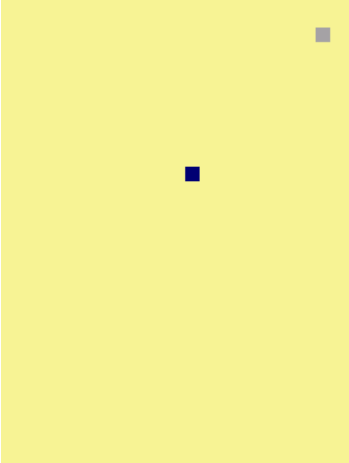
# Simple RGA application

## Introduction

26 Oct 2008

This application shows how to create a simple application using the RGA (Real Time Graphics and Audio) APIs. The application draws two squares on the screen - one controlled with user input and one drawn randomly.



## Main loop

```
void CMyRGAUI::Run()
    {
    while ( mExit == FALSE )
        {
 if( mFocus )
     {
     Draw();
     mIdle->Process( 2000, TRUE );
     }
        else
            {
     mIdle->Process( 0, TRUE );
     }
 }
    }
```

## Using RGA API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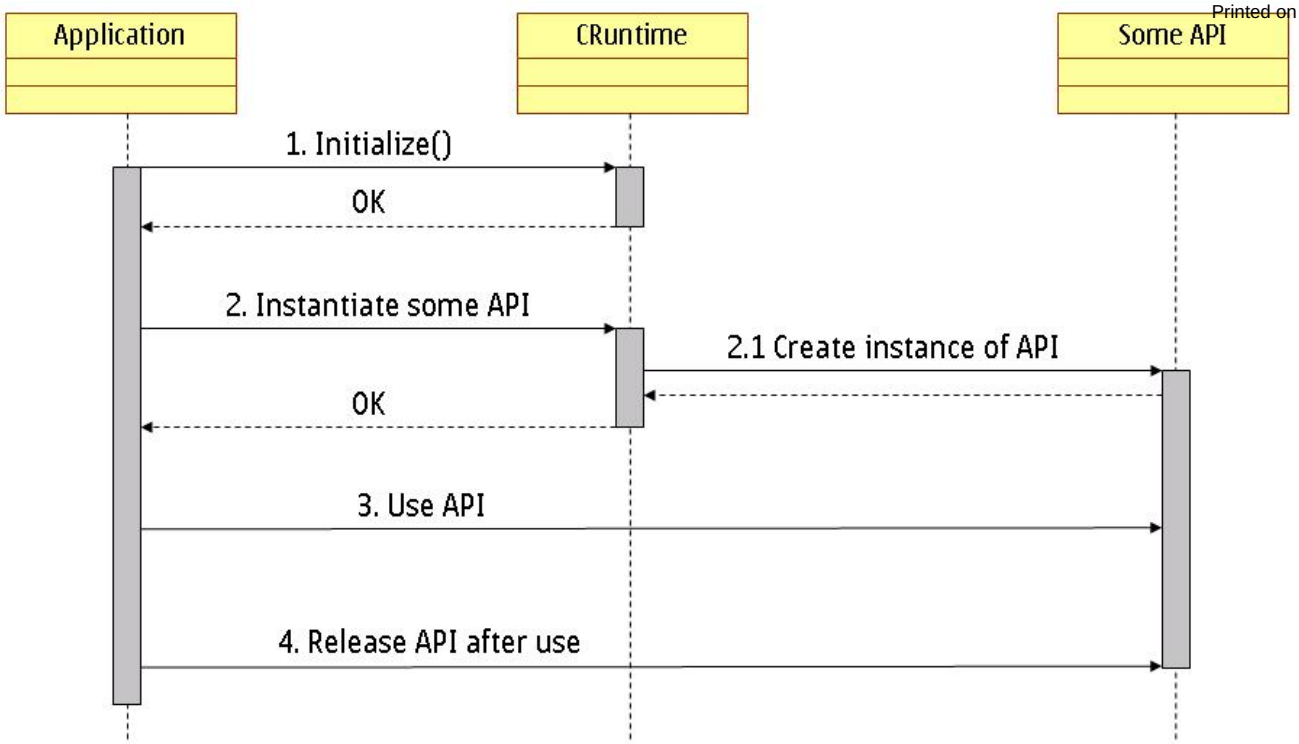


## Initialize application environment

This code initializes the execution environment. The **IApplicationState** (mApplicationState) object allows the application to get events when the application comes to foreground or goes to background. The **IIdle** (mIdle) object enables the waiting between application events.

```
int32 CMyRGAUI::Initialize()
    {
    int32 errorCode;

    errorCode = CRuntime::CreateInstance( mIdle );
    if ( errorCode != OK ) return errorCode;

    errorCode = CRuntime::CreateInstance( mApplicationState );
    if ( errorCode != OK ) return errorCode;
    mApplicationState->SetObserver( this );

    ...
    }
```

## Initialize display

The **IDisplay** (mDisplay) object provides the interface to the devices screen. The **IDisplay** object is created using the **IDisplayManager** object.

```
/// Display number
const uint8 DISPLAY_NUMBER = 0;

/// Display configuration
const uint8 DISPLAY_CONFIGURATION = 0;
```

```
int32 CMyRGAUI::Initialize()
    {
    int32 errorCode;

    ...

    IDisplayManager* displayManager = NULL;
    errorCode = CRuntime::CreateInstance( displayManager );
    if ( errorCode != OK ) return errorCode;

    errorCode = displayManager->CreateDisplay( DISPLAY_NUMBER, mDisplay );
    displayManager->Release();
    if( errorCode != OK ) return errorCode;

    IDisplayConfiguration* displayConfig = NULL;
    errorCode = mDisplay->GetDisplayConfiguration( DISPLAY_CONFIGURATION,
                                                   displayConfig );
    if ( errorCode != OK ) return errorCode;

    errorCode = mDisplay->CreateWindow( *displayConfig, mWindow );
    displayConfig->Release();
    if ( errorCode != OK ) return errorCode;
    mDisplay->SetObserver( this );

    ...
    }
```


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## Initialize graphics

```
int32 CMyRGAUI::Initialize()
    {
    int32 errorCode;

    ...

    IBackBufferFactory* bBFactory = NULL;

    errorCode = CRuntime::CreateInstance( bBFactory );
    if ( errorCode != OK ) return errorCode;

    //set the window handle to the required display mode
    //later this will be done by the Display API
    CBackBufferResolution bBResolution;
    uint32 colorDepthMask;
    errorCode = bBFactory->GetBackBufferConfiguration(
                    BACKBUFFER_CONFIG, BACKBUFFER_RESOLUTION_MASK,
                    BACKBUFFER_COLOR_MASK, bBResolution, colorDepthMask );

    if ( errorCode != OK )
        {
        bBFactory->Release();
        return errorCode;
        }
    errorCode = bBFactory->CreateBackBuffer( mWindow, bBResolution, colorDepthMask,
                                             BACKBUFFER_FLAG_ANTI_TEARING_DISABLED |
                                             BACKBUFFER_FLAG_CONSISTENT, mBackBuffer );
    bBFactory->Release();
    if ( errorCode != OK ) return errorCode;

    errorCode = CRuntime::CreateInstance( mGraphicsContext );
    if ( errorCode != OK ) return errorCode;
    mGraphicsContext->SetGraphicsDevice( *mBackBuffer );

    GraphicsOrientationType type;
    GraphicsOrientationAngle angle;
    mDisplay->GetOrientation( type, angle );
    mBackBuffer->Transpose( type, angle );

    ...
}
```

## Initialize keypad

```
int32 CMyRGAUI::Initialize()
    {
    ...

    IInput* input = NULL;
    errorCode = CRuntime::CreateInstance( input );
    if ( errorCode != OK ) return errorCode;

    int32 number = input->GetDeviceCount();
    for( int32 i = 0; i < number && !mKeypadDevice; ++i )
        {
        CInputDeviceInfo deviceInfo;
        errorCode = input->GetDeviceInfo( i, deviceInfo );
        if ( errorCode != OK )
            {
            input->Release();
            return errorCode;
            }
        if( ( deviceInfo.mDeviceType == INPUT_DEVICE_TYPE_KEYPAD ) &&
            ( deviceInfo.mInterfaceType == INPUT_INTERFACE_TYPE_INTERNAL ) )
            {
            errorCode = input->CreateDevice( i, mKeypadDevice );
            if ( errorCode != OK )
                {
                input->Release();
                return errorCode;
                }
            }
        }
    input->Release();

    if( mKeypadDevice == NULL ) return ERROR_UNEXPECTED;

    errorCode = mKeypadDevice->Start();
    if ( errorCode != OK ) return errorCode;
    mKeypadDevice->SetObserver( this );

    return OK;
    }
```

## MyApplication.cpp

```
// INCLUDE FILES
#include <errorcodes.h>         // ngi
#include <runtime.h>            // ngi

// This is a GCCE toolchain workaround needed when compiling with GCCE
// and using main() entry point
#ifdef __GCCE__
#include <staticlibinit_gcce.h>
#endif

#include "MyRGAUI.h"

using namespace ngi;

namespace MyExample
{
```


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```
    /**
     * ExampleMain()
     *
     * Initializes the runtime, creates the application
     * instance and runs the application.
     */
    int ExampleMain()
    {
        int32 error;
        // Initializes CRuntime
        error = CRuntime::Initialize();
        if ( error == OK )
        {
            CMyRGAUI* rgaUI = new CMyRGAUI(); // create environment
            if ( rgaUI == NULL )
            {
                CRuntime::Close();
                return ERROR_OUT_OF_MEMORY;
            }
            error = rgaUI->Initialize(); // initialize environment
            if ( error == OK )
            {
                rgaUI->Run();          // main loop
            }
            delete rgaUI;
            CRuntime::Close();
        }
        return error;
    }
}

int main(void)
    {
    return MyExample::ExampleMain();
    }
```

## MyRGAUI.h

```
#ifndef MYRGAUI_H_
#define MYRGAUI_H_

#include <applicationstate.h>
#include <backbuffer.h>
#include <display.h>
#include <graphicscontext.h>
#include <idle.h>
#include <input.h>

using namespace ngi;

namespace MyExample
{
    /// Display number
    const uint8 DISPLAY_NUMBER = 0;

    /// Display configuration
    const uint8 DISPLAY_CONFIGURATION = 0;

    /// Background color definition
    const uint32 COLOR_BACKGROUND = 0x00f0f090;

    /// Blue color definition
    const uint32 COLOR_BLUE = 0x00000077;

    /// Gray color definition
    const uint32 COLOR_GRAY = 0x00a0a0a0;

    /// Back buffer configuration to use
    const uint32 BACKBUFFER_CONFIG = 0;

    /// Possible back buffer resolutions
    const uint32 BACKBUFFER_RESOLUTION_MASK = BACKBUFFER_RESOLUTION_176x208 |
                                              BACKBUFFER_RESOLUTION_208x176 |
                                              BACKBUFFER_RESOLUTION_352x416 |
                                              BACKBUFFER_RESOLUTION_416x352 |
                                              BACKBUFFER_RESOLUTION_240x320 |
                                              BACKBUFFER_RESOLUTION_320x240 |
                                              BACKBUFFER_RESOLUTION_320x480 |
                                              BACKBUFFER_RESOLUTION_480x320 |
                                              BACKBUFFER_RESOLUTION_480x640 |
                                              BACKBUFFER_RESOLUTION_640x480 |
                                              BACKBUFFER_RESOLUTION_160x240 |
                                              BACKBUFFER_RESOLUTION_240x160 |
                                              BACKBUFFER_RESOLUTION_480x848 |
                                              BACKBUFFER_RESOLUTION_848x480 |
                                              BACKBUFFER_RESOLUTION_120x160 |
                                              BACKBUFFER_RESOLUTION_160x120 |
                                              BACKBUFFER_RESOLUTION_360x640 |
                                              BACKBUFFER_RESOLUTION_640x360 |
                                              BACKBUFFER_RESOLUTION_352x800 |
                                              BACKBUFFER_RESOLUTION_800x352;

    /// Usable back buffer color resolutions
    const uint32 BACKBUFFER_COLOR_MASK = GRAPHICS_FORMAT_XRGB4444 |
                                         GRAPHICS_FORMAT_XRGB1555 |
                                         GRAPHICS_FORMAT_RGB565 |
                                         GRAPHICS_FORMAT_RGB888 |
                                         GRAPHICS_FORMAT_XRGB8888;

    class CMyRGAUI : public IApplicationStateObserver,
                     public IDisplayObserver,
                     public IInputDeviceObserver
    {
    public: // Constructor & Destructor

     CMyRGAUI();
     virtual ~CMyRGAUI();

    public: // CMyRGAUI interface

     virtual int32 Initialize();
     virtual void Run();

    public: // IApplicationStateObserver
```


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```
        virtual void FocusGained() NO_THROW;
        virtual void FocusLost() NO_THROW;
        virtual void ExitRequested() NO_THROW;

    public: // IDisplayObserver

        virtual void DisplayOrientationChanged( uint32 aDisplayIndex,
           GraphicsOrientationType aType, GraphicsOrientationAngle aAngle )
           NO_THROW;

        virtual void RedrawWindow( const IWindow& aWindow ) NO_THROW;

    public: // IInputDeviceObserver

        virtual void InputKeyPressed( IInputDevice& aDevice,
            uint64 aTimeStamp, uint32 aKeyCode ) NO_THROW;

        virtual void InputKeyReleased( IInputDevice& aDevice,
           uint64 aTimeStamp,  uint32 aKeyCode ) NO_THROW;

        virtual void InputAxisMoved( IInputDevice& aDevice,
           uint64 aTimeStamp,  uint32 aAxisNumber, int32 aNewAxisValue )
           NO_THROW;

        virtual void DeviceDisconnected( IInputDevice& aDevice ) NO_THROW;

        virtual void DeviceConnected( IInputDevice& aDevice ) NO_THROW;

    private:

     virtual void Draw();
     virtual void Cleanup();

    private:

        /// Idle process
        IIdle* mIdle;

        /// Pointer to the application state object.
        IApplicationState* mApplicationState;

        /// Application display object
        IDisplay* mDisplay;

        /// Application window
        IWindow* mWindow;

        /// Pointer to the graphics context object.
        IGraphicsContext* mGraphicsContext;

        /// Pointer to the backbuffer object.
        IBackBuffer* mBackBuffer;

        /// Pointer to the keypad device object.
        IInputDevice* mKeypadDevice;

        /// Application has focus or not
        bool32 mFocus;

        /// Indicates, that the application has stopped.
        bool32 mExit;

        /// My point
        CPoint mPoint;

        /// Screen size
        CSize mResolution;
    };
}

#endif /*MYRGAUI_H_*/
```

## MyRGAUI.cpp

```
#include <stdlib.h>

#include <errorcodes.h>         // ngi
#include <runtime.h>            // ngi
#include <displaymanager.h>     // ngi

#include "MyRGAUI.h"

using namespace ngi;
using namespace MyExample;

CMyRGAUI::CMyRGAUI() :
    mIdle( NULL ),
    mApplicationState( NULL ),
    mDisplay( NULL ),
    mWindow( NULL ),
    mGraphicsContext( NULL ),
    mBackBuffer( NULL ),
    mKeypadDevice( NULL ),
    mFocus( TRUE ),
    mExit( FALSE )
    {
    }

CMyRGAUI::~CMyRGAUI()
    {
    Cleanup();
    }

int32 CMyRGAUI::Initialize()
    {
    int32 errorCode;

    errorCode = CRuntime::CreateInstance( mIdle );
    if ( errorCode != OK ) return errorCode;

 errorCode = CRuntime::CreateInstance( mApplicationState );
 if ( errorCode != OK ) return errorCode;
 mApplicationState->SetObserver( this );

    //***************************************************************************
```


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```
    IDisplayManager* displayManager = NULL;
    errorCode = CRuntime::CreateInstance( displayManager );
    if ( errorCode != OK ) return errorCode;

    errorCode = displayManager->CreateDisplay( DISPLAY_NUMBER, mDisplay );
    displayManager->Release();
    if( errorCode != OK ) return errorCode;

    IDisplayConfiguration* displayConfig = NULL;
    errorCode = mDisplay->GetDisplayConfiguration( DISPLAY_CONFIGURATION,
        displayConfig );
    if ( errorCode != OK ) return errorCode;

    errorCode = mDisplay->CreateWindow( *displayConfig, mWindow );
    displayConfig->Release();
    if ( errorCode != OK ) return errorCode;
    mDisplay->SetObserver( this );

    //**********************************************************************

    IBackBufferFactory* bBFactory = NULL;

    errorCode = CRuntime::CreateInstance( bBFactory );
    if ( errorCode != OK ) return errorCode;

    //set the window handle to the required display mode
    //later this will be done by the Display API
    CBackBufferResolution bBResolution;
    uint32 colorDepthMask;
    errorCode = bBFactory->GetBackBufferConfiguration(
                    BACKBUFFER_CONFIG, BACKBUFFER_RESOLUTION_MASK,
                    BACKBUFFER_COLOR_MASK, bBResolution, colorDepthMask );
    if ( errorCode != OK )
        {
        bBFactory->Release();
        return errorCode;
        }
    errorCode = bBFactory->CreateBackBuffer( mWindow, bBResolution, colorDepthMask,
                                             BACKBUFFER_FLAG_ANTI_TEARING_DISABLED |
                                             BACKBUFFER_FLAG_CONSISTENT, mBackBuffer );
    bBFactory->Release();
    if ( errorCode != OK ) return errorCode;

    errorCode = CRuntime::CreateInstance( mGraphicsContext );
    if ( errorCode != OK ) return errorCode;
    mGraphicsContext->SetGraphicsDevice( *mBackBuffer );

    //**********************************************************************

    GraphicsOrientationType type;
    GraphicsOrientationAngle angle;
    mDisplay->GetOrientation( type, angle );
    mBackBuffer->Transpose( type, angle );

    //**********************************************************************

    mResolution = mGraphicsContext->GetGraphicsDevice()->GetSize();
    mPoint.mX = mResolution.mX / 2;
    mPoint.mY = mResolution.mY / 2;

    //**********************************************************************

    IInput* input = NULL;
    errorCode = CRuntime::CreateInstance( input );
    if ( errorCode != OK ) return errorCode;

    int32 number = input->GetDeviceCount();
    for( int32 i = 0; i < number && !mKeypadDevice; ++i )
        {
        CInputDeviceInfo deviceInfo;
        errorCode = input->GetDeviceInfo( i, deviceInfo );
        if ( errorCode != OK )
            {
            input->Release();
            return errorCode;
            }
        if( ( deviceInfo.mDeviceType == INPUT_DEVICE_TYPE_KEYPAD ) &&
            ( deviceInfo.mInterfaceType == INPUT_INTERFACE_TYPE_INTERNAL ) )
            {
            errorCode = input->CreateDevice( i, mKeypadDevice );
            if ( errorCode != OK )
                {
                input->Release();
                return errorCode;
                }
            }
        }
    input->Release();

    if( mKeypadDevice == NULL ) return ERROR_UNEXPECTED;

    errorCode = mKeypadDevice->Start();
    if ( errorCode != OK ) return errorCode;
    mKeypadDevice->SetObserver( this );

    return OK;
    }

void CMyRGAUI::Draw()
    {
    // copy the content of the graphics context to the ngi backbuffer
    if( mBackBuffer && ( mBackBuffer->Lock() == OK ) )
        {
        CRect clearRegion = CRect( 0, 0, mResolution.mX, mResolution.mY );
        mGraphicsContext->ClearRegion( COLOR_BACKGROUND, clearRegion,
                                       GRAPHICS_FORMAT_RGB888 );

        CRect square = CRect( mPoint.mX - 5, mPoint.mY - 5, 10, 10);
        mGraphicsContext->ClearRegion( COLOR_BLUE, square,
                                       GRAPHICS_FORMAT_RGB888 );

        int32 x = random() % mResolution.mX;
        int32 y = random() % mResolution.mY;

        CRect rand = CRect( x - 5, y - 5, 10, 10);
        mGraphicsContext->ClearRegion( COLOR_GRAY, rand,
                                       GRAPHICS_FORMAT_RGB888 );
        mBackBuffer->Unlock();
        mBackBuffer->Swap( TRUE );
```


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```
        }
    }

void CMyRGAUI::Run()
    {
    while ( mExit == FALSE )
        {
 if( mFocus )
     {
     Draw();
     mIdle->Process( 2000, TRUE );
     }
 else
     {
     mIdle->Process( 0, TRUE );
     }
 }
    }

void CMyRGAUI::Cleanup()
    {
    if( mBackBuffer )
        {
        mBackBuffer->Release();
        mBackBuffer = NULL;
        }
    if( mGraphicsContext )
        {
        mGraphicsContext->Release();
        mGraphicsContext = NULL;
        }
    if( mWindow )
        {
        mWindow->Release();
        mWindow = NULL;
        }
    if( mDisplay )
        {
        mDisplay->SetObserver( NULL );
        mDisplay->Release();
        mDisplay = NULL;
        }
    if( mKeypadDevice )
        {
        mKeypadDevice->SetObserver( NULL );
        mKeypadDevice->Release();
        mKeypadDevice = NULL;
        }
    if( mApplicationState )
        {
        mApplicationState->SetObserver( NULL );
        mApplicationState->Release();
        mApplicationState = NULL;
        }
    if( mIdle )
        {
        mIdle->Release();
        mIdle = NULL;
        }
    }

void CMyRGAUI::FocusGained() NO_THROW
    {
    mFocus = TRUE;
    }

void CMyRGAUI::FocusLost() NO_THROW
    {
    mFocus = FALSE;
    }

void CMyRGAUI::ExitRequested() NO_THROW
    {
    mExit = TRUE;
    }

void CMyRGAUI::DisplayOrientationChanged(
    uint32 aDisplayIndex,
    GraphicsOrientationType aType,
    GraphicsOrientationAngle aAngle ) NO_THROW
    {
    if( aDisplayIndex == DISPLAY_NUMBER )
        {
        mBackBuffer->Transpose( aType, aAngle );

        mResolution = mGraphicsContext->GetGraphicsDevice()->GetSize();
     if ( mPoint.mX > mResolution.mX ) mPoint.mX = mResolution.mX;
     if ( mPoint.mY > mResolution.mY ) mPoint.mY = mResolution.mY;
        }
    }

void CMyRGAUI::RedrawWindow( const IWindow& /*aWindow*/ ) NO_THROW
 {
 Draw();
 }

void CMyRGAUI::InputKeyPressed(
    IInputDevice& /*aDevice*/,
    uint64 /*aTimeStamp*/,
    uint32 aKeyCode ) NO_THROW
    {
    switch ( aKeyCode )
 {
        case INPUT_KEY_LSK:
        case INPUT_KEY_RSK:
            {
     mFocus = FALSE;
            mExit = TRUE;
     break;
     }
 case INPUT_KEY_DIGITAL_UP:
     {
     if ( mPoint.mY > 0 ) mPoint.mY--;
     break;
     }
 case INPUT_KEY_DIGITAL_DOWN:
     {
     if ( mPoint.mY < mResolution.mY ) mPoint.mY++;
     break;
     }
```


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```
 case INPUT_KEY_DIGITAL_LEFT:
     {
     if ( mPoint.mX > 0 ) mPoint.mX--;
     break;
     }
 case INPUT_KEY_DIGITAL_RIGHT:
     {
     if ( mPoint.mX < mResolution.mX ) mPoint.mX++;
     break;
     }
        }
    }

void CMyRGAUI::InputKeyReleased(
    IInputDevice& /*aDevice*/,
    uint64 /*aTimeStamp*/,
    uint32 /*aKeyCode*/ ) NO_THROW
    {
    }

void CMyRGAUI::InputAxisMoved(
    IInputDevice& /*aDevice*/,
    uint64 /*aTimeStamp*/,
    uint32 /*aAxisNumber*/,
    int32 /*aNewAxisValue*/ ) NO_THROW
    {
    }

void CMyRGAUI::DeviceDisconnected( IInputDevice& /*aDevice*/ ) NO_THROW
    {
    }

void CMyRGAUI::DeviceConnected( IInputDevice& /*aDevice*/ ) NO_THROW
    {
    }
```

## Sources

- File:MyApplication.zip

Here are the sources for a more advanced example also:

- File:RGA Morse Code Example.zip

## Links

- Introduction to RGA
- Using RGA with Carbide.c++
- Open C/C++ Plug-ins for S60 3rd Edition

Media:Example.ogg


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