

An Outside Look in at IntelliCAD

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1. Why is IntelliCAD?

A brief history of IntelliCAD's complex past.

Where did the name come from? The name of the software "**IntelliCAD**" comes from a programming company that was formed in the early 1990s in San Diego CA USA. Their main claim to fame was **ADE** (AutoCAD Data Extension), which they sold to **Autodesk**, and which eventually became part of Autodesk Map. ADE lives on, in the names of some Map functions, as well as in some features in IntelliCAD, such as the Outside Polygon option of the **Select** command.

For a short time, the software was called "**Phoenix**" -- partly as a code name, and partly as a holding pattern while Visio obtained use of the IntelliCAD name.

IntelliCAD the software has a complex and fascinating history that winds its way through **Softdesk**, Autodesk, Boomerang, **Visio**, just missing Microsoft, then onto the **IntelliCAD Technology Consortium**, and now under a variety of brand names, such as CADopia, Bricscad, and DWGEditor.

IntelliCAD came into being as the result of paranoia, and continues to strike fear in some quarters. During the 1990s, Softdesk was the largest third-party developer for Autodesk. But all was not rosy. Autodesk had shunned another large developer, **Cyco Software**, after Autodesk

released drawing management software that mimicked Cyco's bread-and-butter AutoManager software. Until Autodesk's **WorkCenter** software failed in the marketplace, it was tough sledding for Cyco.

Softdesk executives wondered if Autodesk might treat them in a similar manner. They were, after all, treading on Autodesk's toes in the area of software that ran on top of AutoCAD, especially in architecture. As well, Softdesk was doing a better job than Autodesk at writing applications using AutoCAD's then-new **ObjectARx** interface.

As I heard the story, a director told Softdesk's ceo that he needed an insurance policy against Autodesk pulling out the rug. By this time, Softdesk had acquired IntelliCAD, and so its programmers were set up in a skunkworks across the continent. Their job: recreate AutoCAD. Of which they accomplished a fair bit, when everything changed. In rapid order:

1. In a bidding war against Parametric Technologies, Autodesk purchased Softdesk for \$90 million.
2. After Autodesk discovered it now owned an AutoCAD clone, the software and employees were spun off as **Boomerang Technologies**.
3. The **FTC** ordered Autodesk to avoid IntelliCAD and the employees for ten years.
4. Visio purchased Boomerang and IntelliCAD, and launched the product late, at 10% of the price of AutoCAD. The company delivered grandiose plans that involved becoming the "the single worldwide standard for business drawing."
5. Days after the launch, the head programmer was fired for failing to include features that Visio said were required. The following Monday, his staff quit in protest. Visio quickly hired all new programmers.
6. During this time, Visio purchased **MarComp** for its *.dwg* read/write libraries. Later, Visio released the code free under the umbrella of the **OpenDWG Alliance** (renamed Open Design Alliance).
7. Autodesk saw OpenDWG and IntelliCAD as attacks against AutoCAD, and so launched its won two-prong attack: (1) created the "100% Pure DWG" campaign to scare away customers from using non-Autodesk CAD software; and (2) released **Actrix Technical**, a competitor to Visio Technical.
8. After spending a reported \$25 million but selling only tens of thousands of copies, Visio made IntelliCAD 98 free, and created the IntelliCAD Technical Consortium to shepherd the code. Shortly there after, Visio announced it was selling itself to Microsoft for \$1.3 billion.
9. The ITC discovered that critical components required royalty payments, and so only a barebones IntelliCAD could be given away free. Nevertheless, companies begin to take on IntelliCAD, either for value-added resale or for in-house CAD projects.

For a detailed history of IntelliCAD, see Appendix A.

PS: As for Actrix, it didn't sell well, and eventually Autodesk gave up on it.

Lessons to be Learned from History

What are the lessons we can learn from this history of IntelliCAD?

Vendettas don't pay.

- you look foolish trying publicly to take out a competitor.
- your competitor may one day need to become your ally.

- it's expensive trying to crush the competition.

Autodesk's ten-year freeze thaws in March, 2007.

- that's just 2.5 years from now.
- what does that mean for you?

Customers worry about the safety of their drawings stored in *.dwg* file format.

- even with the help of the OpenDWG Alliance, there is more to *.dwg* than reading and writing files.
- representation by the CAD editor.

2. Can the ITC Work?

An overview of IntelliCAD's role in the CAD universe.

A parallel to IntelliCAD is the Linux operating system. We can learn from it.

The Linux kernel (its core code) is controlled by one man, Linus Torvald. He makes the key decisions of what goes into the kernel and what does not. In the same way, the ITC determines what goes into the core of IntelliCAD.

Other vendors -- like Red Hat, Mandrake, and Novel (SuSE) -- take the Linux core, and add functions to customize Linux for different markets, such as servers, desktop, and embedded systems. This is like Cadopia and Bricscad.

Third-party vendors write add-ons to Linux for performing useful functions, like database queries, word processing, and Web browsers. The same happens for IntelliCAD and its third-party developers.

Business Week recently interviewed Linus Torvald, whose 13 years work in creating and guiding Linux can provide you with a guide of how to run ITC, and what to expect in the future. Some of the issues he raises: "But as Linux gets really important, strange things come up."

Legal issues: "It's not that I think Linux has legal problems, but that the [legal] system doesn't work as well as it should, and crazy things happen."

Software patents: "I worry about some greedy companies -- possibly failing ones, trying to make trouble and abusing the system."

Open source development: "I think, fundamentally, open source does tend to be more stable software. It's the right way to do things." (IntelliCAD is not open source.)

Speed of development: "All development is very gradual -- whether commercial or open source. Even when you have a big thinker coming along with a new idea, actually getting it working takes a lot of sweat and tears."

Backward compatibility: "People complain about how long it takes us to develop new versions, but we made sure that with new upgrades, old programs continue to run. We have programs written in 1992 that will run on the latest versions."

Copying features from competitors: "It's good to copy good ideas. It should be encouraged. We don't say Einstein was a really smart guy and we should come up with a better theory of relativity. We build on top of his good ideas and have new exciting quests."

His role: "What I do mostly is I'm a communications channel. I don't decide what needs to be done. It's defined by what people need to get done and what they want to do. Getting it working together -- that's where I and other organizers come in. If I see something that needs more attention, I sometimes suggest something."

His leadership technique: "I have no legal or explicit power. I only have the power of having people's trust -- but that's a lot of power. Having another person's trust is more powerful than all other management techniques put together."

(You can read the full interview at

www.businessweek.com/print/technology/content/aug2004/tc20040818_1593.htm?tc)

3. Who Is the Competition?

And an explanation of how Autodesk wins mindshare.

If IntelliCAD is compatible with AutoCAD, that means that the ITC is competing against Autodesk -- whether it wants to or not. In addition, you should be aware of other competitors. AutoCAD and LT are not the only products that use *.dwg* natively.

IntelliCAD's Competitors

VDraft (US\$250) from SoftSource (www.vdraft.com) was the first CAD product to use *.dwg* as its native file format. It now seems stuck at version 2.2 supporting DWG 2000; the developers were distracted by other projects, such as displaying *.dwg* files on PDAs.

Softsource wrote the *.dwg* translator for Generic CADD, after Autodesk purchased Generic Software, and needed to make the CAD program file-compatible with AutoCAD. Softsource used its knowledge to create Project Sausalito (the then-headoffice location for Autodesk), later named Virtual Drafter and then shorted to VDraft. It took five years to write, and by then AutoCAD gained many of the features that were originally unique to VDraft.

PowerCAD (US\$595) is from Felix Computer Aided Technologies, and was previously known as FelixCAD or FCAD by Graebert GmbH of Germany (www.graebert.com). GiveMePower is the North American distributor (www.givemepower.com).

Mr Graebert had a falling out with Autodesk Europe, and so hired programmers to create FelixCAD (named after his son) to compete against AutoCAD. The current release of PowerCAD 5 has these advantages of IntelliCAD 4:

- Runs on Windows desktop (PowerCAD and PowerCAD LT) and PocketPC computers (CeCAD).
- Current version 6 supports AutoCAD 2005.
- Other new features include VoiceNote (attaches voice notes to drawings), inspection list (creates lists of inspection and to-do items), redline and markup tools, digital signatures, and

supports laser measuring devices.

MicroStation PowerDraft (US\$1,295) and **MicroStation V8** (US\$4795) from Bentley Systems (www.bentley.com) claim to read and display *.dwg* files natively. I think that translation does occur, and here's what I think happens: the new V8 *.dgn* file format stores the *.dwg* file in its entirety (as metadata) and then translates it on the fly, as required.

In the early 1990s, Bentley Systems received fame for having the first CAD package to read *.dwg* files directly, and then read and write *.dwg* files. (SolidWorks was first at integrating IntelliCAD with a mature CAD product.) Bentley Systems recently joined the OpenDWG Alliance, precipitating the name change to Open Design Alliance. They have more than 250,000 customers.

ObjectDBX is Autodesk's answer to the Open Design Alliance's DWGdirect. It is a C++ library for accessing, reading, and writing DWG and DXF files, but is compatible with releases 2000i to 2005 only. It differs from ObjectARx in that AutoCAD does not need to be present. Autodesk uses ObjectDBX to provide DWG support in non-AutoCAD-based products, such as VIZ, Revit, and Inventor.

AutoCAD OEM is Autodesk's AutoCAD engine. Developers create a CAD product that uses a subset of AutoCAD features customized for vertical applications, including a different user interface. Both ObjectDBX and AutoCAD OEM are selectively licensed by Autodesk to developers who submit a business plan.

(usa.autodesk.com/adsk/servlet/index?siteID=123112&id=770257)

How Autodesk Wins Mindshare

How does Autodesk keep customers purchasing the overpriced and underpowered AutoCAD LT? By creating a worry in customers that other products cannot read *.dwg* files accurately enough. The only way to be sure is to buy an Autodesk product.

At the time that Visio launched IntelliCAD, Autodesk counter-launched with its "100% Pure DWG" campaign for LT. Ironically, at the time, LT in fact did not handle *.dwg* files 100% pure. It failed to display some objects created in AutoCAD; now that LT correctly displays AutoCAD drawings, Autodesk no longer uses the logo.

With its renewed interest in DWF (design Web format), Autodesk mounted a similarly campaign against Adobe's Acrobat software and PDF format. It consisted of a No-PDF logo and images of acrobatic performers falling. Something -- I don't know what (complaints by customers, Adobe?) -- caused a change, and Autodesk is no longer as vociferous; you even hear their people saying that PDF is good for what it does, and notice that documents on Autodesk's Web site are provided in PDF format, not DWF.

More recently, when SolidWorks announced DWGEditor, Autodesk released a PDF file <g> that warned, "Manufacturing companies simply cannot afford to risk their design data to the SolidWorks 2005 DWG Editor." The FUD factor was that AutoCAD drawings will not show up correctly in DWGEditor, and the PDF included a couple of examples. No mention was made that Inventor also needs to translate *.dwg* files; in any case, the two examples were incorrect. Read my full rebuttal in Appendix B.

Launching a successful fear campaign requires that you think deeply into the minds of customers.

- What worries them?
- How nasty dare we go?

Being faced by a fear campaign requires that you react quickly and accurately:

- Get the word out fast that what's being said about you isn't accurate.
- Some think they take the high road by ignoring the campaign; avoid that temptation. It is important to counter the mis-facts with facts to remove doubts lingering in the minds of customers.
- Respond calmly with verifiable facts; have a third-party check your comments. Counter-campaigns lose credibility when they contain hysterical-sounding counter-claims of dubious statements.
- Get free publicity of out this; some of the media love this sort of thing.

4. How to Market IntelliCAD?

Tactics for selling more product.

Overcome Invisibility

A weakness of IntelliCAD is its **invisibility**. Has this been due to:

- Expectation that licensees market the product?
- A big media campaign that costs too much money?
- Confusion over the product -- too many brand names?

Media awareness need not cost a lot: as cheap as sending out a press release once a month, or more often. I suggest that the ITC coordinate news from its members, so that there is *something* to announce every 2-3 weeks. It's easy to get mailing lists: every so often, a media person accidentally includes their entire mailing list with their press release.

Update Regularly & Publish Roadmaps

IntelliCAD 4, 5, and so on. **Regular updates** are a good thing. It tells the world that the product is progressing.

Roadmaps are another good thing. Roadmaps answer a question: In which general direction is the product progressing? Road maps tell customers (and potential customers) that the product: (1) will progress; (2) has a future; and (3) will have features they can look forward to.

The drawbacks to road maps are: (1) competitors know where your product is heading; and (2) you have to keep to your promise internally. You lose face with your customers when your roadmap changes often. Even if you chose not to make your roadmap public, you should, naturally, have your own internal roadmap that guides development.

To add mystique, use code names. Microsoft has "Longhorn" as the codename for its next operating system. Autodesk calls its next major release "Reo." Codenames do two things: (1) save you from deciding on the product's name and number too early; and (2) make people feel that they are insiders.

Features and Release Dates

Let's look at two public roadmaps from your primary competitor: features and release dates.

Autodesk's **features roadmap** for AutoCAD consists of enhancements in these areas:

- Drafting
- Publishing
- Presentation and 3D
- Workflow
- Customization

If you follow AutoCAD, then you may recognize that some of these have been addressed in previous releases; 3D and customization are up for major overhauls in future releases. (During August's conference call with financial analysts, ceo Carol Bartz indicated that 3D will be beefed up across all platforms in 2005.) Autodesk says that they have the next four releases mapped out, although they have not provided the details for competitive reasons.

Autodesk's **release roadmap**, however, seems written in sand, and shows the problems with making roadmaps public:

- A major release of AutoCAD every 12 months. Releases 2004 and 2005 came out 12 months apart, in March; Ceo Bartz says the next AutoCAD will be released in March, 2006. We'll see if Autodesk can maintain the pace.
Problem: Just two years ago, Autodesk said there would be no more "big-R" releases, just *extensions*; now they are back to major releases.)
- An SE (subscription edition) release mid-year for subscribers only.
Problem: SEs were scrapped a mere 10 weeks after being announced to the media, and were replaced by *extensions*.
- One or more extensions every three or four months. Extensions are program features that can be bolted on, and are available only to subscribers; all extensions are included with the next major release.
Problem: Since December 2002, Autodesk shipped just two extensions for AutoCAD:
Design Publishing Extension - December 2002
Tool Palettes Extension - October 2003
usa.autodesk.com/adsk/servlet/linkedsuindex?siteID=123112&id=329649&linkID=2176881

You can have a roadmap, but the danger is in falling behind in the promises.

What Should Be On IntelliCAD's Road Map?

If the ITC were to put together a roadmap, what should be on it?

Some ideas I have are:

- Decide which release of AutoCAD to aim for in *complete* compatibility. Release 2000? Certainly R14 as a minimum. The AutoCAD history site at betaprograms.autodesk.com/history/area51.htm is inaccurate, but gives you an idea of the commands that have been added over time.
- Define "compatibility": commands? commands and options? system variables? user interface? customization? programming? drawing files?
- Define level of compatibility: for example, if an AutoCAD command is screwy (like DrawOrder),

do you emulate the bad behavior? Or fix it?

- Create a compatibility standard, against which IntelliCAD and competitors are measured. For example:

<u>Commands</u>	<u>System Variables</u>	<u>User Interface</u>	<u>Customization</u>	<u>Programming</u>	<u>Drawing Files</u>
95%	90%	85%	75%	60%	95%

Appendix C lists the commands added to AutoCAD Release 14. It shows which commands work in IntelliCAD Standard (four) and those commands subsequently removed from AutoCAD (seven). Compatibility is a moving target.

- Which areas are most important for the progress of IntelliCAD?

- 2D
- 3D
- Customization
- .*dwg*
- User interface
- Others?

Emphasize IntelliCAD's improvements over AutoCAD. (But do improvements make it incompatible with AutoCAD?) Such as:

- more ways of selecting objects
- save drawings back to v2.5
- lower cost
- macro recorder
- all commands transparent

Provide other improvements that are not reliant on compatibility with AutoCAD. Examples include:

- symbol libraries
- hatch patterns and line type libraries for specific disciplines
- fonts relevant to CAD and languages other than English
- drafting methods, such as creating isometric drawings
- wizard for creating drawing borders and title block
- easier plotting methods
- output to PDF (OpenOffice.org provides it free)

5. What is IntelliCAD's Future?

A discussion on how to move onward and upward.

At one time, IntelliCAD was going to be faster, more advanced, and better than AutoCAD. "A better AutoCAD than AutoCAD," was the goal. By the time IntelliCAD was released, it no longer was; IntelliCAD has been playing catch-up ever since. How did that happen?

- IntelliCAD shipped **late**, giving Autodesk time to add equivalent features, such as MDI (open more than one drawing at a time), DesignCenter, and the customizable UCS icon.
- IntelliCAD shipped **incomplete**, meaning it lacked some of the more difficult-to-code features found in AutoCAD, such as boundary hatches and shapes.

A decade ago, Shell undertook an analysis of the future. They developed three scenarios for what affects them the most -- oil prices: prices skyrocket; prices remain unchanged; and prices plummet.

That allowed Shell to be prepared when prices skyrocketed. It did not, however, prepare them for the human factor, like the greed that caused executives to overstate reserves. Now the company is in danger of being taken over by Total of France.

The ITC should do the same: figure out what affects you most. Then perform three analyses: best case, no change, and worst case.

Appendix A: The History of IntelliCAD

Over the last ten years, the "IntelliCAD" name and software have taken a tumultuous journey:

IntelliCAD began as an independent AM/FM [automated mapping/facilities management] software firm in La Mesa, CA USA. One of its products, **AutoCAD Data Extension**, allowed multiple users to access the same AutoCAD drawing, or have a single drawing point to entities stored in other drawings -- much more efficient than xrefs. It also converted drawings between different map projections and datums by attaching extended entity data to objects. Some of its technology is found today in the IntelliCAD CAD software, such as the Window Circle and Outside Polygon options of the Select command, and the commands for accessing extended entity data.

IntelliCAD sold ADE to **Autodesk**, who released ADE v1 in October 1993 as its first foray into GIS (geographic information systems), and then later incorporated the technology into its GIS software called "**Map**."

1994

August: IntelliCAD is purchased by **Softdesk** of Henniker NH. At the time, ceo David Arnold said, "The products and technology from IntelliCAD increase Softdesk's integrated solution for managing AEC [architecture, engineering, construction] projects, and enable Softdesk to continue its move into the related AM/FM and utilities segments of the AEC market."

Around the same time, Autodesk was having rocky relations with third-party developers. One of the most prominent, **Cyco Software** of The Netherlands, had been kicked out of an AutoCAD conference, because its product competed with one from Autodesk -- never mind that the Cyco AutoManager product was first, and Autodesk's WorkCenter came later. (Ironically, the Autodesk product failed in the marketplace, and Cyco is again a prominent member of the Autodesk Developer Network.)

The falling out with Cyco set off alarm bells at Softdesk -- the largest third-party developer in the AutoCAD world. Their software required AutoCAD. What if Autodesk cuts us off like Cyco? they wondered. It was decided that a skunkworks project would create a secret AutoCAD-compatible engine. Only the highest levels of Softdesk knew of the project, called **Project Phoenix**; the ten programmers were the IntelliCAD team located on the other side of the country.

The goal was to build a clone of AutoCAD: read and write *.dwg* files natively; support all objects, properties, and tables; support customization, macros, scripts, DCL (dialog control language), AutoLISP, and ADS (AutoCAD development system, called SDS in IntelliCAD). And it would be better than AutoCAD: open multiple drawings, all commands transparent, macro recorder, context menus of command options, Explorer window, and more. When IntelliCAD became public, Autodesk quickly added some of these features to AutoCAD.

1996

December: Autodesk acquires Softdesk following a brief bidding war with **Parametric Technology Corporation**, which raised the price from \$72 million to \$90 million. Autodesk wanted Softdesk, because its programmers were further ahead than Autodesk's in exploiting the ObjectARx programming interface that had been added to AutoCAD Release 13.

At the time, we wondered if PTC was merely irritating Autodesk, or was serious in its counterbid and wanted to create an architectural CAD division. PTC is best known for its mechanical CAD software **Pro/Engineer**, but had earlier failed to get into architectural CAD with its purchase of **Reflex** from England. Later, two software programmers left PTC to start their own architectural CAD company, called **Revit**. In an ironic twist, Autodesk eventually buys Revit.

Softdesk apparently did not tell Autodesk about its AutoCAD clone. Perhaps executives no longer considered IntelliCAD important; Autodesk, after all, wouldn't need it, and revealing its existence might jeopardize negotiations. For \$90 million, I'd probably keep my mouth shut, and apologize later.

1997

March: Autodesk investigated by the FTC (Federal Trade Commission) over the alleged monopoly status of AutoCAD. Any market share of over 70% is considered a potential monopoly by the FTC, and grounds for investigation.

In the 1990s, Autodesk used different market-share figures, depending on the circumstances. Most commonly, the number "70%" was bandied about as AutoCAD's market share of PC desktop CAD software. In front of dealers, executives lead chants of "One hundred percent, one hundred percent" -- their goal being 100% of the market. Once the FTC began its investigation, however, Autodesk quickly shrank the figures, claiming less than 10% market share -- based on its \$617 million in annual revenues sales in a total CAD market of \$7 billion a year.

The FTC allowed Autodesk to purchase Softdesk after Autodesk agreed to: (1) spin off IntelliCAD; (2) not attempt re-acquire the technology; (3) not attempt to acquire any company that owns or controls IntelliCAD; and (4) not interfere with employees who leave Autodesk to work with IntelliCAD. It'll be interesting to watch Autodesk's action (if any) when the ten-year agreement runs out in **March, 2007**.

IntelliCAD was spun off as **Boomerang Technology** in San Jose CA. I believe the name is tongue-in-cheek, because I suspect that Visio was already in talks to acquire IntelliCAD, and Boomerang was a temporary holding place until the purchase by Visio was completed. Employees were boomeranging from one company to another -- IntelliCAD -> Softdesk -> Autodesk -> Boomerang -> Visio -> Microsoft or IntelliCAD Technical Consortium -- all in ten years.

The photo below shows the IntelliCAD programming team under the Visio ownership stage.



Photo credit: www.lindaeskin.com/linda/work/visio-group.jpg

The order of events varies according to who tells the story.

- A version I heard from a Visio employee is that Visio alerted the FTC to Autodesk's

ownership of IntelliCAD, who then forced Autodesk to give it up.

- Another version is provided by former employee Linda Eskin at her Web site: The Project Phoenix team was laid off by Softdesk. The laid-off employees won the right to buy the IntelliCAD code; in her account, the FTC ordered Softdesk to sell the IntelliCAD code to Boomerang. It then took three months to get venture capital and angel funding to complete the project. In 1998, Ms Eskin and other IntelliCAD developers founded Radish Works, a games developer. (www.lindaeskin.com/linda/work.html)

Visio bought Boomerang, and allowed the programming team to stay in San Diego, while the project managers resided one thousand miles to the north in Seattle. I wonder sometimes whether that disconnect led to the problems that erupted later. The purchase price is \$6.7 million. (www.intellicad.org/about/TC/itchistory.asp)

Visio Corporation (previously called ShapeWare) was riding high on the popularity of its of Visio software. I attended the 1998 developer's conference where its ceo declared his company's intention to become "the single worldwide standard for business drawing." Upon hearing that, I shook my head. It was an impossible goal for a company that specialized in software that drew diagrams and flowcharts. Had he taken into consideration that the graphics software market includes diverse top sellers like PowerPoint (Microsoft), PhotoShop (Adobe), and AutoCAD (Autodesk)?

Around this time, Visio had released **Visio Technical**, which was geared toward CAD users. Visio saw IntelliCAD as providing two key parts of a Grand Plan: (1) it gave Visio access to the CAD market, as well as to compete effectively against Autodesk; and (2) it added CAD technology -- like object snaps, polyline entities, and DWG read-write translation -- to its diagramming software. IntelliCAD allowed Visio Technical to become even more technical.

It's hard to know how much of the upcoming war with Autodesk was pure competition in a capitalistic marketplace, and how much was personal vendetta. Visio's IntelliCAD product manager was a former AutoCAD product manager. But the plan was simple: sell a better AutoCAD at price 10x cheaper. It was *sure* to topple Autodesk as #1 in CAD, Visio executives believed.

June: At the A/E/C Systems '97 show, Visio held secret meetings with journalists, telling them of their plans for IntelliCAD. My notes from the meeting reported:

- * Visio Corp wants to become the single standard for creating, storing, and exchanging technical drawings.
- * Visio Corp's plan is for Visio Technical to be used for technical drawing, and Phoenix for 2D/3D drafting.
- * Phoenix would probably be named IntelliCAD, after Visio got the rights to the name.
- * Visio 5 borrows from Phoenix for better compatibility with AutoCAD.
- * Eagle Point, Ketiv, and Hitachi have applications running on Phoenix.
- * 3D solids modeling is being left to a high-end partner, because 3D represents just ten percent of the market (at that time); Visio would provide hooks to display 3D solids in Phoenix. ACIS kernel would not ship in v1; solid models are stored but not displayed. (It would be another five years before ACIS becomes available.)
- * IntelliCAD features would include: 4MB executable (considered small); command line like AutoCAD's (considered unusual for Windows-based CAD software); tri-color axes (red=x, green=y, and blue=z); ADE selection modes, like crossing circle; Drawing Explorer shows all named objects of all open drawings, including layers, views, and styles; can copy and paste

named objects between drawings; can preview blocks; enhanced script facility allows recording of macros; all commands are transparent; AutoLISP is re-entrant; includes VBA (visual basic for applications) and reads AutoCAD VB project files.

* The beta of Phoenix was to be made available in August '97, with final release to ship in the fourth quarter (Oct-Dec). Price would be US\$499.



Upon leaving the secret meeting, journalists were giving black T-shirts that read "I've seen the future of CAD" on the front, and "but I'm not allowed to talk about it" on the back.



Documentation writer Linda Eskin recounts, "One of the high points of my working life was watching the nice folks in the Autodesk booth go ashen the first time they saw an out-of-the-box third-party application run on IntelliCAD at a major trade show. They never thought we -- a renegade little group in East county -- would be able to do it."

1998

IntelliCAD failed to ship in 1997. In contrast, over two million copies of Visio software shipped between November 1992 and March 1998.

February: Visio makes its recently-acquired MarComp AutoDirect2 DWG read/write API library freely available for non-commercial use through the Open DWG Alliance; commercial licenses are US\$5,000. The purpose of the alliance is to collect the DWG translation experience of many software developers. Fifteen CAD vendors ponied up US\$25,000 apiece to become Founding Members. www.opendwg.org

Autodesk refuses to join the alliance. CTO Carl Bass said that, by forming this alliance, Visio is admitting that IntelliCAD is not 100% compatible with AutoCAD. "Our customers own their data -- via DXF," Mr Bass told me. You read of the public relations battle between Autodesk and the alliance at www.upfrontzine.com/1998/upf-096.htm.

Also in February, I traveled to Seattle to meet with Visio and to talk about IntelliCAD. According to my notes, the company saw the technical drawing market in three segments:

1. Schematics --> Visio Technical
2. Drafting --> IntelliCAD
3. 3D --> through partnership with **SDRC**.

Visio 5 and IntelliCAD would be linked initially through drawing exchange (reading and writing .dwg files); greater integration would follow in later releases. Executives saw Visio being used for redlining CAD drawings.

(SDRC? I don't know if SDRC ever knew about Visio's speculation, but the CAD vendor was later purchased by **UGS**, and SDRC's I-DEAS software is now integrated into Unigraphics CAD software, known as NX. Later, Visio struck a deal that allowed Visio Technical to work with **SolidWorks**.)

March: IntelliCAD 98 ships. The price was originally pegged at US\$495; upon release, the price dropped to \$349 as a "special introductory price"; the price drops further to \$149 at computer superstores, such as CompUSA. Through to the end of June, the first three months of sales for IntelliCAD were nearly 12,000 licenses, producing \$3 million in gross revenue -- an average of \$250 per license. Visio charges a flat rate of US\$195 per year for IntelliCAD developer support.

April: Digital Business Media launches a Web site dedicated to users of Visio Technical and IntelliCAD 98 software -- 'Design Drawing' at <http://www.design-drawing.com>

May: IntelliCAD is suddenly incompatible with AutoCAD! Autodesk releases a maintenance release for AutoCAD R14.01 that makes a change to the .dwg format, and preventing IntelliCAD from reading drawing files. The ITC explains that the problem stems from, "the inclusion of a copyright string in the 14.01 DWG format that says 'Last saved by AutoCAD 14.01h (Hardware Lock) Copyright 1982-1998 Autodesk, Inc. All rights reserved.'" Visio updated IntelliCAD 98 to work with 14.01 files.

At the Visio Solutions Conference in Seattle, plans for IntelliCAD are changed -- and they would change again in the following year. But in 1998, the plan was for IntelliCAD to become a bridge product for a Visio-based engine called "Farpoint" -- the next major release of Visio due in 1999. It would be faster than AutoCAD and 5x faster than the current Visio software. I was told that IntelliCAD and Visio Technical would eventually merge into a single product, the only question being, "What degree of co-existence?" The merger would never occur, and neither IntelliCAD nor Visio ever became faster than AutoCAD.

June: At the AEC Systems show, Visio announces its acquisition of ArchT software and eight programmers from Ketiv Technologies. ArchT has 23,000 users, will be available for AutoCAD and IntelliCAD (\$495; bundled with IntelliCAD for \$695). At the time, I believe the announcement means Visio is serious about the CAD market.

Also, Visio promises to release a 98B patch to speed up IntelliCAD, making redraws and regens up to 40% faster. Patch 48C will add a facility similar to AutoCAD's BHatch command. There are no plans for adding ObjectARx; instead, Visio believes in the ActiveX/COM model, which should be available by year's end.

September: Autodesk announces Actrix Technical and Actrix Business diagramming software, both of which appear to compete with Visio Technical and Visio Professional. Actrix is priced at \$349, the same as Visio. Autodesk vp Godfrey Sullivan writes, "With Actrix Technical software, Autodesk has created the first real bridge between CAD and diagramming, and between technical and business users."

The Visio Academic Partner program for Technical Products provides educators and school computer labs with license grants of IntelliCAD 98, Visio Technical v5.0, and ArchT v14.5 at no cost to qualifying K-12 school districts, colleges, universities and technical institutes that teach drafting or technical drawing.

October: Visio offers users of AutoCAD, AutoCAD LT, TurboCAD, and TurboCAD Pro an upgrade to IntelliCAD 98 for \$149. **IMSI** strikes back, making TurboCAD Professional available for \$99 as a competitive upgrade to users of IntelliCAD, Visio Technical, AutoCAD, AutoCAD LT, MicroStation, and CADkey.

December: Visio creates an OEM CAD engine version of IntelliCAD. C&G Software Systems, Eagle Point Software, Hitachi Software Global Technology, and Ketiv Technologies license IntelliCAD as the graphical platform for their vertical CAD apps in GIS (geographic information systems), civil engineering, and AEC (architecture-engineering-construction).

1999

A record 272,000 new units of Visio software were sold during Q1, bringing the customer base to 2.7 million users. Sales of IntelliCAD were not revealed.

February: In the *upFront.eZine* e-newsletter, I report that the new Visio Technical Design Suite bundles Visio Technical 5.0 Plus and IntelliCAD 98 for \$499. The price of IntelliCAD was scheduled to increase from \$349 to \$399 in Q2 (April-June).

Users could download Service Release D for IntelliCAD 98 as a free update patch:

- Improvements in performance, such as real-time pan and zoom.
- Improvements in stability, and AutoCAD compatibility.
- WYSIWYG plot preview, support for AutoCAD PCP (plot configuration parameter) files, and pen color mapping support; all plotter setup in a single dialog box.
- Digitizing tablet support via WinTab.
- Xref layer control within the VpLayer and VisRetain commands.
- Boundary polygon (BPoly) command.
- Alternate units and tolerances in dimensioning.

The Visio Solutions Conference is held in Chicago, and gives the first indication that CAD is in

trouble at Visio Corp: there were no sessions for IntelliCAD. The excuse is that the conference is focused on VBA -- a weak excuse, because IntelliCAD includes VBA. Perhaps by then Visio executives had already decided to unload IntelliCAD.

April: Visio closes the San Diego office for its IntelliCAD software development; remaining staff was offered relocation to Seattle WA.

Visio releases Service Release E for IntelliCAD 98 -- a patch that fixes bugs in Service Release D.

May: **BricsNet Architect** (Belgium) is the name of a new architectural add-on for AutoCAD and IntelliCAD. The software uses solid modeling to create architectural designs.

June: Visio gives exclusive marketing and distribution for its ArchT architectural software to **Eagle Point Software** in the United States.

July 27: Visio cuts IntelliCAD loose by granting the IntelliCAD Technology Consortium a royalty-free, perpetual license for the source code of the IntelliCAD 2000 technology. The ITC was set up by Visio, but run by an independent board of directors. Its job is to distribute the source code to IntelliCAD, and collect enhancements and bug fixes. Once IntelliCAD 2000 is released sometime this fall, Visio will give the source code to the ITC. Visio contributed \$100,000 and a programmer to ITC. Commercial members pay \$5,000 to ITC.

At the time, I wondered if Visio took the dramatic step for two reasons: (1) Could it be that the cost of continuing to develop IntelliCAD is dragging down the corporation's bottom line? Sales did live up to expectations; IntelliCAD sold just 30,000 copies. (2) Could it be that compatibility with AutoCAD 2000 was a nut too tough for Visio to crack on its own? Via the ITC, Visio gets getting lots of help in developing IntelliCAD. Later, we found the reason was Visio pending sale to Microsoft.

August: Visio has problems giving away IntelliCAD, because components do not belong to Visio, and cannot be given away. These include the plotting module, the photorealistic rendering module (Lightscape), the spell checker (INSO) the raster image handling (Hitachi), VBA (Microsoft), and other portions (CompuWare). To license the full IntelliCAD, you'd also need to negotiate separate licenses with ITC and a half-a-dozen other vendors.

September: Visio announces that it is selling itself to Microsoft for \$1.3 billion, Microsoft's largest purchase to date. Each Visio share would be exchanged for 0.45 Microsoft shares. Speculation is rampant that Microsoft ordered Visio to unload IntelliCAD as a condition of the deal, a rumor denied by Visio.

At this point, Visio still "owned" IntelliCAD. Originally, Visio was going to ship IntelliCAD 2000, then give the source code to the ITC. The new plan was to finish IntelliCAD 2000, and then give it away, but Visio would not be sell IntelliCAD 2000. Visio is truly out of the CAD business.

Visio says it is going into the arms of Microsoft for two reasons: (1) cash in on the value of the company; and (2) improve global sales of Visio through Microsoft's marketing prowess. Both dreams fail, when Microsoft share price plummets following the dot.com crash, and the Visio software becomes just one more of hundreds of products sold by Microsoft. Numerous Visio executive leave Microsoft within six months, after realizing that demotion from president or vice president to lower a lower point in the Microsoft hierarchy isn't much fun. **new firm**

Later, it is revealed that failure to complete the deal could cost \$2.9 billion: (1) a \$30 million breakup fee paid by Visio to Microsoft; and (2) a Microsoft option to purchase up to 6,012,500 shares of Visio common stock at \$42.78 a share, worth \$2.57 billion. Visio shares traded at about \$35 at the time.

IntelliCAD Technical Consortium opens its Web site at www.intellicad.org.

October: Surya Sarda had been in charge of development for IntelliCAD. He opens his download-IntelliCAD 2000-for-free Web site at www.cadopia.com.

Visio reports that 4Q99 revenues were \$50.1 million, up 13% over a year earlier. 4Q98. Revenues for fiscal year 1999 were \$200.0 million, up 20% over 1998. Profit was \$39.8 million.

November: After five issues, ConnectPress shuts down *Technical Design Solutions*, the first print magazine for Visio Technical and IntelliCAD users. (I was launch editor and contributor to the magazine.) In response, I launch *Visions.eZine* as a bi-weekly e-newsletter for the same audience, but it too lasts only a year. There just isn't a market for publications in the Visio market, despite its size of (apparently) millions of users. Visio's free magazine, *SmartPages*, has a new editor, Steven Bieler, and comes out every three months.

December: Shareholders approve Microsoft's take-over of Visio.

Also in December, the IntelliCAD Technology Consortium hosts its first developer conference for commercial members. Developers from ten companies met with the Visio developers to talk about VBA, TrueType fonts, boundary hatching, MTEXT, and low-level issues such as threading, the entity database, graphics display, and geometric utilities.

2000

January: Autodesk announces that Actrix Technical 2000 can "read" Visio drawings. That feature puzzled industry watchers, because the nature of the .vsd file format makes it impossible to translate Visio drawings. It turns out that the Visio software has to be installed on the same computer as Actrix, because Actrix invisibly launches Visio, and then uses Visio to generate the .dwg files that Actrix then reads in. Needless to say, translation was not perfect.

In my report for *Visions.eZine* on the next major release of Visio, code-named "10," I note that Visio Corp told me that "there will be no further IntelliCAD-style integration for Visio Technical."

February: Bricsnet and Struc Plus plan to ship commercial versions of IntelliCAD 2000 before the end of March. **Bricsnet** made an agreement with the Visio division of Microsoft to provide existing IntelliCAD customers with technical support, and to offer upgrades to a commercial version of IntelliCAD 2000. Bricsnet will distribute and support IntelliCAD in the United States and Europe. www.bricsnet.com **Struc Plus** signed a similar agreement with MS/Visio to handle the commercial release of IntelliCAD 2000 in Australia, New Zealand, and SE Asia, along with free technical support. www.struc-plus.com

April: Actrix seems to be in trouble when Autodesk starts giving away Actrix free in unmarked boxes of AutoCAD LT 2000. The software is fully functional, with no expiry bomb. A rumor circulates that Autodesk is developing a Java version of Actrix to run over the Internet -- something that is not released. Trouble leads to certainty, when Actrix is later killed off.

May: Users are disappointed when Visio 2000 seems less compatible with AutoCAD drawing files. One rumor is that Microsoft doesn't care to cross swords with Autodesk, and has begun to de-emphasize DWG translation in Visio. The most recent move was been to pull all (but five) SHX fonts, and to reduce the number of options available for controlling the translation of .dwg files.

December: The 2001 release of SolidWorks makes the market-leading mechanical CAD software compatible with Visio, providing the 3D CAD package with a 2D component for creating P&ID [piping and instrumentation diagrams] and electrical diagrams. The SolidWorks file format is Visio-aware. Visio was not included, however; you have to purchase it separately. According to Joe Dunne of SolidWorks, two other products were considered, but IntelliCAD wasn't compatible enough, and preliminary talks with TurboCAD went nowhere.

SolidWorks 2001's revamped .dwg import is similar to how Visio 2000 handles AutoCAD drawings: (1) the initial import is 100% visually accurate, but cannot be edited; then (2) as individual elements are selected for editing, they are converted to SolidWorks format on-the-fly.

2001

January: The dream never dies: "Perhaps we do not need Autodesk at all, if IntelliCAD for Mac OS X could come into existence and offer unrivaled AutoCAD compatibility," speculates www.architosh.com/news/2000-12/001218-intellicadosx.html

Or, maybe the dream will die. The Australian distributor of IntelliCAD, Struc Plus, stops supporting IntelliCAD. "End users are unwilling to pay for training or technical support. Their belief is that since the [IntelliCAD 98] product is available free, then training and support should also be free. So in the end, there is no longer any Australian technical support or training provided by ourselves. To my knowledge, I do not believe anyone else is providing it either. I see the eventual demise of the product here."

March: Bricsnet releases IntelliCAD 2000 v2.2 (US\$199; \$129/yr subscription) and adds fly-over snapping, xref manager, complex linetypes, and improved performance and stability. Bricsnet's other major product Architecturals v2.1 has increased modeling and drawing calculation speed, position links between forms, nested compound blocks, and the support of links within compound blocks.

May: The ITC announced IntelliCAD 2001 with Truetype font handling and MTEXT; associative boundary hatching; VBA/Automation; lightweight polylines; complex linetypes with embedded shapes and text objects; xref clipping; display, limited editing, and printing of ACIS solids (if optional libraries are provided by vendor); and fly-over snapping .

Also in May, Microsoft ships Visio 2002 (nee "10"), but dumps Visio Technical. The features previously found in Visio Technical are added to Visio Professional. I urge Autodesk to revive Actrix Technical, but wonder if there is a tit-for-tat: Microsoft abandoned IntelliCAD in exchange for Autodesk abandoning Actrix.

2002

April: ITC releases a development guide with information on accessing the IntelliCAD source code, how to submit code for review, and development guidelines detailing proper coding structure.

July: ITC ships IntelliCAD 2001 v3.3 with 100 fixes for stability issues.

August: The ITC releases the **ArchT** source code to members. A "separate" Web site is opened at www.archt.com.

(ArchT was a 2D architectural drafting add-on for AutoCAD created by Ketiv Technologies. In 1998, Ketiv sold ArchT to Visio. At the time, Visio saw the ArchT acquisition as building on their plan to undercut Autodesk. When Visio was sold to Microsoft, ArchT was included in the deal, perhaps unknowingly. In April 2000, Microsoft gave the ITC a royalty-free perpetual license for the source code of ArchT architectural software. Curiously, Microsoft maintain ownership of ArchT's 2D and 3D symbols, as well as Blocks and Materials and Just Textures.)

November: ITC licenses ACIS from **Spatial**, and then provides two forms of ACIS sub-license to members at reduced fee: (1) ACIS viewer license (displays and plots ACIS solids); and (2) full ACIS license (create, edit, display and plot ACIS solids). ACIS is not part of IntelliCAD Standard; Bricscad had licensed ACIS on its own years earlier.

2003

March: The ITC announces IntelliCAD 4 (US\$249) with multiple layouts, new display engine for faster display performance, ACIS solid modeling, and better memory management.

2004

July: SolidWorks reveals that it uses IntelliCAD from CADopia for its new DWGEditor in SolidWorks 2005.

Visio founders Jeremy Jaech and Ted Johnson landed \$4.75 million in venture financing for their latest company, The Graw Group -- "a consumer Web-service company that is helping to coordinate family members and the communities to which they belong."

August: The ITC announces IntelliCAD 5 for release in September.

September: The ITC holds its IntelliCAD World Meeting in Denver. Versions of IntelliCAD include:

- ADeKo IntelliCAD4 (Turkish)
- Analistgroup IntelliCAD (Italian)
- Autodsys IntelliCAD (English)
- Being IntelliCAD (Japanese)
- BricsCad V5 (Belgium)
- Cad-Manufacturing Solutions IntelliCAD (Spanish)
- Cadlab 2004
- CADopia IntelliCAD (American)
- Cosmo Electronics Corp IntelliCAD (Japanese)
- DPtech IntelliPlus (French)
- IntelliFrance IntelliDESK V5.0
- IntelliJapan IntelliCAD
- IntelliKorea CADian
- INTERsoft-IntelliCAD (Polish)
- ProgeSOFT IntelliCAD (Italian)
- R&C TASK Com. Equip. Inf. Serv. IntelliCAD

SIACAD IntelliCAD
ZwCAD (Chinese)
4M S.A IntelliCAD (Greek)

Appendix B: Rebuttal to Autodesk's "SolidWorks 2D Position Paper"

After Autodesk released its position paper, I critiqued it and sent my comments to Autodesk's pr department. I never heard back. Below, Autodesk's statements are shown in italics.

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"First and foremost, it is important to consider that this software is based on reverse-engineered technology available through the Open Design Alliance."

This sentence indicates confusion between the CAD program, and the software modules with which it is built.

The DWGEditor software is based on technology available through the IntelliCAD Technical Consortium (intellicad.org). The software uses many modules (as does AutoCAD and almost all other CAD software), including the VBA programming module from Microsoft and, in this case, the DWG read-write module from Open Design Alliance.

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"The technology has been available for many years and has gone by the name of IntelliCAD or more recently Bricscad."

This sentence appears to imply that IntelliCAD recently changed its name to Bricscad.

IntelliCAD is like Linux, in that there are several flavors. Bricscad is the name of one flavor, like Red Hat is a name of a flavor of Linux. SolidWorks actually uses the CADopia flavor of IntelliCAD.

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"It does not use any original Autodesk tools or software to correctly read or write .DWG files."

True, but misleading. Autodesk refuses to provide help in decoding .dwg files, even though it has been asked many times by the Open Design Alliance. CEO Carol Bartz calls DWG a "standard" but does not allow the standard to be documented, as standards are.

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"This has led to lag times of as much as six months between when the time Autodesk customers can effectively collaborate with the latest version of DWG and when users of other DWG-based products can."

The same problem exists for Autodesk products. The AutoCAD-based Mechanical Desktop had a lag time of nearly four months after AutoCAD 2005 came out, and need we mention VIZ 2004 that had a lag time of over a year after AutoCAD 2004 came out.

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"This will certainly be an ongoing issue for anyone using IntelliCAD or products that may be based on it, such as SolidWorks DWG Editor."

No more an issue than any third-party product based on AutoCAD. Additionally, most users don't upgrade right away; many no longer even bother upgrading.

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"If this reverse-engineered technology erroneously reads or writes a dimension or note, it is likely that parts will be inaccurately manufactured...."

It is true that OpenDWG does not read .dwg files perfectly. However, the examples you give -- dimensions and notes -- are not a problem. These (and most other entities) are read and written perfectly. This paper would be more believable if you included entities that are a problem; I could tell you, but I'll leave it to you to figure out which these are <g>.

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"IntelliCAD has difficulty with even simple objects like AutoCAD .shx fonts and OLE embedded objects."

Text is the most complex object in CAD, because it has the largest number of parameters. IntelliCAD includes AutoCAD's .shx fonts, and so displays them correctly. See the attached screen grab; the text was created in AutoCAD, and then opened in IntelliCAD.

It is, however, possible to set up IntelliCAD (and AutoCAD) so that fonts do not load correctly, thus creating the false impression that the text is being rendered incorrectly.

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"The entire manufacturing supply chain must have confidence that their CAD tools provide compatibility and quality in reading and writing DWG data."

Autodesk suffers the same problem as SolidWorks: Inventor must interpret DWG files, just as SolidWorks does.

There is no mention of the incompatibilities that .dwg itself suffers from, such as zombie (proxy) objects that are created in one vertical app, making the .dwg incompatible with AutoCAD and other vertical apps. Autodesk provides the inconvenient Object Enabler workaround to deal with zombies created by its own apps; zombies created by third-parties are generally not compatible, because object enablers are not available.

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"Autodesk Inventor Series enables manufacturing companies to design their entire product line with a single solution from a single software company."

AIS is not a single solutions, but consists of four CAD programs and add-ons: AutoCAD, Mechanical, Mechanical Desktop, and Inventor. Inventor is incompatible with AutoCAD and the two vertical apps.

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As Evan Yares of Open Design Alliance reminds us, Autodesk itself uses the APIs from OpenDesign in its Revit and Coode software.

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Finally, the paper talks about the SolidWorks DWGEditor, but then does its comparison with IntelliCAD, which is not identically the same. Recall that there are flavors of IntelliCAD, which have different features. Bricscad, for example, has a different feature set from Cadopia IntelliCAD.

Appendix C: Command Compatibility with AutoCAD R14

The following commands were added to AutoCAD R14. How many of these work in IntelliCAD Standard? Four (shown in boldface.) How many have since been removed from AutoCAD? Seven (shown italicized). Compatibility with AutoCAD is a moving target.

Command	Meaning
Convert	Converts polylines and associative hatches to R14 format.
DrawOrder	Controls the display of overlapping objects.
<i>DWFout</i> (1)	Exports drawings in DWF format.
MatchProp	Matches the properties of one object to others.
Tracking	Locates x and y points during a command.
XAttach	Attaches xrefs to the drawing.
Raster Images	
Image	Places raster images in drawings.
ImageAdjust	Adjusts brightness, contrast, and fading of raster images.
ImageAttach	Controls the attachment of images.
ImageClip	Clips (crops) images.
ImageFrame	Toggles the display of the rectangle around images.
ImageQuality	Toggles the display quality of images.
Rendering	
Background	Displays a solid color, gradient fill, raster image, or the current view behind the rendered image.
Fog	Adds fog-like effect to renderings.
LsEdit	Edits landscape objects.
LsLib	Access the landscape library
LsNew	Inserts landscape objects in drawings.
SetUV	Map materials onto objects.
Transparency	Toggles the transparency of background pixels in a raster image.
Internet Access	
AttachURL	Attaches hyperlinks to objects and areas.
Browser	Launches Web browser with URL.
DetachURL	Remove hyperlinks.
<i>InetCfg</i> (2)	Configures AutoCAD to use the Internet.
<i>InetHelp</i> (3)	Displays online help for AutoCAD's Internet commands.
<i>InsertURL</i> (4)	Inserts a .dwg file as a block from a Web site.
<i>ListURL</i> (5)	Lists the names of hyperlinks attached to selected objects.
<i>OpenURL</i> (6)	Opens a .dwg file from a Web site.
<i>SaveURL</i> (7)	Saves the drawing to a Web site.
SelectURL	Highlights objects with hyperlinks.

(1) Replaced by **Publish** command in AutoCAD 2004; now executes the **Plot** command.

(2) Removed in AutoCAD 2000.

(3) Replaced by **Help** in AutoCAD 2000.

(4) Made part of the **Insert** command in AutoCAD 2000.

(5) Replaced by the **QSelect** command in AutoCAD 2000.

(6) Made part of the **Open** command in AutoCAD 2000.

(7) Made part of the **SaveAs** command in AutoCAD 2000.