

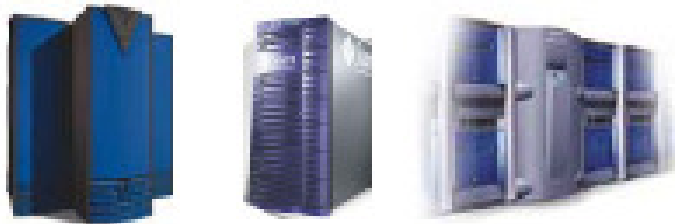
Plataformas de computação paralela e distribuída

- Execução eficiente de aplicações intensivas em dados ou computação
- Tipos de ambientes:
 - HPC (High Performance Computing)
 - HTC (High Throughput Computing)
- Exs de apps HPC: meteorologia, processamento matemático em geral
- Exs de apps HTC: HEP, bioinformática, finanças etc.

Tipos de plataformas

Tipos de Plataformas de Computación

NQE



Servidores SMP

Alternativas Centralizadas

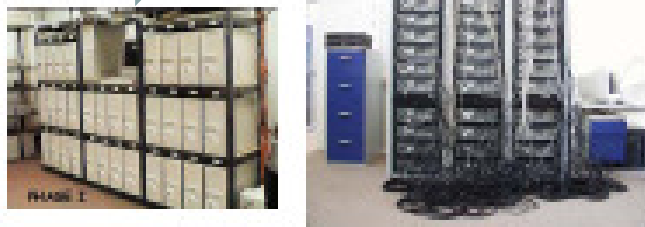


High speed networks
Servidores MPP

IBM sp2,
SGI Origin 2000
Beowulf clusters

More:
• Instruments
• BDs

PBS



Clusters dedicados

Alternativas Distribuidas



Clusters no dedicados

Condor

Exemplos de RMSs (Resource Management Systems)

Sistemas DRM

<i>Independent Suppliers</i>	<i>Open Source</i>	<i>OEM Proprietary</i>
<i>Platform Computing</i> LSF	<i>Altair</i> Open PBS	<i>IBM</i> Load Leveler
<i>Altair</i> PBS Pro	<i>University of Wisconsin</i> Condor	<i>Cray</i> NQE
	<i>Sun Microsystems</i> SGE	

Primeiro pequeno trabalho

- Pesquisa breve sobre RMS (Resource Management Systems)
- Submissão de alguns programas sequenciais utilizando PBS ou SGE
- Submissão de programas que utilizam MPI

What is a **grid**?

- The **infrastructure** used by utility companies to **distribute power** to its consumers.
www.borregosolar.com/resources/glossary.php
- A system of transmission lines which **interconnect** the generating stations and distribution centres of local **electricity** authorities.
www.ergon.com.au/energyed/glossary.asp
- A **distribution network**, including towers, poles, and wires that a utility uses to deliver **electricity**.
www.sunpowercorp.com/homeowners/solar_basics_glossary.html
- A **network of power lines** or pipelines used to move **energy**.
www.windustry.org/resources/glossary.htm

What is a computational **grid**?

- Originally used to denote a **hardware and software infrastructure** that enables applying the **resources of many computers** to a single problem.
- Now increasingly used to denote more broadly a **hardware and software infrastructure** that enables **coordinated resource sharing** within dynamic organizations consisting of individuals, institutions, and resources.

Sites of interest

- OGF, www.gridforum.org
- Links to grid projects and initiatives
 - Globus, www.globus.org
 - OSG, www.opensciencegrid.org
 - EGEE, www.eu-egee.org
 - EELA-2, www.eu-eela.eu
 - OurGrid, www.ourgrid.org
 - DEISA, www.deisa.org
 - EGI, www.eu-egi.org
 - Gridbus, www.gridbus.org
 - Grid Computing Info Centre, www.gridcomputing.com
 - GridCafé, www.gridcafe.org
 - ...

Main conferences and journals

- Grid Computing
- Super Computing
- High performance and distributed computing
- Cluster and grid computing
- Grid and Pervasive Computing
- Global and Peer-to-Peer Computing
- Journal of Grid Computing
- Journal of High Performance applications
- Journal of Parallel and Distributed Computing
- Concurrency and Computation: Practice and Experience

Research Challenges

- Applications
- Programming models and tools
- System architecture
- Algorithms and problem solving methods
- Resource management
- Data management
- Security
- Instrumentation and performance analysis
- End systems
- Network protocols and infrastructure

Fonte: [The Grid: Blueprint for a New Computing Infrastructure](#), by [Ian Foster](#) and [Carl Kesselman](#)

Why Grids?

- **Scientific:** allow coordinated and organized access to remote resources
- **Political (my own view):** allow coordinated and organized access to non-confidential and confidential data, justify investment on HEP
- **Social:** helps to fill the digital divide gap

History and Evolution of Grid

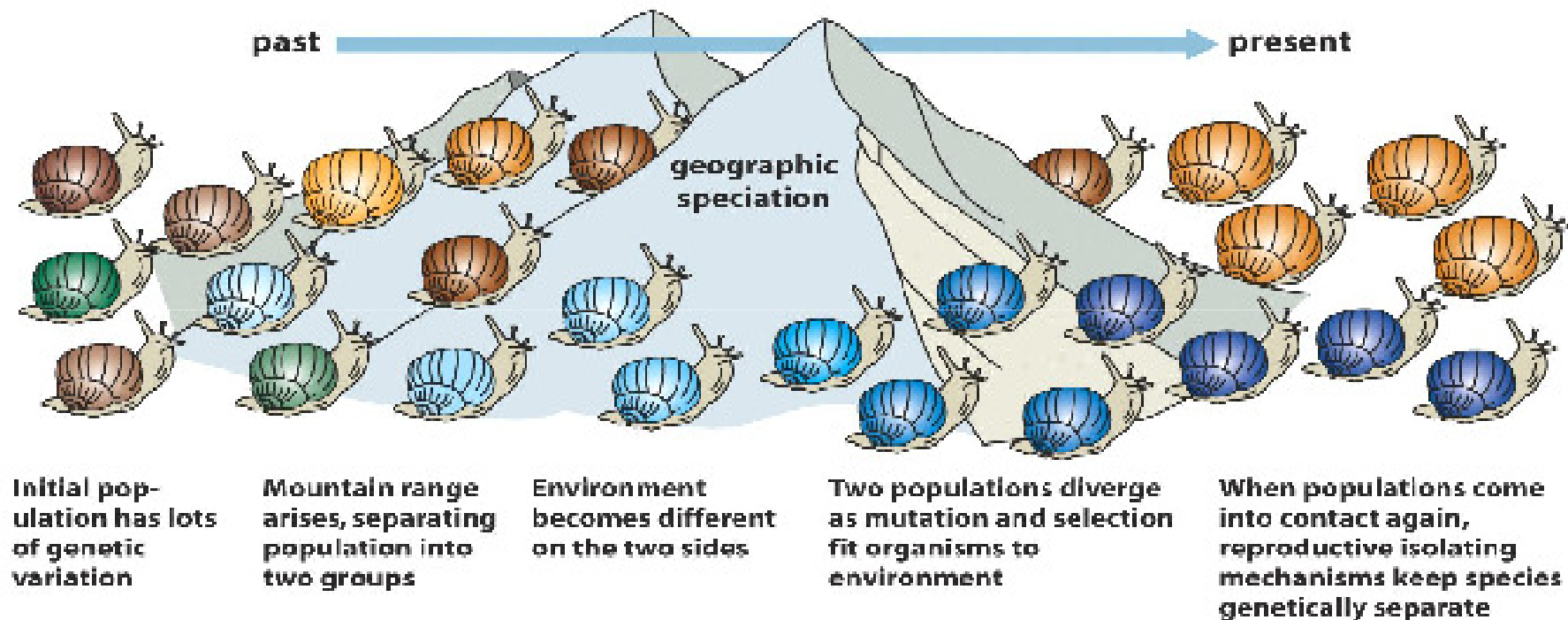


Figure 5-14 Biology Today, 3/e (© 2004 Garland Science)

History and Evolution of Grid

- **Early to mid 90s**: numerous research projects on distributed computing
- **1992** (Smarr and Catlett): **metasystem**
 - a transparent network that will increase the computational and information resources available to an application
- **1995**, I-Way
 - IEEE/ACM 1995 Super Computing (San Diego), 11 high speed networks used to connect 17 sites to create one super **meta-computer**
 - Foster, Nature, **12/2002**

History and Evolution of Grid

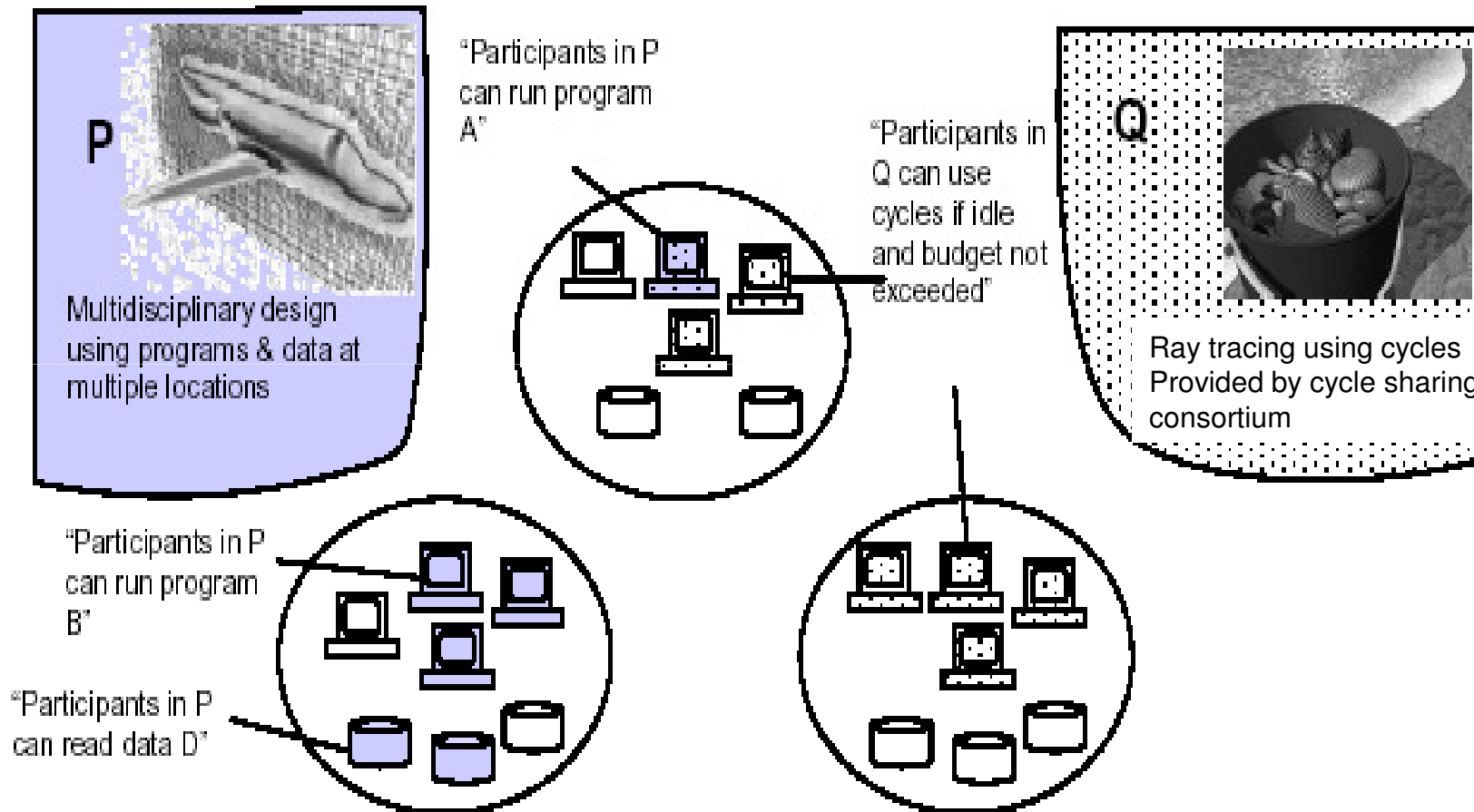
- **1996**, Globus project started (ANL & USC)
 - Followed I-Way
- **2002**, Open Grid Services Architecture (OGSA) was first announced during the Grid Global Forum (now Open Grid Forum)
- **July 2003**: first release of the Globus Toolkit using a service-oriented approach based on OGSA
 - Open Grid Service Infrastructure (OGSI)
- **Jan 2004**: WS-Resource Framework (WS-RF)
- **April 2005**: Globus Toolkit version 4

History and Evolution of Grid

- 1993, Legion (Univ of Virginia)
 - Comercial system became AVAKI Sep 2001
- 1997, Unicore (Germany)
- 2000-2006: The Grid Global Forum
- 2006-: Open Grid Forum

History and Evolution of Grid

The Emergence of Virtual Organisations (VO)



Source: "The Anatomy of the Grid", Foster, Kesselman, Tuecke, 2001

History and Evolution of Grid

The Emergence of Virtual Organisations (VO)

“A **virtual organization** (or company) is one whose members are geographically apart, usually working by computer e-mail and groupware while appearing to others to be a **single, unified organization with a real physical location.**”

(source: whatis.com)

History and Evolution of Grid

The Emergence of Virtual Organisations (VO)

- Sharing resources:
 - The degree of service availability – which resources will be shared
 - The authorization of the shared resource – who will be permitted
 - The type of the relationship - Peer to peer
 - A mechanism to understand the nature of the relationship
 - The possible ways the resource will be used (memory, computing power, etc.)