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SPAN GRAPHICS DISPLAY UTILITIES HANDBOOK (First Edition)

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16. ABSTRACT

The Space Physics Analysis Network (SPAN) is a computer network connecting scientific institutions throughout the United States. This network provides an avenue for timely, correlative research between investigators, in a multidisciplinary approach to space physics studies. An objective in the development of SPAN is to make available direct and simplified procedures that scientists can use, without specialized training, to exchange information over the network. Information exchanges include raw and processes data, analysis programs, correspondence, documents, and graphic images. This handbook details procedures that can be used to exchange graphic images over SPAN.

The intent is to periodically update this handbook to reflect the constantly changing facilities available on SPAN. The utilities described within reflect an earnest attempt to provide useful descriptions of working utilities that can be used to transfer graphic images across the network. Whether graphic images are representative of satellite observations or theoretical modeling and whether graphics images are of device dependent or independent type, the SPAN graphics display utilities handbook will be the users guide to graphic image exchange.

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PREFACE

One of the main objectives of the SPAN system project is to accommodate coordinated data analysis without leaving one's institution. Therefore there is a strong need to develop the ability to have graphic images of data from any node to be displayed by any other node. The current inability to display data on an arbitrary graphics device at any node has been quickly recognized. As general network utilities are developed to support the display of device dependent and independent graphic images, this handbook will serve to document their use and limitations. This handbook, therefore, is a practical guide to those common network facilities which will be used to support network correlative studies between investigators.

For each graphics software utility this handbook first contains information necessary to use the utility. Next, it contains that information which is necessary for obtaining and implementing the utility. Then, limitations of the utility are discussed. Finally, the handbook outlines the guidelines for asking further questions, for contributing new utilities, and for obtaining updates to existing programs. An appendix is included at the end of this document that describes graphic devices used at many of the SPAN modes.

Note that in the descriptions that follow for the various graphics utilities, upper case is used to indicate what you must enter and lower case is used to indicate what the utility will display for you.

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SPAN GRAPHICS DISPLAY UTILITIES HANDBOOK
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I. INTRODUCTION TO DEVICE DEPENDENT AND INDEPENDENT GRAPHICS

A major goal of the SPAN system is to develop the capability to exchange and view graphic presentations of data between any SPAN nodes. To implement this objective, it is necessary to define the types of graphic displays which need to be supported and the procedure for reproducing an image on a remote graphic display device. The first step in defining a common graphic environment is the generation of a graphic file.

Broadly speaking, there are two basic types of graphic files that can be generated: a device-dependent graphics file or a device independent graphics file. The device-dependent file is produced specifically for a particular model of a manufacturers graphics terminal. For each brand of graphics display device which exists on SPAN, a unique graphic image file may be necessary.

A device-independent file consists of coded instructions which are to be interpreted as generic graphic operations. The file is viewed by translating the coded instructions into device-dependent graphic terminal commands. Under such circumstances, only one graphic image file needs to be produced to support all graphic display devices on SPAN. Instead, each display device requires a translator (a program), which accepts the generic graphic coded instructions and produces the unique graphic commands required by the graphic display device.

Graphic presentations of scientific observations are produced at all locations on SPAN, requiring a procedure for image distribution. There are also two principal ways for implementing graphic image exchange: image files may be copied to each destination and graphic images may be directly displayed at any SPAN node by using remote network file access techniques. Replication of graphic image files at various SPAN nodes provides flexibility in the use and archiving of images, but causes a potentially high burden on network "on-line" file storage devices. Although technically more complex, it is also possible to access a graphic file at one node from any other SPAN node without moving the target file. Such access would best be performed from a user program executing at the destination node. The graphic file would occupy storage only at the source network node, however, the time for the display of the image will depend upon network traffic. Heavily loaded communication channels would slow the local display of a remote graphic image file.

The last major task is the display of a graphic image file on a graphic device. Depending upon the limitations of a local computer facility to transmit graphics file contents to a display device, the viewing of a device dependent file may be trivial. Some computers will insert characters, e.g., carriage return and line feed, into the stream of graphic commands "typed" to a local terminal (i.e., graphic display device). Depending upon the graphic display device, the arbitrary insertion of characters into a stream of graphics commands may be unacceptable. Even with such complications, the local display of a device dependent graphics file requires limited processing resources. The display of a device independent graphics file is a more involved process. The translation of generic graphic commands into device dependent plotting commands may require more memory and processing resources.

The necessity of developing a common graphic architecture in the diverse graphic terminal environment which currently exists on the SPAN system dictates the direction which must be taken. Since it is impractical for each node to produce a graphic image file for each device which exists on SPAN, it is necessary to adopt a device independent graphic file format. Efforts are now underway to define and adopt a SPAN METAfile, e.g., device-independent graphic language. Current attention is directed toward the activities of national and international standards committees.

It appears that the industry graphics standard for 2-D graphics has become the Graphics Kernal System (GKS), Graphics Device Interface (GDI, formerly VDI), and Graphics Device Metacode (GDM, formerly VDM). GKS defines a standard structure in various languages for a user's program to perform graphic operations. GDI is an object level interface to the metacode producing routines. GDM is the metacode or metafile format. GDM is the device independent coding of generic graphics operations in any graphic image. Several companies now produce 2-D GKS products. These companies also produce graphic language products that fully support 3-D graphics, some of which are compatible with GDM. As the work of standards committees continue, 3-D graphics standards will be established.

II. DISPLAY OF DEVICE DEPENDENT IMAGES

A. REPLAY

REPLAY allows the user to display a graphics image from any node on SPAN to a device at his local node. It is the user's responsibility to use DEC MAIL, DEC PHONE, or the telephone to determine the location and name of the graphics file and for what device the graphic image was produced. The image must have been produced for display on a device for which you have local access. In the descriptions that follow, optional entries will be enclosed in {} brackets. Refer to your DEC user manuals or your system manager for information concerning the default specifications which result from omitting optional entries.

1. REPLAY: How to use it on a DEC VAX.

```
$ASSIGN DEV: RP:

$RUN REPLAY

enter the device dependent plot filename ?

NODENAME{"USERNAME PASSWORD"}::{DEVICE:}{[DIRECTORY]}FILENAME
```

In the above procedure, the assignment is made to direct the graphic commands from a logical device (called RP: by REPLAY) to a physical device. The physical device name (symbolically shown as DEV:) will be the VAX VMS name that points to the graphic device which is the final destination of the graphic image. REPLAY does not now support DMA output. Device output must go to a serial device.

REPLAY may also be used on a DEC PDP:

>ASN DEV:=RP:

>RUN REPLAY

enter the device dependent plot filename ?

NODENAME{"USERNAME PASSWORD"}::{DEVICE:}{[DIRECTORY]}FILENAME

2. REPLAY: how to get it and implement it.

The REPLAY executable for the DEC VAX can be found in the SPAN NEEDS node. Its full file specification is NEEDS::REPLAY.EXE and the DEC COPY utility can be used to copy this file to your system. If REPLAY is installed on your system by the system manager, the RUN command in the above procedure is omitted and the word REPLAY is simply entered. The REPLAY executable or task file for a DEC PDP has not been completed. It should be completed by February 1985 and will be located in the default network account on the SPAN SSL node. Its full file specification will be SSL::REPLAY.TSK and the Network File Transfer (NFT) utility can be used to transfer this file to your PDP system.

3. REPLAY: its limitations.

REPLAY will deliver a graphic image only to serial devices on your local system. It is not intended to drive DMA devices. Although it is important to support DMA graphic devices on the network, this usually depends upon local DMA hardware characteristics and must be implemented on a case by case basis. Versions of REPLAY that support DMA have been produced or are in progress and you can find out more through the SPAN network manager. For example, work for two Advanced Electronic Design terminals (the 767 and 1024) have been done at the NEEDS and STAR nodes.

III. DISPLAY OF DEVICE INDEPENDENT IMAGES

No device-independent utilities are currently supported.

IV. HANDBOOK GUIDELINES

This handbook is intended to provide short, simple directions for the use of graphic display utilities. Questions about these utilities should be directed through the SPAN network manager. Contributions to this handbook should follow its spirit of direct and simple explanations; what does the utility do, how is it used, and what are its limitations. Updates of this handbook will be performed by retaining the most current version of the handbook in the default network account at the SPAN NEEDS node. The handbook in its most current form can be copied by specifying: NEEDS::SPANGRAF.DOC as the source for the DEC COPY command.

APPENDIX – SPAN GRAPHICS SURVEY

INSTITUTION	NODE	GRAPHICS DISPLAY DEVICES
Applied Physics	APL	HP2648A
		Graphon (4014 emulation)
		AED 512
		Ramtek 9400
		Gould Plotter
Laboratory		
Goddard Space Flight Center	NSSDC	HP2623A
		HP2627A
		Ramtek 6211
		Calcomp Vistagraphic 4218
		VT100/Matrox GT-600A graphics
		Versatec V-80
		HP7580A plotter
		HP7475A plotter
	PSCF	Tektronix 4014
		Tektronix 4027
		Jupiter-7
		Varian 4211 plotter
	SIRIS	Tektronix 4014
		Versatec V-80
		Calcomp 907 plotter
University of California Los Angeles	VXBMS	VT102/retrographics
		AED 512
		Evans & Sutherland MPS
		Tektronix 4014
		HP 2623A
		Printronix
		Versatec
Jet Propulsion Laboratory	PPDS	Grinnell 512x512 frame buffer
		Tektronix 4025A
		VT102/Retrographics
		VT125
		Pro-350
		Printronix P-600
		Calcomp 1051 plotter
	CHICO	Grinnell 1023x1024
		Ramtek frame buffer
		DEC LXY-22 plotter
		VT125
		Pro-350
		VT241
	GROUCH	Printronix P-600

Lockheed Palo Alto Research Laboratory	LOCKHD	Jupiter J7+ Trilog Colorplot
Marshall Space Flight Center	NEEDS	Tektronix 4027 Tektronix 4025
	SSL	AED 767 Selenar HiRes 100 Tektronix 4027 Tektronix 4051 QMS Lasergrafix
	MPB	Tektronix 4025 Princeton PEP 8500M
	SPB	Selenar HiRes 100 Tektronix 4025 Tektronix 4010 CIT-101 w/graphics
Southwest Research Institute	SWRI	Princeton PEP 8500M Chromatics CGC 7900 Chromatics CX 1500 Selenar HiRes 100 Versatec V-80 LA-100 LA-120
Stanford University	STAR	IRIS Bosch Videographics
	PR01	Pro-350
	PR02	Pro-350
University of California San Diego	LJSP01	AED767 Tektronix 4014-1 Tektronix 4012 Tektronix 4051 Printronix Versatec
University of Iowa	IOWA	Selenar HiRes 100 Tektronix 4013 Chromatics CGS 7900 IIS Zenith-29 CIT-414 Printronix P-300 HP Laserjet HP2563A HP7475A Calcomp 5XX plotter Calcomp 835 microfilm plotter

University of Texas at Dallas	UTD	Tektronix 4014 Tektronix 4027 Princeton PEP 8500M Visual 550 VT100 w/graphics QMS Lasergrafix 1200
University of Washington	NEEDS	Sun Workstation Zenith Z19 w/graphics Zenith Z29 w/graphics Tektronic 4015 Calcomp 4-pen plotter Versatec plotter
TRW	TRW	AED 512 Andromeda (4010 emulation) NEC APC w/4010 emulation

APPROVAL

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The information in this report has been reviewed for technical content. Review of any information concerning Department of Defense or nuclear energy activities or programs has been made by the MSFC Security Classification Officer. This report, in its entirety, has been determined to be unclassified.

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A. J. DESSLER
Director, Space Science Laboratory

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