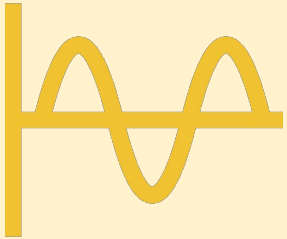

Project 0, Intersymbol Interference

Computer Network Fundamentals

George Varghese - Fall 2024
Discussion - Week 1

Learning Assistants

Pranav Puranam
Discussion 1A, 1B
3rd year, Computer Science
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Project 0

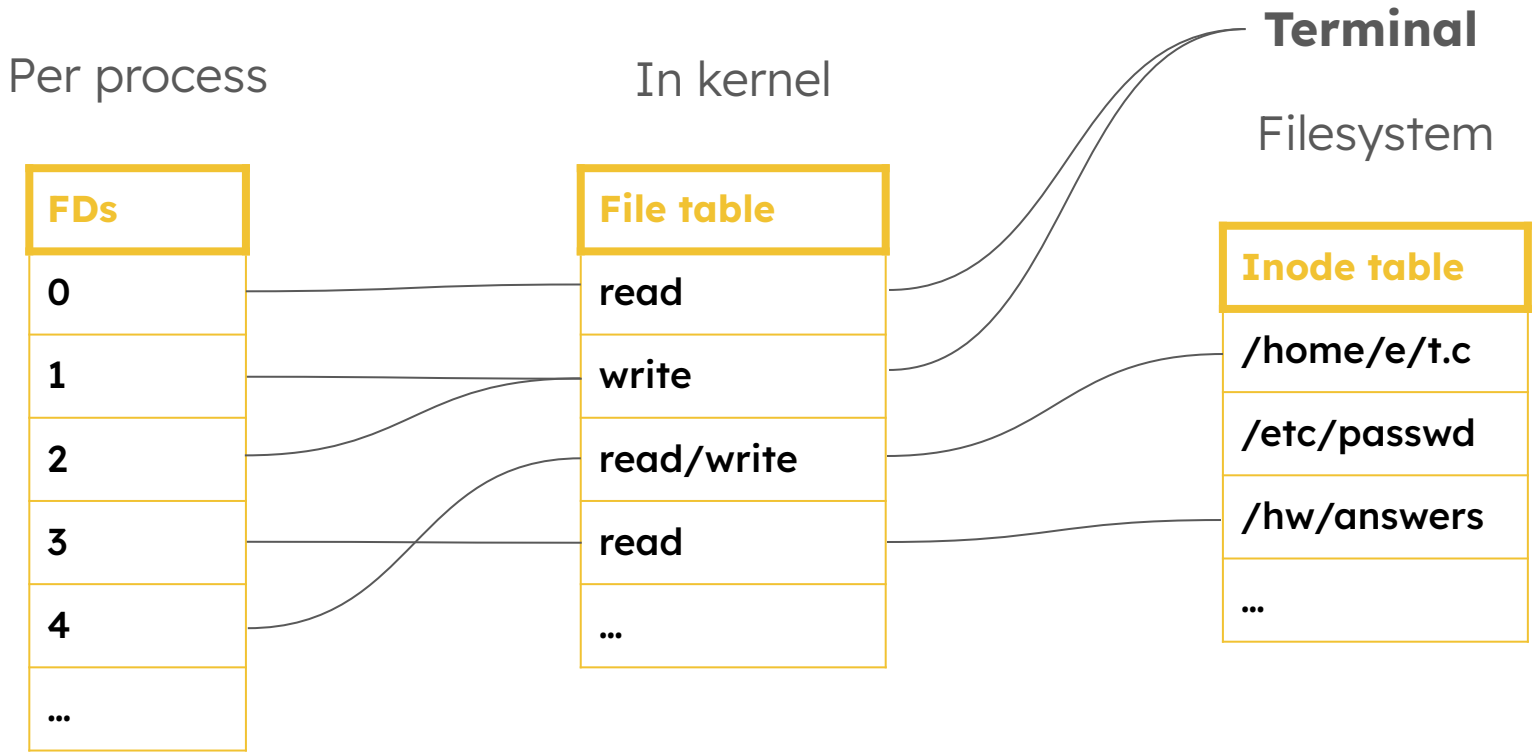
What is a socket?

Wikipedia:

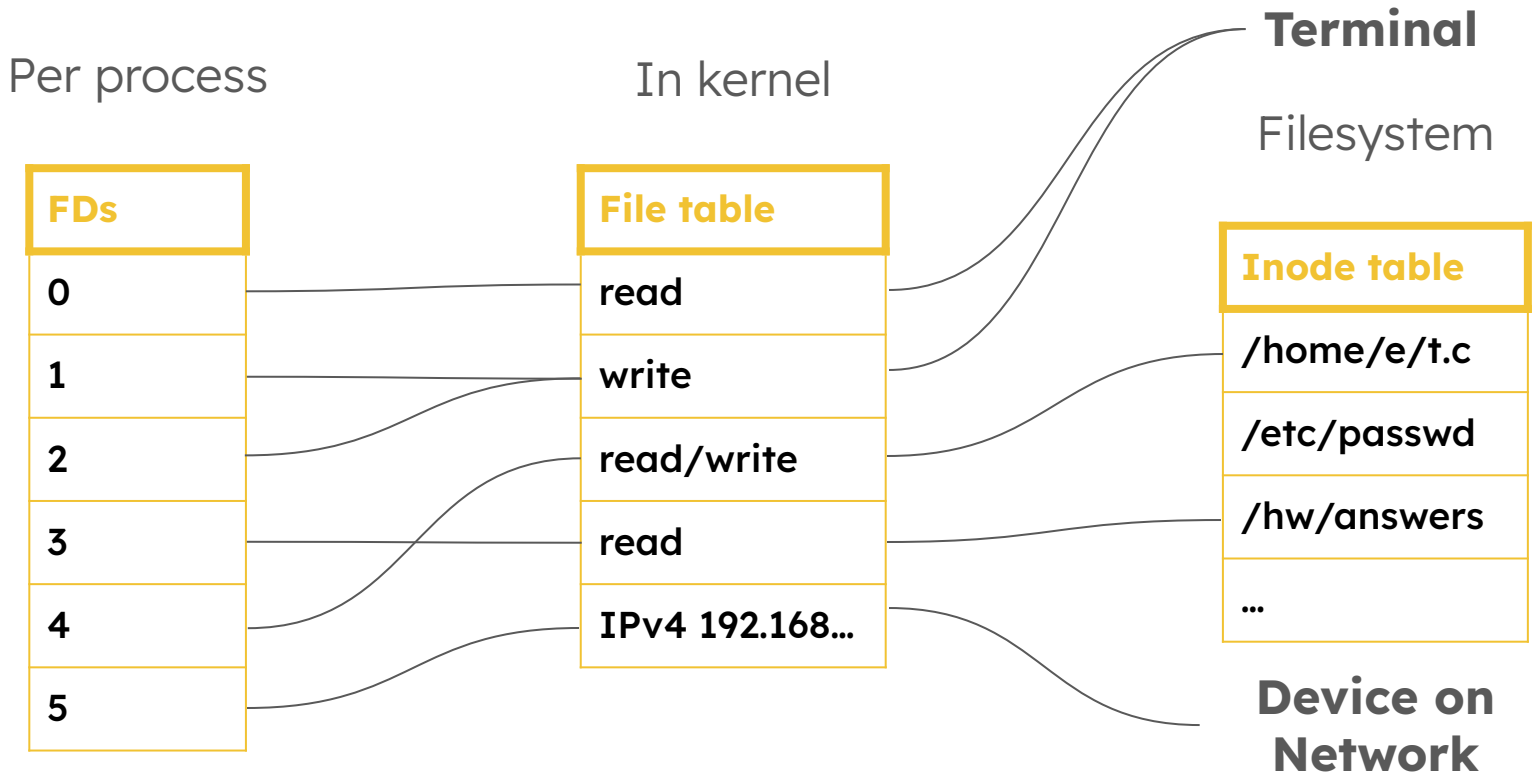
A **network socket** is a software structure within a network node of a computer network that serves as an endpoint for sending and receiving data across the network. The structure and properties of a socket are defined by an application programming interface (API) for the networking architecture. Sockets are created only during the lifetime of a process of an application running in the node.

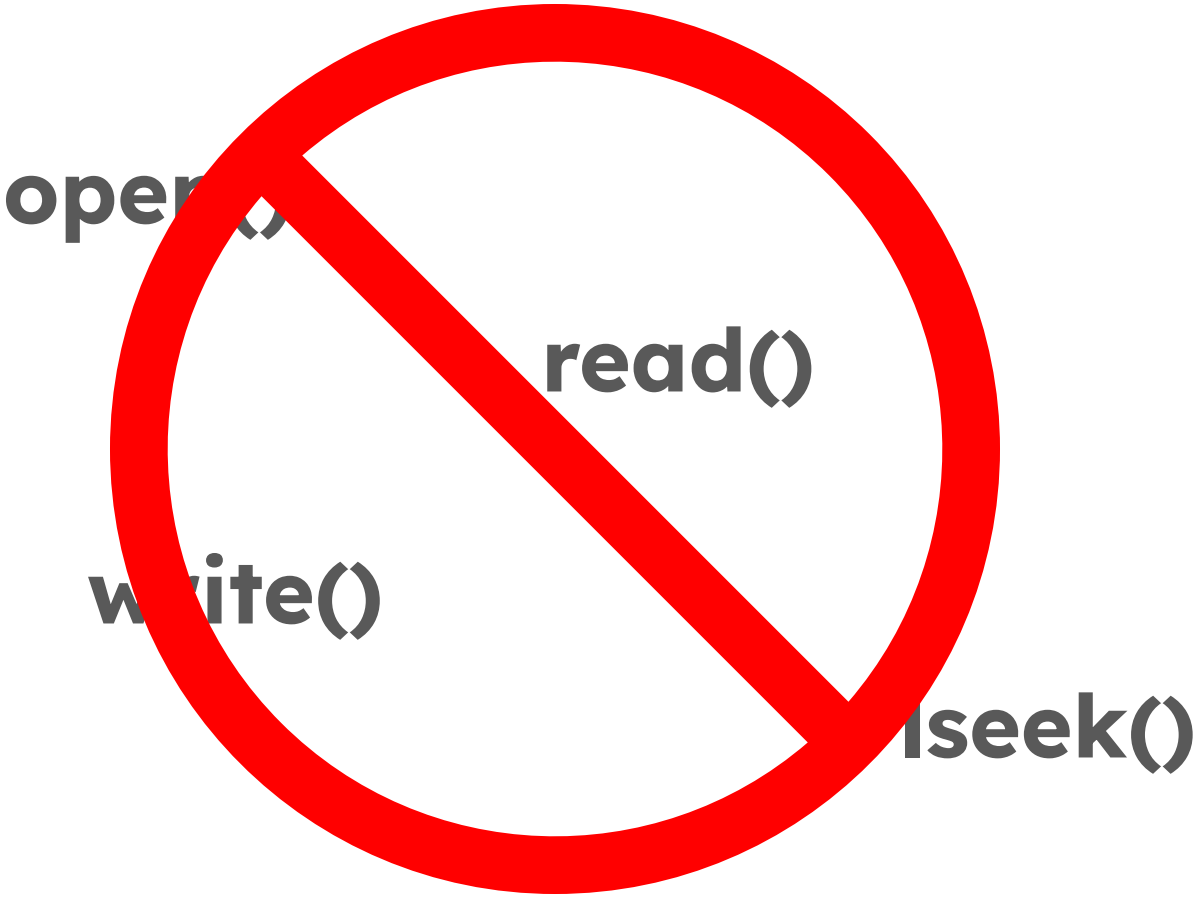
An abstraction that lets us interface with networked devices

File Descriptors (POSIX)



File Descriptors (POSIX)




read()
lseek()

Sockets are special

open() → socket()

read() → recvfrom()

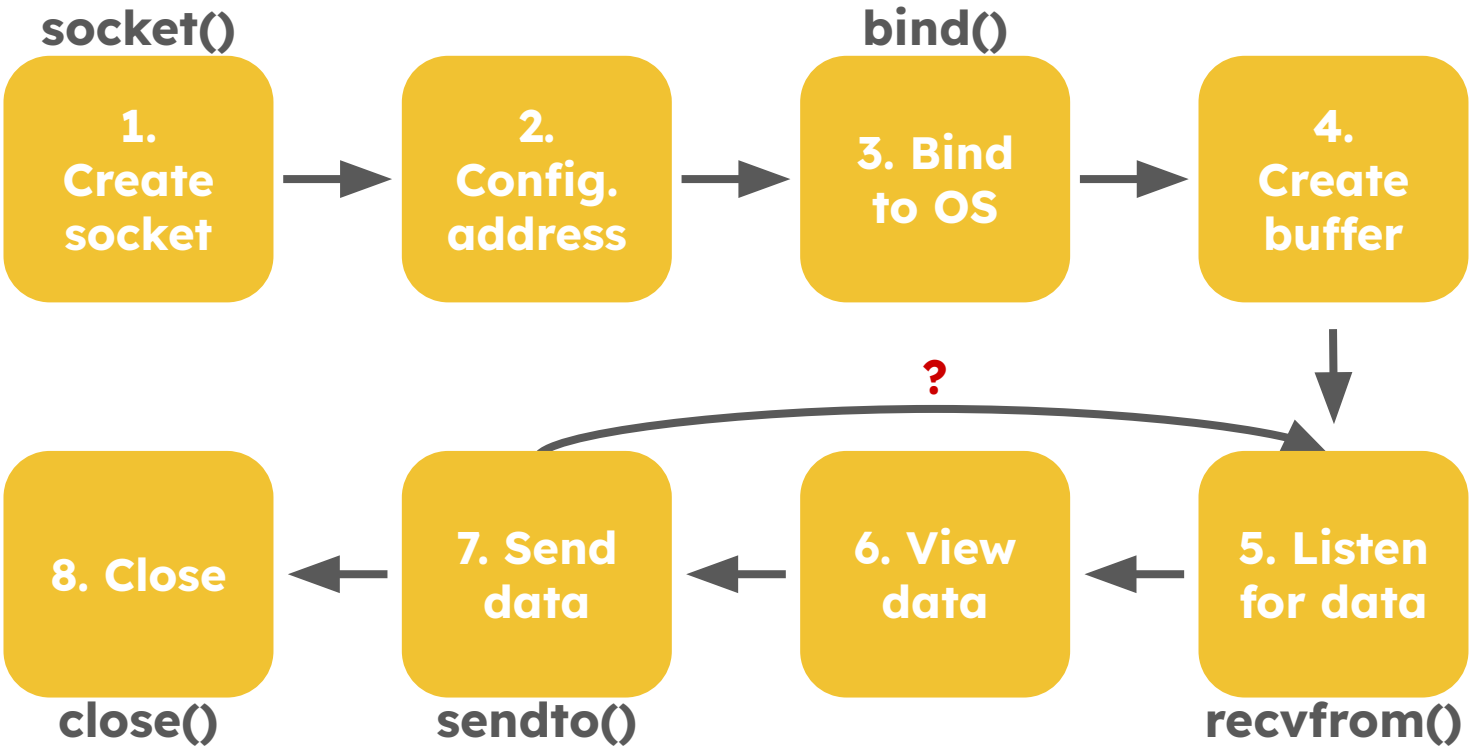
write() → sendto()

lseek() → 

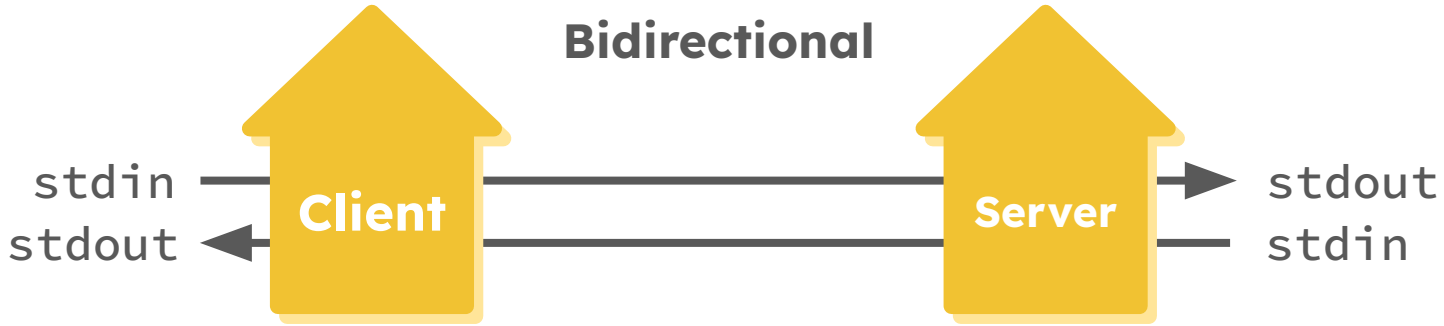
Sockets are special

- Must specify
  - network layer **protocol**, **type**
- For Internet Protocol
  - source/destination **address** and **port**
- Network communication is always **BIG ENDIAN**

Datagram Server/Client Steps



Goal



Demo

Quick Links

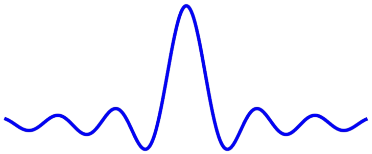
Starter Code: https://github.com/CS118F24/project0starter

Socket Programming Tips

Non-blocking file descriptors

A Brief Intro to Signals and Systems

$x(t)$ S $y(t)$



$$S[x(t)] = y(t)$$

A **signal** is some time varying data
A **system** *transforms* signals

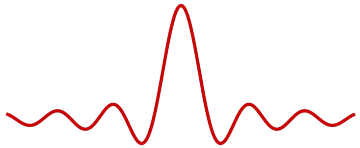
Impulse Response

$g(t)$

$\delta(t)$

S

$h(t)$

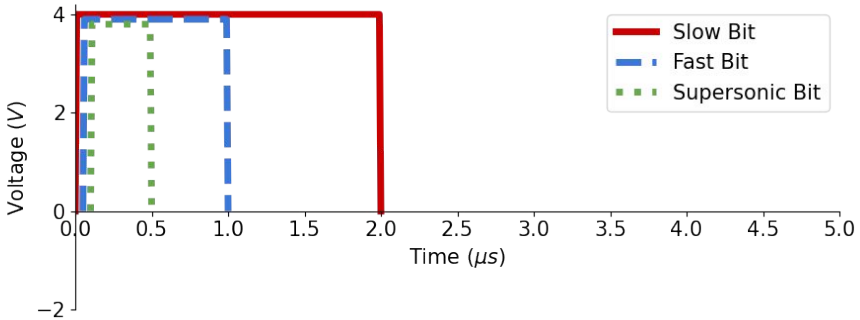


$\mathrm{sinc}(t)$

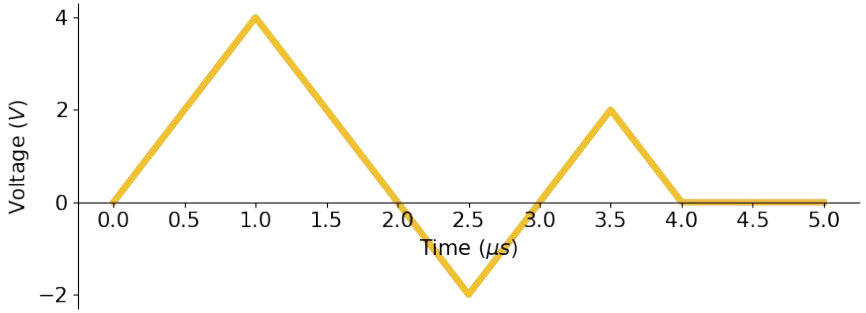
$$S[x(t)] = y(t)$$

$$x(t) * h(t) = y(t)$$

Convolution



$\text{rect}(t)$

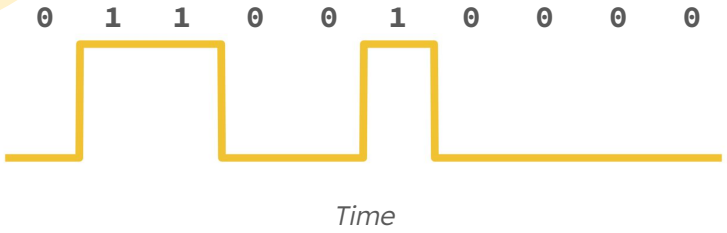


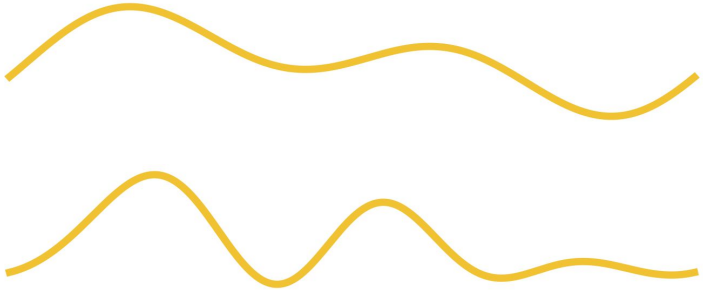
$h(t)$

$$\text{rect}(t) * h(t) \approx h(t)$$

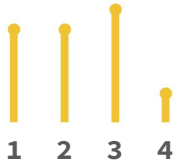
Worksheet

Fourier Transform



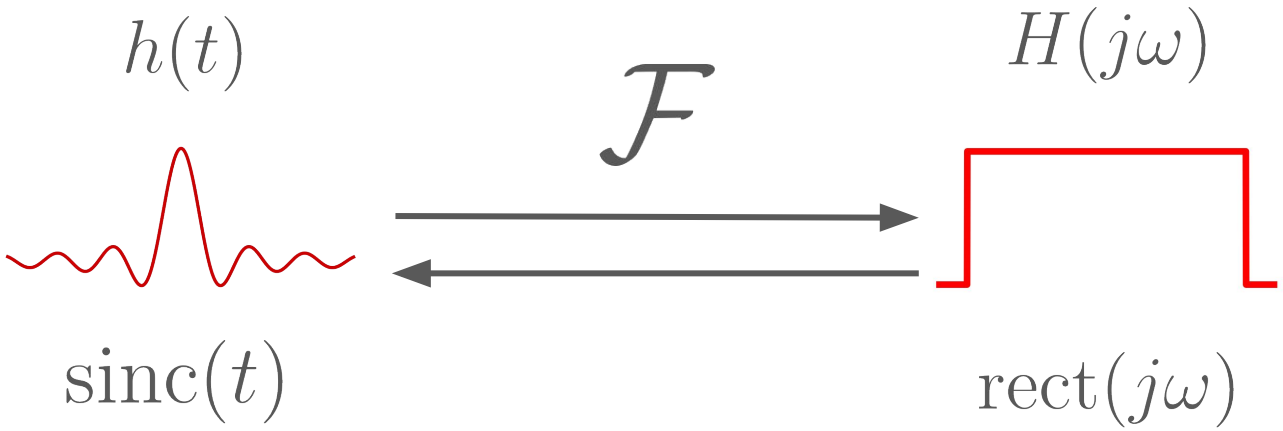


Reconstruction with **2** harmonics



Reconstruction with **4** harmonics

Impulse Response to Amplitude Response



Convolution to Multiplication

$$x(t) * h(t) = y(t)$$

$$\mathcal{F}[x(t) * h(t) = y(t)]$$

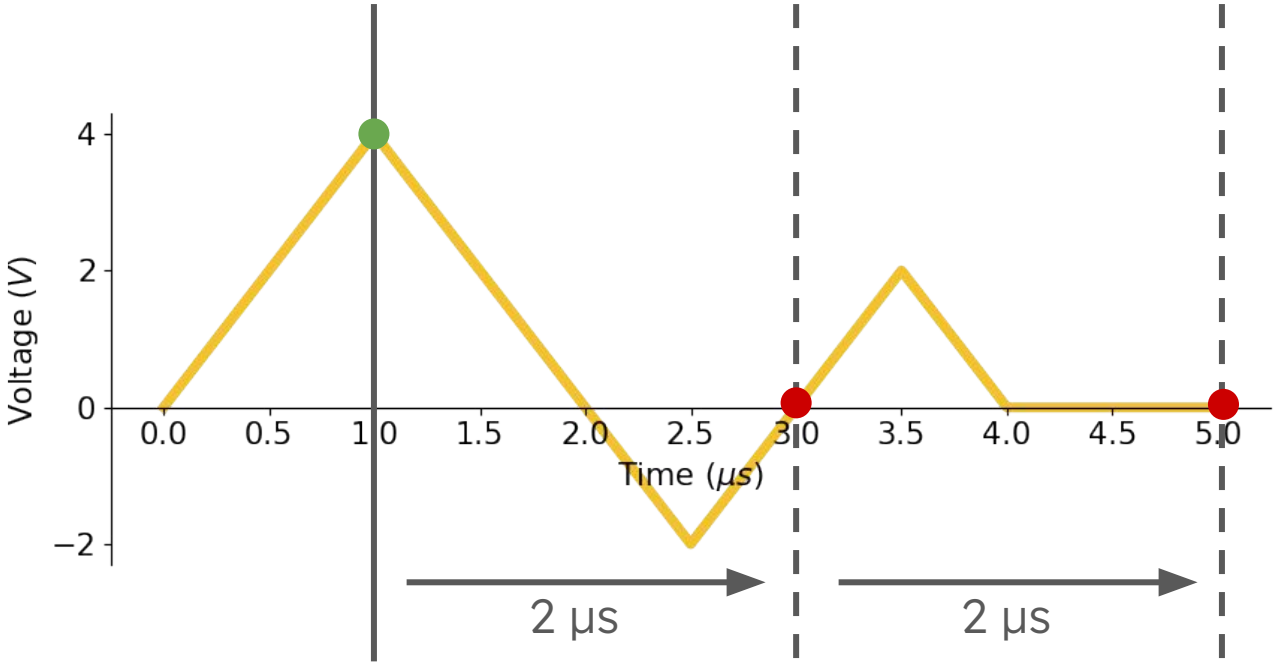
$$X(j\omega) \cdot H(j\omega) = Y(j\omega)$$

Nyquist ISI Criterion

$$\sum_{k=-\infty}^{\infty} h(t - kT) = 0 \text{ for } t \neq kT,\ k \in \mathbb{Z}$$

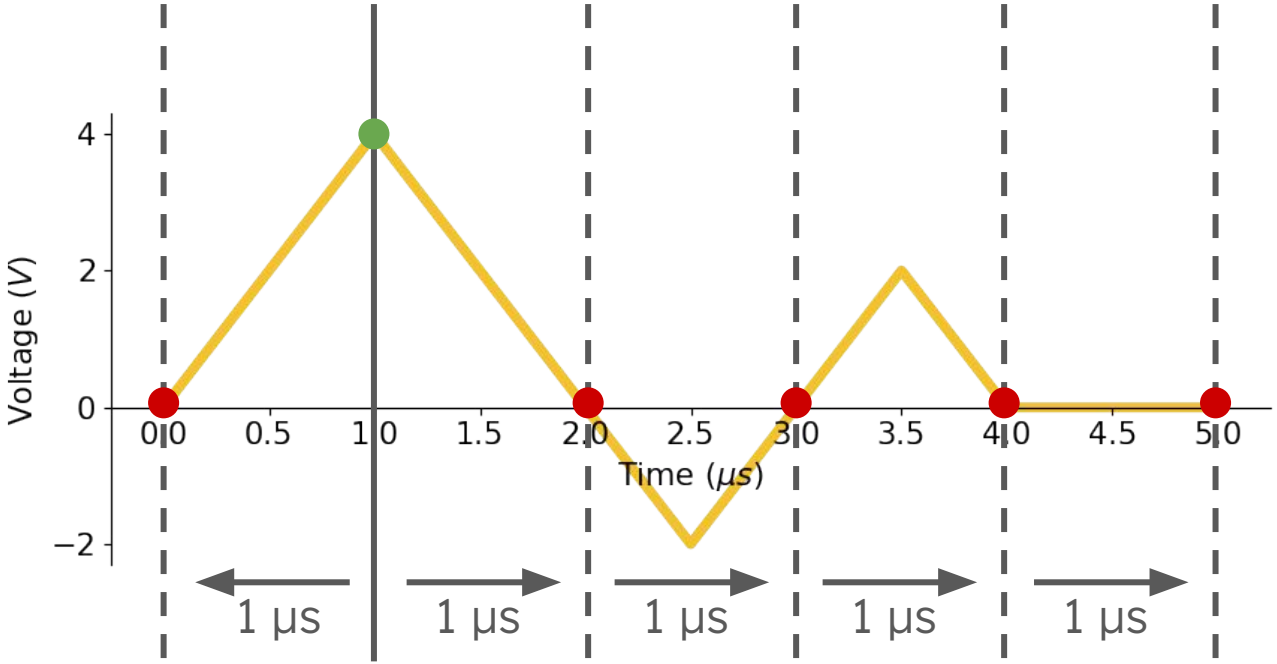
"For every sampling point in the impulse response (except the first one), ***the value must be 0****"*

Why does it (not) work?



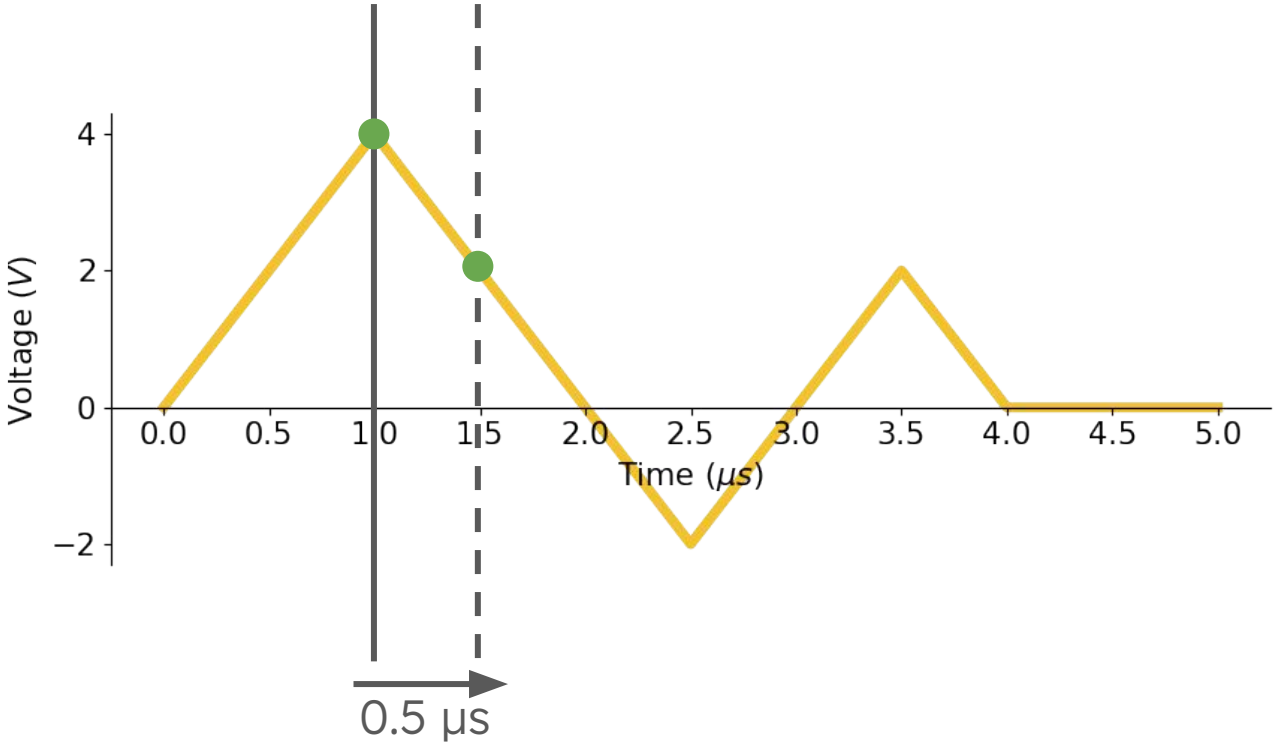
✅

Why does it (not) work?



✅

Why does it (not) work?



Next time

Interactive activity to learn socket programming!

(Actually) bring SSH enabled devices next time :)