ITU Workshop on "Cloud Computing"

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Cloud Computing in the service of e-sciences

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اتصالات تونس
GROUPE TUNISIE TELECOM

ITU International Telecommunication Union

Outline

- Grid … and Volunteer Computing
- Grid vs. Cloud
- Combining Grid and Cloud to serve HPC
- Applications

What is Grid Computing?

- The World Wide Web provides seamless access to information that is stored in many millions of different geographical locations
- In contrast, the Grid is a computing infrastructure which provides seamless access to computing power and data distributed over the globe.
- The name Grid is chosen by analogy with the electric power grid: plug-in to computing power without worrying where it comes from.

The Grid

Aurélien Esnard, Cours Grid

Network of generators
No idea about the identity of the provider

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What is Volunteer computing?

- Public Computing
- So far, based on a “volunteer” philosophy
- Generalisation of the Grid
  - PC, game boys, mobiles, etc.
- Nodes are anonymous, volatile, heterogeneous

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Grid vs. Cloud*

Criteria	Grid	Cloud
Virtualization	In its beginning	Essential
Type of application	Batch	Interactive
Development of application	Local	In the cloud
Access	Grid middleware	Standard Web protocols
Organizations	Virtual	Physical
Business models	Sharing	Pricing (utility model)

* *Cloud Computing – A classification, Business Models, and Research Directions.* Business and information systems Engineering, 2009

Grid vs. Cloud*

Criteria	Grid	Cloud
SLA	Absent	Essential
Control	Decentralized	Centralized (data center)
Openness	High	Low
Ease of use	Hard	Easy
Switching cost	Low (due to standardization)	High (due to incompatibilities)
Availability	Low	High

* *Cloud Computing – A classification, Business Models, and Research Directions.* Business and information systems Engineering, 2009

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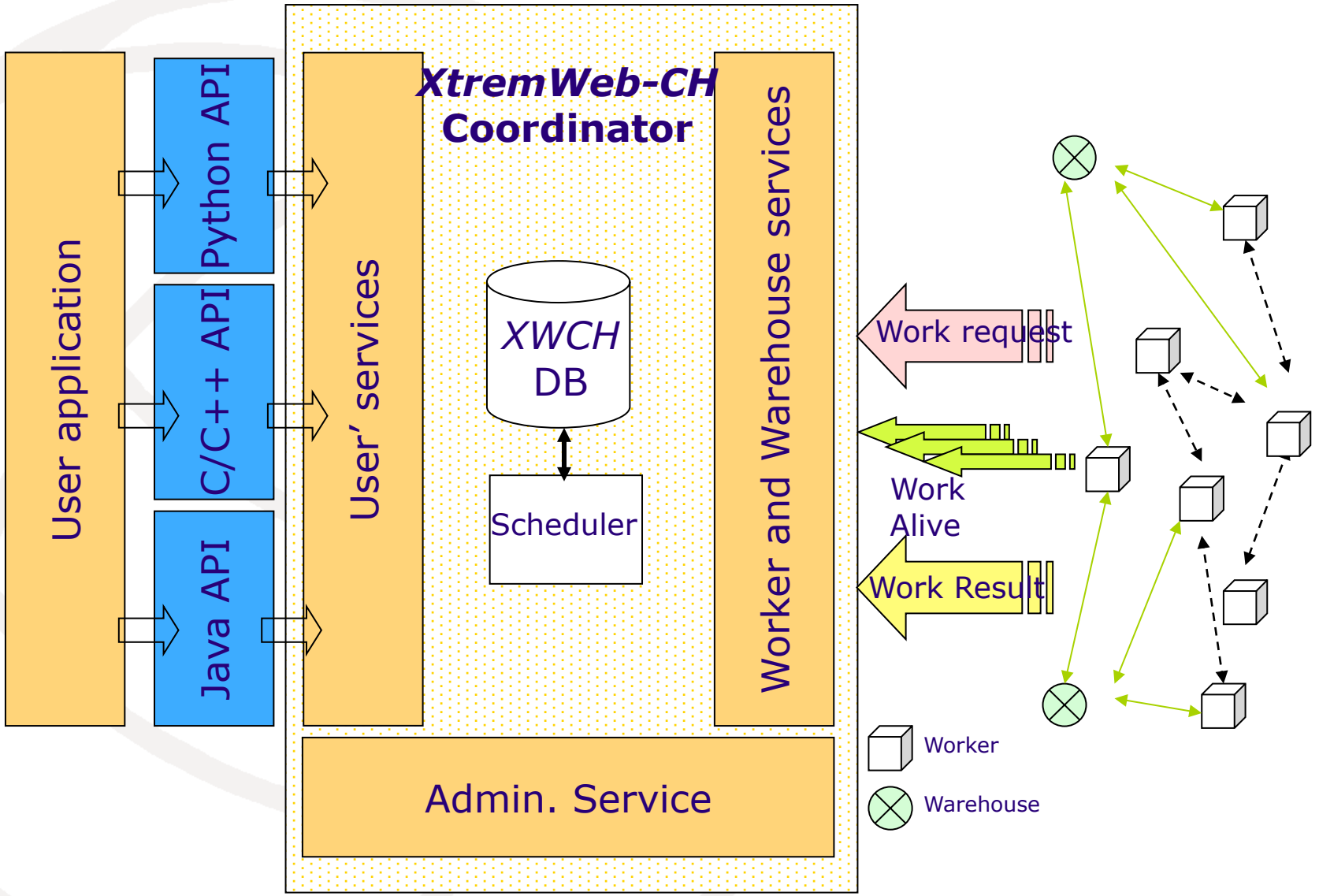
Combining Grid and Cloud to serve HPC (e-sciences)

- Grid and Volunteer Computing
  - XtremWeb-CH 
  - Advanced Resources Connector (ARC)
- Cloud
  - Amazon 
  - Azure 
  - Venus-C
  - OpenStack

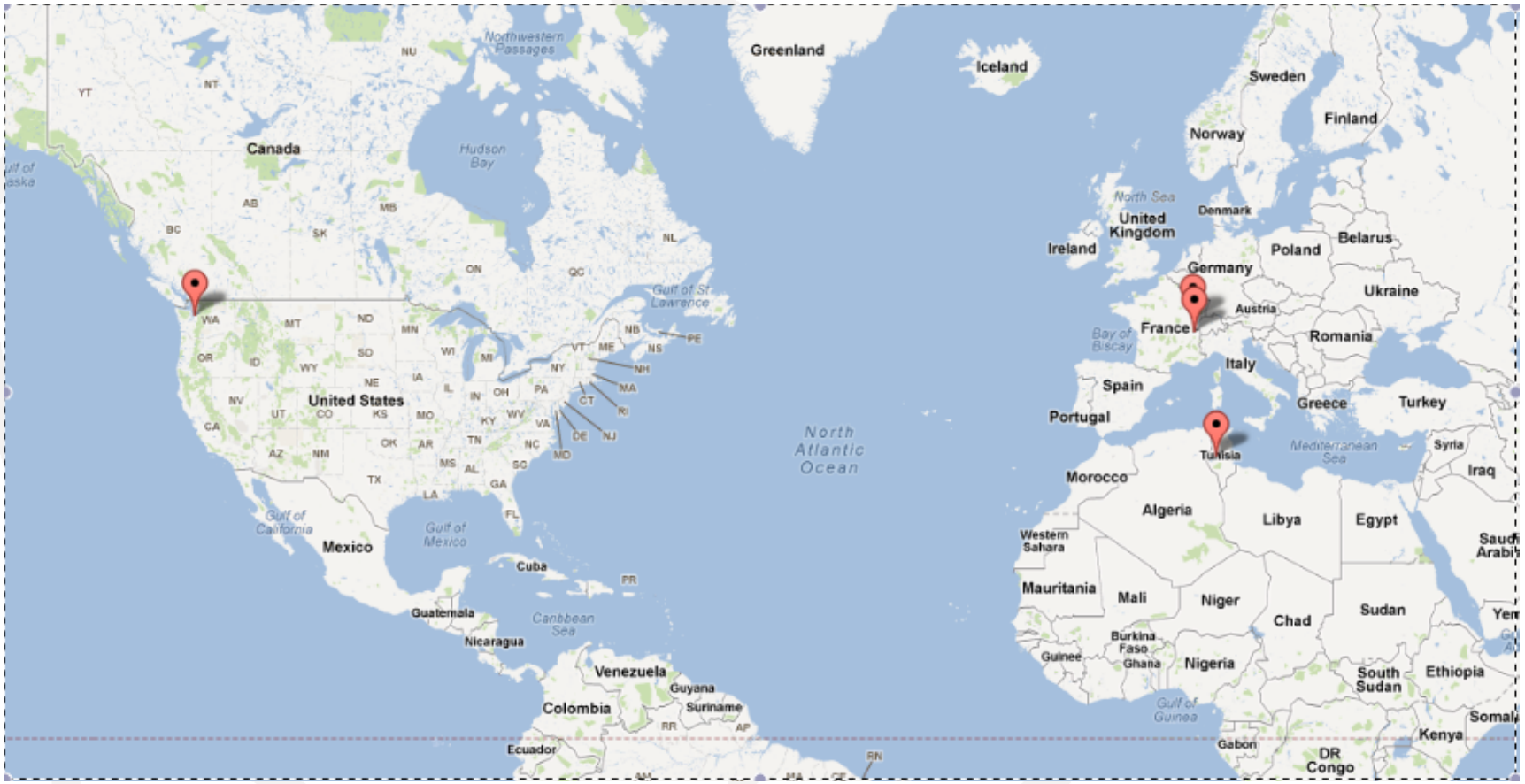
XtremWeb-CH (www.xtremwebch.net)

- A volunteer computing middleware
  - developped at univ. of applied sciences, Western Switzerland **since 2003**
  - Can combine resources coming either from institutions or individuals
  - Can bypass firewalls and NAT
  - Manages the volatility of resources
  - Easy to install, program and monitor
  - Our vision: To “migrate” *XtremWeb-CH* from a prototype to a product

XtremWeb-CH at a glance



The XtremWeb-CH volunteer platform@hepia

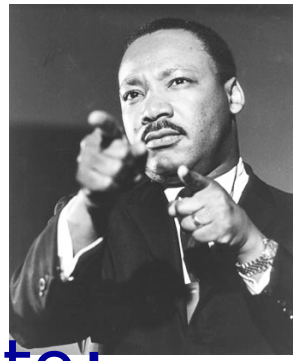


www.xtremwebch.net

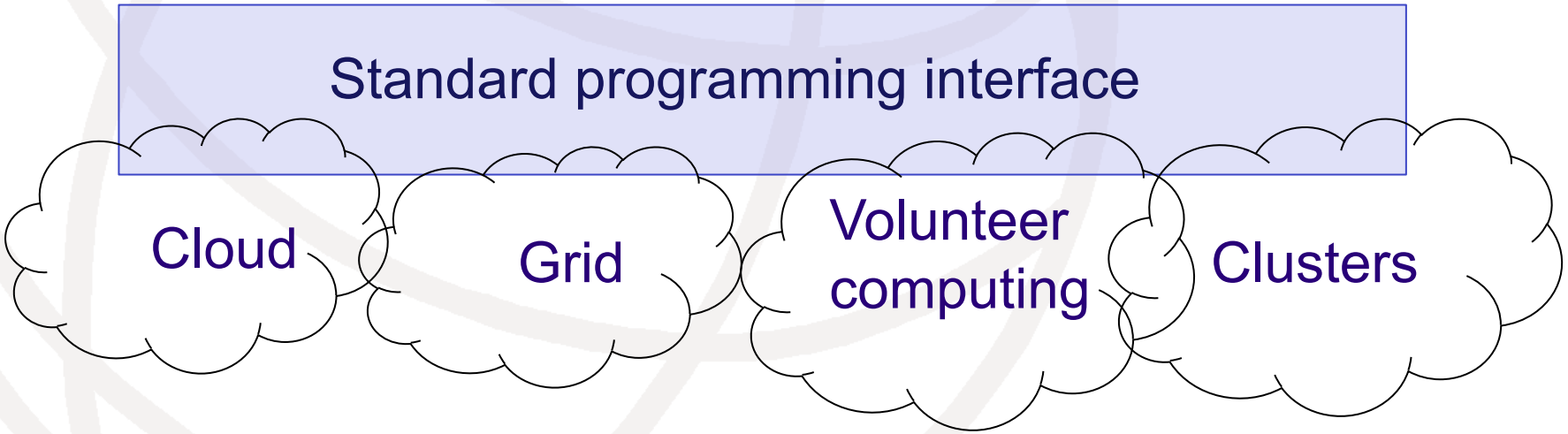
Learned lessons

- Nodes volatility
  - Workers are not dedicated to the volunteer platform
  - Administrated by IT support of different institutions
  - Workers are often disconnected
  - We have only 250 connected nodes (out of 500 computers)
- Resources required by jobs are often not supported by workers

I have a **dream …**



- Combine Cloud and Grid in order to:
  - Enable a stable HPC platform where some of the nodes are governed by our universities, some by cloud infrastructure
  - Take advantage of the HPC environments supported by Grid and VC middleware



The problem

Windows Azure

S M S C G

amazon web services

Venus-C

Virtual multidisciplinary EnviroNments USing Cloud infrastructures

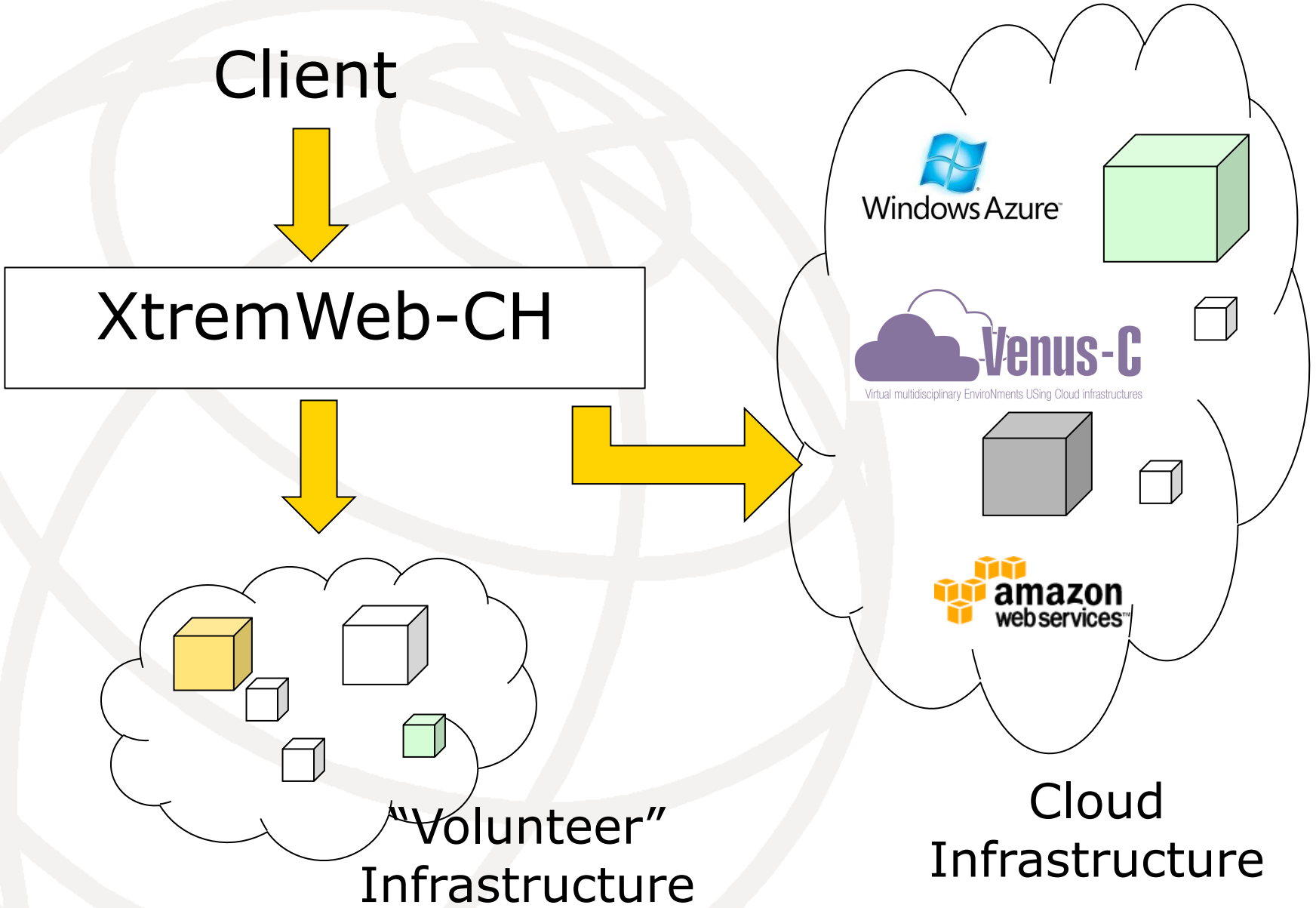
XtremWeb-CH

Towards a true P2P Computing Platform

openstack

EDGI

… and the solution



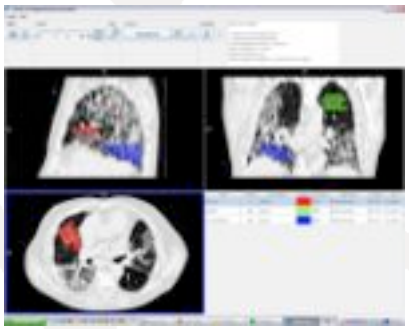
Applications

MetaPIGA : a robust implementation of several stochastic heuristics for large phylogeny inference.
Targeted domain : life science

Selector : Reconstruction of modern humans' prehistoric migrations in East Asia
Targeted domain : genetics

Applications

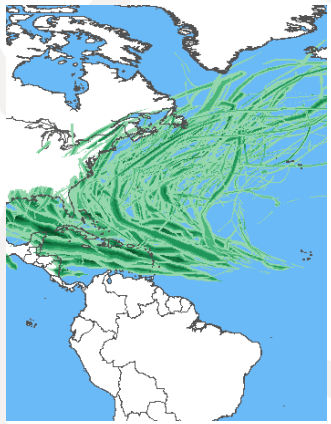
The Neurad software provides a fast and accurate evaluation of radiation doses (treatment of cancerous tumours).



Gift, a content-based image indexing and retrieval package.
Targeted domains: medicine and art.

Applications

CleanCity : to measure and analyse data related to air pollution in the cities
Domain : Environement (urban climate)



Cyclone : to analyse the risk of cyclones
Domain : Environement