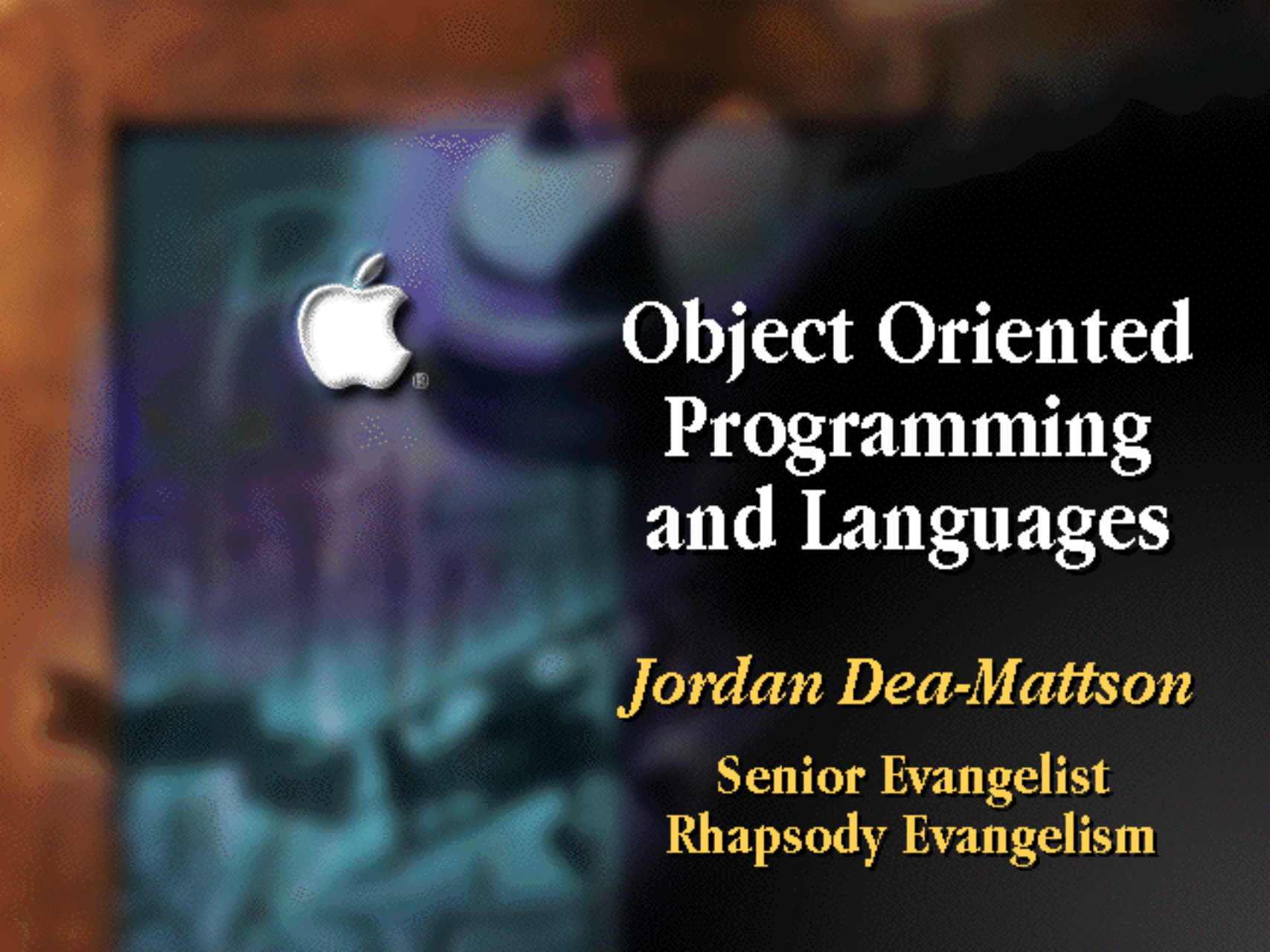
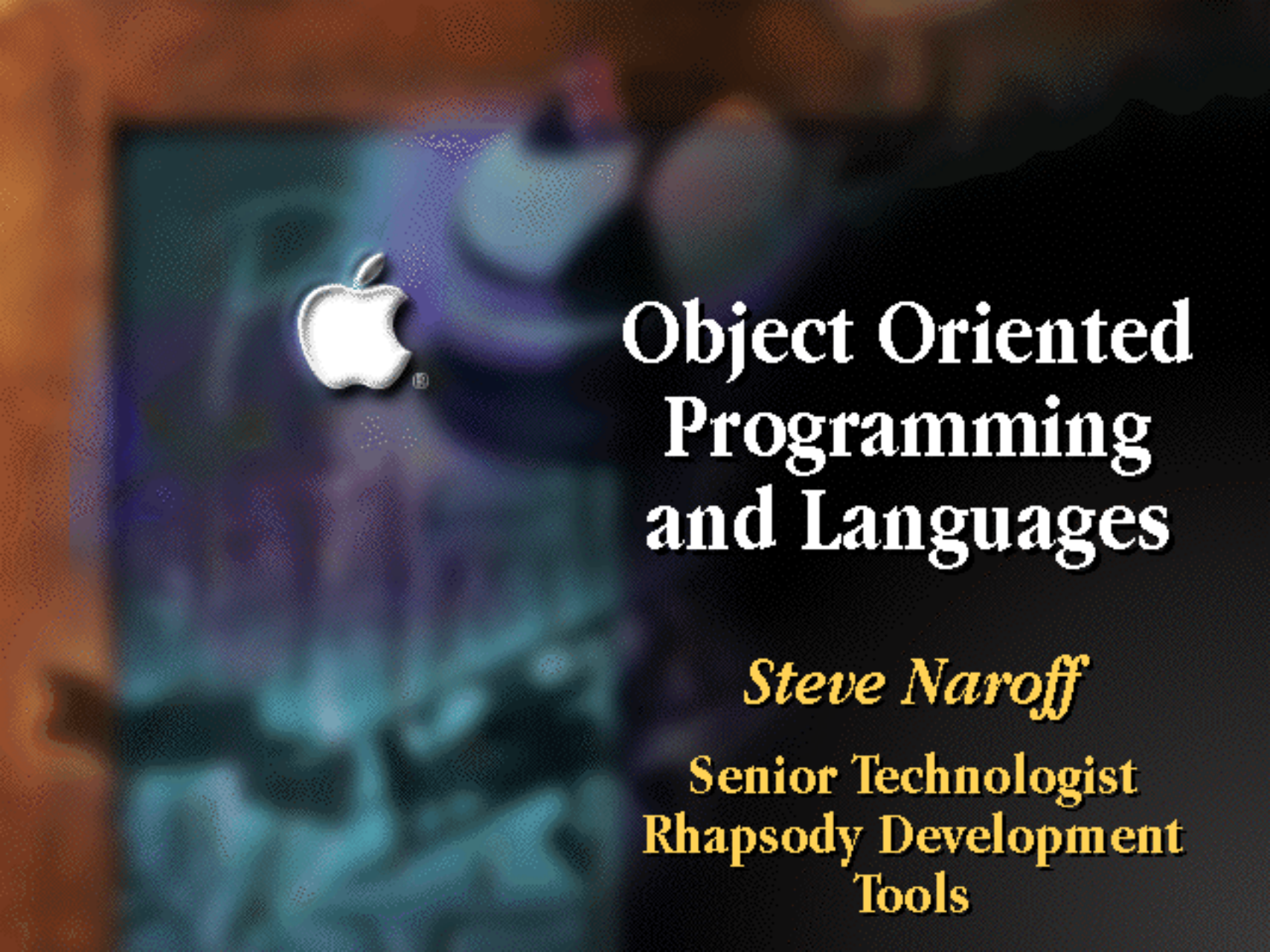

Worldwide
Developers
Conference


Object Oriented
Programming
and Languages
Jordan Dea-Mattson
Senior Evangelist
Rhapsody Evangelism



Object Oriented Programming and Languages

Steve Naroff

Senior Technologist
Rhapsody Development Tools

Session Topics

- Object Oriented Concepts
- Language Requirements
- Language Support
- Closing Thoughts

Object Oriented Concepts

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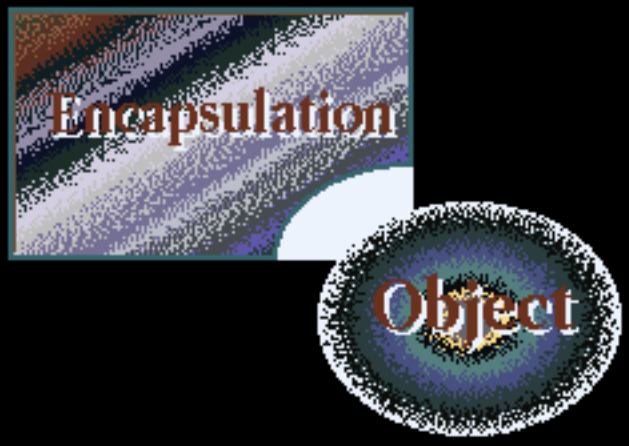
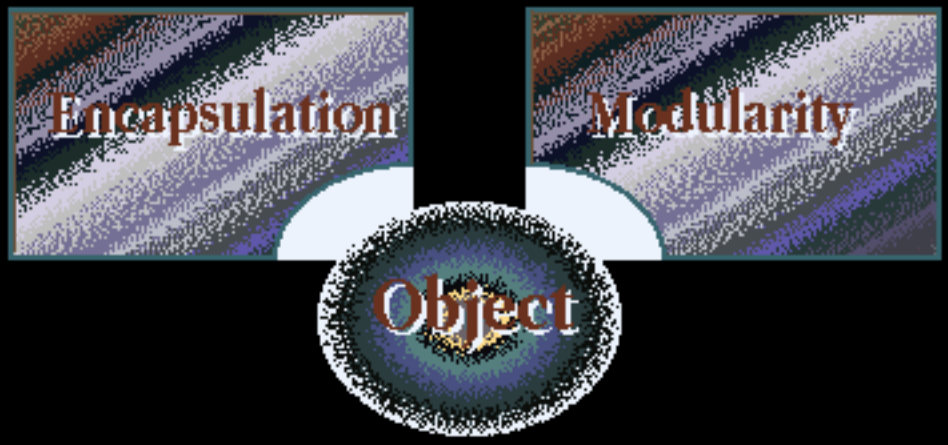


Object Oriented Concepts



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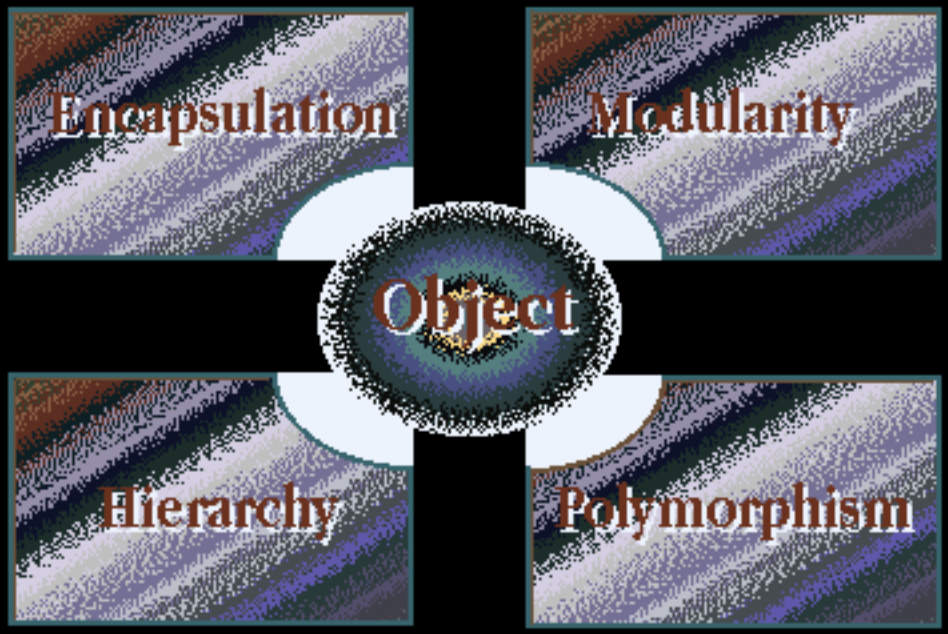

Object Oriented Concepts

Language Requirements

Religion (circa '87)

- Dynamic Object Model
  - Serve application frameworks and tools

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Language Support

- Objective-C
- Objective-C++
- Java
- Dylan?
- Object Pascal?

Objective-C Type Declarations

Classes — implementation reuse

```
@interface NSBrowser : NSControl
{
   <instance varibles>
}

<methods>

@end
```

Objective-C Type Declarations

Protocols — design reuse

```
@protocol NSDraggingInfo

<methods>

@end
```

Objective-C Object Declarations

```
// untyped
id anyObject;

// typed by class
NSBrowser *myBrowser;

// typed by protocol
id <NSDraggingInfo> aDrag;
```

Objective-C Method Declarations

Classic syntax

```
// instance methods
- (void)setTitle:(NSString *)title
        ofColumn:(int)column;
- (void)setDelegate:anObject;
- (void)setAction:(SEL)action;

// class methods
+ (Class)cellClass;
+ (void)setCellClass:(Class)creator;
```

Objective-C Method Declarations

Modern syntax

```
// instance methods
void setTitleOfColumn(NSString *title,
                      int column);
void setDelegate(id anObject);
void setAction(SEL name);

// class methods
static Class cellClass();
static void setCellClass(Class creator);
```

Objective-C Method Categories

Binary extensions

```
@interface NSString(NSStringDrawing)

NSSize size()
void drawAtPoint(NSPoint p);
void drawInRect(NSRect r);

@end
```

Objective-C Message Expressions

```
// classic
[myBrowser setDelegate:obj];

// modern
myBrowser->setDelegate(obj);
myBrowser.setDelegate(obj);
```

Objective-C++

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- Objective-C able to access "C++ goodies"
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  - Etc.

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Objective-C++

Peaceful coexistence

- Both languages retain…
  - Native semantics
  - Native time/space characteristics

Objective-C++

Does CodeWarrior support it?

- YES!

Objective-C++ Example

Reuse via aggregation

```
@interface CalculatorInterface : NSObject
{
  id display;
  CalculatorEngine *engine;
}

id init();
id equalsKey(id sender);
id operationsKey(id sender);

@end
```

Objective-C++ Example

```
id init() // display is set automatically
{
  engine = new CalculatorEngine;
  return self;
}
id operationKeys(id sender)
{
  res = engine->computeResult(sender);
  display->setDoubleValue(res);
  return self;
}
```

Java Integration

Design points

- Exploit similarities with Objective-C

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- Allow hybrid interaction
  - Aggregation and subclassing

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Java Integration

Full client access to Yellow Box APIs

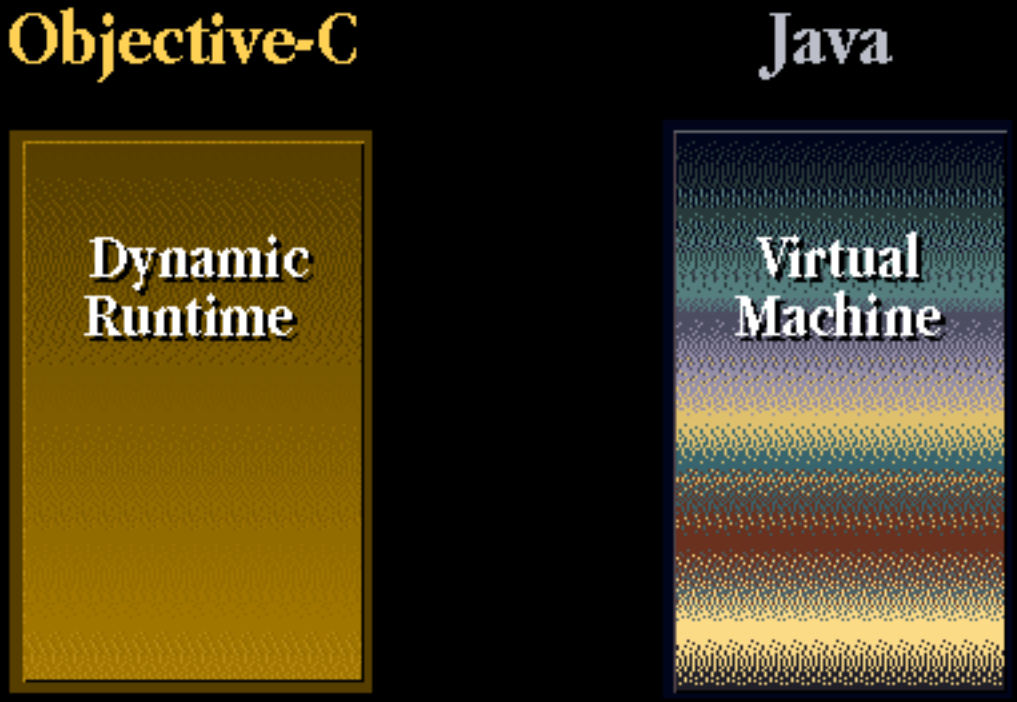
```
public class Browser extends Control
{
public Browser(Rect frameRect);

public native void setDelegate(Object o);
public native void setAction(Selector s);
public native boolean setPath(String p);
public native Array selectedCells();
}
```

Java Integration

Objective-C

Java Integration



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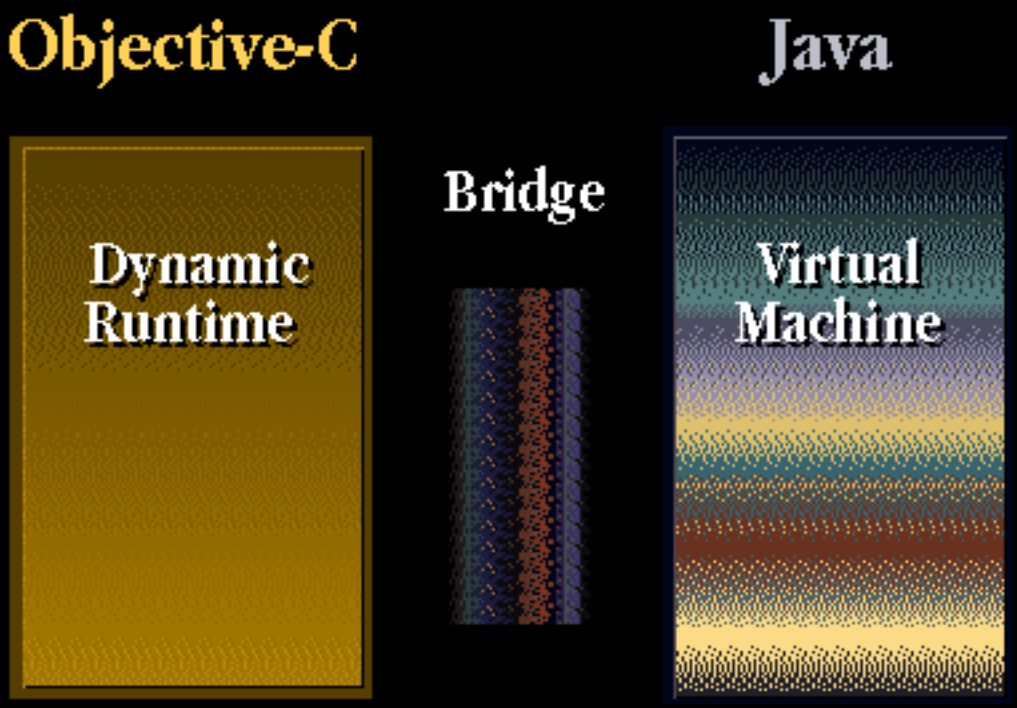

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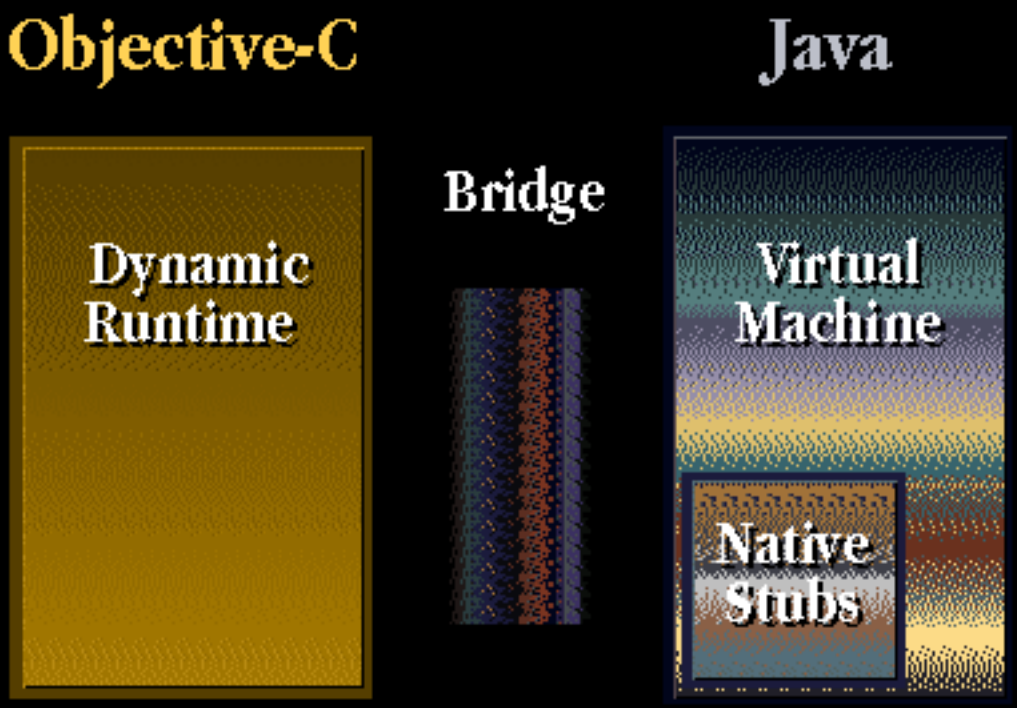

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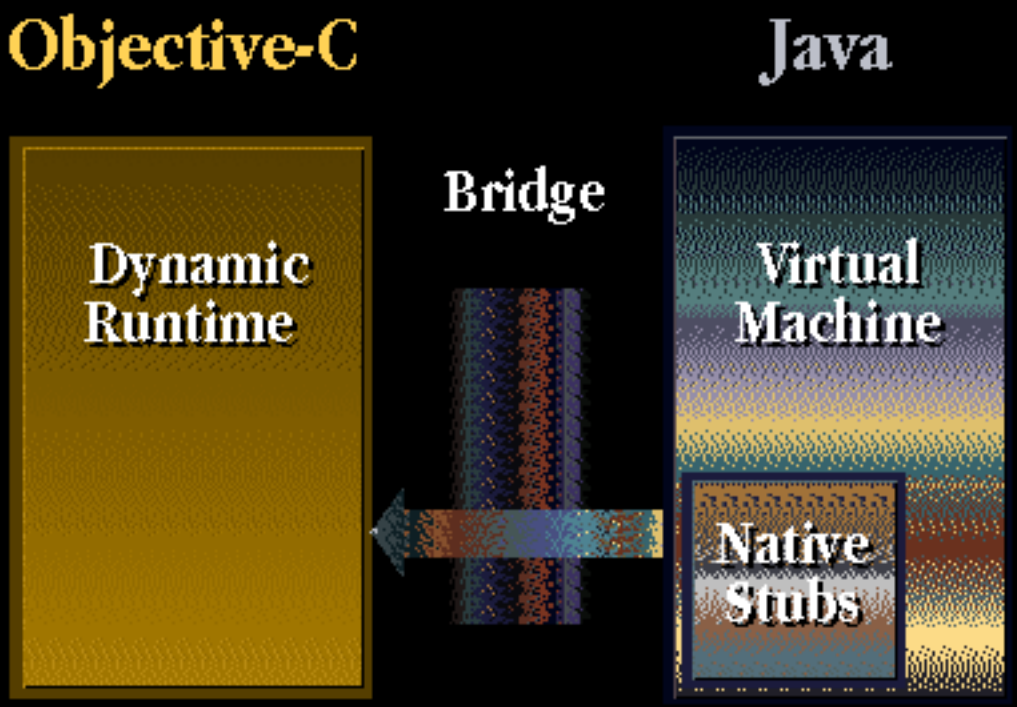

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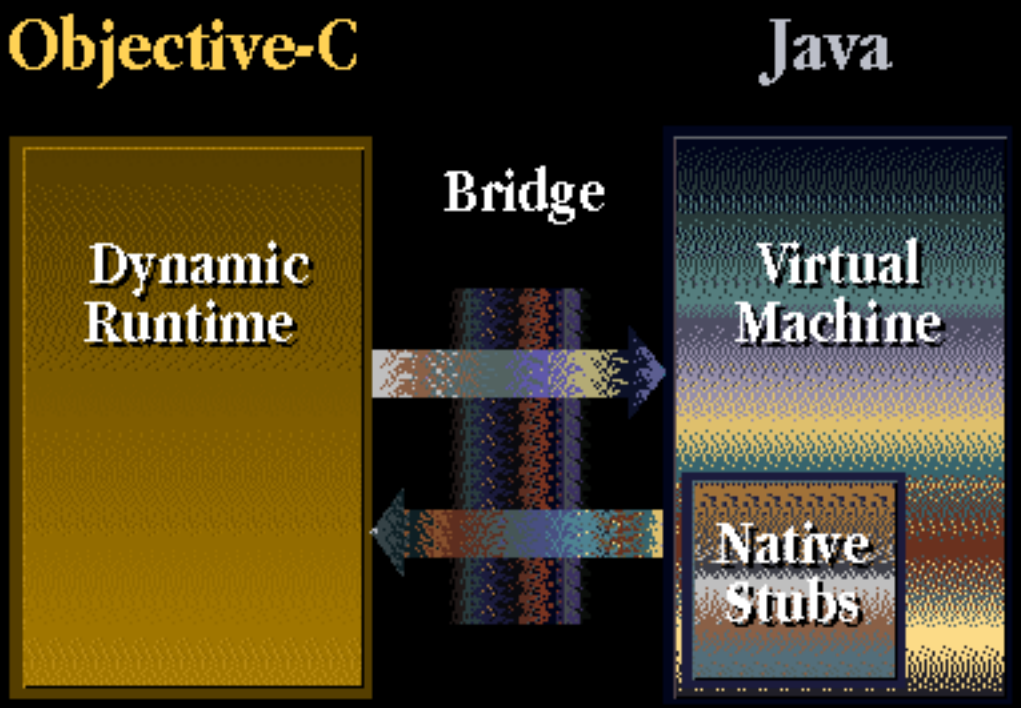
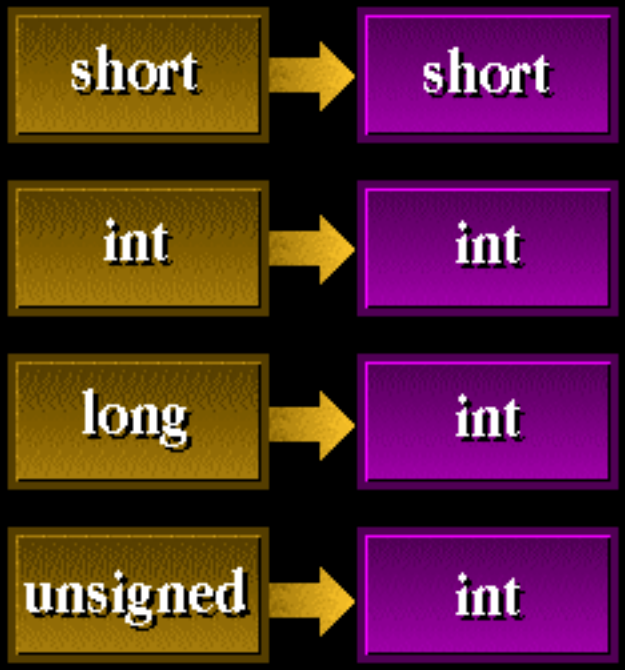


Java Mappings



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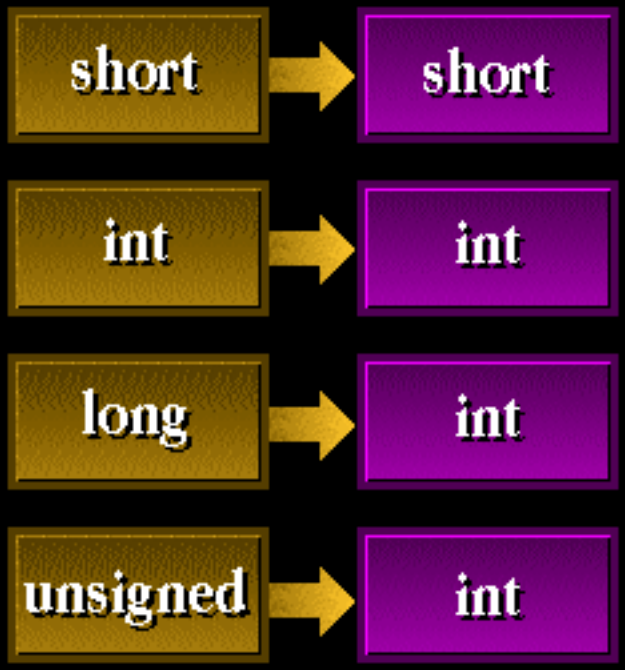

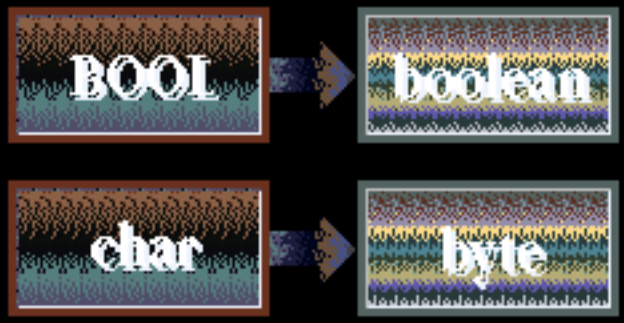

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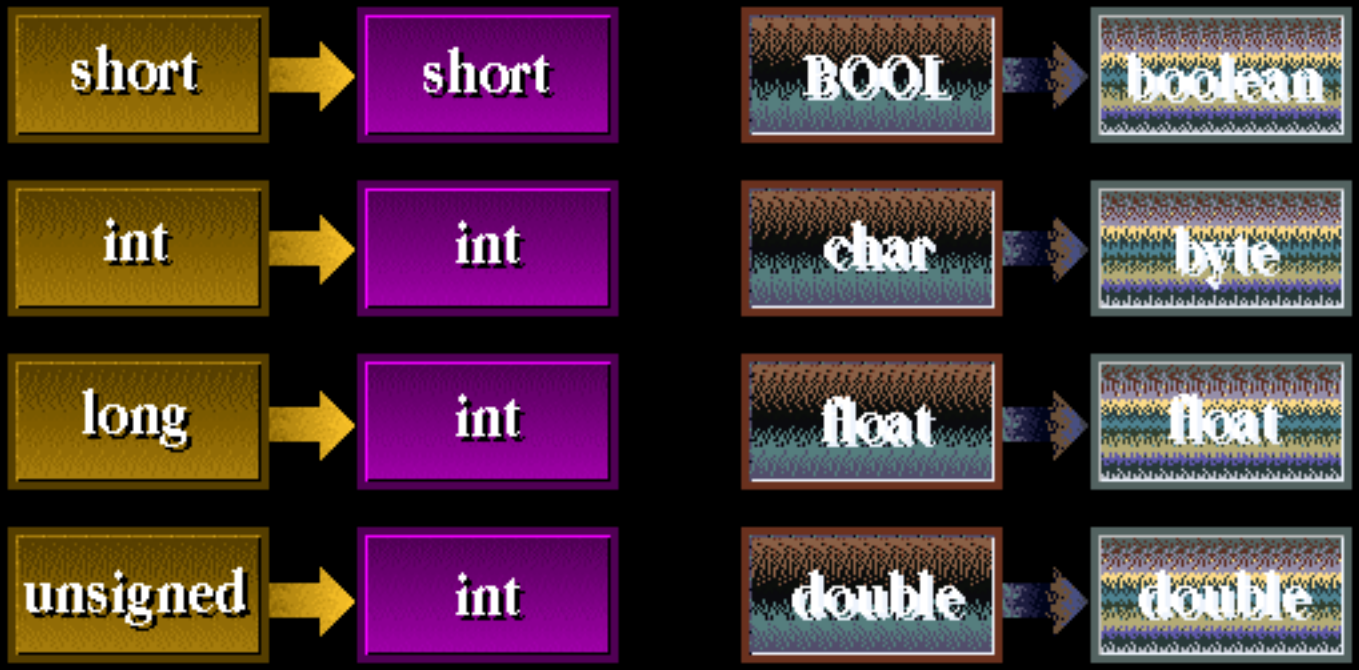

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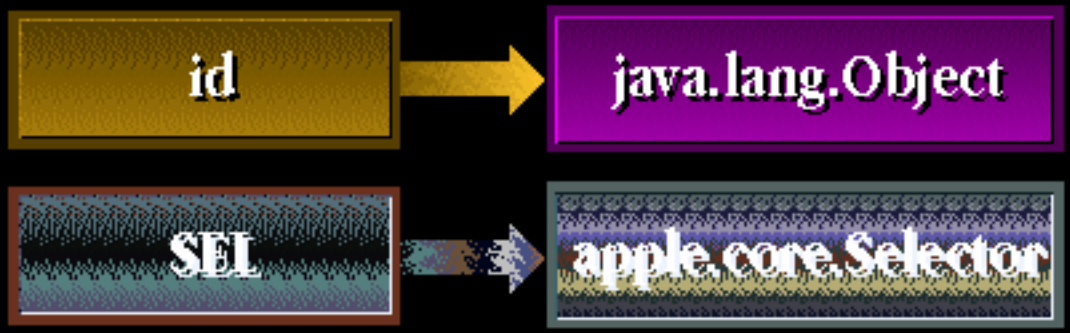

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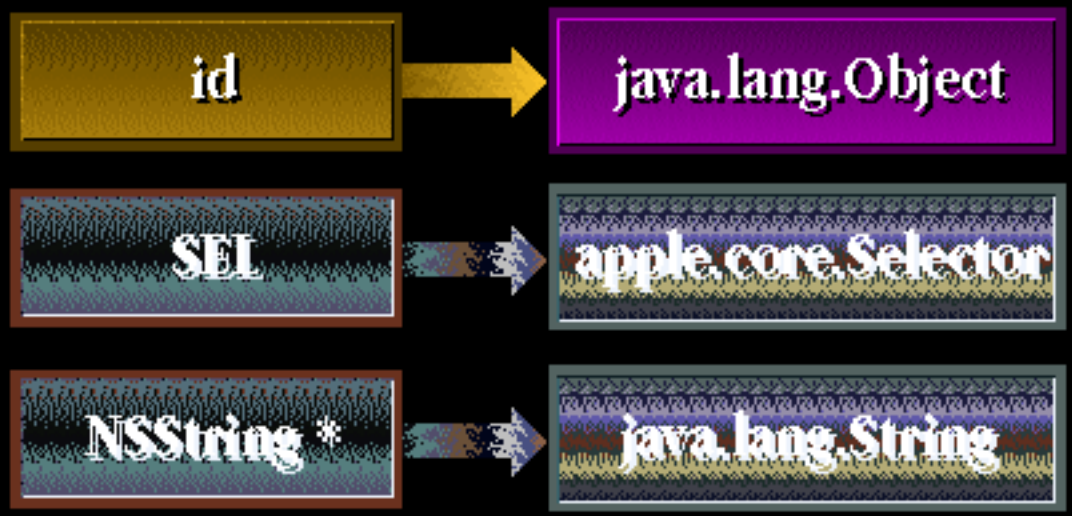

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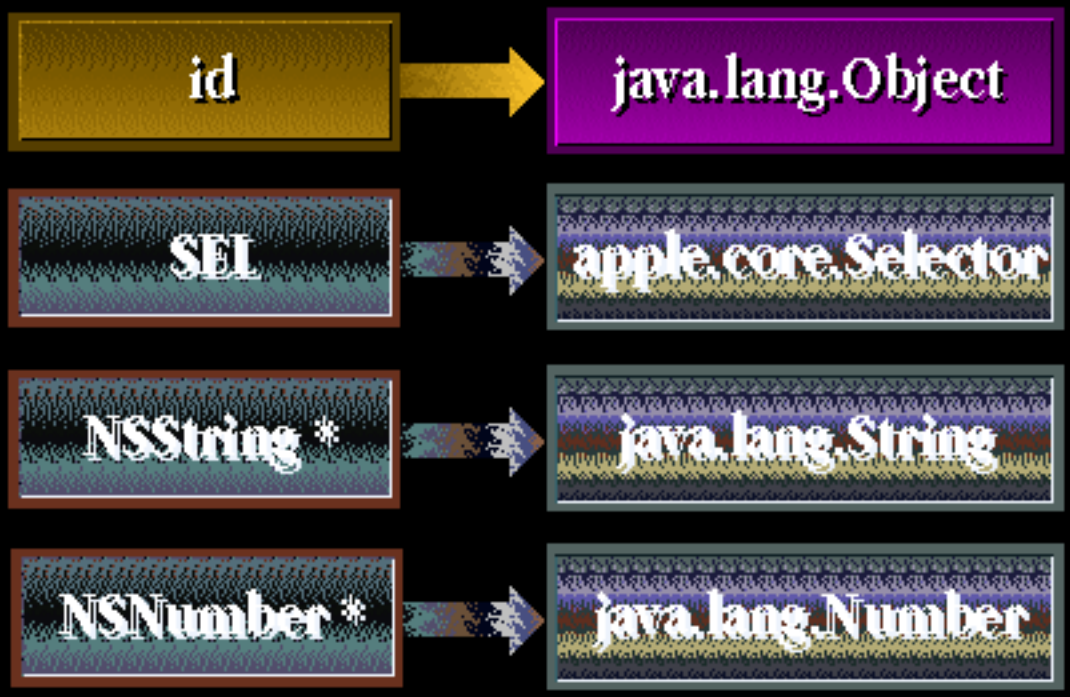

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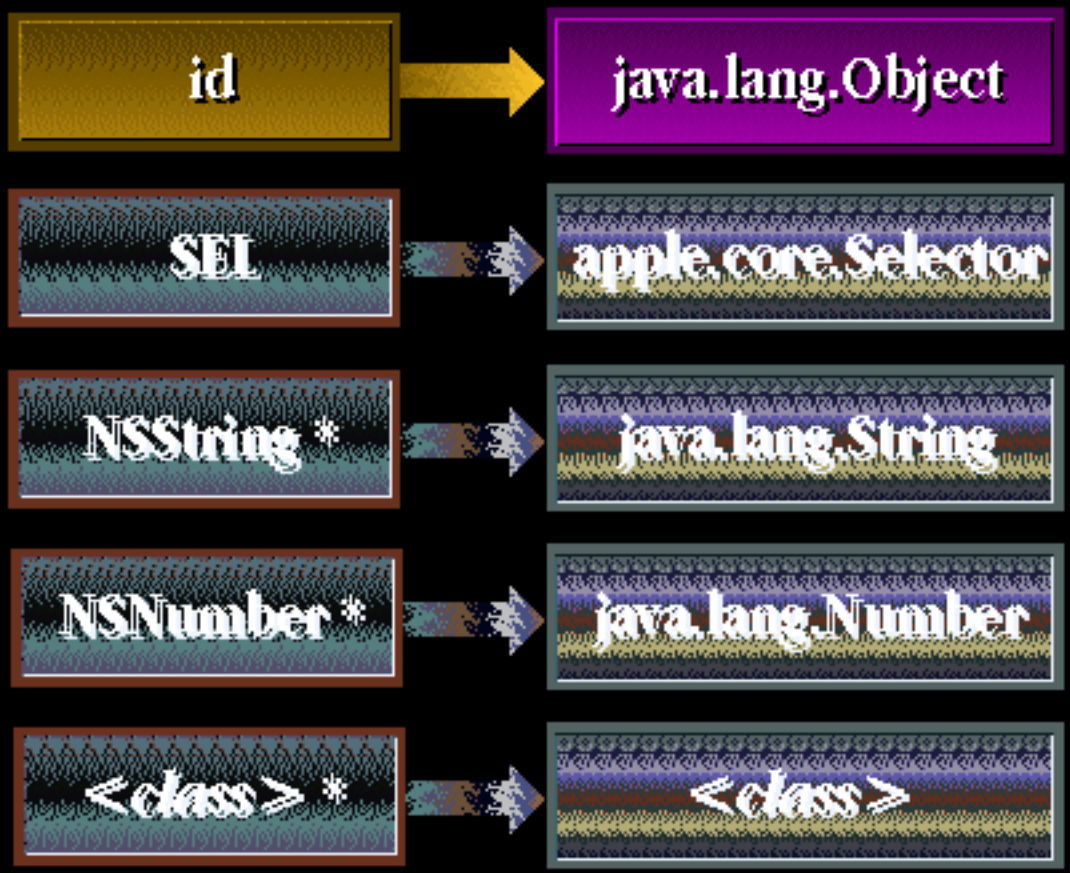

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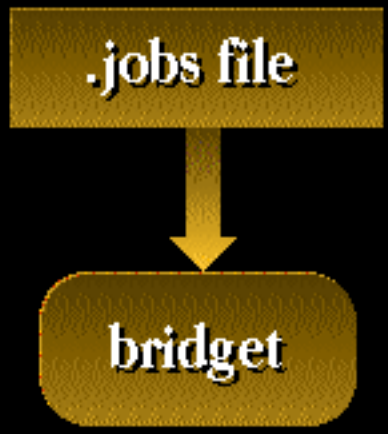
Java to ObjC Bridge Specification

.jobs file

```
type
   BOOL = boolean
   NSRect = apple.core.Rect using
            NSConvertRectToJava
            NSConvertRectFromJava
selector
   -isEqual: = equals
   -hash = hashCode
   -copyWithZone: = clone
```

Java to ObjC Bridge Specification



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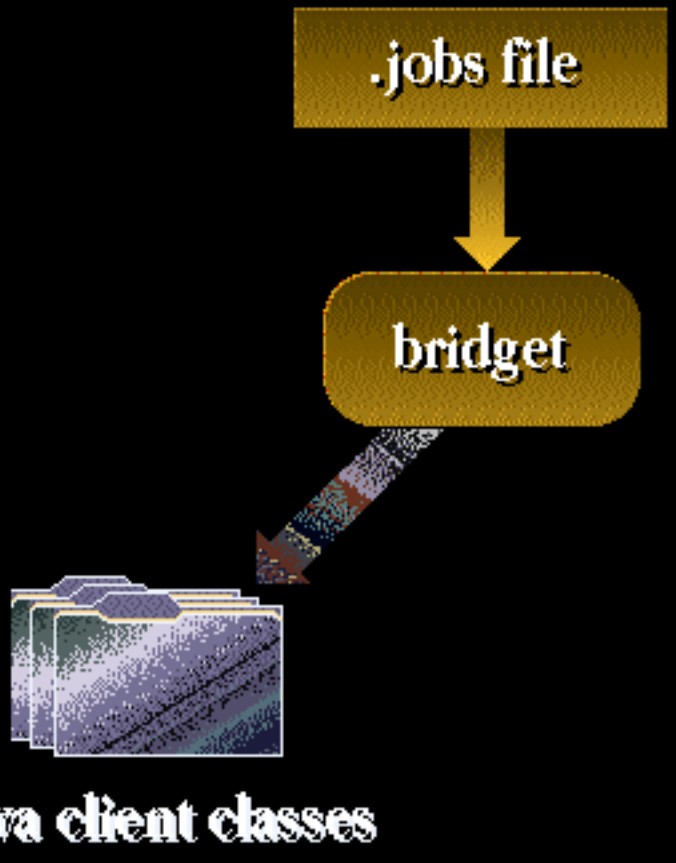

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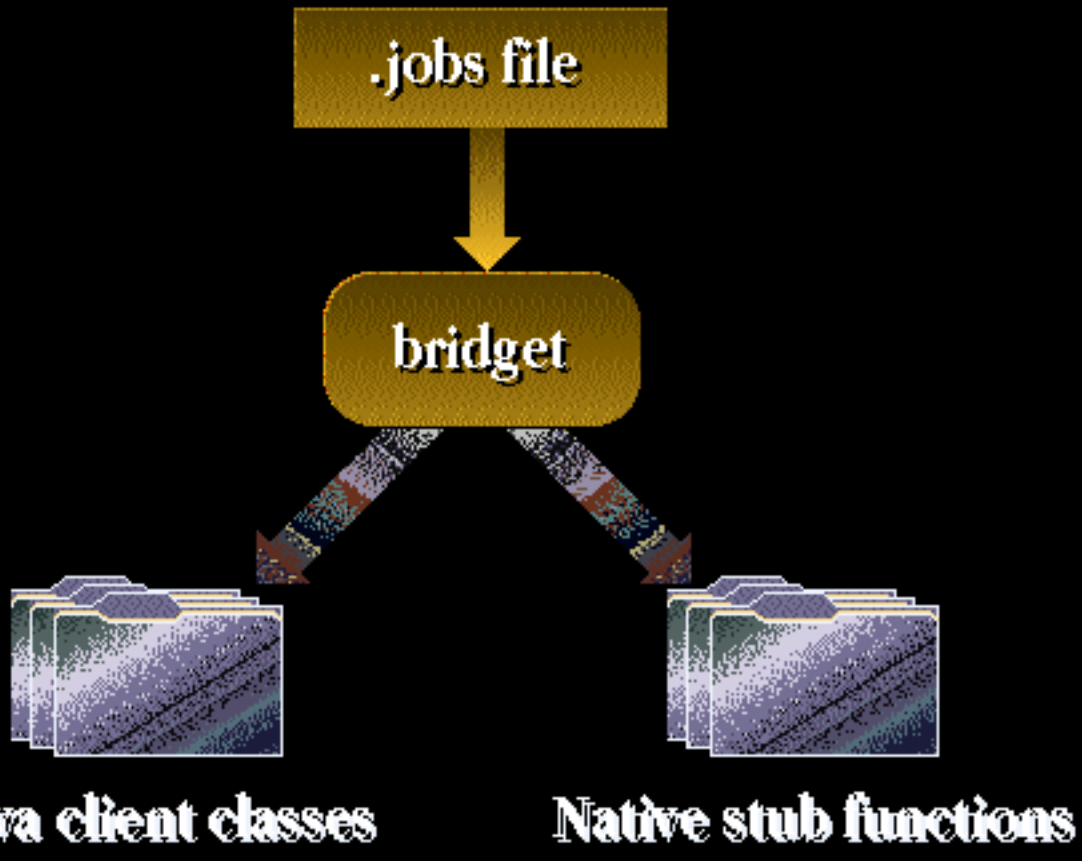

Closing Thoughts

Language choices

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Q&A


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