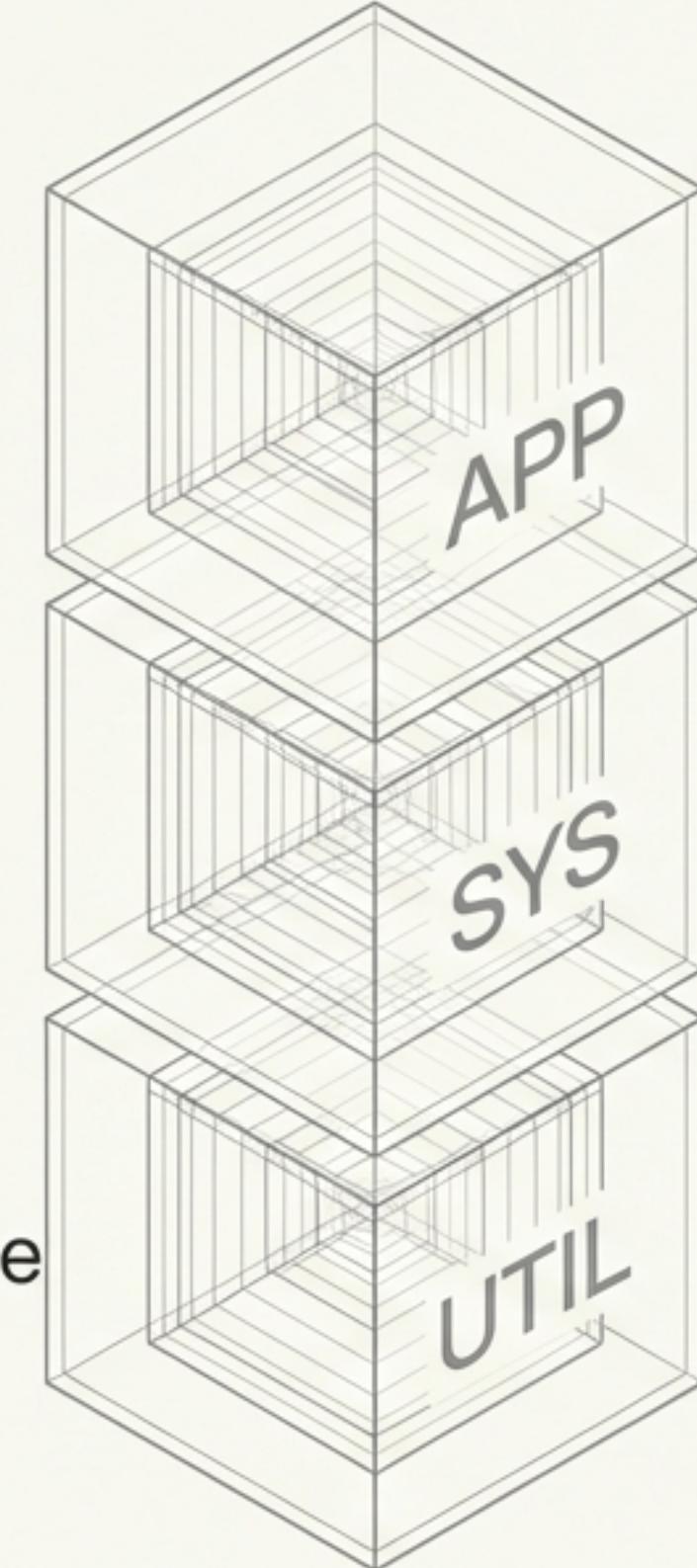


The Software Stack

Architecture of the Modern Interface

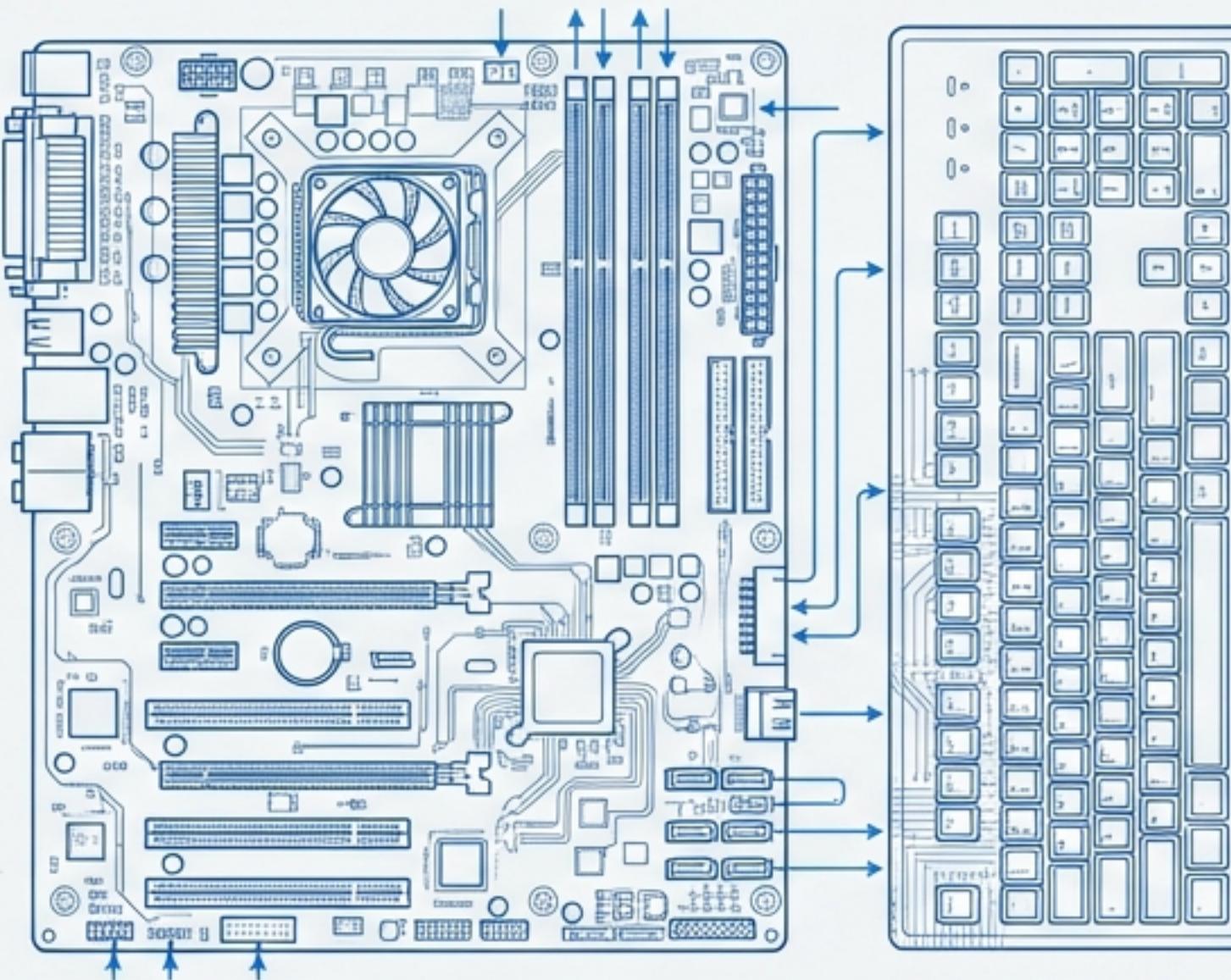


Deconstructing Systems, Applications, and Utilities.

A comprehensive guide to the invisible instructions that bridge silicon and human intent.

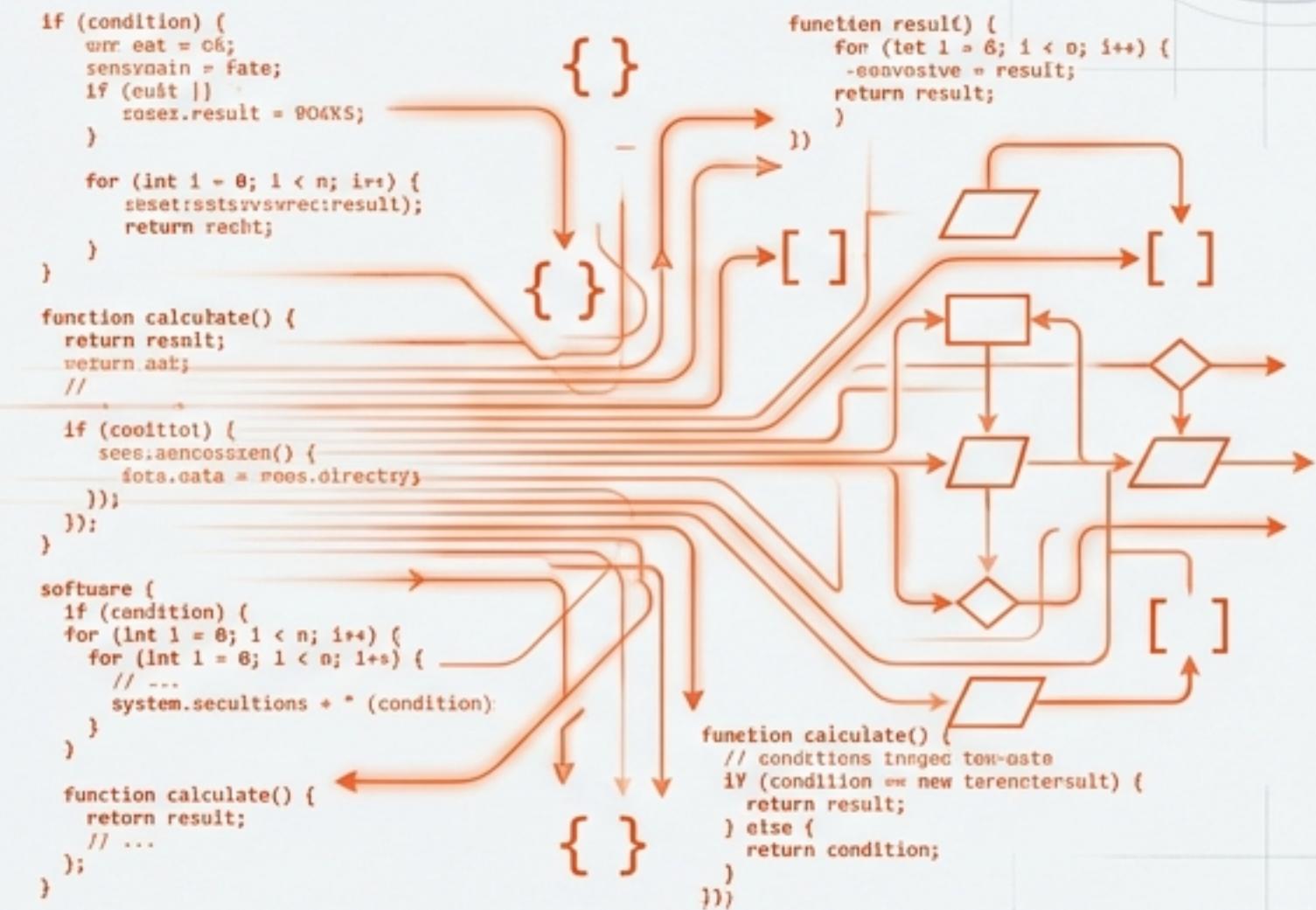
The Duality of Computing: Hardware and Software

The Physical



Hardware. The physical machinery. The components you can touch: Keyboard, Screen, CPU, Storage. **Role:** Capability.

The Instructional



Software. The set of programs and instructions that tell the computer what to do. **Role:** Direction.

**Core Definition: Software is the bridge.
Without instructions, silicon is inert.**

The Software Hierarchy

We classify software into three architectural tiers.

Application Software

JOB. Does a task for the user.

System Software

RUN. Operates the computer.

Utility Software

MAINTAIN. Keeps the system healthy and secure.

The Mnemonic:
Job, Run,
Maintain.

System Software: The Platform

Application Software

JOB. Does a task for the user.

System Software

RUN. Operates the computer.

Utility Software

MAINTAIN. Keeps the system healthy and secure.

System software controls the computer and manages its hardware. It provides the essential platform that application software needs to run.

The Operating System (OS)

The software that facilitates interaction between the user, applications, and the device.



Windows



macOS



Linux



Android



iOS



ChromeOS

Critical Insight: Without an OS, most computers would be very difficult to use, and most applications would not run.

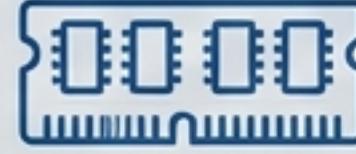
Core Functions of the Operating System

User Interface (UI)



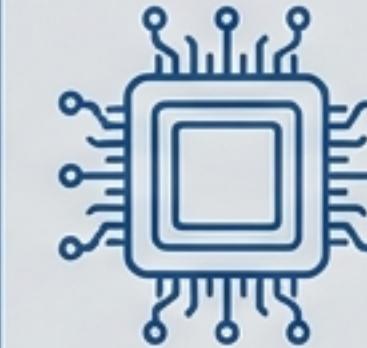
Allows interaction via icons and menus (GUI) or text commands (CLI).

Memory Management



Manages RAM, sharing it between programs to keep operations running smoothly.

CPU Management



Schedules processing time so multiple programs can run simultaneously.

File Management



Handles saving, opening, and organising data on storage.

I/O Control



Manages input/output devices like keyboards, mice, printers, and screens.

Security



Manages user accounts, passwords, permissions, and basic protection.

The Bridge: Drivers and Hardware

How the OS speaks to specific components.



Definition: A driver is a specific piece of software that helps the OS communicate with a specific hardware device.

Utility Software: The Guardians



Distinction: While the OS runs and controls the computer, Utility software helps to maintain, manage, or protect it.

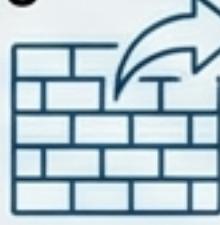
Operation

Utilities often run in the background or are deployed occasionally to ensure the device works properly.

The Nuance

Some utilities come built into the OS (e.g., Windows Security), but functionally, they remain utility software.

Utilities I: Security and Protection

Anti-virus / Anti-malware	Firewall
Scans for and protects against harmful software and malicious code. 	Blocks suspicious network traffic to prevent unauthorised access to the system. 
Backup Software	Encryption
Copies files to separate storage so they can be recovered in case of data loss. 	Scrambles data using mathematical algorithms to keep it private and unreadable to hackers. 

Utilities II: Optimization and Maintenance



Compression Tools

Zip/unzip files to reduce file size and save disk space.



Disk Clean-up

Scans for and removes temporary files and 'junk' data to free up storage.



Disk Defragmentation

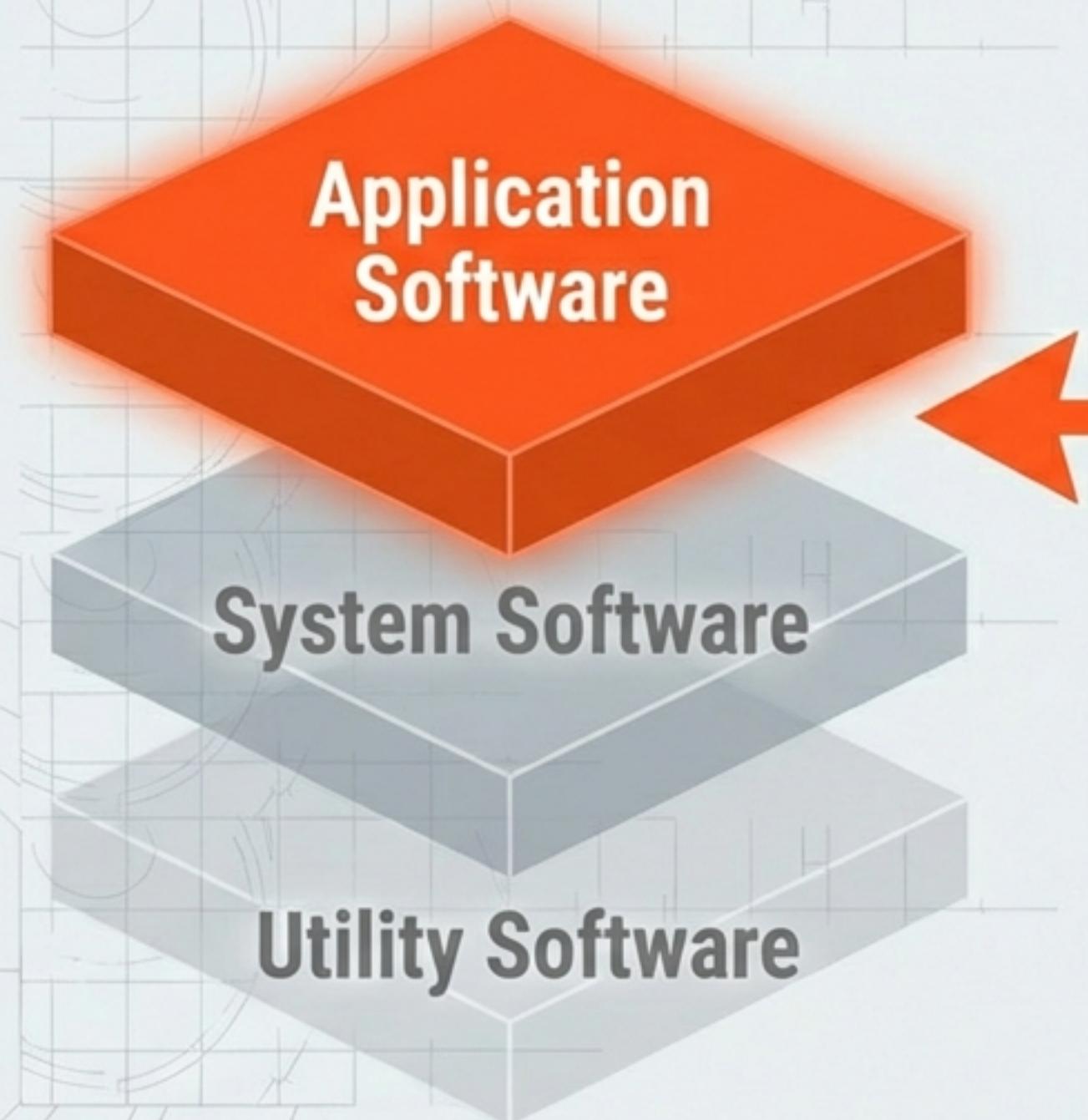
Reorganises files on older Hard Disk Drives (HDDs) to group data together for faster access speeds.



System Monitoring

Tracks CPU, RAM, and storage usage to diagnose performance issues.

Application Software: The Interface



Software designed specifically to help the user complete a task.



The Golden Rule:

Application software usually runs ON TOP of the operating system. Unlike system software (which serves the machine), application software serves the human.

The Application Landscape

Productivity & Creativity

- Word Processing: Word, Google Docs
- Spreadsheets: Excel, Sheets
- Presentations: PowerPoint, Slides
- Graphics: Photoshop, Canva
- Video/Audio: CapCut, Audacity

Communication & Access

- Video Conferencing: Teams, Zoom
- Messaging: WhatsApp
- Web Browsers: Chrome, Edge, Safari

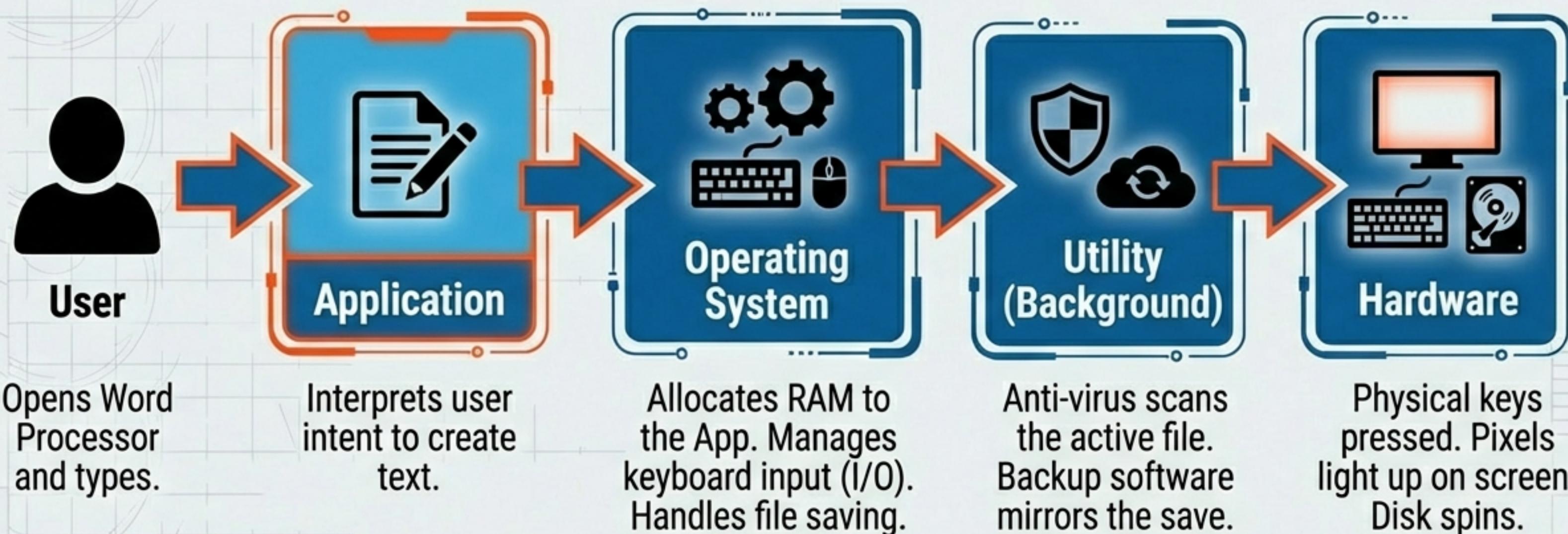
Entertainment

- Gaming: Minecraft, Roblox
- Streaming Apps

Nuance: Web Applications. Software that runs inside a web browser is still classified as Application Software.

The Ecosystem in Action

Scenario: Tracing the Data - Typing a Document



Debugging Mental Models

-  The OS is an App.
-  No. The OS is system software. Apps run on top of it.
-  A file is software.
-  A file is data (passive). Software is the program (active) used to open it.
-  Utilities are the same as the OS.
-  The OS runs the computer; Utilities maintain and protect it.
-  All software must be installed.
-  Web apps run in browsers but remain Application Software.

System Diagnostics: Knowledge Check

Definitions

1. Define Application Software and give one example.
2. Define System Software and name one Operating System.

Functions

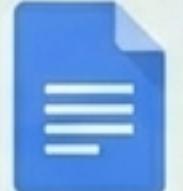
1. State three jobs of an Operating System.
2. What is the specific function of a device driver?

Classification

Classify the following as App, System, or Utility:

Google Docs, Windows, Anti-virus, Photoshop, File Compression.

Architecture Summary

	Function	Examples
Application Software	Does a job for the user.	 Word, Chrome, Games. 
System Software	Runs the computer and hardware.	 Windows, macOS, Drivers. 
Utility Software	Maintains and protects the system.	 Anti-virus, Compression, Backup. 

Hardware provides the capability. Software provides the direction. The seamless interaction of these layers allows complex hardware to serve human needs.