



Assembly Language Lecture Series: Introduction to RARS

Sensei RL Uy

College of Computer Studies

De La Salle University

Manila, Philippines



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RARS

- RARS (RISC-V Assembler, Runtime and Simulator) – assemble and simulate the execution of RISC-V assembly language
- RARS software: <https://github.com/TheThirdOne/rars/releases>
- Current version: v1.5
- RARS is distributed as an executable jar. Requires at least Java 8 to run it.
- Wiki:

<https://github.com/TheThirdOne/rars/wiki>



Build run

run



Register window

Message and output window

File Edit Run Settings Tools Help

Edit
Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x0fc10297	auipc x5,0x0000fc10	8: la x5, ALPHA
<input type="checkbox"/>	0x00400004	0x00028293	addi x5,x5,0x00000000	
<input type="checkbox"/>	0x00400008	0x0002a583	lw x11,0x00000000(x5)	9: lw x11, (x5)
<input type="checkbox"/>	0x0040000c	0x00500513	addi x10,x0,0x00000005	10: addi x10, x0, 0x00000005
<input type="checkbox"/>	0x00400010	0x00158593	addi x11,x11,0x0000...	11: L1: addi x11, x11, 0x00000001
<input type="checkbox"/>	0x00400014	0xffff50513	addi x10,x10,0xffff...	12: addi x10, x10, 0xffffffff
<input type="checkbox"/>	0x00400018	0xfe051ce3	bne x10,x0,0xffffffffc	13: bnez x10, L1
<input type="checkbox"/>	0x0040001c	0x00b2a023	sw x11,0x00000000(x5)	14: sw x11, (x5)
<input type="checkbox"/>	0x00400020	0x00b00533	add x10,x0,x11	16: mv a0, x11
<input type="checkbox"/>	0x00400024	0x00100893	addi x17,x0,0x00000001	17: li a7, 1
<input type="checkbox"/>	0x00400028	0x00000073	ecall	18: ecall
<input type="checkbox"/>	0x0040002c	0x00a00893	addi x17,x0,0x0000000a	20: li a7, 10
<input type="checkbox"/>	0x00400030	0x00000073	ecall	21: ecall

Code segment window

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000005	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010140	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Data segment window

☒ Hexadecimal Addresses
 ☒ Hexadecimal Values
 ☐ ASCII

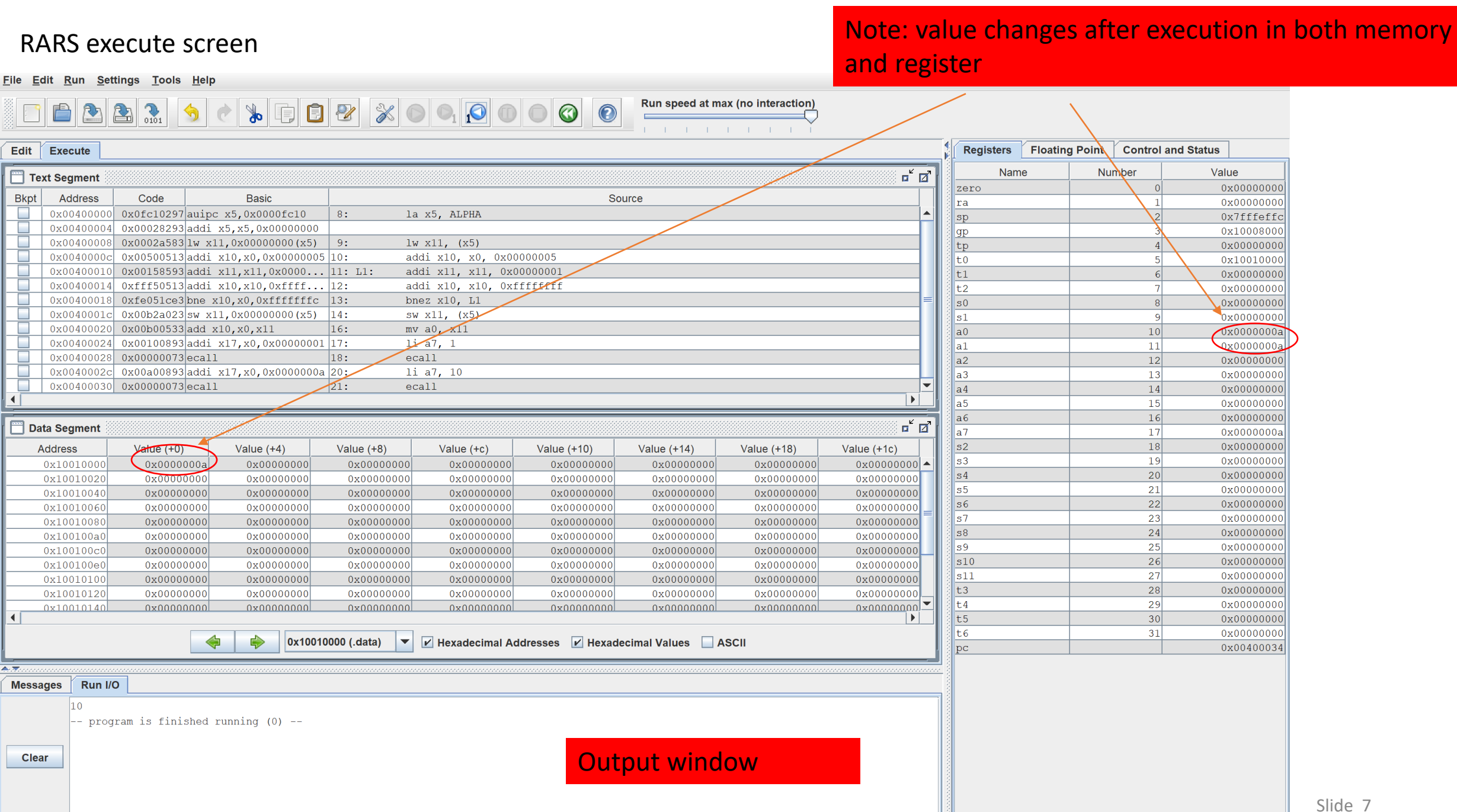
Register window

RARS execute screen

Note: value changes after execution in both memory and register

RARS execute screen

Note: value changes after execution in both memory and register



RARS setting menu

FileEditRunSettingsToolsHelp

demo1.asm

1#RISC-V pr

2.globl mai

3.data

4.ALPHA: .wo

5

6.text

7main:

8la

9lw

10ad

11L1: ad

12ad

13bn

14sw

15#syscall t

16mv a7, ma

17li a7, 1

18ecall

19#syscall to exit program with code 0

20li a7, 10

21ecall

22

23

Settings

Show Labels Window (symbol table)

Program arguments provided to program

Popup dialog for input syscalls (5,6,7,8,12)

Addresses displayed in hexadecimal

Values displayed in hexadecimal

Assemble file upon opening

Assemble all files in directory

Assemble all files currently open

Assembler warnings are considered errors

Initialize Program Counter to global 'main' if defined

Permit extended (pseudo) instructions and formats

Self-modifying code

64 bit

Editor...

Highlighting...

Exception Handler...

Memory Configuration...

Run speed at max (no interaction)

RegistersFloating PointControl and Status

Name	Number	Value
zero	0	0x00000000
ra	1	0x00000000
sp	2	0x7ffffefc
gp	3	0x10008000
tp	4	0x00000000
t0	5	0x00000000
t1	6	0x00000000
t2	7	0x00000000
s0	8	0x00000000
s1	9	0x00000000
a0	10	0x00000000
a1	11	0x00000000
a2	12	0x00000000
a3	13	0x00000000
a4	14	0x00000000
a5	15	0x00000000
a6	16	0x00000000
a7	17	0x00000000
s2	18	0x00000000
s3	19	0x00000000
s4	20	0x00000000
s5	21	0x00000000
s6	22	0x00000000
s7	23	0x00000000
s8	24	0x00000000
s9	25	0x00000000
s10	26	0x00000000
s11	27	0x00000000
t3	28	0x00000000
t4	29	0x00000000
t5	30	0x00000000
t6	31	0x00000000
pc		0x00400000

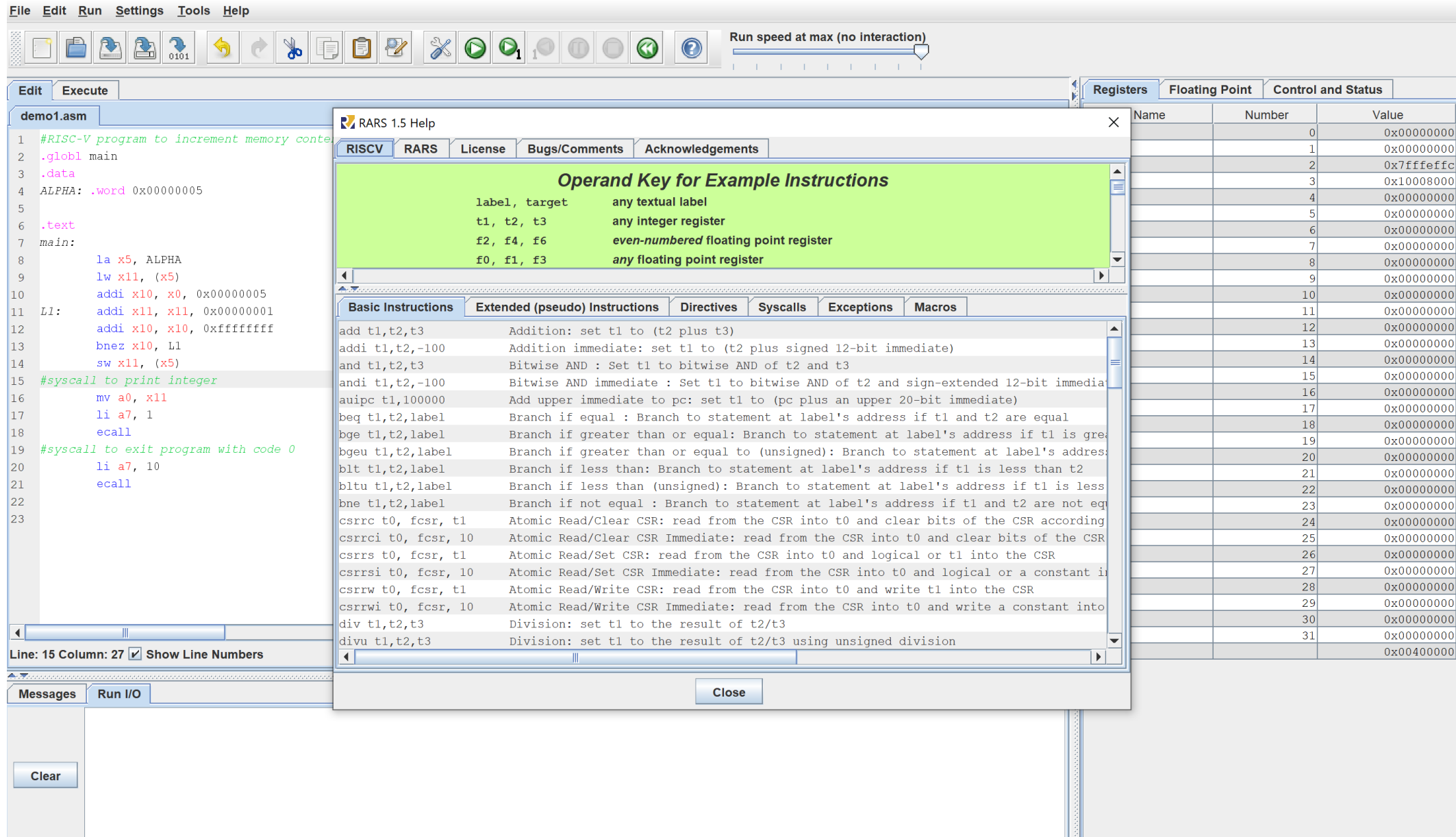
MessagesRun I/O

Clear

Line: 15 Column: 27Show Line Numbers

Slide 8

RARS comprehensive help menu



RARS syscall (for input and output) help menu

