ECE 462 "OOP Using C++ and JAVA"
Assignment 2, Part2
6-bit pipelined processor simulator

Purdue University

Nik Tuzov, Sunitha Jenarius

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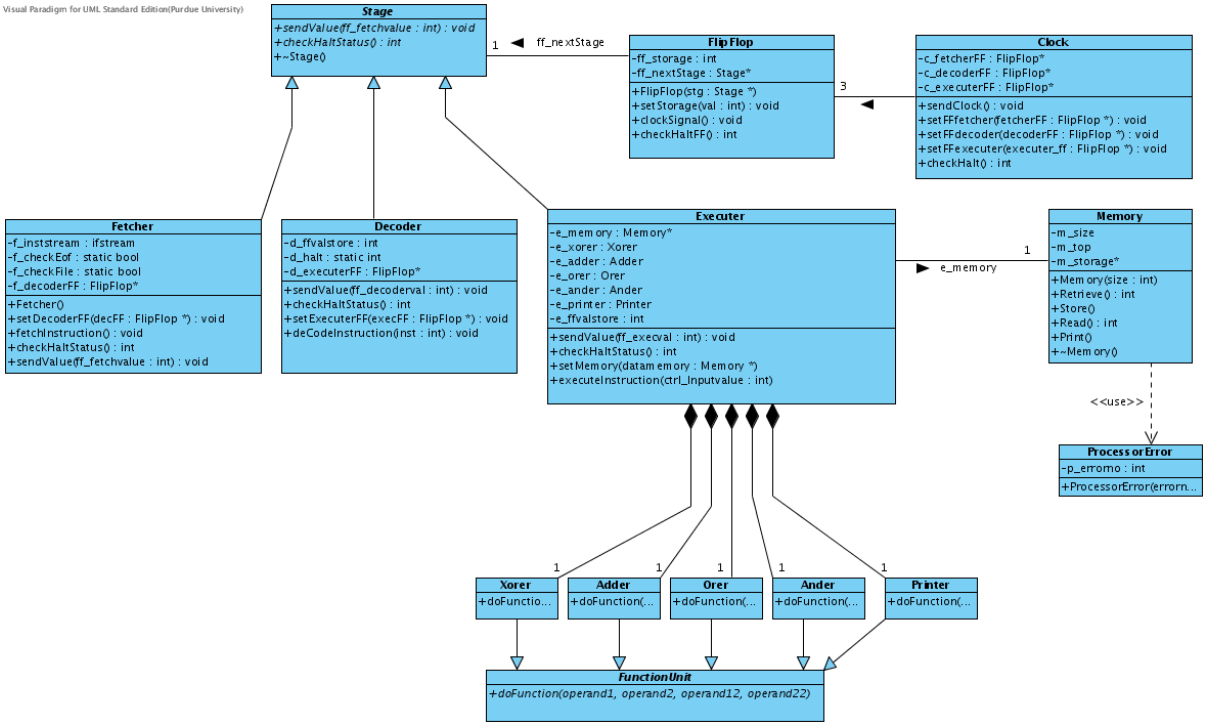
Overall Class Diagram



Summary

Name	Documentation
Adder	Adds two integers
Ander	Bitwise AND operation
Clock	Clock coordinates the flow of information through the processor by sending signals to the three flip-flops.
Decoder	Decodes the instruction obtained from the corresponding flip-flop.
Executer	Executes the processor instruction.
Fetcher	Fetcher - fetchers a processor command from the input file.
FlipFlop	Stores and transfers processor commands and operands from one processor unit to another
FunctionUnit	Abstract class to derive all of the processor operations from.
Memory	Stores results of operations.
Orer	Bitwise OR operation
Printer	Print command
ProcessorError	Exception thrown by some operations of Memory.
Stage	Represents a stage of a processor
Xorer	Bitwise XOR operation

Details

Adder

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Adds two integers

Operations

public doFunction (operand1, operand2, operand12, operand22)		
Parameters	operand1	
	Direction	in
	operand2	
	Direction	in
	operand12	
	Direction	in
	operand22	
	Direction	in
Query	false	

Relationships

Unamed Generalization	
From	FunctionUnit
Visibility	Unspecified

Unamed Association		
From	Name	Value
	End Model Element	Executer
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	Composited
	Navigable	true

Ander

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Bitwise AND operation

Operations

public doFunction (operand1, operand2)		
Parameters	operand1	
	Direction	in
	operand2	
	Direction	in
Query	false	

Relationships

Unnamed Generalization	
From	FunctionUnit
Visibility	Unspecified

Unnamed Association		
From	Name	Value
	End Model Element	Executer
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	Composited
	Navigable	true

Clock

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Clock coordinates the flow of information through the processor by sending signals to the three flip-flops.

Attributes

private c_fetcherFF : FlipFlop			
Getter	false	Setter	false

private c_decoderFF : FlipFlop			
Getter	false	Setter	false

private c_executerFF : FlipFlop			
Getter	false	Setter	false

Operations

public sendClock () : void	
Query	false

public setFFfetcher (fetcherFF : FlipFlop) : void		
Parameters	fetcherFF	
	Type Modifier	*
	Type	FlipFlop
	Direction	in
Query	false	

public setFFdecoder (decoderFF : FlipFlop) : void		
Parameters	decoderFF	
	Type Modifier	*
	Type	FlipFlop
	Direction	inout
Query	false	

public setFFexecuter (executer_ff : FlipFlop) : void		
Parameters	executer_ff	
	Type Modifier	*
	Type	FlipFlop
	Direction	in
Query	false	

public checkHalt () : int	
Query	false

Relationships

Unamed Association		
To	Name	Value
	End Model Element	FlipFlop
	Multiplicity	3
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Decoder

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Decodes the instruction obtained from the corresponding flip-flop.

Attributes

private d_ffvalstore : int			
Getter	false	Setter	false

private d_halt : static int			
Getter	false	Setter	false

private d_executerFF : FlipFlop			
Getter	false	Setter	false

Operations

public sendValue (ff_decoderval : int) : void		
Parameters	ff_decoderval	
	Type	int
	Direction	inout
Query	false	

public checkHaltStatus () : int	
Query	false

public setExecuterFF (execFF : FlipFlop) : void		
Parameters	execFF	
	Type Modifier	*
	Type	FlipFlop
	Direction	inout
Query	false	

public deCodeInstruction (inst : int) : void		
Parameters	inst	
	Type	int
	Direction	in
Query	false	
Documentation	Throws an exception of type ProcessorError	

Relationships

Unamed Generalization	
From	Stage
Visibility	Unspecified

Executer

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Executes the processor instruction.

Attributes

private e_memory : Memory			
Getter	false	Setter	false

private e_xorer : Xorer			
Getter	false	Setter	false

private e_adder : Adder			
Getter	false	Setter	false

private e_orer : Orer			
Getter	false	Setter	false

private e_ander : Ander			
Getter	false	Setter	false

private e_printer : Printer			
Getter	false	Setter	false

private e_ffvalstore : int			
Getter	false	Setter	false

Operations

public sendValue (ff_execval : int) : void		
Parameters	ff_execval	
	Type	int
	Direction	in
Query	false	

public checkHaltStatus () : int	
Query	false

public setMemory (datamemory : Memory)		
Parameters	datamemory	
	Type Modifier	*
	Type	Memory
	Direction	in
Query	false	

public executeInstruction (ctrl_Inputvalue : int)		
Parameters	ctrl_Inputvalue	
	Type	int
	Direction	in
Query	false	

Relationships

Unnamed Generalization	
From	Stage
Visibility	Unspecified

e_memory : Association		
To	Name	Value
	End Model Element	Memory
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Unamed Association		
To	Name	Value
	End Model Element	Xorer
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Unamed Association		
To	Name	Value
	End Model Element	Adder
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Unamed Association		
To	Name	Value
	End Model Element	Orer
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Unamed Association		
To	Name	Value
	End Model Element	Ander
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Unamed Association		
To	**Name**	**Value**
	End Model Element	Printer
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Fetcher

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Fetcher - fetchers a processor command from the input file.

Attributes

private f_inststream : ifstream			
Getter	false	Setter	false

private f_checkEof : static bool			
Getter	false	Setter	false

private f_checkFile : static bool			
Getter	false	Setter	false

private f_decoderFF : FlipFlop			
Getter	false	Setter	false

Operations

public Fetcher ()	
Query	false
Documentation	Constructor.

public setDecoderFF (decFF : FlipFlop) : void		
Parameters	decFF	
	Type Modifier	*
	Type	FlipFlop
	Direction	in
Query	false	

public fetchInstruction () : void	
Query	false

public checkHaltStatus () : int	
Query	false

public sendValue (ff_fetchvalue : int) : void		
Parameters	ff_fetchvalue	
	Type	int
	Direction	inout
Query	false	

Relationships

Unamed Generalization	
From	Stage
Visibility	Unspecified

FlipFlop

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Stores and transfers processor commands and operands from one processor unit to another

Attributes

private ff_storage : int			
Getter	false	Setter	false

private ff_nextStage : Stage			
Getter	false	Setter	false

Operations

public FlipFlop (stg : Stage)		
Parameters	stg	
	Type Modifier	*
	Type	Stage
	Direction	in
Query	false	

public setStorage (val : int) : void		
Parameters	val	
	Type	int
	Direction	in
Query	false	

public clockSignal () : void	
Query	false

public checkHaltFF () : int	
Query	false

Relationships

ff_nextStage : Association		
To	Name	Value
	End Model Element	Stage
	Multiplicity	1
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Unamed Association		
From	Name	Value
	End Model Element	Clock
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	None
	Navigable	true

FunctionUnit

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Abstract class to derive all of the processor operations from.

Operations

public doFunction (operand1, operand2, operand12, operand22)		
Parameters	**operand1**	
	Direction	in
	operand2	
	Direction	in
	operand12	
	Direction	in
	operand22	
	Direction	in
Query	true	

Relationships

Unamed Generalization	
To	Xorer
Visibility	Unspecified

Unamed Generalization	
To	Adder
Visibility	Unspecified

Unamed Generalization	
To	Orer
Visibility	Unspecified

Unamed Generalization	
To	Ander
Visibility	Unspecified

Unamed Generalization	
To	Printer
Visibility	Unspecified

Memory

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Stores results of operations.

Attributes

private m_size			
Getter	false	Setter	false

private m_top			
Getter	false	Setter	false

private m_storage			
Getter	false	Setter	false

Operations

public Memory (size : int)		
Parameters	size	
	Type	int
	Direction	inout
Query	false	

public Retrieve () : int	
Query	false

public Store ()	
Query	false

public Read () : int	
Query	false

public Print ()	
Query	false

public ~Memory ()	
Query	false

Relationships

Unamed Usage	
To	ProcessorError
Stereotypes	use

e_memory : Association		
From	Name	Value
	End Model Element	Executer
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Orer

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Bitwise OR operation

Operations

public doFunction (operand1, operand2, operand12, operand22)		
Parameters	operand1	
	Direction	inout
	operand2	
	Direction	inout
	operand12	
	Direction	inout
	operand22	
	Direction	inout
Query	false	

Relationships

Unamed Generalization	
From	FunctionUnit
Visibility	Unspecified

Unamed Association		
From	Name	Value
	End Model Element	Executer
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	Composited
	Navigable	true

Printer

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Print command

Operations

public doFunction (operand1, operand2)		
Parameters	operand1	
	Direction	in
	operand2	
	Direction	in
	Default Value	0
Query	false	

Relationships

Unamed Generalization	
From	FunctionUnit
Visibility	Unspecified

Unamed Association		
From	Name	Value
	End Model Element	Executer
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	Composited
	Navigable	true

ProcessorError

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Exception thrown by some operations of Memory.

Attributes

private p_errorno : int			
Getter	false	Setter	false

Operations

public ProcessorError (errornum : int)		
Parameters	errornum	
	Type	int
	Direction	inout
Query	false	

Relationships

Unamed Usage	
From	Memory
Stereotypes	use

Stage

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Represents a stage of a processor

Operations

public sendValue (ff_fetchvalue : int) : void		
Parameters	ff_fetchvalue	
	Type	int
	Direction	inout
Query	true	

public checkHaltStatus () : int	
Query	true

public ~Stage ()	
Query	false

Relationships

Unamed Generalization	
To	Fetcher
Visibility	Unspecified

Unamed Generalization	
To	Decoder
Visibility	Unspecified

Unamed Generalization	
To	Executer
Visibility	Unspecified

ff_nextStage : Association		
From	Name	Value
	End Model Element	FlipFlop
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	None
	Navigable	true

Xorer

Name	Value
Active	false
Visibility	public
Leaf	false
Root	false
Documentation	Bitwise XOR operation

Operations

public doFunction (operand1, operand2)		
Parameters	operand1	
	Direction	in
	operand2	
	Direction	in
Query	false	

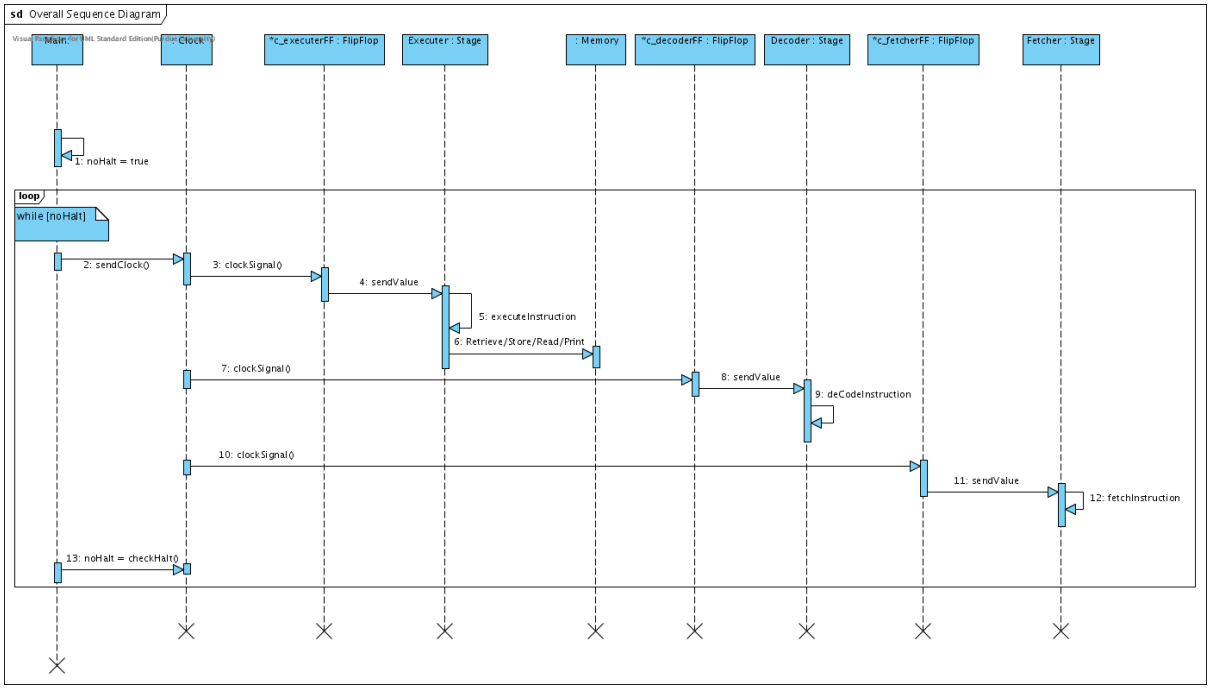
Relationships

Unamed Generalization	
From	FunctionUnit
Visibility	Unspecified

Unamed Association		
From	**Name**	**Value**
	End Model Element	Executer
	Multiplicity	Unspecified
	Visibility	private
	Aggregation Kind	Composited
	Navigable	true

Sequence Diagram

Overall Sequence Diagram



Summary

Name	Documentation
: Memory	
: Clock	
	while [noHalt]
*c_decoderFF : FlipFlop	
*c_executerFF : FlipFlop	
*c_fetcherFF : FlipFlop	
Decoder : Stage	
Executer : Stage	
Fetcher : Stage	
Main:	
noHalt	
while [noHalt]	

Details

: Memory

Name	Value
Multiplicity	Unspecified
Base Classifier	Memory
Active	false
Stopped	true
Multi Object	false

Relationships

Retrieve/Store/Read/Print : Message		
From	Name	Value
	End Model Element	Executer
Type	Message	
Sequence Number	6	
Asynchronous	false	

: Clock

Name	Value
Multiplicity	Unspecified
Base Classifier	Clock
Active	false
Stopped	true
Multi Object	false

Relationships

sendClock() : Message		
From	Name	Value
	End Model Element	Main:
Type	Message	
Sequence Number	2	
Asynchronous	false	

clockSignal() : Message		
To	Name	Value
	End Model Element	*c_executerFF
Type	Message	
Sequence Number	3	
Asynchronous	false	

clockSignal() : Message		
To	Name	Value
	End Model Element	*c_decoderFF
Type	Message	
Sequence Number	7	
Asynchronous	false	

clockSignal() : Message		
To	Name	Value
	End Model Element	*c_fetcherFF
Type	Message	
Sequence Number	10	
Asynchronous	false	

noHalt = checkHalt() : Message		
From	Name	Value
	End Model Element	Main:
Type	Message	
Sequence Number	13	
Asynchronous	false	

N/A

Relationships

Unamed Anchor	
From	while [noHalt]

*c_decoderFF : FlipFlop

Name	Value
Multiplicity	Unspecified
Base Classifier	FlipFlop
Active	false
Stopped	true
Multi Object	false

Relationships

clockSignal() : Message		
From	Name	Value
	End Model Element	
Type	Message	
Sequence Number	7	
Asynchronous	false	

sendValue : Message		
To	Name	Value
	End Model Element	Decoder
Type	Message	
Sequence Number	8	
Asynchronous	false	

*c_executerFF : FlipFlop

Name	Value
Multiplicity	Unspecified
Base Classifier	FlipFlop
Active	false
Stopped	true
Multi Object	false

Relationships

clockSignal() : Message		
From	Name	Value
	End Model Element	
Type	Message	
Sequence Number	3	
Asynchronous	false	

sendValue : Message		
To	Name	Value
	End Model Element	Executer
Type	Message	
Sequence Number	4	
Asynchronous	false	

*c_fetcherFF : FlipFlop

Name	Value
Multiplicity	Unspecified
Base Classifier	FlipFlop
Active	false
Stopped	true
Multi Object	false

Relationships

clockSignal() : Message		
From	Name	Value
	End Model Element	
Type	Message	
Sequence Number	10	
Asynchronous	false	

sendValue : Message		
To	Name	Value
	End Model Element	Fetcher
Type	Message	
Sequence Number	11	
Asynchronous	false	

Decoder : Stage

Name	Value
Multiplicity	Unspecified
Base Classifier	Stage
Active	false
Stopped	true
Multi Object	false

Relationships

sendValue : Message		
From	Name	Value
	End Model Element	*c_decoderFF
Type	Message	
Sequence Number	8	
Asynchronous	false	

deCodeInstruction : Message		
To	Name	Value
	End Model Element	Decoder
Type	Self Message	
Sequence Number	9	
Asynchronous	false	

Executer : Stage

Name	Value
Multiplicity	Unspecified
Base Classifier	Stage
Active	false
Stopped	true
Multi Object	false

Relationships

sendValue : Message		
From	Name	Value
	End Model Element	*c_executerFF
Type	Message	
Sequence Number	4	
Asynchronous	false	

executeInstruction : Message		
To	Name	Value
	End Model Element	Executer
Type	Self Message	
Sequence Number	5	
Asynchronous	false	

Retrieve/Store/Read/Print : Message		
To	Name	Value
	End Model Element	
Type	Message	
Sequence Number	6	
Asynchronous	false	

Fetcher : Stage

Name	Value
Multiplicity	Unspecified
Base Classifier	Stage
Active	false
Stopped	true
Multi Object	false

Relationships

sendValue : Message		
From	Name	Value
	End Model Element	*c_fetcherFF
Type	Message	
Sequence Number	11	
Asynchronous	false	

fetchInstruction : Message		
To	Name	Value
	End Model Element	Fetcher
Type	Self Message	
Sequence Number	12	
Asynchronous	false	

Main:

Name	Value
Multiplicity	Unspecified
Active	false
Stopped	true
Multi Object	false

Relationships

noHalt = true : Message		
To	Name	Value
	End Model Element	Main:
Type	Self Message	
Sequence Number	1	
Asynchronous	false	

sendClock() : Message		
To	Name	Value
	End Model Element	
Type	Message	
Sequence Number	2	
Asynchronous	false	

noHalt = checkHalt() : Message		
To	Name	Value
	End Model Element	
Type	Message	
Sequence Number	13	
Asynchronous	false	

noHalt

while [noHalt]

Interaction Operands

Value
noHalt

Covered LifeLines

Name	Documentation
*c_decoderFF	
*c_executerFF	
*c_fetcherFF	
Decoder	
Executer	
Fetcher	
Main:	