Flow BP

Software Engineering Project
Application Design Document

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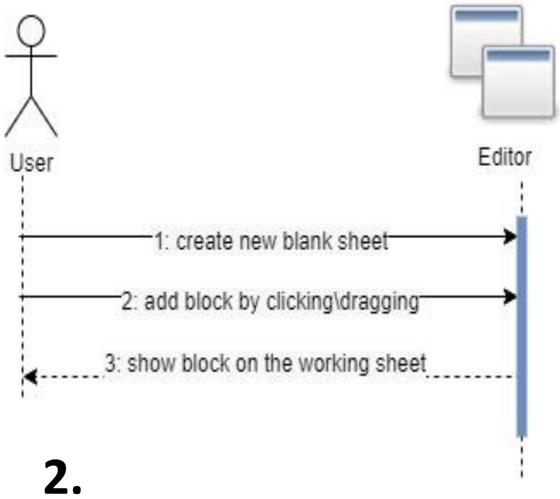
Contents

Chapter 1- Use Cases

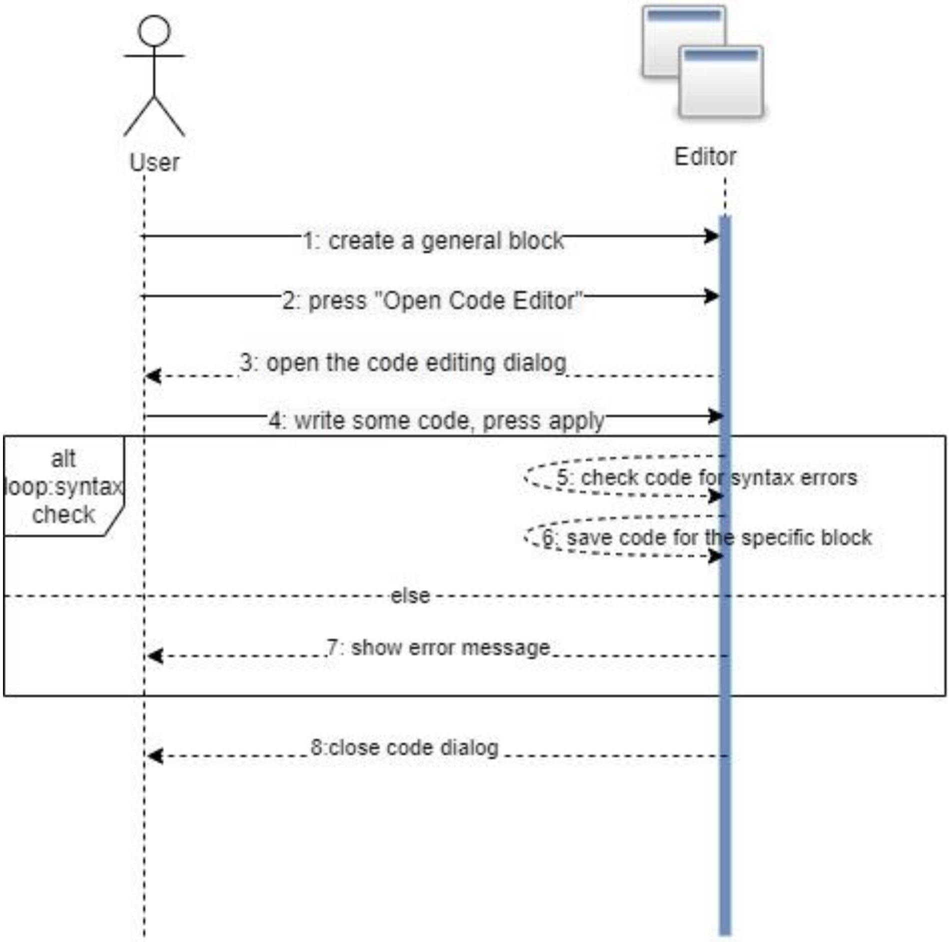
1.

Use-case name	Block addition
Description	The user opens the blocks pop-up menu by clicking the right mouse button and chooses a block.
Pre-conditions	None.
Post-conditions	The block will be visible on the working sheet.


User
Editor
1: create new blank sheet
2: add block by clicking\dragging
3: show block on the working sheet

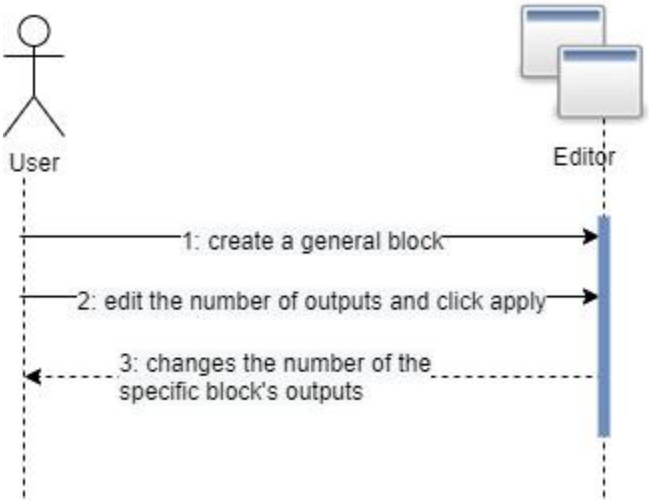
2.

Use-case name	Edit code section on a General/Console block
Description	After creating a general/console block, the user can edit the code on the block by clicking the block, then clicking the "Open Code Editor" button. After clicking the button, a new window with a text area will be opened, and in order to save the code the user should press the apply button.
Pre-conditions	A general/console block was created on the working sheet.
Post-conditions	The editor saves the code of the specific block.
Alternatives	If the user writes code with syntax errors, the editor will notify the user that an error has occurred, and allow the user to fix the code.


User
Editor
1: create a general block
2: press "Open Code Editor"
3: open the code editing dialog
4: write some code, press apply
alt
loop:syntax
check
5: check code for syntax errors
6: save code for the specific block
else
7: show error message
8:close code dialog

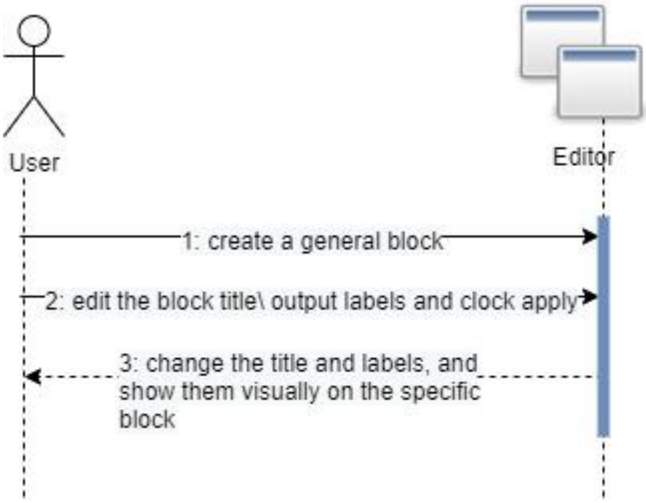
3.

Use-case name	Edit Number of outputs on a general block.
Description	After creating a general block, the user can edit the number of outputs the block has by clicking the block, then editing the "Number of outputs" field. Then pressing apply will change the number of outputs.
Pre-conditions	A General block was created on the working sheet
Post-conditions	The number of outputs on the specific block is changed accordingly


User
Editor
1: create a general block
2: edit the number of outputs and click apply
3: changes the number of the specific block's outputs

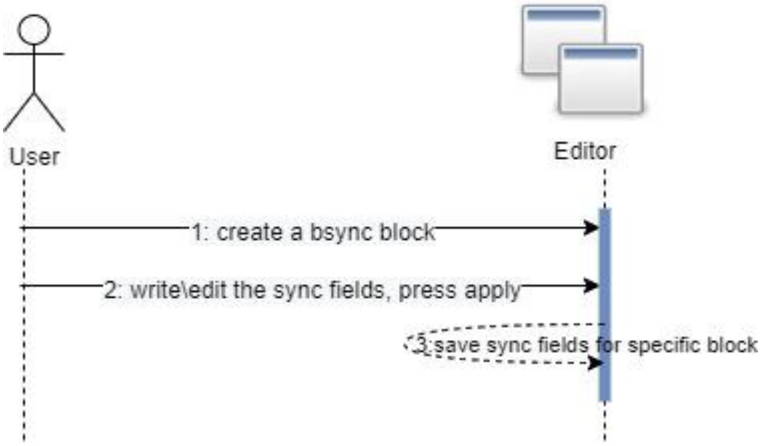
3.1

Use-case name	Edit outputs labels \ block title on general block
Description	After creating a general block, the user can edit the output's labels and the block title by pressing the block and changing the field.
Pre-conditions	A general block was created on the working sheet
Post-conditions	The labels\title are showed visually on the block


User
Editor
1: create a general block
2: edit the block title\ output labels and clock apply
3: change the title and labels, and show them visually on the specific block

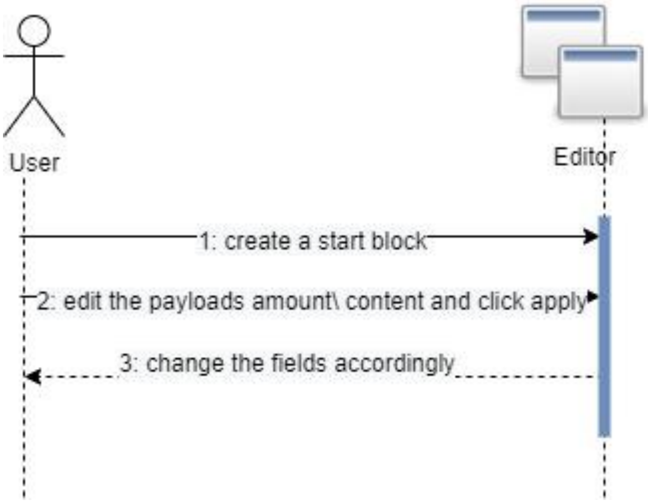
4.

Use-case name	Edit Request, Wait and Block fields on a Bsync block.
Description	After creating a Bsync block, the user can edit the Request, Wait and Block event fields on the block.
Pre-conditions	A Bsync block was created on the working sheet.
Post-conditions	The editor saves the sync fields of the specific block.


User
Editor
1: create a bsync block
2: write\edit the sync fields, press apply
3: save sync fields for specific block

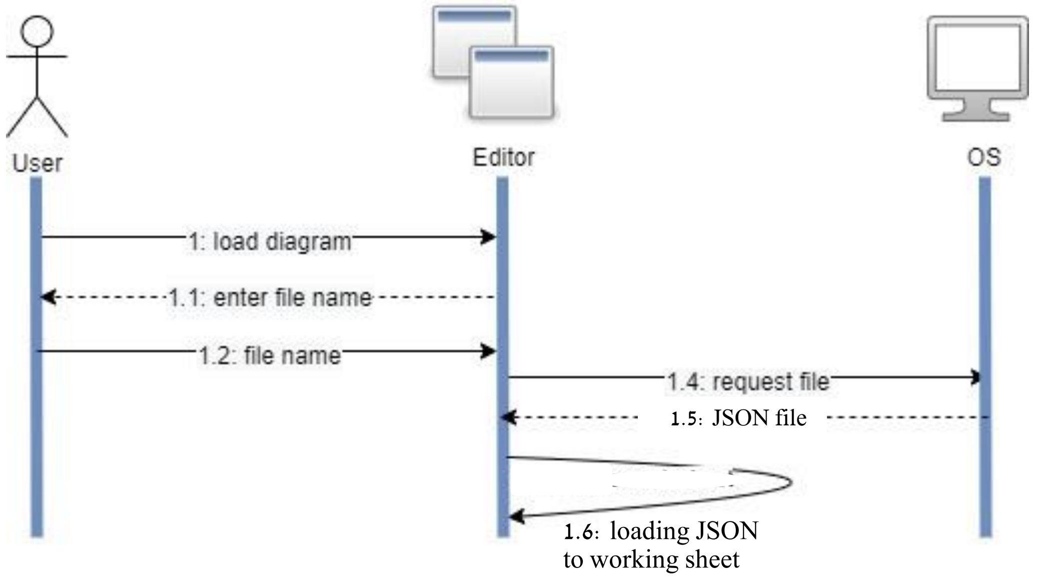
5.

Use-case name	Edit Payloads on a start block.
Description	After creating a start block, the user can edit the number of payloads the block contains, and the payloads contents. The user clicks the block and edits the fields on the pop-up window.
Pre-conditions	A start block was created on the working sheet.
Post-conditions	The fields on the specific block are changed accordingly.


User
Editor
1: create a start block
2: edit the payloads amount\ content and click apply
3: change the fields accordingly

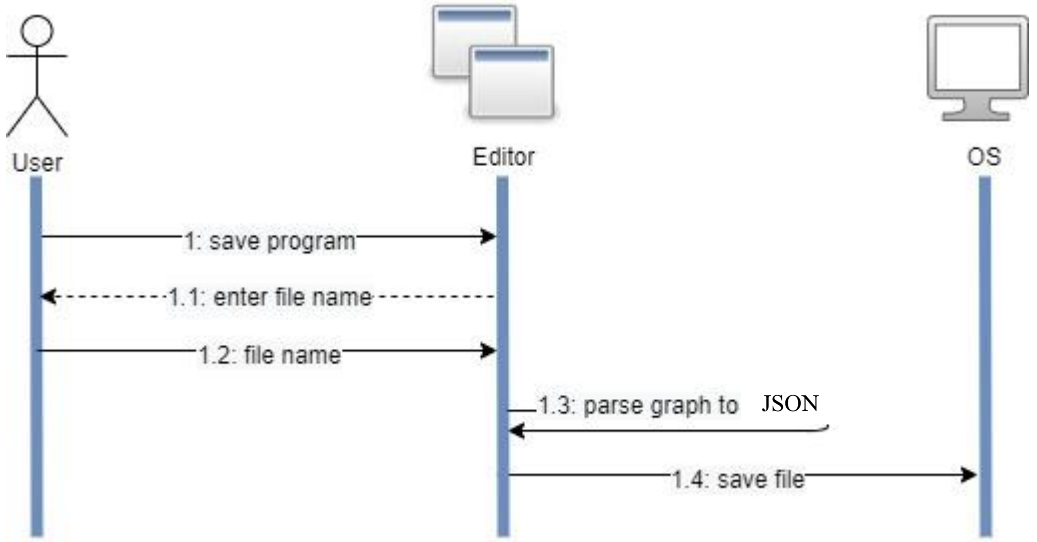
6.

Use-case name	Loading a program
Description	The user is pressing the load-program button, picks a JSON file and opens it.
Pre-conditions	None.
Post-conditions	The working-sheet filled with the graph represented by the structure inside the JSON file.



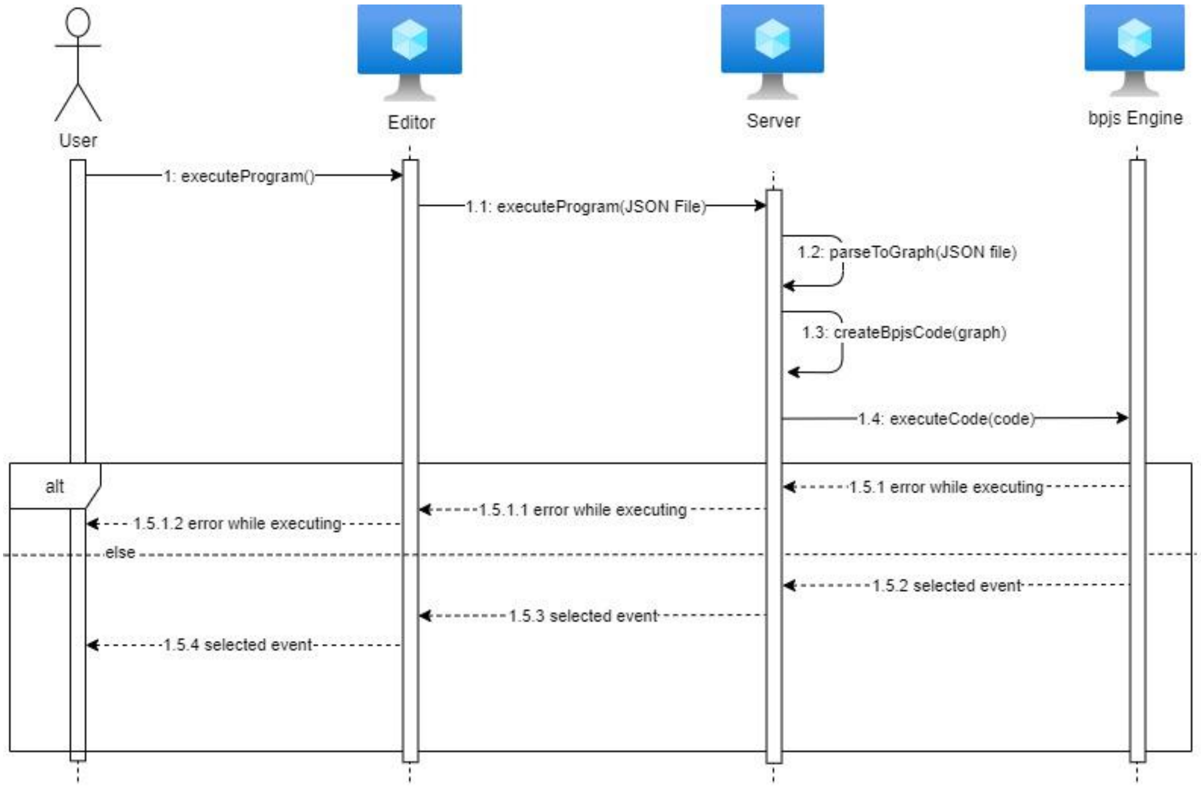
7.

Use-case name	Saving a program
Description	The user is pressing the save-program button, picks location and file name and saves it.
Pre-conditions	None
Post-conditions	An JSON file created on the selected location which contains all the graph details.



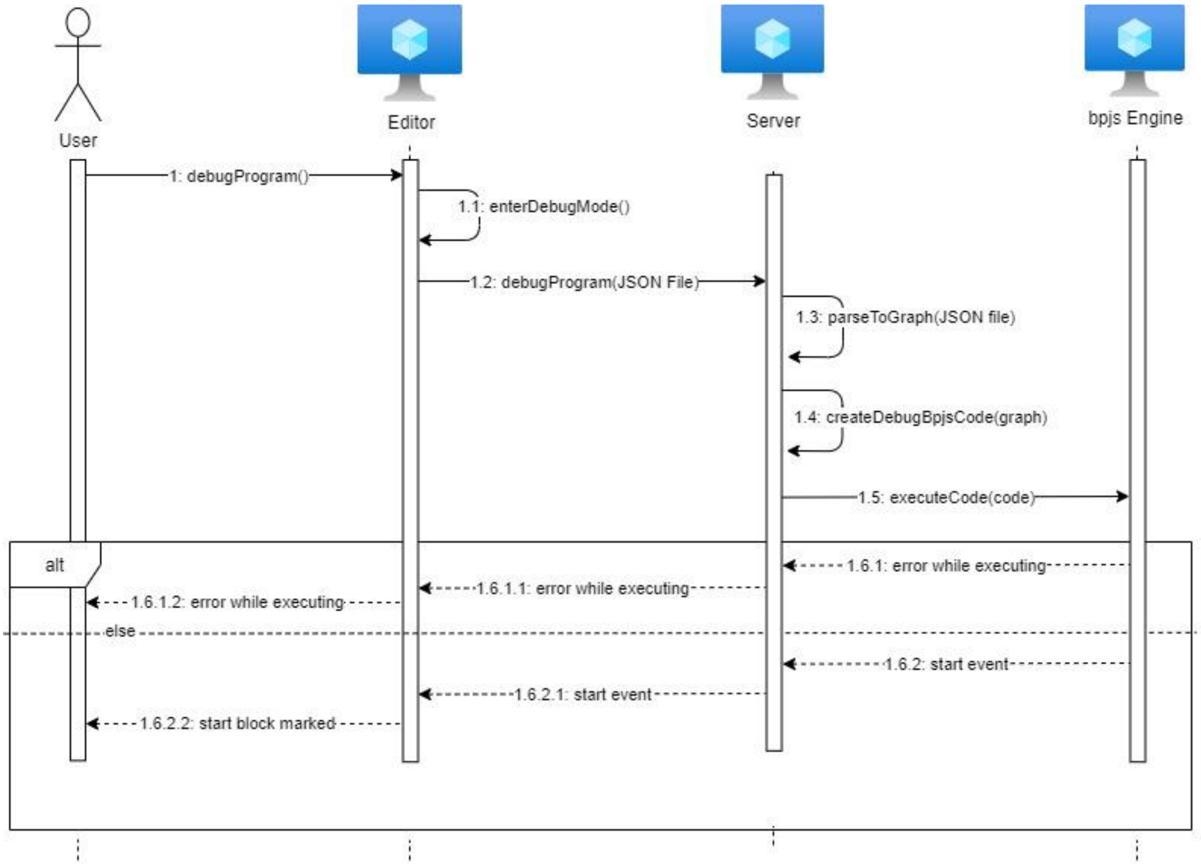
8.

Use-case name	Executing a program
Description	Pressing the run button after a graphical BP Flow program is located on the working sheet. A JSON presents the graph being sent to the server. The server parses and converts the JSON object to a graph-like object. The server creates a bpjs code file based on the graph structure. The server executes the bpjs code using bpjs server.
Pre-conditions	Loaded/Created graph bases on the working-sheet.
Post-conditions	The output console filled with events occurred according to the program restrictions.
Alternatives:	One of the general blocks' code section has code that breaks in run-time. The execution will stop, and an appropriate message will be shown to the user.


User
Editor
Server
bpjs Engine
1: executeProgram()
1.1: executeProgram(JSON File)
1.2: parseToGraph(JSON file)
1.3: createBpjsCode(graph)
1.4: executeCode(code)
alt
1.5.1 error while executing
1.5.1.1 error while executing
1.5.1.2 error while executing
else
1.5.2 selected event
1.5.3 selected event
1.5.4 selected event

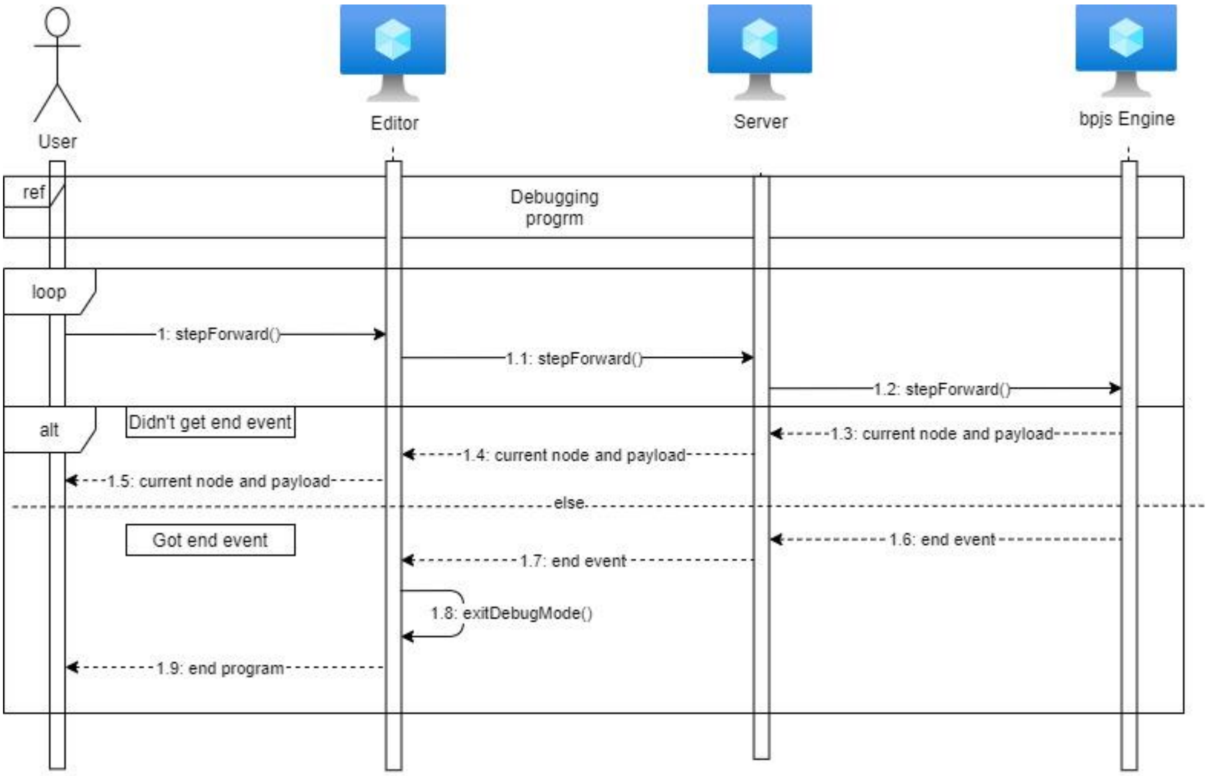
9.

Use-case name	Debugging a BP-Flow program
Description	After a graphical program is located on the working sheet, pressing the debugging button will transform the UI into debug mode. A JSON presents the graph being sent to the server. The server parses and converts the JSON object to a graph-like object. The server creates a **debug** bpjs code file based on the graph structure. The server executes the bpjs code using bpjs server.
Pre-conditions	Loaded/Created graph bases on the working-sheet.
Post-conditions	Step Forward and stop buttons are available, action that changes the program semantics are blocked until exiting debug mode. Start block of the executing flow is marked.
Alternatives:	There was an error while executing the code. an appropriate message will be shown to the user


User
Editor
Server
bpjs Engine
1: debugProgram()
1.1: enterDebugMode()
1.2: debugProgram(JSON File)
1.3: parseToGraph(JSON file)
1.4: createDebugBpjsCode(graph)
1.5: executeCode(code)
alt
1.6.1: error while executing
1.6.1.1: error while executing
1.6.1.2: error while executing
else
1.6.2: start event
1.6.2.1: start event
1.6.2.2: start block marked

9.1

Use-case name	Step forward in debug mode.
Description	While in debug mode, the user can click on the step – forward button, to see the next step of the program that lies on the working sheet.
Pre-conditions	Debug button was clicked, and the editor is in debug mode.
Post-conditions	The next step of the program execution will be visible to the user.
Alternative	The bpflow program has reached the end of the execution, and therefore editor exits from debug mode.



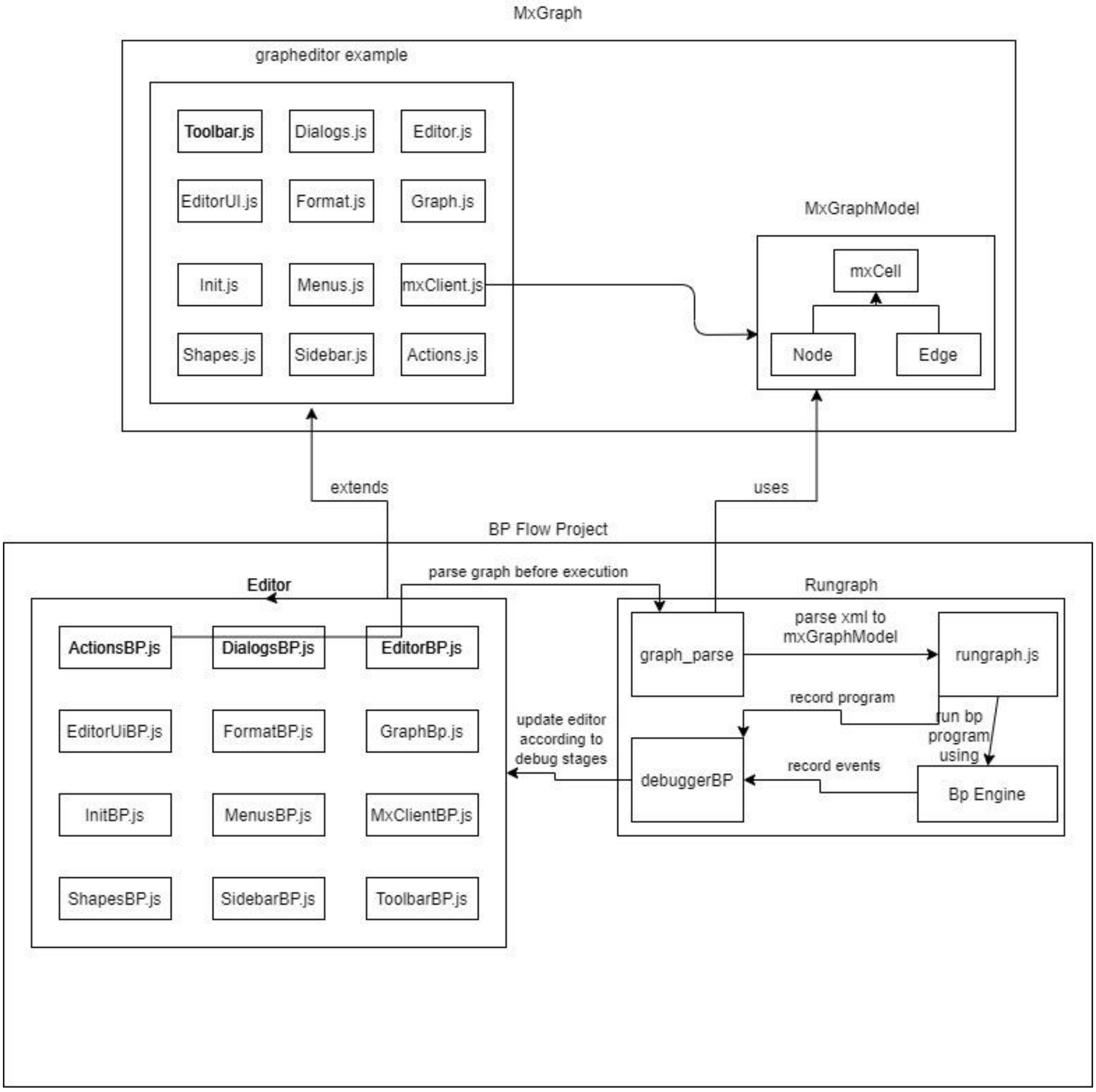
Chapter 2

System Architecture

The system is based on one of the MxGraph javascript graphical editor examples. MxGraph is an open – sourced repository for defining graphical objects, with a model called MxGraph Model[1].

For more information about mxGraph:

- Main repository: https://github.com/jgraph/mxgraph
- Graph editor example (being used in this project): https://github.com/jgraph/mxgraph/tree/master/javascript/examples/grapheditor



The editor part of the project is responsible for the graphical additions and changes to MxGraph's "grapheditor" example.

Editor Files:

- **ActionsBP**.js – extends Actions.js of MxGraph. Responsible for defining different actions (Execution, debugging, etc.).

1: MxGraphModel - A graph-like model in the MxGraph repository. Takes every shape and arrow from the graph and converts it into nodes and edges, using the MxCell object as a node\edge accordingly

- **DialogsBP**.js – extends Dialogs.js of MxGraph. Responsible for defining dialogs and pop up windows opened (Code editor, Output console, etc.).
- **EditorBP**.js - extends Editor.js of MxGraph.
- **EditorUiBP**.js – extends EditorUi.js of MxGraph.
- **FormatBP**.js – extends Format.js of MxGraph. Responsible for the right-hand menu opened while clicking on a certain graphical object.
- **GraphBP**.js – extends Graph.js of MxGraph.
- **InitBP**.js – A new file(not an extension) some like similar to Init.js of MxGraph, but with the certain definitions and file paths needed for the current project to run correctly.
- **MenusBP**.js – extends Menus.js of MxGraph. Responsible for the upper menu (File,Edit,View etc.).
- **MxClientBP**.js – extends MxClient.js of MxGraph. The main file which defines the entire MxGraph Model used for parsing diagrams and graphical objects.
- **ShapesBP**.js – extends Shapes.js of MxGraph. Responsible for the graphical objects' behavior.
- **SidebarBP**.js – extends Sidebar.js of MxGraph. Responsible for the left-hand menu where the shapes and graphical objects lie. In order to create a shape, you need to click it \ or drag it from that sidebar.
- **ToolbarBP**.js – extends Toolbar.js of MxGraph. Responsible for the lowest upper toolbar, with the icons. In this toolbar there are default MxGraph actions like undo and zoom in\out, and added actions like execute \ debug.

The RunGraph part of the project is responsible for Executing and Debugging BP Flow programs, which are created according to the syntax of the graphical objects created in the working sheet by the user.

<u>Rungraph Files:</u>

- **Graph_parse.**js – responsible for converting the XML that describes the diagram into a MxGraph Model. When the user clicks the 'Execute' button, the action written in ActionsBP.js which is connected to that button, sends the xml to this file. Then the XML is being transformed into a MxGraph Model, and sent to rungraph.js for execution.

- **Rungraph**.js – Responsible for executing and debugging BP Flow programs. The file holds an interpreter inside, which traverses over the entire graph given by graph_parse (MxGraph Model) and executes actions according to the BP semantics. Each scenario is handled separately. Events selected and String given from Console nodes are written into the console Window (defined in DialogsBP.js)
- **BPEngine**.js – responsible for registering B threads, selecting events in every bsync point, and continuing bthreads execution according to the BP program flow
- **debuggerBP**.js – responsible for the BP flow debugger definition and functionality. When clicking on the debug button, this file runs the specified BP flow programs and records every step. On every step the debugger saves the state of each scenario's nodes which are relevant to the time of the step, and additionaly writes to the console the events selected in the specific step the debugger is currently on.