

**Week 2 Day 1**

Led by: Emily Crose

for

Oakland University

# INTRODUCTION TO SOFTWARE DEVELOPMENT




# PREVIOUS SESSION QUESTIONS




# TERMS TO LISTEN FOR

- Cache
  - A small portion of RAM set aside for temporary storage for frequently accessed data
- Process Register
  - A quickly accessible location available to a computer processor
- Heap & Stack
  - Memory management methods

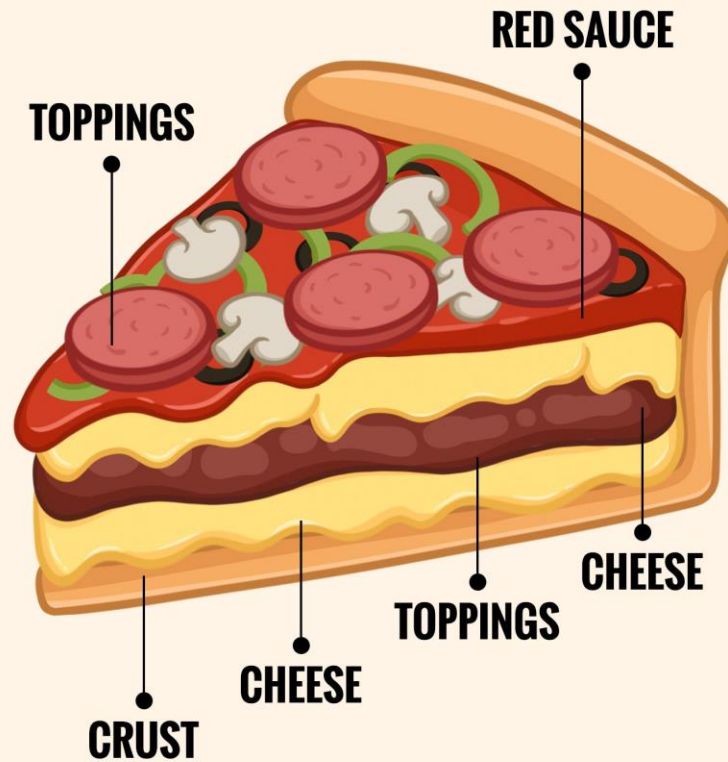


# APPLICATIONS & OPERATING SYSTEMS

The background is a solid dark blue color. It features several abstract, light blue geometric patterns. These include concentric circles of varying sizes, some with dashed lines. Arrows of different lengths and orientations are scattered throughout, some pointing clockwise and others counter-clockwise. Some of the circles have numerical labels around their perimeters, such as 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, and 260. The overall effect is a sense of motion and technical precision.

# OPERATING SYSTEMS OVERVIEW

# DEEP DISH PIZZA



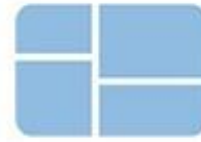


# Operating System

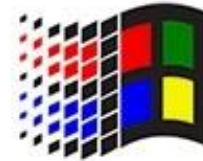


WELL-KNOWN OPERATING SYSTEMS

# OLD & OUT OF SUPPORT WINDOWS VERSIONS



1.0 (1985)



3.1 (1992)



95 (1995)



XP (2001)



Vista (2006)



7 (2009)



8 (2012)

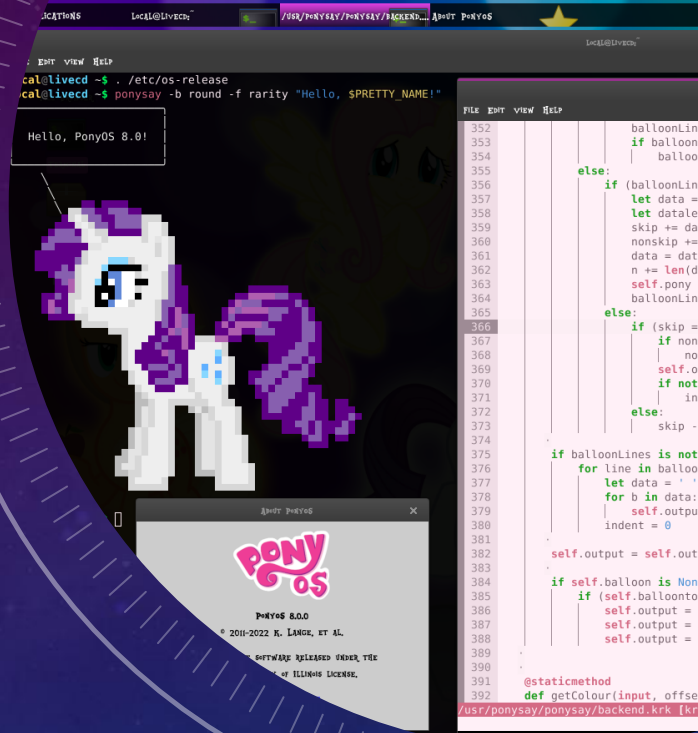


10 (2015)

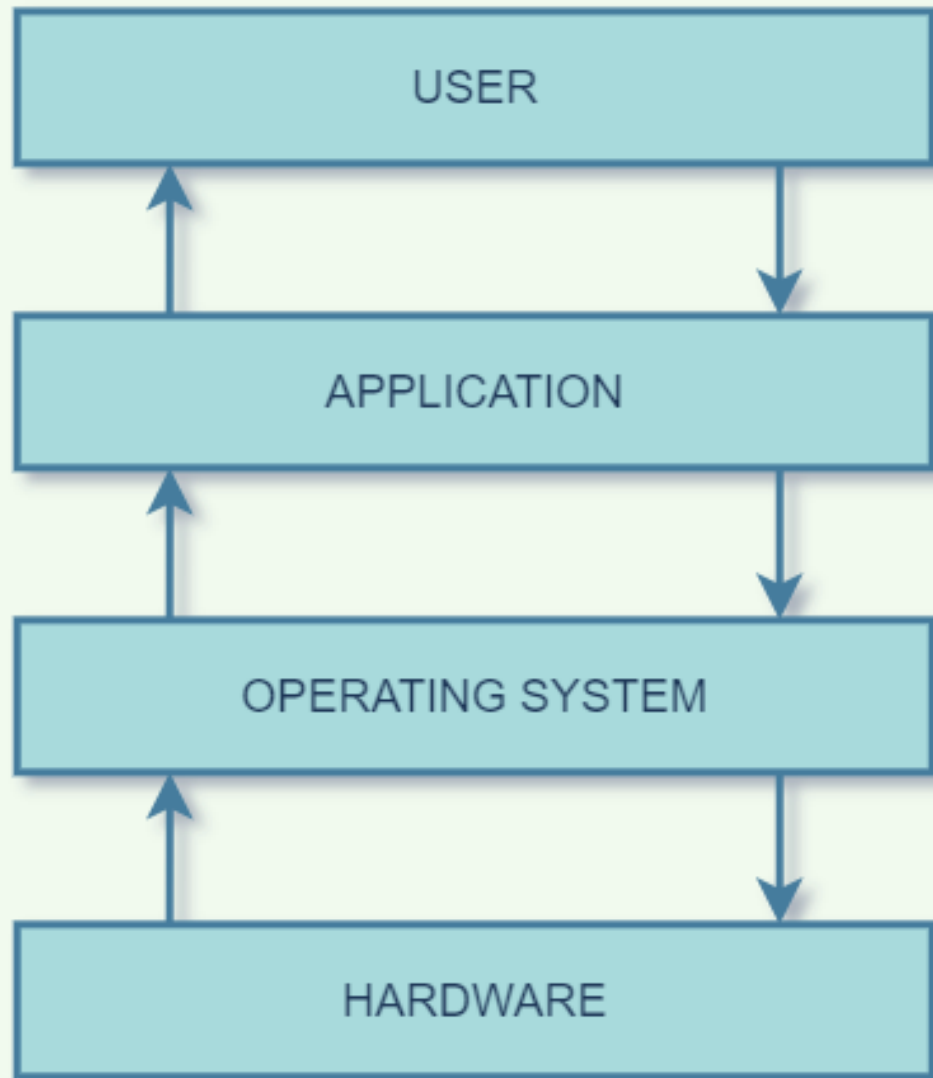


TempleOS

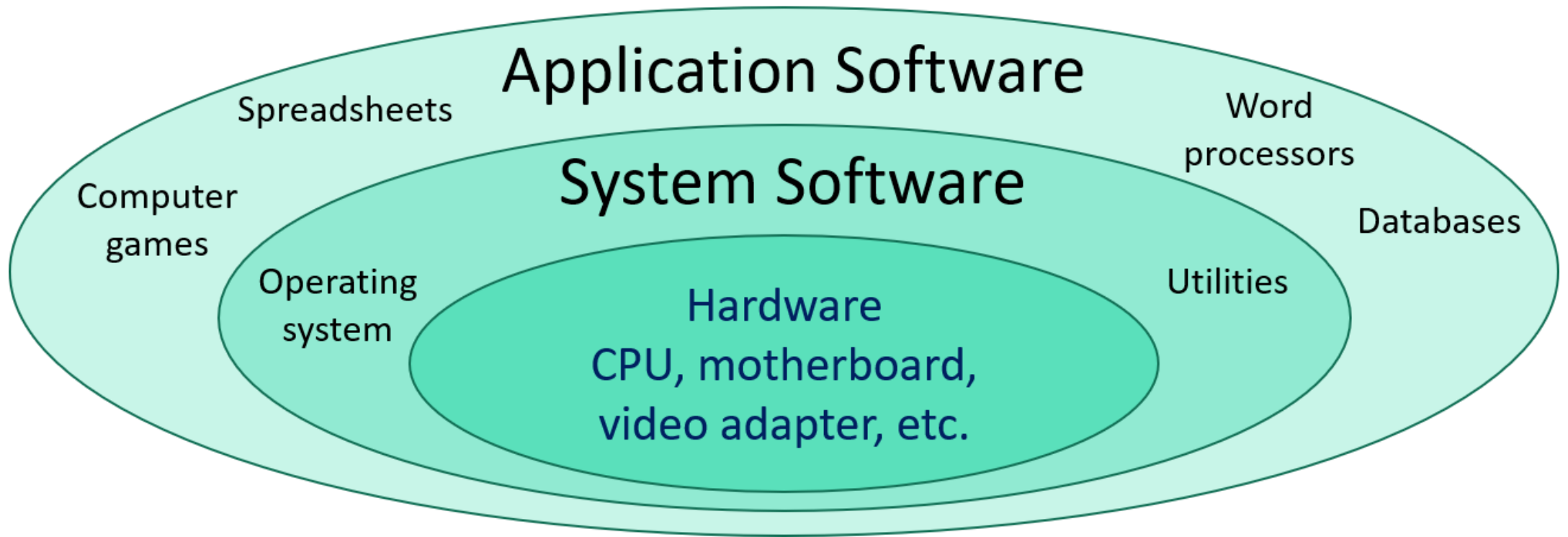
HANNAH  
MONTANA  
M  
LINUX



FUNNY LINUX VARIANTS



# OPERATING SYSTEMS VS APPLICATIONS



# OPERATING SYSTEM VERSUS APPLICATION SOFTWARE

## OPERATING SYSTEM

A system software that manages computer hardware and software resources and provides common services for computer programs

Works as the interface between the user and hardware, performs process management, memory management, task scheduling, hardware device controlling and many more

Developed using C, C++, Assembly languages

Boots up when the user switches on the computer and runs till he switches off the machine

Necessary for the proper functioning of the computer

Ex: Windows, Unix, Linux, DOS

## APPLICATION SOFTWARE

A software designed to perform a group of coordinated functions, tasks or activities for the benefit of the user

Performs a single specific task

Developed using Java, Visual Basic, C, C++

Runs only when the user requests to run the application

Cannot be installed without an operating system

Ex: Word, Spreadsheet, Presentation, Multimedia tools, Database Management Systems

Visit [www.PEDIAA.com](http://www.PEDIAA.com)

# OS & APP DIFFERENCES



# PERMISSIONS





# WHAT DO PERMISSIONS DO?

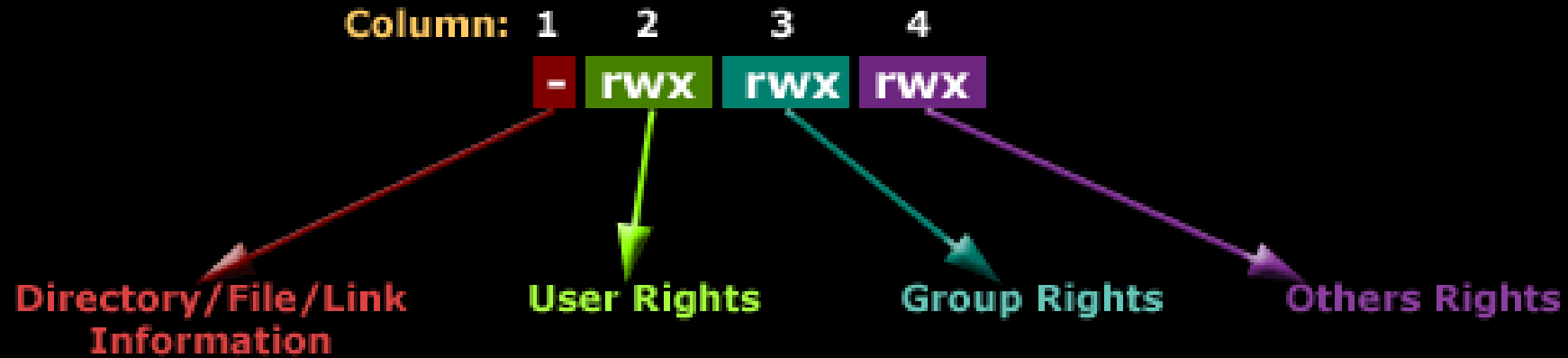
- Allow read, write, and execute permissions for files and folders
- Can be changed with those who have rights to change file and folder permissions levels
- Can be customized for users, groups, and “others”

# LINUX PERMISSIONS IN PRACTICE

jpp@jpp: /boot

```
jpp@jpp:/boots$ ls -la
total 39132
drwxr-xr-x  3 root root    4096 2011-05-13 08:52 .
drwxr-xr-x 23 root root    4096 2011-05-04 09:27 ..
-rw-r--r--  1 root root 700761 2011-03-18 16:33 abi-2.6.35-28-generic
-rw-r--r--  1 root root 730039 2011-04-11 01:24 abi-2.6.38-8-generic
-rw-r--r--  1 root root 122616 2011-03-18 16:33 config-2.6.35-28-generic
-rw-r--r--  1 root root 130313 2011-04-11 01:24 config-2.6.38-8-generic
drwxr-xr-x  3 root root    12288 2011-05-04 09:32 grub
-rw-r--r--  1 root root 11008098 2011-04-15 08:58 initrd.img-2.6.35-28-generic
-rw-r--r--  1 root root 13134896 2011-05-13 08:52 initrd.img-2.6.38-8-generic
-rw-r--r--  1 root root 160988 2010-10-22 09:08 memtest86+.bin
-rw-r--r--  1 root root 163168 2010-10-22 09:08 memtest86+_multiboot.bin
-rw-r--r--  1 root root 2344143 2011-03-18 16:33 System.map-2.6.35-28-generic
-rw-----  1 root root 2654256 2011-04-11 01:24 System.map-2.6.38-8-generic
-rw-r--r--  1 root root    1336 2011-03-18 16:35 vmcoreinfo-2.6.35-28-generic
-rw-----  1 root root    1368 2011-04-11 01:26 vmcoreinfo-2.6.38-8-generic
-rw-r--r--  1 root root 4342384 2011-03-18 16:33 vmlinuz-2.6.35-28-generic
-rw-----  1 root root 4523936 2011-04-11 01:24 vmlinuz-2.6.38-8-generic
jpp@jpp:/boots$
```

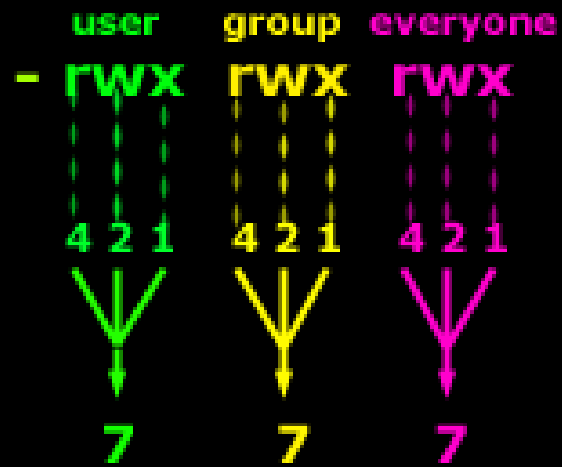
## Understanding The Linux File Permissions



While the first column defines a directory, file or link, the next 3 columns (2, 3, 4) define the permissions for the User, Group and Others (everyone else) groups.

# UNDERSTANDING PERMISSIONS

## Linux Permissions Made Easy



Final calculated permissions

This example shows us how the permissions can be calculated using the simple method of addition, where each permission is assigned a number. Adding them will produce the appropriate number for the rights given.

# LINUX PERMISSIONS





Your PC ran into a problem and needs to restart. We'll restart for you.

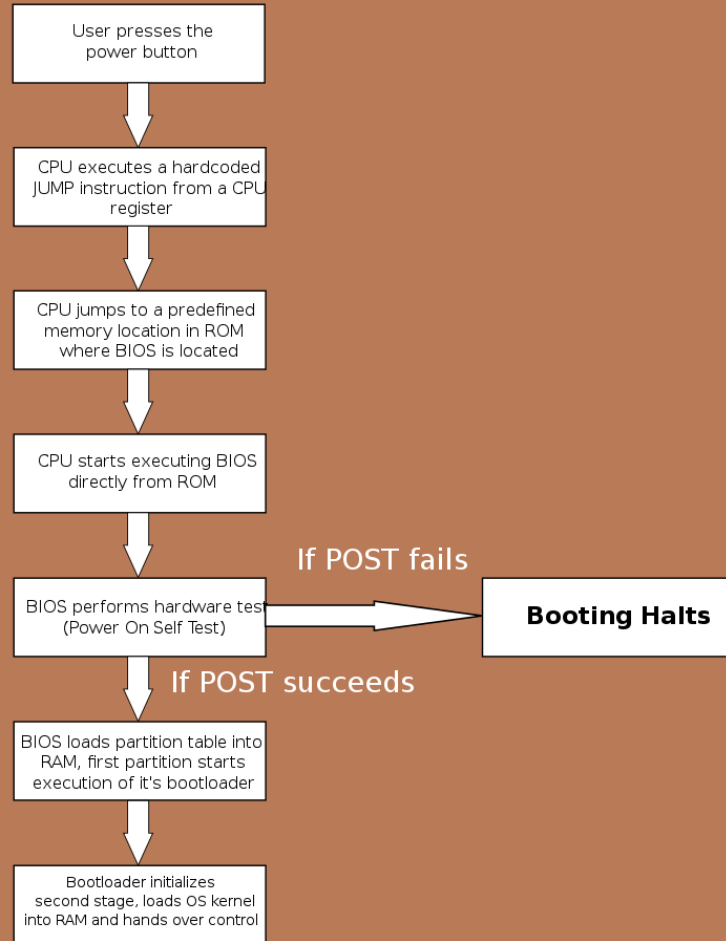


For more information about this issue and possible fixes, visit <https://www.windows.com/stopcode>

If you call a support person, give them this info:  
Stop code: KERNEL SECURITY CHECK FAILURE



## Computer booting sequence

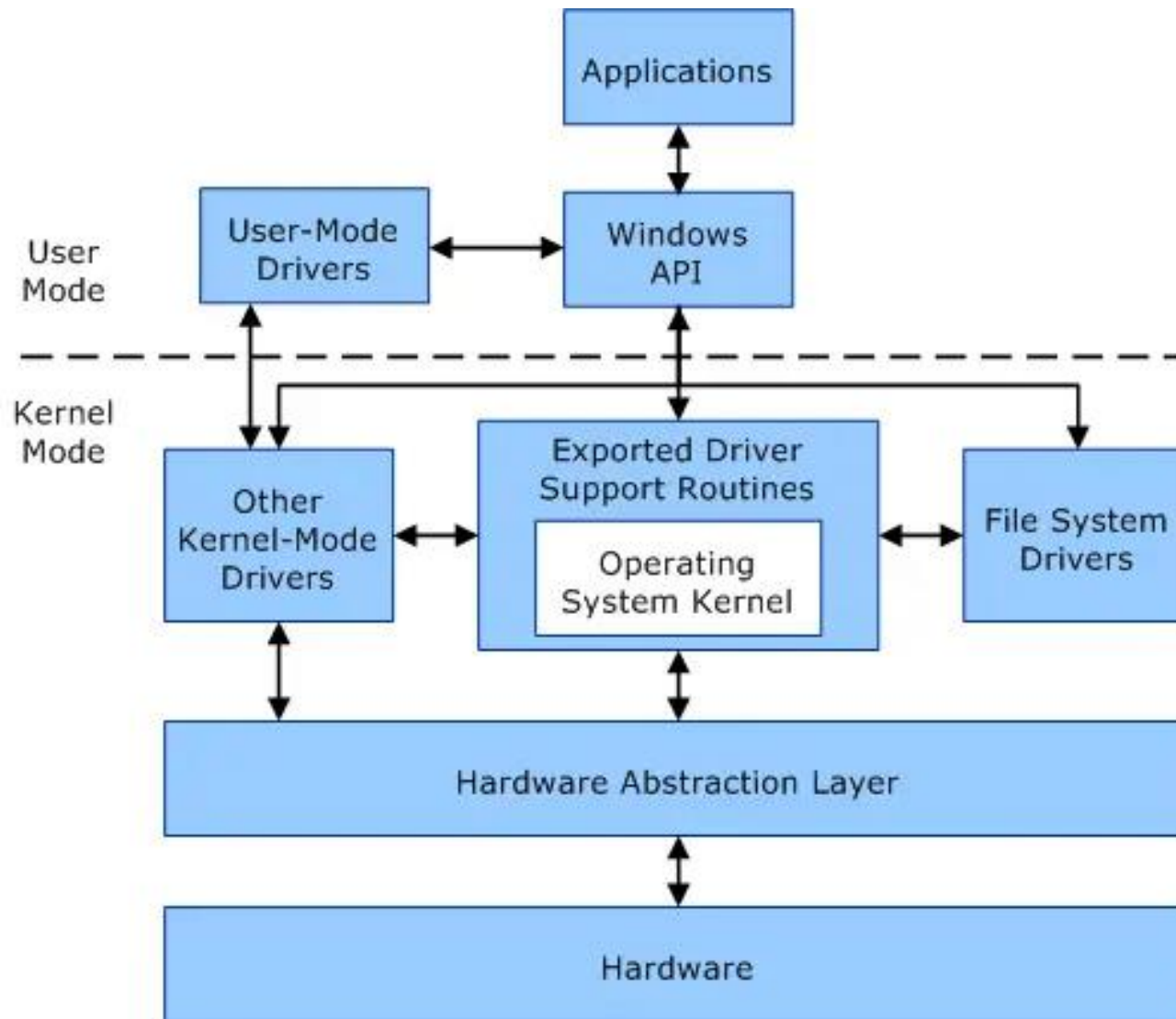


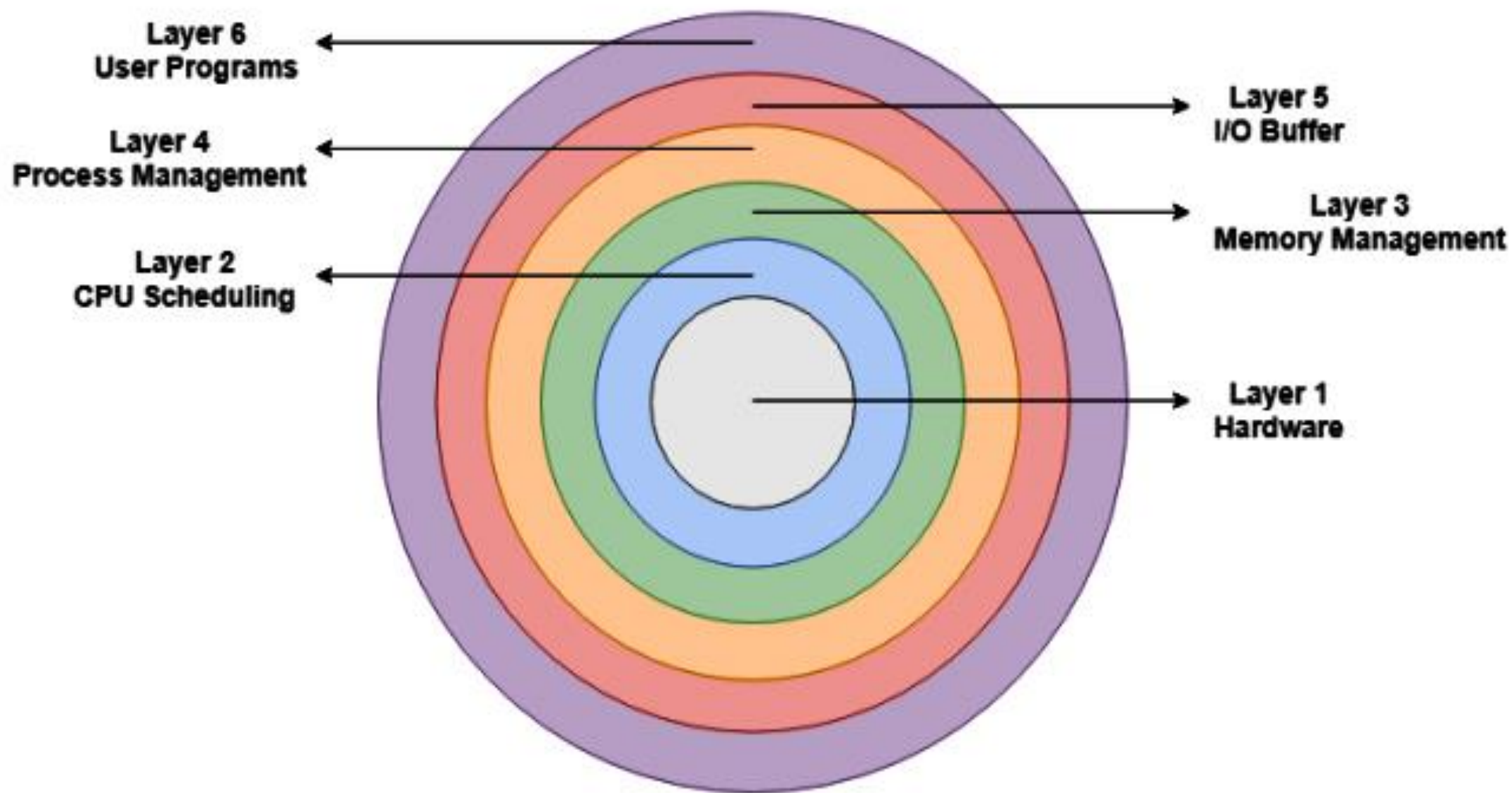
# POWER-ON SELF-TEST (POST)



# THE KERNEL

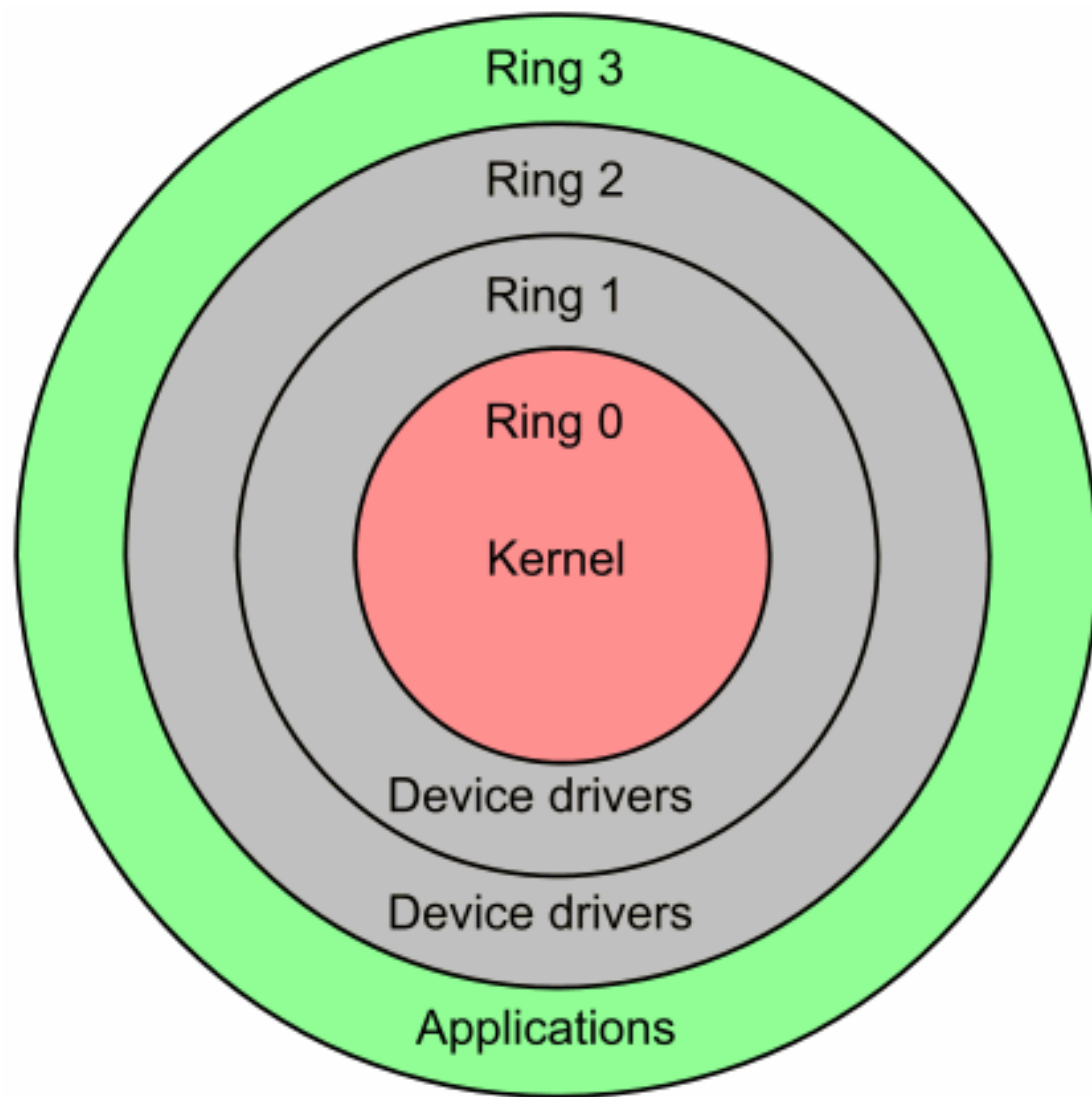
*RIP, King*





Layers of operating system



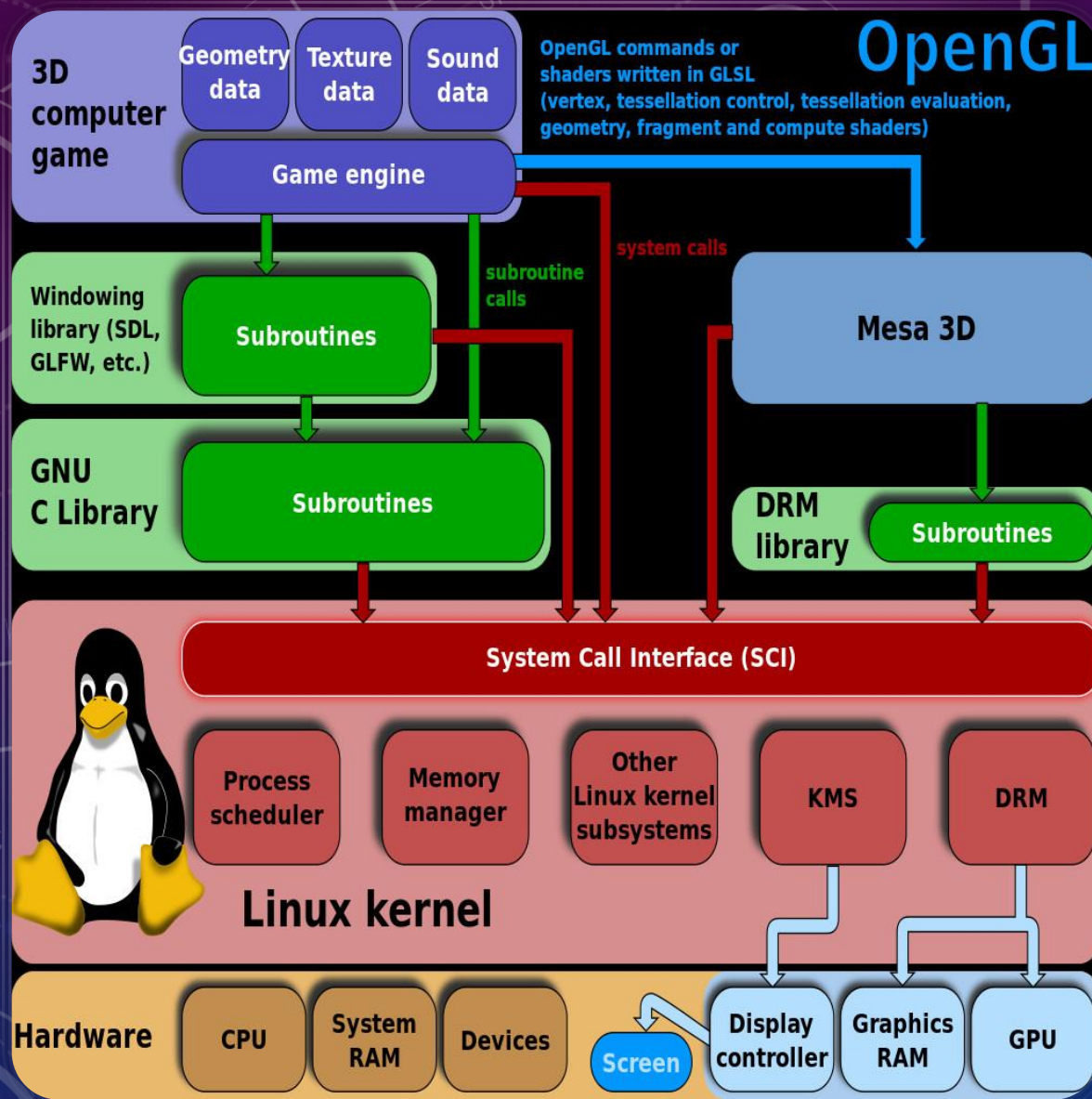


Least privileged



Most privileged





# KERNEL OPERATION

# OPERATING SYSTEM SUPPORT



10 MINUTE  
BREAK





# APPLICATIONS



# TYPES OF APPLICATIONS



Mobile  
applications



Desktop  
applications



Embedded  
applications



Web applications





# DESKTOP APPLICATIONS

# “THIN” CLIENT VS “THICK” CLIENT

## Thick client Architecture



## Thin client Architecture





# MOBILE APPLICATIONS





The Oatmeal

[Home](#) [Comics](#) [Games](#) [Books](#) [Blog](#) [Subscribe](#)

Hi. My name is Matthew Inman. I'm a cartoonist.

I've been publishing comics on this website since 2009. Every few years, I compile these comics into books, such as [How to tell if your cat is plotting to kill you](#). I also make card games, such as [Exploding Kittens](#) and [Throw Throw Burrito](#). Right now, I'm busy making an [animated TV series at Netflix](#).

### The Latest

#### Horrible Therapist

Random comic generator



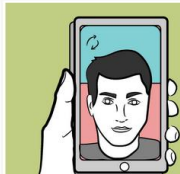
Rise from  
the deep



How venting is supposed to feel



Taking selfies from  
various angles



### Popular comics

My dog:  
the paradox



You're not going to believe  
what I'm about to tell you



You're doing it for the  
EXPOSURE



We need to have a  
conversation about  
wombats.



WEBSITE

# Web Application Architecture



WEB  
APPLICATIONS



# EMBEDDED SOFTWARE & SYSTEMS



Industrial Robots



GPS Receivers



Digital Cameras



DVD Players



Wireless Routers

Embedded Systems



MP3 Players



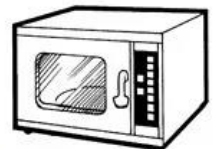
Set top Boxes



Gaming Consoles

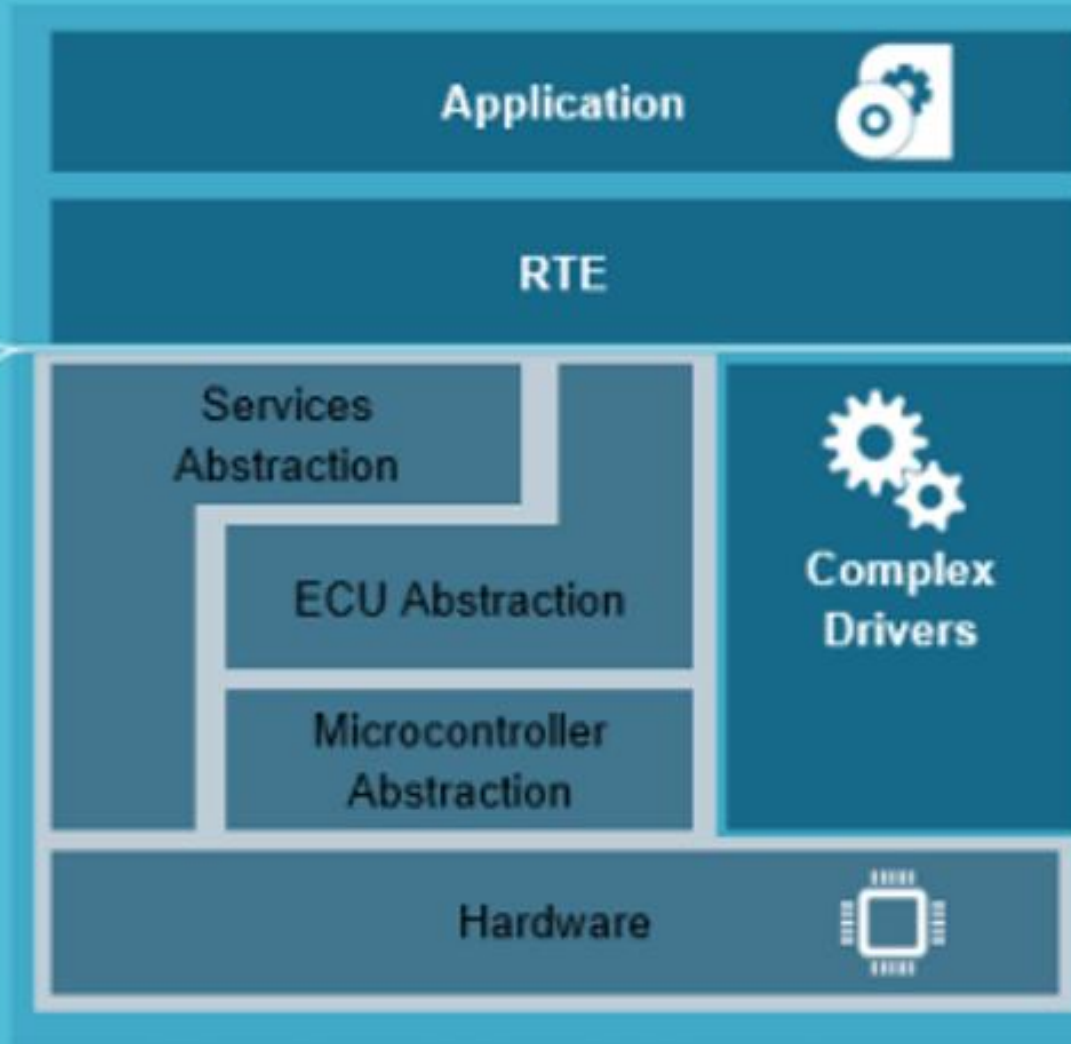


Photocopiers



Microwave Ovens

# EMBEDDED SOFTWARE APPLICATION



## Embedded System

# WHERE DOES IOT FIT?

- What do we know about IoT?
  - Inside of consumer electronics
    - Embedded applications?
- Can IoT be more than one category?

10 MINUTE  
BREAK





The background is a deep blue gradient filled with a pattern of binary digits (0s and 1s) in a lighter blue color. Overlaid on this are several semi-transparent, light blue circular and arc-like shapes, some resembling clock faces or radar screens, with small tick marks and numbers. The overall aesthetic is futuristic and technological.

BINARY



**A** ● —

**B** — ● ● ●

**C** — ● — ●

**D** — ● ●

**E** ●

**F** ● ● — ●

**G** — — ●

**H** ● ● ● ●

**J** ● — — —

**K** — ● —

**L** ● — ● ●

**M** — —

**N** — ●

**O** — — —

**P** ● — — ●

**Q** — — ● —

**S** ● ● ●

**T** —

**U** ● ● —

**V** ● ● ● —

**W** ● — —

**X** — ● ● —

**Y** — ● — —

**Z** — — ● ●

A painting of two muscular men shaking hands. The man on the left is wearing a white shirt and a dark vest, while the man on the right is wearing a red shirt. They are both flexing their biceps. The background is a dark, cloudy sky.

**BINARY  
COMMUNICATION**

**SOFTWARE  
DEVELOPERS**

**TELEGRAPH  
OPERATORS**

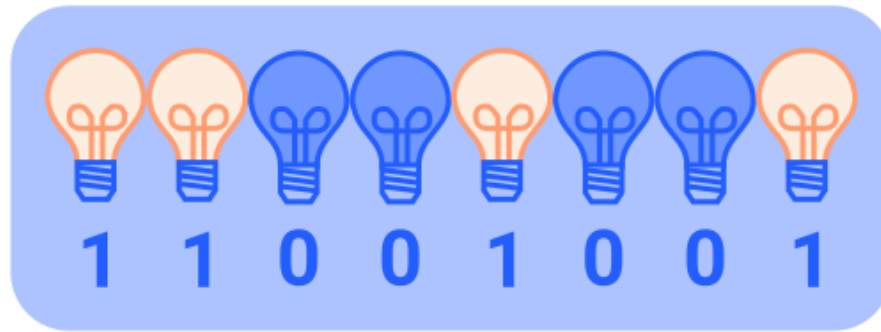
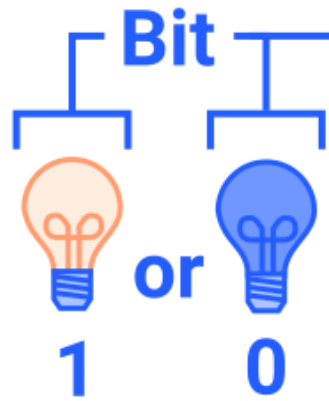
BIT



1



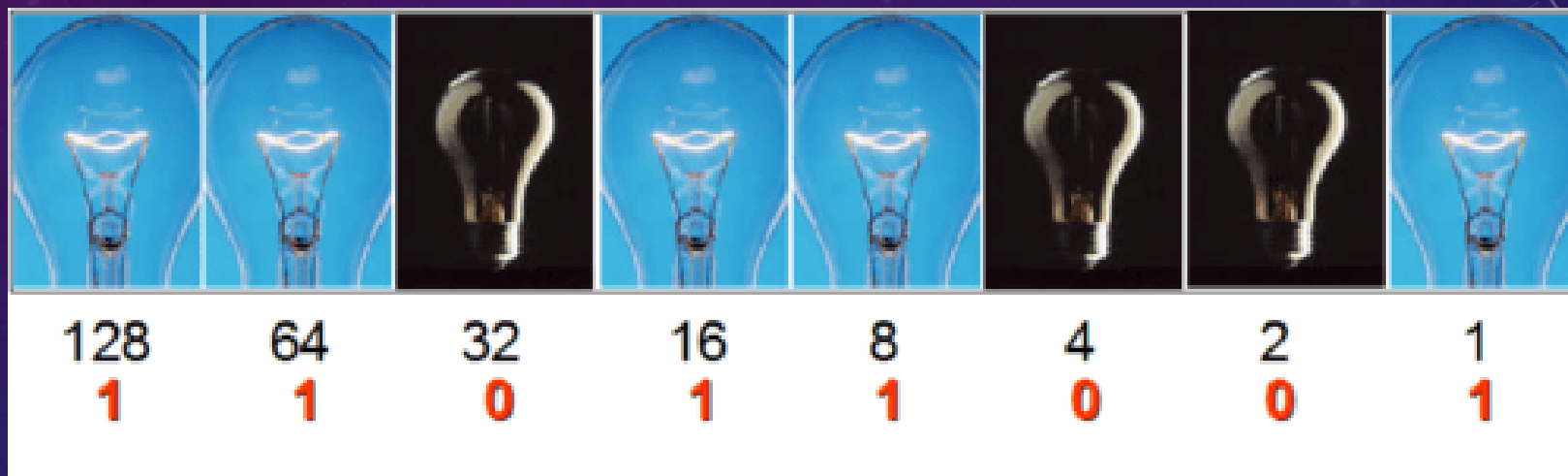
0



**Byte**  
(8 Bits)

# BITS & BYTES





# ASCII Code

---

Char.	ASCII	Char.	ASCII	Char.	ASCII
@	64	U	85	j	106
A	65	V	86	k	107
B	66	W	87	l	108
C	67	X	88	m	109
D	68	Y	89	n	110
E	69	Z	90	o	111
F	70	[	91	p	112
G	71	\	92	q	113
H	72	]	93	r	114
I	73	^	94	s	115
J	74	_	95	t	116
K	75	`	96	u	117
L	76	a	97	v	118
M	77	b	98	w	119
N	78	c	99	x	120
O	79	d	100	y	121
P	80	e	101	z	122
Q	81	f	102	{	123
R	82	g	103		124
S	83	h	104	}	125
T	84	i	105	~	126

B → 1000010

L → 1101100

U → 1110101

e → 1100101

# OTHER BASE FORMATS

- Binary – Base 2 numbering (1, 0)
- Octal – Base 8 numbering (0,1,2,3,4,5,6,7,8,9)
- Decimal – base 10 communication (0-9)
- Hexadecimal – base 16 (0-9, A-F)

# FUN WITH TRANSLATIONS!

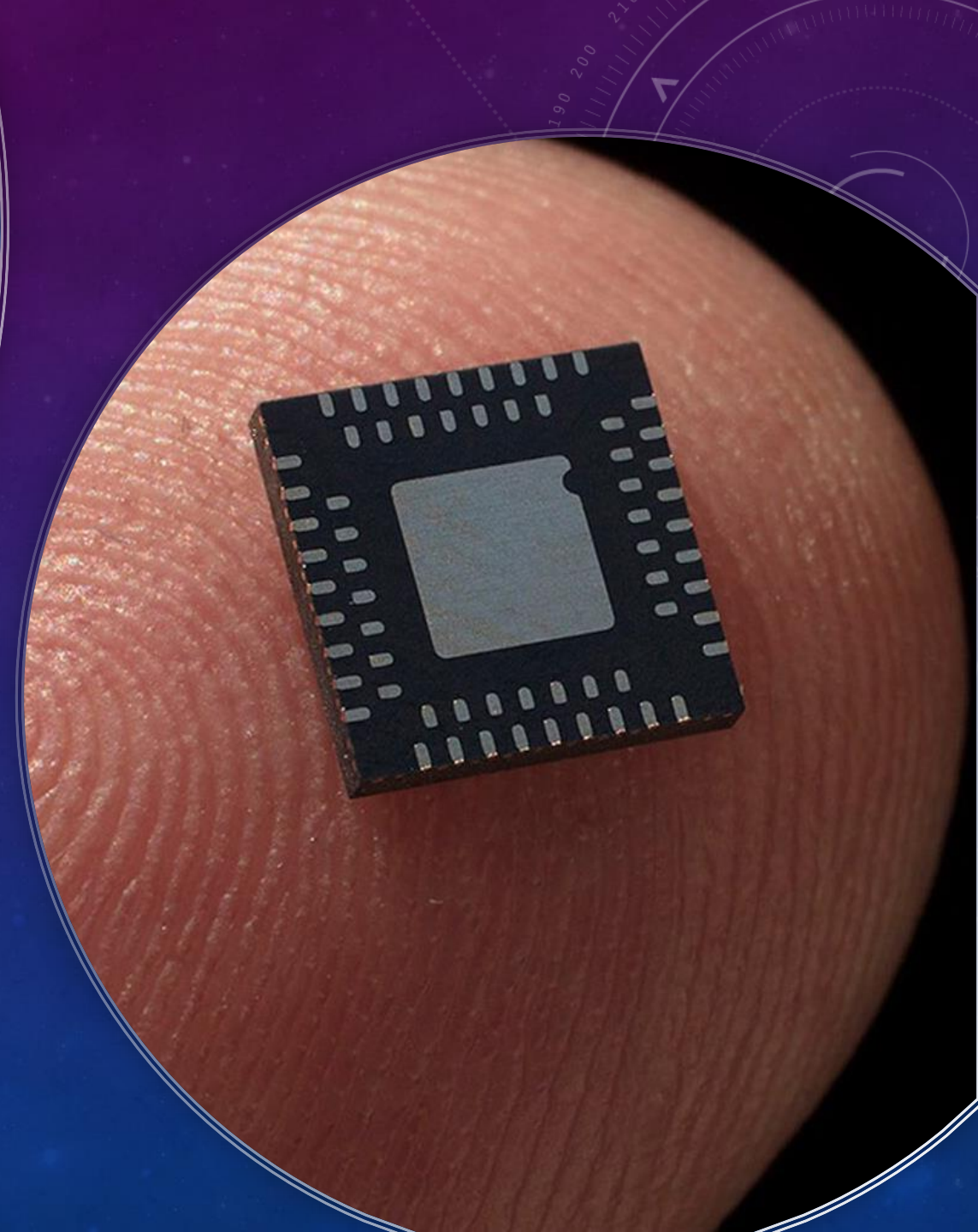
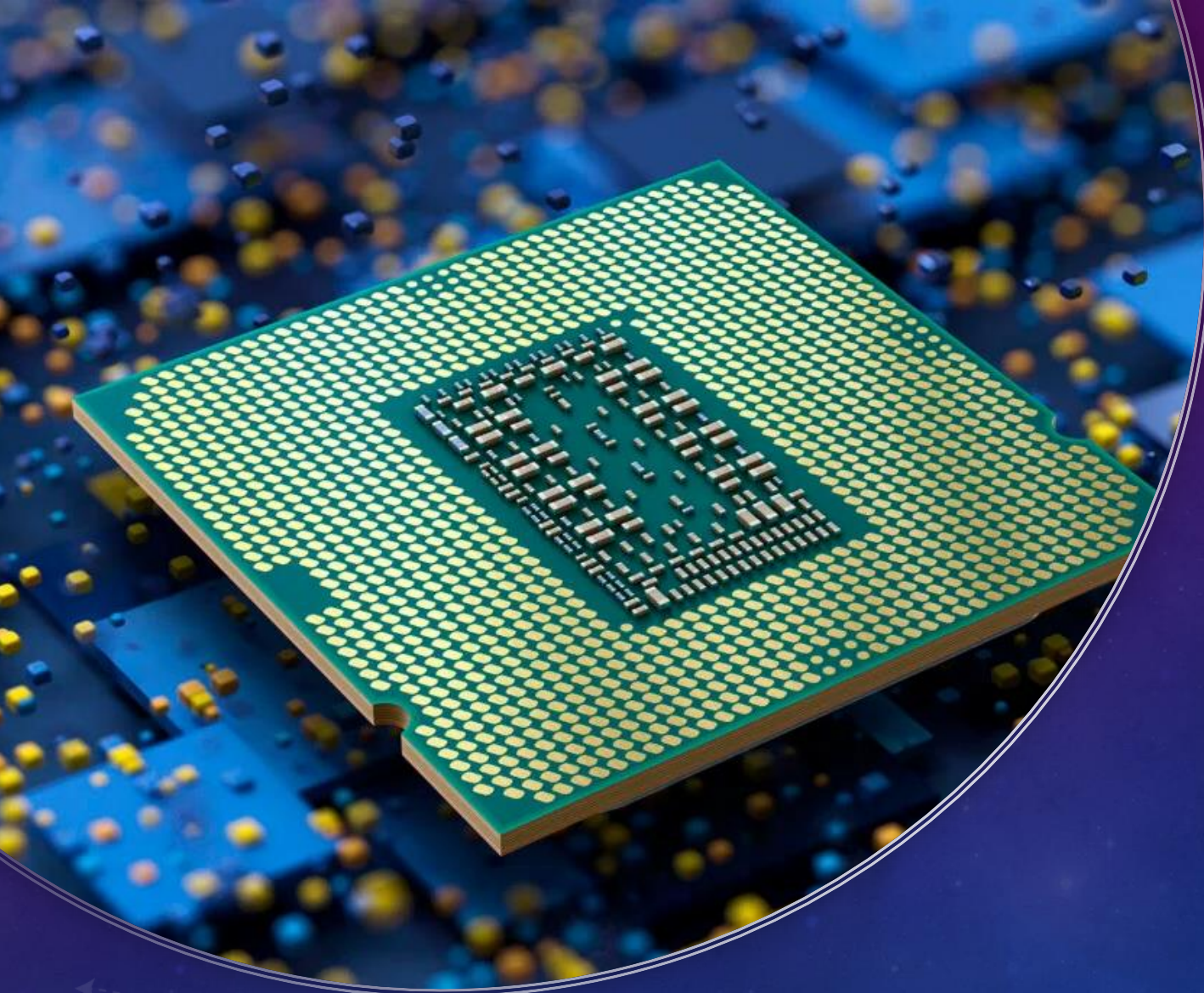
- <https://gchq.github.io/CyberChef/>





# CPU ARCHITECTURE







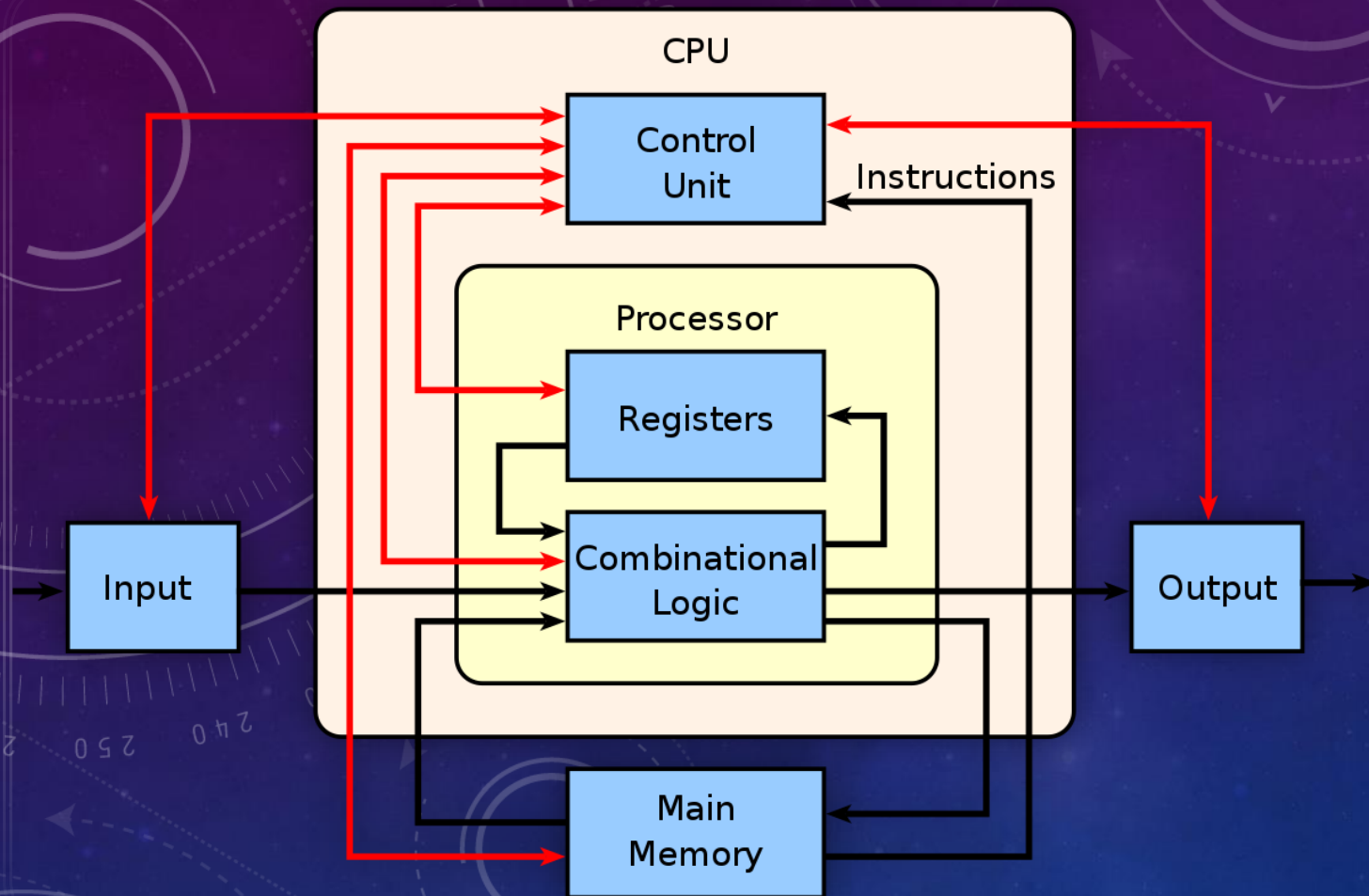
# PROCESSOR CLASSIFICATIONS

- Architecture
- Processed bits
- Design
- Registers

# COMMON CPU ARCHITECTURES

- X86
  - Desktop PCs
  - Most Intel chips are built on this
    - More cores
- Arm/A32
  - Small consumer electronic devices
- Arm/A64
  - New Macbook Pro M1 & M2
- RISC-V





HOW  
PROCESSING  
WORKS

# SESSION REVIEW



QUESTION OR  
CLARIFICATIONS?





PREVIEW NEXT SESSION



SEE YOU NEXT TIME!

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