Migrating from ArcInfo™ Workstation

An ESRI® Technical Paper • December 2002

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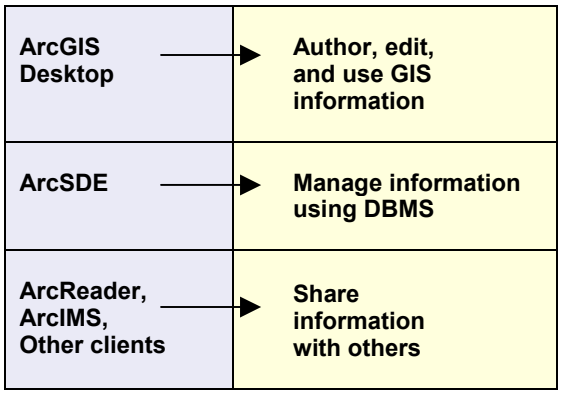
Many users are interested in migrating their geographic information system (GIS) work from ArcInfo™ Workstation to ArcGIS™. There are many facets to implementing a migration plan, but before you begin, it is important to gain some understanding through hands-on experience with ArcGIS.

The purpose of this technical paper is to draw some comparisons between the two architectures and to provide a useful framework in which you can begin to think about and plan your migration. While many of the terms have changed, a common set of GIS concepts and practices provides the foundations for both systems. These concepts will be important to understand in your migration plans to ArcGIS. Throughout this technical paper, we will compare and contrast the system implementations for many of these key concepts.



Each part of the ArcGIS product line has a clear role.

ArcGIS Desktop lets you author and use information such as data, maps, metadata, analyses, and applications. Advanced data editing is performed with ArcEditor™ and ArcInfo. Map-based analysis, simple editing, metadata capture, modeling, and analysis can be performed with ArcView® seats.

ArcSDE® software lets you manage information and data in a database management system (DBMS).

ArcReader™, ArcIMS®, and other clients allow you to publish and share information with others.

When to migrate

Any migration plan should be founded on the expectation that there will be clear benefits in making the move. While there are clear benefits to migrating, you should determine your own migration time frame. Your existing GIS systems will continue to work so you can make the move when you are ready to do so.

Ensure you have the proper hardware and operating systems

Before you begin planning your migration, your first step will be to verify that you have the proper hardware, operating systems, and computer networks in place. ArcGIS Desktop requires a modern PC running the Windows operating system and a recommended 512 MB of RAM. In addition, ArcIMS and access to ArcSDE databases across a network will require good network bandwidth and performance. Detailed information about system requirements for each part of ArcGIS can be obtained at http://support.esri.com/. Look under the System Requirements choice for each product to access up-to-date information about each.

If your computer systems are older and you cannot migrate to the required hardware and operating system, it will be appropriate to continue to use your existing implementations of ArcInfo Workstation, ArcView GIS 3, and so forth. These are good systems and will continue to work well for you until you are able to begin your migration.

Migration stages

Migrating to ArcGIS can be organized into three broad stages. The first stage involves directly using existing data for mapping, analysis, and sharing using ArcIMS. The second stage involves migrating your main data holdings to the geodatabase. The third stage involves implementing the new geoprocessing framework, due to ship with ArcGIS 9.0.

Stage 1	**Direct use of existing data**	Use ArcGIS Desktop, ArcReader, and ArcIMS to access and use existing file-based datasets for mapping, analysis, GIS dissemination, metadata capture, and so on.
Stage 2	**Move to the geodatabase for data management and editing**	Migrate data management from file-based coverages to DBMS, including direct editing of the geodatabase. Many implementations will be possible using free personal geodatabases. However, most large, multiuser systems will require the use of ArcSDE and a commercial DBMS.
Stage 3	**Convert geoprocessing to use ArcGIS 9.0**	At ArcGIS Desktop 9.0, a new geoprocessing framework will be released. This will mainly affect ArcInfo users and will provide a comprehensive substitute for all the geoprocessing commands in ArcInfo Workstation.

Three-stage migration to ArcGIS from ArcInfo Workstation

Stage 1: Data use: Use ArcGIS and ArcIMS with existing data

ArcGIS supports all traditional file-based data types (in addition to the newer geodatabases and other DBMS data sources). Thus, the initial migration step would be to use ArcGIS for data use. You can deploy data access tools, such as ArcView 8, ArcReader, and ArcIMS, to work with existing GIS data, regardless of its format. The impact of this strategy is that you will continue to use ArcInfo Workstation to edit and maintain coverage data during the first stage of migration. Over time, you can begin to investigate data migration to the geodatabase and editing using ArcEditor and ArcInfo.

Multiuser data access and data sharing are key requirements of any GIS, and numerous strategies are used to share GIS information. In ArcInfo Workstation, a common practice is to build data using coverages and map libraries and to share data by converting it into shapefiles. Users deploy various software seats to access this data, including ArcView GIS 3 and ArcExplorer™. Another common distribution mechanism gaining wide and rapid acceptance is Internet access using ArcIMS.

In the first stage of migration, you will continue to edit and maintain data with ArcInfo Workstation and begin to migrate your data using applications from ArcView GIS 3, ArcExplorer, and so on, to ArcView 8, ArcReader, and ArcIMS.

Data-sharing strategies

ArcInfo Workstation	ArcGIS Desktop	Notes
Convert to shapefiles and share copies of shapefiles. Load into continuous ArcSDE feature classes.	Can support direct use of (and conversion to) any open format (shapefiles and so on). Direct use of multiuser geodatabases. Direct use of personal geodatabases. Use of ArcIMS to distribute file-based datasets as well as geodatabases.	In ArcInfo Workstation, most data-publishing strategies require data conversion to a direct-use, open format, such as shapefiles or ArcSDE feature classes. This often requires that tiled coverage data be joined, converted to the desired format (for example, shapefiles), and shared as copies. This same strategy can be pursued with ArcGIS because it supports all supported formats of ArcInfo Workstation for data use. Out-of-date copies can become an issue.

A comparison of the data-sharing strategies between ArcInfo Workstation and ArcGIS Desktop

Data use benefit: One application framework

An application framework is the environment in which a focused application is delivered. It includes the user interface, data support, the customization and programming environment, and so forth. In addition to ArcInfo Workstation, users must work with a series of independent and distinctly different applications for GIS deployment, such as ArcView GIS 3, MapObjects®, ArcExplorer, and ArcIMS. Each deployment method is developed independently. Customizations, graphic user interfaces (GUIs), map layouts, and so forth, are not sharable between these systems (although data is).

By contrast, ArcGIS is designed as a complete, integrated system with many levels of deployment all built on a single, integrated architecture with common user interfaces,

data support, and shared document types (maps, data, metadata, layers, 3D scenes, customizations, and so on).

ArcGIS Desktop is Microsoft® Windows®-based. Customization is simple and familiar to Windows software users. Standard procedures and developer tools, such as Visual Basic®, Visual Basic for Applications, .NET, and Visual C++®, are used for customizing ArcGIS Desktop. ArcInfo Workstation is customized using ARC Macro Language (AML™).

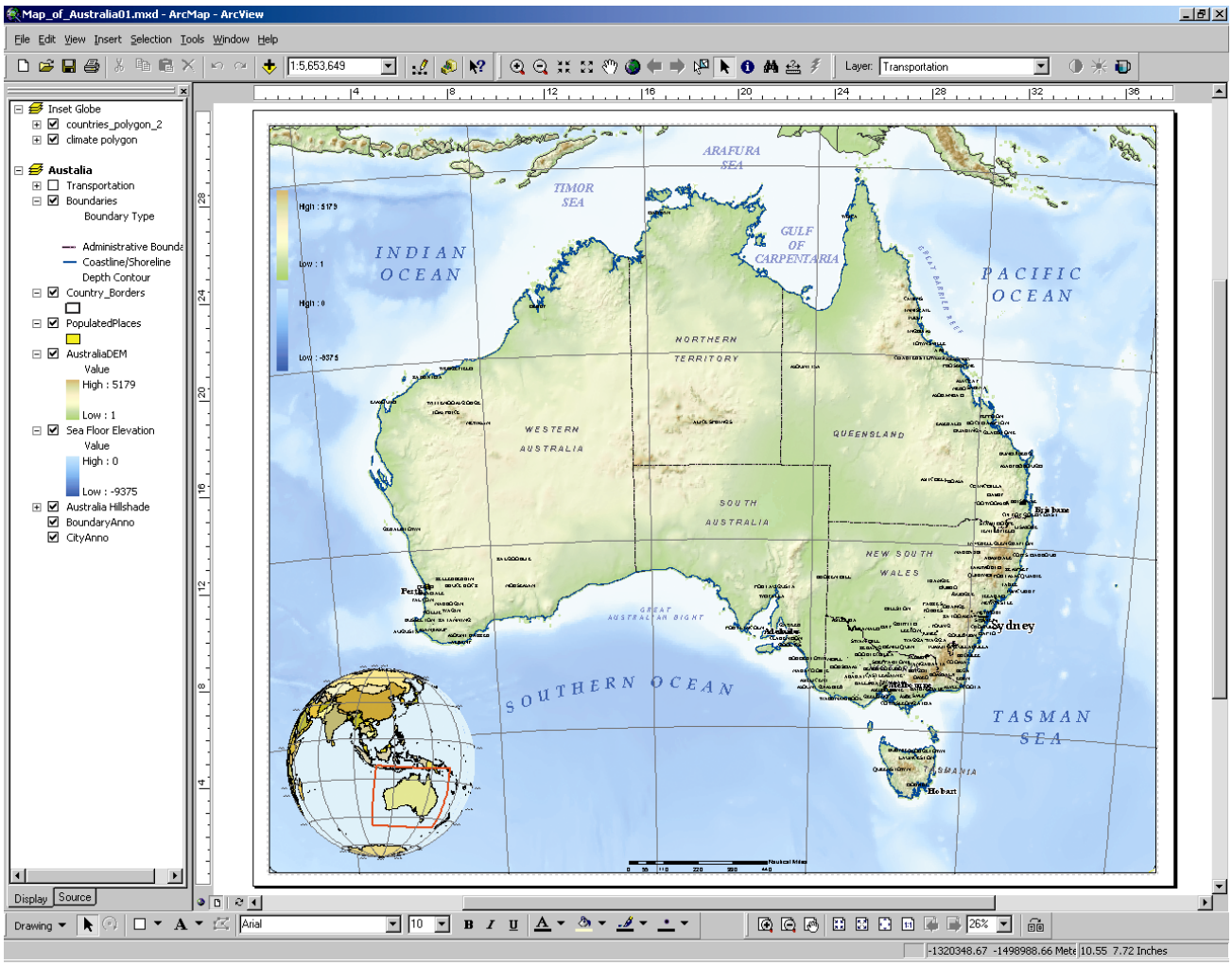
Because ArcGIS Desktop is a standard Windows application, it is easy to learn and use. The required level of customization when moving to ArcGIS is reduced because of the range of functionality included in the ArcGIS Desktop user interface. Many additional tasks are supported over existing systems (for example, ArcView GIS 3, ArcInfo Workstation, and MapObjects). These earlier systems required more customization programming and applications development (using AML, Avenue™, and so on) to complete many common work tasks.

ArcInfo Workstation	**ArcGIS Desktop**
Not tightly integrated with other applications (ArcView GIS 3 and so on), but can use common datasets. Individual programs (Arc, ArcEdit, ArcPlot, Grid, and so on).	Collection of integrated Windows desktop applications, including ArcScene, ArcToolbox, ArcCatalog, and ArcMap.
Command-based.	Windows-based user interface.
Automate work flows and custom GUIs using AML and ODE.	Productive user interface supporting most common GIS tasks. When necessary, custom work flows and tools are built using COM-compliant Windows developer tools, such as VBA, VB, VC++, and .NET.
UNIX and Windows support.	Windows only.
ArcInfo Workstation users require different systems to deploy GIS in their organizations (for example, ArcView and MapObjects). Each product has an independent user interface, data support, and customization tools.	

A comparison between the ArcInfo Workstation and ArcGIS Desktop application frameworks

In ArcGIS 8.3, ArcView, ArcEditor, and ArcInfo Desktop are all based on the same application framework and share a common user interface, as well as common maps, layers, custom tools, and extensions. When you learn ArcView, you are learning to use ArcInfo Desktop, and so on. When you build maps in ArcView 8, they can be reused in ArcInfo Desktop, ArcEditor, ArcReader, and ArcIMS. You can also share custom applications because customization is the same between ArcView 8, ArcEditor, and ArcInfo Desktop. Support for data use is the same between all three products. ArcEditor and ArcInfo are the advanced editing seats.

The same GUIs, customization, data support, and documents (maps, symbols, layers, metadata, 3D scenes, and so on) exist between ArcView, ArcEditor, and ArcInfo Desktop.

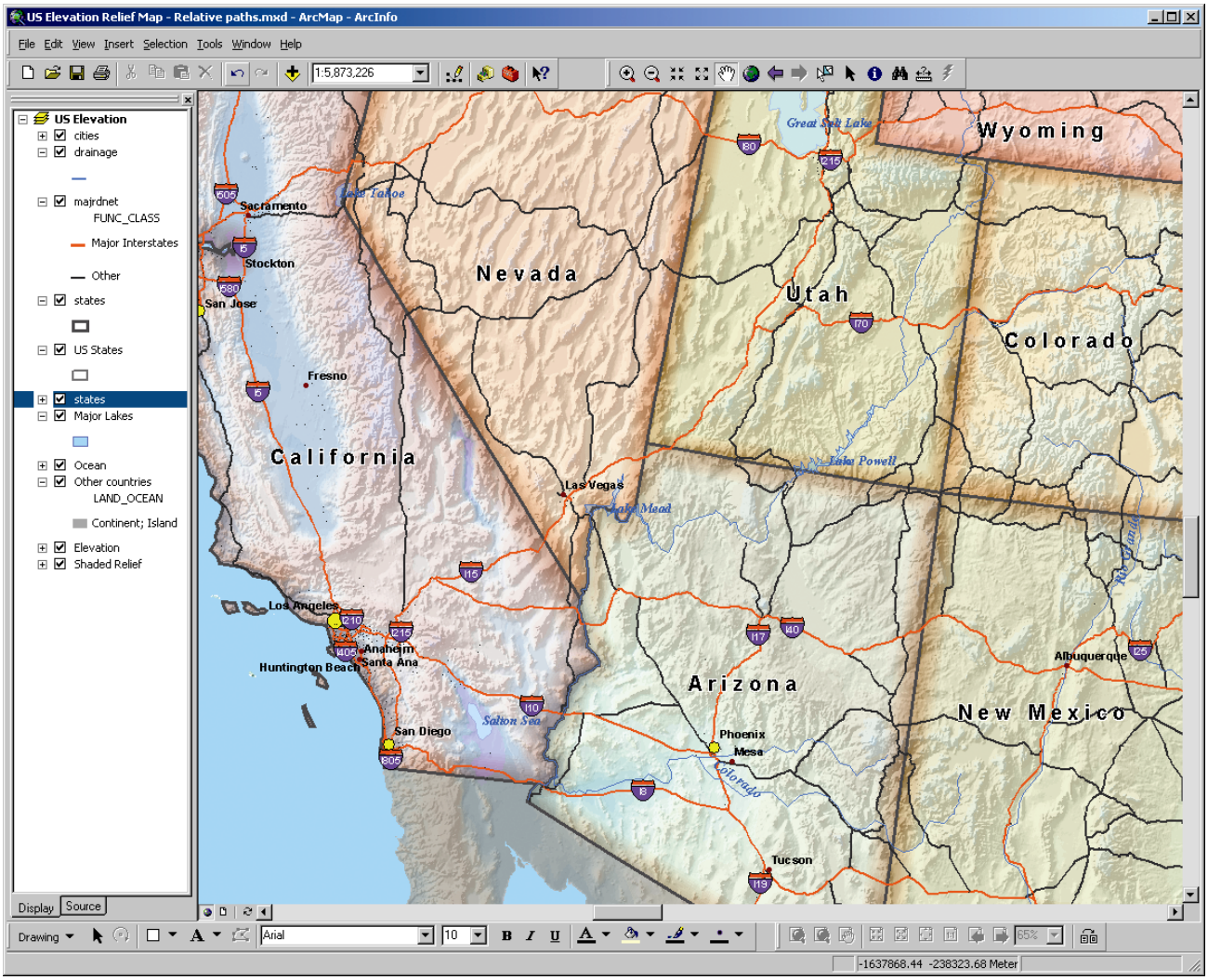


ArcView 8 maps can be reused in ArcGIS Desktop.

Data use benefit: Interactive mapping and cartography

Some of the mapping and cartography advantages in ArcGIS Desktop are readily apparent for many ArcInfo Workstation users. This is especially true for GIS deployment seats in their organizations, such as with ArcView, ArcReader, and ArcIMS maps, because work built with ArcGIS Desktop can be readily shared. Some key capabilities that aid in migration include:

- Symbology: all ArcInfo Workstation symbols—plus many more—are available through style sets. A symbol converter is also available for converting custom ArcInfo symbol sets.
- Legend generation is quick and easy.
- Layers: map layer specifications are easy to generate and share. They can be saved and shared independently of the map. This allows users to standardize the drawing of many map layers in their GIS. Advanced layers can be scale-dependent, can be in many coordinate systems that are projected on the fly, can participate in grouped layers, and can be used in geoprocessing operations.
- Raster and vector layers can have transparent fills.
- Chart mapping is supported.
- On-the-fly map projection and datum conversion is supported, including International Dateline support.
- Building a map layout is simple with the graphical user interface. Sophisticated map layouts can be saved and shared as map templates.
- Works on all existing datasets.
- Maps built in ArcView 8 can be shared and used with ArcEditor and ArcInfo Desktop as well as ArcReader and ArcIMS.
- Map designs can be shared as map templates.
- Custom tools are available for printing map series.



Interactive mapping and cartography are a benefit of using ArcGIS Desktop, ArcEditor, ArcReader, and ArcIMS.

Data use benefit: Common ArcGIS extensions

ArcGIS Desktop products—ArcView, ArcEditor, and ArcInfo—share the same optional extensions and cover the capabilities provided by the ArcInfo Workstation extensions. Please note: Although not yet available, Network Analyst will ship with a future ArcGIS release. ArcInfo Workstation users who have optional extensions have access to—that is, are licensed to use—the corresponding ArcGIS Desktop extensions by keeping their annual maintenance up to date.

There are also several additional extensions not found in ArcInfo Workstation that are available for ArcGIS Desktop. They include ArcGIS Geostatistical Analyst, ArcGIS Survey Analyst, ArcGIS Tracking Analyst, Maplex for ArcGIS, ArcGIS StreetMap™ USA, ArcGIS StreetMap Europe, ArcGIS Schematics, and MrSID® Encoder for ArcGIS.

Migrating your extensions

ArcInfo Workstation	ArcGIS Desktop	Notes
GRID	Spatial Analyst	Existing ArcInfo GRID users have access to both Workstation GRID and ArcGIS Spatial Analyst.
TIN	3D Analyst	Existing ArcInfo TIN users have access to both Workstation TIN and ArcGIS 3D Analyst.
Network	Network Analyst (not available at version 8.3)	Existing ArcInfo NETWORK users have access to both Workstation Network and ArcGIS Network Analyst.
ArcPress	ArcPress	Existing ArcInfo ArcPress users have access to ArcPress tools for both ArcInfo Workstation and ArcGIS Desktop.
ArcScan	ArcScan for ArcGIS	Existing ArcScan for ArcGIS users have access to ArcScan tools for ArcInfo Workstation, ArcEditor, ArcInfo on ArcGIS Desktop, and ArcView.
ArcStorm™	ArcSDE	ArcStorm is used for tile-based coverage management in ArcInfo Workstation for multiuser editing. ArcStorm users will typically migrate to using ArcSDE and the geodatabase.
COGO	Core ArcEditor and ArcInfo Desktop functions	COGO users apply traverse and other coordinate geometry tools to edit coverages in ArcEdit. These capabilities are now supported as core editing operations in ArcEditor and ArcInfo. More advanced survey management tools are included with ArcGIS Survey Analyst, which is freely available as an upgrade to all COGO users.

Migrating extensions from ArcInfo Workstation to ArcGIS Desktop

Data use benefit: Full, standards-based metadata support

Since a limited number of essential metadata capabilities are supported in ArcInfo Workstation, perhaps one of the easiest migration decisions will be to use ArcGIS Desktop to document and publish metadata catalogs.

ArcGIS supports all the metadata content standards (FGDC, ISO, and so on). In ArcGIS, the ArcCatalog application is a highly productive tool for editing and managing metadata. You can use ArcCatalog to document all information sets with easy-to-use editors. This is highly productive because ArcCatalog will automatically populate many of the metadata content fields inherent in your datasets for you simply by pointing ArcCatalog metadata tools at your datasets. The interview style of the ISO editor also makes sense of an overwhelming amount of metadata content and properties. Quite simply, it's a productive environment in which to capture detailed documentation about your information holdings.

ArcGIS Desktop users can also choose to publish a comprehensive metadata catalog using ArcSDE and to serve it openly as an ArcIMS Metadata Catalog Service. This service can be searched using tools provided with ArcIMS, using ArcCatalog, and even through Z39.50 protocols. Users can employ ArcGIS to author, manage, and publish a standards-based clearinghouse node or to establish their own geography network.

Getting started with data use

Before you begin migration, make sure that you have the proper hardware and operating systems on which to deploy ArcGIS. It does require a more modern Windows machine and version of the Windows operating system than do ArcView GIS 3 and ArcInfo Workstation. Ensure your hardware will support your migration. For more information, view the system requirements at http://support.esri.com/.

Starting points for beginning migration
Begin data and map use applications using ArcGIS Desktop.
Work with existing data.
Begin to document your data holdings using the Metadata Editor in ArcCatalog.
Share ArcMap documents with ArcReader, ArcIMS, and other ArcView, ArcEditor, and ArcInfo Desktop users.
Publish standard cartographic layers for your ArcGIS users.
Migrate map production to ArcMap.
Migrate extension use to ArcGIS Desktop.
Begin Internet deployment using ArcIMS.

When you begin migration, consider these options for data use and deployment.

Stage 2: Data management and editing using the geodatabase

The second stage of migration is the most complicated of the three migration phases. Thus, a major decision point in your migration plan to ArcGIS will be to determine when the appropriate time will be to move from the coverage-based data model used in ArcInfo Workstation to the geodatabase model of ArcGIS for managing your vector datasets. This migration stage also presents many new opportunities to extend your GIS. The geodatabase design phase will require prototype implementations of the geodatabase to zero in on the most appropriate database design. This should be followed by a pilot project in which the planned system architecture is used. The goal of the pilot project is to determine a working system configuration to deploy data editing applications.

Data editing and automation also represent some of the more sophisticated work flows to maintain data integrity during editing and maintenance tasks. Thus, these migration tasks are more likely to include application customization.

In this technical paper, we will discuss some of the key data concepts as well as some critical data modeling procedures to follow.

Data management and editing benefit: All GIS data in the DBMS

In ArcInfo Workstation, the primary GIS data focus is on file-based data managed in a set of workspaces or file folders. A workspace contains a set of file-based GIS datasets, such as coverages, shapefiles, grids, triangulated irregular networks (TINs), and other image files. The Info directory in each workspace holds tables. Users often manage related tables in a Structured Query Language (SQL) DBMS (such as Oracle® or Microsoft SQL Server™). In ArcInfo Workstation, coverages are used as the primary vector data format for data management because they support topology and other integrated geometry.

In ArcGIS, the focus is increasingly on GIS data in a relational database, referred to as the geodatabase. The geodatabase storage model is based on the standard relational model of tables containing rows and columns. There is one central repository to hold both the spatial and attribute information. All geodatabase information is held in *standard* DBMS tables.

The charts on the next four pages outline data in ArcInfo Workstation versus ArcGIS Desktop.

Comparison of data support in ArcInfo Workstation and ArcGIS Desktop

ArcInfo Workstation	ArcGIS Desktop	Notes
Workspace	Geodatabase	An ArcInfo workspace is a file-system folder holding a collection of file-based datasets (coverages, Info files, and so on). A geodatabase is a DBMS instance holding a collection of table-based datasets.
Coverage	Feature dataset	A coverage is a collection of feature classes with a very strict specification of topological relationships. A feature dataset is a collection of feature classes with user-defined spatial relationships and topologies.
Coverage Attribute tables	Geodatabase tables	The coverage's attribute tables (PAT, AAT, and so on) in the INFO database are maintained separate from the geometry. In the geodatabase, geometry and attributes are maintained in a single DBMS table (one per feature class).
INFO tables DBMS table via DBI	-Text files -INFO tables -dBASE tables -DBMS tables -Any OLE DB data source	ArcGIS supports the same tables supported in ArcInfo Workstation plus many more formats.
Grids Images Image Catalogs	-Raster dataset -Images -Raster catalogs	Supports full raster operations on numerous raster formats in addition to grids: JPEG, ERDAS IMAGINE, TIFF, and so on, are supported for storage and management in the geodatabase. In ArcGIS, all geodatabase rasters (as well as file-based raster datasets) can have multiresolution pyramids for efficient data use at various map scales. You can manage large raster datasets in the geodatabase (for example, greater than 100 GB). They can either be tiled or mosaicked in a single large, continuous coverage.
COGO arcs, COGO points	Lines with COGO attributes Points with COGO attributes Survey dataset	COGO coverages hold arc and point feature classes that contain specific COGO attributes (such as traverse and curve properties) in the AAT and PAT. Similar properties can be maintained on Line and Point feature classes in the geodatabase. ArcGIS users who have Survey Analyst can manage a comprehensive survey dataset that holds survey points, coordinates, measurements, and computations for managing all survey information as an integral part of the GIS. This also includes the ability to incrementally add new survey information over time. Feature geometry can be linked to survey point locations and adjusted.

Comparison of coverages and feature datasets

ArcInfo Workstation	Data in ArcGIS	Notes
Coverage feature classes:	Geodatabase feature classes:	* The spatial extent and coordinate system are defined as part of the dataset's spatial reference. The tics could optionally be managed as a point feature class.
Tic	Point*	
Bnd	*	** With topological relationships to other line and polygon feature classes.
Arc	Polyline	
Node	Point**	*** A label location with a topological association to its polygon.
Point	Point	
Polygon	Polygon	**** The best strategy is to use generic feature classes whenever possible to ensure support for open, multipurpose, standards-based data. However, the geodatabase is extensible and it is possible to add custom feature classes.
Polygon label	Point***	
Route System	Line with measures	
Region	Polygon	
Annotation	Annotation	
NA	Dimension	
NA	Custom features****	

ArcInfo Workstation and ArcGIS Desktop each have a different geometry model. Coverage feature classes can have x,y coordinate pairs. Geodatabase feature classes can have xy, xyz, xym, or xyzm coordinates (the z's are used to hold elevation and the m's are used to hold measures for linear referencing).

Geodatabase feature classes can hold true curves and parametric geometry.

Coverages can only have one tic, arc, node, and polygon feature class. Feature datasets can hold any number of feature classes of any supported type.

Feature classes in the geodatabase can have subtypes.

Columns in geodatabase tables can be associated with a domain (a set or range of valid values).

Both data models can have relationships. ArcInfo Workstation uses the RELATE command to join rows between tables. A geodatabase can have relationships defined as part of its data model. On-the-fly joins, much like RELATES, are also supported in ArcGIS.

In a coverage, overlapping and multipart polygon features that share geometry must be modeled with a set of region feature classes. In the geodatabase, these would be organized into a set of polygon feature classes with topology rules that define if (and how) polygons can overlap.

In coverages, multiple, integrated line feature classes are modeled as route systems. In the geodatabase, these would be organized into a number of line feature classes and integrated using a topology.

Data management and editing benefit: Strong editing of richer, more flexible data models

In ArcInfo Workstation, the coverage data model has strict topology rules and mechanisms to maintain topological integrity. These are based on the use of topological pointers—internal feature IDs (often referred to as the cover #) for each feature class in the coverage. ArcEdit is the application that works closely with commands, such as BUILD, CLEAN, and RENODE, to maintain this strict topological data and internal ID structure. Topological editing, not simple feature editing (such as shapefile editing), is the focus in ArcEdit. Thus, data must always be edited as coverages in ArcEdit.

In ArcGIS, the fundamental method for managing a feature class is based on the OGC and ISO simple features specification: a feature class is managed as a standard DBMS table where each row holds all information for a single feature. One of the columns holds the geometry (shape) of the feature. This enables ArcMap editing to work with many multipurpose, open data models, such as shapefiles and feature classes from any geodatabase (personal and multiuser). While ArcGIS can use and consume coverages effectively, it cannot edit coverages with any degree of consistency. Thus, coverage editing is not supported in ArcGIS 8.3.

ArcInfo Workstation focuses on coverage editing with latent support for editing some additional data types. ArcEdit is built around the coverage's topological data model and maintaining its integrity (internal cover # IDs, arc–node lists, polygon–arc lists, and so on).

Editing in ArcMap is based on the OGC/ISO simple feature data model (complete feature geometry in simple, standard tables) and includes a comprehensive topological editor that implements the specific user-defined topology rules for each dataset. Thus, ArcMap is not a coverage editing environment but works well for most open vector data models that adhere to standards. This includes the editing of shapefiles and feature classes in any geodatabase.

The target seats for ArcGIS editors are ArcEditor and ArcInfo.

Editing in ArcInfo Workstation and ArcGIS Desktop

ArcInfo Workstation	ArcGIS Dekstop
Coverages	No coverage editing
No shapefile editing	Shapefile editing
Some simple ArcSDE feature classes	Personal geodatabases Multiuser geodatabases
Info tables	Info tables dBASE Access Text files RDBMS OLE DB
Rasters (via GridEdit and ArcScan)	Rasters (via ArcScan)
No Survey dataset support	Survey datasets (via Survey Analyst)

Data management and editing benefit: Standard and open data models

ESRI, in concert with numerous user groups, has been developing a series of ArcGIS Data Models for numerous applications. Some of the key goals have been to build designs that are open, multipurpose, standards-based, and readily sharable. The goal is to build data models that would readily support migration from existing coverage designs and also make the designs flexible and extensible. Helpful sample data models, along with implementation guidance, diagrams, user documentation, and tools, are available at http://support.esri.com/.

Data management and editing benefit: Strong multiuser data management

In ArcInfo Workstation, the most common file-based method for data editing and maintenance is to tile the data into manageable chunks and allow only one user at a time to edit any tile. File-based editing in ArcEdit always operates on the coverage data model. Most often, the data is shared by converting it to shapefiles and other direct use formats (for example, ArcSDE layers).

In ArcGIS, users edit and maintain a relational database—the geodatabase. Users directly interact with and edit the same database as is used for other purposes in their GIS. No conversion is required. The multiuser geodatabase (which requires the use of ArcSDE) can reach any size; it is always continuous (that is, not tiled).

ArcInfo Workstation has a series of options for how a large, continuous vector database is managed. All involve the use of the coverage data model and tiles to manage large collections. Editing is performed against coverage copies and often joined-and-clipped tiles.

The geodatabase is continuous. Data maintenance involves directly editing the large, multiuser geodatabase. No data conversion or copies are necessary (unless dictated by the work flow). Multiuser editing typically requires the use of ArcSDE.

ArcInfo Workstation	ArcGIS Desktop
Three alternatives can be used for multiuser data management: - Tiled workspaces - Map libraries - ArcStorm libraries (using the ArcStorm extension)	One strategy: Multiuser geodatabases (uses ArcSDE and a DBMS such as Oracle, SQL Server, IBM DB2, or Informix): - Continuous, not tiled - Direct use, not converted for editing or shared use

Data management and editing benefits: Support for multiuser editing and other critical GIS work flows

There are a number of key data management work flows in GIS. ArcInfo Workstation directly addresses only one of these work flows for tile-based editing. The other data management work flows (for example, history management) must be built as comprehensive AML applications on the base system.

In ArcInfo Workstation, for disconnected, multiuser editing (where tile-based data is checked, or copied, out and the tiles are joined), the check-out data copy is edited and, once completed, checked back into the multitile repository. The edited copy wholly replaces the check-out data.

By contrast, the goal of the multiuser geodatabase using ArcSDE and ArcGIS is to address any number of key GIS data management work flows. The set of work flows that are currently supported at ArcGIS 8.3 include:

- Multiuser editing
- Persistent design alternatives (for example, “as-planned” and “as-built” versions)
- Disconnected editing (check-out, check-in)
- Synchronized field editing with ArcPad®
- Version-based history management

For good technical papers on how to implement history, refer to the technical papers at http://support.esri.com/.

All of these GIS work flows are based on versioning. At its simplest level, versioning records and tracks updates and changes as standard rows in tables. All of the work flows described here are built using versioned geodatabases.

ESRI's versioning implementation is open for access and use by all other DBMS applications.

Over time, ESRI plans to add support for additional work flows in ArcGIS and ArcSDE. For example, in an upcoming ArcGIS release, we will add support for loosely coupled replication, allowing users to share synchronized updates between remote geodatabases.

Editing work flows

ArcInfo Workstation	Data in ArcGIS	Notes
Check-out/ Check-in editing work flow	Supports check-out/check-in plus additional version-based GIS work flows (via ArcSDE): 1) Multiuser editing 2) Persistent design alternatives 3) Feature history and revision info (metadata) 4) Disconnected editing 5) Integrated field editing via ArcPad 6) Loosely coupled replication (coming in a future ArcGIS release)	In ArcInfo Workstation, multiuser editing requires one copy of the features to be edited by each user. The typical mechanism for this is to tile the GIS dataset and to have a single user edit one or more tiles of data at any point in time. Workstation users often employ map libraries (using Map Library or ArcStorm) to manage the check-out/check-in process. 1) Check-out and join. 2) Edit coverage copy. 3) Check-in edited data copy. In ArcInfo Workstation, checkouts can be made against ArcSDE datasets but must be converted to coverages for editing in ArcEdit. In ArcGIS, multiuser editing requires the use of ArcSDE and a DBMS to manage and store the multiuser geodatabase. The geodatabase is not tiled; it is continuous. Any number of editors can simultaneously edit against the multiuser geodatabase. No data conversion is required like in ArcInfo Workstation; the edits are made directly on the multiuser database. Editors work with their own version (that is, only with their changes, not everyone's changes). Multiple versions can be reconciled against other versions and the changes can be posted to a common version (sometimes called the default version). In ArcGIS, versioned databases can support numerous other critical GIS work flows, such as history tracking and management.

Starting points for stage 2 migration: Data management and editing

Begin to learn, understand, and prototype your use of geodatabases:	Plan your long-term data migration strategy:
Begin to experiment with and use personal geodatabases. Load some sample datasets into a personal geodatabase. Try migrating some coverage data into feature datasets with topologies. Learn how to model your geographic information. Experiment with topologies in ArcCatalog and ArcMap. ArcEditor and ArcInfo 8.3 include very good editing and data management tools as well as strong documentation for this. Begin to prototype your geodatabase data models. Define feature classes, topologies, and other geodatabase elements in a prototype personal geodatabase and begin to experiment with that data model using ArcGIS Desktop. Seek consistency, simplicity, and openness in your geodatabase design. Start with your existing coverage designs and reuse the best concepts in their designs. Experiment with sample ArcGIS data models. Helpful real-world data model implementations, diagrams, user documentation, and tools are available at http://support.esri.com/.	Determine the best data architecture for your GIS. Should you use a small collection of personal geodatabases? Perhaps this will be appropriate if you have a few focused editors and smaller data volumes. There have been acceptable performances on personal geodatabases containing 100,000 to 500,000 features and less than 1 GB in size (Microsoft Access [MDB] database file limits are 2 GB). Some users can organize their GIS layers into a set of personal geodatabases (one for each layer) for use. Once you prototype your data model with personal geodatabases, you should pilot the same architecture you plan on deploying to test your database architecture. Test your complete system design. Use representative data volumes. Adjust your design to work on real-world scenarios. While your implementation costs may increase, it is still strongly recommended that you implement ArcSDE and a DBMS for large multiuser systems. All supported DBMS architectures will work and perform quite well with ArcGIS. Data migration often requires some custom application development for data entry and management work flows.

Stage 3: Migrating your advanced geoprocessing work to ArcGIS

One of the key roles of ArcInfo Workstation has been to provide a comprehensive geoprocessing toolset that is used for:

- Database creation, import, construction, and conversion/export
- Analysis and modeling
- Advanced cartography, including map sheet manipulation, generalization, and feature processing for symbology
- Data management

The command-based geoprocessing framework and the use of AML is one of the key advantages of ArcInfo Workstation.

ArcGIS Desktop 8.3 provides access to the same geoprocessing tools accessed from the Arc: prompt in ArcInfo Workstation plus a few additional tools. In ArcGIS Desktop 9.0, a major focus will be the release of a comprehensive geoprocessing tool kit. Plus, ArcGIS Desktop 9.0 will add support for an integrated and modern ArcToolbox that will work within any ArcGIS application (ArcCatalog, ArcMap, and ArcScene). Tools will work with all data including geodatabases, map layers, coverages, shapefiles, grids, TINs, and all other supported GIS formats. Models can be built and shared. Open support to integrate any external operators and models into ArcToolbox and ModelBuilder™ will be supported as well. Commands and scripting will also be supported.

Since the new geoprocessing support will be released soon after ArcGIS 8.3, you can begin to plan for its migration in the coming months.

Geoprocessing

ArcInfo Workstation	ArcGIS Desktop 8.3	ArcGIS Desktop 9.0
Numerous commands at the Arc: prompt that take various data types (for example, coverages and Info files) as inputs and create new information. AML is used for customizing and scripting.	Supports all Arc: prompt commands for geoprocessing. Runs existing AML scripts. Geoprocessing at ArcGIS 8.3 is a hybrid system. It executes ArcInfo Workstation commands plus a small set of new commands that work on geodatabases. Data would require conversion to coverages for many geoprocessing operations in ArcInfo Workstation (for example, from a map library), as well as in ArcGIS Desktop 8.3. ArcGIS 9.0 will fully modernize all geoprocessing in ArcInfo Desktop.	Comprehensive set of new tools. Includes all existing functions. Works with existing AML scripts and commands. Will work on all file-based and geodatabase data as well as map layers. ModelBuilder for graphically composing scripts and data flows. Open, industry-standard scripting support in Python, Perl, VB Script, JavaScript, and ActiveX programming tools. Easily extensible with custom scripts, commands, and programs. Any external program can be incorporated as a tool.