Software Re-Engineering

Lecture: 04

Dr. Syed Muazzam Ali Shah

Department of Software Engineering

National University of Computer & Emerging Sciences

muazzam.ali@nu.edu.pk

Sequence [Todays Agenda]

Content of Lecture

- Introduction
- Usage of reverse engineering
- Reverse engineering related topics
- Reverse engineering model
- Example tools
- Issues
- References

Scenario

- A company wins a maintenance contract to maintain a Office Automation System. However, the list of document that the client only has are as follows :
  - Software requirement specification (SRS)
  - Old Software Design Document (SDD)
  - Object code/ java class file /source code
- How to understand the software structure?

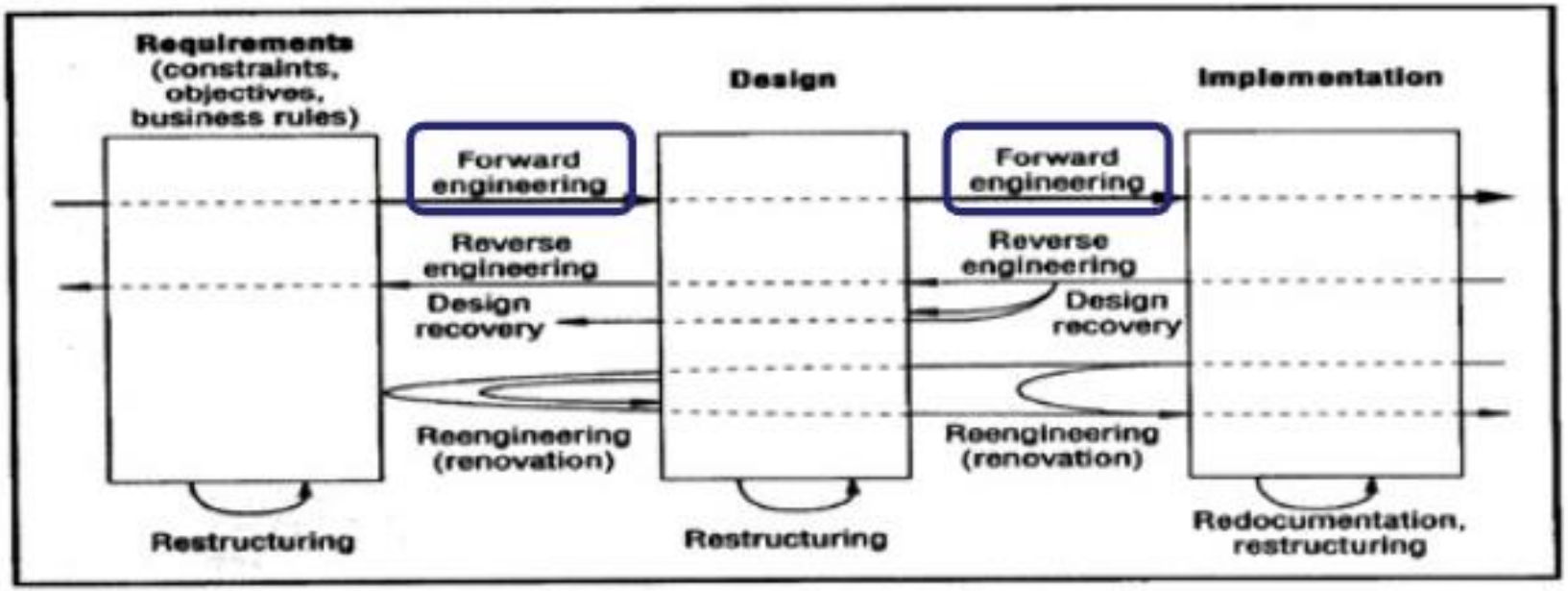
Introduction

- Reverse engineering is the process of analyzing a subject system to [16]
  - Identify the system's component and their relationship.
  - Create representations of the system in another form or at a higher level of abstraction.

Usage of Reverse Engineering

- Usage of Reverse Engineering
  - To support software engineers in the process of analyzing and understanding complex software systems during maintenance activities [13].
  - To retrieve missing design documents from the existing source code in an abstract model UML format for studying both the static structure and dynamic behavior of a system.[2]

Reverse Engineering

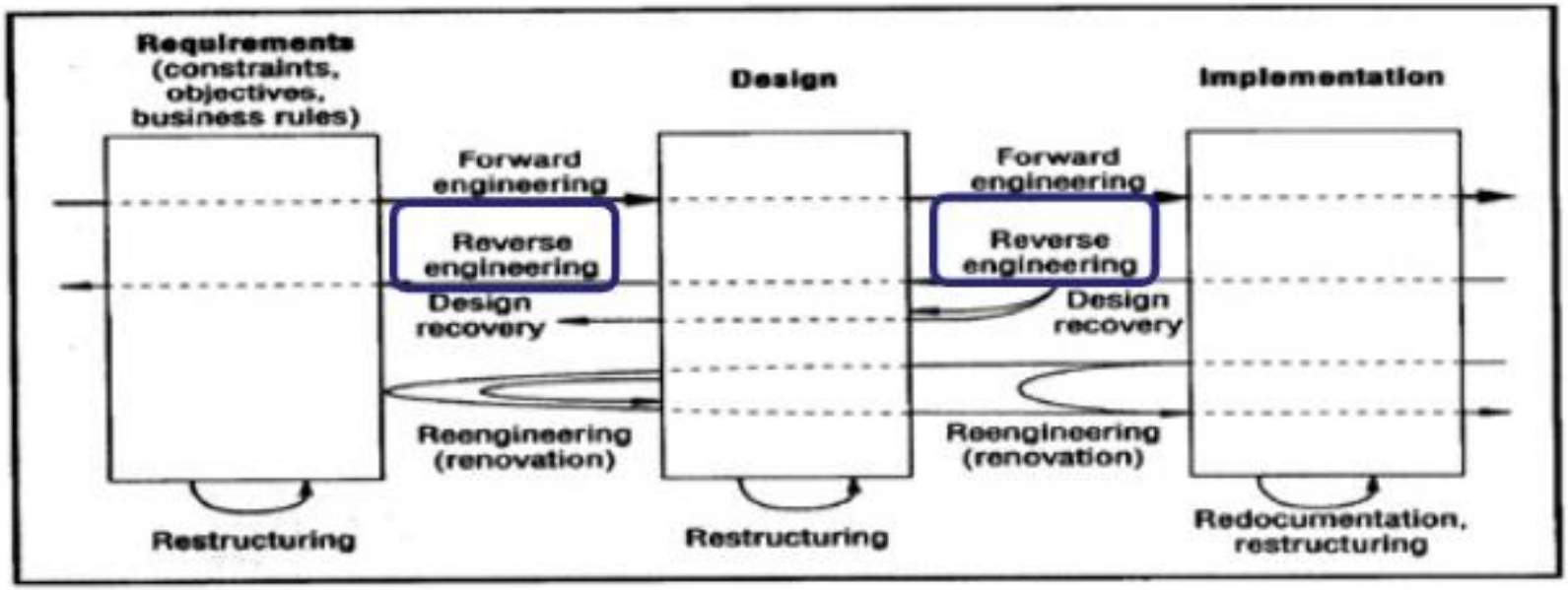


i. Forward Engineering

Traditional process of moving high level abstraction and logical to implementation of a system.

Reverse Engineering

Reverse Engineering and Related Topic [16]

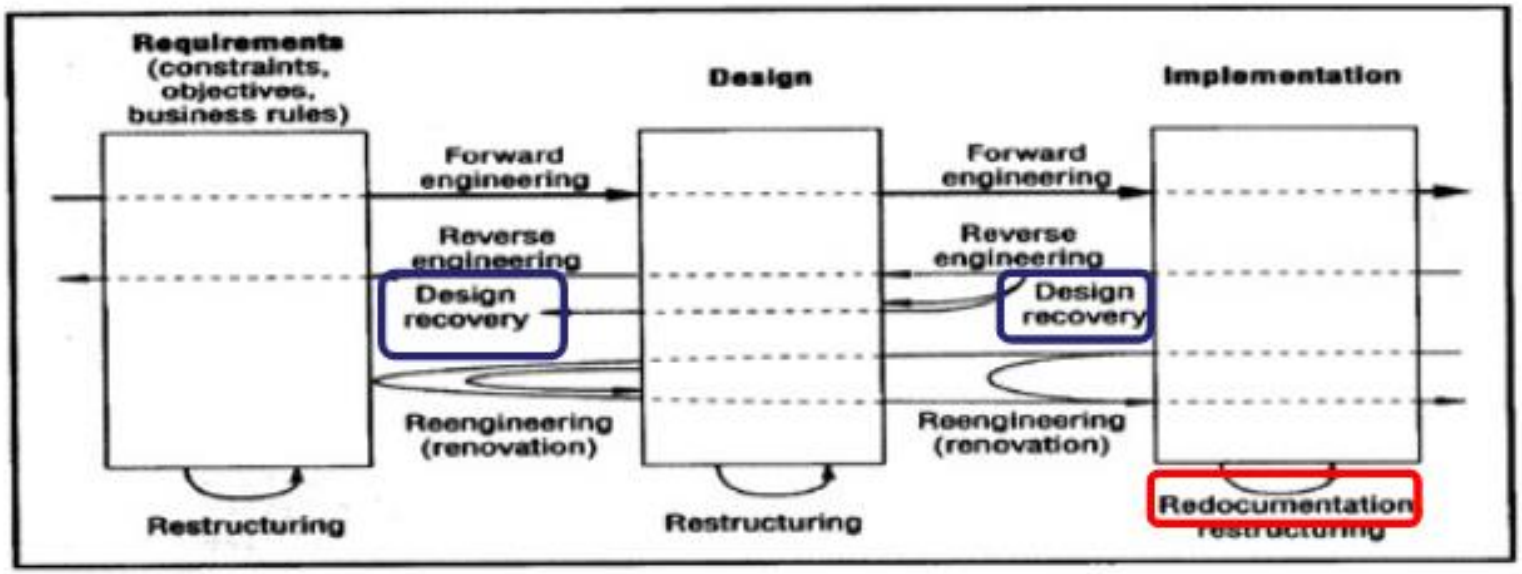


ii. Reverse Engineering

It is a process of examination, not change of replicate. Two subarea of reverse engineering are redocumentation and design recovery.

Reverse Engineering

Reverse Engineering and Related Topic [16]

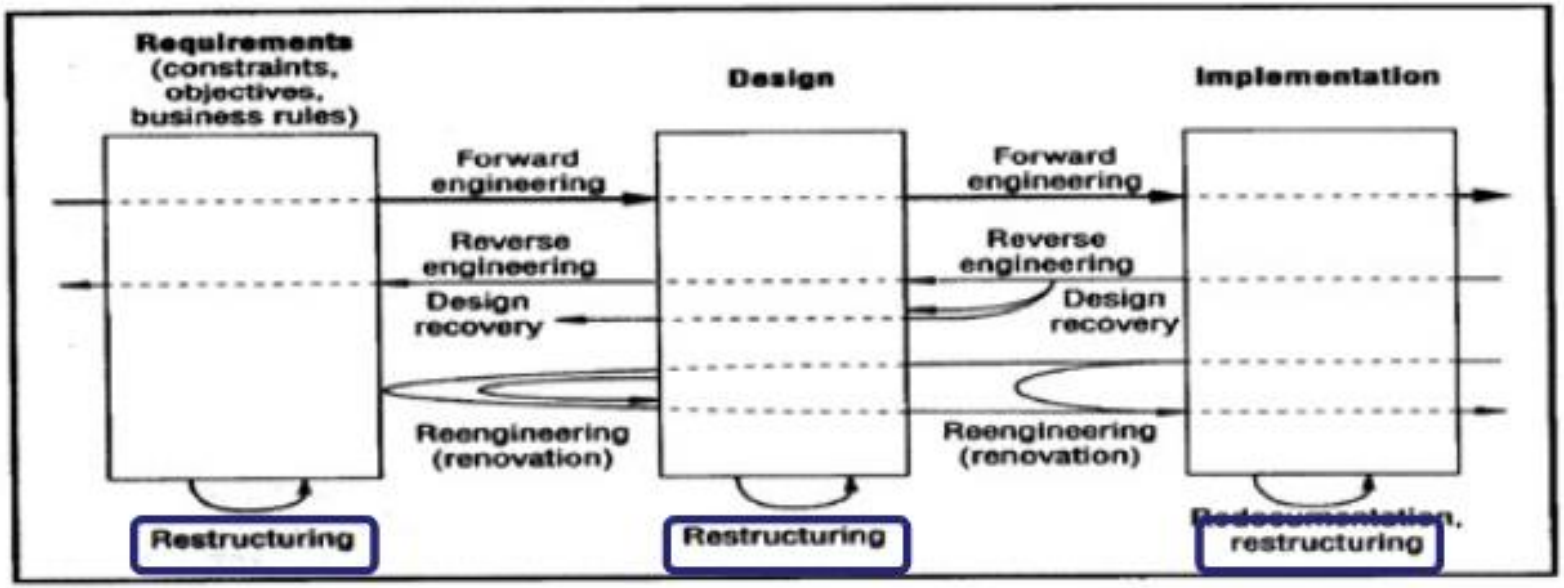


iii. Design recovery
Reproduce all information required for a person to fully understand about the system

iv. Redocumentation
Creation or revision of a semantically equivalent representation within the same relative abstraction level

Reverse Engineering

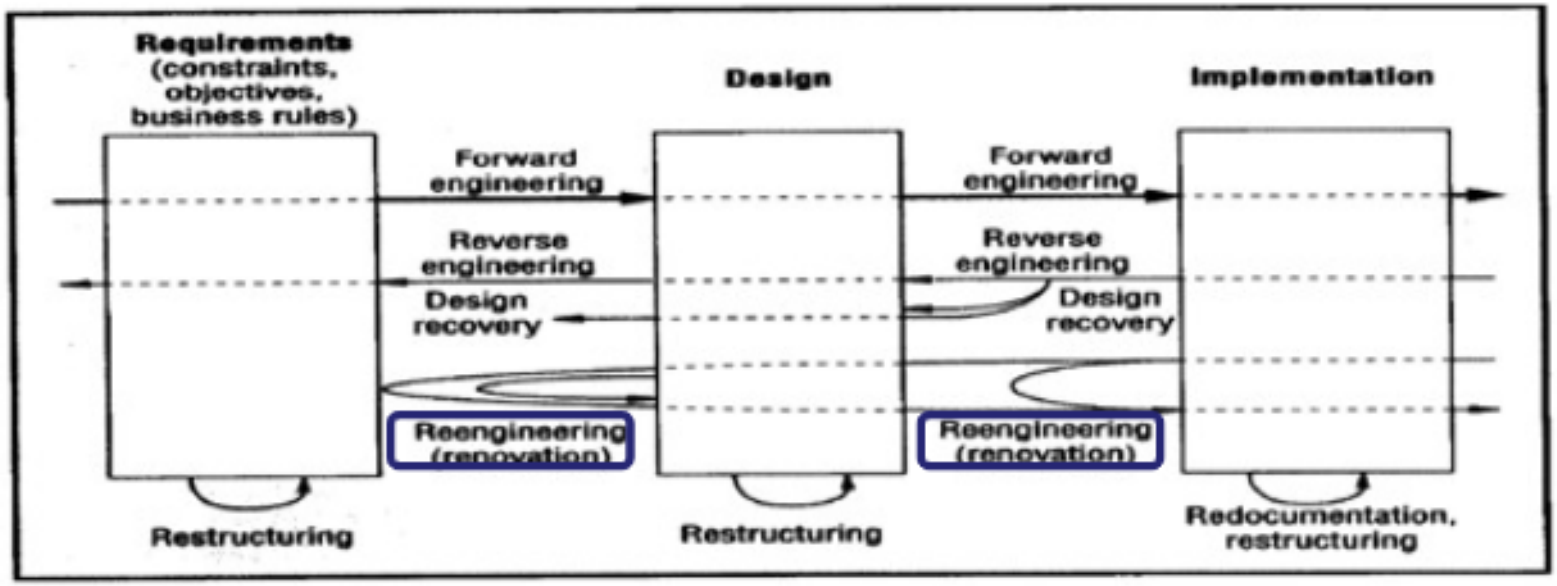
Reverse Engineering and Related Topic [16]



v. Restructuring
Transformation from one presentation to another while remain system's external behavior (functionality and semantic)

Reverse Engineering

Reverse Engineering and Related Topic [16]

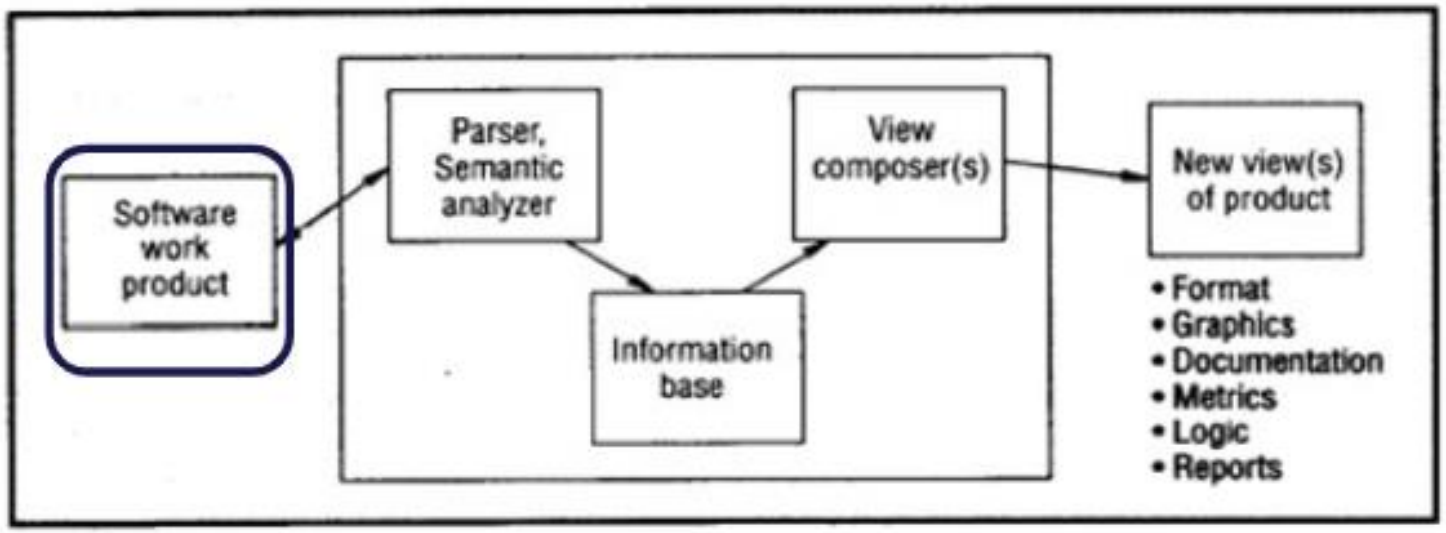


vi. Reengineering

It is also known as reclamation and renovation. Reengineering exam and alter subject system to reconstitute it in a new from and the subsequent implementation of the new form.

Reverse Engineering

Reverse Engineering Model



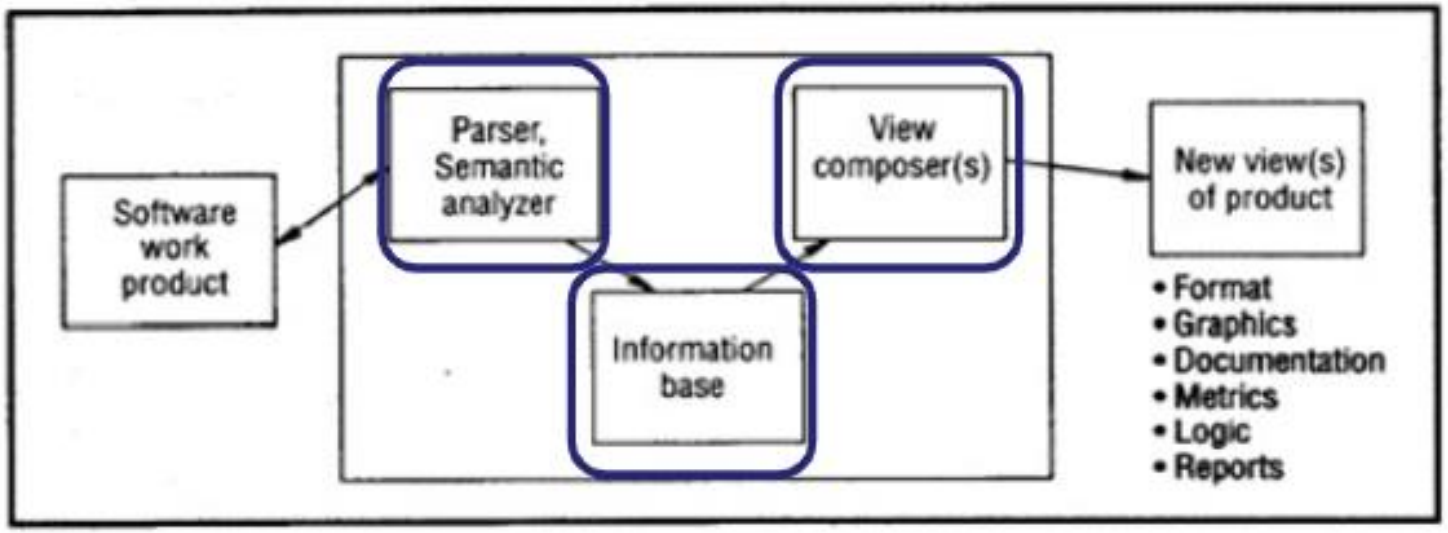
Input :

Software work product such as :

a. Source code (.c, .cpp, .java)
b. Object code (.o, .class)

Reverse Engineering

Reverse Engineering Model



Process :

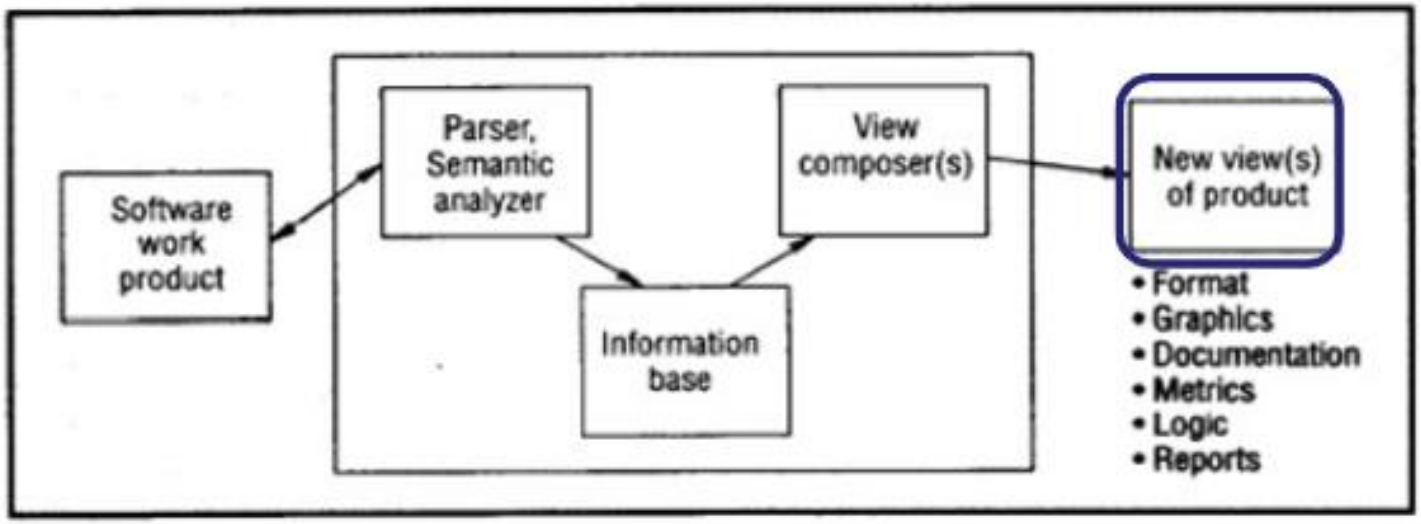
i. Parser, Semantic analyzer
   Analyze input

ii . Information Base
   Store analyzed information

iii. View composer
   Prepare information to be viewed as output

Reverse Engineering

Reverse Engineering Model



Output :

Result of Reverse Engineering that may contain item as follows

i. Format (XMI/XML/GXL)
ii. Graphics (UML)
iii. Documentation (javadoc)
iv. Metrics (soft. Metric)
v. Logic
vi. Reports

Example Tools

Tool	URL	License	Operating systems	Supported languages
AmaterasUML Eclipse plugin 1.2.2	http://amateras.source.jp	free	Microsoft Windows Linux Mac OS X	Java
ArgoUML 0.24	http://argouml.tigris.org	free	Microsoft Windows Linux Mac OS X	Java
IBM Rational Software Architect 7.0	http://www-306.ibm.com/software/awdtools/architect/swarchitect/index.html	comm	Microsoft Windows Linux	Java
JGrasp 1.8.6	http://www.jgrasp.org/	free	Microsoft Windows Mac OS X	Java
Microsoft Visio 2007	http://office.microsoft.com/en-us/visio/default.aspx	comm	Microsoft Windows	C++ C# Visual Basic
NetBeans 5.5	http://www.netbeans.org/	free	Microsoft Windows Linux Mac OS X Solaris	Java
StarUML 5.0	http://staruml.sourceforge.net/en	free	Microsoft Windows	Java C++ C#
VisualParadigm for UML 6.0 Enterprise Edition	http://www.visual-paradigm.com	comm	Microsoft Windows	Java C++ Ada PHP

Issues

- Several issue(s) encountered
  - How to validate the correctness of the result?
  - What type of diagram do reverse engineering tool capable to reversed?
  - How to choose a good tool?

Conclusion

- Reverse engineering tools can be used to enhance system comprehension and retrieving missing design document.
- Although the correctness and completeness of the tools result is varies and sometimes questionable, however, it can be a good starting option to understand a system.

References

- [2] Reverse Engineering UML class and sequence diagrams from Java code with IBM Rational Software Architect, Fenglian Xu, Alex Wood, IBM Technical Library United Kingdom, 2008
- [13] A Comparison of four Reverse Engineering Tools, Bernt Bellay and Harald Gall, Technical University of Vienna, Austria, 1997 Proceedings of the Fourth Working Conference on Reverse Engineering
- [16] Reverse Engineering and Design Recovery : A taxonomy, Elliot J. Chikofsky, James H. Cross II, IEEE Software, January 1990
- [22] Evaluation of some CASE tools for reverse engineering and application generators, Krešimir Fertalj, Faculty of Electrical Engineering and Computing, University of Zagreb, 2007


Thank You!