

# Server-Based Computing Using Open Source Tools

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## Abstract

Server-Based Computing (SBC), that is, replacing workstations with thin client terminals, is a novel and effective approach toward solving many typical problems in the IT infrastructure: the amount of administration work decreases, the quality of service for users and security both increase while the total cost of system decreases. Moreover, the centralised administration of the SBC system facilitates the implementation of open source software through a single point of installation and configuration. Our SBC system enables users to seamlessly use both commercial and open source software giving the possibility of a transparent shift to utilisation of open source software. The novel technology upon which the system is based makes it possible to build IT infrastructure that requires no local administration. Such a system is beneficial to user groups from home users to large organizations.

## Introduction

The basic idea behind the PC – Personal Computer – is that the user works with and also maintains his/her own computer. However, IT systems of today are much richer and more complex than when PC was born. Today the situation is often that many individual users are not capable of maintaining or administering their workstations efficiently and – more importantly – safely enough.

The basic principle of SBC is, at first glance, similar to the old mainframe architecture as in both systems the user works with terminals and data processing is done on the central computer. However, in modern SBC the look-and-feel is the same as working with PC workstations. Further, the SBC system offers many advances compared to PCs. For example, instead of working with a particular computer, the user can utilise several servers running different operating systems at the same time and the user is not bound one client device. Not minimising the benefits to end users, we see that the most remarkable benefit of the SBC system is easier administration. We also suggest that the centralised administration makes it possible to exploit open source software better than the distributed PC environment, since the administrator can choose the most suitable set, install and configure it to fit the requirements of the organization at hand.

## Open Source Based SBC Solution

Our SBC implementation is based on Linux LTSP<sup>1</sup> that has been extended to increase scalability and device support. To better support slow or high delay networks, we have applied an open source implementation of NX, FreeNX<sup>2</sup>. The use of FreeNX makes it possible that the user's desktop remains in the server regardless of network errors or if the user logs out or changes the terminal device. As Figure 1 illustrates, our extended architecture consists of four different components: 1) thin clients, 2) access server(s), 3) application server(s), and 4) SBC image servers.

The access server provides network connection and system images to the clients and takes care of user authentication, desktops, and accessing applications that are run on application servers. Application servers are invisible to the user in the sense that the user does not need to know where the application is run. In a simple composition, the access server can also work as the application server. The SBC image servers are used to distribute server images. There are some variations from the concept. The common situation is illustrated in Figure 2.

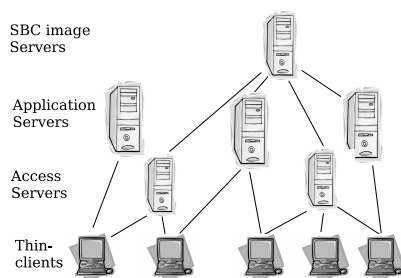


Figure 1: Thin clients, access servers, and application servers

<sup>1</sup><http://www.ltsp.org>

<sup>2</sup><http://freenx.berlios.de>

**SBC Servers** Setting up of a SBC system can be easy but it depends on the chosen configuration. In the simplest case, it is enough to plug-in the network cables and install the server software from available (CD, network) media. If Windows software is also needed, there must be a Windows Server with Terminal Services installed. The Windows use naturally requires Windows licences.

For load balancing and better reliability, the servers should be doubled or organised as clusters. For servers, clustered commodity dual processor PCs with around 4 gigabytes of memory are typically the best solution. The servers in a cluster can be diskless and configured to boot from a central server. By applying this *diskless server concept*, we can keep the administration work of servers almost constant regardless the amount of servers.

**Terminals** One of the first ideas behind the SBC concept was the possibility to reuse old workstations as terminals with very low costs. Still, proper terminals or mini PCs are often better solutions, since nowadays their prices have come down and the selection of terminal devices is quite wide. The most of thin clients are powerful enough for full screen video (often the viewer must be run locally) and still totally silent since no fans or hard disks are needed. Thin clients are also more reliable than PCs, since they have no moving parts. In addition, the very low power consumption is a remarkable benefit.

**Grid and SBC** The reason for this is that SBC infrastructure virtualises resources by hiding their physical location making it possible to use resources seamlessly from the Grid:

- Using Grid as a storage and backup space.
- Grid technologies offer standardised methods for replicating data or running servers in different locations.
- Processing heavy computation on the Grid.
- Using applications provided from the Grid.
- Outsourcing authentication and access rights management.
- Outsourcing network monitoring operations.
- Using the computing (and possible storage) resources of terminals as a Grid resource.

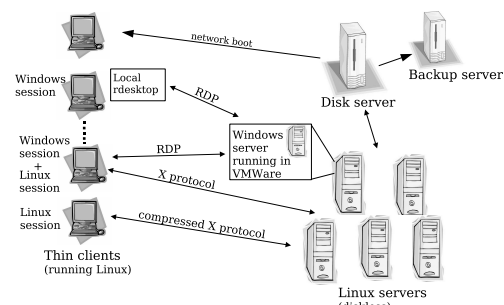


Figure 2: Complete configuration of SBC system

## Pilot Users

**University of Tampere** The Department of Computer Sciences of the University of Tampere, Finland has been using server-based computing since 2002. Now, the SBC solution is the only environment that is offered to students. In addition, many members of personnel have started to use it because of no individual maintenance work, no noise, and less space needed in offices.

**Helsinki Institute of Physics** The server-based computing has been used in the Technology Programme of the Helsinki Institute of Physics (HIP) at CERN (European Organization for Nuclear Research) for offering computing facilities first for summer trainees and visitors. Today half of staff members are using it. Generally, the SBC system was found an excellent solution. The Programme has been able to use its old desktop PCs as terminals that removed the need to buy new computers. However, it was noticed that the biggest benefit was the lack of the installation work of several PCs.