# Memory Allocation Simulator

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## Installation and Overview

- Take the .jar or .exe file from the flash drive and install anywhere you wish on your computer
- Note: .jar and .exe file require java version 1.8 or higher to be installed, .exe requires a windows computer
- Program uses first fit, best fit, worst fit, and next fit, with both fixed and dynamic partitions, to simulate memory allocation
- Program saves the results of each snapshot of a simulation to strings
- These strings are printed to text pane objects in the GUI when the main class calls the simulations to start
- Only thing user is required to do is run the .jar or .exe file and the simulations will run in the background and then display on the screen

## Job Class

- ▶ Job class holds all the information
  - Name
  - Size
  - Status
- Get/set methods like normal
- toString prints all info of the job

## Partition Class

- Holds info about the partitions
  - Name
  - Size
  - Memory address
  - Status (free or not)
  - ▶ Job running in partition
  - Job name
  - Job size
  - Amount of fragmentation

## FixedMemoryAllocator Class

- Holds the logic of first, best, worst, and next fit
- Loops through the jobs and partitions to allocate
- First fit loops through and simply compares the job size to partition size
- Best fit does something similar but first sorts the list of partitions by job size smallest to largest. Then similar steps to the first fit is used. (once the list is sorted by smallest – largest, the first fit essentially becomes the best fit)
- Worst fit does same as best fit but opposite
- Next fit is similar to first fit but has an added step that changes the index to loop from, once a job is allocated
- Returns strings that hold the results of each snapshot

# DynamicMemoryAllocator Class

- Holds the logic of first, best, worst, and next fit
- Loops through the jobs and partitions to allocate
- Slightly different to fixed partition in order to take advantage of the dynamic partitions
- All algorithms start the same by allocating the initial jobs to partitions that fit the job size. Then once the initial jobs start to finish, the functionality to resize partitions and create new ones that become external fragmentation, is added.
- Returns strings that hold the results of each snapshot

# MemorySimulator Class (Main)

- Main class that calls the different simulations of fixed partition allocator and dynamic allocator
- Creates fixedPartitonAllocator and DynamicPartitionAllocator objects
- Adds jobs and partitions as needed to create different simulations that show how the algorithms work
- Calls the gui to draw the results of each simulation

## GUI

The Following Slides have examples of the GUI used. Binary ExpressionTree GUI

- Please note: These pictures are for demonstration purposes, they do not show everything that the GUI prints, some things have been left out for the sake of time
- Please run the program with the .jar or .exe file in order to see everything

1000 total memory Simulation 1: Snapshot 1: First Fit, all partitions same size Job Name: Job Size: Job Status: 100 iob 1 Running job 2 50 Running job 3 Running job 4 300 Waiting job 5 200 Running 75 job 6 Running job 7 200 Waiting P Size: Mem Addr: Job: Job Size: Status: Frag: p1 200 200 job 1 100 Busy 100 р2 200 400 job 2 Busy 150 200 job 3 150 Busy iob 5 Busy **p**5 200 1000 iob 6 75 125 Busy Total Internal Fragmentation: 525 Snapshot 2: First Fit, all partitions same size Job Size: Job Name: Job Status: job 1 100 Running iob 2 50 Finished job 3 Running iob 4 300 Waiting iob 5 200 Running job 6 75 Running job 7 200 Running P Size: Job: Job Size: P Name: Mem Addr: Status: Frag: 200 job 1 100 Busy 100 p2 200 400 job 7 200 Busy рЗ 200 600 job 3 Busy 150 200 800 iob 5 Busy **5**0 200 1000 job 6 75 Busy 125 Total Internal Fragmentation: 375 Snapshot 1: First Fit, all partitions different sizes Job Name: Job Size: Job Status: 100 job 1 Running

Fixed Partition

Binary ExpressionTree GUI									×
	р3	200	600	job 3	50	Busy	150		
	p4	200	800	job 5	200	Busy	0		
	p5	200	1000	job 6	75	Busy	125		
	-		Total Intern	_	ntation: 375	_			- 1 1
				_					
					itions diffe: Job Status				
			b Name: J						
		job 1		100		Running			
		job 2		50		unning			
		job 3		50		unning			
		job 4		300		<b>Vaiting</b>			
		job 5		200		Running			
		job 6		75		unning			
		job 7		200	ī	Vaiting			
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:		
	pl	400	400	job 1	100	Busy	300		
	p1 p2	100	500	job 1	50	Busy	50		
	p2 p3	50	550	job 2 job 3	50	_	0		
	p3 p4	200	750	job 5	200	Busy Busy	0		
	p4 p5	250	1000	job 5 job 6	75	Busy	175		
	ps			_	ntation: 525	busy	175		
			roour inocin	ar rragilio					
		Snapshot 2	: First Fit,	all part	itions differ	rent sizes			
		_		ob Size:	Job Status				
		job 1		100	I	Running			
		job 2		50	R	unning			
		job 3		50	F:	inished			
		job 4		300	ī	Waiting			
		job 5		200	F	inished			
		job 6		75	R	unning			
		job 7		200	I	Running			
		D 0:				<b>a.</b> .	_		
	P Name:	P Size:	Mem Addr:		Job Size:	Status:	Frag:		
	pl =2	400	400	job 1	100	Busy	300		
	p2	100	500	job 2	50	Busy	50		
	p3	50	550	dob 7	200	Free	0		
	p4	200 250	750	job 7 job 6	200	Busy	175		
	p5		1000 Total Intern	-	75	Busy	1/5		
			iocai incern	aı rragme	entation: 525				
			Snapsl	not 1: Bes	st Fit				
		Jol		ob Size:	Job Status	3:			
				100					<b>T</b>

		Snapsl	not 1: Bes	st Fit			
	Job	_	ob Size:	Job Status	:		
	job 1		100	Running			
	job 2		50	Running			
	job 3		50		unning		
	iob 4		300		unning		
	job 4		200		unning		
	job 6		75		aiting		
	job 7		200		aiting		
	, 200		200	•	aroing		
P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:	
р3	50	550	job 2	50	Busy	0	
p2	100	500	job 1	100	Busy	0	
p4	200	750	job 3	50	Busy	150	
p5	250	1000	job 5	200	Busy	50	
pl	400	400	job 4	300	Busy	100	
pı			-	ntation: 300	busy	100	
		rocar incern	ar rragme	incacion. 300			
		Snapsi	not 2: Bes	st Fit			
	Jol	_	ob Size:	Job Status			
	iob 1		100		unning		
	job 1		50		nished		
	job 2		50		nished		
	job 4		300		unning		
	job 4		200		unning		
	job 6		75		unning		
	iob 7		200		anning Maiting		
	, ,		200	•			
P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:	
р3	50	550			Free	0	
p2	100	500	job 1	100	Busv	0	
p4	200	750	job 6	75	Busy	125	
p5	250	1000	job 5	200	Busy	50	
pl	400	400	job 4	300	Busy	100	
-			-	ntation: 275			
		_	ot 1: Wor	st Fit			
		b Name: J	ob Size:	Job Status	:		
	job 1		100	F	unning		
	job 2		50	Rı	unning		
	job 3		50	Rı	unning		
	job 4		300	W	Maiting		
	job 5		200	W	aiting		
	job 6		75	Rı	unning		

Binary ExpressionTree GUI

Binary ExpressionTree GUI

Binary ExpressionTree GUI									×	
			Snapsh	ot 1: Nex	t Fit					
		Jol		b Size:	Job Status	3:				
		job 1		50		unning				
		job 2		10		unning				
		-				-				
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:			
	pl	30	30			Free	0			
	p2	50	80	job 1	50	Busy	0			
	p3	10	90	job 2	10	Busy	0			
	2		Total Intern							
			Dynam	ic Parti	tion					
				total me						
				ulation 2	_					
			Snapsho	t 1: Fir	st Fit					
		Jol		b Size:	Job Status	з:				
		job 1		100		Running				
		job 2		500		Running				
		job 3		200		Running				
		job 4		50		unning				
		job 5		150		Running				
		job 6		75		aiting				
		job 7		200		Naiting				
		,								
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:			
	pl	100	100	job 1	100	Busy	0			
	p2	500	600	job 2	500	Busy	0			
	p3	200	800	job 3	200	Busy	0			
	p4	50	850	job 4	50	Busy	0			
	p5	150	1000	job 5	150	Busy	0			
	2		Total Extern							
			Snapsho	t 2: Fir	st Fit					
		Jol		b Size:	Job Status	3:				
		job 1		100		Running				
		job 2		500		inished				
		job 3		200		Running				
		job 4		50		unning				
		job 5		150		Running				
		job 5		75		unning				
		job 7		200		Running				
		J00 /		200	•					
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:			
	- Indition	- DIEC.	TICH PULL	0001	JOD DIEC.	Doubles.	ug.			

S	napshot	1:	Best	Fit	
Job Name:	Job	Siz	e:	Job	Status:

	job 1		100	R	unning	
	job 2		500	R	unning	
	job 3		200	R	unning	
	job 4		50	Ru	unning	
	job 5		150	R	unning	
	job 6		75	Wa	aiting	
	job 7		200	W	aiting	
P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p4	50	850	job 4	50	Busy	0
pl	100	100	job 1	100	Busy	0
p5	150	1000	job 5	150	Busy	0
p3	200	800	job 3	200	Busy	0
p2	500	600	job 2	500	Busy	0
	Jok	_	ot 2: Bes			
	job 1	Manie. O	100		unning	
	job 2		500		inished	
	job 2		200		unning	
	job 4		50		unning	
	job 5		150		unning	
	job 6		75		unning	
	job 7		200		unning	
P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:
p4	50	850	job 4	50	Busy	0
p2	75	425	job 6	75	Busy	0
pl	100	100	job 1	100	Busy	0
p5	150	1000	job 5	150	Busy	0
p3	200	800	job 3	200	Busy	0
newP	200	225	job 7	200	Busy	0
newP	225	450			Free	225
	1	Total Externa	al Fragmen	ntation: 225		

Snapshot 1: Worst Fit

Job Name: Job Size: Job Status:

Binary ExpressionTree GUI									×
		job 3		200		Running			Ŀ
		job 4		50		unning			
		job 5		150		Running			
		job 6		75		unning			
		job 7		200		Running			
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:		
	newP	225	450			Free	225		
	р3	200	800	job 3	200	Busy	0		
	newP	200	225	job 7	200	Busy	0		
	p5	150	1000	job 5	150	Busy	0		
	pl	100	100	job 1	100	Busy	0		
	p2	75	425	job 6	75	Busy	0		
	p4	50	850	job 4	50	Busy	0		
		Т	otal Externa	al Fragmen	ntation: 225				
				ot 1: Nex					
			Name: Jo	b Size:	Job Statu				
		job 1		30		unning			
		job 2		50		unning			
		job 3		20	B	unning			
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:		
	pl	30	30	job 1	30	Busy	0		
	p2	50	80	job 2	50	Busy	0		
	p3	20	100	job 3	20	Busy	0		
			Total Extern	nal Fragme	entation: 0				
			Snapsh	ot 2: Nex	t Fit				
		Job		b Size:	Job Statu	s:			
		job 1		30		inished			
		job 2		50	F	inished			
		job 3		20		inished			
		job 4		40	P	unning			
		job 5		20		unning			
	P Name:	P Size:	Mem Addr:	Job:	Job Size:	Status:	Frag:		
	pl	30	30			Free	0		
	p2	40	10	job 4	40	Busy	0		
	newP	10	20	-		Free	10		
	р3	20	100	job 5	20	Busy	0		
	-		Total Extern			-			
				_					