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ArcGIS Software Deployment Using External Hard Drives

Since June 2001 the U.S. Geological Survey (USGS) has deployed five major releases of ESRI software under various Enterprise License Agreements with ESRI. Until recently, ESRI has provided USGS with a limited number of CD/DVD media kits, which were then replicated and distributed to approximately 200 physical sites. The last and most recent release (ArcGIS 9.1) was accomplished using 80-gigabyte external hard drives loaded with all ESRI software commonly used in USGS. It's anticipated that the 200 external hard drives acquired for the deployment of version 9.1 will be reused for the next two major releases of ArcGIS. While the costs for deployment media and shipping will roughly be equal for these next two releases, the personnel time savings and convenience will be greatly increased, based upon our experience with the version 9.1 deployment. The time savings is realized on both the distribution end and, to a greater extent, at the field office installation end. The external hard drive method also allows USGS to take full advantage of the unlimited usage aspect of the ESRI/Department of the Interior SmartBUY Enterprise License Agreement by allowing efficient distribution of the entire desktop and server suite of ESRI software to all field offices.

History of ESRI software deployment in USGS

The U.S. Geological Survey has been using ESRI software since the early 1980s. At that time, ESRI directly shipped 9-track tapes to our sites. Later, as ESRI moved to CD-ROM distribution media, contracts were modified so that USGS would receive a limited number of media and internally duplicate software for deployment within the organization. USGS took advantage of this deployment scenario by including custom tools, symbols, and fonts in the installation package to make them available as standard software enhancements across USGS. When ESRI moved to Windows and Microsoft Installer technology, the ESRI media were copied and add-ons were posted on a USGS internal website with scripts to simplify installation of the software. All this customization was limited to ArcGIS Desktop and ArcInfo Workstation software. Other software media were copied and shipped on an ad-hoc basis as requested. This resulted in a large amount of CD duplication as the ESRI software product line grew. For example, the complete ESRI media collection delivered in early 2005 included more than 90 disks (CDs and DVDs).

The solution: external hard drives

Recently external hard drives with Universal Serial Bus (USB) interface have become very popular devices for moving large amounts of data and software. A single drive that holds 100GB currently is available for under $100 dollars and weighs only a few ounces. ESRI and USGS decided to work together to see if this would be a more efficient way to distribute GIS software.

ESRI External hard drive

In order to test the utility of this software distribution method, ESRI worked with USGS to deliver an external drive with all software included in the ESRI-DOI SmartBuy Enterprise License Agreement (ELA). This included the ArcGIS Desktop product line, legacy software such as ArcView GIS, server software, including ArcIMS and ArcSDE, developer tools including ArcEngine, and ESRI Data and Maps. ESRI supplied all these media as ISO image files on a set of identical hard drives and delivered them to USGS for redistribution to the other U.S. Department of the Interior (DOI) bureaus that participate in the same ELA with ESRI. Most of the DOI bureaus simply copied the ISO images to CDs and distributed the CDs to their GIS sites for deployment. USGS decided to go a step further creating and distributing hard drives that had additional features added to improve the deployment with customized applications.

USGS software distribution

USGS started with the hard drives as shipped from ESRI, added more files to the hard drives, and copied and distributed hard drives to all USGS ESRI software sites. The USGS drives included:

1. **ESRI-delivered ISO images of all software and data files (93 images)**
2. **Free Windows Software to extract data from ISO images (ISOBuster, http://www.isobuster.com)**
3. **Data from selected ISO image files saved to folders on the hard drive for installation directly from the hard drive. This "pre-extracted" software and data included ArcGIS Desktop, ArcInfo Workstation, ArcView GIS, and ESRI Data and Maps.**
4. **Software add-ons (fonts and add-on software) for ArcGIS Desktop and ArcInfo Workstation packaged as .msi files**

5. **Visual Basic Script (VBScript) programs to install ArcGIS Desktop, Workstation and software add-ons. The scripts allowed USGS system administrators to install the software by simply attaching a USB drive to a computer, copying the data to a file server, and running an interactive VBScript to install typical desktop software. Alternatively, the scripts can be run directly from the hard drive after attaching it to a computer.**

Benefits of external hard drive deployment

Cost analysis was performed by comparing the last 4 CD/DVD based deployments of ArcGIS versions 8.1, 8.2, 8.3, and 9.0, against an assumption the initial investment in external hard drives would be used for 2 subsequent deployments after ArcGIS version 9.1, i.e., for a total of three ArcGIS deployments total.

Comparison of Costs for Software Deployment

The overall actual costs for materials, labor, and shipping were relatively equal on a direct comparison of the two deployment methods per each major release to 200 USGS field sites. While costs for CD/DVD materials and shipping were less, labor costs were greater for CD/DVD based deployment than for the external hard drive method. These factors roughly evened out the overall costs of the two methods. A major factor difficult to quantify is that CD/DVD based deployments only allowed for distribution of approximately 30% of the entire ArcGIS and Server software suite, while the external hard drive method allowed for deployment of 100% of the software suite. Costs being equal, this factor alone made the use of external hard drives well worth the effort, as USGS sites could more easily provide access to all ESRI products to their GIS users. Estimates used in the cost analysis are as follows:

CD/DVD Based Deployment

- ❖ **Blank CDs and DVDs and Pre-Burned CDs and DVDs from ESRI; $2,000/release**
- ❖ **Replication Labor; 15 minutes/site, 500 hours/release**
- ❖ **Shipping Costs; $2/site, $400/release**
- ❖ **Shipping Labor, stuffing CDs/DVDs in sleeves, then jiffy bags; 16 hours/release**
- ❖ **Server Product distribution, tracking and custom requests; 80 hours/year**

External Hard Drive Based Deployment

- ❖ **Initial investment on 200 external hard drives, $18,200; $6,067/release**
- ❖ **Replication Labor; 10 minutes/site, 333 hours/release**
- ❖ **Shipping Costs; $8/site/release, $1,600/release**
- ❖ **Shipping Labor, packaging hard drives; 8 hours/release**
- ❖ **Custom Requests; 4 hours/year**

Comparison of Costs for Field Site Administration and Installation

The most important cost savings was that of software installation time at the field sites. An informal email and phone survey was performed on 10% of the 200 field sites to quantify the time savings of external hard drive installation over CD/DVD based installation, as well to collect general comments on the relative convenience of the two methods. While the reported time savings varied greatly, every field site administrator surveyed said they preferred the external hard drive installation method over CD/DVD due to the increased convenience and reduced 'baby-sitting' during installation. In this comparison, actual time is the overall elapsed time of installation, monitored or not, and personnel time is the time a system administrator spent monitoring and actively participating with the installation. The average actual installation time was reduced 40% and the average personnel time was reduced 50%:

CD/DVD Based Installation

- ❖ **Actual Time; 100 minutes/Desktop-Laptop-Server**
- ❖ **Personnel Time; 60 minutes/ Desktop-Laptop-Server**

External Hard Drive Based Installation

- ❖ **Actual Time; 60 minutes/Desktop-Laptop-Server**
- ❖ **Personnel Time; 30 minutes/ Desktop-Laptop-Server**

The USGS supports approximately 2,000 users of ESRI GIS software, so the resulting time savings is roughly 1,000 hours/release for our system administrator personnel. This is an estimated $50,000/year cost savings in personnel time, assuming an average grade for a system administrator is a GS-12.

Future methods of software deployment

Software deployment methods will continue to evolve as software and hardware develop. USGS plans to deploy ArcGIS 9.2 using external hard drives, but some future software may be distributed using bit-streaming technology to servers around the enterprise, or using virtualization technology that allows software to be packaged on a server and layered dynamically on a user's Windows desktop environment as needed.

CONCLUSION

Distribution of software using external hard drives has been a success in USGS over the previous methods with CD drives. It has saved significant time for USGS staff, and enabled a more complete and consistent software deployment throughout the organization.

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