Presentation Outline

- Introducing Research Systems
- IDL overview
- ENVI - remote sensing application
- Visible Human - anatomical CD reference
- VIP
- RiverTools
- NeoSys

The Company

- Founded in 1977
- Privately owned - internally financed
- Growing strong, continuously profitable
- 70+ Employees
- 25,000 IDL users worldwide
- Distribution in more than 35 countries

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Some RSI Customers

- Barrick Exploration
- CSIRO
- Daimler Benz
- Fujitsu
- Lawrence Livermore National Lab
- Lockheed Martin
- NASA
- NIH
- NOAA
- Sandia Nat’l Lab
- Siemens
- Texaco
- US Geological Survey

Research Systems’ Products

- IDL
  - Interactive Data Language
- ENVI
  - Environment for Visualizing Images
- Visible Human CD
  - Human Anatomy Reference
IDL Overview

What is IDL?

- Technical computing environment
  - data analysis
  - visualization
  - array-oriented language
  - interactive execution and/or programs
  - portable application development

The Benefits of IDL

- Easy
  - access via GUI, programs and commands
  - high-level language simplifies programming
- Flexible
  - integrated, comprehensive system
  - cross-platform development tool
- Fast
  - rapid application development
  - efficient array processing

IDL is a Language

- 4GL optimized for technical applications
  - simple and complete
  - procedural and modular
- Wide variety of data structures, types:
  - scalar, vector, array and records
  - eight native data types
- Integrated graphics, GUI, math & stats
- Generalized input/output

IDL is Array-Oriented

- Natural representation for technical data
  - Avoids most loops
- Operators work on arrays and scalars:
  - \( A = B + C \)
  - \( C = \sin(2 \cdot \pi \cdot A) \)
  - POWER = \( \log(\text{abs}(\text{FFT}(A, -1))) \)
- Numerous functions for array manipulation
- Quick to program and execute

IDL is Portable

- Built-in program and data portability:
  - Windows 95/98/NT
  - OpenVMS
  - Unix
  - Linux
  - Macintosh
  - Power Mac
- XDR binary data interchange
- Cross-platform GUI toolkit
IDL is Open

- Import/export virtually any type of data
- User-definable functions and procedures
- Programs are cross-platform (somewhat)
- Access to Fortran or C code (not very easy)

Integrated Mapping

- Integrated with graphics
- 2D & 3D polygon filling
- Map overlays
  - images, contours
  - continents, coasts, borders, rivers
  - multiple resolutions
- Many projections

IDL Functionality Overview

2D Graphics

- Contour plots
- XY plots

IDL Map Projections

- Azimuthal
  - Stereographic
  - Orthographic
  - Gnomonic
  - Lambert’s Equal Area
  - Satellite
  - Hammer-Aitoff
- Cylindrical
  - Mercator
  - Conic
  - Cylindrical Equalistant
- Sinusoidal
- Mollweide
- User-defined

Surface Plots

- Mesh surface plots
- Shading with light-sources, elevation or other variables
3D Graphics
- Z-buffered graphics
- Isosurfaces
- Voxel rendering

Image Processing
- Contrast enhancement
- Edge detection, smoothing, sharpening
- Morphological operations
- Geometric transformations
- Frequency domain processing

Fast & Easy Image Processing
- Compute and display a 512 x 512 power spectrum in under 5 seconds on a standard PC:
  \[ b = \text{ALOG}(\text{ABS}(\text{FFT}(a,-1))) \]
  \[ \text{TVSCL, SHIFT}(b, 256, 256) \]

Mathematics
- Arrays & matrices
- Correlation
- Eigenvalues/vectors
- Curve fitting
- Surface fitting
- Gridding
- Interpolation
- Sparse arrays
- Linear systems
- Nonlinear equations
- Optimization
- Time-series analysis
- Integration
- ODE: Runge-Kutta

Statistics
- Hypothesis testing
- Correlation analysis
- Multivariate analysis
- Time-series analysis
- Probability functions and inverses

On-line Help
- Features:
  - all text and graphics
  - hypertext index
  - keyword search
  - bookmarks
  - printing
  - create custom HTML (WWW) help files
Integrated Development Tools

- Editor
- Debugger
- Compiler

GUI Toolkit

- Cross-platform GUI applications
- Large selection of widgets/controls
- Native look & feel
- Portable API

Callable IDL

- Unix Sharable Object Library
- Windows DLL
- Macintosh AppleScript support
- Integrate IDL with other programs
  - complete library for data analysis & display
  - call IDL functions from FORTRAN/C/C++
  - call custom functions prototyped in IDL

Application Distribution

- Run-time IDL licenses
  - IDL save/restore file
  - No access to the IDL prompt
  - Developer retains control of application
  - Protection options available, if desired
  - Embedded licensing

IDL Features Recap

- Choose from many display options:
  - XY Plots, Surfaces, Images, Volumes, etc.
- Powerful mapping capabilities
- Broad suite of math & statistics functions
- Integrated development & interface tools

Summary

- IDL - foremost data visualization and analysis tool
- ENVI - the tool for remote sensing
- Visible Human - an anatomical CD reference
- Research Systems - a company dedicated to customer service and support
**IDL is just a tool (saw)**

UNIX is just a tool (hammer)

- Each is great for certain tasks, not as good in others.
- An image is only as useful as the ancillary data associated with it
- IDL provides visualization and image and computation
- UNIX provides fast text manipulation and general data processing (ancillary data)

**IDL is great at...**

- Visualizing data
- Array and structure manipulation
- Writing something quickly to see if it makes sense (prototyping)
- Providing a graphical user interface (GUI)

**IDL is not the best at...**

- Advanced MATRIX and mathematical methods outside of Numerical Recipes
- True color application
- Routine names that can be remembered
- Distributing "executables"

**Personal Biases**

- IDL under the UNIX environment
- Command Line IDL (vs. IDLDE)
- Above combination allows a seamless integration of strengths

**For those who can’t wait**

```
% idl
OR
% idlde
```