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Case Study

UniNorte

Private University in Manaus, Amazonas Enables Students with LTSP[®]
December 2008
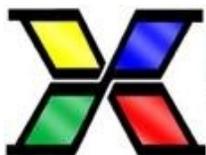
Tackling The Problems

UniNorte, a large private university in Manaus, had the typical list of IT headaches. Every new classroom at the university came with very **high implementation costs**. The universities **desktop PCs had an average life of 2 - 3 years**, and **maintenance costs** for the university were **always rising**.

The climate in Manaus, Amazonas is **extremely hot and humid**, **only accessible by air or by water**, and has **high costs of purchasing and acquiring** new hardware, **high costs of bandwidth**, and **high energy costs**...

Problem Task List

- Desktop PCs with 2 - 3 year average life

- High cost of acquiring new hardware

- Maintenance costs on the rise

- Hot and humid climate

- Users need to access Windows® applications

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Crafting A Solution

Marlon Dutra of Propus Informática began working with the administration at UniNorte to develop a cost-effective, efficient, and long-term solution. Marlon's goal was simple: he wanted to make his customer happy, and ensure that the customer had nothing to complain about. Most of the solutions known to the marketplace were too expensive for UniNorte, and Marlon was pushed to create a better solution.

A solution was proposed utilizing the

Linux Terminal Server Project (LTSP®)

> *"My goal is to provide a cost-effective, low-maintenance solution for my customer. A solution where my customer has trust in their network, with minimal problems."*
>
> Marlon Dutra
> Director
> Propus Informática Ltd.

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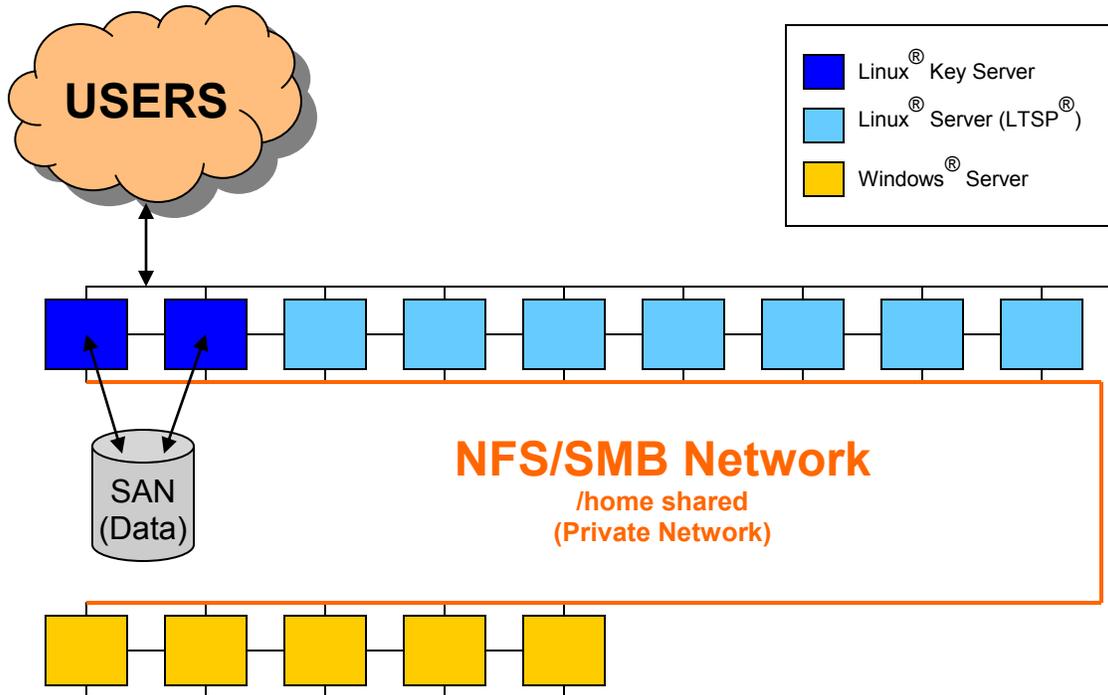| **Requirements**	**Challenges**
• Remote Boot	• 1,000 Simultaneous Users
• Uniform System University Wide	• Keep Existing User Data
• Hardware/Technology Independence	• Access Windows® Platform
• Automatic User Handling	• Users and Multimedia
• Integrated Authentication	• Fast Implementation

Advantages of LTSP®

Recycle Old Hardware
Use New Thin Clients
Reduced Classroom Deployment Cost & Time
Streamlined Support Operations
Eliminated Software Issues

Utilizing the Linux Terminal Server Project (LTSP®), UniNorte was able to solve key-issues which added significant value to the project. LTSP® allowed UniNorte to use old desktop PC's throughout the university as client computers. This provided substantial cost savings and eliminated the need to replace all of the end-user hardware. Where it was necessary for UniNorte to purchase new hardware, UniNorte choose Diskless-Workstations.com's LTSP® Term 1220. The thin client's are cooled without fans which reduces power consumption, allows silent operation, and dissipates less heat. The thin client's are capable of operating in the extreme climate found in Manaus, and have a life of 5 - 10 years, which is significantly longer than the average desktop PC. Recycling old hardware, using new thin clients, and utilizing LTSP® allowed new classrooms to be deployed with reduced cost and time. Support and software maintenance operations became streamlined, as everything was installed on servers, not individually on over 1000 desktop PC's.

![Diskless Workstations.com logo]

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UniNorte's IT Infrastructure
(Academic Network)

USERS

Legend:
- ■ Linux® Key Server
- ■ Linux® Server (LTSP®)
- ■ Windows® Server

NFS/SMB Network
/home shared
(Private Network)

SAN
(Data)

	Student	Staff
Linux® Servers	9	2
Windows® Servers	5	4

Server Hardware

- (2) Two Intel® Quad-core 64-bit processors
- (8) Eight GB Memory
- (2) Hard Drives (RAID-1)
- (2) Gigabit Network Interface Cards

The Linux® servers with LTSP® are designed to handle a maximum of 60 users per server.
All of the servers running LTSP® are designed with identical hardware.
Identical hardware makes support and troubleshooting easier!
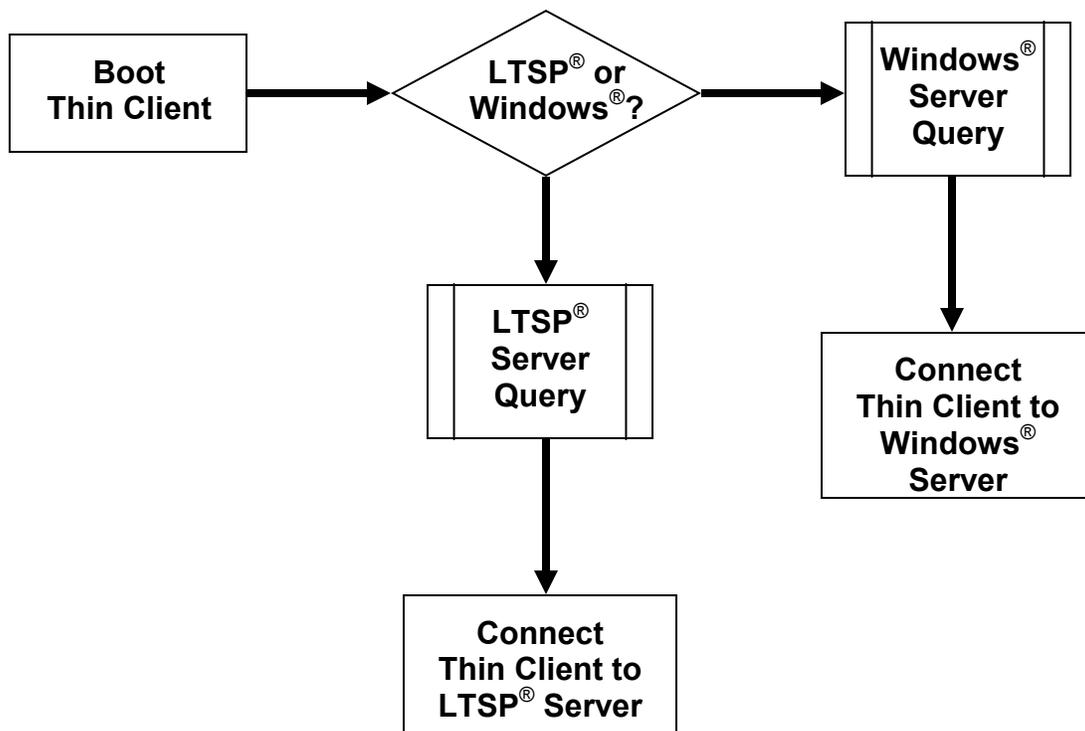
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How Does It Work?

Marlon Dutra and Propus Informática developed both an LTSP® and Windows® clustering solution for UniNorte. This allows the servers on the network to be fail-safe and redundant (i.e. If one server goes down, the user just connects to another server).

When a user boots their thin client, they receive a dialog menu from one of the two "Key Servers." At this point the user has the ability to choose the Linux® or the Windows® operating system. In less than 100ms, the key server queries (via SNMP) all the other servers to get a load average, the number of users logged in on each server, server memory allocation, and processor usage. The "Key Server" calculates a score for each server and tells the thin client which Linux® or Windows® server to connect to. Linux® uses XDMCP, and Windows® uses the remote desktop protocol. When a user logs out of their thin client, they are back at the main menu.

If a server is down, the "Key Server" will identify the server as non-responsive and send the user to connect to a responsive server. This is an efficient, simple, hardware and technology independent clustering solution developed by Propus Informática.

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┌──────────────┐      ╱──────────╲      ┌──────────────┐
│     Boot     │─────▶│ LTSP® or  │─────▶│  Windows®    │
│ Thin Client  │      │ Windows®? │      │   Server     │
└──────────────┘      ╲──────────╱      │   Query      │
                           │            └──────────────┘
                           │                    │
                           ▼                    ▼
                    ┌──────────────┐    ┌──────────────┐
                    │    LTSP®     │    │   Connect    │
                    │   Server     │    │ Thin Client to│
                    │   Query      │    │  Windows®    │
                    └──────────────┘    │   Server     │
                           │            └──────────────┘
                           ▼
                    ┌──────────────┐
                    │   Connect    │
                    │ Thin Client to│
                    │ LTSP® Server │
                    └──────────────┘
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Project Cost Savings

Economists from the staff at UniNorte, compiled data, and ran statistics to analyze the cost savings comparing the old model of operation to this new model utilizing LTSP®. Note: **energy usage is not factored** into the calculations below, due to not being able to accurately measure the power consumption per computer or device in UniNorte's network.

Cost of a New Classroom

Pre-project: USD $30,000
Post-project: USD $13,000

UniNorte now saves approximately **56%** or **USD $17,000** on every new classroom

10-Year Classroom Maintenance Cost

Pre-project: USD $150,000
Post-project: USD $26,000

UniNorte now saves approximately **83%** or **USD $ 124,000** on the 10 year maintenance of each room

Total 10 Year Savings per New Classroom

USD $141,000

A classroom has 25 thin clients per room. The costs calculated included the costs of monitors, keyboards, and mice. The maintenance costs are equated with 10-year depreciation of thin clients, as well as on site staff and support to maintain the classrooms. The maintenance cost dropped significantly in this project due to a dramatic reduction in support required and a smaller support staff.

The above figures and statistics were calculated by the economic staff at UniNorte. These figures reflect substantial cost savings. If UniNorte were able to accurately measure energy consumption, the project cost savings would dramatically increase. Consider that a laptop manufactured in 2007 with an Intel® Core™2 Duo P7700 2.4GHz, 15.4" LCD, and 2GB of DDR2 memory uses approximately 77 watts of power operating at peak performance. New thin clients, which UniNorte has deployed approximately 25% of their end-user seats with, use approximately 11 watts operating at peak performance. Given the fact that UniNorte has over 23,000 students, and energy costs are much higher in Manaus, Amazonas compared to around the world, energy reduction saves this university a substantial sum of money on an annual basis.

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About DisklessWorkstations.com

DisklessWorkstations.com is the global leader in Linux-based, thin-client hardware, strategy and deployment. DisklessWorkstations.com provides cost-effective, powerful and reliable solutions for business, education, government, manufacturing and resellers based on LTSP's advanced thin-client technology. Headquartered in southeastern Michigan, DisklessWorkstations.com combines unparalleled expertise with superior, reliable and easy to use thin client products. More information on DisklessWorkstations.com is available at www.DisklessWorkstations.com.

About Propus Informática

Propus Informática Ltda is a company specializing in Enterprise IT Infra-structure and IP telephony-related services. Propus experts have been in the Linux and network market for over ten years, providing tailored solutions to customers, taking maximum advantage of the strong reliability and performance provided by Linux-based systems. Propus, based in Porto Alegre, Brazil, has a team of highly qualified engineers to deliver services throughout the world at an affordable cost.