CSCE 4114
Asynchronous Communications

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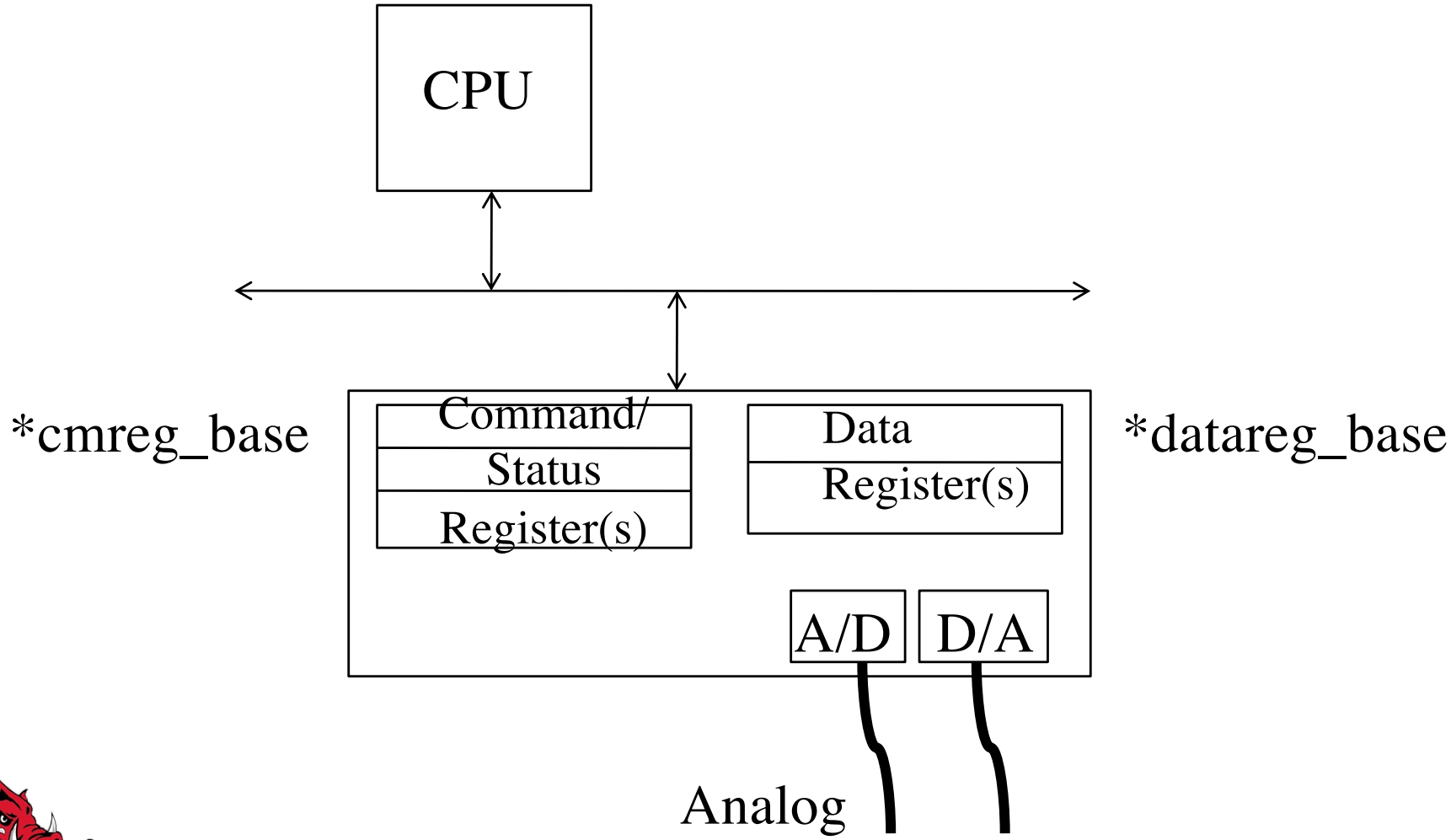
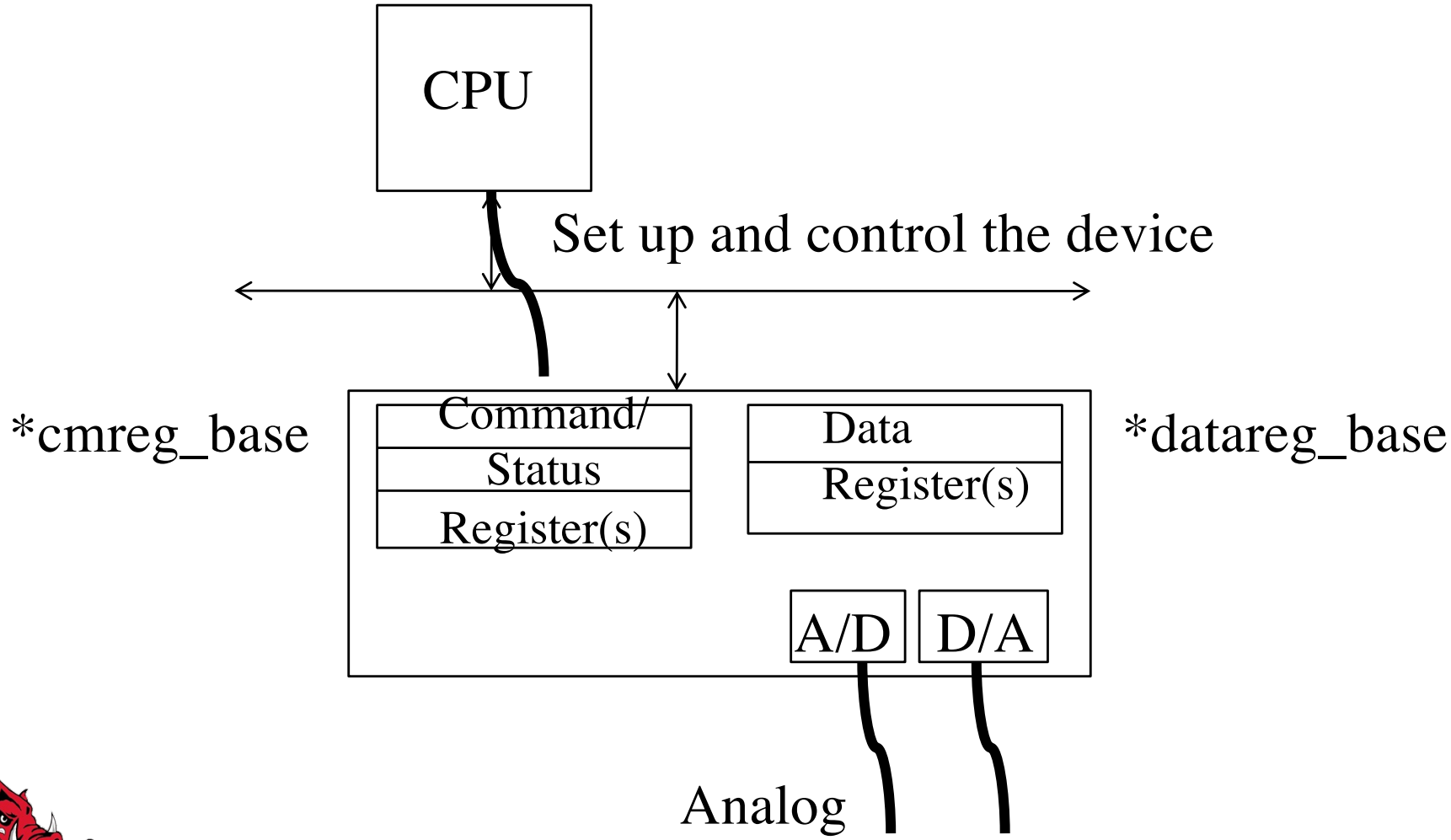
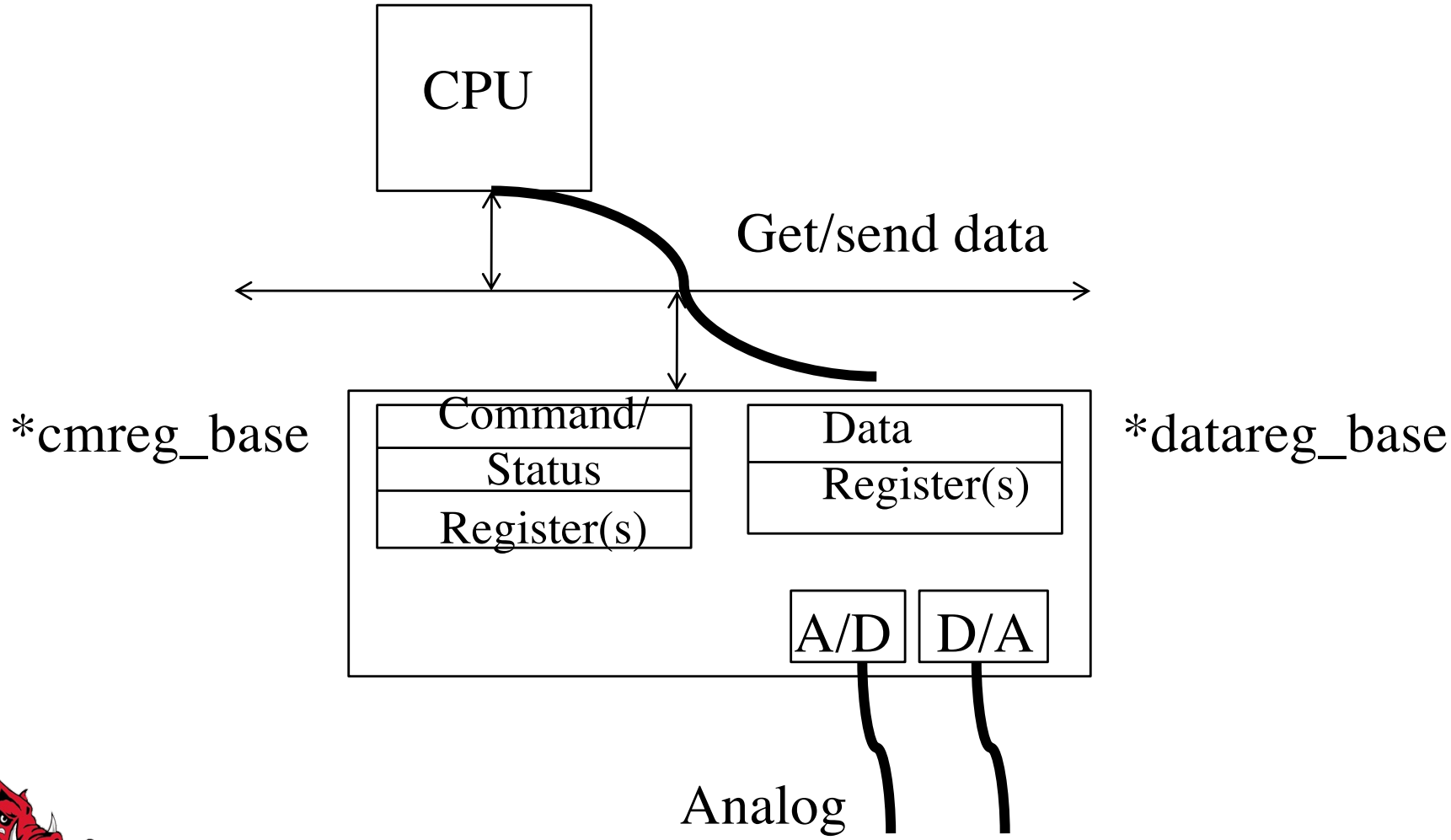
Input/Output: CPU Perspective



Input/Output: CPU Perspective

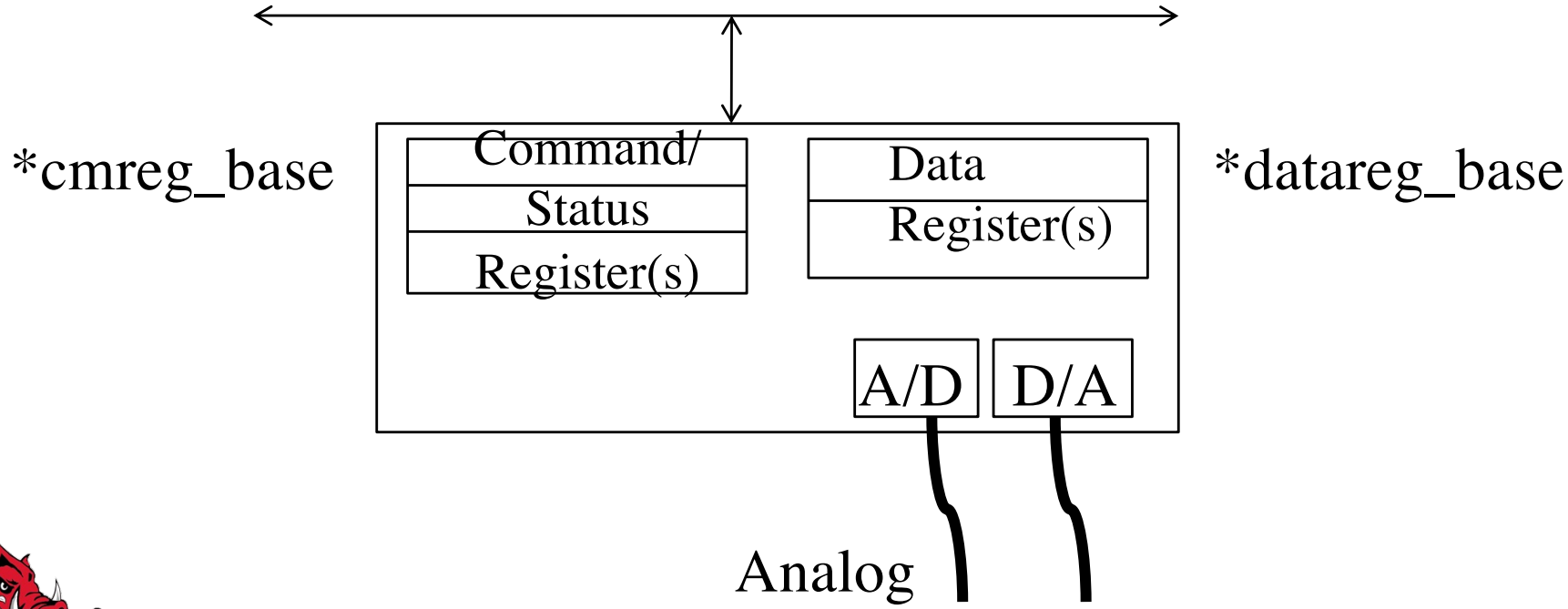


Input/Output: CPU Perspective



Setting Up Device: Command Register

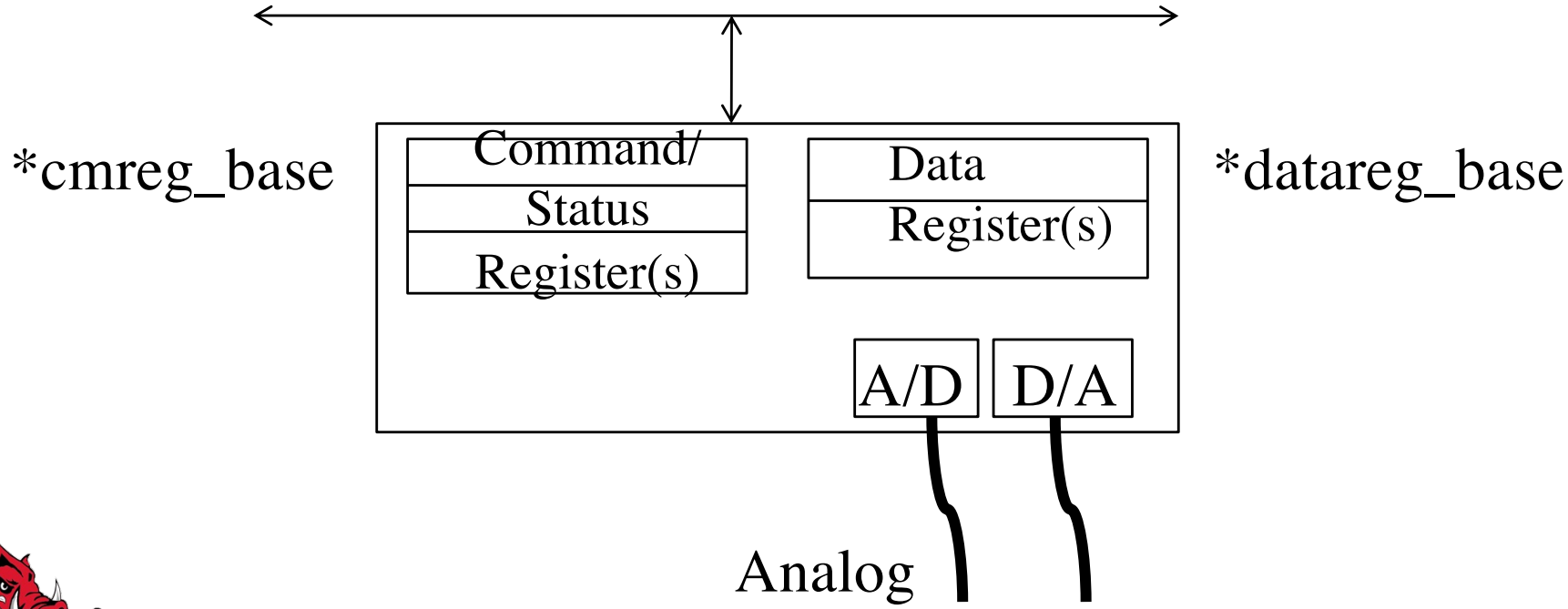
CPU Access:
-Input/Output Direction
-Interrupt/Polling
-Others….



Setting Up Device: Command Register

CPU Access:
-Input/Output Direction
-Interrupt/Polling
-Others….

External Communication:
-Comm Protocol
-Parity, #bits,
-Others



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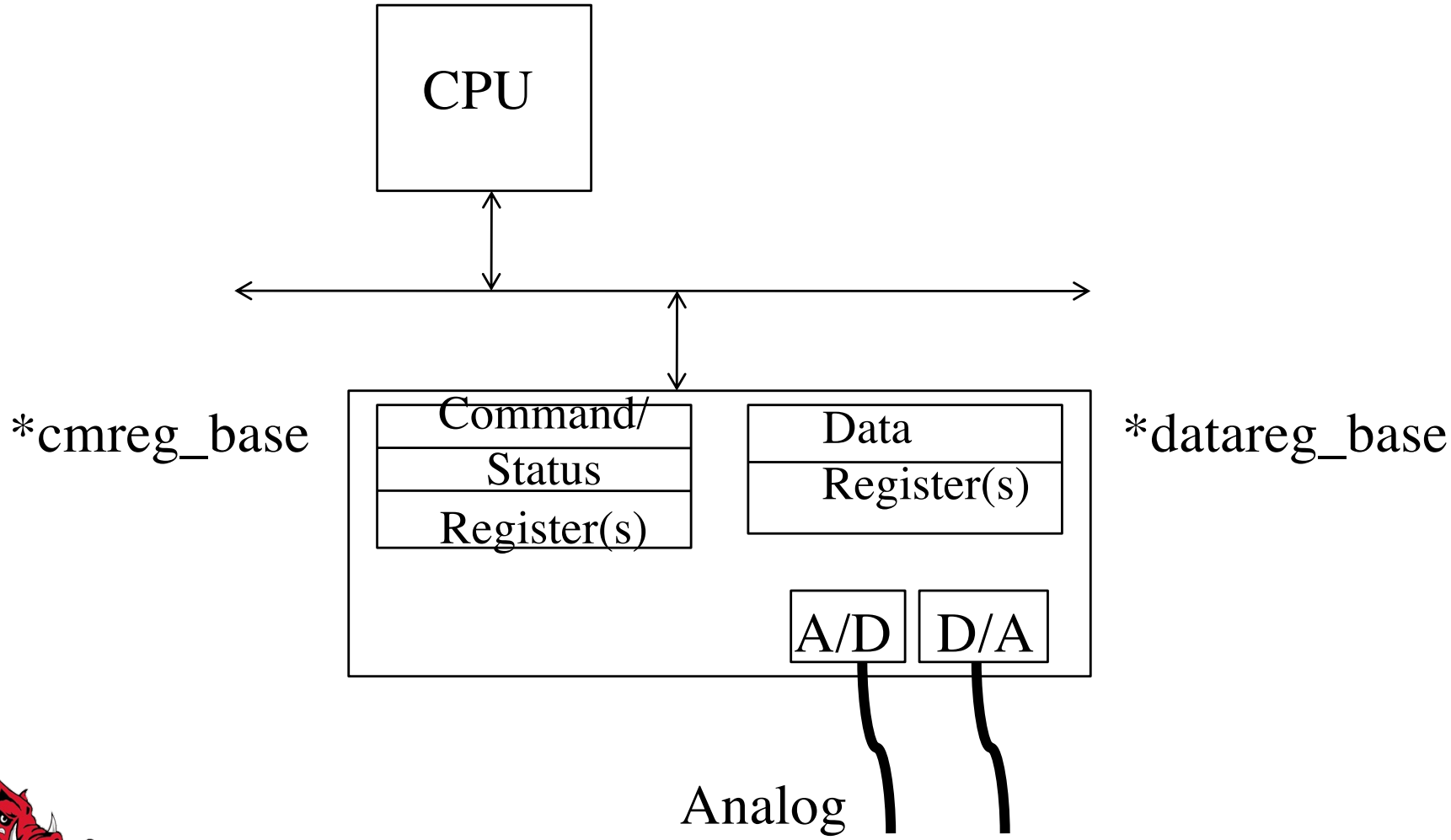
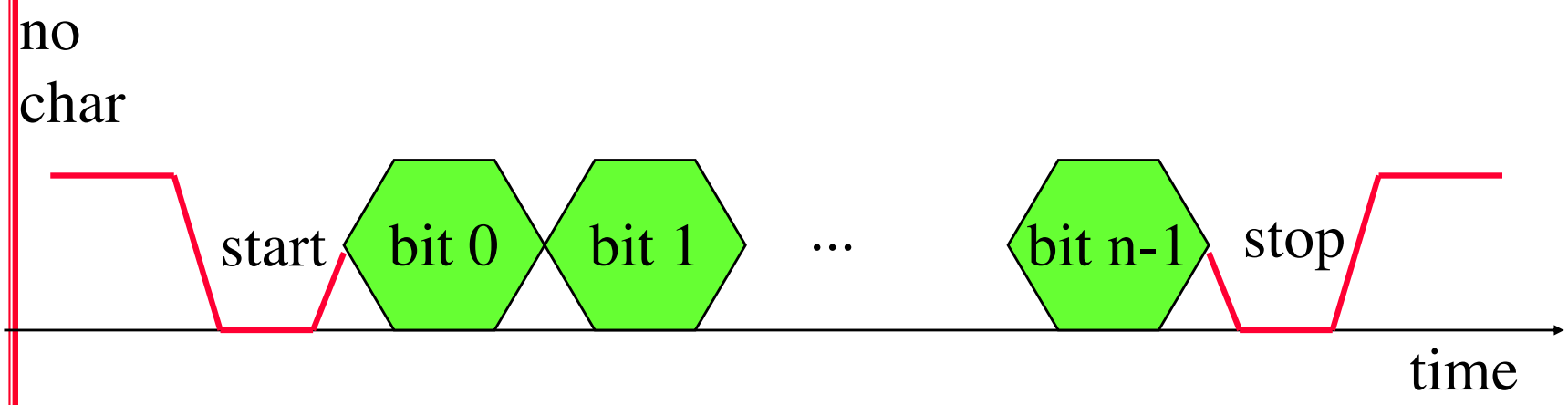


Serial communication

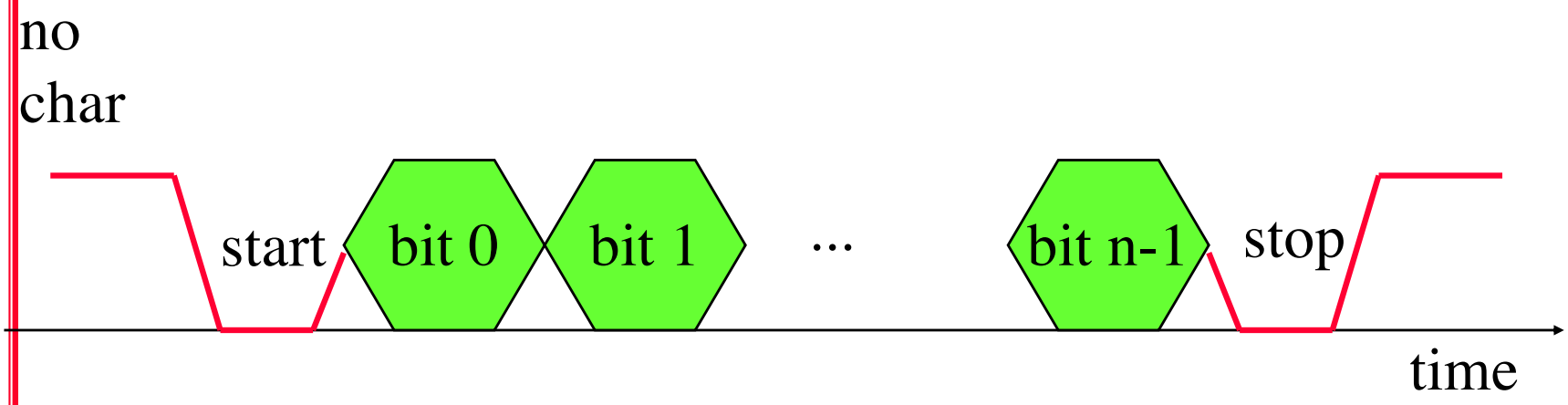
- Bits transferred one at a time:



From Wolf "Computers as Components 2nd ed"

Serial communication

- Bits transferred one at a time:
- "Asynchronous" Timing of bits



From Wolf "Computers as Components 2nd ed"

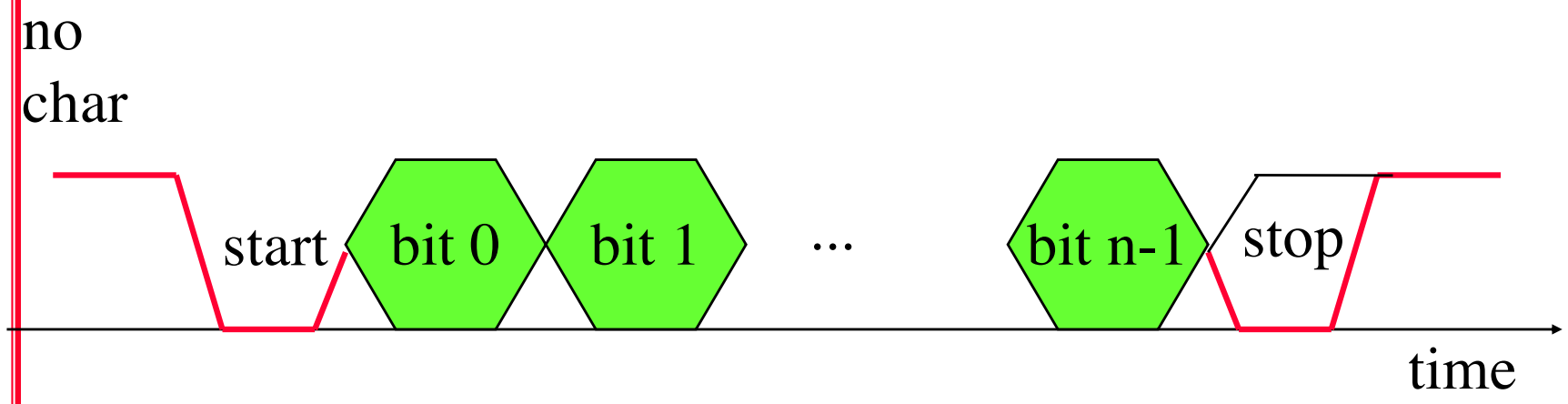
Serial Communication Parameters

- Baud (bit) rate: bits/second
- Number of bits per character 7/8
- Parity/no parity
  - Even/odd parity.
- Number of stop bits (1, 1.5, 2 bits)

- Why does 8251 have all these choices ?

Serial communication

"Asynchronous" Transfer

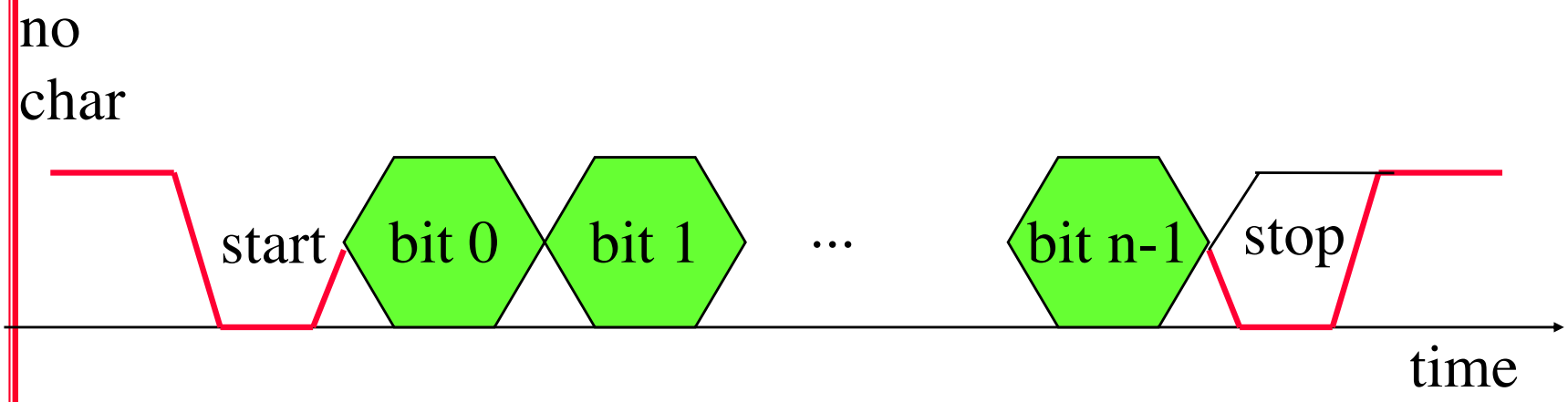


From Wolf "Computers as Components 2nd ed"

Serial communication

"Asynchronous" Transfer

Baud := Bits/Second: So width of a bit = 1/baud



From Wolf "Computers as Components 2nd ed"

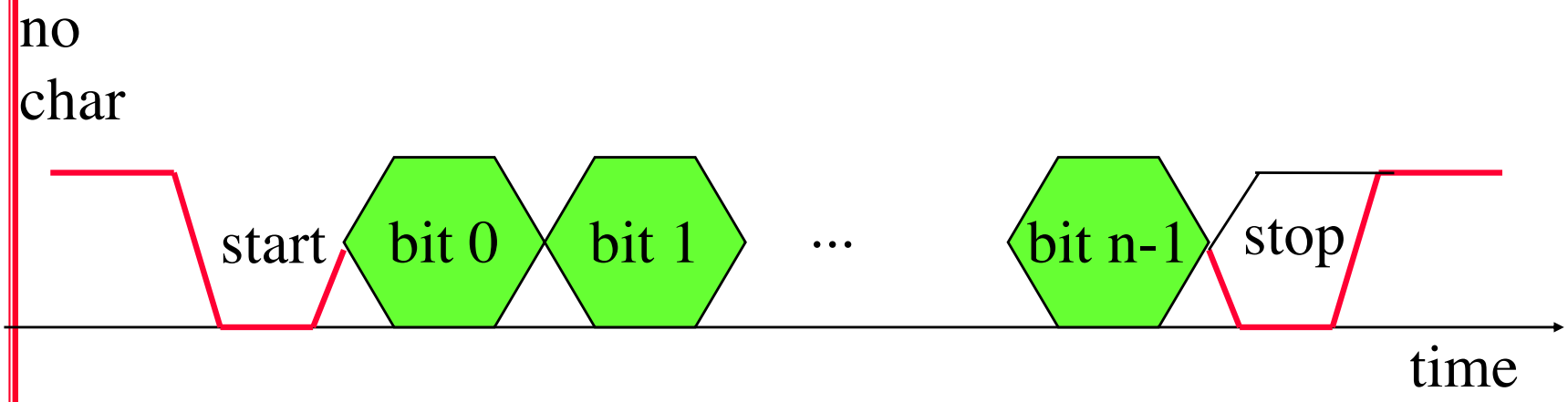
Serial communication

"Asynchronous" Transfer

Baud := Bits/Second: So width of a bit = 1/baud

Each side has own clock

-sets agreed upon baud rate



From Wolf "Computers as Components 2nd ed"

Serial communication

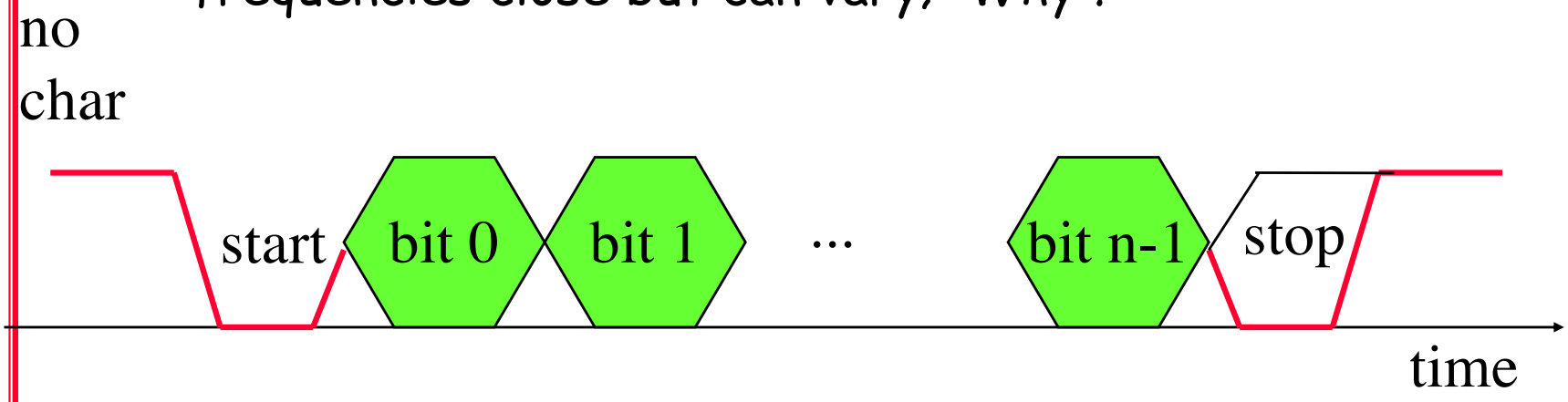
"Asynchronous" Transfer

Baud := Bits/Second: So width of a bit = 1/baud

Each side has own clock

-sets agreed upon baud rate

-frequencies close but can vary; Why ?



From Wolf "Computers as Components 2nd ed"

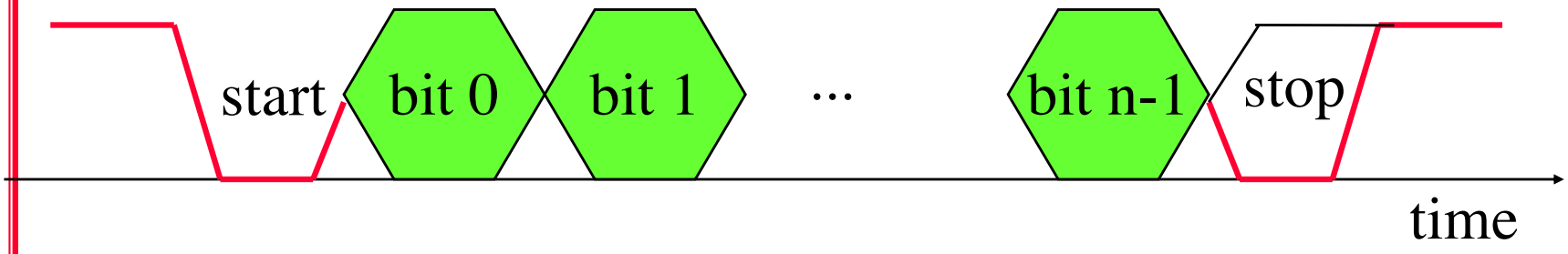
Serial communication

"Asynchronous" Transfer

Baud := Bits/Second: So width of a bit = 1/baud

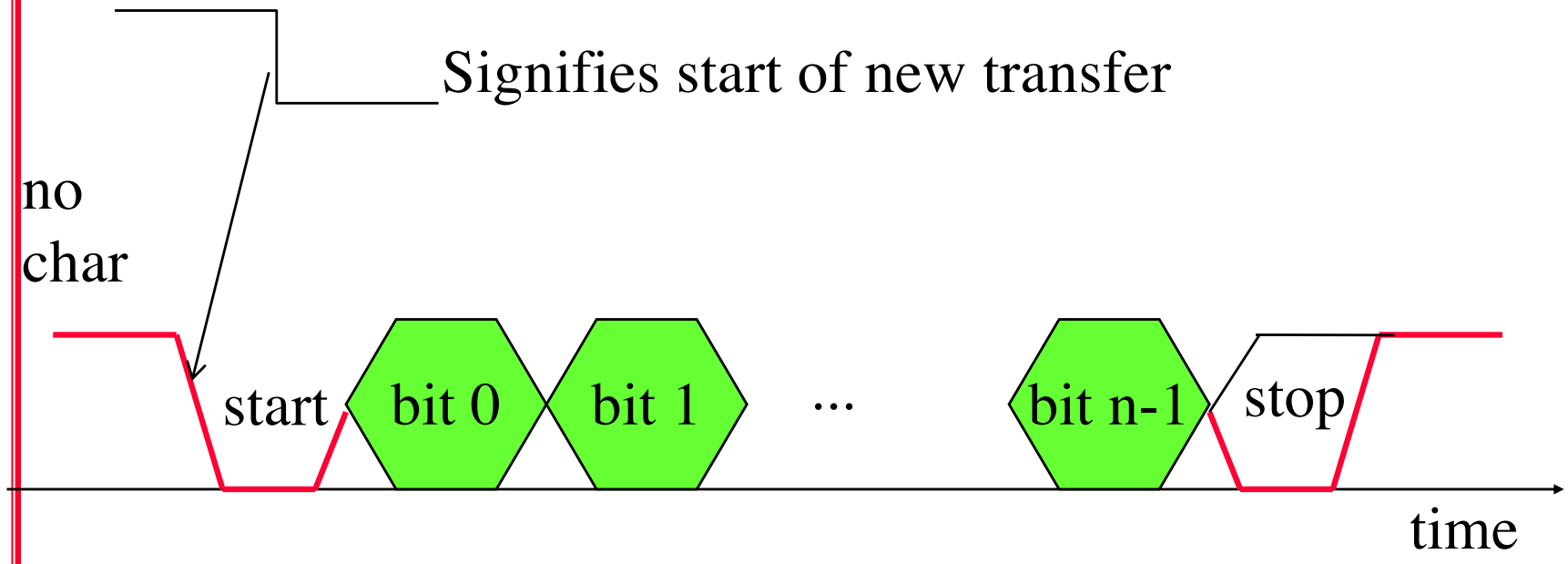
Each side has own clock

- -sets agreed upon baud rate
- -frequencies close but can vary; Why ?
- -phases not locked: Is this a Problem ?



From Wolf "Computers as Components 2nd ed"

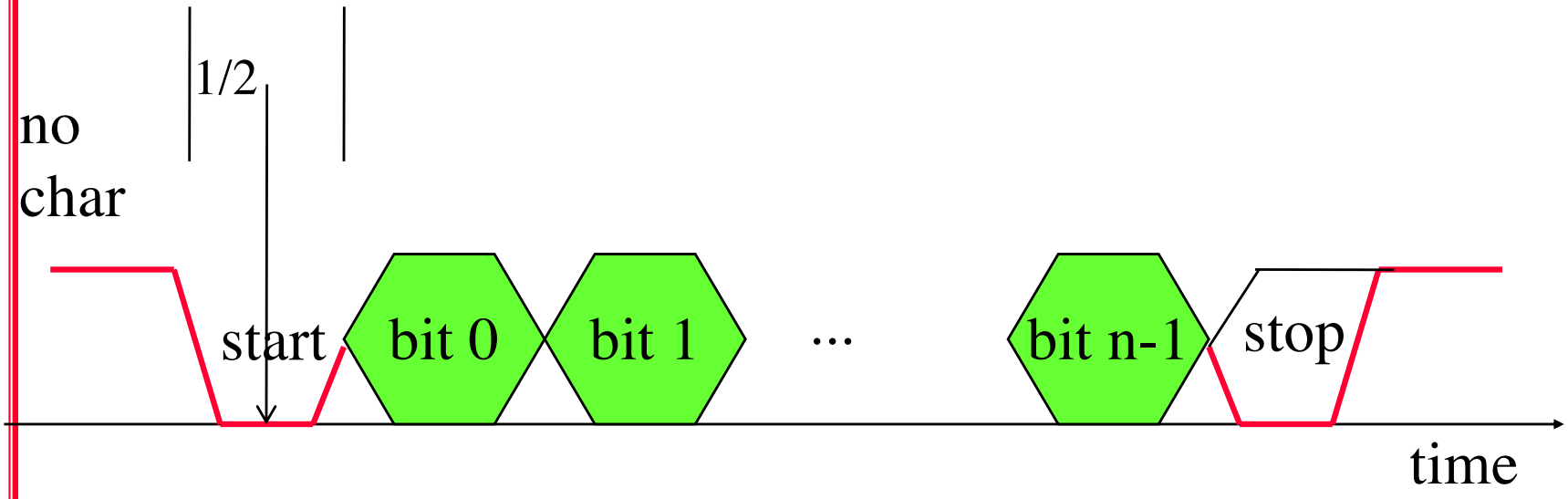
Serial communication



From Wolf "Computers as Components 2nd ed"

Serial communication

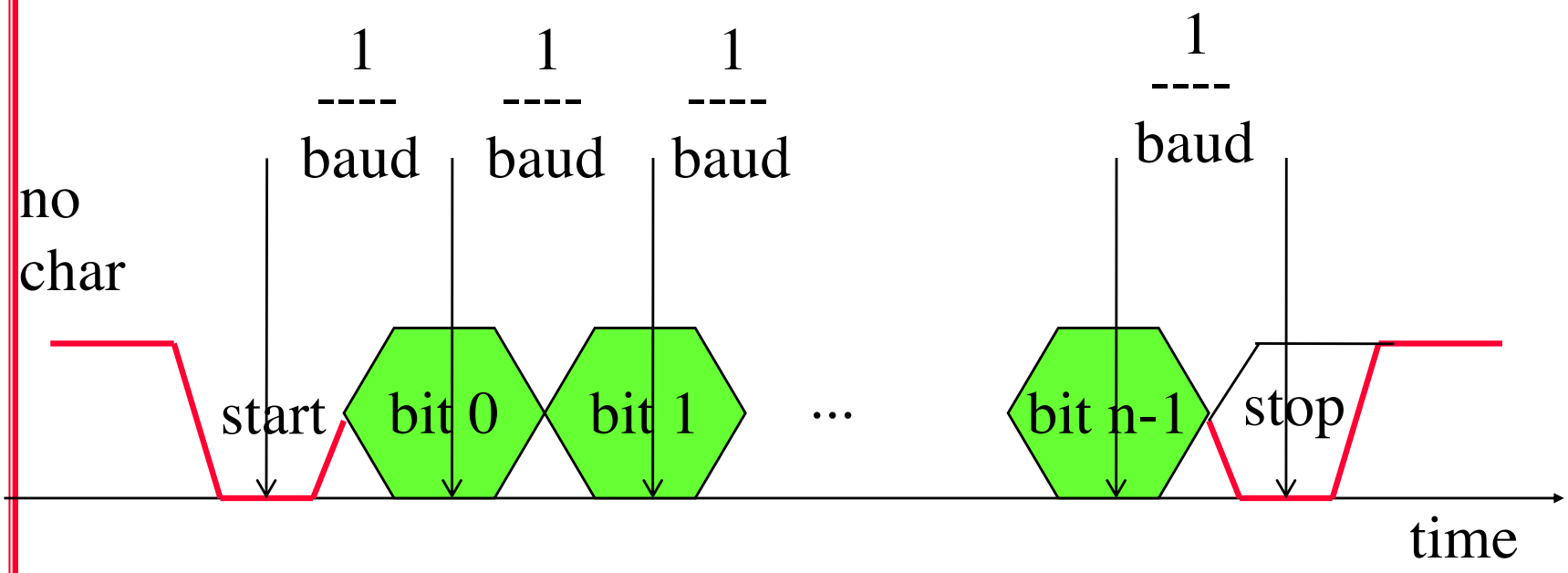
Timing Mark Starts in middle of start bit



From Wolf "Computers as Components 2nd ed"

Serial communication

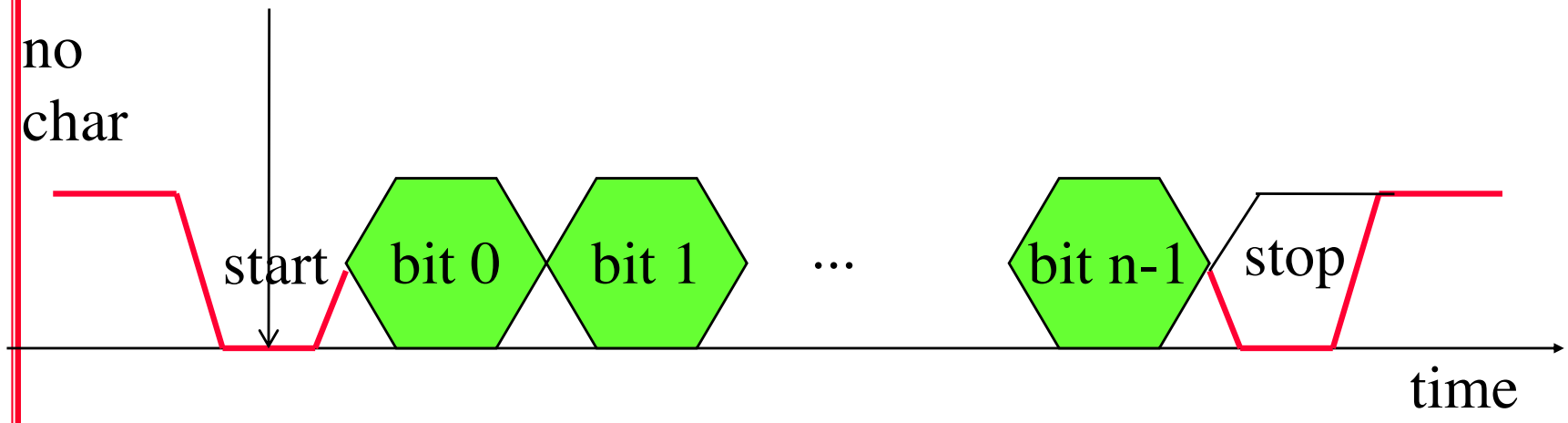
Receiver then counts by 1/baud



From Wolf "Computers as Components 2nd ed"

Serial communication

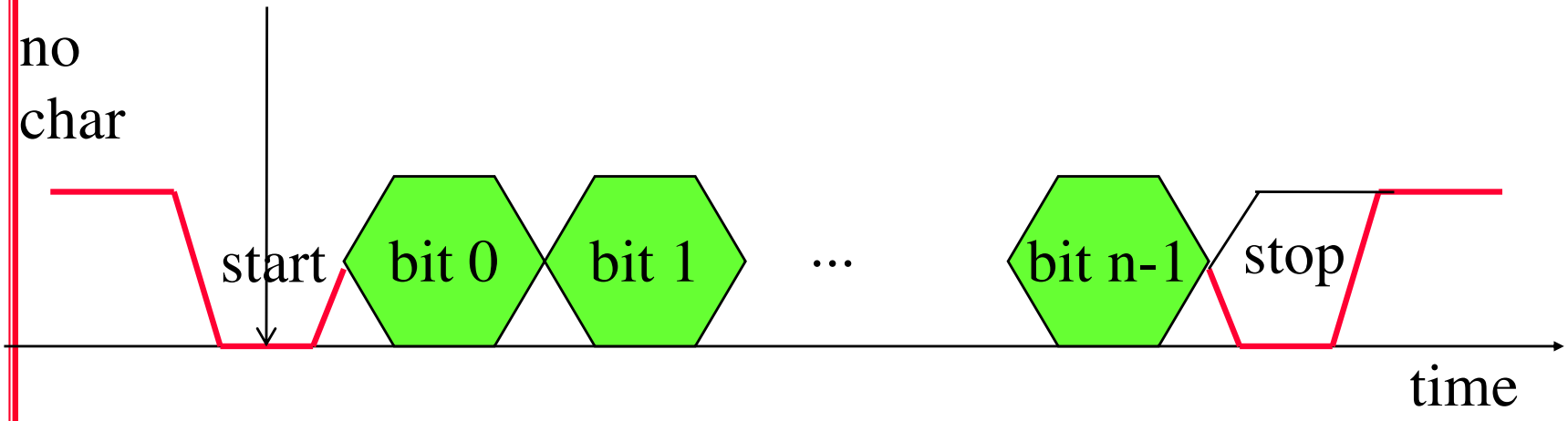
- How Close do frequencies have to match ?



From Wolf "Computers as Components 2nd ed"

Serial communication

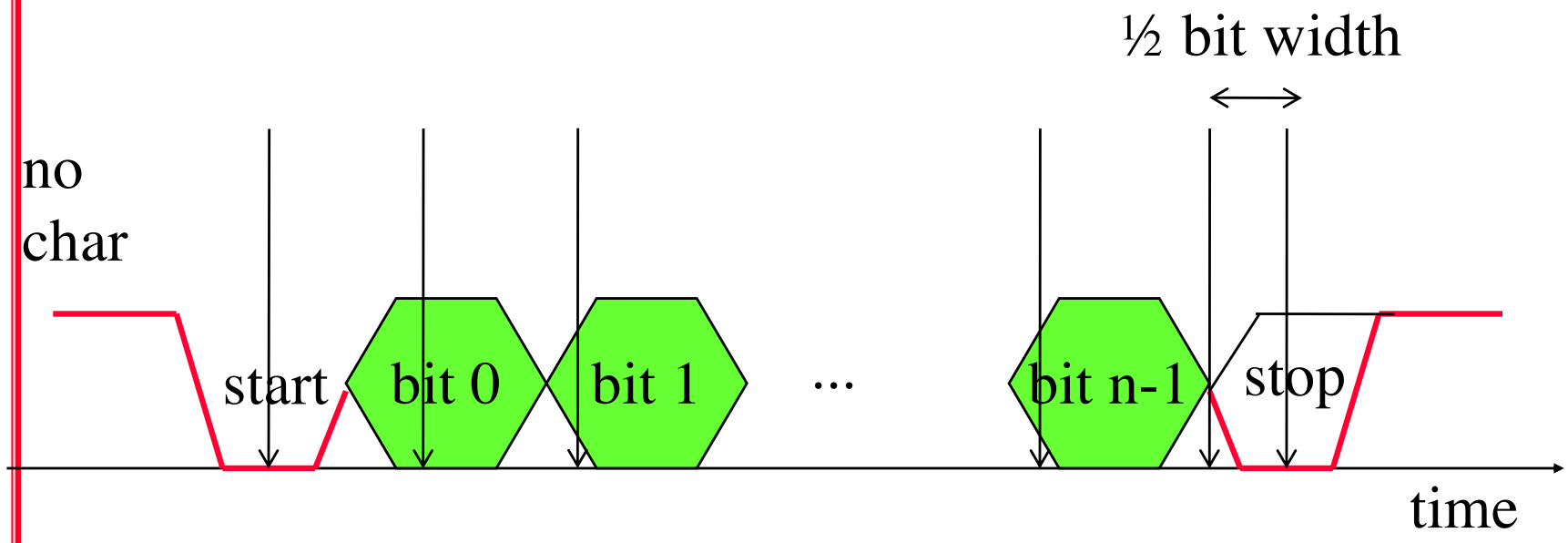
- How Close do frequencies have to match ?
- Depends on total number of bits



From Wolf "Computers as Components 2nd ed"

Serial communication

- Last bit can only be off +/- ½ bit width
  - Can you figure Δ in frequencies ?



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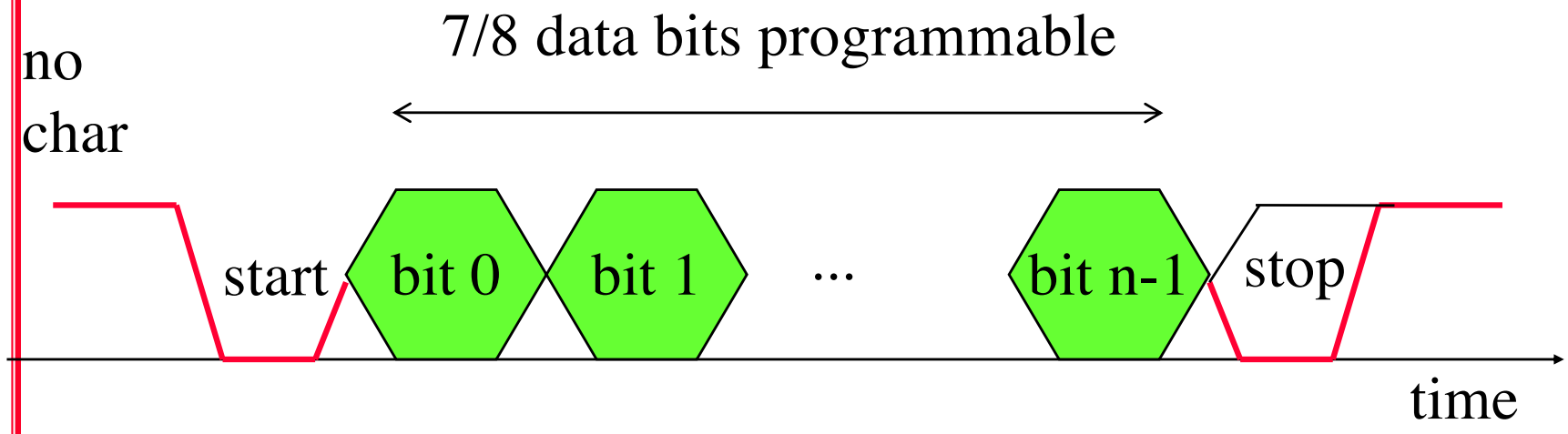

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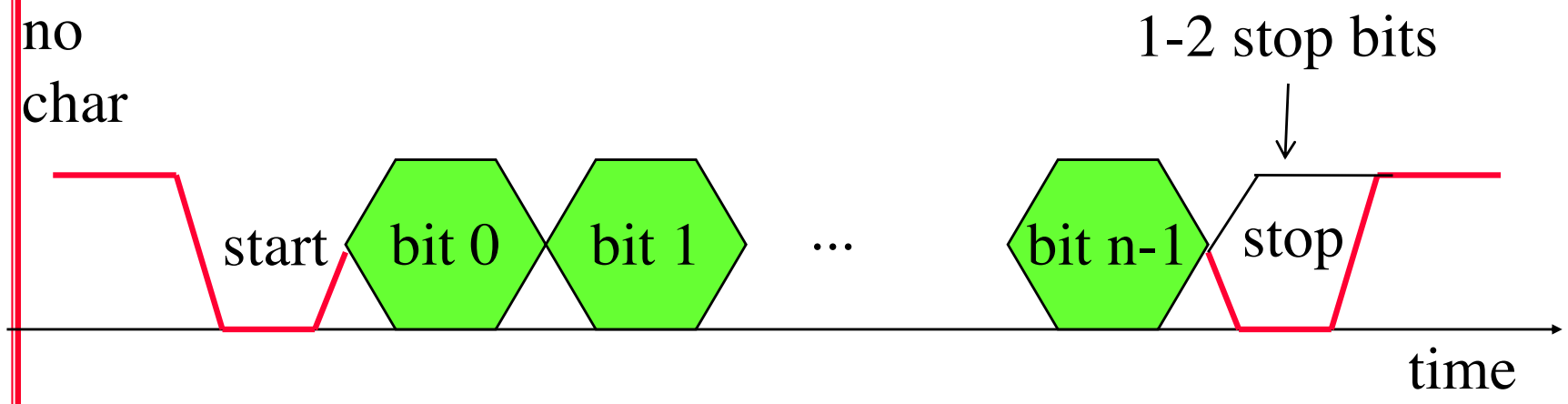

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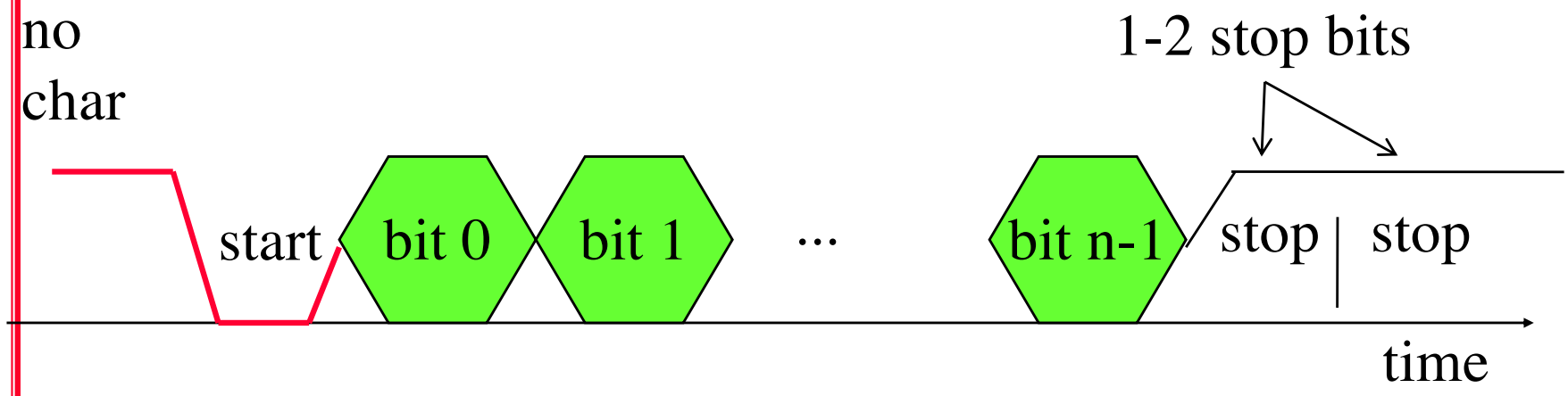
Serial communication



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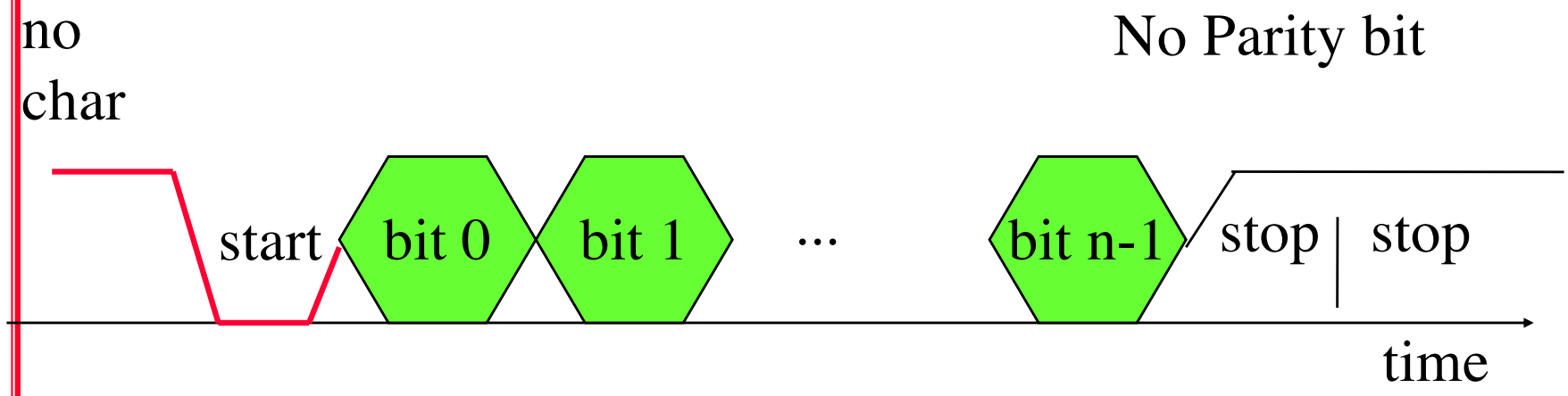
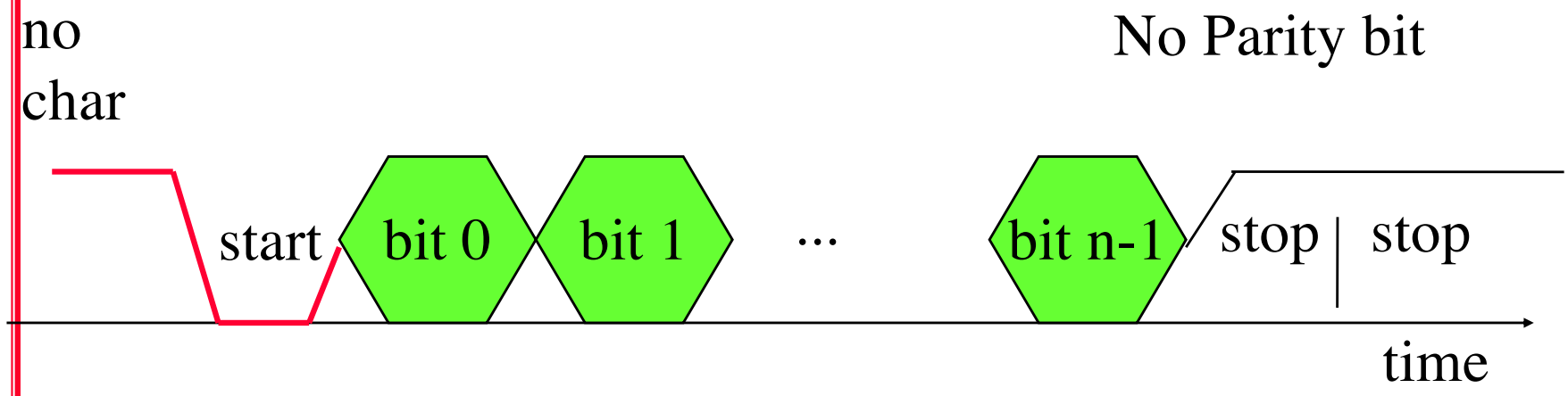


From Wolf "Computers as Components 2nd ed"

Serial communication

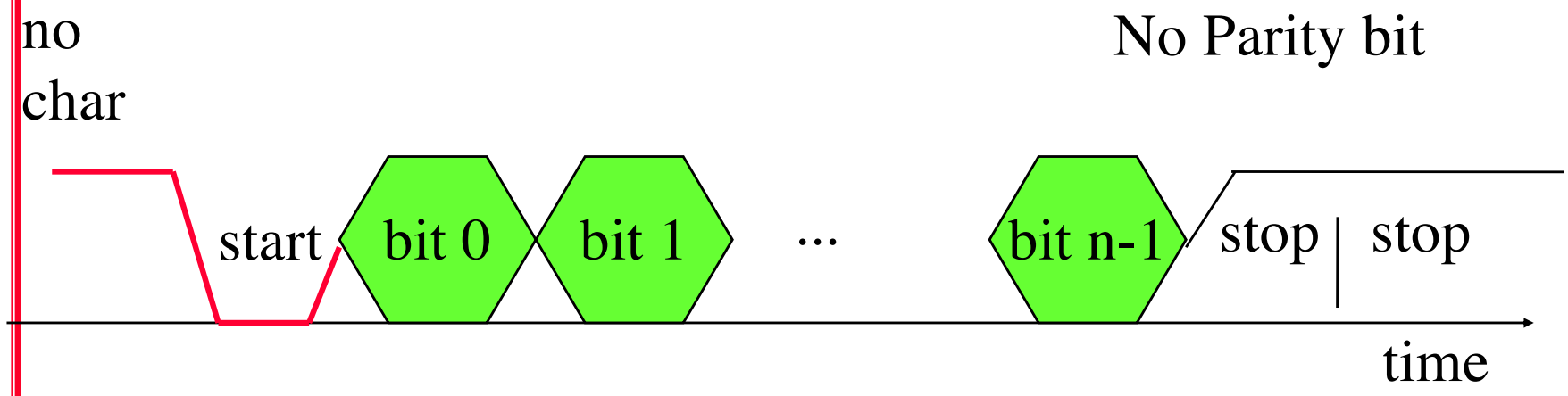
- Why is parity used for ?



From Wolf "Computers as Components 2nd ed"

Serial communication

- Why is parity used for ?
  - Single bit fault detecting (single bit flip)



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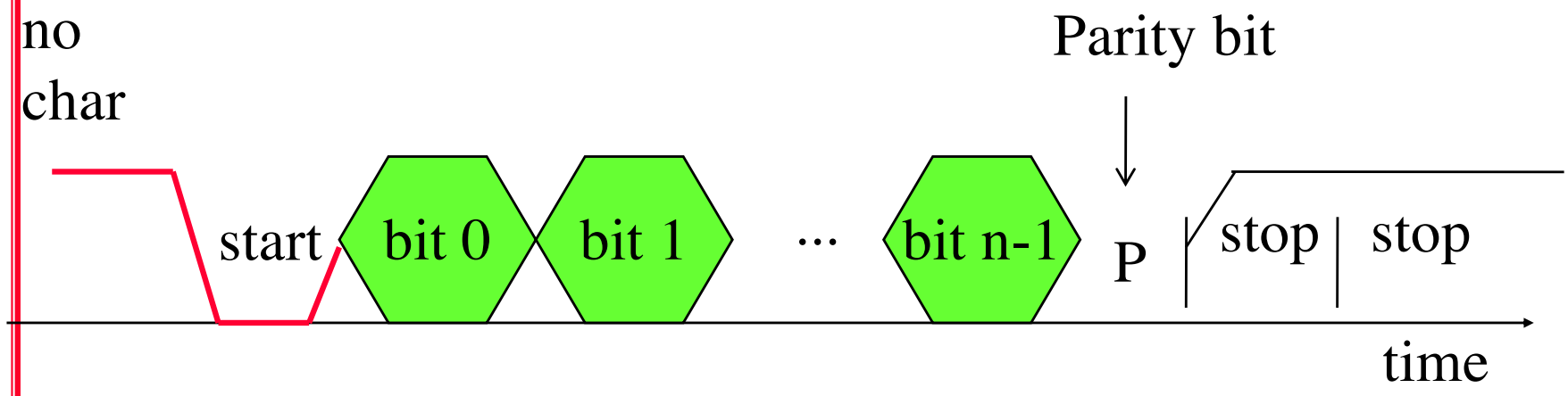
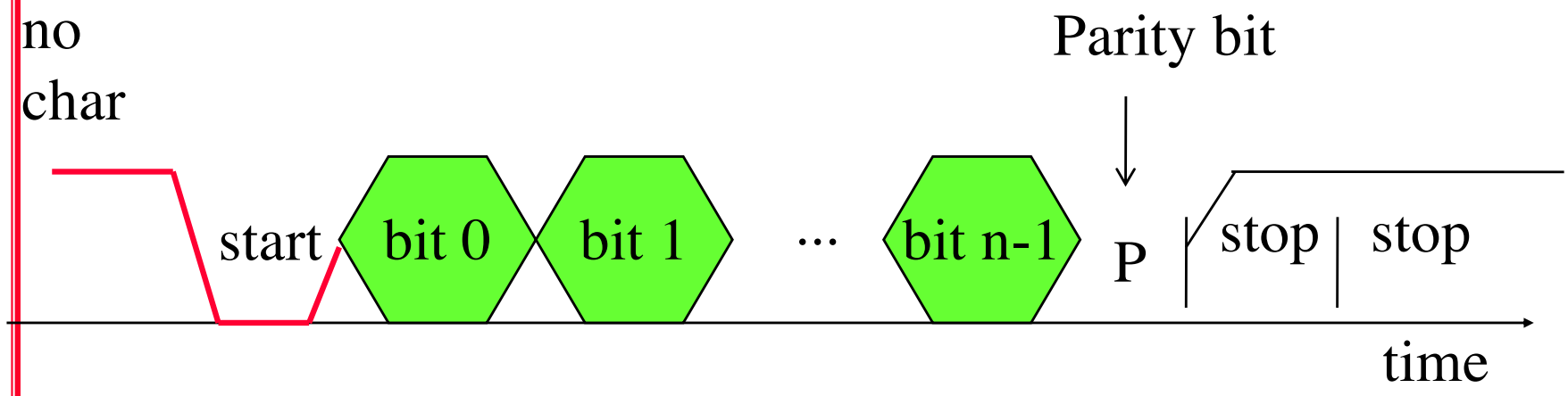
Serial communication



From Wolf "Computers as Components 2nd ed"

Serial communication

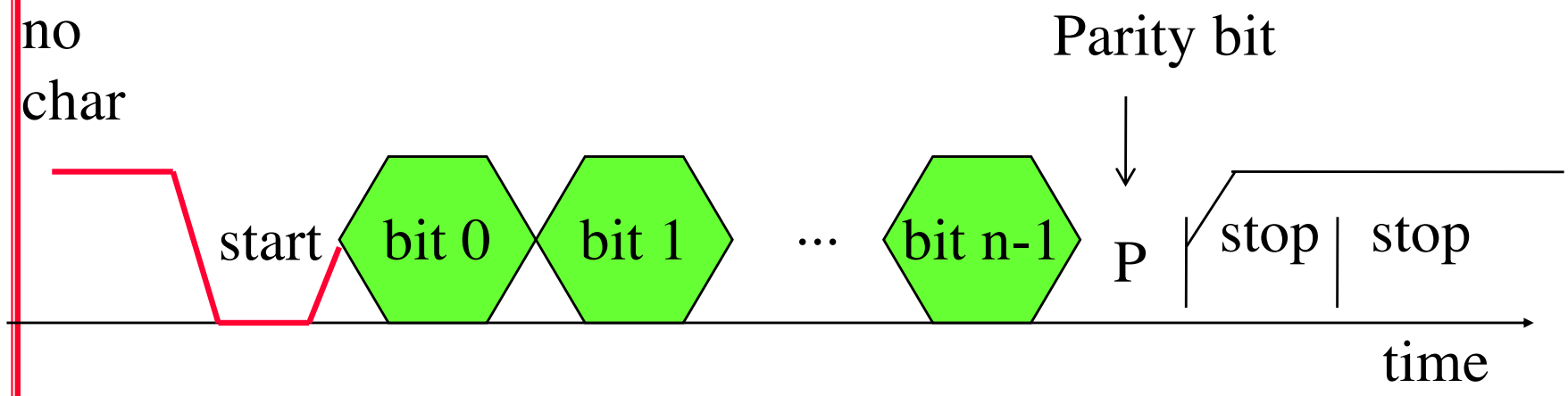
- Even/Odd Parity
  - Even := Even number of bits sent (Data+Parity bit)
  - Odd := Odd number of ……..



From Wolf "Computers as Components 2nd ed"

Serial communication

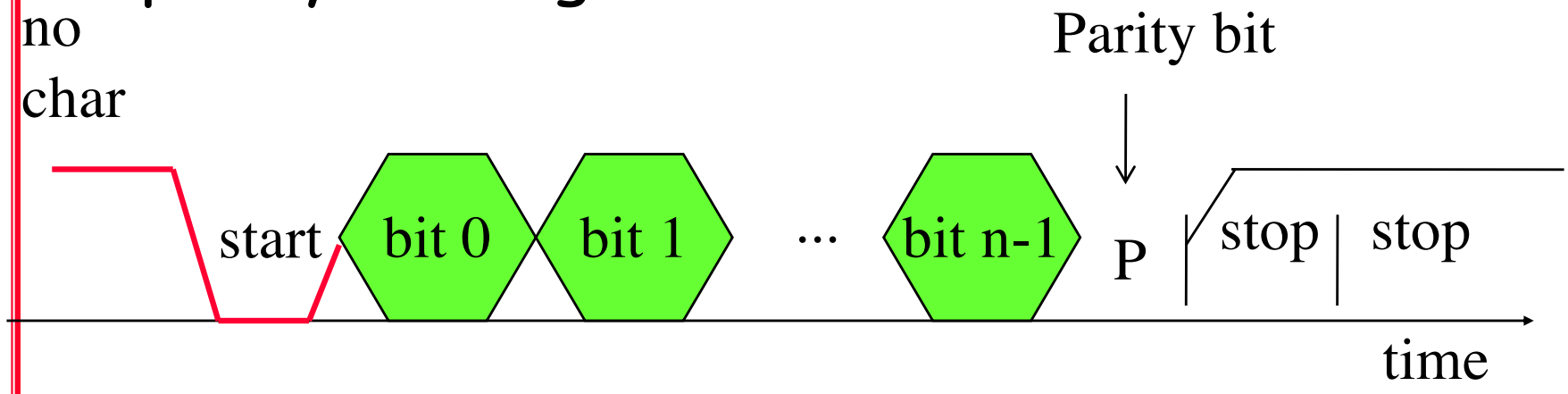
- Sender: Count #1's and set P={1,0} to match parity



From Wolf "Computers as Components 2nd ed"

Serial communication

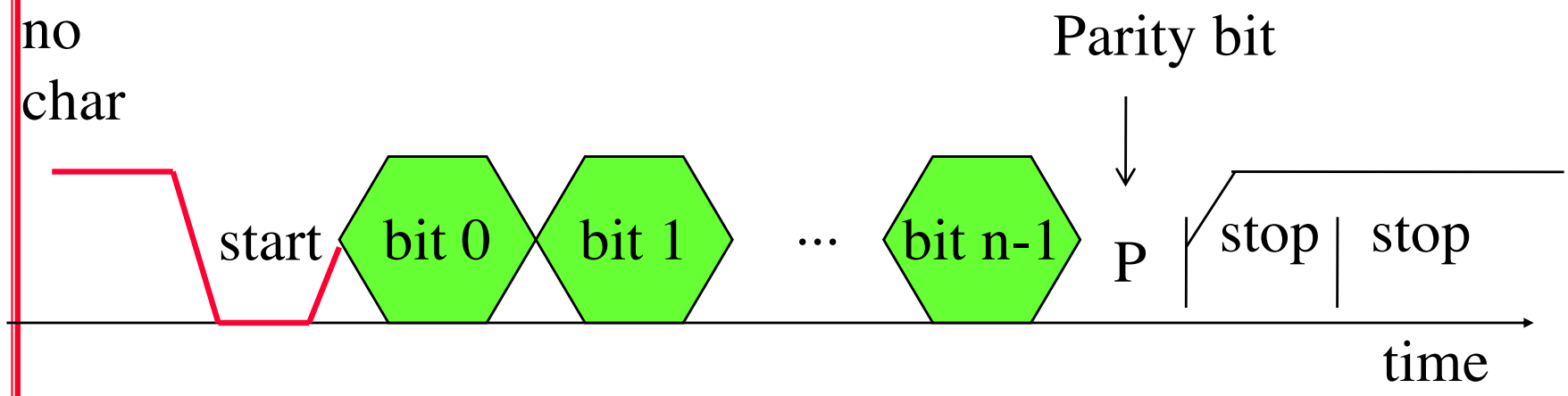
- Sender: Count #1's and set P={1,0} to match parity
- Receiver: Counts #1's and compares to parity setting



From Wolf "Computers as Components 2nd ed"

Serial communication

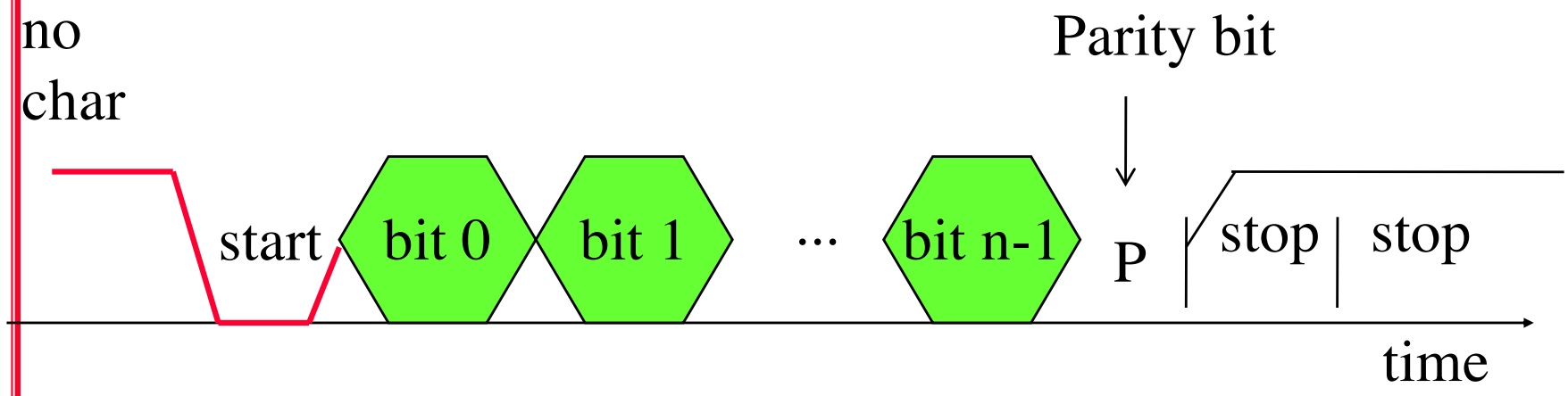
- Sender 1,0,1,0,1,1,1:P
  - For Even P= ?



From Wolf "Computers as Components 2nd ed"

Serial communication

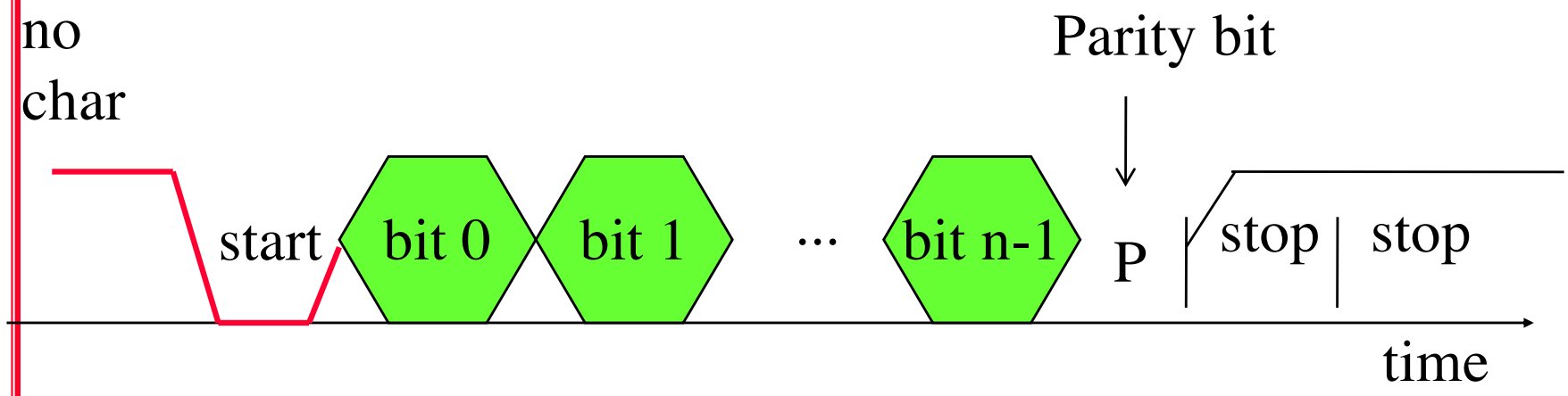
- Sender 1,0,1,0,1,1,1:1
  - For Even P= 1 to make 6 1's



From Wolf "Computers as Components 2nd ed"

Serial communication

- Sender 1,0,1,0,1,1,1:1
  - For Odd P= 0 to make 5 1's



From Wolf "Computers as Components 2nd ed"

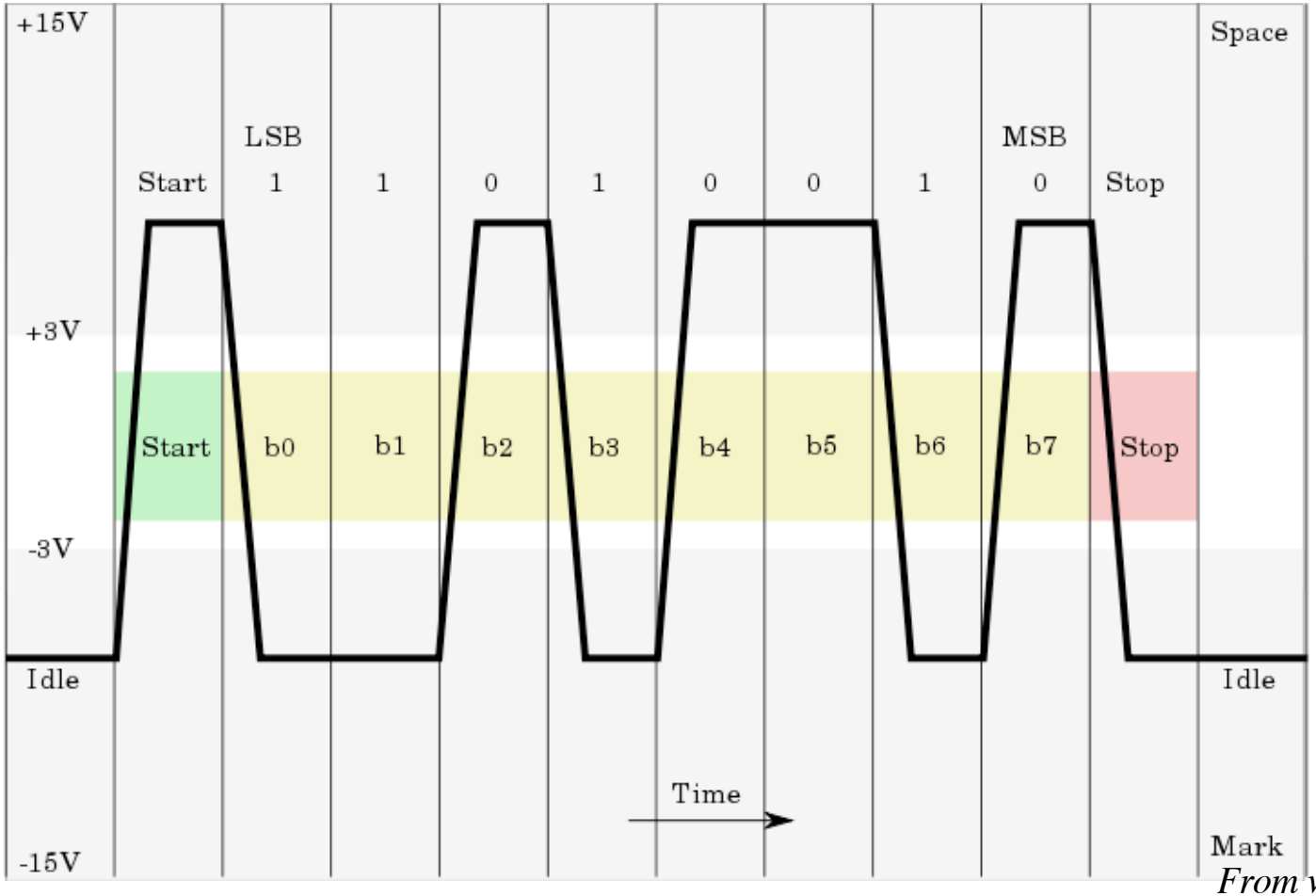
RS232 Standard

- "If you don't link the current standard just wait until it changes".....anonymous

- RS-232 (Recommended Standard 232) is the traditional name for a series of standards for serial binary single-ended data and control signals connecting between a *DTE* (Data Terminal Equipment) and a *DCE* (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The standard defines the electrical characteristics and timing of signals, the meaning of signals, and the physical size and pin out of connectors. - wikipedia

Logic {1,0} by voltage levels

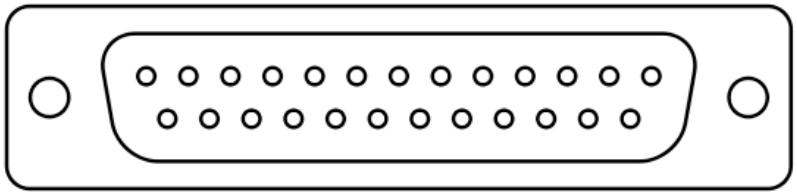
- Logic 1 = +{15:3}volts, Logic 0 = -{3,15}Volts



From wikipedia

Defines Pinouts

- 25 pin connector



Signal			Origin		DB-25 pin
Name	Typical purpose	Abbreviation	DTE	DCE	
Data Terminal Ready	Indicates presence of DTE to DCE.	DTR	●		20
Data Carrier Detect	DCE is connected to the telephone line.	DCD		●	8
Data Set Ready	DCE is ready to receive commands or data.	DSR		●	6
Ring Indicator	DCE has detected an incoming ring signal on the telephone line.	RI		●	22
Request To Send	DTE requests the DCE prepare to receive data.	RTS	●		4
Clear To Send	Indicates DCE is ready to accept data.	CTS		●	5
Transmitted Data	Carries data from DTE to DCE.	TxD	●		2
Received Data	Carries data from DCE to DTE.	RxD		●	3
Common Ground		GND	common		7
Protective Ground		PG	common		1

From wikipedia

Classic: 8251 UART

Universal asynchronous receiver transmitter called "You-Art"

- provides serial communication.
- Original + derivatives found in Most PC's
- Allows many communication parameters to be programmed.

8251 Interface

BLOCK DIAGRAM