Project no. IST-033576

XtreemOS

Integrated Project
BUILDING AND PROMOTING A LINUX-BASED OPERATING SYSTEM TO SUPPORT VIRTUAL
ORGANIZATIONS FOR NEXT GENERATION GRIDS

Demonstrations report and feedback evaluation
D4.4.2

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Task No.	Task description	Partners involved[°]
T4.4.2	Preparation of demonstration applications and scenarios	XLAB[*], INRIA, SAP, BSC, ULM, TID, UDUS
T4.4.3	Demo presentations	INRIA[*]
T4.4.4	Publicly available demonstrations	UDUS[*], XLAB

[°]This task list may not be equivalent to the list of partners contributing as authors to the deliverable

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Executive Summary

This deliverable reports on the XtreemOS demonstrations, both the use cases of applications running on XtreemOS and technical demonstrations of particular features. Rather than describing the demonstration scenarios in detail we give links to videos and screencasts of the finished demonstrations. We also provide viewing statistics for these screencast as well as a list of events where XtreemOS has been demonstrated. Due to dependence on stable XtreemOS release 3.0, some of the demonstrations are not yet finished; however, three of the most important use cases as well as the interactive ad-hoc grid setup scenario are. The document concludes with the results of on-line evaluation of the quality of the main demonstrations and the corresponding analysis, which was missing in the first version submitted in October.

Contents

Chapter 1

Introduction

The final goal of XtreemOS demonstrations is to motivate the users to download the system and try it out themselves. First, we show smoothly running applications and explain how they benefit from running on top of XtreemOS. These demonstrations strive to spark interest in XtreemOS with audience that is not yet acquainted with grid and cloud computing or is primarily interested in using the applications rather than in the technology below them. The diverse set of use cases includes an elastic web portal, multi-player edutainment, computer aided engineering, management of large grid and cloud environments, sharing resources on mobile devices, and various small applications from different fields.

Once these demonstrations or previous experience allows the audience to understand the benefit, i.e. the "why" of XtreemOS, we offer multiple more technical demonstrations explaining the "how". A few technical scenarios show the basic usage of XtreemOS and can double as tutorials. Others still explain some of the features that are particularly interesting from the technical point of view. Finally, the ad-hoc grid setup offers an interactive demonstration of the setup and usage of the system. The audience in this demo start XtreemOS virtual machines on their laptops, configure them and start using the newly created grid.

All demonstrations obviously depend on stable releases of XtreemOS, which for various reasons have been available later than planned. Consequently the demonstrations have also been produced later than planned, and some of them are not yet finished. In particular, some of the applications used in the demos have only been running smoothly since recently or even still have some problems, preventing us from finishing the respective demonstrations. Some of the technical demonstrations will focus on the new features of XtreemOS release 3. Finally, in many demonstrations showing what is happening behind the scenes is a challenge and will be revisited once the web-based monitoring is integrated into XtreemOS.

We provide detailed status of each demonstration in Chapter 2. The finished demonstrations are only summarized and links to videos or screencasts are given, while for the rest we describe the scenario that will be implemented. Because of this unfinished work we will update this deliverable within 31 days.

The demonstrations have been and will be presented at various international scientific conferences, trade fairs and other events. Furthermore, to reach as wide an audience as possible, we have published the demonstrations on the internet as well. The full list of events and number of views of the on-line demonstrations are given in Chapter 3.

Finally, feedback on the main demonstrations has been collected through multiple web surveys. The results are presented in Chapter 4[1]. Although the number of participants in each survey was modest, valuable conclusions can be drawn from them.

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[1] Chapter 4 was added after the first submission of this document.

Chapter 2

Demonstration Scenarios in XtreemOS

The demonstrations developed in this WP focus on promoting XtreemOS as a platform for a wide range of application on one hand, and providing an insight into the most technically interesting features that it can offer on the other. Below we describe the current status of each demonstration. For those that we are still working on we provide more details on the scenario as currently planned. For those that have already been finished we provide only a short report and, more importantly, the URL where they can be watched.

2.1 Demonstration of XtreemOS Use Cases

The demonstrations of various applications running on XtreemOS are intended as the first contact of the audience with XtreemOS. The focus is thus sparking interest and showcasing a smoothly running system. As reported in the previous deliverable [1], we have split the application set from WP4.2 into 'featured' and 'other' applications. The full, up-to-date description of all applications is available in [2].

2.1.1 Web Photo Archive using Cloud Infrastructure

Zmile is a web portal for photography storage and sharing developed by ZIB and VUA. It is intended to serve a large number of users and thus requires distributed storage of the photographs and other data as well as distributed computational resources on which to run the web servers. It has been online since Spring 2010 at http://www.zmile.eu, as shown in Figure 2.1.

Figure 2.2 shows how Zmile exploits XtreemOS. The images and thumbnails are stored on XtreemFS so that the storage can be replicated for availability and performance as well as expanded on-the-fly. Tasks such as thumbnail generation and image analysis are submitted to a scalable compute cloud in the form of XtreemOS
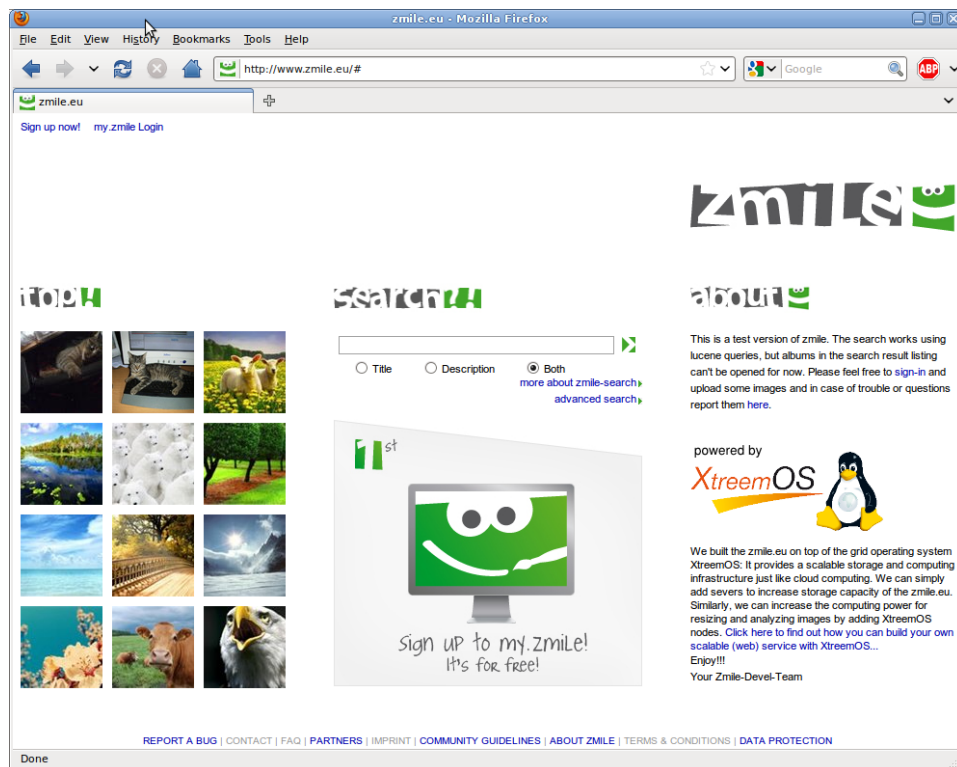
Figure 2.1: The starting page of Zmile

jobs. On the other hand, standard HTTP server and SQL database are used because creating distributed, XtreemOS-enabled versions of these is beyond the scope of this project.

Zmile will be deployed to a cloud or a combination of fixed nodes and cloud. In the demonstration we will first show a lightly loaded system. Then, when demands for storage or processing power increase, more machines from the cloud will be added to the Zmile back-end to cope with the increased load, demonstrating the elasticity of cloud applications on XtreemOS.

2.1.2 Distributed Virtual Presence

Wissenheim is a distributed interactive 3D virtual world for edutainment and entertainment. The scene graph is transparently distributed and replicated by the Object Sharing Service (OSS) developed within WP3.4. Avatar interactions and scene graph changes are synchronized through speculative transactions provided by the OSS. The synchronization is fast enough to enable implementation of arcade gaming scenes inside Wissenheim, as shown in Figure 2.3.

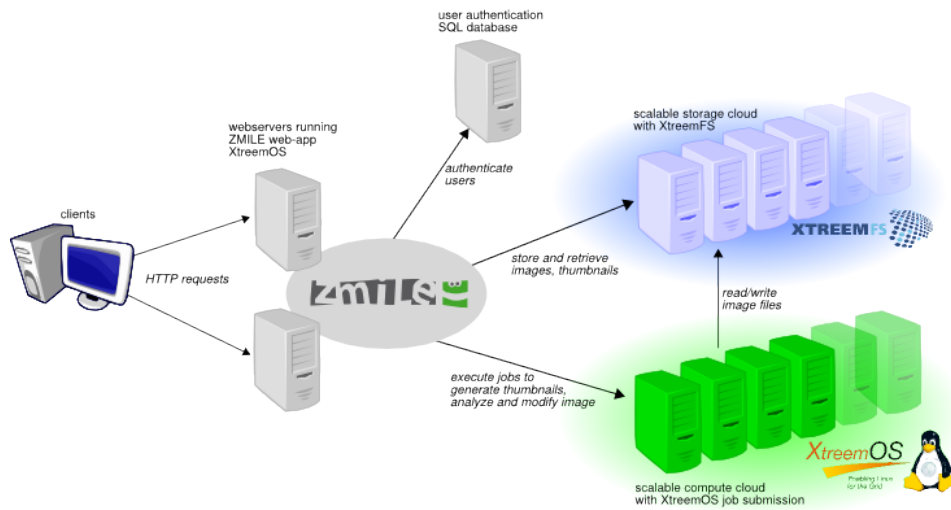The demonstration is finished and has been available since December 2009 at

Figure 2.2: The architecture of Zmile on XtreemOS

Figure 2.3: A volleyball game in Wissenheim

. The video shows
Wissenheim in action with two players sitting at two different universities (Ulm
and Düsseldorf). Explanation of how OSS is used is provided in the form of audio
commentary and in-video slides.

2.1.3 Computer Aided Engineering Workflow

We will show how a group of experts can cooperate on a project using specific
professional software that all runs on XtreemOS. The workflow of the software
applications is shown in Figure 2.4. An engineer wants to check electromagnetic
properties of the shell of e.g. a new aircraft. The designer provides a CAD file,
which is fed through the mesher, mesh converion, electromagnetic simulation, post
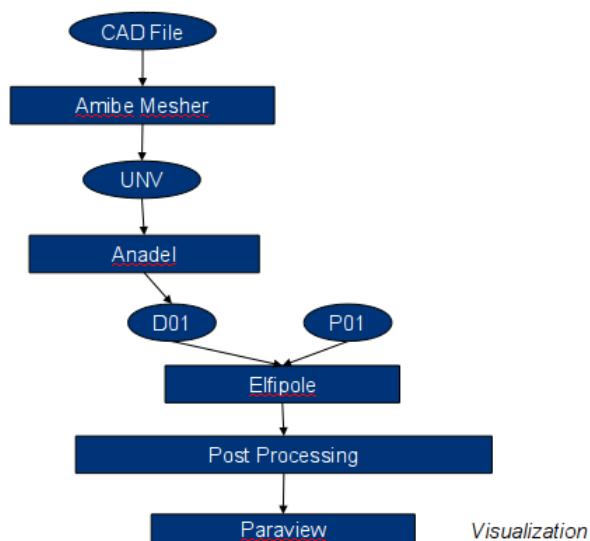processing, and finally visualized in ParaView.

Figure 2.4: Workflow of the CAE demo

The most computationally intensive steps are meshing, simulation, and visu-
alization. The Amibe mesher is parallelized over grid nodes through SAGA. The
Elfipole simulator is proprietary software and thus run on a specific LinuxSSI clus-
ter. Finally, ParaView is an MPI application, which is also supported by XtreemOS.
Certain steps of this scenario take significant time and thus provide the opportunity
to demonstrate some XtreemOS features. In particular we will use the monitoring
GUI during the runtime of the longer jobs.

2.1.4 Rule-based System Management

Rule-based System Management (RBSM) is a large-scale system management tool, providing rule-based decision making capability for the deployment and control of Grid and cloud environments. We aim to show how it can be used for deployment of XtreemOS images into a private cloud based on openNebula.

The scenario will start with preparation of pre-configured XtreemOS images (core, resource). RBSM infrastructure, i.e. monitor and controller, will be added to the images. Requirements for the to-be-deployed grid will be collected, e.g. number of resource nodes. The XtreemOS core node will be deployed in the cloud, followed by as many resource nodes as required.

We will then deploy a grid application into the newly formed grid. Binaries and install scripts will be added to the RBSM repository and a corresponding RBSM Asset will be created. The application will then be installed to selected VM nodes and launched. Then, a rule will be created defining how the deployed grid should adapt in certain circumstances. For example, new OSDs will be launched when the application is close to running out of storage.

2.1.5 Mobile Device in the Grid

The first use case is the updated version of the grid media player. When a video with an unsupported codec is loaded, a transcoding job is submitted to the AEM and, once its result is available, it is played. Any task that is computationally intensive or requires software not available on the MD can be off-loaded to the grid analogously. The current version of this demo is available at http://www.youtube.com/watch?v=bui32T2KTLc.

The second use case is sharing resources of the mobile devices. Their CPUs are too weak to share computational capabilities, but sharing files and special I/O devices, e.g. GPS, is most certainly useful. The file sharing video available at http://www.youtube.com/watch?v=yxySu5orWh0 shows a user configure a sharing folder. The files in this folder are then visible to other users in the same VO. However, they are only copied from the MD on the first actual access, after which they are cached in XtreemFS so that further accesses do not require any more data transfer from the MD. Lastly, the 3G connection sharing demo available at http://www.youtube.com/watch?v=cXeRAS6EB8k shows how a computer, connected to the MD over WiFi, can use the MD's 3G internet connection to access the web; of course, only once the owner of the MD has allowed such sharing.

2.1.6 Other Use Cases from Workpackage 4.2

Simplified demonstrations are being created from most of the applications ported to XtreemOS by workpackage 4.2 to demonstrate that XtreemOS supports a wide range of applications. These are mainly interesting to people familiar with the applications or at least working in the field of each application. For application

descriptions, please refer to [1] (short descriptions) or [2] (longer, recently updated descriptions).

SpecWeb2005 is finished and has been available since April at `http://www.youtube.com/watch?v=-qx-0It4Spw`.

COMP Superscalar is finished and has been available since April at `http://www.youtube.com/watch?v=uuCzMfyS-OQ`.

openTurns, Zephyr, Secured Remote Computing, and MAESTRO have not yet been finished.

XtreemFS replication in database scenario, based on the MaxDB application, is finished and has been available since September at `http://www.youtube.com/watch?v=rQEEjjR7JTw`.

Enterprise Document Indexing and Searching is finished and is mainly used for performance evaluations.

Mobile Instant Messaging is finished and has already been demonstrated multiple times.

Galeb will be used as a simple example application in one of the technical demonstrations rather than as a separate demo scenario.

2.2 Technical Demonstrations

We are producing technical demonstrations for the audience that has seen application demos and is further interested in how things work technically. Some of these technical scenarios are also useful as tutorials.

2.2.1 Current status

The current status of the technical demonstrations is as follows:

Core scenario based on XtreemOS release 2 is finished and has been available since December 2009 at `http://www.youtube.com/watch?v=ypYeqzxVBqw` (part I) and `http://www.youtube.com/watch?v=cPd0oG9dH_o` (part II).

Virtual nodes have been demonstrated multiple times to successfully provide Java Email Server (JES)[1] with fault tolerance. We are working on making this demo available on the Internet.

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[1]`http://www.ericdaugherty.com/java/mailserver/`

Checkpointing has also been demonstrated multiple times. The scenario has recently been simplified and updated to show checkpointing, restart, and migration of a simple, single-process job, as well as checkpointing and restart of a parallel server-client job including checkpointing the state of the communication channel. The video is available at `http://www.vimeo.com/16494297`.

XtreemFS is demonstrated in two scenarios created by WP3.4 that have been available since Summer 2009. They are available at `http://www.youtube.com/watch?v=6WP0V5ABMUA` (XtreemFS replication with failover) and `http://www.youtube.com/watch?v=0co_-_e0Hq4` (XtreemFS read-only replication).

Xterior will be used as the GUI for the new core scenario based on XtreemOS release 3 rather than as a separate demo scenario.

2.2.2 Technical Demonstrations of XtreemOS Release 3

The existing technical demonstrations will be updated and complemented when Release 3 is available. In particular, the core demo will be updated to use the monitoring GUI and Xterior for job submission instead of the xps and xsub commands. New demonstrations will be created focused on the rest of the new features: fault-tolerant AEM, certificate revocation, resource coallocation, isolation, and resource management with VOLife.

2.3 Ad-Hoc Grid Setup Scenario

The ad-hoc grid setup is an interactive demonstration of setup and use of XtreemOS grid nodes. The audience add their own computers to the grid, join an existing VO or create their own, and start using this grid immediately. A helper web site has been developed for this demo that includes detailed instructions for all steps, links to existing XtreemOS status web pages, and two newly added status pages (list of all resources and list of all VOs). Note that the latter two, while greatly simplifying this demonstration, could be regarded as a security risk and are thus not included in XtreemOS by default.

Technically, the demonstration involves the moderator's laptop that runs the core node inside a VM. The audience also use VMs rather than natively rebooting their laptops, which is more convenient for them, more secure and less likely to fail because of problems unrelated to XtreemOS. The process is scripted to a certain degree to lessen the probability of user errors and to keep the time required for the demonstration reasonable. However, the scripts give enough information that the audience understands exactly what is going on and what they would have to do if the process were not scripted.
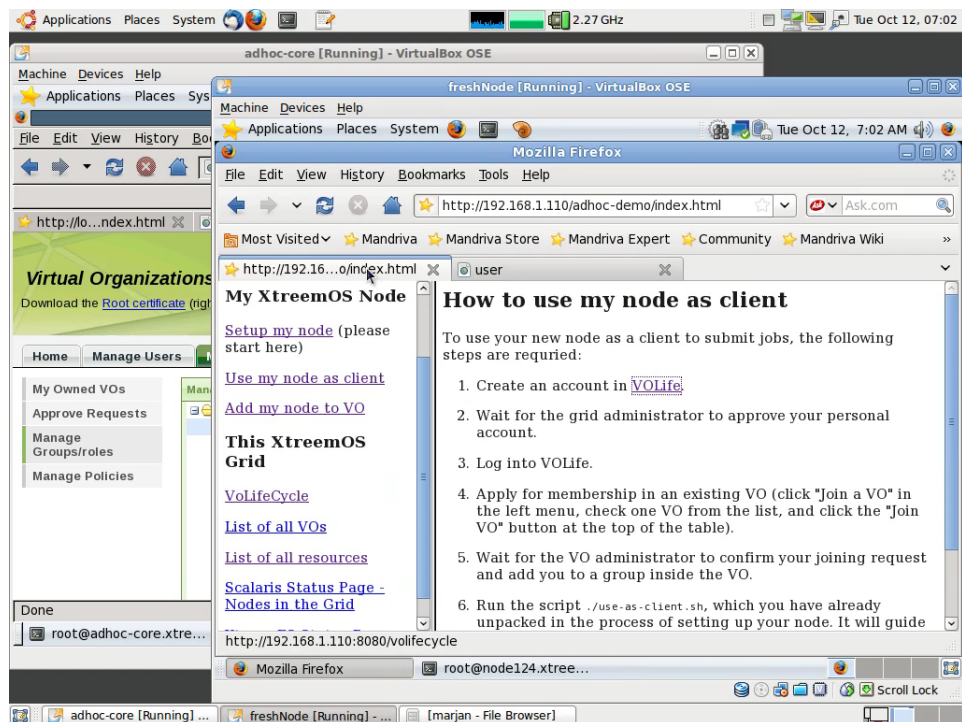
Figure 2.5: A scene from the ad-hoc grid setup demonstration

Figure 2.5 shows a screenshot from testing of the ad-hoc grid setup. The test was done with two virtual machines running on the same computer – the preconfigured core node and one resource/client node being configured. The front VM is operated by a participant, who is currently reading the helper web pages with instructions for the him. The back VM in the screenshot is the core node, on which the demonstration moderator is administering users and VOs using the VOLife web interface.

The scenario has been performed with XtreemOS 2.1.2 and five participants in addition to the moderator. Apart from minor technical problems, it turned out to be too long, so instead of requiring the participants to type many individual commands, the process of configuring the user's new grid node and launching the first job is now scripted. However, the scripts are verbose enough that the participants can see and understand all the individual steps.

The version of the scenario for XtreemOS 2.1.2 has already been finalized but will not be published on-line because the most important advantage, i.e. interactivity, would be lost in a screencast. The demonstration is also being ported to XtreemOS 3.0, which requires only a modest amount of changes. It

Chapter 3

Presentations, Events and Publicly Available Demonstrations

We are disseminating the demonstrations at various events, where the probability to reach new users is the highest, as well as over the internet, where anybody who has heard of XtreemOS can view them.

3.1   Presentations and Events

XtreemOS demonstrations have been shown at the following events since December 2009 (previous events are listed in [1]):

- Demonstration of resource management, job management etc at OpenGrid-Forum, Munich, Germany, March 15-19, 2010.

- XtreemOS-MD demonstrations at EuroSys, Paris, France, April 13-16, 2010.

- Technical demonstration at EGEE, Uppsala, Sweden, April 14, 2010.

- Demonstration of XtreemOS at CCGrid 2010, Melbourne, Australia, May 17-20, 2010.

- Demonstrations of XtreemOS-MD, Wissenheim, and job submission through SAGA at the XtreemOS summer school, GÃijnzburg, Germany, July 5-9, 2010.

- Demonstration of main XtreemOS functionalities at the XtreemOS summit held in conjunction with Euro-Par 2010, Ischia-Naples, Italy, August 30, 2010.

Table 3.1: Number of views for all videos published so far

Scenario title	until June 21st	until October 15th	until November 16th
Core demo part I	2,754	3,091	3,223
Core demo part II	247	302	343
XtreemFS replication with failover (by WP3.4)	11,364	12,243	12,613
XtreemFS read-only replication (by WP3.4)	2,721	3,054	3,206
Checkpointing and migration			25
Wissenheim	636	1,069	1,280
XtreemOS-MD Grid Media Player		203	292
XtreemOS-MD On-Demand file sharing		152	209
XtreemOS-MD 3G connection sharing		131	181
SpecWeb2005	49	160	193
COMPSuperScalar/hmmpfam	30	77	90
XtreemFS replication in database scenario		41	69
Total (WP4.4 only)	3,716	5,226	5,915
Total (WP4.4 and XtreemFS)	17,801	20,523	21,734

In the next months we will do further demonstrations at various international events, most notably at Supercomputing 2010 in New Orleans, USA, November 13-19, 2010.

3.2 Publicly available demonstrations

Publishing videos of the demonstrations on the internet has proven to be the optimal way to reach as wide an audience as possible. We currently have 12 videos published on web video portals and embedded in the project web pages at http://www.xtreemos.eu/documentation-support/screencasts. Table 3.1 gives the number of views for each video. All other scenarios will be published in the same form as soon as they are finished.
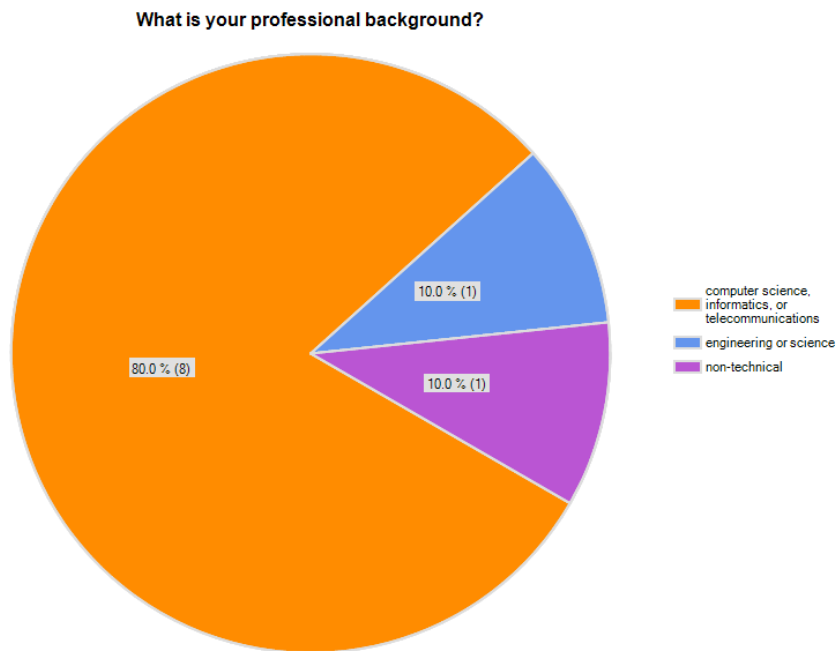
Chapter 4

Feedback Evaluation

The feedback on the most important demonstrations was collected through multiple web surveys. The surveys have been publicized on the project web pages, in the descriptions of the corresponding on-line videos, and through mail. However, the number of participants in each survery was quite low, which has to be taken into account when interpreting the results.

4.1 Wissenheim Survey

This survey covered the Wissenheim demonstration as published on the web. The number of participants in the survey was 11. Most of the participants' background was in IT, others included electrical engineering and economics. 4

What is your professional background?

80.0 % (8)

10.0 % (1)

10.0 % (1)

computer science, informatics, or telecommunications

engineering or science

non-technical

50 percent of the participants had extensive first-hand experience with grid computing and 70 percent had non-trivial prior knowledge on all topics presented in this demo.

Before seeing the XtreemOS/Wissenheim demonstration, what was your level of knowledge on:
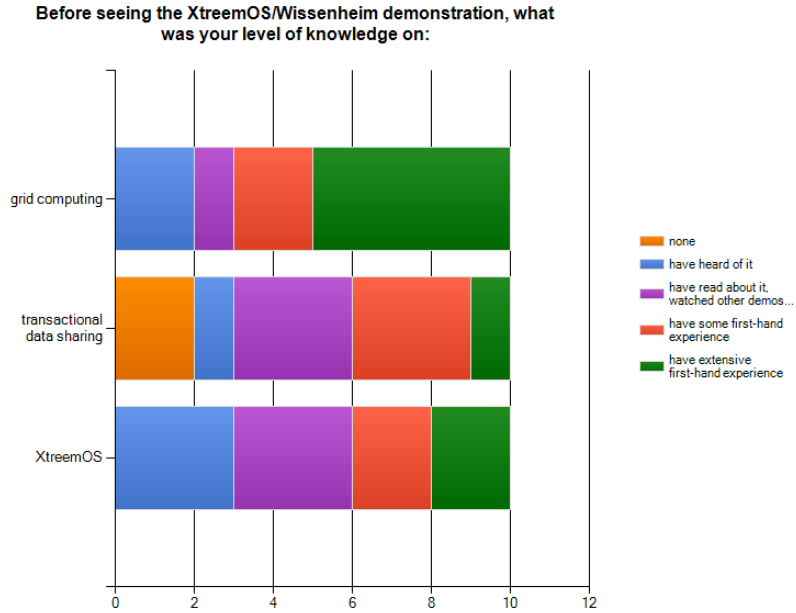
Most of the participants thought that the demo was easy to follow and presented and interesting subject. However, they suggested that the subject could be presented better and that the video should be made more attractive. The latter is surprising given that it uses a graphical, interactive application.

How would you rate this demonstration in terms of:
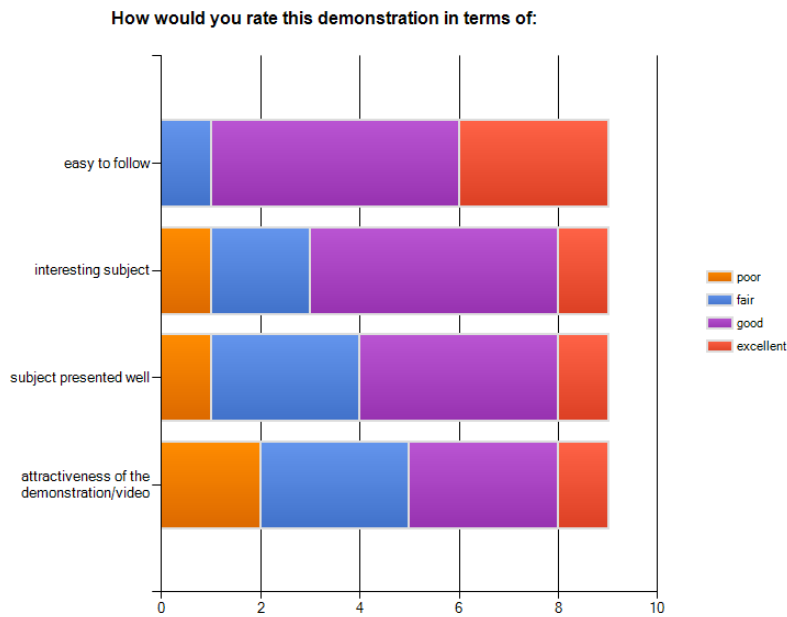
The majority found the level of detail appropriate, while others wished for more technical details about the XtreemOS background of the demo.

Was the level of detail appropriate?
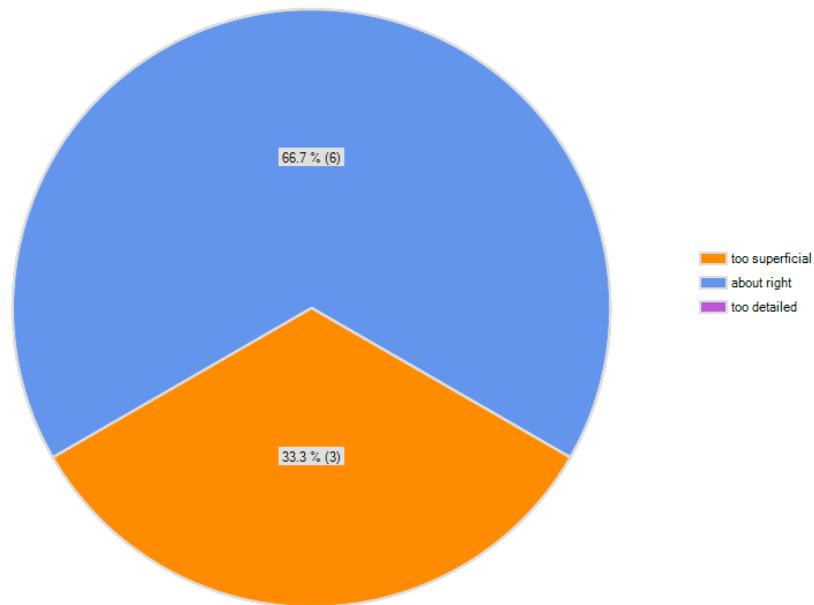
Most of the participants plan to watch other XtreemOS demonstrations before deciding whether to try it out or start using it. One of them plans to use XtreemOS for running parallel and distributed applications.

What are your plans with XtreemOS?
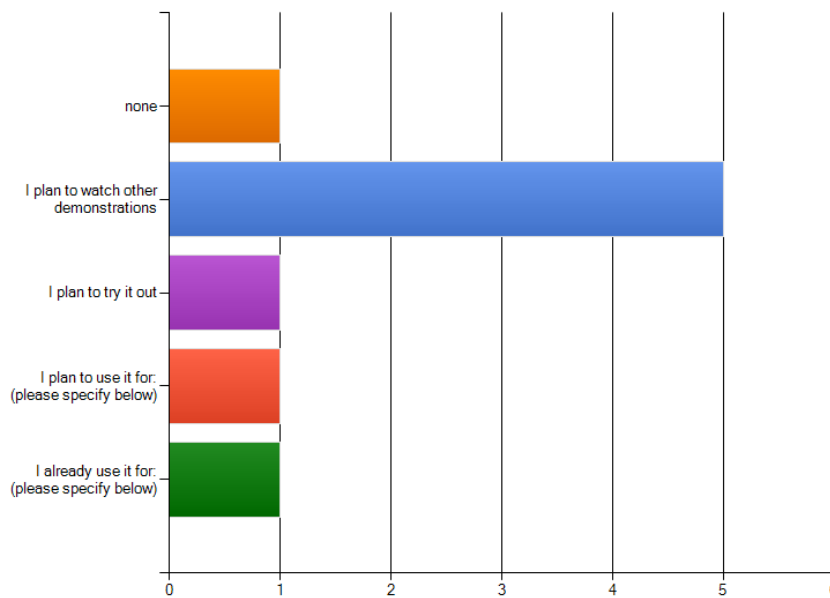
Finally, the participants expressed the hope for further development of XtreemOS and stressed the importance of further demonstrations in order to motivate potential users to try it out.

4.2   XtreemOS-MD Survey

Because of a limited number of people willing to participate in the surveys we used a single survey for all three XtreemOS-MD demonstrations, with some of the questions split over the three scenarios. The number of participants was 9. Their profile was very similar to those in the Wissenheim survey. Two thirds of them had non-trivial prior knowledge of the topics.

Before watching the XtreemOS mobile demonstration(s), what was your level of knowledge on:
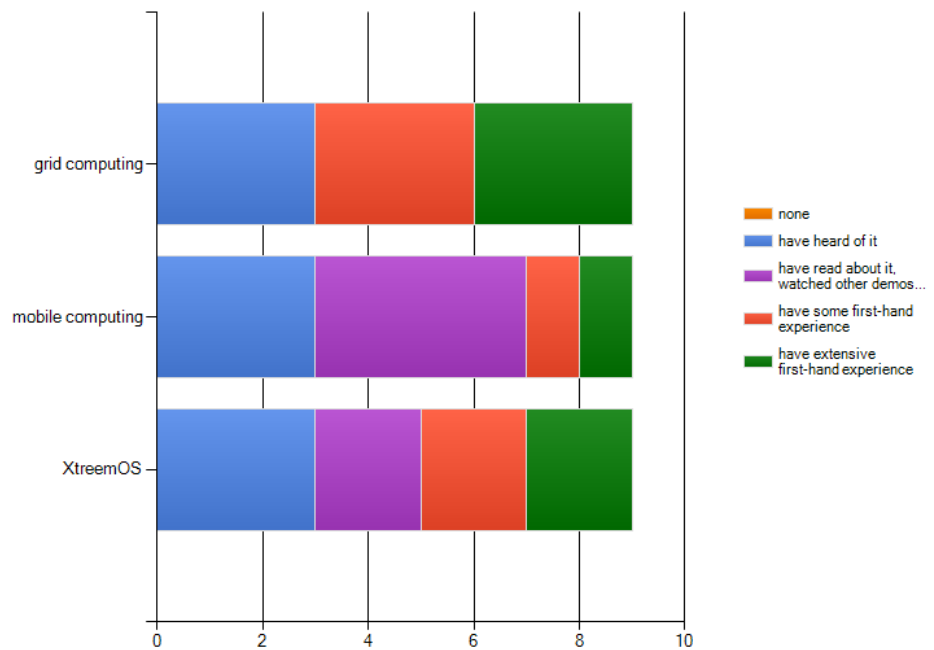
They found the Grid Media Player video very easy to understand. The other two videos were judged as good in this regard as well.

Did you find the demonstrations easy to follow? (Please note that one answer for each of the three demonstrations is required)
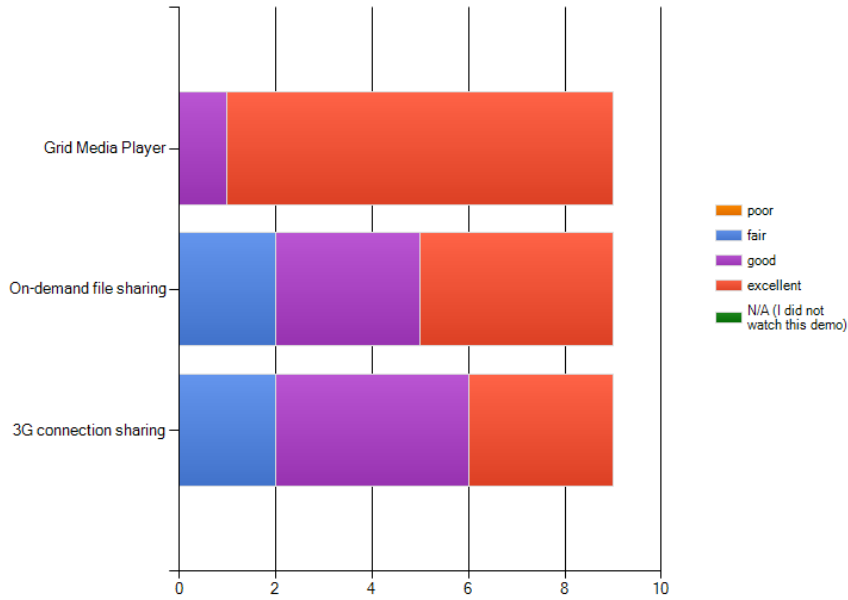

The majority thought that the subject was presented well or very well, except for the 3G connection sharing, which was judged slightly worse in this regard. There was one suggestion to add overlay text to explain what is happening in the video.
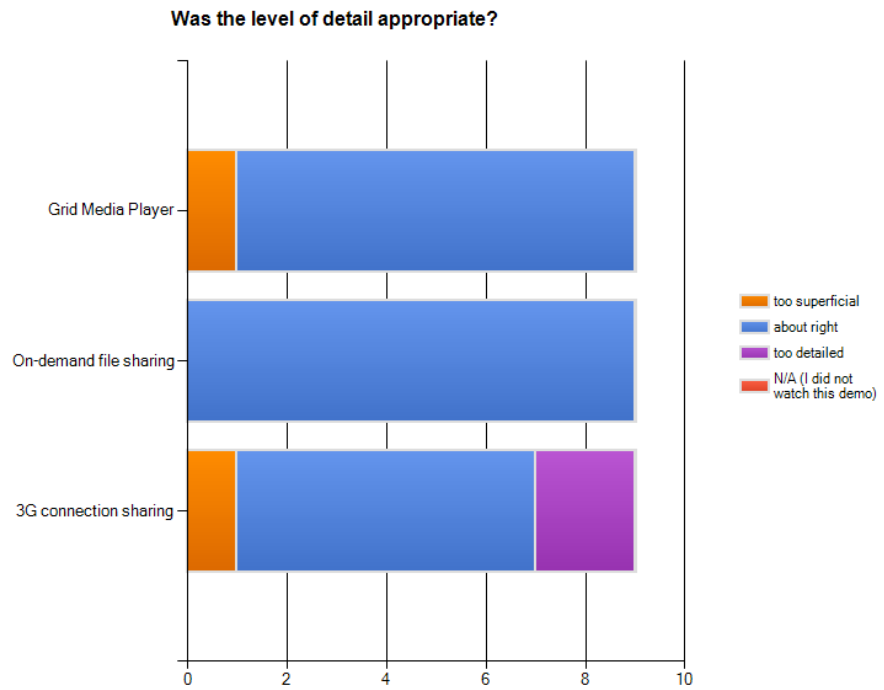
Did they present an interesting subject?

19
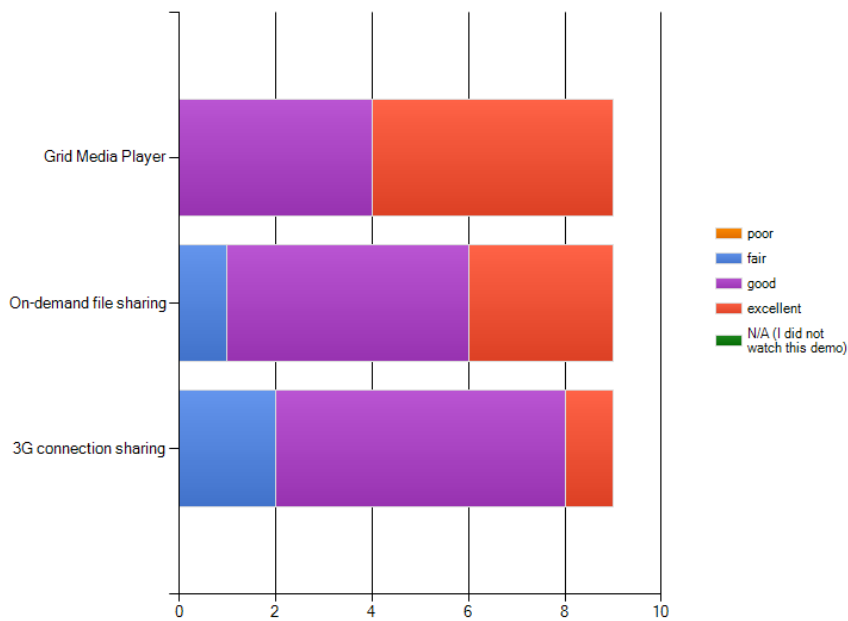
Similarly, they found the demonstrations, in particular the first two, attractive.

Did you find the demonstration/video attractive?
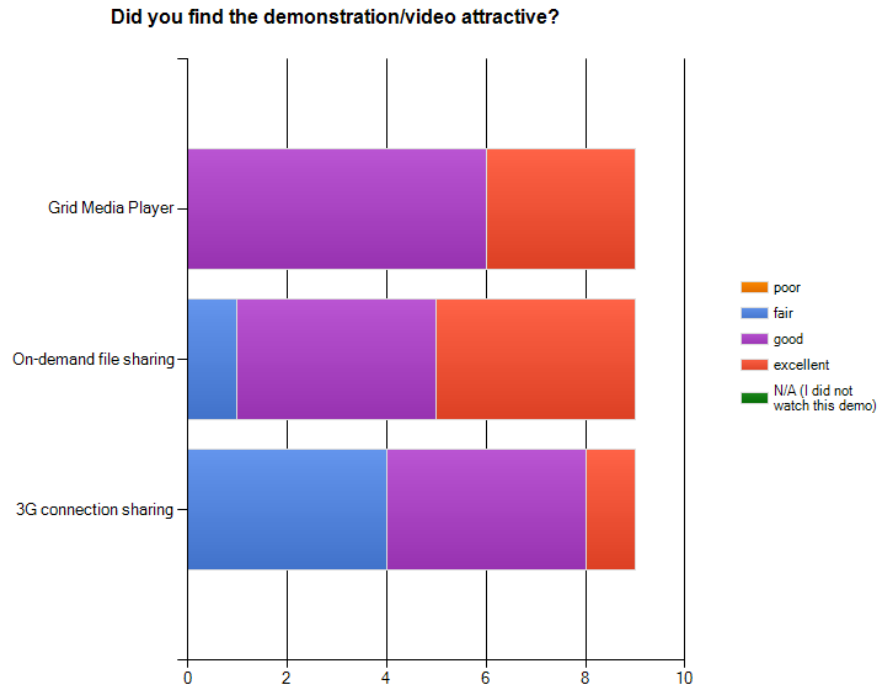
The level of detail was found appropriate in all three videos.

Was the level of detail appropriate?

Just like the Wissenheim video, most participants plan to watch other demonstrations before deciding on their further plans with XtreemOS. One participant specifically plans to set up an XtreemOS grid and use XtreemOS/MD to audit execution of jobs.

Finally, some participants suggested further use cases to demonstrate: tracing job execution, listing the available resources, and integrating some MD functionality into other demonstrations.

4.3 Technical Demonstrations Survey

A single survey was also used for all the technical demonstrations, i.e. the two XtreemFS, two core, and the checkpointing/restart demonstrations. The number of participants was 11 and, again, their profile was similar to those in the previous two surveys. Most were fairly familiar with grid computing, XtreemOS, and GNU/Linux, but less so with distributed file systems and checkpointing.
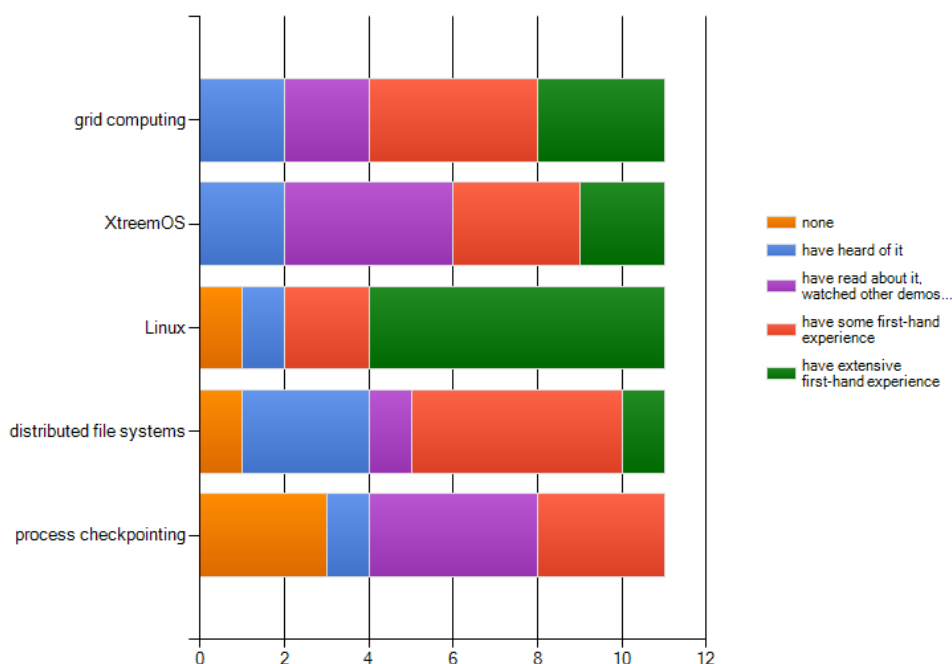

Most found the technical demonstrations easy to follow. The two XtreemFS demonstrations scored worse in this regard, with suggestions that the phrases like OSD and MRC should be explained and that either sound should be added or text boxes should not disappear so quickly. There was also a suggestion for the core demo to colour the three shell tabs differently in order to distinguish them more easily.

Did you find the demonstrations easy to follow? (Please note that one answer for each of the technical demonstrations is required)
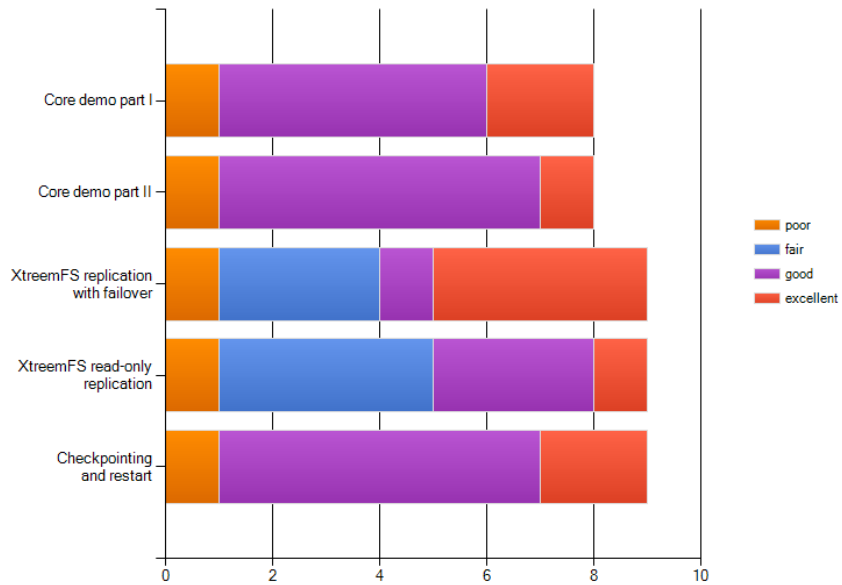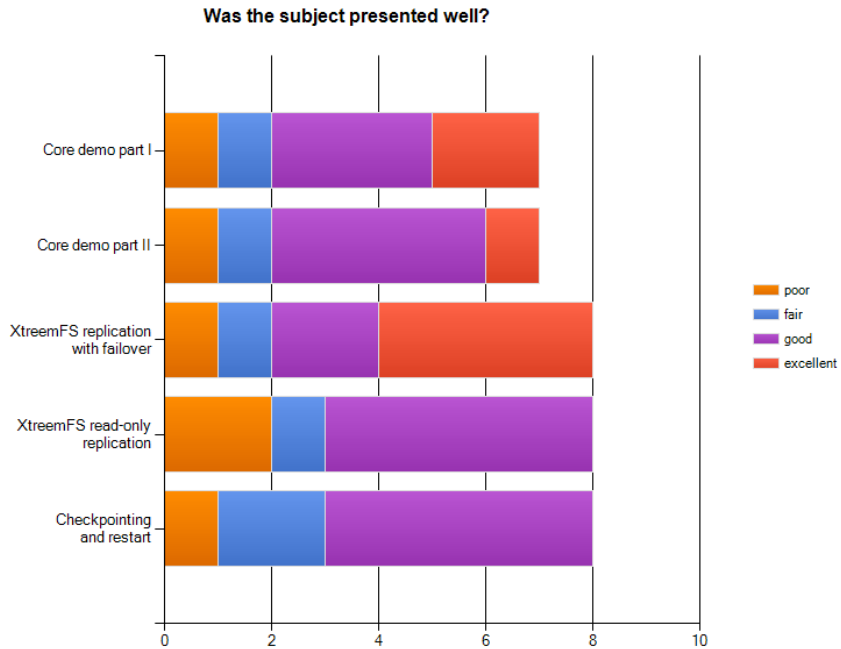

The participants found the subjects interesting. The XtreemFS replication with failover was judged best, most probably due to the presented use-case of fault-tolerant video playback.
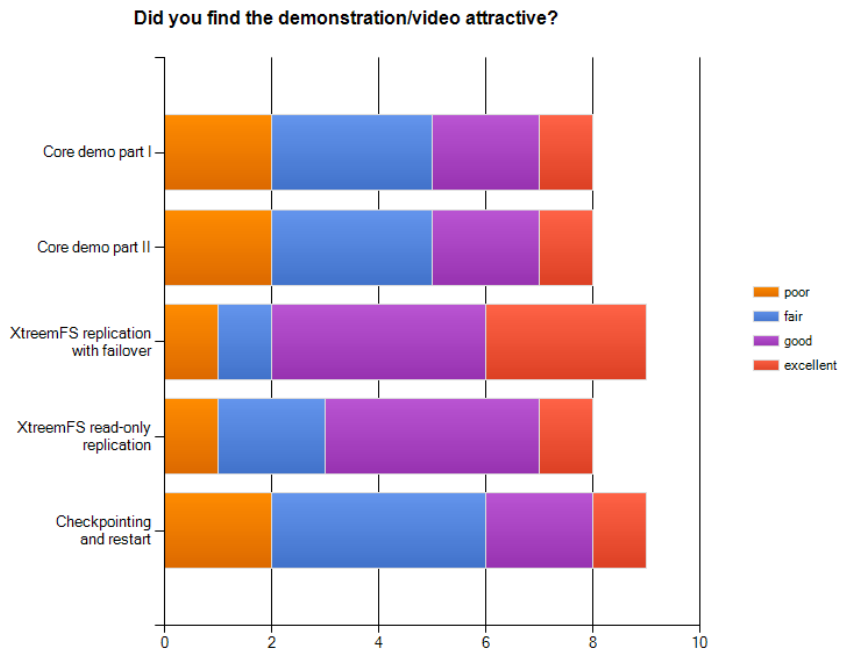
Did they present an interesting subject?
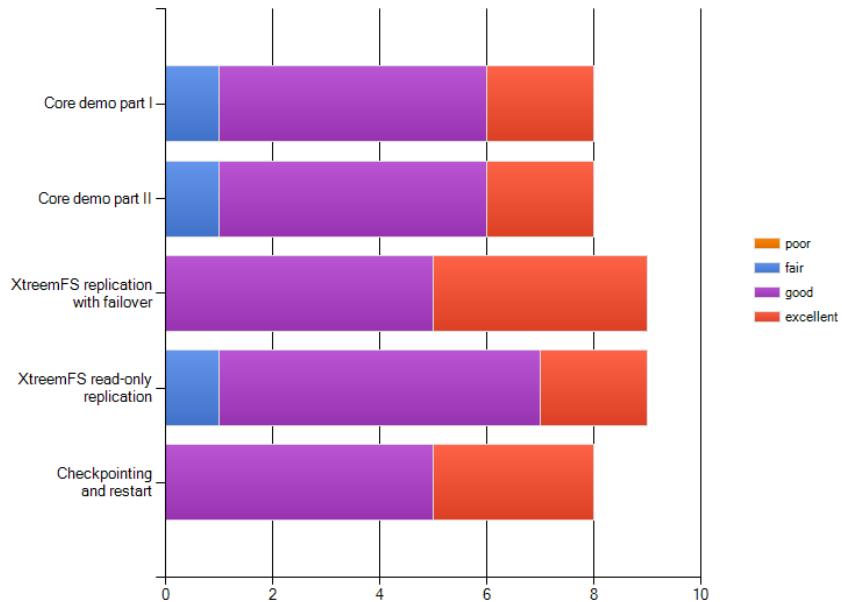
The subject was presented well and, again, the XtreemFS replication with

failover scored the highest.

Was the subject presented well?

As expected, the command-line-based demonstrations are significantly less attractive than the rest.

Did you find the demonstration/video attractive?

However, the GUI-based demonstrations lack some detail that the viewers would wish to see.

Was the level of detail appropriate?
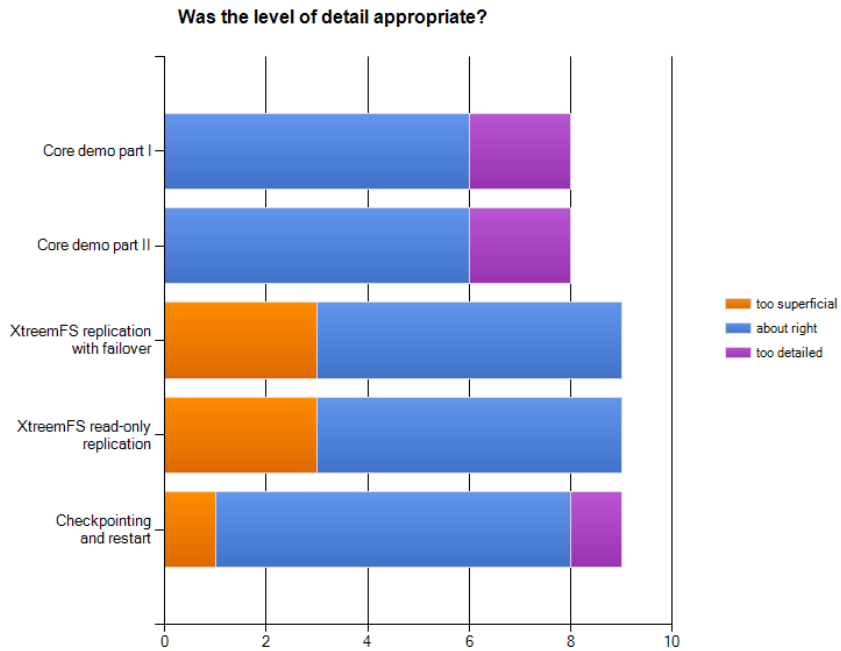
Half of the participants plan to watch other demonstrations. The higher amount of detail shown compared to the Wissenheim and XtreemOS/MD demonstrations and the fact that the normal users can try out the technical scenarios themselves results in a higher proportion of participants planning to try out XtreemOS.

What are your plans with XtreemOS? (Check all that apply)
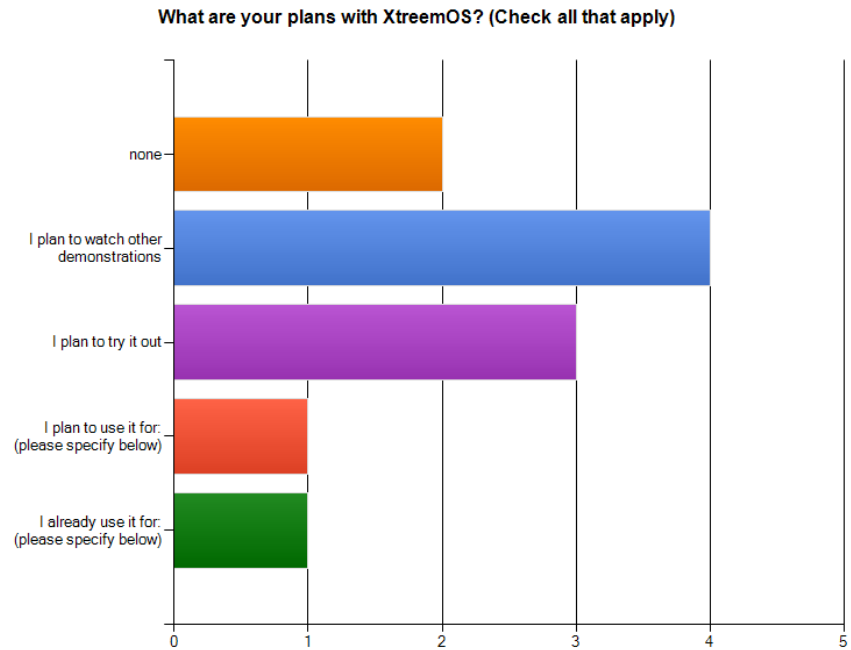
4.4   Ad-Hoc Grid Setup Survey

Finally, the ad-hoc grid setup survey was filled out by all five participants of the first performance of this demonstration. All five were XLAB employees. The moderator, of course, did not participate in the survey. Note that the scenario of the ad-hoc grid setup demonstration is similar to that of the two core demonstrations; however, this demonstration is interactive and the operations like node administration and job submission are performed by each participant.

The background knowledge of the participants was the highest in this survey.
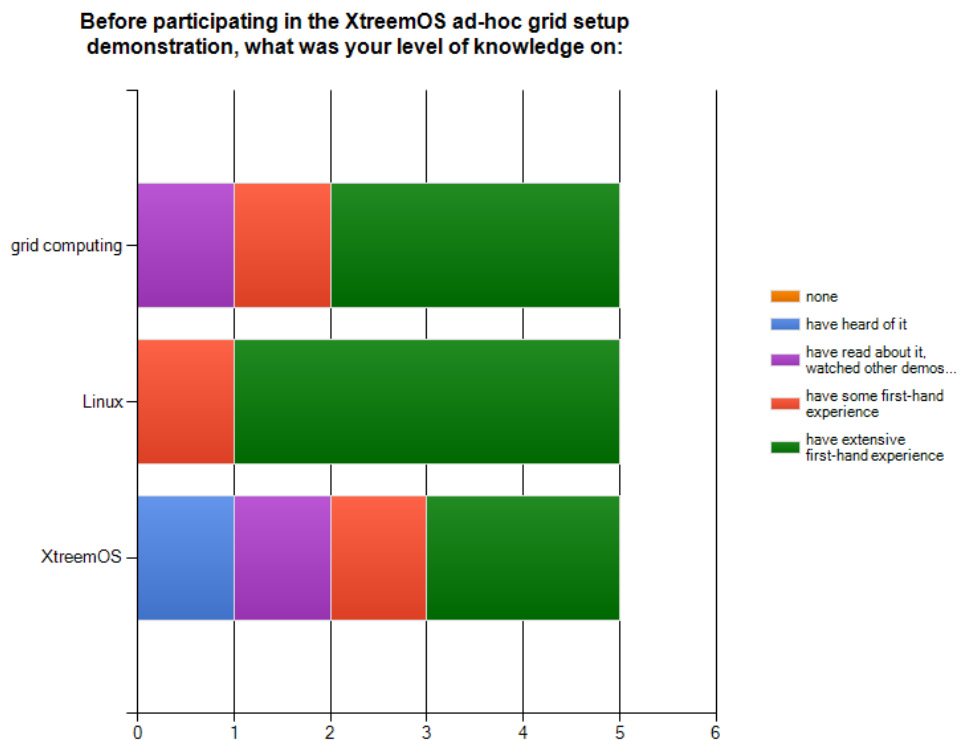
The quality of the demonstration was judged as good to excellent. Possible improvements include quality of instructions and modifying the scenario to make it easier to follow.

25

How would you rate this demonstration in terms of:
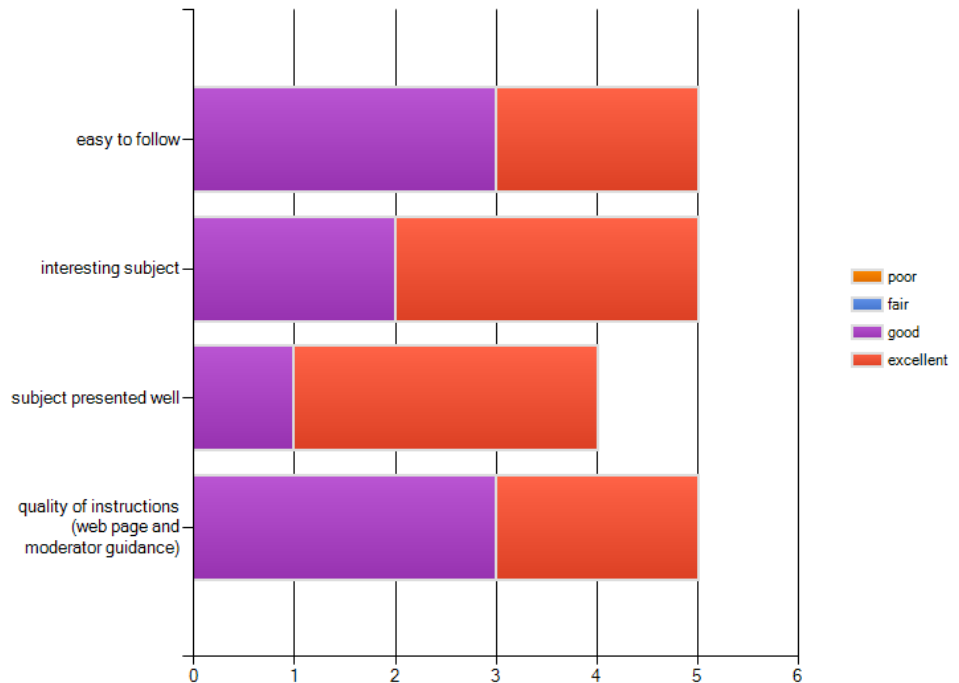
All the participants found the level of detail shown about right. One of them felt uneasy with installing VirtualBox on his laptop for this demo and using the provided virtual machine image. Two reported problems with using the virtual machine, both related to their computer setup. Some also wished for XtreemOS-MD and graphical job monitoring to be included in the scenario.

4.5 Survey Summary

The demonstrations that spark the most interest among the audience seem to be those that present plausible, well-known use-cases in a graphical environment and also show the XtreemOS background. The XtreemFS read-only replication and XtreemOS-MD Grid Media Player are prime examples of such demonstrations.

Also interesting are the scenarios that show the normal usage of XtreemOS without wrapping it into any application, such as the two core and checkpointing demonstrations and the ad-hoc grid setup. These also motivate the audience to download and try out XtreemOS afterwards. They can be improved by using a graphical interface where possible; however, interfaces specifically made just for a specific demonstration should be avoided.

Bibliography

[1] XtreemOS Consortium. Demonstration scenarios and demonstration plan. Deliverable D4.4.1, December 2009.

[2] XtreemOS Consortium. Evaluation Report. Deliverable D4.2.7, October 2010.