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Operating System
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Comparative analysis Between Kali linux and Parrot OS operating systems

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Abstract

Kali Linux and Parrot OS are both debian based ethical hacking operating systems. Both of these Operating systems are integrated with tools to help security professionals to perform penetration testing and other security measures. In this paper we will be discussing the differences between these two operating systems and the features they provide to the security professionals. Thus, deciding which operating system is the best for a certain audience or a task.

Key words: Operating systems, Kali linux vs Parrot OS, cyber security.

1. Introduction

Operating system is a software that acts as a communication tool between the users and the computer hardware . As our lives get more digitized and the number of people who have access to computers is increasing everyday. As a consequence, the reliance on operating systems continues to grow. These increased demands raised new concerns on security, as there are more users there are also more malicious attacks targets.

For this reason, The necessity for more security measurements to tackle these security challenges was necessary. One of the measurements taken is penetration testing. Penetration testing is a series of authorized simulated cyberattack attacks in a system to identify vulnerabilities and secure them before they can be exploited maliciously (Wikipedia contributors, 2024).

Kali Linux and Parrot OS are one of the best security assessment tools. Both of these operating systems are designed for penetration testing and security assessment. Kali Linux, offers a set of security tools and robust community support. Similarly, Parrot security OS offers a set of tools for security professionals.

In this paper we will delve deeper into these operating systems comparing their features, user-interface, performance, hardware support and others to conclude the target users of each operating system and the tasks each operating system can perform.

2. Methodology

This paper will conduct a qualitative study that is based on information found in research papers, technical blogs and user reviews. The objective is to investigate the differences and the features of two ethical hacking operating systems which are kali linux and parrot OS. By comparing their user interfaces, System performance,security features, and hardware and software compatibility in these two operating systems.

2.1 User Interface

Kali Linux offers a simple user experience as the interface is user-friendly, which can be an advantage for beginners. It primarily uses GNOME as its default interface (Ul Hassan et al., 2021). However, kali also supports other desktop environments like KDE, Xfce, and MATE (*Switching Desktop Environments | Kali Linux Documentation*, n.d.).

On the other hand, Parrot OS normally uses the Matte desktop environment. This environment is known for its efficiency, it's optimal for the users who prefer a lightweight and fast interface that conserves system resources and doesn't lag (Ul Hassan et al., 2021).

2.2 System performance

Kali Linux is known for its robust performance. However, its performance can also vary depending on the hardware used. Due to the large number of pre-installed tools in Kali linux, users often report the long boot time of Kali linux. Once tools boot up, Kali can offer rapid response times and a variety of security resources (Ul Hassan et al., 2021).

Parrot OS on the other hand, is known for its lightweight design, which offers faster boot times and lower resource utilization in comparison to Kali Linux. The lightweight design makes Parrot OS preferable for those users who are looking for an operating system that can run on less powerful machines or those who are looking to save system resources for multitasking. The performance of parrot OS is optimized to perform several complex tasks concurrently (Ul Hassan et al., 2021).

	Kali Linux	**Parrot Security OS**
Boot Time	longer boot times. Due to its extensive package of pre-installed tools.	Lightweight and shorter boot times, with a streamlined package of default tools.
Response Time	Once Booted it offers fast response time.	Fast response time with minimal lag even in less powerful machines.
Resource Utilization	Resource-intensive.	Low resource utilization.
Multitasking Capabilities	Can perform multitasking well in a machine with good hardware.	Can handle multitasking smoothly even in less powerful machines.

2.3 Security Features

Kali Linux offers a range of features and encryption tools, which makes it a robust security operating system that is supported by extensive security mechanisms customized for penetration testing and security research. The Operating system is Well securid by default because of its strict policies that limit external access to the system's critical components. Additionally, Kali Linux incorporates various malware protection tools that can detect new threats efficiently (*What Is Kali Linux? | Kali Linux Documentation*, n.d.).

Parrot OS also incorporates strong security features but focuses more on providing a robust security environment that includes many features and tools for penetration testing and digital forensics. Just like Kali, Parrot OS also includes advanced encryption methods and malware protection mechanisms. However, Parrot OS differentiates itself from Kali Linux by also focusing on anonymity, by utilizing tools like AnonSurf that allow a user to anonymize their internet traffic (*AnonSurf*, n.d.).

	Kali Linux	Parrot Security OS
Access Control	Strict access control measures by default	Strong access control that also allows security professionals to define specific access levels based on the task they have.
Encryption	Provides encryption tools like: -LUKS (Linux Unified Key Setup) for full disk encryption. -GPG (GNU Privacy Guard) for file encryption.	Provides encryption tools like kali. full disk encryption with LUKS and file encryption with GPG. Additionally, include tools like VeraCrypt that help users secure their data.
Malware Protection	Incorporates a variety of malware protections tools by default.	Also incorporate malware protections tools.
Vulnerability Management	Incorporate vulnerability management tools like OpenVAS and Metasploit for vulnerability scanning and protection.	Similar vulnerability management tools (OpenVAS and Metasploit). Additionally includes tools like AnonSurf that anonymize users.
Secure Boot and Firmware Protection	Supports Secure Boot that will prevent unauthorized softwares during the boot process.	Supports Secure Boot
Application Sandboxing	incorporate tools such as Firejail that Isolate applications from the	Also incorporates Firejail for sandboxing applications.

	rest of the system.	
Network Security Tools	Incorporate a lot of tools for network security: -Wireshark (network analysis) -Aircrack-ng (wireless network security testing) -Snort (intrusion detection)	Incorporate similar network security tools. Additionally AnonSurf add anonymity features that protect users against network based attacks.

2.4 Software ecosystem and update model

Software compatibility is the ability of an operating system to run various tools seamlessly (Hanna, 2013). Kali Linux is known for its massive repository of pre-installed tools that are used for penetration testing and security related topics. Popular tools in Kali Linux are: Metasploit, Nmap, Wireshark, and Burp Suite.

Parrot OS also offers a set of tools used for various security tasks. It includes tools like Aircrack-ng, Hydra, and OWASP ZAP. Parrot OS offers a development environment making this operating system suitable for security professionals who are also into software development.

Debian based operating systems have an advantage over other linux based operating systems in that they support customization and external applications and libraries. Which makes both kali linux and Parrot OS compatible with additional security tools. Both of these operating systems follow a rolling release model, which means users can have their operating system gradually updated without having to wait for a major release. This model is beneficial and ensures that users are having up-to-date security tools.

2.5 Hardware Support

Kali Linuw is known for its intensive resource utilization operating system that requires a minimum of 1GHz dual-core CPU and minimum of 1 GB of RAM for the installation of its default metapackage. Some Kali Linux tools require graphical acceleration that Parrot OS on the other hand doesn't require. After the installation of Kali Linux, the deployment size of this operating system is also bigger (Pentest, 2023).

On the other hand, Parrot OS is designed as a lightweight alternative. It requires the same CPU specification but with generally lower memory requirements, a minimum of 320 MB of RAM. Both of

these operating systems support legacy and UEFI boot modes, which accommodate a broad range of hardware setups and ensure versatility in deployment across different systems (Pentest, 2023).

	Kali Linux	Parrot Security OS
Compatibility with Different Hardware Devices	- Supports variety of devices like laptops, desktops, and single-board computers. - can also run on ARM architecture.	-Support Wide range of devices from modern laptops to old computers, and single-board computers. - Can also run on both x86 and ARM architectures.
Driver Availability	Support wide range of hardware components Like: - wireless adapters - GPUs - proprietary drivers	Also supports a wide range of hardware components like kali linux.
Ease of Hardware Configuration	Easy and simple installation process with a graphical installer that guides users during the installation process. Additionally the extensive community support that kali linux has.	Easy hardware configuration and installation due to the easy graphical interface. In addition to various configuration tools that help to simplify the management of hardware.

2.6 Community and Support

Kali Linux has a massive community of active users. This gives Kali Linux an advantage over Parrot OS especially for new users of this operating system. Whenever a new user is facing some troubles or errors, there's a 99% chance that someone has previously asked the same question before (Manthan, 2024). The extensive community support ensures that one will most probably find a solution to his problem easily. Kali Linux also offers an extensive documentation that nearly covers most aspects of the kali linux installation process, tools, and usage.

Parrot Os on the other hand has a smaller community, but still has online forums and communities that have dedicated users and is continuously growing. Parrot OS also offers an extensive documentation that is also continuously being updated with up to date information. The documentation covers a wide range of topics ranging from installation to various tools usage.

3. Summary Table

	Kali Linux	Parrot Security OS
Default Desktop Environment	GNOME	MATE
System Resource Usage	More resource-intensive, suitable for more powerful machines	Lightweight, optimized for performance on lower powerful machines
Primary Focus	penetration testing and security research	security, privacy, development, catering, and digital forensics
Base System	Debian	Debian
Community and Support	Large and active support community.	Smaller Support Community with dedicated users.
Licensing	free and open-source, available under GNU (General Public License) and others.	free and open-source, available under GNU (General Public License) and others.

4. Users feedback and reviews

	Kali Linux	Parrot OS
Star Ratings	4.6 out of 5 stars	4.5 out of 5 stars
Total Number of Reviews	140	42
Meets Requirements	9.1 out of 10	9.1 out of 10
Ease of use	8.4 out of 10	8.9 out of 10
Ease of Setup	8.6 out of 10	8.9 out of 10
Quality of community support	8.4 out of 10	8.2 out of 10

Reviewers' Industry	Points scored — Other 25.2%, Computer & Network... 26.6%, Computer Networking 3.6%, Financial Services 3.6%, Computer Software 17.3%, Information Technology 23.7%	Points scored — Other 16.3%, Computer Networking 4.7%, Financial Services 9.3%, Computer Software 9.3%, Computer & Network... 39.5%, Information Technology 20.9%
Most Helpful Favorable Review	"The Kaliinux is preinstalled with all hacking tools a penetration tester needs. Then the best thing it's free and open-source and easy to use even with minimum configurations. The community support is very helpful we will get all support from the community…"	"This is the most important operating system for penetration testing and hacking. Parrot security os is lightweight and have more applications regarding the hacking and pen rest"
Most Helpful Critical Review	"day to day work capability, default desktop environment(xfce) for me, should have selection for different environments!"	"As a former user of Parrot OS, I feel that Parrot has less brand recognition, potentially leading to fewer community resources and solutions. While it still provides a comprehensive toolset for cybersecurity tasks, it has a smaller repository compared to..."

Source: https://www.g2.com/compare/kali-linux-vs-parrot-security-os

5. Conclusion and Recommendations

To sum up, Both kali linux and Parrot OS come with a wide range of tools and come with a high software compatibility. Both of these operating systems are used for security and penetration testing and security related tasks. The decision on which operating system to use solely depends on the user preference, hardware and software specifications, and the task in hand. Kali Linux is beginner friendly OS with a big audience and heavyweight design that can run advanced tools which makes it preferable for new cyber security learners who are looking for a supportive community and have heavy machines. On the other hand, Parrot OS is a lightweight system that runs on a less powerful hardware and has a smaller repository. It distinguishes itself by offering anonymity and development environment to its users which makes it preferable for those who look for a fast, anonymous, and suitable operating system for software development. Kali linux would be recommended to those who are new to the linux operating systems and users with good hardware capabilities. Meanwhile parrot os is recommended for more knowledgeable users who can handle errors alone due to the limitation of the community support. Parrot is also recommended for people who are looking for anonymity and looking for a software environment as well.

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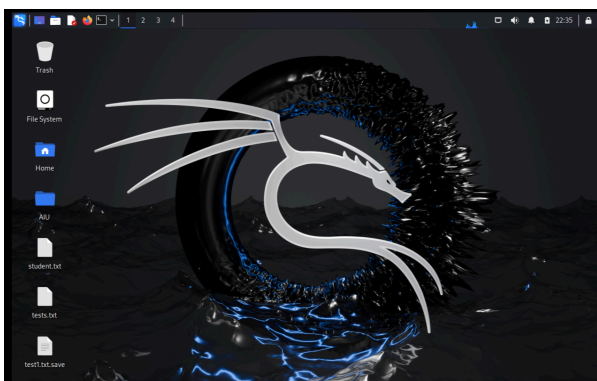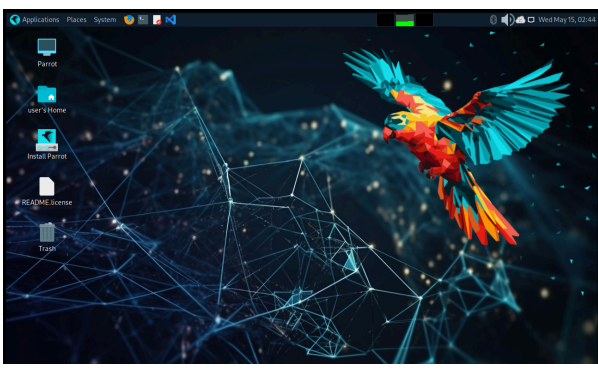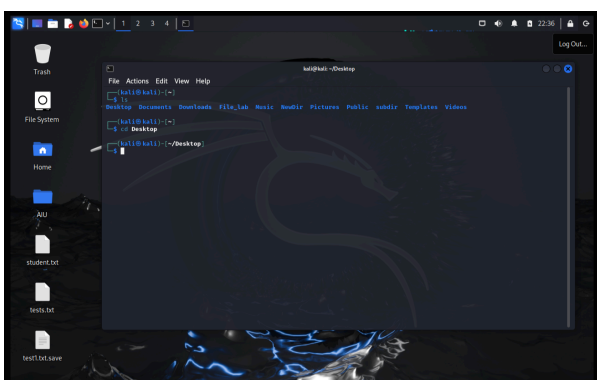
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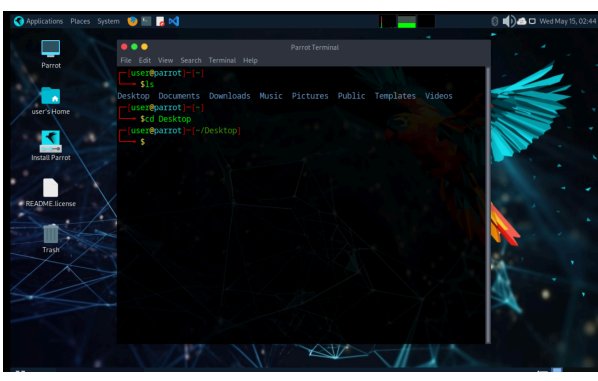
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Appendix

Kali Linux	Parrot OS
The top Command	

top - 22:53:59 up 0 min, 1 user, load average: 1.06, 0.27, 0.09
Tasks: 219 total,   2 running, 217 sleeping,   0 stopped,   0 zombie
%Cpu(s): 2.3 us, 0.0 sy, 0.0 ni, 97.7 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem :   2010.2 total,   1088.8 free,   726.1 used,   402.7 buff/cache
MiB Swap: 1024.0 total,   1024.0 free,   0.0 used.   1284.0 avail Mem
	%Cpu(s): 3.0 us, 1.7 sy, 0.0 ni, 95.3 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
	MiB Mem : 1928.3 total, 126.2 free, 1051.6 used, 964.9 buff/cache
	MiB Swap: 0.0 total, 0.0 free, 0.0 used. 876.7 avail Mem
	
	  PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
	   1871 root 20 0 438868 120812 69248

```
  PID USER    PR NI  VIRT   RES   SHR
S %CPU %MEM   TIME+ COMMAND
 1608 kali    20  0 340676 86156 76764 S
10.0  4.2  0:00.20 qterminal
 1646 kali    20  0 13028  4992  3456 R
10.0  0.2  0:00.01 top
    1 root    20  0 21292 11224  9176 S
0.0  0.5  0:01.01 systemd
    2 root    20  0     0     0     0 S  0.0  0.0
0:00.00 kthreadd
    3 root    20  0     0     0     0 S  0.0  0.0
0:00.00 pool_workqueue_release
    4 root     0 -20     0     0     0 I  0.0  0.0
0:00.00 kworker/R-rcu_g
    5 root     0 -20     0     0     0 I  0.0  0.0
0:00.00 kworker/R-rcu_p
    6 root     0 -20     0     0     0 I  0.0  0.0
0:00.00 kworker/R-slub_
    7 root     0 -20     0     0     0 I  0.0  0.0
0:00.00 kworker/R-netns
    8 root    20  0     0     0     0 I  0.0  0.0
0:00.00 kworker/0:0-pm
    9 root     0 -20     0     0     0 I  0.0  0.0
0:00.00 kworker/0:0H-events_highpri
   10 root    20  0     0     0     0 I  0.0  0.0
0:00.00 kworker/0:1-events
   11 root    20  0     0     0     0 I  0.0  0.0
0:00.00 kworker/u8:0-qrtr_ns_handler
   12 root     0 -20     0     0     0 I  0.0  0.0
0:00.00 kworker/R-mm_pe
   13 root    20  0     0     0     0 I  0.0  0.0
0:00.00 rcu_tasks_kthread
   14 root    20  0     0     0     0 I  0.0  0.0
0:00.00 rcu_tasks_rude_kthread
   15 root    20  0     0     0     0 I  0.0  0.0
0:00.00 rcu_tasks_trace_kthread
   16 root    20  0     0     0     0 S  0.0
0.0  0:00.05 ksoftirqd/0
   17 root    20  0     0     0     0 I  0.0  0.0
0:00.03 rcu_preempt
   18 root    rt  0     0     0     0 S  0.0  0.0
0:00.00 migration/0
   19 root   -51  0     0     0     0 S  0.0
0.0  0:00.00 idle_inject/0
   20 root    20  0     0     0     0 S  0.0
0.0  0:00.00 cpuhp/0
   21 root    20  0     0     0     0 S  0.0
0.0  0:00.00 cpuhp/1
   22 root   -51  0     0     0     0 S  0.0
R   2.7  6.1  0:04.11 Xorg
 2614 user    20  0 511480 53736 37960
S  1.0  2.7  0:00.79 mate-te+
 2150 user    20  0 417808 39892 29564
S  0.7  2.0  0:00.51 marco
  621 root    20  0     0     0     0 I  0.3
0.0  0:00.82 kworker+
 2311 user    20  0 1189352 231880
70364 S  0.3  11.7  0:02.72 opensni+
 2448 user    20  0 343040 30464 19712
S  0.3  1.5  0:01.16 mate-mu+
    1 root    20  0 21044 12904  9448 S
0.0  0.7  0:01.01 systemd
    2 root    20  0     0     0     0 S  0.0
0.0  0:00.00 kthreadd
    3 root     0 -20     0     0     0 I  0.0
0.0  0:00.00 rcu_gp
    4 root     0 -20     0     0     0 I  0.0
0.0  0:00.00 rcu_par+
    5 root     0 -20     0     0     0 I  0.0
0.0  0:00.00 slub_fl+
    6 root     0 -20     0     0     0 I  0.0
0.0  0:00.00 netns
    7 root    20  0     0     0     0 I  0.0
0.0  0:00.29 kworker+
    8 root     0 -20     0     0     0 I  0.0
0.0  0:00.00 kworker+
    9 root    20  0     0     0     0 I  0.0
0.0  0:00.01 kworker+
   11 root     0 -20     0     0     0 I  0.0
0.0  0:00.00 mm_perc+
   12 root    20  0     0     0     0 I  0.0
0.0  0:00.00 rcu_tas+
```

0.0 0:00.00 idle_inject/1 23 root rt 0 0 0 0 S 0.0 0.0 0:00.12 migration/1	