D8.8 Dissemination Report Year 3

DURAARK

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Executive summary

The year 3 of the DURAARK project has seen an increase in all dissemination areas. This is not at last due to the fact, that the consortium has after three years of research created way more tangible research outcomes. This allowed the consortium to target besides the scientific especially stakeholder communities, where the number of associated organisations and companies could be increased by 223% in this year.
During Year 3 20 scientific publications ranging from book chapters to posters were undertaken and consortium members have participated in workshops and conferences across all fields represented in the DURAARK consortium.

In year 3 the stakeholder oriented dissemination activities ranged from individual presentation in offices, participation in fairs, workshops in offices and stakeholder conferences to the organisation of targeted events for practitioners in the field of managing 3D models. The dissemination efforts reflect the aims and actions defined in the Exploitation and Sustainability planning reported in the Deliverable D8.7. The activation of communities to pick up DURAARK research results and hence create a sustainable future for the DURAARK output, was a main driver of these activities. This accompanies in a synergistic way the ongoing engagement with stakeholders for reasons of discussion and evaluation of the research results and the efforts to receive datasets from real life in WP7.

In year 3 DURAARK intensified the efforts to attract scientific exchange besides the publication of articles. The publication of datasets, plugins, policies and code attracted attention among our primary stakeholders and have been disseminated in several outreach activities. The launch of data.duraark.eu for example provided the project target groups among scientists and practitioners access to over 4TB worth Point Cloud and BIM models, from real projects of stakeholders, as well as access to all metadata, schemas and vocabularies and APIs created by DURAARK.

In this deliverable we report on these dissemination activities and use the metrics developed in the previous dissemination report D8.2, D8.3 and D8.5.

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1 Introduction - Year 3 of DURAARK

The year 3 of the DURAARK project has seen an increase in all dissemination areas. As results of the consortium's efforts the outcome is now way more tangible. This allowed for more and more broad dissemination efforts, directed toward scientific and stakeholder communities. During Year 3, 20 scientific publications ranging from book chapters to postes were undertaken and consortium members have participated in workshops and conferences across all fields represented in the DURAARK consortium.

The year 3 saw a massive increase in the dissemination activities towards stakeholders. These range from individual presentation in offices, participation in fairs, workshops in offices and stakeholder conferences to the organisation of targeted events for practitioners in the field of managing 3D models. The dissemination efforts reflect the aims and actions defined in the Exploitation and Sustainability planning reported in the Deliverable D8.7. The aspect of creating communities, that allow a sustainable future for the DURAARK output, was a main driver of these activities. The This accompanies in a synergistic way the ongoing engagement with stakeholders for reasons of discussion and evaluation of the research results and the efforts to receive datasets from real life.

DURAARK intensified in year 3 the efforts to attract scientific attention besides the publication of articles. The publication of datasets, plugins, policies and code attracted attention among our primary stakeholders and have been disseminated in several outreach activities. The launch of http://data.duraark.eu/ provides the DURAARK target groups among scientists and practitioners access to over 4TB worth of Point Cloud and BIM models, from real projects of stakeholders, as well as access to all metadata, schemas and vocabularies and APIs created by DURAARK.

In this deliverable we report on these dissemination activities and use where applicable the metrics developed in the previous dissemination reportd D8.2, D8.3 and D8.5.

2 Impact assessment strategy

Following the reviewer recommendations after year one, the DURAARK project developed strategies to assess the impact of DURAARK activities on a qualitative, but as well quantitative level. These were implemented in the 2nd year of DURAARK and reported in the last dissemination deliverable D8.6. We refined and adapted these strategies in year three, so that they fit to the activities in year three and report on the impact of DURAARK in this Deliverable.
We track the impact through the following tools:

- Using Google Analytics to analyse project website traffic and correlating statistics with events in the project calendar and news, that the project generates. If we can find a correlation between website traffic and certain events, we have a tool for assessing impact.
- Tracking participations in workshops and conferences, in which DURAARK has an active role, is seen as a measure of attraction. The combination of these with the organisational affiliation of the attendees allows for an an assessment of our attraction among the stakeholder groups.
- Tracking interaction with industrial partners; what questions we get and whether they are in line with the project goals, gives an assessment of relevancy with regard to stakeholder needs.
- Tracking use of software components hosted on GitHub[1], which we use since project start, and those, which were added in year three, gives an assessment of impact.
- Tracking downloads of Docker images and Docker repository usage provides an additional metric for the assessment of impact.

[1] http://github.com

3 Joint community oriented dissemination

DURAARK has established several channels, that disseminate the activities of the consortium. Besides the targeted address of stakeholders through workshops, fairs and presentations. For this web-based channels are used predominately, such as the project web-page or social media (Facebook and Twitter) and community oriented pages, such as GitHub or food4rhino.
A special effort was as well set on the dissemination of datasets and software artefacts, where new channels were established in year 3. These grant among others access to an extensive set of IFC and Point Cloud datasets, see also section 3.3.

Figure 1: The organisation of workshops at stakeholder gatherings was one of DURAARKs targeted stakeholder oriented dissemination activities - here at the 2015 Landinspektørforenings Faglige Møde in Nyborg Strand

3.1 Targeted address of stakeholders

Dissemination activities targeted at companies and organisations have been a focus of the DURAARK consortium over the whole span of the project. Several tools have been developed. The impact of these can be seen in the rise of associated companies and organisations by 223% in the last year of DURAARK, as seen in chapter 5. Among those

many stakeholders took part in the evaluation of the DURAARK project results - reported in Deliverable D7.4 Evaluation - and the many new datasets from stakeholders, which we report on in Deliverable D8.7 Market Study and Exploitation Plan v2.0.

Especially the work in Workpackage 7 "Data acquisition, Evaluation and Test" showed, that a targeted address of stakeholders is necessary in order to create avenues for dissemination, evaluation and eventually collaboration. It has been repeatedly reported to us from stakeholders throughout the three years of DURAARK, that they knew about the project, were interested and could see possible benefits, but were too busy with their everyday activities to contact us. A personal link, established through personal face-to-face conversation during or after events as the meeting of the Danish Association of Surveyors (fig. 1) or through an email, followed by a simple phone call, creates a situation, where stakeholders are immediately seeing the relevance and possible positive impact of the project and are even willing to collaborate.
The DURAARK consortium has employed a set of tools to address stakeholders in a targeted way. These include:

- Stakeholder oriented presentations (fig 1)
- Stakeholder specific e-mails
- DURAARK booklets in pdf format, which can accompany emails and highlight research results, relevant to the specific stakeholder, as for instance the DURAARK work on Point Clouds for stakeholders from the land surveying community (fig 2).
- DURAARK Poster, which can be printed in A2-A0 format (Appendix A.3).
- Automatic slideshows for workshops and fairs, that can run in kiosk mode on large scale screens. The demos have a visual focus, short slogans and many demo movies (Appendix A.3).
- DURAARK flyers, which highlight the stakeholder oriented results of the project (Appendix A.1)

These instruments have been employed in several occasions throughout the projects, such as Workshops and Fairs 4, in the stakeholder oriented dissemination activities of the individual DURAARK partners and in the efforts to attract companies and organisations to become associated and collaborate 5 .

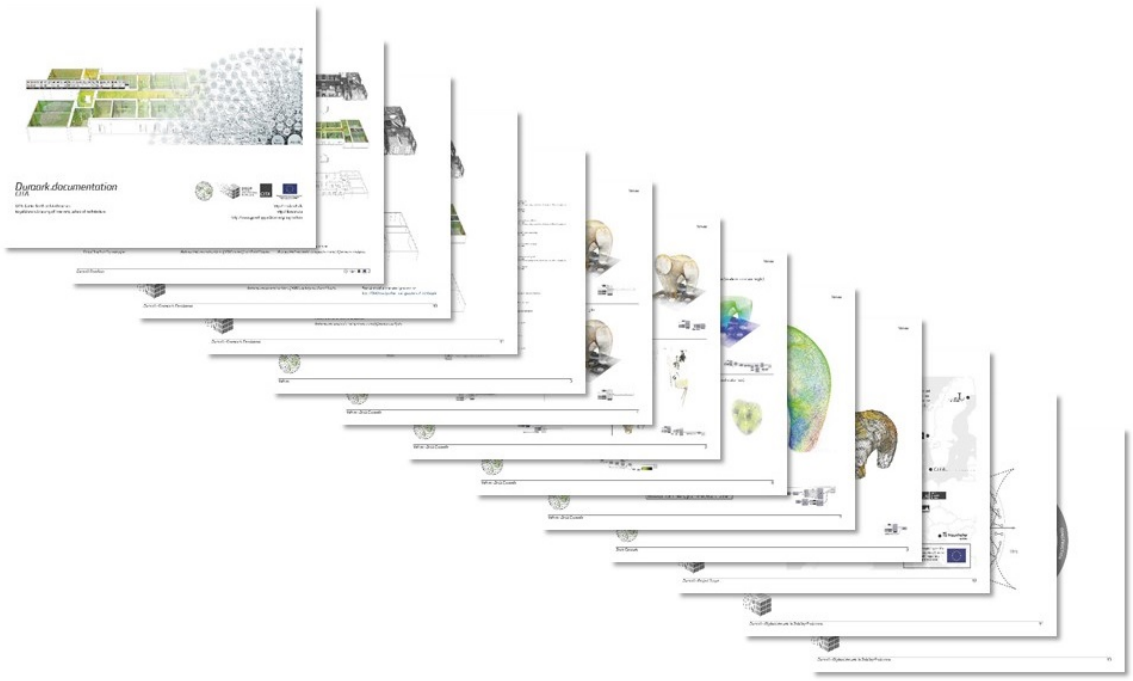


Figure 2: DURAARK developed presentations, which highlight stakeholder specific research results- for example those, that relate to Point Clouds and BIM.

DURAARK partners use the established links to stakeholders, in order to discuss and evaluate the results, as reported on in the Deliverable D7.6, but as well in order to establish collaborations, for instance through the exchange of datasets, the use of code or even the engagement in projects in order to test and demo the developed components.

3.2 Project webpage - DURAARK.eu

The DURAARK website, see figure 3, has been online at http://www.duraark.eu/ from the beginning of 2013 and it has been the primary communication channel for the project news, events, deliverables and all DURAARK related information. A snapshot of the DURAARK website is presented in Appendix A.1.

The website consists of 26 static pages that do not change very often, and a blog that has a dynamic character. To this date there are 50 published blog posts, written by ten different persons within the project. Each post can be published as either a news post or a blog post, or both. The newest posts are automatically published at the top of the page and all posts are also automatically posted on the DURAARK Facebook page and Twitter account.

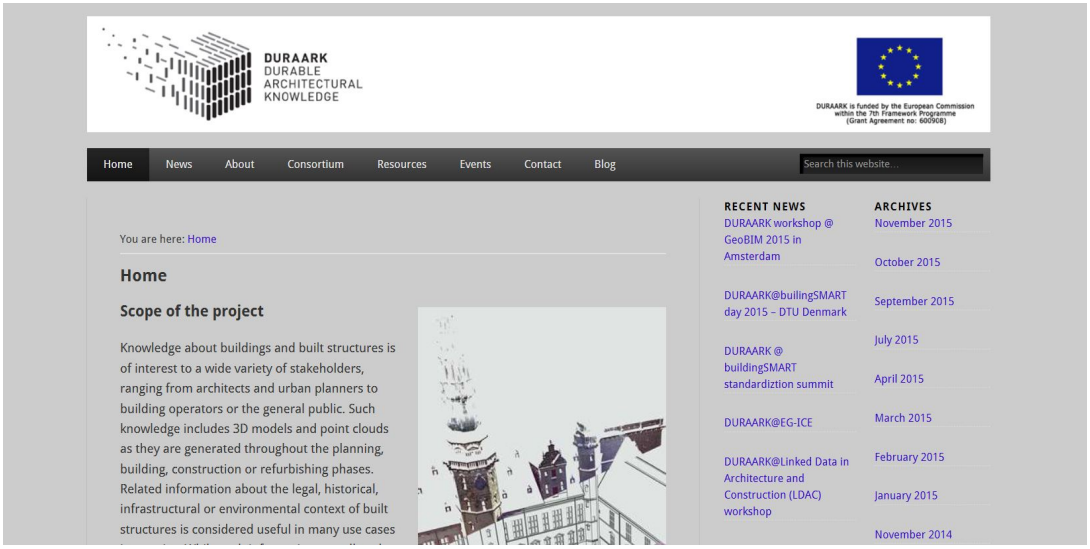


Figure 3: The DURAARK webpage is the primary entry for information about the project

Statistics show that the website has had between 361 - 1,421 visits per month in 2015. Visitors from several countries all around the globe visited the DURAARK website, top ten countries was USA, Russia, Germany, Sweden, Brazil, Denmark, Netherlands, UK, China and Italy.

In the third year, the website attracted 5,356 users and resulted in 13,564 page views. The total number of page views for the entire lifetime of the website is 19,459.

Correlation of Website and DURAARK activities While reviewing the numbers of visitors per month we find several examples, that show the correlation of other Dis-

semination activities on the number of visitors. This demonstrated the importance of the webpage for the project, as it allows interested persons to quickly grasp the project, provide them with further and related content and finally make them act for instance through picking up provided research output, contacting DURAARK.eu or visiting one of the many events.

This correlation can be exemplified by September 2015, which was the **month with the highest number of visitors** on the web site, followed by March and October. As September was a month with a high number of publications and presentations, we see a correlation between our dissemination activities.

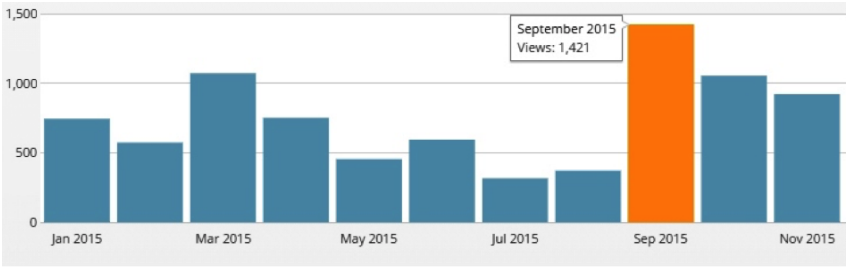


Figure 4: Visits to the DURAARK website during year 3, broken down on individual months

The **highest number of visitors in one single week** occurred in the beginning of September, see Figure 4. On this week the DURAARK team presented results from the project at the annual international EG-ICE (European Group for Intelligent Computing in Engineering) and at Hypertext 2015 Conference, (The ACM Conference on Hypertext and Social Media). The here published article "Automatic reconstruction of parametric building models from indoor Point Clouds" [2], was subsequently ranked the *most downloaded article of the last 90 days* of the hosting webpage Science Direct, which might contribute to the high visitor page count mentioned above.

[2] http://www.sciencedirect.com/science/article/pii/S0097849315001119

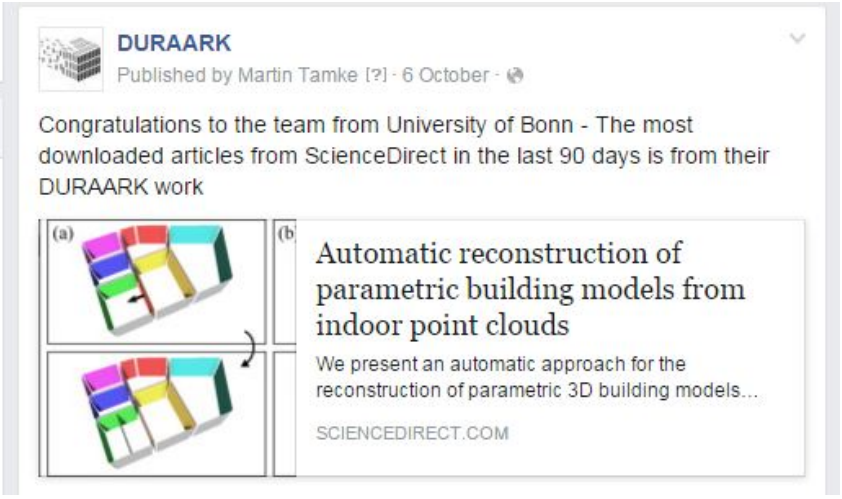


Figure 5: An article with impact, as the one published by the DURAARK team from University of Bonn "Automatic reconstruction of parametric building models from indoor point clouds", results in higher webpage visits.

Figure 6: Peaking week of visits to the DURAARK website during September 2015

The **impact of a single post** on a blog can be seen in the figure below. On November 4, 2015, a blogpost on Rhinoceros (http://blog.rhino3D.com/2015/11/volvox-point-cloud-data-html) presented the plug-in Volvox, developed in the DURAARK project. Already the same day this was reflected in the statistics on the number of visitors day by day, and we can also notice that many of them referees from the domain blog.rhino3D.com.

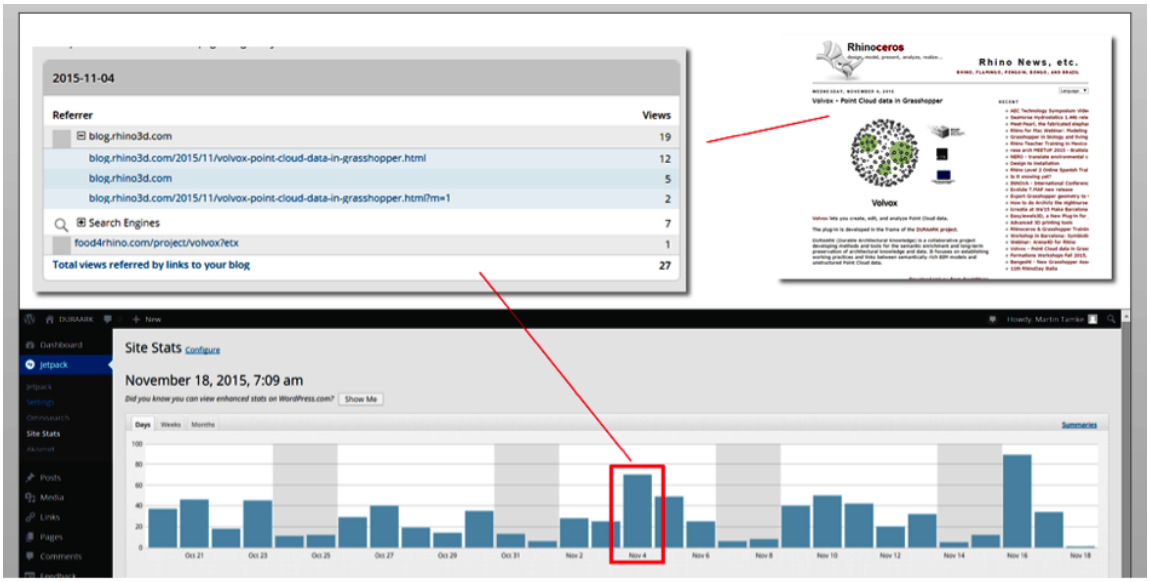


Figure 7: Effects after a post on an external blog, November 4, 2015

Analysis of Website visits

The 15 most visited individual pages and blog posts on the project website are listed in the Table 1 below, which shows the total statistics on views.

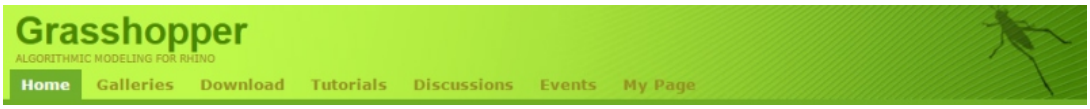
Page in http://duraark.eu	**Count**
Home	5 735
Home page/Archives	3 092
Deliverables	1 260
Publications	1 031
i-KNOW workshop “Building Knowledge”	639
Presentations	522
Use Case	507
Contact	364
Sustainable Building Information Workshop 12. November 2014 – Copenhagen	354
Objectives	340
Project Flyer	330
Consortium	310
Sustainable Building Information Workshop 12. November 2014 – Copenhagen – Presentations Online	262
CITA	261
Who we are	251

Table 1: Webpages on the DURAARK website attracting traffic

Analysis of Website referrals

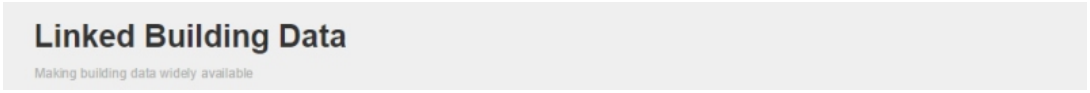
An analysis of referring websites, i.e. those, that have one or more links to the DURAARK website that has led visitors to the project´s website show similar results as last year, with some additions, which can be traced back to additional dissemination activities of DURAARK.

Amongst new referrers, the largest are:



- http://www.grasshopper3d.com/ a website for designers using generative algorithms based on the grasshopper Plugin for the stakeholder CAD tool Rhino. The DURRAARK project published a grasshopper plugin (VOLVOX) in September 2015, which provides Point CLoud functionality and integrates the DURAARK components and workbench.

- http://blog.rhino3D.com/ is a blog about Rhino3d, a commercial 3D computer graphics and computer-aided design (CAD) application software.



- http://linkedbuildingdata.net/ is the website for The W3C Linked Building Data Community Group with experts in the area of building information modelling (BIM) and Web of Data technologies.

- http://www.langzeitarchivierung.de/ is the website of nestor, the German competence network for digital preservation.

- https://dzone.com/ is a worldwide community of technology professionals worldwide and a collection of resources.

- http://www.laserscannerblog.de/ is a German blog about laser scanning, 3D documentation and 3D metrology for architects and engineers. It is written by employee of FARO EUROPE, a company developing computer-aided measurement systems and software. The presence of DURAARK at the FARO 3D registration conference in Stuttgart / June 2015 can be correlated to this refferal.

- http://www.scape-project.eu/ SCAPE is an EU-funded project developing scalable services for large collections of complex digital objects.

Top five referrers from earlier years are:

- http://buildingsmart.org is the website of the buildingSMART community, a worldwide authority driving the transformation of the built environment through creation and adoption of open, international standards. It is also the home of openBIM.
- http://blogs.loc.govistheAmericanLibraryofCongress.
- http://dankersslimmerbouwen.nl is the personal blog of Marc Dankers, which collects resources around Building Information Models.
- http://geospatialworld.net disseminates a wide range of information in GIS, Remote Sensing, GPS, Photogrammetry and related sciences. This is the world's largest geospatial technical resource portal.
- http://alliancepermanentaccess.org is the website of the Alliance for Permanent Access, which promote a vision and framework for sustainable organisational infrastructure for permanent access to scientific information.

Social media, i.e. Facebook, Twitter and LinkedIn, is also found on the list for top referrers during the last year, with a clear increase of visitors from Facebook compared to Twitter in 2015. This can be explained by the increase in publications on the Facebook page of DURAARK.

3.3 Webpages for dataset and software artefact dissemination

The DURAARK consortium currently has four outlets for the dissemination of software and datasets created by the consortium:

- GitHub (https://github.com/DURAARK) - the main outlet for developed sourecode of all software components.
- Docker Hub (https://hub.docker.com/search/?q=duraark&page=1&isAutomated=0) - contains all public, ready to use Docker images provided by DURAARK.
- Grasshopper3D (http://www.grasshopper3d.com/group/volvox). The community page of the Volvox plugin for Rhino.
- data.duraark.eu (www.data.duraark.eu) - the repository of all public datasets, schemas & vocabularies, rdf metadata and Application Programming Interfaces (APIs).

Five months before the end of DURAARK the last two dissemination channels have been established. This provided the project with a boost in recognition in the software developer community.

GitHub is the entry point for professional developers to access the source code of the produced software modules. From there the code can be reviewed, ''starred"[3] and ''forked"[4]. DURAARK maintains an ''organization" on GitHub with 34 public repositories in 10 different programming languages (Javascript and Java are the most prominent ones). Repositories within the DURAARK organization have been starred 14 times and have been forked for 9 times. There haven't been contributions yet from external developers. This is not unusual. Attracting external developers who are actually contributing code to projects outside of the core developer team usually needs a big user base. In DURAARK our main

[3]Equivalent to Facebook's ''Like" button

[4]A copy of the code is created for the forking GitHub user to work on it. Changes to the code can be reintegrated into the original code base via ''pull requests"

stakeholders are mainly users of the system, not programmers. With the foundation of the ''Durable Building Data (DBD)" association one goal is to also position the DURAARK system as a open source platform for researchers and for commercial interests, which will attract external contributors, if successful.

An up-to-date stats visualization for the DURAARK organization is available at http://coderstats.net/github/duraark/. Download statistics for published releases are not available on GitHub.

The GitHub outlet is accompanied by the Docker Hub appearance of DURAARK. There a selection of 15 ready-to-use Docker images are provided which are generated when a new release in a GitHub repository is created. Additionally, the latest version of the selected GitHub projects is available via this channel and is automatically updated on each code change. The following page contains the available Docker images, as well as download statistics[5]:
https://hub.docker.com/search/?q=duraark&page=1&isAutomated=0.
It has to be said that the statistics also include the downloads which are automatically triggered by our continuous integration system, there is no possibility to track ''external" downloads.

The dissemination through the rhino/grasshopper3d community resulted in 512 downloads of the 0.0.1 release of the plugin since its release in September 2015 [6]. Considering the Beta stadium and the specialisation of the plugin we consider this a good results. This is backed up by the fact, that arelated Rhino plugin the e57 file import for Rhino[7] was only downloaded 191 times, since it was published in January 2015.
The DURAARK repository www.data.duraark.eu, see a screenshot in figure 8, went online in September 2015 and has according to the data-centre at TIB Hannover a good download traffic.

[5] A ''download" is called "pull" in Docker Hub jargon.
[6] http://www.food4rhino.com/project/volvox?ufh
[7] http://www.food4rhino.com/project/e57-file-import?ufh

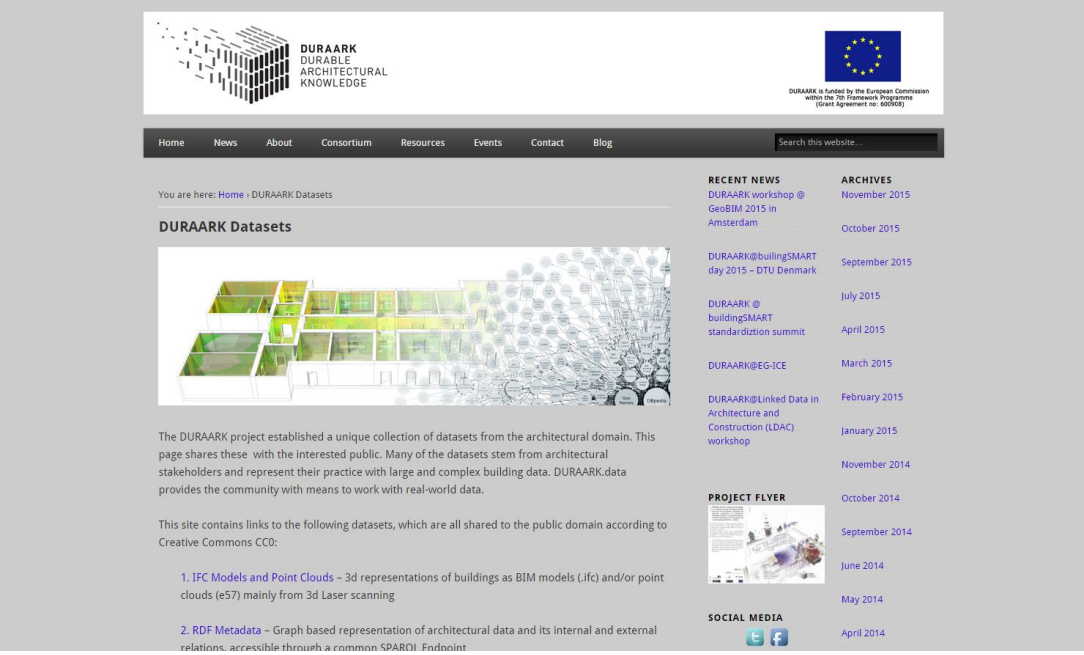


Figure 8: The Duraark repository went online in September 2015.

3.4 Social and other media

The DURAARK project has been active on Facebook and Twitter since January 2013. The DURAARK activities on Facebook, see screenshot in figure 9, were intensified in 2015. For example, a number of posts were written only for the followers on the Facebook page. The other content derives from DURAARK.eu blog post, which are automatically posted on Facebook. The increase in activities resulted in a remarkable rise as the number of followers has more than doubled in one year, from 29 persons in the end of 2014 to almost 100 in January 2016.

DURAARK´s participation on Twitter shows a steady rise in the number of published posts, number of followers and also how often other Twitter accounts link to DURAARK posts. Especially posts about conferences and workshops has a higher level of mentioning and sharing. In the end of 2015, 48 posts was written on Twitter and the account had 50 followers. See figure 10 below.
The activity on DURAARK´s social media accounts is not very large but nevertheless important, because the pages act as gateways for users to the website. Both Twitter and Facebook are top referrers for visitors to the DURAARK website.

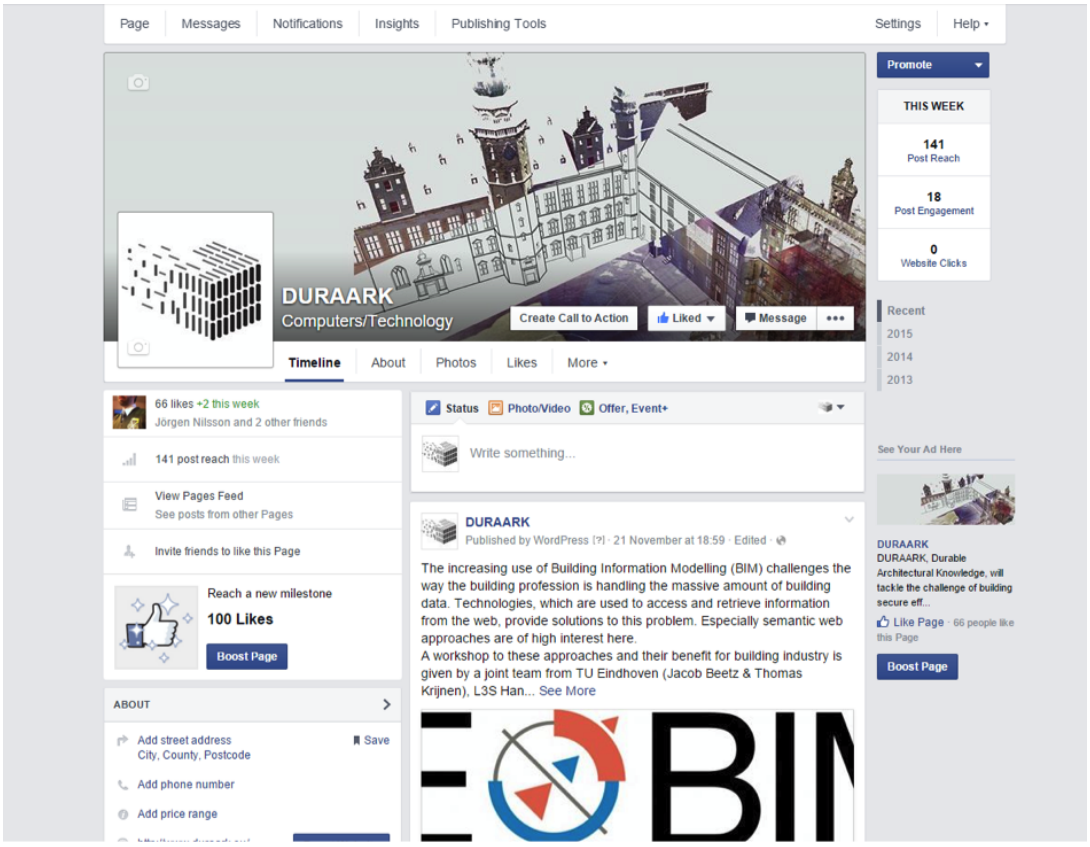


Figure 9: The DURAARK project on Facebook

DURAARK On Air

Figure 11: The Austrian Broadcasting Corporation (ORF) broadcast a radio show on long-term archiving of data with FhA participation.

On Sunday 1st March 2015 DURAARK was part of the Austrian science broadcasting "matrix – computer & neue medien" on OE1.
"Die Angst vor dem digitalen Verlust – Langzeitarchivierung" (The fear of digital loss – long term preservation) was one of the two main topics. Eva Eggeling from Fraunhofer Austria discussed with other experts how digital data can be preserved for future generations.

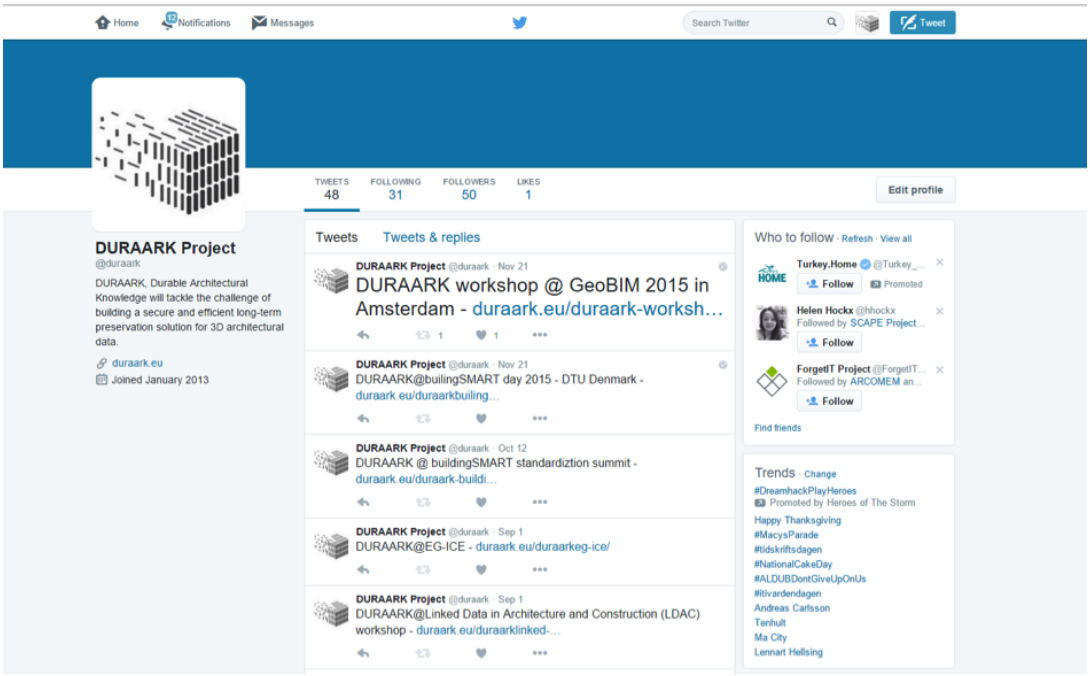


Figure 10: The DURAARK project on Twitter

The rise of webpage visits in March 2015 might be related to this broadcast, which is as well available as record from the ORF webpage [8].

[8] http://oe1.orf.at/programm/398335

4 Workshops and Fairs

In year three members of the DURAARK consortium organised and took part in 10 workshops with scientific and professional audience. This participation aimed simultaneously at disseminating DURAARK research, as to create contacts for collaboration during and beyond the DURAARK research.
The positive impact of these workshops on the communities can be read in the increased number of new associated companies and organisations, as shown in section 5, as well as in invitations to contribute to books and papers. This was for example the result of the DURAARK participation in a workshops organised by the Herder Institute, see section 4.3, and the International EG-ICE Workshop, see section 4.7.

4.1 Hybrid Registrations Student Workshop on 3D scan and analysis methods

The Hybrid Registrations Student Workshop was organised by CITA in collaboration with Jamie Meunier from the Danish land surveying company LE34. 22 architectural students on master level took part in February 2015.

Figure 12: Hybrid Registrations workshop - Intermediate presentation

The workshop investigated how to extract relevant and precise information in order to build arguments for design, and how to use the overload of information, which is provided by laser scans, as a resource for inspiration and design exploration. The students in the workshop were pursuing both directions.

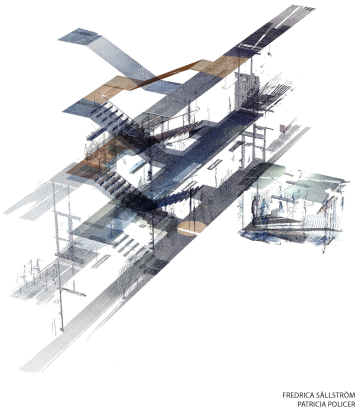


Figure 13: Interior Flow Diagram by F. Sällström and P. Policer

Figure 14: Interior Interpretation by Sarah Sonne Glatz

The workshop started with the claim, that "Any architectural design task requires inspiration and information". 3D scanning provides an overload of this information. The current challenge is however to find ways into the raw data for architectural design. DURAARK members introduced the students to the developments from the research project. This speculative and hands-on workshops help to evaluate the developed tools for generation and linkage of Point Cloud and BIM. It focused the further research direction in year 3, and led ultimately to the programming of the VOLVOX Rhino plugin.

Figure 15: Workshop result by Marcus August Frølich Innvær

The workshop results in a set of architectural representations, which interpret site and program in a novel way, see figure 13, 14 and 15. These were refined in a period following the workshop and exhibited in the The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation in Copenhagen in Spring 2015.
Further results are found on the DURAARK blog[9] and the KADK webpage [10]

4.2 LDP Day in Stockholm

On the 6. February 2015, DURAARK was presented to key personal at the Swedish National Archives (8 participants) and the National Library of Sweden (5 participants), during three hours at respective organisation. There was an overview presentation of the project including e.g. the DURAARK Workbench, which then went into more details and discussions regarding areas of concern for the participants.

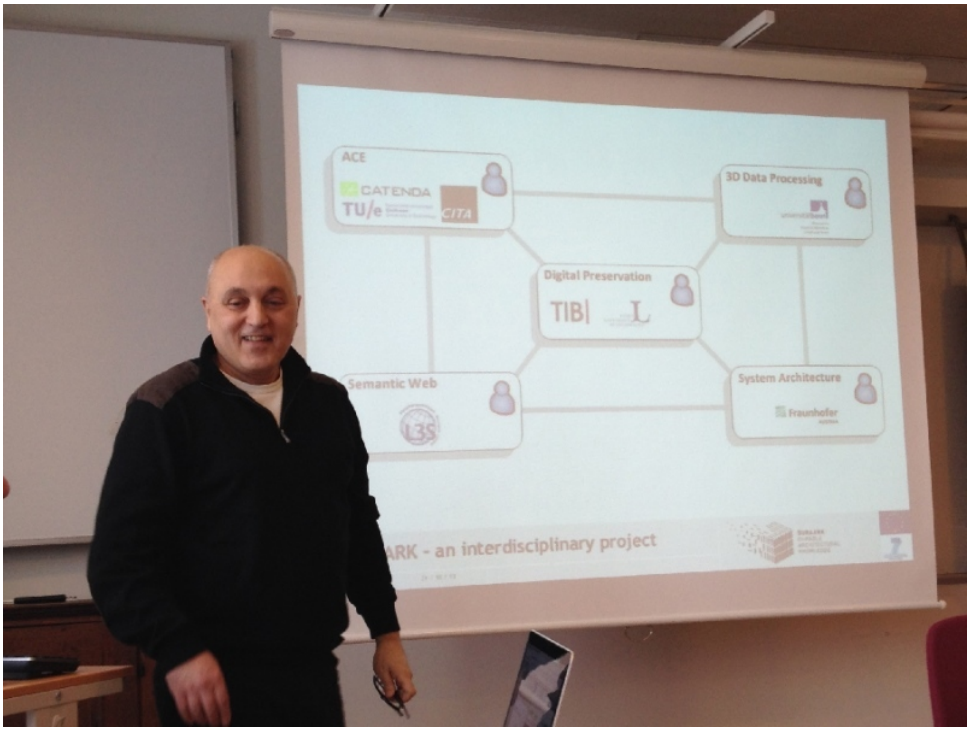


Figure 16: Workshop LDP Day in Stockholm

One topic that was particularly interesting was the possibility to adapt the packaging of

[9] http://duraark.eu/hybrid-registrations-3D-scan-and-analysis-methods/
[10] http://cita.karch.dk/Menu/Workshops

BIM data to be part of the Common Specifications[11] provided by the National Archives to be used by all public agencies in Sweden both for exchange between them and delivery to the National Archives. Another topic of interest was the general possibility to preserve 3D data models. The latter was of interest to all participants since government related BIM material would end up at the National Archives, or at least reside in organisations that the National Archives regulate, while the National Library of Sweden will have the need to preserve 3D data as part of e.g. game design and some (non-governmental) building architecture.

4.3 Workshops organised by the Herder Institute

DURAARK coordinator Stefan Dietze participated in two workshops organised by the Herder Institute[12] in Marburg, Germany. A workshop on 17th of March 2015, attended by roughly 60 experts from architecture, historical sciences and computer sciences, was dedicated to the use of semantic web and linked data in the context of "digital reconstruction", i.e. the construction of 3D models and related contextual data about cultural heritage buildings from sparse and incomplete information sources. Here, works from affiliated projects[13] and working groups[14] were presented and discussed, where several apparent links with DURAARK activities emerged and were discussed with the audience. This event was followed by a second workshop on 18. March on the topic of Virtual Research Environments in related cultural heritage and digital reconstruction settings. this had a strong emphasis on the use of linked data principles. Stefan Dietze presented, amongst others, recent DURAARK research and results[15], which have been met with great interest by the audience and have paved the way for further exchange, for instance, of data, vocabularies and knowledge and further collaboration as part of the digital reconstruction working group.

One of the direct results was the invitation to contribute to an upcoming book, edited by the workshop organisers, on the topic of digital reconstruction. This led to a collaborative book chapter on DURAARK results, authored by all WP leaders and the majority of the

[11] http://riksarkivet.se/fgs-earkiv
[12] http://www.herder-institut.de/
[13] http://goo.gl/LXd0B2
[14] http://www.digitale-rekonstruktion.info/
[15] slides at http://de.slideshare.net/stefandietze/dietze-linked-datavres

Figure 17: Digital reconstruction workshop at Herder institute

project partners in a joint effort, providing an overview of the most crucial DURAARK results.

4.4 Geospatial World Forum Lisbon

DURAARK presented in the GeoBIM track [17] of the INSPIRE-Geospatial World Forum [18], the first collaborative platform between the European Commission and the organisers Geospatial Media and Communications. The conference took place in Lisbon Congress Center (Fig. 18), in the week of 25.-29. May 2015. The five-day long conference was attended by 1714 delegates from 104 countries, cutting across geospatial companies, user industries, government representatives and senior academia.

The session on convergence of Geospatial methods, as GIS and the harmonizing of related standards throughout Europe in the European Commissions sponsored INSPIRE initiative, with the rapidly growing use of Building Information Modelling in the building industry

[17] http://geospatialworldforum.org/2015/geobim.asp
[18] http://geospatialworldforum.org/2015/

Figure 18: The main plenum of the Geo Spatial World Forum in Lisbon - more images can be found on the page of the organisers [16]

had 55 attendees. These were according to the organisers coming from the following stakeholder groups: Policy Makers, Government & Public Sector Undertakings, Infrastructure Developers (Public/ Private), Construction Companies/ EPC Contractors, Engineering Companies, Consultants (Environmental/ Engineering/ Project Management/Advisory), Infrastructure Utility, Consultants/Experts/Service Providers, Funding Agencies, Project Executing Agencies at National and State Level, ICT Companies, Academic & Research Bodies and Geospatial Industry Experts.

The presentations provided a good overview of the main issues in the field:

- Leif Granholm, Senior Vice President, Tekla, Finland - Open Standards for GeoSpatial and BIM Data, How are They Developed and What is Their Role in Building and Operating Built Environment
- Ad van Houtum, Advisor, Dutch Kadaster, Netherlands Implementing INSPIRE Utility Networks in the Netherlands
- Anne Kemp, Director (BIM Strategy and Development), Atkins, United Kingdom
- Piergiorgio Cipriano, Project Manager, Sinergis, Italy Map4Data: a mobile App to refine geodata for the SUNSHINE “Building Efficiency Pre-certification Service”

Figure 19: Martin Tamke presenting during the GeoBIM session of the Geospatial World Forum / Lisbon

- Tae Wook Kang, Senior Researcher, Korea Institute of Construction Technology, South Korea BIM-based Data Mining System Framework to support a Effectiveness Decision-making for Energy Usage Management of Building Space
- John Foster, BIM Business Development Manager, Topcon Europe Positioning,United Kingdom CRR for Asset development and Maintenance
- Laura Pinfold, Lecturer, Cape Peninsula University of Technology, South Africa Using Geo-Spatial Technology to Manage Inner-City Building Construction with Confined Space and Congested Access, Cape Town, South Africa
- Silvia Mastrolembo, Ventura, BIM Researcher, University of Brescia, Italy Geospatial Technologies integrated with Building Information Modelling on Large Construction Site for Health and Safety Management
- Mohamad Kassem, Associate Professor in Engineering Project Management, Teesside University, United Kingdom Benefits from integrating BIM + GIS data & models for assessing their adoption at country level
- Malcolm Taylor, Head of Technical Information, Crossrail Ltd., United Kingdom
- Martin Tamke, Associate Professor, Centre for Information Technology and Archi-

tecture, Copenhagen DURAARK – Enriching BIM and Point Cloud data for the use in building lifecycles, see figure 19.

- Luc Van Linden, Managing Consultant, HL Consulting, Belgium Challenges for Utility Companies in Flanders to Accommodate the New INSPIRE-based, Flemish Cable and Pipes Information Model, the Exchange As-Built Network Information

The exchange with audience and other speakers confirmed the need for more automation in the linkage of Vocabularies and the need to create semantics in building datasets.
The presentation resulted in a set of new contacts, as well as third party publications mentioning DURAARK,as on blogs[19] and reports [20] directed to the Geospatial community.

4.5 3D Documentation Conference Stuttgart

The 5th edition of the annual 3D Documentation Conference 2015 [21], took place at the Motorworld in Stuttgart-Böblingen/Germany from 21.-22. May 2015. It attracted more than 200 participants from all over the world to discuss the latest trends, innovations and applications in 3D Laserscanning 20.

Figure 20: Impressions from the 3D Documentation Conference in Stuttgart / May 2015

Martin Tamke from CITA gave a workshop on 21. May 2015 - titled "DURAARK – means to integrate Point Clouds into architectural workflows", an abstract can be found on the page of the organisers [22]. The workshop was well attended by around 50 land surveyors,

[19] http://www.geoschnitz.de/inspire-gwf-2015-in-case-you-missed-it/
[20] http://tinyurl.com/njlfab2
[21] http://www.faro.com/landingpage_eu/faro-3D-documentation-conference-2015
[22] http://www.faro.com/landingpage_eu/faro-3D-documentation-conference-2015/

architects, engineers and other researchers. The discussion following the discussion was centred on questions of quality of the DURAARK approaches, as well as their integration into workflows and softwares.
The participation in this event resulted in several collaborations with 3D laserscanning companies and BIM modelling companies, who provided datasets and feedback in the evaluation Workpackage 7.
The contacts developed to such an extend, that FARO, world leader in indoor 3D Laserscanning solutions and organiser of the conference, issued a letter of intent for further research collaboration in December 2015. This is document in Deliverable D8.7.

4.6 Linked Data in Architecture and Construction (LDAC) workshop

In July 2015, the third edition of the **Linked Data in Architecture and construction** workshop was held at the Eindhoven University of technology. 26 participants from 13 countries came together for three days for single-track presentations, tutorials and a workshop. A detailed report of all presentations is available at the conference website [23].

Figure 21: Participants of the 2015 LDAC workshop held at the Eindhoven University of Technology

As one of the most important tangible outcomes of the event, detailed technical decisions regarding open questions for the standardization of ifcOWL, the OWL representation of

[23] http://ldac-2015.bwk.tue.nl/LDAC_2015_workshopreport.pdf

the Industry Foundation Classes (IFC) have been made: During an extensive session on the third day, discussion , consensus-building and consecutive voting on a list of 20 issues has executed. The event proved to be a crucial step towards the official standardization that would triggered later on in 2015 at the buildingSMART summit (see section 4.8).

List of Participants of LDAC 2015

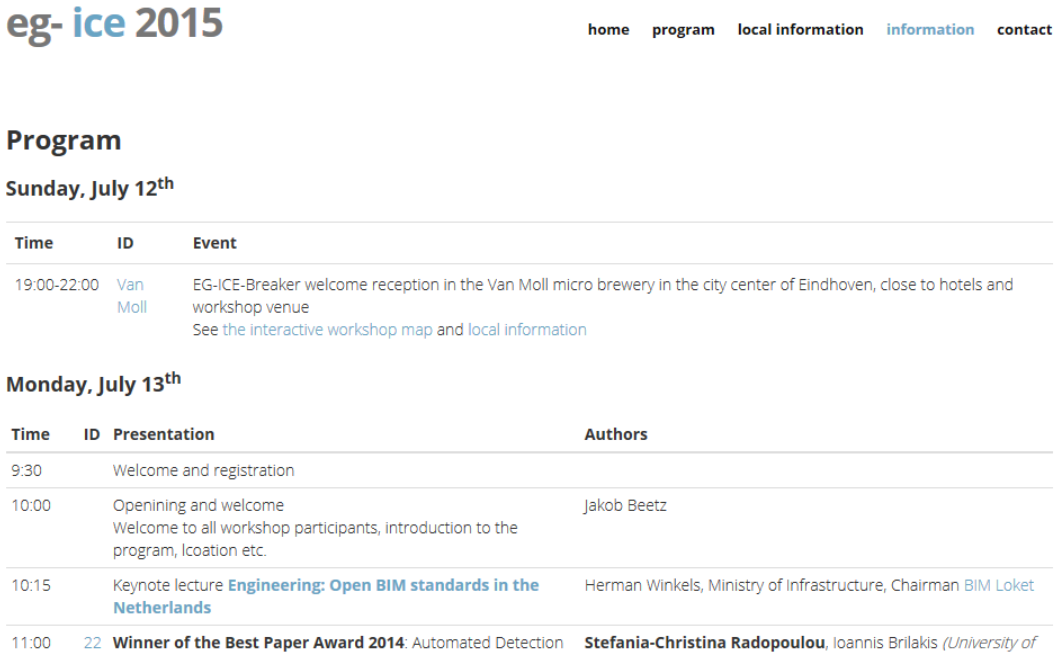
- Ana Roxin, University of Burgundy
- Chi Zhang, TU Eindhoven
- Daan Oostinga, Semmtech
- Hendro Wicaksono, Karlsruhe Institute of Technology
- Francisco Regateiro, Instituto Superior Técnico, Universidade de Lisboa
- Jakob Beetz, TU Eindhoven
- Jyrki Oraskari, Aalto University
- Kris McGlinn, Trinity College Dublin
- Leif Granholm, Trimble/Tekla
- Léon van Berlo, TNO
- María Poveda-Villalón, Universidad Politécnica de Madrid
- Mathias Kadolsky, TU Dresden
- Matthew Horrigan, University College Dublin
- Matthias Weise, AEC3
- Michel Böhms, TNO
- Nam Vu Hoang, Aalto University
- Nick Kaklanis, CERTH-ITI
- Nick Purshouse, Integrated Environmental Solutions
- Odilo Schoch, ETH Zürich
- Peter Bonsma, RDF Ltd.
- Pieter Pauwels, Ghent University
- Pim van den Helm, TNO
- Robert Amor, University of Auckland
- Seppo Törmä, Aalto University
- Thomas Krijnen, TU/e
- Tarcisio Mendes de Farias, Univ. of Burgundy
- Tjeerd Dierckxsens, ProRail
- Walter Terkaj, ITIA-CNR
- Willie Lawton , Tyndall National Institute

4.7 International EG-ICE Workshop

The Annual Workshop of the **European Group for Intelligent Computing in Engineering (EG-ICE)**[24] was held in the time between July 13^{th}-15^{th} at the Eindhoven university of Technology as a single track event with 40 participants from 12 countries. 22

[24] http://eg-ice-2015.bwk.tue.nl/

presentation where given and 2 keynotes delivered. The event was organized back-to-back with the LDAC 2015 workshop (see Section 4.6) with an overlap of one whole day during which members of both communities met, mingled and participated in the respective sessions, presentations and workshops. Among the presentations, a number of works have been presented ongoing research and development in the area of as-built models and the use of point clouds. The first public presentation of the DURAARK contribution of point cloud integration into the IFC schema and the domain-specific compression approaches developed in WP3 have been received with a lot of interest.



eg- ice 2015

home program local information information contact

Program

Sunday, July 12th

Time	ID	Event
19:00-22:00	Van Moll	EG-ICE-Breaker welcome reception in the Van Moll micro brewery in the city center of Eindhoven, close to hotels and workshop venue See the interactive workshop map and local information

Monday, July 13th

Time	ID	Presentation	Authors
9:30		Welcome and registration	
10:00		Openining and welcome Welcome to all workshop participants, introduction to the program, lcoation etc.	Jakob Beetz
10:15		Keynote lecture **Engineering: Open BIM standards in the Netherlands**	Herman Winkels, Ministry of Infrastructure, Chairman BIM Loket
11:00	22	**Winner of the Best Paper Award 2014**: Automated Detection	**Stefania-Christina Radopoulou**, Ioannis Brilakis *(University of*

Figure 22: Screenshot of the EG-ICE 2015 workshop program at http://eg-ice-2015.bwk.tue.nl/program.html

Selected contributions - including the DURAARK point cloud/IFC work - will be published as extended paper in the Advanced Engineering Informatics (ADVEI)[25] journal with a 5-year Impact factor of 2.100.

[25] http://www.journals.elsevier.com/advanced-engineering-informatics

4.8 buildingSMART standardization summit

During the international fall summit of the buildingSMART standardization organization held in Singapore in October 2015, members of the DURAARK consortium contributed to three main standardization activities:

- standardization of **ifcOWL** as the basis for creating and processing Industry Foundation Classes instance models as (distributed) Linked Data sets. Next to the meta data extracted in the DURAARK prototypes according to the `buildm` schema, this allows the storage and query of complete instance IFC instance models in the SDAs
- creating consensus on future versions of the buldingSMART Data Dictionary (bSDD) to be represented in the form of (dereferenceable) Linked Data that would allow futher enrichements of semantically annotated data on the component level.
- presentation of the IFC schema extension allowing the integration of point cloud data.

The activities were carried out in different plenary sessions and working group panels and were heard by many of the more than 100 delegates representing governmental and standardization agencies as well as software vendors, end users and building owners from more than 24 countries. Follow-up activities on all three efforts are in preparation for the spring international summit to be held in March in Amsterdam. More information can also be found in section 5 of D7.8.

4.9 bips BuildingSmart Day

Henrik Leander Evers and Per-Kristian Hansson from CITA presented the DURAARK project on the 26. November 2015 in the frame of the builingSMART day at the Danish Technological University [26]. The event informed about the latest trends concerning Building Information Modelling, with a special focus on the needs of Building Owners, Architects and Engineers and Information exchange. A market place for ideas and discussions related to buildingSMART was the theme of the day, which was thoroughly discussed by all participants representing the entire knowledge chain of the building industry. The participants included developers, architects, engineers, contractors, manufacturers and

[26] http://bips.dk/artikel/buildingsmart-dagen

personal from facility management.

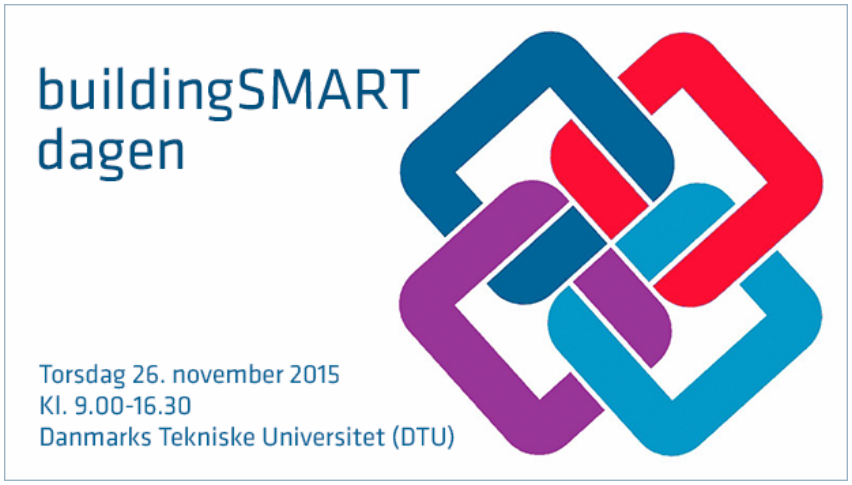


Figure 23: The info graphic of the buildingSMART event at DTU.

The DURAARK team demonstrates, how the semantic web technologies, developed in DURAARK, allow to connect highly different building models, such as IFC and Point Cloud data. Visitors had as well the opportunity to take part in a survey about sustainability in building data. Thinking about long term access to BIM data is of immanent importance for every stakeholder, that invests into these technology and processes.
In general the participants showed a lot if interest in the DURAARK project, and the DURAARK team had several fruitful conversations throughout the day.
To mention a few: Daniel Davis from Cad-Q [27] and Duncan Mactear from Viewpoint [28] were excited about the ifc reconstruction tool. There was also a lot of interest in the archival strategies of DURAARK. Especially Jan Karlshøj from Danish Technological University [29] and Sara Asmussen from The Danish Building and Property Agency [30] showed great interest, filled out the survey and stayed in contact with the CITA team after the day.

Torben Klitgaard, CEO at Bips [31] was especially excited about the project, and invited DURAARK to the upcoming Bips Forum to present the project.

[27] http://www.cad-q.com/
[28] http://viewpoint.com/
[29] http://www.dtu.dk/
[30] http://www.bygst.dk/
[31] http://bips.dk/

Figure 24: Impressions from bips BuildingSmart Day at DTU, Copenhagen / November 2015

The participation in this Danish language event required a registration and was attended by 79 members.

List of Participants of Bips BuildingSMART day 2015

- Kaj A. Jørgensen, Aalborg University
- Kim Nørgaard Jensen, Aalborg University
- Kjeld Svidt, Aalborg University
- Mohammad Irandoust, Aalborg University
- Astrid Skriver Jørgensen, Aalborg University
- Martin Romby, aarhus arkitekterne
- Troels Sønder Olsen, aarhus arkitekterne
- Asger Petersen, ALECTIA A/S
- Kasper Thrysøe, ALECTIA A/S
- Gunnar Friborg, bips
- Peter Langkilde, bips
- Rikke Carlsen, bips
- Søren Spile, bips
- Torben Klitgaard, bips
- Dennis Nordli Hansen, BRICK I/S
- Magnus Dahl Larsen, BRICK I/S
- Anstein Skinnarland, buildingSMART Norge
- Steen Sunesen, buildingSMART Norge
- Peter Hauch, Bygherreforeningen/SBi-AAU/Arkidata
- Sara Asmussen, Bygningsstyrelsen
- Daniel Davis, Cad-Q
- Stefan Brandt, CN3 A/S
- Helle Juul Bak, COWI A/S
- Jørgen Emborg, COWI A/S
- Michael Blom Søefeldt, COWI A/S
- Jan Alstrøm, Dansk Byggeri

- Jan Karlshøj, DTU
- Markus Lampe, DTU
- Nikolaj Nielsen, DTU
- Erik Falck Jørgensen, DTU Byg
- Flemming Vestergaard, DTU Byg
- Eric Sarelius, DTU Campus Service
- Jonas Ransing Lindhardt, DTU Campus Service
- Khoa Dang Ngo, DTU Campus Service
- Poal Ebbesen, DTU Management
- Sofie Larsen, Forsvaret
- Tina Grill, Forsvarsministeriets Ejendomsstyrelse
- Christian Wittrup, Hilti Danmark A/S
- Claus Høghøj Nielse, HØGHØJ byggerådgivning
- Jesper Pildal Hansen, JJW ARKITEKTER
- Steffen Bergsø Terp, KHR Arkitekter A/S
- Michael Ørsted, Københavns Lufthavne A/S
- Anette Persson, Københavns Universitet
- Carsten Hoffmann, Københavns Universitet
- Heidi Hardis, Københavns Universitet
- Tommy Hommel Hansen, Københavns Universitet
- Svend Erik Dam, Københavns Universitet, Science Campus Service
- Ástríóur Elín Ásgeirsdóttir, MOE A/S
- Jesper Trier Henningsen, MOE A/S
- Lars Lennert, MOE A/S
- Joakim Lockert, MT Højgaard
- René Øksengaard, MT Højgaard
- Sascha Vesterlund, MT Højgaard
- Stig Brinck, NIRAS
- Johan Harrestrup, NTI CADcenter A/S
- Mikkel Laurberg, NTI CADcenter A/S
- Morten Strandgaard, NTI CADcenter A/S
- Vibeke Petersen, NTI CADcenter A/S
- Jan Fuglsig Lambrecht, SBi/AAU
- Kim Møllegård Petersen, Sweco Danmark
- Michael Porskær, Søren Jensen Rådgivende Ingeniørfirma A/S
- Peter Gade, UCN act2learn
- Arnaldo Landivar, VIA University Collage
- Regner Bæk Hessellund, VIA University Collage
- Bent Dalgaard, Dalux
- Anders Nielse, Dalux

- Michael Schwarz, Projectspine
- Emil Mortensen, Projectspine
- Magnus Therkildsen, Sigma Estimates
- Thomas Kolenda, Sigma Estimates
- Mark Sung Brinkler, BIM Shark
- Nicklas Verdier Østergaard, BIM Shark
- Lars Kanneworff, NTI CADcenter A/S
- Duncan Mactear, Viewpoint
- Søren Valentin Christensen, IKT:knowhow
- Krinstian Birch Pedersen, Exigo Consult
- Kristina Ekkergaard, Exigo Consult
- Henrik Leander Evers, CITA KADK
- Per-Kristian Hansson, CITA KADK

4.10 GeoBIM Amsterdam

Members of the DURAARK research project from CITA, TU Eindhoven and L3S Hannover organised the workshop **Building Data and the Semantic Web** in the frame of the GeoBIM 2015 conference (10.-11. December 2015) in Amsterdam [32]. The workshop was met by great interest by the participants from the Geospatial community, as well as real estate managers and policy makers.

Figure 25: GeoBIM is an annual summit of the Geospatial community and has close ties to other projects, as the Euopean Inspire Initiative

The claim of the workshop was: "The increasing use of Building Information Modelling (BIM) challenges the way the building profession is handling the massive amount of building data. Technologies, which are used to access and retrieve information from the web, provide solutions to this problem. Especially semantic web approaches are of high interest here."

A joint team from TU Eindhoven (Jacob Beetz & Thomas Krijnen), L3S Hannover (Stefan Dietze) and CITA Copenhagen (Martin Tamke and Henrik Leander Evers) introduced participants to the general ideas of the semantic web, how these can create benefits for the building industry and finally how approaches developed in DURAARK support this. The 4 presentations:

- An introduction to the Semantic Web and its potential for the building domain (Stefan Dietze)
- Semantic data for the building Industry – Integration of semantic concepts in BIM through DURAARK and Building Smart (Jacob Beetz)

[32] http://www.geo-bim.org/Europe/agenda.html

- Securing Access to semantic Building Data– why it is not enough to store data – semantic concepts for a sustainable practice with building data (Thomas Krijnen)
- Linking Reality and BIM – automated transfer and comparison of PointCloud and BIM data (Martin Tamke)

were met by a positive response and many questions from the audience. The inquires dealt partly with the concepts and applicability of semantic web technologies on BIM data, such as the preconditions for connecting a dataset to the linked data cloud in the first place, and whether vocabularies used in AEC can be connected. Further questions concerned the long term access to building data, were discussions on the backwards compatibility of different formats and the support and quality check of migration actions from for instance ifc 2x3 to ifc4 could be supported by DURAARK tools, as Thomas Krijnen showed the flaws that occur in the current migration from legacy to newer BIM standards.

Figure 26: The GeoBim event addressed in the first place policy and decsision makers from the Geospatial community. The DURAARK team (on the right Thomas Krijnen (TUE)) was well received.

Many questions concerned finally the potential and technical challenges of Point Cloud to BIM connections, where the quality of the automatic approaches, that DURAARK developed had to be explained and the audience suggested new user scenarios, as the use of the solution to check whether the constant repositioning of furniture through guests in public spaces violates for instance escape routes and the use of the solution on outdoor 3D scan data. The workshop was hence a fruitful endeavour for all 42 participants and well framed by a well organised GeoBIM event.

5 Associated companies and organisations

To attract companies and organisations for dissemination and collaboration has been a focus of the DURAARK consortium. Year three of the project has seen an increase of these associations by 223% from 13 to 29. Among those industrial heavyweights, as Autodesk and FARO.

DURAARK partners used the linkage with associated companies and organisations to discuss and evaluate the results, as reported on in Deliverable D7.4, but as well in order to collaborate: This could for instance be through the exchange of datasets, the use of code or even the engagement in projects in order to test and demo the developed components. The following lists provides an overview of the state of associated companies and organisations by December 2015.

The following Table 2 lists commercial companies and organisations, which are in exchange with the DURAARK project. They have expressed an interest in the outcome of the project or have contributed to the DURAARK project, e.g. by participating in workshops organised by the consortium, provision of datasets or by inviting presentations.

AG Digital Reconstruction	http://www.digitale-rekonstruktion.info/
The primary goal of the group is to bring together stakeholders in the German speaking countries to address issues of disambiguation and the working methodology, documentation, and preservation of digital reconstruction projects. The group aims at establishing a platform for closer exchanges and a fixed establishment of the digital reconstruction of cultural heritage within the Digital Humanities. DURAARK coordinator Stefan Dietze had a meeting with representatives and will join their next work group meeting.	
Alliance Permanent Access to the Records of Science in Europe Network (APARSEN)	http://www.alliancepermanentaccess.org/index.php/aparsen

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Table 2 – continued from previous page

The objective of this project is to look across research on digital preservation that is carried out in Europe and to try to bring it together under a common vision. During Year 2, DURAARK participated in a workshop they organised at the TPDL Conference[33] in London.	
buildingSMART	http://www.buildingsmart.org
The buildingSMART community is a worldwide authority driving the transformation of the built environment through creation and adoption of open, international standards, among others the IFC standard we use in the DURAARK project. It is also the home of openBIM. Thomas Liebich, who is active within buildingSMART is a member of the DURAARK Advisory Board.	
MIT – FACADE	http://libraries.mit.edu/news/facade-project/457/
The Facade project at MIT is one of the projects that the DURAARK project is based on. We have now a request from MIT for more input from the DURAARK project for extending their Facade work. We will try to have them as one part in our evaluation process of the DURAARK outcome.	
CUNECO[34], **BIPS**[35]	http://cuneco.dk/english http://bips.dk/
These are the two drivers of development in the BIM related part of the national AEC community. Both are establishing standards and best practice examples for the building industry. DURAARK is in exchange with these two stakeholders in order to create awareness for long-term archiving aspects and the reuse of digital data in the AEC industry. Both organisations are as well active on an international level, e.g. in buildingSMART. They have close ties to the Danish government, as well.	

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[33] http://www.scape-project.eu/news/dl2014-workshop

[34] The centre for productivity in construction

[35] BIPS is ”byggeri – informationsteknologi – produktivitet – samarbejde”, which is danish for building industry, information technology, productivity and collaboration

Table 2 – continued from previous page

Bygningsstyrelsen Denmark	http://www.bygst.dk
The Danish Building & Property Agency is the state's property enterprise and developer. They have the responsibility of creating modern, functional and cost-effective frameworks for some of the country's most important government institutions, for example the universities, the police, the courts and the government departments.	
Dalux	http://dalux.com
Dalux provides BIM tools for facility managers. Online in the Dalux Cloud, more than 1,500,000 square meters of BIM and 10,000,000 square meters of CAD drawings are accessible to it's customers. Dalux contributed to the Copenhagen workshop in 2014 and presented their software offering to the participants. They continued to exchange with DURAARK members.	
Krydsrum Architects	http://www.krydsrum.dk
Krydsrum is a renowned Danish architectural firm whose tasks range from architecture to design – in both the public, commercial and private sectors. They develop projects in several scale levels and manages processes from idea development of user involvement to construction management. They have a strong focus on building sensory experiences and qualities, and thus use financial management and process management as tools to improve building quality.	
Købehavns Ejendomme[36]	http://www.kejd.dk
Købehavns Ejendomme is part of Copenhagen Finance Department and was established in 2005 as a merger of the estate professional activities in the municipality. Købehavns Ejendomme (KEjd) manages and maintains the City of Copenhagen's property portfolio and is today one of the largest property managers in charge of, among other things: administration buildings, town halls, cultural centers, libraries, institutions, nursing homes, schools and sports facilities.	
Plan3D	http://www.plan3D.com/pages/home.aspx

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[36] In english: "Copenhagen Property"

Table 2 – continued from previous page

The Berlin based scanning company is supporting the DURAARK project with datasets from their 3D laser scanning practice and insights in their processes. They are giving advice on the integration of DURAARK approaches in their practice and will participate in the case studies and evaluation of these in a later stage.	
Technical University of Denmark (DTU)	http://www.dtu.dk/english
DTU was founded in 1829 and is today providing education in various programmes and doing research in many fields. Interesting from a DURAARK viewpoint is that the university manages a number of facilities distributed over different geographic locations.	
AutoDesk research	http://www.autodeskresearch.com/
Autodesk Research is the research arm of Autodesk, which pursues independed scientific research, among others in Point Clouds and BIM rleated techniques. Autosdesk research contributed with Point Cloud data and advice on the limitations of Revit and ReCap in terms of Point Cloud integration and their SDK. DURAARK had several videocalls with them in year 3.	
Statsbygg Norge	http://www.statsbygg.no/
Statsbyg is the largest state owned realestate company in Norway. They are forerunner in terms of BIM in Norway and conduct actively research themselves. Statsbyg contributed with expertise and datasets to the DURAARK consortium.	
ATS	http://www.ats.se/
ATS provides advanced measurement solutions based on laser technology. ATS collaborated in the development of the HDRI techniques used in workpackage 5 in the RISE component. They provided furthermore expertise and datasets to the DURAARK consortium.	
ZESO	http://www.zeso.dk

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Table 2 – continued from previous page

With more than 20 years experience ZESO Architects is a young architectural firm with considerable experience. ZESO collaborated in the Workpackage 7 activities with expertise, BIM models and granted access to the building site of Nygade 31.	
CCO	http://christensenco.dk/
CHRISTENSEN & Co. (CCO) is an international practice, based in Copenhagen, Denmark, started by Michael Christensen in 2006. CCO collaborated in the Workpackage 7 activities with expertise, BIM models and granted access to the building site at DTU.	
FARO	http://www.faro.com/
FARO is the world's most trusted source for 3D measurement technology - according to their self description [37]. The Company develops and markets computer-aided measurement and imaging devices and software. Technology from FARO permits high-precision 3D measurement, imaging and comparison of parts and compound structures within production and quality assurance processes. Worldwide, approximately 15,000 customers are operating more than 30,000 installations of FARO's systems. FARO collaborated in the Workpackage 7 activities with expertise, BIM models and Point Cloud scans.	
Laser Scanning Architecture	http://www.laser-scanning-architecture.com/
Laser Scanning Architetcure (LSA) is a Hannover based service for laser scanning and modelling of complex building geometries. LSA collaborated in the Workpackage 7 activities with expertise, BIM models and Point Cloud scans.	
wework	https://www.wework.com/

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[37] http://www.faro.com/home

Table 2 – continued from previous page

WeWork is an American company which provides shared workspace, community, and services for entrepreneurs, freelancers, startups and small businesses. Founded in 2010, it is head quartered in New York City. As of March 2015, WeWork had 29 coworking locations in 10 cities around the world with plans to expand to 60 locations by fall 2015. After a December 2014 funding round of $355 million, the company was valued at approximately $5 billion. WeWork was named among the "most innovative companies" of 2015 by Fast Company magazine.[38] WeWork collaborated in the WP7 activities with expertise, BIM models and Point Cloud scans.	
Laserscanning Europe GmbH	http://www.laserscanning-europe.com/
Laserscanning Europe GmbH was founded on April 15, 2009. The company has specialized in the field of laser scanning surveying and delivers comprehensive services around the globe. Laserscanning Europe GmbH collaborated in the Workpackage 7 activities with expertise, BIM models and Point Cloud scans.	
PLH architects	http://www.plh.dk/en/
PLH architects is a Copenhagen based office with over 30 years of expertise. They with a broad spectrum of commissions from architecture, town planning and workplace design to client advisory and industrial design. PLH collaborated in the Workpackage 7 activities with expertise and BIM models.	
NCC	http://www.ncc.dk/en/
NCC AB is a Swedish construction company, the second largest in the Nordic region with annual revenues of 58 billion Swedish krona and about 18,500 employees. PLH collaborated in the Workpackage 7 activities with expertise and BIM models.	

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[38] Kessler, Sarah. "Most Innovative Companies 2015". Fast Company. Fast Company. http://www.fastcompany.com/3039600/most-innovative-companies-2015/wework. Retrieved 13 March 2015.

Table 2 – continued from previous page

Cad-Q	www.cad-q.com/
Cad-Q was founded in 1989 and employs about 220 skilled employees in some 20 offices in Sweden, Norway, Denmark and Finland. Cad-Q collaborated in the Workpackage 7 activities with expertise and BIM models.	
COWI	www.cowi.com
COWI A/S is an international consulting group, specialising in engineering, environmental science and economics, based in Lyngby, Denmark. It has been involved in more than 50,000 projects in 175 countries. COWI collaborated in the Workpackage 7 activities with expertise, Point Cloud scans and BIM models. They supported the development of the HDRI techniques used in workpackage 5 in the RISE component with hardware and the workpackage 4 activities with scans using alternative scanning technigues as SLAM and handbased Dotproduct scanners.	
BIMm Gmbh	http://bimm-gmbh.de/en/
Building Information Model measurement (BIMm Gmbh) develops user-friendly tools and solutions that make measurement efficient and accurate. They are present in more than 20 countries. BIMm Gmbh collaborated in the Workpackage 7 activities with expertise and BIM models.	
p3D systems	www.p3Dsystems.com/
Capturing reality in three dimensions - this usually requires great efforts. p3D systems develops platforms to perform this task much faster and more efficiently. p3D systems collaborated in the Workpackage 7 activities with expertise and Point Cloud datasets.	
FOJAB	http://www.fojab.se/

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Table 2 – continued from previous page

FOJAB was founded 1971 in Lund Sweden and has currently offices in Malmö, Helsingborg and Stockholm. FOJAB collaborated in the Workpackage 7 activities with expertise and BIM models and granted access to the related buildings.	
White	www.en.white.se/
White is one of Scandinavia's leading architectural practices and amongst the ten largest in Europe, with 640 employees based at ten offices in Sweden and Denmark. White collaborated in the Workpackage 7 activities with expertise and BIM models and granted access to the related buildings.	
LE34, **Landmålergården**	http://www.le34.dk http://www.le34.dk/lmg
These two companies merged in 2014 and are amongst the biggest and most experienced land surveying companies in Denmark. Both offer the full spectrum of surveying techniques in all areas of civil engineering and architecture. They share their experience and insights with the DURAARK consortium. This reaches back to the beginnings of laser scanning and digital processing of surveying. Both companies have their own development departments that will provide their insights and tools for reference to the DURAARK project. They are giving advice on the requirements and methods that DURAARK pursues and took part in case studies and evaluation of the developed approaches.	

Table 2: Companies and organisations that have expressed a direct interest in the DURAARK project or collaborate with it.

6 Partner activities

All DURAARK partners have been actively involved in the dissemination activities through their participation in various events and publications in conferences and journals. The project has reached out to the three targeted communities: General, Scientific and Industrial.
This section provides the details of the past activities of the individual partners.

The activities of individual partners are shown in tables, documenting:

- **what** events and activities are addressed (e.g. conference, journal, workshop, presentation, or activities, such as poster presentation, video presentation, etc.)
- **how** to attend the events or execute activities
- **when** to attend or execute
- **who** the targeted communities are (e.g. scientific, industrial, or architects)
- **why** this activity was done

6.1 Joint Partner activities

The third year of the DURAARK research project saw several dissemination activities, which were conducted conjointly by three or more partners.

What	How	When	Who	Why
Book chapter with edited Springer LNCS Volume	Book chapter Beetz, J. Blümel, I. Dietze, S. Fetahui, B. Gadiraju, U. Hecher, M. Krijnen, T. Lindlar, M. Tamke, M. Wessel, R. Yu, R.	2015	Cultural Heritage Community	DURAARK: Enrichment and Preservation of Architectural Knowledge. In Edited Volume Sander Münster, Mieke Pfarr-Harfst, Marinos Ioannides, Piotr Kuroczyński and Ewald Quak (Eds.): How to manage data and knowledge related to interpretative digital 3D reconstructions of Cultural Heritage?

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Table 3 – continued from previous page

What	How	When	Who	Why
GeoBIM Europe conference in Amsterdam [39]	Workshop Jacob Beetz (TUE) Thomas Krijnen (TUE) Stefan Dietze (L3S) Martin Tamke (CITA) Henrik Leander Evers (CITA)	December 2015	Geospatial Cmmunity	Building Data and the Semantic Web

Table 3: The dissemination activities of LUH (L3S/TIB) during year 2

6.2 LUH (L3S/TIB)

The dissemination activities of LUH (L3S/TIB) during year 3:

What	How	When	Who	Why
CHI 2015 Conference on Human Factors in Computing Systems	Full Paper. Ujwal Gadiraju, Ricardo Kawase, Stefan Dietze and Gianluca Demartini	April 18-23, 2015 Seoul, Korea	Human Computer Interaction community	Understanding Malicious Behavior in Crowdsourcing Platforms: The Case of Online Surveys
26th ACM Conference on Hypertext and Social Media, HT'15.	Full Paper. Ujwal Gadiraju, Ricardo Kawase, Patrick Siehndel, Besnik Fetahu	2015 Northern Cyprus	Web practitioners and researchers	Breaking Bad: Understanding Behavior of Crowd Workers in Categorization Microtasks Paper[40]
12th International Semantic Web Conference, ISWC'15.	Full Paper. Besnik Fetahu, Ujwal Gadiraju, Stefan Dietze	2015 Bethlehem, Pennsylvania, USA, 2015	Semantic Web researchers and practitioners	Improving Entity Retrieval on Structured Data Paper[41]

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[39] http://www.geo-bim.org/Europe/agenda.html
[40] http://dl.acm.org/citation.cfm?id=2791053
[41] http://l3s.de/~fetahu/publications/fetahu_iswc2015.pdf

Table 4 – continued from previous page

What	How	When	Who	Why
2015 Conference on Web Information Systems Engineering (WISE2015).	Full Paper. Ran Yu, Ujwal Gadiraju, Besnik Fetahu, Stefan Dietze	2015 Miami, Florida, USA, 2015	Web practitioners and researchers	Adaptive Focused Crawling of Linked Data
7th ACM Web Science Conference (WebSci2015).	Full Paper. Ujwal Gadiraju, Stefan Dietze, Ernesto Diaz-Aviles	2015 Oxford, United Kingdom, 2015	Web Science community	Ranking Buildings and Mining the Web for Popular Architectural Patterns Paper[42]
12th Extended Semantic Web Conference (ESWC 2015).	CEUR Workshop Proceedings, Vol. 1362. Berendt, B., Breslin, J., Demidova, E., Dietze, S., Dragan, L., Hollink, L., Luczak-Rösch, M., Szymanski, J.	2015 Portoroz 2015	PROFILES2015	5th International Workshop on Using the Web in the Age of Data (USEWOD '15) and the 2nd International Workshop on Dataset PROFIling and fEderated Search for Linked Data (PROFILES '15)
IEEE Intelligent Systems, Volume 30 Issue 4 – Jul/Aug 2015.	Journal Paper. Ujwal Gadiraju, Gianluca Demartini, Ricardo Kawase, Stefan Dietze	2015	Web Science community	Human beyond the Machine: Challenges and Opportunities of Microtask Crowdsourcing
Future Internet (ISSN 1999-5903).	Journal Paper. Risse, T., Demidova, E., Dietze, S., Peters, W., Papailiou, N., Doka, K., Stavrakas, Y., Plachouras, V., Senellart, P., Carpentier, F., Mantrach, A., Cautis, B., Siehndel, P.	2015	Archiving Community	The ARCOMEM Architecture for Social and Semantic Driven Web Archiving

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[42] http://l3s.de/~fetahu/publications/fetahu_iswc2015.pdf

Table 4 – continued from previous page

What	How	When	Who	Why
Invited Talk at Herder Institute.	Invited Talk. Stefan Dietze,	2015 Marburg, Germany, 2015	Archiving and Cultural Heritage Preservation Community	Semantic Data Integration in Virtual Research Environments Slides[43]
10th International Digital Curation Conference	Poster Michelle Lindlar	Feb. 2015 London, UK	digital information curation and research data community	Presenting the Pre-Ingest workbench to the wider digital curation domain
19. Tagung des Arbeitskreises "'Archivierung von Unterlagen aus digitalen System"'	Presentation Michelle Lindlar, Michael Panitz	Mar. 2015 Wien, AT	German speaking digital preservation community	Presenting project outcomes and preservation planning for 3D data
Konferenz Langzeitzugriff 2015 Naturkundemuseum Berlin	Presentation Michelle Lindlar, Michael Panitz	Jun. 2015 Berlin	Archiving and Cultural Heritage Preservation Community	Presenting the DURAARK project and metadata formats

Table 4: The dissemination activities of LUH (L3S/TIB) during year 2

6.3 UBO

What	How	When	Who	Why
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2015	Full Paper. Golla, T. Klein, R.	Sept./Oct. 2015	Computer Graphics Community	Scientific Dissemination
CAD/Graphics 2015 conference and Computers & Graphics Journal	Full Paper[44]. Ochmann, S. Vock, R. Wessel, R. Klein, R.	August 2015	Computer Graphics Community	Scientific Dissemination

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[43] http://de.slideshare.net/stefandietze/dietze-linked-datavres
[44] http://www.sciencedirect.com/science/article/pii/S0097849315001119

Table 5 – continued from previous page

What	How	When	Who	Why
22nd EG-ICE International Workshop	Full Paper. Thomas Krijnen, Jakob Beetz, Sebastian Ochmann, Richard Vock, Raoul Wessel	July 2015	Architecture & Engineering Community	Scientific Dissemination
Graphics Interface 2016 conference	Full paper - under submission. Vock, R. Ochmann, S. Wessel, R. Klein, R.	May/June 2016	Computer Graphics Community	Scientific Dissemination

Table 5: The dissemination activities of UBO during year 3

6.4 FhA

The dissemination activities of FhA during year 3:

What	How	When	Who	Why
6th International Workshop 3D-ARCH 2015 [45] - 3D Virtual Reconstruction and Visualization of Complex Architectures	Full Paper. [46] Krispel, U. Evers, H. L. Tamke, M. Viehauser, R. Fellner, D. W.	February 2015	Photogrammetry and Remote Sensing Community	Automatic Texture and Orthophoto Generation from Registered Panoramic Views
Remote Sensing Journal	Journal Paper. [47] Krispel, U. Schinko, C. Ullrich, T.	February 2015	Photogrammetry and Remote Sensing Community	A Survey of Algorithmic Shapes
Austrian National Radio Station Ö1	Radio Interview. [48] Schröttner, M. Eggeling, E.	May 2015	General public	Spreading information about the DURAARK project

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[45] http://www.3D-arch.org/

[46] http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W4/131/2015/isprsarchives-XL-5-W4-131-2015.html

[47] http://www.mdpi.com/2072-4292/7/10/12763

[48] http://oe1.orf.at/programm/404677(german)

Table 6 – continued from previous page

What	How	When	Who	Why
International Conference on Digital Preservation	Full Paper. [49] Lindlar, M. Hecher, M.	November 2015	Digital Preservation Community	DURAARK WorkbenchUI – a Pre-Ingest Toolset Bridging Producer, Archival and Consumer Needs
Article in the annual Fraunhofer report	Hecher, M Krispel, U. Eggeling, E	March 2016	General public, research and industrial partners	Spreading information about the DURAARK project
16th International Conference on Computing in Civil and Building Engineering	Full Paper.[50] Krispel, U. Tamke, M. Ullrich, T.	July 2016	Civil and Building Engineering Commnity	An Automatic Hypothesis of Electrical Lines from Range Scans and Photographs
GRAPP 2016 - 11th International Conference on Computer Graphics Theory and Applications - European Project Space[51] (to be held)	Presentation Krispel, U.	February 2016	Computer Graphics Community	The DURAARK approach
3rd International Academic Conference on Places and Technologies[52]	Full Paper[53] Krispel, U. Tamke, M. Ullrich, T.	14-15 April 2016	Multidisciplinary conference for engineering and technical sciences, cognitive sciences, humanities and social sciences	Under the Skin - Determining Electrical Appliances from Surface Scans

Table 6: The dissemination activities of FhA during year 3

[49] Proceedings to be published
[50] in review
[51] http://www.grapp.visigrapp.org/EuropeanProjectSpace.aspx
[52] http://www.placesandtechnologies.eu/ (planned submission)
[53] Proceedings to be published

6.5 CITA

The dissemination activities of CITA during year 3:

What	How	When	Who	Why
Design Modelling Symposium Copenhagen 2015 - Modelling Behaviour	Full paper Krijnen, T. Tamke, M.	September 2015	Architectural and Engineering Community	Assessing implicit knowledge in BIM models with machine learning. In Ramsgaard Thomsen, M., Tamke, M., Gengnagel, C., Scheurer, F., Faricloth, B.. (Editor) Modelling Behaviour, Springer, Berlin Heidelberg.
6th International Workshop 3D-ARCH 2015 [54] - 3D Virtual Reconstruction and Visualization of Complex Architectures	Full Paper. [55] Krispel, U. Evers, H. L. Tamke, M. Viehauser, R. Fellner, D. W.	February 2015	Photogrammetry and Remote Sensing Community	Automatic Texture and Orthophoto Generation from Registered Panoramic Views
BIM special of the Geospatial World magazine	Article in Professional Magazine Tamke,M.	June 2015	Geospatial Community	DURAARK – Enabling BIM for the full lifecycle of buildings
22. Industriebauseminar Vienna - Integrated Planning for Industrialbuildings 4.0, Technical University Vienna	Stakeholder conference Presentation Tamke, M.	July 2015	Architects and engineers	DURAARK and Innochain - Challenging the traditional thinking of design
Geospatial Worldforum Lisbon	Stakeholder conference Presentation Tamke,M.	May 2015	Geospatial Community	DURAARK – Enriching BIM and Point Cloud data for the use in building lifecycles

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[54] http://www.3D-arch.org/

[55] http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W4/131/2015/isprsarchives-XL-5-W4-131-2015.html

Table 7 – continued from previous page

What	How	When	Who	Why
Hybrid Registrations Workshop and Exhibition on 3D scan and analysis methods	Student Workshop Martin Tamke, Henrik Leander Evers and Jamie Meunier from Land surveying company LE34	February 2015	Architectural Students	Mapping and Speculating - Design integrated Laser Scan Measurement and BIM modelling
FARO 3D Documentation Conference 2015 - Stuttgart	Workshop Tamke, M.	Mai 2015	Geospatial, Architectural, Land Surveyor Community	DURAARK – means to integrate Point Clouds into architectural workflows
Lecture - Geodätisches Kolloquium at Hafencity University [56]	Public Lecture Martin Tamke	June 2015	Scientific Land Surveyor Community, Architects	Metrological Architecture – Scan, BIM and bespoke architecture
Technical University Berlin	Public Lecture Martin Tamke, Henrik Leander Evers	June 2015	Architects	From Points to Buildings -Digital Fabrication and 3D Scan
BIPS buildingSmart Day at Danish Technical University	Sponsored exhibition booth and presentation Evers, Henrik Leander , Hansson, Per-Kristian	November 2015	Facility and BIM managers	DURAARK

Table 7: The dissemination activities of CITA during year 3

6.6 LTU

The dissemination activities of LTU during year 3:

What	How	When	Who	Why
ERCIS-network	Invitation	Oct 2015	Partners of the ERCIS network[57]	Prof. Päivärinta informed about the DuraArk dissemination activity related to the COST application and invited partners of the ERCIS-network

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[56] http://tinyurl.com/plvbyby
[57] http://www.ercis.org/

Table 8 – continued from previous page

What	How	When	Who	Why
InterPARES Trust	European Team Research Workshop [58]	9-10 November, 2015	InterPares Team Europe	Prof. Tero Päivärinta, LTU presented for the workshop the general-level concepts of the DuraArk project and invited the participants to join the COST network application
D3D	Project Report	April, 2015	VINNOVA, National Archives, National Property Board of Sweden, Swedish Fortifications Agency, Falu Municipality	Plans for an implementation project regarding BIM and digital preservation.
Long-term Digital Preservation Day: National Archives and National Library of Sweden	Presentation / Discussion	February 6, 2015	Personell at Swedish National Archives and National Library of Sweden	Presenting project outcomes and discuss how to adapt into existing national initiatives.

Table 8: The dissemination activities of LTU during year 3

[58] https://interparestrust.org/trust/aboutus/europe

6.7 Catenda

The dissemination activities of Catenda during year 3:

What	How	When	Who	Why
BuildingSMART week London	Presentations / discussions	23-24 March 2015	Lars Bjørkhaug	Inform about Duraark
BuildingSMART Industry meetings London	Presentations / discussions	26-27 March 2015	Lars Bjørkhaug	Inform about Duraark
SAC Meeting Iceland	Meeting and presentation	18-20 June, 2015	Lars Bjørkhaug	Inform about buildingSMART and Duraark
SAC Meeting Copenhagen	Meeting and presentation	17-18 November, 2015	Lars Bjørkhaug	Inform about Duraark

Table 9: The dissemination activities of Catenda during year 3

6.8 TUE

The dissemination activities of TUE during year 3:

What	How	When	Who	Why
CIB W78 - IT in Construction	Organization of a conference with 120 participants	October 22nd-24th 2015	Construction informatics scientific community	Promotion of DURAARK related activities, outcomes and technologies
EG-ICE 2015	Organization of a workshop with 45 participants	June 22nd-24th 2015	Construction informatics scientific community	Promotion of DURAARK related activities, outcomes and technologies
EG-ICE 2015	Organization of a workshop with 45 participants	July, 13-15th2015	Semantic Web and construction informatics scientific community	Presentation of IFC = PointCould extension

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Table 10 – continued from previous page

What	How	When	Who	Why
Design Modelling Symposium Copenhagen 2015 - Modelling Behaviour	Full paper Krijnen, T. Tamke, M.	September 2015	Architectural and Engineering Community	Assessing implicit knowledge in BIM models with machine learning. In Ramsgaard Thomsen, M., Tamke, M., Gengnagel, C., Scheurer, F., Faricloth, B.. (Editor)
Linked Data in Architecture and Construction 2015	Organization of a workshop with 35 participants	July, 13-15th2015	TUE	Presentation of DURAARK activities. Standardization of the ifcOWL format to capture IFC as RDF
22nd EG-ICE International Workshop	Full Paper. Thomas Krijnen, Jakob Beetz, Sebastian Ochmann, Richard Vock, Raoul Wessel	July 2015	Architecture & Engineering Community	Scientific Dissemination

Table 10: The dissemination activities of TUE during year 3

7 Planned Dissemination activities after end of Funding Period

DURAARK partners will continue to release publications and engage in other dissemination activities related to DURAARK after the end of the projects funding period. Several publications are at the moment (January 2016) written and in the process of publishing or in preparation by partners. This chapter provides an overview of the ongoing activities.

7.1 Joint activities

The data collected during the DURAARK project is of tremendous value to researchers and stakeholders in different domains ranging from architect over engineers to archivists and so on, as it incorporates geometric information in the form of point clouds and IFC models, but also textual descriptions represented by RDF metadata, schemas, and vocabularies. While this data is already available online at http://data.duraark.eu/ to everyone interested, DURAARK partners plan to additionally provide a paper that presents the data collection from a more scientific point of view by outlining its primary contributions, differences to other state-of-the-art collections in the relevant domains, and comment on possible limitations.

7.2 LUH (L3S/TIB)

The L3S/LUH is already engaged with a number of dissemination activities for the period after the official funding period has ended. These activities include, for instance, publication of research publications involving and acknowledging DURAARK project outcomes at the following venues:

- ACM CHI 2016
- The World Wide Web Conference - WWW2016
- ACM Web Science 2016 - WebSci2016
- The International Semantic Web Conference 2016 - ISWC2016

While project results will directly feed and support new research projects and efforts, the legacy of the DURAARK project will be explicitly and implicitly support and facilitate future research projects and endeavours for an extensive period in the future.

TIB has submitted an abstract for the 20th AUdS conference (Arbeitskreis zur "'Archivierung von Unterlagen aus digitalen Systemen) at the University of Applied Sciences in Potsdam.

7.3 UBO

UBO's current short-term dissemination planning which well extends into the after-funding period of the projects heavily incorporates results and insights gained especially in the later stages of DURAARK. Concretely targeted dissemination activities thereby include but are not limited to one or two publications at each of the following conferences (order according to submission deadlines)

- SGP 2016
- VMV 2016
- SIGGRAPH Asia 2016
- EUROGRAHPICS 2017

and in the following journals :

- Computers & Graphics
- Computer Graphics Forum

Apart from that, UBO's medium- and long-term strategy incorporates the dissemination of new methods that build on those developed in the DURAARK project. Thereby, especially the insights gained by identifying the needs and wishes of various stakeholders as well as the seamless integration into a holistic framework will play an important role, such that the resulting future publications will acknowledge the DURAARK project.

7.4 FhA

FhA has currently a paper under review that is anticipated to be published/presented in July 2016. Furthermore, it is planned to disseminate joint project results in the computer graphics community, at the *European Project Space* chapter of the VISIGRAPP conference 2016[59], and results of the RISE components at the 3rd International Academic Conference on Places and Technologies [60].

7.5 CITA

The DURAARK related dissemination activities of CITA planned for the period after the projects funding period are centred on conferences in the architectural community:

- Geospatial World - Journal "DURAARK – Enabling BIM for the full lifecycle of buildings" (publication in February 2015)
- ecaade 2015 conference[61] - 22.-26.08.2016 Designing with Point Clouds - Volvox enables new ways to situate architecture (planned)
- acadia 2015 conference[62] - 27-29.10.2016- Informing Design with real world behaviour -3D Laserscanning and BIM (planned)

7.6 LTU

LTU will embed ideas and tools from the DURAARK project into existing university courses (Digital Curation, and Development of Digital Preservation Systems) which both have 30-50 students per year. Since many of the students are active as archivists or similar, this spreads the project ideas and results out to organisations actively working with digital preservation.

Some infrastructure heavy organisations in Sweden has expressed interest in topics partially covered by DURAARK and these organisations will be contacted for a workshop to both disseminate results and investigate possibilities for further development/adaptation of project outcomes.

[59] http://www.grapp.visigrapp.org/EuropeanProjectSpace.aspx
[60] http://www.placesandtechnologies.eu/
[61] http://ecaade.org/conference/future-conferences/
[62] https://taubmancollege.umich.edu/news/2015/11/12/taubman-college-host-2016-acadia-conference

7.7 Catenda

Catenda will continue to promote the ideas and results developed in DURAARK after the project is finished. Catenda thinks that the ideas of DURAARK, making architectural data available and readably far into the future is very much in line with their own ideas. This means that they will continue to refer to Duraark publications, datasets and software in the future in meetings with the AEC/FM industry, government, software companies and other organisations.

One specific activity Catenda is planning is a newsletter with an attached survey, possibly with links with interesting DURAARK videos attached. We want to send this to our contacts in Norway and abroad to make people aware of DURAARK, and also to get an up to date reading of how interested the different stakeholders are in general including our own existing contacts (but not limited to those).

Catenda is a Norwegian software company with customers in our home market and abroad, and it might be relevant for us to provide DURAARK related software/services in the future is there is indications of a market demand and the estimated total cost of further development and license issues are not prohibiting.

7.8 TUE

Next to the active role TUE will take in common follow-up activities, TUE will particualarly focus on:

- Continuation of the **standardization activities** regarding the standardization of DURAARK forground within buildingSMART and other standardization bodies.
- **publication of results** on conferences and in journals. At present, three conference submissions have been accepted (ICCCBE in Oskaka, Japan; EG-ICE in Kraków, Poland) and antoher one is planned for CIB W78 in Birsbane, Australia. Journal submissions for ADVEI and Automation in Construction are in preparation.
- Continuation of the research and development, especially regarding the semantic enrichment in **future projects**. Currently, a H2020 proposal has been submitted, a bi-national tender offer regarding road models using linked data is in preparation,

and the consortium formation (UK, Finland, Germany, Netherlands) regarding Object Type Libraries and Dictionaries in the Infrastructure sector has is near completion.

- A number of smaller, **industry-backed R&D projects** using and continuing DURAARK results in the form of MSc thesis are in preparatory stages. These are focused on Facilities Management and on Operation and Maintenance of buildings and infrastructural artefacts.

8 Risk analysis

To some extent, the risk analysis presented in deliverable D8.5 could be applied to the dissemination activities as well. In particular, failure to attract interest from fellow researchers or practitioners within the field – in this context by failing to disseminate the right information through appropriate channels (outlets).

Managerial risks, such as handling loss of resources – which very much became a problem in WP 8 during the second year when we abruptly lost the work package leader – are covered by the risk management in WP 1, as described in deliverable D1.6.

8.1 Failing to address the right community

Risk: Failing to get an outreach from the project where we fail to disseminate information to the right audience, practically failing in building a community around the outcome of the project.

Risk assessment – Impact: High, **Probability:** Low

Description: Depending on target (academy, practitioners within the field, industry) different channels and outlets have to be used – ranging from publishing articles in journals, over actively participating in workshops and conferences, to participating in industrial projects. The DURAARK project is very active, save for the latter alternative (participating in industrial projects).

Contingency solution: This is an ongoing effort where each partner have to be active. As a tool to supervise this activity, we are tracking the number of articles accepted for publishing as well as the number of workshops and conference activities. Should significant gaps be detected, WP8 leadership will proactively initialise targeted activities to increase outreach in the required communities.

8.2 Lack of experience of working with standardisation groups

Risk: Failing to gain attention for contributions to relevant standards.

Risk assessment – Impact: Medium, **Probability:** Low

Description: A certain amount of dissemination activities in the DURAARK project are

similar to what is done in other projects, where we can safely assume that each partner has a good overview of suitable dissemination activities. The little stand out in this project, is the impact we have – but also want – on standardisation. Here we need to work with the right partners to achieve success. This is an area where the consortium might have the least experience, while it is important to find the right way to achieve high impact.

Contingency solution: We have set up a plan for targeting standardisation issues, but we must continuously and carefully listen to and evaluate good advice on how we can proceed in an appropriate way in order to get the best contribution to standardisation. While we follow a loose definition of standardisation, specifically also involving the creation of defacto standards, such efforts will be stepped up under the leadership of LTU.

8.3 Lack of resources regarding ability to reach specific stakeholders

Risk: We fail to sustain outreach to certain stakeholders.

Risk assessment – Impact: Medium, **Probability:** Medium

Description: The DURAARK project covers several topics, for example digital preservation, linked data, file compression and BIM models. This means that the project has stakeholders in many areas, which have to be reached through different channels and through different activities at different times. The risk is that this requires a lot of resources, which are limited for the project.

Contingency solution: The strategy to overcome this issue is particularly based on the network and grounding each partner naturally brings into the consortium. Given the varying expertise of each partner, dedicated dissemination actions will be initialised by LTU with the respective expertise holder in the targeted domain or community.

9 Assessment of dissemination for Year 3

The dissemination activities were consolidated in the third year of the DURAARK project. These activities included public, stakeholder oriented and scientific dissemination. The later resulted among others:

- 1 Book chapter
- 3 Journal Papers
- 15 Full papers
- 1 Poster

These activities were supplemented by several presentations and meetings for interested stakeholders with professional and research background, as documented in Section 6. This level is comparable to that of the previous years, but is due to the published journal articles and book chapter on a scientifically higher level.
The consortium uphold as well the high level of workshop based dissemination activities. 10 Workshops targeted stakeholders and scientific community.
The impact of these workshops and the tools, which address stakeholders in a targeted way, can be tracked through the rise of associated companies and organisations: the amount increased by 223% in the last year of DURAARK (see Section 5. Among the new collaborators are industrial heavyweights, as Autodesk[63] and FARO[64].
A special effort was set on the dissemination of datasets and software modules, were new channels could be established in year 3. These grant stakeholders and researchers for example access to an unique set of IFC and Point Cloud datasets - see Section 3.3. This efforts complemented the already existing outlet channels via GitHub, where the release of software artefacts had already good results among the coding communities. The new dissemination channels target alternative communities, which are situated among stakeholders from science or the architectural community. The latter have for instance a proficient coding practice and look for usable software modules. The coding skills of these communities are however not on the same sophisticated level as that of professional programmers, which are the most frequent users of github[65]. DURAARK addressed this through the publication of PlugIns, APIs and Docker Containers in parallel to the publication of source code on GitHub.

[63] http://www.autodesk.com
[64] http://www.faro.com/
[65] https://gist.github.com/paulmillr/2657075/

The new channels show already a good impact, as they have more clearly defined communities, than GitHub. The efforts were rewarded with a multiplication within and through the community. Individuals and related companies spread news about DURAARK through posts and newsletters. This gave additional attention to the project and increased the traffic on the DURAARK webpage on a measurable degree, as described in Section 3.2. After three years of WP8 activities, we observe, that the project webpage in itself does not attract traffic. It is the combination of this dissemination with other activities, such as articles on Facebook, news in media and third parties, presentations and publications and targeted address of stakeholders, that makes it still the main gateway to the research and researches in the DURAARK project. DURAARK uses the webpage already as the repository of all datasets, publications and reports of the project and will remain as an important legacy of DURAARK.

Appendices

Appendix A

Dissemination Material

A.1 Project website

Figure A.1: Screenshot of DURAARK website

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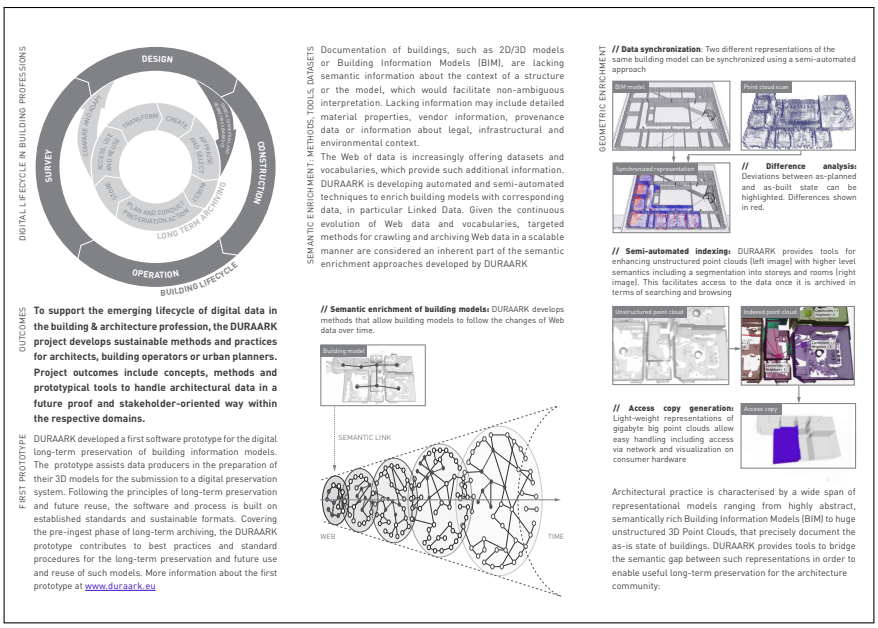
A.2 DURAARK Flyer



A.3 DURAARK Poster

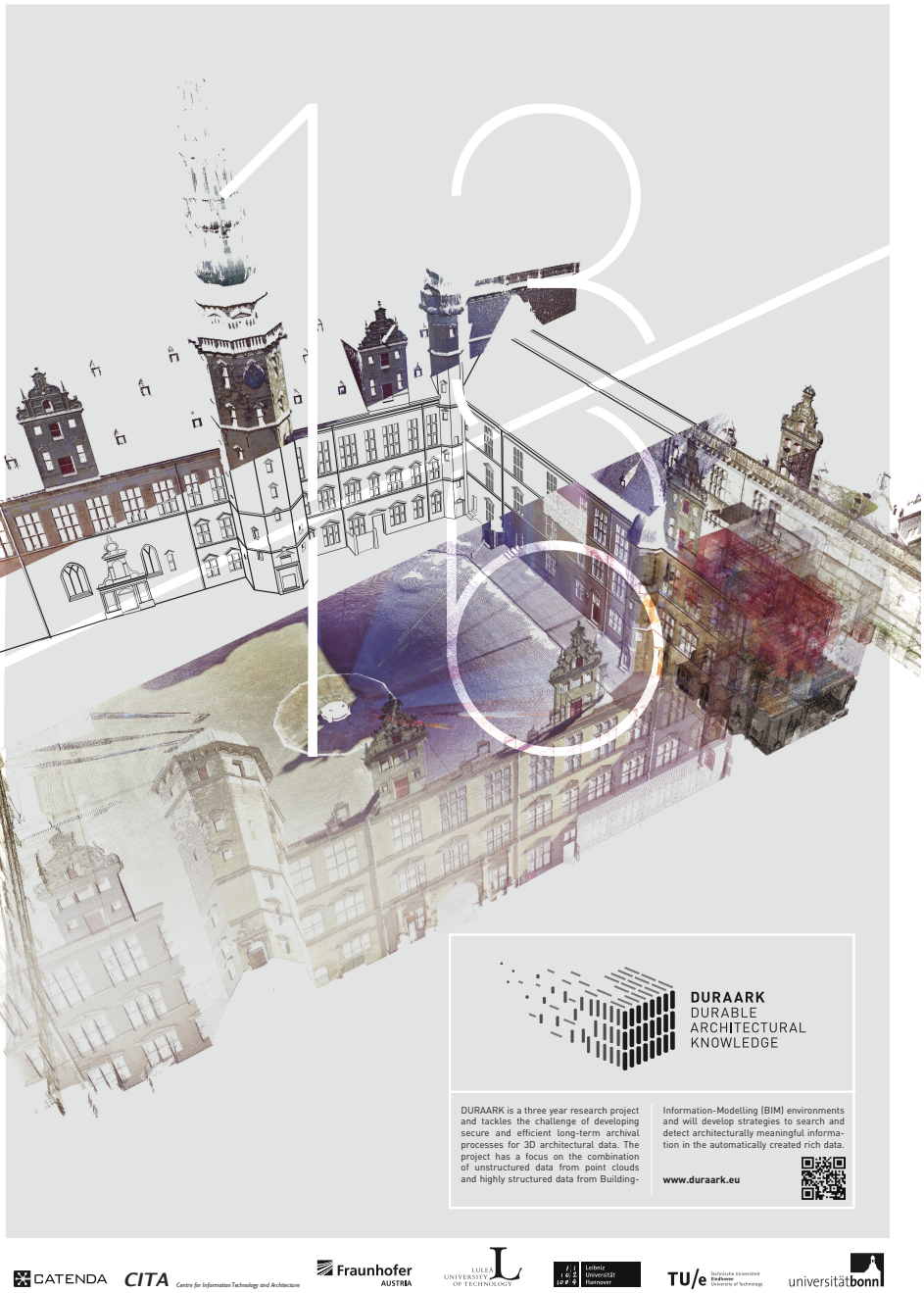


Figure A.2: The DURAARK poster for stakeholder events can be printed in any resolution from A2-A0

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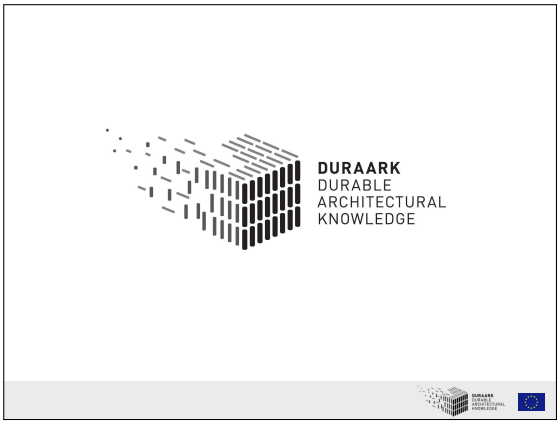
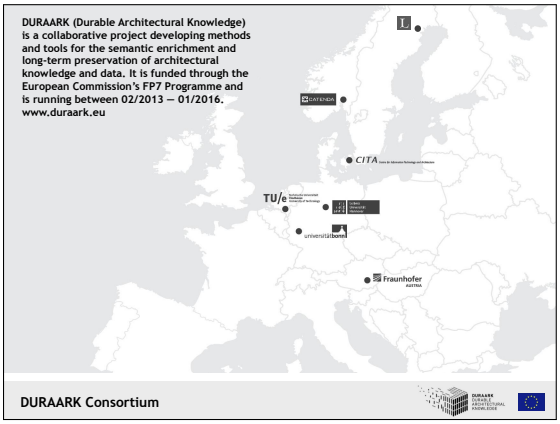
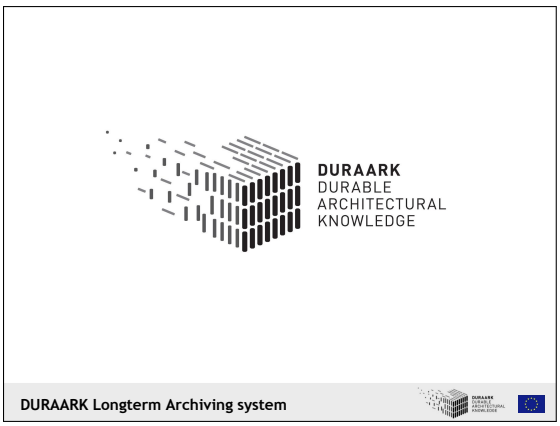
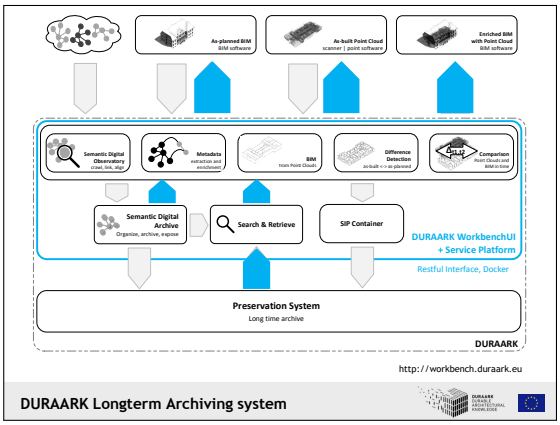
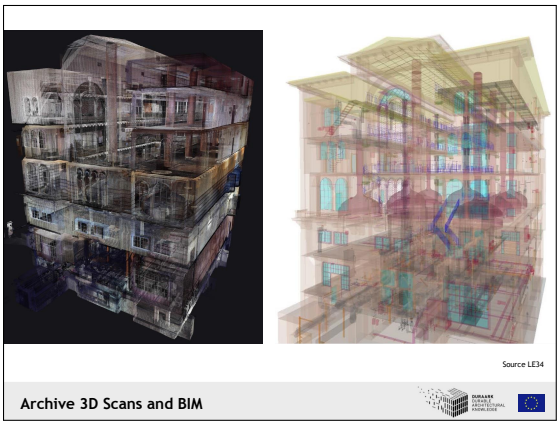
A.4 DURAARK Kiosk mode Presentation

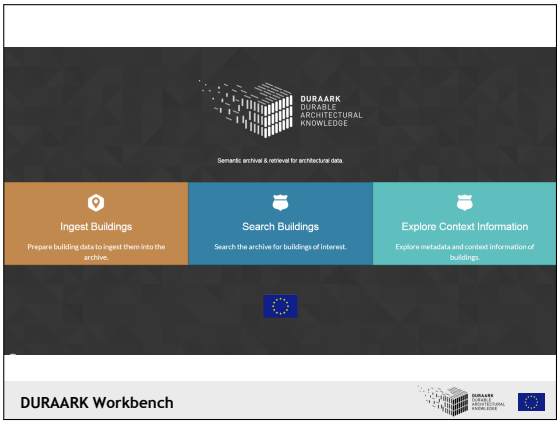




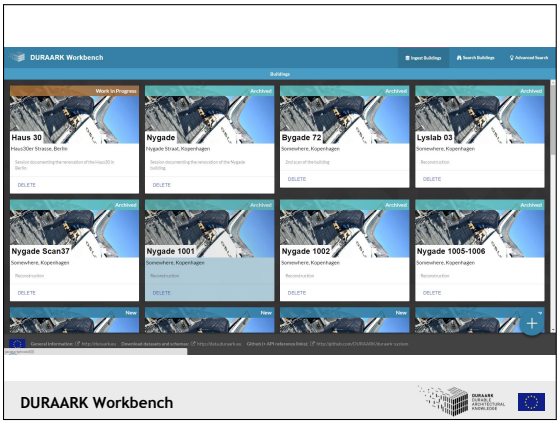




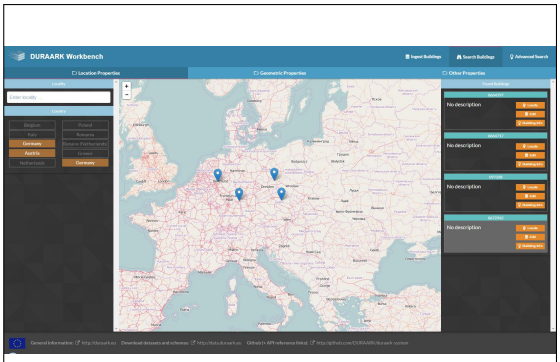




DURAARK Workbench

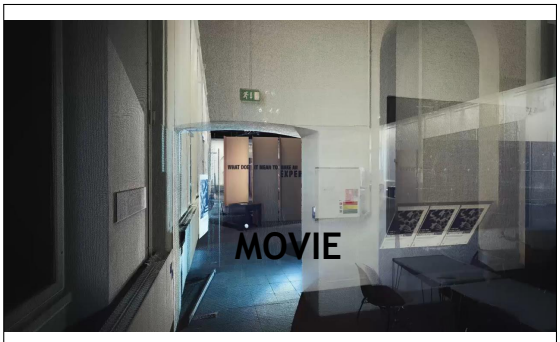


DURAARK Workbench

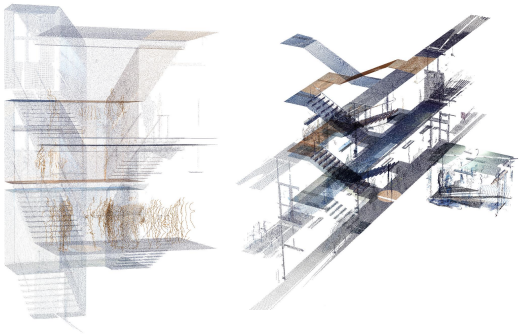


DURAARK Workbench

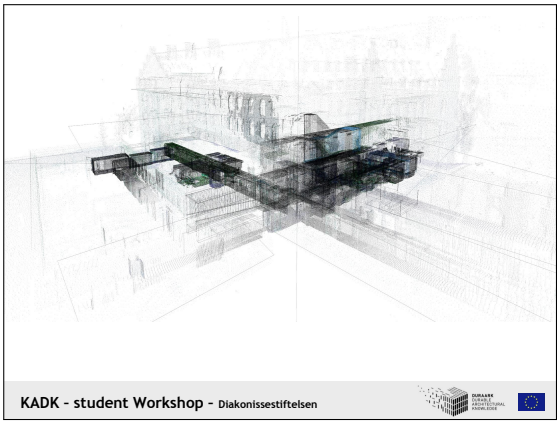
3D Scans

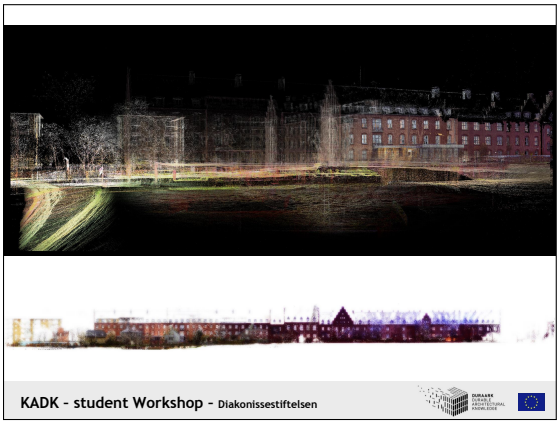


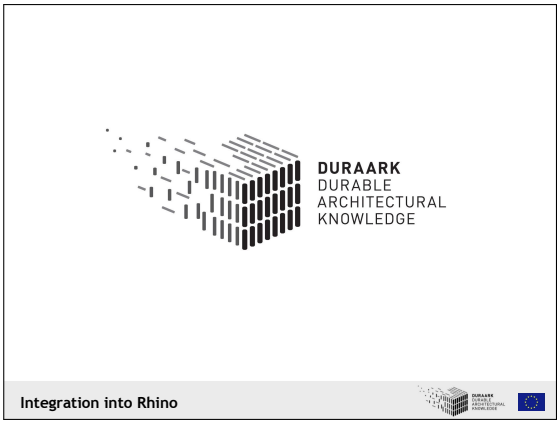
CITA Exhibition - What Does It Mean To Make An Experiment?

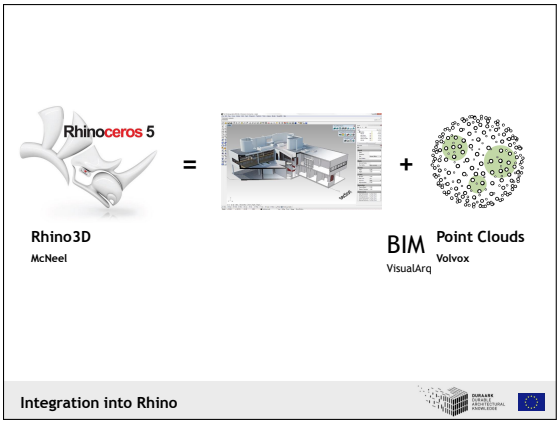


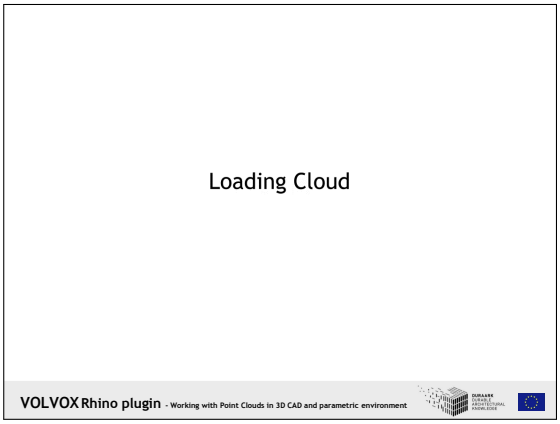
KADK - student Workshop - Diakonissestiftelsen

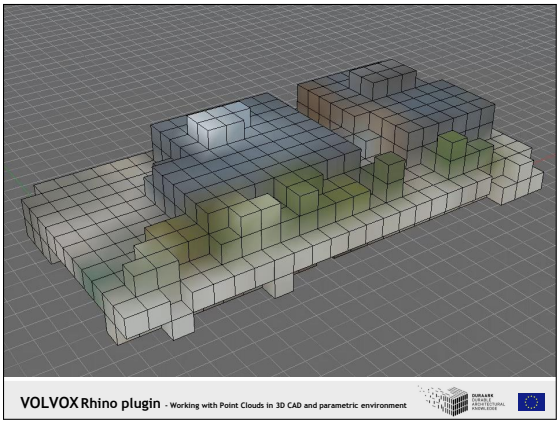

KADK - student Workshop - Diakonissestiftelsen

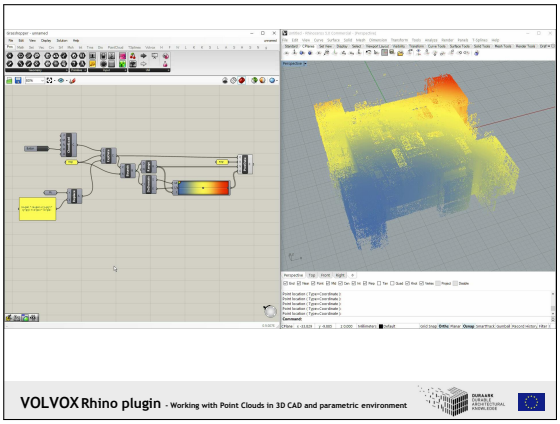

KADK - student Workshop - Diakonissestiftelsen

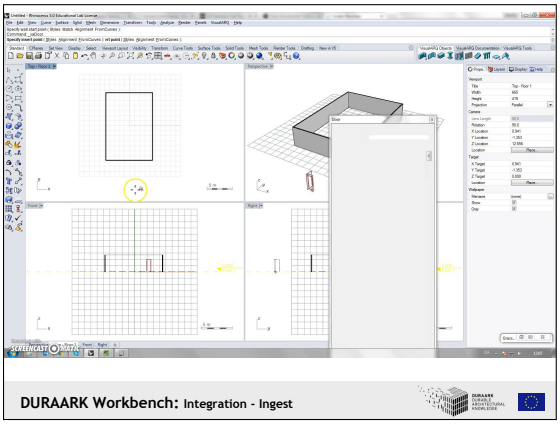

DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE
Integration into Rhino

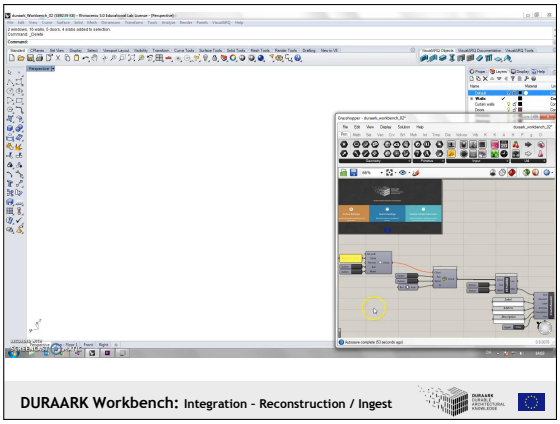

Rhinoceros 5
=
+
Rhino3D
McNeel
BIM
VisualArq
Point Clouds
Volvox
Integration into Rhino

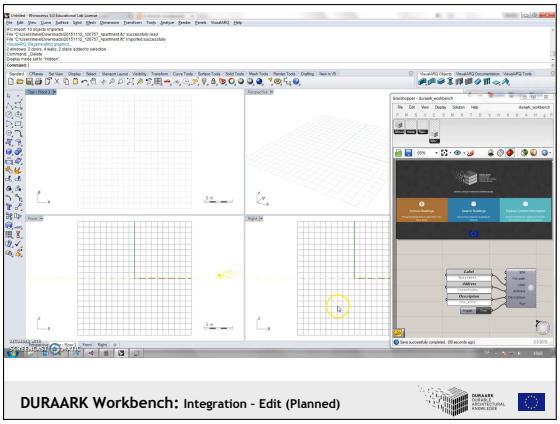

Loading Cloud
VOLVOX Rhino plugin - Working with Point Clouds in 3D CAD and parametric environment

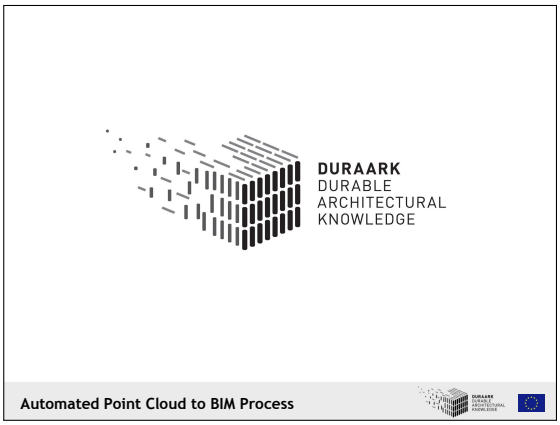

VOLVOX Rhino plugin - Working with Point Clouds in 3D CAD and parametric environment

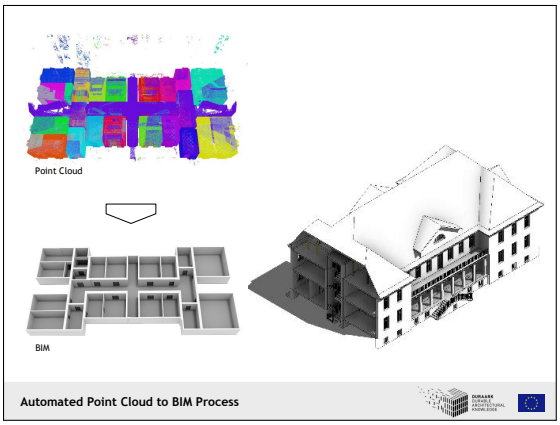

VOLVOX Rhino plugin - Working with Point Clouds in 3D CAD and parametric environment

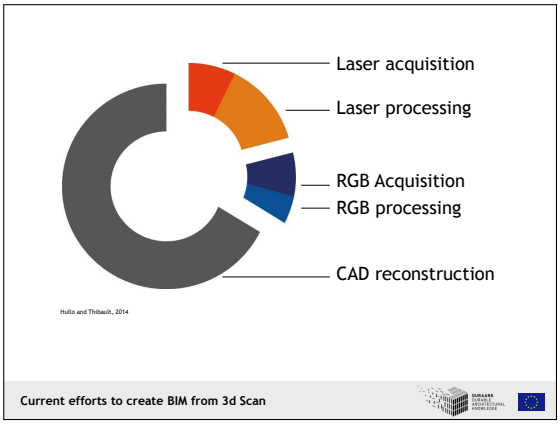

DURAARK Workbench: Integration - Ingest

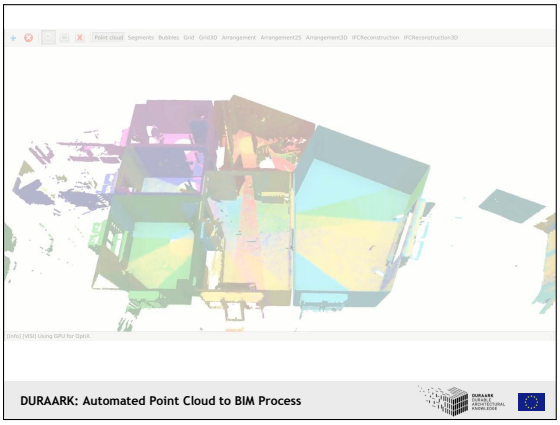

DURAARK Workbench: Integration - Reconstruction / Ingest

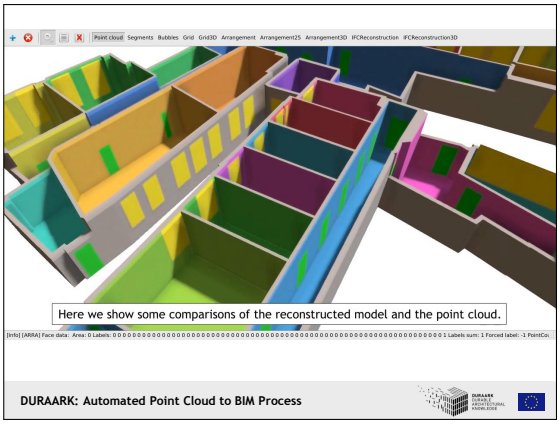

DURAARK Workbench: Integration - Edit (Planned)

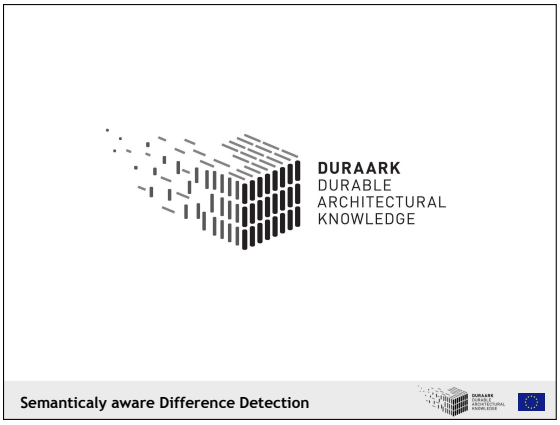

DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE
Automated Point Cloud to BIM Process

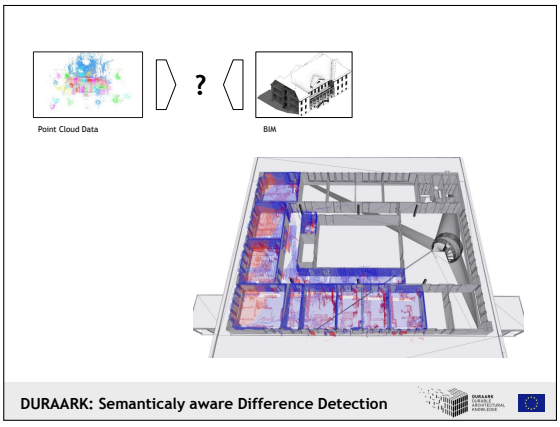

Point Cloud
BIM
Automated Point Cloud to BIM Process

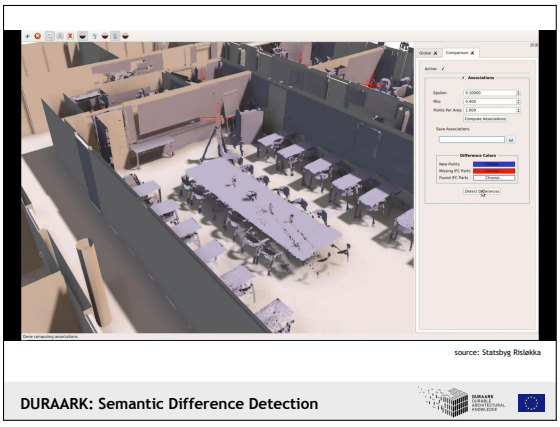

Laser acquisition
Laser processing
RGB Acquisition
RGB processing
CAD reconstruction
Hullo and Thibault, 2014
Current efforts to create BIM from 3d Scan

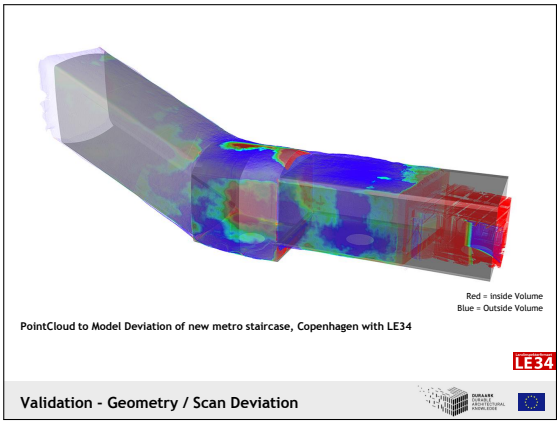

DURAARK: Automated Point Cloud to BIM Process

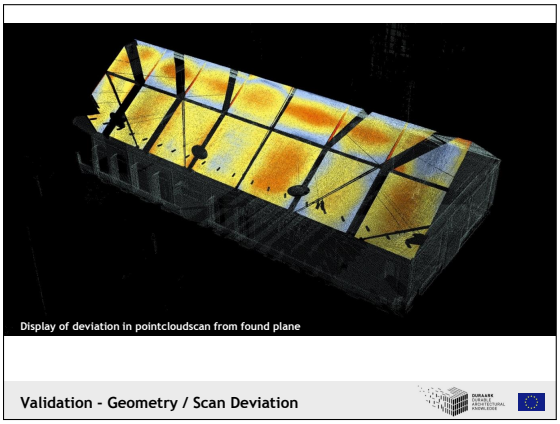

Here we show some comparisons of the reconstructed model and the point cloud.
DURAARK: Automated Point Cloud to BIM Process

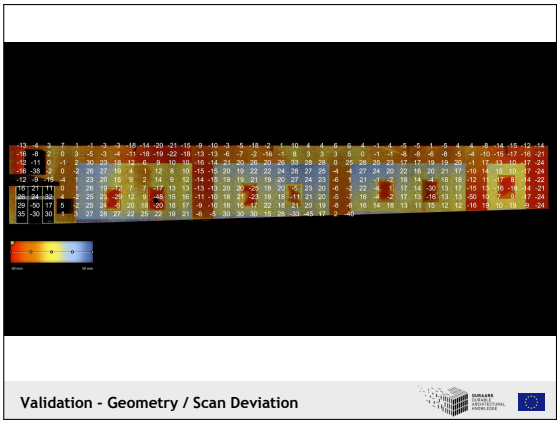

DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE
Semanticaly aware Difference Detection

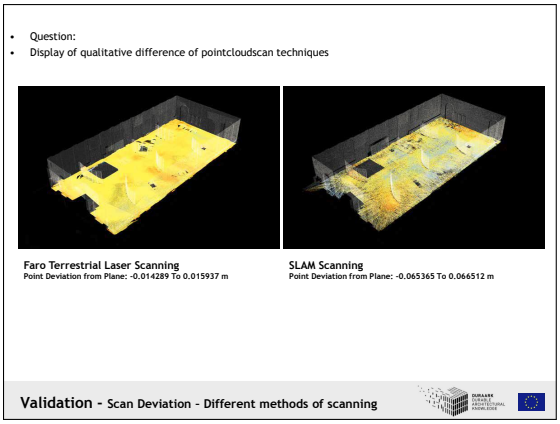

Point Cloud Data
BIM
DURAARK: Semanticaly aware Difference Detection

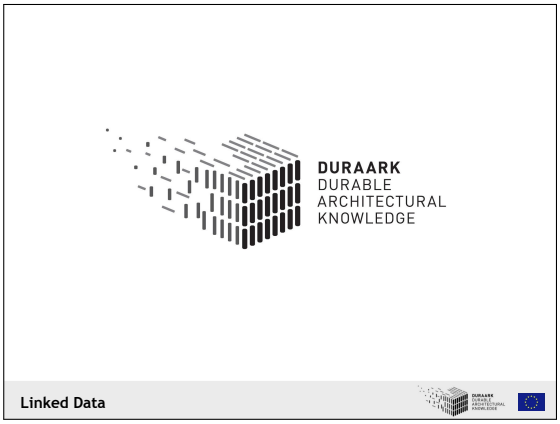

source: Statsbyg Rislakka
DURAARK: Semantic Difference Detection

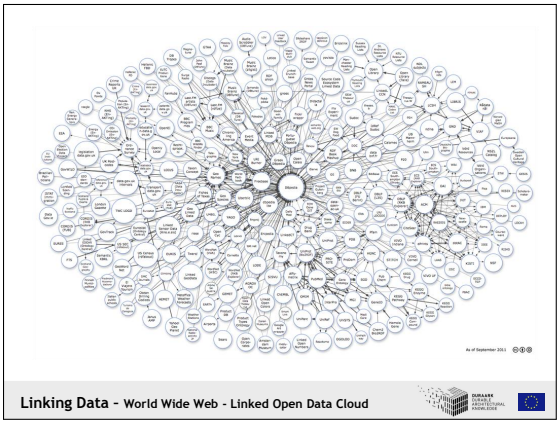

Red = inside Volume
Blue = Outside Volume
PointCloud to Model Deviation of new metro staircase, Copenhagen with LE34
LE34
Validation - Geometry / Scan Deviation

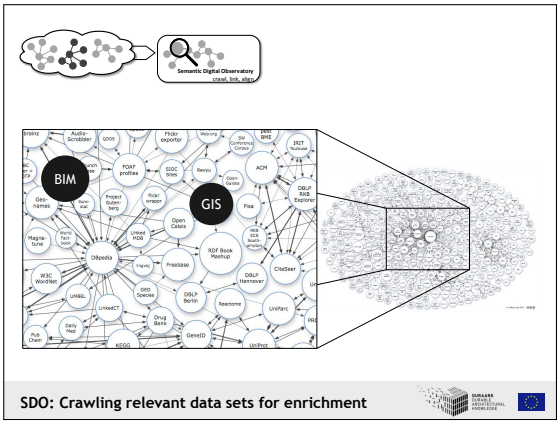

Display of deviation in pointcloudscan from found plane
Validation - Geometry / Scan Deviation


Validation - Geometry / Scan Deviation

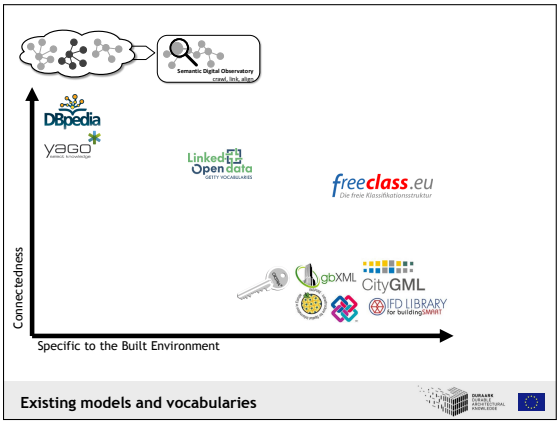

Question:
Display of qualitative difference of pointcloudscan techniques
Faro Terrestrial Laser Scanning
Point Deviation from Plane: -0.014289 To 0.015937 m
SLAM Scanning
Point Deviation from Plane: -0.065365 To 0.066512 m
Validation - Scan Deviation - Different methods of scanning


DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE
Linked Data

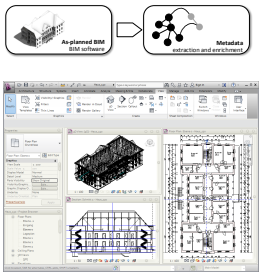

Linking Data - World Wide Web - Linked Open Data Cloud



SDO: Crawling relevant data sets for enrichment



Existing models and vocabularies

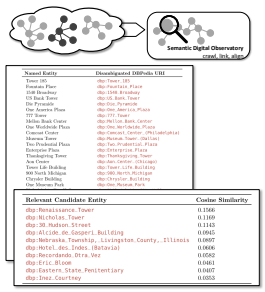


Semantic Digital Archive (SDA) consists of three components:

1. **Meta Data Extraction and Semantic Enrichment**

- **Industry Foundation Classes (IFC), STEP Physical File Format (SPFF)**
- created with native BIM Software (e.g. ArchiCAD, Nemetschek, Revit)

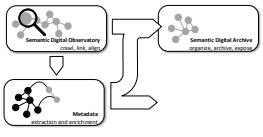
Meta Data Extraction



Semantic Digital Archive (SDA) consists of three components:

1. Meta Data Extraction and Semantic Enrichment
   - *Extract meta data from E57 and IFC files submitted to the archive.*
   - *Enrich by curator and automated methods*
2. **Semantic Digital Observatory (SDO)**
   - *Discover relevant data sets for semantic enrichment*
   - *Cluster similar data based on initial seed list*

SDO: Clustering datasets



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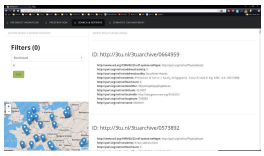
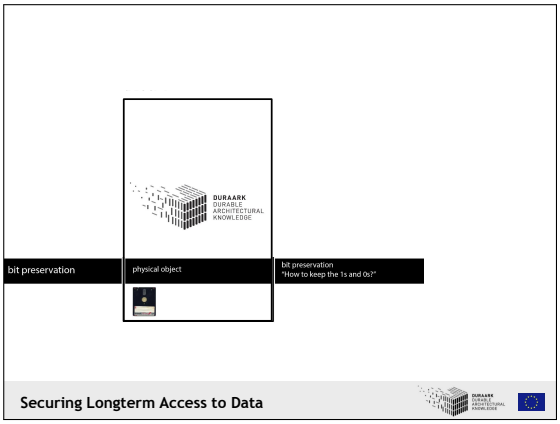


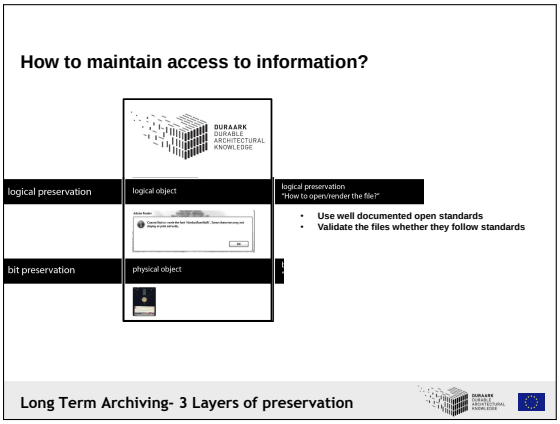
2. Semantic Digital Observatory (SDO)
   - *Discover relevant data sets for semantic enrichment*
   - *Cluster similar data based on initial seed list*
   - *Allow manual validation of discovered links through croudsourceing*
3. **Semantic Digital Archive Storage (SDAS)**
   - *Store meta data of archived content and expose as Linked Data*

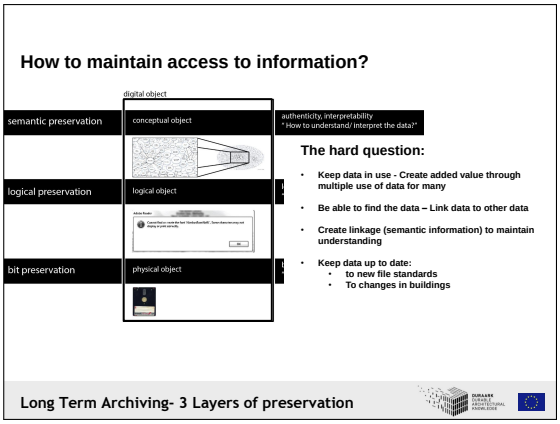
http://mimas.cgv.tugraz.at/search

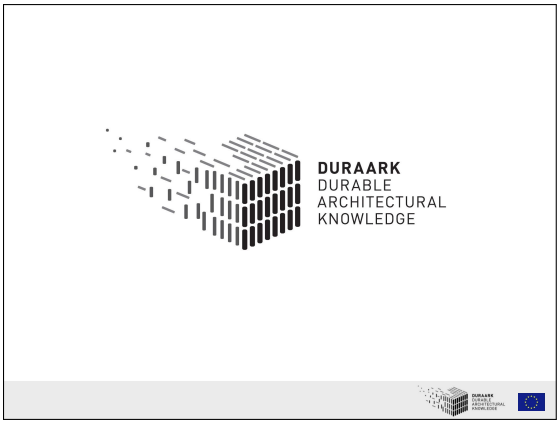
Search in Building Data - Exposed archived meta data

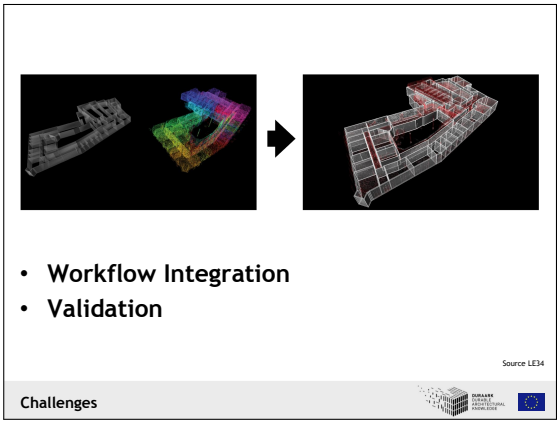
Longterm Preservation

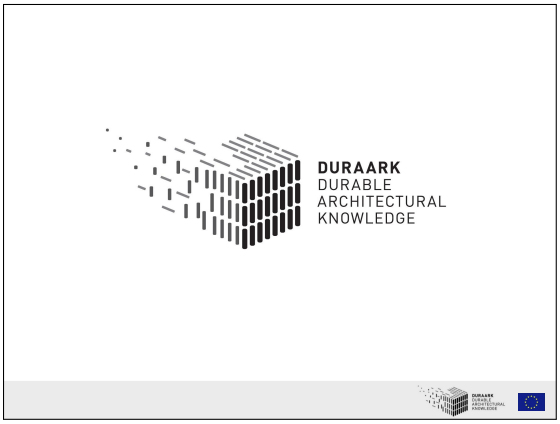

DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE
bit preservation
physical object
bit preservation
"How to keep the 1s and 0s?"
Securing Longterm Access to Data

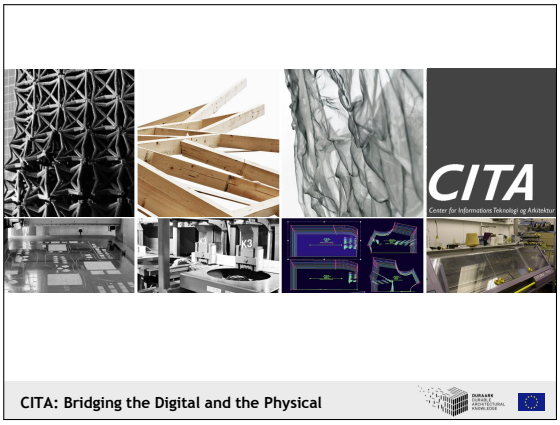

How to maintain access to information?
DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE
logical preservation
logical object
logical preservation
"How to open/render the file?"
Use well documented open standards
Validate the files whether they follow standards
bit preservation
physical object
Long Term Archiving- 3 Layers of preservation

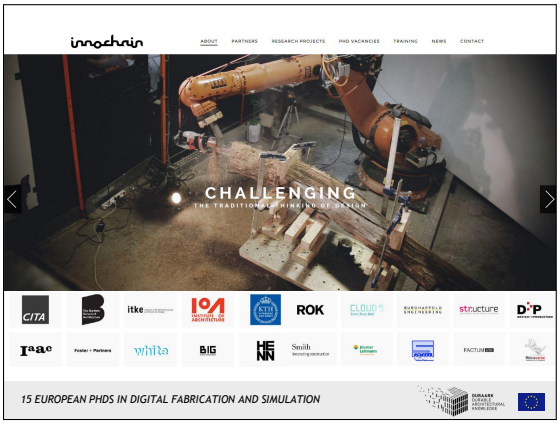

How to maintain access to information?
digital object
semantic preservation
conceptual object
authenticity, interpretability
" How to understand/ interpret the data?"
logical preservation
logical object
bit preservation
physical object
The hard question:
Keep data in use - Create added value through multiple use of data for many
Be able to find the data – Link data to other data
Create linkage (semantic information) to maintain understanding
Keep data up to date:
to new file standards
To changes in buildings
Long Term Archiving- 3 Layers of preservation


DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE


Workflow Integration
Validation
Source LE34
Challenges


DURAARK
DURABLE
ARCHITECTURAL
KNOWLEDGE


CITA
Center for Information Teknologi og Arkitektur
CITA: Bridging the Digital and the Physical


innochain
ABOUT
PARTNERS
RESEARCH PROJECTS
PHD VACANCIES
TRAINING
NEWS
CONTACT
CHALLENGING
15 EUROPEAN PHDS IN DIGITAL FABRICATION AND SIMULATION