Department of
Computer Science and Engineering

Title:Product operation factors: Reliability and Efficiency testing.

Software Testing & Quality Assurance Lab

CSE 434

Green University of Bangladesh

1 Objective(s)

- To be familiar with software reliability testing.
- To be familiar with software efficiency testing.

2 Problem analysis: Reliability

Reliability requirements deal with failures to provide service. They determine the maximum allowed software

system failure rate and can refer to the entire system or to one or more of its separate functions

2.1 Examples

- The failure frequency of a heart-monitoring unit that will operate in a hospital's intensive care ward is required to be less than one in 20 years. Its heart attack detection function is required to have a failure rate of less than one per million cases.
- One requirement of the new software system to be installed in the main branch of Independence Bank, which operates 120 branches, is that it will not fail, on average, more than 10 minutes per month during the bank's office hours. In addition, the probability that the off-time (the time needed for repair and recovery of all the bank's services) be more than 30 minutes is required to be less than 0.5%.

2.2 Sub factors of reliability

- System reliability
- Application reliability
- Computational failure recovery
- Hardware failure recovery

2.3 Calculation

To calculate the system or application reliability we have to go through each individual component of the system. There are two types of arrangement of system components.

1. Series components
2. Parallel backup components.

2.3.1 Series components:

Here, we can see in Figure 1, the series components of a system are denoted by A, B, C with their individual reliability R_a, R_b, R_c.
Let, the system reliability is R_s then, $R_s = R_a * R_b * R_c$ and the failure rate (FR)= $1 - R_s$.
Hence, we get R_s= 0.829 orR_s= 82.9 % and FR= 0.171 or FR= 17.1 %

Figure: 1

2.3.2 Parallel backup components:

Here, we can see in Figure 2, the series components of a system are denoted by A, B, C and a backup component of B is denoted by D with their individual reliability R_a, R_b, R_c and R_d.
Let, the system reliability is R_s then, $R_s = R_a * (1 - F R_b * F R_d) * R_c$ and the failure rate (FR)= $1 - R_s$.
Hence, we get R_s= 0.871 orR_s= 87.1 % and FR= 0.129 or FR= 12.9 %

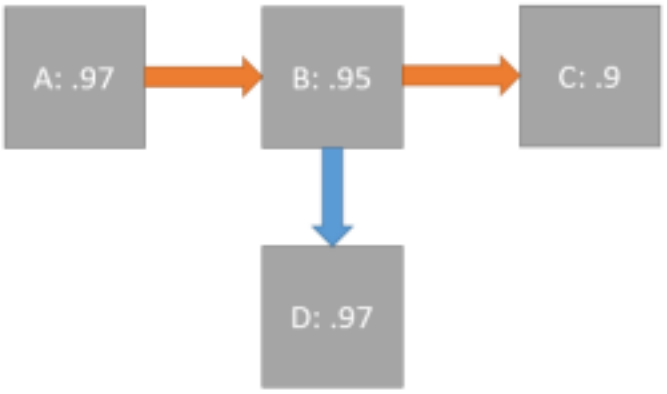

Figure: 2

3 Problem analysis: Efficiency

Efficiency requirements deal with the hardware resources needed to perform all the functions of the software system in conformance to all other requirements. The main hardware resources to be considered are the computer's processing capabilities (measured in MIPS – million instructions per second, MHz or megahertz – million cycles per second, etc.), its data storage capability in terms of memory and disk capacity (measured in MBs – megabytes, GBs – gigabytes, TBs – terabytes, etc.) and the data communication capability of the communication lines (usually measured in KBPS – kilobits per second, MBPS – megabits per second, and GBPS – gigabits per second). The requirements may include the maximum values at which the hardware resources will be applied in the developed software system or the firmware. Another type of efficiency requirement deals with the time between recharging of the system's portable units, such as, information systems units located in portable computers, or meteorological units placed outdoors.

3.1 Examples

- A chain of stores is considering two alternative bids for a software system. Both bids consist of placing the same computers in the chain's headquarters and its branches. The bids differ solely in the storage volume: 20 GB per branch computer and 100 GB in the head office computer (Bid A); 10 GB per branch computer and 30 GB in the head office computer (Bid B). There is also a difference in the number of communication lines required: Bid A consists of three communication lines of 28.8 KBPS between each branch and the head office, whereas Bid B is based on two communication lines of the same capacity between each branch and the head office. In this case, it is clear that Bid B is more efficient than Bid A because fewer hardware resources are required.
- An outdoor meteorological unit, equipped with a 1000 milli-ampere hour cell, should be capable of sup plying the power requirements of the unit for at least 30 days. The system performs measurements once per hour, logs the results, and transmits the results once a day to the meteorological center by means of wireless communication.

3.2 Sub factors of efficiency

- Efficiency of processing
- Efficiency of storage
- Efficiency of communication
- Efficiency of power usage (for portable units)

4 Lab Task (Please implement yourself and show the output to the

instructor)

1. Find out the system reliability.

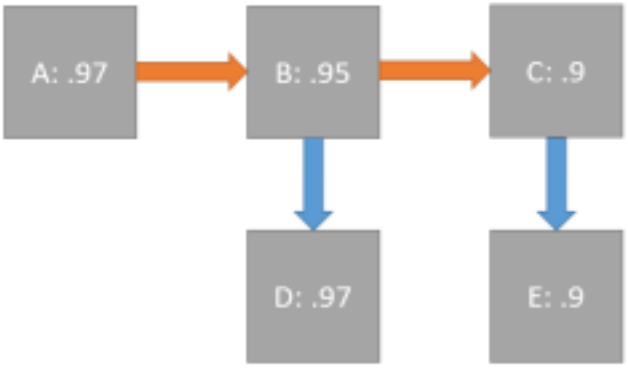

Figure: 3

2. Compare the efficiency among fig 1, fig 2 and fig 3.

5 Lab Exercise (Submit as a report)

1. Find out the system reliability.

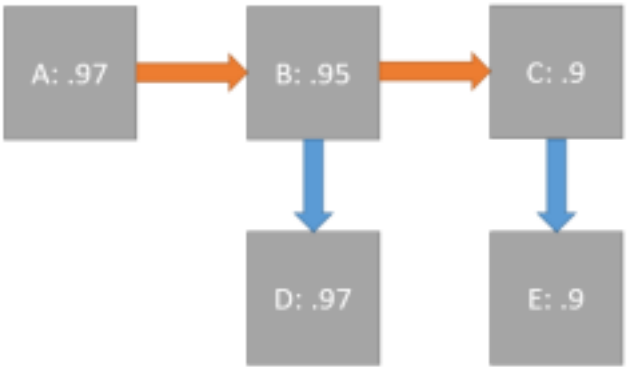

Figure: 3

2. Compare the efficiency among fig 1, fig 2 and fig 3.

6 Policy

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7 Resources

https://www.tutorialspoint.com/software_testing_dictionary/test_management.htm
https://www.geeksforgeeks.org/test-environment-for-software-testing/