Creating Tizen Native Apps with the Native UI & Graphics Framework

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Samsung Electronics

TIZEN™
DEVELOPER CONFERENCE
2013
SAN FRANCISCO

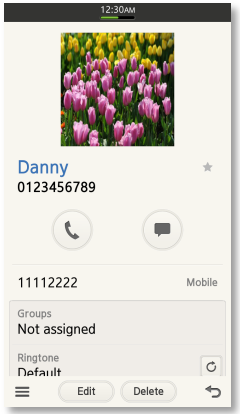
Agenda

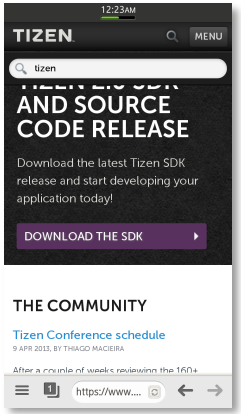
- Overview
- UI and Graphics
- More Features
- Tools

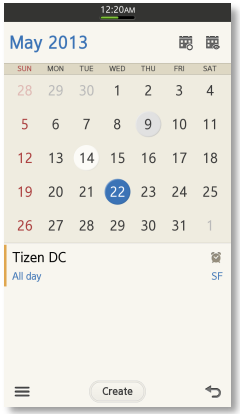
Overview

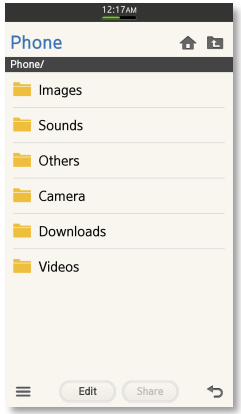
Overview

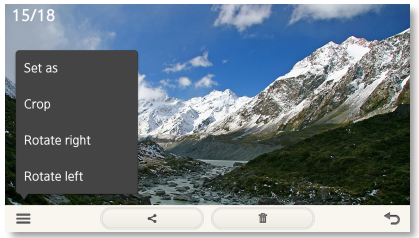
- **The UI & Graphics Framework provides**
  - Hierarchy of controls and containers
  - 2D and 3D Graphics with effects & animation
  - Customization with themes

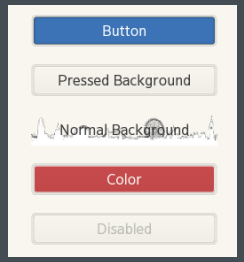


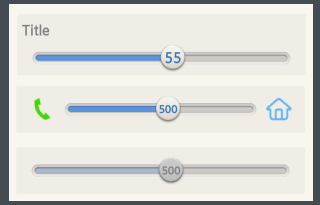


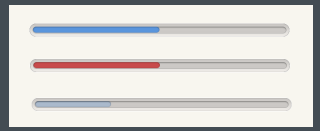


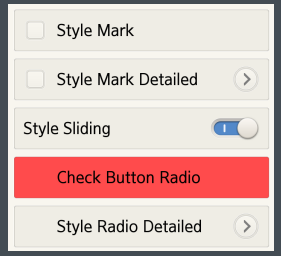





Button
Pressed Background
Normal Background
Color
Disabled

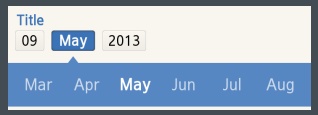

Title
55
500
500




Style Mark
Style Mark Detailed
Style Sliding
Check Button Radio
Style Radio Detailed


Qwerty
Qwerty
Send


To :
111111111
22222222
333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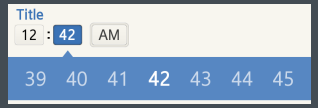
2013
Mar
Apr
May
Jun
Jul
Aug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AM
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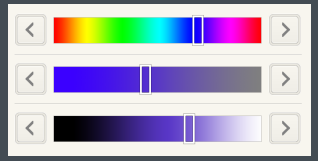
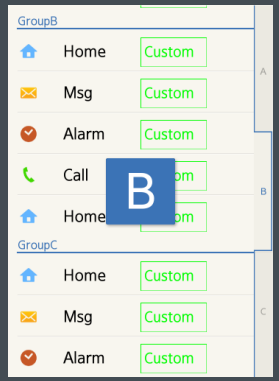
44
45




GroupB
Home
Custom
Msg
Custom
Alarm
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Call
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Home
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GroupC
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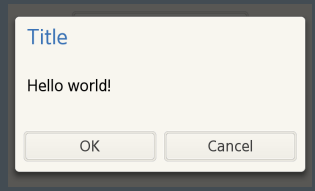
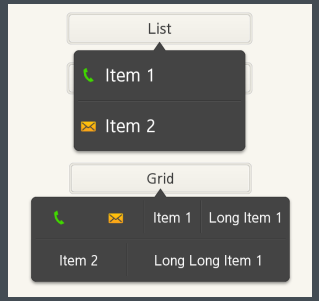
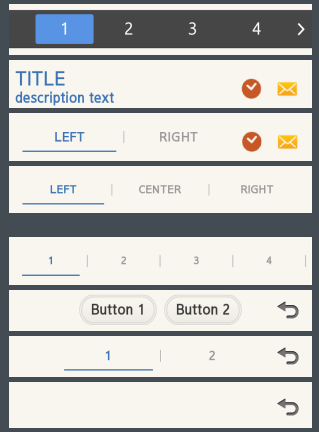
Custom
Alarm
Custom
B

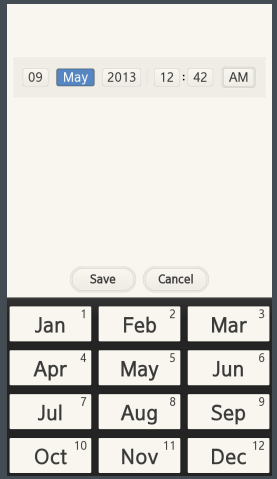

12:49AM
IconListView
Vertical
Horizontal


Title
Hello world!
OK
Cancel


List
Item 1
Item 2
Grid
Item 1
Long Item 1
Item 2
Long Long Item 1


1
2
3
4
TITLE
description text
LEFT
RIGHT
LEFT
CENTER
RIGHT
1
2
3
4
Button 1
Button 2
1
2


12:46AM
Gallery
Play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AM
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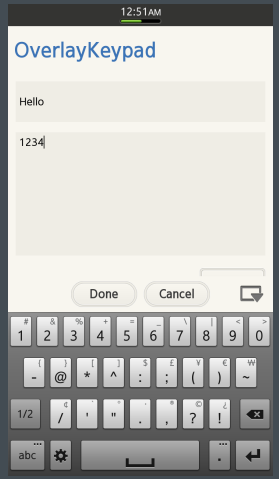
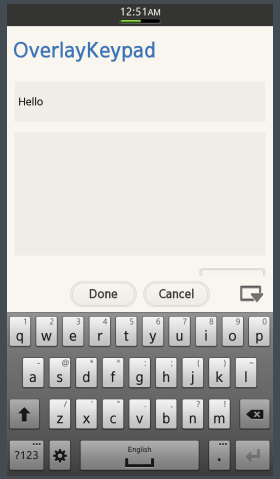
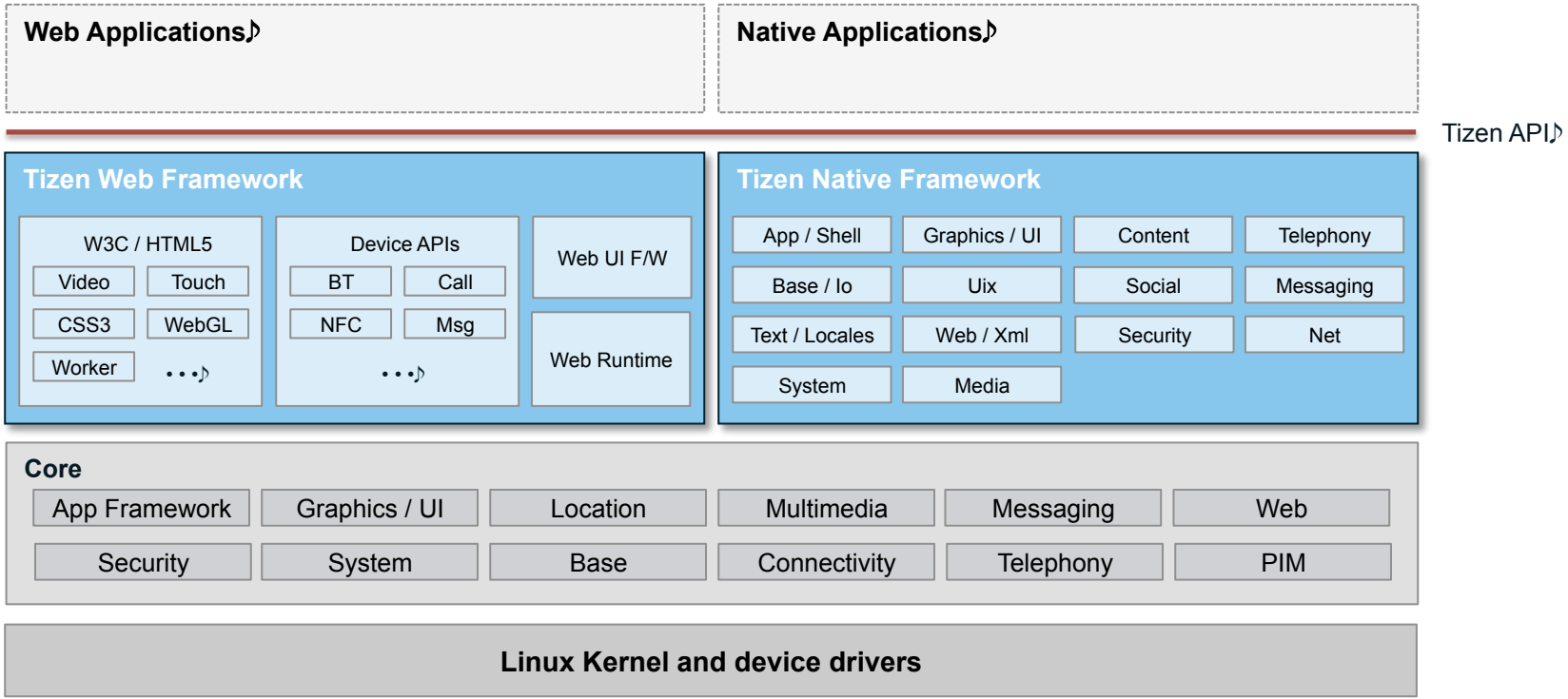
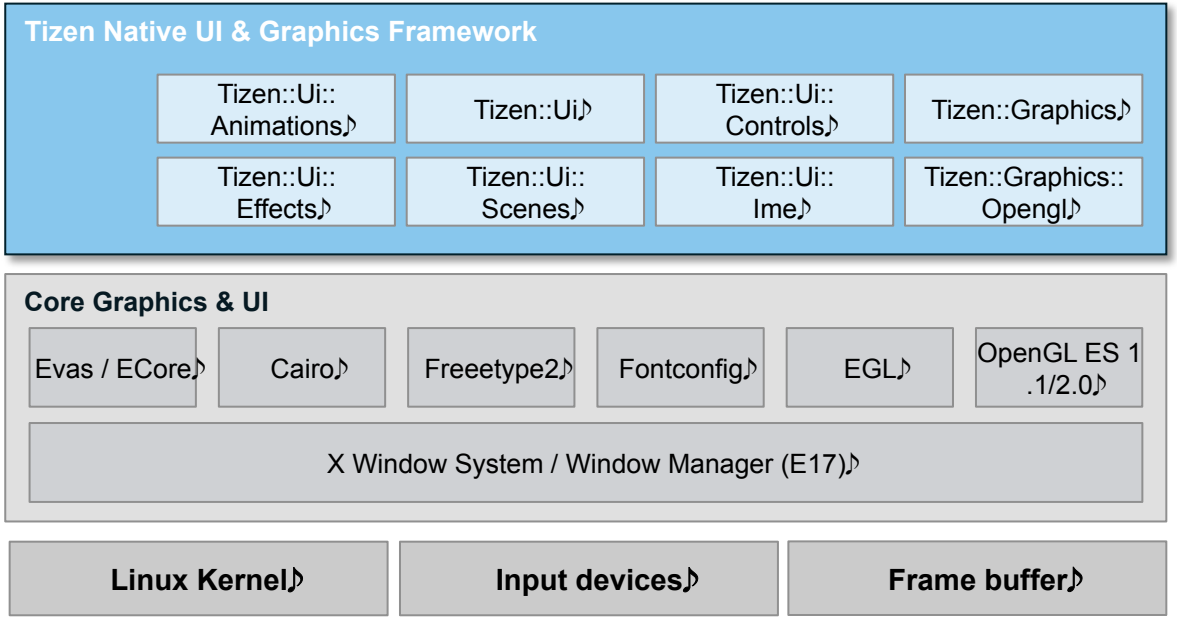

12:51AM
OverlayKeypad
Hello
1234
Done
Cancel


12:51AM
OverlayKeypad
Hello
Done
Cancel

Architectural View



Detailed View



UI & Graphics

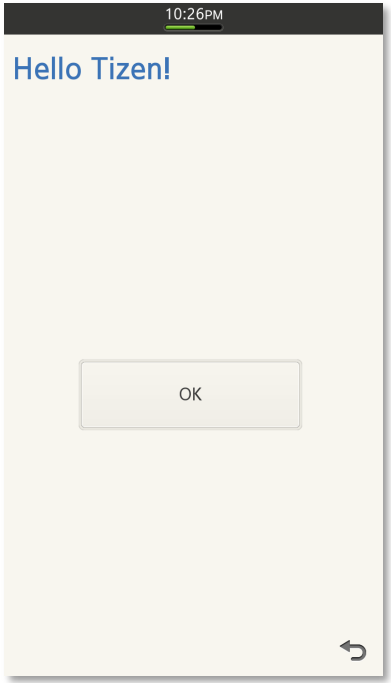
UI & Graphics

- **UI**
  - Hello Tizen
  - Controls
  - Animation
  - Visual Element
- **Graphics**
  - 2D Canvas
  - 3D OpenGL ES
  - Canvas Texture
  - Video Texture

Hello Tizen

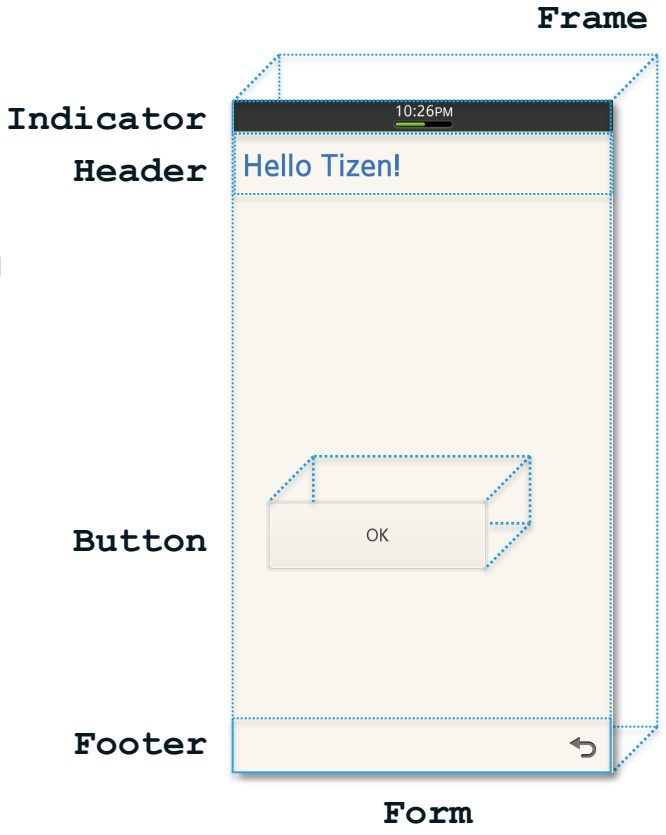
- **Simple Form-based app containing**
  - `Frame`
  - `Indicator`
  - `Form` with a `Header`, `Footer`, and `Button`

- **To create the app, create a new project using the Form-based application template**



Basic Components

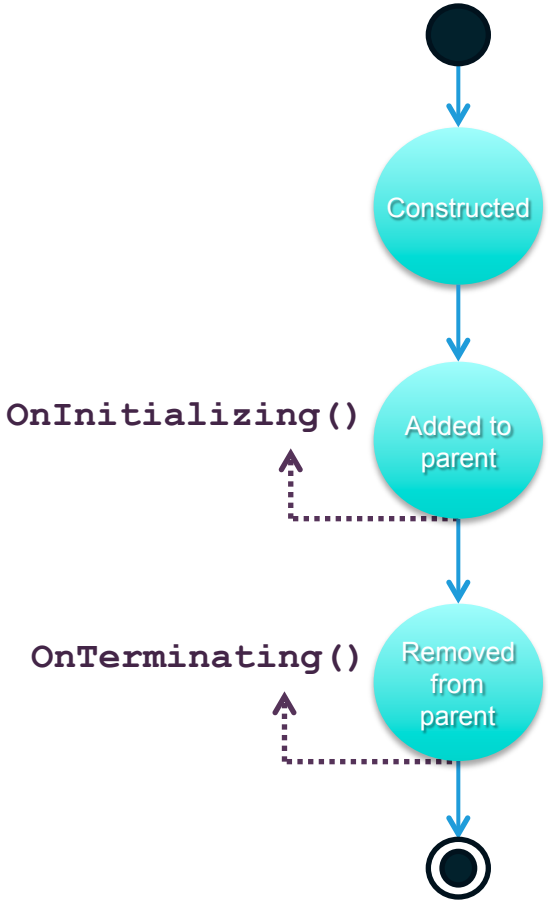
- **UI controls**
  - Functional unit of UI
  - Certain controls called containers can contain other controls
- **Frame**
  - Container of Forms
- **Form**
  - Logical unit of the UI Workflow
  - Base container of most controls



Write Your Own Form

- **To create a Form**
  - Add a **`Form`** subclass
  - Implement **`Form::OnInitializing()`**
  - Implement **`Form::OnTerminating()`**

```
Class MyForm : public Tizen::Ui::Controls::Form
{
Public:
    MyForm(void) {};
    virtual ~MyForm(void) {};

Public:
    virtual result OnInitializing(void);
    virtual result OnTerminating(void);
```



Make Your Form Work

- To make the Form functional, add it to a Frame and set it as the current Form

```
// Create a form in the heap, no need to delete explicitly later
MyForm* pForm = new MyForm();

// Construct the form
pForm->Construct(FORM_STYLE_INDICATOR | FORM_STYLE_HEADER | FORM_STYLE_FOOTER);

// Get the application frame
Frame* pFrame = UiApp::GetInstance()->GetFrameAt(0);

// Add the form to the frame
pFrame->AddControl(pForm);

// Set your form as the current form
pFrame->SetCurrentForm(pForm);

// Draw
pFrame->Invalidate(true);
```

Handle UI Events

- **Inherit the event listener interface**

```
Class MyForm : public Tizen::Ui::Controls::Form,
               public Tizen::Ui::IActionEventListener
{
Public:
    virtual result OnInitializing(void);
    virtual result OnTerminating(void);
    virtual void OnActionPerformed(const Tizen::Ui::Control& source, int actionId);
```

- **Register the event handler**

```
result MyForm::OnInitializing(void) {

    pButton->SetActionId(ID_BUTTON_BACK);
    pButton->AddActionEventListener(*this);

    AddControl(pButton);
}
```

Handle UI Events

- **Implement the event handler**

```
void MyForm::OnActionPerformed(const Control& source, int actionId)
{
    switch(actionId)
    {
    case ID_BUTTON_BACK:
        // Handle the button back (ID_BUTTON_BACK) event
        break;
    }
}
```

Animation

- **To add animation between 2 Forms**
  1. Get the animator (**`FrameAnimator`** or **`ControlAnimator`**)
  2. Set parameters and call **`SetCurrentForm()`** for the transition

```
// Get FrameAnimator for a form transition
FrameAnimator* pAnimator = pCurrentFrame->GetFrameAnimator();

// Set up animation parameters
pAnimator->SetFormTransitionAnimation(
    FRAME_ANIMATOR_FORM_TRANSITION_ANIMATION_TRANSLATE_RIGHT, // Animation type
                                                        500, // Duration
                                ANIMATION_INTERPOLATOR_LINEAR // Interpolation
);

// Change to a new form; transition animation starts automatically
r = pAnimator->SetCurrentForm(pNextForm);
```

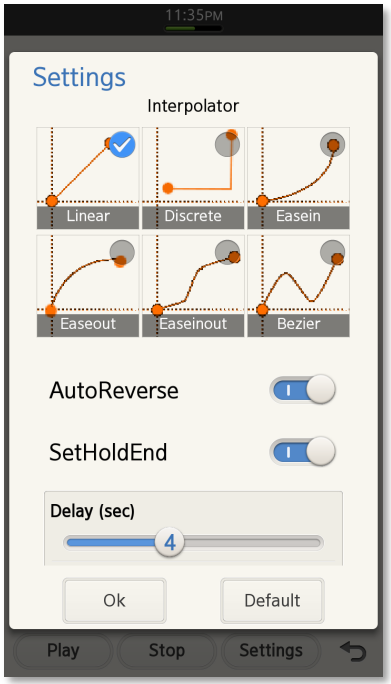
Animation Explained

- **Basic animation contains**
  - Start value
  - Key value (created automatically using interpolators)
  - End value

- **Animation can be applied to the following properties**
  - Position
  - Size
  - Alpha
  - Rotation

Animation Classes

- Classes
  - `IntegerAnimation`
  - `FloatAnimation`
  - `PointAnimation`
  - `DimensionAnimation`
  - `RectangleAnimation`
  - `RotateAnimation`
- Event listener
  - `IControlAnimatorEventListener`
    - `OnControlAnimationStarted()`
    - `OnControlAnimationStopped()`
    - `OnControlAnimationFinished()`



`UiControlAnimator` sample

Animation Example

- **To animate a Button from one position to another**
  - Initialize the UI controls
  - Use point animation to create an animation

```
case ID_BUTTON:
{
    result r;
    ControlAnimator* pButtonAnimator = __pButton->GetControlAnimator();

    Point startPos = __pButton->GetPosition();
    Point endPos(startPos.x, startPos.y + 200);

    PointAnimation pointAnimation(startPos, endPos, 2000, ANIMATION_INTERPOLATOR_LINEAR);
    pointAnimation.SetAutoReverseEnabled(true);

    r = pButtonAnimator->StartUserAnimation(ANIMATION_TARGET_POSITION, pointAnimation);
}
break;
```

Visual Element

- **A conceptual 2D rectangular model for animation and composition**
  - Transforms 2D plane in 3D space (2.5D)
  - Property-based architecture with support for implicit and explicit animations
  - GPU accelerated

Property

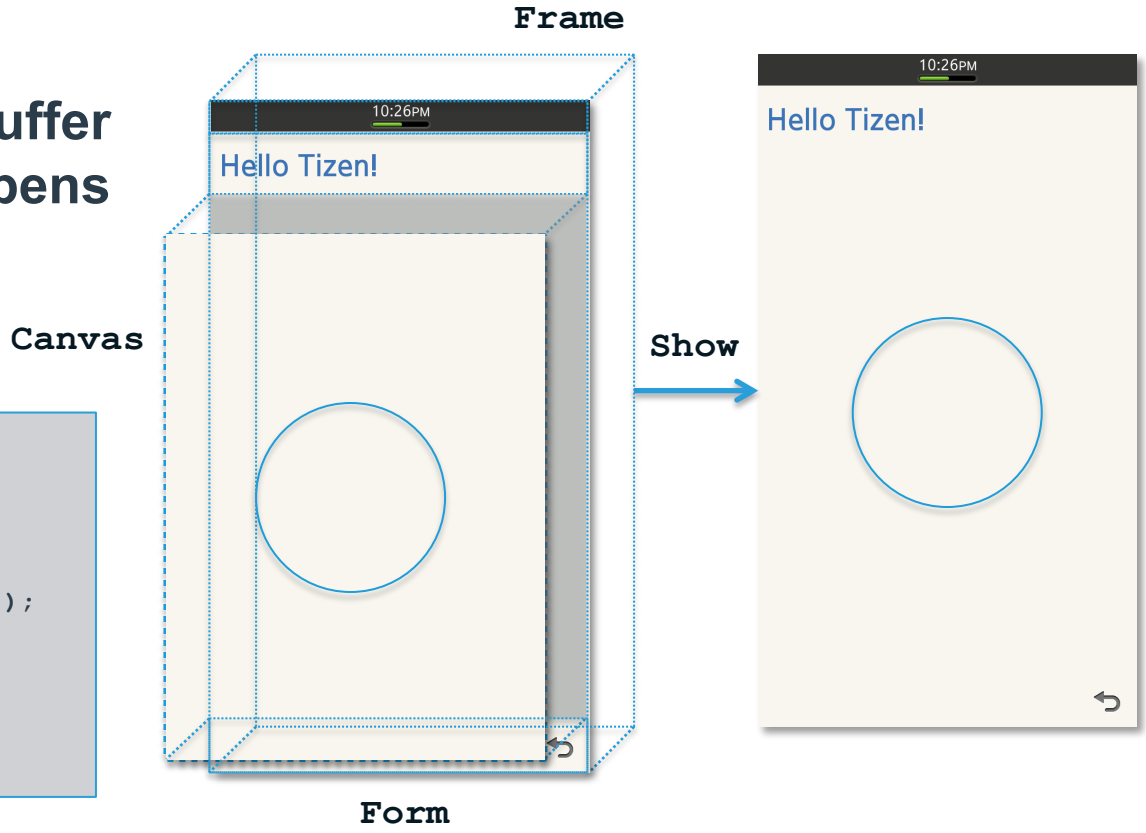
- **Most APIs can be accessed via the `SetProperty()` and `GetProperty()` methods**

```
pVE = new VisualElement();
pVE->Construct();

pVE->SetProperty (L"bounds", FloatRectangle(0.0f, 0.0f, 100.0f, 100.0f));
pVE->SetBounds (FloatRectangle(0.0f, 0.0f, 100.0f, 100.0f));
```

  - Bounds / Opacity / Show state / Anchor
  - Transform Rotate[X|Y|Z], Scale[X|Y|Z], Translation[X|Y|Z]
  - Z-position / Z-order group
- **Custom property can be added**
- **Animation is as easy as changing the property**

Graphics

- Canvas is a memory buffer where all drawing happens




```
result MyForm::OnDraw(void) {
    ...
    Canvas* pCanvas = GetCanvasN();

    pCanvas->Clear();
    pCanvas->SetForegroundColor(...);
    pCanvas->DrawEllipse(...);
    ...
    delete pCanvas;
    return r;
}
```

2D Drawing Primitives

Primitive	Line style					Fill style	Composite mode
	Width	Join style	Cap style	Solid	Dash Pattern	Solid	
Pixel	--	--	-	--	--	--	O
Line	O	Round Miter Bevel	Round Butt Square	O	O	-	O
Polyline	O			O	O	--	O
Triangle	O			O	O	O	O
Rectangle	O			O	O	O	O
Arc	O			O	O	O	O
Polygon	O			O	O	O	O
Ellipse	O	-		O	O	O	O
Text	--	--	-	--	--	O	-
Bitmap	--	--	-	--	--	--	O

OpenGL® ES

- EGL
- OpenGL ES 1.1, 2.0

```
bool GlesSample::InitEGL()
{
  EGLint numConfigs = 1;
  EGLint eglConfigList[] = {/*…*/};
  EGLint eglContextList[] = {/*…*/};

  eglBindAPI(EGL_OPENGL_ES_API);
  eglDisplay = eglGetDisplay((EGLNativeDisplayType)EGL_DEFAULT_DISPLAY);
  eglInitialize(eglDisplay, null, null);
  eglChooseConfig(eglDisplay, eglConfigList, &eglConfig, 1, &numConfigs);
 eglSurface = eglCreateWindowSurface(eglDisplay, eglConfig, (EGLNativeWindowType)pForm, null);
  ...
}
```

Canvas Texture

- **Utility for mapping Canvas to Texture**

```
//  Initialize Canvas Texture
glGenTextures(1, &__texture);
__pCanvasTexture = new CanvasTexture;
__pCanvasTexture->Construct(__texture, 1280, 720);

Canvas* pCanvas = __pCanvasTexture->GetCanvasN();

Font font;
font.Construct(FONT_STYLE_PLAIN, 200);
pCanvas->SetFont(font);

pCanvas->Clear();
pCanvas->DrawText(Point(offset, 500),L"Canvas");
pCanvas->DrawText(Point((-offset, 700),L"Texture");

//  Draw a frame with the texture
glBindTexture(GL_TEXTURE_2D, __texture);

glDrawElements(GL_TRIANGLES, numIndices, GL_UNSIGNED_SHORT, INDICES);
```

Video Texture

- **Utility for mapping Video to Texture**

```
//  Initialize Video Texture
glGenTextures(1, &__texture);
__pVideoTexture = new VideoTexture;
__pVideoTexture->Construct(__texture, 1280, 720);

// This function gets the IVideoTextureUpdateListener
__pVideoTexture->SetVideoTextureUpdateListener(*this);

__pPlayer = new Tizen::Media::Player();
__pPlayer->Construct(*this, __pVideoTexture);
__pPlayer->OpenFile(L"data/Helicopter.mp4");
__pPlayer->Play();

...

//  Draw a frame with the texture
__pVideoTexture->BindTexture();

glDrawElements(GL_TRIANGLES, numIndices, GL_UNSIGNED_SHORT, INDICES);
```

More Features

More Features

- **Tizen::Ui**
  - Accessibility
  - Downloadable IME
  - Effect Manager
  - Scalable UI
  - Scene Manager
- **Tizen::Shell**
  - Notification Manager
  - Notification Tray
  - Dynamic Box

Accessibility

- **Large Font**

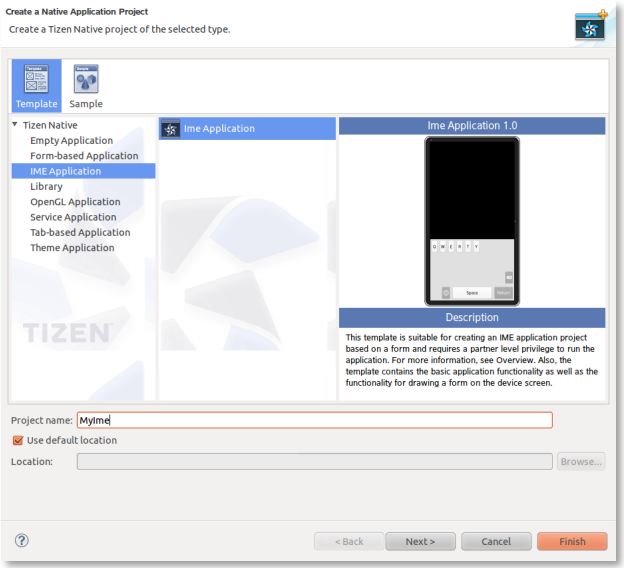
```
// Retrieve font size from user setting

Tizen::System::SettingInfo::GetValue(
            L"http://tizen.org/setting/font.size", fontSizeString);
fontSize = Tizen::Ui::UiConfiguration::GetFontSize(fontSizeString);
```

- **Screen reader**

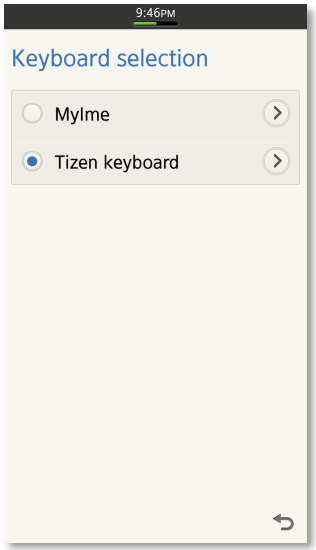
```
// Make an accessibility element for custom drawing

AccessibilityElement* pAccessibilityElement = new AccessibilityElement();

pAccessibilityElement->Construct(GetBounds(), L"Tizen Image");
pAccessibilityElement->SetLabel(L"Tizen Image");
pAccessibilityElement->SetTrait(L"Image");
pAccessibilityElement->SetHint(L"This image rotates automatically.");

GetAccessibilityContainer()->AddElement(*pAccessibilityElement);
```

Downloadable IME

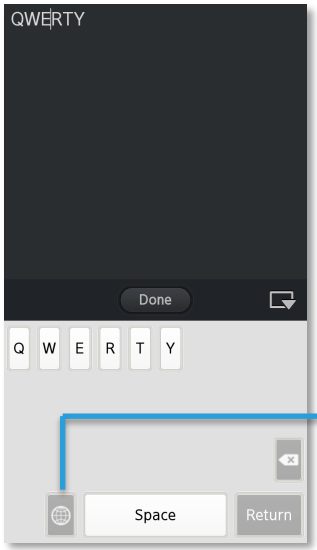
- You can create custom IME in these short steps



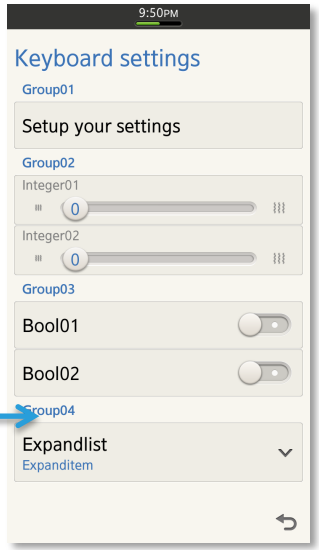
IME Application



Settings UI



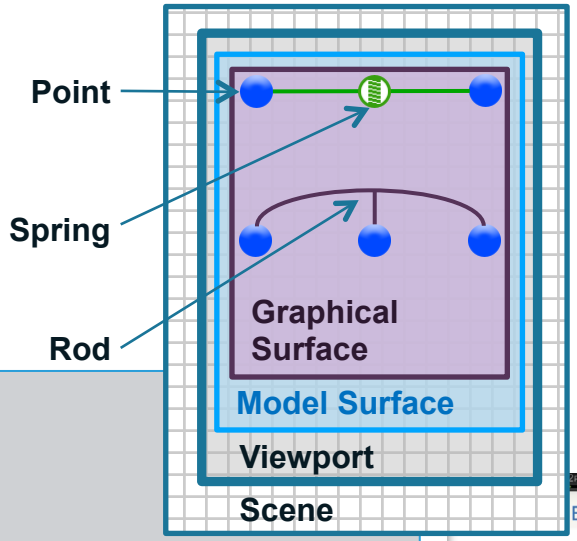
Show SIP



IME Setting (XML)

Effect Manager

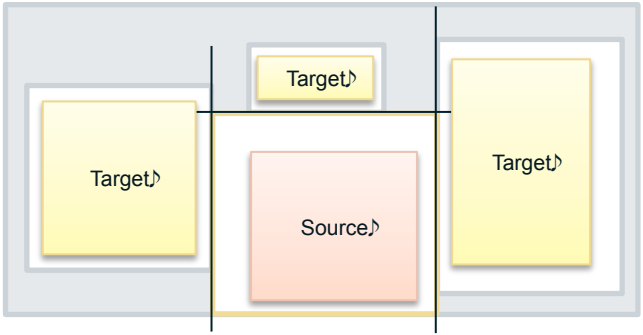
- **Effect model with LUA script-based interaction for 3D transition effects**

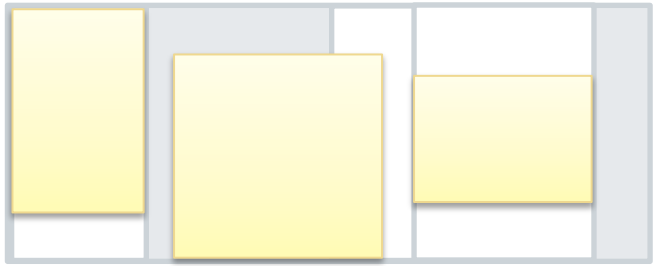



```
Tizen::Ui::Effects::EffectManager* __pEffectManager;

// Effect instance
Effect* __pEffect;

// Panel for OpenGL surface for effect drawing
Panel* __pEffectsPanel;

// IEffectEventListener
virtual void OnEffectStarted(Tizen::Ui::Effects::Effect& effect);
virtual void OnEffectFinished(Tizen::Ui::Effects::Effect& effect,
                              Tizen::Ui::Effects::EffectResult effectResult,
                              const Tizen::Base::Collection::IList& lastShownBitmapIds);

// IEffectResourceProvider
virtual result SetBitmap(Tizen::Ui::Effects::Effect& effect, long bitmapId);
```

Scalable UI

- **Logical coordinate system – 480, 720, etc.**
- **Layout manager – relative, linear (H & V), grid, card**

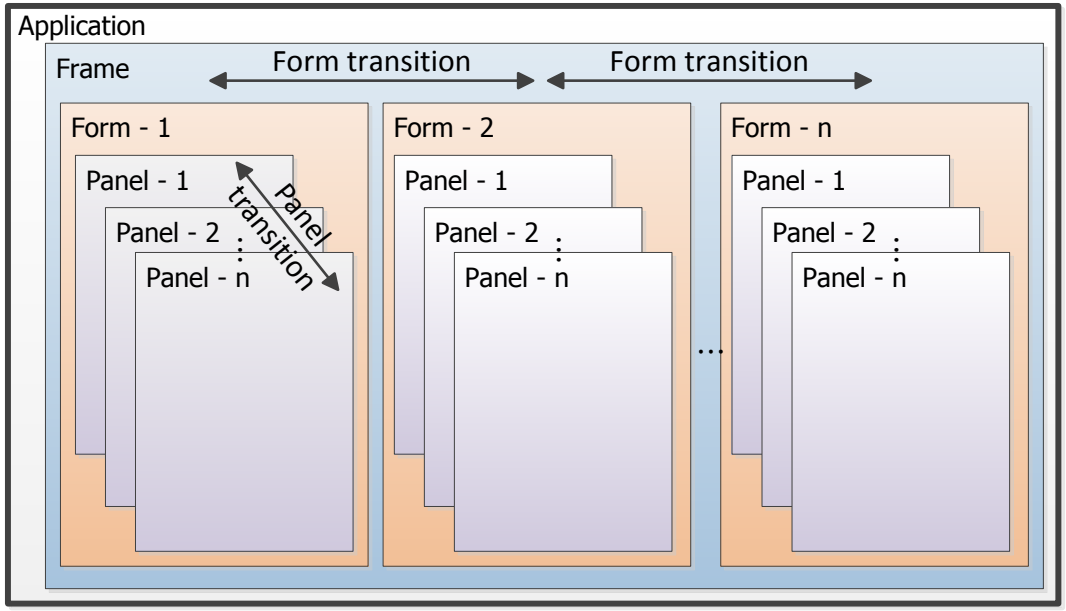




- **Bitmap (density) and XML layout (screen size) fallback**

Scene Manager

- **Simpler Scene-based navigation instead of Forms**



Scene Manager

- **Register scenes**

```
SceneManager* pSceneManager = SceneManager::GetInstance();

pSceneManager->RegisterScene(L"Scene1", L"Form1", L"Form1Panel");
pSceneManager->RegisterScene(L"Scene2", L"Form2", L"Form2anel");
```

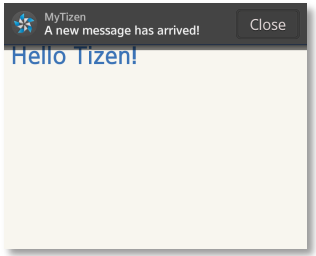
- **Scene transition**

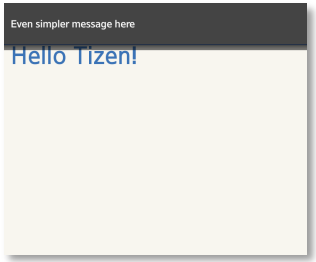
```
pSceneManager->GoForward(ForwardSceneTransition(L"Scene1"));

pSceneManager->GoForward(ForwardSceneTransition(L"Scene2",
                                                SCENE_TRANSITION_ANIMATION_TYPE_NONE,
                                                SCENE_HISTORY_OPTION_NO_HISTORY));

pSceneManager->GoBackward(BackwardSceneTransition(L"Scene1",
                                                  SCENE_TRANSITION_ANIMATION_TYPE_RIGHT));
```

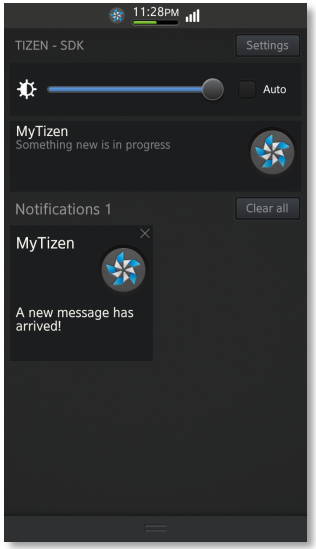
Notification

- **Send notifications to the user easily**

```
Tizen::Shell::NotificationManager notificationMgr;
notificationMgr.Construct();

notificationMgr.Notify(L"A new message has arrived");

notificationMgr.NotifyTextMessage(L"Even simpler message");

notificationMgr.NotifyOngoingActivity
                    (L"Something new is in progress");
```





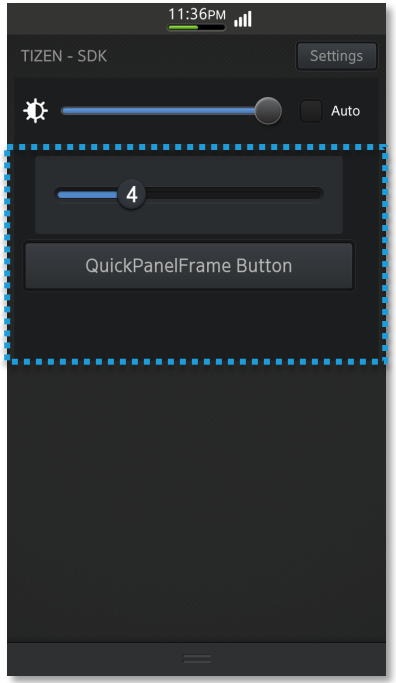


- **`NotificationManager` requires privilege, add this in the `manifest.xml` editor**

Custom Control for Notification Tray

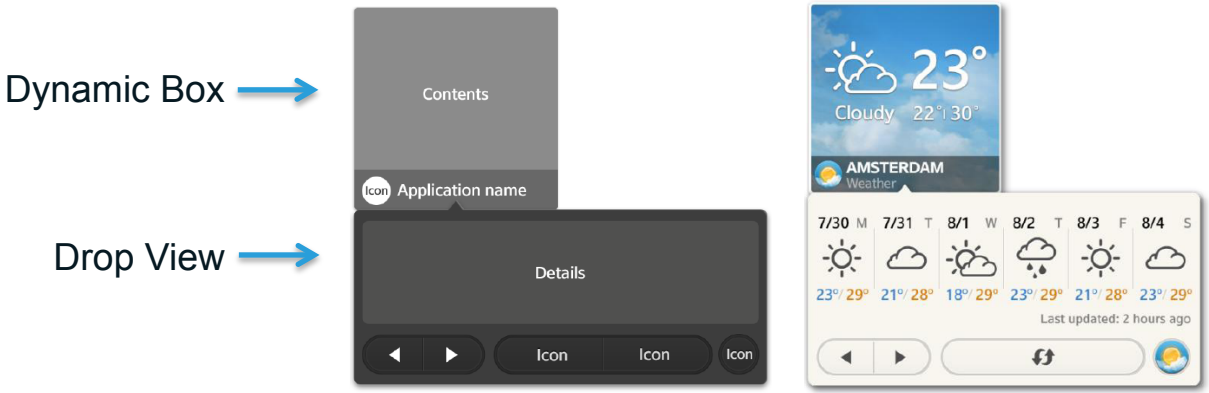
- **Add UI Controls to the `QuickPanelFrame`**

```
// Create QuickPanelFrame
_pQuick = new Tizen::Shell::QuickPanelFrame();
_pQuick->Construct(400.0f);

// Add controls
_pQuick->AddControl(_pSlider);
_pQuick->AddControl(_pButton);

// Change the show state in order to change the visibility
_pQuick->SetShowState(true);
_pQuick->Show();

// Hide
_pQuick->SetShowState(false);
_pQuick->Show();
```



Dynamic Box

- **Dynamic Box is a small app that can be embedded in other apps such as the Home screen**



- **SDK contains host Viewer sample app (using `Tizen::Shell::AppWidgetView`) and AppWidget app template for you to start with**

Dynamic Box

- **Complexity is hidden behind `AppWidgetProvider`**

```
bool MyAppWidgetProvider::OnAppWidgetProviderInitializing(float width, float height,
                                                          const Tizen::Base::String& userInfo)
{
   // Initialize AppWidgetFrame and AppWidgetProvider specific data

   AppWidgetFrame* pFrame = new MyAppWidgetFrame();
   pFrame->Construct(Dimension(width, height));
   this->SetAppWidgetFrame(pFrame);

   pFrame->Show();
   return true;
}

bool MyAppWidgetProvider::OnAppWidgetProviderUpdating(const Tizen::Base::String& argument)
{
   // Update Dynamic Box

   pAppWidgetFrame->Invalidate();
   return true;
}
```

Even More Features

Even More Features

- **Tizen::Uix**
  - Sensor
    - Motion
    - Light
    - Proximity
    - Accelerometer
    - Gyro
  - Speech
  - Vision
    - Face detect
    - Face recognize
    - Image object
    - QR code
- **Tizen::App**
  - AppControl
  - AppResource
    - Localizes strings
    - Bitmaps loader
- **Tizen::Web**
  - Web control
- **Tizen::Media**
  - Image encoder and decoder
  - Audio & video encoder and decoder
  - Audio & Video player
  - Camera

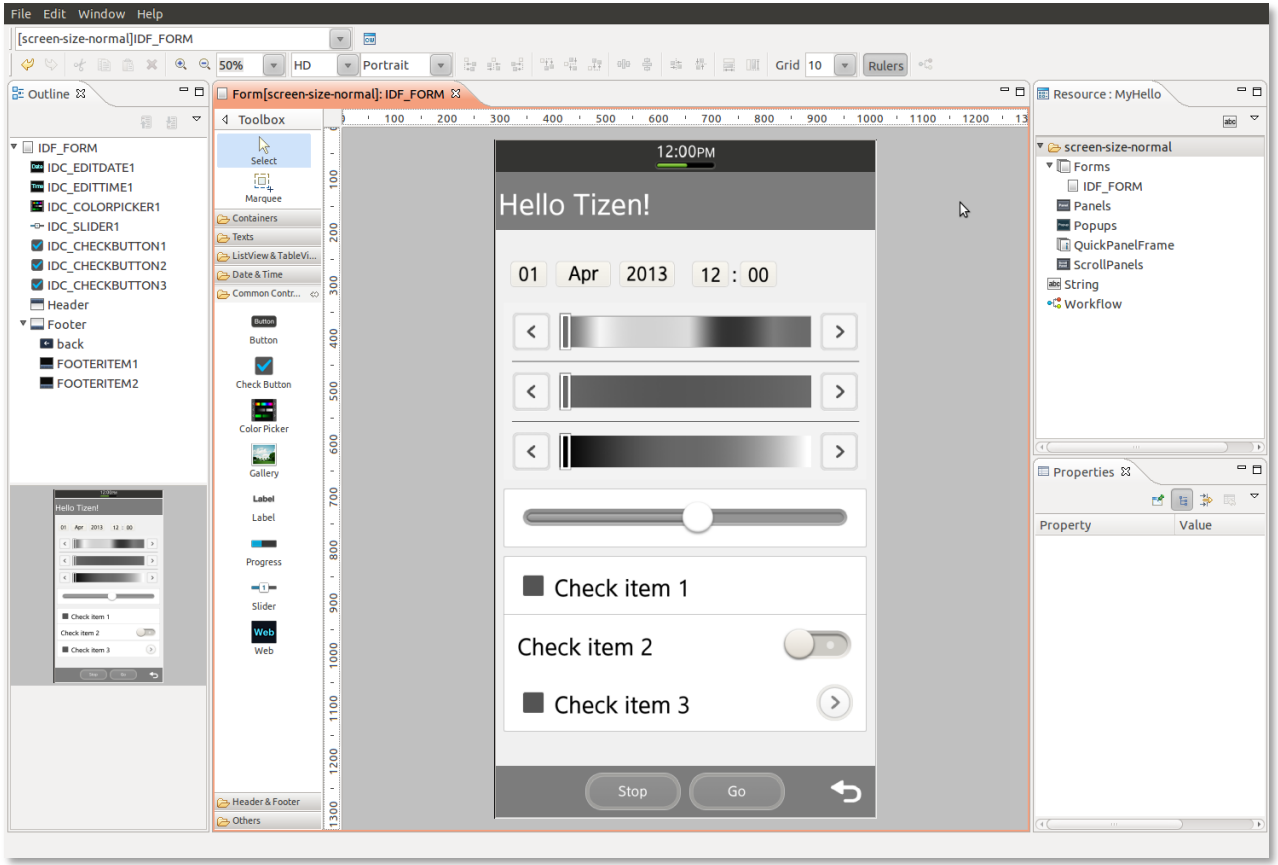
Tools

Tools

- UI Builder
- Effect Builder
- UI Customizer

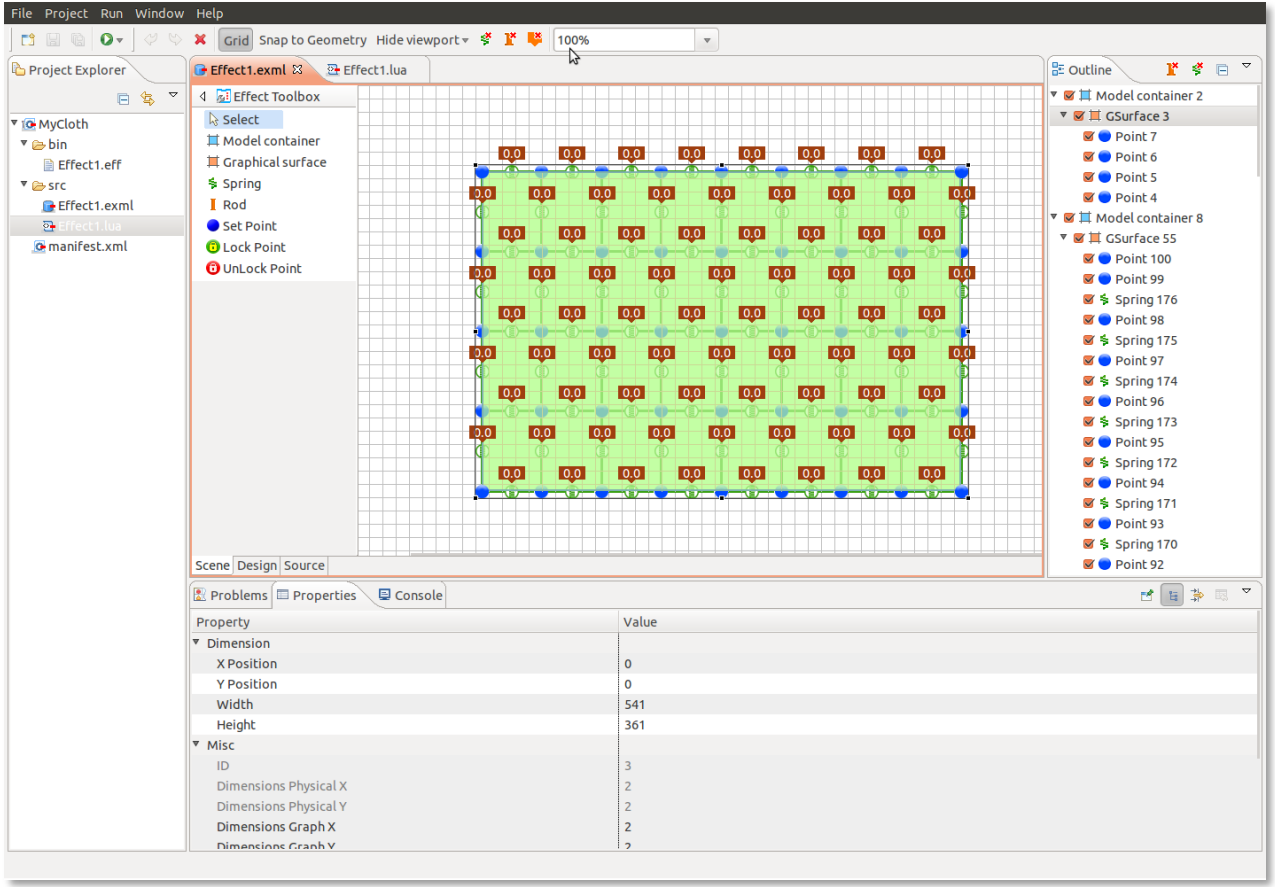
UI Builder

- XML authoring
- Code generator
- Orientation



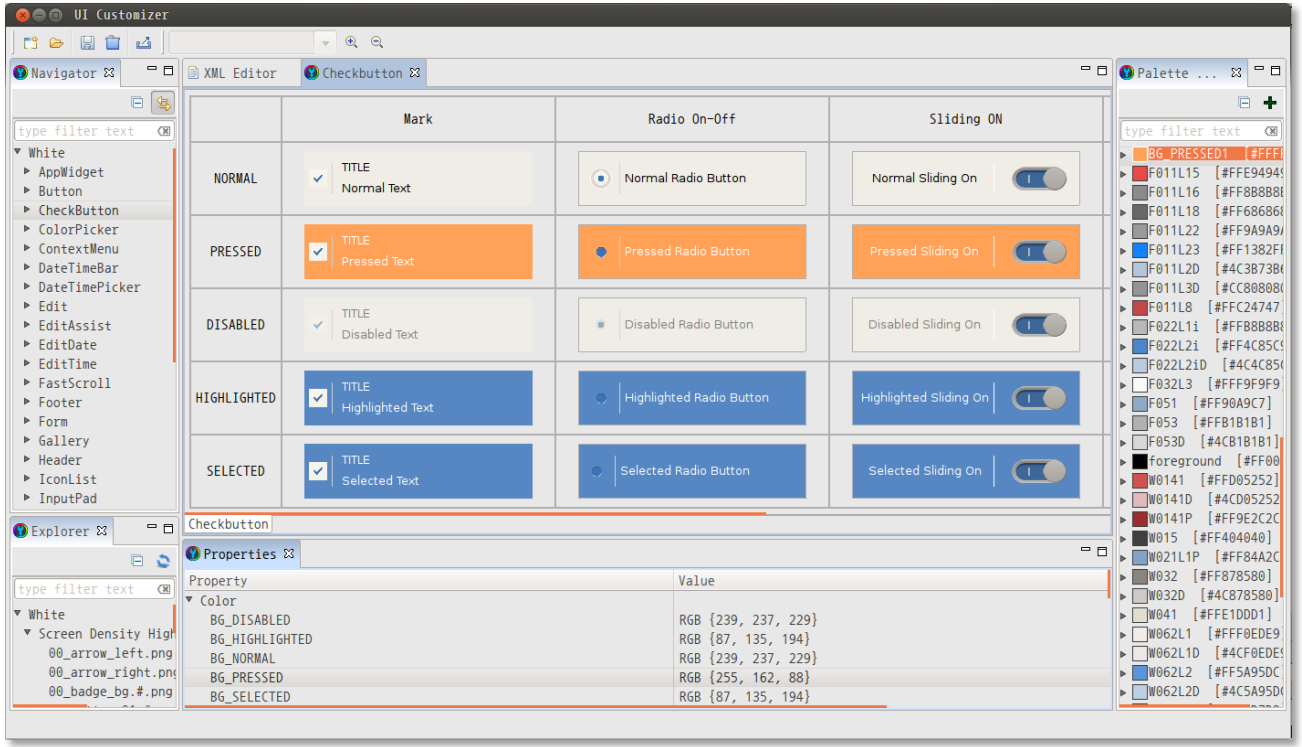
Effect Builder

- **Effect in XML and LUA script**
- **Realistic 3D with physics**
  - Page flipping
  - 3D rotation
  - Scrolling



UI Customizer

- Application can embed a theme
- OEM or carrier can offer custom default theme



Q&A

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