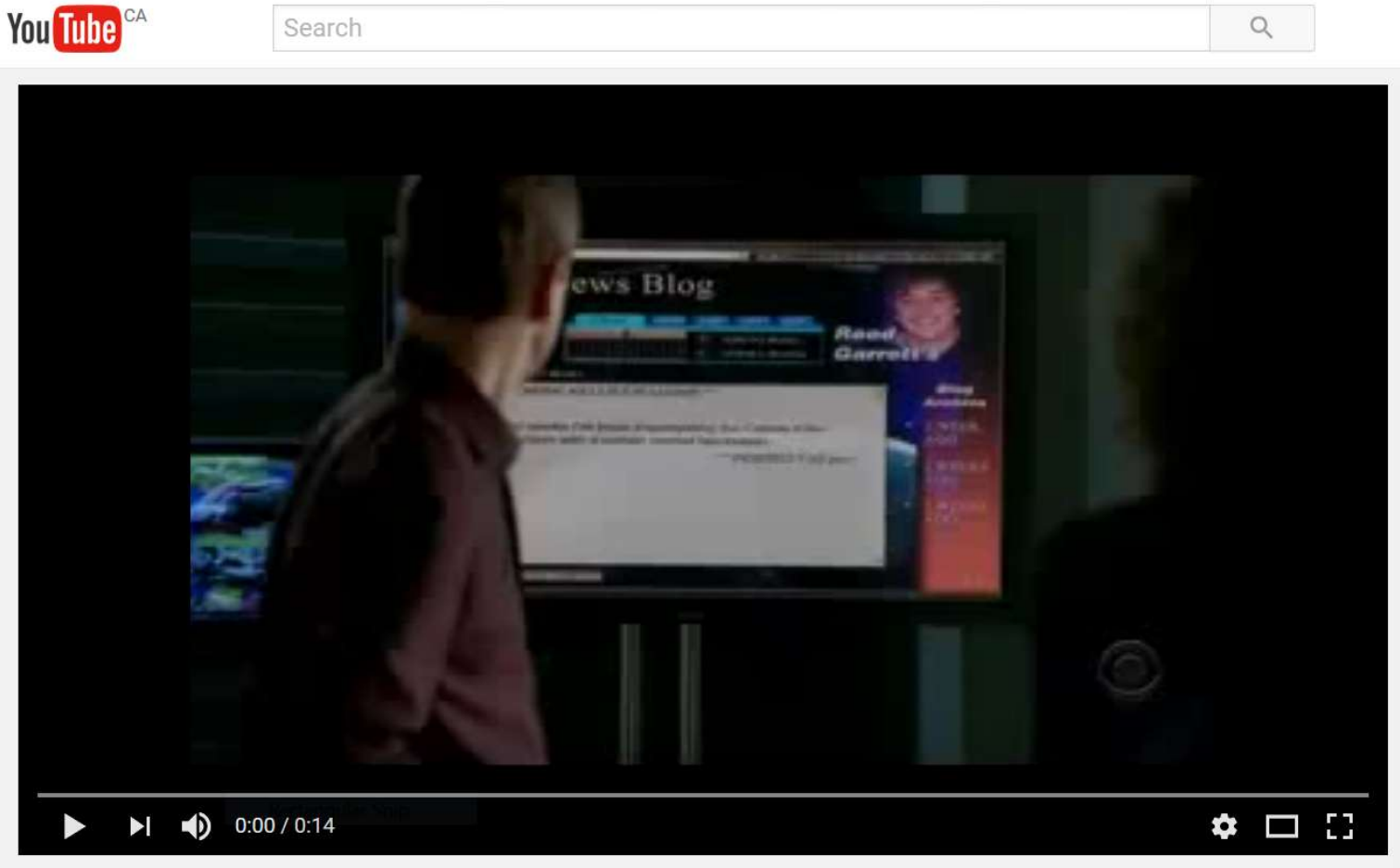
LAYOUT ALGORITHMS

CMPT 381

But first…



Overview

Variable intrinsic size examples

Row layout algorithm

Variable Intrinsic Size

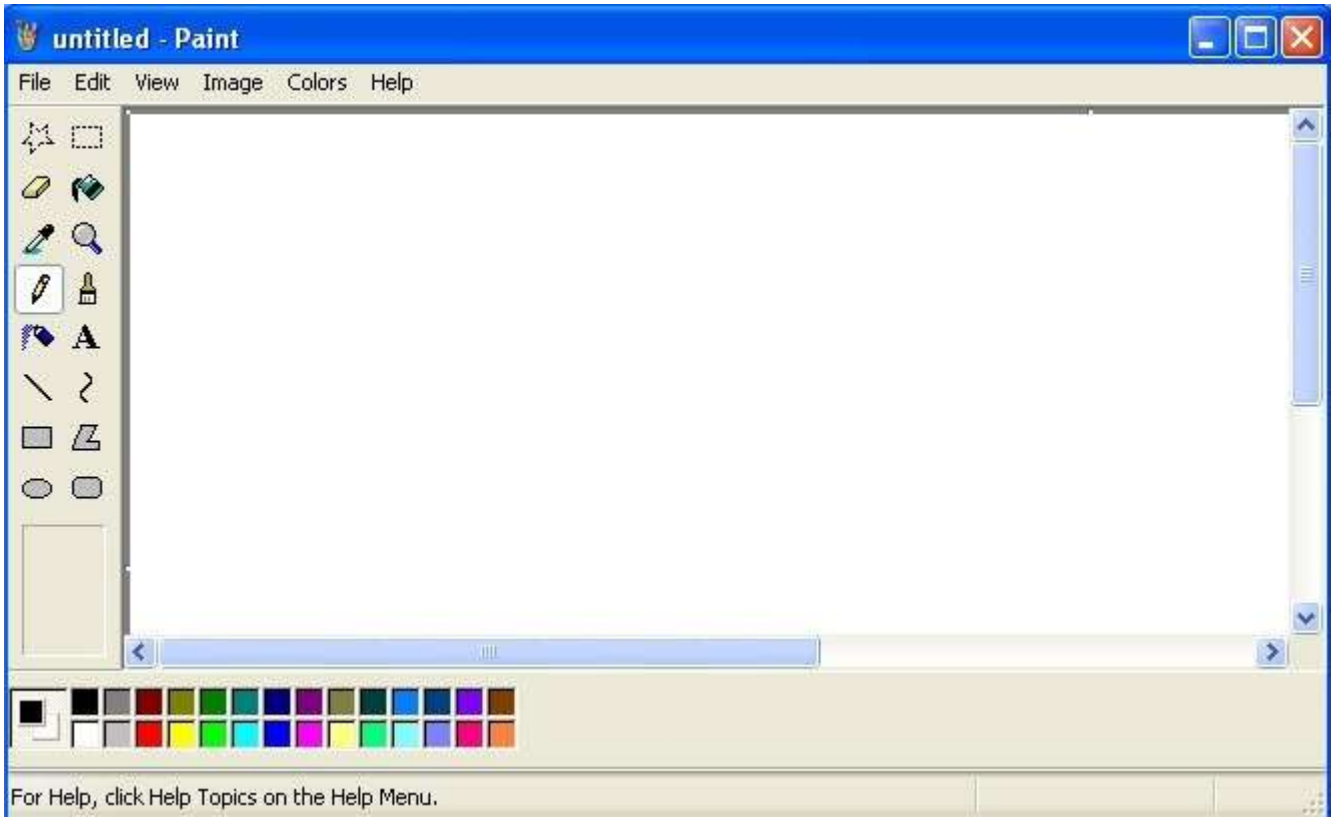
- Size of widget determined by sizes of items within
  - e.g. Menus, most Java widgets

- Intrinsic size does not handle resizing
- Variable Intrinsic Size
  - Each widget reports its size needs (recursively if necessary)
  - Each widget also reports how much it can be reasonably squeezed or expanded

Variable Intrinsic Size: JavaFX Control

- Min size
  - Widget will not shrink below this size
  - setMinSize(), setMinWidth(), setMinHeight()
- Preferred size
  - Used for initial layout
  - setPrefSize(), setPrefWidth(), setPrefHeight()
- Max size
  - Widget will not grow larger than this size
  - setMaxSize(), setMaxWidth(), setMaxHeight()
  - Value of Double.MAX_VALUE means unbounded

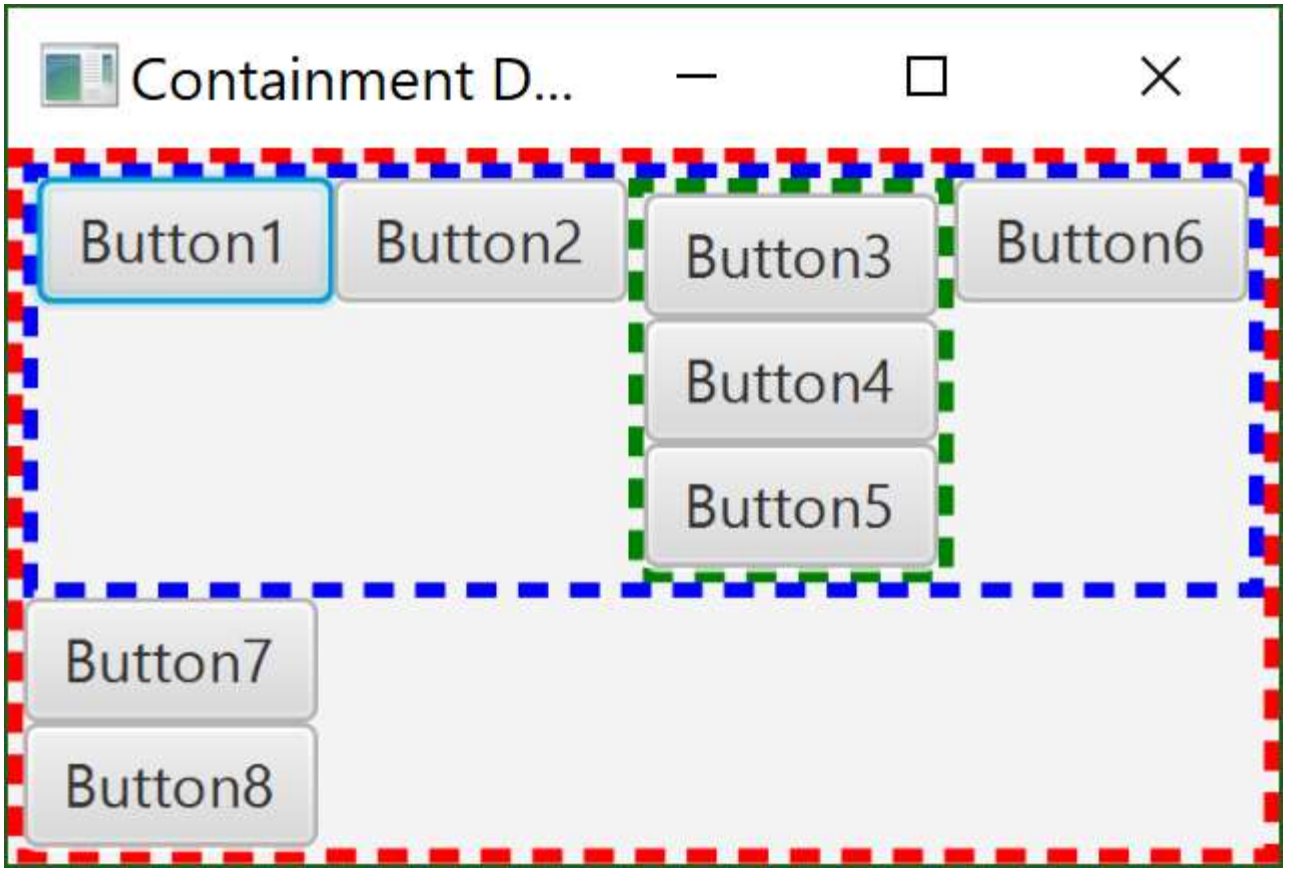
Infer the layout / VIS

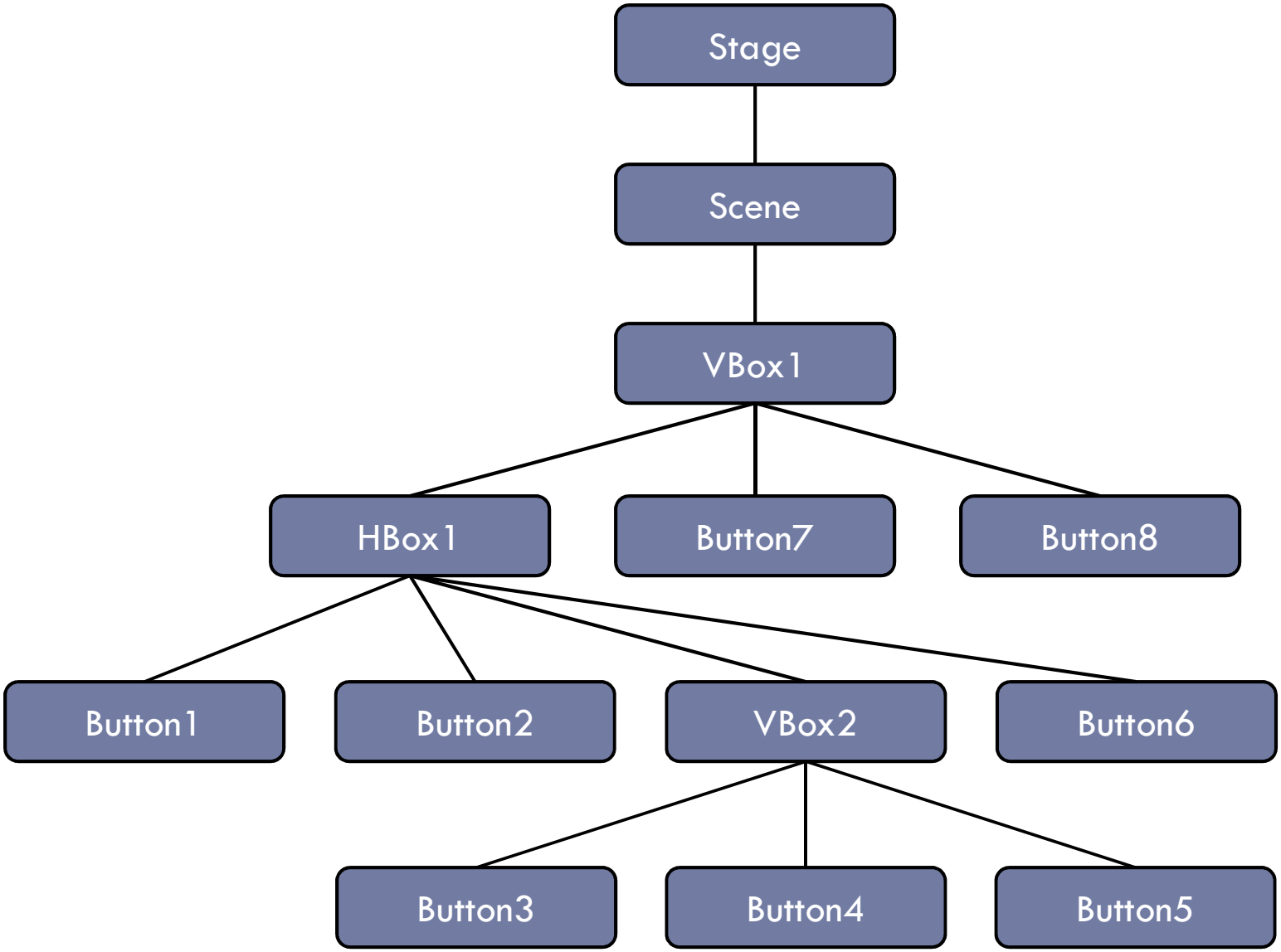


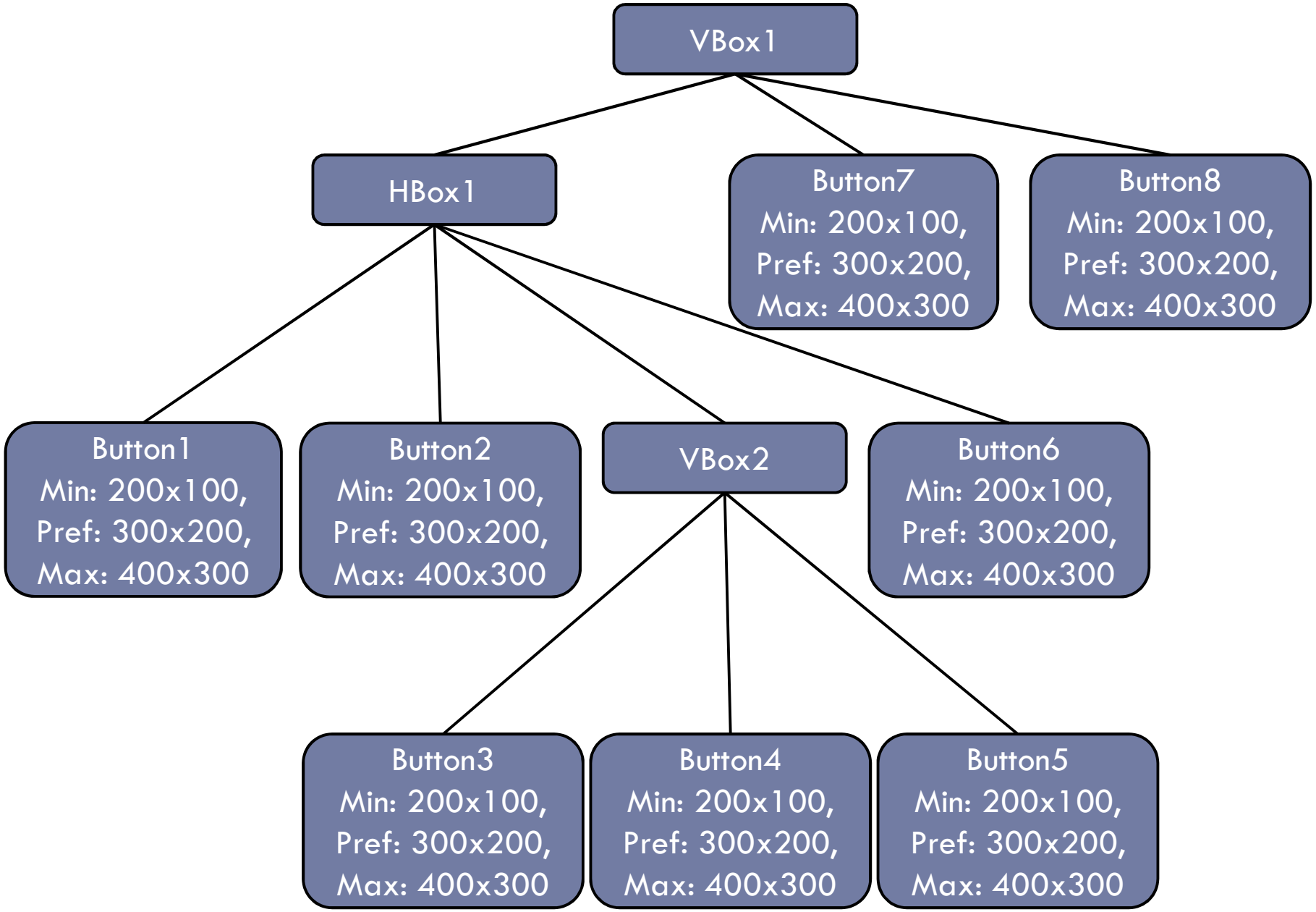
Basic layout algorithm

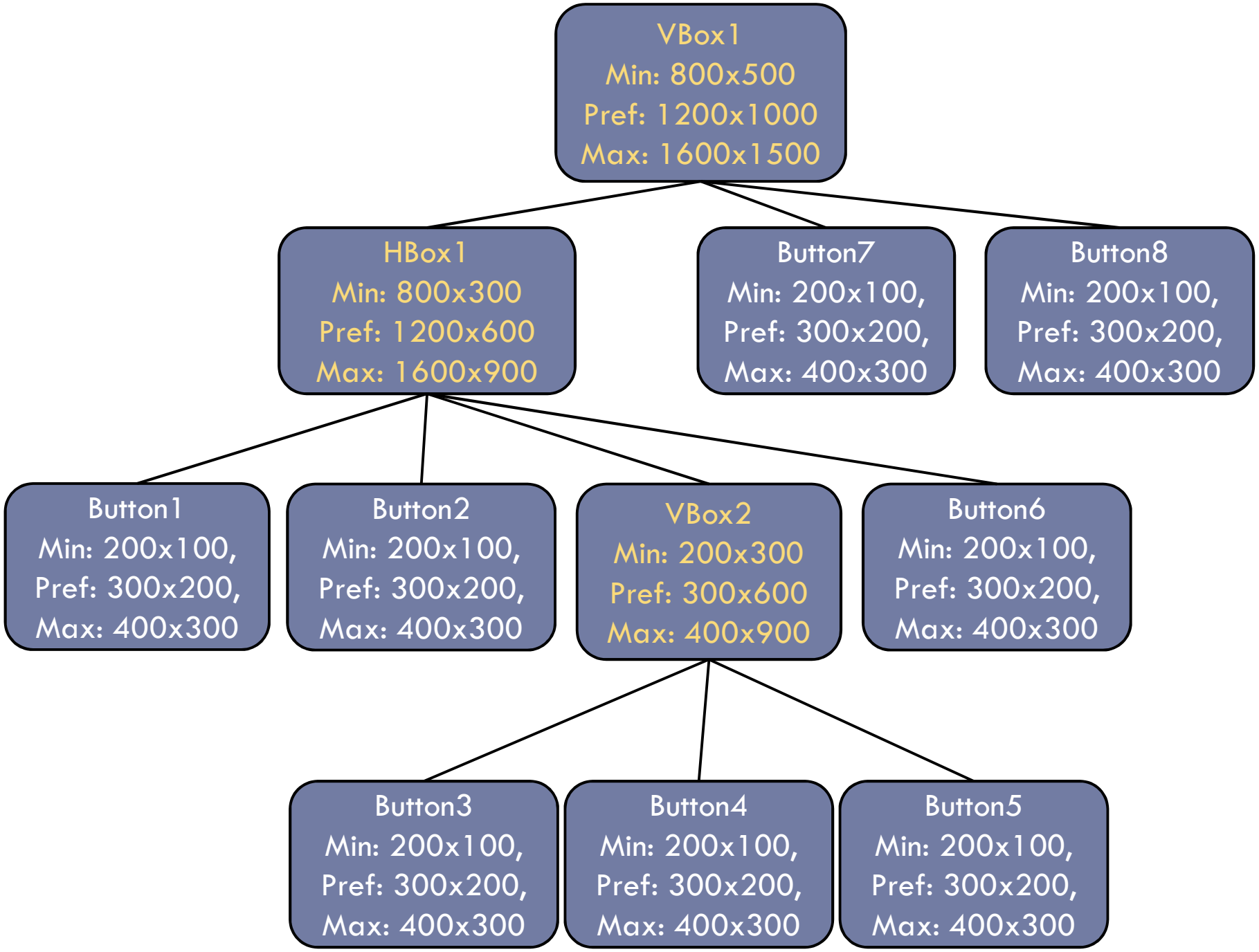
```
public void doLayout(Rectangle myBounds)
        foreach child C:
                get max / min / pref size of C
        update my max / min / pref size
        foreach child C:
                allocate bounds for C, based on layout
                approach, desired sizes, and myBounds
        foreach child C:
                C.doLayout(new bounds for C)
```

Calculate the VISs




Stage
Scene
VBox1
HBox1
Button7
Button8
Button1
Button2
VBox2
Button6
Button3
Button4
Button5

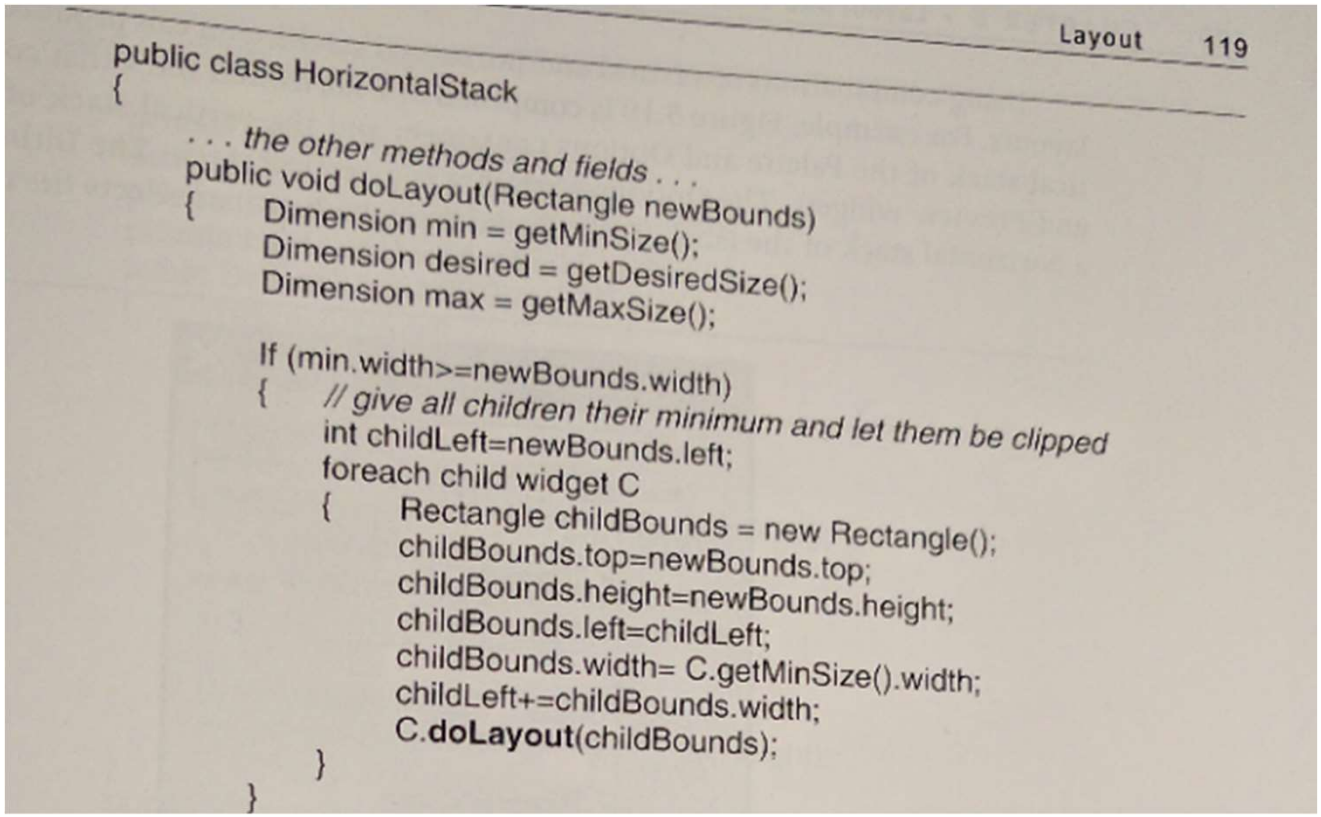

VBox1
HBox1
Button7
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button8
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button1
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button2
Min: 200x100,
Pref: 300x200,
Max: 400x300
VBox2
Button6
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button3
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button4
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button5
Min: 200x100,
Pref: 300x200,
Max: 400x300


VBox1
Min: 800x500
Pref: 1200x1000
Max: 1600x1500
HBox1
Min: 800x300
Pref: 1200x600
Max: 1600x900
Button7
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button8
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button1
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button2
Min: 200x100,
Pref: 300x200,
Max: 400x300
VBox2
Min: 200x300
Pref: 300x600
Max: 400x900
Button6
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button3
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button4
Min: 200x100,
Pref: 300x200,
Max: 400x300
Button5
Min: 200x100,
Pref: 300x200,
Max: 400x300

Calculate size – row layout

```
public class HorizontalStack
{
    public Dimension getMinSize()
    {   int minWidth=0;
        int minHeight=0;
        foreach child widget C
        {   Dimension childSize = C.getMinSize();
            minWidth += childSize.width;
            if (minHeight<childSize.height)
            {       minHeight=childSize.height; }
        }
        return new Dimension(minWidth,minHeight);
    }
    public Dimension getDesiredSize()
    {   similar to getMinSize using C.getDesiredSize() }
    public Dimension getMaxSize()
    {   similar to getMinSize using C.getMaxSize() }
}
```

Do layout – row layout




```
public class HorizontalStack
{
    . . . the other methods and fields . . .
    public void doLayout(Rectangle newBounds)
    {   Dimension min = getMinSize();
        Dimension desired = getDesiredSize();
        Dimension max = getMaxSize();

        If (min.width>=newBounds.width)
        {   // give all children their minimum and let them be clipped
            int childLeft=newBounds.left;
            foreach child widget C
            {   Rectangle childBounds = new Rectangle();
                childBounds.top=newBounds.top;
                childBounds.height=newBounds.height;
                childBounds.left=childLeft;
                childBounds.width= C.getMinSize().width;
                childLeft+=childBounds.width;
                C.doLayout(childBounds);
            }
        }
```

Do layout – row layout

```
        else if (desired.width>=newBounds.width)
        {   // give min to all and proportional on what is available for desired
            int desiredMargin = desired.width-min.width;
            float fraction= (float)(newBounds.width-min.width)/desiredMargin;
            int childLeft=newBounds.left;
            foreach child widget C
            {   Rectangle childBounds=new Rectangle();
                childBounds.top=newBounds.top;
                childBounds.height=newBounds.height;
                childBounds.left=childLeft;
                int minWidth=C.getMinSize().width;
                int desWidth=C.getDesiredSize().width;
                childBounds.width=minWidth+(desWidth-minWidth)*fraction;
                childLeft+=childBounds.width;
                C.doLayout(childBounds);
            }
        }
        else
        {   // allocate what remains based on maximum widths
            int maxMargin = max.width-desired.width;
            float fraction= (float)(newBounds.width-desired.width)/maxMargin;
            int childLeft=newBounds.left;
            foreach child widget C
            {       . . . Similar code to previous case . . .
            }
        }
    }
}
```