### Maven NAR Plugin

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# Content

dole, perfrage the herms "scores" or "chose-up" will be used. The herms "link," "hodink," and "hyperlest" are intent, eaching non-linear experiences, as does the term "Web" thath. It is exciting to know that there are caden rale, scoring and old, who are marning a living designing and shaping the Web of the future. Surely that Web will levent friend today's Web.

- Why we created the NAR Plugin
- What is a Native Archive (NAR) ?
- What is Architecture-OperatingSystem-Linker (AOL) ?
- How does it all work ?
- MAR Plugin
  - Usage
  - Goals
- NAR and Maven Philosophy
- Problems

👩 Ideas

I here have in commond They all pay attention to detail, not just on the horse page. But on the solvefeature innovative, well-executed designs characterized by effective use of color and shape as well as steet. They make efficient and servicide use of available technology—whether it's jaca scripting. CoFBNa Real-Audio—while at the same time keeping the total size of images, sounds, and animations untail to inloads without crashing.

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## Why a Native Plugin for Maven

- Migrate our Java (and C++/Fortran) code to maven.
   Looked at the maven-native-plugin, 1 year ago, (both maven 1 and maven 2) and found:
  - + Very configurable
  - Did not run out of the box (no defaults)
  - No binary dependencies
  - Not cross platform (different profiles for different platforms)

So: we wrote our own, the NAR (Native Archive) Plugin

### **Native Archive Plugin**

For Maven 1 and 2
Compiles and links native code
On Linux, Windows, MacOS X, Solaris, ...
With gcc, g++, Microsoft CL, CC, ...
Creates Native Archives for deployment
Allows dependencies on Native Archives
Uses standard maven mechanisms (deploy, download)
Fully configurable, but works out of the "box"
One configuration for multiple platforms

### **Native Archive**

- nar is a jar file (with ".nar" extension) and consists of a collection of native files:
  - Header files
  - Libraries
  - Binaries
  - Data files
- A nar is an attached artifact to a jar artifact. For example for a native math library:
  - nmath-4.7.jar java archive if applicable
  - nmath-4.7-noarch.nar machine independent archive (headers)
  - nmath-4.7-<AOL>-<type>.nar machine dependent archive (one or more)
  - nar files can be
    - uploaded and published on maven servers (just like jar files)
    - depended on (just like jar files)

## **AOL** Classifier

- AOL Classifier specifies where the nar file was created and where it will work:
  - Architecture
    - 📑 i386, x86, amd64, ppc, sparc, ...
  - Operating System
     Windows, Linux, MacOSX, SunOS, ...
  - Linker

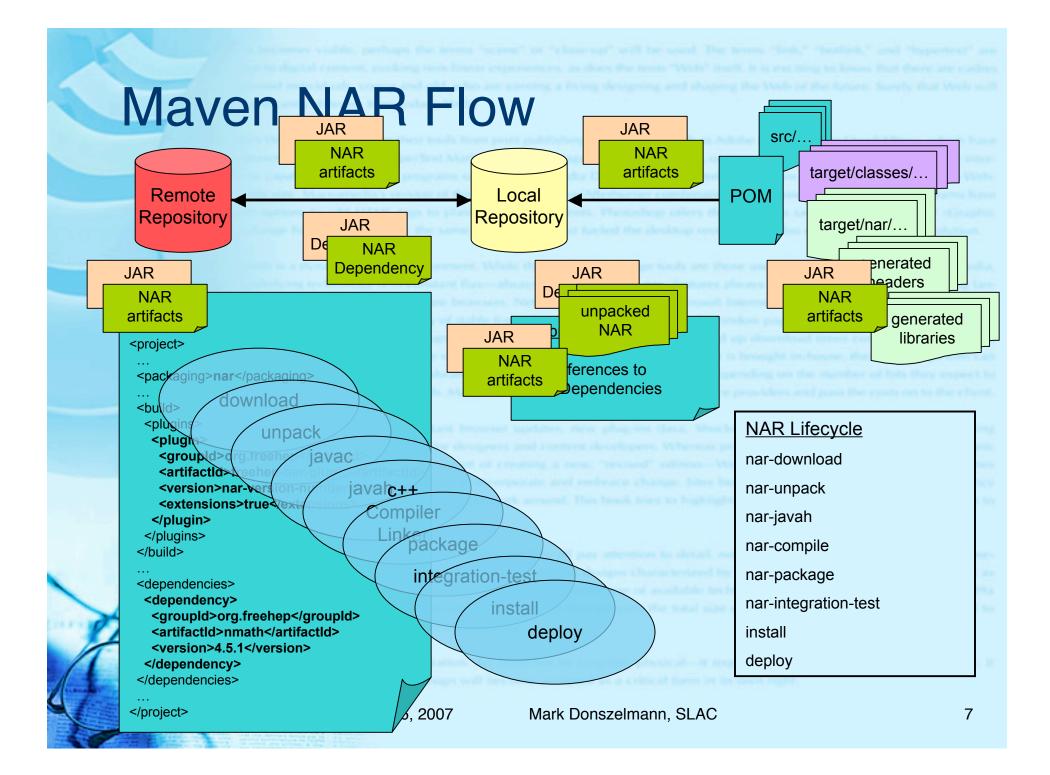
🜌 g++, gcc, msvc, CC, icc, icpc

#### Examples:

x86-Windows-msvc, x86-Windows-g++

i386-Linux-g++, i386-Linux-icpc, amd64-Linux-g++ ppc-MacOSX-g++, i386-MacOSX-g++

sparc-SunOS-CC



### Maven NAR Plugin Goals

- 🖀 nar-download
  - downloads nar dependencies
- anar-unpack
  - unpacks all nar dependencies
- 📓 nar-javah
  - creates header files for classes with native methods
- nar-compile and nar-testCompile
  - compiles all native (test) code

- nar-test
  - runs native test currently inactive
- nar-package
  - bundles up nar files
- nar-integration-test
  - runs integration test against native libraries
- nar-assembly
  - assembles distributions of combinations of nar files (multi-platform)

Goals

- can be configured and run separately
- are configured in the "nar" lifecycle

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### **Usage: shared library**

#### <project>

<packaging>nar</packaging>

#### .. .l.

<build><plugins>

<plugin>

<groupId>org.freehep</groupId>

<artifactId>freehep-nar-plugin</artifactId>

<version>nar-version-number</version>

<extensions>true</extensions>

</plugin>

</plugins>

</build>

</project>

Creates a shared library

Default compiler and linker settings

Note the "nar" packaging

Note the <extensions> tag

es, news phageins (Java, Shocksoave, Real-Acadis, Vintual Reality Modeling intern developers. Whereas print and video protosicates produce a static a new. "revised" edition—Wels professionale create shifting sand shares and embrace charige. Sites because obsolete and trend easily, a tendency rd. This book trees to highlight sites that bring fresheres and investoration to

feature innovative, well-executed designs characterized by effective use of color and shape as well as next. They make efficient and sensible use of available to brodings—scheduse it's law toripting. Cit Bha Read/autio—while at the same time keeping the total size of images, sounds, and animations small to electic without crashing.

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### **Usage: JNI Library**

#### <project>

<packaging>nar</packaging>

<br/>build>

</project>

<plugins>

<plugin>

<groupId>org.freehep</groupId> <artifactId>freehep-nar-plugin</artifactId> <extensions>true</extensions> <configuration> <libraries> <library> </library> </library> </libraries> </configuration> </plugin> </build>

# Creates a JNI libraryNote the configuration section

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### Configuration

	<plugin></plugin>
	<groupid>org.freehep</groupid>
	<artifactid>freehep-nar-plugin</artifactid>
	<configuration></configuration>
	<java></java>
	<include>true</include>
	<javah></javah>
	<excludes></excludes>
	<exclude>**/ModuleJNI.class</exclude>
	<li>libraries&gt;</li>
	<li>library&gt;</li>
	<type>jni</type>
1	

#### Configuration

- add java include files
- run javah but exclude one specific class
- create a JNI library

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## NAR Lifecycle

Phase (standard jar lifecycle phases)	Goals (NAR Goals in <b>bold</b> )		
generate-sources	nar-download		
process-sources	nar-unpack		
process-resources	resources		
compile	compile, nar-javah		
process-classes	nar-compile		
process-test-resources	testResources		
test-compile	testCompile, nar-testCompile		
test	test, nar-testCompile		
package	nar-package, jar		
integration-test	nar-integration-test		
install	install		
deploy	deploy		

### initialization

Derive and set some properties for usage in other goals.
 A(rchitecture) and O(perating System) of AOL are deduced from the machine we run on, but can be overridden.

AOL.properties file defines rest of the defaults.

L(inker) of AOL is specified in a AO dependent property: ppc.MacOSX.linker = g++

All other settings are AOL dependent properties:
 ppc.MacOSX.g++.c.compiler = gcc
 ppc.MacOSX.g++.fortran.options = -Wall -fno-automatic ...

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### nar-download

- Assumes maven has downloaded any declared dependencies of type "jar"
- Looks into these jar dependencies for the file
  - META-INF/nar/*groupId*/artifactId/nar.properties
  - containing a list of nar files to download:
    - groupId/artifactId-noarch.nar
    - groupId/artifactId-\${aol}-static.nar
    - groupId/artifactId-\${aol}-shared.nar
- All nar files are downloaded from a remote maven repository and stored in the local maven repository (unless they were already downloaded before).

### nar-unpack

- All refered nar files are of no direct use to native compilers.
- They are unpacked (unless this has happened already before) into the local repository.
  Nar files are never unpacked on the remote repository.
- Compilers and Linkers can now refer to libraries (.so, .a, .dll), header files (.hh, .h) and other configuration files.

Tools can also refer to binary executables that were packed in nar files,

re have in commond They all pay attention to detail, not just on the home page, but on the solveture innovative, well-executed designs characterized by effective use of color and shape as well as i. They make efficient and sensible use of available technology—schether it's java scripting. Cit'89a d/solics—while at the same time keeping the total size of images, sounds, and animations untail to ads without crashing.

### nar-javah

- Runs javah (just after java class compilation) on any class with "native" methods to produce header files.
- Scans .class files for native methods, not .java files.
- The javah tool is picked up from the java installation used by maven.
- It runs with a CLASSPATH specified by the configuration, the project class files and all "jar" dependencies.
- You can also set a BOOTCLASSPATH.
- This goal has no effect if there are no java sources or none of the java classes have native methods.

### nar-compile and nar-testCompile

- Compiles and Archives/Links any native (test) code under:
   src/main (normally in src/main/c++, src/main/fortran, ..)
   src/test ...
- Uses CPPTasks to handle unified compiler and linker options and general handling of compiler/archiver/linker.
- Will invoke correct compiler based on extension of the source files.
- Compiler Include PATHS:
  - any directories specified in the configuration
  - the path to the header files produced by nar-javah
  - the path to the header files of any unpacked nar dependencies
- Linker Search PATHS:
  - any directories specified in the configuration
     the path to libraries of any unpacked nar dependencies
     the path to the java virtual machine library (if applicable)

### nar-package

Creates the nar files (-noarch and -aol-type)

- nmath-4.5.1-noarch.nar
- nmath-4.5.1-ppc-MacOSX-g++-jni.nar

Creates the nar.properties file
 with references to the above files
 places it in the right place for pickup

Standard package (jar) goal
 picks up any resource files, including the nar.properties files
 picks up any java class files
 creates nmath-4.5.1.jar

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### nar-integration-test

Runs tests against
the packaged jar file
the created libraries
any dependent jar files
any dependent (and unpacked) nar files

Copy of the standard test goal
 turn on forking by default
 setup java.library.path to load shared libraries

Currently only useful to test JNI libraries

to fairne page, but on the subsene of color and shape as well as further it's jaca scripting. Cili Pha

### install and deploy

### Install (default jar goal)

- copies the jar file and its attached nar files to the local repository.
- unpacking of the nar is done by a project that depends on it in the nar-unpack goal.

#### deploy (default jar goal)

- copies the jar file and its attached nar files to a remote repository.
- nar files are **never** unpacked in the remote repository.

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### nar-assembly

- For each listed AOL do:
  - Download all dependencies
  - Unpack all dependencies
  - Copy all library related files to target
- Then the standard assembly plugin will:
  - copy other necessary files to target
  - bundle target into .zip and .tar.gz, ...

- ...
  <plugin>
  <groupId>org.freehep</groupId>
  <artifactId>freehep-nar-plugin</artifactId>
  <configuration>
  <classifiers>
  <classifier>x86-Windows-msvc</classifier>
  <classifier>ppc-MacOSX-g++</classifier>
  <classifier>i386-Linux-g++</classifier>
  </classifiers>
  </configuration>
  <executions>
  <executions>
  <goals>
  <goal>nar-download</goal>
  <goal>nar-unpack</goal>
  - <goal>nar-assembly</goal>
  - </goals>
  - </execution>
- </executions>
- </plugin>

### Maven 2 Philosophy

From the Maven Book:
 Convention over Configuration

 Standard Directory Layout
 Single Project produces Single Output
 Standard Naming Conventions

 Reuse of Build Logic
 Declarative Execution
 Coherent Organization of Dependencies

of here have in commond They all pay attention to detail, not just on the horse page, but on the subset y feature investitive, well executed designs characterized by effective use of color and shape as well as intent. They make efficient and sensible use of available technology—schether it's lava scripting. Cill Bha is final/active—while at the same time keeping the total size of images, sounds, and animations anall to unbeach without crashing.

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### **Convention over Configuration**

### Standard Directory Layout for Native Projects

Parallel to java

/yourproject /src /main /java /resources /include /c++ /c /fortran /test /java /resources /include /C++ /c /fortran

### **Convention over Configuration**

- A single Native Project produces a single Output
   The NAR artifacts are attached artifacts to the primary output
   Why?
  - Native libraries, object files and headers make a complete set. AOL specific nar files have the same functionality, just for different machines. Between -noarch and all -aol-type nar files none seems to be an obvious primary artifact.
  - A JNI library consists of both java classes in a jar file and some shareable library. The jar would logically depend on the shareable library, however javah needs the classes in the jar file to generate the header file, needed for compilation of the shareable library. No way to make this work, except by attaching the shareable library as an artifact to the jar file.
  - Dependencies are declared on jar artifacts, without specifying Architecture, OS and Linker. The POM stays generic and crossplatform. Since most nar files are AOL specific, they would need to be attached.

### **Convention over Configuration**

#### Standard Naming Conventions

Output as attached artifacts
 artifactId-version-noarch.jar
 artifactId-version-aol-type.nar

Unified interface (CPPTasks) to Native Compilers and Tools

- for java compilers and tools this is the case
- for Native tools CPPTasks handles the job
- one setting in the configuration to switch on debugging

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-		<b>u</b>	м		

- <groupId>org.freehep</groupId>
- <artifactId>freehep-nar-plugin</artifactId>
- <configuration>

<cpp>

- <exceptions>false</exceptions> <debug>true</debug>
- </cpp>
- </configuration>
- </plugin>

### **Reuse and Execution**

#### Reuse of Build Logic

nar lifecycle integrates nicely with the jar lifecycle

separate configuration of nar goals is possible

most goals executed via the NarManager which provides programmatic API for other plugins (outside the NAR Plugin) which needs to deal with nar artifacts.

#### Declarative Execution

nar integrates best into maven using the nar lifecycle

- standard pom is used to declare
  - nar lifecycle

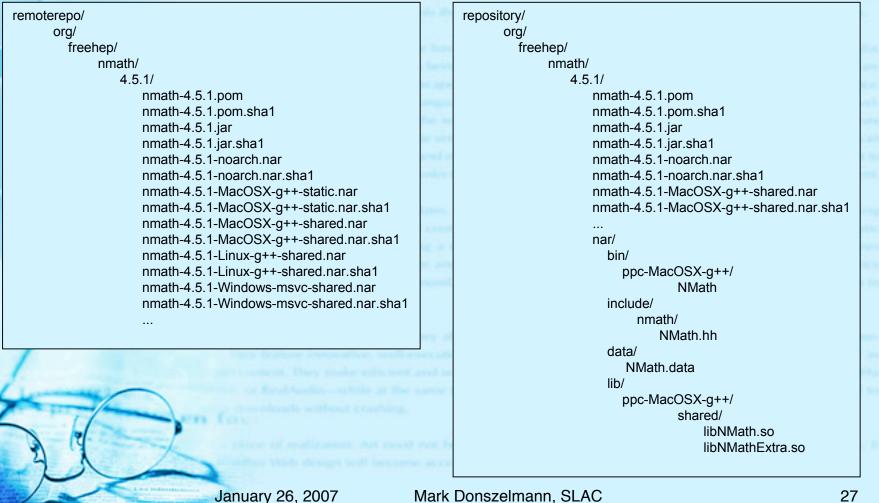
dependency on NAR Plugin

dependencies on artifacts that have attached nar artifacts

### **Organization of Dependencies**

#### **Remote Repository**

#### Local Repository 5%



### Availability

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Version 2.0-alpha-5 nice their tools from print publishing application sock as Adobe PageMaker or QuarkXPress, which have OffspecTextMarkup Language) tags for Wele publishing, or even to add multimedia sound and oner interedia programs such as Maccorrectic Director have created applications that will strip files down to Weba's version of this is the Shockman-Alterburster combination. Even basic word-processing programs have Mickags to plain sumilia documents. Photoshop offers the option to save an image as a Gif. (Graphic server, the same sum of tools that fueled the desktop revolution is also driving the 72-dpi revolution.

Currently in our FreeHEP library
 <u>http://java.freehep.org/freehep-nar-plugin</u>

FreeHEP Maven 2 server
 <u>http://java.freehep.org/maven2</u>

agoins (Leva, Shuckewave, Real-Audits, Virtual Reality Mudeling typers, Whereas print and video pasteroicruals produce a static used" edition-Web professionals create shalling sand shares in charge. Siles became obsolete and treat easily, a tendency of treat to highlight siles that bring fresheres and increasing to

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### Unsupported

- Creation of binaries
- nar-test goal (should maybe use cppunit?)
- nar-integration-test goal only works for JNI libraries
- Linking with shared libraries
- Choice of linking type
- Creation of -noarch nar without creating -aol nar.
- Preservation of disk-space by deleting nar files that have been unpacked.
- And more...

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### Problems

### CPPTasks

Seems not very actively maintained. We made some changes. Does make a unified approach to compilers/linkers and their options.

#### Configuration

Seemed easier in maven 1 with its property files.

### SNAPSHOTS

Publishing attached artifacts as SNAPSHOT seems to create sequence numbers that are not in synch with the primary output (jar file).

SNAPSHOTS of attached artifacts are not re-downloaded

AOL

Not specific enough. Maybe we need a map to handle libs that are backwards compatible.

### Ideas

visible, perhaps the terms "score" or "close-up" will be used. The terms "link," "holink," and "hypertext" are I content, pecking non-linear experiences, as does the terms "Web" that!. It is exciting to know that there are cadres ichasts, social and old, who are narring a fixing designing and shaping the Web of the factore. Society that Web will different frience today's Web.

Standard Configure/Make (GNU) packages could be wrapped by some Maven Plugin into nar files.
 Move the NAR Plugin (at some point) to CodeHaus or Apache.

Add Doxygen to NAR (a la javadoc).

Aids hould, consistent literature spiciates, new plug-its (Leva, Shuckwave, Real-Audio, Vietual Reality Modeling out a challenge for designers and content developers. Whereas print and orders protocitates produce a static is only with the intent of creating a new, "revised" edition-Web protocitation create shifting sand shares links form and flow to incorporate and enderace charge. Siles became obsolete and treat easily, a tenderacy court can anticipate and work around. This book trees to highlight sites that being freshness and inconstant to

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