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Code Changeability

Case Reference: Linux Kernal

Litcoder Parameter

Code Flexibility denotes the adaptability and extensibility of the codebase to accommodate future requirements and modifications. It emphasizes writing modular, reusable code, leveraging interfaces and abstraction to decouple components, and embracing principles such as dependency injection and inversion of control.

Code Changeability, a component of code flexibility, refers to the ease with which modifications, updates, or enhancements can be made to a software system's source code. It is a crucial aspect of software development, particularly in dynamic environments where requirements can evolve rapidly.

About Linux Kernal

The Linux Kernal released in 1991 by Linus Torvalds is a core component of Linux operating systems used in everything from smartphones to supercomputers, embedded systems to enterprise servers. It has a Monolithic kernel architecture and is licensed under GPLv2 an open-source model. Linux Kernel has contributions from 15,000 developers from around the world over the past 30 years as of September 2023. The rapid evolution of Linux along with its ubiquity have necessitated substantial investment to ensure code quality and security as vulnerabilities could have massive implications.

Problems in Linux Kernal Code

Over decades of development, the Linux kernel accrued significant technical debt such as lack of ability to refractor and improve design, suboptimal algorithm, etc. The code complexity escalated dramatically as it expanded to support a myriad of hardware and use cases. The codebase expanded to a mammoth 27.8 million lines of code as of 2020.

The architectural limitations stemming from its monolithic design have led to tight coupling between components, making it challenging to isolate and secure individual modules. This resulted in decreased maintainability, slower feature development, increased security vulnerabilities, and difficulties in supporting diverse hardware. Major vulnerabilities such as Dirty Pipe underscore the risks, given the extensive presence of Linux devices. Thus, there was an urgent imperative to address this complexity and debt through measures like refactoring, removing deprecated code, architectural updates to enhance modularization and proactive security reviews.

Some of the reasons causing this issue are the rapid pace of change, prioritizing new features over quality attributes, architectural challenges, weak incentives to improve quality, and unrealistic performance demands.

Solutions Linux Kernal Developers Adopted

Enhanced security response protocols, spearheaded by a dedicated **CNA (CVE Numbering Authority)**, now oversee vulnerability monitoring, ensuring swift deployment of critical flaw patches and implementing architectural enhancements to bolster modularization. These improvements involve the deliberate decoupling of subsystems, facilitating enhanced code isolation and fortification through refactoring endeavors such as the removal of redundant drivers and outdated code.

By mitigating coupling between components and employing robust code analysis tools for static bug and security issue detection, the code analysis tools' metrics spotlight overly complex modules for optimization. Moreover, the introduction of Long-Term Support versions not only provides a stable foundation for industry innovation but also allocates resources for architectural refinement. The integration of increased automated testing enhances code coverage to diminish new bugs and paves the way for seamless future refactoring endeavors.

References: Click Here