Extensibility, Safety and Performance in the SPIN Operating Systems - Critique

- Shashidhar Kumar Thangallapelli (862395355)

Summary:

The paper tries to address the problems faced by certain applications which require specialized performance and features which are not possible to achieve in conventional operating systems. It proposes SPIN operating system for this problem, which is an extensible operating system. It uses extensions for enabling specified features and performance tuning for certain applications. These extensions are written in type safe language Modula-3 and these are run in DEC alpha workstations. For this it is implemented using a monolithic kernel as it gives limited access to the kernel and memory resources, and of course the additional extensions for specialized functionality. It also mentions a way to provide extensibility, safety and better performance by using four techniques namely co-location communication, dynamic call binding, enforced modularity, and Logical Protection domain.

Strengths:

1. SPIN does deliver good performance benchmarks over the conventional operating systems without actually not degrading the performance of other applications in the memory which is the case of other conventional operating systems.
2. The fact that SPIN was able to handle the system configuration without an overhead of runtime conversion to the memory and processor as the extensions uses Modula-3 which facilitates direct access to system interfaces.
3. The idea of isolating the extensions so that if an extension fails then the applications tied only to that particular extension will be failed not the others.

Weaknesses:

1. The automatic storage management implementation is bad in SPIN. For the clients that require hefty amounts of memory the garbage collector will be triggered too frequently and thus cause adverse effects.
2. The Event dispatcher's latency is considered critical for SPIN as for every procedure and event is created and supposedly event dispatcher should dispatch those events. Thus, is not good for the system performance if there will be a failure or underperformance of event dispatcher.
3. The memory management has bad security in handling the objects returned to heap as malicious/bad clients can modify these freed objects for any undesirable causes.

Other Comments and Discussion:

Overall, the paper does try to solve the main problem that it is trying to tackle, which is specialized performance and features for certain applications using SPIN Operating System and also generalizing it for common day-to-day applications. Although, it felt similar to the Linux system shell extensions, I am impressed how the paper explains the process in details and the amount of flexibility and features it provides to certain applications. Nevertheless, considering the weaknesses, I think there still be a scope of improvement in terms of security and memory management. Looking forward, I believe there will be more ideas and improvements that will emerge in terms of operating systems and their performance, security, memory management, flexibility, so on.