

### Graphisoft strengthens commitment to Interoperability & International IFC Industry Initiative

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While our competitors have suddenly discovered object model CAD and are rationalizing why it possibly might be a good thing, Graphisoft® has been providing such a solution since 1984.

In addition to explaining our vision of the Virtual Building™, and why we support the neutral ISO standard IFC protocol developed by the International Alliance for Interoperability (IAI), we also review another important context – digital product information.

For us it is quite clear - the virtual building (VB), single building model (SBM) or building information model (BIM) are demonstrably the best solutions to support the demands of the industry for greatly increased quality, significant improvements in time, and better value for money. Simply put, the 2D paradigm, based on proprietary data formats such as DWG, only supports documentation for the design & construction teams; two decades experience of serving our customers has taught us that users need far wider functionality and life cycle support for the assets they design, procure, occupy and manage.

Does this strategy present any risks to your current investment and business? No, quite the opposite. It provides solutions that allow you to value add your current data, and simultaneously take advantage of the benefits and business opportunities created by the new paradigm.

#### The Virtual Building Concept

ArchiCAD®'s Virtual Building, pioneered by Graphisoft and used by over 100,000 customers worldwide, offers many advantages to architects and designers: accurate 3D representation of the building, superior visualization and animation for design development and presentation and automated documentation, calculation and estimation – to name but a few.

The Virtual Building concept, based on the integrated 3D object model paradigm, is the most effective technology for the life cycle support of buildings, and is rapidly becoming the preferred technology for contractors and clients.

Graphisoft's vision today builds upon the innovation first conceived in 1984.

Firstly we will continue to deliver the definitive virtual building application – providing a rich and comprehensive representation of a facility, in a language familiar to its users. In effect a powerful building model editor, the application will support winning business, carrying it out more efficiently and reducing risk. In this aspect – understanding the practical & workable functions of an effective building modeling tool - we have made substantial progress, but we have much yet to do.

Secondly, we provide open accessibility of data; not just custom interfaces to one-off applications, but industry standard, open interoperability, allowing communication and data exchange with the many and diverse building engineering, construction and management applications that are now part of an everyday project. Complementing this data issue, we will continue to provide the highest possible quality DWG interfaces, together with value adding

data migration tools to ensure legacy data can be efficiently transformed into the new object model format and reused rapidly and effectively.

This, we believe, gives our users the ultimate flexibility to choose partners and tools based on their prioritized business needs, performance and project requirements, rather than being restricted to proprietary alliances.

Let us examine the issue of information accessibility a little more closely:

## The need for better quality collaboration

The integrated model concept allows architectural coordination and design resolution through its intelligent objects. By virtue of the 3D representation of all building elements, a user can see or automatically check for clash detection, etc. To date, this function has benefited designers as they develop the building concept. What the user has not been able to do - due to the lack of data - is to coordinate those parts of the building that are the responsibility of external consultants, particularly structural and building services engineers.

Why is engineering coordination so important? This turns out to be the very area where most errors on the construction site occur<sup>1</sup>. This is not really so surprising, considering that 2D drafting, full of many approximations and drafting conventions, ignores the 3<sup>rd</sup> dimension. In today's increasingly complex buildings, incorporating more and more technologies to support user functions and better working environments, manual coordination can never be wholly reliable and this is consistently and repeatedly borne out by surveys.

Thus, the crucial potential advantage of reliable coordination cannot be realized for that very aspect of an architect's business where errors are most likely to occur! This is because the majority of consultants, engineers and, indeed, other participants in the facility development process - use 2D CAD, based on a proprietary format DWG, without any agreed semantics or information standards. The result - a multitude of information barriers (between even the same native DWG applications), or, to be more precise, a lack of interoperability in the processes and activities that comprise a building project. This example is based on engineering coordination, but the situation is generic for virtually any AEC application, and is widespread across the industry.

Realizing these fundamental limitations of the 2D drawing paradigm and the use of a multiplicity of proprietary data formats was the genesis of the International Alliance for Interoperability (IAI).

## A globally productive AEC Industry

Founded in 1995, the IAI in its brief history<sup>2</sup> has grown to be a consortium of eleven independent and autonomous chapters around the world. The IAI promotes interoperability in the AEC/FM industry by publishing an open, freely available, non-proprietary data model specification, known collectively as the Industry Foundation Classes (IFCs). Software applications supporting the IFC data model are able to exchange data with other applications that also support the model. The advantage of a non-proprietary data model is that the content, integrity, and reliability of the data can be independently verified. Moreover, and perhaps most significantly, the commissioners of the data, the end users, can exercise independent control over their data, because they are not tied to a proprietary data format.

On 8 November 2002, the IFC protocol became an international standard - ISO/PAS 16793. In a separate development - but one which shows that the IFCs are making a strong impact in both the commercial and institutional world - in a workshop held on 24 October 2002 in

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<sup>1</sup> See the Egan Report

<sup>2</sup> Tardif, M article, AIA, 2001

Frankfurt, Germany, ten software vendors applied for 16 IFC 2x applications to be certified as being IFC compliant. This is in addition to some 30 vendors who already support earlier versions of the model, including the BLIS group with its strong US and Japanese membership.

## Graphisoft's IFC Commitment

Graphisoft has been a member of the IAI since 1996, and ArchiCAD provides the most comprehensive support to users of IFC model based data sharing. Add-Ons have been provided for every release to date.

The adoption of the IFC exchange protocol as an ISO standard has been a major milestone; it is now the definitive global construction exchange protocol; but an equally significant milestone will be reached in May this year (2003) with the publication of the latest release 2x2 of the IFC model. New functionality is now available for:

- structural analysis
- structural engineering (for concrete and steel structures)
- HVAC design and performance simulation
- electrical design
- facilities and property management
- visualization (rendering and lighting)

This release can be thought of as the transition from the shell of the building to the services and systems contained within it. In functional terms, we move from plain geometric coordination to design, simulation and management processes integration; never possible in the 2D CAD environment. Related processes, such as costing, construction management, procurement, and facility management, together with augmented design are now possible. With this addition, the IFC model now addresses the representation of all the major elements and processes in the procurement of a building, and is a mature version ready for widespread adoption by the AEC industry.

This is the real turning point in object model development!

Graphisoft's experience and its ongoing dialogue with its users, makes us aware of the need to make this new collaboration process as natural and easy to use as possible. We are aware of the potential dangers in attempting to write software outside our expertise, for example HVAC. What we instead do is to provide a data sharing mechanism to enable connection to any application supporting the IFC standard. This will extend our users' options well beyond our current thinking, and allow the two collaborating partners to maximize their respective roles in ways never possible in the 2D paradigm.

## Enabling your business

We are currently implementing new solutions that enable an architect, design manager, contractor or owner to manage a master model, composed of multi-disciplinary data, shared through the IFC protocol. This new functionality, web-enabled and based on technology already established in the advanced manufacturing sector, will allow the storage and selection of multiple design concepts, versioning, auditing and, of course, the management of each specific discipline or consultant's data.

Complementing this commitment is our open invitation to work with other application vendors, government agencies and companies to implement IFC based collaboration and to assist them in their implementation efforts.

In this more detailed view of the object model paradigm, let us now consider the collaboration between an architect and an HVAC engineer. Traditionally, the architect gives his engineer the plans, elevations and typical sections of the building. The engineer has to determine the room usage, calculate room volumes from the plans and sections, determine the construction

materials and work out the building location and orientation before he can calculate the HVAC load. Only then is he able to plan the routes and sizes of ductwork, etc, which he then sends back as a new layer on the 2D plans the architect gave him.

Contrast that with the ArchiCAD IFC enabled approach. The architect sends the engineer the full geometry of the building concept in an IFC file; the engineer immediately has access to the spatial layout, dimensions and room volumes, and can see if the architect has selected specific construction types for the walls, skeleton, etc. The HVAC engineer, now accessing directly via the application much richer and more integrated data from the architect, fills in the missing design parameters and begins designing the ductwork system. Instead of doing this a few times at significant points in the major design, the architect and engineer are now free to simulate multiple concepts at a broad level, or to fine tune a selected concept using specific optimized solutions.

In this example, the engineer's library is based on intelligent 3D objects, and his system automates the selection of these, once the system parameters are set. Now he returns his service proposals to the architect; not as a set of plans, but as an assembly of 3D objects located accurately in the architect's master model. The architect can now truly coordinate, as he refines the design, identifies inconsistencies, and, for example, firstly with the client, then later with construction manager, views accurate visualizations of the building. Imagine the same quality data was available for every engineering discipline! That is exactly Graphisoft's second mission:

Support object based collaboration with the most complete range of industry users and application software, using the IFC protocol, to build high quality, accurate models to support the whole lifecycle development of facilities.

The rich model now becomes an indispensable asset for contractors for estimation, procurement and construction management, and once updated, a fundamental resource for owners and clients to plan and manage their assets.

## Digital Product Data

While progress on "upstream" CAD software has increasingly seen the advantages of integrated object models to simulate facility designs, there is still a very significant and serious major obstacle: the availability of digital building product data. This information must come from the building product manufacturers, and in the minds of many industry experts should embrace a single global standard to allow trans-national and multiple language compatibility.

Graphisoft's innovative Virtual Building model is based upon the proven efficiency of GDL Technology – an intelligent parametric digital representation of building products – ensuring that components and products used in the virtual building model truly represent the geometric definition of the supplier's item, and include all the life cycle parameters needed for design performance, installation and facility management. We are convinced that until the industry defines an open international, powerful standard for product representation, the industry will not advance quickly to the important stage of integrated information management.

## Where is object model technology being used?

Fanciful vision? Not at all! Graphisoft is proud to be associated with many leading international IFC based projects. Some notable examples are:

Government of Singapore Code Checking Project – In November this year the government will require building approvals to be submitted in IFC format and processed by an internal expert system. GS's role to date has been to accelerate the development of our IFC 2x Add-On to support the code checking system. This system is attracting widespread international interest, including several European governments and the Ministry of Construction in China.

Finland – The Nordic region of Europe is the world's leading adopter of model based design, property and real estate management. Supported by the Finnish TEKES Vera program which undertook a 5-year construction IT program centered on object model technology, many pilot and then production projects have been realized. The Helsinki University of Technology new Auditorium project completed in 2002, has been independently reviewed by CIFE, Stanford. The study covered both successful and less successful aspects of the project and made many recommendations for future developments, strongly endorsing the approach.

The ProIT project, being managed by CFCI, has mobilized Finland's integrated construction industry organization (comprising of main contractors, sub-contractors, suppliers and product manufacturers) in an ambitious model based paradigm. Four working groups are elaborating the definition of new object based processes, content and standards for product data, industry and best practice guides for object based business and methods of managing & collaborating using object model databases.

Germany – several city authorities are building ArchiCAD databases of their cities. Utilizing cadastral and photogrammetric data, accurate models are being created to assist in, amongst others, town planning, disaster management and the provision of location-based services. For too long over-reliant on proprietary survey data formats, city authorities are now seeking neutral IFC-based data.

ArchiCAD has become the object modeling software of choice in the European Union Construction Research community and is being used by leading client groups, practitioners and construction organizations. Object model technology, and the use of neutral IFC exchange has become the focus of the new Information, Science and Technology research program (FP6). This IFC foundation for the next generation of projects will augment the model and deliver new solutions to achieve widespread improvements in construction, based on the effective use of IT.

## Conclusion:

Object model technology, with its supporting standard IFC, has reached a point of critical maturity. An international standard, the IFC model is the definitive open model for the representation and exchange of information in the construction industry.

Graphisoft implemented its first object model, the Virtual Building, in 1984, and has supported every release of the IFC standard, culminating in the benchmark version IFC2x. Much has changed in the industry, and a new opportunity now exists to achieve much improved project information collaboration, thereby underpinning advanced optimization, better building performance and improved construction quality.

### About Graphisoft

Graphisoft® is a leading provider of design and management software solutions for the architectural profession and the building industry. Founded in 1982, Graphisoft is ranked today among the largest AEC CAD software developers in the world, with ten offices worldwide in addition to its headquarters. ArchiCAD® and other Graphisoft products are used by over 100,000 architects, facility managers and building professionals all over the world. Shares of Graphisoft are traded on the Frankfurt (GPH) and on the Budapest (GRAPHI) Stock Exchange. More information about Graphisoft is available at [www.graphisoft.com](http://www.graphisoft.com).

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