Data Communications Techniques

- Two types of data transmission
  - *Serial* - one bit at a time
  - *Parallel* - more than one bit at a time on several channels Typically 8, 16 or 32 bits
- This course is primarily concerned with *Serial* data transmission

Data Communications Techniques

- Data are typically transmitted one bit at a time over a *channel*
- A high degree of co-operation is required between the communicating devices
- The timing (rate, duration and spacing) must be identical for both the *Transmitter* and *Receiver*
- A method of *error detection* is also required (to be examined later)

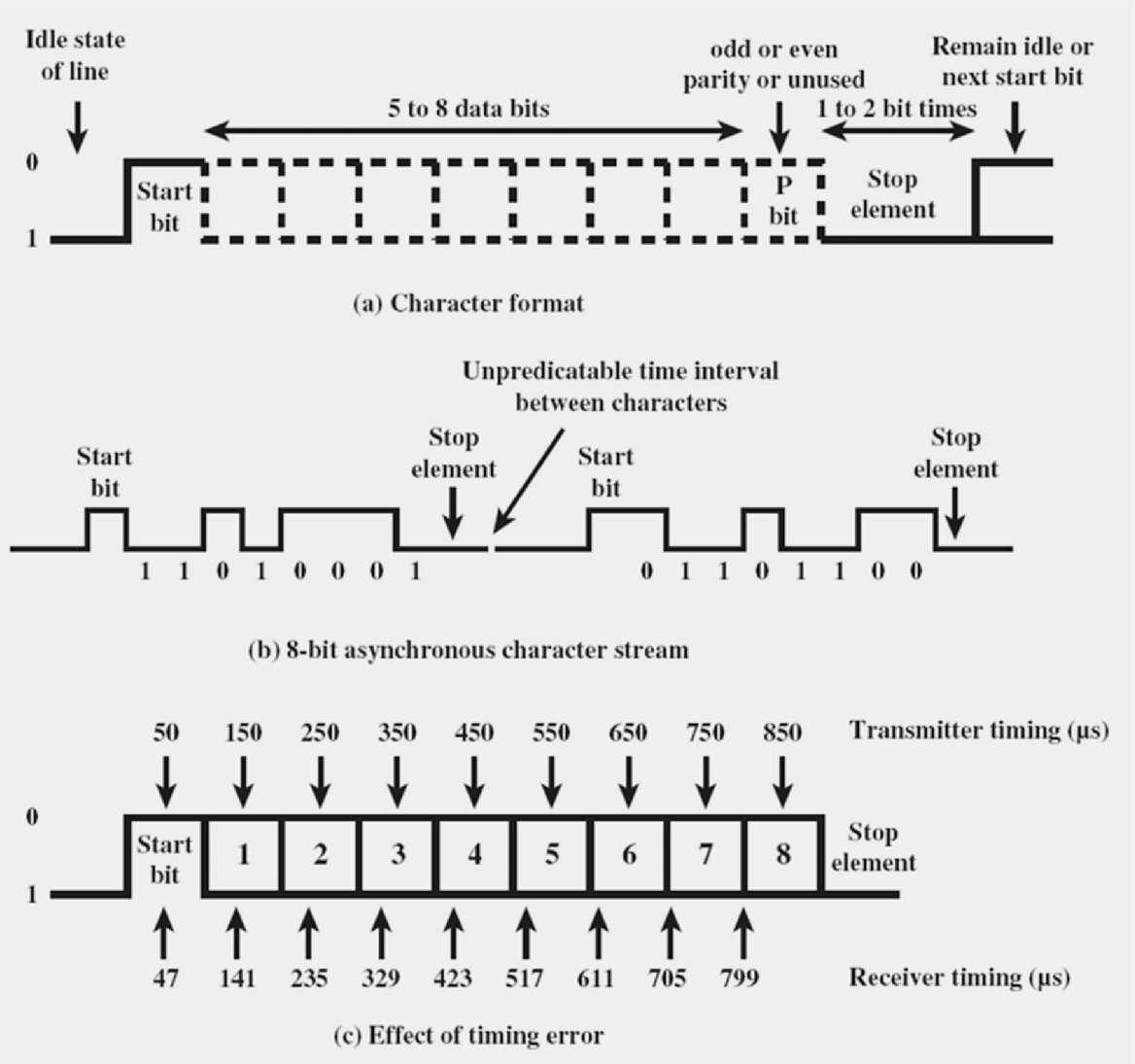
Data Communications Techniques

- The *Receiver* must *sample* an incoming bit stream once every bit interval to extract the binary 1's and 0's associated with the data:
  - Consequently it must know the duration of each bit
- *Timing* is achieved at both ends (the Receiver and Transmitter) using an internal electronic clock:
  - These clocks must be *synchronised*

Data Communications Techniques

- Two possibilities for achieving *synchronization*:
  - Use separate clock line – not viable for computer-to-computer communications
  - Frame the data and embed clocking pulses within the data signal – this *framing* approach is more commonly used.
    - Two methods used for *framing*:
      - *Asynchronous* transmission
      - *Synchronous* transmission

Asynchronous transmission and *Timing* problems

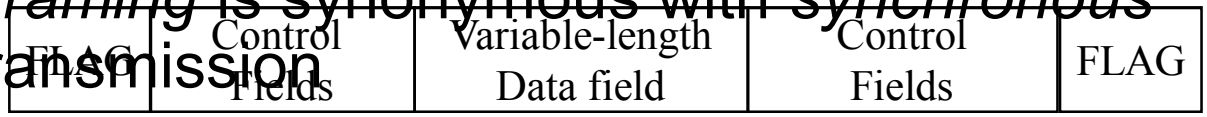


Asynchronous transmission

- The *start* and *stop* bits determine where a character starts and ends
- This function is called *framing*
- Advantage
  - Simple and Cheap
- Disadvantage
  - Overhead of minimum 2 bits in 10 - 20%

Synchronous Transmission

- Here a *stream* of bits is transmitted in a *block*
- Receiver must be able to identify the start and end of a *block* of data
  - Achieved by *framing* the block between a special *preamble* and *postamble* bit pattern
- Additonal *control information* is sent with the block for extra functionality – examined later
- The *preamble*, *postamble*, *data* plus *control information* is called a *frame*
- *Framing* is synonymous with *synchronous* transmission
  - The exact format of the frame depends upon the *data link protocol* being used:



Typical Synchronous Frame Format