

# Newnal aios: An Operating System for the AI Era

**aios is an operating system that manages personal data and runs AI agents.**

This document uses the standard definition of an operating system to set out the conditions an operating system must meet in the AI era, shows that existing operating systems (iOS, Android, macOS, Windows) meet those conditions only at the level of the device and the app, and explains how Newnal aios meets them at the level of the individual.

## 1. Definition of an Operating System

Standard textbooks define an operating system as follows.

- Tanenbaum, Modern Operating Systems: An operating system has two roles. As an extended machine, it hides the complex details of the hardware and provides programs with clean abstractions such as processes and files. As a resource manager, it allocates processors, memory, storage, and I/O devices among programs and protects them.
- Silberschatz, Operating System Concepts: An operating system is a program that manages the computer hardware, provides a basis for application programs, and acts as an intermediary between the computer user and the computer hardware.

Three conditions are common to both definitions.

| Condition           | Description                                                                                                                         |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Resource management | Allocates resources among programs and protects them. Resources include processors, memory, and devices, as well as files and data. |
| Access control      | Determines and enforces which programs and users may access which resources.                                                        |
| Execution platform  | Provides the abstractions and interfaces that application programs need, and runs them.                                             |

The definition is equally clear about what it does not require. It does not require an operating system to boot the device with its own kernel, it does not limit managed resources to hardware, and it does not exclude an operating system that runs on top of other software. Android runs on the Linux kernel and is nonetheless an operating system. The test is whether the three conditions are met.

## 2. Applying the Definition to Existing Operating Systems

Taking iOS and Android as examples, the definition applies as follows. macOS and Windows share the same structure.

| Condition           | iOS                                                                               | Android                                                             |
|---------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Resource management | Hardware of Apple devices and files on the device                                 | Hardware of devices from many manufacturers and files on the device |
| Access control      | App sandbox; user permission for device resources such as the camera and contacts | App sandbox; user permission for device resources                   |
| Execution platform  | Runs apps                                                                         | Runs apps                                                           |

Access control in existing operating systems reaches only the resources on the device. Once an app sends a user's data to the app company's server, that data is outside the operating system's management and control. The same person's data is scattered across apps and stored on each company's server, and no operating system manages it as a resource.

## 3. Conditions for an Operating System in the AI Era

For an AI agent to serve one person, three things are needed. The person's data must be gathered in one place, the person must be able to decide how far the data may be used, and the agent must be able to act on the data first, without waiting for a command. Existing operating systems were built to meet all three conditions at the level of the device and the app, not at the level of the person.

| Condition           | Level at which existing OSes operate  | Level an AI agent requires               | What existing OSes lack                                                                                                              |
|---------------------|---------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Resource management | Hardware and files on the device      | All of one person's data                 | One person's data is scattered across apps on each company's server, and the operating system does not manage it.                    |
| Access control      | App permissions for device resources  | Agent permissions for a person's data    | Once data leaves the device for a company server, the operating system's control ends. The company decides how far the data is used. |
| Execution platform  | Apps that wait for the user's command | Agents that propose first, based on data | An app sees only its own company's server data and cannot reach the person's data on other companies' servers.                       |

There are three ways to build an AI agent on an existing operating system: build an agent that sees only one app's data, have the person hand over data each time it is needed, or gather data from many apps on one company's server. The first does not know the whole person, so the service is not personalized. The second acts only on command, so it cannot propose first. The third concentrates personal data in one company, which raises the risk of leaks and misuse. None of the three is resolved unless the operating system takes on resource management and access control at the level of the person.

This is not a flaw in existing operating systems. iOS, Android, macOS, and Windows were designed to manage resources on the device and to run apps, and they still do. The AI era has introduced a new resource, personal data, and a new kind of program to run, the AI agent. An operating system is now needed to manage both at the level of the person.

## 4. The Shift in Interface

The eras of computing have been divided by the operating system's interface. Consumers experienced new computing through the interface, not through the kernel or the way resources were managed.

| Era                | Operating system | Interface           | How it works                                                            |
|--------------------|------------------|---------------------|-------------------------------------------------------------------------|
| Personal computing | macOS, Windows   | Graphical interface | The person gives commands with a mouse and keyboard.                    |
| Mobile             | iOS, Android     | Multi-touch         | The person chooses an app and gives commands by touch.                  |
| AI                 | aioS             | AI interface        | AI proposes first, based on the person's data, and the person approves. |

The interfaces of the first two eras are both user interfaces: the person commands and the machine performs. The aioS interface runs in the opposite direction. AI proposes first, based on the person's data, and the person only approves.

For AI to propose first, it must know all of the person's data, and the person must have permitted that access. Both conditions hold only when the operating system manages personal data as a resource and controls access to it. This is why the voice assistants of existing operating systems operate within the data on the device and their own company's services. The AI interface is a result made possible by aioS being an operating system, and it is where the user experiences aioS as a new one.

## 5. Applying the Definition to aioS

| Condition           | aioS                                                                                                                                                                                                                      |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resource management | Personal data. Each person's data is gathered under the person's own name in a personal data node, one per person, and opened only with the person's key. On dedicated devices, aioS manages the device hardware as well. |
| Access control      | Permission from the person, identified by DID. AI agents call only the data within the permitted scope, and the records of permission and access are kept on a public ledger (InfraBlockchain).                           |
| Execution platform  | Runs AI agents. Provides the AI interface, in which AI proposes first based on the person's data, and the Agent Place, where verified agents are distributed and run.                                                     |

aioS meets all three conditions. It differs from existing operating systems in that the managed resource is personal data, access control reaches wherever the data is used rather than stopping at the device, and what runs is AI agents rather than apps. That aioS is an operating system follows from the definition itself.

Stated in one sentence according to the definition: aioS is an operating system that manages personal data as a resource, controls access on the basis of the person's permission, and runs AI agents.

## 6. Differences from Existing Operating Systems

|                                   | Existing operating systems                    | aios                                                     |
|-----------------------------------|-----------------------------------------------|----------------------------------------------------------|
| Managed resource                  | Device hardware and files on the device       | Personal data (and device hardware on dedicated devices) |
| Reach of access control           | Within the device                             | Wherever the data is used                                |
| Who grants access                 | The device user                               | The person, identified by DID                            |
| Where permission records are kept | On the device                                 | On a public ledger outside any company                   |
| What runs                         | Apps                                          | AI agents                                                |
| Interface                         | A user interface in which the person commands | An AI interface in which AI proposes first               |

### Managed resource

For AI to serve one person, that person's data must be gathered under one person. Apps on existing operating systems keep the data they collect on their own servers, so the condition is never met. aios gathers scattered data into the personal data node under the person's own name and manages it as an operating system resource.

### Access control

On existing operating systems, the user logs in to an app and the app takes the user's data. How far the data is used after that is decided by the company that made the app. In aios the direction is reversed. An AI agent requests access from the person, and the person permits it. Data does not leave the node; the agent calls only the permitted scope. Newnal calls this arrangement, in which the agent requests access from the person, Reverse Login.

### What runs

An app works only when the user opens it and gives a command. An AI agent proposes first, based on the data the person has permitted, and the person only approves. Companies do not need to build every function themselves. Verified agents build and expand services on the data the person has permitted.

## 7. Anticipated Objections and Answers

### **An operating system must boot the device with its own kernel.**

The definition does not make kernel ownership a condition. Android is an operating system that runs on the Linux kernel. On dedicated devices, aios boots the device with its own kernel; on devices with an existing OS, it leaves hardware management to that OS. In both cases it meets the three conditions in the same way.

### **Anything that runs on top of an existing OS is an app.**

What separates an app from an operating system is its role, not where it runs. An app receives resource management, access control, and an execution platform from the operating system; an operating system provides them. aios manages the personal data node as a resource, controls access to it, and provides an execution platform for other programs, namely AI agents. None of these is something an app does.

**Personal data is not hardware, so it is not an operating system resource.**

The resources in the definition are not limited to hardware. The file system is a core component of every operating system, and files and data are resources the operating system manages. The personal data node that aios manages is a form of storage resource.

**Managing data is the job of a database or a cloud platform.**

A database stores and retrieves data, but it does not provide an execution platform for other programs, and it bases access control on the accounts of the company that owns it. aios bases access control on the person's DID and permission, and runs AI agents on top. A database is a component used inside aios, not a substitute for it.

**An AI agent is just another name for an app.**

An app takes the user's command and works on data held on the company's server. An AI agent calls the data within the scope the person has permitted, proposes first, and cannot use data outside that scope. Because what runs behaves and accesses data differently, the execution platform must differ as well. The execution platform aios provides handles the agent's access request, the person's permission, and the record of both, and it does not exist in existing operating systems.

**The voice assistants of existing operating systems are also AI interfaces.**

The voice assistants of existing operating systems take the person's command and carry it out within the data on the device and their own company's services. They are a form of user interface in which the person commands, and their reach matches the reach of the resources the operating system manages. An interface that proposes first, based on all of a person's data, is possible only when the operating system manages personal data as a resource, and the aios AI interface runs on that basis.

**"Operating system" is a marketing term.**

The test is the definition, not the wording. The table in Section 5 shows, condition by condition, that aios meets the three conditions. If an objection holds that one of the three is not met, that condition is the place to have the discussion.

**8. Deployment**

|                          | Devices with an existing OS | Dedicated Newnal aios devices |
|--------------------------|-----------------------------|-------------------------------|
| Hardware management      | Existing OS                 | aios                          |
| Personal data management | aios                        | aios                          |
| Access control           | aios                        | aios                          |
| Running AI agents        | aios                        | aios                          |

On devices with an existing OS, aios leaves hardware management to that OS and runs on top of it as a security layer for personal data. On dedicated devices, aios runs as a standalone operating system that manages the hardware as well. In both cases, the way aios manages personal data, controls access, and runs AI agents is the same.

## 9. Components of aios

The four components of aios correspond to the three conditions of an operating system as follows.

| Condition           | Component       | Function                                                                                           |
|---------------------|-----------------|----------------------------------------------------------------------------------------------------|
| Resource management | My Data         | Gathers scattered personal data under the person's own name.                                       |
| Access control      | InfraBlockchain | Verifies every record of ownership, permission, and access on a public ledger outside any company. |
| Execution platform  | AI Interface    | AI proposes first, based on the gathered data, and the person only approves.                       |
| Execution platform  | Agent Place     | Verified agents expand services on the data the person has permitted.                              |

### In One Sentence

Where existing operating systems take the person's command and run apps, aios is an operating system for the AI era: it manages personal data, controls access on the basis of the person's permission, and runs AI agents through an interface in which AI proposes first.

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**References** Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems, 4th ed., Pearson, 2015, Chapter 1. / Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 10th ed., Wiley, 2018, Chapter 1.