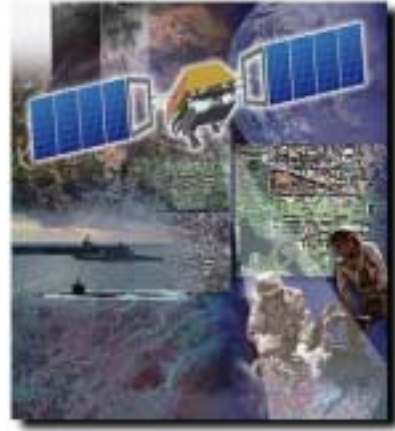


# WIPE OVERVIEW



---

## Introduction

### What is WIPE?

The WWW Image Processing Environment (**WIPE**) - is a WEB based Image Processing and Geographical Information System (IP/GIS) that provides network centric manipulation of geo-spatial/temporal data associated to Earth observing sensors. Web based users can interactively produce high-level products resulting from the data fusion of recent and historical satellite imagery with other static/dynamic data sets.

WIPE was originally implemented to support the US and NATO's Rapid Environmental Assessment (REA) exercises during FY96-98. That particular version of WIPE was called the Warfighter Image Processing Environment. The present version of WIPE has evolved to support both military and non-military communities.

### WIPE as a Tool for Different Types of Users

From a high level, the WIPE system provides support for major classes of users associated with the flow of geo-spatial/temporal data. These are: the data manager, the data provider, and the end-user accessing one or multiple sources of data.

#### *Data Manager Perspective*

WIPE solves the problems of efficiently ingesting/archiving/serving large data volumes and quickly geo-referencing recent and legacy geo-spatial/temporal data. For a data manager, WIPE provides a key building block in the implementation of a LAN based geo-spatial data-warehouse. Depending on the specific project constraints, it may be optimum to locate the WIPE server(s) at the:

- Data provider facility, i.e. a satellite ground station where the data is collected

- Main data fusion center
- Regional fusion center

or all of the above.

### *Data Provider Perspective*

Once a data provider moves data into a pre-established directory, the data assimilation engine will automatically pre-process, geo-reference, and get the data ready for remote access via the WIPE server engine.

### *End-User Perspective*

For the end-user WIPE facilitates going all the way from high level searches on the metadata to interactive access and download to the actual data or virtual data products. Remote end-users can access the server engine via:

1. User application that is HTTP or CORBA enabled, e.g. ProVIEW.
2. WIPE's High Level Search Browser (HLSB) Applet
3. WIPE's Interactive Data Browser (IDB) Applet

---

## Overview of WIPE Features

WIPE provides a fully integrated hardware/software system for the assimilation, processing, and fusion of different satellite image data sets via a simple to use WEB based interface. A single WIPE system consists of an automatic data ingestion engine, and a network enabled server engine. Both the ingestion and server engines provide:

**Low Cost Hardware** – servers are implemented in Windows NT systems

**Multiprocessor capability** – the computational load can be distributed over multiple Windows/NT servers. The ingestion and server engines can reside on different machines.

**Effective use of the Available Bandwidth** – imagery data is automatically geo-referenced and re-sampled for display at the selected user resolution!

### Ingestion Engine

The ingestion engine is constantly checking for the arrival of new data to be processed. It also captures all the methods for the processing of the recently received data.

As part of the ingestion process the source image data is stored in an intermediate format (virtual file format [VFF]) which provides rapid data access over the WWW at any resolution. *Conversion to the VFF is optional.*

The system is modular enough such that new data formats can be rapidly added into the ingestion engine.

## Data Server Engine

The WIPE server engine is constantly checking for the arrival of data requests from a user. The server engine also captures all the different methods to make data available to the remote or local user. Highlights of the server engines include:

**Modular Design** – servers can be configured to access data in other WIPE servers

**Data Access Restrictions** – multiple access layer restrictions are built on top of the Windows NT operating system.

**Client/Server** – the data can be accessed from anywhere over the WWW. The user has the flexibility to process the data on the server in the client side. WIPE's architecture allows transferring portions of the data to the client side and performing sophisticated data analysis in his computer.

**Long term archival** - Once the hard disk quota is reached, the WIPE system administrator can specify what to do with data sets that can be off-loaded from the system.

For users connecting to the server engine via a WEB browser there are two basic JAVA applets that facilitate the interaction: the High Level Search Browser (HLSB), and the Interactive Data Browser (IDB).

### *High Level Search Browser (HLSB) Features*

The HLSB is used to find where data is available as a function of sensor, time, and spatial location. The HLSB provides:

**Spatial/Temporal/Sensor Queries** – metadata queries are done using time, spatial, and sensor constraints via the HLSB simple to use graphical user interface.

**Classification Status of Data** –products can be labeled according to their classification status, unclassified, confidential, secret, top secret.

**Manual Geo-referencing Adjustments** - the user can manually fine tune the registration of an image with respect to known ground control point features, e.g. coastal database, or river database.

**Flexible image sizing** – the user has the ability of interactive zoom (in and out) and scrolling over an image.

**Data Coverage Maps** – easy to interpret data availability is overlaid on different Earth Maps.

### *Interactive Data Browser (IDB) Features*

The IDB provides direct access to the numeric values of the data, and products. Highlights of the IDB include:

**Generation of Image Mosaics on the Fly** – the user can specify which images to use for a mosaic generation and establish the overlay order.

**Relational Region of Interests** – simple interface to locate and/or identify pixel locations on one image based on the pixel values of other images

**Extensive Visualization Options** – the user can visualize the data as an image, 2d-plots, 3d-plots, or video clip.

**Extensive Download Options** – access is provided to the actual data for user-defined regions of interest. The data can be downloaded in a number of industry wide formats, e.g. NetCDF, float files, ASCII files, JPEG, etc.

**Dynamically generated products** - most of the products are generated on the fly depending on the user requests

**Disk Caching system** - intermediate products are cached for a predetermined amount of time for rapid serving of future requests.

**Extraction of Image features on the fly** - the analyst/end-user can dynamically decide which region he wants to process and what type of features/algorithms he wants to apply to the data.

**Image Mensuration** - Latitude and longitude information is dynamically provided to the user as the pointer is moved over the image. The user can make distance measurements over arbitrary paths.

**Session Profiles** – the user can save, edit, and recall the state of a WIPE server (a session profile). This is particularly useful to share information with other users.

## Built-in Interpreter Language

Because WIPE's engine is built on top of ProVIEW, it inherits many of ProVIEW's built in capabilities. A detailed description of ProVIEW can be obtained from the on-line manual at <http://wipe.actgate.com>. In addition, a user in ProVIEW can access the services in WIPE via CORBA and HTTP interfaces.

## Supported Data Types

WIPE supports points, vectors, gridded, non-gridded, volumetric, image blobs, and N-dimensional data.

## Supported Data Formats

SQL relational databases, Vector Product Format, Arc View GIS Shapefiles, NetCDF, CEOS, ASCII Tables, and Planetary Data System (PDS/NASA) formats (See table following this section for additional information)

## Middleware Used

WIPE can be accessed from a WWW browser running the WIPE applet or from a stand-alone application. The middleware interfaces are, respectively, HTTP/CGI and CORBA. Building on top of WIPE's CORBA capabilities, ACT has been demonstrating the NAVY's Data Exchange Interface (DEI/CORBA) middle-ware. This has demonstrated access to the NAVY/TEDS servers via WIPE.

## Satellite Data Sources Presently Supported

Satellite imaging sensors supported under WIPE are: ERS-2/SAR, ERS-GSST, LANDSAT, SPOT, SeaWIFS, RADARSAT, TOPEX/Poseidon, SeaWIFS, SSM/I, and NEMO. Examples of static data sets are bathymetry (water depth) and digital terrain elevation (DTED) from the National Imagery Mapping Agency, and the Naval Oceanographic Office. A complete list of supported data sources and data formats is provided on the following page.

## Customization Support

An organization can contract ACT to create a custom version of WIPE to add functionality not present in the base system.

## Supported Data Providers and Respective Data Sets

ACT has developed automatic data ingestion modules for many key remote sensing sensor systems and data formats, e.g. ERS-2/SAR, NOAA GOES data, ERS-GSST, LANDSAT, SPOT, SeaWIFS, RADARSAT, TOPEX/Poseidon, AVIRIS, ArcInfo Shape files, text data, SQL Tables. The following table provides a comprehensive list of all data sources/formats presently supported by WIPE.

Data Provider to WIPE	Sensor	Dataset Name in WIPE	Source Data Format	Internal Format
CIA (static file)	N/A - Static data	WDB Coastal Outline	Custom vector format	Same as Source
NATO/SACLANTC/DERA	ERS	GSST	Float flat file	WIPE's Internal VFF
FNMOC via TEDS	N/A Simulation	TEDS_3Dtemp	NetCDF	NetCDF
NASA via NRL	AVIRIS	AVIRIS Hyper-spectral	BIL, BIP	BIL, BIP
National Global Data Center	NGDC VAP	NGDC_Global Relief	GIF Color Image	WIPE's Internal VFF
NATO/SACLANTC	N/A - Static data	Water/Land Mask	Shapefiles	Shapefile format
NATO/SACLANTC	LANDSAT	LANDSAT	CEOS format	WIPE's Internal VFF
NATO/SACLANTC	AVHRR	Med_AVHRR	NetCDF	WIPE's Internal VFF
NATO/SACLANTC	SeaWIFS	Med_SeaWIFS	NetCDF	WIPE's Internal VFF
NATO/SACLANTC	TOPEX/Poseidon	Med_TOPEX	NetCDF	NetCDF
NATO/SACLANTC	RADARSAT-1	RADARSAT	CEOS	WIPE's Internal VFF
NATO/SACLANTC	ERS-2 SAR	SAR	CEOS	WIPE's Internal VFF
NATO/SACLANTC	SeaWIFS	SeaWIFS	Float flat files	WIPE's Internal VFF
NATO/SACLANTC	TOPEX	Topex_Gridded	Float flat file	WIPE's Internal VFF
Naval Oceanographic Office	UNK	NAVO Wrecks	DBF	DBF
Naval Oceanographic Office	UNK	NAVO_ACOUSTIC	CHAR	WIPE's Internal VFF
Naval Oceanographic Office	P3-OWL	NAVO_Bathy	Float flat file	WIPE's Internal VFF
Naval Oceanographic Office	UNK	NAVO_Mines	DBF	DBF
Naval Oceanographic Office	UNK	NAVO_Roughness	Shapefiles	Shapefiles
Naval Oceanographic Office	N/A	NAVO_Sediments	Shapefiles	Shapefiles
Naval Oceanographic Office	SPOT	NAVO_SPOT	GeoTiff	WIPE's Internal VFF
Naval Oceanographic Office	MODEL	NAVO_Temperature	NetCDF	NetCDF
Naval Research Laboratory	MODEL	NEMO	ORASIS Compressed	ORASIS Compressed
Naval Research Laboratory	N/A - Simulation	TEDS	NetCDF via DEI	REMOTE ACCESSSS
NIMA data via NRL	N/A - Static Data	DBDB V1.0	NIMA's format	WIPE's Internal VFF
NIMA data via NRL	N/A	DTED	NIMA's format	WIPE's Internal VFF
NOAA	MODEL	FNMOCC	GRIB format	NetCDF
NOAA	RADARSAT-1 & ERS-2 SAR	CW_SAR	CEOS	WIPE's Internal VFF
NOAA	NOAA Buoy's	BUOY Measurements	ASCII files	SQL Table
NOAA	GOES	GOES_IR	Flat file	WIPE's Internal VFF
NOAA	GOES	GOES-8	Float flat time	WIPE's Internal VFF
NOAA	SSM/I	SSMI_Wind	ASCII Table	SQL & Float file with 0.3deg resolution
NOAA	NOAA-14/15	SST_14Km	Float Flat file	NetCDF
NOAA / JHU/APL	SAR VAP	APL_SAR_Wind	NetCDF	WIPE's Internal VFF
NOAA / ERIM International	N/A -VAP	Derived Ship locations	ASCII Table	DB Table
NRL and NASA	Clementine	Clementine	PDS	PDS

---

## Server Side Requirements

### Server Side Minimum Hardware Requirements

The minimum hardware requirement for WIPE is a fully dedicated Windows NT machine (4.0 or higher). Hard disk requirement depends on the data ingestion and serving needs. Note: A high-end WIPE system can consist of a network of WIPE servers with terabyte archive storage capabilities.

### Client Side Minimum Hardware Requirement

The minimum hardware requirement on the client side is any computer with a recent version of Netscape or Internet Explorer (IE) browser. At this time WIPE has been tested with:

- Netscape (version 4.0 or above)
- Internet Explorer (5.0 or above)

In either case we use the SUN's swingjar JAVA classes to provide a consistent graphical user interface between platforms. The swingjar classes can be downloaded from <http://wipe.actgate.com>.

In WIPE most of the work is done at the server. Hence, the basic load on the on the client computer is to run the WIPE applets. As the user downloads more images, the applet will use more memory resources to facilitate easy access to previously downloaded images quickly.

---

# Client Side Requirements

## Browser Requirements

The basic interface to a WIPE server is via a WEB browser. At this time the two browsers under which WIPE has been tested are:

Netscape (version 4.0 or above)

Internet Explorer (5.0 or above)

In either case we use the SUN's swingjar JAVA classes to provide a consistent graphical user interface between platforms. The swingjar classes can be downloaded from SUN or from ACT <http://wipe.actgate.com>.

## Hardware Requirements

Almost any computer with a browser can connect to a WIPE server over the INTERNET. In WIPE most of the work is done at the server. Hence, the basic load on the on the client computer is to run the WIPE applets. As the user downloads more images, the applet will use more memory resources to facilitate easy access to those previously downloaded quickly.

## Data Access Rights

Security in WIPE is build on TOP of the Windows/NT security. Each user must have a dedicated login and password. In addition to the Windows/NT security the WIPE administrator can control:

- IP addresses that can have access to the WIPE server
- Data-set level user group access. For example, if a given user belongs to the NATO group, then all NATO data will be accessible.
- WIPE commands that the user can execute in the interpreter engine