Siftables Emulator
Singularity Software

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1 Domain Model

No updates were made to the domain model because it was initially based on the Sifteo API which has not (and will not) undergo changes over the course of the project.

2 Operation Contracts

No changes were made to the operations contracts because no modifications were made to the way in which the operations will be implemented nor the expectations we have for their effects on the system.

OC1: SelectFileAndClickOpen

Operation	SelectFileAndClickOpen(filePath : String)
Cross-references	UC1: Load program, UC2: Reload program
Preconditions	The OpenFileDialog is open.
Post-conditions	The file name was parsed.
	The emulator opened the file.

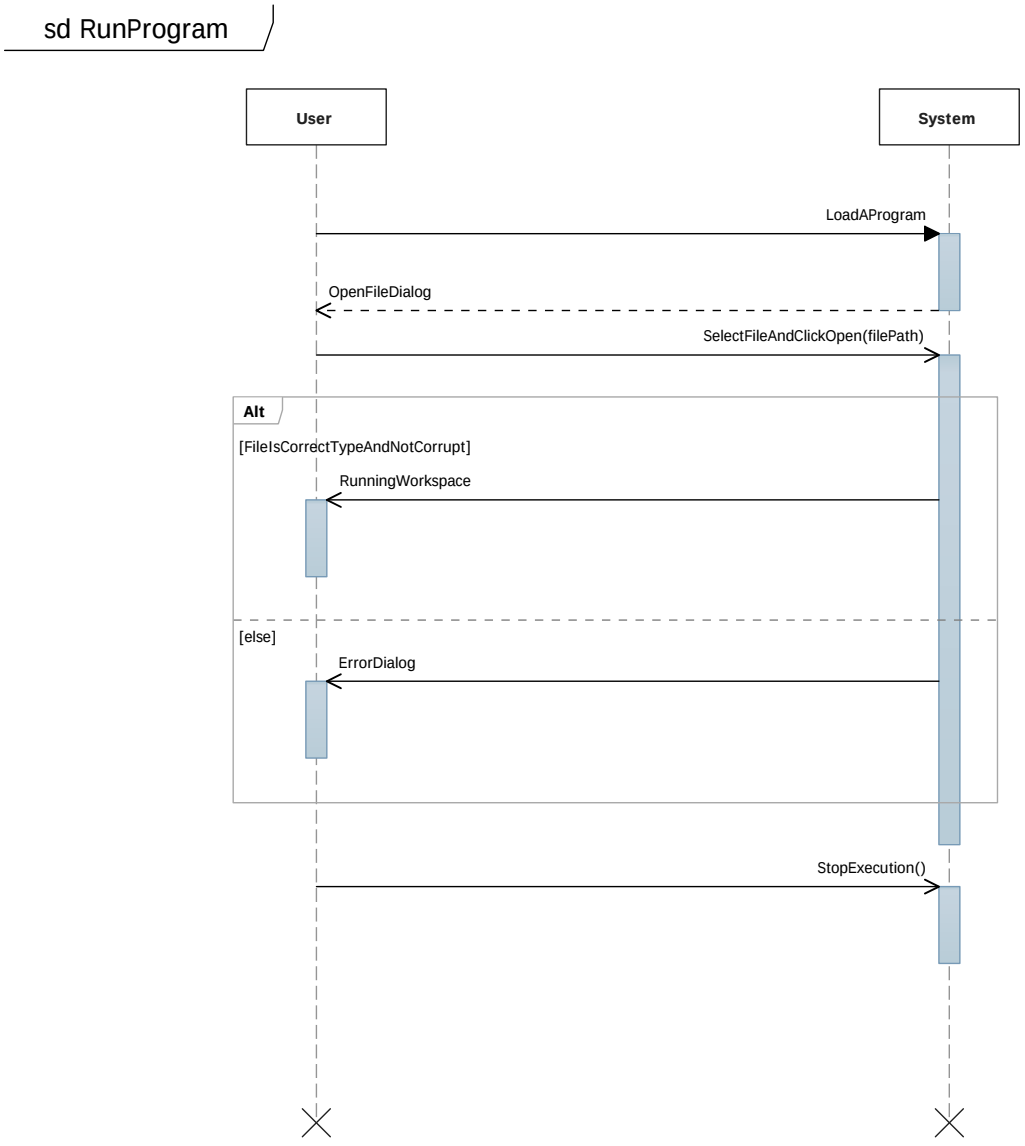
OC2: ZoomSliderChanged

Operation	ZoomSliderChanged(zoomLevel : int)
Cross-references	UC3: Zoom screen
Preconditions	There is an application running in the workspace.
Post-conditions	The workspace canvas has been magnified appropriately.
	The workspace zoomLevel attribute was updated.

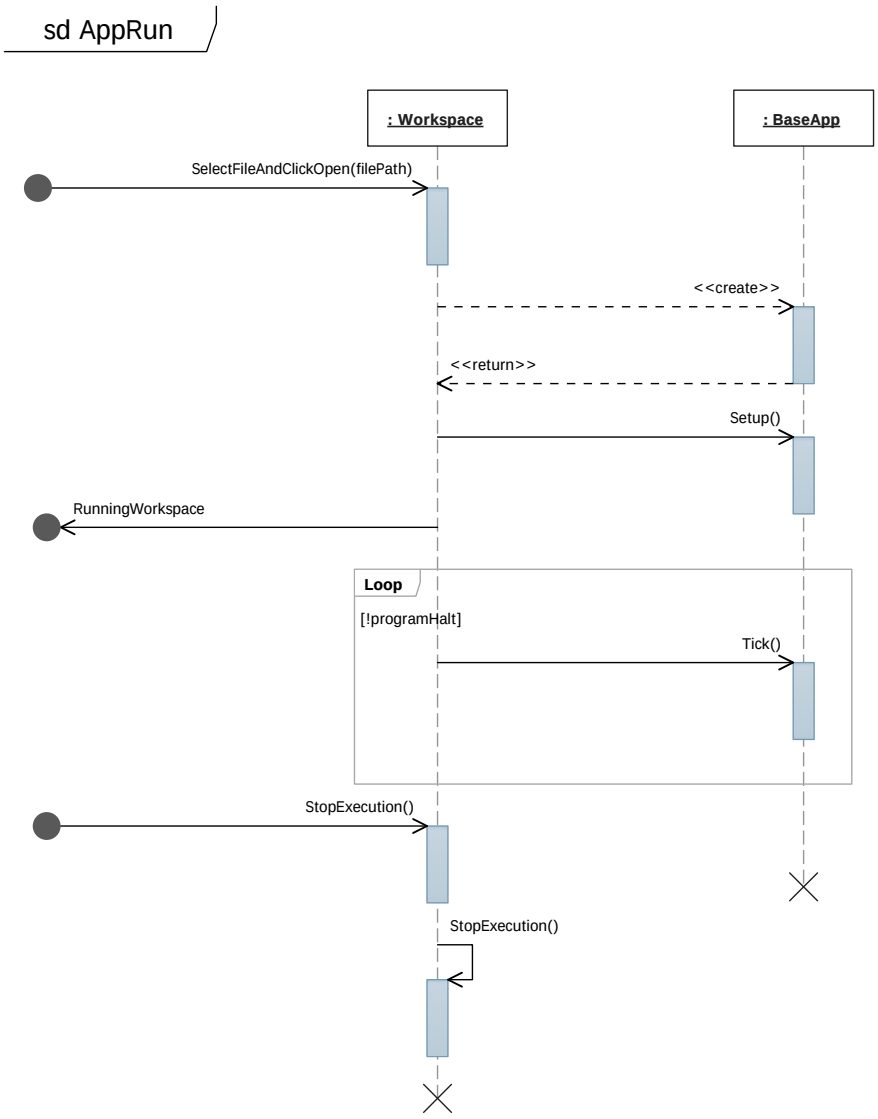
Additional operation contracts for the remaining use cases were not pursued because of their trivial nature. The basic format of this operation contract — user changes UI element, UI adjusts accordingly, and program updates relevant attributes — applies to the other use cases, which has not changed.

3 System Sequence Diagram

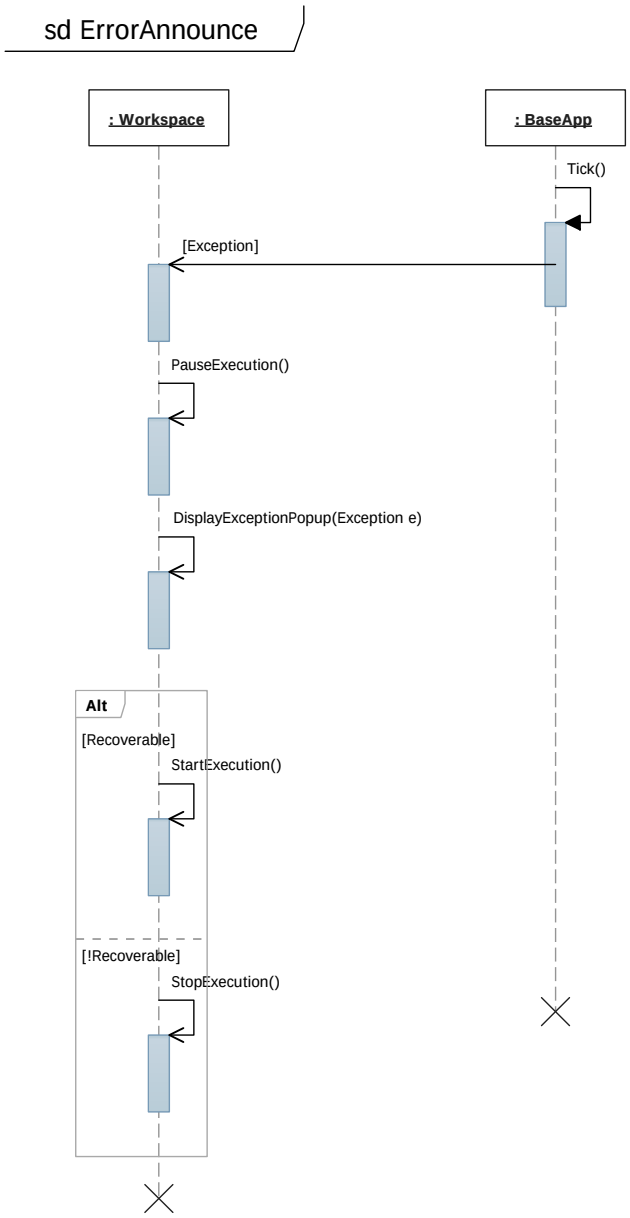
The initial RunProgram system sequence diagram had a duplicate step which was annihilated by replacing the *FileOpened* result with the *RunningWorkspace* result because the two were essentially duplicates.



4 Sequence Diagrams



The *Setup()* operation is necessary in addition to a constructor because this is the way in which initialization of an application is handled per Sifteo's API. No changes were made to this sequence diagram because it is consistent with the way in which the system behaves during this operation.

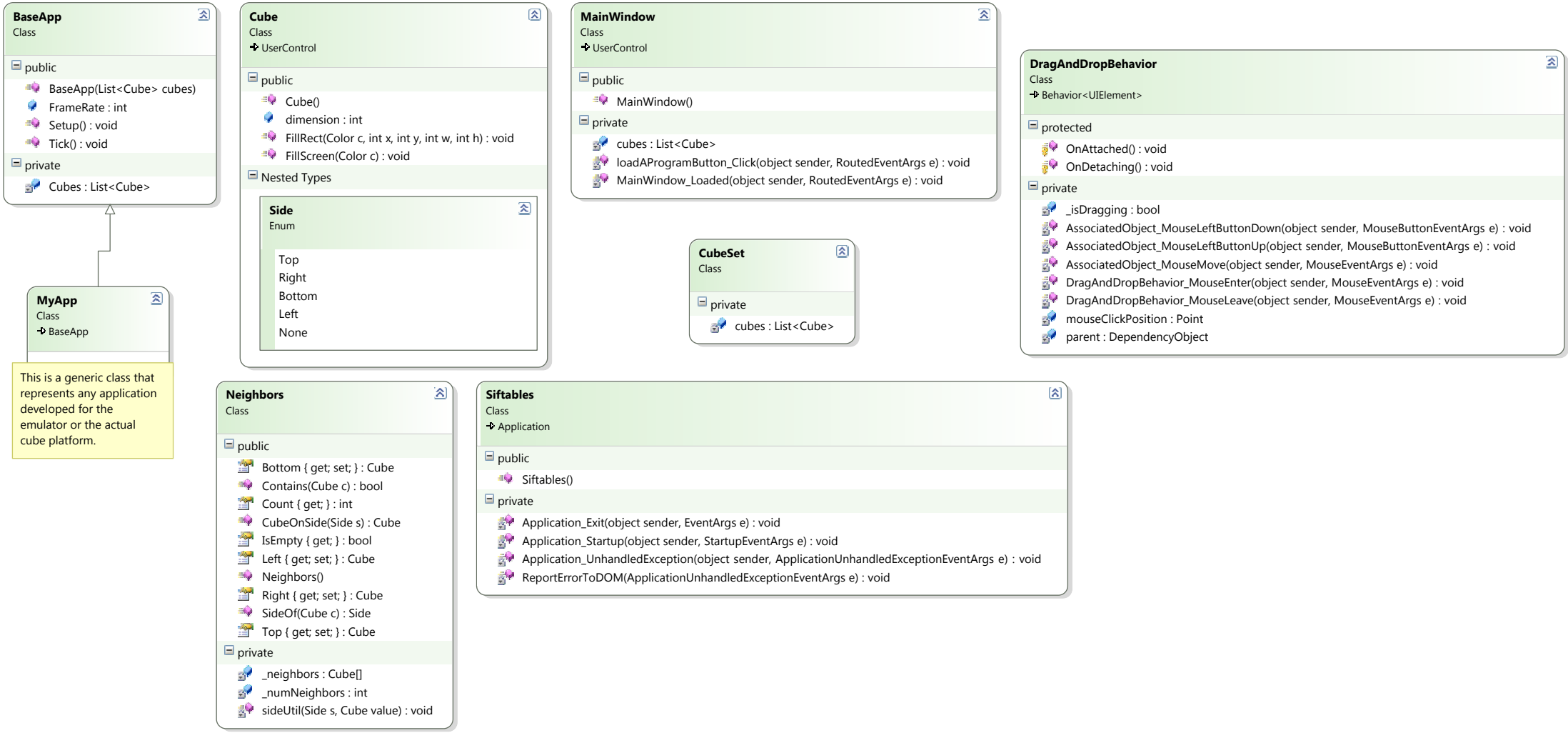


The *Tick()* operation was unintentionally omitted from the original diagram, and it has been added for clarity to indicate that the action is taking place during an actively running application.

5 Design Class Diagram

Any external relationships our shown beneath the class name to emphasize interaction with classes we did not create. For instance, each *Cube* is implemented as a *UserControl* object.

Additionally, every entity in our diagram is being implemented in our own original code, though many classes are inspired by the Sifteo API which we have to mirror. Those entities which do mirror the objects in the Sifteo domain will be separated into a distinct package to clarify the divide between those objects which carry out the emulation and those which the user primarily manipulates in their original applications.


BaseApp
Class
public
BaseApp(List<Cube> cubes)
FrameRate : int
Setup() : void
Tick() : void
private
Cubes : List<Cube>
MyApp
Class
BaseApp
This is a generic class that represents any application developed for the emulator or the actual cube platform.
Cube
Class
UserControl
public
Cube()
dimension : int
FillRect(Color c, int x, int y, int w, int h) : void
FillScreen(Color c) : void
Nested Types
Side
Enum
Top
Right
Bottom
Left
None
MainWindow
Class
UserControl
public
MainWindow()
private
cubes : List<Cube>
loadAProgramButton_Click(object sender, RoutedEventArgs e) : void
MainWindow_Loaded(object sender, RoutedEventArgs e) : void
CubeSet
Class
private
cubes : List<Cube>
DragAndDropBehavior
Class
Behavior<UIElement>
protected
OnAttached() : void
OnDetaching() : void
private
_isDragging : bool
AssociatedObject_MouseLeftButtonDown(object sender, MouseButtonEventArgs e) : void
AssociatedObject_MouseLeftButtonUp(object sender, MouseButtonEventArgs e) : void
AssociatedObject_MouseMove(object sender, MouseEventArgs e) : void
DragAndDropBehavior_MouseEnter(object sender, MouseEventArgs e) : void
DragAndDropBehavior_MouseLeave(object sender, MouseEventArgs e) : void
mouseClickPosition : Point
parent : DependencyObject
Neighbors
Class
public
Bottom { get; set; } : Cube
Contains(Cube c) : bool
Count { get; } : int
CubeOnSide(Side s) : Cube
IsEmpty { get; } : bool
Left { get; set; } : Cube
Neighbors()
Right { get; set; } : Cube
SideOf(Cube c) : Side
Top { get; set; } : Cube
private
_neighbors : Cube[]
_numNeighbors : int
sideUtil(Side s, Cube value) : void
Siftables
Class
Application
public
Siftables()
private
Application_Exit(object sender, EventArgs e) : void
Application_Startup(object sender, StartupEventArgs e) : void
Application_UnhandledException(object sender, ApplicationUnhandledExceptionEventArgs e) : void
ReportErrorToDOM(ApplicationUnhandledExceptionEventArgs e) : void

Note: Because the class diagram was generated by Visual Studio, no associations were created (for instance, between the entity *Cube* which is associated with a unique *Neighbors* entity). We feel no clarity was lost by ommitting these associations.

6 Applications of the GRASP Principles

6.1 Creator

MainWindow creates each of the cubes because it has the information (location in the space) necessary to construct them. Also, the *Siftables* entity is responsible for creating *MainWindow* because it acts as the starting point for the emulator.

6.2 Information Expert

Because each *Cube* object is the sole owner of the information (in this case, a collection of graphical objects) which are contained on its screen, it is responsible for conveying this in the workspace onto the graphical representation of its screen.

6.3 Controller

There is no concrete example of a controller in our design, but *BaseApp* acts like a use case controller because it is in charge of handling interactions between domain-level objects and the user interface (on the *Cube* screens). Though we are not sure which entity will have this responsibility, there will also be a controller (or dispatcher) to begin the emulation of an application and handle the calls to *Tick()* which will subsequently cause changes to the interface.

6.4 Low Coupling

BaseApp only connects to the UI layer simply through the *Cube* entities because it is responsible for controlling events related to the cubes and must be responsible for carrying out the steps specified in each application. This reduces coupling between the two logical layers and allows the domain layer to be implemented more independently from the interface layer.

6.5 Pure Fabrication

The *Neighbors* entity does not exist in the physical domain, but it is useful in the implementation to separate the responsibility of keeping track of a cube's neighbors and their interactions from the graphical representation of the cube. The *CubeSet* class represents the set of cubes which exist in the current workspace, which is maintained as a separate entity to allow events to be defined on the entire set of cubes. For instance, an event can be triggered when a cube is added or removed from the set, which could not easily be handled if a set of cubes was implemented simply as a data structure.

6.6 High Cohesion

The *Cube*, *Neighbors*, and *CubeSet* class all emphasize high cohesion by abstracting out specific, distinct responsibilities to separate entities. The *Cube* acts primarily as a graphical interface to the cube objects, while *Neighbors* has the responsibility of maintaining neihborhood relationships between *Cube* objects. The *CubeSet* responsibilities are mentioned above.

Note: Because our system does not interact with third-party interfaces, there are not clear examples of the **Indirection** or **Protected Variations** patterns.