SOFTWARE ENGINEERING CS 487
Participation-3

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# Participation-3

1) Describe 2 systems that you depend on and discuss how reliable you find each to be.

   Two crucial systems that I kind of depend on are:

- **Devices** (such as laptops, tablets, or smartphones)
- **Internet Connectivity**

   To explain these systems it's important to consider the factors of **Dependability Considerations**

   - **Repairability**
     – The ability to recover from failure
     – Diagnosis, analysis, “surgical” repair, etc.
   - **Maintainability**
     – Economic adaptation to new requirements
   - **Survivability**
     – The ability to withstand “attack”
     – Recognize, resist, and recover
   - **Error tolerance**
     – Avoid or at least tolerate user errors
     – Autocorrect if possible
     – Teach the user along the way

**A. Explain how this reliability can be formally tested.**

   Considering Student POV :
   **Devices (such as computers, tablets, or cell phones)**

   - Device dependability is critical for students like me since they utilise it to access resources for research, complete homework, and participate in online classes. gadget quality, age, and maintenance may all affect

how reliable a gadget is. Although dependable, well-maintained equipment occasionally has hardware or software problems.

- **Formal Assessment of Dependability:**
  - Hardware diagnostics: Performing checks on the device's components to find any possible problems.
  - Software upgrades: To ensure security and dependability, ensure devices receive frequent software upgrades.
  - Battery Performance Testing: Evaluating portable devices' battery life and performance to guarantee dependability throughout prolonged use.

**Internet Connectivity**

- **Reliability:** The capacity to use online resources, participate in virtual classrooms, and turn in assignments can all be greatly impacted by the consistency of their internet connection. Even while internet connectivity has improved overall, there may still be occasional disruptions and fluctuations.

- **Formal Reliability Testing:**

  - Speed testing: Measuring the reliability and speed of the internet connection using programmes like Ookla's Speedtest.
  - Testing for redundancy involves determining how dependable backup internet sources, like mobile hotspots or other ISP connections, are.
  - Ping testing: Ping tests are used to assess the connection's dependability and consistency.

**B. Discuss the engineering of each system which you believe contributes most significantly to its reliability.**

The engineering of devices and internet connectivity significantly contributes to their reliability.
Considering factors like

- **Risk Management**
- **Failure Categories**
- **Hardware failure**
  – Design errors
  – Component failure

- **Software failure**
  – Requirements issues
  – Design errors
  – Coding defects
- **Operational failure**
  – User misuse

- **Engineering of Devices:**

1. **Durability and Hardware Quality:**
   Devices that are engineered with premium parts, long-lasting materials, and thorough testing are far more reliable. Processors, memory, and storage are examples of well-engineered hardware that improves a device's overall performance and endurance over time, increasing its reliability.

2. **Optimisation of Software and Operating Systems:**
   The development of reliable operating systems and software is essential to the dependability of devices. Device reliability is increased by well-designed operating systems and software programmes that are intended to use resources as efficiently as possible, minimise mistakes, and offer smooth user experiences.

3. **Power management and batteries:**
   The long-term dependability of portable devices depends on the creation of reliable power management and battery technologies. Extended battery life and constant performance are guaranteed by well-designed battery systems and effective power management features, which raises the overall reliability of devices.

- **Engineering of Internet Connectivity:**

1. **Network Infrastructure and Redundancy:**
   Reliability of internet access is greatly enhanced by the architecture of strong network infrastructure, which includes redundancy mechanisms, reliable routers, and high-speed data transmission systems. Even in the face of network failures or heavy traffic loads, reliable and continuous connectivity is ensured by well-designed network architecture.

2. **Security and Data Transmission Engineering:**

The engineering of secure data transmission protocols, encryption mechanisms, and network security features is vital for the reliability of internet connectivity. Advanced engineering practices in network security help protect data integrity, privacy, and prevent unauthorized access, thus enhancing the overall reliability of internet connectivity.

3. **Data processing and QoS (quality of service):**
   A key factor in guaranteeing reliable and constant internet connectivity is the development of signal processing technologies and Quality of Service (QoS) procedures. An internet connection's overall stability is increased by well-designed signal processing and QoS features, which also optimise data delivery, lower latency, and prioritise important traffic.

2). What is the “value” of reliability?, and how can we measure it / test for it? Discuss in terms of nonfunctional requirements and associated test cases.

In software and systems engineering, the "value" of dependability cannot be overstated because it directly affects customer satisfaction, trust, and the overall success of a product or service. Reliability is the ability of a system to carry out its duties accurately and consistently over an extended period of time without experiencing malfunctions or unforeseen errors. It's a big non-functional demand that's regularly evaluated and tested using different techniques.

1. **User Satisfaction:** Maintaining and gaining the trust of users demands consistency. Users want software and systems to work as intended and not break unexpectedly since they depend on them for a range of tasks. A reliable system increases customer satisfaction and trust.

2. **Compliance and Legal Requirements:** Certain organisations must adhere to legal requirements as well as regulatory norms. Reliable solutions let businesses fulfil their obligations without running the risk of financial or legal repercussions.

3. **Business Reputation:** The dependability of a firm has a direct impact on its reputation.
Previous instances of unreliable software or systems can harm a business's credibility and reputation, which may result in lost sales opportunities and client attrition.

4. **Cost Savings:** Reliable systems save money on upkeep, assistance, and troubleshooting.

Operating costs are increased by unreliable systems' frequent requirement for additional resources to resolve problems.

**Establishing clear non-functional reliability criteria and developing test cases** to see whether these requirements have been fulfilled are necessary for measuring and testing dependability. These are a few techniques for measuring and evaluating dependability.

1. **Testing for Reliability:** Reliability testing is the process of evaluating the system's performance in multiple contexts to ensure it meets the defined dependability requirements. To uncover defects or places where dependability may be compromised, test cases are designed to mimic real-world situations and possible stress points.

2. **Describe the Conditions for Reliability:** Specify and measure reliability requirements precisely.
You may write, "The system should have an average uptime of 99.99% during a 12-month period," as an example.

Test cases:

- Write test cases including a broad range of scenarios, such as edge-case, worst-case, and best-case situations.
- Add inputs like huge information, multiple users, and unexpected events that challenge the system's dependability.

Dependability also has a significant positive impact on user trust, business reputation, cost savings, and compliance. Establishing criteria, writing relevant test cases, and continuously assessing and enhancing system performance are all necessary for measuring and testing reliability and ensuring that it satisfies or surpasses these specifications.

3). Discuss the role of user awareness in the runtime state of a system’s reliability.

When users engage with a system either directly or indirectly, user awareness plays a critical role in the dependability of the system throughout runtime. The following are some ways that user knowledge might impact a system's runtime stability:

1. **User-Initiated Actions:** User actions can directly affect a system's runtime dependability. Users are less likely to engage in actions that might lead to failures if they are aware of the system's limitations and suggested practices. For example, users who are aware of data entry

limitations are less likely to provide malicious or erroneous data that might compromise the reliability of the system.

2. **Error Reporting and Feedback:** When users encounter errors or problems while utilising the system, they may provide helpful feedback if they are aware of how it works and what to expect from it. Users have the option to report errors right away, which enables developers and system administrators to identify and address reliability problems in real time.
3. **Reaction to Warnings and Alerts:** Systems often notify users and provide warnings when they detect errors or potential malfunctions. It is essential for users to be aware of these warnings in order to acknowledge and follow them.
   Warnings may be ignored by users who don't understand their importance, which might lead to problems with reliability.
4. **Security Practices**: To prevent security breaches and boost system reliability, security measures like strict password management, authentication procedures, and data protection can be implemented. Careless or ignorant user behaviour might lead to security incidents that compromise the reliability of the system.

User awareness and a system's reliability during runtime are fundamentally related. Trained and aware users may play a major role in identifying, preventing, and resolving reliability issues, which enhances the system's overall performance and dependability. Thus, in order to guarantee the system's dependability, user education, feedback systems, and communication of system behaviours and expectations are essential.