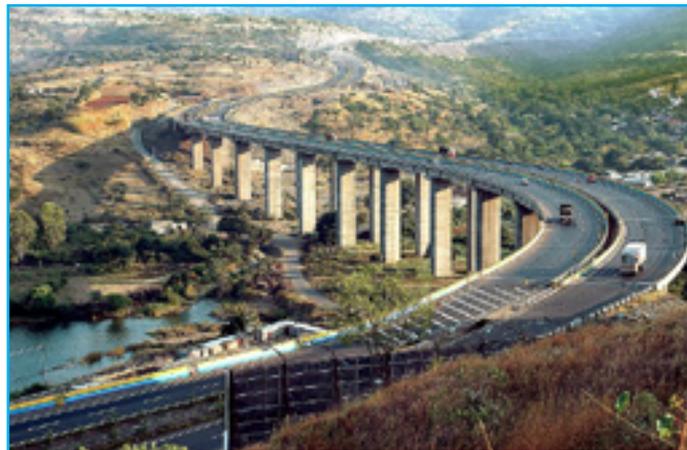


IFC for infrastructure taking shape Alignment project to offer essential standard

A project to create an IFC alignment model started within buildingSMART in January 2014 and will meet an urgent need to make standardised asset data on infrastructure available over the life-cycle of a facility. It will push the coverage of buildingSMART's IFC data model into new territory.

'Alignment' is the route of the road or rail track defined as a series of lines and curves. The construction of roads, tunnels, rail tracks, waterways, bridges and power lines all depend on the alignment, so developing a standard will bring clarity and interoperability to the construction of infrastructure. 'The alignment project is the first and most important step for IFC for Infra,' says Henk Schaap, who leads the project steering group.

The aim of the project is to develop an IFC standard that will allow information about alignment to be exchanged along the supply chain right through to operation: from planning to construction to asset management. The model will allow alignment information to link into other



project information – cross sections, the 3D geometry of construction elements and so on.

To help make the huge task of bringing IFC to infrastructure manageable, the alignment project – just one part of a still larger ambition – has defined its objectives and timescale. It will run for one year,

with clear deliverables. The technical goals are to develop the alignment model, with outcomes available in IFC, EXPRESS, ifcXML XSD and mvdXML. A viewer will be created to check the data modelling solutions and two review panels will be set up – one from the client side providing domain expertise and the other from the software vendor side.

Five work packages are in place, covering a requirement analysis, the IFC schema extension, the creation of a software application or demonstrator to show that the infra model actually works, organising review meetings with the two panels and the project management itself. A steering group is overseeing the work, which is being carried out by a project team led by Thomas Liebich from the Model Support Group.

'This is the first project of the Infra Room and we are up and running,' says Henk. 'Once our alignment model has been created and implemented, all the partners in an infra project will benefit.'

A fuller version of this story appears on the bSI website.

Image: Highway near Pune

Source: Govt of India, Global free licence

BIM guidelines to help users

BIM is being used all around the world – but approaches vary greatly. How is BIM most effectively deployed? What form of guidelines work best?

The NBIMS organisation in the US – which sets standards and guidance for best practice – has made a start in comparing and analysing BIM guidelines from around the world through its Product Development Subcommittee (PDS). Now buildingSMART is moving forward with this guidelines work in a project that was adopted by the Process Room during Munich week 2013.

'We are pleased to secure an international dimension to the guidelines topic,' says Chris Moor, chair of NBIMS-US and a member of the bS working group. Susan

Keenlside, from bS Canada, is chair of the PDS, where the idea was first developed. A further idea to use a wiki platform took hold during Process Room meetings and is led by Sylvain Marie of VTREEM in France. The group has members in North America, Europe and Australia who meet weekly via the web.

The group is evaluating existing BIM guidelines, using a methodology that derives from the work of NBIMS-US PDS. The end goal is to achieve an international framework based on these real-world procedures and requirements from industry. A template has been developed against

which the various guidelines are assessed. A secondary goal is to identify which guides end-users use.

By Stockholm week in March, the aim is to prove the concept of being able to compare the contents of the different guidelines. Stockholm, in fact, will be a key moment for the project. The Process Room will decide if and how the project will continue. Crucially, should bS go on to develop international guidelines? The consensus is that an international framework for planning and executing BIM projects, under the banner of buildingSMART, would be of enormous benefit to building project teams around the world.

Visit <http://bimguides.vtreem.com/> (launching shortly) or contact: sylvain.marie@vtreem.com. A longer version of this story appears on the bSI website.

BIM procedures wiki
guidelines framework
processes review template

Developing a Dutch concept library

The Dutch concept library CB-NL is part way through an intensive programme to develop a common generic dictionary of terms. The end goal is to transform the quality and cost efficiencies of the country's construction supply chains – enabling the accurate and automatic interpretation of terms through ICT tools – but the project will have an impact far beyond the Netherlands. CB-NL will also be placed within the buildingSMART Data Dictionary (bSDD) and made available for reuse everywhere.

Beginnings

CB-NL – CB stands for 'conceptenbibliotheek' – was first mooted in 2011. 'Then in 2012, the pilot phase was done successfully, which secured the finance for the development,' explains Bram Mommers of ARCADIS who is general secretary of CB-NL. Development started on 1 January 2013. 'We should have stable usable content available at the end of this year,' he adds. 'Then the focus will be on expanding and managing the content.'

Public sector agencies in the country have recognised the importance of CB-NL and are putting serious resources behind it. Over 300 people are involved, though not all on a full-time basis, and are drawn from government agencies, commercial companies and a specialist modelling background. There is a core project team of 12–15 people who put in an average of two days a week. The development phase is budgeted at €2 million, provided by the big public sector agencies, 'but it is important that the market delivers in-kind capacity,' observes Bram.

In 2012, in a practical exercise, CB-NL created and evaluated a data set for two elements: a concrete load-bearing structure and an air-conditioning plant. The exercise was successful and showed how the work could be done and the clear advantages of the concepts. With the right ICT infrastructure in place (and getting there was no small task), development of the terms is underway.

Structuring the library

Creating an ontology – the structured organisation of knowledge – that will be usable on a wide scale and enhance innovation is not easy, given the inescapable complexity of the project. 'We are trying to minimise the complexity as far as possible,' says Bram. 'But this is a highly abstract subject that is difficult to grasp.'

CB-NL is collaborating with existing ontologies, mapping them to its own concept library, which uses an RDF/OWL-based ontology. CB-NL users will be able to connect via an API (application programming interface) and a SPARQL endpoint. 'We encourage the use of the SPARQL endpoint,' adds Bram. 'It is pretty innovative technology, with immense potential benefits. But this might deter the market, which is why we also offer the widely accepted API technology'. The CB-NL will be uploaded to the bSDD, so the CB-NL core content is also available using the bSDD.

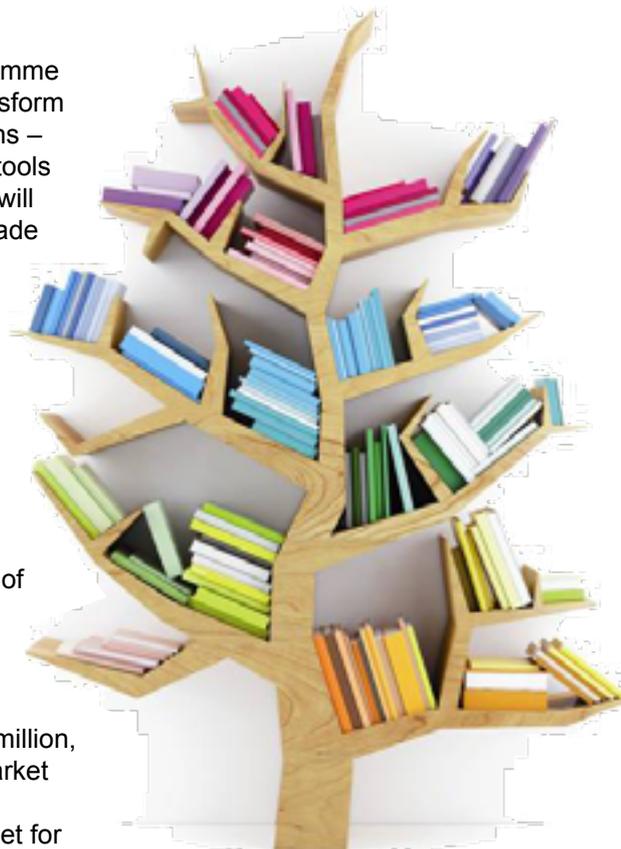
A hugely valuable part of the outcome is the mechanism it will provide to find products based on generic concepts – to link into manufacturer product libraries, in other words. It will offer a powerful tool to digitally connect products to a BIM.

Moving forward

CB-NL has already come a long way. So what advice would Bram give to other countries who are thinking of setting up a similar project? 'Make it a common effort – a joint effort of government and market,' he says. 'Collaborate with all organisations that provide terms and definitions, and acknowledge the different dialects and specific terms. It is all about *linking* different worlds. Learn and reuse. In the end it is not only a technical problem but also a political one.'

CB-NL is on the bSDD steering group. Its work will be freely available through its website. A paper on CB-NL is available in English from Bram Mommers (bram.mommers@cb-nl.nl). An English-language website launches in March.

Note on terms: OWL is the Web Ontology Language (in fact, a family of languages) endorsed by the World Wide Web Consortium (W3C). RDF is the Resource Description Framework, also endorsed by W3C. SPARQL is a language that allows databases to be queried and manipulated.



Governance

Chapter strategy to forge stronger links

A new strategy is being developed to strengthen the links between buildingSMART International at the centre and the chapters at country level. The new strategy will improve liaison and project co-ordination and help put in place a more integrated functioning of bSI and the chapters.

'At the moment, formal contact occurs only three times a year – at the International Council meeting in May and the summits in March and October – and the two-way flow of information is often poor,' says Chris Groome. 'We want to enhance the essential relationship whereby bSI develops international standards and the chapters provide local input to the standards and lead implementation in their countries.'

Under the new strategy, a bSI officer would visit chapters regularly on their home turf. Projects originating in chapters could be linked together, with efficiency and cost savings. Quarterly online meetings are planned.

'We hope that the new strategy will give a boost to chapters at the coal face of open BIM implementation, recognise their work and exploit the synergies,' adds Chris.

Information modelling across community development

PIM project launches with high ambitions

An ambitious research project to enable information modelling for urban development launched in Australia in February 2014.

The Precinct Information Modelling project – PIM for short – will work towards an open standard that defines how information is structured in digital modelling intended for urban renewal or new estates. It will also help urban management at the precinct scale specifically aimed at lowering carbon impact.

The research sits well with the Infra Room's goal of extending IFC to infrastructure. Among its priority projects, bridges and roads feature strongly, but little has been done so far on comprehensive urban modelling, so the Australian project will be watched with interest.

How PIM started

The term 'precinct' was chosen to indicate any specified urban area, usually made up of individual parcels of land. It does not imply a shopping or pedestrian precinct. A scoping study was carried out in 2012/13 within the Cooperative Research Centre for Low Carbon Living (CRC LCL) at the University of New South Wales (UNSW), and a project proposal was prepared. The CRC LCL promotes low-carbon working and living, but PIM – with its process efficiency, improved accuracy, productivity improvements and cost savings – will benefit any project, with or without sustainability goals.

It was during buildingSMART's Munich week in October 2013 that the news broke that the project had been accepted. 'We were hearing about the funding achieved for the bSI alignment project, and then I got the news from Sydney that we had conditional support for our own PIM project too,' says Jim Plume of UNSW and treasurer of buildingSMART Australasia, who leads the project. 'It was an exciting week.'

PIM project 2014–16

The project is anticipated to run for three years,

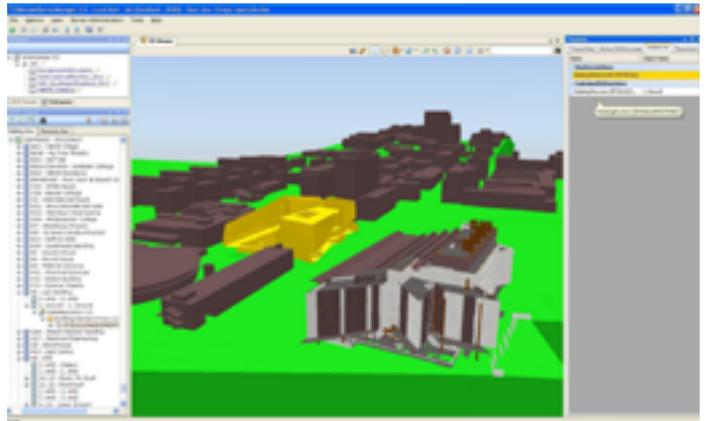
ending in December 2016. It has seven partners, including the University of New South Wales and the University of Melbourne. John Mitchell, chair of bS Australasia, will be involved, contributing to both technical development and the workshops and project reports. There is collaboration with a Norwegian company, Jotne EPM Technology who are providing the technology for the object model server that will be used to test the PIM schema.

The project proposal describes the need 'to realise the new opportunity to make urban planning, design and management into a more rigorous digital science through the integration of building and urban scale spatial modelling technologies' (ie BIM and GIS). In other words, as Jim explains, 'we want to achieve effective information interoperability and the integration of urban systems – across domains like energy, water, transport and housing, and at different scales (the individual building, the local precinct and the wider city).

'Until now, we have lacked an information platform capable of delivering spatial representation and the modelling tools we need.' Importantly, the open platform being created will align with ISO 16739, the open BIM standard.

The Living Labs

Among the technical deliverables will be a series of PIM models for real-world developments, known as the Living Laboratories, which are part of the wider CRC LCL programme. Two urban renewal projects have been



Top: The Living Lab in Sydney's Central Park, where part of the old Carlton Brewery still stands, is being used for PIM field trials. There are further trials in the Tonsley area of Adelaide. Below: Screen grab from precinct information model. Bottom left: Jim Plume, who leads the PIM project

chosen: Tonsley, a suburb of Adelaide, and Central Park, an inner city sustainable mixed-use development on the old Carlton Brewery site in Sydney. 'We plan to construct object-based precinct models of these sites using trial extensions of IFC, and hosted on BIM servers,' says Jim. 'They will be used to test precinct assessment techniques, information exchange protocols and support for precinct object libraries.'

Conclusion

Expectations for the project are running high. 'At last we may have a platform that will enable us to cover all the elements of the urban landscape, from the urban zone down to individual buildings and even street furniture like bus stops and park benches,' concludes Jim. This innovative work has much to contribute to the Infra Room, where Jim serves as a member of InfraCom, the Infra Room Committee.

The project partners are UNSW, Melbourne University, Brookfield Multiplex, Renewal SA, AECOM, Aurecon and Hassell Studio.



Case study

Hagebyen housing project in Norway

As a major new development takes shape in Fornebu, west of Oslo, one housing project has made open BIM a requirement for its subcontractors. The project is coming in ahead of schedule and under budget, but how are contractors responding to the open BIM regime?

Background

The peninsula of Fornebu lies to the west of Norway's capital and was the site of Oslo airport until Gardemoen opened in 1998. Now it is an area of redevelopment, both commercially – Telenor has its HQ there – and residentially. Over a ten-year period, around 5,000 homes will be built in Fornebu, with accommodation for 15,000–20,000 people. Some 20,000–25,000 jobs will also be created in the area.

Hagebyen is a housing project within the wider development, responsible for 345 homes in three phases. There is an emphasis on green open spaces – 'hage' means garden – and there are squares, a green corridor to a local park and terraces or balconies for all the homes.

Subcontractor engagement

The main contractor is Veidekke Entreprenør, one of Norway's largest construction companies and part of the Veidekke group, another arm of which co-owns the project in a joint venture. It was a condition of the project that subcontractors had to work in open BIM.

Veidekke provided the base information for the subcontractors to develop their own individual models for the separate disciplines: architectural, structural and MEP. This discipline-specific modelling (known as EntreprenørBIM) also included models for site operations such as temporary roads, waste management, scaffolding and cranes.

Formwork manufacturer Peri Norge, which makes girders, frames, scaffolds and so on, received data in IFC and imported it into its own systems. 'No information was exchanged outside the open BIM platform,' confirms Jarle Knudsen, an engineer with Peri. He is enthusiastic about the benefits of open BIM – the accuracy and precision it allows in designing for onsite assembly and the clash detection that is possible working in 3D. He also highlights the safety benefits: the client can identify safety risks via the model and take preventative action.

Mickael Olsson from concrete products company Färdig Betong, making its first foray into open BIM, was surprised that his company had not previously used such a practical tool. There were mild teething problems with exporting to IFC – and Veidekke stepped in to help – but Olsson was impressed by how quickly he could get his queries answered via the model and in turn make any adjustments. 'Not only has this saved us a lot of time, but the product delivered has also been far better,' he states. He plans to encourage the use of open BIM in suitable projects in future.

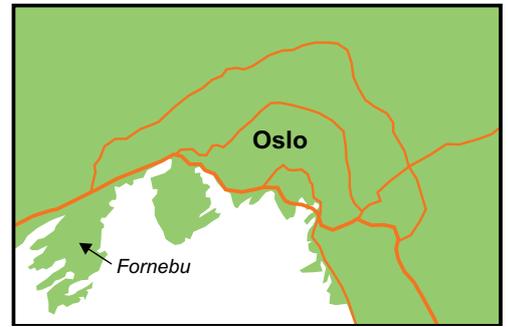
Efficiencies and savings

One activity that brought clear gains was the use of BIM for scheduling, notably on phase 1. 'Most of the schedule improvements were done before the project started, when we simulated different starting points in 4D to determine the best feasible construction sequence,' explains Morten Barreth, project developer at Veidekke Entreprenør. 'This gave a two-month reduction on the schedule, while continuous task clash avoidance with BIM during construction reduced the schedule for phase 1 by a further month.'

Phase 2 came in on time and phase 3 was running one month ahead of schedule at the end of 2013. 'Our gains in phase 3 are related more to increased efficiency due to repetition and better supply-chain management,' adds Morten. The trades also experienced time savings: the concrete assembly, for example, was simulated ahead of time through the BIM so that work on site was accurately phased and around 4,000 hours were saved.

Conclusion

The final word goes to Asle Gjøstein Resi, Veidekke design manager for phase 1 of Hagebyen. 'We are very pleased with the collaboration [we achieved]. Once you have a consistent 3D model, you can plan and simulate everything virtually... it also means that we save a lot of time logistically.' He praises the ability of a



Hagebyen: location and visualisations

'living' open BIM model to provide a clearer understanding of the project and enhancing safety procedures. The plan now is to extend the use of open BIM to other projects and, in time, to all subcontractors.

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