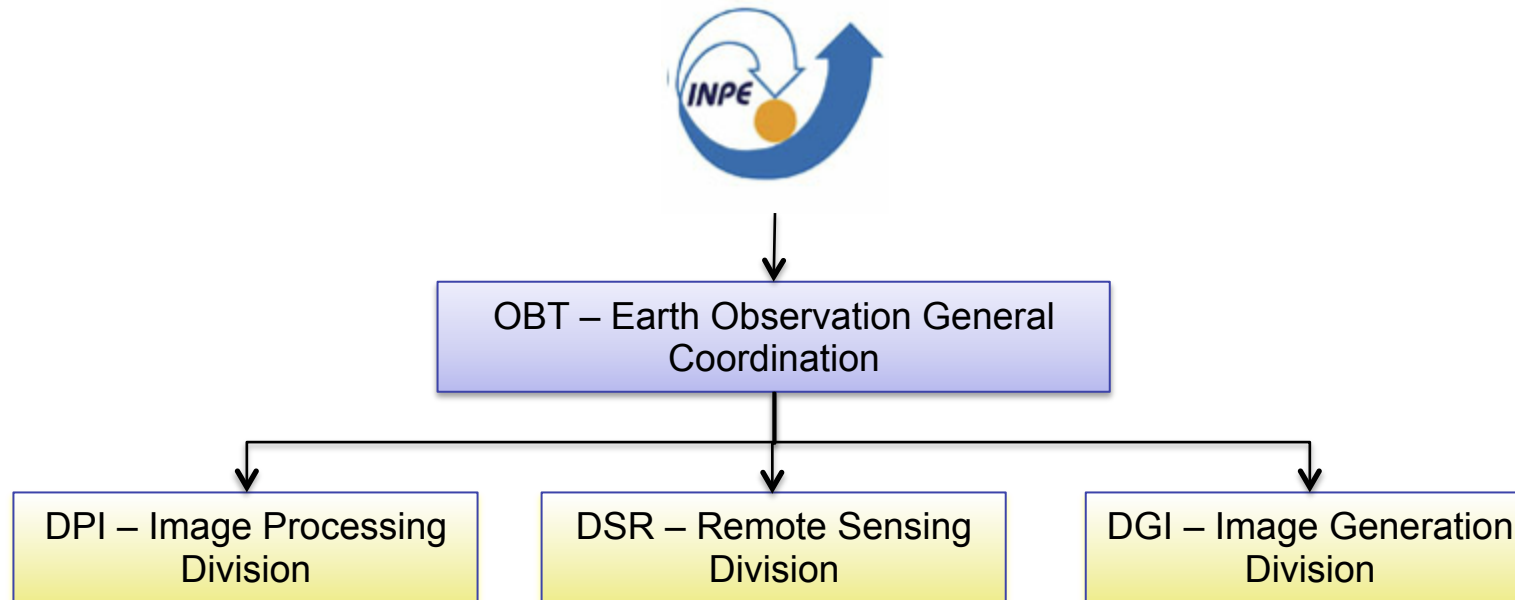




INPE's Image Processing Division: a “geo-tech” vision

Lúbia Vinhas

May 21, 2012



Created in 1984, DPI has 50 employees plus some students and contractors

DPI's mission is to conduct research and development in GIScience and Image Processing

Designing, prototyping and deployment of GIS and Image Processing systems

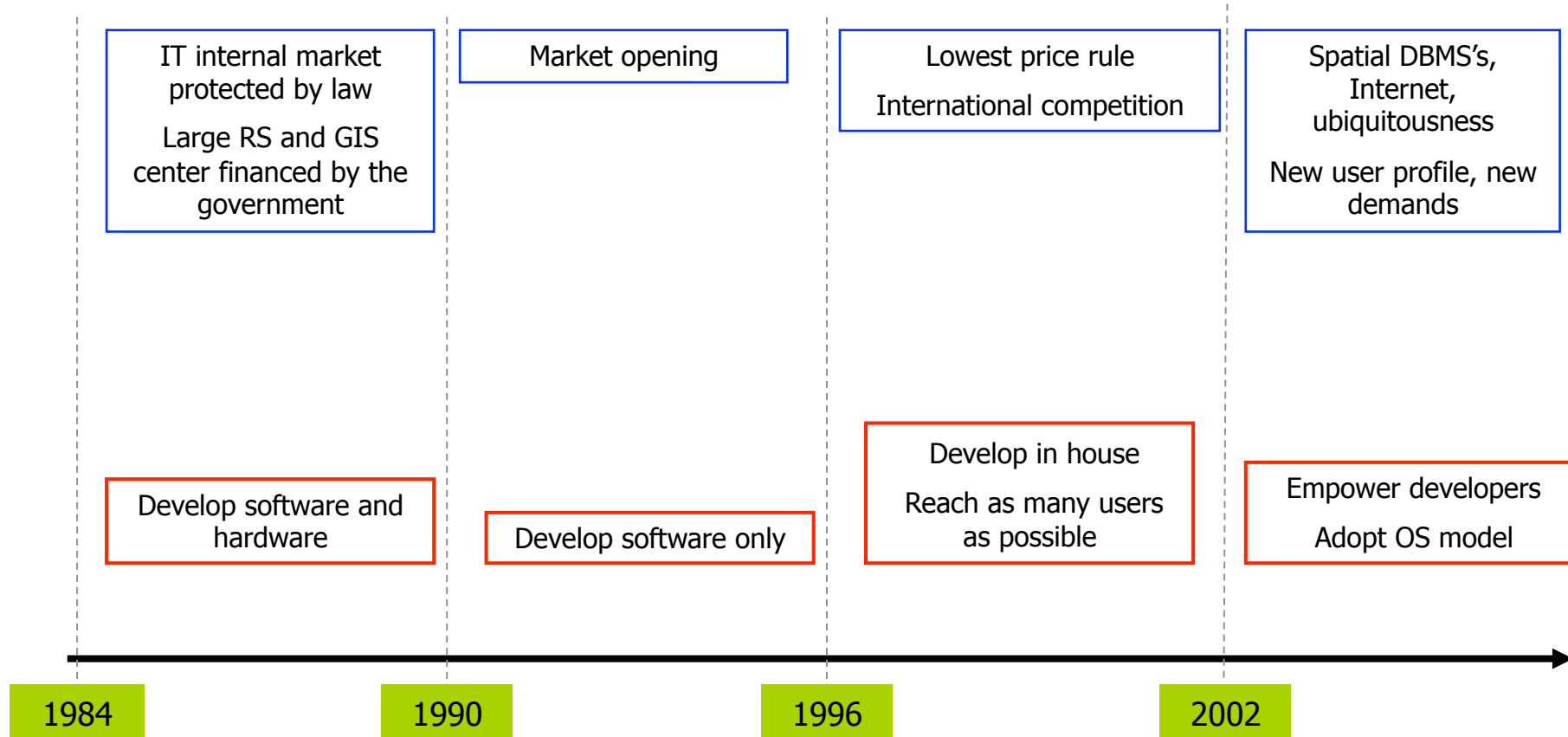
Promote capacity building in academic, government and private sectors, as well as for the general public

Participate of relevant projects of national scope



A bit of history

□ context
□ decisions



A bit of history



SITIM/SGI



SPRING for
workstations

SPRING for PC



TerraLib

TerraView

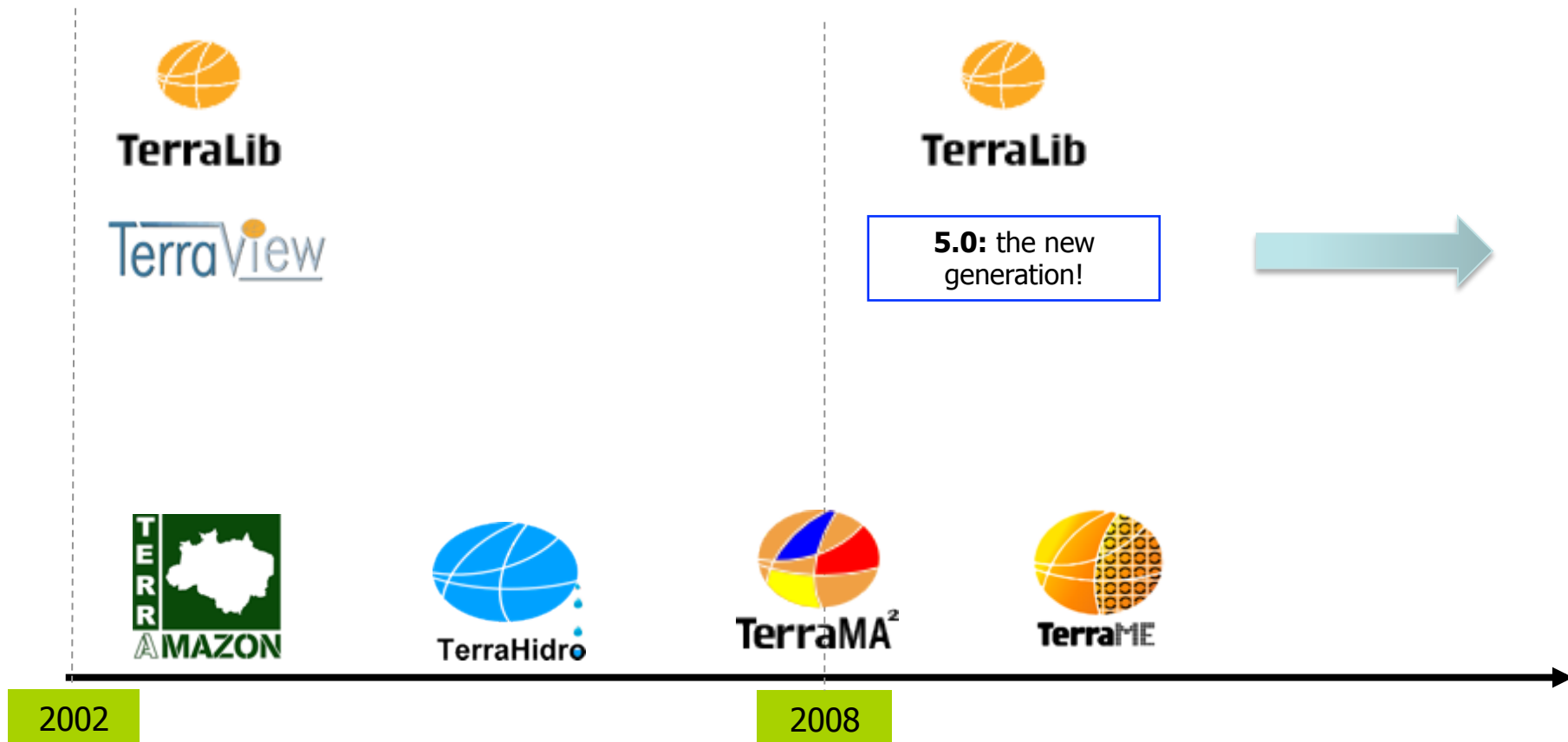
1984

1990

1996

2002

A bit of history





www.dpi.inpe.br/spring

General purpose GIS mainly suitable for a desktop single-user environment

Dual architecture.

Offers all of the “traditional” GIS functionalities such as Image Processing, DTM, Map Algebra, Geostatistics, Cadastral management, and others

Freeware since 1994 and Open Source since 2011

Does not allow customizations: all-in-one philosophy



Painel de Controle

Tela Ativa : Principal

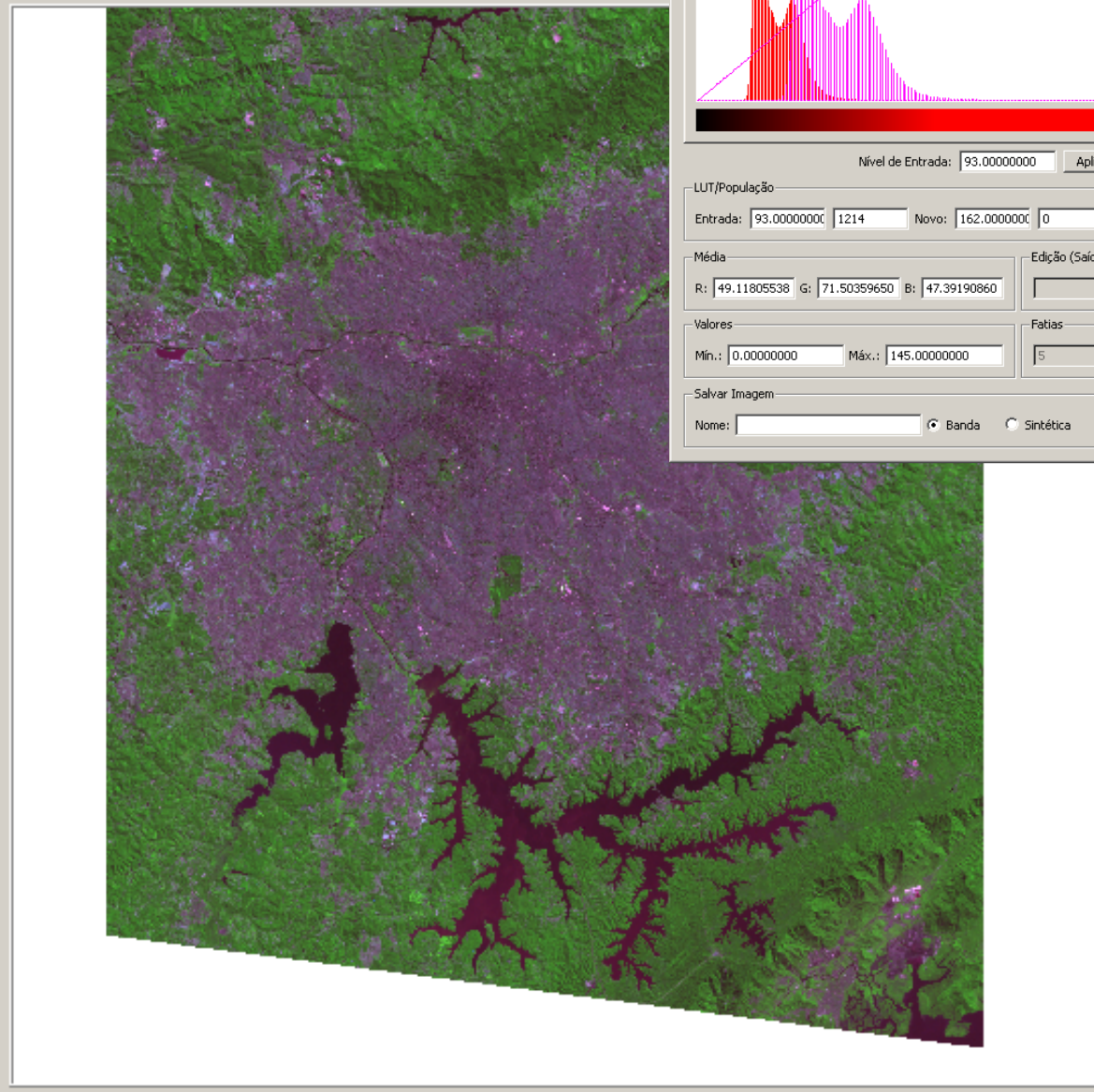
PI Disponíveis | PI Selecionados

Categoria / Plano de Informação

- T () Drenagem
- I () Imagem_CBERS
- I (v) Imagem_TM
- C () Levantamento_GPS
- T () Limite
 - () Limite_Municipal
- R () Rede_viária
 - () Mapa_vias
 - () Rede_Ferrovias
 - () Rede_Metrô
- C () Uni_Políticas
 - () Mapa_Distritos
- C () Unidades_Ambientais
- T () Uso_Terra



M Texto
 R G B



Contraste

Operação Canal Exibir Executar Ajuda

Nível de Entrada: 93.00000000 Aplicar

LUT/População

Entrada: 93.00000000 1214 Novo: 162.00000000 0

Média Edição (Saída)

R: 49.11805538 G: 71.50359650 B: 47.39190860

Valores Fatias

Min.: 0.00000000 Máx.: 145.00000000 5

Salvar Imagem

Nome: Banda Sintética

SPRING

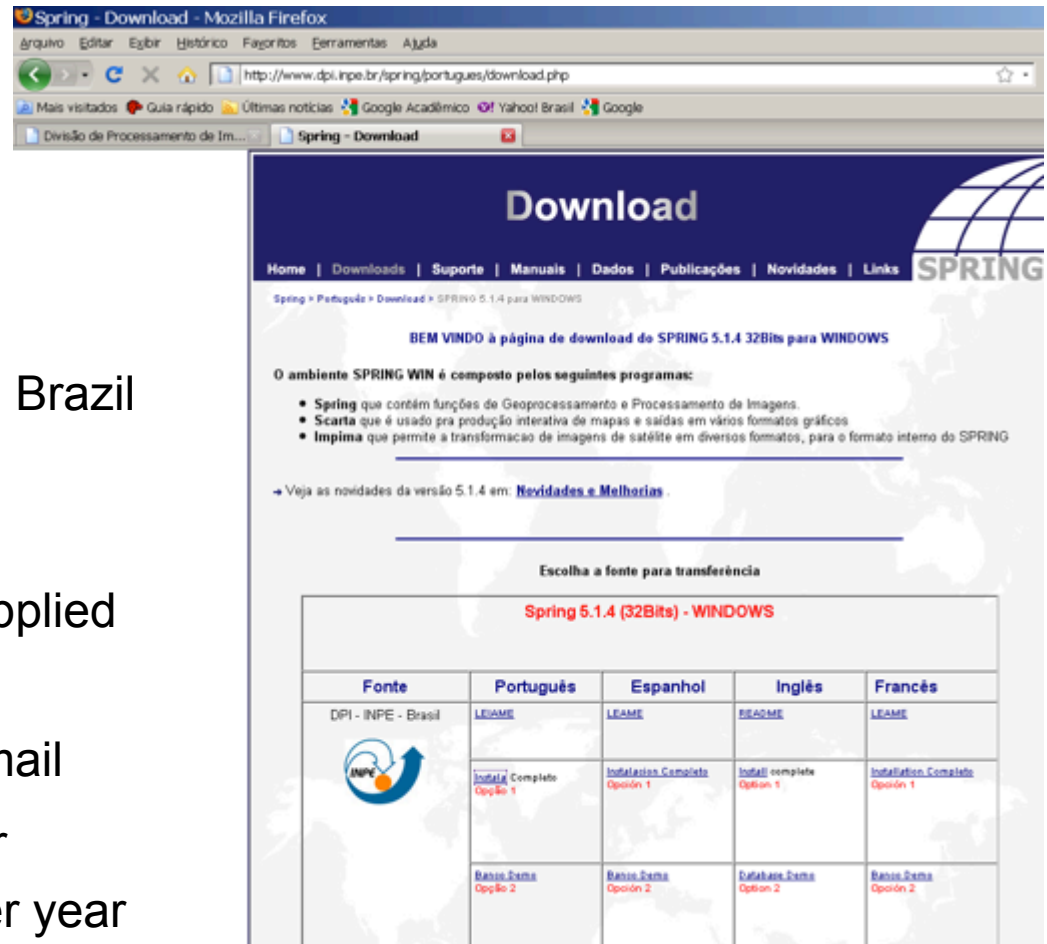
Largely used for capacity building in Brazil and Latin America. More than 2000 people trained

Used in the Remote Sensing and Applied Grad Courses at INPE

Solid user support system using e-mail

Over 150000 registered users in our database and ~10000 new users per year

Currently maintenance and new developments is being done by a contractor (K2 Systems)





NOT a final application, but blocks (C++) to build different applications

Benefit from object-relational DBMS

Benefit from spatially enabled DBMS: Oracle Spatial, PostGIS, ...

Use OGC (and others) standards to promote interoperability

To develop innovative algorithms (e.g. spatio-temporal data, high-resolution image processing, multiprocessing)

To develop innovative data types (e.g. cell spaces, Generalize Proximity Matrix)

Able to deal with large datasets and ubiquitous data

Free and Open Source Software



Platform to develop the tools needed to address the demands posed to INPE

Platform to materialize our research in GIScience

Platform to develop tools that enable collaboration within INPE and with other organizations

WHAT IS TERRALIB?

TerraLib is a GIS classes and functions library, available from the Internet as open source, allowing a collaborative environment and its use for the development of multiple GIS tools. Its main aim is to enable the development of a new generation of GIS applications, based on the technological advances on spatial databases.[more]

NEWS

[2007-08-12] [TerraLib 3.2.0 RC1 is available](#)

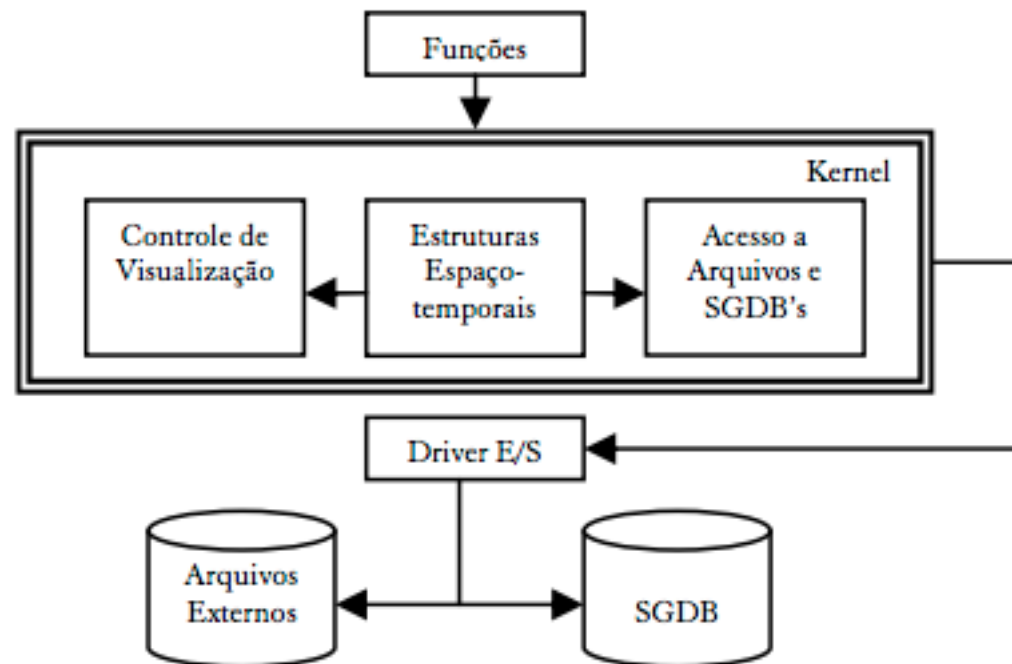


The last stable version of TerraLib is the 3.1.3.2.0. TerraLib 3.2.0 RC1 is the first candidate release that has been tested internally unless fatal bugs emerge. We are now making remove any remaining bugs. If you are interested

[2006-12-23] [New release of TerraLib TerraLib 3.1.4 is now available](#)

[2006-05-03] [New release of TerraLib TerraLib 3.1.3 is now available](#)

[2006-02-20] [New release of TerraLib TerraLib 3.1.2 is now available](#)



BDQueimadas

Ministério da Ciência e Tecnologia

BDQueimadas
Monitoramento de Focos

Basic Parameters

Start Date (yyyy-mm-dd) 2007-09-20

Final Date (yyyy-mm-dd) 2007-09-24

Country BRASIL

State AM

City (optional)

Satellite TODOS

Vegetation Opcional

By Region (optional)

North 55.0

West -90.0 East 90.0

South -40.0

Submit

Graphic

Type Politico

Graphic

Fires in the Conservation Units...

Accessories

Fires coordinates in UTM, Policonic, Mercator, Albers...

NOAA's Old Data: 1992 until 1998...

Help...

FAQ...

Geographic Calculator

Comments & Suggestions:
proarco@dpi.inpe.br

Site update:
07:30, 13:30, 16:30, 22:30, 00:30 e 02:30
GMT

14:16:59

Visits since 31/05/2002

LandSat Mosaico 2006 (AMZ)/Administrative Units/None

N15:00:00 O30:00:00

2000 km

S30:00:00 O90:00:00

472 Fires between 2007-09-20 00:00:00 - 2007-09-24 23:59:59
The NOAA-12 data had been discontinued definitively in 2007-08-10 17:10 UTC, details here

Legenda Focos

NOAA 12N NOAA 12D NOAA 16T NOAA 16M MODIS 01 MODIS 01D MODIS 01M GOES-12

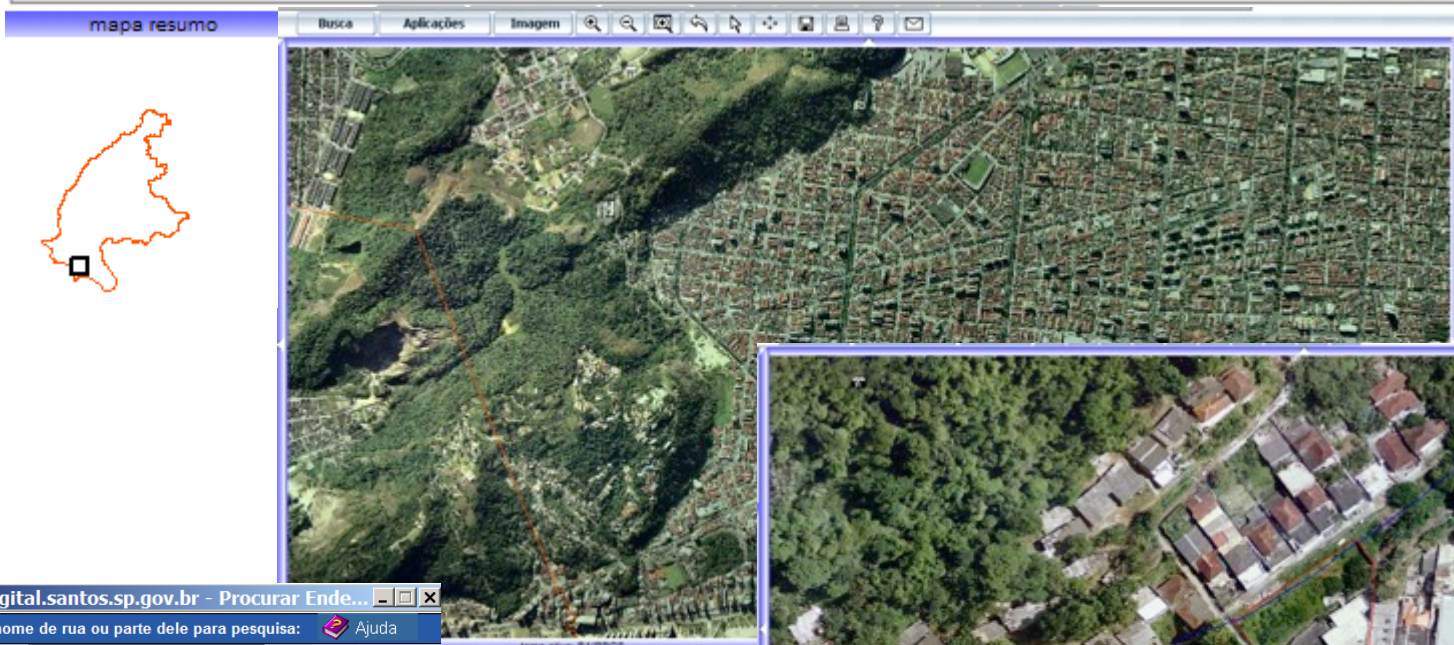
AQUA 01 TERRA 01 METE0AT 02 NOAA 15 NOAA 17 NOAA 18 NOAA 18D

Export Fires Tela/Screen/Pantalla (Html) Ok

Fire monitoring application:
daily fire sports detection
using satellite data, for
Brazil and South America
dissemination in the web for
the general public
alerts sent to law
enforcement organization



Santos Digital



<http://www.digital.santos.sp.gov.br> - Procurar Ende...
Passo 1: Digite um nome de rua ou parte dele para pesquisa:
Endereço para pesquisa:
Passo 2: Selecione uma das vias e complete o número:
Total de Endereços Listados: n°
1

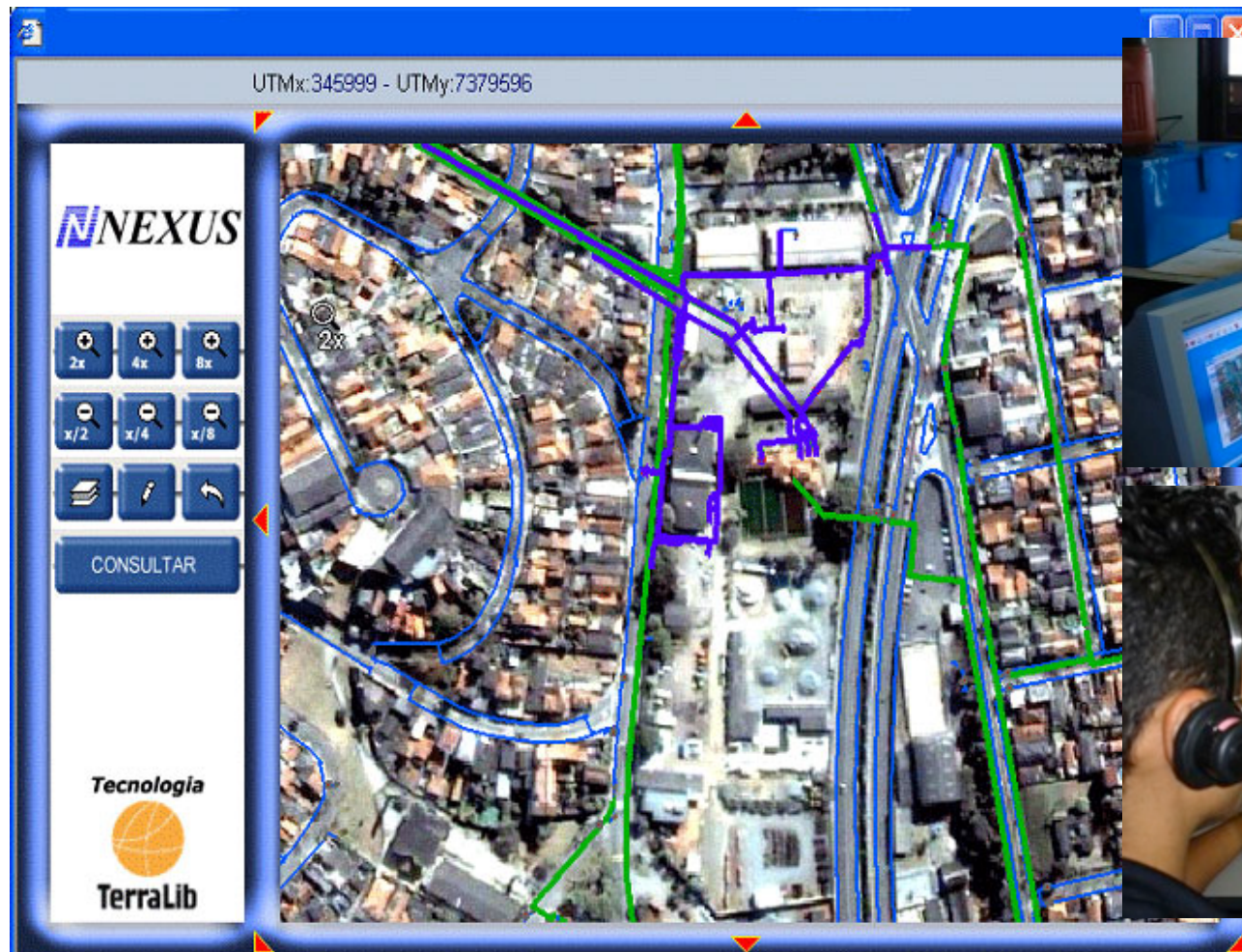
Funcate - Fundação de Ciência, Aplicações e Tecnologia Espaciais
Concluído



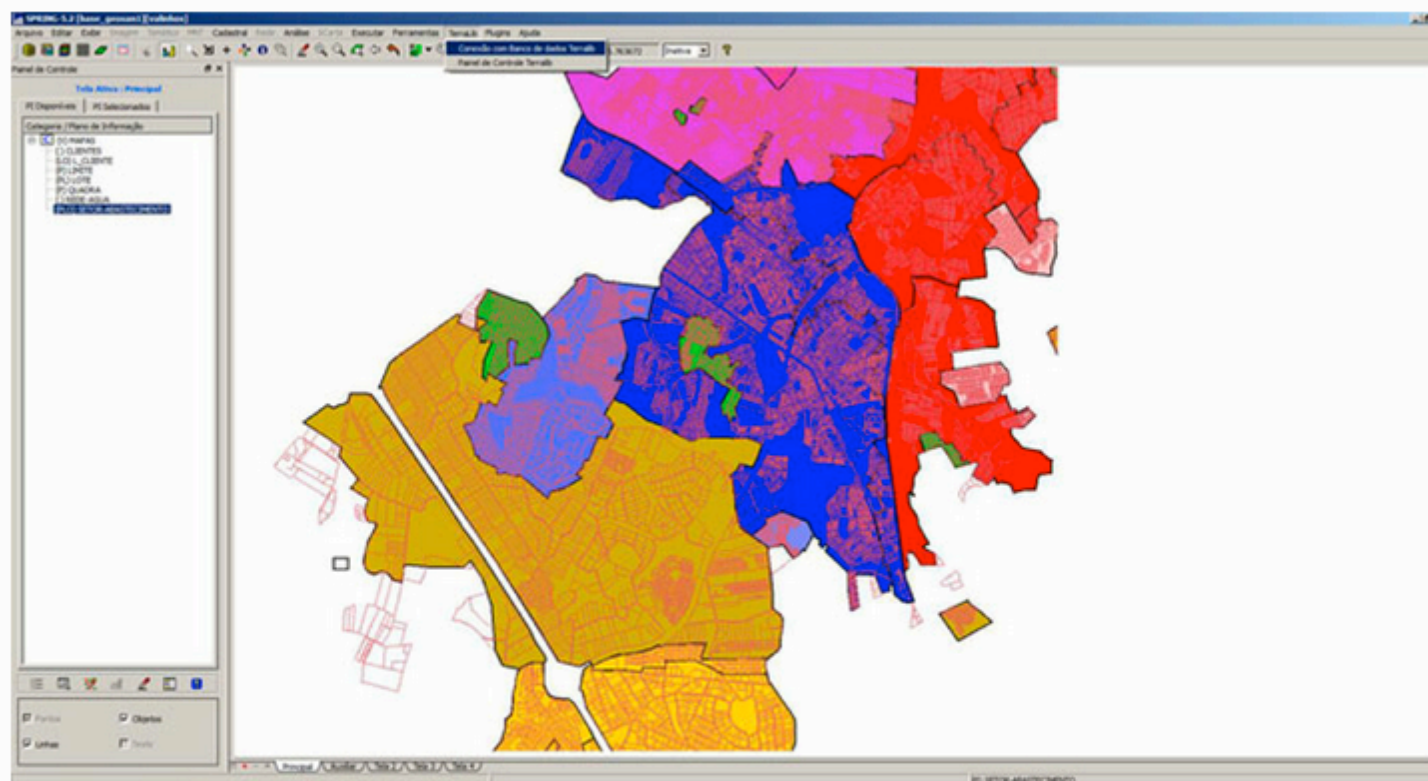


GeoSan

Sanitation GIS



Integração entre o Spring e GeoSan



O INPE liberou a versão a versão 5.2 do Spring. Como destaque está a integração com o Terralib v. 3.3.1. Agora você poderá visualizar suas redes de água e esgoto, bem como consumidores, diretamente no Spring, realizar mapas temáticos, importar feições, imprimir com escala e exportar os arquivos para outros sistemas CAD com mais integração entre as tecnologias.



Database

Drawing area

Views and Themes

Grid

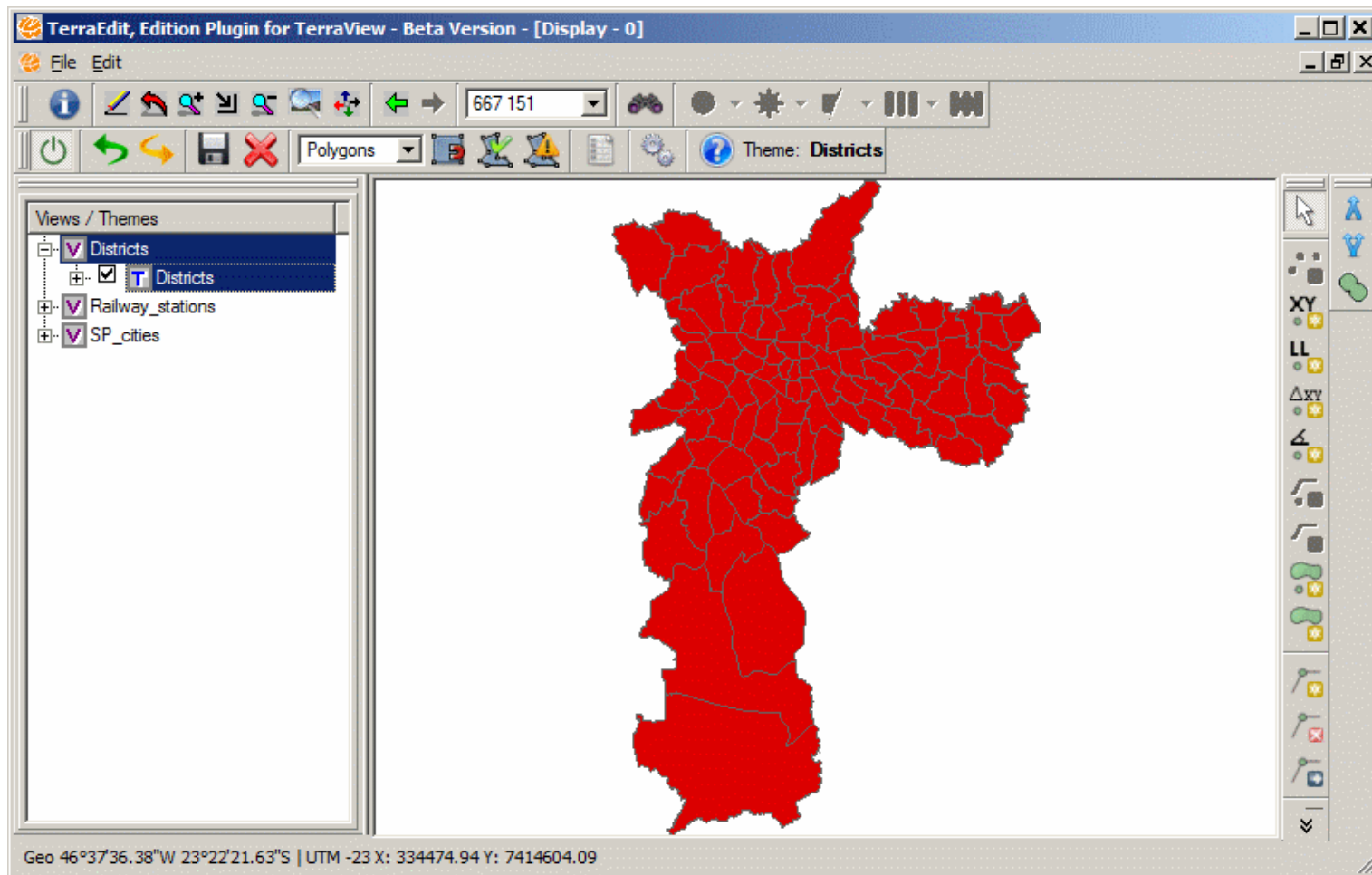
	SPRAREA	SPRPERIMET	SPRROTULO	COD	SIGLA	DENO	POP_FAVELADA	MORT_INFANTIL
1	208960097.125	85097.2894		1	52 MAR	MARSILAC	0	59.004
2	9967799.3438	14983.1893		10	96 VSO	VILA SONIA	25.05	22.797
3	11994034.8281	14394.0498		11	81 SOC	SOCORRO	1.67	9.387
4	12937072.8438	15639.6731		12	16 CGR	CAMPO GRANDE	3.34	26.82
5	16091303.3281	15917.3056		13	72 SAM	SANTO AMARO	0	9.387
6	11530589.0781	15134.2508		14	55 MOR	MORUMBI	23.38	16.092
7	8714790.5	13172.5228		15	15 CBE	CAMPO BELO	11.69	22.797

General purpose GIS to view and analyze a TL database

FOSS – LGPL

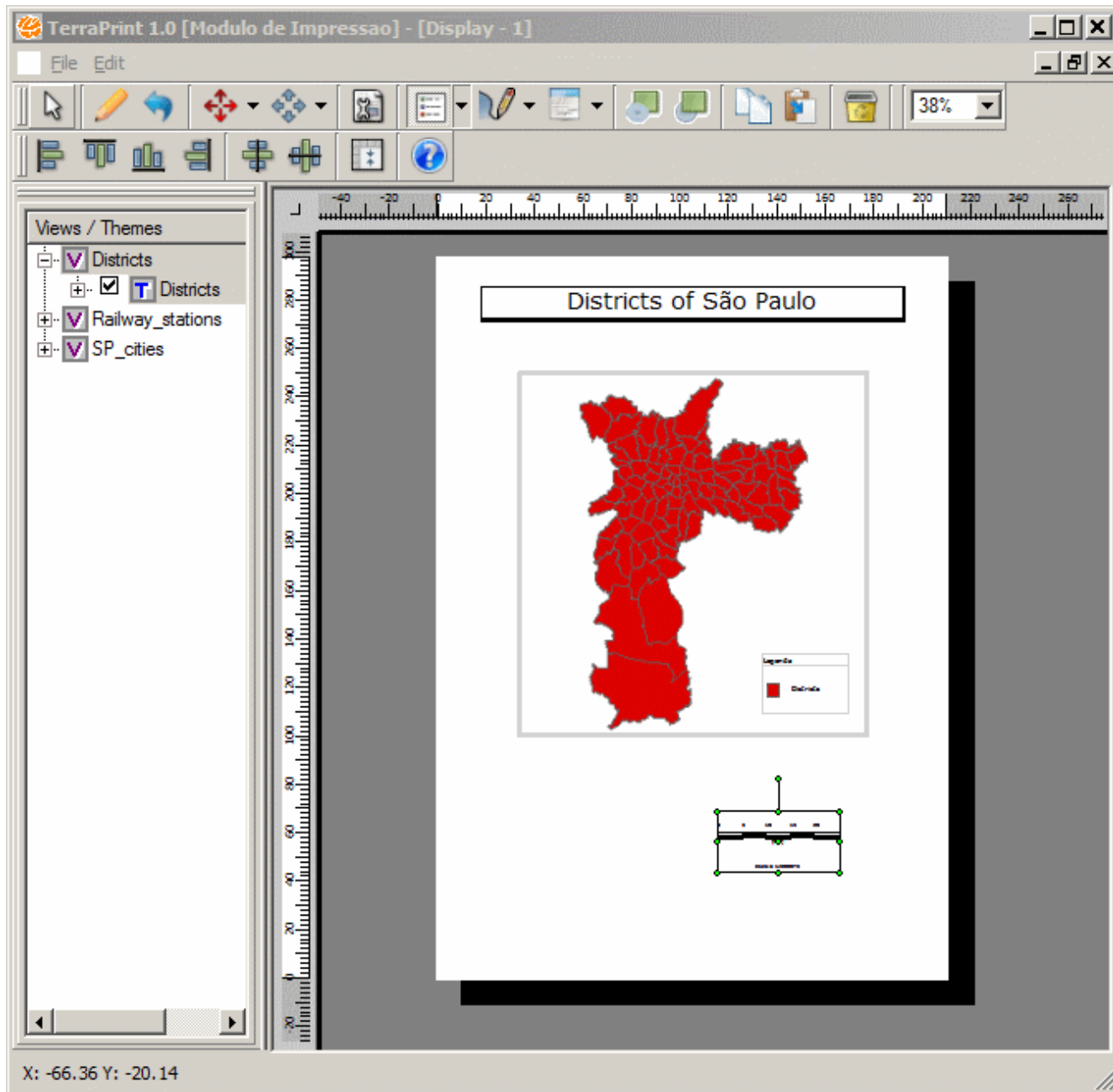
Customized with plugins
www.dpi.inpe.br/terraview





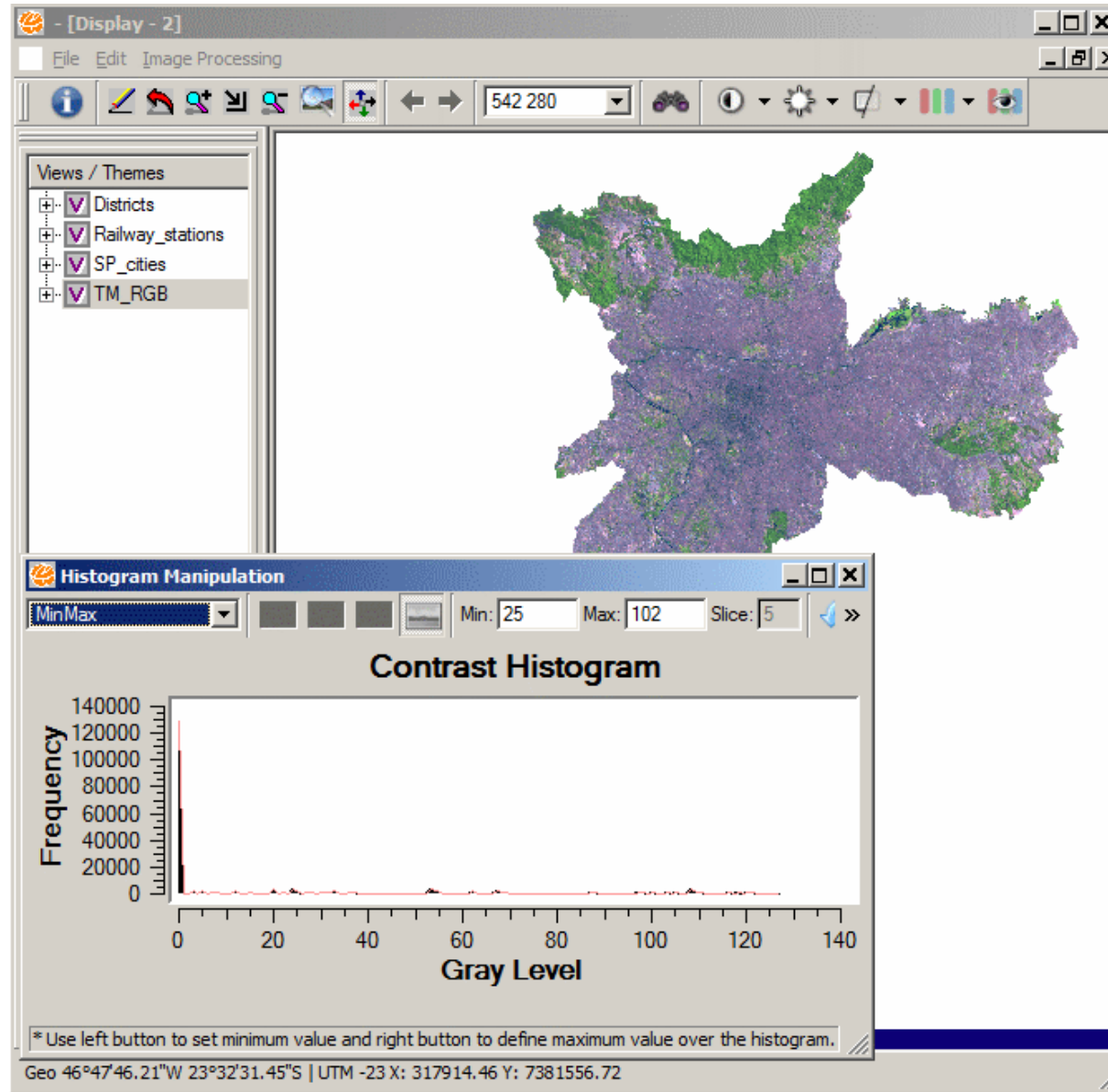
TerraEdit: vector edition





TerraPrint: chart generation





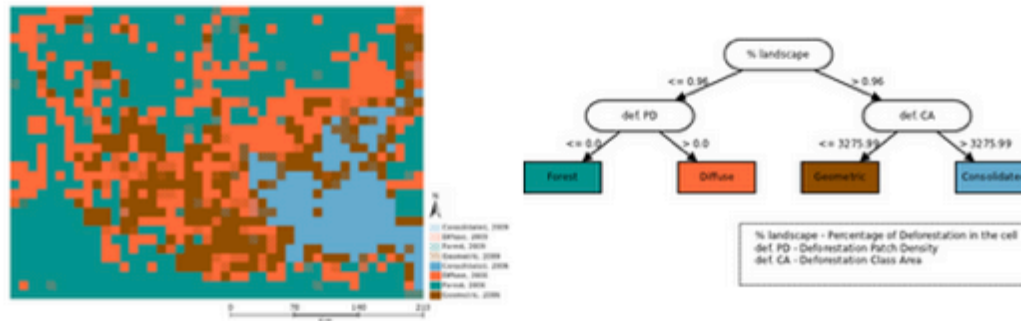
TerraPDI: Image processing plugin



Welcome to the GeoDMA wiki!

GeoDMA means Geographical Data Mining Analyst. It is a free and open source system of Object-Based Image Analysis developed in C++ devoted to data mining of geographical data. It is a plugin for [TerraView](#) GIS.

GeoDMA has already been used to classify deforestation dynamics in Brazilian Amazonia.



GeoDMA works also with high spatial resolution urban imagery.



GeoDMA: Object-Based Image Analysis





Hydrology studies:

DTM Upscaling

Accumulated flux

Drainage definition

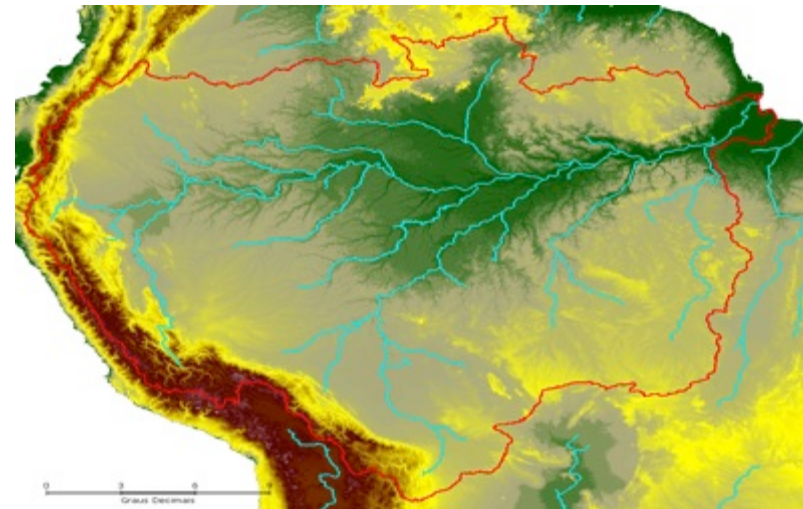
River segments detection

Basin delimitation

Special interest in large areas that
require heavy processing



Amazonia Basin



Brazilian Semi-Arid

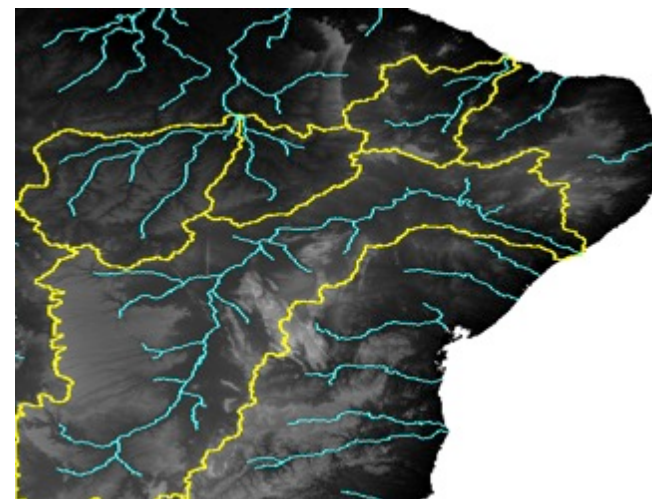


Table: solos_sbcs_ibge - Table type: TeAttrStatic

NUMERO	IDENT									
1	700									
2	1876									
3	1202									
4	1249									
5	692	149	Cx43	Neossolos	Nitossolos		1.464109	11.02867	Cambissolo	2786
6	521	57	PVA56	Cambissol	Neossolos		1.168522	2.389142	Argissolos v	2787
7	1916	441	+RL51	Cambissol	Nitossolos	Media	1.121785	1.900614	Neossolos l	2788



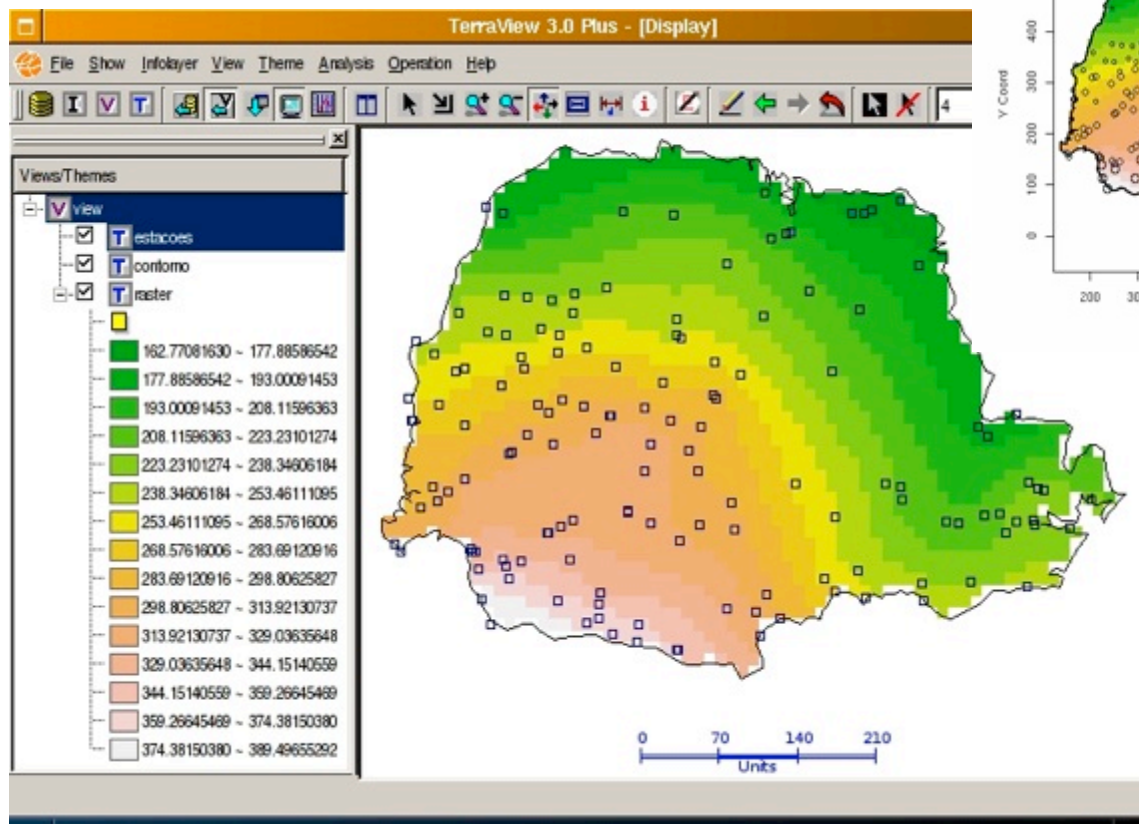
openModeller is a fundamental niche modelling library, providing a uniform method for modelling distribution patterns using a variety of modelling algorithms.



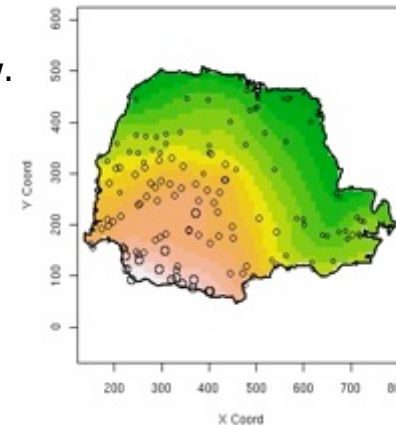
TerraLib and R: arT and MyR

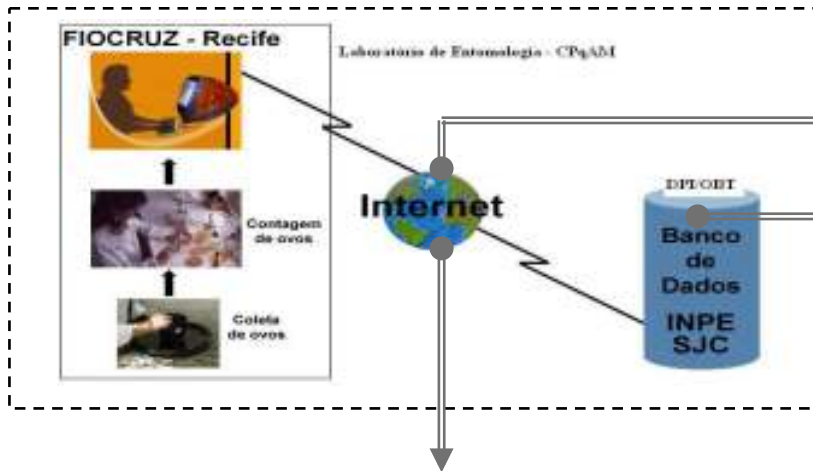


Carregado em um banco **TerraLib** e visualizado com **TerraView**.



Dado R do pacote **geoR**





TerraView 3.0 - [Tela de Visualização]

Banco de Dados:

- SAU0_MABET_OA_L3
- SAU0_MABET_OA_L4
- SAU0_Armadilha
- SAU0_Armadilha_pos
- SAU0_Lugares_cad
- SAU0_Observacao_pos
- SAU0_Sites

Mapa Temático:

- ETM_SACO
- Mala_Caneta
- Subdistrito
- Município
- Setores
- Logradouro
- Logradouro_Topo
- Posto_Urbano
- Posto_Rural
- Posto_Drenagem
- Zonas
- Assentamento
- Demografia

Brasília Teimosa

amarragem_pos_LOTE

- Lot 1
- Lot 2
- Lot 3
- Lot 4

SPRADA	SPRADERCT	LOTE	MABET_ID
1	100	100	10T101
2	100	100	10T102
3	100	100	10T103
4	100	100	10T104
5	100	100	10T105
6	100	100	10T106

SAUDAVEL
Sistema de Apoio Unificado para a Detecção e Acompanhamento em Vigilância Epidemiológica

SAUDAVEL - PESQUISA DE CAMPO

* Área Restrita *

* Email:

* Senha:

* Preenchimento obrigatório

SAUDAVEL
Sistema de Apoio Unificado para a Detecção e Acompanhamento em Vigilância Epidemiológica

SAUDAVEL - PESQUISA DE CAMPO

Quantidade de ovos coletados em Abril de 2004.

Escolha o Tipo de gráfico que deseja visualizar (quatro lotes).

Estatística 1 - Quantidade de ovos coletados em um mês.

Estatística 2 - Quantidade de ovos coletados em um mês.

Escolha o sítio:

Para as estatísticas 1 ou 2, escolha o mês desejado:

Sítios	Nº de ovos
BT	16295
CFP	15033
DI	10588
EM	31504
MCP	21505

SAUDAVEL
Sistema de Apoio Unificado para a Detecção e Acompanhamento em Vigilância Epidemiológica

SAUDAVEL - PESQUISA DE CAMPO

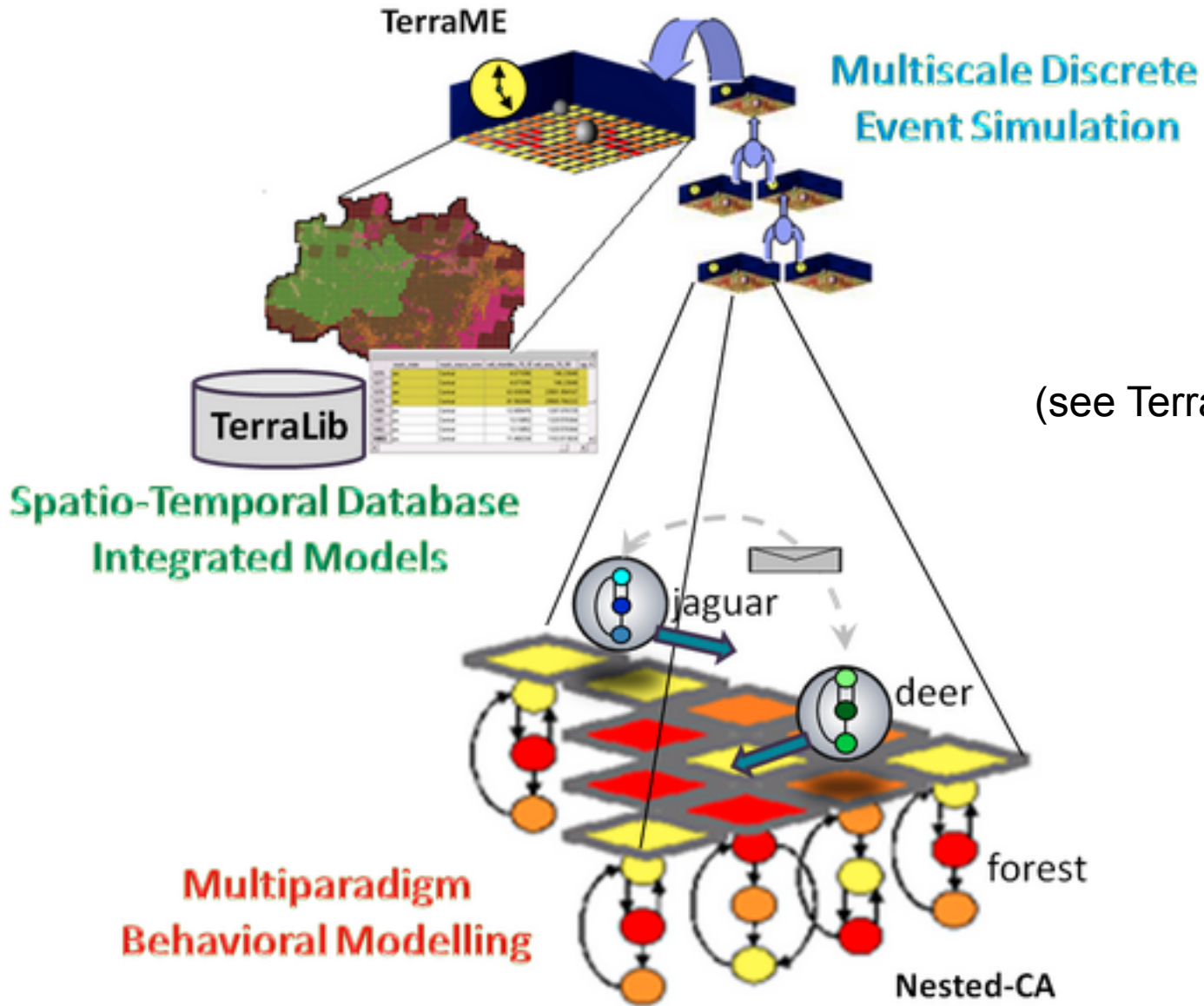
[Cadastro de Armadilha] [Listar Armadilhas]

Listando Armadilhas

Código da Armadilha	Coordenadas	Status	Ação
EM101	265906 / 9109707	Ativa	Excluir
EM102	266013 / 9109613	Ativa	Excluir
EM103	266186 / 9109595	Ativa	Excluir
EM104	266281 / 9109545	Ativa	Excluir
EM105	266116 / 9109508	Ativa	Excluir
EM106	266325 / 9109411	Ativa	Excluir
EM107	266290 / 9109421	Ativa	Excluir
EM108	266006 / 9109245	Ativa	Excluir
EM109	265911 / 9109253	Ativa	Excluir
EM110	265848 / 9109185	Ativa	Excluir
EM111	265745 / 9109170	Ativa	Excluir
EM112	265678 / 9109115	Ativa	Excluir
EM113	265630 / 9109072	Ativa	Excluir
EM114	265617 / 9109024	Ativa	Excluir
EM115	265564 / 9108971	Ativa	Excluir

Menu Lateral:

- Página Principal
- Sítios
- Armadilhas
- Contagem de Ovos
- Pontos Estratégicos
- Estatísticas
- Pesquisadores
- Controle de Usuários
- Desconectar

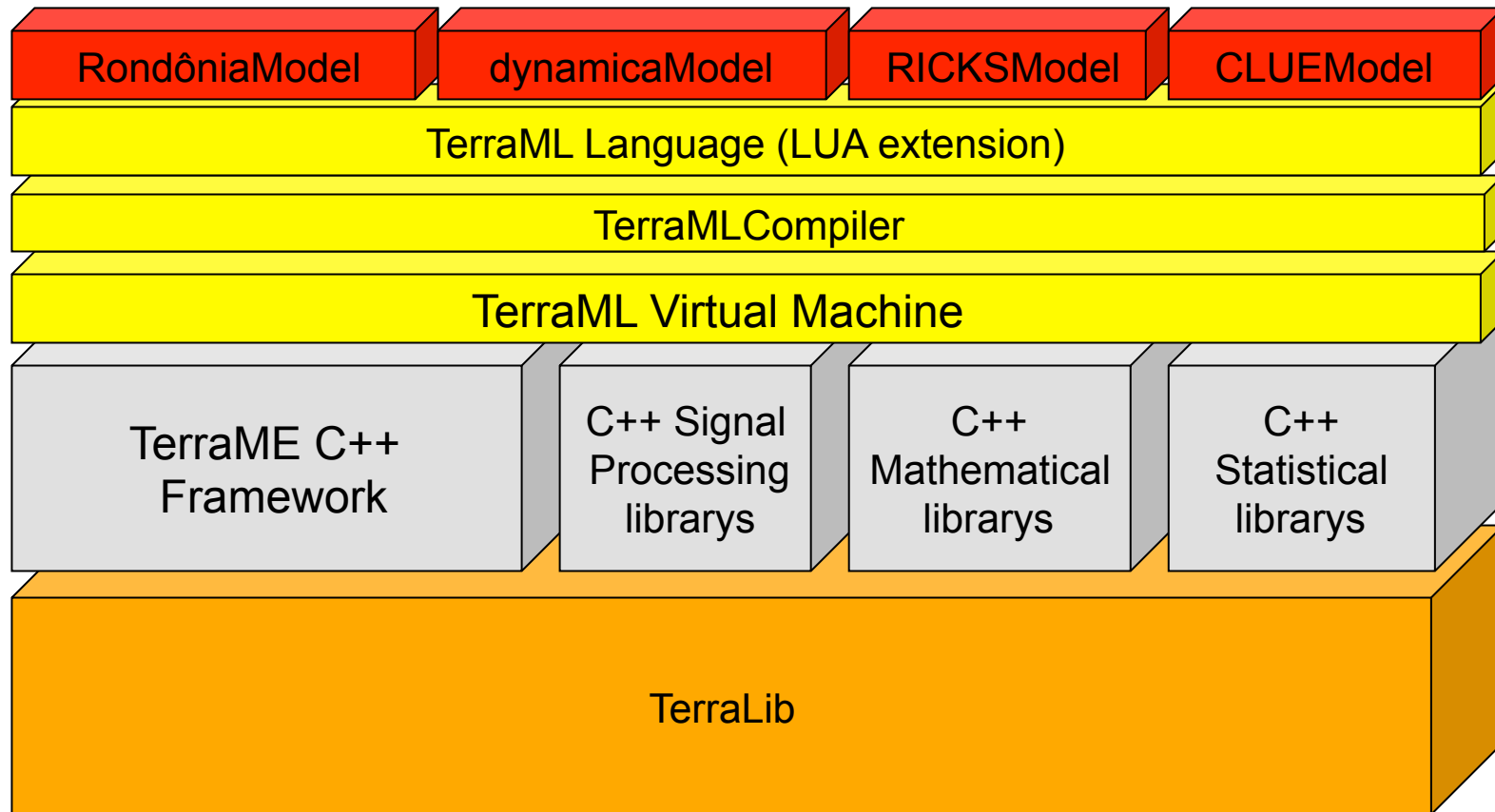


(see TerraME page)

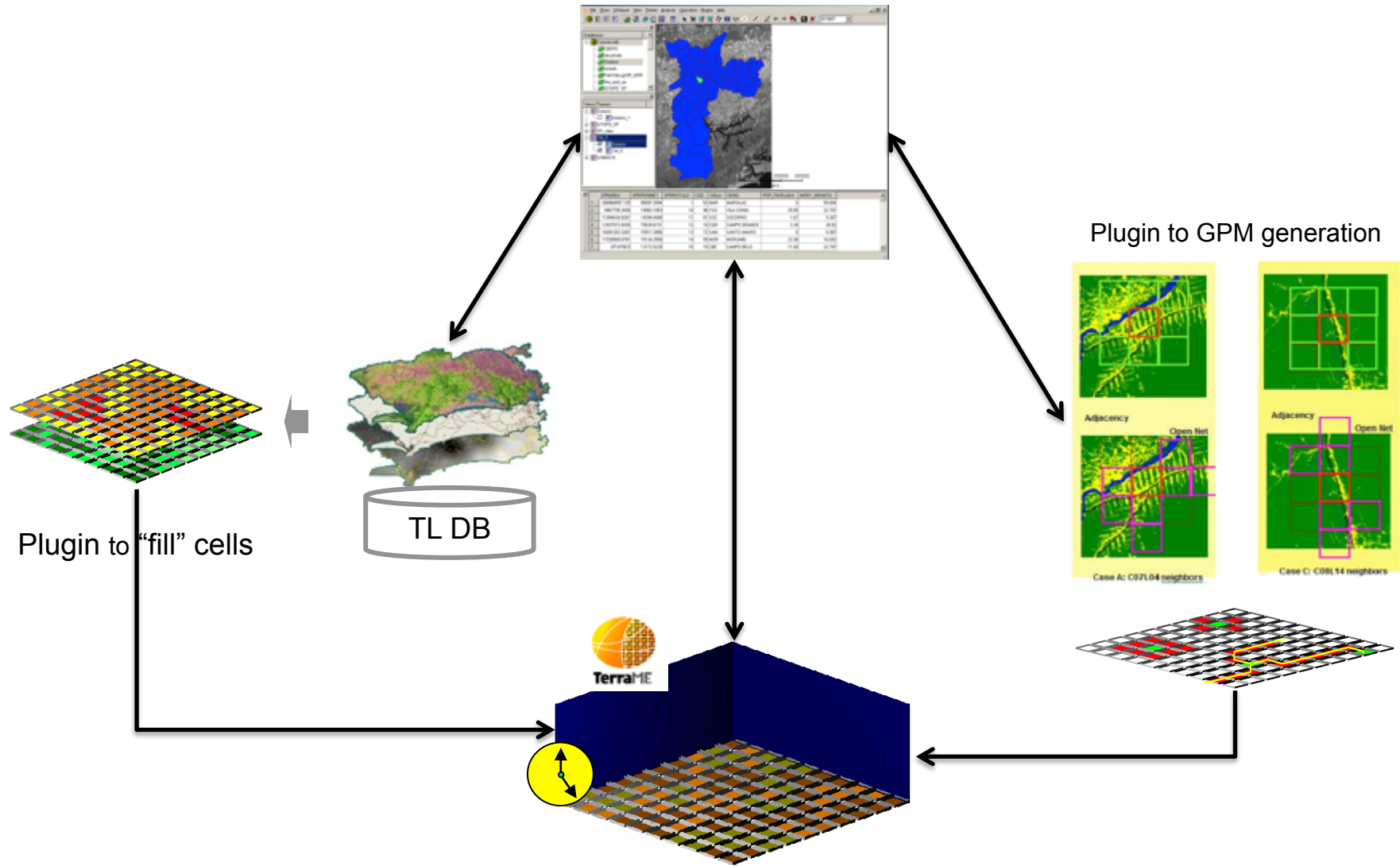
TerraME - Earth System Modelling Environment

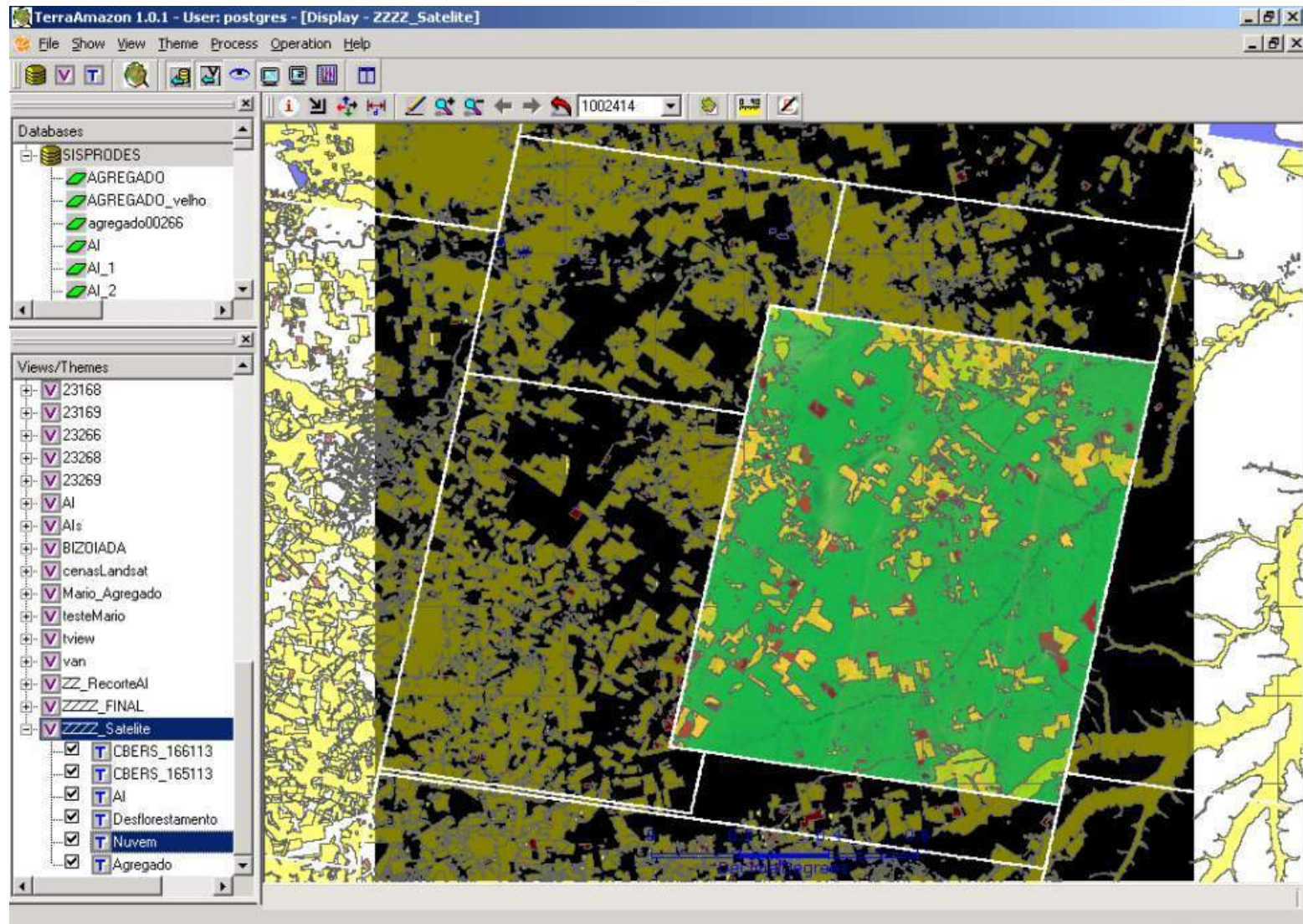


TerraME Architecture



TerraME Toolbox







TerraAmazon 2.0.0 - User: postgres - [Display - 2006]

File Show View Theme Process Operation Help

Databases

- CBERS2CCD_159105_05082006
- CBERS2CCD_159106_05082006
- CBERS2CCD_176112_01092006
- CBERS2CCD_177109_03082006
- CBERS2CCD_177110_03082006
- CBERS2CCD_177111_03082006
- CBERS2CCD_177112_03082006

Views/Themes

- Theme Landsat5TM_00166_C
- EDITION_SL_22967
- SP_NUVEM_
- SP_NUVEM_RECORTE_AI_2
- EDITION_NV_22966_2006
- Landsat5TM_23365_31082006
- SP_DESFLO_RECORTE_AI_2
- SP_DESFLO_SOB_NV_PREV
- Landsat5TM_22368_2005
- residuo_intersection
- residuo
- Landsat5TM_22668_14082006
- Landsat5TM_00367_04082006
- Landsat5TM_22864_27072006
- Landsat5TM_22865_27072006
- Landsat5TM_23368_31082006
- sp_mosaico_recorte_previa2_2
- Landsat5TM_23161_02092006

2006a

Mario

View_CBERS2CCD_117110_03082006

8971887

0.00 Desflorestamento Polygons

Green cells are being edited by current user

Red cells were blocked by current user for edition

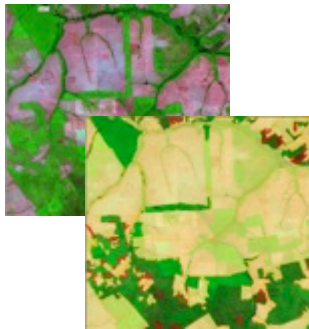
0 2 4 6
DecimalDegrees

EditionLayer: EDITION_SL_22967

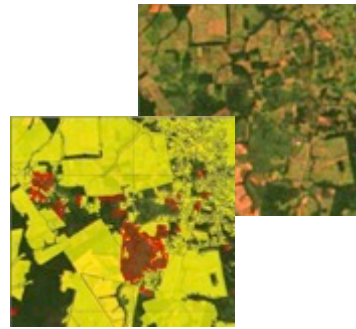
The screenshot shows the TerraAmazon 2.0.0 software interface. The main window displays a map of a region with a grid overlay. Several cells are highlighted in green, and others are highlighted in red. A scale bar at the bottom indicates distances in DecimalDegrees (0, 2, 4, 6). The interface includes a menu bar (File, Show, View, Theme, Process, Operation, Help), a toolbar with various icons, and two panels on the left: 'Databases' and 'Views/Themes'. The 'Databases' panel lists several CBERS2CCD datasets. The 'Views/Themes' panel lists various themes, including Landsat5TM datasets and a 'residuo' theme. The status bar at the bottom right shows 'EditionLayer: EDITION_SL_22967'. Annotations with arrows point to green cells (labeled 'Green cells are being edited by current user') and red cells (labeled 'Red cells were blocked by current user for edition').



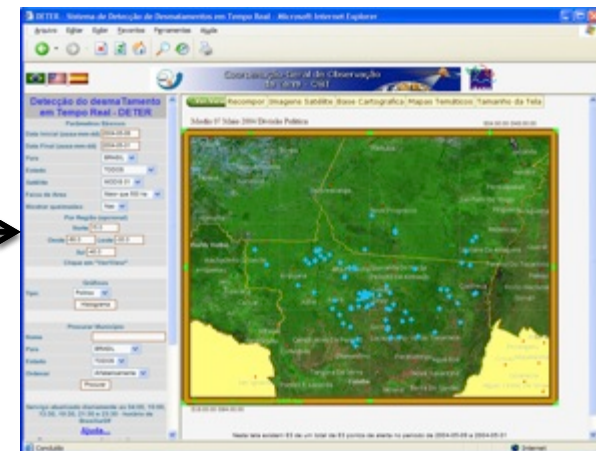
Unified database to results



PRODES with Landsat



DETER with MODIS





CENTRO REGIONAL DA AMAZÔNIA

CRA



Joint initiative between the FAO component in the UN-REDD Programme and INPE, entitled “Forest monitoring systems based on Remote Sensing and Geographic Information System techniques”, using TerraAmazon

What happens after deforestation?



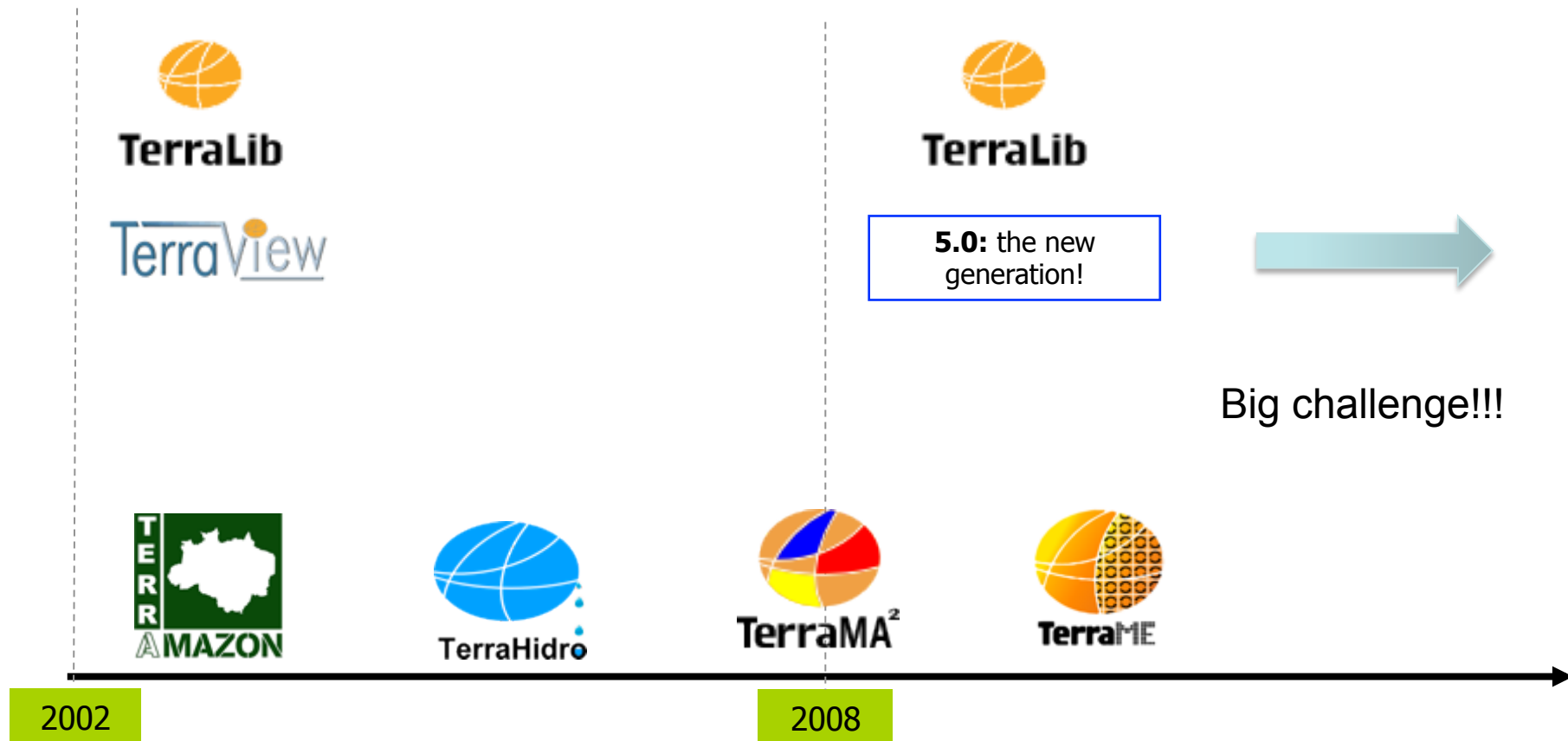
TerraClass

Levantamento de informações de uso e cobertura da terra na Amazônia

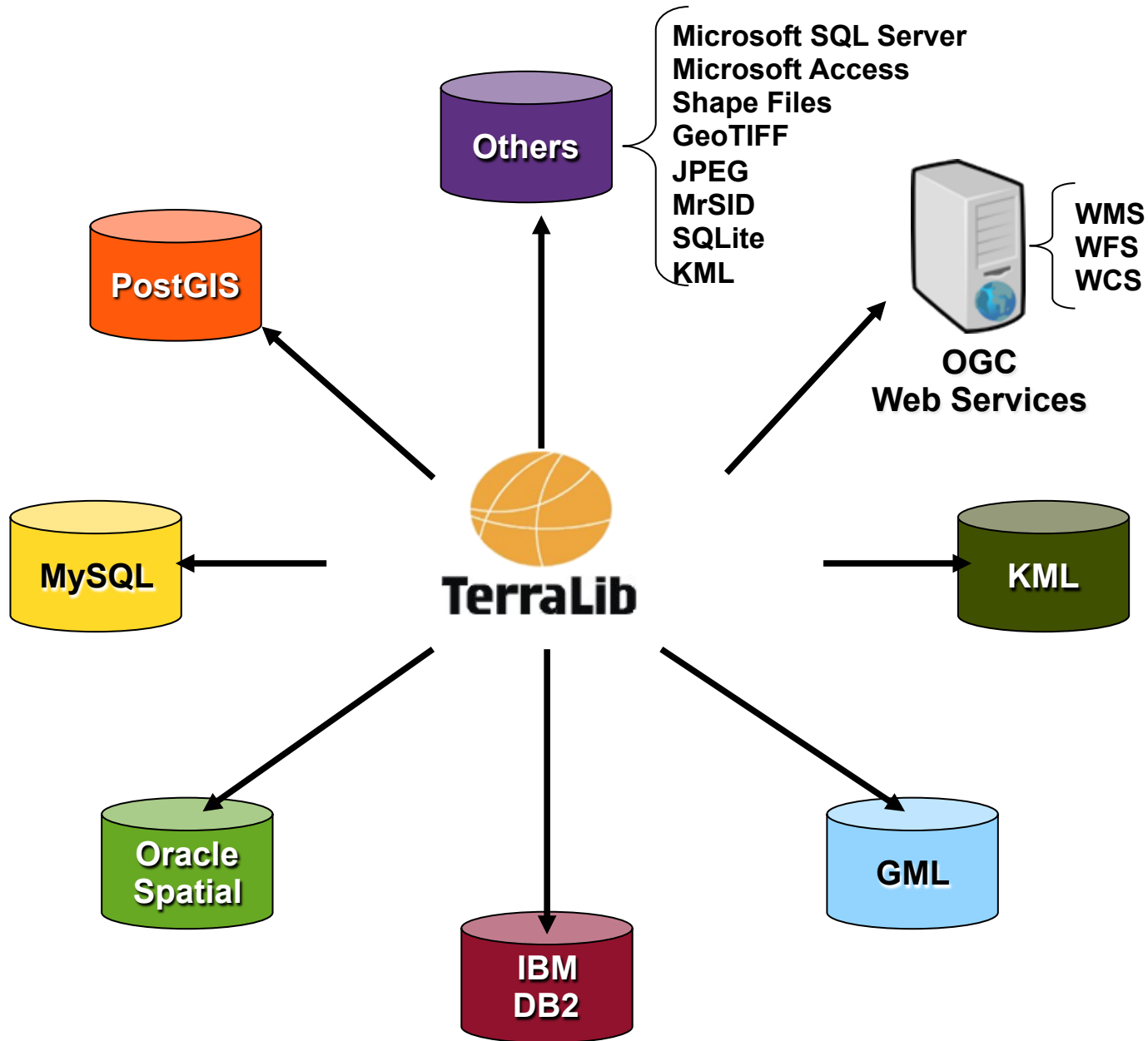
Sumário Executivo

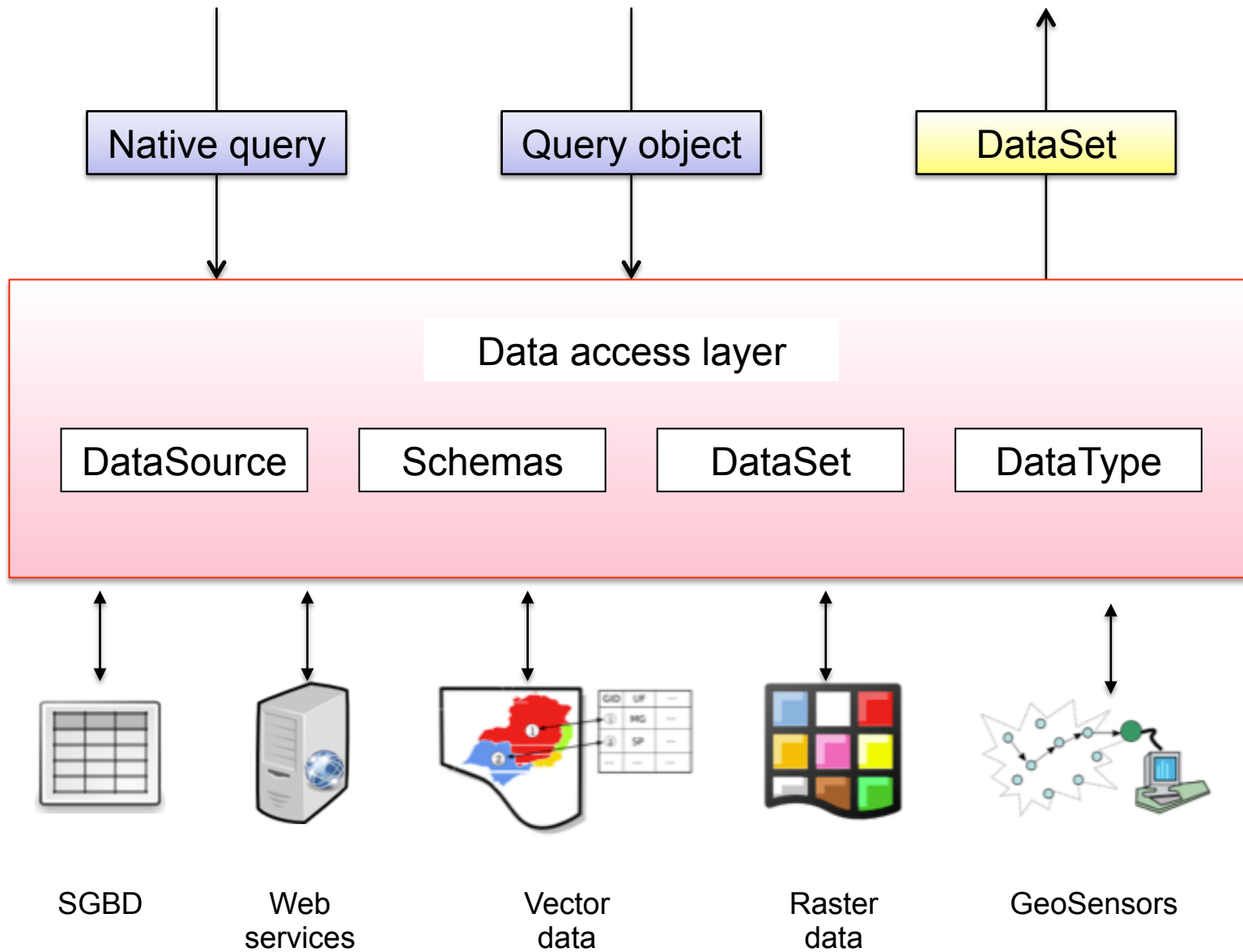
EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA - EMBRAPA | INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS - INPE

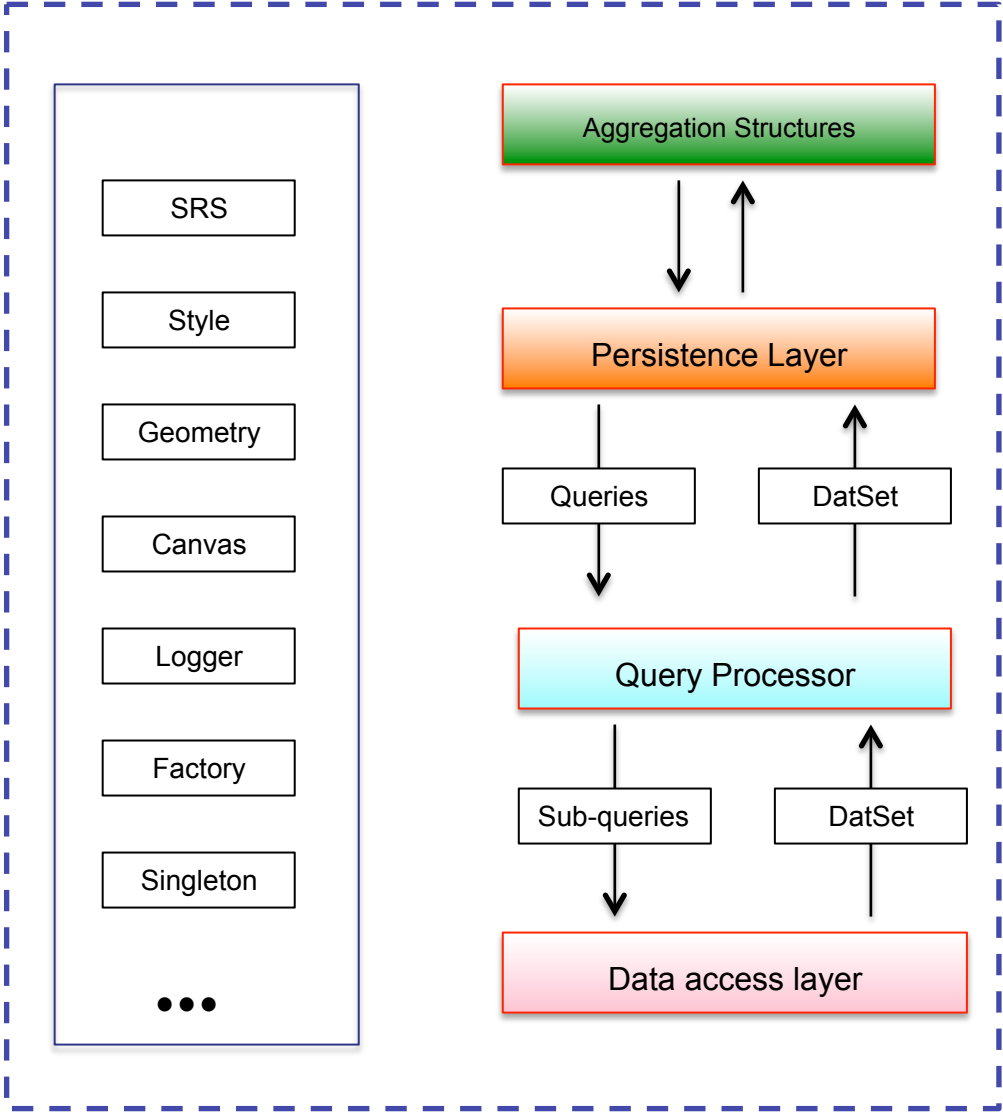
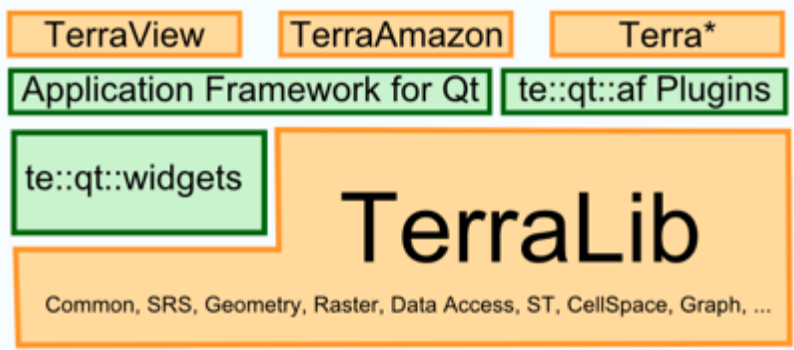
“Looking into future without forgetting the past”



Data sources







[special pages](#)[edit this page](#)[old revisions](#)

TerraLib5 Wiki

[Home](#) / [Downloads](#) / [Documentation](#) / [About](#) / [FAQ](#)

[\[edit\]](#)

navigation

- [Home](#)
- [Downloads](#)
- [Documentation](#)
- [About](#)
- [FAQ](#)
- [Meeting Schedule](#)
- [Events](#)
- [Calendar](#)
- [Suggested Readings](#)
- [Open Training](#)
- [Links](#)
- [Vocabulary](#)
- [Help](#)
- [Recent Changes](#) [↗](#)
- [Site map](#) [↗](#)
- [twitter](#) [↗](#)

[\[edit\]](#)

search

toolbox

- [What links here](#)
- [Upload file](#)

You are here: [start](#) » [wiki](#) » [wiki:designimplementation](#)

Design and Implementation of TerraLib 5

This document presents the TerraLib 5 design and it gives an overview of its architecture.

[\[edit\]](#)

Architecture Overview

[\[edit\]](#)

TerraLib Platform Modules

In TerraLib a **module**¹⁾ encapsulates a set of related functionalities. The following modules are provided in the TerraLib Platform:

[\[edit\]](#)

Common

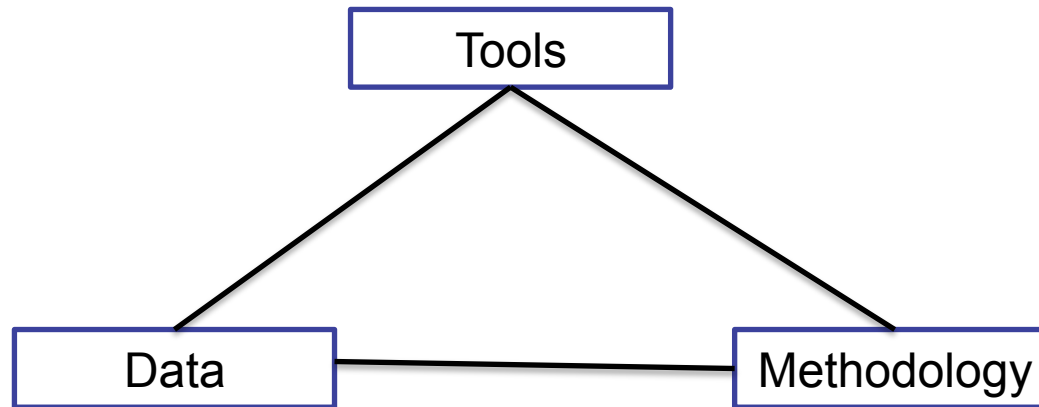
The [Common Runtime](#) module contains the foundation classes and functions for all TerraLib modules:

- **Module Management:**
 - [TerraLib](#): an utility class to control the startup and cleanup of

-Table of Contents

- Design and Implementation of TerraLib 5
 - Architecture Overview
 - TerraLib Platform Modules
 - Common
 - Plugin
 - Spatial Reference System (SRS)
 - Data Types
 - Geometry
 - Raster
 - Data Access
 - Spatiotemporal (ST)
 - Raster Processor
 - Color
 - OGC
 - MapTools
 - Qt
 - Tools Integration
 - Tools
 - Installation and Build System
 - TerraLib 5 Status

Our philosophy



Free to society!

References and acknowledgments

- www.dpi.inpe.br
- www.terralab.ufop.br
- www.inpe.br/cra
- www.dpi.inpe.br/terraview
- www.dpi.inpe.br/spring
- www.terralib.org

Some of the slides in this presentation were modified from, adapted from, inspired by these pages and other materials prepared by other colleagues at DPI.

lubia@dpi.inpe.br

THANK YOU!