

Belgian Institute for Space Aeronomy (BIRA-IASB)

SPENVIS

Space Environment Information System

Software User Manual

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This document follows the PSS-05 Software Engineering Standards defined by ESA Board for Software Standardization and Control [1].

Abstract

The ESA Space Environment Information System (SPENVIS) is a web-based interface for assessing the space environment and its effects on spacecraft systems and crews. The system is used by an international user community for various purposes, e.g. mission analysis and planning, educational support, and running models for scientific applications. The system also includes extensive background information on the space environment and the environment models. Since 1996 the development of SPENVIS is achieved by the Belgian Institute for Space Aeronomy (BIRA-IASB) under the management of the European Space Research and Technology Centre (ESTEC).

This Software User Manual (SUM) explains the usage, installation, configuration and management of the software system developed in the project “Development of a 3-D Analysis Tool for the Space Environment Information System (SPENVIS)”, short SPENVIS-4 [2]. This document also describes how third-party developers can use the system to implement new models.

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1 Introduction

SPENVIS is a WWW based tool providing space engineers and scientists with information on the space environment and its likely effects on space systems. SPENVIS generates spacecraft orbits and then evaluates the orbital environment for a specified mission. The WWW interface allows easy navigation between models, user input, graphical and textual results, extensive help and background information.

1.1 Purpose and Audience

This document fulfils the documentation requirements of the “Guide to Applying the ESA Software Engineering Standards to Small Software Projects” BSSC(96)2 [3] of the project “Development of 3-D Analysis Tools for the Space Environment Information System” called hereafter SPENVIS-4. Structure and content were derived from the ESA PSS-05-0 standard [1]. This document is part of the entire SPENVIS-4 project documentation.

This document addresses three kinds of SPENVIS users:

1. normal users,
2. operators at the server side, and
3. third-party developers.

The following text is ordered in three bigger sections, each describing the necessary knowledge for the respective reader group.

1.2 Related Documents

SPENVIS-4 required documentation items are:

1. User Requirements Document (URD)
2. Software Specification Document (SSD)
3. Software Quality Plan (SQP)
4. Acceptance Test Specification (ATS)
5. Software Transfer Document (STD)
6. Software User Manual (SUM, this document)
7. Project History Document (PHD)

The SUM describes the implemented software product, which was outlined in the User Requirement Document and the Software Specification Document.

The SUM has a very close relation with the Acceptance Test Specification and the Software Transfer Document, which document the transfer process of the completed software product into operation.

2 SPENVIS Usage

This first chapter of the SUM is intended of the normal users, i.e. for scientists, engineers and all other people interested in using the Space Environment Information System (SPENVIS).

2.1 Using SPENVIS via the WWW

SPENVIS can be accessed via the web-link: <http://www.spervis.oma.be/>.

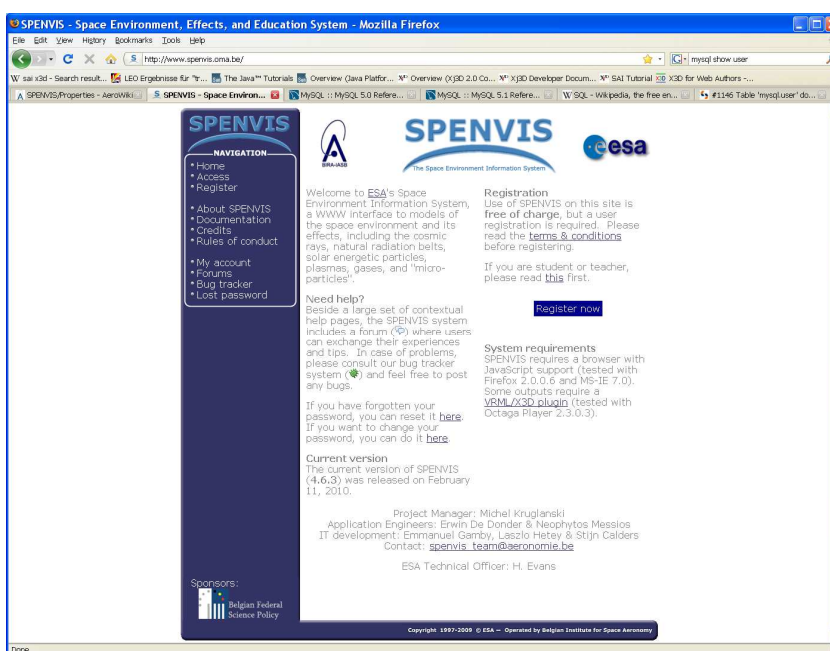


Figure 1 Screenshot of the SPENVIS Homepage (accessed: 25.2.2010)

2.1.1 Requirements

Following hard- and software is required to **USE** the SPENVIS system:

- **Graphical desktop computer environment**
- **Mozilla Firefox v.3.0+** or **Internet Explorer v.5.0+** web-browser software
- **Vivaty Player** or **Octaga Player v. 2.3.0.3** (not mandatory, used for 3D VRML visualization)
- **Java Web Start v.1.6.0** framework including OpenGL support (not mandatory, used for the geometry definition tool)

2.1.2 Registration

In order to use SPENVIS each new user first needs to register by filling a basic questionnaire. Therefore, follow the link “Register” on the top left side of the SPENVIS home page, shown in Figure-1. E-mail addresses should be linked to your affiliation, in particular hotmail, yahoo and similar accounts are not allowed. When filling the registration form you **need to read and accept** the “**Rules of Conduct**” and the “**Terms and Conditions**”, see Appendix-B. The SPENVIS service is free of charge for educational purposes in ESA member states.

The registration process is handled automatically and should be processed within one working day. Once a new user has received his password he can login into the system by following the link “Access” on the top left side of the SPENVIS home page, shown in Figure-1.

Following information need to be supplied in the registration form:

- Username
- Email
- Title (Mr., Mrs., Ms., Miss, Dr., Prof.)
- First name
- Last name
- Phone number (voluntary)
- Fax number (voluntary)
- Affiliation
- Affiliation type (commercial firm, government, military, university/institute, unknown)
- Affiliation URL
- Country
- I know about SPENVIS from
- I intend to use SPENVIS for

In case information (email, affiliation, user level) changed the user can update his settings following the “My account” link shown in Figure-1. The “My Account” page is shown in Figure-2.

2.1.4 Information for Students and Teachers

SPENVIS allows also students to perform model simulations. In order to facilitate and promote the use of SPENVIS in educational programmes, specific student accounts have been introduced. The SPENVIS student accounts should be requested by the teacher or a representative of the educational institution. Each

student will get his own SPENVIS account with access to the full SPENVIS features. A specific console allows the teacher to manage the student accounts.

Students should contact their teacher about a SPENVIS student account. Teachers can contact the SPENVIS team (spenvis_team@aeronomie.be) to request student accounts. Please do not forget to include:

- the title of the class or lecture for which you plan to use SPENVIS
- a short abstract or a web link describing the content of this class
- an estimate of the numbers of students
- the normal period and duration of the class (e.g. 2 months a year)
- the name of your SPENVIS account

Detailed information can be found at: <http://www.spenvis.oma.be/student.php>.

Managing Student Accounts

When teachers receive an account for managing students their “My Account” page will have an additional link to the “My Students” page, see Figure-2.

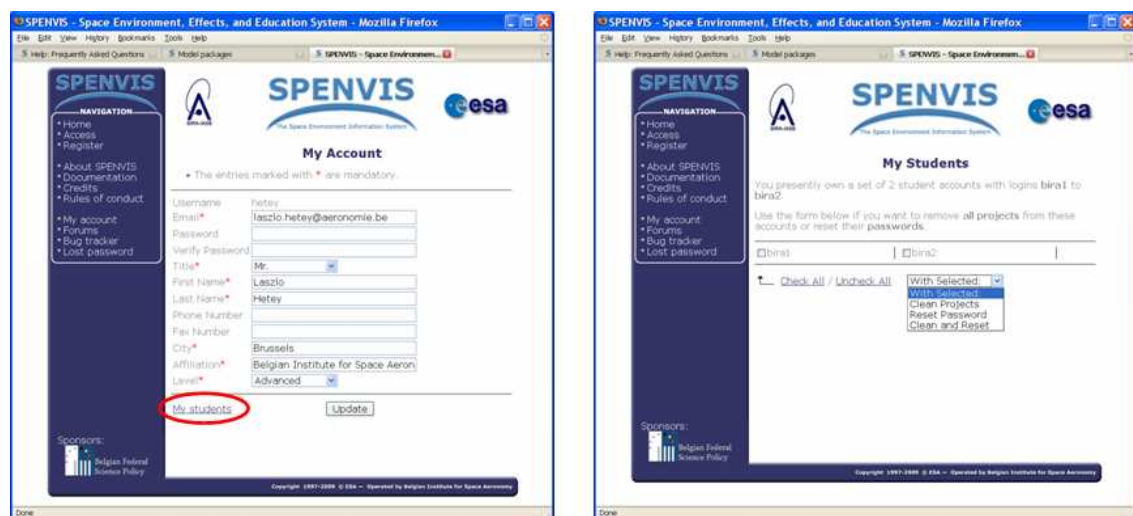


Figure 2 “My Account” and “My Students” Pages (accessed: 19.3.2010)

In this example the teacher has two students: bira1 and bira2. The teacher can select individual students and:

- Clean the project
- Reset the password
- Clean the project and reset the password

Students can then login to SPENVIS with the given username (bira1, bira2, ...) and the password provided by the teacher.

2.2 Using SPENVIS on a local System

Using SPENVIS on a local system allows working without having an internet connection. To achieve this a web-server with the SPENVIS software has to be setup on the local system. The local SPENVIS version can be delivered in two flavours: as single-user or as multi-user.

2.2.1 Requirements

Following resources are required to **INSTALL** the local SPENVIS system:

- **Graphical desktop computer environment** with standard x86-compatible or x86-64 with Intel VT or AMD-V processor, Processor speed 1.3 GHz or faster, 25 GB free disk space and at least 1 GB memory (RAM)
- A valid **SPENVIS account** (see 2.1.2)
- **IDL 7.0** runtime license
- **SPENVIS local package** (DVD with installation manual)
- **VMware Player** 3.0 freeware virtualization software, see below

2.2.2 VMware Player Visualization Software

The local version of SPENVIS is delivered as a virtual machine on MS-Windows. The delivered system is already compiled and correctly configured. The user only needs to install the embedding software (VMware Player) and to load the virtual machine. VMware Player can be downloaded from:

<http://www.vmware.com/products/player/>



Figure 3 VMware Player Visualization Software

After the installation the program looks as shown in Figure-3.

2.2.3 Configuration

- In order to run SPENVIS the delivered system needs to be uncompressed from the DVD and stored to a local hard drive.
- In a second step the hosts file is adapted: add the IP-address of the local SPENVIS version to the hostfile, see Appendix-C.
- No additional installation or configuration is required as the virtual machine is an already running Linux system.

2.2.4 Launch and Access the SPENVIS System

Following the link “Open a Virtual Machine” in the VMWare-Player and opening the file spenvis*.vmx will load the SPENVIS system.

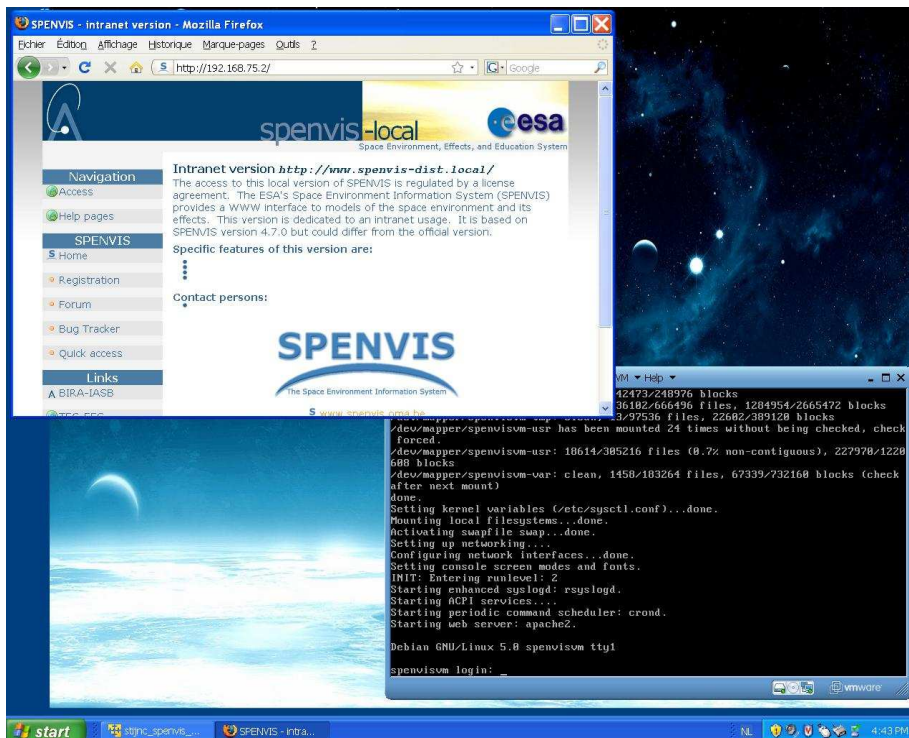


Figure 4 MS-Windows Desktop Environment showing the local SPENVIS Server inside VMWare Player and an Internet Browser accessing SPENVIS

Figure-4 shows the functionality of the local SPENVIS system. The local web-server with SPENVIS runs as a virtual machine inside the VMware-Player. The user only has to open an internet browser and to access the

default site: <http://192.168.75.2>, as shown in the figure. This address may be changed in the VMWare-Player configuration.

2.2.5 Updating SPENVIS

See the documentation attached to the DVD.

2.3 SPENVIS Projects and Quotas

2.3.1 The Project Concept

At the heart of SPENVIS is the project concept. A project is defined as the collective input to and output from the SPENVIS system for a series of related runs. The physical representation of a project is a sub-directory on the storage of the computer system running SPENVIS. In this sub-directory, all the input parameters are stored, together with all output files generated by the system. This means that all the input and the output of a run are conserved, so that an analysis can be performed over more than one session.

2.3.2 Project Management

To work with SPENVIS, at least one project has to be defined. This is done at the project management page, see Figure-5. Every new project will have a name and a title and optionally an abstract.

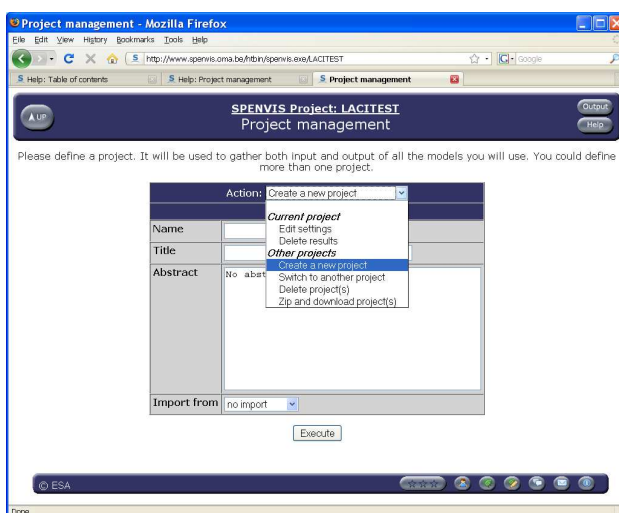


Figure 5 Screenshot of the SPENVIS Project Management Site (accessed: 3.3.2010)

Following options are provided for the current project:

- Change current project settings
- Delete current project results

Following options are provided for other projects:

- Project creation
- Project switching
- Project deletion
- Zip and download projects

2.3.3 Account Management

Because of the complexity of the models and simulations, a number of features and options in SPENVIS are restricted to advanced users. The user can change his level and other account settings using the account management page (how to access this page is explained in section 2.4.1), see Figure-6.

Figure 6 The Account Management Site (accessed: 3.3.2010)

The most important settings are:

- Email address
- Password
- Level: (Normal, Advanced)

2.3.4 User Quotas

Each user can create new projects and save his simulation results. Some analyses require larger amount of disk space. By default each user has following quotas on the SPENVIS (version 4.6.3) server:

- Disk space: 400 MB
- CPU time per model run: 150 seconds
- Number of projects: 2

The number of projects allocated to a user is limited (two by default). Once the maximum number of projects has been reached, no new projects can be created without deleting an existing project. In order to free disk space the user can zip-compress and download a project. Users can always ask the SPENVIS team (spenvis_team@aeronomie.be) to increase their user quota.

2.4 User Interface

The SPENVIS user interface allows comfortable project navigation. Apart from the SPENVIS core system, this section also describes the SPENVIS help, the Forum and the Bug-Tracker.

2.4.1 General Navigation

Figure-7 explains the options of the SPENVIS user interface. On top of every page is a blue stripe for the project navigation with following functionality:

- The underlined title is actually a HTML-link which leads to the **Project Management**, see section 2.3.2.
- Using the button “UP” the user can always step to the **Model Packages** page, see section 2.4.2.
- The button “Output” leads to the **Output** page summarizing all previous results (figures, tables, export files), see section 2.4.4.
- Pressing the button “Help” will open the contextual **Help**, see section 2.4.5.



Figure 7 SPENVIS User Interface explained

The user interface is made consistent for all implemented models. The user has to enter model parameters and then execute the model by pressing “Run”. Depending on the model the user input can be spread over several HTML-pages. By pressing “Reset” all parameters on the current page are set back to their default values. In Figure-7 are the “Trapped radiation models” shown which are part of the “Radiation sources and effects” model collection.

At the bottom of every model page is another blue stripe for the SPENVIS system navigation. It provides links to:

- **Announcements** listing new features of releases and other information
- **User settings** which show the settings of the user **My Account**, see section 2.3.3.
- **Bug list** is a link to the Bug-Tracker and opens an overview list, see section 2.4.7.
- **Bug report** opens the form to report bugs (also part of the Bug-Tracker)
- **Forum** is a link to the SPENVIS Forum, see section 2.4.6.
- **Contact** will open a HTML page for sending an email to the SPENVIS team.

2.4.2 Model Package Page

After login the user is guided to the “Model Packages” page, except when no project has been defined previously. This is the lowest level of the SPENVIS interface hierarchy. The models are grouped in packages, see Figure-8. The user will be forwarded to a model parameter page by clicking on one of the provided links.

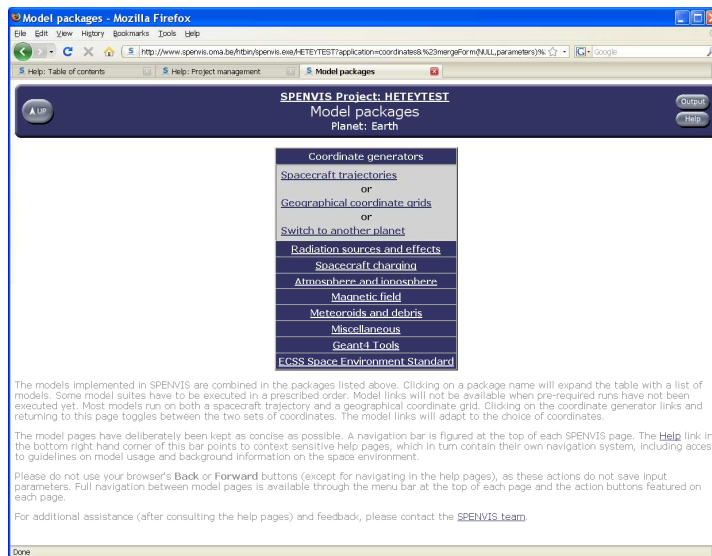


Figure 8 SPENVIS Start Page after Login with “Model Packages” (accessed: 3.3.2010)

The model packages and coordinate generators will be described in section 2.5. Other packages are:

- **Miscellaneous** with satellite observation data (GEOS5-12, Meteosat, Mir, ...), satellite illumination models, coordinate transformations and others
- **Geant4 Tools** as Mulassis, GEMAT, SSAT, interface for user defined materials, ect.
- The **ECSS Standard** as described in section 2.4.8

2.4.3 Model Pages

The model pages guide the user through the correct use of the models. One or more model parameter pages help the user to input the model parameters, and the model result page summarise the outcome.

Model Parameter Page

For every model there is at least one “Model Parameter” page for inputting model parameters. SPENVIS supplies reasonable default values as shown in Figure-9.

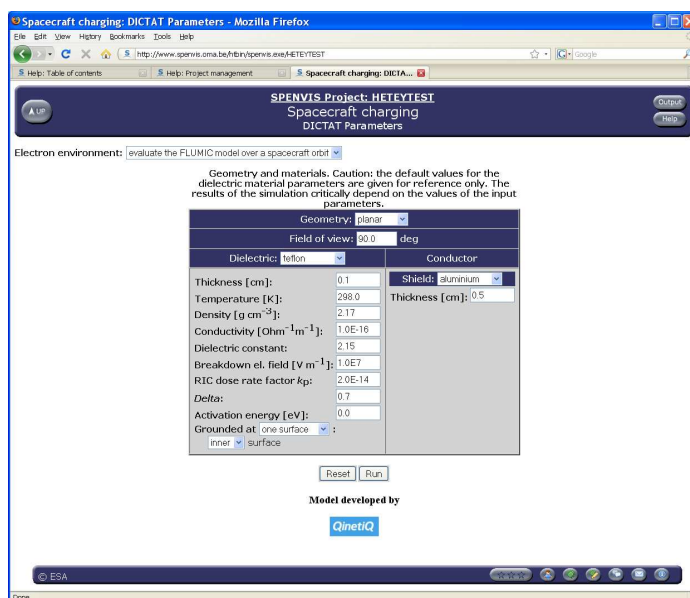


Figure 9 DICTAT Model Page with default Parameters (accessed: 3.3.2010)

The model is then executed by pressing the “Run”-button. The input parameters will be saved for a later resubmission. Pressing “Reset” will restore the original default values.

Model Result Page

When the model was correctly set up and executed, SPENVIS will generate results in the the “Model Result” page, see Figure-10.

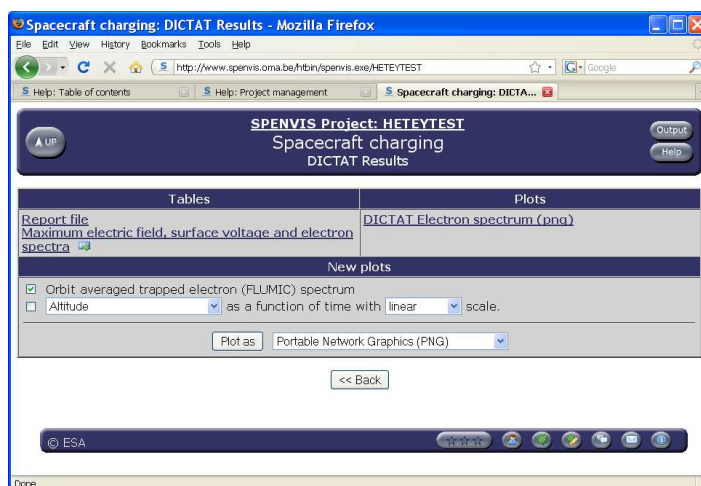


Figure 10 “Model Result” Page (accessed: 3.3.2010)

Tabulated results can be accessed in the “Tables” section and figures are provided in the “Plots” section. New plots can be generated by pressing “Plot as”. Result plots can be generated in various formats: png, gif, jpeg, tiff, ps, eps, cgm, bmp.

2.4.4 Model Output Page

The model output page summarizes the results of all previously executed models, see Figure-11.

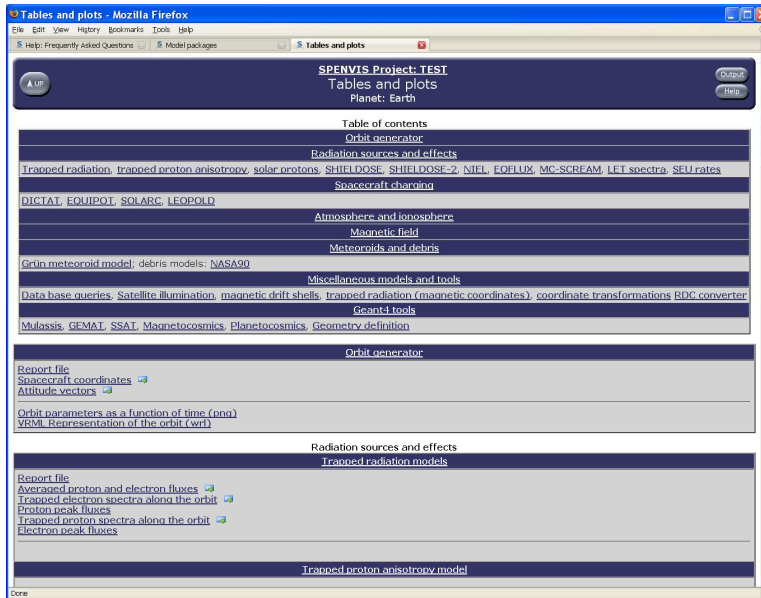


Figure 11 “Model Output” Page (accessed: 19.3.2010)

This page is very helpful to retrieve the results of an analysis which was done some time ago. But always keep in mind that all results will be deleted once a planet is changed or the orbit is changed to a grid.

2.4.5 Help System

The SPENVIS help is provided via static HTML-files. Figure-12 shows the start page of the help with the table of contents.



Figure 12 SPENVIS Help: Table of Contents Page (accessed: 25.2.2010)

Navigation within the help is provided by links and the “Table of contents” box, which is present on top of every help page. The help is organized according to the structure of the SPENVIS system. The site following the link “Model packages” describes the coordinate generators and all model packages of sections 2.4.2 and 2.4.3. Other useful features are the glossary and frequently asked questions (FAQ).

2.4.6 SPENVIS Forum

The SPENVIS Forum, shown in Figure-13, is the place to discuss problems and features of the software. Knowledge can be gained by reading through previous discussions.

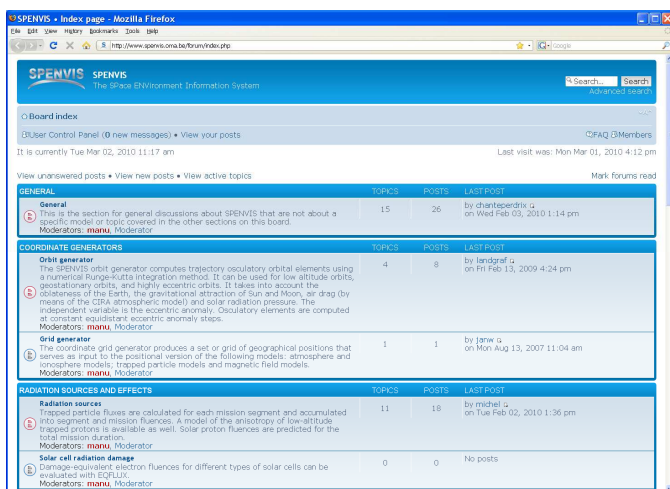


Figure 13 SPENVIS Forum (accessed: 25.2.2010)

The Forum is organized according to the structure of the SPENVIS system in sections (General, Coordinate Generators, Radiation Sources and Effects, ...). Every section contains a list of discussion topics, ordered by the date of the latest discussion update. More information about the Forum can be found in the FAQ-section, which can be accessed by following the web-link on the upper right corner.

2.4.7 BugTracker

The Bug-Tracker, shown in Figure-14, provides an interface to report bugs. But not every reported issue in the database is a bug. Often results were interpreted wrongly or the bug was actually a feature.

ID	#	Category	Severity	Status	Updated	Summary
0000113	1	Package: Magnetic Field	minor	resolved (Michel Kruglanski)	2010-03-01	idi plot fails
0000112	2	Package: Atmosphere and Ionosphere	minor	new	2010-03-01	solar activity factor IRI-2001
0000111	2	System: Documentation	minor	resolved (Michel Kruglanski)	2010-03-01	Broken links
0000110	2	Package: Geant4 tools	minor	resolved (Michel Kruglanski)	2010-02-26	plotting of rigidity cut off should ignore the "bad data" points
0000109	2	Package: Single Event Effects	minor	new	2010-02-24	letorb for line 386: use of dipole radius in FACSHADOW, rather than xic radius &
0000107	1	Package: Single Event Effects	crash	resolved (Erwin De Donder)	2010-02-22	UPSET crashes with SIGINT error when He->U specified, instead of H->U.
0000104	1	Package: Single Event Effects	major	resolved (Erwin De Donder)	2010-02-22	The orbital point by point SEE calculation uses the orbit average LET spectrum
0000100	2	Package: Spacecraft Charging	major	resolved (Michel Kruglanski)	2010-02-22	Does not generate plot (DICTAT)
0000105	2	Package: Single Event Effects	feature	assigned (Erwin De Donder)	2010-02-19	change "Device #" in HTML label to the user defined device name
0000103	2	Package: Radiation Sources	major	resolved (Erwin De Donder)	2010-02-17	Solar proton rigidity meta data field "RIGIDITY" in the MK-CSV file does not correspond to the "ENERGY" meta-data field.

Figure 14 SPENVIS BugTracker (accessed: 25.2.2010)

Before reporting a new issue it is important to read the already reported ones. All reported issues get an ID and are sorted with the date of the latest update. Every issue passes the categories: new, feedback, acknowledged, confirmed, assigned, resolved and closed.

2.4.8 ECSS Space Environment Standard

The SPENVIS system contains a copy of the European Cooperation for Space Standardization (ECSS) standard on space environment, see Figure-15. The official site (www.ecss.nl) is maintained by the ECSS secretariat at ESTEC.

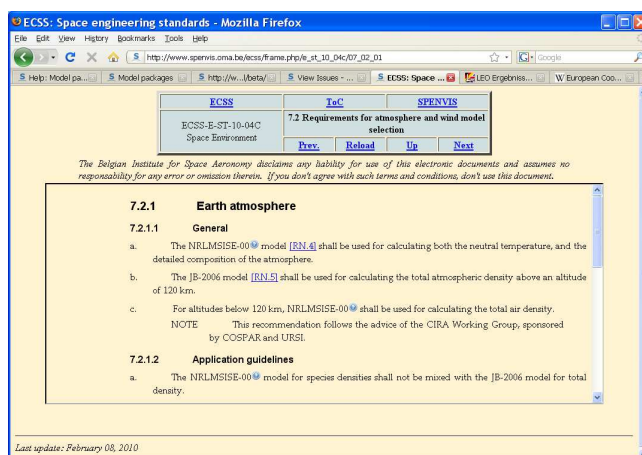


Figure 15 Screenshot of the ECSS Page (accessed: 25.2.2010)

The ECSS document is provided as web-pages. Navigation within the ECSS standard is facilitated by the table of contents (ToC) box, which is present on top of every page.

2.4.9 Java Geometry Definition Tool

As mentioned in section 2.1.1, following software is required to **RUN** the jgd-tool:

- **Java Web Start v.1.6.0** framework including OpenGL support

The Geometry definition Tool is software for geometry creation and GDML export. The program allows the user to interactively build geometries using a number of basic primitives. Simply by adding these objects to a tree, the 3D geometry is created and displayed. Created objects can be inspected immediately for corrections or modifications. The geometry perspective can easily be rotated, panned and zoomed by the user. Loading and saving of geometries created with the Geometry Generation Tool is also provided.

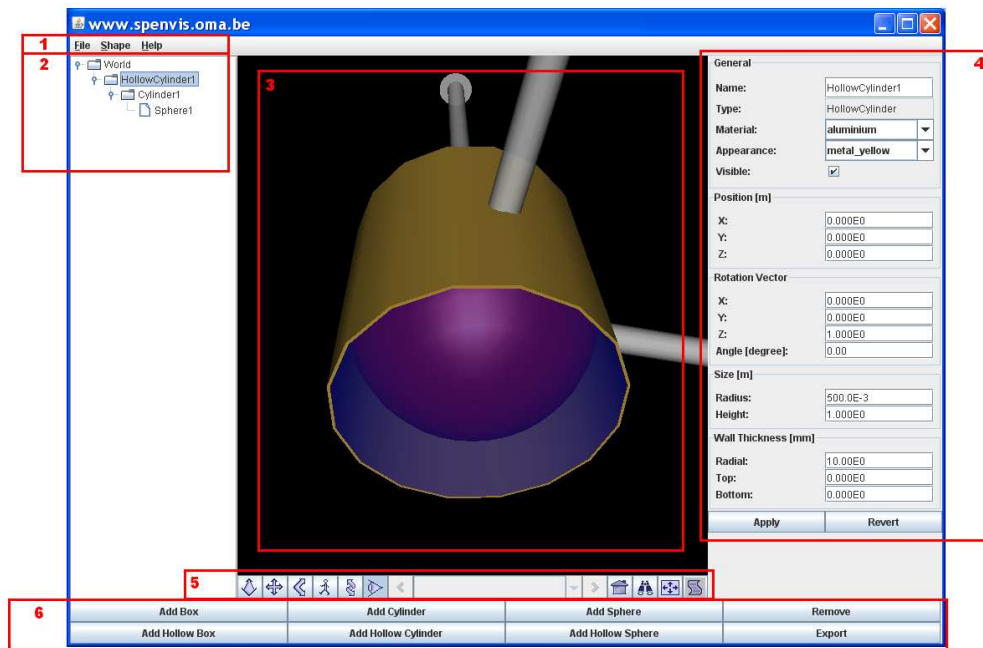


Figure 16 Java Geometry Definition Tool in use

Figure-16 shows the program in use and explains its features:

1. **Menu bar:** The menu bar offers all functionality by using pop-up menus. File->Open, File->Save and File->SaveAs provide the import and export of model geometries in binary format. They will be saved as a .ser file
File->Export will export the geometry in GDML format. It will be saved as a .gdml file.
2. **Tree panel:** The tree shows all created objects and their parent-child relation. The current object can be selected by clicking on it.
3. **Visualisation panel:** Here is the created structure displayed
4. **Property panel:** Every object has its own properties like: Material, Appearance, Position, Rotation and Size. They can be changed using the provided widgets in this panel. The current object of the property panel is chosen in the tree panel (2) by selecting it with the mouse.
5. **Xj3d buttons:** With these options the viewing perspective can be changed.

6. **Action buttons:** These buttons expand the program usability by offering shortcuts to the most used functions. The same functionality can be accessed with the menu bar (1).

Detailed description of the jgd-tool can be found at: <http://www.spenvis.oma.be/help/system/jgdtool.html> .

2.5 SPENVIS Models

2.5.1 Introduction

The planning of space missions requires an analysis of the space environment and its impact on space systems. The space environment includes the following hazardous environments:

- radiation environment due to the radiation belts, solar particles and cosmic rays,
- the plasma environments of the ionosphere and geomagnetic sub-storms,
- neutral gaseous environments, including upper-atmospheric atomic oxygen,
- micro-meteoroids and space debris,
- magnetic fields,
- electromagnetic solar emissions.

These environmental factors impact spacecraft components through the following effects:

- ionizing dose,
- non-ionizing energy loss,
- solar cell degradation,
- single event upsets,
- spacecraft charging (surface and internal),
- surface erosion (atomic oxygen),
- sensor interference (solar and Earth infrared irradiation),
- micro-particle impacts and punctures,
- orbital decay.

Empirical or quasi-empirical models of these hazardous environments and effects have been developed by different organizations, often independent of one another. SPENVIS provides an interface for analysing the diverse environmental effects on spacecraft with its unique collection of models. Table-3 gives an overview of all models and Figure-19 explains the relation between the models.

2.5.2 Coordinate Generators

Most of the models implemented in SPENVIS require as input a set of points on a spacecraft trajectory or a user defined set of geographic points. These sets of points are produced by two tools: the **orbit generator** and the **coordinate grid generator**.

Orbit Generator

A spacecraft orbit is described by means of a number of parameters as the start date and the duration. The start date corresponds to the date and time of the first point written into the output file. The duration can be specified as a number of orbits, or directly as duration in days. For Earth the orbit generator takes into account the oblateness (ellipticity) of the Earth, the gravitational attraction of Sun and Moon, air drag (by means of the CIRA atmospheric model) and solar radiation pressure. Orbit generator versions are also available for other planets as Mars and Jupiter.

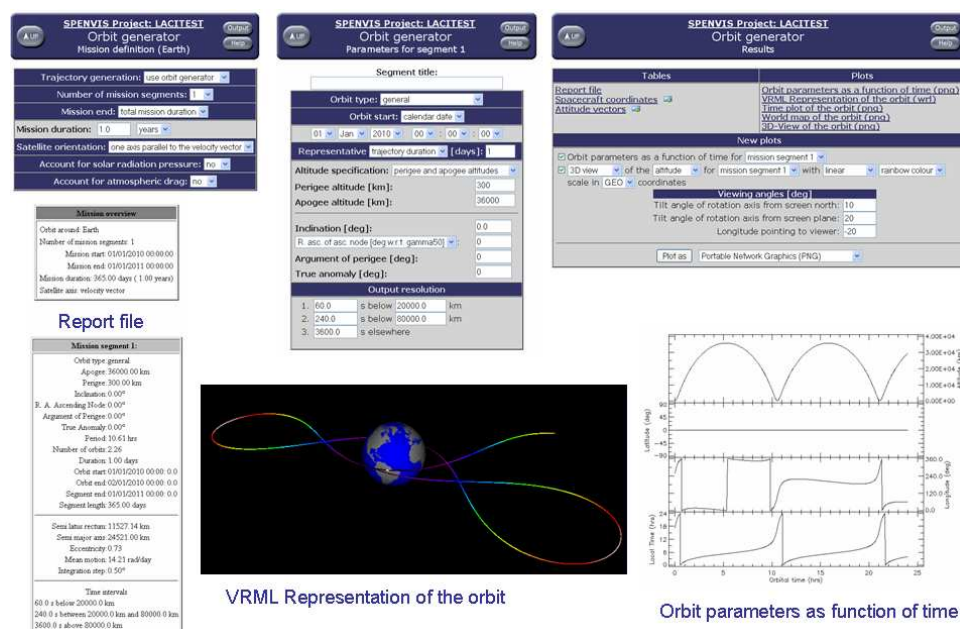


Figure 17 The Orbit Generator with Input (top) and Output (bottom)

Figure-17 shows the orbit generator input tables at the top and the output (report file and orbit visualisation) at the bottom. In the figure are all default selections shown, i.e. a general orbit with duration of one year and one mission segment. The report file summarises the in- and output. Different visualisation options can be selected. The VRML representation provides a colourful illustration. The sinuous line shape illustrates the fact that the orbit is around a rotating planet. The other plot shows orbit parameters as a function of time.

Five different orbit types can be selected:

- general,
- circular heliosynchronous,
- geostationary,

- near Earth interplanetary,
- two line elements.

For the general orbit, all parameters have to be entered, while the last four cases are provided as special cases that only require a restricted number of input parameters.

Coordinate Grid Generator

The coordinate grid generator produces a set or grid of geographical positions that serves as input to the positional version of the following models:

- atmosphere and ionosphere models,
- trapped particle models,
- magnetic field models.

Once a grid has been generated, it can be used with different models.

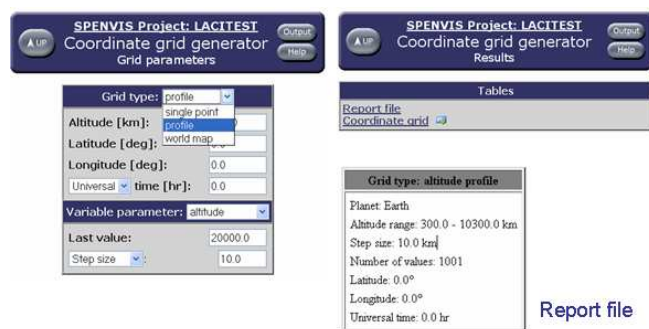


Figure 18 The Grid Generator with Input (top) and the Report File (bottom)

Figure-18 shows the grid generator input table, the result page and the report file. Three grid types can be produced:

- a single geographic point: for this grid type, a profile can be generated in terms of the input parameters of the models to be run on this grid,
- an altitude, latitude, longitude or time (universal or local) profile, with the other coordinates fixed. This is the default selection and shown in Figure-15,
- a world map for a given altitude and fixed universal or local time.

2.5.3 Model Packages

SPENVIS provides models in the following groups:

- Radiation sources and effects

- Spacecraft charging
- Atmosphere and ionosphere
- Magnetic field
- Meteoroids and debris
- Miscellaneous
- Geant4 Tools

This grouping is similar as the one described in the introduction (section 2.5.1). The groups Miscellaneous and Geant4-Tools were introduced to sort models also by their functionality.

Table-3 gives an overview of the models implemented in SPENVIS. The model types are ordered in groups (Radiation sources and effects, Spacecraft charging, ...marked in bold) and sub-groups (Trapped particle flux, Trapped proton flux anisotropy, ...) according to the grouping in the SPENVIS user interface. The table indicates for which planet the model is applicable and if an orbit or a grid definition is necessary.

Table 3 SPENVIS Models

Type	Name	Planet	Orbit	Grid	Other
Radiation sources and effects					
Trapped particle flux (proton)	AP-8, CRRESPRO, SAMPEX/PET PSB97	Earth	Yes	Yes	BL grid (a)
	D&G83, Salammbo	Jupiter	Yes	No	No
Trapped particle flux (electron)	AE-8, AE-8 MIN update ESA-SEE1, CRRESELE	Earth	Yes	Yes	BL grid (a)
	IGE-2006/POLE	Earth	Yes	No	No
	D&G83, Salammbo, GIRE	Jupiter	Yes	No	No
Trapped proton flux anisotropy	Badhar & Konradi 90 MAX, Watts et al 1989 VF1-MAX	Earth	Yes	No	No
Solar particle fluences	JPL, King, ESP-PSYCHIC, Rosenquist et al.	Earth	Yes (f)	No	No
Cosmic ray flux	MSU (ISO, Nymmik et al), CREME-86	Earth	Yes (f)	No	No

Type	Name	Planet	Orbit	Grid	Other
Geomagnetic cutoff	Stoermer	Earth	Yes (b)	Yes	No
Mars energetic radiation environment models (MEREM)	MEREM	Mars	Yes (f)	Yes	Yes
Solar cell radiation damage	EQFLUX, MC-SCREAM	Earth, Jupiter	Yes (e)	No	No
Ionizing and non-ionizing dose models	SHIELDOSE, SHIELDOSE-2, NIEL	Earth, Jupiter	Yes (e)	No	No
LET spectrum and single event upset rates	CREME-86, Slowing and stopping ions algorithm (ESTEC), Variable LET algorithm (BIRA)	Earth, Jupiter, Mercury, Mars	Yes	No	No
Spacecraft charging					
Internal deep electric charging	DICTAT	Earth	Yes (f)	No	BL value (a)
Surface charging	EQUIPOT	Earth	No	No	Yes
Solar array and spacecraft structure potentials	SOLARC	Earth	No	No	Circular orbit
LEO environment parameters	LEOPOLD	Earth	No	No	Circular orbit
Atmosphere and ionosphere					
Atmosphere densities and temperature	NRLMSISE-00, MET-V 2.0, DTMB78, HWM93	Earth	Yes	Yes	No
Ionosphere densities and temperature	IRI2001, NeQuick v2.0	Earth	Yes	Yes	No
Atomic oxygen erosion	NRLMSISE-00, MET-V 2.0, DTMB78	Earth	Yes	No	No
Magnetic field					
Magnetic field vectors (internal)	IGRF	Earth	Yes	Yes	No
Magnetic field vectors	Mead-Fairfield, Tsyganenko,	Earth	Yes	Yes	No

Type	Name	Planet	Orbit	Grid	Other
(external)	Olsen-Pfitzer quiet, Olsen-Pfitzer dynamic, Ostapenko-Maltsev, Paraboloid model				
Magnetic coordinates	Unilib	Earth	Yes	Yes	Driftshell (c)
Meteoroids and debris					
Meteoroids	Gruen	Earth	No	No	Circular orbit
Debris	NASA-90	Earth	No	No	Circular orbit
Miscellaneous					
Satellite illumination	--	Earth	Yes	Yes	No
Visualization of magnetic drift shells	See group "Magnetic field"	Earth	No	No	Yes
Trapped particle flux	See group "Radiation sources and effects"	Earth	Yes	Yes	BL-grid
Coordinate transformation	--	Earth	No	No	Yes
RDC converter	JPL green book	* (d)	No	No	Yes
Geant4 tools					
Radiation transport through a geometry	MULASSIS, GEMAT	Earth, Jupiter	Yes (e)	No	Yes
	MULASSIS, GEMAT	Mercury, Mars	No	No	Yes
	GRAS	* (d)	No	No	Yes
Sector shielding analysis	SSAT	* (d)	No	No	Yes
Radiation transport into neighboring planet	Magnetocosmics	Earth	Yes	No	Yes
	Planetocosmics	Earth, Mercury, Mars	No	No	Yes

Comments:

a) BL-grid: the evaluation of the trapped particle flux over a BL grid is available from the group

Type	Name	Planet	Orbit	Grid	Other
Miscellaneous.					
b) Geomagnetic cutoff along an orbit is available when accessing the “LET spectrum and single upset rates”.					
c) Driftshell for Magnetic coordinates, see group “Miscellaneous”.					
d) The model is independent of a planet.					
e) The model only uses mission averaged values as input.					
f) The model only provides values integrated over the whole mission.					

A more detailed description of the models and their input parameters can be found in the help pages. The table summarizes if a model requires an orbit or a grid as input. But several models need additionally the result of other models. Figure-19 explains the most important orbital model dependencies for planet Earth. There are no dependencies for the grid model versions.

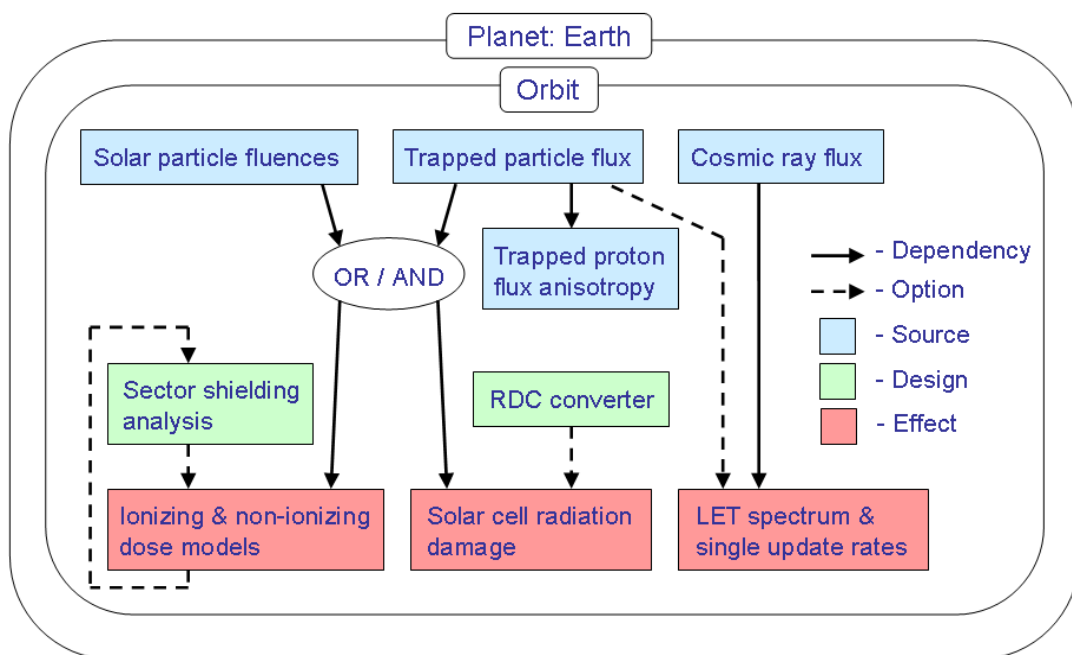


Figure 19 Model Dependencies

The figure explains the dependencies for the orbital models of the Earth. There are three model types:

- **Source** for calculation of the space environment,
- **Design** to compute parameters specific to the spacecraft/instrument design,
- **Effect** to determine the effects of the sources.

Dependency means that the dependent model must be used with the output from the other one. E.g. “Ionizing & non-ionizing dose models” need the result of either “Trapped particle flux” or “Solar particle fluences”.

Some of the dependency is optional, e.g. “Solar cell radiation damage” may use output from “RDC converter”. More complicated is the dependency between “Sector shielding analysis” and “Ionizing & non-ionizing dose models”, which require as input a set of shielding thicknesses. When the Sector shielding analysis tool (SSAT) has run, the user gets the option to use the SSAT shielding distribution as input to the dose models. In that case, the dose models also provide a cumulated dose that takes into account the shielding distribution.

Since a dose curve could be uploaded into SSAT, the same result can be obtained through a reverse scenario where a dose model is first used to generate a dose curve which is used by SSAT to compute the cumulated dose. This second scenario is less straightforward (the dose curve has to be extracted and uploaded back into SPENVIS) and is reserved for "advanced users". The second scenario is useful when computing a dose for several geometries within a fixed radiative environment.

3 SPENVIS Installation and Maintenance

3.1 Installing the System

The instructions given in this section will enable to install and configure the operational SPENVIS web-site on a server. Necessary requirements are described in the next sub-section. The components of the SPENVIS system are delivered as zip-compressed tar files on a DVD.

3.1.1 Server Configuration Requirements

Following hard- and software is required to **INSTALL** SPENVIS:

- **Intel / X86** server hardware with the Linux (Debian, Suse, Ubuntu, ...) operating system, 1 GB RAM and 20 GB disk space (explained in table-4)
- **CDF** 3.3 library software tool
- **IDL** 7.0 (ITT.com) program for result plotting
- **Apache** (with package **mod-auth-mysql**) 2.2.3 web server software
- **PHP** (with **curl extension**) 5.1.2 scripting language especially suited for web development
- **Python** 3.0 programming language
- **Geant4** library
- Access to a **MySQL server**
- **MySQL client**
- **Postfix** or **Sendmail** mail-transfer and -delivery software

Required external data files:

- **Geant4 data**
- **Geant4 GDML Schema**
- **Glauber data**

Table-4 specifies the required disk space for a SPENVIS installation. For this system 10 heavy and 300 normal users are assumed. "Temporary peak user" contains also the used disk space during calculations.

Table 4 Used Disk Space for a typical SPENVIS Installation

Used Disk Space	Aggregate [Gb]	Usage
2.5 Gb	2.5	SPENVIS core installation
1.5 Gb	1.5	External data
10 x 500 Mb	5	Heavy users
300 x 20 Mb	6	Normal users
5 Gb	5	Temporary peak user
Total:	20	

3.1.2 Installation Check List

The installing user should have either root access or be member of the web server daemon group. It is assumed that BASH is the used shell. Before starting the installation procedure you need to identify several installation parameters. In the following each parameter will be stored in a shell variable. The values marked with green color provide examples of typical values. We recommend saving the shell variables in a text file.

1) Installation process parameters

1.1) INSTALL_HOME is the path to the directory where the installation will copy all files. The installing user shall have full right on INSTALL_HOME.

```
INSTALL_HOME=/home/spenvis
```

1.2) Location of the installation source.

```
INSTALL_ARCH=/tmp/spenvis-463.tgz
```

1.3) Installation date.

```
INSTALL_DATE=$(date +%Y%m%d)
```

1.4) The folder containing the SPENVIS components.

```
INSTALL_TARGET=${INSTALL_HOME}/${tar -ztf ${INSTALL_ARCH} | head -1 \
| cut -f 1 -d/}
```

2) Web server daemon parameters

2.1) Name of the user running the web server daemon.

```
WWW_USER=www-data
```

2.2) Name of the group to which the WWW_USER belongs.

```
WWW_GROUP=www-data
```

2.3) Email address of the webmaster.

WEBMASTER=webmaster@spenvis.esa.int

2.4) Name of the virtual host that will host the SPENVIS system.

SPENVIS_HOSTNAME=www.spenvis.esa.int

3) SPENVIS properties parameters

3.1) Apache configuration file of the SPENVIS virtual host.

SPENVIS_HTTPD_CONF=\${INSTALL_HOME}/spenvis.conf

3.2) Apache configuration include file for SPENVIS authentication.

SPENVIS_HTACCESS=\${INSTALL_HOME}/spenvis.htaccess

3.3) Folder to store work space of SPENVIS users.

SPENVIS_HTUSERS_PATH=\${INSTALL_HOME}/htusers

3.4) SPENVIS URL's (see Appendix-B)

SPENVIS_URL=/.

SPENVIS_HTUSERS_URL=/spenvis/htusers

4) Geant4 Parameters

4.1) Location of the Geant4 data.

GEANT4_DATA_PATH=\${INSTALL_HOME}/vendor/geant4-data/data

4.2) Location of the Geant4 GDML XML schema.

GEANT4_GDML_PATH=\${INSTALL_HOME}/vendor/geant4-data/GDML2Schema

5) MySQL database parameters

5.1) MySQL server hosting the SPENVIS user database.

DB_SERVER=localhost

5.2) Database user.

DB_USER=spenvis_dbuser

5.3) Database password.

DB_PASSWD=spenvis_dbuser

5.4) Database name.

DB_NAME=spenvis_db

6) Space Environment database parameters

6.1) CDF (Common Data Format, see <http://cdf.gsfc.nasa.gov/>) installation location.

```
CDF2SKT=/spenvis/cdf33_0-dist/bin/skeletonable  
SKT2CDF=/spenvis/cdf33_0-dist/bin/skeletoncdf
```

6.2) Location of the CDF database.

```
CDF_DATA_PATH=${INSTALL_HOME}/vendor/spaceenv-data
```

7) Auxiliary parameters

7.1) Location of the spenvis.properties file (see Appendix-D).

```
PROPERTY_FILE=${INSTALL_TARGET}/htbin/spenvis.properties  
PHPCONFIG_FILE=${INSTALL_TARGET}/htdocs/base/config.php
```

7.2) The web client.

```
export DISPLAY=:0.0  
WVIEW="firefox -safe-mode"
```

3.1.3 Deploying the SPENVIS System Main Component

1) Extract the archive from the tar file:

```
cd ${INSTALL_HOME}  
tar --extract --file=${INSTALL_ARCH} --gunzip  
ls -la ${INSTALL_TARGET}
```

Checking the result of the above commands:

```
total 52  
dr-xr-x--- 11 install users 4096 2009-12-03 14:14 .  
drwxr-xr-x 4 install users 4096 2010-02-05 01:55 ..  
dr-xr-x--- 2 install users 4096 2009-12-03 14:15 bin  
dr-xr-x--- 6 install users 4096 2009-12-03 14:09 data  
dr-xr-x--- 4 install users 4096 2009-12-03 14:14 geant4  
dr-xr-x--- 2 install users 4096 2009-12-03 14:14 htbin  
dr-xr-x--- 7 install users 4096 2009-12-03 14:14 htdocs  
dr-xr-x--- 2 install users 4096 2009-12-03 14:10 idl  
dr-xr-x--- 6 install users 4096 2009-12-03 14:11 other  
dr-xr-x--- 3 install users 12288 2009-12-03 14:11 templates  
drwxr-x--- 2 install users 4096 2009-12-03 13:44 tmp
```

2) Assign correct execution rights to the installation folders:

```
if [ -z "$(groups | grep ${WWW_GROUP})" ]; then \  
    echo "you are not member of ${WWW_GROUP}"; else \  
    chgrp -R ${WWW_GROUP} ${INSTALL_TARGET}; fi  
chmod -R g-w,g+rx,u+w ${INSTALL_TARGET}  
ls -la ${INSTALL_TARGET}
```

The result of the above commands should look like:

```
total 52  
dr-xr-x--- 11 install www-data 4096 2009-12-03 14:14 .  
drwxr-xr-x 4 install users 4096 2010-02-05 01:55 ..  
dr-xr-x--- 2 install www-data 4096 2009-12-03 14:15 bin  
dr-xr-x--- 6 install www-data 4096 2009-12-03 14:09 data  
dr-xr-x--- 4 install www-data 4096 2009-12-03 14:14 geant4
```

```
dr-xr-x--- 2 install www-data 4096 2009-12-03 14:14 htbins
dr-xr-x--- 7 install www-data 4096 2009-12-03 14:14 htdocs
dr-xr-x--- 2 install www-data 4096 2009-12-03 14:10 idl
dr-xr-x--- 6 install www-data 4096 2009-12-03 14:11 other
dr-xr-x--- 3 install www-data 12288 2009-12-03 14:11 templates
drwxr-x--- 2 install www-data 4096 2009-12-03 13:44 tmp
```

3) Backup the file spenvis.properties and edit it for SPENVIS_HOSTNAME environment:

```
SPENVIS_URL_ORG=$(grep SPENVIS_URL ${PROPERTY_FILE} \
| cut -f 2 -d= | sed -e 's/ //g' -e 's/\./\\./')
SPENVIS_VERSION=$(grep SPENVIS_VERSION ${PROPERTY_FILE} \
| cut -f 2 -d= | sed -e 's/ //g')
cp ${PROPERTY_FILE} ${PROPERTY_FILE}.${INSTALL_DATE}
cat > ${PROPERTY_FILE} << END-OF-FILE
MODE = spenvis
SPENVIS_VERSION = ${SPENVIS_VERSION}
SPENVIS_URL = ${SPENVIS_URL}
SPENVIS_PATH = ${INSTALL_TARGET}
IDL_CMD = $(type -p idl) <startup.pro>
IDL_RT = $(type -p idl) -novm -rt=<main.sav>
PHP_CMD = $(type -p php)
ZIP_CMD = $(type -p zip) -rq <archive> <file>
USERPREFIXSIZE = 1
HTUSERS_PATH = ${SPENVIS_HTUSERS_PATH}
HTUSERS_URL = ${SPENVIS_HTUSERS_URL}
END-OF-FILE
diff --ignore-space-change ${PROPERTY_FILE}.${INSTALL_DATE} ${PROPERTY_FILE}
```

The result of the above commands should look like:

```
4c4
< SPENVIS_PATH = /data/tmp/runtime_spenvis_463-1809
---
> SPENVIS_PATH = /home/spenvis/runtime_spenvis_463-1809
7c7
< PHP_CMD = /usr/bin/php5
---
> PHP_CMD = /usr/bin/php
10,11c10
< BATCH_ENABLED = true
< HTUSERS_PATH = /tmp/htusers
---
> HTUSERS_PATH = /home/spenvis/htusers
```

4) Adapt the absolute URL's present in the HTML.

```
find ${INSTALL_TARGET}/htdocs -type f -name '*.html' -exec \
sed -i -e "s#${SPENVIS_URL_ORG}#${SPENVIS_URL}#g" {} \;
find ${INSTALL_TARGET}/htdocs/ecss -type f -name '*.htm' -exec \
sed -i -e "s#${SPENVIS_URL_ORG}#${SPENVIS_URL}#g" {} \;
```

5) Create the directories for logging and uploads. Set the correct access rights for the folders.

```
mkdir -p ${SPENVIS_HTUSERS_PATH}/_tmp_ ${SPENVIS_HTUSERS_PATH}/_log_
chmod -R g+rwX ${SPENVIS_HTUSERS_PATH}
chmod g+s ${SPENVIS_HTUSERS_PATH}
chgrp -R ${WWW_GROUP} ${SPENVIS_HTUSERS_PATH}
ls -laR ${SPENVIS_HTUSERS_PATH}
```

The result of the above commands should look like:

```
/home/spenvis/htusers:
total 16
drwxrwsr-x 4 install www-data 4096 2010-02-05 03:25 .
drwxr-xr-x 5 install users 4096 2010-02-05 03:23 ..
drwxrwsr-x 2 install www-data 4096 2010-02-05 03:25 _log_
drwxrwsr-x 2 install www-data 4096 2010-02-05 03:23 _tmp_

/home/spenvis/htusers/_log_:
total 8
drwxrwsr-x 2 install www-data 4096 2010-02-05 03:25 .
drwxrwsr-x 4 install www-data 4096 2010-02-05 03:25 ..

/home/spenvis/htusers/_tmp_:
total 8
drwxrwsr-x 2 install www-data 4096 2010-02-05 03:23 .
drwxrwsr-x 4 install www-data 4096 2010-02-05 03:25 ..
```

6) Make Geant4 data folders available to WWW_USER and create soft-links.

```
chgrp -R ${WWW_GROUP} ${GEANT4_DATA_PATH}
chmod -R g+r ${GEANT4_DATA_PATH}
chgrp -R ${WWW_GROUP} ${GEANT4_GDML_PATH}
chmod -R g+r ${GEANT4_GDML_PATH}
if [ -h ${INSTALL_TARGET}/geant4/GDML2Schema ]; then
rm ${INSTALL_TARGET}/geant4/GDML2Schema
fi
if [ -h ${INSTALL_TARGET}/geant4/data ]; then
rm ${INSTALL_TARGET}/geant4/data
fi
ln -s ${GEANT4_GDML_PATH} ${INSTALL_TARGET}/geant4/GDML2Schema
ln -s ${GEANT4_DATA_PATH} ${INSTALL_TARGET}/geant4/data
ls -gd ${INSTALL_TARGET}/geant4/data/* ${INSTALL_TARGET}/geant4/GDML2Schema/*\
| sed -e "s|${INSTALL_TARGET}/geant4/||"
```

The result of the above commands should look like:

```
drwxr-xr-x 2 www-data 4096 2009-12-01 07:36 data/G4ABLA3.0
drwxr-xr-x 3 www-data 4096 2009-12-01 07:40 data/G4ELASTIC1.1
drwxr-xr-x 14 www-data 4096 2009-12-01 07:43 data/G4EMLow4.0
drwxr-xr-x 14 www-data 4096 2009-12-01 07:36 data/G4EMLow4.3
drwxr-xr-x 15 www-data 4096 2009-12-01 07:37 data/G4EMLow5.1
drwxr-xr-x 9 www-data 4096 2009-12-01 07:35 data/G4NDL3.11
drwxr-xr-x 9 www-data 4096 2009-12-01 07:39 data/G4NDL3.12
drwxr-xr-x 7 www-data 4096 2009-12-01 07:45 data/G4NDL3.9
drwxr-xr-x 2 www-data 126976 2009-12-01 07:40 data/GlauberData
drwxr-xr-x 2 www-data 36864 2009-12-01 07:34 data/PhotonEvaporation2.0
drwxr-xr-x 2 www-data 61440 2009-12-01 07:33 data/RadioactiveDecay3.2
drwxr-xr-x 2 www-data 4096 2009-12-01 07:45 GDML2Schema/CVS
drwxr-xr-x 4 www-data 4096 2009-12-01 07:45 GDML2Schema/doc
drwxr-xr-x 3 www-data 4096 2009-12-01 07:46 GDML2Schema/Examples
-rw-r--r-- 1 www-data 9047 2009-12-01 07:46 GDML2Schema/gdml_core.xsd
-rw-r--r-- 1 www-data 4512 2009-12-01 07:46 GDML2Schema/gdml_define.xsd
-rw-r--r-- 1 www-data 1176 2009-12-01 07:46 GDML2Schema/gdml_extensions.xsd
-rw-r--r-- 1 www-data 15028 2009-12-01 07:46 GDML2Schema/gdml_materials.xsd
-rw-r--r-- 1 www-data 5196 2009-12-01 07:46 GDML2Schema/gdml_parameterised.xsd
-rw-r--r-- 1 www-data 3876 2009-12-01 07:46 GDML2Schema/gdml_replicas.xsd
-rw-r--r-- 1 www-data 38887 2009-12-01 07:46 GDML2Schema/gdml_solids.xsd
-rw-r--r-- 1 www-data 9646 2009-12-01 07:46 GDML2Schema/gdml.xsd
```

7) Setup of the scientific databases. (Previous CDF files, in the future ODI system.)

Generate a new skeleton file with the correct path.

```
SPENVIS_SKT=${INSTALL_HOME}/databases.skt
PREVIOUS_SPENVIS_SKT=${INSTALL_HOME}/databases.${INSTALL_DATE}.skt
${CDF2SKT} -skeleton ${PREVIOUS_SPENVIS_SKT} -noscreen \
    ${INSTALL_TARGET}/bin/databases.cdf
sed -i -e '/' -e '/N' -e 's/' -e '\n *'/' ${PREVIOUS_SPENVIS_SKT}
PREVIOUS_CDF_DATA_PATH=$(grep "FILE" ${PREVIOUS_SPENVIS_SKT} | \
    grep indices | sed -r -e 's#.*"([a-zA-Z0-9_-]+)/indices.*#\1#')
sed -e "/FILE/s|${PREVIOUS_CDF_DATA_PATH}|/${CDF_DATA_PATH}/|" \
    ${PREVIOUS_SPENVIS_SKT} > ${SPENVIS_SKT}
diff ${PREVIOUS_SPENVIS_SKT} ${SPENVIS_SKT}
```

The result of the above commands should look like:

```
Making a skeleton table from "/home/spenvis/runtime_spenvis_463-
demo/bin/databases.cdf" to "/home/spenvis/databases.20100226.skt"...
389c389
< "FILE" CDF_UCHAR { "/home/spenvis/vendor/spaceenv-
data/indices/indices.cdf" }
---
> "FILE" CDF_UCHAR { "/home/spenvis/vendor/spaceenv-
data/indices.cdf" }
```

Replace the databases.cdf file.

```
mv ${INSTALL_TARGET}/bin/databases.cdf \
    ${INSTALL_TARGET}/bin/databases.cdf.${INSTALL_DATE}
${SKT2CDF} -cdf ${INSTALL_TARGET}/bin/databases.cdf ${SPENVIS_SKT}
chgrp ${WWW_GROUP} ${INSTALL_TARGET}/bin/databases.cdf
ls -l ${INSTALL_TARGET}/bin/databases.*
```

The result of the above commands should look like:

```
Making a cdf from skeleton table: "/home/spenvis/databases.skt" to
"/home/spenvis/runtime_spenvis_463-demo/bin/databases.cdf"...
-rw-r--r-- 1 vmplanet www-data 14506 2010-03-25 08:42
/home/spenvis/runtime_spenvis_463-demo/bin/databases.cdf
-rw-r--r-- 1 vmplanet www-data 14506 2010-03-25 08:39
/home/spenvis/runtime_spenvis_463-demo/bin/databases.cdf.20100226
```

8) Create the following auxiliary web-server configuration file with correct access rights.

```
cat > ${SPENVIS_HTTPD_CONF} << END-OF-FILE
<VirtualHost *:80>
    ServerAdmin ${WEBMASTER}
    ServerName ${SPENVIS_HOSTNAME}
    DocumentRoot ${INSTALL_TARGET}/htdocs
    ScriptAlias $(echo ${SPENVIS_URL}/htbin | sed -e 's#/\./#/#g')
    ${INSTALL_TARGET}/htbin
    Alias ${SPENVIS_URL} ${INSTALL_TARGET}/htdocs
    Alias ${SPENVIS_HTUSERS_URL} ${SPENVIS_HTUSERS_PATH}
    ErrorLog ${INSTALL_HOME}/${SPENVIS_HOSTNAME}_error.log
    LogLevel warn
    CustomLog ${INSTALL_HOME}/${SPENVIS_HOSTNAME}_access.log combined

    <Directory ${INSTALL_TARGET}/htdocs>
        DirectoryIndex intro.php intro.shtml intro.html
        Order Allow,Deny
        Allow from all
    </Directory>
```

```
<Directory ${INSTALL_TARGET}/htdocs/restricted>
  Include ${SPENVIS_HTACCESS}
</Directory>

<Directory ${INSTALL_TARGET}/htbin>
  Options +ExecCgi +FollowSymLinks
  Order Allow,Deny
  Allow from all
  Include ${SPENVIS_HTACCESS}
</Directory>

<Location ${SPENVIS_HTUSERS_URL}>
  Order Allow,Deny
  Allow from all
  Options -Indexes
</Location>
</VirtualHost>
END-OF-FILE
chmod g+r,g-w,o-rwx ${SPENVIS_HTTPD_CONF}
chgrp ${WWW_GROUP} ${SPENVIS_HTTPD_CONF}
nl -ba ${SPENVIS_HTTPD_CONF}
```

The result of the above commands should look like:

```
1  <VirtualHost *:80>
2    ServerAdmin webmaster@localhost
3    ServerName localhost
4    DocumentRoot /home/spenvis/runtime_spenvis_463-1809/htdocs
5    ScriptAlias /htbin /home/spenvis/runtime_spenvis_463-1809/htbin
6    Alias /. /home/spenvis/runtime_spenvis_463-1809/htdocs
7    Alias /spenvis/htusers /home/spenvis/htusers
8    ErrorLog /home/spenvis/localhost_error.log
9    LogLevel warn
10   CustomLog /home/spenvis/localhost_access.log combined
11
12   <Directory /home/spenvis/runtime_spenvis_463-1809/htdocs>
13     DirectoryIndex intro.php intro.shtml intro.html
14     Order Allow,Deny
15     Allow from all
16   </Directory>
17
18   <Directory /home/spenvis/runtime_spenvis_463-1809/
19   htdocs/restricted>
19     Include /home/spenvis/spenvis.htaccess
20   </Directory>
21
22   <Directory /home/spenvis/runtime_spenvis_463-1809/htbin>
23     Options +ExecCgi +FollowSymLinks
24     Order Allow,Deny
25     Allow from all
26     Include /home/spenvis/spenvis.htaccess
27   </Directory>
28
29   <Location /spenvis/htusers>
30     Order Allow,Deny
31     Allow from all
32     Options -Indexes
33   </Location>
34 </VirtualHost>
```

9) Create a test user and execute a simple web-server access control.

```
cat > ${SPENVIS_HTACCESS} << END-OF-FILE
AuthType Basic
```

```
AuthName "SPENVIS Authentication"
AuthUserFile ${INSTALL_HOME}/spenvis.password
Require valid-user
END-OF-FILE
chmod g+r,g-w,o-rwx ${SPENVIS_HTACCESS}
chgrp ${WWW_GROUP} ${SPENVIS_HTACCESS}
nl -ba ${SPENVIS_HTACCESS}
htpasswd -cbs ${INSTALL_HOME}/spenvis.password testuser testuser
```

The result of the above commands should look like:

```
Adding password for user testuser
1      AuthType Basic
2      AuthName "SPENVIS Authentication"
3      AuthUserFile /home/spenvis/spenvis.password
4      Require valid-user
```

10) Include SPENVIS_HTTPD_CONF into the web-server configuration. Restart the Apache server in order to take the new configuration into account:

```
ln -s ${SPENVIS_HTTPD_CONF} /etc/apache2/sites-enabled/spenvis
sudo /etc/init.d/apache2 restart
WGET_OPT="--output-document=- --progress=dot --no-verbose --http-user=testuser\
--http-password=testuser"
WGET_PAGE="intro.php help/system/index.html ecss/frame.php/e_st_10_04c\
ecss/e_st_10_04c/ecss_00_03_00.htm\
htbin/spenvis.exe?%23sendpage%28project.html%29"
nohup $WVIEW &
sleep 5
for page in $WGET_PAGE; do
echo http://${SPENVIS_HOSTNAME}/$page
wget http://${SPENVIS_HOSTNAME}/$page $WGET_OPT | wc
sleep 5
$WVIEW http://testuser:testuser@${SPENVIS_HOSTNAME}/$page &
done
```

The result of the above commands should look like:

```
http://localhost/intro.php
2010-02-12 06:12:44 URL:http://localhost/intro.php [8826] -> "-" [1]
175      600      8826
http://localhost/help/system/index.html
2010-02-12 06:12:44 URL:http://localhost/help/system/index.html [25905/25905] ->
"-" [1]
577      1529      25905
http://localhost/ecss/frame.php/e_st_10_04c
2010-02-12 06:12:44 URL:http://localhost/ecss/frame.php/e_st_10_04c [37763] ->
"-" [1]
512      2217      37763
http://localhost/ecss/e_st_10_04c/ecss_00_03_00.htm
2010-02-12 06:12:44 URL:http://localhost/ecss/e_st_10_04c/ecss_00_03_00.htm
[385770/385770] -> "-" [1]
12962      22330      385770
http://localhost/htbin/spenvis.exe?%23resettoprevious(packages.html)
2010-02-12 06:12:44
URL:http://localhost/htbin/spenvis.exe?%23resettoprevious(packages.html)
[7912/7912] -> "-" [1]
212      617      7912
```

The result in the web browser should look like the following screenshots:



Figure 20 Screenshot of the SPENVIS System at Startup

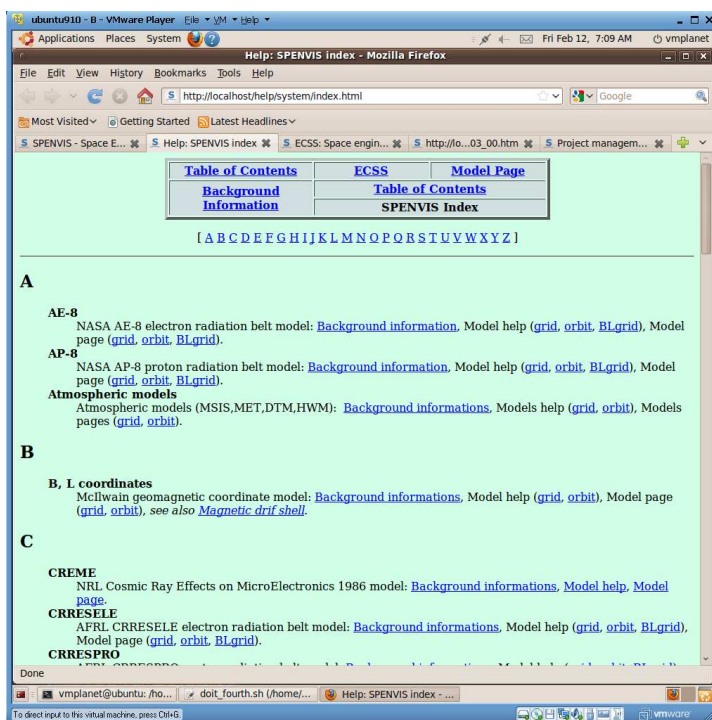


Figure 21 The SPENVIS Help

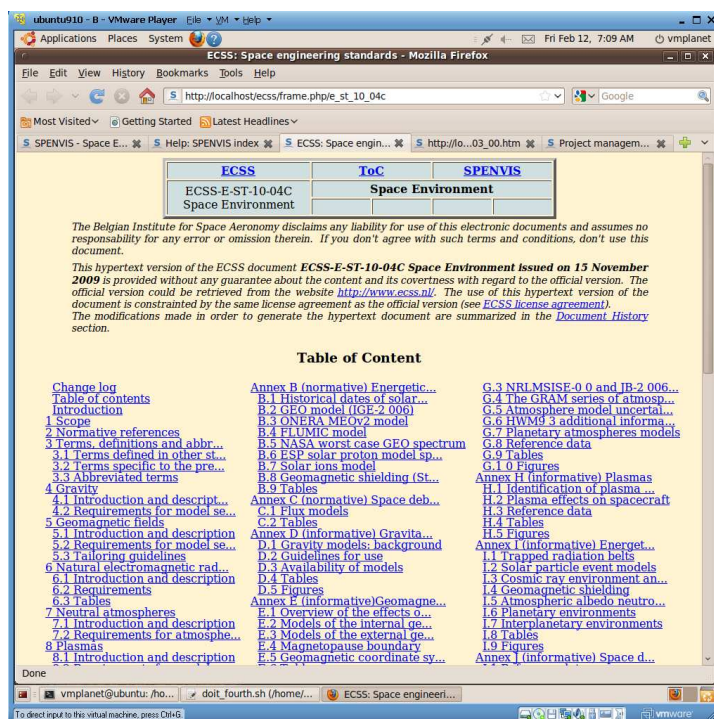


Figure 22 The ECSS-E-ST-10-04C Standard

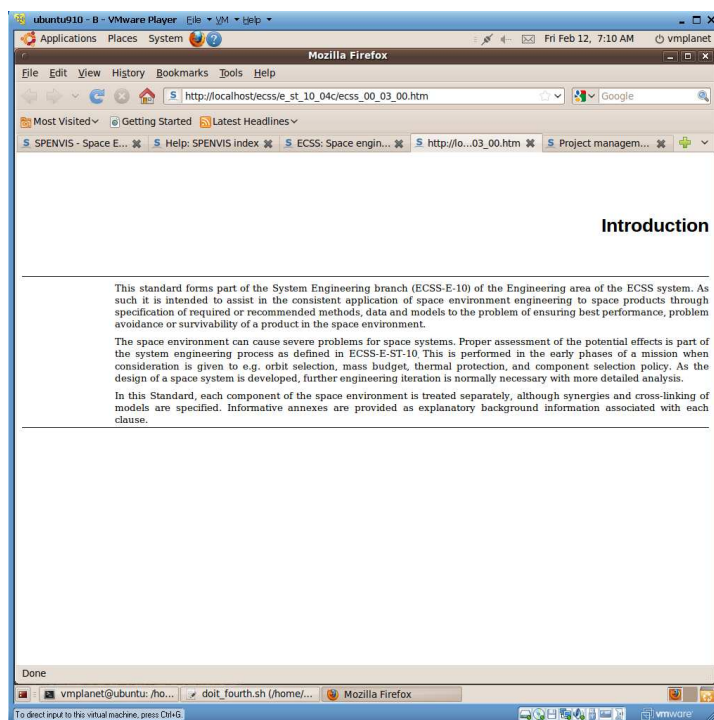


Figure 23 Inside the ECSS-E-ST-10-04C Standard

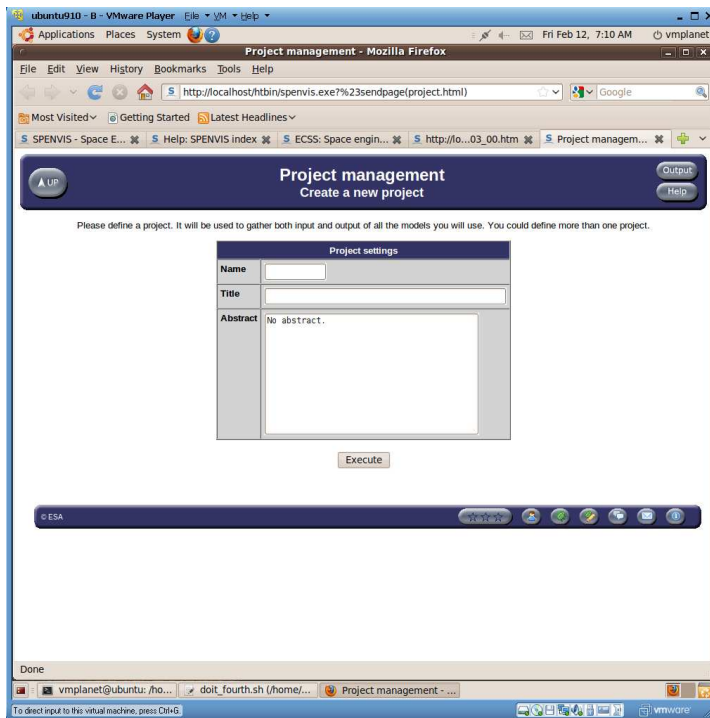


Figure 24 Project Management Page for creating a SPENVIS Project

11) Continue checking SPENVIS with the web-browser. Use SPENVIS system to create a project and access different models as described in chapter-2.

3.1.4 Deploying User Management Tools

1) Prepare the SPENVIS database: on MySQL server DB_SERVER, a database DB_NAME should be accessible for user DB_USER from SPENVIS_HOSTNAME.

```
cat <<END-OF-SQL
-- SQL Statements to be executed on ${DB_SERVER}
CREATE USER '${DB_USER}'@'${SPENVIS_HOSTNAME}' IDENTIFIED BY '${DB_PASSWD}';
CREATE DATABASE ${DB_NAME}
    CHARACTER SET = latin1 COLLATE = latin1_general_ci;
GRANT ALL ON TABLE ${DB_NAME}.* TO '${DB_USER}'@'${SPENVIS_HOSTNAME}';
--
END-OF-SQL
mysql ${DB_NAME} --host=${DB_SERVER} --user=${DB_USER} \
    --password=${DB_PASSWD} <<END-OF-SQL
SHOW GRANTS;
END-OF-SQL
```

The result of the above commands should look like:

```
-- SQL Statements to be executed on localhost
CREATE USER 'spenvis_dbuser'@'localhost' IDENTIFIED BY 'spenvis_dbuser';
CREATE DATABASE spenvis_db
    CHARACTER SET = latin1 COLLATE = latin1_general_ci;
GRANT ALL ON TABLE spenvis_db.* TO 'spenvis_dbuser'@'localhost';
--
Grants for spenvis_dbuser@localhost
```

```
GRANT USAGE ON *.* TO 'spenvis_dbuser'@'localhost' IDENTIFIED BY PASSWORD  
'*565E51BE89F50442927505B9C1796E1C81518E11'  
GRANT ALL PRIVILEGES ON `spenvis_db`.* TO 'spenvis_dbuser'@'localhost'
```

2) Create tables to manage users, as described in Appendix-E.1.

```
mysql ${DB_NAME} --host=${DB_SERVER} --user=${DB_USER} \  
--password=${DB_PASSWD} --table <<END-OF-SQL  
SHOW TABLES;  
DESCRIBE users;  
END-OF-SQL
```

The result of the above commands should look like:

+-----+ Tables_in_spenvis_db +-----+						
affiliation_types affiliations countries shared_projects user_levels users +-----+						
Field	Type	Null	Key	Default	Extra	
username	varchar(31)	NO	PRI	NULL		
email	varchar(63)	YES	UNI	NULL		
is_valid_email	tinyint(1) unsigned zerofill	YES		0		
password	varchar(95)	NO				
title	enum('Mr.', 'Mrs.', 'Ms.', 'Miss', 'Dr.', 'Prof.', '')	YES		NULL		
first_name	varchar(31)	NO		NULL		
last_name	varchar(31)	NO		NULL		
phone	varchar(31)	YES		NULL		
fax	varchar(31)	YES		NULL		
city	varchar(31)	YES		NULL		
affiliation_id	bigint(20)	YES	MUL	NULL		
account_since	datetime	YES		NULL		
is_active	tinyint(1) unsigned zerofill	YES		0		
is_admin	tinyint(1) unsigned zerofill	YES		0		
is_team_member	tinyint(1) unsigned zerofill	YES		0		
is_power_user	tinyint(1) unsigned zerofill	YES		0		
is_third_party	tinyint(1) unsigned zerofill	YES		0		
class	varchar(4)	NO		NULL		
level_id	smallint(2)	YES	MUL	NULL		
max_level	smallint(2)	NO		NULL		
max_projects	smallint(2) unsigned	NO		NULL		
quota_cpu	smallint(2) unsigned	NO		NULL		
quota_disk	smallint(2) unsigned	NO		NULL		
valid_from	datetime	YES		NULL		
valid_until	datetime	YES		NULL		
parent	varchar(31)	YES	MUL	NULL		
child_index	smallint(2) unsigned	YES		NULL		
details	text	YES		NULL		
session	varchar(127)	YES		NULL		

3) Populate the MySQL database:

```
mysql ${DB_NAME} --host=${DB_SERVER} --user=${DB_USER} \  
--password=${DB_PASSWD} <<END-OF-SQL  
INSERT INTO affiliation_types (type, name)  
VALUES  
( 'com', 'Commercial Firm'),  
( 'edu', 'University/Institute'),  
( 'gov', 'Government'),  
( 'mil', 'Military'),  
( 'unk', 'Unknown');  
  
INSERT INTO user_levels (id, name)  
VALUES  
(1, 'Normal'),  
(2, 'Advanced');  
  
INSERT INTO countries (code, name, is_esa, is_eu, is_us, is_eeca, is_obsolete)  
VALUES  
( 'at', 'Austria', 1, 1, 0, 0, 0),  
( 'be', 'Belgium', 1, 1, 0, 0, 0),  
( 'ca', 'Canada', 1, 0, 0, 0, 0),  
( 'ch', 'Switzerland', 1, 0, 0, 0, 0),  
( 'de', 'Germany', 1, 1, 0, 0, 0),  
( 'dk', 'Denmark', 1, 1, 0, 0, 0),  
( 'es', 'Spain', 1, 1, 0, 0, 0),  
( 'fi', 'Finland', 1, 1, 0, 0, 0),  
( 'fr', 'France', 1, 1, 0, 0, 0),  
( 'gp', 'Guadeloupe (French)', 1, 1, 0, 0, 0),  
( 'gr', 'Greece', 1, 1, 0, 0, 0),  
( 'ie', 'Ireland', 1, 1, 0, 0, 0),  
( 'is', 'Iceland', 1, 1, 0, 0, 0),  
( 'it', 'Italy', 1, 1, 0, 0, 0),  
( 'li', 'Liechtenstein', 1, 1, 0, 0, 0),  
( 'lu', 'Luxembourg', 1, 1, 0, 0, 0),  
( 'mc', 'Monaco', 1, 1, 0, 0, 0),  
( 'mk', 'Macedonia', 1, 1, 0, 0, 0),  
( 'nl', 'Netherlands', 1, 1, 0, 0, 0),  
( 'no', 'Norway', 1, 0, 0, 0, 0),  
( 'pt', 'Portugal', 1, 1, 0, 0, 0),  
( 're', 'Reunion (French)', 1, 1, 0, 0, 0),  
( 'se', 'Sweden', 1, 1, 0, 0, 0),  
( 'sm', 'San Marino', 1, 1, 0, 0, 0),  
( 'uk', 'United Kingdom', 1, 1, 0, 0, 0);  
  
INSERT INTO affiliations (id, name, acronym, url, country_code, type,  
is_confirmed)  
VALUES  
(226, 'European Space Research and Technology Centre', 'estec',  
'http://www.estec.esa.nl/', 'nl', 'gov', 1);  
  
INSERT INTO users (username, email, is_valid_email, password, title, first_name,  
last_name, phone, fax, city, affiliation_id, account_since, is_active, is_admin,  
is_team_member, is_power_user, is_third_party, class, level_id, max_level,  
max_projects, quota_cpu, quota_disk, valid_from, valid_until, parent,  
child_index, details, session) VALUES  
( 'testuser', '${WEBMASTER}', 1, SHA('testuser'), 'Mr.', 'John', 'Doe', NULL,  
NULL, 'Unknown', 226, NOW(), 1, 0, 0, 0, 0, 'FREE', 2, 1, 30, 10, 5, NULL, NULL,  
NULL, NULL, NULL, NULL);  
END-OF-SQL
```

The result of the above commands should look like:

```
Query OK, 5 rows affected (0.01 sec)  
Records: 5 Duplicates: 0 Warnings: 0
```

```
Query OK, 2 rows affected (0.01 sec)
Records: 2 Duplicates: 0 Warnings: 0

Query OK, 25 rows affected (0.10 sec)
Records: 25 Duplicates: 0 Warnings: 0

Query OK, 1 row affected (0.00 sec)

Query OK, 1 row affected (0.00 sec)
```

4) Update the authentication of the web server configuration file, see 9) of section 3.1.3. Shown is here the Ubuntu/Debian version (Appendix-F provides the Suse version):

```
cat > ${SPENVIS_HTACCESS} <<END-OF-FILE
    AuthType Basic
    AuthName "SPENVIS Authentification"

    AuthUserFile /dev/null
    AuthBasicAuthoritative Off

    AuthMySQL On
    AuthMySQL_Host ${DB_SERVER}
    AuthMySQL_DB ${DB_NAME}
    AuthMySQL_User ${DB_USER}
    AuthMySQL_Password ${DB_PASSWD}
    AuthMySQL_Password_Table users
    AuthMySQL_Username_Field username
    AuthMySQL_Password_Field password
    AuthMySQL_Encryption_Types SHA1Sum
    AuthMySQL_Empty_Passwords Off
    AuthMySQL_Password_Clause "AND is_active=1"

    Require valid-user
END-OF-FILE
```

5) Edit config.php to adapt SPENVIS portal parameters:

- `$g_db_hostname $g_db_name $g_db_username $g_db_password`
Parameters to access SPENVIS MySQL database.
- `$g_notify_registered_account $g_notify_registered_account_email`
Parameters to control email notification in case of new registration.
- `$g_show_error_details $g_email_to_send_error`
Parameters to control error handling.
- `$g_bad_email_mailbox $g_bad_email_username $g_bad_email_password`
Parameters to access WEBMASTER mailbox in order to flag invalid email addresses.
- `$g_sso_forum $g_sso_slaves $g_sso_login $g_sso_password`
Parameters to synchronize services (e.g. Forum, Bug Tracker) sharing the same Single Sign-On access.

```
cp -p ${PHPCONFIG_FILE} ${PHPCONFIG_FILE}.${INSTALL_DATE}
awk '
    /\^ *define\\( *'SPENCST_DB_PASSWORD'/ {
        sub(/\^ *define\\( *'SPENCST_DB_PASSWORD' *, */, "\\")
```

```

sub(/ *\\) *; *$/, "\\")
print \"export PREVIOUS_DB_PASSWORD=\" \\$0    }
/^ *define\\( *'SPENCST_WEBMASTER_EMAIL'/ {
sub(/^ *define\\( *'SPENCST_WEBMASTER_EMAIL' *, */, "\\")
sub(/ *\\) *; *$/, "\\")
print \"export PREVIOUS_WEBMASTER=\" \\$0    }
/^ *define\\( *'SPENCST_BAD_EMAIL_PASSWORD'/ {
sub(/^ *define\\( *'SPENCST_BAD_EMAIL_PASSWORD' *, */, "\\")
sub(/ *\\) *; *$/, "\\")
print \"export PREVIOUS_WEBMASTER_PASSWORD=\" \\$0    }
/^ *\\$g_bad_email_mailbox */ {
sub(/^ *\\$g_bad_email_mailbox *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_WEBMASTER_MAILBOX_BADEMAILS=\" \\$0    }
/^ *\\$g_bad_email_username */ {
sub(/^ *\\$g_bad_email_username *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_WEBMASTER_USER=\" \\$0    }
/^ *\\$g_notify_registered_account */ {
sub(/^ *\\$g_notify_registered_account *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_NOTIFICATION=\" \\$0    }
/^ *\\$g_notify_registered_account_email */ {
sub(/^ *\\$g_notify_registered_account_email *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_NOTIFICATION_EMAIL=\" \\$0    }
/^ *\\$g_db_name */ {
sub(/^ *\\$g_db_name *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_DB_NAME=\" \\$0    }
/^ *\\$g_db_username */ {
sub(/^ *\\$g_db_username *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_DB_USER=\" \\$0    }
/^ *\\$g_db_hostname */ {
sub(/^ *\\$g_db_hostname *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_DB_SERVER=\" \\$0    }
/^ *\\$g_show_error_details */ {
sub(/^ *\\$g_show_error_details *= */, "\\")
sub(/ *; *$/, "\\")
print \"export PREVIOUS_ERROR_DETAILS=\" \\$0    }
" ${PHPCONFIG_FILE} \\
> ${INSTALL_HOME}/previous_spenvis_config.sh
source ${INSTALL_HOME}/previous_spenvis_config.sh
sed -e "/^ *define( *'SPENCST_DB_PASSWORD'/'\"
"s|${PREVIOUS_DB_PASSWORD}|'${DB_PASSWD}'|\" \\
-e "/^ *define( *'SPENCST_WEBMASTER_EMAIL'/'\"
"s|${PREVIOUS_WEBMASTER}|'${WEBMASTER}'|\" \\
-e "/^ *define( *'SPENCST_BAD_EMAIL_PASSWORD'/'\"
"s|${PREVIOUS_WEBMASTER_PASSWORD}|'unknown'|\" \\
-e "/^ *\\$g_bad_email_mailbox */\"
"s|${PREVIOUS_WEBMASTER_MAILBOX_BADEMAILS}|\" \\
"|'${DB_SERVER}:143}Mail/BadEmails'|\" \\
-e "/^ *\\$g_bad_email_username */\"
"s|${PREVIOUS_WEBMASTER_USER}|'${DB_USER}'|\" \\
-e "/^ *\\$g_notify_registered_account */\"
"s|${PREVIOUS_NOTIFICATION}|ON|\" \\
-e "/^ *\\$g_notify_registered_account_email */\"
"s|${PREVIOUS_NOTIFICATION_EMAIL}|'%webmaster_email%'|\" \\
-e "/^ *\\$g_db_name */=s|'${PREVIOUS_DB_NAME}'|'${DB_NAME}'|\" \\
-e "/^ *\\$g_db_username */=s|'${PREVIOUS_DB_USER}'|'${DB_USER}'|\" \\
-e "/^ *\\$g_db_hostname */=s|'${PREVIOUS_DB_SERVER}'|'${DB_SERVER}'|\" \\
-e "/^ *\\$g_show_error_details */=s|'${PREVIOUS_ERROR_DETAILS}|OFF|\" \\
-e "/^ *\\$g_sso_password */=s|; *$|; \\$g_sso_slaves=array();|\" \\
-i ${PHPCONFIG_FILE}

```

```
diff ${PHPCONFIG_FILE}.${INSTALL_DATE} ${PHPCONFIG_FILE}
```

The result of the above commands should look like:

```
6,8c6,8
< define('SPENCST_DB_PASSWORD', '');
< define('SPENCST_WEBMASTER_EMAIL', 'spenvis_team@aeronomie.be');
< define('SPENCST_BAD_EMAIL_PASSWORD', '');
---
> define('SPENCST_DB_PASSWORD', 'spenvis_dbuser');
> define('SPENCST_WEBMASTER_EMAIL', 'webmaster@localhost');
> define('SPENCST_BAD_EMAIL_PASSWORD', 'unknown');
32c32
< $g_db_username          = 'spenvisuser';
---
> $g_db_username          = 'spenvis_dbuser';
34c34
< $g_db_name              = 'spenvis';
---
> $g_db_name              = 'spenvis_db';
56c56
< $g_bad_email_username = 'spenuser';
---
> $g_bad_email_username = 'spenvis_dbuser';
68c68
< $g_notify_registered_account_email = '%webmaster_email%, Hugh.Evans@esa.int';
---
> $g_notify_registered_account_email = '%webmaster_email%';
222c222
< $g_sso_password = '';
---
> $g_sso_password = ''; $g_sso_slaves = array();
```

6) Restart and check.

```
sudo /etc/init.d/apache2 restart
WGET_OPT="--output-document=- --progress=dot --no-verbose\
--http-user=testuser --http-password=testuser"
WGET_PAGE="intro.php restricted/account_edit.php"
nohup $WVIEW &
sleep 5
for page in $WGET_PAGE; do
    echo http://${SPENVIS_HOSTNAME}/${page}
    wget http://${SPENVIS_HOSTNAME}/${page} $WGET_OPT | wc
    sleep 5
    $WVIEW http://testuser:testuser@${SPENVIS_HOSTNAME}/${page} &
done
```

The result of the above commands should look like:

```
* Restarting web server apache2
apache2: Could not reliably determine the server's fully qualified domain name,
using 127.0.1.1 for ServerName
... waiting apache2: Could not reliably determine the server's fully qualified
domain name, using 127.0.1.1 for ServerName
[ OK ]
[1] 3577
nohup: ignoring input and appending output to `nohup.out'
http://localhost/intro.php
2010-02-26 06:11:12 URL:http://localhost/intro.php [8820] -> "-" [1]
    175      600    8820
[2] 3595
http://localhost/restricted/account_edit.php
```

```
2010-02-26 06:11:13 URL:http://localhost/restricted/account_edit.php [5960/5960]
-> "-" [1]
      104      343      5960
[3] 3608
```

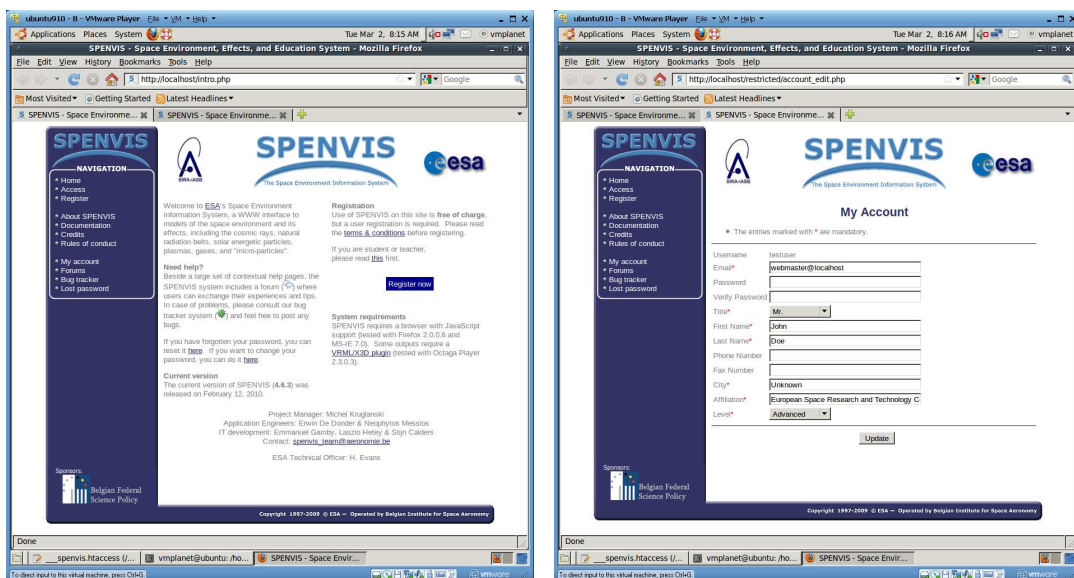


Figure 25 Left: The SPENVIS System at Startup, now via MySQL Authentication, Right: SPENVIS “My Account” Page for editing own Settings

7) Try to register a new user (interactively):

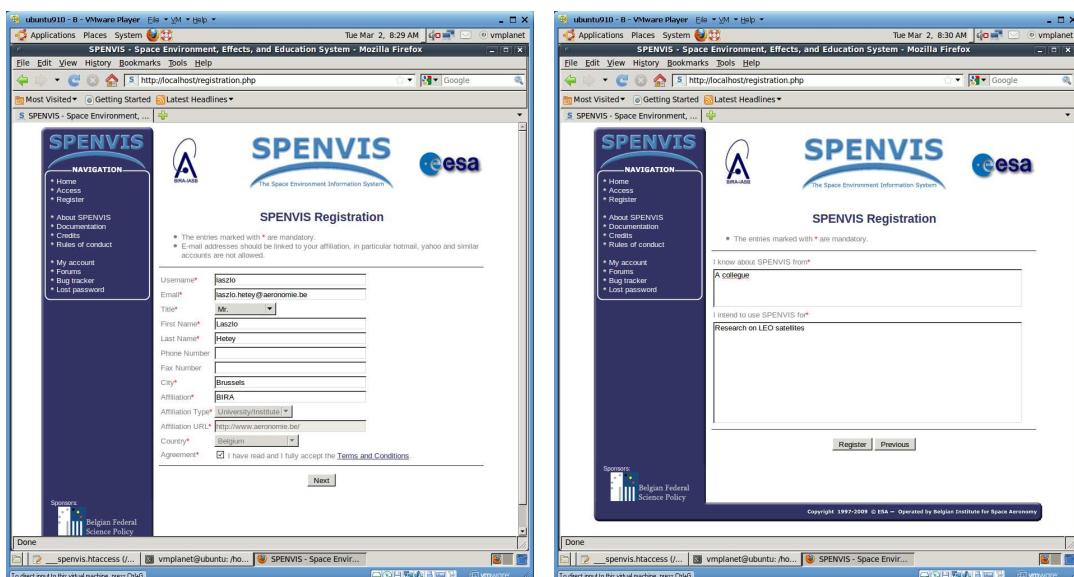


Figure 26 SPENVIS Registration Forms

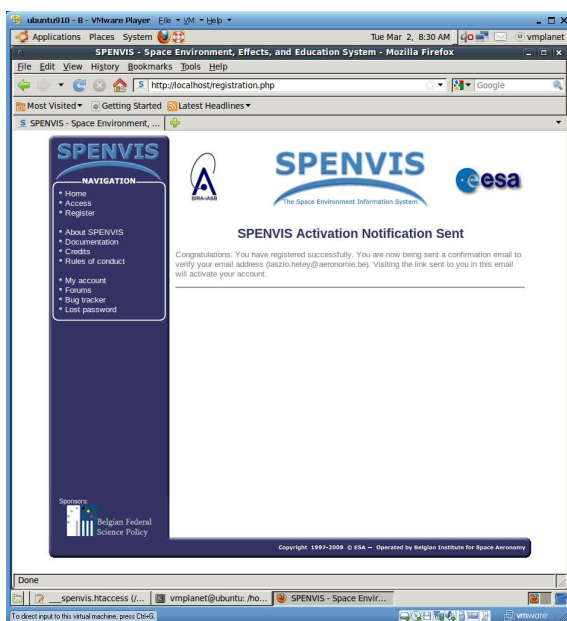


Figure 27 This Page is shown after a successful Registration

8) Login to SPENVIS. After successful registration, an email is send which contains a link to set the user password, see Figure-28.

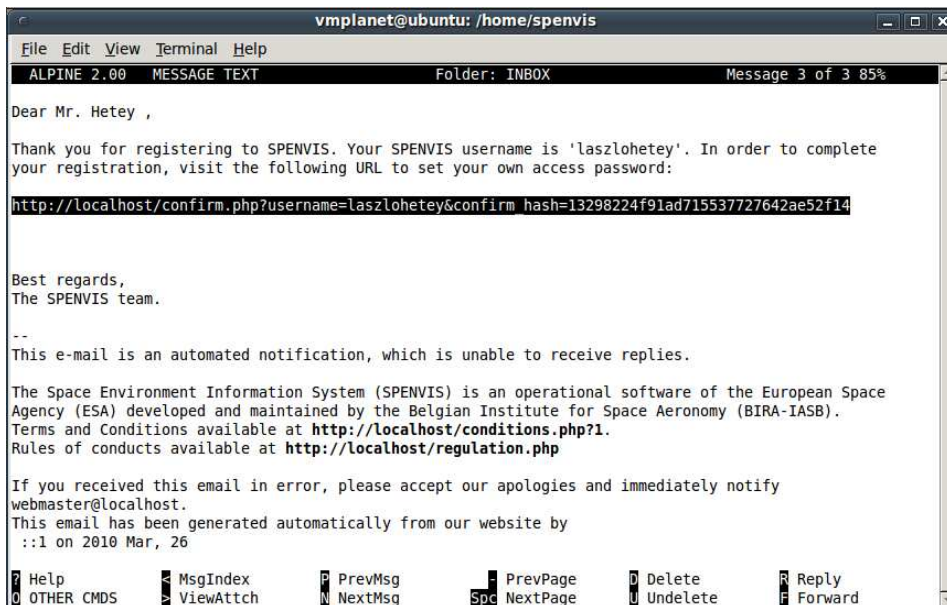


Figure 28 The Notification Email contains a Link for setting the User Password

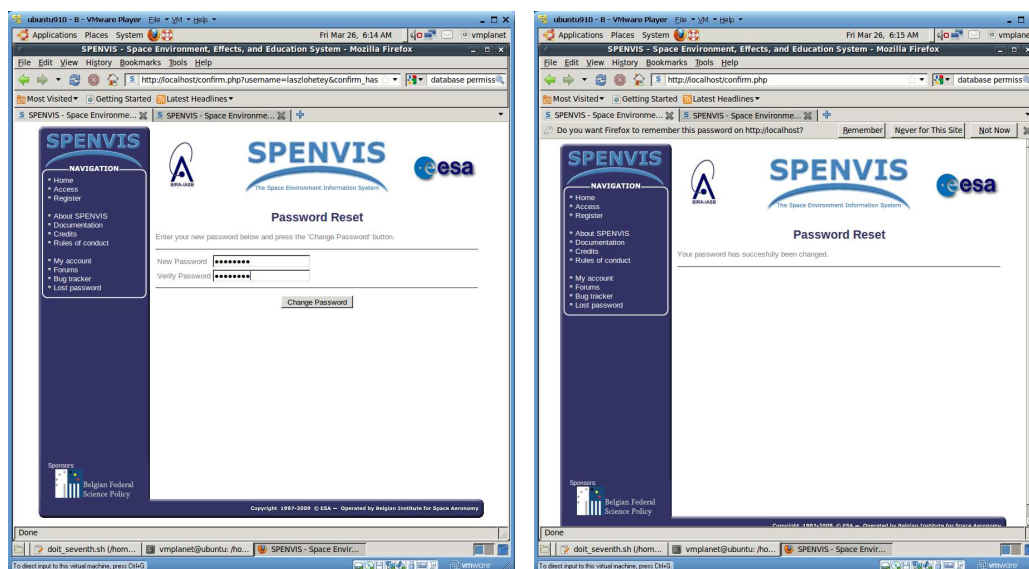


Figure 29 Setting the SPENVIS User Password

After the password has been set the SPENVIS system can be accessed by the new user. The MySQL database contains a new entry:

```
mysql ${DB_NAME} --host=${DB_SERVER} --user=${DB_USER} \
--password=${DB_PASSWD} --table <<END-OF-SQL
SELECT username,first_name,last_name FROM users;
END-OF-SQL
```

The result of the above commands should look like:

username	first_name	last_name
laszlohetey	Laszlo	Hetey
testuser	John	Doe

3.1.5 Forum and BugTracker

The Forum and the BugTracker are part of the SPENVIS system and use functionality provided by:

- **phpBB** a free-software internet forum package written in the PHP scripting language used for the Forum, source: <http://www.phpbb.com/>
- **mantis** an open-source web-based bug tracking system used for the BugTracker, source: <http://www.mantisbt.org/>

Both tools have to be installed independently of SPENVIS. Therefore, the location of their installation at the server hardware is not prescribed.

Both tools require user authentication using a SQL database which is different from the main SPENVIS database, see Figure-30.

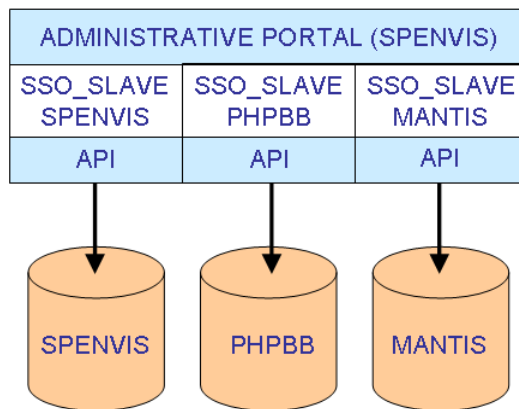


Figure 30 SSO-API using three different SQL Databases for User Authentication

The SPENVIS system manages its core database and both other databases using functionality provided by SSO (Single Sign On)-scripts. This means whenever a new user registers or an email changes the databases will be updated. The SPENVIS system will then generate HTTP queries to the URL of the SSO-scripts. The URL is specified in config.php (alias \${PHPCONFIG_FILE}) in the array \$g_sso_slaves. This has to be adapted when installing SPENVIS. Samples of the SSO-scripts are located in:

```

${INSTALL_HOME}/htdocs/sso_slaves/phpbb_sso_slave.php
${INSTALL_HOME}/htdocs/sso_slaves/mantis_sso_slave.php

```

Important parameters of the scripts are:

- 'action'='user_create', 'user_modify', 'user_sync', 'user_remove', 'user_activate', 'user_deactivate', 'version_create' (Bug Tracker only), 'version_deactivate' (Bug Tracker only)
- 'username'
- 'email'
- 'first_name'
- 'last_name'
- 'active' (boolean)
- 'admin' (boolean)
- 'power_user' (boolean)
- 'third_party' (boolean)
- 'project_id' (integer)
- 'version'

3.2 Monitoring and Managing the System

System monitoring and management will facilitate a correct functionality of SPENVIS. This section will describe the most important tools.

3.2.1 Monitoring the System

Whenever a problem occurs it is best to first check the log-files of the Apache web-server and the SPENVIS system. It is advisable to configure SPENVIS in a way that it produces daily logs with names like:

```
www.spenvis.oma.be_2010-04-01.run_log  www.spenvis.oma.be_2010-04-06.run_log
www.spenvis.oma.be_2010-04-02.run_log  www.spenvis.oma.be_2010-04-07.run_log
www.spenvis.oma.be_2010-04-03.run_log  www.spenvis.oma.be_2010-04-08.run_log
www.spenvis.oma.be_2010-04-04.run_log  www.spenvis.oma.be_2010-04-09.run_log
www.spenvis.oma.be_2010-04-05.run_log  www.spenvis.oma.be_2010-04.error_log
```

Apache Access Log

```
${INSTALL_HOME}/${SPENVIS_HOSTNAME}_access.log
```

Apache Error Log

```
${INSTALL_HOME}/${SPENVIS_HOSTNAME}_error.log
```

SPENVIS Run Log (depending on the date the naming could be):

```
${INSTALL_HOME}/htusers/_log_/localhost_2010-03-03.run_log
```

A typical log could look like:

```
09/04/2010 12:01:01 irf_stud11 p sapre - 150.00 1
09/04/2010 12:01:01 irf_stud9 p letorb - 150.00 1
09/04/2010 12:01:01 irf_stud9 x exit_ - 0.20 2
09/04/2010 12:01:01 irf_stud11 x exit_ - 6.64 2
09/04/2010 12:01:43 irf_stud11 m sapre - 150.00 1
09/04/2010 12:01:43 irf_stud11 x exit_ - 5.77 2
09/04/2010 12:01:57 irf_stud11 p sapre - 150.00 1
09/04/2010 12:01:57 irf_stud11 x exit_ - 6.77 2
09/04/2010 12:02:25 irf_stud9 m letorb - 150.00 1
09/04/2010 12:02:25 irf_stud9 x exit_ - 2.32 2
09/04/2010 12:02:28 irf_stud11 p sapre - 150.00 1
09/04/2010 12:02:28 irf_stud11 x exit_ - 4.40 2
09/04/2010 12:02:33 irf_stud9 p letorb - 150.00 1
09/04/2010 12:02:33 irf_stud9 x exit_ - 0.56 2
09/04/2010 12:02:39 irf_stud11 p sapre - 150.00 1
09/04/2010 12:02:39 irf_stud11 x exit_ - 4.43 2
09/04/2010 12:02:53 maurobartesaghi m sapre - 150.00 1
09/04/2010 12:02:53 maurobartesaghi m trep - 150.00 2
09/04/2010 12:02:53 maurobartesaghi m aniso - 150.00 3
09/04/2010 12:02:53 maurobartesaghi m sep - 150.00 4
09/04/2010 12:02:53 maurobartesaghi m eqflux - 150.00 5
09/04/2010 12:02:53 maurobartesaghi x exit_ - 1.62 6
09/04/2010 12:03:09 irf_stud9 m eqflux - 150.00 1
09/04/2010 12:03:09 irf_stud9 x exit_ - 0.12 2
```

The columns mean:

1. Date
2. GMT-time (start of the request, it is the same time as in the Apache log)
3. Username
4. Submission parameter: p = plot, m = model, x = exit
5. Model executed
6. Quota CPU time (column-7=1, usually 150.00) or CPU time used (column-7 > 1)
7. Number counting the single requests (1,2,3,4,). Most of the time there will be only two lines: the model run and the exit.

SPENVIS Error Log (depending on the date the naming could be):

```
{$_INSTALL_HOME}/htusers/_log/_localhost_2010-02.error_log
```

A typical log could look like:

```
09/04/2010 12:01:01 irf_stud11 p sapre - 150.00 1
03/04/2010 07:16:28 - gutierrez - MODEL_ERROR - Mission duration is shorter than
the combined mission segments
03/04/2010 07:16:45 - gutierrez - MODEL_ERROR - Mission duration is shorter than
the combined mission segments
03/04/2010 07:17:37 - gutierrez - MODEL_ERROR - Mission duration is shorter than
the combined mission segments
03/04/2010 07:17:59 - gutierrez - MODEL_ERROR - Mission duration is shorter than
the combined mission segments
03/04/2010 10:43:52 - sportxxx - MODEL_ERROR - An error occurred in routine
<CODE>globeplot</CODE>. <P>Error message: Loop limit expression too large for
loop variable type. <LONG ( 43201)>. <P> <P>Traceback:
03/04/2010 10:48:55 - sportxxx - MODEL_ERROR - An error occurred in routine
<CODE>globeplot</CODE>. <P>Error message: Loop limit expression too large for
loop variable type. <LONG ( 43201)>. <P> <P>Traceback:
04/04/2010 03:31:58 - reddell - MODEL_ERROR - Execution of Mulassis aborted:
execution time exceeded.
04/04/2010 03:36:47 - reddell - MODEL_ERROR - Execution of Mulassis aborted:
execution time exceeded.
04/04/2010 04:51:07 - sportxxx - MODEL_ERROR - An error occurred in routine
<CODE>globeplot</CODE>. <P>Error message: Loop limit expression too large for
loop variable type. <LONG ( 43201)>. <P> <P>Traceback:
04/04/2010 08:26:45 - coepsat - BAD_AUTH - Invalid username 'coepsat '
04/04/2010 08:30:34 - coepsat - BAD_AUTH - Invalid username 'coepsat '
04/04/2010 10:15:10 - sportxxx - MARK - #001 @ action-handler.c:675 running.cgi
is missing or 'newInstance' is already present.
04/04/2010 10:15:10 - sportxxx - ERROR - No output
05/04/2010 08:40:36 - bernard - ERROR - No actions associated to the submitted
form.
05/04/2010 11:17:42 - sportxxx - MODEL_ERROR - An error has occurred... : Error
opening the datafile.
05/04/2010 11:18:10 - sportxxx - MODEL_ERROR - An error has occurred... : Error
opening the datafile.
05/04/2010 11:18:31 - sportxxx - MODEL_ERROR - An error has occurred... : Error
opening the datafile.
05/04/2010 17:31:44 - chesser - MODEL_ERROR - An error occurred in routine
<CODE>vrml</CODE> when creating the image. <P>Error
```

```
message: Attempt to call undefined procedure/function: 'CONGRID'. <P>
<P>Traceback:
05/04/2010 17:33:02 - chesser - MODEL_ERROR - An error occurred in routine
<CODE>grid_spheres</CODE> when creating the image.
<P>Error message: Attempt to call undefined procedure/function: 'CONGRID'. <P>
<P>Traceback:
05/04/2010 23:09:01 - nickles - MODEL_ERROR - ICELL out of range
06/04/2010 00:49:21 - tristancho - MODEL_ERROR - Mission duration is shorter
than the combined mission segments
06/04/2010 00:50:17 - tristancho - MODEL_ERROR - Mission duration is shorter
than the combined mission segments
```

The meaning of the columns is similar to the SPENVIS-run-log. Important is column number four, which explains the occurred error:

- MODEL_ERROR: occurs during the model run, the description corresponds to the content of spenvis.err (the error message shown to the user)
- BAD_AUTH: invalid username, detected at script level (generally a trailing white space)
- QUOTA: exceeding of user quotas detected
- ERROR: all other errors
- MARK: debug info generated by the script

3.2.2 Suggested additional Monitoring

The suggested monitoring described in this section is not an internal part of the SPENVIS distribution. It should be implemented depending on the used system. The examples show the installation at BIRA.

Disk Usage Cron: will regularly report about the used disk and sent information mails

Subject: Disk space info : /data/spenvis-htusers : CRITICAL level !
From: root <root@spenvis-ae.oma.be>

```
The mount '/data/spenvis-htusers' on spenvis-ae has less than 1 GB of free disk
space (CRITICAL level)

Characteristics (issued from the Unix 'df -kP' command) :

    Total space :      19 GB
    Used space  :      19 GB
Available space :       0 GB =~    0 % <--- CRITICAL level !!

This message was automatically generated by /root/_bin/checkSpace.pl.
```

Subject: Disk space info
From: root <root@spenvis-ae.oma.be>

```
Dear SPENVIS Team

Please find below the Top 40 of the SPENVIS users (disk usage in kb).
The full listing is temporary stored at
/tmp/michelk_20100328235901_check_htusers_raw.txt.
```

Regards

CRON

```
--
361760    /bira-iasb/projects/spenvis/spenvis-htusers/o/oleg/11F644
300372    /bira-iasb/projects/spenvis/spenvis-htusers/h/holzmann/OCTOSHIELD
248008    /bira-iasb/projects/spenvis/spenvis-htusers/c/cda1985/TEST
237344    /bira-iasb/projects/spenvis/spenvis-htusers/m/mccarrdw/METSM6
223960    /bira-iasb/projects/spenvis/spenvis-htusers/a/aramirez/TEST
212724    /bira-iasb/projects/spenvis/spenvis-htusers/s/samrason/PPC750
200976    /bira-iasb/projects/spenvis/spenvis-htusers/l/luisbenz/DEFI
170176    /bira-iasb/projects/spenvis/spenvis-htusers/j/jwhan/CRRES
160188    /bira-iasb/projects/spenvis/spenvis-htusers/l/lemair/IOPACS
125492    /bira-iasb/projects/spenvis/spenvis-htusers/g/golightly/LROGCR
119072    /bira-iasb/projects/spenvis/spenvis-htusers/h/hopkinson/EUCLID
...
```

Broken Links Cron: will regularly send mails with a list of all broken links

Subject: [CRON] Broken links
From: root <root@spenvis-ae.oma.be>

The mount '/data/spenvis-htusers' on spenvis-ae has less than 1 GB of free disk space (CRITICAL level)
Dear SPENVIS team

Please find in attachement a list of broken links.

kronos

Thu Mar 25 01:59:01 CET 2010

```
==== http://www.spenvis.oma.be/help/background/background.html ====
http://www oulu.fi/~spaceweb/textbook/ Line: 84 Code: 404 Not Found
==== http://www.spenvis.oma.be/help/system/glossary.html ====
http://www.jpl.nasa.gov/basics/bsfgloss.htm Line: 2671 Warning: Forbidden by
robots.txt
==== http://www.spenvis.oma.be/help/system/acronyms.html ====
https://wist.echo.nasa.gov/v0ims/Acronyms.html Line: 716 Code: 404 Not
Found
http://www oulu.fi/~spaceweb/textbook/solarwind.html Line: 433 Code: 404
Not Found
http://daac.ornl.gov/BOREAS/boreas_home_page.html Line: 155 Code: Bad
hostname 'daac.ornl.gov'
http://www.gfz-potsdam.de/portal/- Line: 367 Warning: Forbidden by
robots.txt
...
```

3.2.3 Managing Users

The user management tool can be accessed via:

<http://www.spenvis.oma.be/admin/>

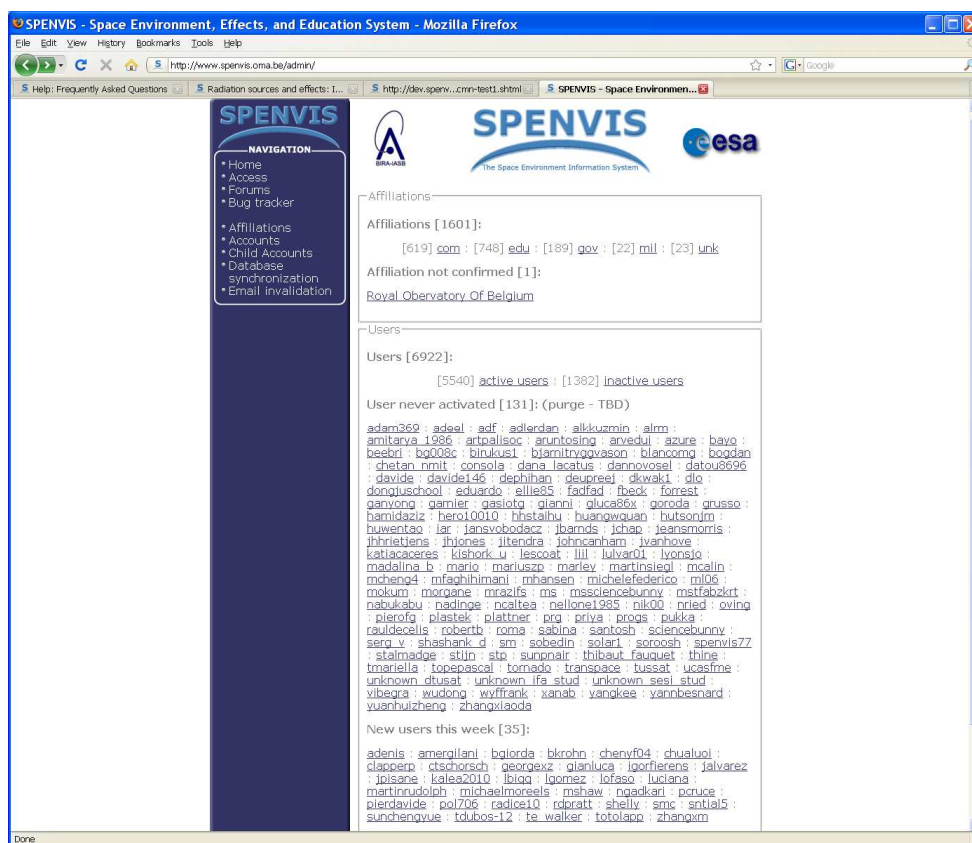


Figure 31 SPENVIS User Management Page

Figure-31 shows the user management page. It lists new, active, inactive and never activated user. Active users are of most interest. When following the link “active user” a list with all active users (currently about 5500) will be generated. To ease the search, administrators can find users by their first or last name, affiliation, email, etc., see Figure-32.

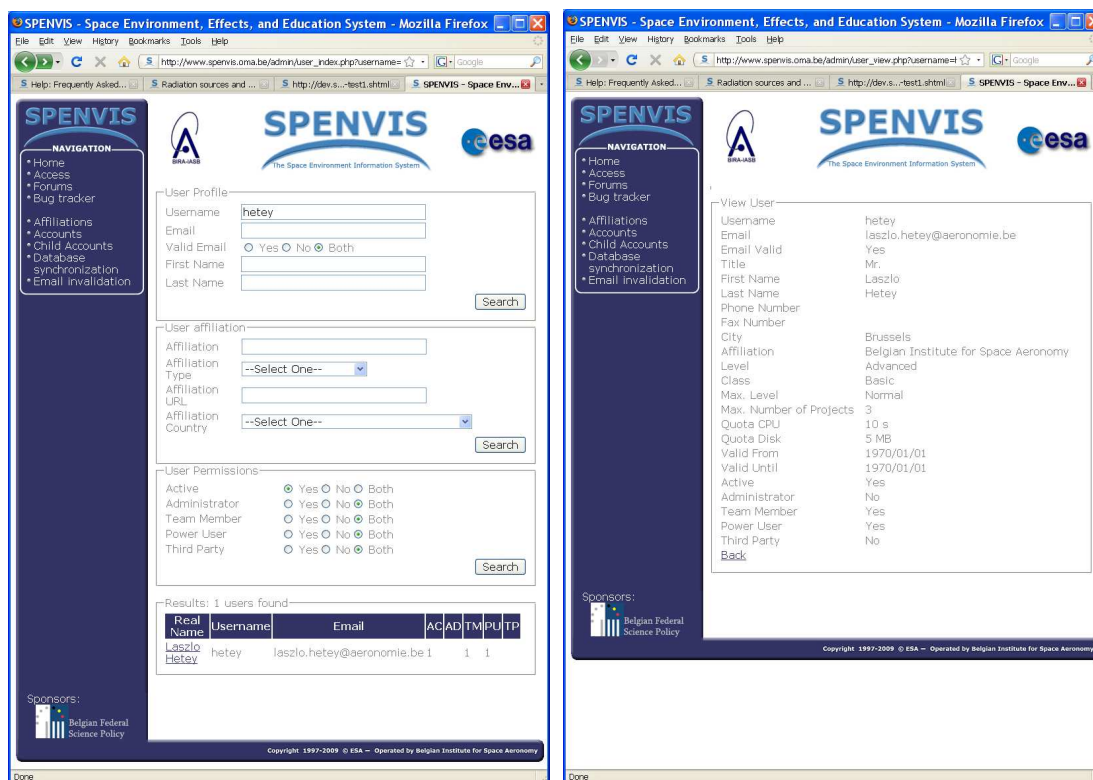


Figure 32 Searching and managing a specific User with the User Management

Figure-32 explains how a user can be found easily by searching his name. For every user exists a page displaying his attributes, see the right side of Figure-32. Administrators can make changes to the entries using this site.

3.3 Troubleshooting

To be completed. This will be a list of errors which occurred during installation or usage of SPENVIS.

4 Third-Party Developers

This chapter explains briefly the building of the third-party developer version of SPENVIS for Windows. The description for Linux/Unix can be found online, see section 4.3. The policy to be followed for validation and verification of developed models is described in the SQP.

4.1 Prerequisites

- At least Windows XP with the last service packs and patches installed.

4.2 Installation

1. download TortoiseSVN from <http://tortoisesvn.tigris.org> & install
2. download XAMPP from <http://www.apachefriends.org> & install
3. download MinGW from <http://www.mingw.org/> & install
4. download Msys from <http://www.mingw.org/> & install
5. download gfortran 4.3 from <http://gcc.gnu.org/wiki/GFortranBinaries> & install
6. edit the PATH environment variable (check <http://support.microsoft.com/kb/310519/en-us> for instructions):

- c:\Program Files\gfortran\libexec\gcc\i586-pc-mingw32\4.4.0
- c:\mingw\mingw32\bin
- c:\mingw\bin

(The order of the path elements is important! The gfortran compiler path has to come before the default mingw compilers.)

7. download IDL from <http://www.itvis.com> & install (caution: this is non-free software!)
8. start IDL, create a workspace and insert a license key
9. checkout your third party branch from <http://dev.spenvis.oma.be/svn/> to c:\spenvis (use TortoiseSVN!)
10. take a look at the README file (c:\spenvis\000_readme.txt)

11. check the content of c:\spenvis\contact.info (if the file doesn't exist, please refer to the README file)
12. download the [toolkit.zip](#) file and unpack it (including all subdirectories) to c:\spenvis
13. check the content of c:\spenvis\htbin\spenvis.properties
14. edit c:\xampp\apache\conf\httpd.conf:

```
# Spenvis settings
include conf/extra/spenvis_win32.conf
```

15. create the file c:\xampp\apache\conf\extra\spenvis_win32.conf and edit it (the installation paths depend on the Apache installation, see the documentation <http://httpd.apache.org/docs/>):

```
#
# SPENVIS.conf
#

ScriptAlias /spenvis/htbin c:\spenvis\htbin
Alias /spenvis/htusers c:\spenvis\htusers
Alias /spenvis c:\spenvis\htdocs

<Directory c:\spenvis\htdocs>
    DirectoryIndex intro.html
    Order deny,allow
    Deny from none
    Allow from all
</Directory>

<Directory c:\spenvis\htbin>
    Order deny,allow
    Deny from none
    Allow from all
</Directory>

<Directory c:\spenvis\htusers>
    Order deny,allow
    Deny from none
    Allow from all
</Directory>

<Directory c:\spenvis\doc>
    Order deny,allow
    Deny from none
    Allow from all
</Directory>
```

16. start apache using c:\xampp\xampp-control.exe

4.3 Further Information

This part of the user documentation is only accessible from the online developer site:

<http://dev.spenvis.oma.be/dev/>

Appendix A Definitions, Acronyms and Abbreviations

API	Application Programming Interface
ATS	Acceptance Test Specification
BIRA-IASB	Belgian Institute for Space Aeronomy
BSSC	Board for Software Standardisation and Control
CCN	Contract Change Notice
CGI	Common Gateway Interface
ESA	European Space Agency
ESTEC	European Space Research and Technology Centre
GSTP	General Support Technology Programme, ESA optional programme, activities of which aim at the pre-development and qualification of critical technologies required by future space projects
GUI	Graphical User Interface
HTML	HyperText Markup Language
IDL	Interactive Data Language, dynamically typed data analysis programming language initiated in the 1970s by D. Stern (University of Colorado) and distributed by <i>ITT Visual Information Solutions</i>
MR	Monthly Report
OM	Operations and Maintenance
PHD	Project History Document

PHP	PHP Hypertext Preprocessor (originally: Personal Home Page)
PM	Progress Meeting
PSS	Procedures, Specifications and Standards
RID	Review Item Discrepancy
SLES	Suse Linux Enterprise Server
SPENVIS	Space Environment Information System
SQP	Software Quality Plan
SSD	Software Specification Document
SSO	Single Sign On
STD	Software Transfer Document
SUM	User Manual
SVN	Subversion (version control software)
TN	Technical Note
URD	User Requirement Document
WP	Work Package
WWW	World Wide Web

Appendix B User Agreements

B.1 Terms and Conditions

Source: <http://www.spennis.oma.be/conditions.php> (accessed: 25.2.2010)

These Terms and Conditions constitute a binding contract between the “Customer” and the Belgian Institute for Space Aeronomy (the “Institute”) and are referred to herein as either “Terms and Conditions” or the “Agreement.” Customer accepts these Terms and Conditions by registering or placing an order on the SPENVIS website (the “Site”). These Terms and Conditions are subject to change without prior notice, except that the Terms and Conditions posted on the Site at the time Customer places an order will govern the order, unless otherwise agreed in writing by the Institute and Customer.

Jurisdiction and applicable right

The current Terms and Conditions are subjected to Belgian law. Any contention with regard to the present contract, its conclusion, its execution or termination is submitted to Belgian law. In case of disputes, only the courts of Brussels (Belgium) are sole qualified.

Service Provider

The Contractor is the Belgian Institute for Space Aeronomy (the “Institute” or “BIRA-IASB”), its legal denomination is either “Belgisch Instituut voor Ruimte-Aëronomie” or “Institut d’Aéronomie Spatiale de Belgique.” The Institute is located at Ringlaan 3 Avenue Circulaire, 1180 Brussels (Belgium). The Institute is a governmental research centre depending on the Belgian Federal Science Policy. The Institute is exempted from Value Added Tax (VAT).

Intellectual Property and Technology Transfer

The Space Environment Information System (“SPENVIS”) is an engineering Operational Software of the European Space Agency (the “Agency” or “ESA”). The Agency owns all Intellectual Property Rights of the SPENVIS software. An irrevocable worldwide license to use SPENVIS for peaceful purpose is granted by the Agency to the Institute. Nevertheless sub-license or transfer of the SPENVIS software to an entity not located in an ESA Member State or to any international organization are subject to the veto of the Agency Technology and Product Transfer Board.

All the material of the Site (pages, concepts, help files, documentation, etc.), except the models developed by other institutions, is the property of the Agency. The Customer should not copy (except for personal use) or sell this material without the permission of either the Institute or the Agency.

Effectiveness of the Agreement

The Agreement becomes effective on the date on which the Institute activates the requested Services. The Institute reserves the right to refuse access to the Services, for any of the following reasons:

- if the Customer refuses to provide the required information, or if the Customer has given incorrect or false details;

- if the Institute has proof or serious suspicions of non-payment, fraud or purposes that do not comply with the Agreement, are illegal or against statutory regulations;
- if the Customer is subject to embargo by the Agency.

Obligations of the Customer

The Customer commits himself or herself

- to keep a valid postal address as well as a functional email address at all times and consult them regularly (the Site includes an electronic administrative console to manage this data, under http://www.spenvis.oma.be/user_account.php);
- to use the Services in conformity with the provisions of the Agreement and all laws and regulations that are in force;
- to respect intellectual property rights of any third parties;
- to request permission of the Institute or the Agency to use SPENVIS for commercial purposes (only the interpretation of the results of the models and the user inputs entered are the property of the Customer and could be used in a commercial way);
- to properly acknowledge the service in all publications and presentations using results obtained with the SPENVIS system.

It is the responsibility of the Customer to make backups of useful information such as model inputs and outputs (the Site includes a backup utility in the electronic project console, under <http://www.spenvis.oma.be/htbin/spenvis.exe?%23resetToPrevious%28project.html%29>).

Performances and liability

The Institute will provide the Customer with all necessary information with regard to the Services. The Institute commits itself to undertake all that is necessary, for providing access to the Services in an optimal manner. The Institute makes a resource commitment.

Both parties agree that the Internet may have various transfer capacities and its own usage policy, and that nobody can guarantee a flawless and continuous operation of the Internet as a whole. The Customer is aware of the fact that

- the transfer of information through the Internet is only relatively trustworthy;
- the information that is dispersed through the Internet is not protected against possible alterations.

The Institute will not be liable in case of technical problems against its will, such as power cut, power breakdown or technical breakdown. The customer will not be able to claim any damages nor repayment resulting from any technical problem encountered. The Institute cannot be made liable for damages

- in case of technical problems against its will or Force Majeure (e.g. power cut, technical breakdown, natural disasters);
- in case of suspension or termination of a Service in conformity with the Agreement or at the explicit request of an authorized administrative or judicial institution;

- when the Customer has not provided required information or has provided incorrect information.

The Institute, the Agency or the model and data providers are not to be held responsible for the contents or the accuracy of the models in SPENVIS and the use of the results. It is the responsibility of the Customer to verify that the outputs are appropriate for his or her application.

Personal information

The Institute does not gather any personal information unless it is provided on a voluntary basis. By completing and sending a registration form, the Customer grants the Institute permission to save his or her personal information in a database for the purpose of automated user profiling, customer management and market research. The information provided can be transferred for these purposes to the Agency and to companies contractually connected with the Institute in the framework of SPENVIS. The Institute may call upon third parties to provide it with data relating to the Customer, either with the aim of ensuring the exact and complete character of the information contained in its databases, or in order to carry out market research. The Customer has the right to review his or her relevant personal information and make corrections if applicable.

The Institute also collects anonymous or aggregated information of a non-personal nature, such as browser type, IP address and operating system used by the Customer.

Passwords and secure areas of the site

The Customer needs a password to access certain parts of the Site. Entering these parts without a password is strictly prohibited. The Customer must keep his password secret and confidential. Each use of services made after valid identification using the Customer's password shall be deemed to be committed by the Customer himself. If the Institute has reason to believe that the safety of the site is in jeopardy, the Institute can change the Customer's password without prejudice to its other rights.

B.2 Rules of Conduct

Source: <http://www.spenvis.oma.be/regulation.php> (accessed: 25.2.2010)

By using this site, you signify your agreement to these Rules of Conduct (the "Rules"). If you disagree with any of the Rules, do not use this site. The Belgian Institute for Space Aeronomy ("BIRA-IASB") may modify the Rules at any time, so please check for changes when you use this site.

Purpose of the site

This site is designed to be a general resource on, as well as an access point to, the Space Environment Information System ("SPENVIS"). SPENVIS is an engineering Operational Software of the European Space Agency ("ESA") maintained and operated by BIRA-IASB. BIRA-IASB is a governmental research centre depending on the Belgian Federal Science Policy. It is located at Ringlaan 3 Avenue Circulaire, 1180 Brussels (Belgium).

You agree to use this site in a responsible way taking into account that SPENVIS is a centralized system used by a whole community.

Availability and disclaimers

BIRA-IASB commits itself to provide access to this site and to maintain its content on a best effort basis. BIRA-IASB does not guarantee that this site will be continuously available.

Neither ESA nor BIRA-IASB nor the model and data providers could be held responsible for the contents or the content accuracy of this site. It is your responsibility to verify that the provided data are appropriate for your application.

Copyright

ESA owns all Intellectual Property Rights of the SPENVIS software and documentation. All the material of the Site (pages, concepts, help files, documentation, etc.), except the models developed by other institutions, is the property of ESA. You should not copy (except for personal use) or sell this material without the permission of either BIRA-IASB or ESA. In absence of specific agreements, you should use this site only for your own personal, non-commercial purposes.

All publications and presentations using data obtained from this site should properly acknowledge the service. Please send a reprint of, or a reference to, such publications to the SPENVIS project manager (M. Kruglanski, BIRA-IASB, Ringlaan 3, B-1180 Brussel, Belgium).

Secure areas of the site

Certain parts of the Site are password protected and require a valid authentication. Entering these parts are subject to the Terms and Conditions listed under <http://www.spenvis.oma.be/conditions.php>.

Personal information

BIRA-IASB collects anonymous or aggregated information of a non-personal nature, such as your browser type, IP address and operating system. BIRA-IASB does not gather any personal information unless it is provided on a voluntary basis.

Prohibited uses

You agree not to use this site:

- in a manner that violates any local, state, national, foreign, or international law or regulation;
- to stalk, harass, or harm another individual;
- to interfere with or disrupt this site or servers connected to this site;
- to attempt to gain unauthorized access to any portion of this site or any other accounts or computer systems connected to this site, whether through hacking or password mining.

Appendix C Example of a Host-File

File location (WindowsXP): C:\WINDOWS\system32\drivers\etc\hosts

This is an example of a host-file adapting the local SPENVIS server running inside VMWare. Here, the local version is assigned to the address: www.spenvvis-dist.local:

```
# Copyright (c) 1993-1999 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
#
# For example:
#
#       102.54.94.97       rhino.acme.com           # source server
#       38.25.63.10       x.acme.com               # x client host
127.0.0.1       localhost
192.168.126.131 www.spenvvis-dist.local
```

Appendix D SPENVIS Properties

The configuration refers to the files `${INSTALLATION_HOME}/runtime/htbin/spenvis.properties` and `${INSTALLATION_HOME}/htusers/*/${USER_NAME}/user.properties`.

Table D.1 SPENVIS Parameter List

Parameter name	spenvis. properties	user. properties	Description
SPENVIS_URL	mandatory	ignored	document root of SPENVIS web site, mandatory
SPENVIS_PATH	mandatory	ignored	SPENVIS root folder, mandatory
IDL_CMD	optional	ignored	shell command to execute a IDL script named <code><startup.pro></code> , optional must contain " <code><startup.pro></code> "
IDL_RT	optional	ignored	shell command to execute a IDL runtime named <code><main.sav></code> , optional must contain " <code><main.sav></code> "
PHP_CMD	optional	ignored	shell command to execute a PHP script, optional
PYTHON_CMD	optional	ignored	shell command to execute a PY script, not used
JAVA_CMD	optional	ignored	shell command to execute a Java script, not used must contain " <code><class></code> " and " <code><arguments></code> "
ZIP_CMD	optional	ignored	shell command for archiving, optional must contain " <code><archive></code> " and " <code><file></code> "
DATA_PATH	optional	ignored	path to the SPENVIS data folder, optional default is <code>{SPENVIS_PATH}/data</code>
IDL_PATH	optional	ignored	path to the SPENVIS idl folder, optional default is <code>{SPENVIS_PATH}/idl</code>
BIN_PATH	optional	ignored	path to the SPENVIS idl folder, optional default is <code>{SPENVIS_PATH}/bin</code>
HTUSERS_URL	optional	ignored	location corresponding to the SPENVIS htusers folder, optional

			default is {SPENVIS_URL}/htusers see also HTUSERS_PATH
HTUSERS_PATH	optional	ignored	path to the SPENVIS htusers folder, optional default is {SPENVIS_PATH}/htusers, see also HTUSERS_URL
USERPREFIXSIZE	optional	ignored	optional, default is "0"
STATIC_ RESULTS DIR	optional	ignored	optional, default is "false"
SERVER	ignored	ignored	server address, informational (ignored by the SPENVIS script) format is PROTOCOL://SERVER:PORT
MODE	optional	ignored	should be set to "developer" in case of third party development
NEED_VALID	optional	ignored	optional, not set by default
VALID_UNTIL	ignored	optional	
VALID_FROM	ignored	optional	
IS_VALID	ignored	ignored	
BATCH_ ENABLED	optional	overload	optional, default is "false"
MAX_PROJECTS	optional	overload	optional, default is "2"
USER_LEVEL	optional	overload	default user level, optional must contain either "novice", "advanced" or "normal" default is "normal" (default)
DEBUG	optional	overload	optional, must contain either "on" or "off"
QUOTA_CPU	optional	overload	optional, must be an integer
QUOTA_DISK	optional	overload	optional, must be an integer
PROJECT_COUNT	ignored	ignored	
USER_CLASS	ignored	optional	
QUOTA_ERROR	ignored	optional	

Appendix E MySQL Database Commands

E.1 User Management

```
USE `${DB_NAME}`;  
SET SQL_MODE="NO_AUTO_VALUE_ON_ZERO";
```

Create table countries:

```
CREATE TABLE `countries` (  
  `code` char(2) character set latin1 collate latin1_bin NOT NULL,  
  `name` varchar(63) collate latin1_general_ci NOT NULL,  
  `is_esa` tinyint(1) unsigned zerofill default '0',  
  `is_eu` tinyint(1) unsigned zerofill default '0',  
  `is_us` tinyint(1) unsigned zerofill default '0',  
  `is_eeca` tinyint(1) unsigned zerofill default '0',  
  `is_obsolete` tinyint(1) unsigned zerofill default '0',  
  PRIMARY KEY (`code`),  
  UNIQUE KEY `name` (`name`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table affiliation_types:

```
CREATE TABLE `affiliation_types` (  
  `type` char(3) character set latin1 collate latin1_bin NOT NULL,  
  `name` varchar(127) collate latin1_general_ci NOT NULL,  
  PRIMARY KEY (`type`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table affiliations:

```
CREATE TABLE `affiliations` (  
  `id` bigint(20) NOT NULL auto_increment,  
  `name` varchar(127) collate latin1_general_ci NOT NULL,  
  `acronym` varchar(15) collate latin1_general_ci default NULL,  
  `url` varchar(127) collate latin1_general_ci default NULL,  
  `country_code` char(2) character set latin1 collate latin1_bin NOT NULL,  
  `type` char(3) character set latin1 collate latin1_bin NOT NULL,  
  `is_confirmed` tinyint(1) unsigned zerofill default '0',  
  PRIMARY KEY (`id`),  
  UNIQUE KEY `name` (`name`),  
  UNIQUE KEY `acronym` (`acronym`),  
  UNIQUE KEY `url` (`url`),  
  KEY `country_code` (`country_code`),  
  KEY `type` (`type`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci  
AUTO_INCREMENT=5000;
```

Alter table affiliations:

```
ALTER TABLE `affiliations`  
  ADD CONSTRAINT `affiliations_ibfk_1`  
    FOREIGN KEY (`country_code`) REFERENCES `countries` (`code`),  
  ADD CONSTRAINT `affiliations_ibfk_2`  
    FOREIGN KEY (`type`) REFERENCES `affiliation_types` (`type`);
```

Create table user_levels:

```
CREATE TABLE `user_levels` (  
  `id` smallint(2) NOT NULL,  
  `name` varchar(63) collate latin1_general_ci NOT NULL,  
  PRIMARY KEY (`id`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table users:

```
CREATE TABLE `users` (  
  `username` varchar(31) character set latin1 collate latin1_bin NOT NULL,  
  `email` varchar(63) collate latin1_general_ci default NULL,  
  `is_valid_email` tinyint(1) unsigned zerofill default '0',  
  `password` varchar(95) collate latin1_general_ci NOT NULL default '',  
  `title` enum('Mr.', 'Mrs.', 'Ms.', 'Miss', 'Dr.', 'Prof.', '') collate  
latin1_general_ci default NULL,  
  `first_name` varchar(31) collate latin1_general_ci NOT NULL,  
  `last_name` varchar(31) collate latin1_general_ci NOT NULL,  
  `phone` varchar(31) collate latin1_general_ci default NULL,  
  `fax` varchar(31) collate latin1_general_ci default NULL,  
  `city` varchar(31) collate latin1_general_ci default NULL,  
  `affiliation_id` bigint(20) default NULL,  
  `account_since` datetime default NULL,  
  `is_active` tinyint(1) unsigned zerofill default '0',  
  `is_admin` tinyint(1) unsigned zerofill default '0',  
  `is_team_member` tinyint(1) unsigned zerofill default '0',  
  `is_power_user` tinyint(1) unsigned zerofill default '0',  
  `is_third_party` tinyint(1) unsigned zerofill default '0',  
  `class` varchar(4) character set latin1 collate latin1_bin NOT NULL,  
  `level_id` smallint(2) default NULL,  
  `max_level` smallint(2) NOT NULL,  
  `max_projects` smallint(2) unsigned NOT NULL,  
  `quota_cpu` smallint(2) unsigned NOT NULL,  
  `quota_disk` smallint(2) unsigned NOT NULL,  
  `valid_from` datetime default NULL,  
  `valid_until` datetime default NULL,  
  `parent` varchar(31) character set latin1 collate latin1_bin default NULL,  
  `child_index` smallint(2) unsigned default NULL,  
  `details` text collate latin1_general_ci,  
  `session` varchar(127) collate latin1_general_ci default NULL,  
  PRIMARY KEY (`username`),  
  UNIQUE KEY `email` (`email`),  
  KEY `affiliation_id` (`affiliation_id`),  
  KEY `level_id` (`level_id`),  
  KEY `parent` (`parent`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Alter table users:

```
ALTER TABLE `users`  
  ADD CONSTRAINT `users_ibfk_4` FOREIGN KEY (`affiliation_id`)  
  REFERENCES `affiliations` (`id`),  
  ADD CONSTRAINT `users_ibfk_5` FOREIGN KEY (`level_id`)  
  REFERENCES `user_levels` (`id`),  
  ADD CONSTRAINT `users_ibfk_6` FOREIGN KEY (`parent`)  
  REFERENCES `users` (`username`) ON DELETE CASCADE;
```

E.1.1 Project Sharing

Since SPENVIS version 4.6.4 project sharing is implemented.

Create table shared_projects:

```
CREATE TABLE shared_projects (
  reference varchar(32) CHARACTER SET latin1 COLLATE latin1_bin NOT NULL,
  sender varchar(31) CHARACTER SET latin1 COLLATE latin1_bin NOT NULL,
  project varchar(63) COLLATE latin1_general_ci NOT NULL,
  recipient varchar(31) CHARACTER SET latin1 COLLATE latin1_bin NOT NULL,
  valid_until datetime NOT NULL DEFAULT '0000-00-00 00:00:00',
  copied_on datetime DEFAULT NULL,
  PRIMARY KEY (reference,valid_until),
  KEY sender (sender),
  KEY recipient (recipient)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Alter table shared_projects:

```
ALTER TABLE `shared_projects`
  ADD FOREIGN KEY (`sender`)
    REFERENCES spenvis.users(`username`);

ALTER TABLE `shared_projects`
  ADD FOREIGN KEY (`recipient`)
    REFERENCES `spenvis`.`users` (`username`);
```

E.2 User Statistics

Create table _stat_agent_list:

```
CREATE TABLE `_stat_agent_list` (
  `pattern` varchar(127) collate latin1_general_ci default NULL,
  `id` varchar(127) collate latin1_general_ci default NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table _stat_calendar:

```
CREATE TABLE `_stat_calendar` (
  `date` date default NULL,
  UNIQUE KEY `date` (`date`)
) ENGINE=MyISAM DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table _stat_url_patterns:

```
CREATE TABLE `_stat_url_patterns` (
  `id` varchar(150) collate latin1_general_ci NOT NULL,
  `url_pattern` varchar(150) collate latin1_general_ci NOT NULL,
  `desc` varchar(100) collate latin1_general_ci default NULL,
  `type` varchar(5) collate latin1_general_ci default NULL
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table stat_per_browser:

```
CREATE TABLE `stat_per_browser` (
  `date` date NOT NULL default '0000-00-00',
  `browser` varchar(127) collate latin1_general_ci NOT NULL,
  `nbr_diff_calls` int(4) default NULL,
  `sum(xfer_size)` int(4) default NULL,
  PRIMARY KEY (`date`,`browser`)
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table stat_per_content_type:

```
CREATE TABLE `stat_per_content_type` (
  `date` date NOT NULL default '0000-00-00',
  `id` varchar(127) collate latin1_general_ci NOT NULL,
  `nbr_download` int(4) default NULL,
```

```
`sum(xfer_size)`      int(4) default NULL,  
`nbr_diff_hosts`      int(4) default NULL,  
PRIMARY KEY (`date`,`id`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table stat_per_model:

```
CREATE TABLE `stat_per_model` (  
  `date` date NOT NULL default '0000-00-00',  
  `modelname` varchar(127) collate latin1_general_ci NOT NULL,  
  `nbr_model` int(4) default NULL,  
  `nbr_plot` int(4) default NULL,  
  `nbr_users` int(4) default NULL,  
  PRIMARY KEY (`date`,`modelname`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table stat_per_user_from_apache:

```
CREATE TABLE `stat_per_user_from_apache` (  
  `date` date NOT NULL default '0000-00-00',  
  `user` varchar(127) collate latin1_general_ci NOT NULL,  
  `nbr_script_access` int(4) default NULL,  
  `sum(xfer_size)` int(4) default NULL,  
  PRIMARY KEY (`date`,`user`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table stat_per_user_from_spenvis:

```
CREATE TABLE `stat_per_user_from_spenvis` (  
  `date` date NOT NULL default '0000-00-00',  
  `username` varchar(127) collate latin1_general_ci NOT NULL,  
  `nbr_model` int(4) default NULL,  
  `nbr_plot` int(4) default NULL,  
  `cputime` float default NULL,  
  `nbr_of_combined` int(4) default NULL,  
  PRIMARY KEY (`date`,`username`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Create table stat_resp_code:

```
CREATE TABLE `stat_resp_code` (  
  `date` date NOT NULL,  
  `nbr_1xx` int(4) default NULL,  
  `nbr_2xx` int(4) default NULL,  
  `nbr_3xx` int(4) default NULL,  
  `nbr_4xx` int(4) default NULL,  
  `nbr_5xx` int(4) default NULL,  
  PRIMARY KEY (`date`)  
) ENGINE=InnoDB DEFAULT CHARSET=latin1 COLLATE=latin1_general_ci;
```

Appendix F Apache Configuration for Suse-Linux

```
cat > ${SPENVIS_HTACCESS} <<END-OF-FILE
    AuthType Basic
    AuthName "SPENVIS Authentication"

    AuthUserFile /dev/null
    AuthBasicAuthoritative Off

    AuthMySQLEnable On
    AuthMySQLHost ${DB_SERVER}
    AuthMySQLDB ${DB_NAME}
    AuthMySQLUser ${DB_USER}
    AuthMySQLPassword ${DB_PASSWD}
    AuthMySQLUserTable users
    AuthMySQLNameField username
    AuthMySQLPwEncryption sha1
    AuthMySQLPasswordField password
    AuthMySQLUserCondition "is_active=1"

    Require valid-user
END-OF-FILE
```

Appendix G References

- [1] ESA Software Engineering Standards, BSSC, ESA PSS-05-0 Issue 2, February 1991 (revised in Octobre 1994).
- [2] Proposal in response to RFQ/3-11509/05/NL/GLC/jk Development of 3-D Analysis Tool for the Space Environment Information System (SPENVIS) , D. Heynderickx, January 2006.
- [3] Guide to applying the ESA software engineering standards to small software projects, BSSC, ESA BSSC(96)2 Issue 1, May 1996.