The Influence to Information Security Software by Programming Languages

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Abstract - Development and selection is important for good software. In particular, information security software has characteristics of emphasizing security, and therefore it is very important to select a programming language when developing software.
This paper is intended to compare and explain programming languages used in developing information security software by comparing ISO/IEC 9126 and CC with the characteristics of information security software.

Key-Words: - Programming language, Information Security software, IOS/IEC 9126, Software Evaluation, Information Security Software Features, CC

1 Introduction

A part operated by hardware is controlled by software owing to fast computing speed. Accordingly, an advantage of improving flexibility and maintenance is brought. However, software largely depends on the expression and computing capability of programming language used in the development of software, and developer’s experience and accumulated technology makes a big difference in performance. In particular, these days when a system becomes complex and distributed, a controversy about the stability of software system and the preciseness of programming language is largely aroused.[1]
This paper is intended to analyze elements for evaluating an effect produced by programming language in developing information security software by comparing C language with JAVA language used most.

2 Related research

This chapter will discuss an effect produced by programming language in developing information security software by checking ISO/IEC common criteria and security element among software evaluation model through comparing the characteristics of information security software and the characteristics of C and JAVA programming language.

2.1 Information Security Software

Korea Internet & Security Agency (2010) defines information security SW as software run in order to prevent information damage · alteration· leak and so on during the collection · processing · storage · search · transmission · reception of information. Information security emphasizes measures against information leak, destruction, and alteration intentionally made to occur by human being. Information protection is a comprehensive term that includes measures against infringement by a mistake of human being or a natural disaster that occurs by chance as well as intentional infringement. Information protection is defined in various forms according to each country, and it is defined as ‘what is to devise managerial and technical means in order to prevent information damage · alteration· leak and so on during the collection · processing · storage · search · transmission · reception of information’ in Article 2 of Framework Act on Infomatization Promotion.[8]

2.1.1 Information Security Software Features
In case of information security software, the most important quality is security differently from general software. Features such as integration compatibility, maintainability, reliability, usability, high performance that is performance element shall be considered. [11]

(1) High performance
General software is run and used when necessary. However, information protection products shall be always run in order to protect assets inside operating environment. [11]

(2) Usability
It shall be easy to understand a function, interface, message, and help, and so on and to learn a function in order that any user who uses information security software can easily and conveniently use information security products. [11]

(3) Reliability
Information security software shall have its own response capability against a defect that makes the product down in using these or a defect that puts the product severely out of order so as to guarantee that it is always run. And it shall be capable of taking measures so that it can prevent a severe error that may occur due to being mishandled by user. [11]

(4) Maintainability
A new weak point may always appear in information security software. And in case a new weak point appears, the information protection product shall be made to be capable of dealing with the new weak point by upgrading the information protection product. [11]

(5) Integration compatibility
It shall be possible to be successfully installed and removed according to installation and removal procedure. And in case of upgrade, it shall be possible to use a function and data used in the previous version in the same way as before. [11]

2.2.2 Java language
Java programming language is based on C language and C++ language. However, Java language aims at purer object-oriented [6, 10] programming language than C++ language. And Java language doesn’t include feature that is complex and may easily cause an error, which C++ language has. Java language syntax is comparatively simple, and has an aspect where the use of keyword is natural in comparison with C language or C++ language. [4]

2.2.2 Compare C and Java language

Table 1 Compare C and Java language(Modified from http://introcs.cs.princeton.edu/java/faq/c2java.html) [10]

<table>
<thead>
<tr>
<th>Thing</th>
<th>C</th>
<th>java</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of language</td>
<td>function oriented</td>
<td>object oriented</td>
</tr>
<tr>
<td>basic programing unit</td>
<td>function</td>
<td>class = ADT</td>
</tr>
<tr>
<td>portability of compiled code</td>
<td>possible with discipline</td>
<td>yes</td>
</tr>
<tr>
<td>security</td>
<td>no, recompile for each architecture</td>
<td>yes, bytecode is &quot;write once, run anywhere&quot;</td>
</tr>
<tr>
<td>integer types</td>
<td>limited</td>
<td>built-in to language</td>
</tr>
<tr>
<td>floating point types</td>
<td>float usually 32 bit, double usually 64 bit</td>
<td>float is 32 bit IEEE 754 binary floating point, double is 64 bit IEEE 754</td>
</tr>
<tr>
<td>character type</td>
<td>char is usually 8 bit ASCII</td>
<td>char is 16 bit UNICODE</td>
</tr>
<tr>
<td>memory address</td>
<td>pointer</td>
<td>reference</td>
</tr>
<tr>
<td>ass-by-value</td>
<td>primitive data types, structs, and pointers are passed by value; array decays to pointer</td>
<td>all primitive data types and references (which includes arrays), are passed by value</td>
</tr>
<tr>
<td>allocating memory</td>
<td>malloc</td>
<td>new</td>
</tr>
<tr>
<td>de-allocating memory</td>
<td>free</td>
<td>automatic garbage collection</td>
</tr>
</tbody>
</table>
memory allocation of data structures and arrays | heap, stack, data, or bss | heap
buffer overflow | segmentation fault, core dump, un predicatab le program | checked run-time error exception
data hiding | opaque pointers and static | private
interface method | non-static function | public method
data type for generic item | void * | Object
polymorphism | union | inheritance
graphics | use external libraries | Java library support, use our standard drawing library
preprocessor | yes | no

Quality characteristics presented like <Fig.1> are achieved through a number of metrics. Because international standards like this have a lot of comprehensive and abstract part, standards suitable for the actual condition of their own country according to country are established and used with international standards as the center in order to apply the standards to a specific country. [7]

2.3 Common Criteria (CC)

CC required in all security products "security feature" a full set of class - family - component - elements are classified hierarchically through. Security for the correctness of the implementation of the "SARs" a full set of hierarchical levels were classified into seven steps that require a guarantee of assurance requirements (components) has defined. Additional requirements included in this class, if the use Argumentation (eg: EAL3). Higher than the security level of the lower level of assurance is complete, is a strict and formal. Between the level of assurance integrity, rigor, and information has formed a relationship. Information protection system based on the type of product CC select the part of the security functional requirements and the security level of seven steps by selecting one of the PP or ST is configured. [2, 3]

Common criteria are largely composed of 3 parts. Introduction and general model is presented in Part 1, and security functional requirements are included in Part 2, and security assurance requirements are included in Part 3.

3 Research Model

Information security software quality model is defined by extending a software quality model defined in ISO/IEC 9126 through the analysis of security function and performance on the basis of information security software characteristics like [Fig. 2]. [11]
4 Conclusion
This paper arranged an effect produced by a programming language in developing information security software. An evaluation model was presented in consideration of the characteristics of programming language by grasping the characteristics of information security software, CC, and ISO/IEC 9126 that is a software quality model. An information protection product is changing from hardware to software. Besides, an integrated information protection product is preferred in order to manufacture a product suitable for the changing environment. It is important to select a programming language that becomes the basis of software development, if the role of highly flexible software becomes important in the information protection product market changing like this. The limit of this paper is comparison between C language and Java language that is representative programming language. Programming languages are very diverse. And even now, many languages convenient for human being come into the world. A study on evaluation model in consideration of the characteristics of these languages shall continue.

Acknowledgement
This research was supported by the MSIP(Ministry of Science, ICT & Future Planning), Korea, under the "Employment Contract based Master's Degree Program for Information Security" supervised by the KISA(Korea Internet Security Agency)(H2101-13-1001)

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