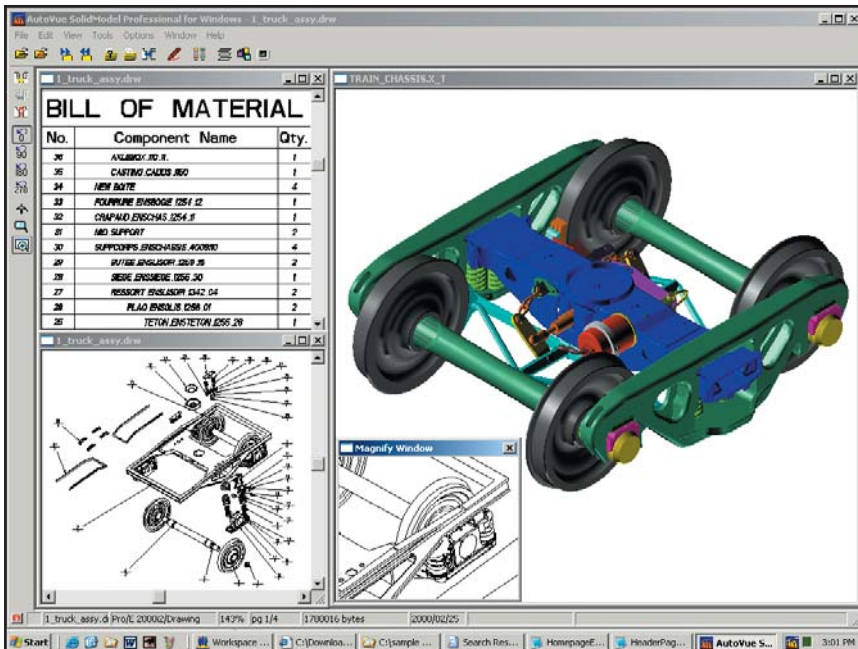# AutoVue: A foundation for view, markup and collaboration

by Martyn Day

Viewing a 3D Assembly and its related 2D drafts

We live in the age of the digital engineering enterprise. Hundreds of thousands of global companies create, edit and manage literally millions of digital engineering files everyday. These are created in hundreds of different desktop and enterprise applications, both old and new, running on Windows, UNIX, Linux and Macintosh platforms. It is now seen that these 'islands of automation' and disconnected information stores are affecting productivity and profitability.

The task to integrate and widen access to this 'hodgepodge' of digital engineering information, both inside and outside of the enterprise, is highlighted by analysts and consultants as being a critical component in improving efficiency, reducing the risk of errors and driving productivity. This can be accomplished through improved collaborative work within the enterprise and throughout supply chains or geographically dispersed design/ manufacture/ assembly locations.

This concept has been embodied in the term PLM (Product Lifecycle Management) and describes the management of a product from its initial concept right through to the point where it becomes redundant and needs decommissioning or recycling. The term 'management' does not just refer to the engineering draw-

ings generated in CAD but also all the documents related to scheduling, stock control, shipping, financials, serial number tracking, repair maintenance and field service. These documents would typically be controlled by a PDM (Product Data Management) system and integrated into other key business applications like ERP (Enterprise Resource Planning) to provide a comprehensive engineering infrastructure.

To do this successfully, existing 'walls' between engineering, manufacturing, sales and marketing IT systems have to be broken down, to allow viewing access to pertinent, integrated information, for the benefit of other divisions, partners or customers. Many companies are finding that by deploying a capable multi-format viewing tool, as part of their PLM management solution, it's possible to seamlessly breach these inhibiting 'walls' and improve inter-departmental collaboration, communication and productivity.

As this engineering information is created in a plethora of software solutions, the cost of replicating full-blown applications to every person that needs to only see the data would be prohibitively expensive and unwise for security reasons. While it would be possible to convert most information to an industry standard distribution format, the issue of mass conversion of thousands (or millions) of documents becomes a very serious and complex issue. It's also a fact that should any changes occur to the original file, the conversion process needs to be done again, further complicating the management process.

What is clearly needed is an easy-to-use, flexible viewing application that can integrate into an existing and evolving company IT infrastructure, possibly with mixed platforms, certainly with support for new and legacy native file formats. For the extended enterprise, it should also be capable of server and Internet/Intranet-based operations with a high level of security. With such a complex and diverse list of requirements, one would not have thought that there would be a single-source solution for both the complex infrastructure needs of an engineering enterprise and the specific file viewing requirements of a workstation-based engineer.

AutoVue

One field-proven solution that fulfils these diverse requirements comes from Montreal-based Cimmetry Systems, which has been developing its AutoVue family of viewing and markup tools since 1988.

AutoVue comes in a number of guises meeting

the requirements of the individual end user and the mixed-platform, extended enterprise. With a strong engineering background, AutoVue is especially developed for professionals in the Mechanical CAD (MCAD), Architecture/ Engineering/ Construction (AEC) and Electronic/Electrical Design Automation (EDA) markets, while offering support for a host of traditional digital 'Office' and Image formats.

All of Cimmetry's AutoVue products are available as both a desktop (stand-alone) application and a thin-client, server-based version. Currently, Cimmetry offers four flavours of AutoVue:

AutoVue - The base application supports over 200 2D CAD, Raster, Office and graphical formats, providing view, print/plot with some file conversion capability.

AutoVue Professional - offers all the features of the entry-level variant but in addition offers comprehensive markup/redlining/annotation tools, including text, colour fills, hyperlinks together with vector lines and pointers.

AutoVue SolidModel - in addition to the core functionality, supports an extra set of 3D CAD & EDA formats, without the markup/redline feature set. The program displays parts and assemblies models of the essential solid modelling applications, such as SolidWorks, Inventor, Pro/E, UG, Ideas, and CATIA. Likewise, the EDA support includes PCB and IC layouts and schematics from all the major vendors including Mentor, Zuken and Cadence.

AutoVue SolidModel Professional - builds on AutoVue SolidModel's 3D, 2D and EDA viewing capability by adding markup functionality. In addition, the software offers the ability to add text and precise 3D markup measurements to specific points on a part or assembly. Markups can also be created on all EDA file types.

Viewing & Marking up AEC drawings in AutoVue

AutoVue Thin-Client

Cimmetry has also developed a 'thin-client' version of AutoVue that runs from a central server, enabling files to be viewed across an organisation, using a standard web browser as an interface. This thin-client option is easier to maintain, as the software runs from a single point and an ideal solution to deploy across project teams or enterprises.

Cimmetry has managed to offer the complete suite of functions and format support of the desktop version in its thin-client offering with some additional productivity enhancing features. The thin-client versions of AutoVue offer a newly added real-time collaboration capability allowing groups of engineers or architects to review design files simultaneously, while adding markups and manipulating the session view. More on this exciting project review feature later.

Being Browser-based, AutoVue thin-client, also offers the ability to easily install on to a plethora of operating systems. The client can run on Windows, UNIX, Mac and LINUX. AutoVue thin-client can also be deployed centrally, or clustered on Windows or UNIX servers.

Which version to deploy, really depends on user requirements. Some users may only need to view and print drawings, while others may work with 3D or EDA data, or require collaborative review sessions. It's also worth considering the deployment and maintenance issues, with the client/server option having a clear advantage when looking at an enterprise wide deployment. There's also the added benefit of the real-time review capability in opting for the thin-client variant of AutoVue.
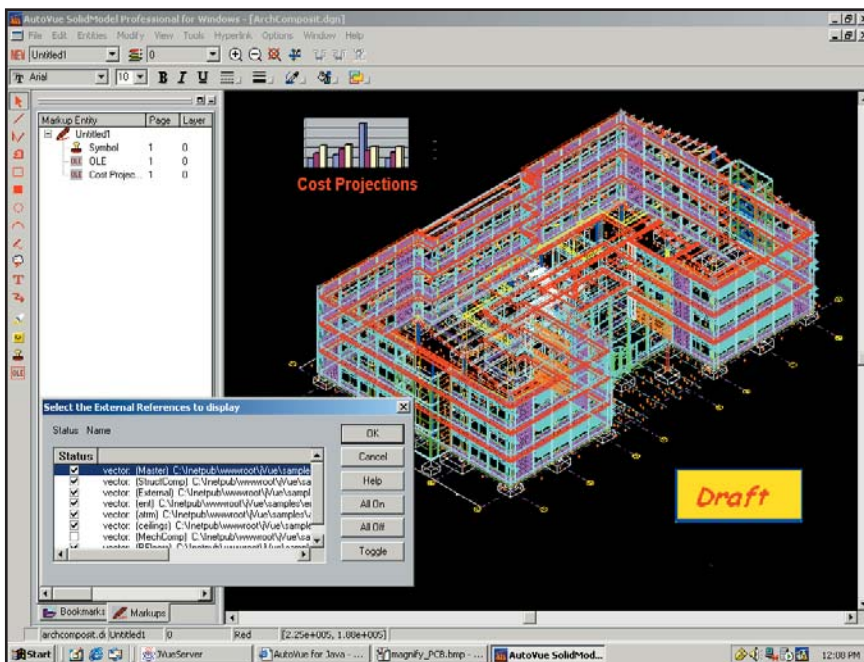
If security is an issue, you really don't want to have the native engineering files in active circulation. Again, here the thin-client option offers a benefit, as the native file is never sent for viewing on the client. AutoVue thin-client, generates and sends a Metafile to the client which includes graphical and attribute data.
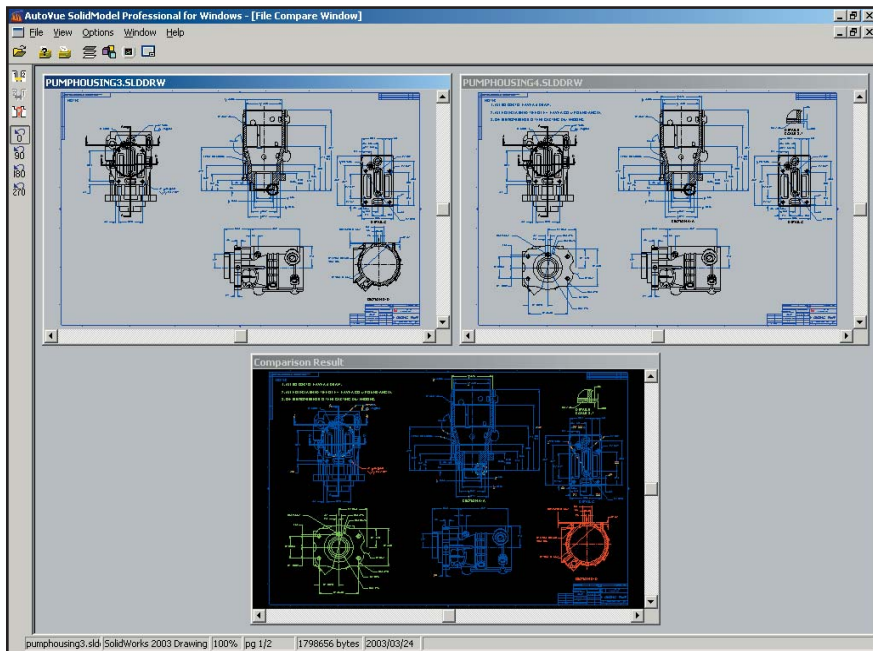
Format Support

AutoVue supports a massive array of file formats, with over 200 2D & 3D mechanical CAD, EDA, engineering and office formats listed on the company's website. With each subsequent release, Cimmetry adds broader format support and frequently produces updates to augment existing formats, as the native products get released. A case in point was this year's introduction by Autodesk of AutoCAD 2004, which featured a new compressed DWG format. Cimmetry released a patch for AutoVue to support this within 30 days of AutoCAD 2004's release, being the first viewer to support the new DWG format.

Viewing

The AutoVue interface is easy to use, customisable and standard across the range of products. There are a number of standard functions available to interrogate the document or multiple documents that have been opened. Zooming in/out can be done via the tools on the interface or done dynamically using a Microsoft Intellimouse wheel (or equivalent). Other manipulation features include Pan, Rotate and Flip. AutoVue also supports right button mouse commands, which vary depending on the type of file being viewed.

Compare drawing versions in AutoVue

Within each of the 2D CAD, MCAD and EDA file viewing windows there is a menu tree which presents selectable options - Modelspace/ Paperspace, sheet and page views, quick access to feature tree 'parts' in modelling assemblies and a tick box to select which features within a model to be displayed. The EDA viewing window is populated with listings of components, component pins and networks or various schematic layouts contained within a drawing. By simply clicking on the nodes, the corresponding graphic is highlighted in the drawing, but more on this later.

AutoVue comes with a range of useful utilities to interrogate and view embedded information within documents, such as Layers, Blocks, saved Views, Reference files (also called XREFS or seed files), Entity handles, Attributes and Text. On the last issue, there's a really handy utility to extract the text from within a document and save it as a text dump, for possible inclusion in reports or emails. AutoVue also has a powerful 'Compare' feature which allows two raster or vector files to be loaded in a three-window environment, displaying the data that has been added, subtracted and remained unchanged. Zooming on any of the display windows updates all the other views.

Print/Plot
By using the standard Windows print driver, AutoVue can print or plot to any output devices. It's possible to print/plot the extents of a drawing or a selected area. There's a useful print preview function to reassure that the selection will be printed properly and, as AutoVue can handle documents with multiple pages, a page range can be set too. Prior to output, headers, footers and stamps can be added, indicating the file name, date and time. There's a watermark capability and also a batch print/plot function with the ability to 'force to black'.

Markup/Redline
In the Professional versions of AutoVue, it's possible to add comments and redline graphics using Cimmetry's comprehensive suite of markup tools. These additions do not alter or amend the original file but are stored in separate files which are linked to the original.

The markup Navigation tree displays redline entities as they are added to the drawing. By clicking on each entry, the corresponding mark is highlighted in the drawing view, so they are easy to locate.

In the SolidModel Professional version of AutoVue, it's possible to add accurate 3D distances between vertices. As the model rotates, these markups intelligently face towards the view and simply clicking on the dimension and moving the mouse resizes the text. When applying text or notes to a 3D model, they can be attached to a vertex, edge, face, mid edge or arc centre. Again, these follow the user around as he or she navigates the model and the markup navigator provides quick access to any number of notes or redlines. This is really cool stuff.

It is also possible to markup EDA files with all the usual markup tools available.

SolidModel
When AutoVue SolidModel opens a 3D file, it offers a specific set of 3D tools within the interface. Assemblies and parts can be rotated in real-time, while shaded in a number of options; wireframe, flat, hidden line (compute intensive), silhouette and wire polygons (useful for surfaces). The model can be set to spin in a direction set by mouse movements, and more precise movements can be achieved using a neat transformation control window.

3D geometry can also be precisely measured, including faces, edges, and mass properties. AutoVue also has an excellent sectioning tool that uses a visible plane to cut the models. This can be set in various planes, together with a range of cut options. The plane position-slider provides real-time sectioning, with the section outline appearing in red on the section plane, which is really useful for taking important internal measurements.

EDA
While it would have been easy for Cimmetry to just add support for the most commonly found circuit, schematic and PCB layout application formats, for viewing, redlining and printing, it's clear that this company doesn't do things in halves. AutoVue, which supports an extensive range of PCB, Schematic and IC layouts, provides a raft of extremely powerful and intelligent EDA associated functions that appear in the tool bars on loading a known EDA format.

The left hand toolbar offers the rotation commands, (which is useful as many of the formats produce a mirror image by default), together with Bird's Eye and Magnify Glass options. Depending on the EDA format opened, the top icon bar displays a Cross Probe icon, Entity Browser, PCB Views (layers), Bill of Materials and Measurement (distance, area and minimum distance) tools.

The Cross Probe feature allows a PCB layout to be associated to a relevant schematic file, after loading both files. By simply selecting a component in either

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the schematic or the PCB, the corresponding entity is highlighted in both displays. It's pretty obvious from this that Cimmetry has managed to access the intelligence within the EDA files.

By using keywords or values, it's possible to search files for Parts, Components or Devices, as well as Pins, Vias and Nets. The Bill Of Materials command also provides a powerful compilation tool, which offers a number of end-user variables. The generated report lists could contain: location, device type, component name, package symbol, rotation and provide a count of all the instances within the file. These report variables are user-configurable, and it's easy to create content-specific listings.

The measure command, which has been enhanced to work with EDA formats, is capable of recognising and actually snapping to a component's mid, end or center points. Precise measurements can also be taken between Pins, Vias Symbol Origins and Net intersections. There's also a 'minimum distance' tool to check against any specific minimum separation requirement within the design.

As layouts can be incredibly dense and multi-layered, Cimmetry has included a number of tools to easily locate and identify drawing elements. There's a masking feature, which, once the component has been selected, colour fills the component to make it stand out. This can be used to select and locate a number of components at the same time. It's also possible to use the standard layer command to quickly switch layers on and off. Saving the best for last, it's also possible to select a Component or Net for instance, from the navigator, right click and zoom selected, where the object of interest will appear in the middle of the display area.

By picking up on the intelligence within the EDA formats, AutoVue offers a number of other highly advanced features, such as the automatic highlighting of physical and logical Nets, even through PCB layers and across multiple schematic pages. AutoVue helps

you locate the original design intent. By selecting a Component, Pad, Pin or Via, while right clicking the 'show Nets' option, AutoVue immediately highlights any associated Net connectivity. Again, here if the Net is outside of the current view, a simple right click and 'Zoom Selected' will place the highlighted Net at the centre of the display. Also by right clicking, it's possible to get a complete list of Entity information, such as part number, attributes and associations.

Finally, as AutoVue SolidModel has 3D capability, it's possible to view the PCB design in shaded 3D, when applicable. From my knowledge of the viewing tool market, this 3D capability is a unique feature.

Collaborative Review

Cimmetry has extended one of its core data streaming technologies to allow interactive, real-time design review capability. Put into English, this means that an engineer can email participants to join a hosted review session, at a specific time. Using the Internet or internal network, users can log into an active AutoVue virtual session. On joining a session, the file to be reviewed will be loaded by all participating AutoVue clients and synchronised.

While other collaborative applications on the market limit the input of session participants, allowing only the host (or baton holder) to manipulate markups, Cimmetry's solution allows designers to view and manipulate the document independently, while adding markups - which are displayed on all members' displays. Control of the session, really means control of the common view displayed and this can be handed between session members using a 'baton' system.

Each project reviewer is given a different colour, so redlines can be easily differentiated and attributed. AutoVue, allows feedback to be added from other session members as well as an 'instant messaging' system, which gets stored as a session log.
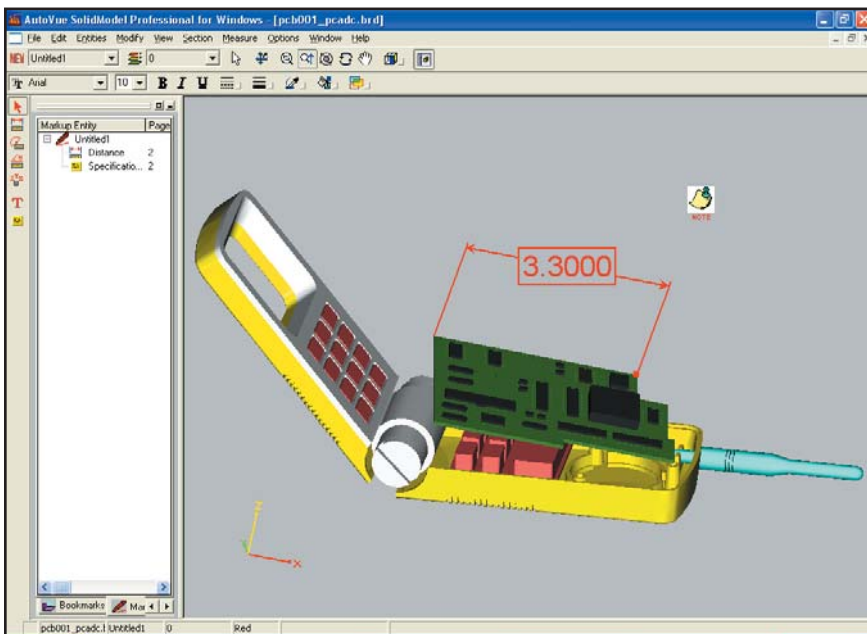
Cimmetry has targeted the key area where engineering teams actually do want to collaborate, that being at the design review stage. The software is easy to use and when combined with a conference phone, could save companies a lot of money and time wasted in unnecessary travel.
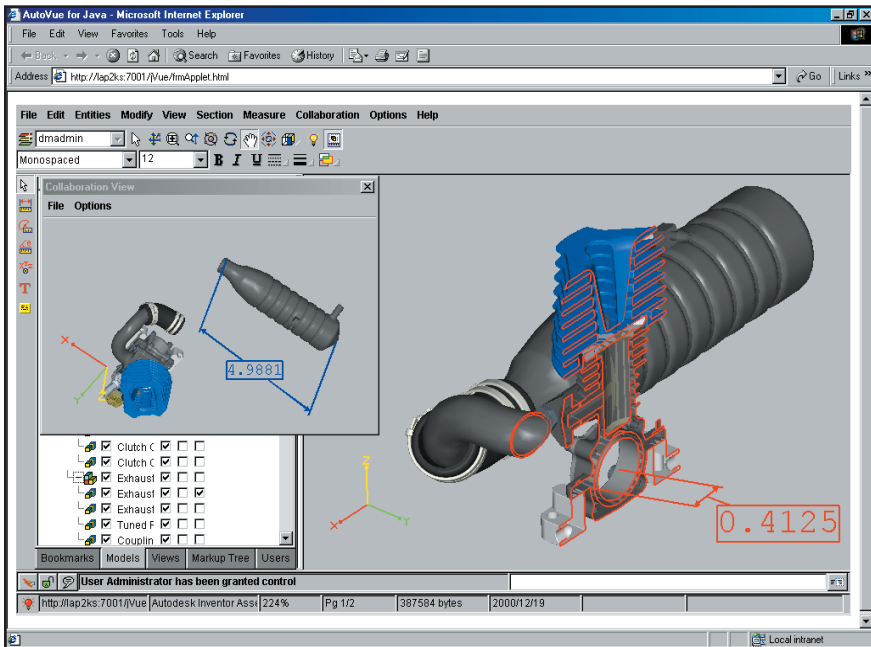
System Integration

Integration has become the industry's most used buzzword and to enable AutoVue's deployment within existing systems, Cimmetry has provided a number of Application Programming Interfaces (APIs) to provide customers and developers with tools to integrate AutoVue with EDM, PDM and ERP systems. Cimmetry has already forged links with many of the major players in this area, including Agile, Documentum, Dassault Systemes SmarTeam, FileNET, MatrixOne, Windchill (PTC), OpenText etc.

Conclusion

It's clear that Cimmetry has taken AutoVue and created a foundation product for engineering enterprises. By offering a number of variants, using a common interface, and offering multiple deployment technologies, it's possible to utilise AutoVue as the front end for all document viewing, whether the file is in a

Viewing 3D PCBs in AutoVue

Real-Time Collaboration using AutoVue

The new EDA functionality goes way beyond traditional view and markup, providing real data interrogation tools to locate components, trace connections, cross probe between layout and schematic, highlight logic nets and search on real-world items such as pins, devices, parts and create BOMs. This kind of functionality and intelligence, combined with depth of file support, makes AutoVue an extremely powerful design review tool for the EDA market.

With AutoVue, Cimmetry Systems has produced the most comprehensive view and markup tool on the market today. The extensive range of file formats supported continues to expand, covering all the key 2D/3D CAD, EDA and typical project documents like Microsoft Office, PDF etc. Cimmetry has extended its commitment to supporting the key EDA industry formats, together with providing some unique EDA interrogation tools, making AutoVue a one-stop shop for multi-discipline engineering or any design-related file viewing. There also is a highly innovative 'on-line', 'collaborative' view and markup feature which could enhance or replace project review meetings.

By supporting desktop, thin-client and UNIX variants, AutoVue covers all operating system bases, making it a natural choice for 'across-the-enterprise' deployment or vertically through a supply chain. I believe that AutoVue is also the only visualisation tool to offer support for 2D, 3D and EDA in a thin-client environment and from the looks of things, it will take the other visualisation vendors a lot of development work to catch up. I highly recommend the product, and when evaluating desktop, team-based or corporate-wide view and markup solutions, AutoVue has the power and flexibility to be at the top of your evaluation list.

native application format or an industry open standard, on a desktop or via a network.

When used in conjunction with one of the many PLM/ PDM and Enterprise Content Management products, AutoVue offers a consistent interface to a managed environment. Using the scalability of the thin-client version, this could range from small to global enterprises or even across your supply chain, and still offer ease of maintenance through a single installation.

"I highly recommend the product, and when evaluating desktop, team-based or corporte wide view and markup solutions, AutoVue has the power and flexibility to be at the top of your evaluation list."

AutoVue - Supported File Types

Looking at the list, it's clear to see that AutoVue supports all the common and not so common file types:

2D - The range of commonly used formats include: HPGL, HPGL/2, HP RTL, EPS, CALS Group IV, TIFF, Visio, PDF, Word, Excel and Microsoft Project. The specific 2D CAD support includes: AutoCAD (DWG, DXF, DWF), MicroStation (DGN), Mechanical Desktop, ME10, SolidEdge 2D, SolidWorks 2D.

2D/3D MCAD - AutoVue SolidModel's support for 3D is the widest I've seen on the market, comprehensively covering all the latest mid and high range of solid modelling tools, including: CATIA 4 and 5 (3D & 2D), Pro/Engineer (3D & 2D), Unigraphics (3D & 2D), SolidWorks (3D & 2D) 2003, Solid Edge (3D & 2D), Autodesk Inventor (3D & 2D), Solid Designer and Mechanical Desktop (2D and 3D). In addition, the industry generic formats are more than adequately catered for, supporting: ACIS, Parasolids, IGES, STEP, STL, DirectModel JT and VRML.

EDA - AutoVue has had some powerful EDA tools added to it, together with a host of new formats covering all the leading players in the PCB and IC design market, including: Cadence Allegro, Cadence Concept, Mentor Board Station, Design Architect, PADS Power PCB and Zuken CADSTAR. Schematic and layout applications and formats like, Orcad Layout & Capture, P-CAD Layout & Schematic and PDIF Layout & Schematic are included, together with industry standard formats like Gerber, IDF, EDIF, ODB++, GenCAM, GDS II and CIF.