Summary on Jan. 7's paper

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The paper title is *Exokernel: an operating system architecture for application-level resource management.* It is written by Dawson R. Engler, M. Frans Kaashoek and James O'Toole Jr.

In this paper, the authors propose a new operating system architecture, which contains a very simple yet efficient kernel and leave traditional operating system abstractions to application-level library system.

The authors claim that implementing abstractions, such as processes, file system storage, address spaces and inter-process communication will severely degrade the performance of application, since it is impossible to design such implementation that meets the special need of each specific application. In order to address this problem, the authors propose that the kernel, named *exokernel*, is only responsible to securely multiplex available hardware resources. It defines very low-level interface. In addition, an application-level software, named *ExOS*, works above the kernel and implements traditional operating system abstractions and other, if needed, abstractions specially tailored for applications running above it. Applications run above *ExOS* and use its interface.

The largest flaw of this architecture to me is the general applicability. In short, this architecture exploits specialization to improve efficiency. That is to say, for every specific application or specific group of application, there should be a library operating system to implement abstractions, including processes, virtual memory and so on. In order to build a general system which allows different kinds of applications, how many library operating systems must be implemented for those applications to run above? Another natural question is who will write these library operating systems. Application developer does not seem to be a good candidate, since they are not likely to be familiar with underlying hardware and they don't want to spend time on tediously implementing processes and virtual memory time after time. It is not a good idea to leave this job to service provider, since they can not predict the special need of applications. In fact, this problem is used by the authors to argue that traditional operating system limits the performance of application. This is a dilemma.

Additionally, in the experimental study, the authors implement a kernel and a library operating system. They carry out experiments under this circumstance and get encouraging results. However, this circumstance is far from what is like in real scenarios. In real scenarios, many library operating systems will run simultaneously

on a single kernel. Their impact on each other must be taken into account before getting any conclusion.