



## D8.6 Dissemination Report Year 2

### **DURAARK**

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## Executive summary

During Year 2, a number of academic articles have been published and we have participated in conferences as well as organised targeted workshops for practitioners in the field of managing 3D models.

In addition to publishing articles to attract academic attention, the software artefacts that are produced in the project are attracting attention among our primary stakeholders and can be used as a base for our discussions around the stakeholders' needs.

We have put effort into finding quantifiable metrics for measuring impact. What we now have in place is a scheme to connect metrics on traffic to our web site with the calendar of events as set forth in our impact assessment strategy.

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# 1 Introduction

During the second year, the project has been very active and conducted a wider range of dissemination activities. With respect to scientific dissemination, the consortium submitted 17 papers, held 14 presentations at conferences, presented 5 posters at conferences, presented one conference keynote and organised 3 workshops in addition to promoting DURAARK at meetings.

We have taken steps to assess impact of our efforts, primarily looking for quantifiable data and looking to our public web site for this information. We have been able to detect a positive correlation between our participation in conferences and spikes in traffic to our Website. As we have also seen such spikes that do not necessarily correlate with conferences or meetings, we are not yet able to present any figures but we are taking this into account for the next year by enforcing a strategy for impact measurements.

We are reusing the structure of last year's dissemination deliverable D8.3, which also contains relevant information regarding the different target communities of the DURAARK project.

## 2 Impact assessment strategy

We have identified several approaches to quantitatively assess impact:

- Using Google Analytics to analyse project website traffic and correlating statistics with events in the project calendar. 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 that we organise, which we view as a measure of attraction, together with the organisational affiliation of the attendees, gives an assessment of our attraction among the stakeholder groups.
- Tracking requests from 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<sup>1</sup> gives an assessment of impact.
- Tracking downloads of Docker images and Docker repository usage gives an assessment of impact.

### 2.1 Analysing DURAARK website traffic

Since quantifiable metrics from the project web site is readily available, we want to use the traffic to the web site as an indication of impact. The project has not yet been concluded and the planned outcome has yet to be created. Because of this, the traffic measurements are among the few quantifiable measurements that we have access to. Our strategy thus is based on being able to correlate project web site traffic with activities in the project.

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<sup>1</sup><http://github.com>

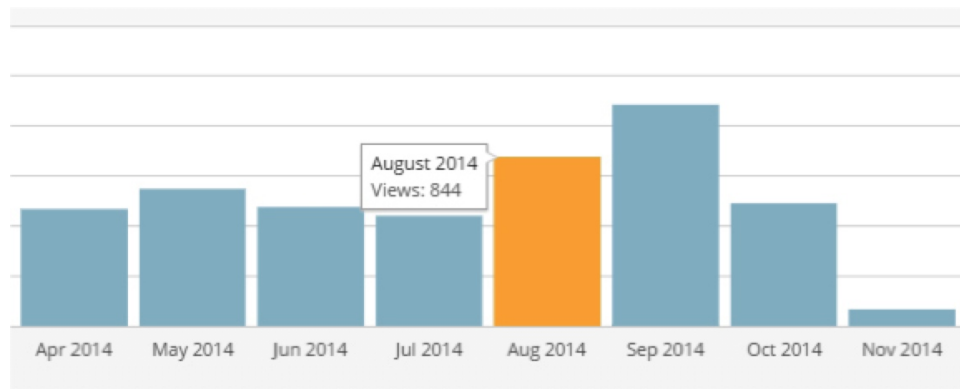


Figure 1: Example of traffic reports on the DURAARK website



Figure 2: Example of traffic reports on the DURAARK website, broken down on days

Hence, all activities have to be reported – particularly we need information about the date of the activity, the place of the activity and a description of the activity in the same way as they are reported in this document. Based on these dates, we are able to go back and check the traffic measurements to the web site.

These figures will be presented at the end of the project (Year 3) in the dissemination report.

## 2.2 Tracking participation in workshops and conferences that we organise

In Section 4, we have reports from the three workshops that we have organised the last year of the project.

## 2.3 Tracking use of software components hosted on GitHub

GitHub provides the possibility for developers active on GitHub to "watch" a project, i.e. getting information about changes to source code repositories. Through tools provided

on the GitHub website, it is possible for us to both count as well as get information about who is actively following the development of our software components.

GitHub also provides a mechanism called "cloning", that gives interested developers the opportunity to locally modify source code components without interfering with the development in the source repository. If bugfixes are made, another mechanism called "pull request" may be used to inform the owners of the source code repository that there are pending changes. These changes may also contain incremental code changes that add features to the software.

Both these mechanisms gives ample opportunity to assess interest among external developers. Since we have only recently moved public software components, more specifically those covered by open licenses, we have not yet had the opportunity to use these tools. More information will be reported next year.

## **2.4 Tracking downloads of software components packaged as Docker images**

The individual software components, packaged as individual services according to the overall architecture of DURAARK, may be re-used by interested parties. These images are not yet available in the central Docker repository, where statistics about download are provided. During the third year of the project and as the individual software components are finalised, those components that are covered by an open license will be made available through the Docker repository. Somewhat depending on when we reach finalisation, we will be able to report on these number next year.

## 3 Joint community activities

### 3.1 Project website

The DURAARK website is online at <http://www.duraark.eu/> and a snapshot of the DURAARK website is presented in Appendix B. It is the primary communication tool for the project news, events, deliverables, blog etc. to the general audience, from which news entries are relayed to Twitter and Facebook. Statistics show that the website has had between 531-1,275 visits per month in 2014, and visitors from several countries on all continents. The last 90 days, the website attracted 607 unique users and resulted in 1987 page views. The total number of page views for the entire lifetime of the website is 13,129<sup>2</sup>.

February was the month with the highest number of visitors to the web site, see Figure 3, probably due to preparations for the annual examination. The next peak is visible in the fall with high rates especially in September and November.

September was the month with the highest number of presentations and publications, which we assume is the reason for the good results – 6 presentations were held and 4 papers were published around that time.

In mid-September, DURAARK arranged the "Building Knowledge" workshop at the iKnow 2014 in Graz, described in Section 4.2, which we believe explains the increase in visitor numbers on the second week of September, see Figure 4.

In mid-November, DURAARK arranged the "Sustainable Building Information Workshop" in Copenhagen, described in Section 4.3, which we believe explains the increase in visitor numbers on the second week in November, see Figure 4. The workshop gave a lot of visitors to the specific page on the website.

The blog post written about the workshop on November 17 was also published on Twitter and Facebook. By statistics on Facebook we can see that this was the post with the highest number of views on the DURAARK Facebook page in 2014.

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<sup>2</sup>per 2015-03-17

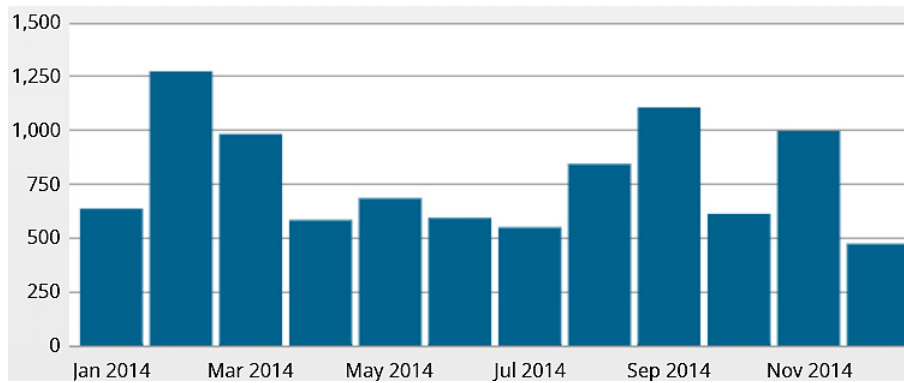


Figure 3: Visits to the DURAARK website during year 2, broken down on individual months.

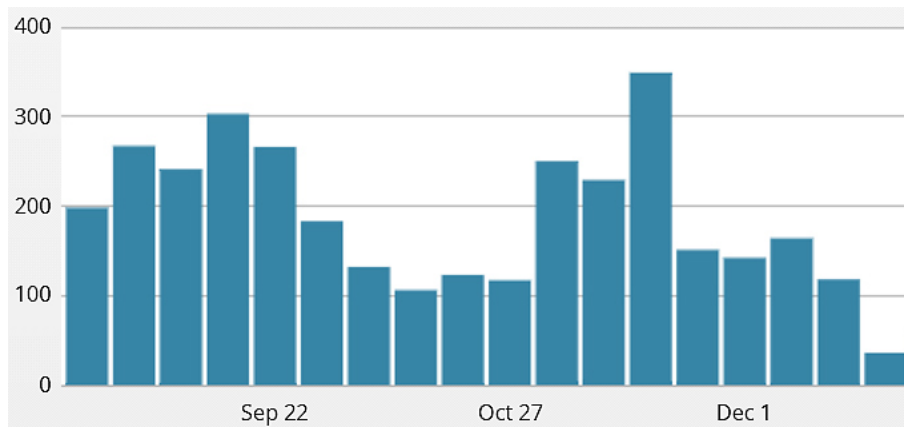


Figure 4: Peaking weeks of visits to the DURAARK website during the autumn of 2014.

<u>Oct 27</u>	<u>Oct 28</u>	<u>Oct 29</u>	<u>Oct 30</u>	<u>Oct 31</u>	<u>Nov 1</u>	<u>Nov 2</u>
24	14	18	38	4	11	8

Figure 5: Effects after a blog post about contribution to the PREMIS Implementation Fair October 30.



Another proof that it is worthwhile to write blog posts is visible in Figure 5, where we see the effects of a single blog post. On October 30, a blog post was published and it was immediately reflected in the statistics on the number of visitors day by day.

Table 1 (below) shows the total statistics on views of individual pages on the project website.

Page on <a href="http://duraark.eu">http://duraark.eu</a>	Count
Home page	3,214
Home page / Archives	2,391
Publications	775
Deliverables	772
i-KNOW workshop "Building Knowledge" <sup>3</sup>	544
Use Case	413
Presentations	359
Contact	291
Objectives	252
Sustainable Building Information Workshop <sup>4</sup> 12. November 2014, Copenhagen	243
Consortium	234
Sustainable Building Information Workshop 12. November 2014, Copenhagen Presentations Online	223
Who we are	193
Joint workshop on Linked Data in Architecture and Construction – LDAC 2014	160
Approach	147
DURAARK poster at the "10th Building Day: BIM – a challenge for Germany" at Jade University of Applied Sciences, Oldenburg	133
Catenda	128
Associated partners	127
Advisory Board	98

continues on next page...

<sup>3</sup>See Section 4.2

<sup>4</sup>See Section 4.3

Table 1 – continued from previous page

Page on <a href="http://duraark.eu">http://duraark.eu</a>	Count
DURAARK contribution accepted at GRAPP 2014	80
i-KNOW workshop "Speed Dating of Linked Building Data Vocabularies"	79
DURAARK's Semantic Digital Observatory approach presented at ESWC	72
Project Flyer	71
DURAARK Presentation at 3DOR	69
DURAARK presentation at GRAPP 2014	57
DURAARK poster presentation @ "Kulturelles Erbe in der Cloud"	54
DURAARK contribution to PREMIS Implementation Fair	54
DURAARK at EUROGRAPHICS 3DOR	54
DURAARK to be presented at Archiving 2014	50
DURAARK presentation at 30th CIB W78 conference in Beijing	45
DURAARK branding itself on <i>Our Digital Memory!</i>	45
ScanLAB 3d scanning workshop at CITA 21.-25.October 2013	43
DURAARK work makes an impression at ISWC 2014!	42
DURAARK Semantic Digital Archive approach presented at buildingSMART meeting in Stockholm	41
DURAARK invites to a workshop "Sustainable Building Information" in Copenhagen November 12, 2014	40
Hybrid Registrations Student Workshop on 3d scan and analysis methods	40
DURAARK presents at GeoBIM Europe	34
DURAARK on discussion panel at Indoor3D Cape Town	33
DURAARK – BETA tester for Faro WebshareCloud	30
What's the Problem	29
Plan3D associated partner of DURAARK	28
DURAARK Showcase in the Digital Preservation Sustainability on the EU policy level workshop	26

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Table 1 – continued from previous page

Page on <a href="http://duraark.eu">http://duraark.eu</a>	Count
DURAARK poster at the 10th "Building Day" at Jade University of Applied Sciences, Oldenburg March 21st, 2014	25
LE34 becomes associated partner in the DURAARK consortium	23
Landmålergarden becomes associated partner in the DURAARK consortium	20
DURAARK explores Semantic Digital Archives	17
LDP Day in Stockholm	17
DURAARK @ "Bauen auf Fraunhofer"	16
Capturing spaces with a mobile phone!	13
DURAARK @ 5th Conference "Digitale Bibliothek"	9
Links to more LDP sites	9
DURAARK On Air	9
DURAARK @ Digitale Bibliothek 2013 "Kulturelles Erbe in der Cloud"	4

Table 1: Webpages on the DURAARK website attracting traffic.

An analysis of referring websites, i.e. tracking websites that have links to the DURAARK website that have actually been "clicked", shows that we have managed to penetrate relevant communities:

- <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://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.

- <http://architecture.com> is the website of Royal Institute of British Architects (RIBA).
- <http://creation2creation.nl> is the personal blog of Nicole Segers with a mission statement to make sustainability more creative and fun. Nicole works at the HAS Hogeschool.
- <http://dankersslimmerbouwen.nl> is the personal blog of Marc Dankers, which collects resources around Building Information Models.
- <http://smartlab.elis.ugent.be> is the website of the Department of Architecture and Urban Planning of the Universiteit Gent.
- <http://thebuildingcoder.typepad.com> is the personal blog of Jeremy Tammik, a member of AEC (architecture, engineering, and construction) and ADVA (Autodesk Data and View API) workgroups of the Autodesk Developer Network (ADN) team. He is a central blogger on the Autodesk Revit API.

Additionally, we are attracting traffic through links published at:

- <http://cordis.europa.eu> is the Community Research and Development Information Service website, a central information hub in Europe.
- <http://blogs.loc.gov> is the American Library of Congress.
- <http://tib-hannover.de> is the website of the Technische Informationsbibliothek in Germany.

### 3.2 Project flyer

A second version of the DURAARK flyer was created during year 2, reflecting the development in the project. As the first flyer was published early in the project lifetime, we found it relevant to refocus on the intermediate achievements so far. It has been shared amongst the partners and distributed to stakeholders at various events (see attached snapshot of the DURAARK flyer in Appendix C).

We are planning for releasing another flyer closer to the end of the project, to focus on the actual outcomes of the project in order to spur uptake in the target audience.

### 3.3 Visibility in social media

The DURAARK project is active on social media, 40 posts was written on Twitter and the account had 46 followers. The Facebook page had 29 followers in mid-December 2014. Both Twitter and Facebook are top referrers for visitors to the DURAARK website, and every blog post written on the website is posted automatically on both Twitter and Facebook – as shown in figures 6 and 7 respectively.

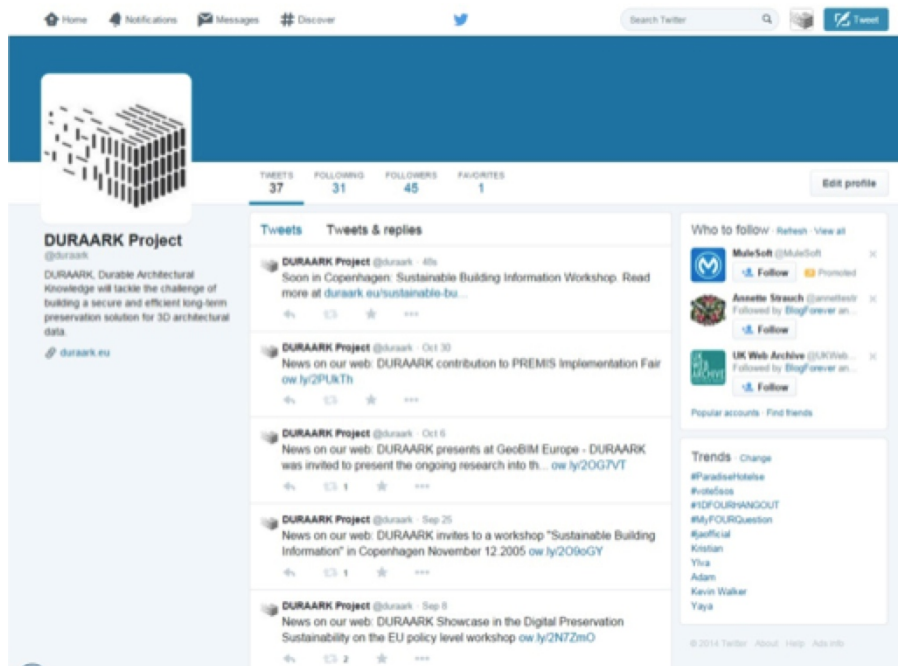


Figure 6: The DURAARK project presence on Twitter



Figure 7: The DURAARK project presence on Facebook

The number of followers may not appear to be overwhelming, but taken into account that both Twitter and Facebook is only relaying news from the project website, it is indicated from the website statistics that the most interest is focused on the website itself.

## 4 Workshops

### 4.1 LDAC workshop Helsinki



Figure 8: Logo of the Linked Data in Architecture and Construction workshop 2014

The Linked Data in Architecture and Construction (LDAC) workshop<sup>5</sup> was the second installation of an annual community group meeting of experts on core topics of interlinked building models with preservation services, as addressed by the DURAARK project. Co-organised by members of the DURAARK consortium, the 2014 joined forces with the 6th eeSemantics VoCamp edition and was held in Espoo/Helsinki during May 26th and 27th 2014, see figure 8.

The workshop's aims and goals are described as follows:

”The topic of this event is why and how to use the Web of Data technologies for building information management. The interest to this question arises from the expected benefits such as the ability to easily link building information models to and from external data sources, to open the models to new use cases and applications, to enable truly decentralised publication of models, to support loosely coupled interoperation through cross-model linking, and to utilise reasoning and other services developed in Semantic Web research. The topic is studied from two different perspectives: The VoCamp will focus

<sup>5</sup><http://linkedbuildingdata.net/events/ldac2014/>



on use cases and vocabularies for the Web of Building Data, and the LDAC workshop will study the technical solutions.”

The DURAARK consortium contributed to the planning and execution and the projects' preliminary results and future plans were prominently placed, presented and discussed among a strong field of experts from the field of AEC/FM as well as Linked Data.

List of the organizing committee:

- **Workshop Chair** Seppo Törmä; Department of Computer Science and Engineering, Aalto University, Espoo, Finland
- Pieter Pauwels Department of Architecture and Urban Planning, Ghent University, Ghent, Belgium
- Jakob Beetz **DURAARK TC** Department of the Built Environment, Eindhoven University of Technology, Eindhoven, Netherlands
- Matthias Weise AEC3 Deutschland GmbH, München, Germany

As a tangible result a special issue of the renowned journal ”Automation in Construction” was initiated that is due to appear in early 2015, see figure 9.

Full list of participants:

- Anna Osello, Politecnico di Torino, Italy
- Arto Kiviniemi, University of Liverpool, United Kingdom
- Bruno Fiès, CSTB, France
- Dag Fjeld Edvardsen, Catenda, Norway
- Eilif Hjelseth, Norwegian Building Authority, Norway
- Goncal Costa, Universitat Ramon Llull, Spain
- Jakob Beetz, Eindhoven University of Technology, Netherlands
- James O'Donnell, University College Dublin, Ireland
- Jyrki Oraskari, Aalto University, Finland
- Kary Främling, Aalto University, Finland
- Kris McGlinn, Trinity College Dublin, Ireland
- Leif Granholm, Tekla, Finland
- María Poveda-Villalón, Universidad Politécnica de Madrid, Spain



The screenshot shows the Elsevier website interface. At the top, there is a search bar with the text "Type here to search on Elsevier.com" and a magnifying glass icon. To the right of the search bar are links for "Advanced search", "Follow us:" with social media icons for Facebook, LinkedIn, Twitter, and YouTube, and a "Help & Contact" link. Below the search bar is a navigation menu with the following items: "Journals & books", "Solutions", "Authors, editors & reviewers", "About Elsevier", "Community", and "Store".

The main content area features a blue sidebar on the left with the "Automation in Construction" logo and a list of links: "Guide for Authors", "Submit Your Paper", "Track Your Paper", and "Order Journal". The central content area is titled "Special Issue on Linked Data in Architecture and Construction". It contains the following text:

The topic of this special issue is why and how to use the Web of Data technologies (RDF, OWL) for building information management (BIM). The interest to this question arises from the expected benefits such as the ability to easily link building information models to and from external data sources, to open the models to new use cases and applications, to enable truly decentralized publication of models, to support loosely coupled interoperability through cross-model linking, and to utilize reasoning, query and other services developed in Semantic Web research.

It concentrates primarily on *practical use cases* clearly showing the benefits of using these technologies in a BIM context, but also submissions about *technical details* of using Web of Data technologies are welcome.

This Special Issue is loosely linked to the LDAC2014 event (<http://linkedbuildingdata.net/ldac2014/>).

**About the Topics of Interest**

In particular, the topic of interest includes but is not limited to

- Use case presentations (sensor data, building performance checking, building regulation integration, etc.)
- ifcOWL, ifcRDF, bsDD

On the right side of the page, there is a "Share this page:" section with icons for email, star, Facebook, Twitter, LinkedIn, and Google+. Below this is an "ADVERTISEMENT" section.

Figure 9: Cfp for the special issue on Linked Data in Architecture and Construction (LDAC) appearing as a follow-up action to the workshop in 2015

- Markku Kiviniemi, VTT, Finland
- Mathias Kadolsky, Technical University Dresden, Germany
- Matthias Weise, AEC3, Germany
- Mervi Himanen, Digital Living, Finland
- Nam Vu Hoang, Aalto University, Finland
- Niels Trelldal, Technical University of Denmark, Denmark
- Peter Bonsma, RDF, Bulgaria
- Petteri Villa, Tekla, Finland
- Pieter Pauwels, Ghent University, Belgium
- Ragnar Wessman, Tekla, Finland
- Raimar Scherer, Technical University Dresden, Germany
- Raju Pathmeswaran, Birmingham City University, United Kingdom
- Reijo Hänninen, Granlund, Finland
- Seppo Törmä, Aalto University, Finland
- Sven-Eric Schapke, think project, Germany
- Thomas Liebich, AEC3, Germany
- Tuomas Laine, Granlund, Finland
- Vishal Singh, Aalto University, Finland



Figure 10: Participants of the 2nd workshop on Linked Data in Architecture and Construction (LDAC) 2014 in Espoo, Finland

## 4.2 Workshop "Building Knowledge" at the iKnow 2014 Graz

As a special workshop track during the annual iKnow in Graz Vienna was initiated by the DURAARK team. Together with the co-organisers from other projects (see complete committee and participants below) the workshop was set up as a full day workshop in parallel to others prior to the main conference on September 16th 2014. The workshop had 14 participants and 8 presentations served as the initial input to the lively discussions about bringing different building-related data models, ontologies, structured vocabularies and other data sets together and aligning them with each other.

The initial call for participation advertised on the DURAARK websites had the ambitious goals described as follows:

"We propose an interactive workshop that provides a forum for researchers and practitioners from building and infrastructure-related areas as well as from fields such as data engineering, semantic web and knowledge modelling to share and discuss novel works in the field. One of the intended outcomes of the workshop is the establishment of a common registry for datasets and vocabularies from the fields of building and construction in architecture and civil engineering, where mappings and links provide a more integrated view on the existing landscape. Instead of aiming at a rigid axiomatic high-level pivot- or upper- ontology to which everything is mapped (a la SUO/SUMO), a light-weight approach using vocabularies with softer semantics such as SKOS & DC will be pursued. This allows the rapid, ad hoc creation of many rela-



Figure 11: Overview of some of the slides from the iKnow "Building Knowledge" workshop

tions among concepts without risking to invalidate intricate description logic models while staying faithful to the LOD spirit that cherishes the emergence of synergetic effects by means of machine readable interrelations.”

During the planning this initial schedule was collaboratively adapted to with regard to the manifest examples in the form of a concrete repository of RDF vocabularies stored in the Semantic Digital Archive (SDA) as part of WP3.

As a main outcome, new and reinforced relations between the DURAARK project and related initiatives and projects regarding the sustainable use of semantically rich and interlinked models of the built environment have been established. In particular the EU support action project ready4SmartCities<sup>6</sup> and specifically the catalogues of relevant ontologies<sup>7</sup>, the EU project DIMMER<sup>8</sup> and the DRUM project<sup>9</sup> had interesting connection points for current and future aims of the DURAARK project.

List of the organizing committee:

<sup>6</sup><http://www.ready4smartcities.eu/home>

<sup>7</sup><http://smartcity.linkeddata.es/>

<sup>8</sup><http://dimmer.polito.it/project>

<sup>9</sup>[http://cse.aalto.fi/en/research/groups/distributed\\_systems/projects/drum/](http://cse.aalto.fi/en/research/groups/distributed_systems/projects/drum/)

- Jakob Beetz (DURAARK technical coordinator)
- Pieter Pauwels is a postdoctoral researcher at the Department of Architecture and Urban Planning, Ghent University. He investigates how and to what extent information system support can be provided to experts in architecture and construction, thereby focusing on Building Information Modelling (BIM) and semantic web technologies.
- Matthias Weise is head of the software development department of AEC3, an international consulting company in the field of process optimisation in the building industry. AEC3 is frequently acting on behalf of the buildingSMART organisation, the predominant standardisation body in the AEC/FM field
- Seppo Törmä is a researcher at the Distributed Systems Group of the Department of Computer Science and Engineering at Aalto University. His fields of research include complex event processing, linked data and cognitive collaboration.
- Stefan Dietze (DURAARK project coordinator)

The i-KNOW workshop programme:

Time	Topic	Description	Presenter/Responsible
08:30	Registration, get together	Please present printed copies of the Workshop registration ticket on the conference floor	all
09:00	Welcome	Kick-off, Introduction among participants	Jakob Beetz, all
09:15	Workshop intro	Aims and goals: creating new knowledge by making an inventory, repository and alignments among vocabularies relevant to the building industry. Intro to technical infrastructure	Jakob Beetz
10:00	Ready4SmartCities catalogue <sup>10</sup>	Introduction to repository. Top-level contents of catalogued vocabularies, future strategies	María Poveda

continues on next page...

<sup>10</sup><http://smartcity.linkeddata.es/>

Table 2 – continued from previous page

Time	Topic	Description	Presenter/Responsible
10:30	Linking strategies	Dataset Profiling, Semantic Enrichment, Focussed Crawling, Relevance Assessment	Ujwal Gadiraju
11:00	Alignment server		Jerome Euzenat (remote)
11:30	Plenary session	- use case inventory - requirements evolving from use cases - alignment strategies for vocabularies and datasets / instances	all, moderated by Jakob Beetz
12:30	Lunch break	Buffet in main hall	all
13:30	INSPIRE - Building-related vocabulary <sup>11</sup>	Introduction to the model	Seppo Törmä
13:50	IfcOWL/RDF and SimMode	Introduction to the model, mapping session	Pieter Pauwels, Edward Corry (remote)
14:10	CityGML, COINS	- Presentation from 2009 about GeoBIM <sup>12</sup> - Presentation <sup>13</sup> about open source COINS tool <sup>14</sup> (a Dutch initiative <sup>15</sup> )	Léon van Berlo <sup>16</sup> , TNO
14:20	DIMMER project <sup>17</sup>	Introduction to the project	Alberto Musetti <sup>18</sup>
14:30			Matthias Weise
15:00	Plenary working session		
17:00	Closing session	Conclusions, future steps	all

Table 2: The i-KNOW workshop programme

<sup>11</sup><https://drive.google.com/file/d/0BxWyVUjLAeHFbWNvdEtLT2RtNms/edit?usp=sharing>

<sup>12</sup>[https://docs.google.com/file/d/0B-BPlmFc7PddQnRVShp3cDF6d3M/edit?usp=drive\\_web](https://docs.google.com/file/d/0B-BPlmFc7PddQnRVShp3cDF6d3M/edit?usp=drive_web)

<sup>13</sup>[https://docs.google.com/file/d/0B-BPlmFc7PddR2dBMGlwSGZHa0U/edit?usp=drive\\_web](https://docs.google.com/file/d/0B-BPlmFc7PddR2dBMGlwSGZHa0U/edit?usp=drive_web)

<sup>14</sup><https://github.com/opensourceCOINS/CoinsServer>

<sup>15</sup><http://coinsweb.nl/wiki/>

<sup>16</sup><http://nl.linkedin.com/in/leonvanberlo>

<sup>17</sup><http://dimmer.polito.it>

<sup>18</sup><http://it.linkedin.com/in/albertomusetti>

### 4.3 Copenhagen workshop

The Sustainable Building Information Workshop on November 12, 2014, gathered practitioners, researchers, software developers and members of the archival community in order to discuss the ongoing shift in the operation, design, documentation and construction of buildings. The aim of the workshop was to facilitate an exchange between stakeholders from institutional building owners and researchers on approaches that will provide a long-term usability to the currently short-lived building related digital data. This workshop created an opportunity for separated working practices to merge around discussions of a digital lifecycle of building information.

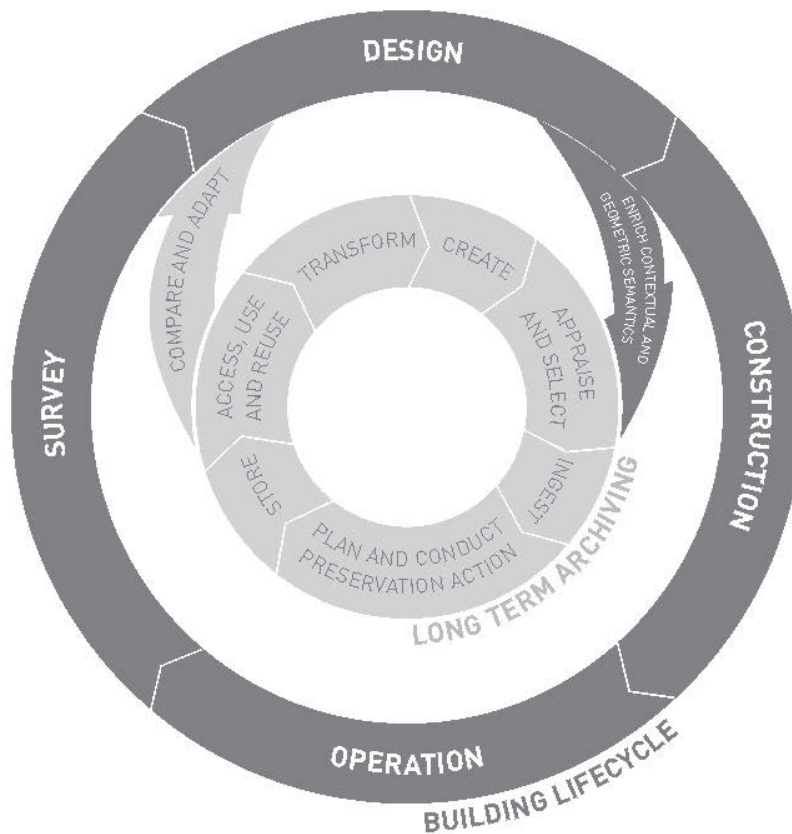


Figure 12: The digital lifecycle of building information

The event was structured around a set of lectures that introduced the current state and questions in research and practice – visited through the perspectives of institutional building owners, facility management software developers and the DURAARK project. For the DURAARK project, the day presented a great opportunity to receive stakeholder



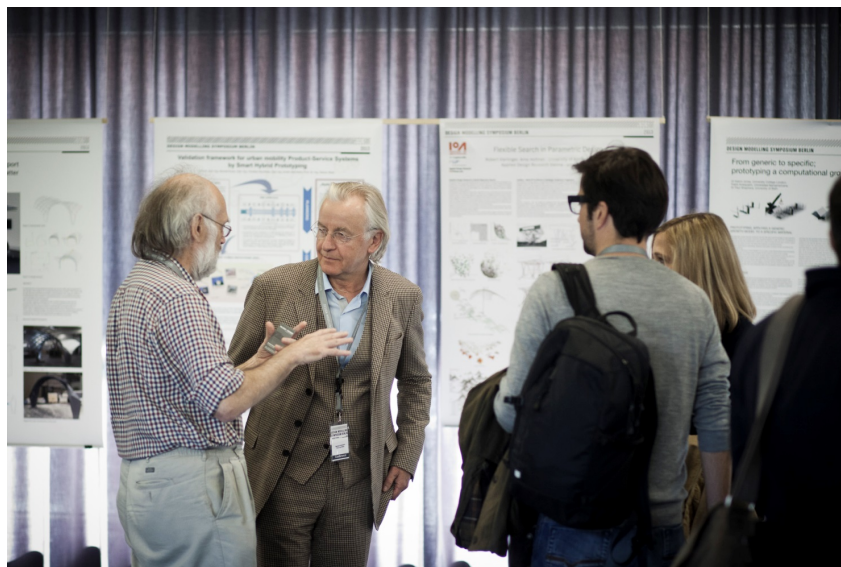


Figure 13: Workshop participants in conversation

feedback on the current state of the project. For this we want to thank every participant for their valuable time and feedback.

**Participants of the workshop** The workshop brought together researchers from all work packages of the DURAARK project with stakeholders from institutional building owners, software developers and cultural heritage. All of these had a common interest in maintaining long-term access to building information. A total of 23 persons from Norway, Iceland, Sweden, Denmark, The Netherlands, Germany and Austria participated in the event.

They were:

- Arkivverket (Norwegian National Archives), Norway, Erik Aaberg
- Bane Danmark, Denmark, Gita Monshizadeh
- Catenda, Norway, Dag Fjeld Edvardsen
- CITA, Denmark, Martin Tamke
- CITA, Denmark, Henrik Leander Evers
- Copenhagen Properties, Denmark, Emil Bisgaard Mortensen
- Copenhagen Properties, Denmark, Morten Steffensen
- Dalux, Denmark, Torben Dalgaard
- Danish Technical University, Denmark, Markus Lampe

- dRofus, Norway, Ole Kristian Kvarsvik
- Falu Kommun, Sweden, Anders Engstrom
- L3S, Germany, Stefan Dietze
- LTU, Sweden, Hamid Rofoogaran
- LTU, Sweden, Lena Lindbäck
- LTU, Sweden, Frode Randers
- Lufthavn København, Denmark, Michael Ørsted
- Riksarkivet (The National Archives), Norway, Johan Ekdahl
- Statens Fastighetsverk (The National Property Board of Sweden), Sweden, Jesus Montilla
- TIB, Germany, Michelle Lindler
- TIB, Germany, Michael Panitz
- TUE, Netherlands, Jacob Beetz
- TUE, Netherlands, Thomas Krijnen
- UBO, Germany, Richard Vock

**Preparation of the workshop** The workshop was organized within the DURAARK project by:

*Martin Tamke*, Centre for Information Technology and Architecture, Denmark

*Michelle Lindlar*, Leibniz University Hannover / TIB - German National Library of Science and Technology, Germany

*Dag Fjeld Edvardsen*, Catenda AS, Norway

*Östen Jonsson*, Luleå University of technology / Centre for Long-term Digital Preservation, Sweden

*Jacob Beetz*, Eindhoven University, Netherlands

A dedicated page on the durark website informed and invited the public<sup>19</sup>. All registered participants received several sets of mails, providing information about the workshop and the research project as well as a questionnaire about their work practices and their experience with 3D building documentation and archiving. This questionnaire, which is documented in Deliverable D7.3, provided input for the detailed preparation of the workshop, as well as for the work within WP 6 and WP 7.

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<sup>19</sup><http://duraark.eu/sustainable-building-information-workshop/>



**Aim of the workshop** The aim of the workshop was to exchange knowledge and experience on processes and practices for the long term handling of architectural data, as they are emerging in the field of facility management, building documentation systems and cultural heritage. Common experiences and approaches were highlighted and challenges and future steps towards a sustainable practice of building information were discussed. The insights that were gained were of interest to the participants in their daily work with 3D building information and simultaneously aided the DURAARK project in ensuring that methods and tools developed in the project actually meet practitioners' needs.

**Structure of the day** The day was structured around introductions to – and reports about – the state of research and practice of maintaining understandability and usability to digital data over long periods of time. The presentations highlighted general challenges as well as solutions on the organisational and technological levels of long-term archiving related processes and systems. Later presentations were given by practitioners on their institutions' implementations and procedures as well as by researchers on the state-of-the-art knowledge on the processes within their respective field. In breakout sessions workshop participants investigated their individual data handling practices and processes in groups and discussed how these can be extended to better meet needs in improving and maintaining long-term access. A detailed agenda can be found in the Appendix D.

The workshop was led by Martin Tamke (CITA), presenting the project as revolving around methods and tools for semantic enrichment and long-term preservation of architectural knowledge and data. Jacob Beetz (TUE) presented the future challenges of growing the knowledge base with interlinking of web resources. Martin Tamke and Richard Vock (UBO) presented geometric enrichment of building data, followed by a presentation by Michelle Lindlar (LUH) regarding sustainable data practices. Emil Bisgaard Mortensen (Københavns Ejendome) held a presentation of their use of BIM data for mapping the building stock of Copenhagen. Markus Lampe (Danish Technical University) presented how they manage the building stock on a university scale. Bent Dalgaard Larsen (DaLux) held a demonstration of their systems for managing building data, followed by a presentation by Ole Kristian Kvarsvik (dRofus) of their system [14](#). Dag Fjeld Edvardsen (Catenda) described the `bimsync` collaboration tool. Thomas Krijnen (TUE) presented the DURAARK approach to long-term archiving of building information.

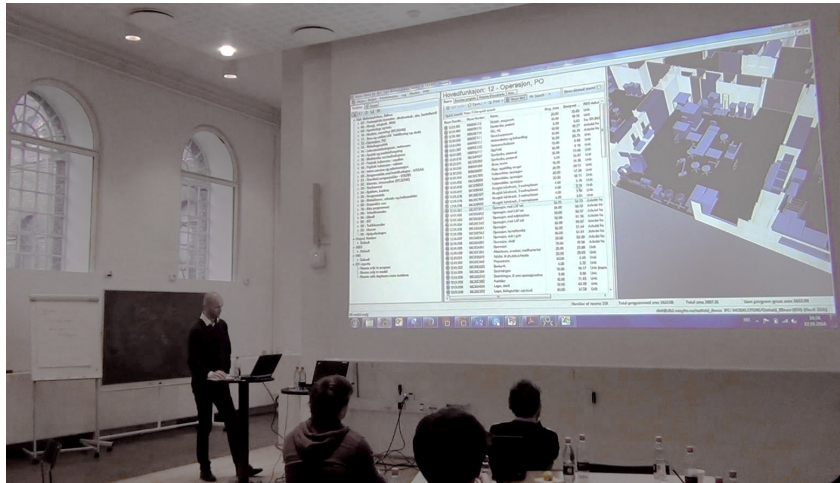


Figure 14: The Norwegian company dRofus presents their approach towards semantically rich large scale BIM models during the workshop

The workshop then continued with group discussions (three groups) and finished with a plenary discussion around the findings in the individual groups. A reflection on the workshop is presented in deliverable D7.3, section 2.1.1.

**Documentation of the workshop** The workshop and its outcomes were documented through videos, images, audio recordings videos and notes by assigned researchers from the DURAARK consortium. These notes, presented in figure 15, were gathered and used for internal purposes.

The presenters were asked whether they could provide their slides for publication. All but one can now be found in a refined state on the DURAARK website on a page<sup>20</sup> dedicated to the documentation of the workshop, see figure 16.

**Aim and impact within the DURAARK project** The workshop had beforehand formulated internal aims and was as directly linked to the activities of the work package 7, as was the activities in work package 6 and 8:

Deliverable 6.2 — *Technical implementation*

Deliverable 7.2 — *Workflow and High level system architecture*

<sup>20</sup><http://duraark.eu/sustainable-building-information-workshop-12-november-2014-copenhagen-presentations-online/>

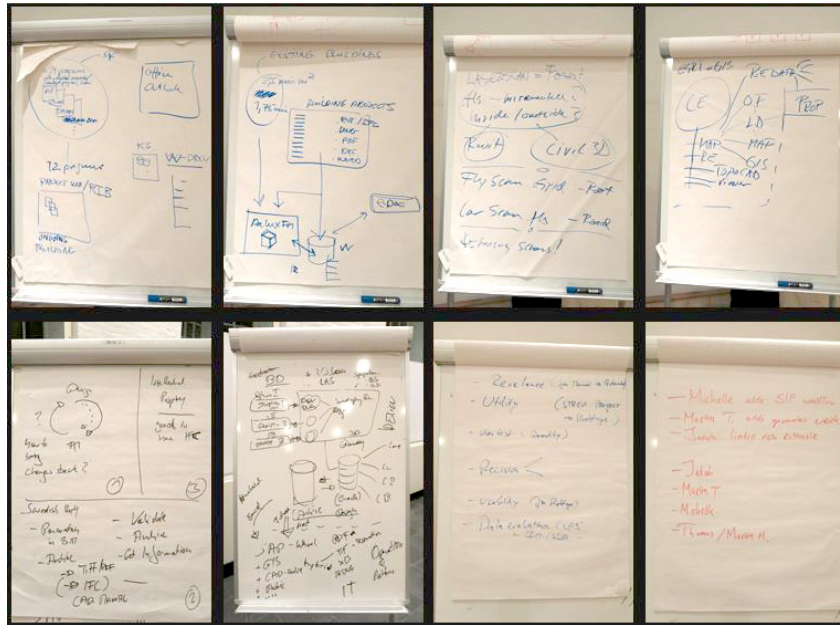


Figure 15: Documented whiteboard sketches by the participants

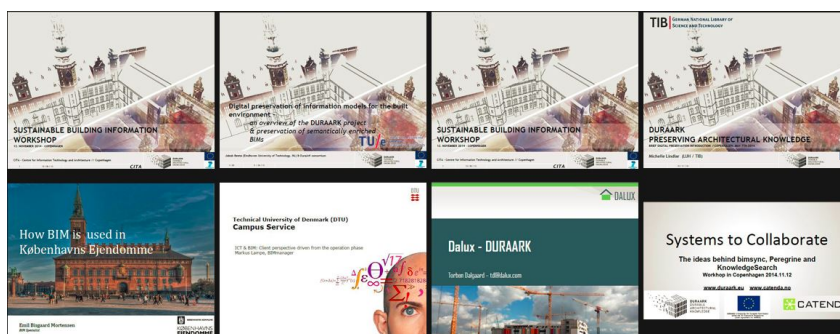


Figure 16: Overview of some of the slides from the workshop published on the DURAARK webpage

Deliverable 8.5 — *Market Study and Exploitation Plan V1*: Our aim was to describe our intended outcome at the end of the DURAARK project (for example the DURAARK Workbench). An important question is what the stakeholders see as necessary steps before they can take our outcomes into their working process (i.e. the perceived gap between DURAARK project and existing processes among stakeholders).

The workshop builds on stakeholder identification and procedural analysis as previously described in D2.1 and D7.1. Details on the aspects under evaluation can be found in the deliverable D7.3.

The outcome of the workshop was used to establish how well the DURAARK processes and tools meet the stakeholder identifications. All input was discussed within the DURAARK consortium and considered for the upcoming second prototype.

## 5 Other important joint activities

The blogg section of the DURAARK website is actively maintained by individual members of the project. Primarily we have blogged about participation in conferences, keeping the activity level at about two blogg posts per month during year 2.

Date	Topic
January 19, 2014	DURAARK presentation at GRAPP 2014
February 11, 2014	DURAARK at EUROGRAPHICS 3DOR
February 20, 2014	DURAARK poster at the 10th "Building Day" at Jade University of Applied Sciences, Oldenburg – March 21st, 2014
March 10, 2014	i-KNOW workshop "Speed Dating of Linked Buidling Data Vocabularies"
March 18, 2014	Capturing spaces – with a mobile phone!
March 24, 2014	DURAARK poster at the 10th "Building Day: BIM – a challenge for Germany" at Jade University of Applied Sciences, Oldenburg
April 8, 2014	Joint workshop on Linked Data in Architecture and Construction – LDAC 2014
April 8, 2014	DURAARK Semantic Digital Archive approach presented at buildingSMART meeting in Stockholm
May 11, 2014	DURAARK to be presented at Archiving 2014
May 23, 2014	DURAARK Presentation at 3DOR
June 3, 2014	DURAARK's Semantic Digital Observatory approach presented at ESWC
September 8, 2014	DURAARK Showcase in the Digital Preservation Sustainability on the EU policy level workshop
September 12, 2014	DURAARK invites to a workshop "Sustainable Building Information" in Copenhagen November 12, 2014
October 6, 2014	DURAARK presents at GeoBIM Europe
October 30, 2014	DURAARK contribution to PREMIS Implementation Fair
November 6, 2014	DURAARK work makes an impression at ISWC 2014!
November 7, 2014	DURAARK branding itself on Our Digital Memory!

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Table 3 – continued from previous page

Date	Topic
November 17, 2014	Sustainable Building Information Workshop 12. November 2014 – Copenhagen – Presentations Online

Table 3: Joint activities in DURAARK in Year 2

## 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 LUH (L3S/TIB)

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

What	How	When	Who	Why
Oldenburger Bau- tage 2014	Poster, short article in conference report, Michelle Lindlar, Hedda Saemann	March 2014, Oldenburg, Germany	Researchers, Architects, Engineers	Presentation wall with general DURAARK poster and flyers, short article in conference report "Das EU Projekt DURAARK – Forschung zur langfristigen Auf- bewahrung von 3D Daten aus der Architektur"

continues on next page...

Table 4 – continued from previous page

What	How	When	Who	Why
What's all the data about – profiling and linking of Web datasets at LIRRM	Presentation, Stefan Dietze	March 27, Montpellier France	Semantic Web, Linked Data and general Web Technologies communities (academia & industry)	<a href="#">Slides<sup>21</sup></a>
The 23rd International World Wide Web Conference	Paper submission, Besnik Fetahu, Stefan Dietze, Bernardo Pereira Nunes, Marco Antonio Casanova, Davide Taibi, Wolfgang Nejdl	April 7-11 2014, Coex, Gangnam, Seoul, Korea	Semantic Web, Linked Data and general Web Technologies communities (academia & industry)	What's all the data about?: creating structured profiles of linked data on the web
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		Understanding Malicious Behavior in Crowdsourcing Platforms: The Case of Online Surveys  <a href="#">Slides<sup>22</sup></a>

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<sup>21</sup><http://de.slideshare.net/stefandietze/whats-all-the-data-about-linking-and-profiling-of-linked-datasets>

<sup>22</sup><http://de.slideshare.net/stefandietze/whats-all-the-data-about-linking-and-profiling-of-linked-datasets>



Table 4 – continued from previous page

What	How	When	Who	Why
Archiving <sup>23</sup>	Paper submission and presentation, Lindlar, M., and Tamke, M.	May 13-16 2014, Berlin Germany	Cultural Heritage, Digital Preservation Community	A Domain-driven Approach to Digital Curation and Preservation of 3D Architectural Data — Stakeholder Identification and Alignment in the DURAARK project  <a href="#">Paper<sup>24</sup></a> <a href="#">Slides<sup>25</sup></a>
From data to knowledge at KEYSTONE Working Groups meeting	Presentation, Stefan Dietze	May 25, Hersonissos, Crete, Greece		<a href="#">Slides<sup>26</sup></a>
11th International Conference, ESWC 2014 <sup>27</sup>	Paper submission, and presentation, Besnik Fetahu, Stefan Dietze, Bernardo Pereira Nunes, Marco Antonio Casanova, Davide Taibi, Wolfgang Nejdl	May 25-29 2014, Anissaras, Crete, Greece	Semantic Web, Linked Data and general Web Technologies communities (academia & industry)	A Scalable Approach for Efficiently Generating Structured Dataset Topic Profiles  <a href="#">Paper<sup>28</sup></a> <a href="#">Slides<sup>29</sup></a>

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<sup>23</sup><http://www.imaging.org/ist/conferences/archiving/><sup>24</sup>[http://duraark.eu/wp-content/uploads/2014/06/DURAARK\\_Archiving\\_2014\\_paper.pdf](http://duraark.eu/wp-content/uploads/2014/06/DURAARK_Archiving_2014_paper.pdf)<sup>25</sup><http://de.slideshare.net/lindlar/a-domaindriven-approach-to-digital-curation-and-preservation-of-3d-architectural-data-stakeholder-identification-and-alignment-in-the-duraark-project><sup>26</sup><http://www.keystone-cost.eu/keystone/wp-content/uploads/2014/04/keystone-datasetprofiling-dietze.pdf><sup>27</sup><http://2014.eswc-conferences.org/><sup>28</sup>[http://link.springer.com/chapter/10.1007%2F978-3-319-07443-6\\_35](http://link.springer.com/chapter/10.1007%2F978-3-319-07443-6_35)<sup>29</sup><http://www.slideshare.net/BesnikFetahu/a-scalable-approach-for-eciently-generating-structured-dataset-topic-proles>

Table 4 – continued from previous page

What	How	When	Who	Why
6th International Conference on Qualitative and Quantitative Methods in Libraries <sup>30</sup>	Presentation, Michelle Lindlar, Martin Tamke, Morten Myrup Jensen, Henrik Leander Evers	May 27-30 2014 Istanbul, Turkey	Michelle, Martin	Quality criteria for architectural 3D data in usage and preservation processes  <a href="#">Slides<sup>31</sup></a>
Nestor Praktikerntag(German Competence Network for Digital Preservation) <sup>32</sup>	Poster, Michael Panitz	June 2014, Hannover, Germany	Digital curation and preservation community	Short lightning talk and presentation wall with general DURAARK poster and flyers
Rosetta Advisory Group Meeting	Part of presentation, Thomas Bähr, Michelle Lindlar	June 2014, Jerusalem, Israel	Rosetta user community, digital preservation and user community	Short introduction to the DURAARK project as part of the general TIB digital preservation presentation
CIDOC 2014 - Annual conference of the International Committee for Documentation / the International Council of Museums	Paper and presentation, Michelle Lindlar, Hedda Saemann	September 2014, Dresden, Germany	Cultural heritage community	The DURAARK Project – Long-Term Preservation of Architectural 3D-Data  <a href="#">Paper<sup>33</sup></a>
Digital Specimen	Poster, Michelle Lindlar, Michael Pantiz	September 2014, Berlin, Germany	3D scanning in museum / cultural heritage context	Curating and Preserving Architectural 3D data: the DURAARK project
7th Wildauer Library Symposium	Presentation, Michael Panitz, Michelle Lindlar, Peter Löwe	September 2014, Wildau, Germany	Library community	Digital Preservation of 3D research data (Presentation in German Language)

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<sup>30</sup><http://www.isast.org/><sup>31</sup><http://de.slideshare.net/lindlar/qqml-lindlar-final><sup>32</sup><http://www.langzeitarchivierung.de><sup>33</sup>[http://www.cidoc2014.de/images/sampled/data/cidoc/papers/L-1\\_Lindlar-Saemann\\_paper.pdf](http://www.cidoc2014.de/images/sampled/data/cidoc/papers/L-1_Lindlar-Saemann_paper.pdf)

Table 4 – continued from previous page

What	How	When	Who	Why
5th International Conference on Knowledge Engineering and Semantic Web (KESW2014)	Keynote by Stefan Dietze on Data Linking and Profiling	September 2014, Kazan, Russia	Semantic Web, Knowledge Representation, Linked Data Community	Keynote on Linking and Profiling Linked Data <a href="#">Slides</a> <sup>34</sup>
25th International Conference on Database and Expert Systems Applications (DEXA 2014) <sup>35</sup>	Paper submission, Fisichella, M., Ceroni, A., Deng, F., and Nejdl, W.	September 1-5 2014, Munich Germany		Predicting pair similarities for near-duplicate detection in high dimensional spaces
PREMIS Implementation Fair	Presentation and discussion contribution, Michelle Lindlar	October 2014, Melbourne, Australia	PREMIS user community, PREMIS editorial board	Presentation and discussion of questions regarding PREMIS implementation in DURAARK workbench - contribution of use cases for upcoming PREMIS v3
11th International Conference on Digital Preservation (iPRES 2014)	Paper and presentation, Michelle Lindlar	October 2014, Melbourne, Australia	Digital preservation community	Building Information Modeling – A Game Changer for Interoperability and a Chance for Digital Preservation of Architectural Data?
13th International Semantic Web Conference (ISWC 2014) <sup>36</sup>	Demo submission, Besnik Fetahu, Ujwal Gadiraju, Stefan Dietze	October 19-23, 2014, Riva del Garda, Italy		Crawl Me Maybe: Iterative Linked Dataset Preservation
13th International Semantic Web Conference (ISWC 2014) <sup>37</sup>	Poster submission, Ujwal Gadiraju, Ricardo Kawase, Stefan Dietze	October 19-23, 2014, Riva del Garda, Italy		Extracting Architectural Patterns from Web Data

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<sup>34</sup><http://de.slideshare.net/stefandietze/turning-data-into-knowledge-kesw2014-keynote><sup>35</sup><http://www.dexa.org/node/72><sup>36</sup><http://iswc2014.semanticweb.org/><sup>37</sup><http://iswc2014.semanticweb.org/>

Table 4 – continued from previous page

What	How	When	Who	Why
2nd Data Management Workshop	Poster	November 2014, Cologne, Germany	Research Data Management	Curating and Preserving Architectural 3D Data – Meeting Stakeholder Needs Along and Past a Building's Lifecycle  <a href="#">Slides<sup>38</sup></a>

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

## 6.2 UBO

The dissemination activities of UBO during year 2:

What	How	When	Who	Why
Eurographics Workshop on 3D Object Retrieval (3DOR) <sup>39</sup>	Paper submission, Ochmann, S., Vock, R., Wessel, R., and Klein R.	April 6, 2014, Strasbourg France	Computer Graphics community	Towards the Extraction of Hierarchical Building Descriptions from 3D Indoor Scans  <a href="#">Paper<sup>40</sup></a> <a href="#">Slides<sup>41</sup></a>
Geospatial World <sup>42</sup>	Paper submission, Tamke, M., Ochmann, S., and Meunier, J.	August 2014	Geospatial Community	Deriving architectural information from point clouds  <a href="#">Paper<sup>43</sup></a>

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<sup>38</sup><http://www.tr32db.uni-koeln.de/workshops/poster.php?wsID=4>

<sup>39</sup><http://3dor2014.ensea.fr/>

<sup>40</sup><https://diglib.org/handle/10.2312/3dor.20141054.085-092>

<sup>41</sup>[http://cg.cs.uni-bonn.de/aigaion2root/attachments/3dor2014\\_presentation.pdf](http://cg.cs.uni-bonn.de/aigaion2root/attachments/3dor2014_presentation.pdf)

<sup>42</sup><http://geospatialworld.net/>

<sup>43</sup><http://geospatialworld.net/Paper/Technology/ArticleView.aspx?aid=31078>

Table 5 – continued from previous page

What	How	When	Who	Why
eCAADe Conference <sup>44</sup>	Paper submission, Tamke, M., Blümel, I., Ochmann, S., Vock, R., and Wessel, R.	September 10-12 2014, Newcastle England	Architecture, Engineering & Construction community	From Point Clouds to Definitions of Architectural Space  <a href="#">Paper<sup>45</sup></a>
9th International Workshop on Vision, Modeling and Visualization (VMV 2014) <sup>46</sup>	Paper submission, Tim Golla, Christopher Schwartz, Reinhard Klein	October 2014, Darmstadt, Germany	Computer Graphics community	Towards efficient online compression of incrementally acquired point clouds  <a href="#">Paper<sup>47</sup></a>
Computer Graphics International (CGI) 2015 <sup>48</sup>	Paper submission, Ochmann, S., Vock, R., Wessel, R., and Klein R.	June 2015, Strasbourg, France	Computer Graphics community	Automatic Reconstruction of Building Information Models from Indoor Point Clouds <i>Currently under review</i>

Table 5: The dissemination activities of UBO during year 2

<sup>44</sup><http://www.ecaade.org/conference><sup>45</sup>[http://cumincad.scix.net/cgi-bin/works/Show?\\_id=ecaade2014\\_138&sort=](http://cumincad.scix.net/cgi-bin/works/Show?_id=ecaade2014_138&sort=DEFAULT&search=series%3aecaade%20year%3a2014&hits=132)

DEFAULT&amp;search=series%3aecaade%20year%3a2014&amp;hits=132

<sup>46</sup><http://www.vmv2014.de/><sup>47</sup><http://diglib.eg.org/handle/10.2312/vmv.20141271.017-022><sup>48</sup><http://cgi2015.unistra.fr/>

### 6.3 FhA

The dissemination activities of FhA during year 2:

What	How	When	Who	Why
3D-ARCH'2015 – 6th International Workshop on 3D Virtual Reconstruction and Visualization of Complex Architectures <sup>49</sup>	Paper submission, 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  <a href="#">Paper</a> <sup>50</sup>
Article in the annual Fraunhofer report	Hecher, M Eggeling, E	March 2014	General public, research and industrial partners	Spreading information about the DURAARK project

Table 6: The dissemination activities of FhA during year 2

### 6.4 CITA

The dissemination activities of CITA during year 2:

What	How	When	Who	Why
6th International Conference on Qualitative and Quantitative Methods in Libraries <sup>51</sup>	Presentation, Michelle Lindlar, Martin Tamke, Morten Myrup Jensen, Henrik Leander Evers	May 27-30 2014, Istanbul, Turkey	Archival and Cultural Heritage Community	Quality criteria for architectural 3D data in usage and preservation processes  <a href="#">Slides</a> <sup>52</sup>

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<sup>49</sup><http://www.3d-arch.org/>

<sup>50</sup><http://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-5-W4/131/2015/isprsarchives-XL-5-W4-131-2015.html>

<sup>51</sup><http://www.isast.org/>

<sup>52</sup><http://de.slideshare.net/lindlar/qqml-lindlar-final>

Table 7 – continued from previous page

What	How	When	Who	Why
Geospatial World Magazine <sup>53</sup>	Paper submission, Aage Normolle, Tamke, M.	July 2014	Geospatial Community	Laser Scanning/Case Study: Building the Old Carlsberg  Paper <sup>54</sup>
Geospatial World Magazine <sup>55</sup>	Paper submission, Tamke, M., Ochmann, S., and Meunier, J.	August 2014	Geospatial Community	DURAARK – Deriving architectural information from point clouds  Paper <sup>56</sup>
eCAADe Conference <sup>57</sup>	Paper submission, Tamke, M., Blümel, I., Ochmann, S., Vock, R., and Wessel, R.	September 10-12 2014, Newcastle, Great Britain	Architecture, Engineering & Construction community	From Point Clouds to Definitions of Architectural Space  Paper <sup>58</sup>
eCAADe Conference <sup>59</sup>	Paper submission, Tamke, M., Jensen, M. M., Beetz, J., Krijnen, T., and Edvardsen D. F.	September 10-12 2014, Newcastle, Great Britain	Architecture, Engineering & Construction community	Building Information Deduced State and potentials for Information query in Building Information Modelling  Paper <sup>60</sup>

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<sup>53</sup><http://geospatialworld.net/><sup>54</sup><http://geospatialworld.net/Magazine/MArticleView.aspx?aid=31060><sup>55</sup><http://geospatialworld.net/><sup>56</sup><http://geospatialworld.net/Paper/Technology/ArticleView.aspx?aid=31078><sup>57</sup><http://www.ecaade.org/conference><sup>58</sup>[http://cumincad.scix.net/cgi-bin/works/Show?\\_id=ecaade2014\\_138&sort=DEFAULT&search=tamke%202014&hits=443](http://cumincad.scix.net/cgi-bin/works/Show?_id=ecaade2014_138&sort=DEFAULT&search=tamke%202014&hits=443)<sup>59</sup><http://www.ecaade.org/conference><sup>60</sup>[http://cumincad.scix.net/cgi-bin/works/Show?\\_id=ecaade2014\\_141&sort=DEFAULT&search=tamke%202014&hits=443](http://cumincad.scix.net/cgi-bin/works/Show?_id=ecaade2014_141&sort=DEFAULT&search=tamke%202014&hits=443)

Table 7 – continued from previous page

What	How	When	Who	Why
GeoBIM <sup>61</sup>	Presentation, Martin Tamke	November 19-20 2014, Amsterdam	Policy makers from European Building Industry & Surveillance	Linkage with Policy-makers on european level. Contacts to Manufacturers of 3d scanning devices and processes, feedback on DURAARK development  <a href="#">Video</a> <sup>62</sup>
Sustainable Building Information Workshop	Presentations by Martin Tamke, Jacob Beetz, Michelle Lindlar, Richard Vock, Dag Fjeld Edvardsen, Thomas Krijnen	November 12 2014	Stakeholders from Institutional Building Owners, Archives and FM related software developers	Evaluation and feedback on DURAARK development  <a href="#">More information</a> <sup>63</sup>
3D-workshop at Landinspektörernes Fagligt Møde 2015	Martin Tamke, Henrik Leander Evers	January 30-31 2015, Nyborg Strand	500 participants from Geospatial Community of Danmark	Demonstration and evaluation of developed processes with BIM and point-clouds  <a href="#">Event</a> <sup>64</sup>

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<sup>61</sup><http://www.geo-bim.org/Europe/><sup>62</sup><http://www.youtube.com/watch?v=ZhXfQObVasw&index=24&list=PLfxkJ62iIzmTUOFmmZdqtfDTSB-J-b0yz><sup>63</sup><http://www.duraark.eu/sustainable-building-information-workshop-12-november-2014-copenhagen-presentations-online/><sup>64</sup><http://www.xn--landinspektren-0qb.dk/fagligt/fagligt-moede-2015/fagligt-moede-2015>



Table 7 – continued from previous page

What	How	When	Who	Why
Book publication "Architecture Information Modeling", chapter "Point Taken", on invitation of editor Danelle Briscoe, Publisher Routledge	Martin Tamke, Sebastian Ochmann	Scientific book publication, Publisher Routledge, expected date 2015	Architecture, Engineering & Construction community	The book presents DURAARK in the context of other speculative research projects with a focus on the USA
In addition to the above activities, CITA had several meetings with architects, engineers, building owners, land surveyors, representatives from policy makers.				

Table 7: The dissemination activities of CITA during year 2

## 6.5 LTU

The dissemination activities of LTU during year 2:

What	How	When	Who	Why
Joint SCAPE and APARSEN workshop at the TPD Conference <sup>65</sup>	Presentation	September 8 2014, London, Great Britain	Research community within long-term digital preservation	Preservation of 3D objects of buildings <a href="#">Slides</a> <sup>66</sup>
D3D <sup>67</sup> Workshop	Workshop	November 25, 2014 at the National Archives in Stockholm	Partners of the D3D pre-study	This was a project meeting with the D3D partners. Since D3D is based on the results of the DURAARK project, so discussion centered around individual outcomes from DURAARK.

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<sup>65</sup><http://www.scape-project.eu/news/dl2014-workshop>

<sup>66</sup><http://www.slideshare.net/netsoxx/preservation-of-3-d-objects-of-buildings>

<sup>67</sup>See Section 7.1

Table 8 – continued from previous page

What	How	When	Who	Why
Presentation flyer for DURAARK	Presentation material	November, 2014		A new version of the flyer was made, reflecting new events and findings in the project.
Workshop at "FRÖN <sup>68</sup> Forum"	Workshop	January 15, 2015 Stockholm	Members of several FRÖN projects	The agenda of this workshop was to identify project ideas to develop. DURAARK was presented together with D3D.  <a href="#">More information [sv]<sup>69</sup></a> <a href="#">More information [en]<sup>70</sup></a>

Table 8: The dissemination activities of LTU during year 2

## 6.6 Catenda

The dissemination activities of Catenda during year 2:

What	How	When	Who	Why
Product Info exchange meeting (PIX)	Meeting	January 29-30 2014, Oslo, Norway	Lars Bjørkhaug	Spreading information about the DURAARK goal and process
BuildingSMART conference	Conference	March 17-20 2014, Stockholm, Sweden	Lars Bjørkhaug	Spreading information about the DURAARK goal and process
Product Info exchange meeting (PIX)	Meeting	April 23-24 2014, Berlin, Germany	Lars Bjørkhaug	Spreading information about the DURAARK goal and process

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<sup>68</sup>The swedish word FRÖN literally means The SEEDS, see Section 7.1

<sup>69</sup><http://www.vinnova.se/sv/Var-verksamhet/Innovationsformaga-hos-specifika-malgrupper/Innovationskraft-i-offentlig-verksamhet/FRON--okad-innovation-i-offentlig-verksamhet/>

<sup>70</sup><http://www.vinnova.se/en/>

Table 9 – continued from previous page

What	How	When	Who	Why
BIM network Østfold Norway ( <i>meeting with industry organisations and companies</i> )	Meeting	May 07-08 2014, Norway	Lars Bjørkhaug	Spreading information about the DURAARK goal and process
PlanBIM UK meeting BRE	Meeting	May 23-24 2014, Watford, Great Britain	Lars Bjørkhaug	Spreading information about the DURAARK goal and process
Product Info exchange meeting (PIX)	Meeting	October 8-9 2014, Bussels, Belgium	Lars Bjørkhaug	Spreading information about the DURAARK goal and process
BuildingSMART conference	Conference	October 16-30 2014, Toronto, Canada	Lars Bjørkhaug	Spreading information about the DURAARK goal and process
In addition to the activities listed above, Catenda has presented DURAARK in all our meetings with the industry in Norway and abroad.				

Table 9: The dissemination activities of Catenda during year 2

## 6.7 TUE

The dissemination activities of TUE during year 2:

What	How	When	Who	Why
Linked Data in Architecture and Construction Workshop <sup>71</sup>	Workshop co-organisation, presentation, standardisation, coordination	May 26-27 2014, Helsinki, Finland	Architecture, Engineering & Construction community, Linked Data community, EU projects	<a href="#">Report<sup>72</sup></a>

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<sup>71</sup><http://linkedbuildingdata.net/events/ldac2014/>

<sup>72</sup><http://linkedbuildingdata.net/wp-content/uploads/2014/05/LDACworkshopreport.pdf>

Table 10 – continued from previous page

What	How	When	Who	Why
Joint ICCCBE and CIB W78 and conferences 2014 <sup>73</sup>	Paper, Beetz, J.	June 23-25 2014, Orlando Florida	Architecture, Engineering & Construction community	A framework for a scalable network of concept libraries using distributed graph databases.  <a href="#">Paper<sup>74</sup></a>
eCAADe Conference <sup>75</sup>	Paper submission, Tamke, M., Jensen, M. M., Beetz, J., Krijnen, T., and Edvardsen D. F.	September 10-12 2014, Newcastle, Great Britain	Architecture, Engineering & Construction community	Building Information Deduced State and potentials for Information query in Building Information Modelling <i>Proceedings of the 32nd eCAADe Conference</i>

Table 10: The dissemination activities of TUE during year 2

<sup>73</sup><http://128.227.160.197/icccb2014/><sup>74</sup><http://dx.doi.org/10.1061/9780784413616.071><sup>75</sup><http://www.ecaade.org/conference>

## 7 Clustering and associated partners

### 7.1 Clustering with projects

#### Digital 3Dimensional objects for reuse (D3D)<sup>76</sup>

D3D is a planning project (a pre-study project), partly financed by VINNOVA<sup>77</sup> under the programme "SEEDS — For greater innovation in public funding".

The pre-study project started in August 2014 and runs until March 2015, resulting in a project proposal.

The goal with D3D is an application and a project plan adapting DURAARK processes and tools for preservation of 3-dimensional objects of buildings for future reuse in property and heritage for Swedish stakeholders. Hamid Rofogaran of LTU is so far participating in this work.

#### District Information Modelling and Management for Energy Reduction (DIMMER)<sup>78</sup>

The DIMMER system integrates BIM and district level 3D models with real-time data from sensors and user feedback to analyse and correlate buildings utilisation and provide real-time feedback about energy-related behaviours. It allows open access with personal devices and Augmented Reality (A/R) visualisation of energy-related information to client applications for energy and cost-analysis, tariff planning and evaluation, failure identification and maintenance, energy information sharing.

#### Distributed Transactional Building Information Management (DRUM)<sup>79</sup>

DRUM develops software to make building information modelling (BIM) more usable in practical building projects. The semi-open, heterogeneous, and fragmented nature of building projects as well as the contractual boundaries, need to protect expertise, and the danger of legal disputes makes the naive notion of a centralised

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<sup>76</sup><http://www.vinnova.se/sv/Resultat/Projekt/Effekta/2012-01393/D3D---Digitala-3Ddimensionella-objekt-for-ateranvandning/> [sv]

<sup>77</sup>VINNOVA is Sweden's innovation agency – <http://www.vinnova.se/en/> – and is a major funder of needs-driven research

<sup>78</sup><http://dimmer.polito.it/project>

<sup>79</sup>[http://cse.aalto.fi/en/research/groups/distributed\\_systems/projects/drum](http://cse.aalto.fi/en/research/groups/distributed_systems/projects/drum)

BIM database unrealistic. Instead, there is a need for distributed information management solutions that recognise the reality that BIM consists of multiple partial models (e.g., architectural model, structural model, mechanical model, construction process) that have complex relationships (one model being an elaboration of another, two models having spatial clashes, and so on).

These are good arguments for the use of semantic information to interconnect distributed archives.

### **ForgetIT<sup>80</sup>**

ForgetIT deals with the urgent problem of selecting web data and knowledge for preservation as well as targeted "forgetting". The topic is of high relevance for DURAARKs preservation efforts and we are planning research collaborations and joint publications.

L3S and LTU are participating in both ForgetIT and DURAARK.

### **KNOWeSCAPE<sup>81</sup>**

KNOWeSCAPE is a European COST Action dealing with the mapping, discovery and analysis of knowledge across the web. KNOWeSCAPE tackles this urgent problem through networking.

DURAARK coordinator Stefan Dietze has earlier given an invited talk where he introduced DURAARK.

### **ready4SmartCities<sup>82</sup>**

The READY4SmartCities project intends to increase awareness and interoperability for the adoption of ICT and semantic technologies in energy system to obtain a reduction of energy consumption and CO2 emission at smart cities communities level through innovative relying on RTD and innovation outcomes and ICT-based solutions.

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<sup>80</sup><http://www.forgetit-project.eu/en/start/>

<sup>81</sup><http://knowescape.org>

<sup>82</sup><http://www.ready4smartcities.eu/home>

The goal of the project is to support:

A new energy data ecosystem that will accommodate cross-domain data (climatic, occupation, pollution, traffic, activity, etc.) and will allow the exploitation of such data at a global scale; by identifying the set of ontologies relevant to energy-efficiency in Smart Cities and the different requirements and guidelines on how to use (publish and interchange) data described according to those ontologies.

By allowing feasible step-by-step action plans for city authorities and other relevant stakeholder groups to develop and use ICT-based solutions for energy system in urban and rural communities towards future Smart Cities, the vision of the project is that this will lead to reduced energy consumption and CO2 emissions.

### **Timeless Business Processes and Services (TIMBUS)<sup>83</sup>**

The TIMBUS project focuses on resilient business processes. It will make the execution context, within which data is processed, analysed, transformed and rendered, accessible over long periods. TIMBUS considers the dependencies on third-party services, information and capabilities that will be necessary to validate digital information in a future usage context – continued accessibility is otherwise often considered as a set of activities carried out in the isolation of a single domain.

TIMBUS will deliver activities, processes and tools that ensure continued access to services and software to produce the context within which information can be accessed, properly rendered, validated and transformed into knowledge.

Andreas Rauber, who is part of the TIMBUS Project Coordination Committee, is also a member of the DURAARK Advisory Board.

### **Tools & Expertise for 3D Collection Formation (3D-COFORM)<sup>84</sup>**

The over-riding aim of the 3D-COFORM consortium is to establish 3D documentation as an affordable, practical and effective mechanism for long term documentation of tangible cultural heritage. In order to make this happen the consortium is highly conscious that both the state of the art in 3D digitisation and the practical aspects of deployment in the sector must be addressed. Hence 3D-COFORM proposes an ambitious program of technical research, coupled with practical exercises and

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<sup>83</sup><http://timbusproject.net>

<sup>84</sup><http://www.3d-coform.eu>

research in the business of 3D to inform and accelerate the deployment of these technologies to good effect.

The DURAARK consortium is especially interested in capture methods, modelling tools and data formats, and information to be kept in the metadata for ingest to repository – results that we seek to reuse.

## 7.2 Associated companies and organisations

<b>AG Digital Reconstruction</b>	<a href="http://www.digitale-rekonstruktion.info/">http://www.digitale-rekonstruktion.info/</a>
<p>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.</p> <p>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.</p> <p>DURAARK coordinator Stefan Dietze had a meeting with representatives and will join their next work group meeting.</p>	
<b>Alliance Permanent Access to the Records of Science in Europe Network (APARSEN)</b>	<a href="http://www.alliancepermanentaccess.org/index.php/aparsen">http://www.alliancepermanentaccess.org/index.php/aparsen</a>
<p>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.</p> <p>During Year 2, DURAARK participated in a workshop they organised at the TPDF Conference<sup>85</sup> in London. See Table 8 for more information.</p>	

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<sup>85</sup><http://www.scape-project.eu/news/dl2014-workshop>



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<b>buildingSMART</b>	<a href="http://www.buildingsmart.org">http://www.buildingsmart.org</a>
<p>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.</p> <p>Thomas Liebich, who is active within buildingSMART is a member of the DURAARK Advisory Board.</p>	
<b>Bygningsstyrelsen Denmark</b>	<a href="http://www.bygst.dk">http://www.bygst.dk</a>
<p>The Danish Building &amp; 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.</p>	
<b>COWI Engineers</b>	<a href="http://www.cowi.com">http://www.cowi.com</a>
<p>The COWI Group is an international consulting group, specialising in engineering, environmental science and economics, based in Lyngby, Denmark.</p> <p>It has been involved in more than 50,000 projects in 175 countries and has over 6,000 employees, including engineers, biologists, geologists, economists, surveyors, anthropologists, sociologists and architects.</p>	
<b>Dalux</b>	<a href="http://dalux.com">http://dalux.com</a>
<p>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 its customers.</p> <p>Dalux contributed to the Copenhagen workshop described in Section 4.3 and presented their software offering to the participants.</p>	

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<b>CUNECO</b> <sup>86</sup> , <b>BIPS</b> <sup>87</sup>	<a href="http://cuneco.dk/english">http://cuneco.dk/english</a> <a href="http://bips.dk/">http://bips.dk/</a>
<p>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.</p> <p>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.</p>	
<b>Krydsrum Architects</b>	<a href="http://www.krydsrum.dk">http://www.krydsrum.dk</a>
<p>Krydsrum is a renowned Danish architectural firm whose tasks range from architecture to design – in both the public, commercial and private sectors.</p> <p>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.</p>	
<b>Købehavns Ejendomme</b> <sup>88</sup>	<a href="http://www.kejd.dk">http://www.kejd.dk</a>
<p>Købehavns Ejendomme is part of Copenhagen Finance Department and was established in 2005 as a merger of the estate professional activities in the municipality.</p> <p>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.</p>	

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<sup>86</sup>The centre for productivity in construction

<sup>87</sup>BIPS is ”byggeri – informationsteknologi – produktivitet – samarbejde”, which is danish for building industry, information technology, productivity and collaboration

<sup>88</sup>In english: ”Copenhagen Property”

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<b>LE34, Landmålergården</b>	<a href="http://www.le34.dk">http://www.le34.dk</a> <a href="http://www.le34.dk/lmg">http://www.le34.dk/lmg</a>
<p>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.</p> <p>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 shall pursue and will partake in case studies and evaluation of the developed approaches.</p>	
<b>MIT – FACADE</b>	<a href="http://libraries.mit.edu/news/facade-project/457/">http://libraries.mit.edu/news/facade-project/457/</a>
<p>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.</p>	
<b>Plan3D</b>	<a href="http://www.plan3d.com/pages/home.aspx">http://www.plan3d.com/pages/home.aspx</a>
<p>The Berlin based scanning company is supporting the DURAARK project with datasets from their 3D laser scanning practice and insights in their processes.</p> <p>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.</p>	
<b>Technical University of Denmark (DTU)</b>	<a href="http://www.dtu.dk/english">http://www.dtu.dk/english</a>
<p>DTU was founded in 1829 and is today providing education in various programmes and doing research in many fields.</p> <p>Interesting from a DURAARK viewpoint is that the university manages a number of facilities distributed over different geographic locations.</p>	

Table 11: Companies and organisations that have expressed a direct interest in the DURAARK project

Table 11 lists commercial companies and organisations expressing a direct interest in cooperating 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 on workshops organised by the consortium or by giving presentations.

## 8 Standardisation

### 8.1 Contribution to OpenBIM standardisation in buildingSMART standardisation body

The buildingSMART organisation is an international standardisation body focused on specification of interoperability agreements in the fields of Architecture, Engineering, Construction and Facility Management (AEC/FM). Established as a spin-off of the ISO 10303 family of standards referred to as STEP (STandard for the Exchange of Product models) the organisation currently hosts the most relevant open interoperability standards in the building and construction industry:

- The Industry Foundation Classes (**IFC**) data model which has been extensively described in earlier deliverables across all work packages. IFC instances are the main information carrier for long term preservation of Building Information Models in the context of the DURAARK project<sup>89</sup>.
- The International Framework for Dictionaries (IFD, ISO 12006) as concept and vocabulary structure originally intended for the homogeneous organisation of the various classification standards. A reference implementation and population of concepts officially hosted and supported by the organisation is the buildingSMART Data Dictionary (**bsDD**). The development of the framework as well as the production servers are currently hosted by DURAARK consortium partner Catenda. In the context of the DURAARK project, the bsDD is extensively used for the semantic enrichment of ingested models and their meta data. Detailed descriptions of the framework itself as well as the enrichment can be found in earlier deliverables of WP3.
- The Information Delivery Manual (**IDM**) and Model View Definition (**MVD**) standards for the structured, process-based exchange of data models and further requirements formulations. For the formal descriptions of information required during the exchange of information for the purposes of archiving, experiments have been conducted in the context of the DURAARK project to develop a dedicated MVD for archival purposes similar to e.g. the PDF/A profile. While theoretically desirable and technically feasible the effort has been considered unrealistic in current business

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<sup>89</sup>besides E57

practice. The preliminary results however will be submitted to the buildingSMART organisation for future standardisation efforts.

- The Building Collaboration Format (**BCF**) for the formalised exchange and management of issues (e.g. defects during construction, model clashes etc.). In future DLP scenarios this could be used in the context of reporting checking results based on an 'IFC/A MVD' during the ingest of IFC files.

The formal procedure to propose new standards to buildingSMART includes significant promotion work in the community, gathering of support and presentations during the international technical summits including the respective sub-groups and committees of the organisation such as ISG (Implementer Support Group), IUG (International User Group), MSG (Model Support Group), TAG (Technical Advisory Group) and – most importantly for technical specifications – ITM (International Technical Management). Throughout the DURAARK project such promotion of the foreground has been done contentiously during several meetings. To increase the success of the standardisation efforts, the highest ranking technical buildingSMART member (Thomas Liebich, AEC3) has been successfully invited to the DURAARK board. During DURAARK meetings and workshops the DURAARK progress and (intermediary) results have been presented on several occasions and feedback has been incorporated into succeeding R&D efforts. The contributions of the DURAARK project to the standardisation efforts of the buildingSMART organisation are focused on a number of areas with varying degrees of impact which are described in the following overview:

**Exposing and maintaining bSDD as Linked Data and mapping it to other vocabularies.** For the preservation of semantically rich models, the use of external references from within IFC instances is expected to rise in the future. To allow a complete preservation of the entire model including its external references, the choice to transform the bSDD into RDF has been made in the context of the DURAARK project. The resulting RDF version of the bSDD has been presented to the bSDD working group during the buildingSMART international meeting in Stockholm in 2014. Since then it has been used by the community for a number of mapping processes, duplication detections, performance evaluations and a number of experiments.

The complete endorsement of the RDF version of the bSDD is currently held up

by conflicts with potential business models of the buildingSMART organisation. Currently, the visions favoured by the leaders of this community is to re-finance the developments through use fees of member organisation chapters and individual businesses and stakeholders that would like to use the vocabularies. If published and exposed under permissive licenses like in the context of the Linked Open Data movement – as is strongly suggested by the DURAARK project and other members of the community – these business models would have to be reconsidered and re-arranged. Note that licensing and pay-per-use models are also technically suitable for Linked Data. The DURAARK consortium will continue to promote these approaches throughout and beyond the lifecycle of the project. To this end, members of the consortium regularly participate in the bi-weekly conference calls of the bSDD working group.

**Integration of (compressed) Point Cloud structures in future versions of the IFC core schema.** Although only starting in year 3 of the DURAARK project, the efforts envisaged in the project description and DOW to develop a point cloud extension to the existing core schema of the IFC model has been promoted in the buildingSMART community even before the official start of the DURAARK project during an International Technical Meeting in Tokyo in November 2012. It was embraced unanimously by the community since it has been a long-standing item on the agenda and strategic visions for the buildingSMART organisation. Early conceptual approaches have already been discussed and preliminary experiments have been carried out. However the peak of these efforts is focused in year 3.

**Standardisation and promotion of the use of RDF serialisations of (distributed) IFC models as Linked Data.** Although it is not expected to be used on a broad scale within the next few years, capturing and storing building information models as Linked Data is on the strategic agenda of the buildingSMART organisation. The topic has also been frequently identified as a future item in many research roadmaps (including those of the European Union) and in scientific literature. A number of attempts to add RDF/OWL serialisation on a generic level spanning all industry domains within the STEP initiative, similar to the part 28 of the ISO 10303 (which specifies the serialisation of STEP models in XML data formats) have been undertaken over the years<sup>90</sup> but never managed to gain signif-

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<sup>90</sup>examples include the <http://exff.org> initiative

icant traction in the respective standardisation committees. Partially, this can be attributed to the very early effort that was made before RDF and Linked Data had gained wide-spread acceptance across many IT application and interoperability domains. Early attempts to promote such approaches have been made by DURAARK consortium members in the context of the buildingSMART standardisation community as well as in the EU FP6 project "Inteligrid"<sup>91</sup>. Results, demonstrators and use cases have been developed further over the years including the examples developed in the DURAARK context and documented in WP3 deliverables D3.1 and D3.3. DURAARK results are contributing to the efforts in a buildingSMART working group that will be proposing a definite ifcOWL profile to the International Technical Management group during the summit held in March 2015 in London, UK. This will be a significant step towards both facilitating concurrent, collaborative engineering and sustainable digital long term preservation using open formats.

**Model View Definition for archival purposes.** Developments towards creating Model View Definitions / information profiles for archival purposes, will be formally submitted as an MVD specification working group to the respective buildingSMART platforms. In related research and development, partners of the DURAARK consortium have created and tested the first automated checker for formal specifications of MVD requirements in the mvdXML format. The prototypical software has been published as Open Source and has been circulated in the buildingSMART community. As mentioned in the introduction to this section however, the wide-spread support of MVDs apart from the most established ones (e.g. Coordination View) cannot realistically be expected in the immediate future.

## 8.2 WC3 community group for Linked Data in Architecture and Construction

Supported by the workshops organised and co-organised in the context of the DURAARK project (also see section 4) and a broad discussions in a community communicating over a number of different channels such as mailing lists and social media platforms, a W3C community group for "Linked Data in Architecture and Construction" has been formed. The group aims at standardisation efforts for the support of Linked Data technologies

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<sup>91</sup><http://inteligrid.eu-project.info>



in the building and construction sector. As the first primary goal, the submission of a recommendation of a common notation and profile for an OWL/RDF version of the Industry Foundation Classes is under active development. These efforts are carried out in parallel to comparable efforts within the buildingSMART community. Next to members of the DURAARK consortium, active members are involved in other European research and development projects such as DRUM and ready4smartCities.

### 8.3 PREMIS

The editorial committee of the de-facto preservation metadata standard PREMIS hosts PREMIS Implementation fairs, which usually take place in conjunction with the iPRES conferences. The DURAARK project presented the work of the pre-ingest project at the last PREMIS Implementation Fair held in conjunction with the 11th International Conference on Digital Preservation – iPRES 2014. As part of the presentation, questions associated with the nature of archival processes around architectural 3D data and the integration of the pre-ingest workbench into existing digital preservation systems were put forward and discussed. The forthcoming PREMIS v3 will be addressing some of these issues and the DURAARK work is regarded a well-suited use case for the changes included in the new version. [source: McKinney, P., Zierau, E. and Guenther, R. PREMIS Implementation Fair Workshop. In: Proceedings of the 11th International Conference on Digital Preservation. 2014. 306-308]

### 8.4 PRONOM profiles for E57 and IFC-SPF

For the standardised identification of archival data, signature patterns for specific file formats are used and registered across implementation borders of individual LTP tools in the PRONOM registry. In this central registry both PRONOM Unique IDs (PUIDs) per file format and the respective signature patterns (similar to the Unix ‘file’ utility) are maintained. The absence of such profiles for IFC and E57 files has been identified as part of the gap analysis carried out earlier in work packages 2 and 6. A successful standardisation effort of the DURAARK project is the creation, submission and acceptance of such profiles — e57 (`fmt/643`) and IFC-SPF (`fmt/659`) — to the PRONOM registry, which can now be reused in an interoperable and hence sustainable way in future archival tools for the long term preservation of building information models and point cloud scans. Further details can be found in deliverable D6.2.

## 9 Assessment of dissemination for Year 2

This section assesses the dissemination activities of year 2. As reported in Sections 3 to 6, the DURAARK project has been successful in raising awareness through various collective and individual activities. The project partners have published 17 papers, held 14 presentations at conferences, presented 5 posters at conferences, presented one conference keynote and organised 3 workshops in addition to promoting DURAARK at meetings. At the moment, UBO have a journal article under review.

The project website has been developed under the year in order to strengthen our dissemination efforts. The project is striving to keep the website up to date, publishing news and blog entries and linking to papers and presentations. As reported in Section 3.1, we can see a correlation between events and traffic to the project website. This gives us an opportunity to assess the level of interest in what we do and – by scrutinising where the traffic comes from – also an opportunity to assess impact.

As described in Section 3.1, analysis shows that we are penetrating relevant online communities, i.e. we are being linked to from websites used by relevant communities. The project has managed to attain a good level of visibility and attract awareness and interest from the primary stakeholders; especially from organisations representing building owners, real estate managers and cultural heritage institutions, as seen by the participation on workshops organised by the project.

As an example of the interest garnered for our cooperation activities, the workshop held in Copenhagen in November 2014 was successful in attracting delegates and the discussions emanating from the workshop were excellent. The value of being able to present good examples by means of the software artefacts developed in the project cannot be depreciated. They made a good starting point for the discussions around need and utility of the ideas targeted in the DURAARK project. More detailed information about this workshop is available in deliverable D7.3.

The statistics discussed in Section 3.1 regarding traffic to the DURAARK website, indicate that we have a fluctuating number of visitors. We are currently relaying news to social media such as Twitter and Facebook in order to bring together project mem-

bers and the interested general audience. At the moment neither Twitter nor Facebook represents any significant communication channel for DURAARK.

The project needs to monitor this number and apply different strategies to increase the visibility of the website vis-à-vis the number of visitors, followers, and members. For example, there have been some changes in the structure of the website, and consortium partners will increase the tweets by broadcasting all the individual as well as collective events and activities.

Consortium partners can post blog entries on the project web, sharing ideas and comments on issues regarding preservation of the 3D architectural model. The blog provides an opportunity for the partners to discuss the issues beyond regular emails and discussions with the designated communities as well. The blog started at a slow pace – but is picking up momentum. In fact, we have instigated a prize for the best blogger that is awarded in conjunction with face-to-face meetings, in order to stimulate blogging.

Similarly, Wiki and mailing lists have been used internally in the project to form a shared understanding among consortium partners. The platform is also useful for discussing key issues and possible solutions.

The project has a printed flyer that was revised during year 2 in order to make it more understandable for general, scientific, and industrial communities. The flyer was created through active discussion among consortium members. The printed materials briefly summarise the existing problems in the preservation of 3D architectural models and the DURAARK's proposed solutions.

The advisory board in one of our general assembly meetings strongly suggested that there is a need to formulate specific strategies to increase the collaboration with other related projects. This has been partially achieved through individual efforts from project partners. However, this work is ongoing and the effort will be increased substantially during the third year. Our strategy to build a strong community is depending on our success in creating an outreach for the project outcomes. While we seem to succeed in attracting awareness among our primary stakeholders and target groups, we need to reach a critical volume as well. This will have to be a primary focus of WP 8 during the last year of the project.

A general overview of forthcoming dissemination activities are listed in Appendix [A](#).

## 10 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.

### 10.1 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.

### 10.2 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.

### 10.3 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.

## 11 Conclusions and Impact

In this deliverable, we have described activities conducted by partners individually and collectively with regard to dissemination of the project ideas, results, and on-going promotional activities.

The dissemination activities were targeted to three major audiences: general, scientific, and targeted (industrial) audiences. These audiences were addressed through various events such as conferences, seminars, workshops, and promotional materials such as flyers, posters, websites, and social media. The past activities showed that all three audiences were represented in the dissemination activities.

We have made quantitative assessments of impact based on statistics available to us. We have also tried to make qualitative assessments of impact based on feedback borne out of the different dissemination activities. Based on last year's dissemination report, we have had focus on increasing the use of online media in the second year, and also emphasised clustering with other project partners to maximise the result and impact. We can do better – leaving room for betterment for the last year.

The DURAARK project has managed to manifest itself and is producing tangible outcomes with a growing audience. This has demanded targeted efforts in order to penetrate primary target communities and to establish a presence. The interest we see among the stakeholders for the topics covered by DURAARK shows that the project results are of relevance to the community.

As mentioned earlier, it is a primary concern to achieve maximal outreach during the active life time of the project – kick-starting the community-building efforts that we depend on. Year three will be particularly aimed at implementing the exploitation, dissemination and sustainability strategy described in D8.5 to ensure long-term sustainability of project outcomes.

# Appendices



## A Preliminary dissemination actions for year 3

The activities of individual partners – known at this time – are shown in tables, documenting:

- **where** this events or activity is planned (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** is doing the work
- **what** this activity is about

This information is preliminary by it's very nature.

### A.1 LUH (L3S/TIB)

Some preliminary dissemination actions for LUH (L3S/TIB) for year 3:

Where	How	When	Who	What
ESWC2015	Paper	January 2015	Ujwal Gadiraju, Besnik Fetahu, Stefan Dietze	Focused crawling on the Web of Data. It is used for the semantic enrichment component
SIGIR2015	Paper	January 2015	Besnik Fetahu, Ujwal Gadiraju, Stefan Dietze	Entity Retrieval. It is used as part of the semantic enrichment component (coupled together with the focused crawler)
SIGIR2015	Paper	January 2015	Andrea Ceroni, Ujwal Gadiraju, Marco Fisichella	Entity temporal relationship validation
IDCC – 10th International Digital Curation Conference	Poster	February 2015		Presenting the Pre-Ingest workbench to the wider digital curation domain
FOSS4G – Europe 2015	Paper	July 2015		Linking results to geospatial community
iPRES 2015 – 12th International Conference on Digital Preservation	Paper	November 2015		

Table 12: Some preliminary dissemination actions for LUH (L3S/TIB) for year 3

## A.2 UBO

Some preliminary dissemination actions for UBO for year 3:

Where	How	When	What
AEC and / or computer graphics journal	Paper	Mid 2015	Detailed evaluation of IFC generation from point clouds especially regarding stakeholder demands
Computer graphics journal or conference, possibly VMV2015 or SMI2015	Paper	Mid 2015	Dissemination of technical details on difference detection between point clouds and BIM
AEC journal	Paper	Late 2015	Detailed evaluation of difference detection between point clouds and BIM especially regarding stakeholder demands
Computer graphics conference	Paper	Mid/Late 2015	Dissemination of point cloud compression techniques
AEC and / or computer graphics journal	Paper	Late 2015 / Early 2016	Dissemination of technical details on IFC generation from point clouds including multiple building storeys

Table 13: Some preliminary dissemination actions for UBO for year 3

## A.3 CITA

Some preliminary dissemination actions for CITA for year 3:

Where	How	When	What
ecaade	Paper	September 16-18 2015, Vienna	Detailed evaluation of IFC generation from point clouds especially regarding stakeholder demands
acadia	Paper	October 22-25 2015	Description of principal approaches developed in DURAARK, concerning architectural workflows to combine scan and BIM data
Design Modelling Symposium	Paper	September 30 - October 2, 2015, Copenhagen	Introduction of machine learning approaches for BIM assessment
Geo Spatial World Forum	Paper	May 25-29 2015	Developed workflows and potential role of Scan2BIM processes for surveying
3D Documentation Conference 2015	Workshop	May 21-22 2015, Stuttgart Böblingen	Demonstration and evaluation of developed processes with BIM and pointclouds
AEC and / or computer graphics journal	Paper	Late 2015 / Early 2016	Dissemination of technical details on IFC generation from point clouds including multiple building storeys

Table 14: Some preliminary dissemination actions for CITA for year 3

## A.4 LTU

Some preliminary dissemination actions for LTU for year 3:

Where	How	When	Who	What
GeoBIM at INSPIRE-GWF	Presentation	May 25-29 2015, Lisbon Congress Centre, Portugal	All interested partners	Presenting DURAARK
Joint project submission	Paper	Autumn 2015	All partners	Description of DURAARK as a whole, pulling in highlights from respective work package  A possible target could be the International Conference on Preservation of Digital Objects (iPRES) in November
ENSAM <sup>92</sup> seminar, Sweden	Presentation	Autumn 2015	Hamid Rofoogaran	Attending the seminar and making presentation of the DURAARK project <sup>93</sup>
Meeting with infrastructure-heavy organisations in Sweden	Seminar / Workshop	Autumn 2015	All interested partners	Presenting DURAARK for a consortium in Sweden consisting of LKAB <sup>94</sup> , SSAB <sup>95</sup> , Boliden <sup>96</sup> , and Smurfit Kappa <sup>97</sup> that have expressed an interest in the topics covered by DURAARK
Long-term preservation day: National Archives and National Library, seminar	Presentation	October 2015	Lena Lindbäck, Hamid Rofoogaran, Jörgen Nilsson	Arrange the seminar and present state and plans for the project
Presentation flyer for DURAARK	Presentation material	Nearing end of project	Lena Lindbäck, Jörgen Nilsson	A presentation of DURAARK, focussing heavily on the individual outcomes of the project, meant to enhance community building and paving the way for uptake.

Table 15: Some preliminary dissemination actions for LTU for year 3

<sup>92</sup>Swedish National corporation group on digital preservation

<sup>93</sup><http://www.ltu.se/centres/Centrum-for-langsiktigt-digitalt-bevarande-LDB/Vara-projekt/ENSAM?l=en>

<sup>94</sup><http://www.lkab.com/en/>

<sup>95</sup><http://www.ssab.com>

<sup>96</sup><http://www.boliden.com>

<sup>97</sup><http://www.smurfitkappa.com>

## A.5 Catenda

Some preliminary dissemination actions for Catenda for year 3:

Where	How
BuildingSMART and possibly other conferences and workshops	Conference / workshop
Catenda website	Blog entries
Meetings with industry and other organisations	Verbally and handing out flyers

Table 16: Some preliminary dissemination actions for Catenda for year 3

## B DURAARK website

The DURAARK website is accessible through the URL <http://duraark.eu>



Figure 17: A snapshot of the DURAARK webpage

## C DURAARK flyer

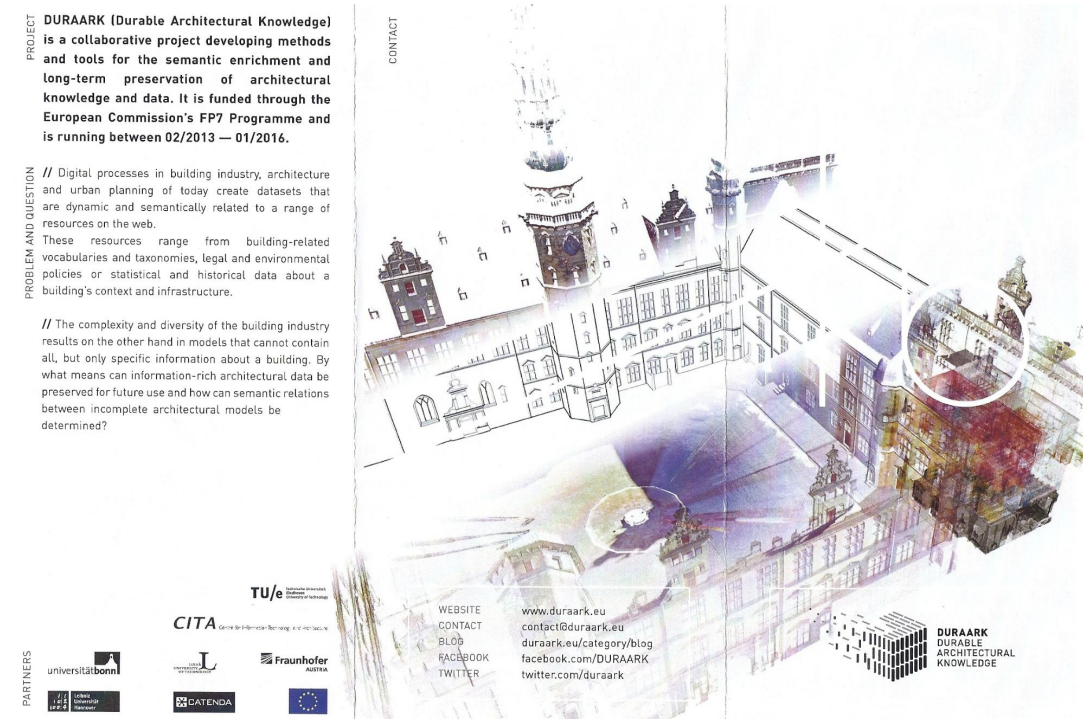


Figure 18: The DURAARK flyer (scanned front)

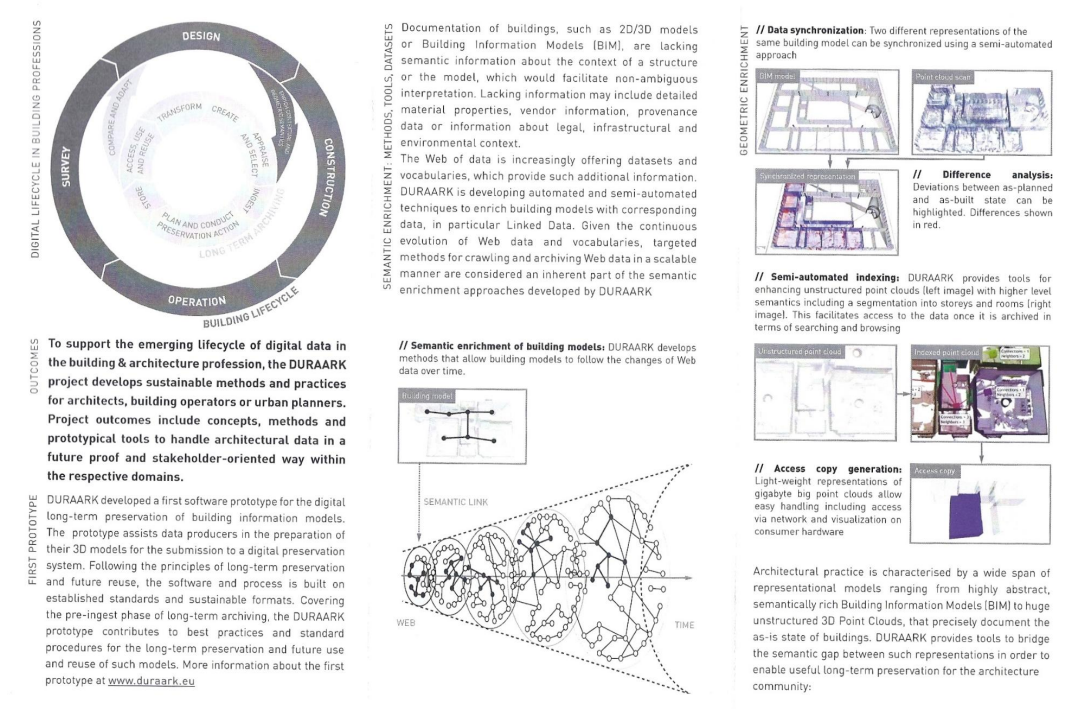


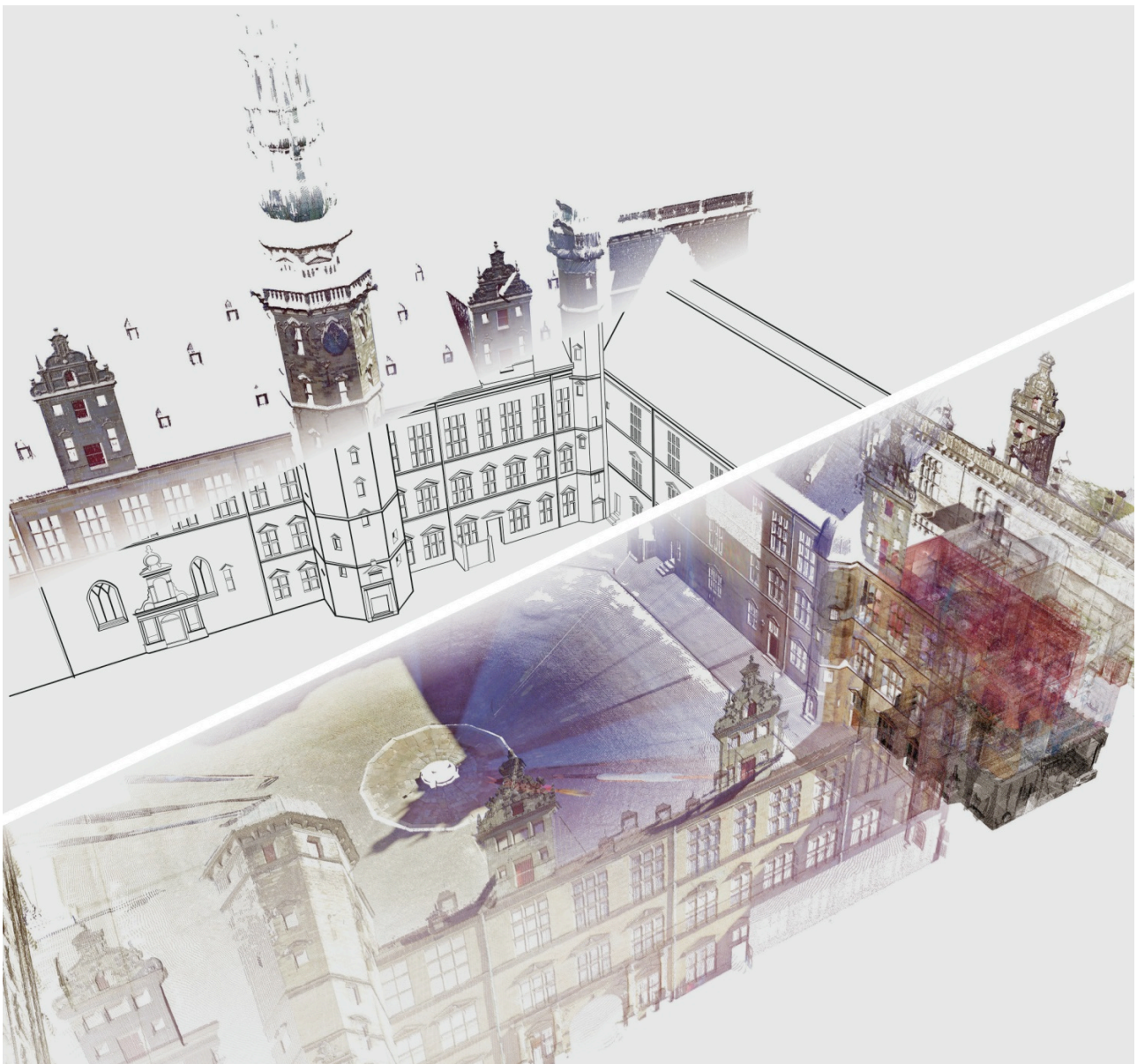
Figure 19: The DURAARK flyer (scanned back)

## D Sustainable Building Information workshop: Schedule and Agenda



## **Sustainable Building Information Workshop 12. November 2014 - Copenhagen**

*Have you identified problems in keeping your valuable 3D Building Models usable in the future? You are invited to participate in the “Sustainable Building Information Workshop”, where the EU project DURAARK would like to discuss possible solutions for this with you. This is an opportunity to learn from practitioners and researchers in order to make your management of Building Information future proof and influence the direction of research.*



The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation - Copenhagen | Denmark

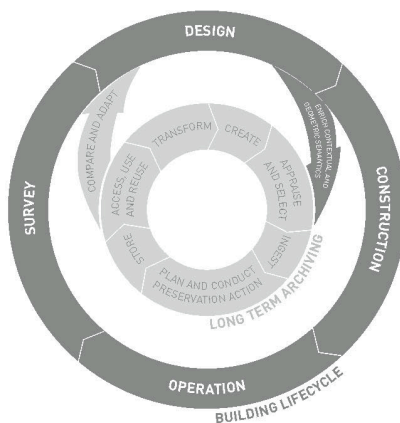
CITA | Centre for Information Technology and Architecture

## Introduction

The ongoing shift in the operation, design, documentation and construction of buildings from separated working practices to interconnected digital processes points towards the emergence of a digital lifecycle of building information. With an ever-growing amount and level of detail in building related information residing in web-based systems a new level of collaboration is achieved. Even though Building Information data is becoming the backbone of the profession, it can simultaneously be observed that the possibility to access stored architectural data is often disappearing only a few years after its creation. The result is a loss of invested capital, knowledge and high future costs, when existing building mass has to be reassessed for future maintenance or re-purposing tasks.. The question of how to organize and maintain access to valuable building information in the future poses a major challenge for the building profession of today,

This challenge needs to be addressed by establishing work processes and IT-systems that allow the profession to store architectural data over the long term in order to keep it available for assessment, inquiry and editing.

The Sustainable Building Information workshop on November 12th 2014 in Copenhagen aims to facilitate an exchange between stakeholders from institutional building owners and researchers on approaches that will provide a long-term usability to the currently short lived building related digital data.



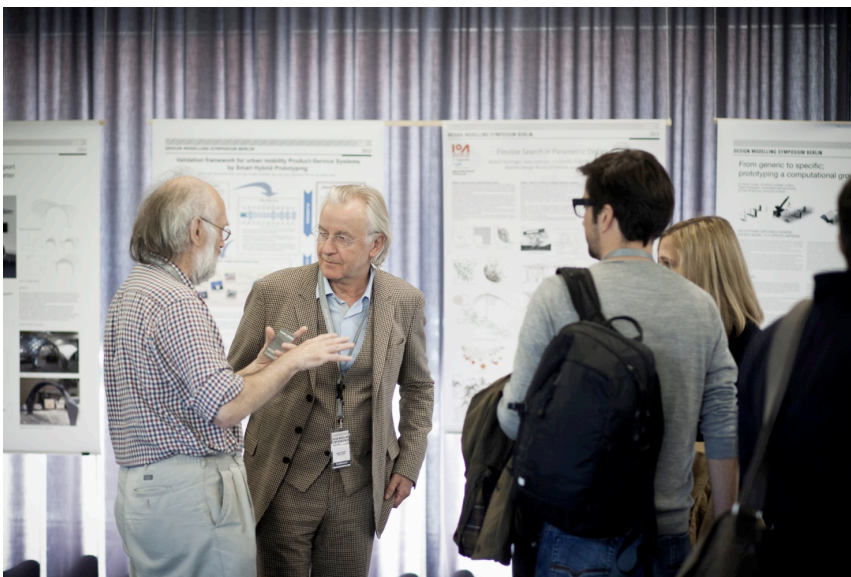
*A future lifecycle of building data will need to include and integrate components that stem from operational systems - such as Facility Management Software - as original BIM data.*

## Aim and Approach of the workshop

The Sustainable Building Information workshop brings together **researchers and stakeholders** that have a vested interest in maintaining long-term access to building information. The event is organized by the DURAARK project (DURABLE ARchitectural Knowledge), a collaborative European research project, which is developing methods and tools for the semantic enrichment, digital curation and long-term preservation of architectural knowledge and data. The concepts and prototypes developed within the

DURAARK project will be introduced during the event. More information on the project can be found under [www.duraark.eu](http://www.duraark.eu).

**The aim** of the workshop is to exchange knowledge and experience on processes and practices for the long term handling of architectural data, as they are emerging in the field of Facility management, building documentation systems and cultural heritage. Common experiences and approaches will be highlighted and challenges and future steps towards a sustainable practice of building information will be discussed. The gained insights shall help participants in their daily work with 3D building information and simultaneously aid the DURAARK project in ensuring that developed methods and tools meet practitioners' needs.



## Structure of the day

The day is structured around **introductions to and reports about the state of research and practice** of maintaining understandability and usability to digital data over long periods of time. The presentations highlight general challenges as well as solutions on the organizational and technological levels of long-term archiving related processes and systems. Presentations are given by practitioners on their institutions' implementations and procedures as well as by researchers on the state of the art knowledge on the processes within their respective field. In **breakout sessions** workshop participants will investigate their individual data handling practices and processes in groups and discuss how these can be extended to better meet needs in improving and maintaining long-term access.



The approaches and challenges that were identified over the day are discussed in a **final session**. This discussion shall contribute to a more general understanding of necessary structures, techniques and systems to maintain long-term access to architectural data.

## Workshop Organizers

The workshop is organized within the DURAARK project by:

- Martin Tamke, Centre for Information Technology and Architecture, Denmark
- Michelle Lindlar, Leibniz University Hannover / TIB - German National Library of Science and Technology, Germany
- Dag Fjeld Edvardsen, Catenda AS, Norway
- Östen Jonsson, Luleå University of technology / Centre for Long-term Digital Preservation, Sweden
- Jacob Beetz, Eindhoven University, Netherlands

The Centre for Information Technology and Architecture (CITA) will be hosting the event at the The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation.



For registration and questions – please send an email to martin.tamke @kadk.dk

## Workshop Participants

The participants are coming from organizations and companies that stem from building owners, FM software and service providers and archives.

## Schedule and agenda

### 11 November 2014

20.00 Informal get-together during dinner at restaurant in [biomio](#) Halmtorvet 19, 1700 København V /  
Copenhagen

### 12 November 2014

9.00 - Coffee and registration

9.15 - Intro to the day, the participants and the general questions - Martin Tamke, Centre for Information  
Technology and Architecture ([CITA](#))

9.25 - Personal intro of the participants

### Session 1: Approaches

10.00 – Future challenges: the shift to external web resources and their consequences for the architectural  
profession – The DURAARK approach –Eindhoven University of Technology (Jacob Beetz, [TUE](#))

10.25 – Geometric Enrichment of Building Data (Martin Tamke, [CITA](#), Richard Vock UBO)

10.30 - Sustainable data practices – state of research in long-term archiving of Building Information Data –  
Intro to approaches, organization and technical systems – The German National Library of Science and  
Technology (Michelle Lindlar, [TIB](#))

10.40 Question and Answers/Discussion

11.00 Coffee

### Session 2: Data Practices

11.20 –Mapping the building stock of Copenhagen, Copenhagen Property (Emil Bisgaard Mortensen,  
[Københavns Ejendomme](#) )

11.40 – Managing the Building stock on university scale, Danish Technical University (Markus Lampe, [DTU](#))

12.00 - Q+A Discussion

13.00 Lunch

### Session 3: System architectures

13.40 - Systems to manage building data – Torben Dalgaard/Denmark ([DaLux](#))

13.55 - Systems to manage building data – Ole Kristian Kvarsvik / Norway (dRofus)

14.10 - Systems to Collaborate- bimsync - Dag Fjeld Edvardsen / Norway (Catenda)

14.20 – Approaches to long-term archiving systems – The DURAARK approach , Thomas Krijnen (TUE)

## Breakout sessions

14.45 Work sessions in groups: processes, techniques, implementation, steps forward

## Conclusion

16.30 Presentation of group results, summary and general discussion

17.30 Expected End



[www.duraark.eu](http://www.duraark.eu)

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