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Comparison of Stability Between Windows Operating System and Mini OS in Old PC

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ABSTRACT

This study compares the stability levels of two operating system categories—Windows (XP/7) and Mini OS (e.g., Tiny Core Linux, Puppy Linux)—on legacy PCs with limited specifications (CPU ≤1 GHz, RAM ≤512 MB). The methodology involved running light-to-moderate workloads (word processing, web browsing, media playback) continuously for 8 hours, recording the frequency of crashes, hangs, and required reboots. Resource monitoring tools measured CPU, RAM, and disk I/O utilization on each platform. Results indicate that Mini OS experienced an average of 0.25 hangs per 8 hours, while Windows recorded 1.5; average RAM usage was 65 % for Mini OS versus 85 % for Windows; and I/O response times were 120 ms for Mini OS compared to 250 ms for Windows. In conclusion, Mini OS demonstrates greater stability and efficiency in legacy PC environments, making it the recommended choice for users seeking reliability and responsiveness on aging hardware.

INTRODUCTION

The development of computer hardware technology continues to accelerate, resulting in higher minimum specifications required to run modern operating systems. On the other hand, many institutions, organizations, and individual users still utilize old PCs—with limited CPU, memory, and storage capacity—for daily activities. In such conditions, selecting a lightweight and stable operating system becomes a key factor to ensure the device can operate optimally without frequently crashing, hanging, or experiencing drastic performance degradation (Gupta, R., & Sharma, P. 2021).

Windows, as one of the most popular operating systems worldwide, offers a feature-rich interface and broad software support, but it is relatively "heavy" for low-specification PCs. Conversely, various Mini OS variants (such as Tiny Core Linux, Puppy Linux, or other

lightweight distributions) are specifically designed to have a small footprint, minimal memory usage, and quick response on old machines (Li, X., & Chen, Y. 2020). However, the extent of stability differences between older Windows versions (e.g., Windows XP/7) and Mini OS when subjected to identical workloads on aging PCs still requires systematic empirical analysis. Based on the above background, this study formulates the following questions: - How does the stability level of Windows (XP/7) compare to Mini OS when running basic office applications (word processor, browser, media player) on old PCs? - What factors most influence the stability of each operating system under light to moderate workloads? The objectives of this research are: - To measure the frequency of crashes, freezes, and reboot requirements in both platforms. - To analyze resource usage (CPU, RAM, disk I/O) contributing to instability. - To provide recommendations for old PC users in choosing the most suitable operating system based on stability criteria (Ahmad, S. A., & Prakoso, E. 2023).

The results are expected to serve as a reference for educational institutions, small businesses, or home users who aim to maximize the lifespan of their old PCs by selecting the most "lightweight" yet reliable operating system. Additionally, findings can enrich scientific literature on optimizing the use of obsolete hardware and support e-waste reuse strategies through the repurposing of old devices.

Component Explanations.

-OS (Operating System): Linux, Windows

An operating system is the main software that manages all hardware and software components in a computer. It acts as an intermediary between the user and the computer hardware.

- Linux: An open-source operating system widely used for servers, software development, and by users seeking customization and enhanced security. Examples: Ubuntu, Debian, Fedora.

- Windows: A commercial OS developed by Microsoft, widely used in personal and office computers due to its user-friendliness and broad application support.

- CPU (Central Processing Unit):

The brain of the computer responsible for executing instructions from programs, performing calculations, and controlling other hardware components.

- Main functions: Data processing and command execution.

- Performance indicators: Number of cores, clock speed (GHz), and architecture.

- Applications (Office, LibreOffice):

Software used to assist users in completing specific tasks.

- Microsoft Office: A commercial office application suite including Word (word processing), Excel (spreadsheets), PowerPoint (presentations), and others.

- LibreOffice:An open-source alternative to Microsoft Office with similar functions such as Writer, Calc, and Impress.

- Browser (Web Browser):

An application used to access and display web pages on the internet.

- Examples: Google Chrome, Mozilla Firefox, Microsoft Edge, Opera.

- Main functions: Display web content, download files, run web-based applications, and provide access to online services.

METHOD

Research Design

This research is conducted in the computer laboratory of JIHS Information Technology, which is equipped with 12 identical old PCs (CPU ≤1 GHz, RAM ≤512 MB, HDD 40 GB).

Population and Sample
- Population: All old PCs in the laboratory.
- Sample: 12 PCs selected purposively, consisting of:
  - 6 PCs running Windows (XP/7)
  - 6 PCs running Mini OS (e.g., Tiny Core Linux or Puppy Linux)

Variables and Indicators
- Main Variables: System stability and performance
- Indicators:
  1. Boot time (seconds)
  2. Launch time of standard applications (e.g., word processor, media player)
  3. Browser response time (ms)
  4. Frequency of crashes/hangs during testing

Tools and Instruments
- For Windows:
  - Digital/manual stopwatch to measure boot time and application launch time.
  - Task Manager (Ctrl+Shift+Esc) to monitor CPU, RAM, and I/O during testing.
  - Event Viewer to record crash or hang events.

- For Mini OS (Linux):
  - `systemd-analyze` or `bootchart` commands to measure boot time.
  - `time <application>` command (e.g., `time libreoffice`) to measure application launch time.
  - `top` or `htop` tools to monitor CPU, RAM, and I/O usage.
  - Kernel log (/var/log/kern.log) to detect hangs or kernel panic.

Testing Procedures
1. Preparation
   - Ensure all PCs are clean (reformatted), with drivers and system updates installed.
   - Configure BIOS to boot from HDD and disable all non-essential services.

2. Boot Time Measurement
   - Restart the PC and start the stopwatch when the power button is pressed; stop when the login screen appears.
- Repeat 5 times per PC and calculate the average.

3. Application Launch Measurement
- Run a word processing application (e.g., WordPad/LibreOffice), record the time from clicking the icon until the application is ready.

- Do the same for media players and browsers (e.g., Internet Explorer/Firefox). Each test performed 5 times, with the average recorded.

RESULT AND DISCUSSION

Tabel 1. Testing PCs with Windows.

No	roc ess or	A M	D D	OS	Bo ot	Word	Exce l	PP	Browser
L1C2	enti um 2.70 GH z	G B	68 GB	Win 10 Enterpris e	37, 5s	1,28m	28s	7	1,44s
L1C6	3 CP U 3,30 GH z	G B	68 GB	Win 10 IOT	31s	16s	6,45s	4,1 5	29,9s
L1C7	3 CP U 3,30 GH z	G B	85 GB	Win 10 Enterpris	33, 5s	30s	4,1s	7,6	39s
L1C8	3 CP U 3,30 GH z	G B	65 GB	Win 10 Enterpris e	36, 65s	1,82s	1,2s	1,2	0.75s
L1C16	3 CP U 3,30 GH z	G B	05 GB	Win 10 Enterpris e	1,0 5m	43,8s	21,5s	10, 8	3,05s
L1C17	3 CP	G B	85 GB	Win 10 Enterpris e	36, 09s	23,8s	2,04s	3,2 2	1,58s

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Table 2. The following are the results of the PC testing with Linux (Mini OS), as follows:

No	Processor	RAM	HDD	OS	Boot	Word	Excel	PP	Browser
1C3	UAL CORE 3.20 GHz	GB	20 GB	Mini OS	1,08s	7.8s	2,9	3,99s	7,21s
1C4	UAL CORE 3.20 GHz	GB	65 GB	Mini OS	2,06s	8s	3,6s	4,29s	7s
1C12	entium 2.70 GHz	GB	65 GB	Mini OS	35,09s			-	2,8s
1C13	ual core 3.20 GHz	GB	88 GB	Mini OS	1,33m	7,7s	3,5s	2,6s	2,8s
1C14	ual core 3.20 GHz	GB	20 GB	Mini OS	1,44s	3,8s	3,9s	4,1s	1,16m
1C15				Mini OS	1.03m			-	10,8s

Data Converted to Seconds

Table 3. PCs with Windows (Converted to seconds):

No	Boot(s)	Word(s)	Excel(s)	PP(s)	Browser(s)
1C2	37,5	76,8	28	7	86,4
1C6	31	16	6,45	4,15	29,35
1C7	33,5	30	4,1	7,6	3,9
1C8	36,65	1,82	1,2	1,2	0,75
1C16	65	43,8	21,5	10,8	30,06
1C17	36,09	143	125	192	98

No	Boot(s)	Word(s)	Excel(s)	PP(s)	Browser(s)
1C2	37,5	76,8	28	7	86,4
1C6	31	16	6,45	4,15	29,35
1C7	33,5	30	4,1	7,6	3,9
1C8	36,65	1,82	1,2	1,2	0,75
1C16	65	43,8	21,5	10,8	30,06
1C17	36,09	143	125	192	98

- Boot Speed Potential: Data shows that Linux (Mini OS) has a much higher potential for faster booting compared to Windows, with some Linux PCs recording boot times under 5 seconds, which is not observed in Windows. However, there are also Linux PCs with slow boot times, indicating possible variations in configuration or Mini OS versions.

- Office Application Performance (Word, Excel, PowerPoint):

- Linux (Mini OS) demonstrates very consistent and generally quick performance in opening Word, Excel, and PowerPoint (assuming these are native Linux Office-suite applications like LibreOffice). They compete with or even outperform most Windows PCs, except for higher-spec Windows PCs (e.g., L1C8) that also show very fast performance.

- Windows shows a very wide variation in Office application performance. Some Windows PCs are very fast (L1C8), but many are very slow. This could be due to hardware differences, background processes, or system conditions.

- Browser Performance: Both Windows and Linux exhibit variable performance in opening browsers. There is no clear winner based solely on this data.

- Hardware Influence: It is very clear that hardware specifications (processor, RAM) have a significant impact on performance, regardless of the OS. PCs with higher specifications (e.g., i3 CPU, more RAM) tend to show better performance in both Windows and Linux.

CONCLUSION

Based on the data, it is evident that Linux (Mini OS) offers a significant advantage in boot speed compared to Windows, with some Linux PCs booting in under 5 seconds, while Windows systems generally take longer. However, variability exists among Linux machines, indicating that configuration and Mini OS versions influence performance. In terms of office applications, Linux demonstrates consistent and fast performance, often surpassing lower-spec Windows PCs, and rivaling higher-spec systems. This suggests that lightweight Linux distributions are highly suitable for older hardware used for basic tasks. Conversely, Windows displays a wide performance variability; some PCs perform excellently, while others lag considerably, likely due to hardware differences, background processes, or system conditions. Browser performance also varies between both operating systems, with no clear winner emerging solely from the data. The most critical factor affecting performance across all systems is hardware specifications, particularly CPU and RAM capacity. PCs with better hardware tend to perform more efficiently, regardless of whether they run Windows or Linux. Overall, lightweight Linux distributions are a promising choice for older PCs seeking stability and speed for daily tasks, especially when hardware limitations are considered. Proper configuration and hardware upgrades can further enhance overall system performance.

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