Getting started with JCrypTool

May 2012 Edition

Getting started with JCrypTool

JCrypTool – the cryptography e-learning platform

Developing your own plug-in – extending JCrypTool

Resources for a fast start – getting to know JCrypTool

Getting started with JCrypTool

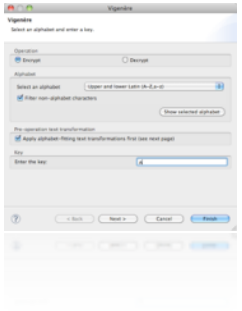
JCrypTool – the cryptography e-learning platform

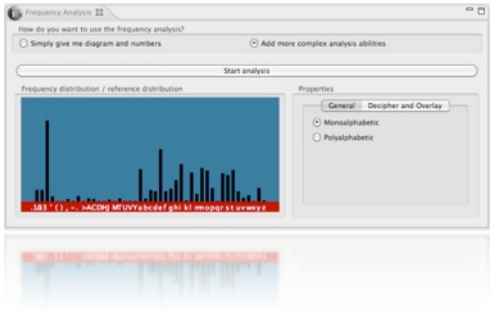
Developing your own plug-in – extending JCrypTool

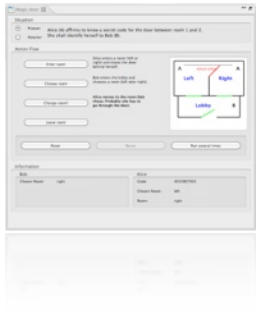
Resources for a fast start – getting to know JCrypTool

Experience cryptography

- From classic to modern cryptography
  - Algorithms (classic, symmetric, asymmetric, hybrid, xml)
  - Analysis
  - Games
  - Visualizations
- Extensive help with user guide and cryptographic theory
- Record, replay, and share sequential crypto cascades
- Console to enter crypto commands directly inside JCrypTool
- Available in German and English







Develop cryptography

- Based on the Eclipse Rich Client Platform (RCP) 3.7
  - Modern user interface
  - Extremely extendable
  - Reusable plug-ins
- Open source
  - Licensed under the Eclipse Public License (EPL) 1.0
- Available for different platforms
  - Supports 32 and 64 bit operating systems

JCrypTool offers almost 20 special extension points which provide easy extensibility for new crypto plug-ins.

Obtaining JCrypTool

- Download
  - Visit http://www.cryptool.org and follow the **Download** link to get the zip archive or installer for your operating system
- Install
  - Extract/ install the downloaded file into an empty directory (the **jcryptool** directory is automatically created)
- Launch
  - Launch **JCrypTool**
     JCrypTool.exe  JCrypTool.app  JCrypTool.sh
  - JCrypTool uses English or German based on your regional settings (the language can be changed in the JCrypTool preferences)

JCrypTool requires Java 1.6 or newer.

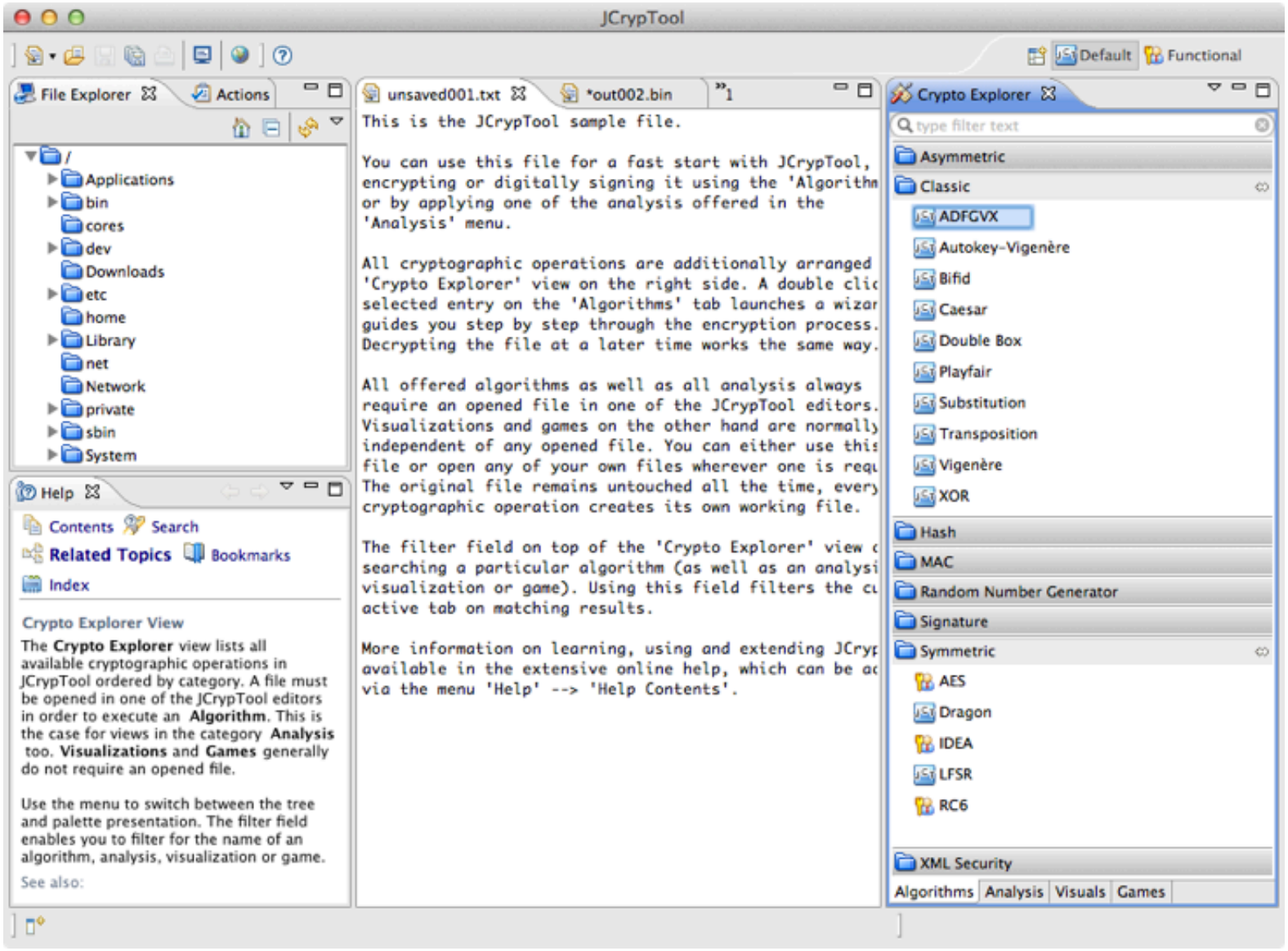
Get an overview on the Welcome Page

- After the first launch, the **Welcome Page** shows up
  - Provides an **Overview** and some **Tutorials** as an introduction
  - Click on **Start** to begin your JCrypTool experience
  - The **Welcome Page** can be reopened via the **Help** menu (entry **Welcome**)

Perspectives, views and editors

- JCrypTool contains two perspectives
  - **Default**: document-centric
  - **Functional**: function-centric
  - Use the perspective switcher in the upper right to switch perspectives
- Each perspective offers its own set of views
  - Views are independent in each perspective
  - Views can be rearranged, resized, and closed
- Two editors, hex and text, are included
  - Use the **Edit – Open with** menu in order to switch to another editor
  - Right-click a file in the view **File Explorer** and select **Open with** to directly choose the desired editor

Default Perspective



Document-centric access to JCrypTool

- The main document-centric perspective
  - Provides easy access to all JCrypTool functionality
  - Dynamic help (lower left) shows help for the active part (if available)
  - Open **Help – Help Contents** for the complete help
- JCrypTool is file-based
  - Open your file in one of the editors (hex or text)
  - Select your file in the File Explorer view and use the context menu to apply a cryptographic function to it
  - The original file remains untouched, every cryptographic operation creates a new file

Some views, like **Visualizations**, provide simulations and do not require any file input.

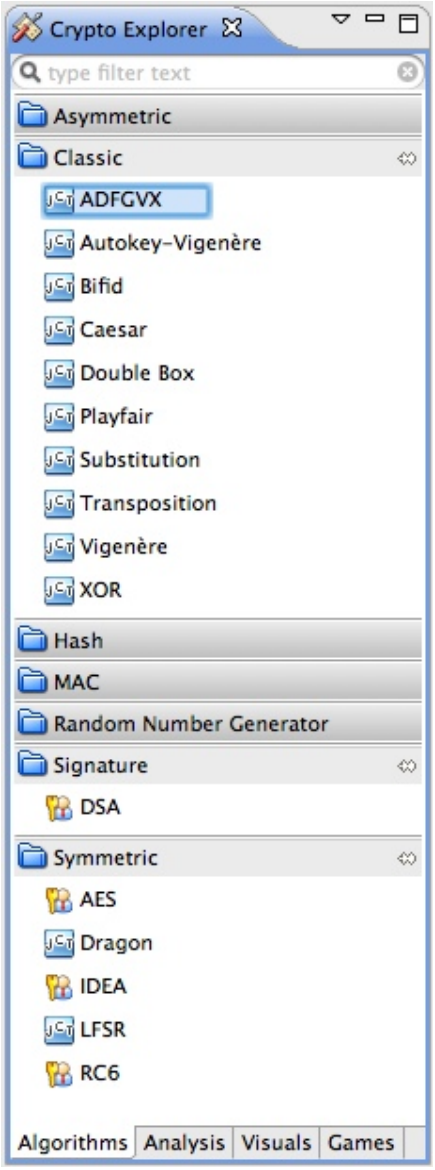
Cryptographic actions

1. Open your file or create a new one
2. Choose the cryptographic operation
   1. By double clicking on an entry in the **Crypto Explorer** view,
   2. By dragging and dropping an entry from the **Crypto Explorer** view onto an open editor, *or*
   3. By selecting an entry in the **main menu**
3. Provide the required information in the **wizard**
4. Click on **Finish** when done

Most wizards and views provide context sensitive help by clicking on the **help icon** or pressing **F1**.

Most crypto plug-ins provide background information in the help system.

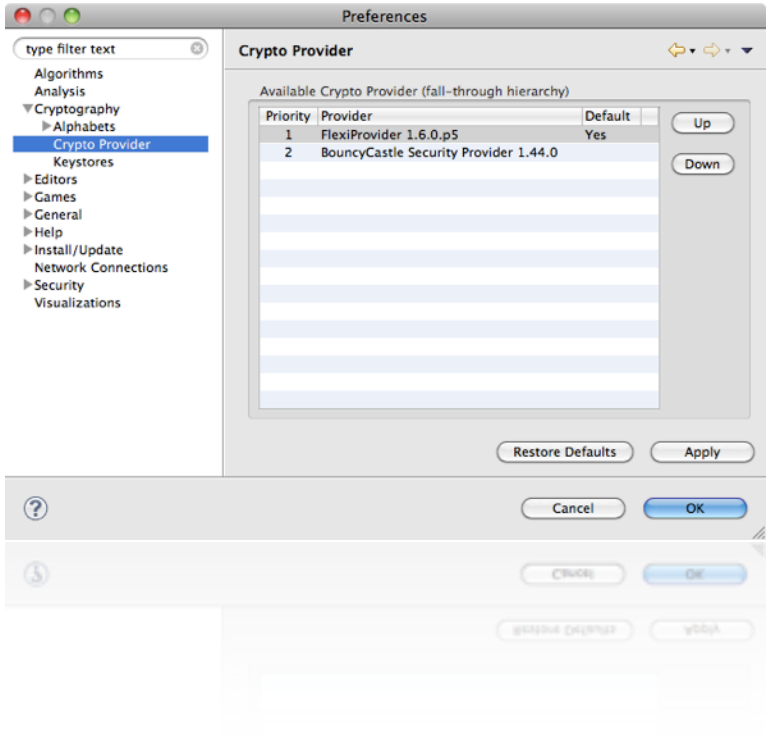
Accessing cryptographic plug-ins



- Four groups are available
  - Algorithms
  - Analysis
  - Visuals
  - Games
- Accessible via
  - The **main menu**
  - The **Crypto Explorer** view
    - Switch with the four tabs at the bottom
    - Search for an algorithm with the search field at the top
- Available algorithms
  - Menu and view entries are identical and depend on the installed crypto plug-ins

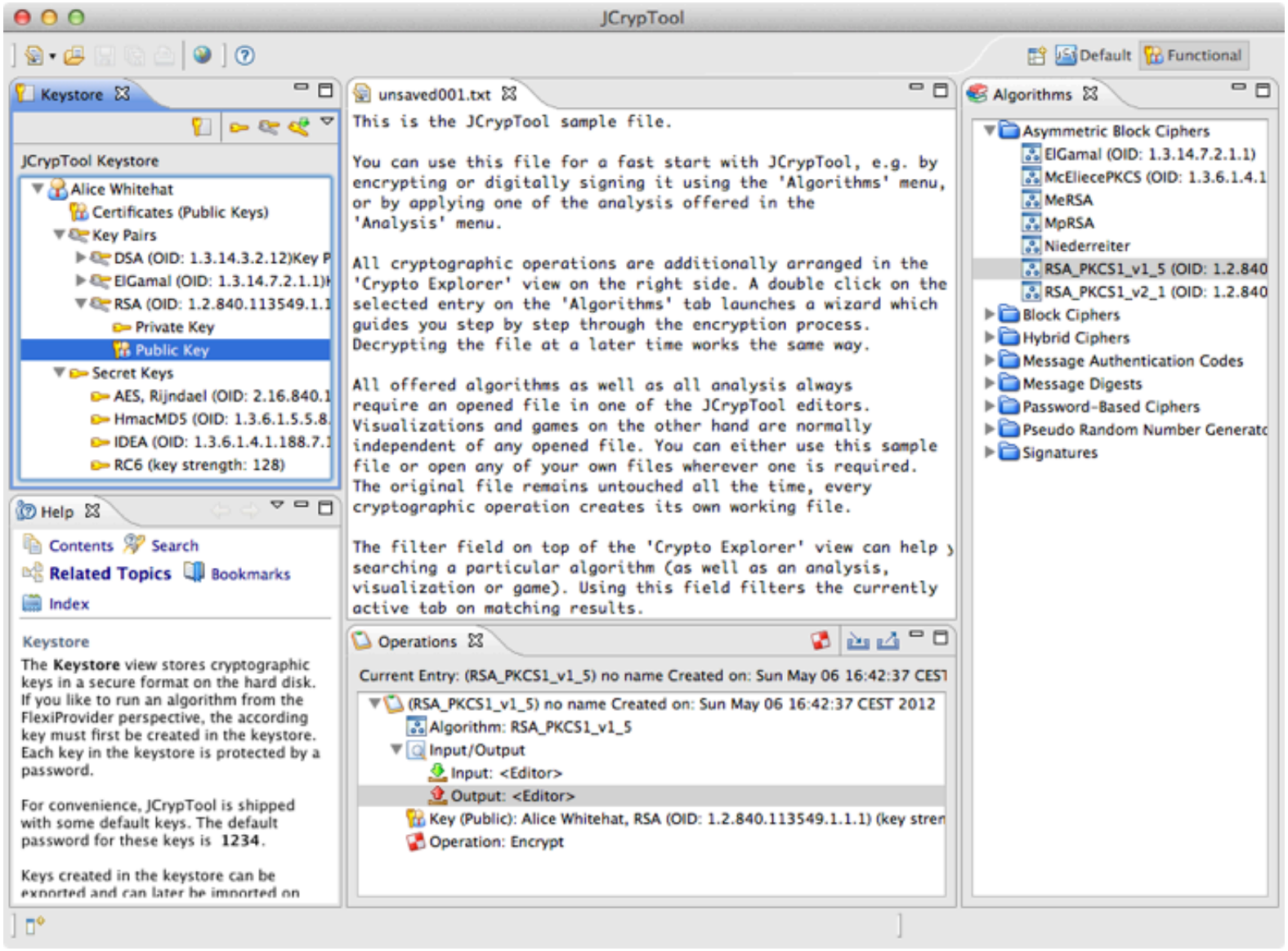
JCrypTool comes with two crypto providers

- FlexiProvider is the default crypto provider
  - BouncyCastle is also available
  - Other crypto providers can be installed as plug-ins
- Preferences
  - **Crypto Providers:** Select your default provider



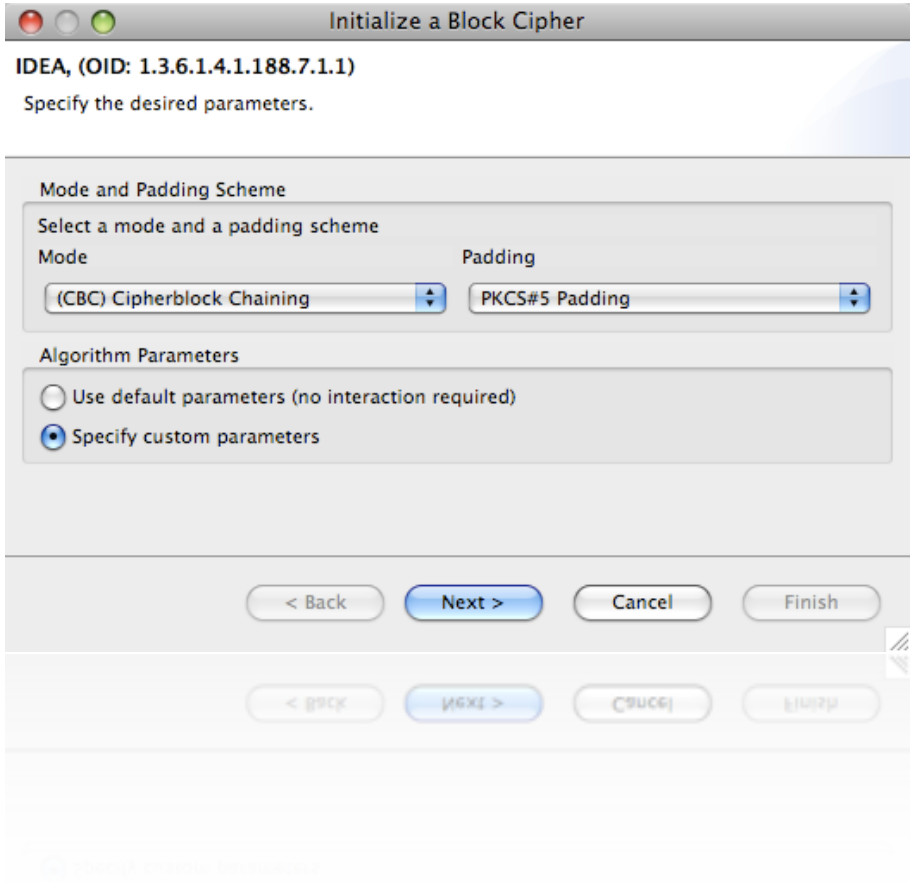
Fall-through hierarchy: JCrypTool searches all installed providers in the defined order to find an implementation of the selected algorithm.

Functional Perspective



Function-centric access to the FlexiProvider

- Advanced operations with FlexiProvider
  - Dynamic wizards directly linked to the FlexiProvider library
    - Default parameters (no interaction required)
    - Custom parameters (choose every possible parameter by yourself)



Getting started with JCrypTool

JCrypTool – the cryptography e-learning platform

Developing your own plug-in – extending JCrypTool

Resources for a fast start – getting to know JCrypTool

JCrypTool is an Eclipse RCP application

- Eclipse Rich Client Platform (RCP)
  - Collection of plug-ins and a runtime
  - Provides basic functionality
    - Preferences
    - Help system
    - And plenty more
  - Integrates update functionality
  - Contains supporting views
    - Error log
    - Progress view

There are differences between plug-in and *normal* Java application development. An existing Java application won't work without modifications as an Eclipse plug-in.

Everything is a plug-in

- A plug-in is the smallest deployable component
- A plug-in provides one kind of functionality, such as
  - An implementation of the AES algorithm
  - An implementation of a DES brute-force-attack
  - A visualization of a cryptographic process
  - …
- In fact, almost every project in our repositories is a plug-in
  - Exceptions
    - The feature projects ending on **.feature**
    - The build projects **org.jcryptool.releng** or **org.jcryptool.repository**

A feature bundles one or more plug-ins

- A feature is a simple container
  - Bundles plug-ins that belong together
  - Does not contain any code
  - Is a separate project that ends on the name **.feature**
- JCrypTool is completely feature based
  - Every plug-in must be included in one
  - Makes installations easier
  - Reduces or removes dependency problems

There a lots of features already available in JCrypTool. Before creating a new one, make sure that there is not already a suitable feature for your plug-in.

Requirements for your JCrypTool development

- **Java** (1.6 or newer) http://www.oracle.com/technetwork/java
  - **Java Runtime Environment** (JRE)
    or
  - **Java Development Kit** (JDK)
- **Eclipse** (3.7 or newer) http://www.eclipse.org
  - **Eclipse Classic**
    or
  - **Eclipse for RCP and RAP Developers**
- **Git** plug-in
  - **EGit** http://www.eclipse.org/egit

JCrypTool Core and Crypto repositories

- The **Core Repository** contains the main platform
  - Runtime
  - Logging, help, preferences
  - Crypto providers (FlexiProvider and BouncyCastle)
  - Editors (hex and text)
  - Views (Actions, Commands, Crypto Explorer, File Explorer, Web browser)
- The **Crypto Repository** contains the crypto plug-ins
  - Analysis
  - Classic, modern, hybrid and xml security algorithms
  - Games
  - Visualizations

JCrypTool Core project (1)

Core (org.jcryptool.core.feature)	org.jcryptool.core
	org.jcryptool.core.action
	org.jcryptool.core.cryptosystem
	org.jcryptool.core.help
	org.jcryptool.core.logging
	org.jcryptool.core.nl
	org.jcryptool.core.operations
	org.jcryptool.core.util
	org.jcryptool.core.views
Views (org.jcryptool.views.feature)	org.jcryptool.actions.core
	org.jcryptool.actions.ui
	org.jcryptool.commands.core
	org.jcryptool.commands.ui
	org.jcryptool.fileexplorer
	org.jcryptool.webbrowser

JCrypTool Core project (2)

Providers (org.jcryptool.providers.feature)	de.flexiprovider
	org.bouncycastle
Crypto (org.jcryptool.crypto.feature)	org.jcryptool.crypto
	org.jcryptool.crypto.keystore
FlexiProvider (org.jcryptool.crypto.flexiprovider.feature)	org.jcryptool.crypto.flexiprovider
	org.jcryptool.crypto.flexiprovider.algorithms
	org.jcryptool.crypto.flexiprovider.engines
	org.jcryptool.crypto.flexiprovider.integrator
	org.jcryptool.crypto.flexiprovider.keystore
	org.jcryptool.crypto.flexiprovider.operations
Editors (org.jcryptool.editors.feature)	org.jcryptool.editor.text
	net.sourceforge.javahexeditor

JCrypTool Crypto project (1)

Analysis
(org.jcryptool.analysis.feature)

org.jcryptool.analysis

org.jcryptool.analysis.entropy

org.jcryptool.analysis.freqanalysis

org.jcryptool.analysis.friedman

org.jcryptool.analysis.graphtools

org.jcryptool.analysis.kegver

org.jcryptool.analysis.textmodify

org.jcryptool.analysis.transpositionanalysis

org.jcryptool.analysis.vigenere

JCrypTool Crypto project (2)

Classic Algorithms
(org.jcryptool.crypto.classic.feature)

- org.jcryptool.crypto.classic
- org.jcryptool.crypto.classic.adfgvx
- org.jcryptool.crypto.classic.alphabets
- org.jcryptool.crypto.classic.autovigenere
- org.jcryptool.crypto.classic.caesar
- org.jcryptool.crypto.classic.delastelle
- org.jcryptool.crypto.classic.doppelkasten
- org.jcryptool.crypto.classic.model
- org.jcryptool.crypto.classic.playfair
- org.jcryptool.crypto.classic.substitution
- org.jcryptool.crypto.classic.transposition
- org.jcryptool.crypto.classic.vigenere
- org.jcryptool.crypto.classic.xor

JCrypTool Crypto project (3)

Modern Algorithms (org.jcryptool.crypto.modern.feature)	org.jcryptool.crypto.modern
	org.jcryptool.crypto.modern.sha3
	org.jcryptool.crypto.modern.stream.dragon
	org.jcryptool.crypto.modern.stream.lfsr
Games (org.jcryptool.games.feature)	org.jcryptool.games
	org.jcryptool.games.numbershark
	org.jcryptool.games.sudoku

JCrypTool Crypto project (4)

Visualizations (1/2)
(org.jcryptool.visuals.feature)

- org.jcryptool.visual
- org.jcryptool.visual.aco
- org.jcryptool.visual.crt
- org.jcryptool.visual.dsa
- org.jcryptool.visual.ecc
- org.jcryptool.visual.ecdh
- org.jcryptool.visual.elGamal
- org.jcryptool.visual.grille
- org.jcryptool.visual.he
- org.jcryptool.visual.kleptography
- org.jcryptool.visual.library
- org.jcryptool.visual.pairingbd2
- org.jcryptool.visual.rsa
- org.jcryptool.visual.secretsharing

JCrypTool Crypto project (5)

Visualizations (2/2)
(org.jcryptool.visuals.feature)

- org.jcryptool.sidechannelattack.dpa
- org.jcryptool.sidechannelattack.spa
- org.jcryptool.visual.viterbi
- org.jcryptool.visual.verifiablesecretsharing
- org.jcryptool.visual.viterbi
- org.jcryptool.visual.xeuclidean
- org.jcryptool.visual.zeroknowledge

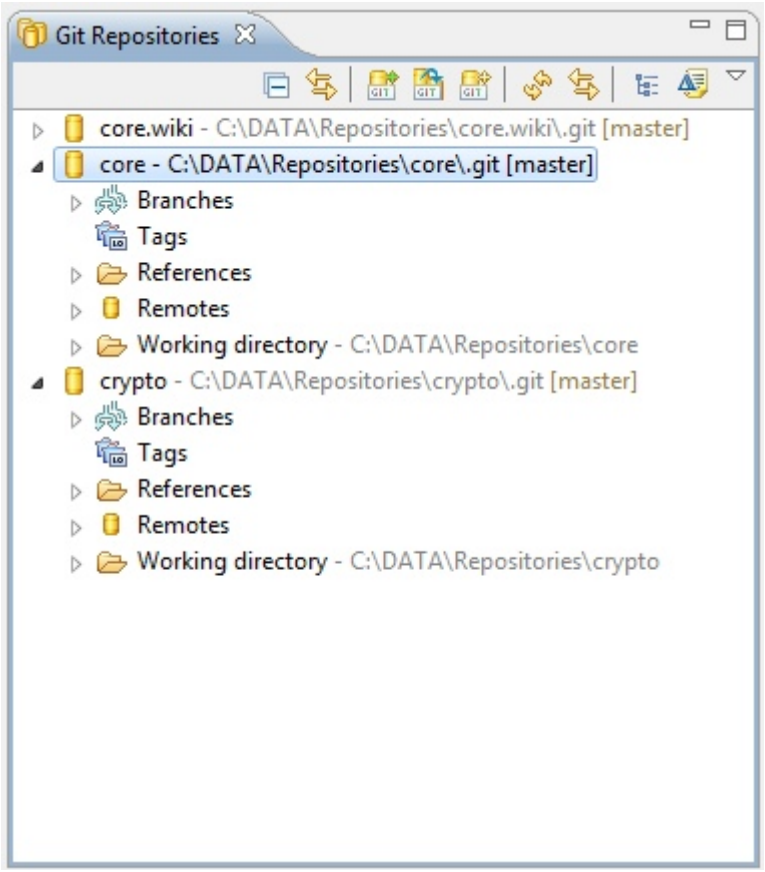
Obtaining the JCrypTool sources

- Two repositories
  - Both offer anonymous read access
  - A GitHub user (and registration with the JCrypTool project) is required for write access
  - Feel free to create a fork for the JCrypTool project and start right away
- **JCrypTool Core**
  https://github.com/jcryptool/core
- **JCrypTool Crypto**
  https://github.com/jcryptool/crypto

As a developer you must check out all core repository plug-ins. The crypto plug-ins are optional, but they make development easier since you can use them as samples.

Using EGit to check out the projects

- Add both repository locations and clone the repositories
- Right click on each repository and choose **Import Projects...**



Visit our wiki for more information on our repositories: https://github.com/jcryptool/core/wiki/doc-GettingStarted

Starting JCrypTool in your Eclipse IDE

- First launch
  - Open the file **jcryptool.product** located in the **org.jcryptool.repository** project
  - Click on the **Launch an Eclipse application** link in the lower left
- Two things happen now
  - JCrypTool is started
  - A new run configuration is created
- Later launches
  - Either use the **Launch an Eclipse application** link again
  - Or use the generated **run configuration**

Visit our wiki for more information on how to get started: https://github.com/jcryptool/core/wiki/doc-GettingStarted

JCrypTool divides plug-ins into related groups (1)

- Mainly view based plug-ins
  - **Analysis** plug-ins
    - Example plug-in: org.jcryptool.analysis.freqanalysis
    - Branding plug-in: org.jcryptool.analysis
    - Feature: org.jcryptool.analysis
  - **Visualization** plug-ins
    - Example plug-in: org.jcryptool.visual.ecc
    - Branding plug-in: org.jcryptool.visual
    - Feature: org.jcryptool.visual
  - **Game** plug-ins
    - Example plug-in: org.jcryptool.games.numbershark
    - Branding plug-in: org.jcryptool.games
    - Feature: org.jcryptool.games

JCrypTool divides plug-ins into related groups (2)

- Mainly wizard based plug-ins
  - **Classic** algorithm plug-ins
    - Example plug-in: org.jcryptool.crypto.classic.caesar
    - Branding plug-in: org.jcryptool.crypto.classic
    - Feature: org.jcryptool.crypto.classic
  - **Modern** algorithm plug-ins
    - Example plug-in: org.jcryptool.crypto.modern.stream.dragon
    - Branding plug-in: org.jcryptool.crypto.modern
    - Feature: org.jcryptool.crypto.modern

It is not required that classic and modern plug-ins must be wizard-based, nor that analysis, game, and visualization plug-ins must be view-based, but that tends to be how it works out.

Creating an official JCrypTool plug-in

- Official JCrypTool plug-ins (hosted in our repository)
  - Must have a name starting with **org.jcryptool.**
  - Followed by one of the following
    - analysis.[name]
    - games.[name]
    - visual.[name]
    - crypto.classic.[name]
    - crypto.modern.[name]
- Add your plug-in(s) to the corresponding feature
  - One feature project for every crypto plug-in family
  - Example
    - Plug-in: org.jcryptool.games.numbershark
    - Feature: org.jcryptool.games

Creating an unofficial JCrypTool plug-in

- Unofficial plug-ins (hosted by yourself)
  - Can have any name
  - Stick to Java recommendations (reverse domain name)
- Create a feature for your plug-ins
  - Always provide a feature for your plug-ins
- Shipping your plug-ins
  - Offer downloadable archives for your plug-ins
  - Create your own update site
    - Users can manually add this site to their JCrypTool installation

Development hints

- Choose the crypto plug-in group
  - Make sure it matches with the plug-in you intend to develop
  - Learn from the existing plug-ins in the corresponding group
- Reuse existing functionality
  - Especially when provided by extension points
  - Especially when requiring existing third party jars
  - Use the **org.jcryptool.core.util** plug-in, which provides different services and interfaces used all over JCrypTool
- JCrypTool is an e-learning software
  - An extensive help with (cryptographic) background information and a tutorial should be part of your plug-in
  - Context sensitive help provides immediate support
  - Cheat Sheets provide a guided tour for new users

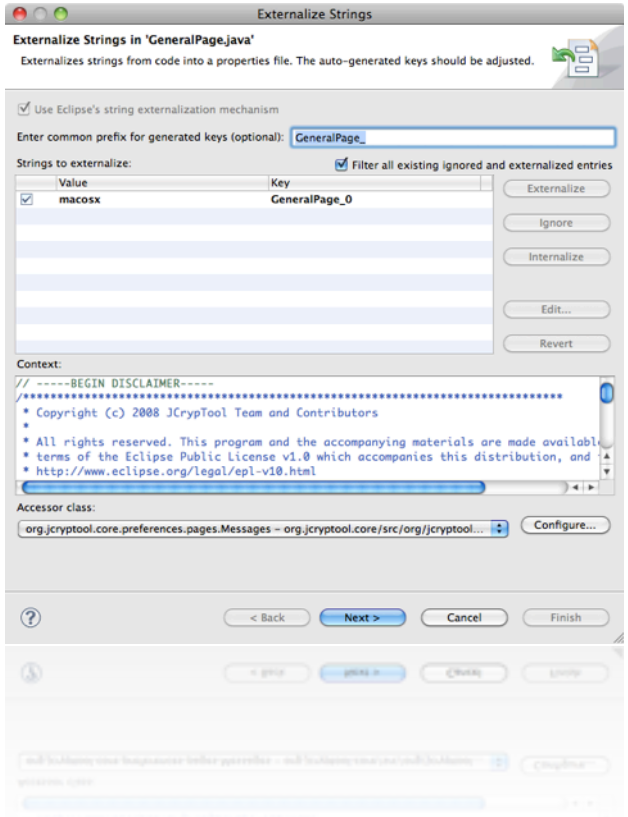
Mind some Eclipse RCP restrictions and specialties

- No garbage collection in SWT
  - Clean up all used OS resources after usage, especially fonts and images
- JCrypTool is shipped for multiple platforms
  - Exotic fonts may not be available on all platforms
  - Use the default font wherever possible
- Loading resources
  - Every plug-in ends up in a jar-file, which influences the required path to load a resource like an image

The org.jcryptool.core.util plug-in makes font handling easy: Simply request a font, the plug-in frees you from all other tasks.

Internationalize your plug-in

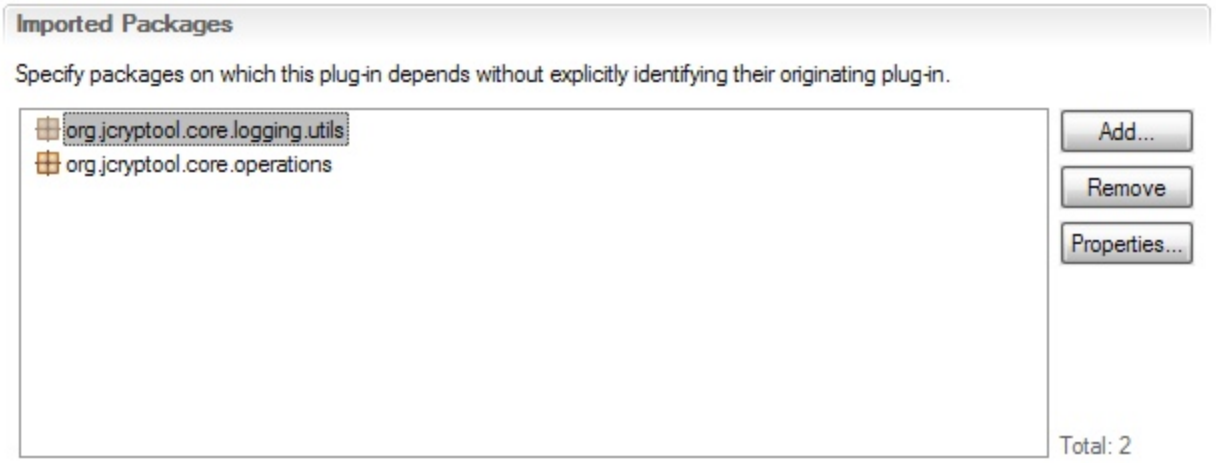
- English GUI and help are a must have
  - German is optional but strongly requested
- Use the **Externalize Strings** wizard in the **Source** menu
  - Always mark the checkbox **Use Eclipse's string externalization mechanism**
  - Provide property files for every supported language



- Externalize plugin.xml and MANIFEST.MF files
  - Use **PDE Tools - Externalize Strings**

Use the JCrypTool logging plug-in

- Use org.jcryptool.core.logging
  - Add the package **org.jcryptool.core.logging.utils** as dependency via **Imported Packages**
- The helper class LogUtil provides easy access points
  - LogUtil.logInfo(“*message*”)
  - LogUtil.logWarning(“*message*”)
  - LogUtil.logError(“*message*”)



Using the JCrypTool extension points

- Documentation
  - Most of the extension points include documentation and an implementation sample
- Find a sample implementation
  1. Open the **plugin.xml** of the plug-in that provides the extension point
  2. Switch to the **Extension Points** tab
  3. Select the desired extension point in the list
  4. Click on the **Find references** link and examine the implementation

An extension point is a public API.

Available extension points in JCrypTool

- **org.jcryptool.core**
  - editorButton
  - platformLanguage
- **org.jcryptool.core.operations**
  - algorithms
  - alphabets
  - analysis
  - editorServices
  - games
  - keystores
  - operationsManager
  - pkcsFactories
  - providers
  - providers2
  - visuals
- **org.jcryptool.commands.core**
  - commands
- **org.jcryptool.crypto.flexiprovider.algorithms**
  - newOperation
- **org.jcryptool.crypto.flexiprovider.operations**
  - performFlexiProviderOperation
- **org.jcryptool.crypto.keystore**
  - keyStoreActions

Optimizing your run menu configuration

- **Main** tab
  - Activate the **Clear** checkbox to start with an empty runtime workspace all the time
- **Arguments** tab
  - Add **-consolelog** as last parameter in the **Program Arguments** box
  - Replace the **-nl ${target.nl}** in the **Program Arguments** box with **-nl en** for the English JCrypTool
- **Plug-ins** tab
  - Click the **Add Required Plug-ins** button

Name this run menu entry **JCrypTool English**, copy it, name the new one **JCrypTool German** and replace **-nl en** with **-nl de** for the English version on the Arguments tab.

Getting started with JCrypTool

JCrypTool – the cryptography e-learning platform

Developing your own plug-in – extending JCrypTool

Resources for a fast start – getting to know JCrypTool

Become a part of the JCrypTool community

- Discussion Groups
  - http://groups.google.com/group/jcryptool-developers
  - http://groups.google.com/group/jcryptool-users
- GitHub
  - https://github.com/jcryptool
- Issues
  - https://github.com/jcryptool/core/issues
  - https://github.com/jcryptool/crypto/issues
- Web
  - http://www.cryptool.org
- Wiki
  - https://github.com/jcryptool/core/wiki

Getting in touch with JCrypTool

- JCrypTool project lead
  - Dominik Schadow – dominikschadow@googlemail.com

- CrypTool project lead
  - Prof. Bernhard Esslinger – esslinger@fb5.uni-siegen.de

Happy coding…