Upgrade to Freedom

Schools in South Tyrol have their own GNU/Linux distribution

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Table of Contents

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In 2004, Bolzano's schools needed to upgrade the software on their computers. Carlo Pomaro, working at the school authority of Bolzano's provincial government, and Antonio Russo, a teacher at a local vocational school, discovered that they had the same idea: If a substantial amount of money had to be spent on upgrading software, why not spend it on FLOSS, rather than another round of licences for proprietary software?

Logo of the FUSS project

An idea takes hold

South Tyrol - called Bolzano in Italian - is a province in the north of Italy. With a population of just under 500.000, it enjoys considerable independence from the government in Rome, giving it a status akin to that of an autonomous province.

In early 2005, Bolzano's school authority[1] started a massive migration towards FLOSS. Under the label of FUSS - "Free Upgrade South Tyrol's Schools"[2] - a team set about replacing all proprietary software in the Italian-speaking schools of the province with FLOSS (Free/Libre/Open Source Software).

Unusually for Italy, the province of Bolzano has substantial autonomy in educational matters. This made it possible for the local school authorities to go their own way in this matter. Importantly, the school authority also has full competency over the schools' hard- and software budget.

At the Luigi Einaudi vocational school in the city of Bolzano, IT teacher Antonio Russo had been thinking about getting the province's schools to use FLOSS. The same was true for Paolo Zilotti at the provincial school authority. When they discovered at a meeting in December 2004 that they had very similar ideas, they decided to set up the FUSS project. FUSS was formally initiated and coordinated by the school authority.

The technical aspects of the migration were taken care of by Truelite[3], a FLOSS company from Firenze. Christopher Gabriel, Truelite's Chief Technical Officer, acted as the technical coordinator of the project. He was responsible for the development guidelines and the management of the development team. He also managed the team of twelve who deployed FUSS GNU/Linux over the summer vacations of 2005.

Until 2005, Bolzano's schools were using Microsoft Windows XP or 2000 on server and desktop computers. Why did the school authority decide to migrate to GNU/Linux rather than to upgrade to

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1   http://www.provincia.bz.it/intendenza-scolastica/

2   http://fuss.bz.it/

3   http://truelite.it/

another version of Microsoft Windows?

Christopher Gabriel says: "FUSS was designed to offer more to the teachers and the students: more software, more freedom." The initiators of the FUSS project are convinced that the use of FLOSS in schools benefits education in a number of ways. Russo emphasises that the use of FLOSS in schools trains students to be flexible, adaptive and creative in working with software. A very direct and practical advantage is that students can use the same software at home as they do at school, without having to buy licences or illegally copying these programs. Pomaro and Russo emphasise that this enables schools to teach their students about copyright with a straight face.

The project team argues that students should learn about functionalities rather than merely how to navigate menus. They should understand how technology works, not just how to use it. Russo also points out that schools should put human values before technological ones, communicating technology as an instrument to be used in the interest of society, rather than as an end in itself. The project team hopes to motivate students to become actively involved with the software they are using.

The move towards FLOSS is supported by an official document from 2003. In its "eSouth Tyrol 2004-2008: Action Plan for the development of the Information Society in South Tyrol", the provincial government announces that "the use of Free Software solutions in the classroom shall be integrated into the curriculum, and shall be promoted through training activities for educational personnel."

IT costs of Bolzano's schools have dropped sharply after remaining at about their previous level during the first year of the migration. But Russo insists that money was not the primary reason for the migration. "Prices for software licences are very relative", he says. "If you tell Microsoft: 'I don't have 100 000 Euro to spend on software licences, I'll migrate to Linux', they'll say "OK, then just pay 30 000, but don't migrate'." Rather, it is the desire for freedom in the use and modification of the software that is attractive to the school district, and which the FUSS team sees as fitting for a model where the school is a community where all the participants contribute to the process of building knowledge. Students and teachers may not only participate by contributing code, but alos by providing feedback, making translations, preparing documentation and working on new contents.

Yet there is another factor that helps to lower cost: FUSS (like Debian GNU/Linux[4], the distribution it is based on) does not need the powerful computers that are necessary to run Microsoft Windows. This makes FUSS cost-effective, as it doesn't require frequent hardware upgrades for schools.

The migration strategy: Six phases

The organisers divided the migration process into six phases, each with its own very different tasks. The first step was a thorough analysis of the situation in the schools' computer rooms. All schools in the province of Bolzano have a teacher who is in charge of their computer system. Rather than fully trained technicians, these are teachers "with a slightly above-average knowledge of computer systems", as Gabriel puts it. Since the post is rotated every year, there is a constant need for training. During February and March of 2005, questionnaires were sent to these teacher-administrators at all schools, asking them for precise descriptions of the hard- and software they were using. All 80

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4   http://www.debian.org/

teacher-administrators were also interviewed in depth about how their schools used computers for teaching, and about the kinds of applications teachers would like to have. They were also asked to back up their school's data in time for the upgrade.

Though this analysis required a lot of effort, it gave the FUSS team detailed knowledge of the IT needs of Bolzano's Italian-language schools. Both Russo and Gabriel agree that this intense analysis was crucial to the project's success. The information gained from these interviews also helped the team to develop the procedures for the deployment of FUSS Soledad, and to ensure that the new system would allow the teacher-administrators to manage computers in a way similar to the old system. Now already, training began for the teacher-administrators.

At the time, there was no example of a migration of schools at such a large scale. "We looked at Extremadura [...], but there, they had not migrated", says Russo. "Their schools hadn't had computers before." The FUSS team had to come up with its own ways to deal with the migration, especially with its most difficult part: Helping teachers and students make the transition.

Time is short

After they knew what was required of the new school software, Truelite Srl developed the first edition of FUSS GNU/Linux, codenamed Soledad[5], to fit the needs of teachers and students. This happened between April and June 2005. The company's programmers adapted various aspects of Debian GNU/Linux. At the end of this phase, LiveCDs[6] were distributed to teachers and students, so that they could try FUSS Soledad at home.

FUSS Soledad was ready in time for the summer holidays. While schools were closed in July and August, the project team deployed the software across the region's Italian-language schools. In 72 schools, 2460 desktops and 81 servers were installed and configured with the new operating system. At the same time, 20.000 LiveCDs with the FUSS GNU/Linux distribution were sent to families in the province, including all the software that is used in the schools.

Cover of the FUSS Soledad LiveCD

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The project team did not tell the media about the migration until it was accomplished. Though the teachers were informed, there was no conscious effort to publicise it. According to Russo, this helped to avoid pressure before the new system was functioning properly.

When teachers and students returned after the summer break, the technical part of the migration was complete. Now both teachers and students had to learn how to use the new system. The transition was somewhat smoothed as schools in Bolzano usually have a two-week warm-up phase after the summer break, during which staff and students are familiarised with the things that have changed for the new school year; "and this time, among the changes there was also this new thing called GNU/Linux", says Russo. The time from

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5   http://fuss.bz.it/la-release-soledad-0

6   http://fuss.bz.it/download-di-fuss-gnu-linux

September 2005 to January 2006 was dedicated to verifying that FUSS Soledad did indeed work as expected.

Teacher training

During this phase, Truelite also trained the teachers who know form the technical-didactic support team. This team consists of eight persons who have received 590 hours of technical training each. "They're practically system administrators", says Russo. They provide technical advice and support to the schools for the use of the new operating system. They also handle didactical questions, helping teachers to make full use of the system's capabilities in their classes, and inspiring them with new ideas.

From September 2005 to May 2006 was an intense time of training for the teachers. There were two types of courses. The "desktop-level" course, with a duration of 20 hours, was aimed at teachers in general. They learned how to use the Gnome[7] desktop and OpenOffice[8], as well as various didactical applications. These courses were conducted in the school's computer room, with the very machines that the teachers would be using in their work.

The second type of training course was designed for those teachers who are in charge of the IT system of their school. These courses were more technical as well as longer, lasting 40 hours. They were conducted at the Einaudi vocational school, to give the teacher-administrators the experience of using a system that was different from their normal one and train them to be more versatile.

The last phase of the migration is still ongoing. It consists of further development of the FUSS distribution, and of more research into schools' needs. The next release

Screenshot of FUSS Soledad

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of FUSS GNU/Linux, codenamed "Dolores[9]", is currently being prepared and is due for publication in June 2007.

The technical side of FUSS

The FUSS team chose Debian for its strictly free nature and its deep roots in the community, which

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7   http://www.gnome.org/

8   http://www.openoffice.org/

9   http://fuss.bz.it/la-release-dolores

make the distribution independent of any single company or distributor. Debian also has a reputation for quality and stability, and makes it easy to prepare customised version of the distribution. Debian offers more than 15.000 software packages for download, all licensed as FLOSS.

According to Christopher Gabriel, the technical challenges were minimal. As two of Truelite's staff are active Debian developers, they are deeply familiar with the distribution and found it relatively easy to prepare a localised version. However, they had develop tools to build the actual distribution and prepare the CD images for FUSS.

Changes were made to the standard Debian distribution to simplify the deployment, and the management of the workstation; Truelite customised several packages and created new meta-packages. Among these was an application to allow the client machine to configure itself for the network. These installation tools were improved and adapted during the deployment phase. The Truelite programmers also modified the standard Debian installer, preselecting the right language, keyboard and locale settings.

They also modified the Gnome desktop's main menu in order to make it easier to use: Instead of showing the applications' names (e.g. "OpenOffice"), the user can select tasks ("Write a text document").

Where possible, the developers release their work under the GPL[10] and contribute modifications back to the mainline projects. Specifically, the project team translated the Gnome user guide into Italian, and shared the translation with the desktop software's user guide project.

The analysis of the hardware present in the schools brought up a small number of devices which could not be made to work under GNU/Linux, usually because there were no drivers for them. These were mainly scanners, which were replaced. The project team had analysed the compatibility requirements during the Analysis phase, and prepared FUSS Soledad accordingly.

Special challenges

One problem concerned software for students with special needs, which usually worked only on Windows. Gabriel explains: "These are usually standard programs with simplified user interfaces." Where it was not possible to replace the software with FLOSS, the machines in question were left in their current state: "These students usually always use the same machine. These computers are migrated when the student leaves the school."

Another issue concerns some specialist software, such as that used for computer-aided design (CAD). Here, free programs remain far behind the proprietary standard. Russo admits that the proprietary software usually used for this purpose is "ten times more powerful" than its free alternative. He however points out that the free programs usually suffice for the purposes of the vocational schools where they are deployed. "With [the free CAD program] gCAD, you can't design a car or a ship. With [proprietary] AutoCad, you can. But I've never seen anyone in a vocational school do such a complex task. For their purposes, gCAD is powerful enough."

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10 http://www.gnu.org/licenses/licenses.html#GPL

Perhaps the most important problem of FUSS Soledad is managing large numbers of users. Though the necessary software is present on the system, it until now lacks a graphical interface. Gabriel explains: "System administrators are used to command line tools, and they have no problem writing a small script to manage a lot of users. But the teacher-administrators don't have those skills, they're not technicians. They need a graphical interface." Truelite is now developing an interface called "OctoFUSS", which will make it possible to manage users and their privileges across an entire school. Like the rest of the software developed for FUSS, this program will be made available to the general public under the GPL. The software will also make it easier to centrally administrate permissions, firewalls, content filters and other system tasks.

Easing the transition: the technical-didactical support team

Helping teachers and students to make the transition to the new system is perhaps the most important part of the migration. Russo explains that there had been computers in Bolzano's schools since the mid-1990s. This meant that teachers had been using proprietary software on Microsoft Windows operating systems for a decade, and their personal routines of classroom computer use were deeply ingrained.
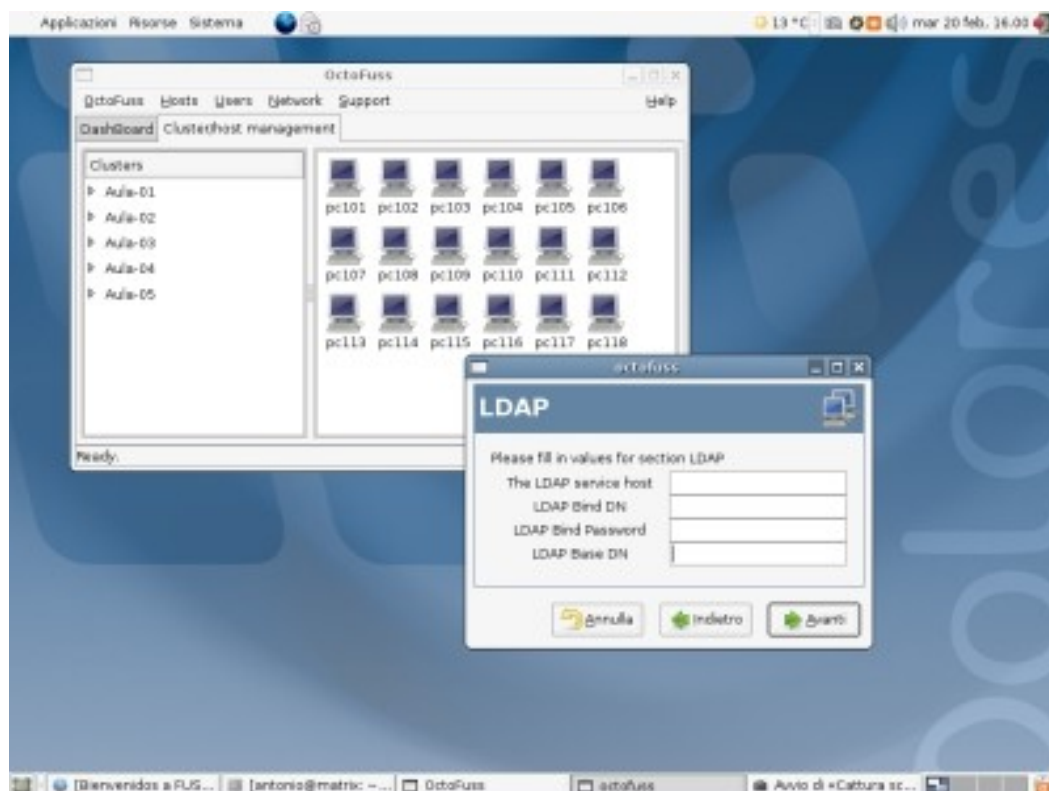
The next FUSS release, Dolores, with the OctoFUSS client

The new system would force them to break these habits, and the project team knew that teachers

would need help to deal with the change. An extensive training effort was set up. This training mostly met with enthusiasm among the teachers, who attended courses in their spare time.

While such training gives the teachers the knowledge they need to productively use computers in the classroom, some technical problems may run deeper. For such issues, there is the "Technical-didactical support team". Consisting of eight specially trained teachers, it provides constant support and advice to the schools' teacher-administrators.

Each of Bolzano's schools receives a visit by support staff once a week for half a day. This gives them time to address each school's particular problems, to learn about schools' needs, and to give teacher-administrators new ideas for using their system. Perhaps most importantly, Russo says, it provides the teacher-administrators with a feeling of security: "No matter what the problem is, they know that the doctor comes to see them once a week."

The economics of FUSS: Using existing means creatively

The costs of the FUSS project were paid from two sources. The first one was simply the province's regular IT budget for Italian-language schools; the only difference was that now it was not spent on software licences, but rather on the preparation of FUSS GNU/Linux. The second source was the European Social Fund[11], which paid for the training of teachers and that of the technical-didactical support team.

In 2005, the first and perhaps most intense year of the FUSS project, spending remained within previous levels, close to 200 000 Euro. But while the bulk of this had previously gone into buying licences for Microsoft products, these now only had to be bought for a limited number of computers. Most of the money went into the consulting, development and deployment of FUSS GNU/Linux by Truelite.

By 2006, the financial effect of the migration was clearly visible. Instead of the nearly 200.000 Euro spent in each of the previous years, the school authority now only spent 12.200 Euro. The largest part of this money was spent on licences for proprietary anti-virus software on the remaining Windows computers. The rest was paid for consulting work by Truelite. For 2007, costs are foreseen to drop below 10.000 Euro.

The European Social Fund provided 470.000 Euro. Out of this, 200.000 Euro went towards the migration process. The training of teachers was supported with 70.000 Euro. Another 200.000 Euro are used to fund development of new applications and improvements to the installed system.

The migration is also helping to enliven the local economy. Some small companies in the Bolzano area are starting to offer support, customisation and solutions for FUSS to schools. A large local computer reseller is offering PCs with FUSS pre-installed.

FUSS is a success, thanks to analysis and enthusiasm

All those involved consider FUSS a great success. Although the migration had to be completed within

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11 http://ec.europa.eu/employment_social/esf2000/index_en.html

little more than six months, the solution was very stable from the start.

Most of Bolzano's teachers welcomed the new system, although they had to adjust their habits of computer use. According to Russo, they are especially attracted to the social side of FLOSS: the free sharing of knowledge, the way of learning as a team, and the empowerment of the individual. Crucially, most teachers supported the project, and attended the training courses in their spare time.

There were however complaints that teachers - as the future users - had not been sufficiently involved in the development of FUSS. Gabriel thinks that such an involvement might have led to even greater acceptance from the start, as it would have made it easier for teachers to voice their demands.

The success of the FUSS project rests on the enthusiasm of the project team, the school authority and most of the teachers. Especially during the deployment phase, the project team sometimes worked 70 to 80 hours a week. "I can tell you the paid working hours. But the real working hours - I've never tried to write them down", says Christopher Gabriel.

Without the thorough analysis of schools' situation and requirements, it would not have been possible to develop and deploy the new system in so little time. The school authority had the courage to innovate and try something new, rather than to simply continue in the usual tracks.

The technical-didactical support team ensures that schools are not left alone when problems occur. Since it is made up of teachers with technical training rather than "pure" technicians, its members are able to understand their colleagues' needs and address them, helping them to get the most out of the FUSS system.

The project team wants to help the schools become increasingly independent from centralised IT procurement and support. "Initially, they just went from being dependent on Microsoft to being dependent on the FUSS team", says Russo. But step by step, schools are learning to stand on their own feet. Russo explains the strategy: "In the first year, we gave them the software for both the server and the client. In the second year, we're only giving them the server; the teacher-administrators can choose the GNU/Linux client they like best, whether it's Debian[12], Ubuntu[13], Red Hat[14], or something else." A program called FUSSclient will then automatically configure the client machine to work with the server.

According to Russo, the project team initially concentrated too much on the client, rather than on the server. Most problems did not occur on the desktop computers, but were rather related to networking, printer sharing, file permissions and user management.

Ideally, Russo thinks that schools should be entirely independent in terms of software in five year's time. He sees them getting there, especially since the schools' basic technical capabilities are growing.

FLOSS is a perfect fit for schools

Gabriel and Russo reckon that getting FLOSS into education has improved teaching. Traditionally,

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12 http://debian.org/

13 http://www.ubuntu.com

14 http://www.redhat.com/

says Gabriel, computers in schools are not seen as tools for learning, but as "typewriters". With FUSS, students and teachers can become actively involved with the software they are using. The FLOSS model of sharing knowledge fits perfectly with that of schools, which are an environment for doing just that: sharing knowledge.

This case study is brought to you by the Open Source Observatory and Repository (OSOR)[15], a project of the European Commission's IDABC project[16].

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This case study is based on interviews with Antonio Russo, CTS Luigi Einaudi, Bolzano; Christopher Gabriel, Truelite srl; and Carlo Pomaro and Carlo Dalle Luche, provincial school authority, Bolzano. Much useful information was provided by Stefania Bressan's thesis (see below).

Links

- FUSS project website: *http://www.fuss.bz.it/*

- Thesis by Stefania Bressan on the FUSS project (2006): I sistemi open source nella didattica: Indagine sul progetto FUSS di Bolzano (.pdf, 678 KB, Italian): *http://www.lettere.unimore.it/davoli/studenti/Davoli-TESIStefaniaBressan.pdf*

- Italian television station RAI3 aired a 7-minute item on FLOSS use in Bolzano on April 29 2007, which is available on YouTube (Italian).

  o Subtitles in English: *http://www.youtube.com/watch?v=R2kM6bTh_XY*

  o Subtitles in Spanish: *http://www.youtube.com/watch?v=X7FOq0KbhyE*

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15 http://ec.europa.eu/idabc/en/chapter/452

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17 http://www.merit.unu.edu/about/profile.php?id=707

18 http://www.merit.unu.edu/