NAND 2 Roblox

acm @OSU

Thu Jan 29, 2026

Overview of Running “Code”

Applications

Operating System

Hardware

Roblox Game

Lua VM

Game Engine

...

Overview of Running “Code”

- Process Model & Execution
- Memory Systems
- I/O Device Drivers and Abstraction
- System Services & Security Primitives

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- Applications
- Operating System
- Hardware

Overview of Running “Code”

Applications

Operating System

Hardware

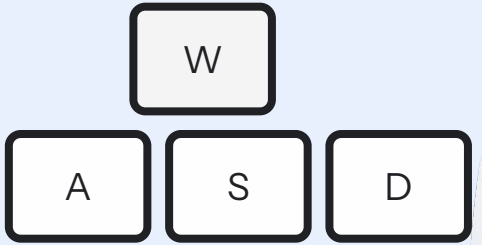
Architecture

Digital Logic

Transistors

Electrons

Gaming



Lua Code

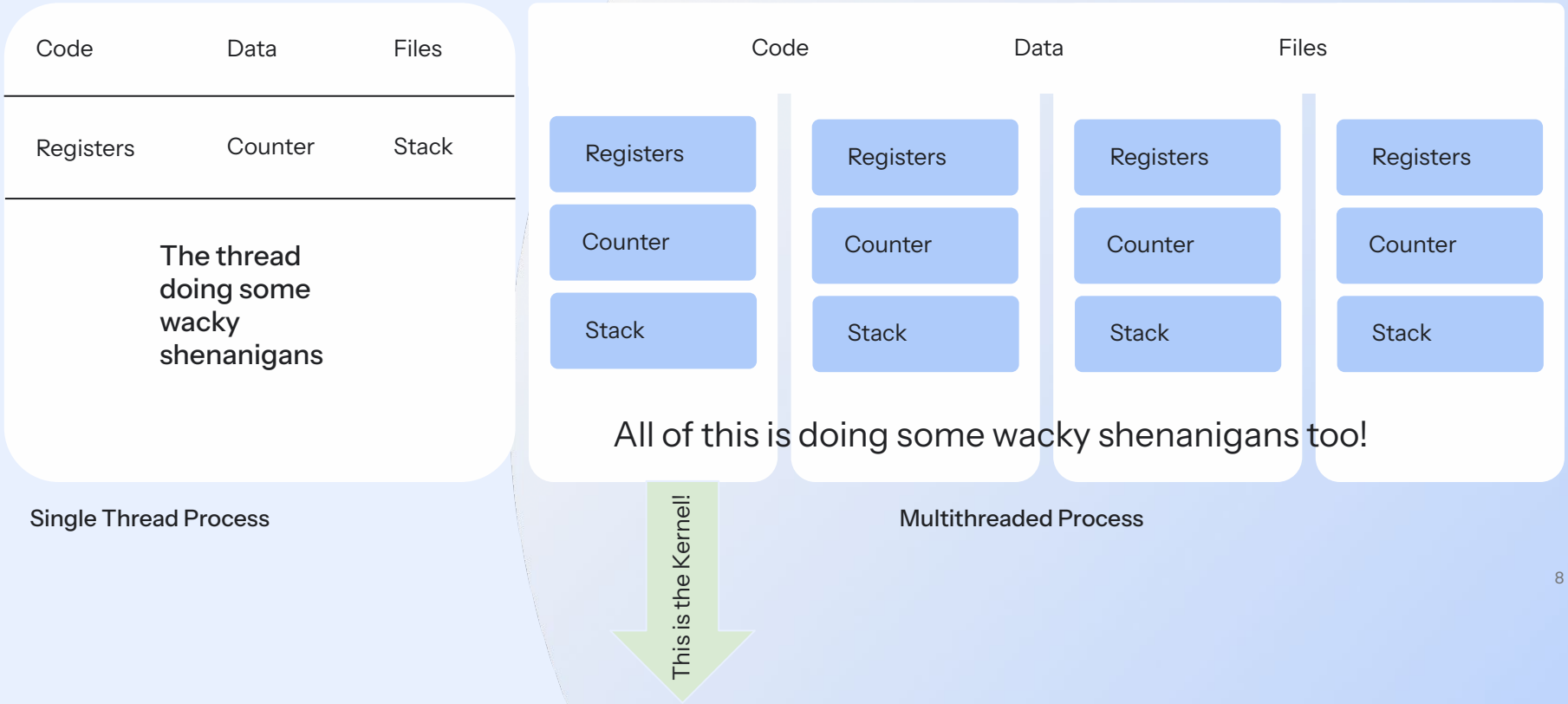
```lua
--create a helper function to access the
function OnTouched(thing)
	local active = false --start with this
	return function(target) --provides actu
		if active then return end 		--do
		local player=thing.Parent:findFirstC
		if player then --if it is, then
			active = true --toggle to prevent
			script.Parent:play() --play rustl
			wait(1)
			active = false --reset so functi
		end --end of if statement
	end
end

--loop over the children and connect touc
local bricks = script:GetChildren()
for i, brick in ipairs(bricks) do
	if brick:IsA("Part") then
		local onTouchedFunc = OnTouched(bric
		brick.Touched:Connect(onTouchedFunc)
	end
end
```

High level language, easy to implement

Software Layers

Lua	`Jump()`
C/C++	`ApplyForce(0.5f)`
Assembly	`MOV, ADD, MULT`
Machine Code	`01010010 11011001`

Processing the Software Layer



Single Thread Process

Multithreaded Process

Meet your Memory!

More Kernel stuff

Technically the Kernel Space

Slower, with more space!

This is not Kernel though

CPU

Register File

Fast but no space

Cache L1

Some space, and very fast

Microprocessor

Cache L2

Large amount of storage while still decently fast

My RAM is literally 1000$ right now, just so I can watch the AI Slopocalyse

SRAM and DRAM

Main Memory

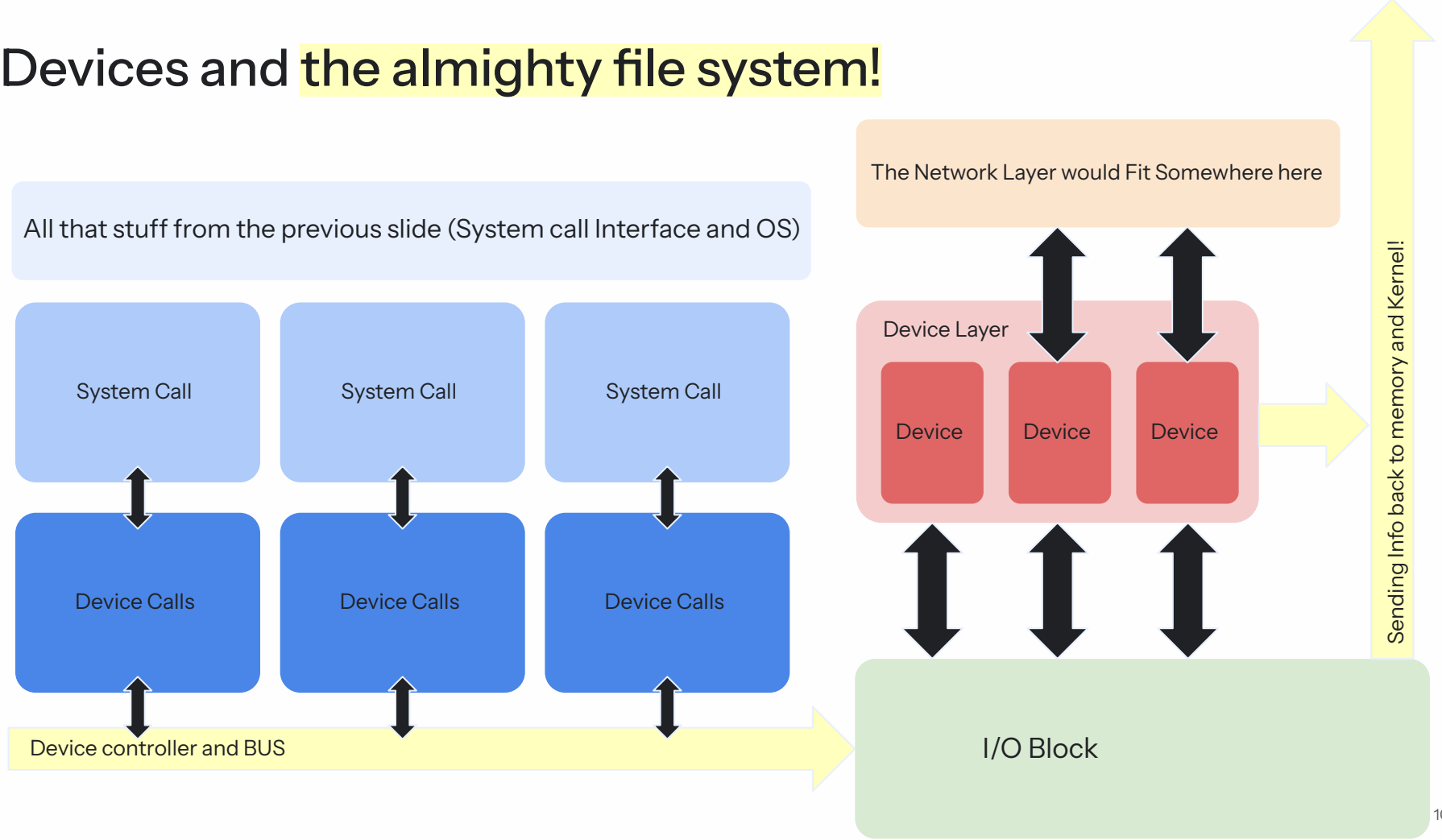
Secondary Memory

Solid State Disks, Magnetic Disks, Optical Disks, Magnetic Tapes

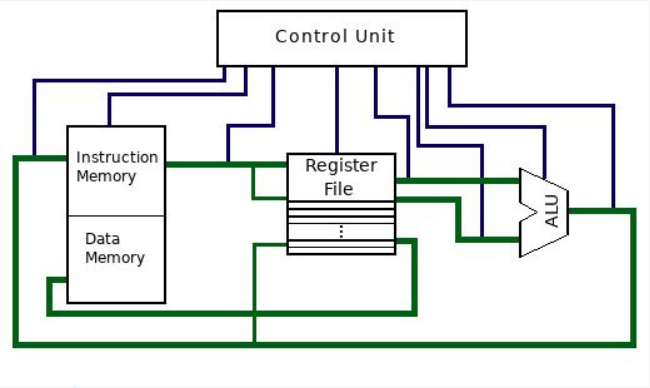
Huge space! But Extremely slow!

Fast → Slow

Devices and the almighty file system!

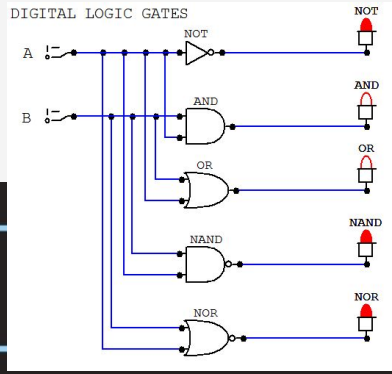


Instruction Set Architecture (ISA)	→	A set of pre-designated inputs and instructions the CPU expects and can execute
Word Size	→	Designates the size of registers and how big the datapaths/buses are
Memory Map	→	Where RAM/ROM/Devices live in our address space
Von Neumann Architecture	VS.	Harvard Architecture



The Shape of a Computer. Defining what a computer/CPU can and can't do

Logically, with Digital Logic (Sequential)



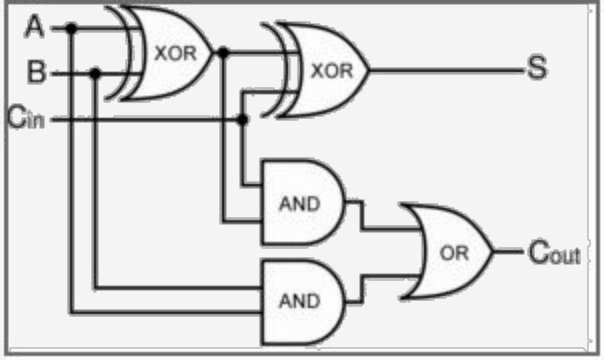
Thousands of these registers work together to bring you the youtube you watch every night or the Instagram reels you scroll for hours through.

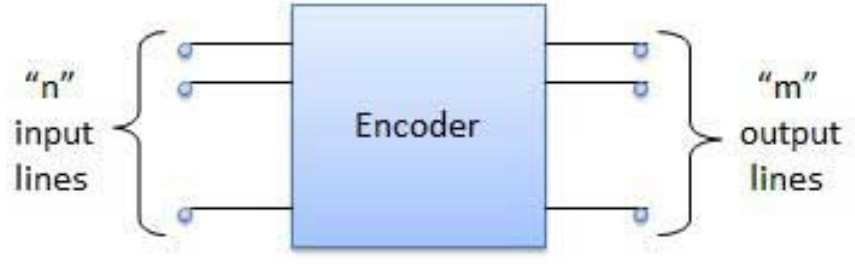
These Registers run based off of Flip Flops and Digital Logic Gates!

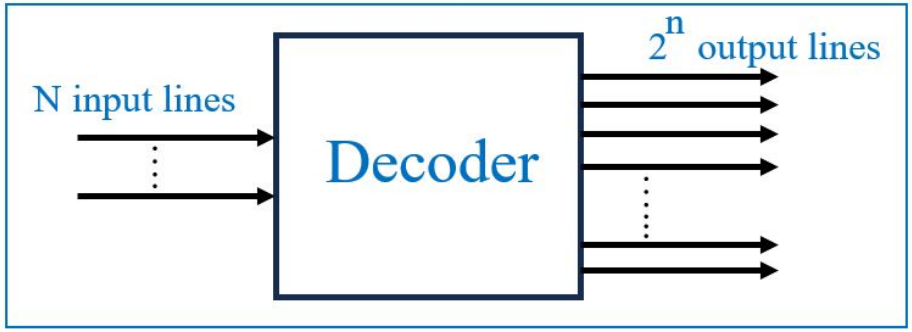
Combinational Logic, but Digital

Let's meet our big players!

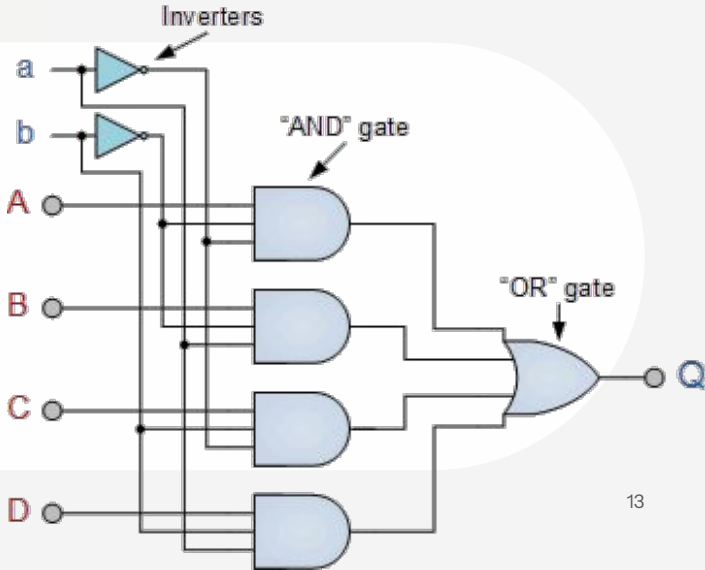
The Adder





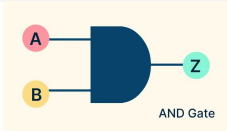


The Multiplexer

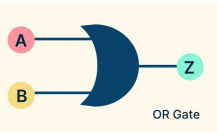


Back to Basics. **Basic Logic Gates**

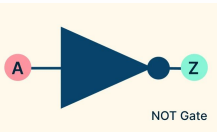
Basic Logic Gates



x	y	F
0	0	0
0	1	0
1	0	0
1	1	1

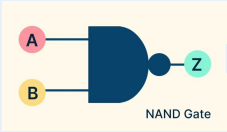


x	y	F
0	0	0
0	1	1
1	0	1
1	1	1

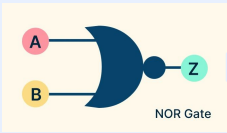


x	y	F
0	0	1
0	1	0
1	0	0
1	1	0

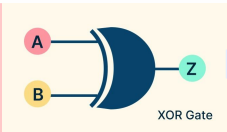
Universal Logic Gates



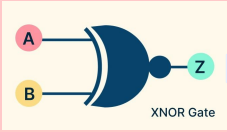
x	y	F
0	0	1
0	1	1
1	0	1
1	1	0



x	y	F
0	0	1
0	1	0
1	0	0
1	1	0



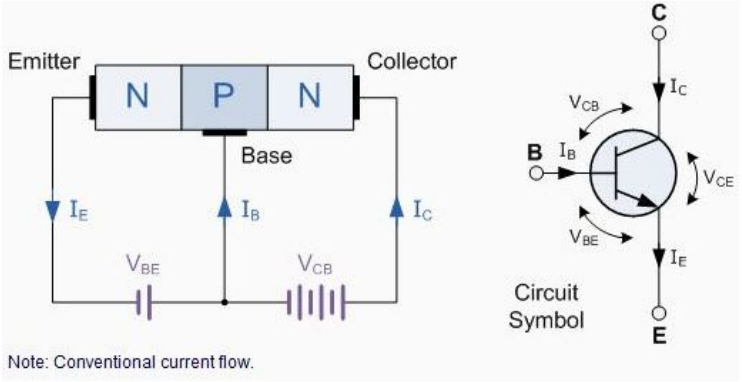
x	y	F
0	0	0
0	1	1
1	0	1
1	1	0



x	y	F
0	0	1
0	1	0
1	0	0
1	1	1

Derived Logic Gates

The Workhouse of EVERY. SINGLE. ELECTRONIC.

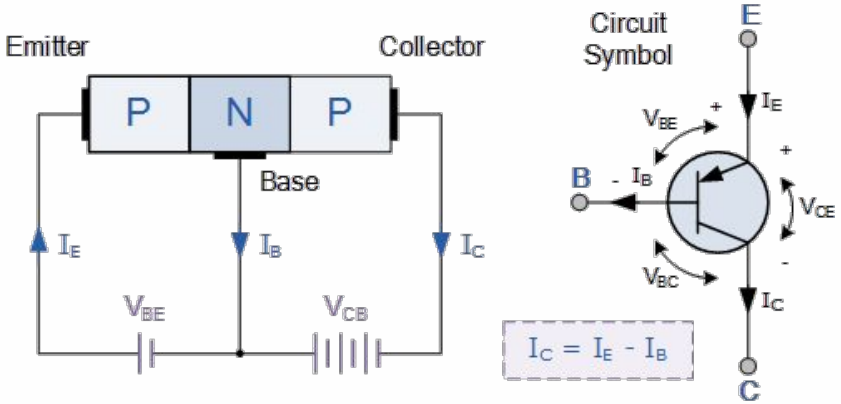


N and P stand for different sections within the Transistor. N is for Phosphorus doped Silicon (Negative Charge Carriers), and P is for Boron doped Silicon (Positive Charge Carriers).

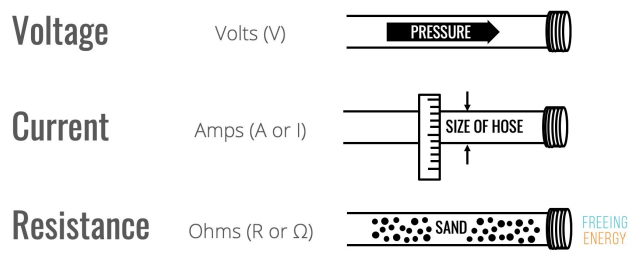
Applying small voltages to the Base, we can control whether electrons can flow (1) or not (0).

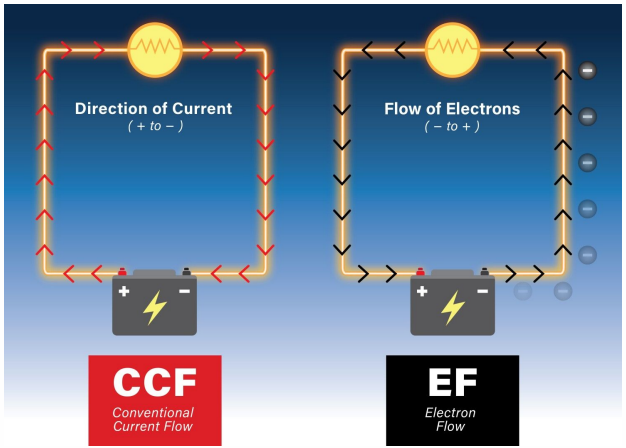
At a glance

- Transistors make up Logic Gates
- Logic Gates make up Digital Logic
- Digital Logic makes up microarchitecture



Electricity is like a water hose





Bonus Questions! For all you Filthy Nerds. (It's me. I'm the nerd)

If electrons are bound to atoms, how do they travel from one end to the other in a wire?

How fast does an Electron move within the wire?

Anyone else? I will stay around to answer any questions!

Thank you for coming and have a great evening!