National Information & Communications
Technology Authority of Papua New Guinea

CONNECT THE SCHOOLS

NComputing thin client virtual desktop technology

OVERVIEW

In the 21st century, the advances in Information and Communications Technology (ICT) has made the world a smaller place. This has created a society that is so dependent on technology that we have reached a point of no return. As the rest of the world advances on, Papua New Guinea lacks behind by a decade. The cost of internet and computing are enormous, thus hindering the rapid development of human resource and most of all, the general population. Thus, this projects seeks to address the issue as outlined in the following paragraphs and pages.

1. Project Background and Description

This project aims to provide internet connectivity and broadband services to all primary, secondary and tertiary institutions throughout the country. In addition to internet access, the project aims to provide each school with a computer laboratory equipped with desktop PCs and printers. The Department of Education is expected to partner NICTA in this project. The proposed project is in line with the National Broadband Policy and supports the Government's development plans including Vision 2050 and the Medium-Term Development Strategy

2. Application of NComputing thin client virtual desktop technology

The Thin Client

A thin client is a stateless, fan less desktop terminal that has no hard drive. All features typically found on the desktop PC, including applications, sensitive data, memory, etc., are stored back in the data center when using a thin client.

A thin client running Remote Desktop Protocols (RDP), like Citrix ICA and Windows Terminal Services, and/or virtualization software, accesses hard drives in the data center stored on servers, blades, etc. Thin clients, software services, and backend hardware make up thin client computing, a virtual desktop computing model.

Thin clients are used as a PC replacement technology to help customers immediately access any virtual desktop or virtualized application. Thin clients provide businesses a cost-effective way to create a virtual desktop infrastructure (VDI). Thin clients are utilized in various industries and enterprises worldwide that all have different requirements but share common goals. The cost, security, manageability, and scalability benefits of thin clients are all reasons that IT personnel are exploring –and switching– to thin clients.

Cost-wise, the price per seat of a thin client deployment has dropped to the point where it is more cost effective than regular PCs. This has been a claim that many in the thin client industry have made in the past, but the fact is that the technology that has been developed within the past year has made it a definitive reality.

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The NComputing Thin Client

The NComputing Thin clients run an operating system locally and carry flash memory rather than a hard disk. Since it has no hard drive or local storage, all applications and data are stored on a central server, but advanced thin client technologies help users still experience the same look and feel as on a PC. Thin clients allow for local printing, audio and serial device support, web browsing, terminal emulation and can combine local processing with network computing.

By hosting more of what users need remotely, the thin client devices used to access that data can become both more powerful and cheaper. Additionally, as individual connection protocols improve, through developments like Remote FX and Citrix HDX, businesses are able to gain that much more effectiveness out of virtual desktops.

A major part of a thin client solution is the thin client management console. The management console such as Echo, is a virtual appliance that can be installed on your Server to remotely manage all of the deployed thin clients. It then can create, clone, and push out the customized image to the deployed thin client devices. This allows IT administrators to freely access any device that is connected to the server, as well as pushing through certificates, software packages, as well as upload full disk images. This proves to be an invaluable tool for both simple and complex VDI environments.

Benefits of thin client

There are many thin client benefits for different enterprises and their IT infrastructure. IT departments are migrating to unique platforms to centralize business through today's virtual desktop technologies.

1) **Cost Savings**

Thin Clients Reduce Multiple Costs:

- IT support costs
- Upfront purchasing costs up to 60%
- Capital costs
- Use of space in data center
- Licensing costs
- Total administration and operating cost reduction up to 70%
- Reduces Energy Bill by 97%
- Thin clients consume an average of 8-20 watts compared to a 150-watt PC
- This reduces carbon footprint
- Cost savings from electricity can be reinvested

2) **Simplified Management**

- All software and hardware upgrades, security policies, application changes, etc. can be made in the data center
- IT personnel are not required (as they are with PCs) to fix individual problems at the end user desktop location
- Less downtime, increasing productivity amongst End Users and IT personnel
- Centralized and simplified back up of desktops, laptops, and other client access devices

3) **Enhanced Security**

- Thin clients are protected from the use of unauthorized software or the introduction of viruses
- Data cannot be copied to a disk or saved to any other location than the server
- Centralized processing makes it easy to manage and monitor the system
- Simplify security, protect intellectual property, ensure data privacy

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4) **Increased Productivity**

  – Systems can be Virtually Preconfigured, Packaged and Put into Operation in Minutes
  – Quickens setup and enables flexibility, without needing a specialist staff
  – Productivity can increase, while standard PCs have long repair times that cause delays and higher costs
  – Access the same apps and data from virtually anywhere within the system

3. Integrating NComputing technology into a network

NComputing devices can either connect through a network star or bus topology depending on the specific tasks that are required to be performed, High end 3D gaming and cutting edge software will require an NComputing device that has an inbuilt graphics card and connected through a star topology while those that require the basic MS office applications and other accounting such as MYOB will be connected either through bus topology with the use of standard RJ 45 cables or use wireless NComputing thin client devices.

A simple i7/16GB DDR3/1TB HDD PC will comfortably host up to a maximum of 40 users if their applications were simply office productivity such as MS Word, MS Excel, MS Power Point and web-browsing.
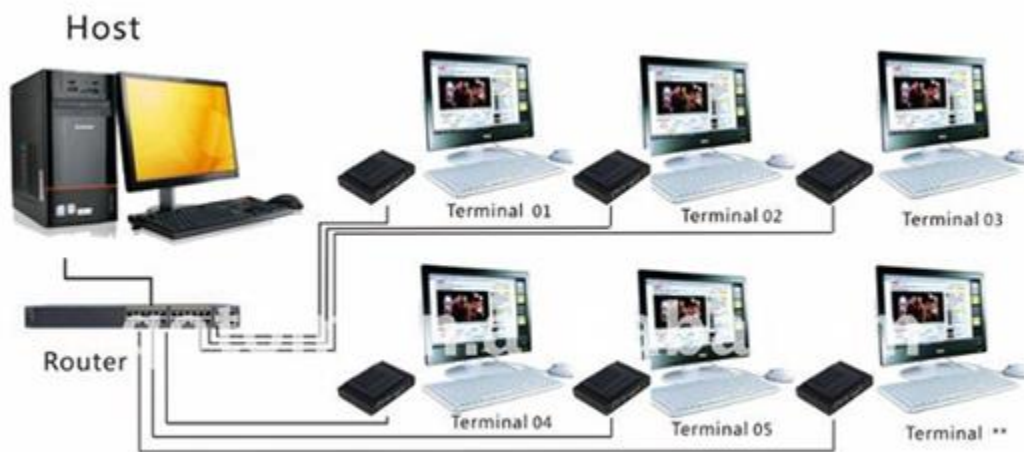

Fig. 1 schematic of an NComputing thin client 'star' network topology.

Every workstation will have an NComputing thin client device that will have an audio jack port, HDMI and VDA port, multiple USB ports for external storage and other peripherals such as mouse and Keyboard. The NComputing thin client device will then be connected to the network through the RJ45 cables and then onto a 'switch' labeled as router in fig 1. The Switch will be connected to the host PC which will act as a server. Addition shared peripherals such as printers and scanners can be connected to the network through the Switch.

In cases where high end 3D gaming and application is required, two sets of PC will be used, one to serve the work stations that need graphic intensive application while the other to serve simple office productivity such as MS Word, MS Excel, MS Power Point and web-browsing. Depending on the processing capabilities of the PC used, the number of graphic intensive application will be determined, a graphics card within another set of NComputing thin client device will share the load.

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Proposed LAN layout of graphic intensive application
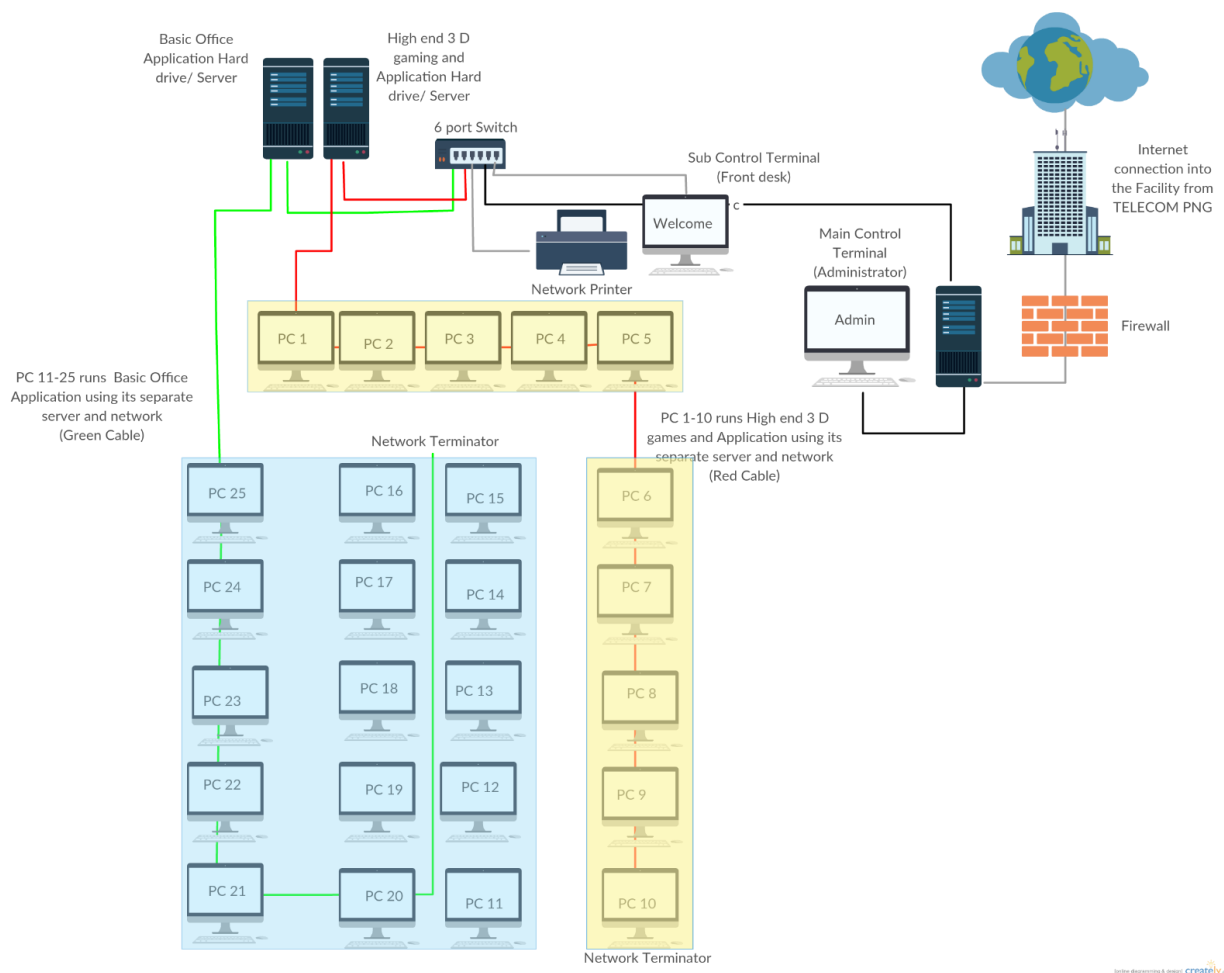and non-graphic intensive application

Fig 2. A proposed layout of a robust Local Area Network (LAN) using thin client in a 25 workstation computer lab. Despite the NComputing device capacity to serve a maximum of 40 workstations, to give students the experience of standard clock speed of a standard PC, a maximum 20 workstations will function perfectly fine without causing any inconvenience.

Installation of the Vspace software that comes with NComputing thin client device will manage the system and give the Host PC access to all workstations. All files will be stored in the host PC but can displayed on individual workstations. The host PC has control over all workstations as well as all peripherals such as the printers within the network. Different set of authority and accessibility can be assigned to different workstations via the Host PC so both the teachers and the students can use the computer lab.

4. Implementation of NComputing thin client in rural Papua New Guinea schools

A critical aspect to addressing the issue of providing ICT infrastructure within Papua New Guinea is the vast terrain and lack of electricity in many rural areas. With the use of NComputing thin client technology, that would not stand as

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a barrier to accomplishing the aim of the project given the nature of the core devices used – The low energy consumption of 8-20 watts while only the host uses 150 watts. The energy requirement of the entire network can be predetermined given the size of the computer lab, the amount of peripherals to be use and depending on the geographical location of the school, appropriate renewable source of energy will be used to provide energy. That will enable a self-subsistent system energy wise.

5. Accessing the Internet and regulations with NComputing thin client

With the increase in coverage by telecommunications industry within the country and upgrading of the networks to 3G, using cellphone signal boosters next to the computer labs in cases of weak signals and then a modem can be connected to the Host workstations. Depending on the policies of the NICTA, The Papua New Guinea Education Department and the schools, control mechanism will be put in place by the use of a free third party software 'True Café' that is used to manage a majority of the internet cafes all over the world.

Within True Café, it has the capacity to manage many workstations with a single admin to control the bandwidth of upload and download, allocation of timeslots for the use of internet – A teacher in this case will be the admin, True Café has the capability of sending text messages to all terminals. When a student has some issues, the student can directly send a text over in a displayed box to the main terminal and the teacher in the terminal can respond, instead of walking over and seen the problem, the teacher will remotely solve the issue from the main terminal.

Saves energy in the computer labs, shutdown idle or all terminals by one click. Shutdown an idle terminal automatically after a few minutes of inactivity. Turn on a terminal remotely before starting a class session.

6. Project Scope

Via the use of NComputing thin client virtual desktop technology:

1. The Project will improve the accessibility and quality of telecom services in PNG, particularly to improve computing experience for schools in remote and rural areas;
2. The project will increase affordability and improved accessibility will enable inclusive economic growth be facilitating access to markets and information and developing other business relying on telecom service; and
3. The project will Improve network and enable better access to information, including for public service delivery, education, health and security for the school and neighboring communities.

7. High-Level Requirements

The system will include the following 3 crucial parameters:

*   Ability to allow both users even with limited IT background to configure, operate and trouble shoot problems.
*   Ability to interface with the existing data warehouse application from virtualized desktop environment that minimizes the need to duplicate e-library resources from one workstation to the next.
*   Ability to centralize all administrative and technical aspects of operations within a single dashboard for installation of new software's or update and monitor individual workstations.

8. Deliverables

*   Students

    Develop basic computing knowledge to set a platform that they can further assimilate into further ICT fields, in particular computing

- Teachers

  Gives teachers the leverage to fully utilize and cover materials designed within the syllabus

- Education Department of Papua New Guinea

  Ensure that students are equipped with the basic knowledge of computing to actively participate in learning to build the human resource which is the Education Department of Papua New Guinea primary role.

- National Information and Communications Authority of Papua New Guinea (NICTA)

  Delivers the framework that aligns with the Education Department of Papua New Guinea policies within the period allowable and the budget allocated.

- The Government of Papua New Guinea

  Creates a strategic feasible approach to achieves its vision 2050 through implementation of its policies at a reasonable cost that will have an optimum benefit.

9. Implementation Plan

The NComputing devices are 'made to order' and will take 8-12 weeks to be manufactured and shipped to destination. The implantation of the project will vary depending on the availability of buildings to house the facilities as well as supporting infrastructures such as electricity, tables and chairs. In cases where the infrastructure is available, the installation of the imported NComputing devices will be a 'plug and play' with a basic common networking topology and system operating software configuration which will procced with testing that can last from 2 weeks to a month based on the size and requirements of specific schools.

APPROVAL AND AUTHORITY TO PROCEED

We approve the project as described above, and authorize the team to proceed.

Name	Title	Date

_____   _____   _____   _____
Approved by   Date   Approved by   Date

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About myself:

My name is Christopher Odorry, I am 22 years of age from Papua New Guinea currently in my final years of a 4-year undergraduate program majoring in Industrial and Systems Engineering and Computer Science in Antalya International University, Turkey. I myself was under-privilege to not have access to computer at an earlier stage in my life and got introduced to it when I was in grade 11 and 12 which proved to be insufficient for me when I owned my first laptop as I was enrolled in the School of Natural and Physical Sciences in the University of Papua New Guinea prior to my scholarship.

I therefore have made it my commitment to find alternatives that could reduce the cost of computing experience for my fellow country men and women in Papua New Guinea so they can learn computing at an earlier stage in life which gives them a leverage to be competent in their specific field of expertise in regards to IT which is now a basic requirement.

I have various experience in working on computer oriented project both within the university and in the Industry since my major encompasses the use of computer science and mathematics to solve complex engineering problems. I am proficient in all Microsoft Office application and program in 5 different languages: Python, C, Mathlab, SQL and HTML as well as Arduino – An open-source electronic prototyping platform that enables users to create interactive electronic objects.