

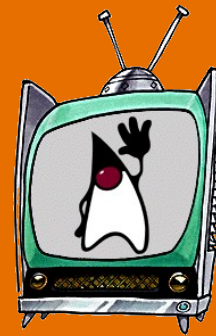


java.com.sun/javaone

Java™ Technology for Blu-ray and TV: Creating your own Blu-ray Java Discs

The Blu-ray Java Authoring Team:
Bill Foote, Chihiro Saito,
A. Sundararajan, Jaya Hangal

TS-5449



Talk Outline

- HD Cookbook Community Overview
 - Target: Blu-ray Disc, OCAP and MHP
 - Free, open-source resources
- Animation Framework
 - Drawing Optimization
- GRIN Scene Graph
 - Declarative Graphics and Animation
 - Scene Graph and Asset Compilation
- Disc Creation Tools
 - Netbeans Plugin
 - Security and Signing
- JavaFX and BD-J
 - In authoring and at runtime
- Demos

HD Cookbook Community

Animation Framework

Bill Foote

HD Cookbook Community

➤ We want to spur creativity and innovation in new media

- “Televisual” media – in the living room
- Innovation comes from the grassroots
 - A bit of production infrastructure needed
 - Some prosumer tools are needed too
- To make a Blu-ray disc from scratch, you need:
 - HD Camera
 - Video Editing Suite
 - Disc Image Creation Tool
 - Media Format Conversion (transcoding, ...)
 - Java programming “elbow grease”
 - A computer with a Blu-ray drive and a BD-RW disc

➤ Targeted platforms: PBP-class TV devices

- Blu-ray Disc, OCAP, MHP
- IPTV devices

HD Cookbook Community

➤ Open-source Project

- <https://hdcookbook.dev.java.net>
- Source Code Repository
- Authoring Guidelines Wiki
- Discussion Forum
 - One of the most active ME forums
 - e-mail gateway, too!

➤ Disc Production Tools

- disc packaging, signing
- Asset preparation (e.g. sound file builder, cpistrip)
`packet[0] = (byte) (packet[0] & 0x3f);`

➤ Frameworks and Code for BD-J on-disc Applications

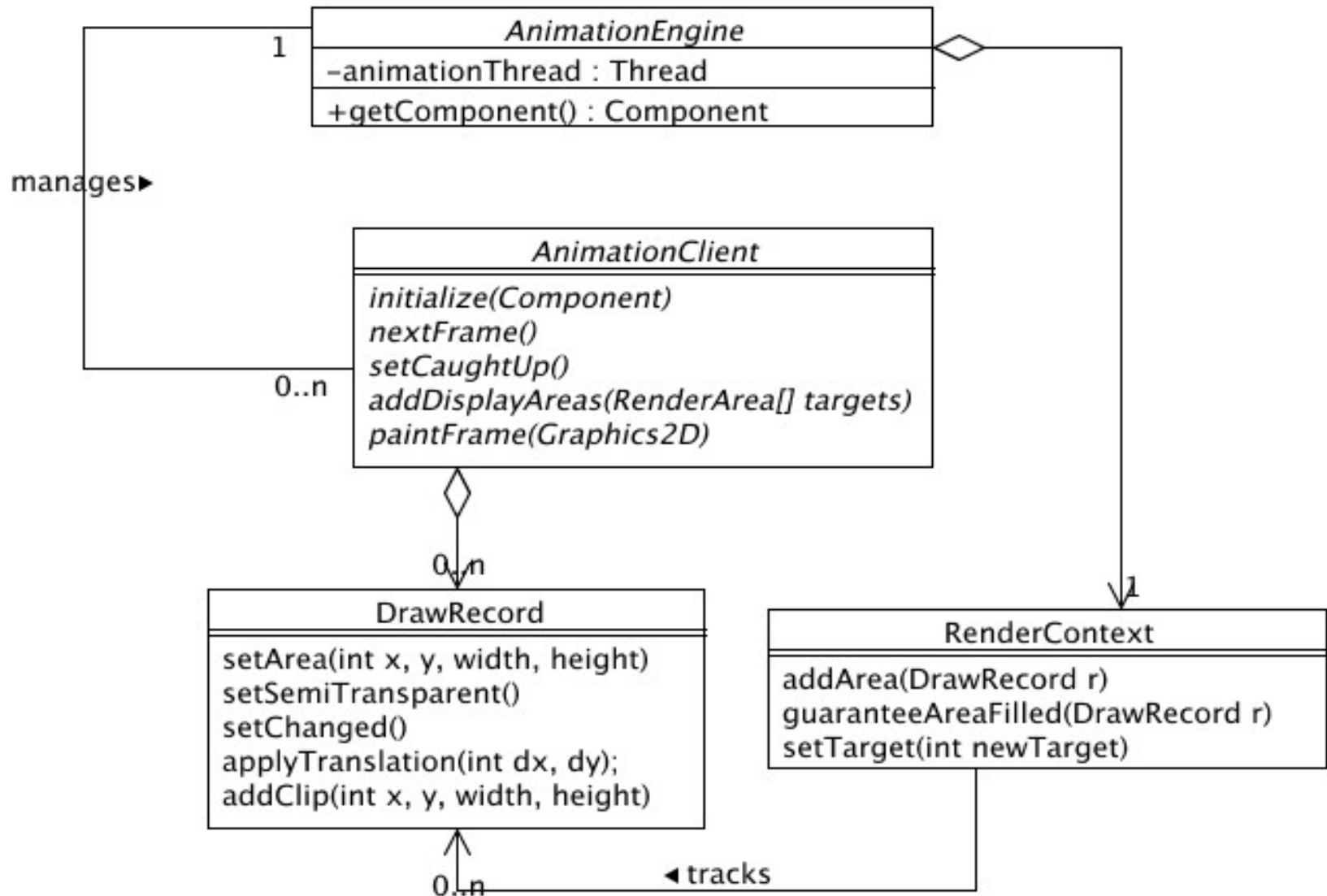
- Animation Framework
- Scene Graph
- Sample Disc
 - menu, game, bonus features

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Animation Framework

- Updates screen regularly (e.g. 24 frames/second)
- Provides time-based animation
 - If animation falls behind, frames are discarded
- Provides Double-buffering
- Optimizes Drawing
- Minimizes Object Allocation (avoids GC)
- Provides threading model for animated application

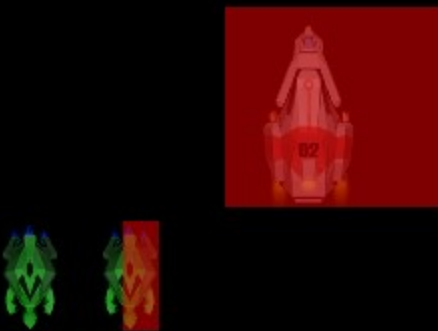


Animation Framework: Drawing Optimization

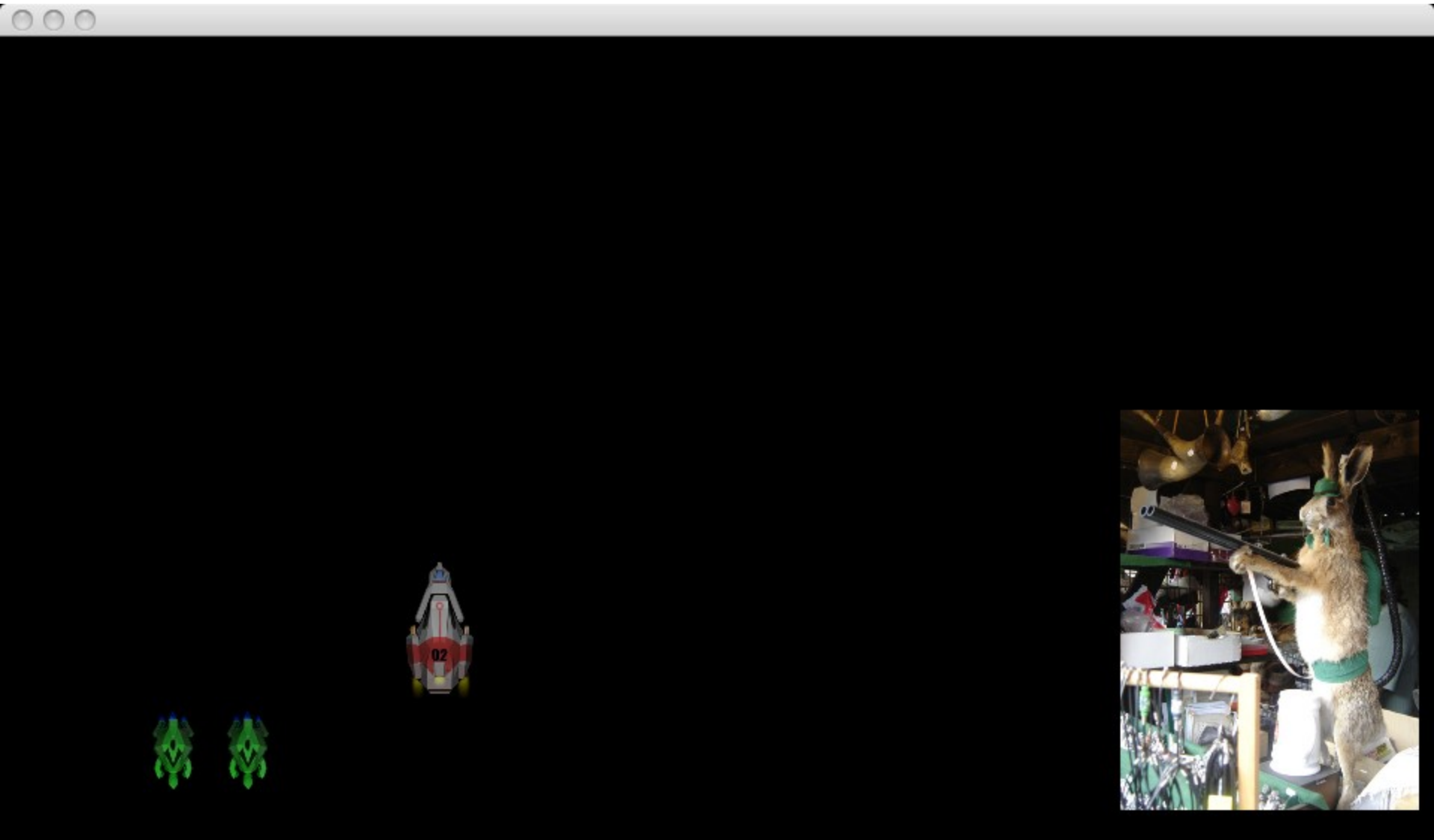
Only draw pixels that have changed...

```
private DrawRecord drawRecord;  
private boolean changed;  
  
public void addDisplayAreas(RenderContext  
                           context) {  
    drawRecord.setArea(x, y, width, height);  
    if (changed) {  
        drawRecord.setChanged();  
    }  
    context.addArea(drawRecord);  
}
```









GRIN Scene Graph

Chihiro Saito

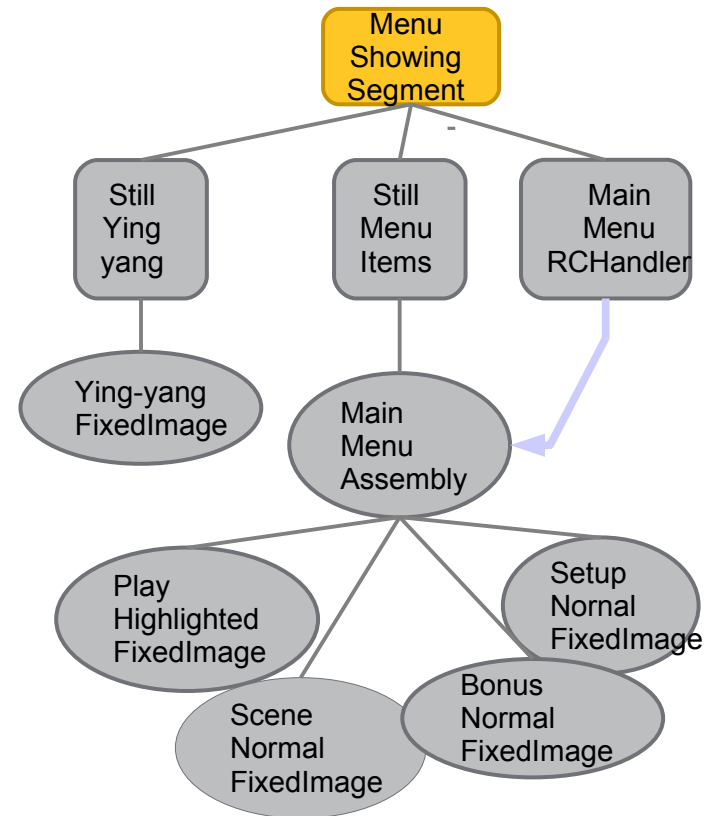
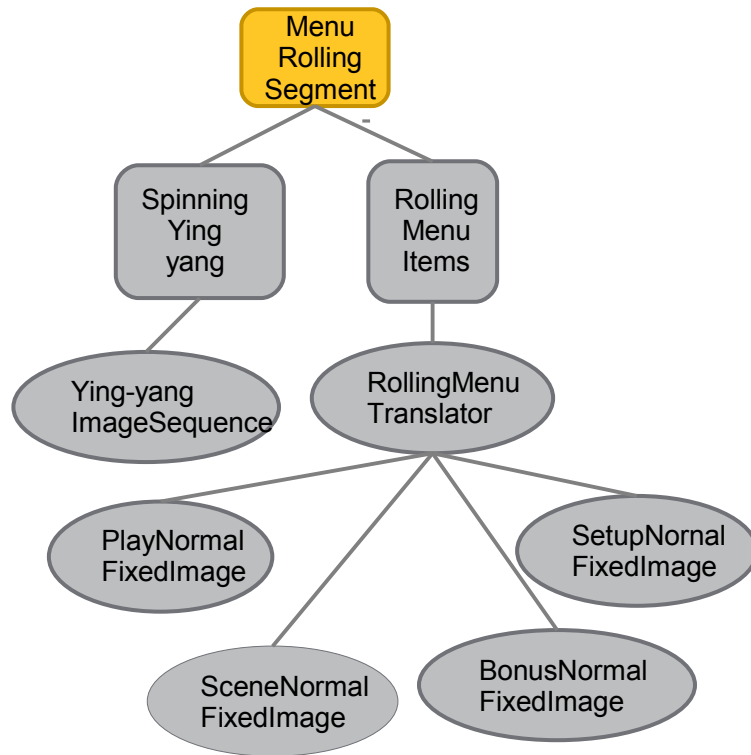
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What is a Scene Graph?

- **“Collection of nodes in a tree structure representing a graphical scene.”**
- Allows us to organize and display visual assets based on scenes, with user input handling and logic for transitioning between scenes.

Scene Graph Example using GRIN: Disc Main Menu Rollout Transition



UP

SCENES

BONUS



PLAY

SETUP

SCENES

BONUS

GRIN Scene Graph: Our Answer to the BD-J AWT Programming

- Targetted for BD-J : Runs on Personal Basis Profile (!!)
- Great focus on runtime efficiency
 - Small code size (on the order of 80K obfuscated)
 - Quick loading time
 - Avoidance of floating point operations
 - Minimal generation of heap objects
 - Efficient screen redraw optimization (Animation Framework)
 - Some complexity for developers as a consequence
- Easy to extend – users can add their own features
- Declaritive syntax, more designer oriented compared to the traditional desktop-oriented Widget development for Java

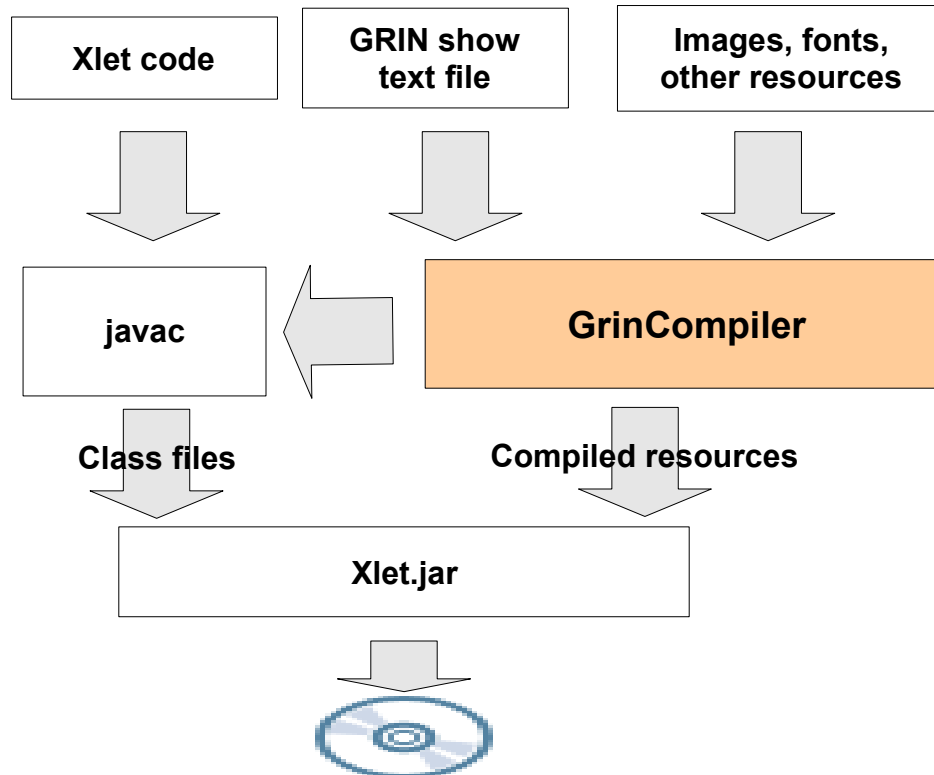


Comes with GrinView, our Scene Graph viewer for the desktop

GRINCompiler: Off-line Compilation of a “Show”

- Scenes should be written in a descriptive way at a design time, but should run efficiently on a disc.
- Do **off-line compilation** - take a human-readable Show file, create Show graph structure, apply optimization, then write it out as a binary file.

GRIN Off-line Compilation Workflow



- > Constructs Show
- > Applies Node transformation
- > Applies resource optimization
- > Output
 - GRIN binary show file
 - Image mosaic files
 - Possibly .java file(s)
 - Possibly other resources
- > GrinView supports both uncompiled and compiled Show file viewing

GRIN Show Node Types: Built-ins and Extensions

➤ Four major node types:

- Features, Modifiers, Commands, RCHandlers

➤ Build-in features

- Graphical primitives
 - Box, Text, FixedImage, ImageSequence
- Grouping nodes
 - Assembly, Group
- GrinCompiler and runtime helpers
 - SetTarget, “MosaicHint”, MenuAssembly

➤ Built-in modifiers (Feature subclasses)

- Clipped, Fade, Timer, SrcOver, InterporatedModel

➤ Commands – triggered during state or scene transition

➤ RCHandlers – handles user input

➤ Extension supported for Features(+modifiers) and Commands

Extensions: Customize GRIN To Suit Your Need!

- Extension mechanism supported for Feature(+modifier) and Command types
 - Can be a new graphical primitive, transformation logic, a way to call into to your BD-J library functionality, etc.
 - GRIN show text file also supports lightweight extension mechanism via “java_commands” syntax
 - Our external partner is building multiple independent extension “plug-ins” around GRIN.
- See HDCookbook xlets (BOOK:PlayVideo and BOOK:BioImage) and grin/samples/Scripts/CustomFeature (Oval) for an example.

Disc Creation Tools and Security

Jaya Hangal

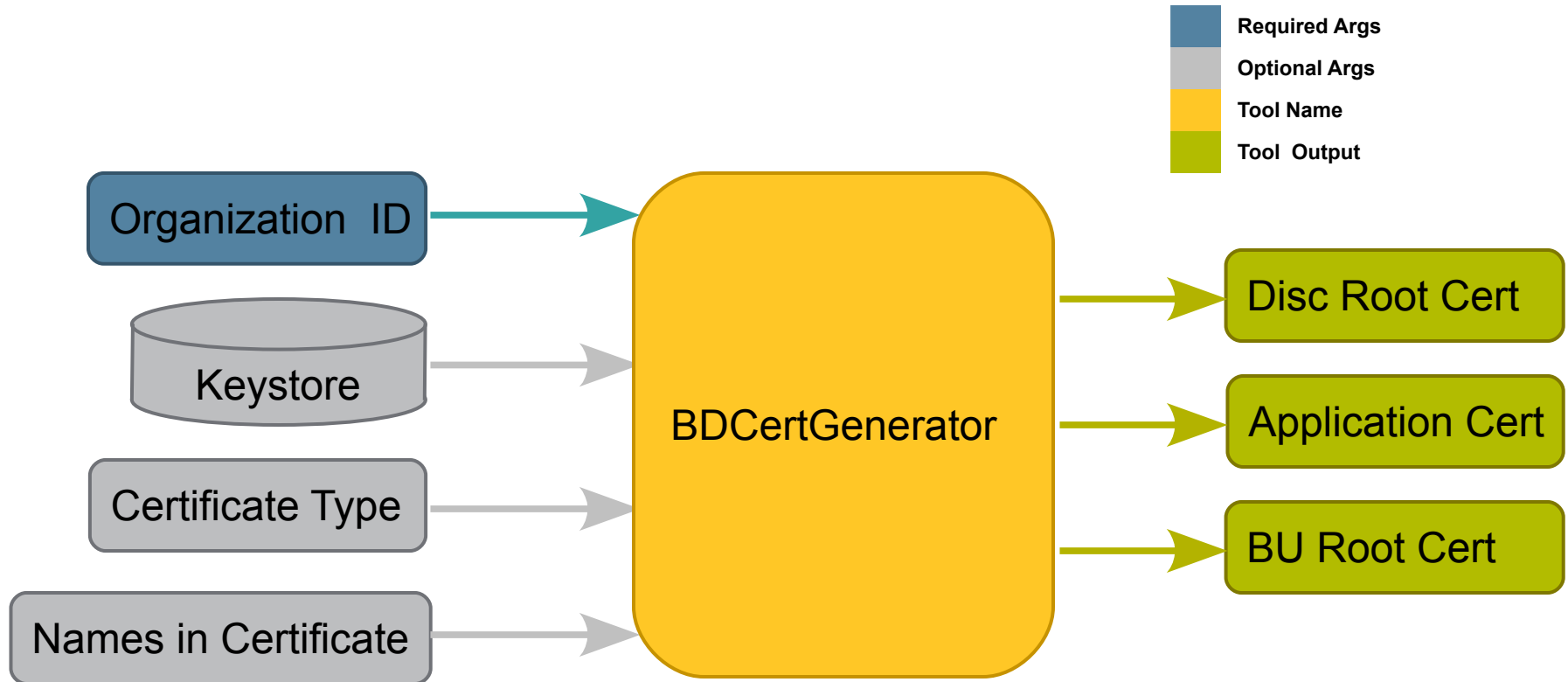
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Blu-ray Disk Creation Tools

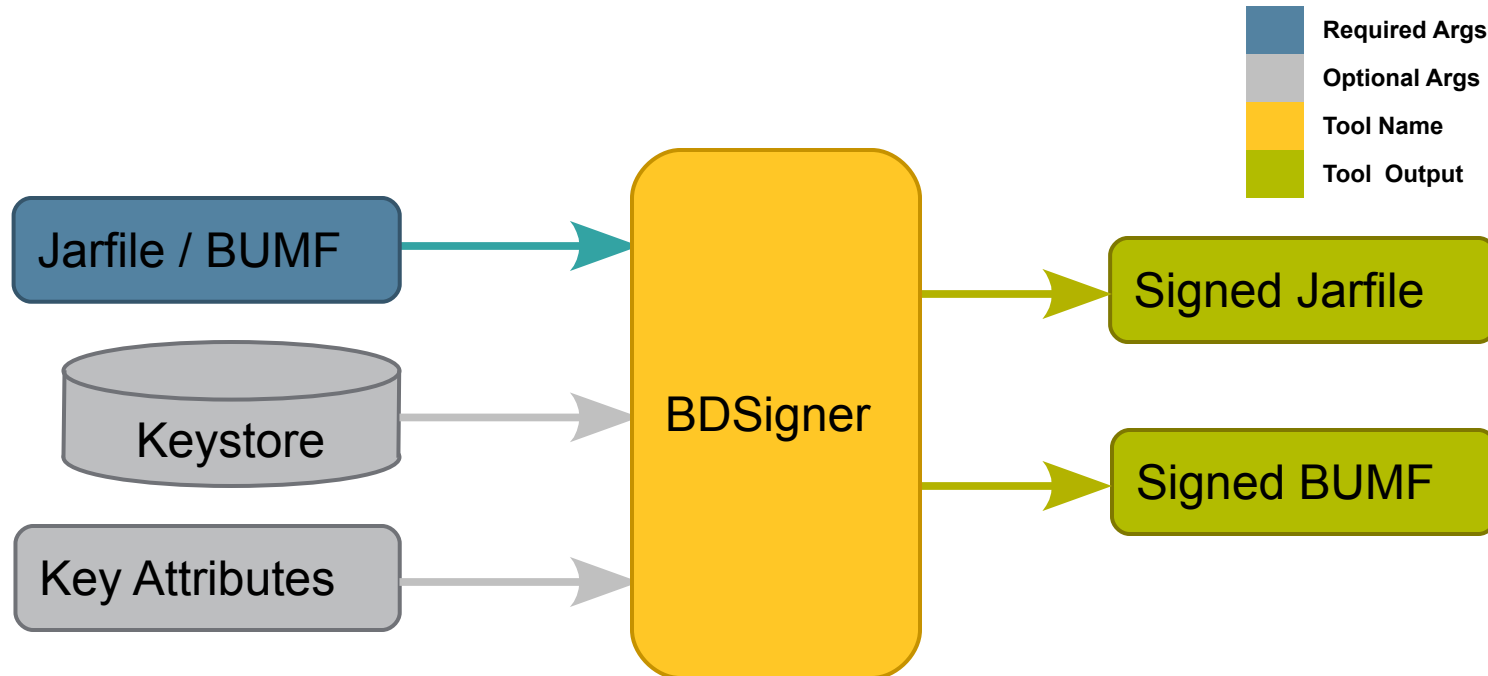
- BDCertGenerator (creates certificates for signing)
- BDSigner (signs the jars and other files)
- BDCredentialSigner (creates credentials and signs jars)
- BDJO Converter (XML to binary converter)
- Netbeans Plugin (enables easy development of BD-J apps)

BDCertGenerator



```
net.java.bd.tools.security.BDCertGenerator -cp <jars> 7fff1111
```

BDSigner

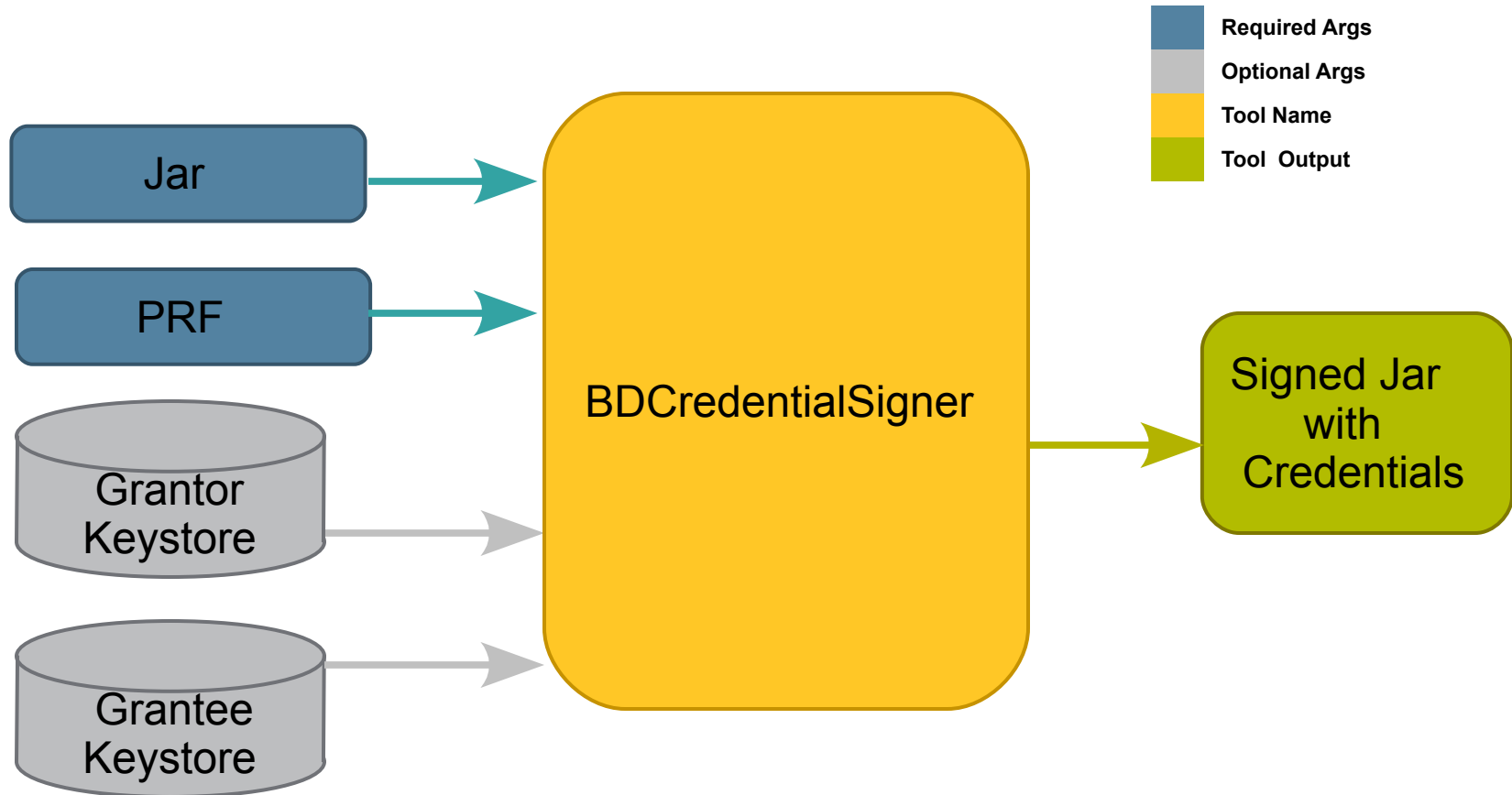


```
net.java.bd.tools.security.BDSigner -cp <jars> 00000.jar
```

Certificates and signing

- **BDCertGenerator:** Creates certificates for disc root and applications.
 - Generates a keystore and root certificate exported to: `app.discroot.cert` or `bu.discroot.crt`
 - Application certificate signed by the disc root certificate
 - Multiple application certificates can be signed by a single root certificate
 - Self signed Binding Unit Certificate – a signing certificate
 - Self verification by the tool.
- **BDSigner:** Sign Jar and Binding Unit Manifest File (BUMF)
 - Source is a keystore
 - Can choose a signer (signer alias)
 - Allows multiple signers
- **Distribution name:** `security.jar`

BDCredentialSigner



```
$.net.java.bd.tools.security.CredentialSigner -cp <jars>\
00000.jar bluray.TestXlet.perm
```

Credentials ...

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<n:permissionrequestfile xmlns:n="urn:BDA:bdmv;PRF"
    appid="0x4002" orgid="0x7fff1234">
    <file value="true"/>
    <applifecyclecontrol value="true"/>
    <servicesel value="true"/>
    <userpreferences read="true" write="false"/>
    <persistentfilecredential>
        <grantoridentifier id="0x7fff3456"/>
        <expirationdate date="10/12/2010"/>
        <filename read="true"
write="true">7fff3456/4001/tmp.txt</filename>
    </persistentfilecredential>
</n:permissionrequestfile>
```

Credentials (contd...)

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<n:permissionrequestfile xmlns:n="urn:BDA:bdmv;PRF"
  appid="0x4002" orgid="0x7fff1234">
  <file value="true"/>
  <applifecyclecontrol value="true"/>
  <servicesel value="true"/>
  <userpreferences read="true" write="false"/>
  <persistentfilecredential>
    <grantoridentifier id="0x7fff3456"/>
    <expirationdate date="10/12/2010"/>
    <filename read="true"
      write="true">7fff3456/4001/tmp.txt</filename>
    <signature>KSrmmBCGY9RkOCug6HRWjBLC29VkCOKBoPAVbbxv
      +q7Ed4iVv6tzerrkXudjs1rezCYtrGysX0VK=
    </signature>
    <certchainfileid>MGIwXTEPMA0GA1UEAwGU3R1ZG1vMR8
      xMQswCQYDVQQGDAJVUwIBAQ==
    </certchainfileid>
  </persistentfilecredential>
</n:permissionrequestfile>
```

BDJO Converter

- Enables BD-J Object File specification in XML format
- Converts to Binary Format
- Package: `net.java.bd.tools.bdjo`
- Distribution name: `bdjo.jar`

:

```
<applicationManagementTable>
  <applications>
    <applicationDescriptor>
      <baseDirectory>00000</baseDirectory>
      <binding>TITLE_BOUND_DISC_BOUND</binding>
      <classpathExtension></classpathExtension>
      <iconFlags>0x0</iconFlags>
      <iconLocator></iconLocator>
```


Summary of Blu-ray Disc Creation Tools

➤ `net.java.bd.tools.security`

- Dependencies
 - Bouncy Castle Provider (we use version:jdk15-137)
 - Java SE “tools.jar”
 - Java SE 6

➤ `net.java.bd.tools.bdjo`

- Dependencies
 - Java SE 6



Blu-ray Disc Java Project - NetBeans IDE 6.0

File Edit View Navigate Source Refactor Build Run Profile Versioning Tools Window Help



Projects Files Services

Blu-ray Disc Java Project

- src
 - helloTVxlet
 - HelloTVXlet.java
 - bluray.HelloTVXlet.perm
 - build.xml
- credentials
- hdcocookbook
 - grin/library/src
 - grin/jdktools/library/src
 - grin/jdktools/grinviewer/src
 - grin/jdktools/binaryconverter/src
 - grin/jdktools/mosaic/src
 - tools/bdjs/src
 - grin/xlets/bookmenu/src
 - grin/xlets/gunbunny/src
 - tools/security/src
 - <default package>
 - net.java.bd.tools.security
 - BDCertGenerator.java

HelloTVXlet.java - Navigator

- HelloTVXlet :: Xlet
 - HelloTVXlet()
 - destroyXlet(boolean unconditional)
 - initXlet(XletContext context)
 - pauseXlet()
 - startXlet()

```
package hellotvxlet;

import javax.tv.xlet.Xlet;
import javax.tv.xlet.XletContext;
import javax.tv.graphics.TVContainer;
import java.awt.Color;
import java.awt.Container;
import java.awt.Font;
import java.awt.Graphics;
import java.awt.BorderLayout;

import org.havi.ui.HScene;
import org.havi.ui.HSceneFactory;

/**
 * Just a simple xlet that draws a String in the center of the screen.
 */

public class HelloTVXlet implements javax.tv.xlet.Xlet {

    private static Font font;
    private HScene scene;
    private Container gui;
    private static final String message = "Hello BD-J World!";

    /** Creates a new instance of MainXlet */
    public HelloTVXlet() {
```

Output - HelloTVXlet (deploy)

```
Certificate reply was installed in keystore
Certificate stored in file <app.discroot.crt>
adding: META-INF/SIG-BD00.SF(in = 392) (out= 250) (deflated 36%)
adding: META-INF/SIG-BD00.RSA(in = 1640) (out= 1065) (deflated 35%)
copy-to-bdnav:
Copying 8 files to C:\tmp\BluRayProject\dist\DiscImage
Copied 18 empty directories to 14 empty directories under C:\tmp\BluRayProject\dist\DiscImage
Copying 1 file to C:\tmp\BluRayProject\dist\DiscImage\BDMV\JAR
Copying 1 file to C:\tmp\BluRayProject\dist\DiscImage\BDMV\BDJO
Copying 1 file to C:\tmp\BluRayProject\dist\DiscImage\CERTIFICATE
Copying 1 file to C:\tmp\BluRayProject\dist\DiscImage\CERTIFICATE\BACKUP
Created a disc image at C:\tmp\BluRayProject\dist\DiscImage
bundle:
Building zip: C:\tmp\BluRayProject\hellotvxlet.HelloTVXlet.zip
deploy:
BUILD SUCCESSFUL (total time: 3 seconds)
```

Lab setup

Software Player	Web Page
WinDVD	http://apps.corel.com
Total Media Theater	http://www.arcsoft.com
PowerDVD	http://cyberlink.com

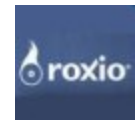


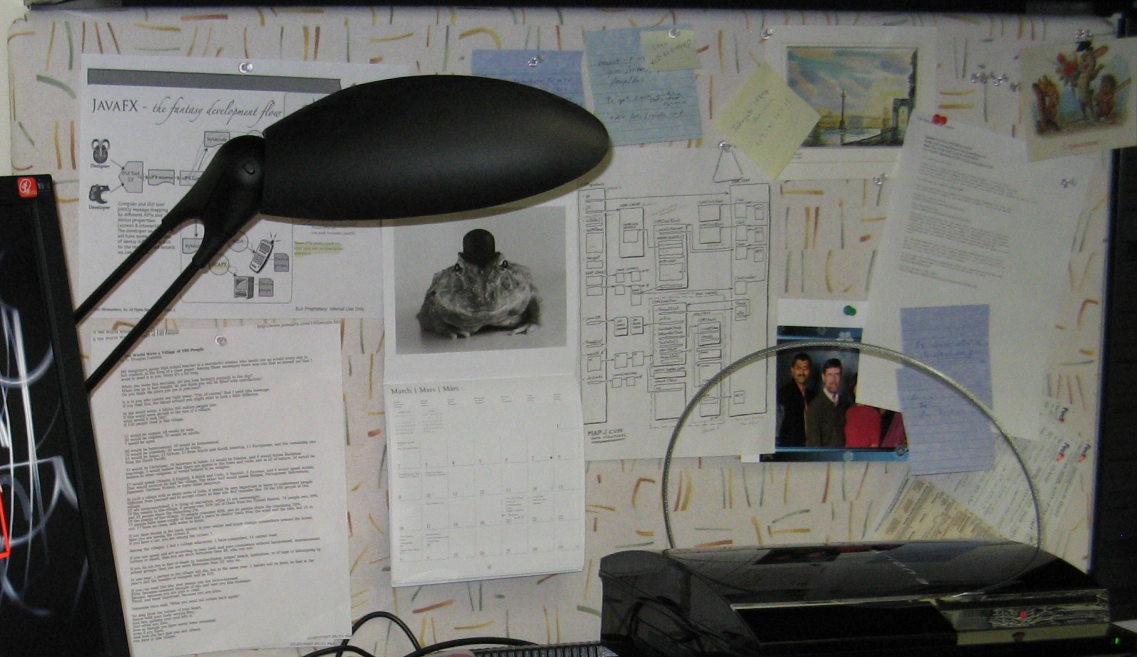
Hardware Player	Profile
PS3	2
Pioneer	1.1

SONY

Pioneer

Laptop with
Blu-ray Burner





JavaFX and BD-J

A. Sundararajan

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JavaFX on BD-J development

- Using JavaFX at “development time”
- **GrinFX** tool
 - GRIN Show graph expressed in JavaFX syntax
 - GrinFX converts JavaFX show graph to GRIN binary format
- What about existing GRIN text format show graphs?
 - GrinFX converts GRIN text to JavaFX syntax
- If you have existing GRIN text
 - `grinfx <grin text file>`
- GrinFX can be used to better express/edit show graphs. For example, build-time expressions for sequences etc.
- JavaFX editors (such as in NetBeans) can be used to edit/“compile” scene graphs.

Demo GrinFX in action

A large, light blue arrow pointing to the right, positioned behind the word "DEMO".

DEMO

JavaFX on BD-J at runtime

- “**se2me**” tool – Java SE to Java ME converter
- A tool to convert JDK 1.5/1.6 compiled .class files to JDK 1.3.1 class file format
- Also takes care of API rewriting – so that you can replace classes/methods accessed from application to API available on target platform (such as CDC/PBP for BD-J)
- User specified API rewrite configuration file for specific platforms.
- As of now, can run “hello world” with JavaFX features such as bind, sequences etc. on CDC/PBP.
- Need ~300KB for JavaFX “core” runtime classes – not including GUI classes etc!

Demo

se2me in action

A large, light blue arrow pointing to the right, positioned behind the word "DEMO".

DEMO

Demo “hdcookbook” on Blu-ray Player

A large, light blue arrow pointing to the right, positioned behind the word "DEMO".

DEMO

THANK YOU

Bill Foote, Chihiro Saito,
A. Sundararajan, Jaya Hangal

<http://hdcookbook.dev.java.net>

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