Smalltalk
redline

Smalltalk on the JVM

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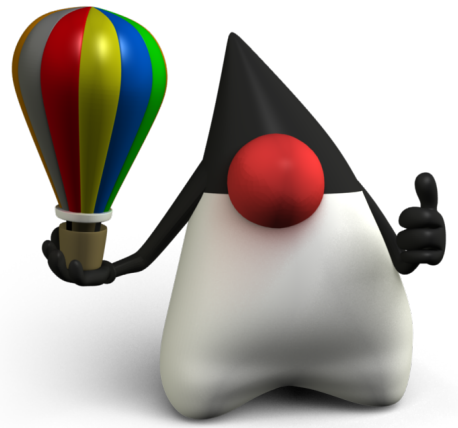
- ESUG 2011



Our Promise:

Our promise is to provide you with high quality Smalltalk to enjoy every day. If you are not 100% satisfied, let us know and we will happily try to improve.

NUTRITION INFORMATION:

Servings per package: Endless
Serving size: Minimal

	% Daily Intake* Per Serving
Smalltalk	100%
Java Byte Code	100%
- Java integration	100%
Fat, total	0%

Note: All values are considered averages unless otherwise indicated and relate to uncooked product.

* Smalltalk is naturally a source of productivity.

Ingredients:

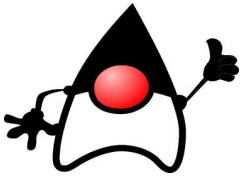
Smalltalk, for the Java Virtual Machine.

Storage:

Download and keep on disk. Do not delete, if downloaded try within 24 hours.

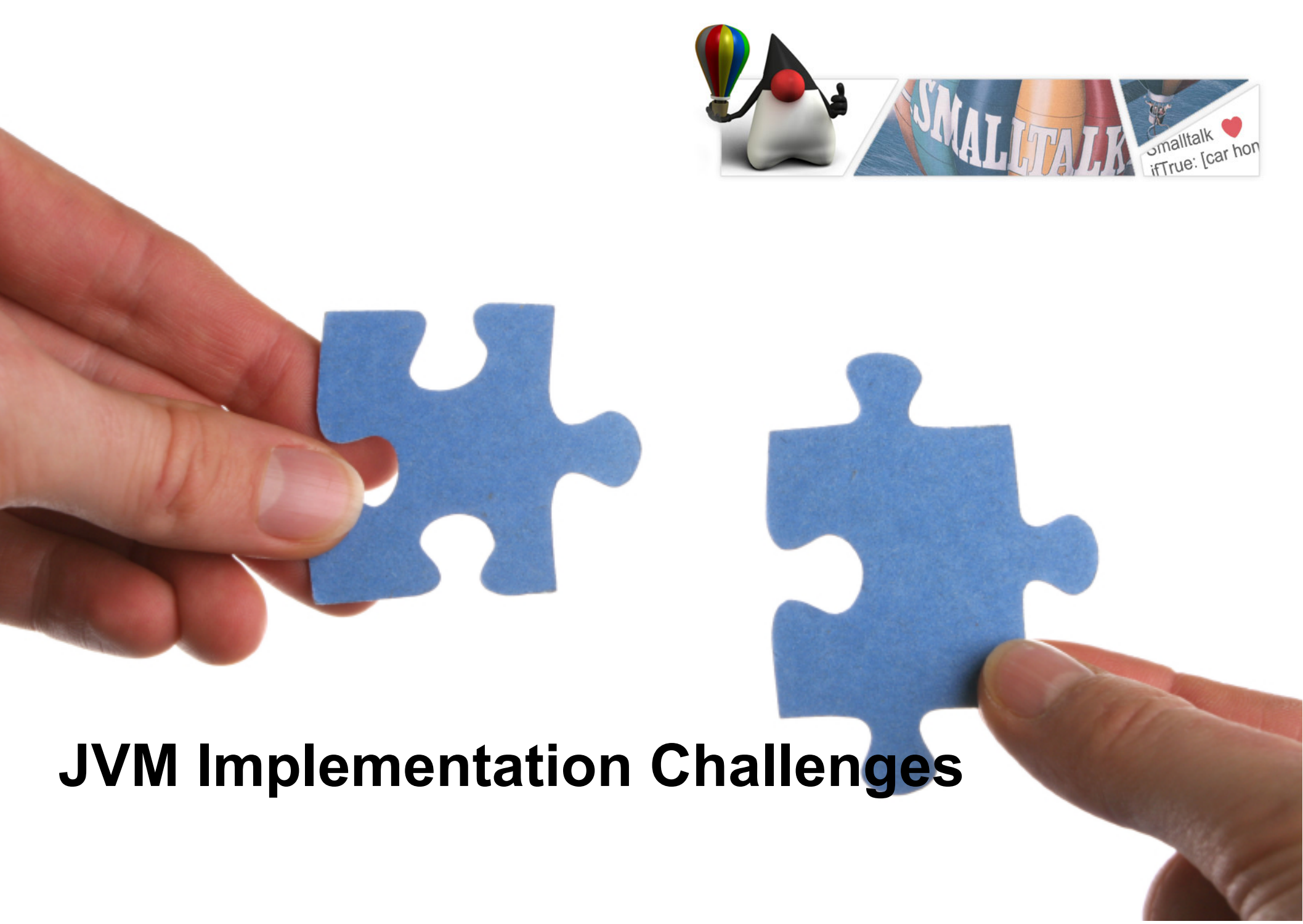
Information:

Product of Australia.
Redline Smalltalk is open source and free.



Please Share

BEST BEFORE TOMORROW



JVM Implementation Challenges

JVM Implementation Challenges:

JVM Unit of execution is a class

Sequence of bytes in class format

Class is not an Object
(more like data structure)

JVM Implementation Challenges:

JVM Unit of execution is a class

Load Class

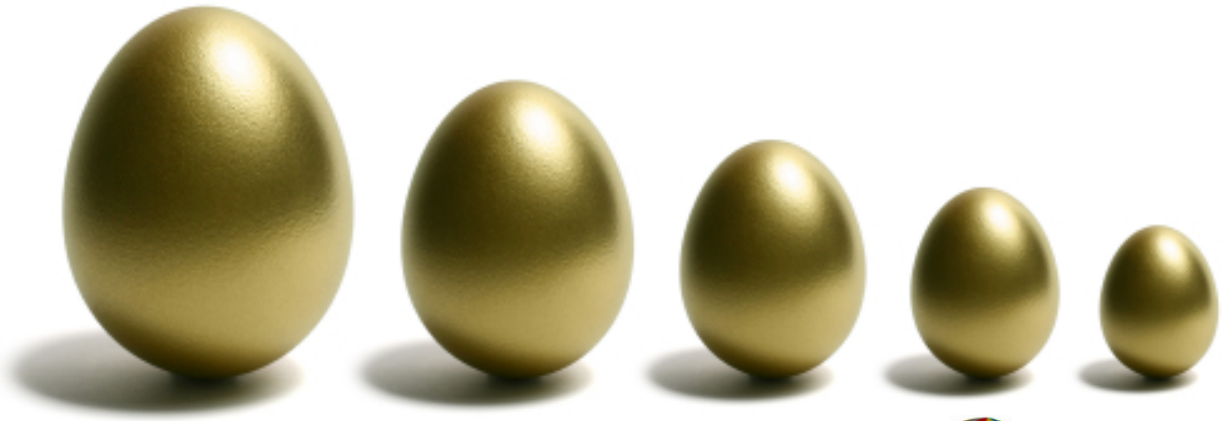
newInstance()

<init> called

JVM Implementation Challenges:

JVM loads classes with a Class Loader

loadClass("java.lang.String")

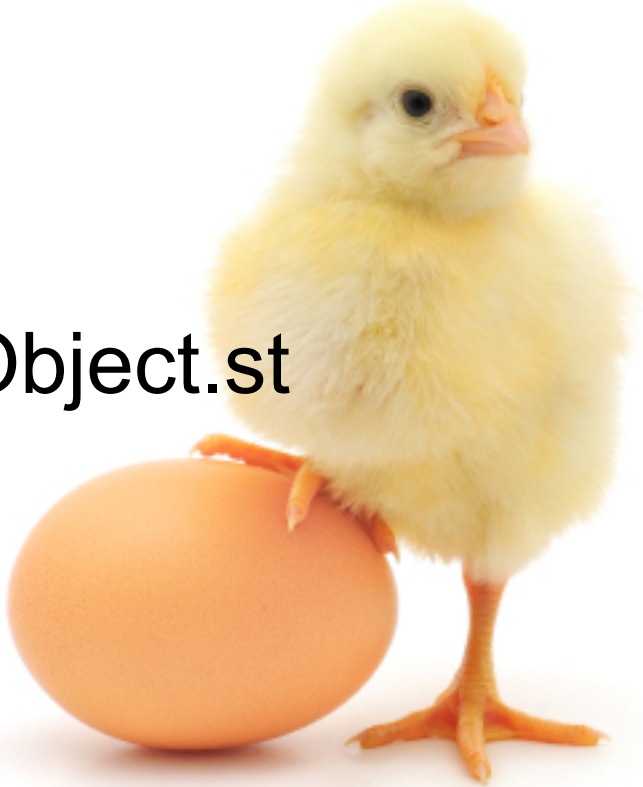


JVM Implementation Challenges:

JVM loads classes with a Class Loader

SmalltalkClassLoader

loadClass('Object') = Object.st



JVM Implementation Challenges:

JVM classes are namespaced

java.lang, st.redline

Package

Must specify fully qualified name

JVM Implementation Challenges:

Calling methods is cumbersome

Very static

Must specify exact type

JVM Implementation Challenges:

Calling methods is cumbersome

St/redline/ProtoObject

(Ljava/lang/Object;)Ljava/lang/StringBuilder;

JVM Implementation Challenges:

Calling methods is cumbersome

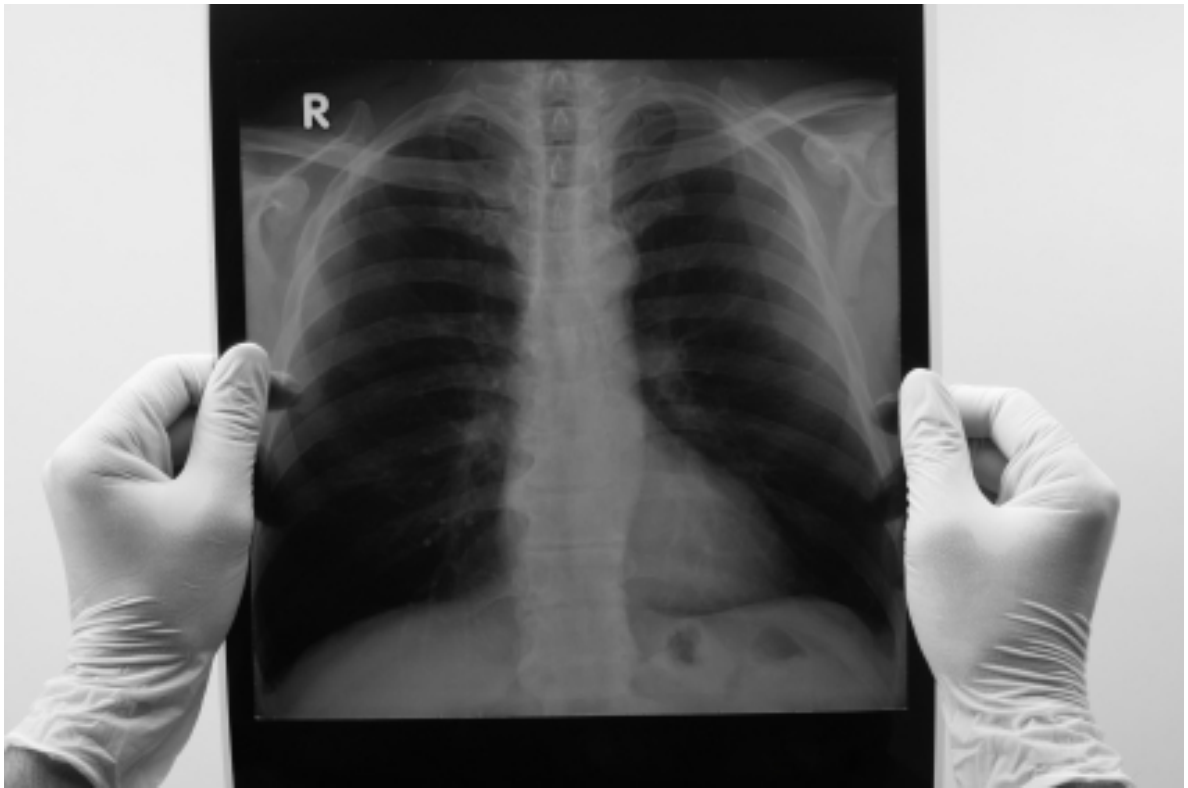
Luckily everything in Smalltalk is an Object (ProtoObject)

JVM Implementation Challenges:

Methods are part of a class

Change class to change method

Redline Smalltalk Internals



Redline Smalltalk Internals

Uses ANTLR

Smalltalk.g

PreProc.g

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Users ANTLR

Jim Idle wrote pre-processor

Will eventually make grammar skinnable

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Uses ObjectWeb ASM

Bytecode class writing library

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Base of hierarchy is ProtoObject

Java object that implements primitives

Each primitive is a static Java method

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Base of hierarchy is ProtoObject

Smalltalk Objects built using message sends to ProtoObject

Compiler's job is to generate message sends

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Two other Java Objects

ProtoMethod

ProtoBlock

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Redline Java Class Loader

SmalltalkClassLoader

Searches for source (.st file)

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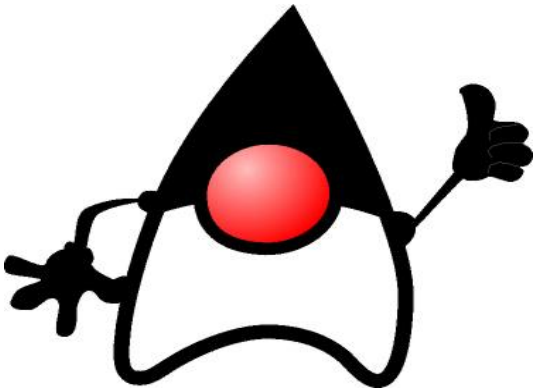
Redline Java Class Loader



Can use Smalltalk classes from Java

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Namespace support

Modelled on Java Packages

File path is package

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Namespace support

st/redline/Object = st/redline package

Each class has own 'set' of imports

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SmalltalkClassLoader

Partitions applications within single JVM

Redline Execution

Redline Execution

What happens when st.redline.Example is Executed?

Redline Execution: executing st.redline.Example

Invoke class from command line

./stic st.redline.Example

Redline Execution: executing st.redline.Example

Stic

Creates instance of SmalltalkClassLoader

Sets as context ClassLoader

Redline Execution: executing st.redline.Example

Stic

Asks SmalltalkClassLoader to bootstrap

Asks ProtoObject to resolve
'st.redline.Example'

Redline Execution: executing st.redline.Example

ProtoObject loads class

Class.forName(“st.redline.Example”);

Redline Execution: executing st.redline.Example

SmalltalkClassLoader

Checks cache – returns object if present

Searches source path for 'Example.st'
ie: src/main/smalltalk/st/redline/Example.st

Redline Execution: executing st.redline.Example

SmalltalkClassLoader

Invokes compiler on source file

Resulting class loaded into JVM

Instance created class.newInstance()

Redline Execution: executing st.redline.Example

Method newInstance()

Runs Class <init> method

<init> method contains message sends from Source

Redline Execution: executing st.redline.Example

Compiler

Creates Java class to contain logic

Class is subclass of ProtoObject

Package is based on file path

Redline Execution: executing st.redline.Example

Compiler

Creates <init> method, which is executed when instance created.

Logic in 'st.redline.Example' is encoded as message sends: ProtoObject.primitiveSend(...)

Redline Execution: executing st.redline.Example

Compiler – Smalltalk Methods

Methods are encoded as a message send to compile the method source.

Because class doesn't exist yet.

Redline Execution: executing st.redline.Example

Method Compilation

Methods are 1st class objects

Subclass of ProtoMethod

Added to receivers method dictionary

Redline Execution: executing st.redline.Example

Method Compilation

All Methods Objects have only 1 method

applyTo(...)

Contains logic embodied in Smalltalk method

Redline Execution: executing st.redline.Example

Block Compilation

Blocks are 1st class objects

Subclass of ProtoBlock

Redline Execution: executing st.redline.Example

Block Compilation

Blocks instance created when used

Have a Java applyTo(...) method

^ semantics handled correctly

Redline Demo

Questions?

Please visit:

http://redline.st