Microprocessor & Computer Architecture (µpCA)

UE19CS252

Dr. D. C. Kiran

Department of
Computer Science and Engineering

PES UNIVERSITY ONLINE

Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions: Stack

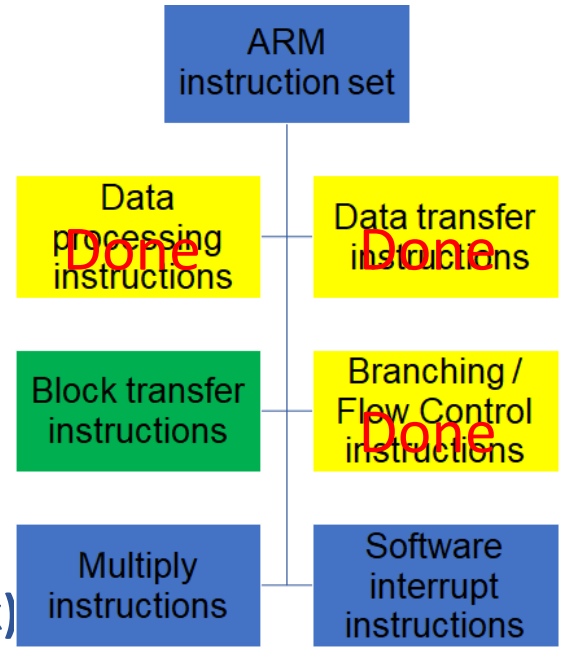
Dr. D. C. Kiran
Department of Computer Science and Engineering

Microprocessor & Computer Architecture (µpCA)

Syllabus

Unit 1: Basic Processor Architecture and Design

- ~~Microprocessor Overview~~
- ~~CISC VS RISC~~
- ~~Introduction to ARM Processor & Applications~~
- ~~ARM Architecture Overview~~
- ~~Different ARM processor Modes~~
- ~~Register Bank~~
- ~~ARM Program structure~~
- ~~ARM Instruction Format~~
- **ARM INSTRUCTION SET**
  - ~~Data Processing Instructions~~
  - ~~Flow Control Instructions~~
  - ~~Data Transfer Instructions~~
  - **Block Transfer Instructions (Stack)**



Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)

The Memory access can be in FILO fashion.

i.e Can be treated like STACK.

R13 is a stack pointer which will keep the address of TOP of the STACK.

Mainly used in Procedural Call.

Stack can grow upward or downward direction based on the MODE used by the user in the program.

Addr	data
0x1010	
0x1014	
0x1018	10
0x101C	20
0x1010	30
0x1020	40
0x1024	50
0x1028	60
0x102C	
0x1030	
0x1034	

Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)

10 20 10 140 15 60 27

R13=0x1018

SP

Addr	data
0x1010	
0x1014	
0x1018	
0x101C	
0x1010	
0x1020	
0x1024	
0x1028	
0x102C	
0x1030	
0x1034	

Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)

10 20 75 140 15 60 27

R13=0x101C

SP

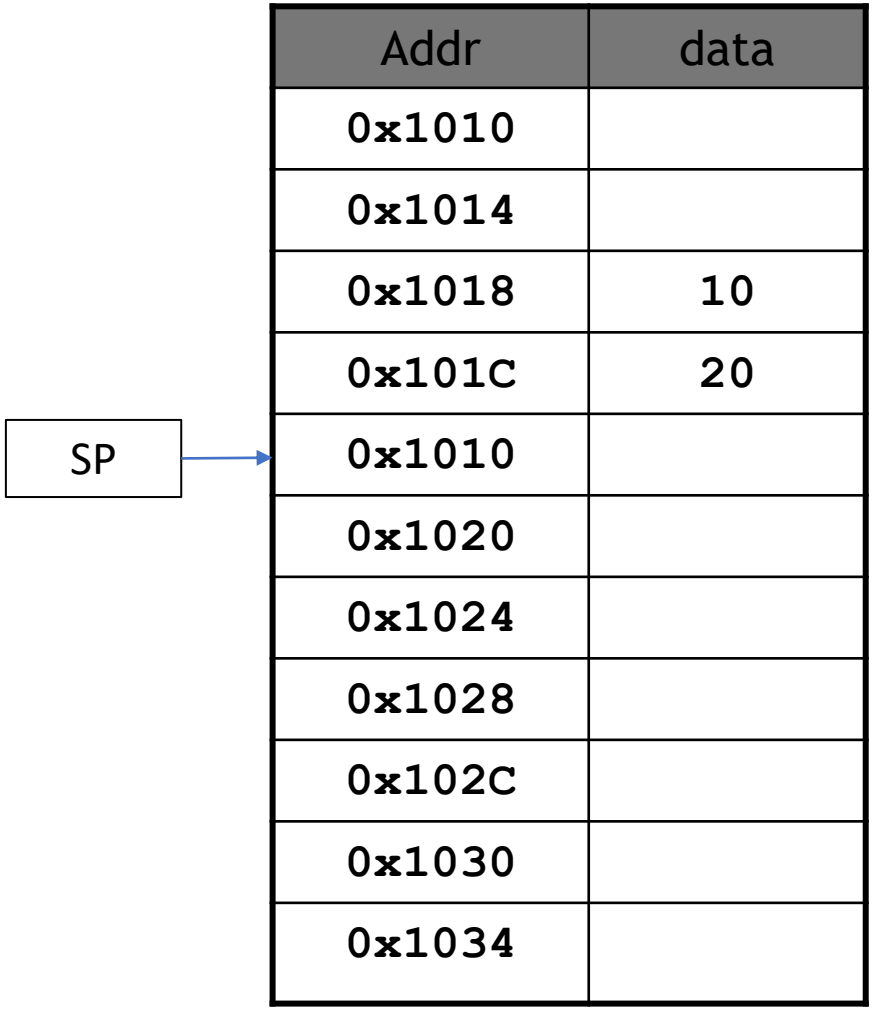
Addr	data
0x1010	
0x1014	
0x1018	10
0x101C	
0x1010	
0x1020	
0x1024	
0x1028	
0x102C	
0x1030	
0x1034	

Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)

10 20 75 140 15 60 27

R13=0x1010



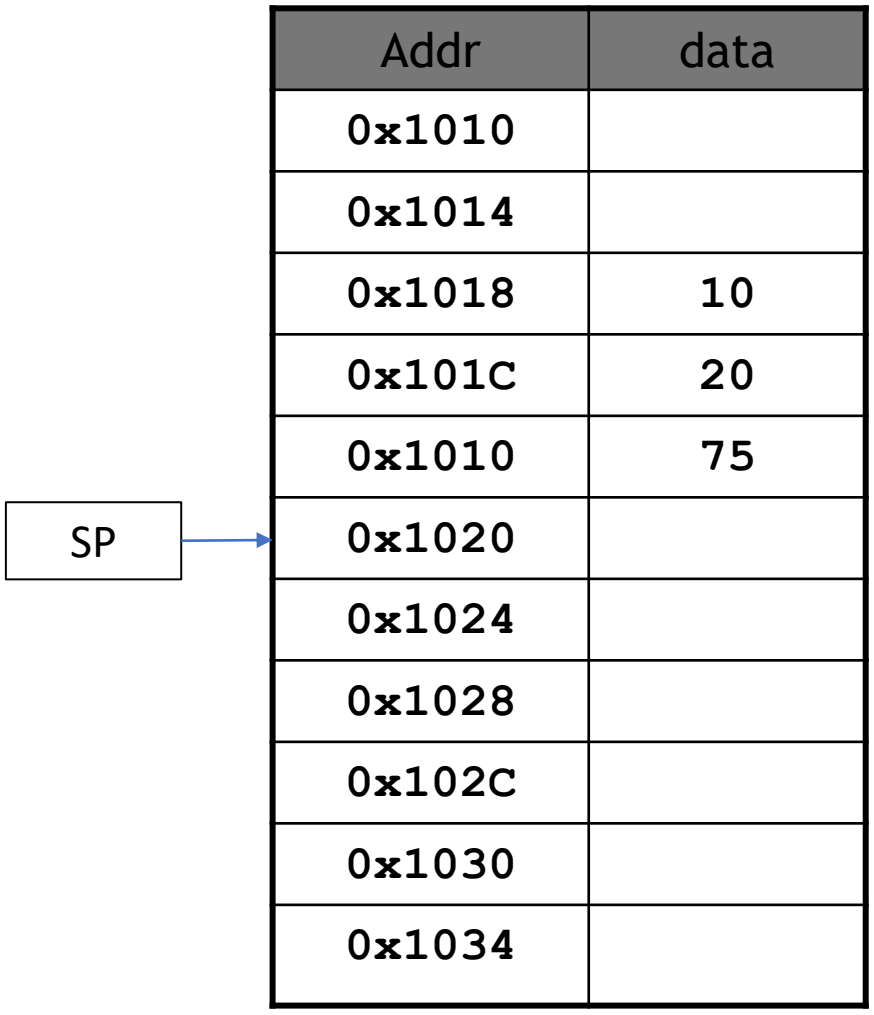
Addr	data
0x1010	
0x1014	
0x1018	10
0x101C	20
0x1010	
0x1020	
0x1024	
0x1028	
0x102C	
0x1030	
0x1034	

Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)

10 20 75 140 15 60 27

R13=0x1020



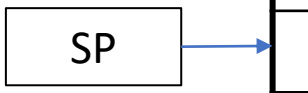
Addr	data
0x1010	
0x1014	
0x1018	10
0x101C	20
0x1010	75
0x1020	
0x1024	
0x1028	
0x102C	
0x1030	
0x1034	

Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)

10 20 75 140 15 60 27

R13=0x1024



Addr	data
0x1010	
0x1014	
0x1018	10
0x101C	20
0x1010	75
0x1020	140
0x1024	
0x1028	
0x102C	
0x1030	
0x1034	

Block Transfer Instructions (Stack)

Syntax:

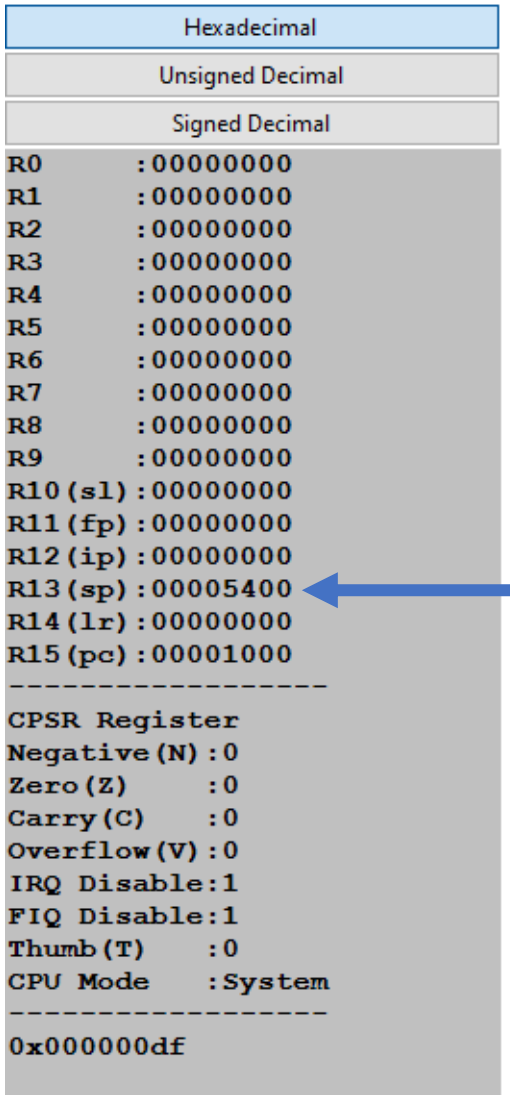
<LDM/STM> <Addressing Mode>R13 {!},Registers

Addressing Mode	=LDM	=STM
Full ascending (FA)	LDMDA	STMIB
Full descending (FD)	LDMIA	STMDB
Empty ascending (EA)	LDMDB	STMIA
Empty descending (ED)	LDMIB	STMDA

STM is used to PUSH on to the STACK
LDM is used to POP from the STACK

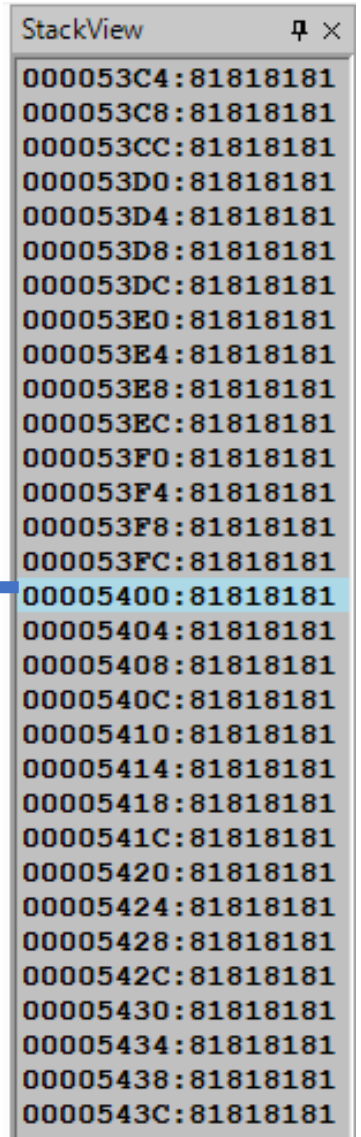
Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)



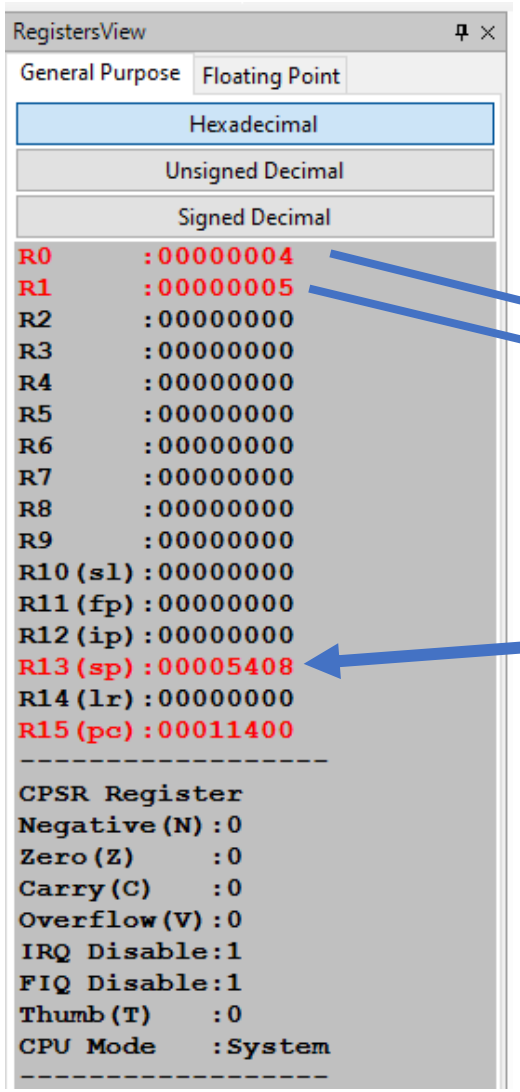

```
.text
MOV R0,#4
MOV R1,#5
STMEA R13!, {R0,R1}
.end
```

Initially Stack is Empty



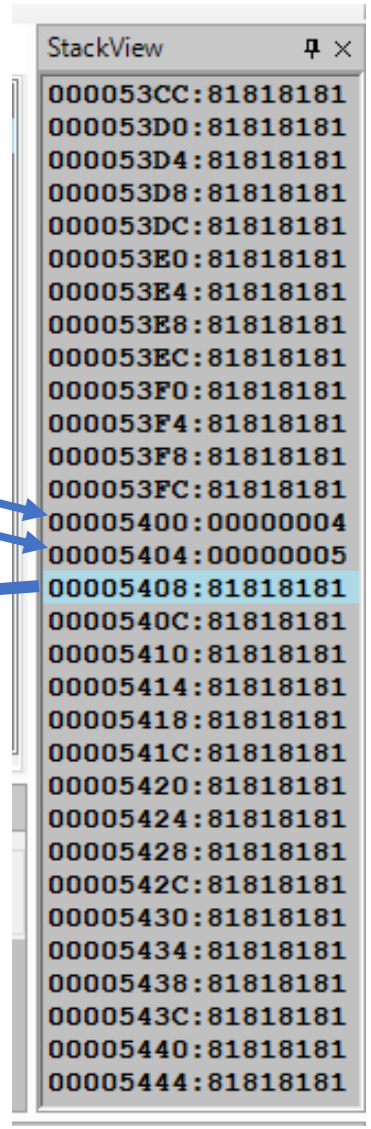
Microprocessor & Computer Architecture (µpCA)

Block Transfer Instructions (Stack)



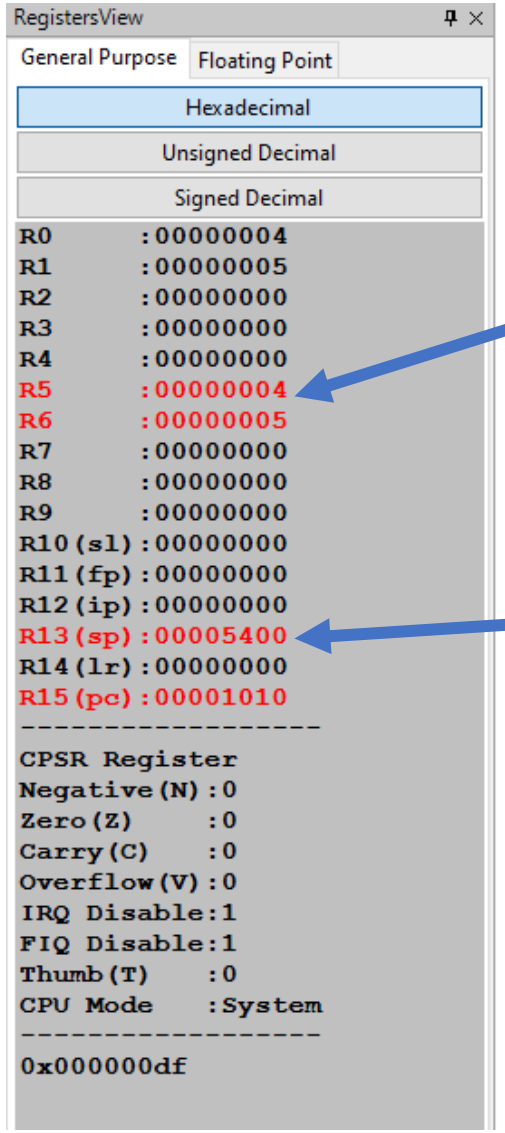

```
.text
MOV R0,#4
MOV R1,#5
STMEA R13!, {R0,R1}
.end
```

PUSH



Microprocessor & Computer Architecture (µpCA)

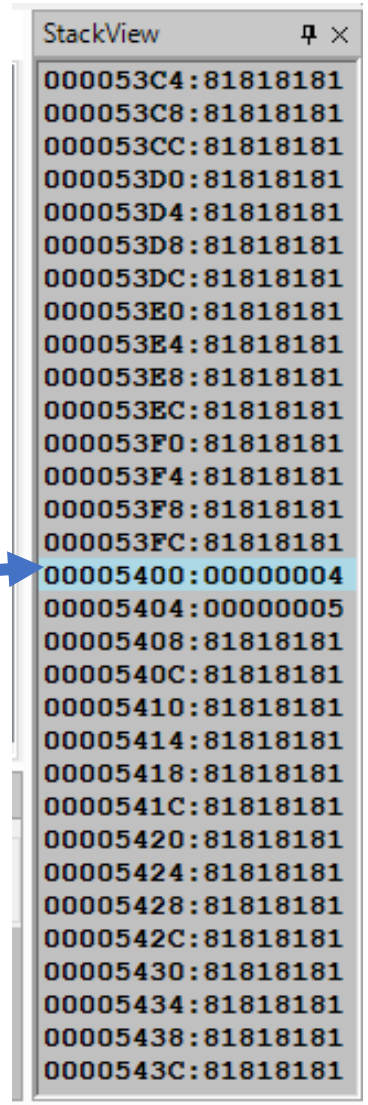
Block Transfer Instructions (Stack)




```
.text
MOV R0,#4
MOV R1,#5
STMEA R13!, {R0,R1}
LDMEA R13!,{R5,R6}
.end
```

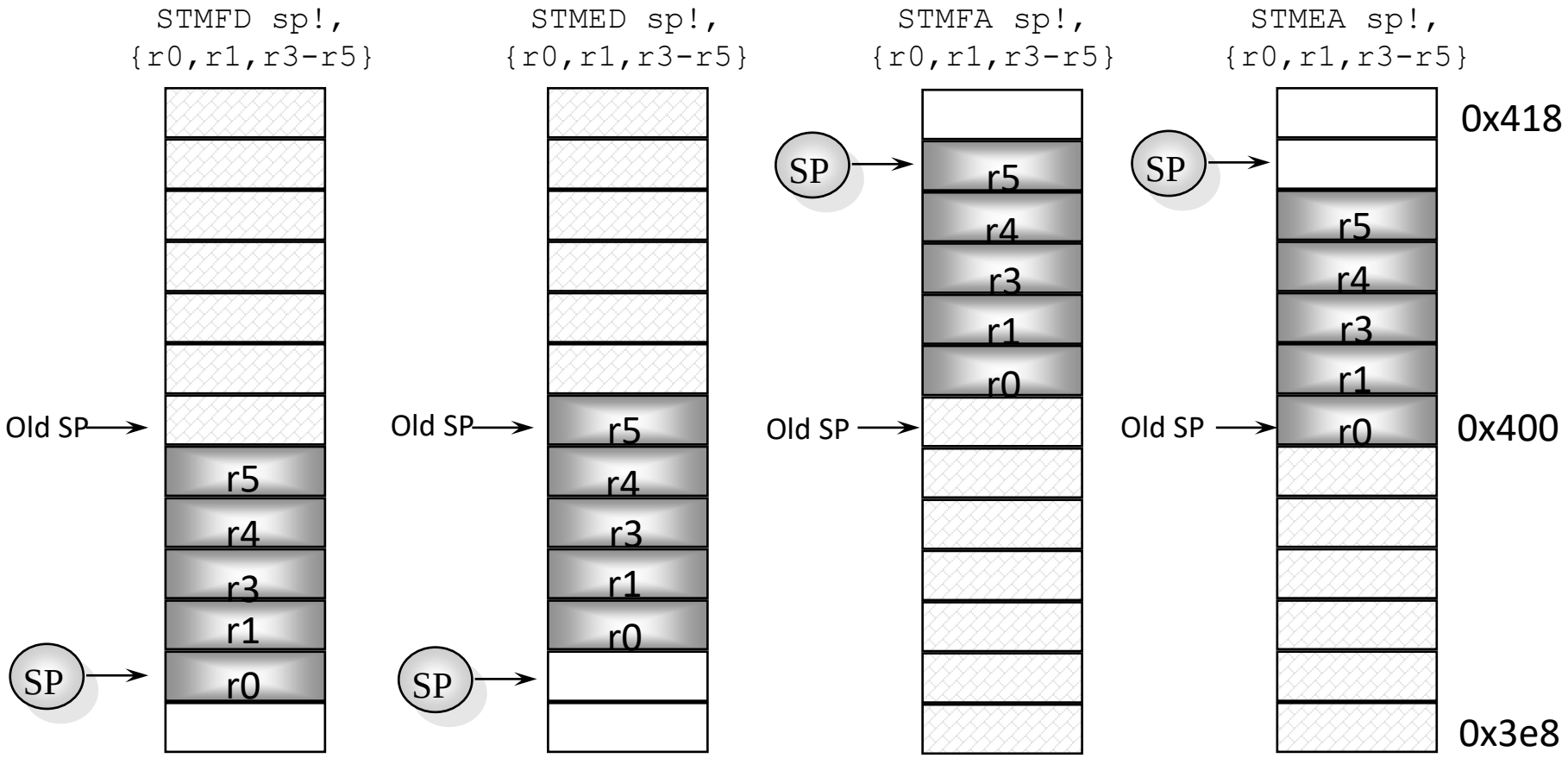
POP

Again the Stack is Empty

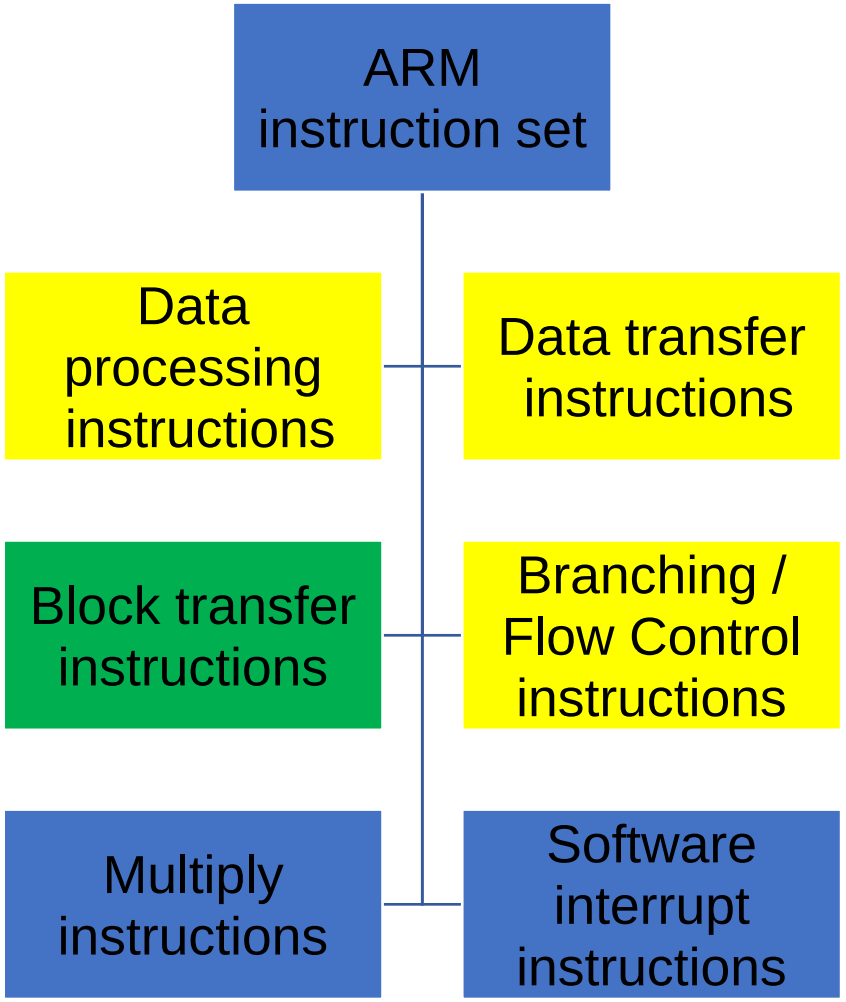


Microprocessor & Computer Architecture (µpCA)

Stack Examples



NEXT Session : Procedure Call



THANK YOU

Dr. D. C. Kiran
Department of Computer Science and Engineering

dckiran@pes.edu

9829935135