

Team 2 Project -1

Lab : VLSI

Experiment : D-Latch and D-Flip Flop

Members:

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Test Case -1

The experiment doesn't work on Chrome

- State: Open
- Severity: S1
- Category: Interoperability
- Objective : Demonstrate interoperability defect on Chrome
- Pre conditions : Chrome Web Browser should be installed and running on the system.
- Post conditions : The plugin needed to run the applet is observed to be not supported on
- Chrome.
- Test Steps :
 - Step1: Open Chrome.
 - Step2: Visit link:
 - http://cse14iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
- Expected result : The applet must work as expected.

Test Case-2

The components which are not required for the current experiment are also displayed in the toolbar.

- State: Open
- Severity: S3
- Category: Usability
- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : The components on the left hand side column (toolbar), some of which are not required for the experiment, are displayed without reason.
- Test Steps :
 - Step1: Open and run experiment by visiting link:
http://cse14iith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: Click on the following available icons one by one: PMOS, NMOS, Capacitor, Ground, Inductor, Resistor, Vdd.
- Expected result : The applet must only display those components that are required of the experiment.

Test Case -3

The experiment opens in a new window in the browser which harms the user experience.

- State: Open
- Severity: S3
- Category: Usability
- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : The experiment opens in a new window.
- Test Steps :
 - Step1: Visit the link: <http://cse14iith.vlabs.ac.in/Experiment.php?tid=T005&code=C006>
 - Step2: Scroll to the bottom and click on either “Start the Positive Level DLatch and DFlipFlop Experiment” or “Start the Negative Edge DFlipFlop Experiment”
- Expected result : The experiment must ideally run within the same operating window without obstructing the user experience.

Test Case -4

The current procedure manual is tough to locate and understand as no schematic representation is there.

- State: Open
- Severity: S3
- Category: Usability
- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : The manual is hard to find.
- Test Steps :
 - Step1: Visit the link: <http://cse14iiith.vlabs.ac.in/Experiment.php?tid=T005&code=C006>
 - Step2: Try and locate the manual for running the experiment.
- Expected result : The manual must be easy to locate and understand.

Test Case -5

The UI color scheme uses Neon colors.

- State: Open
- Severity: S3
- Category: Usability
- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : UI color scheme is indecipherable and obscure.
- Test Steps :
 - Step1: Visit the link:
http://cse14-iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: Observe and try to discern the color scheme.
- Expected result : The UI color scheme must be discernible and eyefriendly.

Test Case -6

Moving the components on the grid is tough or not possible. Some components can be moved but others can't be moved. No clear specifications.

- State: Open
- Severity: S3
- Category: Usability
- Objective : To test the movability of the components on the grid
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : The components are cumbersome to be operated on. There are no clear instructions on their behavior.
- Test Steps :
 - Step1: Visit the link:
http://cse14iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: Select any of the components and try to move them in the grid.
- Expected result : The components must ideally be smoothly movable as desired and without any lag.

Test Case - 7

Rotate button stopped working after a certain amount of time.

- State: Open
- Severity: S3
- Category: Functionality
- Objective : Demonstrate functionality defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet
- must be running.
- Post conditions : Rotate button does not work as expected.
- Test Steps :
 - Step1: Visit the link:
http://cse14iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: Select any of the components(ex. inverter) and click on rotate button.
- Expected result : The rotate button must be able to rotate the component selected.

Test Case - 8

Popup windows aggravate the user experience.

- State: Open
- Severity: S3
- Category: Usability
- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : Popup windows for every unpermitted action.
- Test Steps :
 - Step1: Visit the link:
http://cse14iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: Select any of the components that are not required for the experiment or perform any action that is unpermitted.
- Expected result : Avoid popup windows as it severely harms the user experience.

Test Case -9

There is no button to restart the experiment.

- State: Open
- Severity: S2
- Category: Functionality
- Objective : Demonstrate functionality defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : No option to restart the experiment.
- Test Steps :
 - Step1: Visit the link:
http://cse14iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: To restart the experiment, refresh the browser and load the plugin again.
- Expected result : There must be a button to restart the experiment without refreshing the browser and reloading the applet.

Test Case -10

Spelling Mistake Negative is written as Negativetive

- State: Open
- Severity: S3
- Category: Usability
- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : Typo for the word Negative.
- Test Steps :
 - Step1: Visit the link:
http://cse14.iith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_negative/exp6_flipflop_negative.html
 - Step2: Observe the typo Negativetive instead of Negative.
- Expected result : Negative must be spelt correctly.

Test Case - 11

Simulate button not working even after multiple refreshes and the system hangs if button is pressed.

- State: Open
- Severity: S2
- Category: Functionality
- Objective : Demonstrate functionality defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet must be running.
- Post conditions : Simulate button does not work.
- Test Steps :
 - Step1: Visit the link:
http://cse14.iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_negative/exp6_flipflop_negative.html
 - Step2: Construct the complete circuit and press simulate button.
- Expected result : The circuit must be successfully simulated on pressing the simulate button.

Test Case - 12

A different applet starts from beginning if the experiment is changed (i.e. another option is selected from given drop down menu).

- Objective : Demonstrate usability defect with experiment applet
- Pre conditions : The plugin should be installed in the browser and the experiment applet
 - must be running.
- Post conditions : The applet restarts when the experiment is changed.
- Test Steps :
 - Step1: Visit the link:
http://cse14iiith.vlabs.ac.in/EXP_1sep2010/exp6/exp6_latch_positive.html
 - Step2: Change the experiment to Negative Edge DFlipFlop from the drop down menu on the topright.
- Expected result : The experiment must ideally run within the same operating window, without restarting the applet/plugin.

Java Code Metrics

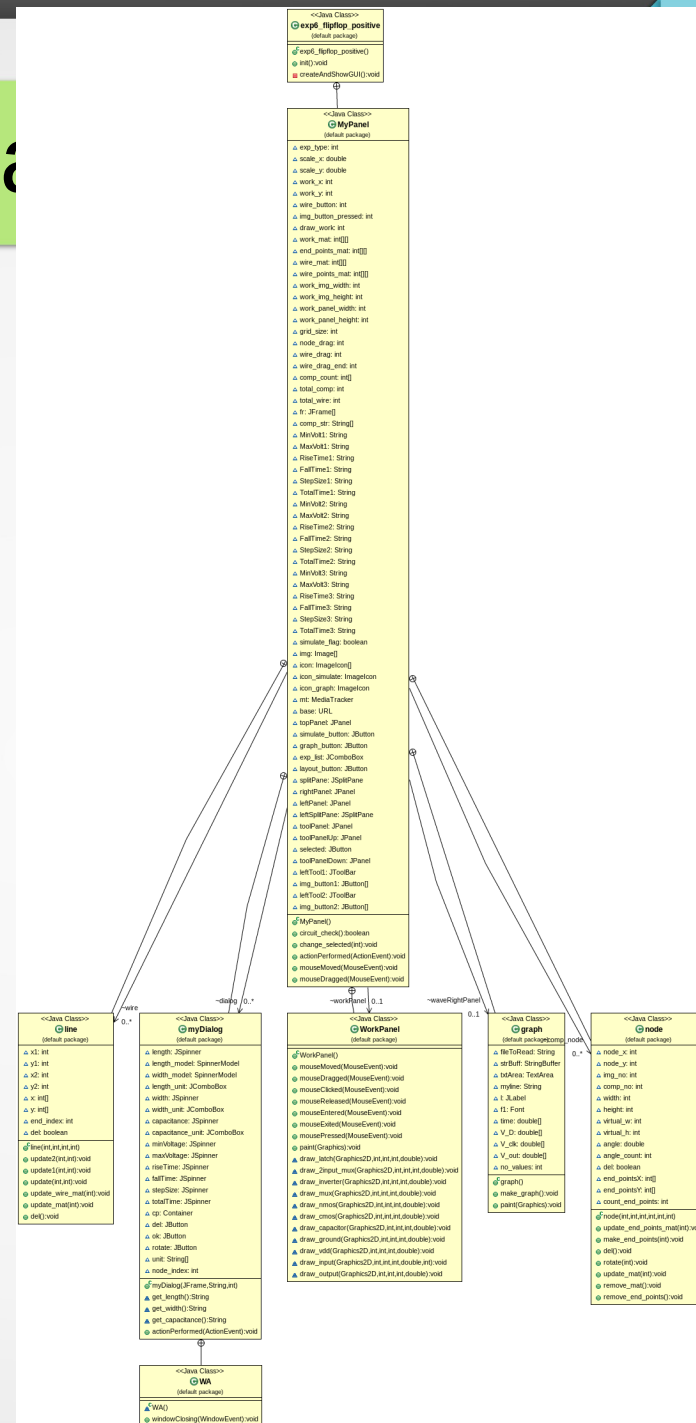
- Flip Flop :
- There are two major modules in the Java Positive Flip Flop Code :
- WorkPanel and MyPanel
- There Metrics are on the following slides.
- Latch :
- There are two major modules in the Java Latch Code :
- WorkPanel and MyPanel
- There Metrics are on the following slides.

Flip Flop Code Metrics

the value (11.10) calculated using only these relationships rather than

Metric	Tag	Overall	Per Module
Number of modules	NOM	43	
Lines of Code	LOC	2015	46.860
McCabe's Cyclomatic Number	MVG	283	6.581
Lines of Comment	COM	880	20.465
LOC/COM	L_C	2.290	
MVG/COM	M_C	0.322	
Information Flow measure (inclusive)	IF4	85	1.977
Information Flow measure (visible)	IF4v	85	1.977
Information Flow measure (concrete)	IF4c	0	0.000
Lines of Code rejected by parser	REJ	18	

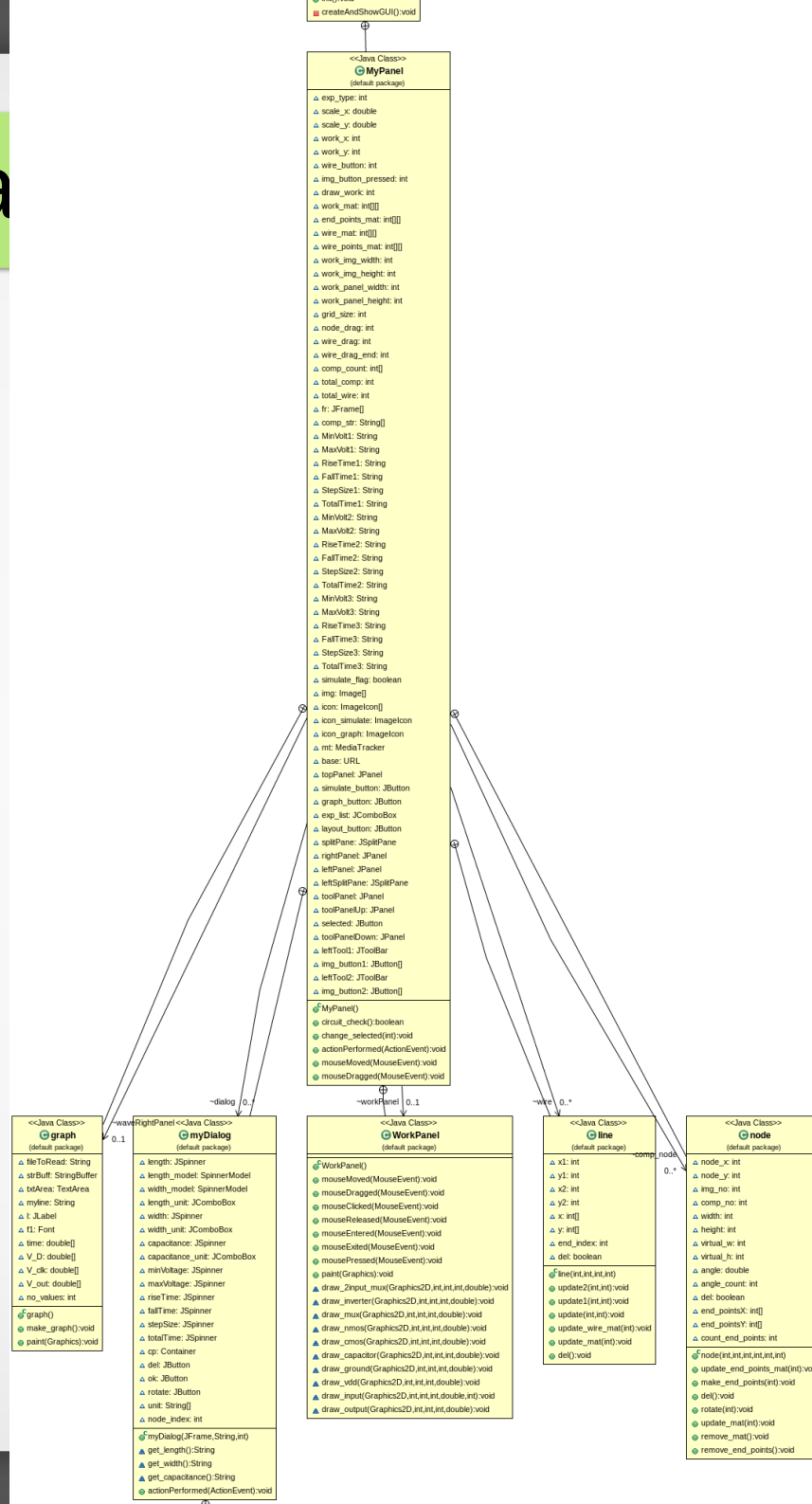
Flip Flop Class Diagram



Latch Code Metrics

Metric	Tag	Overall	Per Module
Number of modules	NOM	43	
Lines of Code	LOC	2040	47.442
McCabe's Cyclomatic Number	MVG	293	6.814
Lines of Comment	COM	883	20.535
LOC/COM	L_C	2.310	
MVG/COM	M_C	0.332	
Information Flow measure (inclusive)	IF4	85	1.977
Information Flow measure (visible)	IF4v	85	1.977
Information Flow measure (concrete)	IF4c	0	0.000
Lines of Code rejected by parser	REJ	18	

Latch Class Diagram



Desing Smells in Java Code

- **Inappropriate use of patterns:** It is evident from the above class diagram that suitable design patterns were not used to design the structure of the codebase.
- **Missing Abstraction:** All the class files follow the same structure causing lots of redundancy in the methods. Using abstraction would have helped in reducing redundancy and also easier in understanding functionality.
- **Insufficient Modularization:** Some classes are too large and could have been modularized further.
- **Leaky Encapsulation:** Some of the encapsulation is unnecessary and bloated. There are several variables which can be combined together as one and used across all the classes.

Code smells within classes

- **No comments** : No comments are used throughout the code explaining some finer details that need to be noted. This made some parts of the code incomprehensible.
- **Long Methods** : Most of the methods are long which makes the scope of their variables incomprehensible.
- **Long Parameters List** : The class MyPanel has several parameters which makes it very complex to understand.
- **Combinatorial Explosion** : The code in all the positive and negative files for both latch and the flipflop are mostly duplicated except for the values of the parameters. This need can be avoided by the use of proper inheritance.

Code smells within classes

- **Conditional complexity** : Some of the classes contain complex conditionals which can be avoided altogether by proper structuring.
- **Uncommunicative names** : Most of the variable names and method names do not suggest their purpose and are incomprehensible.
- **Inconsistent names** : The names of the methods in one class are intermingled with the names of other classes and do not lead to a proper understanding of the flow or their functionality.
- **Dead code and speculative Generality** : Some of the code is never used and most of it was modified to solve the problem, rather a hack to get its functionality working.

Code smells between classes

- **Refused Bequest** : There are a few classes which inherit other classes but rarely use the inherited functionality.
- **Divergent Change** : If any change is made in one class the trace of the change needs to be identified to make the change consistent across all the classes.
- **Indecent Exposure** : Most of the parameters and methods are public and are exposed.

JavaScript Code Metrics

- The tool used to evaluate the code is : **CodePro**
- This tool is used to audit the JavaScript Code
- The JavaScript Library used by us is **jsPlumb**
- jsPlumb provides a means for a developer to visually connect elements on their web pages. It uses SVG and runs on all browsers from IE9 and later.

Javascript Code Metrics

- **Flip Flop**
 - **Sloc** :55
 - **Maintainability**:45.53
 - **Jshint**:0.00
 - **Complexity** :
 - **Sloc** : logical:40, physical :55
 - **Cyclomatic** :1,
 - **Halstead** : **operators** : {"distinct":8,"total":85 }, **operands**: {"distinct":28,"total":139 },
 - **Cyclomatic density** : 2.5
 - **Length**:224,
 - **Vocabulary**:36,
 - **Difficulty**:19.857142857142858,
 - **Volume**:1158.063200323078,
 - **Effort**:22995.826406415406,
 - **Bugs**:0.3860210667743593,
 - **Time**:1277.5459114675225

Javascript Code Metrics

- Latch Metrics

Sloc :67

Maintainability :43.15704726965145}

Complexity :

Sloc :{logical:48,physical :67},

Cyclomatic:1,

Halstead:{**operators**:{distinct:8,total:102,}, **operands**:{distinct:31,total:168}}

Length:270

Vocabulary:39

Difficulty:21.677419354838708

Volume:1427.058599092807

Effort:30934.947696463427

Bugs:0.47568619969760234

Time:1718.6082053590792

Cyclomatic density:2.0833333333333333

Proposed Class Diagram

