

Communications Electronics

Introduction to Electronic Communications Systems

What Communications Systems Can you think of?

- What types of communications systems can you think of?
 - SmartPhone
 - WiFi, Bluetooth, NFC
 - IoT devices
 - Broadcast radio/television, cable systems
 - RFID tags
- Lots of different types of systems with different requirements

Common/Different Elements

- What elements do they have in common?
- How are they different?

Common/Different Elements

- Range of communications
 - Inches, across town, around the world, Mars and back
- Types of information
 - Voice, music, imagery, telemetry data, sensor data
- Direction of information
 - One-way (broadcast)
 - Two-way one at a time (walkie-talkie) – Half Duplex
 - Two-way at the same time – Phone, data – Full Duplex

Common/Different Elements

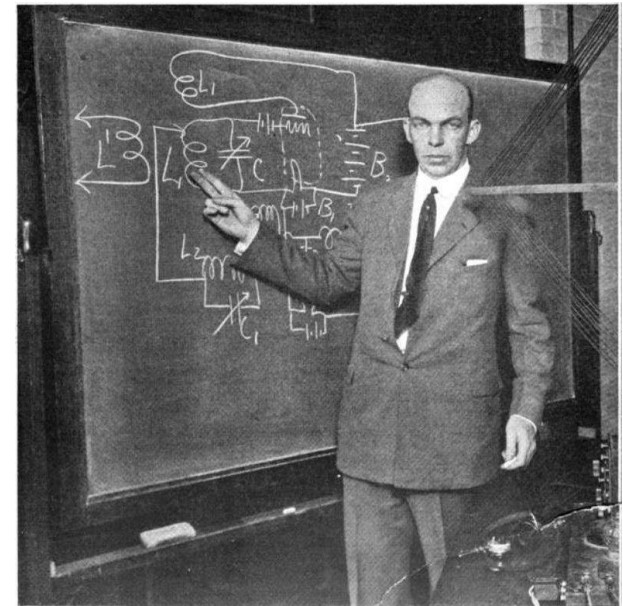
- Different mediums
 - Free space or the “ether” – Radio, wireless
 - Infrared light
 - Coaxial cables
 - Optical fiber
 - Household wiring
 - Water – submarine communications
- Each of these differences presents its own set of constraints to the designer of the system

A Few (Older) Milestones in Communications

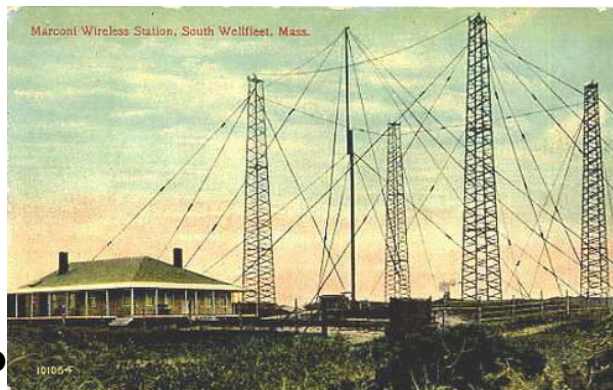
- 1865 – James Clerk Maxwell -- Theorized existence of electromagnetic waves
- Late 1880's – Heinrich Hertz – Proved existence of electromagnetic waves
- 1901 – Marconi Transatlantic Wireless Communications
- 1918 – Armstrong Superhet Receiver
- 1936 – TV
- 1948 – Transistor
- 1958 – IC
- 1965 – Intelsat
- 1983 – Cellular Phone
- 1984 – Motorola DynaTAC
- ~1985 – WiFi
- 1995 – Bluetooth
- 2007 – iPhone introduced



Marconi Wireless – 1901
Cornwall England to Newfoundland,
Canada

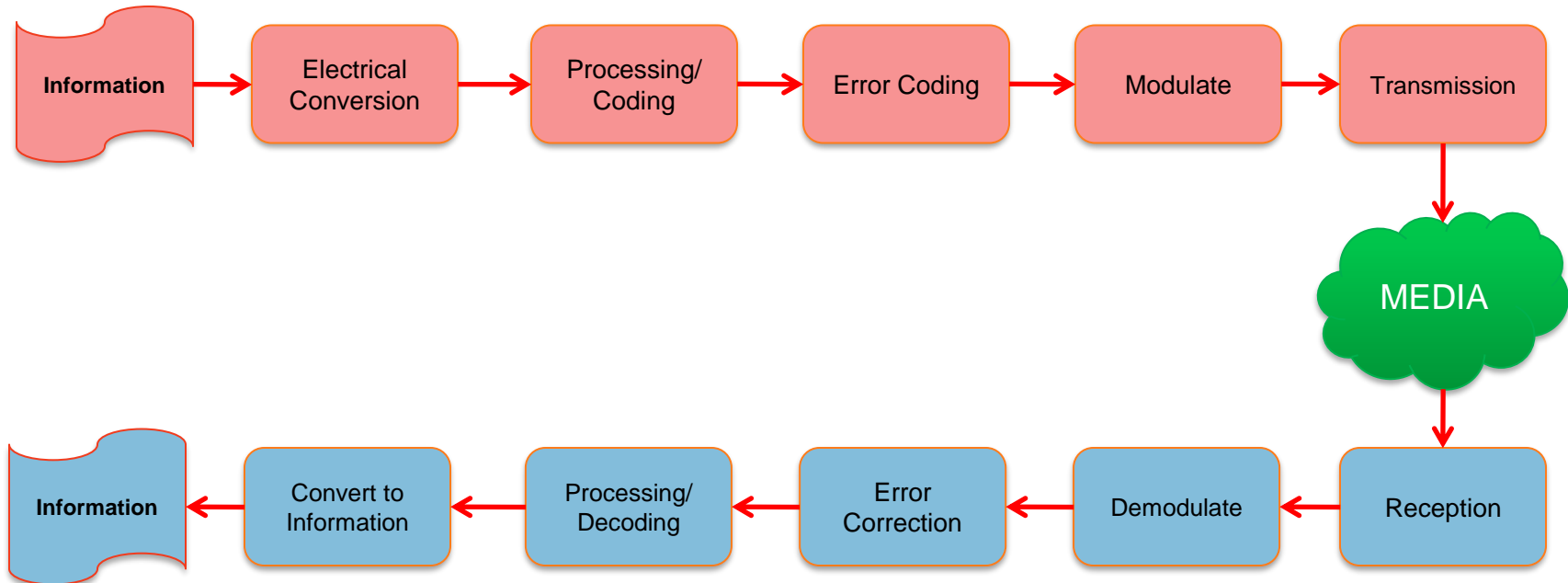


Edwin Armstrong – SuperHet Receiver
(1918), FM modulation



Components of a Communications System

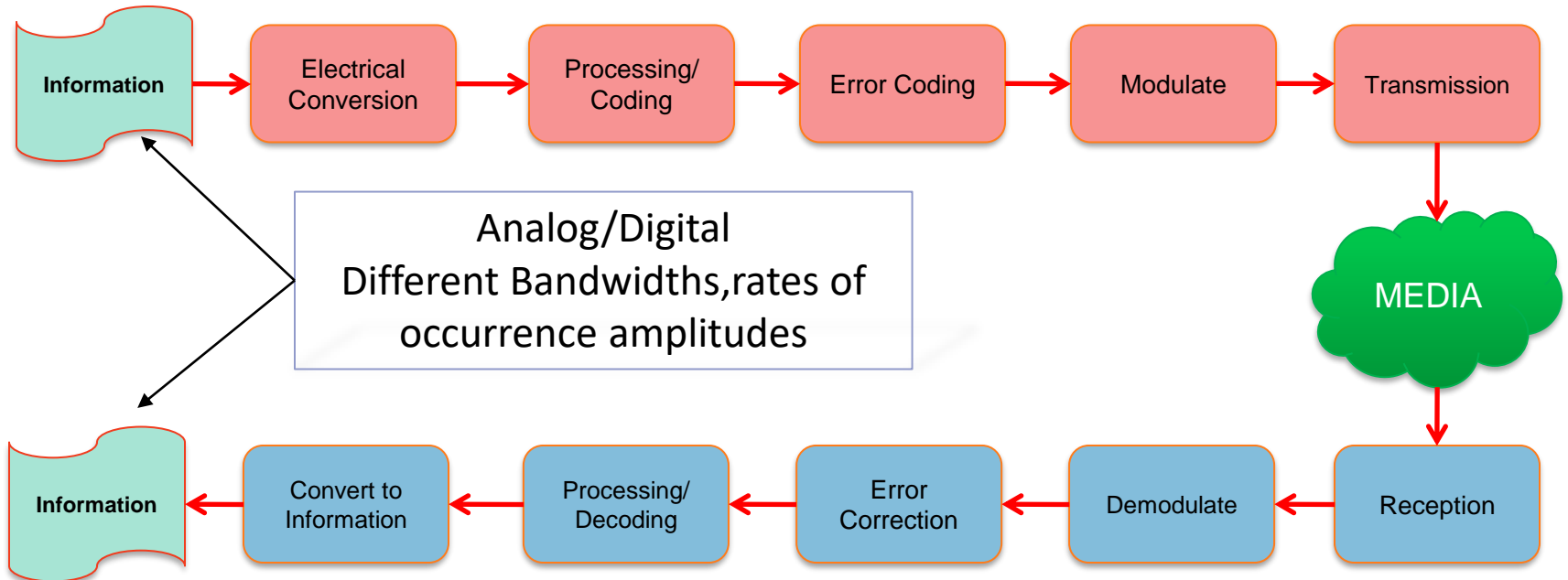
Transmitter



Receiver

Information Sources

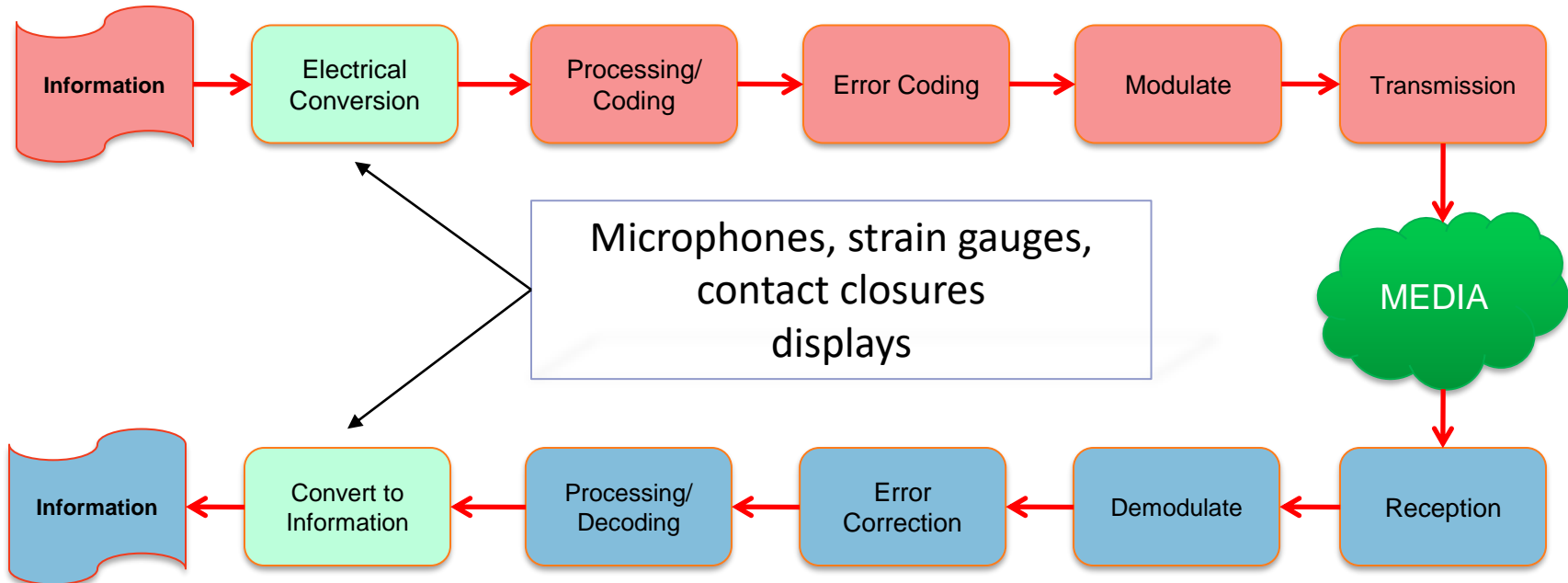
Transmitter



Receiver

Conversion to/from Electrical Signals

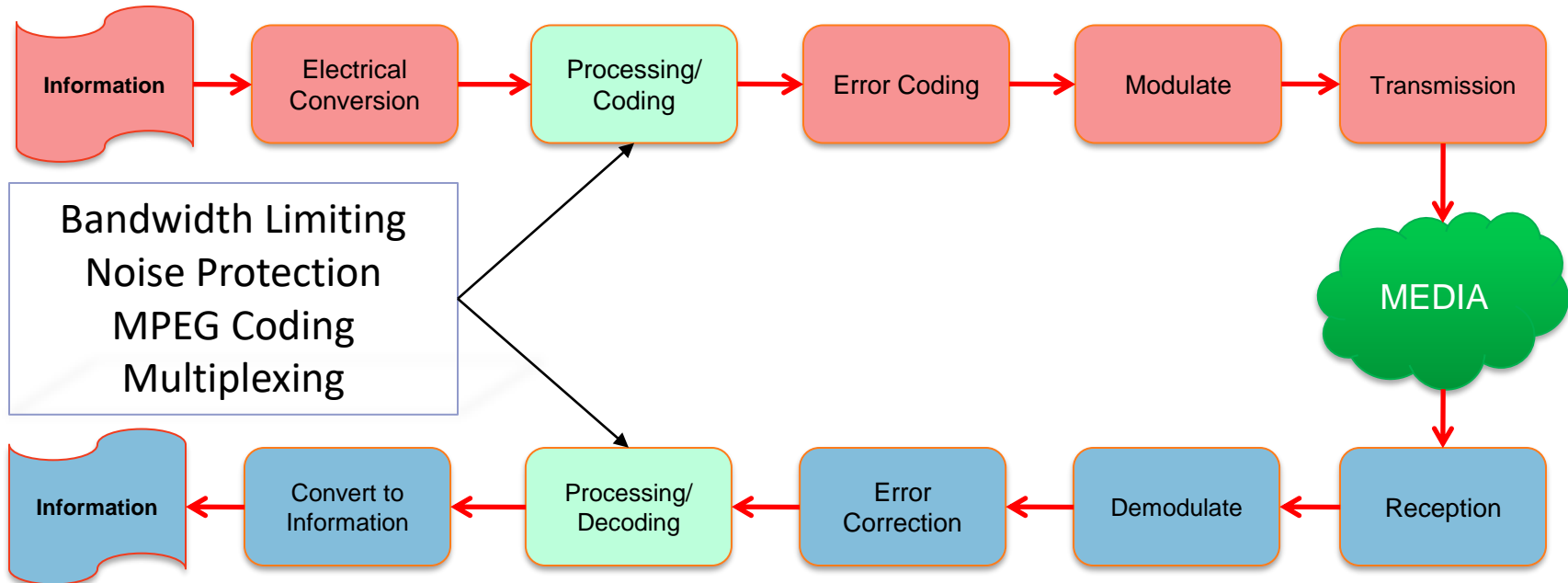
Transmitter



Receiver

Source Processing/ Coding and Decoding

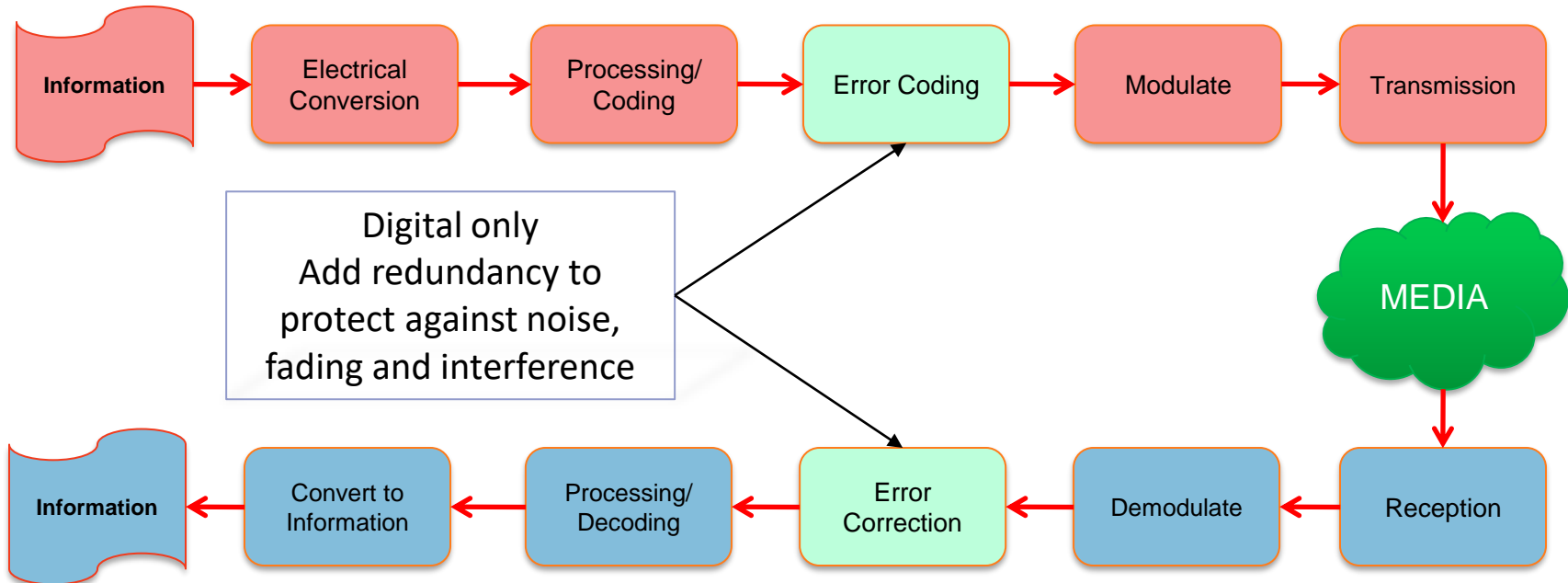
Transmitter



Receiver

Error Correction Coding/Decoding

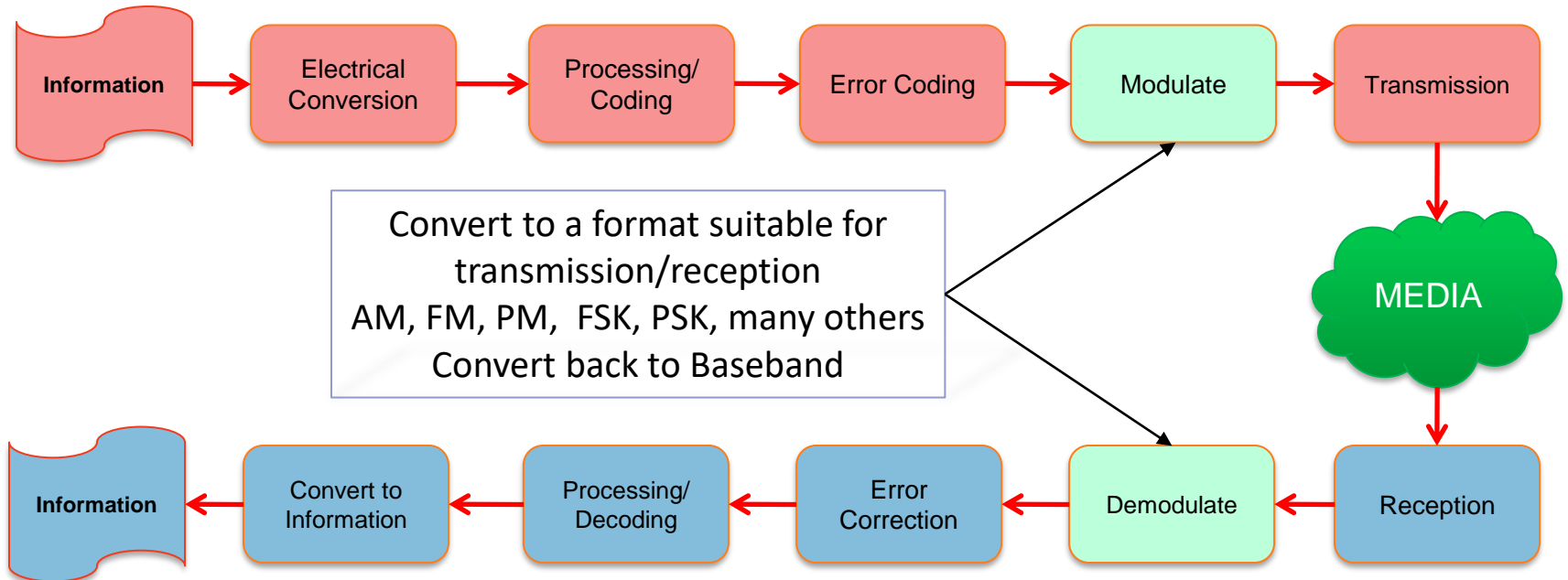
Transmitter



Receiver

Modulation/ Demodulation

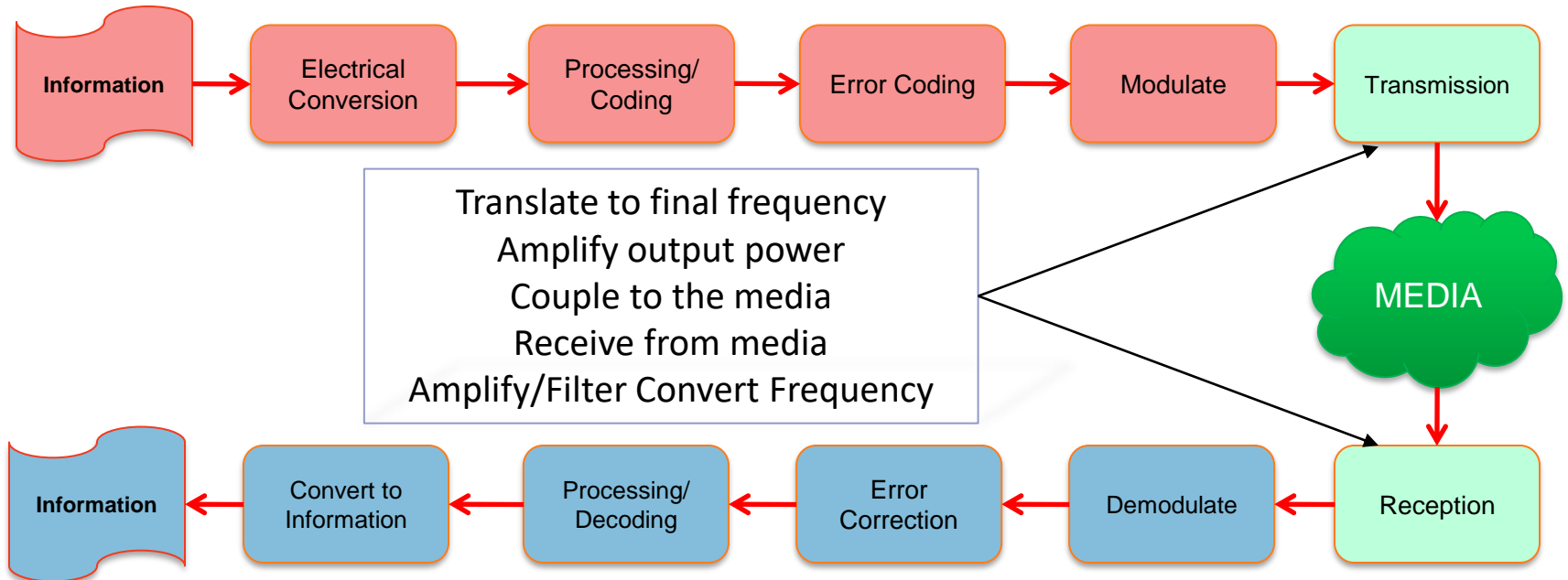
Transmitter



Receiver

Transmission/Reception

Transmitter

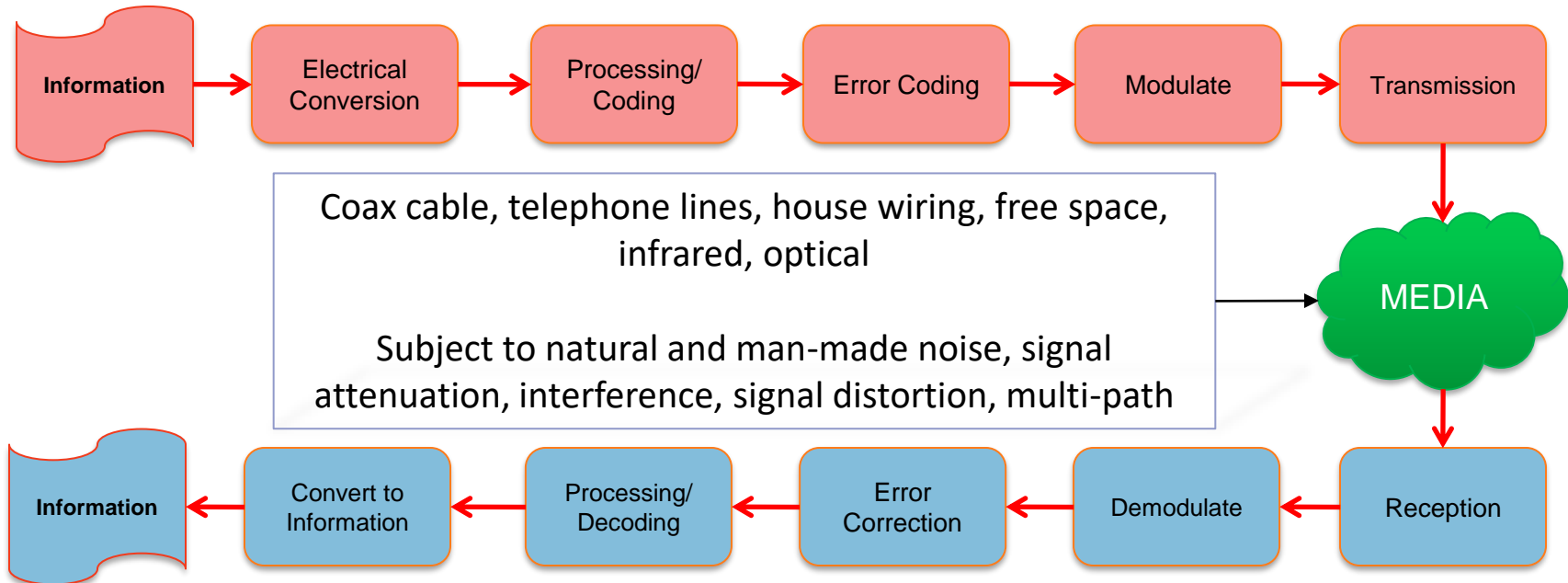


Receiver

There's a lot going on here!!

Components of a Communications System

Transmitter



Receiver