Qt Quick Composing UIs

Training Course

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Produced by Digia Plc.

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Module: Composing User Interfaces

- Nested Elements
- Graphical Elements
- Text Elements
- Anchor Layout

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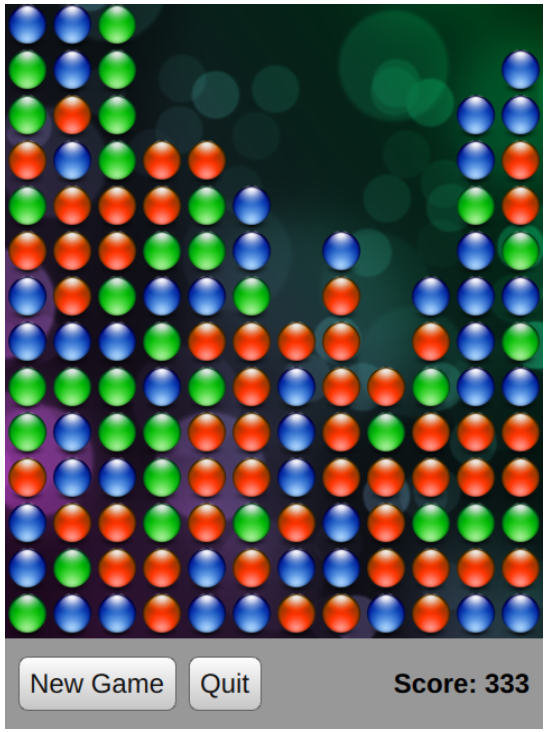
Objectives

- Elements are often nested
  - one element contains others
  - manage collections of elements
- Colors, gradients and images
  - create appealing UIs
- Text
  - displaying text
  - handling text input
- Anchors and alignment
  - allow elements to be placed in an intuitive way
  - maintain spatial relationships between elements

Why use nested items, anchors and components?

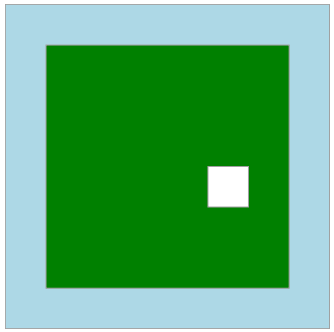
- Concerns separation
- Visual grouping
- Pixel perfect items placing and layout
- Encapsulation
- Reusability
- Look and feel changes

Demo $QTDIR/examples/qtdeclarative/demos/samegame/samegame-desktop.qml



- Nested Elements
- Graphical Elements
- Text Elements
- Anchor Layout

```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400
    color: "lightblue"

    Rectangle {
        x: 50; y: 50; width: 300; height: 300
        color: "green"

        Rectangle {
            x: 200; y: 150; width: 50; height: 50
            color: "white"
        }
    }
}
```



- Each element positioned relative to its parents

Demo qml-composing-uis/ex-elements/nested2.qml

- Nested Elements
- Graphical Elements
- Text Elements
- Anchor Layout

Specifying colors

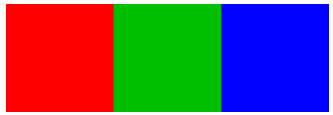
- Named colors (using SVG names): `"red"`, `"green"`, `"blue"`, ...
- HTML style color components: `"#ff0000"`, `"#008000"`, `"#0000ff"`, ...
- Built-in function: `Qt.rgba(0,0.5,0,1)`

Changing items opacity:

- using the `opacity` property
- values from `0.0` (transparent) to `1.0` (opaque)

See QML Basic Type: color Documentation

```
import QtQuick 2.0

Item {
  width: 300; height: 100

  Rectangle {
    x: 0; y: 0; width: 100; height: 100; color: "#ff0000"
  }
  Rectangle {
    x: 100; y: 0; width: 100; height: 100
    color: Qt.rgba(0,0.75,0,1)
  }
  Rectangle {
    x: 200; y: 0; width: 100; height: 100; color: "blue"
  }
}
```

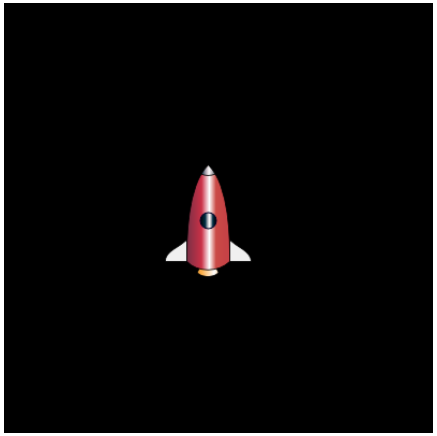


Demo qml-composing-uis/ex-elements/colors.qml

Images

- Represented by the `Image` element
- Refer to image files with the `source` property
  - using absolute URLs
  - or relative to the QML file
- Can be transformed
  - scaled, rotated
  - about an axis or central point

```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400
    color: "black"

    Image {
        x: 150; y: 150
        source: "../images/rocket.png"
    }
}
```

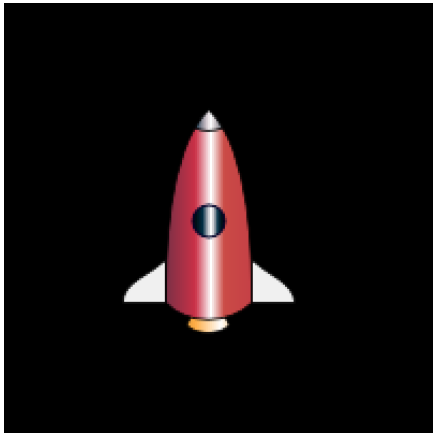


- `source` contains a relative path
- `width` and `height` are obtained from the image file

Demo qml-composing-uis/ex-elements/images.qml

Image Scaling

```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400
    color: "black"

    Image {
        x: 150; y: 150
        source: "../images/rocket.png"
        scale: 2.0
    }

}
```

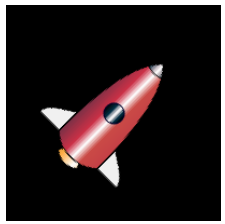


- Set the `scale` property
- By default, the center of the item remains in the same place

Demo qml-composing-uis/ex-elements/image-scaling.qml

Image Rotation

```
import QtQuick 2.0

Rectangle {
    width: 200; height: 200
    color: "black"

    Image {
        x: 50; y: 35
        source: "../images/rocket.png"
        rotation: 45.0
    }
}
```

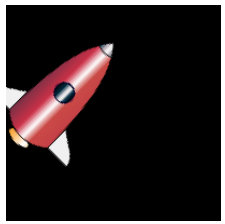


- Set the `rotate` property
- By default, the center of the item remains in the same place

Demo qml-composing-uis/ex-elements/image-rotation.qml

Image Rotation

```
import QtQuick 2.0

Rectangle {
    width: 200; height: 200
    color: "black"

    Image {
        x: 50; y: 35
        source: "../images/rocket.png"
        rotation: 45.0
        transformOrigin: Item.Top
    }
}
```



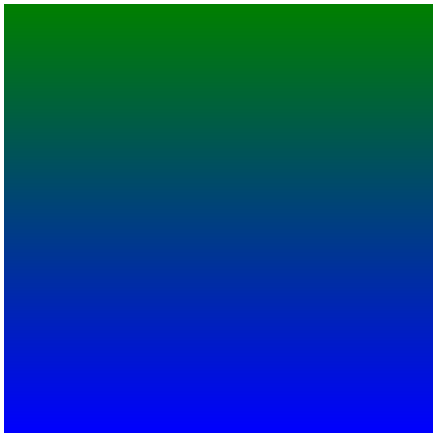
- Set the `transformOrigin` property
- Now the image rotates about the top of the item

Define a gradient using the `gradient` property:

- With a `Gradient` element as the value
- Containing `GradientStop` elements, each with
  - a `position`: a number between 0 (start point) and 1 (end point)
  - a `color`
- The start and end points
  - are on the top and bottom edges of the item
  - cannot be repositioned
- Gradients override `color` definitions
- Alternative to gradients: A simple background image.

See QML Gradient Element Reference Documentation

```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400

    gradient: Gradient {
        GradientStop {
            position: 0.0; color: "green"
        }
        GradientStop {
            position: 1.0; color: "blue"
        }
    }
}
```

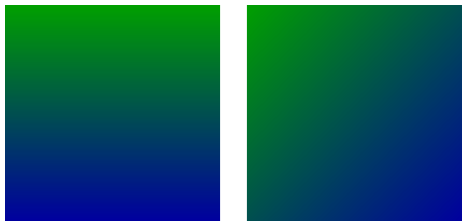


- Note the definition of an element as a property value

Demo qml-composing-uis/ex-elements/gradients.qml

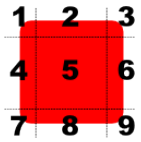
Gradient Images

```
import QtQuick 2.0

Rectangle {
    width: 425; height: 200

    Image {
        x: 0; y: 0
        source: "../images/vertical-gradient.png"
    }

    Image {
        x: 225; y: 0
        source: "../images/diagonal-gradient.png"
    }
}
```



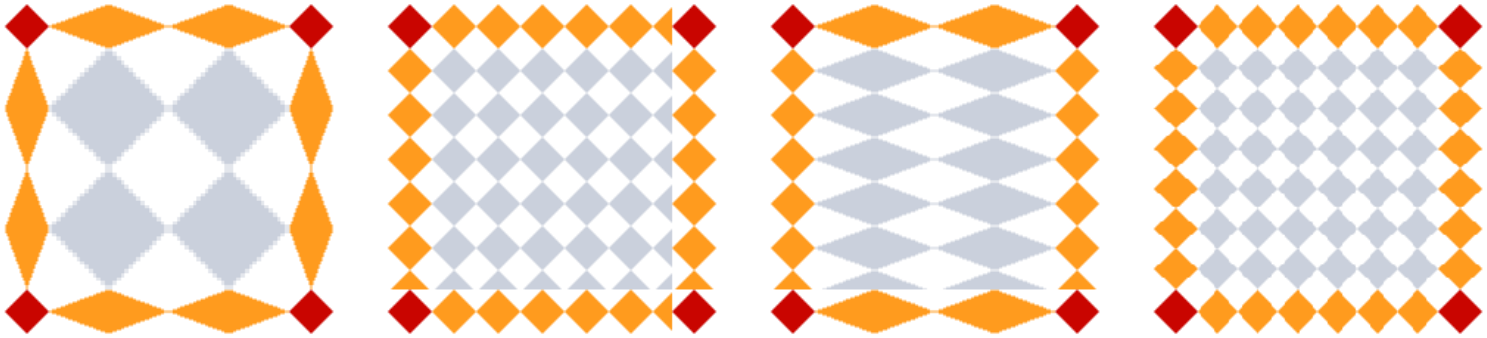
- It is often faster to use images instead of real gradients
- Artists can create the desired gradients

Demo qml-composing-uis/ex-elements/image-gradients.qml



- Create border using part of an image:
  - corners (region 1, 3, 7, 9) are not scaled
  - horizontal borders (2 and 8) are scaled according to `horizontalTileMode`
  - vertical borders (4 and 6) are scaled according to `verticalTileMode`
  - middle region (5) is scaled according to both mode
- There are 3 different scale modes
  - `Stretch`: scale the image to fit to the available area.
  - `Repeat`: tile the image until there is no more space.
  - `Round`: like `Repeat`, but scales the images down to ensure that the last image is not cropped

Border Images

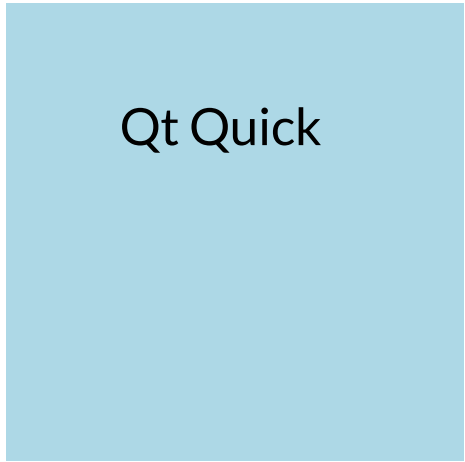


```
BorderImage {
    source: "content/colors.png"
    border { left: 30; top: 30; right: 30; bottom: 30; }
    horizontalMode: BorderImage.Stretch
    verticalMode: BorderImage.Repeat
    ...
}
```

Demo $QTDIR/examples/qtdeclarative/qtquick/imageelements/borderimage.qml

- Nested Elements
- Graphical Elements
- Text Elements
- Anchor Layout

```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400
    color: "lightblue"

    Text {
        x: 100; y: 100
        text: "Qt Quick"
        font.family: "Helvetica"
        font.pixelSize: 32
    }
}
```



- Width and height determined by the font metrics and text
- Can also use use HTML tags in the text:

```
"<html><b>Qt Quick</b></html>"
```

Demo qml-composing-uis/ex-elements/text.qml

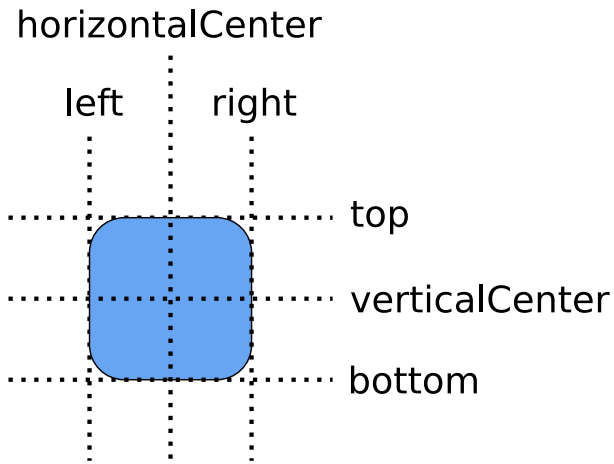
```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400
    color: "lightblue"

    TextInput {
        x: 50; y: 100; width: 300
        text: "Editable text"
        font.family: "Helvetica"; font.pixelSize: 32
    }
}
```

- No decoration (not a `QLineEdit` widget)
- Gets the focus when clicked
  - need something to click on
- `text` property changes as the user types

Demo qml-composing-uis/ex-elements/textinput.qml

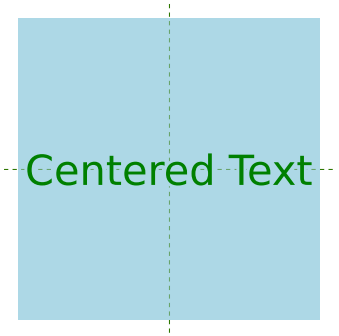
- Nested Elements
- Graphical Elements
- Text Elements
- Anchor Layout

- Used to position and align items
- Line up the edges or central lines of items
- Anchors refer to
  - other items (`centerIn`, `fill`)
  - anchors of other items (`left`, `top`)



See Anchor-based Layout Documentation

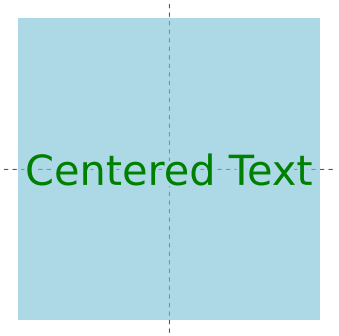
```
import QtQuick 2.0

Rectangle {
    width: 400; height: 400
    color: "lightblue"
    id: rectangle1

    Text {
        text: "Centered text"; color: "green"
        font.family: "Helvetica"; font.pixelSize: 32
        anchors.centerIn: rectangle1
    }
}
```



- `anchors.centerIn` centers the `Text` element in the `Rectangle`
  - refers to an item not an anchor

Demo qml-composing-uis/ex-anchor-layout/anchors.qml

```
import QtQuick 2.0

Rectangle {
    // The parent element
    width: 400; height: 400
    color: "lightblue"

    Text {
        text: "Centered text"; color: "green"
        font.family: "Helvetica"; font.pixelSize: 32
        anchors.centerIn: parent
    }
}
```

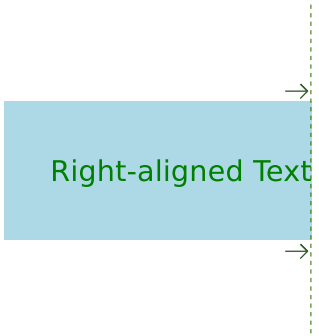


- Each element can refer to its parent element
  - using the `parent` ID
- Can refer to ancestors and named children of ancestors

Demo qml-composing-uis/ex-anchor-layout/anchors2.qml

Anchors

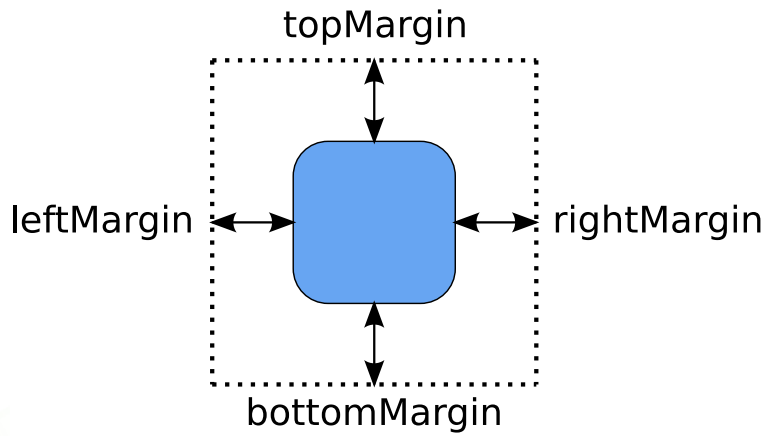
```
import QtQuick 2.0

Rectangle {
    width: 300; height: 100
    color: "lightblue"

    Text {
        y: 34
        text: "Right-aligned text"; color: "green"
        font.family: "Helvetica"; font.pixelSize: 32
        anchors.right: parent.right
    }
}
```



- Connecting anchors together
- Anchors of other items are referred to directly
  - use `parent.right`
  - not `parent.anchors.right`

Demo qml-composing-uis/ex-anchor-layout/anchor-to-anchor.qml

- Used with anchors to add space
- Specify distances
  - in pixels
  - between elements connected with anchors



```
import QtQuick 2.0

Rectangle {
  width: 400; height: 200
  color: "lightblue"

  Image { id: book; source: "../images/book.svg"
          anchors.left: parent.left
          anchors.leftMargin: parent.width/16
         anchors.verticalCenter: parent.verticalCenter }

  Text { text: "Writing"; font.pixelSize: 32
         anchors.left: book.right
         anchors.leftMargin: 32
         anchors.baseline: book.verticalCenter }
}
```

Demo qml-composing-uis/ex-anchor-layout/alignment.qml

Hints and Tips – Anchors

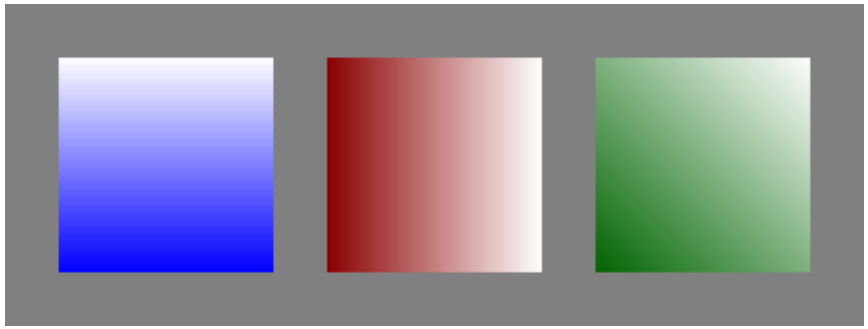
- Anchors can only be used with parent and sibling items
- Anchors work on constraints
  - some items need to have well-defined positions and sizes
  - items without default sizes should be anchored to fixed or well-defined items
- Anchors creates dependencies on geometries of other items
  - creates an order in which geometries are calculated
  - avoid creating circular dependencies
    - e.g., parent → child → parent
- Margins are only used if the corresponding anchors are used
  - e.g., `leftMargin` needs `left` to be defined

Identify item with different roles in the user interface:

- Fixed items
  - make sure these have `id` properties defined
  - unless these items can easily be referenced as parent items
- Items that dominate the user interface
  - make sure these have `id` properties defined
- Items that react to size changes of the dominant items
  - give these anchors that refer to the dominant or fixed items

Exercise – Colors and Gradients

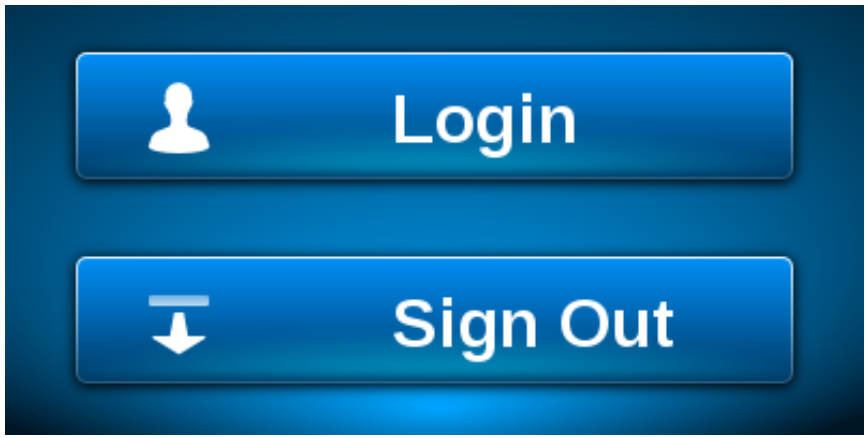
1. How else can you write these colors?
   - `"blue"`
   - `"#ff0000"`
   - `Qt.rgba(0,0.5,0,1)`
2. How would you create these items using the `gradient` property?



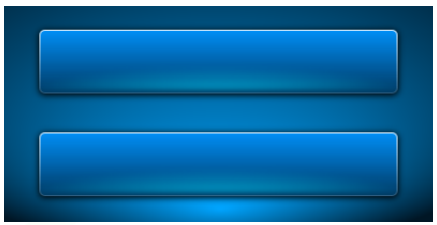
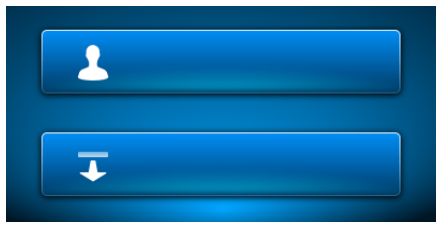
3. Describe another way to create these gradients?

1. When creating an `Image`, how do you specify the location of the image file?
2. By default, images are rotated about a point inside the image. Where is this point?
3. How do you change the text in a `Text` element?

Lab – Images, Text and Anchors



- Create a user interface similar to the one shown above.
- Hint: Use the background image supplied in the common `images` directory.

Lab qml-composing-uis/lab-text-images-anchors