Motivation :

With increase in hardware resources such as adding processor cores, current OS systems fail to exploit the hardware when scaled up. With increase in diversity of hardware in a single system, such as cores with different ISA features and performance, the optimizations of OS designs become less efficient as they are made for common hardware case, and some OS systems are not adaptable to new hardware environment. Network effects are increasingly common in hardware designs, and OS should also be adaptable to this connecting nature of the hardware.

Key Idea :

The paper introduces multikernel model for OS, treating machine as a distributed system of independent cores, communicating with message passing and no memory is shared. The idea also aimed to make hardware-neutral OS, not specific for any machine architecture. Each core maintains a replica of the state, instead of shared state between all the cores. Thus, the state is closer to the cores and always available. Consistency is maintained between all the replicas of this state. The paper also implements Barrelfish, a prototype for this multikernel model and discusses its performance results.

Strengths :

* Message passing provides batching, isolation, better resource management and efficient scheduling on multiple and different cores.
* Inter-core communication, which is traditionally intensive hardware-dependent is implemented using messages. The distributed communication algorithms is independent of the hardware implementation details, hence it is compatible with hardware changes in the future.
* Multikernel is scalable in number of cores. The performance is constant with significant increase in cores, thus the paper accompolished its key problem of scaling the system using distributed model.

Weakness :

* Monitors are responsible for maintaining consistency among replicas of state in the cores, which is achieved by using agreement protocols. However, there is no specified mechanism for it. Consistency is a well known major problem in distributed systems, and the paper should have given insight on this problem.
* Barrelfish is just a light weight implementation of multikernel model and not a full-scale OS. Hence, the result shown for it does not certainly guarantee similar results from a complete implementation of the model.

Additional thoughts on paper :

The paper brings a new approach to the table of scaling and utilizing hardware resources with OS. It applies concepts and insights from distributed systems to the problems of scalability, adaptivity, and diversity in operating systems for future hardware. The paper does not gives complete research insight and the performance of Barrelfish. It does not give evaluation of complicated application workloads, higher-level operating system services such as a storage system, the system’s scalability beyond currently-available commodity hardware, or its ability to integrate heterogeneous cores. The performance of Barellfish is similar to that of Linux on CPU and IO workloads. I can say that Barrelfish is not the ideal implementation of complete OS on multikernel model, and it would be interesting to see result of a full-scale implementationof the model.