture



Cross-platform VGI application

- ✓ Report of a POI: setting the class and rating

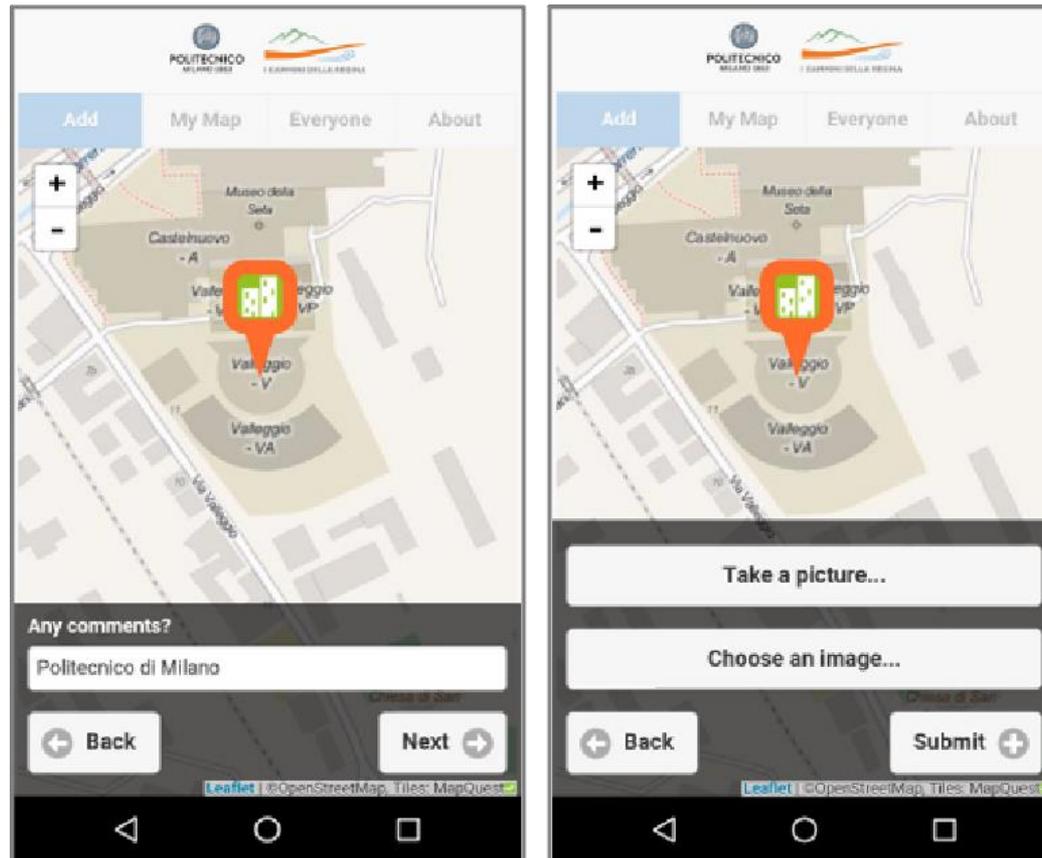


- ✓ Available at <http://viaregina3.como.polimi.it/app/>



Cross-platform VGI application

- ✓ Report of a POI: take/upload a picture of it

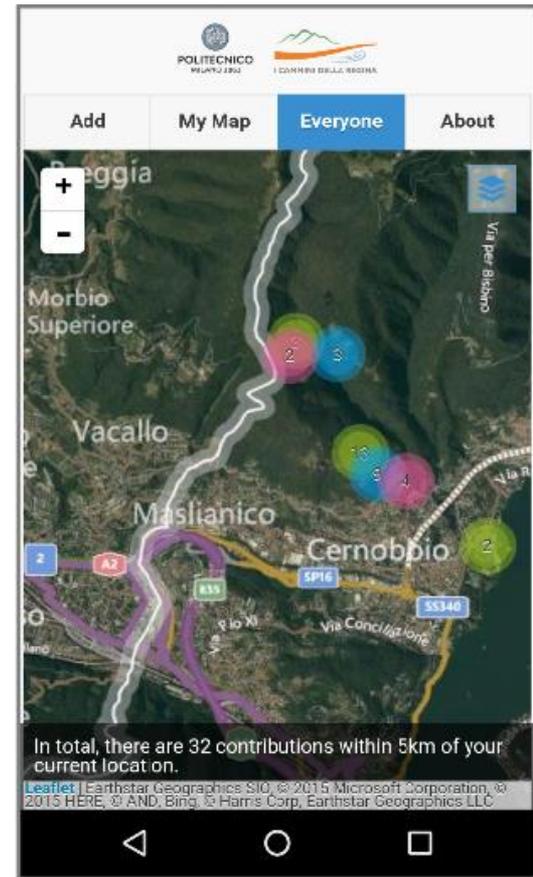
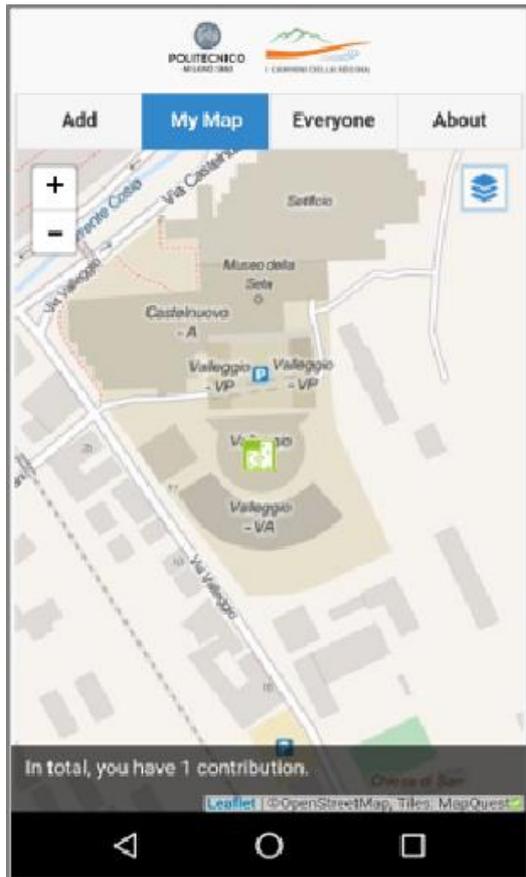


- ✓ Available at <http://viaregina3.como.polimi.it/app/>



Cross-platform VGI application

- ✓ The map of POIs added by **you** or by **all the users**

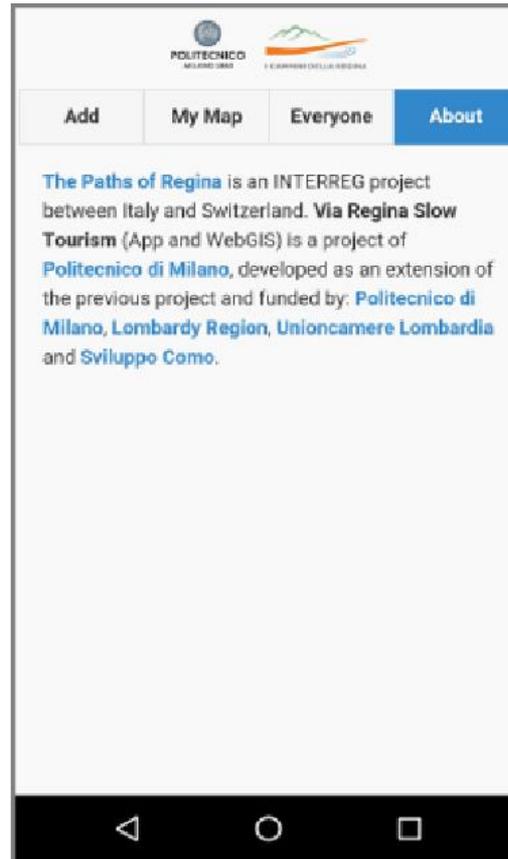
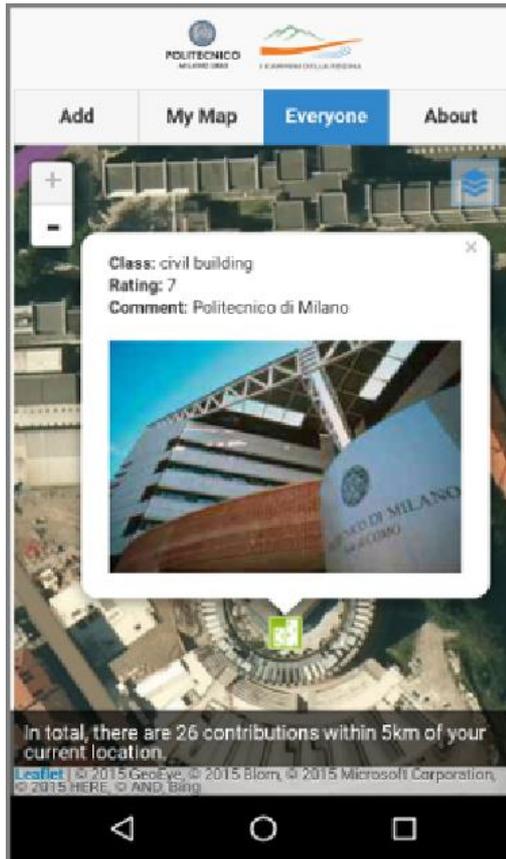


- ✓ Available at <http://viaregina3.como.polimi.it/app/>



Cross-platform VGI application

- ✓ Query of a POI and the app info



- ✓ Available at <http://viaregina3.como.polimi.it/app/>



Conclusions

- ✓ ODK Collect and a [cross-platform](#) application (Via Regina) is used to collect geographical information.
- ✓ The collected information is displayed on a NASA Web WorldWind based virtual globe in the scope of [OpenCitySmart](#).
- ✓ The application can be used to [involve](#) citizens in the decision-making processes, as a result to [empower citizens](#) and foster the development of smart cities.
- ✓ The capacity of a powerful framework, [NASA Web WorldWind](#), that can be used in many fields is demonstrated.



Thanks for your attention!

