**Introduction**

In a complex world of always changing technology and an endless amount of options, it can sometimes be overwhelming and costly to upgrade your operating system every time a new version is released. Mark Shuttleworth sought to combat these costly upgrades and costs of operating systems with a free operating system distribution based on Debian GNU/Linux. The name of the operating system would be named after Shuttleworth’s South African origins and philosophical belief called Ubuntu. These beliefs have been transformed into the software environment, and are making a big impact on the computing community.

Mark Shuttleworth, a South African Entrepreneur and Design/Product strategy leader at Canonical, created the Ubuntu Foundation on July 1st, 2005 with an initial investment of $10 Million. Upon its creation, founder Mark Shuttleworth said “The core team members employed by the Ubuntu Foundation will ensure that we can meet public commitments to keep Ubuntu entirely free of charge, as well as meeting commitments of support for extended periods.” However, the first official release of Ubuntu was in October 2004. Shuttleworth’s choosing of the word Ubuntu reflects some of the overall goals that Ubuntu has created. Shuttleworth states that in the ethical ideology of the South Africans, Ubuntu is “humanity towards others and the belief in a universal bond of sharing that connects all humanity.” Nelson Mandela’s definition of Ubuntu may describe the core beliefs and potential that Ubuntu has an operating system platform. He stated in an interview that “Ubuntu does not mean that people should not address themselves, the question therefore is, are you going to do so in order to enable the community around you to be able to improve? These are the important things in life. And if one can do that , you have done something very important with the appreciator.” The first Ubuntu release was an enterprise server platform, and when Mark Shuttleworth sought to transfer this idea of free software to the majority of home computer users, he teamed up with developers from another well-known Linux project, Debian.

Debian, as described by its founder Ian Murdock, is a free operating system based on the Linux kernel and enhanced with OS tools from the GNU project. The first release of Debian was in August 1993. Debian strived to provide more than a standard operating system, as it is bundled with over 29,000 packages. These packages, as described by Debian, are “precompiled software bundled up in a nice format for easy installation on your machine.” The GNU Project was developed well before Debian had been founded, and is the core of the free software movement that is thriving today more than ever.

GNU is a recursive acronym for GNU’s Not Unix. This play on words extends further than just the acronym, as GNU is completely Unix compatible. When created by Richard Stallman in 1984, he stated that “GNU is not in the public domain. Everyone will be permitted to modify and redistribute GNU, but no distributor will be allowed to restrict its further redistribution. That is to say, proprietary modifications will not be allowed. I want to make sure that all versions of GNU remain free. Once GNU is written, everyone will be able to obtain good system software free, just like air.” This free software philosophy is still alive and seen in computing everywhere today.

**Job / Process Management**

Multiprogramming is the computer’s ability to effectively carry out more than one process at one time. On a single processor computer, each process runs individually little by little, but two processes never actually run at the same time. The processor is shared between multiple running programs, and the processor executes only one process at a time. This technique of multiprogramming does not use genuine parallelism, it uses what’s known as pseudo-parallelism.

Ubuntu uses a different technique than multiprogramming, yet somewhat similar, called multitasking. Modern processors are equipped with multiple functioning units, all connected through an internal pipeline. Since each of these units is capable of processing one instruction per clock cycle, the processor can effectively exceed the one instruction per cycle limitation. Multiprocessing in comparison to multiprogramming, which involved pseudo-parallelism, involves true parallel processing between the processors.

Multithreading is a closely related concept, and also uses pseudo-parallelism like multiprogramming. Instead of the processor time being shared between processes, it is shared between threads making up the processes. Unless these threads need to be synchronized with each other, they run completely independently. On multiple core processors, multithreading can involve both true parallelism and pseudo-parallelism. For example, there may be true parallelism between the multiple functional units, yet pseudo-parallelism between threads.

**Memory Management**

The physical address of a computer is an address assigned to the Network Interface Card of the computer at the time of manufacturing, and is dependent upon what kind of technology the Network Interface Card was equipped with. This 48-bit address can also be referred to as the Media Access Control, hardware, or real address.

The logical address of the computer is assigned and mapped on top of the Network Interface Card’s current address, and is known as an IP Address. These IP Addresses can range from IPv4’s 32-bit addresses to IPv6’s 128-bit addresses and are also known as virtual addresses.

A virtual memory system operates by allocating necessary memory on the computers resources. When the RAM gets overloaded with data, virtual memory copies a portion of RAM to a temporary location on the hard drive, thus freeing up RAM. Although virtual memory systems can compensate for a lack of RAM, it is not intended to completely replace RAM. The computer can read data off of RAM much faster than it can off of the hard disk, which is why virtual memory systems are not a fail-safe replacement to RAM.

**File System**

Ubuntu uses a hierarchical file system structure, with the very base of the file system being called the root. Root contains a plethora of directories and subdirectories belonging to Ubuntu. Ubuntu uses the ext3 file system, which Keir Thomas states, “Allows journaling, a way of recording what has been written to disk so that a recovery can be attempted when things go wrong. This is the default file system used by Ubuntu and not without reason: it’s a reliable technology.” Ubuntu also supports mounting, which makes a file system such as an external hard disk, a CD-ROM, a floppy drive, available under Linux.

**TCP/IP Stack**

The TCP/IP Protocol Suite was originally created with four layers, and was developed prior to the OSI Model. These layers are Host-to-Network, Internet, Transport, and Application. However, when comparing to the OSI Model, the TCP/IP Protocol Suite has five layers. The first layer of the stack, Host-to-Network, is split into the Physical and Data Link layers. Each upper layer protocol in the TCP/IP Stack is supported by one or more lower-level protocols. The physical and data link layers of the TCP/IP Stack do not define specific protocol and is said to support all the standard protocols. The network layer of the TCP/IP Stack supports IP, or Internetworking Protocol. IP also uses four separate protocols; Address Resolution Protocol, Reverse Address Resolution Protocol, Internet Control Message Protocol, and Internet Group Message Protocol. The transport layer identifies two transport level protocols, User Datagram Protocol, and Transmission Control Protocol. Some newer applications may also require the use of a newer transport layer protocol, Stream Control Transmission Protocol. The application layer of the TCP/IP stack is equal to the combined session, presentation, and application layers of the OSI model, and defines a plethora of protocols.

**User Interfaces**

With Ubuntu’s promise to upgrade their operating system every six months, comes a constant change to the user interface. With just the past release of Ubuntu, 11.04 codenamed Natty Narwhal, they upgraded the user interface from GNOME to Unity. Unity is capable of being run on an assortment of different screen sizes, including tablets and netbooks. Chief Executive of Canonical Jane Silber said “With this release Ubuntu will recruit an entirely new wave of users to free software, Ubuntu 11.04 is a high watermark for what has been achieved with open-source technologies for the everyday computer user.”   
  
**Strengths** The major advantage of Ubuntu over other commercial operating systems such as Windows is the fact that getting a virus is impossible. In the 6 years that Ubuntu has released its product, and in 13 versions, they have had 0 virus’s to date. This is a major determinant for businesses, public institutions, and others to use Ubuntu. Another major advantage of Ubuntu is that it is completely free. Founder Mark Shuttleworth stated at the founding of Ubuntu, “Both Canonical and the Ubuntu Foundation have made public commitments that Ubuntu will always be freely available, without the need for royalties or license payments of any kind.” This commitment to the free and open-source community is one of the reasons Ubuntu has become one of the most popular operating systems today. Ubuntu is also compatible with almost every single Windows program such as Microsoft Word through a program called WINE, which is also a recursive acronym for Wine Is Not an Emulator. This means that current users of Windows can easily switch without having to leave their favorite programs behind. New users to Ubuntu can also simply run the Ubuntu Operating System from a Live CD to test it out before they install it to their systems. New users also have the option of dual booting their current operating system with Ubuntu, with the included GRUB loader. This gives them the option every time they start their computer to boot their old operating system or Ubuntu. This can allow new users to ease into the operating system, without completely letting go of their old operating system if they don’t feel entirely comfortable. Ubuntu’s Long Term Support system guarantees that the operating system will be technically supported for an extended period of time.

**Weaknesses**

The average user may be perplexed by installing a new operating system on their computer, and the thought of moving off their current operating system may be discouraging. A major disadvantage that Ubuntu and other Linux distributions alike have are the lack of manufacturer cooperation in releasing drivers compatible for Linux. Although this does not happen often, this could mean running a generic driver for some of your devices. Ubuntu also requires the user to be more technologically savvy to fully operate the operating system to full capabilities, and the thought of having to use a Command Prompt type of approach for everyday use may deter some prospect users. Another weakness that Ubuntu carries is its lack of comfort ability in the Operating System market, as an experienced Windows user of 10 years may be hesitant to even try Ubuntu.   
  
**Conclusion**

Since Ubuntu’s grand induction in 2005, it has made some gigantic strides. It currently has the highest market share of any Linux distribution, with 50.25% of the market as of March 2011. In a press release issued in July 2005, Ubuntu was said to become the “Leading distribution in the free software world, taking the #1 place in DistroWatch popularity rankings over all timescales which are published.”