DATA ANALYTICS
AND LINUX
OPERATING SYSTEM

2 BUNDLE MANUSCRIPT

Beginners Guide to Learn Data Analytics, Predictive Analytics and Data Science with Linux Operating System

ISAAC D. CODY

Data Analytics and Linux Operating System 2 Bundle Manuscript

Beginners Guide to Learn Data Analytics, Predictive Analytics and Data Science with Linux Operating System

Series: Hacking Freedom and Data Driven (Senior Edition) + Data Analytics

By Isaac D. Cody

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This book will contain 2 manuscripts from the Hacking Freedom and Data Driven series. It will essentially be two books into one.

Data Analytics will help you learn how to leverage the power of data analytics, data science, and predictative analytics.

Hacking University Senior Edition will begin your quest in learning to dominate the linux operating system!

Data Analytics:

Practical Data Analysis and Statistical Guide to Transform and Evolve Any Business

Leveraging the Power of Data Analytics, Data Science, and Predictive Analytics for Beginners

BY: ISAAC D. CODY

DATA ANALYTICS

PRACTICAL DATA ANALYSIS AND STATISTICAL GUIDE TO TRANSFORM AND EVOLVE ANY BUSINESS

Leveraging the power of Data Analytics, Data Science, and Predictive Analytics for Beginners

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Preview of this book

Have you ever wanted to use data analytics to support your business?

With many businesses, data analytics can just that plus more. It's a great system to see how things are going, and you can collect the information to form conclusions through this. But how does it work? What are the nuances of this? Well, that's where this book comes in.

In this book, you'll learn the following:

- What are data analytics - The importance of big data - How to conduct data analytics - Why a business needs this for success and prosperity now, and in the future With data analytics, you can save your business, and this book will further prove to you the importance of this subject, what it can do for you, and how you can use data analytics to make your business shine and grow

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Introduction

I want to thank you and congratulate you for downloading the book

Data Analytics: Practical Data Analysis and Statistical Guide to Transform and Evolve Any Business, Leveraging the power of Data Analytics, Data Science, and Predictive Analytics for Beginners This book contains proven steps and strategies on how to become proficient with big data, data analysis, and predictive analytics, even if you have never studied statistical science. This book takes you from the beginning concepts of data analytics to processing the information, structuring your organization, and even security issues with data management. From the knowledge contained within this book the business owner can create and install big data analytics in even the smallest business.

Data analysis has been proven to change the business world. Companies that are using data analysis for their business decisions are moving ahead of the competition by leaps and bounds. Armed with the knowledge supplied from their analysts, business owners and organizations are making better business decisions regarding marketing, sales and forecasting, to name just a few helpful functions of data analysis.

Here's an inescapable fact: you will need data analysis to keep up with the competition, because they are using it now, in real-time, to make their business decisions.

If you do not develop your understanding of data analysis and big data, you will be left behind in the dust. Your sales may drop and your business may be in jeopardy as a result of inexperience and the lack of information about a growing and necessary trend in business intelligence.

This book is an amazing resource that defines data analysis and the tools and methods that make it successful.

Good luck!

Chapter 1 The Importance of Data Analytics and Why Your Business Should Use It

Data analytics is the buzzword of the decade. Everyone is discussing and promoting data analytics from healthcare to big business. Small business and mega-corporations are touting the advantages of using Big Data to transform their business practices. Warehouses, trucking companies and suppliers are raving about the money they have saved using Data Mining to overhaul their organizations. Is it hype or is it the new Casino, offering cash at every pull of the slot machine handle (or in this case, the data set)?

Data analytics (DA) is the process of interpreting raw data for the purpose of informing the individual (or group) the conclusions derived from the data. Data analytics are used throughout industry to make business decisions on inventory, cash-flow, sales projections, customer characteristics, and loss-prevention strategies, just to name only a few of the practical uses. In science, data analytics are used to prove and disprove theories.

The concept of business analytics and big data has been around since the 1950s to predict insights and trends in the consumer markets. The difference between data collection sixty years ago and today is that today's information set is almost in real time. Today businesses can receive the information in thirty minutes or less to make an immediate business decision. This gives companies that use data analysis a big competitive edge over a company that does not.

The data that is received today by a corporate executive is thorough, fast and reliable. This allows the decision maker to determine the best course of action within minutes of receiving the desired information, rather than weeks, months or even years as previously experienced.

Businesses are tapping into the data mines to utilize the information in many ways, including, but not limited to:

1. **Cost reduction for data storage**. In 1981 it cost $700,000 to store 1GB of information. In 1996 that cost was $295.00 and in 2014 that same storage cost was only $00.03. (*source:* http://www.mkomo.com/cost-per-gigabyte-update) 2. **Opportunity for real data for R&D**. Customers are now very vocal about their wants and needs. A new product launch on Twitter can determine quickly the interest in an innovative product design. Data analysis allows immediate feedback for research and development of market trends.

3. **Inventory and product analysis.** Using data analysis, a company can see what is popular on the shelves and what products need dusting off and moved on out of the store and off the valuable shelf space. Why do grocers' place the most utilized products on the very top and very bottom shelves? They know those products will always sell but the products with the highest markup are at eye-level for the consumer.

Lenovo was designing a new keyboard for their customers, but failed to recognize their loyal customer base in the gaming industry. After using data analytics, Lenovo changed their design to incorporate the gamers' needs and launched a worthy product that brought millions in sales. Data analytics saved their product and increased their profits.

Data analytics is by no means limited to the retail sector. Other businesses use data analytics to increase their profitability and efficiency. Here are a few uses that are currently being adopted by industries: **Travel and Hospitality**

Customer satisfaction is very hard to measure but the key to a thriving enterprise. Big data analytics give the management instant access to customer preferences as they check-in, at customer decision points, and even as they leave the facility. This gives management the opportunity to rectify grievances as they occur, turning a potential customer relations bomb into a satisfactory experience for all parties concerned.

Health Care

In the health care industry, big data is changing the way records are kept, research is analyzed, and patient care is managed. The result is a better method of caring for the patient with a computerized record that can follow the patient no matter treatment is given. In addition, sometimes a new procedure or medicine is available immediately because of the instantaneous information of a query. Staffing for hospitals has been transformed also with data analysis, allowing the care facilities to schedule more personnel in the peak times and less for the slower times.

Government

Local police forces are using data analytics to determine the areas with the greatest crime statistics, where more foot patrols would be advantageous, and even the peak times for burglaries and petty crimes. The technology of analysis can pinpoint the problem areas in a suburb or city without sacrificing the limited manpower for surveillance.

Small and mid-size businesses have the same opportunities for collecting data as large factions, but it will be helpful to keep in mind these strategies:

To tap into the mainstream of consumers there must be a digital presence for the business. Customers and clients that are shopping for services and products go to websites and Social Media for opinions, reports, comparisons and reviews.

The website should be straightforward and honest. It should also describe the benefits of the product or service without exaggeration or misrepresentation. Consumers know hype when they see it, and will studiously avoid those websites as potential outlets of information or products. The website should be enabled to give information and to collect information.

Website analytics will gather the demographics of the customer, their interests, their entry point, their boredom and "click off" point, and their favorite social media sites.

If the website is designed correctly with many points of interaction, the client or customer will specify their needs and wants before they realize they have been "mined".

Small Business Example

Here is a good example of a small business that used big data:

A local bakery finds the chocolate chip cookie sales are booming, with orders by the dozen on both the website and from call-in orders. The chocolate cupcakes, however, become slower and slower to move. The baker reads the remarks on the website and finds this innocuous remark: "I love the chocolate cupcakes and the chocolate chip cookies, but I can buy 12 chocolate chip cookies for the price of only 2 cupcakes."

This data became an "aha" moment for the baker. The baker quickly made a separate page for just cookie sales (to continue the chocolate chip cookie trend), but also changes the product offering of full-sized cupcakes to mini-cupcakes. Four mini-cupcakes were priced the same as the chocolate chip cookies by the dozen. The baker also placed a coupon special on the Facebook listing of "buy one dozen assorted cookies and receive a free mini-cupcake of your choice, by mentioning this ad." Sales of all cookies and the new product increased.

Chapter 2 How to Handle Big Data

Big Data and Its Issues

Big data is the data mined that is too large, disorganized or unstructured for an analysis using the traditional technology and techniques currently used in data management. The quantity of data is less important than the how the data is used and categorized.

Big data is divided by three sectors: volume, velocity and variety. Companies are inundated with huge amounts of data and need ways to identify and utilize the data sets.

Regardless of the management issues, big data is still very valuable for a business or organization. Big data makes information transparent and usable. Now that organizations are collecting larger amounts of data, it is much less expensive to store in digital formatting than it ever was by tape. Management uses performance data to explore trends in sick days and employee tardiness, product inventory, movement, and even storage capacity. Other businesses are using data to explore forecasting for budgets and purchasing decisions.

Big data aids companies in segmenting their customer base so that they can tailor the product offerings to the customer needs and desires. More importantly, big data is being utilized in Research and Development to improve the next generation of service and product offerings.

Grabbing and Grasping Big Data

Companies now have to use new storage, computing, collecting, analysis and techniques to capture and crunch the big data. Even though the technology challenges and even the priorities of individual firms are different, they all have the same issues: older computer systems, incompatible formats, and incomplete integration of data that inhibits the interpretation of the database information.

There are new approaches available for crunching the data to assist with quality management of big data. The best approach will analyze the volume, variety and complexity of the data before making purchasing decisions.

Big data has open source technologies for the database management systems, including Hadoop and Cassandra. There are also several business intelligence software products on the market that report, present and analyze the finished product to the business owner.

Utilizing Big Data for Business

It is estimated that businesses only use 5 percent of the information they receive. This leaves a big space for improvement, which may be filled with the technological stack of implements needed for Big data analysis. There is a requirement of storage, computing, visualization software and analytical software, to start the list. There will the need for additional personnel and probably an IT department.

Does investing in big data payoff in the ROI? In a nutshell, positively. The McKinsey Global Institute anticipates that a business that correctly utilizes big data could increase the operating margin by over 60 percent, a huge sum.

Here are the steps suggested to implement big data in your organization:

- Inventory all data related assets

- Move the management to embrace a data-driven worldview

- Develop technology implementation

- Address policy issues including data security, privacy and property

- Identify opportunities and risks

Data security is of particular importance. Databases contain confidential information that may be trade secrets, personal medical information, and even copyrighted materials. Data should be centralized and secure. Encryption is not an option due to the large amounts of data and the time and personnel that would be required to continue such a practice. Protection of the database begins with the first step mentioned, inventory all sources of input. Only when the scope of the contributing sources is analyzed can businesses determine which security measures need revamping and which particular products with take care of the job.

Chapter 3 The Benefits and Challenges of Data Management

Long ago and far away the business owner would look at a new product, listen to the sales presentation from the jobber, and decide upon whether to purchase the product based on their "gut" intuition. Just like the general store with a post office and gas station, those days are gone.

This is the age of information. Businesses must keep current with trends, market dynamics, consumer preferences, and economic pressures to make the appropriate decisions regarding their presence in the marketplace. The enormous amount of information that is available requires educated persons that are comfortable and accurate in interpreting the data provided.

Case Western Reserve University in Cleveland has recently announced there will soon be a shortage of 190,000 analytics personnel and over 1.5 million data managers. This problem will mostly affect the small and medium sized businesses that cannot afford to hire a personal data analyst on a shoestring budget.

The demand for Information Technology Project Managers with big data skills increased by 123.6% last year, and big data skilled Computer Systems Analysts increased 89.8%, according to Forbes Magazine.

(source: http://www.forbes.com/sites/louiscolumbus/2014/12/29/where-big-data-jobs-will-be-in-2015/#2caeda00404a) Even when a business has access to data analytics there are still challenges for the business besides how to use the information provided. One of these challenges is Data Management.

Data management is the organizational management of the data and gathered information for security, limited access, and storage issues. Tasks that the data management requires include governance policies, database management systems, integration of data systems, data security, source identification, segregation of data and storage issues.

Keys to Effective Data Management

Data management issues are not a new dilemma. As long as data has been collected the businesses have been dealing with the problematic issue of keeping data pristine. Now, with the increase in data and marketing automation, data security has moved to the pinnacle of the problem areas.

If data isn't clean or relevant, it is of no use to the marketing and business primary officers. Data management requires constant surveillance as hackers are waiting to scoop up and destroy millions of relevant information and resources. There are few things that should be automatic for security issues with data, such as: 1. **Limit Access**

Many times the access to materials and information is wide open to all employees to modify. Office managers, sales personnel, and office staff should not have the ability to enter the database and change, access or delete and add information. The best way to control this situation is to establish boundaries, or limited access.

Set controls based on specific functions, such as marketing personnel are limited to viewing market data, but not to editing. Determine which person in the organization will do all the data changes including additions/deletions and actions (such as changing contact information for the client). Establish data import and export rules so that secured data is not flying out the door and so that viruses are not being uploaded. Create a master list of data so that information is neither duplicated nor compromised.

2. **Create a Data Map**

A data map is a flow chart data the route of data, delineating the intake and output, the departmental

integration, and the use for each data entry. Data mapping is an ongoing exercise that maintains controls and data consistency.

3. **Organize your Data in Segments**

Data is not about quantity but instead about quality. It does no good to have millions of names in the database if your clientele is in the hundreds. It is not helpful to have hundreds of names in the database if you have no organization for retrieval.

Instead, separate the data by your needs. Examples could be by sex, age, address demographics, zip code, contact preferences, *etc.* Correctly segmenting the database can make the data come alive with potential whereas a disordered database will look and feel like chaos.

Begin with your current active customer base. Segment them into demographics and then by purchasing habits. Connect with your customers on a regular basis to glean their input on your products and services.

4. **Data Hygiene**

Data hygiene is the process of keeping data clean and current. Old data and corrupted data will only clutter your database and possibly even infect all of your records. Just like the previous functions, hygiene should be provided on a regular basis to ensure the data is not decayed or contaminated.

The importance of maintaining a pristine and organized database cannot not be overlooked. If the data isn't good, all the contacts and marketing projects will not succeed if they are addressed to the wrong contact point. To enhance the value of your database for marketing and sales endeavors, do not neglect database management.

Chapter 4 Real World Examples of Data Management

An Example of Ineffectual Usage

- John Belushi, 33
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- Elvis Presley, 42
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- Anna Nicole Smith, 39
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Source: http://www.usatoday.com/story/life/people/2016/06/02/celebrities-who-have-died-addiction/85314450/

These celebrities have a sad connection: They all died from a drug overdose at a too young age.

The prescription drug-monitoring program can inform prescribers (doctors and nurse practitioners) and dispensers (pharmacists) to establish controls for drug abuse and diversion of opioids, the major contributor to the aforementioned deaths. Celebrities only make up a small percentage of the yearly deaths attributed to drug overdoses. The US Centers for Disease Control and Prevention (the CDC) has established that it is the primary cause of accidental death in the United States. At the last published data analysis, it was determined there were over 47,000 drug overdoses in 2014. Prescription pain killers were responsible for 18,893 of those deaths.

The names of these drugs are common prescriptions when one has surgery or a broken arm or just about any circumstance that requires a trip to the local hospital emergency room: Percocet, Lortab, OxyContin, Fentanyl, Vicodin, Morphine and Xanax are just a few examples. Xanax is a benzodiazepine, not a painkiller, but is lethal when ingested with an opioid, even at the minimal quantity of just one dose.

For preventing this epidemic of drug overdose, the separate states have established databases to monitor prescriptions of the products. This database entails the dosage, the frequency the prescription is filled, and the prescribing doctor, in order to determine which patients may be diverting or mismanaging their dosages and which patients are frequenting different doctors and hospitals within a thirty-day period to acquire more drugs.

The concept is great: Have one database that combines the data from various and multiple sources of pharmacies and medical personnel to combat the issue. Unfortunately, the database has several problems that prevent effective management.

- Data is derived from multiple sources and is time-consuming and complex.

- The data is incomplete as many physicians don't take the time to consult the database. Although the installation of the system is mandatory in 49 states, only 22 states require compliance, and no one is monitored for conformity.

- There are too few personnel to conduct real-time analysis of the information. It is fed into the database but not retrieved effectively.

Leading Data Analytics at SAS Institute have addressed the issue in the report *Data and Analytics to Combat the Opioid Epidemic*. Their take is that the information at present is almost unusable.

With better analytics and interpretation physicians could develop improved treatment protocols, patient

education and policy boundaries. For example:

- Physicians can compare their treatments with their peers to determine specific patterns of early drug addiction.

- Insurance and government payment systems can catalog the potential misuse or diversion, avoiding the expense costs of paying for fraud.

- Larger hospital and public health systems could develop better educational programs, treatment protocols and resource decisions.

- Pharmacies could compare their dispensing data to determine geographic overlap in abuse, among other factors.

- States could utilize the database for funding treatment centers by demographical information.

Combining and segmenting the data could work to alleviate macabre headlines by saving lives.

An Example of Effectual Usage

A famous mid-sized business owner found $400,000 by using Data Analytics. It seems that he had lost track 1,000 items of inventory, which was impeding his much desired cash-flow. The first day that he started his

inventory, he saw the product that had not moved from the shelves.

He initiated a huge warehouse sale and sold the entire stock in one weekend, increasing his cash flow by $400,000. This more than paid for the implementation of the new database and peripherals. With the quick and decisive move to sell the new-found inventory, the company has utilized their data in a positive fashion with immediate results.

Previously this company had no IT department and did not have a POS system that traced product aging. He had money molding on the shelves. Once he had the database system installed, he was able to reduce older inventory by 40%, in addition to changing price points that were overblown, supplier costs, and profit margins. He also cleaned up the customer base with updated information, saving a substantial sum on postage and printing costs. With his new information, he can target the purchasers of the product to upgrade their sales rather than broadcasting mail to uninterested households. This company also uses their data to offer special discounts to their loyal and top customers, which generates income through upselling.

Chapter 5 The Different Types of Data Analytics

Big data is such a buzzword there is a misconception of what it is and what it does. The uses of Big Data are tremendous: fraud detection, competitive analysis, consumer preference analysis, traffic management, call center optimization, managing utility power grids, and managing warehouse and inventory, just to name only a few. Big data itself is problematic because it is the business intelligence code word for data overload.

There are three V's of Big data:

1. Too much data, or **volume**
2. Too much speed; the data is moving so quickly it cannot be analyzed, or **velocity**
3. Too much information from too many sources, or **variety**.

Even though the collection and assimilation of big data is daunting, the business intelligence that is derived from big data can aid a business immensely.

Four Kinds of Big Data Business Intelligence

There are four kinds of big data business intelligence that are particularly helpful for business owners:

1. Prescriptive

2. Predictive

3. Diagnostic

4. Descriptive

Prescriptive Analysis

Prescriptive analysis is the most valuable analysis because it informs the business what steps should be taken to improve the situation. The use of this data can be the beginning of change for the organization. Even though it is considered the most valuable, it is the least used as barely 3 percent of the organizations reported to use big data. Companies could use prescriptive analysis to give specific issues to isolated problems, such as in the health care industry and the problem of diabetes and obesity. Big data could identify the obese patients with both diabetes and high cholesterol, three contributing factors in the development of heart disease. These patients could be targeted immediately to initiate a four-fold attack on the risk factors through diet, diabetes education, exercise encouragement and cholesterol monitoring. At present, the issues are addressed by different specialists, if they are even addressed at all. Combining treatment strategies would be much more effective and the combination of information could be compiled through prescriptive analysis.

Predictive Analysis

Predictive analysis is the prediction of possible scenarios derived from the analysis of the information. This is usually in the form of a business forecast. This form of analysis looks at the past to foretell the future. For example, the business might look at the previous Christmas sales to predict the future Christmas potential sales for a particular product. Predictive analysis is especially useful in marketing and sales departments to mimic previous campaigns that were successful. Some businesses are using predictive analysis to examine the sales process, from customer introduction, communications with the customer, the lead to the customer, the sale to the customer, the closing of the sale, and the follow-up communications.

Diagnostic Analytics

Diagnostic analysis focuses on past predicaments to discern the who, what and why of a situation. This analysis can use an analytic dashboard, or widgets that help the reader see at a glance the information at hand. An example of use of diagnostic analytics could be examining a sales campaign or a social media marketing campaign. With the widgets, one could see the number of posts, the number of visitors, the quantity of comments and likes, the page views and the feedback from the customer. Seeing these analytics at a glance instead of paging through reports brings a faster grasp of the salient points of the data. Utilizing diagnostic analytics will explain the failure of a marketing campaign to increase sales of a specific product.

Descriptive Analytics

This type of analytics gives real-time data on the current situation. Instead of giving last week's or even yesterday's data, this information is happening now. An example of the usage of descriptive analytics is pulling the current credit report for a customer desiring to purchase a new car. Examining the past behavior to assess the current credit risk and predict the future credit profile would help the sales manager determine if the potential customer can or will fulfill the credit contract.

Big data analytics will bring certain value to a company for the ROI because it fills in the blanks regarding customer performance and product sales. By reducing the enormity of big data into manageable chunks of information, a business owner can make better business decisions regarding staffing, sales, profits, and product variances.

Chapter 6 They all Work Together: Data Management, Data Mining, Data Integration and Data Warehousing

The terms for Big Data are many; this section of the book identifies the most useful terminology when addressing the logistics of big data.

Data management. Data management is the process of placing restrictions on the access and quality of data that flows in and through and out of an organization. Restrictions may include limited access, security measures to prevent viruses and corrupted data, and maintenance issues.

Data mining. Data mining is the process of sifting through the data to extract patterns and relevant information to solve the current issues in the business. Using software, data mining will take all the chaos out of the voluminous data.

Hadoop. This is open source software (meaning it's free!) to store data and run discriminating applications on commodity hardware. It is key to sifting the multiples of data information that is bombarding the data sets. It is known for the speed for which it processes data.

In-memory analytics. By investigating information from framework memory (rather than from your hard plate drive), you can get prompt bits of knowledge from your information and follow up on them rapidly. This innovation can expel information prep and investigative handling latencies to test new situations and make models; it's not just a simple route for businesses to stay agile and settle on better business choices, it likewise empowers them to run iterative and intelligent examination situations.

Predictive analytics. Predictive analytics uses, statistical algorithms, machine-learning techniques and data to identify the predictive outcomes based on previous patterns of usage. It's about giving a best evaluation on what will happen later, so businesses can feel more assured that they're settling on the best business choice. The most common and basic utilizations of predictive analytics incorporate misrepresentation and fraud, risk management, operations management and marketing functions.

Text mining. In utilizing text mining technology, the business you examine text data from the world wide web, comments, articles and other text sources to uncover insights that were previously unseen. Text mining incorporates machine learning and language processing to evaluate and sort web documents like blogs, feeds, intelligence on competitors, emails, comments and surveys to assist the business in analyzing quantities of information and discover tangents and hidden relationships.

Data integration is the combination of adding new information and data to an old computer system while keeping the data both clean and uncorrupted in content. Moving data effectively has become a challenge for businesses in the following areas:

- **Data Needs**

  - Delivering the correct data in the required format to alleviate the business needs is the primary reason for the integration of data. Every new source of data can impact the previous collection of information and systems to which it migrates.

- **Anticipating the Needs of the Business**
  - Data is not helpful if it is not available in a timely fashion. Integration must be adequate to manage both batches of information and real-time

- **Confirm all Data is Stamped with Pertinent Information**

  - Old systems did not time stamp or date activity in the server. For quick identification of the changes made to the data, the data integration needs to record this information.

- **Be Suspicious of All Incoming Data**

  - It is natural to anticipate data from other sources, but be suspicious that it may

be infected or other corrupt. Scan everything that comes in for compatibility and integration needs.

- **Validate Customer Information**

  - Compare incoming data to the master database to confirm the customer database is correct and current.

- **Keep a History of Every Change**

  - There is always a need to backtrack changes sometimes for statutory compliance and often when integration doesn't work as anticipated.

- **Upgrade the Systems and Evaluate the Process**

  - Constantly look for ways the system may be deficient for your business needs. Upgrade the systems regularly to ensure you have the best possible solution to your data management and integration needs.

Data Warehousing. Data warehousing is the storage of electronic data by the organization for which it is prepared. Data must be stored so that it is reliable, uncompromised, secure, easily retrievable and easily managed.

Chapter 7 Conducting Data Analysis for Your Business

We have stressed throughout this book the need for data analysis in the business enterprises, but we have yet to explain exactly how to collect data. This chapter will focus on basic data collection so that you can implement a strategy that will further your organizational goals.

A Step by Step Guide

What is Collecting Data?

Basically, gathering collected data implies putting your configuration for gathering data into operation. You've chosen how you're going to get data – whether by direct perception, interviews, overviews, investigations and testing, or different techniques – and now you and/or different spectators need to actualize your arrangement. There's more to gathering information, be that as it may. You'll need to record the information in suitable ways and sort the data so it's ideally helpful.

The way you gather your information ought to identify with how you're wanting to dissect and utilize it. Despite what strategy you choose to utilize, recording ought to be done simultaneous with information accumulation if conceivable, or soon thereafter, so nothing gets lost and memory doesn't blur.

Some of the functions necessary for useful data collection:

Assembling data from all sources.

Computing any numerical or comparative operations expected to get quantitative data prepared for examination. These might, for example, incorporate entering numerical perceptions into a diagram, table, or spreadsheet, or figuring the mean (normal), middle (midpoint), and/or mode (most every now and again happening) of an arrangement of numbers.

Coding information (deciphering information, especially subjective information that isn't communicated in numbers, into a structure that permits it to be handled by a particular programming project).

Arranging data in ways that make them simpler to work with.

How you do this will rely on upon your design of research and your assessment questions. You may amass perceptions by the independent variable (pointer of achievement) they identify with, by people or gatherings of members, by time, by movement, and so on. You may likewise need to group the collected information in a few distinctive ways, so you can consider interactions and relationships among various variables.

There are two sorts of variables in data. An independent variable (the intercession) is a condition executed by the analyst or group to check whether it will make change and improve the situation. This could be a project, strategy, framework, or other activity. A dependent variable is the situation that may change as a consequence of the independent variable or intercession. A dependent variable could be a conduct or a result.

How Do We Examine Data?

Investigating data includes looking at it in ways that reveal the connections, designs, patterns, and so on that can be found inside. That may mean subjecting it to statistical operations that can let you know not just what sorts of connections appear to exist among variables and additionally to what level you can believe the answers you're getting. It might mean contrasting your data with that from different data sets (a control group, statewide figures, and so on), to reach a few inferences from the information. The point, as far as your assessment, is to get a precise evaluation so as to better comprehend your work and its consequences.

There are two sorts of information you will use, even though not all assessments will fundamentally incorporate both. Quantitative data alludes to the data that is gathered as, or can be interpreted into, numbers, which can then be shown and broke down mathematically. Qualitative data are gathered as descriptions, accounts, conclusions, quotes, understandings, and so forth., and are by and large either not ready to be reduced to numbers, or are viewed as more important or enlightening if left as narratives. As you may anticipate, quantitative and qualitative data should be analyzed in different ways.

Quantitative data

Quantitative data is collected as numbers. Examples of quantitative data include:

- Frequency (rate and duration) of specific behaviors or situations
- Survey results (reported behaviors, ratings of customer satisfaction, etc.)

- Percentages of people with certain characteristics in the demographic (those with diabetes, obese, with heart disease indicators, the education level, etc.)

Data can also be collected other than numerically, and converted into quantitative data that is ready for analysis. Compilers can assign numbers to the levels of emphasis of a specific behavior. For instance, compilers can enumerate the quantity of Facebook "likes" or "comments". Whether or not this kind of information is necessary or helpful is dependent upon the kinds of questions your data is meant to answer.

Quantitative data is converted to statistical procedures such as calculating the mean number of times an event repeats. These calculations, because numbers are exacting, can offer definitive answers to varying questions. Quantitative analysis can identify changes in dependent variables that are related to – duration, frequency, timing intensity, *etc.* This allows comparative analysis with like issues, like changes within the population count of a zip code, or purchasing changes between women of a similar age.

Qualitative Data

Unlike numbers, qualitative information is considered "soft" data, meaning it can't be reduced to a specific conclusion. A number may indicate the population in a demographic, but the soft data may tell you the stress levels of the shoppers by the attitude and appearance of the customers.

Qualitative data can occasionally be converted into numbers, by counting the number of times specific things happen, or by assigning numbers to levels of importance, customer satisfaction or whether a function is user friendly when placing an order on a website.

The translation of qualitative data into quantitative data is dependent upon the human factor. Even if the customers agree to use the numbers 1-5 (1 being very unsatisfied and 5 being extremely satisfied) to evaluate customer satisfaction, there is still the issue of where 2, 3, and 4 fall on the assessment scale. The numbers only give a partial assessment; they give no information about the "why" of the customer rating. Was the customer unhappy because of the product inventory on the shelf, a detail about the product, a problem with the atmosphere or music in the store, the location of the store, etc.?

Likewise, when counting specific instances of a behavior, did the counter include those who exhibited only partial behaviors (those that hit "like" but did not comment on Facebook, for example)?

Qualitative data can impart particular knowledge that is not available in quantitative data, such as why a sales campaign is working, or how the campaign is culturally conflicting with the customer base. (In 1962, Chevrolet was puzzled why their new "Nova" was so popular in the United States but had almost no sales in Mexico. Researchers failed to translate the word "Nova" into Spanish, which means "no go." The Spanish vernacular for the name of the car was "doesn't run." No wonder sales were down in Mexico! The automobile was renamed to Caribe and sales increased.) It is often helpful to evaluate both quantitative and qualitative data sets.

What are the steps to collecting and analyzing data?

- Clearly design and define the measurements that are required to answer the questions.

- Conduct the research for the needed period of time in the correct timeframe.

- Organize the data dependent on the function of the data; how will you use the information?

- If possible and appropriate, change qualitative data into quantitative data.
-
- Use graphs and visualization charts (examples are in Chapter 10) to make the data easier to assimilate.

- Visually inspect the patterns of information to identify trends and connections.

- Seek patterns in the qualitative data, just like the quantitative data. If people consistently refer to similar problems, these may be crucial to understanding the problem and a workable solution.

Interpret the findings by using one of the following categories:

- Your marketing plan is performing on target with no obvious problems.

- Your marketing plan had no significant effect on sales.

- Your marketing plan had a negative effect on sales. (Possibly it was offensive or deemed silly by consumers.)

- Your marketing plan had mixed results. The promoted product sold well but a previously popular product may have decreased sales. For example, Secret deodorant offered a new scent category that was very popular but the unscented product sales decreased significantly as loyal users just swapped their preferences.

- If the analysis shows your marketing program is working you have a simple choice of continuing the program or tweaking it to hopefully increase sales.

- If analysis shows the program isn't working, interpretation is more convoluted. What is missing from the equation? What factor is preventing the desired results?

Analyzing and interpreting the results brings you full circle in the process; now you can use the knowledge you've gain to adjust your business and improve your service. Continuing to analyze and evaluate the business goals and results will keep the business current and an effective presence in the marketplace.

Chapter 8 An Organizational Approach to Data Analytics

This chapter discusses the framework that needs to be in place in the organization that incorporates big data into the corporate culture. A workable analytics governance will enable the business to utilize big data for an edge over the competition.

The Framework

To integrate information technology, business intelligence, and analytics four dominant questions must be under consideration:

1. Are analytics a key component of the business, in the same categories as finance, sales, product development, research and marketing?

2. Are the appropriate personnel in place?

3. Do the personnel have the ability for deep knowledge of the business needs?

4. Is there a governance structure in place?

This framework is referred to as the CSPG framework.

- Culture

    - Does the business revolve around the data analytics or does analytics take a backseat to marketing, R&D, and sales?

- Staffing

    - Is there adequate staffing and is hiring of qualified staff a priority? Does the IT department work on a shoestring budget or do they have the proper resources to conduct big data analysis?

- Processes

    - If the analytics process is completed correctly, data can be traded with like organizations without fear of contamination, allowing multiple streams of information.

- Governance

    - Governance is a new concept for businesses that have come recently to the table of data analytics. The governance needs a structure that encompasses people, structure, and salaries so that the IT department is not out of variance with the other departments.

Placement of the Analytics Function in the Business

There are three models for placement of the Data Analytics function:

1. Placing the analytics department in a central unit. The advantage of this location is that it is easy to obtain data, integration into the company culture is simpler, and the data retrieval is faster. The challenge for a centralized department can be the location (as an add-on department it may be located away from the hub of decision makers), there may be confusion as to whom the department reports, and the data analysts may be so far away from the corporate culture that they cannot anticipate the business needs.

The second possibility is to decentralize the analytics and place analysts in each department throughout the company. This allows the analysts to focus on the business sector in which they reside. The challenge is to work together on company-wide projects that are not segmented and need all the analysts focused on one problem set.

2. The third option is a mix of the two previous scenarios. This places the analysts in a centralized location but also deploys analysts throughout the organization. This requires a very large staff of analysts, which may be the biggest challenge for the business.

The Key Analytics

Analytics is composed of models, infrastructure and operations. The models are statistical or predictive or datamining that are originated from statistical data. Key to the analytics process is the building of the models, which is usually performed by the analysts or data scientists or statisticians.

Infrastructure is the software components, applications used and platforms utilized for data management, data processing and decision making. The processes connected to analytics infrastructure are data management, model deployment and multiple analytics that must be incorporated in the business operations.

Operation are the processes that create the data used for models and actions for business use. Data can be purchased, internal, external, or collaborative.

The Data Analytics team must identify the internal and external relevant data, manage the data, build the analytical models and introduce the models into the internal systems. Most businesses organize these functions thusly: The business department requests the model, the Analytics team constructs the model, the IT department supplies the raw data, and operations launches the model. This brings us to the why of analytics governance.

Analytics Governance

The three challenges that businesses face when extracting big data are:

1. Identifying the unique needs for which the data will be used

2. Obtaining the needed information

3. Deploying the analytics models into the organization

The analytics manager must have enough authority to negate these challenges. The structure of governance needs a mechanism for identification, communications and resolution of issues stemming from data analysis problems. The analytics manager also needs the flexibility to hire qualified and knowledgeable personnel.

Chapter 9 Data Visualization

Visualization is what makes data come alive to the reader. A list of information can be a struggle to try to translate into useable data; translating the groups of data into a manageable form is essential to help the reader differentiate between the important and the superfluous.

Using graphic designing software can draw notice to the key statistics, and by using visual images, can uncover hidden patterns and connections that might not otherwise be detected.

The following is a list of _free_ data visualization software programs that are easily accessible on the web:
Chart.js

http://www.chartjs.org/

This program offers 6 different graphics HTML5, and is one of the most popular small-charting programs.

Dygraphs

dygraphs.com/

This is a JavaScript charting tool that is customizable, works with almost all browsers, and is used for dense data sets. It is mobile device and tablet friendly.

FusionCharts

www.fusioncharts.com/

FusionCharts Suite XT offers more than 90 charts, 965 data maps, and customizable, interactive business dashboard. FusionCharts is AJAX application-friendly and can be used with JavaScript API.

Instant Atlas

www.instantatlas.com/

Instant Atlas combines statistics with map data, which is very useful with demographic information.

Raw

raw.densitydesign.org/

Raw is customizable and available for modification, can be uploaded from the app to the compute, exported as SVG or PNG, can be embedded into the webpage, and offers vector-based images.

Tableau

www.tableau.com/

Tableau allows the user to drag and drop data to update immediately into real-time charts.

Timeline

https://timeline.knightlab.com/

Timeline gives a detailed analysis of events that offers a clickable ability to open the chart for more particularized information.

Visual.ly

visual.ly/

Visual.ly is a gallery tool and an infographic tool. With Visual.ly one can build stunning representations of data that are brilliant and easy to create.

Visualize Free

https://visualizefree.com/

Visualize Free allows you to upload your own data sets and build HTML5 interactive charts for visualization.

ZingChart

https://www.zingchart.com/

ZingChart is another JavaScript charting program that has interactive Flash and HTML5 charts, more than 100 selections for your data analysis.

Chapter 10 Using Social Media

Domo released the infographic of statistics for Social Media users in 2015. Here are the statistics showing the phenomenal increase in users.

In just one minute,

BuzzFeed streams 34,000+ videos

Instagram displays 1.7 million+ photos

Netflix streams 80,000 video hours

Vine streams 1,000,000 videos

YouTube has uploads of 300 hours of video

Facebook has more than 4.1 million likes for posts (this is not the same as posts quantity as everyone does not take the time to like)

Twitter has 347,000 tweets

Source: Domo, Data never sleeps

Obviously Social Media is now a major player for reaching consumers. A successful implementation of integration with social media and business practices can only enhance the opportunities for customer development. It would be wise for businesses to search for their products to find the answers to their tricky troubleshooting problems.

One of the often-neglected sources of information for a retail-related business is YouTube videos. Customers often make available videos that demonstrate how-to's that are not available in the product user manual. Sometimes Frequently Asked Questions writers are stymied at a little-known product failure. YouTube may have the answer that can be a solution if the Analysts engage in data mining.

Social Media Analytics

Social media analytics is using gathered information from blogs and social media websites to make a business more successful and more visible. Having an Internet presence is key to attracting younger generations of customers. Eighty-one percent of purchasers under 30 use the Internet to influence their purchases. A connection point to these purchasers is primary to business growth and development.

Social media analytics involves the practice of data mining, analysis of website information, data gathering, and utilizing the information for business forecasting and product shaping. The primary use of social media analytics is to evaluate customer responses to support marketing progress and customer service decisions. The second major use of social analytics is to get an edge over the competitor by maintaining a presence on the web. The third use for social media analysis is to gauge the customer sentiment regarding a product or service. The fourth use for social media analysis is to enhance the products by offering web only resources and discounts. The fifth use of social media analysis is for producing products that are contrary to logic (like runners pulling the lining out of running shoes because it makes their feet too hot) but desired by the consumer.

Social media analysis is similar to any other data analysis, but has specific needs to consider such as:

Form the hypothesis

Social media analysis is more about why something happened and less about reporting the event itself. Begin the analysis with of a circumstance or even with a question of why. Why did readers engage with this question but not respond to a similar survey on Facebook or Twitter? Examine the posting frequency and times you post. Are they optimal for your brand or product? For example, advertising for a food delivery would be much more effective at 5:00 than at 2:00 in the afternoon, as customers are hungry and tired when they leave work and want an instant solution to the dinner-hour dilemma.

Utilize the information to identify new ways of sharing information that attracts increased reader traffic. For example, Twitter now allows Vine videos to be embedded into posts. A hypothesis for testing would be: Does the new addition to Twitter increase traffic to the website or just entertain the readers more fully?

Move the Data to a Spreadsheet

Start with identifying trends and patterns on the spreadsheet. From this data you can extrapolate issues and variances for exploration.

Expand the Sample to Encompass as Much Data as you Possibly Can

Expanding the sample can be accomplished in many ways, but here are two of the possibilities: changing the end date of the sample, or tracking the competitors also.

Question the Results

It is easy to determine a false correlation when there is more data than one needs. Just like proof-testing, it can be a quick resolution by finding data to support your anticipated and desired outcome. Continue to test the results to eliminate bias in the conclusions.

Tools to Help Manage Social Media

Posting to several social media outlets day by day is time consuming, but also necessary. Rather than devote several hours a day to maintaining social media updates, consider some of the following tools that take the drudge out of daily monitoring.

Here is a list of recommended tools to help the business owner complete the task in less time. Some of these tools are free, but most require a paid subscription.

Buffer, HootSuite, and Sprout Social

These tools allow you to log in one time and schedule the posts for the major social media outlets. You can perform more than one function at the same time, writing and scheduling a week's worth of posts, analyzing the efficacy, and sharing information.

SumAll, Social Express, Socialight

These programs send the data to you instead of you having to go to them for retrieval. You get to choose what reports interest you for your business.

Social Count, SharedCount, BuzzSumo

This program tracks your "shares" from the different URLs. You enter the URL and it spits out the "shares" per day, week and month. This saves time so that you don't surf from Website to Website seeking the information.

Social Media Strategies for the Business Owner

These are the most helpful tips for the small and medium business owner that is managing the business and the social media.

Use a business dashboard to consolidate your social media.

Complete all social media posts at the same time and schedule them ahead of time.

Watch the engagement of your posts.

Segment your audience for faster analysis.

Social media is here to stay and gets bigger and more complex every day. Managing social media is now essential to maintain a presence on the web. Businesses that are ignoring social media with their heads hidden in the sand like ostriches are losing the opportunity for a new income stream. Online sales of products are increasing more every moment. In one minute, Amazon has over 4,000 new customers purchase a product. A savvy business owner will want to tap that potential customer base as quickly as possible.

Social media analytics helps the business owner target customers that are already interested in the product or service promoted by the organization. With a little attention to the customer service needs of the consumer, a pathway may be discovered that opens the gateway for communication and sales through the Internet outlet.

Chapter 11 How Data Analytics Can Sustain any Business

The Age of Analytics has dawned and the Age of Aquarius has moved on. Organizations that collect, interpret, and act on the raw data they derive can change to the rapidly moving marketplace, and stay well ahead of the competition.

To use the data correctly and quickly, analyzing the data with these tools will bring clarity and innovative suggestions.

Begin with **Measuring**, determines which analytics will be most helpful for decision making within the firm.

Diagnose the problems that have occurred with customer satisfaction or product placement. Why has something happened in an adverse way? Data analytics can help you locate the specific issue for a satisfying solution.

Predict and Optimize to forecast changes and the potential consequences of the change. Use the "if"…"then" method of questioning. (If I make this change with customer service how can I then anticipate the reaction?) This analytical technique helps to determine the direction of the organization and the best route to sustain continued growth.

Operationalize, or placing the information into use by the front-line workers, sales staff, engineers, marketers, managers and the remaining decision makers. This is the transition from analysis to usefulness,

leaving the laboratory and moving into real-world experience.

Automation is when the business managers use real-time information to make immediate changes in the organization. For example, in a grocery industry, couponing is a big money maker for both the customer and the grocer. The grocer moves the product but is reimbursed by the couponing agency, along with a processing fee based on the value of the coupon. The customer receives the product at a reduced price, and the product is usually a newly introduced item that would be considered a luxury item in a depressed economy. What happens, though, when the customer takes advantage of the retailer by purchasing all of the shelf stock of the product, leaving none for the following customers and creating an environment of disgruntled customers? The store manager immediately assesses the situation and applies a "3 coupons only per transaction" rule. Now the customer can still purchase the item but very few want to leave the checkout to make more than one transaction. The retail grocer has used automation to analyze the problem and create an immediate solution.

The last stage of implementation is **transformation**, when the business moves to a data-driven corporate culture, making business decisions based on current analytics instead of tradition or gut instinct.

How You Can Collect Data for Analysis Today

1. Establish a digital presence that both gives and receives information. Before you can collect data you need a way like a social media outlet and an interactive website.

2. Remember your goal is to receive, sort, and address the data you have collected from as many sources as possible, as quickly as possible so the data won't be stale or even unreliable. The more data you collect the more accurate your findings will be.

3. Focus on the questions that need answers. It will be tempting to read and ponder everything, but that will defeat the purpose of collecting the data. Keeping the questions at the forefront of your mind will help you

mine the customer intelligence for the necessary information to change your business practices into a positive spin.

4. Engage with your customers through social media. Don't assume you know what they want. Give them plenty of opportunities to push the like button. This valuable button will target the customers' wants and needs much better than a formal questionnaire.

5. Use Google Analytics and Alex to determine relevant information regarding your client base. They have easy-to-understand statistics on website traffic and SEO rankings. Use this information to cater to your clientele. Just changing a few keywords on your site can increase your traffic and move you to number one in the Google search engine, a prime place for attracting new customers and readers.

Conclusion

Thank you again for downloading this book, *Data Analytics: Practical Data Analysis and Statistical Guide to Transform and Evolve Any Business, Leveraging the power of Data Analytics, Data Science, and Predictive Analytics for Beginners*!

I hope this book was able to help you to understand and utilize data analytics to increase your business sales, marketing and efficiency.

The next step is to implement the policies and procedures that are presented in this guide to data analytics.

Finally, if you enjoyed this book, please take the time to share your thoughts and post a review on Amazon. It'd be greatly appreciated! Thank you and good luck!

Hacking University Senior Edition

Linux

Optimal beginner's guide to precisely learn and conquer the Linux operating system. A complete step-by-step guide in how the Linux command line works

BY ISAAC D. CODY

Table of Contents

Disclaimer

Introduction

Computers contain two functional components-software and hardware. The hardware is the physical parts that spin, compute, and use electricity to perform calculations, but software is a more virtual concept. Essentially, software consists of programming code that gives instructions to the hardware-telling the parts what to do. There is "high level" software such as Internet browsers, word processors, music players, and more. But the often overlooked component is the "low level" software known as an operating system.

Operating systems are required for our personal computers to work. At an office, or with a relatively inexpensive desktop computer the operating system used is probably Microsoft's Windows. Content creators, writers, and graphic artists prefer Apple computers because they come with the creativity-focused OSX operating system. Those two OS's, Windows and OSX, have dominated the consumer market for many years. However, an alternative operating system exists that excels in usability, customization, security, and price. OS's based off of the relatively unknown Linux meet and exceed in all of those areas, but it remains an obscure option that many people have not even heard of.

Linux is not an operating system by itself. It is a kernel, or the "core" of an OS. Just as Windows NT is the kernel of Windows 7, Linux is the kernel of "distributions" such as Ubuntu, Debian, Arch, Fedora, and more.

But why would anybody abandon the familiarity of Windows for an unheard of computing environment? Linux is not only monetarily free, but it is

also compatible with a huge range of devices. Older computers, and especially ones that no longer work can be rejuvenated with a Linux OS, making it run as though it were new again.

This book will explicate upon the benefits of switching to Linux, as well as serve as a beginners guide to installing, configuring, and using the most popular distribution. Then, the terminal command line will be explained to tell how to take advantage of the OS in ways not possible in other systems. Truly there are many advantages to be gained by switching to Linux, and you just might find a suitable primary OS to use on your computers by reading this book.

History of Linux

In the early 1990s Linus Torvalds was a student in Finland. Computers of the time usually ran on either DOS or UNIX, two operating systems that were both proprietary and difficult to use at the time. Torvalds sought to create his own operating system as a hobby project (based off of UNIX), but the project quickly grew and attracted more developers. The kernel continued to transform until it was portable (usable on a variety of systems) and entirely usable for computing. A kernel is not an OS, though, so Linux was combined with the GNU core utilities to create a computing environment reminiscent of an operating system.

Then, 3rd party organizations took the base Linux product and added their own high level software and features to it, thereby creating Linux "distributions". Linux remains a free hobby project even through today, and thus the kernel is continuously receiving updates and revisions by Torvalds and the community. Throughout the 2000s, many other 3rd parties saw the usefulness of the Linux environment and they began to incorporate it into their production environments and corporations. Today, Linux is known for being highly used in servers and business settings with a small dedicated desktop following. Working towards the future, the kernel has reached a level of popularity where it will never die out. Large companies revel in Linux because of its advantages and usefulness, and so the kernel and various distributions will always exist as the best alternative operating system.

Benefits of Linux

To compare how great of an option Linux is for a computer, we shall compare it to the more familiar modern operating systems.

First, Linux is free. The background of GNU places Linux into a "free and open source" mentality where most (if not all) of the software shipping with Linux is free. Free and open source (FOSS) refers to two things-the software is both monetarily free and the source code is also transparent. FOSS differs from proprietary software in that everything is open with FOSS, and there are no hidden spyware, fees, or catches involved with using it. The software is often more secure because anybody can contribute to the readily available source code and make it better. Because Linux and most of the software you can download for it is free, it is a fantastic operating system for small businesses or individual users on a budget. Certainly no quality is sacrificed by not charging a fee, because the Linux project and its various distributions are community-driven and funded through donations. Compare this to the cost of Windows, which is often many hundreds of dollars for the OS alone. Microsoft Office is a popular document writing program suite, but it also prices high. Free alternatives to these programs exist in Linux, and they definitely compare in quality to the big name products.

Probably the largest complaint held by PC owners is viruses. Windows computers are especially susceptible to them, and even anti-virus software companies are always playing catch-up to the newest threats. Simply visiting a malicious website is often enough to infect a computer, and many users choose Mac computers because of the significantly less frequency of incidents relating to malware. Linux-based operating systems are similar to Macs in that viruses

are virtually non-existent. This increased security makes switching to Linux a must for anybody concerned about privacy, security, or reliability.

Linux is very popular within corporations and government agencies. This is because high-powered servers and critical devices will run remarkably better with Linux as the operating system. The OS is known for reliability and stability too. While a Windows computer will need regular restarts and maintenance to "freshen" it up and keep it from running slow, Linux servers can run months or even years without a single restart. IT professionals inevitably choose Linux to be the backbone of their network because of its reputation. Its renowned stability is available to consumers as well on the desktop platform, and it is definitely useful for us as well.

Perhaps the best benefit to using Linux is the speed. Low system requirements mean that computers that are normally slow and groggy on Windows will be zippy and quick on Linux. Users frustrated with computer slowdowns can replace their OS for a more responsive experience. Furthermore, Linux can be installed on older computers to reinvigorate them. So even though that old laptop may be too outdated for the newest version of Windows, there will probably be a distribution of Linux that will squeeze a few more years of useful life out of it.

Customization is a sought after feature in technology. Windows, and especially OSX, limit the amount that you can do with your operating system out of fear that the average user would break it. This is not the case with Linux, as it encourages editing and changing visuals and functionality of the OS. Of course it is not necessary, and the default configuration of most Linux distributions is extremely stable and difficult to break unintentionally. But for those that love jailbreaking, modding, and playing around with computers, Linux can facilitate the creative side and even provide curious hackers with access to tools unavailable in other systems.

And finally, Linux is compatible with a huge range of devices. Linux can run on almost any architecture, meaning it can be installed on cell phones, desktops, laptops, servers, game consoles, and "smart" devices. Hobbyists take pleasure in simply installing Linux on niche, old, or quirky devices simply because they can. For the average user, it means that Linux is probably compatible with your computer.

Overall, Linux beats out the mainstream operating systems in many areas. All of these things definitely make Linux the better choice for your computer, and you should use it to gain access to these revered features. Artists, hackers, creative individuals, small business owners, techies, non-techies, and just about everyone can find something to like about Linux. The wide range of distributions means there is something for everyone, so install Linux today to see what you can gain from it.

Linux Distributions

Installing Linux can be done in a few ways, such as burning an image of the OS onto a disc, writing it to a USB, ordering a Live CD from online, formatting an SD card, or trying one out via Virtual Box. Ultimately though you cannot just install "Linux" and have a usable OS. Because Linux is just the kernel, you will need the other software as well that gives you graphical user interfaces, Internet access, etc… As previously mentioned, "distributions" of Linux exist. Distributions are versions of Linux containing preinstalled programs and a distinctive style and focus. A distribution takes the core of Linux and makes it into an entire operating system fit for daily use.

There are a mind-boggling amount of distributions. Some have specific purposes, such as Kali Linux for hacking, Sugar Linux for education, or Arch Linux for customization. Others are more general purpose, such as Ubuntu and Debian. Getting the most out of installing Linux means you will need to understand about different distributions and make a choice as to which will work best for you. Read the following sections to understand what a few of the most popular distributions are used for.

Ubuntu is the most widely known distribution at the time of writing. Throughout the 2000's it gained popularity for being user friendly and intuitive. Based off of the earlier Debian distro, Ubuntu is very similar to Windows computers in use, meaning it is an excellent choice for the Linux newbie. Because of this, we will be installing an Ubuntu variant later in the book. Canonical Ltd is the company that actively develops Ubuntu-yearly versions updates mean that the OS is always up to date and usable with emerging technology. Despite this, Ubuntu still work on many older devices at a

reasonable speed. Applications can be installed from a "store" of sorts, meaning that the beginning user does not need to understand the often complicated command line. Conclusively, the Ubuntu distro is a great choice for the first time Linux user, and you should install it to learn how Linux works without diving into the harder distros.

For more specific cases of computing, Ubuntu has various sub-distributions or "flavors". These are distros that use Ubuntu as a base but have a different focus, such as Lubuntu's emphasis on lightweight applications. Here are a few:

- Lubuntu – A version of Ubuntu designed to run on older hardware or computers with limited resources. The install file is less than 1GB, and the hardware requirements are much lower than standard Ubuntu. Use this distro for revitalizing older computers but while retaining the usability of Ubuntu.

- Ubuntu Studio – Ubuntu for artists including digital painters, sound producers, and video editors. Ubuntu studio is Ubuntu but with editing tools installed already.

- Kubuntu – Ubuntu reskinned with the KDE desktop environment. The look and feel of Kubuntu differs from the classic Ubuntu feel by providing a desktop environment that is more traditional to other operating systems.

- Xubuntu is another lightweight distro that is not as quite as bare bones as Lubuntu. Xubuntu sacrifices size and hardware requirements to provide an OS that works on old, but not too old computers. It certainly is more aesthetic than other minimal Linux distributions, and it also uses Ubuntu as a base for user-friendliness

and familiarity.

- Ubuntu Server – A Ubuntu variant more suited to industrial and corporate needs, Ubuntu server can be run headless and provide functionality for other Linux systems in a network.

- Mythbuntu – A variant with TV streaming and live television programs preinstalled. This is a great distro for converting old computers into "smart TV" devices via Kodi.

In conclusion, the wide range of Ubuntu distributions mean that there is a beginner OS for everybody. It is highly recommended that you take advantage of the ease of use features and general familiarity contained within Ubuntu. It serves as a stepping stone OS, one that will gradually introduce you to Linux. Definitely install it as your first Linux experience.

Linux Mint is a highly used OS in the Linux world. "Powerful and easy to use", Mint contains FOSS and proprietary software as well with the purpose of being a complete experience for Linux beginners. While not totally Linux-like, Mint is an excellent choice for a first-time alternate operating system. It consistently ranks among the most used operating systems ever, and its default layout is very similar to Windows facilitating a smooth transition into the Linux world.

Debian is one of the oldest Linux distributions, being created in 1993.

Combining with the Linux philosophy, Debian keeps stability and solidity as the guiding development principal. Certainly the amount of time Debian has been around is an indicator of refinement, so those seeking an experience free of bugs and glitches can turn to Debian. Free and open source software also has a home in Debian, because most of the software contained within is FOSS. This does not mean that you are limited, though, because there is an official repository of non-free software for proprietary programs such as Adobe Flash. Debian is a decent choice for beginners, but Ubuntu still stands as the best introductory OS. Install Debian for stability, FOSS, and a wholly Linux experience.

    Slackware is an OS that goes back even further than Debian. It stays close to the original Linux intent, meaning that you will have to install your own GUI and program dependencies. Because of that fact, Slackware is mostly for intermediate Linux users, as beginners will be confused at the unfamiliar methods. However, if you want to experience a Linux distribution that is closer to the UNIX roots, Slackware can provide for you.

    Fedora is an OS more oriented towards workstations and business uses. Even Linus Torvalds himself is a user of Fedora, attributing to the operating system's popularity and use. Fedora is updated very often, meaning that it is always up-to-date and on the cutting edge of Linux technology. Security and FOSS are also a focus within the OS, which is why it is commonly used on endpoint computers in small businesses. There could be a challenge with working with Fedora, though, so consider it as an intermediate OS.

    Arch Linux is another distribution, but one that is mostly designed for experienced users. The OS comes as a shell of a system that the user can customize to their liking, by adding only the programs and services that they want. Because of this, Arch is difficult to set up, but a rewarding and learning experience as well. By building your own personal system, you will understand the deeper Linux concepts that are hidden from you on the higher level

distributions. Install this advanced OS after becoming very comfortable with the basics.

And finally, there is an abundance of other unique distributions that are worth mentioning. In the following list, we will talk about a few of them. Just note that there are so many distributions, this entire book could be filled describing each and every niche use.

- CrunchBang – A Debian-based distribution that aims to be less resource intensive. It is simple and without some of the bloatware that some distributions include by default. CrunchBang can run fast and be efficient at computing.

- Android – The popular phone OS is actually a Linux variant. Since many phones have lower specifications than full desktop PCs, the OS is a great choice for laptops, touchscreen devices, or home media computers. Furthermore, you can use many of the Google Apps from the Play store, meaning that thousands of apps, games, and utilities are available to be used on your phone and computer. While it is not recommended as your first Linux OS, it is definitely a neat choice for experimenting with older computers or children's PCs.

- Chrome OS – Another mobile-type OS developed by Google, Chrome OS is essentially a lightweight Linux browser meant for online use. Google has this OS preinstalled on their ChromeBooks, which have lower specifications than other laptops. But the OS is really only a full screen Chrome browser, so the OS is perfect for

users wanting an uncomplicated experience or a dedicated Internet machine.

- Tiny Core – An OS measured in megabytes, Tiny Core is for antique computers or embedded devices. This OS is mostly for intermediate users that have a hobby project or dedicated purpose in mind.

- Damn Small Linux – Another minimal Linux variant, this OS is best for quick access to a Linux command line.

- openSUSE – This is a distribution for experienced computer users. With many tools for administrators and program developers, openSUSE is the best OS for users confident in their skills.

Positively the number of operating systems based off of the Linux kernel is astounding. With a huge amount of choices, you might be confused as to where to start and how to install it. When in doubt (and as we will demonstrate shortly), install Ubuntu or one of its variants. The OS is great for beginners and makes the Linux transition smoother. But as you increase in skill and wish to learn more about Linux, you can always install another operating system.

Booting Into Linux

If you are ready to take the plunge into a Linux based distribution, the first thing you must do is back up your files. Overwriting the OS on your hard drive will erase any data contained within, meaning you must back up any pictures, music, or files you wish to keep after the transition. Use an external hard drive, or an online data storage site (such as Google Drive) to temporarily hold your files. We are not responsible for you losing something important, back it up!

Next we will need to choose an OS. This book will use Ubuntu 16.04 as an extended example, and it is recommended you do the same. Navigate to Canonical's official website (http://www.ubuntu.com) and acquire a copy of the OS. You will download the image from the site to your computer.

Next we need to obtain an installation media. This can be a DVD, a USB drive, an SD card, or any other writable media that your computer can read. The only restriction is that the device must be able to hold an image as large as the OS download, so 4GB should be suffice. Remove everything from the drive, as it will also be formatted.

Download a tool for writing the image file. For DVDs install Imgburn (http://www.imgburn.com/), and for flash media download Rufus (https://rufus.akeo.ie/). The most common method of OS installation is to use a 4GB USB drive, and it is more recommended. Insert your media, start the appropriate program, select the OS image that was downloaded, and begin the writing process. It will take some time, as the image needs to be made bootable

on the media. When it is finished, you can shut down your computer fully.

       This is the point to make double sure you are ready to install Linux. Check that your files are backed up, understand that you will be erasing your current OS, and preferably have a Windows/OSX install disc handy in case you decide to switch back. If you are indeed ready to switch, continue.

       With the installation media still inserted, turn on your computer. The first screen that you will see is the BIOS / UEFI POST screen, and it will give a keyboard button that you should press to enter setup. This screen shows every time you boot, but you probably pay no attention to it. Press the indicated key to enter the BIOS setup. If you are too slow, the screen will disappear and your usual OS will begin to load. If this happens, simply shut the computer back down and try again.

       Once within the BIOS / UEFI, you will have to navigate to the "boot order" settings. Every computer's BIOS / UEFI is slightly different, so we cannot explain the process in detail. But generally you can follow button prompts at the bottom of the screen to understand how to navigate. After arriving at the boot order settings, place your boot medium at the top of the list. As an example, if you used a USB drive, then you would see its name and have to bring it to the top of the list. These settings control the order in which the PC searches for operating systems. With our boot medium at the top of the list, it will boot into our downloaded Linux image instead of our usual OS. Save your settings and restart the computer. If everything was done correctly the computer will begin to boot into Ubuntu.

   But if something goes wrong, try troubleshooting it with these tips:

- Primary OS boots instead of Linux – You probably did not save the settings with your alternate boot medium at the top of the list. The PC is still defaulting to the internal HDD to boot.

- "No boot media found" – Did you "drag and drop" your Linux image onto the media instead of writing it? Without explicitly telling the computer it is bootable, it will not know what to do with the data files on the media. Alternatively, you could have a corrupted download, or an incomplete write. Try downloading the image again and making another installation.

- "Kernel Panic" – Something is wrong with the boot process. See above for the possibility of a corrupted installation. Otherwise, the image you are trying to install may not be compatible with your hardware. IF you see any other error messages, do an Internet search on them. For prebuilt computers and laptops, search for the model name and Linux to find other user's experiences. Finally, you might have attempted to install a 64-bit image on a 32-bit computer. With your next image download, specifically select a 32-bit image.

- "Problem reading data from CD-ROM…" – Try using a different install medium, because some distributions no longer support CD and DVD installations. USB drives are recommended.

- PC seems to boot, but there is nothing at all on the screen – If you are using a dedicated graphics card (compared to integrated GFX from the CPU), Linux might not be recognizing it completely. Plug your monitor into the motherboard directly instead of the card.

But most of those problems are rare or simply due to user error. Linux has high compatibility and is relatively easy to install/use past the initial installation. The typical user will have Ubuntu boot successfully at this point, and they will be presented with a working computing environment.

The desktop you see is referred to as a "Live CD", which is pretty much a demonstration of the OS and how it works. You have not actually installed the OS to your hard drive yet, as it is still running directly from your boot media. It is a chance for you to test out Linux without actually removing your primary OS, so take the opportunity to explore how Linux distributions work.

Ubuntu Basics

Similar to Windows, Ubuntu has a desktop graphical user interface. Applications open within Windows that can be maximized, minimized, closed, and moved around with the top bar. Ubuntu also has a "task bar" of sorts that functions much like its Windows counterpart-icons resemble programs that can be launched by clicking on them. The "Windows Button" (called the Dash Button) on the task bar is used to open a search functionality from which you can type in the name of a program or file on your computer to quickly start it.

Furthermore, there is a bar at the top of the screen that works like the "menu" bar of other operating systems. This is where drop-down menus such as "file", "edit", "help", etc… will appear once a program is active.

Besides a few nominal differences Ubuntu functions is a very familiar way. In fact, many of the programs that you may already use on other operating systems, such as Firefox, are available and sometimes preinstalled on Linux distributions. With enough experimentation and practice, you will be able to navigate the GUI of Ubuntu as if you were a professional. Continue exploring the system, and continue if you are ready to replace your main operating system with this Linux one.

Installing Linux

On the desktop, you will see an "Install Ubuntu 16.04 LTS" icon. Double clicking it will launch an application that makes installation very easy. If you are not connected to the Internet, do so now by plugging in an Ethernet cord or by connecting to Wi-Fi from the top right icon. Select your language and click "continue". The next prompt will ask whether you would like to download updates and install third-party software during the OS installation. These options are highly recommended for beginners, so check them and click "continue".

The application will move on to another screen asking for your install method. There are various options, such as erasing the disk altogether, installing alongside your primary OS, or updating a previous version of Linux. Select an option that works best for you. If you are still hesitant about making a full switch, elect to install Ubuntu as your secondary OS. That option will allow you to choose which OS to boot into after the BIOS screen. Nevertheless, select your option and click "install now".

While Ubuntu installs, you can specify a few other options, such as your time zone, computer name, account name, and password. The entire installation should not take too long, but it will take long enough that your computer should be plugged in (if it is a laptop). After finishing, the OS will require a reboot. Congratulations, you now have a usable Linux system on your computer. Throughout the next chapters in this publication we will focus on Linux concepts, how do achieve certain tasks, and how to further your knowledge of your system.

Managing Hardware and Software

Hardware in Linux is actually much easier to manage than hardware on Windows. Instead of downloading individual drivers for devices, most of the drivers are built-in to the OS itself. This means that most popular devices can simply be installed with no further steps involved before they are usable. Printers, networks, hard drives, and other common devices are included-fiddling with drivers is not usually needed on Linux.

However, powerful graphics cards and other specific hardware will need proprietary drivers from that company to function to full efficiency. Because although your graphics card works by default with Linux, the secret and often hidden technology within can only be fully utilized with that company's software. On Ubuntu the process is straightforward-open the "additional drivers" application and let the OS search for you. After determining whether you have the devices, it will ask you which version of the driver to use. Follow any on-screen prompts to enable the 3rd party drivers. For any devices that do not appear, do Internet research on the manufacturer's website to determine whether they released a specific Linux driver that you can download.

Software is another aspect of Linux that excels over Windows. Much like an Apple computer, Ubuntu has an app store of sorts from which you can search through repositories of applications that are compatible with your device to download and install with just a few clicks. Just search for the "Ubuntu Software Center" from dash to open the application. From there you can browse individual categories such as "Games", "Office", or "System" for a list of programs, or you can search directly by name. After finding a program, click on it and then queue up the download by clicking "install". After authenticating yourself the software will automatically download and install. From there, the

application can be run by searching for it in the dash.

       Another method of installing software is available through the terminal, but we will discuss that later. Ubuntu is not totally limited to software found in the app store, because programs downloaded from the Internet can also be installed. Once again, we will touch on that subject after discussing the terminal.

       Overall, managing hardware and software in Ubuntu is effortless. Whether installing a new hardware device or downloading a popular program, Linux distributions make you're computing experience trouble-free. That is not to say that Linux is wholly meant for beginners, because as we will learn Linux is definitely a great choice for power users and experienced admins.

The Command Line / Terminal

Before modern computers, hardware and software were interfaced by using keyboards exclusively. The mouse brought graphical interfaces and simplified the process, but many functions remained text-only as to not present complicated options to end users. In Linux, this process continues today. There exists the GUI that is present on most distributions, but every Linux distro also has a built-in text-based interface as well, from which powerful commands can be typed and executed. Think of the terminal as a much more powerful command prompt, because you can completely use your computer exclusively through the terminal alone. With enough knowledge, a user can actually browse the Internet, install programs, manage their file system, and more through text.

Begin the terminal by launching it from dash or by using the Ctrl+Alt+T keyboard shortcut. A purple window will open and wait for your input. You can type a command and press enter to activate it. For our first command, enter "ls". This is short for list, and it will display all of the files within our current directory. You will be able to see the files and folders in Home, Ubuntu's main user folder. If you are lost, you can always type in "pwd" to print the working directory and display the name of the folder you are currently browsing. As you learn commands, it helps to write them down as to better internalize their use.

Managing Directories

Directories, another name for folders, work the same as they do in other operating systems. Folders hold files, and you must be currently accessing a directory in order to interact with the files inside of it. You can use the terminal command "cd" to change directory and move about the file system. As an example, typing "cd Desktop" from the Home folder will transfer you to that folder. Now using "ls" will not show anything (unless you added files to the desktop). To back out, type "cd ..". Practice navigating around the file system in this fashion; cd into a directory and ls to view the files.

Because you are typing commands, Linux expects your input to be exact. If you misspell a command it will simply not work, and if you type a folder or file incorrectly it will try to reference something that does not exist. Watch your input carefully when using the terminal.

Opening a file is done with a different command – ".". The period is used to start the specified file, so if you were attempting to open a picture it could be done like so: "./house.png". Both the period and the slash are necessary, as it denotes that you are running a file within the current directory. When you run a file it will be opened with the default application assigned to the file type, so in the case of a picture it will most likely be opened in an image viewer.

You can also create and remove directories and files through terminal as well. For this example navigate to the Home directory. As a shortcut you can type "cd ~" to change the directory to your Home, because the tilde key is short

for "the current user's home". Make a directory with the "mkdir" command; type, "mkdir Programming" to create a new folder with that title. You can CD into it, or you can go to the GUI and enter it to prove that you have indeed created a new folder. Now remove that directory by going Home and typing "rmdir Programming". Without hesitation, Linux will remove the specified directory. Similarly, using "rm" will remove the specified file.

Linux has a design philosophy that many users are not used to. In Windows and OSX, the OS will almost always double check that you want to commence with an action such as deleting a file or uninstalling a program. Linux distributions believe that if you are imitating an event, you definitely mean to follow through with it. It will not typically confirm deleting something, nor will it display any confirmation messages (file successfully deleted). Rather, the absence of a message indicates the process completed successfully. While the philosophy is somewhat dangerous (because you could potentially ruin your OS installation without warning), it serves as a design contrast to other operating systems. Linux gives you complete control, and it never tries to hide anything or obscure options because they might be too complicated. It takes some time to get used to, but most users agree it is a welcome change to be respected by the technology they own.

This does not compromise security, however, because any critical action requires the "sudo" command as a preface. Sudo stands for "super user do", meaning that the user of the highest permissions is requesting the following command. Any sudo entry will require an administrator password, so malicious software or un-intending keyboard spammers cannot accidently do damage without knowing the password first. A lot of the commands we use in this book require sudo permissions, so if the command fails to complete with a message explaining it does not have enough permissions you can retry with sudo.

Apt

Learning the terminal opens up computer functions that are not available through the GUI. Also, you can shorten the amount of time it takes to do many things by typing it instead. Take, for instance, the amount of work required installing a program. If you wanted to download the Google Chromium browser, you would have to open the software center, type in the name of the program, locate the correct package, mark it for installation, and execute the action. Compare that to typing "sudo apt-get install chromium-browser" into the terminal. With that one command, Ubuntu will save you many minutes.

Apt (advanced packaging tool) is the command associated with managing applications in Ubuntu. Other distributions may use their own tool, but apt is commonly used for its large repositories and simple commands. Packages are installed with the "apt-get install" formatting, where you specify the name of the program you wish to install. In the example above we specify the Chromium program with the package name "chromium-browser". Given that you do not know every package name, there is another command "apt-cache search" that can be used to locate package names matching the supplied string. So "apt-cache search chromium" would show "chromium-browser", and you could specify the correct name to install.

The usefulness of apt extends beyond that, as you can use it to update every single application on your system with a few commands. Use "apt-get update" to refresh the repository, then use "apt-get upgrade" to have every application upgrade itself to the newest version. Windows OS users should be envious at this easy process, because updating a Windows programs requires uninstalling and reinstalling with the newest version.

As time goes by, you might need to update the Ubuntu version. Every year there is a new release, and it can be installed with "apt-get dist-upgrade". Staying up to date with the newest fixes and additions ensures your Linux system will be working healthy for a long time. You might have even noticed that installing and updating the system does not require a reboot; a feature that contributes to Linux computer's lengthy uptimes and stability. Lastly, removing an application is done with "apt-get remove" followed by the package name.

To run the programs that we install we can either search for them from the dash, or we can just type the package name into the terminal. Typing "chromium-browser" will launch it just the same as double clicking its icon would. Some programs must be started from the command line by typing the package name exclusively because the package does not show up in a dash search. Overall utilizing the terminal is a time-saver and a great way to practice moving away from slow and cumbersome graphical user interfaces.

Easy installation and management of packages is a Linux feature that becomes highly useful-master it to improve your experience. There is a third method of installing packages, and it involves downloading and launching .deb files from the Internet. Some software are bundled in that format, and they act similar to .exe files in that they just need to be double clicked to begin the installation process.

More Terminal Commands

Here are a few more basic terminal commands that you should internalize and put to use in your system. Fully understanding the basics will provide a decent foundation upon which to build on later.

- cp – "cp image1.jpg image2.jpg" – copies (and renames) the first parameter to the second supplied parameter. Copy directories with the –r switch.

- mv – "mv cat.jpg *home*Pictures" – Move the specified file to the given directory.

- shutdown – "shutdown –h now" – shuts down the computer. –h is a tag meaning "halt", but you can also use –r to restart. Now refers to the time until it executes.

- date – "date" – Displays the current date and time.

- free – "free –g" – Show the current RAM usage of programs.

- du – "du –h" – Give the HDD usage.

- ps – "ps" – Show the active processes using CPU time.

- touch – "touch memo.txt" – Used to create a new blank file in the current directory with the specified name.

- ifconfig – "ifconfig" – The Linux equivalent of ipconfig, it shows network information.

Some commands have "tags" or "switches" associated with them. These are the letters preceded by dashes. They all do different things, and learning which switches to use for what purpose is best found through that command's manual pages. See the advanced section for opening the manual.

One of the most useful programs from the command line, nano is a simple text editor that can be used to edit files and quickly make changes to settings or scripts. It is accessed by typing "nano" into a command line. You can type a file as needed and then press ctrl+x to save and quit. As you save, you will give it the name and file extension associated with it; notes.txt will create a text file with the name "notes". Alternatively, you can edit a file by typing "nano notes.txt". In that example, we open notes in the editor and display its contents

in an editable state.

Nano may be very simple, but it is undoubtedly powerful and a time saver for quick changes and file creation.

Connecting to Windows / Mac Computers

Windows and OSX computers have built-in networking functions such as workgroups, domains, shares, and more. Integrating Linux computers into the network infrastructure that has been dominated by Windows server computers is fairly easy, though, and correct setup will allow you to see Windows shares as well as join corporate domains.

The first step to intercommunication is installing the "samba" package. Either find it through the software center, or type in "sudo apt-get install samba" to obtain and install the necessary software.

Sharing files from your Ubuntu machine to other computers involves creating a samba share. Samba runs off of the same protocols that other popular file sharing methods use, so files shared from the Ubuntu machine can easily be seen on Windows. After installing samba, use "sudo nano *etc*samba/smb.conf" to start editing the configuration file. At the very bottom of the file add these lines: [share]

comment = File Share from Ubuntu

path = *srv*samba/share

browsable = yes

guest ok = yes

read only = no

create mask = 0755

Now, create the folder specified in "path" (sudo mkdir -p *srv*samba/share) and set permissions (sudo chown nobody:nogroup *srv*samba/share/) so that anybody can access its contents. Place any files you want to share within that directory, and then restart the service (sudo restart smbd, sudo restart nmbd) to make the share active. Lastly, log on to your other computer and navigate to the network shares. In Windows, they will appear in the left panel of file explorer. If the share does not appear automatically, type the IP into the file path box (find Ubuntu IP with ifconfig). You are now able to access Ubuntu's files from other operating systems.

You might also need to see files from other operating systems in the Ubuntu computer. Firstly, open the Ubuntu file explorer. From the menu bar, click "files", and then select "connect to server". In the resulting box, type the URL of the share you wish to access. It could be an ftp address

(ftp://ftp.test.com), an http address (http://test.com), or a share address (smb://share/Folder). Without any additional hardware or setup, you can see the files this way.

Finally, joining a domain such as Active Directory allows your computer to interact with other operating systems on the network and achieve other business-oriented tasks. Whether you have a small home network, or whether you are adding Linux computers to a corporate domain, the process is the same. Install a few extra packages (realmd, sssd, sssd-tools, samba-common, samba-common-bin, samba-libs, krb5-user, adcli, packagekit). While installing them, it will ask for your domain name. Enter it in all caps. Enter "kinit -V adminname" replacing that with an actual admin account name in the domain. After entering the password you will have been authenticated to the domain. Now joining it is done with "realm –-verbose join -U adminmame domainname.loc".

If it fails, it means the DNS is misconfigured on our device. Type "echo 'ad_hostname = nix01.domainname.loc' >> *etc*sssd/sssd.conf", then "echo 'dyndns_update = True' >> *etc*sssd/sssd.conf" and finally use "service sssd restart" to restart with those new settings. The first line sets the FQDN of our computer, so the line needs to be changed according to our domain settings. After a successful restart with correctly configured settings the terminal will claim it has joined the domain. Test this with "realm list". Now connected to AD you can administer the Linux device from your server!

For most users, however, creating shares and joining domains is far beyond the connectivity needs. Simple file sharing is much better done through USB drive transfers or a service such as Dropbox. Indeed Dropbox can be installed on the big three operating systems and files can be synced between them with no additional setup. On Ubuntu either download the .deb file directly from the website, install it from the software center, or use "sudo apt-get install nautilus-dropbox" to obtain the application. Within the Dropbox folder, place

any files that you wish to transfer between computers and it will automatically be downloaded and updated on all other Dropbox computers you own.

Using other operating systems is not complicated when you connect them together. So long as the computers are on the same network you can create file shares, join them into a domain, or use a simple service such as Dropbox.

Useful Applications

Here is a list of the best Applications for your Ubuntu system that will help you get the most out of your computer.

- Office Productivity – Abiword, VI, Emacs, LibreOffice, nano

- Multimedia – VLC, DeaDBeef, Cmus, AquaLung, MPlayer, Miro

- Web Browsing – Firefox, Chromium, Midori, W3M

- Creativity – Aud

- acity, GIMP

- Other – Kupfer, Thunderbird, qBittorrent

And for programs that help with usability, there are so many varied choices that it depends on what you are trying to accomplish. The best way to discover a program is to search on the internet for a functionality you wish to add. For example, if you are searching for a quick way to open and close the terminal you

might come across the program "Guake". Or if you are wanting audio within the terminal it might recommend "Cmus". Finding the perfect applications for you is part of the customization aspect of Linux, and it makes every install a little more personal for each user.

Administration

If you are looking for a "Control Panel" of sorts, you can find shortcuts to administrative tools such as network, printing, keyboard, appearance, and more from within the "System Settings" application. Some Ubuntu variants use "Settings Manager" or just "Settings" for the same purpose.

After launching it there will be links to other default configuration applications; just click on whichever you need to change to obtain a GUI for settings a few options. But not everything administrative is found through the GUI. Most low-level settings are only available through the command line, and as such you will need to know exactly what to type to edit them.

As an example, adding a new user to Ubuntu requires the "adduser" command. By following the command with a username, the terminal will prompt for basic information and a password. Setting that new user to be an administrator is done with "usermod -aG sudo nameofuser". Moreover a user can be deleted with "deluser". These options are difficult to find through GUI but can be done in seconds with a terminal.

"Task Manager", or the administration of running applications within Ubuntu is done through the terminal as well. The program "top" is standardly installed on all distributions (mostly), and starting it displays a list of all currently running processes as per task manager. By default though, the list of

processes will be updated and moving around in such a way that it might be difficult to read the data we need. Press the "f" button to bring up a sorting list, navigate to "PID" with the arrow keys and press "s" to set over that option. Now use escape to return to top and we can now scroll through the list with page-up and page-down to view the tasks. Say, for instance, we want to close the program "Pidgin" because it is unresponsive. Find it in the list (or search for it with the above filtering commands) and take note of the PID (Process ID) number. Press "q" to quit top, then type "kill 4653" obviously replacing the number with the PID. At any time within top you can press "h" to see a list of keyboard shortcuts for various actions. If top is too difficult to use consider installing "htop", a "human readable" version of the program. It actually shows neat ASCII graphs detailing CPU, RAM, and other usage statistics. Search for a program with F3, then use F9 and Enter to kill it.

   As for services, you might have noticed we use the "service" command to change their status. So starting a web server would be done with "service apache2 start", restarting it done by replacing start with restart, and stopping it by replacing start with stop. Finding a list of services is done with "service –-status-all". Services are daemons, or background tasks that are continuously running. They can be gathering data, running a service such as Bluetooth and Wi-Fi, or waiting for user interaction.

Security Protocols

Linux has a focus on security in general, which contributes to its use in corporate and server settings. Taking advantage of the security protocols means that you are more secure than other operating systems and less likely to have your computer compromised. This requires good security principals, of course, and always being safe online. A computer without a password is hardly protected at all.

One feature brought over from UNIX is file permissions. Every file has a set of permission-the owner, group, and rights. The command "chown" changes the owner of a file, "chgrp" changes the group, and "chmod" changes the rights associated with the file. Discovering the permissions of a file or folder is done by typing "ls -l filename". It will return an initially confusing line such as "- rw- rw- r--". "R" means read, "W" stands for write, and the third option is "X" for execute. The three sets are respectively owner, group, and other. So our example file above has read and write permissions set for the owner and its group, but only read permissions for other users. This means that the owner and the group he belongs to (most likely sudo users) have permission to both access the file and change its contents, but other users on the network or PC can only view the contents and not edit it. Script files will need to have the X in order to be executed, and without it they cannot be run.

Most people will only need to use the "chmod" command to change the permissions of files they wish to use. We use the command and a set of numbers to set the permission of the file. "chmod 777 test.sh" makes the file readable, writable, and executable by all users anywhere because each specification (owner, group, other) has the number 7 attached to it. Numbers determine the permissions that entity has, and the number used is calculated like so:

- Start with the number 0.

- Add 4 for adding readability.

- Add 2 for write-ability.

- Add 1 for executable-ness.

- The number you have left determines the permissions.

6 would be read/write, but 1 would only be executable. 5 would be readable and executable, but not changeable. In our 777 example, we set owner, group, and others to all be 7. This is not particularly good security, because that means anybody anywhere can mess with that file. A more conservative permission set would be 775. Use security permissions advantageously for secure computing.

Security within Linux expands beyond just permissions. Ensure that you practice good security practices, and that you are following common sense in regards to security-install only needed programs, do not follow all internet advice, do not use sudo too often, use passwords, use encrypted networks, keep software up to date, encrypt important files, and make regular backups. As a final word of advice, look into using a distribution with SELinux, a module that supports AC and other security policies.

Scripting

Bash is the "programming language" or the terminal. When we type a command, we are doing so within bash. A script is a list of bash commands that execute in order, meaning we can create a script with a list of commands and run it to save time or automate terminal tasks that we normally have to type. As an intermediate and advanced Linux administrator, you can use scripts to greatly shorten the amount of work required for repetitive or constantly running tasks.

To start a script, create a new file "script.sh" within nano. The first line must always be "#!/bin/bash" to mark it as a bash script. Type the following lines for your first script.

echo "What is your name?"

read name

echo "Hey, $name. Here is your current directory, followed by the files."

Pwd

Ls

Save the script. Now we have to set the permissions to allow it to be run. Use "sudo chmod 777 script.sh", and then run the script with "./script.sh". So long as you copied the script exactly, it will ask for your name and then show you your directory and files. Take the concept and expand it further in your own scripts. You can run commands from installed programs as well, so you can write a script that automatically joins a domain, or one that connects to the network specified. Shutting down remote computers is a great automatic task as well.

Scripts can either be run manually or set to execute at certain times. To run a certain script every time the user logs in, open the "startup applications" program from dash and create a new app with the script as the source. Now every time that user logs in the script will run automatically. This is useful for setting up certain options or starting background services without requiring the user to do it themselves.

Scheduling tasks for a certain time can be done with the Cron system daemon. It is installed be default on some systems, but if not "sudo apt-get install cron" can be used. Start the service with "service cron start" and create a new crontab file with "crontab -e". Select nano as your text editor. At the bottom of the created file, add a new line with our scheduled task. The format goes as follows: minute, hour, day, month, weekday, command

And we format it with these options to specify when to run the command.

Time numbers start with 0, so the hours range from 0 to 23 and minutes are from 0 to 59. Replace any option with an asterick to specify that it will run on any value. Pay attention to these examples: 0 12 * ~/script.sh

This will run the script.sh found in the Home directory every day at noon.

30 18 25 12 * *usr*bin/scripts/test.sh

And this will run test.sh within the *usr*bin/scripts directory at 6:30 on Christmas day every year.

Conclusively, scripting and automating scripts are fantastic ways to take administrative control of regularly occurring tasks. Continue writing scripts, or look up examples online to see how your computing experience can be made easier with bash.

Advanced Terminal Concepts

Mastering Linux comes down to intimate comprehension of the tools available in the OS and how to utilize them. Many of the topics discussed in this chapter will focus on more tasks and how to accomplish them, or a few QOL improvements to the OS in general.

Compression and decompression of files often confuses Linux beginners. The tools are typically already installed, but the command line must be used. Furthermore, the strange .tar and .gz file-types are Linux-specific formats that you might often come across. All files can be unzipped or zipped with the gzip tool. Preinstalled on Ubuntu, we access it with the "tar" command. To compress a folder and the files contained within, navigate to it in terminal and type "tar –czvf name.tar.gz foldername". C stands for "create", z means "compress (gzip)", v is for "verbose", and f allows filename specification. If you want more compression (but at the cost of time), zip the folder with gzip2 by replacing the –z switch with the –j switch instead.

Now extracting that same archive can be done with "tar –xzvf name.tar.gz". You will notice that the –c was replaced with an –x, and this indicates extraction. Once again if you are dealing with bzip2 files use the –j switch instead.

Continuing with advanced terminal concepts, let us talk about a few

quality tips and tricks that can save you time in the terminal. When typing a command or file name, press tab halfway through. This feature, tab completion, will guess what you are attempting to type and fill in the rest of the phrase. For files it will complete the name as shown in the directory, or complete a command by considering what you are trying to do. Linux experts and anyone that has to use the terminal regularly may seem as though they are typing exactly what they want with extreme accuracy and speed, but they are actually just using tab completion.

Users, especially administrators, will spend a decent amount of time with the sudo command because their instructions require elevated privileges to run. But when typing out a long command and forgetting to type sudo, you will be angered at having to type it again. Instead simply type "sudo !!", shorthand for "super user do again". It generously saves from typing an entire command again.

Another method of repeating commands is to use the up and down arrows. Pressing up continuously cycles through previously typed commands. You can also edit the commands with the left and right arrows to change the text contained within.

And the most requested terminal tip involves copy and pasting. Attempting to paste a line into the terminal results in the strange character ^v. The keyboard shortcut is not configured to work in the terminal, and that is why the strange combination is displayed. To actually paste, right click and select the option; or use the key combination shift+insert. Copy in the same way, but with ctrl+insert instead. While it might be okay to copy and paste terminal commands from the Internet (provided you understand the risk and know what they are doing in the command), do not try to paste from this publication. The formatting introduced through the medium in which you are reading it might have inserted special characters that are not recognized by the terminal, so it is

best if you do not copy and paste, but rather you should type manually any commands presented.

Linux has a hidden feature that not many users know about. Files are displayed to the user when you visit that directory or type ls, but actually not all of the files are viewable this way. In Linux if you name a file with a period as the first character it will be marked as hidden. Hidden files are not normally visible by common users, and it acts as a way to protect configuration files from accidental editing/deleting/so forth. To see those files, we only need to add the –a tag to our ls search. In the GUI press ctrl+h in a directory to reveal the secret content. And as you create scripts and other configuration files consider hiding them with the period as a form of user protection.

Any command within terminal can be interrupted or quit with the ctrl+d key combination. Use it to stop a lengthy process or to exit out of a program/command that you do not understand.

Aliasing is a way to create your own personal shortcuts within the terminal. Instead of typing a long command or a bunch of smaller commands aliases can be used to combine them into a single user defined option. Just as the name implies, aliases are different names for anything you specify. Every alias is contained within a hidden config file-begin editing it with "nano ~/.bashrc". Because it exists within the user's home directory every alias will be pertinent only to that user. At the bottom of the file we can begin creating alias as per the following example: alias gohome='cd ~ && ls'

This alias will change the directory to home and display the contents by typing "gohome". When creating aliases you must follow the formatting

presented above exactly, meaning there is no space between the command and the equal sign. Multiple commands are strung together inside the single quotes separated by "&&". For more robust aliases, add a function instead. The following example combines cd and ls into a single command.

function cdls () {

  cd "$@" && ls

                              }

      After writing your aliases, save the file and restart the computer. Your new commands are then available for use.

      That file we edit, .bashrc, is the configuration file for the Ubuntu terminal. Besides making aliases we can also use it to customize our terminal settings, such as color, size, etc... A quick tip is to uncomment the "#force_color_prompt=yes" by removing the # and ensuring "yes" is after the equals. This adds color to the terminal, making certain words different colors. More options are available when you open a terminal, right click on it, and select profiles followed by profile preferences. Through the tabs here you can customize the font, size, colors, background colors, and much more. Customization of the terminal is recommended if you are going to be using it a lot, because it helps to be comfortable with the tools you will work with.

I/O Redirection

During normal terminal command execution, "normal input" (typed by the user, or read from a file/attribute/hardware) is entered and parsed by the command. Sometimes the command has "standard output" as well, which is the return text shown in the terminal. In "ls", the standard input is the current working directory, and the standard output is the contents of the folder.

Input and output are normally direct, but by using I/O redirection we can do more with the terminal. As an example, the "cat" command (concatenate) followed by a file will output that file to the screen. Running cat by itself opens a parser where any line that is input will be immediately output (use ctrl+d) to quit. But with I/O redirection hotkeys (<, >, <<, >>, |) we can redirect the output to another source, such as a file. And "cat > test.txt" will now put the standard output in that new file. Double signs signify appending, so "cat >> test.txt" will place the output at the end of the file rather than erasing the contents at the beginning.

The vertical line character, or the "pipe", uses another form of I/O redirection to take the output of one command and directly insert it into the input of another. "ls | sort –r" would take the output of ls and sort it into a backwards list. We redirected the output and gave it to another command to accomplish this.

And finally, the "grep" command is used very often within I/O redirection. Grep can search for a certain string within a specified file and return the results to standard output. Using redirection, this output can be put into other commands. An interesting feature of Linux to note is that object is a file, even hardware. So our CPU is actually a file that stores relevant data inside of it, and we can use grep and other tools to search within it. That example is fairly advanced, but here is a simpler instance: "grep Conclusion report.txt"

And it will search within the file for that specific word. I/O redirection can become a complicated process with all of the new symbols and commands, but it is a feature that you can incorporate into your scripts and daily use that often allows for certain features and functions of Linux to be done in a single line.

Linux and the terminal are difficult concepts to fully master. But with practice and continuing dedication you will be able to perform masterful feats of computing and do helpful tasks that are not possible in Windows or OSX. Learning more about commands and how to use them certainly helps in this regard, so persist in your studies of new commands and their use. Positively the only command you actually need to memorize is "man", a command that will show the manual pages and documentation of any other command specified. The manual pages show switches, examples, and the intended use of every command on your system. Use the tool to your advantage and gain intimate knowledge of your system.

More Linux Information

To continue learning about Linux and the possibilities it can provide, consider the examples in this section. It will briefly discuss more uses for Linux, and a few other concepts that have yet to be talked about.

The "Linux file system" refers to the main layout of the files and folders on your computer. If you continue to "cd .." in the terminal, or if you click the back button on the GUI until it goes no further you will stumble upon the "root" directory. The folders here, bin, boot, etc, usr, and so on are how your hardware and settings are configured. Each folder has a specific purpose and use, and you can understand them by exploring the contents. As an example, user data is stored in home, but user programs are stored in usr. Because of how diverse and complicated the file system actually is it will not be discussed here, but if you wish to learn more do an Internet search or read the documentation associated with your operating system.

Linux systems are often used for purposes other than desktop use. Dedicated machines run variants of Linux because of the power and stability it provides. Even our cars have a Linux kernel running to keep track of error codes and help mechanics.

Servers often have Linux installed because of reliability and the functions the distributions have within them. For instance, Linux machines are used as

firewalls because the "iptables" application provides excellent port blocking and intelligent filtering. You yourself can run a firewall on your system with the application as well, thus gaining business-level software for free. In this way, Linux is also great for networking. The machine can act as a switch, router, DNS server, DHCP server, and more just by installing the relevant applications.

And finally, Linux systems are not limited to the interfaces we have seen insofar. Every distro has its preferred desktop environment, but the interface can be extremely customized to the individual's preference. There are even file and web browsers for the terminal, which is greatly helpful for those using SSH or remote computing. All-in-all, you should try out different DE's by installing them and configuring them to your liking.

What Next and Conclusion

How you continue depends on what you want to do with your Linux distribution. For casual browsing and simple use, continue with Ubuntu and install the programs you need. For more adventurous people, consider installing a new distribution to see what each has to offer. Those wishing to learn even more deeply about Linux can install one such as Arch or DSL to build their own unique OS from scratch. Administrators and power users can install a server version of a distro to build their own Linux network, or they can consider changing over their environment from other operating systems to entirely free ones.

Conclusively, Linux is a powerful and relatively easy to use set of operating systems. But their real potential comes from the hard-to-master terminal and command line functions. Thank you for reading this publication, and I hope that it has shed some light on the mysterious subject of the defacto alternative operating system. If Linux has confused you or did not live up to expectations, I implore you to take a second look at the features it can offer. While it may not have the same caliber of games or 3rd party proprietary software, the OS is simple and customizable enough to be used as a primary OS with maybe Windows or OSX as a secondary OS. Alternatives exist for just about every program, so if it is possible to get rid of Microsoft and Apple entirely, it is highly recommended you do so. Thank you again, and make good use of your new Linux knowledge.
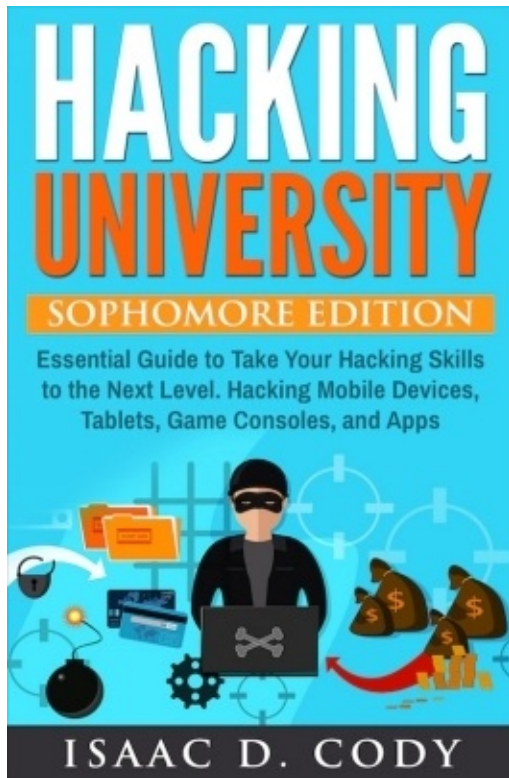
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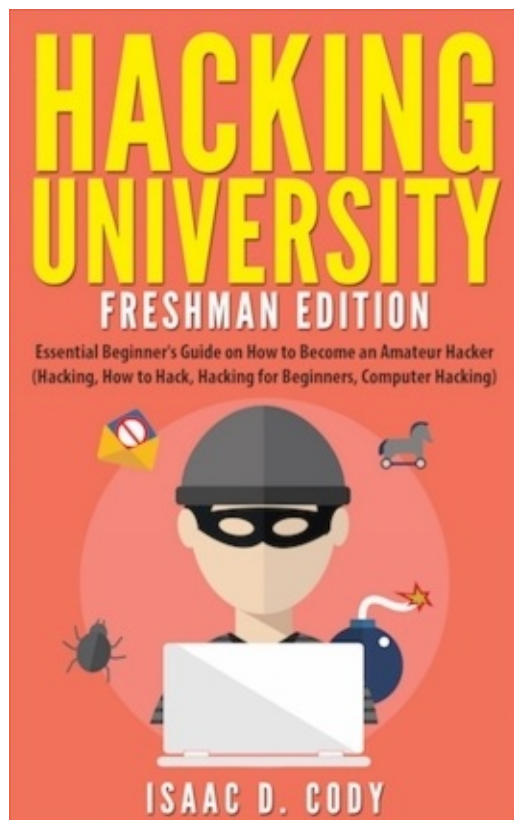
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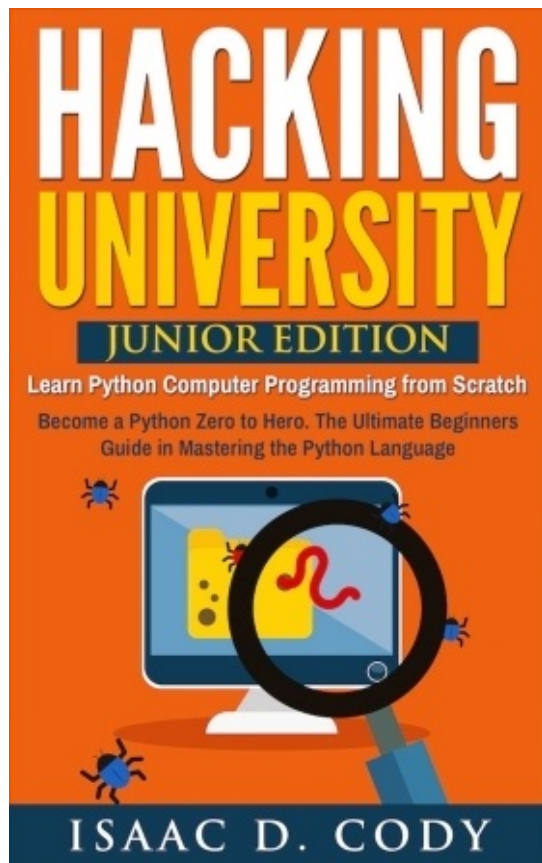
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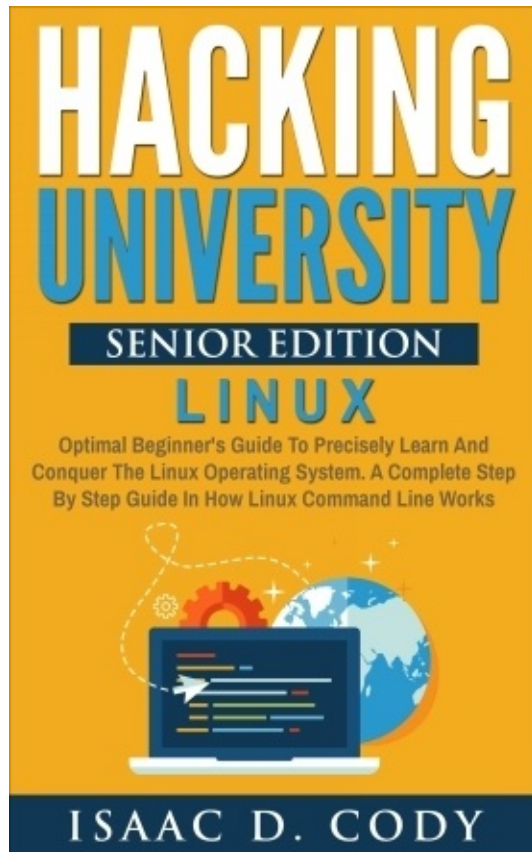
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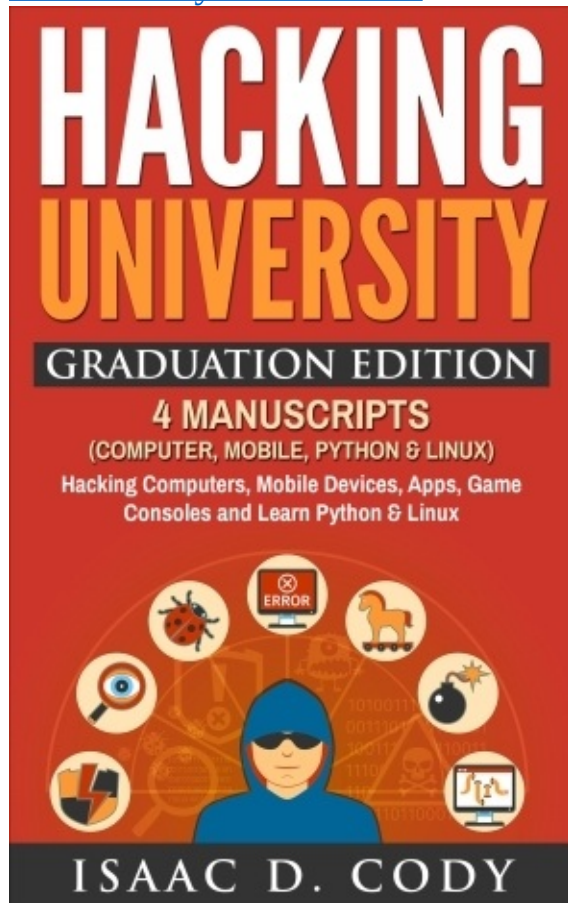
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Isaac D. Cody is a proud, savvy, and ethical hacker from New York City. After receiving a Bachelors of Science at Syracuse University, Isaac now works for a mid-size Informational Technology Firm in the heart of NYC. He aspires to work for the United States government as a security hacker, but also loves teaching others about the future of technology. Isaac firmly believes that the future will heavily rely computer "geeks" for both security and the successes of companies and future jobs alike. In his spare time, he loves to analyze and scrutinize everything about the game of basketball.