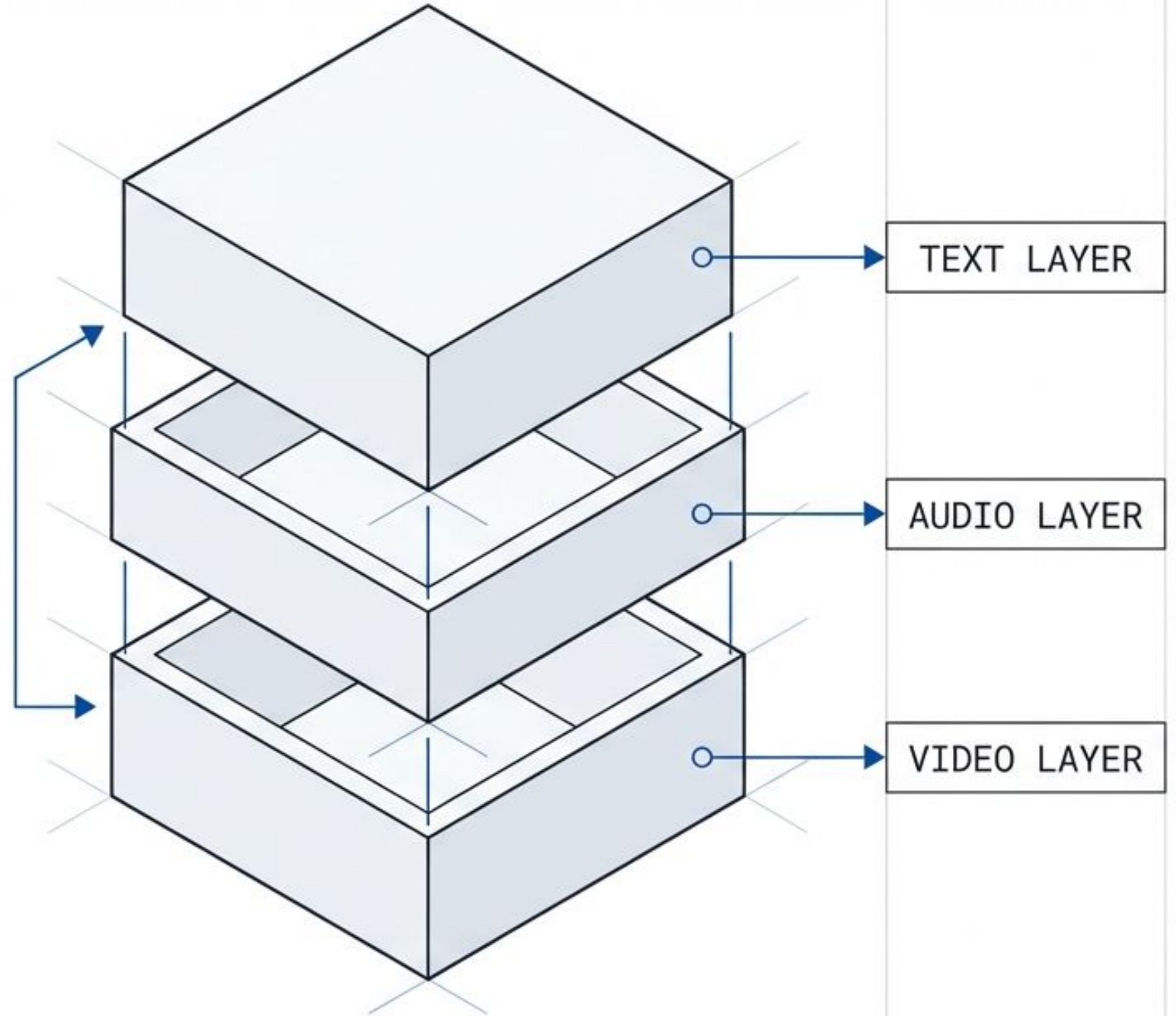


MULTIMEDIA SYSTEMS

ARCHITECTURE & ENGINEERING

Unit 1: Introduction | Principles,
Components, and Global Structure



DEFINING THE INTERFACE

- * **DEFINITION:** Integration of multiple media elements (text, graphics, audio, video) controlled by a computer.
- * **GOAL:** To convey information or create an interactive experience
create an interactive experience.

CORE SECTORS

EDUCATION:

Interactive labs & e-learning (Coursera).

MEDICINE:

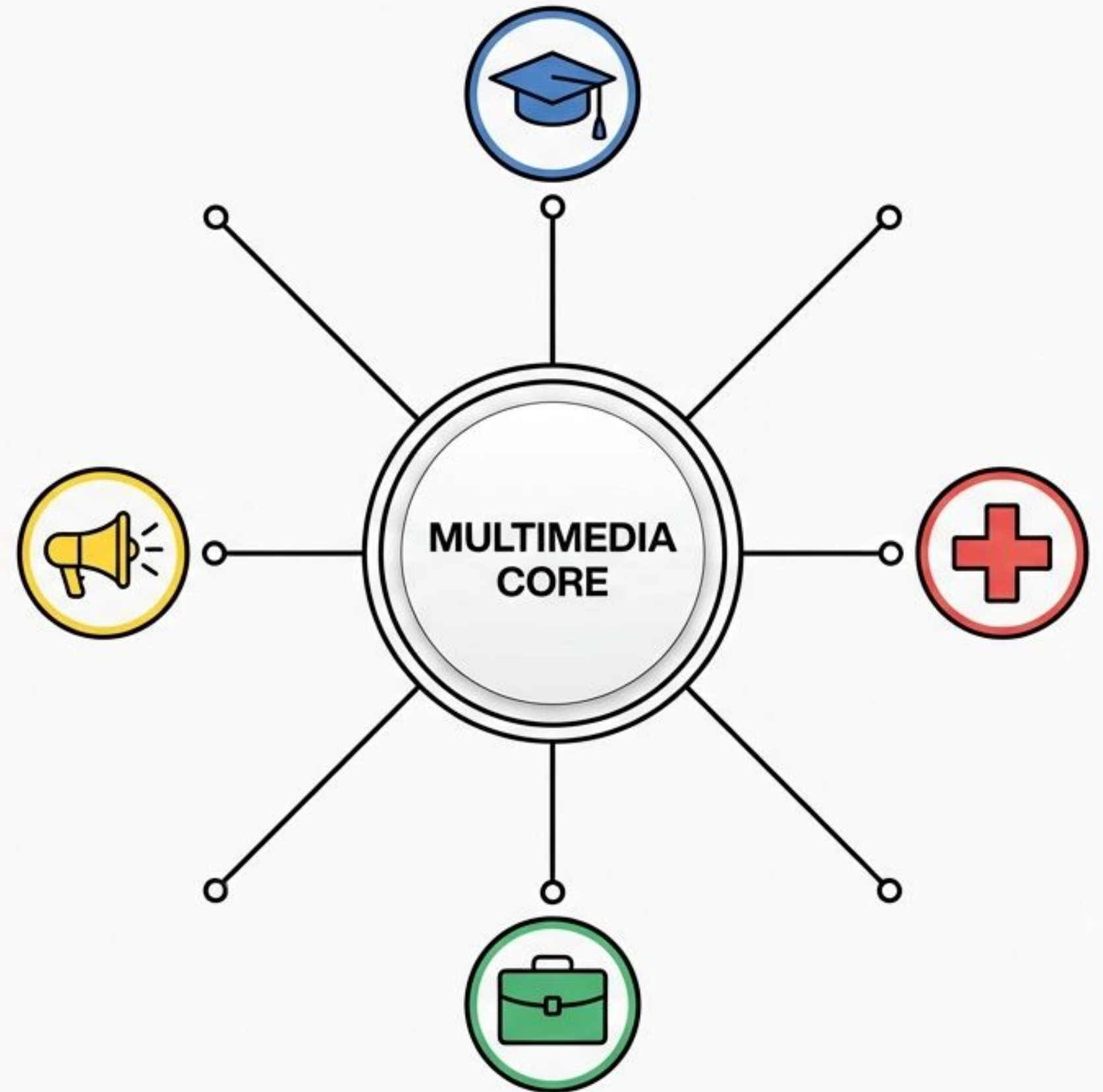
3D visualization & telemedicine.

BUSINESS:

Virtual training & conferencing.

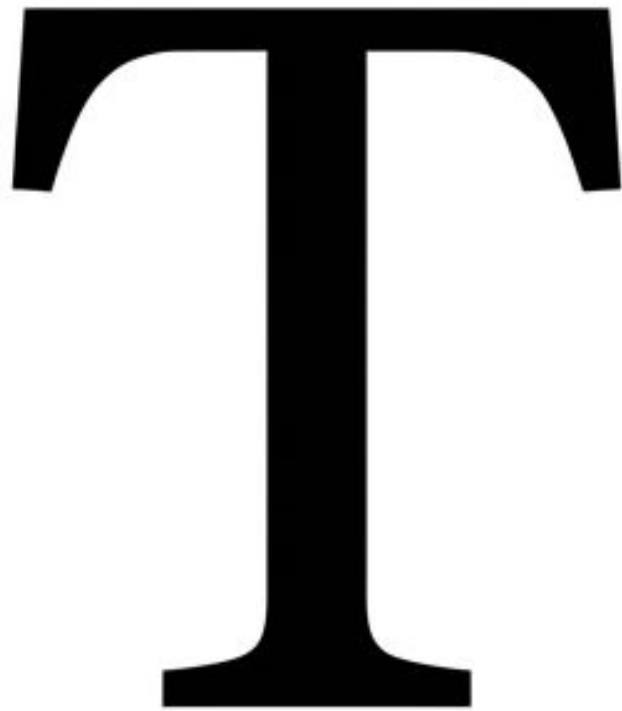
GOV/ADS:

Digital signage & simulators.



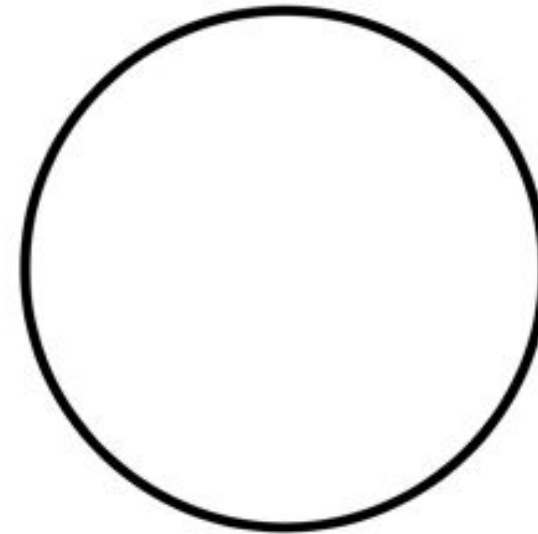
BUILDING BLOCKS I: STATIC MEDIA

TEXT

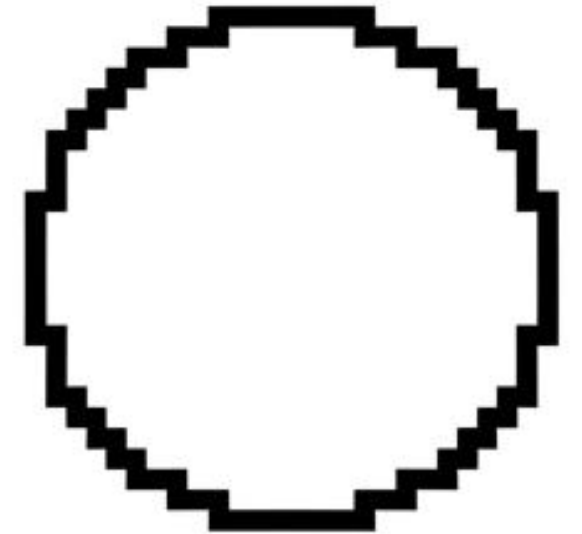


The fundamental unit for precision and logic.
Formats: Plain (.txt), Rich (.rtf), Hypertext (HTML).

GRAPHICS



VECTOR
(Math-based)



BITMAP
(Pixel-based)

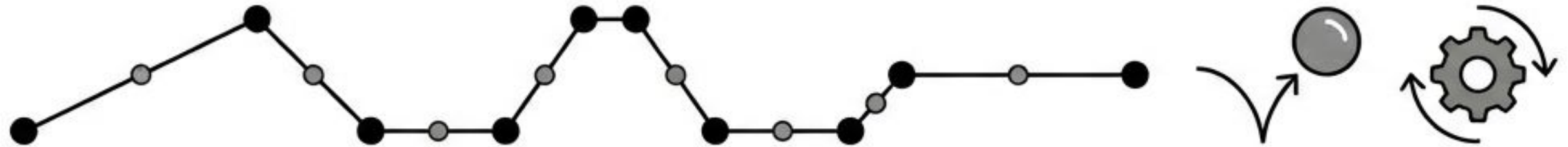
Digital representation of visual info.
BITMAP: Raster/Pixel-based. Best for photos.
VECTOR: Math-based paths. Best for logos.

BUILDING BLOCKS II: DYNAMIC MEDIA

VIDEO:
Captured Reality



ANIMATION:
Synthetic Motion



AUDIO:
Mood & Clarity



Essential for
notifications, music,
and voice-overs.

Sequence of frames
capturing real-life
processes.

Illusion of motion from
generated drawings.

CLASSIFYING THE MEDIUM

A medium is a means of communication. In CS, we classify based on function.

NOTE: The 'Representation' layer is where the analog-to-digital shift occurs.

1. PERCEPTION (Sight, Hearing)

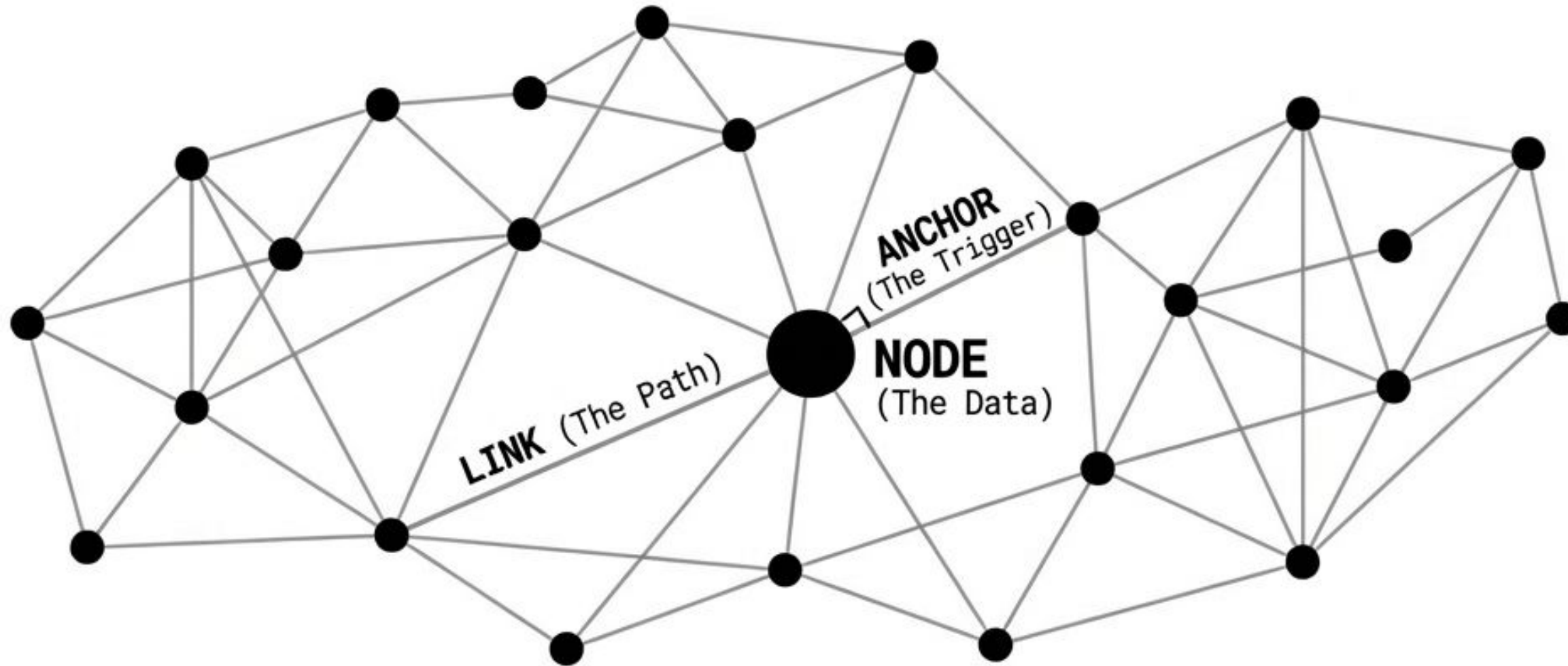
2. REPRESENTATION (ASCII, JPEG, MP3)

3. PRESENTATION (Monitor, Speaker)

4. STORAGE (HDD, SSD)

5. TRANSMISSION (Fiber, Wi-Fi)

GLOBAL STRUCTURE: HYPERMEDIA



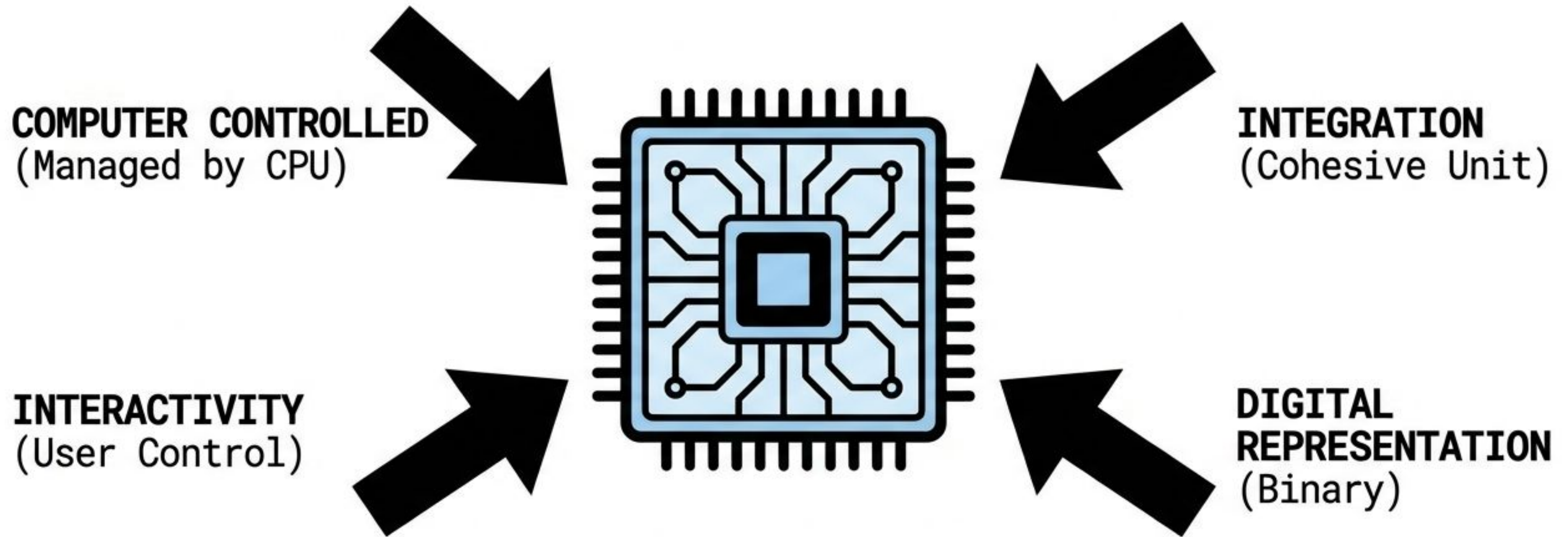
CONCEPT: Non-linear organization (unlike a book).

HYPERTEXT: Linked text structure.

HYPERMEDIA: Extension including images/video.

EXAMPLE: Clicking a photo (Anchor) to open a video (Node).

THE MULTIMEDIA SYSTEM



DEFINITION: A system capable of creating, integrating, storing, and presenting 2+ media types.

SYSTEM CHARACTERISTICS

PROCESSING POWER



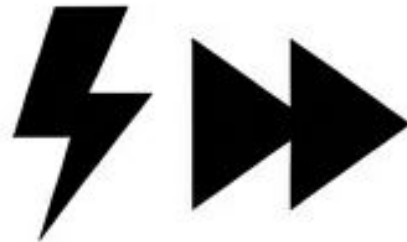
High CPU capabilities for encoding/decoding (e.g., Rendering 4K).

STORAGE CAPACITY



Massive space required for media files (HDD/SSD).

ACCESS SPEED



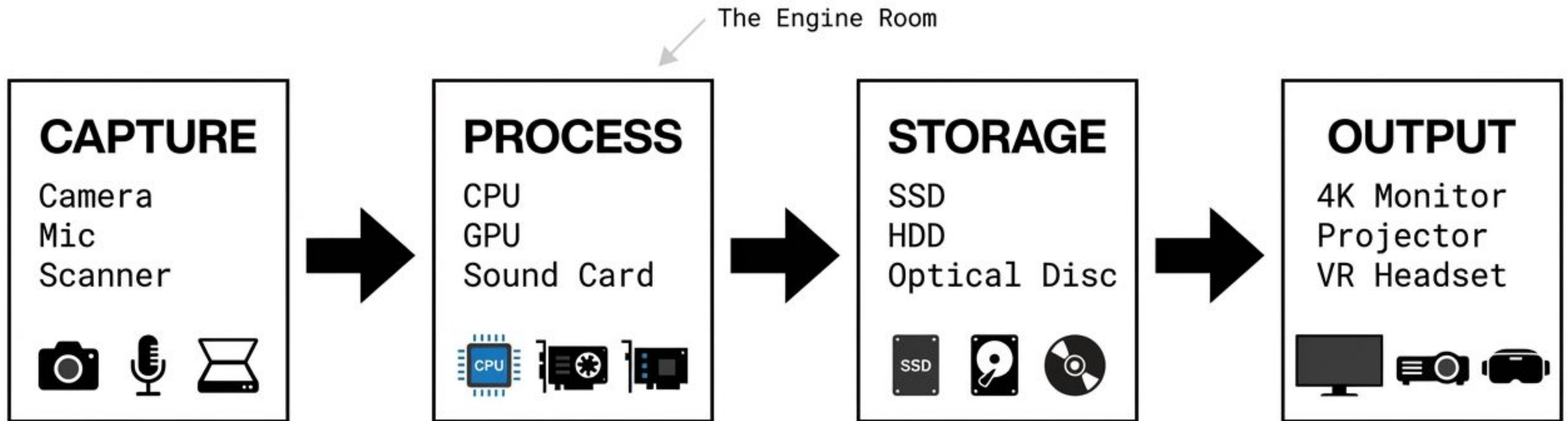
Fast retrieval times to prevent playback lag.

BANDWIDTH & OS

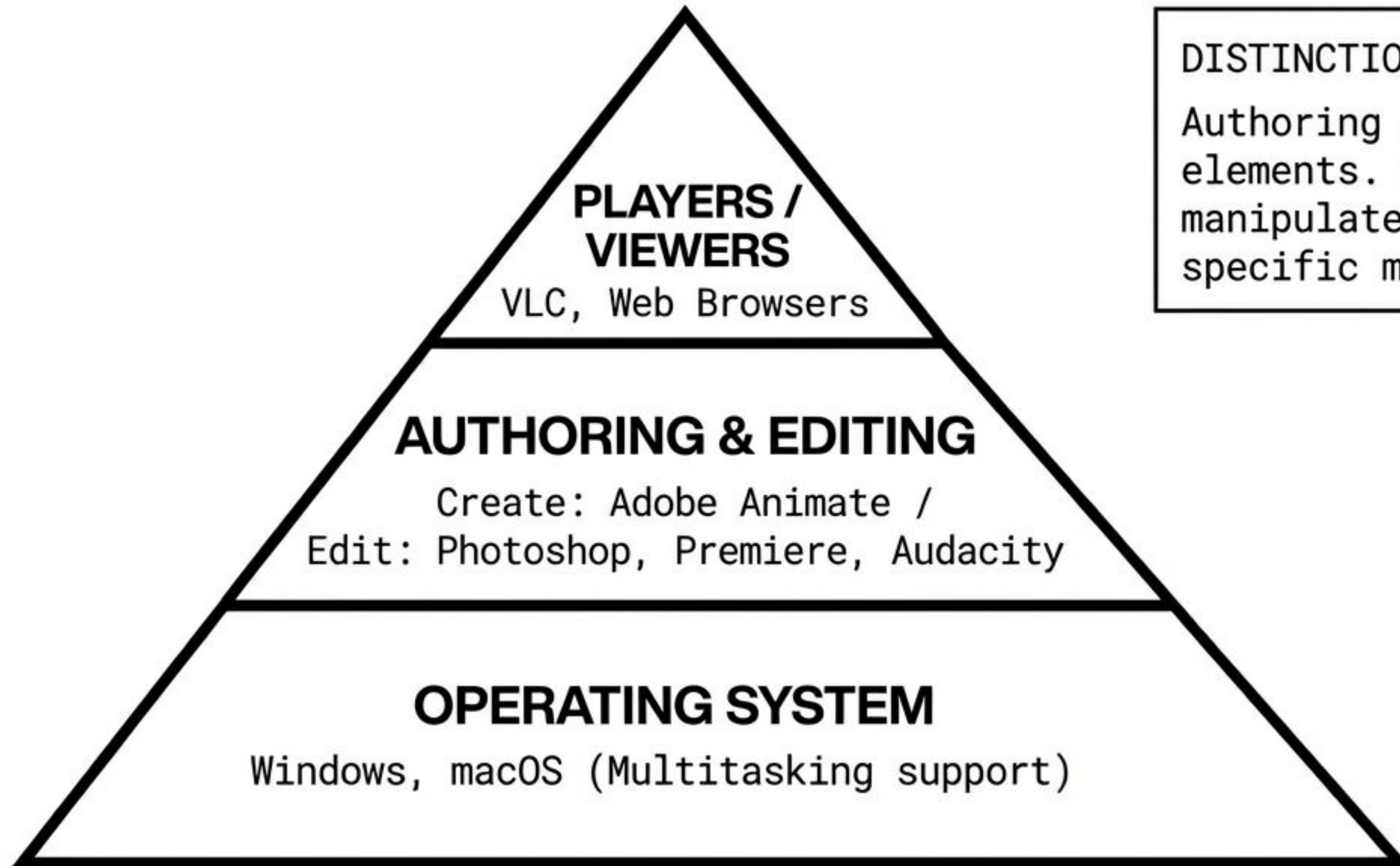


High-speed channels + Multitasking OS.

COMPONENT LAYER: HARDWARE



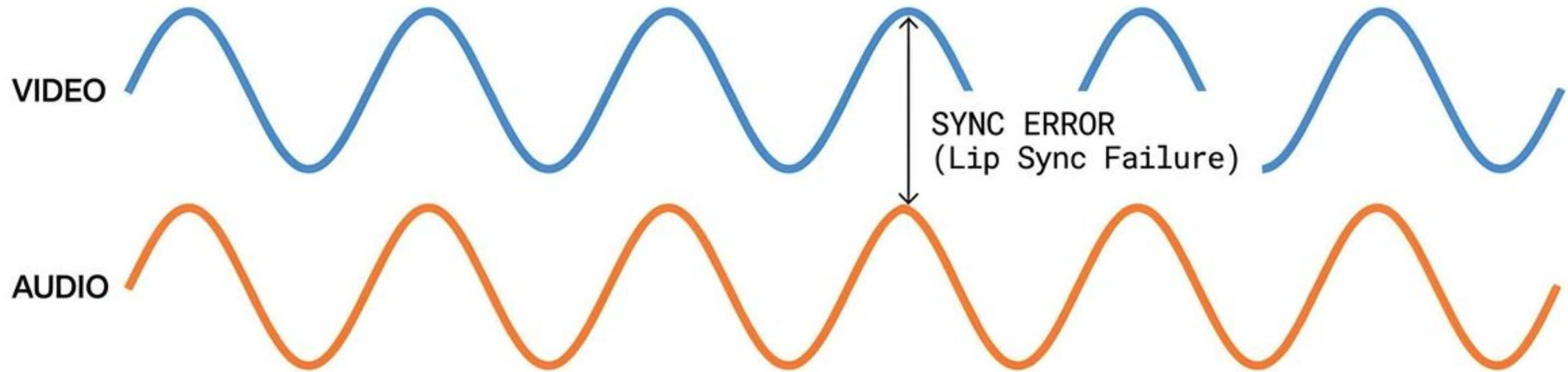
COMPONENT LAYER: SOFTWARE



DISTINCTION:

Authoring combines elements. Editing manipulates specific media.

CRITICAL CHALLENGES: SYNC & DATA



SYNCHRONIZATION: Temporal coordination of different media streams.

DATA MANAGEMENT: Indexing and searching unstructured data (e.g., finding a specific moment in billions of YouTube hours).

CRITICAL CHALLENGES: BANDWIDTH & QOS

HIGH BANDWIDTH

Video consumes massive data pipes.
Benchmark: 25 Mbps minimum for stable 4K streaming.



QUALITY OF SERVICE (QoS)

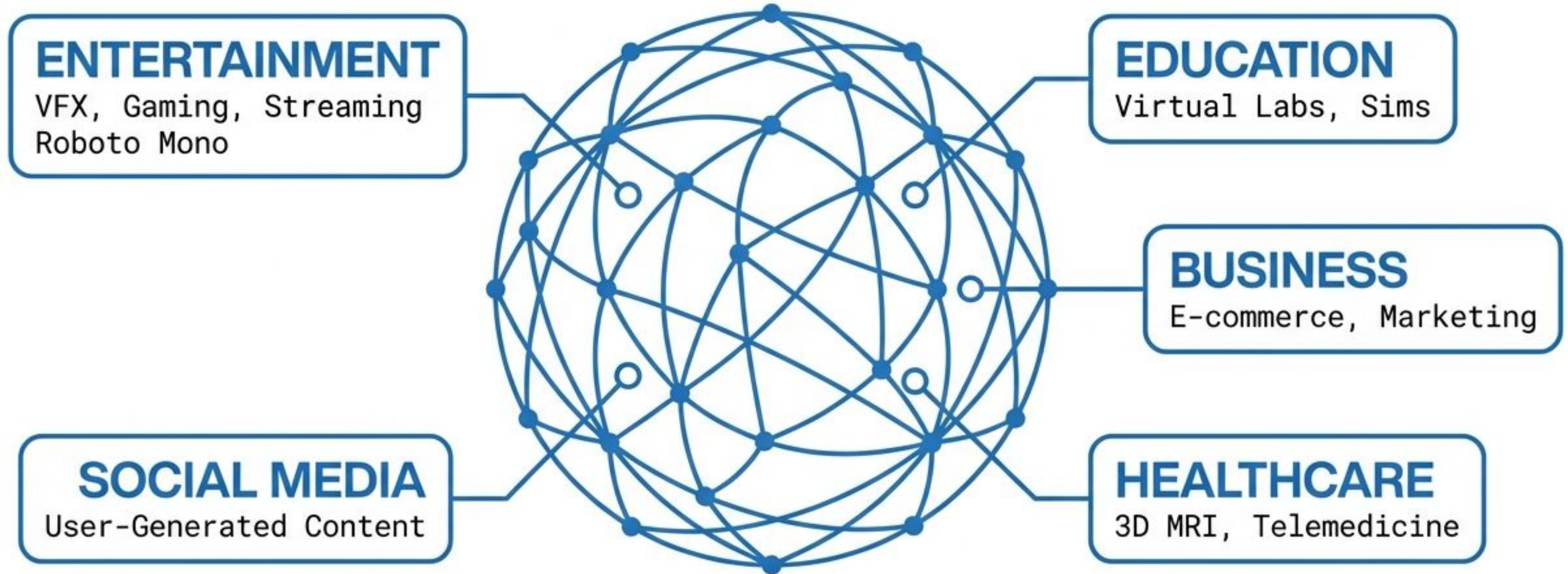
Guaranteeing performance (low jitter/delay). Context: Critical for live video calls.



COMPRESSION (CODECS)

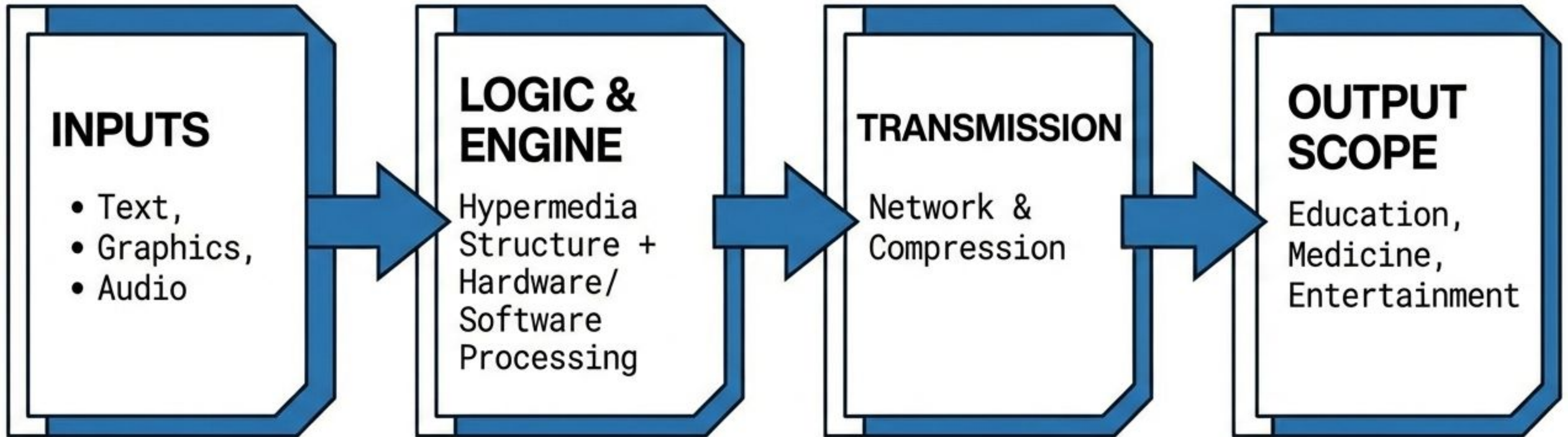
Algorithms to shrink file size. Essential for storage and transmission efficiency.

THE SCOPE OF MULTIMEDIA



EMERGING: VR/AR (Immersive Interaction)

SYSTEM ARCHITECTURE: SYNTHESIS



CORE TERMINOLOGY (EXAM RECAP)

MULTIMEDIA

→ Combination of elements + Computer Control.

HYPERMEDIA

→ Linked non-linear media (Nodes & Links).

SYNCHRONIZATION

→ Time-coordination of streams.

QoS

→ Quality of Service (Network performance).

BITMAP vs VECTOR

→ Pixel vs Math-based graphics.

INTERACTIVITY

→ User control over the flow.