A Comparative Analysis of macOS and Windows:
Assessing Product Evolution, Influence, and Strategies

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Presented by Shariah A.

Objective & Scope

OBJECTIVE

- We aim to analyze the historical rivalry between macOS and Windows by examining their evolution, technological advancements, and market strategies.
- We also aim to evaluate how Apple and Microsoft's strategic decisions have affected the success & market positioning of their operating systems.

SCOPE

- Topics:
  - Comparison of features
  - Comparison of architectures
  - Market analysis
  - Historical analysis
  - Assessment of strategic decisions
- Timespan:
  - 1970s to present
- Markets assessed:
  - Domestic & international

Prepared by Joshua

Introduction

- Two dominant operating systems in the personal computing industry, with a rich history to support their leading positions.
- Distinct foundations, innovation goals, and marketing tactics.
- Project aims to explore the evolution, strategy, and influence of each operating system.
- Apple’s Vertical Integration vs. Windows widespread compatibility
- Apple’s Architectural Shifts vs. Windows System Architectural Loyalty

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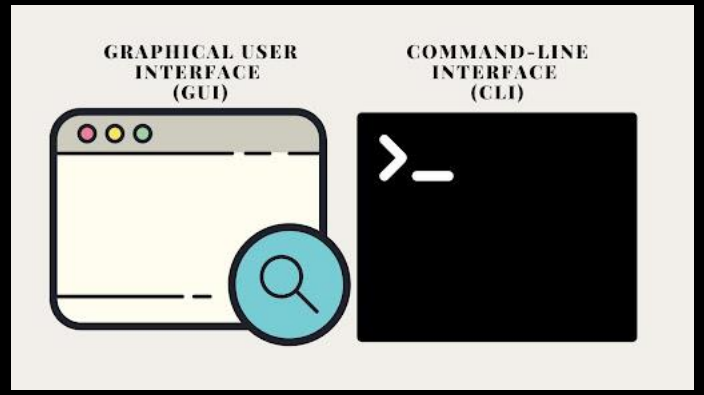
Operating System [Melvyn]

Operating System (OS): Manages hardware and software resources — memory, CPU, input/output devices, and storage.



Key Managers:

- **Memory Manager:** Allocates/deallocates RAM.
- **Processor Manager:** Allocates CPU time and tracks processes.
- **Device Manager:** Connects and allocates system devices.
- **File Manager:** Manages file access, permissions, and storage.
- **Network Manager:** Oversees network connectivity and resource sharing.

User Interface:

- **Graphical User Interface (GUI):** Mouse/touch-based, user-friendly.
- **Command Line Interface (CLI):** Text-based, powerful for advanced users.

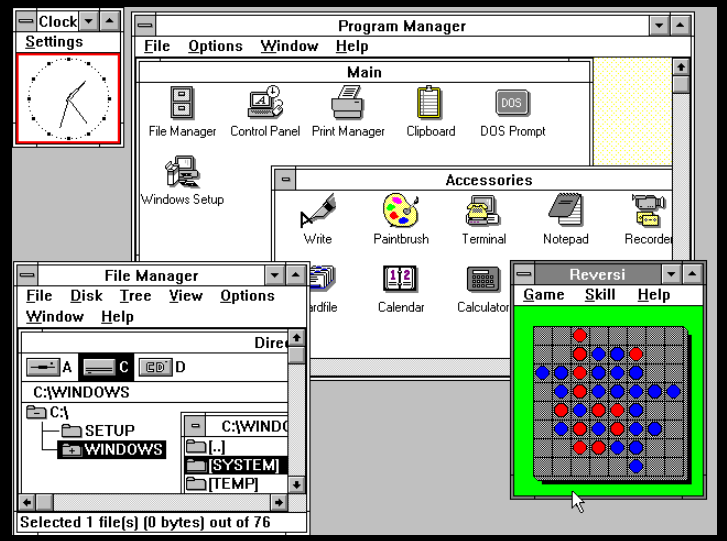
Historical Overview — Early Development of PCs

- Prior to the PC, computers were almost strictly found in places of business, government, and academia.
- Several factors gave rise to the PC in the 1970s:
  - Invention & mass production of the microprocessor
  - General reductions in the cost of computer logic & memory circuitry
  - Improvements in operating speed due to shortened electrical path lengths
  - Reductions in power requirements
  - Reductions in hardware size
- These factors represent the realization of Moore’s Law, which incentivized businesses to enter the quickly growing PC market.

Historical Overview — Emergence of Apple & Microsoft

- Apple & Microsoft achieved their early success in the PC market through notably different strategies.
  - Apple's blend of custom hardware and custom software in its Apple II computer made it stand out among competitors, not only due to features but to cost saving methods made possible by their approach as well.
  - Microsoft made an agreement with the well-established and successful IBM to produce the operating system for its first PC, allowing it to be promoted to the public in ways that would have otherwise not been possible for such a small company.
    - When IBM clones emerged, Microsoft benefitted from the terms of its IBM contract which allowed the marketing of its operating system to other companies.
- The open-ended designs of the Apple II and original IBM PC were factors in their success.
  - In subsequent years, Apple would cease designing computers in this way while Microsoft continues to target open-ended IBM PC compatible computers.
- The release of the IBM PC quickly resulted in operating system market dominance for Microsoft's MS-DOS, a status that persists to this day with Windows.

Origins of macOS and Windows [Melvyn]



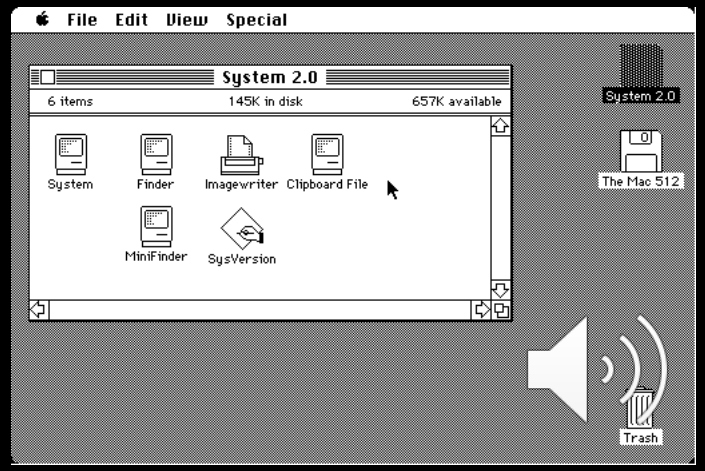
The Origins of macOS and Windows:

Windows (Microsoft)

- First launched in 1985 as a GUI extension for MS-DOS.
- Major milestones:
  - **Windows 3.0:** File Manager, Program Manager, dynamic interface.
  - **Windows 95:** Built-in internet browser (Internet Explorer), mainstream internet adoption.
  - **Later versions:**
    - **XP:** Stability and user experience.
    - **8:** Touchscreen interface.
    - **11:** Modernized aesthetics, interface improvements.

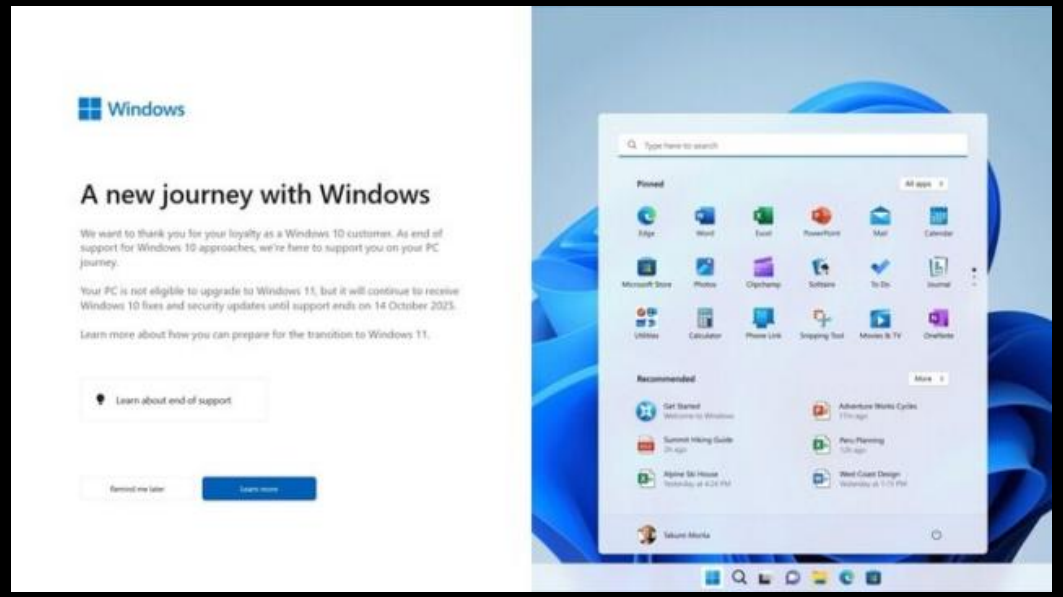
Origins of macOS and Windows [Melvyn]

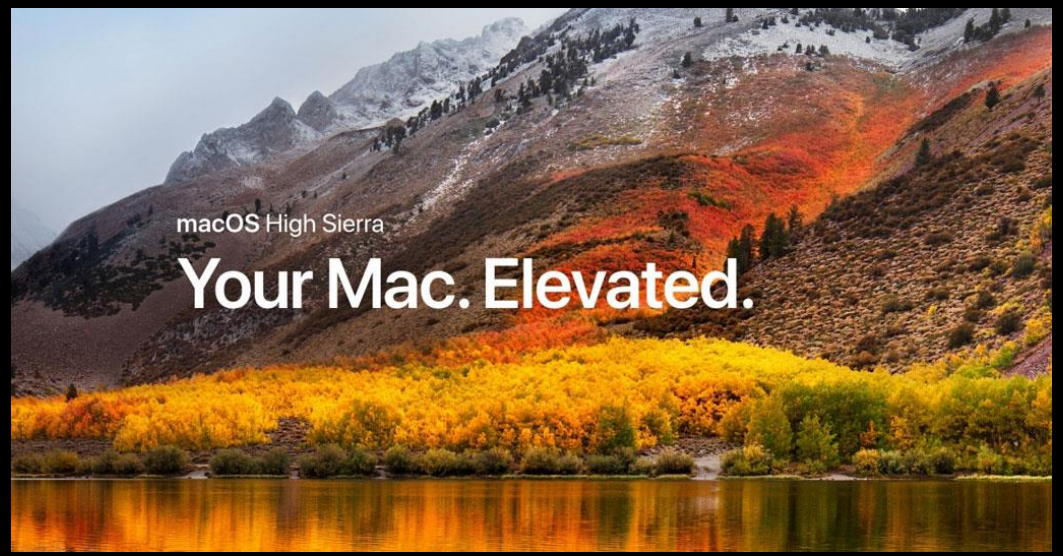
- **macOS (Apple):**
  - Launched in 1984 for Apple's own computers.
  - Exclusive to Apple hardware (optimized performance and reliability).
  - Evolution:
    - Transitioned to a Unix-based system.
    - Focused on aesthetics, security, and seamless user experience.
    - Integrated features: Spotlight, Time Machine, ecosystem connectivity (iPhone, iPad, Apple Watch).



Competitive Analysis

- Windows dominates global market share
- Apple utilizes vertical integration vs. Microsoft supports widespread hardware compatibility.





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System Architecture

- Distinct Processor & Design Philosophy
- macOS transitioned from Intel x86 to Apple ARM chips
- Windows remains loyal to the x86, gradual expansion into ARM
- Apple is Unix-based, Windows has a Hybrid NT Kernel

User Preferences & Adaptation Analysis [Melvyn]

Windows:

- Powers **70%+** of global desktop OS market.
- **Windows 10:** ~54% of Windows users (1+ billion active users).
- **Windows 11:** ~42% and growing; Windows 10 support ends October 2025.

macOS:

- Holds **~15%** of global desktop market.
- **100 million active users** globally.
- Growth fueled by Apple's **M-series ARM chips** (efficiency + performance).

Key Trends:

- Windows remains dominant in businesses and general users.
- macOS steadily expanding due to **hardware/software optimization** and **user experience focus**.

User Preferences & Adaptation Analysis [Melvyn]

Factors that influence OS adoption:

- User Experience
- Cost
- Hardware
- Ecosystem integration
- Support
- Security & Privacy

User Preferences & Adaptation Analysis [Melvyn]

Strategic Reasons Behind User Preference

macOS:

- Seamless integration with Apple devices (Handoff, ecosystem).
- Intuitive, consistent user experience and premium design.
- Strong security, regular updates, long device support.

- **Windows:**
  - Versatile across many hardware brands and price points.
  - Highly customizable to user needs.
- Strong enterprise and business support.

Windows 11

New Technologies [Melvyn]

AI and Machine Learning in macOS and Windows

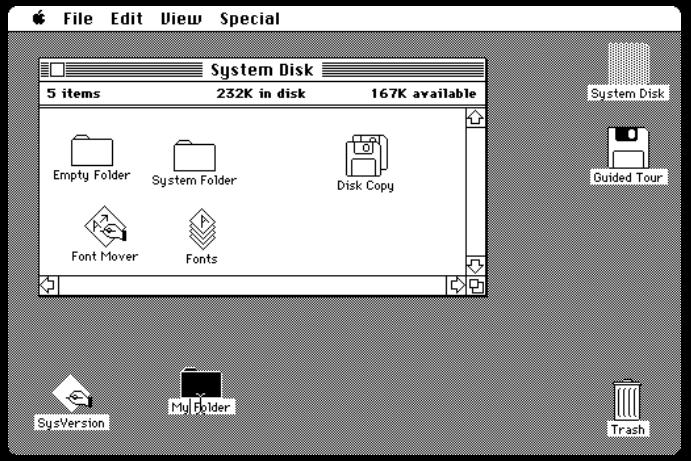
macOS:

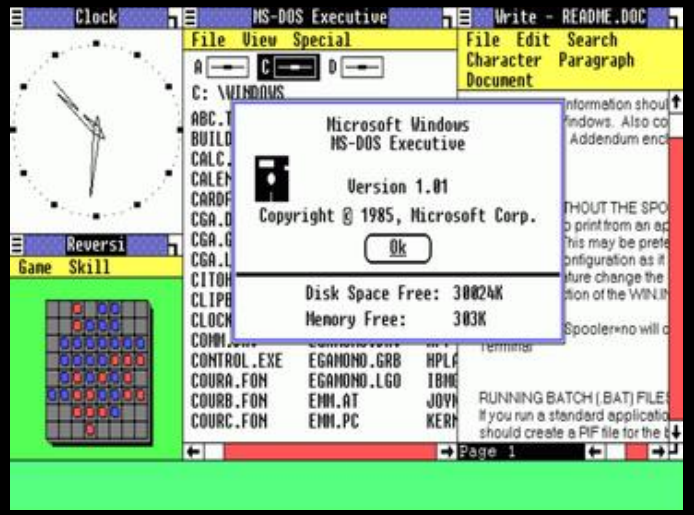
- **Apple Intelligence (2024):**
  - On-device + Private Cloud Compute (encrypted).
  - Natural language understanding, AI text editing, upgraded Siri (ChatGPT integration).

- **Windows:**
  - **Copilot in Windows 11:**
    - AI help with emails, documents, settings.
    - **Windows Recall:** Searchable timeline of user activity.
  - AI also integrated into Microsoft Office and Azure AI.

Select Innovations In Modern Computing — Graphical User Interfaces (GUIs)

- After seeing the original implementation of a GUI on a Xerox Alto, Apple's Steve Jobs was inspired to bring it to the public via the Apple Lisa in 1983.
  - The mouse, which was used on the Alto to interact with the GUI, was also brought to the Lisa.
  - Apple's GUI did not reach wide audiences with the Lisa, but it did when the Macintosh was released with a much lower price tag the next year.
- Much like Jobs, Microsoft's Bill Gates was inspired to bring GUI to his next operating system in the form of Windows in 1984.
  - Although Windows would not become Microsoft's most popular OS until the 1990s, it would eventually introduce even more PC users to the GUI than Apple.





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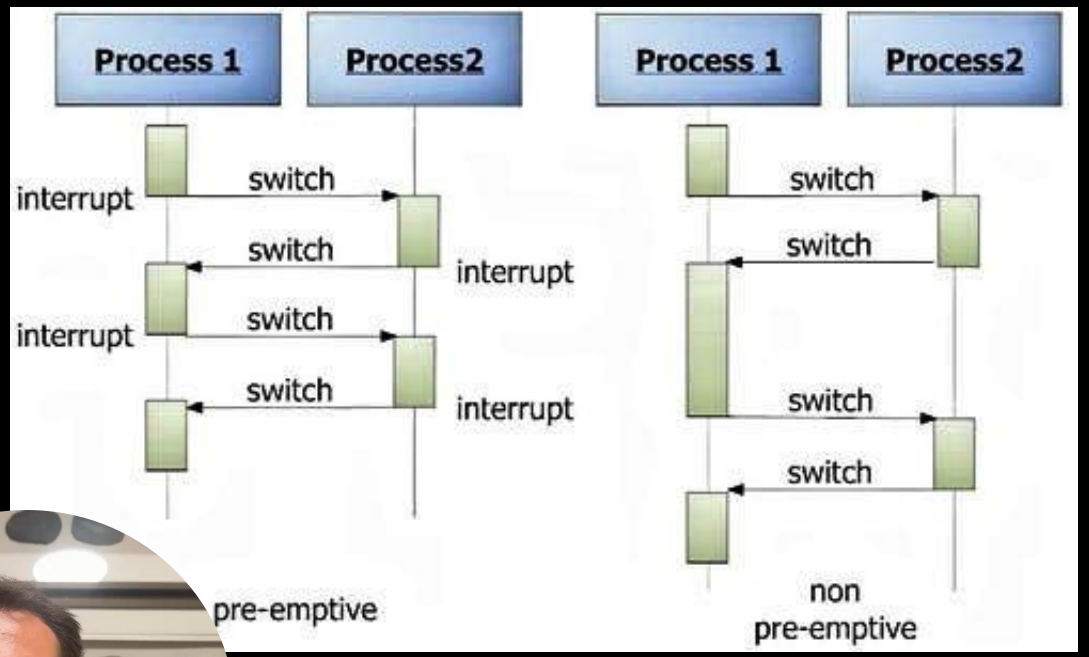
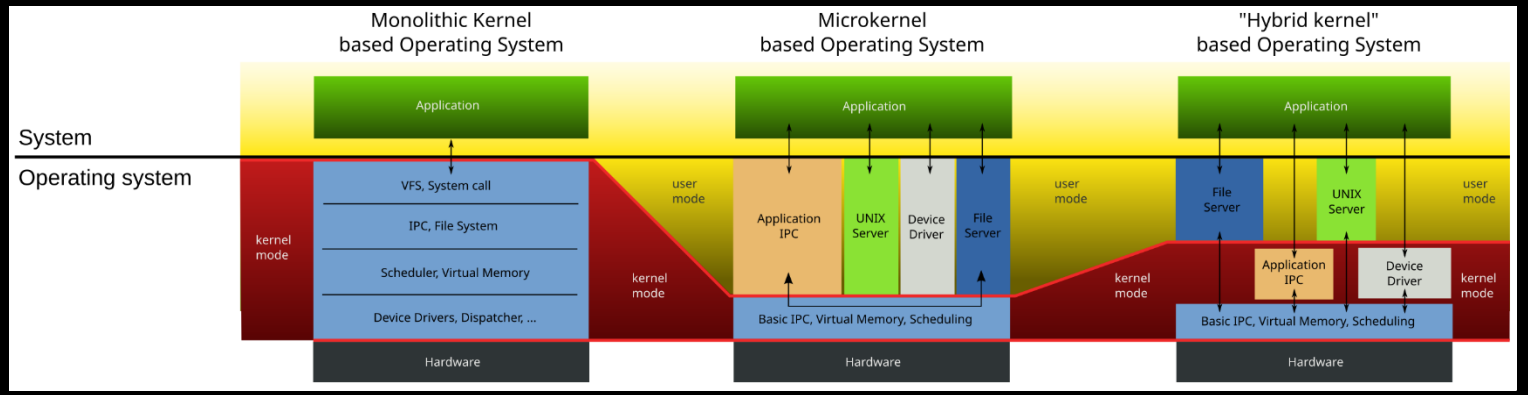
Select Innovations In Modern Computing — Preemptive Multitasking



- The paradigm shift from command-line interfaces to GUIs with windowed applications increased the demand for performant multitasking.
- Preemptive multitasking offered the solution by allowing the OS to interrupt a process in favor of a higher-priority one.
    - Microsoft implemented it in Windows 95, which was also its first widely popular version.
    - Apple relied on the older cooperative multitasking until 2001.

Select Innovations In Modern Computing — Hybrid Kernel Architectures

- Hybrid kernel architectures seek a balance between the performance monolithic kernels and the maintainability of microkernels.
- Windows and MacOS both shifted to a hybrid architecture in 2001 and continue to use it to this day.
    - Its use has since expanded into other forms of computer operating systems such as iOS.



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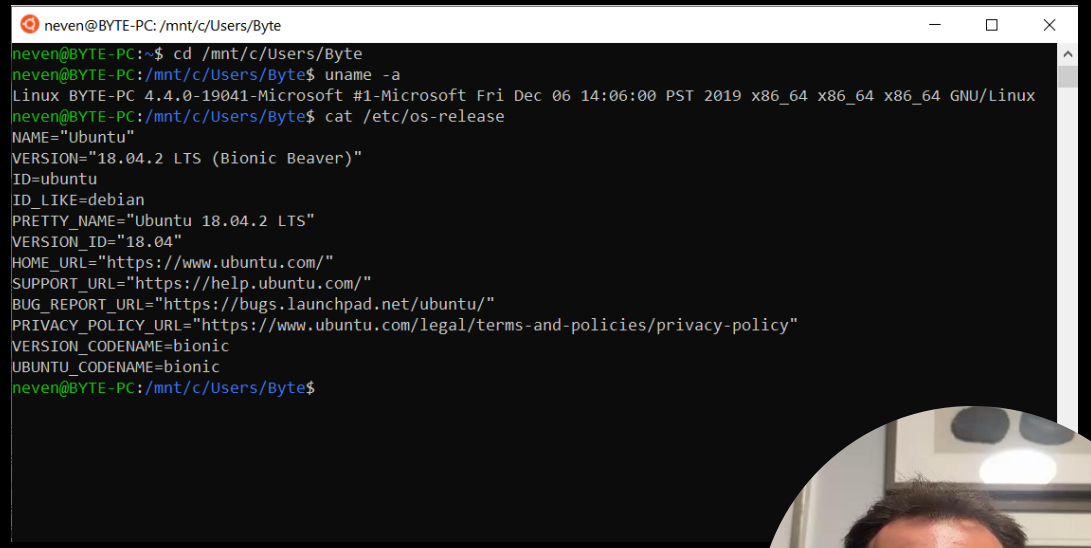
Select Innovations In Modern Computing — Integrated Linux Virtual Machines

- Unlike macOS and Linux, Windows is not POSIX-compliant.
  - This limits the degree to which cross-platform software can be written and tested on Windows.
- To improve the developer experience on Windows, Microsoft integrated a Linux shell via Windows Subsystem for Linux.
  - Unlike a traditional virtual machine, there is virtually no overhead and less setup is required.



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Select Innovations In Modern Computing — Continuity Features

- Apple has developed many proprietary communications protocols for its devices over the years, describing the tools that use them as “Continuity features.”
- The ability to seamlessly connect between devices in various ways has become strongly associated with Apple in recent years due to their focus on Continuity.
    - An Apple executive has described Continuity as “…the embodiment of how we design software at Apple.”

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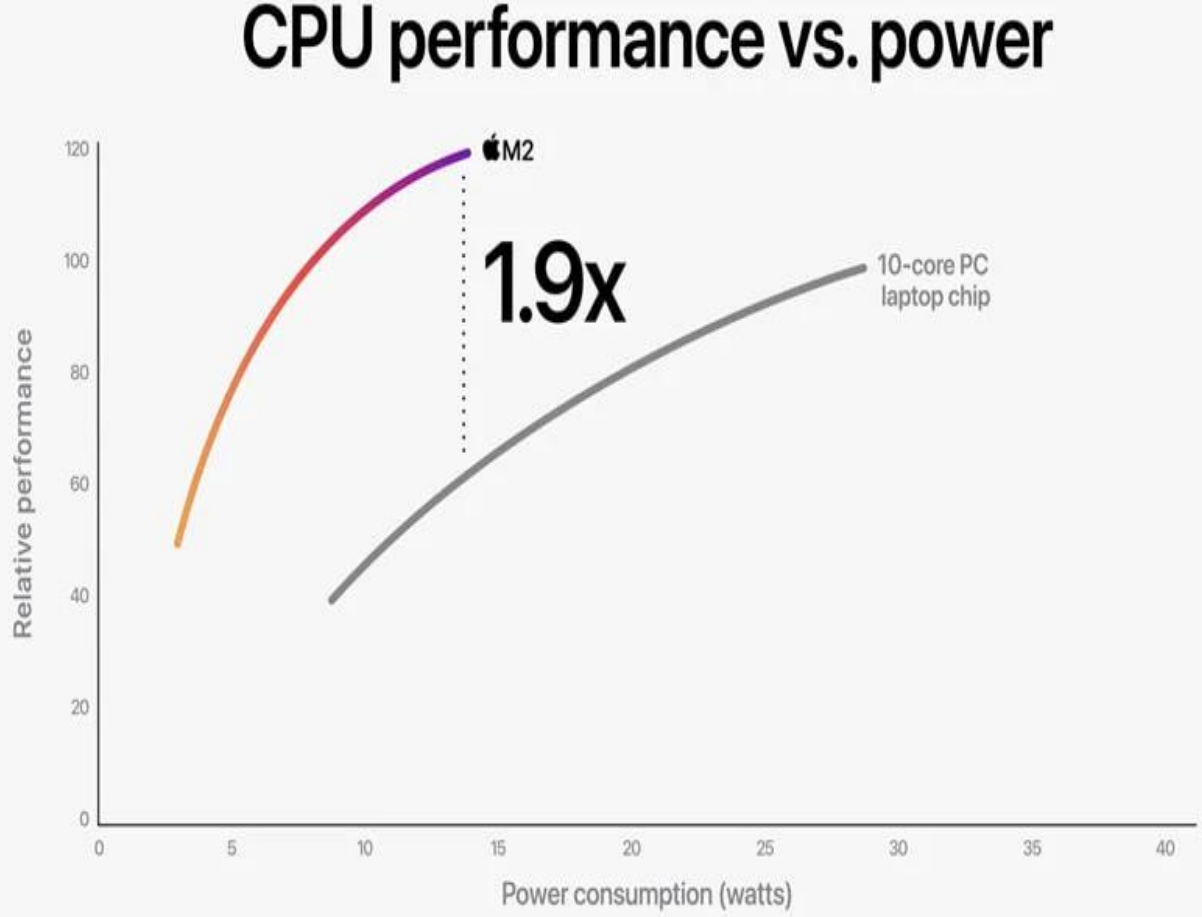
Architectural Shifts in OS

X86 = POWER

ARM = EFFICIENCY

Apple:
Full shift to ARM (M1, M2, M3)

Microsoft:
Challenges with Windows on ARM



Tactical Moves: Different Paths

APPLE	MICROSOFT
Closed ecosystem	Open ecosystem
ARM-only devices	Dual x86/ARM
Private AI	Cloud-first AI

Microsoft

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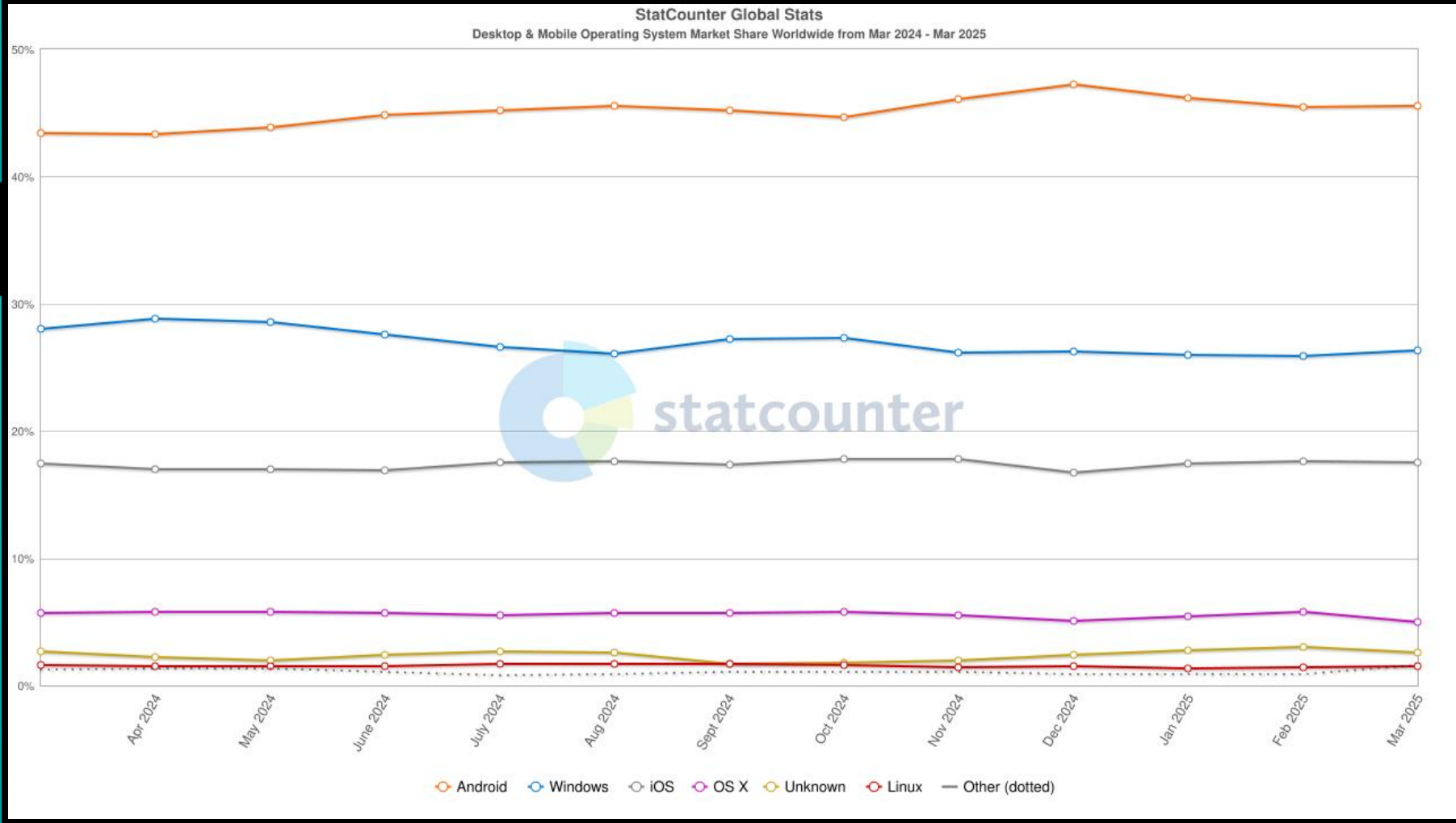
GROWTH PATTERNS 2024–2025

Windows 25.8%
vs
macOS 4.9%

Windows remains dominant.
vs
Mac growth in premium segment.



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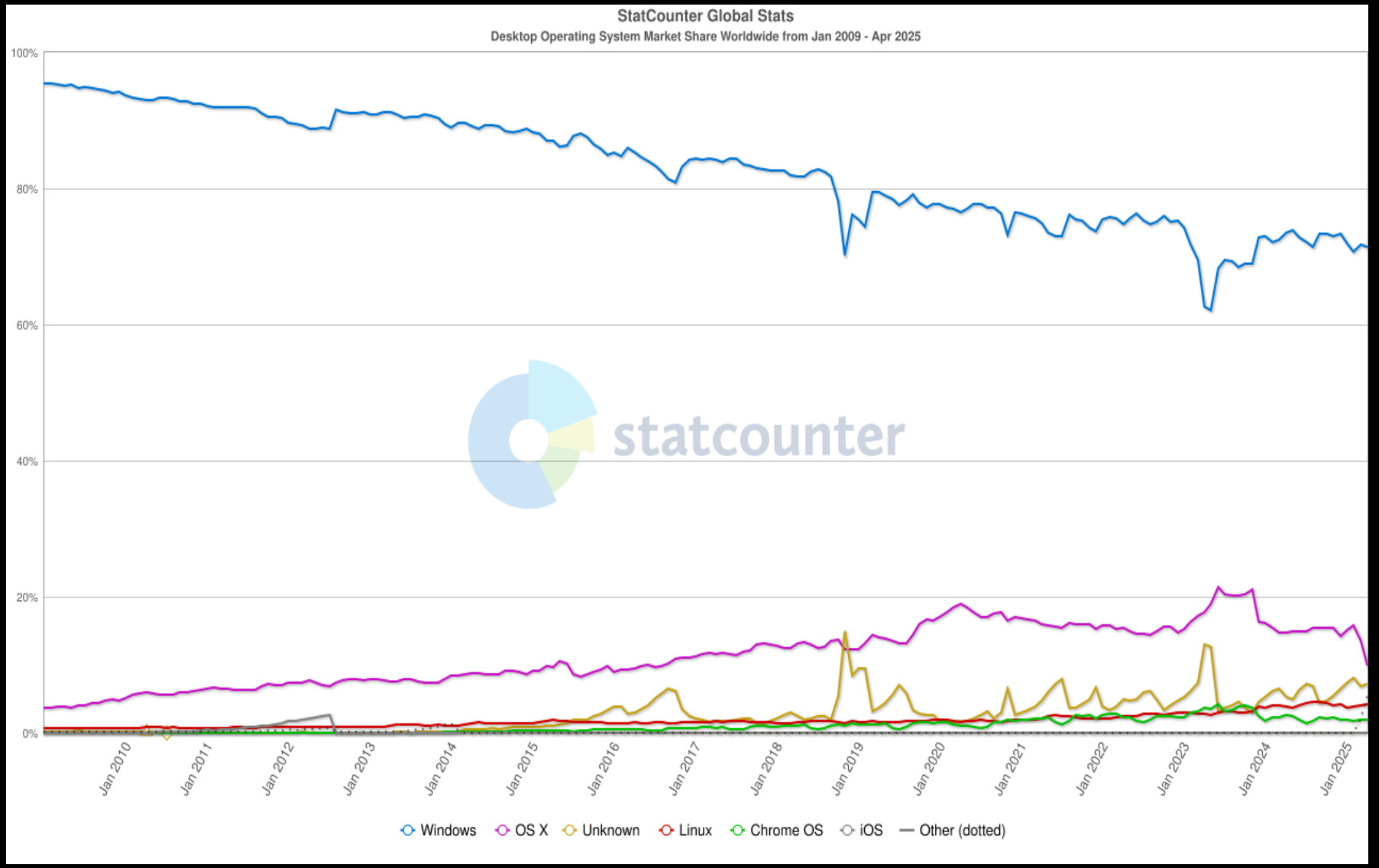
MARKET SHARE DYNAMICS AND TRENDS

Microsoft:

OEM partnerships mass market

Apple:

Control + Premium strategy



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Building Market Positions: Microsoft vs Apple

Microsoft

- Focused on accessibility and scalability.
- The company distributed Windows through Original Equipment Manufacturers to establish itself as the dominant operating system for personal and commercial use.
- The company established various products alongside services which served multiple client requirements.
- Expanded influence through strategic acquisitions like LinkedIn and Skype.
- Azure cloud solutions have received substantial financial investment from the company.
- The company reached success by establishing itself among mainstream audiences through flexible product offerings.

Apple

- Apple established a prioritized closed ecosystem that controlled both platform hardware and software components. The company focused on creating designs that were both excellent and easy for users to operate.
- Apple concentrated its focus on exceptional design development combined with intuitive interface management.
- The company developed deep emotional loyalties through branding and product experiences.
- The company recovered from its crisis by introducing the iMac along with the iPod and iPhone.
- The "Think Different" marketing campaign promoted innovative thinking and lifestyle branding.
- The company succeeded through premium positioning and exclusivity.

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Conclusion

Both operating systems influence future innovations

Distinct approaches to market success

Windows expands on hardware support and AI integration

macOS prioritizes performance improvements via integration

Presented by Shariah A.