Infrared Communication

(Short-Range Wireless Technology)

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What is Infrared?

Electromagnetic Spectrum

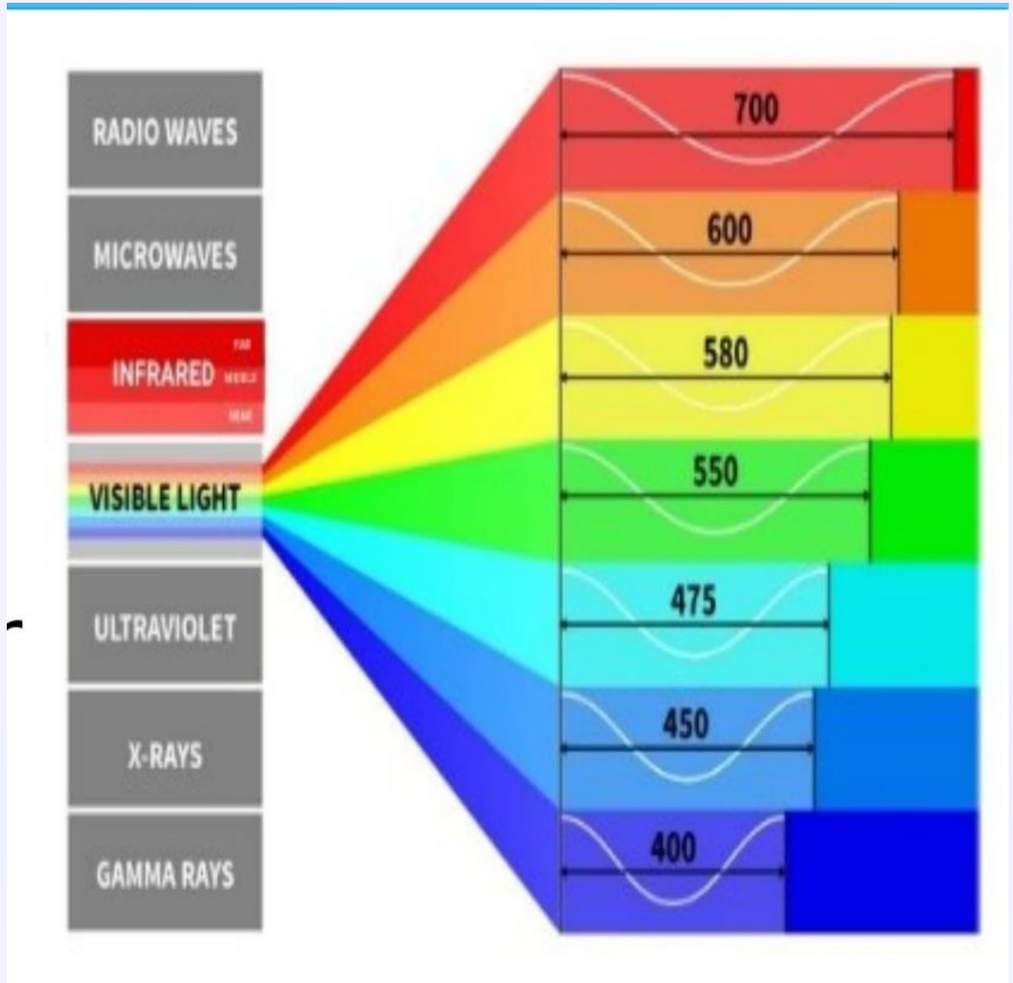
Infrared means 'below red' with a wavelength of 700 nm to 1 mm.

Communication Range

Used for short-range, line-of-sight communication, like TV remotes.

Purpose

Developed as a low-cost, simple wireless alternative for device control.



The Basic Principle of IR Communication

Light Waves

Communication occurs through invisible infrared light waves.

Transmitter

An Infrared LED sends the signal.

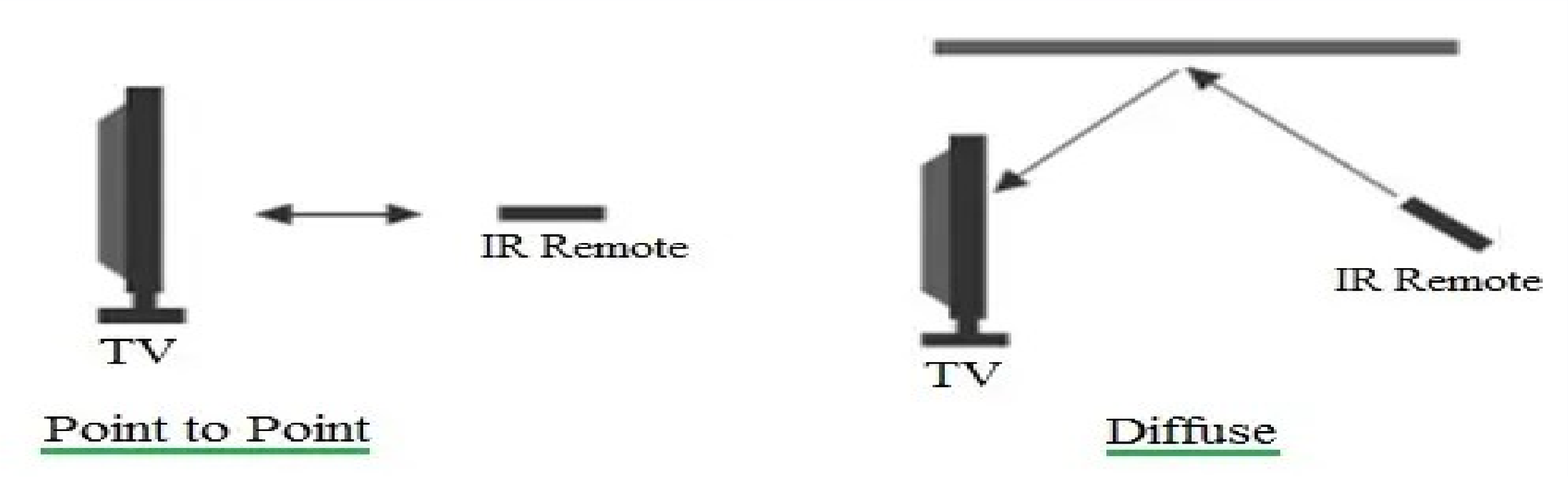
Receiver

A photo-diode or phototransistor detects the signal.

Data Transmission

Data is sent as light pulses representing binary data.

Three Types of Infrared Communication



Point-to-Point

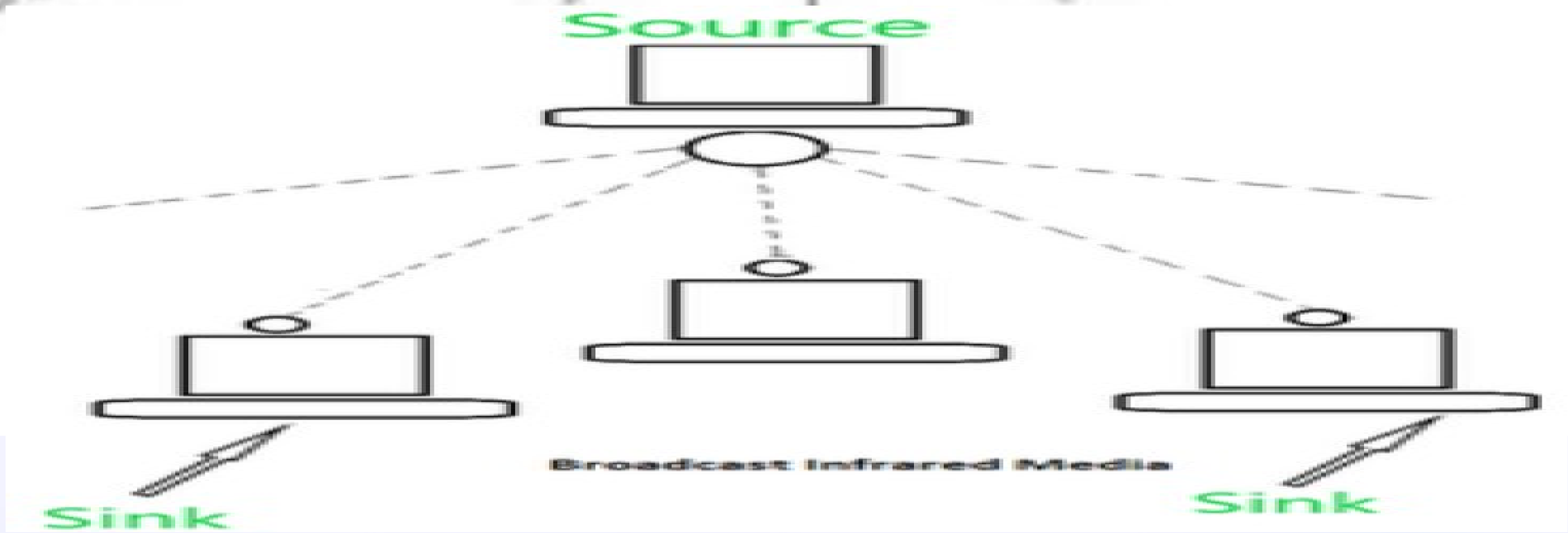
Direct, line-of-sight communication between two devices (e.g., remote and TV).

Diffuse

Signals are reflected from walls or ceilings to reach the receiver.

Ir-DA Standard

High-speed data exchange protocol (older technology) for devices like laptops or phones.



Key Characteristics of IR Technology

1-5m	16 Mbps	Low	High
Range	Data Rate	Power	Directionality
Short communication distance.	Maximum speed under the IrDA standard.	Low power consumption, making it battery friendly.	Requires a clear line-of-sight.

Advantages: Why IR Remains Relevant

Low Cost

Easy and inexpensive to implement in devices.

High Security

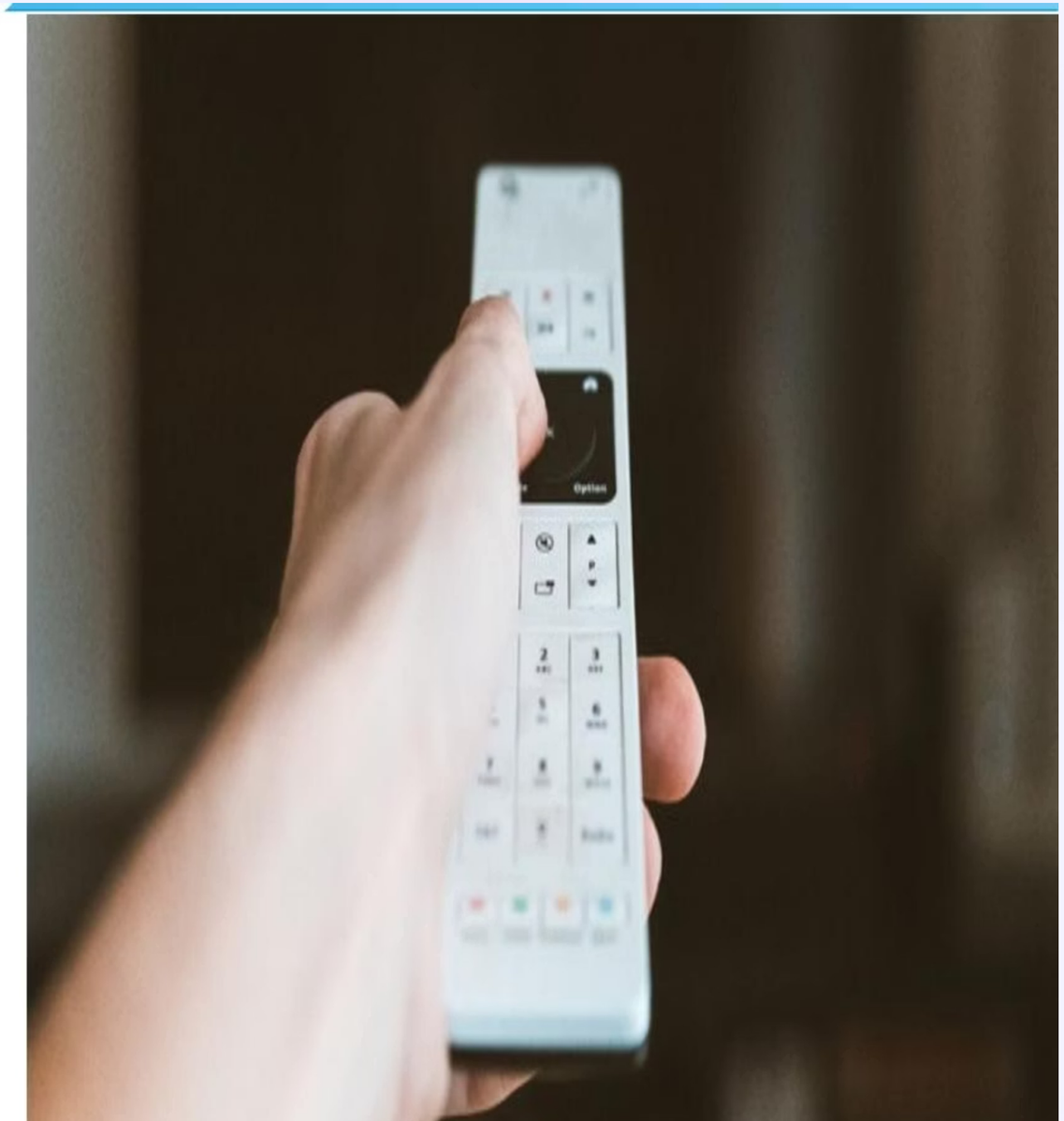
Cannot penetrate walls, limiting eavesdropping.

Low Power Usage

Efficient and friendly for battery-operated devices.

No Interference

Free from radio signal interference.



Disadvantages: Limitations of IR

Short Range

Limited communication distance (1–5 meters).

Line-of-Sight

Requires clear path; easily blocked by obstacles.

Light Sensitivity

Performance is affected by sunlight or bright indoor lights.

Slower Data Rate

Slower compared to modern standards like Wi-Fi or Bluetooth.

Diverse Applications of Infrared

Infrared technology is used across various sectors, from consumer electronics to industrial systems.

Device Control

TVs, AC units, and projectors.

Sensing

Motion detectors and automatic doors.

Security

Intrusion detection systems.

Specialized Instruments

Industrial and medical equipment.

Case Study: The TV Remote Process

Button Press

Circuit generates the corresponding binary code.

Signal Transmission

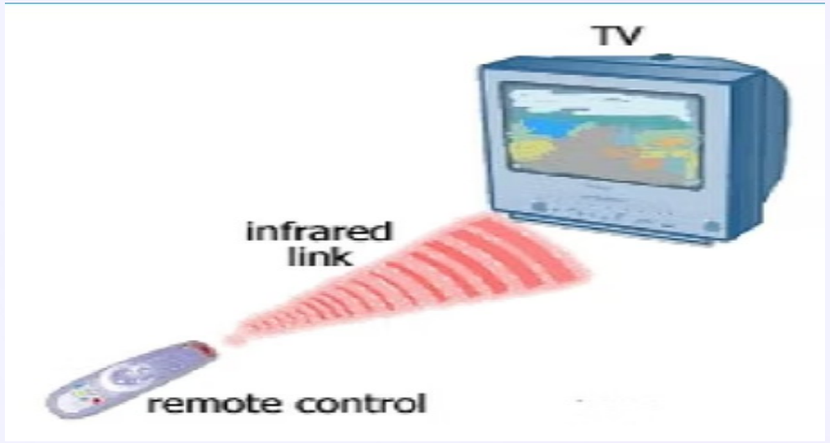
IR LED sends modulated light pulses.

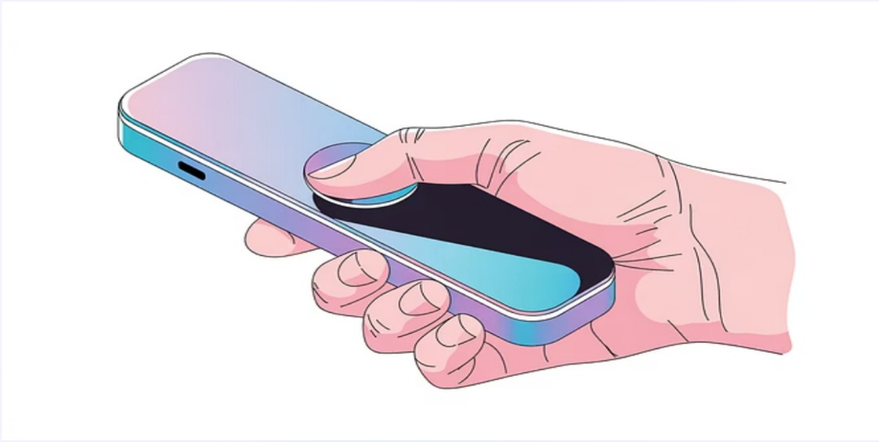
Signal Reception

TV receiver detects and decodes the signal.

Action Performed

TV executes the desired command (e.g., volume up).





Conclusion: The Enduring Role of IR

Core Strengths

Secure, simple, and low-cost short-range communication.

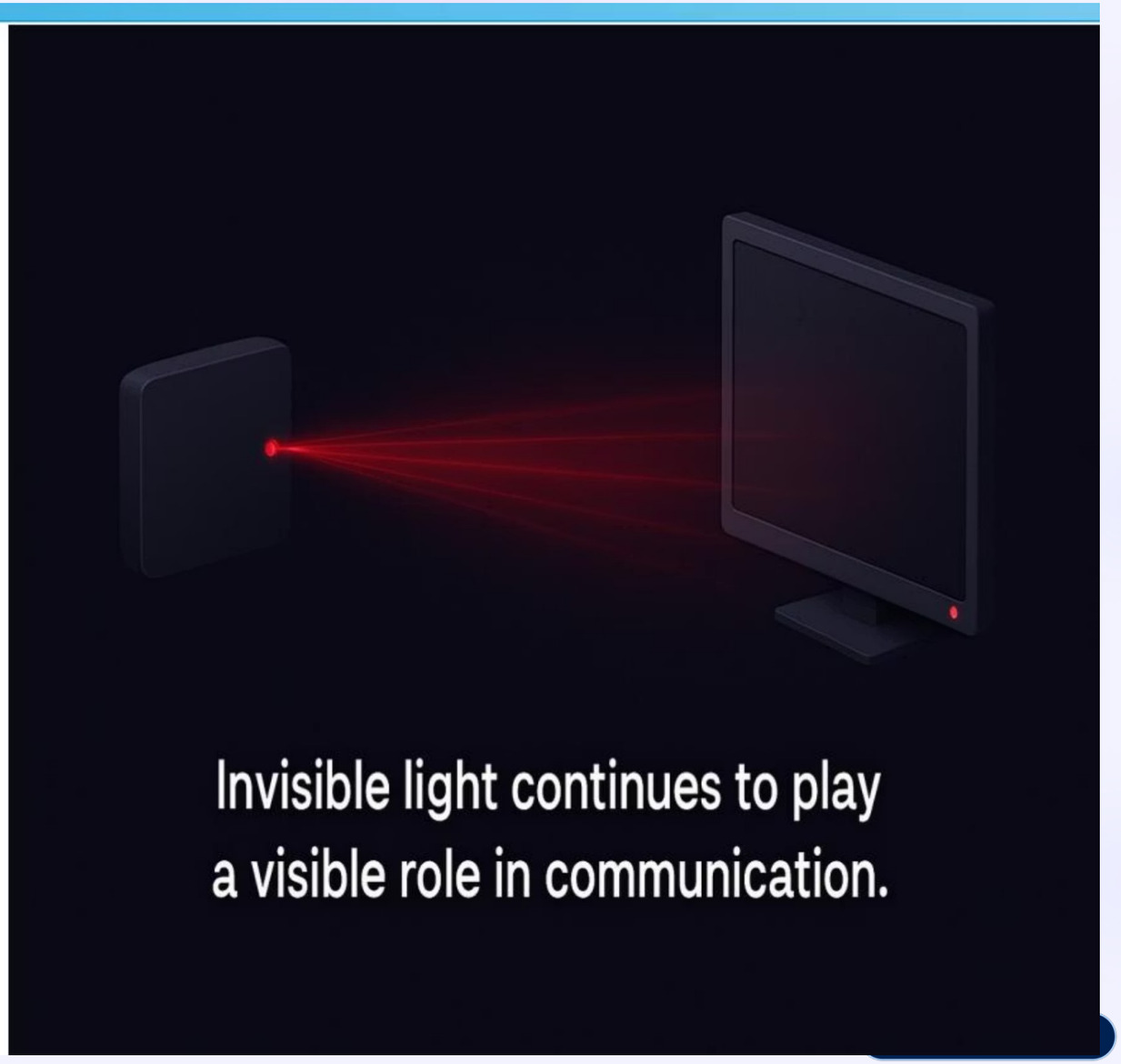
Best Use Cases

Ideal for device control, sensor applications, and embedded

Modern Relevance

Still vital in thermal imaging, robotics, and gesture control.

Invisible light continues to play a visible role in communication.




Thank You