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Security with Java Deployment

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JavaOne ORACLE

Program Agenda

1. Overview
2. Security Changes
3. New Features
4. Best Practices
5. Packager
5. Future

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Overview

Overview

- Security Levels
- Java Control Panel (JCP) option to disable Java in the browser
- Expiring JRE
- Security Baseline
- Local applets blocked
- Applet Sandboxing with Safari 6.1 and 7
- JNLP auto-download support removed
- Deployment Toolkit (DT) auto-download for secure Java versions

Security Changes

Security Changes

- Security Levels
  - Medium Security Level has been removed JDK 8u20

Security Changes

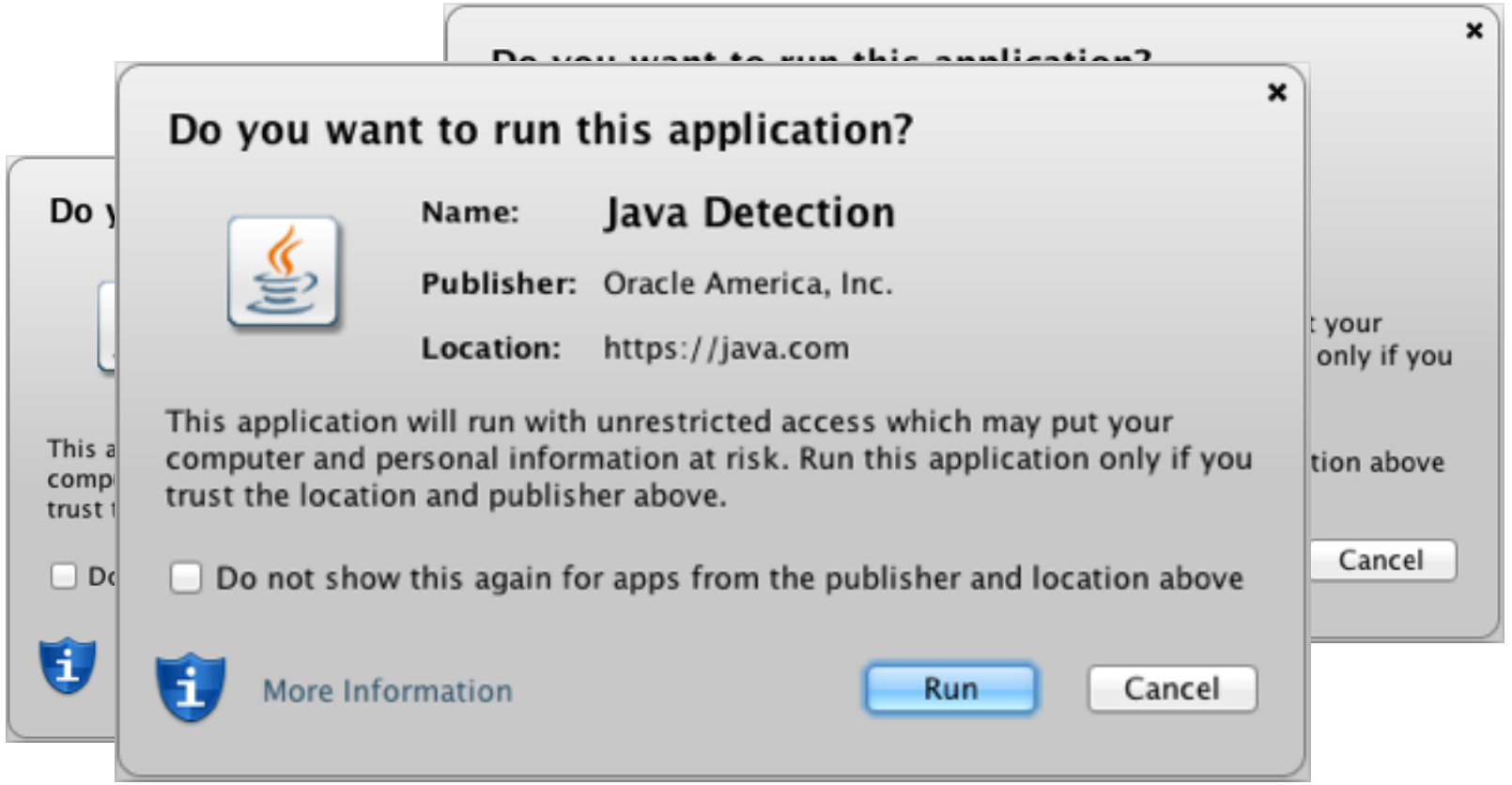
- Security Levels
  - High
    - All JARs must be signed
    - Main JAR must have Permission Attribute
    - Only exceptions are when app is covered by DRS or ESL
  - Very High
    - All features of High
    - Revocation server cannot be reached, Very High will block

Security Changes

- Restore Security Prompts
  - Added in JDK 7u45/8
  - Prompted by Installer

Security Changes

- Reduced Dialog Frequency JDK 7u55/8
  - We heard you, now with fewer dialogs



Security Changes

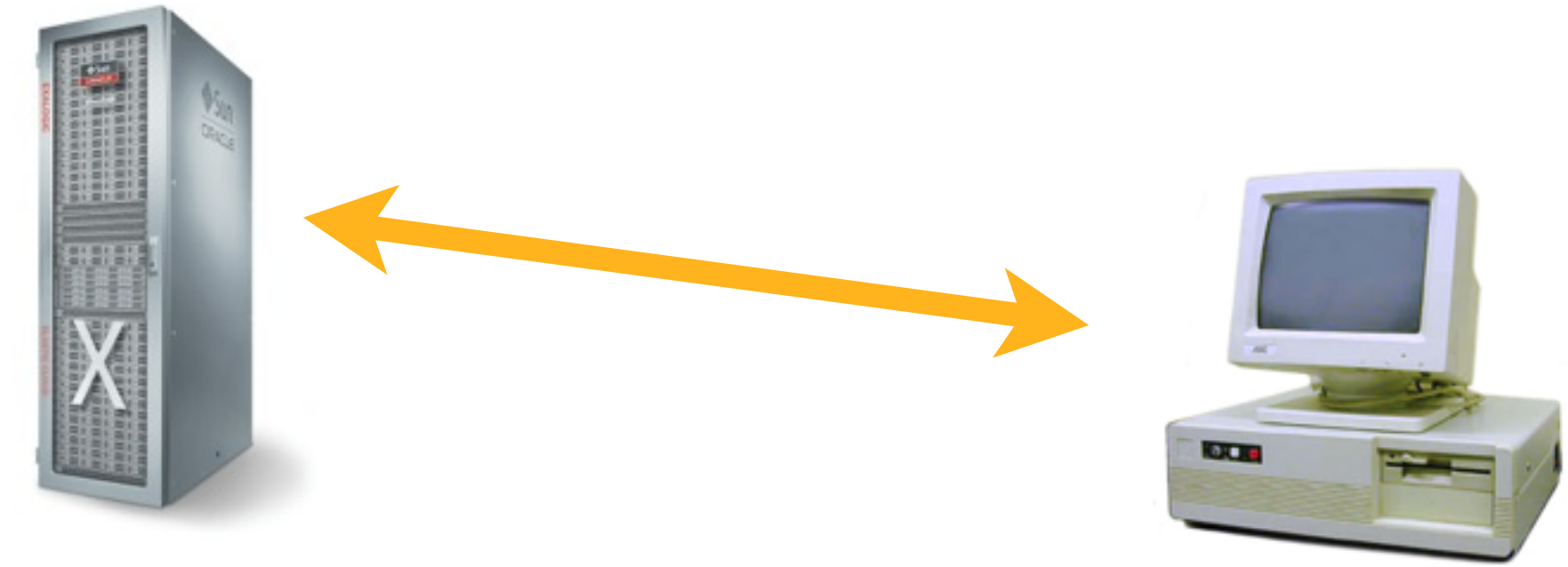
- JavaScript to Java (Liveconnect)
  - Can be blocked or allowed by:
    - Caller-Allowable-Codebase (CAC)
      - DRS rule cannot override Caller-Allowable-Codebase attributes
    - Deployment Rule Set (DRS)
    - Exception Site List (ESL)
    - If not blocked or allowed by above user can allow or block
  - If App and HTML are on different hosts
    - Specific rule is required

Security Changes

- Dynamic Blacklist Changes
  - Blacklist was only used for signing certificates
  - Secure Sockets Layer (SSL) Certificates
  - Transport Layer Security (TLS) Certificates
  - Blacklist automatically updates from java.com
  - Oracle can add any SSL/TLS Certificate
  - Preemptive for Heartbleed exploit

Security Changes

- JDK Same Origin Policy (SOP)



Security Changes

- JDK Same Origin Policy (SOP)

Security Changes

- JDK Same Origin Policy (SOP)

Security Changes

- JDK Same Origin Policy (SOP)

Security Changes

- JDK Same Origin Policy (SOP)
  - Was using IP address
  - Now uses hostname
  - Virtual hosting
  - Cloud services
  - JDK 8 only

New Features

New Features

- Manifest Attributes
  - NEW! Entry-point
  - NEW! Caller-allowable-codebase
  - NEW! Application-library-allowable-codebase
  - Main-Class
  - Permissions
  - Codebase
  - Application-Name
  - Application-Library-Allowable-Codebase
  - Trusted-Library
  - Trusted-Only

New Features

- NEW! Entry-Point
  - Manage public/private state of main classes in JAR
  - Entry-Point is an optional attribute
  - Manifest Example:

```
Main-Class: package.Example
Entry-Point: package.Example package.Example2
```

New Features

- NEW! Caller-allowable-codebase
  - Prohibit a trusted JAR from being reused on other domains
  - Example 1
    - Caller-Allowable-Codebase: *
  - Example 2
    - Caller-Allowable-Codebase: *.com *.org
  - Example 3
    - Caller-Allowable-Codebase: https://www.example.com
  - Example 4
    - Caller-Allowable-Codebase: https://*.example.com:443

New Features

- NEW! Application-library-allowable-codebase
  - List of hosts that match the specified patterns
    - protocol
    - host
    - port
  - Any jnlp extensions (or non-main JARS in html applets) must come from listed places

New Features

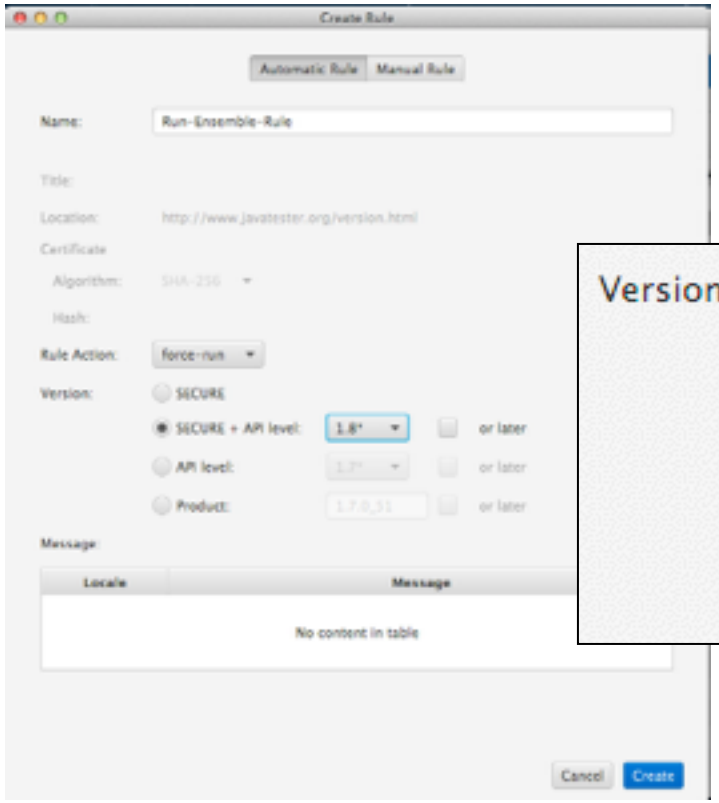
- NEW! Application-library-allowable-codebase
  - Example 1
    - Application-Library-Allowable-Codebase: *.example.com
  - Example 2
    - Application-Library-Allowable-Codebase: https://www.example.com
  - Example 3
  - Application-Library-Allowable-Codebase: *.example.com:1080

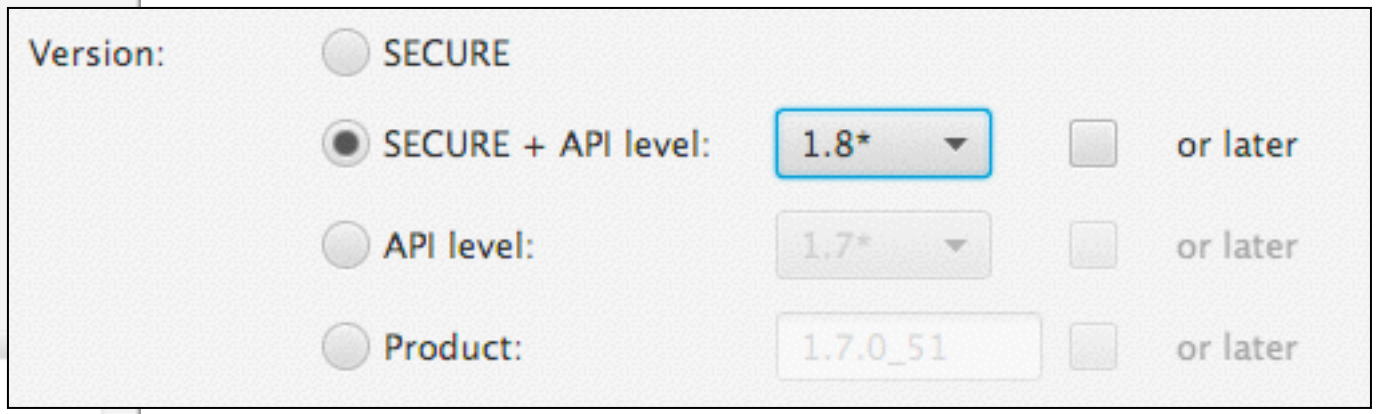
New Features

- Advanced Management Console (AMC)
  - Deployment Rule Set (DRS)
    - force attribute
    - Specify a specific version of the JRE to use
  - AMC exposes force attribute as force-run feature

New Features

- Advanced Management Console (AMC)





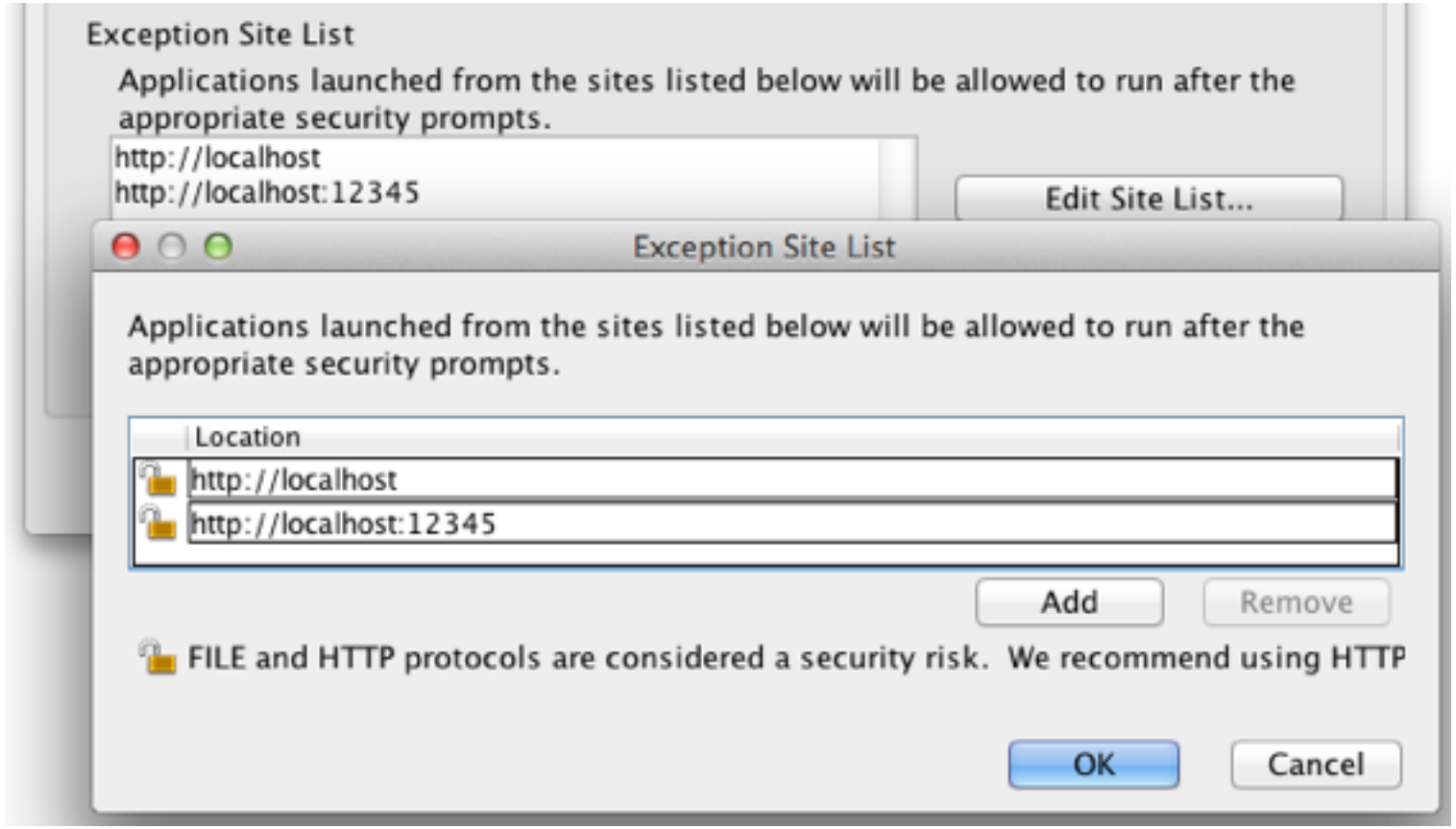
New Features

- Advanced Management Console (AMC)
  - ruleset.xml

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<ruleset version="1.1+">
    <rule>
        <id location="http://www.example.com/test.html"/>
        <action permission="block"/>
    </rule>
    <rule>
        <id location="http://www.javatester.org/version.html"/>
        <action force="true" permission="run" version="1.8*"/>
    </rule>
</ruleset>
```

New Features

- Exception Site List (ESL)



Best Practices

Best Practices

Deployment Choices

- Java Web Start
- Browser Applet
- Self-Contained Application (Packager)
  - http://docs.oracle.com/javase/8/docs/technotes/guides/deploy/part_packaging.html#HGBFGCBI

Best Practices

Evaluate your application

- Deployment Considerations
  - all-permissions or sandbox
  - liveconnect, JS->Java, Java->JS, roundtrip
  - JVM options
  - Java System properties
  - JRE Version
  - Location of artifacts - html/jnlp/JARs
    - Location of hosting (same host, different hosts)
    - Lazy resources
    - 3rd party resources
  - Signed JARs

Best Practices

Read Secure Coding Guidelines

- Secure Coding Guidelines http://www.oracle.com/technetwork/java/seccodeguide-139067.html
- Good recommendations regarding coding securely.
- It has some discussion on subjects directly related to deploying Java securely on the web such as how to use doPrivileged blocks

Best Practices

doPrivleged Example

- Example:

```
public class LibClass {
  // System property used by library,
  //  does not contain sensitive information
  private static final String OPTIONS = "xx.lib.options";

  public static String getOptions() {
    return AccessController.doPrivileged(
      new PrivilegedAction<String>() {
        public String run() {
          // this is checked by SecurityManager
          return System.getProperty(OPTIONS);
        }
      }
    );
  }
}
```

Best Practices

Signed JNLP

- The JNLP file is duplicated in your main signed JAR
- Copy of JNLP in signed JAR must match web server copy
  - JNLP-INF/APPLICATION.JNLP
  - JNLP-INF/APPLICATION_TEMPLATE.JNLP
- Template specifies values that can be substituted by the external JNLP

Best Practices

JVM Options and Java system properties

- Secure properties and JVM arguments
  - Considered safe for use by anyone
  - Available to all applications
  - Prefixes such as “jnlp.*” and “javaws.*” available for application defined properties
- Insecure properties and arguments
  - All other properties and arguments
  - Requires use of signed JNLP
- List of secure properties found at http://docs.oracle.com/javase/7/docs/technotes/guides/javaws/developersguide/syntax.html

Best Practices

JRE Version

- Target to family
  - Use either jnlp “java” element, “java_version” applet parameter or deployment toolkit.
  - JNLP example:
    - <java version=”1.7+” />
    - Run with version of 1.7 and above, i.e., will run with 1.8
    - Split JRE versions requiring different params into separate “java” elements, ordered by priority
  - HTML example (applet/object/embed tag):
    - <param name=”java_version” value=”1.7*”/>
    - Run with version in 1.7, i.e. will NOT run with 1.8

Best Practices

JRE Version

- Target to family
  - DT example:
```
<script src="http://java.com/js/dtjava.js">
        dtjava.embed( { url: "app.jnlp }, { jvm: "1.7*" } );
</script>
```
  - Run with version in 1.7, i.e. will NOT run with 1.8
- Target specific version or versions or families
  - 1.7.0_40 Run with 7u40 specifically, not recommended
  - 1.7.0_40+ Run with 7u40 or later
  - 1.6* 1.7* Run in the latest of either 6 or 7

Best Practices

JRE Version

- Example 1: Runs only with Java version 1.7 update 11

```
<param name="java_version" value="1.7.0_11">
```

- Example 2: Runs with only Java version 1.7 (not with 1.6 or 1.8)

```
<param name="java_version" value="1.7*">
```

- Example 3: Runs with all versions of Java 1.7 or higher

```
<param name="java_version" value="1.7+">
```

Best Practices

Prevent your JARs from being repurposed

- Repurposing is when an attacker uses some of your JARs, with some combination of other JARs, JNLP files, applet tags or javascript using liveconnect
- Set optional “Codebase” manifest attribute to indicate origin
  - You can specify multiple locations
  - Prevents attacker copying JAR to another server
  - Examples:
    - Codebase: oracle.com
    - Codebase: https://*.oracle.com *.java.net

Best Practices

Prevent your JARs from being repurposed

- Set “Permissions” manifest attribute to indicate required permission
  - “all-permissions”
  - “sandbox”
- Set permissions level in html/jnlp.
  - Must match “Permissions” manifest attribute
- Mixed code, i.e., both sandbox/all-permissions jars
  - Should not use HTML applet tag for mixed code
  - Use one JNLP to reference JARs with same permissions
  - Reference extension JNLP with different permissions
  - Should sign all JARs with same certificate
  - Extension JARs can be signed with different certificate

Best Practices

Prevent your JARs from being repurposed

- Signed JNLP prevents
  - Your application being run with different application arguments, JVM arguments and system properties
  - Replacing your JARs with other extensions
  - Using your JARs in a non JNLP application
- Recommend using HTTPS
  - Prevents repurposing with man-in-the-middle attack
- Preventing applications from being repurposed http://docs.oracle.com/javase/8/docs/technotes/guides/deploy/manifest.html#A1213309

Best Practices

Signing JARs

- Moved to a model where jars must be signed (required as of Jan 2014)
- More friendly user experience with valid CA signed jars
- Always sign with a valid CA certificate, sandbox and all-permissions
- Timestamp JAR signatures (more robust future validation)
- Revoke your certificate if it is compromised
- Import certificate into key store during development
  - Import from the Java Control Panel
  - Import from command line
  - Self-signed or local CA certificate treated as valid CA certificate

Best Practices

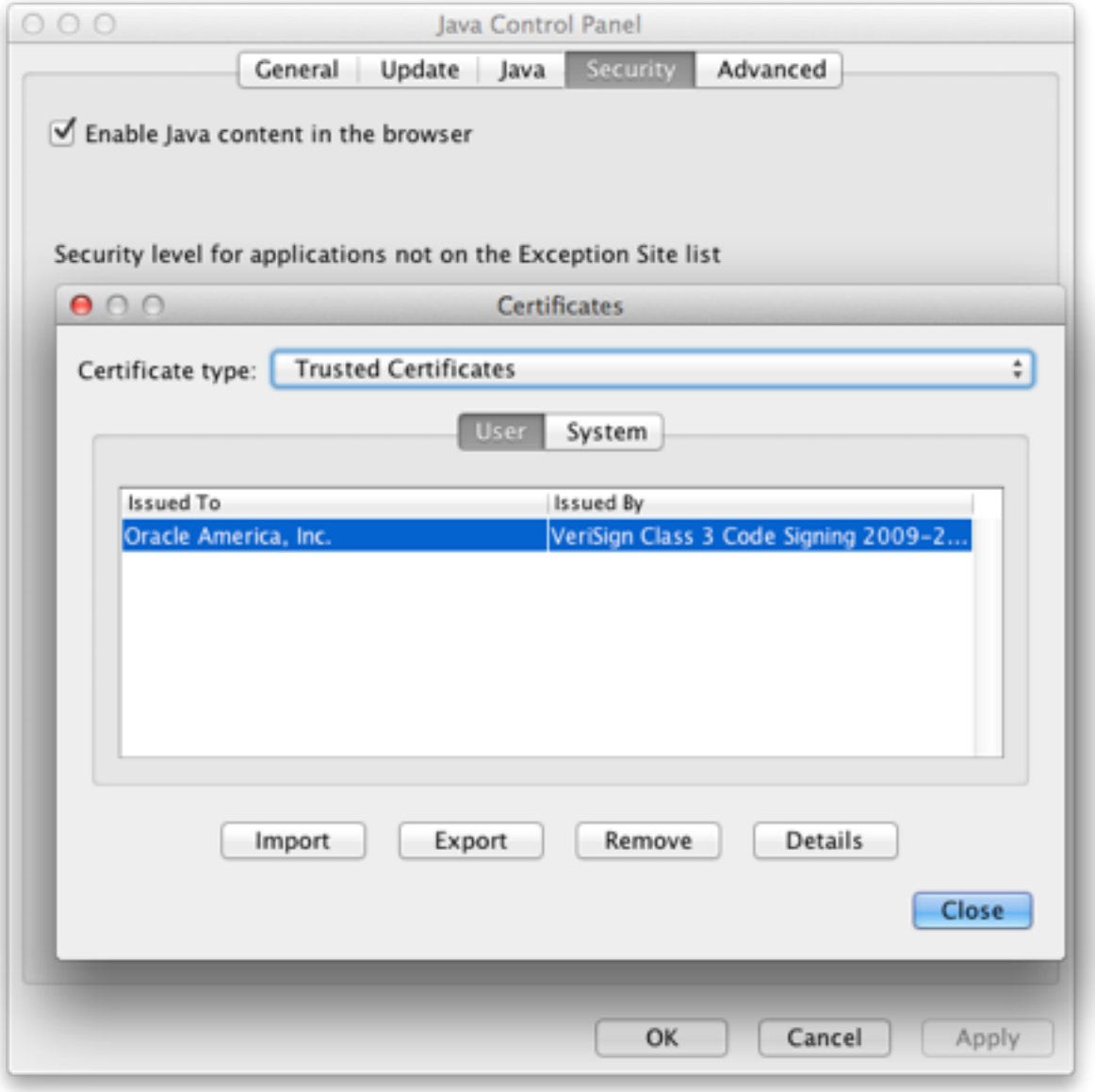
Managing certificates for development

- keytool:
  - keytool -selfcert -alias <name> -dname “CN=..., OU=..., ...”
  - keytool -import -alias <name> -file mycert.cer
  - keytool -export -alias <name> -file outcert.cer

Best Practices

Managing certificates for development

- Java Control Panel:



Best Practices

Keeping your application secure and up to date

- Monitor upcoming changes to Java security and use the latest security features:
- Java Platform Group, Product Management blog (focuses on developers/IT)
  - News about Java from the PM staff
    https://blogs.oracle.com/java-platform-group/
- Security Assurance (all audiences)
  - GPS blog covers Java security news where it impacts Oracle/Java
    https://blogs.oracle.com/security/
- Java Security (for consumers)
  - Related to Java browser users
    http://www.java.com/en/security/

Packager

Packager

- JDK 8u20
  - Renamed Java Packager
  - API for IDEs
    - Add external bundlers
  - Mac PKG Bundler
  - Mac App Store Ready
  - Signing of Mac Apps
  - Services/Daemons

Packager

- JDK 8u40
  - Single Source Launcher
  - Multiple Launchers (Windows, Linux)
  - File Associations
    - PKG, APP, MSI, RPM, DEB
  - Default Application Arguments
  - Simple DMG
  - JVM User Overrides
    - Java API to read/write in Packager.jar

Future

All items discussed are subject to change, bla bla bla

Future
(All items discussed are subject to change)

- Continue to improve security
- Windows Low Integrity
- Java Control Panel Rewrite
  - Security Levels will be a checkbox rather than slider
- Advanced Management Console (AMC) 2.0
  - Web based with REST API
  - Push DRS ruleset.xml to desktop
  - More Instrumenting

Future
(All items discussed are subject to change)

- Packager
  - Better Platform Support
  - Auto Update
  - Launcher metadata
  - Splash Screen
  - Auto Memory

Summary

- Use Packager
- Use Deployment Rule Set:
  - Improve the user experience
  - Continue to use legacy applications in the enterprise
- Follow best practices
  - Use manifest attributes
  - Use HTTPS over HTTP
  - Sign all JARs
  - Follow secure coding guidelines
  - Update your JRE
- Keep up with evolving security practices

Deployment Blog

- https://blogs.oracle.com/talkingjavadeployment/

Packager Talks

- JavaFX Packager Tool Integration Deep Dive - BOF2248
  9/29/14 (Monday) 9:00 PM - Moscone South - 236
  https://oracleus.activeevents.com/2014/connect/sessionDetail.ww?SESSION_ID=2248
- Packaging Your JavaFX Apps for the Mac and the Mac App Store - CON2228
  10/1/14 (Wednesday) 10:00 AM - Hilton - Plaza A
  https://oracleus.activeevents.com/2014/connect/sessionDetail.ww?SESSION_ID=2228
- Packaging and Deploying Java Apps in Java 8u20 - CON2247
  10/2/14 (Thursday) 11:30 AM - Hilton - Plaza A
  https://oracleus.activeevents.com/2014/connect/sessionDetail.ww?SESSION_ID=2247

Questions & Answers

Thank you!

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