# NintendoWare for CTR

## Layout Programmers Guide

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PROVISIONAL TRANSLATION

**The content of this document is highly confidential and should be handled accordingly.**

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# 1 Introduction

The lyt library, which is included in the NintendoWare for CTR (NintendoWare) LayoutLib package, is a library designed for CTR game layout programming. The library enables you to display on CTR the layout data that was created with the NintendoWare layout development tool, NW4C_LayoutEditor.

This document explains the necessary steps for using the lyt library to put together a layout program. The document first describes how to build the layout program development environment. It then uses sample demos to explain in concrete terms how to use the layout program. Finally, it describes the structure of the lyt library, the classes that have been prepared, and how they interrelate.

To learn more about the individual classes, please read the Function Reference.

# 2 Layout Program Development Environment

This chapter explains how to build the layout program development environment.

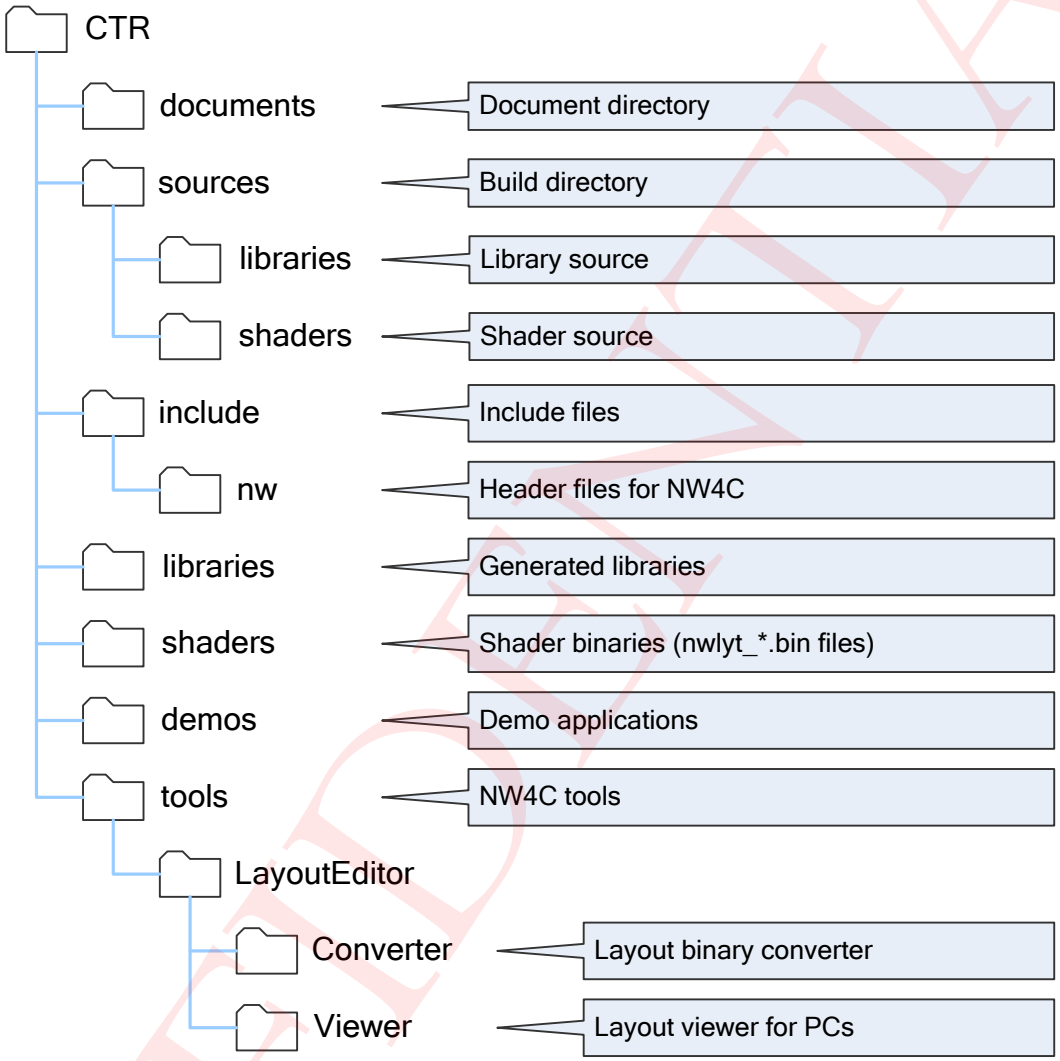
## 2.1 lyt Library

The layout program is put together using the lyt library. This library is included in the NintendoWare package.

## 2.2 Directory Structure

In the directory structure of the lyt library, `$NW4C_ROOT` represents the NintendoWare install directory, `NintendoWare/CTR`.

**Figure 2-1 Directory Structure**




## 2.3 Development Using the lyt Library

To develop using the lyt library, you configure the settings described below.

### 2.3.1 Configure the NintendoWare Build Environment

You first need to construct the NintendoWare build environment. For details, read the Programmers Guide.

### 2.3.2 Include the Build Definitions

The CTR_SDK contains a definitions file for building CTR programs using the OMake build system.

The NintendoWare package provides a definitions file for adding the definitions needed to use the NintendoWare library.

The OMake configuration file has OMakeroot in the top directory of the project and OMakefile in a subdirectory. Usually the NintendoWare definitions file is included to OMakeroot.

**Code 2-1 Including the Build Definitions File**

```
include $(getenv NW4C_ROOT)/build/omake/commondefs
```

In this way you can add specifications for links to library files needed for lyt library use and the include path.

### 2.3.3 Position the Shader Binary

The shader binary necessary for the lyt library is located in the `shaders` directory of the ROM file system.

The filename for the shader binary necessary for the lyt library is defined as `NW_LYT_SHADER_NAMES` in the build definitions file.

> **Note:** Files in the directory specified as `ROMFS_ROOT` by OMakefile are located in the ROM file system.

### 2.3.4 Position the Layout Data

The layout data created by the layout designer are passed to the programmer in folders containing the layout and animation data and binary font and texture data.

To use this data, the programmer needs to place them in the ROM file system.

> **Note:** For the lyt library samples, these files are archived and then placed here.

# 3 Quick Start

In this chapter a sample demo is used as an example to explain how to put together a simple layout program.

First, we build and execute the sample demo. Then, we look at the source code to see how the layout program is put together.

## 3.1 Executing the Sample Demo

### 3.1.1 Sample Demo Location

The sample demos are stored in the `$NW4C_ROOT/demos/lyt` directory. For explanatory purposes we will use the demo named `simple`.

### 3.1.2 Building the Sample Demo

To build the sample lyt demo,move the directory where the sample resides and the run `omake`.

**Code 3-1 Demo Build**

```
$ cd $NW4C_ROOT/demos/lyt/simple
$ omake
```

If the build is successful, the file `simple.cci` will be created in the `simple/images/CTR-TS.Process.MPCore.fast/Development/ directory`.

| **Note:** The actual directory name will differ depending on the build option. |
|---|

### 3.1.3 Running the Sample Demo

To run the sample demo, load the created file `simple.cci` into the PARTNER-CTR debugger. To do this, select **File (F)** > **Load (L)** from the PARTNER-CTR debugger and open `simple.cci.`

Next, select **Run (R)** > **Run Program (G)** to start the sample program. If the sample demo starts normally, the layout panes will display as they are animated in the screen of the actual hardware..

## 3.2 Source Code

This section explains the layout program by looking at the source code. This source code is from the file `main.cpp`, located in the `$NW4C_ROOT/ demos/lyt/simple/sources` directory. Comments have been omitted, as well as portions of the code that are irrelevant to an explanation of the layout program.

**Code 3-2 main.cpp for simple demo**

```
#include <GLES2/gl2.h>
#include <nn.h>
#include <nn/fs.h>
#include <nw/sdk.h>
#include <nw/demo.h>
#include <nw/lyt.h>

namespace
{

void
InitGX()
{
    glClearColor(0.3f, 0.3f, 0.3f, 1.0f);
}

void
InitDraw(int width, int height)
{
    // Color buffer information
    // Face toward LCD and substitute width and height
    const nw::font::ColorBufferInfo colBufInfo =
    {
        height, width, PICA_DATA_DEPTH24_STENCIL8_EXT
    };

    const u32 commands[] =
    {
        // Billboard settings
        NW_FONT_CMD_SET_VIEWPORT(0, 0, colBufInfo.width, colBufInfo.height),

        // Disable scissoring
        NW_FONT_CMD_SET_DISABLE_SCISSOR(colBufInfo),

        // Disable w buffer
        // Set depth range
        // Disable polygon offset
        NW_FONT_CMD_SET_WBUFFER_DEPTHRANGE_POLYGONOFFSET(
            0.0f,         // wScale : 0.0 disables w buffer
            0.0f,         // depth range near
            1.0f,         // depth range far
```

```
            0,           // polygon offset units : 0.0 disables polygon offset
            colBufInfo),
    };

    nngxAdd3DCommand(commands, sizeof(commands), true);

    static const u32 constCommands[] =
    {
        // Disable culling
        NW_FONT_CMD_SET_CULL_FACE(NW_FONT_CMD_CULL_FACE_DISABLE),

        // Disable stencil test
        NW_FONT_CMD_SET_DISABLE_STENCIL_TEST(),

        // Disable depth test
        // All components of color buffer can be overwritten
        NW_FONT_CMD_SET_DEPTH_FUNC_COLOR_MASK(
            false,  // isDepthTestEnabled
            0,     // depthFunc
            true,   // depthMask
            true,   // red
            true,   // green
            true,   // blue
            true),  // alpha

        // Disable early depth test
        NW_FONT_CMD_SET_ENABLE_EARLY_DEPTH_TEST(false),

        // Restrict framebuffer access
        NW_FONT_CMD_SET_FBACCESS(
            true,   // colorRead
            true,   // colorWrite
            false,  // depthRead
            false,  // depthWrite
            false,  // stencilRead
            false), // stencilWrite
    };

    nngxAdd3DCommand(constCommands, sizeof(constCommands), true);
}

void
```

```
SetupCamera(nw::lyt::DrawInfo& drawInfo, const nw::lyt::Layout& layout)
{
    nw::ut::Rect layoutRect = layout.GetLayoutRect();

    f32 znear = 0.f;
    f32 zfar = 500.f;

    nw::math::MTX44 projMtx;
    nw::math::MTX44OrthoPivot(
        &projMtx,
        layoutRect.left,   // left
        layoutRect.right,  // right
        layoutRect.bottom, // bottom
        layoutRect.top,    // top
        znear,
        zfar,
        nw::math::PIVOT_UPSIDE_TO_TOP);
    drawInfo.SetProjectionMtx(projMtx);

    nw::math::VEC3 pos(0, 0, 1);
    nw::math::VEC3 up(0, 1, 0);
    nw::math::VEC3 target(0, 0, 0);

    nw::math::MTX34 viewMtx;
    nw::math::MTX34LookAt(&viewMtx, &pos, &up, &target);
    drawInfo.SetViewMtx(viewMtx);
}

}   // namespace {anonymous}

/*---------------------------------------------------------------------------*
  Main functions of @brief sample
 *---------------------------------------------------------------------------*/
void
nnMain()
{
    // Initialize the basic library
    nn::os::Initialize();
    nn::fs::Initialize();

    // Initialize application
    nw::demo::SimpleApp& demoApp = nw::demo::SimpleApp::GetInstance();
```

```
demoApp.Initialize();



// Initialize the layout library
nw::lyt::Initialize(&demoApp.GetAllocator(), &demoApp.GetDeviceAllocator());

// Create layout
nw::lyt::Layout* pLayout = new nw::lyt::Layout();

// Load layout's binary resource (archive)
File fileLayout;
if (!fileLayout.Read(
        NW_DEMO_FILE_PATH(L"layout.arc"),
        demoApp.GetDeviceAllocator()))

{
    NW_FATAL_ERROR("can not open layout archive.¥n");
}

// Specify root directory of binary resource and create resource accessor
nw::lyt::ArcResourceAccessor* pResAccessor
 = new nw::lyt::ArcResourceAccessor;
if (!pResAccessor->Attach(fileLayout.Buffer(), "."))
{
    NW_FATAL_ERROR("can not attach layout archive.¥n");
}

// Load layout resource
{
    const void* lytRes = pResAccessor->GetResource(0, "simple.bclyt");
    NW_NULL_ASSERT(lytRes);
    pLayout->Build(lytRes, pResAccessor);
}

nw::lyt::AnimTransform* pAnimTrans = 0;
// Load animation resource
{
    const void* lpaRes = pResAccessor->GetResource(0, "simple.bclan");
    NW_NULL_ASSERT(lpaRes);
    pAnimTrans = pLayout->CreateAnimTransform(lpaRes, pResAccessor);
    pLayout->BindAnimation(pAnimTrans);
```

```
}

f32 animFrame = 0;

nw::lyt::GraphicsResource graphicsResource;

// Load global resource file
{
    graphicsResource.StartSetup();
    const wchar_t* resourcePath = 0;
    for (int i = 0;
         (resourcePath = graphicsResource.GetResourcePath(i)) != NULL;
         ++i)
    {
        File file;
        if (!file.Read(resourcePath, demoApp.GetAllocator()))
        {
            NW_FATAL_ERROR("can not read lyt resource file.");
        }
        graphicsResource.SetResource(i, file.Buffer(), file.Size());
    }
    graphicsResource.FinishSetup();
}

nw::lyt::DrawInfo drawInfo;
drawInfo.SetGraphicsResource(&graphicsResource);

nw::lyt::Drawer drawer;
drawer.Initialize(graphicsResource);


InitGX();

bool mainloop = true;
while (mainloop)
{
    demoApp.SetRenderingTarget(demoApp.DISPLAY0);
    {
        glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);

        SetupCamera(drawInfo, *pLayout);
```

```
            InitDraw(demoApp.DISPLAY0_WIDTH, demoApp.DISPLAY0_HEIGHT);
            pLayout->Animate();
            pLayout->CalculateMtx(drawInfo);

            drawer.DrawBegin(drawInfo);
            drawer.Draw(pLayout, drawInfo);
            drawer.DrawEnd(drawInfo);

        }

        demoApp.SetRenderingTarget(demoApp.DISPLAY1);
        {
            glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
        }

        // Update framebufffer
        animFrame += 1.0f;
        while (animFrame >= pAnimTrans->GetFrameSize())
        {
            animFrame -= pAnimTrans->GetFrameSize();
        }
        pAnimTrans->SetFrame(animFrame);

        demoApp.SwapBuffer(demoApp.DISPLAY_BOTH);
    }

    delete pLayout;
    delete pResAccessor;

    demoApp.GetDeviceAllocator().Free(fileLayout.Buffer());
        }
```

### 3.2.1 Referenced Header Files

The header files are referenced as shown below.

**Code 3-3 Referenced Header Files**

```
#include <GLES2/gl2.h>
#include <nn.h>
#include <nn/fs.h>
 #include <nw/sdk.h>
 #include <nw/demo.h>
```

```
#include <nw/lyt.h>
```

`nw/lyt.h` is the header file for the lyt library. In order to use this library, you must reference this header file.

### 3.2.2 Namespace

The namespace for the lyt library is defined as `nw::lyt`.

For simplification, the namespace is shortened to `lyt`.

## 3.3 Initialization

In order to use the lyt library, first you conduct the following initialization process:

**Code 3-1 Initializing the library**

```
nw::lyt::Initialize(&demoApp.GetAllocator(), &demoApp.GetDeviceAllocator());
```

Two memory allocators are specified as arguments of the initialization function.

The first allocator allocates memory blocks from regular memory, while the second allocates memory blocks from device memory.

## 3.4 Creating a Layout

Create the Lyt::Layout class object.

**Code 3-2 Creating Layout**

```
nw::lyt::Layout* pLayout = new nw::lyt::Layout();
```

## 3.5 Loading the Layout Data

Before displaying the layout you need to load the necessary layout data. The data is loaded in units of layout resources and animation resources.

To load a layout resource, pass the starting address of the resource and the resource accessor to the `Build` function of the `lyt::Layout` class. The binary font and texture data required for layout display is loaded at this time.

To load an animation resource, pass the starting address of the resource and the resource accessor to the `CreateAnimTransform` function of the `lyt::Layout` class, and retrieve the pointer to the `lyt::AnimTransform` class that is created. Next, pass this pointer to the `BindAnimation` function of the `lyt::Layout` class in order to bind the animation to the pane and the material. The texture data used for texture pattern animation is loaded at this time.

**Code 3-6Loading the Layout Data**

```
// Create a resource accessor specifying the root directory
// for binary resources
nw::lyt::ArcResourceAccessor* pResAccessor
   = new nw::lyt::ArcResourceAccessor;
if (!pResAccessor->Attach(fileLayout.Buffer(), "."))
{
   NW_FATAL_ERROR("can not attach layout archive.¥n");
}
// Read the layout resource
{
   const void* lytRes = pResAccessor->GetResource(0, "simple.bclyt");
   NW_NULL_ASSERT(lytRes);
   pLayout->Build(lytRes, pResAccessor);
}

nw::lyt::AnimTransform* pAnimTrans = 0;
// Read the animation resource
{
   const void* lpaRes = pResAccessor->GetResource(0, "simple.bclan");
   NW_NULL_ASSERT(lpaRes);
   pAnimTrans = pLayout->CreateAnimTransform(lpaRes, pResAccessor);
   pLayout->BindAnimation(pAnimTrans);
}
```

## 3.6 Initializing Graphics Resources

The `GraphicsResource` class maintains objects used by shader (and other) programs for rendering. Graphics resources are initialized as shown in Code 3-7.

**Code 3-7 Initializing Graphics Resources**

```
nw::lyt::GraphicsResource graphicsResource;
   // Read the global resource files
   {
       graphicsResource.StartSetup();
```

```
      const wchar_t* resourcePath = 0;
      for (int i = 0;
          (resourcePath = graphicsResource.GetResourcePath(i)) != NULL;
          ++i)
      {
         File file;
         if (!file.Read(resourcePath, demoApp.GetAllocator()))        {
            NW_FATAL_ERROR("can not read lyt resource file.");
         }
         graphicsResource.SetResource(i, file.Buffer(), file.Size());
      }
      graphicsResource.FinishSetup();
   }
```

An initialized graphics resource is configured in the rendering information (`DrawInfo`).

**Code 3-8 Initializing Graphics Resources**

```
nw::lyt::DrawInfo drawInfo;
drawInfo.SetGraphicsResource(&graphicsResource);
```

## 3.7 Initializing Drawer

Create the Drawer class object for drawing the layout.

**Code 3-3 Initialization of Drawer**

```
     nw::lyt::Drawer drawer;
     drawer.Initialize(graphicsResource);
```

## 3.8 Setting Up the Camera

The lyt library uses polygons and textures to display layouts. The application must configure the rectangular region in which the layout will be displayed as well as the projection and modelview matrix, which are required for rendering.

**Code 3-10 Setting Up the Camera**

```
void
SetupCamera(nw::lyt:: DrawInfo& drawInfo, const nw::lyt::Layout& layout)
{
   nw::ut::Rect layoutRect = layout.GetLayoutRect();
```

```
   f32 znear = 0.f;
   f32 zfar = 500.f;

   // Set the projection matrix to an orthogonal projection
   //(The Layout data is sideways, so the direction changes)
   nw::math::MTX44 projMtx;
   nw::math:: MTX44OrthoPivot (
      &projMtx,
      layoutRect.left,    // left
      layoutRect.right,   // right
      layoutRect.bottom, // bottom
      layoutRect.top,     // top
            znear,

      znear,
      zfar,
      nw::math::PIVOT_UPSIDE_TO_TOP);
     drawInfo.SetProjectionMtx(projMtx);


   // Set the model view matrix
  // (The Layout data is sideways, so the upward direction of the screed is the x-
direction of the layout
     nw::math::VEC3 pos(0, 0, 1);
     nw::math::VEC3 up(0, 1, 0);
     nw::math::VEC3 target(0, 0, 0);

    nw::math::MTX34 viewMtx;
    nw::math::MTX34LookAt(&viewMtx, &pos, &up, &target);
    drawInfo.SetViewMtx(viewMtx);
}
```

## 3.9 Displaying the Layout

For the layout to be displayed, first the animation result is calculated for the current playback frame, then the matrix for display is calculated, and finally the layout is rendered.

The Drawer class is used for layout drawing.

**Code 3-11 Displaying the Layout**

```
InitDraw(demoApp.DISPLAY0_WIDTH, demoApp.DISPLAY0_HEIGHT);
pLayout->Animate();
```

```
pLayout->CalculateMtx(drawInfo);

drawer.DrawBegin(drawInfo);
drawer.Draw(pLayout, drawInfo);
drawer.DrawEnd(drawInfo);
```

The lyt library does not configure the following GL settings and leaves that up the application:.

- Culling
- Depth test
- Stencil test
- Scissoring
- Masking
- Polygon offfset
- Early depth test

In the sample demo, the `InitDraw` function configures the appropriate drawing settings for 2D expression.

**Code 312 Configuring the Render Mode**

```
void
InitDraw(int width, int height)
{
   // Color buffer information
   // Face toward LCD and substitute width and height
   const nw::font::ColorBufferInfo colBufInfo =
   {
      height, width, PICA_DATA_DEPTH24_STENCIL8_EXT
   };

   const u32 commands[] =
   {
      // Set Viewport
      NW_FONT_CMD_SET_VIEWPORT(0, 0, colBufInfo.width, colBufInfo.height),

      // Disable scissoring
      NW_FONT_CMD_SET_DISABLE_SCISSOR(colBufInfo),

      // Disable w buffer
      // Set depth range
```

```
    // Disable polygom offset
    NW_FONT_CMD_SET_WBUFFER_DEPTHRANGE_POLYGONOFFSET(
        0.0f,         // wScale : 0.0 disables w buffer
        0.0f,         // depth range near
        1.0f,         // depth range far
        0,           // polygon offset units : 0.0 disables polygon offset
        colBufInfo),
};

nngxAdd3DCommand(commands, sizeof(commands), true);

static const u32 constCommands[] =
{
    // Disable culling
    NW_FONT_CMD_SET_CULL_FACE(NW_FONT_CMD_CULL_FACE_DISABLE),

    // Disable stencil test
    NW_FONT_CMD_SET_DISABLE_STENCIL_TEST(),

    // Disabledepth test
    // All color buffer components can be overwritten
    NW_FONT_CMD_SET_DEPTH_FUNC_COLOR_MASK(
        false,  // isDepthTestEnabled
        0,     // depthFunc
        true,   // depthMask
        true,   // red
        true,   // green
        true,   // blue
        true),  // alpha

    // Disable early depth test
    NW_FONT_CMD_SET_ENABLE_EARLY_DEPTH_TEST(false),

    // Restrict framebuffer access
    NW_FONT_CMD_SET_FBACCESS(
        true,   // colorRead
        true,   // colorWrite
        false,  // depthRead
        false,  // depthWrite
        false,  // stencilRead
        false), // stencilWrite
};
```

```
    nngxAdd3DCommand(constCommands, sizeof(constCommands), true);
}
```

## 3.10 Animation Process

The animation's playback frame is updated to the frame that will play when it is time for the next drawing process to occur.

**Code 3-13 Frame Processing**

```
// Update frame
animFrame += 1.0f;
while (animFrame >= pAnimTrans->GetFrameSize())
{
    animFrame -= pAnimTrans->GetFrameSize();
}
pAnimTrans->SetFrame(animFrame);
```

The lyt library does not automatically update the playback frame, so the program must set the next frame that will be played. If you are playing animation to match the video frames, your program should update the playback frame in every video frame.

# 4 Basic Operations in the Pane

This chapter explains a number of basic operations that can be performed in the pane in which the layout is being displayed.

For details about the functions introduced here (as well as some other functions not mentioned here), see the Function Reference Manual.

## 4.1 Search for Panes

The panes in which layouts are displayed are all child panes of a single root pane. To search for a pane, get the pointer to the root pane using the `lyt::Layout` class function `GetRootPane`, then search using the `lyt::Layout` class function `FindPaneByName` to get the target pane.

**Code 4-1 Searching for Panes**

```
// Get the root pane
nw::lyt::Pane* pRoot = pLayout->GetRootPane();

// Search for pane using name
nw::lyt::Pane* pTarget = pRoot->FindPaneByName("Pane_0");
```

## 4.2 Move, Rotate, and Enlarge Panes

Use the functions `SetTranslate`, `SetRotate`, and `SetScale` to move, rotate, and enlarge panes. Each modification affects all child panes.

Use the `SetSize` function to change the size of the pane (and not the scale). Use the `SetSRTElement` function to change only specified elements of the pane.

**Code 4-2 Move, Rotate, and Enlarge Panes**

```
// Move the pane to local coordinates (120.0, 120.0, 0.0)
pPane->SetTranslate(nw::math::VEC3(120.0f, 120.0f, 0.0f));

// Rotate the pane 30 degrees clockwise
pPane->SetRotate(nw::math::VEC3(0.0f, 0.0f, -30.0f));

// Show the pane at double the original size
pPane->SetScale(nw::math::VEC2(2.0f, 2.0f));

// Change the size of the pane to (128.0, 128.0)
pPane->SetSize(nw::lyt::Size(128.0f, 128.0f));
```

## 4.3 Show and Hide Panes

Use the `SetVisible` function to toggle between showing and hiding the display of panes. The change also affects all child panes.

**Code 4-3 Show and Hide Panes**

```
// Hide the pane and all its children
pPane->SetVisible(false);

// Show the pane and all its children
pPane->SetVisible(true);
```

## 4.4 Control Animation

There are also functions to bind and unbind animation to only a specific pane, or to it and its child panes, and to enable and disable animations.

**Code 4-4 Control Animation**

```
// Bind an animation (only to the specified pane)
pPane->BindAnimation(pAnm1, false);

// Bind an animation (To the specified pane and its children)
pPane->BindAnimation(pAnm2, true);

// Disable animation
pPane->SetAnimationEnable(pAnm2, false, true);

// Unbind animation
pPane->UnbindAnimation(pAnm2);
```

# 5 Group Features

This chapter explains how to use the layout library's Group features.

## 5.1 Structure of Group Features

The Group features are comprised of these two classes:

- Group
- GroupContainer

### 5.1.1 Group

The `Group` class is for grouping multiple panes and processing them as a group. This is used to control groups of panes for specific purposes.

### 5.1.2 GroupContainer

The `GroupContainer` class is for managing the multiple groups that exist in the layout. For the layout to access groups, it must search for them via `GroupContainer`.

## 5.2 Executing the Group Sample Demo

The sample demo named Group makes use of the Group features, so let's execute that sample demo.

### 5.2.1 Starting the Sample Demo

The sample demo is stored in the directory `$NW4C_ROOT/demos/lyt/group`, so start it the same way you start the simple demo.

### 5.2.2 Explanation of Display

The screen displays nine picture panes. These nine panes are divided into three groups (left, center, and right) of three vertical panes each. The panes that belong to the current group are all shown rotated 30 degrees counterclockwise.

### 5.2.3 Controlling the Display

Press the A Button of Controller 1 to switch the current pane.

## 5.3 Searching for Groups

To search for a group, use the `GroupContainer` class function `FindGroupByName` and search using the group name.

**Code 5-1 Searching for a Group**

```
pCurrentGroup =
   pLayout->GetGroupContainer()->FindGroupByName(groupName[currentGroup]);
```

Instead of searching by name, you can also get a list of the groups in `GroupContainer` by using the `GetGroupList` function.

**Code 5-2 Getting the List of Groups**

```
nw::lyt::GroupList& groupList =
       pLayout->GetGroupContainer()->GetGroupList();

for (nw::lyt::GroupList::Iterator it = groupList.GetBeginIter();
       it != groupList.GetEndIter(); ++it)
{
   // Here is where you would describe processes for each group (it->mTarget).
}
```

## 5.4 Getting Panes That Belong to a Group

Use the `GetPaneList` function to get the list of panes that belong to a group (`lyt::PaneLinkList`) and access them via an iterator.

**Code 5-3 Getting Panes That Belong to a Group**

```
nw::lyt::PaneLinkList& paneList = pCurrentGroup->GetPaneList();

for (nw::lyt::PaneLinkList::Iterator it = paneList.GetBeginIter();
       it != paneList.GetEndIter(); ++it)
{
   it->mTarget->SetRotate(nw::math::VEC3(0.f, 0.f, 30.f));
}
```

# 6 Accessing Resources Processed With arc

The sample programs use layout data that have been archived.

The lyt library has features for accessing resources that have been archived. Unless you want to manage resources on your own, you can utilize the library's accessor for easy management of resources.

## 6.1 ArcResourceAccessor

This class manages a single arc file and accesses resources.

The type of the resource determines which directory is searched. Consequently, when you archive the output from the layout converter (`NW4C_LayoutConverter`), do not make any modifications, such as changing the file locations or directory names.

## 6.2 MultiArcResourceAccessor

This class manages multiple arc files and accesses resources.

If multiple layouts share use of the same texture images and font data, you can separate these layout resources from other resources and archive them separately. Then, when you load the resources, you can use this class to reduce the volume of content on the optical disc drive that holds the layout data.

For more details on how to use this class, see the `multiArc` sample demo.

## 6.3 Building Your Own Way to Access Resources

Instead of inheriting the `ResourceAccessor` class, you can build your own procedure for accessing resources.

To do this, override the `GetResource` function to return the resource's starting address and size from its type and name. The resource types are declared in the `nw/lyt/lyt_Resources.h` header file. If you are going to use the binary files that get output from the layout converter, be aware that the directory where these files get placed differ depending on the resource type.

To access your own resources, you also need to overide the various GetFont and GetTexture functions. You can implement this by using the `lyt::FontContainer` class and the `lyt::TextureContainer` class.

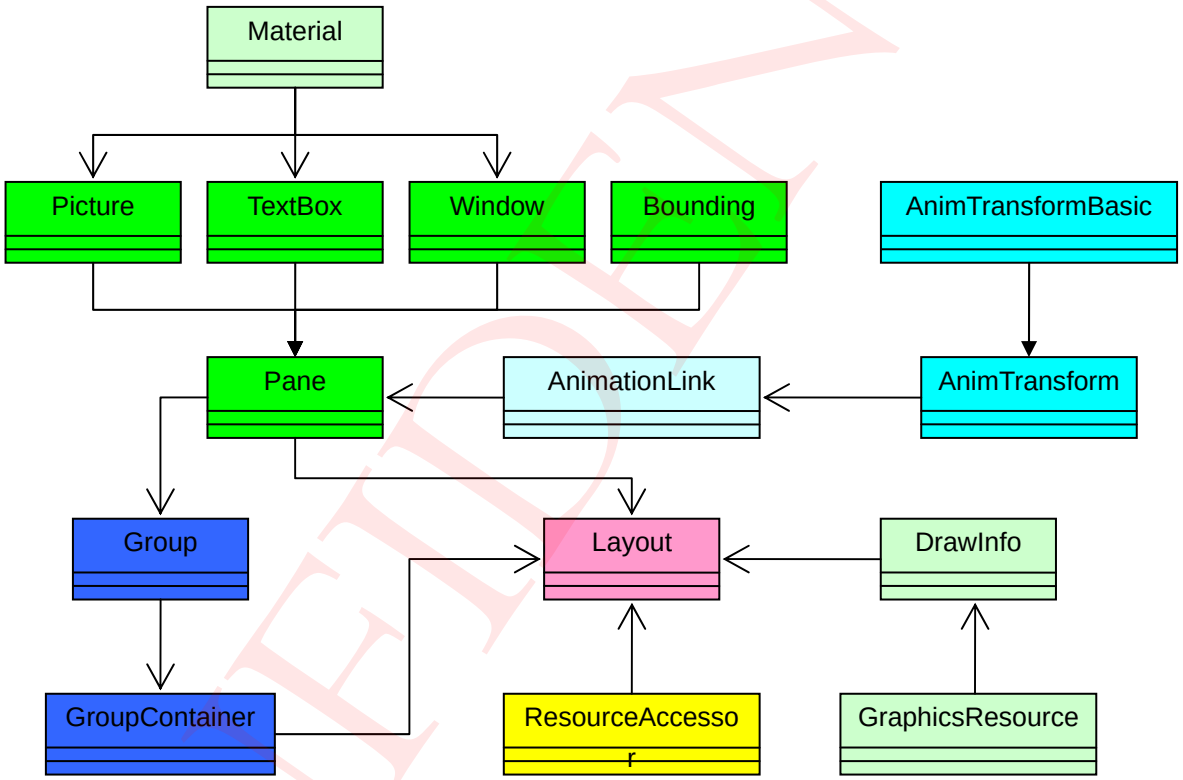
# 7 Structure of the lyt Library

This chapter looks at the structure of the lyt library.

## 7.1 Class Schematic

The schematic shows the structure of the classes of the `lyt` library.

**Figure 7-1 Class Schematic**




## 7.2 Descriptions of Classes

Table 7-1 presents an overview of the various classes.

**Table 7-1 Description of Classes**

| Category | Class | Description |
|---|---|---|
| System | `Layout` | Class for managing the overall layout system. |
| Resources | `ResourceAccessor` | Abstract class for entering layout data. |
| | `ArcResourceAccessor` | Concrete class of the ResourceAccessor class for handling archived layout data. |
| | `MultiArcResourceAccessor` | Concrete class of the ResourceAccessor class for handling multiple sets of archived layout data. |
| Group features | `Group` | Class for managing multiple panes. |
| | `GroupContainer` | Class for managing multiple groups in the layout data. |
| Panes | `Pane` | Base class for panes. |
| | `Picture` | Class for displaying pictures. |
| | `TextBox` | Class for displaying text. |
| | `Window` | Class for displaying windows. |
| | `Bounding` | Class used for hit checks. |
| Animations | `AnimationLink` | Class for linking panes and animations. |
| | `AnimTransform` | Base class for animations. |
| | `AnimTransformBasic` | Class for storing animation information. |
| Material | `Material` | Class for storing material information needed to display panes. |
| Drawing | `Drawer` | Class for drawing panes. |
| | `DrawInfo` | Class for storing the layout's drawing information. |
| | `GraphicsResource` | Class for maintaining global objects used when rendering. |

# 8 Revision History

| Version | Revision Date | Description |
|---|---|---|
| 1.45 | 2010/09/30 | • Revised text to reflect changes in the library's API<br>• Updated the sample code to be current |
| 1.4 | 2010/07/29 | • Revised text to reflect changes in the library's API<br>• Updated the description of the build method<br>• Updated the sample code to be current |
| 1.3 | 2010/06/28 | • Revised text to reflect changes in the library's API<br>• Updated the sample code to be current |
| 1.2 | 2010/02/19 | • Revised text to reflect changes in the library's API<br>• Revised sample code to be current<br>• Changed the format of the Revision History and moved it to the end of the document. |
| 1.1 | 2009/12/22 | • Revised sections that described "NintendoWare for Revolution". |
| 1.0 | 2009/10/30 | • Initial version. |