**Arithmetic Expression Evaluator**

**Version <1.0>**

*[Note: The following template is provided for use with the Unified Process for EDUcation. Text enclosed in square brackets and displayed in blue italics (style=InfoBlue) is included to provide guidance to the author and should be deleted before publishing the document. A paragraph entered following this style will automatically be set to normal (style=Body Text).]*

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**Revision History**

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1. **Introduction**
   1. **Purpose**

*Covers the most important components (or modules or classes). Software architecture plays a crucial role in software development by providing a high-level structural framework for a system, allowing for efficient organization, scalability, and maintainability. It facilitates the abstraction and separation of concerns, fosters reusability, and ensures flexibility when choosing components and technologies. A well-designed architecture optimizes performance, addresses quality attributes, and aids in risk management.*

* 1. **Scope**

*What’s affected by this document: Our teams choices on the oncoming software coices pertaining its architecture*

* 1. **Definitions, Acronyms, and Abbreviations**

*SDLC - Software Development Life Cycle*

*API - Application Programming Interface*

*SDK - Software Development Kit*

*GUI - Graphical User Interface*

*TDD - Test Driven Development*

*DB - Database*

*Derivable - Tangible or intangible item that is delivered to a client or stakeholder as part of a project.*

*Sprint - A "sprint" is a set period during which specific work has to be completed and made ready for review. It's essentially a short, focused phase of development.*

*Bug: An error, flaw, or unintended result in software.*

*Deployment: The process of releasing a new feature, app, or update to the available infrastructure.*

*Push/Pull: Sending or receiving changes to/from a remote repository in a version control system.*

*Commit: A set of changes or edits saved to a version control system.*

*Branch: A separate line of development created in a version control system, which can later be merged back with the main line.*

*Framework: A platform for developing software applications. It provides a foundation on which software developers can build programs for a specific platform.*

* 1. **References**

00-Project-Description.pdf

01-Project-Plan-marked.pdf

01-Project-Plan.dot

02-Software-Requirements-Spec.docx

03-Software-Architecture

* 1. **Overview**

*The remaining portion of the Software Architecture document contains the bulk of the architectural choices made for the group:*

*- Architectural Representation*

*- Architectural Goals and Constraints*

*- Use-Case View*

*- Use-Case Realizations*

*- Logical View*

*- Overview*

*- Architecturally Significant Design Modules or Packages*

*- Interface Description*

*- Size and Performance*

*- Quality*

1. **Architectural Representation**

*We are going to use an object-oriented programming software architecture where we are representing input from the user.*

1. **Architectural Goals and Constraints**

*Constraint - Object Orientated, In C, We all work so the schedule is tight*

*Goal - Functional Code with the object for all unique expressions and callable functions*

1. **Use-Case View**

*[This section lists use cases or scenarios from the use-case model if they represent some significant, central functionality of the final system, or if they have a large architectural coverage—they exercise many architectural elements or if they stress or illustrate a specific, delicate point of the architecture.]*

* 1. **Use-Case Realizations**

*[This section illustrates how the software actually works by giving a few selected use-case (or scenario) realizations and explains how the various design model elements contribute to their functionality. If a Use-Case Realization Document is available, refer to it in this section.]*

1. **Logical View**

*User Handler Class:*

*Handles user input and turns it into something usable*

*Input Verifying Class:*

*Verifying user input, making sure no errors*

*Parenthesis Handler Class:*

*The class that handles the inputs parenthesis, partitioning the individual math expressions in the correct order to the next class*

*Arithmetic Evaluator Class:*

*Takes in arithmetic expressions and does necessary math to find solution*

* 1. **Overview**

*Pemdas = Classes*

*Main - takes user input and checks if valid (no letters)*

*Using a stack filter through the equation turning each operation into a number removing one operation at a time till there is just one number left*

*Recursive function to check for pemdas in order, when no operators left return value*

*P(parentheses) - if any parentheses left return equation inside of parentheses by putting it through the recursive function*

*E(exponents) - if any exponents do math then return the value*

*M(multiplication) - if any multiplication do math then return the value*

*D(division) - if any exponents do math then return the value*

*A(addition) - if any exponents do math then return the value*

*S(subtraction) - if any exponents do math then return the value*

* 1. **Architecturally Significant Design Modules or Packages**

*Module: Calculator*

*Description: Main Object that houses sub objects for different functionality within the calculator*

*Sub-Module: Operators*

*Description: class that represents the operator and tells the evaluator how to use it to evaluate the expression*

*Sub-Module: Numbers*

*Description: class that represents numerical input.*

*Sub-Module: Stack*

*Description: holds operator and number classes put on by the user input class*

*Sub-Module: User Input*

*Description: takes input from a file and turns it into list of operators and numbers and sends them off to be verified*

*Sub-Module: Verifier*

*Description: verifies the list of operators and numbers to be correct and if correct puts the list on the stack.*

*Sub-Module: Evaluator*

*Description: takes off portions of the stack and evaluates them*

*Sub-Module: Output*

*Description: takes values from the evaluator and completes the operations and outputs the values*

1. **Interface Description**

*The user will input the arithmetic expression into input, and after clicking the button to start the process the solution will be displayed below in a separate box.*

1. **/Size and Performance**

*[A description of the major dimensioning characteristics of the software that impact the architecture, as well as the target performance constraints.]*

1. **Quality**

***Extensibility:***

*The architecture's modularity and clear interfaces enable seamless integration of new features, adapting to evolving requirements.*

***Reliability:***

*Robust fault-tolerance mechanisms and effective error handling ensure system resilience, crucial for mission-critical applications.*

***Portability:***

*Abstraction of hardware dependencies and use of platform-independent elements make the system adaptable to diverse environments.*

***Performance:***

*Efficient design choices and scalability planning optimize response times, throughput, and resource utilization.*

***Scalability:***

*The architecture supports scalable solutions, incorporating features like load balancing and distributed computing.*

***Security:***

*Access controls, encryption, and secure communication protocols safeguard against unauthorized access and protect sensitive data.*

***Maintainability:***

*Modularity, coding standards, and comprehensive documentation enhance system maintainability, reducing the total cost of ownership.*

***Safety:***

*Safety-critical systems include error-checking, fail-safes, and redundancy features to prevent and mitigate potential hazards.*

***Privacy:***

*Privacy measures like data encryption and strict access controls are integrated into the architecture to protect sensitive information and comply with regulations.*