Ftklipse – Design and Implementation of an Extendable Computer Forensics Environment
Software Requirements Specification Document

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Chapter 1

Introduction

1.1 Purpose

The purpose behind this document is to describe the features of ftkclipse, an extendable platform for computer forensics. This document will explain the product for the customer, as well as provide a detailed specification for the developer.

1.2 Scope

Ftkclipse is a thick-client solution for forensics investigation. It allows to collect and preserve evidence, to analyze it and to report on it.

It supports chain of custody management, access control policies and batch operation of its included tools in order to facilitate and accelerate the investigation. The environment itself and its tools are configurable as well.

1.3 Definitions and Acronyms

Cryptographic Hash Function Function mapping input data of an arbitrary size to a fixed-sized output that is highly collision resistant.
CHAPTER 1. INTRODUCTION

**JVM** The Java Virtual Machine. Program and framework allowing the execution of program developed using the Java programming language.

**GUI** Graphical User Interface.

### 1.4 Compliance

This document was written based on [So98].
Chapter 2

Overall Description

2.1 Product Perspective

- Ftklipse is meant to be a stand-alone product, depending on a variety of standard tools organized as plug-ins.

- Ftklipse is meant to be extendable using plug-ins that will add evidence gathering and analysis properties

- The product has only one interface, a graphical user interface residing on the client computer

2.1.1 System interfaces

The only interface to the system will be its GUI.

2.1.2 User Interfaces

Ftlipse implements a user interfaces that is evidence-centric. It offers wizards for each of its features for ease of use. It allows investigators to record notes for each piece of evidence as well as to record additional reporting information. Please refer to Figure 2.1 and Figure 2.2 for an example of the look and feel of the application.
CHAPTER 2. OVERALL DESCRIPTION

Figure 2.1: User Interface Showing the Case Introduction
Figure 2.2: User Interface Showing the Evidence Information and Notes
2.1.3 Software Interfaces

The product must expose a software interface for plug-in developers to use. The interfaces provided must allow to:

- Register the plug-in
- Extend the Graphical User Interface’s tool menus (window, pop-up, etc.)
- Offer an interface for the plug-in to implement to allow callbacks enabling execution

2.2 Product Functions

The system will implement the following functionalities:

- Creation of cases
- Evidence Gathering using integrated and plug-in tools
- Evidence Integrity validation using a hash function
- Evidence Import from any media to an existing case
- Logging of all operations performed on the evidence
- Validation of integrity of evidence after each operation over it
- Display of evidence in read-only mode either in ASCII, Unicode or Hex formats
- Recording of investigative notes for each piece of evidence
- Capability to extract a part of the evidence into another file
- Capability to copy and rename the copy of the evidence
• Generation of reports in PDF and \LaTeXe\ formats that includes listing of the evidence in the case, a printout of selected parts of the evidence, the investigative notes related to selected parts of the evidence and a customized executive summary, introduction, and conclusion. It also integrates the chain of custody information for each part of the evidence displaying the principal, time stamp and operation performed on the evidence.

• An extendable set of tools through a plug-in architecture

• Tool-specific defaults and configuration screens

2.3 User Characteristics

Users are cyber forensics investigators. They are experienced using existing sets of tools, and will be trained in the use of ftkclipse before its deployment.

Indirect users are investigators, prosecutors, judges and laypersons, which will consult the reports generated. They expect reports of high quality which demonstrate objectivity and methodology.

2.4 Constraints

2.4.1 Hardware Constraints

Any computer able to operate the Eclipse platform can be used to operate Ftkclipse.

2.4.2 Software Constraints

It is assumed that the investigator’s computer supports and includes the following programs:

• JVM, version 5 or higher

• \LaTeXe\, preferably pdflatex
Other tools are not assumed to be present, as they are integrated in each plug-in.

In the case of using Ftklipse for evidence collection only, only the JVM is required.

2.5 Assumptions and Dependencies

The software assumes a non-hostile environment (i.e. not aiming at disturbing its operation).

2.6 Apportioning of requirements

Some features are to be implemented in later versions of Ftklipse, notably:

- Integration of the Access Control framework with administrator screens
- \LaTeX output of reports
- Object-specific logging
- Hexadecimal and image display
- Evidence Extraction
Chapter 3

Specific Requirements

3.1 External Interfaces

The product must expose a software interface for plug-in developers to use. The interfaces provided must allow to:

- Register the plug-in
- Extend the Graphical User Interface’s tool menus (window, pop-up, etc.)
- Offer an interface for the plug-in to implement to allow callbacks enabling execution

3.2 Functional Requirements

3.2.1 Domain Model

Our domain model is a traditional police investigation one, augmented with some information specific to cyber forensics and our requirements[Deb]. It is summarized in Figure 3.1.

3.2.2 Use Case Model

The use case model for Ftklipse is illustrated in Figure 3.2.
Figure 3.1: Domain Model for Ftklipse
CHAPTER 3. SPECIFIC REQUIREMENTS

Figure 3.2: Use Case Diagram for Ftkclipse
3.3 Requirements Description

3.3.1 Creation of cases

**Description**  Ftklipse allows the creation of cases with their associated metadata, as specified in section 3.5.

**Criticality**  This feature is critical to the software.

**Technical Issues**  None

**Dependencies with Other Requirements**  None

3.3.2 Evidence Gathering

**Description**  Ftklipse allows to run different tools in order to perform evidence collection on a live system.

**Criticality**  This feature is critical to the software.

**Technical Issues**  The collection of the output of the gathering tool can be problematic, considering the variety of tools and their working. The redirection of the tool’s standard input and output in a manner useful to the investigator should be considered.

**Dependencies with Other Requirements**  None

3.3.3 Evidence Analysis

**Description**  Ftklipse allows to run different tools on one or more selected evidences, as well as to operate a batch analysis. In the latter case, the system must offer a GUI to the user that allows the selection of the evidence and operations to perform on it.
Criticality  The ability to analyze the evidence is critical. However, the automated analysis of multiple pieces of evidence is not critical.

Technical Issues  The development of a generic programming interface for the variety of analysis tools is likely to be complex.

Dependencies with Other Requirements  None

3.3.4 Evidence Integrity Validation

Description  Ftklipse records the SHA-1 signature of every piece of evidence and ensures that the evidence is kept correct during the investigation. In the case of a corruption of the evidence, Ftklipse detects it and records which operation caused this corruption.

Criticality  This feature is important to the operation of the software, although not critical.

Technical Issues

Dependencies with Other Requirements

3.3.5 Evidence Import

Description  Ftklipse allows to import evidence that was collected outside of itself. The evidence must be accompanied by a SHA-1 digest that is correct in order to import the evidence in the system.

Criticality  This feature is important, although not critical.

Technical Issues  The encoding and format of the SHA-1 signature can vary from one tool to another.

Dependencies with Other Requirements
3.3.6 Logging

**Description**  All operations are logged globally by Ftklipse. Furthermore, all operations related to a given piece of evidence are logged for that evidence specifically.

**Criticality**  The global logging is critical to Ftklipse. The specific logging is important, but not essential.

**Technical Issues**

**Dependencies with Other Requirements**

3.3.7 Evidence Display

**Description**  The evidence can be visualized, if authorized, in read-only mode either in ASCII, Unicode or Hex formats. Furthermore, images can be viewed within Ftklipse and can be opened in an external viewer program.

**Criticality**  This function is critical to the operation of the software in ASCII.

**Technical Issues**

**Dependencies with Other Requirements**

3.3.8 Recording of Investigative Notes

**Description**  The investigator must be able to record information regarding each piece of evidence, as well as report-specific information.

**Criticality**  This function is critical to the operation of Ftklipse.

**Technical Issues**
CHAPTER 3. SPECIFIC REQUIREMENTS

Dependencies with Other Requirements

3.3.9 Evidence Extraction

**Description**  The investigator must be able to select a subset of the viewed evidence and extract it into another file, which will then be treated as evidence itself. Ftklipse must record this operation and keep relationship information in the database of evidence.

**Criticality**  This feature is of moderate importance.

Technical Issues

Dependencies with Other Requirements

3.3.10 Evidence Cloning

**Description**  The investigator must be able to copy a piece of evidence in full and optionally to rename the copy.

**Criticality**  This feature is nice to have.

Technical Issues

Dependencies with Other Requirements

3.3.11 Report Generation

**Description**  The investigator must be able to generate a report for a selected case that includes all evidence, their notes, as well as other report-specific data. The output formats can be PDF or \LaTeXe.

**Criticality**  This feature is critical.

Technical Issues
CHAPTER 3. SPECIFIC REQUIREMENTS

Dependencies with Other Requirements

3.3.12 Plug-in Architecture

Description Ftklipse allows third-party developers to create plug-ins that can be added at configuration time by system administrators.

Criticality This feature is critical.

Technical Issues

Dependencies with Other Requirements

3.3.13 Access Control Management

Description Ftklipse operates with an access control list for each case, piece of evidence, and report information. Each user must be authenticated and each operation must be authorized in the view of the user’s access rights. Notably, the rights that must be implemented are:

- View rights over a case or piece of evidence. This defines if the user is authorized to be aware of the existence of a given case or piece of evidence.

- Read rights over a case or piece of evidence. This defines if the user, being previously granted view rights over the object, is able to read the case’s information or visualize or operate on a piece of evidence.

- Write rights over a case or piece of evidence. This defines if the user is authorized to add to the general case notes or the evidence notes. This also defines if the user is allowed to add evidence to a given case.

By default, Ftklipse must offer default access rights based on the user’s role, as well as default access rights for different categories of objects.

Ftklipse must provide GUI tools to manage the both user and object rights.
CHAPTER 3. SPECIFIC REQUIREMENTS

Criticality  This feature is important, not critical.

Technical Issues  The implementation of the access control algorithm can be complex. Furthermore, some administration functions (such as the impact of a redefinition of default rights) require some thought to ensure that no previously confidential information becomes publicly available.

Dependencies with Other Requirements

3.3.14 Tool-specific defaults and configuration screens

Description  Each tool is responsible to maintain its state, notably regarding its default settings which must be modifiable by the user and preserved from one run of ftklipse to another.

Each tool must supply a screen that allows to set the proper parameters before the operation of the tool.

Default options are to be used on direct invocation of the tool.

Criticality  This feature is important

Technical Issues

Dependencies with Other Requirements

3.4 Performance Requirements

Ftklipse does not have any particular performance requirements

3.5 Logical Database Requirements

A database is required in order to store the case management and chain of custody information.

The database must be able to store:
CHAPTER 3. SPECIFIC REQUIREMENTS

- The relationship between parts of the evidence
- The operations done on the evidence, including its time stamp, its description and the investigator that performed it.

The information that must be tracked by the database is the following:
- The case’s meta-information (ID, details, description, timestamps, investigators)
- The case’s evidence.
- The user credentials.
- The object access control lists.
- The chain of custody over every piece of evidence. This includes the cryptographic hash sums, the operations performed on the evidence and the principal who performed it.

3.6 Design Constraints

The design must take in consideration that the base implementation language is Java. It also must take in consideration the different options of the tools that can be plugged into it.

3.7 Software System Attributes

In this section, we describe the non-functional attributes of Ftklipse.

3.7.1 Security

3.7.2 Reliability

The software must behave correctly during 20 continuous hours of operation.
3.7.3 Availability

There are no availability constraints.

3.7.4 Maintainability

The software must allow for tool plug-ins to be integrated automatically. The software must also be self-updatable.

3.7.5 Portability

The software must operate on POSIX and Windows systems. Tools integrated in the software must be adjusted accordingly.
Bibliography

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Chapter 4

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