



ENIGMA
DATA SYSTEMS

NEAR LINE SOLUTIONS

ALL THE TOOLS YOU NEED

Software (developed by Enigma) for:

- Optimizing Use of Tape Devices
- Protecting Company's Assets
- Reclaiming Underutilized Disk Space
- Streamlining Entire Data Management Process
- Reducing cost of ownership of data

Resellers of:

- Tape Drive Technology
(Ampex, Sony, ADIC, STK)
- Server Technology (SUN, SGI)



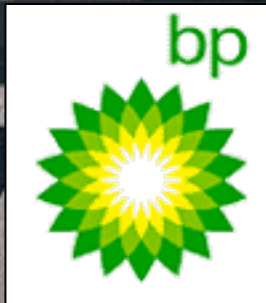
Company History

Enigma Data Systems was formed in 1998 from a management buyout of PECC (CGG's Data Management Division), where the founding technologies of IDS and PARS were transferred to Enigma Data Systems.

Further enhancements of these two core technologies continued along with development of new technologies such as Migrator and Linear Disk.



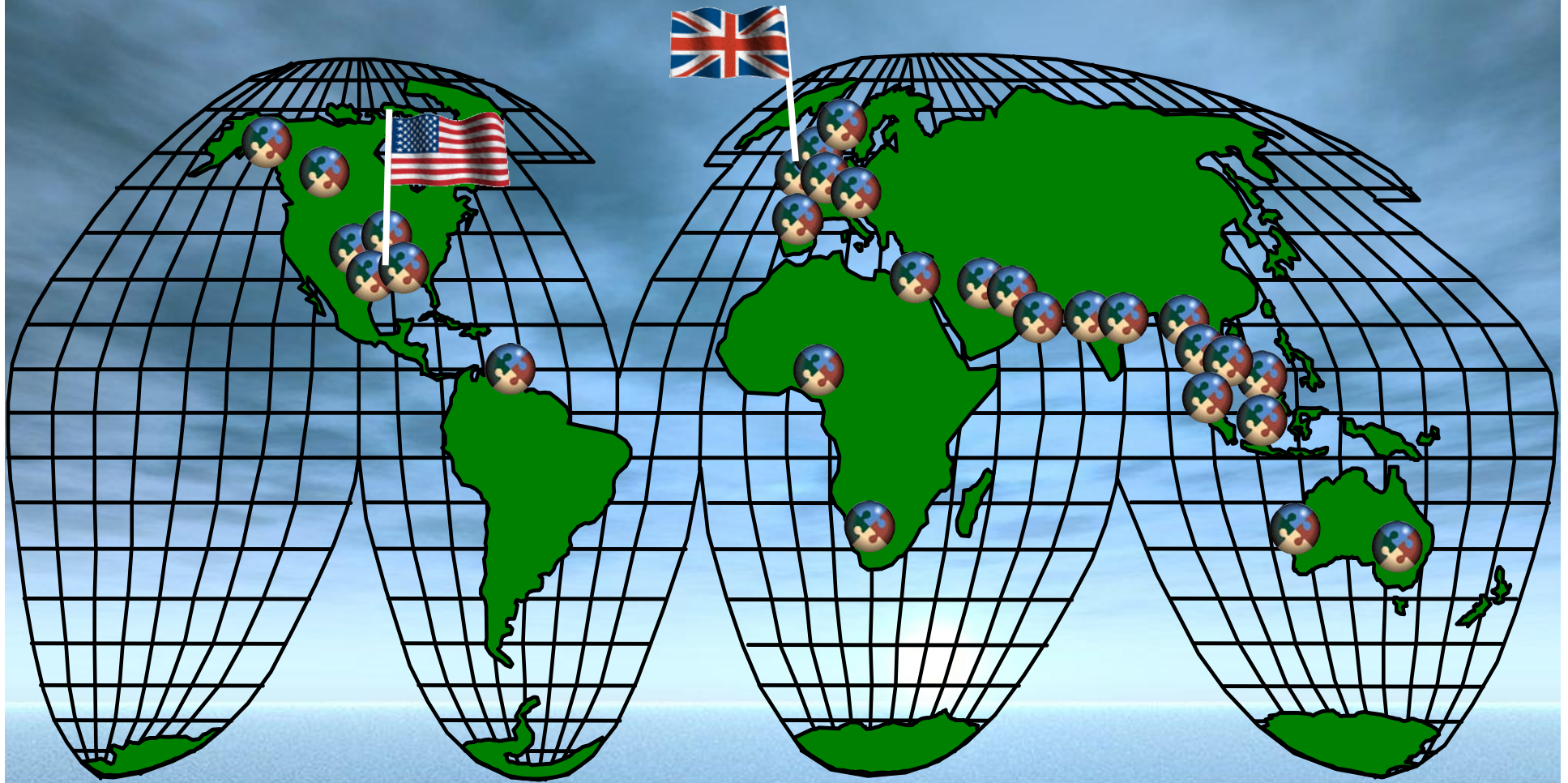
Cross Section of Customers



PIONEER NATURAL RESOURCES

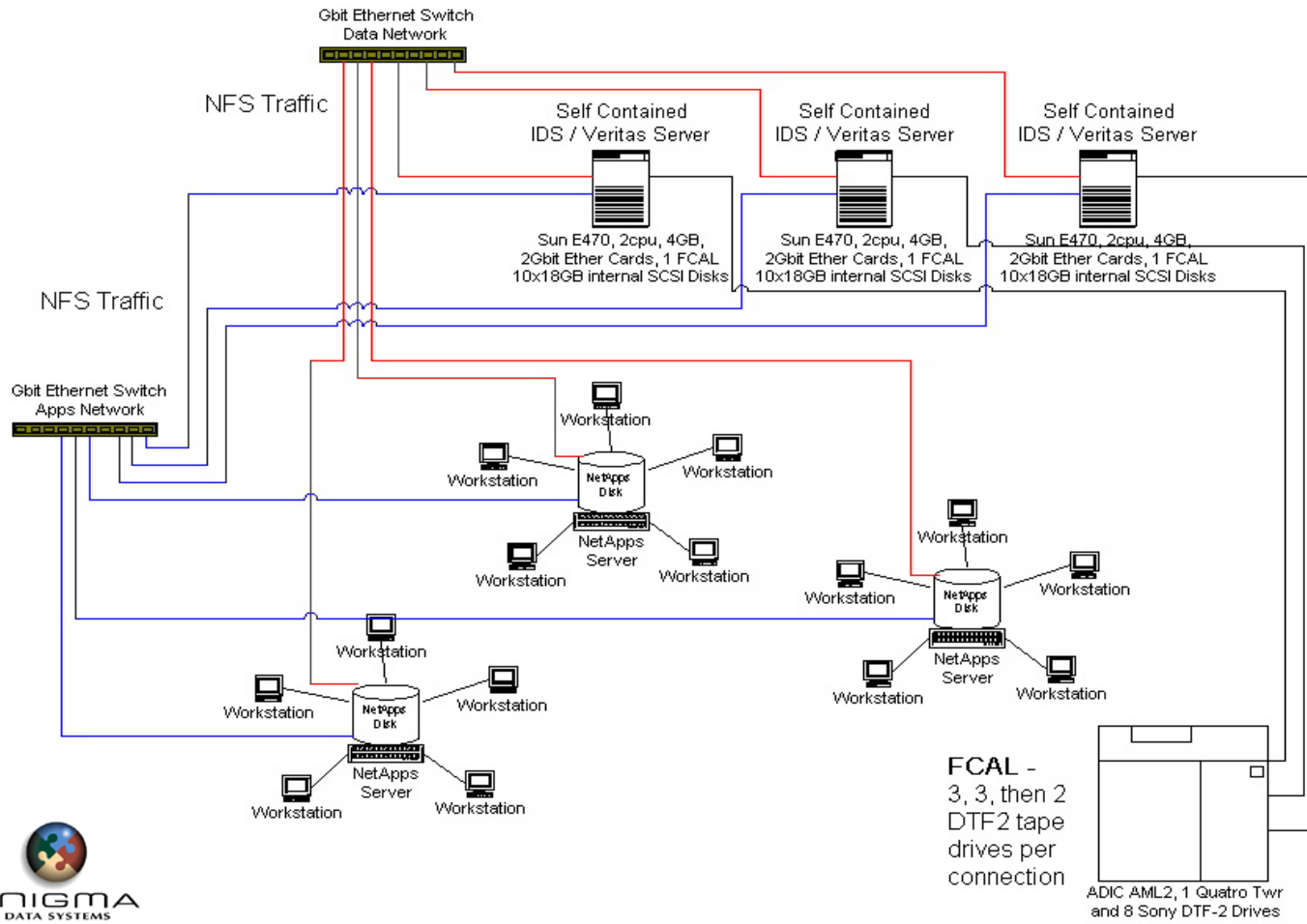


Enigma Data Systems Client Locations



Currently, Enigma has 50+ worldwide installations, with both major and independent oil companies, and geophysical service companies. Recent agreements have also allowed Enigma to begin providing near line storage solutions to companies in various other industries.

System Design / Project Management



Through reseller agreements with various hardware suppliers, Enigma can offer a complete near line solution, but is flexible enough to adapt to existing software and hardware environments providing functional alternatives.

Product Overview

- **Intelligent Data Store (IDS)**
 - **PARS Archiver**
 - **PARS Migrator**
 - **Linear Disk**



ENIGMA
DATA SYSTEMS

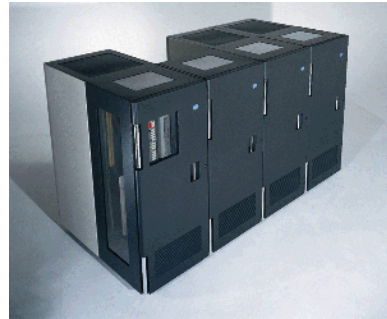
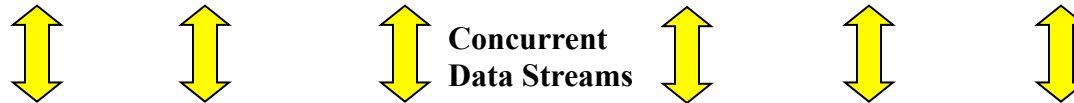
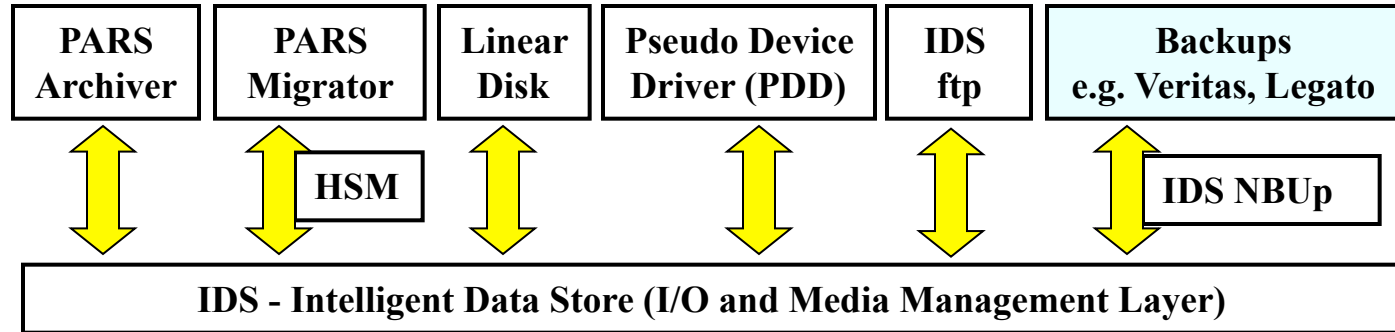
Technology Framework

Enigma Server



SUN, SGI

Data from Client Systems: Applications, Servers and Disks via SAN or LAN



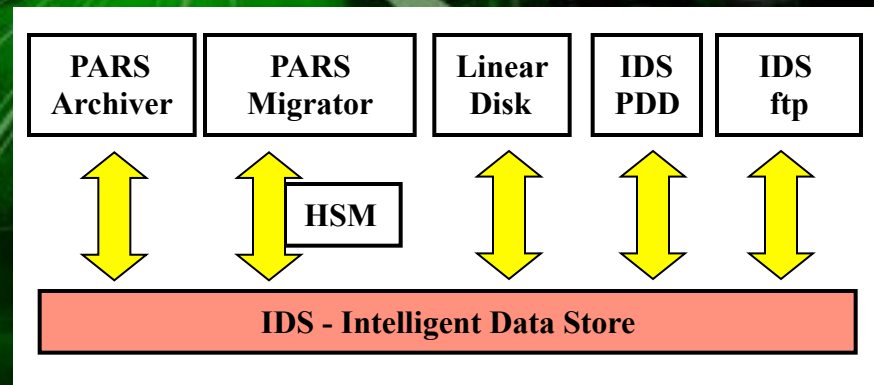
Multiple data streams to same tape library and/or control of other tape devices

Intelligent Data Store (IDS)

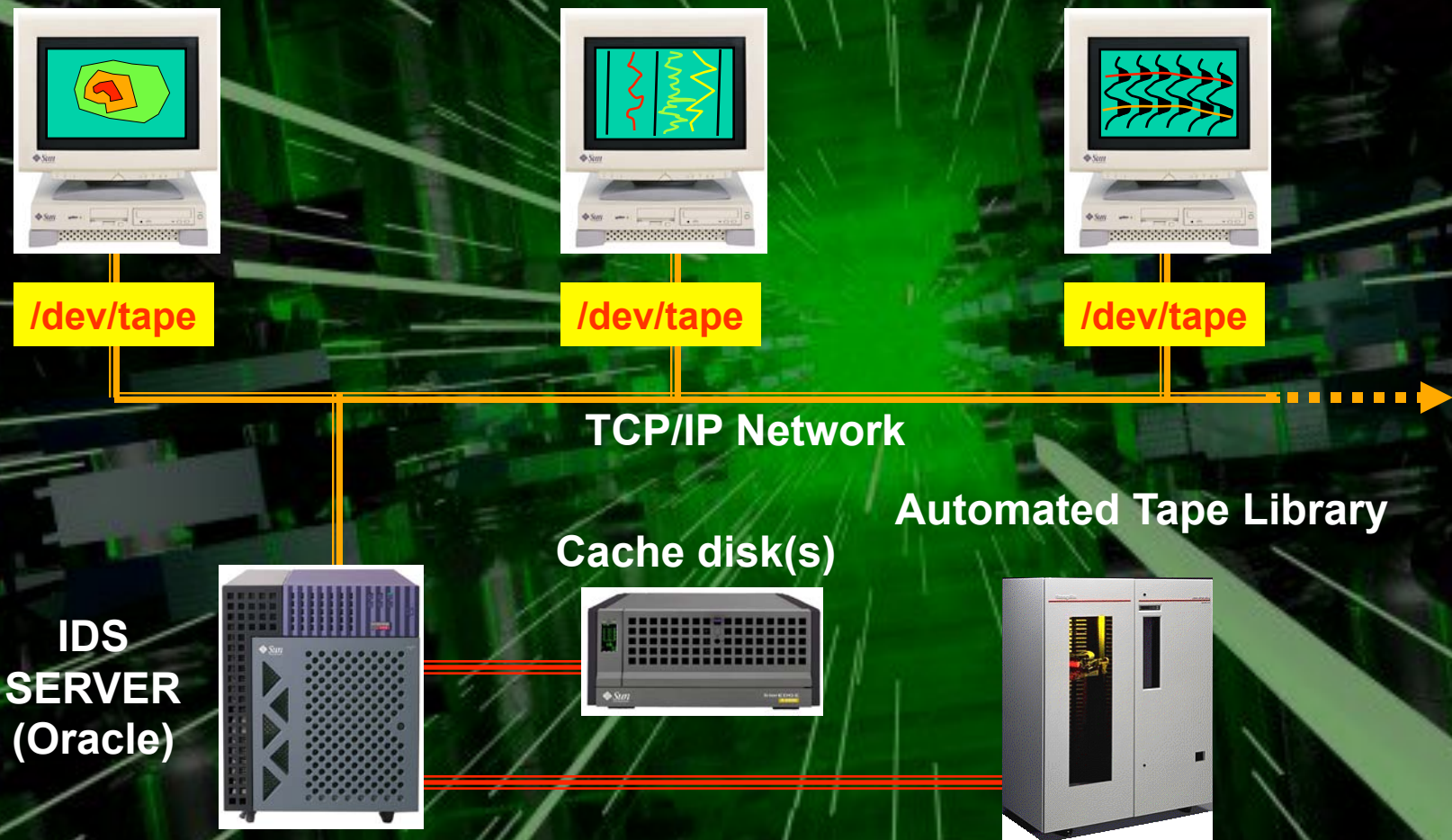
IDS mediates between client systems – ranging from workstations to large servers – and one or more high capacity tape storage units. By caching data on multiple disks, IDS gives users (i.e., processes) concurrent access. This avoids all the traditional issues related to device locking, conflicting access requests by different applications, and under usage of tape drives due to e.g. network bottlenecks.

IDS Functionality

- General purpose I/O layer for near-line storage
- Manages huge volumes of data
- Manages tapes outside the library
- Users or processes can share near-line devices
- High speed (fast access increases user productivity)
- Reduces network backup time
- Hardware specific error reporting
- Automatic read retry / write retry
- Scalable / Configurable (grows with your company)



Network Attached Tape (PDD)



Many applications expect to interact directly with a local tape drive. Enigma Pseudo Device Driver software simulates a local drive while, behind the scenes, it routes data transactions to a high-speed tape library through IDS. PDD makes Enigma solutions universal - able to interoperate with all Landmark applications regardless of application requirements. Examples are ProMax (tape to tape processing), and data loading routines from Landmark.

Near-Line in E&P Environment

Application Layer

Landmark,
GeoQuest,
(PARS Clients)

Processing
Packages
(IDSPDD)

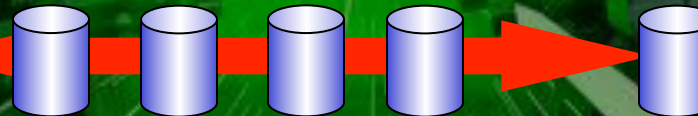
Data
Loaders
(IDSPDD)

Other Third Party Applications
or remote machines (IDSPDD, IDSFTP)

Network Layer



IDS:
Tracking &
Media
Management



Disk Cache Segments (1 to n)

Use Enigma Software and the Tape Library for:

- Archiving Interpretation Project Data
- Storing intermediate processing datasets
- Storing original SEG-Y
- Storing 32 bit versions of interpretation volumes
- Keeping all the above from taking up disk space*
- Intermediate Project Backups, Disaster recovery
- Final Archives
- Make the tape library available to a number of users
- Running Multiple Concurrent Processes to/from tape library
- Tape to Tape Seismic Processing

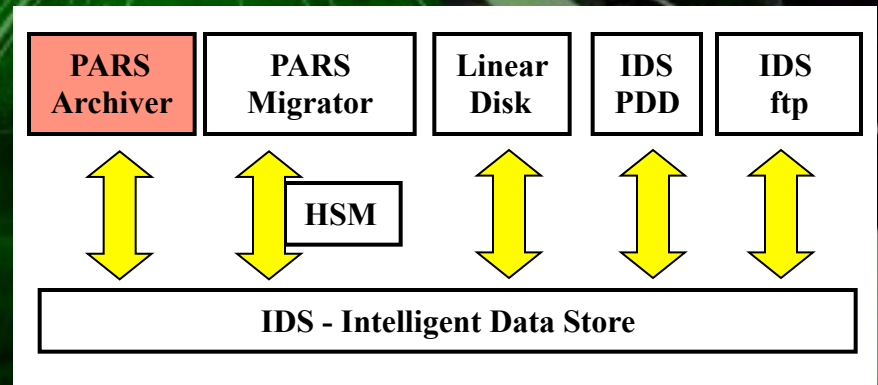


Near-Line Data Repository
Number of terabytes of storage
required depends on usage
and projected growth.

Project Archiver (PARS)

- *Project* oriented archival and retrieval package designed to query Landmark and GeoQuest file lists and database pointers - also archive global (shared) data.
- PARS gives users the flexibility to bundle and manage project specific data spread over several file systems on multiple servers. Users can define exactly which types of data comprise a given project, and archive those all at the same time, regardless of file type or format or the application they came from (i.e., cgm files, montages, reports, image files, raw SEG-Y, files from specialized applications outside of e.g. the Landmark environment).
- As archives are often produced at milestones within a project, and not just at project completion, projects archived with PARS remain on disk, and then are manually removed, if the objective is to save disk space.
- Once removed from disk, project files can later be easily restored into the Landmark environment, as application specific metadata is captured during archival stage.

- True Project Oriented Archive
- Web browser based
- Requirements distinct/different to normal backup/data management operations (normally user initiated)
- Automatic capture of application specific metadata
- Handles complex file and database associations
- Verification (via IDS)



PARS - Main Menu

| <input type="checkbox"/> | Project Name | Project Description | Project Staff | Affiliate Name | Project Area | Project Reg |
|--------------------------|--------------|---------------------|---------------|----------------|--|-------------|
| <input type="checkbox"/> | Daves Stuff | Good things.. | dharbour | PECC | PO VALLE | COUNTRY-WI |
| <input type="checkbox"/> | SeisWorks | SeisWorks Testing | dharbour | PECC | N/ | N/ |
| <input type="checkbox"/> | gui_test | testing the gui | ENIGMA | MEPUS-Houston | CASMA/SOLEDA | COUNTRY-WI |
| <input type="checkbox"/> | dave123 | dave123 | dharbour | MEPTEC-Dallas | BENI, CORIOLE, DALMATIAN B, DURRIES, EMERALDOL | BOL MADRED |
| <input type="checkbox"/> | rest_delete | testing | enigma | MEPA | CGRAB VH | CHANNEL |

File Type Filters:

- Audio
- Image
- Video
- CGM
- Text
- Tar
- Design
- Postscript

Application Type Filter /Backup:

- General
- ProMAX
- GeoQuest
- SeisWorks
- Charisma
- PDD
- OpenWorks
- GeoFrame

Job Control

On-Line Help

Action Types

Project (Asset) Name

Freeform Project Descriptions
(can be pick-listed)

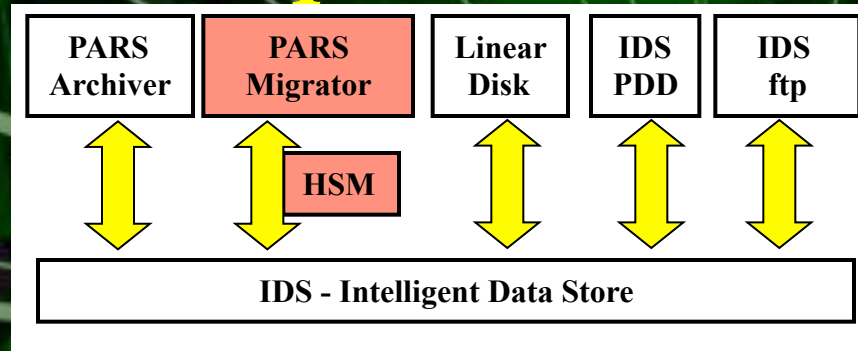
Filter
for Queries

File types that can be archived
(configurable)

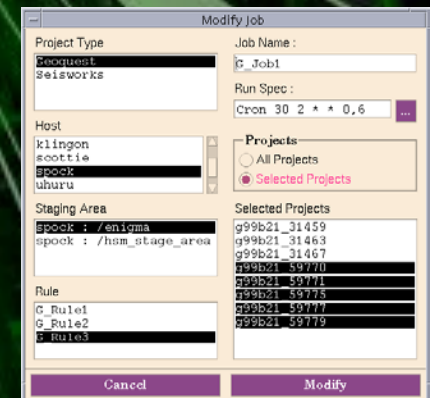
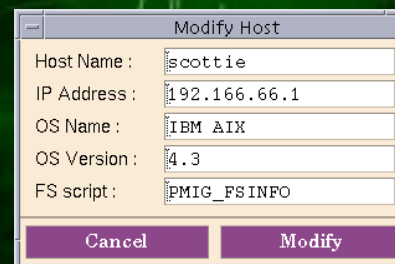
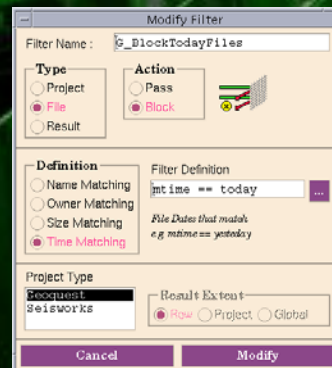
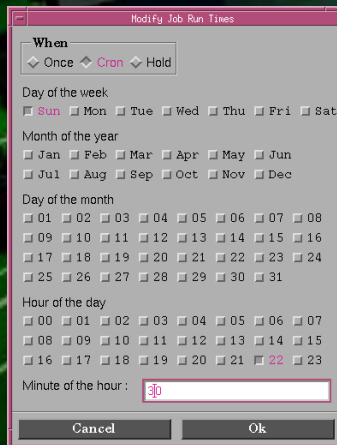
Application types that can be archived
(configurable)



The Next Step - PARS Migrator



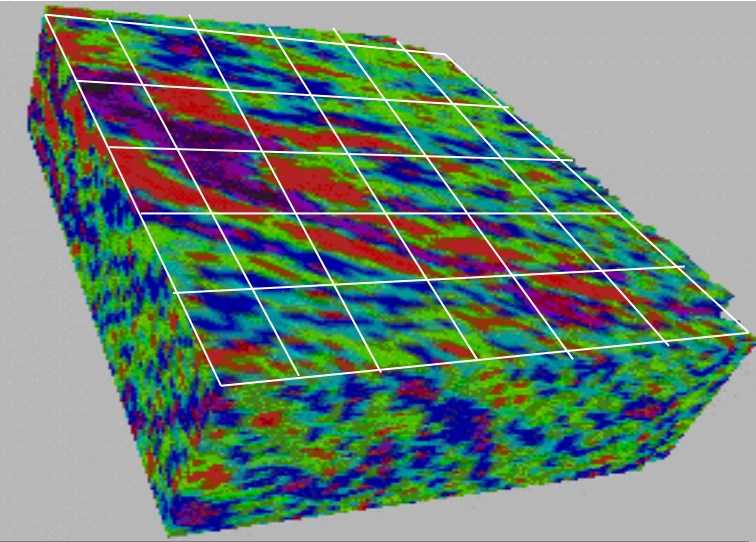
- As data is generated, and added to disk, *PARS Migrator* continues cycling older, less-used data off disk to rapid near line storage.
- PARS Migrator* automatically migrates data to near line tape according to rules specified by the user, and moves these files to a HSM disk creating a link on the original disk. Migrator then forces the HSM to copy the files to tape using IDS and removes these files from disk.



- Scheduled Migration
- Avoid data read/write at the same time
- Avoid overfilling HSM partition

•Rules Base - Provides “Configurable HSM”

Managing 3D Volumes with PARS Migrator



30 Offshore blocks of GOM Deepwater final migrated data ~ **45GB** (1.5 GB/Block) at 32 bit.

Add 32 different attribute volumes @ 16 bit ~ **765GB** total disk space taken by .3dv files for this project.

With only 10 projects of this size, total disk space in use is **7.65 TB**

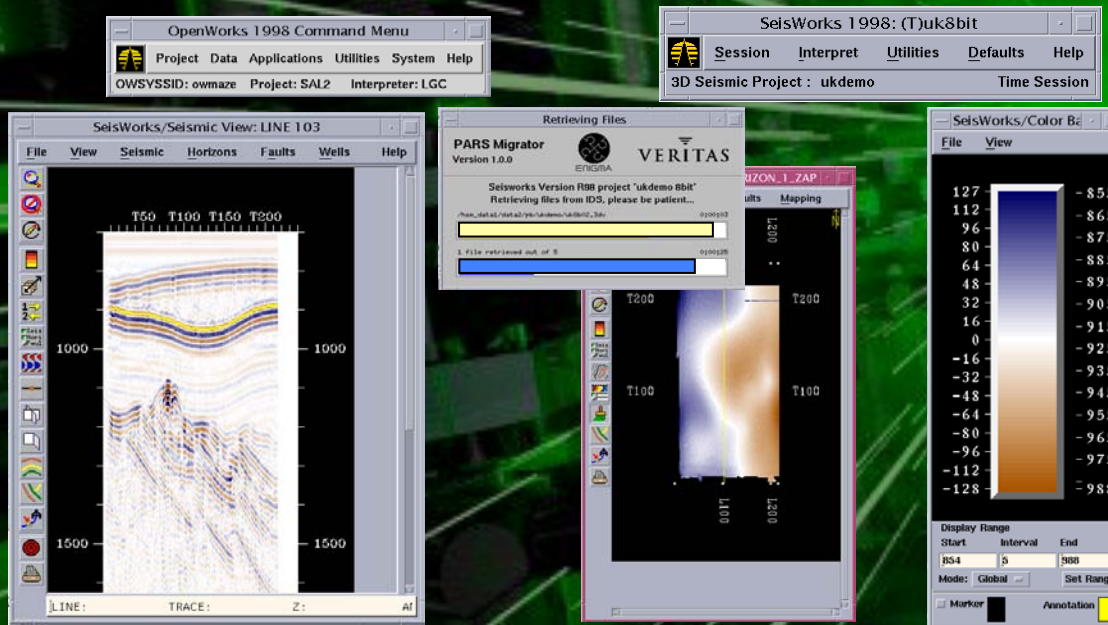
Are there any .3dv files no longer being used for interpretation either due to newer reprocessed versions in use or final interpretation being done on another attribute volume?*

| 3D Seismic Blocks | Intervals |
|--|--|
| <input checked="" type="checkbox"/> FACIES_ChannelTop0to100 | AMP_JH_16_66 |
| <input checked="" type="checkbox"/> FACIES_raw-30+30-amp-qfa | <input checked="" type="checkbox"/> Texas_AMP_JH |
| <input checked="" type="checkbox"/> PCA_ChannelTop16to66 | <input checked="" type="checkbox"/> Interval geometry |
| <input checked="" type="checkbox"/> PCA_ChannelTop0to100 | <input type="checkbox"/> Upper boundary |
| <input checked="" type="checkbox"/> Texas | <input type="checkbox"/> Lower boundary |
| <input type="checkbox"/> acceleration_of_phase | <input type="checkbox"/> Isopach |
| <input type="checkbox"/> acoustic_impedance | <input checked="" type="checkbox"/> Sample amplitudes |
| <input type="checkbox"/> amplitude | <input type="checkbox"/> Average |
| <input type="checkbox"/> band_width | <input type="checkbox"/> Standard deviation |
| <input type="checkbox"/> chaotic_reflection | <input type="checkbox"/> Third derivative |
| <input type="checkbox"/> dip | <input type="checkbox"/> Fourth derivative |
| <input type="checkbox"/> dip_azimuth | <input checked="" type="checkbox"/> Peak/trough statistics |
| <input type="checkbox"/> dip_max_coherency | <input checked="" type="checkbox"/> Amplitudes |
| <input type="checkbox"/> dip_variance | <input type="checkbox"/> Average |
| <input type="checkbox"/> dominant_frequency | <input type="checkbox"/> Peaks |
| <input type="checkbox"/> envelope_modulated_phase | <input type="checkbox"/> Troughs |
| <input type="checkbox"/> envelope_weighted_frequency | <input type="checkbox"/> Ratio peak-trough |
| <input type="checkbox"/> envelopes | <input checked="" type="checkbox"/> Frequency |
| <input type="checkbox"/> event_continuity | <input type="checkbox"/> Peaks |
| <input type="checkbox"/> frequency | <input type="checkbox"/> Troughs |
| <input type="checkbox"/> frequency_normalized | <input checked="" type="checkbox"/> Strongest events |
| <input type="checkbox"/> imaginary_complex_traces | <input checked="" type="checkbox"/> Negative polarity |
| <input type="checkbox"/> lateral_continuity | <input type="checkbox"/> Isochron map |
| <input type="checkbox"/> normalized_amplitude | <input type="checkbox"/> Amplitude map |
| <input type="checkbox"/> para_bedding_indicator | <input checked="" type="checkbox"/> Positive polarity |
| <input type="checkbox"/> phase | <input type="checkbox"/> Isochron map |
| <input type="checkbox"/> q_factor | <input type="checkbox"/> Amplitude map |
| <input type="checkbox"/> real_complex_trace | <input checked="" type="checkbox"/> Cumulated amplitudes |
| <input type="checkbox"/> second_derivative_envelope | <input type="checkbox"/> TraceMedian |
| <input type="checkbox"/> semblance | ChannelTop_0+100 |
| <input type="checkbox"/> semblance_variance | ChannelTop_16to66 |
| <input type="checkbox"/> shale_indicator | raw-30+30 |
| <input type="checkbox"/> smoothed_dip_max_coherency | |
| <input type="checkbox"/> smoothed_semblance | |
| <input type="checkbox"/> thin_bed_indicator | |
| <input type="checkbox"/> time_deriv_envelope | |
| <input type="checkbox"/> trace_envelope | |
| <input type="checkbox"/> zone_unconf | |
| <input checked="" type="checkbox"/> Texas_AMP_JH | |

* The Rules Base in PARS Migrator can help identify which attribute volumes are no longer in use, and migrate these to tape, freeing up disk space. Volumes can be retrieved if they are needed back.

Disk Management - PARS Migrator

- Since file stubs and pointers remain on disk, data can be quickly retrieved and restored. Because there will be a time delay to retrieve data, the user receives a pop-up window (progress marked by bar graph) informing the user that the data is being retrieved and the estimated seconds it will take.

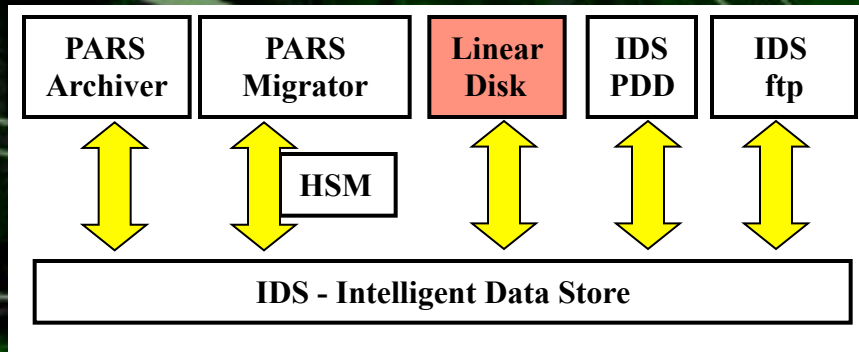


Practical Example:

- Look at all GOM projects
- Find all .3dv files
- Find .3dv files over ?? GB
- Check access date is >1month
- Migrate to tape

- Purchasing additional disks in response to data growth is never a long-term solution; new disks fill up within weeks, and more need to be purchased, on a cyclical basis. Data growth can be managed through use of a high speed near line tape library, with the economics and flexibility of modern tape systems.
- A neutral arbitrator of the fight for disk space, Migrator can instantly recoup up to 25% of disk space and free up system administrator's time for more important tasks. Migrator ensures a long-term solution to data growth headaches.

Linear Disk



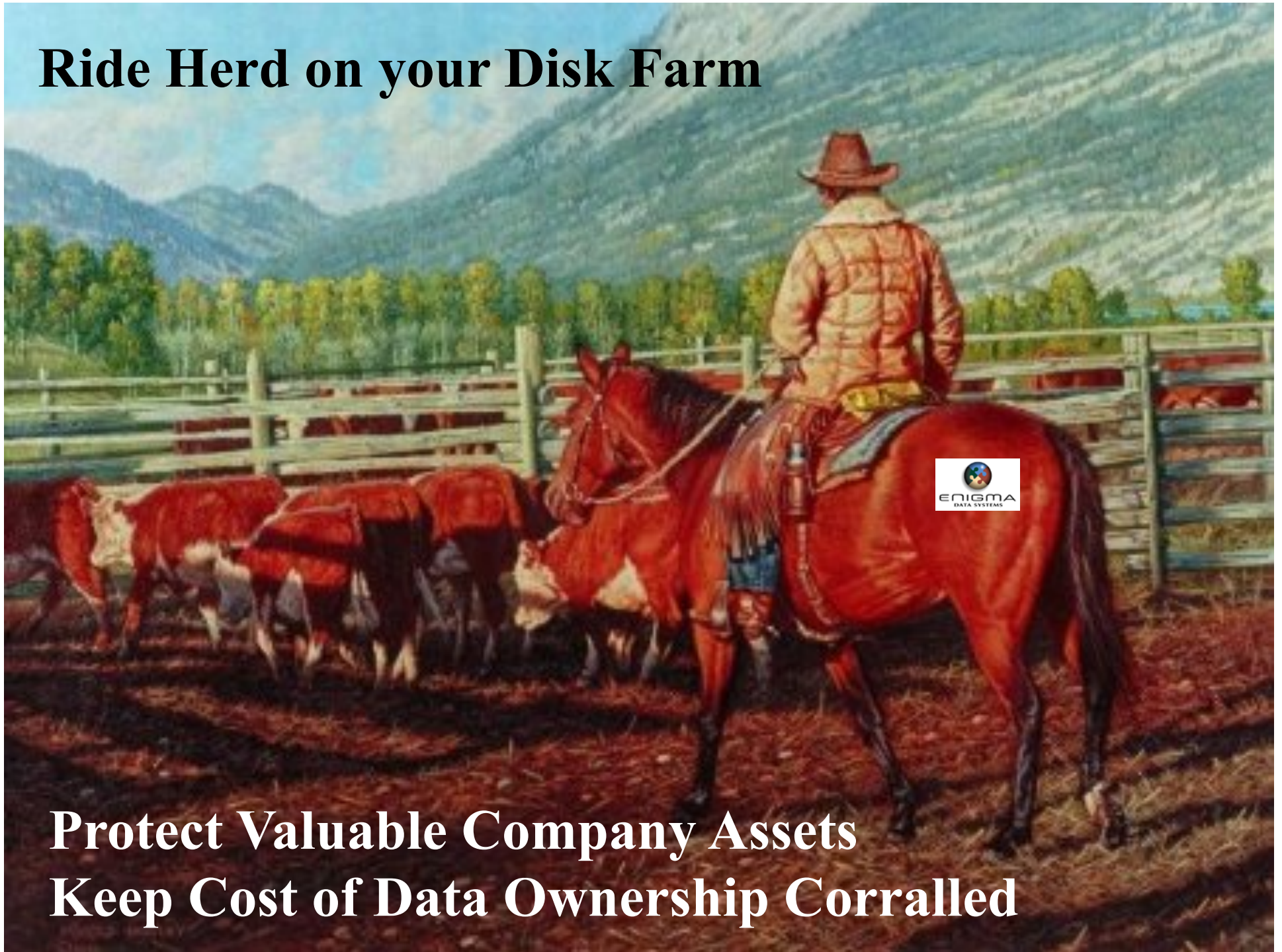
- Disk emulation interface to IDS (PHD)
- Complete 100% emulation of a filesystem on a tape/tape library
- Totally transparent Unix or NFS access
- Targeted at large sequential access requirements

Linear Disk allows data to pass straight from tape, to an application without ever actually residing on or taking up space on disk.

Linear Disk would be ideal for datasets that are to be read into an application only once, seldom, or multiple times for repetitive processing runs, where normally, these data would take up enormous amounts of space on disk.



Ride Herd on your Disk Farm



**Protect Valuable Company Assets
Keep Cost of Data Ownership Corralled**

THANK YOU !!!

