

GDL – GNU Data Language

presented by Alain Coulais & Sylwester Arabas

alain.coulais@obspm.fr / sarabas@igf.fuw.edu.pl

The GDL team:

Marc Schellens, Alain Coulais, Joel Gales, Sylwester Arabas,
and many, many more volunteers around the world!

(Marc is the primary author and the maintainer of GDL)



GNU Hackers Meeting
Paris, August 27th 2011

Plan of the talk

- What's GDL? (Sylwester)
- Who uses it and why? (Alain)
- Why/how/when could GDL become a GNU package? (You)

What's GDL (and IDL/PV-WAVE)

<http://www.ittvis.com/>

The screenshot shows the ITT Visual Information Solutions website. The header includes the ITT logo and the text "Visual Information Solutions". Below the header is a navigation menu with links for "Company", "Products & Services", "Academic", "Events & Training", "Downloads", "User Community", and "Support". A search bar is located on the right side of the header. The main content area is titled "The IDL Programming Language" and contains the following text: "When you need to transform complex scientific data from numbers into visualizations to convey meaningful information -- such as 2 and 3-dimensional lines, surface and contour plots, or high-quality images -- you need a programming language that is intuitive and powerful at the same time, and one that doesn't require excessive time and effort to produce expert-level results. IDL is the programming language choice of scientists and engineers because it's easy to learn, easy to use, and requires fewer lines of code than other programming languages, so getting from data to discovery is easier and faster." Below this text is a 3D visualization titled "Coastline Topography" showing a map of a coastline with a color-coded topography overlay. To the right of the visualization is a code snippet showing IDL code used to create the plot. Below the code snippet is the text: "The IDL programming language requires fewer lines of code than many other languages (bottom). Five lines of IDL code were used to create a contour plot of coastline topography (top)." A "[back]" link is located below the text. The right sidebar contains a "Stay Connected" section with links to Facebook, Twitter, YouTube, and ShareThis, and a "Quick Links" section with links to "Login to ItVis.com", "Contact a Representative", "Contact Technical Support", "Request Literature", and "Subscribe". Below this is a "Resources IDL" section with links to "IDL Home", "Recent Releases", "Advanced Math & Stats Module Overview", "Information Packet", and "Watch an IDL Demo". The footer contains the navigation menu and the text "Permissions/Legal © 2010 ITT Visual Information Solutions".

- GDL^a is developed with the aim of providing a free/libre/open-source drop-in replacement for IDL[®]

- IDL (ITT VIS Interactive Data Language):

- is a tool for data analysis and visualisation

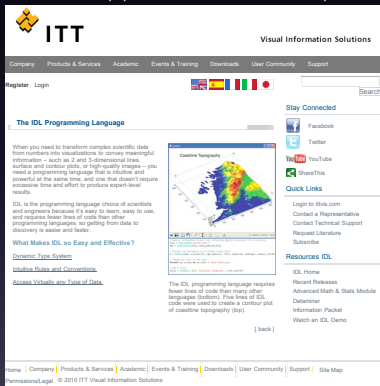
- is a popular software package in astrophysics, atmospheric physics, hyperspectral and medical imaging (in some cases a de facto standard)

- is proprietary and expensive
- is related with GDL as Matlab with Octave/Scilab, etc.

^a despite its name, GDL is not an official GNU package yet

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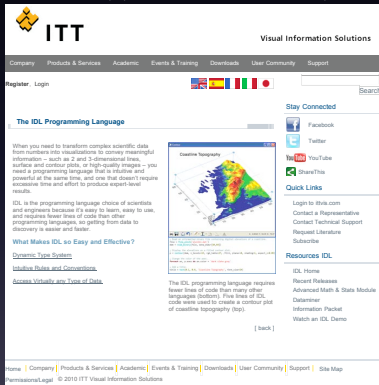
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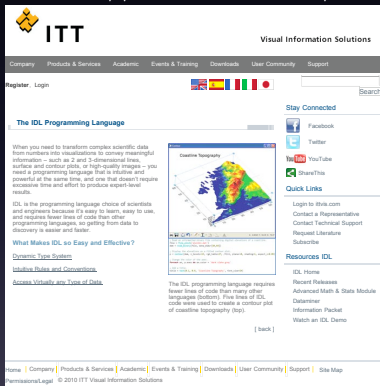
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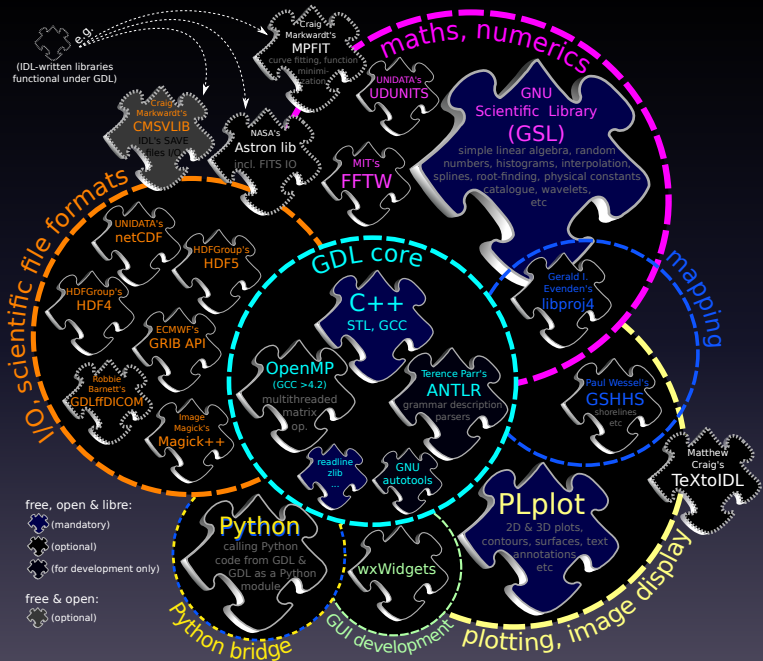
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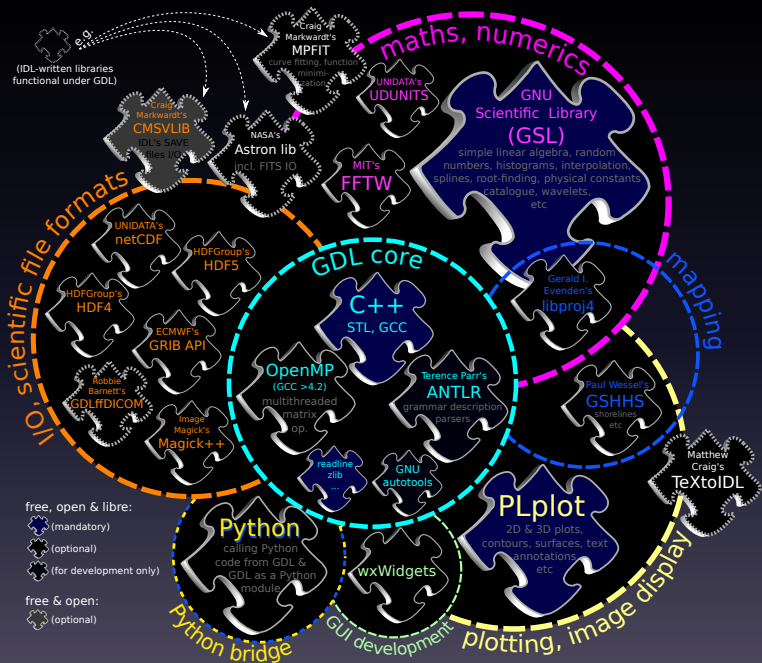
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Demo (typical usage: load, analyse and plot data)

```
a = make_array(1024, /float)
a[9] = 1
save, a, file='demo.sav'
```

```
restore, 'demo.sav'
help
print, min(a)
print, max(a)
print, sqrt(mean(a^2) - mean(a)^2)
f = fft(a)
help, f
p = abs(f)^2
print, sqrt(total(p[1:-1]))
print, python('numpy', 'std', a)
plot, wtn(a, 4, /inverse)

; <- here we use CMSVLIB
;   for reading IDL's obscure file format
; \
; | ----- with a bigger array, OpenMP
; |         would be used for parallelisation
; /
; <- FFTW
; \
; | _____ /
; /
; <- here Python/numpy is called
; <- here we use Plplot for plotting
;   and GSL for wavelet transform
```

```

Plik Edycja Widok Terminal Karty Pomoc
File Edit Options Buffers Tools Debug IDLWAVE Help
ncdf_varget, nc, 'range', r
ncdf_varget, nc, 'average_time', avt
ncdf_varget, nc, 'beta_raw', snl
ncdf_varget, nc, 'temp_int', temp_int
ncdf_varget, nc, 'temp_ext', temp_ext
ncdf_varget, nc, 'temp_det', temp_det
ncdf_varget, nc2, 'time', t2
ncdf_varget, nc2, 'range', r2
ncdf_varget, nc2, 'average_time', avt2
ncdf_varget, nc2, 'beta_raw', snl2
ncdf_varget, nc2, 'temp_int', temp_int2
ncdf_varget, nc2, 'temp_ext', temp_ext2
ncdf_varget, nc2, 'temp_det', temp_det2

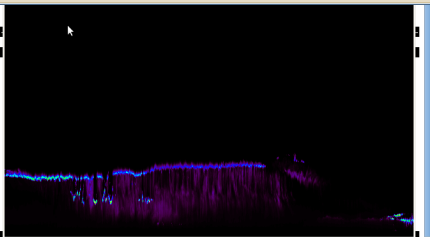
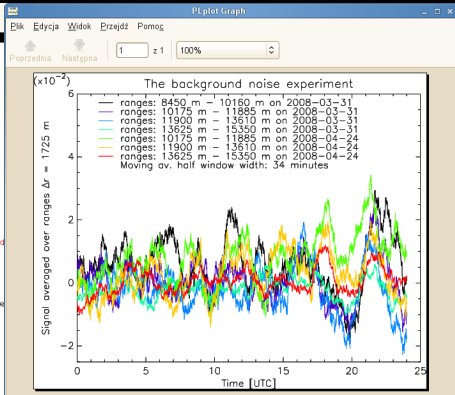
; Przygotowanie danych
; lacze dane z dwoch sasiednich
; plikow zadajac warunek, zeby
; pierwszy bin byl o godzin 00 UTC a
; ostatni 00 UTC 24 godziny pozniej)
t_0 = day1904(mm, dd, yyyy, 0, 0, 0) ; godzina zapisana w formacie sekund
t_1 = day1904(mm2, dd2, yyyy2, 0, 0, 0)
indx_t_0 = where(t gt t_0 and t lt t_0+20)
indx_t_1 = where(t2 lt t_1 and t2 gt t_1-20)
print, indx_t_0, indx_t_1
; help, snl, t, temp_int, snl2, t2, temp_int2
snl = [[snl(*, indx_t_0):n_elements(t)-1], [snl2(*, 0:indx_t_1(n_eleme

; Tworze tablice odpowiadajace regionowi powyzej wyznaczonej granicy
r_brdr = 5000
snl_up = snl(r_brdr/15:n_elements(r)-1,*)
r_up = r(r_brdr/15:n_elements(r)-1)

; snl(*, 0:500) = 1000
for i=8, n_elements(r_up)-1 do begin
    snl(i,*) = (15*i)^2*snl(i,*)
end

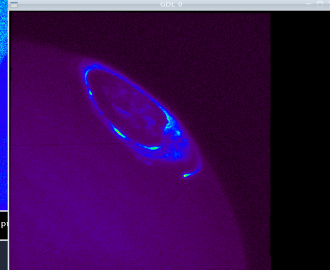
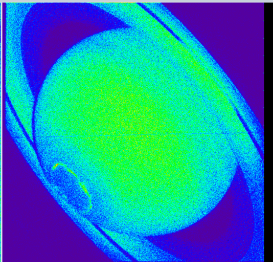
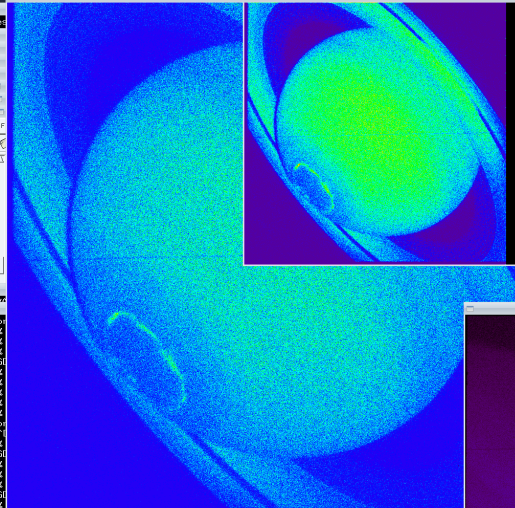
--2-1---F1 normalis.pro (IDLWAVE Abbrev F111)--L137--C0--31%-----
@ bash
% Compiled module: CMSV_WREC.
% Compiled module: CMSV_WREC.
% Compiled module: CMSV_WRAW.
% Compiled module: CMSV_WTYPE.
% Compiled module: CMSV_WDATA.
SNL FLOAT = Array[1024, 8520]
GDL> normalis, 20000424
153.313
% LOADCT: Loading table Rainbow + white
1.57355e-06
SNL FLOAT = Array[1024, 8516]
GDL> normalis, 20100304
25278.4
% LOADCT: Loading table Rainbow + white
5.29369e-06
SNL FLOAT = Array[1024, 2871]
GDL> normalis, 20000424
2 bash
Komputer sirocco GDL 13 GDL 2 PLplot Graph czw 15 kwi, 15:23

```



Applications Raccourcis Système 4 févr. 12:38

GDAL



```
File Edit Options Buffers Tools Debug GDWAVE Help
AC Mars 2006
reading FITS files and displaying pretty images
pro demoHST, test-test
LOADCT, 30
begin
while (id.window NE 0) do WHEELX
image=READFITS('obs03000_fit.fits', h, ext=1)
WINDOW, 0
TVSCL, REBIN(image, 512, 512)
image=READFITS('obs03010_fit.fits', h, ext=1)
WINDOW, 1, noise=1000, ysize=1000
TVSCL, image
ia2=REBIN(image, 512, 512)
WINDOW, 2
TVSCL, ia2
stop
read, 'press enter to continue ', mess
histo, ia2
read, 'press enter to continue ', mess
twc1, ia2 %2 <10
read, 'press enter to continue ', mess
if KEYWORD_SET(test) then stop
end
demoHST.pro (IDLWAVE Abbeq Filly--L04--All
Wrote /obs/coulais/demoIDL/demoHST.pro
```

```
gdal>
# READFITS: Now reading FITS extension of type IMAGE
# READFITS: Now reading 1024 by 1024 array
# READFITS: Reading FITS extension of type IMAGE
# READFITS: Now reading 1024 by 1024 array
# Stop encountered: DEMOHST 24 demoHST.pro
gdal>
```

readfits.p

People do acknowledge the use of GDL in refereed papers:

- Roukema et al. 2010: On the suspected timing error in WMAP map-making (A&A; arXiv:1004.4506v3)
„Calculations on 4-core, 2.4 GHz, 64-bit processors with 4 Gib RAM, using GDL-0.9rc4 running under GNU/Linux, took about 3 hours per map.”
- Fathi et al. 2010: Scalelength of disc galaxies (MNRAS; arXiv:1004.1507)
„Using one single IDL session, we would need 47 days ... installing an IDL licence on each cluster node was not an option, we used the open source clone of IDL, GNU Data Language”
- Koleva et al. 2009: ULySS: A Full Spectrum Fitting Package (A&A; arxiv: 0903.2979)
„The open source GDL (Gnu Data Language) interpretor can also be used to run ULySS”
- Breitling 2007: Detection of VHE Gamma Radiation from the Pulsar Wind Nebula MSH 15-52 with H.E.S.S. (arxiv:0903.2056v2)
„The deconvolution of the count maps was done numerically with GDL, the GNU Data Language”

Packages

- Thanks to all packagers:
(incl. Juan A. Añel, Markus Dittrich, Takeshi Enomoto, Sébastien Fabbro, Orlando Garcia Feal, Gaurav Khanna, Justin Lecher, Sebastien Maret, Lea Noreikal, Orion Poplawski, Marius Schamschula, Gürkan Sengün, Thierry Thomas, ...)
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 - ArchLinux
 - Debian
 - Fedora
 - Gentoo
 - Ubuntu
 - FreeBSD
 - Fink
 - MacPorts
 - Hmug
 - ...
- - upgrades/enhancements to existing packages
 - new packages (OpenSUSE, Homebrew, Cygwin, Solaris, CentOS, Slackware ...)

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- More help and feedback needed...
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Thanks for your attention!

<http://gnudatalanguage.sf.net/> (new website!)

Topics for discussion:

- becoming a GNU package:
 - why?
 - how? (progress on GDL documentation)
 - who can help? whom to contact?
- Google SoC? (Juan's suggestion)
- Packaging issues:
 - ...