

Module: R4: Computer Architecture

Section: Caches Task: Cache Visualization

Task 1

Cache Visualization

➤ Question:

1. Venus Setup:

Opened the terminal in my Lab Directory and ran this command to connect my labs to venus:

```
java -jar tools/venus.jar . -dm
```

```
xe-user10@noman-10xengineers: /10x-Engineers/Remedial-Training/R4: Computer Architecture/Caches$ java -jar tools/venus.jar . -dm
To connect, enter 'mount http://localhost:6161 vdfs 3geRVUo73h9syhUX86d9F_6_bNa041SeZKwR92xldu=' on Venus.
[main] INFO org.eclipse.jetty.server.Server - jetty-9.4.30.v20200611; built: 2020-06-11T12:34:51.929Z; git: 271836e4c1f4612f12b7bb13ef5a92a927634b0d; jvm 19.0.2+7-Ubuntu-0ubuntu322.04
[main] INFO org.eclipse.jetty.server.Server - Started @375ms
[main] INFO io.javalin.Javalin - Logging initialized @210ms to org.eclipse.jetty.util.log.Slf4jLog
[main] INFO io.javalin.Javalin -
Javalin
https://javalin.io/documentation
[main] INFO io.javalin.Javalin - Starting Javalin ...
[main] INFO org.eclipse.jetty.server.Server - jetty-9.4.30.v20200611; built: 2020-06-11T12:34:51.929Z; git: 271836e4c1f4612f12b7bb13ef5a92a927634b0d; jvm 19.0.2+7-Ubuntu-0ubuntu322.04
[main] INFO org.eclipse.jetty.server.AbstractConnector - Started ServerConnector@80be70a[HTTP/1.1, (http/1.1)][0.0.0.0:6161]
[main] INFO io.javalin.Javalin - Listening on http://localhost:6161/
[main] INFO io.javalin.Javalin - Javalin started in 107ms \o/
Got ping request from 0:0:0:0:0:0:1 Pong!
Got version request from 0:0:0:0:0:0:1...
An application from 0:0:0:0:0:0:1 is requesting to connect. If requested, please enter in this key to continue with the connection: 3geRVUo73h9syhUX86d9F_6_bNa041SeZKwR92xldu=
Auth request
Got ping request from 0:0:0:0:0:0:1 Pong!
Got ping request from 0:0:0:0:0:0:1 Pong!
Got ping request from 0:0:0:0:0:0:1 Pong!
ls request: file:///home/xe-user106/10x-Engineers/Remedial-Training/R4:k20Computerk20Architecture/Caches/
Got ping request from 0:0:0:0:0:0:1 Pong!
ls request: file:///home/xe-user106/10x-Engineers/Remedial-Training/R4:k20Computerk20Architecture/Caches/
file info request: file:///home/xe-user106/10x-Engineers/Remedial-Training/R4:k20Computerk20Architecture/Caches/lab07/
```

2. Cache Simulation:

Ran the cache.s in my venus simulator.




The screenshot shows the Venus simulator interface. The main window displays the assembly code for 'cache.s'. The right sidebar shows the cache configuration settings. The bottom console shows the output of the simulation.

PC	Machine Code	Basic Code	Original Code
0x0	0x10000513	addi x10 x0 256	main: li a0, 256 # array size in BYTES (power of 2 < array size)
0x4	0x00200503	addi x11 x0 2	li a1, 2 # step size (power of 2 > 0)
0x8	0x00100613	addi x12 x0 1	li a2, 1 # rep count (int > 0)
0xc	0x00100603	addi x13 x0 1	li a3, 1 # 0 - option 0, 1 - option 1
0x10	0x00C000EF	jal x1 12	jal accessWords # lw/sw
0x14	0x00A00513	addi x10 x0 10	li a0, 10 # exit
0x18	0x00000073	ecall	ecall
0x1c	0x10000417	auipc x8 65536	la s0, array # ptr to array
0x20	0xFE40413	addi x8 x8 -28	la s0, array # ptr to array
0x24	0x00A040B3	add x9 x8 x10	add s1, s0, a0 # hardware array limit (ptr)
0x28	0x00259313	slli x0 x11 2	slli t1, a1, 2 # multiply stepsize by 4 because WORDS
0x2c	0x00008A63	beq x13 x0 20	beq a3, zero, wordZero

Cache Configuration:

- Cache Levels: 1
- Block Size (Bytes): 4
- Number of Blocks: 1
- Associativity: 1
- Cache Size (Bytes): 4
- Enable?: ☒ Enables current selected level of the cache.
- Direct Mapped: ☒
- LRU: ☒
- Hit Count: 0
- Accesses: 0
- Hit Rate: ???
- 0) EMPTY
- NOTE: This is a write through, write allocate cache.
- Seed: 3248760190527380381

Display Settings: Hex

Registers Memory Cache VDB	
Cache Levels	<input type="text" value="1"/>
Block Size (Bytes)	<input type="text" value="4"/>
Number of Blocks	<input type="text" value="1"/>
Associativity	<input type="text" value="1"/>
Cache Size (Bytes)	<input type="text" value="4"/>
<input type="button" value="Enable?"/>	Enables current selected level of the cache.
<input type="button" value="Direct Mapped"/> 	
<input type="button" value="LRU"/> 	<input type="button" value="L1"/> 
Hit Count	<input type="text" value="0"/>
Accesses	<input type="text" value="64"/>
Hit Rate	<input type="text" value="0"/>
0) EMPTY	
NOTE: This is a write through, write allocate cache.	
Seed	<input type="text" value="3248760190527385381"/>