

# 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

---

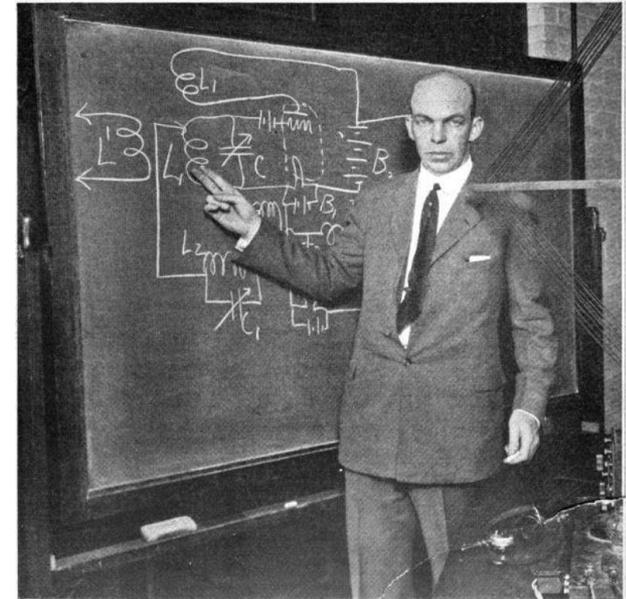
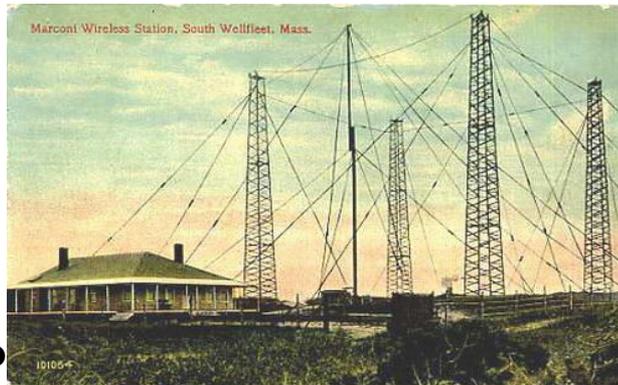
- Different mediums
  - Free space or the “ether” – Radio, wireless
    - Infrared light
  - Coaxial cables
  - Optical fiber
  - Household wiring
  - Water – submarine communications
- Each of these differences presents its own set of constraints to the designer of the system

# 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



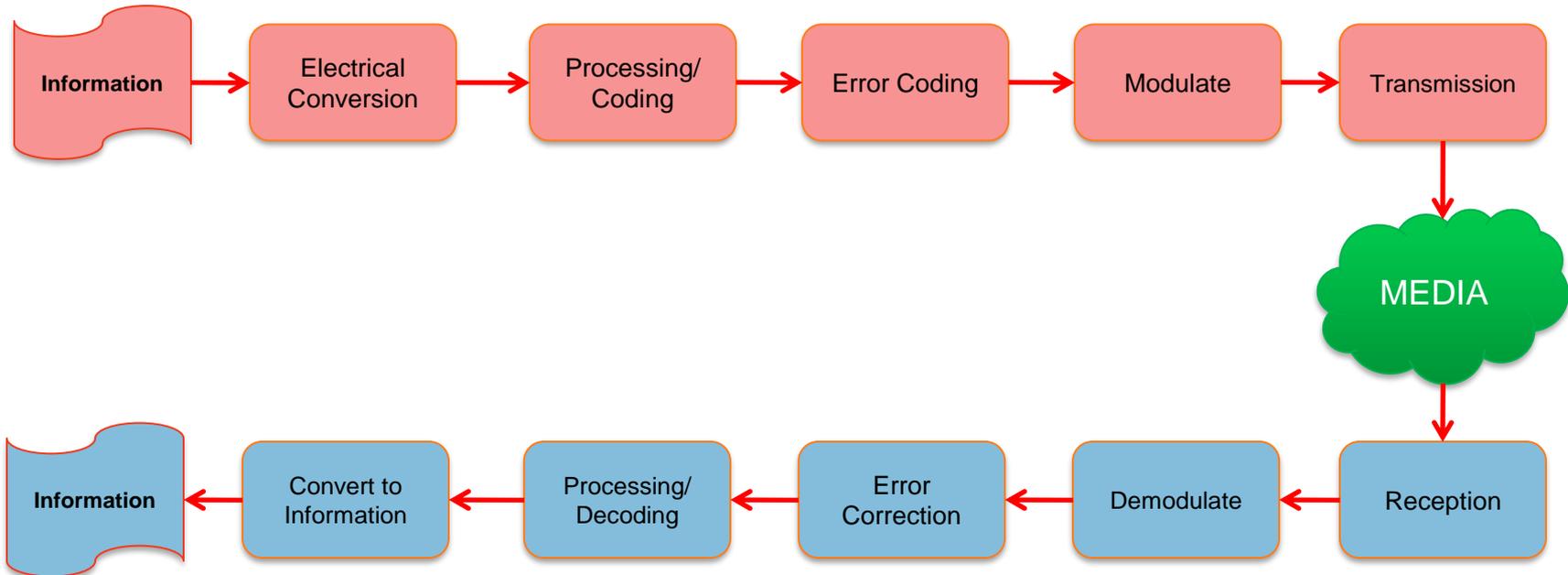
Marconi Wireless – 1901  
Cornwall England to Newfoundland,  
Canada



Edwin Armstrong – SuperHet Receiver  
(1918), FM modulation

# Components of a Communications System

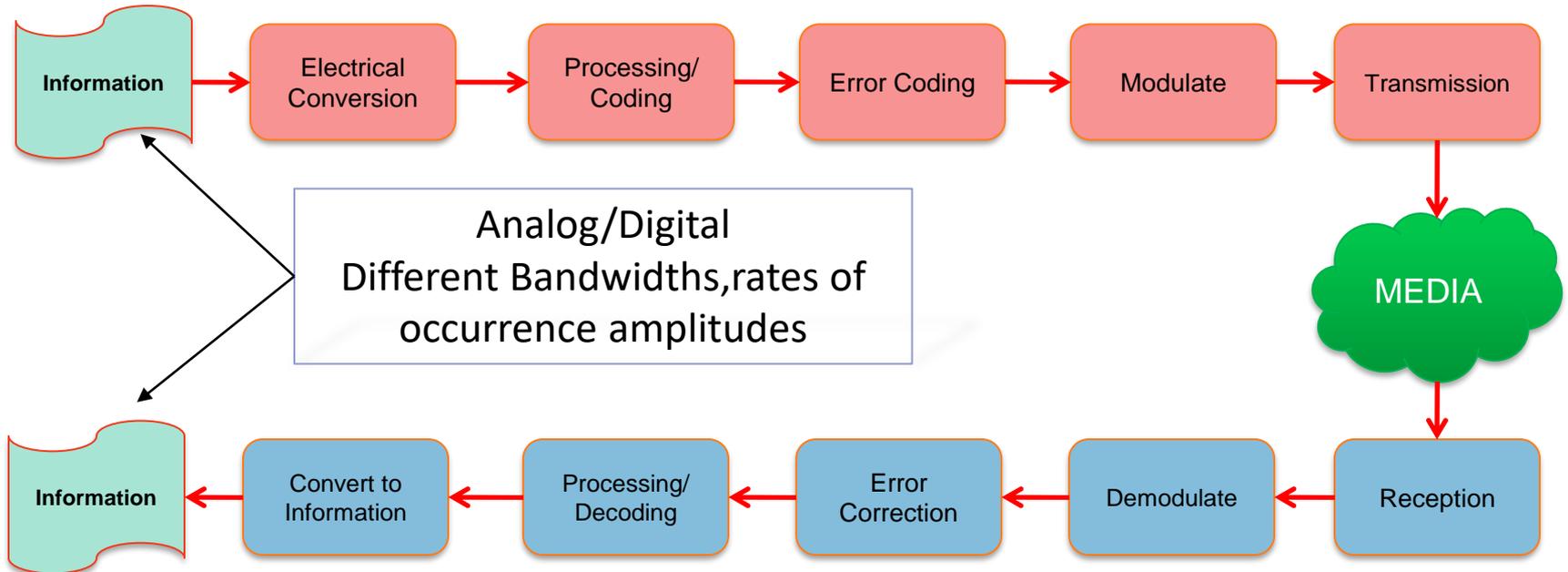
## Transmitter



## Receiver

# Information Sources

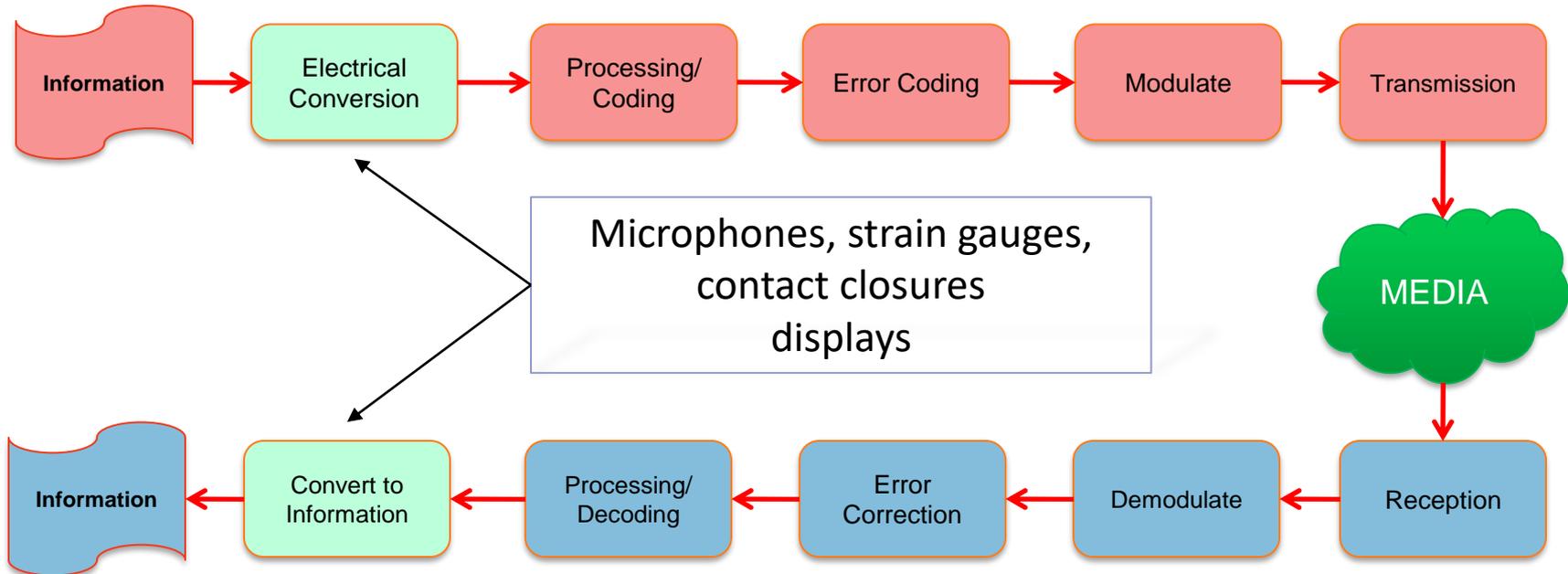
## Transmitter



## Receiver

# Conversion to/from Electrical Signals

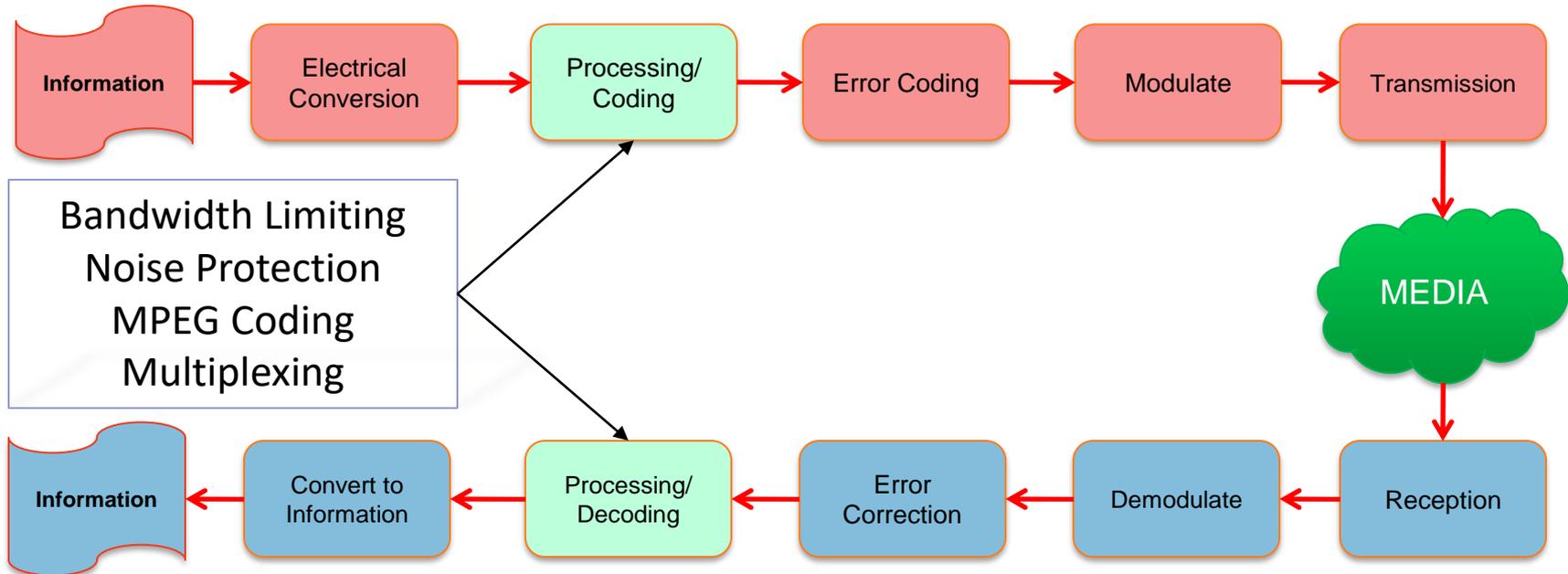
## Transmitter



## Receiver

# Source Processing/ Coding and Decoding

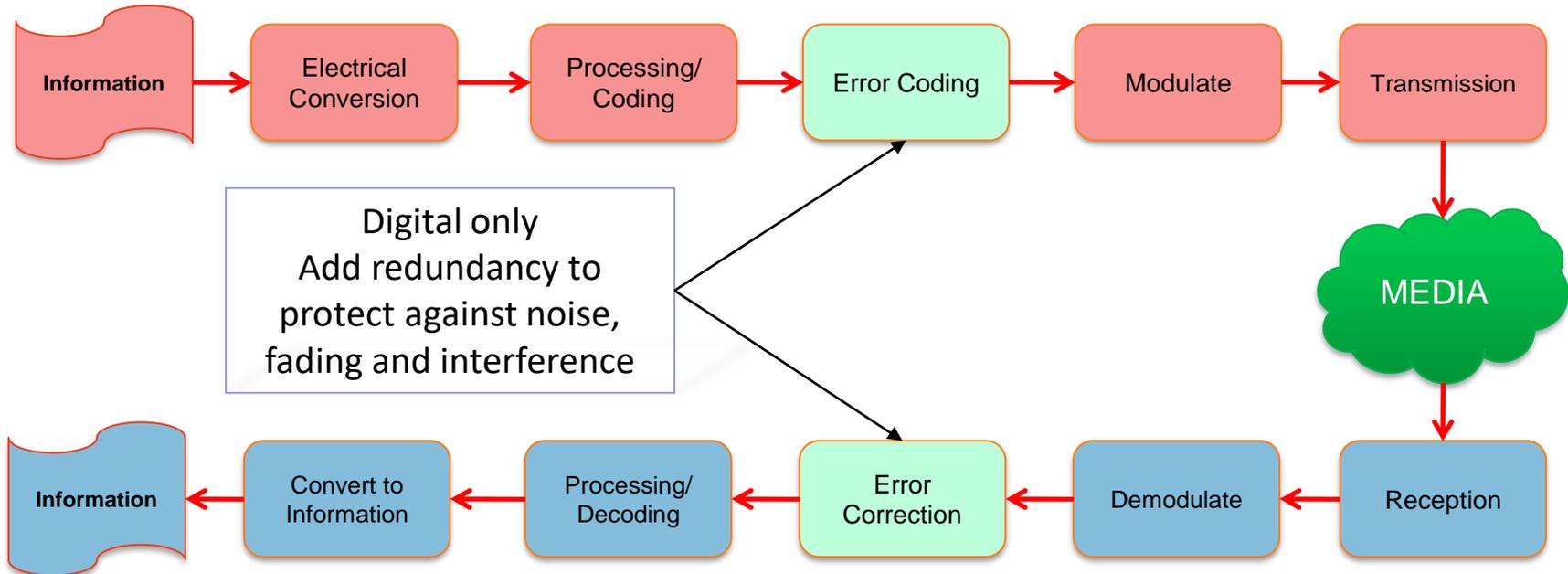
## Transmitter



## Receiver

# Error Correction Coding/Decoding

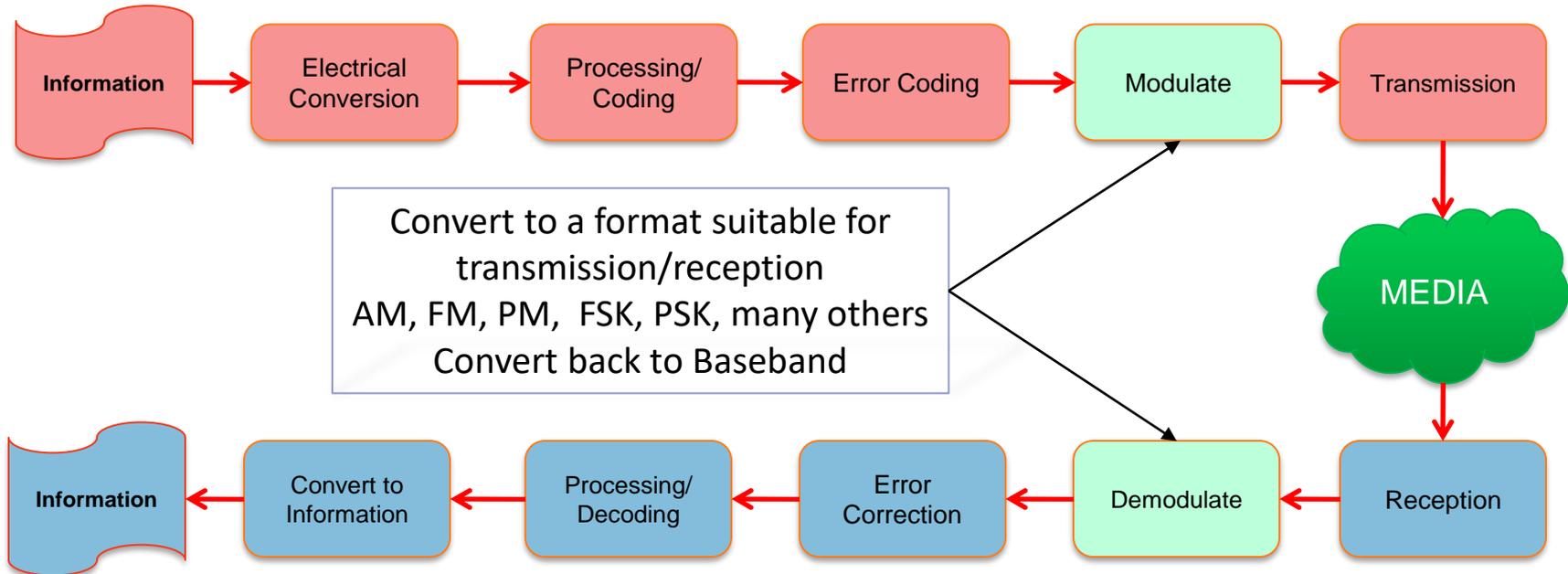
## Transmitter



## Receiver

# Modulation/ Demodulation

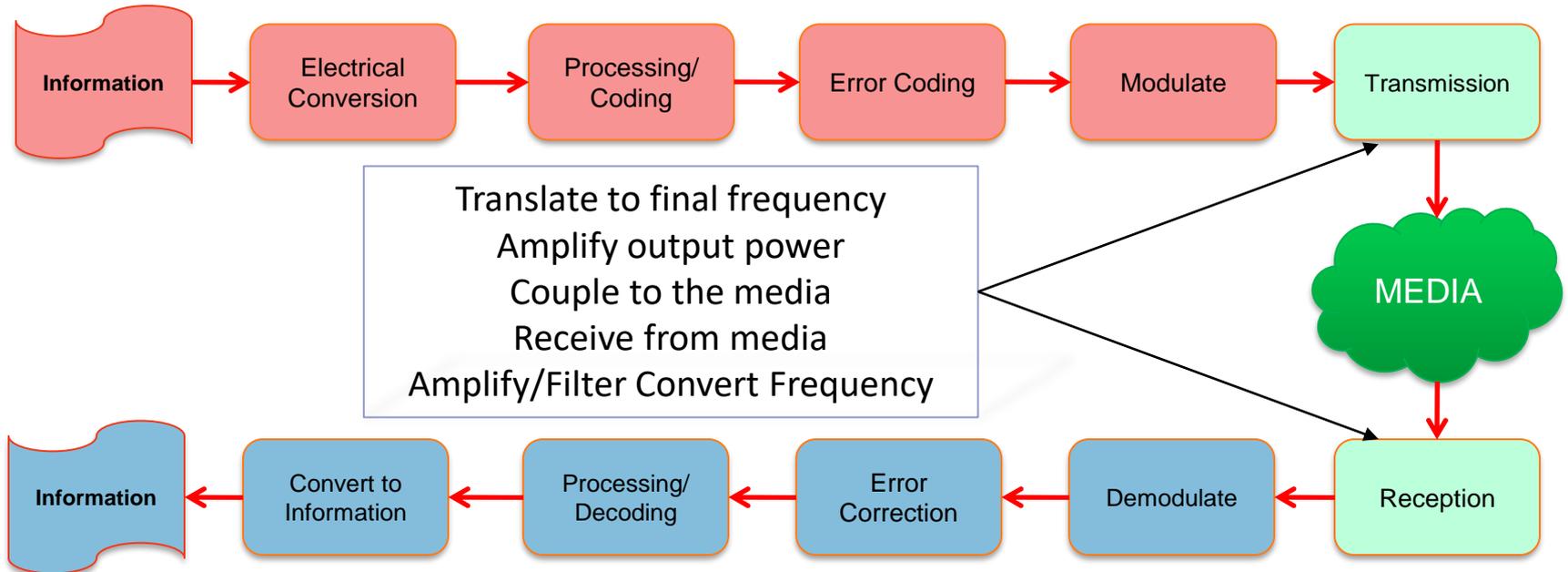
## Transmitter



## Receiver

# Transmission/Reception

## Transmitter

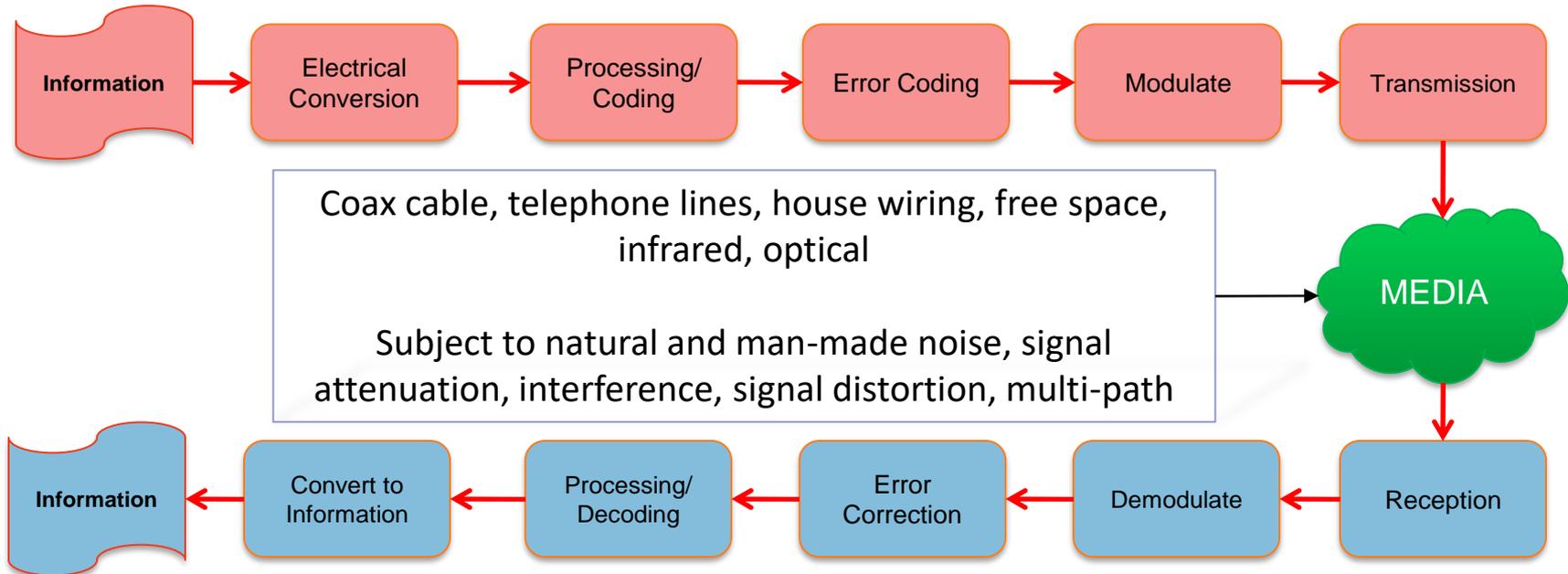


## Receiver

There's a lot going on here!!

# Components of a Communications System

## Transmitter



## Receiver