

TUTORIAL - 1

UI9CS012

1> Explain How the universal use of the web has changed software systems. Also, Explain why there are Fundamental ideas of software engineering that apply to all types of software systems.

1> The universal use of web has transformed software systems and software systems engineering. Software Engineering has proven to be continuous development process. In the beginning, the web had very few certain effects on software systems, unlike we have it today.

These days, the high use of web based software development has highly affected the software Industry. The points below are to show this:

i) In place of monolithic development, most of the applications are developed for web users.

ii) The updating and maintenance of web-based software is easy. Changes made at one place will have effect globally.

iii) Software is developed in parts. One part is developed at one place and second is developed at any other place. By using web, it becomes easy to collect all parts to make a working app.

iv) Popular Technologies like HTML5, Ajax, Reactjs, etc are most widely used for web software development. These are the web based technologies that a vast majority of people interact with on a daily basis.

Because of all software systems having common quality attributes, including availability, modifiability, performance, security & safety, testability & usability. The Fundamental software Ideas provides common solution/tactics to support those qualities.

2.7 Software is the differentiating characteristics in many computer-based products and systems. Provide examples of two or three products and at least one system in which software, not hardware is differentiating element.

2.7 Yes, software is differentiating characteristics in many computer-based systems and products. Here are the examples:

Products Examples: Cellular Phones and Pocket PC's.

System's Examples: Automated Teller Machine (A.T.M.)

3.7 Explain why professional software is not just programs that are developed for customer.

3.7 The software systems which are developed for any specific user to simplify their specific business requirements are known as professional software. These are not just simple programs.

Following points show how professional software is different from normal code:-

- i) Professional software has certain Industrial standards which must be followed for their use and development.
- ii) It requires design's document, support for user platform, user manual and instructor.
- iii) A professionally developed software is often more than just a single program. The system consist of a number of separate programs and configurations files that are required to setup the software.
- iv) For example, a word processing system consist of executable program, user manual and the document such as requirements

and the design needed to produce the executable program.

v) Updating and Maintenance is also required in the software.

- 4> The 1988 Internet Worm - Write detailed description of the given case. (2/3 pg)
- The case study should have detailed Analysis which shows how worms can propagate by taking advantage of security vulnerabilities and how the programming languages failed to cause such vulnerabilities.
- 4> The 1988 internet worm was the first major worldwide computer security incident where a malware propagated throughout the internet. This worm had infected unix servers, taking advantage of different types of vulnerability in installed code such as 'send mail' & 'finger'.
- (1) The lessons learnt from that incident are still valid and suprisingly perhaps, the vulnerabilities identified that allowed the worm to cause such problems are still present in some modern software.
- 'Worm' - can be defined as program that can spread itself across a network of computers.
- (2) The perpetrator of the worm (Robert Morris, a graduate student at Cornell University) meant no harm but was experimenting with what was possible. In itself, the program did no damage caused extensive loss of system service and reduced system responsiveness in thousands of host computers.

Worm was made of two parts

- i) The main program that worked for other machines that might get infected and tried to find ways of getting into those machines
- ii) A vector program (99 lines of c) that was compiled and run on the infected machine and which then transferred the control to

main program to continue the process of infection.

Following are the security vulnerabilities exploited by worm:

i) Finger :- It is an identity program that is written in C and run continuously. C did not have bound checking on arrays. Finger expects an input string but the writer of the worm noticed that if a string longer than what was allowed for was presented, this overwrote part of memory.

Hence, by designing a string that included machine instructions and that overwrote a return address using which the worm was able to invoke a remote shell, that allowed privileged commands to be executed.

ii) Send Mail :- It is a principal mail distribution program, it routes mails. The worm took advantage of a debug facility that was often left on and which allowed a set of commands to be issued to the sendmail program.

This allowed the worm to specify that information should be transferred to new hosts through the mail system without having to process normal mail messages.

iii) Password Cracking :- Unix passwords are encrypted and are available in encrypted form in `/etc/passwd`. The worm encrypted list of possible passwords and compared them with the password file to discover user passwords.

It used a list of about 400 passwords / common words that are known to be used as passwords. It exploited fast versions of the encryption algorithm that were not envisaged when UNIX scheme was designed.

iv) Trusted Logins: On UNIX, tasks can be executed on remote machines. To support this, there is the notion of a trusted login so that if a login command is issued to a machine Z from user Y in machine X, then Z assumes that Y is trusted user as X might have already carried out the authentication; hence no password required. The worm exploited this by looking for machines that might be trusted. It did this by examining files that listed machines trusted by current machine and then assumed reciprocal trust.

5> Differentiate between a) Software Engineering and Computer science
b) Software Engineering and system engineering.

5> a) Software Engineering

① It mainly focusses on the application of engineering, processes for software development, maintenance, and design in variety of ways.

② S.E. applies all the standards and principles of engineering to design, develop, maintain, test and evaluate computer software which is also known as life cycle of software development.

③ It involves study and application of software only.

④ Software engineers are programmers who perform various quality assurance techniques in order to test the general behaviour of software.

Computer Science

① The study of principles and use for computers covered theory and applications takes the computer science in broader terms.

② Computer science is basically formed with collection of computer engineering, computer science, Information system, Information Technology and Software engineering.

③ It involves study of hardware and software both.

④ Students studying computer science study concepts of various subjects like mathematics, EE, Physics & mgmt Info syst.

Software Engineering

Computer Science

⑤ It is a structural process of checking, Verifying, finding the errors and bugs according to need of software and then provide a solution for removing that bug.

⑥ Software Engineering involves some area of study which are Software Development, Software Testing and Quality Assurance.

⑦ Software Engineering has not compulsory project management but knowledge of project management is a plus.

⑧ It majorly concern to apply engineering for the creation, maintenance and designing the software in order to build different products.

⑤ It is not a structural process as everything is to be done in a process and required proper study before executing.

⑥ Computer Science involves areas of study which are Networking, Artificial Intelligence, Data Base systems etc.

⑦ Project management is an internal part of study in Computer Science.

⑧ It majorly concern to apply engineering in software's and hardware devices.

b) Difference between System Engineer and software engineer.

System Engineer

① A system engineer is a person who deals with overall management of engineering products during their life cycle.
(focusing more on physical aspects)

Software Engineer

① A software engineer is a person who deals with designing and developing good quality of software applications/ software products.

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| ① System Engineers Follows an interdisciplinary approach governing the total technical and managerial effort required to transform requirements into solutions. | ② Software Engineers Follows a systematic and disciplined approach of software design, development, deployment and maintenance of software applications. |
| ③ System Engineers mostly focus on users and domains. | ③ Software Engineers mostly focus on developing good software. |
| ④ Systems Engineering methods are Stakeholder Analysis, Interface specification, Design tradeoffs, configuration management, Systematic Verification & Validation, Requirements Engineering etc. | ④ Software Engineering methods are modeling, Incremental Verification & Validation, Process Improvement, Model-driven Development, Agile methods, Continuous Integration etc. |
| ⑤ It ensures correct external interfaces, interfaces among subsystems and softwares. | ⑤ It makes interfaces among softwares module, data and communication path work. |
| ⑥ Systems engineers require a broader educational background like Engineering, Mathematics and Computer Science. | ⑥ While Software Engineers require Computer Science or Computer Engineering background. |

Q.7 "It is Important to spend sufficient time for Requirement Analysis and specification phase of software development". Do you agree with this statement? Justify your Answer.

Q.7 YES, I agree with above statement.

The main aim of Requirement Analysis is to fully understand main objective of requirement that includes why it is needed, does it add value to product, will it be beneficial, does it increase quality of the project, does it will have any other effect.

All these points are fully recognized in prog problem recognition so that requirements that are essential can be fulfilled to solve business problems.

If this is not done well, there would be Time, Money & labour } loss.

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