

Analysis of the directions of development of digital aesthetics on the example of Windows interfaces

Analiza kierunków rozwoju estetyki cyfrowej na przykładzie interfejsów systemów Windows

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Abstract

The analysis of digital aesthetics in Windows systems was undertaken due to an observable trend over the past decade toward the gradual simplification and even marginalization of interface visual appeal. The aim is to demonstrate that the peak of usability, accessibility, and quality was reached at the end of the first decade of the 21st century and the beginning of the second – during a period when a humanistic trend in interface design, now referred to as Aero, prevailed. This aesthetic will be compared with other trends, surveys will be conducted, and credible sources will be cited. One of the main objectives of this study is to raise awareness of this topic and emphasize the need for change.

Keywords: Windows; interface; digital aesthetics

Streszczenie

Analiza estetyki cyfrowej w systemach Windows została przeprowadzona ze względu na obserwowany od ponad dekady trend stopniowego upraszczania, a wręcz marginalizowania kwestii atrakcyjności wizualnej interfejsów. Celem jest wykazanie, że szczyt użyteczności, przystępności i jakości osiągnięto pod koniec pierwszej dekady XXI wieku oraz na początku drugiej – w czasach, gdy panował humanistyczny trend w projektowaniu interfejsów, który dziś określa się mianem Aero. Estetyka ta została porównana z innymi nurtami, przeprowadzone zostaną ankiety, a także przytoczone wiarygodne źródła. Jednym z głównych celów pracy jest popularyzacja tego tematu i zwrócenie uwagi na potrzebę zmian.

Słowa kluczowe: Windows; interfejs; estetyka cyfrowa

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1. Introduction

In operating systems such as Windows, the user interface is a key element. By combining functionality with aesthetics, it significantly influences user satisfaction. The fundamentals of interface design in operating systems, including principles of user interaction with graphical user interfaces, have been extensively discussed in sources available on the Wikibooks platform [1].

Digital aesthetics is a broad topic encompassing both visual and functional elements that form the foundation of operating system design. In the context of Windows systems, the user interface plays a crucial role in shaping user experience. Analyzing the evolution of these interfaces provides insight into design trends and their impact on how technology is perceived by consumers. The aim of this article is to present the key directions of digital aesthetics development in Windows systems observed over the past three decades. Particular emphasis has been placed on two research stages: identifying key design trends, such as skeuomorphism (Figure 1), minimalism (Figure 2), and Fluent Design (Figure 3), and examining how they were received by users in terms of their visual appeal.



Figure 1: Digital audio plugin VST interface imitating a real compressor – an example of skeuomorphism.

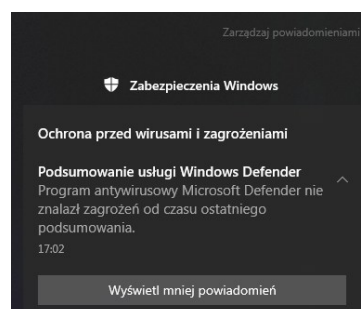


Figure 2: Minimalist sidebar design in Windows 10.

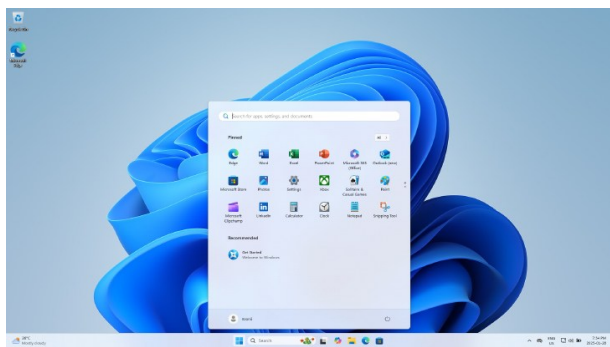


Figure 3: Fluent Design System in Windows 11 [2].

2. Literature Review

The literature review included an analysis of scientific publications, technical documentation, and popular science articles on interface design.

Key topics covered include the evolution of design styles in Windows systems (e.g., Aero, Fluent Design), a comparison of skeuomorphism and minimalist approaches in design, and the impact of aesthetics on system usability and intuitiveness.

Among the most important sources used in the analysis were:

- Microsoft Manual of Style for Technical Publications [21], an official guide on Microsoft's visual identity, detailing interface design principles in subsequent editions.
- Scientific publications [20, 8, 10, 11, 4] from journals such as the *Journal of Computer Sciences Institute*, describing changes in different versions of Windows.
- Articles from Wikibooks [1, 5, 14], which present the history and evolution of graphical interfaces.
- Comparative analyses [3, 7, 9, 12, 13] of design styles, such as skeuomorphism versus flat design (Figure 4), published in journals like *Human-Computer Interaction*.

	Minimalistic	Skeuomorphic
My PC/This PC		
Internet Explorer		
Recycle Bin		
Microsoft Word		

Figure 4: Comparison of icons designed in skeuomorphic style (right) and flat design (left) – as seen in Windows systems.

The article *The Evolution of Microsoft Windows Operating Systems After 2001* [20] analyzes changes in Windows XP, Windows 7, Windows 10, and Windows 11, comparing them in terms of performance, resource usage, file operation speed, and most relevant to the study of digital aesthetics – graphical interface usability. The authors conducted experiments using two test stations and specially designed scenarios to identify trends in operating system development.

The study found that newer versions of Windows introduced more features, increasing usability but also raising hardware requirements. Memory (RAM) and processor usage became particularly demanding. Windows 7 achieved the best results in file operation performance and interface intuitiveness, while Windows 11 stood out with cloud service integration and early artificial intelligence functionalities. Despite increasing hardware requirements, technological advancements allowed users to adapt to new systems efficiently. The study concluded that Microsoft Windows evolved in response to market needs and technological advancements, introducing significant improvements in security, stability, and peripheral device compatibility.

A paper published by the Association for Computing Machinery [4] analyzes the preferences of senior users regarding graphical icon styles. The research involved a survey of 30 participants aged 65 and older, evaluating their subjective perception of realism and abstraction levels in icons. Results indicated that highly realistic icons were more visually appealing, particularly for women and users less familiar with smartphones. Higher abstraction levels, however, improved icon clarity. Skeuomorphic icons – those realistically depicting real-world objects – were found to better meet the needs of older users, combining intuitiveness with aesthetics. The authors emphasized that appropriate icon style choices could enhance usability and user satisfaction.

3. Methodology

3.1. Literature Analysis

The distinction between skeuomorphism and flat design was thoroughly discussed by Burmistrov et al. [3], who examined differences in user perception of these approaches in terms of intuitiveness and aesthetics.

Skeuomorphism (Figure 5) is a graphic design style that mimics the appearance of real objects in digital interfaces. Examples include icons resembling physical objects, such as a trash bin or folder. This style emerged in systems like Windows 95, 98, and XP, designed to facilitate navigation for less experienced users. Later versions of skeuomorphism incorporated realistic graphical elements, such as reflections, transparency, shadows, and gradients. Research by Cho et al. [4] demonstrated that older users prefer skeuomorphism in icon design.



Figure 5: Skeuomorphic style in the KDE Plasma system [5].

Flat design (Figure 6) emerged as an alternative to skeuomorphism. This style, used in Windows 8 and later versions, rejects excessive embellishments, focusing on simple shapes, solid colors, and clarity. The goal was to

improve performance and simplify the interface so that users could concentrate more easily on functionality.

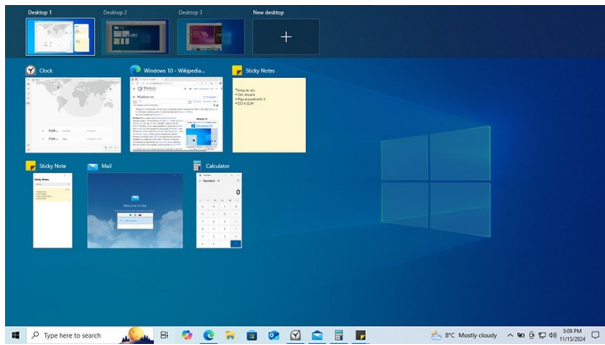


Figure 6: Flat design as seen in Windows 10 [6].

The guidelines for user interface design in Microsoft systems have been summarized in the Microsoft Manual of Style [7]. Wójtowicz and Wójcik, in their article [8], analyzed the evolution of Windows systems, including changes in GUI. Meanwhile, the development of interfaces over the years has been summarized in a publication on the Wikibooks platform [9].

The earliest versions of Windows, such as 1.0 and 2.0, introduced a graphical user interface (Figure 7) as an overlay on DOS. Their primary functions included multitasking and window manipulation. These systems featured high contrast and readability, adapted to the technical limitations of CRT monitors. Despite their innovative aspects, hardware constraints and strong competition from Apple made it difficult for Microsoft to achieve greater market success.

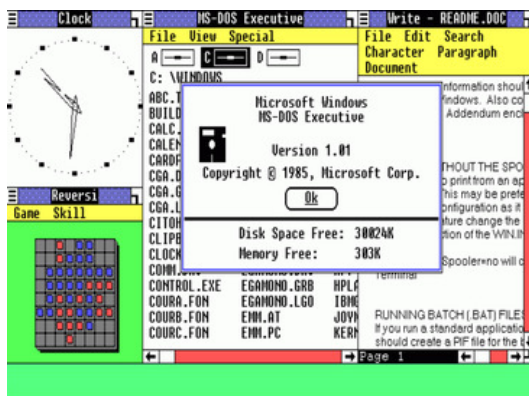


Figure 7: Graphical user interface of Windows 1.0 [10].

The classic style, introduced in Windows 3.11 and continued in versions 95, 98, 2000, and Millennium, marked the first approach to skeuomorphism (Figure 8). Icons represented real-world objects (e.g. "My Computer," "Recycle Bin"). As shown in the studies of Liu and Zheng [11], icon styles influence user behavior. Functionality was the priority, particularly given the hardware limitations of the time. However, despite these constraints, the classic style increased accessibility for a broader audience, including older users. Enhanced high-contrast options and accessibility modes further facilitated system use for those less familiar with technology.

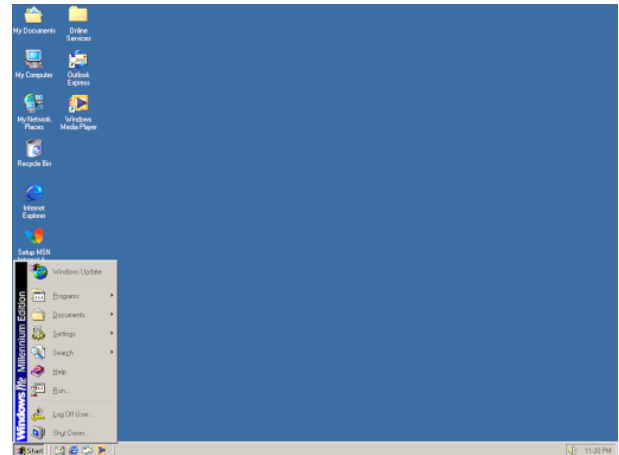


Figure 8: Classic style in Windows Millennium [12].

Windows XP introduced the Luna interface, incorporating colorful graphical elements (Figure 9) that mimicked three-dimensionality. A strong emphasis was placed on nature-inspired aesthetics, as illustrated by the famous Bliss wallpaper, the default desktop background. In this version, the color palette also changed—shades of gray from previous versions were replaced with various hues of blue and green. Skeuomorphism was continued and enriched with a more humanistic approach, making the system more user-friendly and ultimately securing XP's global popularity.

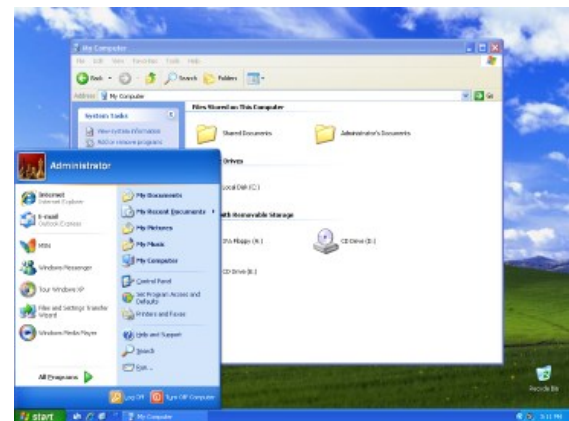


Figure 9: Luna interface in the default color scheme [13].

The next version, Windows Vista, introduced the revolutionary Aero interface. The name stands for Authentic, Energetic, Reflective, and Open—concepts meant to define its visual appeal. Aero was characterized by a unique combination of aesthetics and functionality, as described in sources available on the Wikibooks platform [14]. As a natural evolution of previous paradigms, it introduced more dynamic visual effects (Figure 10), including window transparency and smooth animations. The nature-inspired aesthetic remained. Icons and buttons were designed with a futuristic, technology-driven optimism. New graphical capabilities enabled effects such as the aurora borealis simulation. However, Aero demanded substantial hardware resources, which were not yet widely accessible to the average user. Vista was often pre-installed on computers with insufficient performance,

particularly in terms of RAM and processing power, leading to low efficiency and performance issues.



Figure 10: Initial screen upon first startup of Windows Vista [15].

Microsoft responded quickly, releasing Windows 7 just two years later. Technically, it was version 6.1, an enhanced layer on NT 6.0 (Windows Vista). Windows 7 combined modern design (Figure 11) with significant performance improvements. More glass-like elements were introduced, improving significant aspects like clarity and readability.

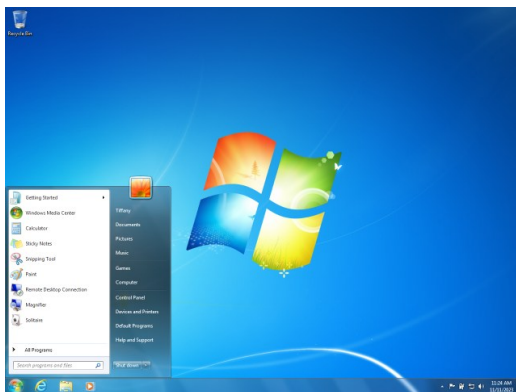


Figure 11: Windows 7, designed in the Aero style [16].

With Windows 8, Microsoft introduced the Metro style (Figure 12), abandoning skeuomorphism in favor of a minimalist design with simple shapes, solid colors, and dynamic tiles. This decision was driven by users' increasing familiarity with personal computers and the desire to maximize system performance. Metro was also implemented in Windows Phone touchscreen devices, which competed at the time with iOS and Android smartphones. Akiba and Yang [17] analyzed the characteristics of mobile interfaces.

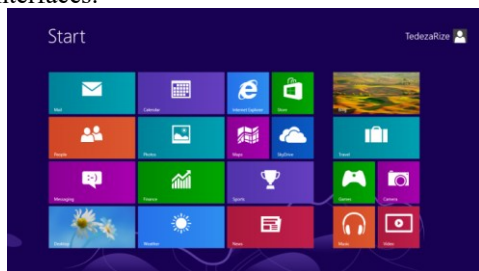


Figure 12: The tile-based interface, a major change introduced in Windows 8 [18].

The Metro interface was met with criticism. The most controversial change was the replacement of the classic Start Menu with a full-screen tile interface instead of a list of program names and icons. While this may have been functional on touchscreen devices, it was unpopular among PC users, who still preferred using keyboards and mice. The anticipated transition from traditional monitors to touchscreen displays never fully materialized, partly due to user habits and partly because of the reduced convenience of touch-based interactions on desktop systems.

Due to these inconveniences and the overall simplification of graphical elements, Windows 8 did not gain widespread approval. Many users preferred to stick with Windows 7 or XP, the most popular versions at the time. In response, Microsoft introduced refinements in Windows 8.1 and 10 (Figure 13), restoring some features from previous versions while retaining the minimalist aesthetic.

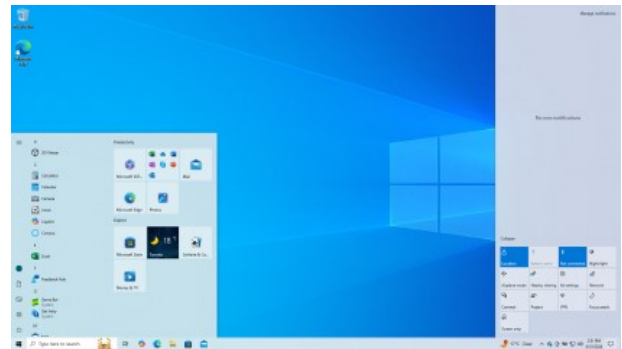


Figure 13: Windows 10 in the Metro/Modern UI style [6].

The Fluent Design System, also known as Fluent, was introduced in Windows 11 (Figure 14). It represents a fusion of minimalism and skeuomorphism, striving for a balanced approach. Fluent reintroduced three-dimensional depth, transparency effects, and subtle animations. Wang and Wang [19] explored dynamic motion graphics in this context. The design draws inspiration from Aero but in a more scalable form. Fluent was developed with cross-platform usability in mind, targeting both PCs and tablets.

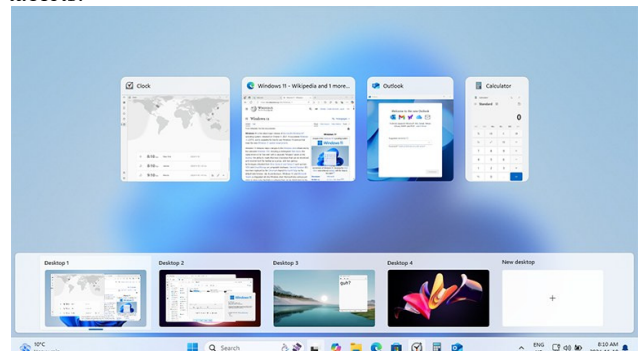


Figure 14: Windows 11 in the Fluent style, reintroducing shadows, gradients, and transparency effects [2].

3.2. Survey Research

Conducting surveys was essential to obtaining measurable results regarding user preferences in digital aesthetics

across Windows systems. Google Forms was used to streamline the data collection process.

Surveys were conducted in person, under controlled conditions. The study group consisted of 40 participants, divided into six groups of eight individuals each. All participants were part-time computer science students in their early adulthood. The questions (Figure 15) followed a repetitive format: "Do you consider X in this style (illustrated) visually appealing?" The only variable was the graphical object being evaluated. Since aesthetics should be examined in the context of user experience (UX), Hasenzahl [20] emphasized this aspect in his research.

The surveys contained 12 questions, in which participants rated the visual appeal of Windows interface elements. Before answering, they were shown an overall illustration of each style. The evaluation sequence remained constant:

- Empty folder icon,
- Start Menu,
- Windows Explorer (My Computer/This PC section),
- My Computer/This PC icon,
- Default web browser interface (Internet Explorer/Microsoft Edge),
- Control Panel interface,
- Microsoft Word interface,
- System calculator interface,
- Microsoft Paint interface,
- Notepad interface,
- Recycle Bin icon,
- Overall desktop appearance.



Figure 15: Example of a survey question.

A Likert scale (Figure 16) was used to determine the degree of visual appeal for each style. This scale is commonly employed in psychological and political questionnaires, as well as in computing research.



Figure 16: Likert scale as a standard response format.

4. Results

Tables 1 and 2 illustrate the survey findings. The minimum possible score was 1.0, while the highest was 5.0.

Table 1: Averages of key survey responses

Inter- face	Classic	Luna	Aero	Metro	Fluent
Overall	3.25	3.73	4.40	3.85	3.85
Menu	2.75	3.62	4.10	2.22	3.37
Icon	3.12	3.77	4.05	3.92	3.15

Table 2: Average of the results of the survey

Inter- face	Classic	Luna	Aero	Metro	Fluent
Mean	2.82	3.46	3.97	3.49	3.68

The use of the Google Sheets environment (Figure 17) enabled the rapid processing of results. Its integration with the forms system significantly streamlined the process. An additional advantage of such automation is the elimination of potential errors (human factor), ensuring that the data remained intact.

Figure 17: A detailed excerpt of the results from one of the surveys.

Aero (Windows Vista, 7) (Figure 18) emerged as the most preferred visual style, achieving an average rating of 4.40. The next highest ratings were for Fluent Design System (Windows 11) and Metro (Windows 8, 10).



Figure 18: Transparency effect, flagship feature of the Aero style [21].

The overall results (Figure 19) are as follows: on average, the most preferred visual style in Windows systems is Aero (known from Vista and 7), followed by Fluent (Windows 11), Metro (Windows 8 and 10), and Luna (Windows XP). The Classic Windows style ranks last, with an average score of 2.82.

Figure 19: Calculation of averages in Google Sheets.

The use of Google Forms proved helpful in processing the results (Figure 20).

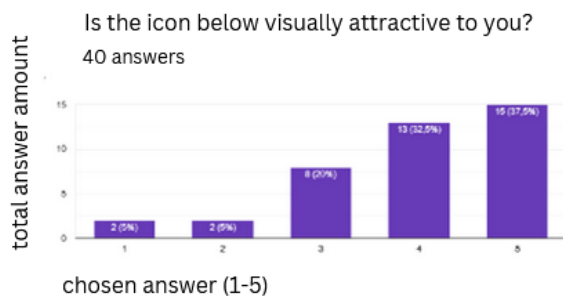


Figure 20: Presentation of part of the survey results in Google Forms. The figure shows a question, selected responses ranging from 1 to 5 (X-axis), and their frequency (Y-axis).

Its integration with Google Sheets ensured data integrity and preserved the accuracy of the information collected in the surveys.

5. Discussion and conclusions

The most important results include the overall rating of each aesthetic, the Start Menu, icons, and the average score derived from all results. These elements were considered the most significant because each style exhibits fundamental differences in these aspects. Therefore, they are crucial in evaluating the perception of a given visual layout. Silvennoinen [22] emphasized the importance of user perception in experiencing digital interfaces.

A significant discrepancy can be observed between the Classic Windows style and the other digital aesthetics trends. One reason for this is the low popularity of Windows 9x, 2000, and Millennium, as they have long since lost official Microsoft support. While some users appreciate the simplicity of classic interfaces, most contemporary users value a balance between functionality and modern aesthetics. It was also noted that excessive minimalism, characteristic of Metro, is often perceived as un-intuitive and overly austere, resulting in lower ratings for this style.

The digital aesthetics of Windows systems have undergone many changes, evolving from skeuomorphism through minimalism to the currently developed Fluent Design. The study found that Aero, which combines advanced aesthetics with functionality, received the highest rating from users.

Although the surveys confirm that certain interfaces are perceived as more visually attractive, this aesthetic preference does not automatically translate into the users' willingness to engage with these exact solutions on a daily basis. While visual appeal can contribute to the first impression and a sense of satisfaction, usability is more strongly influenced by familiarity and ease of interaction. Therefore, while respondents may indicate a high appreciation for more decorative or expressive designs, the everyday use of user interfaces is often dictated by habits. Further research could explore to what extent visual preferences correlate with actual behavioral patterns over time.

This suggests the necessity of designing more complex interfaces (Figure 21) that not only provide visual appeal but also ensure intuitive usability. The findings confirm studies conducted by Podkowiak et al. [23], which highlighted the importance of adapting interface styles to user perception.



Figure 21: Comparison of Aero, Metro, and Fluent styles [24].

Fluent Design represents a return to some of the key paradigms of the Aero era, such as humanistic design and skeuomorphic elements, which was reflected in the survey results. Users, likely feeling fatigued by overly simplified interfaces, appreciated more complex visual designs that combine aesthetics with intuitive usability.

Therefore, Fluent Design (Figure 22) ranked second, serving as an evolution that integrates modern trends with classical interface design principles. Kim & Lee [25] proposed a hybrid approach, combining skeuomorphism with flat design to maintain a balance that enhances user experience.

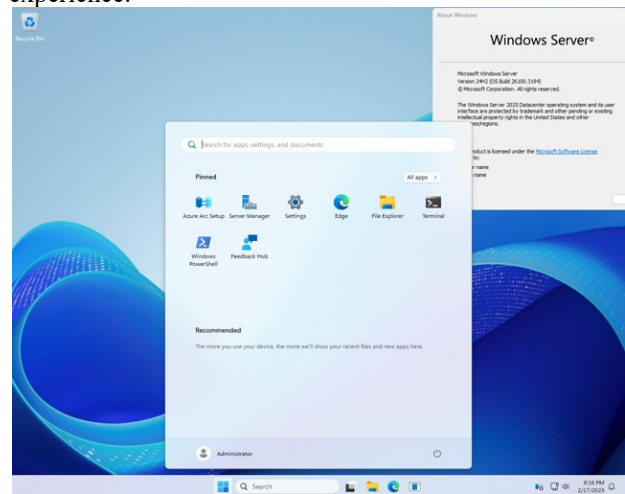


Figure 22: Windows Server 2025 in Fluent style [26].

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