

*Project-Team Scilab**Equipe opérationnelle du consortium  
Scilab**Rocquencourt*

THEME 4A

The logo features the word "Activity" in a white serif font, with a large, stylized, light grey letter "A" to its left. Below this, the word "Report" is written in a white serif font, with a large, stylized, light grey letter "R" to its left. A horizontal white line is positioned between the "Activity" and "Report" text.

2003



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# 1. Team

## Head of project team

Claude Gomez [DR, Inria]

## Administrative assistant

Martine Verneuille [TRS, Inria]

## Staff member

François Delebecque [DR, Inria, part time]

Serge Steer [DR, Inria, part time]

## Senior technical staff

Hugues Perdereau

## Junior technical staff

Djalel Abdemouche

Vincent Couvert

## Project technical staff

Alan Cornet [since July 2003]

Olivier Huynh [since July 2003]

# 2. Overall Objectives

Scilab is a scientific software package providing a powerful open computing environment for engineering and scientific applications. Developed since 1990 by INRIA and ENPC, it is now maintained and developed by Scilab Consortium which was launched in May 2003.

Scilab project is not a “research project” but a “development project” at INRIA-Rocquencourt. It is the operational team of Scilab Consortium.

Scilab is distributed freely with the sources via the Internet since 1994, Scilab is currently being used in educational and industrial environments around the world.

Scilab includes hundreds of mathematical functions with the possibility to add interactively programs from various languages (FORTRAN, C, C++, JAVA...). It has sophisticated data structures (including lists, polynomials, rational functions, linear systems...), an interpreter and a high level programming language.

Scilab has been conceived to be an open system where the user can define new data types and operations on these data types by overloading operators.

A number of toolboxes are available with the system:

- 2-D and 3-D graphics, animation.
- Linear algebra, sparse matrices.
- Polynomials and rational functions.
- Mathematical functions.
- Simulation: ODE solver (ODEPACK) and DAE solver (DASSL).
- Scicos: hybrid dynamic systems (comparable to Simulink).
- Classic and robust control, LMI optimization.
- Differentiable and non-differentiable optimization.
- Signal processing.
- Metanet: graphs and networks.
- Parallel Scilab using PVM.
- Statistics.

- Interface with Computer Algebra (Maple, MuPAD).
- Interface with TCL/TK.
- And a great number of contributions for various domains.

Scilab works on most UNIX systems including GNU/Linux and on Windows 9X/NT/2000/XP. It comes with source code, on-line help and English user manuals. Binary versions are available.

Web site: <http://www.scilab.org>

Newsgroup: `comp.soft-sys.math.scilab`

Contact: `Scilab@inria.fr`

## 3. Scientific Foundations

### 3.1. Scilab Consortium

Scilab Consortium has been created in May 2003. Today there are 13 members: APPEDGE, AXS INGENIERIE, CEA, CNES, CRIL TECHNOLOGY, DASSAULT-AVIATION, EDF, ENPC, ESTEREL TECHNOLOGIES, INRIA, PSA PEUGEOT CITROËN, RENAULT and THALES. The purpose of Scilab Consortium is:

- To organize cooperation and exchange within the community of developers in order to make Scilab a platform which integrates the latest scientific advances in the field of numerical computation.
- To organize cooperation and exchange within the community of users in order to make Scilab a product that meets specifications required for use in industrial, educational and research environments.
- To obtain the resources necessary to maintain a team committed to editing new versions of the software which meets specified standards, encourage the community of developers and ensure first level support for users.

The Consortium is chaired by Professor Alain Bensoussan, former Chairman of INRIA, CNES and European Space Agency Council.

The main parts of the Consortium are:

- The *Conference of Participants* elects the persons taking part to the Steering Committee and to the Scientific Board and decides any other matter proposed for the agenda by the Steering Committee. The participants can take part to working groups. The purpose of working groups is to help and prepare the decisions of the steering committee. There are three working groups: on Scilab licence, on Scilab promotion and for the international development of Scilab.
- The *Steering Committee* is the decision-making body representing the Consortium's Conference of Participants.
- The *Scientific Board* analyses the scientific value of contributions and previews the scientific value of developments to be carried out.
- the *Operational Team* described below.

## 3.2. Operational Team

The Operational Team implements the decisions of the Consortium about Scilab development and promotion. It is the “Scilab development project” at INRIA-Rocquencourt.

The team is organized as follows:

- The Chief Technology Officer who manages the operational team: Claude Gomez.
- The Quality Assurance Manager who monitors and enhances quality assurance processes used in development and maintenance of Scilab: Hugues Perdereau.
- The Contributor Network Development Manager who monitors and solicits contributions, coordinates and develops the Contributor community and serves as the point of contact for the various bodies for information regarding Accepted Contributions: François Delebecque.
- The Product Manager who is responsible for product policy for Scilab software: Claude Gomez.
- The Development Manager who coordinates the Development Team: Serge Steer.  
The Development Team, tasked with developing or delegating the development of new functions or enhancement of existing features, evaluating new contributions in collaboration with the Scientific Board for purposes of their acceptance, and to compile and distribute subsequent versions of the Scilab software. It is compound by:
  - Djalel Abdemouche.
  - Allan Cornet.
  - Vincent Couvert.
  - Olivier Huynh.

# 5. Software

## 5.1. Scilab Development

The Scilab development is based on a management plan and a quality policy. We describe below :

- The management plan.
- The quality assurance plan.
- The bug tracking policy.
- The qualification procedure and the qualification environment.

**The management plan** A management plan has been written and diffused to the Steering Committee of the Consortium. This document gives the general rules that the operational team sets up for the realization of the development of Scilab software within consortium framework.

- Operational organization and regular check (team organization, responsibilities, meetings, etc.)
- Road map proposal (calendar and dead-line).

**The quality assurance plan (draft version)** This document gives the general rules that the operational team sets up for the management, the development, the qualification, the diffusion and the maintenance of Scilab software.

- Quality plan (organization and follow-up).

- Cross procedures to the Scilab activity (documentation management and configuration management).
- Qualification procedure (process, referential, non-regression and implementation).
- Management procedure of the technical requests (bugs management, means, etc.).

The bug tracking policy The choosen policy is to have a complete tracability of all the Scilab bugs and requests. In order to respect the policy, an open source tool (Bugzilla) has been modified and installed to manage and track the Scilab bugs and the Scilab requests (see below the description of the bug tracking system).

The qualification procedure and the qualification environment Scilab team has defined and installed a qualification procedure and related environment to ensure the internal acceptance of the scilab software.

This procedure is based upon a reference scale of qualification. Each step of this scale is composed of critical elements and information elements:

- critical elements generally correspond to tests which must be successfully passed to achieve acceptance,
- information elements corresponds to others tests, documentation checking, etc.

This provides not only criteria for classical acceptance but also thorough information on the final state of the scilab product version to be described in “released notes” document as well as known by support team prior to external delivery.

The used methodology should be answer to the constraint of a software product:

- large diffusion
- heterogenous target machine
- regular delivery (major or minor releases)

## 5.2. Technical support

- System migration.
  - We have moved the ftp, Web and CVS server from an old Unix machine into a new Linux server.
- Technical support daily activities.
  - Answering emails coming from Scilab users and forwarding the emails to the Scilab experts in cas of specialized problem.
  - Filtering and deleting spam emails by using procmail software.
  - Storing scilab bug-reports into a text file.
  - Managing the bugzilla system and the database.
  - Administrating the CVS server, managing the users, and access.
- Scilab Website
  - Manage and update Scilab website <http://www.scilab.org>.



- **Bugzilla:** a bug tracking system for Scilab  
In addition to the Scilab newsgroup, providing a wealthy Scilab software knowledge database, the Scilab development team proposes on Scilab website the Scilab bugs tracking system, a bugzilla-based system. It is a centralized web-database tracking system for Scilab bugs and Scilab requests. This tool allows to share and take advantage of the experiment of the Scilab community (developers and users). Now, each user, after creating an account, can:
  - create a new bug report or a new request,
  - give an attached file reproducing the defect and/or advising a workaround,
  - make a search in the bugs database or requests database,
  - find an existing patch for a registered bug.

### 5.3. Windows Version

This section describes the developements made for the Windows Scilab release.

- Integration of the Scilab software to the Windows environment by modification of the GUI to have the Windows look and feel:
  - Files association with Scilab.
  - Rewriting of dialogues boxes.
  - Management of the menus (French and English).
  - Command Window for interactive exploration and development.
  - Command History for recording the running history of interactive Scilab sessions.
  - Better integration of Scipad editor.
- Transcription of all the Unix Makefile's towards the Visual Studio .NET enviroment:
  - Improvement of the performances of the Windows version.
  - Optimization for various processors.
  - Improvement of the stability.
- Creation of examples of interfaces of the Scilab DLL with various programming languages such as Java, Borland C++, C#.
- Integration of a free embedded compiler C in Scilab so that Scilab be autonomous to generate code C.

### 5.4. New Object Oriented Graphics

Even if SCilab graphics is quite powerful, users complains in particular about the graphics functions syntax and the poor customization tools available. The conception of this graphic does not allow to make it evolve enough. A new entity oriented graphics has been built. To ensure backward compatibility the old graphic has been maintained.

In the new mode, each graphics window and the drawing it contains are represented by hierarchical entities. The hierachy top level is the "Figure". Each Figure defines at least one child of type "Axes". Each Axes entity contains a set of leaf entities which are the basic graphics objects like Polylines, Rectangles, Arcs, Segs, ...It can also contain "Agregation" entities which are recursive sets of entities.

Graphics entities are associated to Scilab variables of type handle. The handle is a unique identifier which is associated to an instance of an entity. Using this handle, it is possible to control the properties of the entities

using the “set” and “get” functions. The handles are also used to manipulate graphics objects, to move them, to make copies or delete them. The main interest of the new graphics mode is to make property change easier and to avoid cumbersome list of arguments in the graphics function calling sequence to set the properties.

This year work was devoted to complete this new graphics mode and its documentation. The focus was on the clipping, the axes graduations and gridding, the handling of multi-axes figures and overall on the 3-D world. The Axes entity has been extended to be able to handle both 2-D and 3-D worlds. The 2-D basic objects have been extended to 3-D and the development of 3-D plots merge with respect to hidden faces has begun. All these developments make possible to set the new graphics mode as default graphics mode in next Scilab-3.0 version.

## 5.5. Matlab To Scilab Conversion Toolbox

Since Scilab 2.6, a toolbox which can convert Matlab M-files to Scilab was distributed as a Scilab toolbox. Called initially “mfile2sci”, it is now called “M2SCI” and is part of Scilab software in Scilab CVS version.

Work on M2SCI can be split into two steps:

- Tests and validation of existing CVS version.
- New M2SCI version development.

First work for M2SCI was to build a set of tests to validate Matlab to Scilab existing mfile2sci. These tests verify that every Matlab function call is well converted to Scilab and that execution of translated script gives the same result (taking machine accuracy into account). For each Matlab function, a test file is written or generated (for numerical functions). This test file is then converted to Scilab using mfile2sci and finally Matlab and Scilab results are compared. This function conversion is validated once conversion goes well and that results are similar. This work allowed us to fix some bugs and to evaluate main difficulties for future M2SCI development. All these test sequences will be integrated in Scilab tests when qualifying a new Scilab version.

During this test period, a Matlab/Scilab function dictionary as been written. It allows to get a Scilab (respectively Matlab) equivalent for a Matlab (respectively Scilab) function and to have their main differences (parameters order, particular cases...). This document is available in PDF and HTML formats.

After this work, it seemed that writing new conversion functions should be difficult for a lambda user:

- conversion instructions and code generation were imbricated,
- mfile2sci() used lists sometimes very complicated.
- ...

Then we decided to write a new M2SCI version (which will be included in Scilab 3.0). This new M2SCI must be easier to understand for a user who will be able to write new conversion functions in an easy way. M2SCI works now on a Scilab tree (actually an overlap of tlists).

The main components of this new version are:

- M2SCI kernel functions.
- Matlab function call conversion functions.
- Emulation functions.
- Help files.

M2SCI kernel modifies M-file so that it can be read by Scilab interpreter. Then M-file is converted to an instruction tree which is the base for Matlab to Scilab conversion. Using appropriate conversion function, Matlab instruction is ported to Scilab. While converting, if inferred data do not give enough informations for converting Matlab instruction to Scilab instruction, instruction is replaced by a Matlab emulation function (`mtlb_<function-name>`) which will evaluate input parameters while executing result script. The user can find replacement possibilities for this non-optimized conversion by consulting corresponding the help file.

Future steps for M2SCI are:

- Writing a user and developer documentation.
- Improve new Matlab data types conversion (cells, structs...).
- Complete the set of conversion functions (mainly for graphics functions).
- ...

## 5.6. Other Developments and Support

The `diary` (used to rule the generation of session traces) and `history` tools, have been improved and rewritten in C.

Scilab has been adapted to Itanium IA64 architecture.

Little syntax, adaptations have been made to make the Matlab to Scilab translator work easier.

Developments were done to improve the use of Scilab as a computational engine in a JAVA environment.

Beyond its activity of development, the project brings its supports with the users. These relations with the users are a good way to improve the quality and the usability of the software.

## 5.7. Contributor Depository

A new contributor depository is currently be designed. The goal is to facilitate the task of potential contributors by providing advices and guidelines for contributions and managing existing contributions.

# 7. Contracts and Grants with Industry

## 7.1. Scilab Consortium

The main funding of Scilab project comes from the dues given by the members who subscribe to Scilab Consortium.

## 7.2. Consortium

- Claude Gomez: assembly of Consortium participants, steering committee, 16 May 2003.
- François Delebecque, Claude Gomez: scientific board, 3 November 2003.
- Claude Gomez: steering committe, 5 november 2003.

# 8. Other Grants and Activities

## 8.1. National Actions

- Participation to Salon Solutions Linux 2003, Paris, 4–6 February 2003.
- François Delebecque: co-organizer of the seminar about Scilab and teaching at ENPC, Marnes la Vallée, 15 October 2003.
- Scilab presentation by Consortium Members, Centre de conférences Etoile Saint Honoré, Paris, 5 November 2003.

## 8.2. International Actions

- Claude Gomez: visit to China (LIAMA, CAS, MOST), 12–19 March 2003.
- Claude Gomez: visit to Japan, 24–28 November 2003.

## 9. Dissemination

### 9.1. Scientific Committee Activities

- Claude Gomez: RNTL evaluator

### 9.2. University Teaching

- Claude Gomez
  - Ecp: Dynamical Systems, 3rd year.
  - Pulv: Computer Algebra, Post Graduate.

### 9.3. Examination

Claude Gomez: Member of the board of examiner of "Aggrégation de Mathématiques" in MOROCCO

### 9.4. Member of thesis committee

- Claude Gomez: for thesis defense of M. Picard, Ecp, 29 January 2003.

### 9.5. Participation à des colloques, séminaires, invitations

- Claude Gomez: presentation of Scilab, INRIA-Industrie seminar about transportation, INRIA-Rocquencourt, 16 January 2003.
- Serge Steer, Hugues Perdereau: Presentation of Scilab and Scilab Consortium, "Journée LMCS - IFP", Rueil, 25 April 2003.
- Claude Gomez, Serge Steer: "Scilab/Scicos, un environnement libre pour le calcul scientifique", Rencontres IRISA-Tech, Rennes, 20 June 2003.
- Claude Gomez: "Scilab: un software libre de cálculo científico para la Industria y la Educación", LACFREE 2003, Cusco, Peru, 11–13 August 2003.
- Claude Gomez, Serge Steer: Presentation of Scilab and Scilab Consortium at the group "Outil de conception et simulation", CNES, Toulouse, 25 September 2003.
- Claude Gomez: presentation of Scilab at the 10th anniversary of Liapunov Institute, Moscva, Russia, 06–08 October 2003.
- Claude Gomez: presentation of Scilab at SMAI seminar "Réflexion sur les logiciels : valorisation et diffusion de logiciels, les grands challenges applicatifs", INRIA-Rocquencourt, 9 October 2003.
- Serge Steer: Presentation of Scilab/Scicos and Scilab Consortium at INRIA Rhône Alpes, Grenoble, 24 November 2003.
- François Delebecque, Claude Gomez: Presentation of Scilab and Scilab Consortium at LAAS, Toulouse, 19 November 2003.
- François Delebecque, Claude Gomez, Serge Steer: Scilab workshop in Xi'an, 1–3 December, Xi'an, China.