DESURBS Deliverable 6.3: Dissemination and exploitation plan

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Authors: J. Rydock, RESMAN; L. Bosher and K. Chmutina, Loughborough; D. Felsenstein and N. Shoval, HUJI; G. Exadaktylos, TUC; F. Zárate, CIMNE; Z. Sabeur, IT Innovation; J. Coaffee and R. Rowlands, Warwick

Actual delivery date: End of project

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Table of contents

1. Introduction

This report constitutes Deliverable 6.3 of the FP7 Security Program research project 'Designing Safer Urban Spaces' (DESURBS, Grant Agreement no. 261652). The purpose of Deliverable 6.3 is to provide a dissemination and exploitation plan describing the strategy of the consortium for spreading the knowledge gained during the work, and for exploiting the results of the project among the different target groups, focusing primarily on activities to be carried out after the end of the project.

2. Exploitable results

DESURBS is a 48 month security project that has had the goal of making significant and novel advances in the area of planning, design and engineering of urban spaces to make them less vulnerable and more resilient to security threats. The following is a list of DESURBS outputs that one or more partners judges to be exploitable beyond the end of the project:

2.1 Security incidents database: An important goal in DESURBS has been to develop and exploit a web-based security incidents database that is revised and updated on a regular basis, and will continue to be maintained beyond the lifetime of the DESURBS project.

During the course of the project, three versions of an incidents database have evolved separately, in parallel and by different actors during the DESURBS project. These can be uniquely identified and characterized as follows:

A. *ISR security incidents database:* This is a relational database developed by Birmingham/Warwick, with contributions from all other partners, and is the main basis for Deliverables 1.1, 1.2 and 1.3. It is currently embedded within the ISR portion of the workflow of the DSSP, on IT Innovation servers. As such, the ISR security incidents database is not easy to access or update externally and is not viewable/searchable directly on the Internet.

B. *Security incidents mapping tool database:* This includes an incidents and preventive cases list (database) incorporated into the WP3 mapping web tool. This database is an integral part of the mapping tool at CIMNE (on CIMNE servers), but can easily be updated and modified externally in the tool back office by users with editor privileges. It is accessible directly on the Internet. Third parties can comment by sending an email through the mapping tool home page. It has been updated periodically through the project by RESMAN.

C. *Security incidents report list database:* This is an incidents database and a preventive cases database incorporated into the DSSP security incidents reporting tools. They are completely separate from the ISR and are both directly accessible on the DSSP Internet site (after login to the DSSP). These two databases can easily be updated and modified externally by DSSP users with editor privileges. Both the security incidents report list and the preventive cases report list accept possible new incidents for submission by third parties with subsequent evaluation and approval by editors, as well as comments from third parties. These databases have been updated periodically through the project by RESMAN.

2.2 Integrated Security and Resilience (ISR) design framework: This is derived from British/International Standards for risk management (BSI 2009)[1] and subsequently based upon case study work undertaken in Nottingham and Jerusalem, which can be used through the DSSP as a generic tool for other cities in Europe and beyond.

2.3 Web-based, open source security incident mapping tool: This tool has been developed from the beginning of the project by CIMNE, in parallel with the incidents database work directed toward the DSSP. Currently the database (reported as the *Security incidents mapping tool database* above) remains updated and is a user-friendly tool in visualizing various disasters. It does not require a login or an authentication system for end users and can be viewed and searched directly at: http://www2.cimne.com/websmaps/desurbs/mapa.aspx

This tool has been developed using open source codes, allowing free use without payment of royalties to third parties. This positions it to be useful in future projects or by others for similar purposes.

2.4 Generic security product design methodology yielding several new industrial design security products that have reached the prototype phase by the end of the project:

A. HopeSpot: An efficient, cost-effective, accessible and portable tethered balloon to ease communication challenges with crowds http://vimeo.com/94975469

B. CityZen: A free GPS enabled mobile application featuring near real-time security reporting coupled with a back-end monitoring application. http://vimeo.com/94975467

C. CityTalk: Concept for a web-based tool which aims to increase the inclusion of elderly populations in the urban design process

2.5 Urban Resilient Design Guidelines (URDG): This is a manual produced in paper and pdf formats that highlights various types of information available to support resilient planning and stress the importance of analyzing different data layers to create a comprehensive picture of the existing situation. The URGD details a number of outputs from the DESURBS project, including the ISR stages and makes recommendations for optimal use of new DESURBS industrial design security products.

2.6 Agent-based model simulation package (DySTUrbD) for urban simulation modeling, probability estimation and optimal location modeling for emergency planners and responders contemplating design alternatives for achieving safer urban spaces. This includes suite of programmed disaster models (small scale terror attack, industrial accident, earthquake and missile attack). The user runs these models using input data and can modify them to match specific needs. An accompanying handbook can be downloaded and describes the mechanics of operating and customizing the model. The model provides rich graphic outputs. An example of these is available at an accompanying site:

http://ccg.huji.ac.il/AgentBasedUrbanDisaster/index.html

2.7 Smartphone application (SensoMeter) that can be used to investigate crowd behavior and perceived security in urban spaces.

[1] British Standards Institution, (2009). *Risk management: Principles and guidelines* London: British Standards Institution Group

2.8 Materials database (STREMA-DB) and material model calibration tool **FCMODEL** for assisting decision making about either achieving safer and more resilient urban infrastructure engineering structures or back-analysis of premature failures to understand what went wrong. Being a modular concept upon which STREMA-DB has been built, it is possible to easily switch between different and diverse final user needs, that is, let's say, from a pure structural engineering tool such as for example underground excavations design, or a foundation design, to a commercial application tool like the selection of the most appropriate building stone material according to prescribed architectural specifications. Parallel to the web application, a novel Matlab™ application called FCMODEL, for yield/failure surface calibration on experimental test data of materials has been developed. Failure models are inserted as modules in the core code, thus an advanced user may import new models in addition to the already supplied. FCMODEL is fed with data either from simple text files created by the user or from the Strema-DB and particularly from the export data functionality of the Standard Tests module. We have implemented a demo "reader" and a demo "member" in the Strema database. We have presented it in previous a DESURBS meeting at Chania. There are also included two links in the welcome screen of the web page of strema-db. The first is a demo video of the Strema-db and the second is a demo video of FC-MODEL. An example application with FC-MODEL is also under preparation to demonstrate its use to enrich with more data the Strema-db that may be used with subsequent numerical structural engineering applications. The Strema-db is also linked with the DSSP. The main difference of the separate Strema-db site, apart from the layout/design, comparing to the DSSP is that we can alter the existing data or we can create new data. In the DSSP one may only view the data. The Strema-db application also supports a ”. pdf export scheme” of the material report. The search capabilities of Strema-db also support a multivariate search engine of materials satisfying any given specification (strength, elasticity, unit cost etc).

2.9 Vulnerability of structures database for blast and earthquake (RISK-AT): This is at the scale of single buildings (RISK-AT), with Barcelona as the example test case, with a generalized methodology to employ the technique, showing the feasibility of its use for urban areas in Europe and beyond.

2.10 Decision Support System Portal (DSSP) as an access point for many of the DESURBS tools and methodologies in a user-friendly and technologically state-of-the-art package aimed at urban planners, designers and engineers, but also relevant for urban space managers including emergency responders and crisis managers.

3. Dissemination and exploitation plan

3.1 Dissemination

3.1.1 Dissemination during the project

Dissemination of the project results and advances has been facilitated through the following activities:

3.1.1.1 Developing and maintaining project websites: The main website of the project has been designed and developed for supporting the needs of the consortium management and internal synergy. In parallel it has aimed to provide for the widest possible visibility of the project objectives and its results.

The project web presence was designed and implemented during the first months of the project, and then upgraded before the mid-term review. It has been updated continuously added content, as the project has advanced. The public website of the project is a central site from which all the publicly available work done as part of the project can be found. The site provides project overviews and highlights; up-to-date information on intermediate and final project results, including public reports; project events, including conferences and workshops; contact details, etc. The website will continue to be updated and kept current in the foreseeable future.

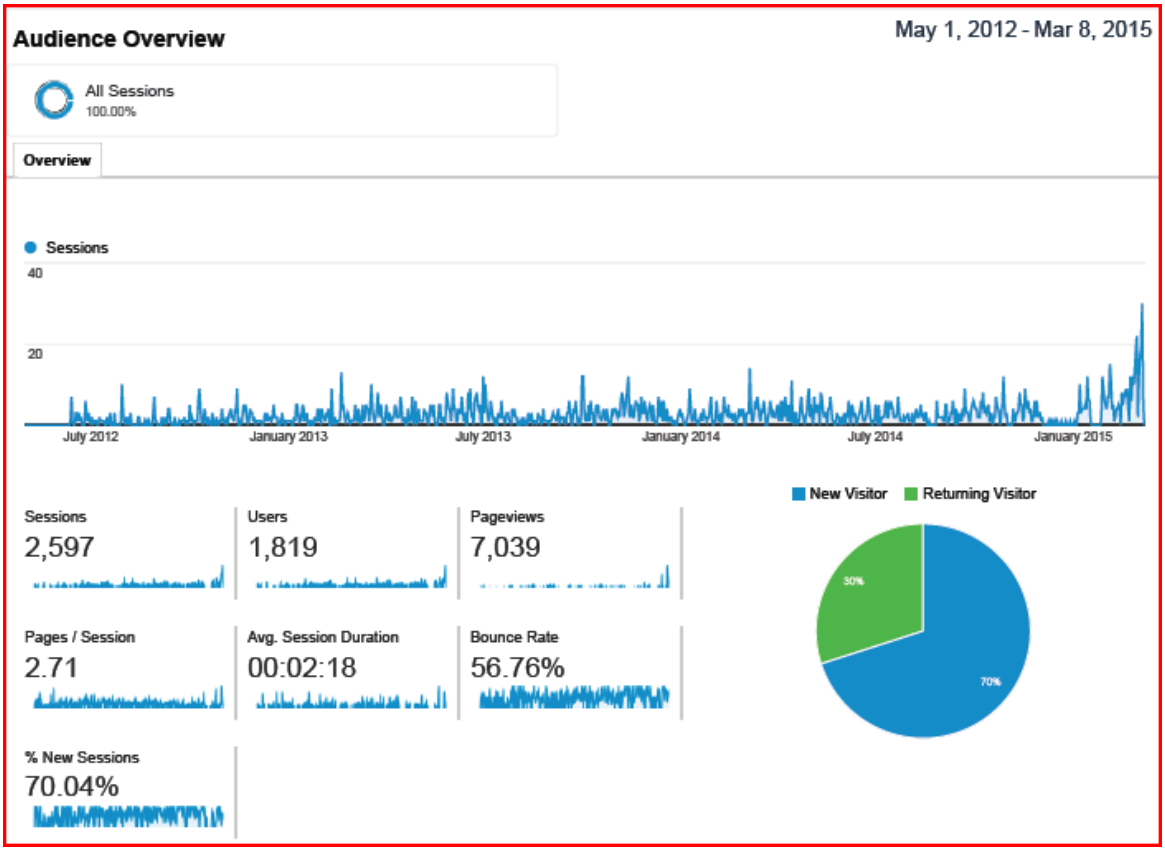
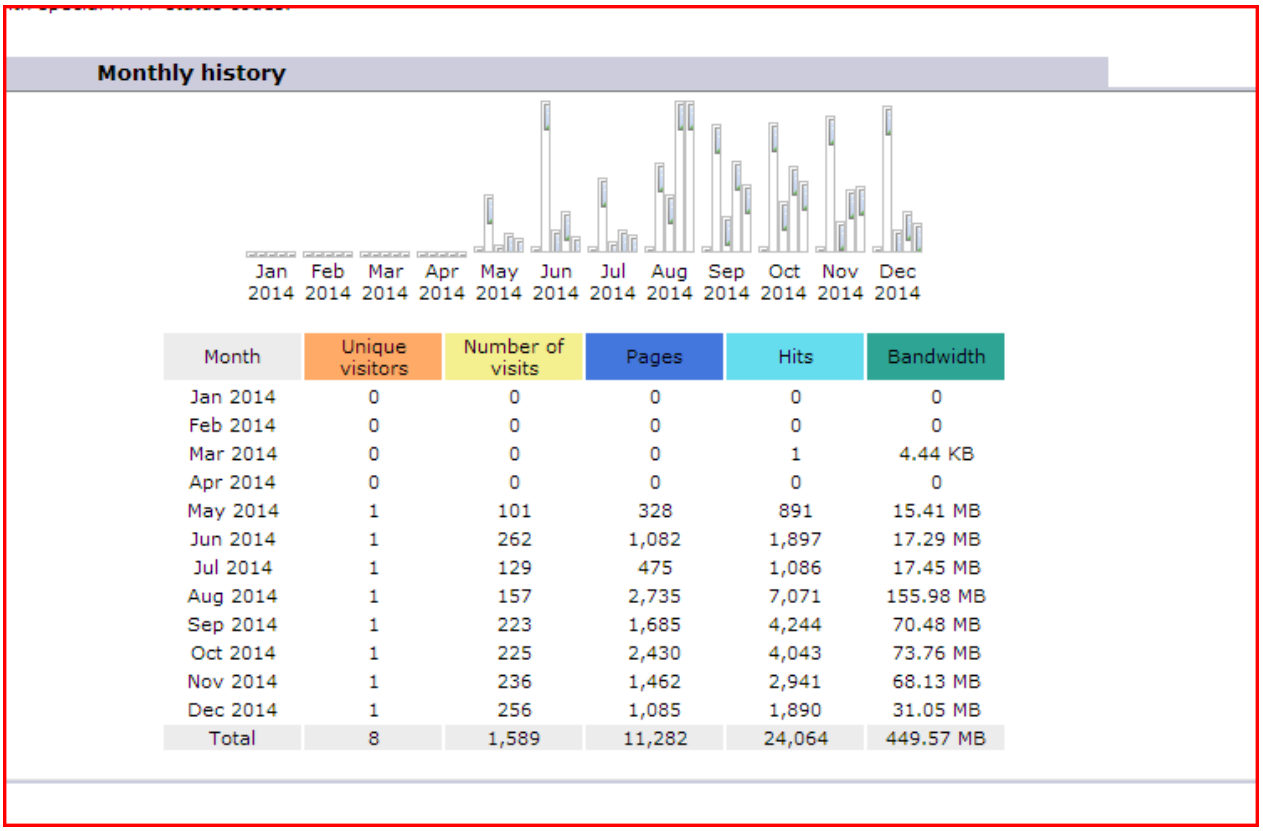


Figure 3.1.1.1.a: Google analytics on DESURBS website

Figure 3.1.1.1a shows a summary of the Google analytics of the DESURBS website. For the first part of January 2015 the website was down as it was being transferred from partner WARWICK to partner RESMAN. This explains the section of approximately no hits for that period. We see also that in the second half of January 2015 and onward there is a hint that the number of hits is significantly increasing. This is early evidence that our attempts to increase the visibility of the project may be paying off.

For the CIMNE incidents mapping tool, we have just activated Google Analytics one week ago to start tracking the activity there. Up to now, there have been about 3-4 visits per day on that site. This is not surprising, though, as we are not actively trying to get real practitioners to use this data set at this time, acknowledging that the information in the cases needs to be made significantly richer and deeper in order for the mapping tool to be of real value to end users.

The Decision Support System Portal was under heavy development during most of 2014, going live in September. The current stats for the site have some problems in that the number of unique users is not registered correctly. But the total number of visits per month can be seen in Figure 3.1.1.1.b below.



Monthly history

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2014	0	0	0	0	0
Feb 2014	0	0	0	0	0
Mar 2014	0	0	0	1	4.44 KB
Apr 2014	0	0	0	0	0
May 2014	1	101	328	891	15.41 MB
Jun 2014	1	262	1,082	1,897	17.29 MB
Jul 2014	1	129	475	1,086	17.45 MB
Aug 2014	1	157	2,735	7,071	155.98 MB
Sep 2014	1	223	1,685	4,244	70.48 MB
Oct 2014	1	225	2,430	4,043	73.76 MB
Nov 2014	1	236	1,462	2,941	68.13 MB
Dec 2014	1	256	1,085	1,890	31.05 MB
Total	8	1,589	11,282	24,064	449.57 MB

Figure 3.1.1.b: Number of monthly visits to DSSP in 2014.

3.1.1.2 Social media/microblogging: The project keeps up an active presence on social media, especially the microblog on LinkedIn where we currently have 579 followers.

3.1.1.3 Developing and distributing project brochures: Printed dissemination material of the project such as the Project Fact sheet, brochures and leaflets have been produced and distributed at relevant events.

3.1.1.4 Publishing in refereed academic journals and making presentations at academic conferences: Currently, there are 16 journal articles published with traceable D.O.I. numbers from the DESURBS project, and at least eight additional refereed articles that are forthcoming. These have been cited a total of 40 times according to Google Scholar (most of these have been published for a relatively short time). A complete list of peer reviewed papers published or submitted to academic journals, as well as theses can be found in Appendix 1 at the end of this report. For the peer reviewed papers, the number of citations is given at the end in red in parentheses for each paper that can at present be located on Google Scholar.

3.1.1.5 End-user dissemination and training workshops: There have been two main end-user dissemination and training workshops in the project, one in Jerusalem in May 2014 and the other in Brussels in November 2014. The purpose of these has been to extend the presence of the project in areas where significant initiatives with regard to urban security are already occurring, and thus to increase the level of feedback and input about best practice from an audience of interested end-users and stakeholders. The workshop in Jerusalem had about 60 external participants and was composed mostly of policy makers and practitioners from the Jerusalem area. The workshop in Brussels had close to 20 external participants, also mostly policy makers and security research consultants.

3.1.1.6 Project videos: The Bezalel team has put together a number of videos to profile the products they have developed in DESURBS. The URL's of these are as follows:

- HopeSpot- http://vimeo.com/94975469
- CityZen- http://vimeo.com/94975467
- Urban Resilient Design Guidelines- http://vimeo.com/93713153

Stats for the viewing of these videos on the net for the week of March 5 – March 12, 2015 are shown below. The CityZen video was played 8,722 times with 330 'likes' during that week, while HopeSpot was played 3,300 times with 98 'likes' and the Urban Resilient Design Guidelines (URDG) video 157 times with 1 'like'. There are also 150 printed copies of the URDG for distribution going forward

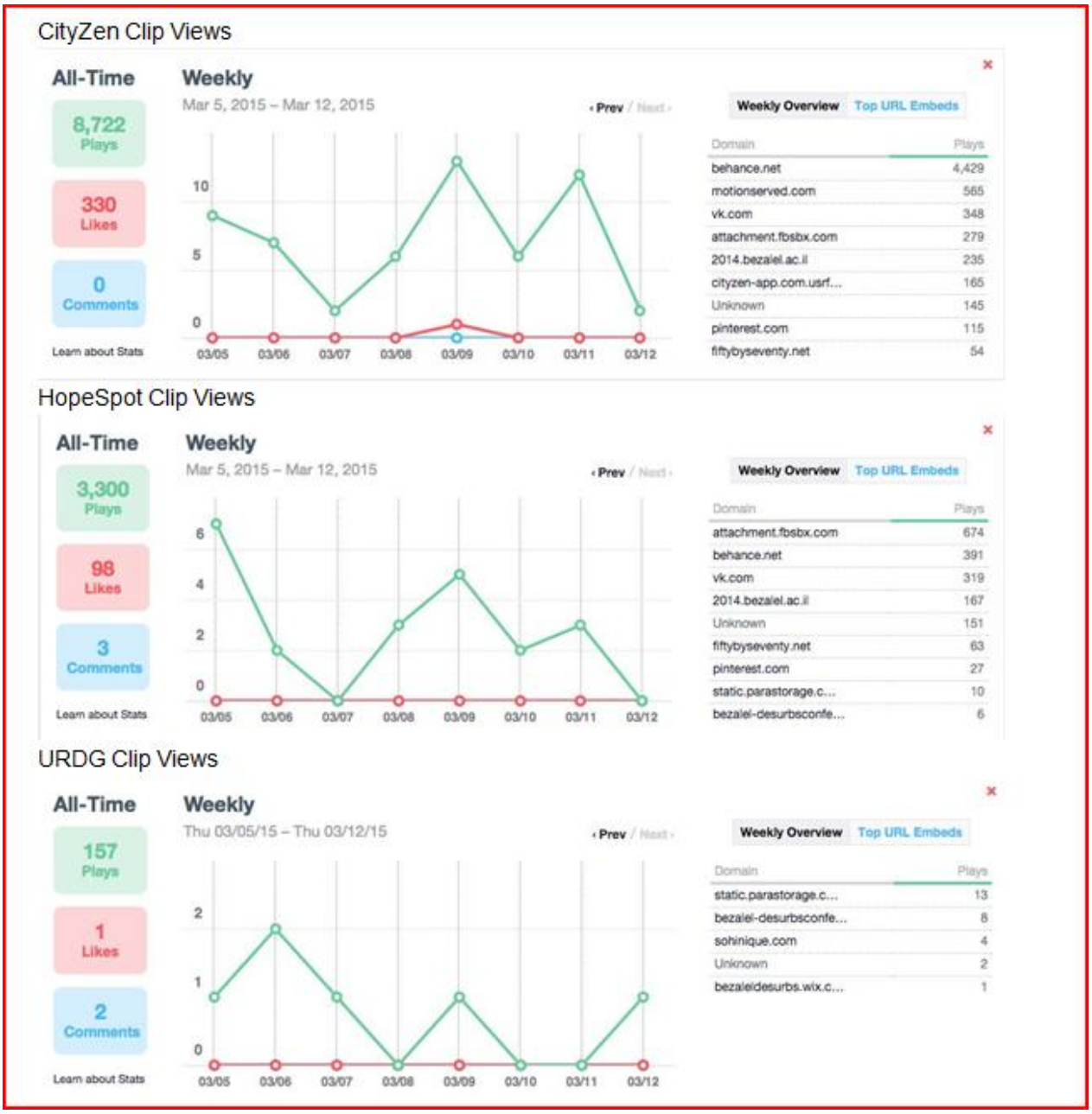


Figure 3.1.1.6 – Clip views for Bezalel videos for a week in March 2015.

3.1.2 Dissemination after the project ends

3.1.2.1 Continued dissemination in Europe and beyond: DESURBS partners will continue to network and spread the word about the project results among their contacts and stakeholders; the project website will be refashioned to promote the project outputs; the DSSP portal will continue to operate, the databases will continue to be updated, partners will continue to publish in refereed journals and academic conferences.

3.2 Exploitation

3.2.1 Exploitation during the project

3.2.1.1 DESURBS end-user training workshops: As previously mentioned, there have been two main end-user dissemination and training workshops in the project, one in Jerusalem in May 2014 and the other in Brussels in November 2014. In addition to dissemination, an additional purpose of these workshops was to highlight the potential utility of a number of the tools and products that have been under development in the DESURBS project to an audience of interested end-users and stakeholders.

Specifically:

-With regard to the ISR design framework, from the workshops some useful contacts were made with people interested in a) conducting further research related to the ISR process and b) embedding the ISR process into their risk management practices when planning and designing urban spaces. The number of external participants was close to 20.

-With regard to the DESURBS industrial design security products, the HopeSpot balloon and the CityZen app were showcased in a live demonstration, while CityTalk and the Urban Resilient Design Guidelines were explained through slide and video presentations to end-users attending the workshop during Jerusalem in May 2014. All four products were represented with large posters and promotional clips screened at the Brussels workshop in November. The number of external participants was 60.

Through the Jerusalem dissemination event close connections were made by Bezalel Academy with the UNISDR Global Resilient Cities Campaign, and work is ongoing to have the DESURBS Industrial design security products available through their extensive campaign in thousands of cities around the world.

-With regard to the security incident mapping tool, this was presented during the workshop held in May 2014 in Jerusalem, and has also has been shown to the municipality of Barcelona.

3.2.1.2 Invited seminar presentation for STREMA-DB/FCMODEL tool: A one-day invited seminar on the materials database was delivered by G. Exadaktylos (of partner TUC) at Ruhr Universität Bochum on 10th of July 2014. A group of about 20 professors and graduate students attended, interested in using the tool for computational simulations of potential use of deep geothermal energy reserves and geothermal engineering.

3.2.1.3 DESURBS thesis topics for Ph.D. and Master's students: The project has contributed to the production of five Ph.D. degrees and five Master's degrees. The thesis authors, titles, institutions and dates of submission are listed in Appendix 1.

3.2.2 Exploitation after the project ends

The plan for exploiting the outputs of the DESURBS project, both individually as tools and methodologies, and collectively within the DESURBS Decision Support System Portal, after the end of the project is given below. A table of the present and expected future Technology Readiness levels of each of the DESURBS products is given in Appendix 2.

3.2.2.1 Security incidents databases:

A. *ISR security incidents database:* This database may be exploited going forward by Warwick/Loughborough as part of the ISR exploitation discussed below.

B. *Security incidents mapping tool database*: This database will be updated periodically and exploited by RESMAN with CIMNE, perhaps in collaboration with other DESURBS partners, in one or more applications for research projects through upcoming Horizon2020 calls.

C. *Security incidents report list database*: This database will be updated periodically exploited by RESMAN with IT Innovation, perhaps in collaboration with other DESURBS partners, in one or more applications for research projects through upcoming Horizon2020 calls.

3.2.2.2 ISR design framework:

Future professional practice: It is anticipated that the ISR could form a useful risk management framework that can be utilized on forthcoming urban development projects by Loughborough, Warwick and perhaps other DESURBS partners. Accordingly, endeavors will be made to promote the benefits of the DSSP and supporting tools by giving brief talks to key stakeholders across Europe; such stakeholders so far have included the Metropolitan Police, Clarke Bond, Control Risks and Local Authorities in the UK.

Ongoing undergraduate training courses: The School of Civil and Building Engineering at Loughborough University provides a range of undergraduate courses (BEng, BSc, MEng and MSc) on built environment topics, such as 'Civil Engineering', 'Construction Management' and 'Architectural Engineering and Design Management'. The ISR framework is now being embedded into the teaching of a number of optional modules on these courses with the aim that a significant proportion of future graduates will have incorporated urban risk and security as an important part of their training and ultimately their future professional practice.

3.2.2.3 Web-based, open source security incident mapping tool:

This tool will be exploited by RESMAN with CIMNE, perhaps in collaboration with other DESURBS partners, in one or more applications for research projects through upcoming Horizon2020 calls.

3.2.2.4 Industrial design security products:

Through the Jerusalem dissemination event close connections were made with the UNISDR Global Resilient Cities Campaign, and work is ongoing to have the DESURBS industrial design security products available through their extensive campaign in thousands of cities around the world.

A. *Hope Spot:* The HopeSpot will be presented at the 3rd World Conference on Disaster Risk Reduction, 14-18 March 2015 in Sendai, Japan. The HopeSpot applied for the UNISDR RiskAt award for continued funding for development in order to bring the product to market, and a number of commercial companies have expressed interest in the HopeSpot balloon.

B. *CityZen:* At the beginning of December 2014, CityZen was invited to give a presentation to the chief security officer and the chief information officer of the Tel-Aviv municipality. Following the Jerusalem Marathon Pilot the project was also presented to security officials at the Jerusalem's municipality.

   To continue its promotion and exploitation, Bezalel Academy applied for a number of international prizes. CityZen was a local (Israel) finalist in the 2014 European Satellite Navigation Competition. CityZen was also a finalist for the GNSS Living Lab Prize, as a finalist GNSS Living Lab Prize, a connection was made with the Forum Virium Helsinki. An option to run a CityZen pilot with a user group from the local population was discussed with a representative from the forum. CityZen also created a mockup of the app for the Israel Nature and Parks Authority.

C. *CityTalk:* The core working group of TUD COST Action TU1203 'Crime Prevention through Urban Design and Planning' attended the Jerusalem workshop and expressed interest in running a CityTalk pilot in the Netherlands. The project is currently in the mockup stage and needs to go the through a programming phase at Bezalel Academy prior to running a pilot.

3.2.2.5 Urban Resilient Design Guidelines:

These guidelines database may be exploited going forward by Bezalel Academy through the UNISDR Global Resilient Cities Campaign, and perhaps also in conjunction with Warwick/Loughborough, as part of the ISR exploitation discussed above

3.2.2.6 DySTUrbD - Agent-based model simulation package:

Exploitation of the agent based simulation model will take the following form:

Training Tool: the simulation model is useful for both estimated outputs it generates and the training and instruction opportunities it presents. In terms of the latter we envisage the model for training professional emergency responders. In conjunction with local and national government agencies, we intend to conduct training courses for emergency planners. These will use the tool to appreciate some of the wider implications of severe shocks to the urban system. It will provide a framework for thinking about longer term impacts of urban disasters beyond the immediate response that they are generally called to provide.

Web-Based GIS site: to exploit the outputs of the model, the HUJI team has launched an accompanying website that demonstrates the array of visualized outputs produced and shows how these can be displayed as dynamic web maps and graphs. This can be accessed at:

http://ccg.huji.ac.il/AgentBasedUrbanDisaster/index.html

Academic Channels of Exploitation: The HUJI team has a publications and presentations agenda covering the period 2015/6. This includes pre-commissioned chapters for two academic books, presentation at international specialist meetings and NSF workshops and a string of papers dealing with the data, modeling and policy aspects of the tool, earmarked for international peer-reviewed journals.

3.2.2.7 Sensometer:

General exploitation: The Sensometer is available for use for the wide public. Individuals and groups who wish to utilize the tool for various purposes such as monitoring crowd behavior, collecting reports about hazards and sense of security and tracking human behavior in general can do so using the Sensometer system. Links to the Sensometer can be found on the DSSP on: http://desurbs.it-innovation.soton.ac.uk/osense_index (login is required). The Android and iOS mobile apps are available on the application stores for free.

*Research Activity***:** The Sensometer was already exploited in a PhD study and MA study that are expected to be submitted in the next few months at HUJI. Another academic study about the livability of cities is expected to take place in New Zealand in the beginning of 2015. Several other researchers from Israel, United State and Denmark showed interest in exploiting the Sensometer system in their studies.

Academic publications: The work on the Sensometer led to the submission of an article in a geographical journal. Two other articles are expected to be submitted during 2015. Moreover, we expect that future studies that will make use of the Sensometer will be published in highly ranked peer-review Journal in the next years as well.

3.2.2.8 STREMA-DB and FCMODEL:

STREMA-DB alone or accompanied with the FC-MODEL subroutine could be indispensable tools for assisting decisions regarding selection of materials for a structural applications or assessing the remaining life of structures or back-analyzing disaster incidents (like the Sao Paulo underground station collapse presented in the frame of Eurotun2013 international workshop also at Bochum, Germany) or in deep geothermal applications to pre-assess the potential of a geothermal field to be productive among others. Such seminars may be continued after the end of the DESURBS project in order to attract the interest of potential future collaborators for continuously upgrading the database or modifying it by adding new modules to consider more engineering applications (for example resistance of structures to impacts or explosions etc). Further we shall consider both the STREMA-DB database and the accompanying FC-model calibration tool in a next proposal funded partly by Greece and/or European Union aiming at promoting the link of Universities with Private Enterprises and the creation of start-up companies. For this purpose we have to conduct a feasibility study, a market analysis and then come up with a business plan.

3.2.2.9 RISK-AT vulnerability of structures database – blast and earthquake:

The simulation of complex events requires an intense process of calculation, the tool developed generalizes the numerical process and allows a priori calculation for a lot of possible scenarios; thereby displaying a specific event can be performed in real time and in a simple way. This is one of

the great advantages of the program developed. On the one hand vulnerability curves of each structure to a specific risk are generated and on the other hand the visualization tool which uses the vulnerability curves associated to a specific structure, presented the damage depending on the magnitude of the event.

All design methodology, calculation and implementation, as well as the visualization has been entirely developed by CIMNE, thus allowing use of it freely without payment of royalties to third parties.

This tool has been presented during the workshop held in May 2014 in Jerusalem and also shown to the municipality of Barcelona and has been used to analyze the Lorca earthquake in 2011.

The interest shown by the city of Barcelona was enough to generate a demo version in order to assess its implementation within the Project SMART-CITY (http://smartcity.bcn.cat)

Similarly, the development of this tool has given rise to a variety of Bachelor's, Master's theses and scientific articles produced by CIMNE, as reflected in the final report of WP4.

The current status of this tool allows it to be used as a platform for decision-making by public agencies dedicated to safety and design plans. A great advantage is its implementation in any city, with a minimum of effort.

Moreover, CIMNE's short-term objective for exploitation includes spreading the benefits of this tool as well as the research and its application to the simulation of other risks, either by any public body, or as a starting point for a project set.

3.2.2.10 DSSP - Decision Support System Portal:

RESMAN with IT Innovation, perhaps in collaboration with other DESURBS partners, in one or more applications for research projects through upcoming Horizon2020 calls.

4. Conclusion

In this deliverable we have given an overview of the dissemination and exploitation plan for the DESURBS project, focusing primarily on activities to be carried out after the end of the project.

Appendix 1: DESURBS publications

Refereed journal articles from the project:

The number of citations so far (as of February 2015) is given in parentheses (in red) after each article.

Bosher L. (2014), Built-in resilience through disaster risk reduction: operational issues, *Building Research and Information*, 42(2), 240-254. 10.1080/09613218.2014.858203 (5)

Carreño M.L., O. D. Cardona and A. H. Barbat, Método numérico para la evaluación holística del riesgo sísmico utilizando la teoría de conjuntos difusos, *Revista internacional de métodos numéricos para cálculo y diseño en ingeniería*, 30(1), 2014, 25-34. 10.1016/j.rimni.2012.10.002 (3)

Coaffee J. (2013), Rescaling and Responsibilising the Politics of Urban Resilience: From National Security to Local Place-Making, *Politics*, 33(4). 240-252. 10.1111/1467-9256.12011 (8)

Coaffee J. (2013), Towards Next-Generation Urban Resilience in Planning Practice: From Securitization to Integrated Place Making, *Planning Practice and Research*, 29(3), 323-339. 10.1080/02697459.2013.787693 (6)

Chmutina K., Ganor T., Bosher L. (2014), Role of urban design and planning in disaster risk reduction, *Proceedings of the Institution of Civil Engineers: Urban Design and Planning*, 167(3), 125-135. 10.1680/udap.13.00011 (1)

Schach Pinsly D., Ganor T. (2014), Security sensitivity index: evaluating urban vulnerability, *Proceedings of the Institution of Civil Engineers: Urban Design and Planning,* 167(1), 1-14.

Gonzalez-Drigo R., Avila-Haro J.A. , Barbat A.H., Pujades L.G. , Vargas Y.F., Lagomarsino S., Cattari S. (2015), Modernist URM buildings of Barcelona. Seismic vulnerability and risk assessment, *International Journal of Architectural Heritage*, 9(3), 214-230. 10.1080/15583058.2013.766779

Grinberger A. Y., & Felsenstein D. (2014). Bouncing Back or Bouncing Forward? Simulating Urban Resilience. *Urban Design and Planning*, 167(3), 115-124. 10.1680/udap.13.00021 (1)

Liolios P., Exadaktylos G. (2013), A smooth hyperbolic failure criterion for cohesive-frictional materials. *International Journal of Rock Mechanics & Mining Sciences*, 58, 85–91. doi:10.1016/j.ijrmms.2012.09.001 (3)

Liolios P., Exadaktylos G. (2013), Comparison of a hyperbolic failure criterion with established failure criteria for cohesive-frictional materials, *International Journal of Rock Mechanics & Mining Sciences*, 63, 12–26. doi:10.1016/j.ijrmms.2013.06.005

Marulanda M. C., Carreño M. L., Cardona O.D., Ordaz M.G. , Barbat A.H. (2013), Probabilistic earthquake risk assessment using CAPRA: application to the city of Barcelona, Spain, *Natural Hazards*, 69(1), 59-84. 10.1007/s11069-013-0685-z (11)

Marulanda M. C., Cardona O.D., Mora M.G., Barbat A.H. (2014), Design and implementation of a voluntary collective earthquake insurance policy to cover low-income homeowners in a developing country, *Natural Hazards*, 74(3), 2071-2088. 10.1007/s11069-014-1291-4

Valcárcel J. A. , Mora M.G., Cardona O.D., Pujades L.G., Barbat A.H. , Bernal G.A. (2013), Methodology and applications for the benefit cost analysis of the seismic risk reduction in building portfolios at broadscale, *Natural Hazards*, 69(1), 845-868. 10.1007/s11069-013-0739-2 (2)

Vargas Y. F., Hurtado J. E., Pujades L.G., Barbat A.H. (2014), Probabilistic seismic risk evaluation of reinforced concrete buildings, *Proceedings of the Institution of Civil Engineers: Structures and Buildings*, 167(6), 327-336. 10.1680/stbu.12.00031 (6)

Velásquez C. A., Cardona O. D., Mora M. G., Yamin L. E., Carreño M. L., Barbat A. H. (2014), Hybrid loss exceedance curve (HLEC) for disaster risk assessment, *Natural Hazards*, 72(2), 455-479. (7) 10.1007/s11069-013-1017-z

Velásquez C.A., O.D.Cardona, M.L.Carreño, A.H.Barbat, Retrospective assessment of risk from natural hazards, *International Journal of Disaster Risk Reduction*, (10), 2014, 477-489. DOI: 10.1016/j.ijdrr.2014.05.005 (1)

Forthcoming refereed journal articles from the project:

Baetu S.A., A. H. Barbat and I. P. Ciongradi, Seismic damage evaluation of reinforced concrete slit walls, *Engineering Computations*, 2015, (in press). (Doesn't have a DOI number yet)

Baetu S.A. , A. H. Barbat, I. Ciongradi and G. Vasies, Seismic damage evaluation of reinforced concrete slit walls using nonlinear dynamic analysis, *Engineering Computations*, 2016, (in press). (Doesn't have a DOI number yet)

Birenboim, A. and Shoval, N. (to be published in 2016) Mobility Research in the Age of the Smartphone. *Annals of the Association of American Geographers,* Special issue on the theme of the Geographies of Mobility.

Barbat A.H., Y. F.Vargas, L. G. Pujades y J. E. Hurtado, Evaluación probabilista del riesgo sísmico de estructuras con base en la degradación de rigidez, *Revista internacional de métodos numéricos para cálculo y diseño en ingeniería*, 2016, (in press). (Doesn't have a DOI number yet)

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Mora M.G., J. A. Valcárcel, O. D. Cardona, L. G. Pujades, A. H. Barbat and G. A. Bernal, Prioritizing interventions to reduce seismic vulnerability in school facilities in Colombia, *Earthquake Spectra*, 2015, (in press). DOI: 10.1193/040412EQS151T

Pujades L.G., Y. F. Vargas-Alzate, A. H. Barbat and J. R. González-Drigo, Parametric model for capacity curves, Bulletin of Earthquake Engineering, 2015, (in press). DOI 10.1007/s10518-014-9670-5

Salgado-Gálvez M.A., M. L. Carreño, A. H. Barbat, O. D. Cardona, Evaluación probabilista del riesgo sísmico en Lorca mediante simulaciones de escenarios, *Revista internacional de métodos numéricos para cálculo y diseño en ingeniería*, 2016, (in press). (Doesn't have a DOI number yet)

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Avila-Haro J.A., González-Drigo J.R., Vargas Y.F., Pujades L.G., Barbat A.H. and S. Cattari, Seismic performance of unreinforced masonry buildings: application to Barcelona, Spain, XVth World Conference on Earthquake Engineering, WCEE, Lisbon, 24-28 September 2012.

Barbat A. H., Vargas Y. F., Pujades L. G. and J. E. Hurtado, Probabilistic assessment of the seismic damage in reinforced concrete buildings, International Symposium Computational Civil Engineering, Iasi, Romania, May 25, 2012. Editura Societății Academice "MATEI -TEIU BOTEZ", ISSN 2285-2735, Iasi, Romania, 2012.

Barbat A. H., Salgado-Galvez M. A., Carreño M. L. and O. D. Cardona, Comparing a simulated loss scenario with the observed damage: the Lorca 2011 case study, 5th National Conference on Earthquake Engineering & 1st National Conference on Earthquake Engineering and Seismology, Bucarest, Romania, 2014.

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Ph.D. theses from the project:

Financial support from the DESURBS project is acknowledged explicitly in the following Ph.D. theses:

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Kahani A., Tourist expenditure in time and space: Inquiry using smartphones, The Hebrew University of Jerusalem, April 2015.

Liolios P., A hyperbolic failure model for cohesive and frictional materials, Technical University of Crete, June 2013.

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Master's theses from project:

Financial support from the DESURBS project is acknowledged explicitly in the following Master's theses:

Amorós Martí C., Structural damage analysis of a concrete wall after a detonation, Universidad Politécnica de Cataluña, November 2013.

García Reyes C.E., Paralelización del Método de Elementos Discretos para el Análisis de Daño Después de una Explosión, Universidad Politécnica de Cataluña, November 2013.

Glazman D., CityZen: a community that is active in improving the quality and safety of its environment, Bezalel Academy of Art and Design, September 2014.

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Appendix 2: Technology Readiness Levels[2] of DESURBS outputs

Item	TRL achieved in project	Challenges to further development	TRL expected in next four years
1. ISR security incidents database	TRL4	Need to have real cases validated in real environments to gain acceptance among end users; liability issues need to be addressed	TRL5
2. Security incidents mapping tool database	TRL4	Getting third parties to contribute meaningful (Richer and deeper) data to database.	TRL6
3. Security incidents report list database	TRL4	Getting third parties to contribute meaningful data to database.	TRL6
4. Urban Space Design Safety Scale	TRL4	Need to have real cases validated in real environments to gain acceptance among end users; liability issues need to be addressed	TRL5

[2] TRL 1 – basic principles observed; TRL 2 – technology concept formulated; TRL 3 – experimental proof of concept; TRL 4 – technology validated in lab; TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies); TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies); TRL 7 – system prototype demonstration in operational environment; TRL 8 – system complete and qualified; TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

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5. Integrated Security and Resilience (ISR) design framework	TRL4	Need to have real cases validated in real environments to gain acceptance among end users; liability issues need to be addressed	TRL5
6. Web-based, open source security incident mapping tool	TRL7	Increased functionality in tandem with significant third party data contributions (from item 2)	TRL8
7. RISK-AT visualization and mapping tool	TRL4	Needs to be made publicly available, tested on other cities than Barcelona	TRL6
8. Generic security product design methodology	TRL5	Need to show commercially successful product from use of the methodology	TRL6
9. TASKit – The all situation crowd control kit	TRL4	Need a commercial developer to take past prototype stage	TRL5
10. HopeSpot signaling balloon	TRL6	Need a commercial developer to take past prototype stage	TRL8
11. CityZen smartphone application	TRL7	Need a business model to make the tool commercially attractive for a software developer/provider	TRL9
12. CityTalk smartphone application	TRL2	Smartphone application itself needs to be developed, tested, accepted by end user groups (esp. the elderly)	TRL5
13. Urban Resilient Design Guidelines	TRL4	Guidelines need to be validated in real contexts; liability issues need to be addressed	TRL5
14. Dynamic simulation tool for urban disasters	TRL4	Model needs to be validated for real decisions/situations to be of practical value	TRL5

(DySTUrbD)			
15. Crowd monitoring smartphone application (SensoMeter)	TRL8	Real data in a real context remains to be shown	TRL9
16. Materials database (STREMA-DB)	TRL4	Model needs to be validated for real decisions; liability issues	TRL6
17. FCMODEL	TRL4	Model needs to be validated for real decisions; liability issues	TRL6
18. Vulnerability of structures database for blast and earthquake	TRL4	Models need to be validated for real decisions; liability issues	TRL5
19. Designing Safer Urban Spaces Decision Support System Portal (DSSP)	TRL6	System showing real decision making in a real context remains to be shown	TRL7
20. UK Crime Explorer	TRL6	Real decision making in a real context remains to be shown. Tool was developed mainly as an illustrative example of what might be done with portal functionality	TRL6
21. Security culture assessment methodology	TRL4	This is a social sciences research/assessment tool. As such, it is hard to get funding to use and further develop the methodology	TRL4
22. Security incident Mapping	TRL4	Hard to get enough data from an incident in order to carry	TRL4

and Prevention Opportunities (IMPO) methodology		out the methodology in a cost-effective way	

Appendix 3: DESURBS product development end-user contributors

Product	End users/stakeholders/experts giving tool development feedback
1. ISR security incidents database	Same as in number 5 below
2. Security incidents mapping tool database	None so far
3. Security incidents report list database	None so far
4. Urban Space Design Safety Scale	Same as in number 5 below
5. Integrated Security and Resilience (ISR) design framework	A flood manager (floods, crowds), a senior police officer (terrorism, crowds, floods), an architect (floods, crowds), a senior emergency manager (flood, crowds), all from Nottingham
6. Web-based, open source security incident mapping tool	None so far
7. RISK-AT visualization and mapping tool	Planners and officials from the City of Barcelona
8. Generic security product design methodology	Same end user panel in number 10 below
9. TASKit – The all situation crowd control kit	Same end user panel in number 10 below
10. HopeSpot signaling balloon	The end users/stakeholders/experts included members of relevant organizations on both the national and municipal levels. On the municipal level this included engineers, architects, security experts, GIS specialists, together with representatives of a medical center and a Jerusalem transportation authority. On the national level, this included represnetatives of police operations, police statistics, public security, planning & building, geological surveys,

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	Inter-ministerial Earthquake Committee, Home Front Command, Antiquities Authority, emergency medicine, Joint Distribution Committee and the security expert from the private sector.
11. CityZen smartphone application	Same end user panel in number 10 above
12. CityTalk smartphone application	Same end user panel in number 10 above
13. Urban Resilient Design Guidelines	Same end user panel in number 10 above
14. Dynamic simulation tool for urban disasters (DySTUrbD)	The chief security officers of the cities of several small cities in Israel, chief security officer of a Jerusalem mall, representatives of the Israeli police, representatives of the agency for Home Front protection, director of the trauma center and all senior doctors at the a hospital in Jerusalem.
15. Crowd monitoring smartphone application (Sensometer)	A head of unit in the Jerusalem transportation authority; A survey team leader in a Jerusalem transportation authority; A GIS manager in the Ministry of Public Security in Israel; three geography professors at two universities in Denmark.
16. Materials database (STREMA-DB)	A head of dept. of building materials at a building research institute; a member of the promotion dept., research dept. and CE-marking dept. of a stone/marble building materials supplier; a professor in geotechnical engineering at a German university
17. FCMODEL	Same as number 16 above
18. Vulnerability of structures database for blast and earthquake	Planners and officials from the City of Barcelona
19. Designing Safer Urban Spaces Decision Support System Portal (DSSP)	Same as in number 5 above

20. UK Crime Explorer	None so far
21. Security culture assessment methodology	Same end user panel in number 10 above
22. Security incident Mapping and Prevention Opportunities (IMPO) methodology	Same end user panel in number 10 above