

DigMap
DigMap – Digital Map Excerpt Software
FINODEX_048

# Phase 3 Deliverable

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## Online working demo for review

### Is the service and product accessible via web

☒ Yes      User:      Password:

Access Instructions: <http://gis.dugaresa.yottabyte.hr>

☒ No      No action required

There are two demos hosted at FIWARE Cloud:

DigMap Fiware Lab is available at: <http://digmap-lab.fiware.yottabyte.hr>

<http://digmap-lab.fiware.yottabyte.hr/leaflet/> - demo showing DigMap usage using Leaflet front end



<http://digmap-lab.fiware.yottabyte.hr/geoext/> - demo showing DigMap using GeoExt front end

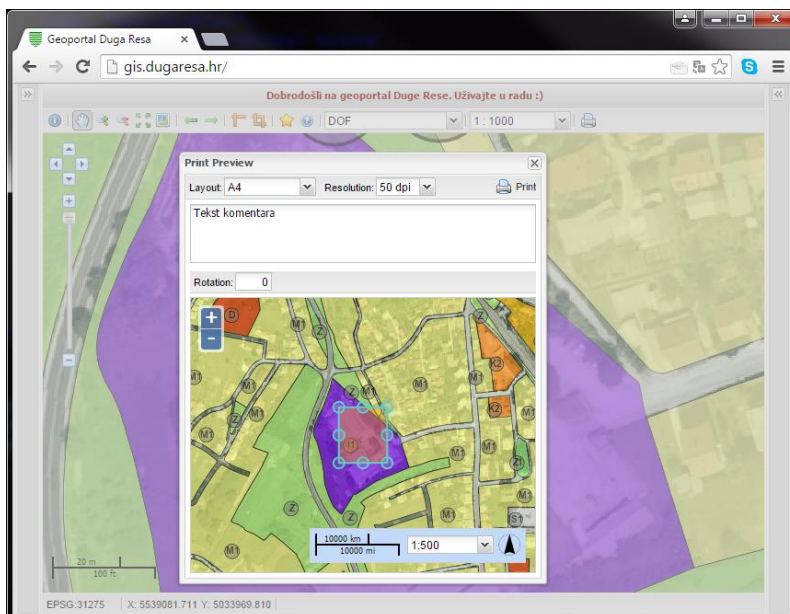
Operational test and operational production implementation is available at FIWARE Cloud:

Test: - <http://gis.dugaresa.yottabyte.hr>, **Production:** <http://gis.dugaresa.hr>

## Test instructions

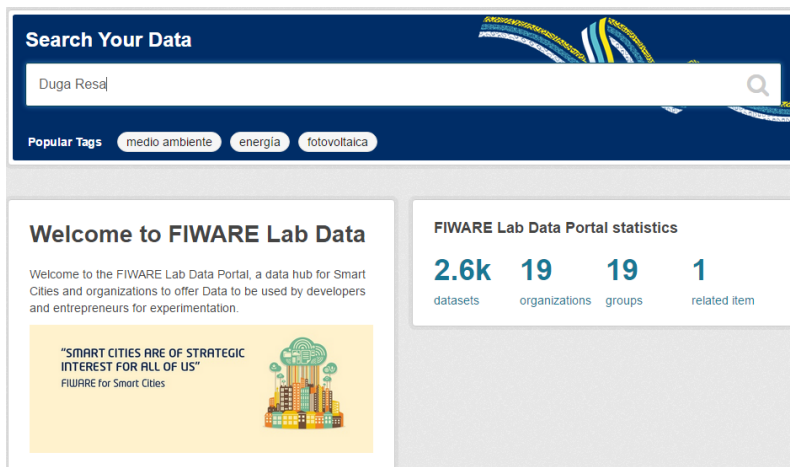
### Test DigMap functionality:

1. Open Duga Resa City GeoPortal in Internet browser (preferably Google Chrome):  
<http://gis.dugaresa.hr>
2. Press "Print" button 
3. Leave or change default settings and Press "Print" button  again
4. Review .pdf content:
  - a. digital signature
  - b. attached WKT and
  - c. attached GML file



### Test dataset search in Global FIWARE CKAN:

1. Open Global FIWARE CKAN in Internet browser:  
<https://data.lab.fiware.org/>
2. Enter "Duga Resa" into search field
3. Click on found resource
4. Review Data and Resources



### Does the service / product involve the development of a mobile app?

DigMap doesn't involve mobile app development, but it is possible to run DigMap on mobile phone or tablet as a web application.

## Feedback from Users and/or Customers

DigMap is a software solution and as such its features are rather abstract for presentation. DigMap solution is presented using several sources, depending if presentation is intended to business or technical users:

- General slides presentation: <http://digmap.yottabyte.hr/>
- Video presentation: <http://digmap-lab.fiware.yottabyte.hr/video.html>
- Operational demo: <http://gis.dugaresa.hr/>
- Technical demo: <http://digmap-lab.fiware.yottabyte.hr/>
- Workshop: <https://digmap.wordpress.com/>
- Source code: <https://github.com/zekonja/digmap>

Based on presented materials feedback was taken either by survey or during interview with prospect/customer.

### Summary of Feedback

From survey sent to potential customer we have concluded 88.9% would prefer a use of interoperable software for creation of digital map excerpt, digitally signed, based on free and open source software. On the scale 1-10 (where 0=Not attractive at all and 10=Vary attractive) our customers judge on average the DigMap solution 6.8.

For fee & open DigMap solution we offer payable services and our customers would pay for the following weighted average prices on the local market: 1055 €/year for Installation and configuration, 1720 €/year for Commercial support and maintenance, 1998 €/year for User and administrator training, 2444 €/year for Consultancy hours included and more than 2750 €/year for Dedicated customized development.

Customers haven't expressed price sensitivity for spatial data dissemination solution in form of digital map excerpt, but biggest concerns are standardization and vendor lock. DigMap target exactly those issue by offering solution based on interoperable OGC services and portable PDF file format. DigMap is open source solution sold on "freemium" business model, providing real value for customer.

All of our customers would prefer end-users to be able to standardized offline storage and printing on their computer. We have also offered a demonstration of web application at: <http://digmap-lab.fiware.yottabyte.hr/geoext> Customer feedback was positive, scoring an average 4 (on scale from 1 to 5). Majority of customers would like to try out free software version and to have a live personal demo demonstration. In that sense, maybe COS (cost of sales) have been underestimated earlier in business plan.

From interview we found that some customers are not ready to adopt DigMap solution due the usage of CAD (computer-aided design) formats (like AutoCad .dwg) for storing geo-spatial data. Translation from CAD (where data is encoded combining line type, colour, and line weight properties) to GIS formats (where data have its topology and additional attributes) is a heavy duty expensive job with huge users resistance since they have to made a technological switch. Such customer environment obstructs DigMap adoption. Data migration could be additional service in form of assistance or complete data migration performance that fore generating additional income.

Public procurement and one's year time frame for budgeting is a main reason for long sales cycle in governmental and public institutions. DigMap low price due the open source usage seems like an advantage because its procurement can be made directly following simplified procurement procedure.

Using DigMap for providing administrative excerpt in Republic of Croatia will be possible as soon. Instead of buying state markers administrative fee will be paid electronically. The government is preparing a new law on administrative fees in compliance with the EU directives, which means that citizens should have the option of paying administrative fees electronically. Law on validity of digital signature is already enforced.

In general, customer feedback is showing a DigMap as simple and affordable GIS software for SMB and government institutions. Because it is cloud-based software (hosted in FIWARE Lab), users can access data anytime, anywhere, even from mobile devices.

Very small businesses don't have the time to deal with technically complicated GIS software, or the resources to implement lengthy training programs. What makes DigMap especially SMB friendly is that it offers a very simple, easy to use interface, even for the least tech-savvy users.

Complete results from customer's survey with graphical presentation are available in APPENDIX II – results of a survey.

## Selection

Dig Map primary target are SME and institutions with need to disseminate spatial data. As such any member of Croatian's NSDI (National Spatial Data Infrastructure) Working Group was targeted as a customer for DigMap solution.



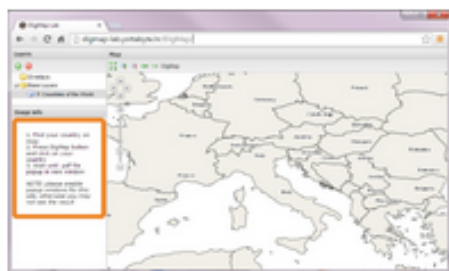
Additionally DigMap was presented on several conferences that gather potential customers and supporters interested in DigMap project.

Conference	Description	Selection
 <b>Share-PSI 2.0</b>  The fifth and final workshop in the Share-PSI series hosted by Fraunhofer Institute for Open Communication Systems in November 2015.	<p>Berlin Workshop: Maximising interoperability — core vocabularies, location-aware data and more. Workshop will focus particularly on questions related to technical implementation.</p> <p>The following crucial factors have to be met:</p> <ol style="list-style-type: none"> <li>1. staff at public authorities with different technical experience have to be able to increase the discoverability and interoperability of their datasets;</li> <li>2. public authorities should make it easy to combine datasets from different sources, different member states or different domains;</li> <li>3. public authorities should be aware of the tools in most common use to import, process and visualise data;</li> <li>4. public authorities should refer to locations in a consistent manner to enable the combination of multiple datasets that refer to the same place.</li> </ol>	<p>DigMap papers are already submitted since fifth Share PSI workshop. Workshop seems like a perfect fit for DigMap, since it can met all the crucial factors set by Share PSI:</p> <ol style="list-style-type: none"> <li>1. Interoperability is met by using today's leading OGC web services standards and PDF data format.</li> <li>2. DigMap can combine different datasets published over OGC web feature service.</li> <li>3. DigMap is based on open standards and promotes easy to use open source software</li> <li>4. DigMap is primary dealing with spatial location</li> </ol>
  <b>Share-PSI 2.0</b>  Share PSI 2.0 workshop and eDEM 2015 Conference hosted by Danube University Krems, Centre for E-Governance in May 2015.	<p>Conference that focuses on a variety of issues including open data, transparency and open innovation and opens the opportunity for mutual discussions. The fourth workshop in the Share-PSI series will address the topic of self-sustaining business models for open data and PSI. The workshop is explicitly interested in business models for commercial entities that reuse PSI and for the public sector itself as it develops the culture of sharing its information in a sustainable 'business as usual' manner.</p>	<p>Share PSI conference is selected to promote DigMap since DigMap can perfectly resolve issues related to PSI re-usage and dissemination.</p> <p>Conference is interesting in business sense since DigMap prospects are present, offering good promotion and networking opportunity.</p>
 <b>Javantura</b> 15.11.2014 Zagreb 2014  Javantura v2 conference, in Zagreb, on 15th November 2014.	<p>Javantura is a community-driven Java conference in Croatia. It is one of the biggest Java community conferences in the region, built on a lot of enthusiasm with intent to gather the majority of Java community in Croatia and from the region.</p>	<p>Promote solution among developers and gather DigMap advocates and power users.</p>

Conference	Description	Selection
<b>JavaSi '14</b>  20. oktober 2014	Java Si is International Java conference bringing developers and business users together.	Promote solution among developers and gather DigMap advocates and power users.
 OSGeo Croatian Local Chapter	<p>The Croatian local chapter of the Open Source Geospatial Foundation.</p> <p>The HR OSGeo community is for everyone who is interested in open data, open source software and spatial IT. From a newbie to a guru, all are welcome.</p>	DigMap live presentation was held on HR-OSGeo Meetup on 2 <sup>nd</sup> October 2014 to attract local developers and users.
 FOSS4G EUROPE BREMEN2014	<p>FOSS4G is the acronym for Free and Open Source Software for Geospatial. It is the annual recurring global event hosted by OSGeo since it's inception in 2006.</p> <p>In July 2014 conference took place in in Bremen, Germany.</p>	<p>First GeoReports live tutorial is held at FOSS4G-E conference in Bremen, on 14th of July 2014.</p> <p>Intention was to create DigMap user community promoting it on European level.</p>

In particular prospects that have shown a special interest for solution have been contacted and live DigMap presentation was made following an interview. Such prospects are listed in the next chapter with most relevant notes and conclusions.

## Feedback Method



### DigMap Questionnaire

We are a group of young Croatian startup entrepreneurs that are developing DigMap – Digital Map Excerpt Software, an free and open source, cloud-based Geographic Information (GI) delivery system for public and private sector users to help them:

(1) to easier disseminate online, spatial and non-spatial digital data (through digitally signed PDF report with excerpt maps and embedded data, which includes any additional paper work) and (2) standardized offline storage and printing on end-users' computer.

This survey will be used to collect information on what people's concerns are and what design specifications are the most important. Thank you in advance for your time and thoughtful answers. Also, it's even more helpful to us, if you can share your critical reasoning for your answers.

We'll inform you about survey summary if you will be interested.

#### Problem Statement

These questions are designed for us to understand what issues are most important to you.

1. What do you see as the biggest problem regarding dissemination of spatial and non-spatial data?

- ☐ Not standardized.
- ☐ Not easy to implement.
- ☐ Too expensive to implement.
- ☐ Interoperability and portability.
- ☐ Not re-usable service.
- ☐ Data security.
- ☐ Data billing.
- ☐ Other:

2. Do you know of any ways to resolve these problems?

1 2 3 4 5

I can't find any solutions ☐ ☐ ☐ ☐ ☐ I have the perfect solution and am already doing it

3. How much you expect such a product/service would cost your project annually?

- ☐ I don't know.
- ☐ ~ 0 €
- ☐ ~ 1000 €
- ☐ ~ 2000 €
- ☐ ~ 5000 €
- ☐ ~ 10000 €
- ☐ > 15000 €
- ☐ Other:

4. What kind of map excerpt would help to solve your problem?

	No	Yes, but I have better solutions.	Sort of, but still unsolved.	Perfect solution.
Paper map excerpt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only creation of digital excerpt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Digitally signed excerpt software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Digitally signed

Feedback is taken by online survey primary sent to The Working Group for spatial data of Croatian's NSDI (National Spatial Data Infrastructure)<sup>1</sup> and other business contacts who might be interested in DigMap solution.

We have designed online DigMap questionnaire (<http://goo.gl/8rQwlm>) which structure we have used in standard personal (offline) interviews as well.

The questionnaire is separated in two sections:

**(A) Problem Statement** – where we have tested problem hypothesis and

**(B) Solution Statement** – where we have tested hypothesis regarding the fitting of our DigMap solution to the customers' problem.

Summary is presented in previous chapter while complete results are presented in APPENDIX II – results of a survey.

<sup>1</sup> [http://www.nipp.hr/UserDocsImages/dokumenti/dok-nippa/Registar%20subjekata%20NIPPa\\_20150729.pdf](http://www.nipp.hr/UserDocsImages/dokumenti/dok-nippa/Registar%20subjekata%20NIPPa_20150729.pdf)

## Feedback itself

DigMap value proposition hinges on an attractive, free initial offer (“razor”) that encourages continuing future purchases of follow-up items or services (“blades”). Customers seem to like this kind of “freemium” business model offering the best value for the money.

Prospect/Customer	Relevant information																				
<b>City of Velika Gorica , Croatia</b> <b>Peter Karačić , Senior Surveyor Advisor,</b> <b>Administrative Department of Urban</b> <b>and Environmental Protection</b>	<p>City where DigMap solution provider company yottabyte j.d.o.o is established. DigMap author is familiar with some influence decision’s makers in City of Velika Gorica.</p> <p>At the moment City of Velika Gorica has a GeoPortal provided by APIS IT (large Croatian’s state owned IT company). Current GeoPortal <a href="https://e-uprava.apis-it.hr/GeoportalVG/">https://e-uprava.apis-it.hr/GeoportalVG/</a> doesn’t have print out or map excerpt functionality. Current solution is well overpaid and there is a potential for GeoPortal swap or adding additional functionality using DigMap.</p> <p>As local municipality solution provider has to go through public procurement process.</p> <p>Customer was not comfortable talking about price of current web GIS solution, but since city has a legal obligation to publish a public procurement plan prices for current solution are available on Internet (search for item <i>geoportal</i> inside .pdf file):</p> <p><a href="http://www.gorica.hr/dokumenti/plan-nabave-2013.pdf">http://www.gorica.hr/dokumenti/plan-nabave-2013.pdf</a></p> <p><a href="http://www.gorica.hr/dokumenti/javna-nabava/plan-nabave-2014.pdf">http://www.gorica.hr/dokumenti/javna-nabava/plan-nabave-2014.pdf</a></p> <p><a href="http://www.gorica.hr/dokumenti/javna-nabava/plan-nabave-2015.pdf">http://www.gorica.hr/dokumenti/javna-nabava/plan-nabave-2015.pdf</a></p> <table><tr><th>Year</th><th>Description</th><th>Amount [kn]</th><th>Amount [€]</th></tr><tr><td>2013</td><td>Initial setup</td><td>28.000,00 kn</td><td>3.733,33 €</td></tr><tr><td>2013</td><td>Maintenance</td><td>40.000,00 kn</td><td>5.333,33 €</td></tr><tr><td>2014</td><td>Maintenance</td><td>60.000,00 kn</td><td>8.000,00 €</td></tr><tr><td>2015</td><td>Maintenance</td><td>60.000,00 kn</td><td>8.000,00 €</td></tr></table> <p>First year’s expenses were 68 thousand kunas, just two thousand below the threshold for public procurement procedure. Comparing TCO (total cost of ownership) for a three years period clearly shows DigMap competitive price advantage offering a solution for less than a third of the amount customer has already paid for solution with less functionality (there is no digital signature for print out, no data embedding and custom made client doesn’t support additional options like rotation or template selection).</p> <p>DigMap could be implemented for the price lower than current solution yearly maintenance costs.</p>	Year	Description	Amount [kn]	Amount [€]	2013	Initial setup	28.000,00 kn	3.733,33 €	2013	Maintenance	40.000,00 kn	5.333,33 €	2014	Maintenance	60.000,00 kn	8.000,00 €	2015	Maintenance	60.000,00 kn	8.000,00 €
Year	Description	Amount [kn]	Amount [€]																		
2013	Initial setup	28.000,00 kn	3.733,33 €																		
2013	Maintenance	40.000,00 kn	5.333,33 €																		
2014	Maintenance	60.000,00 kn	8.000,00 €																		
2015	Maintenance	60.000,00 kn	8.000,00 €																		
<b>Duga Resa City, Croatia</b> <b>Mladen Rakočević, Head of Department,</b> <b>Administrative Department for Urban</b> <b>Planning</b> <b>Tomislav Boljar, Vice Mayor of Duga</b> <b>Resa</b>	<p>yottabyte j.d.o.o. already had a previous business experience with Duga Resa City setting up spatial IT infrastructure based on OpenGeoSuite.</p> <p>Due the good previous business experience with Duga Resa City expressed interest in implementation of DigMap functionality and additional publishing of city’s open data on Croatian’s government open data portal based on CKAN (DKAN – Drupal and CKAN) as well as publishing over FIWARE Global CKAN</p>																				

<p><b>Duga Resa Utilities</b></p> <p><b>Ivan Klokočki, Head of delivery of water services and management structures for water services</b></p>	<p>instance.</p> <p>Selling services related to GeoPortal and DigMap product was successful, but due the short period for negotiation (caused by FINODEX deadline and condition to show product in operational environment) a heavy discount was approved.</p> <p>Beside Duga Resa City, Duga Resa Utility company will also publish data on Duga Resa GeoPortal.</p>
<p><b>Ericsson Nikola Tesla, Croatia – large innovation company</b></p> <p><b>Saša Desić, Research and Innovation manager</b></p> <p><b>Ilija Čačić, Manager Software Design</b></p>	<p>Main technology partner for Croatian's Cadastre. Developing similar solution on its own, based on same platform (GeoServer), using same OGC services and using same libraries (itext) but with no willingness for cooperation or creation of open source component.</p> <p>Business model is oriented towards big clients (like Cadastre) selling engineering working hours.</p>
<p><b>Environmental Protection Agency</b></p> <p><b>Ivana Lampek - Pavčnik , Assistant Director</b></p> <p><b>Branimir Pavlinec, Head of IT</b></p>	<p>Environmental Protection Agency has a several GeoPortal solution, mainly based on proprietary ESRI and Microsoft software. There is an intention to start using open source solution but it doesn't seem like major efforts have been made for such switch. In general there is expression of interest for DigMap solution but</p>
<p><b>Apis IT, Croatia – large innovation company</b></p> <p><b>Sanja Batić, Sales Specialist at APIS IT d.o.o.</b></p> <p><b>Zoran Žižek, Business analyst/Project Manager</b></p> <p><b>Helena Pezer, GIS specialist</b></p>	<p>Apis IT is one of the main GIS providers for public administration and local government. Their GeoPortal solutions are based on GeoServer (FIWARE GE) as a mapping server and front end is made in OpenLayers. As such Apis IT is a perfect compatible match for DigMap as add-on to their existing portal functionality.</p>
<p><b>State Geodetic Administration</b></p> <p><b>Nikola Vučić, Head of Department for administrative and professional supervision</b></p>	<p>State Geodetic Administration has indeed huge need for IT products and services, especially for delivery of different kind of excerpts. However all services go through public procurement and at the moment Ericsson Nikola Tesla Company is implementing a huge IT solution for integrated Cadastre and Land Registry System.</p> <p>At the moment SGA has a web shop application for selling geodetic control points. However there is no solution for providing digital map excerpt service to the public.</p>
<p><b>Real estate Agencies</b></p>	<p>Contact was made with several real estate Agencies. A lack of interest is shown for custom made geo spatial solution, with primary focus on trivial POI functionality based on Google Maps. Seems like real estate agencies in Croatia are more interested to invest in employee outfit and company car than in innovative online solution to deliver information to their clients about real estates on sale.</p>

## Commercial Video File

A Commercial Video File lasting 5 minutes is created to promote the developed product and yottabyte services. This video is uploaded in the FINODEX Youtube Channel where it is accessible by anyone. DigMap Video is also available at DigMap Fiware Lab: <http://digmap-lab.fiware.yottabyte.hr/video.html>

The audio of the video is on fluent English and there is option to turn on subtitles. Video format is mp4 and the file size is 44 MB.



Figure 1 Scene from DigMap promotion animated video

☒ Commercial Video File uploaded to the DropBox Folder

## APPENDIX I – open data used

Base layer data source (DOF – Digital Orthophoto, TOPOGRAFSKA KARTA (topographic map) and HRVATSKA OSN. KARTA (Croatian's basic map)) is available from Croatian's State Geodetic administration:

<http://geoportal.dgu.hr/podaci-i-servisi/svi-servisi-i-aplikacije/>

Some overlays (like *Naselja* – settlement, *UPU koristenje* – urban planning usage) are open data provided by Duga Resa City in WMS and WFS format:

<http://ows.dugaresa.yottabyte.hr/geoserver/wms>

<http://ows.dugaresa.yottabyte.hr/geoserver/wfs>

Roads (hrv. Promet) open data dataset is taken from OpenStreetMap and published from Duga Resa City GeoServer. <https://www.openstreetmap.org/#map=12/45.4086/15.5319>

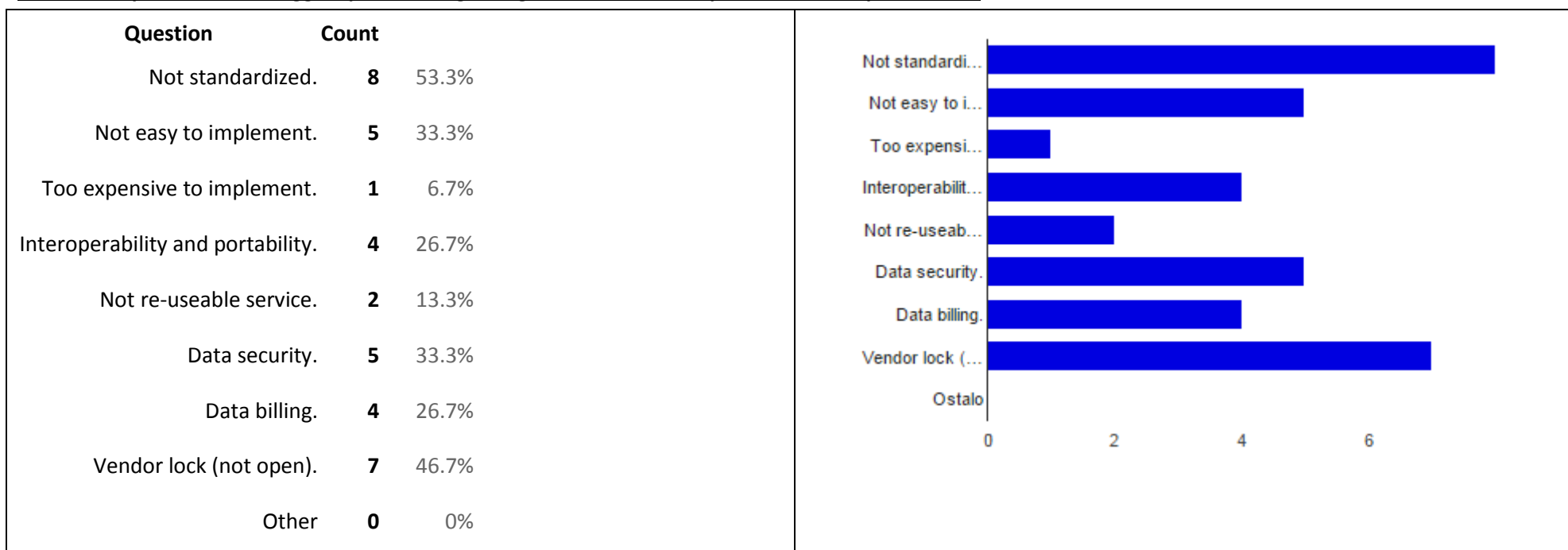
CORINE Land Cover open data set is taken from Agency for Environmental protection:

[http://gis.azo.hr/gisapp/services/AZO\\_PublicData/Corine\\_Land\\_Cover\\_2012/MapServer/WMSServer?](http://gis.azo.hr/gisapp/services/AZO_PublicData/Corine_Land_Cover_2012/MapServer/WMSServer?)

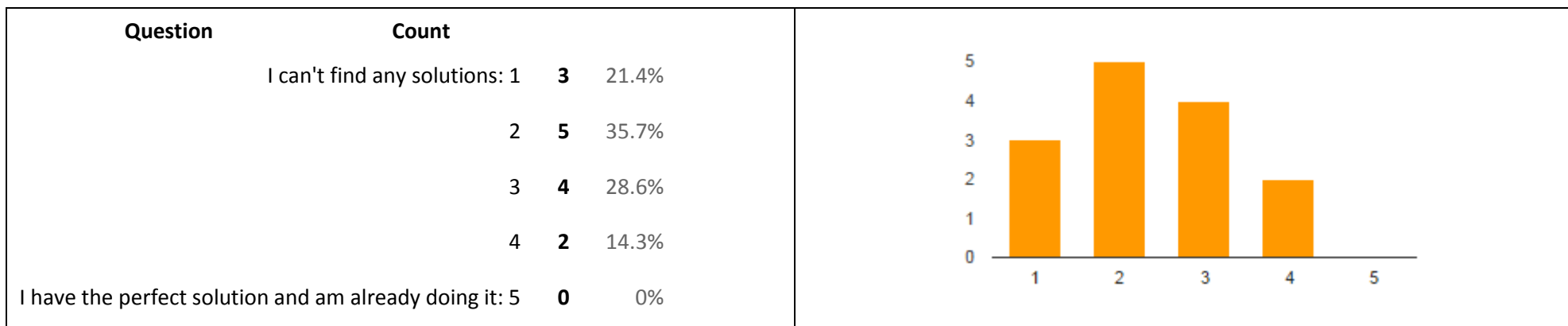
## APPENDIX II – results of a survey

### Problem Statement

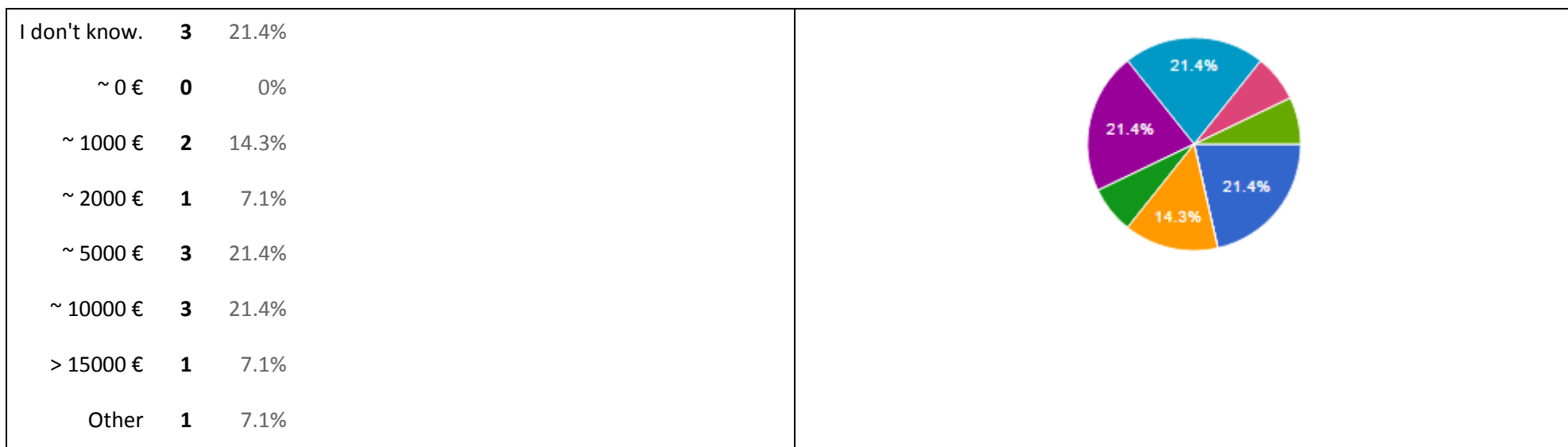
#### 1. What do you see as the biggest problem regarding dissemination of spatial and non-spatial data?



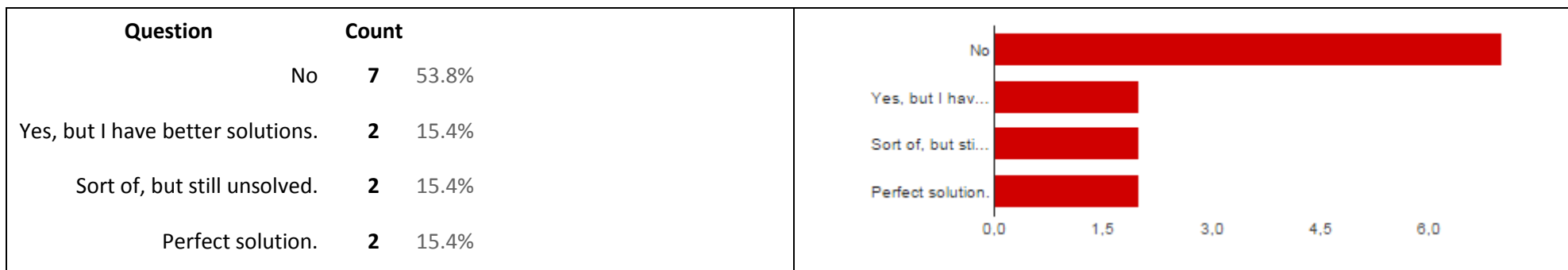
## 2. Do you know of any ways to resolve these problems?



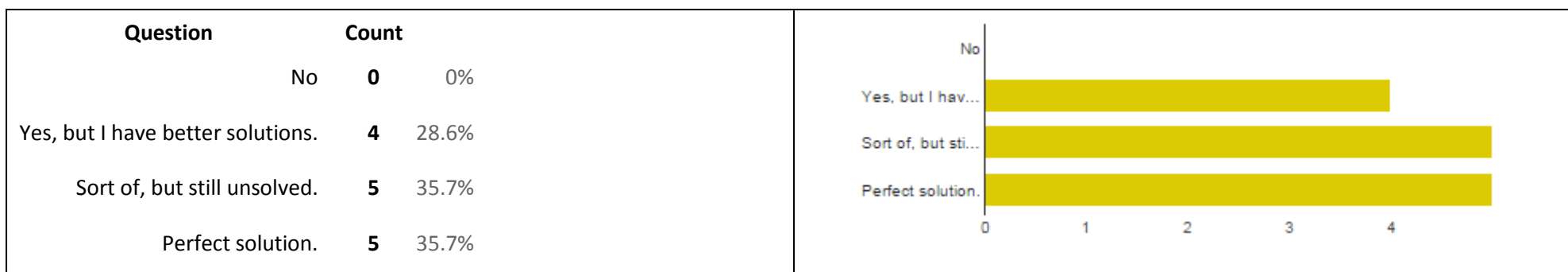
## 3. How much you expect such a product/service would cost your project annually?



#### Paper map excerpt [4. What kind of map excerpt would help to solve your problem?]



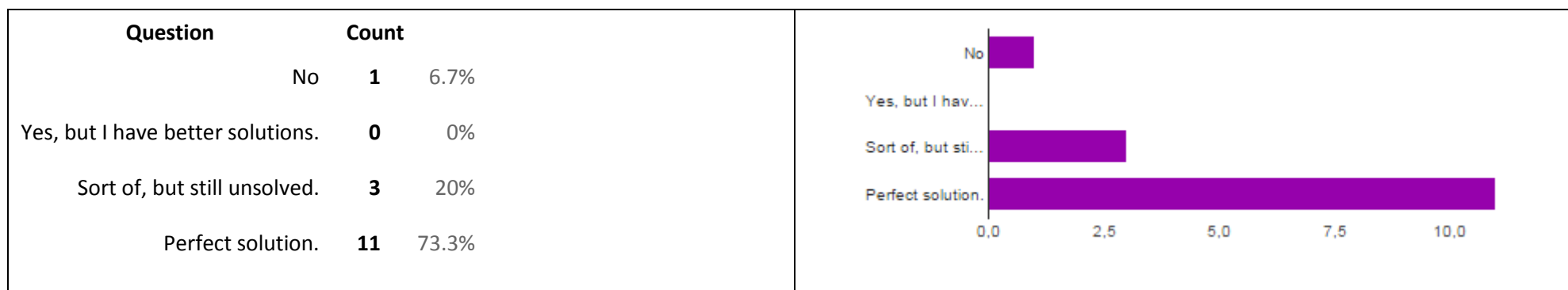
#### Only creation of digital excerpt [4. What kind of map excerpt would help to solve your problem?]



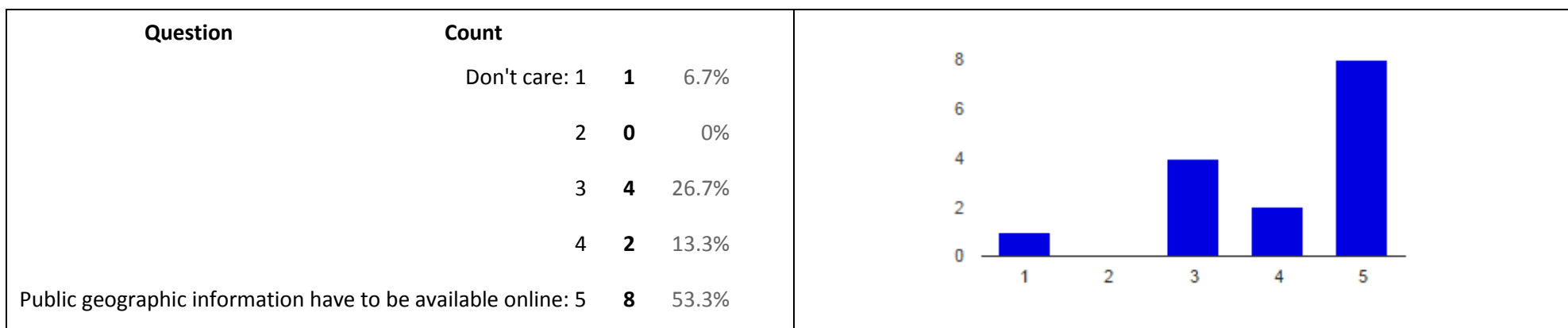
### Digitally signed excerpt software [4. What kind of map excerpt would help to solve your problem?]



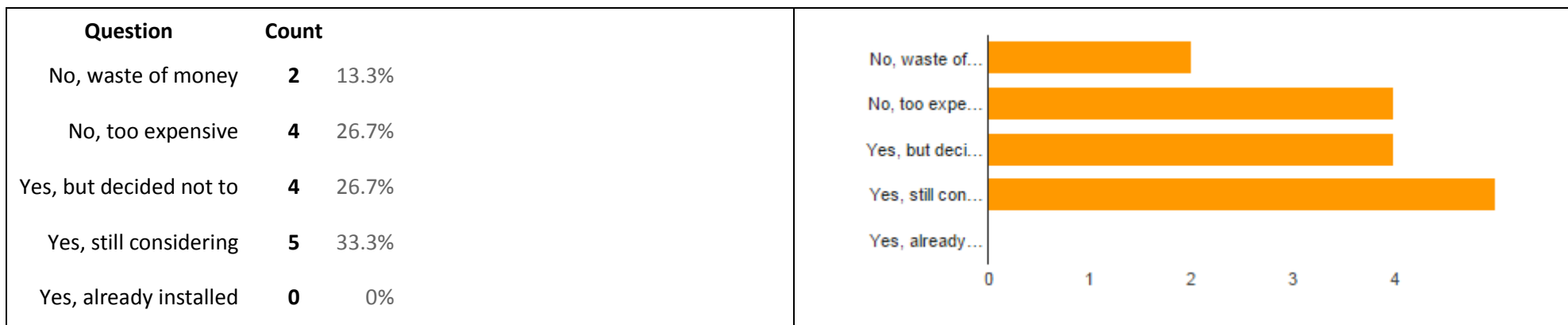
### Digitally signed excerpt software based on free and open source software [4. What kind of map excerpt would help to solve your problem?]



### 5. How the idea of online dissemination of public sector geographic information appeals significant to you?



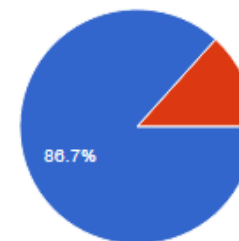
### Amount of consideration [6. Have you looked into Digital Map Excerpt software so far?]



### 7. Would you prefer a use of interoperable software for creation of digital map excerpt, digitally signed, based on free and open source software?

Yes **13** 86.7%

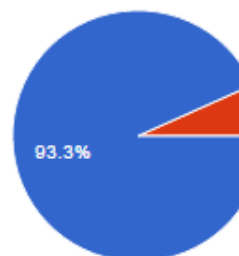
No **2** 13.3%



### 8. Would you prefer your end-users to be able to standardized offline storage and printing on their computer?

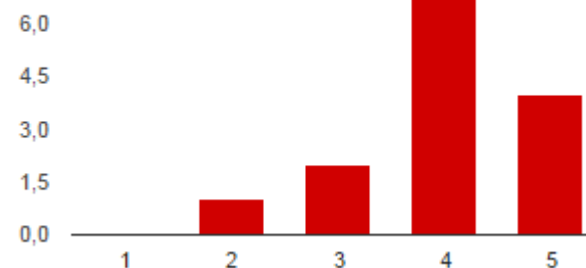
Yes **14** 93.3%

No **1** 6.7%



### 9. An example picture is shown at the top of this page. Sample web application is available at: <http://digmap-lab.fiware.yottabyte.hr/>. What do you think it looks like?

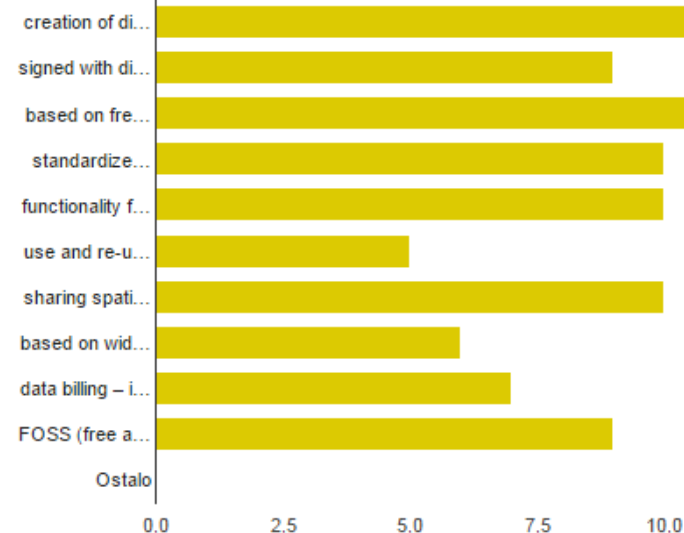
Question	Count	Percentage
Too complex: 1	<b>0</b>	0%
2	<b>1</b>	7.1%
3	<b>2</b>	14.3%
4	<b>7</b>	50%
Awesome!: 5	<b>4</b>	28.6%



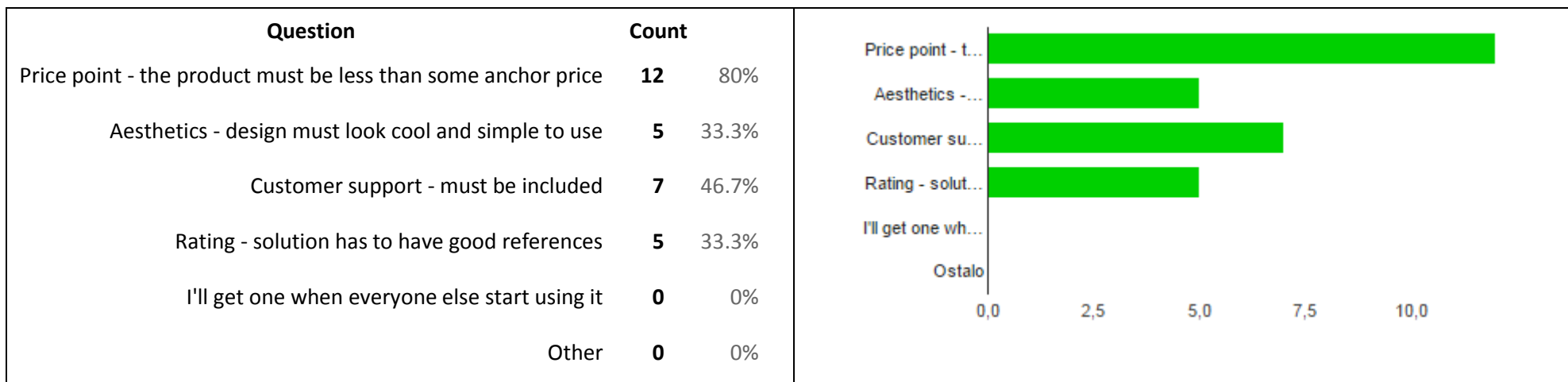
## Solution Proposal

### 10. What features would you require the DigMap to have?

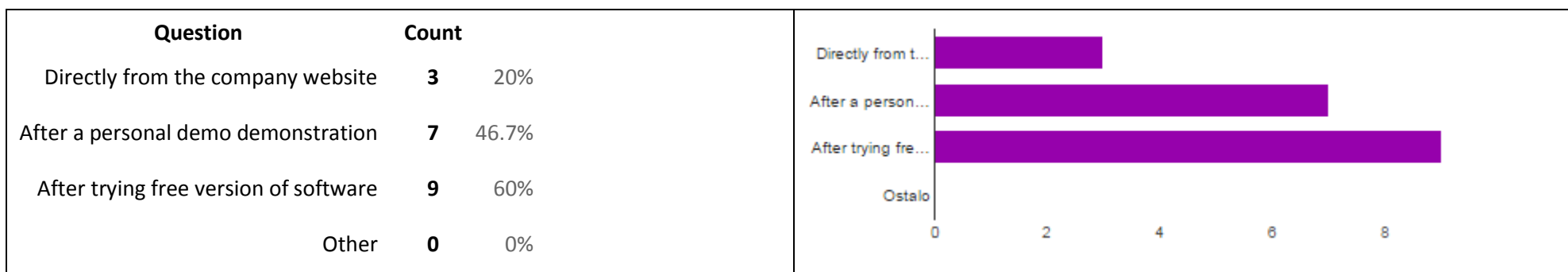
Question	Count	
creation of digital map excerpt	11	73.3%
signed with digital signature	9	60%
based on free and open source software	11	73.3%
standardize offline storage on end-users' computers	10	66.7%
functionality for printing maps on end-users' computers	10	66.7%
use and re-use of harmonised and interoperable data sets	5	33.3%
sharing spatial data in standardized .pdf format embedding .gml	10	66.7%
based on wide accepted OGC SLD, WMS, WCS WFS and WPS standard	6	40%
data billing – implement different billing rules (eg. by area, number of points...)	7	46.7%
FOSS (free and open source software) - wide spread at low cost, no vendor lock	9	60%
Other	0	0%

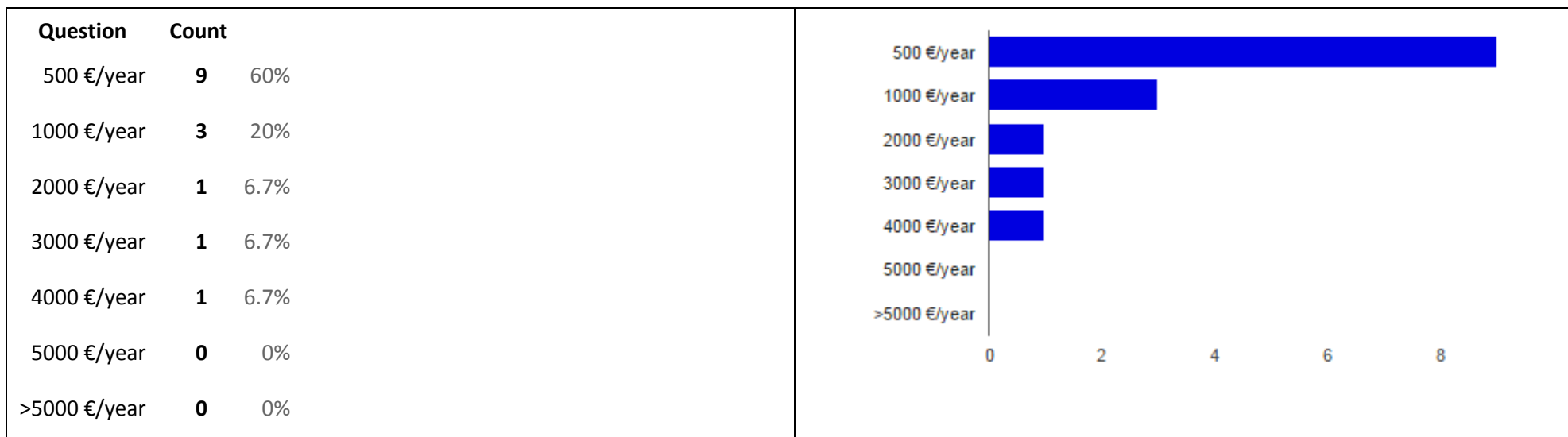
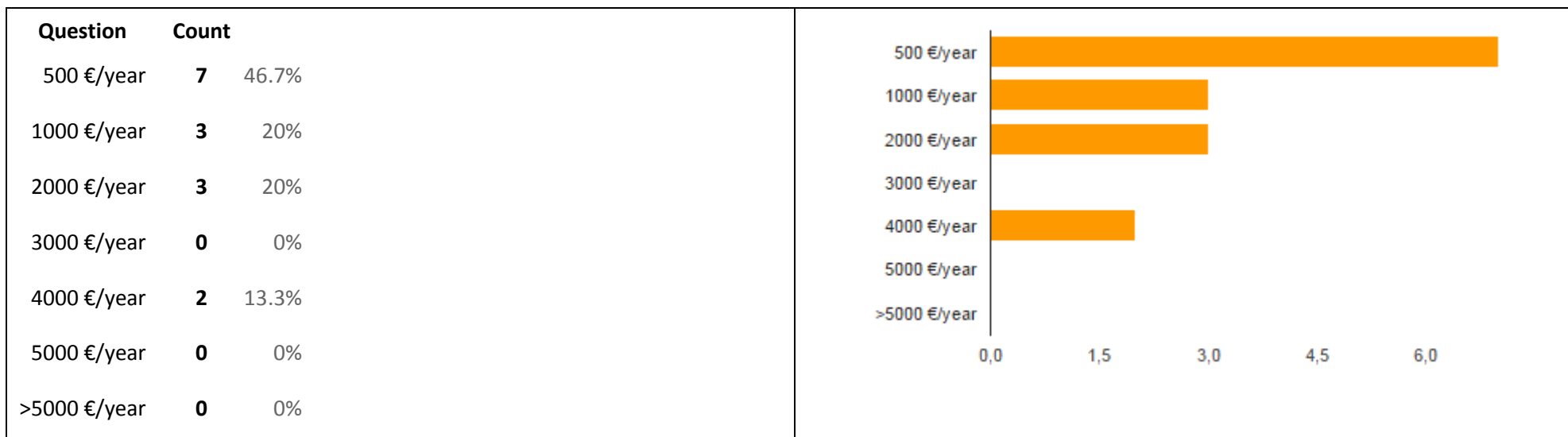


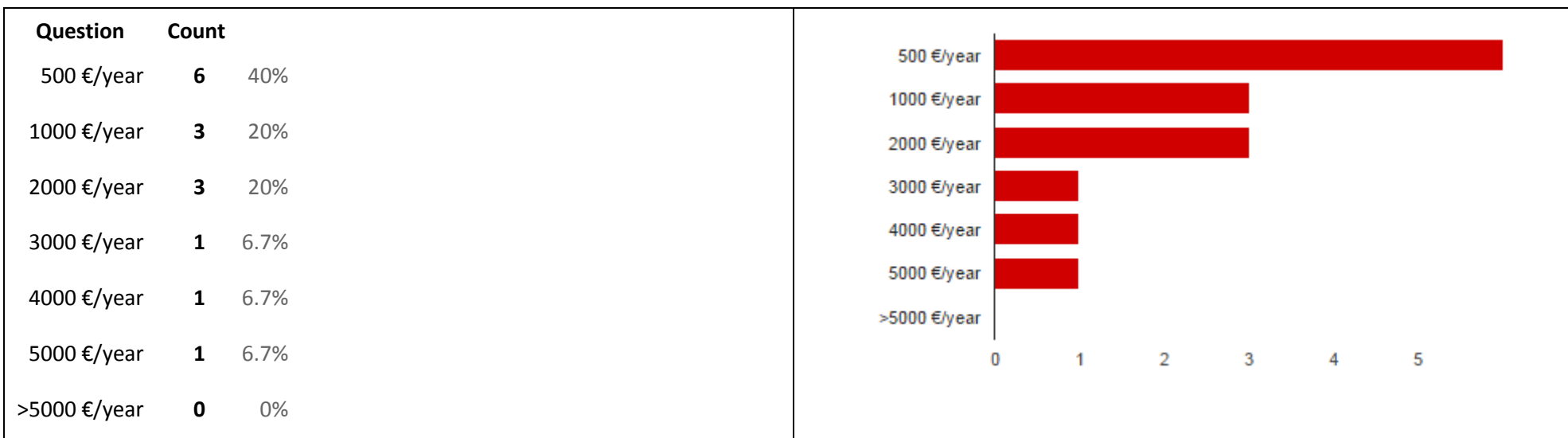
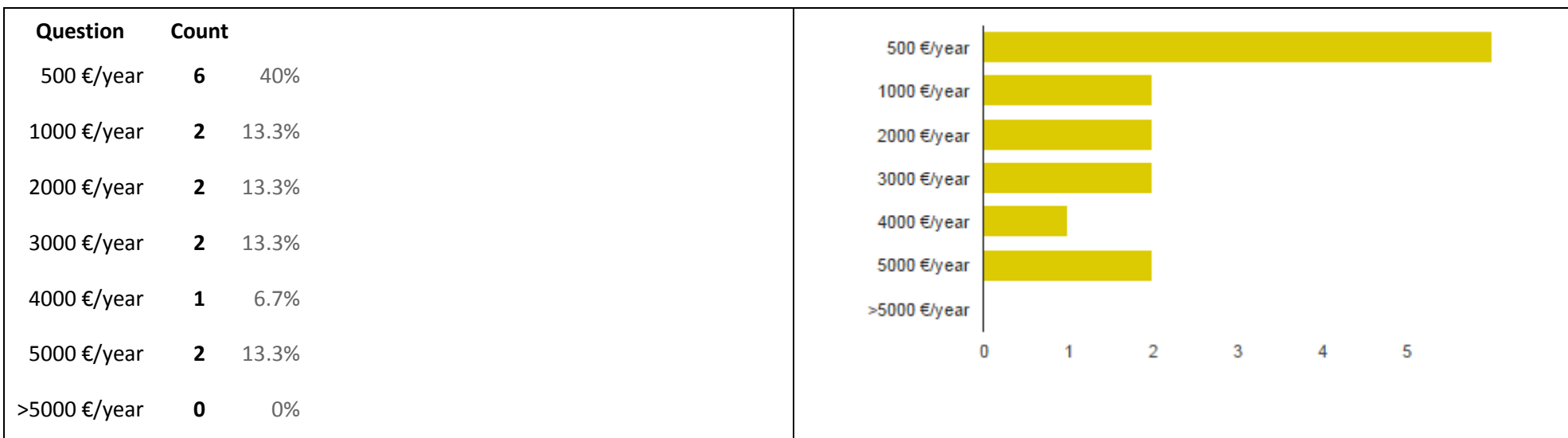
### 11. What would be your most important considerations in deciding whether to purchase this item?



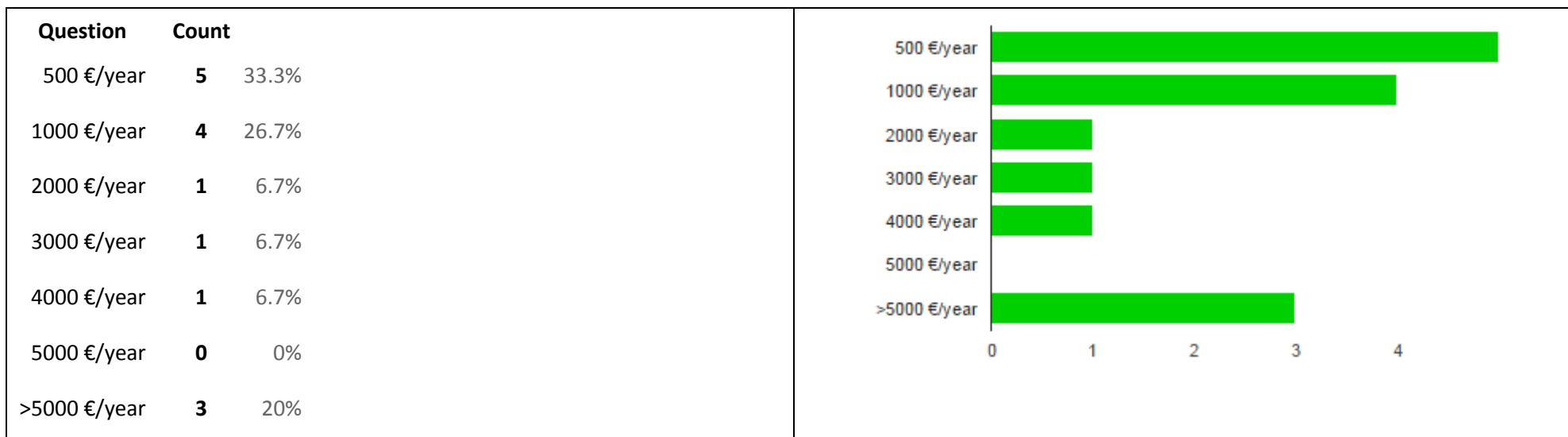
### 12. If you were to buy a product of this type, how would you get it?



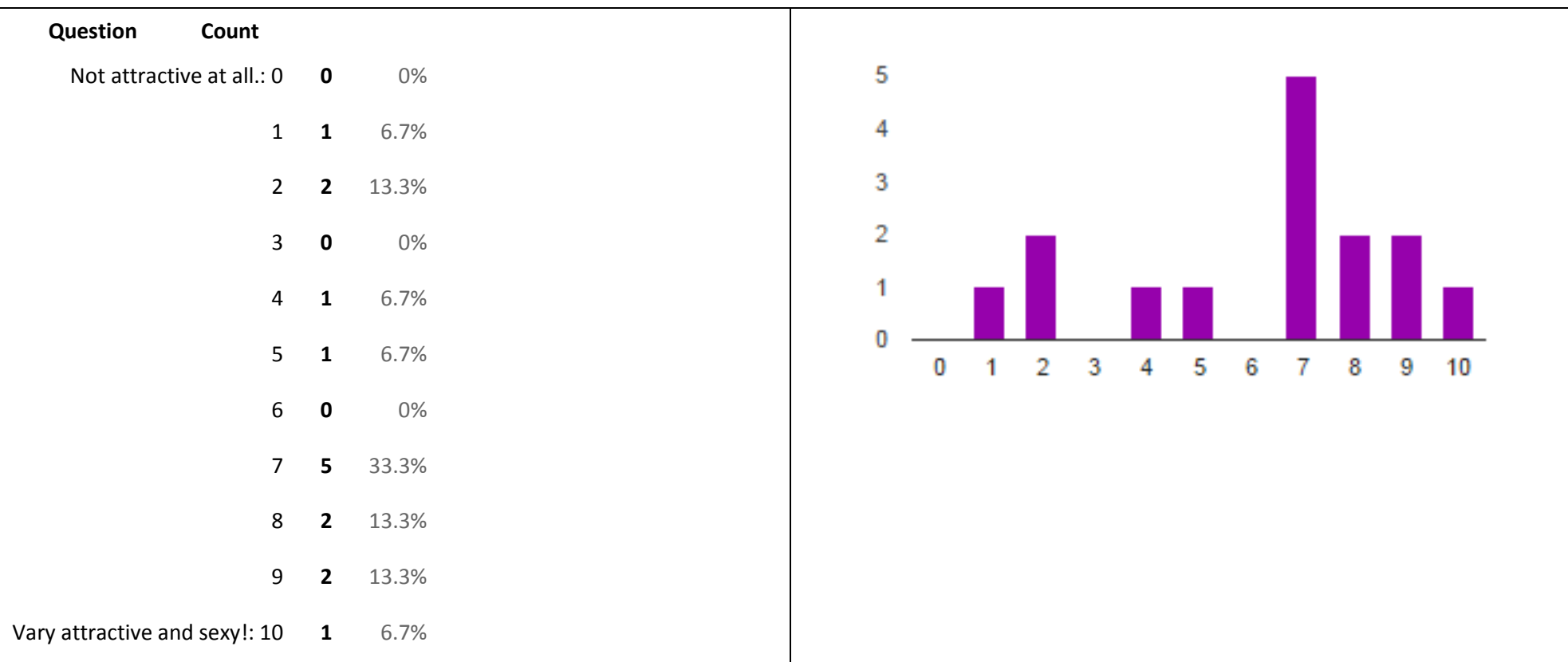
**Installation and configuration [13. How much does supporting services for fee DigMap solution would worth to you?]**

**Commercial support and maintenance [13. How much does supporting services for fee DigMap solution would worth to you?]**


**User and administrator training [13. How much does supporting services for fee DigMap solution would worth to you?]**

**Consultancy hours included [13. How much does supporting services for fee DigMap solution would worth to you?]**


**Dedicated development [13. How much does supporting services for fee DigMap solution would worth to you?]**



#### 14. How much does a DigMap solution seem attractive to you?



## APPENDIX III – DigMap testing procedure

DigMap itself is a component for digital map excerpt. The specific Dig Map project objectives (POs) are to design, develop, test and demonstrate the use of tool for digital map excerpt that support:

- **PO1. Authenticity** - use issued DigMap for legal purpose it must be signed with digital signature
- **PO2. Standardization** - enable sharing spatial data in standardized .pdf format embedding .gml
- **PO3. Interoperability** - based on wide accepted OGC SLD, WMS, WCS WFS and WPS standard
- **PO4. Data billing** – implement different billing rules (eg. by area, size in MB, number of points...)
- **PO5. FOSS (free and open source software)** - wide spread at low cost, no vendor lock

DigMap architecture is based on GeoTools, Map Fish Print and itext frameworks, GeoServer (FIWARE GE) mapping server and Java programming language.

DigMap is primary backend service processed on server side. DigMap interface is published through OGC WPS GetCapabilities request already available on DigMap Demo Lab.

<http://digmap-lab.fiware.yottabyte.hr/geoserver/ows?service=WPS&version=1.0.0&request=GetCapabilities>

two most important process are:

- Cost Calculation process - <http://digmap-lab.fiware.yottabyte.hr/geoserver/ows?service=WPS&version=1.0.0&request=DescribeProcess&identifier=gs:DigMapCalcCost>
- Digital Map Excerpt process - <http://digmap-lab.fiware.yottabyte.hr/geoserver/ows?service=WPS&version=1.0.0&request=DescribeProcess&identifier=gs:DigitalMapExcerpt>

## DigMap input

DigMap is

Choose process

**gs:DigMapCalcCost**

DigMap - Calculate data cost (WPS DescribeProcess)

Process inputs

baseURL\* - String

WFS host URL

**http://digmap-lab.fiware.yottabyte.hr/geoserver**

layers\* - String

Comma separated features list

**topp\_states**

geometry\* - Geometry

Area of interest

**TEXT – application/wkt**

**POINT(36 -106)**

costPerPoint\* - Double

Cost per point

**1**

costPerLine\* - Double

Cost per line

**1**

costPerPolygon\* - Double

Cost per polygon

**1**

costPerArea\* - Double

Cost per area

**1**

costPerExcerpt\* - Double

Cost per excerpt

**1**

Figure 2 DigMap Calc Cost input parameters

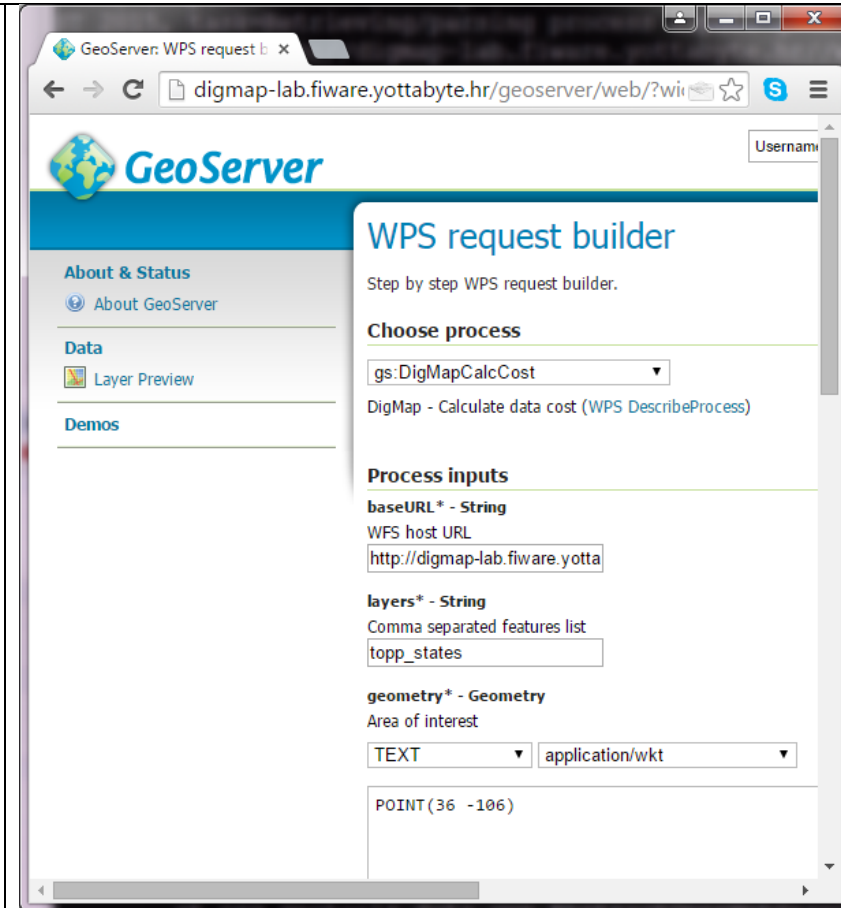


Figure 3 GeoServer WPSclient user interface

Choose process

**gs:DigitalMapExcerpt**

DigMap - create digital map excerpt. (WPS DescribeProcess)

Process inputs

spec\* - RawData

Input JSON MFP DigMap spec

**TEXT- application/octet-stream**

```
{
  "units": "dd",
  "srs": "EPSG:4326",
  "layout": "A4",
  "dpi": 50,
  "outputFormat": "pdf",
  "mapTitle": "",
  "mapComment": "Tekst komentara",
  "mapFooter": "",
  "mapAttribution": "",
  "layers": [
    {
      "baseURL": "http://digmap-dme.fware.yottabyte.hr/geoserver/wms",
      "opacity": 1,
      "singleTile": false,
      "type": "WMS",
      "layers": [
        "topp:states"
      ],
      "format": "image/jpeg",
      "styles": [
        ""
      ]
    }
  ],
  "pages": [
    {
      "center": [
        -109.04782,
        36.99664
      ],
      "scale": 1500,
      "rotation": 0
    }
  ]
}
```

Figure 4 DigMap Excerpt input parameter

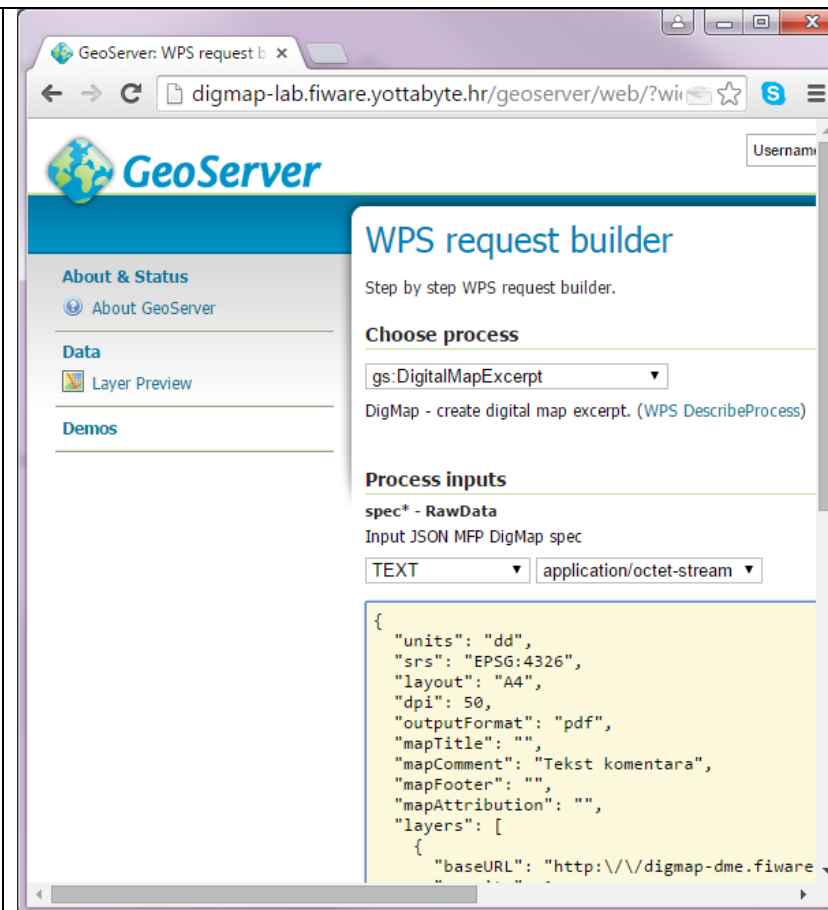


Figure 5 GeoServer WPSclient user interface

## DigMap output

DigMap has very tangible output in form of .pdf document with geospatial data represented on map image (with additional decorations like north arrow and scale bar) and embedded data in vector format (GML - Geography Markup Language) digitally signed. Sample mock-up output is given below.

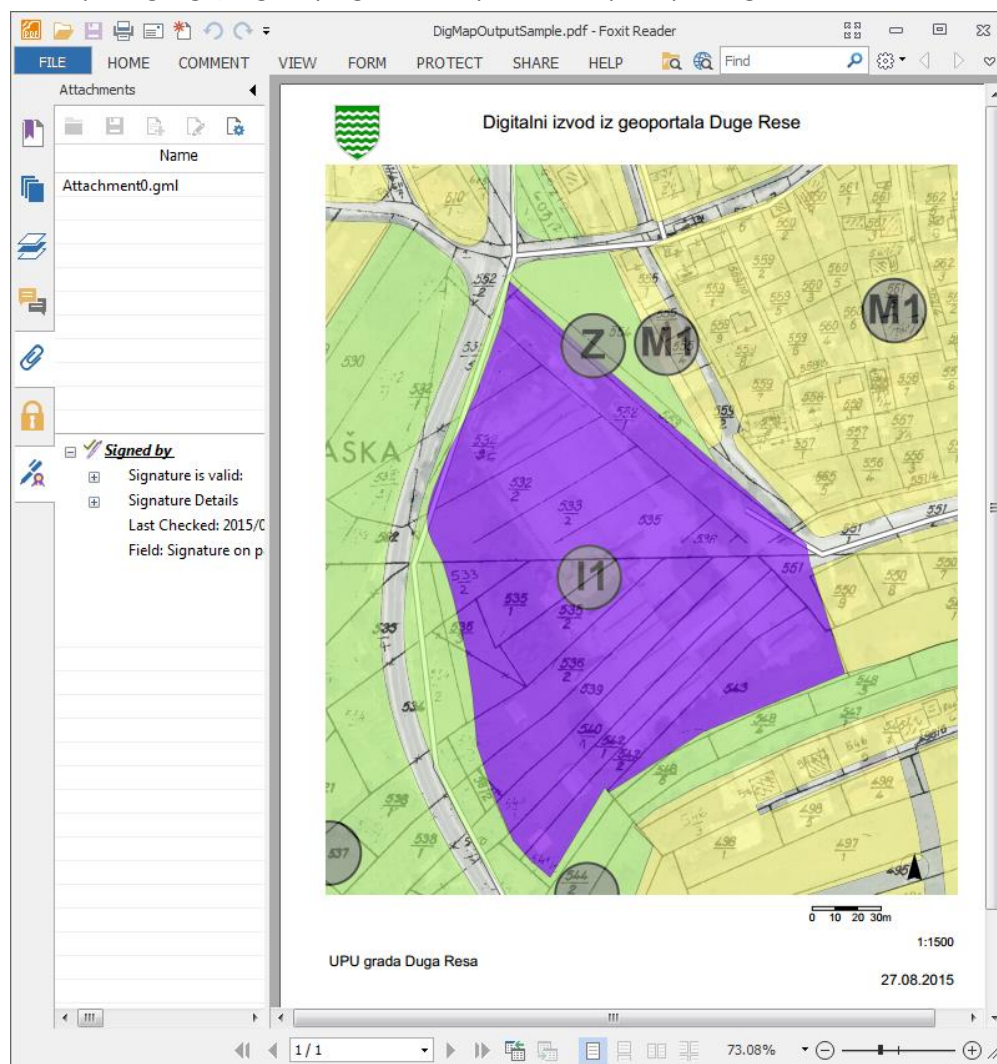
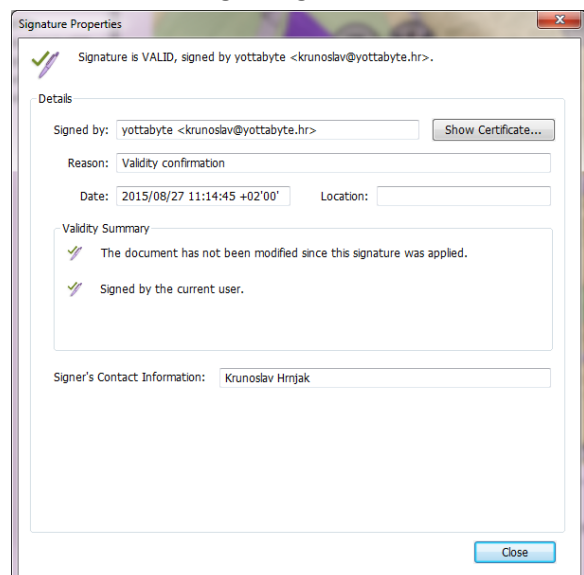
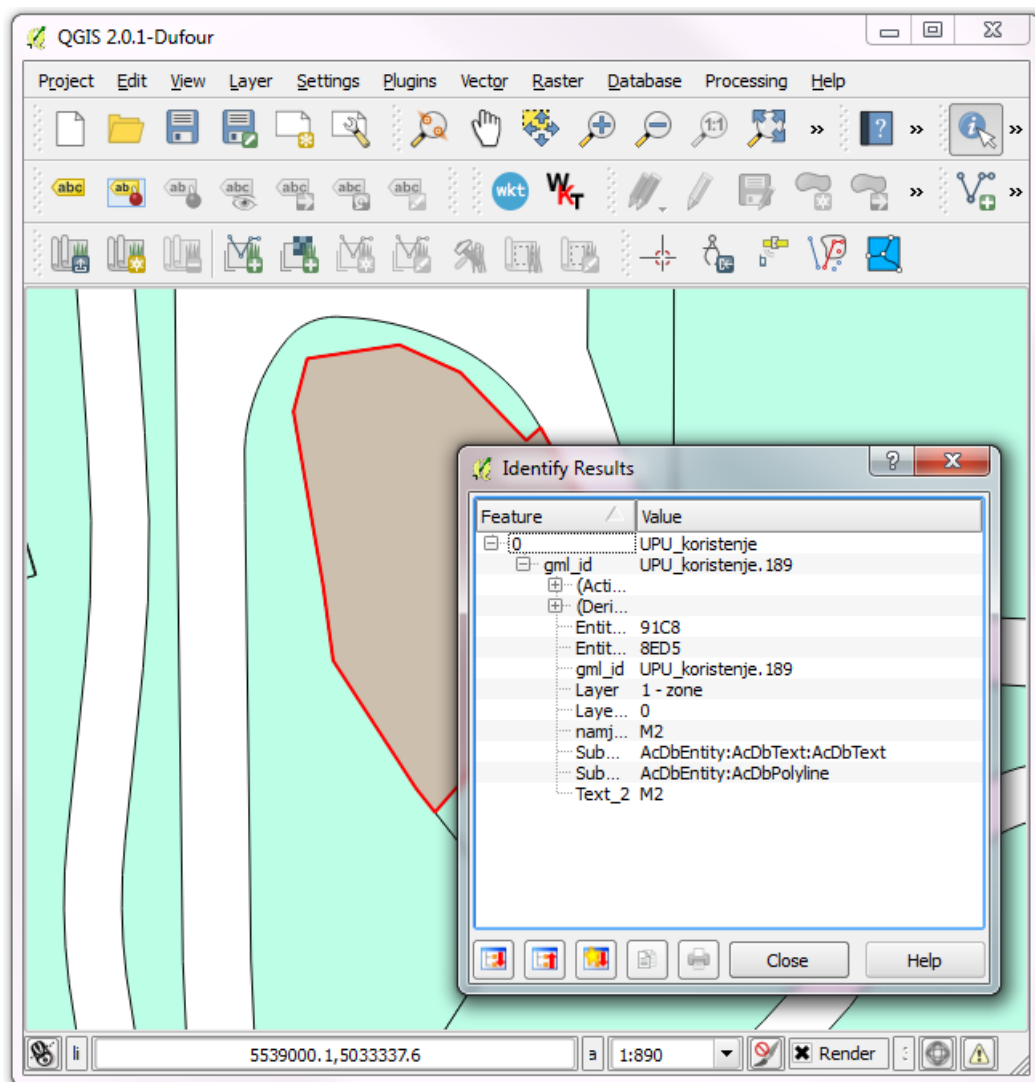


Figure 6 sample PDF document with GML data and digital signature

User can check digital signature source and review certificate.



Attached GML data can be open in any open source GIS software preferably QGIS (as leading GIS tool for geospatial analysis).



Data billing service over WPS service simply return decimal number representing selected data costs, calculated based on costs given in DigMap configuration.

## DigMap configuration

DigMap configuration is divided into two parts:

### *Map Fish Print configuration*

MFP configuration contains information about print options (dots per inch used for printing, allowed scales, hosts, and layout with printing options). MFP configuration uses Yaml file format.

```
dpis: [50, 75, 150, 200]
scales:
  - 500
hosts:
  - !localMatch
    dummy: true
  - !ipMatch
    ip:
  - !dnsMatch
    host: ows.dugaresa.yottabyte.hr

layouts:
  A4:
    metaData: &commonMetaData
      title: "${mapTitle}"
      author: "www.yottabyte.hr"
      subject: "DigMap print"
      keywords: "map,print,signature,export,billing"
      creator: "yottabyte"
    mainPage:
      pageSize: A4
      rotation: true
      items:
        - !text
          text: "Digitalni izvod iz geoportala Duge Rese"
          fontSize: 15
          spacingAfter: 15
          align: center
        - !text
          text: "${mapTitle}"
          fontSize: 30
          spacingAfter: 15
          align: center
        - !map
          spacingAfter: 10
          width: 520
          height: 600
        - !scalebar
          type: bar
          maxSize: 100
          barBgColor: white
          fontSize: 9
          align: right
          spacingAfter: 5
        - !text
          font: Helvetica
          fontSize: 10
          align: right
          text: '1:${scale}'
        - !text
          text: "${mapComment}"
        - !text
          align: right
          text: '${now dd.MM.yyyy}'
          spacingAfter: 5
```

*DigMap configuration*

DigMap configuration contains information about digital signature (private key file, keystore passwords, keystore type, etc...), list layers authorized to be embedded into .pdf file and information about data costs. DigMap configuration uses Java properties format.

```
#mandatory configuration
#key configuration
KEY_PATH=./samples/digmap/yottabyte.pfx
KEY_PASSWORD=yottabyte
KEYSTORE_PASSWORD=yottabyte
KEY_TYPE=pkcs12
SEC_PROVIDER=BC
#list of WFS layers available for data embedding
LAYERS=topp:states,tiger:poly_landmarks,Db_brUPU_koristenje,Telekomunikacije,Promet,V
oda,Energetika
#optional configuration
#signature appearance configuration
SIGN_VISIBLE=true
SIGN_IMAGE=./samples/digmap/certificate2_pencil.png
SIGN_REASON=Validity confirmation
SIGN_CONTACT=Krunoslav Hrnjak
SIGN_RECT_LLX=10
SIGN_RECT_LLY=10
SIGN_RECT_URX=30
SIGN_RECT_URY=30
#define excerpt and data cost
COST_PER_EXCERPT=5
COST_PER_POINT=1
COST_PER_LINE=2
COST_PER_POLYGON=3
COST_PER_AREA=4
```

### DigMap output input/specification

DigMap input/specification contains JSON object with map configuration, additional user data (like comments), and additional print options (dots per inch used for printing) etc.

```
{
  "units": "m",
  "srs": "EPSG:31275",
  "layout": "A4",
  "dpi": 50,
  "outputFormat": "pdf",
  "mapTitle": "",
  "mapComment": "Comment",
  "mapFooter": "",
  "mapAttribution": "",
  "layers": [
    {
      "baseUrl": "http:\\\\geoportal.dgu.hr\\wms",
      "opacity": 1,
      "singleTile": false,
      "type": "WMS",
      "layers": [
        "DOF"
      ],
      "format": "image\\jpeg",
      "styles": [
        ""
      ]
    },
    {
      "baseUrl": "http:\\\\gis.dugaresa.yottabyte.hr\\geoserver\\wms\\",
      "opacity": 0.7,
      "singleTile": false,
      "type": "WMS",
      "layers": [
        "UPU_koristenje"
      ],
      "format": "image\\png",
      "styles": [
        ""
      ],
      "customParams": {
        "TRANSPARENT": true
      }
    }
  ],
  "pages": [
    {
      "center": [
        5539034.4455056,
        5033400.5347458
      ],
      "scale": 500,
      "rotation": 0
    }
  ]
}
```

## DigMap Front End

Since print specification is rather complex JSON data structure there are user interface components providing interactive form for creating specification and sending request.

User map selection is possible through two open source JavaScript components:

1. GeoExt.data.PrintProvider – <http://geoext.org/lib/GeoExt/data/PrintProvider.html>
2. Leaflet.print – <https://github.com/aratcliffe/Leaflet.print>

Both components can be tested at DigMap Fiware Lab:

<http://digmap-lab.fiware.yottabyte.hr/geoext/> - demo showing DigMap using GeoExt front end

<http://digmap-lab.fiware.yottabyte.hr/leaflet/> - demo showing DigMap usage using Leaflet front end

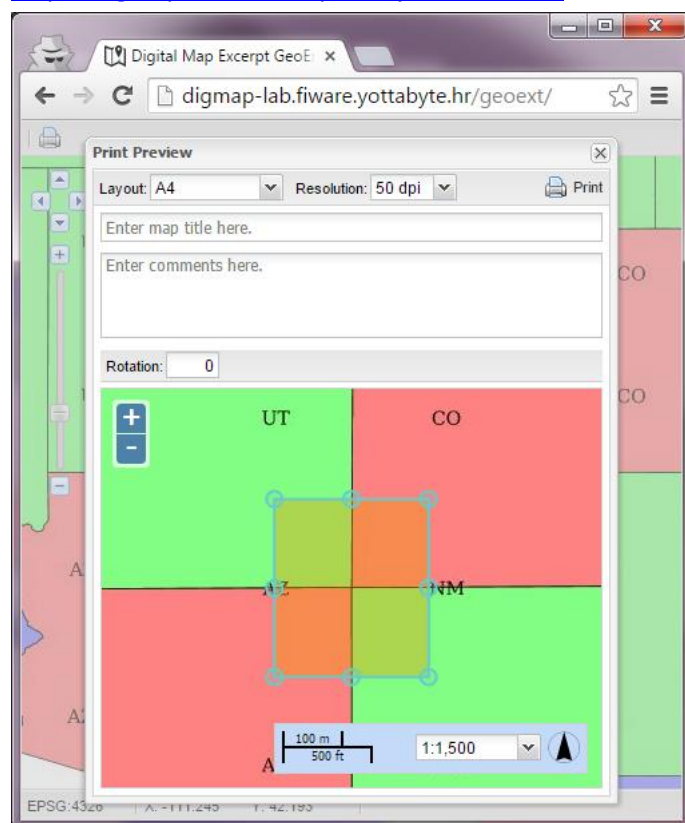


Figure 7 Geo Ext front end user interface

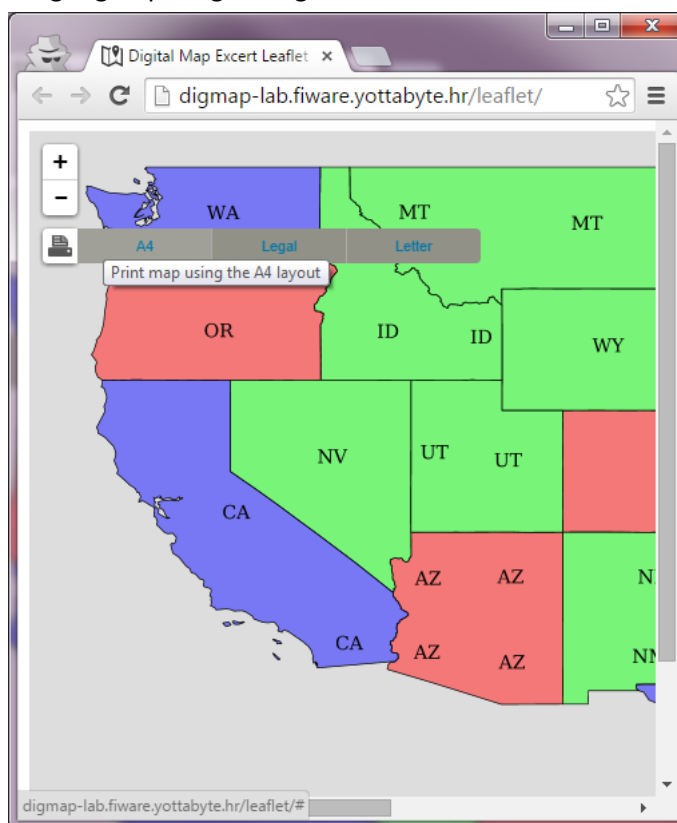


Figure 8 Leaflet front end user interface

As it can be seen from above figures, Leaflet print provider offers only basic template selection defaulting map selection to the centre of map, while GeoExt print provider offers a wide range of options for specification setup including: layout, resolution, map title and map comment, rotation, scale and interactive map area selection.

DigMap doesn't involve mobile app development, although it is possible to run DigMap on mobile phone or tablet as a web application. Figure right show DigMap demo loaded on Chrome mobile phone browser (based on Android OS).

Building DigMap on today's leading open source front end platform – GeoExt cross browser is secured. DigMap has been intensively tested using Google Chrome, although other browsers should support it.

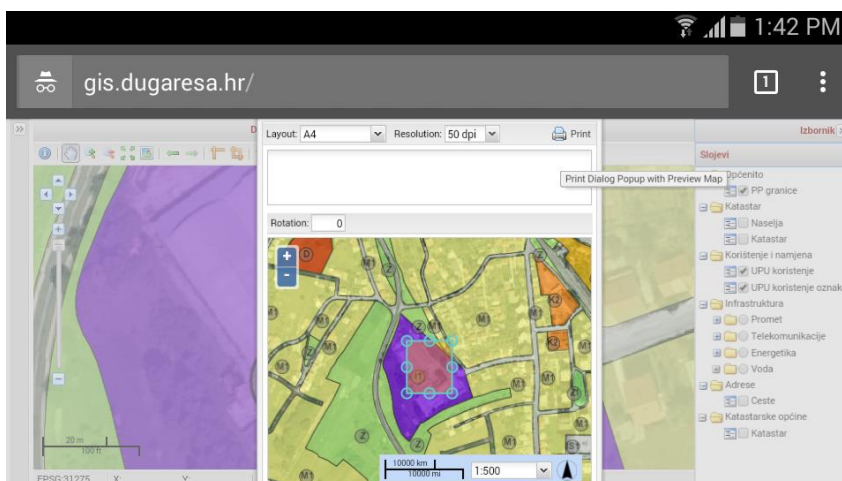
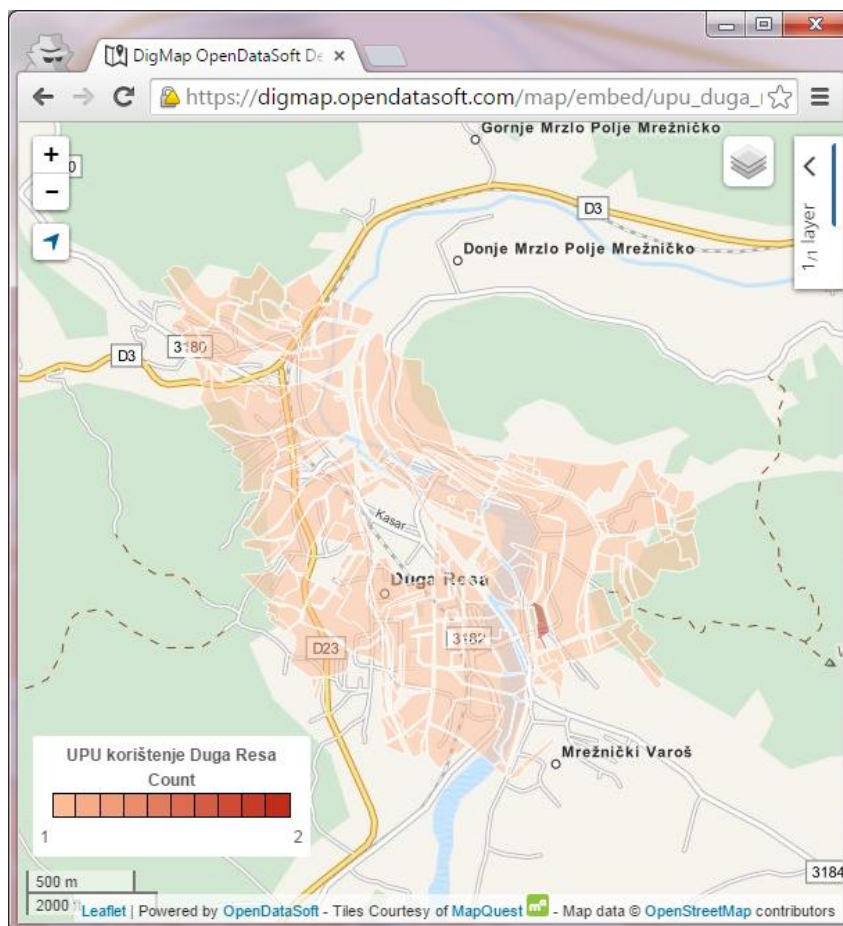


Figure 9 DigMap demo loaded on mobile phone browser

## OpenDataSoft SE

OpenDataSoft SE, data publishing and reusing platform with user friendly interfaces with powerful API creation and data visualization capabilities also provides capabilities to display geo spatial data. At the moment there are basic functionalities supported for OGC services, only adding base layer through WMS. OpenDataSoft SE map presentation is based on Leaflet framework. Unfortunately at the moment OpenDataSoft SE doesn't have a print functionality enabled so DigMap functionality could not be tested using OpenDataSoft SE. Visual presentation is possible by loading overlay layer as Shape file:

[https://digmap.opendatasoft.com/map/embed/upu\\_duga\\_resa/](https://digmap.opendatasoft.com/map/embed/upu_duga_resa/)



## APPENDIX IV – DigMap source code

DigMap source code is publicly available via GitHub.

Source code consists of two parts:

- modified MapFishPrint code and
- DigMap code itself



<https://github.com/zekonja/digmap>