ISIS®

An Image and Scanner Interface Specification

P Pixel Translations

Contents

Executive Summary

Although knowledge workers transact much of their business in the electronic domain, a great deal of business information lies outside the electronic realm - in paper documents. The use of paper for business documents will continue for some time to come, because paper can be viewed by anyone without using computer technology.

The proliferation of imaging applications along with computer printers, scanners, fax machines, and fax modems has started to create bridges between these domains. However, this increasing availability of imaging hardware and software has created the need for a standardized and extensible way for scanners and applications to communicate with one another, and for a way to quickly implement a variety of imaging solutions without recreating low-level imaging functions for every application.

This paper describes ISIS® (an acronym for *Image and Scanner Interface Specification*), a modular and extensible standard for the acquisition, viewing, data format conversion, printing, and storage of document images. ISIS was created by Pixel Translations, which markets and sells commercial-quality tools and services for ISIS developers. ISIS is also the basis for a public domain standard, the AIIM MS61 Application Programming Interface (API) for Scanners in Document Imaging Systems.

ISIS is a modular software system in which each module performs a specific low-level function related to imaging. Each ISIS module communicates with other ISIS modules through a system of tags. Tags are data storage areas within each module from which status information can be read and to which parameters can be written. ISIS modules can be easily linked together into ISIS pipes to perform specific imaging functions. ISIS modules include drivers for over 145 scanner models, image data format converters, file-writing modules and modules to aid in the viewing and printing of document images.

Extensibility is also provided by ISIS:

- New features and functions can be incorporated into ISIS by creating a new module.
- Support of new scanner features is implemented in a generalized fashion so that when an application supports a feature, that feature is supported for all similar scanners.

ISIS includes a number of features designed to maximize the performance of ISIS applications. Some of these features include:

- Streaming - the processing of image data in 8Kb packets to conserve system resources.
- Scan & Rotate - the automatic rotation of landscape images to boost effective scanning throughput.
- ScanAhead™ - the prefetching of page images in memory to reduce scanning latency.

ISIS supports and exploits the features provided by third-party imaging subsystems from vendors such as Dunord Technologies, Kofax Image Products, Seaport Imaging, and Xionics Document Technologies. ISIS supports these products with performance equal to or greater than that which can be obtained with the developer toolkits which accompany these products.

Developer benefits of ISIS include compatibility with over 145 scanner models, a consistent and robust API, the ability to create a custom user interface or use ISIS native dialogs, and the availability of commercial-quality tools, professional technical support, driver development services, certification of scanner drivers, and driver testing services. User benefits include reliable applications, consistent user interfaces which are independent of hardware, and compatibility with over 110 applications and 145 scanner models.

This paper also discusses the similarities and differences between ISIS and TWAIN, a document image acquisition API.

The Need for Document Imaging

Although many of us spend a good portion of the workday sitting in front of a computer, much of the business information we access lies outside the electronic medium - in the form of paper documents. Each day, businesses create and file billions of new paper documents. The reasons for the continued use of paper documents include apparent low cost, portability, and the fact that anyone can view a paper document with little resort to technology. Although the use of electronic documents - e-mail and word processing -- is on the rise, paper will be around for quite a while.

Paper documents have drawbacks. Because they exist in a physical medium, paper documents are easily misplaced, document and viewer must be in physical proximity, and paper documents are viewable by only a few people at a time. The most serious problem with paper documents is that they do not integrate well into the electronic environment. Paper documents for the most part remain in an information domain separate from their electronic peers. Until recently, the only tools for integrating the two domains were the printer, for translation into the paper domain, and the human typist, for translation into the electronic domain.

Today, this situation is beginning to change. The technology of facsimile machines is rapidly being integrated into the desktop computing environment. Many computer users can now send and receive fax documents (images of documents) using a computer which, when coupled with paper-based fax machines and printers, provides a limited amount of two-way exchange between the domains. In the last few years, we have witnessed a widening deployment of desktop scanners, multifunction devices such as the Hewlett-Packard Office Jet, and production scanners. In addition, we have seen the emergence of a new category of device: the desktop scanner, which is selling in the tens of thousands per month. Each of these devices is a potential source of document images.

At the same time, many new document imaging applications have emerged. These applications range from inexpensive fax capture and viewing programs for individual users, to workgroup document imaging solutions, to production document imaging systems that can process thousands of documents per hour.

This proliferation of document image acquisition devices (IADs), coupled with the growing universe of imaging applications, means that a standard way of coupling imaging applications and IADs is needed. Further, the development community needs an open framework in which to create imaging solutions that will do more than just capture images if the gap between the paper and electronic domains is to be effectively bridged.

This paper will discuss ISIS, a modular and extensible standard for the acquisition, viewing, data format conversion, printing, and storage of document images. ISIS is an acronym for *Image and Scanner Interface Specification*. It is an open standard which facilitates the development of complete imaging applications. Topics covered will include:

- An overview of ISIS
- The ISIS standard
- ISIS architecture, modules, and pipes
- The benefits of ISIS for end-users and developers

Appendices to this paper will cover:

- A comparison between ISIS and TWAIN a scanner control language
- Listings of applications currently supporting ISIS and scanners supported by ISIS
- Information about Pixel Translations and Peabody Systems, companies which support ISIS with commercial-quality tools and support services

An Overview of ISIS

ISIS is a system of software modules, each of which performs a specific imaging related function. ISIS modules are available to control scanners and printers, assist in the viewing of images, compress and convert the format of image data, and read or write files containing image data. ISIS modules communicate with one another using messages that carry information in tags and choices. The modules are linked together into pipes to perform specific imaging functions.

ISIS is finding application in many segments of the document imaging marketplace:

- For ad-hoc desktop scanning by individual users, ISIS applications are being used to image faxes for non-paper storage, markup, and forwarding of business correspondence. Other applications for this class of user include imaging of receipts for expense reporting and capture of image files for newsletters and the like.

- For departmental scanning, ISIS applications are being used to image invoices, purchase orders, and other documents to allow multiple, simultaneous, geographically dispersed viewers to share paper documents across a network or across the Internet.

- For the production document imaging user, complete document imaging processing systems are being created by piping together ISIS-supported peripherals and ISIS modules bringing new levels of automation and reliability to high-volume applications such as insurance claim processing and air bill tracking.

For the application developer, ISIS provides a rich, robust, and consistent API for the integration of scanners into applications, as well as the ability to seamlessly weave scanner control into any application using ISIS pipes. ISIS toolkits, developer support, and scanner driver development/certification programs ensure that developers can quickly deliver reliable scanner-enabled products by adopting ISIS.

Because ISIS is a *de facto* standard and the basis of a proposed industry standard (AIIM MS61), ISIS users can be confident that the hardware they have purchased will be supported by a variety of applications, and that their imaging applications will support a wide variety of scanners.

As technologies such as OLE automation and OCX become prevalent and applications become more easily customized, the lines between applications and developer toolkits are blurring. Support for ISIS is in harmony with this trend. Pixel Translations is developing a system of OCX objects (the successor to VBX custom controls) to support the construction of ISIS applications using Microsoft's Visual BASIC and other development systems. OCX objects are sometimes referred to as ActiveX objects when used with Internet browsers.

The ISIS Standard

ISIS is not only a de facto standard supported by more than 110 software developers and 30 scanner manufacturers; it is also the basis for the proposed AIIM MS61 standard titled Application Programming Interface (API) for Scanners in Document Imaging Systems - the specification for which was originally developed by Pixel Translations. AIIM MS61 is now in the public domain and may be used free of charge.

Pixel Translations supports the developer community with ISIS toolkits for the development of imaging applications, developer support for ISIS toolkit customers, and turnkey ISIS scanner driver development and certification services.

The vast majority ISIS scanner drivers have either been developed and certified by Pixel Translations on behalf of specific hardware vendors, or developed by the hardware vendors and then certified by Pixel Translations. Other modules such as data format converters and file read/write engines are included in ISIS toolkits. Currently, ISIS toolkits and modules are available for the Windows 3.x, Windows 95, Windows NT, OS/2, Macintosh, and UNIX environments. The names of ISIS toolkit suppliers can be found in an appendix to this document.

ISIS Architecture

ISIS provides a robust and consistent API for image acquisition from a variety of scanners through both video-style, SCSI, and proprietary interface cards. Some scanner interface cards are sold as part of specific third-party imaging solutions and include on-board processing and memory which is used to implement various image processing capabilities such as deskewing, rotation, and support of job separator sheets. The image processing functions of these enhanced interface cards are supported by scanner control APIs specific to each card. The ISIS scanner drivers which support these cards implement the added-value features provided by these subsystems. Therefore, ISIS applications can take full advantage of all features of these subsystems. As will be discussed later in this document, the use of these subsystems under ISIS imposes no performance penalty, and can even improve performance in some cases.

The figure below illustrates the relationships among the various hardware and software components in the ISIS image acquisition architecture. ISIS itself consists of two layers: ISIS library functions, which are compiled into and called by imaging applications, and a scanner-specific ISIS driver.
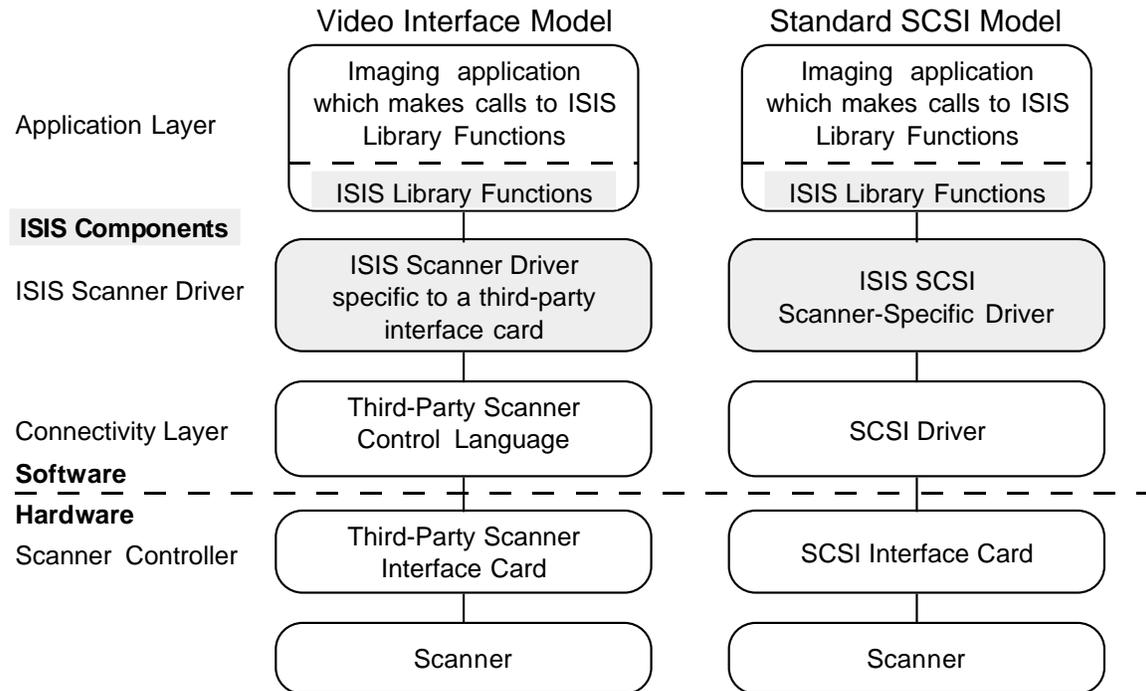

	Video Interface Model	Standard SCSI Model
Application Layer	Imaging application which makes calls to ISIS Library Functions	Imaging application which makes calls to ISIS Library Functions
	ISIS Library Functions	ISIS Library Functions
ISIS Components		
ISIS Scanner Driver	ISIS Scanner Driver specific to a third-party interface card	ISIS SCSI Scanner-Specific Driver
Connectivity Layer	Third-Party Scanner Control Language	SCSI Driver
Software		
Hardware		
Scanner Controller	Third-Party Scanner Interface Card	SCSI Interface Card
	Scanner	Scanner

Figure 1 - ISIS image acquisition architecture

ISIS Modules

Document imaging applications generally involve some combination of image acquisition, viewing, manipulation, data extraction, printing, and storage. However, any given application may draw its data from a variety of sources; perform data extraction and format conversion in various ways; and display, print, or store the resulting image data in one or more of many possible formats. Further, the environment for document imaging is constantly changing. New scanner models - often with features not seen before - may come to market and new data compression methods are likely to emerge. ISIS efficiently accommodates this variety of imaging permutations and dynamic environments by implementing each image acquisition, format conversion, data extraction, and file read/write function as a separate *ISIS module.* An ISIS module is a software component which performs a specific imaging function. Examples of ISIS modules include ISIS scanner drivers, ISIS data format converters, and ISIS file-writing modules.

Tags and Choices

ISIS modules communicate with one another through a facility called *tags*. ISIS tags are data storage areas within ISIS modules that describe the capabilities of the module, express the current values of the parameters associated with the module, and control the behavior of the module. Tag information includes its current value, a default value, and a set of legal values called *choices*, which may be expressed as a list or a range of values.

For example, an ISIS scanner driver may express tags related to scanner capabilities for color depth, palette information, scan resolution, scan area, and output data format. Any ISIS application may read these tags to determine the current state of the scanner, or write them to change scan parameters. Often there are dependencies between tags. For example, a particular scanner may not be capable of scanning at its highest resolution and at its highest color depth simultaneously. When such dependencies exist, dependency orders are expressed by the driver so that developers can make the appropriate programmatic and user-interface decisions when designing their applications.

ISIS Pipes

ISIS provides a mechanism to use ISIS modules in combination to perform specific imaging functions. Two or more ISIS modules linked together in this fashion are called an ISIS pipe. The figure below illustrates a simple ISIS pipe which acquires document images from a scanner in uncompressed form, applies PCX compression, and writes the resulting images to disk as PCX files.
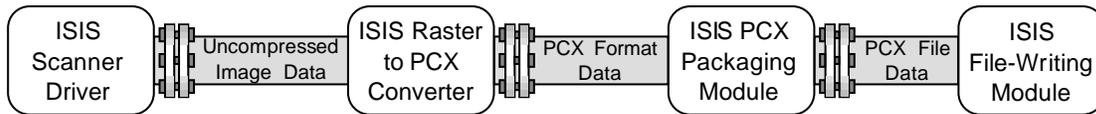
Figure 2 - A simple ISIS pipe
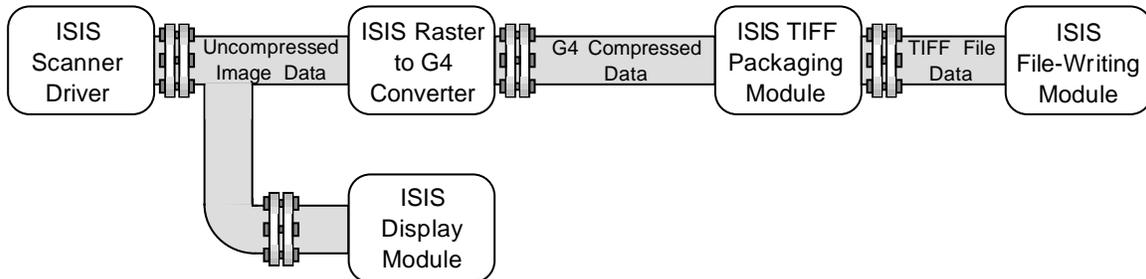
The figure below illustrates a more complex pipe.

Figure 3 - An ISIS pipe with display driver

In this pipe, data is taken from the scanner in uncompressed format, then sent to a display module for viewing and simultaneously to a compression module which converts the data to Group 4 compressed data. Then the data is sent to a file-packaging module and a file-writing module which writes a TIFF image to disk.

All of the ISIS modules used in these scenarios are available in toolkits from Pixel Translations. However, in the ISIS environment, pipes can be built using ISIS modules from any source - as long as the modules comply with the ISIS standard.

ISIS Performance

Streaming

ISIS pipes generally do not attempt to process an entire document image as a single unit of data. Rather, image data is passed along the pipe from module to module in 8Kb packets for sequential processing. In

this way, there is rarely a need to cache the entire image in memory. The ISIS pipe architecture permits applications to be constructed so only the modules required for the currently executing function are loaded into memory. In this way, system resources are conserved and the load time for executable code is kept to a minimum. All ISIS scanner drivers are specifically designed so that the scanners they control can run at their maximum rated speed.

In addition, since ISIS processing takes place on relatively small units of data, system control can be periodically relinquished to the operating system to allow other important processes to share CPU time. This is an important issue when document imaging applications are running in cooperative multitasking environments such as the Macintosh and Windows 3.x.

Scan & Rotate

ISIS toolkits also provide a scan and rotate function for use with 11" wide scanners. With this feature, page images are scanned in landscape orientation and rotated in software through an ISIS function. In this mode, 8.5"x11" documents are scanned using 8.5" rather than 11" of scanner mechanism travel, effectively boosting scanner throughput by about 20%. ISIS running on a fast Intel platform PC can scan and rotate over 100 pages per minute.

ScanAhead™

With some scanners, ISIS supports the scanning of pages not yet requested by the application. Many of the faster scanners from Fujitsu, Ricoh, and Kodak and scanners controlled using Kofax Image Products interface boards support this feature. This allows ISIS to scan and buffer images in advance of their use by the application. When the application is ready for the next image, it's already in memory, eliminating any latency caused by the time needed to scan a document.

Extensibility

The breadth of technology available in the document imaging arena grows daily. One of the benefits of the ISIS system of modules, pipes, tags, and choices is its ability to express new device capabilities and handle new data or compression formats, merely by creating a new module for the device or data structure.

One of the most visible areas of change is in the realm of scanners and their features. Many scanners are supported by ISIS and more are supported each month. ISIS applications don't keep a list of available scanners; rather, they implement a standard scanner selection dialog box which displays a list of available scanners - based on the presence of ISIS scanner drivers - which is displayed when the user wishes to select or change scanners. Application developers need not modify their code to support a new scanner. The scanner selection dialog box is shown in the figure below.
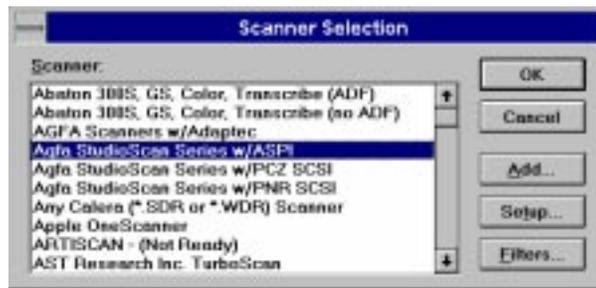
Figure 4 - The ISIS scanner selection dialog box

Scanner features and controls are expressed both in the API (through tags and choices) and in dialog boxes which may be displayed to the user. Those developers wishing to specifically express or suppress particular scanner features may do so by bypassing the standard dialogs and presenting their user interface. Developers who choose to allow access to all scanner features can turn on the standard dialog boxes which

will express all available scanner features. The standard scanner features dialog box and the scanner-specific features dialog box are shown in the next two figures.

All scanners supported by ISIS provide a basic set of features which include color depth, dithering options, scan resolution, page size, contrast, brightness, and scan area. Access to these features and controls may be provided though the standard features dialog box shown below.

Figure 5 - The ISIS standard features dialog box

Many scanners include features and capabilities such as the control of gamma curves, endorsing, and image processing features. These scanner-specific features are expressed in the scanner-specific features dialog which the developer may present to the user under program control. Alternately, if the ISIS application provides access to the standard features dialog box, the user may access the scanner-specific features dialog (shown below) by clicking the *More* button.

Figure 6 - The ISIS scanner-specific features dialog box

By utilizing this two-tier structure of dialog boxes for scanner setup, ISIS applications present a consistent user interface for control of the most common scanner features while allowing scanner-specific features to express themselves without requiring the developer to know which extended features exist in the scanner that the user has chosen.

While this discussion has centered on scanner feature sets and user-level access to them, it should be remembered that the complete scanner feature set will always be expressed by the driver in the form of ISIS tags and choices. This allows other ISIS modules in the pipe to access all applicable features without displaying dialogs.

It should also be emphasized that use of the ISIS scanner dialog boxes is optional. Tags and choices give ISIS developers the ability to control all scanner settings wholly within their application, to provide a custom user interface, or to allow the standard ISIS dialog boxes to express themselves as shown in the figure below.
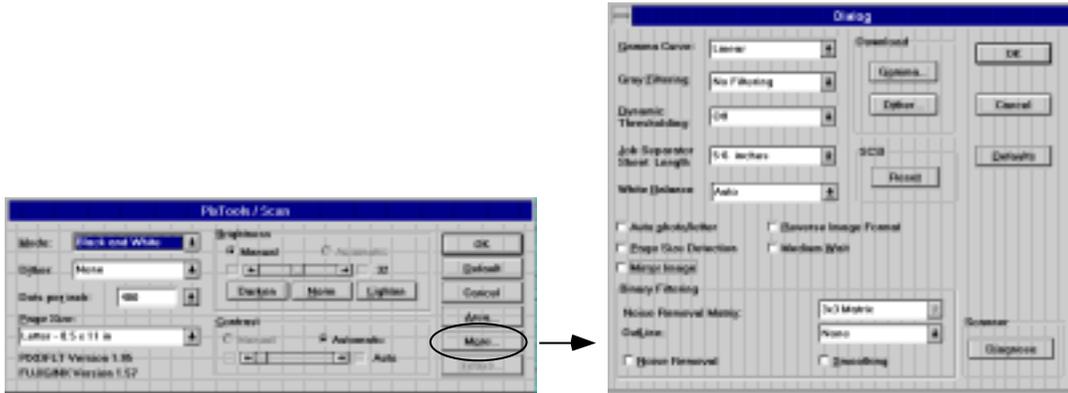

Figure 7 - ISIS standard features dialog (left) and scanner-specific features dialog (right)

Tags and choices enable an ISIS developer to provide a custom user interface that expresses some or all of the elements contained in the standard features dialog, but at the same time, still providing user access to the scanner-specific features dialog by implementing a *More* button. This is shown in the figure below.
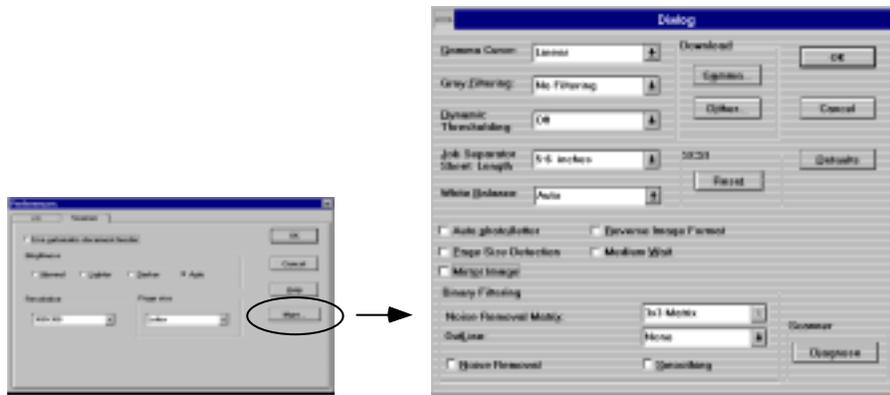

Figure 8 - ISIS developer's features dialog (left) and scanner-specific features dialog (right)

Support for New Features

All supported scanner features within ISIS and within the AIIM MS61 standard are implemented in a generalized and consistent way. For example, if an ISIS application is written to take advantage of scanners equipped with endorsers, that application will support endorsing on any ISIS-supported scanner that includes this feature. This is because all ISIS scanner drivers have been written such that similar features are expressed using the same tags. Therefore, if an ISIS application supports endorsing, it queries the current scanner driver to see if an endorser is supported by the driver; if it is, the application can automatically make endorsing available.

As new scanner features become available, it is anticipated that they also will be supported in this generalized manner as succeeding releases of the ISIS toolkits are released.

Localizing ISIS

All ISIS modules and toolkit libraries are designed for easy translation into the languages of other countries. All strings are stored in resource files and can be modified and resource-compiled without access to source code.

Wide-Ranging Hardware Support

In addition to directly supporting a large selection of scanners, ISIS supports popular document image capture subsystems from vendors such as Dunord Technologies, Kofax Image Products, Seaport Imaging, and Xionics Document Technologies. These products provide powerful image acquisition services - including ScanAhead - and document imaging functions such as real-time deskew and intelligent filtering using a combination of proprietary hardware and software.

The ISIS modules for these subsystems express the added-value features of these subsystems into the ISIS environment without performance penalty. Under ISIS, these subsystems perform as fast or faster than they do when used with their native toolkits because of the ISIS performance features enumerated earlier.

How ISIS Benefits the Developer

Compatibility

ISIS is compatible with over 145 scanner models at this writing. Each driver has been certified by Pixel Translations to be compatible with any properly written ISIS application.

Consistency

All ISIS modules, regardless of their function, are accessed using ISIS tags and choices. Access to common scanner settings at the user interface level can optionally be handled through a pair of dialog boxes implemented in the ISIS scanner driver. No matter which scanner is used with an application, the user controls for these functions are the same. This greatly simplifies the testing and documentation of an application since scanner-dependent changes to the application can be masked from the user or expressed in the *More* dialog box.

Short Development Cycles

ISIS toolkits come with scanner drivers, file read/write modules, data transport/format conversion modules, and an on-screen document viewer. The basic functions of imaging are already defined, implemented, and tested. This allows developers to concentrate on the structure of their applications and not the details of device interfaces, helping to keep development cycles short.

ISIS toolkits come with hundreds of pages of clear documentation and with lots of example code. All aspects of each function call have been well thought out and documented, leaving little or no room for interpretation of how a particular function will perform.

Robust Execution

Three factors contribute to the robust execution of ISIS applications, regardless of the size or color depth of the images being processed:

- ISIS pipes, which allow ISIS modules to be loaded into and purged from memory as needed
- ISIS scanner drivers, which allow scanners to run at their maximum rated speed
- ISIS data streaming, which allows most images to be acquired and processed in 8Kb packets

Extended Functionality

The ISIS convention of tags and choices allows new device features, compression formats, and file formats to be supported in existing applications by writing ISIS modules for the new devices or functions. ISIS applications can easily take advantage of this extended functionality by accessing the tags associated with these new features and capabilities.

A Supporting Organization and Business Model

While ISIS is the basis for the AIIM MS61 standard, whose specification is in the public domain, it is the business of Pixel Translations to sell ISIS application toolkits and ISIS driver development services. This business model helps ensure that:

- There will be a continuing source of support for ISIS developers.

- The quality of ISIS modules and toolkits will remain high. Even though module development services and toolkits will be available from third parties, the availability of toolkits, testing and certification services from Pixel Translations and Pixel's participation in the market will help ensure that competition will only enhance the quality of ISIS implementations.

Further, Pixel Translations will continue to add value in the marketplace by:

- Developing solid scanner drivers that support all the latest features, functions, and performance enhancements in scanning devices as they are introduced to the market.

- Delivering robust toolkits that conform to an unambiguous API defined by industry standards organizations.

- Maintaining a competent developer support staff for quick and efficient resolution of issues surrounding ISIS implementations.

- Maintaining a presence in the marketplace, continually updating its tools and services as hardware and operating systems evolve and emerge.

Testing and Certification Services

Pixel Translations has developed a substantial suite of testing software to thoroughly test ISIS modules and ISIS toolkits before they are released to the market. Rigorous testing of all scanning device features is always performed before a driver is certified ready for introduction.

How ISIS Benefits the User

Reliability

Because of the amount of support and testing available to ISIS developers, ISIS-based applications are inherently more reliable than applications based on less formally supported standards.

Consistency

As discussed earlier, the interface presented to the user for scanner setup can be the standard ISIS dialog boxes, an interface of the application developer's design, or some combination of standard and custom interface elements. Regardless of the path chosen by a particular developer, the user interface presented by an ISIS application for these functions (with the exception of the features expressed by the *More* dialog) will be consistent from scanner to scanner.

Conserves the User's Investment in Hardware and Software

ISIS is almost ubiquitously supported in the document imaging marketplace, with hardware and software support expanding each month. This allows users to upgrade or add scanners at will - with assurance that their existing application will support their new hardware investment seamlessly. Similarly, most imaging

applications support ISIS. Users can be sure that, when they move from one imaging application to another, their existing hardware will be supported.

The Future of ISIS

As a public domain standard, AIIM MS61 will evolve as market forces dictate. However, the tools for implementing ISIS applications will evolve quickly as OLE automation and OCX versions of ISIS toolkits become available. These technologies will allow application developers and users to more quickly prototype and deploy ISIS-based document imaging solutions. As stated earlier, Pixel Translations is developing a system of OCX objects to support the construction of ISIS pipes using Microsoft's Visual BASIC and other development environments.

Appendix A - ISIS and TWAIN

Introduction

Two standards have emerged over the last few years which define how applications can communicate with and control the behavior of scanners. These standards are ISIS and TWAIN. Fundamentally, TWAIN is limited to the domain of image acquisition, while ISIS provides image acquisition as part of a complete framework for the creation of document imaging applications.

History

TWAIN was originally defined by a working group of scanner manufacturers and software publishers including Aldus, Caere, Eastman Kodak, Hewlett-Packard, and Logitech. The TWAIN toolkit was designed to establish a common methodology for applications to access scanners and other raster-generating devices such as still-image video capture boards. TWAIN was designed during a two-year period from 1990 to 1992 to meet the then-current needs of users who occasionally used scanning for desktop publishing. The goals for TWAIN were to allow the products of various scanner manufacturers and application developers to gain mutual interoperability.

ISIS was developed by Pixel Translations in 1990 as a framework for the construction of high-volume document image capture and processing systems. ISIS goes far beyond TWAIN in providing a unified method of connecting a variety of imaging functions including image acquisition, a variety of image data compression formats, a variety of file formats, and modules for the viewing and printing of image data. ISIS also supports third-party scanner control and image processing hardware from vendors such Dunord Technologies, Kofax Image Products, Seaport Imaging, and Xionics Document Technologies, effectively layering into the ISIS application development environment the added value that these technologies provide. ISIS is the basis for the AIIM/ANSI MS61 API standard for scanners in the document imaging environment.

Common Attributes of ISIS and TWAIN

Currently, both ISIS and TWAIN enjoy wide support in the marketplace. When viewed solely as vehicles for the acquisition of images from scanners, both are technologies with similar capabilities. Both support over 145 scanner models and are supported by over 110 document imaging applications.

- Both standards can be extended to embrace new scanner features.
- Both standards provide a freely available specification.
- Both standards are supported by large, stable companies within the imaging and personal computer communities.
- Both standards are expected to benefit from wide user and developer support for many years to come.

Practical Differences Between ISIS and TWAIN

The differences between ISIS and TWAIN center on:
- The design intent and architectural features.
- The availability of commercial quality products.
- The level of available support.
- The ISIS driver certification program.
- The performance which can be obtained from applications.
- The cost of implementation using the two standards.

Design Intent

The design intent of ISIS was to create a framework which includes image acquisition and most other image manipulation functions that might be required in the document imaging environment, and to make these functions available to the developer to create complete, high-volume document imaging solutions. ISIS was designed to solve the problems of the production scanning environment where thousands or even hundreds of thousands of documents may be scanned and processed by a single application each day.

The design intent of TWAIN was to create a common standard for image acquisition in the desktop publishing environment where most scanning is done one image at a time.

Architectural Features

The architecture of ISIS has at its core two fundamental concepts: modules and pipes. As discussed earlier, every ISIS module communicates with its peers in fundamentally the same way. This allows the modules to be linked together using ISIS pipes to create specific functionality. The concepts of modules and pipes allows the developer to construct simple yet powerful imaging functionality from well-tested building blocks. In addition to image acquisition, ISIS provides image format conversion, data extraction, document viewing, and file read/write functions.

The architecture of TWAIN provides image acquisition drivers (often scanner drivers) whose function is to create a common language for application control of the image acquisition process.

Availability of Commercial-Quality Tools

Although both TWAIN and AIIM MS61 (based on ISIS) are industry standards freely available to any interested party, ISIS is the only one of the two which is supported by companies whose business it is to supply products and services which support the standard. Commercial products and paid technical support for ISIS are available from:

- Pixel Translations in the Windows 3.1, Windows 95, Windows NT, and Macintosh markets
- Peabody Systems in the UNIX market

Both of these companies produce commercial-quality products which are ready for implementation within production document imaging solutions.

In contrast, TWAIN, while supported by a consortium of reputable companies, is supported by these companies as a sideline. This is not to say that the support one might receive for TWAIN development is substandard. However, a notice that appears near the beginning of the TWAIN developer's manual specifically disclaims the quality of the TWAIN toolkit and reads in part:

"The TWAIN Toolkit was designed to be used by third parties to assist them in becoming compliant with the TWAIN standard, but it has not been developed to the standards of a commercial product. Consequently, the TWAIN Toolkit is provided AS IS without any warranty."

Support

ISIS is supported by a paid staff of engineers whose only business is to support Pixel Translations customers through telephone, fax, and internet assistance.

TWAIN is supported today through a volunteer effort mounted by some of the original proponents of the standard, which include Caere, Hewlett-Packard, and Logitech. The TWAIN developer's manual provides e-mail and CompuServe forum addresses as primary contact points for TWAIN developer support. Fax and telephone numbers at Caere, Hewlett-Packard, and Logitech are also provided for developers who don't have access to e-mail. TWAIN toolkits may be obtained from Hewlett-Packard for a nominal fee.

Driver Certification

Although AIIM MS61 (based on ISIS) is an open standard, most ISIS scanner drivers and all modules provided with Pixel Translations' toolkits have been tested and certified for ISIS compatibility. This means that the vast majority of ISIS modules whose functions could be meaningfully linked together will be compatible with one another when linked into an ISIS pipe. The testing and certification process for an ISIS module is extensive. In the case of scanner drivers, this testing ensures that the scanner runs at maximum rated speed, that scanner functions are fully supported, and that the scanner can be easily configured.

TWAIN drivers are created following the guidelines in the TWAIN standard. Each TWAIN driver is written by a software or hardware vendor to support a specific product, or by a third party on behalf of that vendor. Since TWAIN drivers are not necessarily tested as rigorously as ISIS modules, their performance and compatibility cannot be predicted with any certainty.

There is no certification program for TWAIN drivers nor any structure for compliance with the TWAIN specification at this time. The latest edition of the TWAIN FAQ, dated September 1995, states under Subject 11, TWAIN Compliance:

"At the time of this posting there is no official verification of compliance to the TWAIN specification. The TWAIN Working Group is examining methods of verifying conformance through self-certification and outside certification."

ISIS Application Performance

In the production scanning environment, performance is always a key issue and production scanners are often sold on the basis of scanner speed and the ability to reliably feed documents at high speed. When a document imaging application cannot support a scanner at its rated speed, money spent on high-speed hardware and, more important, on operator time is being wasted. ISIS maximizes image acquisition performance in these ways:

- The ISIS pipe architecture supports the construction of efficient functional units of code which run fast and conserve system memory.

- ISIS pipes generally move data in 8Kb packets which conserve system resources and ensure that I/O devices such as disk drives are fed a constant flow of data.

- The ISIS scan and rotate function allows some scanners to acquire letter-size documents at 120% of rated scanner throughput.

- The ISIS ScanAhead feature allows some drivers to prefetch document images before the application actually needs them, reducing some of the latencies associated with scanning.

- All ISIS scanner drivers are designed to drive scanners at their maximum rated speed.

The performance of a document imaging system which employs a TWAIN driver at the front end will vary by application and will be dependent on the design of the individual driver. TWAIN does not offer the specific performance advantages of ISIS:

- TWAIN does not implement pipes. Therefore, the application and scanner driver stand alone from one another.

- TWAIN drivers are written by a variety of developers and therefore don't necessarily support scanners at their rated speed.

Direct Costs of Developing with ISIS and TWAIN

While both ISIS and TWAIN are freely available in specification, most developers will want to begin application development with a toolkit. Application development toolkits are available for both TWAIN and ISIS. TWAIN toolkits are available from Hewlett-Packard for less than $50. ISIS toolkits cost substantially more with technical support available for a yearly fee. There are no ongoing royalties associated with TWAIN implementations, ISIS developers can expect to pay royalties.

Indirect Costs of Developing with ISIS and TWAIN

While the direct costs of developing with ISIS are substantially higher than those associated with TWAIN, the indirect costs of developing with these two standards should be evaluated as well. Issues which have a bearing on indirect costs include:

- The quality of documentation provided by the organizations supporting the two standards. Documentation quality directly affects development time.

- The quality of toolkit implementation, which affects development time.

- The quality of existing modules. As applications are deployed, they will interact with the universe of existing modules. The quality and consistency of these modules directly affects the amount of technical support that the developer must provide in response to errors caused by driver problems. This issue has a direct influence on:
    - The cost of technical support.
    - The market's perception of the quality of an application as driver incompatibilities reflect on the application developer in the eyes of the user.

The ISIS/TWAIN Features Comparison Chart

	ISIS	TWAIN
Architecture		
API for image acquisition	Yes	Yes
Image viewer	Yes	No
Print modules	Yes	No
Image data format conversion	Yes	No
Image data compression & data types	12	None
File read/write	Yes	No
Pipes	Yes	No
Packet streaming architecture	Yes	No
Optimized to run scanners at rated speed	Yes	No
Platforms Supported		
Windows (16-bit and 32-bit)	Yes	Yes
Macintosh	Yes	Yes
OS/2	Limited	No
UNIX	Yes	No
Market & Support Issues		
Primary application	Production imaging	Desktop publishing
Scanners supported	145+	145+
Applications supported	110+	110+
Standard	AIIM/ANSI MS61, de facto	de facto
Technical support	Paid	Volunteer
Module testing/certification	All modules	Sometimes
License fees	Yes	No
Availability of commercial-quality tools	Yes	No

Appendix B - Applications and Scanners Supported by ISIS

A Partial List of Application Developers Currently Supporting ISIS

Adobe Systems
Advanced Technologies International
Alpha Pacific
Arkenstone
Ausdata
Auto Data Systems
Avatar
Axxis
Bader Technologies
BancTec
Bluebird Systems
Bridgeway Software
Caere
Cardiff Software
CD Networks
Cognitive Technology Corp.
Compulink Management Center
Comspec Corp.
Creative Microsystems
Datacap
Diamond Head Software
Digital Transport
Docucon
DocuMagix
Eastman Kodak Company
E-Data Link
Executive Technologies
Expervision
Filenet
Fujitsu
Galahad Information Systems
GammaGraphX
GANT
GTESS
Hewlett-Packard S.p.a.
IBEX Technologies
ICAP International
Ideas Commercial Systems
Image Network Technology (INT)
Image Solutions
Imagery Software
ImageTech Corporation
Imagination Software
Inmagic
Innovatic/Mimetics
International Business Machines
Jetsoft
JOB Systemintegration
Kanishka Systems USA
KAZ Computer Services
Keyfile

Kofax Image Products
Kyushu Matsushita Electric Co.
Lanier Worldwide
Lasercopy Optical Imaging Solutions & Services
Legal-Ease Data Services
Light Source Computer Images
Lotus Development Corporation
Metropolitan State College
Mindworks .
MJ Systems
Nestor
Network Imaging Systems Corp.
Norms Forms
NUKO Information Systems
Optika Imaging Systems
PaperClip Imaging Software
Pixel Magic
Portfolio Technologies
PowerMatch
Powervision
Principia Products
Profitability of Hawaii
Promind
Resumix
Ricoh Corporation
Rorke Data - Software Services Division
Run Time Solutions
Scandex
ScanVec
Simplify Development Corp.
SIRSI Corporation
SMC Technologies
Summation Legal Technologies
Synergon
Syscon/Connecting Point
TASC
Telesensory
Telos
Teratec
Tower Technologies
Toyota Tsusho America
Universal Systems
US West
Viewstar
Virginia Systems
Watermark Software
Westbrook Technologies
Wheb Systems
Xerotex
Xerox

A Partial List of Scanner Manufacturers Currently Supported by ISIS

Abaton

Agfa

Apple

BancTec/TDC

Bell & Howell

Canon

Chinon

Complete PC

Datacopy

Envision

Epson

Ficus

Fujitsu

Hewlett-Packard

Howtek

IBM

Jetfax

Kodak

Microtek

Nikon

Okidata

Panasonic

Pentax

Relysis

Ricoh

Scan-Optics

Sharp

Tamarac

UMAX

Xerox

Appendix C - Companies Providing Commercial Products and Services for ISIS Development

Pixel Translations

Pixel Translations is a provider of scanner interface and imaging acceleration software libraries to developers in the OCR, fax, and document imaging markets. Pixel Translations is a wholly owned subsidiary of Input Software, Inc.

Input Software, Inc., headquartered in San Jose, CA, engineers and markets hardware and software system components to enable the use of scanned document images in computer systems based on open industry standard architectures. The company's products address the display, scan, print, storage, and application development of document imaging and are designed to simplify system integration. Input Software, Inc., is a publicly held company traded on the Nasdaq National Market under the INPT symbol.

Pixel Translations
1299 Parkmoor Avenue
San Jose, CA 95126-3448
Telephone (408) 325-3800
Fax (408) 232-9292
Internet info@pixtran.com

Peabody Systems

Peabody Systems provides ISIS toolkits for the UNIX market. Its products currently support the following platforms: SunSoft Solaris SPARC and x86, IBM RS/6000 AIX, Hewlett-Packard HP-UX, Silicon Graphics IRIX and SCO UNIX/OpenServer.

Peabody Systems, located in Orange County, CA, is a supplier of document image processing software for the UNIX and NT platforms. The company specializes in adapting industry standard document imaging interfaces to standard UNIX platforms, providing developers with widely used, comprehensive, and stable APIs that can be used on multiple operating system platforms.

Peabody Systems
270 North Buckskin
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Pixel Translations

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